B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

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List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
12SETZ	12th Street East Treatment Zone
2008 CAP	Cleanup Action Plan issued in 2008
bgs	Below ground surface
BMP	Best management practice
CAA	Cleanup Action Area
CMP	Compliance Monitoring Plan
CPOC	Conditional point of compliance
CUL	Cleanup level
Consent Decree	Consent Decree 08-210610-7
DMR	Discharge Monitoring Report
DOC	Dissolved organic carbon
DOSH	Washington Department of Occupational Safety and Health
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
Eh	Redox potential
EPCRA	Emergency Planning and Community Right-to-Know Act
FRP	Fiberglass-reinforced plastic
GWTP	Groundwater treatment plant
HASP	Health and Safety Plan
HDPE	High-density polyethylene
HMEP	Hazardous Materials Emergency Plan
HMI	Human machine interface
HOA	HAND/OFF/AUTO
I-5	Interstate 5
ITTZ	Interurban Trail Treatment Zone
Landfill	B&L Woodwaste Landfill
LSAq	Lower Sand Aquifer

Acronym/ Abbreviation	Definition
Landfill	B&L Woodwaste Landfill
LSAq	Lower Sand Aquifer
µg/L	Micrograms per liter
MSL	Mean sea level
MTCA	Model Toxics Control Act
MSDS	Material Safety Data Sheets
NAVD88	North American Vertical Datum of 1988
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and maintenance
OMMP	Operations, Monitoring, and Maintenance Plan
ORP	Oxidation-reduction potential
OSHA	Occupational Safety and Health Act
PLC	Programmable logic controller
PPE	Personal protection equipment
PRB	Permeable reactive barrier
PVC	Polyvinyl chloride
RAO	Remedial Action Objective
SAP/QAPP	Sampling and Analysis Plan/Quality Assurance Project Plan
SCADA	Supervisory control and data acquisition
SCP	Spill Control Plan
Site	B&L Woodwaste Site
SOW	Scope of Work
SR 167	State Route 167
SWPPP	Stormwater Pollution Prevention Plan
Trust	B&L Woodwaste Site Custodial Trust
USAq	Upper Sand Aquifer
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WSDOT	Washington State Department of Transportation
ZVI	Zero-valent iron

1.0 Introduction

In response to documented releases from the B&L Woodwaste Site (Site), in 2008 the Washington State Department of Ecology (Ecology) issued a Final Cleanup Action Plan (2008 CAP; Ecology 2008) to remediate contaminated groundwater and achieve compliance with regulatory requirements established under the Washington State Model Toxics Control Act (MTCA). As described in the 2008 CAP, the Site includes the following areas:

- The B&L Woodwaste Landfill (Landfill) is an approximately 13-acre area on which woodwaste materials have been placed and covered by an engineered cap.
- The B&L Property, which includes the Landfill and the immediate surrounding area comprising the tax parcel under common ownership.
- Contaminated groundwater beneath and adjacent to the Landfill, some of which extends beyond the southern and western boundaries of the B&L Property.
- Contaminated ditch sediments adjacent to and extending to the west of the B&L Property.
- Contaminated groundwater beneath the wetlands area extending north from the Landfill and the agricultural property west and northwest of the Landfill.

As defined under the MTCA regulations (Washington Administrative Code [WAC] 173-340), the Site includes all areas that have been affected by releases from the Landfill. The 2008 CAP remedy provides a comprehensive, long-term solution to protect human health and the environment for site contamination.

Implementation of the 2008 CAP is described in Consent Decree No. 08-210610-7 (Consent Decree) between Ecology and Murray Pacific Corporation. As described in the Scope of Work (SOW; Exhibit B to the Consent Decree), the 2008 CAP is being implemented in three major phases. Phases 1 and 2 include additional site investigation, collection of design data, design, construction, startup, and initial operations for the remedy specified in the 2008 CAP. Phase 3 includes long-term operations, maintenance, and monitoring for the site remedy. In accordance with the terms of the Consent Decree, the B&L Woodwaste Site Custodial Trust (Trust) will perform work during Phases 1 and 2.

Phase 1 work, including the design and construction of remedy components providing physical containment of contaminated groundwater beneath the Landfill and stabilization of the leading edges of the contaminant plume, has been completed. The basis of the design of the physical containment system, which consists of a subsurface barrier wall and groundwater interceptor system, was developed with Ecology and documented in a memorandum (Floyd|Snider/AMECGeo 2009a) Elements of the engineering design information common to all remedy components for the 2008 CAP remedy is documented in the Engineering Design Report (EDR; Floyd|Snider/AMECGeo 2009b). Specific engineering design information for the physical containment system is included in EDR Addendum 1 (Floyd|Snider/AMECGeo 2009c). Specific engineering design information for in-situ treatment is included in EDR Addendum 2 (Floyd|Snider/AMECGeo 2009d).

Phase 2 work includes design, construction, and initial operations of a groundwater recovery and treatment system, plus removal of contaminated sediment in agricultural ditches adjacent to

and downslope from the Landfill. The groundwater recovery and treatment system will provide active recovery and hydraulic containment of contaminated groundwater beneath the Landfill and recovery of the most highly contaminated groundwater from the areas outside the Landfill. The basis of the design of the groundwater treatment and recovery systems, and for remediation of the arsenic plumes outside the barrier wall, was developed with Ecology based on an engineering alternatives evaluation (Floyd|Snider/AMECGeo 2010a) and documented in a memorandum (Floyd|Snider/AMEC 2010b). Specific engineering design information for the groundwater treatment plant (GWTP) and recovery system is included in EDR Addendum 3 (Floyd|Snider/AMECGeo 2011a). Specific engineering design information for the ditch sediment excavation is included in EDR Addendum 4 (Floyd|Snider/AMECGeo 2012).

After initial operations of the Phase 2 systems are determined complete by Ecology, Phase 2 implementation of the 2008 CAP will be substantially complete and Phase 3 work will commence. The Phase 3 portion of the 2008 CAP remedy consists of long-term operation and maintenance of the remedy components put in place during Phases 1 and 2. Under the terms of the Consent Decree, Ecology will assume complete responsibility for the Phase 3 implementation program, which will include long-term operation of the groundwater recovery and treatment system and maintenance of the in-situ treatment for groundwater outside the Landfill. This Operations, Monitoring, and Maintenance Plan (OMMP) describes the plans and procedures for routine management of the Phase 1 and Phase 2 remedy components.

1.1 SITE DESCRIPTION AND BACKGROUND

The Site is located primarily in Pierce County, with portions extending into the city limits of Milton, Washington. The B&L Property is located on a tax parcel of approximately 18.5 acres in unincorporated Pierce County, approximately 0.25 mile east of Interstate 5 (I-5) and 5 miles east of Tacoma. The Landfill, shown on Figures 1.1 and 1.2, is situated in a residential and agricultural area in northern Pierce County. Farmland borders the western and southwestern edges of the B&L Property, and the Greenwood Apartment complex adjoins the southeastern corner. Fife Way defines the southeastern boundary. The Interurban Trail (formerly designated the Puget Power Access Road or Barth Road) runs along the north side of the B&L Property. The Interurban Trail and adjacent drainage ditches are located in the City of Milton; because contaminated groundwater from the Landfill is present in this area, portions of this road and adjacent ditches are within the Site. The pentagonal-shaped Landfill occupies approximately 13 acres of the 18.5-acre B&L Property parcel and rises to an elevation of approximately 50 feet above mean sea level (MSL).

To the north of the Landfill and Interurban Trail is former farmland that has re-established itself as a grassy wetland that stretches north and west to I-5. Portions of this wetland have been affected by releases from the Landfill and are within the Site. This wetland area is located in unincorporated Pierce County. The wetland ground surface is flat and lies approximately 9 to 10 feet above MSL. During winter months, the ground is generally covered with shallow standing water. Several hundred feet north of the Interurban Trail is another roadway, 12th Street East, which is a primitive, unused, and now mostly overgrown road grade that cuts through the wetland, marking the boundary between the parcels.

1.1.1 Land Use and Ownership

Historically, land surrounding the Landfill was used for agriculture; however, in recent years it has become increasingly developed, as has much of the land in northern Pierce County and southern King County. The Landfill, wetlands, and 12th Street East parcels are zoned for moderate-density, single-family development (Pierce County 2008). The Interurban Trail is owned by the City of Milton and is zoned as an open space district as part of the Interurban Trail Project (City of Milton 2008).

The B&L Property is currently bordered by vacant and/or agricultural lands immediately to the south/southwest and west, and wetlands to the north. The property south/southeast is a multi-unit residential apartment complex (Autumn Village Apartments) built in the late 1980s. East of the B&L Property is Fife Way East, a public road. To the northeast lies a parcel of land previously occupied by a single-family private residence; the residence has been demolished and the property is presently unused. A utility easement runs along the northeastern and eastern property lines; underground utilities present in the easement include a sanitary sewer line and communications lines.

The B&L Property is currently owned by Executive Bark, Inc., which is a dissolved corporation. Camille Fjetland is named as the addressee for Executive Bark, Inc. by the Pierce County Tax Assessor. Property taxes for the property were paid by Ms. Fjetland via her attorney through 2009; in early 2013 the property was listed as being in tax foreclosure with Pierce County. Communications regarding remediation activities conducted on the B&L Property have been conducted through her attorney.

Ownership of parcels adjacent the B&L Property is illustrated on Figure 1.2. MF Associates owns the wetland property directly to the north of the Interurban Trail, north of the B&L Property. The Washington State Department of Transportation (WSDOT) owns the agricultural area southwest and west of the B&L Property and the wetland parcels to the west and north of the M-F Associates parcel. The Autumn Village Apartments parcel southeast of the B&L Property is owned by Greenwood LLC. Benaroya Capital Company, LLC owns the parcel along the northwest side of the B&L Property. The City of Milton owns the Interurban Trail and maintains the Fife Way easement. The 12th Street East unimproved easement to the north of the MF Associates property is held by Pierce County.

The WSDOT properties will be affected by the pending State Route 167 (SR 167) project. This project will include construction of a new interchange between SR 167 and I-5. The wetlands and agricultural fields owned by WSDOT will be used for construction of the interchange and development for wetlands mitigation. It is expected, based on preliminary planning documents, that the wetlands mitigation will relocate both Hylebos Creek and the Surprise Lake Drain, moving both streams closer to the Landfill. The SR 167 project has not been fully designed or scheduled, but it is likely to occur in the near future.

1.1.2 Regional Topographic and Hydrologic Setting

The regional topographic and hydrologic settings exert significant influence on the surface water and the shallow groundwater regime at the Site. More detailed information on site hydrogeology and local surface water drainage is presented in the Groundwater Alternatives Evaluation (GAE) Report attached to the 2008 CAP.

Regional topography, surface water, and drainage features are shown on Figure 1.3. The Site is located in the floodplain of the Hylebos Creek Watershed, close to where the creek merges with the larger Puyallup River valley. To the east of the Site, Fife Way East marks the steep transition between the flat floodplain and the rolling, hilly relief of the uplands glacial drift plain.

1.2 PURPOSE

The purpose of this OMMP is to document the requirements and procedures for proper operation, monitoring, and maintenance of the key components of the site remedy and to address post-closure plan requirements for the Landfill, as specified in the Minimum Functional Standards for Solid Waste Handling (WAC 173-304-407). The site remedy is a key component of Landfill post-closure care, provides for comprehensive containment of wastes within the Landfill, and for provides for remediation of groundwater contaminated by historic releases from the Landfill. This OMMP describes the remedy components and provides procedures for their proper long-term operation and maintenance. The OMMP also documents the monitoring program to confirm that the remedy is effective in remediating the Site, achieving the cleanup objectives specified in the 2008 CAP. This plan must be updated as appropriate as cleanup goals are achieved and as any modifications are made to remedy components. The actions and procedures described in the OMMP must be performed to ensure that the remedy functions as designed, remains in proper working order, and is in compliance with the regulations issued under the MTCA (WAC 173-340).

1.3 SCOPE

The key components of the site remedy addressed by this OMMP include the following:

- Site access and security system
- Landfill containment system, including:
  - Multilayer cap above wastes within the above-grade Landfill
  - Subsurface barrier wall enclosing the area beneath the Landfill
  - Groundwater interceptor trench that facilitates groundwater flow around the barrier wall
  - Landfill stormwater management system
- Groundwater recovery system, including:
  - Groundwater recovery well and collection system network within the Landfill barrier wall
  - Groundwater recovery well and collection system network in areas outside the Landfill
  - Piezometer and transducer network to monitor cross-wall groundwater elevations along the barrier wall
- Groundwater treatment system that removes arsenic from recovered groundwater so that it may be discharged to surface water
- In-situ groundwater treatment program, within the End-of-Plume treatment zones that control downgradient migration of site contaminants

- Groundwater monitoring well network used to monitor the extent of groundwater contamination outside the Landfill

Each of these components is described in more detail below.

1.3.1 Site Access and Security System

A key component of the site remedy that is necessary to protect human health and the environment is the system to provide security and limit access to the contaminated Site. The access and security system must be regularly inspected and maintained to provide adequate protection. Security must be provided for the Landfill, the groundwater recovery system, the groundwater treatment system, and the monitoring well network. The site access and security system includes the following elements:

- Fencing and gates enclosing the groundwater treatment building
- Fencing and gates enclosing the Landfill, interceptor trench, and ponds
- Security camera network
- Groundwater treatment building
- Surface vaults for groundwater recovery and monitoring wells

These elements must be regularly inspected and maintained to provide adequate security for the site remedy and to limit the potential for exposure of the public to site contaminants.

1.3.2 Landfill Containment System

The Landfill containment system provides primary confinement for wastes located within the Landfill and for the most highly contaminated groundwater impacted by leachate from the Landfill wastes. The containment system provides physical barriers to reduce generation of leachate by limiting infiltration of stormwater and movement of groundwater beneath the Landfill. Other components of the containment system support the physical containment structures. This system includes the following:

- The multi-layer, low-permeability cap that promotes runoff and limits infiltration. The cap was constructed following waste consolidation in 1993. The cap surface consists of native grasses that control erosion.
- The subsurface barrier wall surrounding the Landfill and providing a physical flow barrier for contaminated groundwater immediately beneath the Landfill. The barrier wall encloses the area beneath the Landfill cap.
- The groundwater interceptor trench that is located outside and along the eastern and southern portions of the barrier wall. The interceptor trench includes a passive drain and two lift stations that facilitate groundwater flow around the barrier wall, discharging to the West and North Ponds.
- A perimeter ditch/drainage system that collects runoff and drainage from the cap and directs flow to the North Pond. The ditch/drainage system controls runoff flow to limit erosion.

- The North Pond collects cap runoff, receives the discharges from the east interceptor trench and the treated discharge from the GWTP. This pond overflows to the agricultural ditch north of the North Pond.
- The West Pond receives discharges from the south interceptor trench. This unlined pond provides some infiltration and stores groundwater directed to the west, around the Landfill barrier wall.

Regular inspection, monitoring, and maintenance is necessary for all elements of the Landfill containment system to ensure the system performs as designed and is kept in proper repair.

1.3.3 Groundwater Recovery System

The groundwater recovery system is a major remediation component of the remedy specified in the 2008 CAP. This system removes contaminated groundwater to maintain an inward-directed gradient across the barrier wall and to remove the most highly contaminated groundwater in the areas outside the barrier wall. Continuous recovery of groundwater is necessary to achieve the remediation objectives specified in the 2008 CAP. This system consists of the following components:

- The network of groundwater recovery wells located inside the Landfill barrier wall, including the wells and surface vaults
- The Landfill recovery well pumps, electrical wiring, and controls
- The underground collection piping and valve network for the Landfill wells
- The network of piezometers along the perimeter of the Landfill, including the groundwater-level transducers within each piezometer
- The network of groundwater recovery wells located outside the Landfill, including the wells and surface vaults
- The groundwater recovery well pumps, electrical wiring, and controls for the recovery wells located outside the Landfill
- The underground collection piping and valve network for the outside wells

Continuous service from both groundwater recovery networks is necessary to achieve remediation objectives and for regulatory compliance. All components of the groundwater recovery system must be routinely checked, regularly maintained, and properly operated in accordance with this OMMP.

1.3.4 Groundwater Treatment System

The groundwater treatment system receives contaminated groundwater from the groundwater recovery system, removes contaminants, and discharges clean water to the North Pond for discharge under a National Pollutant Discharge Elimination System (NPDES) discharge permit. The GWTP must operate continuously to support operation of the groundwater recovery system. The GWTP includes the following key components:

- Head Tank and associated instrumentation. The Head Tank receives recovered groundwater and supports gravity flow through the first two stages of treatment.

- Oxidation Tank and associated instrumentation, chemical feed system, and mixer. The Oxidation Tank mixes groundwater with potassium permanganate solution to chemically oxidize groundwater constituents to promote precipitation of arsenic and dissolved iron.
- Coprecipitation Tank and associated instrumentation, chemical feed system, and mixer. The Coprecipitation Tank mixes oxidized groundwater with lime to raise the pH and precipitate additional iron and arsenic.
- Clarifier Unit and associated instrumentation, chemical feed system, and mixers. The Clarifier Unit promotes settling of precipitated solids, removing them from the partially treated groundwater. Clarified overflow flows to subsequent treatment stages; sludge containing separated solids is pumped to the Sludge Treatment Unit.
- pH Adjust Tank and associated instrumentation, chemical feed system, mixer, and pumps. The pH Adjust Tank is used to mix sulfuric acid into the water to lower the pH prior to final adsorption and discharge.
- The cartridge filters/activated alumina adsorbers and associated instrumentation that are used for secondary removal of arsenic from the groundwater. This is the final stage of treatment prior to discharge to the North Pond.
- The Sludge Dewatering Unit includes a storage tank and filter press that are used to remove water from clarifier sludge prior to disposal. This unit operates on a batch basis and produces a dewatered filter cake that is suitable for landfill disposal.
- The automatic control system includes the programmable logic controller (PLC) and autodialer. This system is linked to process equipment and instrumentation, and is used to monitor and control the groundwater recovery and treatment systems.

The GWTP includes mechanical and electronic equipment and instruments that require routine monitoring and maintenance to ensure the GWTP operates properly and achieves the required effluent quality.

1.3.5 In-situ Groundwater Remediation System

In-situ remediation is being conducted using a permeable reactive barrier (PRB) configuration in two areas along the leading edge of the groundwater plume emanating to the north from the Landfill. Additionally, a pilot program is underway to assess area-wide treatment of low to moderate levels of arsenic contamination in the main portion of the plume, north of the Landfill. Remediation is accomplished by injecting appropriate reagents into the subsurface to promote biological and chemical conditions to remove arsenic from the plume and immobilize it in aquifer sediments. In-situ remediation is a key component of the remedy specified in the 2008 CAP. In-situ treatment will be used to achieve the arsenic cleanup level (CUL) over most of the plume. Continued monitoring and maintenance of the in-situ remedy is necessary for successful implementation of the 2008 CAP remedy, and it is included in the scope of this OMMP.

1.3.6 Groundwater Monitoring System

A key component of the remediation program is the network of groundwater monitoring wells that are sampled to assess movement of the groundwater plume and changes in groundwater

quality. The monitoring well network is also used for compliance monitoring, as required in the MTCA regulations. The wells comprising the monitoring well network are located at the following properties:

- The B&L Property
- The WSDOT properties located west and northwest of the B&L Property
- The City of Milton Interurban Trail
- The M-F Associates wetlands property
- The 12th Street Easement belonging to Pierce County
- The WSDOT property north of the 12th Street Easement

Inspection, maintenance, and monitoring of the monitoring wells are included in the scope of this OMMP.

1.4 OBJECTIVES

Remedial action objectives (RAOs) for the Site were established in the 2008 CAP. Specific RAOs were established for three Cleanup Action Areas (CAAs) comprising the Site. The three CAAs included the Landfill/Ditch CAA, the Wetlands CAA, and the End-of-Plume CAA. As construction of the remedy components for each CAA is essentially complete and this OMMP comprehensively addresses the Site as a whole, a single set of RAOs for operation, inspection, maintenance, and monitoring of the site remedy has been established and is consistent with the 2008 CAP RAOs. The objectives for long-term operation, inspection, maintenance, and monitoring of the Site are as follows:

- Achieve the cleanup standard specified in the 2008 CAP. The cleanup standard defined in the 2008 CAP requires attainment of site CULs at the conditional point of compliance (CPOC), which was established outside the Landfill cap perimeter and extending vertically to the first aquitard. Thus, the site constituent of concern, arsenic, must be lower than the CULs specified in the 2008 CAP for groundwater, surface water, soil, and sediment located outside the perimeter of the Landfill cap and beneath the depth of the upper aquitard.
- Comply with post-closure requirements specified in the Minimum Functional Standards for Solid Waste Handling (WAC 173-304-407).
- Prevent arsenic-containing groundwater from migrating beyond the Landfill into adjacent wetlands and agricultural drainage ditches.
- Protect the sediment and surface water quality of Hylebos Creek, WSDOT restoration projects, and other nearby surface water bodies from arsenic releases from the Landfill.
- Operate and maintain remedy components to attain MTCA threshold requirements, including protection of recreational, human, and ecological receptors from arsenic contamination that is seasonally present in ponded surface water, soil porewater, and groundwater within site wetlands.

- Remove or control the potential for the groundwater plume beneath and outside the Landfill to migrate downgradient and discharge to surface water, within a reasonable restoration time frame.
- Conduct remediation activities so that they are consistent with wetlands restoration and Hylebos Creek relocation activities associated with the WSDOT SR 167 Project. Coordination with the WSDOT planning, design, and construction process will be provided to ensure the remedy will not negatively impact the WSDOT riparian restoration.

The arsenic CULs to be achieved by the site remedy are 5 micrograms per liter (µg/L) for groundwater and surface water and 20 milligrams per kilogram (mg/kg) for soil and sediment. The overall objective for operation and maintenance of the remedy is to keep all components of the remedy in proper working order and in operation 100 percent of the time.

1.5 ROLES AND RESPONSIBILITIES

Roles and responsibilities for implementing Phase 3 of the 2008 CAP are distributed between Ecology and the Trust under the terms of the revised 2013 Consent Decree and accompanying Trust Agreement. In accordance with these documents, the Trust is expected to contract with a professional consultant, and an operations and maintenance (O&M) contractor. The primary roles and responsibilities of each are summarized below.

1.5.1 Washington State Department of Ecology

The role of Ecology is generally composed of three parts: (1) lead agency providing oversight for the cleanup action conducted under MTCA; (2) client of the Trust; as a state agency, Ecology will act as the representative of the sole beneficiary of the Trust; and (3) responsible entity for the long-term operations, monitoring, maintenance and compliance of the Site.

Ecology will make decisions regarding the cleanup action under MTCA, several of which will be needed for the adaptively managed remediation of groundwater outside the barrier wall. As part of this process, it is expected that Ecology will assist the Trust and its consultants and contractors with a variety of activities, including review of plans and reports and obtaining permits and access agreements. Ecology will be responsible for the eventual administrative and legal closure process for the Site, including groundwater compliance for areas outside the barrier wall and management of institutional controls.

1.5.2 B&L Woodwaste Site Custodial Trust

The Trust will oversee the implementation of the Phase 3 SOW as the site manager. The Trust will implement the SOW by procuring and maintaining appropriate contracts with professionals and contractors to effectively implement the 2008 CAP. The Trust will also obtain permits and access agreements as needed to perform site cleanup services in accordance with applicable laws and regulations and requirements of affected property owners.

1.5.3 Professional Consultant

The Trust will contract with an environmental consultant or consultant team whose primary responsibilities will include the following:

- Overall site management
- Project management including cost tracking and reporting
- Technical oversight of the GWTP O&M including management of the NPDES permit
- Adaptive management of outside area groundwater remediation including in-situ treatment O&M
- Compliance monitoring and reporting

In addition to the responsibilities above, the environmental consultant or consultant team will be responsible for any other adaptive and technical tasks needed to implement Phase 3 of the 2008 CAP at the request of the Trust and Ecology. The professional consultant team will work closely with the O&M contractors, described below.

1.5.4 Operations and Maintenance Contracting

The Trust will contract with companies other than the professional consultant team to provide for routine O&M of the groundwater recovery and treatment system and to provide other services as needed to maintain the components of the 2008 CAP remedy and Landfill cap. Contractors retained by the Trust will perform their work with support and direction, as appropriate, from the professional consultant team. The primary responsibilities of the O&M contractor include the following:

- Routine operation and maintenance of the groundwater recovery well system and the GWTP in compliance with the permit and applicable laws and regulations.
- Provide timely remote response to process alarms during times when no operator is present on-site, and restore operations if the alarm resulted in a system shutdown.
- Provide timely remote response to security service calls during times when no operator is present on-site.
- Collect and test process control samples using field instrumentation and test kits, and collect and submit monthly composite samples for discharge monitoring.
- Download and collate process monitoring data using preset report formats for weekly process monitoring reports.
- Provide maintenance for building systems, including: security systems; heating, ventilation, and air conditioning (HVAC) systems; fire alarms; fire protection systems; etc.; and maintain the building and equipment in clean and serviceable conditions by performing housekeeping and cleaning as necessary.
- Perform safety inspections and testing as required for compliance with applicable state and federal safety regulations.
- Prepare weekly operations reports for the professional consultant.

- Maintain on-site records of maintenance and operations activities as required for effective operation for compliance with permits.
- Report noncompliance events (presently including high arsenic or high/low pH in the effluent) to the professional consultant immediately upon discovery of the noncompliance, and assist in assessing the cause and resolution of noncompliant discharges.
- Perform preventive maintenance of process equipment in accordance with manufacturer recommendations; perform minor maintenance procedures on an as-needed basis, as approved by the professional consultant; and oversee work performed by maintenance contractors.
- Monitor and maintain treatment chemical inventories and spare part inventories to ensure continuous operation of the GWTP.
- Arrange for disposal of site wastes generated by facility operations.
- Provide recommendations to the professional consultant as appropriate to improve performance of the system, improve operations efficiency, or reduce costs.

Additional details of routine operations and maintenance procedures are provided in the O&M Manual (Appendix A). Other services to be contracted by the Trust include maintenance of the Landfill cap, special maintenance needs for the groundwater recovery and treatment systems, site security, power, utilities, and communications.

1.6 MANAGEMENT OF CHANGE

This OMMP documents plans for long-term operation, monitoring, and maintenance of all components of the remedy. The OMMP is a working document that will evolve as the cleanup progresses and new cleanup technologies are developed. In order for the OMMP to remain up to date and effective in achieving the objectives outlined above, it will require periodic revision and modifications to adapt to changes in the extent of contamination, changes in the remedy components, changes in the monitoring well network, or changes in equipment being operated. The groundwater plume outside the Landfill is expected to contract as implementation proceeds, eventually achieving the cleanup standard. Contraction of the plume is also likely to change operation of the active components of the remedy and the monitoring well network. Specific equipment or instrumentation may also be changed due to replacement or process modification. These changes must be properly managed, verified, and documented to ensure that the OMMP is kept up-to-date; accurately describes operating procedures and maintenance requirements; ensures that safety standards are properly maintained; and complies with the 2008 CAP, permits, and applicable regulations. Therefore, the procedures included in this document will require confirmation by operations and management personnel that any changes that are made during remedy implementation and maintenance are incorporated into the OMMP. A revision log for the OMMP is included at the front of this OMMP, which will be used to document the date and nature of changed or new sections or pages, in accordance with the procedures described in this section. When a revision is made, a copy of the revision log will be distributed to Ecology, the Trust, the professional consultant, and the O&M contractor.

Significant changes must be approved by site management prior to implementation. A significant change is any change to the remedy, monitoring well network, process, equipment,

instruments, or controls that is not a replacement in kind. It is expected that these types of changes would comply with the 2008 CAP. Once approved by management, changes must be properly designed and reviewed for safety, environmental compliance, and verified effective. Site workers must be trained as appropriate for any changes, and the change must be properly documented in this OMMP and in site files and documentation. It is anticipated that the OMMP, one or more of its appendices, and all active copies of the OMMP and appendices will require revision for each significant change. Equipment records must also be properly updated to reflect any changes in equipment or instruments. Equipment information for old or obsolete equipment must be moved from active equipment files. Implementation of any change will not be complete until it is confirmed in writing by site management personnel that documentation has been revised to reflect the change. Any replacement in kind must also be documented so that an accurate record is kept of the manufacturer, model number, and specifications for all site equipment. Management of change procedures will be incorporated into site O&M procedures, as appropriate.

2.0 Site Regulatory Requirements

Several regulations apply to O&M of the remedy being implemented under the 2008 CAP. In this section, the regulatory context is described and requirements applicable to the Site during long-term operations and monitoring are described. O&M will be performed for the groundwater recovery system, the interceptor trench, the GWTP and the building housing the GWTP, stormwater ponds, and the in-situ remediation program. Additionally, inspection and maintenance will be performed for the cap that is in place over the closed Landfill. Groundwater and surface water monitoring will also be performed at the Site.

2.1 MTCA REQUIREMENTS

The cleanup action is being implemented in accordance with applicable requirements under the MTCA, as documented in the Construction Completion Reports (Floyd|Snider/AMECGeo 2011b, Floyd|Snider/AMEC 2013a and 2013b). This OMMP addresses the MTCA requirements for an O&M plan as specified in 173-340-400(4)(c).

During long-term operations, monitoring, and maintenance of the cleanup action during Phase 3, the following MTCA requirements are applicable to the Site:

- Compliance monitoring in accordance with the requirements of WAC 173-340-410, and construction of a Sampling and Analysis Plan meeting the requirements of WAC 173-340-820
- Periodic ("5-Year") review in accordance with the requirements of WAC 173-340-420
- Institutional controls in accordance with the requirements of WAC 173-340-440

Compliance with these requirements is summarized below.

2.1.1 Point of Compliance and Compliance Monitoring

As described in the 2008 CAP, and in accordance with the requirements for groundwater provided in WAC 173-340-720(8)(c) and the soil requirements for containment remedies given in WAC 173-340-740(6)(f), a CPOC for soil, ditch sediment, groundwater, and surface water has been established at the edge of the Landfill cap, extending vertically downward through the first aquitard. The location of the CPOC is shown on Figure 1.2. Beyond this CPOC, groundwater and soil CULs must be attained for the Site to be in compliance with the cleanup standard. The plume of affected groundwater presently extends downgradient of the designated CPOC location, so it is expected that several years will be needed to achieve the CULs in the Outside Area beyond the CPOC. The CPOC will be monitored for compliance using monitoring wells between the barrier wall and the nearby property boundary. The CPOC monitoring wells are shown on Figure 1.2.

A Compliance Monitoring Plan (CMP) with a Sampling and Analysis/Quality Assurance Project Plan (SAP/QAPP) is included with Appendix B. Compliance monitoring will be used to address performance and confirmational monitoring requirements for groundwater and surface water at the Site, comply with appropriate closure and monitoring standards for solid waste landfills (refer to Section 2.4), and provide for inspection and maintenance of the monitoring network.

Compliance monitoring will be used to regularly assess groundwater quality trends, confirm the long-term effectiveness of the cleanup action completed at the Site, and eventually establish compliance with cleanup standards at the CPOC.

Because it is expected to be several years before compliance with groundwater and surface water CULs has been achieved, this CMP will be modified as appropriate and as approved by Ecology to address changing conditions and new information acquired over time.

2.1.2 Institutional Controls

The institutional controls that were part of the 2008 CAP remedy consist of site perimeter fencing and restrictive covenants. The Trust does not own any of the properties affected by the remedy but has taken reasonable actions necessary to implement institutional controls for the remedy, as described in the Consent Decree. Site perimeter fencing (refer to Section 3.7) was installed in 1994 and expanded as part of construction activities between 2009 and 2012.

Use restrictions in the form of restrictive covenants were prepared in accordance with 173-340-440(9) and provided to the affected parties for signature in 2012. Local governments were notified in accordance with WAC 173-340-440(10). Restrictive covenants for affected properties adjacent to the Landfill were prepared to limit use that may result in environmental exposures; to protect remedy components including recovery wells and monitoring wells; and to provide access for inspection, maintenance, and monitoring. Final, signed, and entered restrictive covenants are included with the Phase 2 Part 1 Construction Completion Report (Floyd|Snider AMEC ***In preparation***) in accordance with WAC 173-340-400(6)(c).

Maintenance of these institutional controls is a Phase 3 work element along with maintenance of the other remedy components. Maintenance of fencing is described in Section 3.7. Maintenance of institutional controls, if necessary, will be based on Ecology review of restrictive covenants as part of periodic review.

2.1.3 Periodic Review

Periodic review of the cleanup action is required every 5 years under the WAC 173-340-420(2)(a) provision governing sites with institutional controls. The purpose of the review is to evaluate site conditions and monitoring data, and to ensure human health and the environment are being protected. All requested data and documentation will be provided to Ecology to assist in the review, particularly to confirm the effectiveness of the cleanup action in limiting exposures to hazardous substances remaining at the Site.

Periodic reviews are required as long as institutional controls are present; because the restrictive covenant on the Landfill parcel is expected to remain in perpetuity, the Site is expected to remain subject to periodic reviews in perpetuity.

2.2 SOLID WASTE ACT REQUIRMENTS

Requirements of regulations issued pursuant to the Solid Waste Act apply to the Landfill. Long-term operations, maintenance, and monitoring activities will meet the requirements specified in the Washington Minimum Functional Standards for Solid Waste Handling (WAC 173-304), as

summarized below. Landfill closure activities are documented in the B&L Landfill Closure Report (Hydrometrics 1994). No documentation of permitting as a landfill with the jurisdictional health department is available. Due to the Site's status as a MTCA cleanup site under a Consent Decree, closure documentation has been coordinated primarily by Ecology, with notifications provided to the Pierce County Health Department. This OMMP meets the substantive requirements for a post-closure plan in accordance with WAC 173-304-407(7), including the requirements for woodwaste landfills provided in WAC 173-304-462 and requirements for groundwater monitoring under WAC 173-304-490. Post-closure inspection, maintenance, and monitoring procedures; and site access controls, institutional controls, and financial assurance provisions described in this OMMP supersede the previous procedures described in the 1994 Closure Report. The post-closure performance standard is met by provisions of this OMMP for maintenance and monitoring, and additional monitoring of air, land, and water as directed by Ecology for as long as necessary in order for the facility to stabilize and to protect human health and the environment. If and when post-closure activities are considered complete, the Trust shall certify why post-closure activities are no longer necessary. The period of landfill gas production is considered complete. Settlement monitoring is discussed in Section 3.0. Leachate production may continue in perpetuity.

Financial assurance required under WAC 173-304-468 consists of the fund management, reporting requirements, and auditing provisions of the Trust as documented in the Trust Agreement (Appendix G to Consent Decree No. DE 082106107). In accordance with these regulatory requirements, a cost estimate of post-closure O&M costs for 20 years is included in Appendix C. This post-closure cost estimate will be reviewed annually for adjustments due to cost changes, including inflation, and will be revised accordingly.

2.3 CLEAN WATER ACT REQUIREMENTS

State and federal provisions of the Clean Water Act that are applicable to site operations are summarized in this section. These include discharges of treated water under a NPDES permit, management of site stormwater, and spill prevention and reporting.

2.3.1 NPDES Discharge

Discharge of water from the GWTP is governed by NPDES permit No. WA0040321, issued in November 2011, and included as Appendix D. This permit is administered by Ecology in compliance with the provisions of Washington Water Pollution Control Law and the Clean Water Act. Operation and maintenance of the site remedy includes activities necessary for compliance with this permit, including, but not limited to the following:

- Sampling and analysis, and other monitoring for compliance with discharge limits
- Discharge monitoring reporting and reporting of violations of the permit
- Records retention
- Adherence to, and updating of, an O&M Manual (Appendix A) specific to the permit
- Periodic permit renewal
- Specific studies including a receiving stream study, an outfall evaluation, and toxicity studies

In addition, the NPDES permit specifies procedures for spill control and stormwater pollution, as described in the following sections. Refer to the NPDES permit for additional details.

2.3.2 Stormwater Management

A Stormwater Pollution Prevention Plan (SWPPP) addressing stormwater management during construction of the groundwater recovery and treatment systems was approved by Ecology in July 2011. The SWPPP was prepared in accordance with the 2005 Stormwater Management Manual for Western Washington, and established best management practices (BMPs) to prevent unacceptable releases to the environment from stormwater drainage during and immediately after construction work. Under the terms of the NPDES permit, the SWPPP must be reviewed and updated annually. Because the Landfill is capped and closed, stormwater is not exposed to contaminants beneath the cap nor exposed to untreated groundwater or other sources of contamination. The GWTP is completely housed within a building, minimizing the potential for releases to stormwater from the treatment process. Stormwater runoff from the eastern portion of the B&L Property, including the area around the GWTP building, drains along a swale on the northeast edge of the Landfill, which drains through a culvert to the ditch adjacent to the Interurban Trail, a tributary of Hylebos Creek. Similarly, stormwater runoff from the vegetated Landfill cap drains to a stormwater collection ditch, which empties into the North Pond, adjacent to the Landfill. The pond overflows through a culvert to the ditch adjacent to the Interurban Trail. This ditch combines with the Surprise Lake Drain to the west of the Landfill; the combined flow then crosses beneath I-5 where it joins Hylebos Creek, eventually emptying to the Hylebos Waterway and Commencement Bay. Refer to Section 3.4 for additional details on the Landfill cap system.

The SWPPP attached to this document (Appendix E) has been revised to address the Site under current conditions. This SWPPP documents BMPs for preventing releases to stormwater from the lime delivery pad on the north side of the GWTP building and during routine maintenance of the interceptor trench, groundwater recovery system, and the monitoring well network. This SWPPP will be reviewed annually and updated as appropriate to address changes, if any, to the remedy components.

2.3.3 Spill Control and Reporting

The Spill Control Plan (SCP) included with the O&M Manual (Appendix A) was approved by Ecology in December 2012 in accordance with the NPDES permit. The SCP lists materials used or stored on-site that may become pollutants or cause pollution upon reaching state waters; establishes spill prevention, containment, and response measures to avoid potential environmental impacts; and includes reporting requirements for any spills. In accordance with the NPDES permit, the SCP must be reviewed at least annually and updated as necessary with Ecology approval.

2.4 HAZARD COMMUNICATIONS

2.4.1 Emergency Planning and Community Right-to-Know

The community right-to-know provisions of the Emergency Planning and Community Right-to-Know Act (EPCRA) apply to the GWTP because hazardous materials are stored within the

facility building and used in the groundwater treatment process. In Washington State, EPCRA requirements are administered by Ecology. Refer to the Hazardous Materials Emergency Plan (HMEP) in Appendix F. The HMEP summarizes the reporting requirements and procedures and includes reporting forms that will be submitted to Ecology and local agencies in accordance with EPCRA requirements.

2.4.2 Worker Hazard Communication

All project work will comply with the health and safety standards prescribed by the federal Occupational Safety and Health Act (OSHA) and the Washington Department of Occupational Safety and Health (DOSH). Worker Hazard Communication standards will be used for work involving applicable hazardous materials present at the Site. Chemicals stored at the Site are properly stored and labeled, and Material Safety Data Sheets (MSDS) for chemicals used at the Site are included in the Health and Safety Plans (HASPs; included with the O&M Manual in Appendix A for the GWTP, and with the CMP in Appendix B for groundwater sampling and related activities) and are available on-site at all times. Site personnel are trained to safely handle the hazardous materials used at the Site and are trained in proper use and maintenance of personal protection equipment (PPE). Workers will use the procedures in the SCP for managing any spills.

3.0 Landfill Containment System and Site Security

3.1 OVERVIEW

Physical containment of the Landfill is provided by an engineered system that provides physical barriers to minimize the generation of leachate and to restrict the flow of groundwater from beneath the Landfill. For operations and monitoring purposes, the containment system is comprised of the following components:

- Multilayer cap
- Stormwater management system
- Subsurface barrier wall
- Groundwater interceptor trench and lift stations
- North and West Ponds

Selected site features are illustrated to Figure 1.2, and more detailed information is provided in Appendix G (Phase 1 Record Drawings), Appendix H (Phase 2 Record Drawings), and Appendix I (1994 Closure Report; Hydrometrics 1994). The Landfill cap was constructed in 1993–1994 following the consolidation of the woodwaste, which was once spread throughout the property at varied thicknesses, into a raised mound. The North Pond and a perimeter stormwater ditch, which drained into the North Pond, were also constructed at this time along with a limited leachate collection system and perimeter fencing. The Landfill cap promotes controlled stormwater runoff, limits infiltration, and has a vegetative cover to limit erosion. During Phase 1 construction in 2009–2010, additional components were added to the containment system. A subsurface barrier wall, a groundwater interceptor trench and lift stations, and the West Pond were constructed. The subsurface barrier wall consists of a subsurface, low-permeability wall placed beneath the perimeter of the Landfill; this barrier limits the flow of groundwater into and from the area beneath the Landfill. The interceptor trench was constructed to provide a high-permeability flow path for groundwater to flow around the barrier wall, with the objective of minimizing effects on the groundwater table upgradient of the barrier wall. The North Pond is used to receive flow from the east interceptor trench and stormwater runoff from the cap. The West Pond is used to receive flow from the south interceptor trench. Stormwater runoff from the cap is managed by a perimeter ditch system that drains to the North Pond. The containment system must be properly operated and maintained to achieve remediation objectives specified in the 2008 CAP.

As part of institutional controls (refer to Section 2.0), the Site is secured to prevent inadvertent access by the general public and to prevent vandalism or theft. Site security is provided by the following components:

- A permanent fence surrounding the GWTP
- A permanent fence surrounding the Landfill, including five kiosk enclosures
- Signage on the perimeter fence and entry gates notifying the public of site contamination
- A network of monitored security cameras

The security system components must be properly inspected and maintained to provide effective security.

3.2 REGULATORY REQUIREMENTS

Procedures for inspection and monitoring of the Landfill containment system and site security described in this section are consistent with the requirements for landfill closure activities under WAC 173-304, for institutional controls under WAC 173-340-440, and for stormwater management under a site-specific NPDES permit.

3.3 HEALTH AND SAFETY

Operations, maintenance, and monitoring of the Landfill containment system, as described in this section, complies with the health and safety standards prescribed by OSHA and the Washington Industrial Safety and Health Act (WISHA). During any Landfill containment system monitoring and/or maintenance, all personnel shall be protected as appropriate with PPE that may include, but not be limited to, hard hat, steel-toed boots, eye protection, work gloves, and/or nitrile gloves. A HASP summarizing site hazards and protection standards during GWTP monitoring and/or inspection work is included with the O&M Manual (Appendix A). A second HASP summarizing site hazards and protection standards for compliance monitoring and related activities is included with the CMP (Appendix B).

3.4 RECORDS AND RECORDKEEPING

O&M records are necessary to document inspection and monitoring of the physical containment system to confirm compliance with cleanup criteria and objectives, and landfill closure requirements. Recordkeeping for the physical containment system, including the Landfill cap, barrier wall, interceptor trench, and security system, is done manually. Manual records include the Site Operations Log, inspection sheets, maintenance sheets, and settlement survey data.

All inspections and maintenance activities described in this section will be documented on inspection sheets and maintenance sheets for the Landfill containment system and site security, as described in the sections below. Specific inspection procedures and inspection sheets are provided in the O&M Manual (Appendix A). Inspection sheets will include the date and time of inspection, the inspector's name, a checklist of items to inspect, and a summary of significant observations and any items requiring corrective action. Maintenance activities will be documented on maintenance sheets indicating the date and time of the maintenance action, the person or company performing the maintenance, the purpose of the maintenance action, and a summary of work completed. Original inspection and maintenance sheets will be filed at the GWTP building; scanned copies will be filed in the GWTP desktop computer and at an off-site location by the professional consultant.

Inspection and maintenance activities will also be recorded along with all site visits conducted by operations personnel in a bound Site Operations Log that is maintained in the GWTP building; refer to Section 5.6 for additional details on the Site Operations Log.

3.5 LANDFILL CAP AND STORMWATER MANAGEMENT SYSTEM

3.5.1 Cap Design

The Landfill cap and stormwater management system are described in detail in the Closure Report (Hydrometrics 1994), which described the cap and perimeter stormwater system; and the Phase 1 Completion Report (Floyd|Snider/AMECGeo 2011b), which details the modifications made to the cap at the Landfill perimeter, adjacent to the barrier wall, and to the stormwater collection system at the Landfill perimeter. The cap consists of the following layers from the surface downward: 6 inches of vegetated topsoil, 18 inches of sandy pit run, a geonet, a 40-mil polyvinyl chloride (PVC) liner, a geosynthetic clay layer, and a 6-inch sand layer for gas migration. As described in the Closure Report, the cap is outfitted with a network of gas migration vents. During Phase 1 construction, an approximately 30-foot perimeter portion of the cap was re-built over the previous cap. This perimeter area was re-graded following use as a mixing pad during barrier wall construction. The new perimeter cap section was constructed to cover the re-graded mixing pad and the subsurface barrier wall with the same design as the prior cap. The stormwater drainage ditch and the roadway along the perimeter of the Landfill were also reconfigured at this time.

The stormwater collection ditch, located around the perimeter of the cap and designed to discharge into the North Pond, was substantially redesigned and modified during Phase 1. The v-ditch was modified to include placement of a perforated high-density polyethylene (HDPE) culvert in the base followed by filling the ditch with 4-inch rock. The covered, perforated pipe ditch design, which used larger pipe for portions of the ditch with higher flow, was estimated to provide adequate flow capacity for drainage. The final constructed collection ditch consisted of 10-, 12-, and 15-inch diameter perforated pipe installed around the perimeter of the cap. The perforated pipes were bedded and cradled in 1- to 2-inch rock and covered with a minimum of 4 inches of 2.5- to 4-inch rock. Cleanouts were installed approximately every 200 linear feet. The highest point of the v-ditch was located at Sta. 3+25. The high point diverts runoff water from the cap to the different portions of the ditch; the ditch ultimately discharges into the North Pond at three locations. Each of the three locations consists of a Type II catch basin and culvert to collect flow from the perimeter ditch and direct flow to the North Pond. The catch basins provide a minimum 8-inch sediment trap at their base. Additional construction completion details are summarized in the Phase 1 Construction Completion Report (Floyd|Snider/AMECGeo 2011b).

Procedures for inspecting and maintaining the Landfill cap, stormwater collection ditch, and culverts are summarized below.

3.5.2 Landfill Cap and Stormwater System Inspection

Landfill cap and stormwater system inspection procedures and inspection forms are provided in the O&M Manual (Appendix A). Inspections will be performed annually. Inspection results will be recorded on the Landfill cap and stormwater system inspection sheet.

The Landfill cap will be mowed annually prior to inspection as part of regular maintenance. The Landfill cap will be inspected for signs of erosion, the condition of the vegetative cover, signs of inadequate drainage, settlement, and slope failure. Landfill gas vents and the leachate collection monitoring sump will be inspected. The condition of the perimeter road will be

inspected, including the ground surface above the interceptor trench. The general condition of the outfalls, ponds, pond berms, culverts, catwalks and related structures will be checked; they will also be inspected for signs of erosion, sedimentation, and obstructions. Pond inspections include observations of vegetation growth and accumulation of sediment in both ponds. In the event that conditions requiring maintenance are observed, excessive sediment accumulation is observed, or vegetation growth otherwise adversely affecting the condition or storage functions of the ponds are observed, appropriate action will be taken to correct the problem and restore function of the ponds.

3.5.3 Landfill Settlement Evaluation

Landfill settlement evaluation will be conducted to provide a basis for documenting site stability based on settlement of the ground surface on the engineered cap. The Washington Minimum Functional Standards for Solid Waste Handling provide that landfill site stability may be demonstrated if, among other requirements, post-closure monitoring has established that little or no settlement is occurring (WAC 173-304-407(8)(c)).

Topographic surveys of the Landfill were conducted at the Landfill in 1994 as part of closure activities and in 2008 as part of cap maintenance during remedy construction. The purpose of the procedures in this section is to obtain and compile data regarding settlement rates in order to document changes over time.

3.5.3.1 Monument Installation

Twelve permanent monuments (approximately 1 per acre) will be installed on the engineered cap surface. Where possible, existing landfill settlement monuments installed in 2008 will be utilized. The monuments will be installed in accordance with industry practice for long-term topographic evaluation. Monuments will be installed in a manner that will not degrade the effectiveness of the engineered cap.

3.5.3.2 Topographic Survey

Landfill settlement will be evaluated by conducting aerial or ground-based topographic surveys at 5-year intervals. Survey results will be documented with tabulated elevations and a landfill contour map with 2-foot (or smaller) contour intervals. Survey data will be filed electronically at the GWTP and at an off-site location by the professional consultant. Survey results collected at 5-year intervals will be compared to previous Landfill closure grades to identify and monitor areas of settlement. Survey and comparison results will be submitted to Ecology.

3.5.4 Landfill Cap and Stormwater System Maintenance

Conditions identified during inspections that trigger the need for corrective maintenance activities will be addressed in a timely manner. Conditions requiring major action will be submitted to the professional consultant for approval. Corrective maintenance will be implemented by the O&M contractor or a subcontractor. Maintenance actions will be documented in a maintenance form and filed at the GWTP.

3.6 SUBSURFACE BARRIER WALL

The soil-bentonite barrier wall was constructed from August 7, 2009 to October 6, 2009. The barrier wall alignment follows the existing stormwater collection ditch at the toe of the Landfill cap. Refer to As-built Drawing C-1 in Appendix C.

3.6.1 Barrier Wall Design

The subsurface barrier wall was constructed with a conventional soil-bentonite slurry wall technique. The barrier wall alignment follows the perimeter of the Landfill cap, as shown on As-built Drawing C-1 in Appendix C. The barrier wall alignment has a total surveyed length of approximately 2,642 feet. The barrier wall extends 2 feet into the Lower Silt Aquitard where achievable. In the areas of aquitard gaps, the "hanging" wall sections extended to 35 feet below ground surface (bgs) to reduce the flux of groundwater through the aquitard gaps and, consequently, to reduce the future groundwater extraction rate needed to establish hydraulic control, as specified in the 2008 CAP. The total vertical surface area of the barrier wall is estimated to be approximately 80,230 square feet, with a maximum depth of 35 feet, an average depth of 30 feet, and an estimated thickness of 3 feet. The hydraulic conductivity of the barrier wall is less than 10^{-6} centimeters per second. Additional construction completion details are summarized in the Phase 1 Construction Completion Report.

3.6.2 Inspection and Maintenance

The long-term inspection procedures consist of inspection for the condition of the cap surface above the barrier wall alignment for signs of settlement of the slurry wall. If areas of settlement or erosion are noted, maintenance will be implemented as necessary to ensure the continued effectiveness of the barrier wall and cap based on the inspection results. Inspection and maintenance procedures and forms are included in the O&M Manual (Appendix A).

3.7 INTERCEPTOR TRENCH

The interceptor trench was installed as part of Phase 1 construction to facilitate groundwater flow around the barrier wall. It consists of a passive underground drain and two lift stations with separate lines for active interception of groundwater. Intercepted groundwater flows to the North Pond and the West Pond. Refer to As-built Drawing C-6 in Appendix C.

3.7.1 Interceptor Trench and Pond Design

The interceptor trench system was designed to control groundwater mounding on the upgradient or southeast side of the barrier wall and direct flow to the downgradient, or north and west sides, of the Landfill to restore natural groundwater flow patterns. The system allows for groundwater along the southern boundary of the Landfill to be managed separately from groundwater along the eastern side of the Landfill. The interceptor trench system consists of two groundwater interceptor trenches, each with a passive line, an active line with lift station, and a pond (refer to Drawings C-6 through C-11, C-14, E-1, and P-1 in Appendix C). The passive line flows by gravity; the active line receives discharge from pumps located in the lift stations. The lift stations' pumps are activated by level control. The eastern interceptor trench discharges into the North Pond, and the southern interceptor trench discharges into the West Pond.

The passive system was installed at an invert elevation of 14 feet North American Vertical Datum of 1988 (NAVD88). This elevation is approximately 0.5-foot below the bottom of the nearby agricultural ditch. This elevation was determined to be effective for draining the groundwater mound without draining the nearby agricultural ditch. The passive drain pipe was constructed with a 6-inch diameter, perforated, HDPE, smooth pipe installed within a 2-foot layer of 2-inch diameter crushed rock (ballast) to facilitate groundwater movement. The crushed rock layer was wrapped in an 8-ounce per square yard, non-woven geotextile to control siltation.

The active drain system (Drawings C-9 through C-11; Appendix C) consists of two lift stations, one in each trench, with discharge pipes at an invert elevation of 16.5 feet NAVD88. The pumps are activated by sensors installed in the lift station sumps when the groundwater level reaches an elevation of 16.5 feet NAVD88. This elevation was selected to prevent surface ponding because it is the low point of the nearby ground surface elevation; this elevation can be manually reset to other elevations during future operation of the system. Each lift station discharge pipe will be a 4-inch diameter, solid, smooth HDPE pipe.

Both active and passive piping systems have cleanouts approximately every 150 feet (Drawing C-9; Appendix C). Cleanouts were constructed with 45-degree elbows installed with angled risers to the ground surface. The passive and active drain pipes were installed on opposing sides of the trench to allow the cleanouts to reach the ground surface unobstructed. Cleanouts for both pipes are at the same location such that inlets are side-by-side at the ground surface, where they are housed inside a small protective vault with surface access. The active pipes' cleanouts have screw-on caps to prevent pressurized water from discharging. The passive drain pipes have a check valve and manual shutoff valve at their discharge end in the infiltration ponds (Drawings C-11 and P-1; Appendix C).

The North Pond receives water from three sources: stormwater runoff from the Landfill cap, groundwater from the eastern interceptor trench, and treated groundwater from the groundwater extraction and treatment system. The West Pond receives water only from groundwater from the southern interceptor trench. Both ponds have overflow structures that allow discharge to the adjacent ditch system under high water conditions. The North Pond is expected to regularly overflow to the agricultural ditch system because it receives cap runoff and treated water from the GWTP.

3.7.2 Operations Theory

The interceptor trench system is designed to operate in the following manner. The upgradient groundwater elevation exceeds the elevation of the passive drain, and groundwater will flow to the ponds through the perforated pipe. This system allows groundwater to flow passively around the Landfill, maintaining a uniform groundwater level around the Landfill. When the passive drain is unable to keep the upgradient groundwater elevation below a pre-set level, the active system, triggered by a high-level sensor, conveys groundwater to the ponds using pumps. When there is no capacity in the ponds, the pumps in the lift stations shut down by high-level sensors in the ponds. Check valves installed at the discharge ends of the gravity drain pipes prevent direct backflow from the ponds to the interceptor trenches. The ponds primarily provide detention and storage, and neither pond provides substantial infiltration.

The interceptor trench system was shut down, and valves connecting the trenches to the ponds were closed in the spring of 2011, with Ecology approval, due to detection of elevated arsenic

concentrations in the intercepted water. The elevated arsenic concentrations are associated with the Halo of elevated arsenic in groundwater south of the Landfill and the Eastern Boundary Mini-plume, which was not identified prior to the construction of the interceptor trench system. No unacceptable mounding of groundwater has been measured in the area upgradient of the Landfill to date. It is expected that the interceptor trench system may be reactivated in the future following remediation of the Halo and the Eastern Boundary Mini-plume.

3.7.3 Operations, System Set Points, Startup, and Shutdown

Specific operations procedures and set points for the interceptor trench system, including routine startup, shutdown, and startup after power failure and after shutdown for alarm are included in Appendix J.

The system set points include the lift station pumps, which are automatically triggered when water levels exceed a manually set elevation to control mounding of groundwater upgradient of the Landfill. The lift station pumps are shut down when the lift station water level is below the activation set point or if a high level occurs in the infiltration ponds. The level switches for activation and shutdown of the lift station pumps are manually adjusted to support proper operation of the system. Each of the two lift stations operates independently, with separate high-pond-level cutoff switches.

The interceptor trench system utilizes the setting or adjusting of water level switch settings to alter pump start and stop levels in each of the two lift stations and to monitor water levels in the lift stations to assess potential plugging in the passive drain lines. The lift station pumps, when active, are switched on if the water level elevation in the lift station reaches 16.5 feet NAVD88 and the pumps are shut down at a water elevation of 16.0 feet NAVD88. Additionally, level sensors are set to stop pumping in each lift station when the water level in the north and west infiltration pond reaches an elevation of 17 feet NAVD88 and 17.5 feet NAVD88, respectively. The high-level cutoff in the infiltration ponds prevents pumped groundwater from overtopping the stormwater infiltration ponds and discharging to the adjacent agricultural ditch system. When high-water conditions occur that cause shut down of the lifts' station pumps, only passive transport of groundwater occurs (provided valves at the outfall are open). High-water conditions resulting in shutdown of the lift station pumps are only expected to occur during flood conditions in the vicinity of the Landfill.

3.7.4 Inspection

Interceptor trench system inspection procedures and inspection forms are provided in the O&M Manual (Appendix A). Inspections will be performed semiannually. Inspection results will be recorded on the interceptor trench system inspection sheet.

Lift station inspections consist of inspecting the ladder rungs and concrete vault for any signs of damage or cracks, the presence and quantity of sediment or fouling, assessment of pump operation, and inspection of function and settings for controls and level switches. Any significant problems noted are corrected in a timely manner, with the corrective action noted on a maintenance form (refer to the following section).

When in operation, lift stations are inspected once every 6 months and immediately after storm events of greater than or equal to 2 inches of rain in 24 hours. Lift stations are cleaned to

remove appreciable accumulated sediment, as identified by inspections. The pumps in both lift stations are tested annually in early October (prior to the wet season) to ensure proper operation and pumping capacity, with results documented in the Site Operations Log. Annual testing includes verifying operation of the level switches in the lift stations and the infiltration ponds.

Drainage and discharge pipe cleanouts, cleanout vaults, and outfalls are annually inspected for damage, the presence of fouling, sediment accumulation, vegetation or other obstructions, using the existing inspection procedures for pipes and culverts. The inlet and discharge outfalls are inspected to check the condition of the inlet, valves, surrounding riprap, and associated walkways. The ponds are inspected annually in conjunction with the stormwater system (refer to Section 3.5 above) and maintained as necessary.

3.7.5 Maintenance

Interceptor trench system maintenance are implemented as appropriate based on the results of inspections and manufacturer recommendations for mechanical equipment and controls (refer to Drawing P-1; Appendix C). Routine maintenance activities include mechanical/electrical maintenance for the pumps and controls in accordance with manufacturer recommendations, cleaning to remove fouling or sediment accumulation in the lift station sumps and underground lines. If fouling or other obstructions are creating conditions requiring maintenance, or otherwise interfering with operations, appropriate action is taken to remove the obstruction(s) and/or clean out the fouling.

Conditions identified during inspections that trigger the need for corrective maintenance activities will be addressed in a timely manner. Conditions requiring major action will be submitted to the professional consultant for approval. Corrective maintenance will be implemented by the O&M contractor or a subcontractor. Maintenance actions will be documented in a maintenance form and filed at the GWTP.

3.8 SITE SECURITY

3.8.1 Overview

Security for the Site includes two locked gates at the site entrance, perimeter fencing around the Landfill and control panels, security fencing for the GWTP building, and a monitored security system for the GWTP building and control panels for the groundwater recovery system.

3.8.2 Design

The site security system is designed to protect site features considered potential targets for theft, including the following:

- GWTP equipment
- Interceptor trench electrical breaker panel
- Interceptor trench control panel
- Interceptor trench lift station vaults,

- Landfill recovery well vaults
- Landfill electrical kiosks
- Miscellaneous equipment located outside the GWTP
- Instrumentation deployed in Landfill perimeter piezometers

The Landfill and GWTP area is protected by a 5.5-foot-tall, chain-link fence topped with three strands of barbed wire. The main site entrance gate at Fife Way and the main Landfill entrance gate are both secured with heavy-duty keyed padlocks. The Fife Way gate lock is configured to resist bolt cutters. The Fife Way gate is equipped with an electronic fob that is connected to a monitored surveillance system monitored by a private security system when armored. The secondary gates in the GWTP perimeter fence are secured with heavy duty padlocks because they are accessible from Fife Way. A truck gate has been added to the GWTP perimeter fence to allow space for delivery trucks to turn around. The Landfill perimeter fence and the two secondary Landfill perimeter gates are secured with heavy-duty chain and standard combination padlocks.

Inside the GWTP fence, additional security and theft-deterrent measures have been implemented for the treatment plant building. Theft-deterrent measures include exterior yard lights, wall-mounted lights, and motion-activated security cameras that are monitored by the private security company. The building itself has additional barriers to forced entry, including security bars on office windows and door lights, keyed locksets on all exterior and interior doors, and a locking mechanism on the larger roll-up doors, which can only be operated from inside the building. Several pieces of equipment used in the groundwater treatment process are secured in their locations outside the building. The sewer pump control panel is mounted to the building and secured with a keyed padlock. The post indicator valve for the fire sprinkler supply is secured with a combination lock, and the vault itself is equipped with a closure mechanism, which requires a specialized five-sided socket key to open. All other in-ground vaults outside the building are also secured by this socket key system.

Inside the Landfill perimeter fence, the recovery well vaults are secured with the same specialized closure mechanism employed for the fire supply and other in-ground vaults. The Landfill electrical kiosks are secured by keyed padlocks and a secondary keyed mechanism within their door handles. The interceptor trench electrical panel cover is secured with a combination lock, and the interceptor trench control panel cover is secured with keyed locks. Security measures are in place specifically to address wire theft from the groundwater recovery system. The five kiosks panels, stainless steel panels mounted on a concrete slab that enclose controls and electrical service for the recovery wells, include the following security measures:

1. A mast extending approximately 6 feet above each kiosk panel to support a strobe light, flood light and a video camera securely.
2. A motion-activated red strobe light at the top of each mast. Strobe is to flash for 30 minutes each time it is activated by the motion sensor.
3. A motion activated flood light on the mast approximately 5 feet above each kiosk panel.
4. A monitored security camera on the mast for each kiosk vault, with the camera pointed to the front of the kiosk. Each kiosk has a key fob reader. The key fob reader is located at the gate to the Landfill.

5. Fencing has been extended similar to existing site fencing around Kiosk 5, located north of the Landfill, along the Interurban Trail. The fencing is tied to the Landfill perimeter fence. A locked man gate is located on the east side of the fence for worker access to Kiosk 5.

The security cameras provide monitored security similar to that for the building area. The strobe and flood lights are intended to provide a deterrent; letting the intruder now they have been detected and are highly visible. A notice is visible on each kiosk stating that the kiosk is monitored.

Areas outside the protective fencing include the wetlands and agricultural fields to the north, south and west of the Landfill. Site features considered to be theft targets in these areas include the groundwater extraction well vaults and wetlands kiosk. Other wetlands monitoring wells and piezometers, though not of particular theft value, may also be targets for crimes of opportunity such as vandalism because they are accessible to the public and not able to be surrounded by locked gates.

Two types of extraction well vaults are in use in the outer areas, including above ground steel vaults that protect the stick-up wells in the seasonally flooded wetlands and agricultural fields, and in-ground vaults that protect the wells installed flush with ground surface in dry areas. The aboveground vaults are secured with keyed padlocks on the vault covers. The flush-mount vaults are secured with the same specialized closure system used for the Landfill vaults. Similarly to the Landfill kiosk, the wetlands electrical kiosk is also secured with a keyed padlock and a secondary keyed mechanism within its door handles. The remaining monitoring well and piezometer network is secured with keyed padlocks. For aboveground wells, padlocks are used to secure the lids of the steel well monuments. For the flush-mounted wells near public right-of-ways, padlocks are used to prevent the compression cap fittings on the well casings from being loosened. All flush-mounted well monuments are further secured by bolted-on steel covers.

3.8.3 Inspection and Maintenance

Security measures will be subject to inspection and maintenance in accordance with the procedure provided in the O&M Manual (Appendix A). Security system inspection procedures and inspection forms are provided in the O&M Manual. Fencing, gates, monitoring stations, and other security measures will be inspected annually and following any security incidents. Inspection results will be recorded on the security system inspection sheet.

Conditions identified during inspections that trigger the need for corrective maintenance activities will be addressed in a timely manner. Conditions requiring major action will be submitted to the professional consultant for approval. Corrective maintenance of the fence, gates, and other physical security features will be implemented by the O&M contractor or a subcontractor. Corrective maintenance of the monitored surveillance system will be implemented by the security firm under the service contract. Maintenance actions will be documented in a maintenance form and filed at the GWTP.

4.0 In-situ Groundwater Remediation System

4.1 OVERVIEW

This section addresses the operation/maintenance, monitoring, and inspection of the in-situ groundwater remediation system. At the completion of Phase 2, the in-situ groundwater remediation system consisted of two injected PRBs in the End-of-Plume CAA, specifically the 12th Street East Treatment Zone (12SETZ) in the Wetlands End-of-Plume and the Interurban Trail Treatment Zone (ITTZ) in the Western Lobe End-of-Plume (Floyd|Snider/AMECGeo 2010). Refer to Figure 1.2. Following several years of groundwater recovery from areas with the highest arsenic concentrations, the in-situ groundwater remediation system is expected to be expanded into the remaining portions of the Outside Area where arsenic in groundwater exceeds the CUL, in accordance with the 2008 CAP. This OMMP will be updated to address any maintenance and monitoring requirements for the expanded in-situ groundwater remediation system (refer to Section 4.7 and Appendix K ***Reserved***).

O&M requirements for the in-situ remediation system are generally expected to be minimal; O&M will be performed as needed, based on evaluation of monitoring data. O&M consist of monitoring groundwater quality to assess the need for additional treatment injections to maintain conditions appropriate for arsenic removal, and implementing maintenance injections. Injection of treatment substrate does not involve the construction of physical structures or mechanical equipment that requires regular maintenance.

4.2 SYSTEM DESIGN

The design of the two PRB treatment zones comprising the in-situ groundwater remediation system is based on introducing an effective dosage of treatment reagent within two transects of injection borings spanning the widths and depths of the plume lobes in the two arsenic plume areas. System design elements relevant for assessing the effectiveness and maintenance needed to sustain effectiveness of in-situ treatment are described in this section. For additional design details, refer to the EDR Addendum 2 (Floyd|Snider/AMECGeo 2009d).

The chemical reagent and dosage design is based on the results of the Phase 1 In-situ Pilot Study. Treatment utilizes subsurface injection of EHC-M, a commercially available remediation amendment containing organic carbon, zero-valent iron (ZVI), and both magnesium and potassium sulfate. This product induces arsenic removal from groundwater through precipitation of stable sulfide compounds. The treatment approach is based on microbial reduction of sulfate to sulfide to precipitate iron sulfides, with arsenic initially co-precipitating with amorphous iron sulfides and becoming incorporated into pyrite over time. Additional arsenic may be removed with iron corrosion byproducts generated by the ZVI. The amendment serves to provide a carbon source to support growth of sulfate-reducing bacteria and to supply sufficient sulfate and dissolved iron to support iron sulfide precipitation. In addition to releasing dissolved iron, ZVI supplements biological activity and further decreases redox potential (Eh) by releasing hydrogen gas (H_2) into groundwater.

The two treatment zones consist of linear transects oriented approximately perpendicular to the direction of groundwater flow and spanning the general plume orientation. The EHC-M treatment amendment consists of a thick slurry of slow-release organic carbon and microscale

ZVI, which is too large in diameter and too insoluble for transport in groundwater. Arsenic removal has been observed to be most effective during the active sulfide precipitation that occurs while appropriate conditions are maintained (i.e., sulfate-reducing conditions and sufficient sulfate and iron). Iron sulfides that precipitate in-situ remain within the treatment zones and continue to immobilize arsenic. The zones into which the amendment was injected are expected to remain reactive for a period of years and serve as a long-term reaction zone that captures elevated arsenic entering from upgradient. The naturally reducing conditions of the wetland are expected to provide a stable, long-term environment for arsenic sequestered in iron sulfides.

Treatment dosages of approximately 0.33 percent and 0.27–0.4 percent mass EHC-M as a percentage of soil weight were used in the initial installation of the PRBs in the 12SETZ and ITTZ, respectively. Refer to the Phase 1 Construction Completion Report (Floyd|Snider/AMECGeo 2011b) for additional implementation details. A PRB application dosage of 0.26 percent of soil mass was attained in a supplemental treatment zone transect in the ITTZ PRB in 2011. Following monitoring of treatment constituent concentrations in Monitoring Well W-1 that indicated treatment constituents were not being effectively delivered to groundwater in the western portion of the ITTZ, it was determined that additional treatment was needed to maintain conditions for remediation and to achieve CULs in the ITTZ (Floyd|Snider 2011c). Supplemental maintenance injections were performed between October 10 and November 7, 2011. To supplement the original treatment, a transect of injection borings delivering EHC-M was advanced within the Interurban Trail across the center and west of the inferred plume edge. In the ITTZ, 14 injection borings were advanced, approximately 10 feet apart, along the southwest-northeast trending northern gravel shoulder of the Interurban Trail and upgradient of Monitoring Wells W-1 and W-2. The supplemental injection targeted the same depth interval as the previous ITTZ treatment, 8 to 23 feet bgs. Refer to the Phase 2 Pilot Study Monitoring Report for additional details (Floyd|Snider/AMEC 2013c).

4.2.1 Design Criteria for Assessing Monitoring and Maintenance

Monitoring and maintenance criteria based on the requirements of the 2008 CAP are described in this section. The key design criteria for in-situ treatment based on the 2008 CAP are that the treatment remove arsenic from groundwater to achieve the CULs specified in the 2008 CAP; and that the treatment incorporate arsenic into a solid phase with a high degree of permanence for long-term effectiveness.

Both criteria are assessed through groundwater monitoring of arsenic concentration, the fundamental indicator of long-term treatment performance and permanence. In addition to assessing performance and maintenance needs by monitoring arsenic concentration, monitoring of other constituents provides insight into groundwater conditions needed for assessing maintenance needs. The primary maintenance task is preserving the appropriate groundwater conditions for removal of arsenic by reductive precipitation. These conditions consist of two primary components: (1) maintaining sulfate-reducing conditions (i.e., lowered Eh resulting from providing sufficient organic carbon for anaerobic microbial metabolism and/or release of hydrogen gas [H_2] from ZVI corrosion), and (2) supplying sufficient sulfate and ferrous iron, which are the constituents required to precipitate iron sulfides. In some areas of the plume, impacted groundwater contains elevated ferrous iron (up to approximately 100 milligrams per liter).

4.3 MONITORING

The monitoring network and program described in this section is intended to evaluate attainment of design criteria by assessing the effectiveness of in-situ treatment in maintaining conditions for arsenic removal. The performance and short-term effectiveness of the two PRBs in the 12SETZ and the ITTZ have been monitored as part of the Phase 1 and Phase 2 2008 CAP implementation programs. The monitoring program described in this section addresses the long-term effectiveness of the two PRBs. This monitoring program is expected to be modified as needed to encompass the expanded in-situ treatment program for the Outside Area (refer to Appendix K ***Reserved***).

Phase 1, Part 2 performance monitoring was performed in conjunction with injection of in-situ treatment reagent (Floyd|Snider/AMECGeo 2010). The results of this performance monitoring program confirmed that the 12SETZ and ITTZ remedy components were implemented as intended with treatment reagent applied at the intended depths and locations, so that the injected mass of reagent was applied appropriately over the target treatment volume comprising the PRBs.

The effectiveness of the in-situ treatment with respect to the removal of arsenic in groundwater was addressed through monitoring during Phases 1 and 2 of the 2008 CAP implementation (Floyd|Snider/AMECGeo 2011 and 2010). Based on this monitoring, supplemental maintenance injection of reagent was undertaken in the ITTZ between October 10 and November 7, 2011 and reported with the results of the Phase 2 Pilot Study monitoring (Floyd|Snider/AMEC 2013c).

Long-term monitoring will consist of monitoring in-situ remediation indicators in groundwater until other components of the remedy—source control containment of Landfill leachate and groundwater recovery in the Outside Area—has stabilized the arsenic plume and there is no longer a need to maintain the PRBs for attainment of cleanup objectives. At this point, long-term monitoring of the in-situ treatment areas will transition to monitoring of arsenic only. Eventually, it is expected that long-term in-situ treatment monitoring will either be combined with regular compliance monitoring or be discontinued.

4.3.1 Monitoring Program

The long-term (Phase 3) monitoring program will consist of semiannual sampling of representative monitoring wells from both PRBs until Ecology has determined that the arsenic plume has stabilized sufficiently so that no further monitoring of in-situ treatment constituents is needed from the PRB areas. The monitoring program described here addresses only the two existing PRBs (i.e., 12SETZ and ITTZ); the duration, monitoring wells, and other parameters of long-term monitoring of expanded in-situ treatment of Outside Area groundwater will be defined in a future appendix based on the implementation of Outside Area remediation (Appendix K ***Reserved***).

Sampling for in-situ treatment monitoring will be coordinated with compliance monitoring sampling (refer to Appendix B). Groundwater samples will be collected in accordance with the SAP/QAPP (refer to Appendix B). Water quality parameters temperature, pH, specific conductance, dissolved oxygen, and oxidation-reduction potential (ORP) will be measured and

recorded when stabilization criteria have been attained. Groundwater samples will initially be submitted for the following analytes:

- Total and dissolved arsenic
- Total and dissolved iron
- Sulfate
- Sulfide
- Dissolved organic carbon (DOC)

It is expected that the analyte list will be modified so that only total arsenic is monitored when Ecology determines that source control containment of landfill leachate and groundwater recovery in the Outside Area have stabilized the arsenic plume and there is no longer a need to maintain the PRBs for attainment of cleanup objectives. Monitoring results data will be validated and managed in accordance with the SAP/QAPP. The specific monitoring wells that will be sampled are provided below.

4.3.1.1 12th Street East Treatment Zone

Monitoring wells in the 12SETZ are arranged in two rows, the first located along the southern edge of 12th Street East (MW-31A, PD-105, PD-122, and PD-106); and in a second row north of 12th Street East (PD-130, PD-131, and PD-132). Refer to Figure 1.2. In-situ treatment for this area was designed to achieve CULs in the northern row of monitoring wells, which are located downgradient of the treatment transect injected through the 12th Street East road. Treatment effects have been observed in groundwater measured in both rows of monitoring wells due to the low horizontal hydraulic gradient and groundwater velocity in the vicinity.

The following monitoring wells in the 12SETZ will be monitored as part of long-term monitoring:

- PD-130
- PD-105
- MW-31A

These wells are located on the western side of the treatment area, because the overall long-term groundwater flow direction in this area is north-westerly to westerly.

4.3.1.2 Interurban Trail Treatment Zone

While the ITTZ is similar to the 12SETZ in that it is a PRB treatment zone transecting the downgradient reaches of an arsenic plume in the Upper Sand Aquifer (USAq), the ITTZ differs from the 12SETZ in several important respects. Monitoring well data indicate that arsenic concentrations prior to treatment were lower than in the 12SETZ. There are also other major differences in baseline groundwater quality that have implications for ongoing treatment. Prior to treatment, iron, DOC, and sulfate concentrations were notably lower than in the 12SETZ. In addition, the initial injection borings that introduced EHC-M into the ITTZ were spread over a broader area than in the 12SETZ due to difficulties with keeping the injected material from surfacing, and the resulting larger treatment zone had a wider gap between transects, causing

treatment constituents to be less concentrated within the in-situ treatment zone. These factors are thought to explain the need for a supplemental maintenance injection event, described above, that was implemented to improve in-situ treatment.

The groundwater monitoring network in the ITTZ consists of monitoring wells upgradient and downgradient of the treatment zone. Two monitoring wells (W-1 and W-2) are placed within the downgradient reaches of the treatment zone, one monitoring well (W-3) is located downgradient of the leading edge of the plume, and one monitoring well (MW-33) is upgradient of the treatment zone.

The following monitoring wells in the ITTZ will be monitored to assess performance of the treatment zone:

- W-1
- W-2
- MW-33

Monitoring Well W-3 is not monitored because it is located outside the plume and PRB.

4.4 OPERATIONS/MAINTENANCE INJECTIONS

In the event that long-term monitoring results indicate that maintenance is needed to support arsenic removal, the basis for requiring maintenance injection and recommendations for additional amendment injection will be reported to Ecology for approval. Maintenance injections will be implemented in accordance with Ecology approval.

It is expected that maintenance, if necessary, will primarily require injection of additional organic carbon and sulfate, and may also require injection of a dissolved iron source. According to the manufacturer, an EHC-M PRB is typically effective for approximately 5 years. After 5 years, insufficient organic carbon and sulfate may be present for continued pyrite precipitation. Replacement of ZVI may be necessary to achieve sulfate-reducing conditions or restore dissolved iron concentrations. Additional buffering agent may also be necessary in to control potentially adverse pH effects caused by biodegradation of the organic carbon substrate.

The appropriate treatment materials and dosage for reinjection, if necessary, will be recommended to Ecology. The recommended injection plan will consider the status of the cleanup of other areas of the Site; as upgradient groundwater is remediated, the need for continued in-situ treatment in the downgradient reaches of the plume is lessened. Reinjection of EHC-M would likely accomplish the goals of maintenance injection and has the benefit of already having been tested in site conditions. Other potential amendment measures that will be considered for maintenance injections include use of high-fructose corn syrup solution, molasses or other sugars, potassium or magnesium sulfate, and pH buffers.

4.5 REPORTING

In-situ treatment monitoring results will be reported to Ecology with annual O&M reports. Results are used in managing the remediation effort by maintaining the conditions for arsenic removal from groundwater. Refer to Section 7.2.3 for the contents of the in-situ section of the annual O&M Report.

4.6 HEALTH AND SAFETY

This OMMP complies with the health and safety standards prescribed by the OSHA and the DOSH. The HASP included with the CMP (Appendix B) documents chemical and physical hazards associated groundwater monitoring and the injection of in-situ treatment chemicals.

In general, potential chemical exposure hazards include exposure to arsenic-contaminated groundwater and surface water. Potential routes of exposure include ingestion, dermal contact, and eye contact. No chemical hazards are associated with proper use and handling of EHC-M. Chemical hazards for treatment chemicals will be assessed on an individual basis; the HASP will be appended with appropriate health and safety provisions including MSDSs for all treatment chemicals that present a potential hazard. Physical hazards may include falling, lifting, mechanical, noise, heat stress, cold stress, sunburn, biohazards, and traffic hazards. Appropriate site control measures will be maintained in all work areas to limit access during and after work hours. Emergency response and administrative requirements are described in the HASP.

4.7 PLUME-WIDE OUTSIDE AREA TREATMENT

In 2010, Ecology made the decision to implement the 2008 CAP remedy for the areas outside the Landfill using a hybrid approach. The remedial action for the Wetlands CAA utilizes a combination of technologies. The goal of this approach, which is based on the results of an Engineering Alternatives Evaluation (Floyd|Snider/AMECGeo 2010), is to first reduce the mass of arsenic in the groundwater plume by recovering groundwater (using groundwater recovery and treatment) from the highest concentration areas (defined as areas with arsenic concentrations greater than 500 µg/L). Following reduction of the arsenic mass from these areas of the plume, in-situ treatment using the same reductive precipitation approach described above will be utilized to achieve site CULs throughout the plume. The design for area treatment will be based on results of the Phase 2 Pilot Study currently being performed.

A Phase 2 Pilot Study was begun in 2011 to address Ecology's request for further demonstration of the technology to confirm that it is a proven and cost-effective remediation strategy for area-wide arsenic treatment application. Refer to the Phase 2 Pilot Study Work Plan (Floyd|Snider/AMECGeo 2011) for additional details.

This OMMP will be updated as appropriate to incorporate monitoring and maintenance requirements for the expanded in-situ groundwater remediation system at the time of its implementation (refer to Appendix K ***Reserved***).

5.0 Groundwater Recovery System

The 2008 CAP requires that contaminated groundwater beneath the Landfill be contained and that highly contaminated groundwater outside the Landfill be recovered to reduce the mass of arsenic in the groundwater plume that is not contained. The groundwater recovery system for the Site accomplishes these objectives. The recovery system consists of two components addressing the two groundwater areas identified in the 2008 CAP. The Landfill recovery system collects groundwater from the area beneath the Landfill and inside the barrier wall. The Outside Area Recovery System collects groundwater from the areas of highest contamination in the plumes outside the barrier wall. Groundwater from both systems is combined for treatment in the GWTP. The groundwater recovery systems are described in more detail below.

5.1 LANDFILL RECOVERY SYSTEM DESIGN

The groundwater recovery system for the Landfill is designed to withdraw groundwater from the USAq, within the area enclosed by the existing slurry wall surrounding the Landfill. The primary purpose of this recovery system is to maintain the groundwater elevation within the enclosed area at a lower head than the head in the USAq outside the barrier wall and the head in the Lower Sand Aquifer (LSAq) that lies below the lower silt aquitard, so that contaminated groundwater will not flow from the contained area. The Landfill groundwater recovery system, in conjunction with the barrier wall, will provide hydraulic containment of the contaminated groundwater beneath the Landfill. Groundwater recovered from the well network is collected and treated in the GWTP. Performance of the Landfill recovery well network is assessed by the network of piezometers installed around the periphery of the Landfill.

5.1.1 Landfill Recovery Well Network

The Landfill recovery well network was designed to achieve the hydraulic control objectives stated in the Design Basis (Floyd|Snider/AMECGeo 2011): a minimum inward-directed cross-wall hydraulic gradient of 0.5 foot and an upward gradient between the USAq and LSAq. The network of groundwater recovery wells within the Landfill is shown on Drawing C-04. Groundwater modeling conducted for system design indicated that the optimal pumping pattern to achieve target cross-wall gradient of 0.5 foot can be attained by pumping primarily from wells distributed over the northwestern (i.e., downgradient) portion of the Landfill. Minimal pumping requirements were predicted for the southeastern (upgradient) portion of the Landfill. Groundwater modeling also predicted that the highest pumping rates for individual wells would be those located near the known aquitard gaps (i.e., the central portion of the east side and in the southwest corner of the Landfill).

A total of 11 recovery wells were installed in the Landfill (Wells R-1 through R-11). Two recovery wells (R-3 and R-6) were found to have insufficient capacity to be used for groundwater recovery. The network of nine active Landfill recovery wells is expected to provide sufficient groundwater pumping capacity to attain the hydraulic control objective of 0.5 foot across the barrier wall and a net upward gradient from the LSAq to the contained area. The existing well network will likely require expansion if additional pumping capacity is required to fully dewater wastes within the Landfill, as described in the 2008 CAP. The piping and controls installed for the two unused wells can be used to supplement the nine Landfill recovery wells if additional pumping capacity becomes necessary.

The pumping rates for individual wells predicted by the groundwater model to establish hydraulic control varied from 0 to 4 gallons per minute (gpm). The highest pumping rate was predicted for Well R-2, on the east side of the Landfill. The predicted pumping rates for the three wells located in the southwest portion of the Landfill were 2.5 to 3 gpm. The total predicted optimal pumping rate for hydraulic control was approximately 20 gpm. The variable speed pumps installed in the wells provide a nominal pumping capability of 0 to 5 gpm per well. The well pumps in the wells are automatically controlled by the PLC. The well head includes a back pressure regulator and flow meter that can be used to control pumping rates.

The well locations are shown on Drawing C-04. Two collection lines direct recovered groundwater from the nine Landfill recovery wells to the GWTP. Wellhead details are shown on Drawing C-9 and logs are included as Appendix L. The Landfill recovery well design, top-of-casing (TOC) elevation, well screen depth, and the depth to the well pumps are summarized in Table 5.1. Due to the low flow capacity of some wells, the pumps had to be placed within the screen section of the well; flow sleeves were added to the pumps placed in the screened well section to ensure adequate cooling of the pump motor.

As shown on Drawings C-06 and C-07, three electrical control kiosks have been placed in the Landfill area to house local controls for the Landfill recovery wells. Each kiosk is a locked stainless steel cabinet equipped with a motion sensing security camera, as described in Section 3.8. The kiosks control the following wells:

Kiosk	Recovery Well Controls
No. 1	R-7, R-8, R-9, R-10
No. 2	R-2, R-3 (inactive), R-5, R-6 (inactive)
No. 3	R-1, R-4, R-11

The kiosks contain the well pump CU-300 pump speed control unit, which can be locally accessed with the R-100 infrared remote control unit normally located at the GWTP. Each CU-300 unit has local indication of various pump faults, including overload, run-dry, lack of electrical contact, etc. More information is available via the R-100 remote control when it is used in conjunction with the individual CU-300 unit, as described in the O&M Manual.

The Landfill recovery wells include variable speed pumps under automatic control by the central PLC. Each active Landfill recovery well has a Grundfos 5SQE-90 submersible pump. The wellhead completion includes a well sample port, pressure gauge, wye strainer, flow meter, and adjustable backpressure valve within the well vaults. The lids for the well vaults are secured with a pentabolt that can be accessed using a pentagonal socket wrench attachment. The security pentabolts must be completely removed from the vault door before it can be opened. Manufacturer manuals for the 5SQE-90 pumps, CU-300 control units, and R-100 remote control, are available in the O&M Manual and in the equipment files.

Local pump controls in the kiosks provide for manual control using the R-100 remote control unit and for automatic control by the PLC. Local control is intended for use in testing the pumps and adjusting flow rate using the backpressure regulator. Under normal conditions, the active wells are to be kept on “AUTO” mode to allow automatic control by the PLC. Automatic control is discussed in Section 5.4.

The Landfill wells are divided up into two separate collection manifolds, both of which empty into the Head Tank of the GWTP (Drawings C-4, C-6, C-7). Wells R-01, R-02, R-04, R-05, and R-11 make up the east landfill flow. Wells R-07, R-08, R-09, and R-10 make up the west landfill flow. The piping enters the GWTP building near the southeast corner of the building.

The maximum flow for each well can be set by adjusting the backpressure valve in the well vault. Using the local flow meters in the well vaults, the 100 percent pump speed flow can be set to a desired flow rate by manually adjusting the backpressure regulator. Samples can be collected from each recovery using the sample valve. Landfill recovery well vaults will be inspected quarterly when the pump is operating to check for pump, piping, or instrumentation defects. Refer to the procedure in the O&M Manual (Appendix A). Inspections will be documented on an inspection sheet that is filed at the GWTP; refer to Section 5.6 below.

5.1.2 Landfill Recovery System Monitoring

The performance objective for the Landfill groundwater recovery network is to maintain an inward-directed groundwater gradient across the barrier wall of 0.5 foot and an upward groundwater gradient between the LSAq and USAq. Performance of the Landfill groundwater recovery network is measured and monitored by 19 piezometers installed around the perimeter of the Landfill (Drawing C-04). Paired piezometers have been completed in the USAq at eight locations; at each location, the "a" piezometer (e.g., PZ-4a) is located outside the barrier wall, and the "b" piezometer (e.g., PZ-4b) is located inside the barrier wall. The cross-wall hydraulic head difference is determined by subtracting the groundwater elevation from the "b" piezometer from the elevation measured by the "a" piezometer. A positive cross-wall head difference indicates an inward-directed gradient while a negative head difference indicates an outward-directed gradient. Piezometers completed at depths corresponding to the LSAq are present at three locations: one on the east side of the Landfill and two near the southwest corner of the Landfill, as shown on Drawing C-04; the deep piezometers are designated as the "c" piezometer (e.g., PZ-8c). The vertical hydraulic head difference between the USAq and LSAq is determined by subtracting the groundwater elevation measured in the "b" piezometer from the elevation measured in the "c" piezometer; a positive value indicates an upward-directed gradient while a negative value indicates a downward-directed gradient. Logs for the piezometers are included in Appendix L.

A sealed transducer is installed in each of the 19 piezometers that are used to monitor performance of the groundwater recovery system. The transducers directly measure the total pressure in each piezometer; they are all connected to the PLC system as follows:

Control Panel	Piezometer Controls
Kiosk No. 1	PZ-2a/b, PZ-3a/b, PZ-4a/b/c, PZ-5a/b/c
Kiosk No. 3	PZ-1a/b
Kiosk No. 4	PZ-8a/b/c
PLC Panel (GWTP building)	PZ-6a/b, PZ-7a/b

Abbreviations:
GWTP Groundwater treatment plant
PLC Programmable logic controller

The PLC records and monitors transducer readings for each of the 19 piezometers. It also calculates the cross-wall head difference and upward gradients at each of the eight locations and uses the information to implement control actions for the nine recovery wells.

The transducers are all sealed (unvented) transducers. As such, each transducer reads the total pressure above the transducer, including the pressure due to the head of water in the piezometer plus atmospheric pressure. A barometric transducer is installed at the GWTP building; barometric pressure is monitored by the PLC and can be used to convert the piezometer transducer readings to groundwater head at each piezometer. The converted readings can be used to assess actual groundwater elevation in the piezometers. No barometric correction is needed for calculation of cross-wall or vertical head differences. The cross-wall and vertical hydraulic head differences measured in the piezometers are used by the PLC to control pumping rates for the nine Landfill recovery wells, as discussed in more detail in Section 5.4.

The PLC system reads transducer readings in the 19 piezometers and the barometer every minute and records the readings in a process control data queue. Cross-wall and vertical head differences are also calculated and recorded to the data control queue every minute. The data recorded to the process control queue are used by the PLC for process control and can be viewed remotely to assess current conditions. As data in the process control queue are eventually overwritten by the PLC, data must be extracted from the queue to establish a compliance database; this is done once each week. Transducer and barometer readings are extracted from the process control data queue hourly (24 readings per day for each piezometer). The hourly transducer readings are then converted to groundwater elevation using the barometer readings. The groundwater elevation results are then recorded to the compliance database to document performance of the Landfill groundwater recovery system. This database will be maintained on the desktop computer at the GWTP building, in backup storage, and on a CD-ROM or DVD stored off-site.

Transducers for each of the 19 piezometer wells should be calibrated annually. The procedure for transducer calibration can be found in the O&M Manual (Attachment A). It is important that the transducers accurately report groundwater level so that the performance objective specified in the 2008 CAP can be accurately monitored.

In addition to monitoring of water levels to assess performance, Landfill groundwater quality will be monitored annually. The CPOC is at the Landfill perimeter, so there is no performance objective or compliance standard for USAq groundwater inside the Landfill perimeter. These data will instead be collected to track change in groundwater quality inside the Landfill perimeter over time, for use in operations and for understanding groundwater quality trends in CPOC monitoring wells and Outside Area monitoring wells. Groundwater quality from inside the Landfill perimeter will be assessed annually through sampling of inactive Recovery Wells R-3 and R-6, and Monitoring Well PZ-12, or based on sampling of other Recovery Wells at the direction of Ecology.

5.2 OUTSIDE AREA RECOVERY SYSTEM DESIGN

The objective for the outside area recovery well network is to remove the most highly contaminated groundwater from the Outside Area plume to reduce arsenic concentrations to levels suitable for in-situ treatment. To accomplish this objective, groundwater is recovered from three general areas located outside the Landfill, as follows (refer to Figure 1.2):

- An area of elevated arsenic within the Wetlands Plume extending north of the Landfill, including an area across the Interurban Trail
- A small elevated plume area located to the east of the Landfill
- A plume of elevated arsenic levels located immediately west of the Landfill

The Outside Area recovery well design, top-of-casing (TOC) elevation, well screen depth, and the depth to the well pumps are summarized in Table 5.2. The groundwater recovery network for these areas includes six wells within the Wetlands Plume (R-16 through R-21), two wells east of the Landfill (R-12 and R-13), and two wells west of the Landfill (R-14 and R-15), within the area adjacent to an agricultural field. These wells are completed within the areas most highly contaminated with arsenic. Some of the Wetland Plume recovery wells (R-18 through R-21) are located north of the Interurban Trail, within a marshy area. Due to the presence of standing water during the wet season, access to these wells is difficult, requiring waders or possibly a boat. If these wells need to be accessed during the wet season, task-specific health and safety plans and procedures must be prepared. Groundwater produced from the Outside Area wells is collected and treated within the GWTP. The general design for the Outside Area groundwater recovery system is described below.

5.2.1 Outside Area Recovery Well Network

The groundwater recovery wells for the three outside areas consists of a network of 10 wells distributed as shown on Drawing C-04. Groundwater modeling results used for design indicate that these wells will capture groundwater within the estimated extent of the plume exceeding 500 µg/L arsenic in each of these three areas. Optimal pumping rates predicted by groundwater modeling are as follows:

- Wetlands Plume area: 6 recovery wells pumping at 1 gpm per well; 6 gpm total
- Eastern recovery area: 2 recovery wells pumping at 1.6 to 2.1 gpm per well; 3.6 gpm total
- Western plume area: 2 recovery wells pumping at 1.6 gpm per well; 3.2 gpm total

The predicted total pumping rate for the three outside areas is 12.8 gpm.

The well distribution for the Outside Area recovery well network is shown in Drawings C-04 and C-05. As the locations of the outside area recovery wells are prone to flooding during the wet season, the wellheads extend above the expected flood elevations to protect surface equipment. The wellheads are also secured within steel vaults to protect from theft and/or vandalism. The design for the outside area groundwater extraction wells is shown on Drawings P&ID-05, C-08a, and C-08b. Each of the 10 recovery wells well is constructed with 6-inch diameter Schedule 80 PVC casing with a minimum screen length of 10 feet. Well screens are 6-inch diameter PVC vee-wire wells screens. Well logs are included in Appendix L. Controls for the Outside Area wells are as follows:

Kiosk	Recovery Well Controls
No. 4	R-12, R-13
No. 5	R-14, R-15, R-16, R-17, R-18, R-19, R-20, R-21

Kiosk 4 is located east of the Landfill and Kiosk 5 is located north of the Landfill and south of the Interurban trail, as shown on Drawing C-05. Each well has a fixed speed well pump (Grundfos 5SQ-90) with a nominal capacity of 0–5 gpm. Well heads include a flow meter and back pressure regulator that provide for manual adjustment of pumping rate from each well.

The pumps can be started or stopped locally or under automatic control by the PLC. All of the Outside Area recovery wells have HAND/OFF/AUTO (HOA) switches located in the two kiosks. The HOA switches for all Outside Area recovery wells should be kept on AUTO so that the PLC can control the pumps. Local controls allow pumping rates to be manually adjusted using the backpressure regulator and the flow meter.

Groundwater from all outside area wells is collected within a single manifold, as shown on Drawing C-05. The line runs along the north and east sides of the Landfill, starting at the western wells and ending at the GWTP building. Power and controls are installed in the same trench as the collection piping. Additional information for the well equipment and controls is presented in Section 5.3.

5.2.2 Outside Area Recovery System Performance

Performance of the outside area recovery system is monitored to assess attainment of the cleanup objective for the outside area groundwater recovery system: removal of contaminant mass to achieve residual concentration that can be remediated using in-situ treatment. Performance monitoring consists of periodic testing of arsenic concentrations in water recovered from individual recovery wells and monitoring both contaminant concentrations and groundwater levels in monitoring wells near the recovery wells. Outside area recovery wells will be sampled once quarterly (unless they cannot be accessed safely) and tested for arsenic using the field test kit; this test method is capable of detecting arsenic concentrations greater than 10 µg/L; results are semi-quantitative, but are of sufficient accuracy to assess the arsenic level and concentration trends in the recovered water. Samples for laboratory analysis will be taken as appropriate, based upon field testing results. Monitoring of adjacent monitoring wells will be performed as part of the compliance monitoring program for the Site; details are presented in the CMP (Appendix B). Monitoring wells will be sampled to assess contaminant trends in the vicinity of the recovery wells and water level measurements will be taken to assess the capture zone for the recovery wells. Analytical results and groundwater levels from recovery well sampling and monitoring wells will be used to manually control pumping rates from the recovery wells. Performance of the Outside Area recovery wells will be assessed in operations reports, as described in Section 7.0. It should be noted that results from pilot testing of in-situ treatment technologies may change the arsenic recovery objectives for the outside area recovery wells.

5.3 HEALTH AND SAFETY

The health and safety of site workers is of primary importance for operation and maintenance of the groundwater recovery system. A site-specific HASP covering this work has been prepared and is included with the O&M Manual (Appendix A). Additionally, health and safety aspects specific to each routine O&M task are clearly described in the O&M Manual (Appendix A). All personnel providing routine operations, maintenance, or inspection (O&M personnel) will be fully trained in accordance with OSHA and WISHA requirements. All O&M personnel will be required

to read and sign a copy of the HASP maintained at the GWTP office and to be familiar with the O&M Manual applicable to the work they are doing. Personnel involved in servicing or repairing well pumps or energized equipment in the kiosks must be fully trained in Lock-out/Tag-out procedures. Personnel working at the Site alone must have an off-site contact aware of the work being done at the Site; personnel must check in with the off-site contact at least once every 4 hours.

5.4 CONTROL STRATEGY

The control system for the recovery wells must be coordinated with the control system for the GWTP to maintain compliance with both the 2008 CAP cleanup objective and the NPDES discharge permit. The cleanup objective provides for long-term protection of human health and the environment and requires withdrawal of contaminated groundwater. The discharge permit provides for continuous protection of surface waters by regulating the quality of treated water discharge. The groundwater recovery and treatment systems must both perform effectively to achieve both objectives. The overall control strategy for the two systems is to operate the recovery system continuously while maintaining compliance with the NPDES discharge permit for the GWTP. If conditions indicate that the GWTP may discharge noncompliant water, the recovery and treatment systems will both be shut down. The strategies for control of the Landfill and Outside Area recovery systems are described below. These strategies are designed to achieve the performance objectives for the two systems specified in the 2008 CAP and to support control of the GWTP to support compliance with the discharge permit.

5.4.1 Landfill Recovery Wells

The Landfill recovery wells must be operated to achieve an inward directed cross-wall hydraulic head difference greater than or equal to 0.5 foot at eight paired piezometers and an upward gradient at three piezometer clusters. The groundwater system within the barrier wall is fairly complex, as it extends over about 11 acres, varies in depth, and encompasses areas where the underlying aquitard is absent. The area over which the USAq and LSAq are in direct contact (i.e., the Lower Sand Aquitard is absent) is not known. For these reasons, the control strategy has been designed to be flexible and adaptable; it is expected that the control inputs will be revised as appropriate as experience is gained during operation of the Landfill recovery system. The strategy includes primary control directed toward achieving the 0.5 foot inward cross-wall head difference at the eight paired piezometers. The primary control action will be taken to establish a baseline pumping scenario to achieve the cross-wall head difference objective. Secondary or trim control will then be used to increase pumping as appropriate to achieve the upward vertical gradient objective; trim control may result in achieving a cross-wall head difference greater than 0.5 foot, but it cannot reduce the cross-wall head difference. As noted above, the PLC calculates and records the cross-wall and vertical gradients to the process control data queue every minute.

The control objective for primary control algorithm is to achieve an inward hydraulic head difference across the wall that is greater than 0.5 foot at all eight paired “a/b” piezometers. The PLC program allows the operator to input the frequency of taking control actions (i.e., the frequency at which the PLC will check the process control data queue, compare the system status to process control set points, and automatically initiate a control action). This design allows the operator to modify the control frequency if necessary to maintain effective control.

Control actions are currently taken once every 8 hours for the Landfill recovery well system. Control actions consist of checking the latest measured cross-wall or vertical gradient to a lookup table that specifies pumping rate settings for the recovery wells. The control system is designed to allow the operator to identify which wells should be pumped to achieve gradient control for each of the piezometer pairs that monitor cross-wall gradient. Up to three recovery wells may be associated with each piezometer pair. The current control arrangement is as shown on the table below.

Control Piezometer Pair	Control Basis	Controlled Recovery Wells		
		Well1	Well2	Well3
PZ-1a/b	Water level difference (a level – b level)	R-1	R-11	
PZ-2a/b & PZ-3a/b	Minimum water level difference for the two piezometer pairs (a level – b level)	R-10	R-4	
PZ-4a/b	Water level difference (a level – b level)	R-8	R-9	
PZ-5a/b	Water level difference (a level – b level)	R-7		
PZ-6a/b & PZ-7a/b	Minimum water level difference for the two piezometer pairs (a level – b level)			
PZ-8a/b	Water level difference (a level – b level)	R-2	R-5	
PZ-4b/c & PZ-5b/c	Minimum water level difference for the two piezometer pairs (a level – b level)	R-7	R-8	R-9
PZ-8b/c	Water level difference (a level – b level)	R-2	R-5	

The following piezometers are treated collectively by the control system:

- PZ-6a/b and PZ-7a/b

The two grouped piezometers are checked by the PLC for control purposes; the minimum inward gradient from these two grouped points is used for determining control actions. Thus, the minimum inward gradient for PZ-2a/b and PZ-7a/b is used to control pumping from R-10 and R-4. No wells have been assigned to control inward gradient for PS-6a/b and PZ-7a/b based on previous water level data. A similar grouping has been made for vertical piezometer pairs PZ-4b/c and PZ-5b/c; both of these piezometer pairs are located near the southwest corner of the Landfill, in an area where the aquitard is not continuous.

The control system first establishes pumping rates for the Landfill recovery wells based on the primary control system that is based on cross-wall groundwater gradient. The set points for the wells assigned to the eight cross-wall gradient pairs are shown in Table 5.3. The set points are in percent of maximum pump speed for the recovery wells. The actual pumping rate will depend upon the manual setting of the back pressure regulator for each well. The control system then

checks the vertical gradient for the "b/c" piezometer pairs and compares the set points for the "b/c" pairs (PZ-4b/c, PZ-5b/c, and PZ-8b/c). If the pumping set point for the vertical piezometer pairs is greater than the set point for the cross-wall gradient, the PLC will increase the pumping rate for the designated wells. If the vertical piezometer pumping set point is less than or equal to the cross-wall gradient, no change in pumping rate is made by the PLC. This process is repeated every 8 hours.

5.4.2 Outside Area Recovery Wells

The Outside Area recovery wells must be operated to recover groundwater exceeding 500 µg/L arsenic from the LSAq. This is accomplished by pumping groundwater from the recovery wells at a rate sufficient to establish a capture zone encompassing the portion of the plume exceeding 500 µg/L total arsenic. Pumping rate for individual wells is controlled manually by adjusting the back pressure regulator at each well head. A flow meter is installed for each well to facilitate flow adjustment. Wells can be started and stopped by the PLC. It is expected that Outside Area recovery wells will be operated continuously except for shutdown initiated automatically or through operator control. Individual wells can be removed from automatic control as the cleanup objective is attained within the Outside Area.

5.5 OPERATIONS

Groundwater recovery system operations are straightforward. The Landfill recovery wells must be operated to maintain an inward-directed cross-wall groundwater head difference greater than 0.5 foot and an upward gradient at all times, as measured by the piezometer network. The Outside Area recovery wells must be operated to capture and recover contaminated groundwater exceeding 500 µg/L total arsenic. The operations goal is to maintain operation of the recovery system continuously; however, the recovery system can only be operated when the GWTP is in operation. The controls for the recovery wells are to be set to AUTO to support automatic control by the PLC and to allow remote control from and off-site location through the PLC. Flow rates from individual wells can be checked by reading the wellhead flow meter while the pump is in operation.

Performance of the recovery wells is checked annually by performing specific capacity testing for each recovery well. The procedure and documentation form for specific capacity testing is provided in the O&M Manual (Appendix A). Comparing the measured specific capacity to the original specific capacity provides a means to monitor any changes in the well that may be caused by silting, chemical fouling, or biological fouling.

Routine sampling and analysis of groundwater from the individual wells is not necessary. However, each wellhead is equipped with a sampling valve if sampling is necessary. The operator needs to make sure that the well is operating either under automatic or manual control. Sampling must be performed and documented in accordance with the sampling procedure included in the O&M Manual (Appendix A). Appropriate PPE and safety planning must be performed. The operator must also allow sufficient pumping time for the well to be purged if it was not in operation prior to collecting the sample and the sample valve and line must also be properly purged to obtain a representative sample. Appropriate sample handling and preservation methods must be followed, as groundwater samples can be readily oxidized by the atmosphere, causing changes to water chemistry.

Samples of recovered groundwater from each of the three collection manifolds or from the effluent of the Head Tank can be collected at the GWTP. The appropriate sampling procedures included in the O&M Manual (Appendix A) must be followed when collecting a sample to ensure the sample is representative.

5.6 RECORDS AND RECORDKEEPING

O&M records are necessary to document operations parameters and to confirm compliance with cleanup criteria and objectives. Recordkeeping for the groundwater recovery system, including recovery wells and piezometers, is done both manually and by the supervisory control and data acquisition (SCADA) system. Manual records include the Site Operations Log, inspection sheets, testing logs, and maintenance logs. Records kept by the SCADA system include total groundwater recovery rate, transducer readings for the 19 piezometers, barometer readings, cross-wall head difference at the 8 cross-wall piezometer pairs, and vertical gradient at the 3 vertical piezometer pairs.

5.6.1 Operations and Inspection

Operations and inspection records for the groundwater recovery and treatment system document operating conditions over time, monitor process conditions, record instrument calibrations, confirm that inspections were performed, and provide documentation that any issues identified in the inspection have been resolved. Records documenting performance of the Outside Area recovery wells will be presented in the annual O&M Report. Operations and inspections recordkeeping is described in more detail below.

5.6.1.1 Site Operations Log

A bound Site Operations Log is maintained at the GWTP office that documents all site visits conducted by operations personnel. The purpose of the log is to keep a written record of on-site operations activity. Log entries are made whenever operations personnel enter the site. Operations personnel manually enter their name, the date and time they entered the site, describe the general purpose of the site visit, and summarize significant issues noted or work completed. The data and time personnel leave the site are also noted in the log. The log is maintained in the office located in the GWTP building. Copies of the Site Operations Log are maintained at the GWTP building office for up to 3 years. A single log entry is made for each visit to the Site, whether the visit is to address issues related to the groundwater recovery system, GWTP operation, security, or other reasons.

5.6.1.2 Operations Checks and Inspections

Results from checking operations and inspecting the recovery well systems will be recorded to establish and maintain an operating record. As noted above, the Landfill and Outside Area well networks will be checked for operations, wells will be tested for specific capacity, and the system will be completely inspected annually. Records will be maintained as follows:

- Total flow through each of the three collection manifolds will be measured quarterly using the influent flow meter at the GWTP. Measured flows will be recorded in the log book and entered into a spreadsheet maintained on the desktop computer in the

GWTP office. The spreadsheet will include a plot of the data so that any trends can be readily identified.

- Specific capacity testing conditions and results will be recorded on a Specific Capacity Test Log Sheet, as described in the Specific Capacity Test Procedure. These results will also be entered into a spreadsheet maintained on the desktop computer in the GWTP office for comparison to historical data. Original log sheets will be filed at the GWTP building; scanned copies will be filed in the GWTP desktop computer and at an off-site location by the professional consultant.
- Inspections for well vaults will be documented on a Well Vault Inspection Log Sheet. This sheet will include the name of the inspector, date, time, checklist of inspection items, and a summary of any significant observations and any items requiring corrective action. Original log sheets will be filed at the GWTP building; scanned copies will be filed in the GWTP desktop computer and at an off-site location by the professional consultant.
- Inspections for the groundwater collection manifolds will be recorded on the Manifold Inspection Log Sheet. This sheet will include the date and time of inspection, inspector's name, checklist of items to inspect, and a summary of significant observations and any items requiring corrective action. Original log sheets will be filed at the GWTP building; scanned copies will be filed in the GWTP desktop computer and at an off-site location by the professional consultant.
- Kiosk inspections will be recorded on the Kiosk Inspection Log Sheet. This sheet will include the date and time of inspection, inspector's name, checklist of items to inspect, and a summary of significant observations, and any items requiring corrective action. Original log sheets will be filed at the GWTP building; scanned copies will be filed in the GWTP desktop computer and at an off-site location by the professional consultant.

Original and electronic copies of log sheets for operations checks, testing, and inspections will be maintained at the GWTP building for a minimum of 5 years. Spreadsheets will be maintained continuously during system operations; these sheets will tabulate data as it is collected to provide a long-term history of the data. The primary spreadsheet will be maintained at the GWTP desktop; backup copies will be maintained at the GWTP building and at the professional consultant's office. Files on the desktop computer at the GWTP will be backed up on a monthly basis to a portable hard drive or more frequently to a remote server. The portable backup drive will be stored at an off-site location.

5.6.2 Landfill Piezometer Network

Data to be recorded for the Landfill piezometer network include the containment gradient data documenting the magnitude of the inward head difference and upward gradients and data confirming that the groundwater levels are being measured accurately. Maintenance performed on the piezometer network and data collection system must also be properly recorded.

Data recorded by the PLC system from the 19 piezometers and barometer will be used to document compliance with the containment objective for the Landfill. Compliance for cross-wall head difference is monitored by the eight “a/b” piezometer pairs around the Landfill. Compliance for the vertical gradient is monitored by the three “b/c” piezometer pairs that have been

completed near the areas where the aquitard is known to be absent. Pressure transducer data for the 19 piezometers and the barometer are recorded by the PLC system to a process control file on the desktop hard drive every minute. The PLC also calculates and records the eight cross-wall and three vertical gradients every minute. The process control file includes other data monitored by the PLC; this data file is essentially a data queue that grows until it reaches the maximum authorized size; when the file becomes full, the PLC begins to write new data over the oldest data. Data demonstrating compliance with the cross-wall and vertical gradients will be extracted from the process control file once monthly. Readings from the 19 piezometers and the barometer plus the 8 cross-wall and 3 vertical gradients calculated by the PLC will be extracted at 1 hour intervals (24 readings per day per monitoring point) and stored in a compliance workbook. The extracted data will be placed within a monthly spreadsheet; 12 monthly spreadsheets will be stored within an annual workbook. The workbooks containing the groundwater level and containment gradient data will be stored on the desktop computer at the GWTP and at an off-site location by the professional consultant. These data will be kept in a computer for a minimum of 5 years. As noted above, electronic data from the GWTP desktop computer will be regularly backed up to a portable hard drive or a remote server.

The transducers that have been placed in the piezometers will be checked for accuracy semiannually, in accordance with monitoring procedures provided in the O&M Manual (Appendix A). Accuracy checks will be recorded onto a log sheet by field staff; information recorded on the log sheets will include date, time, inspector name, results of measurements and calculations, and a summary of any significant observations or issues. If issues are identified indicating that corrective action (e.g., maintenance or calibration) is required, documentation of corrective action will be prepared as described below. Log sheets will be filed in the GWTP office, with scanned copies provided to the professional consultant. If the calibration for a piezometer changes, the PLC will be updated and the PLC changes will be documented in the Site Operations Log.

5.6.3 Maintenance

Records to document maintenance for the groundwater recovery system will be maintained for each well, piezometer, and kiosk in the system. General maintenance records will be maintained for other system components such as the groundwater collection manifolds. Maintenance activities include routine preventive maintenance and specific maintenance to address a particular issue, problem, or component failure. Preventive maintenance will be performed on a routine schedule; performance will be documented on a preventive maintenance log sheet identifying the date, time, piece of equipment, and operator name; maintenance log sheets will describe the work completed and will be signed by the operator performing the work. Specific maintenance will note the equipment being repaired, date and time of repair, describe the repair work performed, and be signed by the operator performing the work. If maintenance results in replacement of a piece of equipment or a component of the system, the work must be done in accordance with the management of change procedures and equipment documentation for the equipment that is maintained in the GWTP building will be updated accordingly to reflect the change. Documentation for equipment replacement will also be approved by the professional consultant. Maintenance records will also be scanned and stored in an electronic file on the GWTP desktop computer. Original and electronic copies of maintenance records will be maintained at the GWTP building for a minimum of 5 years.

6.0 Groundwater Treatment System

The 2008 CAP requires that contaminated groundwater beneath the Landfill be recovered to establish and maintain hydraulic containment and that contaminated groundwater outside the Landfill be recovered reduce the mass of arsenic in the groundwater plume that is not contained. Recovered groundwater must be treated to remove contaminants. The GWTP is designed to properly treat the recovered groundwater for discharge. A NPDES permit was issued by Ecology to cover treatment and discharge of recovered groundwater. The treated water is discharged to the North Pond, which overflows to an agricultural ditch. The ditch flows toward the west, eventually crossing beneath I-5 and joining the Hylebos Waterway. The GWTP is located within a steel building that protects the treatment equipment, prevents rainwater from contacting treatment equipment and chemicals, and provides secondary containment for process spills.

An overview of the GWTP components and systems is provided in this section. Additional detailed procedures and health and safety information is provided in the O&M Manual (Appendix A). The GWTP is designed to operate under automatic control. It is estimated that the system will require two visits to the site per week by operations personnel to ensure continuous and effective operation, dewater sludge, ensure adequate treatment chemicals are available, and to perform routine maintenance. The frequency for operator attention may be greater during periods of high groundwater flow but is not expected to be less at low flow rates. The GWTP and building are described in more detail below.

6.1 DESIGN CRITERIA AND DESIGN BASIS

The GWTP is designed to remove arsenic present in recovered water and to achieve discharge criteria in the treated effluent. The system has a hydraulic capacity sufficient to treat the highest expected flow of recovered groundwater to achieve the required cross-wall hydraulic gradient and to recover highly contaminated groundwater in the area outside the Landfill. The system uses chemical oxidation, precipitation, settling, filtration, and adsorption to achieve a high degree of arsenic removal. Process wastes are treated to reduce waste volumes. The system is also designed for automated operation and provides for remote access to monitor process operations and to provide inputs to the control system.

6.1.1 Design Criteria

The following criteria were used for design of the GWTP:

- Provide sufficient treatment capacity and operating flexibility to support operation of the groundwater recovery system to achieve 2008 CAP objectives.
- Remove site contaminants from groundwater and achieve discharge criteria that are protective of human health and the environment.
- Discharge treated water to the existing surface water drainage system.
- Size process equipment for the current design flow and for expected future flow reductions.

- Include standby redundancy for critical process equipment to minimize process downtime.
- Automate the main treatment processes to allow un-manned operation during weekends, evenings, and weekdays when an operator is not present.
- Include a centralized control system that can be remotely monitored via an internet connection.
- Provide sufficient storage for chemical feed solutions for at least 1 week of run time under average flow conditions.
- Comply with applicable, relevant, or appropriate regulations and standards (federal, state, and local).
- Conduct remediation work within wetland areas located on or adjacent to the B&L Property in accordance with applicable laws and regulations and in accordance with permits, as appropriate.
- Do not adversely impact neighboring properties, including the Interurban Trail, during and after construction of the remedy components.
- Comply with applicable, relevant, or appropriate regulations and standards (federal, state, and local).
- Comply with appropriate industry, professional engineering, and technical standards.

6.1.2 Design Basis

The general design basis for the GWTP is as follows:

- Groundwater recovery within the contained area beneath the Landfill will be capable of achieving a minimum head differential across the barrier wall of 0.5 foot.
- The total pumping capacity for the GWTP is 150 percent of the recovery rates estimated to achieve the hydraulic control remediation objectives identified in the 2008 CAP.
- The GWTP was designed for a continuous, average flow capacity of 40 gpm.
- The groundwater treatment system was designed to operate at a minimum continuous flow rate of 15 gpm and a maximum, short-term flow rate of 60 gpm to accommodate a range of potential recovery system operations.
- The GWTP was designed to treat groundwater quality that is considered as a reasonable, worst-case groundwater quality that will be recovered from either inside and outside the Landfill (refer to EDR Addendum 3, Floyd|Snider/AMECGeo 2011).
- The GWTP was designed to achieve the water quality criteria presented in the NPDES permit (Appendix E) in the treated effluent.
- The GWTP process design was based on the results of a pilot treatability study conducted in 2010.
- The GWTP includes an automated control and data acquisition system, and was designed to operate under automatic control, with minimal direct operator attention

during normal operations. The control and data acquisition system monitors groundwater level in selected observation wells/piezometers, and will allow remote monitoring and adjustment of operating parameters. The control and data acquisition system includes the following:

- Automatic control of the groundwater recovery well pumps for the contained area and the areas outside the Landfill.
- Automatic control of the GWTP.
- Monitoring of transducers in selected groundwater wells and piezometers.
- Remote autodialing and alarm capability.
- Data logging/recording capability.
- Remote monitoring and control capability for the groundwater recovery pumps, GWTP operations, and level monitoring instruments.

6.2 DESIGN OVERVIEW

The GWTP includes several unit operations that collectively treat recovered groundwater to achieve the required effluent quality and groundwater gradients.

6.2.1 Groundwater Treatment Process

The groundwater treatment system has been designed with the primary goal of removing arsenic from the contaminated groundwater recovered from the Site, to achieve effluent concentrations that meet discharge criteria specified in the discharge permit. The treatment system consists of oxidation, pH adjustment and coprecipitation, clarification, pH adjustment, filtration, and adsorption. A flow diagram is presented in Drawing PFD-01. The treated groundwater is pumped along a buried pipeline and is discharged into the North Pond (Drawing C-04). The solids stream from the clarification process will be stored in a Sludge Tank before being dewatered with a filter press; dewatering of sludge will be done periodically on a batch basis. The filter cake will be picked up and transported to an appropriate waste receiver for disposal. Treatment chemicals will be stored in tanks or transportable totes. Ancillary equipment includes chemical storage, chemical feed systems, process instrumentation, process water, and compressed air. An automated process control and data acquisition system controls individual unit operations and provides process monitoring. Chemicals used in the treatment process include potassium permanganate, lime, sulfuric acid, coagulant, and polymeric flocculant. Later sections of this document describe the treatment processes and equipment in more detail. Detailed procedures for operation of the GWTP are presented in the O&M Manual (Appendix A).

Groundwater recovered from the Landfill and Outside Area enters the treatment process through three collection lines that enter the building near the southwest corner of the building. The lines discharge to a Head Tank located near the southwest corner of the mezzanine. Water flows by gravity from the Head Tank through the influent flow meter to the Oxidation Tank where potassium permanganate feed solution is added to oxidize iron, manganese, and arsenic; the ferric iron forms hydroxide precipitates upon oxidation. The rate of permanganate addition is proportional to the flow rate measured in the influent flow meter. The water then flows to the Coprecipitation Tank where lime slurry is added to raise the pH to 8.8, causing additional precipitation of iron hydroxide. Coagulant is also added to the Coprecipitation Tank to improve

the settleability of precipitated solids. The water then flows by gravity to the Clarifier Unit, which consists of a rapid mix section, a slow mix section, and an inclined plate separator. A polymeric flocculant is added to further improve settleability of the solids. Clarified water overflows from the Clarifier Unit. Sludge is removed from the bottom of the settler; a portion of the sludge is recycled to the coprecipitation tank and the remainder flows to the Sludge Tank. The clarified water flows to the pH Adjust Tank where the pH is lowered to 6.8 with sulfuric acid. Water is pumped from the pH Adjust Tank through the Cartridge Filter and then to the Adsorbers for final treatment. The effluent pH sensor and effluent flow meter record the pH and flow for the final treated effluent, which flows from the building to the North Pond, discharging through Outfall 001. A composite sampling station to collect effluent monitoring samples is also located in the effluent line from the Adsorbers.

6.2.2 Treatment Building

The GWTP is located within a dedicated building to provide security, limit generation of contaminated runoff, and to contain any spills from process equipment and tanks. The building layout is shown on Drawings M-01 and M-02. The 2,400-square-foot building includes a main floor and mezzanine, with man door entrances on the west and east sides of the building. Key features of the GWTP building are described below.

6.2.2.1 Building Pad

Due to the historical flooding events in the vicinity of the Site, during periods of high rainfall in the area of the B&L Property, a building pad was constructed at an elevation of approximately 20 ft NAVD88 to match the elevation of the existing access road around the Landfill. This elevation has been consistently above recent flood elevations and is above the elevation of the 100-year flood (MGS Engineering Consultants, Inc. et al. 2004).

The floor of the building is a concrete pad providing curbing and containment for the GWTP and for lime slurry delivery to the building. A concrete pad and sump is located north of the building to contain any spills or releases of lime slurry during delivery; the concrete pad is sloped to a collection sump. This will provide spill containment in the event of an unplanned release from the lime slurry truck during unloading, preventing lime from entering the surrounding wetland areas. An environmental containment enclosure is installed on the outside of the building, surrounding the lime connection point, to collect any drips and spills from the hose connection during lime truck unloading.

The lime delivery sump includes a sluice gate, which when open will allow stormwater collected on the concrete pad to flow northeast, following the normal drainage pattern. Written delivery procedures specify that the operator must close the sluice gate before a lime truck is brought on to the Site and parked on the concrete pad. If a spill occurs, the lime would be held in the sump and on the concrete pad where it can be collected and disposed of properly. Following successful delivery or cleanup of any spills, the sluice gate will be reopened.

6.2.2.2 Treatment Building

The building includes two man-doors and two overhead doors (Drawing M-01). The large roll-up door provides access for moving the dewatered sludge roll-off bin in and out of the building, and

the smaller roll-up door provides access for bulk chemical deliveries and equipment. The building is electrically heated to maintain the interior temperature above a minimum of 50°F during winter conditions. Exhaust fans are provided to vent moisture and prevent excess heat accumulation in the summer.

The concrete floor of the building provides containment for the GWTP process equipment. The floor beneath process equipment is 1 foot lower than the elevation of the main floor of the building; the lower area is drained by a sump and collection trough. All process equipment and vessels are located within this lower area, which provides secondary containment for any spills or leaks from the equipment within the building. The sump is used to collect polymer dosing pump seal water, any spills, filter press filtrate, and wash water generated during equipment maintenance. Water collected in the sump will be pumped to the Oxidation Tank for subsequent treatment in the treatment process. Water level in the sump is monitored by the PLC to detect spills or excess accumulation of liquids in the containment area. If high level is detected in the sump, the PLC will issue an alarm and initiate emergency shutdown of the groundwater recovery system and the GWTP. As noted on Drawing M-01 separate secondary containment is provided for the lime slurry and potassium permanganate feed tanks.

6.2.2.3 Building Layout

The building layout is shown in Drawings M-01 and M-02. As shown, the building includes a small laboratory area, a small office, and a restroom. The electrical room, which includes the PLC, is located on the mezzanine. A computer used for monitoring and controlling the GWTP is located in the office. A safety shower and eye wash fountain is located on the main floor of the building, outside the lab/office area. The building layout was developed so the process equipment is in a logical sequence, optimizing piping lengths and supporting system O&M.

6.2.2.4 Security and Alarms

Because of concerns over potential property damage or malicious interference, all process equipment and chemical storage tanks are housed inside the treatment building. The treatment building doors will remain locked at all times when an operator is not present. The building has protected windows to minimize the potential for vandalism or unauthorized building entry. The roll-off containers for the solids storage will be stored indoors. The groundwater recovery well heads are each contained in locked well vaults. A monitored security camera system is in place to provide continuous surveillance of the building for intruders during times when an operator is not present at the site. The building area is enclosed with a three-stranded barbed-wire fence. One gate is present at the entrance to the site, one gate is present at the entrance to the Landfill area, and two gates are present at the north end of the fenced area. All gates are normally locked. The building includes fire and smoke alarms that communicate alarm status to the local fire department.

6.2.2.5 Communications

The building is equipped with telephone and internet communications and emergency communications to support a safe working environment. Dedicated telephone lines provide communications via a standard telephone located in the office, a line dedicated to the building fire alarm, and an autodialer. The autodialer provides automated communication to designated

off-site personnel notifying them of alarm or emergency conditions detected by the automated monitoring and control system. Internet service is provided over the telephone lines using an ADSL modem.

6.2.3 Automatic Monitoring and Control

The GWTP includes significant instrumentation for control and monitoring purposes. The treatment equipment and instrumentation have been automated with a single, centralized PLC. Instrumentation and controls for the GWTP are depicted in the process and instrumentation diagrams (Drawings P&ID-00 through P&ID-05). System operations can be monitored via one human machine interface (HMI) located in the electrical control room and a second on the desktop computer located in the office. The system also provides remote HMI access through an internet interface to allow off-site personnel to view the status of the system and initiate control actions from an off-site location. The control system also has dial-out functionality via the autodialer so that critical alarms will be issued by an automated call to the off-site personnel by telephone. Process data are also logged by the PLC system; data are stored on the desktop computer.

The PLC monitors the instrumentation as shown on the process and instrumentation diagrams and controls all primary treatment units. Permanganate feed to the Oxidation Tank is controlled by feeding the chemical proportional to the influent flow rate, as measured by the influent flow meter. The Operator routinely tests the influent for oxidant demand (iron, manganese, arsenic) and inputs the appropriate proportional feed setpoint to the control system. The ORP meter in the Oxidation Tank is monitored by the PLC to identify over- or under-feeding of oxidant. The lime slurry feed pump speed is controlled by the PLC to control the pH at the setpoint entered by the Operator (design setpoint of 8.8). Coagulant feed to the coprecipitation tank and flocculant feed to the Clarifier Unit are automatically controlled based on the influent flow rate; the PLC controls pump speed to maintain the proper chemical dosage. The pH in the pH Adjust Tank is automatically controlled by controlling the sulfuric acid feed pump speed to achieve the pH setpoint in the pH sensor installed in the tank. Water is pumped from the pH Adjust Tank under automatic level control; pumped water flows through the Cartridge Filter and the Adsorbers prior to being discharged. The control system records effluent pH and effluent flow rate every minute; daily flow total is recorded daily. The PLC also controls collection of the effluent composite sample required for compliance with the discharge permit.

The control system provides for safe shutdown in the event of adverse process or safety conditions. Alarms are also issued to off-site personnel in the event of a shutdown or other alarm condition. Shutdowns are initiated for the following events:

- High-high or low-low pH measured by the effluent pH meter, coprecipitation tank pH meter, or pH adjust tank pH meter
- High-high or low-low ORP measured by the oxidation tank ORP meter
- High-high level in the pH Adjust Tank
- High level in the secondary containment area around the process equipment
- High level in the secondary containment area for the lime slurry and permanganate feed tanks
- High-high level in the sludge storage tank

- Failure of a sulfuric acid tote
- Failure of a lime pump hose
- Activation of the safety shower or eye wash fountain
- Activation of the fire alarm (smoke, sprinkler flow, or manual pull station)
- Activation of the emergency process stop switches located within the GWTP building or at the two entrance doors

Shutdown of the GWTP equipment also initiates shutdown of all groundwater recovery wells. In the event of a shutdown, the effluent pumps continue to pump to prevent overflow from the pH Adjust tank, as water flowing by gravity through the process vessels does not stop immediately when influent flow to the head tank stops. An exception to this is in the case of a high-high or low-low pH measured by the effluent pH meter, the effluent pumps stop immediately.

6.3 REGULATORY REQUIREMENTS

Several regulatory requirements apply to the GWTP in addition to the requirements specified in the 2008 CAP. The process must be operated in compliance with the NPDES permit covering the discharge. Any spills or releases must be managed and reported as required by applicable state and federal rules. Solid wastes generated from the GWTP, some of which may be Dangerous Wastes, must be managed and disposed as required. The hazardous materials that are used in the GWTP process must be stored, handled, and reported as required to ensure any emergency first responders understand the nature of chemical hazards present at the building. Most of the regulatory requirements were discussed in Section 2.0. Additional regulatory requirements for hazardous materials handling and reporting are described in Appendix F (HMEP). Specific requirements of particular importance for GWTP operations are summarized here.

6.3.1 NPDES Permit

The NPDES discharge permit (Appendix E) covers all components of the GWTP and discharge. Operations personnel must read and be familiar with the requirements of the NPDES permit. All personnel working at the GWTP are responsible for ensuring compliance with the permit. Specific requirements that must be addressed routinely include the following:

- Monitoring and recording effluent pH and flow rate every minute
- Monthly sampling and analysis of a composite sample for total arsenic, total copper, total zinc, total lead, total suspended solids, and turbidity
- Completing and filing a monthly Discharge Monitoring Report
- Noncompliance reporting

Additional sampling and reporting is required in accordance with the schedule in the permit. The permit must be renewed in order to continue discharging treated groundwater. An application for permit renewal must be submitted to Ecology prior to expiration of the current permit. The current permit expires December 31, 2016.

6.3.2 Solid Waste and Dangerous Waste Management

Several wastes are generated by the GWTP operations, maintenance, and support activities. All wastes and wastewaters generated at the GWTP building must be properly characterized and managed to comply with applicable regulations and to protect human health and the environment. Additionally, sink and toilet drains direct wastewater to the sanitary sewer for treatment in the local publically owned treatment works (POTW). Only sanitary wastes and wastewater from washing glassware can be discharged to the sinks and/or toilet. No other drains discharge to the sanitary sewer. Some wastes generated at the GWTP building have the potential to be classified as Dangerous Wastes; all wastes generated must be carefully characterized to if the Dangerous Waste rules apply to waste management. All site wastes are to be managed and disposed in accordance with Washington and federal laws and regulations.

The following wastes are generated at the GWTP building on a regular basis:

- Dewatered clarifier sludge — Nonhazardous
- Spent cartridge filters — Nonhazardous
- Spent adsorber media — Nonhazardous
- Spent instrument (pH, ORP) electrodes — Nonhazardous
- Wastes from lab testing of process samples — May be hazardous
- Used paper towels, tissues, etc. — Nonhazardous
- General office refuse (waste packaging, etc.) — Nonhazardous
- Waste paper — Recyclable
- Floor sweepings — Nonhazardous

The above nonhazardous wastes can be placed in the roll-off container with dewatered sludge for disposal at Waste Management. No liquids can be placed in the roll-off container. Waste paper should be collected and transported to a recycling facility on an as-needed basis. Laboratory wastes must be placed in the designated receptacle in the laboratory (refer to Section 7.0). Laboratory wastes must be properly characterized either based on the MSDSs for the chemical test kits and calibration solutions or by sampling and analysis. The laboratory wastes must be packaged as required by the disposal contractor and disposed in accordance with the waste classification. It is expected that laboratory wastes will require disposal two to three times yearly. If the laboratory waste is a dangerous waste, it must be properly manifested; dangerous waste manifests must be signed by the Trust.

Other wastes, such as waste from maintenance activities or off-spec chemicals may be generated on an irregular basis. Some maintenance wastes may include waste oil or other chemicals. Any maintenance wastes must be properly handled and characterized prior to disposal. Operations personnel should work with engineering personnel to ensure proper waste characterization for all wastes not identified above prior to disposal.

6.4 GENERAL HEALTH AND SAFETY

Operators and workers at the Site will maintain safe working practices by adhering to the procedures outlined in the O&M Manual (Appendix A) with relevant information summarized in this section. There are a number of chemical and mechanical hazards on-site. Workers must be well versed in the site HASP (refer to Appendix A; O&M Manual). Proper PPE must be worn during all work tasks. Procedure-specific PPE can be found in the procedures section of the O&M Manual, along with safety steps specific to each task. The treatment building should be kept stocked with proper PPE including nitrile gloves, chemical-resistant rubber clothing for working with acid, and extra safety glasses and hard hats. PPE will generally be stored in the lab and office. In the event that any PPE is damaged or lost, it must be replaced as soon as possible.

Housekeeping is a large part of general facility safety. The plant must be kept clean and organized so that operators can find necessary equipment, instructions, and supplies. This will improve safety and also save operating costs.

6.4.1 Worker Health and Safety

There are a number of mechanical hazards on-site as well as the chemical safety hazards explained in the following section. Water travels through parts of the groundwater recovery system and the treatment system under pressure. Workers must ensure proper isolation and lockout of flow paths before performing maintenance on machines with water or chemical flow.

Mechanical lockout hazards come from machinery in the treatment system including the filter press, drum dumper and permanganate auger. Lockout will be accomplished by placing lock-out/tag-out padlocks on the electrical disconnects located in the MCC room. Proper individually keyed padlocks must be used for this purpose. The locks must be labeled with the owner's name.

6.4.2 Process Materials and Chemical Safety

Chemical hazards present the main dangers to health at the Site. There are a number of contaminants and chemicals used to treat water on-site that are harmful to human health. Proper safety techniques must be used.

6.4.2.1 Contaminated Groundwater

Contaminated groundwater is collected by the groundwater recovery system and delivered to the treatment plant via three manifold systems. Within the building, the groundwater is initially received in the head tank.

Many operations in the treatment system require taking samples of groundwater, and handling of groundwater is common for plant operators. Proper PPE including nitrile gloves and safety glasses must be worn when handling contaminated groundwater on-site. The groundwater contains arsenic, which is harmful if ingested or absorbed through the skin.

Operators should wash their hands using soap after handling contaminated groundwater and before eating or drinking.

6.4.2.2 Lime Slurry

Lime slurry is used to raise the pH of contaminated groundwater in the coprecipitation tank, to allow for precipitation of metals and arsenic. The lime slurry is stored in the lime storage tank where it is mixed and recirculated to prevent settling and caking. The slurry is delivered to the lime storage tank via a line that extends outside through the north wall of the plant.

The lime slurry is alkaline and will dry skin upon contact. It can also react exothermically with acidic chemicals in the treatment plant. Plant operators must wear nitrile gloves and eye protection when working around lime. Some procedures occurring near lime include maintenance of the lime recirculation and lime dosing pumps, and lime delivery. Follow the safety instructions in the O&M Manual for these operations.

6.4.2.3 Potassium Permanganate

Potassium permanganate is used to oxidize metals in the oxidation tank, which is just downstream of the head tank. The potassium permanganate is stored in a solid powdered form before being mixed into a large batch on-site.

Potassium permanganate will irritate the respiratory system when in its solid form. Half-mask respirators must be worn by operators when handling the solid potassium permanganate. This will occur when a new batch of permanganate solution is mixed. Nitrile gloves and eye protection must also be worn when working around open drums of solid permanganate. A vacuum with a HEPA filter is on-site and can be used to clean up any permanganate spilled while using the drum dumper and helix. The operator should wear a respirator while vacuuming permanganate, as the dust can easily be stirred up and become airborne.

Once in a liquid form, the permanganate will be stored in a storage tank and dosed directly to the oxidation tank using the permanganate dosing pumps. A respirator is not necessary for dealing with permanganate in solution, though nitrile gloves and safety glasses should be worn.

6.4.2.4 Sulfuric Acid

Ninety-three percent sulfuric acid is used to lower the pH of contaminated groundwater in the pH adjust tank. The acid is kept in two 300-gallon totes located on an acid-resistant grating above an acid-resistant secondary containment sump near the small rollup door in the northwest corner of the treatment building. The sulfuric acid is extremely hazardous. Precautions must be taken so that the acid never comes in contact with skin or is allowed to spill onto any non-resistant surface.

Sleeve-length rubber gloves, a rubber smock, goggles, and a plastic face shield must be worn whenever handling or working around acid. This may occur during maintenance of the acid dosing skid or switching of acid totes. The rubber PPE will be stored in a plastic tote in the treatment building lab.

Acid will react exothermically if in contact with water or other chemicals in the treatment plant such as lime and permanganate. Acid must not be allowed to spill onto the floor of the plant or any other unprotected surfaces. Any beakers or other containers used to hold acid must be washed out thoroughly with water to prevent unexpected reactions or skin contact at a later time.

6.4.2.5 Polymeric Flocculant

Polymer is supplied to the clarifier's flash mixer tank in order to form larger flocculant, which will settle more easily in the clarifier. The polymer is supplied in 5-gallon plastic pails and is inverted on a polymer makedown skid located next to the polymer dosing pumps, on the ground floor next to the coprecipitation tank.

Polymer will create extremely slippery surfaces if in contact with water, and it should not be allowed to spill onto any surface or to contact skin. Skin will become very slippery and irritated if in contact with neat polymer or polymer solution.

Proper PPE including nitrile gloves and eye protection should be worn whenever working with polymer. Switching polymer pails and maintaining the polymer makedown skid both require PPE.

6.4.2.6 Coagulant

Coagulant is dosed to the coprecipitation tank in order to coagulate solids so that they settle more easily downstream in the clarifier. The coagulant is supplied in 5-gallon plastic totes and is dosed as a neat solution directly into the coprecipitation tank. The coagulant dosing skid is located on the ground floor next to the coprecipitation tank.

The coagulant is a solution of ferric sulfate and sulfuric acid, supplied by Nalco as Ferralyte 8130. Coagulant has a pH of 0.5 to 1, is a skin and eye irritant, and will stain surfaces that it comes into contact with. It will react exothermically if in contact with water or alkaline substances such as lime slurry. Proper PPE including nitrile gloves and eye protection should be worn whenever working with coagulant.

6.4.2.7 Activated Alumina

Activated alumina is used as media in the adsorption columns as the last element of treatment of contaminated groundwater. The media is made up of small yellow/orange sand-like particles approximately 2–4 millimeters in size. The media will be contained in the adsorption columns and should not come in contact with the operator. If in contact with skin, the media will cause irritation.

Media will only be removed from the adsorption columns during media replacement. A certified contractor will be on-site during the media change out, but proper PPE including nitrile gloves and eye protection should still be worn by an operator during change out.

6.4.2.8 Water Treatment Sludge

Water treatment sludge is gathered in the clarifier as a result of flocculation settling to the bottom of the clarifier. The sludge is pumped from the clarifier underflow via an air-operated double diaphragm (AODD) pump to the sludge tank, where it is stored until the water is removed using the filter press.

The water treatment sludge contains high levels of arsenic and is harmful if ingested. While working around water treatment sludge, operators must wear nitrile gloves and eye protection. Operators should wash their hands before eating if working with sludge.

Common operations involving proximity to sludge include filter press scraping, change-out of cartridge filters, and clarifier sampling. Refer to the procedures section of the O&M Manual for specific instructions. Sludge should be cleaned up immediately if spilled onto the floor, and dewatered sludge should be placed in the roll-off bin.

6.5 EQUIPMENT AND PROCESS CONTROLS

6.5.1 Head Tank

6.5.1.1 Overview

The head tank (TK-100) is a 400 gallon polyethylene tank located on the mezzanine in the southwest corner of the building. It receives contaminated groundwater from three sources: Landfill A, Landfill B, and the wetland/eastern boundary. Each of the three sources arrives via a PVC pipe. Each of the three pipes has an automatic solenoid valve (EV-100/101/102) and a hand valve (HV-100B/101B/102B). The head tank serves as a small equalization basin, evening out small surges in water flow rate. The discharge from the head tank flows by gravity through a flowmeter (FIT-100) into the oxidation tank.

6.5.1.2 Controls

The head tank has a single control element—a high level switch (LSH-100).

Flowmeter FIT-100 is located between the head tank and the oxidation tank. It measures the influent flow rate, which is used to determine the dosing rate of several process chemicals (potassium permanganate, polymer, and coagulant).

6.5.1.3 Alarms

LAH-100 alarms at the HMI, shuts off the well pumps, and shuts the three influent pipes' solenoid valves (EV-100/101/102).

FAL-100/FAH-100 alarms at the HMI upon low flow rate or high flow rate.

6.5.2 Oxidation Tank

6.5.2.1 Overview

The oxidation tank (TK-110) is a 1,659-gallon fiberglass-reinforced plastic (FRP) tank located within the containment area ground floor, in the southwest corner of the building. It receives water by gravity from the head tank. Potassium permanganate solution is dosed into the oxidation tank in order to oxidize the iron, manganese, and arsenic present in the groundwater. The permanganate flow rate is determined by the influent flow meter and by the dosing rate input box on the HMI. The tank is constantly mixed by a mechanical mixer (AG-110).

6.5.2.2 Controls

The oxidation tank has an ORP sensor (AIT-110) that measures the ORP of the water in the tank. This is used to confirm that the groundwater is being oxidized to a sufficient degree to precipitate iron, manganese, and arsenic. The ORP does not have any control function, it is used as a process check.

6.5.2.3 Alarms

AAHH/AAH/AAL/AALL-110 is a set of alarms that alarm at the HMI to alert the operator that the ORP is out of range, which indicates that permanganate dosing is not correct.

AAHH-110 and AALL-110 shut down the treatment process and call out to the operator.

6.5.3 Potassium Permanganate Feed System

6.5.3.1 Overview

The potassium permanganate feed system consists of several components. Powdered potassium permanganate is brought on-site in small drums. When a new batch of potassium permanganate solution is needed, the operator uses the drum dumper and feed auger system to convey dry chemical from the drum into the potassium permanganate storage tank (TK-310). The operator then fills the tank to the appropriate level by using the water solenoid valve (EV-390), controlled on the HMI. The tank is mixed with a mechanical mixer (AG-310) and has two level instruments: a level transmitter (LIT-310) and a level switch (LSH-310). The tank discharges to the potassium permanganate dosing pump skid, which consists of two diaphragm metering pumps (PU-310A/B) that are operated in duty/standby mode. The pumps discharge potassium permanganate solution to the oxidation tank to oxidize iron, manganese, and arsenic.

6.5.3.2 Controls

The two potassium permanganate dosing pumps have manually accessed controls and PLC-dependent settings. The operator may change the stroke percentage manually by turning the dial on the front of either pump. After adjusting the stroke percentage, the operator must enter the new value for stroke percentage in the PLC under the “Alarm 2” tab.

The “Alarm 2” tab also contains the maximum flow rate for the pumps. This number should be set to the flow rate of the pump at full stroke percentage and stroke frequency. These settings should not be changed during normal operation.

The operator adjusts the permanganate dosing ratio via the dosing ratio box on the Chemical Oxidation System screen of the PLC. The dosing ratio should be set according to metal concentrations measured at the head tank. These measurements will be performed in the on-site laboratory. Refer to the procedures in the O&M Manual for more information.

6.5.3.3 Alarms

The permanganate storage tank has a high level alarm (LAH-310), which will close the water solenoid valve (EV-390). The HIHI float switch (LAHH-310) will shut down the plant and call out to the operator. The ORP alarm (from AIT-110) on the oxidation tank could signify a possible problem with the permanganate feed system.

6.5.4 Coprecipitation Tank

6.5.4.1 Overview

The coprecipitation tank (TK-120) is a 1,659-gallon FRP tank located within the containment area ground floor, adjacent to the oxidation tank, near the southwest corner of the building. It receives water by gravity from the oxidation tank. Lime slurry is dosed into the coprecipitation tank in order to precipitate the iron, manganese, and arsenic present in the groundwater. Coagulant is also dosed to the coprecipitation tank in order to coagulate the solids. The tank is constantly mixed by a mechanical mixer (AG-120).

6.5.4.2 Controls

The lime flow rate is determined by a PID loop that measures the pH in the tank using a pH sensor and transmitter (AIT-120). The PID loop attempts to raise the pH in the tank to the setpoint as set on the HMI by adding lime slurry, which is pumped by the variable speed peristaltic lime dosing pump (PU-325).

The coagulant dosing rate is determined by the influent flow meter (FIT-100) and by the dosing ratio input box on the HMI.

6.5.4.3 Alarms

AAHH/AAH/AAL/AALL-120 is a set of alarms that alarm at the HMI to alert the operator that the pH in the coprecipitation tank is out of range, possibly indicating that lime dosing is not correct.

AAHH-120 and AALL-120 shut down the treatment process and call out to the operator.

6.5.5 Lime Feed System

6.5.5.1 Overview

The lime feed system consists of several components. Lime slurry is delivered to the site via tanker truck through the EnvironBox located on the north side of the building, to the lime storage tank (TK-320). The tank is mixed with a mechanical mixer (AG-320) and the lime recirculation pump (PU-320). The large red peristaltic lime recirculation pump takes suction from the bottom of the lime storage tank and discharges to the top of the lime storage tank; this helps to ensure that lime slurry does not harden in the lime piping. A sidestream from the lime recirculation pump discharge feeds the small green lime dosing pump (PU-325).

6.5.5.2 Controls

The lime storage tank has two level instruments: a level transmitter (LIT-320) and a level switch (LSH-320). The level transmitter will alarm locally upon LAL/LAH-320. LALL/LAHH-320 will alarm and call out to the operator via the autodialer.

The lime dosing pump is a variable-speed peristaltic pump that feeds lime slurry to the coprecipitation tank according to a PID loop controlled by the pH sensor AIT-120 located in the coprecipitation tank. When the pH in the coprecipitation tank drops below the setpoint, the control loop increases the speed of the lime dosing pump to discharge more lime into the tank.

6.5.5.3 Alarms

Leak Detection Alarm LAH-321 will trigger if there is a leak in the lime recirculation pump housing. This will shut down the plant and the lime recirculation pump, and call the operator via the autodialer.

Leak Detection Alarm LAH-326 will trigger if there is a leak in the lime dosing pump housing. This will shut down the plant and the lime dosing pump, and call the operator via the autodialer.

The lime/permanganate containment area has a high level switch (LAHH-390) that will alarm, shut down the plant, and call out to the operator. In addition, LAHH-390 will shut off the lime recirculation pump PU-320.

pH alarms AAHH/AAH/AAL/AALL-120 in the coprecipitation tank (via AIT-120) signify a problem in the lime feed system, such as hardening in the dosing line.

6.5.6 Clarifier Unit

6.5.6.1 Overview

The clarifier consists of three sections: the flash mixing tank, the flocculation tank, and the settling basin. The flash mixing tank is a rectangular tank that receives polymer from the Moyno polymer dosing pumps (PU 330-A and B). The tank is stirred by the flash mixer, a mechanical mixer (AG-130) with a motor directly overhead the flash mix tank.

The flocculation tank is stirred by a slower flocculation mixer (AG-131). When groundwater reaches this tank, all chemical concentrations are in place for proper flocculation formation. During operation, flocculant should generally be visible floating and circulating within the tank.

The settling basin uses parallel plates to increase settling area and channel flocculant to the bottom of the clarifier, where they are pumped to the sludge tank via an AODD pump (P-220). Water flows over the outlet weir into the clarifier to the pH adjust tank (TK-420).

6.5.6.2 Controls

The flash mixer and flocculation tank mixer are both controlled by drives located in the MCC. The flocculation mixer drive is a variable speed drive, and should generally be set around 60 hertz to form flocculant with the best settling characteristics.

There are no moving parts in the parallel plate settling portion of the clarifier. However, the sludge pump timer must be set to prevent sludge from accumulating at the bottom of the clarifier. The sludge should be pumped out at volumetric ratio equal to the volume of sludge coming into the settling chamber. The procedure for measuring sludge input is located in the O&M Manual.

6.5.6.3 Alarms

There are no alarms associated with the clarifier system.

6.5.7 Polymer Dilution and Feed System

6.5.7.1 Overview

The polymer dilution and feed system consists of a Siemens polymer makedown skid, a polymer storage day tank (TK-330), and two Moyno polymer dosing pumps (PU-330 A and B).

The makedown skid inverts polymer in a small cylindrical mixing tank on the skid. The tank receives polymer from a pail of neat polymer as well as two streams of tap water from the plant line. The skid contains a metering pump that pulls polymer from the tote. The mixing tank is discharged to the polymer day tank. The makedown skid operates and feeds to the day tank based on readings from level transmitter LIT-330.

The polymer day tank is stirred continuously with a mechanical mixer (AG-330). The day tank supplies inverted polymer solution to pumps PU-330A and 330B, which dose polymer to the flash mixing tank. Polymer can also be dosed to the sludge tank from these dosing pumps.

6.5.7.2 Controls

The polymer makedown skid metering pump has two controls that can alter polymer inversion rates on the skid. The pump dial can be rotated manually to change stroke percentage. Normally, stroke percentage is kept at 100 percent. The stroke frequency is controlled on the

polymer skid via a control panel to the right of the mixing cylinder. Inlet water flow can also be changed via valves at the foot of the makedown skid.

During normal operation, makedown skid settings should be left constant. The polymer dosing ratio can be most easily changed via the PLC in the "Polymer Dosing Ratio" control box. The operator may use the PLC in this manner to set a proper volumetric dosing for polymer based on desired concentration.

6.5.7.3 Alarms

LAHH-330 is a HIHI alarm signaled by a ball float switch in the polymer day tank. The alarm will shut down the system and signifies a problem with the polymer makedown skid. LAHH-330 will also trigger an autodialer call.

Alarms LAL-330 and LAH-330 control makedown skid operation. These alarms are controlled by level transmitter LIT-330. Upon reaching the low alarm, the makedown skid will begin inverting polymer and feeding the solution into the polymer day tank. The makedown skid will continue polymer inversion until the high level alarm LAH-330 is reached.

A LOLO alarm LALL-330 is triggered if there is very little polymer left in the polymer day tank. This will cause a plant shutdown and signifies that no polymer is being dosed to the flash mixing tank. The autodialer will trigger.

6.5.8 pH Adjust Tank

6.5.8.1 Overview

The pH adjust tank (TK-420) is a 1,538-gallon FRP tank located in the southern corner of the treatment building. The tank is dosed with sulfuric acid to lower the pH of contaminated groundwater to optimum adsorption pH before it flows through the cartridge filters and adsorbers. The plant effluent pumps are located just downstream of the pH adjust tank and provide 100 percent of the head through the filters and adsorbers to the treatment outfall. The tank is stirred by a mechanical mixer (AG-420).

6.5.8.2 Controls

The pH adjust tank contains a level transmitter (LIT-420), a high-high level switch (LSHH-420), and a pH sensor (AIT-420). The level sensor controls the effluent pumps via a "target height" input on the PLC. The effluent pumps will seek to keep the pH adjust tank at the target water level by pumping at variable speeds.

The acid dosing pumps (PU 410A and B) dose to the pH adjust tank based on a "target pH." The target pH is set on the same PLC screen as the target height. The pH reading from AIT-420 is used to control the acid dosing pumps, which dose acid to meet the target pH via a PID loop.

6.5.8.3 Alarms

LAHH-420 is a float switch-controlled alarm. The alarm triggers a plant shutdown and an autodialer call. It signifies a clog in the adsorbers or cartridge filters, or a problem with the effluent pumps.

LALL-420 is a LOLO alarm using readings from water level transmitter LIT-420. The alarm will shut off the effluent pumps and the mixer.

LAL-420 and LAH-420, which are warning alarms based on LIT-420, will warn the plant operator if the pH adjust tank water level is out of normal operating boundaries.

AAL-420 and AAH-420 are high and low pH warning alarms that will notify the plant operator if the pH adjust tank pH level is out of normal operating boundaries.

AALL-420 and AAHH-420 are HIHI and LOLO pH alarms that will trigger plant shutdown and autodialer calls. These alarms may signify acid dosing pump error.

6.5.9 Cartridge Filters and Adsorbers

6.5.9.1 Overview

There are two cartridge filters and two adsorption columns downstream of the pH adjust tank at the site treatment system. The cartridge filters are located next to the pH adjust tank and are operated in a duty/standby configuration. The filters remove solids from the water before it enters the adsorption columns. Each cartridge filter vessel holds six 30-inch filter elements, which will be replaced as-needed (generally on each operator visit) by the plant operator. There are hand-operated air/pressure release valves on top of each filter vessel, which should be released before replacing filter elements. The process for changing filters is in the Procedures section of the O&M Manual.

The two adsorption columns are operated in a lead/lag setup and are the final treatment step for arsenic. The columns are filled with activated alumina-based media, which adsorbs arsenic before groundwater is discharged. The media will be changed approximately yearly (before arsenic breakthrough) by a certified contractor.

The columns are capable of being backwashed on an as-needed basis, but this procedure should be avoided as it interferes with the best efficiency of the adsorption media and creates a dirty water residual, which must be sent to the sludge tank for filter pressing and retreatment of the water. Backwashing is in the Procedures of the O&M Manual.

6.5.9.2 Controls

The cartridge filters and adsorption columns both have differential pressure transmitters (DPIT-430A and B for filters, DPIT-440 A and B for columns) to measure pressure drop across the respective treatment devices. The differential pressure readings will be displayed on the PLC and should be used by the operator to replace filter elements at the proper time or to identify problems in the adsorption columns.

6.5.9.3 Alarms

Differential pressure alarms DPAH 430A and B warn the operator of high pressure drop across the cartridge filters. At this point, the filter elements should be changed out.

Differential pressure alarm DPAHH 430A and B are HIHI differential pressure alarms that will shut down the plant because of pressure drop across the cartridge filters. The operator will also be called via the autodialer.

DPAH 440A and B warn the operator of high pressure drop across the adsorption columns. This signifies an issue in the columns.

DPAHH 440A and B are HIHI alarms that will shut down the plant due to pressure drop across the adsorption columns. The autodialer will be triggered.

6.5.10 Sludge Dewatering

6.5.10.1 Overview

The sludge dewatering system consists of two AODD pumps (P-220 and P-230), a sludge storage tank (TK-220), and a frame-and-plate filter press. Through the sludge dewatering system, sludge made up of settled flocculant is transferred through the filter press where solids are separated and set aside in a roll-off container for disposal in a landfill.

The sludge is transferred from the bottom of the clarifier to the sludge tank via a 0.5-inch AODD pump (P-220). The two AODD pumps are powered by an air compressor. The sludge tank is a 6,055-gallon FRP tank located in the center of the treatment system. The tank is mixed with a mechanical motor (AG-220). A 1-inch AODD (P-230) moves sludge from the sludge tank through the filter press. This pump will operate when a plant operator is on-site because the filter press must be started manually. Water from the sludge will go to the plant sump where it will be pumped to the oxidation tank.

6.5.10.2 Controls

Solenoid valve (EV-920) controls air flow to the 0.5-inch AODD and is controlled via the PLC. The operator should refer to the Clarifier Procedures section of the O&M Manual to determine the correct timing ratio for Valve EV-920.

Solenoid valve (EV-930) controls air flow to the 1-inch AODD pump and will be opened automatically during filter press operation. The filter press will be manually started by an operator, who will also need to scrape off the press upon cycle completion.

6.5.10.3 Alarms

Alarm LAHH-220 is a HIHI level alarm in the sludge tank controlled by a ball float switch. The alarm will trigger a plant shutdown and an autodialer call.

Alarms LAL-220 and LAH-220 are low and high level alarms, respectively. They are controlled by level transmitter LIT-220. These alarms will notify the plant operator if sludge tank levels are out of normal operating boundaries.

Alarm LALL-220 is a LOLO alarm that will shut down the sludge tank mixer when triggered.

6.5.11 Air Compressor

6.5.11.1 Overview

The air compressor system supplies air flow to the two AODD sludge pumps and the filter press. The system includes a compressor (CO-910), air cooler, and accumulator vessel (TK-910).

6.5.11.2 Controls

There are pressure-regulating valves on all three lines of the air compressor system (one to each AODD pump, one to the filter press). These regulators may be used to control flow from the AODD pumps.

Solenoid valves on each air line allow the AODD pumps to operate. As mentioned in the sludge dewatering section above, EV-920 is controlled by an operator-set timer on the PLC. EV-930 is controlled automatically by the filter press PLC when running the press.

The overall air pressure may be set by the regulator at the air compressor manifold.

6.5.11.3 Alarms

Alarm PAL-910 is a low pressure alarm at the air accumulator vessel (TK-910). The alarm signifies a problem with the air compressor and will result in an autodialer call. Operators may set the alarm setpoint at the pressure indicator on the vessel (PI-910) using a specialized key located in the plant office.

6.5.12 Control System

6.5.12.1 Overview

The site treatment system is controlled automatically by a PLC located in the MCC room at the treatment facility. The PLC has a user-friendly interface that can be operated via a touch screen in the MCC, the desktop computer in the office, or remote access.

The PLC records all analog signals at the plant every minute and also controls plant processes based on the analog readings. Shutdowns and alarms are logged in the PLC and can be accessed along with analog signal records by a plant operator.

The treatment system autodialer is located in the PLC cabinet in the MCC room. The autodialer will call operators from a set phone list when certain high/low parameter level alarms occur. The

operator receiving an autodialer call will have to acknowledge the alarm by pressing “555” or the autodialer will continue calling additional operators.

6.5.12.2 Controls

The PLC treatment system interface is split amongst six main screens, which are based upon stages of the treatment system. For example, the first panel holds controls for the head tank, oxidation tank, and permanganate system as these are the first treatment processes once water enters the building.

The PLC also holds three “alarm” tabs where parameter levels can be set for transmitter alarms in the operating system. Permanganate dosing pump settings are also located in Alarm Panel 2. Alarm panel three contains piezometer pair differential alarms as well as controls to enable and disable the plant autodialer and some plant shutdown parameters.

The “configuration” tab on the PLC allows the operator to configure the analog signals coming from all transducers and transmitters at the Site. These include signals from the piezometers, pH/ORP analyzers, flow meters, and level transmitters. The electrical signals may weaken over time, and the operator can adjust the PLC accordingly to convert the analog signals correctly.

The “differentials” tab is used to adjust groundwater recovery well speed settings based on analog readings from the transducer pairs in the Landfill. Refer to the O&M Manual for a procedure on setting recovery well speeds.

6.5.13 Utility Systems

6.5.13.1 Overview

The B&L Treatment System has several utility systems, including potable water, process (nonpotable) water, and fire water. Process water is dealt with in this section, other water types dealing with site safety are dealt with in other sections.

6.5.13.2 Controls

The process water line is controlled via Solenoid Valve SV-980. This valve is open during plant operation and shuts during a plant shutdown. The water is necessary for inversion of polymer, and mechanical seal lubrication of the effluent and polymer pumps. The operator may open and close this solenoid valve on the first panel of the PLC to the left of the permanganate storage tank icon by pushing the “FORCE” button.

A separate process water solenoid valve, EV-390, controls water flow to the permanganate storage tank and will open automatically when making a batch of permanganate.

6.5.13.3 Alarms

There are no alarms directly associated with the process water line.

6.6 OPERATING TASKS

On overview of operating tasks is provided in this section. More specific operating procedures are provided in the O&M Manual (Appendix A).

6.6.1 Equipment and Process Checks

When on-site, the operator should monitor all site equipment and processes to ensure that they are operating properly.

Plant operators should check site operations remotely on a regular basis. Alarm status can be checked remotely to see if any plant operations are out of normal conditions. Operators should use remote checking to ensure that supplies such as chemicals and filters will be available when needed.

Analog information trends can also be viewed and downloaded from the PLC while accessing the site remotely. Trends in pH, tank levels, and flow can be used to foresee upcoming maintenance issues. Operators should take note of piezometer head difference trends to see that compliance will be met. It is very important that troubleshooting be done by plant operators in advance and trends be spotted before an issue occurs. This will prevent plant shutdowns and noncompliance events.

6.6.2 Chemical Feed Rate Determination

6.6.2.1 Potassium Permanganate

Potassium permanganate dosing will be determined by the ferrous iron, manganese, and arsenic concentrations in the influent water stream. These concentrations will be measured by the operator on a semiweekly basis. Refer to the individual procedures in the O&M Manual for information on measuring these chemicals using Hach test kits and the laboratory spectrophotometer.

After these concentrations are obtained, the operator should determine the oxidant demand of the influent water to determine a dosing rate. There is a spreadsheet on the office desktop named “Chemical Dosing Rates” that may be used to simplify this calculation.

It is especially important that the operator measure influent metal concentrations and recalculate dosing ratio if a low/high ORP alarm occurs.

6.6.2.2 Lime Slurry

Lime slurry will be dosed to the coprecipitation tank based on a PID loop using the current pH reading on AIT-120 and the rate of change of that pH meter. The operator cannot adjust these PID settings. However, the operator must ensure that the pH meter is reading accurately. A sample of coprecipitation tank water should be tested by the lab pH meter to confirm the reading of the process instrument, this should happen weekly. The meter should be cleaned off with deionized water and a cloth semiweekly, and the operator should perform a two point calibration on the meter monthly.

6.6.2.3 Sulfuric Acid

Sulfuric acid will be dosed to the pH adjust tank based on a PID loop using the current pH reading in AIT 420 and the rate of change of that pH meter. The operator cannot adjust these PID settings. However, the operator must ensure that the pH meter is reading accurately. A sample of pH adjust tank water should be tested by the lab pH meter to confirm the reading of the process instrument, this should happen weekly. The meter should be cleaned off with deionized water and a cloth semiweekly, and the operator should perform a two point calibration on the meter monthly.

6.6.2.4 Polymer

Polymer is dosed to the flash mixing tank by two Moyno dosing pumps located next to the polymer makedown skid. The plant operator sets a polymer dosing ratio on the PLC and the polymer dosing pumps adjust their speed based on the influent flow rate at FIT-100 to meet this dosing ratio. Polymer should be dosed at a rate that promotes the formation of flocculant with the best settling characteristics. There is a fairly wide range of dosing that will result in good flocculant, a dosing ratio of 200 to 300 generally is sufficient.

6.6.2.5 Coagulant

Coagulant is dosed to the coprecipitation tank by the coagulant dosing pump skid located next to the polymer makedown skid and the coprecipitation tank. The plant operator sets a coagulant dosing ratio on the PLC and the coagulant dosing pump adjusts its speed based on the influent flow rate at FIT-100 to meet this dosing ratio. Coagulant should be dosed at a rate that neutralizes the surface charge on the oxidized solids particles and promotes the formation of flocculant with the best settling characteristics. Based on testing by Nalco, a dosing rate of 15–25 parts per million works well.

6.6.3 Chemical Feed Solutions

6.6.3.1 Preparation of Potassium Permanganate

Potassium permanganate is made in large batches by transporting solid chemical in the drum dumper and helix. When the permanganate tank is at a level such that a full batch can be mixed, the operator will use the drum dumper to move chemical from a 35-gallon drum into the chemical hopper. Read the procedure in the O&M Manual to ensure proper safety precautions are taken, such as the donning of a half-mask respirator.

From the chemical hopper, the solid chemical is moved to the permanganate storage tank with a metal helix. The operator presses the “Make Batch” button on the PLC to open a solenoid valve and allow water to enter the tank. The mixer will also turn on when the “Make Batch” button is pressed. A more detailed procedure may be found in the O&M Manual.

6.6.3.2 Lime Slurry Delivery

Lime slurry will be delivered via tanker trucks at the Environbox port on the east side of the treatment building. A plant operator will be present outside the building to watch contractors hook up their lime line to the Environbox. During lime slurry delivery, the hand valve on the outdoor secondary containment (HV 399) must be closed to that no lime will travel off-site if there is a lime spill.

The lime delivery contractors should be told beforehand how much lime will fill the lime tank to 1 foot below the overflow so there is no wasted chemical. The operator should leave about a foot of extra room so that the contractors can wash out their lime compartment into the lime tank as well.

Once a lime delivery is completed, the operator will inspect the secondary containment to see if any lime has been spilled. Refer to the O&M Manual procedures section for instructions on cleaning secondary containment.

6.6.3.3 Sulfuric Acid Delivery and Setup

Sulfuric acid will be delivered in 300-gallon totes. There will be one “duty” tote and one extra tote on-site. When an operator switches to the spare tote, a new tote should be ordered to change out with the empty vessel.

The tote will be delivered through the small garage door immediately next to the acid totes. A deliveryman-supplied forklift or pallet jack will remove the empty acid tote from on top of the secondary containment grating and place the new acid tote onto the grating. There is a system of two portable ramps available to get the tote over the containment curb. The operator will watch carefully to look for any spillage or leaks.

The new acid tote will be inspected once it is firmly on the secondary grating. The delivery person should wait until the operator is satisfied that the tote is placed correctly, as it cannot be moved by the operator alone. The tote’s effluent port should be able to reach the acid skid suction tubing.

The operator will install a level transmitter (LIT-410/411) on the spare tote to sense rapid level change in the case of a leak. The sensor will remain on the tote for the length of its use.

6.6.3.4 Polymer and Coagulant Delivery and Setup

Polymer will be delivered to the B&L Treatment Plant in 5-gallon pails. The operator will switch the pails out once the current polymer pail is almost out. Do not wait until the polymer runs out completely. Simply save the material in the old pail and pour it into the new pail after it has time to empty.

A vacuum relief hole needs to be drilled into the top of a pail upon setup. Use the on-site drill and drill the hole so that it is on top of the pail when it is sitting as it will sit upon usage. The bulkhead fitting can simply be switched to the new pail from the old pail when switching supply.

There should always be at least one extra full pail on-site to prevent plant downtime. Maintaining extra chemical supply is the operator's duty.

6.6.4 Sludge Dewatering

6.6.4.1 Sludge Inventory Management

Once sludge is run through a filter press auto cycle, it will be dropped into the roll off bin in front of the large garage door. Plant operators must note the amount of sludge in the roll off so that pickup can be organized in a timely fashion. The sludge tank fills quickly; it is imperative that the roll off have room for sludge to prevent plant downtime.

6.6.4.2 Waste Characterization

The sludge in the roll off bin will be recharacterized on a yearly basis at an Ecology-certified laboratory via a toxicity characteristic leaching procedure (TCLP) analysis.

6.6.4.3 Waste Disposal

The plant operator will coordinate with waste disposal contractors to haul the roll off bin away before the bin fills completely. A new roll off bin must be delivered when the old bin is shipped off-site to prevent plant downtime.

6.7 BUILDING AND UTILITY SYSTEMS

An overview of the building and utility systems is provided in this section. Additional detailed operating procedures and health and safety information for these systems are provided in the O&M Manual (Appendix A).

6.7.1 Facility Safety Systems

6.7.1.1 Safety Shower/Eye Wash Fountain

The safety shower and eye wash fountain is located on the wall between the lab and the bathroom in the treatment plant. The safety shower can be activated by pulling the metal lever directly down. The shower should be used in the case of hazardous chemical spills that contact skin or clothing.

The emergency eyewash is located directly below the shower head and should be used in any hazardous chemical comes in contact with the eyes of an operator.

Both the emergency eyewash and the safety shower will shut down treatment operation upon activation. An alarm will be issued and the autodialer will begin calling operators. The shower and eyewash shall be tested every month. For the purposes of testing, there is an "Alarm Disable" button on the PLC that will temporarily disable the plant shutdown and autodialer callout in the event of operation of the shower and eyewash.

6.7.1.2 Fire Protection System

The fire protection system at the Site consists of smoke detectors, a sprinkler system, fire alarm pull stations, and a fire panel autodialer, which is separate from the plant process autodialer. In the case of a fire, the sprinkler system will actuate. All secondary containment areas in the treatment building are sized to hold a chemical spill as well as water volume from 20 minutes of sprinkler operation.

The fire alarm autodialer will make a direct call to the fire department in the case of a fire alarm. There is a lockbox on the entrance gate that contains keys and a fire department-specific code. This will allow fire marshals to enter the premises if there is no operator on-site.

6.7.1.3 Fire Extinguishers

There are three ABC-rated fire extinguishers present on-site. One is present just inside each of the two man doors, and one is present just outside the electrical room. These extinguishers must be visually inspected on a monthly basis, and a record of the inspection recorded.

6.7.1.4 Emergency Shutdown/Remote Alarm

There are three emergency shutdown buttons at the treatment building. One is located on the wall near the safety shower. That button is a mushroom head push to actuate, pull to deactivate. The other two are located just outside of each man door. Those two buttons are “break glass” type with a small attached hammer. If activated, each of the buttons will immediately shut down the treatment system and issue an Emergency Stop Alarm. This alarm will be communicated via autodialer to operators.

The autodialer will call operators in the case of any system shutdown triggered by a system alarm. The autodialer must be acknowledged by an operator by typing “555” on the phone, in order to stop it from calling the next operator on the call list.

6.7.2 Housekeeping

The plant operator must maintain clean working conditions in the plant. Good housekeeping will improve plant operation and health and safety practices. The on-site office and laboratory are especially important for housekeeping practices. The office must be kept in order so that proper manuals, permits, and figures may be found quickly during maintenance or shutdown events. The office will also be where manual records of maintenance and testing results are kept.

The laboratory must be kept clean to prevent contamination during testing and to ensure health and safety. The operator should be familiar with the laboratory housekeeping procedure in the procedures section of the O&M Manual. There are many small reagent packets and testing materials in the laboratory that must be stored and disposed of in the correct manner, so the operator must take care when using the lab.

6.7.3 Secondary Containment

6.7.3.1 Storage Tanks

Lime and permanganate solutions are stored in FRP tanks located inside of a concrete secondary containment area. The secondary containment is a 3-foot-6-inch-high wall surrounding the lime tank, lime recirculation pump, lime dosing pump, permanganate tank, and permanganate dosing skid. The containment is sized to hold a spill from one of either the lime tank or the permanganate tank, as well as sprinkler water.

The secondary containment surface is coated with a chemical-resistant coating and will not be harmed in the case of a lime or permanganate spill. If a sizeable spill does occur, a vacuum truck may be necessary to empty out the secondary containment around the storage tanks.

There is a HIHI float switch in the storage tank secondary containment that will trigger a plant shutdown and autodialer call if activated.

6.7.3.2 Acid Containment Sump

Two 300-gallon totes holding 93 percent sulfuric acid are located directly over an acid containment sump large enough to hold a spill from one tote and water from sprinkler operation. The sump is coated with an acid-resistant coating that will protect the concrete in case of an acid spill.

If a spill does occur, a hazardous chemical contractor will need to come in and vacuum out the chemicals. The low pH acid will likely need to be carefully neutralized with lime or another basic chemical.

The acid tote level sensors will alarm at the PLC, cause a plant shutdown, and call out to the operator if there is a high rate of change of level in a tote, which could indicate a failure of the acid tote and leakage of acid.

6.7.3.3 Lime Delivery Pad

The lime delivery pad includes secondary containment during lime delivery via tanker truck. The truck will attach its delivery hose to the Environbox located on the outer wall of the treatment building. A line runs from the Environbox directly to the lime storage tank in the treatment building.

Lime spillage may occur during the delivery process, so the secondary containment area is sloped down to a containment pit, which will catch any spilled lime. A berm surrounds the ramp, so spills will not travel outside of the containment area.

A hand valve is located in the secondary containment pit and should remain closed during lime delivery. This valve opens a drain to the drainage swale.

The procedure for lime delivery is provided in the O&M Manual.

6.7.3.4 GWTP Containment Area

The secondary containment of the GWTP is located on the lower grade portion of the building, allowing it to catch any spills outside of chemical storage tanks. Water will flow regularly into the containment area from polymer dosing pump seal water and filter press operation. There is a sump in the containment area (measuring 4 feet wide by 4 feet long by 4 feet deep) that contains a sump pump, which flows into the oxidation tank. The sump pump has a high and low level switch that will control the level in the sump.

There is a HIHI float switch in the sump which will trigger a plant shutdown if there is a problem with the sump pump or if inflow to the sump is so high that the pump cannot keep up.

6.7.4 Sewage Lift Station

The north side of the building includes the sewage lift station and control panel, which gathers site domestic wastewater from the toilet, lab sink, and bathroom sink in a wet well. Inside the wet well is a sewage grinder pump, which operates automatically to discharge sewage to a sewage manhole located north of the Site. The pump operates on level control, based on two float switches present inside the wet well. There is a locked (the key is in the site office) control panel attached to the building, adjacent to the wet well. Upon a problem with the lift station, an alarm is sent to the PLC and an audible alarm is sounded at the sewage control panel. The audible alarm can be silenced with a pushbutton located on the bottom of the control panel. A high-high level switch will actuate upon a high level in the wet well, indicating a problem with the grinder pump.

6.8 ON-SITE LABORATORY TESTING

Laboratory testing will be performed on-site at the lab in the GWTP. The laboratory is fully equipped with all equipment used to perform several laboratory tests needed for routine O&M. Other analyses will be performed off-site at an accredited analytical laboratory. On-site testing will be conducted according to the procedures described in the O&M Manual (Appendix A). Laboratory equipment will be kept clean and maintained according to procedures in the O&M Manual.

Laboratory testing on-site utilizes two instruments, a spectrophotometer and a pH/ORP analyzer with two electrodes and a colorimetric test kit for measuring arsenic concentration. The spectrophotometer measures the concentration of ferrous iron and manganese in water. The pH/ORP analyzer has two electrodes, one for each parameter. These tests are performed weekly. The ferrous iron, manganese, and arsenic tests will determine the permanganate dosing ratio. The pH and ORP tests will confirm the accuracy of the in-line sensors.

6.8.1 Laboratory Safety Practices

Laboratory practices for safe and effective operations are described in this section. Health and safety measures for on-site laboratory work are described in the HASP (included with the O&M Manual; Appendix A). Personnel will conduct all on-site laboratory work in accordance with the laboratory practices described in the O&M Manual and the HASP.

Personnel will don appropriate PPE prior to performing laboratory tests. Nitrile gloves and safety glasses will be worn whenever handling laboratory materials or performing tests.

MSDS will be maintained for each chemical in the laboratory and are located in the storage cabinet in a labeled container. The MSDS's can be easily accessed in case of a chemical spill or accident in the laboratory.

The laboratory will be kept in orderly condition to maintain safety while performing tests. Test materials and reagents will be placed back in their original labeled positions after testing. Water from the groundwater treatment system used for testing will be poured back into the groundwater treatment system if it does not contain laboratory reagents.

All beakers, testing vessels, and sampling containers will be cleaned out after each round of testing in accordance with cleaning procedures. Chemical residues cannot be present in containers after testing, to maintain both safety and accurate results.

In case of a spill, refer to the Spill Prevention and Control Plan in the O&M Manual (Appendix A). There is a spill cloth on top of the storage cabinet in the laboratory with plenty of surface area to contain all laboratory chemicals. It can be used to prevent chemicals from exiting the laboratory if a spill occurs.

The site safety shower and eye wash are located just outside of the laboratory. Triggering the safety shower or eye wash will shut down the plant. Refer to the HASP included in Appendix A for detailed information regarding chemical hazards that would require the use of the site safety shower and/or eye wash.

6.8.2 Laboratory Waste Management

Waste from laboratory tests will be managed in accordance with the procedures in the O&M Manual. These wastes will be disposed of in the appropriate labeled containers located in the laboratory. These containers will be taken off-site by a licensed hazardous materials collector.

Two 3-liter hazardous material containers will be maintained in the laboratory. They will be used for storage of for arsenic testing materials and basic oxidant testing materials, respectively. Water, containing arsenic test reagents, from the arsenic test cells will be stored in the arsenic materials container. Water from the manganese and ferrous iron tests will be stored in the basic oxidant testing materials container. Once the containers are full, they will be transported to a hazardous waste landfill by a certified contractor.

Solids and reagent-containing packets from laboratory tests must also be kept out of the trash, as they contain residues of hazardous test reagents. These packets will be placed in a plastic ziplock bag located in the storage cabinet. Test strips from arsenic testing will also be placed in these bags. The ziplock bag, when filled, will be transported to the hazardous waste landfill by a licensed contractor along with the 3-liter containers.

The pH and ORP calibration solutions will be diluted with water and disposed of in the sink drain.

6.8.3 Analyses

Analyses will be conducted and documented in the GWTP laboratory in accordance with the procedures in the O&M Manual (Appendix A). An overview of these analyses is provided in this section.

6.8.3.1 Arsenic

Arsenic concentration will be tested in influent and effluent water samples weekly. The influent test will be used to adjust the permanganate dosing ratio. The effluent test will confirm that the treatment system is functioning correctly.

The procedure for testing arsenic utilizes a Hach or equivalent arsenic test kit. The arsenic test kit includes four reagent packets and one reagent bottle with a scoop stick. There are arsenic test strips in the test kit, and two arsenic test cells are maintained in the on-site laboratory. They are small glass containers with plastic black lids.

Arsenic test results will be documented both in the field book on-site and in a recordkeeping Excel spreadsheet. The Excel spreadsheet shall contain all test results. The results are given in an approximate range of micrograms per liter.

6.8.3.2 Ferrous Iron

Ferrous iron concentration will be tested in influent water samples weekly. The test will be used to adjust the permanganate dosing ratio.

The procedure for testing water for ferrous iron utilizes a ferrous iron reagent. After the test both the 10-milliliter sample cell and the remaining 15 milliliter of beaker fluid should be transferred into the oxidant 3 liters hazardous waste container. The reagent packet should be disposed of in the required ziplock bag.

Ferrous iron test results will be documented in both the field book on-site and in a recordkeeping Excel spreadsheet. The Excel spreadsheet shall contain all test results. The results are given in micrograms per liter.

6.8.3.3 Manganese

Manganese concentration will be tested in influent water samples weekly. The test will be used to adjust the permanganate dosing ratio.

The procedure for testing water for manganese utilizes two manganese test reagents. After the test, the 10-milliliter sample cell should be transferred into the basic oxidant 3 liters hazardous waste container. Reagent packets should be disposed of in the required ziploc bag.

Manganese test results will be documented in both the field book on-site and in a recordkeeping Excel spreadsheet. The Excel spreadsheet shall contain all test results. The results are given in micrograms per liter.

6.8.3.4 pH

Water pH will be tested weekly in the lab to check the accuracy of inline instruments. Samples will be taken from the coprecipitation tank, the pH adjust tank, and the effluent sample port.

The procedure for testing water pH utilizes the laboratory pH meter. A two point calibration of the laboratory pH meter in accordance with the manufacturer specifications will be performed prior to use. The pH given on the inline instruments will be noted at the time of sample collection. The pH measured by the laboratory electrode should be within 0.05 of the inline sensors.

Any water sampled from the system will be placed back into its corresponding place in the system. Water from the coprecipitation tank will be placed back in the coprecipitation tank. Water from the pH adjust tank and from the effluent will be poured into the pH adjust tank. After use, the pH sensor will be cleaned with distilled water.

Inline sensor pH and the laboratory-measured pH will be documented in the on-site field book and entered in a recordkeeping Excel spreadsheet to chart sensor accuracy over time.

6.8.3.5 Oxidation-reduction Potential

The ORP of water in oxidation tank will be tested weekly in the on-site lab to check the accuracy of the ORP sensor in the oxidation tank. A sample will be taken from the oxidation tank.

The ORP reading on the oxidation tank ORP sensor will be documented at the time of sample collection. Calibration of the ORP meter will be performed in accordance with the manufacturer specifications prior to use. The ORP measured by the meter should be within 10 millivolts of the inline instrument.

The water sampled from the oxidation tank will be poured back into the oxidation tank after analysis. After use, the ORP sensor will be cleaned with distilled water.

The oxidation tank sensor ORP and the laboratory-measured ORP will be documented in the on-site field book and entered in a recordkeeping Excel spreadsheet to chart sensor accuracy over time.

6.8.4 Laboratory Records and Recordkeeping

Good recordkeeping will allow plant operators to examine trends and foresee system errors. It is of the utmost importance that records be kept in an easily accessible manner that is explained to all plant operators.

Laboratory analyses will be documented in accordance with the O&M Manual. Records will be kept on-site in multiple locations to prevent loss of data. Whenever a measurement is made, it will be noted in the on-site field book as well as entered in a recordkeeping Excel spreadsheet.

6.8.4.1 On-site Analysis Records

Sampling records will be kept for all laboratory measurements described in this section. Records will be stored in one spreadsheet, in separate tabs for ease of access. Analyzed pH and ORP values, as well as the values given by inline sensors at the time of sampling, should be kept on a separate tab of the recordkeeping spreadsheet. Trends in differences from the inline sensors to the lab analysis should be noted to foresee instrument error.

Data obtained by the spectrophotometer are automatically logged, providing for a secondary backup. If a ferrous iron or manganese record is lost for some reason, it may be accessed on the spectrophotometer by clicking on the “data log” button on the home screen and scroll down to the date of the missing data.

6.8.4.2 Off-site Laboratory Analytical Records

Analytical laboratory reports with chain-of-custody documentation will be kept in a hardcopy file in the GWTP building for all analyses performed by off-site laboratories, including analyses to meet NPDES permit requirements. Electronic copies will also be stored on the GWTP computer.

7.0 Reporting

Reporting is required to comply with facility permits, assess migration of the groundwater plume, document work completed for implementation of the 2008 CAP, and for compliance with applicable regulations. This section of the OMMP describes overall reporting requirements associated with the 2008 CAP implementation.

7.1 COMPLIANCE MONITORING REPORTS

Compliance monitoring reports will be prepared to document groundwater and surface water quality monitoring performed in accordance with the CMP (Appendix B). The CMP describes the scope of semiannual monitoring conducted for the Site in April and October of each year. Results will be reported to Ecology twice yearly. A semiannual data report will be prepared following the April monitoring event and an annual Compliance Monitoring Report will be prepared to present and discuss monitoring conducted for each calendar year. The semiannual data report is intended to present current monitoring data in an easily understandable format with minimal discussion. The annual Compliance Monitoring Report will present and discuss monitoring data during the calendar year.

The semiannual data report is intended to document semiannual sampling and data collection methods and to provide monitoring data. The data report will include the following:

- Summary tables of field and laboratory data from the latest monitoring event
- Groundwater elevation contour maps
- Trend charts including historical and current data
- Arsenic concentration contour maps
- Documentation of sampling and data collection methods
- Laboratory data validation results
- Very brief discussion noting only significant issues considered abnormal or that are not consistent with historic trends
- Brief description of compliance monitoring well network maintenance and discussion of relevant changes in site conditions

The semiannual report will provide monitoring data to Ecology soon after monitoring is completed but will not include interpretive discussion.

The annual Compliance Monitoring Report will be prepared after the second semiannual monitoring event has been completed each year. This report will provide the information noted above from the semiannual data report for the second semiannual monitoring event. In addition the annual report will provide interpretive discussion for both monitoring events completed in the calendar year. The annual Compliance Monitoring Report will be similar to the semiannual reports that have been prepared during Phases 1 and 2 of the 2008 CAP implementation.

7.2 OPERATIONS AND MAINTENANCE REPORTING (ANNUAL)

Ongoing maintenance and operations are conducted for the groundwater recovery system, the GWTP, the Landfill physical containment systems, and the in-situ treatment program. Reporting for these components of the 2008 CAP remedy will include non-routine and routine reporting. Non-routine reports will be prepared on an as-needed basis and will address significant operations issues and issues affecting compliance with the 2008 CAP performance criteria. Non-routine reports will be submitted to Ecology by email within 10 days of discovering significant operations or performance issues. Routine reporting in the form of an annual O&M Report will address overall performance and monitoring of these systems; routine reports will be prepared and submitted to Ecology on an annual basis. Annual reports will be prepared on a calendar year basis and will be submitted to Ecology by March 1 of each year. Details regarding reporting for these systems are described in more detail below.

7.2.1 Groundwater Recovery System Reporting

The groundwater recovery system includes the Landfill recovery well network and the Outside Area recovery well network. The Landfill recovery well network should be operated continuously to maintain the inward and upward groundwater gradients specified in the 2008 CAP. The Outside Area recovery well network should be operated continuously to capture highly contaminated groundwater and reduce the contaminant mass present in Outside Area groundwater. Reporting will include timely communications regarding issues or circumstances that affect performance of the two recovery well networks and overall annual reporting of system performance.

Non-routine reports will be prepared and submitted to the Ecology Project Manager via email within 10 days of learning of the following issues:

- Failure to maintain an inward-directed cross-wall groundwater head difference of 0.5 foot for each of the eight “a/b” piezometer pairs
- Failure to maintain an upward-direct groundwater gradient at the three “b/c” piezometer pairs
- Shutdown of the Landfill and/or Outside Area recovery well networks
- Failure or inoperability of an individual recovery well lasting more than 7 days
- Failure of a piezometer transducer lasting more than 1 day

Non-routine reports will describe the issue, address the cause of the issue, describe actions taken to mitigate the issue, and outline plans to correct the problem.

Annual O&M reporting for the groundwater recovery system will include the following:

- Cross-wall head difference data for each piezometer pair over the calendar year.
- Vertical gradient data for each piezometer pair over the calendar year.
- Total volume of groundwater recovered.
- Yearly operating factor (i.e., percentage of total time the system was in operation) for the groundwater recovery system.

- Analytical data for samples collected from groundwater recovery wells, both within the Landfill and Outside Area.
- Assessment of capture zone and mass recovery for the Outside Area recovery well network, including an assessment of recovery well effectiveness for the agricultural field, wetlands area, and eastern property line plume areas.
- Summary of maintenance performed and operations issues that occurred during the year.

Annual reporting for the groundwater recovery system will be presented as a section in the annual O&M Report prepared for the Site.

7.2.2 Groundwater Treatment Plant Operations Reporting

Reporting for operation of the GWTP will include non-routine and routine reporting; non-routine reports will be prepared and submitted to Ecology on an as-needed basis to address significant issues affecting operations, such as process shutdowns, equipment failures, or discharge permit noncompliance. Routine reporting will address overall GWTP performance, maintenance requirements, and potential for improvements or cost savings.

Non-routine reports will be prepared and submitted to the Ecology Project Manager via email within 10 days of learning of the following issues:

- GWTP shutdowns
- Equipment failure resulting in a period of GWTP inoperability lasting longer than 3 days
- Spills or releases to the lime delivery containment area, acid containment area, lime/permanganate containment area, or to an area outside the GWTP building and lime delivery pad area
- Security or vandalism events resulting in physical damage to facilities or equipment
- Noncompliance with the NPDES permit
- Significant maintenance requirements
- Extended shutdowns required for maintenance
- Health and safety incidents that involve activation of the safety shower/eye wash fountain or result in lost time

Non-routine reports will describe the issue, address the cause of the issue, describe actions taken to mitigate the issue, and outline plans to correct the problem, as appropriate for the incident being reported.

Annual O&M reporting for the GWTP will include the following:

- Total volume of groundwater water treated for disposal during the year
- Summary of chemicals purchased for GWTP operations during the year
- Summary of wastes generated during the year

- Summary of maintenance required during the calendar year
- Summary of NPDES noncompliance events that occurred during the year
- Operating factor for the GWTP, with discussion of issues resulting in downtime
- Overview of health and safety performance for GWTP O&M personnel
- Summaries for non-routine items reported during the year
- Summary of revisions, if any, to O&M Manual
- Recommendations, if any, for process or operations improvements

Annual reporting for the GWTP will be presented as a section in the annual O&M Report prepared for the Site.

7.2.3 In-situ Treatment Operations

The annual O&M Report will include a section addressing operations, maintenance, and performance of in-situ treatment for the Site. This will include the two areas where in-situ treatment is being conducted as a PRB and pilot operations within the wetlands area. The annual O&M Report will include the following:

- Review and discussion of monitoring data for the in-situ treatment programs
- Overview of the in-situ treatment effectiveness
- Summary of maintenance injections conducted during the year
- Evaluation of site attainment of the cleanup standard
- Recommendations, if any, for future in-situ treatment

Annual reporting for in-situ treatment will continue for as long as in-situ treatment is actively performed to achieve cleanup objectives specified in the 2008 CAP.

7.2.4 Landfill Physical Containment System Maintenance and Operations

For years in which important operational adjustments or major maintenance is performed on a component of the Landfill containment system, the annual O&M Report will contain a summary of the relevant activities and provide a reference to the documentation of the work. This is expected to apply primarily to the stormwater collection system, interceptor trench system, and/or security system.

Landfill cap inspections are reported as part of the general facility compliance section of the annual O&M Report, as described below.

7.3 FACILITY COMPLIANCE REPORTING

Several reports must be prepared for compliance with applicable regulations. The annual O&M Report will include a section addressing general facility compliance. The report will summarize compliance activities conducted during the year. The annual O&M Report will include, at a

minimum, compliance activities described in the subsections below. These topics will be modified as appropriate as future regulatory requirements change.

7.3.1 Dangerous Waste Generation Reports

The Dangerous Waste regulations require annual reporting for generation of dangerous wastes. Dangerous waste generation is expected to be limited to wastes from field testing of water quality, although the dewatered sludge has the potential to be a dangerous waste. An annual dangerous waste generation report will be prepared and submitted to Ecology in accordance with Dangerous Waste regulations (WAC 173-303-220). Annual generation reports must be submitted by March 1 of each year. The Ecology Site Manager will be provided a copy of annual dangerous waste generation reports; confirmation of report submittal will be included in the annual O&M Report.

7.3.2 National Pollutant Discharge Elimination System Reports

The NPDES discharge permit requires monthly Discharge Monitoring Reports (DMRs) in addition to other reports that must be submitted, as described in the NPDES permit (Appendix E). The monthly DMRs are generally prepared and submitted online using the Ecology WebDMR system. Copies of other reports required by the NPDES permit will be submitted to the Ecology Site Manager when submitted to the Ecology NPDES program. The annual O&M Report will include the following to document compliance with the NPDES permit:

- Copies of the monthly DMRs submitted during the year
- A summary discussion of NPDES noncompliance during the year, with appended copies of noncompliance reports that were submitted to Ecology
- A summary discussion of additional sampling results conducted during the year for permit compliance
- A listing of other reports submitted for compliance with the NPDES permit during the year

The annual O&M Report will also discuss permit renewal applications or other submittals needed for continued compliance for the treated water discharge.

7.3.3 Landfill Inspections

Documentation for annual Landfill inspections, including the Landfill cap and stormwater management system, settlement monitoring, subsurface barrier wall, interceptor trench, and security system (refer to Section 3.0), will be included in the annual O&M Report. Copies of the inspection sheets signed by the inspector will be attached to the report.

7.3.4 Health and Safety

The annual O&M Report will present an overview of health and safety issues for the Site. This will include the following:

- Summary of any health and safety incidents and response actions

- Documentation of routine health and safety inspections and testing, including:
  - Safety shower testing
  - Eye wash fountain testing
  - Fire extinguisher inspection/replacement
- Documentation of fire alarm and fire protection system inspections
- Summary of security incidents, such as break-ins or vandalism

7.3.5 Other Compliance Reports

It may be necessary to submit additional reports for compliance with applicable regulations. As an example, if a change is made to the chemicals used in the GWTP, it would be necessary to update the list of hazardous materials registered with Pierce County (refer to the HMEP; Appendix F). Copies of other reports and submittals prepared for regulatory compliance will be provided to the Ecology Site Manager. The annual O&M Report will include a summary of these reports.

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Tables

Table 5.1
Landfill Recovery Wells

Well ID	Top of Casing Elevation (ft NAVD88)	Top of Sounding Tube Elevation (ft NAVD88)	Total Well Depth (ft TOC)	Depth to Top of Well Screen (ft TOC)	Well Screen Length (ft)	Well Casing Diameter (inches)	Depth to Top of Pump (ft TOC)	Flow Sleeve[1]
Active Wells								
R-1	24.96	24.89	26.89	14.5	10	6.0	17.0	Sleeve
R-2	27.05	27.01	31.82	18.5	10	6.0	23.0	Sleeve
R-4	48.24	NA	53.38	42.25	10	4.0	39.0	None
R-5	52.5	NA	57.35	41	15	4.0	45.3	Sleeve
R-7	24.79	24.69	26.19	14.5	10	6.0	10.9	None
R-8	30.68	30.61	35.17	23.5	10	6.0	27.7	Sleeve
R-9	23.79	23.79	30.23	18.5	10	6.0	14.9	None
R-10	27.59	27.48	33.93	22.2	10	6.0	26.3	Sleeve
R-11	29.96	NA	33.88	18.5	15	4.0	17.0	Sleeve
Inactive Wells								
R-3	47.21	NA	46.73	35.75	10	4.0	NA	None
R-6	38.87	NA	37.22	26	10	4.0	NA	None

Note:

1 Flow sleeves were installed to maintain proper pump temperatures for pumps installed within the screened interval of the well.

Abbreviations:

ft Feet
NA Not applicable
NAVD88 North American Vertical Datum of 1988
TOC Top of casing

Table 5.2
Outside Area Recovery Wells

Well ID	Top of Casing Elevation (ft NAVD88)	Top of Sounding Tube Elevation (ft NAVD88)	Total Well Depth (ft TOC)	Depth to Top of Well Screen (ft TOC)	Well Screen Length (ft)	Casing Diameter (inches)	Depth to Top of Pump (ft TOC)	Flow Sleeve[1]
R-12	18.71	18.63	19.07	8.5	10	6.0	12.2	Sleeve
R-13	18.83	18.87	17.71	7.5	10	6.0	4.5	None
R-14	17.02	16.84	18.3	7.5	10	6.0	11.5	Sleeve
R-15	16.83	16.69	18.91	8.5	10	6.0	12.9	Sleeve
R-16	17.61	17.6	19.3	9.5	10	6.0	9.6	Sleeve
R-17	17.39	17.3	19.23	9.5	10	6.0	4.9	None
R-18	16.18	16.14	20.25	9.5	10	6.0	6.5	None
R-19	15.69	15.21	21.52	10.5	10	6.0	12.2	Sleeve
R-20	15.92	15.57	21.12	10	10	6.0	7.0	None
R-21	15.51	15.46	22.52	12	10	6.0	9.1	None

Note:

1 Flow sleeves were installed to maintain proper pump temperatures for pumps installed within the screened interval of the well.

Abbreviations:

ft feet
NA not applicable
NAVD88 North American Vertical Datum of 1988
TOC top of casing

Table 5.3
Landfill Recovery Well Control Setpoints

Δ Setpoint (ft)	Controlled Wells[1]			Controlled Wells[1]		
	W1	W2	W3	W1	W2	W3
	PZ-1a/b			PZ-2a/b or PZ-3a/b		
	R-1	R-11	--	R-10	R-4	--
Δ ≥ 0.9	0%	0%	--	0%	0%	--
0.9 > Δ ≥ 0.7	50%	0%	--	50%	0%	--
0.7 > Δ ≥ 0.6	75%	50%	--	75%	50%	--
Δ < 0.6	100%	100%	--	100%	100%	--
	PZ-4a/b			PZ-5a/b		
	R-8	R-9	--	R-7	--	--
Δ ≥ 0.9	0%	0%	--	0%	--	--
0.9 > Δ ≥ 0.7	50%	0%	--	50%	--	--
0.7 > Δ ≥ 0.6	75%	50%	--	75%	--	--
Δ < 0.6	100%	100%	--	100%	--	--
	PZ-6a/b or PZ-7a/b			PZ-8a/b		
	--	--	--	R-2	R-5	--
Δ ≥ 0.9	--	--	--	0%	0%	--
0.9 > Δ ≥ 0.7	--	--	--	50%	0%	--
0.7 > Δ ≥ 0.6	--	--	--	75%	50%	--
Δ < 0.6	--	--	--	100%	100%	--
	PZ-4b/c or PZ-5b/c			PZ-8b/c		
	R-7	R-9	R-8	R-2	R-5	--
Δ ≥ 0.15	0%	0%	0%	0%	0%	--
0.15 > Δ ≥ 0.1	50%	50%	50%	50%	50%	--
0.1 > Δ ≥ 0.05	75%	75%	75%	75%	75%	--
Δ < 0.05	100%	100%	100%	100%	100%	--

Notes:

Δ The diference in groundwater level for the paired piezometers. The difference is the outside water level (a piezometer) minus the inside water level (b piezometer) or the LSAq water level (c piezometer) minus the inside water level (B piezometer). A positive value indicates inward or upward gradient.

1 W1, W2, W3 indicates the designation for controlled wells in the PLC program.

Abbreviations:

LSAq Lower sand aquifer

PLC Programmable logic controller

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Figures

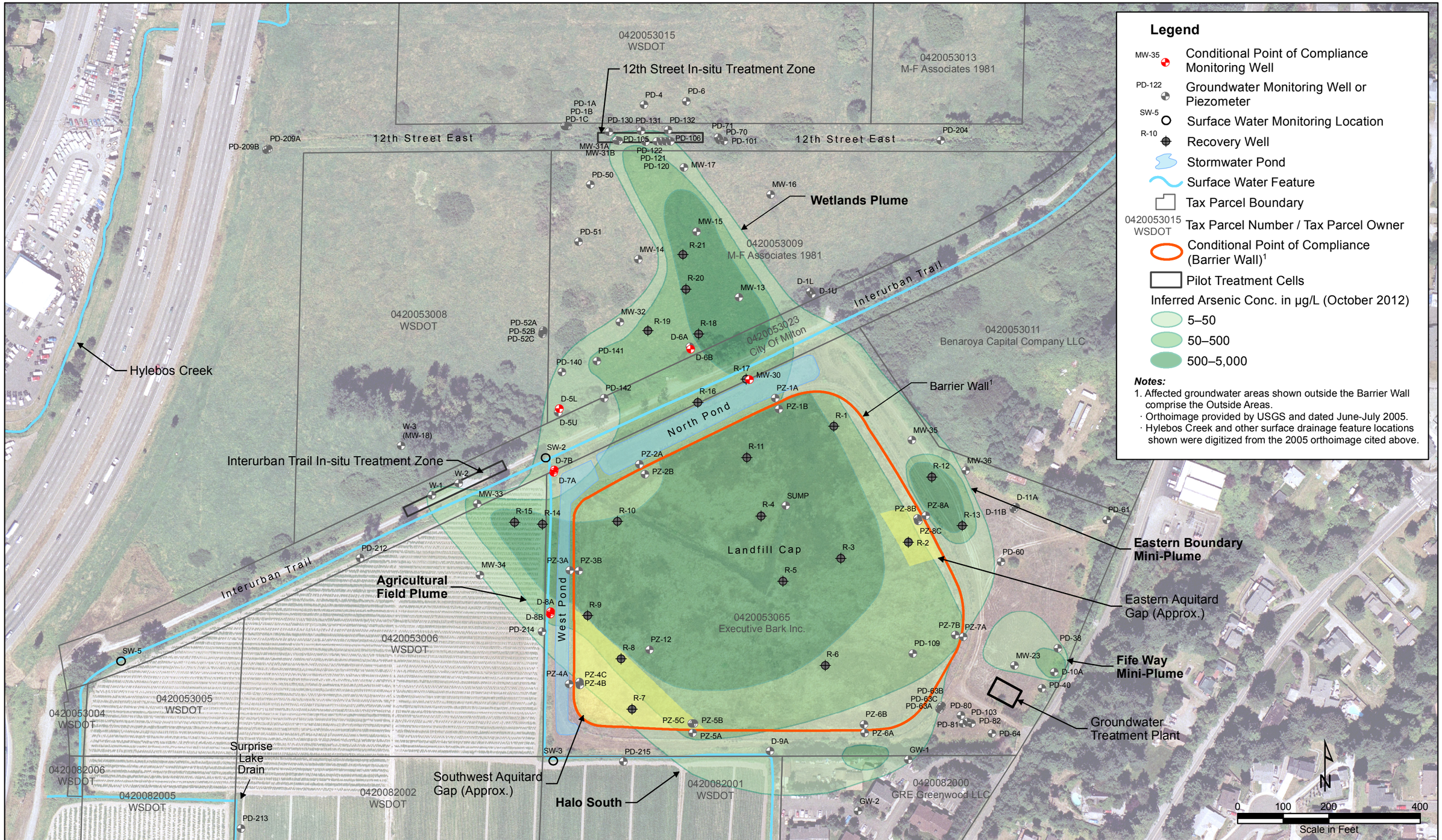


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Operations, Maintenance, and Monitoring Plan
B&L Woodwaste Site
Pierce County, Washington

Figure 1.1
Vicinity Map

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2/20/2013

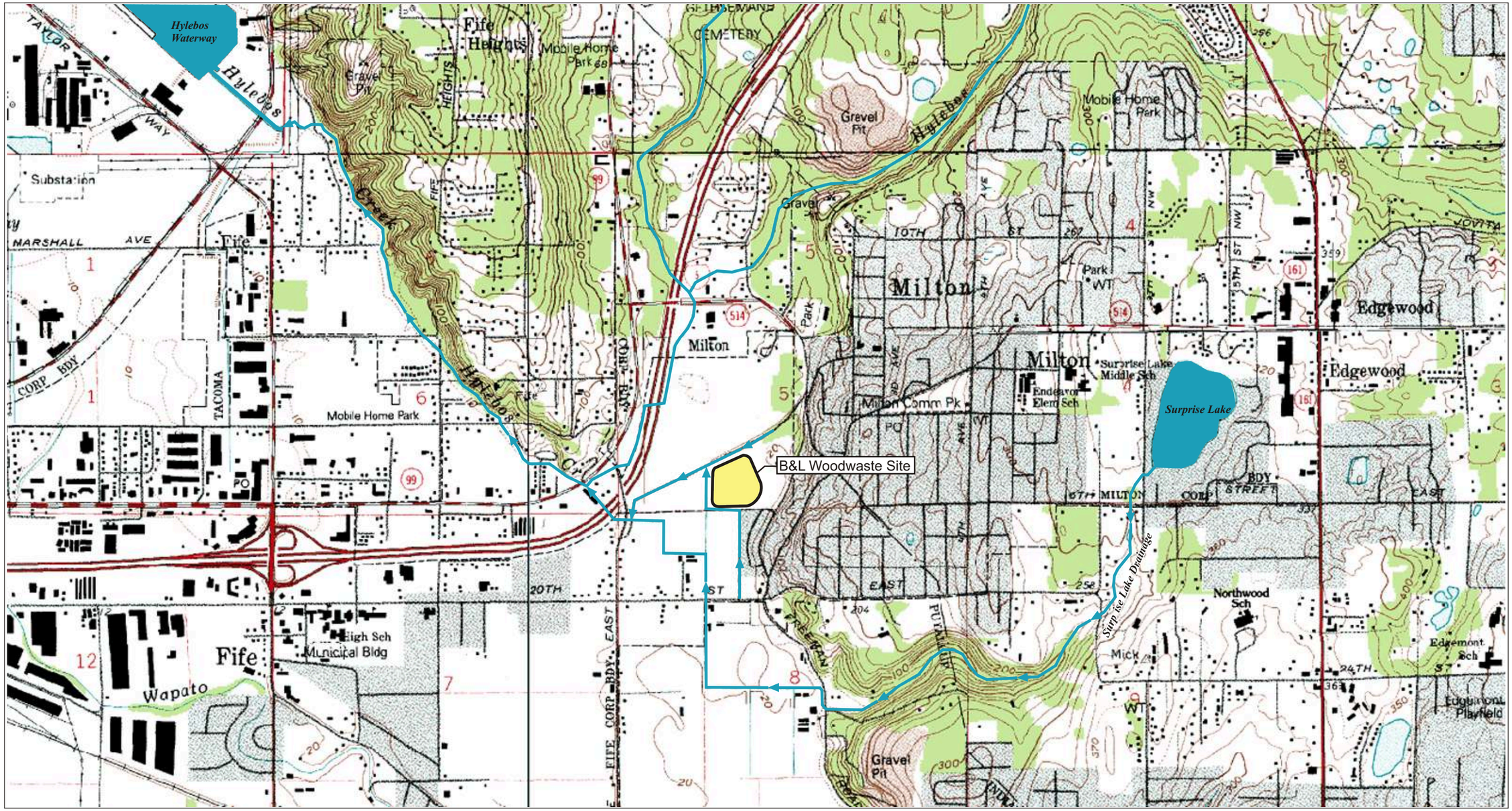


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Operations, Maintenance, and Monitoring Plan
B&L Woodwaste Site
Pierce County, Washington

Figure 1.2
Site Map

F:\projects\B&L RIM\GIS\MXD\Figure 2.1 (Site Map).mxd
3/18/2013



Existing Stream or Surface Water Conveyance

Approximate Location of B&L Woodwaste Site

0 1/4 1/2

Approximate Scale in Miles

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AMEC Geomatrix

Operations, Monitoring, and Maintenance Plan
B&L Woodwaste Site
Pierce County, Washington

Figure 1.3
Topography and Drainage Features in Site Vicinity

g:projects/clients/floydsnider/B&L/2013/Figure1.3

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix A
Groundwater Treatment Plant Operations and Maintenance Manual

and

Operations Checklists

B&L Woodwaste Site
Pierce County, Washington

Groundwater Treatment Plant Operations and Maintenance Manual

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1.0 Introduction

This Operations and Maintenance Plan (O&M Plan) has been prepared to document plans and procedures and other information relevant to operation of the Groundwater Treatment Plant (GWTP) at the B&L Woodwaste Site (Site). The GWTP is a key component of the groundwater remediation remedy being implemented at the Site under the terms of Consent Decree No. 08-2-10610-7 (Consent Decree) and the 2008 Cleanup Action Plan (CAP) issued by the Washington Department of Ecology (Ecology). Contaminated groundwater must be recovered to achieve remediation objectives described in the CAP; the recovered groundwater is treated in the GWTP for discharge to surface water, as authorized by National Pollutant Discharge Elimination System (NPDES) Permit No. WA0040321 (Permit). This O&M Plan has been prepared to document operation and maintenance procedures and to address the requirements of the Permit.

1.1 BACKGROUND

The Site is located within unincorporated Pierce County (Drawing G-01); the street address for the property on which the B&L Woodwaste Landfill is located is 1522 Fife Way East, Milton, WA. The GWTP is located in the southeast portion of the property (Drawing C-02). Groundwater requiring treatment for removal of arsenic must be recovered from a network of recovery wells located beneath the Landfill and in the groundwater plume located outside the Landfill. The recovery wells must be operated as specified in the CAP and in compliance with regulations pursuant to the Model Toxics Control Act (MTCA). The sole source of water treated at the GWTP is from the two recovery well networks. Groundwater is pumped from the wells using electrically operated pumps under automatic control. The automatic control system for the groundwater recovery wells is also used to control the GWTP, so that the wells can be controlled to maintain remediation objectives and the well pumps can be stopped as needed during GWTP upsets. This integrated system is intended to eliminate the need to bypass the GWTP and to minimize the potential for discharge of noncompliant effluent. The GWTP Permittee is the B&L Woodwaste Site Custodial Trust (Trust). The Trust is responsible for implementation of the overall remediation program at the Site, which includes operation of the GWTP.

1.2 RESPONSIBLE INDIVIDUALS

The names and phone numbers for the individuals responsible for operation, maintenance, and permit compliance are as follows:

Permittee:	Dan Silver, Trustee, B&L Woodwaste Site Custodial Trust (360) 754-9343	
Project Manager:	Larry McGaughey, P.E. (206) 342-1788	AMEC Environment & Infrastructure, Inc.

2.0 Groundwater Treatment Plant Design Criteria and Basis

The design criteria and basis provide a foundation for design of the GWTP. This section summarizes the engineering and design basis used for preparation of the plans and specifications.

2.1 DESIGN CRITERIA

Design criteria were developed for design of the GWTP. These criteria are summarized below for each component of the plant:

- Provide sufficient treatment capacity and operating flexibility to support operation of the groundwater recovery system to achieve CAP objectives.
- Remove site contaminants from groundwater and achieve discharge criteria that are protective of human health and the environment.
- Discharge treated water to the existing surface water drainage system.
- Size process equipment for the current design flow and for expected future flow reductions.
- Include standby redundancy for critical process equipment to minimize process downtime.
- Automate the main treatment processes to allow un-manned operation during weekends, evenings, and weekdays when an operator is not present.
- Include a centralized control system that can be remotely monitored via an internet connection.
- Provide sufficient storage for chemical feed solutions for at least 1 week of run time under average flow conditions.
- Comply with applicable, relevant, or appropriate regulations and standards (federal, state, and local).
- Conduct remediation work within wetland areas located on or adjacent to the B&L Property in accordance with applicable laws and regulations and in accordance with permits, as appropriate.
- Do not adversely impact neighboring properties, including the Interurban Trail, during and after construction of the remedy components.
- Comply with applicable, relevant, or appropriate regulations and standards (federal, state, and local) for the remedy components included in this Addendum.
- Comply with appropriate industry, professional engineering, and technical standards for the remedy components included in this Addendum.

2.2 DESIGN BASIS

The general design basis for the GWTP is as follows:

- Groundwater recovery within the contained area beneath the Landfill will be capable of achieving a minimum head differential across the barrier wall of 0.5 feet (ft).
- The total pumping capacity for the GWTP is 150 percent of the recovery rates estimated to achieve the hydraulic control remediation objectives identified in the CAP.
- The GWTP was designed for a continuous, average flow capacity of 40 gallons per minute (gpm).
- The groundwater treatment system was designed to operate at a minimum continuous flow rate of 15 gpm and a maximum, short-term flow rate of 60 gpm to accommodate a range of potential recovery system operations.
- The GWTP was designed to treat the groundwater quality presented in Table 2, which is considered as a reasonable, worst-case groundwater quality that will be recovered from either inside and outside the Landfill.
- The GWTP was designed to achieve the water quality criteria listed in Table 3 in the treated effluent.
- The GWTP process design was based on the results of a pilot treatability study conducted in 2010.
- The GWTP includes an automated control and data acquisition system, and was designed to operate under automatic control, with minimal direct operator attention during normal operations. The control and data acquisition system monitors groundwater level in selected observation wells/piezometers, and will allow remote monitoring and adjustment of operating parameters. The control and data acquisition system includes the following:
    - Automatic control of the groundwater recovery well pumps for the contained area and the areas outside the Landfill.
    - Automatic control of the GWTP.
    - Monitoring of transducers in selected groundwater wells and piezometers.
    - Remote autodialing and alarm capability.
    - Data logging/recording capability.
    - Remote monitoring and control capability for the groundwater recovery pumps, GWTP operations, and level monitoring instruments.

3.0 GWTP Process Overview

The groundwater treatment system has been designed with the primary goal of removing arsenic from the contaminated groundwater recovered from the Site to achieve effluent concentrations that meet the discharge criteria summarized above. The treatment system consists of oxidation, pH adjustment and co-precipitation, clarification, pH adjustment, filtration, and adsorption. A process flow diagram is presented in Drawing PFD-01. The treated groundwater will be pumped along a buried pipeline to the north pond (Drawing C-04). The solids stream from the clarification process will be stored in a sludge tank before being dewatered with a filter press; dewatering of sludge will be done periodically on a batch basis. The filter cake will be picked up and transported to an appropriate waste receiver for disposal. Treatment chemicals will be stored in tanks or transportable totes. All treatment equipment is located within the treatment building. The recovery well networks are shown on Drawing C-02. Recovered groundwater is collected in three piping manifolds that direct the recovered groundwater to the GWTP. Each line discharges to the Head Tank, located inside the GWTP Building.

3.3 UNIT OPERATIONS

The treatment process comprises seven primary unit operations, including the Head Tank, Oxidation Unit, Co-Precipitation Unit, Clarifier Unit, pH Adjustment Unit, Filtration Unit, and Adsorption Unit. Ancillary units include the Sludge Management Unit (filter press for sludge dewatering) and an air compressor providing air for equipment requiring compressed air. A centralized programmable logic controller (PLC) is used for data acquisition and automatic control of the entire GWTP and groundwater recovery system. Dewatered sludge from the filter press are collected in a roll-off container that will be picked up as needed for offsite disposal within a permitted commercial landfill. Treated effluent is sampled and discharged to the north pond, which overflows to an adjacent drainage ditch. The drainage ditch combines with the Surprise Lake Drain, then flows beneath Interstate Highway 5 where it joins the Hylebos Creek, eventually discharging to the Hylebos Waterway and into Commencement Bay. The unit operations and ancillary units are described in more detail below.

3.3.1 Head Tank

The Head Tank receives pumped water from the three recovery lines. This unmixed tank provides flow equalization upstream of the subsequent unit operations. The tank volume is 400 gal.; it is an open-top tank equipped with a removable cover. Groundwater is discharged from the Head Tank by gravity flow to a flow meter and the downstream process units. The outlet includes a sample tap for influent groundwater. The Head Tank is equipped with a level switch to initiate emergency shutdown if high level is detected.

3.3.2 Oxidation Tank

The Oxidation Tank provides mixing with potassium permanganate ($KMnO_4$) and provides reaction time to oxidize iron, manganese, and arsenic, resulting in precipitation of ferric hydroxide and removal of arsenic. Based on the 2010 treatability testing, $KMnO_4$ was selected

as the preferred oxidant. The addition of $KMnO_4$ causes both arsenic (III) and iron (II) to be oxidized to arsenic (V) and iron (III), respectively. The higher oxidation states of arsenic and iron precipitate more readily and arsenic (V) is amenable to adsorption on the iron hydroxide floc. Water flows from the Oxidation Tank under gravity flow.

The Oxidation Tank has a working volume of 1,659 gal., which provides 41 minutes of residence time at the average treatment flow rate. Mixing is provided by a top-mounted 1.0 horsepower (HP) mixer. The tank is completely mixed to ensure sufficient distribution and reaction of the $KMnO_4$, and reduce the likelihood of short-circuiting.

During the 2010 treatability testing, the optimal dosage for $KMnO_4$ was determined to be 145 milligrams per liter (mg/L) of groundwater. The dosage depends upon the influent concentration of permanganate-consuming constituents (i.e., iron, arsenic, manganese, and oxidizable organics). The $KMnO_4$ feed has been designed to provide a range of dosages that can be set by the operator to support the required flexibility to accommodate changes in the groundwater quality and to service the full range of influent groundwater flows. The actual dosage will be adjusted as needed by the operator, based on testing the influent for arsenic, iron, and manganese to avoid over- or under-dosing.

Based on the average flow, the expected consumption of dry $KMnO_4$ will be 70 pounds (lb) per day, or approximately 500 lb per week. A bulk handling system has been included in the design to prepare feed solution. Drums of granular, crystalline $KMnO_4$ are purchased from a local chemical supplier and delivered to the treatment building as needed. The drums are loaded into a drum dumper which will lift and tip the drum to empty the contents into a hopper. The top of the drum and the hopper is sealed during dumping to minimize the escape of dust or fines. From the hopper the $KMnO_4$ is transferred to the top of the $KMnO_4$ feed tank via a flexible screw conveyor. $KMnO_4$ solution is made up on a batch basis as needed. The operator will add the correct amount of water to the tank based on the volume of solution to be prepared (determined by the tank level). The run time of the conveyor is controlled to ensure the correct amount of $KMnO_4$ is added to the storage tank. The operator adds sufficient $KMnO_4$ and the correct volume of water to produce the target concentration. The make-up tank will have a volume of 1,800 (2279?) gal, which will allow approximately 7 days of operation. For operations at the design flow, it is expected that partial batches of $KMnO_4$ feed solution will be prepared twice per week to prevent interruption in treatment operations.

The target $KMnO_4$ solution concentration will be 35 grams (g) of powdered $KMnO_4$ per liter (L) of solution (350 lb of $KMnO_4$ per 1,800-gal tank). This is below the published solubility of about 43 g/L water at 10^{o}C (Lange 1999). The $KMnO_4$ feed tank is located within a secondary containment area to contain spillage in the event of tank or line failure.

The $KMnO_4$ feed solution is fed to the Oxidation Tank via a chemical dosing skid that includes redundant diaphragm metering pumps to ensure accurate and continuous dosing. The solution is fed to the system at a rate that is proportional to the influent groundwater flow rate, as measured in the discharge from the Head Tank. The pumping rate is controlled by the PLC. Based on the results of the 2010 pilot testing (observed arsenic and iron concentration in untreated water and the optimal dose) and the target $KMnO_4$ feed solution concentration, a volumetric feed ratio of 1:241 ($KMnO_4$ feed solution flow to groundwater flow) will be used. The

feed ratio will be adjusted by operations personnel as necessary to achieve proper treatment and avoid overdosing. At the average design groundwater flow rate (40 gpm), the $KMnO_4$ feed solution flow rate would be 627 mL/min for this volumetric feed ratio. Concentrations of the permanganate-consuming constituents in the untreated groundwater will be monitored to establish and control the proper $KMnO_4$ feed rate.

An oxidation-reduction potential (ORP) sensor and transmitter is installed in the Oxidation Tank to monitor ORP and ensure appropriate oxidation conditions are maintained. The ORP sensor will be monitored by the PLC. A warning alarm will be initiated if the ORP is outside of the expected range to alert the operator that there is a potential problem with the $KMnO_4$ dosing system so that corrective action can be taken.

3.3.3 Co-Precipitation Tank

Partially treated groundwater flows by gravity from the Oxidation Tank to the Co-Precipitation Tank. This tank is completely mixed by a 1 HP, top-mounted mixer. Lime slurry is added to the Co-Precipitation Tank under automatic control to raise the pH to a target value of 8.8 in order to induce further co-precipitation of arsenic with the iron that is present in the groundwater. The ferric iron (Fe^{+3}) formed in the Oxidation Tank will form hydroxides at the elevated pH and precipitate. Arsenic (V) will adsorb to the floc and be entrapped by the precipitated iron hydroxides. Addition of the lime raises the pH and causes additional precipitation of ferric hydroxide. The Co-Precipitation Tank also received sludge recycle from the Clarifier Unit to provide seed floc and support formation of rapid settling solids. Coagulant is also added to the Co-Precipitation Tank to facilitate formation of a well settling floc. The Co-Precipitation Tank has a working volume of 1,659 gal, which provides a 41-minute retention time at the design average flow rate. The Co-Precipitation Tank is equipped with a pH sensor that is monitored by the PLC to automatically control pH of the water in the tank.

In order to induce the pH change, a lime dose of 5.95 g of dry hydrated lime [$Ca(OH)_2$] per gallon of groundwater was required in the treatability testing. Hydrated lime is will be delivered to the Site in the form of a slurry, at a concentration of 3.5 lb $Ca(OH)_2$ per gallon of water. Delivery and feed of the lime in this manner eliminates the need for a complex and high maintenance slaking or dry chemical feeding process on site. Lime slurry will be delivered in 2,500-gal bulk loads and stored in a 5,509-gal lime storage tank. The lime storage tank is located within a secondary containment area to contain the slurry in the event of tank or line failure. The storage tank is continuously and completely mixed by a 5-HP mixer to prevent sedimentation. The lime within the lime tank is constantly recirculated in a loop via a large peristaltic pump to prevent deposition and scale formation in the lime piping. Lime will be fed to the Co-Precipitation Tank under PLC control by a small peristaltic dosing pump drawing from the lime recirculation line. The lime slurry feed rate is automatically controlled by the PLC to achieve the target pH in the Co-Precipitation Tank.

At the design average groundwater flow rate (40 gpm), the estimated consumption of lime slurry is 216 gallons per day (gal/d). Each load of slurry (2,500 gal) would last approximately 12 days under these conditions. Lime is delivered by parking the truck at a specially designed delivery station. A concrete pad and sump was constructed along the north side of the GWTP building to contain any spills that may occur during lime delivery. Prior to delivery, the operator manually

closes a valve on the spill collection sump associated with the delivery pad. Delivery hoses are connected to an Environ-Box, designed to minimize spillage during connection/disconnection. If spillage occurs during delivery, it would be contained by the curbed delivery pad and sump; spillage would be cleaned up by the operator. If no spillage occurs, the operator will reopen the sump valve, to direct stormwater runoff from the pad to normal drainage channels.

3.3.4 Clarifier Unit

Groundwater flows by gravity from the Co-Precipitation Tank to an inclined plate Clarifier Unit to separate the floc from the treated water. The Clarifier Unit includes integral flash mix and flocculation tanks, each equipped with a mixer. A polymer flocculant will be added directly to the flash mix tank under automatic control at a rate proportional to the influent groundwater flow rate. The feed rate will be determined by the operator, working with the vendor supplying the flocculant.

The polymer is purchased as neat liquid in 5-gal pails, and diluted to a concentration of 0.1 percent (wt/wt) in batches. An automated make down system is used to prepare polymer feed solution as needed. The polymer feed solution is prepared and stored in a 60-gal feed tank. The small feed tank was selected to ensure short storage times for dilute polymer, which will minimize degradation and ensure that freshly prepared polymer is provided to the treatment process. The feed tank is equipped with a low-speed mixer that is operated continuously. New batches of feed polymer will be automatically prepared when the level in the polymer day tank reaches the low-level set point.

The rapid-mix tank provides complete mixing of the groundwater with the dilute polymer solution and a short residence time. The slurry from the rapid-mix tank flows by gravity to the flocculation tank to provide a period of slow mixing to allow floc formation. The flocculated groundwater then flows into the inclined plate settler, allowing the solids to settle to the sludge hopper, and the clarified groundwater to overflow the effluent weir. The clarifier provides an effective settling area of 160 square feet (ft^2), which provides an overflow rate of 360 gallons per day/ft^2 (gpd/ft^2) at average design conditions (40 gpm) , and 540 gpd/ft^2 at maximum design conditions (60 gpm). Sludge from the sludge hopper is pumped to the sludge management process, which is described below.

3.3.5 pH Adjust Tank

The Clarifier Unit overflows by gravity to the pH Adjust Tank where the water pH is adjusted to achieve effective adsorption of the remaining arsenic in the adsorption columns, based on the 2010 treatability testing, the pH should be lowered to a target value of 6.6. The pH is reduced by the addition of 93 percent sulfuric acid (H_2SO_4) under automatic pH control. The pH Adjust Tank has a working volume of 1,420 gal, providing a residence time of 35 minutes at the average design flow rate. The pH tank is completely mixed with a 1.0-HP, top-mounted mixer.

Acid is added to the pH Adjust Tank via automatic dosing pumps. Redundant duplex diaphragm metering pumps feed acid to the pH Adjust Tank. The acid-wetted parts of the pumps and the acid feed tubing are compatible with concentrated sulfuric acid. The rate of acid addition is controlled by the PLC, using the continuous pH sensor in the pH Adjust Tank. The dosing rate

under average flow conditions is approximately 1 gallon per hour (gal/hr). The Teflon acid feed line is enclosed in a protective CPVC line to contain acid if the Teflon feed line fails. The CPVC protective casing is designed to drain either to the pH Adjust Tank or the acid containment sump.

Concentrated acid will be delivered in 265-gal acid totes. The totes are placed on the acid containment sump upon delivery; the sump, which is lined with acid-resistant coating, provides secondary containment in the event of a leak. Two totes are present at any time; one tote is used to supply acid to the process while the second tote provides extra acid to ensure a constant supply. At the expected dosing rate and the design average flow rate, a single tote should last approximately 11 days. The level of acid in each tote is continuously monitored by the PLC to monitor inventory and identify catastrophic loss of acid from the totes.

Water from the pH Adjust Tank is pumped to provide sufficient pressure to force the water through the filters and the adsorption columns and discharge treated water to the North Pond via Outfall 001. The pH Adjust Tank is equipped with a continuous level sensor and a high level switch. The continuous level sensor is used as the control signal for the PLC to automatically regulate the speed of the redundant discharge pumps. Pump speed is controlled by the PLC to maintain a constant level in the pH Adjust Tank. The level sensor in the pH Adjust Tank will issue an alarm in the event the high level setpoint is detected. If the high-high level is detected, the high level switch will initiate a complete emergency shutdown of the groundwater recovery and treatment systems to prevent overflow of the process units.

3.3.6 Filter Unit

Water is pumped from the pH Adjust Tank directly to a duplex-cartridge filter unit to remove remaining suspended solids and prevent plugging of the Adsorption Unit. Two Filter Units are present; each unit is capable of handling full process flow (up to 60 gpm). One unit is kept online; the offline filter is fitted with fresh cartridges and placed into service when the online unit is spent. Pressure loss across the Filter Unit is monitored continuously by the PLC; an alarm is issued if high pressure loss (indicating plugging of the filter) is detected. Switching of the Filter Units and replacement of the cartridges is done manually, as needed to maintain acceptable pressure drop readings across the filter housings.

3.3.7 Activated Alumina Adsorber Unit

The final unit operation to achieve the low-level arsenic treatment target is adsorption on activated alumina. After passing through the filters, the groundwater flows to the two adsorption columns operated in a series configuration. The activated alumina requires an empty bed contact time of 5 minutes, which equates to a 200-gal (media volume, not including freeboard) adsorption column. The empty bed contact time was recommended by the media manufacturer and verified during the 2010 pilot treatability testing. The media is expected to function for 40,000 bed volumes before significant breakthrough. After 40,000 bed volumes of groundwater have been treated or breakthrough of arsenic is detected in samples collected after the first column, the media in the first column will be replaced and the second column will become the primary column. The spent media will either be returned to the vendor to be recycled or will be transported to an appropriate waste facility for disposal. Each adsorber is equipped with a

continuous differential pressure sensor so that pressure drop can be monitored by the PLC. An alarm is issued if high pressure drop is detected, indicating that the affected adsorber has become plugged and requires operator attention.

Effluent from the second adsorber column is the final, treated effluent that is directed to the North Pond for discharge via Outfall 001. The discharge from the second adsorber flows through a pH sensor (AIT 450) where final effluent pH is recorded every minute for reporting under the NPDES permit. The water also flows through the final effluent flow meter (FIT 490) were total flow rate is recorded for reporting the daily discharge volume. The quality of the final treated effluent is monitored by collecting a composite sample tap located adjacent to the flow meter, inside the GWTP building.

3.3.8 Sludge Storage and Dewatering Unit

Excess sludge generated from treatment of groundwater is collected and dewatered for disposal in a permitted, offsite landfill. Underflow from the clarifier is pumped to the sludge storage tank with a pneumatic diaphragm pump operated on a timer control system. The sludge storage tank has a working volume of 5,850 gal and is continuously mixed by a 1.5 HP top-mounted mixer. The sludge will be accumulated in the storage tank for batch-wise dewatering by a filter press. Filter press operation requires continuous operator attention, so the sludge dewatering process will be manually initiated when an operator is on-site. The sludge storage tank is equipped with a continuous level sensor and a high level switch that are monitored by the PLC. Alarms are initiated when high inventory or high levels are detected in the sludge storage tank. Polymer flocculant can be added to the sludge storage tank by the operator to facilitate sludge dewatering.

When a sludge dewatering batch is initiated, sludge will be pumped from the sludge storage tank to the filter press by a second pneumatic diaphragm pump. The filtrate flows from the filter press by gravity to a collection sump, where it will be pumped to the Oxidation Tank for treatment with groundwater. At the end of each filter press cycle, as determined automatically by pressure at the filter press feed, the press will be opened and the sludge cake will discharge from the plates into a roll-off container located immediately below the filter press. The roll-off container will be removed and replaced as necessary for disposal of the dewatered sludge. The filter press produces dewatered sludge that meets the paint filter test and is suitable for landfill disposal.

The solids loading to the clarifier is estimated to be 144 lb dry solids per day, based on the average design flow rate. This estimate includes a 15 percent safety factor over the theoretical value, which is based on the influent water quality and treatment chemistry. It is estimated that under average flow conditions, two filter press cycles will be needed each week. The sludge storage tank will have enough capacity for 5 days of storage under average groundwater flow rates and the groundwater quality observed during the 2010 pilot treatability testing.

Approximately 960 lb of dry solids in the dewatered filter cake would be produced each week under average design flow conditions. Assuming a conservative (i.e., low) cake solids concentration of 25 percent (wt/wt), the expected total cake weight per week is 3,830 lb (wet).

Based on these quantities, the roll-off container of filter cake will require removal for off-site disposal once approximately every 8 weeks.

An air compressor provides compressed air for operation of the pneumatic sludge pumps and the pneumatic controls and valves used by the filter press. Compressed air is necessary for operation of the Sludge Storage And Dewater Unit. The air compressor includes an accumulator vessel that feeds compressed air to the distribution lines. A pressure switch on the accumulator vessel is monitored by the PLC to initiate a low pressure alarm, indicating compressor failure.

3.3.9 Instrumentation and Controls

Instrumentation for the GWTP is depicted in the process and instrumentation diagrams (P&IDs, Drawings PID-00 through PID-05). The system has been designed to be automated to the extent practical. It is estimated that the system will require two visits to the site per week by the operator to ensure continuous and effective operation. The frequency for operator attention may be greater during periods of high groundwater flow, but is not expected to be less at flow rates below the design average.

The GWTP includes significant instrumentation for control and monitoring purposes. The treatment equipment and instrumentation will be automated with a single, centralized PLC. The system operations can be monitored via a human machine interface (HMI) located in the treatment building. The system also has remote monitoring and data collection capabilities through an internet interface to allow the operator to view the status of the system at any time from an offsite location. The control system also has dial-out functionality so that critical alarms will be issued by an automated call to the offsite personnel by telephone. The control system includes data logging and tracking of most process instruments, as shown on the P&IDs.

3.3.10 Treatment System Building

The GWTP is located within a dedicated building to provide security, limit generation of contaminated runoff, and to contain any spills from process equipment and tanks. Key features of the GWTP building are described below.

3.3.10.1 Building Pad

Due to the historical flooding events in the vicinity of the Site, during periods of high rainfall in the area of the B&L Property, a building pad was constructed at an elevation of approximately 20 ft ASL to match the elevation of the existing access road around the Landfill. This elevation has been consistently above recent flood elevations and is above the elevation of the 100-year flood (MGS Engineering Consultants et al. 2004).

The floor of the building is a concrete pad providing curbing and containment for the GWTP and for lime slurry delivery to the building. A concrete pad and sump is located north of the building to contain any spills or releases of lime slurry during delivery; the concrete pad is sloped to a collection sump. This will provide spill containment in the event of an unplanned release from the lime slurry truck during unloading, preventing lime from entering the surrounding wetland

areas. An environmental containment enclosure is installed on the outside of the building, beneath the lime connection point, to collect any drips and spills from the hose connection during lime truck unloading.

The lime delivery sump includes a sluice gate, which when open will allow stormwater collected on the concrete pad to flow north-east, following the normal drainage pattern. Written delivery procedures specify that the operator must close the sluice gate before a lime truck is brought on to the Site and parked on the concrete pad. If a spill occurs, the lime would be held in the sump and on the concrete pad where it can be collected and disposed of properly. Following delivery or cleanup of any spills, the sluice gate will be reopened.

3.3.10.2 Treatment Building

The building includes two man-doors and two overhead doors (Drawing M-01). The large roll-up door provides access for moving the dewatered sludge roll-off bin in and out of the building, and the smaller roll-up door provides access for bulk chemical deliveries and equipment. The building is electrically heated to maintain the interior temperature above a minimum of 50°F during winter conditions. Exhaust fans are provided to vent moisture and prevent excess heat accumulation in the summer.

The concrete floor of the building provides containment for the GWTP process equipment. The floor beneath process equipment is 1 ft lower than the elevation of the main floor of the building; the lower area is drained by a sump and collection trough. All process equipment and vessels are located within this lower area, which provides secondary containment for any spills or leaks from the equipment within the building. The sump is used to collect polymer dosing pump seal water, any spills, filter press filtrate, and wash water generated during equipment maintenance. Water collected in the sump will be pumped to the Oxidation Tank for subsequent treatment in the treatment process. Water level in the sump is monitored continuously by the PLC to detect spills or excess accumulation of liquids in the containment area. If high level is detected in the sump, the PLC will issue an alarm and initiate emergency shutdown of the groundwater recovery system and the GWTP. As noted on Drawing M-01 separate secondary containment is provided for the lime slurry and $KMnO_4$ feed tanks.

3.3.10.3 Building Layout

The building layout is shown in Drawings M-01 and M-02. As shown, the building includes a small laboratory area, a small office, and a restroom. The electrical room, which includes the PLC, is located on the mezzanine. A computer used for monitoring and controlling the GWTP is located in the office. A safety shower and eye wash fountain is located on the main floor of the building, outside the lab/office area. The building layout was developed so the process equipment was in a logical sequence, optimizing piping lengths and supporting system operations and maintenance.

3.3.10.4 Security

Due to concerns over potential property damage or malicious interference, all process equipment and chemical storage tanks are housed inside the treatment building. The treatment building doors will remain locked at all times when an operator is not present. The building has

protected windows to minimize the potential for vandalism or unauthorized building entry. The roll-off containers for the solids storage will be stored indoors. The groundwater recovery well heads are each contained in a locked well vault. A monitored security camera system is in place to provide continuous surveillance of the building for intruders during times when an operator is not present at the site. The building area is enclosed with a 3-stranded barbed-wire fence. One gate is present at the entrance to the site, one gate is present at the entrance to the Landfill area, and two gates are present at the north end of the fenced area. All gates are normally locked.

3.4 OPERATIONAL OBJECTIVES

The B&L Woodwaste Site GWTP is a fairly simple physical-chemical treatment system. The overall treatment objective is to reduce arsenic concentrations in the effluent so that they are below the MTCA cleanup level of 5 µg/L. To achieve this, the following operational objectives have been established for individual unit operations:

Oxidation Tank:	Achieve complete oxidation of arsenic and iron
Co-Precipitation Tank:	Achieve pH of 8.8
pH Adjustment Tank:	Achieve pH of 6.6

4.0 Groundwater Treatment Plant Operations and Maintenance Procedures

Each of the unit operations of the GWTP has an Operations and Maintenance Procedure (O&M Procedures) associated with it. These procedures are presented in this section. Note that these O&M Procedures are intended to be standalone documents, designed to provide operators with technical and health and safety information needed for operations tasks. As these procedures are intended to be used independently for operations tasks, each procedure has its own page numbering and the numbering does not follow page numbering in this O&M Plan. In general, specific valves and/or equipment are referenced by their number, as specified on the P&ID drawings (Drawings PID-00 through PID-05).

These procedures provide an overview of health and safety issues and requirements specific to the tasks addressed by the procedure. The procedures also identify and special tools or personnel protective equipment required to complete the work. The procedures also provide a step-by-step process to properly complete the task. These procedures are continuously reviewed and may be updated as needed to ensure the work is performed safely and properly. This manual will be updated as necessary when procedures are updated or if equipment is replaced.

List of Procedures:

Procedure P-001: Documentation and Recordkeeping
Procedure P-010: Laboratory Operating Procedures
Procedure P-020: Routine Maintenance
Procedure P-050 – Normal Startup and Shutdown
Procedure P-100: Head Tank & Oxidation Tank Operations
Procedure P-120: Co-Precipitation Tank Operations
Procedure P-130: Clarifier Operations
Procedure P-250: Process Secondary Containment System
Procedure P-310: Permanganate Feed System
Procedure P-320: Lime Feed System Operations
Procedure P-330: Polymer Feed System
Procedure P-410: Acid Feed System
Procedure P-420: pH Adjust Tank and Discharge Pumps
Procedure P-430: Cartridge Filters
Procedure P-440: Adsorption Columns and Effluent pH Meter
Procedure P-910: Air Compressor
Procedure P-940: Sludge Dewatering System

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OPERATION PROCEDURE P-001:
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
DOCUMENTATION AND RECORDKEEPING
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for general documentation and recordkeeping at the B&L Woodwaste Site.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Landfill Inspection & Maintenance	3
3.0	Security/Fence Inspection & Maintenance	3
4.0	Maintenance Records	4
5.0	Management of Change	4

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Low** Due to the presence of dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 LANDFILL INSPECTION & MAINTENANCE

Critical Information	The landfill should be inspected to ensure that there are no deformities or faults with the pump vaults, kiosks, or discharge ponds.

Personal Protective Equipment

Safety Glasses	Hard Hat

Procedure

Step	Landfill Inspection
1	Check for any deformities on the covers of kiosks and well vaults. Well vault inspections should also take place at this time. See corresponding procedure in this manual.
2	Check treatment system effluent outfalls to make sure there has been no erosion or pipe wear.
3	Ensure that the gravel road is in good condition.

3.0 SECURITY/FENCE INSPECTION & MAINTENANCE

Critical Information

The fence and security objects on site, such as kiosk locks, gate locks, and well vault bolts, should be checked on a monthly basis.

Personal Protective Equipment

Safety Glasses	Hard Hat

Procedure

Step	Fence/Security Inspection and Maintenance
1	Do a visual fence perimeter inspection, checking all gate locks on the way. Make sure that all gates are tightly shut and there are no deformities in fencing or barbed wire.
2	Check that security cameras have not been tampered with and are operational.
3	Check light on entry gate when arming and disarming site alarm. It should blink red for arming and green for disarming as usual.
4	Check kiosk shrouds and handles for any sign of damage. Locks should be in place inside of metal shrouds.
5	Check well vault bolts to make sure they have not been tampered with.

4.0 MAINTENANCE RECORDS

Critical Information

Records of all maintenance operations should be kept onsite and easily accessible. This will simplify scheduling.

Procedure

Step	Maintenance Records

1	Make a note of any irregular maintenance performed on the equipment-specific irregular maintenance form. The forms will be kept in the office of the treatment building.
2	Regular maintenance should be noted on a regular maintenance calendar. The calendar will be kept in the office of the treatment building.

5.0 MANAGEMENT OF CHANGE

Critical Information

Changes in the treatment system or groundwater recovery system will be noted and changed in all onsite references to prevent operator confusion.

Procedure

Step	Management of Change
1	All process changes shall be subjected to a documented safety and process review by a professional engineer before being implemented.
2	All changes shall be documented on the set of as-built drawings located in the office of the treatment plant.
3	

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OPERATION PROCEDURE P-010
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
LABORATORY OPERATING PROCEDURES
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the lab operating procedures in the groundwater treatment system at the B&L Woodwaste Site.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Laboratory waste management	3
3.0	Housekeeping	3
4.0	pH measurement	4
5.0	ORP measurement	4
6.0	Arsenic measurement	5
7.0	Iron measurement	6
8.0	Manganese measurement	6

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Medium** There are hazardous materials used in the laboratory which necessitate proper PPE at all times. Make sure to properly dispose of all laboratory chemicals. Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 LABORATORY WASTE MANAGEMENT

Critical Information	Laboratory materials must be disposed of appropriately. Do not put chemical-contaminated material in the trash can.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves

Procedure

Step	Laboratory Waste Management
1	Dispose of water testing chemicals in the appropriate Cole Parmer 3L waste vessel. Only pure system water (used in pH and ORP testing) may be reintroduced to the treatment system. Each test should have its own 3L waste vessel for waste. Do not mix reagents or liquids from multiple tests in the same waste container.
2	Make sure powder packets contain no chemicals before you put them in the trash.
3	Decontaminate lab materials after each test. Decon water should be disposed of with testing chemicals in 3L vessel.

3.0 HOUSEKEEPING

Critical Information	Document lab testing and results. Keep a timely schedule so as to not fall behind in testing.

Procedure

Step	Laboratory Housekeeping
1	Return testing chemicals, operation manuals, etc. to proper labeled container after use.
2	Document lab testing date, time, and results on the appropriate spreadsheet (B&L Lab Results.xlsx; Influent As Mn Fe Concs.xlsx)
3	Decontaminate testing vessels immediately after use. Do not leave dirty equipment in the lab.
4	Leave the lab as clean as it was upon entrance. If new laboratory materials are purchased, label them with the labeler or store them in the properly labeled container.

4.0 PH MEASUREMENT

Critical Information	The Thermo Scientific Orion Dual Star™ pH/ISE/mV meter is used to measure the pH and ORP of water samples.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves

Procedure

Step	pH Measurement

1	Don appropriate PPE. Calibrate the machine with a two-point pH calibration.
2	Pull out the "quick pH calibration" sheet tab located in the middle underside of the machine. Use pH 4.0 and ph 7.0 buffer. Follow instructions to complete the calibration.
3	Insert the pH measurement electrode into the sample.
4	Document testing time and result. Used pH buffer solutions can be saved for short periods of time, or may go down the sink drain for disposal.

5.0 ORP MEASUREMENT

Critical Information

The Thermo Scientific Orion Dual Star™ pH/ISE/mV meter is used to measure the pH and ORP of water samples.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves

Procedure

Step	ORP Measurement
1	Don appropriate PPE. Calibrate the machine with a one-point ORP calibration.
2	Pull out the "quick pH calibration" sheet tab located in the middle of the underside of the machine. Use the ORP quick-cal solution located in the lab to do a one-point calibration. The ORP procedure is the same as the pH procedure listed on the instruction tab, except using the ORP quick-cal solution.
3	Insert the ORP measurement electrode into the sample.
4	Document testing time and result.

6.0 ARSENIC MEASUREMENT

Critical Information

The procedure for Hach-kit arsenic testing can be found in the testing procedures box in the lab.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves

Procedure

Step	Arsenic Measurement
1	Don PPE listed above.
2	Obtain water sample from desired location in treatment system.
3	Lift the flap on the black cap and slide a test strip into the groove so that the reactive pad faces the small opening and completely covers it; secure by pressing the flap back in place.
3	Fill the reaction vessel with sample water to the fill line (50mL).
4	Add the contents of 1 reagent #1 powder pillow to the sample and swirl to dissolve. **NOTE: DO NOT ALLOW ANY LIQUID TO CONTACT TEST STRIP DURING THIS OR ANY STEP.**
5	Add the contents of 1 reagent #2 powder pillow to the sample and swirl to dissolve.
6	Wait at least 3 minutes.
7	Add the contents of 1 reagent #3 powder pillow to the sample and swirl to mix.
8	Wait at least 2 minutes and swirl again to mix.
9	Using the plastic scoop, add 1 level scoop of reagent #4 to the sample and swirl to mix.
10	Add the contents of 1 reagent #5 powder pillow to the sample.
11	Immediately attach the black cap, with the test strip inserted, to the reaction vessel. **Do not shake or invert!**
12	Allow vessel to react for at least 30 minutes but no more than 35 minutes; swirl twice during the reaction period.
13	Remove the test strip and immediately compare the developed color to the chart on the test strip bottle.
14	Dispose of lab chemicals accordingly. Document testing and results.

7.0 IRON MEASUREMENT

Critical Information	The procedure for Hach-kit iron testing can be found in the testing procedures box in the lab.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves

Procedure

Step	Iron Measurement
1	Obtain water sample from desired location in treatment system.
2	Select the test on the DR 3900 (255 Iron, Ferrous).
3	Fill a clean graduated mixing cylinder with 25mL of sample.
4	Add the contents of one Ferrous Iron Reagent pillow to sample.
5	Insert a stopper and invert cylinder to mix. Undissolved powder does not affect accuracy.
6	Start a three minute timer. Allow for reaction during this time.
7	Fill a BLANK sample cell with 10mL of sample (without reagent).
8	Fill a second sample cell with 10mL of fluid from the mixing cylinder.
9	Insert the blank sample cell into the cell reader. Zero the instrument. The display should read 0.00 Fe 2+
10	Insert the prepared sample into the cell reader. Read the results in mg/L Fe 2+.

8.0 MANGANESE MEASUREMENT

Critical Information

The procedure for Hach-kit manganese testing can be found in the testing procedures box in the lab.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves

Procedure

Step	Manganese Measurement
1	Obtain water sample from desired location in treatment system.
2	Select the test on the DR 3900 (295 Manganese, HR).
3	Fill a sample cell with 10mL of sample.

4	Add the contents of one Buffer Powder Pillow, Citrate Type for Manganese.
5	Insert a stopper or cap and invert to mix.
6	Add the contents of one Sodium Periodate Powder Pillow to the sample cell.
7	Insert the cap or stopper and mix. A violet color will develop if manganese is present.
8	Start a timer for two minutes. Reaction will occur.
9	Fill a second BLANK cell with 10mL of sample (without reagent).
10	Insert the BLANK sample cell into the cell reader. Zero the instrument. The display will show 0.00mg/L Mn.
11	Within eight minutes of the timer expiring, insert the sample into the cell holder. Read the results in mg/L Mn.

9.0 NPDES SAMPLING AND MONITORING

Critical Information

The two explicit discharge limits on the B&L NPDES permit are for arsenic and pH. A printout of the NPDES permit is located in the building office. It must be updated when a new permit is issued. The permit designates the required laboratory sampling that must occur.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	NPDES Sampling and Monitoring
1	Analyses must be performed on a monthly basis for the NPDES permit requirements. For the B&L Woodwaste site, these are Arsenic, pH, Copper, Lead, Zinc, TSS, and Turbidity. The sampling location is on the plant effluent pipe, just downstream of the arsenic adsorption vessels.
2	The sample will be collected as a 24-hour time composite. The PLC interface is used to start and stop the sampling.

3	Press the “ON” button under the sampling diagram to begin sampling. This button is found on the adsorption column page on the PLC.
4	The solenoid valve open-close-purge settings should be set to produce a full jug of water over a 24-hour period.
5	Press the “OFF” button to stop sampling after the jug has been filling for one day. Swirl the jug thoroughly to ensure that the sample is well-mixed.
6	Pour the water into appropriate sample containers provided by an accredited lab. Put the samples into an ice-filled cooler.
7	Bring the cooler to accredited lab with chain of custody document.
8	Daily effluent flow (gallons per day) must be recorded.
9	Monthly instantaneous minimum and maximum pH must be recorded.
10	Acute and chronic toxicity testing must occur twice per year, using a 24-hour time composite sample. Refer to the NPDES permit for details.
11	VOC, SVOC, and Pesticides/PCB testing must occur once per permit cycle. Refer to the NPDES permit for details.

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OPERATION PROCEDURE P-020
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
ROUTINE MAINTENANCE
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines routine maintenance for the groundwater treatment system at the B&L Woodwaste Site.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Piping, Tubing, and Valve Maintenance	3
3.0	Mixers	5
4.0	Flowmeters	9
5.0	Housekeeping	10

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Medium** The treatment system piping contains groundwater potentially contaminated with low concentrations of arsenic. Due to the presence of dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site. Pumps within the system add pressure to piping, so care should always be used when working around the equipment. Never block a pressure throughway by closing a valve without first turning off the corresponding system.

2.0 PIPING, TUBING, AND VALVE MAINTENANCE

Critical Information	The majority of piping and valves onsite are 2 schedule 80 PVC. In addition, the majority of valves onsite are true union type valves, which allow the valves to be removed using only a strap wrench. Since PVC does not rust or corrode and since biological or chemical fouling of the system has not occurred, minimal maintenance is necessary for routine operation of the valves and piping. Monitoring of system flow, pressure, and pumping cycles in combination with surface inspection for subsidence will allow for detection of subsurface pipe leaks. All problems should be reported on a maintenance resolution form and reported to the system engineer.

Tools/Supplies

Strap wrench	Screwdrivers

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Piping Maintenance
1	Above ground piping in the groundwater treatment building should be inspected on a monthly basis, per the Treatment System Inspection form.
2	Piping in the extraction well monuments and subsurface piping should be checked on an annual basis, per the annual inspection form.
3	The piping in the monuments should be inspected for cracks and leaks, with the extraction well pump operating, per the annual inspection form.
4	The ground above all subsurface piping runs (from each monument back to the GW treatment building) should be inspected for cracking or depressions indicating subsurface disturbance.
5	Anything unusual should be noted and reported to the system engineer. Pictures should be taken in order to track surface disturbances from inspection to inspection.

Procedure

Step	Valve Maintenance and Troubleshooting
1	Since the system has minimal sediment and no biological or chemical fouling has been noted, minimal maintenance is necessary to keep system valves operational.
2	For routine operations, most valves are kept either normally open or normally closed.
3	During the annual system inspection, the extraction wells should be turned to off, per the standard shutdown procedure.
4	All valves should then be opened and closed once or twice to check for normal operation.
Problems	**Resolutions**
Stuck Check Valve	Turn off system extraction well pumps. Close ball valves upstream and downstream of check valve if possible. Use a strap wrench to unscrew the valve and unseat the ball. Clean washers and replace.

Procedure

Step	Tubing Maintenance
1	There are two areas of tubing which should be inspected in the system.

2	1/2" PVC hose will attach the air compressor to the filter press pump. 1" PVC hosing will run in between the sludge tank and the press.
3	Tubing should be checked during monthly inspections for leaks.
4	Tubing is checked during annual inspections for cracking or scarring indicating potential failure below 40 psi (The differential pressure switches will trip at 40 psi).
5	If tubing has deteriorated, it can be easily replaced by removing hose clamps.

3.0 MIXER MAINTENANCE

Critical Information

There are a total of 10 mixers used in the B&L treatment system. The mixers are used in the $KMnO_4$ storage tank, the lime storage tank, the polymer dosing makedown skid, the polymer day tank, the oxidation tank, the co-precipitation tank, the clarifier (2), the pH adjust tank, and the sludge tank.

Preventative maintenance should be performed on each mixer according to timeline in the procedures below. Operators should continually monitor sounds and vibrations, documenting changes.

Tools/Supplies

Wrench	Lubrication Oil
Screwdrivers	Megger

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Polymer Day Tank Mixer PMSL PG-12 (6 months)
1	Inspect mixer for unusual sounds, excessive vibration, excessive heat, or grease leakage.
2	If any of these symptoms occur, the mixer must be stopped and the cause determined.
3	Every six months, inspect propeller for evidence of erosion or corrosion.

4	During the six month inspection, check hardware tightness. Re-torque the mixer hardware to original specifications. Screws and bolts should be tightened to 6 ft-lbs wrench torque.

Procedure

Step	$KMnO_4$ Tank, Oxidation Tank, Co-Precip Tank, pH Adjust Tank, Sludge Tank Mixer PMSL PV-2 (6 months)
1	Inspect mixer for unusual sounds, excessive vibration, excessive heat, or grease leakage.
2	If any of these symptoms occur, the mixer must be stopped and the cause determined.
3	Every six months, inspect propeller for evidence of erosion or corrosion.
4	During the six month inspection, check hardware tightness. Re-torque the mixer hardware to original specifications. See torque value in PMSL PV-2 instruction manual (value depends on bolt size).
5	During extended shutdown, run mixer for approximately 10 minutes once a week to coat gears and bearings with grease and to prevent rust due to moisture condensation.

Procedure

Step	Lime Storage Tank Mixer PMSL 4040 (Weekly/2500 Hours)
1	Inspect mixer for unusual sounds, excessive vibration, excessive heat, or grease leakage.
2	Check oil level weekly. The mixer must be off to perform the check. Record level and add oil as necessary.
3	Every 2500 hours of operation, the oil in the mixer must be changed. The recommended type of lubricant is Extreme Pressure meeting ANSI/AGMA 9005. See PMSL 4040 manual for a list of acceptable lubricants.
4	Lock out and tag out power source before beginning.
5	Drain oil in mixer drive. Take necessary precautions when handling hot oil.
6	Flush the mixer drive housing thoroughly after the original oil has been drained.
7	The mixer drive can be filled in two places: the fill plug or the breather.
8	Remove the fill plug or breather and wipe clean.
9	Fix mixer drive with recommended lubricant until level is at the “F” line scribed on the dipstick. Make sure dipstick is fully seated for determining measurement. Or, if using oil sight glass window, fill until level is at mid-point of the window. Do not under fill or over fill.
10	Replace fill plug or breather.

11	Add grease to all bearings, couplings, and seals.
12	Inspect impeller for evidence of erosion or corrosion.
13	Check hardware tightness. Re-torque mixer to original specifications. See PMSL 4040 manual for torque values.

Procedure

Step	Polymer Makedown Skid Mixer (Every 500 hours)
1	Every 500 hours, the polymer makedown skid mixer should be inspected.
2	Lockout and tag out power source before beginning if electrical components are to be disturbed.
3	Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
4	Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
5	Check all electrical connectors to be sure that they are tight.

Procedure

Step	Lamella Clarifier Flocculator (Every 20,000 Hours)
1	Nord helical worm gear reducers are lubricated with ISO VG 680 synthetic-hydrocarbon/polyalphaolefin worm gear oil.
2	The helical-worm gear oil should be replaced at least after every 20,000 operating hours or after every four years.
3	The proper ISO viscosity for the helical-worm gear is VG680. Mobil's SHC636 is the recommended brand.
4	Lockout and tag out power source before beginning if electrical components are to be disturbed.
5	The location of the oil drain is shown on figure 1.

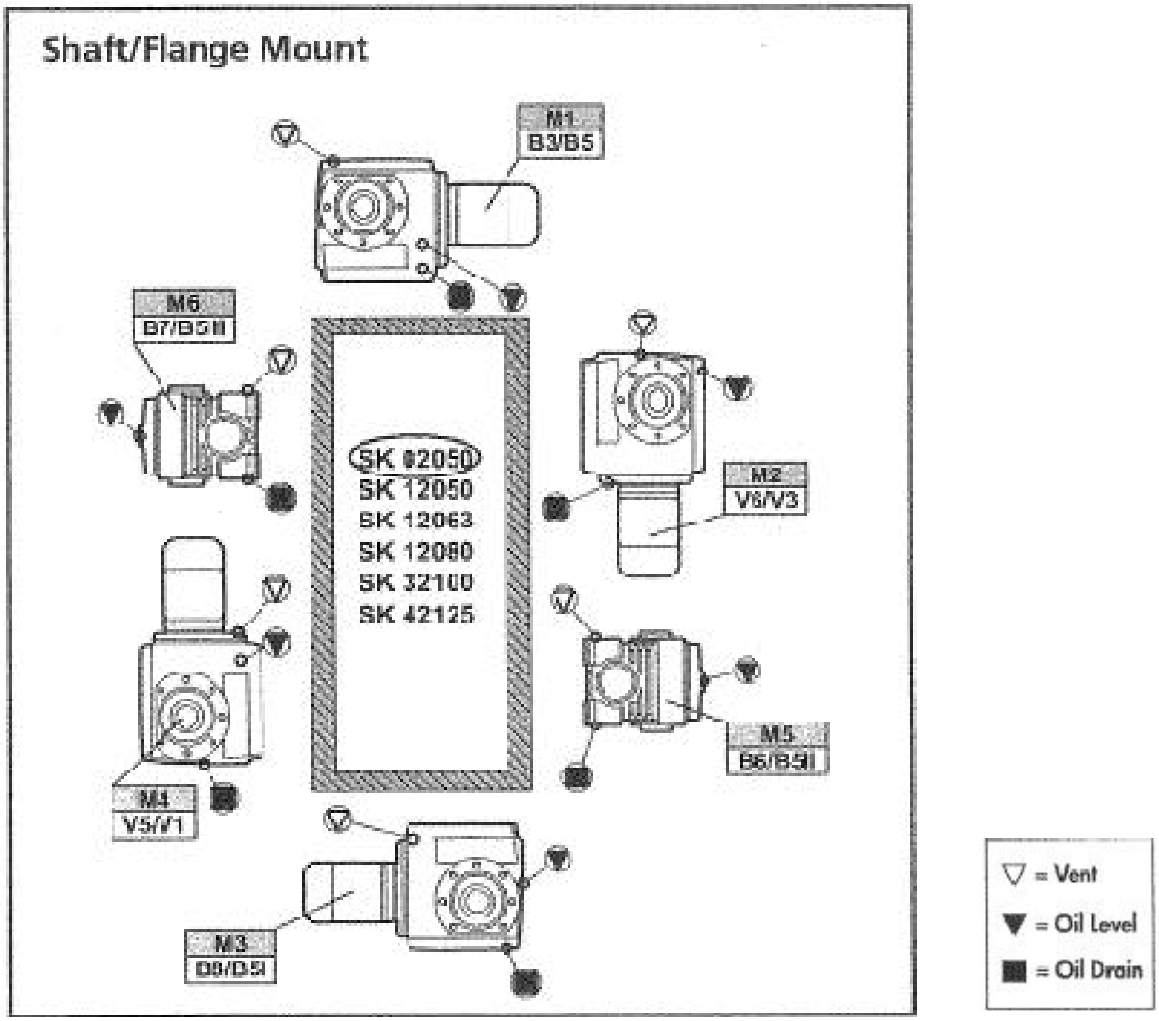


Figure 1: Locations of oil vent, level, and drain on Nord Drivesystems flocculator motor.

Procedure

Step	Lamella Clarifier Flash Mixer (Every 10,000 Hours)
1	Nord helical flange-mounted reducers are lubricated with ISO VG 220 mineral oil.
2	The gear oil should be replaced at least after every 10,000 operating hours or after every two years.

3	The proper ISO viscosity for the helical-worm gear is VG220. Mobil's Spartan EP220 is the recommended brand.
4	Lockout and tag out power source before beginning if electrical components are to be disturbed.
5	The location of the oil drain is shown on figure 2.

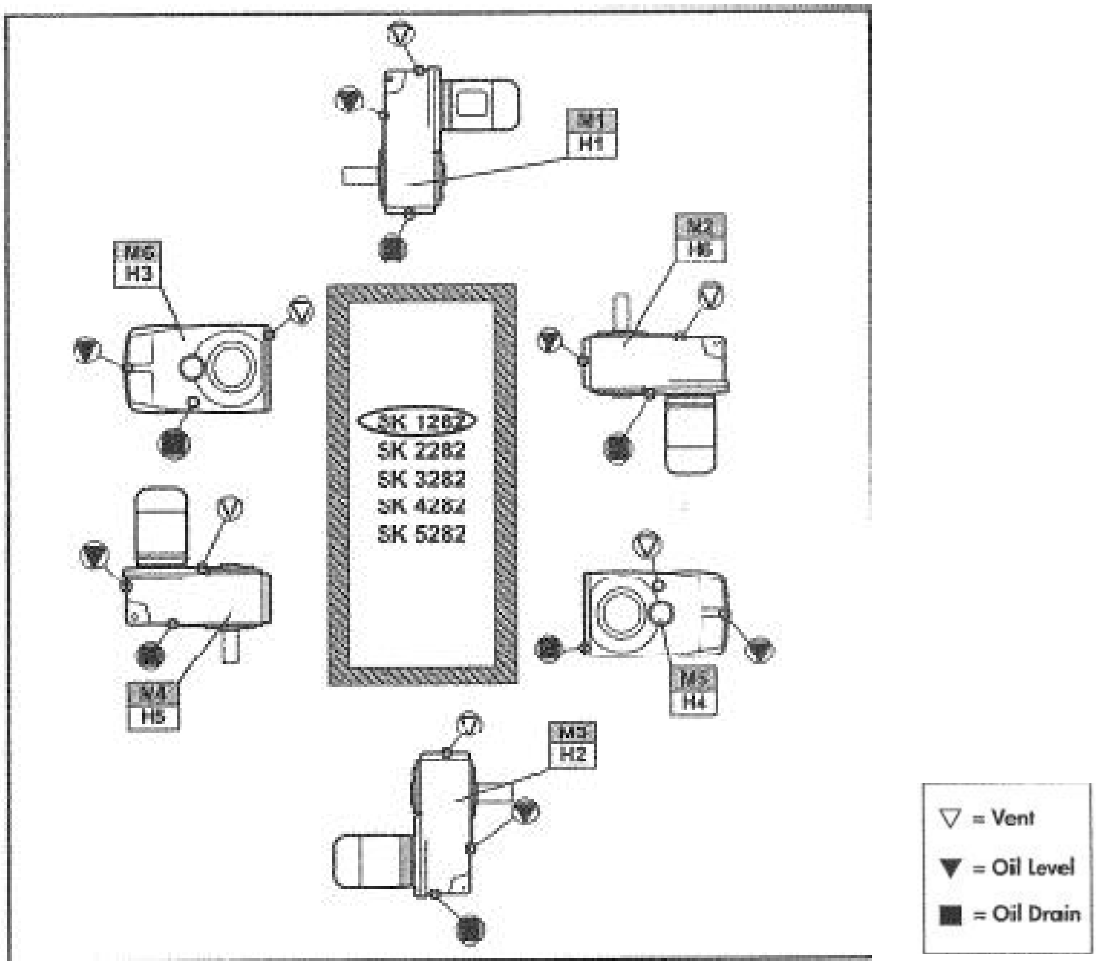


Figure 2: Locations of oil vent, level, and drain on Nord Drivesystems flash mixer motor.

4.0 FLOWMETER MAINTENANCE

Critical Information

There are two different types of flowmeters on the B&L woodwaste site. Twenty-one GP2 ½" turbine flowmeters are located near the top of well casings in the groundwater procurement setup. Two magmeter flowmeters measure influent and effluent flows in the pretreatment system. They are located before the co-precipitation tank and after the arsenic adsorption columns, respectively.

Preventative maintenance should be performed on all 23 flowmeters to ensure quality of data.

Tools/Supplies

Wrench	Batteries
Screwdrivers	

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	GP2 Turbine Flowmeters (Yearly)
1	There are 21 GP2 ½" flowmeters onsite. They are located near the top of each groundwater procurement well.
2	When batteries are disconnected or run out, batch and cumulative totals return to zero. Batteries must be replaced on a regular schedule to prevent this loss of data.
3	Battery replacements can be ordered from GPI. The part number for replacement batteries is 113520-1. Orders should be placed in time for delivery prior to battery replacement.
4	When replacing the battery, the battery terminal should also be wiped clean.
5	Document battery replacement dates for future reference.

Procedure

Step	Magmeter Flowmeters (Yearly)
1	No maintenance mentioned in instruction manual. Refer to manual for maintenance requirements.

5.0 HOUSEKEEPING

Critical Information

Good housekeeping practices will keep the B&L water treatment system operating smoothly and efficiently. Site operators should keep the facility clean and orderly at all times. All actions and maintenance should be documented and stored neatly for future reference.

Procedure

Step	Housekeeping
1	Trash should be thrown out weekly by system operators.
2	Documents and records of all maintenance, sampling, laboratory analysis, etc. should be kept both in the office and onsite. This will ensure that system operators have all necessary information when making decisions.
3	Onsite security should be enforced at all times. The gates and treatment building doors shall remain locked whenever there is no one present onsite. The security cameras shall remain functional.
4	A schedule of deliveries, required maintenance activites, and operator shifts shall be kept in an easily accessible location onsite and in the office. It should be accessible to all operators, and it will ensure smooth site operations.

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OPERATION PROCEDURE P-050
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
NORMAL STARTUP AND SHUTDOWN
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the normal startup and shutdown of the B&L Woodwaste groundwater treatment system.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Normal Startup and Shutdown	2

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Low** Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 NORMAL STARTUP AND SHUTDOWN

Critical Information	Procedure for normal startup and shutdown of the B&L Woodwaste groundwater treatment system.

Personal Protective Equipment

Safety Glasses	Hard Hat
Steel-Toed Boots	

Procedure

Step	Normal Startup
1	Confirm that no personnel are working on any parts of the system and that the system is safe to start up.
2	Confirm that no process variables are out of range (in alarm).
3	Press the “Alarm Reset” button on the PLC.
4	Start the well pumps on the PLC. Confirm that the well pumps start up and flow into the head tank commences.
5	Monitor the system to ensure that all process variables stabilize within their normal ranges.

Procedure

Step	Normal Shutdown
1	Shut off the well pumps on the PLC.
2	The system will “coast” down as flowrate through the system diminishes. After a period of time, the levels in all the tanks will be static, the chemical feed pumps will not feed any more chemicals, and the effluent pumps will not pump any more water to the outfall.

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OPERATION PROCEDURE P-100
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
HEAD TANK & OXIDATION TANK OPERATIONS
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the head tank and oxidation tank in the groundwater treatment system at the B&L Woodwaste Site. The head tank is the receiving tank for water pumped from the landfill and wetland wells. Untreated water is gravity fed from the head tank into the oxidation tank, where the water is mixed with potassium permanganate, which oxidizes the iron and arsenic before it is co-precipitated at high pH in the co-precipitation tank.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)

The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.

Level of Hazard

Low

Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 HEAD TANK STARTUP & SHUTDOWN

Critical Information

The head tank collects water pumped from the inside and outside of the landfill and discharges it to the oxidation tank for treatment. Many sections of the treatment system are under atmospheric pressure with water flow controlled passively by gravity, so the purpose of this tank is to transition the water from under pressure of the pumps to in equilibrium with atmospheric pressure.

Procedure

Step	Normal Startup
1	When the well pumps are started, check that water is entering the head tank from the well pumps and, once the water reaches the outflow level, that water flows out of the head tank and into the oxidation tank. The manual hand valve downstream of the head tank needs to be open in order for the tank to drain. There is a flowmeter (FIT-100) between the head tank and the oxidation tank.

Procedure

Step	Normal Shutdown
1	When the well pumps are shut off, the head tank will continue to drain until the water level reaches the outflow level.

3.0 OXIDATION TANK STARTUP & SHUTDOWN

Critical Information

The oxidation tank is dosed with potassium permanganate solution to oxidize iron, manganese, and arsenic. Potassium permanganate is added to the oxidation tank automatically when there is flow through FIT-100 (the flowmeter between the head tank and the oxidation tank).

Procedure

Step	Normal Startup
1	The oxidation tank mixer should be spinning when the system is turned on. If the mixer is not spinning, press “reset alarms” on the PLC.

Procedure

Step	Normal Shutdown
1	The flow of potassium permanganate to the oxidation tank will automatically cease when there is no flow through FIT-100 or when the system shuts down.

4.0 MIXER OPERATION

Critical Information	The mixer in the oxidation tank ensures thorough mixing of potassium permanganate with the water to better oxidize iron, manganese, and arsenic.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Oxidation Tank Mixer Inspection and Maintenance (6 months)
1	Inspect mixer for unusual sounds, excessive vibration, excessive heat, or grease leakage. If any of these symptoms occur, stop the mixer and determine and fix the cause.
2	Every six months, inspect propeller for evidence of erosion or corrosion.
3	During the six month inspection, check hardware tightness. Re-torque the mixer hardware to original specifications. See torque value in PMSL PV-2 instruction manual (value depends on bolt size).
4	If there is an extended shutdown, run mixer for approximately 10 minutes once a week to coat gears and bearings with grease and to prevent rust due to moisture condensation.

5.0 ORP METER OPERATION AND MAINTENANCE

Critical Information

The oxidation-reduction potential (ORP) transmitter will measure ORP in the oxidation tank. The ORP transmitter output must be calibrated yearly to ensure quality of data. If the sensor is suspected of being the source of problems, a quick visual inspection can identify the problem.

Tools/Supplies

Digital Multimeter (DMM)	Bladed Screwdrivers (Small and Large)

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Calibrate ORP Transmitter Output (Yearly)
1	Use the bladed screwdriver to loosen the four captive screws that secure the rear cover to the transmitter.
2	Use the small bladed screwdriver to remove the shorting jumper from the test terminals, TB1-3 (+) and TB1-4 (-), as shown in Figure 1.
3	Connect the DMM to the TEST terminals, TB1-3 (+) and TB1-4 (-). Set the DMM to measure mA,
4	Press the NEXT smart key until CALIBRATE is highlighted on the display.
5	Press the SELECT smart key to enter calibration mode.
6	Press the NEXT smart key until OUT.CAL appears on the display.
7	Press the SELECT smart key to start the output calibration procedure.
8	Use the up and down smart keys to adjust the output so that the DMM reads 4.0 mA.
9	Press the ENTER smart key to enter the new value and proceed to the 20-mA output.
11	Use the up and down smart keys to adjust the output so that the DMM reads 20.0 mA.

12	Press the ENTER smart key to enter the new value. The transmitter returns to the output calibrate state. NOTE: Once the output level has been permanently stored using the ENTER smart key, the output calibration procedure must be repeated to rectify a bad calibration.
13	Press the exit to MEASURE smart key to return to the measure mode.

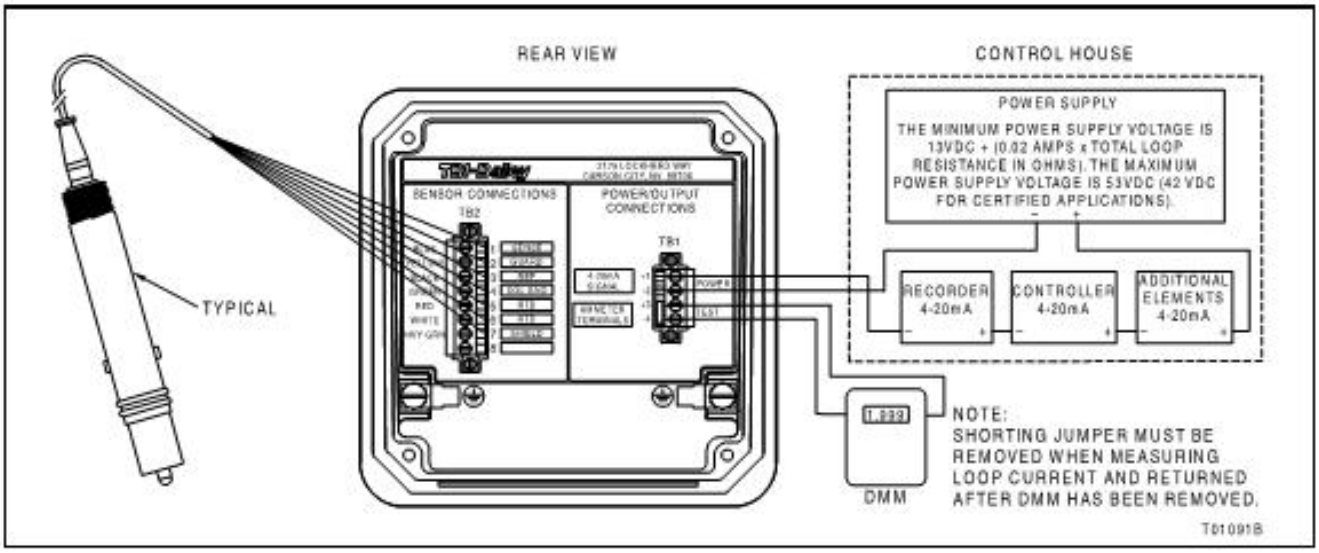


Figure 1. Location of shorting jumper

Procedure

Step	Sensor Visual Inspection (If Suspected of Error)
1	Remove the sensor from the process.
2	Inspect the sensor body for cracks and distortions. If cracks or distortions exist, contact ABB for alternative sensor styles and materials.
3	Inspect the sensor cable for cracks, cuts or shorts.

4	Check the junction box or extension cable for moisture, oil, corrosion or particulates. All connections must be dry and free of oil, corrosion and particulates. Even slight amounts of these contaminants can short sensor signals due to their high impedance.
5	Locate the BNC connector. Check to see that it is dry and not shorting against any metal, earth grounds or conduit.
6	Inspect the glass measuring electrode for breaks or cracks. If breaks or cracks exist, contact ABB for alternative electrode choices or suggestions regarding alternate sensor mounting locations.
7	If no breaks or cracks exist, use a tissue to dry the measuring electrode. Hold the sensor up to a bright light. Scaling appears as a whitish, textured material on the surface of the measuring electrode. Films usually have a streaky, multicolored appearance. If scales or film exists, clean the sensor using the procedures presented below.
8	The reference junction is the area between the measuring electrode and the sensor body. Inspect the reference junction for heavy foulants or Scaling. If heavy fouling or scaling exists, clean the sensor using the procedures presented below.
9	If the reference junction has been corroded or dissolved by process chemicals, contact ABB for alternate reference junction materials.
10	If the solution ground shows evidence of corrosion or deterioration or the O-rings appear distorted or swollen, contact ABB for alternate material choices.

Tools/Supplies

Clean Cloth	1% to 5% HCl solution
Isopropyl Alcohol or Other Appropriate Solvent	Rag, Acid Brush, or Toothbrush

Procedure

Step	Sensor Cleaning (After Inspection)
1	The sensor cleaning takes place in three parts: the acid dip, the solvent dip, and physical cleaning. An operator may use one or all of these three steps to clean the sensor. The acid dip will remove scales caused by hard water. The solvent dip will remove organic coatings. Physical cleaning removes especially thick scales and accumulations.

2	Acid dip: verify that any process fluid on the sensor is not incompatible with HCl. Put on gloves, eye protection, safety shields and other protective items as needed for protection. Dip the tip of the sensor into a one-percent to five-percent solution of HCl until this region is free of the unwanted coating. Do not expose any of the metal on the sensor to this solution or corrosion may occur. Rinse the sensor with water.
3	When cleaning the sensor, always use a soft bristle brush in order to avoid damaging the insulative coating on the solution ground (the metallic collar around the measuring electrode). This coating is only present on the outer diameter next to the reference junction and must be intact to function properly.
4	Use a rag, acid brush or tooth brush to clean the sensor. Observe caution in cleaning the glass ORP electrode, if present, to prevent glass breakage.

Tools/Supplies

Thermometer	ORP Buffer Solution

Procedure

Step	ORP Sensor Calibration
1	Prepare the buffer solution.
2	Remove the sensor from the process.
3	Press the NEXT smart key until CALIBRATE is highlighted on the display.
4	Press the SELECT smart key to enter the calibrate state.
5	Press the NEXT smart key until 1PT.CAL appears on the display.
6	Press the SELECT smart key to start the one-point calibration procedure.
7	The transmitter displays the current temperature in degrees Celsius and TMP°C. Use the thermometer to measure the temperature of the buffer or standard and enter that number into the transmitter.
8	The transmitter asks for the ORP VAL. Enter the ORP of the buffer solution.
9	Place the sensor in the buffer or standard solution
10	Stir the solution with the sensor in a slow, circular motion.
11	The transmitter displays STABL?. Observe the displayed reading. If it is stable, press the YES smart key. If it is not stable, press the NO smart key. If NO is selected, the transmitter returns to the process sensor calibration state. Perform Steps 12 through 14. If YES is selected, go to Step 15.
12	Wait until process liquid composition stabilizes.

13	Check to see if the transmitter has detected a fault condition by looking for the FAULT icon on the display. If there is a fault, Interrogate the fault by escaping to the measure mode through the exit to MEASURE smart key and then pressing the FAULT info smart key in that order.
14	Remove the sensor from the buffer solution.
15	Rinse the sensor and return it to the process.
16	If the entered calibration value is not valid, the transmitter displays BAD.CAL, and the calibration value is rejected. If the entered calibration value is valid, the slope (sensor efficiency) appears on the display. Press the NEXT smart key to display the offset.
17	Press the NEXT smart key to return to the process sensor calibrate state or press the exit to MEASURE smart key to go to the measure mode.

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OPERATION PROCEDURE P-120
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
CO-PRECIPITATION TANK OPERATIONS
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the co-precipitation tank in the groundwater treatment system at the B&L Woodwaste Site. The co-precipitation tank mixes lime with the groundwater. The lime lowers the pH of the groundwater, which accelerates the co-precipitation of arsenic and other metals with oxidized iron in the groundwater. The iron sludge then settles at the bottom of the tank.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)

The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.

Level of Hazard

Medium

The co-precipitation tank is fed with lime, which will cause irritation if it comes in contact with skin or eyes. Thus, operators should stay alert and wear appropriate PPE when working with the co-precipitation system. There are also electrical components acting in the system which necessitate proper lockout/tagout prior to maintenance. Due to the presence of dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 NORMAL STARTUP AND SHUTDOWN

Critical Information

Procedure

Step	Normal Startup
1	Turn on the coprecipitation tank mixer in the MCC by turning the HOA switch labeled “Coprecip Tank Mixer” to “Auto.” Ensure that the co-precipitation tank mixer is spinning smoothly.
2	The pH target in the coprecip tank is 8.8. If the PLC is reporting a value far from the target, take note and investigate.

Procedure

Step	Normal Shutdown
1	Cut power to the coprecipitation tank mixer from the MCC by flipping the HOA switch labeled “Coprecip Tank Mixer” to “OFF”.
2	The lime dosing pump will shut off during a plant shutdown.

3.0 PH METER OPERATION AND MAINTENANCE

Critical Information

The pH/ORP transmitter will measure pH in the co-precipitation tank to control rate at which lime is added to the tank. The sensor must be maintained properly to prevent improper lime dosing. The pH transmitter output must be calibrated yearly to ensure quality of data. Also, If you suspect the sensor is the source of a problem, you can do a quick visual inspection to identify the problem.

Tools/Supplies

Digital Multimeter	Bladed Screwdrivers (Small and Large)
Kimwipes	

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Calibrate pH Transmitter Output (Yearly)
1	Use the bladed screwdriver to loosen the four captive screws that secure the rear cover to the transmitter.
2	Use the small bladed screwdriver to remove the shorting jumper from the test terminals, TB1-3 (+) and TB1-4 (-), as shown in Figure 1.
3	Connect the DMM, set to measure mA, to the TEST terminals, TB1-3 (+) and TB1-4 (-).
4	Press the NEXT smart key until CALIBRATE is highlighted on the display.
5	Press the SELECT smart key to enter the calibrate state.
6	Press the NEXT smart key until OUT.CAL appears on the display.
7	Press the SELECT smart key to start the output calibration procedure.
8	Use the up and down smart keys to adjust the output so that the DMM reads 4.0 mA.
9	Press the ENTER smart key to enter the new value and proceed to the 20-mA output.
10	Use the up and down smart keys to adjust the output so that the DMM reads 20.0 mA.

11	Press the ENTER smart key to enter the new value. The transmitter returns to the output calibrate state. NOTE: Once the output level has been permanently stored using the ENTER smart key, the output calibration procedure must be repeated to rectify a bad calibration.
12	Press the exit to MEASURE smart key to return to the measure mode.

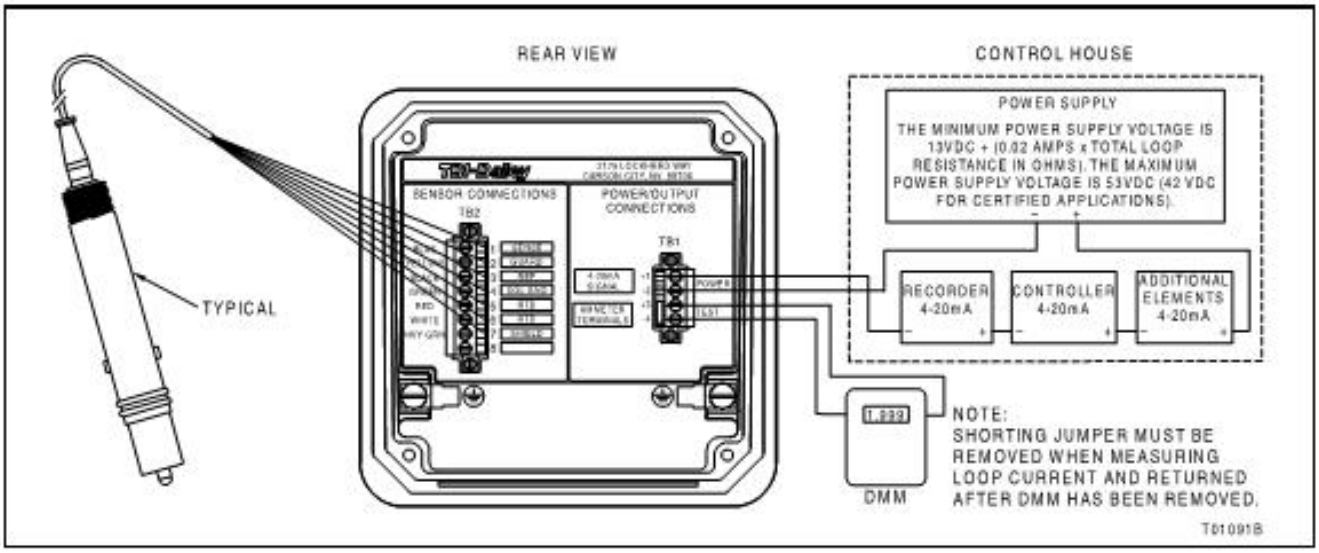


Figure 1: Location of shorting jumper

Procedure

Step	Sensor Visual Inspection (If Suspected of Error)
1	Remove the sensor from the process.
2	Inspect the sensor body for cracks and distortions.
3	If cracks or distortions exist, contact ABB for alternative sensor styles and materials.
4	Inspect the sensor cable for cracks, cuts or shorts.

5	Remove the sensor from the process. Inspect the glass measuring electrode for breaks or cracks. If breaks or cracks exist, contact ABB for alternative electrode choices or suggestions regarding alternate sensor mounting locations. If no breaks or cracks exist, use a tissue to dry the measuring electrode.
6	Hold the sensor up to a bright light. Scaling appears as a whitish, textured material on the surface of the measuring electrode. Films usually have a streaky, multicolored appearance. If scales or film exists, clean the sensor using the procedures presented below.
7	The reference junction is the area between the measuring electrode and the sensor body. Inspect the reference junction for heavy foulants or scaling. If heavy fouling or scaling exists, clean the sensor using the procedures presented below. If the reference junction has been attacked by process chemicals, contact ABB for alternate reference junction materials.

Tools/Supplies

Clean Cloth	1% to 5% HCl solution
Isopropyl Alcohol or Other Appropriate Solvent	Rag, Acid Brush, or Toothbrush

Procedure

Step	Sensor Cleaning (After Inspection)
1	The sensor cleaning takes place in three parts: the acid dip, the solvent dip, and physical cleaning. You may use any or all of these three steps to clean the sensor.
2	The acid dip will remove scales caused by hard water.
3	Verify that any process fluid on the sensor is not incompatible with HCl.
4	Put on gloves, eye protection, safety shields and other protective items as needed for protection from acid.
5	Dip the tip of the sensor into a one-percent to five-percent solution of HCl until this region is free of the unwanted coating. Do not expose any of the metal on the sensor to this solution or corrosion may occur.
6	Rinse the sensor with water.
7	The solvent dip will remove organic coatings – repeat step 5 and 6 but using isopropyl alcohol instead of HCl.

8	Physical cleaning removes especially thick scales and accumulations. When mechanically cleaning the sensor, always use a soft bristle brush in order to avoid damaging the insulative coating on the solution ground (the metallic collar around the measuring electrode). This coating is only present on the outer diameter next to the reference junction and must be intact for the reference diagnostics to function properly.
9	Use a rag, acid brush or tooth brush to clean the sensor. Observe caution in cleaning the glass pH electrode to prevent glass breakage.

Tools/Supplies

Temperature Measuring Device	Low and High pH Buffer Solutions

Procedure

Step	pH Sensor Calibration
1	Prepare the buffer solutions or standards.
2	Remove the sensor from the process piping if required.
3	Press the NEXT smart key until CALIBRATE is highlighted on the display.
4	Press the SELECT smart key to enter the calibrate state.
5	Press the NEXT smart key until 2PT.CAL appears on the display.
6	Press the SELECT smart key to start the two-point calibration procedure.
7	The transmitter displays the current temperature in degrees Celsius and TMP°C. Use the temperature measuring device to measure the temperature of the buffer or standard and enter that number into the transmitter.
8	The transmitter asks for the LO VAL. Enter the value of the low buffer or standard.
9	Place the sensor in the low buffer or standard solution
10	Stir the solution with the sensor in a slow, circular motion.
11	The transmitter displays STABL?. Observe the displayed reading. If it is stable, press the YES smart key. If it is not stable, press the NO smart key. If NO is selected, the transmitter returns to the process sensor calibration state. Perform Steps 12 through 14. If YES is selected, go to Step 15.
12	Wait until process liquid composition stabilizes.
13	Check to see if the transmitter has detected a fault condition by looking for the FAULT icon on the display. Interrogate the fault by escaping to the measure mode through the exit to MEASURE smart key and then pressing the FAULT info smart key in that order.

14	The transmitter asks for the HI VAL. Enter the value of the high buffer or standard.
15	Remove the sensor from the low buffer or standard solution.
16	Rinse the sensor.
17	Place the sensor in the high buffer or standard solution.
18	Stir the solution with the sensor in a slow, circular motion.
19	The transmitter displays STABL?. Observe the displayed reading. If it is stable, press the YES smart key. If it is not stable, press the NO smart key. If NO is selected, the transmitter returns to the process sensor calibration state. Perform Steps 21 through 23. If YES is selected, go to Step 24.
20	Wait until process liquid composition stabilizes.
21	Check to see if the transmitter has detected a fault condition by looking for the FAULT icon on the display. Interrogate the fault by escaping to the measure mode through the exit to MEASURE smart key and then pressing the FAULT info smart key in that order.
22	If the entered calibration value is not valid, the transmitter displays BAD.CAL, and the calibration value is rejected. If the entered calibration value is valid, the slope (sensor efficiency) appears on the display. Press the NEXT smart key to display the offset.
23	Press the NEXT smart key to return to the process sensor calibrate state or press the exit to MEASURE smart key to go to the measure mode.

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OPERATION PROCEDURE P-130
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
CLARIFIER OPERATIONS
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the clarifier in the B&L Woodwaste groundwater treatment system.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Normal operation / Running Adjustments	3
3.0	Normal startup and shutdown	4
4.0	Startup after power failure or first time startup	5
5.0	Flash mixer operation and maintenance	5
6.0	Flocculation mixer operation and maintenance	6

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Low** Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 NORMAL OPERATION / RUNNING ADJUSTMENTS

Critical Information	Periodic equipment adjustment of the clarifier feed rate, and chemical dosage is needed for maximum clarifier efficiency. The agitator described below is used in the flash mixer and will quickly stir the water to produce chemical mixing. The flocculator mixer produces a slow stir to encourage flocculation.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Normal Operation

1	Check the dosage of polymer during operation. Confirm that dosing ratio results in proper amount of polymer. The polymer dosing ratio on the PLC should remain constant and the PLC will automatically dictate dosage based on system flow.
2	Adjust the RPM of the flocculator. If the speed of the agitator is too high, the flocs will break down and therefore settle more slowly, which will result in a poorer quality effluent. If the speed is too low, flocculation will not be complete due to lack of mixing for better contact between flocs and suspended solids. Flocculator should be left at constant speed unless flocculation is suspect.
3	Adjust the sludge pump to discharge a volume equal to the percentage volume of solids going into the Lamella Gravity Settler (LGS). To determine the approximate percentage volume of solids, fill a 1000 ml graduated cylinder with liquid from the flash mixer. Sample the liquid 4 to 8 inches from the wall adjacent to the LGS tank and at a depth of 2 to 3 feet. Wait five minutes for the solids to settle in the cylinder and then measure. If the sludge volume in the cylinder is 100ml, the sludge pump should discharge an average rate equal to 10% of the feed rate. Look in the equipment manual for the Husky 515 air diaphragm pump to find pump curves and calculate solenoid timers.
4	Make sure the sludge level is not above the upper-most tap (top effluent gate valve) in the sludge hopper.

3.0 NORMAL STARTUP AND SHUTDOWN

Critical Information

Start-up and shutdown procedures required before and after system downtime.

Procedure

Step	Normal Startup

1	All processes should start as normal when powering up the system and starting flow.
2	Ensure that the flash mixer and flocculator are both running.
3	Check that gate valves are open on the air compressor pathway to the first sludge diaphragm pump.
4	Check that the sludge pump settings (run time vs. downtime on air compressor solenoid valve) are correct (see normal operation procedures for more information.).
5	During system inspection, take a sample from the higher effluent sampling valve to ensure that sludge is not accumulating in vessel. If there is sludge at this effluent, the air compressor solenoid valve settings must be adjusted for more run time. (See normal operation procedures for more information.)

Procedure

Step	Normal Shutdown
1	Power down flash mixer and flocculator from the MCC. Breakers are labeled, HOA switch should be switched to "off."
2	Close the gate valve transporting air from the compressor to the sludge pump under the clarifier. This will prevent the diaphragm pump from pumping water (as opposed to sludge) out of the clarifier.

4.0 START-UP AFTER POWER FAILURE OR FIRST TIME STARTUP

Critical Information	This procedure should be followed upon first use or use after a power or mechanical failure. Perform the following preliminary checks before starting up system for the first time or after power/mechanical failures.

Procedure

Step	Startup After Power Failure
1	Confirm that gear reducers are filled to proper level with recommended lubricant (see procedures below).
2	Check for proper secure installation of guards and safety devices at any hazardous location.
3	Check that electric motors have been greased with one shot as per lubrication instructions.
4	Check for completion of all electrical connections.
5	Check all mounting bolts for proper torque.
6	Check all external bolts to make sure they have not loosened.
7	Check the bottom of the floc and or flash mix tank for any obstacles.
8	Follow normal startup procedure (3.0).
9	Observe the mixer shaft and prop or shaft and turbine rotation. This rotation should be smooth and concentric about the output shaft centerline.

5.0 FLASH MIXER OPERATION AND MAINTENANCE

Critical Information

The Lamella Clarifier Flash Mixer needs preventative maintenance, which should be documented and performed according to the schedule below.

Tools/Supplies

Wrench	Screwdrivers

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Lamella Clarifier Flash Mixer Maintenance (Every 10,000 Hours)
1	Lockout and tagout power source before beginning if electrical components are to be disturbed.
2	Lubricate the Nord helical flange-mounted reducers with ISO VG 220 mineral oil.
3	The flash mixer gear oil should be replaced at least after every 10,000 operating hours or after every two years.
4	The proper ISO viscosity for the helical-worm gear is VG220. Mobil's Spartan EP220 is the recommended brand.
5	The location of the oil drain is shown on figure 1.

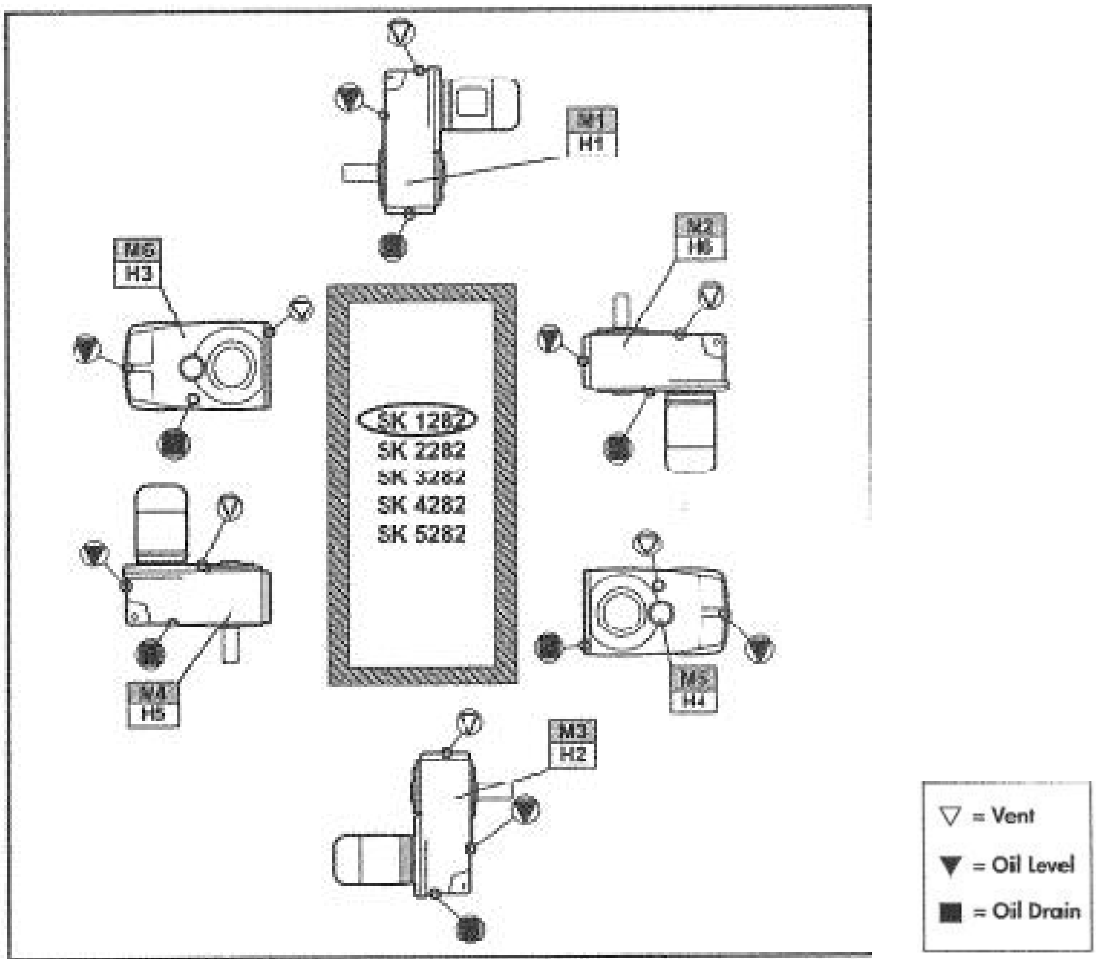


Figure 1: Locations of oil vent, level, and drain on Nord Drivesystems flash mixer motor.

6.0 FLOCCULATOR MIXER OPERATION AND MAINTENANCE

Critical Information	The Lamella Clarifier Flocculator mixer needs preventative maintenance that is documented and performed on schedule.

Tools/Supplies

Wrench	Screwdrivers

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Lamella Clarifier Flocculator Maintenance (Every 20,000 Hours)
1	Lockout and tag out power source before beginning if electrical components are to be disturbed.
2	Nord helical worm gear reducers are lubricated with ISO VG 680 synthetic-hydrocarbon/polyalphaolefin worm gear oil.
3	The helical-worm gear oil should be replaced at least after every 20,000 operating hours or after every four years.
4	The proper ISO viscosity for the helical-worm gear is VG680. Mobil's SHC636 is the recommended brand.
5	The location of the oil drain is shown on figure 2.

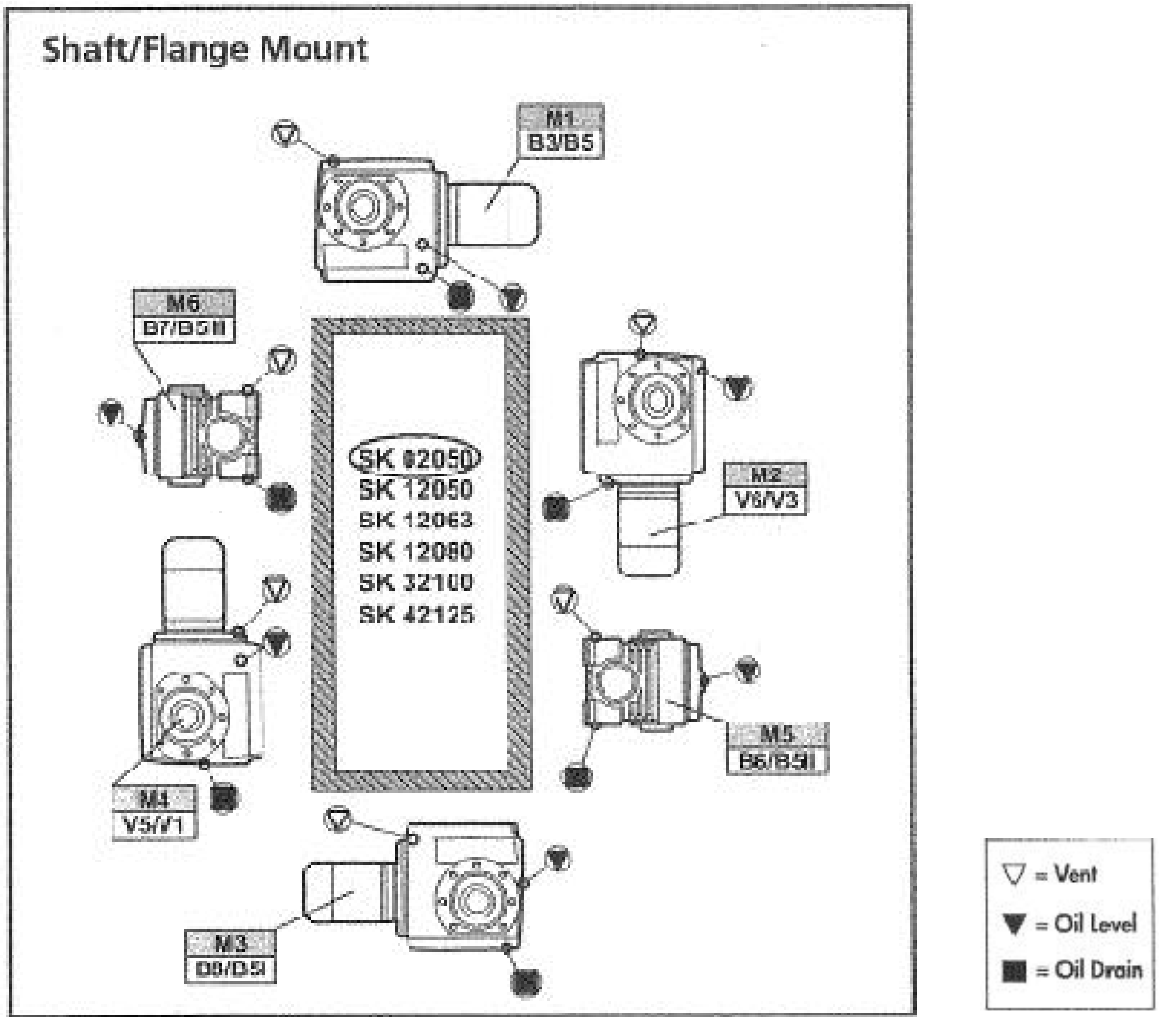


Figure 2: Locations of oil vent, level, and drain on Nord Drivesystems flocculator motor.

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OPERATION PROCEDURE P-250
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
PROCESS SECONDARY CONTAINMENT SYSTEM
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the secondary containment system in the B&L Woodwaste groundwater treatment system.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Setup and normal operation	3
3.0	Sump pump operation and maintenance	3

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Medium** The secondary containment area will prevent leakage of contaminated water to the environment. Operators should don appropriate PPE before investigating secondary containment fluids, which will contain contaminated water. Lockout secondary containment sump if taking off secondary containment grate. Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 SETUP AND NORMAL OPERATION

Critical Information	The secondary containment system will gather any spills in the treatment system at the lowest concrete basin. The water will gather in a large sump and be pumped to the oxidation tank.

Procedure

Step	Setup and Normal Operation
1	Water should be flowing into the sump from the polymer dosing pump seals during normal operation.
2	Ensure that the water is not rising above the sump pump float switch. The sump pump should occasionally be turning on automatically due to polymer seal water.
3	Ensure that the containment area high-high level float switch is operational.

3.0 SUMP PUMP OPERATION AND MAINTENANCE

Critical Information

The sump pump will pump water out of the secondary containment area into the oxidation tank. The sump pump needs to be tested after plant downtime to ensure it will work when needed. During normal operation the sump pump will activate occasionally to discharge seal water from the polymer pumps, so it will be obvious if the sump pump is faulty.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Sump Pump Testing
1	Before starting the system for the first time or after extended downtime, the sump pump should be tested.
2	Plug in the sump pump and fill the sump basin with water from the hose located next to the filter press.
3	The pump should turn on when the water is about 13” to 14” high.
4	Perform several ON-OFF cycles by refilling the sump several times to assure satisfactory operation.

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OPERATION PROCEDURE P-310
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
PERMANGANATE FEED SYSTEM
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the permanganate feed system in the B&L Woodwaste groundwater treatment system.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Receiving Permanganate Delivery	3
3.0	Drum dumper startup	4
4.0	Drum dumper shutdown	5
5.0	Drum dumper operation and maintenance	6
6.0	Feed solution preparation	7
7.0	Permanganante system startup, shutdown, operation	7
8.0	Mixer maintenance and operation	8
9.0	Dosing pump operation and maintenance	9

10.0	Spill response and cleanup	14

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**High** Permanganate will cause irritation if it contacts the skin or eyes or is inhaled, so appropriate PPE must be worn by operators. Due to the presence of dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 RECEIVING PERMANGANATE DELIVERY

Critical Information	Permanganate drums will be delivered to the site well in advance of their need. The drums will either be delivered on a pallet, be offloaded by a supplied forklift, or be offloaded with a drum dolly drum-by-drum,

Tools/Supplies

Drum Dolly	

Personal Protective Equipment

Hard Hat	Safety Glasses
High Visibility Vest	Steel toed shoes

Procedure

Step	Permanganate Delivery
1	Don appropriate PPE before receiving permanganate shipment.

2	Clear a pathway to the permanganate drum storage area. The pathway should be wide enough to accommodate a drum dolly.
3	Clear the drum storage area. Have a clear space to deposit delivered drums.
4	Open the overhead delivery door.
5	Allow the truck driver to lower the pallet or drum onto the ground. Do not try to lift materials directly off of the truck. Avoid back strain.
6	If the delivery is on a pallet, allow the truck driver to bring the pallet to the storage area with a forklift. If the delivery is a single drum, use a drum dolly to put them in the storage area. Drums may also be moved one-by-one with the drum dolly or by rolling using the head of the drum, using appropriate drum handling techniques.

3.0 DRUM DUMPER STARTUP

Critical Information

The Hapman Series 400 Helix Conveyor and Drum Dumper will unload delivered permanganate from the drums into a mixing skid. An operator will unload permanganate into the mixing tank using the drum dumper and helix conveyor. The following procedure outlines the startup command for the drum dumper.

Tools/Supplies

Wrench	Screwdrivers
Multimeter	

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Respirator – Purple P100 filter	

Procedure

Step	Drum Dumper Startup
1	Before starting up the system, make the following checks:
2	Check the tightness of all set screws, nuts, and bolts.

3	Verify that the supply voltage is correct.
4	Don a respirator with a purple P100 filter. Operator should have a current fit test and be comfortable wearing said PPE. Facial hair will interfere with respirator performance and should be shaved.
5	Remove the lid of permanganate drum and set it aside. Insert drum into drum dumper.
6	Press UP button to lift drum. Confirm that drum is held securely to gasket material inside dumper.
7	Press DUMP button to lift the drum dumper into dumping position. Open butterfly valve to begin dumping material. Do not overfill permanganate hopper. If excess solids come free of dumper/hopper, close butterfly valve.
8	Introduce a small amount of permanganate into the auger infeed hopper. Turn on the conveyor and continue to add permanganate as it is conveyed upward. The Helix will run continually more smoothly until the conveyer is full and material begins to discharge. After the conveyor is full, verify the current draw (amperage) of the motor under load. Compare this value with the FULL LOAD amperage specification stamped on the motor nameplate. If load exceeds amount on nameplate, reverify wiring. If issue continues, go to troubleshooting section in Hapman manual.
9	Continue to load permanganate into the dosing system until the helix ceases to load material. Confirm that butterfly valve is closed.

4.0 DRUM DUMPER SHUTDOWN

Critical Information

The Hapman Series 400 Helix Conveyor and Drum Dumper will unload delivered permanganate from the drums into a mixing skid. An operator will unload permanganate into the mixing tank using the drum dumper and helix conveyor. The following procedure outlines the shutdown command for the drum dumper.

Tools/Supplies

Wrench	Screwdrivers

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Respirator – Purple P100 filter	

Procedure

Step	Drum Dumper Shutdown
1	Press the RETURN button to tilt the drum upright. Then press the DOWN button to lower drum. Empty drum should be returned to chemical supplier.
2	Clean out the conveyor when most of the material has been conveyed forward from the unit's hopper and little is being expelled from the discharge end. A small residual amount of material will remain in the bottom of the hopper.
3	Turn off the drive motor.
4	If a full cleanup of the hopper is desired, follow steps 5-6. Under normal circumstances, skip to step 7.
5	Place a catch basin under the boot end. Release the quick disconnect clamp on the hopper boot and remove the bottom clean-out cap. Using the reverse jog button on the control panel, reverse the direction of the auger for 3 to 5 seconds in incremental surges. This "jogging" will remove most of the material from the casing. In most applications, this should allow adequate cleaning. If it is, replace the clean-out cap and reconnect the clamps.
6	If the jogging cleaning was not adequate, remove the metal top cover on the steel drive box or the access cover on the polyethylene drive box. A cleaning solution or water may be flushed through the casing.
7	Inspect the infeed hopper, casing and drive box for wear points.
8	Check the tightness of the casing connection points and retighten as necessary.
9	Check and retighten all bolts and fasteners, specifically the auger connection U-bolt assembly and drive-mounting hardware.
10	Inspect the motor/gear motor connection for signs of dust leakage.
11	Inspect gear box (if supplied) for signs of oil leakage.
12	Check belt tension on belt-driven models.
13	Properly secure all access ports and safety guards.

5.0 DRUM DUMPER MAINTENANCE

Critical Information

The Hapman Series 400 Helix Conveyor and Drum Dumper will unload delivered permanganate from the drums into a mixing skid. An operator will unload permanganate into the mixing tank using the drum dumper and helix conveyor. The following procedure outlines preventative maintenance measures for the drum dumper.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Drum Dumper Operation and Maintenance
1	Grease the point between the bucket and the frame on the drum dumper.
2	Keep the hydraulic power unit clean at all times.
3	Check the hydraulic fluid level in reservoir by removing breather cap. The fluid should be at maximum level at all times.
4	Inspect the bronze bushings cylinder pivot points regularly. Also check set screws in pivot supports (pins should not rotate).

6.0 FEED SOLUTION PREPARATION

Critical Information

The PLC will aid the operator in preparing a feed solution of potassium permanganate using the drum dumper and helix conveyor.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves

Procedure

Step	Feed Solution Preparation
1	Press the "MAKE BATCH" button on the PLC after preparing the drum dumper. Make sure that the helix is ready to deliver permanganate to storage tank before opening the water solenoid valve. Confirm that the tank mixer is operating.
2	Upon pressing the "MAKE BATCH" button, water will begin flowing into the tank. Water will flow into the tank until it reaches the level sensor "high" level, and then the solenoid valve will shut off. During this time, operator should dump the entire 35-gallon drum of permanganate into the tank.
3	Run the auger until all potassium permanganate from one 35-gallon drum has been discharged into the tank.
4	Monitor the level of the permanganate tank, making sure that there is no overfilling. The solenoid valve controlling water influent should close when the designated "high" level is reached.
5	The tank mixer will stop at a given time after the batch has been made. The time setting can be found on the PLC next to the "MAKE BATCH" button.

7.0 PERMANGANATE SYSTEM STARTUP AND NORMAL OPERATION

Critical Information	The permanganate system will begin dosing to the oxidation tank when flow is introduced to the system and the system power is on.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Normal Operation
1	The two permanganate dosing pumps are in duty/standby. The pump in operation will start dosing when there is flow in the system as sensed by the influent flowmeter, FIT-100. Check the PLC display to make sure that one pump is running and there are no errors.

2	In order to change the stroke length percentage on the dosing pumps, manually turn the wheel on the front of the dosing pumps. Change the PLC option under "alarm settings 2" for permanganate stroke percentage to complete the logic change. The stroke frequency will be automatically adjusted by the PLC.
3	Perform a visual inspection while operating the system. Look for leaks of purple fluid in secondary containment area or along permanganate process line.

8.0 MIXER MAINTENANCE AND INSPECTION

Critical Information

Preventative maintenance should be performed on the $KMnO_4$ mixer according to timeline in the procedure below. Operators should continually monitor sounds and vibrations, documenting changes.

Tools/Supplies

Wrench	Screwdrivers

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	$KMnO_4$ Tank Mixer PMSL PV-2 (6 months)
1	Inspect mixer for unusual sounds, excessive vibration, excessive heat, or grease leakage.
2	If any of these symptoms occur, the mixer must be stopped and the cause determined.
3	Every six months, inspect propeller for evidence of erosion or corrosion.
4	During the six month inspection, check hardware tightness. Re-torque the mixer hardware to original specifications. See torque value in PMSL PV-2 instruction manual (value depends on bolt size).
5	During extended shutdown, run mixer for approximately 10 minutes once a week to coat gears and bearings with grease and to prevent rust due to moisture condensation.

9.0 DOSING PUMP OPERATION AND MAINTENANCE

Critical Information	The permanganate dosing pump at the B&L Woodwaste treatment system is a ProMinent Sigma/2 dosing pump. The procedures below will allow for the proper dosing of permanganate to the co-precipitation tank. Operations will include dosage adjustment and preventative maintenance on the dosing pump.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

The following “Operating Information” section is an excerpt from the equipment O&M manual that is present in the GWTP office. Refer to that manual for more information.

Operating Information

Set stroke length Stroke length is continually adjustable within a range of 0-100 %. The recommended stroke length range, which will practically guarantee technical reproducibility, is 30-100 % (SEK type: 50-100 %).

NOTE:
At low stroking rates (less than 1/3 maximum stroking rate) the controller switches to digital stroking mode. This ensures adequate cooling of the motor at low stroking rates.

The following operating options are available via the different keys

Stop/Start S2Ca
To stop S2Ca: press STOP/START key.
To start S2Ca: press STOP/START key.

Start batch
Press the P key briefly in “batch” operating mode.

Load factory settings
Press the P key for 15 s to load factory calibration settings. Current settings will be deleted.

Change to settings mode
When you press the P key for 2 s in any continuous display the S2Ca will change to settings mode.
If CODE 1 is set, the code must be entered after pressing the P key.

Check adjustable values
Each time you press the i key you will see a different continuous display. The number of continuous displays depends upon the identity code, the selected operating mode and the connected accessories.

Change directly alterable values
To change a value (see below) directly in the corresponding continuous display, press one of the arrow keys until “set” appears in the LCD display. The delay has been programmed in to prevent inadvertent changing of values. If CODE 2 has been set, this code must be entered after pressing the arrow key.

Directly alterable values are as follows:

Stroke rate
In “manual”, “contact” and “batch” operating modes, the stroke rate can be altered in the “stroke rate” display.

Feed rate
In “manual” operating mode, the feed rate can be altered in the “feed rate” display.

Operating Information

Factor
The factor is the number of strokes activated by an external pulse or a press of the P key (in "batch" mode only). In "Batch" operating mode, You can alter the factor from the "remaining strokes" display. The S2Ca returns to the original continuous display a few seconds after the factor has been reset.

Display program version
Press the P key for 10 seconds to display the program version. Example: "V1052" + "X1010". In the case of "LOAD3" release the key immediately!

Batch size
In "batch" operating mode, the batch size can be changed from the "batch size/remaining litres" display. The S3Ca returns to the original continuous display a few seconds after the batch size has been reset.

Priming
The "priming" function is activated by pressing both arrow keys at the same time (in "Stroke rate" permanent display).

Cancel error
Error messages are cancelled by pressing the P key briefly.

Procedure

Step	Pump Maintenance
1	General recommendation for maintenance interval is three months. Check the following during maintenance:
2	Secure fit of liquid end screws.
3	Secure fit of metering lines (intake and delivery sides).
4	Secure fit of head valve and intake valve.
5	Leakage hole at end disc for moisture (indicates possible diaphragm failure).
6	Operate pump continuously for a short period of time in order to check whether it delivers correctly.

Procedure

Step	Gear Oil Change
1	Gear oil should be changed once every 5000 operating hours.
2	Specifications for gear oil: gear oil ISO viscosity class VG 460, e.g. Mobil Gear 634, ProMinent Order No. 555325 (Amount of oil approx. 0.5 l).

Procedure

Step	Replacing the Diaphragm
1	IMPORTANT • Flush liquid end first in the case of hazardous media. For this purpose, force water or a suitable flushing agent through the intake connection of the liquid end with a wash bottle.
2	Set the stroke length to zero when the pump is running. Switch the pump off.
3	Unscrew the diaphragm rupture sensor from the dosing head.
4	Slacken the six screws from the dosing head and remove the dosing head with screws (see figure 1).
5	Then release the diaphragm from the driving rod by jerking anti-clockwise and unscrew.
6	Screw on the new diaphragm onto the driving rod until it has a tight fit.
7	Install the dosing head with the screws so that the suction connector is pointing downwards (observe the flow direction / arrow marking on the valves).
8	Screw the diaphragm rupture sensor into the dosing head.
9	Switch on the pump.
10	Adjust the stroke length to 100 %, screw in the screws and tighten cross-wise with 7.5 ±0,5 Nm.
11	Check the pump for leaks at max. pressure.

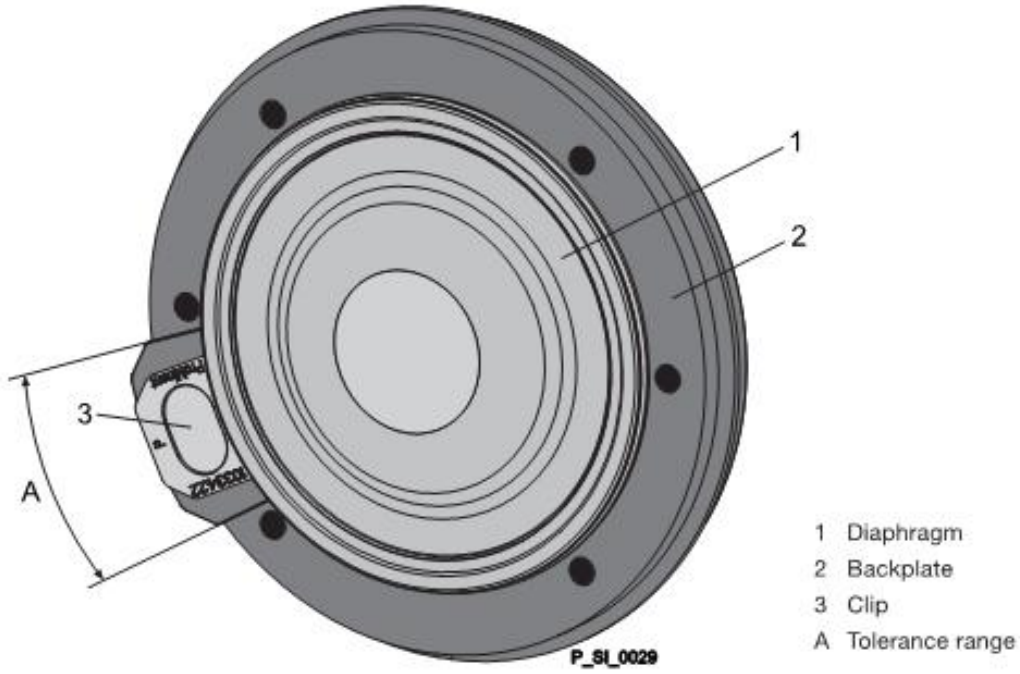


Fig. 16

Figure 1: Pump Diaphragm

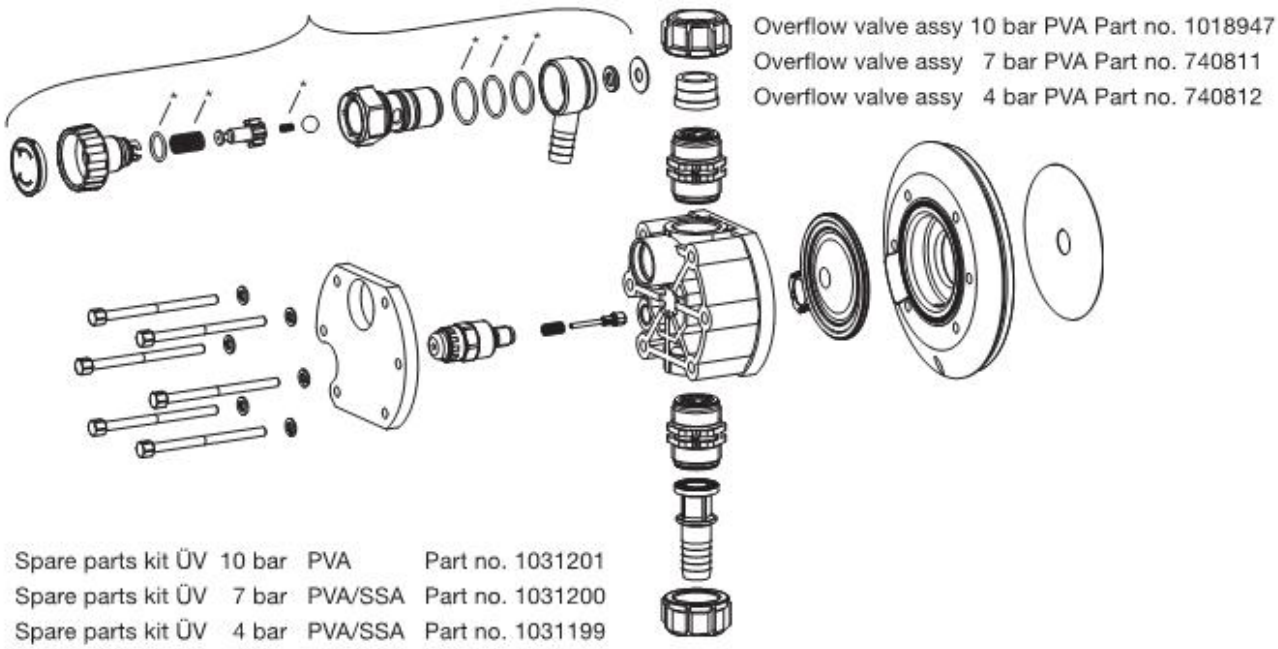


Figure 2: Expanded parts diagram with ordering numbers for wearing parts

10.0 SPILL RESPONSE AND CLEANUP

Critical Information	Perform visual inspections for spills on a regular basis. In the event of a liquid spill, a wet vac or vac truck will be used to clean up. If the spill is solid, sweep up the powder.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Spill Response and Cleanup
1	If a liquid spill occurs within the treatment building, document the occurrence and notify onsite personnel.
2	If the spill is small enough to be cleaned up by the onsite wet vacuum, use that to clean up the liquid. Ensure that the vacuum has been decontaminated and cleaned out before use. The liquid may be recycled into the permanganate tank if it has come in contact with no other chemicals.
3	Decontaminate the vacuum after use. Drain decontamination water into a separate container and dispose of it at a licensed landfill.
4	If the drain is too large for a wet vacuum to clean, call a vacuum truck. Make sure that the truck is compatible with potassium permanganate and that the driver knows the substance, concentration, and volume.
5	Allow the vacuum truck to park out front of the building and extend the hose through the smaller garage door into the secondary containment area. If no other chemicals were mixed with the permanganate in the secondary containment area, recycle the stock into the tank if possible. Otherwise, it must be disposed of at a licensed facility.

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OPERATION PROCEDURE P-320
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
LIME FEED SYSTEM OPERATIONS
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the lime feed system in the B&L Woodwaste groundwater treatment system. The lime will raise the pH in the co-precipitation tank to encourage the formation of solids.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Normal operation	3
3.0	Normal startup and shutdown	3
4.0	Startup after power failure	4
5.0	Dosing pump operation and maintenance	4
6.0	Peristaltic pump operation and maintenance	5
7.0	Lime delivery	20
8.0	Spill response and cleanup (inside building)	21

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**High** The lime feed system contains a lime slurry concentrate of about 20-25% (approximately 3.5 lb $Ca(OH)_2$ per gallon). This material will cause irritation if it comes in contact with skin or eyes. Thus, operators should stay alert and wear appropriate PPE when working with the lime feed system. There are also electrical components acting in the system which necessitate proper lockout/tagout prior to maintenance. Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 NORMAL OPERATION

Critical Information	The lime recirculation pump and lime tank mixer should always be on to prevent caking or hardening of the lime. Visual inspections must be performed on a regular basis to ensure the lime feed system is not in danger of being blocked and that it is not leaking.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Visual Inspections During Normal Operation
1	Check for kinking in the lime dosing pump line running from the recirculation line to the lime dosing pump, and out to the dosing line.
2	Check for leakage in the dosing pump and recirculation pump.
3	Look for lime spillage around lime/permanganate secondary containment area.

3.0 NORMAL STARTUP AND SHUTDOWN

Procedure

Step	Normal Startup
1	The dosing pump will come online automatically when the measured pH in the coprecipitation tank is below the pH setpoint. It may be necessary to press the "reset alarms" button on the PLC if the dosing pump does not turn on automatically. The lime tank mixer and peristaltic recirculation pump should already be operational.
2	Do a visual inspection as detailed above when starting up system.

Procedure

Step	Normal Shutdown
1	The lime tank mixer and peristaltic recirculation pump automatically remain on, even if groundwater pumping is stopped, unless there is a power failure.
2	The lime dosing pump will shut off on its own when the measured pH in the coprecipitation tank is at or above the pH setpoint. In addition, the pump will shut down during a plant shutdown.

4.0 STARTUP AFTER POWER FAILURE

Procedure

Step	Startup After Power Failure

1	After a power failure, the lime system should automatically resume operation. First, the lime tank mixer will turn on for approximately one minute. Then the lime recirculation pump will start in reverse for approximately one minute, to flush out the lime feed line. Then the lime recirculation pump will switch to forward operation. If the lime system does not start automatically, restart the lime tank mixer and lime recirculation pump as soon as possible after power failure by turning the circuit breakers back on. Turn the circuit breakers off and on in the MCC if the mixer and pump do not restart automatically.
2	Perform a visual inspection of the secondary containment area before restarting system after a power failure.
3	After a power failure, the "reset alarms" button on the PLC will likely need to be pressed in order to restart the lime dosing pump once the groundwater pumping system is restarted.

5.0 DOSING PUMP OPERATION AND MAINTENANCE

Critical Information

The Watson-Marlow dosing pump will meter lime from the peristaltic pump circulation line to the co-precipitation tank. The pump must be properly maintained to achieve pH target levels in the treatment system.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Dosing Pump Operation and Maintenance
1	The flexible hose inside the pump must be changed out periodically. It can be flattened or kinked on the inside of the pump. Remove the plastic covering over the peristaltic rotator to remove hosing. Replace with a new stretch of hosing. The hosing is flexible and tan in color and is located in a labeled Watson-Marlow box. Ensure that the installed hose is not subject to abrasion against any concrete or other abrasive surfaces.

6.0 PERISTALTIC PUMP OPERATION AND MAINTENANCE

Critical Information

The SPX-40 peristaltic pump operating the lime slurry feed system will need preventative maintenance and occasional reactive maintenance. It is important to keep the pump running to avoid hardening of the lime and resulting stasis. Maintenance activities including checking the lubricant level, changing the lubricant, replacing the pump hose, and changing the gearbox oil. These should be documented for reference during troubleshooting .

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
6.1	Routine Inspection	
6.2	Checking the Lubricant Level	
6.3	Replacing the Lubricant	
6.4	Replacing the Pump Hose	
6.5	Changing Oil in Gearbox	
6.6	Replacing Pump Seal and Wear Ring	
6.7	Replacing Pressing Shoes	
6.8	Replacing Bearings	

Tools/Supplies

Funnel	Tray	Wrench

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure 6.1

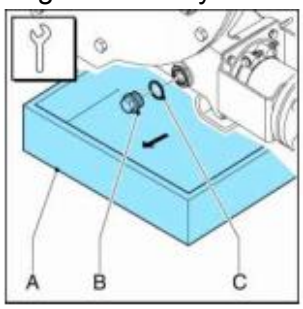
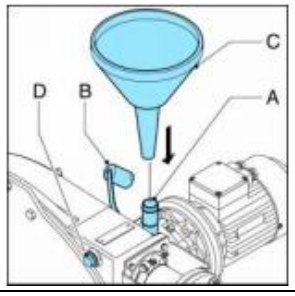
Step	Routine Inspection
1	Check the pump head for any leakage of lubricant around the cover, the flanges and the rear of the pump head.

2	Check the gearbox for any leakage.
3	Check pump for deviating temperature or strange noises.
4	When replacing the pump hose, check pressing shoes for excessive damage.

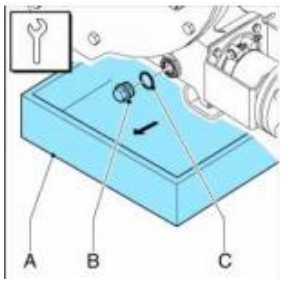
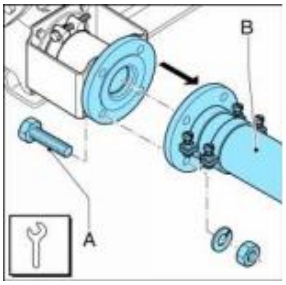
Procedure 6.2

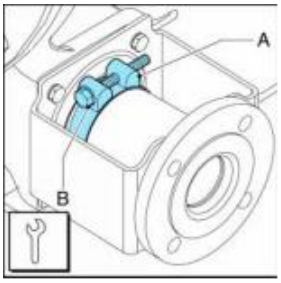
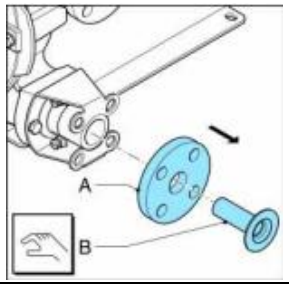
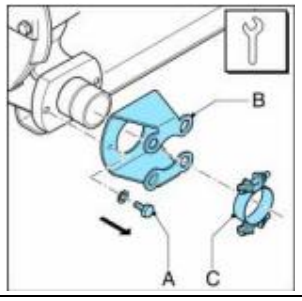
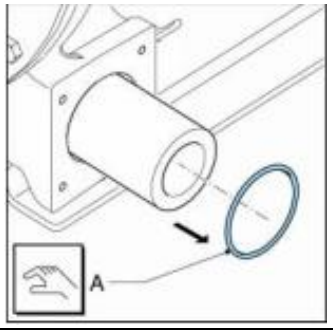
Step	Checking the Lubricant Level
1	Periodically make sure that the lubricant level is above the minimum level line in the lubricant level inspection window. If the lubricant is below the minimum level line, replace the lubricant per procedure below.

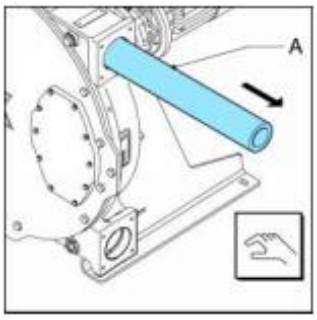
Procedure 6.3

Step	Replacing the Lubricant
1	Place a tray (A) under the drain plug in the bottom of the pump. Remove the drain plug (B). Catch the lubricant from the pump housing in the tray. Check that the sealing ring (C) is not damaged and replace it if necessary. Position the drain plug and tighten it firmly. 
2	The pump can be filled with lubricant (lubricant is green colored and in a clear plastic Watson-Marlow labeled container) via the breather/vent (A) on the rear of the pump housing. For this purpose remove the breather cap (B) and position a funnel (C) in the breather. In order to facilitate the filling with lubricant the plug (D) on the front of the pump housing can be removed. Pour the lubricant in the pump housing via the funnel. Continue until the lubricant level is above the minimum level line. Replace the plug if you removed it. Replace the breather cap. 

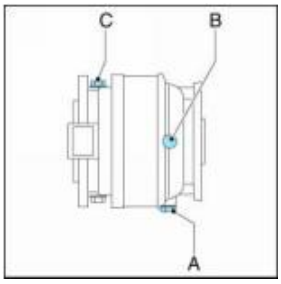
Procedure 6.4

Step	Replacing the Pump Hose
1	The pump hose should be replaced preventatively after 75% of its lifetime.
2	Isolate the pump from the electrical supply using proper lockout/tagout procedures. Turn off lime recirc pump breaker in MCC room and lock with LOTO padlock.
3	Close shut-off valves in both the suction and discharge line to minimize product loss.
4	Place a tray (A) under the drain plug in the bottom of the pump head. The tray must be large enough to contain the lubricant, possibly contaminated with lime, from the pump head. Remove the drain plug (B). Catch the lubricant from the pump housing in the tray. Check that the breather vent mounted on the rear is not obscured. Check that the sealing ring (C) is not damaged and replace it if necessary. Position the drain plug and tighten it firmly. 
5	Loosen the retaining bolts (A) of both the suction and discharge line (B). Disconnect the suction and discharge lines. 

6	Loosen hose clamp (A) of both the inlet and outlet ports by loosening retaining bolt (B). 
7	Pull the insert (B) from the hose and remove the flanges (A). Carry out this procedure both for the inlet and outlet ports. 
8	Loosen the retaining bolts (A) of the flange bracket (B) and remove the bolts. Slide the flange bracket and the hose clip (C) off the hose. Carry out this procedure both for the inlet and outlet ports. 
9	Slide off the sealing ring (A). Check that the sealing ring is not deformed or damaged and replace it if necessary. Carry out this procedure both for the inlet and outlet ports. 

10	Connect the pump to the electrical supply.
11	Remove the hose (A) from the pump chamber by jogging the drive motor to push the hose out of the pump. The speed of the motor can be changed using the manual speed pot in the MCC room. 
12	Insert new hose into the influent side of the pump.
13	Jog motor to move hose through pump. Use slow speed to move hose through pump. CAUTION: AT FULL SPEED, PUMP ROTATES QUICKLY. DO NOT STAND WITH FACE IN FRONT OF EFFLUENT AND ONLY JOG PUMP VERY BRIEFLY.
14	Replace pump parts by reversing above steps.

Procedure 6.5

Step	Changing Oil in Gearbox (Every 2500 Hours)
1	Isolate the pump from the electrical supply by turning off the lime recirc pump circuit breaker in the MCC room and locking with LOTO padlock.
2	Position a tray under the gearbox. Remove plug (A) and drain the gearbox.
3	The plug (A) is also a magnet so that any metal particles in the oil are pulled to the plug. Clean the plug and remove any metal particles. Check that the sealing ring is not damaged and replace it if necessary. Place the plug back in the gearbox and tighten it firmly. 

4	Remove level plug (B) and breather (C). Position a funnel in the hole of breather (C) and fill the gearbox with oil (see table below for specified product) until the oil just comes out of the level plug hole (B). Place plug (B) and plug (C) back and tighten them firmly.

Recommended lubricants for the Watson-Marlow Bredel planetary gearboxes*

	-20 °C to 5 °C -4 °F to 41 °F IV 95 min	5 °C to 30 °C 41 °F to 86 °F IV 95 min	5 °C to 50 °C 41 °F to 122 °F IV 95 min	-30 °C to 65 °C -22 °F to 149 °F IV 165 min
ISO 3448	VG 100	VG 150	VG 320	VG 150 - 220
AGIP	Blasia 100	Blasia 150	Blasia 320	Blasia SX 220
ARAL	Drgol BG 100	Drgol BG 150	Drgol BG 220	Drgol PAS 220
BP	Energol GR-XP 100	Energol GR-XP 150	Energol GR-XP 320	Enersyn EXP 22O
CASTROL	Alphamax 100	Alphamax 150	Alphamax 320	Alphasyn PG150
ESSO	Spartan EP 100	Spartan EP 150	Spartan EP 320	Spartan SEP 220
Q8	Goya NT 100	Goya NT 150	Goya NT 320	El Greco 220
I.P.	Mellana 100	Mellana 150	Mellana 320	Telesia Oil 150
MOBIL	Mobilgear XMP 100	Mobilgear XMP 150	Mobilgear XMP 320	Mobilgear SHC XMP 220
SHELL	Omala oil 100	Omala oil 150	Omala oil 320	Omala HD 220
TOTAL FINA ELF	Carter EP 100	Carter EP 150	Carter EP 320	Carter SH 220
KLÜBER	Kluberoil GEM 1-150	Kluberoil GEM 1-150	Kluberoil GEM 1-320	Klubersynth EG 4-220
TEXACO	Meropa 100	Meropa 150	Meropa 320	Pinnacle EP

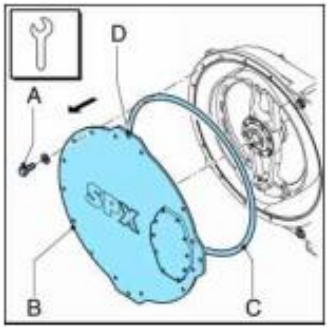
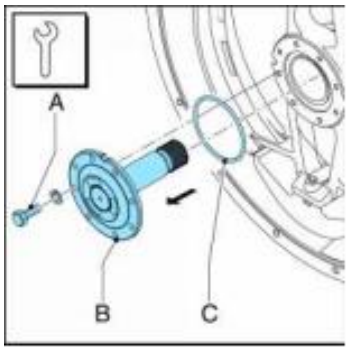
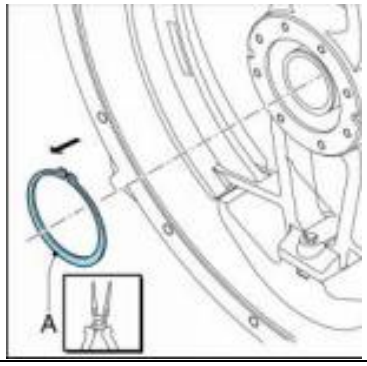
5	Switch on the electrical supply to the pump.

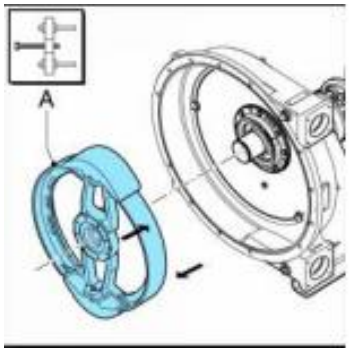
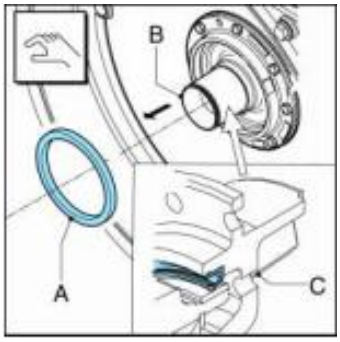
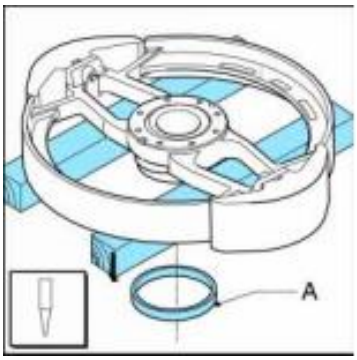
Tools/Supplies

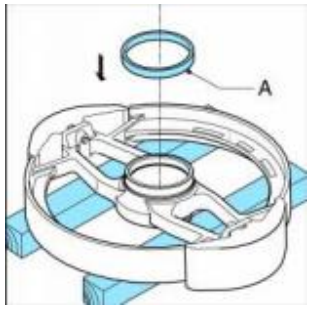
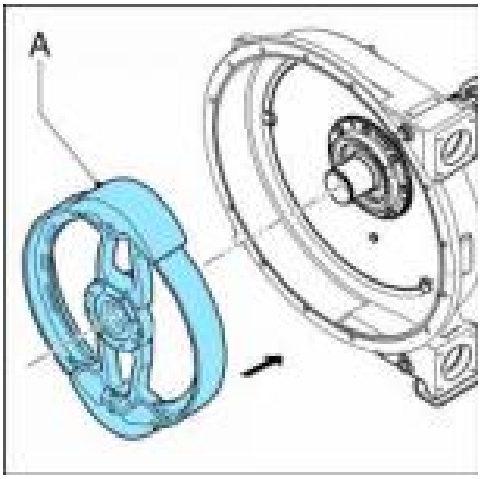
Funnel	Tray	Wrench
Needlenose Pliers	Hammer	Extraction Tool

Procedure 6.6

Step	Replacing Pump Seal and Wear Ring (If Necessary)
1	Remove the pump hose (refer to above procedure).
2	Isolate the pump from the electrical supply by turning off the lime recirc pump circuit breaker in the MCC room and locking with LOTO padlock.

3	Use lifting hole (D) to move the cover. Remove the cover (B) by loosening the retaining bolts (A). Check the sealing ring (C) of the pump cover for damage. 
4	Remove the retaining bolts (A) of the drive shaft (B) and remove the drive shaft. Check the sealing ring (C) for damage and replace if necessary. 
5	Remove the rotor retaining circlip (A), which locks the rotor on the hub. Use needle-nose pliers. 

6	Extract the rotor (A) from the hub. A suitable puller or similar extraction tool will be required during this stage of the disassembly. 
7	Remove the seal (A) from the hub (B). Clean the bore. 
8	Fit a new seal using a wooden block and hammer. Carefully hit the seal crosswise and with equal strength in the bore until it touches the hub. The seal must be fitted in the correct orientation (C). Make sure that the open side points to the pump cover.
9	Support the rotor with wooden blocks at 90° to the spokes, with the ring (A) facing down. Position a punch against the rear of the glued wear ring. Prevent damage to the wear ring seat or other parts. 

10	Turn the rotor over. Make sure that the seats of the new wear ring (A) and rotor are clean, dry and free of grease. Apply Loctite® type 641 or 603 both on the rotor and the wear ring. Position the new wear ring with the tapered edge facing up. Use a plastic hammer to fit the ring on the rotor until it touches the rotor completely. 
11	Check that the hub is clean and free of grease. Fit rotor (A). The bearings have been placed on the hub with a slight interference fit. Use a pressing tool to press the rotor on the hub. 

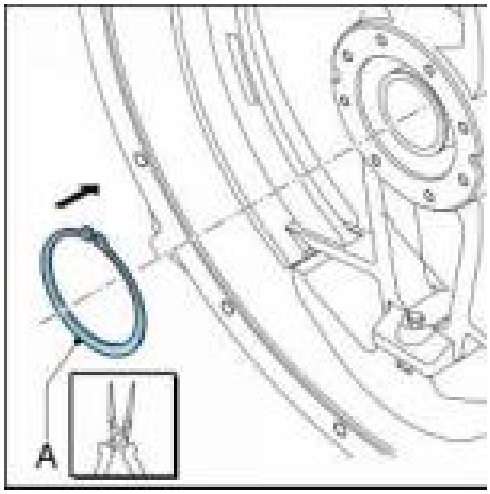
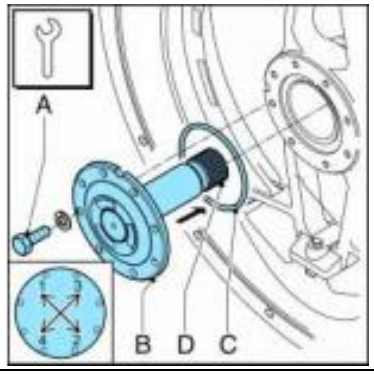
12	Check rotor retaining circlip (A) for any signs of damage and replace if necessary. Refit the circlip. Use needle-nose pliers for this purpose. 
13	Heavily grease the spline (D) of the drive shaft (B) with a graphite-loaded grease. Ensure the mating faces of the drive shaft and rotor are clean, dry and free from lubricant. Check that the sealing ring (C) is not damaged and replace it if necessary. Fit the sealing ring in the groove of the shaft flange. Fit the drive shaft. Turn the rotor until the bolt holes in the drive shaft correspond with the threaded holes in the rotor. Mount the retaining bolts (A) of the drive shaft. Tighten the bolts finger-tight. Tighten them diagonally opposite to each other to the specified torque limits (see figure 2, below). 
14	Replace the cover and fasten the retaining bolts with the correct torque (see figure 2, below)
15	Switch on the electrical supply to the pump.
16	Fit the (new) pump hose (see procedure above).

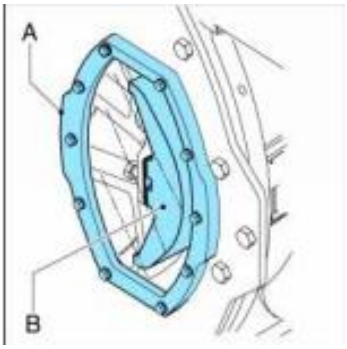
Figure 2: Specified Torque Amounts

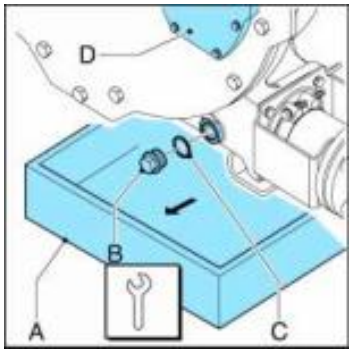
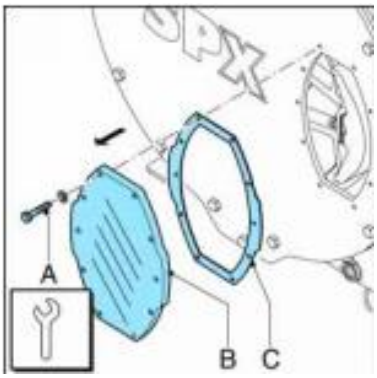
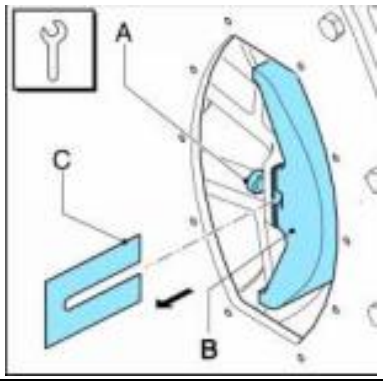
Pos	Description	Unit	SPX40	SPX50	SPX65	SPX80	SPX100
A	Pressing shoe bolt(s)	Nm	59	103	103	250	250
		lbs in	522	911.6	911.6	2212.5	2212.5
B	Inspection window bolts	Nm	5	8	8	8	8
		lbs in	44.25	70.8	70.8	70.8	70.8
C	Cover bolts	Nm	50	85	210	210	400
		lbs in	442.5	752.25	1858.5	1858.5	3540
D	Hose clamp	Nm	25	40	40	40	40
		lbs in	221.25	354	354	354	354
E	Flange bracket bolts	Nm	25	50	50	85	85
		lbs in	221.25	442.5	442.5	752.25	752.25
F	Drive shaft bolts	Nm	25	50	85	210	210
		lbs in	221.25	442.5	752.25	1858.5	1858.5

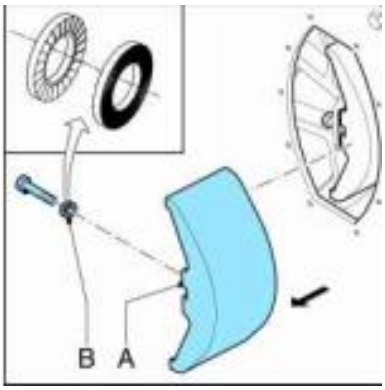
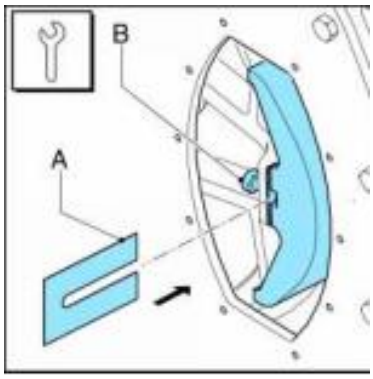
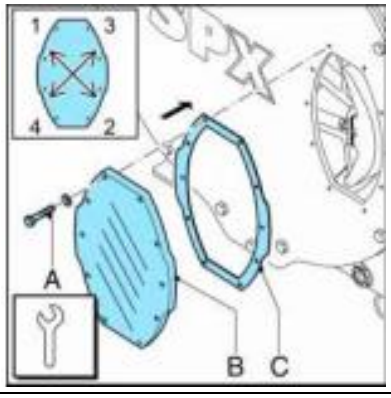
Pos	Description	Unit	SPX40	SPX50	SPX65	SPX80	SPX100
G	Hub bolts	Nm	50	50	85	210	210
		lbs in	442.5	442.5	752.25	1858.5	1858.5
H	Support bolts	Nm	50	50	85	210	210
		lbs in	442.5	442.5	752.25	1858.5	1858.5
I	Gearbox bolts	Nm	25	85	85	85	135
		lbs in	221.25	752.25	752.25	752.25	1194.75

Pos	Description	Thread, A/F				
		SPX40	SPX50	SPX65	SPX80	SPX100
A	Pressing shoe bolt(s)	M10 17 mm	M12 19 mm	M12 19 mm	M16 24 mm	M16 24 mm
B	Inspection window bolts	M6 10 mm	M8 13 mm	M8 13 mm	M8 13 mm	M8 13 mm
C	Pump cover bolts	M10 17 mm	M12 19 mm	M16 24 mm	M16 24 mm	M20 30 mm
D	Hose clamp	M8 13 mm	M10 17 mm	M10 17 mm	M10 17 mm	M10 17 mm
E	Flange bracket bolts	M8 13 mm	M10 17 mm	M10 17 mm	M12 19 mm	M12 19 mm
F	Drive shaft bolts	M8 13 mm	M10 17 mm	M12 19 mm	M16 24 mm	M16 24 mm
G	Hub bolts	M10 17 mm	M10 17 mm	M12 19 mm	M16 24 mm	M16 24 mm
H	Support bolts	M10 17 mm	M10 17 mm	M12 19 mm	M16 24 mm	M16 24 mm
I	Gearbox bolts	M8 13 mm	M12 19 mm	M12 19 mm	M12 19 mm	M14 22 mm

Procedure 6.7

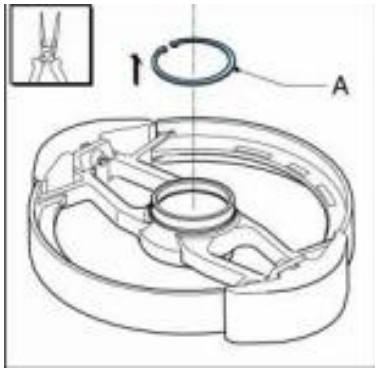
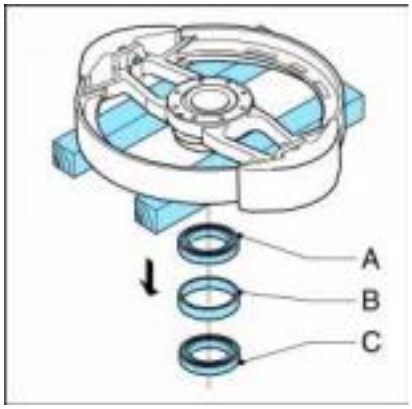
Step	Replacing The Pressing Shoes (When there is visible wear on the surface)
1	Jog the motor from the MCC (requires two people) until the pressing shoe (B) is positioned in view of the inspection window (A). 
2	Isolate the pump from the electrical supply by turning off the lime recirc pump circuit breaker in the MCC room and locking with LOTO padlock

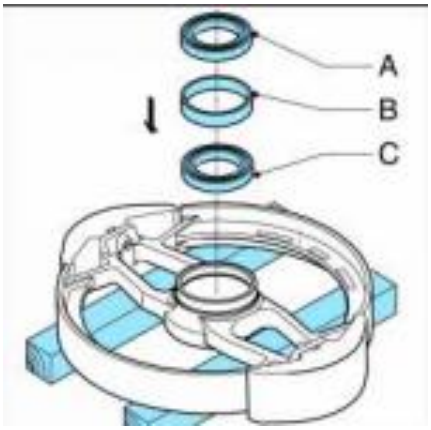
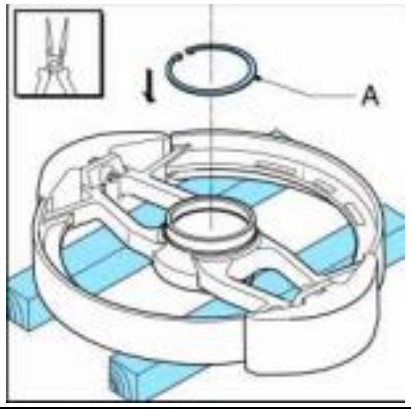
3	Place a tray (A) under the drain plug (B) in the bottom of the pump head. Remove the drain plug. Drain as much lubricant until the level has lowered just below the inspection window (D). Check that the sealing ring (C) is not damaged and replace it if necessary. Position the drain plug and tighten it firmly. 
4	Loosen the retaining bolts (A) of the inspection window (B) and remove the bolts. Remove the inspection window. Care must be taken not to damage the gasket (C). 
5	Loosen the retaining bolt(s) (A) of pressing shoe (B) a few turns. Remove the shims (C) if present. Loosen the retaining bolt(s) (A) of pressing shoe (B) completely and remove the pressing shoe. 

6	Position the (new) pressing shoe (A), check that the NordLock®-rings (B) have been positioned correctly and tighten the retaining bolt(s) a few turns. 
7	Fit the removed shims (A) again. Tighten the retaining bolt(s) (B) with the correct torque (see figure 2). 
8	Refit the inspection window (B). Check the inspection window gasket (C) for damage and replace if necessary. Make sure that all bolts (A) are refitted and that they are tightened in the correct order, diagonally opposite each other. 
9	Switch on the electrical supply.

10	Jog the motor until the second pressing shoe is positioned in front of the inspection window.
11	Isolate the pump from the electrical supply.
12	Repeat the procedure for removing and fitting this second pressing shoe by repeating steps 4 through 9.
13	Refill the lubricant. Refer to procedure above.

Procedure 6.8

Step	Replacing Bearings (If Necessary)
1	Dismount the pump hose, the cover and rotor by following steps 1 through 6 from hose removal procedure above.
2	Lay the rotor on a flat surface with the wear ring face up. Remove retaining circlip (A) with the correct tools. 
3	Turn the rotor over. Remove using the correct pressing tools, first the first bearing (C), the spacer ring (B) and the second bearing (A) from the rotor. Check the spacer ring for damage. Retain the spacer ring (B). 

4	Turn the rotor over. Check that the hub is clean and dry. Press using the pressing tool the first bearing (C) in its place. Position the spacer ring (B). Subsequently press the second bearing (A) in its place. 
5	Refit the retaining circlip (A) in the rotor. Use the correct tools for this purpose. 
6	Fit the rotor, the cover and pump hose by following steps 11 through 16 from the hose replacement procedure above.

7.0 LIME DELIVERY

Critical Information	Lime will be delivered to the site when the level in the slurry tank dips to the low level. Delivery will occur through the Environbox outside the building, with lime being pumped directly from the truck into the lime slurry tank and recirculation system.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Lime Delivery
1	Notify other onsite personnel of incoming delivery.
2	Clear the delivery area of any obstructions to truck parking space, Environbox, or secondary containment.
3	Check Environbox setup. Gate valve should be closed until attaching delivery hose. Drain ball valve should remain closed throughout.
4	Attach the lime delivery hose to the Environbox inlet. Open the influent gate valve on the Environbox.
5	Begin the lime delivery. If fluid is seen exiting hose or discharging to ground, stop flow. Be cautious around delivery system. Do not allow chemicals to contact clothes or skin.
6	Stop lime delivery once tank is filled to approximately one foot below overflow pipe. Do not overfill tank. Note that after lime slurry is delivered, truck driver will rinse truck with approximately 200 gallons of potable water, then pump that rinsate into the lime tank.
7	Close influent gate valve on Environbox.
8	Remove hose from Environbox. Keep hose tilted up towards truck to prevent spillage.
9	Check lime tank and recirculation system for any deformities or irregular noises. Follow outdoor secondary containment procedure after delivery.
10	Document delivery.

8.0 SPILL RESPONSE AND CLEANUP

Critical Information

If a lime spill occurs inside the secondary containment area inside the treatment system, use a wet vac or call a vac truck to clean up the spill.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Chemical Resistant Boots	Hard Hat

Procedure

Step	Spill Response and Cleanup (Inside Building)
1	If a lime spill occurs in the secondary containment area that is of a size manageable with the wet vacuum on site, vacuum up the spill with the wet vac. Ensure that the wet vac is empty of fluids and has been decontaminated before use.
2	If it has not come in contact with other chemicals, recycle the lime back into the lime storage tank from the wet vac after cleaning the spill.
3	If the lime mixed with other chemicals during the spill, it will need to be disposed of in a licensed landfill facility.
4	Clean the floor of the secondary containment area by sweeping and scraping off hardened lime.
5	If the spill is too large for a wet vacuum, call a vacuum truck. Be sure to tell the provider the amount and type of chemical; the vac truck must be compatible with lime.
6	Allow the vac truck to park out front and run the hose through the smaller garage door. Finish cleaning the spill by sweeping and scraping off the crusted lime. If clean, the lime can be returned to the slurry tank.

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OPERATION PROCEDURE P-330
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
POLYMER FEED SYSTEM
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the polymer feed system in the groundwater treatment system at the B&L Woodwaste Site. The system includes a polymer makedown skid, where the polymer is diluted and mixed with water, a day tank where the dilute solution is mixed and held until dosing to the system, and two dosing pumps that supply polymer to the flash mixing tank and the sludge tank. Proper polymer dosing enables flocculation.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Normal Operation	3
3.0	Makedown Skid Operation	3
4.0	Mixer Operation and Maintenance	4
5.0	Dosing Pumps Operation and Maintenance	5

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Medium** Polymer will cause extremely slippery conditions if it comes in contact with skin or water. Caution should be maintained and proper PPE donned before working with the polymer feed system.. There are also electrical components acting in the system which necessitate proper lockout/tagout prior to maintenance. Due to the presence of dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 NORMAL OPERATION

Critical Information	The polymer feed system will make a batch of polymer solution and dose it to the clarifier flash tank through two Moyno pumps.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Normal Startup
1	The polymer feed system will automatically mix a batch of polymer in the polymer day tank when the level of polymer solution reaches the low level alarm. This alarm can be set on the "Alarm settings 1" page on the PLC. Ensure that both water influent rotameters on the polymer makedown skid are opened to let in one gpm each. The cylinders are on the bottom left side of the skid and have flow indicators which are set with the hand valves on top of the indicator columns. Stroke frequency should be set at 20 with 2 gpm of influent water. Confirm that the magnetic switch clamped on the dilution water rotameter is set low enough to be actuated by the rotameter float when operating.
2	When polymer level inside neat polymer pail is running low, attach influent suction end of hosing to new pail. Be sure to wear safety gloves and glasses when working with polymer. Do not allow polymer to contact water outside of makedown skid to avoid extremely slippery conditions.
3	The skid will stop making polymer when the level of the day tank reaches the high level alarm. High level settings are also found on "Alarm settings 1" page of the PLC.

Procedure

Step	Normal Shutdown
1	The polymer system will automatically stop dosing when the plant stops running. This will prevent the low level alarm from triggering since there will be no outflow from the day tank.

3.0 MAKEDOWN SKID OPERATION

Critical Information	The polymer makedown skid mixes polymer batches with an influent water flow of 2 gpm and 20 strokes per minute polymer dosing at 100% stroke.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Flushing the Makedown Skid Mixing Chamber
1	If shutting down the makedown skid for over a week, the mixing chamber should be flushed and the neat polymer line from the pail to the discharge point in the mixing chamber should be flushed with vegetable oil.
2	To flush the mixing chamber, first turn off the switch on the back of the makedown skid to turn off the polymer dosing pump.
3	Open the influent water valve and the mixing chamber influent cylinders.
4	Allow the chamber to flush with water.
5	Close the influent water valve.
6	To flush the neat polymer line, remove the suction line from the neat polymer pail and place it into the container of vegetable oil. Run the solenoid pump at maximum stroking rate until vegetable oil enters the mixing chamber.
7	Prevent any water from contacting neat polymer in order to prevent an unsafe slippery condition and possible pipe/tube plugging.

4.0 MIXER OPERATION

Critical Information	The polymer day tank mixer should be left running while polymer solution is in the day tank.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Polymer Day Tank Mixer PMSL PG-12 (6 months)
1	Inspect mixer for unusual sounds, excessive vibration, excessive heat, or grease leakage. If any of these symptoms occur, stop the mixer and find the cause.
2	Every six months, inspect the propeller for evidence of erosion or corrosion.

3	During the six month inspection, check hardware tightness. Re-torque the mixer hardware to original specifications. Screws and bolts should be tightened to 6 ft-lbs wrench torque.

5.0 DOSING PUMP OPERATION

Critical Information

The polymer dosing pumps supply polymer solution to the flash mixing chamber and the sludge tank.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Dosing Pump Operation
1	The polymer dosing pumps are to be used in duty/standby configuration. The pump seals need to be primed using potable water from an inlet on the wall
2	Pump seal water should be flowing at all times when a pump is running. Check the water lines behind the pumps and ensure that there is pressure on the gauge and the valves going to the duty pump are open during pump operation.
3	The PLC will adjust the pump dosing to match flow through the system, based on the influent flowmeter (FIT-100).
4	When changing duty/standby on the PLC, ensure that the breaker for the new duty pump is switched to “on” in the MCC and that seal water is available.

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OPERATION PROCEDURE P-410
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
ACID FEED SYSTEM
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the acid feed system in the groundwater treatment system at the B&L Woodwaste Site.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Acid Delivery & System Setup	2
3.0	Normal operation, startup and shutdown	4
4.0	Dosing pump operation and maintenance	4

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**High** Sulfuric acid delivered to the site will be between 93% and 97% acid. Concentrated sulfuric acid is a thick oily liquid. Sulfuric acid is very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, and of inhalation. Sulfuric acid is not volatile, but mists can cause lung damage. Operators should stay cautious and alert when working with the acid feed system and corresponding deliveries. All personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site. Appropriate PPE should be worn at all times when operating around sulfuric acid.

2.0 ACID DELIVERY AND SYSTEM SETUP

Critical Information	The acid dosing system will use 93%-97% sulfuric acid which will be delivered in totes to the site. Operators must use caution and proper PPE when working around concentrated sulfuric acid. Deliveries will be scheduled when one tote runs out. There will generally be two totes onsite at a time, both will be located on the grating over the acid containment sump.

Personal Protective Equipment

Goggles and Face Shield	Rubber Pants and Coat
Rubber Gloves and Sleeves	Chemical-resistant Boots

Procedure

Step	Receiving Acid Delivery
1	Don proper PPE before receiving sulfuric acid shipment.
2	Open the delivery door and ready the area for acid shipment. Clear any pathway obstructions and notify other onsite personnel that acid is being delivered. Place acid delivery ramps.
3	Disable acid level alarm on PLC by pressing the “Disable” button on the HMI. Remove pressure relief valve and level transmitter from empty acid tote. Tubing should have already been removed from empty tote.
4	Allow truck driver to remove empty acid tote from secondary containment area.
5	Allow truck driver to place full tote in secondary containment area. Check for any deformities in tote or secondary containment area.
6	Install pressure relief valve and level transmitter in new acid tote. Ensure that level transmitter is operational and that acid level alarms are re-enabled in the PLC.

Procedure

Step	Changing Acid Tote Feed
1	Don proper PPE before working with sulfuric acid totes.
2	Close hand valve 411 attaching acid tote to acid dosing skid.
3	Close hand valve 412 between flex hose and dosing pumps.
4	Disconnect the tubing connected to the tote. Be careful and keep tubing end tilted upwards to prevent spilling. If any liquid is discharged, do not let it come in contact with skin or clothing. Neutralize the spill with an excess of calcium hydroxide (lime). Be sure to neutralize all spilled sulfuric acid completely because sulfuric acid takes a very long time to evaporate. In the event of a discharge to the secondary containment area, alert onsite personnel.
5	Connect tubing to full tote. Open hand valve on full tote.
6	Check that desiccating breather vent is unobstructed, desiccant is active (pink, not blue), and level transmitter is operational.

3.0 NORMAL OPERATION AND STARTUP

Critical Information

The programmable logic controller (PLC) will automatically run the acid dosing pumps when there is flow through the system. Adjustments must be made to the PLC in order to change stroke speed.

Procedure

Step	Normal Operation and Startup
1	When the plant is not in shutdown mode and the pH adjust tank pH level is away from its setpoint, the active acid dosing pump turns on automatically. The pumps are set in a duty/standby configuration.
2	Check the PLC to ensure that one of the acid pumps is green (pumping). The targeted pH in the pH adjust tank is 6.8.
3	To switch the active dosing pump, click on the “A/B mode” button on the HMI. Pumps should be switched on a bi-monthly basis.
4	If changing the stroke length percentage is necessary, turn the dial on the pump by hand to desired number. This measure should not be necessary. Only use if the PLC control loop is creating the wrong pH and a different stroke length is needed. After manually adjusting the stroke percentage, change the PLC settings for “stroke percentage” under alarm setting 2.

4.0 DOSING PUMP OPERATION AND MAINTENANCE

Critical Information

The acid dosing pump is a ProMinent Gamma/L dosing pump. The procedures below are for the proper dosing of sulfuric acid to the pH adjust tank, where water is acidified to an acceptable pH range after earlier lime dosing. Operations include dosage adjustment and preventative maintenance on the dosing pump.

Personal Protective Equipment

Face Shield and Goggles	Rubber Gloves
Rubber Jacket and Sleeves	Rubber Pants

Operating Information

Set stroke length
Stroke length is continually adjustable within a range of 0 - 100%.
The recommended stroke length range for best reproducibility is 30 - 100%.

The following operating options are available via the different keys:

Stop/Start pump
To stop gamma/ L: press STOP/START key.
To start gamma/ L: press STOP/START key.

Load factory settings
Press the P key for 15 s only if you wish to load factory calibration settings! Current settings will be deleted. Before doing this, be sure to record the current settings for future reference.

Change to settings mode
When you press the P key for 2 s in any continuous display, the gamma/ L will change to settings mode. If CODE 1 is set, the code must be entered after pressing the P key.

Check adjustable values
Each time you press the ”i” key you will see a different continuous display. The number of continuous displays depends upon the identity code, the selected operating mode and the connected accessories.

Change directly alterable values
To change a value (see below) directly in the corresponding continuous display, press one of the arrow keys until “set” appears in the LCD display. The delay has been programmed in to prevent inadvertent changing of values. If CODE 2 has been set, this code must be entered after pressing the arrow key. Directly alterable values are as follows:

Stroke rate
In “manual”, “contact” and “batch” operating modes: The stroke rate can be altered in the “stroke rate” display.

Operating Information

Priming
The "priming" function is activated by pressing both arrow keys at the same time in the "Stroke rate" permanent display. This causes the pump to run at maximum speed for a short period of time.

Cancel error
Error messages are cancelled by pressing the P key briefly.

Display program versions
Press on the P key for 10 seconds to display the programme versions.
Example: "V 1052" + X 1010".
Release the key on "LOAD 3" immediately after batch size has been reset.

Procedure

Step	Pump Maintenance (Perform Bimonthly)
1	The Gamma / L pump should be inspected quarterly while it is operating. USE CAUTION WHEN OPERATING ON ACID DOSING PUMPS. PREVENT ANY CHEMICAL CONTACT WITH SKIN. Wear rubber gloves and rubber pants/jacket when maintaining the pump.
2	The parts of the dosing pump are shown below. The sulfuric acid is pumped through the "liquid end" of the pump by the diaphragm.

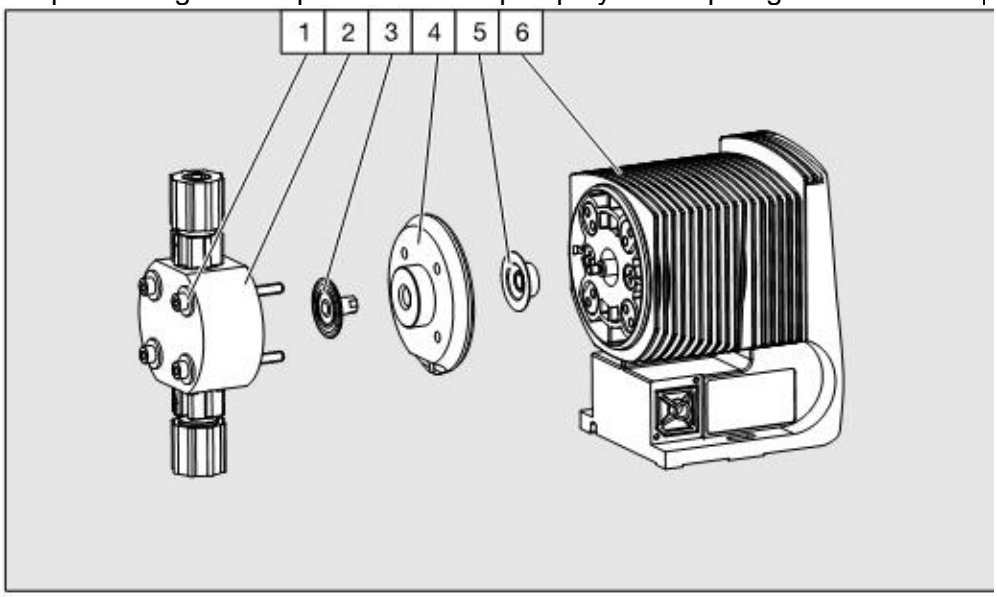
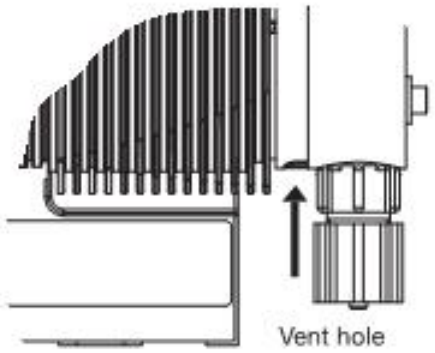


Fig. 21

1 Screws
2 Liquid end
3 Diaphragm
4 Top plate
5 Safety diaphragm
6 Pump housing

3	Check for chemical seepage at vent hole on the pump housing. If there is chemical seepage, tighten the connection… 
4	Check that the discharge tubing is connected firmly to the liquid end.
5	Check that discharge and suction valves are firmly fixed.
6	Check that the liquid end is generally watertight
7	Check for correct feed: run the dosing pump for a short period. To do this manually, press both arrow keys together.
8	Check electrical connections for wear.
9	Check that liquid end screws are fastened tightly.

Procedure

Step	Inspecting and Changing the Diaphragm (Every 6 Months)
1	Empty the liquid end (turn the unit upside down and let the feed chemical run out, rinse with water thoroughly.)
2	When the pump is running set the stroke length to 0% (the drive axis is then set).
3	Switch off the pump.
4	Unscrew the hydraulic connectors from the discharge and suction side of the liquid end.
5	Remove the four screws on the liquid end of the dosing pump.
6	Loosen the liquid end and the top plate from the pump housing - loosen only!
7	Hold the housing in one hand and with the other, clamp the diaphragm between the liquid end and the top plate. Then release the diaphragm from the drive spindle with a light anticlockwise turn of the liquid end and top plate.
8	Unscrew the diaphragm completely from the drive spindle.
9	Remove the top plate from the housing.

10	Check the condition of the safety diaphragm and replace if necessary.
11	Push the safety diaphragm only as far onto the drive axis until it lies flat on the pump housing – no further!
12	Screw the new diaphragm carefully up to the stop on the drive axis – this must be exact to ensure correct metering!
13	Screw the diaphragm tight once more.
14	Position the top plate on the pump housing. CAUTION - The leakage hole must point downwards when the pump is fully assembled.. Also, do not distort the top plate on the pump housing, otherwise the safety diaphragm will not fit.
15	Lay the diaphragm into the top plate.
16	Hold the top plate and screw the diaphragm in a clockwise direction until it is firmly in position (you will feel the resistance of the return spring). CAUTION - Do not overtighten the diaphragm. Also, the top plate must remain in position to prevent the safety diaphragm from distorting.
17	Place the liquid end with the screws on the diaphragm and the top plate (the priming connector must point downwards once the pump is fully assembled).
18	Screw on screws lightly and tighten

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OPERATION PROCEDURE P-420
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
PH ADJUST TANK AND DISCHARGE PUMPS
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the pH adjust tank in the B&L Woodwaste groundwater treatment system. The purpose of this tank is to bring the pH of the groundwater back down to around 6.5 after the clarifier.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Normal operation	2
3.0	Normal startup and shutdown	3
4.0	pH meter operation and maintenance	3
5.0	Discharge pump operation and maintenance	8

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**High** Sulfuric acid used in the pH adjust tank is between 93% and 97%. It will cause burning and extreme irritation if it comes in contact with skin. Appropriate PPE should always be worn when working around the pH adjust tank. Due to this and the presence of Dangerous Waste onsite, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the site.

2.0 NORMAL OPERATION

Critical Information	The acid dosing pumps and tank effluent pumps are controlled by the PLC. If the pH goes above the pH setpoint, the PLC will engage the acid dosing pump according to a PID algorithm. The effluent pump will change speed and attempt to set the water level in the tank to the level set point according to a PID algorithm. The level setpoint can be adjusted on the PLC.

Procedure

Step	Normal Operation
1	Occasional checks should be made to ensure that the pH tank liquid level is reported correctly by the PLC. Perform a visual check during system inspections.
2	The pH target for the tank is 6.8. If the PLC is reporting a value far from the target, take note and investigate.
3	Check that the mixer is spinning during visual inspection.

3.0 NORMAL STARTUP AND SHUTDOWN

Critical Information	All instrumentation and motor controls must be on and operating properly to run the pH adjust tank.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Normal Startup and Shutdown
1	The pH tank-related operations will start when there is power to the system and the plant is not in shutdown mode.
2	Ensure that the power is on to the tank mixer.
3	Check the valves on the pH adjust tank effluent and the discharge pump influent and effluents. One pump should operate at a time. The breaker for the “duty” pump should be on in the MCC, and the pump should be set to auto. The pump’s seal water valve should be open.

4.0 PH METER OPERATION AND MAINTENANCE

Critical Information	The pH/ORP transmitter will measure pH in the pH adjust tank and control the sulfuric acid dosing pump accordingly. The sensor must be maintained properly to prevent overdosing. The pH transmitter output must be calibrated yearly to ensure quality of data. If the pH sensor is suspected of being the source of a problem with the pH metering, a quick visual inspection can identify the problem. Often the problem is a dirty sensor that needs to be cleaned.

Tools/Supplies

Digital Multimeter (DMM)	Bladed Screwdrivers (Small and Large)

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Calibrate pH Transmitter Output (Yearly)
1	Use the bladed screwdriver to loosen the four captive screws that secure the rear cover to the transmitter.
2	Use the small bladed screwdriver to remove the shorting jumper from the test terminals, TB1-3(+) and TB1-4(-), as shown in Figure 1.
3	Set the DMM to measure mA and connect it to the TEST terminals, TB1-3(+) and TB1-4(-).
4	Press the NEXT smart key until “CALIBRATE” is highlighted on the display.
5	Press the SELECT smart key to enter the calibrate state.
6	Press the NEXT smart key until “OUT.CAL” appears on the display.
7	Press the SELECT smart key to start the output calibration procedure.
8	Use the UP and DOWN smart keys to adjust the output so that the DMM reads 4.0 mA.
9	Press the ENTER smart key to enter the new value and proceed to the 20-mA output.
10	Use the UP and DOWN smart keys to adjust the output so that the DMM reads 20.0 mA.
11	Press the ENTER smart key to enter the new value. The transmitter returns to the output calibrate state. NOTE: Once you take this step, you will have to repeat the output calibration procedure if you wish to change anything about the calibration.
12	Press the exit to MEASURE smart key to return to the measure mode.

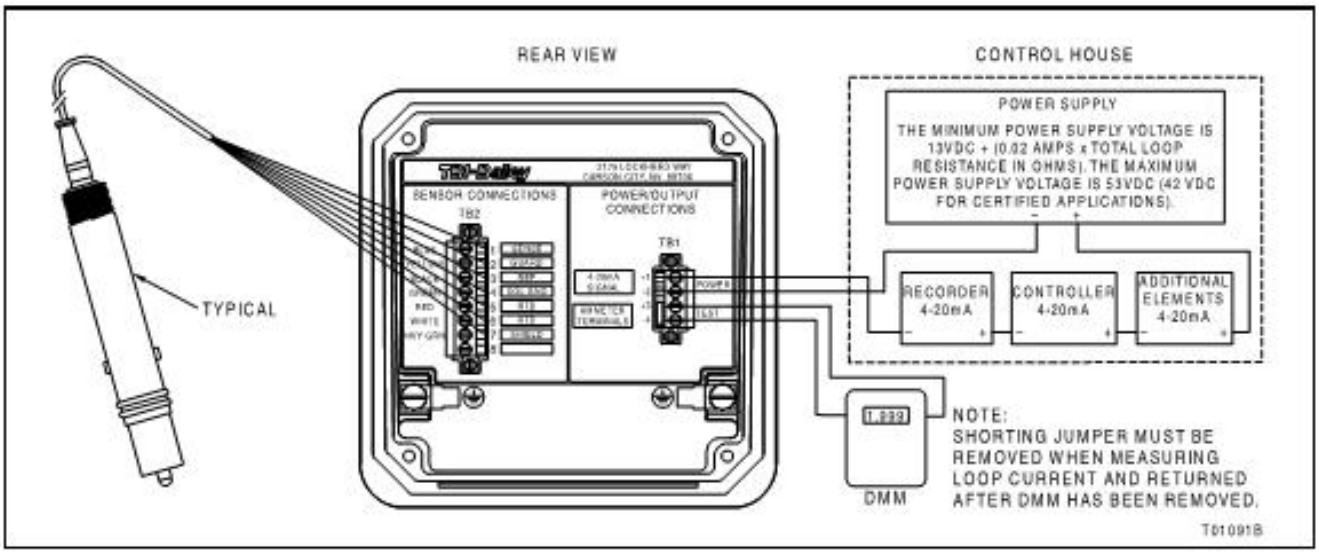


Figure 1. Location of shorting jumper.

Procedure

Step	Visual Sensor Inspection (If Suspected of Error)
1	Remove the sensor from the process.
2	Inspect the sensor body for cracks and distortions. If cracks or distortions exist, contact the manufacturer (ABB) for alternative sensor styles and materials.
3	
4	Inspect the sensor cable for cracks, cuts or shorts.
5	Inspect the junction box or extension cable for moisture, oil, corrosion or particulates. Even slight amounts of these contaminants can short sensor signals due to their high impedance.
6	Locate the BNC connector. check to see that it is dry and not shorting against any metal, earth grounds or conduit.
7	Remove the electrode from the process.
8	Inspect the glass measuring electrode for breaks or cracks. If breaks or cracks exist, contact ABB for alternative electrode choices or suggestions regarding alternate sensor mounting locations.
9	If no breaks or cracks exist, use a tissue to dry the measuring electrode. Hold the sensor up to a bright light to look for scaling. Scaling appears as a whitish, textured material on the surface of the measuring electrode. Films usually have a streaky, multicolored appearance. If scales or film exists, clean the sensor using the procedures presented below.
10	Inspect the reference junction for heavy foulants or scaling. The reference junction is the area between the measuring electrode and the sensor body. If heavy fouling or scaling exists, clean the sensor using the procedures presented below..
11	The solution ground on Type TBX5 sensors is the metallic collar around the measuring electrode. If using a Type TBX5 sensor, inspect the solution ground and sealing O-rings for attack by the process liquid. If the solution ground shows evidence of corrosion or deterioration or the O-rings appear distorted or swollen, contact ABB for alternate material choices.

Tools/Supplies

Clean Cloth	1% to 5% HCl solution
Isopropyl Alcohol or Other Appropriate Solvent	Rag, Acid Brush, or Toothbrush

Procedure

Step	Sensor Cleaning (After Inspection)
1	The sensor cleaning has three steps: the acid dip, the solvent dip, and physical cleaning. You may use one or all of these three steps to clean the sensor. The acid dip removes scaling. The solvent dip removes organic coatings. Physical cleaning removes thick scaling and accumulations.
2	Acid dip: verify that any process fluid on the sensor is not incompatible with HCl. Put on gloves, eye protection, safety shields and other protective items as needed for protection. Dip the tip of the sensor into the HCl solution until it dissolves the scale. Do not expose any of the metal on the sensor to the HCl or corrosion may occur. Rinse the sensor with water when done.
3	Solvent dip:
4	Physical cleaning: always use a soft bristle brush in order to avoid damaging the insulative coating on the solution ground (the metallic collar around the measuring electrode). This coating is very thin. Use a rag, acid brush or toothbrush to clean the sensor. Observe caution in cleaning the glass pH electrode to prevent glass breakage.

Tools/Supplies

Temperature Measuring Device	Low and High pH Buffer Solutions

Procedure

Step	pH Sensor Calibration
1	Prepare the buffer solutions or standards.
2	Remove the sensor from the process piping if required.
3	Press the NEXT smart key until CALIBRATE is highlighted on the display.
4	Press the SELECT smart key to enter the calibrate state.
5	Press the NEXT smart key until 2PT.CAL appears on the display.
6	Press the SELECT smart key to start the two-point calibration procedure.
7	The transmitter displays the current temperature in degrees Celsius and TMP°C. Use the temperature measuring device to measure the temperature of the buffer or standard and enter that number into the transmitter.
8	The transmitter asks for the LO VAL. Enter the value of the low buffer or standard.
9	Place the sensor in the low buffer or standard solution

10	Stir the solution with the sensor in a slow, circular motion.
11	The transmitter displays STABL?. Observe the displayed reading. If it is stable, press the YES smart key. If it is not stable, press the NO smart key. If NO is selected, the transmitter returns to the process sensor calibration state. Perform Steps 12 through 14. If YES is selected, go to Step 15.
12	Wait until process liquid composition stabilizes.
13	Check to see if the transmitter has detected a fault condition by looking for the FAULT icon on the display. Interrogate the fault by escaping to the measure mode through the exit to MEASURE smart key and then pressing the FAULT info smart key in that order.
14	The transmitter asks for the HI VAL. Enter the value of the high buffer or standard.
15	Remove the sensor from the low buffer or standard solution.
16	Rinse the sensor.
17	Place the sensor in the high buffer or standard solution.
18	Stir the solution with the sensor in a slow, circular motion.
19	The transmitter displays STABL?. Observe the displayed reading. If it is stable, press the YES smart key. If it is not stable, press the NO smart key. If NO is selected, the transmitter returns to the process sensor calibration state. Perform Steps 21 through 23. If YES is selected, go to Step 24.
20	Wait until process liquid composition stabilizes.
21	Check to see if the transmitter has detected a fault condition by looking for the FAULT icon on the display. Interrogate the fault by escaping to the measure mode through the exit to MEASURE smart key and then pressing the FAULT info smart key in that order.
22	If the entered calibration value is not valid, the transmitter displays BAD.CAL, and the calibration value is rejected. If the entered calibration value is valid, the slope (sensor efficiency) appears on the display. Press the NEXT smart key to display the offset.
23	Press the NEXT smart key to return to the process sensor calibrate state or press the exit to MEASURE smart key to go to the measure mode.

5.0 DISCHARGE PUMP OPERATION AND MAINTENANCE

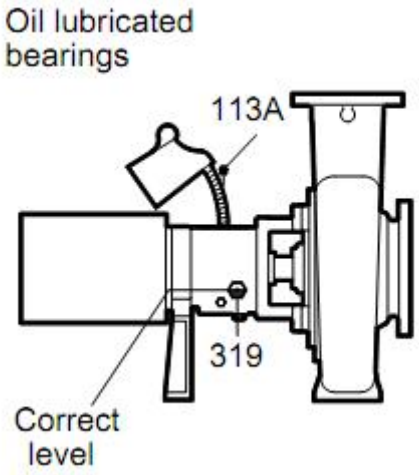
Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Normal Operation
1	The discharge pumps will start when the tank liquid level is above its set value, which can be changed on the PLC. Simply enter a different level in the box next to the pH adjust tank and press enter.
2	The effluent pumps are in duty/standby mode. When the PLC reads “A Mode,” only pump A will operate. Switch to B mode when pump A needs to rest. This should be done bimonthly or during individual pump maintenance.
3	The pumps will shut off when the water level in the pH adjust tank reaches the “low” level. This setting is found under alarm settings 1 on the PLC.
4	Ensure seal water is on when pump is running. Seal water line can be seen on wall behind effluent pumps and should have pressure on the gauge when water is flowing to pump seal.

Procedure

Step	Changing Oil
1	The bearing oil should be replaced every 2000 operating hours or every 3 months. Lock out the pump by closing influent and effluent ball valves and turning the circuit breaker in the MCC room to “OFF.” Place a lockout/tagout padlock on the breaker.
2	Remove the fill plug located on top of the bearing casing,
3	 Fill the bearing frame with oil through the filler connection, which is located on top of the bearing frame. Fill the bearing frame with oil until the oil level reaches the middle of the sight glass (319).
3	Replace the fill plug.

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OPERATION PROCEDURE P-430
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
CARTRIDGE FILTERS
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the cartridge filters in the B&L Woodwaste groundwater treatment system. The cartridge filters are used to separate additional sludge material from the wastewater before the final arsenic adsorption column step.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Normal Operation	3
3.0	Operation and Maintenance	3

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Low** Make sure to discharge pressure (pressure relief valves located on top of filters) before performing maintenance on the cartridge filters. Wear appropriate PPE as the filters will contain groundwater contaminants. Due to this risk and the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 NORMAL OPERATION

Critical Information	The metal housing of each of the two filter vessels contains six filter elements which should be replaced once a pressure differential of 20-30psi is reached. Water will flow through one filter vessel at a time – the filters are intended to be run in duty/standby configuration with one vessel valved out and the other in operation.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Normal Operation
1	Open influent and effluent butterfly valves completely for operational cartridge filter unit. Close valves for standby unit.
2	Check unit for leaks while running water through it. Screws should be tight enough to ensure seal.

3	Check pressure differential when inspecting operational filter unit. Note if differential reaches 20-30psi range. If so, the flow of wastewater must be switched to another filter unit and the old filter elements need to be replaced and disposed of.

3.0 OPERATION AND MAINTENANCE

Critical Information

The cartridge filters must be removed and replaced once the pressure differential reaches 20-30psi.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Replacing Filters
1	Close butterfly valves for influent and effluent to stop flow to filter housing. Water may be routed through other filter if pressure differential does not exceed 20psi across it.
2	Release pressure in the filter housing by releasing the metal hand valve on the top of the housing and allowing the vessel to discharge air and high velocity water. Water will drain into the secondary containment sump.
3	Unscrew the three oval screws on top of the filter cartridge housing. Be cautious, as pressurized water could spray out of vessel. Always open the screw facing away from you first to prevent discharge onto body.
4	Place six spring/cup devices in a secure place to ensure they don't get lost. If filter lid gasket is damaged, replace with new gasket.
5	Remove and dispose of six old filter elements, replace with six new filter elements.
6	Replace six spring/cup devices on top of filter elements.
7	Tighten the three oval screws on top of the filter cartridge housing. Screws must be fully wrench-tight to ensure closure of the unit.
8	Open influent butterfly valve, then effluent butterfly valve for the active filter.

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OPERATION PROCEDURE P-440
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
ADSORPTION COLUMNS AND EFFLUENT PH METER
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the adsorption columns in the groundwater treatment system at the B&L Woodwaste Site.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Normal Operation	2
3.0	Media Changeout	3
4.0	pH Meter Operation and Maintenance	3

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Low** Make sure there is no pressure across columns when opening up for media change. Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 NORMAL OPERATION

Critical Information	The adsorption columns contain an alumina-based media which is the last "polishing" filter for arsenic. The adsorption columns must be valved the correct way for correct operations.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Normal Operation
1	Before treatment plant startup, check that the valve path will create a lead and lag column (columns are in series, not parallel). Check each valve since they can "stick" and are then not actually 100% closed nor open. The tags labeled "open" and "closed" on the gate valves will create the correct lead/lag setup with column B acting as lead and column A acting as lag.
2	The differential pressure indicators should read (nominally) 0 when there is no flow. The PLC will monitor differential pressure level during operation.

3.0 MEDIA CHANGEOUT

Critical Information

Media changeout is necessary when arsenic begins to pass through the adsorption columns. Arsenic testing should catch this before arsenic concentrations exceed the NPDES permit limit, and is expected to be required approximately annually. Siemens will normally do the media changeout, using a vacuum truck to remove the spent media and replace it with new media.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Media Changeout
1	Confirm that there is a clear path from the rollup door to the media vessels, and surrounding the vessels, to allow for Siemens vacuum truck hose access.
2	Siemens will remove spent media and replace it with new media.
3	Confirm that media has been replaced and wetted appropriately, and that any required backwashing has been performed by Siemens.

4.0 EFFLUENT pH METER OPERATION AND MAINTENANCE

Critical Information

The pH/ORP transmitter will measure pH after the adsorption columns to act as the compliance monitoring point. The sensor must be maintained properly to correctly monitor the pH and comply with the NPDES permit.

The retractable insertion-type sensor is installed through a ball valve to enable calibration and maintenance while the process is operational. As the pipe is under pressure during operation, it is very important that when removing the sensor, the proper procedures be followed such that the ball valve is closed before the sensor is fully removed and unscrewed.

Tools/Supplies

Crescent Wrenches	pH Buffer Solutions (pH 4 and 7), approximately a 1” level in individual beakers

Kimwipes	

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedures

The following is an excerpt from the equipment O&M manual, including maintenance, sensor removal from the process, sensor cleaning and calibration. The manual is present in the GWTP office. Refer to that manual for more information.

4.1 Maintenance. The Model 385+ Sensor is a disposal type sensor and therefore requires only periodic cleaning and calibration. If the sensor has failed, it should be discarded and replaced.

4.2 Sensor Removal. Please refer to the appropriate paragraph for instructions regarding removal of the sensor for periodic maintenance.

1. Be certain system pressure at the sensor is below 64 psig (442 kPa) before proceeding with the retraction.

2. Push in on the sensor using the top of the J-box and slowly loosen the hex nut (B) of the process end male connector (A).

3. When the hex nut is loose enough, slowly ease the sensor back completely until the retraction stop collar is reached.

4. Close the ball valve slowly. If there is resistance, the valve may be hitting the sensor. Double check that the sensor has been retracted to the retraction stop collar.

5. The Male Connector Body (A) may now be completely unthreaded from the reducing coupling and the sensor removed for servicing.

4.3 pH Electrode Cleaning. If the electrode is coated or dirty, it may be cleaned as follows:

1. Remove the sensor from process as instructed in Section 4.2.

2. Wipe the glass bulb with a soft, clean, lint free cloth or tissue. If this does not remove the dirt or coating, proceed to step 3. If the sensor appears to be clean, go to step 5.

3. Wash the glass bulb in a strong detergent solution and thoroughly rinse with tap water. If the bulb still appears to have a coating, proceed to step 4.

4. Following the caution above, wash the glass bulb in dilute 5% hydrochloric acid solution and then rinse it thoroughly in tap water. Replace the sensor if it cannot be cleaned. If the glass bulb appears clean, proceed to step 5.

5. Buffer calibrate the sensor. If the sensor appears to respond sluggishly to pH change, soaking it overnight in a weak acid solution (5% hydrochloric acid) may improve its response. Be sure to rinse the sensor's tip thoroughly with tap water. If the sensor will not calibrate, it must be replaced.

4.4 Platinum Electrode Cleaning. Remove any film or dirt by wiping the electrodes platinum band with a clean, lint free, cloth. If needed, a strong detergent should be used to remove any remaining dirt or film. Platinum electrodes can become poisoned by cyanide or sulfide compounds. However, processes involving these compounds (such as cyanide destruction) will destroy all the cyanides or sulfides before they can react with the platinum. Should poisoning occur, the electrode can be restored to normal operation by polishing the platinum (metallic) surface with moistened baking soda (after a strong detergent wash to remove any film on the platinum surface).

4.5 pH CALIBRATION

4.5.1 DESCRIPTION

New sensors must be calibrated before use. Regular recalibration is also necessary. Use auto calibration instead of manual calibration. Auto calibration avoids common pitfalls and reduces errors. The analyzer recognizes the buffers and uses temperature-corrected pH values in the calibration. Once the Model 1056 successfully completes the calibration, it calculates and displays the calibration slope and offset. The slope is reported as the slope at 25°C.

THIS SECTION DESCRIBES HOW TO CALIBRATE THE MODEL 1056 WITH A pH SENSOR. THE FOLLOWING CALIBRATION ROUTINES ARE COVERED.

Measure Sec. Menu function: default Description

pH Auto Calibration - pH 2 point buffer calibration with auto buffer recognition

Manual Calibration - pH 2 point buffer calibration with manual buffer value entry

Entering A Known Slope Value - pH Slope calibration with manual entry of known slope value

Standardization - pH 1 point buffer calibration with manual buffer value entry

A detailed flow diagram is provided at the end of this section to guide you through the calibration routines.

pH Calibration Routines

To calibrate pH:

1. Press the **MENU** button

2. Select Calibrate. Press **ENTER**.

3. Select **Sensor 1** or **Sensor 2** corresponding to pH. Press ENTER.

4. Select **pH**. Press ENTER.

The following screen will appear. To calibrate pH or temperature scroll to the desired item and press ENTER.

S1: 1.234µS/cm 25.0oC

S2: 12.34pH 25.0oC

S*N* Calibrate?

pH

Temperature

4.5.2 AUTO CALIBRATION — pH

This screen appears after selecting **pH calibration**. Note that pH auto calibration criteria can be changed.

The following criteria can be adjusted:

- Stabilization time (default 10 sec.)
- Stabilization pH value (default 0.02 pH)
- Type of Buffer used for AUTO CALIBRATION (default is Standard, non-commercial buffers).

The following commercial buffer tables are recognized by the analyzer:

- ☐ Standard (NIST plus pH7)
- ☐ DIN 19267
- ☐ Ingold
- ☐ Merck

The following screen will appear to allow adjustment of these criteria:

S1: 1.234µS/cm 25.0oC

S2: 12.34pH 25.0oC

S*N* pH Cal

Buffer Cal

Standardize

Slope: 59.16mV/pH

Offset: 600 mV

S1: 1.234µS/cm 25.0oC

S2: 12.34pH 25.0oC

S*N* Setup

Stable Time: 10 sec

Stable Delta: 0.02 pH

Buffer: Standard

The following sub-sections show the initial display screen that appears for each calibration routine. Use the **flow diagram for pH calibration** and the live screen prompts to complete calibration.

MODEL 1056 CALIBRATION

The following screen will appear if the auto cal is successful. The screen will return to the pH Buffer Cal Menu.

S1: 1.234µS/cm 25.0oC

S2: 12.34pH 25.0oC

S*N* pH Auto Cal

Slope: 59.16 mV/pH

Offset: 60 mV

A High/Low Slope Error will generate this screen display:

S1: 1.234µS/cm 25.0oC

S2: 12.34pH 25.0oC

S*N* pH Auto Cal

High(/Low) Slope Error

Calculated: 62.11 mV/pH

Max: 62.00 mV/pH

Press EXIT

An Offset Error will generate this screen display:

S1: 1.234µS/cm 25.0oC

S2: 12.34pH 25.0oC

S*N* pH Auto Cal

Offset Error

Calculated: 61.22mV

Max: 60.00mV

Press EXIT

4.5.3 MANUAL CALIBRATION — pH

New sensors must be calibrated before use. Regular recalibration is also necessary. Use manual calibration if non-standard buffers are being used; otherwise, use auto calibration. Auto calibration avoids common pitfalls and reduces errors.

This screen appears after selecting Manual pH calibration.

S1: 1.234µS/cm 25.0oC

S2: 12.34pH 25.0oC

S*N* pH Manual Cal

Buffer 1

Buffer 2

4.5.4 STANDARDIZATION — pH

The pH measured by the Model 1056 analyzer can be changed to match the reading from a second or referee instrument. The process of making the two readings agree is called standardization. During standardization, the difference between the two pH values is converted to the equivalent voltage. The voltage, called the reference offset, is added to all subsequent measured cell voltages before they are converted to pH. If a standardized sensor is placed in a buffer solution, the measured pH will differ from the buffer pH by an amount equivalent to the standardization offset.

S1: 1.234µS/cm 25.0oC

S2: 12.34pH 25.0oC

S*N* Enter Value

07.00pH

4.5.5 ENTERING A KNOWN SLOPE VALUE — pH

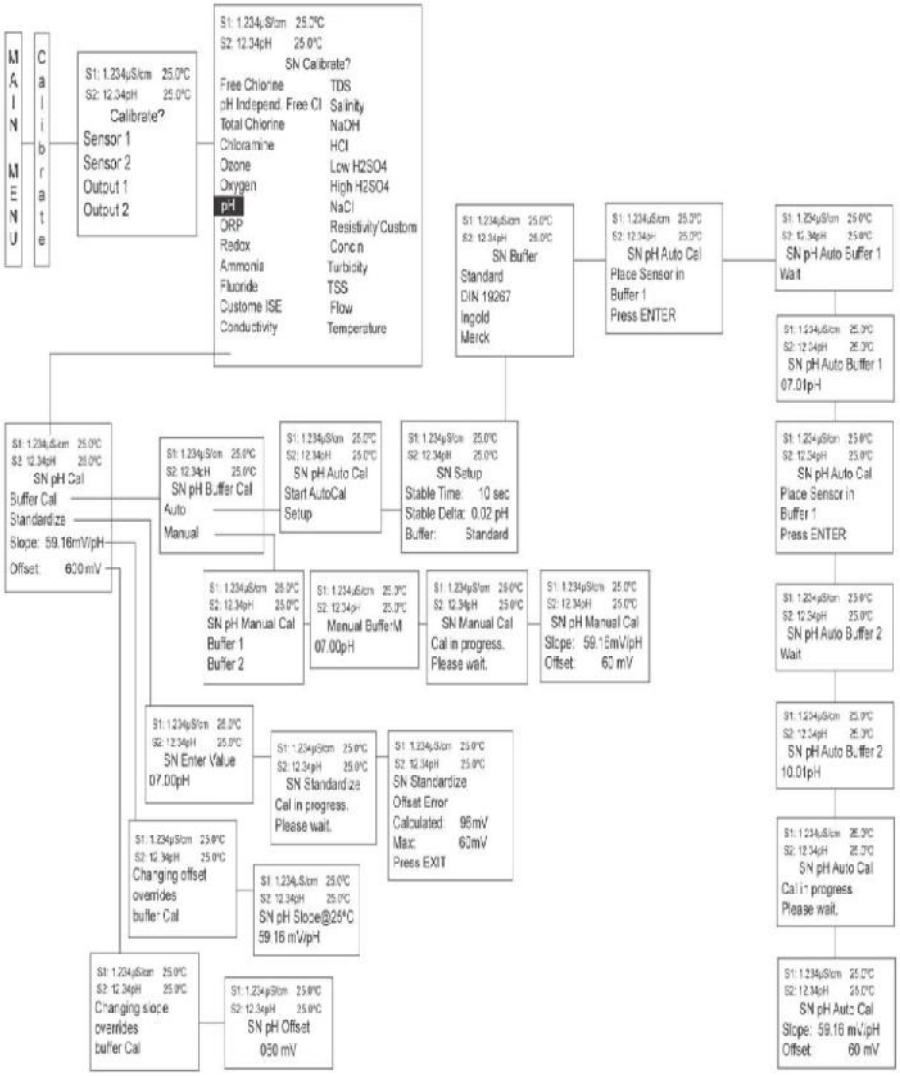
If the electrode slope is known from other measurements, it can be entered directly in the Model 1056 analyzer. The slope must be entered as the slope at 25°C.

S1: 1.234µS/cm 25.0oC

S2: 12.34pH 25.0oC

S*N* pH Slope@25oC

59.16 mV/pH



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OPERATION PROCEDURE P-910
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
AIR COMPRESSOR
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the air compressor in the B&L Woodwaste groundwater treatment system. The air compressor is used to supply air for the air operated diaphragm pumps, including the clarifier underflow pump and the filter press feed pump. In addition, the filter press itself uses air for several of its operational modes.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Normal Startup and Shutdown	2
3.0	Startup and Shutdown After Power Failure	3
4.0	Operation and Maintenance	4

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Medium** Use caution when performing maintenance on the air compressor unit. Utilize proper lockout/tagout procedures and ensure that there is no mechanical movement of the compressor during maintenance and troubleshooting. Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 NORMAL STARTUP AND SHUTDOWN

Critical Information	Procedure for normal startup and shutdown of the Kaeser SK air compressor.

Personal Protective Equipment

Safety Glasses	Hard Hat
Steel-Toed Boots	

Procedure

Step	Normal Startup
1	Ensure that no personnel are working on the machine and that all access doors and panels are closed and secure.
2	Switch on the power supply disconnecting device. After the controller has performed a self-test, the green *POWER ON* LED lights continuously.

3	Press the «ON» key. The green Machine ON LED lights continuously. NOTE: If a power failure occurs, the machine is not prevented from automatic re-starting. It can start automatically again as soon as power is restored.

Procedure

Step	Normal Shutdown
1	Press the «OFF» key. If the machine is running, there will be a rundown time of approximately 15 seconds after pressing the OFF key. If the machine is already in IDLE mode, it will shut off immediately after pressing the OFF key. The machine can be started again as soon as the Machine ON LED is extinguished.
2	Switch off and lock out the power supply disconnecting device. The machine is switched off and isolated from the power supply. The Controller Power LED extinguishes.
3	NOTE: To shut down the compressor immediately in the event of an emergency, press the red EMERGENCY STOP button. The button stays locked and prevents the machine from restarting automatically.

3.0 STARTUP AFTER POWER FAILURE

Critical Information

Procedure for startup of the Kaeser SK air compressor after power failure.

Personal Protective Equipment

Safety Glasses	Nitrile Gloves
Hearing Protection (only for annual relief valve testing)	Hard Hat

Procedure

Step	Normal Startup
1	The machine will restart on its own as soon as power is restored to the system.

2	CAUTION: Do not work on air compressor parts during a power outage without first locking out the machine at the power source (breaker in MCC).

4.0 PREVENTATIVE MAINTENANCE

Critical Information

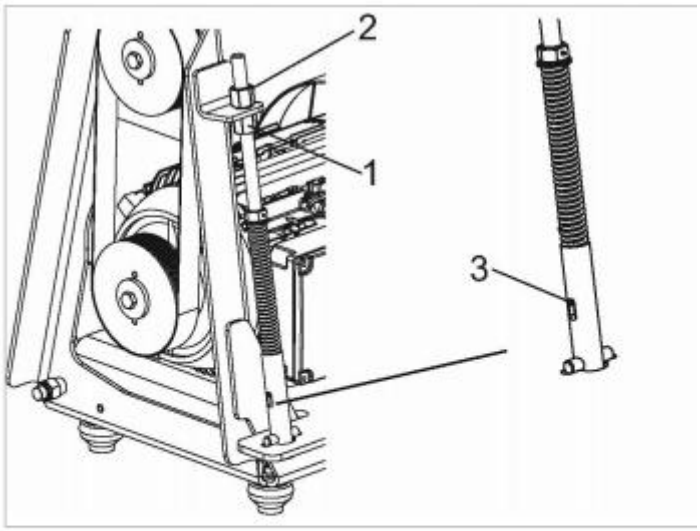
Preventative maintenance for the Kaeser SK air compressor.

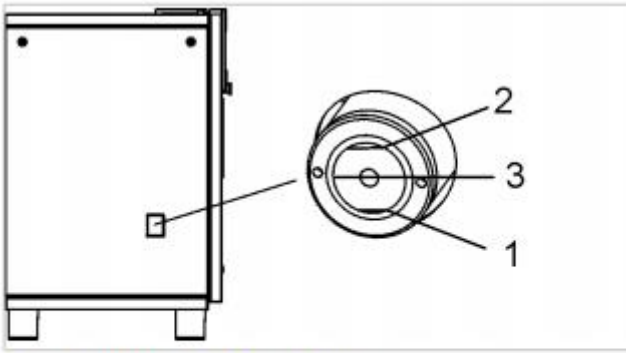
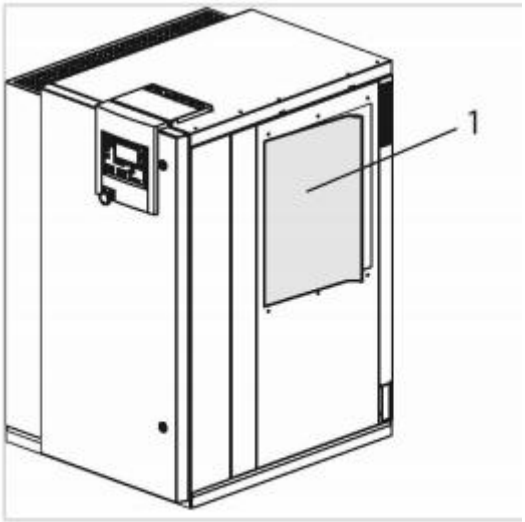
Tools & Equipment

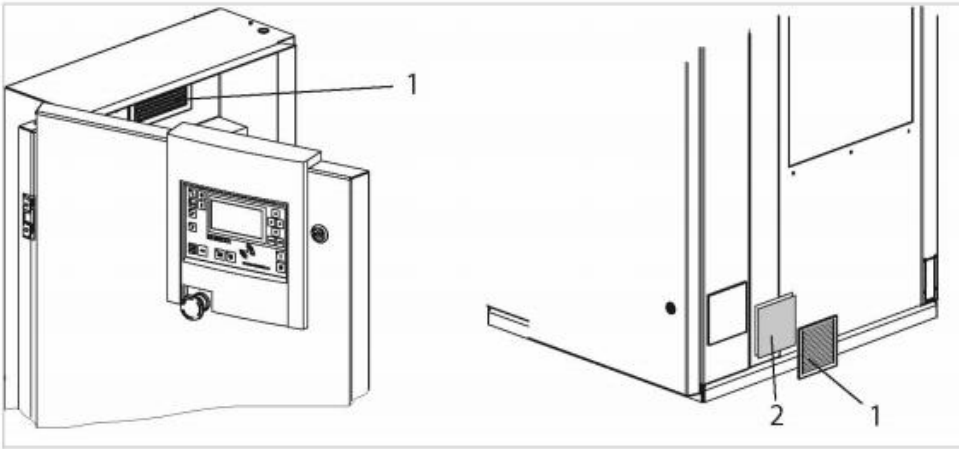
Lukewarm Water	Household Laundry Detergent
Crescent Wrench	Multimeter
Lockout Padlock	

Procedure

Step	Weekly Maintenance
1	The following maintenance activities should be performed on a weekly basis.
2	Check the belt tension as shown in step 3.

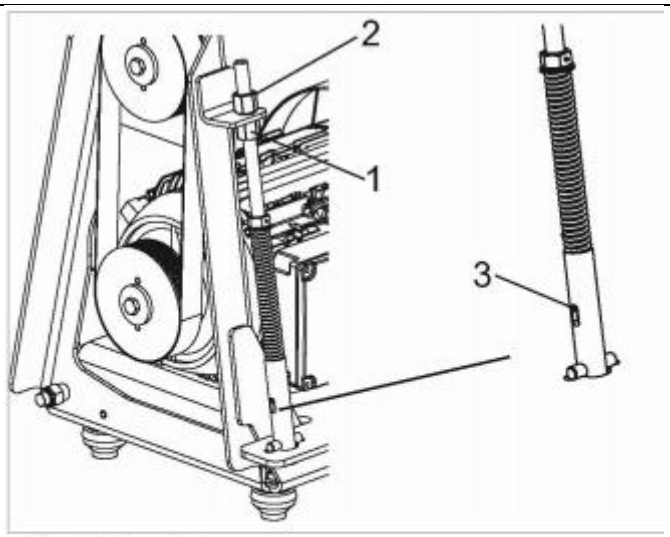
3	 Drive belt maintenance [1] Clamping nut [2] Clamping nut [3] Marker pin (shown as: belt tensioning required) The tensioning device uses spring force to apply correct tension to the belt. Adjust the tension when the marker pin reaches the top end of the elongated hole. The marker pin can be seen through a viewing window from outside. This means that belt tension can be checked without opening the machine.
4	If adjustments are necessary, follow the following procedure.
5	Loosen the locking nut 2.
6	Use the adjusting nut 1 to adjust the spring tension until the marker pin reaches the lower end of the elongated hole.
7	Tighten the locking nut 2.

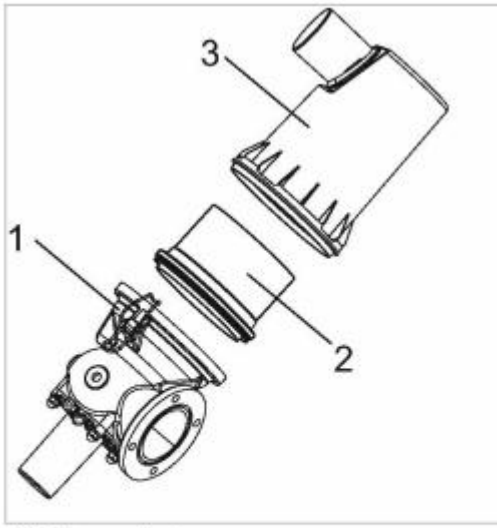
8	The cooling oil level should also be checked on a weekly basis. Make sure the machine has been running for at least five minutes and check the level:  Checking the cooling oil level [1] Minimum oil level [2] Maximum oil level [3] Optimum oil level
9	Turn the machine off and check the filter mat in the cooler:  Filter mat for the air and oil cooler [1] Filter mat
10	Carefully remove the filter mat from the retaining frame.
11	Beat the mat or use a vacuum cleaner to remove loose dirt. If necessary, wash with lukewarm water and household detergent.

12	Change the filter mat if cleaning is not possible or if the change interval has expired.
13	Carefully insert the filter mat in the retaining frame.
14	The filter mats in the control cabinet must also be checked on a weekly basis.
15	Shut off the air compressor (should already be off from procedure 9) and lock it out at the breaker in the MCC room. Test floating relay switches with the multimeter to see that there is no voltage left in system. Ensure that the compressor has cooled down.
16	 Switching cabinet ventilation 1 Ventilation grill 2 Filter mat
17	Carefully remove the ventilation grill and take out the filter mat.
18	Beat the mat or use a vacuum cleaner to remove loose dirt. If necessary, wash with lukewarm water and household detergent.
19	Change the filter mat if cleaning is not possible or if the change interval has expired.
20	Insert the filter mat in the frame and latch in the ventilation grill.
21	Remove lockout device and return breaker to “ON.”

Procedure

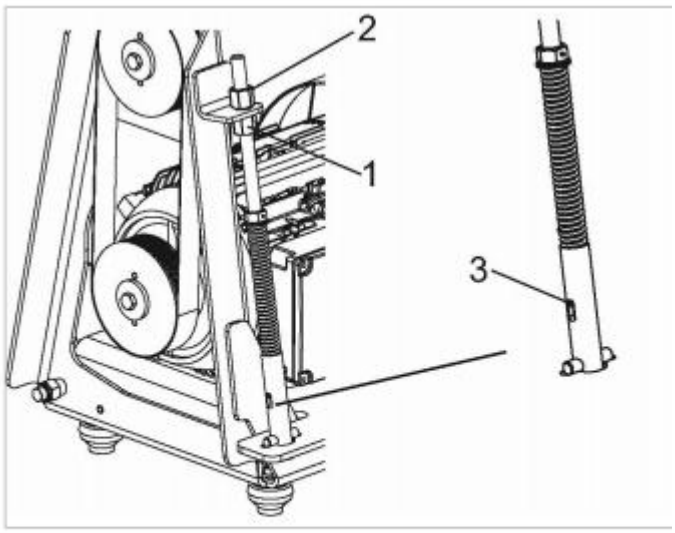
Step	1,000 Hour Maintenance

1	The following maintenance activities should be performed approximately every 1,000 hours of operating time.
2	Power off and lockout the machine at the breaker in the MCC room. Test floating relay switches with the multimeter to see that there is no voltage left in system. Ensure that the machine has cooled down. Check the drive belt.
3	 Drive belt maintenance [1] Clamping nut [2] Clamping nut [3] Marker pin (shown as: belt tensioning required)
4	Visually check the drive belt for damages. Turn the pulley by hand so that all of the belt can be inspected.
5	If damage exists, replace the drive belt (following procedure).

6	Check the air filter:  Air filter maintenance 1 Snap fastener 2 Air filter element 3 Air filter housing
7	Visually inspect the air filter. If the filter is excessively dirty and is noticeably letting dirt to ingress the pressure system, replace the filter (see procedure below).
8	Clean the cooler with a duster and vacuum.
9	Remove lockout device from system and return the breaker to the “ON” position.

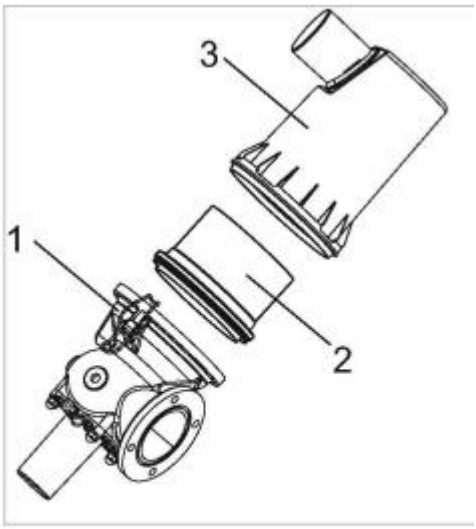
Procedure

Step	Changing the Drive Belt
1	Power off and lockout the machine at the breaker in the MCC room. Test floating relay switches with the multimeter to see that there is no voltage left in system. Ensure that the machine has cooled down. Check the drive belt.

2	 Drive belt maintenance [1] Clamping nut [2] Clamping nut [3] Marker pin (shown as: belt tensioning required)
3	Loosen the locking nut 2.
4	Turn adjusting nut 1 to loosen the tension on the belt until it can be removed from the pulley.
5	Install the new belt and use the adjusting nut 1 to adjust tension until the marker pin reaches the lower end of the elongated hole.
6	Tighten the locking nut 2.

Procedure

Step	Replace Air Filter

1	Power off and lockout the machine at the breaker in the MCC room. Test floating relay switches with the multimeter to see that there is no voltage left in system. Ensure that the machine has cooled down. Check the drive belt.
2	 Air filter maintenance 1 Snap fastener 2 Air filter element 3 Air filter housing
3	Release the spring clips and remove the element.
4	Clean all parts and sealing surfaces.
5	Insert the new element in the housing.
6	Clip the air filter housing onto the inlet valve

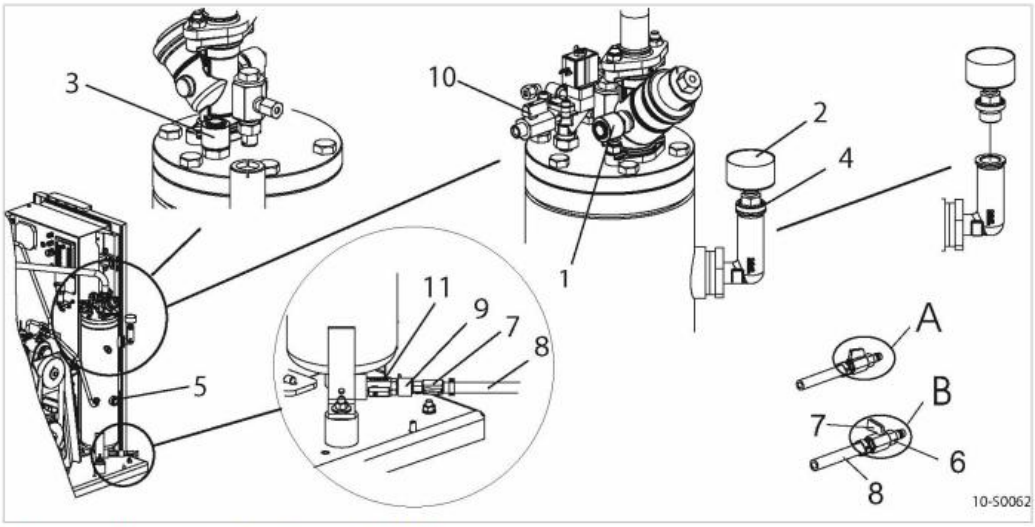
Procedure

Step	Annual Maintenance
1	The following maintenance actions should be performed on an annual basis.
2	Before proceeding with maintenance, turn off machine.
3	Visually check that all electrical connections are tight.

4	The safety pressure release valve must be tested.
5	Close the user's shut-off valve between the machine and the air distribution network.
6	Read off the activating pressure on the valve. (the activating pressure is usually to be found at the end of the part identification)
7	Scroll to parameter 3 "Pressure relief valve check mode" with the arrow keys and confirm by depressing the «Enter» key for at least three seconds.
8	Enter the password ""BASIC" and confirm with the «Enter» key.
9	Use the arrow keys to select parameter "on" and confirm.
10	The machine starts in IDLE as soon as it is switched on. As long as the «ON» key is depressed and held, the machine will run in LOAD operating mode and pressure builds up in the oil separator tank. As soon as the «ON» key is released, the machine switches back to IDLE and switches automatically to STANDSTILL when the idling period has elapsed.
11	The safety relief valve may blow off at any time! Excessive noise is caused when the safety relief valve blows off! There is danger of scalding from hot oil. There is danger of injury from bursting components and compressed air! • Close all access doors and replace and secure all removable panels. • Wear ear and eye protection. • Abort the test if the working pressure reaches 10 % above the blowoff pressure of the valve.
12	Press the «ON» key for short time. The machine starts in IDLE.
13	Observe the pressure indication on the SIGMA CONTROL BASIC keep the «ON» key pressed.
14	Stop the test as soon as the safety relief valve blows off or working pressure rises to 10 % above the activating pressure of the safety relief valve.
15	If necessary, vent the machine and replace the defective safety relief valve.
16	Call up the edit mode again and enter the password "BASIC".

17	Use the arrow keys to set the parameter to "off" and confirm with the enter key.
18	Open the user's shut-off valve between the machine and the air distribution network.
19	Check the cooler for leaks.

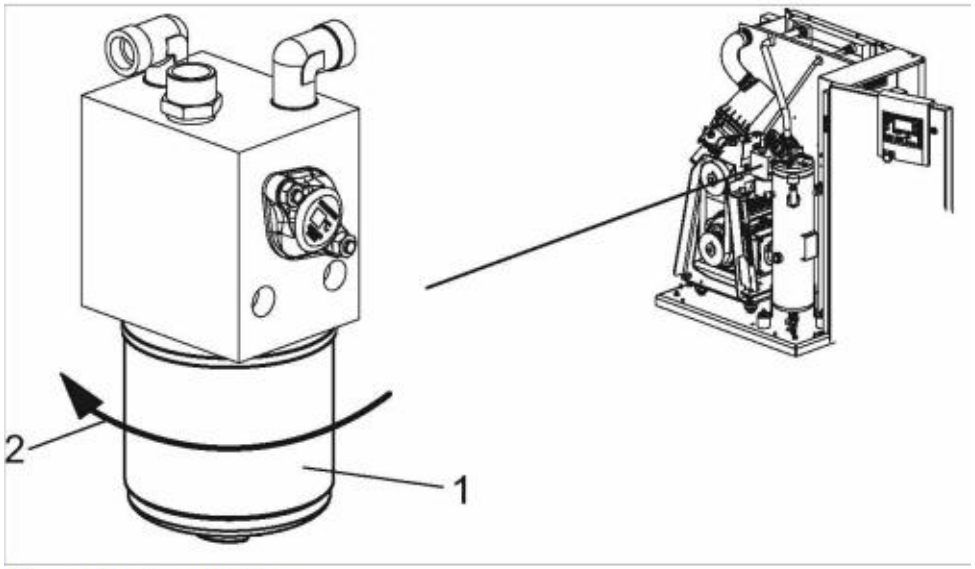
Procedure

Step	Changing Cooling Oil
1	Always change the oil filter and oil separator cartridge when changing the cooling oil (see separate procedures bellow).
2	 Changing the cooling oil, oil separator tank 1 Hose coupling (air cooler venting) 2 Pressure gauge 3 Hose coupling (oil separator tank venting) 4 Oil filler port with plug 5 Cooling oil level indicator 6 Plug-in nozzle 7 Shut-off valve A Shut-off valve open B Shut-off valve closed 8 Maintenance hose 9 Hose coupling (oil drain) 10 Shut-off valve (venting line) 11 Shut-off valve (oil drain)
2	Allow the compressor to run for at least 5 minutes under the “LOAD” setting. Ensure that the machine is fully vented and the pressure gauge on the oil separator tank reads 0psig.
3	Close the shutoff valve (10) in the venting line.

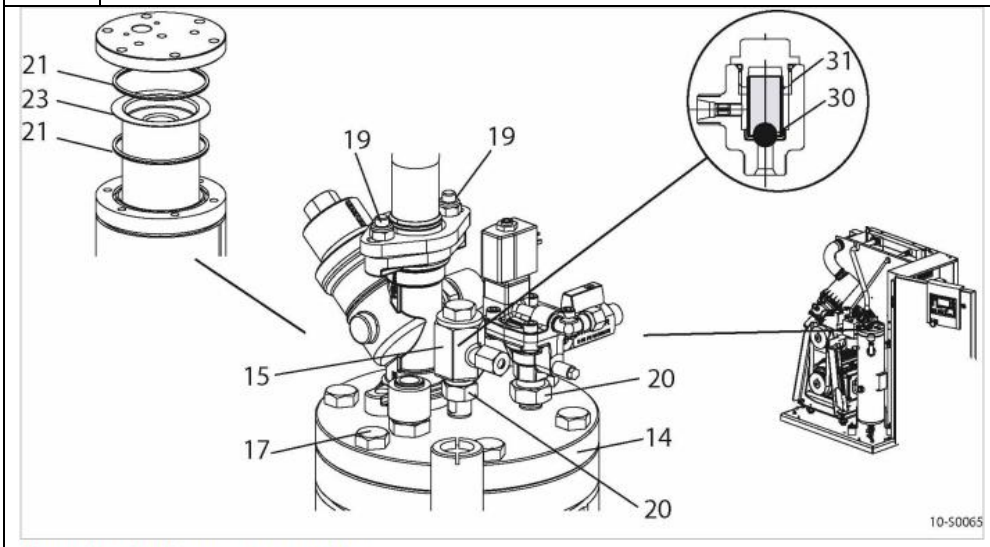
4	Start the machine and watch the oil separator pressure gauge (2) until it reads 43.5-72.5 psig.
5	Switch off the machine. Wait at least two minutes to allow the oil to flow back to the oil separator tank.
6	Lock out the device by turning off the breaker in the MCC room and locking with a LO/TO padlock.
7	Have an oil receptacle nearby.
8	With the shut-off valve closed, insert the male hose fitting (6) into the hose coupling (9) .
9	Place the other end of the maintenance hose in the oil receptacle and secure it in place.
10	Open the shut-off valve (11). Slowly open the shut-off valve (7) in the maintenance hose and allow oil and air to drain completely. Pressure gauge on the oil separator tank indicates 0 psig.
11	Close the shut-off valve (11) and unplug the male hose fitting.
12	Dispose of used oil in accordance with environmental protection regulations.
13	Slowly unscrew the filler plug (4).
14	Fill with cooling oil.
15	Check the filler plug and ring seal for damage and screw the plug back in again.

Procedure

Step	Changing the Oil Filter
1	Turn off the air compressor and lock it out by turning the breaker in the MCC room to “OFF.” Lock the breaker with a LO/TO padlock.
2	Ensure that the machine is fully vented and the pressure gauge on the oil separator tank reads 0 psig.

3	 Changing the oil filter [1] Oil filter [2] Direction to unscrew
4	Unscrew the oil filter anti-clockwise, catch oil spillage and dispose of in accordance with environmental protection regulations.
5	Lightly oil the new filter's gasket.
6	Turn the oil filter clockwise by hand to tighten.
7	Close all access doors. Replace and secure all removable panels.
8	Open the user's shut-off valve between the machine and the air distribution network.
9	Switch on the power supply and reset the maintenance interval counter.
10	After approx. 10 minutes of operation: Check the cooling oil level and top up if necessary.
11	Switch off the machine and check visually for leaks.

Step	Changing the Oil Separator Cartridge
1	Turn off the air compressor and lock it out by turning the breaker in the MCC room to “OFF.” Lock the breaker with a LO/TO padlock.
2	Ensure that the machine is fully vented and the pressure gauge on the oil separator tank reads 0 psig.



Changing the oil separator cartridge

14	Cover	20	Screw connection
15	Dirt trap	21	Gasket
16	Air pipe	23	Oil separator cartridge
17	Fixing screw	30	Ball (functioning as a check valve)
19	Self-locking nut	31	Strainer

3	Unscrew the fitting (20) and carefully put the parts to one side, then pull out the copper pipe at item 15.
4	Unscrew the nut (19) and turn the air pipe (16) to one side.
5	Remove the cover fixing screws (17) and carefully remove the cover (14).
6	Take out the old oil separator cartridge (23) together with the gaskets (21) and dispose of according to environmental protection regulations.
7	Clean all sealing faces.

8	Insert the new oil separator cartridge with gaskets and screw down the cover.
9	Replace the strainer (31) and O-ring 15 .Make sure the ball (30) is properly seated.
10	Attach the air pipe to the cover (14) with a new, self-locking nut.
11	Replace and tighten all fittings.
12	Close all access doors. Replace and secure all removable panels.
13	Open the user's shut-off valve between the machine and the air distribution network.
14	Switch on the power supply and reset the maintenance interval counter.
15	After approx. 10 minutes of operation: Check the cooling oil level and top up if necessary.
16	Switch off the machine and check visually for leaks.

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OPERATION PROCEDURE P-940
B&L WOODWASTE GROUNDWATER TREATMENT SYSTEM
SLUDGE DEWATERING SYSTEM
B&L Woodwaste Landfill
Milton, Washington

OPERATION PROCEDURES, GENERAL OVERVIEW

Introduction

This procedure outlines operational procedures for the sludge dewatering system in the B&L Woodwaste groundwater treatment system.

Pre-requisites to Do This Procedure

To do this procedure you must:

- Be fully trained for treatment system operations or be training in the area with someone who has been fully trained.
- Be fully trained for handling and management of dangerous wastes.
- Be familiar with all aspects of this operating procedure.
- Be Hazardous Waste Operations (HAZWOPER)-trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

	Description	See Page
1.0	Safety Considerations	2
2.0	Normal Sludge Transfer Operation	3
3.0	Filter Press Operation	3
4.0	Mixer operation	4
5.0	Diaphragm pump operation and maintenance	6
6.0	Instrumentation operation and maintenance	9

1.0 SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP maintained in the treatment building provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the groundwater extraction and treatment system. All workers must be familiar with and sign the HASP. Specific requirements for Personal Protective Equipment (PPE) are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Medium** The sludge dewatering system utilizes large moving machinery. Operators must be cautious and wear appropriate PPE when controlling the system. Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site.

2.0 NORMAL SLUDGE TRANSFER OPERATION

Critical Information	Sludge will be transferred from the bottom of the clarifier to either the sludge tank or the co-precipitation tank by an air diaphragm pump. The pathway of the sludge is controlled by the PLC via a solenoid valve and timer.

Tools/Supplies

Sampling Container (Beaker)	

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Sludge Transfer
1	The PLC contains time settings for the solenoid valves which control sludge transfer from the bottom of the clarifier to the co-precipitation tank and the sludge tank.
2	Set the solenoid timers on the sludge handling screen to discharge a volume equal to the sludge flowing into the clarifier. See the clarifier “Normal Operations” procedure for information on finding this volume.

3	The “BYPASS” box next to the clarifier sludge pump should be set to open one third of the total time sludge is being pumped. When the bypass valve is open, sludge will flow into the sludge tank. Otherwise, sludge will run into the co-precipitation tank. As an example, if the solenoid valve controlling the air diaphragm pump is set on a 30 second cycle (10 on, 20 off), then the sludge bypass should be set to 30 seconds and the sludge bypass off set to 60 seconds. This way, 1/3 of the total pumped sludge will travel to the sludge tank and 2/3 will go to the co-precipitation tank.
4	As described in the clarifier procedure, adjust the pumping rate from the clarifier base after testing the top and bottom effluent taps for sludge. The adjustment will be made on the PLC by increasing time when the solenoid valve carrying air to the first air diaphragm pump is open. This testing should be performed twice a month.
5	The second air diaphragm pump will only pump sludge from the sludge tank to the filter press when an auto cycle has begun.

3.0 FILTER PRESS OPERATION

Critical Information

The filter press should be run weekly (or as needed) by an onsite operator. The full cycle will take around four hours to complete, and the operator must be onsite at the finish of the auto cycle to scrape the filter cake off of the filter cloths.

Tools/Supplies

Scraper	

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Filter Press Operation
1	Push the “AUTO CYCLE START” button on the filter press to begin the sludge disposal process. The filter press must be in auto mode for the button to activate the cycle. If filter is in manual mode, simply press the “AUTO MODE” button on the main screen.

2	The filter press will close the ram and drip tray and open the necessary valves to begin sludge flow. The treatment system PLC will receive a signal and open the solenoid valve between the sludge tank and the filter press, which will start sludge flow.
3	Sludge flow will continue into the filter press until a backpressure of approximately 90 psi is reached. This may take four hours or more depending on sludge consistency.
4	After the auto cycle is completed, the drip tray will open and the filter press will depressurize.
5	Pull the pullcord to cycle through filter press plates and pull it again to stop the motion. Make sure to work from the front side of the filter press (with the light curtain). The light curtain will sense any movement near the press and stop press motion in the event that the operator attempts to touch the press when the hydraulic system or plate shifter is active.
6	Scrape the filter cake off of each plate by using the pullcord to cycle through the press. The filter cake should fall through the drip tray hole into the roll-off bin located underneath the press when scraped off using the scraper.
7	Document the sludge dewatering and note the level of waste in the roll-off bin. If the bin is near full, notify Waste Management and coordinate a changeout.

4.0 MIXER OPERATION AND MAINTENANCE

Critical Information

The PMSL PV-2 mixer must be inspected by system operators on a regular basis to detect necessary preventative maintenance. A more rigorous inspection will occur every six months.

Tools/Supplies

Wrench	Screwdrivers

Personal Protective Equipment

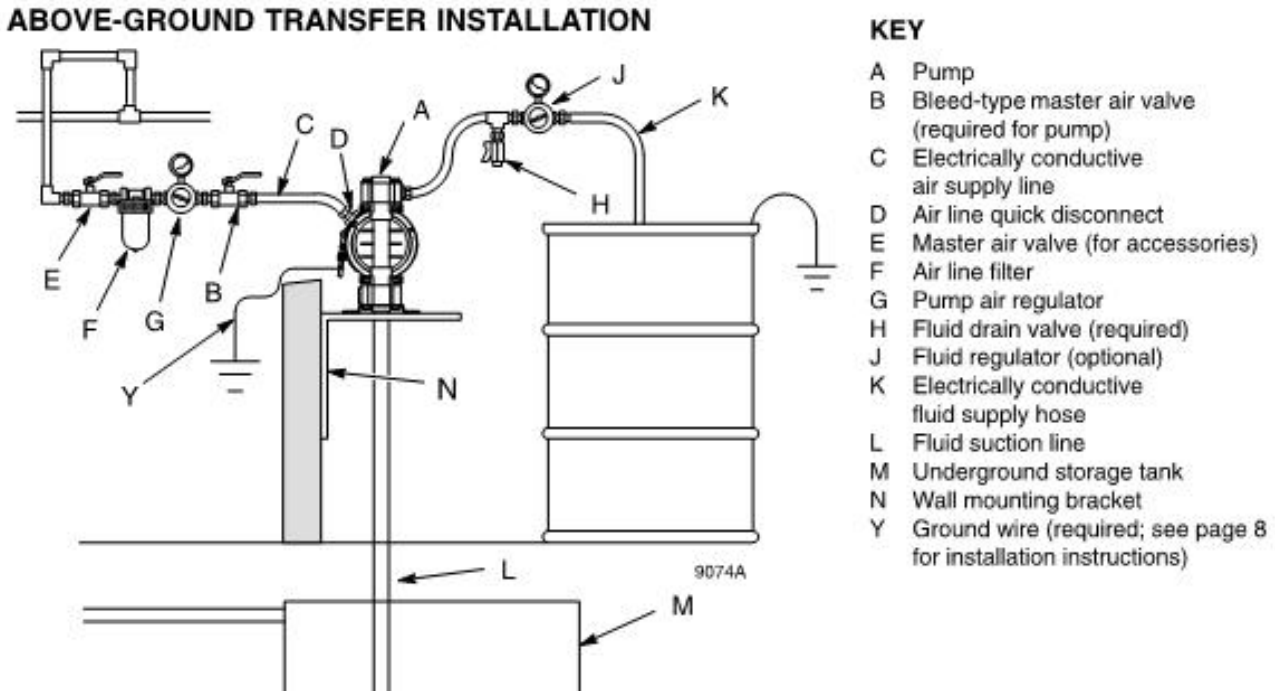
Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Mixer Operation and Maintenance

1	Inspect mixer for unusual sounds, excessive vibration, excessive heat, or grease leakage.
2	If any of these symptoms occur, the mixer must be stopped and the cause determined.
3	Every six months, inspect propeller for evidence of erosion or corrosion.
4	During the six month inspection, check hardware tightness. Re-torque the mixer hardware to original specifications. See torque value in PMSL PV-2 instruction manual (value depends on bolt size).
5	During extended shutdown, run mixer for approximately 10 minutes once a week to coat gears and bearings with grease and to prevent rust due to moisture condensation.

5.0 DIAPHRAGM PUMP OPERATION AND MAINTENANCE



Critical Information	Two Graco Husky air-powered double diaphragm pumps which move sludge from the clarifier to the sludge tank and then from the sludge tank to the filter press.

Personal Protective Equipment

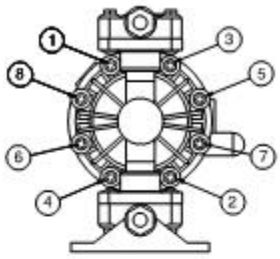
Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Diaphragm Pump Preventative Maintenance
1	The air valve is factory lubricated, so no other lubrication should be necessary. If additional lubrication is wanted, add two drops of motor oil to the air valve once every month.
2	Before each use, check all hoses for wear or damage and replace as necessary. Check to be sure all threaded connections are tight and leak-free. Check fasteners. Tighten or retorque as necessary. Although pump use varies, a general guideline is to retorque fasteners every two months. See Torque Sequence below.

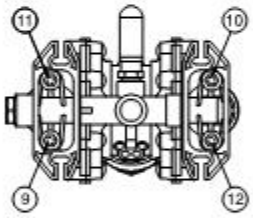
Husky 515

1. Left/Right Fluid Covers
   Torque bolts to 80–90 in–lb (9–10 N•m)



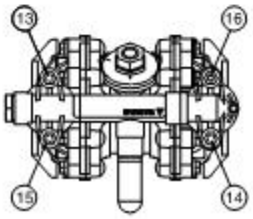
SIDE VIEW

2. Inlet Manifold
   Torque bolts to 80–90 in–lb (9–10 N•m)



BOTTOM VIEW

3. Outlet Manifold
   Torque bolts to 80–90 in–lb (9–10 N•m)



6.0 INSTRUMENTATION OPERATION AND MAINTENANCE

Critical Information

The filter press should be inspected by operators whenever onsite. The daily, weekly, monthly and annual service intervals listed below are suggested by Micronics and generally refer to a filter press that is used more often than weekly.

Personal Protective Equipment

Safety Glasses	Latex or Nitrile Gloves
Hard Hat	

Procedure

Step	Filter Press Weekly Checks
1	Hydraulic cylinders rod is clean and free from score marks and pitting.
2	Filter cloths are clean relative to the process and last wash cycle.
3	Filter cloths are not ripped, torn, or creased.
4	Plate shifter carriage tracks are clean and free from obstruction.
5	Tension of all mechanized plate shifter chains are in good order.
6	Plate shifter carriage functions in the correct manner and there is no excessive wear.
7	There are no unwanted hydraulic leaks.
8	Fluid level in the power pack is correct (look in sight window on side of HPUI reservoir).

Procedure

Step	Filter Press Monthly Checks
1	All emergency stop buttons function correctly and reset accordingly.
2	No chafed, pinched or cut electrical cables.
3	No chafed, pinched or cut flexible pipes.
4	Filter plates are undamaged.
5	Press frame is undamaged.
6	Bearings and bushings are in good condition.
7	Pressure gauges are functioning and zeroing.

Procedure

Step	Filter Press Annual Service
1	Renew hydraulic oil with the recommended lubricant (see lubrication schedule). Always renew oil filters at this time.
2	Check the performance and running conditions of the whole system. Inspect strainers, locking of relief valves, tank cover and solenoid covers etc. Check fluid temperature and pressure.

Procedure

Step	Filter Press Lubrication Schedule
1	The following tables should be kept onsite and updated as applicable (also found on pages 183-187 of the filter press instructions manual): ..\..\..\..\Phase 2 Construction\Equipment Instruction Manuals\Filter Press Lubrication Info.pdf
2	Service engineers must perform maintenance according to the lubrication schedule. Be sure to document work performed by checking the respective box and noting in the fieldbook.
3	Preferred lubricant can be found in the pdf file on page four. The locations where lubricant is necessary are on page five.

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5.0 Groundwater Treatment Plant Maintenance

5.1 MAINTENANCE PROCEDURES

See Section 4 for individual component maintenance procedures.

5.2 SPARE PARTS INVENTORY AND SUPPLIERS

The treatment system has several components which require regular maintenance supplies. See below for individual items which are anticipated to be needed on a fairly regular basis.

Filter Elements – 1 or 3 micron melt-blown polypropylene double-open-ended 30" filter elements, Parker AVS1M30 or AVS3M30.

Calhoun & Dejong, Inc
3907 N. Interstate
Portland, OR 97227
503-288-5091
Chelsea@cdisales.com

pH/ORP Probes

ABB Inc
INYIV Customer Service Center - MS 3L7
29801 Euclid Ave
Wickliffe, OH 44092-2530
1-800-435-7365

Peristaltic Pump Hoses and Parts

Fluid Process Engineering, Inc
Sammamish, WA
425-868-0899
sales@fluidprocessengineering.com

Diaphragm Pump Parts (diaphragms, check valves)

TMG Services
3216 E Portland Ave
Tacoma, WA 98404
800-562-2310
Teresa@tmgservices.net

Filter Press Spare Parts

Micronics, Inc. USA - Headquarters
200 West Road
Portsmouth, NH 03801
603-433-1299
info@micronicsinc.com

6.0 Health and Safety

Health and safety of workers and the general public are of primary importance to operation and maintenance of the GWTP. Operation and maintenance of the Site GWTP is covered by MTCA and federal laws pertaining to remediation of contaminated sites. Therefore, operation of the GWTP is subject to the hazardous waste operations health and safety requirements of 29 CFR 1910, commonly referred to as HAZWOPER. A site-specific Health and Safety Plan (HASP) has been prepared to cover operations and maintenance work to be performed at the Site, which includes the GWTP. This HASP is included as Appendix A to this O&M Plan. A copy of the HASP is kept at the GWTP office; all Site workers are required to become familiar with the HASP and to sign the plan, acknowledging that they have read it and are familiar with its requirements. As noted previously, health and safety procedures and required safety equipment have been included in the task-specific O&M procedures included in this O&M Plan. All operations personnel are trained in Site hazards, handling hazardous materials used in the process, and in the safety features associated with the GWTP process and the building.

Additional health and safety considerations have been incorporated into the facilities and control system. These considerations are as follows:

- A safety shower and eye-wash fountain is located outside the laboratory, and is maintained functional and available for emergency use.
- In the event that either the safety shower or eye-wash fountain is used, the PLC will issue an alarm to offsite personnel that the operator has activated emergency equipment.
- Emergency shutoff switches have been placed outside each man door and near the safety shower. Activation of the shut off switches causes the PLC to safely shut down the groundwater recovery wells and the GWTP and to issue an alarm to offsite personnel.
- The secondary containment system for the lime and $KMnO_4$ storage tanks includes a level sensor that will initiate an offsite alarm and a safe shutdown of the groundwater recovery system and the GWTP if liquid is detected in the containment area.
- The secondary containment system for the GWTP includes a level sensor that will initiate an offsite alarm and a safe shutdown of the groundwater recovery system and the GWTP if liquid is detected in the containment area.
- The building is equipped with smoke detectors, fire alarm, and a sprinkler system that will be activated if fire is detected. The fire alarm system also issues an alarm to the local fire department and offsite personnel.
- Local fire department officials have been notified of the hazardous materials inventory that are present in the GWTP building. The building has been classified as an H-3 building. Signage is displayed on the building and tanks identifying the hazards associated with the process chemicals.

- Manual fire extinguishers are located outside the electrical room on the mezzanine and near the two man doors.

7.0 Emergency Plans and Procedures

Emergencies can happen due to a variety of causes. None of the process chemicals are explosive. Sulfuric acid is a water reactive chemical that will react violently when in contact with water; the sulfuric acid handling and storage system is specifically designed to minimize the potential for contact with water, even in the even the acid containers fail and contents are released. Therefore, emergencies are expected to be associated with spills, releases, worker exposure to process chemicals, or other worker safety issue. Emergency response to worker exposure or worker safety is addressed in the HASP. Emergency response related to process failure or spills/releases is discussed below.

A detailed evaluation of failure events associated with the GWTP process design was completed in March 2012; the Fail Safe Design Report is included as Appendix B. This report describes how the design and control system accommodate anticipated process failures under both controlled and uncontrolled events. The Fail Safe Design Report included as Appendix B accurately describes the GWTP as constructed.

As noted above, the system is designed to contain spills or releases from storage tanks and to safely shut down the groundwater recovery system and the GWTP whenever initialed by process conditions monitored by the control system, activation of a manual emergency shutdown button, or when shutdown is initiated by remote access to the control system. As noted in Appendix B, the system will safely shut down. Three emergency shutdown buttons are readily available to workers in the building, as noted above; activation of an emergency shutdown button will initiate a safe shutdown of all groundwater recovery wells and the complete GWTP, including all chemical feed pumps.

7.1 SPILL RESPONSE COORDINATOR

The following individual has been designated as the Spill Response Coordinator accountable for Site spills:

Spill Response Coordinator

Individual: Mark Mierzejewski, P.E., Process Engineer

Phone Number: Office 206-838-8475

Mobile 425-761-6174

The following individual has been designated as the alternate Spill Response Coordinator for the Site spill response:

Alternate Spill Response Coordinator

Individual: Larry McGaughey, Ph.D., P.E., Project Manager

Phone Number: Office 206-342-1788

Mobile 206-755-1525

7.2 SPILLS AND RELEASES TO CONTAINMENT AREAS

Failure of tanks or piping within the GWTP building will be contained by the secondary containment; the automatic control system is designed to detect the spill and initiate a safe shutdown of the groundwater recovery wells and the GWTP. If a spill or release occurs that is contained within the containment area, the following procedure will be implemented:

1. Check the GWTP in accordance with the procedures for shutdown of the unit operations to confirm that the treatment equipment is in a safe shutdown mode.
2. Notify the Spill Response Coordinator of the failure or release.
3. Work with management and health and safety personnel as directed by the Spill Response Coordinator and other management personnel as appropriate to retain appropriate contractors to safely clean up the release and establish safe conditions for working on the failed equipment.
4. Assess the failed equipment to ascertain the nature and cause of the failure.
5. Initiate work to repair the failure to re-establish safe working conditions. Health and safety planning must be completed appropriate to the nature of the failure.
6. After confirmation that engineering and management personnel concur that the cause(s) of failure have been identified and addressed, return the equipment to operation and proceed with startup of the GWTP and the groundwater recovery system.
7. Prepare a report documenting the nature and cause of the failure and the actions taken to initiate repairs and prevent recurrence of the failure.

7.3 SPILLS AND RELEASES OUTSIDE CONTAINMENT AREAS

Spills and/or releases to areas outside the secondary containment facilities constitute a threat to human health and the environment. These spills must be contained and reported to appropriate authorities as soon as possible and in accordance with the procedures below. Spills of the following materials outside of the secondary containment areas will initiate emergency shutdown and response as described below:

- Untreated groundwater that may contain arsenic at concentrations exceeding the cleanup level specified in the CAP (5 µg/L).
- Concentrated sulfuric acid used in the GWTP.
- Potassium permanganate feed solution used in the GWTP.
- Lime slurry used in the GWTP.

Other process chemicals are solid (i.e., granular $KMnO_4$) or are liquids that are used in small quantities (< 20 gallons) and are of low to moderate hazard to the environment.

7.3.1 Spill Discovery And Containment

Any spills extending outside the secondary containment areas within the GWTP building and/or the lime slurry delivery pad should be readily discoverable by personnel either at the Site (e.g., during delivery of lime slurry) or traveling to the Site due to alarms issued by the automatic control system. As noted above, the automatic control system will issue an alarm to offsite personnel in the event that spills or releases are detected by the level sensors present within the secondary containment areas or if process conditions indicate a safe shutdown is warranted.

Spill containment will never take precedence over the safety of personnel. No countermeasure activities will be undertaken until conditions are safe for workers. The following general procedures should be implemented as countermeasures.

- Initiate an emergency shutdown of the GWTP using an emergency shutdown button. This will automatically notify offsite personnel of emergency conditions.
- Account for all onsite personnel and ensure they are aware of the spill and take appropriate safety precautions.
- Identify the material spilled.
- Don appropriate personal protective equipment as necessary.
- Attempt to divert flow away from or dam swales or ditches impacted by the spill.
- Attempt to seal or stop the source of the release if it can be done safely.
- Notify the Site Spill Response Coordinator as described in Section 7.3.2 for assistance in reporting, spill control and spill cleanup.

In the case of a large volume spill requiring the services of an outside contractor to contain, Site personnel will take emergency containment action and initiate additional spill response conducted by a contracted spill response service. Emergency containment action taken by Site personnel may include of placement or containment berms at the spill location or other appropriate locations around the Building to prevent discharge of spills into area ditches.

The contracted spill response service will complete the cleanup activities, pump out contained spills, and place spill cleanup materials in appropriate containers and as needed for offsite disposal. All spill cleanup materials and other wastes generated from the spill response will be evaluated against dangerous waste and solid waste regulations and be transported offsite for disposal in a properly permitted facility by an appropriately licensed waste contractor.

7.3.2 Spill Reporting

The Spill Response Coordinator should be prepared to relate relevant spill information when reporting the spill to the appropriate agencies. This information will include but not be limited to the following:

- The address or location and phone number of the facility: 1522 Fife Way East, Milton, WA, (253) 926-5841;
- The date and time of the spill;
- The type of material spilled;
- Estimates of the total quantity discharged;
- The source of the discharge;
- A description of all affected media (soil, water, etc);
- The cause of the discharge;
- Any damages or injuries caused by the discharge;
- Actions being used to stop, remove, and mitigate the effects of the discharge;
- Whether an evacuation may be needed;
- The names of other individuals and/or organizations that have been contacted regarding this spill.

In the event of a spill, personnel discovering the spill shall contact the Spill Response Coordinator or Alternate at the numbers listed below:

Spill Response Coordinator

Individual: Mark Mierzejewski, P.E., Process Engineer

Phone Number: Office 206-838-8475

Mobile 425-761-6174

The following individual has been designated as the alternate Spill Prevention Coordinator for the Site spill response:

Alternate Spill Response Coordinator

Individual: Larry McGaughey, Ph.D., P.E., Project Manager

Phone Number: Office 206-342-1788

Mobile 206-755-1525

Other names and phone numbers that may need to be contacted by the Spill Response Coordinator to report a spill are listed below:

Entity	Name	Phone Number
Fire Department/Local Emergency Planning	Fife Fire District 10	911 or 253-591-5798
Emerald Services	Licensed waste contractor	206-832-3100, 24-hour
State Emergency Response Agency	Washington State Response Center:	1-800-258-5990 or 1-800-OILS-911
County Emergency Response Agency	Pierce County Emergency Management	253-798-6595 or 911 after hours
Water Quality Control Agency	Ecology-Southwest Regional Office	360-407-6328
National Response Center Hotline	----------	1-800-424-8802

8.0 Recordkeeping

Record keeping will be conducted in accordance with the NPDES discharge permit. Electronic and/or hard copy records of all sample collection and analysis data, continuous monitoring data, calibration records, maintenance records, reports required by the Permit, and data used for the Permit application will be maintained at the GWTP Building. These records will be maintained for a minimum of three years. At the discretion of the Trust, additional copies of all records addressed in this O&M Plan may also be maintained at offsite location(s).

8.1 SAMPLE COLLECTION AND ANALYSIS DATA

The following records will be maintained regarding sample collection and analysis:

- Composite sample collection forms documenting sample start time and date, sample stop time and date, and the name of the sampler.
- Chain-of-custody forms for all samples provided to the laboratory for analysis.
- Laboratory reports.
- For any samples analyzed for pH in the GWTP laboratory, a copy of the analytical report documenting instrument calibration and sample analysis methods.

Hard copy originals of field forms (sample collection, originator chain-of-custody copy, field pH analyses) will be maintained in the GWTP Building. These forms will also be scanned and maintained in electronic files in the GWTP Building.

8.2 CONTINUOUS MONITORING DATA

As noted above in this O&M Plan, process instrumentation is monitored and recorded by the automated monitoring and control system whenever the GWTP is in operation. The control system records readings from several process instruments to allow analysis and control of process variables. Additionally, process data are recorded for Permit compliance purposes to monitor the quality of the treated water effluent.

The following process instrumentation is monitored and recorded for process control purposes:

- Influent Flow Transmitter FIT-100
- Oxidation Tank ORP Transmitter AIT-110
- Co-Precipitation Tank pH Transmitter AIT-120
- pH Adjust Tank Level Transmitter LIT-420
- pH Adjust Tank pH Transmitter AIT-420
- Cartridge Filter Differential Pressure Transmitter DPIT-430A and B
- Adsorption Column Differential Pressure Transmitter DPIT-440A and B

- Sludge Storage Tank Level Transmitter LIT-220
- $KMnO_4$ Feed Tank Level Transmitter LIT-310
- Lime Slurry Tank Level Transmitter LIT-320
- Polymer Feed Tank Level Transmitter LIT-330

Data recorded from the above instruments are automatically stored in the process control database. Data from these instruments will be copied to a database for process data and maintained as an electronic data file in the GWTP computer on a monthly basis no later than the 15th day of the month following data collection. These data will be simultaneously copied to a backup storage drive maintained at the GWTP Building. The electronic data files will be maintained for a minimum of three years.

The following process instruments are monitored and recorded to comply with the Permit:

- Effluent pH Transmitter AIT-450
- Effluent Flow Transmitter FIT-490

The data recorded from these two instruments are used to complete monthly discharge monitoring reports (DMRs). The data recorded from these two instruments will be downloaded separately from the process control data; these data will be stored as an electronic data file in the GWTP computer on a monthly basis no later than the 10th day of the month following data collection. These data will be simultaneously copied to a backup storage drive maintained at the GWTP Building and they will be used as appropriate for preparation of the monthly DMRs. A copy of the monthly DMR data will be maintained with the DMR files. The electronic and hard copy data files will be maintained for a minimum of three years.

8.3 CALIBRATION AND MAINTENANCE RECORDS

Written records will be prepared for calibration of process and laboratory instrumentation. These hard copy records will be maintained at the GWTP Building. Calibration records will also be scanned and stored electronically on the GWTP computer, a backup storage drive maintained at the GWTP. These records will be maintained for at least three years.

Written records confirming maintenance activities will be prepared and maintained at the GWTP Building. These records will document routine, preventive maintenance and also non-routine maintenance. Maintenance records will be placed in the equipment files that are maintained onsite for each piece of equipment. Maintenance records for all GWTP equipment will be maintained at the GWTP Building for a minimum of three years. If a piece of equipment is replaced with less than three years of use, equipment and maintenance files will be placed in an archive folder and kept onsite for a minimum of three years.

8.4 REPORTS

Several reports are required for compliance with the Permit. These include monthly DMRs, noncompliance reports, and the other plans and reports, as specified in Permit provisions.

Reports and plans prepared for compliance with the Permit will be maintained at the GWTP Building in hard copy and electronic format. These reports and plans will be maintained for a minimum of three years from the date the plan or report was prepared.

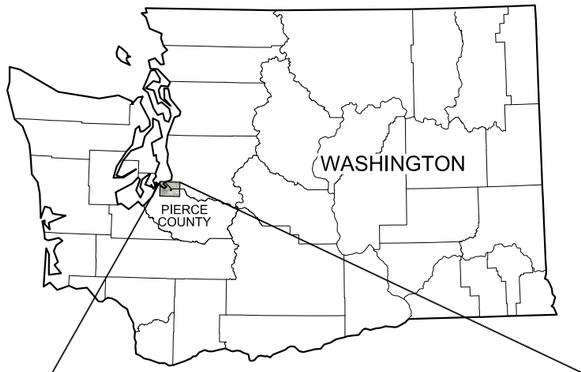
8.5 PERMIT APPLICATION DATA

A complete hard copy and electronic copy of the application for the Permit will be maintained at the GWTP Building for a minimum of three years. The application will be kept at the GWTP Building for as long as the Permit is effective. Future applications for permit renewal will also be maintained in the same manner at the GWTP Building.

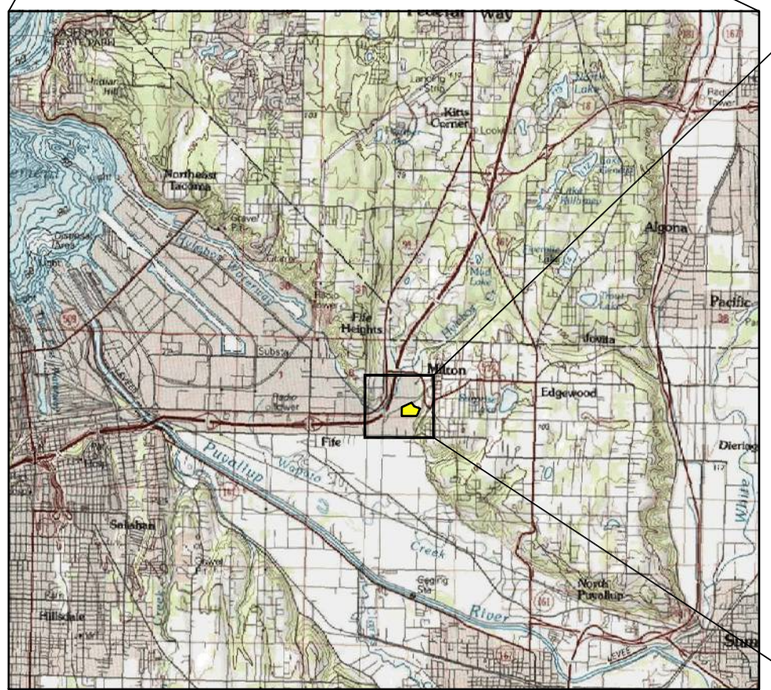
DRAWINGS

PLANS AND SPECIFICATIONS - DRAWINGS
ADDENDUM 3: PHASE 2 REMEDIATION DESIGN
GROUNDWATER RECOVERY AND TREATMENT SYSTEM

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

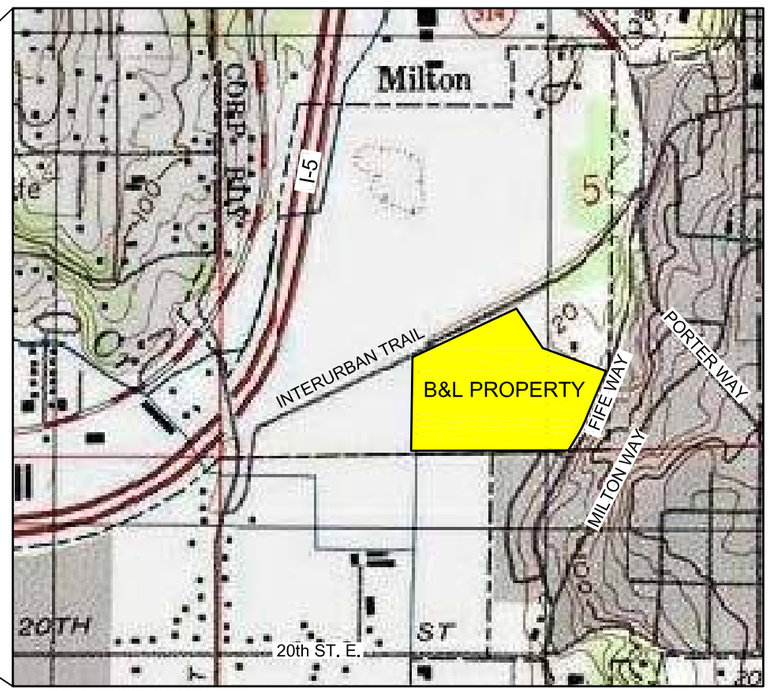


LOCATION MAP



VICINITY MAP

0 1 2
APPROXIMATE SCALE IN MILES



PROJECT SITE MAP

0 500 1000
APPROXIMATE SCALE IN FEET

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR REVIEW	MAR 24	GP
	2	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 21	GP
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET	3	ISSUED FOR TENDER	MAY 26	WJM
	4	TRANSMITTED TO CONTRACTOR	JLY 13	–

DRAWN JR
DESIGNED GP
CHECKED LDV
REVIEWED WJM

AMEC Geomatrix

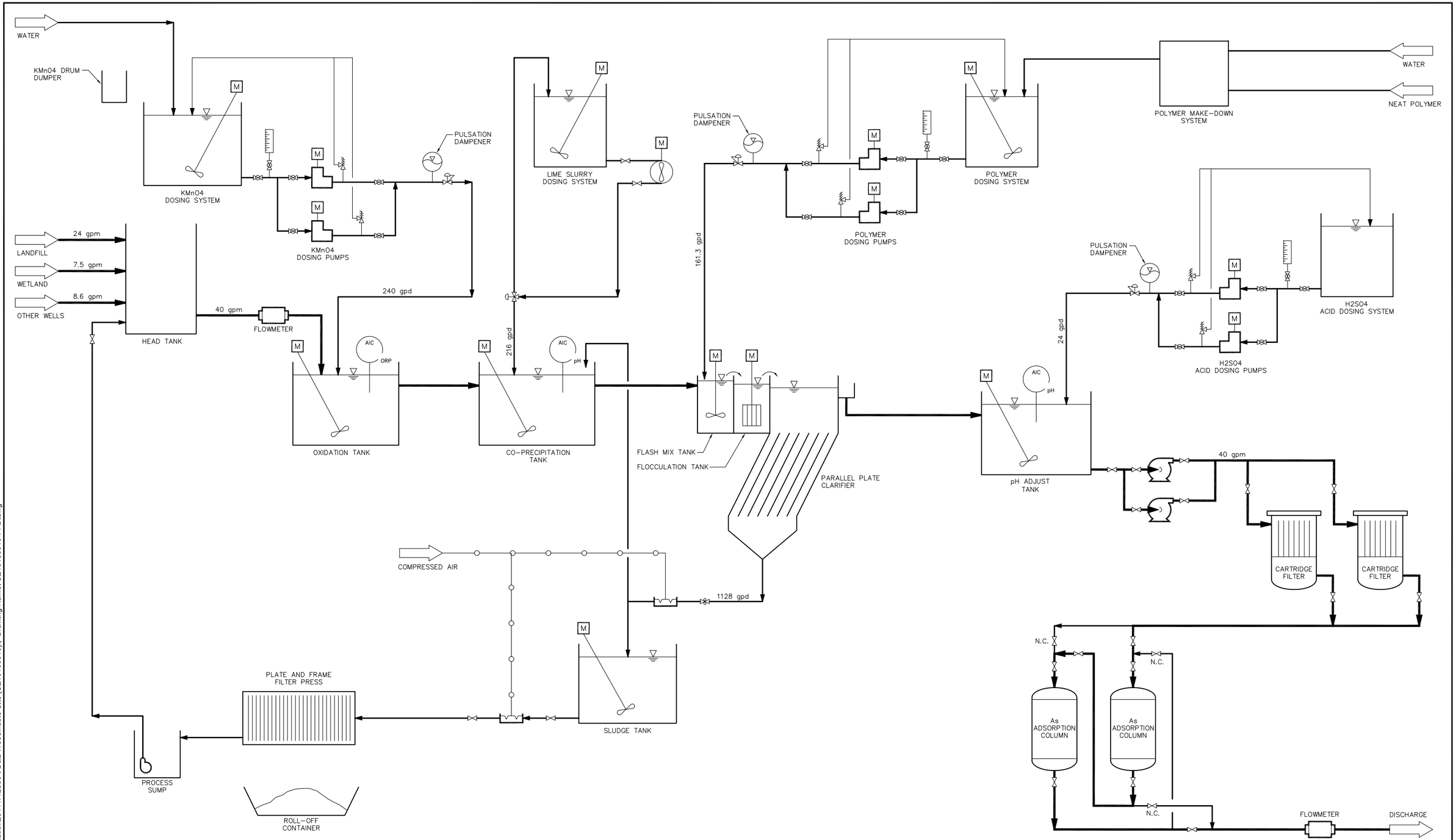
COVER SHEET
ADDENDUM 3

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/15/11
PROJECT NO.: SE10160010

DRAWING
G–01

Plot Date: 07/15/11 - 3:46pm Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-cover.dwg



Plot Date: 07/27/11 - 8:29am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-4 B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-PFD.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR REVIEW	MAR 04	GP
2	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 21	LDV
3	ISSUED FOR TENDER	MAY 26	LDV
4	ISSUED FOR CONSTRUCTION	JLY 26	LDV
5			

DRAWN PRV
DESIGNED CH
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

LARRY M. McGAUGHEY STATE OF WASHINGTON 30623 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW DIAGRAM

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/27/11
PROJECT NO.: SE10160010
DRAWING PFD-01

INSTRUMENT IDENTIFICATION

GENERAL INSTRUMENT OR FUNCTION SYMBOLS

	FIELD MOUNTED	PRIMARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR	AUXILIARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR
DISCRETE INSTRUMENTS	X / X–X–X	X / X–X–X	X / X–X–X
SHARED DISPLAY, SHARED CONTROL	X / X–X–X	X / X–X–X	X / X–X–X
COMPUTER FUNCTION	X / X–X–X	X / X–X–X	X / X–X–X
PROGRAMABLE LOGIC CONTROL	X / X–X–X	X / X–X–X	X / X–X–X

NORMALLY INACCESSIBLE OR BEHIND–THE–PANEL DEVICES OR FUNCTIONS ARE DEPICTED BY THE SAME SYMBOLS BUT WITH DASHED HORIZONTAL BARS, i.e.

X / X–X–X X / X–X–X X / X–X–X

ISA INSTRUMENTATION IDENTIFICATION LETTERS

LETTER	FIRST LETTER (S)		SUCCEEDING LETTERS		
	PROCESS OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER FLAME		USERS CHOICE	USERS CHOICE	USERS CHOICE
C	CONDUCTIVITY			CONTROL	
D	DENSITY (S.G)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGE		GLASS	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION/MOISTURE				MIDDLE
N	TURBIDITY		MIDDLE/INTERMEDIATE		
O	USERS CHOICE		ORIFICE		
P	PRESSURE (OR VACUUM)		POINT (TEST CONNECTION)		
Q	QUANTITY OR EVENT	INTEGRATE	INTEGRATE		
R			RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMITTER	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VISCOSITY			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	AS DEFINED				
Y	STATUS			RELAY OR COMPUTE	
Z	POSITION			DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

LINE LEGEND

- PROCESS (CLOSED CONDUIT, DASHED LINE INDICATES ALTERNATE FLOW STREAM)
- PROCESS (OPEN CHANNEL)
- ANALOG SIGNAL (4 TO 20 mAdc, ETC.)
- DISCRETE SIGNAL (ON/OFF, ETC.)
- COMPRESSED AIR
- PNEUMATIC SIGNAL
- FILLED SYSTEM SIGNAL
- HYDRAULIC SYSTEM SIGNAL
- SONIC SIGNAL
- PACKAGED BUILDING OR FACILITY BOUNDARY
- CONNECTING LINES
- NON–CONNECTING LINES
- HEAT TRACE

ABBREVIATIONS & LETTER SYMBOLS

AC	ALTERNATING CURRENT
CCS	CENTRAL CONTROL SYSTEM
CSC	CAR SEAL CLOSED
CSO	CAR SEAL OPEN
CP–X	CONTROL PANEL NO. X
CS	CARBON STEEL
DC	DIRECT CURRENT
DISC	DISCONNECT
ES	EMERGENCY STOP
FOS	FAST–OFF–SLOW
FOSA	FAST–OFF–SLOW–AUTO
FOSR	FAST–OFF–SLOW–REMOTE
FR	FORWARD–REVERSE
GALV	GALVANIZED STEEL
HOA	HAND–OFF–AUTO
HOR	HAND–OFF–REMOTE
LEL	LOWER EXPLOSIVE LIMIT
LCP	LOCAL CONTROL PANEL
LOS	LOCKOUT STOP
LR	LOCAL–REMOTE
MA	MANUAL–AUTO
MC	MODULATE–CLOSE
MCC	MOTOR CONTROL CENTRE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OC	OPEN–CLOSE (D)
OCR	OPEN–CLOSE–REMOTE
OCA	OPEN–CLOSE–AUTO
OO	ON–OFF
OOA	ON–OFF–AUTO
OOR	ON–OFF–REMOTE
OSC	OPEN–STOP–CLOSE
REM	REMOTE
RPU	REMOTE PROCESSING UNIT
SF	SLOWER–FASTER
SS	START–STOP
SSC	SUPERVISORY SET POINT CONTROL
VIB	VIBRATION

PUMP AND COMPRESSOR SYMBOLS

- CENTRIFUGAL PUMP
- CHEMICAL FEED PUMP
- DIAPHRAGM PUMP
- GEAR PUMP OR BLOWER (POSITIVE DISPLACEMENT)
- PISTON PUMP
- PROGRESSIVE CAVITY PUMP
- SUBMERSIBLE SUMP PUMP
- COMPRESSOR (CENTRIFUGAL) BLOWER OR TURBINE
- COMPRESSOR (PISTON)
- PERISTALTIC PUMP

MISCELLANEOUS SYMBOLS

- SIGHT GLASS
- DIAPHRAGM SEAL
- BLIND FLANGE
- AIR GAP
- VENT TO ATMOSPHERE
- RUPTURE DISK
- M — ELECTRIC MOTOR
- PRESSURE GAUGE
- AIR FILTER
- CALIBRATION COLUMN
- CAM–LOCK
- REDUCER

PRIMARY ELEMENT SYMBOLS

- ORIFICE PLATE
- FLOW TUBE
- VORTEX METER
- ELECTROMAGNETIC FLOWMETER
- PROPELLER OR TURBINE METER
- LEVEL (ULTRASONIC)
- LEVEL (FLOAT)

ACTUATOR SYMBOLS

- P Z — PNEUMATIC W/POSITIONER
- P S — PNEUMATIC W/SOLENOID
- E — ELECTRIC/MOTOR
- E Z — ELECTRIC/MOTOR W/POSITIONER
- EH — ELECTROHYDRAULIC
- H — HYDRAULIC
- P B — PNEUMATIC WITH VOLUME BOOSTER
- S — SOLENOID
- T — MANUAL

VALVE SYMBOLS

- GATE
- K — KNIFE GATE
- BUTTERFLY
- GLOBE
- BALL
- V — VEE–BALL
- SEAT PORT — ECCENTRIC PLUG
- PLUG OR COCK
- NEEDLE
- DIAPHRAGM
- PINCH
- SWING CHECK
- BALL CHECK
- HOSE VALVE OR BIBB
- PRESSURE RELIEF
- PRESSURE/VACUUM RELIEF VALVE
- AIR AND/OR VACUUM RELEASE
- ACTUATOR — MOTORIZED VALVE
- ACTUATOR — SOLENOID VALVE
- ACTUATOR — TO TEMPERATURE SENSOR — TEMPERATURE SENSING VALVE
- REGULATED SIDE — PRESSURE CONTROL

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
2	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 21	LDV
3	ISSUED FOR TENDER	MAY 26	LDV
4	ISSUED FOR CONSTRUCTION	JLY 26	LDV
5	CONTROL CHANGES	DEC 20	
6	CONTROL CHANGES (2)	JAN 10	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

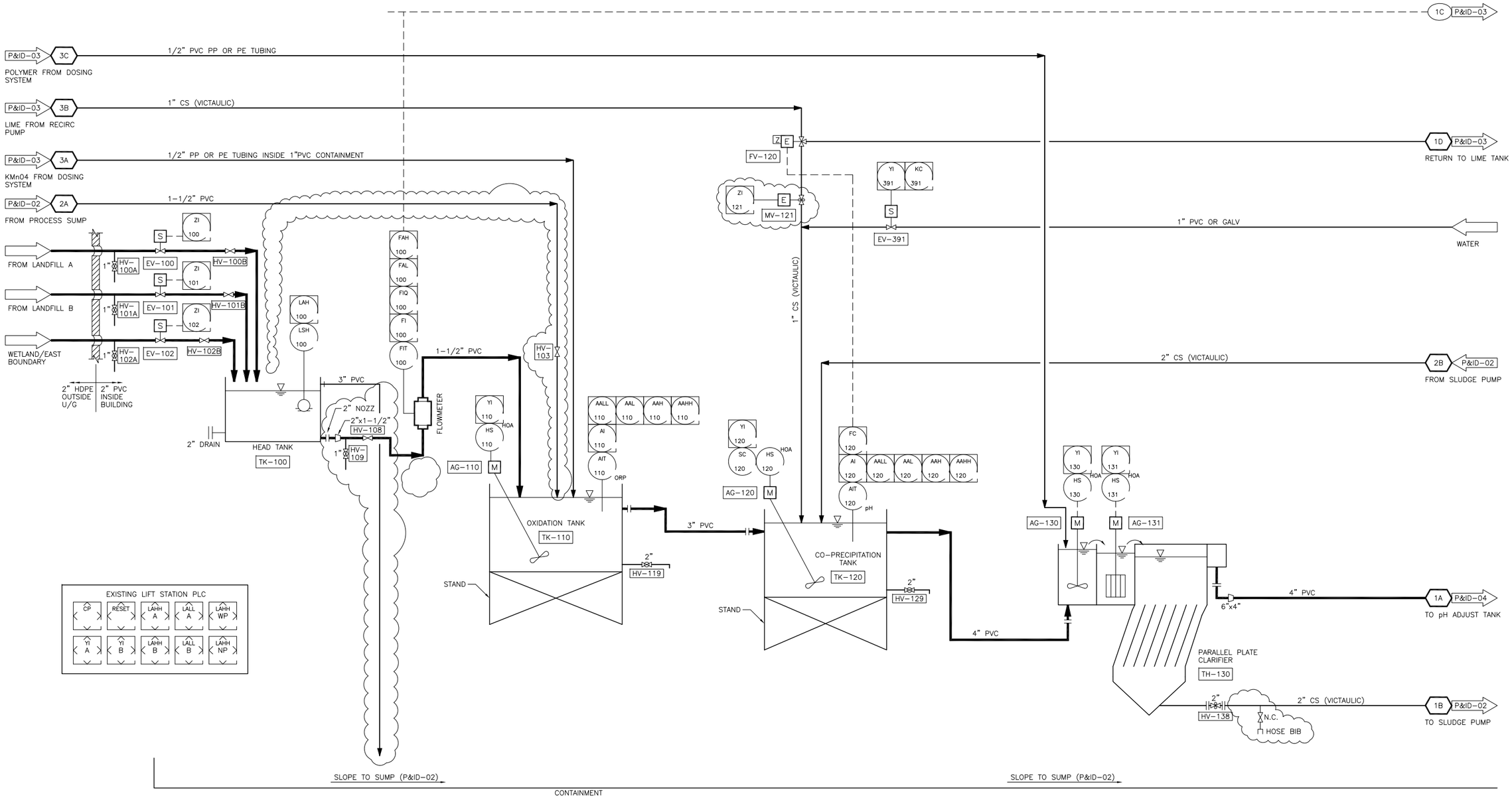
LARRY M. McCAUGHEY — STATE OF WASHINGTON — 19823 — REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW AND INSTRUMENTATION LEGEND

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/06/12
PROJECT NO.: SE10160010
DRAWING P&ID–00

Plot Date: 03/06/12 - 11:44am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-PIDs.dwg



REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
3	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 21	LDV
4	ISSUED FOR TENDER	MAY 26	LDV
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	CONTROL CHANGES	DEC 20	
7	CONTROL CHANGES (2)	JAN 10	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

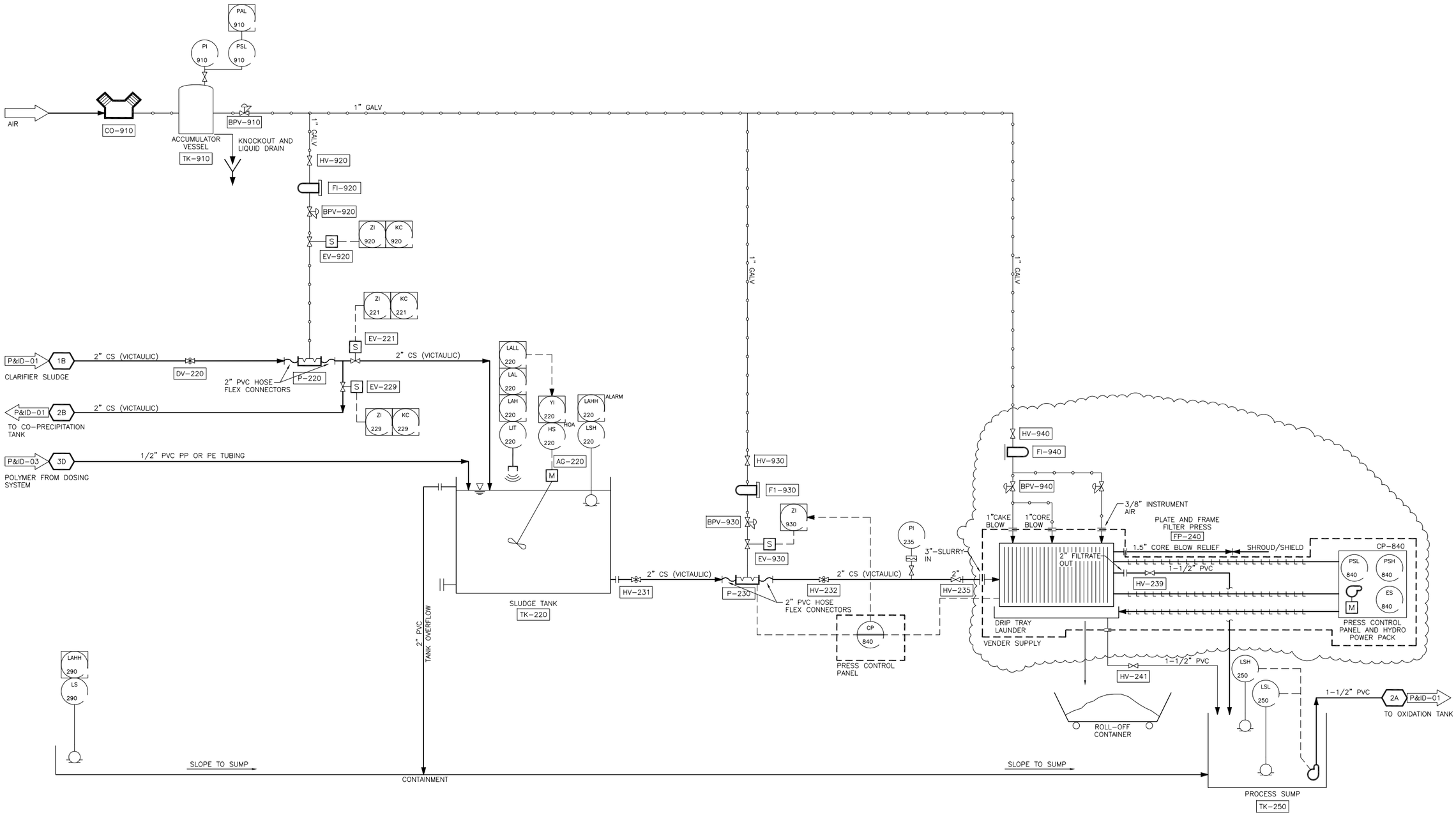
LARRY M. McCAUGHEY STATE OF WASHINGTON 10903 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW AND INSTRUMENTATION OXIDATION / PRECIPITATION

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/06/12
PROJECT NO.: SE10160010
DRAWING P&ID-01

Plot Date: 03/06/12 - 11:44am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-PIDs.dwg



Plot Date: 03/06/12 - 11:44am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-PIDs.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
3	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 21	LDV
4	ISSUED FOR TENDER	MAY 26	LDV
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	CONTROL CHANGES	DEC 20	
7	CONTROL CHANGES (2)	JAN 10	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

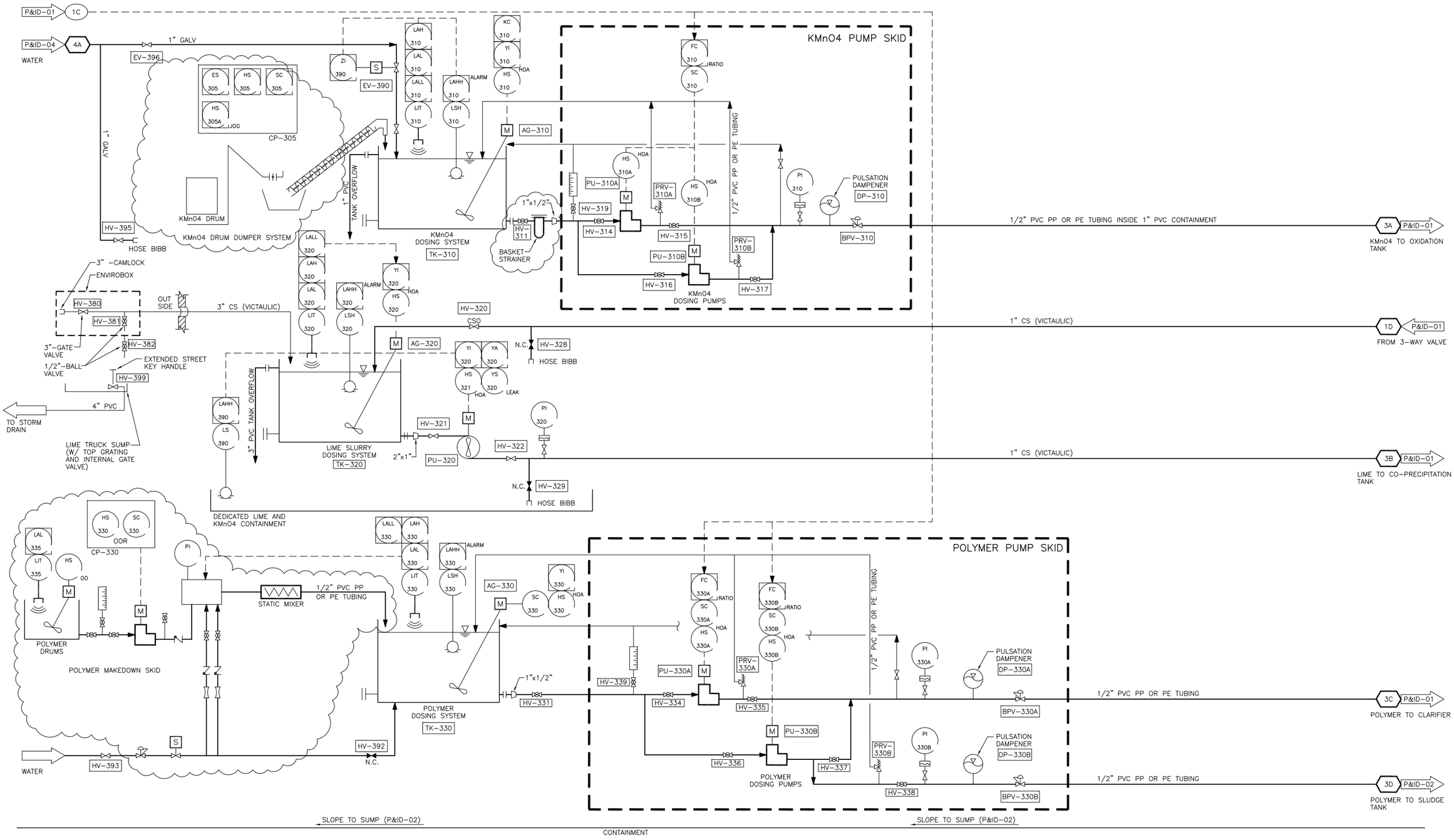
AMEC Geomatrix

LARRY M. McGAUGHEY STATE OF WASHINGTON 10923 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW AND INSTRUMENTATION SLUDGE HANDLING

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/06/12
PROJECT NO.: SE10160010
DRAWING P&ID-02



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REFERENCES:
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DATUM
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VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
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4	ISSUED FOR TENDER	MAY 26	LDV
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	CONTROL CHANGES	DEC 20	
7	CONTROL CHANGES (2)	JAN 10	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

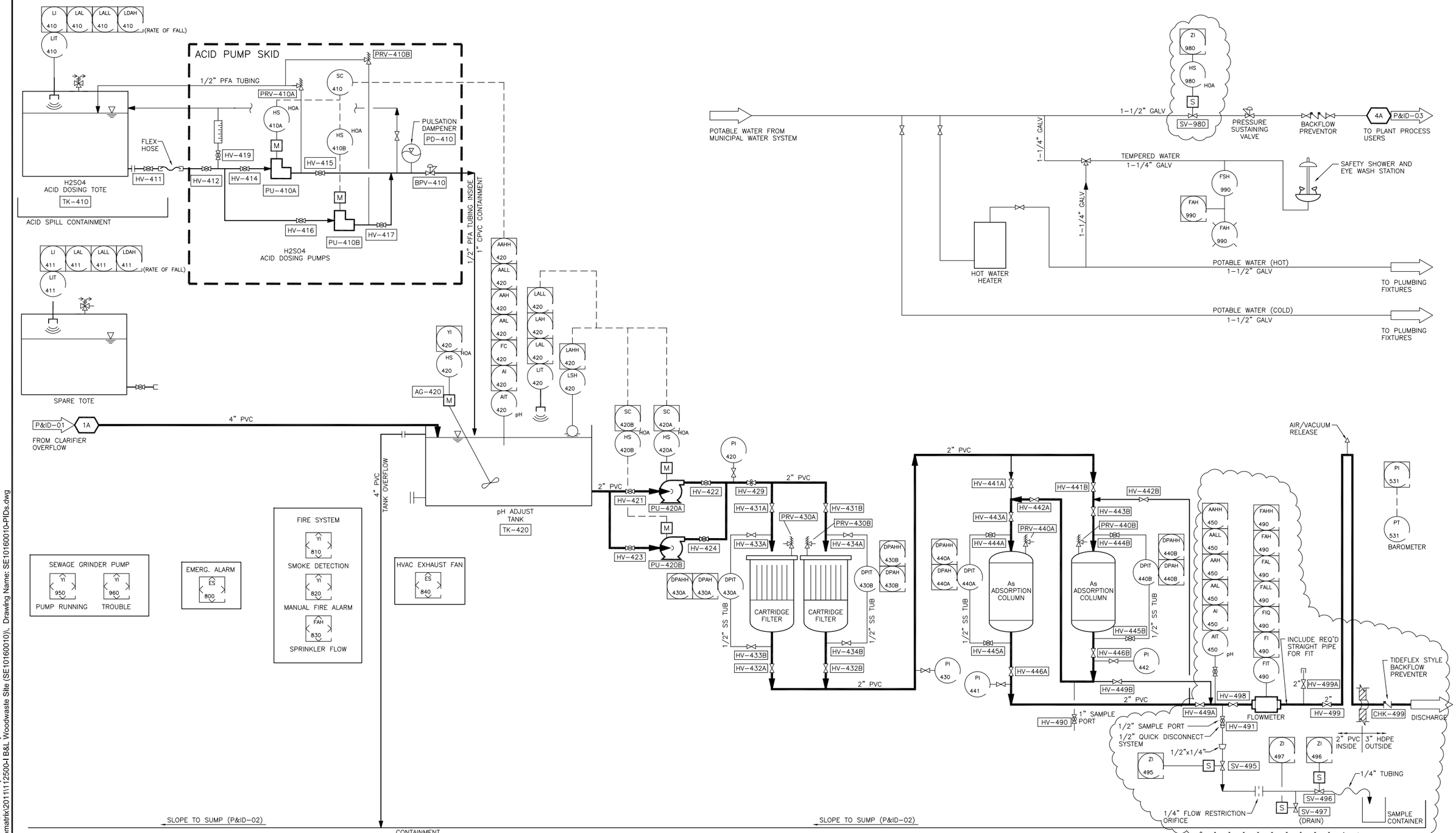
LARRY M. McGAUGHEY STATE OF WASHINGTON 30923 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW AND INSTRUMENTATION ADDITIVES

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/08/12
PROJECT NO.: SE10160010

DRAWING P&ID-03



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REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
4	ISSUED FOR TENDER	MAY 26	LDV
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	MATERIAL CHANGE	SEPT 8	LMM
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8	CONTROL CHANGES (2)	JAN 10	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

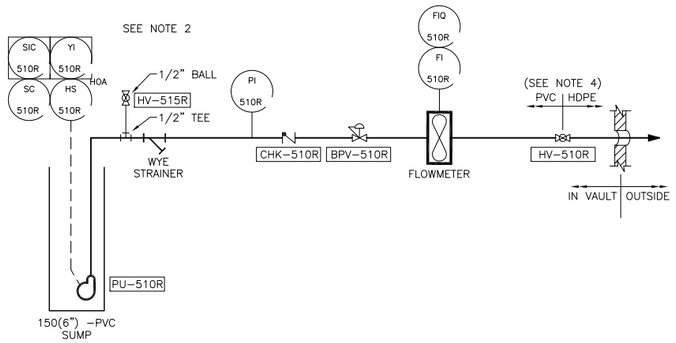
LARRY M. McGAUGHEY STATE OF WASHINGTON 30923 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW AND INSTRUMENTATION EFFLUENT POLISHING

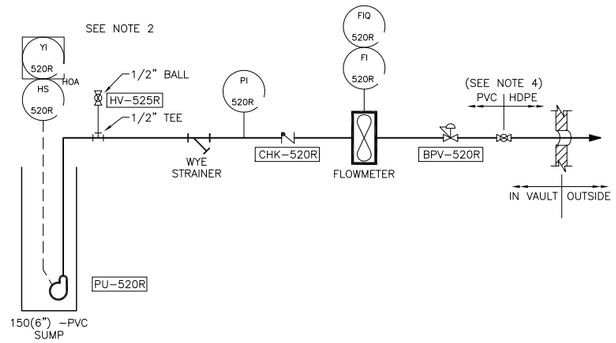
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/08/12
PROJECT NO.: SE10160010

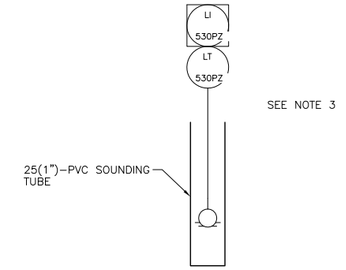
DRAWING P&ID-04



LANDFILL WELLS DETAIL (TYP OF 11)



AG. FIELD AND WETLAND WELLS DETAIL (TYP OF 10)



PIEZOMETER DETAIL (TYP OF 16)

STATION	COORDS	TERMINATION
R-01	1186310.409 702291.5027 inside	KIOSK 3
R-02	1186467.023 702042.2185 inside	KIOSK 2
R-03	1186327.49 702003.56 inside	KIOSK 2
R-04	1186152.52 702096.41 inside	KIOSK 3
R-05	1186200.63 701953.59 inside	KIOSK 2
R-06	1186293.15 701769.26 inside	KIOSK 2
R-07	1185852.906 701693.703 inside	KIOSK 1
R-08	1185907.93 701803.16 inside	KIOSK 1
R-09	1185776.662 701873.0772 inside	KIOSK 1
R-10	1185842.089 702081.232 inside	KIOSK 1
R-11	1186121.23 702223.96 inside	KIOSK 3

TABLE OF LANDFILL WELLS

STATION	COORDS	TERMINATION
R-12	1186517.737 702182.2116 outside-east	KIOSK 4
R-13	1186579.559 702070.3399 outside-east	KIOSK 4
R-14	1185679.036 702073.3376 outside-west	KIOSK 5
R-15	1185617.392 702077.515 outside-west	KIOSK 5
R-16	1186011.284 702345.452 outside-north	KIOSK 5
R-17	1186126.763 702394.4934 outside-north	KIOSK 5
R-18	1186032.526 702468.6627 outside-north	KIOSK 5
R-19	1185911.289 702509.2755 outside-north	KIOSK 5
R-20	1185980.764 702595.2624 outside-north	KIOSK 5
R-21	1185984.041 702673.8679 outside-north	KIOSK 5

TABLE OF AG. FIELD AND WETLAND WELLS

STATION	COORDS	TERMINATION
PZ-1a	1186183.28 702353.14 perimeter	KIOSK 3
PZ-1b	1186191.53 702329.08 perimeter	KIOSK 3
PZ-2a	1185886.44 702209.88 perimeter	KIOSK 1
PZ-2b	1185897.84 702186.89 perimeter	KIOSK 1
PZ-3a	1185733.73 701976.73 perimeter	KIOSK 1
PZ-3b	1185753.71 701976.05 perimeter	KIOSK 1
PZ-4a	1185731.96 701728.73 perimeter	KIOSK 1
PZ-4b	1185755.21 701726.18 perimeter	KIOSK 1
PZ-4c	1185754.96 701732.98 perimeter	KIOSK 1
PZ-5a	1186002.81 701621.79 perimeter	KIOSK 1
PZ-5b	1186005.46 701641.88 perimeter	KIOSK 1
PZ-5c	1186000.96 701642.36 perimeter	KIOSK 1
PZ-6a	1186379.5 701620.95 perimeter	DIRECT
PZ-6b	1186377.84 701640.57 perimeter	DIRECT
PZ-7a	1186595.69 701831.05 perimeter	DIRECT
PZ-7b	1186578.05 701835.09 perimeter	DIRECT
PZ-8a	1186513.106 702097.0787 perimeter	KIOSK 4
PZ-8b	1186495.24 702090.37 perimeter	KIOSK 4
PZ-8c	1186496.75 702085.74 perimeter	KIOSK 4

TABLE OF PIEZOMETERS

NOTES:

1. WELL COORDINATES EXPRESSED IN WASHINGTON STATE PLANE COORDINATE SYSTEM. DATUM CITATION IN LOWER LEFT.
2. "R" = STATION NUMBER FOR EACH WELL
3. "PZ" = STATION NUMBER FOR EACH PIEZOMETER
4. INSIDE VAULT USE SCH 80 PVC, OUTSIDE VAULT USE SDR11 HDPE R2, R7, R9 ARE 1.5", ALL OTHERS ARE 1"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
3	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 6	LDV
4	ISSUED FOR TENDER	MAY 26	LDV
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	CONTROL CHANGES	DEC 20	
7	CONTROL CHANGES (2)	JAN 10	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

LARRY M. McGAUGHEY STATE OF WASHINGTON 30623 REGISTERED PROFESSIONAL ENGINEER

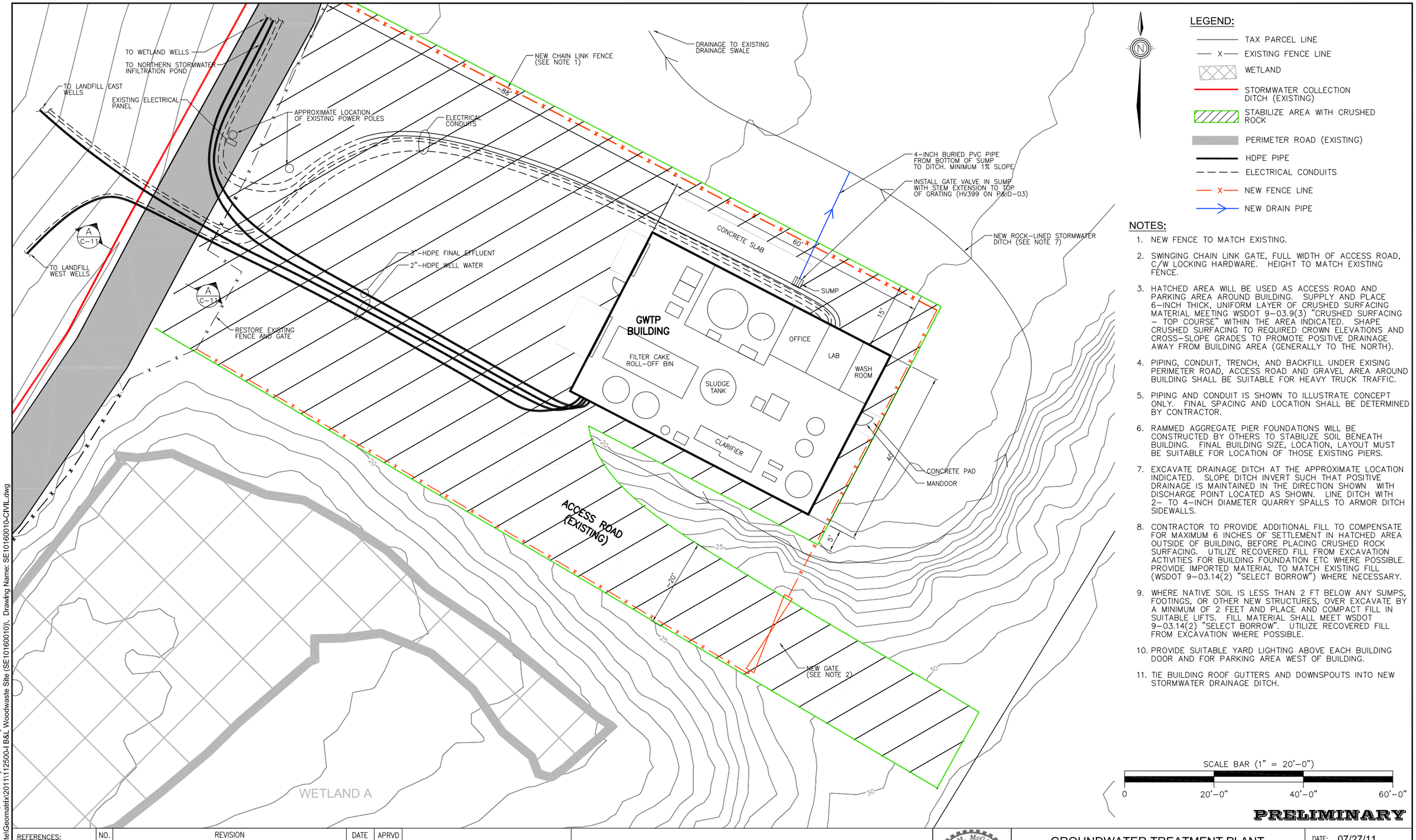
PROCESS FLOW AND INSTRUMENTATION
EXTRACTION AND MONITORING WELLS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/06/12
PROJECT NO.: SE10160010

DRAWING
P&ID-05

Plot Date: 03/06/12 - 11:46am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-PIDs.dwg



LEGEND:

- TAX PARCEL LINE
- EXISTING FENCE LINE
- WETLAND
- STORMWATER COLLECTION DITCH (EXISTING)
- STABILIZE AREA WITH CRUSHED ROCK
- PERIMETER ROAD (EXISTING)
- HDPE PIPE
- ELECTRICAL CONDUITS
- NEW FENCE LINE
- NEW DRAIN PIPE

NOTES:

1. NEW FENCE TO MATCH EXISTING.
2. SWINGING CHAIN LINK GATE, FULL WIDTH OF ACCESS ROAD, C/W LOCKING HARDWARE. HEIGHT TO MATCH EXISTING FENCE.
3. HATCHED AREA WILL BE USED AS ACCESS ROAD AND PARKING AREA AROUND BUILDING. SUPPLY AND PLACE 6-INCH THICK, UNIFORM LAYER OF CRUSHED SURFACING MATERIAL MEETING WSDOT 9-03.9(3) "CRUSHED SURFACING - TOP COURSE" WITHIN THE AREA INDICATED. SHAPE CRUSHED SURFACING TO REQUIRED CROWN ELEVATIONS AND CROSS-SLOPE GRADES TO PROMOTE POSITIVE DRAINAGE AWAY FROM BUILDING AREA (GENERALLY TO THE NORTH).
4. PIPING, CONDUIT, TRENCH, AND BACKFILL UNDER EXISING PERIMETER ROAD, ACCESS ROAD AND GRAVEL AREA AROUND BUILDING SHALL BE SUITABLE FOR HEAVY TRUCK TRAFFIC.
5. PIPING AND CONDUIT IS SHOWN TO ILLUSTRATE CONCEPT ONLY. FINAL SPACING AND LOCATION SHALL BE DETERMINED BY CONTRACTOR.
6. RAMMED AGGREGATE PIER FOUNDATIONS WILL BE CONSTRUCTED BY OTHERS TO STABILIZE SOIL BENEATH BUILDING. FINAL BUILDING SIZE, LOCATION, LAYOUT MUST BE SUITABLE FOR LOCATION OF THOSE EXISTING PIERS.
7. EXCAVATE DRAINAGE DITCH AT THE APPROXIMATE LOCATION INDICATED. SLOPE DITCH INVERT SUCH THAT POSITIVE DRAINAGE IS MAINTAINED IN THE DIRECTION SHOWN WITH DISCHARGE POINT LOCATED AS SHOWN. LINE DITCH WITH 2- TO 4-INCH DIAMETER QUARRY SPALLS TO ARMOR DITCH SIDEWALLS.
8. CONTRACTOR TO PROVIDE ADDITIONAL FILL TO COMPENSATE FOR MAXIMUM 6 INCHES OF SETTLEMENT IN HATCHED AREA OUTSIDE OF BUILDING, BEFORE PLACING CRUSHED ROCK SURFACING. UTILIZE RECOVERED FILL FROM EXCAVATION ACTIVITIES FOR BUILDING FOUNDATION ETC WHERE POSSIBLE. PROVIDE IMPORTED MATERIAL TO MATCH EXISTING FILL (WSDOT 9-03.14(2) "SELECT BORROW") WHERE NECESSARY.
9. WHERE NATIVE SOIL IS LESS THAN 2 FT BELOW ANY SUMPS, FOOTINGS, OR OTHER NEW STRUCTURES, OVER EXCAVATE BY A MINIMUM OF 2 FEET AND PLACE AND COMPACT FILL IN SUITABLE LIFTS. FILL MATERIAL SHALL MEET WSDOT 9-03.14(2) "SELECT BORROW". UTILIZE RECOVERED FILL FROM EXCAVATION WHERE POSSIBLE.
10. PROVIDE SUITABLE YARD LIGHTING ABOVE EACH BUILDING DOOR AND FOR PARKING AREA WEST OF BUILDING.
11. TIE BUILDING ROOF GUTTERS AND DOWNSPOUTS INTO NEW STORMWATER DRAINAGE DITCH.

SCALE BAR (1" = 20'-0")

0 20'-0" 40'-0" 60'-0"

PRELIMINARY

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PERMIT	FEB 25	WJM
2	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
3	ISSUED FOR TENDER	MAY 26	WJM
4	ISSUED FOR FINAL ENGINEERING DESIGN	JLY 26	LDV

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

LARRY M. McGAUGHEY STATE OF WASHINGTON 30623 REGISTERED PROFESSIONAL ENGINEER

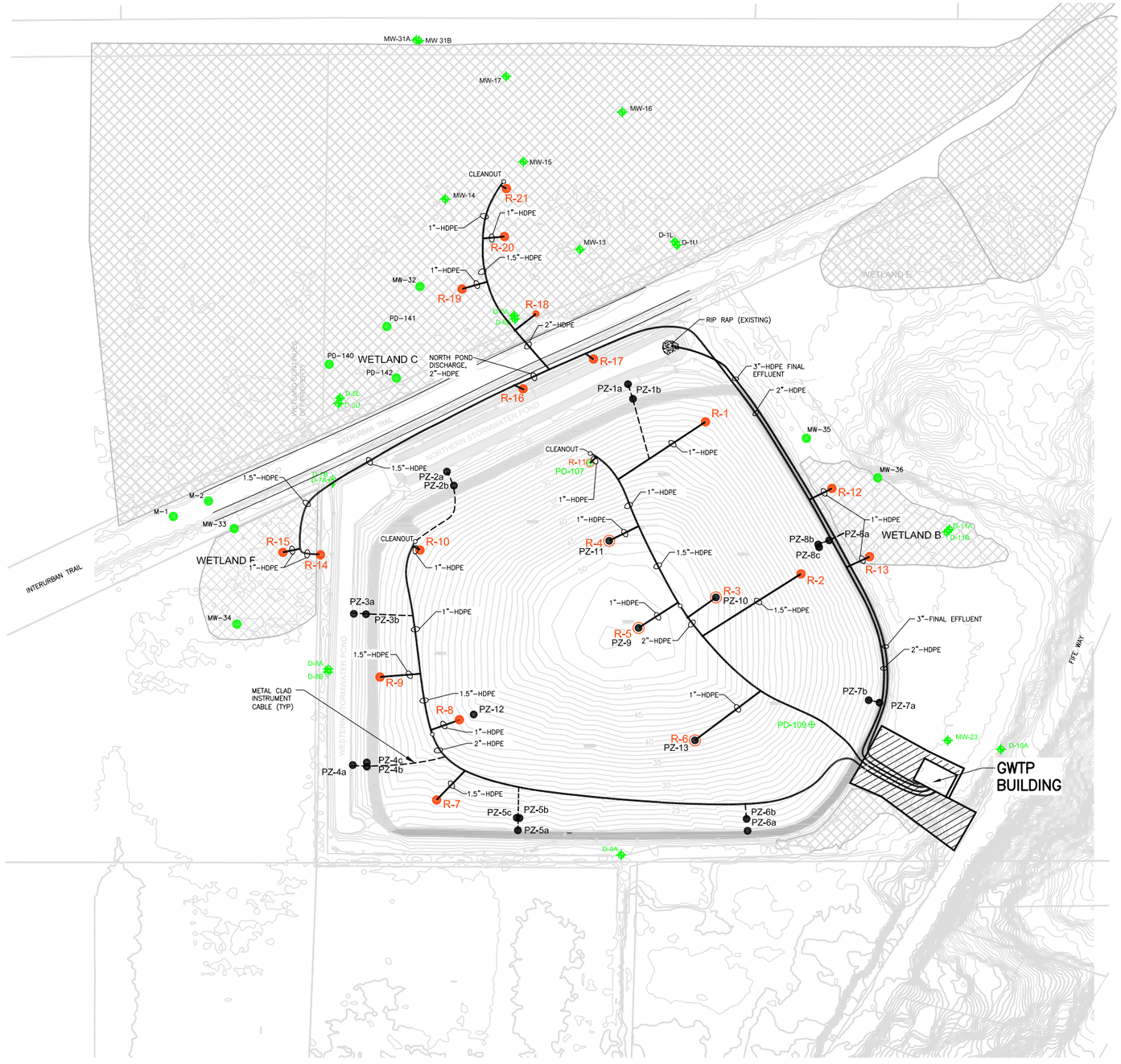
GROUNDWATER TREATMENT PLANT
PARTIAL SITE PLAN

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/27/11
PROJECT NO.: SE10160010

DRAWING
C-03

Plot Date: 07/27/11 - 8:24am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\12500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-CIVIL.dwg



LEGEND:

- TAX PARCEL LINE
- FENCE LINE (EXISTING)
- 12" DIAMETER CULVERT (EXISTING)
- AGRICULTURAL DITCH (EXISTING)
- WETLAND
- FINAL STORMWATER COLLECTION DITCH (EXISTING)
- STABILIZE AREA WITH CRUSHED ROCK
- PERIMETER ROAD (EXISTING)
- R-21 — NEW EXTRACTION WELL (BY OTHERS)
- R-11 — EXISTING WELL INCLUDED IN EXTRACTION NETWORK (BY OTHERS)
- MONITORING WELL (BY OTHERS)
- PZ-7a — PIEZOMETER (BY OTHERS)

NOTES:

1. GREEN WELLS SHOWN FOR INFORMATION ONLY.
2. CONTRACTOR MUST TAKE CARE NOT TO DAMAGE ANY EXISTING WELLS. ANY DAMAGE SHALL BE REPAIRED AT CONTRACTOR'S FULL EXPENSE.
3. WELLS WILL BE DRILLED BY OTHERS.
4. CONTRACTOR SHALL PROVIDE ALL PUMPS, PIPING, VALVES, FITTINGS, CLEANOUTS, POWER, CONTROLS, FOR ALL R LABELED WELLS.
5. CONTRACTOR TO PROVIDE WELL VAULTS FOR ALL WELLS INSIDE LANDFILL AREA. WELL VAULTS FOR WELLS OUTSIDE OF LANDFILL WILL BE BY OTHERS.
6. CONTRACTOR TO PROVIDE CONTROL WIRING FOR ALL PZ LABELED WELLS TO CONNECT TO PLC.
7. APPROPRIATE NUMBER AND SPACING OF CLEANOUT LOCATIONS FOR PIGGING AND CLEANING LINES TO BE DETERMINED BY CONTRACTOR. CLEANOUTS SHALL BE HOUSED IN TAMPER-PROOF VAULTS SUITABLE FOR H-15 AASHTO TRAFFIC RATING. TOP OF VAULTS TO MATCH EXISTING GRADE.

SCALE BAR (1" = 200'-0")

0 200' 400' 600'

PRELIMINARY

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR REVIEW	FEB 25	WJM
2	ISSUED FOR PERMIT	MAR 18	GP
3	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
4	ISSUED FOR TENDER	MAY 26	WJM
5	ISSUED FOR FINAL ENGINEERING DESIGN	JLY 26	LDV

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

LARRY M. McGAUGHEY STATE OF WASHINGTON 35623 REGISTERED PROFESSIONAL ENGINEER

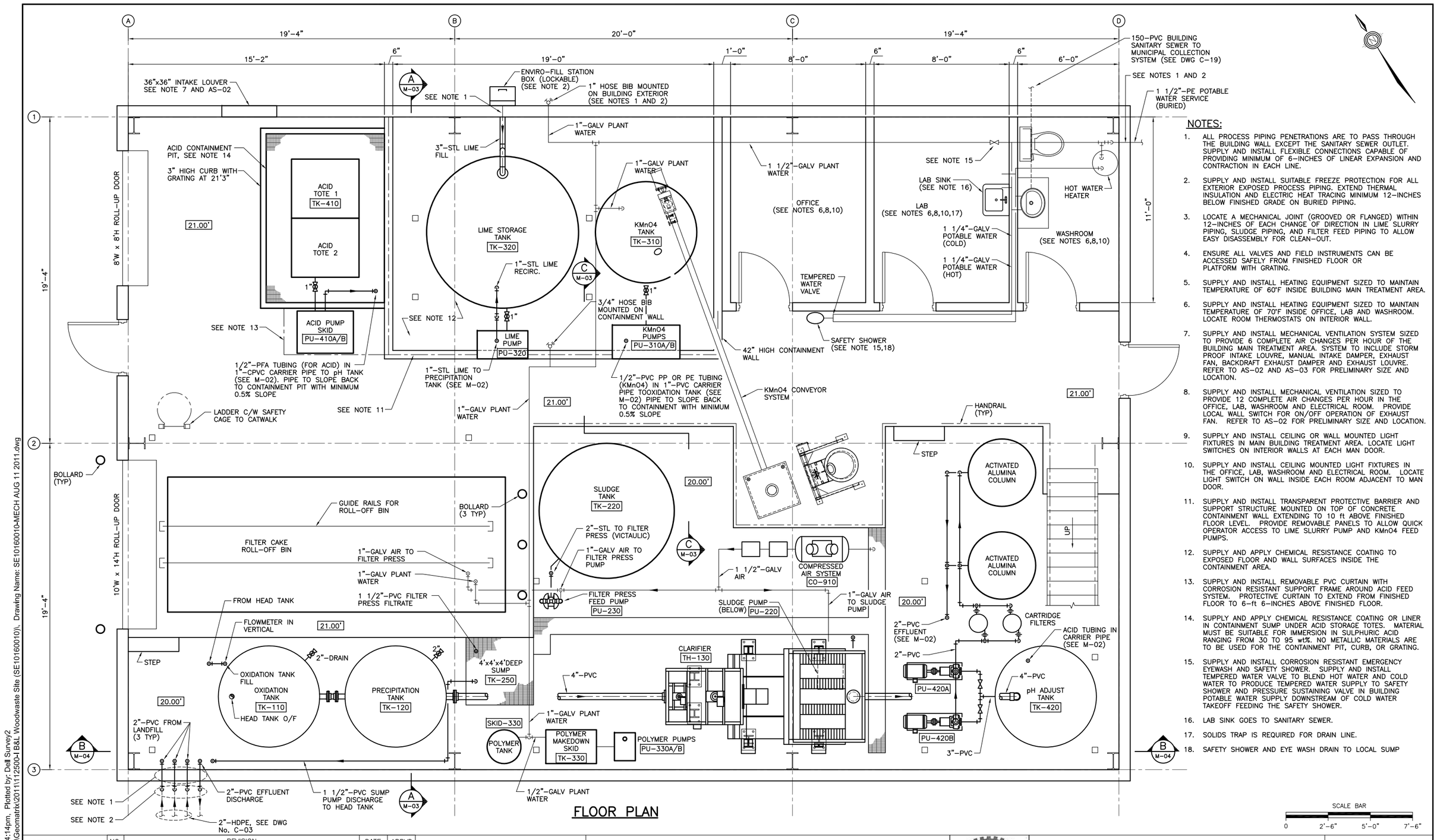
GROUNDWATER RECOVERY AND TREATMENT PLANT PIPING LAYOUT

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/27/11
PROJECT NO.: SE10160010

DRAWING C-04

Plot Date: 07/27/11 - 8:24am. Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\. Drawing Name: SE10160010-CIVIL.dwg



FLOOR PLAN

NOTES:

1. ALL PROCESS PIPING PENETRATIONS ARE TO PASS THROUGH THE BUILDING WALL EXCEPT THE SANITARY SEWER OUTLET. SUPPLY AND INSTALL FLEXIBLE CONNECTIONS CAPABLE OF PROVIDING MINIMUM OF 6-INCHES OF LINEAR EXPANSION AND CONTRACTION IN EACH LINE.
2. SUPPLY AND INSTALL SUITABLE FREEZE PROTECTION FOR ALL EXTERIOR EXPOSED PROCESS PIPING. EXTEND THERMAL INSULATION AND ELECTRIC HEAT TRACING MINIMUM 12-INCHES BELOW FINISHED GRADE ON BURIED PIPING.
3. LOCATE A MECHANICAL JOINT (GROOVED OR FLANGED) WITHIN 12-INCHES OF EACH CHANGE OF DIRECTION IN LIME SLURRY PIPING, SLUDGE PIPING, AND FILTER FEED PIPING TO ALLOW EASY DISASSEMBLY FOR CLEAN-OUT.
4. ENSURE ALL VALVES AND FIELD INSTRUMENTS CAN BE ACCESSED SAFELY FROM FINISHED FLOOR OR PLATFORM WITH GRATING.
5. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 60°F INSIDE BUILDING MAIN TREATMENT AREA.
6. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 70°F INSIDE OFFICE, LAB AND WASHROOM. LOCATE ROOM THERMOSTATS ON INTERIOR WALL.
7. SUPPLY AND INSTALL MECHANICAL VENTILATION SYSTEM SIZED TO PROVIDE 6 COMPLETE AIR CHANGES PER HOUR OF THE BUILDING MAIN TREATMENT AREA. SYSTEM TO INCLUDE STORM PROOF INTAKE LOUVRE, MANUAL INTAKE DAMPER, EXHAUST FAN, BACKDRAFT EXHAUST DAMPER AND EXHAUST LOUVRE. REFER TO AS-02 AND AS-03 FOR PRELIMINARY SIZE AND LOCATION.
8. SUPPLY AND INSTALL MECHANICAL VENTILATION SIZED TO PROVIDE 12 COMPLETE AIR CHANGES PER HOUR IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. PROVIDE LOCAL WALL SWITCH FOR ON/OFF OPERATION OF EXHAUST FAN. REFER TO AS-02 FOR PRELIMINARY SIZE AND LOCATION.
9. SUPPLY AND INSTALL CEILING OR WALL MOUNTED LIGHT FIXTURES IN MAIN BUILDING TREATMENT AREA. LOCATE LIGHT SWITCHES ON INTERIOR WALLS AT EACH MAN DOOR.
10. SUPPLY AND INSTALL CEILING MOUNTED LIGHT FIXTURES IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. LOCATE LIGHT SWITCH ON WALL INSIDE EACH ROOM ADJACENT TO MAN DOOR.
11. SUPPLY AND INSTALL TRANSPARENT PROTECTIVE BARRIER AND SUPPORT STRUCTURE MOUNTED ON TOP OF CONCRETE CONTAINMENT WALL EXTENDING TO 10 ft ABOVE FINISHED FLOOR LEVEL. PROVIDE REMOVABLE PANELS TO ALLOW QUICK OPERATOR ACCESS TO LIME SLURRY PUMP AND KMnO4 FEED PUMPS.
12. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING TO EXPOSED FLOOR AND WALL SURFACES INSIDE THE CONTAINMENT AREA.
13. SUPPLY AND INSTALL REMOVABLE PVC CURTAIN WITH CORROSION RESISTANT SUPPORT FRAME AROUND ACID FEED SYSTEM. PROTECTIVE CURTAIN TO EXTEND FROM FINISHED FLOOR TO 6-ft 6-INCHES ABOVE FINISHED FLOOR.
14. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING OR LINER IN CONTAINMENT SUMP UNDER ACID STORAGE TOTES. MATERIAL MUST BE SUITABLE FOR IMMERSION IN SULPHURIC ACID RANGING FROM 30 TO 95 wt%. NO METALLIC MATERIALS ARE TO BE USED FOR THE CONTAINMENT PIT, CURB, OR GRATING.
15. SUPPLY AND INSTALL CORROSION RESISTANT EMERGENCY EYEWASH AND SAFETY SHOWER. SUPPLY AND INSTALL TEMPERED WATER VALVE TO BLEND HOT WATER AND COLD WATER TO PRODUCE TEMPERED WATER SUPPLY TO SAFETY SHOWER AND PRESSURE SUSTAINING VALVE IN BUILDING POTABLE WATER SUPPLY DOWNSTREAM OF COLD WATER TAKEOFF FEEDING THE SAFETY SHOWER.
16. LAB SINK GOES TO SANITARY SEWER.
17. SOLIDS TRAP IS REQUIRED FOR DRAIN LINE.
18. SAFETY SHOWER AND EYE WASH DRAIN TO LOCAL SUMP

SCALE BAR
0 2'-6" 5'-0" 7'-6"

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
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3	TRANSMITTED TO CONTRACTOR	JLY 13	–
4	CONTAINMENT MODIFICATIONS	SEPT 01	LMM
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	PLUMBING CHANGES	SEPT 21	LMM

DRAWN PRV
DESIGNED BE
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

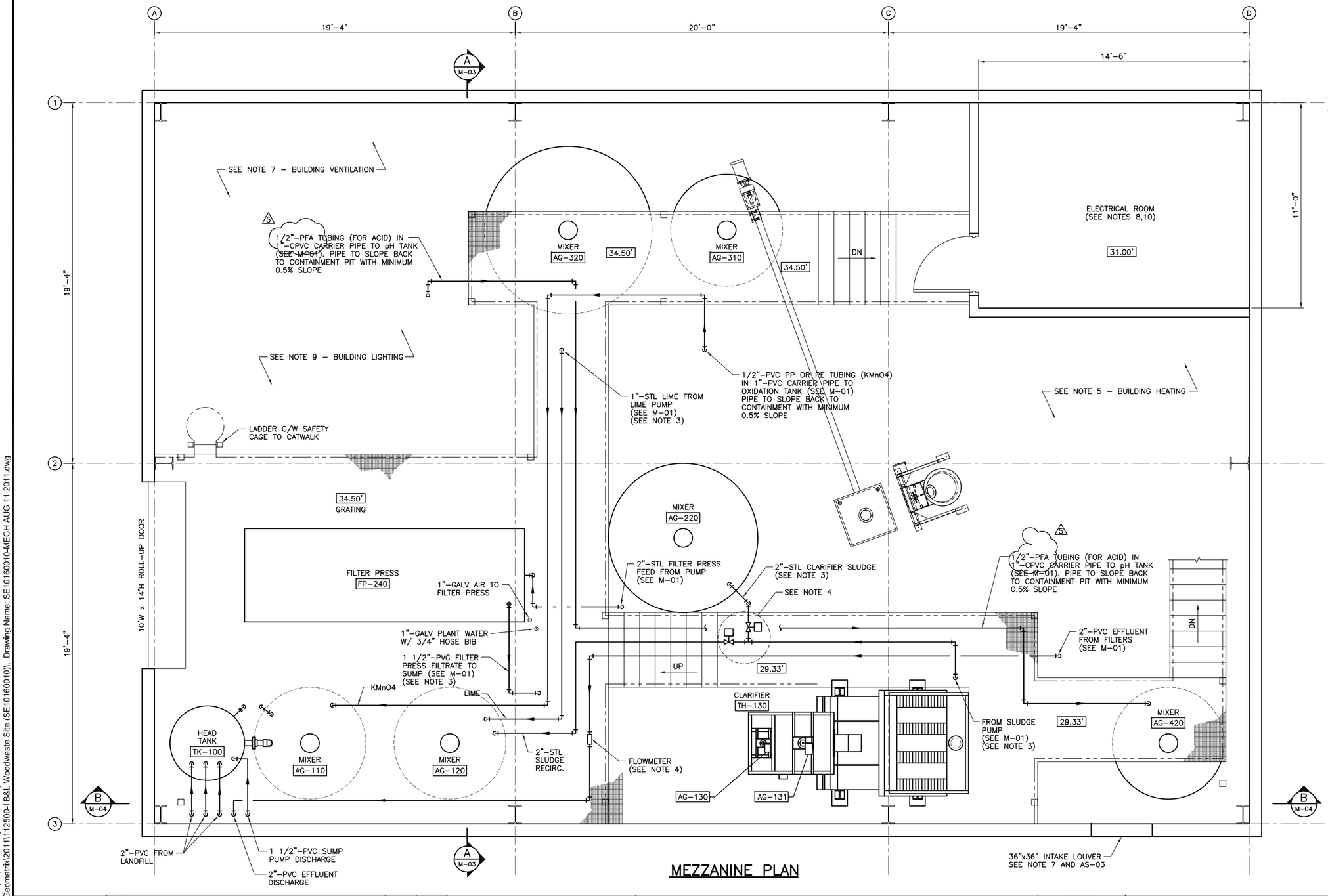
LARRY M. McCAUGHEY STATE OF WASHINGTON 19062 REGISTERED PROFESSIONAL ENGINEER

GROUNDWATER TREATMENT PLANT
MECHANICAL LAYOUT - FLOOR PLAN

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 09/21/11
PROJECT NO.: SE10160010
DRAWING M-01

Plot Date: 09/21/11 - 4:14pm, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-MECH AUG 11 2011.dwg



MEZZANINE PLAN

NOTES:

1. ALL PROCESS PIPING PENETRATIONS ARE TO PASS THROUGH THE BUILDING WALL EXCEPT THE SANITARY SEWER OUTLET. SUPPLY AND INSTALL FLEXIBLE CONNECTIONS CAPABLE OF PROVIDING MINIMUM OF 6-INCHES OF LINEAR EXPANSION AND CONTRACTION IN EACH LINE.
2. SUPPLY AND INSTALL SUITABLE FREEZE PROTECTION FOR ALL EXTERIOR EXPOSED PROCESS PIPING. EXTEND THERMAL INSULATION AND ELECTRIC HEAT TRACING MINIMUM 12-INCHES BELOW FINISHED GRADE ON BURIED PIPING.
3. LOCATE A MECHANICAL JOINT (GROOVED OR FLANGED) WITHIN 12-INCHES OF EACH CHANGE OF DIRECTION IN LIME SLURRY PIPING, SLUDGE PIPING, AND FILTER FEED PIPING TO ALLOW EASY DISASSEMBLY FOR CLEAN-OUT.
4. ENSURE ALL VALVES AND FIELD INSTRUMENTS CAN BE ACCESSED SAFELY FROM FINISHED FLOOR OR PLATFORM WITH GRATING.
5. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 60°F INSIDE BUILDING MAIN TREATMENT AREA.
6. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 70°F INSIDE OFFICE, LAB AND WASHROOM. LOCATE ROOM THERMOSTATS ON INTERIOR WALL.
7. SUPPLY AND INSTALL MECHANICAL VENTILATION SYSTEM SIZED TO PROVIDE 6 COMPLETE AIR CHANGES PER HOUR OF THE BUILDING MAIN TREATMENT AREA. SYSTEM TO INCLUDE STORM PROOF INTAKE LOUVRE, MANUAL INTAKE DAMPER, EXHAUST FAN, BACKDRAFT EXHAUST DAMPER AND EXHAUST LOUVRE. REFER TO AS-02 AND AS-03 FOR PRELIMINARY SIZE AND LOCATION.
8. SUPPLY AND INSTALL MECHANICAL VENTILATION SIZED TO PROVIDE 12 COMPLETE AIR CHANGES PER HOUR IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. PROVIDE LOCAL WALL SWITCH FOR ON/OFF OPERATION OF EXHAUST FAN. REFER TO AS-02 FOR PRELIMINARY SIZE AND LOCATION.
9. SUPPLY AND INSTALL CEILING OR WALL MOUNTED LIGHT FIXTURES IN MAIN BUILDING TREATMENT AREA. LOCATE LIGHT SWITCHES ON INTERIOR WALLS AT EACH MAN DOOR.
10. SUPPLY AND INSTALL CEILING MOUNTED LIGHT FIXTURES IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. LOCATE LIGHT SWITCH ON WALL INSIDE EACH ROOM ADJACENT TO MAN DOOR.
11. SUPPLY AND INSTALL TRANSPARENT PROTECTIVE BARRIER AND SUPPORT STRUCTURE MOUNTED ON TOP OF CONCRETE CONTAINMENT WALL EXTENDING TO 10 ft ABOVE FINISHED FLOOR LEVEL. PROVIDE REMOVABLE PANELS TO ALLOW QUICK OPERATOR ACCESS TO LIME SLURRY PUMP AND KMnO4 FEED PUMPS.
12. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING TO EXPOSED FLOOR AND WALL SURFACES INSIDE THE CONTAINMENT AREA.
13. SUPPLY AND INSTALL REMOVABLE PVC CURTAIN WITH CORROSION RESISTANT SUPPORT FRAME AROUND ACID FEED SYSTEM. PROTECTIVE CURTAIN TO EXTEND FROM FINISHED FLOOR TO 6-ft 6-INCHES ABOVE FINISHED FLOOR.
14. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING OR LINER IN CONTAINMENT SUMP UNDER ACID STORAGE TOTES. MATERIAL MUST BE SUITABLE FOR IMMERSION IN SULPHURIC ACID RANGING FROM 30 TO 95 wt%. NO METALLIC MATERIALS ARE TO BE USED FOR THE CONTAINMENT PIT, CURB, OR GRATING.
15. SUPPLY AND INSTALL CORROSION RESISTANT EMERGENCY EYEWASH AND SAFETY SHOWER. SUPPLY AND INSTALL TEMPERED WATER VALVE TO BLEND HOT WATER AND COLD WATER TO PRODUCE TEMPERED WATER SUPPLY TO SAFETY SHOWER AND PRESSURE SUSTAINING VALVE IN BUILDING POTABLE WATER SUPPLY DOWNSTREAM OF COLD WATER TAKEOFF FEEDING THE SAFETY SHOWER.

SCALE BAR
0 2'-6" 5'-0" 7'-6"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	–
2	ISSUED FOR TENDER	05/20/11	WJM
3	TRANSMITTED TO CONTRACTOR	JLY 13	–
4	ISSUED FOR CONSTRUCTION	JLY 26	LDV
5	MATERIALS CHANGE	SEPT 8	LMM

DRAWN PRV
DESIGNED BE
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

LARRY M. McCAUGHEY STATE OF WASHINGTON 19963 REGISTERED PROFESSIONAL ENGINEER

GROUNDWATER TREATMENT PLANT MECHANICAL LAYOUT - MEZZANINE PLAN

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 09/09/11
PROJECT NO.: SE10160010
DRAWING M-02

Plot Date: 09/09/11 - 5:13pm, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-MECH AUG 11 2011.dwg

APPENDICES

APPENDIX A

Health and Safety Plan

Site-Specific Health and Safety Plan: Facility Operation and Maintenance

B&L Woodwaste Site

1522 Fife Way East

Milton, Washington 98354

Prepared for:
B&L Woodwaste Custodial Trust

Prepared by:

Floyd|Snider
600 Union Street, Suite 600
Seattle, Washington 98101

AMEC Environment & Infrastructure, Inc.
600 University Street, Suite 600
Seattle, Washington 98101

June 2012

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2.0 SCOPE OF FIELD ACTIVITIES 3
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Figure 2 Site Location
Figure 3 Route to Hospital

ATTACHMENTS

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Attachment 2 Material Safety Data Sheets

SITE-SPECIFIC HEALTH AND SAFETY PLAN: GROUNDWATER RECOVERY AND TREATMENT SYSTEMS

B&L Woodwaste Landfill
Seattle, Washington

1.0 PURPOSE

This Health and Safety Plan Appendix (HASP Appendix) outlines the health and safety procedures that shall be followed while conducting field activities related to operation and maintenance of the groundwater recovery system, groundwater interceptor trench, the groundwater treatment system, Landfill cap, and associated buildings and fencing. The project site is located at 1522 Fife Way East, Milton/Fife, WA.

This HASP Appendix defines site-specific hazards and controls to prevent injury and illness for project personnel working on remediation and monitoring conducted at the Site. The observance and practice of the procedures in this plan are mandatory for personnel working on the above remedy components. All contractors and visitors associated with this work shall be made aware of the requirements of this plan; however, contractors are responsible for the health and safety of their own employees and subcontractors they employ and for following all applicable federal, state, and local regulations. At a minimum, any contractors associated with this work must meet the requirements of this document.

This HASP Appendix has been reviewed jointly by the AMEC Project Manager and the AMEC Project Health and Safety Officer. Prior to entering the project area, project personnel shall read this plan and be familiar with health and safety procedures specific to their project responsibilities when working at the project. A copy of the plan shall be available at the Site project office and, for work conducted outside the B&L Property, a copy shall be readily available at the off-property work area. The work area and Site history are described in the main body of the Site Specific HASP.

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2.0 SCOPE OF FIELD ACTIVITIES

Project activities will include operation and maintenance of the groundwater interceptor trench, the groundwater recovery and treatment system, and associated security systems and buildings associated with the Site remedy. Tasks will include:

- Operation of groundwater treatment system equipment, machinery, and controls/instruments;
- Operation of groundwater recovery wells, pumps, and controls/instruments;
- Collection of groundwater samples from groundwater recovery wells as needed to support operations;
- Contaminated water sampling from treatment system components;
- Laboratory testing and analysis using onsite test kits and instruments;
- Process chemical receipt and handling;
- Operation of the groundwater interceptor trench system;
- Maintenance of equipment, machinery, and instruments associated with the interceptor trench, groundwater recovery system, and groundwater treatment system;
- Monitoring and maintenance of systems associated with the groundwater treatment building (e.g., heating system, sewage lift station);
- Inspection and maintenance of the Landfill cap, perimeter drainage system, and ponds; and
- Inspection and maintenance of security fencing and surveillance systems.

The field activities involve potential exposure to contaminated groundwater, hazardous chemicals, mechanical hazards associated with machinery and equipment, and electrical hazards. Except for operations and maintenance activities conducted on groundwater recovery wells located on adjacent wetlands or agricultural properties, field work addressed by this HASP Appendix will be performed on the B&L Property.

A job safety analysis (JSA) has been completed for each routine task associated with project work addressed by this HASP Appendix. The JSA has been built into the specific Operations

Procedure developed for each task. The Operations and Maintenance Procedures (O&M Procedures) are included in the Operations, Monitoring, and Maintenance Plan (OMMP); these detailed procedures are not reproduced in the HASP Appendix, but are included in this HASP Appendix by reference. Project personnel are required to be familiar with and to follow the O&M Procedures when performing project work. Material Safety Data Sheets (MSDS) for chemicals that will be used in performing project tasks or otherwise will be present in the work areas are provided in Attachment 2.

3.0 ADMINISTRATIVE INFORMATION

Project Name: B&L Woodwaste Site Groundwater Recovery & Treatment System O&M

Project Start Date: May 2012

Project Address: 1522 Fife Way East, Milton, WA

AMEC Project Manager: Larry McGaughey

Telephone No.: (206) 342-1788

AMEC Project Health & Safety Officer: Tim Reinhardt

Telephone No.: (206) 838-8464 / (425) 241-5816

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4.0 PRIMARY RESPONSIBILITIES

4.1 PROJECT MANAGER

The Project Manager (PM) will have overall responsibility for the success of the project, including the successful implementation of this HASP Appendix. The PM will review health and safety issues as needed and as consulted and will have the authority to reallocate resources and personnel to safely accomplish the field work.

In addition the PM shall:

1. Direct all project personnel involved in the work covered by this HASP Appendix;
2. Make the Project Health and Safety Officer aware of all pertinent project developments and changes or revisions to project plans;
3. Make available the resources that are necessary for a safe working environment;
4. Maintain communications with the client, as necessary; and
5. Ensure that all project personnel have received required training, are aware of the potential hazards associated with the project work, have been instructed in the work practices necessary for personal health and safety, and are familiar with the HASP Appendix and safe O&M Procedures for all scheduled activities and for dealing with emergencies.

4.2 PROJECT HEALTH AND SAFETY OFFICER

The Project Health and Safety Officer (PHSO) shall:

1. Advise PM and project personnel on all health and safety aspects of the work covered by this HASP Appendix activities conducted by project personnel in the field;
2. Specify exposure monitoring as appropriate to assess health and safety conditions in the field;
3. Review any accident/incident reports and make corrective action recommendations;
4. Modify the HASP Appendix as required based on accidents/incidents and findings regarding hazards and work practices;
5. Report all accidents/incidents and findings regarding personnel exposure, field hazards, and work practices to the PM;

6. Suspend field work if the PHSO believes that project personnel, including any subcontractor's personnel, are or may be exposed to an immediate health hazard.

7. Periodically inspect/audit the project site for compliance with health and safety standards and safe practices.

4.3 SITE SAFETY OFFICER

Field work addressed by this HASP Appendix will usually be done by a single worker. Multiple workers may be present during some maintenance or calibration work. The Site Safety Officer (SSO) will normally be the operator assigned to the Site, and the SSO will have the responsibilities of both the SSO and the Site Supervisor (see Section 4.4). If multiple personnel are on site, the PM will ensure that SSO Site Supervisor responsibilities are clearly defined; the SSO may function as the Site Supervisor, as designated by the PM. The SSO shall:

1. Ensure that appropriate personal protective equipment is available to and used by project personnel;

2. Ensure that all AMEC personnel have received required training, are aware of the potential hazards associated with site operations, have been instructed in the work practices necessary for personal health and safety, and are familiar with the HASP Appendix's procedures for all scheduled activities and for dealing with emergencies;

3. Suspend field work if the SSO believes that project personnel are or may be exposed to an imminent health hazard;

4. Implement the HASP Appendix and report any observed significant differences from the field conditions anticipated in the plan to the PM;

5. Review O&M Procedures before performing project tasks to ensure that safe practices are followed;

6. If directed by the PHSO, perform exposure monitoring;

7. Assume other duties as directed by the PHSO; and

8. Prepare reports of any observed accidents/incidents or inadequate work practices and communicate them to the PM and PHSO.

4.4 SITE SUPERVISOR

The Site Supervisor shall:

1. Maintain control of the project site and direct daily field operations to be consistent with applicable environmental and health and safety regulations, O&M Procedures, and this project HASP Appendix, and enforce safe work practices and proper utilization of personal protective equipment by all project personnel working in the field;

2. With guidance from the PHSO, observe AMEC and subcontractor's procedures with respect to health and safety;

3. Suspend field work and, as appropriate, coordinate work suspension through the subcontractor's site supervisor, if the SS believes that any project personnel are or may be exposed to an imminent health or safety hazard;

4. Implement the HASP Appendix and report any observed significant differences from the field conditions anticipated in the plan to the project manager;

5. Conduct field safety briefings as needed;

6. Ensure that required personal protective, monitoring, and emergency equipment is provided and maintained in effective working condition prior to performing assigned field work; and

7. Report observed accidents/incidents or inadequate work practices to the PM and the PHSO.

4.5 PROJECT PERSONNEL

Project personnel involved in project work shall:

1. Perform assigned work in accordance with the O&M Procedures and safe work practices. Project personnel shall take reasonable precautions to prevent injury to themselves and to their fellow workers;

2. Perform only those tasks that they can do safely and for which they have proper personnel protective equipment, tools, and safeguards. Immediately report accidents and/or unsafe conditions to the SSO or PHSO;

3. Follow the procedures set forth in the HASP Appendix and report to the SSO, Site Supervisor, or PHSO any observed deviations by project personnel from the procedures described in this plan; and

4. Inform the SSO and PHSO of any physical conditions that might affect their ability to perform the planned field tasks prior to performing the work.

4.6 TRAINING REQUIREMENTS

All project personnel must comply with applicable regulations specified in Title 29, U.S. Code of Federal Regulations (29 CFR) Part 1910.120 and the Washington Administrative Code (WAC) Chapter 296-843, hazardous waste operations (HAZWOPER), administered by the Washington State Department of Labor and Industries (L&I). These include completion of a 40-hour health and safety training course for HAZWOPER, an annual 8-hour refresher training, and participation in AMEC's medical surveillance program and respiratory protection program. In addition to the 40-hour course and 8-hour refreshers, the Site Supervisor (and SSO, if performing the duties of the SS) will have completed an 8-hour course for hazardous waste site supervisors as required by WAC 296-843-20015. Each field worker will also have a minimum of 3 days of supervised field experience at a hazardous waste site before working in the project area without close, direct, supervision. Documentation of all required training for personnel assigned to the project site will be maintained at the project site by the Site Supervisor.

Additional site-specific training that covers task-specific hazards; personal protection equipment (PPE) requirements, use, and limitations; decontamination procedures; and emergency response information as outlined in this HASP Appendix will be given by the PHSO or SSO before performed project work. Site-specific training briefings should be documented on the "Project Health and Safety Field Meeting Form," included as Attachment 1.

4.7 MEDICAL SURVEILLANCE

All AMEC personnel assigned field duties for the project area shall participate in AMEC's medical surveillance program, which includes annual audiometric and physical examinations for employees involved in HAZWOPER projects. It requires that all such personnel have medical clearance before being issued a respirator and participating in field activities. Frequency of medical examinations which comply with 29 CFR § 1910.120(f)(3) and WAC 296-843-21005 are:

- Prior to performing field work;
- At least once every 24 months (12 months if exposed to air contaminants above the permissible exposure limit [PEL]), or if working in respiratory protection more than 30 days per year);
- At termination of employment;

- Upon occurrence of possible unprotected overexposure to chemicals or harmful physical agents; and

- More frequently if deemed necessary by a physician.

5.0 HAZARD ASSESSMENT

An assessment of the potential hazards that may be encountered during project work is designated by project task in Table 1 and discussed below.

5.1 POTENTIAL CHEMICAL HAZARDS AT SITE

Listed below are hazardous materials and contaminants that are suspected to be present for the work addressed by this HASP Appendix within the project area. Other hazardous substances are present in wastes and affected soil and sediments present at the Site; project work is not expected to result in potential exposure to landfilled wastes or affected soil/sediment. If it becomes necessary to conduct subsurface work, a separate HASP must be prepared specifically addressing the potential hazards associated with the subsurface work. Additional information on the potential chemical hazards associated with the project work, including their acute exposure effects, is noted below.

TABLE 1

HAZARDOUS CONSTITUENTS KNOWN OR SUSPECTED
B&L Woodwaste Site, Groundwater Recovery and Treatment System
Pierce County, Washington

Chemical, Form	Media	Maximum Concentration	Routes of Exposure[2]	Acute Exposure Symptoms
Contaminated Groundwater				
Arsenic	GW	4,540 µg/L	RISE	Skin irritation, possible dermatitis; respiratory distress; diarrhea; kidney damage; muscle tremor, convulsions; possible gastrointestinal tract, reproductive effects; possible liver damage

TABLE 1

HAZARDOUS CONSTITUENTS KNOWN OR SUSPECTED
B&L Woodwaste Site, Groundwater Recovery and Treatment System
Pierce County, Washington

Chemical, Form	Media	Maximum Concentration	Routes of Exposure[2]	Acute Exposure Symptoms
Treatment System Chemicals				
Sulfuric Acid, ~93%	Liquid	93-98%	RISE	Very hazardous upon skin or eye contact, producing burns, itching, redness, possible blistering; liquid mist may produce mucous membrane damage; inhalation of mist will produce extreme irritation of respiratory tract
Lime Slurry	Liquid	3.5 lb $Ca(OH)_2$ per gal water	RISE	Irritation of skin upon contact, burning of eyes if contacted; severe irritation of respiratory system if inhaled
Potassium Permanganate	Solid	Industrial Grade $KMnO_4$ Crystals	RISE	Irritation, blistering upon contact; burning, sneezing, and coughing upon inhalation; corneal damage or blindness upon eye contact
Potassium Permanganate	Liquid	3% solution in water	RISE	Skin and eye irritator causing redness and itching, nausea and vomiting if ingested
Coagulant, Nalco Ferralyte 8130	Liquid	100%	RISE	Skin and eye irritator. May injure eye tissue if not removed promptly. Ingestion may cause irritation to the gastrointestinal tract. Inhalation of liquid mist may be irritating to eyes, nose, throat and lungs.
Polymer, Nalco Core Shell 71307	Liquid	100%	RISE	Can cause mild eye irritation. Prolonged skin contact will lead to discomfort and dermatitis

1. Maximum concentrations are in milligrams per kilogram for soil samples, and micrograms per liter for water samples
2. RISE = respiratory, ingestion, skin, eyes.

Several of the chemicals used in the groundwater treatment process and in the laboratory are damaging to the eyes, skin, and mucous membranes. Along with wearing the PPE designated for the task when handling these chemicals, a plumbed eyewash and safety shower is located centrally within the building. Workers will ensure that they know the location of the safety shower/eyewash fountain and that it is readily accessible prior to commencing a task that has any potential for eye or skin exposure to corrosives, caustics, water reactive chemicals, and/or oxidizers.

5.2 POTENTIAL PHYSICAL HAZARDS

Potential physical hazards are listed in Table 2 and discussed below.

TABLE 2

ANTICIPATED HAZARDS
B&L Woodwaste Site
Pierce County, Washington

	Hazards											
Task	**Slip/Trip/Fall**	**General Electrical Hazards**	**Noise**	**Heat Stress**	**Cold Stress**	**Sunburn**	**Confined Spaces**	**Mechanical Hazards**	**Heavy Equipment**	**Traffic**	**Insects and Wildlife**	**Lockout/Tag Out/ Hazardous Energy**
Groundwater Recovery Well Operation & Maintenance	X	X	X	X	X	X		X			X	X
Groundwater Treatment System Operations	X	X	X	X				X				X
Laboratory Testing and Analysis	X	X	X	X				X				
Groundwater Sampling	X		X	X								
Chemical Delivery & Handling	X	X	X	X	X	X			X	X	X	

Common safety hazards include slip/trip/fall hazards, chemical handling hazards, contaminated media, debris and tools, and hazards associated with working around machinery, equipment, and with hand or power tools. All project area personnel will keep materials, equipment, and debris organized and flagged as necessary to prevent trip hazards. Project area personnel will wear the following PPE at a minimum when entering and/or working in the groundwater treatment building:

- Sturdy work boots or shoes with steel toes and shanks;
- Safety glasses; and
- Hard hats.

Work conducted outside the building will require the same PPE with the exception of hard hat. Hard hats are not required in the office, laboratory, or lavatory; and safety glasses are not required in the office or lavatory. Additional PPE may be required for specific tasks, as described in the O&M Procedures for the specific work task.

5.2.1 General Electrical Hazards

Electrical hazards are present throughout the GWTP Building, as much of the equipment, instrumentation, and controls require electrical power. Prior to performing maintenance or servicing of any process equipment, instruments, or controls, documented lockout/tag out procedures must be followed, in accordance with the O&M Procedures. Circuits powering equipment, instruments, and/or controls must be confirmed to be de-energized prior to removing or opening housings to perform service or when entering confined spaces where water may be present.

To prevent electrocution hazards caused by utilizing electrically powered tools and/or other mobile equipment, all electrical extension cords must be rated for the combined amperage of the equipment they power, and must be factory listed as rated SJOW or STOW (an “-A” extension is acceptable for either) and inspected prior to each use for defects in the cord and plugs. Any reduction or damage to the original cord jacket, gap between the strain relief, or any evidence of overheating (cord discoloration or melting) will result in the immediate destruction of the cord and replacement, as necessary.

The following safe work practices will also be enforced.

- No exposed energized conductors operating above 50 volts to ground will be allowed unless properly guarded from contact by site workers.
- Electrical distribution systems and electrical repairs to equipment operating above 50 volts to ground will be performed only by a qualified licensed electrician.
- All portable power tools will be inspected by the user for defects before use and will be of a double-insulated design.
- Any generator brought to the work area will be grounded to a suitable earth and will be equipped with overcurrent protection.
- All extension cords will be protected by a ground-fault circuit interrupter, which will be tested before each use.
- No extension cords will be routed through walls, ceilings, doors, or windows.

5.2.2 Noise Hazards

GWTP process equipment will operate continuously and has the potential for requiring hearing protection. Site personnel will wear hearing protection when working in any areas designated as requiring hearing protection. This measure is designed to prevent hearing loss that can occur when daily 8-hour time weighted average noise exposures meet or exceed 85 decibels (dBA) (WAC 296-817-20015).

5.2.3 Heat Stress Hazards

Heat stress is a slight hazard during the summer months in the Pacific Northwest, but becomes a significant hazard for workers wearing protective clothing under certain conditions. Heat stress may affect workers to varying degrees. The signs, symptoms, and treatment of these varying degrees of heat stress are summarized below.

- Heat rash may result from exposure to heat or humid air.
- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen. Persons experiencing these symptoms should rest in a cooler area, drink cool (not cold) liquids, and gently massage cramped muscles.
- Heat exhaustion occurs from increased stress on various body organs and may include inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; and fainting. Persons experiencing these symptoms should lie down in a cooler area, drink cool liquids with electrolytes (Gatorade, etc.), remove

any protective clothing, and cool body with wet compresses at forehead, back and neck, and/or armpits.

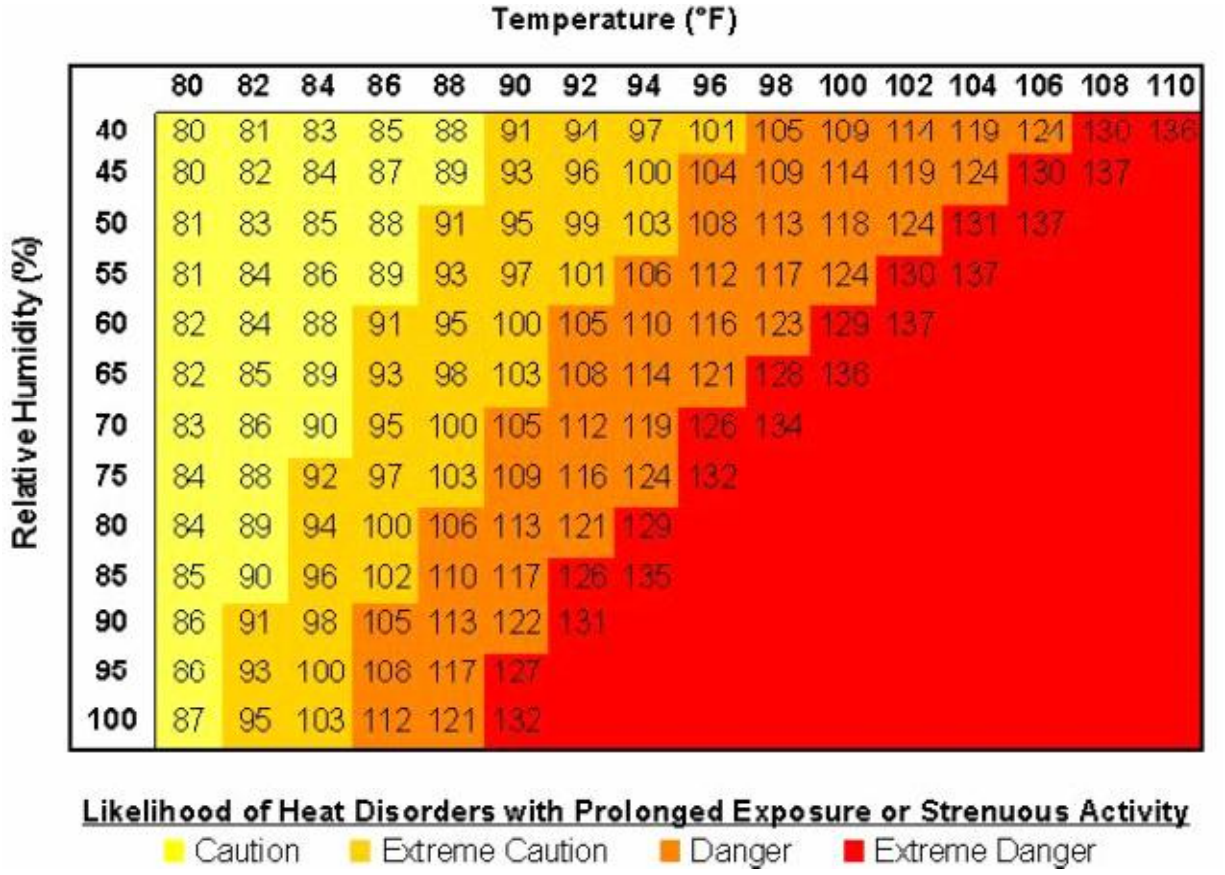
- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are red, hot, usually dry skin; lack of or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse; and coma.

From May 1 to September 30, if physically demanding field work will occur in the combination of temperatures and clothing/PPE ensembles shown in the table below, actions will be taken to prevent heat stress among the affected workers.

WORK AREA TEMPERATURE ACTION LEVELS

Non-breathing clothes, including vapor- and chemical-resistant suits (Levels B and A, and impermeable raingear)	**52° F**
Double-layer woven clothes, including coveralls, jackets, and sweatshirts	**77° F**
All other clothing	**89° F**

Site staff working outdoors will be trained in heat-related illness and in management of potential risk factors in accordance with WAC 296-62-095. To prevent heat stress, at least one quart per person-hour of cool potable water will be readily available via individual cups, and field personnel will be encouraged to drink plenty of fluids and take periodic work breaks in hot weather. The SSO will promptly consult with the PHSO, and a radial pulse monitoring method will be implemented to ensure that adequate work-rest cycles will be established to manage heat stress potential among the affected workers. Combined temperature and humidity conditions that result in a heat index exceeding 100° will trigger mandatory radial pulse monitoring and heat stress management. The following chart indicates the relative risk of heat stress at combinations of temperature and relative humidity.



5.2.4 Cold Stress Hazards

Exposure to even moderate levels of cold can cause the body's internal temperature to drop to a dangerously low level. This is called hypothermia, and is a significant hazard in the fall, winter, and spring months in the Pacific Northwest. Exposure to temperatures below freezing can cause frostbite of hands, feet, and face.

Symptoms of hypothermia include:

- vague, slow, slurred speech;
- forgetfulness, memory lapses;
- inability to use hands;
- frequent stumbling;

- drowsiness.

To prevent hypothermia, project personnel should stay dry and avoid exposure. Project personnel are encouraged to wear sufficient clothing in layers such that outer clothing is wind- and waterproof and inner layers retain warmth (wool or polypropylene). Project personnel should keep hands and feet well protected at all times, especially when working in cold conditions.

5.2.5 Sunburn Hazards

Skin exposure to ultraviolet radiation can result in sunburn. Site personnel will use long-sleeved shirts, hats, and sunscreen to protect against sunburn when working outdoors.

5.2.6 Confined Spaces

Confined spaces and associated hazards include the following:

Confined Space	Potential Hazards	Lockout / Tag Out
Head Tank, TK-100	Engulfment in water, Arsenic contaminated water (wells)	Well pumps
Oxidation Tank, TK-110	Engulfment & arsenic contaminated water (TK-100), Contaminated water from process sump (TK-250), Potassium Permanganate feed (TK-310), Rotating machinery (mixer)	Permanganate dosing pump, well pumps, process sump pump, mixer
Co-Precipitation Tank, TK-120	Engulfment & arsenic contaminated water (TK-110), Lime Slurry dosing, Sludge recycle, Rotating machinery (mixer)	Lime dosing pump, sludge line to co-precipitation tank, well pumps, mixer
pH Adjust Tank, TK-420	Engulfment & arsenic contaminated water (TH-130), Sulfuric acid dosing, Rotating machinery (mixer)	Acid dosing pumps, well pumps, mixer
Potassium Permanganate Feed Tank, TK-310	$KMnO_4$ powder addition, Engulfment (potable water line), Rotating machinery (mixer)	Permanganate conveyor, potable water line, mixer
Lime Storage Tank, TK-320	Engulfment & Lime slurry exposure, Rotating machinery (mixer)	Mixer, lime recirculation pump

Sludge Tank, TK-220	Engulfment and arsenic exposure in sludge (P-220), Polymer exposure (TK-330), Rotating machinery (mixer)	Sludge pump (P-220), polymer feed pump (PU-330A/B), mixer
Sewage Grinder Sump	Exposure to sewage (biological hazard), Low oxygen, methane/H_2S gas, Electrical energy, Grinder pump operation	Sewer grinder pump power, toilet, lab sink, bathroom sink
Interceptor Trench Vaults A & B	Exposure to arsenic contaminated groundwater, Electrical energy, Sump pump operation	Inlet and outlet passive water lines, Sump pump power

No confined space entries will be required during ordinary operations and maintenance procedures. The O&M Procedures for specific tasks will identify any confined space entry that may be necessary for maintenance work. If entry into a confined space is required, the PHSO must be consulted and a confined space entry plan prepared and followed prior to anyone entering the space. The plan will include additional training and certification for confined space entry. A Confined Space Entry Permit, signed by the PHSO, must be obtained prior to entry to a confined space.

5.2.7 Mechanical Hazards

There are a number of electrical motors associated with mixers, pumps, and other process equipment that present mechanical hazards to system operators providing operations and maintenance services. Common mechanical hazards will include spinning blades of mixers, spinning shafts in pumps, rotating augers, and reciprocating shafts in metering pumps. Additionally, there is stored energy in compressed air and hydraulic systems associated with the air compressor, filter press, and drum dumper that present significant mechanical hazards.

Pinch points exist for some equipment (such as mixers or the drum dumper) as the equipment moves through its designed range of motion. Covers and guards are in place to protect workers during normal operations. These guards and covers must be kept in place and be regularly inspected to ensure they are in proper working condition at all times for moving equipment. Proper lockout/tag out procedures must be followed to prevent mechanical energy from harming system operators during machine maintenance. Replacement of all guards and covers is mandatory after completing maintenance and before removing lockout/tag out devices. The safe work practices described in the O&M Procedures must be followed for normal operations and for planned maintenance

5.2.8 Heavy Equipment

Heavy equipment will not be used during normal operations. If it is necessary to use heavy equipment for maintenance or equipment replacement, a task-specific HASP that includes JSAs, will be prepared and implemented to document associated hazards and establish safe work practices.

5.2.9 Traffic Hazards

Delivery truck operations in the work area may pose a hazard to site workers if working outside the GWTP Building. Truck deliveries will be coordinated with work conducted outside the building, and site workers will be notified of pending deliveries. High-visibility safety vests will be worn by personnel working outside the building during truck deliveries. A speed limit of 5 miles per hour on the B&L property will be enforced. Trucks will only be approached from the front or side of the cab, and eye contact with the operator will be made prior to entering the strike radius of the vehicle. Loads leaving the work area will be secured and covered as necessary to prevent loss of material on the highway. Site personnel assisting delivery vehicles by directing the driver while backing to delivery areas will maintain a safe distance from the vehicle and maintain visual contact with the driver.

5.2.10 Insects and Wildlife

Bees, other insects, and spiders may be encountered during site activities. Persons with allergies to bees will make the SS and SSO aware of their allergies and will avoid areas where bees are identified. Black widow, hobo, and brown recluse spiders are occasionally encountered in dry, dark areas. Field personnel will maintain a safe distance from any urban wildlife encountered, including raccoons and rodents, to preclude a bite from a sick or injured animal. Personnel will not put ungloved hands into dark places that could contain spiders, and will use tools to lift covers from catch basins, cleanouts, and well monuments. In order to avoid contact with bees, wasps, spiders, and mosquitoes, field personnel will wear gloves and long sleeved shirts as needed.

5.2.11 Lockout/Tag Out / Hazardous Energy

The groundwater treatment system poses a hazard from exposure to hazardous energy during operation, maintenance, and repair from pressurized, contaminated groundwater, pressurized air, hydraulic systems, and/or from electrical and mechanical energy. Written AMEC Lockout Procedures will be followed whenever these systems must be shut down for maintenance or repair/replacement if the unexpected energizing of the system (or release of stored energy such

as pressure) could cause serious injury to employees. Such activities will be implemented or overseen only by employees named as authorized persons in AMEC's downtown Seattle office lockout program.

The O&M Procedures will inform the operator of lockout/tag out-requirements for normal maintenance procedures. The operator must be lockout/tag out trained in order to complete the maintenance procedures which require such actions. Non-standard maintenance procedures that are not explicitly covered by existing O&M Procedures and this HASP will be performed under a task-specific HASP (including JSAs) approved by the SSO and PM.

5.2.12 Water Hazards

Operations and maintenance of recovery wells located in wetlands areas may present water hazards during periods of the year when these areas are flooded. Special precautions must be taken when working in these areas during the wet season. Whenever work must be conducted when standing water is present in these areas, the provisions for working safely specified in the O&M Procedures must be followed. These provisions will require appropriate waders or flotation devices and working in buddy teams. Specific health and safety precautions identified in the appropriate O&M Procedures must be followed when working on recovery wells in the seasonally inundated areas.

5.3 GENERAL HAZARDS

In working with or around any hazardous or potentially hazardous materials or hazardous situations, field personnel should plan all activities before starting any task. Field personnel shall identify health and safety hazards involved with the work planned and consult with the PM, PHSO or SSO as to how the task can be performed in the safest manner, if he/she has any uncertainties. Standard O&M Procedures, which identify safe work practices, must be followed for all operations and maintenance tasks addressed by the procedures. For any tasks not covered by the standard O&M Procedures and this HASP, a task-specific HASP(including JSAs) must be prepared and submitted to the SSO, PM, or PHSO for approval.

Common field safety hazards include slip/trip/fall hazards, sharp or rough-surface equipment, debris and tools, and hazards associated with working around heavy equipment. All staff who will use portable ladders must be specifically trained in ladder safety. All operations personnel will adhere to the following general safety rules.

- Wear protective equipment and clothing, as specified in Section 6 of this HASP Appendix and as specified in applicable O&M Procedures.
- Do not eat, drink, or use tobacco or cosmetics in restricted work areas.
- Prevent splashing of contaminated groundwater and chemical solutions, and minimize emissions of dust.
- Prevent back injury by never lifting or carrying a load that is heavier than you can comfortably handle. When lifting heavy objects, bend the knees and use the leg muscles, and get assistance when necessary.
- Keep all heat and ignition sources away from combustible liquids, gases, or any flammable materials. When working in areas where combustible gases may be present, use only intrinsically safe (non-sparking) equipment.
- Be familiar with the physical characteristics of the work area, including:

    1. accessibility of other personnel, equipment, and vehicles;
    2. areas of known or suspected chemicals in soil, surface water, or groundwater;
    3. areas where hazardous materials are stored or used;
    4. locations of the safety shower, eye wash fountain, fire extinguishers, and emergency shutdown buttons;
    5. access;
    6. nearest water sources; and
    7. location of communication devices.

- Dispose of wastes generated in accordance with the O&M Procedures.
- Inspect power cords for damage such as cuts and frays. Suspend cords only with nylon rope or plastic “S” hooks.
- When in doubt of your safety, it is better to overprotect.
- Practice defensive driving.
- Wear sturdy outer gloves when handling sharp or rough-surfaced objects.
- Keep a first-aid kit in the work area and/or in a field vehicle when performing field work.

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6.0 PERSONAL PROTECTIVE EQUIPMENT

At a minimum, a modified Level D PPE ensemble will be used with the main objective to prevent unnecessary dermal exposure to contaminated groundwater. Additional PPE shall be used in accordance with specific O&M Procedures for specific GWTP operations and maintenance tasks. The PHSO will be consulted to up- or downgrade any PPE requirements, followed by updating of the appropriate O&M Procedure. The following minimum PPE is required.

SYSTEM OPERATION TASKS

PPE Required[1]	Groundwater Well Maintenance	Effluent Water Sampling	Laboratory Analysis	Treatment System Operations	Chemical Delivery Handling
Steel-Toe/Shank Boots (Rubber)	Av			Av	Av
Steel-Toe/Shank Boots (Leather)	X	X	X	X	X
Hard Hat	X	X	Av	X	X
Safety Glasses/Goggles	X	X	X	X	X
Face Shield			Av	Per O&M Procedure	Per O&M Procedure
Ear Plugs	Av	Av	Av	Per O&M Procedure	Av
Gloves:					
Nitrile Inner/Leather Outer	Av	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure
Nitrile Inner/Rubber Outer	Av	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure
Nitrile Only	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure
Tyvek Coverall (permeable)	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure
Chemically Resistant Coverall	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure
High-visibility Vest	X	Av	Av	Av	Per O&M Procedure
Respirator (particulate cartridge)	Per O&M Procedure			Av	Per O&M Procedure

Other	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure	Per O&M Procedure

Abbreviations
Av = Have available at work site
O = PPE Optional
X = PPE Required

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7.0 ACCESS CONTROL

The purpose of access control is to minimize potential exposure to hazards, to prevent vandalism and access by children and other unauthorized persons, and to provide secure and safe facilities for workers. Fencing, gates, surveillance systems, and building access control will be used to safeguard workers at the project site. Signs will be posted at each door to the GWTP Building stating that only authorized personnel are allowed inside the building. A field log, listing of all personnel present at the project site and listing all visitors, vendors, or contractors is entering the project site will be maintained at the GWTP Building. Arrival and departure times will be noted to enable an accurate roll call for onsite personnel in the event of an emergency.

Work area controls, appropriate safety procedures, and decontamination/PPE areas will be clearly identified to all personnel entering the project area to limit the potential for chemical exposure associated with work activities. Access to the GWTP Building restroom and washing facilities will be identified and provided as appropriate; sanitary facilities in the GWTP Building will be maintained in hygienic conditions at all times.

7.1 COMMUNICATIONS

On-site communications will be by voice, hand-held radio, office phone, or cell phone. Emergency alarms are readily available at locations within the GWTP Building. Personnel entering the GWTP Building will be notified of the locations and use of emergency alarm buttons, which will initiate an emergency shutdown of the GWTP and issue an alarm to offsite and emergency personnel.

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8.0 EMERGENCY RESPONSE

This section defines the emergency action plan for the site. It will be rehearsed with all personnel regularly performing project work, including maintenance subcontractors, and will be reviewed with delivery workers and/or visitors upon their initial visit to the work area, and whenever the plan is modified or the SS or SSO believe that field personnel are unclear about the appropriate emergency actions.

After every emergency is resolved, the entire project team will meet and debrief on the incident—the purpose is not to fix blame, but to improve the planning and response to future emergencies. The debriefing will review the sequence of events, what was done well, and what can be improved. The debriefing will be documented in a written format and communicated to the PHSO. Modifications to the emergency plan will be approved by the PHSO.

Reasonably foreseeable emergency situations include medical emergencies, accidental release of hazardous materials (such as potassium permanganate, lime slurry, or sulfuric acid) or hazardous waste, and general emergencies such as fire, thunderstorm, flooding, and earthquake. It is important that each person present understands his or her role in an emergency, and that s/he remains calm and acts efficiently to ensure everyone's safety. Expected actions for each potential incident are outlined below.

8.1 EMERGENCY EVACUATION

In the event of an emergency that requires evacuation of the GWTP Building, workers inside the building must immediately exit the building through the nearest building exit. One exit is located on each end of the building, as shown on Figure 1. Upon exiting the building, workers shall go to the muster point as shown on Figure 1. This muster point is located west of the building, and should be clear from expected hazards. This location also provides alternate pathways to leave the site, should it be necessary.

This muster point will be communicated to the field personnel and visitors. Hazardous materials and contaminated groundwater are generally present in the GWTP Building, which provides effective containment. Building ventilation exhausts from the roof of the building. In an emergency, all field personnel and visitors will evacuate to the muster point for roll call. The SSO will confirm that all personnel working at the site have evacuated the building and will direct site personnel to take specific actions, such as calling 911 or taking steps to minimize or mitigate dangers.

8.2 MEDICAL EMERGENCIES

In the event of a medical emergency, the following procedures should be used.

1. Stop any imminent hazard if you can safely do it.

2. Remove ill, injured, or exposed person(s) from immediate danger if moving them will clearly not cause them harm, and no hazards exist to the rescuers.

3. Evacuate other personnel present to a safe place in an upwind or cross-wind direction until it is safe for work to resume.

4. If serious injury or life-threatening condition exists, call:

   911 – for paramedics, fire department, police

   Clearly describe the location, injury, and conditions to the dispatcher. Designate a person to go to the site entrance and direct emergency equipment to the injured person(s). Provide the responders with a copy of this health and safety plan, to alert them to chemicals of potential concern.

5. Trained personnel may provide first aid/cardiopulmonary resuscitation if it is necessary and safe to do so. Remove contaminated clothing and PPE only if this can be done without endangering the injured person. Use universal precautions and required PPE (latex or nitrile gloves, barrier mask) if bodily fluid exposure is possible to prevent exposure to pathogens.

6. Call the PHSO and/or PM.

7. Immediately implement steps to prevent recurrence of the accident.

A map showing the nearest hospital location is shown at the end of this section, in Figure 3.
The address and contact information for the nearest hospital is shown below:

Tacoma General Hospital
315 Martin Luther King Jr. Way
Tacoma, WA 98405-4234
(253) 403-1000

Telephone number of nearest Poison Control Center: (800) 222-1222

8.3 ACCIDENTAL RELEASE OF HAZARDOUS MATERIALS OR WASTES

Accidental releases of hazardous materials, contaminated groundwater, or wastes may occur to contained areas or to the environment. Containment systems are in place for areas and operations with the potential to have accidental releases; containment systems are designed to prevent the release from reaching the environment outside the building or containment area. Releases to secondary containment systems present a potential hazard to the site worker but do not present a hazard to the environment, provided that the release is properly addressed by site workers. Releases to areas outside containment systems represent hazards to site workers, the general public, and to the environment.

In the event of personnel exposure to the hazardous process chemicals, including sulfuric acid, lime slurry, or potassium permanganate solution, the affected worker should immediately proceed to the safety shower and eye wash fountain and flush the affected area with water. Activation of the eye wash fountain or safety shower will automatically initiate a safe shutdown of the GWTP and issue an alarm to offsite personnel. Off site personnel will immediately report the incident to emergency response services.

Secondary containment is provided for the areas inside the building where contaminated groundwater or process chemicals are processed or stored. Containment is also provided for the delivery pad and hose connector (Environbox) used to receive bulk shipments of lime slurry. The lime slurry delivery pad provides capability to contain minor spills that may occur during lime slurry deliveries. Releases to secondary containment areas are to be addressed in accordance with the O&M Procedures.

In the event of accidental release of hazardous materials to areas outside the GWTP Building and/or the lime slurry delivery pad, the following procedures must be followed.

1. Evacuate all personnel to a safe place in an upwind direction until the PHSO determines that it is safe for work to resume.

2. Contact the Tacoma Fire Department (911) and inform them of a hazardous material release.

3. Contact the Washington State Emergency Management Division (800) 258-5990 AND the National Response Center (800) 424-8802 in accordance with the procedures for spill response and reporting, as described in the O&M Procedures.

4. Contact or designate a person to contact the PHSO and PM and confirm a response from the PHSO or PM.

5. Contain spill in accordance with the applicable MSDS, if it is possible and if it can be done safely.

6. Initiate cleanup in accordance with the MSDS and using personnel trained in responding to the material that was released.

8.4 GENERAL EMERGENCIES

The following procedures should be followed for general emergencies.

- In the event of a general process failure, the onsite operator can initiate an emergency, safe shutdown of the GWTP using any of the three emergency shutdown switches. An emergency shutdown switch is located near each of the two man doors to the building and one near the safety shower. After activating an emergency shutdown switch, the onsite operator must report the reason to offsite operations personnel and local emergency authorities, as appropriate based on the nature of the emergency shutdown.

- In the case of fire, severe flooding, explosion, earthquake, or other imminent hazard, GWTP operations shall be halted using the emergency shutdown buttons and hazardous materials shall be secured. Site personnel will be immediately evacuated to a safe place. The local police/ fire department shall be notified by calling 911 if the emergency poses a hazard to the community or environment.

- During the incipient phase of a fire, the available fire extinguisher(s) may be used by persons trained in putting out fires, if it is safe for them to do so. The sprinkler system is expected to extinguish significant fires.

- In the event of a thunderstorm, outdoor work will be discontinued until the threat of lightning has abated.

- In the event of a strong earthquake, the work area will be evacuated and secured, and personnel will quickly mobilize to high ground until it is clear that no seiche (inland tsunami) is expected.

8.5 EMERGENCY COMMUNICATIONS

The GWTP is equipped with an autodialer that will issue telephone calls to offsite personnel in the event of emergency conditions detected by process instruments, building instruments, or the emergency shutdown switches. The building smoke alarm and fire alarm systems will issue a local alarm and will alarm local emergency response services if a fire or smoke is detected in the building. Telephone service is also available from the building office that can be used in the event of an emergency.

8.6 EMERGENCY EQUIPMENT

The following minimum emergency equipment will be readily available in the work area and functional at all times:

- First Aid Kit—Contents approved by the PHSO, including two blood borne pathogen barriers;
- A safety shower and eye wash fountain for use if chemical exposure occurs;
- Fire extinguishers and automatic sprinkler system;
- Emergency shutdown buttons (three, one at each man door and one at the safety shower) to shut down the GWTP and issue an offsite alarm;
- Fire alarms and smoke detectors;
- Emergency lighting and exit signs;
- Spill response materials in accordance with the MSDS for the hazardous materials stored onsite
- Spare PPE suitable for working with the hazardous materials present in the GWTP Building; and
- A copy of the current site-specific HASP Appendix.

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B-9.0 APPROVALS

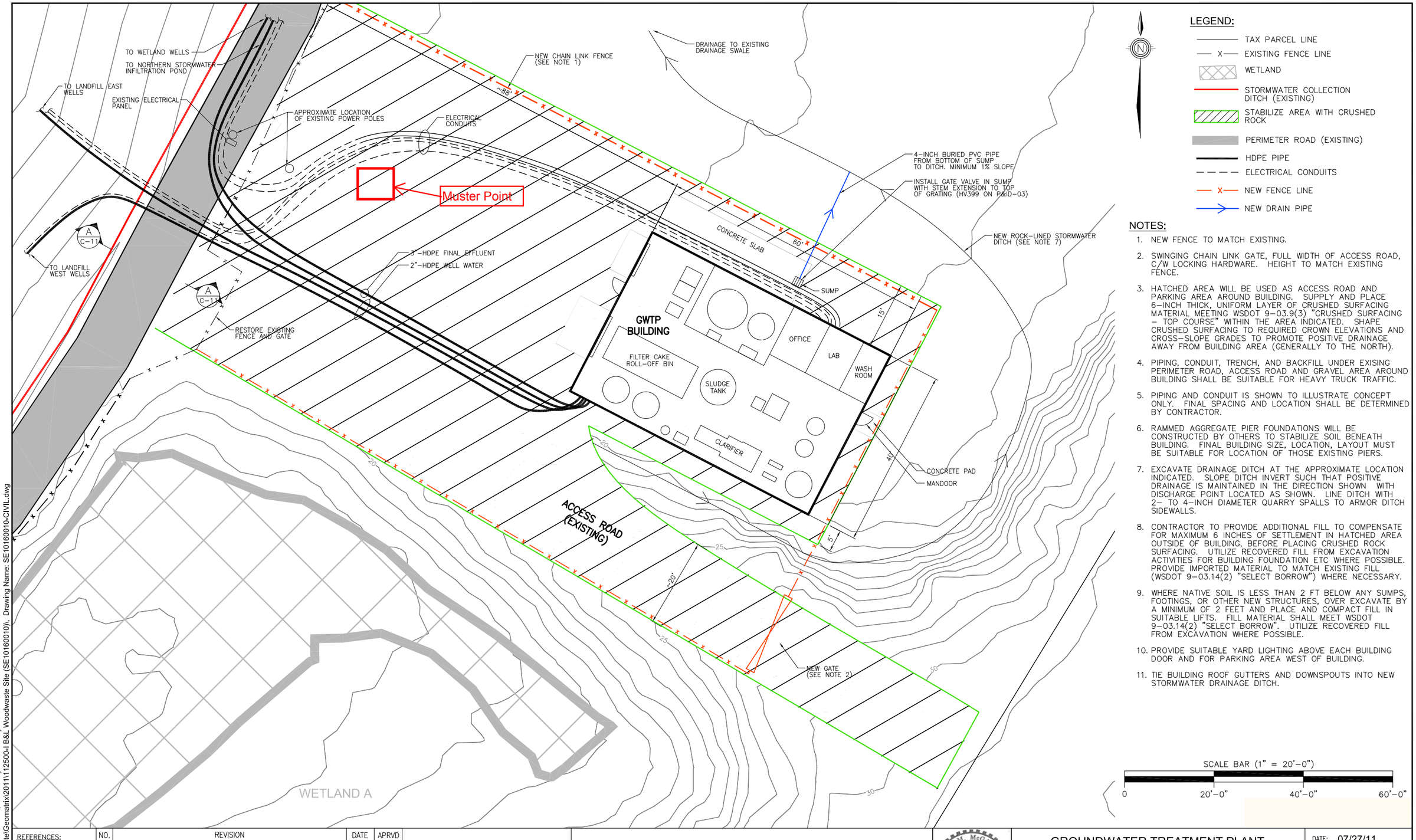
Project Manager — Date: 11-8-12

Project Health & Safety Officer — Date: 11/8/12

Site Safety Officer — Date: 11-8-12

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FIGURES



LEGEND:

- TAX PARCEL LINE
- EXISTING FENCE LINE
- WETLAND
- STORMWATER COLLECTION DITCH (EXISTING)
- STABILIZE AREA WITH CRUSHED ROCK
- PERIMETER ROAD (EXISTING)
- HDPE PIPE
- ELECTRICAL CONDUITS
- NEW FENCE LINE
- NEW DRAIN PIPE

NOTES:

1. NEW FENCE TO MATCH EXISTING.
2. SWINGING CHAIN LINK GATE, FULL WIDTH OF ACCESS ROAD, C/W LOCKING HARDWARE. HEIGHT TO MATCH EXISTING FENCE.
3. HATCHED AREA WILL BE USED AS ACCESS ROAD AND PARKING AREA AROUND BUILDING. SUPPLY AND PLACE 6-INCH THICK, UNIFORM LAYER OF CRUSHED SURFACING MATERIAL MEETING WSDOT 9-03.9(3) "CRUSHED SURFACING - TOP COURSE" WITHIN THE AREA INDICATED. SHAPE CRUSHED SURFACING TO REQUIRED CROWN ELEVATIONS AND CROSS-SLOPE GRADES TO PROMOTE POSITIVE DRAINAGE AWAY FROM BUILDING AREA (GENERALLY TO THE NORTH).
4. PIPING, CONDUIT, TRENCH, AND BACKFILL UNDER EXISING PERIMETER ROAD, ACCESS ROAD AND GRAVEL AREA AROUND BUILDING SHALL BE SUITABLE FOR HEAVY TRUCK TRAFFIC.
5. PIPING AND CONDUIT IS SHOWN TO ILLUSTRATE CONCEPT ONLY. FINAL SPACING AND LOCATION SHALL BE DETERMINED BY CONTRACTOR.
6. RAMMED AGGREGATE PIER FOUNDATIONS WILL BE CONSTRUCTED BY OTHERS TO STABILIZE SOIL BENEATH BUILDING. FINAL BUILDING SIZE, LOCATION, LAYOUT MUST BE SUITABLE FOR LOCATION OF THOSE EXISTING PIERS.
7. EXCAVATE DRAINAGE DITCH AT THE APPROXIMATE LOCATION INDICATED. SLOPE DITCH INVERT SUCH THAT POSITIVE DRAINAGE IS MAINTAINED IN THE DIRECTION SHOWN WITH DISCHARGE POINT LOCATED AS SHOWN. LINE DITCH WITH 2- TO 4-INCH DIAMETER QUARRY SPALLS TO ARMOR DITCH SIDEWALLS.
8. CONTRACTOR TO PROVIDE ADDITIONAL FILL TO COMPENSATE FOR MAXIMUM 6 INCHES OF SETTLEMENT IN HATCHED AREA OUTSIDE OF BUILDING, BEFORE PLACING CRUSHED ROCK SURFACING. UTILIZE RECOVERED FILL FROM EXCAVATION ACTIVITIES FOR BUILDING FOUNDATION ETC WHERE POSSIBLE. PROVIDE IMPORTED MATERIAL TO MATCH EXISTING FILL (WSDOT 9-03.14(2) "SELECT BORROW") WHERE NECESSARY.
9. WHERE NATIVE SOIL IS LESS THAN 2 FT BELOW ANY SUMPS, FOOTINGS, OR OTHER NEW STRUCTURES, OVER EXCAVATE BY A MINIMUM OF 2 FEET AND PLACE AND COMPACT FILL IN SUITABLE LIFTS. FILL MATERIAL SHALL MEET WSDOT 9-03.14(2) "SELECT BORROW". UTILIZE RECOVERED FILL FROM EXCAVATION WHERE POSSIBLE.
10. PROVIDE SUITABLE YARD LIGHTING ABOVE EACH BUILDING DOOR AND FOR PARKING AREA WEST OF BUILDING.
11. TIE BUILDING ROOF GUTTERS AND DOWNSPOUTS INTO NEW STORMWATER DRAINAGE DITCH.

SCALE BAR (1" = 20'-0")

0 20'-0" 40'-0" 60'-0"

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PERMIT	FEB 25	WJM
2	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
3	ISSUED FOR TENDER	MAY 26	WJM
4	ISSUED FOR FINAL ENGINEERING DESIGN	JLY 26	LDV

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

LARRY M. McGAUGHEY STATE OF WASHINGTON 20623 REGISTERED PROFESSIONAL ENGINEER

GROUNDWATER TREATMENT PLANT
PARTIAL SITE PLAN

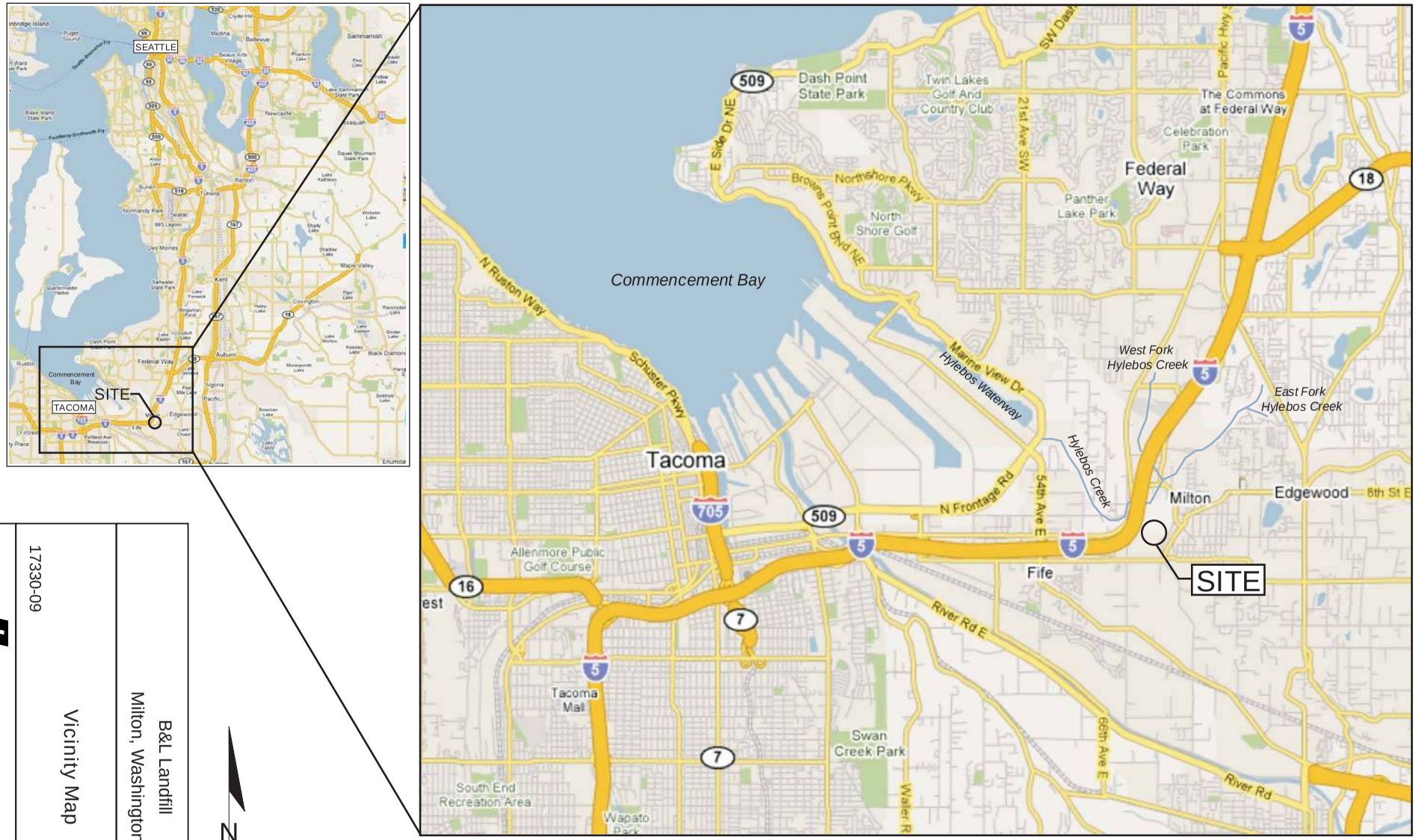
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/27/11
PROJECT NO.: SE10160010

FIGURE 1

Plot Date: 07/27/11 - 8:24am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\12500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-CIVIL.dwg

EAL 05/25/07 1733009-AJ.cdr



B&L Landfill
Milton, Washington

Vicinity Map

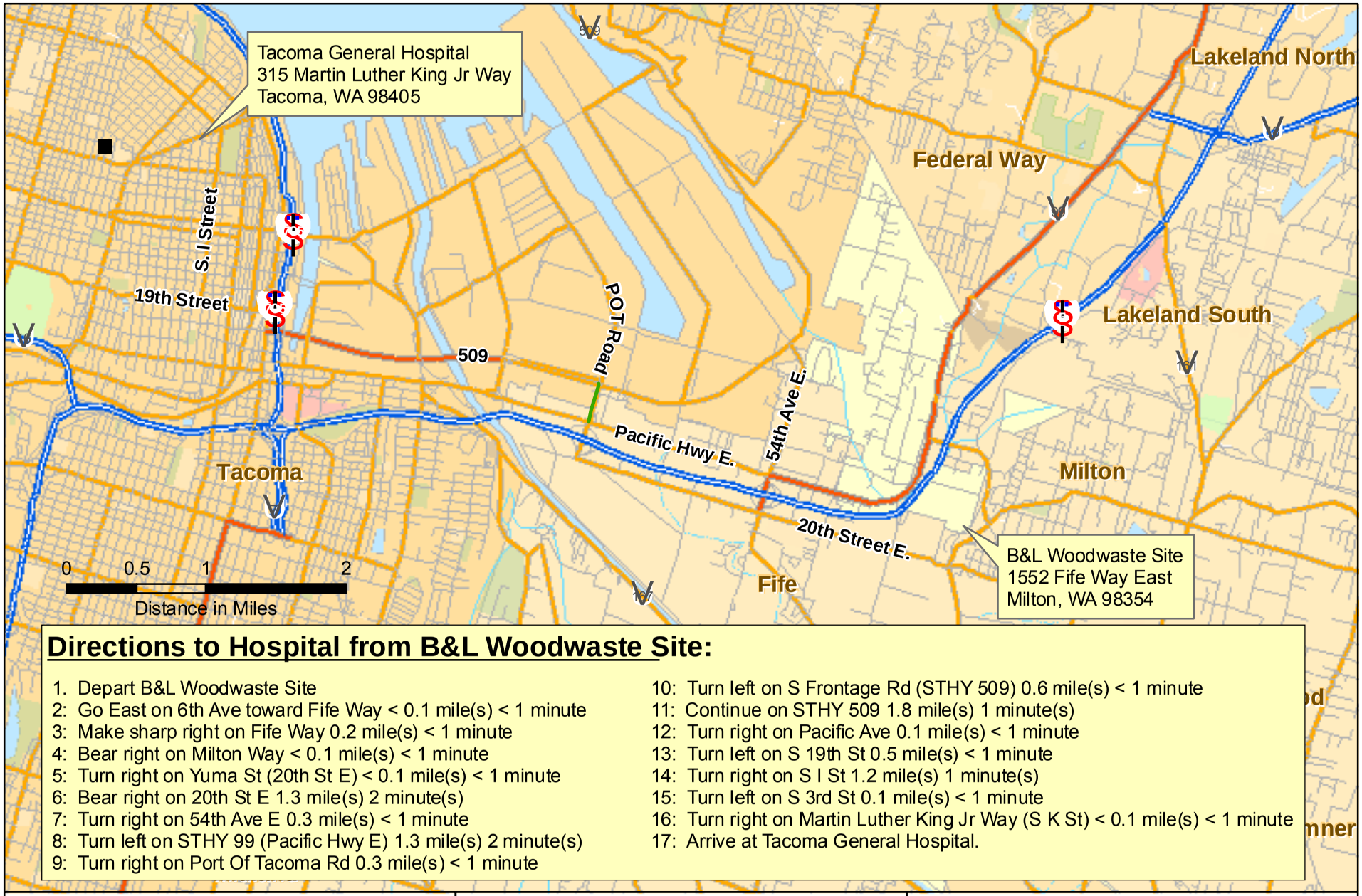
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5/07

Figure 1

HARTCROWSER

Note: Figure based on drawing from Groundwater Alternatives Evaluation Report, prepared by Floyd/Snider, January 2007.



Directions to Hospital from B&L Woodwaste Site:

1. Depart B&L Woodwaste Site
2. Go East on 6th Ave toward Fife Way < 0.1 mile(s) < 1 minute
3. Make sharp right on Fife Way 0.2 mile(s) < 1 minute
4. Bear right on Milton Way < 0.1 mile(s) < 1 minute
5. Turn right on Yuma St (20th St E) < 0.1 mile(s) < 1 minute
6. Bear right on 20th St E 1.3 mile(s) 2 minute(s)
7. Turn right on 54th Ave E 0.3 mile(s) < 1 minute
8. Turn left on STHY 99 (Pacific Hwy E) 1.3 mile(s) 2 minute(s)
9. Turn right on Port Of Tacoma Rd 0.3 mile(s) < 1 minute
10. Turn left on S Frontage Rd (STHY 509) 0.6 mile(s) < 1 minute
11. Continue on STHY 509 1.8 mile(s) 1 minute(s)
12. Turn right on Pacific Ave 0.1 mile(s) < 1 minute
13. Turn left on S 19th St 0.5 mile(s) < 1 minute
14. Turn right on S I St 1.2 mile(s) 1 minute(s)
15. Turn left on S 3rd St 0.1 mile(s) < 1 minute
16. Turn right on Martin Luther King Jr Way (S K St) < 0.1 mile(s) < 1 minute
17. Arrive at Tacoma General Hospital.

FLOYD | SNIDER
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B&L Woodwaste Site
Pierce County, Washington

Figure 1H.1
Route to Hospital Map

File: F:\projects\B&L RIM\GIS\MXD\Figure 1H.1 (Streetmap USA Route to Hospital Map).mxd
6/5/2009 11:02 AM

ATTACHMENT 1

Project Health & Safety Field Meeting Form

PROJECT HEALTH AND SAFETY MEETING FORM

Date: _____ Time: _____ Project No.: 13488

Project Name: B&L Woodwaste Site Groundwater Treatment

Location: 1522 Fife Way East, Milton, WA

Meeting Conducted by: _____

Topics Discussed:

Physical Hazards: _____

Chemical Hazards: _____

Personal Protection: _____

Decontamination: _____

Other: _____

Emergency Information: Tacoma General Hospital 315 Martin Luther King Jr. Way
Tacoma, WA 98405-4234

Attendees

Name/Company (printed)	Signature

Meeting Conducted by: _____

Signature

ATTACHMENT 2

Material Data Safety Sheets

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00244

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #1
Catalog Number: 2797899

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00244
Chemical Name: Phosphoric acid, disodium salt
CAS No.: 7558-79-4
Chemical Formula: Na_2HPO_4
Chemical Family: Inorganic Salt
Hazard: May cause irritation.
Date of MSDS Preparation:
Day: 25
Month: September
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Sodium Phosphate, Dibasic
CAS No.: 7558-79-4
TSCA CAS Number: 7558-79-4
Percent Range: 100.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 17 g/kg.
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Colorless crystals
Odor: None
MAY CAUSE EYE AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 1
Flammability: 0

Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.

NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable

Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: No effects are anticipated
Skin Absorption: No effects anticipated
Target Organs: Not applicable
Ingestion: Very large doses may cause: fever lethargy diarrhea muscular cramps nausea vomiting
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation
Target Organs: None reported
Medical Conditions Aggravated: None reported
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, corrosive and toxic gases may be generated by thermal decomposition.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: Toxic fumes of: phosphorus oxides
Fire / Explosion Hazards: None reported
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Dry chemical. Carbon dioxide Water.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:

Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as a hazardous water pollutant.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Protect from: heat moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes Do not breathe: dust Wash thoroughly after handling. Protect from: heat moisture
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Colorless crystals
Physical State: Solid
Molecular Weight: 141.96 g/mol
Odor: None
pH: 9.1 (1% solution)
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Not determined
Specific Gravity (water = 1): 1.62
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not determined
Solubility:
Water: Soluble
Acid: Not determined
Other: Insoluble in alcohol
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Extreme temperatures Excess moisture
Reactivity / Incompatibility: None reported
Hazardous Decomposition: Toxic fumes of: phosphorus oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: Oral rat LD50 = 17 g/kg.
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Eye irritation rabbit: 500mg/24 hrs = MILD; Skin irritation rabbit: 500 mg/24 hrs = MILD.
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: --
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: Not applicable
Special Instructions (Disposal): Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA

ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Sodium phosphate, dibasic 5000 lbs.
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Sodium phosphate, dibasic - RQ 5000 lbs.
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: TSCA Listed: Yes
TSCA CAS Number: 7558-79-4

16. OTHER INFORMATION

Intended Use: Laboratory Reagent
References: CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Vendor Information. Technical Judgment. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans. World Health Organization (Volumes 1-42) Supplement 7. France: 1987. List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labeling of

Dangerous Substances, Amended July 1992. Sixth Annual Report on Carcinogens, 1991. U.S. Department of Health and Human Services. Rockville, MD: Technical Resources, Inc. 1991.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

HACH COMPANY ©2009

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M01887

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #2
Catalog Number: 2797799

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M01887
Chemical Name: Potassium peroxymonosulfate
CAS No.: 70693-62-8
Chemical Formula: $H_3K_5S_4O_{18}$
Chemical Family: Oxidizing Agents
Hazard: Oxidizer. Causes burns. May cause allergic reaction.
Date of MSDS Preparation:
Day: 25
Month: August
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Oxone, monopersulfate compound
CAS No.: 70693-62-8
TSCA CAS Number: Not Applicable
Percent Range: 100.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 2000 mg/kg.
LC50: Inhalation rat LC50 > 5 mg/l/4H.
TLV: Not Established
PEL: Not Established
Hazard: Oxidizer. Causes burns. May cause allergic reaction.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White powder
Odor: None
CAUSES BURNS CAUSES RESPIRATORY TRACT IRRITATION MAY CAUSE ALLERGIC REACTION

STRONG OXIDIZER: CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE

HMIS:
Health: 2

Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 2
Flammability: 0
Reactivity: 0
Symbol: oxy
Potential Health Effects:
Eye Contact: Causes eye burns.
Skin Contact: Causes burns. May cause allergic reaction
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: gastrointestinal irritation
Target Organs: None reported
Inhalation: Causes: irritation of nose and throat
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Skin conditions Eye conditions Allergies or sensitivity to potassium persulfate.
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Remove contaminated clothing. Call physician immediately.
Ingestion (First Aid): Do not induce vomiting. Give 1-2 glasses of water. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. Call physician.

5. FIRE FIGHTING MEASURES

Flammable Properties: Strong oxidizer. Contact with combustible materials may cause a fire. During a fire, this product decomposes to form toxic gases.
Flash Point: Not Determined
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not Applicable
Upper Explosion Limits: Not Applicable
Autoignition Temperature: Not Determined
Hazardous Combustion Products: This material will not burn.
Fire / Explosion Hazards: May react violently with: oxidizable materials
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Water.

Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear. Evacuate area and fight fire from a safe distance.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment. Cover spilled solid material with sand or other inert material.
Clean-up Technique: Cover with an inert material, such as sand. Sweep up material. Work in an approved fume hood. Working in small batches, dilute with excess water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Filter to remove solids. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: a pound or more of loose powder is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as RCRA hazardous waste.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep away from: reducers oxidizable materials Protect from: moisture heat
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Use a fume hood to avoid exposure to dust, mist or vapor.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: lab coat disposable latex gloves
Inhalation Protection: laboratory fume hood
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: oxidizable materials reducers
TLV: Not Established
PEL: Not Established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White powder
Physical State: Solid
Molecular Weight: 614.9
Odor: None
pH: 1% solution = 2.3; 3% solution = 2.0
Vapor Pressure: Nil
Vapor Density (air = 1): Not Determined
Boiling Point: Not Determined
Melting Point: Decomposes
Specific Gravity (water = 1): 1.1 - 1.4

Evaporation Rate (water = 1): Not Applicable
Volatile Organic Compounds Content: Not Applicable
Partition Coefficient (n-octanol / water): Not Applicable
Solubility:
Water: Soluble
Acid: Not Determined
Other: Not Determined
Metal Corrosivity:
Steel: Not Determined
Aluminum: Not Determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Excess moisture Exposure to air. Heating to decomposition.
Reactivity / Incompatibility: May react violently in contact with: oxidizable material reducers
Hazardous Decomposition: Heating to decomposition releases: oxygen sulfur oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: Oral rat LD50 = 2000 mg/kg.
LC50: Inhalation rat LC50 > 5 mg/l/4H.
Dermal Toxicity Data: Skin rabbit LD50 > 11,000 mg/kg.
Skin and Eye Irritation Data: None Reported
Mutation Data: None Reported
Reproductive Effects Data: None Reported
Ingredient Toxicological Data: Not Applicable
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Work in an approved fume hood. Dilute material with excess water making a weaker than 5% solution. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash. Rinsate from empty containers may contain sufficient product to require disposal as hazardous waste.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Corrosive Solid, Acidic, Inorganic, N.O.S.

Potassium Monopersulfate
DOT Hazard Class: 8
DOT Subsidiary Risk: NA
DOT ID Number: UN3260
DOT Packing Group: III
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Corrosive Solid, Acidic, Inorganic, N.O.S.
Potassium Monopersulfate
ICAO Hazard Class: 8
ICAO Subsidiary Risk: NA
ICAO ID Number: UN3260
ICAO Packing Group: III
I.M.O.:
I.M.O. Proper Shipping Name: Corrosive Solid, Acidic, Inorganic, N.O.S.
Potassium Monopersulfate
I.M.O. Hazard Class: 8
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: UN3260
I.M.O. Packing Group: III
Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
Fire Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): Not Applicable
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not Applicable

16. OTHER INFORMATION

Intended Use: Laboratory Reagent

References: TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Technical Judgment. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labeling of Dangerous Substances, Amended July 1992. In-house information. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor).
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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(970) 669-3050

MSDS No: M01888

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #3
Catalog Number: 2797999

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M01888
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: May cause irritation.
Date of MSDS Preparation:
Day: 25
Month: August
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Ethylenediaminetetraacetic Acid, Disodium Salt
CAS No.: 6381-92-6
TSCA CAS Number: 139-33-3
Percent Range: < 55
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 2000 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

EDTA Tetrasodium Salt
CAS No.: 64-02-8
TSCA CAS Number: 64-02-8
Percent Range: < 55
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White crystals
Odor: None
MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 1
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: May cause irritiation
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: irritation of the mouth and esophagus calcium deficiency in the blood gastrointestinal irritation Very large doses may cause: kidney damage
Target Organs: Kidneys
Inhalation: May cause: irritation of nose and throat
Target Organs: None reported
Medical Conditions Aggravated: None reported
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with soap and plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Combustion generates toxic fumes.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable

Autoignition Temperature: Not determined
Hazardous Combustion Products: Toxic fumes of: sodium oxides carbon monoxide, carbon dioxide. nitrogen oxides.
Fire / Explosion Hazards: None reported
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Adjust to a pH between 6 and 9. Use sulfuric or citric acid to lower pH. Use soda ash or sodium bicarbonate to increase pH. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: a pound or more of loose powder is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: None

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Protect from: oxidizers heat moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: oxidizers heat moisture
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White crystals
Physical State: Solid
Molecular Weight: Not applicable
Odor: None
pH: Not determined

Vapor Pressure: Not determined
Vapor Density (air = 1): Not determined
Boiling Point: Not determined
Melting Point: Not determined
Specific Gravity (water = 1): Not determined
Evaporation Rate (water = 1): Not determined
Volatile Organic Compounds Content: Not determined
Partition Coefficient (n-octanol / water): Not determined
Solubility:
Water: Soluble
Acid: Soluble
Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Extreme temperatures Excess moisture
Reactivity / Incompatibility: May react violently in contact with: oxidizers
Hazardous Decomposition: Toxic fumes of: nitrogen oxides carbon dioxide carbon monoxide sodium oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: EDTA Tetrasodium Salt: Skin rabbit 500mg/24H, MODERATE; Eye rabbit 1900µg; Eye rabbit 100mg/24H, MODERATE.
Mutation Data: EDTA Disodium Salt: Cytogenetic analysis Hamster lung at 200mg/L.
Reproductive Effects Data: None reported
Ingredient Toxicological Data: EDTA Disodium Salt: Oral rat LD50 = 2000 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: EDTA Tetrasodium Salt: BOD 0.02 g/g; COD 0.54 g/g; Fish toxicity: Bluegill LC50 = 410 mg/l for 96 hours.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dilute material with excess water making a weaker than 5% solution. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.

NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).

TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Laboratory Reagent

References: TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Technical Judgment. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. In-house information. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor).

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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(970) 669-3050

MSDS No: M00007

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #4
Catalog Number: 45429

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00007
Chemical Name: Sulfamic Acid
CAS No.: 5329-14-6
Chemical Formula: H_3NO_3S
Chemical Family: Inorganic Acid
Hazard: Causes eye burns.
Date of MSDS Preparation:
Day: 25
Month: 06
Year: 2010

2. COMPOSITION / INFORMATION ON INGREDIENTS

Other component
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: < 1.0
Percent Range Units: weight / weight
LD50: Not applicable
LC50: Not applicable
TLV: Not established
PEL: Not established
Hazard: Any ingredient(s) of this product listed as "Other component(s)" is not considered a health hazard to the user of this product.

Sulfamic Acid
CAS No.: 5329-14-6
TSCA CAS Number: 5329-14-6
Percent Range: > 99.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 3160 mg/kg.
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes eye burns.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White crystals

Odor: None
CAUSES EYE BURNS CAUSES SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 2
Flammability: 1
Reactivity: 1
Protective Equipment: X - See protective equipment, Section 8.

NFPA:
Health: 2
Flammability: 1
Reactivity: 1
Symbol: Not applicable

Potential Health Effects:
Eye Contact: Causes eye burns.
Skin Contact: Causes severe irritation
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: irritation of the mouth and esophagus gastrointestinal irritation
Target Organs: None reported
Inhalation: May cause: irritation of nose and throat
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Eye conditions Skin conditions Respiratory conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No
IARC Listed: No
NTP Listed: No
Additional Cancer / Reproductive Toxicity Information: Not applicable

Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Call physician immediately.
Ingestion (First Aid): Do not induce vomiting. Give 1-2 glasses of water. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, irritating and highly toxic gases may be generated by thermal decomposition.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: Toxic fumes of: ammonia nitrogen oxides. sulfur oxides.
Fire / Explosion Hazards: May react violently with: chlorine / chlorine compounds metal nitrates metal nitrites nitric acid
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Dry chemical. Water.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:

Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment. Cover spilled solid material with sand or other inert material.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: a pound or more of loose powder is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as RCRA hazardous waste in the U.S.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Maintain general industrial hygiene practices when using this product.
Storage: Store away from: oxidizers alkalies chlorine/chlorinated metals Protect from: heat moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: alkalies metals Protect from: heat moisture
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White crystals
Physical State: Solid
Molecular Weight: 97.10
Odor: None
pH: 1% soln = 1.18
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Product decomposes at 205 °C; 401 °F
Specific Gravity/ Relative Density (water = 1; air =1): 2.15
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): None reported
Solubility:
Water: 1:2 ratio @ 80 ° C (176 °F)
Acid: Soluble
Other: Slightly soluble in alcohol, methanol.
Metal Corrosivity:
Steel: 0.814 in/yr
Aluminum: 0.212 in/yr

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.

Conditions to Avoid: Heating to decomposition. Excess moisture
Reactivity / Incompatibility: May react violently in contact with: chlorates metal nitrates metal nitrites nitric acid Incompatible with: alkalies oxidizers
Hazardous Decomposition: Heating to decomposition releases toxic and/or corrosive fumes of: ammonia nitrogen oxides sulfur oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: Oral rat LD50 = 3160 mg/kg.
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Skin Human 4%/5 days intermittent MILD, Skin rabbit 500 mg/24H SEVERE, Eye rabbit 20mg MODERATE, Eye rabbit 250µg/24H SEVERE.
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: --
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Sulphamic Acid
--
DOT Hazard Class: 8
DOT Subsidiary Risk: NA
DOT ID Number: UN2967
DOT Packing Group: III
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Sulphamic Acid
--
ICAO Hazard Class: 8
ICAO Subsidiary Risk: NA
ICAO ID Number: UN2967
ICAO Packing Group: III
I.M.O.:
I.M.O. Proper Shipping Name: Sulphamic Acid
--
I.M.O. Hazard Class: 8
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: UN2967
I.M.O. Packing Group: III

Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.

--

302 (EHS) TPQ (40 CFR 355): Not applicable

304 CERCLA RQ (40 CFR 302.4): Not applicable

304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Not applicable

RCRA: Contains no RCRA regulated substances.

C.P.S.C.: Not applicable

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.

Identification of Prop. 65 Ingredient(s): Not applicable

California Perchlorate Rule CCR Title 22 Chap 33:

Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: TSCA Listed: Yes

TSCA CAS Number: 5329-14-6

16. OTHER INFORMATION

Intended Use: Laboratory Use

References: Vendor Information. NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U.S. Department of Health and Human Services, April, 1987. Gosselin, R. E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. Outside Testing. Technical Judgment. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992.

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M01157

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #5
Catalog Number: 2798199

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M01157
Chemical Name: Zinc
CAS No.: 7440-66-6
Chemical Formula: Zn
Chemical Family: Inorganic Metals
Hazard: Flammable solid. Finely divided dust may be flammable or explosive. May cause irritation.
Date of MSDS Preparation:
Day: 18
Month: February
Year: 2009

2. COMPOSITION / INFORMATION ON INGREDIENTS

Zinc
CAS No.: 7440-66-6
TSCA CAS Number: 4770-66-6
Percent Range: > 99.0
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: 5 mg/m^3 (ZnO)
PEL: 5 mg/m^3 (ZnO)
Hazard: Flammable solid. Finely divided dust may be flammable or explosive. May cause irritation.

Impurities
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: < 1.0
Percent Range Units: weight / weight
LD50: None reported.
LC50: None reported.
TLV: Not established.
PEL: Not established.
Hazard: Not applicable

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Bluish-gray powder
Odor: None
MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION

FLAMMABLE SOLID DANGEROUS WHEN EXPOSED TO HEAT, FLAMES OR OXIDIZERS

HMIS:
Health: 1
Flammability: 1
Reactivity: 1
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 1
Reactivity: 1
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: Causes mild irritation
Skin Absorption: No effects anticipated
Target Organs: Not applicable
Ingestion: Very large doses may cause: thirst sweating gastrointestinal irritation abdominal pain
Target Organs: None reported
Inhalation: May cause: irritation of nose and throat coughing difficult breathing sweating
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Skin conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician if irritation develops.
Skin Contact (First Aid): Wash skin with plenty of water.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, irritating and highly toxic gases may be generated by thermal decomposition.
Flash Point: Not determined
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable

Autoignition Temperature: Not determined
Hazardous Combustion Products: zinc oxide
Fire / Explosion Hazards: Finely divided dust may form a flammable or explosive mixture with air. May form explosive mixtures with: oxidizers
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Sand or inert dry powder Do NOT use water.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Sweep up material. Dispose of material in an E.P.A. approved hazardous waste facility. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes Do not breathe dust. Wash thoroughly after handling. Use with adequate ventilation. Maintain general industrial hygiene practices when using this product.
Storage: Protect from: heat moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes Do not breathe: dust Wash thoroughly after handling. Use with adequate ventilation. Protect from: heat moisture
TLV: 5 mg/m^3 (ZnO)
PEL: 5 mg/m^3 (ZnO)

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Bluish-gray powder
Physical State: Solid
Molecular Weight: 65.37
Odor: None
pH: Not applicable
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: 907° C (1665° F)

Melting Point: 419° C (786° F)
Specific Gravity (water = 1): 7.14
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Insoluble
Acid: Soluble
Other: Soluble in alkali solutions
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heating to decomposition. Avoid creating dust.
Reactivity / Incompatibility: Incompatible with: Barium dioxide barium nitrate cadmium carbon disulfide chlorates chlorine fluorine hydroxylamine sulfur magnesium manganese chloride potassium chloride selenium
Hazardous Decomposition: Heating to decomposition releases: zinc oxide
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Skin human 300 µg/3D (Intermittent) - MILD
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: --
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dispose of material in an E.P.A. approved hazardous waste facility.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:

D.O.T. Proper Shipping Name: Zinc Powder

--

DOT Hazard Class: 4.3

DOT Subsidiary Risk: 4.2

DOT ID Number: UN1436

DOT Packing Group: III

I.C.A.O.:

I.C.A.O. Proper Shipping Name: Zinc Powder

--

ICAO Hazard Class: 4.3

ICAO Subsidiary Risk: 4.2

ICAO ID Number: UN1436

ICAO Packing Group: III

I.M.O.:

I.M.O. Proper Shipping Name: Zinc Powder

--

I.M.O. Hazard Class: 4.3

I.M.O. Subsidiary Risk: 4.2

I.M.O. ID Number: UN1436

I.M.O. Packing Group: III

Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
Fire Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product contains a chemical(s) subject to the reporting requirements of Section 313 of Title III of SARA.
Zinc

302 (EHS) TPQ (40 CFR 355): Not applicable

304 CERCLA RQ (40 CFR 302.4): Zinc 1000 lbs.

304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Not applicable

RCRA: Contains no RCRA regulated substances.

C.P.S.C.: Not applicable

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.

Identification of Prop. 65 Ingredient(s): None

California Perchlorate Rule CCR Title 22 Chap 33:

Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: TSCA Listed: Yes

TSCA CAS Number: 4770-66-6

16. OTHER INFORMATION

Intended Use: Laboratory Reagent

References: Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. In-house information. Patty, Frank A. Industrial Hygiene and Toxicology, 3rd Revised Edition. Volume 2. New York: A Wiley-Interscience Publication, 1981. Prager, Jan C. Environmental Contaminants Reference Databook, Volumes I and II. Van Nostrand Reinhold Company, New York. Sax, N. Irving and Richard J. Lewis, Sr., revised by. Hawley's Condensed Chemical Dictionary, Eleventh Ed. New York: Van Nostrand Reinhold Co., 1987. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. Technical Judgment. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Vendor Information.

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

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P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00024

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Ferrous Iron Reagent
Catalog Number: 103769

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00024
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: May cause irritation.
Date of MSDS Preparation:
Day: 05
Month: October
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

1, 10-Phenanthroline
CAS No.: 5144-89-8
TSCA CAS Number: 66-71-7
Percent Range: 1.0 - 10.0
Percent Range Units: weight / weight
LD50: Oral Rat LD_{50} = 132 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

Sodium Bicarbonate
CAS No.: 144-55-8
TSCA CAS Number: 144-55-8
Percent Range: 90.0 - 100.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 4220 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White powder
Odor: Not determined
MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 1
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: May cause irritiation
Skin Absorption: None reported
Target Organs: None reported
Ingestion: Very large doses may cause: abdominal pain gastrointestinal disturbances alkalosis which causes abnormally high alkali reserve of the blood and other body fluids hypotension
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Kidney conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with soap and plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Does not burn, but may melt in a fire, releasing toxic fumes.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable

Hazardous Combustion Products: Toxic fumes of: sodium monoxide nitrogen oxides. carbon monoxide, carbon dioxide.
Fire / Explosion Hazards: None reported
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Water. Carbon dioxide Dry chemical.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Flush the spilled material to the drain with a large excess of water. Decontaminate the area of the spill with a weak acid solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: None

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep container tightly closed when not in use. Protect from: moisture oxidizers
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: oxidizers
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White powder
Physical State: Solid
Molecular Weight: Not applicable
Odor: Not determined
pH: Not determined
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable

Boiling Point: Not applicable
Melting Point: Not determined
Specific Gravity (water = 1): 2.10
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Slightly soluble
Acid: Slightly soluble
Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Excess moisture Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: oxidizers
Hazardous Decomposition: Toxic fumes of: nitrogen oxides sodium oxides carbon monoxide carbon dioxide
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Sodium Bicarbonate: Eye - rabbit - 100 mg/30 seconds - MILD; Skin - Human - 30 mg/3 days intermittent - MILD
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Sodium Bicarbonate: Oral rat LD_{50} = 4220 mg/kg; 1, 10-Phenanthroline: Oral rat LD_{50} = 132 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dilute material with excess water making a weaker than 5% solution. Open cold water tap completely, slowly pour the material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:

D.O.T. Proper Shipping Name: Not Currently Regulated

--

DOT Hazard Class: NA

DOT Subsidiary Risk: NA

DOT ID Number: NA

DOT Packing Group: NA

I.C.A.O.:

I.C.A.O. Proper Shipping Name: Not Currently Regulated

--

ICAO Hazard Class: NA

ICAO Subsidiary Risk: NA

ICAO ID Number: NA

ICAO Packing Group: NA

I.M.O.:

I.M.O. Proper Shipping Name: Not Currently Regulated

--

I.M.O. Hazard Class: NA

I.M.O. Subsidiary Risk: NA

I.M.O. ID Number: NA

I.M.O. Packing Group: NA

Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply. ALSO NOTE: If the National Competent Authority declares this product an environmental hazard by Special Provision 909 (IMDG) and Special Provision A97 (IATA) the classification may be UN3077 or UN3082.

15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.

--

302 (EHS) TPQ (40 CFR 355): Not applicable

304 CERCLA RQ (40 CFR 302.4): Not applicable

304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Not applicable

RCRA: Contains no RCRA regulated substances.

C.P.S.C.: Not applicable

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.

Identification of Prop. 65 Ingredient(s): None

California Perchlorate Rule CCR Title 22 Chap 33:

Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).

TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Iron determination

References: TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). In-house information. Technical Judgment. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991.

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

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Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00024

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Ferrous Iron Reagent
Catalog Number: 2514025

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00024
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: May cause irritation.
Date of MSDS Preparation:
Day: 05
Month: October
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

1, 10-Phenanthroline
CAS No.: 5144-89-8
TSCA CAS Number: 66-71-7
Percent Range: 1.0 - 10.0
Percent Range Units: weight / weight
LD50: Oral Rat LD_{50} = 132 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

Sodium Bicarbonate
CAS No.: 144-55-8
TSCA CAS Number: 144-55-8
Percent Range: 90.0 - 100.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 4220 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White powder
Odor: Not determined
MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 1
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: May cause irritiation
Skin Absorption: None reported
Target Organs: None reported
Ingestion: Very large doses may cause: abdominal pain gastrointestinal disturbances alkalosis which causes abnormally high alkali reserve of the blood and other body fluids hypotension
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Kidney conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with soap and plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Does not burn, but may melt in a fire, releasing toxic fumes.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable

Autoignition Temperature: Not applicable
Hazardous Combustion Products: Toxic fumes of: sodium monoxide nitrogen oxides. carbon monoxide, carbon dioxide.
Fire / Explosion Hazards: None reported
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Water. Carbon dioxide Dry chemical.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Flush the spilled material to the drain with a large excess of water. Decontaminate the area of the spill with a weak acid solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: None

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep container tightly closed when not in use. Protect from: moisture oxidizers
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: oxidizers
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White powder
Physical State: Solid
Molecular Weight: Not applicable
Odor: Not determined
pH: Not determined
Vapor Pressure: Not applicable

Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Not determined
Specific Gravity (water = 1): 2.10
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Slightly soluble
Acid: Slightly soluble
Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Excess moisture Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: oxidizers
Hazardous Decomposition: Toxic fumes of: nitrogen oxides sodium oxides carbon monoxide carbon dioxide
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Sodium Bicarbonate: Eye - rabbit - 100 mg/30 seconds - MILD; Skin - Human - 30 mg/3 days intermittent - MILD
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Sodium Bicarbonate: Oral rat LD_{50} = 4220 mg/kg; 1, 10-Phenanthroline: Oral rat LD_{50} = 132 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dilute material with excess water making a weaker than 5% solution. Open cold water tap completely, slowly pour the material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.

NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply. ALSO NOTE: If the National Competent Authority declares this product an environmental hazard by Special Provision 909 (IMDG) and Special Provision A97 (IATA) the classification may be UN3077 or UN3082.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).

TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Iron determination

References: TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). In-house information. Technical Judgment. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991.

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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(970) 669-3050

MSDS No: M00023

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Buffer Powder Citrate Type
Catalog Number: 2107669

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00023
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: Causes moderate eye irritation.
Date of MSDS Preparation:
Day: 21
Month: May
Year: 2009

2. COMPOSITION / INFORMATION ON INGREDIENTS

Citric Acid
CAS No.: 77-92-9
TSCA CAS Number: 77-92-9
Percent Range: 15.0 - 25.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 6730 mg/Kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes severe eye irritation.

Sodium Phosphate Monobasic
CAS No.: 7782-85-6
TSCA CAS Number: 7558-79-4
Percent Range: 45.0 - 55.0
Percent Range Units: weight / weight
LD50: Oral rat LD_{50} = 12930 mg/kg.
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

Sodium Sulfate
CAS No.: 7757-82-6
TSCA CAS Number: 7757-82-6

Percent Range: 30.0 - 40.0
Percent Range Units: weight / weight
LD50: Oral mouse LD50 = 5989 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White powder
Odor: None
CAUSES EYE IRRITATION MAY CAUSE SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 1
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: Causes irritation
Skin Contact: May cause irritiation
Skin Absorption: No effects anticipated
Target Organs: Not applicable
Ingestion: Very large doses may cause: nausea vomiting diarrhea lethargy muscular cramps fever
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Eye conditions
Chronic Effects: Citric acid chronic overexposure may cause effects due to the ability of citric acid to chelate metals, which could impair the body's ability to absorb calcium and iron.
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.

Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Can burn in fire, releasing toxic vapors.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not determined
Hazardous Combustion Products: Toxic fumes of: phosphorus oxides sodium monoxide sulfur oxides. carbon monoxide, carbon dioxide.
Fire / Explosion Hazards: May react violently with: aluminum / aluminum compounds metal nitrates
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Water.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Flush the spilled material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Mixture contains a component which is regulated as a water pollutant.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Store at 10 - 30°C. Keep container tightly closed when not in use. Protect from: moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes Do not breathe: dust Wash thoroughly after handling. Protect from: moisture
TLV: Not established

PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White powder
Physical State: Solid
Molecular Weight: Not applicable
Odor: None
pH: of 1% solution at 23 °C = 6.35
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: 160 °C 320 °F
Specific Gravity (water = 1): 2.30
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not determined
Partition Coefficient (n-octanol / water): Not determined
Solubility:
Water: Soluble
Acid: Not determined
Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Excess moisture Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: metal nitrates aluminum
Hazardous Decomposition: Toxic fumes of: phosphorus oxides sulfur oxides carbon monoxide carbon dioxide
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Citric Acid Skin rabbit 500 mg/24 hour: MODERATE. Citric Acid Eye rabbit 750 µg/24 hour: SEVERE.
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Citric acid Oral rat LD50 = 6730 mg/kg; Sodium Sulfate Oral mouse LD50 = 5989 mg/kg; Sodium Phosphate Oral rat LD50 = 17 g/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: Sodium Sulfate: Aquatic Toxicity: TLm 13500 mg/L bluegill sunfish / 96 hours, TLm 16500 mg/L mosquito fish / 96 hours

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: Not applicable
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Open cold water tap completely, slowly pour the material to the drain. Flush system with plenty of water.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Sodium phosphate, dibasic 5000 lbs.
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Sodium phosphate, dibasic - RQ 5000 lbs.

RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Determination of manganese
References: NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U.S. Department of Health and Human Services, April, 1987. CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Technical Judgment. In-house information. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00021

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sodium Periodate
Catalog Number: 2107769

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00021
Chemical Name: Sodium Periodate
CAS Number: 7790-28-5
Additional CAS No. (for hydrated forms): Not applicable
Chemical Formula: $NaIO_4$
Chemical Family: Oxidizing Agents
Intended Use: Laboratory Use

2. HAZARDS IDENTIFICATION

GHS Classification:
Hazard categories: Oxidizing Solids: Ox. Sol. 2 Acute Toxicity: Acute Tox. 4-Orl
GHS Label Elements:
DANGER



Hazard statements: May intensify fire; oxidiser. Harmful if swallowed.
Precautionary statements: Keep/Store away from clothing/combustible materials. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. In case of fire: Use dry sand, extinquishing powder, foam or water for extinction. Wear protective gloves / protective clothing / eye protection / face protection. IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth.
HMIS:
Health: 2
Flammability: 0
Reactivity: 2
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 2
Flammability: 0
Reactivity: 2
Symbol: oxy

3. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Components according to GHS: Yes
Sodium m-Periodate

CAS Number: 7790-28-5
Chemical Formula: $NaIO_4$
GHS Classification: Ox. Sol. 2, H272; Acute Tox. Orl. 4, H302
Percent Range: 100.0
Percent Range Units: weight / weight
PEL: Not established
TLV: Not established

4. FIRST AID

General Information: In the event of exposure, show this Material Safety Data Sheet and label (where possible) to a doctor.
Advice to doctor: Treat symptomatically.
Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Remove contaminated clothing. Call physician immediately.
Inhalation: Remove to fresh air.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.

5. FIRE FIGHTING MEASURES

Flammable Properties: Strong oxidizer. Contact with combustible materials may cause a fire.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear. Evacuate area and fight fire from a safe distance.
Extinguishing Media: Water. Carbon dioxide Dry chemical.
Extinguishing Media NOT To Be Used: Not applicable
Fire / Explosion Hazards: May react violently with: strong reducers
Hazardous Combustion Products: Toxic fumes of: iodine iodine compounds sodium monoxide

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.
Containment Technique: Stop spilled material from being released to the environment. Cover spilled solid material with sand or other inert material.
Clean-up Technique: Working in small batches, dilute with excess water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Flush reacted material to the drain with a large excess of water. Decontaminate site with an alkali solution.
Evacuation Procedure: Evacuate general area (50 foot radius or as directed by your facility's emergency response plan) when: any quantity is spilled. If conditions warrant, increase the size of the evacuation.
DOT Emergency Response Guide Number: 140

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin clothing Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Protect from: moisture oxidizable materials all sources of ignition
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields

Skin Protection: lab coat disposable latex gloves In the EU, the selected gloves must satisfy the specifications of EU Directive 89/686/EEC and standard EN 374 derived from it.
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin clothing Do not breathe: dust Wash thoroughly after handling.
TLV: Not established
PEL: Not established
For Occupational Exposure Limits (OEL) for ingredients, see section 3 - Composition/Information on Ingredients.:

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White powder
Physical State: Solid
Molecular Weight: 214.0
Odor: None
Odor Threshold: Odorless
pH: of 5% solution = 4 - 4.5
Metal Corrosivity:
Corrosivity Classification: Not classified as corrosive to metals according to GHS criteria.
Steel: Not determined
Aluminum: Not determined
Specific Gravity/ Relative Density (water = 1; air =1): 3.865
Viscosity: Not applicable
Solubility:
Water: Soluble - 14.4 g/100 g of water
Acid: Soluble
Other: Not determined
Partition Coefficient (n-octanol / water): Not determined
Coefficient of Water / Oil: Not determined
Melting Point: 300°C 572°F
Decomposition Temperature: > 300 °C
Boiling Point: Not applicable
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Flammable Properties: Strong oxidizer. Contact with combustible materials may cause a fire.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not determined
Explosive Properties:
Not applicable Not classified according to GHS criteria.
Oxidizing Properties:
Not applicable Not classified according to GHS criteria.
Reactivity Properties:
Not applicable Not classifed as self-reactive, pyrophoric, self-heating or emitting flammable gases in contact with water according to GHS criteria.
Gas under Pressure: Not classified as gas under pressure according to GHS. Not applicable

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Mechanical Impact: None reported
Static Discharge: None reported.
Reactivity / Incompatibility: May react violently in contact with: reducers organic materials
Hazardous Decomposition: Toxic fumes of: Iodine iodine compounds sodium monoxide
Conditions to Avoid: Excess moisture Heating to decomposition.

11. TOXICOLOGICAL INFORMATION

Toxicokinetics, Metabolism and Distribution: No information available
Toxicologically Synergistic Products: None reported
Acute Toxicity: Route Data Given Below
Analoguos compound, sodium perchlorate CAS 7601-89-0, (oral rat LD50 900 - 2100 mg/kg) was classified in Annex VI (EU Index No 017-010-00-6) as Acute Tox 4.
Specific Target Organ Toxicity - Single Exposure (STOT-SE): Based on classification principles, the classification criteria are not met.
Specific Target Organ Toxicity - Repeat Exposure (STOT-RE): Based on classification principles, the classification criteria are not met.
Skin Corrosion/Irritation: Based on classification principles, the classification criteria are not met.
Eye Damage: Based on classification principles, the classification criteria are not met.
Sensitization: Based on classification principles, the classification criteria are not met.
CMR Effects/Properties (carcinogenic, mutagenic or toxic to reproduction): No germ cell mutagenicity, carcinogeniicty or reproductive toxicity data found.
IARC Listed: No
NTP Listed: No
O.S.H.A. Listed: No
Symptoms/Effects:
Ingestion: May cause: abdominal pain vomiting diarrhea
Inhalation: Causes: irritation of nose and throat
Skin Absorption: None Reported
Chronic Effects: None reported
Medical Conditions Aggravated: Pre-existing: Eye conditions Skin conditions

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
CEPA Categorization: Persistent Not Bioaccumulative Not inherently toxic to aquatic organisms
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: D001
Special Instructions (Disposal): Work in an approved fume hood. Working in a large container, cautiously add small portions of the material to cold water with agitation. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system. Verification should be made that such disposal is not inconsistent with any pretreatment agreement your facility may have with the wastewater treatment facility.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information. In Europe: Chemical and analysis solutions must be disposed of in compliance with the respective national regulations. Product packaging must be disposed of in compliance with the country-specific regulations or must be passed to a packaging return system.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Oxidizing Solid, N.O.S.
(Sodium Periodate)
Hazard Class: 5.1
Subsidiary Risk: NA
ID Number: UN1479
Packing Group: II
T.D.G.:
Proper Shipping Name: Oxidizing Solid, N.O.S.
(Sodium Periodate)
Hazard Class: 5.1
Subsidiary Risk: NA

PIN: 1479
Group: II

I.C.A.O.:

I.C.A.O. Proper Shipping Name: Oxidizing Solid, N.O.S.
(Sodium Periodate)
Hazard Class: 5.1
Subsidiary Risk: NA
ID Number: UN1479
Packing Group: II

I.M.O.:

I.M.O. Proper Shipping Name: Oxidizing Solid, N.O.S.
(Sodium Periodate)
Hazard Class: 5.1
Subsidiary Risk: NA
ID Number: UN1479
Packing Group: II

Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard Fire Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.

--

302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): Not applicable
California Perchlorate Rule CCR Title 22 Chap 33: Not applicable
Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: TSCA Listed: Yes
CAS Number: 7790-28-5
Canadian Inventory Status: DSL Listed: Yes
EEC Inventory Status: EINECS Listed: Yes
Australian Inventory (AICS) Status: Listed
New Zealand Inventory (NZIoC) Status: Listed
Korean Inventory (KECI) Status: Listed
Japan (ENCS) Inventory Status: Listed
China (PRC) Inventory (MEP) Status: Listed

16. OTHER INFORMATION

References: Vendor Information. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Technical Judgment. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labeling of Dangerous Substances, Amended July 1992. Air Contaminants,

Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor).

Complete Text of H phrases referred to in Section 3: H272 May intensify fire; oxidiser. H302 Harmful if swallowed.

Revision Summary: Substantial revision to comply with EU Reg 1272/2008, Reg 1907/2006 and UN GHS (ST/SG/AC.10/36/Add.3).

Date of MSDS Preparation:

Day: 01

Month: October

Year: 2010

MSDS Prepared: MSDS prepared by Product Compliance Department extension 3350

CCOHS Evaluation Note: It is offered under the interim policy that was established by Health Canada permitting use of GHS-formatted safety data sheets in Canada prior to revision of CPR to GHS. It is offered under exemption from WHMIS labeling as specified in the Controlled Products Regulation (CPR) Section 17.

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00135

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: FerroVer® Iron Reagent
Catalog Number: 2105769

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00135
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: May cause allergic reaction. May cause irritation.
Date of MSDS Preparation:
Day: 15
Month: October
Year: 2009

2. COMPOSITION / INFORMATION ON INGREDIENTS

Sodium Thiosulfate
CAS No.: 10102-17-7
TSCA CAS Number: 7772-98-7
Percent Range: 45.0 - 55.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 > 8 gm/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

1,10-Phenanthroline-p-toluenesulfonic Acid Salt
CAS No.: 92798-16-8
TSCA CAS Number: 92798-16-8
Percent Range: 1.0 - 5.0
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation. Toxic properties unknown.

Sodium Hydrosulfite
CAS No.: 7775-14-6
TSCA CAS Number: 7775-14-6
Percent Range: 15.0 - 25.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 > 500 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established

Hazard: Allergen Causes moderate eye irritation. Flammable solid.

Sodium Citrate
CAS No.: 68-04-2
TSCA CAS Number: 68-04-2
Percent Range: 1.0 - 10.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 >8 g/Kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

Sodium Metabisulfite
CAS No.: 7681-57-4
TSCA CAS Number: 7681-57-4
Percent Range: 20.0 - 30.0
Percent Range Units: weight / weight
LD50: Oral rat LD_{50} = 1131 mg/kg
LC50: None reported
TLV: 5 mg/m^3 (ACGIH - TWA)
PEL: Not established
Hazard: May cause irritation. May cause allergic reaction.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White to light yellow crystals
Odor: Sulfur-like
MAY CAUSE EYE AND RESPIRATORY TRACT IRRITATION
MAY CAUSE ALLERGIC RESPIRATORY REACTION IF SWALLOWED OR INHALED

HMIS:
Health: 2
Flammability: 0
Reactivity: 1
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 2
Flammability: 0
Reactivity: 1
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: No effects are anticipated
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: allergic respiratory reaction gastrointestinal irritation circulatory disturbances central nervous system depression Very large doses may cause: abdominal pain diarrhea vomiting depression
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation allergic respiratory reaction difficult breathing coughing rapid pulse and respirations chest pain blood pressure changes sweating flushing hives
Target Organs: None reported
Medical Conditions Aggravated: Sulfites are strong sensitizers. Inhalation and ingestion may cause allergic respiratory reactions in asthmatics. Persons with respiratory conditions should take special care when working with products that contain sulfites.
Chronic Effects: Chronic overexposure may cause allergic respiratory reactions
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

An ingredient of this mixture is: IARC Group 3: Non-classifiable
Metabisulfites
This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: Contains: an experimental mutagen.
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with soap and plenty of water.
Ingestion (First Aid): Give 1-2 glasses of water. Do not induce vomiting. Call physician immediately.
Inhalation: Give artificial respiration if necessary. Remove to fresh air. Call physician.

5. FIRE FIGHTING MEASURES

Flammable Properties: Can burn in fire, releasing toxic vapors.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not determined
Hazardous Combustion Products: Toxic fumes of: sulfur oxides. sodium monoxide carbon monoxide, carbon dioxide.
Fire / Explosion Hazards: May react violently with: organic materials aluminum / aluminum compounds strong oxidizers combustible materials strong acids water
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Carbon dioxide Alcohol foam. Dry chemical.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment. Cover spilled solid material with sand or other inert material.
Clean-up Technique: Sweep up material. Dilute with a large excess of water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: any quantity is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin clothing Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Store between 10° and 25°C. Protect from: heat moisture light Keep away from: acids / acid fumes. combustible materials organic material oxidizers
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Use general ventilation to minimize exposure to mist, vapor or dust. Maintain general industrial hygiene practices when using this product.

Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation and / or dust / mist mask
Precautionary Measures: Avoid contact with: eyes skin clothing Do not breathe: dust Wash thoroughly after handling. Use with adequate ventilation. Protect from: heat Keep away from: acids/acid fumes organic materials combustible material oxidizers water
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White to light yellow crystals
Physical State: Solid
Molecular Weight: Not applicable
Odor: Sulfur-like
pH: 5% solution = 5.29
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: decomposes at 192° C
Specific Gravity (water = 1): 2.27
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not determined
Partition Coefficient (n-octanol / water): Not determined
Solubility:
Water: Soluble
Acid: Soluble
Other: Not determined
Metal Corrosivity:
Steel: 0.106 in/yr
Aluminum: 0.003 in/yr

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Exposure to light. Excess moisture Extreme temperatures
Reactivity / Incompatibility: Incompatible with: combustible materials organic materials oxidizers aluminum acids sodium nitrite sodium chlorite
Hazardous Decomposition: Heating to decomposition releases toxic and/or corrosive fumes of: sulfur oxides carbon monoxide carbon dioxide
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Erythema at 3 minutes, 1 hour, 4 hours, 24 hours, 48 hours, 72 hours = 0. Edema at 3 minutes, 1 hour, 4 hours, 24 hours, 48 hours, 72 hours = 0.
Mutation Data: Sodium Metabisulfite: cytogenetic analysis hamster ovary 180 µg/l; sister chromatid exchange on hamster ovary @ 200 µg/l .
Reproductive Effects Data: Sodium Metabisulfite: oral rat TDLo = 20 g/kg - effects on newborn - stillbirth; oral rat TDLo = 40 g/kg - effects on newborn - weaning or lactation index.
Ingredient Toxicological Data: Sodium Hydrosulfite Oral rat LD50 > 500 mg/kg; Sodium Thiosulfate Oral rat LD50 > 8 g/kg; Sodium Citrate Oral rat LD50 > 8 g/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: Sodium Metabisulfite: 120 ppm / 24, 48 & 96 hours / mosquito fish / TLm / fresh water (converting bisulfite figure to metabisulfite); Sodium Thiosulfate: Aquatic toxicity: 24,000 mg / 1 / 96 hours / mosquito-fish / TLm / turbid water at 22 ° - 24° C.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: Not applicable
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable

RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): Not applicable
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Iron determination
References: CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U.S. Department of Health and Human Services, April, 1987. Outside Testing. Vendor Information. Gosselin, R. E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. Technical Judgment. In-house information. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00135

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: FerroVer ® Iron Reagent
Catalog Number: 2507025

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00135
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: May cause allergic reaction. May cause irritation.
Date of MSDS Preparation:
Day: 15
Month: October
Year: 2009

2. COMPOSITION / INFORMATION ON INGREDIENTS

Sodium Thiosulfate
CAS No.: 10102-17-7
TSCA CAS Number: 7772-98-7
Percent Range: 45.0 - 55.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 > 8 gm/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

1,10-Phenanthroline-p-toluenesulfonic Acid Salt
CAS No.: 92798-16-8
TSCA CAS Number: 92798-16-8
Percent Range: 1.0 - 5.0
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation. Toxic properties unknown.

Sodium Hydrosulfite
CAS No.: 7775-14-6
TSCA CAS Number: 7775-14-6
Percent Range: 15.0 - 25.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 > 500 mg/kg
LC50: None reported
TLV: Not established

PEL: Not established
Hazard: Allergen Causes moderate eye irritation. Flammable solid.

Sodium Citrate
CAS No.: 68-04-2
TSCA CAS Number: 68-04-2
Percent Range: 1.0 - 10.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 >8 g/Kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

Sodium Metabisulfite
CAS No.: 7681-57-4
TSCA CAS Number: 7681-57-4
Percent Range: 20.0 - 30.0
Percent Range Units: weight / weight
LD50: Oral rat LD_{50} = 1131 mg/kg
LC50: None reported
TLV: 5 mg/m^3 (ACGIH - TWA)
PEL: Not established
Hazard: May cause irritation. May cause allergic reaction.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White to light yellow crystals
Odor: Sulfur-like
MAY CAUSE EYE AND RESPIRATORY TRACT IRRITATION
MAY CAUSE ALLERGIC RESPIRATORY REACTION IF SWALLOWED OR INHALED

HMIS:
Health: 2
Flammability: 0
Reactivity: 1
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 2
Flammability: 0
Reactivity: 1
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: No effects are anticipated
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: allergic respiratory reaction gastrointestinal irritation circulatory disturbances central nervous system depression Very large doses may cause: abdominal pain diarrhea vomiting depression
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation allergic respiratory reaction difficult breathing coughing rapid pulse and respirations chest pain blood pressure changes sweating flushing hives
Target Organs: None reported
Medical Conditions Aggravated: Sulfites are strong sensitizers. Inhalation and ingestion may cause allergic respiratory reactions in asthmatics. Persons with respiratory conditions should take special care when working with products that contain sulfites.
Chronic Effects: Chronic overexposure may cause allergic respiratory reactions
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

An ingredient of this mixture is: IARC Group 3: Non-classifiable
Metabisulfites
This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: Contains: an experimental mutagen.
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with soap and plenty of water.
Ingestion (First Aid): Give 1-2 glasses of water. Do not induce vomiting. Call physician immediately.
Inhalation: Give artificial respiration if necessary. Remove to fresh air. Call physician.

5. FIRE FIGHTING MEASURES

Flammable Properties: Can burn in fire, releasing toxic vapors.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not determined
Hazardous Combustion Products: Toxic fumes of: sulfur oxides. sodium monoxide carbon monoxide, carbon dioxide.
Fire / Explosion Hazards: May react violently with: organic materials aluminum / aluminum compounds strong oxidizers combustible materials strong acids water
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Carbon dioxide Alcohol foam. Dry chemical.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment. Cover spilled solid material with sand or other inert material.
Clean-up Technique: Sweep up material. Dilute with a large excess of water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: any quantity is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin clothing Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Store between 10° and 25°C. Protect from: heat moisture light Keep away from: acids / acid fumes. combustible materials organic material oxidizers
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Use general ventilation to minimize exposure to mist, vapor or dust. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation and / or dust / mist mask
Precautionary Measures: Avoid contact with: eyes skin clothing Do not breathe: dust Wash thoroughly after handling. Use with adequate ventilation. Protect from: heat Keep away from: acids/acid fumes organic materials combustible material oxidizers water
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White to light yellow crystals
Physical State: Solid
Molecular Weight: Not applicable
Odor: Sulfur-like
pH: 5% solution = 5.29
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: decomposes at 192° C
Specific Gravity (water = 1): 2.27
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not determined
Partition Coefficient (n-octanol / water): Not determined
Solubility:
Water: Soluble
Acid: Soluble
Other: Not determined
Metal Corrosivity:
Steel: 0.106 in/yr
Aluminum: 0.003 in/yr

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Exposure to light. Excess moisture Extreme temperatures
Reactivity / Incompatibility: Incompatible with: combustible materials organic materials oxidizers aluminum acids sodium nitrite sodium chlorite
Hazardous Decomposition: Heating to decomposition releases toxic and/or corrosive fumes of: sulfur oxides carbon monoxide carbon dioxide
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Erythema at 3 minutes, 1 hour, 4 hours, 24 hours, 48 hours, 72 hours = 0. Edema at 3 minutes, 1 hour, 4 hours, 24 hours, 48 hours, 72 hours = 0.
Mutation Data: Sodium Metabisulfite: cytogenetic analysis hamster ovary 180 µg/l; sister chromatid exchange on hamster ovary @ 200 µg/l .
Reproductive Effects Data: Sodium Metabisulfite: oral rat TDLo = 20 g/kg - effects on newborn - stillbirth; oral rat TDLo = 40 g/kg - effects on newborn - weaning or lactation index.
Ingredient Toxicological Data: Sodium Hydrosulfite Oral rat LD50 > 500 mg/kg; Sodium Thiosulfate Oral rat LD50 > 8 g/kg; Sodium Citrate Oral rat LD50 > 8 g/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: Sodium Metabisulfite: 120 ppm / 24, 48 & 96 hours / mosquito fish / TLm / fresh water (converting bisulfite figure to metabisulfite); Sodium Thiosulfate: Aquatic toxicity: 24,000 mg / 1 / 96 hours / mosquito-fish / TLm / turbid water at 22 ° - 24° C.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: Not applicable
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): Not applicable
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Iron determination
References: CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U.S. Department of Health and Human Services, April, 1987. Outside Testing. Vendor Information. Gosselin, R. E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. Technical Judgment. In-house information. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

HACH COMPANY ©2009

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M01892

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Test Strips
Catalog Number: 2800150

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M01892
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: Highly toxic. Experimental carcinogen. Cumulative poison. Harmful if absorbed through skin. Harmful if swallowed
Date of MSDS Preparation:
Day: 25
Month: August
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Mercuric Bromide Saturated Paper
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: 100.0
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Highly toxic. Experimental carcinogen. Cumulative poison. Harmful if absorbed through skin. Harmful if swallowed

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White paper
Odor: None
HARMFUL IF SWALLOWED OR ABSORBED THROUGH SKIN
POSSIBLE BIRTH DEFECT HAZARD: MAY CAUSE BIRTH DEFECTS BASED ON ANIMAL DATA CAN CAUSE LUNG AND KIDNEY DISEASE

HMIS:

Health: 4
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.

NFPA:
Health: 4
Flammability: 0
Reactivity: 0
Symbol: Not applicable

Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: May cause irritiation
Skin Absorption: Will be absorbed through the skin. Effects similar to those of ingestion
Target Organs: Central nervous system Liver Kidneys
Ingestion: Highly toxic. Causes: abdominal pain nausea vomiting diarrhea metallic taste rapid pulse and respirations weakness May cause: inflammation of the mouth increased urinary output excessive salivation liver damage kidney damage central nervous system effects collapse death
Target Organs: Central nervous system Liver Kidneys
Inhalation: Toxic. May cause: Effects similar to those of ingestion.
Target Organs: Central nervous system Kidneys Liver
Medical Conditions Aggravated: Allergies or sensitivity to mercury. Central nervous system diseases Kidney conditions Liver conditions Pre-existing: Eye conditions Skin conditions Respiratory conditions
Chronic Effects: Mercury can cause personality changes such as: depression, despondency, fearfulness, restlessness, irritability, timidness, indecision and embarrassment. Mercury is a general protoplasmic poison; it circulates in the blood and is stored in the liver, kidneys, spleen and bones. Main symptoms are sore mouth, tremors and psychic disturbances.
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

IARC Group 3: Non-classifiable
Mercury and Inorganic Mercury compounds
This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: an experimental teratogen. an experimental mutagen.

Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Flush eyes with water. Call physician if irritation develops.
Skin Contact (First Aid): Wash skin with plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water or milk. Induce vomiting using syrup of ipecac or by sticking finger down throat. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: None required.

5. FIRE FIGHTING MEASURES

Flammable Properties: Can burn in fire, releasing toxic vapors.
Flash Point: Not determined
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not determined

Hazardous Combustion Products: May vaporize to form Mercury vapor. bromides
Fire / Explosion Hazards: Reacts with sodium aci-nitromethanide and acid to form explosive mercury fulminate.
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Releases of this material may contaminate the environment. Stop spilled material from being released to the environment.
Clean-up Technique: Sweep up material. Dispose of all mercury contaminated material at an E.P.A. hazardous waste facility. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as a hazardous air pollutant. Product is regulated as RCRA hazardous waste.
304 EHS RQ (40 CFR 355): Mercuric Bromide - RQ 1 lb.
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with skin eyes clothing Do not breathe dust. Use with adequate ventilation. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep container tightly closed when not in use.
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain adequate ventilation to keep vapor level below TWA for chemicals in this product. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin clothing Do not breathe: dust Use with adequate ventilation. Wash thoroughly after handling.
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White paper
Physical State: Solid
Molecular Weight: Not applicable
Odor: None
pH: Not applicable
Vapor Pressure: Not applicable

Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Not applicable
Specific Gravity (water = 1): Not applicable
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Not applicable
Acid: Not applicable
Other: Not applicable
Metal Corrosivity:
Steel: Not applicable
Aluminum: Not applicable

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: formates sulfites phosphates arsenic boron compounds carbonates iron copper silver salts
Hazardous Decomposition: Heating to decomposition releases: mercury bromides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: None reported
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Mercuric Bromide: Oral rat LD50 = 40 mg/kg, Dermal rat LD50 = 100 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: Mercury and mercury compounds: Calculated Bioconcentration factor > 100. LC50/96H fish <1 mg/L

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: D009
Special Instructions (Disposal): Dispose of all mercury contaminated material at an E.P.A. hazardous waste facility.
Empty Containers: Rinse three times with an appropriate solvent. Rinsate from empty containers is hazardous waste and should be disposed of at an E.P.A. approved facility. Dispose of empty container as normal trash.

NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Mercury Bromides Mixture
--
DOT Hazard Class: 6.1
DOT Subsidiary Risk: NA
DOT ID Number: UN1634
DOT Packing Group: II
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Mercury Bromides Mixture
--
ICAO Hazard Class: 6.1
ICAO Subsidiary Risk: NA
ICAO ID Number: UN1634
ICAO Packing Group: II
I.M.O.:
I.M.O. Proper Shipping Name: Mercury Bromides Mixture
--
I.M.O. Hazard Class: 6.1
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: UN1634
I.M.O. Packing Group: II
Additional Information: There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods. If the item is NOT in a set or kit, the classification given above applies. If the item IS part of a set or kit, the classification would change to the following: UN3316 Chemical Kit, Class 9, PG II or III. If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product contains a chemical(s) subject to the reporting requirements of Section 313 of Title III of SARA.
Mercury Compounds
302 (EHS) TPQ (40 CFR 355): 500 lbs. Mercury Bromide
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Mercuric Bromide - RQ 1 lb.
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: WARNING - This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Identification of Prop. 65 Ingredient(s): Mercury Compounds
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).

TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Laboratory Reagent

References: Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. Sax, N. Irving and Richard J. Lewis, Sr., revised by. Hawley's Condensed Chemical Dictionary, Eleventh Ed. New York: Van Nostrand Reinhold Co., 1987. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Vendor Information. Gosselin, R. E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Technical Judgment.

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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Vernon Hills IL 60061, USA
Phone: 888-462-5866 Fax: 847-247-2984 E-mail: info@4oakton.com

Oakton 00654-00, 05942-21, 05942-22, 05942-24, 05942-25, 35653-01
pH 4.01 Buffer
Material Safety Data Sheet

I. PRODUCT AND COMPANY IDENTIFICATION:

CATALOG NUMBERS: 00654-00, 05942-21, 05942-22, 05942-24, 05942-25, 35653-01

PRODUCT NAME: pH 4.01 Buffer

PRODUCT USE: Buffer

NFPA RATINGS: HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0

MANUFACTURER'S NAME: Thermo Fisher Scientific, Inc

ADDRESS: 166 Cummings Center, Beverly MA 01915, USA

PHONE NUMBER FOR INFORMATION: 978-232-6000

CHEMTREC® 24 hr Emergency: US 800-424-9300; International 703-527-3887

II. COMPOSITION/INFORMATION ON INGREDIENTS

		%	LD_{50} mg/kg
COMPONENT	Potassium Hydrogen Phthalate ($C_8H_5O_4K$)		
CAS NO.	877-24-7	1	> 3,200 (ORL-RAT)
COMPONENT	Amaranth Red Dye ($C_{20}H_{11}N_2O_{10}S_3Na_3$)		
CAS NO.	915-67-3	<0.01	1000 (IRP-MUS)
COMPONENT	Deionized Water (H_2O)		
CAS NO.	7732-18-5	99	190,000 (IPR-MUS)

III. HAZARDS IDENTIFICATION

Low hazard for normal use.
Maybe harmful if swallowed. May cause irritation to eyes and skin.
TARGET ORGANS: Eyes, skin.
ACUTE TOXICITY: Low hazards.
CHRONIC TOXICITY: May cause irritation to skin after prolonged exposure.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Disease of the skin.

IV. FIRST AID MEASURES

EYE AND SKIN CONTACT: Wash off with large amounts of water.
INGESTION: Give large amounts of water. Consult physician.
INHALATION: Not hazardous.

V. FIRE FIGHTING MEASURES

FLASH POINT: NA AUTOIGNITION POINT: NA
FLAMMABILITY LIMITS: UPPER: NA LOWER: NA
EXTINGUISHING MEDIA: Water, CO_2, dry chemical or foam.

VI. ACCIDENTAL RELEASE MEASURES

Take up with absorbent materials. Place in small containers for disposal. Wash spill site after material pick up is complete.

VII. HANDLING AND STORAGE

Always wear eye protection and gloves when working with this product.
Avoid contact with eyes, skin or clothing. Do not ingest.
Store at room temperature. Keep away from heat and keep container closed.

VIII. EXPOSURE CONTROLS/ PERSONAL PROTECTION

OSHA & ACGIH THRESHOLD LIMIT: None listed.
PROTECTIVE EQUIPMENT: Safety glasses, lab coat and gloves.

IX. PHYSICAL AND CHEMICAL PROPERTIES

STATE: Light red liquid ODOR THRESHOLD: None
SENSITIVITY TO MECHANICAL IMPACT: None
SENSITIVITY TO STATIC DISCHARGE: None
COEFFICIENT OF OIL/WATER DISTRIBUTION: None
SOLUBILITY IN WATER: Soluble pH: 4.01
SPECIFIC GRAVITY: 1.0
BOILING POINT: 100ºC MELTING POINT: Not determined
VAPOR DENSITY: Not determined

X. STABILITY AND REACTIVITY

Product is stable. Hazardous polymerization will not occur.
Incompatibles: Strong oxidizing agents, nitric acid.
Hazardous decomposition product: None known.

XI. TOXICOLOGICAL INFORMATION

Route of Exposure: Eyes, skin.
Teratogen Status: None
Mutagen Status: None
Reproductive Toxicity: None.
Carcinogen Status: None.

XII. ECOLOGICAL INFORMATION

None available.

XIII. DISPOSAL CONSIDERATIONS

Dispose of in a manner consistent with Federal, State and Local Regulations.

XIV. TRANSPORT INFORMATION

Product is not hazardous for transport.

XV. REGULATORY INFORMATION

EUROPEAN INFORMATION:

RISK PHRASES: None
SAFETY PHRASES: S24/25 Avoid contact with skin and eyes.

US/CANADA INFORMATION

SARA/Title III: Ingredients not listed.
Cal. Proposition 65: Ingredients not listed.
US TSCA Inventory: Ingredients are listed
CPR Class: None.
TDG Class: None.
MSDS discloses elements required by the CPR.

XVI. OTHER INFORMATION

THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. ALL PRODUCTS ARE OFFERED IN ACCORDANCE WITH THE MANUFACTURER'S CURRENT PRODUCTION SPECIFICATIONS AND ARE INTENDED SOLELY FOR USE IN ANALYTICAL TESTING. THE MANUFACTURER SHALL IN NO EVENT BE LIABLE FOR ANY INJURY, LOSS OR DAMAGE RESULTING FROM THE HANDLING, USE OR MISUSE OF THESE PRODUCTS.

MSDS prepared by Environmental, Health and Safety group.

Document Number 264586-001 Rev. A Effective Date: 2/17/2010

OAKTON® MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Catalog Number(s)

00654-04, 35654-04, 05942-41, 05942-42, 05942-44, 05942-45, 35653-02

Product Identity

BUFFER, Standard, pH 7.00 (Color Coded Green)

Manufacturer's Name	Emergency Telephone Number (24 hr)
RICCA CHEMICAL COMPANY	CHEMTREC®: 800-424-9300
Address (Number, Street, City, State, and ZIP Code)	Telephone Number For Information
P.O. Box 13090	817-461-5601
	Date Prepared
Arlington, Texas 76094	3-8-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits ACGIH TLV	Exposure Limits OSHA PEL
Sodium Phosphate, Dibasic	7558-79-4	< 1	N/A	N/A
Potassium Phosphate, Monobasic	7778-77-0	< 1	N/A	N/A
Preservative* *(No Mercury Compounds or Formaldehyde)	Proprietary	< 0.1	N/A	N/A
Inert Dye	Proprietary	< 0.1	N/A	N/A
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

EMERGENCY OVERVIEW

Non-flammable, non-toxic, non-corrosive. Does not present any significant health hazards. May cause irritation. Wash areas of contact with water

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS: eyes, skin.

EYE CONTACT: May cause slight irritation.

INHALATION: May cause allergic respiratory reaction to those allergic to phosphates.

SKIN CONTACT: May cause slight irritation to those allergic to phosphates.

INGESTION: Large doses may cause stomach upset.

CHRONIC EFFECTS / CARCINOGENICITY:

IARC – No
NTP – No
OSHA – No

TERATOLOGY (BIRTH DEFECT) INFORMATION:

No information found in "Registry of Toxic Effects of Chemical Substances" or other information sources.

REPRODUCTION INFORMATION:

No information found in "Registry of Toxic Effects of Chemical Substances" or other information sources.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

SKIN CONTACT: Flush with plenty of water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire.

FIRE & EXPLOSION HAZARDS: Not considered to be a fire or explosion hazard.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions.

FIRE FIGHTING EQUIPMENT: Use protective clothing and breathing equipment appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material (vermiculite, clay, etc.) and dispose of in accordance with local regulations. Check with local agencies for the proper disposal of phosphate containing solutions.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, green liquid	**pH:**	7
ODOR:	Odorless	**BOILING POINT (^{O}C):**	approximately 100
SOLUBILITY IN WATER:	Infinite	**MELTING POINT (^{O}C):**	approximately 0
SPECIFIC GRAVITY:	approximately 1	**VAPOR PRESSURE:**	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage.

INCOMPATIBILITY: None identified.

HAZARDOUS DECOMPOSITION PRODUCTS: Phosphorus oxides may form when heated to decomposition.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Rat: (Sodium Phosphate Dibasic) 17 gm/kg; LD50, Dermal, Rabbit: (Potassium Phosphate Monobasic) >4640 mg/kg; details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Dilute with water, then flush to sewer if local regulations allow for the flushing of phosphate containing solutions. If not allowed, save for recovery or recycling in an approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME:	Not regulated
D.O.T. HAZARD CLASS:	None
U.N. / N.A. NUMBER:	None
PACKING GROUP:	None
D.O.T. LABEL:	None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: The above items either do not contain any specifically hazardous material or the potentially hazardous material is present in such low concentration that the items do not present any immediate threat to health and safety. These items do not meet the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory or are mixtures (hydrates) of items listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY: Sodium Phosphate, Dibasic - 5,000 pounds.

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No

SECTION 311/312 HAZARDOUS CATEGORIES: No

SECTION 313 TOXIC CHEMICALS: No

RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed.

PENNSYLVANIA: Sodium Phosphate Dibasic is listed as an environmental hazard on the state Hazardous Substance list.

Section 16. Other Information

NFPA Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Special Notice Key: None**
HMIS® Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Protective Equipment: B (Protective eyewear, gloves)**

Rev 1, 8-25-2000: (Section 2) corrected concentration of preservative from 1 – 2 to < 0.1%.
Rev 2, 03-25-2003: Reviewed and approved, (Section 15) added CERCLA reportable quantity.
Rev 3, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

OAKTON®
P.O. Box 5136
Vernon Hills IL 60061, USA
Phone: 888-462-5866 Fax: 847-247-2984 E-mail: info@4oakton.com

Oakton 00654-08, 05942-61, 05942-62, 05942-64, 05942-65, 35653-03
pH 10.01 Buffer
Material Safety Data Sheet

I. PRODUCT AND COMPANY IDENTIFICATION:

CATALOG NUMBERS: 00654-08, 05942-61, 05942-62, 05942-64, 05942-65, 35653-03

PRODUCT NAME: pH 10.01 Buffer

PRODUCT USE: Buffer

NFPA RATINGS: HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0

MANUFACTURER'S NAME: Thermo Fisher Scientific, Inc

ADDRESS: 166 Cummings Center, Beverly MA 01915, USA

PHONE NUMBER FOR INFORMATION: 978-232-6000

CHEMTREC® 24 hr Emergency: US 800-424-9300; International 703-527-3887

II. COMPOSITION/INFORMATION ON INGREDIENTS

		%	LD_{50} mg/kg
COMPONENT	Sodium Bicarbonate ($NaHCO_3$)		
CAS NO.	144-55-8	<1	4220 (ORL-RAT)
COMPONENT	Sodium Carbonate (Na_2CO_3)		
CAS NO.	497-19-8	<1	117 (IPR-MUS)
COMPONENT	Methyl Paraben ($C_8H_8O_3$)		
CAS NO.	99-76-3	<0.1	3000 (ORL-DOG)
COMPONENT	FD&C Blue #1 ($C_{37}H_{34}N_2O_9S_3Na_2$)		
CAS NO.	3844-45-9	<0.01	Not available
COMPONENT	Deionized Water (H_2O)		
CAS NO.	7732-18-5	99	190,000 (IPR-MUS)

III. HAZARDS IDENTIFICATION

Low hazard for normal use.
May be harmful if swallowed. May cause irritation to eyes and skin.
TARGET ORGANS: Eye, skin.
ACUTE TOXICITY: Low hazard.
CHRONIC TOXICITY: May cause irritation to skin after prolonged exposure.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Disease of the skin.

IV. FIRST AID MEASURES

EYE AND SKIN CONTACT: Wash off with large amounts of water.
INGESTION: Give large amounts of water. Consult physician.
INHALATION: Not hazardous.

V. FIRE FIGHTING MEASURES

FLASH POINT: NA AUTOIGNITION POINT: NA
FLAMMABILITY LIMITS: UPPER: NA LOWER: NA
EXTINGUISHING MEDIA: Water, CO_2, dry chemical or foam.

VI. ACCIDENTAL RELEASE MEASURES

Take up with absorbent materials. Place in small containers for disposal. Wash spill site after material pick up is complete.

VII. HANDLING AND STORAGE

Always wear eye protection and gloves when working with this product.
Avoid contact with eyes, skin or clothing. Do not ingest.
Store at room temperature. Keep away from heat and keep container closed.

VIII. EXPOSURE CONTROLS/ PERSONAL PROTECTION

OSHA & ACGIH THRESHOLD LIMIT: None listed.
PROTECTIVE EQUIPMENT: Safety glasses, lab coat and gloves.

IX. PHYSICAL AND CHEMICAL PROPERTIES

STATE: Light blue liquid ODOR THRESHOLD: None
SENSITIVITY TO MECHANICAL IMPACT: None
SENSITIVITY TO STATIC DISCHARGE: None
COEFFICIENT OF OIL/WATER DISTRIBUTION: None
SOLUBILITY IN WATER: Soluble pH: 10.01
SPECIFIC GRAVITY: 1.0
BOILING POINT: 100ºC MELTING POINT: Not determined
VAPOR DENSITY: Not determined

X. STABILITY AND REACTIVITY

Product is stable. Hazardous polymerization will not occur.
Incompatibles: Na-K alloy, $NH_4H_2PO_4$, Al, P_2O_5, H_2SO_4.
Hazardous decomposition product: May emit fumes of carbon dioxides when heated to decomposition.

XI. TOXICOLOGICAL INFORMATION

Route of Exposure: Eyes, skin.
Teratogen Status: None
Mutagen Status: None
Reproductive Toxicity: None
Carcinogen Status: None

XII. ECOLOGICAL INFORMATION

None available.

XIII. DISPOSAL CONSIDERATIONS

Dispose of in a manner consistent with Federal, State and Local Regulations.

XIV. TRANSPORT INFORMATION

Product is not hazardous for transport.

XV. REGULATORY INFORMATION

EUROPEAN INFORMATION:

RISK PHRASES: None
SAFETY PHRASES: S24/25 Avoid contact with skin and eyes.

US/ CANADA INFORMATION

SARA/Title III: Ingredients not listed.
Cal. Proposition 65: Ingredients not listed.
US TSCA Inventory: Ingredients are listed.
CPR Class: None.
TDG Class: None.
MSDS discloses elements required by the CPR.

XVI. OTHER INFORMATION

THE ABOVE INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. ALL PRODUCTS ARE OFFERED IN ACCORDANCE WITH THE MANUFACTURER'S CURRENT PRODUCTION SPECIFICATIONS AND ARE INTENDED SOLELY FOR USE IN ANALYTICAL TESTING. THE MANUFACTURER SHALL IN NO EVENT BE LIABLE FOR ANY INJURY, LOSS OR DAMAGE RESULTING FROM THE HANDLING, USE OR MISUSE OF THESE PRODUCTS.

MSDS prepared by Environmental, Health and Safety group.

Document Number 264594-001 Rev. A Effective Date: 2/17/2010

Thermo Orion
a Thermo Electron business
500 Cummings Center
Beverly, MA 01915-6199 USA
Telephone 978-232-6000

MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

Product Name: ORP Standard	**Catalog No.** 967961 967901	**Effective Date** 2/16/01
Hazardous Shipment Labeling:	**DOT** None	**IATA** None
Prepared By	**Title** Quality Assurance Chemist	
Approved By	**Title** Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTIFY INFORMATION)

Hazardous Components * Specific Chemical Identity: Common Name(s)	**CAS NO.**	**%**	**OSHA PEL**	**ACGIH TLV**	**LD_{LO}** mg/Kg
Potassium Iodide (KI)	7681-11-0	40	None Listed	None Listed	120 (IVN-RAT)
Trade Secret - Chemical Identity Withheld	Trade Secrect	60	None Listed	None Listed	None Listed
***Aqueous mixture of non-hazardous proprietary ingredients not found on the most recent Massachusetts substance list.					

III. PHYSICAL DATA

Boiling Point 750mm Hg	106°C	**Freezing Point**	-6°C
Specific Gravity (H_2O=1)	1.08	**Vapor Pressure @ 25°C**	NA**
pH @ 25°C	(6.98-7.02)	**Solubility In Water, % by Wt @ 25°C**	Miscible
Volatiles % By Wt.	NA	**Evaporation Rate (BUTYL, ACETATE = 1)**	NA
Vapor Density (AIR = 1)	NA		
Appearance and Odor	Dark Amber Solution		

IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point (Test Method) NA	**Autoignition Temperature** NA	
Flammable Limits in air, % by volume:	**Lower** NA	**Upper** NA
Extinguishing Media	Dry chemical, water, foam, or CO_2	
Special Fire-Fighting Procedures	Wear Self-contained breathing apparatus.	
Unusual Fire and Explosion Hazards	Toxic K_2O and I_2 fumes may be released during a fire.	

*Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product

** NA Not available/not applicable

*** Non-hazardous component

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated. Safe use of the materials is the responsibility of the user.

Document No. 232162-001
Rev . B

Printed in U.S.A.
Form MSDS/1192

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: ORP Standard **Catalog No.: 967961, 967901**

V. REACTIVITY DATA

Stability:			**Conditions to Avoid**
Unstable	Stable X		None
Incompatibility (Materials to avoid)			
Incompatible with oxidants, metallic salts, calomel.			
Hazardous Decomposition Products	When heated emits K_2O and I		
Hazardous Polymerization:			**Condition to Avoid**
May Occur	Will Not Occur X		None

VI. HEALTH HAZARD DATA

Route(s) Of Entry:	**Inhalation?**	**Skin?**	**Ingestion?**
	No	No	Yes
Health Hazards (acute and chronic)			
Moderately toxic by ingestion. May irritate eyes or skin.			
Carcinogenicity: **NTP?**		**IARC Monographs?**	**OSHA Regulated?**
Not found on these lists.			
Signs and Symptoms of Exposure			
Itching of skin, irritation of eyes if allowed to come in direct contact.			
Medical Conditions Generally Aggravated by Exposure	Cause stinging in an open cut.		
Emergency And First Aid Procedures Eyes – Irrigate with water. Skin – Wash with soap and water. If ingested – dilute with large amounts of water. Get medical attention for eyes or internal exposure.			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

Steps To be Taken In Case Material Is Released or Spilled
Clean up and set aside for waste disposal.
Waste Disposal Method
Observe all Federal, State and local laws when disposing of this product..
Precautions To Be Taken In Handling and Storing
None, product is a low hazard. NFPA rating: Scale (0-4); Health – 2, Fire - 0, Reactivity - 0, Specific - None.
Other Precautions
Keep closure sealed and store at room temperature to protect product integrity. This product is not affected by SARA TITLE III: Not found on CAL Prop 65. Components are listed in EPA TSCA inventory.

VIII. CONTROL MEASURES

Respiratory Protection (specify type)			
None			
Ventilation	**Local Exhaust**	**Special**	
	None		None
Ventilation	**Mechanical (General)**	**Other**	
	None		None
Protective Gloves	Yes	**Eye Protection**	Safety glasses
Other Protective Clothing Or Equipment			
None			
Work/Hygienic Practices			
Emergency eye wash should be available. Wash off hands after working with this product.			

ALCONOX MSDS

Section 1 : MANUFACTURER INFORMATION

Product name: Alconox

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/03/09

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
497-19-8	7-13	SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION 1200 MG/M3/2H MOUSE INHALATION
7722-88-5	10-30	TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE
7758-29-4	10-30	SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

Section 2A : ADDITIONAL INGREDIENT INFORMATION

Note: (supplier).
CAS# 497-19-8: LD50 4020 mg/kg - rat oral.
CAS# 7758-29-4: LD50 3100 mg/kg - rat oral.

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Solid

Appearance & odor: Almost odourless.
White granular powder.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): Not applicable.

Vapour density (air=1): Not applicable.

By weight: Not available.

Evaporation rate (butyl acetate = 1): Not applicable.

Boiling point (°C): Not applicable.

Freezing point (°C): Not applicable.

pH: (1% aqueous solution).
9.5

Specific gravity @ 20 °C: (water = 1).
0.85 - 1.10

Solubility in water (%): 100 - > 10% w/w

Coefficient of water\oil dist.: Not available.

VOC: None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.

Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Not available.

Sensitivity to mechanical impact: Not applicable.

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Rate of burning: Not available.

Explosive power: None

Section 5 : REACTIVITY DATA

Chemical stability: Stable under normal conditions.

Conditions of instability: None known.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids.
Strong oxidizers.

Hazardous decomposition products: See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of Acute Exposure

Eye contact: May cause irritation.

Skin contact: Prolonged contact may cause irritation.

Inhalation: Airborne particles may cause irritation.

Ingestion: May cause vomiting and diarrhea.
May cause abdominal pain.
May cause gastric distress.

Effects of chronic exposure: Contains an ingredient which may be corrosive.

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available for mixture, see the ingredients section.

Exposure limit of material: Not available for mixture, see the ingredients section.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Medical conditions aggravated by exposure: Not available.

First Aid

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
Seek medical attention if symptoms persist.

Ingestion: Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.
Do not induce vomiting, seek immediate medical attention.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak / Spill: Contain the spill.
Recover uncontaminated material for re-use.
Wear appropriate protective equipment.
Contaminated material should be swept or shoveled into appropriate waste container for disposal.

Waste disposal: In accordance with municipal, provincial and federal regulations.

Handling procedures and equipment: Protect against physical damage.
Avoid breathing dust.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Launder contaminated clothing prior to reuse.

Storage requirements: Keep containers closed when not in use.
Store away from strong acids or oxidizers.
Store in a cool, dry and well ventilated area.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves / Type:



Neoprene or rubber gloves.

Respiratory / Type:



If exposure limit is exceeded, wear a NIOSH approved respirator.

Eye / Type:



Safety glasses with side-shields.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

SAFETY DATA SHEET

PRODUCT

FERRALYTE® 8130

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **FERRALYTE® 8130**

APPLICATION : COAGULANT

COMPANY IDENTIFICATION : Nalco Company
1601 W. Diehl Road
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 2 / 2 FLAMMABILITY : 0 / 0 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme * = Chronic Health Hazard

2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)
Ferric Sulfate	10028-22-5	30.0 - 60.0

3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

WARNING
Irritating to eyes and skin. Harmful if swallowed.
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water.
Wear suitable protective clothing.
Not flammable or combustible. Contact with reactive metals (e.g. aluminum) may result in the generation of flammable hydrogen gas. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions. May evolve oxides of carbon (COx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Irritating, and may injure eye tissue if not removed promptly.

SKIN CONTACT :
Can cause moderate irritation.

INGESTION :
Not a likely route of exposure. Harmful if swallowed. There may be irritation to the gastro-intestinal tract.

INHALATION :
Not a likely route of exposure. Elevated temperatures or mechanical action may form vapors, mists or fumes which may be irritating to the eyes, nose, throat and lungs.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

HUMAN HEALTH HAZARDS - CHRONIC :
No adverse effects expected other than those mentioned above.

4. FIRST AID MEASURES

EYE CONTACT :
Immediately flush eye with water for at least 15 minutes while holding eyelids open. If symptoms develop, seek medical advice.

SKIN CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :
Get medical attention. Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5. FIRE FIGHTING MEASURES

FLASH POINT : > 200 F/ > 93.3 °C

EXTINGUISHING MEDIA :
Not expected to burn. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
Not flammable or combustible. Contact with reactive metals (e.g. aluminum) may result in the generation of flammable hydrogen gas. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions. May evolve oxides of carbon (COx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Ventilate spill area if possible. Ensure clean-up is conducted by trained personnel only. Do not touch spilled material. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
This product may pose a risk to the aquatic ecosystem if released., Prevent material from entering sewers or waterways.

7. HANDLING AND STORAGE

HANDLING :
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Do not breathe vapors/gases/dust. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labeled.

STORAGE CONDITIONS :
Store in suitable labeled containers. Store the containers tightly closed. Store separately from bases.

SUITABLE CONSTRUCTION MATERIAL :
Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

UNSUITABLE CONSTRUCTION MATERIAL :
Aluminum

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

Substance(s)	Category:	ppm	mg/m3	Non-Standard Unit

ENGINEERING MEASURES :
The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

RESPIRATORY PROTECTION :
Where concentrations in air may exceed the limits given in this section, the use of a half face filter mask or air supplied breathing apparatus is recommended. A suitable filter material depends on the amount and type of chemicals being handled. Consider the use of filter type: Multi-contaminant cartridge. with a Particulate pre-filter. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :
When handling this product, the use of chemical gauntlets is recommended. The choice of work glove depends on work conditions and what chemicals are handled, but we have positive experience under light handling conditions using gloves made from PVC Gloves should be replaced immediately if signs of degradation are observed. Breakthrough time not determined as preparation, consult PPE manufacturers.

SKIN PROTECTION :
When handling this product, the use of overalls, a chemical resistant apron and rubber boots is recommended. A full slicker suit is recommended if gross exposure is possible.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Use good work and personal hygiene practices to avoid exposure. Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Always wash thoroughly after handling chemicals. When handling this product never eat, drink or smoke.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
APPEARANCE	Dark Amber
ODOR	None

SPECIFIC GRAVITY	1.33 - 1.37 @ 77 °F / 25 °C
DENSITY	11.39 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	0.5
VOC CONTENT	0 % Calculated

Note: These physical properties are typical values for this product and are subject to change.

10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Extremes of temperature

MATERIALS TO AVOID :
Bases Contact with strong alkalies (e.g. ammonia and its solutions, carbonates, sodium hydroxide (caustic), potassium hydroxide, calcium hydroxide (lime), cyanide, sulfide, hypochlorites, chlorites) may generate heat, splattering or boiling and toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of sulfur, Oxides of nitrogen, Oxides of carbon

11. TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Moderate

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product, unless otherwise indicated.

Acute Fish Results :

Species	Exposure	Test Type	Value	Test Descriptor
Rainbow Trout	96 hrs	LC50	6.4 mg/l	Product
Fathead Minnow	96 hrs	LC50	37 mg/l	Product

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	Test Type	Value	Test Descriptor
Daphnia magna	48 hrs	LC50	230 mg/l	Product

CHRONIC FISH RESULTS :

Species	Exposure	Test Type	Value	End Point	Test Descriptor
Fathead Minnow	7 d	EC25 / IC25	13.6 mg/l	Growth	Product
Fathead Minnow	7 d	NOEC	13 mg/l	Growth	Product
Fathead Minnow	7 d	LOEC	25 mg/l	Growth	Product

PERSISTENCY AND DEGRADATION :

Chemical Oxygen Demand (COD) : 2,090 mg/l

Biological Oxygen Demand (BOD) :

Incubation Period	Value	Test Descriptor
5 d	0 mg/l	Product

The organic portion of this preparation is expected to be poorly biodegradable.

MOBILITY :
The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.
If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air	Water	Soil/Sediment
<5%	30 - 50%	50 - 70%

The portion in water is expected to be soluble or dispersible.

BIOACCUMULATION POTENTIAL
This preparation or material is not expected to bioaccumulate.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Moderate

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

The presence of an RQ component (Reportable Quantity for U.S. EPA and DOT) in this product causes it to be regulated with an additional description of RQ for road, or as a class 9 for road and air, ONLY when the net weight in the package exceeds the calculated RQ for the product.

LAND TRANSPORT :

Proper Shipping Name :	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.
Technical Name(s) :	FERRIC SULFATE
UN/ID No :	UN 3264
Hazard Class - Primary :	8
Packing Group :	III
Flash Point :	> 200 F/ > 93.3 °C
Reportable Quantity (per package) :	2,850 lbs
RQ Component :	FERRIC SULFATE

AIR TRANSPORT (ICAO/IATA) :

The presence of an RQ component (Reportable Quantity for U.S. EPA and DOT) in this product causes it to be regulated with an additional description of RQ for road, or as a class 9 for road and air, ONLY when the net weight in the package exceeds the calculated RQ for the product.

Proper Shipping Name :	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.
Technical Name(s) :	FERRIC SULFATE
UN/ID No :	UN 3264
Hazard Class - Primary :	8
Packing Group :	III
Reportable Quantity (per package) :	2,850 lbs
RQ Component :	FERRIC SULFATE

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.
Technical Name(s) :	FERRIC SULFATE
UN/ID No :	UN 3264
Hazard Class - Primary :	8
Packing Group :	III

15. REGULATORY INFORMATION

This section contains additional information that may have relevance to regulatory compliance. The information in this section is for reference only. It is not exhaustive, and should not be relied upon to take the place of an individualized compliance or hazard assessment. Nalco accepts no liability for the use of this information.

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Ferric Sulfate : Eye irritant

CERCLA/SUPERFUND, 40 CFR 302 :
This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product. If a reportable quantity of product is released, it requires notification to the NATIONAL RESPONSE CENTER, WASHINGTON, D.C. (1-800-424-8802).

RQ Substance	RQ
Ferric Sulfate	2,850 lbs

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

X	Immediate (Acute) Health Hazard
	Delayed (Chronic) Health Hazard
	Fire Hazard
	Sudden Release of Pressure Hazard
	Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

NSF INTERNATIONAL :
This product has received NSF/International certification under NSF/ANSI Standard 60 in the coagulation and flocculation category. The official name is "Polymer Blends." Maximum product application dosage is : 150 mg/l.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
This product contains the following substances listed in the regulation. Additional components may be unintentionally present at trace levels.

Substance(s)	Citations
Ferric Sulfate Sulfuric Acid	Sec. 311

CLEAN AIR ACT, Sec. 112 (Hazardous Air Pollutants, as amended by 40 CFR 63), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

CALIFORNIA PROPOSITION 65 :
Substances listed under California Proposition 65 are not intentionally added or expected to be present in this product.

MICHIGAN CRITICAL MATERIALS :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

Ferric Sulfate 10028-22-5

INTERNATIONAL CHEMICAL CONTROL LAWS :

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

AUSTRALIA
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

CHINA
All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on or exempt from the Inventory of Existing Chemical Substances China (IECSC).

JAPAN
All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Existing and New Chemical Substances list (ENCS).

KOREA
All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)

NEW ZEALAND
All substances in this product comply with the Hazardous Substances and New Organisms (HSNO) Act 1996,and are listed on or are exempt from the New Zealand Inventory of Chemicals.

PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American P—µvu”uµsu&-v&T —u”µ° uµ q§¥Ut ”yq§U wyuµy 5& U7&N”yu§¥µ ywx &PQ-ROM Version), Ariel Research Corp., Bethesda, MD.

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IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

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Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Aryu§¥u ywx &PQ-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH,
1d\ Z Rc &P] c &PQ-ROM Version), Micromedex, Inc., Englewood, CO.

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North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel \µ ywx &PQ-ROM Version), Ariel Research Corp., Bethesda, MD.

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Prepared By : Product Safety Department
Date issued : 05/07/2012
Version Number : 1.12

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **CORE SHELL® 71307**

APPLICATION : FLOCCULANT

COMPANY IDENTIFICATION : Nalco Company
1601 W. Diehl Road
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 1 / 1 FLAMMABILITY : 1 / 1 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme * = Chronic Health Hazard

2. COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

CAUTION
May cause irritation with prolonged contact.
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. Protect product from freezing.
Wear suitable protective clothing.
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions. Water in contact with the product will cause slippery floor conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Can cause mild irritation.

SKIN CONTACT :
Frequent or prolonged contact with product may defat and dry the skin, leading to discomfort and dermatitis.

INGESTION :
Not a likely route of exposure. If swallowed a jelly mass may form which in digestion may cause blockage.

INHALATION :
Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
Frequent or prolonged contact with product may defat and dry the skin, leading to discomfort and dermatitis.

AGGRAVATION OF EXISTING CONDITIONS :
Skin contact may aggravate an existing dermatitis condition.

HUMAN HEALTH HAZARDS - CHRONIC :
No adverse effects expected other than those mentioned above.

4. FIRST AID MEASURES

EYE CONTACT :
Flush affected area with water. Get medical attention.

SKIN CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. Get medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5. FIRE FIGHTING MEASURES

FLASH POINT : > 200 °F / > 93.3 °C (PMCC)

EXTINGUISHING MEDIA :
This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions. Water in contact with the product will cause slippery floor conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Notify appropriate government, occupational health and safety and environmental authorities. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. Water in contact with the product will cause slippery floor conditions. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
This product is toxic to fish. It should not be directly discharged into lakes, ponds, streams, waterways or public water supplies.

7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Ensure all containers are labeled. Keep the containers closed when not in use.

STORAGE CONDITIONS :
Protect product from freezing. Store in suitable labeled containers. Store the containers tightly closed. Store separately from oxidizers.

UNSUITABLE CONSTRUCTION MATERIAL :
Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Respiratory protection is not normally needed. If significant mists, vapors or aerosols are generated an approved respirator is recommended. A suitable filter material depends on the amount and type of chemicals being handled. Consider the use of filter type: Multi-contaminant cartridge. with a Particulate pre-filter. If respiratory protection is

required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used.

HAND PROTECTION :
Neoprene gloves Nitrile gloves Butyl gloves PVC gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Emulsion
APPEARANCE	Opaque Off-white Light brown
ODOR	Hydrocarbon

SPECIFIC GRAVITY	0.995 - 1.078 @ 77 °F / 25 °C
DENSITY	8.30 - 9.00 lb/gal
SOLUBILITY IN WATER	Emulsifiable
pH (100 %)	4.0 - 5.0
VISCOSITY	400 - 1,500 cps @ 72 °F / 22 °C
VOC CONTENT	28.7 % Calculated

Note: These physical properties are typical values for this product and are subject to change.

10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Avoid temperatures below 0 and above 93 degrees C which will cause polymer to precipitate. Avoid extremes of temperature.

MATERIALS TO AVOID :
Addition of water results in gelling. Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen, Oxides of sulfur

11. TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Low

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The tests for (products or similar products) were performed in clean water as set forth by USEPA (EPA/600/4-90/027). In order to evaluate the potential toxicity mitigation, the tests for (representative polymers) were performed in environmentally relevant water with dissolved organic carbon (DOC: 4.5 mg/l). The toxicity of this product is due to an external mode of action, e.g., suffocation or immobilization. In the presence of suspended material, e.g., DOC, the polymers are bound to suspended material and the bioavailability is substantially reduced. As a result, the toxicity is expected to be lower. Under normal use and discharge conditions, the LC50 values of the representative polymers tested in the presence of DOC are expected to apply to this product. However, for large spills, the clean water data is more applicable.

Acute Fish Results :

Species	Exposure	Test Type	Value	Test Descriptor
Zebra Danio	96 hrs	LC50	1 - 10 mg/l	Representative polymer tested in water with DOC
Inland Silverside	96 hrs	LC50	185.14 mg/l	Product
Rainbow Trout	96 hrs	LC50	0.51 mg/l	Product

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	Test Type	Value	Test Descriptor
Daphnia magna	48 hrs	LC50	10 - 100 mg/l	Representative polymer tested in water with DOC
Daphnia magna	48 hrs	LC50	6.09 mg/l	Product
Mysid Shrimp (Mysidopsis	96 hrs	LC50	3.38 mg/l	Product

bahia)				

CHRONIC FISH RESULTS :

Species	Exposure	Test Type	Value	End Point	Test Descriptor
Topsmelt	7 Days	EC25 / IC25	> 10 mg/l		Similar Product
Fathead Minnow	7 Days	EC25 / IC25	1.55 mg/l	Growth	Similar Product
Topsmelt	7 Days	LOEC	> 10 mg/l		Similar Product
Fathead Minnow	7 Days	LOEC	2.5 mg/l	Growth	Similar Product
Topsmelt	7 Days	NOEC	1 mg/l		Similar Product
Fathead Minnow	7 Days	NOEC	1.25 mg/l	Growth	Similar Product

Chronic Invertebrate Results :

Species	Exposure	Test Type	Value	End Point	Test Descriptor
Ceriodaphnia dubia	7 Days	LOEC	0.313 mg/l	Reproduction	Similar Product
Ceriodaphnia dubia	7 Days	EC25 / IC25	0.25 mg/l	Reproduction	Similar Product
Ceriodaphnia dubia	7 Days	NOEC	0.156 mg/l	Reproduction	Similar Product

ADDITIONAL ECOLOGICAL DATA
NOEC on earthworm: > 1000 mg/l (representative polymer) AOX information: Product contains no organic halogens.

MOBILITY :
The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.
If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air	Water	Soil/Sediment
<5%	10 - 30%	70 - 90%

The portion in water is expected to be soluble or dispersible.

BIOACCUMULATION POTENTIAL
This preparation or material is not expected to bioaccumulate.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: High

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name(s) :	Cationic polymer
UN/ID No :	UN 3082
Hazard Class - Primary :	9
Packing Group :	III

15. REGULATORY INFORMATION

This section contains additional information that may have relevance to regulatory compliance. The information in this section is for reference only. It is not exhaustive, and should not be relied upon to take the place of an individualized compliance or hazard assessment. Nalco accepts no liability for the use of this information.

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
This product may contain trace levels (<0.1% for carcinogens, <1% all other substances) of the following substance(s) listed under the regulation. Additional components may be unintentionally present at trace levels.

Substance(s)	Citations
Adipic Acid	Sec. 311

CLEAN AIR ACT, Sec. 112 (Hazardous Air Pollutants, as amended by 40 CFR 63), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
This product may contain trace levels (<0.1% for carcinogens, <1% all other substances) of the following substance(s) listed under the regulation. Additional components may be unintentionally present at trace levels.

Substance(s)	Citations
Acrylamide	Sec. 112

CALIFORNIA PROPOSITION 65 :
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels, which would require a warning under the statute.

MICHIGAN CRITICAL MATERIALS :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

Adipic Acid 124-04-9

INTERNATIONAL CHEMICAL CONTROL LAWS :

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

AUSTRALIA
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

CHINA
All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on or exempt from the Inventory of Existing Chemical Substances China (IECSC).

EUROPE
The substance(s) in this preparation are included in or exempted from the EINECS or ELINCS inventories

JAPAN
All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Existing and New Chemical Substances list (ENCS).

KOREA
All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)

NEW ZEALAND
All substances in this product comply with the Hazardous Substances and New Organisms (HSNO) Act 1996,and are listed on or are exempt from the New Zealand Inventory of Chemicals.

PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American P–µvu”uµsu&–v&T —u”µ° uµ q§¥Vµt ”yq§¥U wyuµy 5& U7&N”yu§¥Vµ ywx &PQ-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library ov&Z ut ysyuu5&Ou xu t q5&Z q” §¡µt &d\ Z Rc&P] c &PQ-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

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CD-ROM Version),
Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

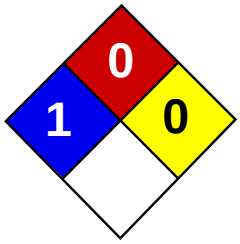
Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety qμt &Uuq§x&Nt ° yμy ”q y–μ&1\ c UN2&N”yu§&Vμ ywx &PQ-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH,
1d\ Z Rc &P] c &PQ-ROM Version), Micromedex, Inc., Englewood, CO.

N”yu§&Vμ ywx (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Vμ ywx &PQ-ROM Version), Ariel Research Corp., Bethesda, MD.

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Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 02/15/2012
Version Number : 1.17





Material Safety Data Sheet
Potassium permanganate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Potassium permanganate

Catalog Codes: SLP4912, SLP3892, SLP1075

CAS#: 7722-64-7

RTECS: SD6475000

TSCA: TSCA 8(b) inventory: Potassium permanganate

CI#: Not available.

Synonym: Potassium Permanganate, Biotech Grade

Chemical Name: Potassium Permanganate

Chemical Formula: KMnO4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Potassium permanganate	7722-64-7	100

Toxicological Data on Ingredients: Potassium permanganate, Biotech: ORAL (LD50): Acute: 1090 mg/kg [Rat]. 2157 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator). Possibly corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: organic materials, metals, combustible materials

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of organic materials, of metals.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Spontaneously flammable on contact with ethylene glycol. Potassium Permanganate being conveyed through propylene tube ignited the tube. When solid hydroxylamine is brought into contact with solid potassium permanganate, there is produced immediately a with flame. Potassium permanganate decomposes hydrogen trisulfide so rapidly that sufficient heat is liberated to ignite the trisulfide. When Antimony or arsenic and solid potassium permanganate are ground together, the metals ignite.

Special Remarks on Explosion Hazards:
Take care in handling as explosions may occur if it is brought in contact with organic or other readily oxidizable substances, either in solution or in dry state. Explosive in contact with sulfuric acid or hydrogen peroxide. Potassium permanganate + acetic acid or acetic anhydride can explode if permanganate is not kept cold. Explosions can occur when permanganates come on contact with benzene, carbon disulfide, diethyl ether, ethyl alcohol, petroleum, or oganic matter. Contact with glycerol

may produce explosion. Crystals of potassium permanganate explode vigorously when ground with phosphorous. A mixture of .5% potassium permanganate + ammonium nitrate explosive caused an explosion 7 hrs. later. Addition of Potassium permanganate + dimethylformamide to give a 20% solution led to an explosion after 5 min. During a preparation of chlorine by addition of the concentrated acid (Hydrochloric acid) to solid potassium permanganate, a sharp explosion occurred on one occasion.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Oxidizing material. Corrosive solid. Stop leak if without risk. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Keep away from combustible material. Do not ingest. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as organic materials, metals, acids.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 5 Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Sweetish, astringent.

Molecular Weight: 158.03 g/mole

Color: Purple. (Dark.)

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: Decomposes.

Critical Temperature: Not available.

Specific Gravity: 2.7 @ 15 C (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, acetone.

Solubility:
Easily soluble in methanol, acetone. Partially soluble in cold water, hot water. Soluble in Sulfuric Acid

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:
Highly reactive with organic materials, metals, acids. Reactive with reducing agents, combustible materials.

Corrosivity: Not available.

Special Remarks on Reactivity:
It is a powerful oxidizing agent. Incompatible with reducing agents, acids, formaldehyde, ammonium nitrate, dimethylformamide, glycerol, combustible materials, alcohols, arsenites, bromides, iodides, charcoal, organic substances, ferrous or mercurous salts, hypophosphites, hyposulfites, sulfites, peroxides, oxalates, ethylene glycol, Manganese salts in air oxidize the toxic sulfur dioxide to more toxic sulfur trioxide. Can react violently with most metal powders, ammonia, ammonium salts, phosphorous, many finely divided organic compounds (materials), flammable liquids, acids, sulfur.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 1090 mg/kg [Rat]. Lowest Published Lethal Dose: LDL[Woman] - Route: Oral; Dose: 100 mg/kg LDL[Human] - Route: Oral; Dose: 143 mg/kg.

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of eye contact (corrosive), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (Male and Female fertility) based on animal data. May affect genetic material (mutagenetic) based on animal data.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Potassium permanganate UNNA: 1490 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut carcinogen reporting list.: Potassium permanganate Illinois toxic substances disclosure to employee act: Potassium permanganate Illinois chemical safety act: Potassium permanganate New York release reporting list: Potassium permanganate Rhode Island RTK hazardous substances: Potassium permanganate Pennsylvania RTK: Potassium permanganate Massachusetts RTK: Potassium permanganate Massachusetts spill list: Potassium permanganate New Jersey: Potassium permanganate New Jersey spill list: Potassium permanganate Louisiana spill reporting: Potassium permanganate California Director's list of Hazardous Substances: Potassium permanganate

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. CLASS E: Corrosive solid.

DSCL (EEC):
R8- Contact with combustible material may cause fire. R22- Harmful if swallowed. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:50 PM

Last Updated: 11/01/2010 12:00 PM

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Potassium Permanganate Solution, 0.1M

MSDS # 584.10

Section 1: Product and Company Identification

Potassium Permanganate Solution, 0.1M

Synonyms/General Names: Chameleon Mineral
Product Use: For educational use only
Manufacturer: Columbus Chemical Industries, Inc., Columbus, WI 53925.

24 Hour Emergency Information Telephone Numbers

CHEMTREC (USA): 800-424-9300 **CANUTEC (Canada): 613-424-6666**

ScholAR Chemistry; 5100 W. Henrietta Rd, Rochester, NY 14586; (866) 260-0501; www.Scholarchemistry.com

Section 2: Hazards Identification

Violet solution, no odor.

HMIS (0 to 4)

Health	**1**
Fire Hazard	**0**
Reactivity	**0**

WARNING! Oxidizing agent and slightly toxic by ingestion.
Target organs: None known

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Section 3: Composition / Information on Ingredients

Potassium Permanganate (7722-64-7), 1-2%. Water (7732-18-5), 98-99%.

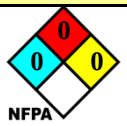
Section 4: First Aid Measures

Always seek professional medical attention after first aid measures are provided.

Eyes: Immediately flush eyes with excess water for 15 minutes, lifting lower and upper eyelids occasionally.
Skin: Immediately flush skin with excess water for 15 minutes while removing contaminated clothing.
Ingestion: Call Poison Control immediately. Rinse mouth with cold water. Give victim 1-2 cups of water or milk to drink. Induce vomiting immediately.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration.

Section 5: Fire Fighting Measures

Oxidizing agent. When heated to decomposition, emits acrid fumes of manganese oxides and potassium hydroxide.



Protective equipment and precautions for firefighters: Use foam or dry chemical to extinguish fire. Firefighters should wear full fire fighting turn-out gear and respiratory protection (SCBA). Cool container with water spray. Material is not sensitive to mechanical impact or static discharge.

Section 6: Accidental Release Measures

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Contain spill with sand or absorbent material and place in sealed bag or container for disposal. Ventilate and wash spill area after pickup is complete. See Section 13 for disposal information.

Section 7: Handling and Storage Yellow

Handling: Use with adequate ventilation and do not breathe dust or vapor. Avoid contact with skin, eyes, or clothing. Wash hands thoroughly after handling.
Storage: Store in Oxidizer Storage Area [Yellow Storage] with other oxidizers and away from any combustible materials. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.

Section 8: Exposure Controls / Personal Protection

Use ventilation to keep airborne concentrations below exposure limits. Have approved eyewash facility, safety shower, and fire extinguishers readily available. Wear chemical splash goggles and chemical resistant clothing such as gloves and aprons. Wash hands thoroughly after handling material and before eating or drinking. Exposure guidelines: Potassium Permanganate: OSHA PEL: Not Available, ACGIH: TLV: Not Available, STEL: Not Available.

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Section 9: Physical and Chemical Properties

Molecular formula	KNO_3.	**Appearance**	Violet solution solid.	
Molecular weight	101.11.	**Odor**	No odor.	
Specific Gravity	1.02 g/mL @ 20°C.	**Odor Threshold**	N/A.	
Vapor Density (air=1)	N/A.	**Solubility**	Soluble in water .	
Melting Point	N/A.	**Evaporation rate**	N/A.	*(Butyl acetate = 1).*
Boiling Point/Range	N/A.	**Partition Coefficient**	N/A.	*(log P_{OW}).*
Vapor Pressure (20°C)	N/A.	**pH**	N/A.	
Flash Point:	N/A.	**LEL**	N/A.	
Autoignition Temp.:	N/A.	**UEL**	N/A.	

N/A = Not available or applicable

Section 10: Stability and Reactivity

Stability: Stable under normal conditions of use and storage.
Incompatibility: Reducing agents, alcohols, bromides, iodides, charcoal, hydrochloric acid, organic material, ferrous or mercurous salt, sulfites, peroxides or oxalates.
Shelf life: Indefinite shelf life, store in cool, dry environment.

Section 11: Toxicology Information

Acute Symptoms/Signs of exposure: ***Eyes***: Redness, tearing, itching, burning, conjunctivitis. ***Skin***: Redness, itching. ***Ingestion***: Irritation and burning sensations of mouth and throat, nausea, vomiting and abdominal pain. ***Inhalation***: Irritation of mucous membranes, coughing, wheezing, shortness of breath,
Chronic Effects: No information found.
Sensitization: none expected
Potassium Permanganate: LD50 [oral, rat]; 1090mg/kg; LC50 [rat]; N/A; LD50 Dermal [rabbit]; N/A
Material has not been found to be a carcinogen nor produce genetic, reproductive, or developmental effects.

Section 12: Ecological Information

Ecotoxicity (aquatic and terrestrial): Toxic to beneficial microorganisms (e.g. soil and sewage treatment microorganisms).. Do not release to environment.

Section 13: Disposal Considerations

Check with all applicable local, regional, and national laws and regulations. Local regulations may be more stringent than regional or national regulations. Small amounts of this material may be suitable for sanitary sewer or trash disposal.

Section 14: Transport Information

DOT Shipping Name:	Not regulated by DOT.	**Canada TDG:**	Not regulated by TDG.
DOT Hazard Class:		**Hazard Class:**	
Identification Number:		**UN Number:**	

Section 15: Regulatory Information

EINECS: Listed (231-760-3) .
TSCA: All components are listed or are exempt.
WHMIS Canada: C, E: Oxidizing material, Corrosive.
California Proposition 65: Not listed.

The product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Section 16: Other Information

Current Issue Date: January 10, 2012

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Material Safety Data Sheet
HYDRATED LIME SLURRY

Rev. Date:5/1/2008

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	**Hi-Cal Lime Slurry**	
Synonym/s:	**Hydrated Lime Slurry, Calcium Hydroxide Slurry, Lime Slurry, Slurry, Milk of Lime**	
Manufacturer:	**US Operations:** **Chemical Lime Co.** **3700 Hulen St.** **Fort Worth, TX 76107** **817-732-8164**	**Canadian Operations:** **Chemical Lime Co. of Canada Inc.** **20302-102B Ave.** **Langley, BC V1M 3H1** **604-888-4333**
Emergency Phone:	**Chemtrec 1-800-424-9300**	
Chemical Name: **Chemical Family:** **Chemical Formula:**	**Calcium Hydroxide** **Alkaline Earth Hydroxide** **$Ca(OH)_2 + H_2O$**	**WHMIS Classification:** **D2A, E**
Product Use/s:	**Water treatment, pH adjustment, FGT, Construction**	
Prepared By:	**Chemical Lime Co.** **R&D/Technical Services, KSA**	

SECTION 2: COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS	OSHA PEL, TWA 8/40h (mg/m3)	ACGIH TLV, TWA 8/40h (mg/m3)	NIOSH REL, TWA 8/40h (mg/m3)	NIOSH IDLH (mg/m3)	Conc. (%)
Calcium Hydroxide, $Ca(OH)_2$ (Hydrated Lime)	**1305-62-0**	**15** (total dust) **5** (respirable)	**5**	**5**	**N.A.**	**20 - 55**
Magnesium Hydroxide, $Mg(OH)_2$ (Brucite)	**1309-42-8**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**< 5**
Crystalline Silica, SiO_2 (Quartz)	**14808-60-7**	**10/(SiO2% + 2)** (respirable)	**0.025** (respirable)	**0.05** (respirable)	**50**	**< 2**

OSHA Regulatory Status: This material is subject to 29 CFR 1910.1200 (Hazard Communication).

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview: Lime Slurry is an odorless, low viscosity suspension of calcium hydroxide in water. Contact can cause irritation to eyes, skin, gastrointestinal tract. In mist form or if material becomes dry, it will irritate the respiratory system.

Potential Health Effects

Eyes: Contact can cause severe irritation or burning of eyes, including permanent damage.

Skin: Contact can cause irritation of skin.

Ingestion: This product can cause severe irritation of gastrointestinal tract if swallowed.

Inhalation: This product can cause severe irritation of the respiratory system in mist or dry form. Long-term exposure may cause permanent damage. Lime Slurry is not listed by MSHA, OSHA, or IARC as a carcinogen. However, this product may contain trace amounts of crystalline silica in the form of quartz or crystobalite, which has been classified by IARC as a Group I carcinogen to humans when inhaled. Inhalation of silica can also cause a chronic lung disorder, silicosis.

Medical Conditions Aggravated by Exposure: Contact may aggravate disorders of the eyes, skin, gastrointestinal tract, and respiratory system.

Potential Environmental Effects: This material is alkaline and if released into water or moist soil will cause an increase in pH.

SECTION 4: FIRST AID MEASURES

Eyes: Immediately flush eyes with generous amounts of water or eye wash solution if water is unavailable. Pull back eyelid while flushing to ensure that all lime dust has been washed out. Seek medical attention promptly if the initial flushing of the eyes does not remove the irritant. Do not rub eyes.

Skin: Remove as much lime slurry as possible and wash exposed area with large amounts of water. If irritation persists, seek medical attention promptly.

Inhalation: Move victim to fresh air. Seek medical attention. If breathing has stopped, give artificial respiration.

Ingestion: Do not induce vomiting. Seek medical attention immediately. Never give anything by mouth unless instructed to do so by medical personnel.

SECTION 5: FIRE FIGHTING MEASURES

Fire Hazards:	Lime Slurry is not combustible or flammable. However, it reacts vigorously with acids, and may release heat sufficient to ignite combustible materials in specific instances. Lime Slurry is not considered to be an explosion hazard, although reaction with acids or other incompatible materials may rupture containers.
Hazardous Combustion Products:	None
Extinguishing Media:	Use extinguishing agent suitable for surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of Lime Slurry.
Fire Fighting Instructions:	Keep personnel away from and upwind of fire. Avoid skin contact or inhalation of dust. Wear full fire-fighting turn-out gear (full Bunker gear), and respiratory protection (SCBA).

SECTION 6: ACCIDENTAL RELEASE MEASURES

Spill / Leak Procedures:	**Do Not** use water on bulk material spills. Use proper protective equipment.
Small Spills:	Use wet material containment methods. Do not clean up with compressed air. Store collected materials in sealed plastic or non-aluminum metal containers. Residue on surfaces may be water washed.
Large Spills:	Use wet containment/collection techniques to collect spilled materials. If material has sufficiently dried to generate dust, evacuate area downwind of clean-up operations to minimize dust exposure. Store spilled materials in sealed plastic or non-aluminum metal containers.
Containment:	Minimize dust generation and prevent bulk release to sewers or waterways.
Clean-up:	Residual amounts of material can be flushed with large amounts of water. Equipment can be washed with either a mild vinegar and water solution, or detergent and water.

SECTION 7: HANDLING AND STORAGE

Handling:	Keep in tightly closed plastic or non-aluminum metal containers. Protect containers from physical damage. Avoid direct skin contact with the material.
Storage:	Store in a cool, dry, and well-ventilated location. Do not store near acids or other incompatible materials. Keep away from moisture. Do not store or ship in aluminum containers.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls:	Provide ventilation adequate to maintain PELs.
Respiratory Protection:	Use NIOSH/MSHA approved respirators if airborne concentration exceeds PELs.
Skin Protection:	Use appropriate gloves and footwear to prevent skin contact. Clothing should fully cover arms and legs. Should lime slurry get inside clothing or gloves, remove the clothing and the lime slurry promptly.
Eye Protection:	Use safety glasses with side shields or safety goggles. Contact lenses should not be worn when working with lime products.
Other:	Eye wash fountain/stations and emergency showers should be available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	**Odor:**	**Physical State:**
White or grayish-white liquid suspension	Odorless	Solid
Boiling Point (°C/°F):	**Melting Point (°C/°F):**	**Specific Gravity**
100 / 212	dec 580 / 1076	(Apparent) g/cc: N.A. (True) g/cc: 1.2 - 1.5
Vapor Pressure (mm Hg):	**Vapor Density:**	**Evaporation Rate:**
N.A.	N.A.	N.A.
Solubility in Water	**pH (25°C/77°F):**	
Material is a suspension of calcium hydroxide in water.	12.4	

SECTION 10: STABILITY AND REACTIVITY

Stability: Chemically stable, but decomposes at 580°C to form calcium oxide. See also Incompatibility below.

Incompatibility/ Conditions to Avoid: Lime Slurry should not be mixed or stored with the following materials, due to the potential for vigorous reaction and release of heat:

Acids (unless in a controlled process)	Organic Acid Anhydrides
Reactive Fluoridated Compounds	Nitro-Organic Compounds
Reactive Brominated Compounds	Reactive Phosphorous Compounds
Reactive Powdered Metals	Interhalogenated Compounds

Hazardous Decomposition Products: None

Hazardous Polymerization: None

Visit
www.chemicallime.com
for latest MSDS versions
Chemical Lime
A Lhoist Group Company

SECTION 11: TOXICOLOGICAL INFORMATION

If product becomes dry and is in its calcium hydroxide form, the following toxicological characteristics apply:
ORL-RAT LD50: 7,340 MG/KG
ORL-MUS LD50: 7,300 MG/KG

Lime Slurry is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product may contain trace amounts of crystalline silica, which has been classified by IARC as carcinogenic to humans when inhaled in the form of quartz or crystobalite.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: Because of the high pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems in high concentrations.

Environmental Fate: This material shows no bioaccumulation effect or food chain concentration toxicity.

SECTION 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable federal, state, and local environmental regulations. If this product as supplied, and unmixed, becomes a waste, it will not meet the criteria of a hazardous waste as defined under the U.S. Resource Conservation and Recovery Act (RCRA).

SECTION 14: TRANSPORTATION INFORMATION

Lime Slurry is not classified as a hazardous material by US DOT and is not regulated by the Transportation of Dangerous Goods (TDG) when shipped by any mode of transport.

SECTION 15: REGULATORY INFORMATION

U.S. EPA Regulations:
RCRA Hazardous Waste Number (40 CFR 261.33): not listed
RCRA Hazardous Waste Classification (40 CFR 261): not classified
CERCLA Hazardous Substance (40 CFR 302.4) unlisted specific per RCRA, Sec. 3001; CWA, Sec. 311(b)(4); CWA, Sec. 307(a), CAA, Sec. 112
CERCLA Reportable Quantity (RQ), not listed
SARA 311/312 Codes: not listed
SARA Toxic Chemical (40 CFR 372.65): not listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): not listed, Threshold Planning Quantity (TPQ): not listed
All chemical ingredients are listed on the USEPA TSCA Inventory List.

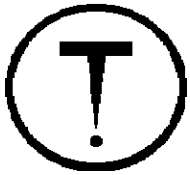
OSHA/MSHA Regulations:
Air Contaminant (29 CRF 1910.1000, Table Z-1, Z-1-A): 5mg/M^3 TWA-8
MSHA: not listed
OSHA Specifically Regulated Substance (29 CFR 1910): not listed

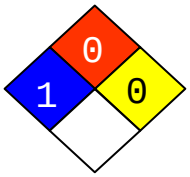
State Regulations:
Consult state and local authorities for guidance. Components found in this product may contain trace amounts of inherent naturally occurring elements (such as, but not limited to arsenic and cadmium) that may be regulated.

Canada:
WHMIS Classification: "D2A" Materials Causing Other Toxic Effects
WHMIS Classification: "E" Corrosive Materials (listed due to corrosive effect on aluminum)
Canada DSL: Listed

NFPA Hazard Class: Health: 1 Flammability: 0 Reactivity: 0
HMIS Hazard Class: Health: 1 Flammability: 0 Reactivity: 0 Personal Protection: E





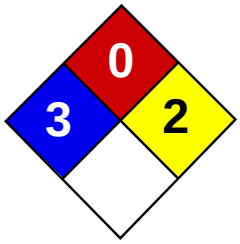


SECTION 16: OTHER INFORMATION

Prepared By: **Chemical Lime Company, R&D/Technical Services, KSA**

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Material Safety Data Sheet
Sulfuric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfuric acid

Catalog Codes: SLS2539, SLS1741, SLS3166, SLS2371, SLS3793

CAS#: 7664-93-9

RTECS: WS5600000

TSCA: TSCA 8(b) inventory: Sulfuric acid

CI#: Not applicable.

Synonym: Oil of Vitriol; Sulfuric Acid

Chemical Name: Hydrogen sulfate

Chemical Formula: H2-SO4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sulfuric acid	7664-93-9	95 - 98

Toxicological Data on Ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged

contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion:
Products of combustion are not available since material is non-flammable. However, products of decompostion include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phorphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:
Mixturesofsulfuricacidandanyofthefollowingcanexplode:p-nitrotoluene,pentasilver trihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picratres, fulminats, dienes, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decompositon.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m3) from NIOSH [United States] Inhalation TWA: 1 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:
270°C (518°F) - 340 deg. C Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

Critical Temperature: Not available.

Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:
Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.

Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene +

sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium aceteylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thalium (I) azidodithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.). Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:
Non-corrosive to lead and mild steel, but dillute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs.(RTECS) Teratogenecity: neither embryotoxic, fetoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestial tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the repiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisons), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sulfuric acid New York release reporting list: Sulfuric acid Rhode Island RTK hazardous substances: Sulfuric acid Pennsylvania RTK: Sulfuric acid Minnesota: Sulfuric acid Massachusetts RTK: Sulfuric acid New Jersey: Sulfuric acid California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid Tennessee RTK: Sulfuric acid TSCA 8(b) inventory: Sulfuric acid SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid SARA 313 toxic chemical notification and release reporting: Sulfuric acid CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R35- Causes severe burns. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

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Last Updated: 11/01/2010 12:00 PM

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Material Safety Data Sheet



1 - Chemical Product and Company Identification

Manufacturer: WD-40 Company **Address: 1061 Cudahy Place (92110)** **P.O. Box 80607** **San Diego, California, USA** **92138 0607** **Telephone:** **Emergency only: 1-888-324-7596 (PROSAR)** **Information: 1-888-324-7596** **Chemical Spills: 1-800-424-9300 (Chemtrec)** **1-703-527-3887 (International Calls)**	**Chemical Name: Organic Mixture** **Trade Name: WD-40 Aerosol** **Product Use: Lubricant, Penetrant, Drives Out Moisture, Removes and Protects Surfaces From Corrosion** **MSDS Date Of Preparation: 3/11/10**

2 Hazards Identification

Emergency Overview:
DANGER! Flammable aerosol. Contents under pressure. Harmful or fatal if swallowed. If swallowed, may be aspirated and cause lung damage. May cause eye irritation. Avoid eye contact. Use with adequate ventilation. Keep away from heat, sparks and all other sources of ignition.

Symptoms of Overexposure:
Inhalation: High concentrations may cause nasal and respiratory irritation and central nervous system effects such as headache, dizziness and nausea. Intentional abuse may be harmful or fatal.
Skin Contact: Prolonged and/or repeated contact may produce mild irritation and defatting with possible dermatitis.
Eye Contact: Contact may be irritating to eyes. May cause redness and tearing.
Ingestion: This product has low oral toxicity. Swallowing may cause gastrointestinal irritation, nausea, vomiting and diarrhea. This product is an aspiration hazard. If swallowed, can enter the lungs and may cause chemical pneumonitis, severe lung damage and death.
Chronic Effects: None expected.
Medical Conditions Aggravated by Exposure: Preexisting eye, skin and respiratory conditions may be aggravated by exposure.

Suspected Cancer Agent:
Yes No X

3 - Composition/Information on Ingredients

Ingredient	CAS #	Weight Percent
Aliphatic Hydrocarbon	64742-47-8	45-50
Petroleum Base Oil	64742-58-1 64742-53-6 64742-56-9 64742-65-0	<25
LVP Aliphatic Hydrocarbon	64742-47-8	12-18
Carbon Dioxide	124-38-9	2-3
Surfactant	Proprietary	<2
Non-Hazardous Ingredients	Mixture	<10

4 First Aid Measures

Ingestion (Swallowed): Aspiration Hazard. DO NOT induce vomiting. Call physician, poison control center or the WD-40 Safety Hotline at 1-888-324-7596 immediately.
Eye Contact: Flush thoroughly with water. Remove contact lenses if present after the first 5 minutes and continue flushing for several more minutes. Get medical attention if irritation persists.

Skin Contact: Wash with soap and water. If irritation develops and persists, get medical attention.
Inhalation (Breathing): If irritation is experienced, move to fresh air. Get medical attention if irritation or other symptoms develop and persist.

5 Fire Fighting Measures

Extinguishing Media: Use water fog, dry chemical, carbon dioxide or foam. Do not use water jet or flooding amounts of water. Burning product will float on the surface and spread fire.
Special Fire Fighting Procedures: Firefighters should always wear positive pressure self-contained breathing apparatus and full protective clothing. Cool fire-exposed containers with water. Use shielding to protect against bursting containers.
Unusual Fire and Explosion Hazards: Contents under pressure. Keep away from ignition sources and open flames. Exposure of containers to extreme heat and flames can cause them to rupture often with violent force. Vapors are heavier than air and may travel along surfaces to remote ignition sources and flash back.

6 Accidental Release Measures

Wear appropriate protective clothing (see Section 8). Eliminate all sources of ignition and ventilate area. Leaking cans should be placed in a plastic bag or open pail until the pressure has dissipated. Contain and collect liquid with an inert absorbent and place in a container for disposal. Clean spill area thoroughly. Report spills to authorities as required.

7 Handling and Storage

Handling: Avoid contact with eyes. Avoid prolonged contact with skin. Avoid breathing vapors or aerosols. Use only with adequate ventilation. Keep away from heat, sparks, pilot lights, hot surfaces and open flames. Unplug electrical tools, motors and appliances before spraying or bringing the can near any source of electricity. Electricity can burn a hole in the can and cause contents to burst into flames. To avoid serious burn injury, do not let the can touch battery terminals, electrical connections on motors or appliances or any other source of electricity. Wash thoroughly with soap and water after handling. Keep containers closed when not in use. Keep out of the reach of children. Do not puncture, crush or incinerate containers, even when empty.
Storage: Store in a cool, well-ventilated area, away from incompatible materials Do not store above 120°F or in direct sunlight. U.F.C (NFPA 30B) Level 3 Aerosol.

8 Exposure Controls/Personal Protection

Chemical	Occupational Exposure Limits
Aliphatic Hydrocarbon	1200 mg/m3 TWA (manufacturer recommended)
Petroleum Base Oil	5 mg/m3 TWA, 10 mg/m3 STEL ACGIH TLV 5 mg/m3 TWA OSHA PEL
LVP Aliphatic Hydrocarbon	1200 mg/m3 TWA (manufacturer recommended)
Carbon Dioxide	5000 ppm TWA (OSHA/ACGIH), 30,000 ppm STEL (ACGIH)
Surfactant	None Established
Non-Hazardous Ingredients	None Established

The Following Controls are Recommended for Normal Consumer Use of this Product
Engineering Controls: Use in a well-ventilated area.
Personal Protection:
Eye Protection: Avoid eye contact. Always spray away from your face.
Skin Protection: Avoid prolonged skin contact. Chemical resistant gloves recommended for operations where skin contact is likely.
Respiratory Protection: None needed for normal use with adequate ventilation.

For Bulk Processing or Workplace Use the Following Controls are Recommended
Engineering Controls: Use adequate general and local exhaust ventilation to maintain exposure levels below that occupational exposure limits.

Personal Protection:
Eye Protection: Safety goggles recommended where eye contact is possible.
Skin Protection: Wear chemical resistant gloves.
Respiratory Protection: None required if ventilation is adequate. If the occupational exposure limits are exceeded, wear a NIOSH approved respirator. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.
Work/Hygiene Practices: Wash with soap and water after handling.

9 Physical and Chemical Properties

Boiling Point:	361 - 369°F (183 - 187°C)	Specific Gravity:	0.8 0.82 @ 60°F
Solubility in Water:	Insoluble	pH:	Not Applicable
Vapor Pressure:	95-115 PSI @ 70°F	Vapor Density:	Greater than 1
Percent Volatile:	70-75%	VOC:	412 grams/liter (49.5%)
Coefficient of Water/Oil Distribution:	Not Determined	Appearance/Odor	Light amber liquid/mild odor
Flash Point:	122°F (49°C) Tag Open Cup (concentrate)	Flammable Limits: (Solvent Portion)	LEL: 0.6% UEL: 8.0%
Pour Point:	-63°C (-81.4°F) ASTM D-97	Kinematic Viscosity:	2.79-2.96cSt @ 100°F

10 Stability and Reactivity

Stability: Stable
Hazardous Polymerization: Will not occur.
Conditions to Avoid: Avoid heat, sparks, flames and other sources of ignition. Do not puncture or incinerate containers.
Incompatibilities: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide and carbon dioxide.

11 Toxicological Information

The oral toxicity of this product is estimated to be greater than 5,000 mg/kg based on an assessment of the ingredients. This product is not classified as toxic by established criteria. It is an aspiration hazard.
None of the components of this product is listed as a carcinogen or suspected carcinogen or is considered a reproductive hazard.

12 Ecological Information

No data is currently available.

13 - Disposal Considerations

If this product becomes a waste, it would be expected to meet the criteria of a RCRA ignitable hazardous waste (D001). However, it is the responsibility of the generator to determine at the time of disposal the proper classification and method of disposal. Dispose in accordance with federal, state, and local regulations.

14 Transportation Information_

DOT Surface Shipping Description: Consumer Commodity, ORM-D
IMDG Shipping Description: Un1950, Aerosols, 2.1, LTD QTY

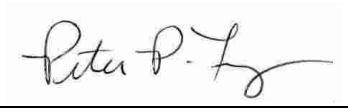
15 Regulatory Information

U.S. Federal Regulations:

CERCLA 103 Reportable Quantity: This product is not subject to CERCLA reporting requirements, however, oil spills are reportable to the National Response Center under the Clean Water Act and many states have more stringent release reporting requirements. Report spills required under federal, state and local regulations.
SARA TITLE III:
Hazard Category For Section 311/312: Acute Health, Fire Hazard, Sudden Release of Pressure
Section 313 Toxic Chemicals: This product contains the following chemicals subject to SARA Title III Section 313 Reporting requirements: None
Section 302 Extremely Hazardous Substances (TPQ): None
EPA Toxic Substances Control Act (TSCA) Status: All of the components of this product are listed on the TSCA inventory.
California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): This product does not contain chemicals regulated under California Proposition 65.
VOC Regulations: This product complies with the consumer product VOC limits of CARB, the US EPA and states adopting the OTC VOC rules.
Canadian Environmental Protection Act: One of the components is listed on the NDSL. All of the other ingredients are listed on the Canadian Domestic Substances List or exempt from notification.
Canadian WHMIS Classification: Class B-5 (Flammable Aerosol)
This MSDS has been prepared according to the criteria of the Controlled Products Regulation (CPR) and the MSDS contains all of the information required by the CPR.

16 Other Information:

HMIS Hazard Rating:
Health 1 (slight hazard), Fire Hazard 4 (severe hazard), Reactivity 0 (minimal hazard)

SIGNATURE:  TITLE: Director of Global Quality Assurance

REVISION DATE: March 2010 SUPERSEDES: August 2009

APPENDIX B

Fail Safe Design Evaluation

FAIL SAFE DESIGN EVALUATION

Groundwater Recovery and Treatment System

B&L Woodwaste Site

Milton, Washington

Prepared for:

B&L Woodwaste Site Custodial Trust
Olympia, Washington

Prepared by:

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March 2012

Project No. SE10160010.1422

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FAIL SAFE DESIGN EVALUATION
Groundwater Recovery and Treatment System
B&L Woodwaste Site
Milton, Washington

1.0 INTRODUCTION

A groundwater recovery and treatment system has been designed and is being constructed at the B&L Woodwaste Site (Site) located in unincorporated Pierce County, near Milton, Washington. The system is a component of a comprehensive cleanup program being conducted at the Site. The cleanup is being conducted in accordance with a Model Toxics Control Act Cleanup Action Plan (CAP) approved by the Washington State Department of Ecology (Ecology). This work is also covered by Consent Decree No. 08-2-10610-7. This work is being performed for the B&L Woodwaste Site Custodial Trust and under direct oversight by Ecology.

The groundwater treatment system is being constructed within a building located on Site property. The treatment process will receive groundwater contaminated with arsenic and will treat the water to remove arsenic to levels specified in a National Pollutant Discharge Elimination System (NPDES) discharge permit. The treatment process requires the use of hazardous chemicals, including potassium permanganate, lime slurry, and concentrated sulfuric acid. The hazardous chemicals used in the process have been described previously in the Hazardous Materials Inventory Sheet (HMIS) submitted to the Pierce County Fire Marshall's office. The November 16, 2011, Technical Opinion and Report prepared by the Fire Protection International Consortium, Inc. (FPIC), presents a comprehensive overview of hazardous materials used at the Site and provisions for compliance with the hazardous materials provisions of the International Fire Code (FPIC, 2011). In addition to the hazardous materials used in the treatment process, it will generate waste sludge that will contain most of the arsenic removed from the groundwater. The untreated groundwater, process chemicals, and process residues could create hazards in the event of uncontrolled releases.

As demonstrated in the November 16, 2011 Technical Opinion and Report, the groundwater treatment process and building are designed to safely use, store, and contain the hazardous materials used in the process. Another key factor for overall process and facility safety is the potential for unsafe conditions during emergency shutdown of the process or in the event of an overall power failure. An overview and evaluation of the fail safe design provisions for the groundwater treatment system is presented in this report.

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2.0 PROCESS OVERVIEW

The groundwater recovery and treatment process consists of the groundwater recovery system and the groundwater treatment plant. The groundwater recovery system includes 21 groundwater extraction wells, each equipped with a submersible pump, and a network of underground collection piping. The groundwater treatment plant will receive the pumped groundwater and treat it in a series of unit operations, producing a high quality effluent that will be discharged to surface water under a NPDES permit issued by Ecology. The groundwater recovery system and the groundwater treatment plant are both under automatic monitoring and control by a single programmable logic controller (PLC). Under normal circumstances, the groundwater recovery and treatment systems will operate unattended. The PLC interfaces with an autodialer that will provide notice to off-site personnel as appropriate for alarm conditions.

2.1 GROUNDWATER RECOVERY SYSTEM

The groundwater recovery system includes 21 recovery wells, as shown on Drawing C-04. The recovery wells cover two general areas:

- Landfill recovery wells: 11 wells completed beneath the landfill, within the area enclosed by the subsurface barrier wall.
- Outside area recovery wells: 10 wells completed in areas outside the landfill. Eight wells are located in the wetlands north (private property) and west (Washington Department of Transportation property) of the landfill. Two wells are located immediately east of the landfill, on the same parcel as the landfill.

The 21 wells are all powered and controlled from the electrical and control systems located in the groundwater treatment building.

The landfill recovery wells are each equipped with a variable speed pump that is controlled by the central PLC. Power for the pumps is provided through the electrical supply center located in the groundwater treatment building. The PLC or a remote operator can start, stop, and set the flow rate for each well pump. The six eastern landfill recovery wells discharge into a common pipe that directs recovered groundwater to the treatment building. The four western landfill recovery wells discharge to a common pipe that also runs to the treatment building. The landfill recovery wells will normally operate under automatic control by the PLC, with the automatic control strategy determining which pumps will be in operation and setting the pumping rates for individual wells. Each well can be operated independently of the other wells.

The wetlands recovery wells and the other recovery wells are each equipped with a fixed speed pump that is controlled by the PLC. Power for the pumps is provided through the electrical supply center

located in the groundwater treatment building. The pumping rate for each well is controlled manually by setting valves located at each wellhead. The PLC or a remote operator can start and stop each pump. The pumps in these 10 wells all discharge to a single pipe that directs the recovered groundwater to the treatment building. The 10 recovery wells located outside the landfill will normally operate continuously. Each well can be operated independently of the other wells.

2.2 GROUNDWATER TREATMENT PROCESS

The groundwater treatment process is designed to remove arsenic from the recovered groundwater. The treatment system must be in operation during operation of any recovery well. A process flow diagram is included as Drawing PFD-01. Process controls are shown on the Process Flow and Instrumentation Diagrams (Drawings P&ID-00 through P&ID-05). The control strategy for the groundwater recovery and treatment systems is described in the Control Narrative included as Appendix A. The process unit operations and controls are summarized below.

The groundwater treatment process is located within a secondary containment area designed to contain any spillage or leaks from the treatment units. The treatment units have been placed on a portion of the building floor that is one foot lower than the main floor of the building, forming the secondary containment area. A concrete drainage trench and sump are located within the secondary containment area to collect water. A sump pump under automatic level control pumps water from the sump to the Head Tank, where the water flows to the treatment process. A high level alarm in the sump is activated if high water level occurs in the sump. The high level alarm indicates a release to the secondary containment area, and causes the PLC to issue a remote alarm and initiate a controlled shutdown of the groundwater recovery and treatment system. The high level alarm will occur before the water level in the sump exceeds the elevation of the secondary containment area floor. The high level alarm in the secondary containment area provides redundancy for detecting and alarming failure conditions.

2.2.1 Head Tank

Contaminated groundwater pumped from the recovery wells to the three collection lines discharges to an open top head tank, which serves as an inlet reservoir for the treatment process. Water flows from the Head Tank by gravity flow. The Head Tank includes a level sensor that will issue an alarm if the level in the tank becomes too high (P&ID-01). The high level alarm will initiate shutdown of all pumping wells prior to overfilling the tank. In the unlikely event the tank overfills, water will overflow the tank and be collected in the secondary containment area.

2.2.2 Oxidation Tank

The Oxidation Tank receives flow from the Head Tank. Potassium permanganate is mixed into the water in this tank and allowed to react with arsenic and ferrous iron to facilitate precipitation of these metals and remove them from the water. The Oxidation Tank is an open top tank with a gravity overflow. This tank includes an oxidation/reduction potential (ORP) instrument that will issue an alarm if the ORP is above or below control limits, indicating that the permanganate dosage is too high or too low. If the tank overflows, water will be collected in the secondary containment area. Potassium permanganate solution is fed to the Oxidation Tank from the permanganate feed tank and pump under PLC control.

2.2.3 Co-Precipitation Tank

The Co-Precipitation Tank mixes flow from the Oxidation Tank with lime slurry. The rate of lime addition is controlled by the PLC to maintain the pH setpoint. Lime is used to raise the pH of the groundwater, resulting in additional precipitation of iron, arsenic, and other metals that may be present in the groundwater. The pH monitor will issue alarms if the pH of the tank is too high or too low, indicating over- or under-dosing with lime. If the tank overflows, water will be collected in the secondary containment area. Lime slurry is fed to the Co-Precipitation Tank from the lime slurry feed tank and pump under PLC control.

2.2.4 Clarifier

Water will flow by gravity from the Co-Precipitation Tank to the Clarifier for separation of precipitated solids from the partially treated water. The Clarifier includes a flash mix tank, where polymer is mixed with the water to facilitate the coagulation/flocculation of precipitated solids. The water then flows to the flocculator before entering the inclined plate settler where solids will settle to the bottom of the unit. Clarified water will exit via the overflow weir. Sludge will be removed from the bottom of the Clarifier by a diaphragm pump, which transfers most of the sludge for temporary storage in the sludge tank. Some sludge from the Clarifier will be pumped to the Co-Precipitation Tank to facilitate precipitation reactions and improve sludge settling characteristics. As noted for the other process tanks, the Clarifier is located within the secondary containment area. Polymer is fed to the Clarifier from the polymer feed system under PLC control.

2.2.5 pH Adjust Tank

The overflow from the Clarifier will flow by gravity to the pH Adjust Tank where sulfuric acid is added to lower the pH of the water to facilitate adsorption of remaining arsenic in the adsorbers and to adjust the pH to meet effluent quality criteria specified in the NPDES permit. Concentrated sulfuric acid is added to the water under automatic pH control. The continuous pH monitor will issue an alarm if the water pH is above or below control limits. Water is pumped from the pH Adjust Tank. The pumps

operate under automatic speed control to maintain a preset level in the pH Adjust Tank. As the pH Adjust Tank is the last unit operation under gravity flow, the level in the tank affects the level in all upstream treatment units. The pH Adjust Tank is equipped with a high level sensor and alarm; if a high level is detected in the pH Adjust Tank, a controlled shutdown of the groundwater recovery and treatment system is initiated and a remote alarm is issued by the PLC. Any spills or releases from the pH Adjust Tank will be contained within the secondary containment area.

2.2.6 Filtration

After pH adjustment, the water is pumped through a cartridge filter to remove residual suspended solids prior to adsorption. The cartridge filters are closed filter units and require pumps to force water through the filters. The filter vessels are equipped with pressure relief valves that discharge to the secondary containment area. Two filter units are included in the process design; only one unit will be in operation at any time, with the spare unit being available for use when the main unit becomes plugged with solids. Each filter is equipped with a differential pressure sensor that enable the PLC to monitor pressure drop across the filters. The pressure drop identifies plugging of the filter media, indicating that the filters must be serviced by the operator. The filter units are located within the secondary containment area so that any spills or leaks, especially during servicing, are contained.

2.2.7 Adsorbers

The final treatment stage consists of two adsorption columns charged with activated alumina. The alumina removes arsenic remaining in the water to very low levels. Two adsorbers are included in the design. They are to be operated in series. When the alumina in the lead adsorber is spent, the lag adsorber will become the lead unit and fresh media will be placed in the spent unit, which will be placed in lag service. The Adsorbers are closed vessels equipped with pressure relief valves that discharge to the secondary containment area. Differential pressure sensors monitored by the PLC are included for each Adsorber to identify plugging. The Adsorbers are located within the secondary containment area so that spills and/or leaks are contained. Water discharged from the Adsorbers flows through a flow meter and is then discharged to the pond located north of the landfill. Treated water will be regularly sampled to monitor compliance with the NPDES permit. The pH of the treated effluent will be measured by an in-line pH meter (AIT 435).

2.2.8 Sludge Dewatering

Sludge containing most of the arsenic present in the recovered groundwater will be generated by the Clarifier, as described above. The sludge pumped from the Clarifier is expected to contain 0.5 to 2% dry solids. This sludge will be pumped to the sludge storage tank where it will be kept mixed to prevent settling within the tank. The sludge tank is equipped with level sensors tied to the PLC that will issue an alarm if the sludge level becomes too high. The PLC will also initiate a controlled

shutdown of the groundwater recovery and treatment systems under high level conditions in the sludge tank. When sufficient sludge is generated it will be dewatered using the Plate and Frame Filter Press. An operator will be present whenever the filter press is in operation. Sludge dewatering is a cyclical process:

- Sludge is pumped to the filter press until it is fully loaded and pumping is stopped;
- The filter press is opened to remove filter cake; and
- The filter press is then cleaned as appropriate, closed, and readied for another cycle.

Sludge will be pumped from the sludge tank and forced through filter fabric in the filter press. Filtrate will flow from the filter press to the secondary containment sump where it will be pumped to the Head Tank for treatment. Filter cake that forms in the filter press will drop into a roll-off container beneath the filter press. When the roll-off container is filled to capacity, it will be removed for off-site landfill disposal and an empty container will be placed beneath the filter press.

2.2.9 Chemical Feed Units

As noted above, chemical feed systems will be used to provide treatment chemicals to the process. These units are ancillary to the process unit operations described above. Additional details regarding hazardous materials storage are included in the FPIC technical opinion and report (FPIC, 2011). Each feed system is described below.

Potassium permanganate will be purchased as granular material in drums. It will be fed to the process using a chemical metering pump that draws from a storage tank containing potassium permanganate feed solution. The permanganate feed solution is prepared by adding potassium permanganate granules using a mechanical drum dumper and feed auger. The dry feeder adds the preset amount of permanganate to the tank based on the run time of the variable speed auger. Potable water is added to the tank under level control to prepare the solution at the desired concentration. A mixer is used to dissolve the permanganate. The permanganate metering pump is controlled by the PLC to add permanganate to the Oxidation Tank at a rate proportional to the influent flow rate measured between the Head Tank and the Oxidation Tank. The permanganate feed line has been placed inside a larger plastic pipe so that any permanganate solution released if the feed line fails will be contained and drained back to a secondary containment area around the permanganate tank.

Lime slurry will be purchased in bulk and stored in a lime slurry tank. The tank will be equipped with a mixer that will operate continuously to keep the lime suspended. A peristaltic pump will be used to maintain continuous lime slurry flow in a recirculation loop, drawing from the slurry tank and recycling

back to the slurry tank. Flow control valves in the slurry recirculation line will be used by the PLC to add lime slurry as needed to maintain the preset pH in the Co-Precipitation Tank.

Sulfuric acid will be obtained in commercial totes. The acid will be fed neat using a chemical metering pump that draws directly from the tote. The PLC will control the acid pumping rate to lower the pH in the pH Adjust Tank to the preset control point. The acid line will be placed inside a larger plastic pipe to contain any release of acid if the acid tubing fails. The containment pipe will drain to the acid containment sump beneath the acid tote storage pad.

Polymer will be purchased as a concentrated liquid in buckets or small drums. Feed solutions will be prepared by automatically pumping neat polymer to the polymer feed tank. Potable water will be added under level control to prepare the feed solution. A chemical metering pump will draw polymer from the feed tank and discharge to the flash mix tank on the Clarifier under automatic control. The pump rate will be controlled by the PLC to achieve the preset dosage, based on the influent flow rate. A second metering pump will be operated manually during sludge dewatering operations to provide the desired polymer dose to the sludge tank.

3.0 PROCESS SHUTDOWN DESIGN

Shutdown of the groundwater recovery and treatment system can occur if instrumentation indicates process failure, emergency conditions occur, or power to the system fails. Process failure conditions that initiate process shutdown are described thoroughly in the Control Narrative (Appendix A). Process failure or emergency conditions would initiate automatic shutdown controlled by the PLC. Power failure would initiate an uncontrolled shutdown. The groundwater recovery and treatment system has been designed to shut down safely under either circumstance.

Shutdowns controlled by the PLC will follow the same sequence, regardless of the event initiating the shutdown. Whenever the PLC initiates an automatic shutdown, an alarm will be delivered to off-site personnel via the autodialer. A variety of conditions indicating process failure would initiate automatic shutdown, as described in the Control Narrative (Appendix A). Additionally, emergency conditions can also initiate automatic shutdown and issuance of remote alarms. The following emergency circumstances can initiate an automatic shutdown controlled by the PLC:

1. Detection of high level in the secondary containment area around the lime slurry storage tank and the potassium permanganate feed tank;
2. Detection of high level in the collection sump for the secondary containment area around the groundwater treatment units;
3. Detection of rapid loss of contents in a sulfuric acid tote;
4. Activation of the safety shower or eye wash station located in the treatment building;
5. Manual activation of an emergency alarm switch located in the treatment building;
6. Detection of flow in the fire protection sprinkler system;
7. Detection of smoke by a building smoke alarm; and
8. Emergency shutdown of the ventilation system via the emergency ventilation shutdown switch.

The remote alarm issued with shutdowns for these emergencies will identify the cause of the shutdown. Remote alarms related to non-emergency, process failure conditions will be a general alarm, and will require remote or on-site operator action to determine the specific nature of the failure condition.

Uncontrolled emergency shutdown of the system would occur during any event that results in failure of power supplied to the groundwater treatment building. All electricity used for the groundwater recovery and treatment system is routed through the building; interruption of power to the building would interrupt power to all equipment associated with the groundwater recovery and treatment

system. Emergency backup power is supplied to the PLC and autodialer so that process data, process control programming, and remote alarm capability will be maintained during short term power loss. The autodialer will provide an alarm to off-site personnel in the event of power failure. Emergency shutdown due to power failure would immediately stop all recovery well pumps, which would stop the flow of untreated groundwater to the treatment process. Additionally, chemical feeds would stop due to loss of power to the chemical feed pumps. All mixers, pumps and other equipment associated with the treatment process would also cease operation under a power failure.

The groundwater recovery system is designed to shut down in a safe and environmentally sound manner. As noted in the FPIC report, secondary containment is provided for hazardous materials and chemicals used within the building. The secondary containment provisions for the groundwater treatment units described above will contain spills and releases from the groundwater treatment process. A more detailed description of the design provisions for safe shutdown of the groundwater recovery and treatment system is presented below.

3.1 CONTROLLED SHUTDOWN: PROCESS FAILURE

As noted above, the automatic control system will initiate a controlled shutdown in the event of process failure conditions or under the emergency conditions noted above. An overview of the general alarm and shutdown design is presented in Sections 1.1 and 1.2 of the Control Narrative included as Appendix A. The automatic shutdown sequence presented in Section 1.2 of the Control Narrative would be implemented for all process failure conditions. This sequence includes the shutdown of all 21 well pumps that would stop the input of contaminated groundwater to the treatment plant. Following shutdown of the well pumps, the solenoid valves on the three influent lines located at the treatment building would be closed. The chemical feed pumps and/or valves would then be stopped or closed, which would stop addition of treatment chemicals to the groundwater treatment vessels. The pumps that feed the cartridge filters and adsorbers would continue to operate under level control until they are stopped automatically due to shutdown of the well pumps and influent lines. Continued operation of the cartridge filter feed pumps will prevent overflow of the treatment tanks and vessels upstream of the filters. The lime recirculation pump would remain in operation to prevent settling of suspended lime solids in piping; the three-way chemical feed valve will be set to recirculate lime to the Lime Tank and pinch valve MV-121 will close to prevent flow of lime to the Co-Precipitation Tank. The air compressor will remain in operation to maintain operating pressure in the receiver vessel. Sludge recirculation from the Clarifier to the Co-Precipitation Tank will be maintained. The sludge recirculation pump is a pneumatic diaphragm pump that requires compressed air to operate. All mixers in process tanks and storage tanks would remain in operation to prevent settling. Building facilities and utilities, including ventilation systems and compressed air supply, will remain in normal operation during a controlled shutdown. However, a solenoid valve on the potable water supply line (P&ID-04) will be closed by the PLC to prevent continued flow of water to the process area; potable

water supply will be maintained for the emergency shower and eye wash station and plumbing fixtures in the building.

If a controlled shutdown is initiated by the PLC, a general process failure alarm will be issued to remote operators via the autodialer. The remote operators would either log onto the PLC via a dial-in line or travel to the groundwater treatment building to address the process failure. The PLC will log process failure conditions that caused the controlled shutdown so that the remote or on-site operators can assess the reason for the shutdown and alarm. As noted in Section 1.1 of the Control Narrative, the alarm conditions must be cleared at the PLC interface before the groundwater recovery and treatment systems can be restarted.

Process and chemical hazard conditions during and after a controlled shutdown will be no different than during normal operations; these hazards are primarily direct contact to process chemicals or contaminated groundwater. No volatile chemicals are used in the process and no aerosols or dusts will be generated by process operations. No releases to secondary containment areas for the process or for process chemicals are anticipated under the controlled shutdown sequence.

3.2 CONTROLLED SHUTDOWN: EMERGENCY CONDITIONS

The emergency conditions noted above will also initiate a controlled shutdown of the groundwater recovery and treatment system. Controlled shutdown will be directed by the PLC and will include an alarm to off-site operations personnel. For emergency conditions 2 thru 8, the shutdown sequence will be the same as that described above for a controlled shutdown due to process failure. For emergency condition 1 (high level in the tank secondary containment area), the normal automatic shutdown sequence described above will be supplemented by shutdown of the lime slurry recirculation pump. Shutdown of the lime slurry recirculation pump is necessary because the lime recirculation line could be the source of the release to the secondary containment area. An appropriate emergency alarm would be issued to offsite personnel for any controlled shutdown of the system due to emergency conditions 1 thru 8.

Process and chemical hazards during and after a controlled emergency shutdown may be greater than those during normal operations due to the emergency that initiated the shutdown. A summary of the key potential hazards associated with each of the 8 emergency conditions listed above is presented on Table 1. For all emergency conditions not associated with fire (i.e., conditions 1 thru 5 and 8), the primary potential hazards are related to direct contact with process chemicals or contaminated groundwater. The only inhalation hazards likely to be encountered during emergency conditions are associated with emergencies related to fire or smoke. As noted above, the controlled shutdown sequence will maintain operation of the ventilation fan. This fan can be shut down manually

under emergency conditions using the emergency shutdown switch that will be located on the building exterior, near the primary entrance.

3.3 UNCONTROLLED SHUTDOWN: POWER FAILURE

In the event that the power supply to the groundwater treatment building fails, the entire groundwater recovery and treatment system will cease operation. All power for the pumps, equipment, and controls will be routed through the electrical panels and controls located in the groundwater treatment building. The system is designed to cease operation in a safe mode in the event of power failure. Backup power will keep the PLC and autodialer powered during short-term power outages. The autodialer will issue a power failure alarm to off-site operations personnel if power to the building fails. The system will remain in shutdown mode until it is restarted by an operator.

The Process Flow and Instrumentation Diagrams (P&ID-00 through P&ID-05) document the process flow elements for the groundwater recovery and treatment system. The shutdown mode for each of the key elements of the system during power failure are described in the following subsections.

3.3.1 Groundwater Recovery Wells and Collection Lines

As shown on P&ID-05, the 21 groundwater wells are each equipped with a submersible electric pump that is used to recover groundwater from the well and transfer it to the groundwater treatment process. Three groundwater collection lines are used to direct recovered groundwater to the treatment building (Drawing C-04). In the event of a power failure, the well pumps will immediately cease operation, stopping the recovery of groundwater and delivery of contaminated groundwater to the treatment process. Each well is equipped with a check valve that will prevent backflow of groundwater to each well. No releases of groundwater would occur at the wells or from the groundwater collection lines in the event of a general power failure. All valves and wellhead instruments associated with the groundwater recovery wells and collection lines operate mechanically, and do not require electricity to operate. Therefore, the valves and wellhead instruments will not be affected by a power outage to the groundwater treatment building.

3.3.2 Groundwater Treatment Process

The process train that receives and treats contaminated groundwater recovered from the wells is designed to shut down in a safe mode in the event of power failure. The treatment process is shown in Drawings P&ID-01 and P&ID-04.

Recovered groundwater from the three collection lines enters the building and is discharged to the Head Tank, as shown on P&ID-01. Each collection line is equipped with an electrically operated solenoid valve (EV-100, -101, and -102). As noted in Section 3.3.1, all well pumps will stop pumping

during power failure. Power to the three influent solenoid valves will be lost during power failure. These three solenoid valves are designed to fail in a closed position; these valves will close when power is lost. This will isolate contaminated groundwater in the collection lines from the treatment process and provide a secondary means of stopping flow to the treatment system. The control system will be programmed to keep the solenoid valves closed until the control system is reset after power failure and the startup sequence is initiated by the operator.

As shown on P&ID-01 and P&ID-04, water in the Head Tank (TK-100) flows by gravity to the Oxidation Tank (TK-110), Co-Precipitation Tank (TK-120), Clarifier (TH-130), and pH Adjust Tank (TK-420). Water is pumped from TK-420 by an electric pump (PU-420A/B) under automatic level control. During power failure, PU-420A/B will cease operation, which will stop flow from TK-420. Water will continue to flow from TK-100, through tanks TK-110, TK-120, and TH-130 until the level in TK-420 equilibrates with TK-100, which will stop groundwater flow through the gravity tanks. The elevation of the tanks will ensure that water within the gravity tanks is contained and no overflow will occur to the secondary containment area. As PU-420A/B cannot operate without electrical power, flow to the cartridge filters, adsorption columns, and discharge line will also stop during power failure. Some flow of treated water from the discharge line to the North Pond may continue during a power failure due to drainage from the discharge line. As this water would be fully treated, no hazards would result from power failure. Flow from the discharge line will stop after water in the line has drained to the North Pond. The pumps will not be restarted until the control system is reset after power failure and the startup sequence is initiated by the operator.

Drawings P&ID-01 and -04 show that TK-110, TK-120, TH-130, and TK-420 are all equipped with electric mixers and process instruments. The mixers and instruments cease operation during a power failure. No potentially hazardous conditions would result from cessation of the mixers and instruments. Sludge may accumulate on the bottom of the Oxidation, Co-Precipitation, and Clarifier Tanks; sludge accumulation may create operations issues when the system is restarted, but it would not create any health or environmental hazards different from those during system operation. When power to the building is restored, the instruments will resume operation, but the mixers will remain off until the control system is reset after power failure and the startup sequence is initiated by the operator.

Safety and environmental hazards related to the treatment process will not be affected by power failure. Potential hazards would be substantially the same as during normal operations. No vapors, dusts, or mists would be created by failure of power for the treatment system unit operations. Any spills or releases from the treatment system would be contained by the secondary containment provided for the treatment process.

3.3.3 Sludge Dewatering System and Air Compressor

The sludge dewatering system consists of the sludge storage tank and filter press, as shown on P&ID-02. For this system, a pneumatic pump (PU-220) draws underflow from the Clarifier and directs flow to the Sludge Tank (TK-220) and the Co-Precipitation Tank (TK-120). When sufficient sludge has been accumulated in TK-220, sludge dewatering is performed. Due to the nature of filter press operations, sludge dewatering is only performed when an operator is present on site. During sludge dewater operations, which is expected to occur approximately for 4 to 6 hours once weekly, a pneumatic pump (PU-230) is used to pump sludge from TK-220 to the plate and frame filter press. Filtrate from the filter press flows by gravity to the process sump located within the secondary containment area for the treatment system. Water collecting in the process sump is pumped to the Head Tank by an electric pump under level control. The filter press is a single manufactured piece of equipment that includes the filter, a hydraulic system, and local controls. The press is operated by the hydraulic system, which is powered by an electric pump.

Compressed air is used to drive the pneumatic pumps, for filter press operation, and as instrument air for the filter press. The compressed air will be provided by the air compressor unit shown on P&ID-02. The compressor is run by an electric motor that will cease operation if power to the building fails. The compressor (CO-910) will operate under on/off control to maintain a preset pressure in the accumulator vessel (TK-910). The accumulator vessel will remain pressured after a power failure; the pressure in the vessel will either remain constant or gradually decrease if any air is used after the compressor stops operation. As shown on P&ID-02, the air lines to the two pneumatic pumps (PU-220 and PU-230) include solenoid valves EV-920 and EV-930. Upon loss of power, these solenoid valves will close, stopping flow of air to the pneumatic pumps that will stop pump operation, causing the flow of sludge to stop. The air compressor will resume operation when power is restored. Solenoid valves EV-920 and EV-930 will remain closed until the control system is reset after power failure and the startup sequence is initiated by the operator.

Under normal operation, sludge will be added to TK-220 via the clarifier sludge pump, PU-220. When the sludge level in TK-220 reaches capacity, the operator will come to the treatment building to operate the filter press and dewater sludge. As noted previously, it is expected that sludge dewatering will be conducted for approximately 4 to 6 hours each week (about 3 to 4% of the time). Operation of the filter press is cyclical; the unit is activated by the operator when dewatering is required. Addition of polymeric flocculant is first initiated to condition the sludge for dewatering by activating polymer dosing pump PU-330B and opening the appropriate valves. When sufficient polymer has been added, the sludge feed pump (PU-230) is started to charge sludge to the filter press. Filtrate generated during the charge cycle drains from the press to the collection sump during the charge cycle. Sludge is pumped to the filter press until it is fully loaded and the feed pump is stopped. When the feed pump is stopped, the filter cake dump cycle is initiated. Compressed air is

used to clear sludge lines and the filter core prior to opening the filter. The filter press is then opened to drop filter cake into the roll-off container beneath the filter press.

If a power failure occurs when sludge dewatering is not active, it will have no effect on the system. If a power failure occurs during sludge dewatering operations, conditions will depend upon the operations occurring at the time power fails. The mixer in TK-220 will stop when power fails. Operation of the filter press FP-240 will stop due to loss of electrical and hydraulic power. If the sludge is being conditioned when the power fails, flow of polymer will stop due to stoppage of the electric polymer feed pump. If power failure occurs during the charge cycle, pneumatic sludge transfer pump PU-230 will stop due to closure of EV-930 and the flow of sludge to the filter press will stop. Production of filtrate will stop simultaneously with pumping of sludge to the filter press. Pneumatic controls will remain powered due to the continued availability of compressed air from the compressed air accumulator vessel (TK-910) after the power fails. The pneumatic controls would remain active as long as sufficient air pressure remains in the compressed air accumulator vessel. If the filter press is in the cake blow or core blow step when the power failure occurs, compressed air will continue to be used until the accumulator vessel is emptied. As the cake blow and core blow operations will occur for only a few minutes during the cake dump cycle (less than 1% of the filter press operation time) the probability of power failure while the filter is in the cake blow or core blow cycle is low (i.e., cake blow and core blow operations are expected to occur about 0.03 to 0.04% of the time).

No hazardous conditions other than those that would occur under normal sludge dewatering operations would result from a power failure during sludge dewatering. No dusts, mists, or vapors would be generated if a power failure occurs during sludge dewatering operations. If a groundwater release occurs from the sludge dewatering system during a power failure, the volume of the release will be minimal and would be contained within the treatment process containment area. The sludge dewater system will not restart upon restoration of power to the building; it will only restart after the operator resets the system and specifically starts up the sludge dewatering system.

3.3.4 Process Additive Systems

The groundwater treatment process requires the addition of potassium permanganate to oxidize groundwater constituents, lime slurry to promote precipitation, polymer to improve solids settling and sludge dewatering characteristics, and sulfuric acid to control the final pH of the groundwater. Process Flow and Instrumentation diagrams for these systems are shown on Drawings P&ID-03 and P&ID-04. Three of these process chemicals (sulfuric acid, potassium permanganate, and lime slurry) are hazardous materials addressed in the HMIS. The hazardous materials are all stored within secondary containment areas to contain any spills or releases. The chemical feed pumps for all

process chemicals are operated by electric motors and require power to operate. No change in potential hazards are likely to occur from these systems during power failure.

The potassium permanganate system (P&ID-03) includes a drum dumper/dry chemical feeder, feed solution storage tank, and the $KMnO_4$ dosing pumps. Granular potassium permanganate will be purchased in small drums. The drums will be placed into the drum dumper/dry feeder manually on an as-needed basis. After placing a drum into the drum dumper, the dumper will be activated; this results in a lid/hopper being placed over the drum, clamping the lid/hopper onto the drum, and then inverting the drum so that the granular material flows into the lid/hopper. The lid/hopper allows the granular chemical to flow to a screw auger that transfers a preset amount of dry chemical to the feed tank. The drum dumper/chemical feeder will automatically prepare the feed solution by adding dry chemical and potable water to the feed tank whenever the level indicates that the solution needs to be replenished. The drum dumper/dry chemical feeder operates using an electrically powered hydraulic system, electric motors, and both electric and electronic controls. The hydraulic system is used for handling the drums of $KMnO_4$ (clamping the drum to the lid and inverting the drum). The feed tank (TK-310) is equipped with an electric mixer and electric dosing pumps (PU-310A/B). If power to the building fails, all electric motors and pumps will cease operation, which will stop transfer of dry chemical and feed solution. The potable water makeup to TK-310 is controlled by a solenoid valve that will close if power fails, stopping addition of water to the feed tank. Power failure will not create any additional potential hazards in the potassium permanganate system; no vapors, mists, or dusts would be generated due to power failure. Restart of the feed system after restoration of power requires a system reset and initiation of the startup sequence by the operator.

The lime slurry system (P&ID-03) consists of the Lime Tank (TK-320) and slurry recirculation pump (PU-320). The Lime Tank is continually mixed to prevent settling of lime solids in the tank. Lime slurry is added to the Co-Precipitation Tank by an electrically actuated valve controlled by the PLC. The PLC directs lime slurry to the Co-Precipitation Tank as needed to maintain the desired pH. The lime recirculation pump is intended to operate continuously to prevent settling in the recirculation line. If a general power failure occurs, the electric mixer in TK-320 will stop; this will not cause the release of lime slurry or generate any aerosols or vapors. Recirculation pump PU-320 will also stop during a power failure, which will also stop flow within the lime slurry recirculation line. The lime slurry control valve (FV-120) will close off flow to TK-120 if power fails. The solenoid valve controlling potable water flow to the lime slurry feed line (EV-391) will close during power failure, stopping flow of potable water to TK-120. No potential hazards, dusts, mists, or vapors would be generated from the lime slurry system during general power failure. Any releases would be contained within the secondary containment system for the lime slurry tank. Restart of the feed system after restoration of power requires a system reset and initiation of the startup sequence by the operator.

The polymer dosing system (P&ID-03) prepares polymer solutions and feeds the solution to the Clarifier and sludge dewatering system. Polymer is purchased as a concentrated liquid in small containers (approximately 5 gallons). The Polymer Makedown unit (SKID-330) pumps the neat polymer from the bucket and mixes it with potable water to prepare the feed solution. The feed solution is stored in the feed tank (TK-330) where it is fed to the treatment processes using the polymer dosing pumps (PU-330A/B). The Polymer Makedown unit uses electric pumps, valves, and controls. The polymer feed tank is equipped with an electric mixer. Pumps PU-330A/B are driven by electric motors. In the event of power failure, the pumps, controls, and mixers associated with the polymer dosing system will cease to operate, stopping the flow of neat polymer to the dilution tank and dilute polymer to the groundwater treatment unit operations. The electric valves used to control addition of potable water to the unit will close if power is lost, which will stop the flow of potable water. No potential hazards, dusts, mists, or vapors will result from the polymer dosing system during general power failure. Restart of the feed system after restoration of power requires a system reset and initiation of the startup sequence by the operator.

The sulfuric acid dosing system (P&ID-04) is used to feed neat acid to the pH Adjust Tank. Acid is added automatically using electric metering pumps (PU-410A/B). Concentrated acid is received in Department of Transportation (DOT) totes with an approximate capacity of 250 gallons. Two totes will be present, only one will be in use. Acid dosing pumps PU-410A/B will draw concentrated acid directly from the DOT totes. The PLC will turn PU-410A/B on and off as needed to control the pH in TK-420 within the target range. During a general power failure, the acid dosing pumps will stop operation, which will stop the flow of acid to TK-420. Acid would remain in the feed line, but will not present any hazard different from normal operations. Power failure will not result any new material contacting the acid; all materials that will be in contact with the acid are acid resistant and are compatible. The feed line is jacketed in a CPVC pipe to control any release of acid from the feed line. No potential hazards, vapors, gases, dusts, or mists will be generated by the acid feed system during general power failure to the building. Restart of the feed system after restoration of power requires a system reset and initiation of the startup sequence by the operator.

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4.0 CONCLUSIONS

Based upon the information presented in this report and appendices, the following conclusions are made regarding shutdown of the groundwater recovery and treatment system for the B&L Woodwaste Site:

1. The system has been designed for safe, automatic shutdown due to conditions monitored by the control system that indicate process failure.
2. The system has been designed for safe, automatic shutdown due to emergency events either detected by the process control system or initiated by manually actuated alarms.
3. The system has been designed to stop operations in a safe manner in the event of a general power failure. No significant hazards other than those present during normal operations would be present after a general power failure.
4. No conditions requiring active ventilation would be created by an uncontrolled shutdown due to general power failure.
5. The system has been designed to prevent uncontrolled restart after a power failure. The system can only be restarted after an operator resets the control system and then initiates the startup sequence.

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5.0 REFERENCES

Fire Protection International Consortium, Inc. (FPIC), 2011, Technical Opinion and Report, November 16.

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TABLE 1

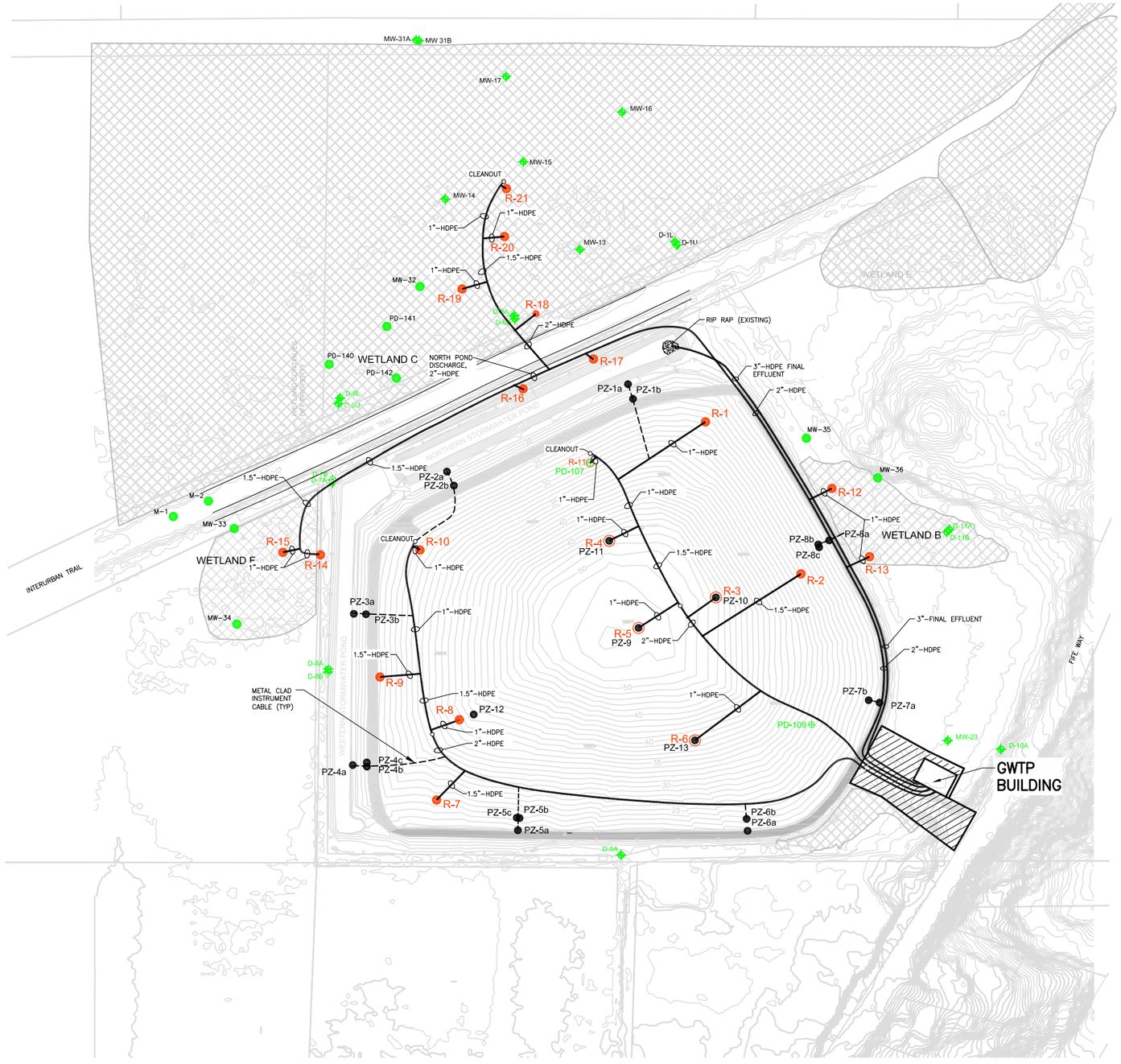
POTENTIAL EMERGENCY SHUTDOWN HAZARDS

B&L Woodwaste Site
Milton, Washington

Emergency Condition	Key Potential Hazards
1 High level, Lime/$KMnO_4$ Secondary Containment	Lime slurry and/or $KMnO_4$ (3% solution) direct contact exposure within containment area.
2 High Level, Process Secondary Containment Sump	Arsenic direct contact exposure within containment area.
3 Loss of Contents, Acid Tote	Sulfuric acid direct contact exposure within containment area.
4 Activation of Safety Shower/Eye Wash Station	Direct contact exposure[1] within release area.
5 Emergency Alarm Activation	Direct contact exposure[1] within release area.
6 Fire Protection Sprinkler Flow	Fire hazard, direct contact exposure[1], chemical decomposition vapors (see HMIS), combustion products.
7 Smoke Detection	Smoke inhalation, fire hazard, direct contact exposure[1], chemical decomposition vapors (see HMIS).
8 Ventilation System Emergency Shutdown	Direct contact exposure[1].

Notes
1. Potential hazardous chemicals include lime slurry, sulfuric acid, or $KMnO_4$ (solid or 3% solution).

Abbreviations
HMIS = Hazardous Materials Inventory Sheet
$KMnO_4$ = potassium permanganate



LEGEND:

- TAX PARCEL LINE
- FENCE LINE (EXISTING)
- 12" DIAMETER CULVERT (EXISTING)
- AGRICULTURAL DITCH (EXISTING)
- WETLAND
- FINAL STORMWATER COLLECTION DITCH (EXISTING)
- STABILIZE AREA WITH CRUSHED ROCK
- PERIMETER ROAD (EXISTING)
- R-21 — NEW EXTRACTION WELL (BY OTHERS)
- R-11 — EXISTING WELL INCLUDED IN EXTRACTION NETWORK (BY OTHERS)
- MONITORING WELL (BY OTHERS)
- PZ-7a — PIEZOMETER (BY OTHERS)

NOTES:

1. GREEN WELLS SHOWN FOR INFORMATION ONLY.
2. CONTRACTOR MUST TAKE CARE NOT TO DAMAGE ANY EXISTING WELLS. ANY DAMAGE SHALL BE REPAIRED AT CONTRACTOR'S FULL EXPENSE.
3. WELLS WILL BE DRILLED BY OTHERS.
4. CONTRACTOR SHALL PROVIDE ALL PUMPS, PIPING, VALVES, FITTINGS, CLEANOUTS, POWER, CONTROLS, FOR ALL R LABELED WELLS.
5. CONTRACTOR TO PROVIDE WELL VAULTS FOR ALL WELLS INSIDE LANDFILL AREA. WELL VAULTS FOR WELLS OUTSIDE OF LANDFILL WILL BE BY OTHERS.
6. CONTRACTOR TO PROVIDE CONTROL WIRING FOR ALL PZ LABELED WELLS TO CONNECT TO PLC.
7. APPROPRIATE NUMBER AND SPACING OF CLEANOUT LOCATIONS FOR PIGGING AND CLEANING LINES TO BE DETERMINED BY CONTRACTOR. CLEANOUTS SHALL BE HOUSED IN TAMPER-PROOF VAULTS SUITABLE FOR H-15 AASHTO TRAFFIC RATING. TOP OF VAULTS TO MATCH EXISTING GRADE.

SCALE BAR (1" = 200'-0")

0 200' 400' 600'

PRELIMINARY

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR REVIEW	FEB 25	WJM
2	ISSUED FOR PERMIT	MAR 18	GP
3	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
4	ISSUED FOR TENDER	MAY 26	WJM
5	ISSUED FOR FINAL ENGINEERING DESIGN	JLY 26	LDV

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DESIGNED ES
CHECKED GP
REVIEWED WJM/LMM

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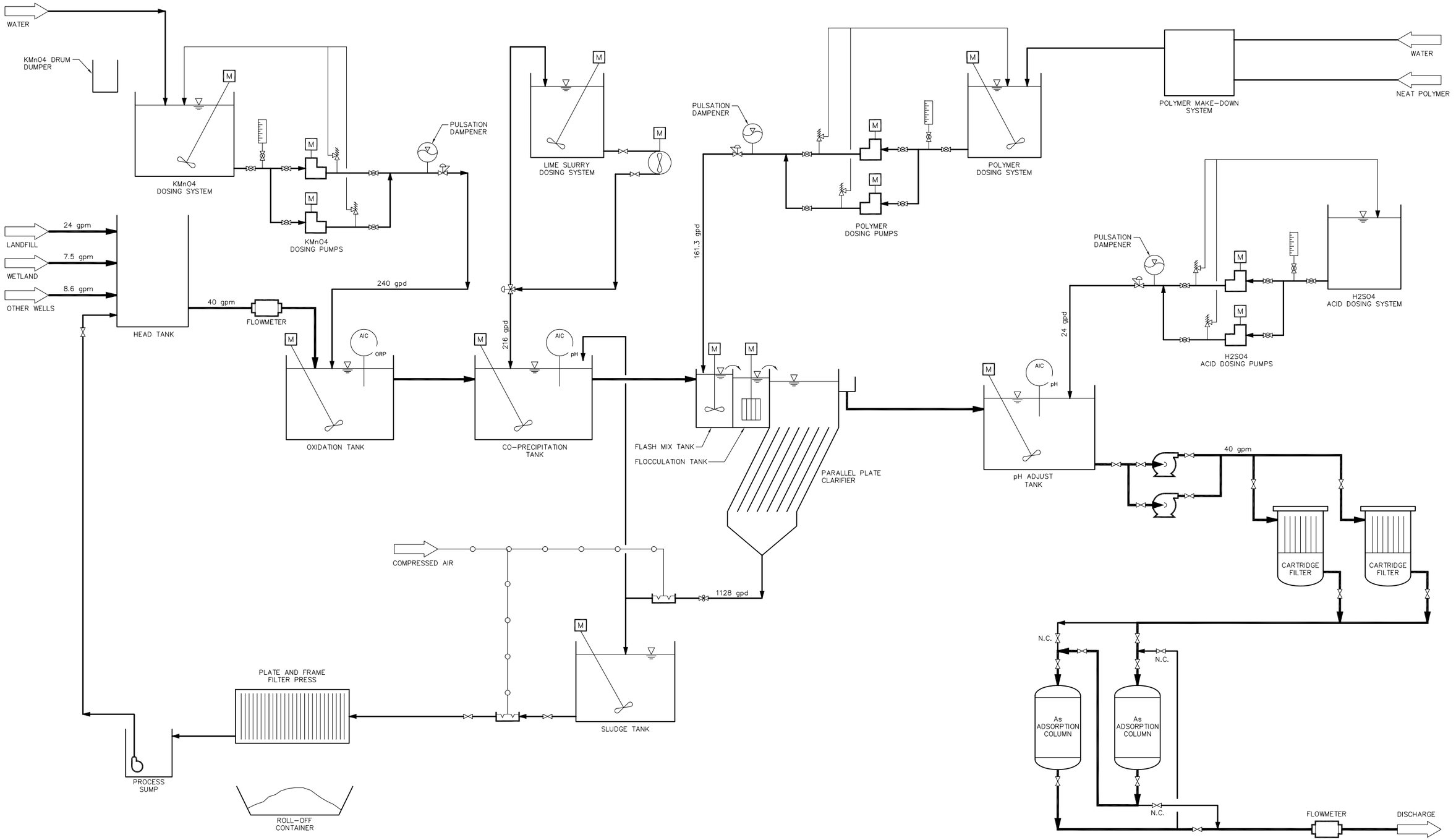
GROUNDWATER RECOVERY AND TREATMENT PLANT PIPING LAYOUT

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/27/11
PROJECT NO.: SE10160010

DRAWING C-04

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4	ISSUED FOR CONSTRUCTION	JLY 26	LDV
5			

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DESIGNED CH
CHECKED GP
REVIEWED WJM/LMM

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LARRY M. McGAUGHEY STATE OF WASHINGTON 30523 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW DIAGRAM

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/27/11
PROJECT NO.: SE10160010
DRAWING PFD-01

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INSTRUMENT IDENTIFICATION

GENERAL INSTRUMENT OR FUNCTION SYMBOLS

	FIELD MOUNTED	PRIMARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR	AUXILIARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR
DISCRETE INSTRUMENTS	X / X–X–X	X / X–X–X	X / X–X–X
SHARED DISPLAY, SHARED CONTROL	X / X–X–X	X / X–X–X	X / X–X–X
COMPUTER FUNCTION	X / X–X–X	X / X–X–X	X / X–X–X
PROGRAMABLE LOGIC CONTROL	X / X–X–X	X / X–X–X	X / X–X–X

NORMALLY INACCESSIBLE OR BEHIND–THE–PANEL DEVICES OR FUNCTIONS ARE DEPICTED BY THE SAME SYMBOLS BUT WITH DASHED HORIZONTAL BARS, i.e.

X / X–X–X X / X–X–X X / X–X–X

ISA INSTRUMENTATION IDENTIFICATION LETTERS

LETTER	FIRST LETTER (S)		SUCCEEDING LETTERS		
	PROCESS OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER FLAME		USERS CHOICE	USERS CHOICE	USERS CHOICE
C	CONDUCTIVITY			CONTROL	
D	DENSITY (S.G)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGE		GLASS	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION/MOISTURE				MIDDLE
N	TURBIDITY		MIDDLE/INTERMEDIATE		
O	USERS CHOICE		ORIFICE		
P	PRESSURE (OR VACUUM)		POINT (TEST CONNECTION)		
Q	QUANTITY OR EVENT	INTEGRATE	INTEGRATE		
R			RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMITTER	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VISCOSITY			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	AS DEFINED				
Y	STATUS			RELAY OR COMPUTE	
Z	POSITION			DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

LINE LEGEND

- PROCESS (CLOSED CONDUIT, DASHED LINE INDICATES ALTERNATE FLOW STREAM)
- PROCESS (OPEN CHANNEL)
- ANALOG SIGNAL (4 TO 20 mAdc, ETC.)
- DISCRETE SIGNAL (ON/OFF, ETC.)
- COMPRESSED AIR
- PNEUMATIC SIGNAL
- FILLED SYSTEM SIGNAL
- HYDRAULIC SYSTEM SIGNAL
- SONIC SIGNAL
- PACKAGED BUILDING OR FACILITY BOUNDARY
- CONNECTING LINES
- NON–CONNECTING LINES
- HEAT TRACE

ABBREVIATIONS & LETTER SYMBOLS

AC	ALTERNATING CURRENT
CCS	CENTRAL CONTROL SYSTEM
CSC	CAR SEAL CLOSED
CSO	CAR SEAL OPEN
CP–X	CONTROL PANEL NO. X
CS	CARBON STEEL
DC	DIRECT CURRENT
DISC	DISCONNECT
ES	EMERGENCY STOP
FOS	FAST–OFF–SLOW
FOSA	FAST–OFF–SLOW–AUTO
FOSR	FAST–OFF–SLOW–REMOTE
FR	FORWARD–REVERSE
GALV	GALVANIZED STEEL
HOA	HAND–OFF–AUTO
HOR	HAND–OFF–REMOTE
LEL	LOWER EXPLOSIVE LIMIT
LCP	LOCAL CONTROL PANEL
LOS	LOCKOUT STOP
LR	LOCAL–REMOTE
MA	MANUAL–AUTO
MC	MODULATE–CLOSE
MCC	MOTOR CONTROL CENTRE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OC	OPEN–CLOSE (D)
OCR	OPEN–CLOSE–REMOTE
OCA	OPEN–CLOSE–AUTO
OO	ON–OFF
OOA	ON–OFF–AUTO
OOR	ON–OFF–REMOTE
OSC	OPEN–STOP–CLOSE
REM	REMOTE
RPU	REMOTE PROCESSING UNIT
SF	SLOWER–FASTER
SS	START–STOP
SSC	SUPERVISORY SET POINT CONTROL
VIB	VIBRATION

PUMP AND COMPRESSOR SYMBOLS

- CENTRIFUGAL PUMP
- CHEMICAL FEED PUMP
- DIAPHRAGM PUMP
- GEAR PUMP OR BLOWER (POSITIVE DISPLACEMENT)
- PISTON PUMP
- PROGRESSIVE CAVITY PUMP
- SUBMERSIBLE SUMP PUMP
- COMPRESSOR (CENTRIFUGAL) BLOWER OR TURBINE
- COMPRESSOR (PISTON)
- PERISTALTIC PUMP

MISCELLANEOUS SYMBOLS

- SIGHT GLASS
- DIAPHRAGM SEAL
- BLIND FLANGE
- AIR GAP
- VENT TO ATMOSPHERE
- RUPTURE DISK
- ELECTRIC MOTOR (M)
- PRESSURE GAUGE
- AIR FILTER
- CALIBRATION COLUMN
- CAM–LOCK
- REDUCER

PRIMARY ELEMENT SYMBOLS

- ORIFICE PLATE
- FLOW TUBE
- VORTEX METER
- ELECTROMAGNETIC FLOWMETER
- PROPELLER OR TURBINE METER
- LEVEL (ULTRASONIC)
- LEVEL (FLOAT)

ACTUATOR SYMBOLS

- P Z — PNEUMATIC W/POSITIONER
- P S — PNEUMATIC W/SOLENOID
- E — ELECTRIC/MOTOR
- E Z — ELECTRIC/MOTOR W/POSITIONER
- EH — ELECTROHYDRAULIC
- H — HYDRAULIC
- P B — PNEUMATIC WITH VOLUME BOOSTER
- S — SOLENOID
- T — MANUAL

VALVE SYMBOLS

- GATE
- K — KNIFE GATE
- BUTTERFLY
- GLOBE
- BALL
- V — VEE–BALL
- SEAT PORT — ECCENTRIC PLUG
- PLUG OR COCK
- NEEDLE
- DIAPHRAGM
- PINCH
- SWING CHECK
- BALL CHECK
- HOSE VALVE OR BIBB
- PRESSURE RELIEF
- PRESSURE/VACUUM RELIEF VALVE
- AIR AND/OR VACUUM RELEASE
- ACTUATOR — MOTORIZED VALVE
- ACTUATOR — SOLENOID VALVE
- ACTUATOR — TO TEMPERATURE SENSOR — TEMPERATURE SENSING VALVE
- REGULATED SIDE — PRESSURE CONTROL

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
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3	ISSUED FOR TENDER	MAY 26	LDV
4	ISSUED FOR CONSTRUCTION	JLY 26	LDV
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CHECKED GP
REVIEWED WJM/LMM

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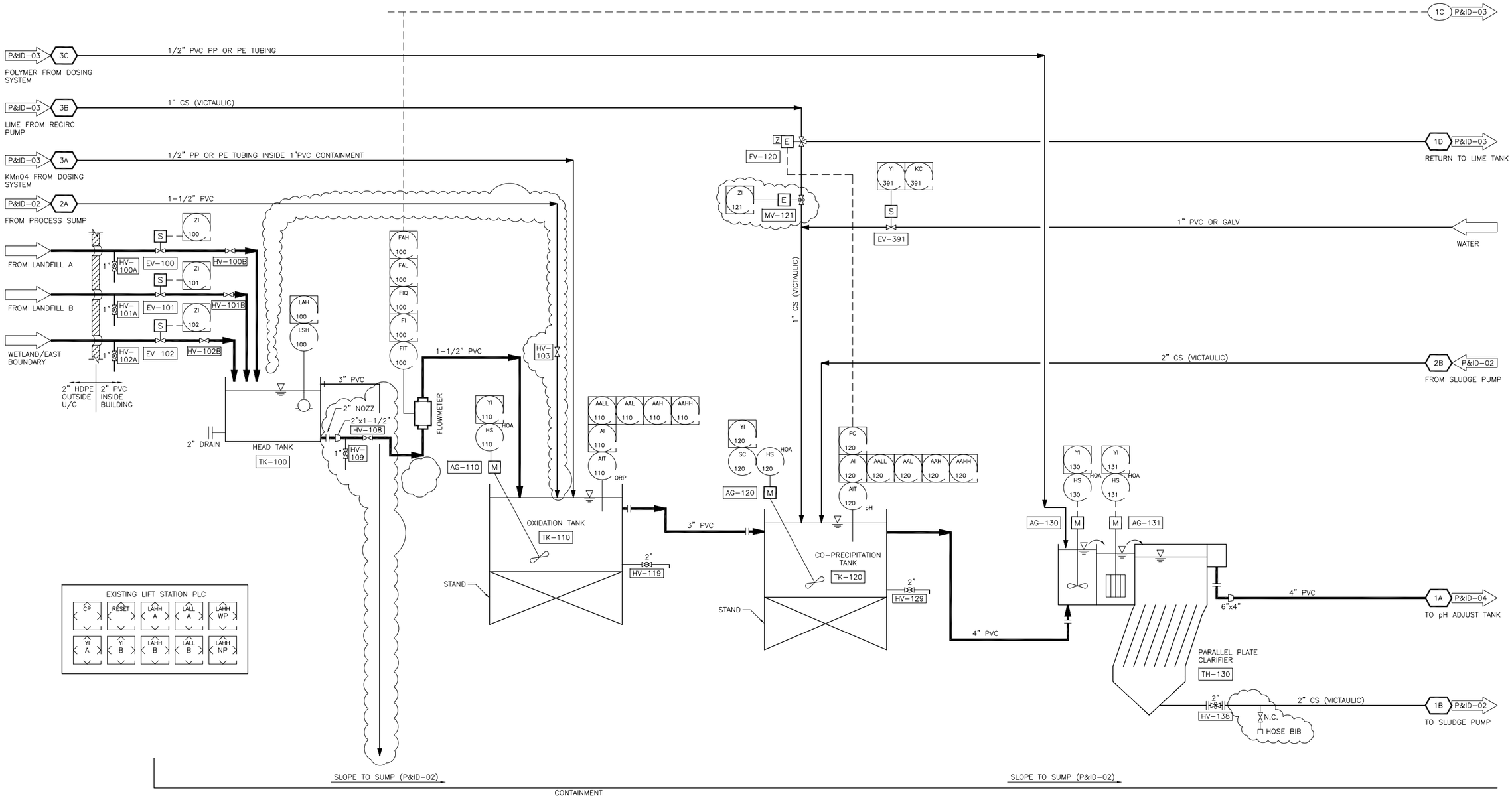
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PROCESS FLOW AND INSTRUMENTATION LEGEND

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

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PROJECT NO.: SE10160010
DRAWING P&ID–00

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AMEC Geomatrix

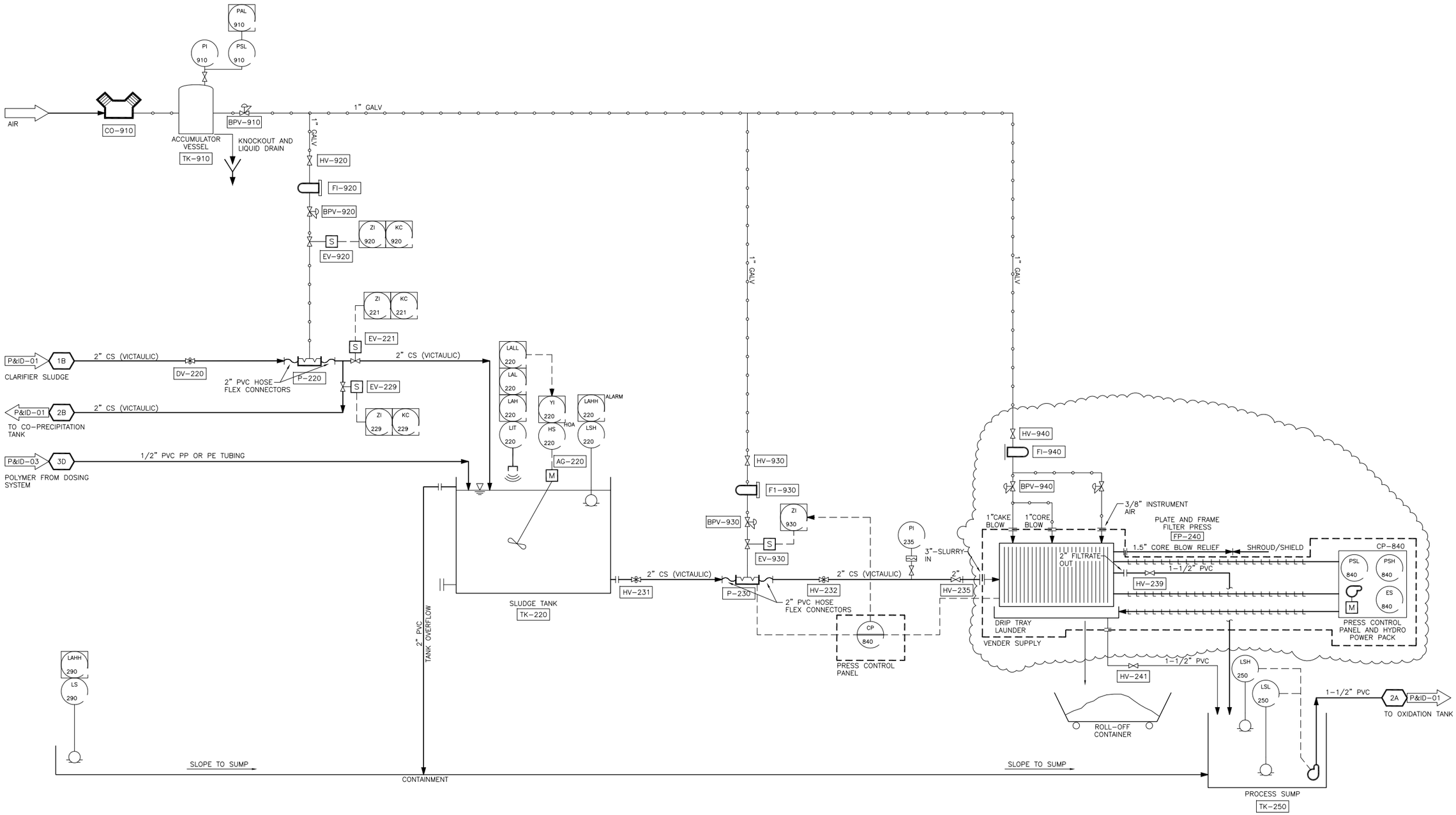
LARRY M. McCAUGHEY STATE OF WASHINGTON 19963 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW AND INSTRUMENTATION OXIDATION / PRECIPITATION

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/06/12
PROJECT NO.: SE10160010
DRAWING P&ID-01

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VERTICAL: NAVD88 FEET

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4	ISSUED FOR TENDER	MAY 26	LDV
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	CONTROL CHANGES	DEC 20	
7	CONTROL CHANGES (2)	JAN 10	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

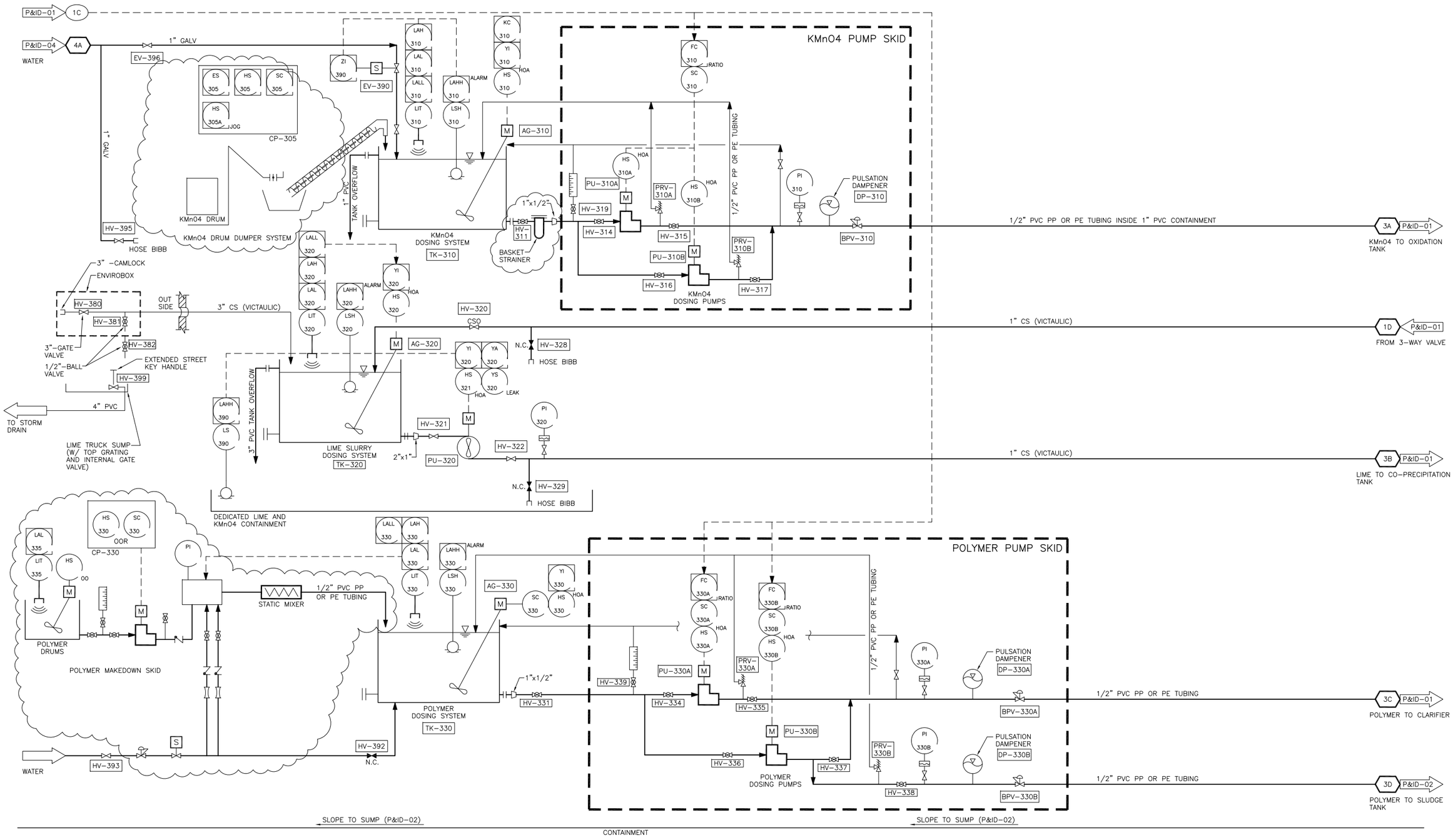
LARRY M. McGAUGHEY STATE OF WASHINGTON 10263 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW AND INSTRUMENTATION SLUDGE HANDLING

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/06/12
PROJECT NO.: SE10160010

DRAWING
P&ID-02



Plot Date: 03/08/12 - 9:33am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-PIDs.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
3	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 21	LDV
4	ISSUED FOR TENDER	MAY 26	LDV
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	CONTROL CHANGES	DEC 20	
7	CONTROL CHANGES (2)	JAN 10	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

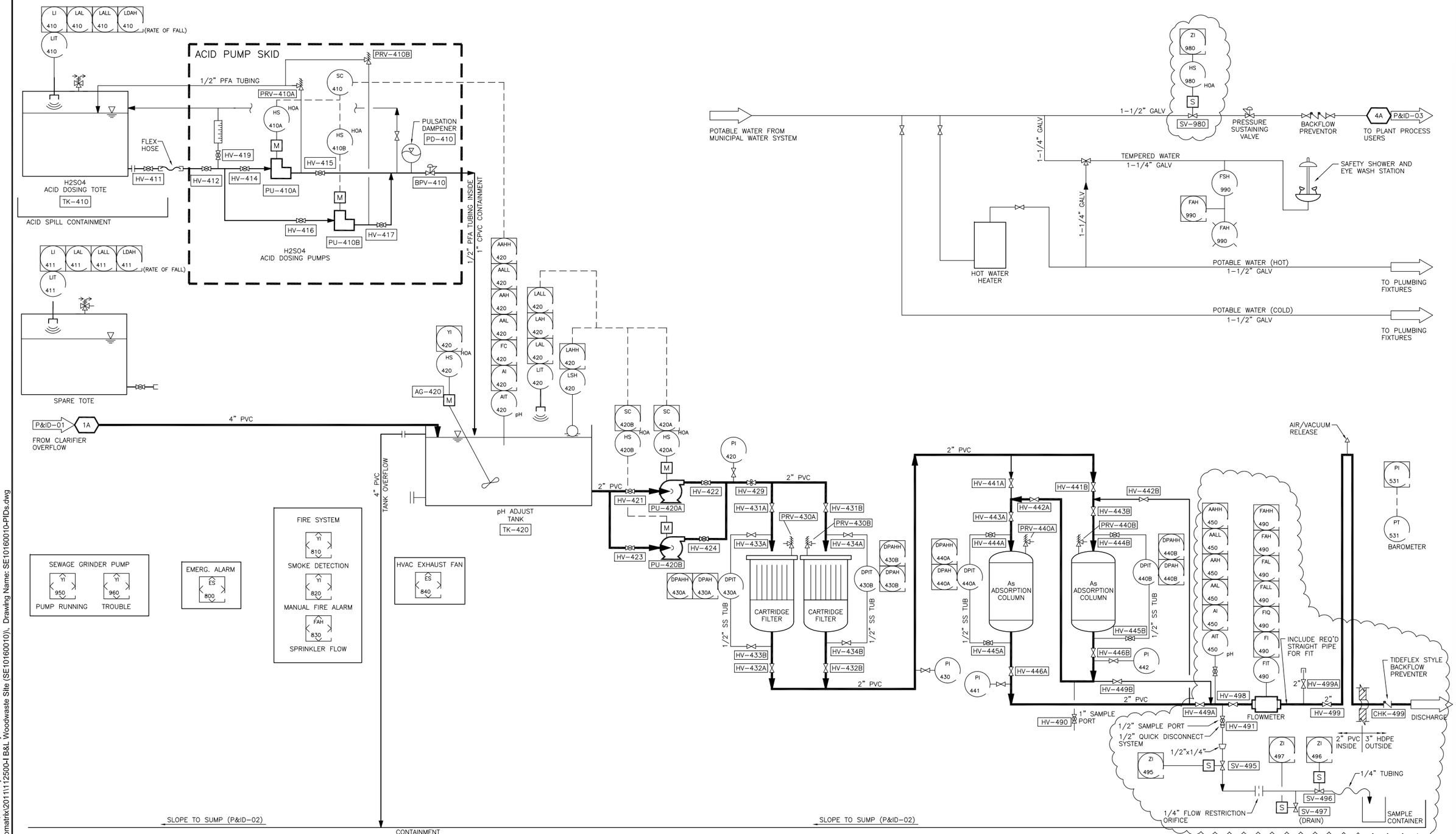
LARRY M. McGAUGHEY STATE OF WASHINGTON 30923 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW AND INSTRUMENTATION ADDITIVES

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/08/12
PROJECT NO.: SE10160010

DRAWING P&ID-03



Plot Date: 03/08/12 - 10:43am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-PIDs.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
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5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	MATERIAL CHANGE	SEPT 8	LMM
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DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

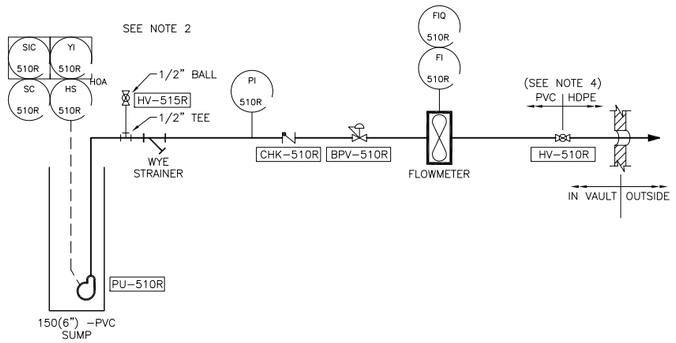
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PROCESS FLOW AND INSTRUMENTATION EFFLUENT POLISHING

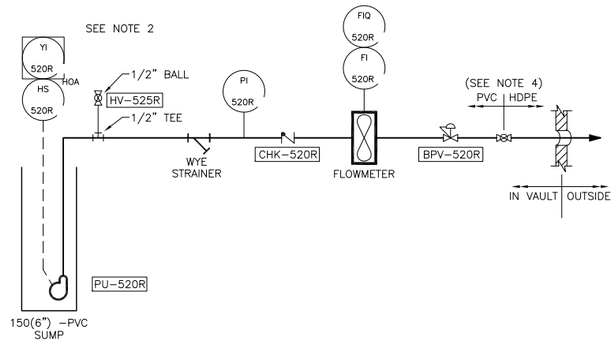
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/08/12
PROJECT NO.: SE10160010

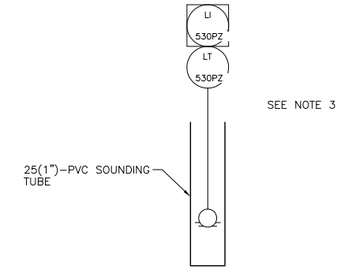
DRAWING
P&ID-04



LANDFILL WELLS DETAIL (TYP OF 11)



AG. FIELD AND WETLAND WELLS DETAIL (TYP OF 10)



PIEZOMETER DETAIL (TYP OF 16)

STATION	COORDS	TERMINATION
R-01	1186310.409 702291.5027 inside	KIOSK 3
R-02	1186467.023 702042.2185 inside	KIOSK 2
R-03	1186327.49 702003.56 inside	KIOSK 2
R-04	1186152.52 702096.41 inside	KIOSK 3
R-05	1186200.63 701953.59 inside	KIOSK 2
R-06	1186293.15 701769.26 inside	KIOSK 2
R-07	1185852.906 701693.703 inside	KIOSK 1
R-08	1185907.93 701803.16 inside	KIOSK 1
R-09	1185776.662 701873.0772 inside	KIOSK 1
R-10	1185842.089 702081.232 inside	KIOSK 1
R-11	1186121.23 702223.96 inside	KIOSK 3

TABLE OF LANDFILL WELLS

STATION	COORDS	TERMINATION
R-12	1186517.737 702182.2116 outside-east	KIOSK 4
R-13	1186579.559 702070.3399 outside-east	KIOSK 4
R-14	1185679.036 702073.3376 outside-west	KIOSK 5
R-15	1185617.392 702077.515 outside-west	KIOSK 5
R-16	1186011.284 702345.452 outside-north	KIOSK 5
R-17	1186126.763 702394.4934 outside-north	KIOSK 5
R-18	1186032.526 702468.6627 outside-north	KIOSK 5
R-19	1185911.289 702509.2755 outside-north	KIOSK 5
R-20	1185980.764 702595.2624 outside-north	KIOSK 5
R-21	1185984.041 702673.8679 outside-north	KIOSK 5

TABLE OF AG. FIELD AND WETLAND WELLS

STATION	COORDS	TERMINATION
PZ-1a	1186183.28 702353.14 perimeter	KIOSK 3
PZ-1b	1186191.53 702329.08 perimeter	KIOSK 3
PZ-2a	1185886.44 702209.88 perimeter	KIOSK 1
PZ-2b	1185897.84 702186.89 perimeter	KIOSK 1
PZ-3a	1185733.73 701976.73 perimeter	KIOSK 1
PZ-3b	1185753.71 701976.05 perimeter	KIOSK 1
PZ-4a	1185731.96 701728.73 perimeter	KIOSK 1
PZ-4b	1185755.21 701726.18 perimeter	KIOSK 1
PZ-4c	1185754.96 701732.98 perimeter	KIOSK 1
PZ-5a	1186002.81 701621.79 perimeter	KIOSK 1
PZ-5b	1186005.46 701641.88 perimeter	KIOSK 1
PZ-5c	1186000.96 701642.36 perimeter	KIOSK 1
PZ-6a	1186379.5 701620.95 perimeter	DIRECT
PZ-6b	1186377.84 701640.57 perimeter	DIRECT
PZ-7a	1186595.69 701831.05 perimeter	DIRECT
PZ-7b	1186578.05 701835.09 perimeter	DIRECT
PZ-8a	1186513.106 702097.0787 perimeter	KIOSK 4
PZ-8b	1186495.24 702090.37 perimeter	KIOSK 4
PZ-8c	1186496.75 702085.74 perimeter	KIOSK 4

TABLE OF PIEZOMETERS

NOTES:

1. WELL COORDINATES EXPRESSED IN WASHINGTON STATE PLANE COORDINATE SYSTEM. DATUM CITATION IN LOWER LEFT.
2. "R" = STATION NUMBER FOR EACH WELL
3. "PZ" = STATION NUMBER FOR EACH PIEZOMETER
4. INSIDE VAULT USE SCH 80 PVC, OUTSIDE VAULT USE SDR11 HDPE R2, R7, R9 ARE 1.5", ALL OTHERS ARE 1"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
3	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 6	LDV
4	ISSUED FOR TENDER	MAY 26	LDV
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	CONTROL CHANGES	DEC 20	
7	CONTROL CHANGES (2)	JAN 10	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC Geomatrix

LARRY M. McGAUGHEY STATE OF WASHINGTON 30923 REGISTERED PROFESSIONAL ENGINEER

PROCESS FLOW AND INSTRUMENTATION
EXTRACTION AND MONITORING WELLS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 01/18/12
PROJECT NO.: SE10160010

DRAWING
P&ID-05

Plot Date: 01/18/12 - 12:49pm. Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\. Drawing Name: SE10160010-PIDs.dwg

APPENDIX A

Control Narrative

B&L CUSTODIAL TRUST
WOODWASTE SITE
GROUNDWATER RECOVERY AND TREATMENT SYSTEM
PIERCE COUNTY, WA

CONTROL NARRATIVE

Submitted to:
B&L Custodial Trust
606 Columbia Street NW, Suite 212
Olympia, Washington 98501

Submitted by:
AMEC Environment & Infrastructure
a division of AMEC Americas Limited
900 Maple Grove Road, Unit 10
Cambridge, ON N3H 4R7

March 2, 2012

SE10160010

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Revision No.	Description	Date
1	Draft	December 14, 2011
2	Draft	January 9, 2012
3	Final	March 2, 2012

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CONTROL NARRATIVE
GROUNDWATER RECOVERY AND TREATMENT SYSTEM
B&L Woodwaste Landfill
Pierce County, WA

1.0 GLOSSARY OF ACRONYMS

Throughout this Control Narrative, a number of acronyms will be used. The table below lists the acronym and the meaning of the acronym.

Term	Description
HOA	Hand/off/auto – control of device can be switched between local and remote. Status of switch is displayed on HMI.
LO	Low level alarm
LOLO	Low, low level alarm
HI	High level alarm
HIHI	High, high level alarm
PLC	Programmable Logic Controller
SCADA	Supervisory Control And Data Acquisition
PID	Proportional Integral Derivative
HMI	Human-Machine Interface (SCADA terminal)
I/O	Input and Output Signals (control communication)
Lead/Lag	Control scenario which identifies the initiation sequence of the pumps, the lead being the first pump
Interlock	Device (motor, pump, valve) is actuated based on the status of another device (typically an alarm)
Ready Condition	No alarm conditions are preventing normal operation of any sub-system.

1.1 GENERAL PHILOSOPHY OF ALARMS AND WARNINGS

All inputs to the SCADA system are monitored, all control parameters are calculated and all alarm and warning conditions are indicated. All warning and alarm conditions remain indicating until they are both acknowledged and cleared by an operator. All alarms are indicated on the main control panel

with a beacon and sound alarm. All warnings and alarms are recorded in the SCADA system warning or alarm log. The log entry includes the source of the warning/ alarm event, the start time of the event, and the time the warning/alarm was acknowledged and cleared.

Alarms and warnings requesting operator call-out must be cleared at the HMI before the system can be returned to normal operation.

1.2 GENERAL PHILOSOPHY OF SYSTEM SHUTDOWN

When a system shut down is initiated by an alarm the following signals will occur in the specified order:

1. Remove run signal from all well pumps (R-1 through and including R-21)

2. Wait 5 seconds, then send close valve signal to valves EV -100, 101, 102.

3. Remove run signal from acid feed, lime feed, polymer feed, and $KMnO_4$ feed pumps.

4. Lime recirculation pump and all process mixers remain in run mode (EXCEPTION: lime recirculation pump PU-320 shall be shut down in the event of lime/permanganate containment area high level, LAHH-390).

5. Send close signal to lime pinch valve MV-121, permanganate water valve EV-390, and potable water stop valve SV-980.

6. It is expected that the run signal for pumps PU 420A and B will be interrupted automatically when the level in the pH adjust tank drops to the set shut off level.

7. Recirculate sludge by sending open valve signal to EV-229 and closing EV -221 while maintaining the air compressor and PU-220 in operation.

System shutdown should be initiated when there is a risk of discharging outside the effluent quality limits, a system failure has occurred, or if there is an emergency at the treatment building. Estimated set points for alarms and warnings are included in the following sections but should be refined by operators in the field.

2.0 SYSTEM OVERVIEW

Arsenic removal from groundwater is the primary goal of the wastewater treatment system. Water is pumped from three areas beneath the landfill to the treatment system consisting of six main parts. The system includes chemical oxidation, co-precipitation, solids separation, pH adjustment, filtration and adsorption and sludge management. The solids from the filter press will be picked up for disposal and the treated effluent will be piped to the north pond for surface discharge. A process description and control narrative for each step of the treatment process is included in this report.

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3.0 WELL PUMPS AND ANCILLARY UNITS

3.1 DRAWING REFERENCES AND EQUIPMENT

Table 3.1
Groundwater Recovery System Drawing Reference

Discipline	Drawing Name	Number
P&ID	Extraction and Monitoring Wells	P&ID-05
P&ID	As Built – Piping and Instrumentation, Addendum 1	P-1
Civil	As Built - Lift Station and Trench Details, Addendum 1	C-10

Table 3.2
Groundwater Recovery System Equipment

Process Tag #	Electrical Tag #	Description	Ref.
PU – 510R		(01-11) Landfill well pumps	P&ID-05
SC – 510R		(01-11) Well pumps speed control	P&ID-05
HS – 510R		(01-11) Well pumps hand switch	P&ID-05
PI - 510R		(01-11) Pressure indicator	P&ID-05
FIQ – 510R		(01-11) Flow meter	P&ID-05
PU – 520R		(12- 21) Field and wetland well pumps	P&ID-05
HS – 520R		(12- 21) Well pumps hand switch	P&ID-05
PI – 520R		(12- 21) Pressure Indicator	P&ID-05
FIQ- 520R		(12- 21) Flow meter	P&ID-05
LT – 530PZ		(1a- 8c) Piezometers	P&ID-05
none		Lift station A submersible pump	P-1
none		Hand switch Lift Station A submersible pump	P-1
none		Low level switch Lift Station A	P-1
none		High level switch Lift Station A	P-1
none		Pressure gauge Lift Station A	P-1
none		Low low level switch Lift Station A	P-1
none		High high level switch Lift Station B	P-1
none		High High level switch West Infiltration Pond	P-1
none		Lift station B submersible pump	P-1
none		Hand switch Lift Station B submersible pump	P-1
none		Low level switch Lift Station B	P-1
none		High level switch Lift Station B	P-1
none		Pressure gauge Lift Station B	P-1
none		Low low level switch Lift Station B	P-1

none		High high level switch Lift Station B	P-1
none		High high level switch North Pond	P-1

3.2 PROCESS DESCRIPTION

There are 10 constant speed well pumps in the recovery wells located outside the landfill area (Wells R-12 – R-21). These will have their flow rates set manually by means of a restriction valve on the pump discharge in each local well vault and the local flow meter reading. It is expected that the flow rates will range between 0 and 3 gallons per minute (gpm), with expected initial flow settings as follows:

Well	Flow (gpm)	Well	Flow (gpm)
R-12	2.1	R-17	1
R-13	1.6	R-18	1
R-14	1.6	R-19	1
R-15	1.6	R-20	1
R-16	1	R-21	1

Flow rates for the above wells will be set manually, based on manual field measurements in nearby wells and piezometers. The objective for operation of these wells is to establish and maintain a capture zone adjacent to the wells. In general, these wells are expected to operate continuously. Periodic shutdown may be required during flooding conditions or other conditions affecting performance of the treatment process. It is expected that these wells will be operated for 2-10 years, after which they may be permanently shut down.

Within the landfill, groundwater elevations are monitored continuously by transducers placed within a series of 19 piezometers distributed around the boundary of the landfill. These piezometers consist of 16 paired piezometers (the pairs designated with an “a” or “b”) that are located on either side of the subsurface barrier wall. These 8 piezometer pairs are used to determine the groundwater gradient across the barrier wall. At three locations, a third piezometer completed in the lower sand aquifer is present (designated “c”). The “c” piezometers are used to determine the upward gradient at these locations. The deeper piezometers are compared to the shallow piezometers to determine the vertical gradient. Inward gradients are determined by subtracting the inside groundwater level (“b”

piezometers from the outside level ("a" piezometers) and the upward gradient is determined by subtracting the "b" piezometer reading from the "c" piezometer reading.

The 11 recovery wells (Wells R-1 through R-11) completed beneath the landfill are each equipped with a variable speed well pump. These wells will be under automatic control (speed and on/off) to establish and maintain inward and upward groundwater gradients as determined by the piezometer network. The average flow rates predicted by the groundwater model for these wells to achieve the control objective are as follows:

Well	Flow Rate (gpm)	Well	Flow Rate (gpm)
R-1	2	R-7	2.5
R-2	4	R-8	2.5
R-3	0	R-9	3
R-4	2	R-10	3
R-5	0	R-11	0.25
R-6	0		

3.3 CONTROL NARRATIVE

3.3.1 General

The principal process control requirements are to:

1. Maintain an inward gradient of at least 6 inches; i.e. maintain the pump flows within the landfill zone such that the water level beneath the landfill is at least six inches below that outside the landfill, and the groundwater tends to enter the landfill area from the outside as a result. This gradient will be measured by the "a" and "b" piezometers. This criterion is a legally enforceable requirement that must be achieved continuously by the groundwater recovery system.

2. Maintain an upward gradient as determined by the "b" and "c" piezometers. No legally enforceable numeric criterion has been established for the upward gradient

The general control strategy for groundwater recovery shall be as follows:

1. Outside Area Recovery Wells (R-12 – R-21)

    a. Pumps will initially be set to run at nominal values based on hydraulic testing, modeling and other local considerations.

    b. The PLC shall poll the 10 recovery well pumps to monitor status, and alarm if a pump is turned off.

    c. The PLC shall allow remote control of well pumps, with associated activation/deactivation of pump alarm actuation. If a pump is manually turned off its alarm will also be deactivated until the pump is turned on again.

2. Landfill Recovery Wells (R-1 – R-11)

    a. The PLC shall poll the 19 pressure transducers in the piezometers at an operator-defined frequency, verifying proper operation of each transducer and recording the level measurement. Each transducer will require calibration to convert the reading into a level measurement. The protocol must allow for re-calibration by the operator. Water levels in each piezometer are to be recorded at the polling frequency.

    b. Cross wall differential head shall be calculated and recorded at the polling frequency for each of the 8 shallow piezometer pairs, (xx-b and xx-a). This applies to all 8 measurement nodes.

    c. Upward differential head shall be calculated and recorded at the polling frequency for the each of the 3 piezometer clusters (xx-b and xx-c).

    d. The cross wall differential head will be used for primary control of pumping rates from the landfill recovery wells, with control actions taken at an interval input to the PLC by the operator.

    e. The upward gradient will be used for trim control of landfill recovery wells, with control actions taken at an interval input to the PLC by the operator.

    f. Total flow will be monitored by the PLC, with total flow readings available for remote monitoring by operators.

3.3.2 Well Pumps

Pump control will be done as described below.

1. Outside Area Recovery Wells (R-12 – R-21)

    a. Well flow rate will be under manual control using the manual valve present at each wellhead.

    b. Well operation will be manual or automatic on/off, with automatic operation determined by operator input, trim control for total flow, or automatic system shutdown.

2. Landfill Area Recovery Wells (R-1 – R-11)

    a. Primary Flow Control

        i. Primary control actions for the PLC will be taken at a time interval to be input by the operator. It is anticipated that control actions will be on the order of once every 8 -12 hours, but the time interval may be longer or shorter.

        ii. Based on groundwater modeling results, the cross wall piezometers have been grouped based on predicted behavior. The PLC will utilize cross wall differential heads in the following manner:

Head Differential	Control Basis
PZ-1a/b	Use calculated head differential for control
PZ-2a/b & PZ-3a/b	Determine minimum head differential and use the minimum for control
PZ-4a/b	Use calculated head differential for control
PZ-5a/b	Use calculated head differential for control
PZ-6a/b & PZ-7a/b	Determine minimum head differential and use the minimum for control
PZ-8a/b	Use calculated head differential for control

PZ-4b/c & PZ-5b/c	Determine minimum head differential and use the minimum for control
PZ-8b/c	Use calculated head differential for control

iii. For each of the 6 cross-wall differential gradients identified above for control, the PLC must provide for 4 action levels to be used for control purposes. The action levels will be input to a lookup table by the operator either locally or remotely. The lookup table will contain cross wall gradient values that will initiate a control action for pumping wells.

iv. For each action level associated with each of the 6 cross wall differentials to be used for control, the PLC will select pumping rates for recovery wells from a lookup table. The PLC will provide for operator input to associate up to 3 wells with each of the 6 head differentials. The PLC will also provide for operator input of pumping rates into a lookup table of control setpoints for up to 3 wells associated with each of the 6 head differentials. The flow setpoint lookup table for each head differential would accept 4 flow setpoints for each well to correspond with the 4 action levels described above. With 3 wells associated to a head differential, this would result in 12 flow setpoints in the flow setpoint lookup table.

v. The PLC will implement flow control for each of the 11 landfill recovery wells based on the flow control lookup tables for cross wall differential head measured at the 6 head differentials used for control. The operator inputs will associate specific pumping wells with each control head differential, and will be done such that duplicate flow setpoints settings will not be issued for any well (i.e., specific wells will be associated with each control head differential, and no well will be associated with more than one head differential).

b. Trim Control

i. Trim control of the recovery wells will be based upon the upward differential heads determined at the 2 vertical head differentials to be used for control, as identified above (i.e., the head differentials calculated from the xx-c piezometer

pairs). For each of the 2 upward control differentials, the PLC will provide for 3 action levels that will be used to implement control actions. The PLC must allow operator input of the action levels for each of the 2 control differentials.

ii. For each of the 2 upward differential head pairs, the PLC will have the capability to implement a control action (i.e., to alter the pumping set point) in wells to be associated with the control differential. The PLC must accept operator input to associate up to 3 of the 11 landfill recovery wells with either control head differential.

iii. Based on the head differential action levels, the PLC will increment the primary flow setpoints for the associated recovery wells. The PLC will provide the capability for the operator to input the magnitude of the setpoint increments. Three setpoint increment values will be input, to be associated with the three different head differential action levels. The same setpoint increment will be used for the two upward head differentials used for control.

The PLC will also compare the total flow rate for the GWTP (as measured by FIT-100) to an operator-inputted value after each recovery well control action. If the total flow exceeds the input criterion, the PLC will issue an alarm. The purpose of the alarm is to notify remote personnel of high flow conditions that may require operator attention. It is anticipated that the high flow input will be a value between the design average flow rate of 40 gpm and the maximum hydraulic capacity of 60 gpm.

3.3.3 Interceptor Trenches

There are two interceptor trenches each equipped with a wet well and an automatic pump that discharge accumulated water to two ponds; the south trench discharges to the west pond and the east trench to the north pond. Each wet well has an existing control panel and HOA located inside the fenced area surrounding the landfill. The operating status from the existing local interceptor trench PLC must be connected into the GWTP PLC so that their operations status can be monitored remotely. Status signals for the control panel (on/off), submersible pumps and HIHI level alarms for lift stations A and B (on/off), and HIHI level alarms for the west and north ponds (on/off) will be sent to the GWTP PLC.

3.3.4 Sanitary Sewer Lift Station

There is a grinder pump and sump for sanitary waste leaving the building. The lift station has a local controller and alarms. The operating status and any alarm conditions from the lift station must be displayed locally and be tied to the PLC for remote logging and reporting purposes.

3.4 ALARMS

Table 3.3
Groundwater Recovery System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
PZ-1	Yes	Cross-wall head differential at PZ-1 is approaching noncompliance. Differential head calculated by PLC from PZ-1a & b.	0.6 ft	Failure of pump control to maintain differential head or failure of well pumps	None
PZ-2	Yes	Cross-wall head differential at PZ-2 is approaching noncompliance. Differential head calculated by PLC from PZ-2a & b.	0.6 ft	Failure of pump control to maintain differential head or failure of well pumps	None
PZ-3	Yes	Cross-wall head differential at PZ-3 is approaching noncompliance. Differential head calculated by PLC from PZ-3a & b.	0.6 ft	Failure of pump control to maintain differential head or failure of well pumps	None
PZ-4	Yes	Cross-wall head differential at PZ-4 is approaching noncompliance. Differential head calculated by PLC from PZ-4a & b.	0.6 ft	Failure of pump control to maintain differential head or failure of well pumps	None
PZ-5	Yes	Cross-wall head differential at PZ-5 is approaching noncompliance. Differential head calculated by PLC from PZ-5a & b.	0.6 ft	Failure of pump control to maintain differential head or failure of well pumps	None
PZ-6	Yes	Cross-wall head differential at PZ-6 is approaching noncompliance. Differential head calculated by PLC from PZ-6a & b.	0.6 ft	Failure of pump control to maintain differential head or failure of well pumps	None
PZ-7	Yes	Cross-wall head differential at PZ-7 is approaching noncompliance. Differential head calculated by PLC from PZ-7a & b.	0.6 ft	Failure of pump control to maintain differential head or failure of well pumps	None
PZ-8	Yes	Cross-wall head differential at PZ-8 is approaching noncompliance. Differential head calculated by PLC from PZ-8a & b.	0.6 ft	Failure of pump control to maintain differential head or failure of well pumps	None
PZ-4V	Yes	Vertical head differential at PZ-4 is approaching noncompliance. Differential head calculated by PLC from PZ-4b & c.	0.1 ft	Failure of pump control to maintain differential head or failure of well pumps	None

Table 3.3
Groundwater Recovery System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
PZ-5V	Yes	Vertical head differential at PZ-5 is approaching noncompliance. Differential head calculated by PLC from PZ-5b & c.	0.1 ft	Failure of pump control to maintain differential head or failure of well pumps	None
PZ-8V	Yes	Vertical head differential at PZ-8 is approaching noncompliance. Differential head calculated by PLC from PZ-8b & c.	0.1 ft	Failure of pump control to maintain differential head or failure of well pumps	None

4.0 CHEMICAL OXIDATION SYSTEM

4.1 DRAWING REFERENCES AND EQUIPMENT

Table 4.1
Chemical Oxidation System Drawing Reference

Discipline	Drawing Name	Number
P&ID	Oxidation/Precipitation	P&ID-01
P&ID	Additives	P&ID-03
Mechanical	Mechanical Layout – Floor Plan	M-01
Mechanical	Mechanical Layout – Mezzanine Plan	M-02
Mechanical	Mechanical Layout – Section B	M-04

Table 4.2
Chemical Oxidation System Equipment

Process Tag #	Electrical Tag #	Description	Notes
TK-310		$KMnO_4$ storage tank	
AG-310		$KMnO_4$ storage tank mixer	
PU-310 A &B		$KMnO_4$ diaphragm dosing pumps	
TK-100		Head tank	
TK-110		Oxidation tank	
AG-110		Oxidation tank mixer	
EV - 100		Actuating Landfill A Wells isolation valve	
EV -101		Actuating Landfill B Wells isolation valve	
EV -102		Actuating Wetland/East Boundary Wells isolation valve	
LSH – 100		Head tank high level switch	
FIT-100		Head tank discharge flow meter	
HS-110		Oxidation tank mixer hand switch	
AIT-110		Oxidation tank ORP sensor	
EV-390		Actuating water shut off valve	
LIT – 310		$KMnO_4$ storage tank level sensor	
LSH - 310		$KMnO_4$ storage tank high level switch	
HS - 310		$KMnO_4$ solution mixer hand switch	
HS – 310 A &B		$KMnO_4$ dosing pumps hand switches	
SC - 310		$KMnO_4$ dosing pumps speed control	
PI - 310		Pressure indicator	

4.2 PROCESS DESCRIPTION

The chemical oxidation subsystem includes a head tank, an oxidation tank, a $KMnO_4$ storage tank, a dosing skid including two dosing pumps and a drum dumping system. Groundwater from the recovery wells will flow into the head tank and subsequently into the oxidation tank by gravity. Flow from the head tank to the oxidation tank will be measured and used to control the $KMnO_4$ dosing pumps via flow pacing.

$KMnO_4$ will be provided in powder form in a drum and added to the storage tank on a batch basis as needed, approximately two half batches per week, via a sealed drum dumper. The operator will add the correct amount of water (based on the water level in the solution tank) to make a solution with a concentration of 35 g/L. $KMnO_4$ will be transferred from the hopper on the drum dumper to the solution tank via a conveyor.

The solution is pumped to the oxidation tank via one of two redundant diaphragm metering pumps on the dosing skid. The chemical will be dosed at a rate proportional to the flow rate between the head tank and oxidation tank in the ratio of, initially, 1:241 ($KMnO_4$ flow to groundwater flow). This will need to be adjusted by operators based on the concentration of permanganate-consuming constituents in the groundwater as determined from sampling results. The oxidation tank will be continuously mixed.

An ORP meter located in the oxidation tank will measure ORP and transmit to the PLC. An alarm will be initiated when the ORP is outside an alarm band which allows flexibility for possible future $KMnO_4$ dosing based on ORP.

4.3 CONTROL NARRATIVE

4.3.1 Inlet Piping

Pumping of groundwater will be controlled at the PLC (refer to Section 3 for well field controls). Wells in the Landfill A, Landfill B and Wetland/East Boundary areas are piped to the treatment building and into the head tank in three separate lines. The lines can each be shut off/on locally via a manual gate valve and remotely via a solenoid valve. The position of the solenoid valve is both displayed on the HMI and can be manipulated by the operator at the HMI. The solenoid valves and well pumps are also interlocked to the high level switch in the head tank and are shut off when the HI level alarm is triggered.

4.3.2 Head Tank

The water level in the head tank is determined by the inflow from the wells and outflow from the tank. A float switch located in the head tank is triggered when the water level reaches a near overflow state.

At this level the solenoid valves and all 21 well pumps are triggered to shut off and an alarm is sounded at the PLC to warn the operator. Water flows out of the head tank to the oxidation tank by gravity and can be shut off/on locally via a gate valve. Normally this valve will be in the open position. A flow meter located between the head and oxidation tank continuously measures the flow from the head tank and displays this value both locally and on the HMI. Flow is displayed as it is measured in real time and as a total flow on the HMI. Total flow is calculated by the PLC based on the pulse output from the flowmeter. An alarm on the HMI is triggered when the flow is either above a set HI value or below a set LO value. The flow measurement is used to control the $KMnO_4$ dosing pumps. There is also a high level switch (LSH-100) in the head tank. This will alarm and call out to the operator in the event of a high level in the head tank.

4.3.3 Dosing System

The $KMnO_4$ feed solution will be prepared manually by the operator. The $KMnO_4$ is stirred in the dosing tank (TK-310) by a mixer on a batch basis. The mixer is a constant speed mixer and can be shut on/off locally HOA. The status of the mixer (on/off) is displayed on the PLC. The mixer needs to operate only when a new batch of solution is being mixed; once the solid permanganate is fully dissolved the mixer will be shut off. This mixer shutoff will be via an operator-adjustable timer. $KMnO_4$ solution is mixed in the tank on a manually controlled batch basis. Granular, crystalline $KMnO_4$ will be delivered by the drum (55 gallons) and placed into the drum dumper. The drum dumper will empty the $KMnO_4$ into the storage tank via a conveyor. The tank will be filled approximately bi-weekly, when a new half batch of $KMnO_4$ solution is required. Given the target concentration of $KMnO_4$ solution of 35g/L approximately one quarter of a drum of $KMnO_4$ will be used per half batch. The quantity of $KMnO_4$ to be added will be controlled based on the runtime of the conveyor, manually operated. Since the average mass loading rate of the conveyor is 30ft^3/hr (20-40 ft^3/hr) the estimated run times for various batch sizes are as follows:

Volume of Solution (gal)	KMnO4 Added (ft3)	Run Time of Conveyor (min)
450	2.3	4.7
900	4.7	9.4
1350	7.0	14.1
1800	9.4	18.8

Note: calculation based on bulk density of $KMnO_4$ of 55 lb/ft3.

Clean water is also added to the dosing tank to achieve the target $KMnO_4$ concentration and is determined by the water level in the tank. Since the time required to add the water will be longer than the time required to add the $KMnO_4$, the length of the batch make up will be limited by the water flow. The water flow and conveyor speed should be adjusted, as much as possible, to complete at the same time. The solenoid valve (EV-390) on the water line will be manually opened and automatically closed by the PLC when the level sensor reaches the HI level. A hand valve on the water line allows the water to be shut on/off manually in case of solenoid valve failure. Normally the conveyor and water line valves will be closed and will only be switched open when a batch is being mixed.

The solution level in the tank is monitored by an ultrasonic level meter and is displayed both locally and on the HMI. When the water level measured reaches the LO or HI level a warning alarm is triggered by the PLC and displayed on the HMI. At the low level a new batch should be made. At the high level the water line solenoid valve (EV-390) is closed. The dosing tank is equipped with a float switch which triggers at the HIHI level, indicating the tank level is nearing overflow. When the switch reaches the HIHI water level an alarm is triggered on the PLC and a callout is sent to the operator. Both the level switch and level sensor trigger alarms at the high water level as a safety measure in case either device fails.

Outflow from the dosing tank is pumped via one of two diaphragm metering pumps on the dosing skid to the oxidation tank. Only one pump will normally operate, as the second pump is an installed spare. Control of the pumps is HOA. The status of the pump (on, off) is displayed on the PLC. Isolation valves for pump servicing are located upstream and downstream of each pump and can be manually manipulated. In the event that a pump is operating against a closed isolation valve, or other downstream blockage (automatic block valve failure, back pressure valve failure) each pump discharge is equipped with a pressure relief valve that discharges back to the $KMnO_4$ tank. The pumps are variable speed and will dose automatically proportional to the flow of wastewater into the oxidation tank based on a ratio input by the operator. Initially this ratio will be based on the 2010 pilot tests, which found the optimal ratio of $KMnO_4$ to groundwater flow on a volumetric basis to be 1:241. This ratio will need to be adjusted as necessary by the operator given the concentration of oxidizable constituents in the groundwater. In addition, the pump stroke length can be manually adjusted by the operator. Pressure in the pump discharge line is measured and displayed locally.

4.3.4 Oxidation Tank

ORP is analyzed in the oxidation tank via a probe and displayed locally and on the HMI. The target ORP level is 200 mV. Alarms are triggered on the HMI when the ORP reaches a LO or HI level alerting the operator to a possible failure in the $KMnO_4$ dosing pumps, valve, lines etc. If the ORP

level reaches the HIHI or LOLO set point another alarm is triggered and a call out is sent to the operator. The LOLO level indicates the treatment plant may not meet discharge requirements and therefore the treatment system is shut down.

Flow is discharged from the oxidation tank by gravity when the water level in the tank reaches the outlet pipe near the top of the tank. The oxidation tank is continuously stirred by a constant speed mixer which is controlled HOA. The status of the mixer (on, off) is displayed on the HMI.

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4.4 ALARMS

Table 4.3
Chemical Oxidation System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
LAH-100	Yes	An alarm notifies the operator that the level in the head tank is above operating level	2 in below tank overflow = 34 in	Blockage in discharge piping Failure of float switch	PLC system initiates an alarm condition. PLC system initiates a shutdown PLC system logs the alarm condition.
FAL – 100	No	An alarm notifies the operator that flow from the head tank is below operating limits	Minimum flow = 16 gpm	Blockage/failure upstream of flowmeter Failure of flowmeter	PLC system initiates an alarm condition. PLC system logs the alarm condition.
FAH – 100	No	An alarm notifies the operator that flow from the head tank is above operating limits	Maximum flow = 60 gpm	Failure of flowmeter	PLC system initiates an alarm condition. PLC system logs the alarm condition.
LALL - 310	Yes	An alarm notifies the operator that the level in the $KMnO_4$ storage tank is nearing empty	10% of Tank Depth = 13 in	Half batch of $KMnO_4$ solution has not been made Tank/piping failure Dosing pumps operating at high speed Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition.
LAL- 310	No	An alarm notifies the operator that the level in the $KMnO_4$ storage tank indicates one half batch of $KMnO_4$ has been used	50% of Working Depth = 51 in	Half batch of $KMnO_4$ solution has been used Tank/piping failure Dosing pumps operating at high speed Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition.
LAH- 310	No	An alarm notifies the operator that the level in the $KMnO_4$ storage tank is above operating limits	Full Batch Level = 102 in	Too much water added to batch Blockage in discharge piping Sensor error	PLC system initiates an alarm condition. PLC system sends a close valve signal to the water inlet valve (EV 390). PLC system logs the alarm condition.
LAHH- 310	Yes	An alarm notifies the operator that the level	90% of Tank Depth = 113 in	Blockage in discharge piping Failure of water line valve to	PLC system initiates an alarm condition. PLC system sends a close valve signal to the

Table 4.3
Chemical Oxidation System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
		in the $KMnO_4$ storage tank is near to the overflow level		close Sensor error	water inlet valve (EV 390). PLC system logs the alarm condition.
AALL - 110	Yes	An alarm notifies the operator that the ORP in the oxidation tank is well below operating limits	Estimated 50 mV	Failure in $KMnO_4$ dosing pumps, valves or piping Ratio of flow between groundwater and $KMnO_4$ solution not adjusted properly Concentration of $KMnO_4$ solution too low	PLC system initiates an alarm condition. PLC system logs the alarm condition. PLC system initiates shutdown sequence.
AAL – 110	No	An alarm notifies the operator that the ORP in the oxidation tank is below operating limits	Estimated 100 mV	Failure in $KMnO_4$ dosing pumps, valves or piping Ratio of flow between groundwater and $KMnO_4$ solution not adjusted properly Concentration of $KMnO_4$ solution too low	PLC system initiates an alarm condition. PLC system logs the alarm condition.
AAH – 110	No	An alarm notifies the operator that the ORP in the oxidation tank is above operating limits	Determined in field	Failure in $KMnO_4$ dosing pumps, valves or piping Ratio of flow between groundwater and $KMnO_4$ solution not adjusted properly Concentration of $KMnO_4$ solution too high	PLC system initiates an alarm condition. PLC system logs the alarm condition.
AAHH – 110	Yes	An alarm notifies the operator that the ORP in the oxidation tank is well above operating limits	Determined in field	Failure in $KMnO_4$ dosing pumps, valves or piping Ratio of flow between groundwater and $KMnO_4$ solution not adjusted properly Concentration of $KMnO_4$ solution too high	PLC system initiates an alarm condition. PLC system logs the alarm condition. PLC system initiates shutdown sequence.

5.0 CO-PRECIPITATION SYSTEM

5.1 DRAWING REFERENCES AND EQUIPMENT

5.1 Co-precipitation System Drawing Reference

Discipline	Drawing Name	Number
P&ID	Oxidation/Precipitation	P&ID-01
P&ID	Additives	P&ID-03
Mechanical	Mechanical Layout – Floor Plan	M-01
Mechanical	Mechanical Layout – Mezzanine Plan	M-02
Mechanical	Mechanical Layout – Section A	M-03
Mechanical	Mechanical Layout – Section B	M-04

5.2 Co-precipitation System Equipment

Process Tag #	Electrical Tag #	Description	Notes
TK-120		Co-precipitation tank	
AG-120		Co-precipitation tank mixer	
MV-121		Lime Recirc Line pinch valve	
TK- 320		Lime storage tank	
AG- 320		Lime storage tank mixer	
PU-320		Lime peristaltic dosing pump	
FV-120		Three-way flow control valve	
EV-391		Water flushing solenoid valve	
HS - 120		Manual switch co-precipitation tank mixer	
SC-120		Speed control co-precipitation tank mixer	
AIT - 120		pH sensor	
LIT -320		Lime slurry storage tank level sensor	
LSH - 320		Lime slurry storage tank level switch high	
HS - 320		Lime slurry tank mixer manual switch	
HS - 321		Lime dosing pump manual switch	
PI - 320		Lime slurry discharge pressure indicator	
LS - 390		Lime and $KMnO_4$ containment level switch	

5.2 PROCESS DESCRIPTION

Arsenic and iron are co-precipitated through the addition of lime sufficient to raise the pH above 8.8 (+/- 0.1). Groundwater flows by gravity from the oxidation tank to the co-precipitation tank where the lime slurry is added. pH is monitored in the co-precipitation tank via a sensor and used to

automatically control the flow of lime slurry from the storage tank. The co-precipitation tank will be continuously mixed with a retention time of 30 minutes.

Hydrated lime at a concentration of 3.5 lbs/gal will be delivered to the site approximately every 12 days and will be stored in a 5500 gallon tank. To prevent solids build up the lime will be continuously recirculated by a peristaltic pump and the lime storage tank will be continuously mixed. The level in the tank will be monitored by a level sensor and level switch which both warn the operator of either a low or high tank level. From the co-precipitation tank water will flow by gravity into the flocculation basin.

5.3 CONTROL NARRATIVE

5.3.1 Co-Precipitation Tank

Wastewater flows by gravity from the oxidation tank into the co-precipitation tank (TK-120) where lime is added. Flow from the sludge sump can be recirculated into the co-precipitation tank as needed (see Section 9 Sludge Management). The lime slurry piping to the co-precipitation tank is flushed periodically with clean water to prevent clogging. The flushing is controlled by a solenoid valve (EV-391) which is open/closed based on a timer and operator specified interval, initially set at 1 min open per hour. The position of the solenoid valve is displayed on the HMI. Before the solenoid valve opens, the three-way valve shuts and lime is sent to recirculation only. The co-precipitation tank is continuously mixed at a constant speed manually set by the operator and the status (on, off, speed) is displayed on the HMI. Control of the mixer is HOA.

pH is monitored in the co-precipitation tank and displayed locally and on the HMI. The pH is set to automatically control the position of the three way valve (FV-120) via the PLC based on a PI loop and tuned in the field. Lime should be dosed at an average rate of 9.0 gal/hr. The three way valve divides flow from the lime storage tank between the co-precipitation tank and recirculation loop. A motor operated pinch valve (MV-121) will provide redundant shutoff for the lime feed line. If the pH is high more lime is directed to the recirculation loop. Flow will always be maintained in the recirculation loop, with the exception that if there is a high level in the lime/permanganate containment area, the lime recirculation pump (PU-320) will shut down. If the pH is low more lime is directed to the co-precipitation tank. An alarm is triggered on the HMI if the pH reaches a set LO or HI, warning the operator the pH is outside operating limits and a failure may have occurred (three way valve, piping, dosing pump etc.). At a LOLO or HIHI pH an alarm is triggered and a call out is sent to the operator. The pH will be maintained above 8.8 (+/- 0.1) to ensure iron and arsenic are precipitated.

5.3.2 Lime Slurry Dosing

Lime slurry at a concentration of 3.5 lbs/gal is delivered to the treatment building in bulk via a truck. The truck pumps the slurry into the storage tank through an outside connection. Flow in this line is isolated by a manual gate valve which the operator will open during fill up. An ultrasonic level sensor in the lime storage tank measures the water level and displays the value locally and on the HMI. The PLC will signal an alarm when the sensor detects either a low or high lime slurry level. If the low level alarm is triggered the operator is warned that the storage tanks needs to be refilled. If the high level alarm is triggered the slurry level is above operating limits. This alarm should only occur during lime slurry addition when an operator will be on site to manually shut off the flow of lime slurry from the delivery truck. The tank is also equipped with a level switch which triggers an alarm on the HMI and sends a call out to the operator at the HIHI level when the tank is nearing overflow. The level sensor and level switch both alarm at a high slurry level as a safety measure in the event of the failure of either device.

The lime slurry tank is mixed at a constant speed and controlled HOA. The status of the mixer (on, off) is displayed on the HMI. The mixer can be shut off for servicing and maintenance but normally is run continuously.

Lime slurry is pumped out of the tank via a peristaltic pump (PU-320). This pump is a constant speed pump and controlled HOA. The status of the pump (on, off) is displayed on the HMI. Isolation valves located directly upstream and downstream of the pump can be manually shut off to allow for pump servicing but normally these valves will be open. A pressure indicator located downstream of the pump is displayed locally. The pump also has indication of a hose break. Flow from the lime storage tank is pumped to the three way valve where it is split between the co-precipitation tank and recirculation loop. In the event of a controlled plant shutdown, the motorized pinch valve (MV-121) located on the discharge line to the coprecipitation tank, just downstream of the three-way valve on the lime feed line, will be closed to avoid lime being discharged uncontrollably.

The lime slurry dosing system and $KMnO_4$ dosing system are located inside a dedicated containment area. A float switch in the containment area will trigger an alarm and will call out to the operator when the level in the containment reaches the HIHI level, warning the operator via the PLC that the containment is near overflow. In that case, the lime recirculation pump (PU-320) will shut down.

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5.4 ALARMS

Table 5.3
Co-precipitation System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
AALL - 120	Yes	An alarm notifies the operator that the pH in the co-precipitation tank is well below operating level	1.0 pH units below set point = 7.8	Valve failure/closed Failure in dosing pump Failure in pH sensor Failure in/blockage in lime piping Concentration of lime slurry too low Level of lime in storage tank low	PLC system initiates an alarm condition. PLC system logs the alarm condition. PLC system initiates shutdown sequence.
AAL - 120	No	An alarm notifies the operator that the pH in the co-precipitation tank is below operating level	0.5 pH units below set point = 8.3	Valve failure/closed Failure in dosing pump Failure in pH sensor Failure in/blockage in lime piping Concentration of lime slurry too low Level of lime in storage tank low	PLC system initiates an alarm condition. PLC system logs the alarm condition.
AAH - 120	No	An alarm notifies the operator that the pH in the co-precipitation tank is above operating level	0.5 pH units above set point = 9.3	Valve failure/closed Failure in pH sensor Concentration of lime slurry too high	PLC system initiates an alarm condition. PLC system logs the alarm condition.
AAHH - 120	Yes	An alarm notifies the operator that the pH in the co-precipitation tank is well above operating level	1.0 pH units above set point = 9.8	Valve failure/closed Failure in pH sensor Concentration of lime slurry too high	PLC system initiates an alarm condition. PLC system sends a close valve signal to the three-way lime dosing valve (FV-120). PLC system sends open valve signal to water flushing valve (EV – 391) which opens for specified time interval. PLC system logs the alarm condition. PLC system initiates shutdown sequence.

Table 5.3
Co-precipitation System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
LAL – 320	No	An alarm notifies the operator that the level in the lime storage tank is below operating level	10% of operating level = 12 in	All the lime slurry has been used Failure in the lime storage tank Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition.
LAH – 320	No	An alarm notifies the operator that the level in the lime storage tank is above operating level	5% above Operating Level = 121 in	Discharge valve closed Blockage in the discharge piping Too much lime slurry added to tank Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition.
LAHH – 320	Yes	An alarm notifies the operator that the level in the lime storage tank is near overflow	95%of Tank Depth = 129 in	Discharge valve closed Blockage in the discharge piping Too much lime slurry added to tank Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition.
LAH - 321	Yes	An alarm notifies the operator of a high liquid level in the pump casing	On/off	Break in peristaltic pump hose	PLC system initiates an alarm condition. PLC system logs the alarm condition. PLC system removes run signal from peristaltic pump. PLC system initiates shutdown sequence.
LAHH – 390	Yes	An alarm notifies the operator that the level in the lime/KMnO4 containment area is near overflow	2 in	Leakage/overflow of tanks Leakage in piping Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition. PLC system initiates the shutdown sequence. PLC shuts off the lime pump (PU-320).

6.0 SETTLING SYSTEM

6.1 DRAWING REFERENCES AND EQUIPMENT

Table 6.1
Settling System Drawing Reference

Discipline	Drawing Name	Number
P&ID	Oxidation/Precipitation	P&ID-01
P&ID	Additives	P&ID-03
Mechanical	Mechanical Layout – Floor Plan	M-01
Mechanical	Mechanical Layout – Mezzanine Plan	M-02
Mechanical	Mechanical Layout – Section B	M-04

6.2
Settling System Equipment

Process Tag #	Electrical Tag #	Description	Notes
AG-130		Clarifier flash mixer	
AG - 131		Clarifier flocculation mixer	
TH - 130		Lamella parallel plate clarifier	
TK - 330		Polymer storage tank	
SKID -330		Polymer make-down skid	
AG- 330		Polymer tank mixer	
HS - 130		Flash mixer manual switch	
PU - 330 A		Polymer dosing pump #1	
PU – 330 B		Polymer dosing pump #2	
HS - 131		Flocculator mixer manual switch	
LIT - 330		Polymer dosing tank level sensor	
LSH - 330		Polymer dosing tank float switch	
SC - 330		Polymer mixer speed control	
HS - 330		Polymer mixer manual switch	
HS – 330A		Polymer dosing pump #1 manual switch	
SC – 330A		Polymer dosing pump #1 speed control	
HS – 330B		Polymer dosing pump #2 manual switch	
SC – 330B		Polymer dosing pump #2 speed control	
PI – 330A		Pressure indicator discharge pump #1	
PI – 330B		Pressure indicator discharge pump #2	

6.2 PROCESS DESCRIPTION

Solids will be flocculated and settled out in the clarifier. Water flows from the co-precipitation tank to the flash mix tank by gravity. Dilute polymer is added in the flash mix tank and stirred. Water flows into the flocculator tank where it is slowly mixed and floc are formed, and then flows into the parallel plate clarifier. In the clarifier the solids settle through the inclined plates to the bottom and the effluent discharges over a weir. The solids are directed to the sludge sump via P-220 and the effluent is directed to the pH adjust tank via gravity.

Polymer is delivered as neat liquid. An automated make down system will dilute the neat polymer to a concentration of approximately 0.1 % by weight. Dilute polymer feed solution will be stored in a 60 gal tank and automatically made up approximately every three hours. A low level switch in the feed tank will be used to automatically add dilute polymer and water on a batch basis. Polymer from this dosing tank is pumped to the clarifier and to the sludge tank via two pumps on the polymer pump skid at a rate proportional to the groundwater flow rate.

6.3 CONTROL NARRATIVE

6.3.1 Clarifier Skid

Water flows by gravity from the co-precipitation tank up into the flash mix tank. The water level in the flash mix tank, flocculation tank and clarifier is constant, as slurry in each case is discharged over a weir into the next tank. From the clarifier the effluent is discharged to the pH adjust tank by gravity. Solids from the clarifier are piped by gravity to the sludge tank. Sludge can also be recirculated to the co-precipitation tank as described in Section 9. The flash mix tank and flocculation tank are each stirred by a mixer. The flash mixer is constant speed, the flocculation tank mixer is variable speed controlled at the MCC. The mixers are controlled HOA and the status of both mixers (on, off) is displayed on the HMI.

6.3.2 Polymer Dosing

Polymer is delivered as neat polymer in drums or pails which are connected to the polymer make down skid by the operator. The polymer make down skid automatically dilutes the neat polymer to 0.1 % by weight and stores it in the polymer dosing tank. The capacity of the polymer dosing tank is 60 gallons. Therefore the feed batches are prepared automatically approximately every three hours. A signal is sent by the PLC to the polymer make-down skid when the level sensor detects a set minimum level, indicating a new batch of polymer is needed. Since the batch volume is 20 gal, the average dosing rate is 6.7 gal/hr and the batch takes 10 minutes to make, the level switch will be

triggered when 18.9 gal has been used. The polymer make-down skid will automatically add the correct amount of neat polymer and clean water to achieve the correct dilution in the dosing tank.

The level sensor installed in the storage tank is displayed locally and on the HMI. When the sensor detects a LO signal, the PLC sends a digital signal to the polymer makedown skid to make a new batch of polymer. When the sensor detects a LOLO or HI the PLC triggers an alarm warning the operator of a possible failure. At the LOLO level an alarm is triggered and the mixer is shut off. A level switch is installed in the storage tank which triggers an alarm at the HIHI. The alarm is displayed on the HMI and a call out is sent to the operator.

The storage tank is continuously stirred via a variable speed mixer. The mixer is controlled HOA and the status of the mixer (on, off, speed) is displayed on the HMI. The speed on the mixer can only be adjusted manually at the tank. Once the optimal speed is determined the mixer will normally operate at this constant speed.

Dilute polymer solution is pumped out of this tank to the clarifier and sludge tank via two pumps on the dosing skid. Isolation valves for pump servicing are located upstream and downstream of each pump and can be manually manipulated. In the event that a pump is operating against a closed isolation valve or other downstream blockage (automatic block valve failure, back pressure valve failure), each pump discharge is equipped with a pressure relief valve that discharges back to the storage tank. Flow from the storage tank can be divided between the two pumps which allows for flexibility in the system. When polymer is only needed in the clarifier, one pump will be operational while the second acts as an online spare. When polymer is needed in the sludge tank, one pump (PU-330 A or B) can be directed to this line by manipulation of the manual valves and adjustment of the pump speed. In the event of a failure of the first pump polymer can be directed to the clarifier via the second pump. The speed of the dosing pumps can be adjusted locally, or by the PLC to keep pace with the influent flowrate (FIT-100). It is set based on the incoming groundwater flow at a volumetric rate of polymer to groundwater flow of 1:358 based on treatability testing. This proportion can be adjusted manually by operators as required based on the final sludge quality. The speed of each pump can be controlled independently HOA, with the status (in/not in auto) displayed on the HMI. Pressure in the pump discharge lines is measured and displayed locally via a pressure gauge.

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6.4 ALARMS

Table 6.3
Settling System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
LALL - 330	Yes	An alarm notifies the operator that the level in the polymer storage tank is well below operating level	10% of Tank Depth = 4 in.	Failure in make-down skid Leak in storage tank or piping Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition. PLC removes run signal from mixer.
LAL – 330	No	An alarm notifies the operator that the level in the polymer storage tank is below operating level	10% Below Batch Level = 12 in	Failure in make-down skid Leak in storage tank or piping Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition.
LAH – 330	No	An alarm notifies the operator that the level in the polymer storage tank is above operating level	80% of Tank Depth = 33 in	Failure in make-down skid Water cleaning valve open Blockage/failure in discharge piping Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition.
LAHH – 330	Yes	An alarm notifies the operator that the level in the polymer storage tank is nearing overflow	90% of Tank Depth = 35 in	Failure in make-down skid Water cleaning valve open Blockage/failure in discharge piping Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition.

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7.0 PH ADJUST SYSTEM

7.1 DRAWING REFERENCES AND EQUIPMENT

Table 7.1
pH Adjust System Drawing Reference

Discipline	Drawing Name	Number
P&ID	Effluent Polishing	P&ID-04
Mechanical	Mechanical Layout – Floor Plan	M-01
Mechanical	Mechanical Layout – Mezzanine Plan	M-02
Mechanical	Mechanical Layout – Section B	M-04

Table 7.2
pH Adjust System Equipment

Process Tag #	Electrical Tag #	Description	Notes
TK- 410		Acid dosing tote	
TK- 420		pH adjust tank	
AG- 420		pH adjust tank mixer	
PU- 410 A		Acid diaphragm dosing pump #1	
PU- 410 B		Acid diaphragm dosing pump #2	
AIT- 420		pH adjust tank pH sensor	
LIT - 420		pH adjust tank level sensor	
LSH - 420		pH adjust tank level switch	
HS - 420		pH adjust tank mixer manual switch	
LIT - 410		Acid dosing tote level sensor	
LIT – 411		Spare tote level sensor	
SC - 410		Acid dosing pumps speed control	
HS – 410A		Acid dosing pump #1 manual switch	
HS – 410B		Acid dosing pump #2 manual switch	

7.2 PROCESS DESCRIPTION

Effluent from the clarifier is adjusted in the pH adjust tank to a pH of 6.6 (+/- 0.05) (based on regulated discharge minimum of 6.5) by the addition of sulfuric acid. Sulfuric acid in the concentration of 93% by weight will be delivered to the site in totes. The acid will be dosed into the adjust tank via two diaphragm pumps on the dosing skid. The acid dose will be controlled by the pump speed which will depend on the pH in the adjust tank.

The pH adjust tank is equipped with a level sensor and level switch which will alarm when the water level in the tank is LOLO, LO, HI or HIHI. The water level is also used to control the speed of the filter feed pumps on the discharge end (see Section 8 Filtration and Adsorption). A mixer continuously stirs the pH adjust tank at a constant speed.

7.3 CONTROL NARRATIVE

7.3.1 pH Adjust Tank

Water flows by gravity into the pH adjust tank where it is mixed with sulfuric acid. The tank is equipped with a mixer, pH sensor, ultrasonic level sensor and level switch. The mixer is a constant speed mixer which runs continuously and can be shut off/on HOA. The status of the mixer (on, off) is displayed on the HMI.

pH is monitored in the tank with the real time reading displayed both locally and on the HMI. The pH is used to control the speed of the acid dosing pumps to maintain the pH in the tank around 6.6 (+/- 0.05). An alarm is signalled by the PLC when the pH reaches a LO level, shutting off the acid dosing pumps, and initiating a system shutdown.

The water level in the tank measured by the ultrasonic level sensor is displayed locally and on the HMI. When the level sensor detects a set LOLO, LO, or HI level the PLC triggers an alarm on the HMI. At the LOLO level the mixers are shut off. At the LO level set point the discharge pumps (PU420 A and B) are shut off. At the HI level set point the inlet valves and well pumps are shut off. A float level switch in the pH adjust tank triggers an alarm on the HMI and triggers the autodialer when the water level reaches the HIHI and is near to overflowing, warning the operator of a failure. The level sensor and level switch both signal alarms via the PLC when the water level is high, as a safety measure in case either device fails.

7.3.2 Acid Dosing

Sulfuric acid at 93% concentration by weight is delivered to the site in totes. The tote is connected to the acid dosing pump skid by the operator. A level sensor is installed in the tote which displays the level on the HMI. When the level in the tote reaches a set low level the PLC triggers an alarm on the HMI. An alarm and a call out to the operator are triggered if the level drops to the LOLO level. These alarms signal the operator to exchange the tote with the spare and/or order a new tote. An alarm is also triggered on the HMI when the level in the tote decreases rapidly, indicating there may be a leak in the tote.

The dosing pump skid transfers acid from the tote to the pH adjust tank via one of two diaphragm pumps, one pump being an installed spare. Isolation valves for pump servicing are located upstream and downstream of each pump and can be manually manipulated. The pumps can be shut off/on HOA and the speed is automatically controlled based on the pH reading in the adjust tank. The pump stroke length is manually adjustable by the operator. The acid dose to pH relationship is based on single point control PI loop. Acid will be dosed at a rate between 0.1 to 2.9 gal acid/hr. In the event that a pump is operating against a closed isolation valve, or other downstream blockage (automatic block valve failure, back pressure valve failure) each pump discharge is equipped with a pressure relief valve that discharges back to the storage tank. The status of the pump (on/off) is displayed on the HMI. Pressure in the pump discharge lines is measured and displayed locally.

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7.4 ALARMS

Table 7.3
pH Adjust System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
LALL – 410	Yes	An alarm notifies the operator that the level in the acid tote is nearing empty	10% of Tote Depth = 5 in	Leak in the acid tote/discharge piping Acid tote needs to be replaced Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition.
LAL – 410	No	An alarm notifies the operator that the level in the acid tote is low	20% of Tote Depth = 9 in	Leak in the acid tote/discharge piping Acid tote needs to be replaced Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition
LDAH (rate of fall) - 410	Yes	An alarm notifies the operator that the level in the acid tote is decreasing rapidly	Decreasing more than 3 times the max = >1 in/hr	Leak in acid tote Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition PLC system initiates a system shutdown sequence.
LAH – 410	No	An alarm notifies the operator that the level in the acid tote is above operating level	90% of Tote Depth = 41 in	Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition
LDAH (rate of fall) – 411	Yes	An alarm notifies the operator that the level in the spare acid tote is decreasing rapidly	Decreasing more than 3 times the max = >1 in/hr	Leak in acid tote Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition PLC system initiates a system shutdown sequence.
AAL - 420	No	An alarm notifies the operator that the pH in the pH adjust tank is below operating level	0.05 pH units below set point = 6.55	Acid dosing failure Low water flow pH sensor error Inconsistent mixing	PLC system initiates an alarm condition. PLC system logs the alarm condition
AALL - 420	Yes	An alarm notifies the operator that the pH in the pH adjust tank is below operating level	0.1 pH units below set point = 6.5	Acid dosing failure Low water flow pH sensor error Inconsistent mixing	PLC system initiates an alarm condition. PLC system initiates a system shutdown sequence. PLC system logs the alarm condition

Table 7.3
pH Adjust System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
AAH - 420	No	An alarm notifies the operator that the pH in the pH adjust tank is above operating level	0.05 pH units above set point = 6.65	Acid dosing pump failure High water flow pH sensor error Inconsistent mixing	PLC system initiates an alarm condition. PLC system logs the alarm condition
AAHH - 420	Yes	An alarm notifies the operator that the pH in the pH adjust tank is above operating level	0.1 pH units above set point = 6.7	Acid dosing pump failure High water flow pH sensor error Inconsistent mixing	PLC system initiates an alarm condition. PLC system initiates a system shutdown sequence. PLC system logs the alarm condition
LALL - 420	Yes	An alarm notifies the operator that the level in the pH adjust tank is well below operating level	10% of Working Depth = 7 in	Leak in the pH adjust tank/discharge piping Discharge pump speed too high Level sensor error	PLC system initiates an alarm condition. PLC system removes run signal from mixer. PLC system logs the alarm condition
LAL – 420	No	An alarm notifies the operator that the level in the pH adjust tank is below operating level	20% of Working Depth = 14 in	Leak in the pH adjust tank/discharge piping Discharge pump speed too high Level sensor error	PLC system initiates an alarm condition. PLC system withdraws the run signal to the filter pumps. PLC system logs the alarm condition
LAH – 420	No	An alarm notifies the operator that the level in the pH adjust tank is above operating level	10% above Working Depth = 75 in	Discharge pump speed too low Blockage/closed valve in discharge pipe Level sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition
LAHH – 420	Yes	An alarm notifies the operator that the level in the pH adjust tank is nearing overflow	95% of Tank Depth = 77 in	Discharge pump speed too low Blockage/closed valve in discharge pipe Level switch error	PLC system initiates an alarm condition. PLC system initiates the shutdown sequence. PLC system logs the alarm condition

8.0 FILTRATION AND ADSORPTION SYSTEM

8.1 DRAWING REFERENCES AND EQUIPMENT

Table 8.1
Filtration and Adsorption System Drawing Reference

Discipline	Drawing Name	Number
P&ID	Effluent Polishing	P&ID-04
Mechanical	Mechanical Layout – Floor Plan	M-01
Mechanical	Mechanical Layout – Mezzanine Plan	M-02
Mechanical	Mechanical Layout – Section A	M-03
Mechanical	Mechanical Layout – Section B	M-04

Table 8.2
Filtration and Adsorption Adjust System Equipment

Process Tag #	Electrical Tag #	Description	Notes
PU – 420 A		Centrifugal pump #1 to filter/adsorption columns	
PU – 420 B		Centrifugal pump #2 to filter/adsorption columns	
none		Filter cartridges #1 and #2	
none		Arsenic adsorption columns #1 and #2	
HS - 420A		Centrifugal pump #1 manual switch	
HS – 420B		Centrifugal pump #2 manual switch	
PI - 420		Cartridge filter feed pressure indicator	
DPIT – 430A		Differential pressure sensor filter #1	
DPIT – 430B		Differential pressure sensor filter #2	
PI - 430		Filter discharge pressure indicator	
DPIT – 440A		Differential pressure sensor adsorption column #1	
DPIT – 440B		Differential pressure sensor adsorption column #2	
PI - 441		Adsorption column #1 discharge pressure indicator	
PI - 442		Adsorption column #2 discharge pressure indicator	
AIT - 450		Final Effluent pH meter	
FIT - 490		Adsorption columns discharge flow meter	

8.2 PROCESS DESCRIPTION

The final stage in the arsenic removal treatment system is polishing via adsorption using activated alumina. First the flow from the pH adjust tank is pumped through one of two cartridge filters to remove particulates larger than 5 micron (nominal). The pressure drop across the filters is monitored and an alarm is triggered when the drop is too high. From there the groundwater flows through two adsorption columns where the remaining arsenic is removed. Again the differential pressure over the adsorption columns is monitored and an alarm is triggered when this pressure difference is too high. From there the groundwater flows to the discharge and the exit flow is monitored.

8.3 CONTROL NARRATIVE

8.3.1 Cartridge Filters

The level in the pH adjust tank is used to control the speed of the centrifugal pumps (PU-420A and 420B). The speed is set via a PID algorithm to be proportional to the water level which is maintained at initially 70% and manipulated to satisfy the level control. Two pumps are installed, one as an installed spare. In the event of a LO level alarm the pumps are shut off and in the event of a HI level alarm the inlet valves and well pumps are shut off. Manual isolation valves located upstream and downstream of the pumps allow for the pumps to be removed for servicing. Normally only one pump will be in operation. A pressure gauge located on the downstream end of the combined pump flow displays the pressure entering the cartridge filters locally. The pumps can be shut off/on HOA.

Water pumped from the pH adjust tank flows through one of two cartridge filters installed in parallel with manual valves (one is an installed spare). The pressure differential across each filter is monitored by a pressure sensor and is displayed locally and on the HMI. When the pressure difference reaches the HI or HIHI level the PLC triggers an alarm on the HMI and a callout is sent to the operator warning the operator that the filter cartridges need to be changed. Pressure in the combined outlet piping is monitored via a pressure gauge and displayed locally.

8.3.2 Adsorption Columns

From the filters the groundwater flows to the two adsorption columns in series which follow a lead/lag operation. Manual valves located upstream and downstream of each column allow for each column to be isolated for servicing or maintenance. Water samples manually collected downstream of the first adsorption column will indicate to the operator when breakthrough has occurred. The columns will also be monitored on a pressure differential basis via pressure sensors located directly upstream and downstream of each column. The differential pressure across each column will be displayed locally and on the HMI. When the pressure differential reaches a HI or HIHI level the PLC triggers an alarm

on the HMI warning the operator that the adsorption media needs to be replaced. In addition a callout is sent to the operator at the HIHI level. Local pressure gauges are located downstream of the each column.

pH in the treated effluent is monitored (AIT-450) in the effluent pipe with the real time reading displayed both locally and on the HMI. The pH is used for compliance monitoring and reporting. The transmitter does not control any equipment, however, an alarm is signalled by the PLC when the pH reaches a LO or HI level. In addition, an alarm is signalled by the PLC, the operator is called, and the system shuts down upon a LOLO or HIHI level.

Flowrate is measured via a magnetic flowmeter (FIT-490) on the downstream end of the columns before it reaches the discharge outlet. The real time flow is displayed both locally and on the HMI. Additionally, the total flow, calculated by the PLC from the flowmeter pulse output, is displayed on the HMI.

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8.4 ALARMS

Table 8.3
Filtration and Adsorption System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
DPAH – 430A	No	An alarm notifies the operator that the pressure differential in the cartridge filter is above operating level	Estimated to be greater than 5 psi	Cartridge filter needs to be cleaned Pressure sensor error Blockage in piping/ valve closed	PLC system initiates an alarm condition. PLC system logs the alarm condition
DPAHH – 430A	Yes	An alarm notifies the operator that the pressure differential in the cartridge filter is well above operating level	Estimated to be greater than 7 psi	Cartridge filter needs to be cleaned Pressure sensor error Blockage in piping/ valve closed	PLC system initiates an alarm condition. PLC system logs the alarm condition
DPAH – 430B	No	An alarm notifies the operator that the pressure differential in the cartridge filter is above operating level	Estimated to be greater than 5 psi	Cartridge filter needs to be cleaned Pressure sensor error Blockage in piping/ valve closed	PLC system initiates an alarm condition. PLC system logs the alarm condition
DPAHH – 430B	Yes	An alarm notifies the operator that the pressure differential in the cartridge filter is well above operating level	Estimated to be greater than 7 psi	Cartridge filter needs to be cleaned Pressure sensor error Blockage in piping/ valve closed	PLC system initiates an alarm condition. PLC system logs the alarm condition
DPAH – 440A	No	An alarm notifies the operator that the pressure differential in the adsorption column is above operating level	Estimated to be greater than 5 psi	Adsorption media needs to be replaced Pressure sensor error Blockage in piping/ valve closed	PLC system initiates an alarm condition. PLC system logs the alarm condition
DPAHH – 440A	Yes	An alarm notifies the operator that the pressure differential in the adsorption column is well above operating level	Estimated to be greater than 7 psi	Adsorption media needs to be replaced Pressure sensor error Blockage in piping/ valve closed	PLC system initiates an alarm condition. PLC system logs the alarm condition

Table 8.3
Filtration and Adsorption System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
DPAH – 440B	No	An alarm notifies the operator that the pressure differential in the adsorption column is above operating level	Estimated to be greater than 5 psi	Adsorption media needs to be replaced Pressure sensor error Blockage in piping/ valve closed	PLC system initiates an alarm condition. PLC system logs the alarm condition
DPAHH – 440B	Yes	An alarm notifies the operator that the pressure differential in the adsorption column is well above operating level	Estimated to be greater than 7 psi	Adsorption media needs to be replaced Pressure sensor error Blockage in piping/ valve closed	PLC system initiates an alarm condition. PLC system logs the alarm condition
AALL-450	Yes	An alarm notifies the operator that effluent pH is below the compliance limit.	<6.5	Acid overdose pH sensor error	PLC system initiates an alarm condition. PLC system initiates shutdown sequence PLC system logs the alarm condition
AAL-450	No	An alarm notifies the operator that effluent pH is approaching the compliance limit.	<6.6	Acid overdose pH sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition
AAH-450	No	An alarm notifies the operator that effluent pH is approaching the compliance limit.	>8.4	Acid underdose Lime overdose pH sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition
AAHH-450	Yes	An alarm notifies the operator that effluent pH is above the compliance limit.	>8.5	Acid underdose Lime overdose pH sensor error	PLC system initiates an alarm condition. PLC system initiates shutdown sequence PLC system logs the alarm condition
FSL – 490	No	An alarm notifies the operator that the flow is below operating level	Min flow = 15 gpm	Blockage/failure upstream Flow sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition

Table 8.3
Filtration and Adsorption System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
FSLL – 490	Yes	An alarm notifies the operator that the flow is well below operating level	43% of average flow = 17 gpm	Blockage/failure upstream Flow sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition
FSH – 490	No	An alarm notifies the operator that the flow is above operating level	43% above average flow = 57 gpm	Level/flow control failure upstream Flow sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition
FSHH - 490	Yes	An alarm notifies the operator that the flow is well above operating level	Max flow = 60 gpm	Failure upstream Level/flow control failure upstream w sensor error	PLC system initiates an alarm condition. PLC system initiates shutdown sequence PLC system logs the alarm condition

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9.0 SLUDGE MANAGEMENT SYSTEM

9.1 DRAWING REFERENCES AND EQUIPMENT

Table 9.1
Sludge Management System Drawing Reference

Discipline	Drawing Name	Number
P&ID	Sludge Handling	P&ID-02
Mechanical	Mechanical Layout – Floor Plan	M-01
Mechanical	Mechanical Layout – Mezzanine Plan	M-02
Mechanical	Mechanical Layout – Section A	M-03
Mechanical	Mechanical Layout – Section B	M-04

Table 9.2
Sludge Management System Equipment

Process Tag #	Electrical Tag #	Description	Notes
TK - 910		Compressed air accumulator vessel	
TK - 220		Sludge tank	
AG - 220		Sludge tank mixer	
FP - 240		Filter press	
CO - 910		Air compressor	
P - 220		Air diaphragm pump #1 (clarifier to sludge tank)	
P- 230		Air diaphragm pump #2 (sludge tank to filter press)	
TK - 250		Process sump	
CP- 840		Filter Press Control Panel	
none		Process sump pump	
LS - 290		Containment level switch	
EV- 920		Compressed air control valve – air diaphragm pump #1	
EV- 930		Compressed air control valve – air diaphragm pump #2	
EV- 221		Solenoid valve (clarifier to sludge tank)	
EV- 229		Solenoid valve (clarifier to co-precipitation tank)	
PI/PSL - 910		Accumulator vessel pressure indicator and pressure switch	
LIT - 220		Sludge tank level sensor	
HS - 220		Sludge tank mixer manual switch	
LSH - 220		Sludge tank level switch	

PI - 235		Filter press pressure indicator	
ES - 840		Filter press emergency stop	
LSL - 250		Process sump level switch low	
LSH - 250		Process sump level switch high	

9.2 PROCESS DESCRIPTION

Slurry from the parallel plate clarifier is pumped to the sludge storage tank via a pneumatic diaphragm pump. Sludge is stored until an operator is on site to batch process the sludge in the filter press. Based on the 2010 pilot testing the tank will store 5 days of sludge. A second pneumatic diaphragm pump moves the solids from the storage tank to the filter press. Filtrate from the press will be collected in the process sump and recirculated back to the head tank. Solids cake will be collected in a roll off bin. Assuming 95% solids capture by the press, 960 lbs of dry solids will be collected per week. Assuming a conservative cake solids concentration of 25% the roll-off bin will need to be removed for off site disposal approximately every 8 weeks.

9.3 CONTROL NARRATIVE

9.3.1 Sludge Tank

Clarifier underflow is pumped to the sludge tank via a pneumatic diaphragm pump (P-220). Compressed air from the compressor (CO-910) flows through an accumulator vessel (TK-910). A pressure gauge on the vessel is displayed locally, and a pressure switch low will alarm to the PLC. Air from the accumulator vessel is divided between the first and second diaphragm pumps and the filter press. Air flow to the diaphragm pump is controlled by a solenoid valve (EV-920) which is set on a timer. The position of the valve is displayed on the HMI.

Sludge flow from the clarifier can be isolated manually via a pinch valve and diverted to either the sludge tank or back to the co-precipitation tank. Sludge flow from the clarifier to sludge tank and to the co-precipitation tank are controlled via the solenoid valve (EV-221) and (EV-229) respectively. Flow will normally be diverted to the co-precipitation tank to achieve a target TSS concentration into the clarifier. These valves therefore will be set to open and close by the PLC based on an operator input time interval. In the event that the clarifier is not working effectively and reprocessing is required flow can be diverted back to the co-precipitation tank.

In the event that the sludge in the tank is not of sufficient quality for dewatering prior to processing in the filter press, polymer can be added in the sludge tank. The operator will manually open/close the correct valves and adjust the polymer dosing pump speed as needed (see Section 6 Settling).

The sludge tank is equipped with a level sensor and level switch as a safety measure in case either device fails. The level sensor continuously measures the sludge level and displays the value both locally and on the HMI. When the level sensor detects a HI, LO or LOLO level the PLC triggers an alarm warning the operator. A LO level indicates the tank is nearing empty and there is not enough sludge to run a batch in the filter press. A LOLO level also switches off the tank mixer to avoid it running dry. A HI level indicates the tank is above operating level and a batch should be processed in the filter press. If the level continues to rise to the HIHI level, near overflow, the float switch is triggered and the PLC signals an alarm on the HMI, sends a callout to the operator and initiates the system shutdown sequence.

The sludge tank is stirred continuously by a constant speed mixer. The mixer can be shut on/off HOA and the status of the mixer (on, off) is displayed on the HMI.

9.3.2 Filter Press

The operator manually processes batches of sludge using the filter press as needed. The operator switches on the diaphragm pump and filter press on the press control panel (CP-840). The PLC signals the solenoid valve (EV-930), which controls the air diaphragm pump, to open when the diaphragm pump is turned on. The majority of the press functions are controlled locally at the control panel.

Filtrate from the press flows by gravity to the process sump. Excess filtrate is collected in the drip launder and also directed into the process sump by gravity. When the filter press cycle is complete the operator shuts off the diaphragm pump via the control panel and opens the press. The cake solids fall into a roll-off bin where they are collected until full and the bin is removed for off site disposal. The operator will need to shut off the filter press and pump and close the valves. In the event of a malfunction the filter press is equipped with an emergency stop which immediately shuts off power to the press. Pressure in the line between the pump and press is measured and displayed locally for the operator to observe while the press is in operation.

9.3.3 Process Sump

Filtrate from the press and flow from the treatment system containment area enter the process sump by gravity. If liquid levels in the containment area reach a HIHI level, a level float switch is activated which triggers an alarm on the HMI and sends a callout to the operator. In total there is one level switch in the containment area and one level switch in the dedicated $KMnO_4$ and lime containment area (see Section 5). Water is pumped out of the sump to the head tank via a submersible pump controlled by two level float switches which signal the pump to turn on at the HI level and off at the LO

level. This sump pump is only active when filter pressing operations are in progress, otherwise it is manually turned off.

9.4 ALARMS

Table 9.3
Sludge Management System Alarms

Alarm	Operator Call Out Condition	Description	Set Point	Possible Causes	Interlocks
LALL - 220	Yes	An alarm notifies the operator that the level in the sludge storage tank is well below operating level	10% of Tank Depth = 19 in	Leak/failure in tank or piping Filter press and pump on but not enough sludge for batch Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition PLC system removes run signal from mixer.
LAL – 220	No	An alarm notifies the operator that the level in the sludge storage tank is below operating level	20% of Tank Depth = 37 in	Leak/failure in tank or piping Filter press and pump on but not enough sludge for batch Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition
LAH – 220	No	An alarm notifies the operator that the level in the sludge storage tank is above operating level	80% of Tank Depth = 148 in	Sludge batch in filter press needs to be run Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition
LAHH – 220	Yes	An alarm notifies the operator that the level in the sludge storage tank is nearing overflow	90% of Tank Depth = 167 in	Sludge batch in filter press needs to be run Sensor error	PLC system initiates an alarm condition. PLC system initiates the shutdown sequence PLC system logs the alarm condition
LAHH - 290	Yes	An alarm notifies the operator that the level in the containment area is nearing overflow	2 in	Spill, leak or tank overflow Process sump overflow Sensor error	PLC system initiates an alarm condition. PLC system logs the alarm condition PLC system initiates the shutdown sequence
PAL - 910	No	An alarm notifies the operator that the pressure in the air accumulator vessel is low	75 psi (adjustable)	Air leak in vessel or piping Compressor failure High air demand in system	PLC system initiates an alarm condition. PLC system logs the alarm condition

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10.0 SAFETY

1. Flow switch FSH-990 will actuate when the safety shower and eyewash station is operated. This will actuate a local warning light and alarm horn, and call out to the operator response list. The local and remote alarms should be tested whenever the station is tested.
2. Flow alarms (local and remote) will activate and call out when the flow to the fire sprinkler system is active, and should be reported and logged at the PLC.
3. The Smoke alarm will activate and call out when any of the smoke alarm(s) are active, and should be reported and logged by the PLC.
4. HVAC system exhaust fan pushbutton emergency stop (ES-840) shall be tied into the PLC so that e-stop can be monitored remotely.
5. The manual shutdown pushbutton (ES-800) shall initiate a plant shutdown and shall call out to the operator.

Startup Checklist

B&L Woodwaste Site
Pierce County, Washington

Confirm that there is sufficient lime, liquid permanganate, coagulant, acid and polymer present.

Confirm that sludge tank is below high-high.

Confirm that process water flow is on, if off then click "Force" button on first PLC screen.

Confirm that seal water to effluent pumps is on.

Confirm that seal water to polymer pumps is on.

Confirm that all process mixers are operating.

Confirm that all process parameters are within the low-low to high-high limits.
If not, change limits temporarily to allow plant to start.

Press "Alarm Reset" button on PLC. This will allow the PLC to start up the plant.

Check pH adjust tank measured pH vs the setpoint.

If pH difference is approximately 0.5 or more, change setpoints over several minutes to slowly "walk" the measured pH to the target value, without significantly overshooting.

Check coprecipitation tank measured pH vs the setpoint.
If pH difference is approximately 0.5 or more, change setpoints over approximately 2 hours to slowly "walk" the measured pH to the target value, without significantly overshooting. Note that the lime control loop is much slower to react than the acid control loop, as lime takes much longer to dissolve. It is very easy to overshoot with this pH control loop.

Shutdown Checklist

B&L Woodwaste Site
Pierce County, Washington

_____ Shut off wells using PLC.

_____ If shutoff will be for >1 day, pump polymer storage tank to sludge tank.

_____ Wait until coprecip tank is at or above its pH setpoint, flush lime tubing with clean water.

_____ Confirm that process water shutoff solenoid is closed.

_____ Confirm that head tank flowmeter reads zero.

_____ Confirm that sludge pump to sludge tank timer is off.

_____ Confirm that there is no inflow into the plant sump.

Troubleshooting Checklist

B&L Woodwaste Site
Pierce County, Washington

Problem	Possible Diagnosis
High head tank level	
	_____ Clog in effluent line
	_____ High flowrate from wells
	_____ Failure of head tank level switch
Low ORP in oxidation tank	
	_____ Low conc of KMnO4
	_____ KMnO4 pump failure
	_____ High oxidant demand
	_____ Failed ORP probe
	_____ KMnO4 tank empty
	_____ Failure of ox tank agitator
High ORP in oxidation tank	
	_____ Overconcentrated KMnO4 in storage tank
	_____ High pumping rate
	_____ Failed ORP probe
	_____ Failure of ox tank agitator
Low pH in coprecip tank	
	_____ pH loop overshoot
	_____ Failed pH sensor
	_____ Clog in lime tubing (common)
	_____ Lime pump failure
	_____ Lime tank empty
	_____ Failure of coprecip tank agitator

Problem	Possible Diagnosis
High pH in coprecip tank	
	_____ Failed pH sensor
	_____ Pump in manual
	_____ pH loop overshoot (very common upon startup even during proper operation)
	_____ Failure of coprecip tank agitator
Muddy water in floc tank (no flocs)	
	_____ Polymer dosing pump failure / underdose
	_____ Polymer makedown skid failure
	_____ Coagulant system failure / under or overdose
	_____ Change in influent water quality (unlikely)
Purple water at clarifier overflow	
	_____ Permanganate overdose (see "High ORP in oxidation tank" entry)
	_____ Low oxidant demand in incoming water
Cloudy water at clarifier overflow	
	_____ See "Muddy Water in floc tank" entry
	_____ High or low pH in coprecip tank
	_____ Low ORP in oxidation tank
	_____ Failure of sludge pump
	_____ Failure of air system
	_____ Incorrect sludge pump timer settings
High pH in pH adjust tank	
	_____ Failure of acid pump
	_____ Acid tote empty
	_____ Failure of pH sensor in pH adjust tank
	_____ pH adjust tank water level below agitator

Problem	Possible Diagnosis
Low pH in pH adjust tank	
	_____ Failure of acid pump
	_____ Failure of pH sensor in pH adjust tank
	_____ pH adjust pH control loop overshoot
	_____ pH adjust tank water level below agitator
High water level in pH adjust tank	
	(after shutdown involving effluent pumps) Process inertia - 1/2 hr or more of water flows from head tank to pH adjust tank after shutdown
	_____ Failure of effluent pump
	_____ Failure of level transmitter
	_____ High diff pressure across cartridge filters
	_____ High diff pressure across adsorbers
	_____ Cartridge filter valving incorrect
	_____ Adsorber valving incorrect
	_____ Effluent pipe valving incorrect
	_____ Clog in effluent line
	(after extended shutdown involving effluent pumps) Process water on -- effluent pump seal water discharges to pH adjust tank
Low water level in pH adjust tank	
	_____ Effluent pump in "hand" mode
	_____ Failure of level transmitter
	_____ Leak in tank or piping
High DP across filters	
	_____ Filters clogged
	_____ Failure of DP meter
	_____ Valves set incorrectly
	_____ High flowrate from effluent pump

Problem	Possible Diagnosis
High DP across adsorbers	
	_____ Adsorbers clogged
	_____ Failure of DP meter
	_____ Valves set incorrectly
High pH in effluent pH meter	
	_____ Failure of pH meter
	_____ Media is raising the pH
	_____ Failure of pH adjust tank system - see high pH in pH adjust tank
Low pH in effluent pH meter	
	_____ Failure of pH meter
	_____ Media is lowering the pH
	_____ Failure of pH adjust tank system - see low pH in pH adjust tank
	Meter is not in flow stream - confirm that meter housing is "pushed down" so that Sharpie line is flush
	_____ with hand-tight nut
Filter press releases wet solids	
	_____ Filter press pressure switch set too low
	_____ Poor quality of solids, contains significant entrained water
	_____ Tear in filter cloth
Filter press will not fill completely	
	_____ Clog in sludge line from sludge tank to pump
	_____ Clog in sludge line from pump to filter press
	_____ Filter press PLC settings incorrect
	_____ Filter press pressure switch set too low
Plant will not start up when "Reset Alarms" is pressed	
	Confirm that all process parameters are between the low-low to high-high limits on "Alarm Setpoints
	_____ 1" screen

B&L Woodwaste | Weekly Checklist | Date:

Parameter	Location	Method	Date/Time	Op Initials	Result	
Arsenic (Total)	Influent	Test Kit				ug/L
Arsenic (Dissolved)	Adsorber Inlet	Test Kit, Syringe Filter				ug/L
Arsenic (Dissolved)	Adsorber Between	Test Kit, Syringe Filter				ug/L
Arsenic (Dissolved)	Effluent	Test Kit, Syringe Filter				ug/L
Lab Meter ORP Calibration	Lab	Cal, Measure ORP Std Before/After				
Lab Meter pH Calibration	Lab	Cal @ pH 4, 7,10; Measure pH 7 buffer Before/After				
ORP Measurement/Process Check	Ox Tank	Note Process Meter Reading, Take Sample				mV
		Lab Meter Reading, Stir Plate				mV
pH Measurement/Process Check	Coprecip Tank	Note Process Meter Reading, Take Sample				pH
		Lab Meter Reading, Stir Plate				pH
	pH Adjust Tank	Note Process Meter Reading, Take Sample				pH
		Lab Meter Reading, Stir Plate				pH
	Effluent	Note Process Meter Reading, Take Sample				pH
		Lab Meter Reading, Stir Plate				pH
NPDES Grab Sample pH	Sample Collection	Closed sample bottle				
	Sample Temp, Buffer Temp	Lab Meter Reading				pH
	Lab Meter pH Result	Lab Meter Reading, Stir Plate				
Spare permanganate drums onsite						
Spare changeouts of cartridge filters onsite						
Spare coagulant pails onsite						
Spare polymer pails onsite						
Weekly flow/pH data dumped, nonstandard operation annotated						
Data sent to AMEC						

B&L Woodwaste | Monthly Checklist | Month/Year:

Parameter	Location	Method	Date/Time	Op Initials	Result	
Iron (Ferrous)	Influent	Spectrophotometer				mg/L
Manganese	Influent	Spectrophotometer				mg/L
Iron (Total)	Adsorber Inlet	Spectrophotometer				ug/L
Iron (Total)	Adsorber Between	Spectrophotometer				ug/L
TSS	Cartridge Filter Infl	Spectrophotometer				mg/L
TSS	Cartridge Filter Eff	Spectrophotometer				mg/L
ORP Calibration Week 1/2	Ox Tank	Cal w/ ORP Std, Measure Process Meter Before/After				mV
ORP Calibration Week 3/4	Ox Tank	Cal w/ ORP Std, Measure Process Meter Before/After				mV
pH Calibration Week 1/2	Coprecip Tank	Cal @ pH 7,10; Measure Process Meter Before/After				pH
pH Calibration Week 3/4	Coprecip Tank	Cal @ pH 7,10; Measure Process Meter Before/After				pH
pH Calibration Week 1/2	pH Adjust Tank	Cal @ pH 4,7; Measure Process Meter Before/After				pH
pH Calibration Week 3/4	pH Adjust Tank	Cal @ pH 4,7; Measure Process Meter Before/After				pH
pH Calibration Week 1/2	Effluent	Cal @ pH 4,7; Measure Process Meter Before/After				pH
pH Calibration Week 3/4	Effluent	Cal @ pH 4,7; Measure Process Meter Before/After				pH
Lime Tank Level OK?		Lime Tank				
Rolloff Bin Level OK?		Rolloff Bin				
NPDES 24-hr Composite Sample	Sampling Apparatus	Sample Collection				
	Tukwila, WA	ARI Lab Pickup/Dropoff				

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix B
Compliance Monitoring Plan

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

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Appendix A Health and Safety Plan

Appendix B Sampling and Analysis Plan/Quality Assurance Project Plan

List of Abbreviations and Acronyms

Acronym/ Abbreviation	Definition
CAA	Cleanup Action Area
CAP	Cleanup Action Plan
CMP	Compliance Monitoring Plan
Consent Decree	Consent Decree No. 08-2-10610-7
CPOC	Conditional Point of Compliance
CUL	Cleanup level
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
HASP	Health and Safety Plan
Landfill	B&L Landfill
MTCA	Model Toxics Control Act
OMMP	Operations, Maintenance, and Monitoring Plan
PRB	Permeable reactive barrier
SAP/QAPP	Sampling and Analysis Plan/Quality Assurance Project Plan
Site	B&L Woodwaste Site
WAC	Washington Administrative Code

1.0 Introduction

This Compliance Monitoring Plan (CMP) has been prepared to supplement the Operations, Maintenance, and Monitoring Plan (OMMP) to support Phase 3 compliance monitoring requirements following implementation of remedy construction specified in the 2008 Cleanup Action Plan (CAP) issued by the Washington State Department of Ecology (Ecology) under Consent Decree No. 08-2-10610-7 (Consent Decree; Ecology 2008). The CAP is being implemented in phases in accordance with the Scope of Work (SOW) included in the Consent Decree. Phase 3 consists of the long-term operations, maintenance, and monitoring of the CAP remedy. In this CMP, procedures are described for collection, evaluation, and reporting of data to assess attainment of cleanup requirements at the B&L Woodwaste Site (Site). Procedures for regular monitoring well inspection and maintenance are also addressed in this CMP.

Phase 3 compliance monitoring is designed to meet the monitoring requirements specified in the Consent Decree and CAP, and the substantive requirements of regulations issued pursuant to the Washington State Model Toxics Control Act (MTCA) and the Washington State Solid Waste Management, Reduction, and Recycle Act. Compliance monitoring will be used to regularly assess groundwater quality trends, confirm the long-term effectiveness of the cleanup action completed at the Site, and eventually confirm compliance with cleanup standards at the point of compliance. Because it is expected to be several years until compliance with groundwater and surface water cleanup levels (CULs) are achieved at the Conditional Point of Compliance (CPOC), this CMP may be modified if it is determined by Ecology that revisions are needed to address changing conditions and/or new information.

1.1 COMPLIANCE MONITORING OBJECTIVES AND SCOPE

The objectives of this CMP include the following:

- **Replace interim compliance monitoring and inspection plans associated with implementation of the final CAP.** This CMP replaces and supersedes the Interim CMP (Floyd|Snider/AMEC 2008) that has been implemented for the Site. The Interim CMP described requirements for groundwater and surface water monitoring conducted during Phases 1 and 2 of CAP implementation.
- **Comply with MTCA requirements.** The monitoring program presented in the CMP complies with MTCA requirements, as specified in Washington Administrative Code (WAC) 173-340-410, and 173-340-720 through 173-340-730.
- **Comply with appropriate closure and monitoring standards for solid waste landfills.** This CMP complies with the regulatory requirements for landfills, including woodwaste landfills, specified in WAC 173-304. The substantive requirements include general closure and post-closure requirements for landfills, (WAC 173-304-407(6) and (7)). Additional post-closure requirements, including landfill cap inspections, are addressed elsewhere in the OMMP.
- **Comply with applicable Remedial Action Objectives specified in the CAP.** This CMP supports attainment of the Remedial Action Objectives specified in Section 4.4 of the CAP.

The scope of this CMP includes the following:

- Compliance monitoring to address remediation performance
- Confirmational monitoring of groundwater and surface water quality at the Site
- Inspection and maintenance of the monitoring well network, as described in this CMP

Additional monitoring, inspection, and maintenance provisions for specific remedy components and for permit compliance are included in the OMMP.

This CMP specifically addresses performance and confirmation monitoring, as described in WAC 173-340-410. Compliance monitoring will address performance monitoring requirements until results indicate the cleanup action has attained cleanup standards. Compliance monitoring will then continue as confirmational monitoring to confirm the long-term effectiveness of the cleanup action. Compliance monitoring for some areas outside the CPOC may be discontinued when Ecology has determined that compliance has been demonstrated in accordance with WAC 173-340-720(9). Compliance evaluation is described in detail in Section 4.0.

1.2 CLEANUP STANDARD

As defined in the MTCA regulations, the cleanup standard for a contaminated site consists of the CULs and the location(s) at which the CULs apply. For the Site, the cleanup standard includes the CULs and the conditional point of compliance specified in the CAP. CULs and the point of compliance relevant to the Site are described in this section. This CMP is designed to support monitoring of the attainment of cleanup standards for the Site.

1.2.1 Cleanup Levels

The CAP established site CULs for soil, ditch sediment, groundwater, and surface water. Cleanup of site soils was addressed in the Closure Report for the 1992 CAP (Appendix I to the OMMP; Hydrometrics 1994). Ditch sediment cleanup was addressed in the Phase 2 Part 2 Completion Report (Floyd|Snider/AMEC 2013). Compliance monitoring addressed by this CMP will be conducted for groundwater and surface water. The CULs established in the 2008 CAP are presented in the following table.

B&L Woodwaste Site Cleanup Levels				
Parameter	**Soil/Fill[1] (mg/kg)**	**Groundwater (µg/L)**	**Surface Water (µg/L)**	**Ditch Sediment[2] (mg/kg)**
Arsenic	20[3]	5.0[3,4]	5.0[5]	20[3]

Notes:
1 More restrictive soil cleanup levels may be required to maintain compliance with groundwater and surface water cleanup levels.
2 Cleanup levels have been chosen as the more stringent level among MTCA residential soil cleanup level, Commencement Bay Record of Decision sediment cleanup objectives, and Ecology marine sediment cleanup level.
3 MTCA Method A residential cleanup levels.
4 Natural background may be demonstrated by Ecology to be higher than the cleanup level per WAC 173-340-708(11). In that case, natural background concentration may be substituted by Ecology as the cleanup level.
5 National Toxics Rule; defaulting to the Washington State background level of 5.0 µg/L used in MTCA Method A cleanup level.

Abbreviations:
Ecology Washington State Department of Ecology
MTCA Model Toxics Control Act
WAC Washington Administrative Code

1.2.2 Point of Compliance

In accordance with WAC 173-340-720(8)(c), a CPOC for groundwater and surface water is established in the 2008 CAP at the landfill/cap perimeter (edge of waste; aerially demarcated by the barrier wall), extending vertically downward through the Upper Sand Aquifer to the lower aquitard, as shown on Figure 1.1. Compliance with this CPOC is evaluated using downgradient monitoring wells located a short distance outside the barrier wall, near the property boundary, and in surface water sampling locations in the ditches adjacent to and downgradient of the B&L Landfill (Landfill). The location of the groundwater CPOC is shown on Figure 1.1. At the completion of remedy construction, affected groundwater extended beyond the designated CPOC onto adjacent properties, which are collectively referred to as the Outside Area. It is expected that monitoring of the Outside Area over a period of several years will be needed to achieve the CULs at the CPOC.

2.0 Compliance Monitoring Well Network

In this section, the sampling locations that will be monitored as part of site compliance monitoring are described. Because contaminated groundwater and surface water extended past the COPC at the completion of remedy construction, representative sampling locations were chosen throughout the Site to monitor trends and the effectiveness of the remedy in bringing contaminated groundwater into compliance over time.

Changes in the monitoring well network since the Interim CMP reflect plume changes and groundwater flow changes associated with remedy implementation and a more comprehensive understanding of the extent of groundwater contamination. An updated concentration contour map of the arsenic plume is presented in Figure 1.1. Monitoring wells have been selected to be representative of (1) the groundwater CPOC at the Landfill perimeter and (2) the Outside Area affected groundwater. For purposes of assessing compliance with CULs, the Outside Area encompasses those portions of the Cleanup Action Areas (CAAs; Wetlands CAA, End-of-Plume CAA, and Landfill/Ditch CAA) distinguished in the CAP that lie outside the CPOC at the Landfill boundary. The Outside Area generally consists of the following sub-areas (refer to Figure 1.1):

- **Wetlands Plume:** an area of affected groundwater beneath the wetlands north of the B&L Property
- **Agricultural Field Plume:** an area of affected groundwater beneath the corner of the agricultural field west of the B&L Property
- **Eastern Boundary Mini-Plume:** an area of groundwater contamination on the northeast side of the Landfill that is confined to the B&L Property
- **Fife Way Mini-Plume:** an area of groundwater contamination on the northeast side of the Landfill that is confined to the B&L Property
- **Halo South:** an affected area adjacent and extending south of the Landfill perimeter; this plume extends beyond the B&L Property

In addition to addressing groundwater quality representative of the CPOC and the Outside Area, the monitoring well network is also intended to monitor the downgradient edges of the affected areas to monitor plume and surface water migration. Monitoring wells and surface water sampling locations that yielded results lower than the CULs during interim compliance monitoring have been omitted from the long-term monitoring program; these wells will be evaluated for additional sampling or abandonment at a future time.

The monitoring wells and surface water sampling locations included in the monitoring program will be modified as appropriate to address changing conditions and new information acquired during compliance monitoring and as directed by Ecology. No monitoring wells are proposed for decommissioning at the outset of Phase 3. Additional data collected from groundwater recovery wells as part of operations, or at the request of Ecology, may be used to supplement data from compliance monitoring wells for purposes of better understanding plume stability or trends, as described in Section 3.4.

2.1 MONITORING WELLS

The monitoring well network is illustrated in Figure 1.1. Monitoring well construction and location details are summarized in Table 2.1. Fourteen Upper Sand Aquifer monitoring wells and four Lower Sand Aquifer monitoring are proposed to monitor groundwater at the CPOC and in the sub-areas comprising the Outside Area. The monitoring well networks for each area are described below.

2.1.1 Conditional Point of Compliance at Downgradient Landfill Perimeter

The location of the groundwater CPOC is shown on Figure 1.1. Three Upper Sand Aquifer monitoring wells and two Lower Sand Aquifer monitoring wells located between the barrier wall and the downgradient property boundary, and two Lower Sand Aquifer wells beyond the property boundary will be used to monitor compliance at the groundwater CPOC. Upper Sand Aquifer Monitoring Wells D-8A, D-7A, and MW-30, and Lower Sand Aquifer Monitoring Wells D-7B, D-8B, D-5L, and D-6B are distributed along the downgradient west and north sides of the Landfill. The D-8A/B well pair is located appropriately for assessing groundwater quality downgradient of the aquitard gap in the southwest corner of the Landfill.

Data from these CPOC monitoring wells are supplemented with data from several other compliance monitoring wells at and near the Landfill perimeter. The data will be used to monitor compliance in Outside Area groundwater. Monitoring Well MW-33 and monitoring wells D-5U and D-6A provide additional data from the Upper Sand Aquifer downgradient of the Landfill. Three Upper Sand Aquifer monitoring wells are located in areas upgradient or cross-gradient of the Landfill: MW-35, D-9A, and D-10A. The use of these monitoring wells is described below.

2.1.2 Wetlands Plume

The Wetlands Plume monitoring wells consist of six Upper Sand Aquifer monitoring wells. Three Upper Sand Aquifer monitoring wells, MW-13, MW-15, and MW-31A, are located along a line corresponding to the main Wetlands Plume axis, prior to the onset of groundwater recovery. MW-13 and MW-15 will provide data for monitoring the highest concentration area of the Wetlands Plume. Monitoring Well MW-31A will assist with monitoring the downgradient edge of the plume, and in conjunction with other monitoring wells, the effectiveness of the 12th Street East Treatment Zone permeable reactive barrier (PRB; refer to Section 4.0 of the OMMP). Three Upper Sand Aquifer monitoring wells that are distributed throughout the west flank of the Wetlands Plume—D-5U, PD-141, and D-6A—will support monitoring of the Upper Sand Aquifer in this area of the plume and supplement the CPOC monitoring wells with additional data collected near the downgradient edges of the Landfill.

As noted in the previous section, two Lower Sand Aquifer monitoring wells, D-5L and D-6B, located in the wetlands a short distance downgradient of the Landfill, will be used will be used to monitor compliance at the groundwater CPOC.

2.1.3 Agricultural Field Plume

Two monitoring wells will be utilized to monitor the Agricultural Field Plume: MW-33 and W-1. MW-33 is representative of the higher range of concentrations of the Agricultural Field Plume and will provide data assessing removal of arsenic mass due to pumping Recovery Wells R-14

and R-15. W-1 is located appropriately for monitoring the downgradient edge of the Agricultural Field Plume. Both MW-33 and W-1, in conjunction with other wells, will be used to assess the effectiveness of the Interurban Trail Treatment Zone PRB (refer to Section 4.0 of the OMMP).

2.1.4 Eastern Boundary Mini-Plume

MW-35 will be used to monitor groundwater quality at the downgradient edge of the Eastern Boundary Mini-Plume and to monitor groundwater quality near the eastern property boundary.

2.1.5 Fife Way Mini-Plume

Monitoring Well D-10A will be used to monitor groundwater with the highest arsenic concentrations within the Fife Way Mini-Plume.

2.1.6 Halo South

Monitoring Well D-9A will be used to monitor arsenic concentrations in the Halo South sub-area.

2.2 SURFACE WATER SAMPLING LOCATIONS

The surface water sampling network consists of three surface water sampling locations, SW-2, SW-3, and SW-5, as illustrated in Figure 1.1. These locations are consistent with previous sampling locations and will support continued time series evaluations with surface water quality data collected prior to the completion of remedy construction. Location SW-3 is representative of surface water quality draining from the ditch south of the Landfill. Location SW-2 is representative of surface water quality in the ditches west and north of the Landfill. Location SW-5 is representative of the combined surface water quality downstream of groundwater contamination and the ditches adjacent to the Landfill.

2.3 COMPLIANCE MONITORING WELL NETWORK ADJUSTMENT

The Phase 3 compliance monitoring well network may require modification to ensure the remedy is adequately monitored as conditions change over time. The monitoring network will be reviewed annually for potential adjustments. Changes will be made in consultation with Ecology and will be implemented only after written Ecology approval.

The potential for adding or removing monitoring wells from the compliance monitoring well network is particularly applicable to the Outside Area monitoring wells, which are intended to monitor arsenic concentrations across a large area of affected groundwater. The plume is expected to contract as it is remediated, but may also shift direction slightly or broaden in shape over time due to changes in flow patterns induced by the barrier wall and pumping wells. It may be appropriate to remove monitoring wells from the compliance monitoring program if they are no longer necessary to demonstrate compliance (refer to Section 4.0). Alternatively, to adjust spatial coverage, it may be necessary to add monitoring wells from the existing network of site monitoring wells or install new monitoring wells. Surface water sampling locations may also be adjusted.

3.0 Compliance Monitoring

The requirements and objectives for Phase 3 compliance monitoring, described in the previous sections, can be met through a groundwater and surface water sampling program similar to the monitoring program implemented during the Phase 1 and Phase 2 CAP implementation and described in the Groundwater Remediation Work Plan (GRWP; Floyd|Snider/AMEC 2009). The program described in this section replaces the Interim CMP, the former Phase 1 and Phase 2 monitoring program for the Site.

Monitoring will occur on a semi-annual basis as described below in Section 3.2. Sampling parameters are described below. Refer to the Sampling & Analysis Plan/Quality Assurance Project Plan (SAP/QAPP; Attachment 2) for sample collection details, quality control measures, and data management procedures.

3.1 COMPLIANCE MONITORING PLAN COMPONENTS

Compliance monitoring of the Upper Sand Aquifer, Lower Sand Aquifer, and affected surface water will consist of collecting groundwater elevation data, sampling for arsenic in the groundwater and surface water, and reporting the potentiometric contours and laboratory analytical results for each sampling event. A summary of monitoring components is provided in this section. The monitoring schedule and reporting requirements are described in the following sections.

3.1.1 Water Level Measurements

Water level measurements will be made to assess hydrogeologic flow in the Outside Area and to evaluate hydraulic containment within the Landfill. Water level measurements will be taken within the wells shown in Figure 1.1 for the Outside Area. Water level measurements will also be collected from the Landfill piezometer network and the network of recovery wells completed inside the barrier wall. Water levels will be measured in compliance monitoring wells and additional wells and piezometers distributed over the Outside Area as well as the western and northern ponds adjacent to the Landfill, to provide water level data for potentiometric contour mapping and determination of groundwater flow directions and gradients.

Water level measurements within the Landfill barrier wall will be taken from the Landfill perimeter piezometer pairs. The goal of these measurements is to monitor flow directions and gradients within the Landfill perimeter vicinity and provide a periodic check on pressure transducer data used in operations to control pumping rates. Hydraulic head differences across the barrier wall will be monitored manually and reported as part of compliance monitoring separately from water level data logging by pressure transducers, which provide inputs to the groundwater recovery system operations.

Monitoring wells and piezometers used to collect groundwater levels may be modified as appropriate to address changing conditions and new information acquired during compliance monitoring. Refer to Table 3.1 for a complete list of water level locations included in the current monitoring program.

Specific water level measurement and equipment decontamination procedures are presented in the SAP/QAPP (Appendix B).

3.1.2 Groundwater Sampling

Groundwater samples will be collected using low-flow sampling procedures designed to obtain samples representative of conditions in the aquifers. Refer to the SAP/QAPP (Appendix B) for specific groundwater sampling procedures and field parameter stabilization criteria.

3.1.3 Surface Water Sampling

Surface water will be sampled using standard methods for obtaining representative samples without disturbing underlying sediment. Peristaltic pumps will be employed in accordance with the procedures described in the SAP/QAPP (Appendix B).

3.1.4 Sampling Parameters

Water from each monitoring well will be sampled for total arsenic. At each surface water location water will be sampled for both dissolved and total arsenic. Analytical methods, reporting limits, and sample collection and preservation requirements are provided in the SAP/QAPP (Appendix B).

Field parameters for water quality will be measured in accordance with the procedures described in the SAP/QAPP (Appendix B). Temperature, pH, specific conductance, dissolved oxygen, and oxidation-reduction potential will be measured during groundwater and surface water sampling.

3.1.5 Purge Water Disposal

Purge water from compliance monitoring wells generated during sampling will be collected in containers and disposed of by transporting the water to the groundwater treatment plant for treatment.

3.1.6 Data Validation

Compliance monitoring analytical results will be subjected to Level 1 data validation. A description of data validation procedures is provided in the SAP/QAPP. If it is determined by Ecology to be necessary to demonstrate compliance, the data will be subjected to a higher level of data validation.

3.1.7 Health and Safety

The health and safety of site workers during compliance monitoring activities is of primary importance. A site-specific Health and Safety Plan (HASP) appended to this CMP (Appendix A) has been prepared that documents chemical and physical hazards associated groundwater monitoring, inspections, and the injection of in-situ treatment chemicals. All personnel involved in site compliance monitoring will be fully trained in accordance with Occupational Safety and

Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) requirements and will be required to read and sign a copy of the HASP maintained at the Site.

Additionally, health and safety aspects specific to groundwater treatment plant operations are described in a separate HASP included in the O&M Manual (Appendix A to the OMMP).

3.2 COMPLIANCE MONITORING SCHEDULE

Compliance monitoring will be conducted semi-annually. Compliance monitoring will continue until each of the Outside Area wells have been demonstrated to have attained compliance status, as described in Section 4.0. The frequency of sampling may be changed (e.g., to annual or quarterly) with Ecology approval in response to changing conditions or to support a compliance evaluation.

3.3 COMPLIANCE MONITORING REPORTING

Compliance monitoring reports will be submitted to Ecology semiannually. A brief data report will be prepared for the first monitoring event occurring each calendar year. A more comprehensive monitoring report will be prepared annually, following the last monitoring event occurring each calendar year. Compliance monitoring data will be reported to Ecology following data validation. Compliance monitoring data will be uploaded to Ecology's Environmental Information Management (EIM) system database using the website portal and conforming to the EIM Submittal Guidelines (refer to the SAP/QAPP; Appendix B).

The annual compliance monitoring report will be prepared and submitted to Ecology within 120 days of the receipt of analytical data from the later of the two semi-annual events each calendar year. The annual report will contain the following:

- Tabulated analytical results for groundwater and surface water compliance monitoring and laboratory analytical reports for the year.
- Water level elevation data.
- Potentiometric surface contour maps for the Upper Sand Aquifer and Lower Sand Aquifer within the Outside Area.
- An assessment of hydraulic containment for the Landfill.
- Time-concentration plots and evaluation of concentration trends for monitoring wells.
- Arsenic concentration contour map based on current data. The baseline arsenic concentration map (Figure 1.1) and arsenic concentration maps from representative years will be included for reference.
- Brief discussion of any deviation from the CMP and SAP/QAPP.
- Data validation results.
- Brief description of compliance monitoring well network maintenance and discussion of relevant changes in site conditions.
- General discussion concerning progress toward attainment of the cleanup standard.
- Status of monitoring wells that meet compliance, if appropriate.

- Recommendations, if any, for modifications to the compliance monitoring program.

In addition, a concise data report will be prepared and submitted to Ecology within 90 days of the receipt of analytical data from the first of the two semi-annual events of the year. The data report will contain the following:

- Tabulated analytical results for groundwater and surface water compliance monitoring results
- Water level elevation data
- Potentiometric surface contour maps for the Upper Sand Aquifer and Lower Sand Aquifer
- Brief discussion of any deviation from the CMP and SAP/QAPP
- Data validation results

3.4 USE OF OPERATIONS DATA

Monitoring wells and surface water sampling locations other than those being sampled as part of compliance monitoring may be sampled periodically during other Phase 3 activities. These data; which may be collected in support of operations, in-situ treatment, or permit compliance; may also be used to assist in interpretation of compliance monitoring data. For example, arsenic concentration data from selected recovery wells are expected to be obtained annually (refer to the OMMP for details), which may provide a more complete picture of groundwater quality at the Site than compliance monitoring data alone. Sampling of these wells (inactive Recovery Wells R-3 and R-6, and Monitoring Well PZ-12, or other wells at the direction of Ecology) is expected to be coordinated with compliance monitoring. It is expected that annual operations and CMP reports will be submitted in conjunction with each other, allowing references to relevant data presented in each.

4.0 Compliance Evaluation

It is expected that after a number of years, the groundwater and surface water arsenic concentrations will decline and come into compliance with CULs and an evaluation to demonstrate full attainment of CULs at the CPOC will be completed. This section describes the procedure for evaluating compliance with groundwater and surface water CULs.

4.1 DATA EVALUATION

The compliance status of the monitoring well network will be reviewed on an annual basis based on concentration trends in each monitoring well, as described in Section 3.2. The determination that the CUL has been attained in a monitoring well will constitute the end of performance monitoring and the start of confirmational monitoring for that monitoring well (refer to Section 1.1). Because of the requirements for monitoring during active groundwater recovery in WAC 173-340-720(9)(c)(vi), it is expected that no compliance demonstration will be conducted in areas where groundwater recovery is active and performance monitoring will effectively extend at least until the end of active groundwater recovery in these areas.

It is expected that a dataset of approximately eight monitoring events will be needed for a demonstration of compliance for each monitoring well or surface sampling location. In anticipation of a demonstration of compliance, the frequency of monitoring a given monitoring well or surface water sampling location may be adjusted to provide for an appropriate dataset for the evaluation. Ecology approval will be requested in advance of any changes to the frequency of monitoring. The final eight or more monitoring events for any monitoring well following approximate attainment of the CUL will constitute confirmational monitoring. For example, if the arsenic concentration decreases to 5 µg/L after several years of performance monitoring, the well may be sampled at a quarterly frequency to produce a dataset of eight monitoring events within the following 2 years.

Compliance throughout the entire monitoring well network is not expected to occur simultaneously. A partial compliance evaluation may be appropriate based on the needs of a property owner or to focus monitoring resources on more recalcitrant areas. If supported by monitoring data and approved by Ecology, a compliance evaluation may be conducted for an individual monitoring well or a select group of monitoring wells prior to the full attainment of compliance at the CPOC.

4.1.1 Statistical Methods

When a dataset for a monitoring well or group of monitoring wells is sufficient to support an evaluation of compliance, Ecology will be notified and a compliance evaluation will proceed. The data collected will be evaluated using the approach described in this section. The data analysis will consist of a comparison between the statistically relevant concentration parameter, derived using MTCAStat and the CUL concentration for arsenic. Procedures for determining compliance are expected to comply with those described in WAC 173-340-720(9) as summarized below:

- Compliance with CULs will be determined for each compliance monitoring well and surface water sampling location.

- The dataset will be comprised of events representative of post-remediation conditions. Specifically, in accordance with WAC 173-340-720(9)(c)(vi), compliance will be determined when the monitoring well or wells are no longer influenced by active pumping of groundwater. If necessary, Outside Area recovery wells may be temporarily shut down for this purpose.
- The upper one-sided 95th percent upper confidence limit on the true mean groundwater concentration, calculated using MTCAStat, shall be less than the groundwater CUL.
- No single sample concentration shall be greater than two times the groundwater CUL during the representative sampling period of the compliance dataset.
- Less than 10 percent of the sample concentrations in the compliance dataset shall exceed the groundwater CUL level during the representative sampling period of the compliance dataset.

Compliance evaluation results will be reported to Ecology in conjunction with annual reporting or as a special report. With Ecology concurrence, monitoring wells(s) that have demonstrated compliance may be removed from the compliance monitoring program. If appropriate, a request will be made to Ecology to authorize decommissioning of wells removed from the monitoring program.

4.2 REVISED SITE STATUS FOR OFF-PROPERTY CONTAMINATION

The Outside Area plume extends onto several different properties with different property owners. Because of the presence of the site plume on these properties, the properties are subject to certain requirements under authority of MTCA. Following a successful demonstration of compliance in one or more Outside Area monitoring well(s) located within a single property, a recommendation may be provided to Ecology regarding the status of remaining site obligations for arsenic on the affected property. Site obligations, including long-term monitoring, are expected to continue in perpetuity for the Landfill. When Outside Area wells within a single property have been demonstrated to be in compliance with the site CUL, it may be recommended to Ecology that site obligations have been resolved on these properties. With Ecology approval, remedy components will be decommissioned and removed from properties determined to have achieved CULs, restrictive covenants will be vacated where appropriate, and the site definition will be revised to remove these properties. Additionally, Ecology will be requested to remove these properties from the hazardous sites list in accordance with WAC 173-340-330(7). The Landfill is expected to remain on the hazardous sites list in perpetuity.

5.0 Inspection and Maintenance

Inspection and maintenance of the groundwater monitoring well network is described in this section. Overall operations and maintenance of the full CAP remedy (including the Landfill cap, Groundwater Treatment Plant, etc.) is described in detail in the OMMP.

5.1 INSPECTION PROCEDURES

As part of compliance monitoring, all groundwater monitoring wells sampled for compliance or monitored for water levels will be inspected during each sampling event. All other wells will be inspected biannually. The following items will be observed and documented at each monitoring well: the lock condition; the monument or cover condition; the paint condition of monument, cover, and bollards, if present; the gripper plug or well cap condition; and obstructive vegetation surrounding the well. The condition of the surface seal and any bollards will be inspected. Measuring points and well identification numbers will be checked and re-marked as needed. All observations will be documented on the inspection forms for each individual monitoring well.

The depth to the bottom of the well should be measured annually in each active monitoring well and biannually in inactive wells. The total well depth will be compared to the well construction (as-built) depth measured at the time of well construction for evidence of excessive silt accumulation (refer to Table 2.1).

5.2 CONDITIONS REQUIRING MAINTENANCE

Conditions requiring maintenance will be recorded on the inspection form. If appropriate, minor maintenance activities may be incorporated into future compliance monitoring events (e.g., installation of new well locks or caps, cutting back vegetation, etc.). Otherwise, a maintenance visit will be scheduled as soon as practicable.

If a well is determined to have more than 1 foot of silt or sediment, the well will be redeveloped by surging and pumping, or an equivalent well development method, to remove sediment in the well and in the sand filter pack surrounding the screened interval.

If a well is damaged, the well protection measures and casing will be repaired to meet requirements of WAC 173-160-400. Significant repairs or modifications to the well seals will be performed by a driller licensed in Washington State as required by WAC 173-160-420(10)(a) and WAC 173-160-450.

If a well is damaged beyond repair, Ecology will be consulted. If Ecology determines that it is appropriate to decommission the well, it will be decommissioned in accordance with WAC 173-160-460. If necessary, a replacement well will be installed at an appropriate location with Ecology approval. Replacement wells will be drilled and constructed to meet the requirements of WAC 173-160-400.

6.0 References

Floyd|Snider/AMEC Team (Floyd|Snider/AMEC). 2009. *Groundwater Remediation Work Plan. B&L Woodwaste Site*. January.

———. 2011. *Phase 1 Construction Completion Report. B&L Woodwaste Site*. 15 March.

———. 2012. Phase 2 Construction Completion Report. B&L Woodwaste Site. December.

Hydrometrics, Inc., 1994. *Closure Report B&L Landfill*. Prepared for Mr. Thomas L. Aldrich, Asarco Incorporated. 6 May.

Washington State Department of Ecology (Ecology). 2008 Final Cleanup Action Plan B&L Woodwaste Site. January.

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Tables

Table 2.1
Monitoring Well Information

Monitoring Well	Installed By	Date Installed	Total Depth Drilled (feet bgs)	Total Depth Cased (feet bgs)	Screened Interval (feet bgs)	Casing Size (ID) (inches)	Approximate Ground Surface Elevation (feet NAVD88)[1]	Measuring Point Elevation (feet NAVD88)[1]	Northing (feet NAD 83/98)	Easting (feet NAD 83/98)
Upper Sand Aquifer										
D-5U	AGI	7/25/1990	16.5	13.5	8.5–13.5	2	13.34	17.36	702,321.47	1,185,708.41
D-6A	Hydrometrics	10/26/1993	15	15	10–15	2	13.09	14.13	702,465.58	1,185,996.46
D-7A	Hydrometrics	10/25/1993	14.5	14.5	9.5-14.5	2	15.27	15.85	702,190.98	1,185,698.42
D-8A	Hydrometrics	11/10/1993	17	15	10–15	2	14.95	16.17	701,886.38	1,185,691.53
D-9A	Hydrometrics	11/11/1993	16	13.5	8.5–13.5	2	15.51	17.16	701,581.35	1,186,172.04
D-10A	Hydrometrics	11/9/1993	15	15	10–15	2	19.50	21.53	701,754.65	1,186,794.84
MW-30	Floyd|Snider	9/14/2006	21	21	16–21	0.75	18.52	18.61	702,394.49	1,186,126.76
MW-13	Hydrometrics	9/16/1998	15	14.5	9.5–14.5	2	13.30	15.43	702,573.91	1,186,104.44
MW-15	Hydrometrics	9/17/1998	15	15	10–15	2	12.75	15.32	702,717.81	1,186,011.71
MW-31A	Floyd|Snider	3/23/2007	22	22	17–22	2	14.06	16.48	702,917.22	1,185,835.90
MW-33	Floyd|Snider	8/4/2011	17	17	7–17	2	NA	18.50	702,122.29	1,185,530.73
MW-35	Floyd|Snider	7/20/2011	24.5	21	11–21	2	16.73	19.31	702,261.68	1,186,483.03
PD-141	Floyd|Snider	8/16/2011	19.5	19	9–19	2	15.55	15.51	702,435.23	1,185,792.59
W-1	Floyd|Snider	9/16/2009	25	22.25	12.25–22.25	2	18.62	18.28	702,140.98	1,185,431.27
Lower Sand Aquifer										
D-5L	AGI	7/24/1990	30.75	30.3	25.3–30.3	2	13.59	17.19	702,330.40	1,185,711.00
D-6B	Hydrometrics	10/26/1993	33	33	28–33	2	13.04	14.54	702,460.20	1,185,997.90
D-7B	Hydrometrics	10/25/1993	34	33	28–33	2	15.17	16.43	702,196.25	1,185,699.32
D-8B	Hydrometrics	11/11/1993	35	33	28–33	2	14.78	16.18	701,881.04	1,185,691.09

Abbreviations:

AGI Applied Geosciences, Inc.
bgs Below ground surface
NA Not applicable or not available.
NAD 83/98 North American Datum of 1983/1998

Table 3.1
Water Level Monitoring Locations

Location	Monument Type	Northing (ft NAD 83/98)	Easting (ft NAD 83/98)	Measuring Point Elevation (ft NAVD88)	Aquifer	Compliance Monitoring Area
Upgradient Areas East of Landfill						
D-10A	Aboveground monitoring well	701,754.65	1,186,794.84	22.90	Upper Sand	Fife Way Mini-Plume
D-11A	Aboveground monitoring well	702,114.96	1,186,710.32	19.89	Upper Sand	
D-11B	Aboveground monitoring well	702,110.81	1,186,706.36	19.93	Lower Sand	
MW-35	Aboveground monitoring well	702,261.68	1,186,483.03	19.31	Upper Sand	Eastern Boundary Mini-Plume
MW-36	Aboveground monitoring well	702,195.50	1,186,601.08	20.15	Upper Sand	
PD-38	Aboveground piezometer	701,806.21	1,186,803.10	21.64	Upper Sand	
PD-60	Aboveground piezometer	701,995.34	1,186,678.21	20.13	Upper Sand	
PD-61	Aboveground piezometer	702,087.89	1,186,909.42	27.29	Upper Sand	
PD-63B	Aboveground piezometer	701,681.26	1,186,548.41	18.85	Upper Sand	
PD-64	Aboveground piezometer	701,620.05	1,186,657.79	22.29	Upper Sand	
PD-65	Flush-mount piezometer	701,319.66	1,186,546.33	30.92	Upper Sand	
PD-201	Flush-mount piezometer	703,536.08	1,187,254.52	40.05	Upper Sand	
PD-202	Flush-mount piezometer	702,529.02	1,187,128.08	56.31	Upper Sand	
PD-203	Flush-mount piezometer	700,959.82	1,186,418.87	37.90	Upper Sand	
Landfill and Perimeter						
D-7A	Aboveground monitoring well	702,190.98	1,185,698.42	15.85	Upper Sand	CPOC
D-7B	Aboveground monitoring well	702,196.25	1,185,699.32	16.43	Lower Sand	CPOC
D-8A	Aboveground monitoring well	701,886.38	1,185,691.53	16.17	Upper Sand	CPOC
D-8B	Aboveground monitoring well	701,881.04	1,185,691.09	16.18	Lower Sand	CPOC
D-9A	Aboveground monitoring well	701,581.35	1,186,172.04	17.16	Upper Sand	Halo South
North Pond Gauge	Aboveground staff gauge	NA	NA	21.69	NA	
North Pond Tube	Aboveground stilling well	NA	NA	22.21	NA	
PD-214	Aboveground piezometer	701,842.80	1,185,673.02	17.67	Upper Sand	
PD-215	Aboveground piezometer	701,558.88	1,185,850.80	19.32	Upper Sand	
PZ-1A	Flush-mount piezometer	702,353.14	1,186,183.28	19.10	Upper Sand	
PZ-1B	Flush-mount piezometer	702,329.08	1,186,191.53	22.46	Upper Sand	
PZ-2A	Flush-mount piezometer	702,209.88	1,185,886.44	19.01	Upper Sand	
PZ-2B	Flush-mount piezometer	702,186.89	1,185,897.84	22.35	Upper Sand	
PZ-3A	Flush-mount piezometer	701,976.73	1,185,733.73	19.05	Upper Sand	
PZ-3B	Flush-mount piezometer	701,976.05	1,185,753.71	22.66	Upper Sand	
PZ-4A	Flush-mount piezometer	701,728.73	1,185,731.96	19.42	Upper Sand	
PZ-4C	Flush-mount piezometer	701,732.98	1,185,754.96	22.95	Lower Sand	
PZ-5A	Flush-mount piezometer	701,621.79	1,186,002.81	20.16	Upper Sand	
PZ-5B	Flush-mount piezometer	701,641.88	1,186,005.46	24.05	Upper Sand	
PZ-5C	Flush-mount piezometer	701,642.36	1,186,000.96	24.08	Lower Sand	
PZ-6A	Flush-mount piezometer	701,620.95	1,186,379.50	20.40	Upper Sand	
PZ-6B	Flush-mount piezometer	701,640.57	1,186,377.84	23.56	Upper Sand	
PZ-7A	Flush-mount piezometer	701,831.05	1,186,595.69	19.75	Upper Sand	
PZ-7B	Flush-mount piezometer	701,835.09	1,186,578.05	21.97	Upper Sand	
PZ-8A	Flush-mount piezometer	702,097.14	1,186,513.23	19.33	Upper Sand	
PZ-8B	Flush-mount piezometer	702,090.37	1,186,495.24	22.91	Upper Sand	
PZ-8C	Flush-mount piezometer	702,085.74	1,186,496.75	22.94	Lower Sand	
West Pond Gauge	Aboveground staff gauge	NA	NA	23.03	NA	
West Pond Tube	Aboveground stilling well	NA	NA	24.16	NA	
Wetlands North of Landfill						
D-1U	Aboveground monitoring well	702,581.15	1,186,263.53	15.15	Upper Sand	
D-1L	Aboveground monitoring well	702,586.75	1,186,260.33	15.08	Lower Sand	
D-5U	Aboveground monitoring well	702,321.47	1,185,708.41	17.36	Upper Sand	Wetlands Plume
D-5L	Aboveground monitoring well	702,330.40	1,185,711.00	17.19	Lower Sand	CPOC
D-6A	Aboveground monitoring well	702,465.58	1,185,996.46	14.13	Upper Sand	Wetlands Plume
D-6B	Aboveground monitoring well	702,460.20	1,185,997.90	14.54	Lower Sand	CPOC
MW-13	Aboveground monitoring well	702,573.91	1,186,104.44	15.43	Upper Sand	Wetlands Plume
MW-14	Aboveground monitoring well	702,656.69	1,185,883.56	15.20	Upper Sand	
MW-15	Aboveground monitoring well	702,717.81	1,186,011.71	15.32	Upper Sand	Wetlands Plume
MW-16	Aboveground monitoring well	702,799.20	1,186,173.74	15.80	Upper Sand	
MW-17	Aboveground monitoring well	702,857.74	1,185,983.46	15.20	Upper Sand	
MW-31A	Aboveground monitoring well	702,917.22	1,185,835.90	16.48	Upper Sand	Wetlands Plume
MW-31B	Aboveground monitoring well	702,916.22	1,185,840.57	16.32	Lower Sand	
MW-32	Aboveground monitoring well	702,520.47	1,185,843.15	15.99	Upper Sand	
PD-1B	Aboveground piezometer	702,948.58	1,185,725.95	15.73	Upper Sand	
PD-6	Aboveground piezometer	703,003.14	1,185,989.09	15.64	Upper Sand	
PD-51	Aboveground piezometer	702,695.03	1,185,752.70	15.20	Upper Sand	
PD-101	Aboveground monitoring well	702,916.21	1,186,071.44	17.01	Upper Sand	
PD-140	Aboveground monitoring well	702,410.08	1,185,716.42	15.53	Upper Sand	
PD-141	Aboveground monitoring well	702,435.23	1,185,792.59	15.51	Upper Sand	Wetlands Plume
PD-142	Aboveground monitoring well	702,353.88	1,185,808.55	15.68	Upper Sand	
PD-204	Flush-mount monitoring well	702,917.32	1,186,546.42	14.42	Upper Sand	
W-3	Aboveground monitoring well	702,249.87	1,185,364.08	17.04	Upper Sand	
Interurban Trail and Agricultural Fields West of Landfill						
MW-30	Flush-mount monitoring well	702,394.49	1,186,126.76	18.15	Upper Sand	CPOC
MW-33	Aboveground monitoring well	702,122.29	1,185,530.73	18.50	Upper Sand	Agricultural Field Plume
MW-34	Aboveground monitoring well	701,965.99	1,185,536.69	17.04	Upper Sand	
PD-212	Aboveground piezometer	702,003.36	1,185,274.18	15.79	Upper Sand	
PD-213	Aboveground piezometer	701,411.86	1,185,013.04	18.25	Upper Sand	
PD-216	Aboveground piezometer	700,921.42	1,185,663.48	20.45	Upper Sand	
W-1	Flush-mount monitoring well	702,140.98	1,185,431.27	18.28	Upper Sand	Agricultrual Field Plume

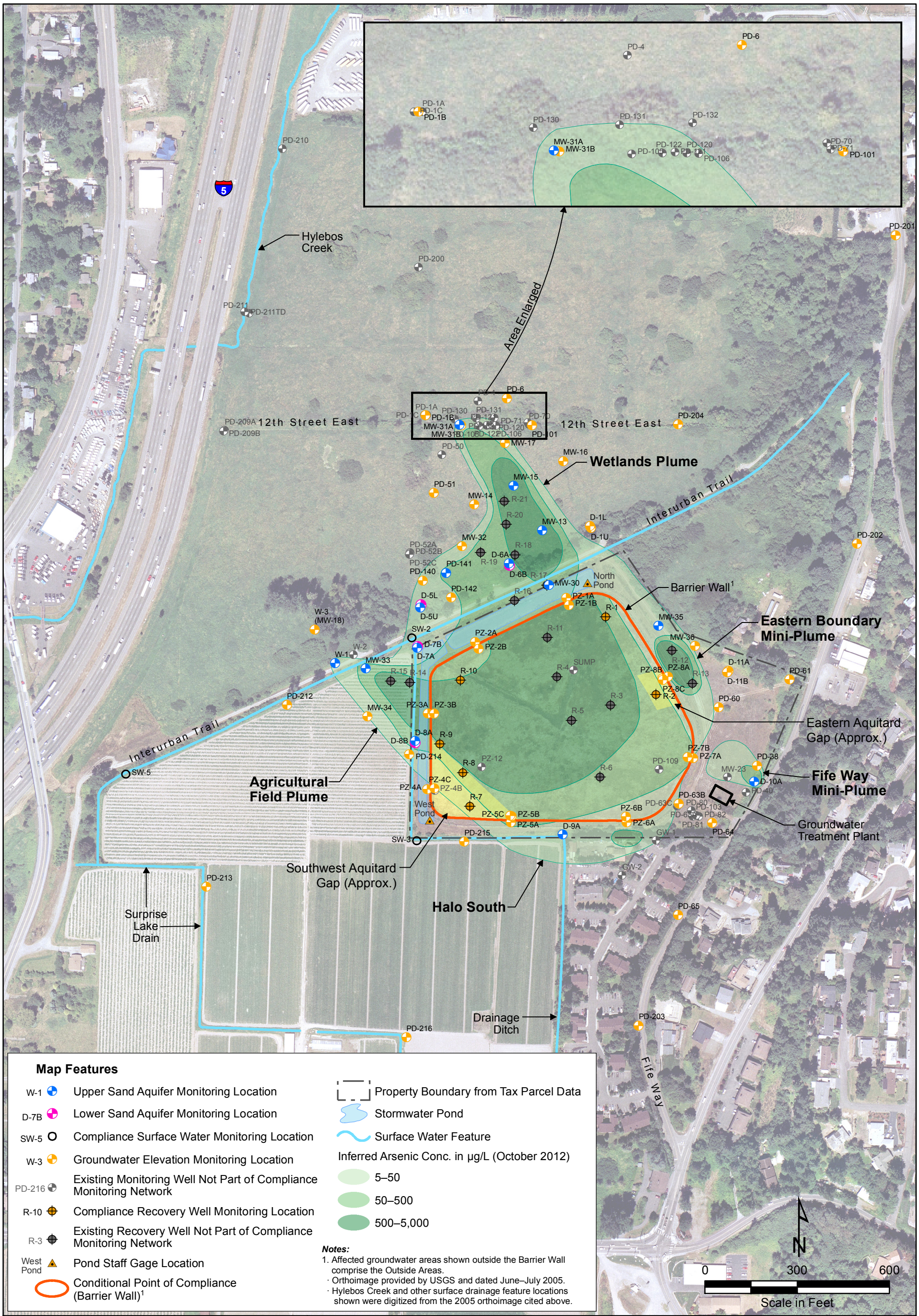
Abbreviations:

CPOC Conditional point of compliance
ft Feet
NAD 83/98 North American Datum 1983/1998
NA Not applicable

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Figure



Map Features

- W-1 — Upper Sand Aquifer Monitoring Location
- D-7B — Lower Sand Aquifer Monitoring Location
- SW-5 — Compliance Surface Water Monitoring Location
- W-3 — Groundwater Elevation Monitoring Location
- PD-216 — Existing Monitoring Well Not Part of Compliance Monitoring Network
- R-10 — Compliance Recovery Well Monitoring Location
- R-3 — Existing Recovery Well Not Part of Compliance Monitoring Network
- West Pond — Pond Staff Gage Location
- Conditional Point of Compliance (Barrier Wall)[1]
- Property Boundary from Tax Parcel Data
- Stormwater Pond
- Surface Water Feature

Inferred Arsenic Conc. in µg/L (October 2012)

- 5–50
- 50–500
- 500–5,000

Notes:

1. Affected groundwater areas shown outside the Barrier Wall comprise the Outside Areas.
   · Orthoimage provided by USGS and dated June–July 2005.
   · Hylebos Creek and other surface drainage feature locations shown were digitized from the 2005 orthoimage cited above.

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Compliance Monitoring Plan
B&L Woodwaste Site
Pierce County, Washington

Figure 1.1
Compliance Monitoring Locations

Path: F:\projects\B&L RIM\GIS\MXD\OMMP\Figure 1.1 (Compliance Monitoring Locations).mxd
Date: 3/14/2013

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix A
Health and Safety Plan

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Attachment A.1 Daily Tailgate Safety Meeting

Attachment A.2 Material Safety Data Sheets (provided on CD-ROM)

1.0 Plan Objectives and Applicability

This Health and Safety Plan (HASP) has been written to comply with the standards prescribed by the Occupational Safety and Health Act (OSHA) and the Washington Industrial Safety and Health Act (WISHA). The purpose of this HASP is to establish protection standards and mandatory safe practices and procedures for all site personnel involved with long-term Operations and Maintenance (O&M) activities at the B&L Woodwaste Site (Site) associated with the landfill cap and the groundwater treatment system. This HASP assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may occur during work activities associated with operating the groundwater treatment system, in-situ remediation, long-term compliance monitoring, and general site maintenance and security. The plan consists of site and facility descriptions, a summary of work activities, an identification and evaluation of chemical and physical hazards, monitoring procedures, site personnel responsibilities, a description of site zones, decontamination and disposal practices, emergency procedures, and administrative requirements.

The provisions and procedures outlined by this HASP apply to all contractors, subcontractors, owner's representatives, oversight personnel, and all other persons involved with the work activities described herein. All such persons are required to read this HASP and indicate that they understand its contents by signing the Health and Safety Officer/Site Supervisors' (HSO/SS) copy of the plan.

It should be noted that this HASP is based on information that was available as of the date indicated on the title page. It is possible that additional hazards that are not specifically addressed by this HASP may exist at the work site, or may be created as a result of on-site activities. Should site personnel identify a site condition that is not addressed by this HASP and have any questions or concerns about site conditions, immediately notify the HSO/SS and an addendum will be provided to this HASP.

The HSO/SS has field responsibility for ensuring that the provisions outlined herein adequately protect worker health and safety and that the procedures outlined by this HASP are properly implemented. In this capacity, the HSO/SS will conduct regular site inspections to ensure that this HASP remains current with potentially changing site conditions. The HSO/SS has the authority to make health and safety decisions that may not be specifically outlined in this HASP, should site conditions warrant such actions. In the event that the HSO/SS leaves the Site while work is in progress, an alternate Site Safety Officer (SSO) will be designated. Personnel responsibilities are further described in Section 4.0.

This HASP has been reviewed by the Project Managers (PMs) and the HSO/SS prior to commencement of work activities. All site personnel shall review the plan and be familiar with on-site health and safety procedures. A copy of the HASP will be on-site at all times.

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2.0 Emergency Contacts and Information

2.1 DIAL 911

In the event of any emergency, DIAL 911 to reach fire, police, and first aid.

2.2 HOSPITAL AND POISON CONTROL

Nearest Hospital Location and Telephone: **(Refer to Figure A.1 for directions and map to the hospital.)**	Tacoma General Hospital 315 Martin Luther King Jr. Way Tacoma, WA 98405-4234 (253) 403-1000
Washington Poison Control Center:	**(800) 222-1222**

2.3 PROVIDE INFORMATION TO EMERGENCY PERSONNEL

All site personnel should be prepared to give the following information:

Information to give to Emergency Personnel	
Site Location: (Refer to Figure A.2 for directions and map to the Site.)	B&L Woodwaste Site 1522 Fife Way, Milton/Fife, WA (Unincorporated Pierce County) **Landfill area and southern part of the wetlands:** the entrance is located 0.75 mile north of intersection between 20th Street East and Fife Way. Enter from Fife Way and drive around the east side of the B&L Landfill to Puget Power Road and the entrance to the Site. **Northern part of the wetlands:** enter the wetlands from Fife Way on the unimproved 12th Street East roadway, located 0.5 mile north of the landfill entrance, at the intersection of Fife Way and Porter Way.
Number that you are calling from:	Look on the phone you are calling from.
Describe accident and/or incident and numbers of personnel needing assistance.	Type of Accident Type(s) of Injuries

2.4 PROJECT CONTACTS

After Calling Emergency Services, contact:

Name	Title	Acronym	Telephone
Teri Floyd	Principal In Charge	**PIC**	(206) 292-2078
Brett Beaulieu	Floyd|Snider Project Manager	**PM**	(206) 292-2078 (office) (206 852-7556 (cell)
Larry McGaughey	AMEC Project Manager	**PM**	(206) 342-1788 (office) (206) 755-1525 (cell)

3.0 Background Information

3.1 SITE BACKGROUND

All O&M associated activities will be conducted on behalf of the Washington State Department of Ecology (Ecology) at the Site located at 552 Fife Way, Milton/Fife, Washington (Unincorporated Pierce County). Groundwater impacted by arsenic is present beneath the B&L Landfill (Landfill) and adjacent Wetlands area. Work at the Site will include soil boring, well, and piezometer installation; compliance groundwater monitoring; surface water sampling; and in-situ injection of reagents into the subsurface. Other O&M-related activities will include landfill cap inspection, general routine maintenance, and maintaining site security.

3.2 SCOPE OF WORK

The scope of work included in this HASP supports the long-term O&M at the Site. The following field work activities may be conducted:

- Groundwater sampling of monitoring wells.
- Surface water sampling.
- Direct-push soil boring advancement, installation of piezometers, soil sampling, and groundwater water sample collection.
- Oversight of hollow-stem auger boring advancement and installation of monitoring wells.
- In-situ treatment injection of reagents using direct-push methodology.
- Landfill cap inspection.
- Maintaining site security and general routine maintenance.

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4.0 Primary Responsibilities

4.1 PROJECT COODINATOR

The Project Coordinator (PC) will approve this HASP and any amendments and will ultimately be responsible for full implementation of all elements of the HASP. The PC will ensure that all hazards of the work are addressed through appropriate health and safety elements of the HASP and the Written Accident Prevention Programs under Washington Administrative Code (WAC) 296-800-140.

4.2 PROJECT MANAGERS

The PMs will have overall responsibility for the completion of the project, including the implementation and review of this HASP. The PMs will review health and safety issues as needed and as consulted, and will have authority to allocate resources and personnel to safely accomplish the field work.

The PMs will direct all personnel involved in field work at the Site. If the project scope changes, the PMs will notify the HSO/SS and the PC and an appropriate addendum will be included in the HASP. The PMs will ensure that all personnel on-site have received the required training, are familiar with the HASP, and understand the procedures to follow should an accident and/or incident occur on-site.

4.3 HEALTH AND SAFETY OFFICER AND SITE SUPERVISOR

The HSO/SS has primary field responsibility for implementation of the HASP and managing site safety and will advise the PMs and project personnel on all potential health and safety issues of the field investigation and remedial activities to be conducted at the Site. The HSO/SS will ensure that all personnel have appropriate personal protective equipment (PPE) on-site and that PPE is properly used. The HSO/SS will ensure required exposure monitoring occurs to assess site health and safety conditions, prepare job hazards analyses (JHAs) and recommendations to modify the site HASP based on field assessment of health and safety accidents and/or incidents, and enforce corrective action if needed. The HSO/SS will report all accidents and/or incidents and near misses to the PMs. If the HSO/SS observes a hazard or unsafe work practices by site personnel or any contractor personnel, the HSO/SS will suspend all work until the hazard has been controlled.

4.4 SITE SAFETY OFFICER

The SSO may be a person dedicated to assist the HSO/SS with this task during field work activities. The SSO will assist the HSO/SS in each of the latter's duties for field supervision of site personnel and contractor personnel safety. If a health or safety hazard is observed, the SSO shall suspend all work activity. The SSO will conduct on-site safety meetings daily before work commences. Health and safety equipment used by site personnel will be maintained in accordance with manufacturer recommendations. Health and safety instruments will be calibrated daily. Maintenance and calibration records will be kept in the field logbook. The SSO

may perform exposure monitoring, if needed, and will ensure that equipment is properly maintained.

4.5 SITE PERSONNEL

All site personnel involved in field work activities will wear required PPE and use specified work procedures to prevent accidents and/or incidents from occurring to themselves and others in the work areas. They will request instructions from the HSO/SS if they are unfamiliar with safety aspects of new procedures or the safe use of tools and equipment. They will inspect equipment and PPE for defects before using it. Employees will report all accidents and/or incidents or other unsafe working conditions to the HSO/SS or SSO immediately. Employees will inform the HSO/SS or SSO of any physical conditions that could impact their ability to perform field work.

4.6 TRAINING REQUIREMENTS

All site personnel must comply with applicable regulations specified in WAC 296-843, Hazardous Waste Operations and Emergency Response (HAZWOPER) training, administered by the Washington State Department of Labor and Industries (L&I). All site personnel will be 40-hour HAZWOPER trained and will maintain their training with an annual 8-hour refresher. Site personnel with limited tasks and exposure potential will be required to have 24-hour training and a site hazard briefing and will be escorted by a trained employee. Site personnel will fulfill the medical surveillance program and respiratory protection program requirements.

In addition to the 40-hour course and 8-hour refreshers, the HSO/SS will have completed an 8-hour HAZWOPER supervisor training as required by WAC 296-843-20015. At least one person on-site during field work will have current cardiopulmonary resuscitation (CPR)/First Aid certification. The CPR/First Aid-trained individual(s) will also be trained in their organization's Bloodborne Pathogen Exposure Control Plan, as required by WAC 296-823. All 40- and 24-hour trained field personnel will have or obtain a minimum of 3 days of hazardous materials field experience under the direction of a skilled supervisor. If flammable or combustible liquids are stored or handled on-site (e.g., refueling), then at least one person will be trained in incipient-phase fire suppression with a portable fire extinguisher. Documentation of all required training will be maintained in a 3-ring binder on-site and kept either in the HSO/SS vehicle or equipment storage bin.

Additional site-specific training that covers on-site hazards, PPE requirements, use and limitations, decontamination procedures, and emergency response information as outlined in this HASP will be given by the HSO/SS before beginning on-site work activities. Daily health and safety meetings will be documented on the ***Daily Tailgate Safety Meeting Form*** included in this HASP as Attachment A.1.

4.7 MEDICAL SURVEILLANCE

All site personnel are required to participate in the medical surveillance program, which includes annual audiometric and physical examinations for employees involved in HAZWOPER projects. The program requires medical clearance before respirator use or participating in HAZWOPER activities. Medical examinations must be completed before conducting field work activities and on an annual basis.

5.0 Hazard Evaluation and Risk Analysis

In general, there are three broad hazard categories that may be encountered during site work: chemical exposure hazards, fire/explosion hazards, and physical hazards. Sections 5.1 through 5.3 discuss the specific hazards that fall within each of these broad categories.

5.1 CHEMICAL EXPOSURE HAZARDS

The following subsections describe chemical hazards associated with monitoring of groundwater and the injection of in-situ treatment chemicals using direct-push borings. Potential routes of exposure are described in the following paragraph. Chemical exposure hazards are not anticipated when measuring groundwater elevations because there will be no contact with contaminated materials during these tasks.

Potential routes of exposure include inhalation, dermal contact, ingestion, and eye contact. The primary exposure route of concern during site work is ingestion of contaminated water, though such exposure is considered unlikely and highly preventable. The work area is outside the area of contaminated soil and landfill wastes. Short-term inhalation exposure to elevated arsenic is unlikely to cause noticeable effects beyond upper respiratory tract irritation. Long-term exposure or brief exposure to very high levels can cause swelling of the face, nausea, vomiting, stomach pain, or diarrhea. Other effects of significant exposures include internal bleeding; nerve damage; weakness; or loss of sensation in the hands, feet, arms, or legs; and long-term exposure to small amounts of arsenic (greater than 6 months) has been linked to bladder cancer, lung cancer, cardiovascular disease, and diabetes.

In-situ injections will utilize subsurface injection of EHC®-M, a commercially available remediation product containing organic carbon, zero-valent iron (ZVI), and both magnesium and potassium sulfate. This product has been designed to induce arsenic removal from groundwater through precipitation. All material safety data sheet (MSDS) are included in Attachment A.2.

Groundwater sampling will involve use of 500 mL bottles containing a small quantity of nitric acid. Nitrile gloves will be used at all times during sampling to prevent exposure to nitric acid. Nitric acid MSDS will be kept on-site and reviewed by site personnel.

5.2 FIRE AND EXPLOSION HAZARDS

Flammable and combustible liquid hazards may occur from fuels and lubricants brought to the property to support heavy equipment and occasional use of portable generators. When on-site storage is necessary, such material will be stored in containers approved by the Department of Transportation (DOT) in a location not exposed to strike hazards and provided with secondary containment. A minimum 2-A:20-B fire extinguisher will be located within 25 feet of the storage location and where refueling occurs. Transferring of flammable liquids (e.g., gasoline) will occur only after making positive metal to metal connection between the containers. A bonding strap may be necessary to achieve this. Storage of ignition and combustible materials will be kept away from storage and fueling operations.

5.3 PHYSICAL HAZARDS

When working in or around any hazardous or potentially hazardous substances or situations, all site personnel should plan all activities before starting any task. Site personnel shall identify health and safety hazards involved with the work planned and consult with the HSO/SS as to how the task can be performed in the safest manner, if personnel have any reasons for concern or uncertainty.

All field personnel will adhere to general safety rules including wearing appropriate PPE, hard hats, safety vests, and safety glasses. Eating, drinking, and/or use of tobacco or cosmetics is not allowed to be in exclusion or laboratory work areas. Personnel will prevent splashing of liquids containing chemicals and minimize emissions of dust.

The following is a summary of a variety of physical hazards that may be encountered on the Site during work activities. For convenience, these hazards have been categorized into several general groupings with recommended preventative measures.

Hazard	Cause	Prevention
Head	Falling, falling sharp objects, bumping hazards.	Hard hats will be worn by all personnel at all times during soil boring/drilling activities, around large, heavy equipment and when an overhead hazard exists.
Foot/ankle	Sharp objects, dropped objects, uneven and/or slippery surfaces, chemical exposure.	Non-skid, steel-toed leather or rubber boots must be worn at all times on-site while heavy equipment is present. Pay attention to uneven surface or wet terrain and do not run. Keep work areas organized and free of unmarked trip hazards.
Hand	Hands or fingers cut, pinched, or crushed. Chemical hazards including dermal exposure to nitric or sulfuric acid preservatives and reagents.	Nitrile safety gloves will be worn to protect the hands from dust and chemicals, and while using equipment. Leather or cotton outer gloves will be used when handling any sharp-edged, rough materials or equipment. Refer to preventive measures for mechanical hazards below.
Eye	Sharp objects, poor lighting, exposure due to flying debris or splashes.	Safety glasses/face shields or goggles will be worn when appropriate.

Hazard	Cause	Prevention
Electrical	Underground utilities, overhead utilities, electrical cord hazards, incorrect grounding of the portable generator.	Utility locate service will be used prior to any investigation to locate all underground utilities. Visual inspection of work areas prior to starting work. Whenever possible, avoid working under overhead high-voltage lines. The HSO/SS is responsible for documenting a determination of the voltage and minimum approach distance to any potentially energized electrical distribution line. Lines will be confirmed to be de-energized when minimum approach distances cannot be met as referenced in WAC 296-24-960. This should be discussed during the tailgate safety meetings. Make sure that no damage to extension cords occurs. If extension cords are used, make sure it is the proper size for the load that is being served. The plug connection on each end should be of good integrity. It shouldn't be loose or frayed, and it shouldn't be pulled loose from the insulation on the cord. Maintain and operate portable generators in accordance with the manufacturer's use and safety instructions and the following: • Never attach a portable generator directly to the electrical system of a structure unless the generator has a properly installed open-transition transfer switch. • Always plug electrical appliances and tools directly into the generator, using the appliance manufacturer's supplied cords. Use heavy-duty extension cords that contain a grounding conductor (3-wire flexible cord and 3-pronged cord connectors). • Proper grounding and bonding are a means to prevent shocks and electrocutions. • Use ground-fault circuit interrupters (GFCIs) per the manufacturer's instructions. • Do not connect a generator to a structure unless the generator has a properly installed transfer switch. • Visually inspect the equipment before use; remove defective equipment from service; mark or tag it as unsafe for use.

Hazard	Cause	Prevention
Mechanical Hazards	Heavy equipment such as drill rigs, service trucks, mowing equipment, saws, drills, etc.	Competent operators, backup alarms, regular maintenance, daily mechanical checks, proper guards. Subcontractors will supply their own HASP. All site personnel should wear high-visibility vests, making eye contact with operator and obtaining a clear OK before approaching or working within swing radius of heavy equipment, staying clear of swing radius. Obey on-site speed limits.
Noise	Machinery creating more than 85 decibels TWA, less than 115 decibels continuous noise, or peak at less than 140 decibels.	Wear earplugs or protective ear covers when a conversational level of speech is difficult to hear at a distance of 3 feet or a sound level meter may be used on-site to document decibel exceedances.
Falling	Elevated and/or slippery or uneven surfaces, including wetland pits, surface water, and mud. Trips caused by poor “house keeping” practices.	Care should be used to avoid such accidents and to maintain good “house keeping.” Fall protection devices are required on elevated surfaces greater than 4 feet to the level below. There must be guardrails or other barrier around the elevated area (Note that flagging would not be adequate). Wetland pits will be identified and marked in the Wetland.
Lifting	Injury due to improper lifting techniques, overreaching/ overextending, lifting overly heavy objects.	Use proper lifting techniques and mechanical devices where appropriate. The proper lifting procedure first involves testing the weight of the load by tipping it. If in doubt, ask for help. Do not attempt to lift a heavy load alone. Take a good stance and plant your feet firmly with legs apart, one foot farther back than the other. Make sure you stand on a level area with no slick spots or loose gravel. Use as much of your hands as possible, not just your fingers. Keep your back straight, almost vertical. Bend at the hips, holding load close to your body. Keep the weight of your body over your feet for good balance. Use large leg muscles to lift. Push up with one foot positioned in the rear as you start to lift. Avoid quick, jerky movements and twisting motions. Turn the forward foot and point it in the direction of the eventual movement. Never try to lift more than you are accustomed to.

Hazard	Cause	Prevention
Heat Exposure	High temperatures exacerbated by PPE, dehydration.	Workers will ensure adequate hydration, shade, and breaks when temperatures are elevated. **Further detail on heat stress in provided in Section 5.3.1.**
Cold Stress	Cold temperatures and related exposure.	Workers will ensure appropriate clothing, stay dry, and take breaks in a heated environment when working in freezing temperatures. **Further detail on heat stress in provided in Section 5.3.3.**
Lighting	Improper illumination.	Work will proceed during daylight hours only, or under sufficient artificial light.

5.3.1 Heat Stress

To avoid heat-related illness, current regulations in WAC 296-62-095 through 296-62-09570 will be followed during all outdoor work activities. Site personnel will identify and evaluate temperature, humidity, and other environmental factors associated with heat-related illness including but not limited to the provision of rest breaks that are adjusted for environmental factors, and encourage frequent consumption of drinking water. Drinking water will be provided and made readily accessible in sufficient quantity to provide at least 1 quart per employee per hour. All site personnel will be informed and trained for responding to signs or symptoms of possible heat-related illness and accessing medical aid.

Employees showing signs or demonstrating symptoms of heat-related illness must be relieved from duty and provided with a sufficient means to reduce body temperature, including rest areas or temperature-controlled environments (e.g., air conditioned vehicle). Any employee showing signs or demonstrating symptoms of heat-related illness must be carefully evaluated to determine whether it is appropriate to return to work or if medical attention is necessary.

Any incidence of heat-related illness must be immediately reported to the employer directly through the HSO/SS.

The signs, symptoms, and treatment of heat stress include the following:

Condition	Signs/Symptoms	Treatment
Heat Cramps	Painful muscle spasms and heavy sweating.	Increase water intake, rest in shade/cool environment.
Heat Syncope	Brief fainting and blurred vision.	Increase water intake, rest in shade/cool environment.
Dehydration	Fatigue, reduced movement, headaches.	Increase water intake, rest in shade/cool environment.

Condition	Signs/Symptoms	Treatment
Heat Exhaustion	Pale and clammy skin, possible fainting, weakness, fatigue, nausea, dizziness, heaving sweating, blurred vision, slightly elevated body temperature.	Lie down in cool environment, increase water intake, loosen clothing. Call 911 for ambulance transport if systems continue once in cool environment.
Heat Stroke	Cessation of sweating, skin hot and dry, red face, high body temp, unconsciousness, collapse, convulsions, confusion or erratic behavior, life-threatening condition.	**Medical Emergency!! Call 911** for ambulance transport. Move victim to shade and immerse in water.

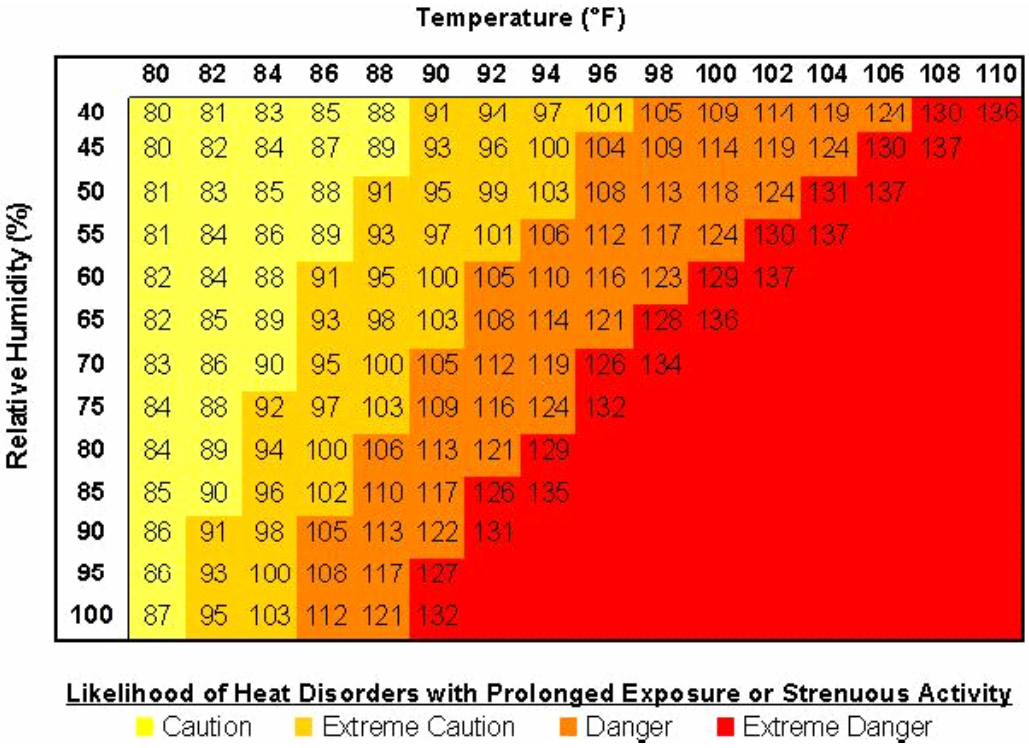
From May 1 to September 30, if physically demanding site work will occur in the combination of temperatures and clothing/PPE ensembles in the table below, actions will be taken to prevent heat stress among the affected workers.

Outdoor Temperature Action Levels

Non-breathing clothes including vapor- and chemical-resistant suits (Levels B and A, and impermeable raingear)	52° F
Double-layer woven clothes, including coveralls, jackets and sweatshirts	77° F
All other clothing	89° F

To prevent heat stress, at least 1 quart per person-hour of cool potable water will be readily available via individual cups, and site personnel will be encouraged to drink plenty of fluids and take periodic work breaks in hot weather. The SSO will promptly consult with the HSO/SS and a radial pulse monitoring method will be implemented to ensure that adequate work-rest cycles will be established to manage heat stress potential among the affected workers. The following chart indicates the relative risk of heat stress at combinations of temperature and relative humidity.

If site temperatures are forecast to exceed the Outdoor Temperature Action Levels, the HSO/SS will promptly consult with a certified industrial hygienist (CIH) and a radial pulse monitoring method will be implemented to ensure that heat stress is properly managed among the affected workers. The following heat index chart indicates the relative risk of heat stress:



5.3.2 Sunburn Hazards

Skin exposure to ultraviolet radiation can result in sunburn. Site personnel will use long-sleeved shirts, hats, and sunscreen as needed to protect against sunburn.

5.3.3 Cold Stress

Field work will be conducted in summer months; therefore, it is unlikely that cold stress will be a health and safety concern for this field investigation.

Should field work be conducted in the colder months of the year and/or near a body of water, exposure to moderate levels of cold can cause the body's internal temperature to drop to a dangerously low level, causing hypothermia. Symptoms of hypothermia include slow, slurred speech, mental confusion, forgetfulness, memory lapses, lack of coordination, and drowsiness.

To prevent hypothermia, site personnel will stay dry and avoid exposure. Site personnel will be encouraged to wear sufficient clothing in layers such that outer clothing is wind- and waterproof and inner layers retain warmth (wool or polypropylene), if applicable. Site personnel will keep hands and feet well protected at all times.

5.3.4 Biohazards

Bees and other insects may be encountered during the field work tasks. Persons with allergies to bees will make the HSO/SS aware of their allergies and will avoid areas where bees are identified. Controls such as repellents, hoods, nettings, masks, or other personal protection may be used. Report any insect bites or stings to the HSO/SS and seek first aid if necessary.

Site personnel will maintain a safe distance from any urban wildlife encountered, including raccoons and rodents, to preclude a bite from a sick or injured animal. Personnel will be gloved and will use tools to lift covers from catch basins and monitoring wells.

5.3.5 Traffic Hazards

Should any work be conducted nearby or along side of a roadway; signs, signals, and barricades should be utilized. Because signs, signals, and barricades do not always provide appropriate protection, flagmen or other appropriate traffic controls should be provided. Flagmen should use red flags at least 18 square inches or sign paddles and will wear orange vests. Traffic control plans and City-issued permits will be required for any lane closures.

6.0 Site Monitoring

The HSO/SS will visually inspect the work site and/or associated work activity at least daily to identify any new potential hazards. If new potential hazards are identified, immediate measures will be taken to eliminate or reduce the risks associated with these hazards.

Airborne hazards are not expected because contaminated soils have been capped and arsenic in groundwater is not an inhalation hazard. Arsenic-contaminated woodwaste and soils could pose an inhalation hazard if they became airborne, but levels are relatively low and the only planned activities that could create airborne hazards from contaminated soils and woodwaste is Geoprobe drilling and rig decontamination, neither of which is likely to create a significant inhalation hazard; therefore, air monitoring in the workplace is not necessary for the currently anticipated fieldwork.

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7.0 Hazard Analysis by Task

The following section identifies potential hazards associated with each task listed in Section 3.2 of this HASP. Tasks have been grouped according to the types of potential hazard associated with them.

Task	Potential Hazard
• Direct-push soil boring advancement and installation of piezometers • Hollow-stem auger boring advancement and installation of monitoring wells and pumping wells • Soil sampling from soil borings • Retractable-screen groundwater sample collection	Exposure to loud noise; overhead hazards; head, foot, ankle, hand, and eye hazards; electrical and mechanical hazards; lifting hazards; inhalation hazards; potential dermal exposure to arsenic in groundwater, soil, or dust; fall hazards, heat exposure hazards. Chemical hazards include dermal or eye exposure to nitric acid and colorimetric field testing hazards.
• Groundwater sampling from monitoring wells	Potential dermal exposure to arsenic in groundwater, dust inhalation hazards; head, foot/ankle, and eye hazards; fall hazards; heat exposure hazards. Chemical hazards include dermal or eye exposure to nitric acid.
• In-situ treatment reagents using direct-push methodology	Chemical hazards from pilot testing are not expected due to planned reagents (carbohydrates, sulfur, and/or zerovalent iron). MSDS sheets will be reviewed and kept on-site for all reagents. Induced gradient tracer testing will use low-reactivity tracer ions such as chloride or bromide and are not expected to result in chemical exposure hazards. Use of reagents that pose a chemical hazard will require an update to this HASP. Other chemical hazards include potential dermal exposure to arsenic in groundwater. Physical hazards include dust inhalation hazards; head, foot/ankle, hand, and eye hazards; fall hazards; heat exposure hazards. Physical hazards associated with use of direct-push soil borings are described above.

Task	Potential Hazard
• Installation of injection wells	Exposure to loud noise; overhead hazards; head, foot/ankle, hand, and eye hazards; electrical and mechanical hazards; lifting hazards; dust inhalation hazards; potential dermal exposure to arsenic in groundwater; fall hazards; and heat exposure hazards.
• Injection of amendment slurry	Chemical hazards from the injections are not expected due to planned reagents (carbohydrates, sulfur, and/or zero valent iron). MSDS sheets will be reviewed and kept on-site. Other chemical hazards include potential dermal exposure to arsenic in groundwater. Physical hazards include dust inhalation hazards; head, foot/ankle, hand, and eye hazards; fall hazards; and heat exposure hazards. Physical hazards associated with use of direct-push soil borings are described above in Installation of Injection Wells.
• Landfill cap inspection	Exposure to head, foot/ankle, hand, and eye hazards; fall hazards; heat and cold exposure hazards.
• Maintaining site security	Exposure to head, foot/ankle, hand, and eye hazards; fall hazards; heat and cold exposure hazards.
• General routine maintenance	Exposure to loud noise; overhead hazards; head, foot/ankle, hand, and eye hazards; electrical and mechanical hazards; lifting hazards; dust inhalation hazards; potential dermal exposure to arsenic in groundwater; fall hazards; and heat exposure hazards.

8.0 Personal Protective Equipment

All work involving field sampling and drilling activities and/or will require contact with potential arsenic-contaminated soil and water will proceed in Level D Personal Protective Equipment (PPE).

All personnel entering the laboratory must wear eye protection (safety glasses). Personnel performing treatability testing must wear a laboratory coat or apron, nitrile gloves, and chemical goggles when working with concentrated acids, bases, and/or oxidants. Safety eyewash will be located immediately outside the door to the field laboratory, and a minimum of five 1-gallon jugs of bottled water will be available inside the laboratory for rinsing incidental spills.

All personnel will be properly fitted and trained in the use of PPE. The level of protection will be upgraded by the HSO/SS whenever warranted by conditions present in the work area. The HSO/SS will periodically inspect equipment such as gloves and hard hats for defects.

For all work involving potential exposure to groundwater conducted outside the field laboratory, workers will wear nitrile gloves and Level D PPE. Some areas, specifically during ditch characterization sampling, may require the use of hip-waders to prevent dermal contact with arsenic-contaminated surface water and sediment.

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9.0 Decontamination

Decontamination procedures will be strictly followed to prevent the off-site spread of arsenic-contaminated soil and water. Decontamination effectiveness will be assessed by visual inspection by the HSO/SS. Before exiting the Site and/or entering vehicles, all boots and/or equipment covered with contaminated soil will be washed with an Alconox solution and rinsed with water at a boot wash station. Decontamination water, drummed soil, and PPE will be collected and containerized on-site, labeled until hazardous waste characterization occurs, and disposed of in accordance with applicable regulations. Before eating, drinking, and use of tobacco, hands must be washed thoroughly.

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10.0 Site Control and Security

The Site is located in a relatively isolated area. Pedestrians and other unauthorized personnel will not be allowed near the work site. Access to the work site will be restricted to designated personnel. The purpose of site control is to minimize the potential exposure to site hazards, to prevent vandalism at the Site and access by children and other unauthorized persons, and to provide adequate facilities for workers. A daily field log will be maintained by the HSO/SS. The field log will include a list of all personnel on-site and visitors. Their arrival and departure times will be noted to enable an accurate roll call to occur in the event of an emergency. All site work will occur in teams and the primary means of communication on-site and with off-site contacts will be via cell phones. An agreed-upon system of alerting via air horns and/or vehicle horns may be used around heavy equipment to signal an emergency if shouting is ineffective.

A perimeter security fence currently surrounds the Landfill and extends to enclose the Groundwater Treatment Plant and its entrance from Fife Way. Additional equipment is located outside the fenced areas for remediation of the groundwater arsenic plume beyond the landfill perimeter. Perimeter fencing and locked gates prevent after-hours access to the Landfill. All fencing, signage, or other appropriate control measures will be maintained in all work areas to limit access during and after work hours. Detailed information regarding site security is summarized in the main text of the OMMP, Section 3.8.

Work areas will be accessible by the Interurban Trail, a paved bicycle and pedestrian access trail that runs between the Landfill and the Wetland area. The HSO/SS will determine appropriate site control measures to be implemented for the public, both to maintain access to the paved trail and keep the public out of authorized work areas. The paved trail may have to be closed during work area mobilization and demobilization for public safety.

Work area controls and decontamination areas will be provided to limit the potential for chemical exposure associated with site activities. The support zone (SZ) for the Site includes all areas outside the work area and decontamination areas. An exclusion zone (EZ), contamination reduction zone (CRZ), and SZ will be set up around the work area. Only authorized site personnel shall be permitted access to the EZ/CRZ. The EZ will be demarcated with barrier hazard tape or cones as needed to redirect vehicle traffic and effectively limit unauthorized access. No eating, drinking, or smoking is allowed in the EZ. Egress from the EZ will only be through a CRZ—unless warranted for imminent hazards during an emergency. A buddy system will be implemented at all times when workers are in the EZ and CRZ. In this system, for each worker in the EZ or CRZ, either another worker in that zone will be designated to keep an eye on them and maintain alertness for imminent hazards and symptoms of distress, or a standby person will be outside the work zone in the appropriate PPE and ready to immediately enter the work area and assist the person in the work zone. All hands must be washed before exiting the work areas.

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11.0 Emergency Response and Contingency Plan

This section defines the emergency action plan for the Site. It will be rehearsed with all site personnel and reviewed whenever the plan is modified or the HSO/SS believe that Site personnel are unclear about the appropriate emergency actions.

A point of refuge will be identified by the HSO/SS and communicated to the field team each day. This point will be clear of adjacent hazards and preferably up- or cross-wind for the entire day. In an emergency, all site personnel and visitors will evacuate to the point of refuge for roll call. It is important that each person on-site understand their role in an emergency and that they remain calm and act efficiently to ensure everyone's safety.

After each emergency is resolved, the entire project team will meet and debrief on the incident—the purpose is not to fix blame, but to improve the planning and response to future emergencies. The debriefing will review the sequence of events, what was done well, and what can be improved. The debriefing will be documented in a written format and communicated to the PMs. Modifications to the emergency plan will be approved by the PMs.

Reasonably foreseeable emergency situations include medical emergencies, accidental release of hazardous materials (such as gasoline or diesel) or hazardous waste, and general emergencies such as vehicle accident, fire, thunderstorm, and earthquake. Expected actions for each potential incident are outlined below.

11.1 MEDICAL EMERGENCIES

In the event of a medical emergency, the following procedures should be used:

1. Stop any imminent hazard if you can safely do so.
2. Remove ill, injured, or exposed person(s) from immediate danger if moving them will clearly not cause them harm and no hazards exist to the rescuers.
3. Evacuate other on-site personnel to a safe place in an upwind or cross-wind direction until it is safe for work to resume.
4. If serious injury or life-threatening condition exists, call **911** for paramedics, fire department, and police.
5. Clearly describe the location, injury, and conditions to the dispatcher. Designate a person to go to the site entrance and direct emergency equipment to the injured person(s). Provide the responders with a copy of this HASP to alert them to chemicals of potential concern.
6. Trained personnel may provide first aid/cardiopulmonary resuscitation if it is necessary and safe to do so. Remove contaminated clothing and PPE only if this can be done without endangering the injured person.
7. Call the PMs and PC.
8. Immediately implement steps to prevent recurrence of the accident.

A map showing the nearest hospital location is attached to this HASP (refer to Section 2.0 for number and address).

11.2 ACCIDENTAL RELEASE OF HAZARDOUS MATERIALS OR WASTES

1. Evacuate all on-site personnel to a safe place in an upwind direction until the HSO/SS determines that it is safe for work to resume.
2. Instruct a designated person to contact the PMs or PC and confirm a response.
3. Contain the spill if it is possible and can be done safely.
4. If the release is not stopped, contact **911** to alert the fire department.
5. Contact the emergency numbers in the table in Section 2 to report the release.
6. Initiate cleanup.
7. The PMs and PC will coordinate follow-up written reporting to Ecology in the event of a reportable release of hazardous materials or wastes.

11.3 GENERAL EMERGENCIES

In the case of fire, explosion, earthquake, or imminent hazards, work shall be halted and all on-site personnel will be immediately evacuated to a safe place. The local police/fire department shall be notified if the emergency poses a continuing hazard by calling 911.

In the event of a thunderstorm, outdoor work will be discontinued until the threat of lightning has abated. During the incipient phase of a fire, the available fire extinguisher(s) may be used by persons trained in putting out fires, if it is safe for them to do so. Contact the fire department as soon as feasible.

11.4 EMERGENCY COMMUNICATIONS

In the case of an emergency, an air horn or car horn will be used as needed to signal the emergency. One long (5-second) blast will be given as the emergency/stop work signal. If the air horn is not working, a vehicle horn and/or overhead waving of arms will be used to signal the emergency. In any emergency, all personnel will evacuate to the designated refuge area and await further instruction.

11.5 EMERGENCY EQUIPMENT

The following minimum emergency equipment will be readily available on-site and functional at all times:

- First aid kit—contents approved by the HSO/SS, including two blood-borne pathogen barriers.
- Sorbent materials.
- Portable fire extinguisher (2-A:10 B/C min).
- A copy of the current HASP.

12.0 Administrative

12.1 MEDICAL SURVEILLANCE

Site personnel involved with field activities must be covered under their employer's medical surveillance program that includes annual physical examinations and certification to wear respiratory protective equipment. These medical monitoring programs must be in compliance with all applicable worker health and safety regulations.

12.2 RECORD KEEPING

The HSO/SS, or a designated alternate, will be responsible for keeping daily logs of workers and visitors present at the work site, attendance lists of personnel present at site health and safety meetings, accident reports, and signatures of all personnel who have read this HASP.

This page intentionally left blank.

13.0 Signature Page

I have read this Heath and Safety Plan and understand its contents. I agree to abide by its provisions and will immediately notify the HSO/SS if site conditions or hazards not specifically designated herein are encountered.

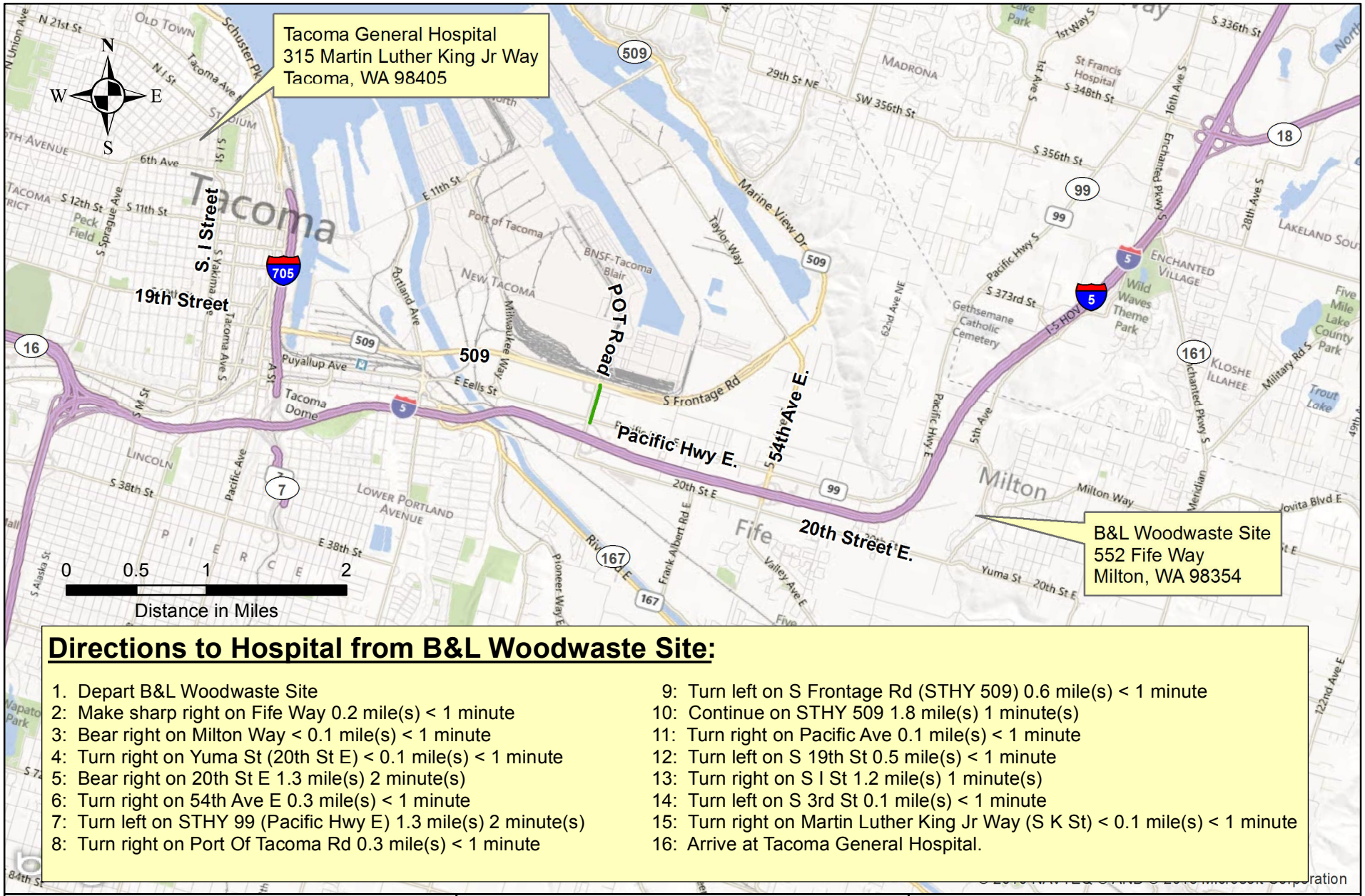
Name (Print)	Signature	Date	Company/Affiliation

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix A
Health and Safety Plan

Figures



Directions to Hospital from B&L Woodwaste Site:

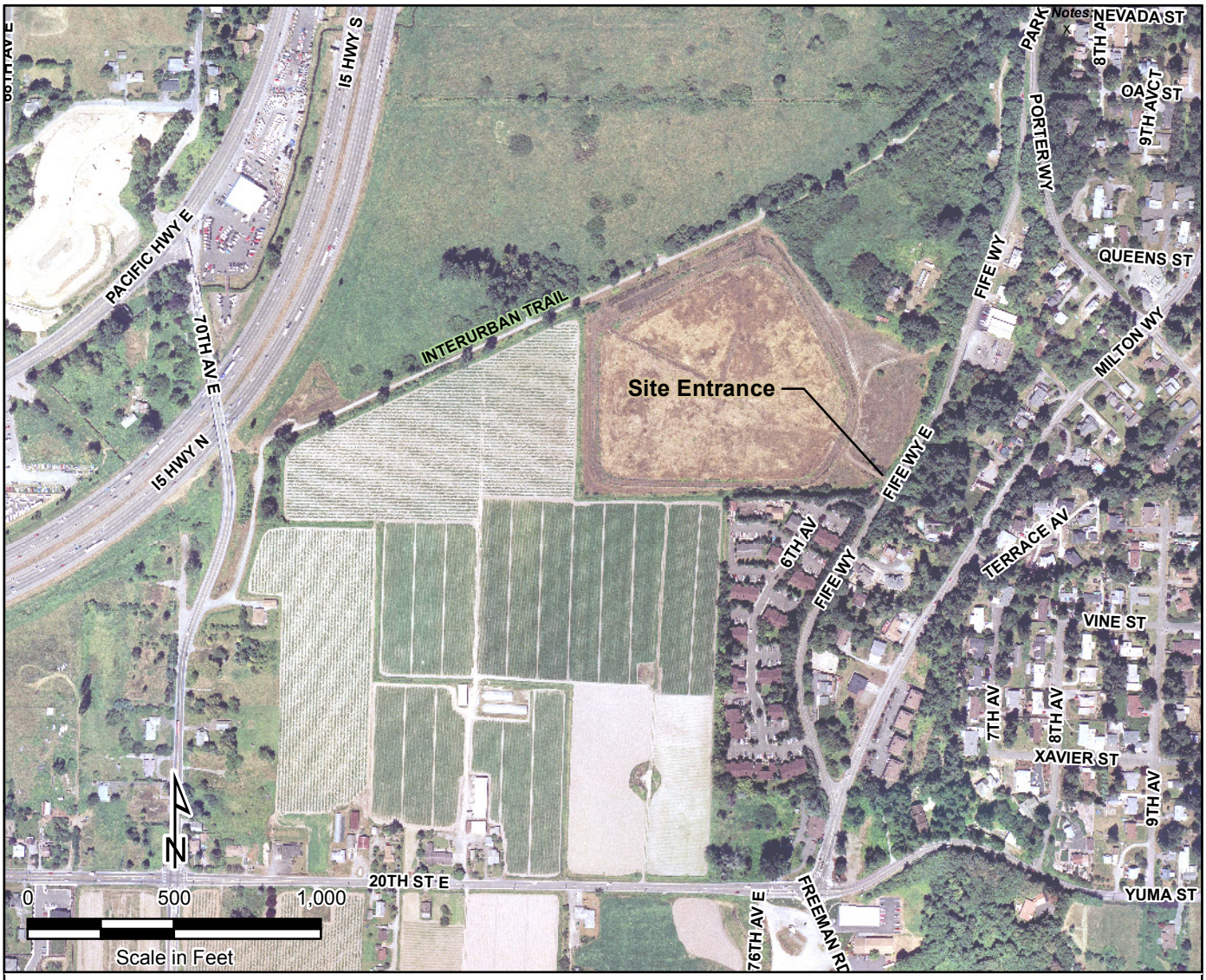
1. Depart B&L Woodwaste Site
2. Make sharp right on Fife Way 0.2 mile(s) < 1 minute
3. Bear right on Milton Way < 0.1 mile(s) < 1 minute
4. Turn right on Yuma St (20th St E) < 0.1 mile(s) < 1 minute
5. Bear right on 20th St E 1.3 mile(s) 2 minute(s)
6. Turn right on 54th Ave E 0.3 mile(s) < 1 minute
7. Turn left on STHY 99 (Pacific Hwy E) 1.3 mile(s) 2 minute(s)
8. Turn right on Port Of Tacoma Rd 0.3 mile(s) < 1 minute
9. Turn left on S Frontage Rd (STHY 509) 0.6 mile(s) < 1 minute
10. Continue on STHY 509 1.8 mile(s) 1 minute(s)
11. Turn right on Pacific Ave 0.1 mile(s) < 1 minute
12. Turn left on S 19th St 0.5 mile(s) < 1 minute
13. Turn right on S I St 1.2 mile(s) 1 minute(s)
14. Turn left on S 3rd St 0.1 mile(s) < 1 minute
15. Turn right on Martin Luther King Jr Way (S K St) < 0.1 mile(s) < 1 minute
16. Arrive at Tacoma General Hospital.

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Compliance Monitoring Plan
B&L Woodwaste Site
Pierce County, Washington

Figure A.1
Route to Hospital Map

Path: F:\projects\B&L RIM\GIS\MXD\Misc Figures\Figure A.1 (Streetmap USA Route to Hospital Map).mxd
Date: 3/18/2013



Directions to B&L Woodwaste Site:

- Landfill entrance is located 1/4 mile north of the intersection between 20th Street East and Fife Way.
- For work in the Landfill area and southern part of the wetlands, the entrance is located 1/4 mile north of the intersection between 20th Street East and Fife Way. Enter from Fife Way and drive around the east side of the Landfill to Puget Power Road and the wetlands.
- For work in the northern part of the wetlands, enter the wetlands from Fife Way on the unimproved 12th Street East roadway, located 1/2 mile north of the Landfill entrance, at the intersection of Fife Way with Porter Way.

FLOYD | SNIDER strategy • science • engineering	**Compliance Monitoring Plan B&L Woodwaste Site Pierce County, Washington**	Figure A.2 Directions to B&L Woodwaste Site

Path: F:\projects\B&L RIM\GIS\MXD\Misc Figures\Figure A.2 (Directions to Site with Aerial).mxd
Date: 3/14/2013

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix A
Health and Safety Plan

Attachment A.1
Daily Tailgate Safety Meeting

B&L Woodwaste Site Health and Safety Plan
Attachment A.1
Daily Tailgate Safety Meeting

Date: _____ Time: _____

Project Name: B&L Woodwaste Site Remedial Investigation

Location: B&L Woodwaste Site, 552 Fife Way, Milton, Washington

Meeting Conducted by: _____

Topics Discussed:

Physical Hazards: _____

Chemical Hazards: _____

Personal Protection: Modified Level D PPE (hard hat, safety glasses, hearing protection, steel-toed shoes, nitrile gloves).

Decontamination: _____

Special Site Considerations: No smoking is allowed within the limits of the landfill. All employees must wash hands before leaving the work areas for breaks and/or lunch. All contractors should have spill kits (i.e., sorbent pads) of their own in all vehicles and/or heavy machinery in case of an emergency.

_____

_____

On-site Emergency Contact: Brett Beaulieu (206) 852-7556 Emergency Dispatch 911

Hospital: Tacoma General Hospital, 315 Martin Luther King Jr. Way,
Tacoma, Washington 98405

Tailgate Safety Meeting Attendees

Name/Company (printed)	Signature

Conducted by: _____ _____ _____

Name Signature Date

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix A
Health and Safety Plan

Attachment A.2
Material Safety Data Sheets

Material Safety Data Sheet

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

CHEVRON REGULAR UNLEADED GASOLINE

Product Number(s): CPS201000 [See Section 16 for Additional Product Numbers]
Synonyms: Calco Regular Unleaded Gasoline

Company Identification
Chevron Products Company
Marketing, MSDS Coordinator
6001 Bollinger Canyon Road
San Ramon, CA 94583
United States of America

Transportation Emergency Response
CHEMTREC: (800) 424-9300 or (703) 527-3887
Health Emergency
ChevronTexaco Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623
Product Information
Technical Information: (510) 242-5357

SPECIAL NOTES: This MSDS applies to: Federal Reformulated Gasoline, California Reformulated Gasoline, Wintertime Oxygenated Gasoline, Low RVP Gasoline and Conventional Gasoline.

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Gasoline	86290-81-5	100 %volume
Benzene	71-43-2	0.1 - 4.9 %volume
Ethyl benzene	100-41-4	0.1 - 3 %volume
Naphthalene	91-20-3	0.1 - 2 %volume
Ethanol	64-17-5	0 - 10 %volume
Methyl tert-butyl ether (MTBE)	1634-04-4	0 - 15 %volume
Tertiary amyl methyl ether (TAME)	994-05-8	0 - 17 %volume
Ethyl tert-butyl ether (ETBE)	637-92-3	0 - 18 %volume

Motor gasoline is considered a mixture by EPA under the Toxic Substances Control Act (TSCA). The refinery streams used to blend motor gasoline are all on the TSCA Chemical Substances Inventory. The appropriate CAS number for refinery blended motor gasoline is 86290-81-5. The product specifications of motor gasoline sold in your area will depend on applicable Federal and State regulations.

SECTION 3 HAZARDS IDENTIFICATION

****

EMERGENCY OVERVIEW

- EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE
- HARMFUL OR FATAL IF SWALLOWED - MAY CAUSE LUNG DAMAGE IF SWALLOWED
- VAPOR HARMFUL
- CAUSES SKIN IRRITATION
- CAUSES EYE IRRITATION
- LONG-TERM EXPOSURE TO VAPOR HAS CAUSED CANCER IN LABORATORY ANIMALS
- KEEP OUT OF REACH OF CHILDREN
- TOXIC TO AQUATIC ORGANISMS

****

IMMEDIATE HEALTH EFFECTS
Eye: Contact with the eyes causes irritation. Symptoms may include pain, tearing, reddening, swelling and impaired vision.
Skin: Contact with the skin causes irritation. Skin contact may cause drying or defatting of the skin. Symptoms may include pain, itching, discoloration, swelling, and blistering. Contact with the skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin.
Ingestion: Because of its low viscosity, this material can directly enter the lungs, if swallowed, or if subsequently vomited. Once in the lungs it is very difficult to remove and can cause severe injury or death.
Inhalation: The vapor or fumes from this material may cause respiratory irritation. Symptoms of respiratory irritation may include coughing and difficulty breathing. Breathing this material at concentrations above the recommended exposure limits may cause central nervous system effects. Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma or death.

DELAYED OR OTHER HEALTH EFFECTS:
Reproduction and Birth Defects: This material is not expected to cause birth defects or other harm to the developing fetus based on animal data.
Cancer: Prolonged or repeated exposure to this material may cause cancer. Gasoline has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Contains benzene, which has been classified as a carcinogen by the National Toxicology Program (NTP) and a Group 1 carcinogen (carcinogenic to humans) by the International Agency for Research on Cancer (IARC).
Contains ethylbenzene which has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).
Contains naphthalene, which has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Whole gasoline exhaust has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Risk depends on duration and level of exposure. See Section 11 for additional information.

SECTION 4 FIRST AID MEASURES

Eye: Flush eyes with water immediately while holding the eyelids open. Remove contact lenses, if worn, after initial flushing, and continue flushing for at least 15 minutes. Get medical attention if irritation persists.
Skin: Wash skin with water immediately and remove contaminated clothing and shoes. Get medical attention if any symptoms develop. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.
Ingestion: If swallowed, get immediate medical attention. Do not induce vomiting. Never give anything by mouth to an unconscious person.
Inhalation: Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.
Note to Physicians: Ingestion of this product or subsequent vomiting may result in aspiration of light hydrocarbon liquid, which may cause pneumonitis.

SECTION 5 FIRE FIGHTING MEASURES

See Section 7 for proper handling and storage.

FIRE CLASSIFICATION:
OSHA Classification (29 CFR 1910.1200): Flammable liquid.

NFPA RATINGS: Health: 1 Flammability: 3 Reactivity: 0

FLAMMABLE PROPERTIES:
Flashpoint: (Tagliabue Closed Cup) < -45 °C (< -49 °F)
Autoignition: > 280 °C (> 536 °F)
Flammability (Explosive) Limits (% by volume in air): Lower: 1.4 Upper: 7.6

EXTINGUISHING MEDIA: Dry Chemical, CO2, AFFF Foam or alcohol resistant foam if >15% volume polar solvents (oxygenates).

PROTECTION OF FIRE FIGHTERS:
Fire Fighting Instructions: Use water spray to cool fire-exposed containers and to protect personnel. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.
Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in the vicinity of the spill or released vapor. If this material is released into the work area, evacuate the area immediately. Monitor area with combustible gas indicator.
Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. All equipment used when handling the product must be grounded. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
Reporting: Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required. This material is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Petroleum Exclusion. Therefore, releases to the environment may not be reportable under CERCLA.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL. This product presents an extreme fire hazard. Liquid very quickly evaporates, even at low temperatures, and forms vapor (fumes) which can catch fire and burn with explosive violence. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Never siphon gasoline by mouth.
Use only as a motor fuel. Do not use for cleaning, pressure appliance fuel, or any other such use. Do not store in open or unlabeled containers. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Do not breathe vapor or fumes. Wash thoroughly after handling. Keep out of the reach of children.
Unusual Handling Hazards: WARNING! Do not use as portable heater or appliance fuel. Toxic fumes may accumulate and cause death.
General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.
Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating an accumulation of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'. Improper filling of portable gasoline containers creates danger of fire. Only dispense gasoline into approved and properly labeled gasoline containers. Always place portable containers on the ground. Be sure pump nozzle is in contact with the container while filling. Do not use a nozzle's lock-open device. Do not fill portable containers that are inside a vehicle or truck/trailer bed.

General Storage Information: DO NOT USE OR STORE near heat, sparks or open flames. USE AND STORE ONLY IN WELL VENTILATED AREA. Keep container closed when not in use.
Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:
Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:
Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT
Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.
Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Chlorinated Polyethylene (or Chlorosulfonated Polyethylene), Nitrile Rubber, Polyurethane, Viton.
Respiratory Protection: Determine if airborne concentrations are below the recommended exposure limits. If not, wear an approved respirator that provides adequate protection from measured concentrations of this

material, such as: Air-Purifying Respirator for Organic Vapors.
When used as a fuel, this material can produce carbon monoxide in the exhaust. Determine if airborne concentrations are below the occupational exposure limit for carbon monoxide. If not, wear an approved positive-pressure air-supplying respirator.
Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

Component	Limit	TWA	STEL	Ceiling	Notation
Benzene	ACGIH_TLV	.5 ppm	2.5 ppm		Skin A1
Benzene	OSHA_PEL	1 ppm	5 ppm		
Benzene	OSHA_Z2	10 ppm		25 ppm	
Ethanol	ACGIH_TLV	1000 ppm			A4
Ethanol	OSHA_PEL	1000 ppm			
Ethyl benzene	ACGIH_TLV	100 ppm	125 ppm		A3
Ethyl benzene	OSHA_PEL	100 ppm	125 ppm		
Ethyl tert-butyl ether (ETBE)	ACGIH_TLV	5 ppm			
Gasoline	ACGIH_TLV	300 ppm	500 ppm		A3
Gasoline	OSHA_PEL	300 ppm	500 ppm		
Methyl tert-butyl ether (MTBE)	ACGIH_TLV	50 ppm			A3
Naphthalene	ACGIH_TLV	10 ppm	15 ppm		Skin A4
Naphthalene	OSHA_PEL	10 ppm	15 ppm		
Tertiary amyl methyl ether (TAME)	CHEVRON		50 ppm		

Refer to the OSHA Benzene Standard (29 CFR 1910.1028) and Table Z-2 for detailed training, exposure monitoring, respiratory protection and medical surveillance requirements before using this product.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Colorless to yellow
Physical State: Liquid
Odor: Petroleum odor
pH: NA
Vapor Pressure: 5 psi - 15 psi (Typical) @ 37.8°C (100°F)
Vapor Density (Air = 1): 3 - 4 (Typical)
Boiling Point: 37.8°C (100°F) - 204.4°C (400°F) (Typical)
Solubility: Insoluble in water; miscible with most organic solvents.
Freezing Point: NA
Melting Point: NA
Specific Gravity: 0.7 g/ml - 0.8 g/ml @ 15.6°C (60.1°F)
Viscosity: <1 SUS @ 37.8°C (100°F)

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Incompatibility With Other Materials: May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Hazardous Decomposition Products: None known (None expected)
Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS
Eye Irritation: The Draize eye irritation mean score in rabbits for a 24-hour exposure was: 0/110.
Skin Irritation: For a 4-hour exposure, the Primary Irritation Index (PII) in rabbits is: 4.8/8.0.
Skin Sensitization: This material did not cause sensitization reactions in a Modified Buehler guinea pig test.
Acute Dermal Toxicity: 24 hour(s) LD50: >3.75g/kg (rabbit).
Acute Oral Toxicity: LD50: >5 ml/kg (rat)
Acute Inhalation Toxicity: 4 hour(s) LD50: >2000ppm (rat).

ADDITIONAL TOXICOLOGY INFORMATION:
Gasolines are highly volatile and can produce significant concentrations of vapor at ambient temperatures. Gasoline vapor is heavier than air and at high concentrations may accumulate in confined spaces to present both safety and heath hazards. When vapor exposures are low, or short duration and infrequent, such as during refuelling and tanker loading/unloading, neither total hydrocarbon nor components such as benzene are likely to result in any adverse health effects. In situations such as accidents or spills where exposure to gasoline vapor is potentially high, attention should be paid to potential toxic effects of specific components. Information about specific components in gasoline can be found in Sections 2, 8 and 15 of this MSDS. More detailed information on the health hazard of specific gasoline components can be obtained calling the Chevron Emergency Information Center (see Section 1 for phone numbers).

NEUROTOXICITY: Pathological misuse of solvents and gasoline, involving repeated and prolonged exposure to high concentrations of vapor is a significant exposure on which there are many reports in the medical literature. As with other solvents, persistent abuse involving repeated and prolonged exposures to high concentrations of vapor has been reported to result in central nervous system damage and eventually, death. In a study in which ten human volunteers were exposed for 30 minutes to approximately 200, 500 or 1000 ppm concentrations of gasoline vapor, irritation of the eyes was the only significant effect observed, based on both subjective and objective assessments. In an inhalation study, groups of 6 Fischer rats (3 male. 3 female) were exposed to 2056 ppm of wholy vaporized unleaded gasoline for 6 hours perday, 5 day per week for up to 18 months. Histopathology of the peripheral nervous system and spinal cord revealed no distal axonal neuropthy of the type associated with exposure to n-hexane even though gasoline contained 1.9% n-hexane. The authors concluded that gasoline treatment may have amplified the incidence and prominence of some naturally occurring age-related (subclinical) in the nervous system. BIRTH DEFECTS AND REPRODUCTIVE TOXICITY: An inhalation study with rats exposed to 0, 400 and 1600 ppm of wholly vaporized unleaded gasoline, 6 hours per day on day 6 through 16 of gestation, showed no teratogenic effects nor indication of toxicity to either the mother

or the fetus. Another inhalation study in rats exposed to 3000, 6000, or 9000 ppm of gasoline vapor, 6 hours per day on day 6 through 20 of gestation, also showed no teratogenic effects nor indications of toxicity to either the mother or the fetus.

CHRONIC TOXICITY/CANCER: Wholly vaporized unleaded gasoline was used in a 3 month inhalation study. Groups of 40 rats (20 males, 20 female) and 8 squirrel monkeys (4 male, 4 female) were exposed 6 hours per day and 5 days per week for 13 weeks to 384 or 1552 ppm gasoline. One group of each species served as unexposed controls. The initial conclusion of this study was that inhalation of gasoline at airborne concentrations of up to 1522 ppm caused no toxicity in rats or monkeys. However, further histopathological examination of male rat kidneys on the highest dose group revealed an increased incidence and severity of regenerative epithelium and dilated tubules containing proteinaceous deposits. Lifetime inhalation of wholly vaporized unleaded gasoline at 2056 ppm has caused increased liver tumors in female mice. The mechanism of this response is still being investigated but it is thought to be an epigenetic process unique to the female mouse.

This exposure also caused kidney damage and eventually kidney cancer in male rats. No other animal model studied has shown these adverse kidney effects and there is no physiological reason to believe that they would occur in man. EPA has concluded that mechanism by which wholly vaporzied unleaded gasoline causes kidney damage is unque to the male rat. The effects in that species (kidney damage and cancer) should not be used in human risk assesment. In their 1988 review of carcinogenic risk from gasoline, The International Agency for Research on Cancer (IARC) noted that, because published epidemiology studies did not include any exposure data, only occupations where gasoline exposure may have ocurred were reviewed. These included gasoline service station attendants and automobile mechanics. IARC also noted that there was no opportunity to separate effects of combustion products from those of gasoline itself. Although IARC allocated gasoline a final overall classification of Group 2B, i.e. possibly carcinogenic to humans, this was based on limited evidence in experimental animals plus supporting evidence including the presence in gasoline of benzene and 1, 3-butadiene. The actual evidence for carcinogenicity in humans was considered inadequate.

MUTAGENICITY: Gasoline was not mutagenic, with or without activation, in the Ames assay (Salmonella typhimurium), Saccharamyces cerevisesae, or mouse lymphoma assays. In addition, point mutations were not induced in human lymphocytes. Gasoline was not mutagenic when tested in the mouse dominant lethal assay. Administration of gasoline to rats did not cause chomosomal aberrations in their bone marrow cells. EPIDEMIOLOGY: To explore the health effects of workers potentially exposed to gasoline vapors in the marketing and distribution sectors of the petroleum industry, the American Petroleum Institute sponsored a cohort mortality study (Publication 4555), a nested case-control study (Publication 4551), and an exposure assessment study (Publication 4552). Histories of exposure to gasoline were reconstructed for cohort of more than 18,000 employees from four companies for the time period between 1946 and 1985. The results of the cohort mortality study indicated that there was no increased mortality from either kidney cancer or leukemia among marketing and marine distribution employees who were exposed to gasoline in the petroleum industry, when compared to the general population. More importantly, based on internal comparisons, there was no association between mortality from kidney cancer or leukemia and various indices of gasoline exposure. In particular, neither duration of employment, duration of exposure, age at first exposure, year of first exposure, job category, cumulative exposure, frequency of peak exposure, nor average intensity of exposure had any effect on kidney cancer or leukemia mortality. The results of the nested case-control study confirmed the findings of the original cohort study. That is, exposure to gasoline at the levels experienced by this cohort of distribution workers is not a significant risk factor for leukemia (all cell types), acute myeloid leukemia, kidney cancer or multiple myeloma.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY
The 96 hour(s) LC50 for rainbow trout (Oncorhynchus mykiss) is 2.7 mg/l.
The 48 hour(s) LC50 for water flea (Daphnia magna) is 3.0 mg/l.
The 96 hour(s) LC50 for sheepshead minnow (Cyprinodon variegatus) is 8.3 mg/l.
The 96 hour(s) LC50 for mysid shrimp (Mysidopsis bahia) is 1.8 mg/l.
This material is expected to be toxic to aquatic organisms. Gasoline studies have been conducted in the laboratory under a variety of test conditions with a range of fish and invertebrate species. An even more extensive database is available on the aquatic toxicity of individual aromatic constituents. The majority of published studies do not identify the type of gasoline evaluated, or even provide distinguishing characteristics such as aromatic content or presence of lead alkyls. As a result, comparison of results among studies using open

and closed vessels, different ages and species of test animals and different gasoline types, is difficult.

The bulk of the available literature on gasoline relates to the environmental impact of monoaromatic (BTEX) and diaromatic (naphthalene, methylnaphthalenes) constituents. In general, non-oxygenated gasoline exhibits some short-term toxicity to freshwater and marine organisms, especially under closed vessel or flow-through exposure conditions in the laboratory. The components which are the most prominent in the water soluble fraction and cause aquatic toxicity, are also highly volatile and can be readily biodegraded by microorganisms.

ENVIRONMENTAL FATE
This material is expected to be readily biodegradable. Following spillage, the more volatile components of gasoline will be rapidly lost, with concurrent dissolution of these and other constituents into the water. Factors such as local environmental conditions (temperature, wind, mixing or wave action, soil type, etc), photo-oxidation, biodegradation and adsorption onto suspended sediments, can contribute to the weathering of spilled gasoline.

The aqueous solubility of non-oxygenated unleaded gasoline, based on analysis of benzene, toluene, ethylbenzene+xylenes and naphthalene, is reported to be 112 mg/l. Solubility data on individual gasoline constituents also available.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Name: GASOLINE
DOT Hazard Class: 3 (Flammable Liquid)
DOT Identification Number: UN1203
DOT Packing Group: II

SECTION 15 REGULATORY INFORMATION

SARA 311/312 CATEGORIES:
1. Immediate (Acute) Health Effects: YES
2. Delayed (Chronic) Health Effects: YES
3. Fire Hazard: YES
4. Sudden Release of Pressure Hazard: NO
5. Reactivity Hazard: NO

REGULATORY LISTS SEARCHED:

4_I1=IARC Group 1
15=SARA Section 313

4_I2A=IARC Group 2A	16=CA Proposition 65
4_I2B=IARC Group 2B	17=MA RTK
05=NTP Carcinogen	18=NJ RTK
06=OSHA Carcinogen	19=DOT Marine Pollutant
09=TSCA 12(b)	20=PA RTK

The following components of this material are found on the regulatory lists indicated.

Benzene	15, 16, 17, 18, 20, 4_I1, 5, 6
Ethanol	17, 18, 20
Ethyl benzene	15, 17, 18, 20, 4_I2B
Gasoline	17, 18, 20
Methyl tert-butyl ether (MTBE)	15, 17, 18, 20, 9
Naphthalene	15, 16, 17, 18, 20, 4_I2B
Tertiary amyl methyl ether (TAME)	9

CERCLA REPORTABLE QUANTITIES(RQ)/SARA 302 THRESHOLD PLANNING QUANTITIES(TPQ):

Component	Component RQ	Component TPQ	Product RQ
Benzene	10 lbs	None	186 lbs
Ethanol	100 lbs	None	1961 lbs
Ethyl benzene	1000 lbs	None	34964 lbs
Methyl tert-butyl ether (MTBE)	1000 lbs	None	7513 lbs
Naphthalene	100 lbs	None	4000 lbs

CHEMICAL INVENTORIES:
CANADA: All the components of this material are on the Canadian DSL or have been notified under the New Substance Notification Regulations, but have not yet been published in the Canada Gazette.
UNITED STATES: All of the components of this material are on the Toxic Substances Control Act (TSCA) Chemical Inventory.

WHMIS CLASSIFICATION:
Class B, Division 2: Flammable Liquids
Class D, Division 2, Subdivision A: Very Toxic Material - Carcinogenicity
Class D, Division 2, Subdivision B: Toxic Material - Skin or Eye Irritation

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 1 Flammability: 3 Reactivity: 0

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

Additional Product Number(s): CPS201023, CPS201054, CPS201055, CPS201075, CPS201090, CPS201105, CPS201106, CPS201120, CPS201121, CPS201122, CPS201126, CPS201128, CPS201131, CPS201136, CPS201141, CPS201142, CPS201148, CPS201153, CPS201158, CPS201161, CPS201162, CPS201168, CPS201181, CPS201185, CPS201186, CPS201188, CPS201216, CPS201217, CPS201218, CPS201236, CPS201237, CPS201238, CPS201266, CPS201267, CPS201268, CPS201277, CPS201278, CPS201279, CPS201286, CPS201287, CPS201289, CPS201296, CPS201297, CPS201298, CPS201849, CPS201850, CPS201855, CPS201856, CPS201857, CPS204000, CPS204001, CPS204002, CPS204003, CPS204010, CPS204011, CPS204022, CPS204023, CPS204046, CPS204047, CPS204070, CPS204071, CPS204088, CPS204089, CPS204104, CPS204105, CPS204116, CPS204117, CPS204140, CPS204141, CPS204164, CPS204165, CPS204188, CPS204189, CPS204200, CPS204201, CPS204212, CPS204213, CPS204224, CPS204225, CPS204248, CPS204249, CPS204272, CPS204273, CPS204290, CPS204291, CPS204322, CPS204323, CPS204324, CPS204350, CPS204352, CPS204354, CPS204356, CPS204358, CPS204359, CPS204364, CPS204365, CPS204370, CPS204371, CPS204376, CPS204377, CPS204382, CPS204383, CPS204388, CPS204389, CPS204394, CPS204395, CPS204400, CPS204401, CPS204406, CPS204407, CPS204412, CPS204413, CPS204418, CPS204419, CPS204424, CPS204425, CPS204430, CPS204431, CPS204436, CPS204437, CPS204442, CPS204446, CPS204450, CPS204454, CPS204458, CPS204462, CPS204466, CPS204467, CPS204484, CPS204485, CPS204502, CPS204503, CPS204520, CPS204521, CPS204538, CPS204539, CPS204556, CPS204557, CPS204574, CPS204575, CPS204592, CPS204593, CPS204610, CPS204611, CPS204628, CPS204629, CPS204646, CPS204647, CPS204664, CPS204665, CPS204682, CPS204690, CPS204691, CPS204696, CPS204697, CPS204702, CPS204703, CPS204708, CPS204709, CPS204721, CPS204722, CPS204727, CPS204728, CPS241765

REVISION STATEMENT: This revision updates the following sections of this Material Safety Data Sheet: Section 1 (Product Codes). This Material Safety Data Sheet has been prepared using the ProSteward MSDS system.

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV	-	Threshold Limit Value	TWA	-	Time Weighted Average
STEL	-	Short-term Exposure Limit	PEL	-	Permissible Exposure Limit
			CAS	-	Chemical Abstract Service Number
NDA	-	No Data Available	NA	-	Not Applicable
<=	-	Less Than or Equal To	>=	-	Greater Than or Equal To

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the ChevronTexaco Energy Research & Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

The following list contains the Material Safety Data Sheets you requested. Please scoll down to view the requested MSDS(s).

Product	MSDS	Distributor	Format	Language	Quantity
2800000	2800100	Hach Company	OSHA	English	1
2800000	2797899	Hach Company	OSHA	English	1
2800000	2797799	Hach Company	OSHA	English	1
2800000	2797999	Hach Company	OSHA	English	1
2800000	45429	Hach Company	OSHA	English	1
2800000	2798199	Hach Company	OSHA	English	1

Total Enclosures: 6

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M01892

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Test Strips
Catalog Number: 2800100

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M01892
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: Highly toxic. Experimental carcinogen. Cumulative poison. Harmful if absorbed through skin. Harmful if swallowed
Date of MSDS Preparation:
Day: 25
Month: August
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Mercuric Bromide Saturated Paper
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: 100.0
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Highly toxic. Experimental carcinogen. Cumulative poison. Harmful if absorbed through skin. Harmful if swallowed

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White paper
Odor: None
HARMFUL IF SWALLOWED OR ABSORBED THROUGH SKIN
POSSIBLE BIRTH DEFECT HAZARD: MAY CAUSE BIRTH DEFECTS BASED ON ANIMAL DATA CAN CAUSE LUNG AND KIDNEY DISEASE

HMIS:

Health: 4
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.

NFPA:
Health: 4
Flammability: 0
Reactivity: 0
Symbol: Not applicable

Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: May cause irritiation
Skin Absorption: Will be absorbed through the skin. Effects similar to those of ingestion
Target Organs: Central nervous system Liver Kidneys
Ingestion: Highly toxic. Causes: abdominal pain nausea vomiting diarrhea metallic taste rapid pulse and respirations weakness May cause: inflammation of the mouth increased urinary output excessive salivation liver damage kidney damage central nervous system effects collapse death
Target Organs: Central nervous system Liver Kidneys
Inhalation: Toxic. May cause: Effects similar to those of ingestion.
Target Organs: Central nervous system Kidneys Liver
Medical Conditions Aggravated: Allergies or sensitivity to mercury. Central nervous system diseases Kidney conditions Liver conditions Pre-existing: Eye conditions Skin conditions Respiratory conditions
Chronic Effects: Mercury can cause personality changes such as: depression, despondency, fearfulness, restlessness, irritability, timidness, indecision and embarrassment. Mercury is a general protoplasmic poison; it circulates in the blood and is stored in the liver, kidneys, spleen and bones. Main symptoms are sore mouth, tremors and psychic disturbances.
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

IARC Group 3: Non-classifiable
Mercury and Inorganic Mercury compounds
This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: an experimental teratogen. an experimental mutagen.

Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Flush eyes with water. Call physician if irritation develops.
Skin Contact (First Aid): Wash skin with plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water or milk. Induce vomiting using syrup of ipecac or by sticking finger down throat. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: None required.

5. FIRE FIGHTING MEASURES

Flammable Properties: Can burn in fire, releasing toxic vapors.
Flash Point: Not determined
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not determined

Hazardous Combustion Products: May vaporize to form Mercury vapor. bromides
Fire / Explosion Hazards: Reacts with sodium aci-nitromethanide and acid to form explosive mercury fulminate.
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Releases of this material may contaminate the environment. Stop spilled material from being released to the environment.
Clean-up Technique: Sweep up material. Dispose of all mercury contaminated material at an E.P.A. hazardous waste facility. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as a hazardous air pollutant. Product is regulated as RCRA hazardous waste.
304 EHS RQ (40 CFR 355): Mercuric Bromide - RQ 1 lb.
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with skin eyes clothing Do not breathe dust. Use with adequate ventilation. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep container tightly closed when not in use.
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain adequate ventilation to keep vapor level below TWA for chemicals in this product. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin clothing Do not breathe: dust Use with adequate ventilation. Wash thoroughly after handling.
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White paper
Physical State: Solid
Molecular Weight: Not applicable
Odor: None
pH: Not applicable
Vapor Pressure: Not applicable

Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Not applicable
Specific Gravity (water = 1): Not applicable
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Not applicable
Acid: Not applicable
Other: Not applicable
Metal Corrosivity:
Steel: Not applicable
Aluminum: Not applicable

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: formates sulfites phosphates arsenic boron compounds carbonates iron copper silver salts
Hazardous Decomposition: Heating to decomposition releases: mercury bromides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: None reported
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Mercuric Bromide: Oral rat LD50 = 40 mg/kg, Dermal rat LD50 = 100 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: Mercury and mercury compounds: Calculated Bioconcentration factor > 100. LC50/96H fish <1 mg/L

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: D009
Special Instructions (Disposal): Dispose of all mercury contaminated material at an E.P.A. hazardous waste facility.
Empty Containers: Rinse three times with an appropriate solvent. Rinsate from empty containers is hazardous waste and should be disposed of at an E.P.A. approved facility. Dispose of empty container as normal trash.

NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Mercury Bromides Mixture
--
DOT Hazard Class: 6.1
DOT Subsidiary Risk: NA
DOT ID Number: UN1634
DOT Packing Group: II
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Mercury Bromides Mixture
--
ICAO Hazard Class: 6.1
ICAO Subsidiary Risk: NA
ICAO ID Number: UN1634
ICAO Packing Group: II
I.M.O.:
I.M.O. Proper Shipping Name: Mercury Bromides Mixture
--
I.M.O. Hazard Class: 6.1
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: UN1634
I.M.O. Packing Group: II
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product contains a chemical(s) subject to the reporting requirements of Section 313 of Title III of SARA.
Mercury Compounds
302 (EHS) TPQ (40 CFR 355): 500 lbs. Mercury Bromide
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Mercuric Bromide - RQ 1 lb.
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: WARNING - This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Identification of Prop. 65 Ingredient(s): Mercury Compounds
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).

TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Laboratory Reagent

References: Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. Sax, N. Irving and Richard J. Lewis, Sr., revised by. Hawley's Condensed Chemical Dictionary, Eleventh Ed. New York: Van Nostrand Reinhold Co., 1987. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Vendor Information. Gosselin, R. E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Technical Judgment.

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00244

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #1
Catalog Number: 2797899

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00244
Chemical Name: Phosphoric acid, disodium salt
CAS No.: 7558-79-4
Chemical Formula: Na_2HPO_4
Chemical Family: Inorganic Salt
Hazard: May cause irritation.
Date of MSDS Preparation:
Day: 25
Month: September
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Sodium Phosphate, Dibasic
CAS No.: 7558-79-4
TSCA CAS Number: 7558-79-4
Percent Range: 100.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 17 g/kg.
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Colorless crystals
Odor: None
MAY CAUSE EYE AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 1
Flammability: 0

Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: No effects are anticipated
Skin Absorption: No effects anticipated
Target Organs: Not applicable
Ingestion: Very large doses may cause: fever lethargy diarrhea muscular cramps nausea vomiting
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation
Target Organs: None reported
Medical Conditions Aggravated: None reported
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, corrosive and toxic gases may be generated by thermal decomposition.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: Toxic fumes of: phosphorus oxides
Fire / Explosion Hazards: None reported
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Dry chemical. Carbon dioxide Water.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:

Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as a hazardous water pollutant.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Protect from: heat moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes Do not breathe: dust Wash thoroughly after handling. Protect from: heat moisture
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Colorless crystals
Physical State: Solid
Molecular Weight: 141.96 g/mol
Odor: None
pH: 9.1 (1% solution)
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Not determined
Specific Gravity (water = 1): 1.62
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not determined
Solubility:
Water: Soluble
Acid: Not determined
Other: Insoluble in alcohol
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Extreme temperatures Excess moisture
Reactivity / Incompatibility: None reported
Hazardous Decomposition: Toxic fumes of: phosphorus oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: Oral rat LD50 = 17 g/kg.
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Eye irritation rabbit: 500mg/24 hrs = MILD; Skin irritation rabbit: 500 mg/24 hrs = MILD.
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: --
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: Not applicable
Special Instructions (Disposal): Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA

ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Sodium phosphate, dibasic 5000 lbs.
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Sodium phosphate, dibasic - RQ 5000 lbs.
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: TSCA Listed: Yes
TSCA CAS Number: 7558-79-4

16. OTHER INFORMATION

Intended Use: Laboratory Reagent
References: CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Vendor Information. Technical Judgment. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans. World Health Organization (Volumes 1-42) Supplement 7. France: 1987. List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labeling of Dangerous Substances, Amended July 1992. Sixth Annual Report on Carcinogens, 1991. U.S. Department of Health and Human Services. Rockville, MD: Technical Resources, Inc. 1991.

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M01887

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #2
Catalog Number: 2797799

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M01887
Chemical Name: Potassium peroxymonosulfate
CAS No.: 70693-62-8
Chemical Formula: $H_3K_5S_4O_{18}$
Chemical Family: Oxidizing Agents
Hazard: Oxidizer. Causes burns. May cause allergic reaction.
Date of MSDS Preparation:
Day: 25
Month: August
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Oxone, monopersulfate compound
CAS No.: 70693-62-8
TSCA CAS Number: Not Applicable
Percent Range: 100.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 2000 mg/kg.
LC50: Inhalation rat LC50 > 5 mg/l/4H.
TLV: Not Established
PEL: Not Established
Hazard: Oxidizer. Causes burns. May cause allergic reaction.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White powder
Odor: None
CAUSES BURNS CAUSES RESPIRATORY TRACT IRRITATION MAY CAUSE ALLERGIC REACTION

STRONG OXIDIZER: CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE

HMIS:
Health: 2

Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.

NFPA:
Health: 2
Flammability: 0
Reactivity: 0
Symbol: oxy

Potential Health Effects:
Eye Contact: Causes eye burns.
Skin Contact: Causes burns. May cause allergic reaction
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: gastrointestinal irritation
Target Organs: None reported
Inhalation: Causes: irritation of nose and throat
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Skin conditions Eye conditions Allergies or sensitivity to potassium persulfate.
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Remove contaminated clothing. Call physician immediately.
Ingestion (First Aid): Do not induce vomiting. Give 1-2 glasses of water. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. Call physician.

5. FIRE FIGHTING MEASURES

Flammable Properties: Strong oxidizer. Contact with combustible materials may cause a fire. During a fire, this product decomposes to form toxic gases.
Flash Point: Not Determined
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not Applicable
Upper Explosion Limits: Not Applicable
Autoignition Temperature: Not Determined
Hazardous Combustion Products: This material will not burn.
Fire / Explosion Hazards: May react violently with: oxidizable materials
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Water.

Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear. Evacuate area and fight fire from a safe distance.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment. Cover spilled solid material with sand or other inert material.
Clean-up Technique: Cover with an inert material, such as sand. Sweep up material. Work in an approved fume hood. Working in small batches, dilute with excess water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Filter to remove solids. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: a pound or more of loose powder is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as RCRA hazardous waste.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep away from: reducers oxidizable materials Protect from: moisture heat
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Use a fume hood to avoid exposure to dust, mist or vapor.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: lab coat disposable latex gloves
Inhalation Protection: laboratory fume hood
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: oxidizable materials reducers
TLV: Not Established
PEL: Not Established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White powder
Physical State: Solid
Molecular Weight: 614.9
Odor: None
pH: 1% solution = 2.3; 3% solution = 2.0
Vapor Pressure: Nil
Vapor Density (air = 1): Not Determined
Boiling Point: Not Determined
Melting Point: Decomposes
Specific Gravity (water = 1): 1.1 - 1.4

Evaporation Rate (water = 1): Not Applicable
Volatile Organic Compounds Content: Not Applicable
Partition Coefficient (n-octanol / water): Not Applicable
Solubility:
Water: Soluble
Acid: Not Determined
Other: Not Determined
Metal Corrosivity:
Steel: Not Determined
Aluminum: Not Determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Excess moisture Exposure to air. Heating to decomposition.
Reactivity / Incompatibility: May react violently in contact with: oxidizable material reducers
Hazardous Decomposition: Heating to decomposition releases: oxygen sulfur oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: Oral rat LD50 = 2000 mg/kg.
LC50: Inhalation rat LC50 > 5 mg/l/4H.
Dermal Toxicity Data: Skin rabbit LD50 > 11,000 mg/kg.
Skin and Eye Irritation Data: None Reported
Mutation Data: None Reported
Reproductive Effects Data: None Reported
Ingredient Toxicological Data: Not Applicable
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Work in an approved fume hood. Dilute material with excess water making a weaker than 5% solution. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash. Rinsate from empty containers may contain sufficient product to require disposal as hazardous waste.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Corrosive Solid, Acidic, Inorganic, N.O.S.

Potassium Monopersulfate
DOT Hazard Class: 8
DOT Subsidiary Risk: NA
DOT ID Number: UN3260
DOT Packing Group: III

I.C.A.O.:
I.C.A.O. Proper Shipping Name: Corrosive Solid, Acidic, Inorganic, N.O.S.
Potassium Monopersulfate
ICAO Hazard Class: 8
ICAO Subsidiary Risk: NA
ICAO ID Number: UN3260
ICAO Packing Group: III

I.M.O.:
I.M.O. Proper Shipping Name: Corrosive Solid, Acidic, Inorganic, N.O.S.
Potassium Monopersulfate
I.M.O. Hazard Class: 8
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: UN3260
I.M.O. Packing Group: III

Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
Fire Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.
C.P.S.C.: Not applicable

State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): Not Applicable
California Perchlorate Rule CCR Title 22 Chap 33:

Trade Secret Registry: Not applicable

National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not Applicable

16. OTHER INFORMATION

Intended Use: Laboratory Reagent

References: TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Technical Judgment. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labeling of Dangerous Substances, Amended July 1992. In-house information. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor).
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M01888

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #3
Catalog Number: 2797999

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M01888
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: May cause irritation.
Date of MSDS Preparation:
Day: 25
Month: August
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Ethylenediaminetetraacetic Acid, Disodium Salt
CAS No.: 6381-92-6
TSCA CAS Number: 139-33-3
Percent Range: < 55
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 2000 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

EDTA Tetrasodium Salt
CAS No.: 64-02-8
TSCA CAS Number: 64-02-8
Percent Range: < 55
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White crystals
Odor: None
MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 1
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: May cause irritiation
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: irritation of the mouth and esophagus calcium deficiency in the blood gastrointestinal irritation Very large doses may cause: kidney damage
Target Organs: Kidneys
Inhalation: May cause: irritation of nose and throat
Target Organs: None reported
Medical Conditions Aggravated: None reported
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with soap and plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Combustion generates toxic fumes.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable

Autoignition Temperature: Not determined
Hazardous Combustion Products: Toxic fumes of: sodium oxides carbon monoxide, carbon dioxide. nitrogen oxides.
Fire / Explosion Hazards: None reported
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Adjust to a pH between 6 and 9. Use sulfuric or citric acid to lower pH. Use soda ash or sodium bicarbonate to increase pH. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: a pound or more of loose powder is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: None

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Protect from: oxidizers heat moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: oxidizers heat moisture
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White crystals
Physical State: Solid
Molecular Weight: Not applicable
Odor: None
pH: Not determined

Vapor Pressure: Not determined
Vapor Density (air = 1): Not determined
Boiling Point: Not determined
Melting Point: Not determined
Specific Gravity (water = 1): Not determined
Evaporation Rate (water = 1): Not determined
Volatile Organic Compounds Content: Not determined
Partition Coefficient (n-octanol / water): Not determined
Solubility:
Water: Soluble
Acid: Soluble
Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Extreme temperatures Excess moisture
Reactivity / Incompatibility: May react violently in contact with: oxidizers
Hazardous Decomposition: Toxic fumes of: nitrogen oxides carbon dioxide carbon monoxide sodium oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: EDTA Tetrasodium Salt: Skin rabbit 500mg/24H, MODERATE; Eye rabbit 1900µg; Eye rabbit 100mg/24H, MODERATE.
Mutation Data: EDTA Disodium Salt: Cytogenetic analysis Hamster lung at 200mg/L.
Reproductive Effects Data: None reported
Ingredient Toxicological Data: EDTA Disodium Salt: Oral rat LD50 = 2000 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: EDTA Tetrasodium Salt: BOD 0.02 g/g; COD 0.54 g/g; Fish toxicity: Bluegill LC50 = 410 mg/l for 96 hours.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dilute material with excess water making a weaker than 5% solution. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.

NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).

TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Laboratory Reagent

References: TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Technical Judgment. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. In-house information. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor).

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00007

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #4
Catalog Number: 45429

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00007
Chemical Name: Sulfamic Acid
CAS No.: 5329-14-6
Chemical Formula: H_3NO_3S
Chemical Family: Inorganic Acid
Hazard: Causes eye burns.
Date of MSDS Preparation:
Day: 09
Month: July
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Other component
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: < 1.0
Percent Range Units: weight / weight
LD50: Not applicable
LC50: Not applicable
TLV: Not established
PEL: Not established
Hazard: Any ingredient(s) of this product listed as "Other component(s)" is not considered a health hazard to the user of this product.

Sulfamic Acid
CAS No.: 5329-14-6
TSCA CAS Number: 5329-14-6
Percent Range: > 99.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 3160 mg/kg.
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes eye burns.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White crystals
Odor: None
CAUSES EYE BURNS CAUSES SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 2
Flammability: 1
Reactivity: 1
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 2
Flammability: 1
Reactivity: 1
Symbol: Not applicable
Potential Health Effects:
Eye Contact: Causes eye burns.
Skin Contact: Causes severe irritation
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: irritation of the mouth and esophagus gastrointestinal irritation
Target Organs: None reported
Inhalation: May cause: irritation of nose and throat
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Eye conditions Skin conditions Respiratory conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: Not applicable
Toxicologically Synergistic Products: None reported

---

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Call physician immediately.
Ingestion (First Aid): Do not induce vomiting. Give 1-2 glasses of water. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: Remove to fresh air.

---

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, irritating and highly toxic gases may be generated by thermal decomposition.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:

Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: Toxic fumes of: ammonia nitrogen oxides. sulfur oxides.
Fire / Explosion Hazards: May react violently with: chlorine / chlorine compounds metal nitrates metal nitrites nitric acid
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Dry chemical. Water.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment. Cover spilled solid material with sand or other inert material.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: a pound or more of loose powder is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as RCRA hazardous waste.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Maintain general industrial hygiene practices when using this product.
Storage: Store away from: oxidizers alkalies chlorine/chlorinated metals Protect from: heat moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: alkalies metals Protect from: heat moisture
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White crystals
Physical State: Solid

Molecular Weight: 97.10
Odor: None
pH: 1% soln = 1.18
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Product decomposes at 205 °C; 401 °F
Specific Gravity (water = 1): 2.15
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): None reported
Solubility:
Water: 1:2 ratio @ 80 ° C (176 °F)
Acid: Soluble
Other: Slightly soluble in alcohol, methanol.
Metal Corrosivity:
Steel: 0.814 in/yr
Aluminum: 0.212 in/yr

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heating to decomposition. Excess moisture
Reactivity / Incompatibility: May react violently in contact with: chlorates metal nitrates metal nitrites nitric acid Incompatible with: alkalies oxidizers
Hazardous Decomposition: Heating to decomposition releases toxic and/or corrosive fumes of: ammonia nitrogen oxides sulfur oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: Oral rat LD50 = 3160 mg/kg.
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Skin Human 4%/5 days intermittent MILD, Skin rabbit 500 mg/24H SEVERE, Eye rabbit 20mg MODERATE, Eye rabbit 250µg/24H SEVERE.
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: --
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None

Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Sulphamic Acid
--
DOT Hazard Class: 8
DOT Subsidiary Risk: NA
DOT ID Number: UN2967
DOT Packing Group: III
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Sulphamic Acid
--
ICAO Hazard Class: 8
ICAO Subsidiary Risk: NA
ICAO ID Number: UN2967
ICAO Packing Group: III
I.M.O.:
I.M.O. Proper Shipping Name: Sulphamic Acid
--
I.M.O. Hazard Class: 8
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: UN2967
I.M.O. Packing Group: III
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.

Identification of Prop. 65 Ingredient(s): Not applicable
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: TSCA Listed: Yes
TSCA CAS Number: 5329-14-6

16. OTHER INFORMATION

Intended Use: Laboratory Reagent
References: Vendor Information. NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U.S. Department of Health and Human Services, April, 1987. Gosselin, R. E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. Outside Testing. Technical Judgment. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M01157

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Arsenic Reagent #5
Catalog Number: 2798199

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M01157
Chemical Name: Zinc
CAS No.: 7440-66-6
Chemical Formula: Zn
Chemical Family: Inorganic Metals
Hazard: Flammable solid. Finely divided dust may be flammable or explosive. May cause irritation.
Date of MSDS Preparation:
Day: 18
Month: December
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Zinc
CAS No.: 7440-66-6
TSCA CAS Number: 4770-66-6
Percent Range: > 99.0
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: 5 mg/m^3 (ZnO)
PEL: 5 mg/m^3 (ZnO)
Hazard: Flammable solid. Finely divided dust may be flammable or explosive. May cause irritation.

Impurities
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: < 1.0
Percent Range Units: weight / weight
LD50: None reported.
LC50: None reported.
TLV: Not established.
PEL: Not established.
Hazard: Not applicable

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Bluish-gray powder
Odor: None
MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION

FLAMMABLE SOLID DANGEROUS WHEN EXPOSED TO HEAT, FLAMES OR OXIDIZERS

HMIS:
Health: 1
Flammability: 1
Reactivity: 1
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 1
Reactivity: 1
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: Causes mild irritation
Skin Absorption: No effects anticipated
Target Organs: Not applicable
Ingestion: Very large doses may cause: thirst sweating gastrointestinal irritation abdominal pain
Target Organs: None reported
Inhalation: May cause: irritation of nose and throat coughing difficult breathing sweating
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Skin conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician if irritation develops.
Skin Contact (First Aid): Wash skin with plenty of water.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, irritating and highly toxic gases may be generated by thermal decomposition.
Flash Point: Not determined
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable

Autoignition Temperature: Not determined
Hazardous Combustion Products: zinc oxide
Fire / Explosion Hazards: Finely divided dust may form a flammable or explosive mixture with air. May form explosive mixtures with: oxidizers
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Sand or inert dry powder Do NOT use water.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Sweep up material. Dispose of material in an E.P.A. approved hazardous waste facility. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes Do not breathe dust. Wash thoroughly after handling. Use with adequate ventilation. Maintain general industrial hygiene practices when using this product.
Storage: Protect from: heat moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes Do not breathe: dust Wash thoroughly after handling. Use with adequate ventilation. Protect from: heat moisture
TLV: 5 mg/m^3 (ZnO)
PEL: 5 mg/m^3 (ZnO)

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Bluish-gray powder
Physical State: Solid
Molecular Weight: 65.37
Odor: None
pH: Not applicable
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: 907° C (1665° F)

Melting Point: 419° C (786° F)
Specific Gravity (water = 1): 7.14
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Insoluble
Acid: Soluble
Other: Soluble in alkali solutions
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heating to decomposition. Avoid creating dust.
Reactivity / Incompatibility: Incompatible with: Barium dioxide barium nitrate cadmium carbon disulfide chlorates chlorine fluorine hydroxylamine sulfur magnesium manganese chloride potassium chloride selenium
Hazardous Decomposition: Heating to decomposition releases: zinc oxide
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Skin human 300 µg/3D (Intermittent) - MILD
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: --
Not applicable

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
Not applicable

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dispose of material in an E.P.A. approved hazardous waste facility.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:

D.O.T. Proper Shipping Name: Zinc Powder

--

DOT Hazard Class: 4.3

DOT Subsidiary Risk: 4.2

DOT ID Number: UN1436

DOT Packing Group: III

I.C.A.O.:

I.C.A.O. Proper Shipping Name: Zinc Powder

--

ICAO Hazard Class: 4.3

ICAO Subsidiary Risk: 4.2

ICAO ID Number: UN1436

ICAO Packing Group: III

I.M.O.:

I.M.O. Proper Shipping Name: Zinc Powder

--

I.M.O. Hazard Class: 4.3

I.M.O. Subsidiary Risk: 4.2

I.M.O. ID Number: UN1436

I.M.O. Packing Group: III

Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard Fire Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product contains a chemical(s) subject to the reporting requirements of Section 313 of Title III of SARA.

Zinc

302 (EHS) TPQ (40 CFR 355): Not applicable

304 CERCLA RQ (40 CFR 302.4): Zinc 1000 lbs.

304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Not applicable

RCRA: Contains no RCRA regulated substances.

C.P.S.C.: Not applicable

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.

Identification of Prop. 65 Ingredient(s): None

Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: TSCA Listed: Yes

TSCA CAS Number: 4770-66-6

16. OTHER INFORMATION

Intended Use: Laboratory Reagent

References: Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. In-house information. Patty, Frank A. Industrial Hygiene and Toxicology, 3rd Revised Edition. Volume 2. New York: A Wiley-Interscience Publication, 1981. Prager, Jan C. Environmental Contaminants Reference Databook, Volumes I and II. Van Nostrand Reinhold Company, New York. Sax, N. Irving and Richard J. Lewis, Sr., revised by. Hawley's Condensed Chemical Dictionary, Eleventh Ed. New York: Van Nostrand Reinhold Co., 1987. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. Technical Judgment. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Vendor Information.

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

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ALCONOX MSDS

Section 1 : MANUFACTURER INFORMATION

Product name: Alconox

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/03/09

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
497-19-8	7-13	SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION 1200 MG/M3/2H MOUSE INHALATION
7722-88-5	10-30	TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE
7758-29-4	10-30	SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

Section 2A : ADDITIONAL INGREDIENT INFORMATION

Note: (supplier).
CAS# 497-19-8: LD50 4020 mg/kg - rat oral.
CAS# 7758-29-4: LD50 3100 mg/kg - rat oral.

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Solid

Appearance & odor: Almost odourless.
White granular powder.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): Not applicable.

Vapour density (air=1): Not applicable.

By weight: Not available.

Evaporation rate (butyl acetate = 1): Not applicable.

Boiling point (°C): Not applicable.

Freezing point (°C): Not applicable.

pH: (1% aqueous solution).
9.5

Specific gravity @ 20 °C: (water = 1).
0.85 - 1.10

Solubility in water (%): 100 - > 10% w/w

Coefficient of water\oil dist.: Not available.

VOC: None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.

Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Not available.

Sensitivity to mechanical impact: Not applicable.

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Rate of burning: Not available.

Explosive power: None

Section 5 : REACTIVITY DATA

Chemical stability: Stable under normal conditions.

Conditions of instability: None known.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids.
Strong oxidizers.

Hazardous decomposition products: See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of Acute Exposure

Eye contact: May cause irritation.

Skin contact: Prolonged contact may cause irritation.

Inhalation: Airborne particles may cause irritation.

Ingestion: May cause vomiting and diarrhea.
May cause abdominal pain.
May cause gastric distress.

Effects of chronic exposure: Contains an ingredient which may be corrosive.

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available for mixture, see the ingredients section.

Exposure limit of material: Not available for mixture, see the ingredients section.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Medical conditions aggravated by exposure: Not available.

First Aid

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
Seek medical attention if symptoms persist.

Ingestion: Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.
Do not induce vomiting, seek immediate medical attention.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak/Spill: Contain the spill.
Recover uncontaminated material for re-use.
Wear appropriate protective equipment.
Contaminated material should be swept or shoveled into appropriate waste container for disposal.

Waste disposal: In accordance with municipal, provincial and federal regulations.

Handling procedures and equipment: Protect against physical damage.
Avoid breathing dust.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Launder contaminated clothing prior to reuse.

Storage requirements: Keep containers closed when not in use.
Store away from strong acids or oxidizers.
Store in a cool, dry and well ventilated area.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves/Type:



Neoprene or rubber gloves.

Respiratory/Type:



If exposure limit is exceeded, wear a NIOSH approved respirator.

Eye/Type:



Safety glasses with side-shields.

Footwear/Type: Safety shoes per local regulations.

Clothing/Type: As required to prevent skin contact.

Other/Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

Material Safety Data Sheet

Nitric acid, 20-70%

ACC# 16550

Section 1 - Chemical Product and Company Identification

MSDS Name: Nitric acid, 20-70%
Catalog Numbers: AC124660000, AC124660010, AC124660011, AC124660025, AC124660026, AC124665000, AC124665001, AC133620000, AC133620010, AC133620011, AC133620025, AC133620026, AC424000000, AC424000025, AC424000026, AC424000250, AC424005000, AC424005001, AC613205000, A198C-212, A198C4X-212, A200-212, A200-500, A200-500LC, A200-612GAL, A200212LC, A200C-212, A200C212EA, A200C212LC, A200C4X-212, A200C4X212L, A200S-212, A200S-500, A200S212LC, A200SI-212, A206C-212, A206C4X-212, A467-1, A467-2, A467-250, A467-500, A483-212, A509-212, A509-212LC, A509-500, A509SK-212, A509SK-212LC, MCC-030822, NC9596579, S719721, S71972SC
Synonyms: Azotic acid; Engraver's acid; Aqua fortis.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7732-18-5	Water	30-80	231-791-2
7697-37-2	Nitric acid	20-70	231-714-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear to yellow liquid.
Danger! May be fatal if inhaled. Causes severe eye and skin burns. Causes severe respiratory and digestive tract burns. Strong oxidizer. Contact with other material may cause a fire. Acute pulmonary edema or chronic obstructive lung disease may occur from inhalation of the vapors of nitric acid. Corrosive to metal.
Target Organs: Lungs, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Causes severe eye burns. Direct contact with liquid may cause blindness or permanent eye damage.
Skin: Causes skin burns. May cause deep, penetrating ulcers of the skin. Concentrated nitric acid dyes human skin yellow on contact.

Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the digestive tract. May cause systemic effects.
Inhalation: Effects may be delayed. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause acute pulmonary edema, asphyxia, chemical pneumonitis, and upper airway obstruction caused by edema. Depending on the conditions, the vapor or fumes of nitric acid may actually be a mixture of nitric acid and various oxides of nitrogen. The composition may vary with temperature, humidity, and contact with other organic materials.
Chronic: Exposure to high concentrations of nitric acid vapor may cause pneuomonitis and pulmonary edema which may be fatal. Symptoms may or may not be delayed. Continued exposure to the vapor & mist of nitric acid may result in a chronic bronchitis, & more severe exposure results in a chemical pneumonitis. The vapor & mists of nitric acid may erode the teeth, particularly affecting the canines & incisors.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Strong oxidizer. Contact with other material may cause fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. May react with metal surfaces to form flammable and explosive hydrogen gas. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 4; Flammability: 0; Instability: 0; Special Hazard: OX

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as sawdust. Provide ventilation. Evacuate unnecessary personnel. Approach spill from upwind. Use water spray to cool and disperse vapors and protect personnel.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not breathe dust, mist, or vapor. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Avoid contact with clothing and other combustible materials. Discard contaminated shoes. Do not use with metal spatula or other metal items. Use only with adequate ventilation or respiratory protection.
Storage: Do not store near combustible materials. Do not store in direct sunlight. Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Store away from alkalies. Separate from organic materials. Inspect periodically for damage or evidence of leaks or corrosion.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use a corrosion-resistant ventilation system.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Water	none listed	none listed	none listed
Nitric acid	2 ppm TWA; 4 ppm STEL	2 ppm TWA; 5 mg/m3 TWA 25 ppm IDLH	2 ppm TWA; 5 mg/m3 TWA

OSHA Vacated PELs: Water: No OSHA Vacated PELs are listed for this chemical. Nitric acid: 2 ppm TWA; 5 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles and face shield.
Skin: Wear butyl rubber gloves, apron, and/or clothing.
Clothing: Wear appropriate clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear to yellow
Odor: strong odor - acrid odor - suffocating odor
pH: 1.0 (0.1M soln)

Vapor Pressure: 51 mm Hg @ 25 deg C
Vapor Density: 2.17 (air=1)
Evaporation Rate: Not available.
Viscosity: 0.761 cps @ 25 deg C
Boiling Point: 86 deg C
Freezing/Melting Point:-42 deg C
Decomposition Temperature: Not available.
Solubility: Soluble in water.
Specific Gravity/Density:1.4
Molecular Formula:HNO3
Molecular Weight:63.01

Section 10 - Stability and Reactivity

Chemical Stability: Stable. Decomposes when in contact with air, light, or organic matter. The yellow color is due to release of nitrogen dioxide on exposure to light.
Conditions to Avoid: High temperatures, light, confined spaces.
Incompatibilities with Other Materials: Metals, reducing agents, strong bases, acetic acid, alcohols, acetone, aniline, hydrogen sulfide, metal powders, carbides, aldehydes, organic solvents, combustible materials, chromic acid, flammable liquids, cyanides, sulfides, Incompatible with many substances.
Hazardous Decomposition Products: Nitrogen oxides.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7732-18-5: ZC0110000
CAS# 7697-37-2: QU5775000; QU5900000
LD50/LC50:
CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
.

CAS# 7697-37-2:
Inhalation, rat: LC50 = 260 mg/m3/30M;
Inhalation, rat: LC50 = 130 mg/m3/4H;
Inhalation, rat: LC50 = 67 ppm(NO2)/4H;
.

Carcinogenicity:
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7697-37-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: Terrestial: During transport through the soil, nitric acid will dissolve some of the soil material, in particular, the carbonate based materials. The acid will be neutralized to some degree with adsorption of the proton also occurring on clay materials. However, significant amounts of acid are expected to remain for transport down toward the ground water table. Upon reaching the ground water table, the acid will continue to move, now in the direction of the ground water flow.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NITRIC ACID	NITRIC ACID
Hazard Class:	8	8
UN Number:	UN2031	UN2031
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7732-18-5 is listed on the TSCA inventory.
CAS# 7697-37-2 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 7697-37-2: 1000 lb final RQ; 454 kg final RQ
SARA Section 302 Extremely Hazardous Substances

CAS# 7697-37-2: 1000 lb TPQ

SARA Codes

CAS # 7697-37-2: immediate, delayed, fire.

Section 313

This material contains Nitric acid (CAS# 7697-37-2, 20-70%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7697-37-2 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 7697-37-2 is considered highly hazardous by OSHA.

STATE

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 7697-37-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 35 Causes severe burns.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36 Wear suitable protective clothing.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 7732-18-5: No information available.
CAS# 7697-37-2: 1

Canada - DSL/NDSL

CAS# 7732-18-5 is listed on Canada's DSL List.
CAS# 7697-37-2 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E, C, D1A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7697-37-2 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/30/1998
Revision #16 Date: 2/11/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix B
Sampling and Analysis Plan/ Quality Assurance Project Plan

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List of Abbreviations and Acronyms

Acronym/ Abbreviation	Definition
bgs	Below ground surface
CAP	Cleanup Action Plan
CMP	Compliance Monitoring Plan
Consent Decree	Consent Decree No. 08-210610-7
Database	Floyd|Snider Environmental Database
DQI	data quality indicator
DQO	data quality objective
DTW	depth to water
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EIM	Environmental Information Management
GPS	global positioning system
GRWP	Groundwater Remediation Work Plan
HASP	Health and Safety Plan
IDW	investigation-derived waste
Landfill	B&L Landfill
MQO	Measurement Quality Objective
MRL	method reporting limit
MTCA	Model Toxics Control Act
NAD 83/91	North American Datum of 1983/1991
NAVD 88	North American Vertical Datum of 1988
OMMP	Operations Maintenance and Monitoring Plan
ORP	oxidation-reduction potential
PARCC	precision, accuracy, representativeness, completeness, and comparability
PPE	personal protective equipment
PQL	Practical Quantitation Limit
QA	quality assurance
QC	quality control
RPD	relative percent difference
SAP/QAPP	Sampling and Analysis Plan/Quality Assurance Project Plan
Site	B&L Woodwaste Site

Acronym/ Abbreviation	Definition
SPT	standard penetration test
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

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1.0 Introduction

This Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) has been prepared to support implementation of the Operations Maintenance and Monitoring Plan (OMMP) compliance monitoring for the B&L Woodwaste Site (Site). The Cleanup Action Plan (CAP) is being implemented pursuant to Consent Decree No. 08-210610-7 (Consent Decree). This SAP/QAPP has been prepared in accordance with Model Toxics Control Act (MTCA) Washington Administrative Code (WAC) 173-340-820 and Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (Ecology 2004).

The SAP/QAPP has been prepared to meet compliance monitoring requirements described under WAC 173-340-410 and other monitoring requirements as described in the Compliance Monitoring Plan (CMP; Appendix B to the OMMP). The SAP/QAPP is intended to meet the monitoring requirements of Phase 3 of the remedy implementation described in the CMP by continuing to verify plume stability and trends during the years while the remedy is implemented. This SAP/QAPP may be modified or amended to address changes in sampling needs in future phases of the project.

The SAP/QAPP has been organized to serve as a reference for field personnel collecting data under the Consent Decree. Individual work plans present details regarding collection of samples from environmental media. This SAP/QAPP includes procedures for activities beyond sample collection, including the following:

- Sample handling
- Handling of investigation-derived waste (IDW)
- Monitoring well and piezometer installation (refer to Attachment A2.1)
- Well development (refer to Attachment A2.2)
- Monitoring
- Lithologic logging (refer to Attachment A2.3)
- Decontamination for drilling, well installation, and monitoring
- Obtaining water-level measurements

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2.0 Groundwater and Surface Water Level Monitoring

Static water level elevations will be measured in monitoring wells and surface water monitoring locations selected for sampling at the Site during each sampling event (refer to the CMP, Appendix B to the OMMP). Nested wells completed at different depths must be measured within 5 minutes of each other so that hydraulic heads can be compared.

An electronic water level indicator is used to measure the depth to water (DTW) to the nearest 0.01 foot. The water level indicator should be decontaminated prior to use by washing the probe and the first 20 to 30 feet of cable in a solution of Liquinox® (or equivalent) and potable water, then rinsing with distilled water.

Nitrile gloves (or chemically protective equivalent) should be worn when unlocking and opening the protective well casing. A clean, unused pair of nitrile gloves must be donned prior to measuring the water level in order to avoid contaminating the well or water level indicator. The DTW is measured from a marked measuring point of known elevation to the static water level inside the well casing. For unmarked wells and piezometers, the default measuring point is on the north side of the well casing.

The DTW measurement must be recorded to the nearest 0.01 foot along with the date and time (to the nearest minute) in the field book or field sampling sheet. Any notable well maintenance issues should be recorded so that these issues can be evaluated and addressed as warranted. After recording the DTW, the protective well casing must be locked, and the used gloves discarded with other IDW generated during the monitoring event.

For surface water monitoring locations, the water level elevation will be determined relative to the staff gauges. The surface water elevation will be measured to the nearest 0.01 foot according to the elevation marks on the gauge, which must be surveyed for elevation relative to the project datum. The water level elevation measurement must be recorded to the nearest 0.01 foot along with the date and time (to the nearest minute) in the field logbook. Any notable staff gauge maintenance issues should be recorded in the field logbook so that these issues can be evaluated and addressed as warranted.

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3.0 Groundwater and Surface Water Sampling

Groundwater samples will be collected from specific Upper Sand Aquifer and Lower Sand Aquifer monitoring wells at the Site to fulfill monitoring requirements under the CMP, data collection activities under the Consent Decree, and other studies used to characterize site conditions. Surface water samples will be collected from specific sampling locations (outlined in the CMP) in the ditch system adjacent the B&L Landfill (Landfill) and in the Wetlands. Greater detail about selected analytes, method reporting limits, and sample collection and handling are provided in this SAP/QAPP and apply to routine monitoring events, such as groundwater and surface water sampling described in the CMP, subsequent monitoring plans, and other site characterization activities.

3.1 GROUNDWATER MONITORING WELL SAMPLING PROCEDURES

Groundwater sampling at the Site consists of static water level measurement, well purging, field parameter measurements, documentation, sample collection and handling, and sample identification. Procedures for each of these groundwater sampling steps are presented in the following sections.

3.1.1 Static Water Level Measurement

The DTW of each well will be measured prior to sampling to provide potentiometric surface elevation information. The procedures for measuring DTW are described in Section 2.0, Groundwater Level Monitoring.

3.1.2 Low-flow Groundwater Purging Procedures

The well should be purged, using a peristaltic pump, at a pumping rate that will not cause excessive drawdown. The purging rate should be controlled as needed using the pump's variable speed flow controller. Monitoring well water levels should be measured approximately every 5 minutes during purging to determine if the drawdown is more than 0.3 feet relative to the pre-purging static water level. The pumping rate should cause less than 0.3 feet of water level drawdown, and the drawdown should stabilize during purging (i.e., drawdown should not increase during purging). Water level measurements should be recorded in the field book or field sampling sheet along with field parameter measurements, as described below. A field sampling sheet is included as Attachment B.1.

The following purging procedures will be followed during sampling:

1. Check static water level as previously discussed. Record measurements and calculations in the field book or field sampling sheet.
2. Document any observable features of the purge water, such as color, odor, or sheen in the field book or field sampling sheet during well evacuation.
3. Remove purge water from each well using a peristaltic pump with clean and unused tubing, dedicated bladder pump, dedicated submersible sample pump, or other suitable variable speed sampling pump. Tubing for peristaltic pumps should be

disposed of after use. Record purge start and stop times in the field book or field sampling sheet.

4. Measure purge water volume in graduated 5-gallon buckets and then transfer the purge water from the buckets to a waste tank for temporary storage until it is disposed of in accordance with applicable regulations. Refer to Section 3.7 for IDW handling procedures. Record the total purge volume in the field book or field sampling sheet.

It may not be possible to meet stabilization criteria (described below) before evacuating low-yield wells to dryness. To the extent possible, wells will not be purged to dryness. When purging monitor wells of this type, the following procedures should be used as a guide.

If the purge process results in a dry well, evacuate the well to dryness only once (one well casing volume). Any water entering the well after purging to dryness is representative formation water and may be sampled within 24 hours without further purging. Samples may be collected at that well upon sufficient recovery, which is defined as water level recovery to at least 80 percent of the original static water level prior to purging. If the purging process does not result in a dry well after one casing volume, attempt to achieve field parameter stabilization as described in the following section.

At no time should the well be purged to dryness if the recharge rate causes formation water to cascade vigorously down the sides of the well screen. Cascading is likely to occur if the well is purged to dryness and the water level fully recovers within several minutes. If this happens, decrease the purging rate.

Wells in which the static water level is at or below the bottom of the well screen will be considered as dry and will not be purged and sampled.

3.1.3 Field Parameter Measurements

Purge water will be discharged through a flow cell for field parameter measurements and will be collected contained in graduated 5-gallon buckets or equivalent during purging, as described above. Temperature, pH, specific conductance, dissolved oxygen, and oxidation-reduction potential (ORP) will be measured approximately every 5 minutes and the units recorded for each parameter. Additional parameters, such as turbidity, may also be measured if instrumentation is available. When field parameters have stabilized for a minimum of three consecutive measurements, the well is considered to contain representative formation water, and no further purging is required. Stabilization criteria are:

- pH ± 0.1 pH units
- Specific conductance ± 3 percent
- Temperature ± 0.1 ^{o}C

When the stabilization criteria have been met, the water in the well casing is considered stabilized and sample collection can begin. The total volume of water purged from each well will be recorded in the field book or field sampling sheet.

If the field parameters do not meet the stabilization criteria, purging should continue until stabilization is obtained or 30 minutes have elapsed. If a well is purged for 30 minutes and more than one casing volume has been removed, the well will be sampled. If well yield is extremely low, it may be necessary to purge the well for more than 30 minutes, or to purge to dryness, and return later to collect the groundwater sample. Refer to Section 3.1.2 for low-yield well purging procedures.

3.1.4 Low-flow Groundwater Sample Collection

Samples will be collected immediately after purging is completed. The time of sample collection should be recorded and marked on the sample label and the field book or field sampling sheet. If two or more bottles from the same well are filled consecutively and without interruption, the bottles may be labeled with the same sampling time. Additional samples will be collected for field and laboratory quality assurance (QA)/quality control (QC), as described in Section 3.4.

Groundwater samples will be collected into laboratory-cleaned, pre-labeled sample bottles. Samples collected for dissolved arsenic or other metals will be field-filtered by affixing a clean, unused 0.45 µm in-line field filter to the end of sample tubing, using clean, disposable silicone tubing. Field filters will be disposed of after each use.

For wells with slow recovery rates, samples should be collected after the well has been purged of all water and water level recovery has achieved at least 80 percent of the static water level prior to purging, as described above. Aliquots for non-volatile (e.g., arsenic or metals) analyses may be collected on subsequent visits to the well and may be partially filled on each visit. No further purging will be necessary if the well is sampled within 24 hours of purging or pumping to dryness during sampling. If insufficient recovery occurs within 24 hours, no sample will be collected as part of the sampling event.

3.1.5 Groundwater and Surface Water Sample Containers, Preservation, and Handling

The analytical methods, reporting limits, sample containers, preservatives, and other sample collection and handling information for routine monitoring analytes are provided in Table B.1. The analytes present in this table apply to on-going monitoring events, such as sampling described in the CMP and other site-specific characterization studies. Additional information regarding specific project sample collection and handling needs will be addressed in project-specific work plans.

The laboratory will, in general, provide sample bottles with appropriate preservatives. Preserved bottles will be pre-labeled and identified as "preserved" in order to distinguish them from non-preserved bottles. During sampling, the personal protective equipment (PPE) specified in the Health and Safety Plan (HASP) will be worn whenever collecting samples and handling sample bottles, especially those containing preservatives.

The temperatures of samples will be controlled to comply with analytical method and laboratory procedures. Samples are typically cooled using coolers with bags of ice or refreezable cooler packs. Sample bottles are to be placed in iced coolers immediately after collection and labeling. Refer to Section 4.3 for Packaging procedures.

3.2 DIRECT-PUSH GROUNDWATER (RETRACTABLE SCREEN) SAMPLING PROCEDURES

The procedure for direct-push groundwater sampling consists of selecting the sample interval depth, placing the sampler at the target depth, purging, and collecting a groundwater sample through the temporary well point. General procedures are provided here for these steps; more specific requirements may be established by individual work plans.

Sample depth intervals are determined in the field after core samples have been logged. This step allows the field geologist or engineer to confirm the depth of important contacts between hydrostratigraphic units and identify water-bearing or contaminant zones of interest.

The pre-cleaned groundwater sampler is then advanced in a separate boring, located approximately 2 to 5 feet away from the soil boring, to avoid disturbed samples. If multiple discrete depth intervals are to be sampled, this second groundwater sampling boring may be used repeatedly, provided that groundwater intervals are sampled from shallowest to deepest.

A 3- or 4-foot stainless steel, retractable screen is driven to the target depth and retracted by the drilling operator, exposing the screened section to groundwater at that depth interval. The field personnel should confirm that the screen is exposed at the target interval by observing that the length of rod retracted is equivalent to the length of the screen and that retraction does not cause control rods to be pulled upward. Movement of control rods during retraction of drilling rods, or retraction of drilling rods in excess of the length of the sampler, indicates that the screen has not opened properly and the target depth is not properly exposed. If the sampler tip is withdrawn to more than 1 foot above the bottom of the targeted depth interval, the drill tooling should be withdrawn and re-driven to the target depth in a new boring location located 2 to 5 feet away.

Groundwater will be sampled through the drilling rods using clean, unused polyethylene tubing and a peristaltic pump. The field personnel should observe this process to ensure that tubing is advancing to a depth at the approximate mid-point of the retractable screen. Enough water will be purged to remove the highly turbid water containing sand that is initially extracted and may quickly clog a 0.45 µm field filter; this volume is typically less than 1 gallon. Purge water will be collected in buckets and managed according to the procedures for IDW in this SAP/QAPP. Retractable screen groundwater samples will be field-filtered into appropriately preserved containers and identified and handled according to the procedures in this SAP/QAPP. Equipment rinsate blank samples will be collected during retractable screen sampling as described in Section 3.4.2.

3.3 SURFACE WATER SAMPLING PROCEDURES

Surface water sampling consists of sample collection, documentation, sample identification, sample collection, and handling. Procedures for surface water sample collection are described in this section.

Surface water will be sampled using methods that obtain representative samples. Peristaltic pumps with clean, unused tubing will be employed to pump surface water directly from the surface water body. Tubing will be lowered into the water body without disturbing underlying sediment or aquatic plants, and the tip of the tubing will be maintained below the water surface

using appropriate measures that do not contaminate the sample. For example, tubing may be attached to a float that keeps the tubing tip submerged.

Surface water samples will be collected into new, pre-labeled sample bottles. Samples collected for dissolved arsenic or dissolved metals will be field-filtered by affixing a 0.45 µm in-line field filter to the end of sample tubing using unused, disposable silicone tubing. Samples collected for analytes for which minimizing aeration is not a concern may also be filtered through a coarse filter to remove sediment, plant material, and debris.

A brief description of the conditions at the sampling location should be noted on the field book or field sampling sheet (e.g., turbidity of the water, floating vegetation, access-related issues, etc.). The time of sample collection should be recorded and marked on the sample label; if two or more bottles from the same well are filled consecutively and without interruption, the bottles may be labeled with the same sampling time. Additional samples will be collected for field and laboratory QA/QC as described in Section 3.4.

3.4 GROUNDWATER AND SURFACE WATER QUALITY CONTROL SAMPLES

The QA/QC samples will be collected to evaluate field and laboratory precision and potential matrix interferences. Field duplicate samples will be the only types of QC samples included as part of the field QC program for routine monitoring. Equipment rinsate blank samples will not be obtained during groundwater well sampling and surface water sampling because groundwater and surface water sampling equipment will be either dedicated or single-use devices disposed of after use. Equipment rinsate blank samples will be collected during direct-push, retractable screen groundwater sampling.

3.4.1 Field Duplicate Samples

Laboratory and field sampling precision will be evaluated by collecting laboratory-blind field duplicate samples. Field duplicates will be collected at a frequency of approximately 10 percent or a fraction thereof of the total number of sample locations per sampling event, exclusive of other QC samples. Field duplicate samples will be collected under conditions as identical as reasonably possible to the original sample. Field duplicate samples will be labeled as noted in Section 3.5.

3.4.2 Equipment Rinsate Blank Samples

For direct-push, retractable screen groundwater sampling, a field equipment rinsate blank will be collected at a frequency of approximately 5 percent or 1 per 20 groundwater samples to evaluate the effectiveness of groundwater sampling equipment decontamination procedures and the potential for equipment cross-contamination.

Rinsate blanks will consist of distilled or deionized water passed over and/or through decontaminated sampling equipment. The equipment surface exposed during sampling collection will be rinsed with the deionized water, which will be collected in the appropriate sample containers (refer to Table B.1). As indicated above, field equipment rinsate blanks will not be collected when using dedicated or disposable field equipment at wells and surface water sampling stations.

3.5 GROUNDWATER AND SURFACE WATER SAMPLE IDENTIFICATION

Sample labels will be affixed to containers prior to sample collection and will contain the specific information as described below. Labels will use the following system for designation.

BLW-GW - ###A-F

Or

BLW-SW - ##-F

Where:

BLW Identifies the sample as originating from the Site.

GW Identifies the sample as groundwater.

SW Identifies the sample as surface water.

##A Identifies the monitoring well number (e.g., 10B or 103A). Use upper case letters without parentheses for aquifer designation (e.g., A or U for Upper Sand Aquifer, B or L for Lower Sand Aquifer).

Identifies the surface water sampling location number (e.g., 06).

F Indicates the sample was field-filtered; no F indicates the sample was not field-filtered.

For direct-push, retractable screen groundwater samples, a similar convention will be used as for groundwater samples from monitoring wells.

BLW-D# - ####-##

Where:

BLW Identifies the sample as originating from the Site.

D# Identifies the sample as groundwater from a direct-push boring with a 3 or 4-foot screened interval

Identifies the direct-push boring number (for example, SB151).

Identifies the bottom of the depth interval in feet below ground surface (bgs).In addition to the sample identification, spaces are also provided on the sample identification label to record the following information at the time of actual sample collection:

- Initials of personnel collecting samples
- Date and time of sample collection to the nearest minute (record the initial sample start time if all aliquots are collected consecutively)
- Requested analyses

A fictitious identification number consistent with the numbering system described above will be assigned to the two types of QA/QC samples (field duplicate and trip blank samples) using the following sample number ranges.

QA/QC Sample Type	Sample Number Range
Field duplicate	170–179
Trip blank	180–189
Rinsate blank	190–199

3.6 SAMPLING AND DRILLING EQUIPMENT DECONTAMINATION

For routine monitoring events, sampling equipment used at the Site is either dedicated or single-use, disposable equipment, and requires no decontamination. Direct-push retractable screen groundwater sample collection is the primary groundwater sampling exception. Water level indicator decontamination procedures are described in Section 2.0 and repeated here to provide a complete reference. Decontamination procedures for site drilling activities are also provided below.

3.6.1 Water Level Indicator Probes

Water level indicators shall be decontaminated prior to use (at each location) by washing the probe and the first 20 to 30 feet of cable in a solution of Liquinox® (or equivalent) and potable water, then rinsing with distilled or deionized water.

3.6.2 Subsurface Drill Tools

Drilling rods, auger flights, and all other drilling tools that are advanced into the subsurface will be decontaminated by steam cleaning prior to the start of drilling and after the completion of drilling and well installation activities for each drill rig and prior to leaving the Site. In addition, decontamination by steam cleaning will be conducted in the following circumstances:

- **Monitoring well installation.** Drilling tools will be decontaminated by steam cleaning prior to the start of drilling where monitoring wells are installed that may be sampled for water quality parameters, including all compliance monitoring wells, permanent compliance monitoring wells, pumping wells, and observation wells installed for tests involving sampling of water quality. For piezometers and observation wells that are not intended for water quality sampling, such as

piezometers located far from impacted areas, steam cleaning is not required prior to drilling, provided the other conditions described in this sub-section have been met.

- **Soil sampling.** Where soil borings are advanced for the purposes of collecting one or more soil samples for chemical analysis, drill rods and the sampler will be decontaminated by steam-cleaning prior to advancing the soil boring. The exception to this condition is the collection of soil samples for chemical analysis using soil samplers driven ahead of auger flights, for example, sampling using a standard penetration test (SPT) split spoon during hollow-stem auger drilling. In such cases, soil samplers will be decontaminated by washing with a solution of Liquinox® (or equivalent) and potable water.
- **Movement from impacted areas to less-impacted areas.** In the event that a drill rig moves from a heavily impacted area (e.g., within the limits of woodwaste or the wetlands plume hotspot) to a less-impacted or non-impacted area (e.g., the End-of-Plume area or any area outside the arsenic plume), all rig components potentially contacting soil will be decontaminated using steam cleaning. Decontamination will not be employed when a drill rig moves within a given impacted area, such as within the limits of woodwaste, the landfill perimeter area, halo areas, within the wetlands plume hotspot area, or within the End-of-Plume area.

Additional decontamination activities may be required at the discretion of the field personnel. Decontamination wash water should be disposed of in accordance with procedures for handling IDW, as described in Section 3.7.

3.6.3 Direct-push Retractable Screen Groundwater Samples

In addition to steam-cleaning prior to the start of drilling and other conditions described above, all groundwater sampling screens will be decontaminated in the field prior to driving the screen into the subsurface. Screens will be washed in a solution of Liquinox® (or equivalent) and potable water, including scrubbing until visibly free of grit, and then rinsed with distilled water (or potable water followed by distilled water). Field personnel will observe drilling subcontractors to make sure the decontamination procedure is acceptable, and to collect equipment rinsate blank samples as a quality control check on the procedure, as described previously in this SAP/QAPP. Decontamination wash water should be disposed of in accordance with procedures for handling IDW, as described in Section 3.7.

3.7 INVESTIGATION-DERIVED WASTE HANDLING AND DISPOSAL

Waste derived will be managed and disposed of in accordance with applicable waste management regulations. Investigation-derived waste includes the following liquids and solids:

- Purge water
- Decontamination wash water
- Soil drill cuttings, including non-soil debris that may be removed from the subsurface during drilling
- Storage tank sludge
- Soil and groundwater samples that are not submitted to a laboratory for analysis

- Disposable materials used during field work that are impacted by landfill waste, contaminated groundwater, or decontamination wash water (e.g., disposable PPE, used filters, plastic sheeting, paper towels, tubing, etc.)

The approach to handling and disposal of these materials is described in the following sections. For IDW that is containerized, 55-gallon drums approved by Washington State Department of Transportation will be used for temporary storage pending disposal or on-site treatment. Each container containing IDW will be sealed and labeled as to its contents (e.g., "soil cuttings"), the dates on which the wastes were placed in the container, the company name and contact information of the field person generating the waste, the site name, and the boring(s) or well(s) from which they were obtained or extracted. At the end of each day, the drums will be transferred to a designated temporary storage area. This waste will be managed in accordance with applicable regulations and standards. Containerized IDW within drums will be characterized relative to dangerous waste criteria in accordance with the procedures described below. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used as appropriate for disposal of dangerous waste, if any.

3.7.1 Purge Water, Well Development Water, and Pumping Test Water

Unless established to be in compliance with site cleanup levels, purge water produced during groundwater sampling will be assumed to be contaminated with arsenic and other leachate constituents and will be containerized and disposed of off-site, treated on-site for discharge, or temporarily stored on-site prior to off-site disposal or on-site treatment. When available, analytical results from well samples will be used to characterize purge water; otherwise characterization samples will be collected from the container for waste characterization. For locations where water quality has been established to be less than detection limits (e.g., upgradient monitoring wells), purge water will be discharged to the ground for infiltration.

Well development water and pumping test water will be containerized and characterized through analytical results from the source well. Containers with water containing arsenic at concentrations greater than site cleanup levels will be disposed of off-site, treated on-site for discharge, or temporarily stored on-site prior to off-site disposal or on-site treatment. Water with concentrations less than site cleanup levels will be discharged to the ground for infiltration.

3.7.2 Storage Tank Sludge

Impacted site groundwater stored in containers on-site has previously been observed to precipitate arsenic and iron into a sludge that settles to the bottom of a tank. If analytical sampling confirms that stored water concentrations are at an acceptable concentration of arsenic and other applicable constituents, the water may be discharged to the ground for infiltration. The remaining sludge will be retained for characterization and disposal as described below for soil cuttings.

3.7.3 Decontamination Water

Decontamination wash and rinse water generated by field personnel, drillers, or subcontractors will be assumed to be contaminated with arsenic and other leachate constituents and will be

containerized and disposed of off-site, treated on-site and discharged, or temporarily stored on-site prior to off-site disposal or on-site treatment. Water generated during the cleaning out of tanks containing contaminated water or sludge will be considered decontamination water.

3.7.4 Soil Cuttings

In areas where it is known that soil has not been impacted, soil cuttings will be placed on the ground surface. In areas where soil is known to have been impacted, soil cuttings will be containerized and characterized through chemical analysis of representative samples. Soil cuttings with concentrations less than site cleanup levels (regional background for arsenic) will be placed on the ground surface. Soil cuttings with concentrations greater than site cleanup levels will be transported off-site for disposal. Soil cuttings produced at properties where access agreements prohibit leaving soils at the ground surface will be transported to the B&L Property and placed on the surface if concentrations are less than site cleanup levels; if concentrations exceed cleanup levels, the soil will be characterized for disposal, containerized, and transported off-site for disposal.

3.7.5 Soil and Groundwater Samples Not Analyzed

Soil and groundwater samples that are not submitted for analysis will be combined with containerized soil and groundwater for off-site disposal, on-site treatment, or temporary storage prior to off-site disposal or on-site treatment.

3.7.6 Impacted Disposables

Disposable materials generated during field work will be combined with containerized soil for off-site disposal when impacted by waste, contaminated groundwater, or decontamination wash water. Disposable materials that have not contacted waste, contaminated soil, or contaminated groundwater, or do not contain significant volumes of contaminant (e.g., nitrile gloves, empty tubing) may be disposed of as conventional refuse at the discretion of the field personnel.

3.8 LOCATION CONTROL

Soil boring locations will be surveyed by field personnel using a sub-meter global positioning system (GPS) unit or standard survey methods. Locations may be surveyed during investigation, prior to decommissioning of the boring location, or at the completion of the field event. This information will be used to meet Washington State Department of Ecology (Ecology) Environmental Information Management (EIM) system data submission requirements, in addition to rendering locations on figures or revisiting soil boring locations.

Monitoring wells, piezometers, extraction wells, staff gauges, and other relevant sampling or measurement locations will be surveyed by a licensed survey for elevation and X/Y coordinates, as needed, depending on the purpose of the well or location.

4.0 Sample Documentation and Delivery

4.1 SAMPLE DOCUMENTATION

Information for each sampling location that will be documented in sampling field books or field sheets includes:

- project name and location
- sampling personnel
- equipment calibration (at least once per day)
- equipment decontamination steps (if not dedicated or single use)
- weather conditions
- static water level
- purging start/stop times
- field parameters
- purge volume
- sample times
- physical sample characteristics (color, sheen, odor)

Additional information that should be recorded in field books and field sampling sheets, if available, includes:

- unusual circumstances that affect data interpretation
- well condition (if noteworthy)
- comments regarding well yield and use of low-yield sampling methods
- repairs made to well or sampling equipment
- health and safety monitoring data (if required)
- identification of any split samples provided during monitoring events
- visitors to the Site, including arrival and departure times

4.2 SAMPLE CHAIN OF CUSTODY

The management of samples collected in the field must follow specific procedures to ensure sample integrity. The possession of samples must be traceable from the time they are collected through the time they are analyzed by the contract laboratory.

Chain-of-custody protocol for the project is defined by the following criteria:

- The sample is in a person's possession or in his/her view after being in his/her possession.

- The sample was in a person's possession and was locked up or transferred to a designated secure area by him/her, or otherwise sealed so that any tampering would be evident.

Samples will be logged onto a chain-of-custody form after they are collected and before leaving the Site. Each time the sample bottles or samples change hands (i.e., custody) both the person relinquishing custody and the person receiving custody will sign and date the chain-of-custody form. When a sample shipment is delivered to the laboratory, the samples must be relinquished to a representative of the laboratory. The top signature copy of the signed chain-of-custody form will be retained by the laboratory. The second copy of the chain-of-custody form will be retained by the person relinquishing custody and will be added to the project file. A chain-of-custody record will be completed for each sampling event or sample shipment.

The following information is included in the chain-of-custody form:

- Project number
- Sample number
- Signature of sampler
- Date and time of collection
- Place of collection
- Type of sample
- Number of containers
- Date and time when sample custody was relinquished
- Signature of person relinquishing samples
- Signature of receiver at laboratory

4.3 SAMPLE PACKAGING

Before packaging samples, clean and dry the exterior of the sample container and make certain that the sample label is legible.

The sample packaging and shipping containers will be constructed and packed to meet the following requirements:

- There will be no release of materials to the environment.
- Inner containers that are breakable must be packaged to substantially reduce the potential for breakage and leakage. The cushioning material must not be reactive with the sample contents.
- Only waterproof ice chests or coolers will be considered acceptable shipping containers. Coolers will be provided by the contract laboratory.

Samples that will be ***hand-delivered*** to the laboratory will be handled as follows:

- Seal drain plug in cooler and place bubble-wrap or equivalent in bottom of cooler.

- Place bottles inside plastic bags.
- Place bagged sample bottles in cooler.
- Add double-bagged ice and packing material, such as bubble wrap or equivalent, to coolers.

Samples that will be ***shipped*** to the laboratory will be handled as follows:

- Seal drain plug in cooler and place bubble-wrap or equivalent in bottom of cooler.
- Wrap glass bottles with bubble wrap or equivalent.
- Place wrapped bottles inside plastic bags.
- Place wrapped, bagged sample bottles in cooler.
- Add double-bagged ice and packing material, such as bubble wrap or equivalent, to coolers.
- Place shipping list chain-of-custody form in plastic bag attached to inside of cooler lid.
- Attach two custody seals (front and back of container) so that the seals must be broken if the cooler is opened. Tape over custody seals with fiber tape.
- Place name and address of receiving laboratory in a position clearly visible on the outside of the cooler.
- Secure the cooler lid with fiber tape.

Notify the laboratory that the samples are being shipped, the airbill tracking number for each cooler shipped, and an estimated time of arrival.

Samples will be delivered to the appropriate laboratory for analysis after each day of sampling.

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5.0 Quality Assurance Project Plan

In this section, QA criteria are established to meet appropriate data quality objectives (DQOs) for investigation efforts and compliance monitoring at the Site. This section was developed in accordance with the Ecology Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (Ecology 2004). The QC procedures are described in previous sections as part of groundwater and surface water sampling procedures.

5.1 DATA QUALITY OBJECTIVES

The DQOs for investigation efforts and compliance monitoring are to obtain the types and quantity of data in such a manner that the data are of known, appropriate, and of sufficient quality to support the intended uses. This SAP/QAPP is intended primarily to govern use of groundwater and surface water data to characterize and monitor the arsenic plume and ditch impacts, evaluate the performance of remedy components as they are implemented, and assess compliance during remedy implementation.

Field methods to support the DQOs for specific sample locations designated for routine groundwater or surface water monitoring are provided in the CMP. Other field methods may be needed for additional work and will be outlined in additional work plans specific to that work.

Measurement Quality Objectives (MQOs) are the performance criteria used to meet the project DQOs. The laboratory methods are designed to generate high quality data through established technical protocols and process documentation that have been evaluated against established criteria for the principle data quality indicators (DQIs; i.e., precision, accuracy, representativeness, completeness, and comparability [PARCC]) as defined by Ecology (Ecology 2004) and U.S. Environmental Protection Agency (USEPA) guidance (USEPA 1998). A summary of key analytical MQOs (e.g., method reporting limits) are listed in Table B.1.

The following information will be provided by the laboratory (upon reporting request) to ensure that the DQOs can be evaluated:

- Method blank analyses will be reported for each sample, and the concentration of all compounds will be identified in those blanks.
- Surrogate spike recovery data will be reported, including the name and concentration of all compounds added, percent recoveries, and tolerance range.
- Matrix spike recovery data will be reported, including the name and concentration of all compounds added, percent recoveries, and tolerance range.
- Matrix duplicate analyses will be reported.
- Relative retention times for each analyte detected in the samples.
- Internal laboratory data, including sample storage, extraction, and preparation logs.
- Instrument calibration logs.
- Quantitative reports for all analyses performed.

5.2 QUALITY CONTROL PROCEDURES

QC procedures described in this SAP/QAPP will implement the following:

- Ensure sample integrity from the time of sample collection to the time of analysis in the laboratory.
- Obtain the representative chemical data.
- Collect QC samples to verify analytical precision and identify cross-contamination in the field.
- Monitor performance of the laboratory and field measurement methods.
- Correct any deviations from the methods or QA requirements established in this SAP/QAPP.
- Verify and validate the data to determine the analytical quality of each data set.

5.2.1 Sample Collection, Handling, and Quality Control Samples

QC procedures for sample collection, documentation, equipment decontamination, sample handling, sample preservation and storage, sample custody, sample handling, and field QC sample collection are described in Section 3.0.

Deviations from the QC procedures and/or failure to meet QC standards will be documented and reported in compliance monitoring reports or other appropriate project deliverables. If appropriate, as determined by the project manager or data quality assurance officer, a corrective action will be implemented. Corrective actions may include: retrieving missing information, collecting additional samples or taking additional field measurements, and qualifying results.

5.2.2 Data Validation

Analytical data reports from the laboratory will be accompanied by sufficient analytical backup information and QA/QC results to enable reviewers to perform a comprehensive Level 3 Summary Data Validation verification and review in accordance with the USEPA functional guidelines for data validation (USEPA 1999), if necessary, to determine the quality of the data.

Laboratory reports will be reviewed for internal consistency, transmittal errors, laboratory protocols, and for adherence to the QC elements specified in this SAP/QAPP at a Level 1 Compliance Screening review. The Level 1 Compliance Screening review will include the following actions:

- Review of sample holding times.
- Verification of laboratory sample identification, chain-of-custody records, and proper analytical methods.
- Verification of attainment of specified reporting limits.
- Verification of the frequency of analysis of QC sample(s).

- Verification of surrogate compound analyses, performance, and attainment of QC criteria.
- Verification that laboratory blanks are free of contaminants.
- Verification that the data set is complete.
- Addition of data qualifiers, if necessary.
- Selection of dilutions to be reported and dilutions to be rejected.

The results of the Level 1 Compliance Screening review will be submitted with the regular compliance monitoring reports or other appropriate deliverables. Items of concern will be noted. If Ecology determines that a higher level of data validation is appropriate, or data are determined by Ecology to have significant deficiencies, they will be evaluated using the more comprehensive Level 3 Summary Validation review process. Following this review, data qualifiers assigned by the laboratory may be amended, as necessary.

This SAP/QAPP may be amended to change the validation procedures for data collected as part of long-term compliance monitoring, following remedy implementation, and completion of the final compliance monitoring network. These changes may be implemented to adopt different data validation needs of the long-term monitoring phase of the project. For example, it may be appropriate to subject compliance monitoring data to a Level 3 Summary Validation when the remedy has successfully reached its performance criteria for a portion of the Site and no further remediation of these areas is planned.

Following data validation, the data are imported into the Floyd|Snider Environmental Database (Database), refer to Section 6.0.

5.3 QUALITY ASSURANCE CRITERIA

This section describes the DQIs and the associated QA criteria that will be used to ensure the data meet the MQOs identified previously in this section. DQIs are quantitative statistics and qualitative descriptors used in interpreting the degree of acceptability or utility of the data (Ecology 2004). The principal DQIs include the PARCC parameters. (i.e., precision, accuracy, representativeness, comparability, and completeness). Secondary DQIs include quantitation limits, sensitivity, repeatability, reproducibility, recovery, and memory effects. Acceptance criteria for the DQIs and the quantitation limits have been established to set quantitative goals for the quality of data generated in the analytical measurement process.

5.3.1 PARCC Parameters/Limits

The statistical tests and target control limits (i.e., the range within which acceptable project data should fall) for the PARCC parameters are described below. The target control limits will be used to evaluate data acceptability and are considered to be QC goals for data acceptance.

5.3.1.1 Precision

Precision is a measure of mutual agreement among individual measurements of the same property under prescribed conditions. Precision is best expressed in terms of the standard

deviation or relative percent difference (RPD). QA/QC sample types that test precision include field and laboratory duplicates and matrix or blank spike duplicates.

The estimate of precision of duplicate measurements will be expressed as an RPD value, which is calculated:

$$RPD = \left| \frac{D_1 - D_2}{((D_1 + D_2) \div 2)} \right| \times 100$$

Where: D_1 = first sample value
D_2 = second sample value (duplicate)

The RPD values for duplicates will be calculated and compared with the laboratory's internal control limits. If control limits are exceeded, the laboratory will perform the required re-extraction/reanalysis. If duplicate sample values differ by less than 5 times the quantitation limit, then the control limit interval will be plus or minus 2 times the quantitation limit.

5.3.1.2 Accuracy

Accuracy is the degree of agreement of a measurement (or an average of measurements of the same property) X, with an accepted reference or true value, T, usually expressed as the difference between the two values (X-T), the difference as a percentage of the reference or true value (100 (X-T)/T), or as a ratio (X/T). Accuracy is a measure of the bias in a system and is measured as the percent recovery of spiked (matrix, surrogate spike, or laboratory control spike) samples:

$$Percent\ Recovery = \frac{(Spiked\ Sample\ Results - Unspiked\ Sample\ Results)}{Amount\ of\ Spike\ Added} \times 100$$

The target control limits for percent recovery values are specified in the governing Ecology and USEPA analytical methodologies. The percent recovery value will be calculated by the laboratory and checked against the laboratory internal or method-specific control limits. If control limits are exceeded, the analytical laboratory will perform the required re-extraction/reanalysis.

5.3.1.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an actual condition or characteristic of a population. Representativeness can be evaluated using replicate samples, representative sampling locations, and blanks. Representativeness for the sampling will be accomplished using appropriate selection of sampling location, following appropriate sampling methods, and analyzing method blanks to verify that the analytical results have not been influenced by cross-contamination.

5.3.1.4 Completeness

Completeness is a measure of the proportion of data obtained from a sampling event that is determined to be valid. It is calculated as the number of valid data points divided by the total number of data points requested. The QA objective for completeness during this project will be 95 percent.

5.3.1.5 Comparability

Comparability is an expression of the confidence in which one data set can be compared to another. QA procedures in this document will provide for measurements that are consistent and representative of the media and conditions measured. All sampling procedures and analytical methods will be consistent to provide comparability of results for samples and split samples. Data collected under this QAPP also will be calculated, qualified, and reported in units specified by the method reporting limits as listed in Table B.1. These units have been selected to provide for comparability of the data with previously generated, relevant site data and pertinent criteria.

5.3.2 Method Reporting Limits

The method reporting limits for each chemical analysis are targeted to be less than site cleanup levels. Reporting limits listed in Table B.1 are standard reporting limits provided by the laboratory. The reporting limits listed are goals only, insofar as instances may arise where high sample concentrations, non-homogeneity of samples, or matrix interferences preclude achieving the desired reporting limit and associated QC criteria. In such instances, the laboratory will report the reasons for deviations from these quantitation limits.

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6.0 Data Management

The purpose of this section is to establish standardized procedures and formats for management of field and laboratory data generated during the implementation of the site remedy, including the following:

- Acquisition and maintenance of project data
- Description of electronic database of chemical/physical and location information
- Data management processes
- Specifications for printed and electronic data deliverables to Ecology, including uploading to the EIM database

6.1 ACQUISITION AND MAINTENANCE OF PROJECT DATA

In this section, the procedures and formats for recording and reporting project data (including field measurements and records) are summarized.

6.1.1 Field Data Documentation Procedures

During field operations, effective data management is the key to providing consistent, accurate, and defensible documentation of data quality. As described in this SAP/QAPP, field data will include descriptive, numeric, and geographical information or records associated with groundwater, surface water, sediment, soil, or other environmental sample collection.

Standardized field record keeping and chain-of-custody documentation will be used to document field activities, thus minimizing the chance of loss or corruption of project data. Field records, which will consist of field books and other field documents, will make up the main documentation for field activities. Field activities and observations will be noted during field work as described in this SAP/QAPP and relevant project documents. Field records will be entered into the project file according to record keeping procedures outlined in Section 6.4 of the Groundwater Remediation Work Plan (GRWP).

Field records will be kept in the project file as a permanent record of the sampling or field measurement activities. Depending on the activity, the type of field record and information recorded on it may vary. If field records are entered in an electronic format, each page will indicate who completed the data entry and when it was created.

As soon after collection as possible, field notes and records will be scanned to create an electronic record. Field measurements will be hand-entered into the database. The database manager will ensure that 20 percent of the transferred data is verified based on hardcopy records.

6.1.2 Sample Identification

Data will be entered and managed in the project database according to the naming convention for sample identification described in Section 3.5. The sample identities designated in the field and entered on chain-of-custody forms will identify samples in the electronic data deliverables

(EDD) from the laboratory. The codes may be used by the database manager to verify database fields (e.g., whether or not a sample was field-filtered).

6.1.3 Sample and Field Measurement Location Information

Location information for monitoring wells, soil borings, staff gauges, and other sampling locations will be assembled from various sources as appropriate for the use of the location data. This information may be derived from observations in field records, boring logs, GPS logs, and survey measurements as they become available. Location information will conform to the project horizontal and vertical datum (refer to Section 6.2.2). Location details for required for submission to EIM will be stored in the project Database.

6.1.4 Format and Contents of Laboratory Deliverables

The database manager will provide the contract laboratory with a Microsoft Excel template for the export of EDDs if one has not already been provided. After completion of laboratory QA/QC, the lab will export all analytical data (i.e., sample, test, batch, and result info) using this template for electronic delivery. The data package should also include QC results including results for all blanks, surrogate compounds, and check standards included in the sample batch, as well as results for any analytical duplicates and matrix spikes.

Adherence to the template provided by the database manager will assure that the data can be readily entered into the database and will be suitable for submission to the EIM.

6.1.5 Chain-of-custody Record and other Laboratory Documentation

In addition to the EDD, the contract laboratory will send a CD containing PDFs of analytical results and additional laboratory documentation, including copies of the chain-of-custody record, case narratives discussing any problems with the analyses, corrective actions taken, changes to the referenced method, a QA/QC summary, and an explanation of qualifiers. This documentation will be managed according to the procedures described in Section 6.4 of the GRWP.

6.2 DESCRIPTION OF ELECTRONIC DATABASE

The Database, a customized relational database based on a Microsoft SQL Enterprise server, will serve as the central repository used to organize, analyze, and store project information and data. The Database contains defined tables that will enable the project data to be output in the EIM format necessary for data submittal through the EIM website. Microsoft Access will be employed to:

- provide an interface for database queries and generation of reports,
- allow the data to be viewed and displayed in a GIS-compatible format, along with other GIS data layers,
- conduct data manipulations and comparisons to cleanup levels,
- support statistical analyses of project data.

6.2.1 Chemical and Physical Data Fields

The Database will be structured into tables that allow all chemical and physical data to be entered consistently, compared against cleanup levels or other criteria, and otherwise queried or exported. The customizable nature of the Database allows additional tables to be generated and as much information about each result to be captured as necessary.

While other tables may be added as needed, the Database will generally be composed of the following tables and has the ability to store the following data:

- **Project table.** Stores details about the project, including: project name, description, client, project manager, status, and project-related notes.
- **Event table.** Stores details about each sampling event, including: the project the event is related to, event name, event start date, event end date, data access flag, and sampling event–related notes.
- **Location table.** Stores basic details about each location, including: location name, the event that created the location, the type of location (upland/in-water, grab/core/tank/well, etc.), X/Y coordinates, coordinate system, elevation, elevation datum, and location-related notes.
    - **LocSrcCoord table.** Stores the source coordinate information as needed for any historical locations that are entered into the database. This preserves the original location information, but allows the converted standard datum to be used for day-to-day analysis and exports.
    - **Additional table.** Stores monitoring well–related information and additional location information that is needed to conform to EIM guidelines. Fields include: horizontal accuracy, horizontal collection method, horizontal reference point, source map scale (if applicable), vertical reference code, vertical collection method, vertical accuracy, well status, well use code, well water use, well natural flow flag (for confined aquifers only), well gradient, well head protection area, well construction start date and end date, well construction method, well completion depth, well hole depth, maximum casing diameter, well completion code (nature of openings letting water into well), well development method, well disinfected flag, well aquifer test flag, and well-related comments.
- **Sample table.** Stores basic details about each sample, including: sample ID, sampling event, sample type (composite/single, etc.), sample date, sample media (groundwater, soil, sediment, etc.), the location sample originated from, field QC (field sample, field duplicate/replicate, split, reference, etc.), sample gear used, sample depth (including unit of measure), sample parent, and sample-related notes.
- **Analysis table.** Stores basic details about each analysis performed, including: sampling event, sample ID, lab that processed the sample, the laboratory sample ID, lab receipt date, extraction method, extraction batch, extraction date, analysis method, analysis batch, analysis date, lab QC (initial run, dilution, re-extraction, etc.), data validator, and data validation level.
- **Results table.** Stores each chemical result, including: analysis ID, parameter, fraction (total/dissolved), result value, result unit, measurement basis (dry/wet), final interpreted qualifier, qualifier added during validation, the initial lab qualifier, number of significant figures in the result, dilution factor, method detection limit, reporting

limit, type of reporting limit (Practical Quantitation Limit [PQL], contracted PQL, etc.), percent moisture, whether the result was detected, whether the result was calculated, and notes related to chemical results.

6.2.2 Location Information and Project Datum

The standard horizontal datum for the project will be the North American Datum of 1983/1991 (NAD 83/91), and the standard vertical datum will be the North American Vertical Datum of 1988 (NAVD 88). All GPS, survey location, and elevation information will be reported relative to these data. Historical X-/Y-coordinate location information will be converted relative to these data, if necessary, through use of CorpsCon or ArcGIS. Original X-/Y-coordinate location and datum info is stored in the LocSrcCoord table as described above. Elevation measurements relative to the original datum are converted for export to GIS or other applications, as appropriate for the intended use.

6.3 DATA MANAGEMENT PROCESS

Sample and location information generated directly from field activities will be subjected to a standard QC check (i.e., verification of 20 percent of hand-entered values using hardcopy) and entered into the appropriate database tables. If inconsistencies are identified in the 20 percent that are verified, a comprehensive QC review will be initiated. When this information is entered, it will undergo basic verification to make sure all required fields are filled in and all the information conforms to internal database standards.

When EDDs are received, the electronic originals are stored in the electronic project file. A copy of each data file is then supplemented with additional location and sample information as appropriate (e.g., composite info, sample method info, etc.). This updated EDD then undergoes data validation according to the procedures described in Section 5.2.2.

After laboratory analytical results have been subjected to Level 1 and/or Level 2 validation, the data are loaded into temporary tables within the section of the Database reserved for imports. The data are processed to conform to the database lookup codes for fields including sample method, analyte names, and measurement units. Checks are also made to confirm that the relationships between results, tests, batches, and samples are in order. In addition, formatting checks are performed at this stage, for example, making sure the date fields are properly formatted, text field length rules have been observed, and the other import constraints written into the database structure are met. Once the data conform to all the necessary import rules, it is uploaded into the permanent database tables in the project for storage and analysis.

6.4 SPECIFICATIONS FOR DATA DELIVERABLES TO ECOLOGY

Data deliverables to Ecology include both submission to the EIM database and submission of laboratory reports to Ecology

6.4.1 Environmental Information Management Submission

The project database contains mapping tables that will enable the project data to be output in the EIM format necessary for data submittal through the EIM website. Once the project EIM

study has been created, all data that are submitted in the reports will be uploaded to the EIM database using the EIM website portal and conforming to the EIM Submittal Guidelines.

6.4.2 Consent Decree Progress Report Requirements

On behalf of the B&L Trust and in accordance with the Consent Decree, the project coordinator shall make the results of all sampling, laboratory reports, and/or test results generated available to Ecology. Pursuant to WAC 173-340-840(5), all sampling data shall be submitted to Ecology in both print and electronic formats, Ecology's Toxics Cleanup Program Policy 840 (Data Submittal Requirements), and/or any subsequent procedures specified by Ecology for data submittal.

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7.0 References

Washington Department of Ecology (Ecology). 2004. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*. Publication No. 04-03-030. July.

U.S. Environmental Protection Agency (USEPA). 1998. EPA Guidance Document for Quality Assurance Project Plans. Publication EPA QA/G-5, EPA/600/R-98/018.

———. 1999. *U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*. Office of Emergency and Remedial Response. EPA 540/R-99/008. October.

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix B
Sampling and Analysis Plan/ Quality Assurance Project Plan

Table

Table B.1
Analytical Methods, Reporting Limits, and Sampling Requirements for Routine Monitoring[1]

Analyte	Analytical Method	Method Reporting Limit	Sample Container, Volume, and Preservative	Holding Time
Total arsenic	USEPA 200.8	0.2 µg/L	500 mL HDPE preserved with 1:1 HNO_3, unfiltered	6 months
Total iron	USEPA 6010C	50 µg/L		
Dissolved arsenic	USEPA 200.8	0.2 µg/L	500 mL HDPE preserved with 1:1 HNO_3 (field-filtered to 0.45 µm)	6 months
Dissolved iron	USEPA 6010C	50 µg/L		
Major Cations				
Calcium	USEPA 6010C	50 µg/L	500 mL HDPE preserved with 1:1 HNO_3, unfiltered	6 months
Magnesium		50 µg/L		
Potassium		500 µg/L		
Sodium		500 µg/L		
Major Anions				
Sulfate	USEPA 300.0	0.1 mg/L	500 mL HDPE	28 days
Chloride		0.1 mg/L		28 days
Nitrate		0.1 mg/L		48 hours
Nitrite		0.1 mg/L		48 hours
Alkalinity	SM 2320	1 mg/L	500 mL HDPE (no headspace)	14 days
Sulfide	SM 4500-S2	0.05 mg/L	500 mL HDPE preserved with 1N Zinc Acetate, unfiltered	7 days
Dissolved arsenite/arsenate Speciation	USEPA 1632	0.01 µg/L	250 mL HDPE preserved with 1 mL 6M HCl (filtered to 0.45 µm, minimal aeration and no headspace)	28 days [2]
DOC	USEPA 9060	1.5 mg/L	250 mL AG preserved with H_2S0_4 (field-filtered to 0.45 µm)	28 days

Notes:

1 The analytes and reporting limits provided in this table apply to routine monitoring events, such as groundwater and surface water sampling associated with Phase 3 compliance monitoring and in-situ sampling. Other remedy implementation components may include additional analytes. Refer to the specific workplan for information on analytical methods, reporting limits, and sampling requirements for these analytes.

2 Samples should always be analyzed as soon after collection as possible.

Abbreviations:

AG	Silver
DOC	Dissolved organic carbon
H_2S0_4	Sulfuric acid
HDPE	High-density polyethylene
HNO_3	Nitric acid
µg/L	Micrograms per liter
µm	Micrometer
mg/L	Milligrams per liter
mL	Milliliter

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix B
Sampling and Analysis Plan/ Quality Assurance Project Plan

Attachment B.1
Groundwater Sampling Field Data Collection Sheet

GROUNDWATER OR SURFACE WATER SAMPLE COLLECTION FORM

Project Name:_____ Date of Collection: _____

Project Number:_____ Field Personnel: _____

Purge Data

Well ID: _____ Secure: ☐ Yes ☐ No Well Condition/Damage Description: _____

_____

Depth Sounder decontaminated Prior to Placement in Well: ☐ Yes ☐ No One Casing Volume (gal): _____

Depth of water (from top of well casing): _____ Well Casing Type/Diameter/Screened Interval: _____

After 5 minutes of purging (from top of casing): _____

Begin purge (time):_____

End purge (time): _____

Gallons purged: _____

Purge water disposal method: _____

Volume of Schedule 40 PVC Pipe

Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Lineal Ft.)
1 ¼"	1.660"	1.380"	0.08	0.64
2"	2.375"	2.067"	0.17	1.45
3"	3.500"	3.068"	0.38	3.2
4"	4.500"	4.026"	0.66	5.51
6"	6.625"	6.065"	1.5	12.5

Time	Depth to Water	Vol. Purged	pH	DO	Conductivity	Turbidity	Temp	ORP	Comments

Sampling Data

Sample No:_____ Location and Depth: _____

Date Collected (mo/dy/yr): _____ Time Collected: _____ Weather: _____

Type: ☐ Ground Water ☐ Surface Water Other: _____ Sample: ☐ Filtered ☐ Unfiltered Other: _____

Sample Collected with: ☐ Bailer ☐ Pump Other: _____ Type: _____

Water Quality Instrument Data Collected with: Type: ☐ Horiba U-22 ☐ Horiba U-50 Other: _____

Sample Decon Procedure: Sample collected with (circle one): decontaminated all tubing; disposable and/or dedicated silicon and poly tubing Other: _____

Sample Description (Color, Turbidity, Odor, Other): _____

Sample Analyses

TPH-D	(HCl) ☐	Chlor / Fluor	(unpres) ☐	COD / TOC	(H2SO4) ☐	Orthophos	(FILTER)☐	Diss. Metals	(HNO3) ☐
TPH-G	(HCl) ☐	BTEX	(HCl) ☐	Total Metals	(HNO3) ☐	TKN/Phos	(N2SO4) ☐	VOCs	(HCl) ☐

Additional Information

Types of Sample Containers: Quantity:	Duplicate Sample Numbers:	Comments:

Signature: _____ **Date:** _____

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix B
Sampling and Analysis Plan/ Quality Assurance Project Plan

Attachment B.2
Monitoring Well and Piezometer Construction Procedures

Attachment B.2
Monitoring Well and Piezometer Construction Procedures

The following procedures are general guidelines for installation of monitoring wells and piezometers. Specific instructions provided in individual work plans shall supersede these procedures in the event there are discrepancies.

1. Arrive on-site with properly sized drilling equipment and materials for site conditions. All drilling equipment and materials should be properly decontaminated prior to its arrival on-site in accordance with the procedures provided in the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP). Decontamination usually includes steam or hot water cleaning methods.
2. Drilling muds or drilling solutions of any kind are not to be used during drilling activities in conjunction with monitoring well construction. Acceptable drilling techniques include air-rotary, cable tool, or hollow-stem auger. If unconsolidated material is encountered, it may be necessary to drive steel casing during drilling to maintain borehole integrity. It is suggested threaded steel casing be used in lieu of welding joints together to minimize this source of potential well contamination. Hydraulic jacks or the drill rig can be used to pull back the steel casing following emplacement of plastic casing.
3. A detailed lithologic log shall be completed during drilling activities. Refer to Attachment B.4.
4. 7- or 10-inch outside diameter hollow-stern augers can be used in drilling shallow exploration drill holes in many situations. Be sure to avoid contamination due to oil and grease from the drill rig and split spoon sampler, and perform appropriate decontamination of the drill rig between drill holes. Soil and sediment samples are collected using a standard 1.4-inch inside diameter split spoon sampler and a 140-pound drive hammer. Record the number of blows necessary to obtain an 18-inch length of sample on the exploration log. Decontaminate the split spoon sampler between samples.

   Either a single or multi completion monitoring well can be constructed in a single borehole where hollow-stern auger drilling is not used. Backfill with chemically inert silica sand to above the perforated interval and emplace a bentonite plug above the sand. Install a factory-screened and blank PVC (or stainless steel or PTFE for organics) well casing into the borehole. Where appropriate, begin pulling temporary steel casing out of borehole. Emplace silica frac sand above and below any perforated sections. Backfill remaining well annulus with a bentonite slurry or with grout to the surface. Refer to Attachment B.3 for monitoring well development.
5. Place locking well protecting over PVC casing(s) after the outer steel casing has been removed from the borehole if necessary. Place bentonite plug below bottom of well protector; grout well protector in place and lock with high quality lock.
6. Monitoring wells should be installed by drillers licensed in the State of Washington, in accordance with state regulations.

7. Safety equipment is required within the vicinity of the drill rig as described in the site-specific Health and Safety Plan (HASP, Appendix A to the Compliance Monitoring Plan). Personal protective equipment includes (at a minimum): hard hat, safety glasses, steel-toed boots, gloves, first aid kit, and a site safety plan with routes to hospitals known by all personnel on-site.

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix B
Sampling and Analysis Plan/ Quality Assurance Project Plan

Attachment B.3
Monitoring Well Development Procedures

Attachment B.2
Monitoring Well Development Procedures

The following procedures are general guidelines for monitoring well development. Specific instructions provided in individual work plans shall supersede these procedures in the event there are discrepancies.

1. Visually inspect all well development equipment for damage, repair as necessary.
2. Decontaminate all stingers, air hoses, and surge blocks by scrubbing with brush and Liquinox solution, rinsing with dilute nitric acid solution, and rinsing with deionized water. If sampling for organics, replace the nitric acid rinse with 10 percent methanol.
3. If using compressed air method for well development, make certain compressor utilized does not produce air laden with hydraulic fluid for lubricating purposes. This may affect the integrity of the monitoring well for producing viable water quality data.
4. Develop well by using surging techniques (surge block or bailer) followed by well evacuation. Repeat this procedure until evacuated water is visibly clean and essentially sand-free. Water will be managed according to the procedures for handling purgewater IDW described in the SAP/QAPP.
5. During well evacuation, collect water samples for field determinations of temperature, specific conductivity, and pH. Continue developing well until field parameters stabilize to within ±5 percent on three consecutive measurements or 10 well volumes have been purged.
6. Report field observations and volume of water removed on standard form.

B&L Woodwaste Site
Pierce County, Washington

Compliance Monitoring Plan

Appendix B
Sampling and Analysis Plan/ Quality Assurance Project Plan

Attachment B.4
Lithologic Logging Procedures

Attachment B.4
Lithologic Logging Procedures

The following procedures are general guidelines for lithologic logging during advancement of soil borings. Specific instructions provided in individual work plans shall supersede these procedures in the event there are discrepancies.

A qualified field geologist or engineer will observe soil samples in the field, inspect the advancement of borings, and prepare and maintain a detailed drilling log for each boring. The lithologic log for each boring will be based on visual observation and description of the corresponding soil samples. A lithologic description will be recorded on a boring log form using the Unified Soil Classification System (USCS) as described in ASTM Standard D 2487-00. Each lithologic description will contain the following information:

- Project and facility name (i.e., B&L Woodwaste Site)
- Name and employer of the field engineer or geologist completing the lithologic log
- Boring identifier
- Description of boring location
- Date drilling was initiated for this boring
- Date drilling was completed for this boring
- Name of company performing the drilling
- Name of the drilling equipment operator(s)
- Drilling method (e.g., HSA)
- Drill rig make and model
- Borehole diameter
- Total depth of boring (measured relative to ground surface, to within 0.1 foot)
- Amount (volume) and type of any drilling fluid(s) used (potable water or drilling mud may be used to mitigate effects of heaving sands)
- Drilling-related observations, such as:
    - Rig chatter
    - Drilling difficulties or problems
    - Presence of running or heaving sands
    - Caving, hole instability, or noticeable ground subsidence
    - Poor sample recovery
- Depth to water table or saturation
- Blow counts
- Reason for termination of boring

- Sample depth interval, in feet bgs
- Soil color
- Signs of weathering (e.g., rust-colored stains or coatings)
- Texture (particle size, angularity, and sorting)
- USCS soil type (ASTM D2487)
- Estimated moisture content (qualitative)
- Organic matter (e.g., plant detritus, woody or fibrous vegetative matter, coal fragments, shell fragments)
- Artificial debris—type and material (e.g., metal filings, wood chips, plastic bottles, glass fragments), if any
- Noticeable odor, if any
- Visual evidence of contamination, if any
- Details of monitoring well or piezometer construction including total depth, screened interval, sizes and types of construction materials, etc.

Note that lithologic descriptions for the Site should include descriptions of thin lenses and fine laminations, especially where these deposits have the potential to affect the water-bearing characteristics of the subsurface.

Effort should be made by field personnel to ensure consistency in logging descriptions with the descriptions of others. Field personnel should collect representative samples of distinct soil types for comparison and consistency control.

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix C
Post-closure Estimate

20-Year Post-closure Cost Estimate
B&L Woodwaste Landfill
Pierce County, WA

20-Year Net Present Value, Post-Closure Cost Estimate **$12,100,000**

Estimated Post-Closure Costs[2]				
Year	Monitoring & Reporting	Routine O&M Estimate	In-Situ Treatment	Estimated Total
2013	$50,000	$372,000	$110,000	$532,000
2014	$52,000	$385,000	$122,000	$507,000
2015	$54,000	$398,000	$90,000	$488,000
2016	$56,000	$412,000	$38,000	$450,000
2017	$58,000	$426,000	$39,000	$465,000
2018	$60,000	$350,000	$2,049,000	$2,399,000
2019	$62,000	$362,000	$127,000	$489,000
2020	$64,000	$374,000	$131,000	$505,000
2021	$66,000	$387,000	$135,000	$522,000
2022	$68,000	$400,000	$140,000	$540,000
2023	$70,000	$414,000	$145,000	$559,000
2024	$72,000	$428,000		$428,000
2025	$74,000	$443,000		$443,000
2026	$77,000	$458,000		$458,000
2027	$80,000	$474,000		$474,000
2028	$83,000	$490,000		$490,000
2029	$86,000	$507,000		$507,000
2030	$89,000	$524,000		$524,000
2031	$92,000	$542,000		$542,000
2032	$95,000	$560,000		$560,000

Notes

1. Assumes rate of return of 5.41%, inflation rate of 3.41%.
2. Estimated costs are approximate, based on current agency-approved plans.
3. Net Present Value estimate is in 2013 dollars.

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix D
National Pollutant Discharge Elimination System Permit WA0040321

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

RECEIVED
DEC - 7 2011
BY:

November 23, 2011

CERTIFIED MAIL 7010 0780 0002 3400 5203

Mr. Dan Silver
B&L Woodwaste Site Custodial Trust
606 Columbia Street Northwest, Suite 212
Olympia, WA 98501

Dear Mr. Silver:

Enclosed is a National Pollutant Discharge Elimination System (NPDES) Permit No. WA0040321 for your facility. Also enclosed is the Departments of Ecology's (Ecology) response to comments received during the public comment period of the draft permit. The permit is issued by Ecology in conformance with the Water Pollution Control Law [Chapter 90.48 Revised Code of Washington (RCW)], and as authorized by the U.S. Environmental Protection Agency (EPA) acting under the Federal Clean Water Act.

Also enclosed are Ecology's Fact Sheet and a pre-printed Discharge Monitoring Report (DMR) form with a key for codes used. Please note that your permit limits, frequency, and sample type are printed in the shaded areas of your DMR. This is your master copy. Please make copies as needed for your submittals. If no discharge occurs during a reporting period, you must still submit a DMR with a statement that no discharge occurred.

Submission of an application for permit renewal or continued discharge must be received by Ecology within 180 days prior to your permit expiration date [Washington Administrative Code (WAC) 173-220-180]. Please contact Sherri Greenup, Permit Administrator, at 360-407-6280, or by e-mail at Sherri.Greenup@ecy.wa.gov for an application form. Please note that Ecology has moved the due date for application submission from six months to 18 months prior to the expiration date. Ecology will contact you about 30 months prior to expiration to remind you about early application submittal.

Appeal Process

You have the right to appeal this permit within 30 days upon receipt of this document. Pursuant to chapter 43.21B RCW, your appeal must be filed with the Pollution Control Hearings Board, and served on the Department of Ecology, within 30 days of the date of your receipt of this document.

If you choose to appeal this action or decision, your notice of appeal must contain: (1) A copy of the permit you are appealing, and (2) A copy of the application for the permit.

Any appeal must contain the following in accordance with the rules of the hearings board:

a. The appellant's name and address;
b. The coverage date and number of the permit appealed;
c. A description of the substance within the permit that is the subject of the appeal;
d. A clear, separate, and concise statement of every error alleged to have been committed;
e. A clear and concise statement of facts which the requester relies to sustain his or her statement of error;
f. A statement setting forth the relief sought; and
g. A copy of the order or decision appealed from and if the order or decision followed an application, a copy of the application.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive Southeast Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel Road Southwest, Suite 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

For additional information: Environmental Hearings Office Website: http://www.eho.wa.gov

If you have any questions on this action, please contact Mohsen Kourehdar at 360-407-6256, or by e-mail at Mohsen.Kourehdar@ecy.wa.gov.

Sincerely,

Rebecca S. Lawson

Rebecca S. Lawson, P.E., L.Hg.
Southwest Region Manager
Toxic Cleanup Program

RSL:sg (WA0040321)
Enclosures

DEPARTMENT OF
ECOLOGY
State of Washington

Issuance Date: November 23, 2011
Effective Date: January 1, 2012
Expiration Date: December 31, 2017

National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0040321

State of Washington
DEPARTMENT OF ECOLOGY
Southwest Regional Office
P.O. Box 47775
Olympia, Washington 98504-7775

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.

B&L Woodwaste Site Custodial Trust
606 Columbia Street Northwest, Suite 212
Olympia, WA 98501

is authorized to discharge in accordance with the Special and General Conditions that follow

Facility Location: 2201 6th Avenue/522 Fife Way, Milton WA 98354	Receiving Water: An unnamed Agricultural ditch which is tributary to Hylebos Creek
Model Toxics Control Act (MTCA) Cleanup Site	Treatment Type: Oxidation, pH adjustment and co-precipitation, clarification, pH adjustment, filtration, and adsorption

Rebecca S. Lawson, P.E., L.Hg.
Southwest Region Manager
Toxics Cleanup Program
Washington State Department of Ecology

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SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report	Monthly	February 15, 2012
S3.E	Reporting Permit Violations	As necessary	
S3.F	Other Reporting	As necessary	
S4.A	Operations and Maintenance Manual		July 1, 2012
S4.A	Operations and Maintenance Manual Update or Review Confirmation Letter	Annually	July 1, 2013
S4.B	Reporting Bypasses	As necessary	
S5.C	Solid Waste Control Plan	1/permit cycle	July 1, 2012
S5.C	Modification to Solid Waste Plan	As necessary	December 30, 2015
S6.	Application for Permit Renewal	1/permit cycle	December 30, 2015
S7.	Engineering Documents	1/permit cycle	September 1, 2012
S8.	Compliance Schedule: Influent/Effluent Testing for Total Arsenic, Total Zinc, Total Lead, and Total Copper Testing of Effluent for Volatile Organic Carbon, Semi-Volatile Organic Carbon and Pesticides/PCBs		May 1, 2012 December 30, 2015
S9.	Non-Routine and Unanticipated Discharges	As necessary	
S10.	Spill Control Plan	1/permit cycle, Updates submitted as necessary	Submitted April 11, 2011
S11.	Stormwater Pollution Prevention Plan/Best Management Practices	1/permit cycle, Updates submitted as necessary	Submitted April 11, 2011
S12.	Receiving Stream Study	1/permit cycle	December 30, 2015
S13.	Outfall Evaluation	2/permit cycle	July 1, 2013 July 1, 2015
S14.A	Acute Toxicity Characterization Data and Summary Report	Twice/year	September 1, 2012 April 1, 2013
S14.C	Acute Toxicity Compliance Monitoring Reports		July 15, 2013 February 15, 2014
S14.D	Acute Toxicity: "Causes and Preventative Measures for Transient Events."	As necessary	
S14.D	Acute Toxicity TI/TRE Plan	As necessary	
S14.F	Acute Toxicity Effluent Test Results with Permit Renewal Application	June 30, 2015 December 30, 2015 (S14.F(1))	December 30, 2015
S15.A	Chronic Toxicity Characterization Data and Summary Reports	Twice/year	September 1, 2012 April 1, 2013

Permit Section	Submittal	Frequency	First Submittal Date
S15.C	Chronic Toxicity Compliance Monitoring Reports		July 15, 2013 February 15, 2014
S15.D	Chronic Toxicity: "Causes and Preventative Measures for Transient Events."	As necessary	
S15.D	Chronic Toxicity TI/TRE Plan	As necessary	
S15.F	Chronic Toxicity Effluent Test Results with Permit Renewal Application	June 30, 2015 December 30, 2015 (S15.F(1))	December 30, 2015
G1.	Notice of Change in Authorization	As necessary	
G4.	Permit Application for Substantive Changes to the Discharge	As necessary	
G5.	Engineering Report for Construction or Modification Activities	As necessary	
G7.	NOTICE of Permit Transfer	As necessary	
G10.	Duty to Provide Information	As necessary	
G13.	Payment of Fees	As assessed	
G21.	Compliance Schedules	As necessary	

SPECIAL CONDITIONS

S1. DISCHARGE LIMITS

A. Process Wastewater Discharges

All discharges and activities authorized by this permit must be consistent with the terms and conditions of this permit.

The discharge of any of the following pollutants more frequently than, or at a level in excess of that identified and authorized by this permit violates the terms and conditions of this permit.

For the first two weeks of operation (the shakedown period), the Permittee will batch discharge the effluent from Outfall # 001. Each batch must meet the effluent limits before discharge for Outfall # 001.

Beginning on the effective date of this permit and lasting through the expiration date, the Permittee is authorized to discharge treated groundwater to northern stormwater pond subject to complying with the following limits:

Effluent Limits: Outfall # 001 **Latitude 47.244722 Longitude 122.329167**		
Parameter	**Average Monthly**	**Maximum Daily [a]**
Flow gallons per day (gpd)	-	Report
Arsenic (Total as µg/L)	-	5.0
Lead (Total as µg/L)	-	Report
Zinc (Total as µg/L)	-	Report
Copper (Total as µg/L)	-	Report
Total Suspended Solids (TSS) (mg/L)	-	Report
Turbidity, nephelometric turbidity units (NTUs)	-	Report
Parameter	**Daily minimum**	**Daily Maximum**
pH, standard units (s.u.)	6.5	8.5
[a] Maximum daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. This does not apply to pH or temperature.		

S2. MONITORING REQUIREMENTS

A. Monitoring Schedule

The Permittee must monitor in accordance with the following schedule and the requirements specified in **Appendix A.**

(1) Wastewater Effluent			
Parameter	**Units & Speciation**	**Minimum Sampling Frequency**	**Sample Type**
Flow	gallons/day (gpd)	Daily	Metered & Recorded
pH [a]	standard units	Continuous	Metered & Recorded
Arsenic (Total)	micrograms/liter (µg/L)	Monthly [b]	24-Hour Time Composite [c]
Zinc (Total)	micrograms/liter (µg/L)	Monthly [b]	24-Hour Time Composite [c]
Lead (Total)	micrograms/liter (µg/L)	Monthly [b]	24-Hour Time Composite [c]
Copper (Total)	micrograms/liter (µg/L)	Monthly [b]	24-Hour Time Composite [c]
TSS	milligrams/liter (mg/L)	Monthly [b]	24-Hour Time Composite [c]
Turbidity	NTU	Monthly [b]	24-Hour Time Composite [c]
(2) Effluent Characterization – Final Wastewater Effluent [e]			
PP – Volatile Organic Carbon	µg/L	1/ Permit Cycle See Special Condition S8	Grab [d]
Semi-Volatile Organic Carbon	µg/L	1/ Permit Cycle See Special Condition S8	24-Hour Time Composite [c]
PP – Pesticides/PCBs	µg/L	1/ Permit Cycle See Special Condition S8	24-Hour Time Composite [c]
(3) Whole Effluent Toxicity Testing – Final Wastewater Effluent [e]			
Acute Toxicity Testing Section S14	Final Effluent [e]	Twice/year	24-Hour Time Composite [c]
Chronic Toxicity Testing Section S15	Final Effluent [e]	Twice/year	24-Hour Time Composite [c]

a. The Permittee must report the instantaneous maximum and minimum pH monthly. Do not average pH values.

b. Monthly means once every calendar month.

c. 24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.

d. Grab means an individual sample collected over a fifteen minute, or less, period.

e. Final Effluent means wastewater exiting, or that has exited, the last treatment process or operation.

[1] See Appendix A for the required detection (DL) or quantitation (QL) levels.

Report single analytical values below detection as "less than (detection level)" where (detection level) is the numeric value specified in attachment A.

Report single analytical values between the agency-required detection and quantitation levels with qualifier code of j following the value.

To calculate the average value (monthly average):

- Use the reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.
- For values reported below detection, use one-half the detection value if the lab detected the parameter in another sample for the reporting period.
- For values reported below detection, use zero if the lab did not detect the parameter in another sample for the reporting period.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

B. Sampling and Analytical Procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 Code of Federal Regulations (CFR) Part 136.

C. Flow Measurement, Field Measurement and Continuous Monitoring Devices

The Permittee must:

1. Select and use appropriate flow measurement, field measurement and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard and the manufacturer's recommendation for that type of device.
3. Calibration as specified in this document is not required if the Permittee uses recording devices certified by the manufacturer.
4. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.

5. Calibrate these devices at the frequency recommended by the manufacturer.

6. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.

7. Maintain calibration records for at least three years.

D. Laboratory Accreditation

The Permittee must ensure that all monitoring data required by the Department of Ecology (Ecology) is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 Washington Administrative Code (WAC), Accreditation of Environmental Laboratories. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement. The Permittee must obtain accreditation for conductivity and pH if it must receive accreditation or registration for other parameters.

E. Request for Reduction in Monitoring

The Permittee may request a reduction of the sampling frequency after 12 months of monitoring. Ecology will review each request and at its discretion grant the request when it reissues the permit or by a permit modification.

The Permittee must:

1. Provide a written request.

2. Clearly state the parameters for which it is requesting reduced monitoring.

3. Clearly state the justification for the reduction.

S3. REPORTING AND RECORDKEEPING REQUIREMENTS

The Permittee must monitor and report in accordance with the following conditions. The falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

A. Reporting

The first monitoring period begins on the effective date of the permit. The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on a Discharge Monitoring Report (DMR) form provided, or otherwise approved, by Ecology. Include a summary listing daily results for the parameters tabulated in Special Condition S2, including MDLs and QLs (when applicable). If submitting DMRs electronically, report a value for each day sampling occurred and for the summary values (when applicable) included on the form.

2. Submit the form as required with the words "no discharge" entered in place of the monitoring results, if the facility did not discharge during a given monitoring

period. If submitting DMRs electronically, you must enter "no discharge" for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate.

3. Report the test method, the DL, and the QL on the discharge monitoring report or in the required report, if the Permittee used an alternative method not specified in the permit and as allowed in Appendix A.

4. Include the following information (for priority pollutant organic and metal parameters lab reports): sampling date, sample location, date of analysis, parameter name, CAS number, analytical method/number, method detection limit (MDL), laboratory practical quantitation limit (PQL), reporting units, and concentration detected. The Permittee must submit a copy of the contract laboratory report to provide this information. Analytical results from samples sent to a contract laboratory must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter. If the Permittee submits electronic DMRs, then it must attach an electronic file of the lab report to the electronic DMR.

5. Ensure that DMR forms are postmarked or received by Ecology no later than the dates specified below, unless otherwise specified in this permit. If submitting DMRS electronically, submit the DMR no later than the dates specified below, unless otherwise specified in this permit.

6. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below. The Permittee must:

   a. Submit **monthly** DMRs by the 15th day of the following month.

   b. Submit 1/Permit Cycle, the data for Volatile Organic Carbon, Semi-Volatile Organic Carbon, and Pesticides/PCBs by **December 30, 2015**.

7. Submit reports to Ecology online using Ecology's electronic DMR submittal forms or send reports to Ecology at:

   Water Quality Permit Coordinator
   Department of Ecology
   Southwest Regional Office
   P.O. Box 47775
   Olympia, WA 98504-7775

B. Records Retention

The Permittee must retain records of all monitoring information for a minimum of three years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

C. Recording of Results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement;

2. The individual who performed the sampling or measurement;

3. The dates the analyses were performed;

4. The individual who performed the analyses;

5. The analytical techniques or methods used;

6. The results of all analyses:

D. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR.

E. Reporting Permit Violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.

2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within 30 days of sampling.

   a. Immediate Reporting

   The Permittee must immediately report to the Department of Ecology and the Department of Health, Drinking Water Program (at the numbers listed below), all:

   - Failures of the disinfection system.
   - Collection system overflows discharging to a water body used as a source of drinking water.
   - Plant bypasses discharging to a waterbody used as a source of drinking water.

Southwest Regional Office	360-407-6300
Department of Health, Drinking Water Program	800-521-0323 (business hours) 877-481-4901 (after business hours)
Pierce County Health Department	800-992-2456

b. Twenty-four hour Reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24-hours from the time the Permittee becomes aware of any of the following circumstances:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.

2. Any unanticipated bypass that causes an exceedance of any effluent limit in the permit (See Part S4.B., "Bypass Procedures").

3. Any upset that causes an exceedance of an effluent limit in the permit (See G.15, "Upset").

4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.

5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit.

c. Report within Five Days

The Permittee must also provide a written submission within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The written submission must contain:

1. A description of the noncompliance and its cause.

2. The period of noncompliance, including exact dates and times.

3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.

4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of Written Reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All Other Permit Violation Reporting

The Permittee must report all permit violations, which do not require immediate or within 24-hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

f. Report Submittal

The Permittee must submit reports to the address listed in S3.

F. Other Reporting

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of Revised Code of Washington (RCW) 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm .

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

G. Maintaining a Copy of this Permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. OPERATION AND MAINTENANCE

The Permittee must, at all times, properly operate and maintain all facilities or systems of treatment and control (and related appurtenances), which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out in a manner approved by Ecology.

A. Operations and Maintenance (O&M) Manual

1. O&M manual submittal and requirements

The Permittee must:

a. Prepare the O&M Manual that meets the requirements of 173-240-150 WAC and submit it to Ecology for approval by **July 1, 2012**. The Permittee must submit a paper copy and an electronic copy (preferably in a portable document format [PDF]).

b. Review the O&M Manual at least annually and confirm this review by letter to Ecology by July 1 of each year.

c. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).

d. Keep the approved O&M Manual at the permitted facility.

e. Follow the instructions and procedures of this manual.

2. O&M Manual Components

In addition to the requirements of WAC 173-240-080 (1) through (5), the O&M Manual must include:

a. Emergency procedures for plant shutdown and cleanup in the event of a wastewater system upset or failure.

b. Wastewater system maintenance procedures that contribute to the generation of process wastewater.

c. Any directions to maintenance staff when cleaning, or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine.)

d. Wastewater sampling protocols and procedures for compliance with the sampling and reporting requirements in the wastewater discharge permit.

e. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit

f. Treatment plant process control monitoring schedule.

g. Specify other items on case-by-case basis such as O&M for any pump stations, lagoon liners, etc.

B. Bypass Procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

2. This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least 10 days before the date of the bypass.

3. Bypass is unavoidable, unanticipated, and results in noncompliance of this permit.

   This permit authorizes such a bypass only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. No feasible alternatives to the bypass exist, such as:

      - The use of auxiliary treatment facilities.
      - Retention of untreated wastes.
      - Stopping production.
      - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
      - Transport of untreated wastes to another treatment facility or preventative maintenance), or transport of untreated wastes to another treatment facility.

   c. The Permittee has properly notified Ecology of the bypass as required in Condition S3.E of this permit.

4. If bypass is anticipated and has the potential to result in noncompliance of this permit.

   a. The Permittee must notify Ecology at least 30 days before the planned date of bypass. The notice must contain:

      - A description of the bypass and its cause.
      - An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.

- A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
- The minimum and maximum duration of bypass under each alternative.
- A recommendation as to the preferred alternative for conducting the bypass.
- The projected date of bypass initiation.
- A statement of compliance with SEPA.
- A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
- Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during preparation of the engineering report or facilities plan and plans and specifications and must include these to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

- If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
- If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

S5. SOLID WASTES

A. Solid Waste Handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

C. Solid Waste Control Plan

1. Submittal Requirements

The Permittee must:

a. Submit a solid waste control plan to Ecology by **July 1, 2012**.

b. Submit to Ecology any proposed revision or modification of the solid waste control plan for review and approval at least 30 days prior to implementation. The Permittee must submit a paper copy and an electronic copy.

c. Comply with the plan and any modifications.

d. Submit an update of the solid waste control plan by **December 30, 2015**. The Permittee must submit a paper copy and an electronic copy.

2. Solid Waste Control Plan Content

The solid waste control plan must:

a. Follow Ecology's guidance for preparing a solid waste control plan (www.ecy.wa.gov/biblio/0710024.html) and address all solid wastes generated by the Permittee.

b. Include at a minimum a description, source, generation rate, and disposal methods of these solid wastes.

c. Not conflict with local or state solid waste regulations.

S6. APPLICATION FOR PERMIT RENEWAL OR MODIFICATION FOR FACILITY CHANGES

The Permittee must submit an application for renewal of this permit by **December 30, 2015**. The Permittee must submit a paper copy and an electronic copy.

The Permittee must also submit a new application or supplement at least 180 days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

S7. ENGINEERING DOCUMENTS

a. The Permittee must prepare and submit two copies of as-built **plans and specifications** to Ecology for review and approval in accordance with chapter 173-240 WAC by **September 1, 2012**. The Permittee must submit a paper copy and an electronic copy.

S8. COMPLIANCE SCHEDULE

By the dates tabulated below, the Permittee must complete the following tasks and submit a report describing, at a minimum:

- Whether it completed the task and, if not, the date on which it expects to complete the task.
- The reasons for delay and the steps it is taking to return the project to the established schedule.

Tasks	Date Due
1. Influent/Effluent testing for Total Arsenic, Total Zinc, Total Lead, Total Copper, TSS and Turbidity for thirty consecutive days following the two weeks of shake down period	**May 1, 2012**. Submit all the influent/effluent data
2. One time testing of effluent for Volatile Organic Carbon, Semi-Volatile Organic Carbon and Pesticides/PCBs	**December 30, 2015**. Submit with the permit application for renewal

S9. NON-ROUTINE AND UNANTICIPATED DISCHARGES

1. Beginning on the effective date of this permit, the Permittee is authorized to discharge non-routine wastewater on a case-by-case basis if approved by Ecology. Prior to any such discharge, the Permittee must contact Ecology and at a minimum provide the following information:

   a. The proposed discharge location

   b. The nature of the activity that will generate the discharge

c. Any alternatives to the discharge, such as reuse, storage, or recycling of the water

d. The total volume of water it expects to discharge

e. The results of the chemical analysis of the water

f. The date of proposed discharge

g. The expected rate of discharge discharged, in gallons per minute

2. The Permittee must analyze the water for all constituents limited for the discharge and report them as required by subpart 1.e above. The analysis must also include any parameter deemed necessary by Ecology. All discharges must comply with the effluent limits as established in Condition S1 of this permit, water quality standards, and any other limits imposed by Ecology.

3. The Permittee must limit the discharge rate, as referenced in subpart 1.g above, so it will not cause erosion of ditches or structural damage to culverts and their entrances or exits.

4. The discharge cannot proceed until Ecology has reviewed the information provided and has authorized the discharge by letter to the Permittee or by an Administrative Order. Once approved and if the proposed discharge is to a municipal storm drain, the Permittee must obtain prior approval from the municipality and notify it when it plans to discharge.

S10. SPILL CONTROL PLAN

A. Spill Control Plan Submittals and Requirements

The Permittee has submitted a spill control plan in April 11, 2011. Ecology has reviewed and approved the plan in July 2011.

The Permittee must:

1. Review the plan at least annually and update the spill plan as needed.

2. Send changes to the plan to Ecology.

3. Follow the plan and any supplements throughout the term of the permit.

B. Spill Control Plan Components

The spill control plan must include the following:

1. A list of all oil and petroleum products and other materials used and/or stored on-site, which when spilled, or otherwise released into the environment, designate as Dangerous Waste (DW) or Extremely Hazardous Waste (EHW) by the procedures set forth in WAC 173-303-070. Include other materials used and/or stored on-site which may become pollutants or cause pollution upon reaching state's waters.

2. A description of preventive measures and facilities (including an overall facility plot showing drainage patterns) which prevent, contain, or treat spills of these materials.

3. A description of the reporting system the Permittee will use to alert responsible managers and legal authorities in the event of a spill.

4. A description of operator training to implement the plan.

The Permittee may submit plans and manuals required by 40 CFR Part 112, contingency plans required by Chapter 173-303 WAC, or other plans required by other agencies, which meet the intent of this section.

S11. STORMWATER POLLUTION PREVENTION PLAN/ BEST MANAGEMENT PRACTICES

1. The Permittee submitted a Stormwater pollution prevention plan (SWPPP) in April 11, 2011. The Permittee must review and update the SWPPP at least annually.

S12. RECEIVING STREAM STUDY

The Permittee must submit the review and evaluation of the surface water data required under MTCA with the permit application for renewal by **December 30 2015**. The report must evaluate the effectiveness of the groundwater containment and treatment system on the arsenic concentration in the agricultural ditch surface water by comparing the concentrations before and after groundwater cleanup and containment implementation. This report will also assess impacts (positive or negative) of the permitted effluent on the receiving water, as well as the impacts of the forthcoming ditch sediment cleanout implemented under MTCA (Consent Decree No. 082106107) on the receiving water.

S13. OUTFALL EVALUATION

The Permittee must inspect the outfall line to document its integrity and continued function every two year. If conditions allow for a photographic verification, the Permittee must include such verification in the report. By **July 1, 2013,** and every two years (July 1, 2015) thereafter, the Permittee must submit the inspection report to Ecology.

S14. ACUTE TOXICITY

A. Effluent Characterization

The Permittee must:

1. Conduct acute toxicity testing on the final effluent twice/year for one year. Testing must be conducted by **July 1, 2012,** and by **February 1, 2013**.

2. Submit a written report to Ecology twice for one year within 45 days of sampling and no later than **September 1, 2012**, and **April 1, 2013**. Further instructions on testing conditions and test report content are in Subsection G below.

3. Use a dilution series consisting of a minimum of five concentrations and a control. The five concentrations should include the ACEC of 100 percent effluent.

4. Conduct the following two, acute toxicity tests on each sample:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna*	EPA-821-R-02-012

5. The effluent limit for acute toxicity listed in Section B below applies if after one year of effluent characterization:

   - The median survival of any species in 100 percent effluent is below 80 percent.

   - Any one test of any species exhibits less than 65 percent survival in 100 percent effluent.

   If the limit applies, then the Permittee must immediately follow the instructions in Subsections B, C, D, E, and G. If the limit does not apply, then the Permittee must follow the instructions in Subsections F and G.

B. Effluent Limit for Acute Toxicity

The effluent limit for acute toxicity is:

No acute toxicity detected in a test concentration representing the acute critical effluent concentration (ACEC).

The ACEC equals 100 percent effluent.

C. Compliance with the Effluent Limit for Acute Toxicity

Compliance with the effluent limit for acute toxicity means the results of the testing specified in Subsection D show no statistically significant difference in survival between the control and the ACEC.

If the test results show a statistically significant difference in survival between the control and the ACEC, the test does not comply with the effluent limit for acute toxicity. The Permittee must then immediately conduct the additional testing described in Subsection E. The Permittee will comply with the requirements of this section by meeting the requirements of Subsection E.

The Permittee must determine the statistical significance by conducting a hypothesis test at the 0.05 level of significance (Appendix H, EPA/600/4-89/001). If the difference in survival between the control and the ACEC is less than 10 percent, the Permittee must conduct the hypothesis test at the 0.01 level of significance.

D. Compliance Testing for Acute Toxicity

The Permittee must:

1. Perform the acute toxicity tests with 100 percent effluent, the ACEC, and a control, or with a full dilution series.

2. Conduct twice/year acute toxicity testing on the final effluent if characterization determines that the effluent limit for acute toxicity is applicable. Testing must begin by **June 1, 2013**.

3. Submit a written report of all the test results to Ecology twice for one year within 45 days of sampling and no later than **July 15, 2013,** and **February 15, 2014**. Further instructions on testing conditions and test report content are in Subsection G below.

4. The Permittee must perform compliance tests using each of the species and protocols listed below on a rotating basis:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna*	EPA-821-R-02-012

E. Response to Noncompliance with the Effluent Limit for Acute Toxicity

If a toxicity test conducted under Subsection D determines a statistically significant difference in response between the ACEC and the control, using the statistical test described in Subsection C, the Permittee must begin additional testing within one week from the time of receiving the test results. The Permittee must:

1. Conduct one additional test each week for four consecutive weeks, using the same test and species as the failed compliance test.

2. Test at least five effluent concentrations and a control to determine appropriate point estimates. One of these effluent concentrations must equal the ACEC. The results of the test at the ACEC will determine compliance with the effluent limit for acute toxicity as described in Subsection C.

3. Return to the original monitoring frequency in Subsection D after completion of the additional compliance monitoring.

Anomalous test results: If a toxicity test conducted under Subsection D indicates noncompliance with the acute toxicity limit and the Permittee believes that the test result is anomalous, the Permittee may notify Ecology that the compliance test result may be anomalous. The Permittee may take one additional sample for toxicity testing and wait for notification from Ecology before completing the additional testing. The Permittee

must submit the notification with the report of the compliance test result and identify the reason for considering the compliance test result to be anomalous.

If Ecology determines that the test result was not anomalous, the Permittee must complete all of the additional monitoring required in this subsection. Or,

If the one additional sample fails to comply with the effluent limit for acute toxicity, then the Permittee must complete all of the additional monitoring required in this subsection.

Or,

If Ecology determines that the test result was anomalous, the one additional test result will replace the anomalous test result.

If all of the additional testing in this subsection complies with the permit limit, the Permittee must submit a report to Ecology on possible causes and preventive measures for the transient toxicity event, which triggered the additional compliance monitoring. This report must include a search of all pertinent and recent facility records, including:

- Operating records
- Monitoring results
- Inspection records
- Spill reports
- Weather records
- Production records
- Raw material purchases
- Pretreatment records, etc.

If the additional testing in this subsection shows another violation of the acute toxicity limit, the Permittee must submit a Toxicity Identification/Reduction Evaluation (TI/RE) plan to Ecology within 60 days after the sample date [WAC 173-205-100(2)].

F. Testing when there is No Permit Limit for Acute Toxicity

The Permittee must:

1. Conduct acute toxicity testing on final effluent during June 2015, and December, 2015 (once in the last summer and once in the last winter prior to submission of the application for permit renewal).

2. Submit the results to Ecology with the permit renewal application.

3. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100 percent effluent and a control.

4. Use each of the following species and protocols for each acute toxicity test:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna*	EPA-821-R-02-012

G. Sampling and Reporting Requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.* Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.

2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.

3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.*

4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Subsection C and the Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.* If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.

5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Subsection A or pristine natural water of sufficient quality for good control performance.

6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.

   a. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the acute critical effluent concentration (ACEC). The ACEC equals 100 percent effluent.

   b. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing must comply with the

acute statistical power standard of 29 percent as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

S15. CHRONIC TOXICITY

A. Effluent Characterization

The Permittee must:

1. Conduct chronic toxicity testing on the final effluent twice/year for one year. Testing must begin by **July 1, 2012,** and by **February 1, 2013**.

2. Submit a written report to Ecology twice for one year within 45 days of sampling and no later than **September 1, 2012**, and **April 1, 2013**. Further instructions on testing conditions and test report content are in Subsection G below.

3. Conduct chronic toxicity testing during effluent characterization on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The ACEC equals 100 percent effluent.

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	*Pimephales promelas*	EPA-821-R-02-013
Water flea survival and reproduction	*Ceriodaphnia dubia*	EPA-821-R-02-013

4. The effluent limit for chronic toxicity listed in Section B below applies if after one year of effluent characterization any test shows a significant difference between the control and the ACEC at the 0.05 level of significance using hypothesis testing (Appendix H, EPA/600/4-89/001).

   - If the limit applies, then the Permittee must immediately follow the instructions in Subsections B, C, D, E, and G. If the limit does not apply, then the Permittee must follow the instructions in Subsections F and G.

B. Effluent Limit for Chronic Toxicity

The effluent limit for chronic toxicity is:

No toxicity detected in a test concentration representing the chronic critical effluent concentration (CCEC).

The CCEC equals 100 percent effluent.

C. Compliance with the Effluent Limit for Chronic Toxicity

Compliance with the effluent limit for chronic toxicity means the results of the testing specified in Subsection D. show no statistically significant difference in response between the control and the CCEC.

If the test results show a statistically significant difference in response between the control and the CCEC, the test does not comply with the effluent limit for chronic toxicity. The Permittee must then immediately conduct the additional testing described in Subsection E. The Permittee will comply with the requirements of this section by meeting the requirements of Subsection E.

The Permittee must determine the statistical significance by conducting a hypothesis test at the 0.05 level of significance (Appendix H, EPA/600/4-89/001). If the difference in response between the control and the CCEC is less than 20 percent, the Permittee must conduct the hypothesis test at the 0.01 level of significance.

Ecology will reevaluate the need for the chronic toxicity limit in future permits. Therefore, the Permittee must also conduct this same hypothesis test (Appendix H, EPA/600/4-89/001) to determine whether a statistically significant difference in response exists between the acute critical effluent concentration (ACEC) and the control.

D. Compliance Testing for Chronic Toxicity

The Permittee must:

1. Perform the chronic toxicity tests using the CCEC, the ACEC, and a control, or with a full dilution series.

2. Conduct twice/year chronic toxicity testing on the final effluent if characterization determines that the effluent limit for chronic toxicity is applicable. Testing must begin by **June 1, 2013**.

3. Submit a written report of all test results to Ecology by **March 1, 2014**. This written report must include the results of hypothesis testing conducted as described in Subsection C. using both the ACEC and CCEC versus the control. Further instructions on testing conditions and test report content are in Subsection G below.

4. Perform compliance tests using the following species on a rotating basis and the most recent version of the following protocols:

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	*Pimephales promelas*	EPA-821-R-02-013
Water flea survival and reproduction	*Ceriodaphnia dubia*	EPA-821-R-02-013

E. Response to Noncompliance with the Effluent Limit for Chronic Toxicity

If a toxicity test conducted under Subsection D determines a statistically significant difference in response between the CCEC and the control using the statistical test

described in Subsection C, the Permittee must begin additional testing within one week from the time of receiving the test results. The Permittee must:

1. Conduct additional testing each month for three consecutive months using the same test and species as the failed compliance test.

2. Use a series of at least five effluent concentrations and a control to determine appropriate point estimates. One of these effluent concentrations must equal the CCEC. The results of the test at the CCEC will determine compliance with the effluent limit for chronic toxicity as described in Subsection B.

3. Return to the original monitoring frequency in Subsection C after completion of the additional compliance monitoring.

Anomalous test results: If a toxicity test conducted under Subsection D indicates noncompliance with the chronic toxicity limit and the Permittee believes that the test result is anomalous, the Permittee may notify Ecology that the compliance test result may be anomalous. The Permittee may take one additional sample for toxicity testing and wait for notification from Ecology before completing the additional testing. The Permittee must submit the notification with the report of the compliance test result and identify the reason for considering the compliance test result to be anomalous.

If Ecology determines that the test result was not anomalous, the Permittee must complete all of the additional monitoring required in this subsection. Or,

If the one additional sample fails to comply with the effluent limit for chronic toxicity, then the Permittee must complete all of the additional monitoring required in this subsection. Or,

If Ecology determines that the test result was anomalous, the one additional test result will replace the anomalous test result.

If all of the additional testing required by this subsection complies with the permit limit, the Permittee must submit a report to Ecology on possible causes and preventive measures for the transient toxicity event, which triggered the additional compliance monitoring. This report must include a search of all pertinent and recent facility records, including:

- Operating records
- Monitoring results
- Inspection records
- Spill reports
- Weather records
- Production records
- Raw material purchases
- Pretreatment records, etc.

If the additional testing required by this subsection shows another violation of the chronic toxicity limit, the Permittee must submit a Toxicity Identification/Reduction Evaluation (TI/RE) plan to Ecology within 60 days after the sample date (WAC 173-205-100(2)).

F. Testing when there is No Permit Limit for Chronic Toxicity

The Permittee must:

1. Conduct chronic toxicity testing on final effluent during June 2015 and December 2015 (once in the last summer and once in the last winter prior to submission of the application for permit renewal).

2. Submit the results to Ecology with the permit renewal application.

3. Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The ACEC equals 100 percent effluent. The series of dilutions should also contain the CCEC of 100 percent effluent.

4. Compare the ACEC to the control using hypothesis testing at the 0.05 level of significance as described in Appendix H, EPA/600/4-89/001.

5. Perform chronic toxicity tests with all of the following species and the most recent version of the following protocols:

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	*Pimephales promelas*	EPA-821-R-02-013
Water flea survival and reproduction	*Ceriodaphnia dubia*	EPA-821-R-02-013

G. Sampling and Reporting Requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.* Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.

2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.

3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.*

4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Section C. and the Ecology Publication no. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.* If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.

5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Subsection C. or pristine natural water of sufficient quality for good control performance.

6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.

7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the CCEC and the ACEC. The CCEC and the ACEC may either substitute for the effluent concentrations that are closest to them in the dilution series or be extra effluent concentrations. The CCEC equals 100 percent effluent. The ACEC equals 100 percent effluent.

8. All whole effluent toxicity tests that involve hypothesis testing must comply with the chronic statistical power standard of 39 percent as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

GENERAL CONDITIONS

G1. SIGNATORY REQUIREMENTS

1. All applications, reports, or information submitted to Ecology must be signed and certified.

   a. In the case of corporations, by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

      - A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or

      - The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

      - In the case of a partnership, by a general partner.

      - In the case of sole proprietorship, by the proprietor.

      - In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

      Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity shall be submitted by the public entity.

2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to Ecology.

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph B.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph B.2, above, must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section must make the following certification:

> "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. RIGHT OF INSPECTION AND ENTRY

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

1. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.

2. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.

3. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.

4. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the permittee) or upon Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

1. The following are causes for terminating this permit during its term, or for denying a permit renewal application:

   a. Violation of any permit term or condition.

   b. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.

c. A material change in quantity or type of waste disposal.

d. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.

e. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.

f. Nonpayment of fees assessed pursuant to RCW 90.48.465.

g. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

2. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:

a. A material change in the condition of the waters of the state.

b. New information not available at the time of permit issuance that would have justified the application of different permit conditions.

c. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.

d. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.

e. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.

f. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.

g. Incorporation of an approved local pretreatment program into a municipality's permit.

3. The following are causes for modification or alternatively revocation and reissuance:

a. When cause exists for termination for reasons listed in A1 through A7 of this section, and Ecology determines that modification or revocation and reissuance is appropriate.

b. When Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G7) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. REPORTING PLANNED CHANGES

The Permittee must, as soon as possible, but no later than sixty (60) days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

1. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b)

2. A significant change in the nature or an increase in quantity of pollutants discharged.

3. A significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. PLAN REVIEW REQUIRED

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least 180 days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. TRANSFER OF THIS PERMIT

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

1. Transfers by Modification:

   Except as provided in paragraph (B) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

2. Automatic Transfers:

   This permit may be automatically transferred to a new Permittee if:

   a. The Permittee notifies Ecology at least 30 days in advance of the proposed transfer date.

b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.

c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. REDUCED PRODUCTION FOR COMPLIANCE

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. REMOVED SUBSTANCES

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. DUTY TO PROVIDE INFORMATION

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. ADDITIONAL MONITORING

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. PAYMENT OF FEES

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof must be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. UPSET

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.

2. The permitted facility was being properly operated at the time of the upset.

3. The Permittee submitted notice of the upset as required in Condition S3.E.

4. The Permittee complied with any remedial measures required under S4.C of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. DUTY TO COMPLY

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. TOXIC POLLUTANTS

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. PENALTIES FOR TAMPERING

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit must, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment must be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. REPORTING REQUIREMENTS APPLICABLE TO EXISTING MANUFACTURING, COMMERCIAL, MINING, AND SILVICULTURAL DISCHARGERS

The Permittee belonging to the categories of existing manufacturing, commercial, mining, or silviculture must notify Ecology as soon as they know or have reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in this permit, if that discharge will exceed the highest of the following "notification levels:"

    a. One hundred micrograms per liter (100 µg/L).

    b. Two hundred micrograms per liter (200 µg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony.

    c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7).

    d. The level established by the Director in accordance with 40 CFR 122.44(f).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in this permit, if that discharge will exceed the highest of the following "notification levels:"

    a. Five hundred micrograms per liter (500µg/L).

    b. One milligram per liter (1 mg/L) for antimony.

    c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7).

    d. The level established by the Director in accordance with 40 CFR 122.44(f).

G21. COMPLIANCE SCHEDULES

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than 14 days following each schedule date.

APPENDIX A

LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels.
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

When the permit requires the Permittee to measure the base neutral compounds in the list of priority pollutants, it must measure all of the base neutral pollutants listed in the table below. The list includes EPA required base neutral priority pollutants and several additional polynuclear aromatic hydrocarbons (PAHs). The Water Quality Program added several PAHs to the list of base neutrals below from Ecology's Persistent Bioaccumulative Toxics (PBT) List. It only added those PBT parameters of interest to Appendix A that did not increase the overall cost of analysis unreasonably.

Ecology added this appendix to the permit in order to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

CONVENTIONAL PARAMETERS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1]** *µg/L unless specified*	**Quantitation Level (QL)[2]** *µg/L unless specified*
Biochemical Oxygen Demand	SM5210-B		2 mg/L
Chemical Oxygen Demand	SM5220-D		10 mg/L
Total Organic Carbon	SM5310-B/C/D		1 mg/L
Total Suspended Solids	SM2540-D		5 mg/L
Total Ammonia (as N)	SM4500-NH3- GH		0.3 mg/L
Flow	Calibrated device		
Dissolved oxygen	SM4500-OC/OG		0.2 mg/L
Temperature (max. 7-day avg.)	Analog recorder or Use micro-recording devices known as thermistors		0.2° C
pH	SM4500-H+ B	N/A	N/A

NONCONVENTIONAL PARAMETERS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1]** *µg/L unless specified*	**Quantitation Level (QL)[2]** *µg/L unless specified*
Total Alkalinity	SM2320-B		5 mg/L as CaCO3
Chlorine, Total Residual	SM4500 Cl G		50.0
Color	SM2120 B/C/E		10 color units
Fecal Coliform	SM 9221D/E,9222	N/A	N/A
Fluoride (16984-48-8)	SM4500-F E	25	100
Nitrate-Nitrite (as N)	SM4500-NO3-E/F/H		100
Nitrogen, Total Kjeldahl (as N)	SM4500-NH3-C/E/FG		300
Ortho-Phosphate (PO4 as P)	SM4500- PE/PF	3	10
Phosphorus, Total (as P)	SM4500-PE/PF	3	10
Oil and Grease (HEM)	1664A	1,400	5,000
Salinity	SM2520-B		3 PSS
Settleable Solids	SM2540 -F		100
Sulfate (as mg/L SO4)	SM4110-B		200
Sulfide (as mg/L S)	SM4500-S2F/D/E/G		200
Sulfite (as mg/L SO3)	SM4500-SO3B		2000
Total Coliform	SM 9221B, 9222B, 9223B	N/A	N/A
Total dissolved solids	SM2540 C		20 mg/L
Total Hardness	SM2340B		200 as CaCO3
Aluminum, Total (7429-90-5)	200.8	2.0	10
Barium Total (7440-39-3)	200.8	0.5	2.0
BTEX (benzene +toluene + ethylbenzene + m,o,p xylenes)	EPA SW 846 8021/8260	1	2
Boron Total (7440-42-8)	200.8	2.0	10.0
Cobalt, Total (7440-48-4)	200.8	0.05	0.25
Iron, Total (7439-89-6)	200.7	12.5	50
Magnesium, Total (7439-95-4)	200.7	10	50
Molybdenum, Total (7439-98-7)	200.8	0.1	0.5
Manganese, Total (7439-96-5)	200.8	0.1	0.5
NWTPH Dx	Ecology NWTPH Dx	250	250
NWTPH Gx	Ecology NWTPH Gx	250	250
Tin, Total (7440-31-5)	200.8	0.3	1.5
Titanium, Total (7440-32-6)	200.8	0.5	2.5

PRIORITY POLLUTANTS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1]** *µg/L unless specified*	**Quantitation Level (QL)[2]** *µg/L unless specified*
METALS, CYANIDE & TOTAL PHENOLS			
Antimony, Total (7440-36-0)	200.8	0.3	1.0
Arsenic, Total (7440-38-2)	200.8	0.1	0.5
Beryllium, Total (7440-41-7)	200.8	0.1	0.5
Cadmium, Total (7440-43-9)	200.8	0.05	0.25
Chromium (hex) dissolved (18540-29-9)	SM3500-Cr EC	0.3	1.2
Chromium, Total (7440-47-3)	200.8	0.2	1.0
Copper, Total (7440-50-8)	200.8	0.4	2.0
Lead, Total (7439-92-1)	200.8	0.1	0.5
Mercury, Total (7439-97-6)	1631E	0.0002	0.0005
Nickel, Total (7440-02-0)	200.8	0.1	0.5
Selenium, Total (7782-49-2)	200.8	1.0	1.0
Silver, Total (7440-22-4)	200.8	0.04	0.2
Thallium, Total (7440-28-0)	200.8	0.09	0.36
Zinc, Total (7440-66-6)	200.8	0.5	2.5
Cyanide, Total (57-12-5)	335.4	5	10
Cyanide, Weak Acid Dissociable	SM4500-CN I	5	10
Phenols, Total	EPA 420.1		50
ACID COMPOUNDS			
2-Chlorophenol (95-57-8)	625	1.0	2.0
2,4-Dichlorophenol (120-83-2)	625	0.5	1.0
2,4-Dimethylphenol (105-67-9)	625	0.5	1.0
4,6-dinitro-o-cresol (534-52-1) (2-methyl-4,6,-dinitrophenol)	625/1625B	1.0	2.0
2,4 dinitrophenol (51-28-5)	625	1.0	2.0
2-Nitrophenol (88-75-5)	625	0.5	1.0
4-nitrophenol (100-02-7)	625	0.5	1.0
Parachlorometa cresol (59-50-7) (4-chloro-3-methylphenol)	625	1.0	2.0
Pentachlorophenol (87-86-5)	625	0.5	1.0
Phenol (108-95-2)	625	2.0	4.0
2,4,6-Trichlorophenol (88-06-2)	625	2.0	4.0
VOLATILE COMPOUNDS			
Acrolein (107-02-8)	624	5	10
Acrylonitrile (107-13-1)	624	1.0	2.0
Benzene (71-43-2)	624	1.0	2.0
Bromoform (75-25-2)	624	1.0	2.0
Carbon tetrachloride (56-23-5)	624/601 or SM6230B	1.0	2.0
Chlorobenzene (108-90-7)	624	1.0	2.0
Chloroethane (75-00-3)	624/601	1.0	2.0

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
METALS, CYANIDE & TOTAL PHENOLS			
2-Chloroethylvinyl Ether (110-75-8)	624	1.0	2.0
Chloroform (67-66-3)	624 or SM6210B	1.0	2.0
Dibromochloromethane (124-48-1)	624	1.0	2.0
1,2-Dichlorobenzene (95-50-1)	624	1.9	7.6
1,3-Dichlorobenzene (541-73-1)	624	1.9	7.6
1,4-Dichlorobenzene (106-46-7)	624	4.4	17.6
Dichlorobromomethane (75-27-4)	624	1.0	2.0
1,1-Dichloroethane (75-34-3)	624	1.0	2.0
1,2-Dichloroethane (107-06-2)	624	1.0	2.0
1,1-Dichloroethylene (75-35-4)	624	1.0	2.0
1,2-Dichloropropane (78-87-5)	624	1.0	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) (542-75-6) 3	624	1.0	2.0
Ethylbenzene (100-41-4)	624	1.0	2.0
Methyl bromide (74-83-9) (Bromomethane)	624/601	5.0	10.0
Methyl chloride (74-87-3) (Chloromethane)	624	1.0	2.0
Methylene chloride (75-09-2)	624	5.0	10.0
1,1,2,2-Tetrachloroethane (79-34-5)	624	1.9	2.0
Tetrachloroethylene (127-18-4)	624	1.0	2.0
Toluene (108-88-3)	624	1.0	2.0
1,2-Trans-Dichloroethylene (156-60-5) (Ethylene dichloride)	624	1.0	2.0
1,1,1-Trichloroethane (71-55-6)	624	1.0	2.0
1,1,2-Trichloroethane (79-00-5)	624	1.0	2.0
Trichloroethylene (79-01-6)	624	1.0	2.0
Vinyl chloride (75-01-4)	624/SM6200B	1.0	2.0
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)			
Acenaphthene (83-32-9)	625	0.2	0.4
Acenaphthylene (208-96-8)	625	0.3	0.6
Anthracene (120-12-7)	625	0.3	0.6
Benzidine (92-87-5)	625	12	24
Benzyl butyl phthalate (85-68-7)	625	0.3	0.6
Benzo(*a*)anthracene (56-55-3)	625	0.3	0.6
Benzo(b)fluoranthene (3,4-benzofluoranthene) (205-99-2) [4]	610/625	0.8	1.6

Pollutant & CAS No. (if available)	Recommended Analytical Protocol	Detection (DL)1 µg/L unless specified	Quantitation Level (QL) 2 µg/L unless specified
Benzo(j)fluoranthene (205-82-3) [4]	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) (207-08-9) [4]	610/625	0.8	1.6
Benzo(r,s,t)pentaphene (189-55-9)	625	0.5	1.0
Benzo(*a*)pyrene (50-32-8)	610/625	0.5	1.0
Benzo(*ghi*)Perylene (191-24-2)	610/625	0.5	1.0
Bis(*2-chloroethoxy)*methane (111-91-1)	625	5.3	21.2
Bis(*2-chloroethyl*)ether (111-44-4)	611/625	0.3	1.0
Bis(*2-chloroisopropyl*)ether (39638-32-9)	625	0.3	0.6
Bis(*2-ethylhexyl*)phthalate (117-81-7)	625	0.1	0.5
4-Bromophenyl phenyl ether (101-55-3)	625	0.2	0.4
2-Chloronaphthalene (91-58-7)	625	0.3	0.6
4-Chlorophenyl phenyl ether (7005-72-3)	625	0.3	0.5
Chrysene (218-01-9)	610/625	0.3	0.6
Dibenzo (a,j)acridine (224-42-0)	610M/625M	2.5	10.0
Dibenzo (a,h)acridine (226-36-8)	610M/625M	2.5	10.0
Dibenzo(a-*h*)anthracene (53-70-3)(1,2,5,6-dibenzanthracene)	625	0.8	1.6
Dibenzo(a,e)pyrene (192-65-4)	610M/625M	2.5	10.0
Dibenzo(a,h)pyrene (189-64-0)	625M	2.5	10.0
3,3-Dichlorobenzidine (91-94-1)	605/625	0.5	1.0
Diethyl phthalate (84-66-2)	625	1.9	7.6
Dimethyl phthalate (131-11-3)	625	1.6	6.4
Di-n-butyl phthalate (84-74-2)	625	0.5	1.0
2,4-dinitrotoluene (121-14-2)	609/625	0.2	0.4
2,6-dinitrotoluene (606-20-2)	609/625	0.2	0.4
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)			
Di-n-octyl phthalate (117-84-0)	625	0.3	0.6
1,2-Diphenylhydrazine (*as Azobenzene*) (122-66-7)	1625B	5.0	20
Fluoranthene (206-44-0)	625	0.3	0.6
Fluorene (86-73-7)	625	0.3	0.6
Hexachlorobenzene (118-74-1)	612/625	0.3	0.6
Hexachlorobutadiene (87-68-3)	625	0.5	1.0
Hexachlorocyclopentadiene (77-47-4)	1625B/625	0.5	1.0
Hexachloroethane (67-72-1)	625	0.5	1.0
Indeno(*1,2,3-cd*)Pyrene (193-39-5)	610/625	0.5	1.0

Isophorone (78-59-1)	625	0.5	1.0
3-Methyl cholanthrene (56-49-5)	625	2.0	8.0
Naphthalene (91-20-3)	625	0.3	0.6
Nitrobenzene (98-95-3)	625	0.5	1.0
N-Nitrosodimethylamine (62-75-9)	607/625	2.0	4.0
N-Nitrosodi-n-propylamine (621-64-7)	607/625	0.5	1.0
N-Nitrosodiphenylamine (86-30-6)	625	0.5	1.0
Perylene (198-55-0)	625	1.9	7.6
Phenanthrene (85-01-8)	625	0.3	0.6
Pyrene (129-00-0)	625	0.3	0.6
1,2,4-Trichlorobenzene (120-82-1)	625	0.3	0.6
DIOXIN			
2,3,7,8-Tetra-Chlorodibenzo-P-Dioxin (176-40-16)	1613B	1.3 pg/L	5 pg/L
PESTICIDES/PCBs			
Aldrin (309-00-2)	608	0.025	0.05
alpha-BHC (319-84-6)	608	0.025	0.05
beta-BHC (319-85-7)	608	0.025	0.05
gamma-BHC (58-89-9)	608	0.025	0.05
delta-BHC (319-86-8)	608	0.025	0.05
Chlordane (57-74-9) [5]	608	0.025	0.05
4,4'-DDT (50-29-3)	608	0.025	0.05
4,4'-DDE (72-55-9)	608	0.025	0.05[10]
4,4' DDD (72-54-8)	608	0.025	0.05
Dieldrin (60-57-1)	608	0.025	0.05
alpha-Endosulfan (959-98-8)	608	0.025	0.05
beta-Endosulfan (33213-65-9)	608	0.025	0.05
Endosulfan Sulfate (1031-07-8)	608	0.025	0.05
Endrin (72-20-8)	608	0.025	0.05
Endrin Aldehyde (7421-93-4)	608	0.025	0.05
Heptachlor (76-44-8)	608	0.025	0.05
Heptachlor Epoxide (1024-57-3)	608	0.025	0.05
PCB-1242 (53469-21-9) [6]	608	0.25	0.5
PCB-1254 (11097-69-1)	608	0.25	0.5
PCB-1221 (11104-28-2)	608	0.25	0.5
PCB-1232 (11141-16-5)	608	0.25	0.5
PCB-1248 (12672-29-6)	608	0.25	0.5
PCB-1260 (11096-82-5)	608	0.13	0.5
PCB-1016 (12674-11-2) [6]	608	0.13	0.5
Toxaphene (8001-35-2)	608	0.24	0.5

1. Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.

2. Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer. (64 FR 30417). ALSO GIVEN AS: The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

3. 1, 3-dichloroproylene (mixed isomers) – You may report this parameter as two separate parameters: cis-1, 3-dichlorpropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).

4. Total Benzofluoranthenes – Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

5. Chlordane – You may report alpha-chlordane (5103-71-9) and gamma-chlordane (5103-74-2) in place of chlordane (57-74-9). If you report alpha and gamma-chlordane, the DL/PQLs that apply are 0.025/0.050.

6. PCB 1016 & PCB 1242 – You may report these two PCB compounds as one parameter called PCB 1016/1242.

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix E
Stormwater Pollution Prevention Plan

B&L Woodwaste Site
Pierce County, Washington

Stormwater Pollution Prevention Plan

Prepared for

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May 2013

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List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
2008 CAP	Cleanup Action Plan issued in 2008
BMP	Best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Ecology	Washington State Department of Ecology
GWTP	Groundwater treatment plant
Landfill	B&L Woodwaste Landfill
NAVD88	North American Vertical Datum of 1988
O&M	Operations and maintenance
OMMP	Operations, Monitoring, and Maintenance Plan
Property	B&L Woodwaste Property
Site	B&L Woodwaste Site
SWPPP	Stormwater Pollution Prevention Plan

1.0 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared to support operations and maintenance (O&M) activities being conducted as part of cleanup activities at the B&L Woodwaste Site (Site) in Pierce County, Washington. This SWPPP addresses management of stormwater runoff from the facilities and activities associated with routine operation and maintenance of the cleanup remedy components that are present at the Site. Remedy components include the following:

- Landfill cap that limits infiltration of rain water to the wastes present beneath the cap.
- Subsurface barrier wall encircling contaminated groundwater beneath the Landfill cap.
- Interceptor trench located along the eastern and southern portions of the barrier wall.
- Groundwater recovery well network beneath the Landfill.
- Outside Area groundwater recovery well network.
- Monitoring well and piezometer network.
- Groundwater treatment plant and building.
- Security fencing.

The locations for these remedy components are shown on Figure 1.1.

This SWPPP addresses stormwater best management practices associated with routine monitoring, operation, and maintenance activities for the above remedy components. This plan does not address spills of chemicals, materials, or groundwater from the groundwater treatment plant (GWTP); spills associated with the GWTP are addressed in the Spill Control Plan included with the O&M Manual (Appendix A of the Operations, Monitoring, and Maintenance Plan [OMMP]).

This SWPPP is divided into the following seven main sections:

- **Section 1.0—Introduction.** This section describes the objectives and organization of this SWPPP.
- **Section 2.0—Project Background and Work Area Description.** This section describes project background, existing conditions in the work area, and construction activities.
- **Section 3.0—Lime Delivery Pad BMPs.** This section provides a detailed description of the best management practices (BMPs) to be implemented to control releases that may occur during delivery of lime slurry to the GWTP building.
- **Section 4.0—Well Maintenance BMPs.** This section describes the BMPs for performing routine maintenance on the monitoring well and recovery well networks.

- **Section 5.0—Pollution Prevention Team.** This section identifies the appropriate contact names (emergency and non-emergency), monitoring personnel, and the on-site temporary erosion and sedimentation control inspector.
- **Section 6.0—Reporting and Recordkeeping.** This section describes the requirements for documentation of BMP implementation and changes, if any, that are made to the BMPs described in this SWPPP.

2.0 Project Background and Work Area Description

2.1 PROJECT BACKGROUND

The Site is located in unincorporated Pierce County, Washington, in Township 20 North, Range 4 East, Section 5, Willamette Meridian. The Site consists of the B&L Woodwaste Property (Property), which includes the B&L Woodwaste Landfill (Landfill), and adjacent areas that have been affected by releases from the Landfill. The Property occupies about 18.5 acres of undeveloped land approximately 0.25 mile east of Interstate 5 and 5 miles east of Tacoma. Within the Property, the pentagonal-shaped Landfill encompasses roughly 11.5 acres and rises to an elevation of approximately 53 feet (North American Vertical Datum of 1988 [NAVD88]). Farmland borders the western and southwestern edges of the Property, the Autumn Village Apartment complex adjoins the southeastern border, and Fife Way defines the eastern boundary. A private property is located to the northeast. Puget Power Access Road, which was converted to a bicycle trail and is now known as the Interurban Trail, borders the north side of the Property. Former farmland that has re-established itself as a grassy wetland lies to the north of the Interurban Trail.

Beginning in the 1970s, the Property was operated as a disposal site for deck debris from log sort yards operating in the Tacoma Tideflats area. Log sort yard operators used Asarco slag as roadway and yard ballast. The slag was mixed with the bark and dirt that was periodically cleaned from the log sort yards and transported to the Property for disposal. During the 1980s, Washington State Department of Ecology (Ecology) discovered that the slag within the waste was leaching arsenic at concentrations in exceedance of surface water standards. The waste was identified as a source of metal contamination to Hylebos Waterway and the Commencement Nearshore/Tideflats Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site by the U.S. Environmental Protection Agency. Remediation and monitoring activities at the Site began in the late 1980s and have continued through the present day. In response to an order from Ecology, the waste was consolidated and a landfill cap was placed over the consolidated waste in 1992 to limit generation of leachate due to infiltration of stormwater. A phased construction program was conducted from 2008 through 2012 to implement the additional cleanup actions specified in the 2008 CAP; this work included the following:

- Construction of a subsurface barrier wall to enclose contaminated groundwater beneath the Landfill (2009–2010).
- Construction of an interceptor trench to facilitate groundwater flow around the barrier wall (2009).
- Implementation of in-situ treatment for downgradient groundwater (2009–2011).
- Construction of a contaminated groundwater recovery and treatment system (2011–2012).
- Excavation and disposal of contaminated ditch sediments (2012).

Remediation activities at the Site include operation and maintenance of the interceptor trench, groundwater recovery system, groundwater treatment plant, and the in-situ treatment program.

Groundwater monitoring and monitoring well maintenance is also conducted in a network of monitoring wells distributed over the Site.

2.2 EXISTING CONDITIONS

The Site includes the Property (which includes the Landfill) and several adjacent properties that have been affected by the groundwater plume or affected sediment. The ground surface on the Property is mostly vegetated with grass. A curbed concrete pad extends approximately 12 feet. from the groundwater treatment plant building. The adjacent properties are primarily wetland areas and agricultural fields. Driving and parking areas on the Property are surfaced with gravel. Farming structures and an apartment complex exist on an adjacent property. The Property topography is characterized by a mound in the middle (i.e., the Landfill), a perimeter access road around the Landfill at a lower elevation, and decreasing elevations around the perimeter. The Landfill cap slopes towards the access road from the topographical high in the middle. The access road is higher than the perimeter ground surface by approximately 4 to 5 feet. An earthen pad is present beneath the groundwater treatment building; the pad elevation is approximately the same as the perimeter road around the Landfill. Agricultural ditches that collect surface runoff from agricultural farmlands are located along the southern, western, and northern boundaries of the Property. The agricultural ditches join with flow from the Surprise Lake Drain and ultimately discharge to Hylebos Creek.

The Landfill is covered by an engineered, multi-layer cap comprised of surface grass, an impermeable liner, and drainage layers; the cap limits rainfall infiltration into the Landfill wastes. Stormwater runoff and drainage from the Landfill cap drains to the perimeter stormwater collection ditch around the Landfill. The ditch conveys the runoff from south to north and discharges to the stormwater detention pond immediately north of the Landfill through three culverts. An overflow pipe in the detention pond discharges into the agricultural ditch along the northern boundary of the Property. The detention pond also receives the treated water discharged by the groundwater treatment plant. Stormwater runoff from the perimeter road either drains inward to the stormwater ditch or drains outward to the agricultural ditches. Stormwater runoff from topographically low area on the east side of the Landfill drains via a culvert to the agricultural ditch.

An organic silt and peat unit lies beneath the Landfill and forms the near-surface soils beneath much of the area surrounding the Landfill. These deposits are 4 to 7 feet thick and correspond to the pre-landfill ground surface. A thin layer of fill material from the 1993 remedy covers much of the Property ground surface surrounding the Landfill. Saturated alluvial deposits (primarily sands) directly underlie the organic silt and peat unit and comprise the Upper Sand Aquifer. The soils beneath the area upgradient of the Landfill consist of a silty, gravelly colluvium deposit with generally low permeability.

Several distinct wetlands areas are located near or within the project area, located both on and off the Property, as shown on Figure 1.1. All of the wetlands are ultimately connected to Hylebos Creek through a series of smaller surface drainages and the Surprise Lake Drain. Wetland A covers approximately 0.2 acres on the southeast side of the Property. As described by the Ecology rating system, Wetland A is a Category IV wetland. Wetland B is a Category III wetland, and occupies approximately 0.7 acres on the northeast portion of the Property. Wetland C covers at least 59 acres north of the Interurban Trail and is classified as a Category I

wetland. Wetland F, approximately 1 acre in size, is a Category IV wetland located in the agricultural field, adjacent the northwest corner of the Property (AMEC 2011). Wetland E is located on the Property to the northeast of the Property; this wetland area is not affected by stormwater runoff from the project area.

2.3 OPERATION AND MAINTENANCE ACTIVITIES

This SWPPP addresses routine operation and maintenance activities conducted to ensure the active remedy components attain cleanup objectives specified in the 2008 Cleanup Action Plan (2008 CAP) and to comply with post-closure care requirements specified in applicable regulations for the Landfill. These routine activities will include operation and maintenance of the groundwater recovery wells, operation and maintenance of the groundwater treatment process located inside the building, monitoring and maintenance injections for in-situ treatment of the groundwater plume, monitoring of groundwater and surface water, and Landfill cap inspection and surface maintenance. These routine activities will not require disturbance of surface soils. Non-routine operation and maintenance activities are not specifically addressed by this SWPPP. Work plans will be prepared for non-routine work that may disturb surface soils or otherwise potentially affect stormwater runoff from the Site. The project-specific work plans will include BMPs or, if earth disturbance is sufficiently large, a construction stormwater permit to properly manage stormwater runoff from the non-routine work.

O&M activities associated with the GWTP will mostly be conducted inside the building housing the process equipment. Figure 2.1 shows the GWTP building and adjacent areas. The building significantly reduces the potential for process operations to affect stormwater runoff. The treatment system includes secondary containment and fail-safe protections that should prevent releases of chemical or untreated water from the building area. Wastes generated by the process and stored inside the building. Chemicals used in the process are stored inside the building. Standard operating procedures for the treatment process include housekeeping requirements to keep walkways clean and limit the potential for tracking process materials outside the building. Chemicals other than lime used in the treatment process are delivered in containers and transferred from delivery trucks directly to the building. Lime is delivered as a slurry in bulk tank trucks at a delivery pad designed to limit the potential for any leakage to be released to the environment; specific BMPs have been established to address stormwater management from the lime delivery area, as described in the following section.

The groundwater recovery system includes a network of recovery wells and 19 piezometers used to monitor groundwater level around the perimeter of the Landfill (Figure 1.1). The groundwater recovery wells are distributed over the Landfill and the areas northwest, north, and east of the Landfill. During normal operation, the 19 submerged well pumps discharge to a sealed, underground line that directs recovered groundwater to the inside of the GWTP building. Routine maintenance may require removal of pumps from recovery wells, opening or replacement of equipment at the well heads, or removal of transducers within piezometers. BMPs have been established to address stormwater management during routine maintenance work.

A network of monitoring wells is used to collect groundwater samples to demonstrate compliance with the cleanup standard specified in the 2008 CAP. The Compliance Monitoring Plan (CMP) and the Sampling and Analysis Plan (SAP), both of which are appended to the

OMMP, describe procedures used to collect samples and to prevent release of groundwater to surface soils. These procedures effectively limit the potential for groundwater sampling to impact stormwater runoff. Routine maintenance of monitoring wells is limited to replacement of well caps and maintaining well identification information on the wells. These maintenance activities have minimal potential for affecting stormwater runoff. No additional BMPs are needed to manage stormwater runoff from the area adjacent to groundwater monitoring wells during routine sampling and maintenance. Project-specific work plans that will include BMPs for stormwater management will be prepared if more invasive maintenance (e.g., replacing the well monument) is needed.

3.0 Lime Delivery Pad BMPs

Deliveries of lime slurry are made only at the Lime Delivery Pad. The location and design of the Lime Delivery Pad are shown on Figures 2.1 and 3.1. The Pad provides an impervious surface that will contain spills, if any occur during delivery of lime slurry. A specially designed enclosure around the delivery connection piping will collect and contain drippage that may occur during hose connection and/or disconnection. The enclosure will prevent these incidental drips from contacting the concrete pad. This Lime Delivery Pad includes BMPs that support stormwater management and will limit the potential for releases of lime slurry to the environment during delivery of lime slurry. The design and BMPs are described in more detail below.

3.1 LIME DELIVERY PAD DESIGN

The Lime Delivery Pad is located on the north side of the building (Figures 2.1 and 3.1). The Pad is a concrete slab (12 feet × 35 feet) oriented northwest to southeast and surrounded by concrete curbing on three sides extending up to 1 foot above the slab; the slope of the slab provides containment on the fourth side. A concrete sump (9.5 feet × 4 feet × 4 feet) covered by a steel grate is located at the southeastern end of the slab. The slab is sloped at 3 percent from a high at the northwest end to a low at the southeast end so that any liquids on the slab will drain toward the sump. The sump is equipped with an outlet gate valve that is manually operated. An extension to the valve handle allows the drain valve to be opened and closed from grade level. The curbed area and sump provide a total containment capacity of approximately 2,350 gallons; the maximum volume of lime slurry that will be delivered is 2,500 gallons. It is highly unlikely that the entire contents of the lime slurry truck would be released to the containment area, as the truck operator will be present at the truck during delivery and the truck will be actively pumping lime slurry to the storage tank inside the building during delivery. The Lime Delivery Pad is capable of containing up to a 10-inch rain event. The Lime Delivery Pad is accessed directly from the gravel parking area around the GWTP building.

An Environ-Box™ is installed on the wall of the building at the Lime Delivery Pad to provide a safe and environmentally sound means to connect the truck to the lime slurry storage tank during delivery. The Environ-Box™ is specially designed to provide containment for any leakage that may occur when connecting or disconnecting the delivery hose to the lime slurry delivery line. The box will contain nominal amounts of drippage or leakage during connections and disconnections, preventing contact of the leaks with the concrete pad. A side connection to the lime delivery line allows the delivery line to be flushed with water from a water hose. A drain valve for the box allows any leaked lime slurry to be removed from the Environ-Box™ and collected into a bucket. The Environ-Box™ is kept closed and locked when it is not being used for delivery or being cleaned.

3.2 LIME DELIVERY PROCEDURES

The lime delivery procedures are documented in the O&M Manual, Operation Procedure P-320, Lime Feed System Operations. These procedures are summarized below. These operating procedures are followed for routine activities associated with the GWTP. Lime is delivered to the GWTP only when ordered. An order is placed for the lime only when there is sufficient capacity in the lime slurry storage tank to accept a load.

Delivery of lime slurry requires that the GWTP Process Operator be present at the facility. Prior to allowing the delivery truck to drive onto the Lime Delivery Pad, the truck and trailer are inspected for oil and/or chemical leaks. If leaks are noted the truck is not allowed to unload and the trucking company is contacted to initiate cleanup of the parking area and entry driveway.

After the truck is approved for delivery, the Operator directs the truck driver to park the truck on the Lime Delivery Pad to commence transfer of lime slurry from the tank truck to the storage tank located inside the building. Prior to connecting the lime slurry delivery lines to the truck or to the GWTP lines, the Operator manually closes the gate valve in the spill containment sump located in the Lime Delivery Pad. When closed, this valve prevents the contents of the sump from release to the environment. Upon authorization from the Operator, The truck driver connects the lime slurry delivery hose to the truck outlet connection and the Environ-Box™ camlock fitting. After double checking the connections, the truck driver opens the delivery gate valve in the Environ-Box™, which allows the lime slurry to flow to the storage tank inside the building. The driver then pumps lime slurry from the truck through the lime delivery piping and into the lime storage tank. When the lime has been delivered, the truck driver then rinses his truck using the water hose located nearby. He then pumps that rinsate water into the lime tank; this also rinses the lime delivery piping. After completing rinsing, the truck driver then closes the delivery gate valve in the Environ-Box™, disconnects the hoses, inspects the pad for spills, and leaves the Site if there are no lime spills. After the lime delivery truck leaves the site the operator flushes the lime delivery piping with clean water using the 0.75-inch ball valve present in the Environ-Box™. The delivery pad, sump, and Environ-Box™ are then checked visually to confirm that no lime has spilled. If no spills are noted, the containment sump gate valve is opened again, allowing for uncontaminated stormwater from the concrete pad to flow to the environment. If spillage has occurred, the Lime Delivery Pad, sump, and/or Environ-Box™ are cleaned, as described in the Procedure P-320 and as summarized below.

3.3 LIME DELIVERY PAD CLEANUP PROCEDURES

The cleanup procedures for the Lime Delivery Pad, are delineated in Procedure 320, Lime Feed System. The cleanup procedures are summarized here.

If lime is spilled onto the Lime Delivery Pad, the truck is not allowed to drive from the pad until cleanup of the pad has been completed. Initially, the size of the spill is assessed by the Operator. If it is small, the spill can be cleaned up using the on-site wet vacuum, a steel brush, and rinsing the concrete surface using a clean water spray from a hose. Rinse water from cleanup will collect within the sump. Cleaning will continue until the area shows no visible evidence of lime. The truck will also be inspected and any lime found on the truck will be washed off using clean water and brushes, as appropriate to remove visible traces of lime from the truck. The truck will not be allowed to leave the Lime Delivery Pad until cleanup of the pad surface and the truck has been completed. The water and lime collected in the sump will be removed and the sump cleaned as outlined below. Lime from cleanup will be reused in the treatment process if it is of sufficient quality. If contamination or debris is mixed with the lime it will be allowed to dry and disposed with the sludge from the groundwater treatment process.

For a moderate spill, the Operator must evaluate the spill and determine an appropriate way to proceed with cleanup. Cleanup options include removal of lime slurry using a shovel and plastic bucket, washing the lime to the sump using a clean water hose and brushes, or removal using a

vacuum truck followed by clean water and brush wash. If any lime is present on the truck tires or chassis, the affected area will be washed with clean water and brushed as appropriate to remove lime. If the recovered lime slurry is of adequate quality, it will be placed into the lime storage tank for use in the treatment process. If the lime contains debris or is contaminated, it would need to be disposed by a commercial disposal firm in accordance with applicable regulations. The truck will be allowed to leave the Lime Delivery Pad after cleanup of the surface has been completed. Water and lime collected in the sump will be removed and the sump cleaned as described below.

For a large spill, such as loss of the entire contents of the lime delivery truck to the Lime Delivery Pad, a commercial cleanup contractor will be dispatched to the Site to remove the spilled lime, clean the truck, clean the Lime Delivery Pad, and to clean the Lime Delivery Pad sump. Any spill which results in the discharge of lime outside the Lime Delivery Pad and sump will be immediately reported in accordance with the Spill Response Plan presented in Section 7.0 of the O&M Manual.

Spills contained within the Environ-Box™ will be immediately cleaned up after the truck has left the Lime Delivery Pad. The Operator will remove lime to the extent possible using trowels or spoons. Lime residue will be flushed to a bucket via a plastic hose connected to the Environ-Box™ drain valve. Brushes will be used as appropriate. Cleanup will continue until there is no visual evidence of residual lime in the Environ-Box™.

The Lime Delivery Pad sump will be emptied and cleaned as described in Procedure P-320 after cleanup of any spills to the Pad. Water and lime in the sump will be removed by vacuum truck. Following removal of the lime and water, the sump will be rinsed using the clean water hose. Rinse water will be tested for pH by the Operator. Rinsing will continue until testing shows that the rinse water pH within the range of 6.5 to 8.5. Rinse water not within this pH range will be removed from the sump by the vacuum truck. Removed sump water will be disposed in accordance with applicable regulations by the commercial vacuum truck company. As only lime will be handled in the Lime Delivery Pad, the sump water pH will not be sufficiently high to designate the water as a characteristic Dangerous Waste.

4.0 Well and Piezometer Maintenance BMPs

Maintenance of extraction wells and piezometer transducers may be required occasionally. It is important that groundwater from the subsurface is not spilled onto the ground surface.

As a piezometer transducer consists only of the transducer and an electrical cable; when a transducer is removed from the ground it should simply be placed into a 5-gallon bucket. It can then be decontaminated using a detergent such as Alconox and a rag or paper towels.

If an extraction well pump needs to be removed for maintenance, the operator should place a layer of plastic sheeting (Visqueen or similar) on the ground to contain any drips or spillage. When the tubing and pump are removed, care should be taken to direct the water, which may be present in the tube, into a 5-gallon bucket. After the conclusion of the pump maintenance, the contents of that bucket must be dumped into the sump, head tank, or oxidation tank inside the GWTP building. The plastic sheeting must be decontaminated using Alconox and a rag or paper towels, and then disposed of in the roll off bin on-site.

5.0 Pollution Prevention Team

5.1 ROLES AND RESPONSIBILITIES

The pollution prevention team consists of personnel responsible for implementation of the SWPPP, including the following:

- Process Operator—responsible for performing the work described in this SWPPP in conformance with the BMPs and applicable O&M procedures and for conducting inspections described in this SWPPP.
- Process Operations Supervisor—responsible for general supervision of the Process Operator and reviewing work performed by the Process Operator to ensure the procedures described in this SWPPP are properly implemented.
- Process Engineer—responsible for overall review of O&M of the Site. Responsible for initiating procedure, BMP, or facility modifications needed to properly manage stormwater at the Site.
- Emergency Ecology Contact—NPDES permit manager at Ecology to be contacted in the event of a stormwater emergency. This contact is in addition to the Ecology contacts identified in the Spill Control Plan.
- Non-emergency Ecology Contact—site manager at Ecology that can be contacted as appropriate for non-emergency issues.
- Owner Contact—individual that is the owner or representative of the owner to be contacted in the case of an emergency or other issue.

5.2 TEAM MEMBERS

Names and contact information for those identified as members of the pollution prevention team are provided in Table 5.1. The personnel designated in Table 5.1 will be responsible for assigning their project responsibilities to a qualified and competent person during times they may be unavailable. This table will be reviewed and revised at least annually to ensure the names and phone numbers are accurate.

6.0 Reporting and Recordkeeping

6.1 RECORDKEEPING

A site log book will be maintained for all relevant on-site activities including a record of the implementation of the SWPPP. The site log book, the SWPPP, and any other relevant documentation will be retained for a minimum of 3 years.

The SWPPP and site log book will be retained on-site or within reasonable access to the Site, and will be made immediately available upon request to Ecology or to representatives of local jurisdictions. A copy of this SWPPP will be provided to Ecology within 14 days of receipt of a written request for the SWPPP from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public within a reasonable amount of time when requested in writing.

6.2 UPDATING THE SWPPP

This SWPPP will be modified if it is determined to be ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the work areas, or if there has been a change in design, construction, operation, or maintenance at the Site that has a significant effect on the discharge, or potential for discharge, of pollutants to the waters of the state. The SWPPP will be modified within 7 days of a determination by a Certified Erosion and Sediment Control Lead (CESCL), based on inspection(s), that additional or modified BMPs are necessary to correct problems identified, and an updated timeline for BMP implementation will be prepared.

6.3 NOTIFICATION OF DISCHARGE

If there is a stormwater discharge from the work area and it causes a potential threat to human health or the environment, the following steps will be taken:

1. Ecology will be immediately notified.
2. Immediate action will be taken to sample and control the discharge and to correct the problem. If applicable, sampling and analysis results will be submitted to Ecology within 5 days of the initial discharge.
3. A detailed written report describing the discharge will be submitted to Ecology within 5 days, unless requested otherwise by Ecology.

Chemical spills to areas outside the building or Lime Delivery Pad will be addressed as described in Section 7.0 of the O&M Manual.

7.0 References

AMEC Earth and Environmental, Inc. (AMEC). 2011. *Wetland Determination and Delineation, B&L Woodwaste Site Remediation*. Prepared for Floyd|Snider. May.

Washington State Department of Ecology (Ecology). 2005. *Stormwater Management Manual for Western Washington, Publication Numbers 05-10-029 through 05-10-033:* Washington State Department of Ecology, Water Quality Program. Olympia, Washington. February.

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Table

Table 5.1
Pollution Prevention Team Members[1]

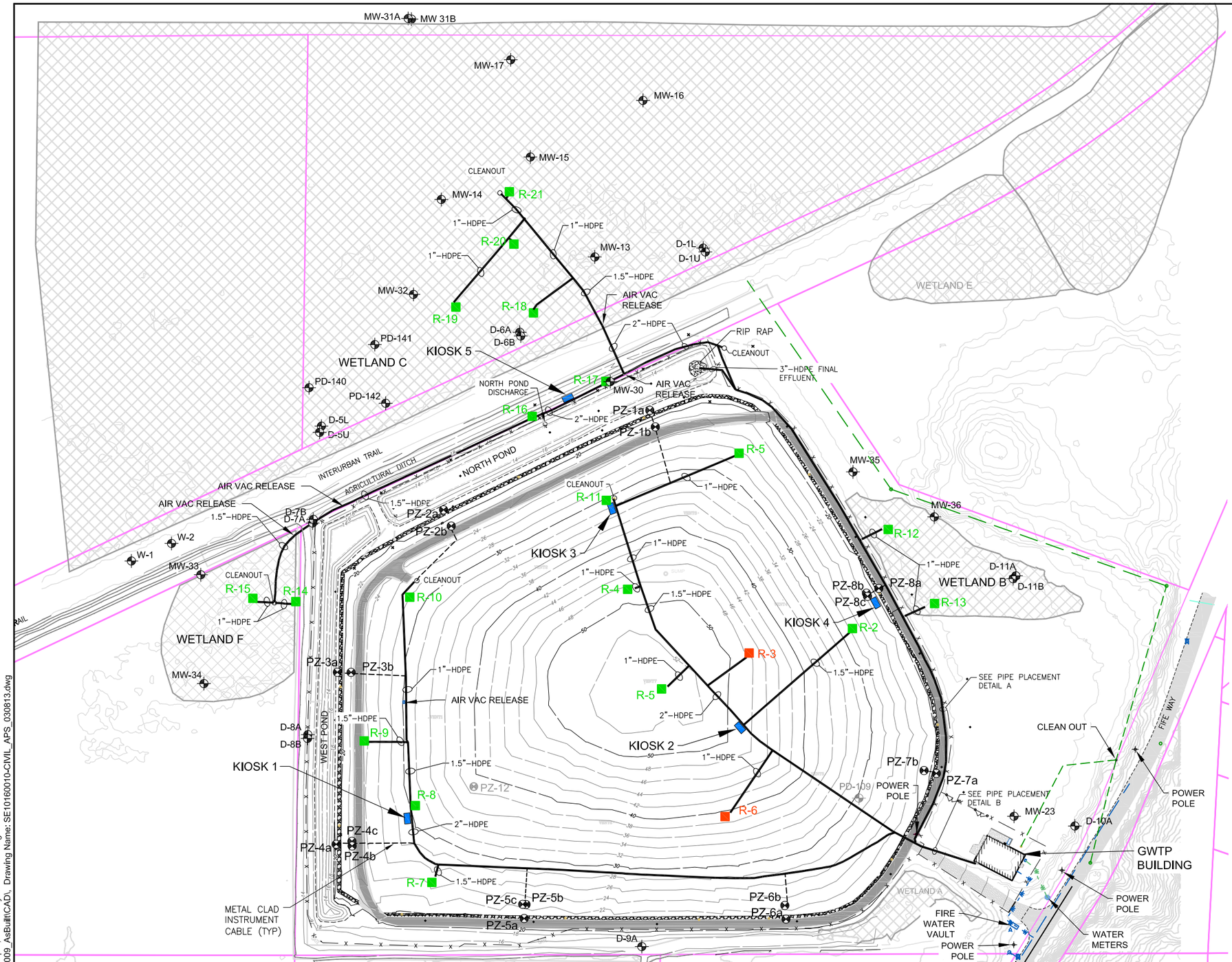
Title	Name(s)	Phone Number
Process Operator	Frank Rorie	360-509-2787
Process Operations Supervisor	Michael Kehoe	217-521-5580
Process Engineer	Mark Mierzejewski	425-761-6174
Emergency Ecology Contact	Mohsen Kourhedar	360-407-6256
Alternate Ecology Contact	Dom Reale	360-407-6266
Owner Contact	Dan Silver	360-754-9343

Note:
1 This table was revised March 18, 2013.

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

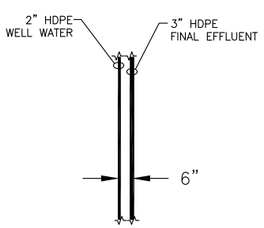
Figures



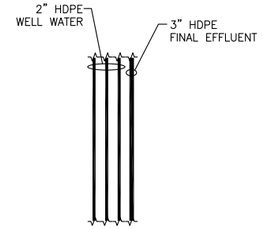
LEGEND:

- TAX PARCEL LINE
- FENCE LINE
- 12" DIAMETER CULVERT
- AGRICULTURAL DITCH
- WETLAND
- STORMWATER COLLECTION DITCH
- PERIMETER ROAD
- GROUNDWATER COLLECTION LINE
- COMMUNICATION LINE
- 2" POTABLE WATER LINE
- 6" FIRE WATER LINE
- WATER LINE
- SANITARY SEWER LINE
- R-5 EXTRACTION WELL
- R-3 EXTRACTION WELL (INACTIVE)
- MW-30 MONITORING WELL
- PZ-8b PIEZOMETER

NOTE:
UNDERGROUND LINE LOCATIONS ARE APPROXIMATE.



PIPE PLACEMENT DETAIL A
NTS



PIPE PLACEMENT DETAIL B
NTS

SCALE BAR (1" = 150'–0")
0 150' 300' 450'

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR REVIEW	FEB 25	WJM
2	ISSUED FOR PERMIT	MAR 18	GP
3	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
4	ISSUED FOR TENDER	MAY 26	WJM
5	ISSUED FOR FINAL ENGINEERING DESIGN	JLY 26	LDV

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM/LMM

FLOYD | SNIDER

amec
AMEC Environment & Infrastructure
600 University Street
Suite 600
Seattle, Washington 98101

GROUNDWATER RECOVERY AND TREATMENT PLANT PIPING LAYOUT

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/15/13
PROJECT NO.: SE10160010
FIGURE 1.1

Plot Date: 05/01/13 - 3:53pm, Plotted by: adam.stenberg
Drawing Path: S:\13486\009_AsBuilt\CAD\, Drawing Name: SE10160010-CIVIL_APS_030813.dwg

GATE

GATE

LIME DELIVERY PAD

ENVIRON BOX

GRAVEL AREA

EXISTING BUILDING

GATE

VEHICLE GATE

FIFE WAY

LEGEND:

FENCE LINE

2" POTABLE WATER LINE

6" FIRE WATER LINE

SANITARY SEWER LINE

SCALE BAR (1" = 20'-0")

0 20' 40' 60'

Plot Date: 05/01/13 - 3:55pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\009_AsBuiltCAD\, Drawing Name: SE10160010-CIVIL_APS_030813.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
3			

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM/LMM

FLOYD | SNIDER

amec

AMEC Environment & Infrastucture
600 University Street
Suite 600
Seattle, Washington 98101

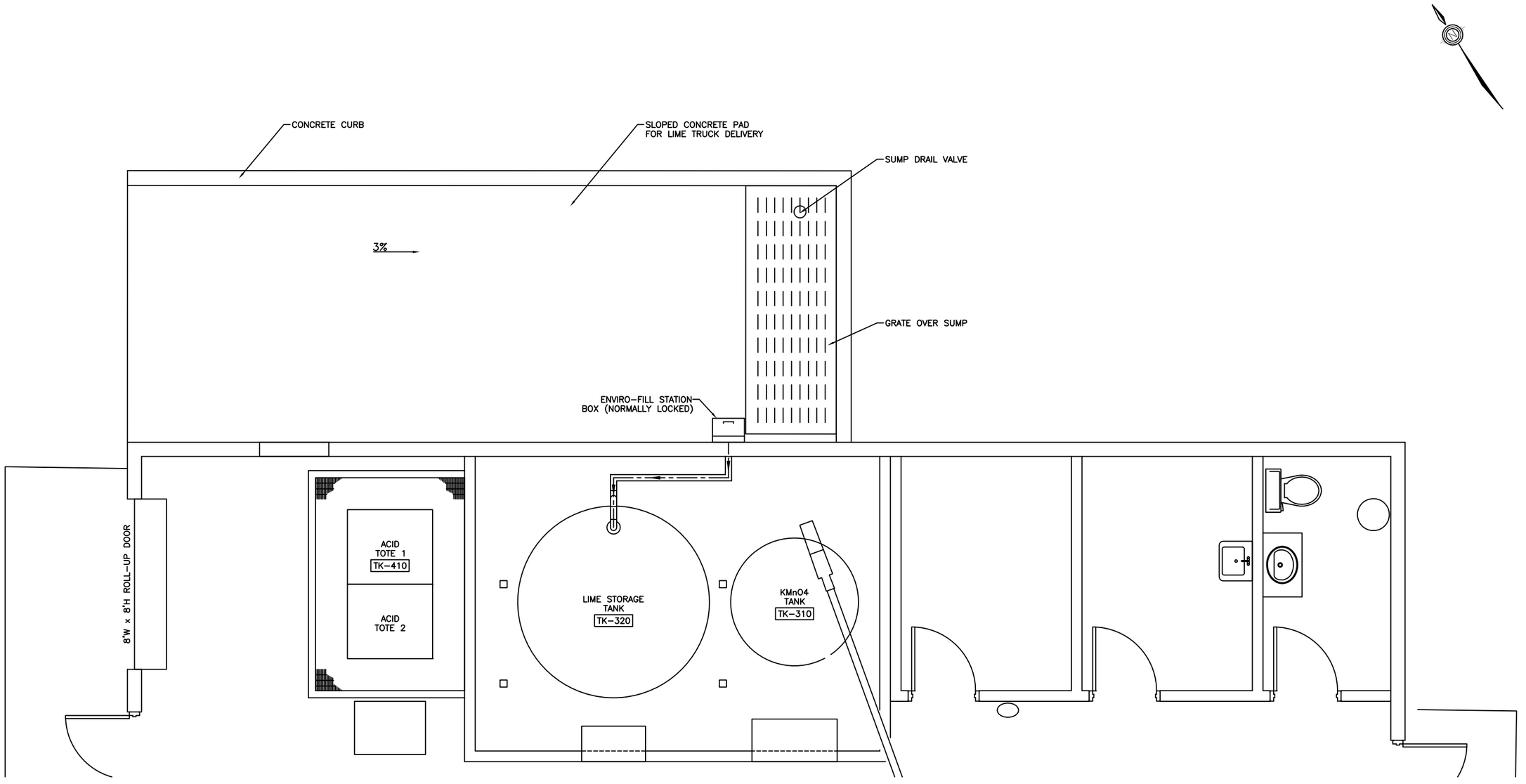
SWPPP SITE PLAN

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 03/15/13

PROJECT NO.: SE10160010

FIGURE 2.1



PLAN VIEW

SCALE BAR
0 2'-6" 5'-0" 7'-6"

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS				
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET				

DRAWN
DESIGNED
CHECKED
REVIEWED

FLOYD | SNIDER

amec

AMEC Environment & Infrastucture
600 University Street
Suite 600
Seattle, Washington 98101

LIME DELIVERY PAD
PLAN VIEW

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/02/13
PROJECT NO.: SE10160010

FIGURE 3.1

Plot Date: 05/02/13 - 9:11am, Plotted by: adam.stenberg
Drawing Path: S:\13488\009_AsBuilt\CAD\, Drawing Name: SE10160010-MECH_APS_041113.dwg

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix F
Hazardous Materials Emergency Plan

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Attachment F.3 EPCRA Reporting Forms

Attachment F.4 EPCRA Section 311 and Tier 2 2013 Submittal

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Ecology	Washington State Department of Ecology
EPCRA	Emergency Planning and Community Right-to-Know Act
GWTP	Groundwater Treatment Plant
HMIS	Hazardous materials information statement

Acronym/ Abbreviation	Definition
LEPC	Local Emergency Planning Committee
MSDS	Material Safety Data Sheet
NRC	National Response Center
O&M	Operations and Maintenance
RQ	Reportable quantity
SARA	Superfund Amendments and Reauthorization Act
SERC	State Emergency Response Commission
Site	B&L Woodwaste Site
TPQ	Threshold Planning Quantity
USEPA	U.S. Environmental Protection Agency

1.0 Introduction and Regulatory Framework

The community right-to-know provisions of the Emergency Planning and Community Right-to-Know Act (EPCRA) apply to the Groundwater Treatment Plant (GWTP) because of hazardous materials storage and use in the groundwater treatment process. The hazardous chemicals used include concentrated sulfuric acid, potassium permanganate solid, and potassium permanganate feed solution.

Under this regulation, the GWTP is required to plan for possible emergencies and report chemical information to the State Emergency Response Commission (SERC), the Local Emergency Planning Committee (LEPC), and the local fire department. EPCRA report forms covering the chemicals stored on-site that are used in the groundwater treatment process have been completed and filed with the Washington State Department of Ecology (Ecology). This Hazardous Materials Emergency Reporting Plan provides a framework to ensure that the proper actions are taken in case of an emergency and the proper reporting is done in accordance with EPCRA requirements.

The Superfund Amendments and Reauthorization Act (SARA) was signed into federal law in 1986. Title III of SARA is also known as EPCRA, or the Community Right-to-Know regulation. The State of Washington adopted the federal Title III law and regulations in 1987. SERC was established to oversee implementation of requirements imposed by SARA Title III, including the formation of the LEPC and the development of a statewide master plan for hazardous materials incident response.

Ecology receives EPCRA reports and manages data on behalf of the Washington SERC. The Community Right-to-Know provisions are intended to increase public knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment, and to help states and communities improve chemical safety and protect public health and the environment.

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2.0 Initial Status

Actions taken and information reported as part of the construction of the GWTP, in accordance with EPCRA and related requirements, are summarized below.

2.1 HAZARDOUS MATERIALS PERMIT

Pierce County Fire Prevention Bureau issued a Hazardous Materials Permit on April 16, 2012 for storage and use of sulfuric acid, lime, and potassium permanganate at the GWTP. A copy of this permit is included as Attachment F.1. Based on the Pierce County submittals and Hazardous Materials Permit, the GWTP building has an H3 hazard classification per the International Building Code (IBC). Signage identifying the presence of hazardous materials is located at both man doors providing entry to the building; specific hazardous materials signs are present for all storage tanks and drums containing hazardous materials.

2.2 HAZARDOUS MATERIALS INVENTORY

During construction of the GWTP, a hazardous materials information statement (HMIS) inventory was submitted to the Pierce County Fire Marshall's office in September 2011. The HMIS is also a supporting appendix to the November 16, 2011 Technical Opinion and Report prepared by the Fire Protection International Consortium, Inc., which presents a comprehensive overview of hazardous materials used at the B&L Woodwaste Site (Site) and a provision for compliance with the International Fire Code (Attachment F.2). This evaluation is included as Attachment F.2. Per the November 16, 2011 Technical Opinion and Report, the groundwater treatment process and building are designed to safely use, store, and contain hazardous materials used in the process.

2.3 FAIL-SAFE DESIGN EVALUATION

A fail-safe design evaluation was completed during final construction of GWTP in March 2012 to demonstrate facility safety and potential for unsafe conditions during an emergency shutdown or in the event of an overall power failure. A copy of this evaluation is included with the O&M Manual (Appendix A to the OMMP). The system was determined to be designed for safe shutdown due to conditions monitored by the control system that indicate process failure and due to emergency events either detected by the control system or initiated by manually actuated alarms. The system has also been designed to stop operations in a safe manner in the event of a general power failure. Other determinations include that no conditions requiring active ventilation would be created by an uncontrolled shutdown due to general power failure, and the system has been designed to prevent an uncontrolled restart after a power failure. This evaluation was accepted by Pierce County; no backup power system was required to support safe shutdown.

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3.0 Reporting Requirements

3.1 SECTION 302—EMERGENCY RESPONSE PLANNING

Per the requirements of SARA Title III Section 302 (40 Code of Federal Regulations [CFR], part 335), Material Safety Data Sheets (MSDS) will be maintained at the GWTP for all hazardous and extremely hazardous substances (EHSs) used in the groundwater recovery and treatment systems. The Emergency Planning Notification requirement addresses chemicals listed on the EHSs list (refer to 40 CFR part 355). For all of the listed, EHS at or above its Threshold Planning Quantity (TPQ) stored at the GWTP, the SERC and LEPC were notified within 60 days after the first shipment was received or the substance was produced at the plant. TPQs do not apply to hazardous substances; however, these chemicals are subject to reportable quantity (RQ) thresholds under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in the case of an accidental release.

The extremely hazardous and hazardous substances stored at the GWTP, including their TPQ or RQ quantities, are summarized below:

Extremely Hazardous Substance (SERC and LEPC Notified; MSDS On-site)			
Substance Name	**CAS Number**	**EPCRA TPQ**	**Quantity Stored**
Sulfuric Acid	7664-93-9	1,000 lbs	8,160 lbs (2, 265-gal totes of 93–95% sulfuric acid solution)
Hazardous Substance (MSDS On-site)			
Substance Name	**CAS Number**	**CERCLA RQ**	**Quantity Stored**
Potassium Permanganate (solid reagent)	7722-64-7	100 lbs	330 lbs
Potassium Permanganate (feed solution)	7722-64-7	2,857 lbs (aqueous solution of 3.5% permanganate)	4,928 lbs (330-lb drum permanganate mixed to 3.5% solution)

Abbreviations:

CAS	Chemical Abstract Number
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPCRA	Emergency Planning and Community Right-to-Know Act
Gal	Gallon
Lb	Pound
LEPC	Local Emergency Planning Committee
MSDS	Material Safety Data Sheets
RQ	Reportable quantity
SERC	State Emergency Response Commission
TPQ	Threshold Planning Quantity

Should there be any changes to status of a substance that would affect emergency planning, notification will be given to the SERC, LEPC, and local fire department within 30 days. These changes that require notification include closing a facility, bringing a new EHS to the GWTP,

moving the substances to a different location, and removing all EHSs from the GWTP. The EHS Notification Form is included in Attachment F.3.

3.2 SECTION 304—EMERGENCY RELEASE REPORTING

Specific steps that will be taken in response to spills are addressed by the spill prevention and control provisions included in Section 7.0 of the O&M Manual (Appendix A to the OMMP). In addition to these measures, actions will be taken to address reporting requirements under EPCRA. If a reportable quantity of an extremely hazardous or hazardous substance, as listed in Section 3.1, is released from the treatment plant, a verbal notification will be made immediately to SERC and the LEPC. Contact information is provided in Section 4.0. A report documenting the release of the hazardous substance will be made to the National Response Center (NRC). Within 30 days of the release, a follow-up written report per Section 304 Chemical Release Reporting Form will be submitted to the NRC, SERC, and LEPC. The U.S. Environmental Protection Agency (USEPA) encourages reporting under Section 304 if there is any potential for a release to migrate off-site (i.e., via groundwater or air pathways). The Emergency Release Form in included in Attachment F.3.

3.3 SECTION 311—HAZARDOUS CHEMICAL REPORTING

Per the requirements of SARA Title III Section 311, MSDS or an MSDS list for the extremely hazardous chemicals listed in Section 3.1 present at the treatment plant in excess of the threshold level or 500 pounds, whichever is less, and for the hazardous chemicals present in excess of 10,000 pounds, will be reported to the SERC, LEPC, and the local fire department. As part of the HMIS submittal, MSDS have been provided to the required agencies. A Section 311 form, including an MSDS list, has also been provided to the required agencies and this submittal is included in Attachment F.4.

MSDS information need only be submitted once, unless the chemicals present at the treatment plant in excess of the threshold level change. If such a change occurs, the B&L Woodwaste Site Custodial Trust will submit updates and notify agencies within 90 days. This notification will occur where new information becomes available on a chemical that has previously been reported; a new extremely hazardous substance is introduced to the treatment plant in excess of the TPQ or 500 pounds, whichever is less; or a hazardous substance is introduced in excess of 10,000 pounds.

A completed Section 311 form (Attachment F.4) must be submitted for extremely hazardous substances (per 40 CFR part 355) that are stored at the GWTP at or in excess of the TPQ per the Consolidated Lists of Lists (refer to http://www.epa.gov/emergencies/tools.htm#lol) or 500 pounds, whichever is less; or hazardous substances at or in excess of 10,000 pounds. The only substance currently subject to a Section 311 form is sulfuric acid. The LEPC or local fire department may request an MSDS for a hazardous chemical at the treatment plant and if so, it will be provided within 30 days. The Section 311 reporting form is included in Attachment F.4.

3.4 SECTION 312—TIER TWO EMERGENCY AND HAZARDOUS CHEMICAL INVENTORY REPORTING

Under SARA Title III Section 312, the Trust must provide an updated annual inventory of hazardous or extremely hazardous substances to the SERC, LEPCs, and the local fire department. The threshold levels for reporting chemicals on-site are the TPQ or 500 pounds at any one time, whichever is less for extremely hazardous substances (refer to 40 CFR part 355) or 10,000 pounds at any one time for hazardous substances.

This inventory will be completed and submitted annually by March 1. The inventory will be completed for each extremely hazardous or hazardous substance present at the GWTP in quantities equal to or greater than established reportable threshold amounts as listed in Section 3.1, unless the substance is excluded under Section 311(e). TPQs for all EHSs and RQs for all HSs are listed on USEPA's Consolidated List of Lists (http://www.epa.gov/emergencies/tools.htm#lol). The Tier 2 Emergency and Hazardous Chemical Inventory forms are included in Attachment F.3. Completed Section 311 and Tier 2 Reporting Forms submitted in 2013 are included as Attachment F.4.

Annual Tier 2 reporting of chemical inventory data can also be completed online to submit forms electronically to the SERC. Instructions for how to complete the Tier 2 Online application are available at http://www.ecy.wa.gov/epcra/saw.html.

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4.0 Contact Information

Entity	Contact and Address	Phone Number
Washington State Emergency Response Commission (SERC)	**Submit written reports of chemical release to:** Community Right-to-Know Unit Department of Ecology PO Box 47659 Olympia, WA 98504-7659	**Report a chemical release:** (800) 258-5990 **General information:** (800) 633-7585 Press 2 at greeting
Local Emergency Planning Committee (LEPC)	Alex Richards Pierce County Emergency Management 2501 S 35th Street Tacoma, WA 98409	**Report a chemical release:** (253) 798-2226 Dial 911 after hours
Pierce County Fire Department District No. 10 (Contracted with Tacoma Fire Department)	Fire Marshall Tacoma Fire Department and Emergency Services 901 Fawcett Avenue Tacoma, WA 98402-5699	**Report a chemical release:** (253) 627-0151 **General Information:** (253) 591-5798
Washington Department of Ecology—Southwest Regional Office	Spill Compliance Section 300 Desmond Drive Lacey, WA 98503	**Report a chemical release:** (360) 407-6300 **General Information:** (360) 407-6300
U.S. Environmental Protection Agency	U.S. EPA, Region 10 1200 Sixth Avenue, Suite 900 Seattle, WA 98101	(800) 424-4372 or (206) 553-1200
Emerald Services	Licensed waste contractor	(206) 832-3100 (24-Hour Line)
Washington State Response Center	--	(800) 258-5990 or (800)-OILS-911
National Response Center Hotline	--	(800)-424-8802

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5.0 Schedule for Submittals

EPCRA Section No.	Reporting Criteria	Submittal Requirements	Receiving Agency
Section 302	Have present at any one time an EHS in quantity equal to or greater than TPQ.	Notification within 60 days.	SERC LEPC
Section 302	Changes in status affecting emergency planning.	Notification and complete form within 30 days.	SERC LEPC
Section 304 CERCLA 103	Release of an EHS in quantity equal to or greater than reportable quantity. OR Release of a CERCLA hazardous substance in quantity equal to or greater than the reportable quantity.	Verbal notification immediately and follow-up written report submitted. Chemical Release Reporting Form submitted with 30 days.	National Response Center[1] SERC LEPC
Section 311	Have present at any one time an OSHA hazardous chemical in quantity equal to or greater than 10,000 lbs. OR An EHS in quantity equal to or greater than TPQ or 500 lbs, whichever is less.	MSDS list of chemical hazardous chemicals and health effect or MSDS copies submitted only one time when chemical is brought to the plant. Submit updates and changes within 90 days. MSDS provided to Fire Department, only if requested, within 30 days. Section 311 Report Form submitted at the time chemical is brought to the plant, only if considered to be extremely hazardous per guidance.	SERC LEPC Fire Department

[1] Notification to the NRC is only required if a CERCLA hazardous substance is released. No follow-up report is required to be submitted to the NRC.

EPCRA Section No.	Reporting Criteria	Submittal Requirements	Receiving Agency
Section 312	Have present at any one time, an OSHA hazardous chemical in quantity equal to or greater than 10,000 lbs. OR An EHS in quantity equal to or greater than TPQ or 500 lbs., whichever is less.	Submit Tier Two—Emergency & Hazardous Chemical Inventory Report. Annually by March 1.	SERC LEPC Fire Department

Abbreviations:

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EHS	Extremely hazardous substance
EPCRA	Emergency Planning and Community Right-to-Know Act
lbs	Pounds
LEPC	Local Emergency Planning Committee
MSDS	Material Safety Data Sheets
OSHA	Occupational Safety and Health Administration
SERC	State Emergency Response Commission
TPQ	Threshold Planning Quantity

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix F
Hazardous Materials Emergency Plan

Attachment F.1
Pierce County Fire Prevention Bureau Hazardous Materials Permit

Fire Prevention Bureau
2401 South 35th Street, Suite 2
Tacoma, Washington 98409
www.piercecountywa.org/pals
Information & Inspections: 253-798-7179 (Note: Residential LPG Inspections call 253-798-3152)

Permit No: **710638**
Application Date: 06/14/2011
Issued Date: 04/16/2012

Hazardous Materials Permit

This permit is issued by Pierce County giving AMEC Geometrics permission according to approved plans, application, and restrictions on record to: Review for hazardous materials on site. (sulfuric acid, lime, potassium permanganate)
BPCO # 712791

Site Address: 522 Fife WAY
Proj. Appl Name: B & L Woodwaste Site Remediation

RTSQQ: 04200534
Parcel No(s): 0420053065

Property Owner: EXECUTIVE BARK INC
1621 MARINE VIEW DR
TACOMA WA 98422

Applicant: AMEC Geometrics
601 S UNION Suite 600
SEATTLE WA 98101

Phone No: 206-292-2078

RECEIVED
APR 18 2012
BY:

Fee Amount	Fee Description	Quantity	Feet (Sq/Ln)
$90.00	Hazardous Materials Store/Handle/Use		
$90.00	Total Fees		
$90.00	Total Paid		
$0.00	**Balance Due**		

Fire Prevention Bureau
2401 South 35th Street, Suite 2
Tacoma, Washington 98409
www.piercecountywa.org/pals
Information & Inspections: 253-798-7179 (Note: Residential LPG Inspections call 253-798-3152)

Permit No: **710638**
Application Date: 06/14/2011
Issued Date: 04/16/2012

Hazardous Materials Permit

This non-transferable permit expires on 11/20/2012.

- Pierce County's approval (issuance) of this permit or decision pertains only to the County's regulatory jurisdiction and thus compliance with County regulations does not necessarily ensure compliance with other federal or state laws.

Not valid without authorized signature.

Review Comments:

* Piping shall be marked with the contents and direction of flow. Markings shall occur at each valve, at penetrations, at each change of direction and at 20 foot intervals.
* Hazard identification signs should be placed at entrances to locations where hazardous materials are stored, dispensed , or used. This includes the entrance to the property.
* NPFA 704 placards shall be provided, see page 7 of technical opinion and report for required markings.
* The solid potassium permanganate used to create the diluted feed solution is delivered and stored in metallic drum and is physically separated from the lime slurry tank, potassium permanganate feed solution tank and their secondary containment area.
* Liquid tight floors are required.
* Secondary containment (sheet M-010) is required and provided . See attachment C for the containment volume calcs.
* An emergency alarm is required by the 2009 IFC Section 2704.9.
* A supervised smoke detection system which sounds a local alarm is required by the 2009 IFC Section 4004.1.6 for the storage of oxidizers in excess of the MAQ. Sprinkler supervision and occupant notification are also required.
* The alarm systems shall be tested in accordance with the alarm matrix provided in the technical opinion and report, appendix A.
* The building is required to be sprinklered and the required design density is .20 gpm over 3,750 sqft, or in this case, the entire building (approx 2,400 sqft). As the criteria exceeds ordinary hazard design a 500 gpm hose allowance is required.

Fire Prevention Bureau
2401 South 35th Street, Suite 2
Tacoma, Washington 98409
www.piercecountywa.org/pals
Information & Inspections: 253-798-7179 (Note: Residential LPG Inspections call 253-798-3152)

Permit No: **710638**
Application Date: 06/14/2011
Issued Date: 04/16/2012

Hazardous Materials Permit

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix F
Hazardous Materials Emergency Plan

Attachment F.2
Technical Opinion and Report Regarding Hazardous Materials

THE FIRE PROTECTION INTERNATIONAL CONSORTIUM, INC.

FIRE PROTECTION - LIFE SAFETY - CODE CONSULTING
SECURITY - PERFORMANCE BASED DESIGN
http://www.the-fpi.com

November 16, 2011

Lori Roosendaal
Fire Permit Coordinator
Pierce County
Fire Prevention Bureau
2401 S 35th Street, Room 2
Tacoma, WA 98409-7494

Subject: B&L Woodwaste – Ecology Cleanup Action
Groundwater Recovery and Treatment System
522 Fife Way
Parcel 0420053065

Introduction

At the request of Floyd|Snider, Inc. I have developed this report in response to your request for a technical opinion and report related to the hazardous materials, processes, IFC and IBC requirements for the ground water treatment system and associated new building at the above referenced site.

The owner has retained Floyd|Snider and AMEC to design and manage the project. I am developing this technical opinion and report based on project drawings and specifications as well as AMEC's process description and the list of chemicals they have provided.

A section-by-section review of 2009 IFC Sections 2704 and 2705 are attached as Appendices A and B. Required HMIS are attached as Appendix C. Chemical classification data from the Hazardous Materials Expert Assistant (HMEx Version 6) database distributed by the ICC used to identify hazard categories applicable to this project are included as Appendix D.

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Concord, CA 94521
(925) 825-4643
w.comeaux@the-fpi.com

1202 N 75th St. #279
Downers Grove, IL 60516
(630) 985-3106
j.schultz@the-fpi.com

9702 SW 57th Street
Cooper City, FL 33328
(305) 915-0488
rick@the-fpi.com

1420 Marvin Road NE
Suite C #432
Lacey, WA 98516
(360) 878-9267
c.anderson@the-fpi.com

It is my opinion that the plans for this project comply with the 2009 IFC as detailed below.

Project Background – Process

The primary purpose of this process is to remove arsenic from the treated ground water. At key points in the process three chemicals are introduced to treat ground water for the removal of arsenic. A 3.5% potassium permanganate solution in water is used to oxidize metals (including arsenic) found in the untreated water. A 95% lime slurry in water is added to raise the pH of the treated water to encourage co-precipitation of the iron and arsenic in the water to remove the arsenic. A 93% sulfuric acid solution in water is later added to lower the pH and allow for adsorption of the remaining arsenic. The process results in treated water and 'filter cakes' with only roughly 0.2% arsenic. The remainder of this section is a more technical and comprehensive discussion of what I've summarized above. The salient points for IFC review are in my summary, three chemicals that are considered hazardous materials are used in the process and MAQs are exceeded. Therefore the building is being categorized as an H-3 occupancy in accordance with 2009 IBC Chapter 3, 2009 IFC Chapter 2 and 2009 IFC Table 2703.1.1(1). Fire sprinkler, fire alarm, ventilation and secondary containment will be provided in accordance with the applicable sections of the IBC and IFC and this report. A more detailed process description provided by AMEC is attached as Appendix E.

Reference Codes and Attachments

To determine MAQs for the chemicals listed by the owner and building occupancy classification the 2009 edition of the International Building and Fire Code (IBC and IFC) were used to develop this report. The 2009 IFC was used to review the hazardous materials requirements pertinent to this building and process.

NFPA 13 and NFPA 430 as referenced in chapter 40 of the 2009 IFC will provide the criteria for fire sprinkler design. Note that NFPA 430, 2004 edition is referenced in the IFC. This standard is being discontinued as a standalone document and is now folded into NFPA 400, 2010 edition. The fire sprinkler design density specified is unchanged between the two documents.

A variety of detailed information and analysis are attached to this report as Appendices A – J. I've included a list of the Appendices here.

- Appendix A – Chapter 27, Section 2704 Review
- Appendix B - Chapter 27, Section 2704 Review
- Appendix C – Hazardous Materials Inventory Statement (HMIS)
- Appendix D – Hazardous Materials Expert Assistant Chemical Data (HMEx)

- Appendix E – Process Description
- Appendix F – AMEC Secondary Containment Calculations
- Appendix G – Vapor Pressure Discussion in Support of Eliminating Standby Power to Ventilation System
- Appendix H – Material Safety Data Sheets (MSDS)
- Appendix I – Laboratory Spill Containment and Control Memorandum
- Appendix J – Laboratory Testing and Reagent Overview Memorandum

Occupancy Classification

The building is an H-3 occupancy based on MAQs of oxidizing and water reactive chemicals being exceeded. The presence of toxic chemicals in excess of MAQs would result in an H-4 designation; however, this building is a single control area so the more restrictive requirements for H-3 are applied throughout.

Fire Sprinkler

The building will fully sprinklered in accordance with NFPA 13. 2009 IFC section 4004.1.4 requires that the fire sprinkler system be designed in accordance with NFPA 430 (2004 edition), Code for the Storage of Liquid and Solid Oxidizers. Design density criteria in NFPA 430 requires a density of 0.20gpm/s.f. over a design area of 3750s.f. which in this case means the entire building (approximately 2400s.f. footprint) will be the design area. As this criteria exceeds ordinary hazard design a 500gpm hose allowance will be added.

Fire Alarm

A supervised smoke detection system which sounds a local alarm is required in accordance with 2009 IFC section 4004.1.6 for the storage of oxidizers in excess of the MAQ. The fire sprinkler system will be supervised and monitored in accordance with 2009 IFC section 903.4. An audible exterior water flow alarm device will be installed. The device will be on the exterior building wall facing Fife Way unless a different location is required by the Fire Marshal. 2009 IFC section 907.5 requires that the smoke detection system required by Chapter 40 activate the occupant notification system; therefore, an occupant notification system will be provided.

Containment

Containment is provided in the form or concrete floors and sumps. 2009 IFC section 4004.1.5 requires liquid tight floors in areas where liquid or solid oxidizers are stored. 2009 IFC section 3703.1.4.1 requires liquid tight floors in areas where toxic liquid or solids are stored. 2009 IFC section 4404.1.2 requires liquid tight floors in areas where water reactive liquid or solids are stored. Referring to sheet M-01 of the AMEC Geomatrix plan set dated 09/21/11, specifically notes 12 and 14, appropriate coatings

will be applied to the concrete floors and walls within the containment areas to create liquid tight chemical resistant surfaces

Secondary containment is provided in accordance with 2009 IFC Chapter 27 section 2704.2.2. Refer to Plan sheet M-01 of the AMEC Geomatrix plan set dated 09/21/11 and the September 9, 2011 letter from Mr. Larry McGaughey of AMEC to Ms. Roosendaal of the PC Fire Marshal's office. Secondary containment volume calculations in accordance with section 2704.2.2.3 were included as Appendix C to that letter and are repeated herein as Appendix F.

Containment volume was calculated for the largest tank in each hazardous materials secondary containment area plus 20 minutes for fire sprinkler water flow at 0.2 GPM/sf over the individual containment areas. Raised curbs prohibit any water outside the hazardous materials secondary containment areas from flowing into the secondary area.

Waterproof room

2009 IFC section 4404.1.3 requires that rooms or areas where water reactive materials are stored in quantities exceeding MAQs be waterproof. In this facility the only water reactive material is sulfuric acid. This water reactive is stored in plastic DOT approved totes which are water tight. No process piping carrying water is extended above these totes. The sulfuric acid is introduced to the treatment process through a closed piping system. Only fire sprinkler pipe will extend above the totes as is allowed by section 4404.1.3. The totes are placed over a containment pit and the pit has a 3 inch elevated curb above the surrounding floor level to prohibit infiltration of water from other portions of the area such as sprinkler discharge occurring away from the acid totes. The containment pit is lined with water proof, acid resistant material to properly contain the sulfuric acid in the unlikely event of a leak.

Incompatible Materials/Explosion Control

2009 IFC section 4404.1.6 points to section 911 for explosion control requirements where water-reactives are stored. For class 2 water-reactives explosion control is not required unless water-reactive materials can form explosive mixtures per 2009 IFC Table 911.1 footnote e. Based on the storage, containment and process methods used at this facility the water-reactive (sulfuric acid) will not form explosive mixtures. See the "Waterproof Room" section above for further discussion of the storage and containment safeguards in place.

As noted in the MSDS for sulphuric acid and in hazardous materials literature, sulphuric acid can promote formation of hydrogen gas when it is in contact with metals. Hydrogen gas can form as a result of oxidation/reactions with metals under acidic conditions, such as occurs during corrosion or during charging of lead-acid batteries. The construction materials selected for the acid storage area and secondary

containment sump specifically exclude metals to eliminate the potential for hydrogen formation. Sulphuric acid will be received at the site in DOT-approved plastic totes; the acid in the container will be in contact only with the polyethylene tote material. The totes will be placed on fiberglass reinforced plastic (FRP) grating; structural members needed to support the grating will also be FRP. The concrete sump will be coated with acid resistant materials. If an acid tote fails, released acid would flow through the grating and be contained in the lined concrete sump.

Additionally, when a tote is placed into service, a continuous level sensor and pressure/vacuum relief valve will be fitted to the tote's access port; the fittings for the level sensor and relief valve will match the access port so that it will be sealed after placement of the instruments. The level sensor will be tied to the central control unit which will continuously monitor acid level in the tote and issue an alarm if a rapid loss of level is detected.

This design essentially eliminates the potential for explosive mixtures of hydrogen to form. The only metals that will be associated with the acid area will be any metals associated with the DOT-approved totes. If a tote were to fail, metals present on the tote would not experience prolonged contact with acid, as the acid would flow downward into the sump and the central control unit would go into alarm. Short-term contact of acid with metals on the tote would not generate sufficient hydrogen to form an explosive mixture.

A concern was raised by the Fire Marshal's office regarding the compatibility of lime slurry and potassium permanganate. The chemical engineer from AMEC prepared a response to this concern. Essentially his analysis was that the potassium permanganate feed solution at only 3.5% in water would pose no incompatibility concern when sharing secondary containment with the lime slurry tank. The solid potassium permanganate used to create the diluted feed solution is delivered and stored in metallic drum and is physically separated from the lime slurry tank, potassium permanganate feed solution tank and their secondary containment area.

The more detailed discussion of this topic can be found in the September 9, 2011 letter from Mr. Larry McGaughey of AMEC to Ms. Roosendaal of the PC Fire Marshal's office.

Liquid Transfer

For toxic liquids 2009 IFC section 3703.1.5.1 requires liquid transfer to comply with section 2705.1.10. The sulfuric acid is transferred via a closed piping system with secondary outer piping for secondary containment, as shown on the process plans.

Ventilation

2009 IFC section 3703.1.5.3 requires, for use of toxic liquids in closed systems where toxic fumes are generated, ventilation in accordance with 2705.2.2.1. Section

2705.2.2.1 is not applicable in this case so the ventilation requirement defers back to section 2704.3.

In accordance with 2704.3 ventilation is required at a minimum of 1cfm per sf of floor area over the storage area. A 6000cfm exhaust fan is shown on the mechanical drawings for this 2400sf building nearly tripling the required ventilation rate. Exhaust air is not recirculated into the building as shown on the mechanical drawings.

Although significant mechanical ventilation is being provided to help prevent water condensation within the building, the owner is requesting that the requirements for standby power (2009 IFC section 2704.7) and the ventilation system emergency shut-off (2009 IFC section 2704.3.1(4)) be deleted. This request is based on the technical information developed by AMEC and attached to this report as Appendix G in accordance with 2009 IFC section 104.9 Alternative Materials and Methods. No hazardous materials are being stored or used in a gaseous form and the hazardous material liquids in the building have low vapor pressures so are not expected to generate dangerous amounts of vapor (see the attached information from AMEC). As a fail-safe, on any alarm (fire, high/low liquid level detection, power failure) the building's process all shutdown. Based on AMEC's analysis and the fail-safe nature (IFC 2704.7 exception 6) of the process system itself, I agree that standby power for ventilation is unnecessary in this case.

Mechanical design takes into account the density of potential hazardous vapors in the positioning of the exhaust and inlet points. Two 3ft x 3ft outside air louvers are shown on the mechanical drawings (sheets Mech-1 and 2) by Evergreen State Heating and Air-Conditioning. These louvers are located near the floors and the 6000cfm exhaust fan is located at the ceiling. Separate exhaust fans are provided for the office, lab, restroom and electrical room.

Seismic Protection

Per the owner, machinery and equipment will be braced and anchored in accordance with the building code to provide protection in accordance with 2009 IFC section 2703.2.8. Pipe supports are detailed on Clearcreek drawings M-06 and M-07.

Standby or Emergency Power

2009 IFC section 2704.7 requires standby or emergency power in certain situations.

Alarm panels will be provided with battery backup power to satisfy their requirement for standby power.

All process equipment is automatically shut down on any fire or process alarm and so is "fail safe" in accordance with 2009 IFC section 2704.7 item 6.

As noted in the ventilation section above, the owner is requesting that the requirement for standby power (2009 IFC section 2704.7) be deleted. This request is based on the technical information developed by AMEC and attached to this report as Appendix G in accordance with 2009 IFC section 104.9 Alternative materials and methods. Since no hazardous materials are being stored or used in a gaseous form and the hazardous material liquids in the building are not expected to generate dangerous amounts of vapor (see the attached information from AMEC).

HMIS

HMIS Inventory and Summary Reports have been prepared in accordance with 2009 IFC Appendix H. See the tables developed in Appendix C of this report.

NFPA 704 Placards

NFPA 704 diamond placarding will be provided in accordance with 2009 IFC section 2703.5. MSDS are attached as Appendix H to support these markings.

The sulfuric acid totes will be marked with:
Health -3, Fire-0, Reactivity-2, Special-~~W~~ and OX
The solid potassium permanganate containers will be marked with:
Health-3, Fire-0, Reactivity-0, Special- OX
The lime slurry tank will be marked with:
Health -1, Fire-0, Reactivity-0, Special- blank
The potassium permanganate feed tank will be marked:
Health-1, Fire-0, Reactivity-0, Special-OX
The building will be marked with a placard indicating the worst case for each ranking
Health-3, Fire-0, Reactivity-2, Special-~~W~~

Laboratory

Small quantities of chemical reagents will be used in the lab room for testing of water samples. The chemicals used are in small prepackaged test kits from the Hach Company. The quantities in question are well within MAQs as the kits contain only several milliliters of the reagent chemicals. Two memorandums prepared by AMEC are attached as Appendices I and J. One describes the spill control used in the lab and the other describes the laboratory testing and reagent use. Spill control is accomplished using Poly Labtrays during testing. By testing over these trays any spills are controlled and contained.

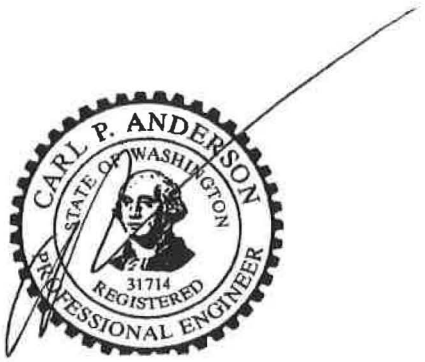
Conclusion

Based on my review of the 2009 IFC, Sections 2704 and 2705 along with other pertinent sections of the 2009 IFC and IBC, it is my opinion that the building and

occupancy planned for this site will be in compliance with the Fire Code as described above.

Respectfully,
FIRE PROTECTION INTERNATIONAL CONSORTIUM, INC.

Carl P. Anderson, PE
Principal
The Fire Protection International Consortium, Inc.



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Appendix A

Chapter 27, Section 2704 Review

This appendix provides a sub-section by sub-section review of pertinent sub-sections of the 2009 IFC Section 2704 to facilitate plan review.

2704.2 – Secondary containment is provided. See detailed discussion in the body of this report. Liquid tight floors, sumps and raised sills are used to provide containment of spills and to maintain separation of incompatible materials. Secondary containment is sized for the largest tank served by each containment area plus 20 minutes of fire sprinkler water flow above the area. Raised sills are used to prohibit flow of sprinkler discharge water from areas away from individual containment areas into other adjacent containment areas. Containment areas will be monitored visually by the process operator. Additionally high level detection is provided for the lime slurry/potassium permanganate feed solution containment area and rapid level change detection is provided for the sulfuric acid tote in use.

2704.3 – Ventilation is provided in accordance with this section. See the detailed discussion in the body of this report.

2704.4 – Separation of incompatible materials is provided. See the detailed discussion in the body of this report.

2704.5 – An automatic fire sprinkler system will be installed. In accordance with section 4004.1.4 and NFPA 430(2004) the design criteria will be 0.2GPM/sf over 3750sf; however, the building only has a 2400sf footprint. The design area will be the entire area. See the detailed discussion in the body of this report.

2704.6 – Explosion control is not required. See the detailed discussion in the body of this report.

2704.7 – Standby or emergency power. See the detailed discussion in the body of this report.

2704.8 –Temperature limit controls are not needed. Pressure control for the sulfuric acid tote is provided by a pressure/vacuum relief valve vented to tubing discharging into the acid containment sump; this valve will allow air to enter the tote during pumping and will provide pressure venting.

2704.9 – An emergency alarm is to be provided. A manual station (palm button) will be installed near the safety shower as well as outside each man door in accordance with this section). Activation of this system will initiate a local alarm. In addition to the emergency alarm required here, additional alarms are provided as indicated in the alarm summary matrix below.

ALARM SUMMARY

Item	Alarm Condition	System Shutdown	Local Alarm	Remote Alarm[1]	Approved Station Alarm
Lime Slurry/Potassium Secondary Containment Area	High level detection	Yes	Yes	Yes	No
Sulfuric Acid Tote	Rapid level change	Yes	Yes	Yes	No
Treatment System Containment Area	High level detection	Yes	No	Yes	No
Ventilation System	Loss of power	Yes	Yes	Yes	No
Fire Alarm, Automatic	Sprinkler flow detection and smoke detection system	Yes	Yes (Interior and Exterior)	Yes	Yes, as req. by Pierce County
Fire Alarm, Manual	Manual, by operator	Yes	Yes (Interior and Exterior)	Yes	Yes, as req. by Pierce County
Safety Shower Alarm	Flow in safety shower	Yes	Yes	Yes	No
Emergency Alarm	Manual by operator	Yes	Yes	Yes	Yes, as req. by Pierce County

1. Remote alarm signals are relayed to off-site operations personnel via telephone.

2704.10 – Supervision of required alarm functions will be provided. See the alarm summary matrix above.

2704.11 – Not applicable

2704.12 – Floors are non-combustible per building plans.

2704.13 – Not applicable

Appendix B

Chapter 27, Section 2705 Review

This appendix provides a sub-section by sub-section review of pertinent sub-sections of the 2009 IFC Section 2705 to facilitate plan review. Only the items not already addresses in Appendix A will be specifically commented on here.

2705.1.7 – Lighting is provided per plans.

2705.1.10 – Liquid transfer of the sulfuric acid (hazard ranking 3) is through a closed piping system. The potassium permanganate feed solution and lime slurry do not have NFPA 704 hazard ranking of 3 or 4.

2705.1.11 – The process has been designed by AMEC Geomatrix engineers competent in designs for ground water treatment.

2705.2 – Indoor dispensing and use requirements for secondary containment, ventilation, and explosion control have been previously discussed in this report.

2705.3 – Outdoor dispensing and use provisions are not applicable to this project.

2705.4 – General requirements for handling have previously been addressed in this report. An emergency alarm is to be provided based on Section 2704.9. Section 2705.4.4 is not applicable to this building.

Appendix C

Hazardous Material Inventory Statements (HMIS)

HMIS Inventory Report

Product Name (components)	CAS Number	Location	Container >55gal	Haz Class 1	Haz Class 2	Haz Class 3	Haz Class 4	Stored (lb)	Stored (gal)	Stored (gas)	Closed (lb)	Closed (gal)	Closed (gas)	Open (lb)	Open (gal)
Sulfuric Acid 93-95% Water 5-7%	7664-93-9	H-3	Yes, Two 265 gal totes	WR2	CORR	TOX	OX1		265			265			
Potassium Permanganate (Solid)	7722-64-7	H-3		OXY2	CORR	TOX		2205			735				
Potassium Permanganate Feed Solution 3.5% Potassium Permanganate 96.5% Water	7722-64-7 Mixture/ Solution	H-3	Yes, 1800 gal Tank	OXY1	CORR										1800
Lime Slurry Calcium Hydroxide 95% Calcium Hydroxide 5% Water	1305-62-0 Mixture/ Solution	H-3	Yes, 4580 gal Tank	CORR								4580			

HMIS Summary Report

Storage

IBC/IFC Class	Hazard Class	Inventory Amount			IBC/IFC Maximum Allowable Quantity		
	(Abbrev)	Solid (lb)	Liquid (gal)	Gas (cu. ft)	Solid (lb)	Liquid (gal)	Gas (cu ft)
Oxidizer	OX2	2940			500		
	OX1		2330			800	
Water Reactive	WR2		530			10	
Corrosive	COR	2940	6910		10,000	1,000	
Toxic	TOX	2940	530		1,000	100	

MAQ's increased based on sprinklered building

Building to be constructed as an H3 occupancy in accordance with 2009 IBC based on inventory amounts exceeding MAQs

Amounts are aggregate in storage plus use-closed and use-open per IFC Appendix H, Section H102.1 item 1.2

HMIS Summary Report

Use Closed

IBC/IFC Class	Hazard Class	Inventory Amount			IBC/IFC Maximum Allowable Quantity		
	(Abbrev)	Solid (lb)	Liquid (gal)	Gas (cu. ft)	Solid (lb)	Liquid (gal)	Gas (cu ft)
Oxidizer	OX2	735			500		
	OX1						
Water Reactive	WR2		265			10	
Corrosive	COR		4845			1,000	
Toxic	TOX	735	265		1,000	100	

MAQ's increased based on sprinklered building

Building to be constructed as an H3 occupancy in accordance with 2009 IBC based on inventory amounts exceeding MAQs

HMIS Summary Report

Use Open

IBC/IFC Class	Hazard Class	Inventory Amount			IBC/IFC Maximum Allowable Quantity		
	(Abbrev)	Solid (lb)	Liquid (gal)	Gas (cu. ft)	Solid (lb)	Liquid (gal)	Gas (cu ft)
Oxidizer	OX2						
	OX1		1800			Not Limited	
Water Reactive	WR2						
Corrosive	COR		1800			200	
Toxic	TOX						

MAQ's increased based on sprinklered building

Building to be constructed as an H3 occupancy in accordance with 2009 IBC based on inventory amounts exceeding MAQs

Appendix D

Hazardous Material Expert Assistant Chemical Data (HMEx)

The HMEx Assistant

Chemical Classification

C.A.S. No.	Concentration	State	RTECS
7722-64-7	12%	Liquid	SD6475000

Boiling Point	ND	**LD 50**	1,090R	**Molecular Weight**	158.00
Melting Point	NA	**LC 50**	ND	**Specific Gravity**	2.70
Flash Point	NA	**LFL/LEL**	NA	**Vapor Density**	5.47
Autoignition Temp.	NA	**UFL/UEL**	NA	**Vapor Pressure**	ND

IUPAC Name

potassium permanganate, 12% aqueous solution

Synonyms

permanganic acid, potassium salt, aqueous solution

IFC Physical Hazards

IFC Health Hazards

Corrosive

DOT

Shipping Name

Permanganates, inorganic aqueous solution, n.o.s.

Labels Required

OXIDIZER

Hazard Class or Division 5.1

ID # UN3214

Packing Group II

SARA

CERCLA Reportable Quantity 100

Section 313 Reportable Quantity 10,000

Notes

LD50 for 100 percent material



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The HMEx Assistant

Chemical Classification

C.A.S. No.	Concentration	State	RTECS
7722-64-7	100%	Solid	SD6475000

Boiling Point	ND	**LD 50**	1,090R	**Molecular Weight**	158.00
Melting Point	<240D C	**LC 50**	ND	**Specific Gravity**	2.70
Flash Point	NA	**LFL/LEL**	NA	**Vapor Density**	5.40
Autoignition Temp.	NA	**UFL/UEL**	NA	**Vapor Pressure**	ND

IUPAC Name

potassium permanganate

Synonyms

permanganic acid, potassium salt

IFC Physical Hazards

Oxidizer Solid/Liquid Class 2

IFC Health Hazards

Corrosive

DOT

Shipping Name

Potassium permanganate

Labels Required

OXIDIZER

Hazard Class or Division 5.1

ID # UN1490

Packing Group II

SARA

CERCLA Reportable Quantity 100

Section 313 Reportable Quantity 10,000



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The HMEx Assistant

Chemical Classification

C.A.S. No.	Concentration	State	RTECS
1305-62-0	95+%	Solid	EW2800000

Boiling Point	DEC C	**LD 50**	ND	**Molecular Weight**	74.10
Melting Point	580 C	**LC 50**	ND	**Specific Gravity**	2.34
Flash Point	NA	**LFL/LEL**	NA	**Vapor Density**	NA
Autoignition Temp.	NA	**UFL/UEL**	NA	**Vapor Pressure**	ND

IUPAC Name

calcium hydroxide

Synonyms

calcium hydrate
slaked lime

IFC Physical Hazards

IFC Health Hazards

Corrosive

DOT

The DOT classification for certain materials may not have been included in the DOT database portion of HMEx Assistant software. The material may not appear in the Code of Federal Regulations (CFR) 49 CFR Table 172.101 by specific name, as it may be included as a generic category. The majority of the materials requiring further identification are indicated by a listing in Table 172.101 that includes the term "not otherwise specified" or "N.O.S." For example, phenyl mercuric compounds, N.O.S. Refer to 49 CFR Parts 100 to 185 for rules governing the further identification of this material.

SARA

The material identified is not specifically listed either as a SARA Title III, OSHA Process Safety Management, CERCLA or Clean Air Act chemical; therefore, threshold quantity limits have not been established. However, any chemical requiring an MSDS may require reporting under the requirements of SARA Title III Section 312.



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The HMEx Assistant

Chemical Classification

C.A.S. No.	Concentration	State	RTECS
7664-93-9	92-98%	Liquid	WS5600000

Boiling Point	290 C	**LD 50**	2,140R	**Molecular Weight**	98.07
Melting Point	3 C	**LC 50**	254P	**Specific Gravity**	1.84
Flash Point	NA	**LFL/LEL**	NA	**Vapor Density**	3.39
Autoignition Temp.	NA	**UFL/UEL**	NA	**Vapor Pressure**	ND

IUPAC Name

sulfuric acid, 92-98% aqueous solution

Synonyms

sulfuric acid, concentrated
oil of Vitriol

IFC Physical Hazards

Oxidizer Solid/Liquid Class 1
Water Reactive Class 2

IFC Health Hazards

Corrosive
Toxic

DOT

Shipping Name
Sulfuric acid with more than 51 percent acid

Labels Required
CORROSIVE

Hazard Class or Division 8

ID # UN1830

Packing Group II

SARA

CERCLA Reportable Quantity	1,000
Section 302 Threshold Planning Qty.	1,000
Section 304 Reportable Quantity	1,000
Section 313 Reportable Quantity	10,000

Notes

Toxicity is based on an ihl-rat LC50: 510 mg/m3/2H; the density listed is for a 98% solution @20°C; the melting point listed is for a 98% solution.

Sulfuric acid 93-98% is classified as a Class 2 Water Reactive liquid as it reacts vigorously with water to produce heat. Experience has shown that localized boiling at the interface between water and acid layers can occur. Bretherick indicates that dilution of the concentrated acid solution by water is "vigorously exothermic and must be effected by adding acid to water to avoid local boiling." (Ref. 1a).

Sulfuric acid is classified as a Class 1 Oxidizer based on the following:

Bretherick includes the material in a list of oxidants (Ref. 1b).

Sulfuric acid has been assigned to the "acids, inorganic oxidizing" category in its listing of chemical compatibility by FEMA/DOT/EPA (Ref. 2).

CAMEO lists a reactivity alert indicating that the material is a strong oxidizing agent (Ref. 3).

The material is listed as a "strong oxidizer" and "strong acid" by Pohanish, R.P. and Green (Ref. 4).

HMEx has listed the material as a Class 1 oxidizer is based on judgment as it does not fit within the definition of Class 2 or

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higher oxidizers and noting that the material does not appear in the list of oxidizers published in Annex G of NFPA 400 (Ref. 5).

References:

(1a) Bretherick, Leslie, Bretherick's Handbook of Reactive Chemical Hazards, Fourth Edition, 1990, Butterworths, London, pp. 1215-1221.

(1b) Bretherick, Leslie, pp. 1727-1731.

(2) Appendix D (Chemical Compatibility Chart), Handbook of Chemical Hazard Analysis Procedures, Federal Emergency Management Agency, U.S. Department of Transportation , U.S. Environmental Protection Agency, 1990, p. D-25

(3) CAMEO Chemical Datasheet for sulfuric acid CAS 7664-93-9, National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce, Washington, D.C., http://cameochemicals.noaa.gov/chemical/5193, site visited 5/24/2010.

(4) Pohanish, R.P. and Green, S.A., "Wiley Guide to Chemical Incompatibilities, 2nd Edition," Wiley Interscience, a John Wiley & Sons Publication, 2003.

(5) NFPA 400, Hazardous Materials Code, Annex G, Oxidizers, 2010 Edition, NFPA 1 Batterymarch Park, Quincy, MA 02169, pp.164-165.



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Appendix E

Process Description

AMEC has provided the following process description.

Groundwater Treatment System Design

Groundwater recovered from beneath the Landfill and from the recovery areas outside the Landfill must be treated so that it can be discharged to surface waters. The treatment process design is based on the results of on-site pilot testing that was conducted on groundwater at the Site in 2010. Testing results indicated that groundwater at the Site can be treated to achieve the high quality discharge criteria. The treatment plant will be operated under a National Pollutant Discharge Elimination System (NPDES) permit issued by Ecology. Treated water will be discharged to the stormwater pond located immediately north of the Landfill; this pond overflows to the adjacent agricultural ditch, which drains to Hylebos Creek via the Surprise Lake Drain.

Process Design

The groundwater treatment system has been designed with the primary goal of removing arsenic from the contaminated groundwater recovered from the Site, and to achieve effluent concentrations that meet discharge criteria. The treatment system consists of several unit operations that consist of chemical oxidation, pH adjustment and co-precipitation, clarification, pH adjustment, filtration, and adsorption. The solids stream from the clarification process will be stored in a sludge tank before being dewatered with a filter press; dewatering of sludge will be done periodically on a batch basis. The filter cake will be picked up and transported to an appropriate waste receiver for disposal. Treatment chemicals will be stored in tanks or transportable totes. All treatment equipment will be located within a treatment building. The following sections describe the treatment processes in more detail.

Chemical Oxidation

Groundwater from the recovery wells will be collected in a small groundwater collection tank located in the treatment building and flow by gravity to the oxidation tank. The collection tank will provide a small amount of flow equalization and provide a suitable location to collect a composite sample of the influent groundwater. The total groundwater flow will be measured by an influent flow meter before it enters the oxidation tank.

The purpose of the oxidation tank is to provide mixing for the addition of $KMnO_4$ and sufficient reaction time to oxidize iron, manganese, and arsenic that are present in untreated groundwater. Based on the 2010 treatability testing, $KMnO_4$ was selected as the preferred chemical for oxidation. The addition of $KMnO_4$ will cause both arsenic (III) and iron (II) to be oxidized to arsenic (V) and iron (III), respectively. The higher oxidation states of arsenic and iron precipitate more readily and arsenic (V) is amenable to adsorption on the iron floc.

The oxidation tank will have a working volume of 1,200 United States gallons (gal) which provides 30 minutes of residence time at the average design flow rate. Mixing will be provided by a top-mounted 1.0 horsepower (HP) mixer. The tank will be completely mixed to ensure sufficient distribution of the $KMnO_4$, and reduce the likelihood of short-circuiting.

During the treatability testing, the appropriate dosage for $KMnO_4$ was determined to be 145 milligrams per liter (mg/L) of groundwater. This dosage has been utilized for design of the full scale treatment system. The dosage depends upon the influent concentration of permanganate-consuming constituents (i.e., iron, arsenic, manganese, and oxidizable organics). The dosage will be adjusted as appropriate based upon measurement of arsenic, iron, and manganese in the untreated groundwater. The $KMnO_4$ handling system will be designed to provide a range of dosages to support the required flexibility to accommodate changes in the groundwater quality and to service the full range of influent groundwater flow. An oxidation/reduction potential (ORP) sensor will be placed in the oxidation tank for process monitoring.

Based on the average flow, the expected consumption of dry $KMnO_4$ will be 70 pounds (lb) per day, or approximately 500 lb per week. Due to this level of consumption, a bulk handling system has been included in the design. Drums of granular, crystalline $KMnO_4$ will be purchased from a local chemical supplier and delivered to the treatment building as needed. The drums will be loaded into a drum dumper which will lift and tip the drum to empty the contents into a hopper. The top of the drum and the hopper will be sealed during dumping operations to minimize the escape of dust or fines. From the hopper the $KMnO_4$ will be transported to the top of the $KMnO_4$ storage tank via a flexible conveyor. $KMnO_4$ solution will be made up automatically on a batch basis, as needed. The $KMnO_4$ feed tank will have a volume of 1,800 gal, which will allow approximately 7 days of operation at the design average flow. It is planned that partial batches of $KMnO_4$ feed solution be made up twice per week to prevent running the tank empty, which may cause an interruption in treatment system operations.

The target $KMnO_4$ feed solution concentration will be 35 grams (g) of powdered $KMnO_4$ per liter (L) of solution (350 lb of $KMnO_4$ per 1,800-gal tank). This is below the published solubility of about 43 g/L water at 10°C (Lange 1999). The $KMnO_4$ feed solution will be fed to the oxidation tank via a chemical dosing skid via redundant diaphragm metering pumps to ensure accurate and continuous dosing. The solution will be fed to the system at a rate that is proportional to the influent groundwater flow. Based on the results of the 2010 pilot testing (observed arsenic and iron concentration in untreated water and the optimal dose), a volumetric feed ratio of 1:241 ($KMnO_4$ feed solution flow to groundwater flow) would be used. The feed ratio will be adjusted by operations personnel as necessary to achieve proper treatment and avoid overdosing. At the average design groundwater flow rate (40 gpm), the $KMnO_4$ feed solution flow rate would be 627 mL/min for this volumetric feed ratio. Concentrations of the permanganate-consuming constituents in the untreated groundwater will be monitored by field testing to establish and control the proper $KMnO_4$ feed rate. An ORP sensor and transmitter will be installed in the oxidation tank to monitor ORP and ensure appropriate oxidative conditions are maintained. The ORP sensor will be monitored by the PLC. A warning alarm will be initiated if the ORP is outside of the expected range to alert the operator that there is a potential problem with the $KMnO_4$ dosing system so that corrective action can be taken.

Co-precipitation

The groundwater will flow by gravity from the overflow of the oxidation tank to the co-precipitation tank. Lime will be added to the groundwater in the co-precipitation tank to raise the pH to a target value of 8.8 in order to induce the co-precipitation of arsenic with the iron that is present in the groundwater; this is a recognized method for the removal of arsenic and was successfully tested during the 2010 treatability testing. The ferric iron (Fe^{+3}) formed in the oxidation tank will form hydroxides at the elevated pH and precipitate.

Arsenic (V) will adsorb to the floc and be entrapped by the precipitated iron hydroxides. These precipitates will settle in the inclined plate clarifier and be removed from the treated groundwater stream. The co-precipitation tank will have a working volume of 1,200 gal, which will provide a 30-minute retention time. The tank will be completely mixed by a 1 HP, top-mounted mixer.

In order to induce the pH change, a lime dose of 5.95 g of dry hydrated lime [$Ca(OH)_2$] per gallon of groundwater was required in the treatability testing. This dosage has been used for full scale system design. Hydrated lime will be delivered to the Site in the form of a slurry, at a concentration of 3.5 lb $Ca(OH)_2$ per gallon of water. Delivery and feed of the lime in this manner eliminates the need for a complex and high maintenance slaking or dry chemical feeding process on site. Lime slurry will be delivered in 2,500-gal bulk loads and stored in a 4,580-gal lime storage tank. The storage tank will be continuously and completely mixed by a 1.5-HP mixer to prevent sedimentation. The lime will be constantly recirculated in a loop via a large peristaltic pump to prevent deposition and scale formation in the lime piping. An automated three-way control valve will be utilized to feed the required volume of lime slurry to the co-precipitation tank from the recirculation loop. An automatic periodic water flush will be utilized to ensure the stagnant portion of piping at the dosing point remains free of any blockage. The pH in the co-precipitaiton tank will be continuously monitored by a pH sensor and transmitter. The lime slurry feed rate will be automatically adjusted with a pH control loop in the PLC to achieve the target pH in the co-precipitation tank. At the design average groundwater flow rate, the estimated consumption of lime slurry is 216 gallons per day (gal/d). Each load of slurry (2,500 gal) would last approximately 12 days under this flow condition and the dosage determined from pilot testing.

Settling

The groundwater will flow by gravity from the co-precipitation tank to an inclined plate clarifier unit. The clarifier unit will be provided with integral flash mix and flocculation tanks. A polymer flocculant will be added directly to the flash mix tank at a rate proportional to the influent groundwater flow rate; for design, a volumetric ratio of 1:358 (flow of polymer to flow of groundwater) has been used. The polymer will be purchased as neat liquid in 5-gal pails, and will be diluted to a concentration of 0.1 percent (wt/wt) in batches with a vendor-supplied, automated make down system designed especially for effective wetting of the polymer to prevent "fish-eyes" and improper dilution. The expected consumption rate of dilute polymer solution will be 161 gal/d and 0.9 gallons of neat polymer per week. The polymer feed solution will be stored in a 60-gal feed tank that will also be used to prepare new feed solution. The small feed tank has been selected to ensure short storage times for dilute polymer, which will minimize degradation and ensure that freshly prepared polymer is provided to the treatment process. The feed tank is equipped with slow mixing while batches are being prepared. New batches of feed polymer will be automatically prepared when the level in the polymer day tank reaches the low-level set point. Initially, the low-level point will initiate preparation of fresh feed polymer solution when 20 gallons have been used, which should occur approximately every 3.0 hours.

The clarifier unit will be a skid-mounted unit with an integrated rapid-mix tank, flocculation tank, and inclined-plate settler. The rapid-mix tank will provide complete mixing of the groundwater and the dilute polymer solution. The flocculation tank will provide a period of slow mixing to allow proper floc formation. The flocculated groundwater will then flow into the inclined plate settler, allowing the solids to settle to the sludge hopper, and the clarified groundwater to overflow the effluent weir. The clarifier will provide an effective settling area of 160 square feet (ft^2), which provides an overflow rate of 360 gallons per day/ft^2 (gpd/ft^2) at

average flow conditions, and 540 gpd/ft^2 at maximum flow conditions. Sludge from the sludge hopper will be pumped to the sludge management process, which is described below.

pH adjustment

The clarifier overflow will flow by gravity to the pH adjustment tank. Pilot testing results indicate that in order to achieve effective adsorption of the remaining arsenic in the adsorption columns, the pH should be lowered to a target value of 6.6. The pH will be reduced by the addition of 93 weight percent sulfuric acid (H_2SO_4). The pH adjustment tank will have a working volume of 1,200 gal, providing a residence time of 30 minutes at the average design flow rate. The pH tank will be completely mixed with a 1.0-HP, top-mounted mixer.

Acid will be added to the pH adjustment tank via a vendor-supplied dosing skid, utilizing a duplex diaphragm metering pump system. The wetted parts of the pumps and the acid tubing will be Teflon® or other material selected to ensure compatibility with concentrated sulfuric acid. The rate of acid addition will be controlled by a pH control loop in the PLC and a pH sensor in the pH tank. The expected dosing rate is 1 gallon per hour (gal/hr). Concentrated acid will be delivered in 265-gal chemical totes. The totes will be placed on containment sump upon delivery to provide secondary containment in the event of a leak. Two totes will be on-site at any given time, to allow one to be in use while the second is being replaced. At the expected dosing rate and the design average flow rate, a single tote should last approximately 11 days.

Filtration and Adsorption

The final unit operation to achieve the low-level arsenic concentration targets is adsorption on activated alumina. Based on the performance during treatability testing and cost, activated alumina was selected as the preferred media.

The groundwater will be pumped from the pH tank to a duplex-cartridge filter system. The pumps will provide sufficient pressure to pass through the filters, the adsorption columns, and the discharge pipeline to the north pond. The cartridge filters will remove any remaining particulate to prevent clogging and fouling of the adsorption columns. The cartridges will be periodically removed and replaced, based on pressure readings across the filter housings. Each filter is sized to handle the maximum design flow rate of 60 gpm. After passing through the filters, the groundwater will flow to the adsorption columns. The activated alumina requires an empty bed contact time of 5 minutes, which equates to a 200-gal (media volume, not including freeboard) adsorption column. The empty bed contact time was recommended by the media manufacturer and verified during the 2010 pilot treatability testing. The media is expected to function for 40,000 bed volumes before significant breakthrough. In order to ensure consistent compliance with the discharge targets, the groundwater will be fed through two 200-gal columns in series. Once 40,000 bed volumes of groundwater have been treated or breakthrough of arsenic is detected in samples collected after the first column, the media in the first column will be replaced and the second column will become the primary column. The spent media will either be returned to the vendor to be recycled or will be transported to an appropriate waste facility. Treated effluent from the second column will be directed to the north pond via an underground pipe.

Sludge Management

Underflow from the clarifier will be pumped to the mixed, cone-bottom, sludge storage tank with a pneumatic diaphragm pump operated on a timer control system. The sludge storage tank will have a working volume of 5,264 gal. It is estimated that the sludge will leave the clarifier at a solids concentration of about 1.5 to 2 percent (wt/wt). The sludge will be accumulated in the storage tank for treatment in batches by a filter press. Filter press operation requires continuous operator attention, so the sludge dewatering process will be manually initiated when an operator is on-site.

When a sludge dewatering batch is initiated, sludge will be pumped from the sludge storage tank to the filter press by a second pneumatic diaphragm pump. The filtrate will flow by gravity to a collection sump, where it will be pumped to the influent collection tank for treatment with untreated groundwater. At the end of each filter press cycle, as determined by pressure at the filter press feed, the press will be opened and the sludge cake will fall out of the plates and into a roll-off container below. The roll off container will be stored indoors. The roll-off containers will be removed and replaced as necessary by a waste handling company and taken to an appropriate waste facility. The filter press will produce dewatered sludge that meets the paint filter test and is suitable for landfill disposal.
The solids loading to the clarifier is estimated to be 144 lb dry solids per day, based on the average design flow rate. This estimate includes a 15 percent safety factor over the theoretical calculated value, which is based on the influent metal concentrations and the expected hydroxides that will form. The design solids loading also includes the solids recirculated back to the clarifier from the filter press filtrate, assuming a 95 percent solids capture by the filter press.

It is estimated that under average design flow conditions, two filter press cycles would be needed each week. This could be done in 8 hours of operation spread out over two separate site visits by the operator. The sludge storage tank will have enough capacity for 5 days of storage under average design groundwater flow rates and the groundwater quality observed during the 2010 pilot treatability testing. If the filter press achieves greater percent solids, the mass of dewatered sludge generated each week would be less.
Approximately 960 lb of dry solids in the dewatered filter cake would be produced each week under average design flow conditions. Assuming a conservative (i.e., low) cake solids concentration of 25 percent (wt/wt), the expected total cake weight per week is 3,830 lb (wet). Based on these quantities, the roll-off container of filter cake would require removal from the system for off-site disposal once approximately every 8 weeks.

Instrumentation and Controls

The instrumentation for the treatment system is depicted in the process and instrumentation diagrams (P&IDs, Drawings PID-00 through PID-05). The system has been designed to be automated to the extent practical. It is estimated that the system will require two visits to the site per week by a qualified operator to ensure continuous and effective operation. The frequency for operator attention may be greater during periods of high groundwater flow, but is not expected to be less at flow rates below the design average.

The treatment system will include significant instrumentation for control and monitoring purposes. The treatment equipment and instrumentation will be automated with a single, centralized PLC. The system operations can be monitored via a human machine interface (HMI) located in the treatment building. The system will also have remote monitoring and data collection capabilities through an internet interface, to allow the operator to view the

status of the system at any time from an alternate location. The control system will also have dial-out functionality so that critical alarms can trigger an automated call to the operator's mobile phone. The control system will include data logging and tracking of all process inputs. In addition to monitoring process operations and alarms, the PLC will also monitor other critical items at the facility, including operation of the sewage lift pump/wet well, operation of the fire sprinkler system, and operation of the safety shower or eye wash fountain.

Flow meters at well heads will provide information about groundwater recovery rates from individual wells; the well head flow meters will not be tied to the PLC. The PLC will monitor and record influent and effluent flow rates, as shown on the P&IDs. The PLC will control pumping rates from the landfill recovery wells, based on a control strategy to be developed and presented in the final design documents. Pumping rates from the outside area wells will be manually controlled using the back pressure regulators included in the well heads. The PLC will exercise on/off control for outside area recovery wells.

Appendix F

AMEC Secondary Containment Calculations

Appendix G

Vapor Pressure Discussion in Support of Eliminating Standby Power to Ventilation System

Technical information regarding vapor pressures and ventilation provided by AMEC 10-27-2011

Several materials will be purchased for use in the groundwater treatment process and process laboratory. Only one nonhazardous material will be used in the treatment process: a polymeric flocculant. Three hazardous materials will be used in the groundwater treatment process:

- Solid potassium permanganate ($KMnO_4$);
- Lime slurry ($Ca(OH)_2$ mixed with water); and
- Sulfuric acid (93-95% H_2SO_4).

As noted on the MSDS for these products, all have low or negligible vapor pressure and are not expected to produce vapors, mists, aerosols, dusts, or gases requiring ventilation under the conditions of storage and/or use within the groundwater treatment building. The reported vapor pressure for sulfuric acid is very low, less than 0.3 mm Hg @ 20 ^{o}C; it also has a sharp odor. The other two materials are reported as having negligible vapor pressure. The polymeric flocculant is a water solution with no appreciable vapor pressure other than the water in the solution. Small quantities of nonvolatile solid or liquid reagents will be used in the prepackaged field test kits that will be used in the laboratory to perform testing on water samples from the process. Thus, no emissions of hazardous materials requiring ventilation are expected from storage or use of the materials to be used in the process or laboratory. Water vapor from the process tanks will be released to the building atmosphere and should be vented to prevent condensation.

Groundwater will be pumped to the building for treatment. The only contaminant of concern identified at the Site is arsenic; concentrations in untreated groundwater are expected to be less than 2 mg/L, based on groundwater sampling data. Arsenic was released to groundwater from the woodwaste mixed with Asarco smelter slag that is present in the landfill. Arsenic is dissolved in the water, and has no vapor pressure. Arsenic present in groundwater would only be present in building air if groundwater is sprayed into the air or if mists are created. None of the process unit operations would produce sprays or mists during normal operations. The groundwater will flow by gravity from the inlet tank to all open vessels used in the treatment process, which include the oxidation tank, co-precipitation tank, clarifier unit, and pH Adjust tank. Water from the pH adjust tank will be pumped through the filters, activated alumina adsorbers, and to the discharge line. After removal from the groundwater, the arsenic will be present as a solid and mixed with ferric hydroxide solids. Sludge from the clarifier (approximately 1-2% solids) will be pumped to the sludge tank and co-precipitation tank; the discharge to both tanks will be at atmospheric pressure, minimizing the potential for creating spray or

mist. Dewatered sludge from the sludge storage tank will be a semi-solid paste (approximately 25% solids) that will drop into a roll-off container for storage until the container is loaded for offsite disposal. The wet condition of the dewatered sludge will minimize the potential for dust generation.

The solid potassium permanganate will be received and stored in sealed DOT-approved drums. One drum will be placed into an automatic drum dumper/feeder for preparation of a potassium permanganate feed solution (3.5%) that will be stored in an open tank. A product sheet for the potassium permanganate material (MSDS) and an equipment photo for the drum dumper system are attached. The solid permanganate material to be used is a granular material with a minimum of fines that would generate dust during handling. After placing a drum of permanganate in the dumper feed mechanism and removing the drum lid, the drum dumper places a gasket-sealed cover over the open drum to seal the drum head and prevent release of dusts from handling the solid material. The solid permanganate will be conveyed to the feed tank using an enclosed screw conveyor. The screw conveyor will drop the solid, granular material a short distance (less than 1 ft) directly into the water solution within the feed tank, where it will be stirred and dissolved into the water to prepare the feed solution. The process for preparing feed solution was designed to minimize dust generation, with the objective of maintaining a safe environment for site workers and to protect equipment within the building from exposure to permanganate.

The permanganate feed solution has negligible vapor pressure for all constituents other than water vapor. The feed solution will be pumped from the feed tank to the treatment process by a positive displacement metering pump. The feed solution will discharge from the feed line directly into the oxidation tank, where it will react with incoming groundwater to oxidize dissolved iron and arsenic. The discharge to the oxidation tank will be at atmospheric pressure, so that it has minimal potential for spraying and production of mists or aerosols. The permanganate solution will react with some of the dissolved constituents in the untreated groundwater. No gases, mists, or vapors will be generated by the oxidation reactions. The reaction will not generate sufficient heat to create noticeable temperature change in the water being treated. This treatment process was tested in the field on site groundwater at pilot scale; no adverse reactions were observed during pilot testing, no temperature change of the water was noted, and no vapor release occurred from the oxidation reaction.

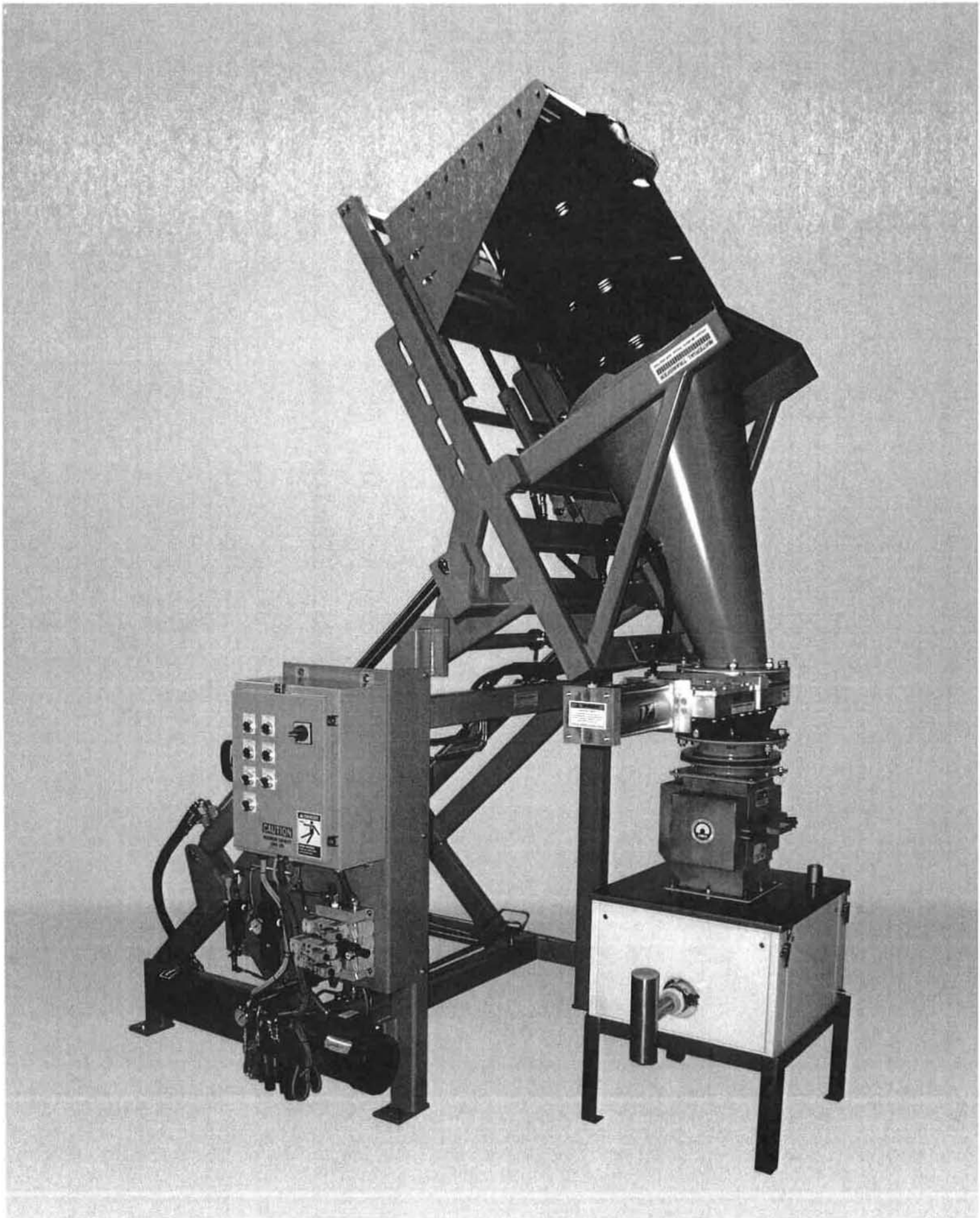
Lime slurry will be received in bulk via tank truck and stored in a closed tank located inside the building. Mixing of the slurry in the tank will be done by continuous recirculation using an external pump. A slipstream from the recirculation loop will be fed to the co-precipitation tank to treat groundwater after oxidation. The slipstream will discharge directly to the coprecipitation tank under atmospheric pressure, and will not generate a spray or mist. The only component of the lime slurry with a significant vapor pressure is water. Since the lime slurry will be received, stored, and used as a slurry, generation of lime dust is not expected to be significant. Due to the small dose of lime used for pH adjustment, no significant temperature change occurs in the treated water. This treatment process was tested in the field at pilot scale; no adverse reactions were

observed during pilot testing, no temperature change of the water was noted, and no vapor, dust, or mist release occurred from the lime addition/pH adjustment step.

A polymeric flocculant will be added to the water in the mixing section of the clarifier. The flocculant will be fed from an open feed tank using a metering pump. The flocculant feed solution will be about 0.1% flocculant dissolved in water; the flocculant is nonvolatile. The pumped flocculant will discharge directly into the clarifier mix tank under atmospheric pressure. No vapors, mists, or sprays are expected from the clarifier process using the polymeric flocculant.

Sulfuric acid will be received and stored in closed, DOT-approved totes at ambient temperature. The totes will be closed during storage and use; a pressure/vacuum relief valve will be placed on the totes during feeding to allow air to enter the tote during pumping and to relieve any pressure building that may occur in the tote. Acid will be drawn from a tote by a metering pump to transfer the acid to the pH Adjust tank to lower the pH of the treated water from 8.8 to 6.6. The acid will be discharged directly into the pH Adjust tank under atmospheric pressure. Addition of acid will be under automatic control, using a pH meter installed in the pH Adjust tank. As noted in the MSDS for sulfuric acid, the vapor pressure of the acid stored in the totes is less than 0.3 mm Hg (<0.006 psi), indicating that the acid is nonvolatile and will not generate significant vapor. Any vapors that would be produced would be significantly heavier than air, based on the MSDS. This pH adjustment process was tested in the field at pilot scale using site groundwater; no adverse reactions were observed during pilot testing, no temperature change of the water was observed, and no vapor release occurred during pH adjustment using sulfuric acid.

The groundwater treatment vessels include several open tanks. These tanks will all contain water. Several of the tanks will be mixed using a mechanical stirrer. While several of the tanks will be well mixed, mixing will not be so vigorous as to create splashing or mists. The mixing propellers will be placed near the bottom of the tanks and will be submerged during normal operations. The open treatment tanks will be operated full (with sufficient freeboard provided above the operating level), with water overflowing to the next treatment tank at the design overflow level. The open tanks will enable water to evaporate into the building atmosphere. During warm months, the groundwater (expected to be about 60 ^{o}F) will be cooler than ambient air much of the time. During the cold months of winter, the groundwater may be warmer than the building ambient temperature, as the building will be heated only to prevent freezing of the water lines. It is expected that the building humidity will be greater than the ambient humidity outside the building. Ventilation of the building will serve to limit the buildup of humidity in the building and control water condensation on the building superstructure. Heating of the building will also limit moisture condensation during the winter.



Appendix H

Material Safety Data Sheets (MSDS)

Potassium Permanganate (solid)

Lime Slurry Solution

Sulfuric Acid (93-95%)

hepure™ technologies inc

innovative solutions for groundwater treatment

MSDS: Potassium Permanganate

SECTION A - PRODUCT INFORMATION

TRADE NAME : POTASSIUM PERMANGANATE, TECHNICAL GRADE **REVISION DATE : JUNE 7, 2006**
CAS NUMBER : 7722-64-7
SYNONYMS : PERMANGANATE OF POTASH; CHAMELEON MINERAL; PERMANGANIC ACID, POTASSIUM SALT
CHEMICAL FAMILY : OXIDIZERS
FORMULA : $KMnO_4$

SECTION B - HAZARDOUS COMPONENTS

COMPONENT	CAS NO.	%	PEL/TLV
POTASSIUM PERMANGANATE (AS INORGANIC MANGANESE COMPOUND CONTAINING 34-35% Mn)	7722-64-7	98% MIN.	5 mg/m^3 as Mn - OSHA CEILING LIMIT 0.2 mg/m^3 as Mn - ACGIH TWA O.2 mg/m^3 as Mn Fume - ACGIH TWA

SECTION C - PHYSICAL PROPERTIES

BOILING POINT (°C) :	N/A	**SPECIFIC GRAVITY :**	2.7
MELTING POINT (°C) :	DECOMPOSES AT < 240	**FREEZING POINT (°) :**	N/A
VAPOR PRESSURE (mm Hg) :	NOT KNOWN	**PERCENT VOLATILE (BY WT.) :**	N/A
VAPOR DENSITY (AIR=1) :	N/A	**EVAPORATION RATE :**	N/A
SOLUBILITY IN WATER :	SOLUBLE, 6.38 g/100cc @ 200°C	**pH (% IN WATER) :**	NOT KNOWN
ODOR THRESHOLD :	N/A		
APPEARANCE & ODOR :	DARK PURPLE CRYSTALS WITH METALLIC LUSTER; ODORLESS		

SECTION D - FIRE & EXPLOSION DATA

FLASH POINT (°) : N/A

FLAMMABLE LIMITS : LEL : (N/A) UEL : (N/A) AUTO IGNITION TEMP (° F): (N/A)

EXTINGUISHING MEDIA : WATER : (X) FOAM : () CO_2: () DRY CHEMICAL: ()

SPECIAL FIRE FIGHTING PROCEDURES : PRODUCT IS NOT COMBUSTIBLE BUT IS A STRONG OXIDIZER. CONTACT WITH OXIDIZABLE SUBSTANCES, EITHER IN THE SOLID OR DRY STATE, CAN CAUSE EXPLOSIVE AND OR FLAMMABLE REACTIONS. EXTINGUISH FIRE WITH LARGE QUANTITIES OF WATER. DIKE TO CONTAIN RUNOFF. WATCH FOR RAPID BURNING AND BE PREPARED TO RETREAT TO A SAFE DISTANCE. POISONOUS GAS IS PRODUCED IN FIRE - WEAR A NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE DEMAND OR POSITIVE PRESSURE MODE AND FULL PROTECTIVE GEAR. CONTAINERS MAY EXPLODE IN FIRE. COOL FIRE EXPOSED CONTAINERS WITH FLOODING QUANTITIES OF WATER SPRAY.

UNUSUAL FIRE & EXPLOSION HAZARDS : STRONG OXIDIZERS MAY EXPLODE AND DECOMPOSE SPONTANEOUSLY IF EXPOSED TO INTENSE HEAT, CONCENTRATED ACIDS, HYDROGEN PEROXIDE, REDUCING AGENTS OR ORGANIC SUBSTANCES. VIOLENT REACTION MAY OCCUR WITH FINELY DIVIDED AND READILY OXIDIZABLE SUBSTANCE. INCREASES FLAMMABILITY OF COMBUSTIBLE MATERIALS.

SECTION E - REACTIVITY DATA

STABILITY : STABLE UNDER NORMAL CONDITIONS

INCOMPATIBILITY : POTASSIUM PERMANGANATE IS A STRONG OXIDIZER, SPONTANEOUSLY EXPLOSIVE OR FLAMMABLE ON CONTACT WITH MANY INCOMPATIBLES. AVOID CONTACT WITH ALCOHOLS, ARSENITES, IODIDES, ACIDS, CHARCOAL, COMBUSTIBLE ORGANIC MATERIALS, FERROUS AND MERCUROUS SALTS, HYPOPHOSPHITES, HYPOSULFITES, SULFITES, PEROXIDES, OXALATES, INORGANIC OXIDIZABLE MATERIALS, METAL POWDERS, WOOD, GLYCERINE, POLYPROPYLENE, AND HEAT. CONTACT WITH HYDROCHLORIC ACID WILL LIBERATE CHLORINE GAS. DO NOT MIX WITH FORMALDEHYDE.

HAZARDOUS DECOMPOSITION PRODUCTS : TOXIC, CORROSIVE FUMES OF K_2O AND/OR SMOKE MAY EVOLVE WHEN IN A FIRE

HAZARDOUS POLYMERIZATION : WILL NOT OCCUR

CONDITIONS TO AVOID : CONTACT WITH INCOMPATIBLE MATERIALS; EXCESSIVE HEAT (>150°C); PHYSICAL IMPACT OR FRICTION

N/A = NOT APPLICABLE

SECTION F - PERSONAL PROTECTIVE EQUIPMENT INFO

RESPIRATORY EQUIPMENT :	USE A NIOSH/MSHA DUST AND MIST RESPIRATOR OR AN AIR SUPPLIED RESPIRATOR WHERE THE POTENTIAL FOR OVEREXPOSURE EXISTS.
PROTECTIVE GLOVES :	RUBBER OR PLASTIC GLOVES
EYE PROTECTION :	CHEMICAL GOGGLES OR FACE SHIELD
VENTILATION :	USE MECHANICAL OR LOCAL EXHAUST TO MAINTAIN EXPOSURE BELOW THE PERMISSIBLE EXPOSURE LIMIT OR THRESHOLD LIMIT VALUE (SEE SECTION B).
OTHER PROTECTIVE EQUIPMENT :	PROTECTIVE WORK CLOTHING INCLUDING AN APRON; ACCESS TO EYE WASH FOUNTAIN AND SAFETY DRENCH SHOWER.

SECTION G - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE :	0.2 mg/m^3 as Mn (INORGANIC MANGANESE COMPOUND) and Mn FUME
PRIMARY ROUTES OF EXPOSURE :	EYES & SKIN CONTACT, INHALATION, INGESTION
ORAL LD_{50} :	1090 mg/kg (RAT); 780 mg/kg MALE RAT; 525 mg/kg FEMALE RAT; ORAL-HUMAN LDLo: 143 mg/kg
DERMAL IRRITATION-RABBIT :	NOT TESTED
EYE IRRITATION-RABBIT :	NOT TESTED
OSHA PEL :	5 mg/m^3 AS Mn CEILING LIMIT
ACGIH TLV :	0.2 mg/m^3 as Mn (INORGANIC MANGANESE COMPOUND) and Mn FUME
EFFECTS OF OVEREXPOSURE :	***SKIN CONTACT:*** CONTACT WITH DRY CRYSTALS OR CONCENTRATED SOLUTIONS WILL IRRITATE AND ACT AS A CORROSIVE, CAUSING BURNS TO SKIN AND BODY TISSUE ON CONTACT. CONTACT AREA WILL BE STAINED BROWN AND THE OUTER LAYER OF SKIN WILL POSSIBLY HARDEN. ***EYE CONTACT:*** CONTACT WITH EYES CAN CAUSE SEVERE BURNS RESULTING IN EYE DAMAGE. ***INHALATION:*** INHALATION OF DUST, MIST, OR SOLUTION SPRAY WILL IRRITATE NOSE, THROAT, AND RESPIRATORY TRACT CAUSING COUGHING, CHEST TIGHTNESS, AND POSSIBLE DAMAGE TO THE RESPIRATORY SYSTEM. HIGH INHALATION EXPOSURES CAN CAUSE A BUILDUP OF FLUID IN THE LUNGS (PULMONARY EDEMA) WHICH MAY RESULT IN DEATH. ***INGESTION:*** INGESTION CAN CAUSE SEVERE IRRITATION OR BURNS TO MOUTH, THROAT, ESOPHAGUS, AND STOMACH WITH DIFFICULTY IN BREATHING, NAUSEA, GASTROINTESTINAL EFFECTS, AND POSSIBLE KIDNEY DAMAGE. EXPERIMENTAL REPRODUCTIVE AND MUTATION DATA HAVE BEEN REPORTED IN LITERATURE. ***CHRONIC:*** REPEATED OR PROLONGED SKIN CONTACT MAY CAUSE DEFATTING AND DERMATITIS. LONG TERM INHALATION OF MANGANESE DUSTS (USUALLY IN FORM OF MANGANESE OXIDES) MAY LEAD TO A HIGH INCIDENCE OF UPPER RESPIRATORY INFECTIONS, LUNG IRRITATION, AND POSSIBLE CENTRAL NERVOUS SYSTEM DISORDERS WITH SYMPTOMS SIMULATING PARKINSON'S DISEASE.
KNOWN EFFECTS ON OTHER ILLNESSES :	CAN AGGRAVATE PRE-EXISTING SKIN, RESPIRATORY, AND NERVOUS SYSTEM CONDITIONS.
LISTED CARCINOGEN :	NONE (X) OSHA () NTP () IARC () OTHER ()

SECTION H - EMERGENCY & FIRST AID DATA

SKIN :	CAN CAUSE IRRITATION OR BURNS. WASH AREA IMMEDIATELY WITH LARGE AMOUNTS OF WATER WHILE QUICKLY REMOVING CONTAMINATED CLOTHING. SEEK MEDICAL ATTENTION.
EYES :	CAN CAUSE SEVERE BURNS RESULTING IN PERMANENT DAMAGE. FLUSH EYES WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES, LIFTING UPPER AND LOWER LIDS. DO NOT USE A CHEMICAL ANTIDOTE. SEEK MEDICAL ATTENTION IMMEDIATELY.
INHALATION :	REMOVE THE PERSON FROM EXPOSURE. BEGIN RESCUE BREATHING IF BREATHING HAS STOPPED AND CPR IF HEART ACTION HAS STOPPED. SEEK MEDICAL ATTENTION IMMEDIATELY. MEDICAL OBSERVATION IS RECOMMENDED FOR 24 TO 48 HOURS AFTER BREATHING OVEREXPOSURE, AS PULMONARY EDEMA MAY BE DELAYED.
INGESTION :	CAN CAUSE BURNING OF THROAT, NAUSEA, VOMITING AND STOMACH PAIN. A TRACHEOTOMY MAY BE REQUIRED IF SWELLING IN THROAT BLOCKS AIR. IF CONSCIOUS AND NOT CONVULSING, GIVE LARGE QUANTITIES OF WATER. SEEK MEDICAL ATTENTION IMMEDIATELY.

SECTION I - SPILL & DISPOSAL INFORMATION

STEPS TO BE TAKEN IN CASE OF SPILL OR LEAK:

WEAR FULL PROTECTIVE EQUIPMENT (SEE SECTION B). RESTRICT ACCESS TO AREA OF SPILL / LEAK UNTIL CLEAN UP IS COMPLETE. REMOVE ALL COMBUSTIBLE MATERIALS FROM AREA. ABSORB SOLUTION SPILLS (LIQUIDS) IN VERMICULITE, DRY SAND, EARTH, OR A SIMILAR MATERIAL AND DEPOSIT IN SEALED CONTAINERS. SWEEP OR SHOVEL UP POWDERED/CRYSTALLINE MATERIAL. AVOID GENERATING DUST. TRANSFER TO CLEAN METAL DRUM FOR DISPOSAL AS RCRA HAZARDOUS WASTE. FLUSH SPILL AREA WITH ABUNDANT QUANTITIES OF WATER. KEEP RUNOFF FROM ENTERING SEWERS OR WATERWAYS TO PREVENT A POSSIBLE EXPLOSION HAZARD. CONTACT THE DEP AND EPA FOR SPECIFIC RECOMMENDATIONS ON DISPOSAL.

WASTE DISPOSAL INFORMATION:

DISPOSE OF AS HAZARDOUS WASTE IN ACCORDANCE WITH LOCAL, STATE (DEP) AND FEDERAL REGULATIONS (EPA).

RCRA HAZARDOUS WASTE : NO () YES (X) **RCRA # :** (D001, D003) CHARACTERISTIC OF IGNITABILITY, REACTIVITY

N/A = NOT APPLICABLE

CERCLA : NO () YES (X) **RQ** (100 LBS.)

FOLLOW ALL LOCAL, STATE AND FEDERAL INFORMATION AND REGULATIONS

SECTION J - OTHER REGULATORY INFORMATION

TSCA: WE CERTIFY THAT ALL COMPONENTS OF THIS PRODUCT ARE REGISTERED UNDER THE REGULATIONS OF THE TOXIC SUBSTANCES CONTROL ACT.
SARA TITLE III, SECT. 313: LISTED (X) NOT LISTED ()
HMIS: HEALTH (3) FLAMMABILITY (0) REACTIVITY (3)

DOT REGULATED: YES: (X) **NO:** ( ) **RQ:** (100 LBS.)
IF REGULATED, PROPER SHIPPING NAME: POTASSIUM PERMANGANATE **HAZARD CLASS:** (5.1)
IDENTIFICATION NO: (UN1490) **PACKING GROUP:** (II) **LABEL REQUIRED:** (OXIDIZER)
INLAND B/L: RQ, POTASSIUM PERMANGANATE; 5.1, UN1490, PACKING GROUP II, OXIDIZER
EMERGENCY RESPONSE GUIDE NO.: (140)

SECTION K - SPECIAL PRECAUTIONS

FOR INDUSTRIAL USE ONLY

HANDLING & STORAGE INFORMATION:
PROTECT CONTAINERS FROM PHYSICAL SHOCK AND DAMAGE. MUST BE STORED TO AVOID CONTACT WITH STRONG ACIDS (SUCH AS HYDROCHLORIC, SULFURIC AND NITRIC); ANY ORGANIC MATERIAL; OR ANY OTHER COMBUSTIBLE OR OXIDIZABLE SOLID, LIQUID OR GAS SINCE VIOLENT REACTIONS OCCUR. AVOID STORAGE ON WOODEN FLOORS. ISOLATE FROM ALL HEAT AND IGNITION SOURCES. STORE IN TIGHTLY CLOSED CONTAINERS IN A COOL WELL-VENTILATED AREA.

OTHER PRECAUTIONS :
DO NOT EAT, SMOKE OR DRINK WHERE POTASSIUM PERMANGANATE IS HANDLED, PROCESSED, OR STORED. WASH THOROUGHLY BEFORE EATING OR SMOKING. DO NOT DRY SWEEP FOR CLEAN UP. USE A VACUUM OR A WET METHOD TO REDUCE DUST DURING CLEANUP. TREAT EMPTY CONTAINERS OF THIS PRODUCT AS HAZARDOUS SINCE THEY MAY STILL CONTAIN PRODUCT RESIDUES.

IN ACCORDANCE WITH GOOD PRACTICES OF PERSONAL HYGIENE, HANDLE WITH DUE CARE AND AVOID ANY UNNECESSARY CONTACT WITH THIS PRODUCT
THIS INFORMATION IS BEING SUPPLIED TO YOU UNDER OSHA "RIGHT TO KNOW" REGULATION 29 CFR 1910.1200 AND IS OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS PRODUCT SPECIFICATION. THE INFORMATION IS BELIEVED TO BE TRUE AND ACCURATE. NO WARRANTY, EXPRESSED OR IMPLIED, REGARDING THE ACCURACY OF THIS DATA, THE HAZARD CONNECTED WITH USE OF THE MATERIAL, OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF, IS MADE. UNITED MINERAL & CHEMICAL CORPORATION AND ITS SUPPLIERS ASSUME NO RESPONSIBILITY FOR DAMAGE OR INJURY FROM THE USE OF THE PRODUCT DESCRIBED HEREIN.
UNITED MINERAL & CHEMICAL CORPORATION

Material Safety Data Sheet
HYDRATED LIME SLURRY

Rev. Date:5/1/2008

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	**Hi-Cal Lime Slurry**	
Synonym/s:	**Hydrated Lime Slurry, Calcium Hydroxide Slurry, Lime Slurry, Slurry, Milk of Lime**	
Manufacturer:	**US Operations:** **Chemical Lime Co.** **3700 Hulen St.** **Fort Worth, TX 76107** **817-732-8164**	**Canadian Operations:** **Chemical Lime Co. of Canada Inc.** **20302-102B Ave.** **Langley, BC V1M 3H1** **604-888-4333**
Emergency Phone:	**Chemtrec 1-800-424-9300**	
Chemical Name: **Chemical Family:** **Chemical Formula:**	**Calcium Hydroxide** **Alkaline Earth Hydroxide** **$Ca(OH)_2 + H_2O$**	**WHMIS Classification:** **D2A, E**
Product Use/s:	**Water treatment, pH adjustment, FGT, Construction**	
Prepared By:	**Chemical Lime Co.** **R&D/Technical Services, KSA**	

SECTION 2: COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS	OSHA PEL, TWA 8/40h (mg/m3)	ACGIH TLV, TWA 8/40h (mg/m3)	NIOSH REL, TWA 8/40h (mg/m3)	NIOSH IDLH (mg/m3)	Conc. (%)
Calcium Hydroxide, $Ca(OH)_2$ (Hydrated Lime)	**1305-62-0**	**15** (total dust) **5** (respirable)	**5**	**5**	**N.A.**	**20 - 55**
Magnesium Hydroxide, $Mg(OH)_2$ (Brucite)	**1309-42-8**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**< 5**
Crystalline Silica, SiO_2 (Quartz)	**14808-60-7**	**10/(SiO2% + 2)** (respirable)	**0.025** (respirable)	**0.05** (respirable)	**50**	**< 2**

OSHA Regulatory Status: This material is subject to 29 CFR 1910.1200 (Hazard Communication).

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview: Lime Slurry is an odorless, low viscosity suspension of calcium hydroxide in water. Contact can cause irritation to eyes, skin, gastrointestinal tract. In mist form or if material becomes dry, it will irritate the respiratory system.

Potential Health Effects

Eyes: Contact can cause severe irritation or burning of eyes, including permanent damage.

Skin: Contact can cause irritation of skin.

Ingestion: This product can cause severe irritation of gastrointestinal tract if swallowed.

Inhalation: This product can cause severe irritation of the respiratory system in mist or dry form. Long-term exposure may cause permanent damage. Lime Slurry is not listed by MSHA, OSHA, or IARC as a carcinogen. However, this product may contain trace amounts of crystalline silica in the form of quartz or crystobalite, which has been classified by IARC as a Group I carcinogen to humans when inhaled. Inhalation of silica can also cause a chronic lung disorder, silicosis.

Medical Conditions Aggravated by Exposure: Contact may aggravate disorders of the eyes, skin, gastrointestinal tract, and respiratory system.

Potential Environmental Effects: This material is alkaline and if released into water or moist soil will cause an increase in pH.

SECTION 4: FIRST AID MEASURES

Eyes: Immediately flush eyes with generous amounts of water or eye wash solution if water is unavailable. Pull back eyelid while flushing to ensure that all lime dust has been washed out. Seek medical attention promptly if the initial flushing of the eyes does not remove the irritant. Do not rub eyes.

Skin: Remove as much lime slurry as possible and wash exposed area with large amounts of water. If irritation persists, seek medical attention promptly.

Inhalation: Move victim to fresh air. Seek medical attention. If breathing has stopped, give artificial respiration.

Ingestion: Do not induce vomiting. Seek medical attention immediately. Never give anything by mouth unless instructed to do so by medical personnel.

SECTION 5: FIRE FIGHTING MEASURES

Fire Hazards:	Lime Slurry is not combustible or flammable. However, it reacts vigorously with acids, and may release heat sufficient to ignite combustible materials in specific instances. Lime Slurry is not considered to be an explosion hazard, although reaction with acids or other incompatible materials may rupture containers.
Hazardous Combustion Products:	None
Extinguishing Media:	Use extinguishing agent suitable for surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of Lime Slurry.
Fire Fighting Instructions:	Keep personnel away from and upwind of fire. Avoid skin contact or inhalation of dust. Wear full fire-fighting turn-out gear (full Bunker gear), and respiratory protection (SCBA).

SECTION 6: ACCIDENTAL RELEASE MEASURES

Spill / Leak Procedures:	**Do Not** use water on bulk material spills. Use proper protective equipment.
Small Spills:	Use wet material containment methods. Do not clean up with compressed air. Store collected materials in sealed plastic or non-aluminum metal containers. Residue on surfaces may be water washed.
Large Spills:	Use wet containment/collection techniques to collect spilled materials. If material has sufficiently dried to generate dust, evacuate area downwind of clean-up operations to minimize dust exposure. Store spilled materials in sealed plastic or non-aluminum metal containers.
Containment:	Minimize dust generation and prevent bulk release to sewers or waterways.
Clean-up:	Residual amounts of material can be flushed with large amounts of water. Equipment can be washed with either a mild vinegar and water solution, or detergent and water.

SECTION 7: HANDLING AND STORAGE

Handling:	Keep in tightly closed plastic or non-aluminum metal containers. Protect containers from physical damage. Avoid direct skin contact with the material.
Storage:	Store in a cool, dry, and well-ventilated location. Do not store near acids or other incompatible materials. Keep away from moisture. Do not store or ship in aluminum containers.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls:	Provide ventilation adequate to maintain PELs.
Respiratory Protection:	Use NIOSH/MSHA approved respirators if airborne concentration exceeds PELs.
Skin Protection:	Use appropriate gloves and footwear to prevent skin contact. Clothing should fully cover arms and legs. Should lime slurry get inside clothing or gloves, remove the clothing and the lime slurry promptly.
Eye Protection:	Use safety glasses with side shields or safety goggles. Contact lenses should not be worn when working with lime products.
Other:	Eye wash fountain/stations and emergency showers should be available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: White or grayish-white liquid suspension	**Odor:** Odorless	**Physical State:** Solid
Boiling Point (°C/°F): 100 / 212	**Melting Point (°C/°F):** dec 580 / 1076	**Specific Gravity** (Apparent) g/cc: N.A. (True) g/cc: 1.2 - 1.5
Vapor Pressure (mm Hg): N.A.	**Vapor Density:** N.A.	**Evaporation Rate:** N.A.
Solubility in Water Material is a suspension of calcium hydroxide in water.	**pH (25°C/77°F):** 12.4	

SECTION 10: STABILITY AND REACTIVITY

Stability: Chemically stable, but decomposes at 580°C to form calcium oxide. See also Incompatibility below.

Incompatibility/ Conditions to Avoid: Lime Slurry should not be mixed or stored with the following materials, due to the potential for vigorous reaction and release of heat:

Acids (unless in a controlled process)	Organic Acid Anhydrides
Reactive Fluoridated Compounds	Nitro-Organic Compounds
Reactive Brominated Compounds	Reactive Phosphorous Compounds
Reactive Powdered Metals	Interhalogenated Compounds

Hazardous Decomposition Products: None

Hazardous Polymerization: None

SECTION 11: TOXICOLOGICAL INFORMATION

If product becomes dry and is in its calcium hydroxide form, the following toxicological characteristics apply:
ORL-RAT LD50: 7,340 MG/KG
ORL-MUS LD50: 7,300 MG/KG

Lime Slurry is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product may contain trace amounts of crystalline silica, which has been classified by IARC as carcinogenic to humans when inhaled in the form of quartz or crystobalite.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: Because of the high pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems in high concentrations.

Environmental Fate: This material shows no bioaccumulation effect or food chain concentration toxicity.

SECTION 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable federal, state, and local environmental regulations. If this product as supplied, and unmixed, becomes a waste, it will not meet the criteria of a hazardous waste as defined under the U.S. Resource Conservation and Recovery Act (RCRA).

SECTION 14: TRANSPORTATION INFORMATION

Lime Slurry is not classified as a hazardous material by US DOT and is not regulated by the Transportation of Dangerous Goods (TDG) when shipped by any mode of transport.

Material Safety Data Sheet
HYDRATED LIME SLURRY

Rev. Date:5/1/2008

SECTION 15: REGULATORY INFORMATION

U.S. EPA Regulations:

RCRA Hazardous Waste Number (40 CFR 261.33): not listed
RCRA Hazardous Waste Classification (40 CFR 261): not classified
CERCLA Hazardous Substance (40 CFR 302.4) unlisted specific per RCRA, Sec. 3001; CWA, Sec. 311(b)(4); CWA, Sec. 307(a), CAA, Sec. 112
CERCLA Reportable Quantity (RQ), not listed
SARA 311/312 Codes: not listed
SARA Toxic Chemical (40 CFR 372.65): not listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): not listed, Threshold Planning Quantity (TPQ): not listed
All chemical ingredients are listed on the USEPA TSCA Inventory List.

OSHA/MSHA Regulations:

Air Contaminant (29 CRF 1910.1000, Table Z-1, Z-1-A): 5mg/M^3 TWA-8
MSHA: not listed
OSHA Specifically Regulated Substance (29 CFR 1910): not listed

State Regulations:

Consult state and local authorities for guidance. Components found in this product may contain trace amounts of inherent naturally occurring elements (such as, but not limited to arsenic and cadmium) that may be regulated.

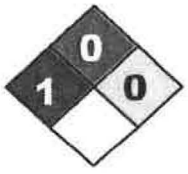
Canada:

WHMIS Classification: "D2A" Materials Causing Other Toxic Effects
WHMIS Classification: "E" Corrosive Materials (listed due to corrosive effect on aluminum)
Canada DSL: Listed

NFPA Hazard Class:	Health: 1	Flammability: 0	Reactivity: 0	
HMIS Hazard Class:	Health: 1	Flammability: 0	Reactivity: 0	Personal Protection: E







SECTION 16: OTHER INFORMATION

Prepared By: **Chemical Lime Company, R&D/Technical Services, KSA**

Chemical Lime Company provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must consult their own technical and legal advisors and/ or exercise their own judgment in determining its appropriateness for a particular purpose. Chemical Lime Company makes no representations or warranties, either express or implied, including without limitation and warranties of merchantability or fitness for a particular purpose with respect to the information set forth herein or the product(s) to which the information refers. Accordingly, Chemical Lime Company will not be responsible or liable for any claims, losses or damages resulting from the use of or reliance upon or failure to use this information.

Visit
www.chemicallime.com
for latest MSDS versions

SULFURIC ACID

MATERIAL SAFETY DATA SHEET

INTEGRA Chemical Company
1216 6th Ave N
Kent WA 98032
Phone: 253-479-7000

MSDS Number: S978
Revision Date: 16-Apr-08
Revision No.: 005

24 Hour Emergency Response: CHEMTREC 800-424-9300 (Outside USA 703-527-3887)

Product Identification

Product Name: SULFURIC ACID
Synonyms: Oil of Vitriol
Chemical Formula: H2SO4
Formula Weight: 98.07
Chemical Family: Mineral Acid
Integra Product Numbers: S978.10; S978.11; S978.16; S978.18; S978.50

Hazard Overview

HMIS Rating: 3-0-3-H NFPA Rating: 3-0-2-W
Warning Label:

DANGER!
Corrosive. Causes severe skin and eye burns. Do not allow contact with skin, eyes or clothing. Use only with adequate protective equipment. Harmful or fatal if swallowed.

Components

Component	CAS #	%
Sulfuric acid	07664-93-9	90-98
Water	07732-18-5	02-10

Physical Data

Boiling Point:	327 °C	Specific Gravity:	1.844 Water=1
Melting Point:	-2 °C	Evaporation Rate:	< 1 Butyl Acetate=1
Vapor Pressure:	< 0.3 mm Hg@20°C	Vapor Density:	3.4 Air = 1

Solubility:

Miscible with water.

Appearance and Odor:

Clear to yellowish oily liquid. Sharp odor.

Fire and Explosion Data

Flash Point: NA Test Method:
Auto-ignition Temperature: NA
Flammable Limits (% by volume in air): Upper: NA Lower: N/A

Fire Extinguishing Media:

Dry chemical or CO2. Do not use water.

Special Firefighting Procedures:

Use water to cool nearby containers and structures. Wear full protective equipment, including suitable respiratory protection.

Unusual Fire and Explosion Hazards:

Reacts with most metals to produce flammable hydrogen gas. Violent exothermic reaction with water. Heat produced may be sufficient to ignite combustible material.

Health Hazard Information

Effects of Overexposure

Skin Contact:

INTEGRA Chemical Company
1216 6th Ave N
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24 Hour Emergency Response: CHEMTREC 800-424-9300 (Outside USA 703-527-3887)

MSDS Number: S978
Revision Date: 16-Apr-08
Revision No.: 005

Health Hazard Information

Effects of Overexposure

Skin Contact:

Corrosive material. Contact may cause severe burns.

Eye Contact:

Vapors mists and liquids are corrosive to the eyes. Brief contact with vapors may be severely irritating. Brief liquid contact with the eyes may cause severe damage and prolonged contact may result in permanent eye injury.

Ingestion:

Harmfull if swallowed. Liquids are extremely corrosive to the mouth and throat. Swallowing the liquid burns tissue, and can cause severe abdominal pain, nausea, vomiting, and collapse. Severe overexposure may be fatal.

Inhalation:

Harmful if inhaled. Vapors and mists are corrosive to the mucous membranes. Symptoms include irritated nose, throat and labored breathing. May have minor initial symptoms followed in several hours by severe shortness of breath requiring prompt medical attention.

Chronic Effects of Overexposure:

Lung damage.

Exposure Limits:

	OSHA PEL		
	TWA	*STEL*	*Ceiling*
Sulfuric acid	1 mg/m3	NE	NE
Water	NE	NE	NE

	ACGIH TLV		
	TWA	*STEL*	*Ceiling*
Sulfuric acid	1 mg/m3	3 mg/m3	NE
Water	NE	NE	NE

Toxicity Data:

Sulfuric acid	LC50 (inhalation, mouse)	320 mg/m3/2H
	LD50 (oral, rat)	2140 mg/kg
	LC50 (Inhalation, rat)	510 mg/m3
Water	No information available	

Medical Conditions Generally Aggravated by Exposure:

Respiratory conditions.

Target Organs:

Respiratory system, lungs, eyes, skin, teeth, kidneys.

Reproductive Effects:

None Identified

Carcinogenicity:

None Identified

Component	NTP Listing	IARC Listing	OSHA Regulated
Sulfuric acid	No listing	No Listing	☐
Water	No listing	No Listing	☐

Emergency First Aid Procedures

INTEGRA Chemical Company
1216 6th Ave N
Kent WA 98032
Phone: 253-479-7000
24 Hour Emergency Response: CHEMTREC 800-424-9300 (Outside USA 703-527-3887)

Skin Contact:

Immediately remove contaminated clothing. Flush skin with water for at least 15 minutes. Seek immediate medical attention.

Eye Contact:

Immediately flush eyes with large amounts of water, holding lids apart to ensure rinsing of entire surface. Washing eyes within several seconds of contact is essential to achieve maximum effectiveness. Get immediate medical attention.

Inhalation:

Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult administer oxygen. Seek medical attention.

Ingestion:

Do not induce vomiting. If victim is conscious, give water. Never give anything by mouth to an unconscious person. Seek immediate medical attention.

Additional First aid and Treatment Notes:

No information available

Reactivity Data

Stability: Stable

Hazardous Polymerization: Will Not Occur

Incompatibles:

Incompatible with strong bases and strong oxidizers Water, organics, most reactive materials, most common metals, carbonates, sulfides, cyanides, carbides.

Decomposition Products:

Oxides of sulfur. Hydrogen.

Conditions to Avoid:

Moisture.

Spill and Disposal Procedures

Spill and Leak Procedures:

Prevent spread of spill. Wear full protective equipment, including a complete protective suit and an appropriate respirator depending upon the size of the spill. Carefully neutralize with soda ash or lime. Place material into clean disposal container. Flush spill area with water.

Disposal Procedures:

Dispose in accordance with all Local, State and Federal regulations. EPA Waste Number: D002, D003 (Corrosive, reactive waste)

Protective Equipment

Ventilation:

Use general or local exhaust ventilation to meet TLV and PEL requirements.

Respiratory Protection:

Respiratory protection required if airborne concentrations exceed PEL or TLV. A chemical cartridge respirator with an acid/organic cartridge is recommended. A supplied air respirator or SCBA should be on hand for use in emergency situations.

Skin and Eye Protective Equipment:

Safety goggles, face shield, chemical-resistant gloves and protective clothing appropriate for the risk of exposure.

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Revision Date: 16-Apr-08
Revision No.: 005

Protective Equipment

Skin and Eye Protective Equipment:

Maintain an eyewash station and safety shower nearby.

Storage and Handling Precautions

Storage Area: CORROSIVE, ACID

Store in a cool, dry, corrosive acids storage area or cabinet. Keep container tightly closed. Mixing with water produces a strongly exothermic reaction that may spray acid solution in the immediate area. When mixing with water, always add acid slowly to the water, never add water to concentrated acid.

Transportation Information

☑ *Regulated Material domestic ground transportation*

(reference: CFR Title 49, Transportation)

Proper Shipping Name: Sulfuric acid
UN or NA Identification number: UN1830 Hazard Class and Label: 8 Corrosive
Packing Group: II Subsidiary Risk and Label:

☑ *Regulated Material via Air Transportation*

(reference: ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air)

Proper Shipping Name: Sulphuric acid
UN Identification Number: UN1830 Hazard Class and Label: 8 Corrosive
Packing Group: II Subsidiary Risk and Label:

	Packing Instruction	Max net qty per package
Passenger Aircraft:	809/Y809	1/0.5 L
Cargo Aircraft:	813	30 L

Regulatory Information

Component	TSCA Inventory	CERCLA RQ	SARA EHS TPQ	SARA 313 Toxic Release *de minimus*
Sulfuric acid	☑	1000 lbs	☑ 1000 lbs	☑ 1.0 lbs
Water	☐	lbs	☐ lbs	☐ lbs

SARA Hazard Categories:	Acute	Chronic	Flammability	Pressure	Reactivity
Sulfuric acid	☑	☑	☐	☐	☑
Water	☐	☐	☐	☐	☐

Clean Air Act Categories:	SOCMI	HAP	Volatile HAP	Organic HAP	Ozone Depleting
Sulfuric acid	☐	☐	☐	☐	☐
Water	☐	☐	☐	☐	☐

MSDS Revision History:

002 - Changed header phone number
003 - Format revisions; updated header phone number
004 – Added product number
005 - Updated Header Information

SULFURIC ACID

MATERIAL SAFETY DATA SHEET

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24 Hour Emergency Response: CHEMTREC 800-424-9300 (Outside USA 703-527-3887)

NE = Not established, NA = Not applicable or Not available

The information presented above is offered for informational purposes only. This MSDS, and the associated product, is intended for use only by technically qualified persons, and at their own discretion and risk. Since conditions and manner of use are outside the control of Integra Chemical Company, we make no warranties, either expressed or implied, and assume no liability in connection with any use of this information.

***** END OF MSDS *****

Appendix I

Laboratory Spill Containment and Control Memorandum

AMEC Geomatrix
600 University Street, Suite 1020 Seattle, WA 98101

FLOYD | SNIDER
strategy • science • engineering
601 Union Street, Suite 600 Seattle, WA 98101

Memorandum

To: Kyle Hansen, Floyd|Snider
Copies: Brett Beaulieu, Floyd|Snider
From: Larry McGaughey
Date: September 30, 2011
Re: **Laboratory Spill Containment and Control, B&L Woodwaste Site Phase 2 Remediation**

The laboratory has been designed and will be used to minimize the potential for any spills to enter the sink. As noted in Attachment 4, chemicals, reagents, and similar laboratory materials will be stored in a closed chemical storage cabinet located across the room from the laboratory sink. Spills of reagents and/or buffers within the storage cabinet are will be very small due to the small quantities to be stored in the cabinet and would be contained within the cabinet. No floor drains will be present in the floor of the laboratory, so that any materials spilled from the cabinet would flow to the floor of the building and would not enter the sink. Spills that may occur during testing and analyses will be contained by performing the tests over a spill containment tray (see attached spill tray cut sheets). A spill containment tray of appropriate size will be placed on the laboratory counter and will be used for all analyses and other tests performed in the laboratory. The larger capacity spill tray will be used for testing involving larger volumes of water; the smaller capacity tray will be used for routine testing with the Hach kits or with laboratory meters. Covered plastic containers will be used to collect and store wastes from laboratory testing prior to offsite disposal. The waste containers will be located on the floor of the laboratory; leakage or failure of the waste containers would flow onto the laboratory floor and would not result in a discharge to the sink or the sanitary sewer.

Analytical testing using the Hach kits requires either mixing of the contents of a packet (foil or plastic) into a small quantity of sample water (typically on the order of 25 mL) or mixing water with reagent in a glass ampule provided by Hach. Testing using the Hach kits, pH meter, ORP meter, or for settling will be conducted over a spill containment tray. Jar or other testing will also be conducted over a spill containment tray. The spill containment tray will prevent spills or splashes during testing from flowing to the sink. Liquids accumulating in the tray will be disposed in the reagent waste container(s) if a reagent is spilled or the groundwater treatment process, if the spilled material consists of groundwater. Sorbent materials used in the spill trays will be placed in solid waste receptacles. Spills will be cleaned up promptly by the facility operator. Materials from spill cleanup, including the chemicals spilled and materials used for cleanup, will be handled and disposed in accordance with supplier recommendations and MSDS information and applicable regulations. Spilled process residues or process water will be managed in accordance with applicable Ecology regulations. Spill cleanup equipment and materials available to the operator will include brooms, dust pans, buckets, mops, and paper

towels. Personal protective equipment (PPE) appropriate for the site and chemical hazards will be available to site personnel, and they will be trained in the use of the PPE. Cleanup will be done in accordance with a site-specific Health and Safety Plan (HASP) and a site-specific spill plan. The HASP and the Operations and Maintenance Manual will specify appropriate personal protective equipment and procedures to be used for laboratory testing and for cleanup of any spills. Any special equipment or materials specified in the MSDS information for the laboratory materials will also made available to the operator. All personnel assigned to the site for operation of the groundwater recovery and treatment system will be thoroughly trained in site plans, operating and testing procedures, chemical hazards, and spill containment and cleanup procedures.

Sincerely yours,
FLOYD | SNIDER
AMEC Geomatrix

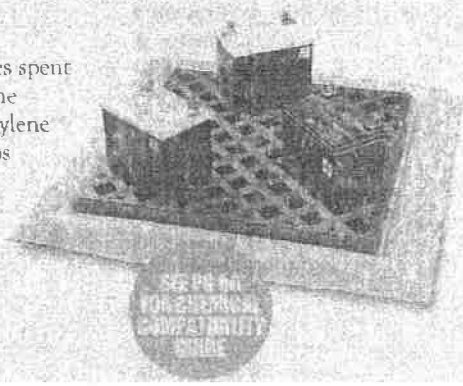
Larry McGaughey, Ph.D., P.E.
Project Manager

Encl.: Laboratory Spill Containment Tray Cut Sheets (2)

POLY-SPILLPAD™

Keep the floor clean with Poly-Spillpad! Handles spent batteries, 5-gallon pails, 16-gallon drums, and the messiest of "smaller" jobs. Sturdy inner polyethylene grate provides protection while vinyl berm keeps incidental spills contained. Poly-Spillpad is lightweight and easily moved. Great on your plant floors or to prevent incidental spills on the go! The large sump area allows for an extended response time.

- Removable 100% polyethylene grate allows easy access to the sump.



POLY-SPILLPADS

5600-YE

Dimensions: 24" L x 24" W x 2" H
60.9 cm x 60.9 cm x 5 cm
Weight: 11 lbs. / 5 kg
Sump Capacity: 2 gal. / 7.6 liters
Regulations: EPA, SPCC and NPDES

5610-YE

Dimensions: 48" L x 24" W x 2" H
121.9 cm x 60.9 cm x 5 cm
Weight: 20 lbs. / 9.07 kg
Sump Capacity: 7.5 gal. / 28.5 liters
Regulations: EPA, SPCC and NPDES

5620-YE

Dimensions: 48" L x 48" W x 2" H
121.9 cm x 121.9 cm x 5 cm
Weight: 40 lbs. / 18.14 kg
Sump Capacity: 12 gal. / 45.5 liters
Regulations: EPA, SPCC and NPDES

POLY-LABTRAY™

BRINGS SPILL PROTECTION TO THE LABORATORY BENCH.

Poly-Labtray™ reduces spills and overflows of liquid and free-flowing powder chemicals during transfer of material in the laboratory. The large surface holds four (4) 1-gallon bottles (up to 40 lbs. static load weight) and features a 2.5 gallon sump capacity. This also makes it perfect for mixing small containers at production sites. There are no metal parts to rust or corrode.

- Low-profile unit is only 3" high
- Small 25" x 21.5" footprint





- Controls spills as they happen.



- Removable grate for easy cleaning.

POLY-LABTRAY™

Part #: 5248-YE
Dimensions:
Base: 25.5" L x 22" W x 3.25" H
65 cm x 56 cm x 8 cm
Grate: 20.75" L x 17.25" W
53 cm x 44 cm
Weight: 3.8 lbs. / 1.7 kg
Sump Capacity: 2.5 gal. / 9.4 liters
Handling Capacity: 40 lbs. / 18 kg
Regulations: EPA, SPCC and NPDES

ECONO SPILL SHELL™

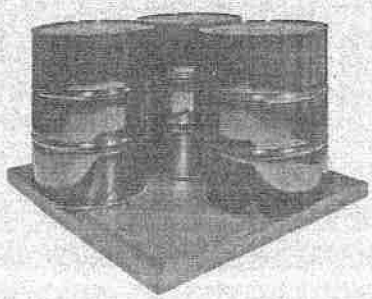
ECONOMICAL SPILL CONTAINMENT

Engineered drainage channels help facilitate the flow of spilled liquids away from containers for safe and effective clean-up.

- One-piece polyethylene construction that will not rust or corrode.
- Low profile design for easy loading
- Economy model Spill Pallet and Spill Tray designed for smaller containers
- 5" Sidewall allows for more sump space
- Diamond center pulls spills away from the drums
- Drip parameter retains liquids for cleaner sump area



2-DRUM ECONO SPILL SHELL™



4-DRUM ECONO SPILL SHELL™

ECONO SPILL SHELL™

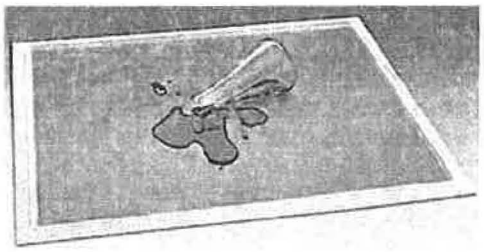
5002-BK

Dimensions: 45" L x 35" W x 5" H
115 cm x 89 cm x 12.5 cm
Weight: 16.5 lbs. / 7.5 kg
Sump Capacity: 21.5 gal. / 81.4 liters
Regulations: EPA, SPCC and NPDES

5004-BK

Dimensions: 51" L x 47" W x 5" H
130 cm x 119 cm x 12.5 cm
Weight: 19.1 lbs. / 8.7 kg
Sump Capacity: 36 gal. / 136 liters
Regulations: EPA, SPCC and NPDES

246750050 Spill Containment Tray



Dimensions: 58cm x 69cm x 12.7mm deep (23" x 27" x 1/2")
Polystyrene tray protects benches from spills
For maximum protection, use with Labmat™ sheets 50.8cm x 61cm (20" x 24")

Appendix J

Laboratory Testing and Reagent Overview Memorandum

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix F
Hazardous Materials Emergency Plan

Attachment F.3
EPCRA Reporting Forms

Print Form

WASHINGTON STATE EMERGENCY RESPONSE COMMISSION
Section 302 - Emergency Planning Notification
Section 303 - Facility Representative Designation
EMERGENCY PLANNING & COMMUNITY RIGHT-TO-KNOW ACT OF 1986

This is a notification that the facility has an Extremely Hazardous Substance at or above the Threshold Planning Quantity.

A chemical that subjects this facility to Section 302 is:

CAS Number _____ CHEMICAL NAME _____

The maximum amount present at one time is: _____ pounds

Washington Community Right-to-Know Number: _____

Name of Owner:_____

Name of Operator: _____

Name of Business: _____

NAICS Code/Primary Business Activity:_____

Dates of Notification: SERC: _____ LEPC: _____ Fire Dept:_____

Physical Address: _____

Mailing Address:_____
(if different from physical address)

Use a separate form for each facility

Latitude _____ Longitude _____

Facility Representative: _____

Telephone Number: _____

Name of Person Making Notification: _____

Title: _____

Signature: _____ Date: _____

SUBMIT TO: Community Right-to-Know Unit
Department of Ecology
PO Box 47659
Olympia WA 98504-7659
(800) 633-7585 or (360) 407-6178

If you need this form in an alternate format, please contact the Hazardous Substance Information Office at 1-800-633-7585 (voice, press 2 at the greeting), or1-800-833-6388 (TTY).

SECTION I: GENERAL INFORMATION

CR-ERNS Number:

Date of Initial Release:

Date of Initial Call to NRC:

Type of Report: Indicate below the type of report you are submitting.

- ☐ Initial Written Notification
- ☐ First Anniversary Follow-up Report
- ☐ Written Notification of a Change to Initial Notification
- ☐ Written Notification of a Change to Follow-up Report

Signed Statement: I certify that the hazardous substances releases described herein are continuous and stable in quantity and rate under the definitions in 40 CFR 302.8(a) or 355.4(a)(2)(iii) and that all submitted information is accurate and current to the best of my knowledge.

_____
Name and Position

_____ _____
Date *Signature*

Part A. Facility or Vessel Information

Name of Facility or Vessel

Person in Charge of Facility or Vessel

Name of Person in Charge

Position

Telephone No. ( ) Alternate Telephone No. ( )

Facility Address or Vessel Port of Registration

Street County

City State Zip Code

Dun and Bradstreet Number for Facility

Facility/Vessel Location

Latitude Deg _____ Min _____ Sec _____
Longitude Deg _____ Min _____ Sec _____

Vessel LORAN Coordinates

Part B. Population Information

Population Density

Choose the range that describes the population density within a one-mile radius of your facility or vessel (Indicate by placing an "X" in the appropriate blank below).

____ 0 - 50 persons ____ 101 - 500 persons ____ more than 1000 persons
____ 51 - 100 persons ____ 501 - 1000 persons

Sensitive Populations and Ecosystems Within One Mile Radius

Sensitive Populations or Ecosystems (e.g., schools, hospitals, wetlands, wildlife preserves, etc.)	Distance and direction from facility

SECTION II: SOURCE INFORMATION

CR-ERNS Number:

Part A: Basis for Asserting the Release is Continuous and Stable in Quantity and Rate.

For EACH source of a release of a hazardous substance or mixture from your facility or vessel, provide the following information on a SEPARATE sheet. Photocopy this page if necessary.

Name of Source:

1. Indicate whether the release from this source is either:

continuous without interruption _____ **OR** routine, anticipated, intermittent _____ .

2. Identify the activity(ies) that results in the release from this source (e.g., batch process, filling of a storage tank). If malfunction, describe the malfunction and explain why the release from the malfunction should be considered continuous and stable in quantity and rate.*

3. Identify below how you established the pattern of release and calculated release estimates.

____ Past release data

_____ Knowledge of the facility/vessel's operations and release history

_____ Engineering estimate

____ AP-42

_____ Best professional judgment

_____ Other (explain)

** Note that unanticipated events, such as spills, pipe ruptures, equipment failures, emergency shutdowns, or accidents, do not qualify for reduced reporting under CERCLA section 103(f)(2). Unanticipated events are not incidental to normal operations and, by definition, are not continuous or anticipated, and are not sufficiently predictable or regular to be considered stable in quantity and rate.*

SECTION II: SOURCE INFORMATION (continued)

CR-ERNS Number:

Name of Source:

Part B: Specific Information on the Source

For the source identified above, provide the following information. Please provide a SEPARATE sheet for EACH source. Photocopy this page if necessary.

AFFECTED MEDIUM. Identify the environmental medium (i.e., air, surface water, soil, or ground water) that is affected by the release from this source. If your source releases hazardous substances to more than one medium (e.g., a wastepile releasing to air and ground water), treat the release to **EACH** medium as a separate source and complete Section II, Parts A, B, and C, of this format for **EACH** medium affected.

⊘ **AIR** ____ (stack ____ or area ____) If the medium affected is air, please also specify whether the source is a stack or a ground-based area source.

- If identified source is a **stack**, indicate stack height: ____ feet or meters; **OR**
- If identified source is an **area source** (e.g., waste pile, landfill, valves, tank vents, pump seals, fugitive emissions), indicate surface area: _____ square feet or square meters.

⊘ **SURFACE WATER** ____ (stream ____ , lake ____ , or other _____)

- If the release affects any **surface water body**, give the name of the water body.

  _____

- If the release affects a **stream**, give the stream order or average flow rate, in cubic feet per second.

  stream order: ____ or average flow rate: ____ cubic feet/second; **OR**
- If the release affects a **lake**, give the surface area of the lake in acres and the average depth in meters.

  surface area of lake: ____ acres and average depth of lake: ____ meters.

⊘ **SOIL OR GROUND WATER** ____

If the release is on or under ground, indicate the distance to the closest water well.

_____

Optional Information

The following information is not required in the final rule; however, such information will assist EPA in evaluating the risks associated with the continuous release. **If this information is not provided, EPA will make conservative assumptions about the appropriate values.** Please note that the units specified below are suggested units. You may use other units; however, be certain that the units are clearly identified.

- For a stack release to air, provide the following information, if available:

  Inside diameter _____ feet or meters
  Gas Exit Velocity _____ feet/second or meters/second
  Gas Temperature _____ degrees Fahrenheit, Kelvin, or Celsius

- For a release to surface water, provide the following information, if available:

  Average Velocity _____ feet/second of Surface Water

SECTION II: SOURCE INFORMATION (continued)

CR-ERNS Number:

Part C. Identity and Quantity of Each Hazardous Substance or Mixture Released From Each Source

Please provide a SEPARATE sheet for EACH source. Photocopy this page if necessary.

Name of Source:

List each hazardous substance released from the source identified above and provide the following information. (For an example, see Table 1 of Reporting Requirements for Continuous Releases of Hazardous Substances - A Guide for Facilities and Vessels on Compliance.)

Name of Hazardous Substance	CASRN #	Normal Range (in lbs. or kg per day)* Upper Bound	Normal Range (in lbs. or kg per day)* Lower Bound	Number of Days Release Occurs (per year)	Total Quantity Released in Previous Year (in lbs. or kg)*	Months of the Release

List each mixture released from the source identified above and provide the following information. (For an example, see Table 2 of Reporting Requirements for Continuous Releases of Hazardous Substances - A Guide for Facilities and Vessels on Compliance.)

Name of Mixture	Name of Hazardous Substance Components	CASRN#	Weight Percentage	Normal Range of Components (in lbs. or kg per day)* Upper Bound	Normal Range of Components (in lbs. or kg per day)* Lower Bound	Normal Range of Mixture (in lbs. or kg per day)* Upper Bound	Normal Range of Mixture (in lbs. or kg per day)* Lower Bound	Number of Days Release Occurs (per year)	Total Quantity of Mixture Released in Previous Year (in lbs. or kg)	Months of the Release

** Please be sure to include units where appropriate. Also, if the release is a radionuclide, units of curies (CI) are appropriate.*

SECTION III: SUBSTANCE INFORMATION

CR-ERNS Number:

Calculation of the SSI Trigger

For EACH hazardous substance or hazardous substance component of a mixture indicated in Section II, Part C, list the names of the releasing sources and their upper bounds. Please use a SEPARATE sheet for EACH hazardous substance. Photocopy this page if necessary.

Name of Hazardous Substance:

To calculate the SSI trigger (i.e., the upper bound of the normal range of a release) for the hazardous substance identified above, aggregate the upper bounds of the normal range of the identified hazardous substance across all sources identified in Section II, Part C. If the hazardous substance is also a component of a mixture, be certain to include the upper bound of the component as calculated in Section II, Part C, in your calculation of the SSI trigger.

Name of Source(s)	Upper Bound of the Normal Range of the Release (specify lbs., kg, or Ci)

TOTAL - SSI trigger for this hazardous substance release* : _____

** This method for calculating the SSI trigger for the hazardous substance assumes that all releases of the same hazardous substance or mixture occur simultaneously. To the extent that a hazardous substance is released from your facility from different sources and at different frequencies, you may adjust the SSI trigger as appropriate, so that it more accurately reflects the frequency and quantity of the release. The SSI trigger in the final analysis must reflect the upper bound of the normal range of the release, taking into consideration all sources of the release at the facility or vessel. The normal range of the release includes all releases previously reported or occurring over a 24-hour period during the previous year.*

CR-ERNS Report -- Addendum to Form R

This Form serves as an addendum to EPCRA Section 313 Toxic Release Inventory (TRI) Form R. This along with EPCRA 313 Form R will provide EPA with the required information for reporting continuous releases.

Name of Facility:

CR-ERNS #:

Type of Report: Indicate below the type of report you are submitting.

☐ Initial Written Report

☐ First Anniversary Follow-up Report

☐ Written Notification of a Change to Initial Written Report

☐ Written Notification of a Change to Follow-up Report

Signed Statement: I certify that the hazardous substances releases described herein are continuous and stable in quantity and rate under the definitions in 40 CFR 302.8(a) or 355.4(a)(2)(iii) and that all submtted information is accurate and current to the best of my knowledge.

_____
Name and Position

_____ _____
Date Signature

Population Density: Choose the range that describes the population density within a one-mile radius of your facility.

_____ 0 - 50 people

_____ 51-100 people

_____ 101 - 500 people

_____ 501- 1000 people

_____ Over 1000 people

Sensitive Populations and Ecosystems: Indicate all sensitive populations and ecosystems within a one-mile radius include the distance and direction from the facility.

Sensitive Population or Ecosystems	Distance and direction from facility

CR-ERNS Report -- Addendum to Form R

CR-ERNS #:

Source Information: For EACH source of a release from your facility, provide the following information on a SEPARATE sheet.

Name of Source:

Indicate whether the release from this source is either:
continuous without interruption _____ OR routine, anticipated, intermittent _____

Pattern of the Release: Identify below how you established the pattern of release and calculated release estimates.

_____ Past release data _____ Knowledge of the facility's operations and release history _____ Engineering Estimates

_____ AP-42 _____ Best professional judgement _____ Other (explain)

Environmental Medium affected by the release from this source:

_____ Air _____ Surface Water _____ Soil or Ground Water

Air

If release is to air, please indicate stack height OR surface area of the release.

_____ Stack Height OR _____ Surface Area

Surface Water

If release is to Surface Water, please indicate name, type and specific information of the water body:

Name of water body _____

If stream: _____ Stream Order OR _____ Average flow rate (ft^3/sec)

If lake: _____ Surface area (ac) AND _____ Average Depth (m)

Soil or Ground Water

Indicate distance of closest water well: _____

Hazardous Substance Information:

Name of Hazardous Substance:	CASRN#	Upper Bound (in lbs. or kg per day)	Lower Bound (in lbs. or kg per day)	Number of Days Release Occurs (per year)	Months of the Release

Print Form

State Emergency Response Commission

SARA -Title III: EPCRA
Section 311 - Reporting Form

DEPARTMENT OF ECOLOGY State of Washington

Facility Name:_____ Community Right-To-Know #_____

Mailing Address:_____

City, State, Zip:_____ County: _____

Physical Address:_____
(if different from
mailing address)_____

Facility Representative:_____ Phone: _____

It is the facility's option to use this form or to submit MSDSs for certain chemicals at your facility under SARA, Section 311; however, the list must be grouped in the five Hazard Categories listed below. This is a one-time reporting requirement. However, if there is a significant change in the status of a reportable chemical (i.e., a change in the MSDS) or a new chemical that is covered is acquired, a facility must submit an MSDS or a new list for those chemicals within three months.

Is this an initial submittal or an update? ☐ Initial ☐ Update

A copy of this submittal must be sent to: 1) local fire department; 2) Local Emergency Planning Committee; and, 3) State Emergency Response Commission.

You must report on:
1) the Extremely Hazardous Substances at or in excess of the Threshold Planning Quantity, or 500 pounds, whichever is less, and
2) any of the hazardous chemicals in excess of 10,000 pounds.

Check off all of the physical and health categories that apply. The categories are not mutually exclusive; a chemical can fall under several categories. The hazardous categories are as follows:

F - Fire Hazard
P - Sudden Release of Pressure
R - Reactivity
AH - Immediate (Acute) Health Hazard
CH - Delayed (Chronic) Health Hazard

(Over)

HAZ CATEGORIES

CHEMICAL NAME	CAS NUMBER	F	P	R	AH	CH
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
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		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐

Form Approved OMB No. 2050-0072

Tier Two EMERGENCY AND HAZARDOUS CHEMICAL INVENTORY

Specific Information by Chemical

Facility Identification

Name _____

Street _____

City _____ County _____ State _____ Zip _____

NAICS Code _____ Dun & Brad Number _____

FOR OFFICIAL USE ONLY

ID # _____

Date Received _____

Owner/Operator Name

Name _____ Phone ( ) _____

Mail Address _____

Emergency Contact

Name _____ Title _____

Phone ( ) _____ 24 Hr. Phone ( ) _____

Name _____ Title _____

Phone ( ) _____ 24 Hr. Phone ( ) _____

Important: Read all instructions before completing form

Reporting Period From January 1 to December 31, 20 ____

[ ] Check if information below is identical to the information submitted last year.

Chemical Description

CAS _____ Trade Secret [ ]

Chem. Name _____

Check all that apply [ ] Pure [ ] Mix [ ] Solid [ ] Liquid [ ] Gas [ ] EHS

EHS Name _____

Physical and Health Hazards *(check all that apply)*

[ ] Fire
[ ] Sudden Release of Pressure
[ ] Reactivity
[ ] Immediate (acute)
[ ] Delayed (chronic)

Inventory

Max. Daily Amount (code) [ ][ ]

Avg. Daily Amount (code) [ ][ ]

No. of Days On-site (days) [ ][ ][ ]

Container Type / Pressure / Temperature

Storage Codes and Locations (Non-Confidential)

Storage Locations

Optional

[ ]

CAS _____ Trade Secret [ ]

Chem. Name _____

Check all that apply [ ] Pure [ ] Mix [ ] Solid [ ] Liquid [ ] Gas [ ] EHS

EHS Name _____

[ ] Fire
[ ] Sudden Release of Pressure
[ ] Reactivity
[ ] Immediate (acute)
[ ] Delayed (chronic)

Max. Daily Amount (code) [ ][ ]

Avg. Daily Amount (code) [ ][ ]

No. of Days On-site (days) [ ][ ][ ]

[ ]

CAS _____ Trade Secret [ ]

Chem. Name _____

Check all that apply [ ] Pure [ ] Mix [ ] Solid [ ] Liquid [ ] Gas [ ] EHS

EHS Name _____

[ ] Fire
[ ] Sudden Release of Pressure
[ ] Reactivity
[ ] Immediate (acute)
[ ] Delayed (chronic)

Max. Daily Amount (code) [ ][ ]

Avg. Daily Amount (code) [ ][ ]

No. of Days On-site (days) [ ][ ][ ]

[ ]

Certification ***(Read and sign after completing all sections)***

I certify under penalty of law that I have personally examined and am familiar with the information submitted in pages one through _____, and that based on my inquiry of those individuals responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner/operator OR owner/operator's authorized representative _____ Signature _____ Date signed _____

Optional Attachments

[ ] I have attached a site plan
[ ] I have attached a list of site coordinate abbreviations
[ ] I have attached a description of dikes and other safeguards measures

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix F
Hazardous Materials Emergency Plan

Attachment F.4
EPCRA Section 311 and Tier 2
2013 Submittal

Print Form

State Emergency Response Commission

SARA -Title III: EPCRA
Section 311 - Reporting Form

DEPARTMENT OF ECOLOGY State of Washington

Facility Name: B&L Woodwaste Community Right-To-Know # CRK000081260

Mailing Address: 606 Columbia St NW, Suite 212

City, State, Zip: Olympia, WA 98501 County: Thurston (mailing addr); Pierce (physical addr)

Physical Address: 1522 Fife Way E

(if different from mailing address) Milton, WA 98354

Facility Representative: Dan Silver Phone: 360-754-9343

It is the facility's option to use this form or to submit MSDSs for certain chemicals at your facility under SARA, Section 311; however, the list must be grouped in the five Hazard Categories listed below. This is a one-time reporting requirement. However, if there is a significant change in the status of a reportable chemical (i.e., a change in the MSDS) or a new chemical that is covered is acquired, a facility must submit an MSDS or a new list for those chemicals within three months.

Is this an initial submittal or an update? ☒ Initial ☐ Update

A copy of this submittal must be sent to: 1) local fire department; 2) Local Emergency Planning Committee; and, 3) State Emergency Response Commission.

You must report on:
1) the Extremely Hazardous Substances at or in excess of the Threshold Planning Quantity, or 500 pounds, whichever is less, and
2) any of the hazardous chemicals in excess of 10,000 pounds.

Check off all of the physical and health categories that apply. The categories are not mutually exclusive; a chemical can fall under several categories. The hazardous categories are as follows:

- F - Fire Hazard
- P - Sudden Release of Pressure
- R - Reactivity
- AH - Immediate (Acute) Health Hazard
- CH - Delayed (Chronic) Health Hazard

(Over)

HAZ CATEGORIES

CHEMICAL NAME	CAS NUMBER	F	P	R	AH	CH
Sulfuric Acid, 93-98%	7664-93-9	☐	☐	☒	☒	☒
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
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		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐

Tier Two Emergency and Hazardous Chemical Inventory
Specific Information by Chemical
Revised September 2005

Community Right-to-Know
(REQUIRED INFORMATION)

ID #: CRK000081260
(12-digit number beginning with CRK or WA)

Facility Identification UBI/DOR#:
Name B AND L WOODWASTE
Address 1522 FIFE WAY E
City MILTON County Pierce State Zip 98354
NAICS Code 562910 Latitude 47-14-35 Longitude 122-19-36
SIC Code Dun & Bradstreet No. LEPC PIERCE

Main Contact Name DANIEL J SILVER Email DANIEL.JSILVER@MSN.COM
Title TRUST ADMINISTRATOR Phone (360) 754-9343 Fax

Mailing Address *Must be included if different from Facility Address*
Address 606 COLUMBIA ST NW
City OLYMPIA State WA Zip 98501

Owner/ Operator Name DANIEL J SILVER
Street 606 COLUMBIA ST NW
City OLYMPIA State WA Zip 98501- Phone (360) 754-9343

Emergency Contact
Name LARRY MCGAUGHEY Title PROJECT MANAGER
Phone (206) 342-1788 24-hr. Phone (206) 755-1525
Name MARK MIERZEJEWSKI Title PROCESS ENGINEER
Phone (206) 838-8475 24-hr. Phone (425) 761-6174

Important: Read all instructions before completing form.

Reporting Period: From January 1 to December 31, 2012

☐ Subject to section 112r of Clean Air Act

Chemical Description	Physical and Health Hazards (check all that apply)	INVENTORY	Storage Codes (Container Type / Pressure / Temperature)	Storage Locations (Non-Confidential)
CAS 007664-93-9 Trade Secret ☐ Chem. Name SULFURIC ACID SOLUTION EHS Name SULFURIC ACID Check all that apply: ☐ Pure ☒ Mix ☐ Solid ☒ Liquid ☐ Gas ☒ EHS	☐ Fire ☐ Sudden Release of Pressure ☒ Reactivity ☒ Immediate (acute) ☒ Delayed (chronic)	4,075 Max. Amount (lbs.) 3,500 Avg. Amount (lbs.) 3 Max. Daily Amount (code) 3 Avg. Daily Amount (code) 189 No. of Days On-site	0 / 1 / 4	NW CORNER OF BLDG, WITHIN SECONDARY CONTAINMENT SUMP

Certification (Read and sign after completing all sections)
I certify under penalty of law that I have personally examined and am familiar with the information submitted in pages one thru 1 and that based on my inquiry of these individuals responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

DANIEL SILVER, Trustee — Signature — 3/4/13

Name and offical title of owner/operator's authorized representative | Signature | Date Signed

OPTIONAL ATTACHMENTS
☐ I have attached a site plan
☐ I have attached a list of site coordinate abbreviations
☐ I have attached a description of dikes and other safeguard measures

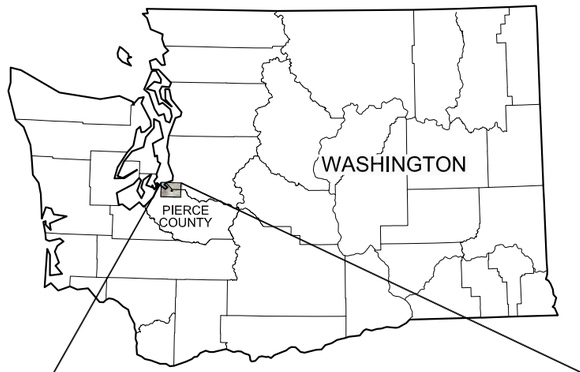
B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

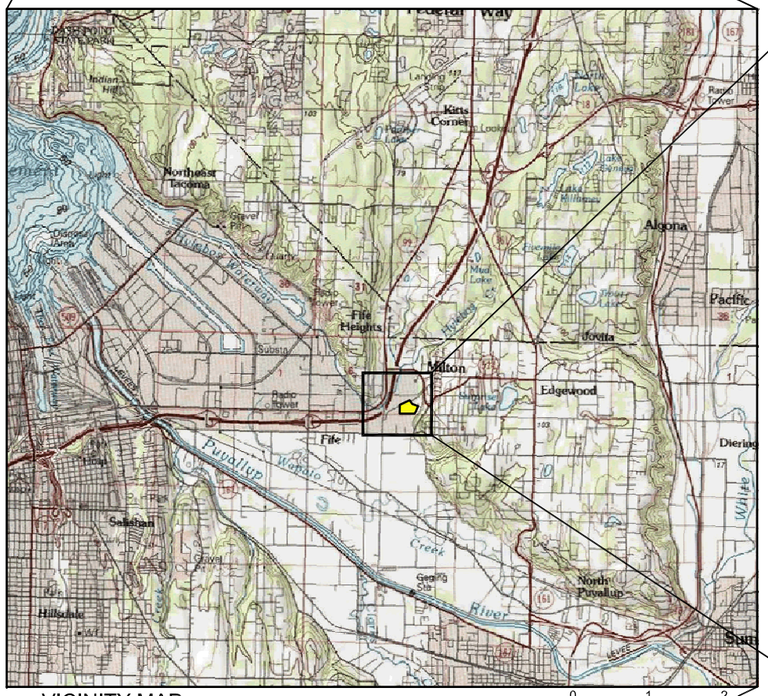
Appendix G
Phase 1 Record Drawings

CONSTRUCTION PLANS AND SPECIFICATIONS
ADDENDUM 1: PHASE 1 PART 1 REMEDIATION DESIGN
BARRIER WALL AND INTERCEPTOR TRENCH SYSTEM

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

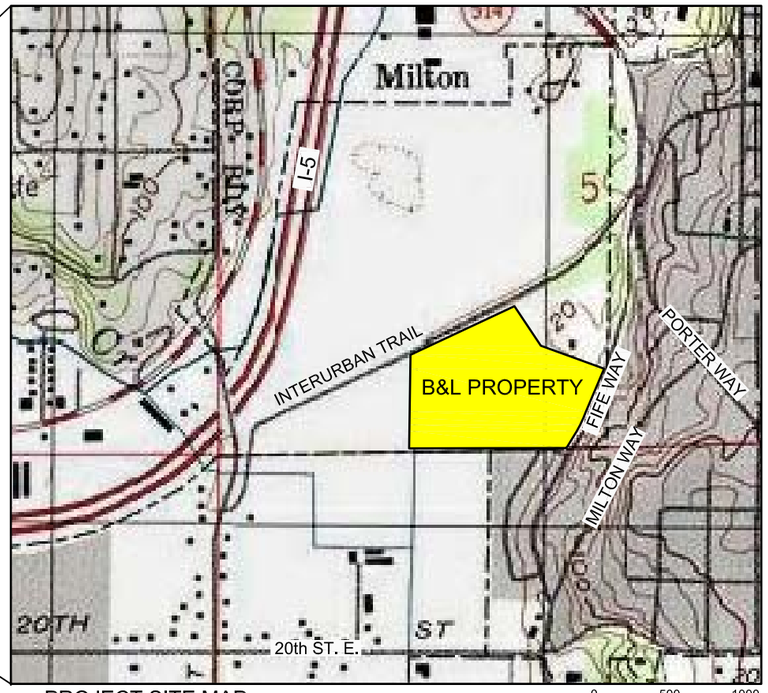


LOCATION MAP



VICINITY MAP

0 1 2
APPROXIMATE SCALE IN MILES



PROJECT SITE MAP

0 500 1000
APPROXIMATE SCALE IN FEET

DRAWING LIST

G-1	COVER SHEET
G-2	SITE PLAN
G-3	EROSION & SEDIMENTATION CONTROL PLAN
G-4	EROSION & SEDIMENTATION CONTROL DETAILS
C-1	BARRIER WALL PLAN
C-2	BARRIER WALL PROFILE STA. 0+00 TO 7+00
C-3	BARRIER WALL PROFILE STA. 7+00 TO 14+00
C-4	BARRIER WALL PROFILE STA. 14+00 TO 21+00
C-5	BARRIER WALL PROFILE STA. 21+00 TO 26+42
C-6	INTERCEPTOR TRENCH SYSTEM
C-7	WESTERN INFILTRATION POND PLAN
C-8	INFILTRATION POND DETAILS
C-9	INTERCEPTOR TRENCH PROFILES
C-10	LIFT STATION AND TRENCH DETAILS
C-11	OUTFALL AND CLEANOUT DETAILS
C-12	LANDFILL CAP RESTORATION PLAN
C-13	LANDFILL CAP RESTORATION DETAILS
C-14	DETAILS
N-1	GROUNDWATER MONITORING NETWORK PLAN
N-2	PIEZOMETER CONSTRUCTION DIAGRAMS
E-1	ELECTRICAL ONE-LINE DIAGRAM AND CONTROL DIAGRAMS
P-1	PIPING & INSTRUMENTATION DIAGRAM

NOTES:

1. GROUND SURFACE CONTOUR LINES WERE OBTAINED FROM LIDAR AND AUGMENTED WITH SOME LAND SURVEYING BY BARGHAUSEN.
2. LIDAR ELEVATIONS ARE GENERALLY ACCURATE TO ±1 FOOT.
3. SITE GROUNDWATER AND LANDFILL WASTE ARE CONTAMINATED WITH ARSENIC. SEE SITE HEALTH AND SAFETY PLAN FOR RELEVANT INFORMATION. ALL WORKERS MUST BE CURRENT WITH HAZWOPER-TRAINING AND MEDICAL MONITORING.
4. CONTACT UTILITIES UNDERGROUND LOCATION CENTER BEFORE START OF CONSTRUCTION. THERE ARE NO KNOWN SUBSURFACE UTILITIES WITHIN THE WORK AREA.
5. BESIDES CONTRACTOR'S OWN FIELD OFFICE, PROVIDE AN ADDITIONAL FIELD OFFICE TRAILER WITH SPACE AND FURNITURE FOR THE CONSTRUCTION MANAGER, AT LEAST 28 FT LONG, AND CONNECT WITH POWER AND PHONE SERVICES.
6. A POWER POLE WITH METER AND 3-PHASE, 480V, SUPPLY WILL BE PROVIDED BY OTHERS AT THE LANDFILL ENTRANCE GATE. CONTRACTOR WILL BE RESPONSIBLE FOR ALL OTHER TRANSFORMERS AND LINES NEEDED FOR TEMPORARY AND PERMANENT SERVICE.
7. PHONE SERVICE WILL BE PROVIDED TO THE POWER POLE BY OTHERS.
8. WATER SUPPLY SHALL BE OBTAINED FROM A CITY OF MILTON FIRE HYDRANT ON FIFE WAY, APPROXIMATELY 0.5 MILE NORTH OF THE SITE.
9. PROVIDE OTHER TEMPORARY FACILITIES FOR THE DURATION OF THE PROJECT.

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	RECORD DRAWING	10/15/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

FLOYD | SNIDER
AMEC Geomatrix

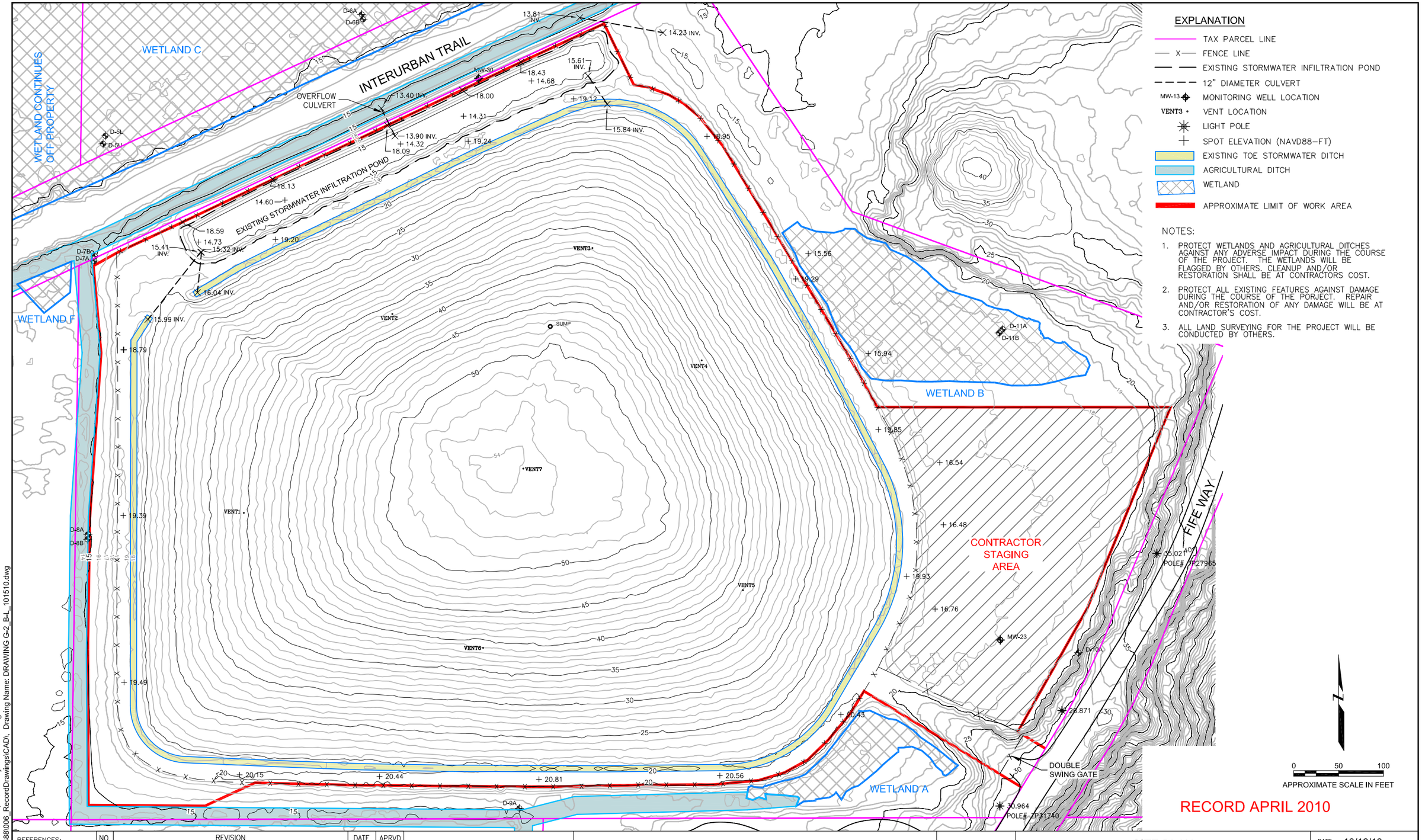
COVER SHEET
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/15/10
PROJECT NO.: 13488

DRAWING
G-1

Plot Date: 10/15/10 - 9:04am, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING G-1_B-L_101510.dwg



Plot Date: 10/18/10 - 11:36am, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING G-2_B-L_101510.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	STAGING AREAS	4/12/10	KT

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

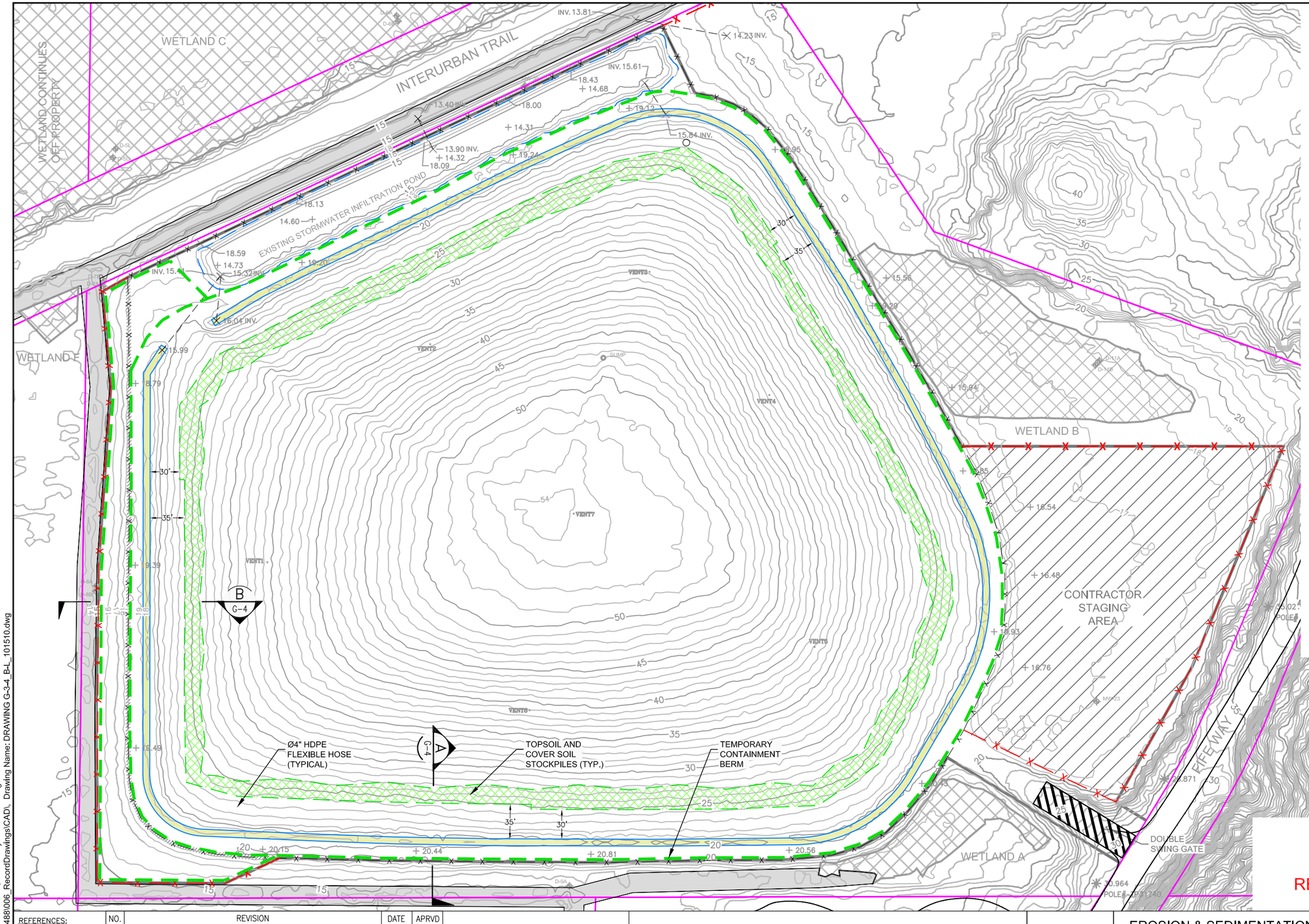
FLOYD | SNIDER
AMEC Geomatrix

SITE PLAN
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/18/10
PROJECT NO.: 13488

DRAWING
G–2



EXPLANATION

- TAX PARCEL LINE
- FENCE LINE
- EXISTING STORMWATER INFILTRATION POND
- 12" DIAMETER CULVERT
- MONITORING WELL LOCATION
- VENT LOCATION
- LIGHT POLE
- SPOT ELEVATION (NAVD88–FT)
- EXISTING TOE STORMWATER DITCH
- AGRICULTURAL DITCH
- WETLAND
- APPROXIMATE LIMIT OF WORK AREA
- EXISTING FENCE TO BE REMOVED
- PROPOSED TEMPORARY FENCE
- TEMPORARY CONTAINMENT BERM
- STABILIZED ACCESS ROAD WITH CRUSHED ROCK

NOTES:

1. EROSION AND SEDIMENTATION CONTROL MEASURES SHOWN ARE MINIMUM REQUIREMENTS, AND SHALL BE CONSTRUCTED PRIOR TO THE START OF ANY CONSTRUCTION.
2. MAINTAIN EROSION AND SEDIMENTATION CONTROL MEASURES FOR THE DURATION OF THE WORK AND UNTIL PERMANENT STABILIZATION IS ESTABLISHED.
3. INSTALL TEMPORARY FENCING WHERE SHOWN OR NEEDED. REMOVE EXISTING FENCING ON THE WEST SIDE AS SHOWN. SALVAGE FOR REUSE IF COST EFFECTIVE.
4. COVER ALL PERIMETER FENCES WITH A LAYER OF GEOTEXTILE FOR THE DURATION OF CONSTRUCTION FOR SPLASH CONTROL.
5. INSTALL CONTAINMENT BERMS AROUND THE WORK AREAS AS SHOWN.
6. STOCKPILE TOPSOIL AND COVER SOIL OVER THE MIXING PAD AS SHOWN. COVER THE STOCKPILES FOR THE DURATION OF THE PROJECT WITH PLASTIC SHEETING.
7. INSTALL 4–INCH DIA. DRAIN PIPES TO CONVEY STORMWATER RUNOFF FROM THE LANDFILL CAP TO OUTSIDE THE WORK AREA. FILL THE GAPS AROUND THE DRAIN PIPES WITH GEOTEXTILE TO PREVENT SEDIMENT DISCHARGE.
8. SALVAGE AND PROTECT GEONET, PVC GEOMEMBRANE, AND GCL OVER THE MIXING PAD TO THE EXTENT POSSIBLE FOR REUSE. PLACE A LAYER OF 4 OZ/SY NONWOVEN GEOTEXTILE OVER THE EXPOSED SUBGRADE.

RECORD APRIL 2010

Plot Date: 10/18/10 - 11:41am, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING G-3-4_B4L_101510.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	FLEXIBLE HOSES / DRAIN PIPE REMOVED	4/12/10	KT

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

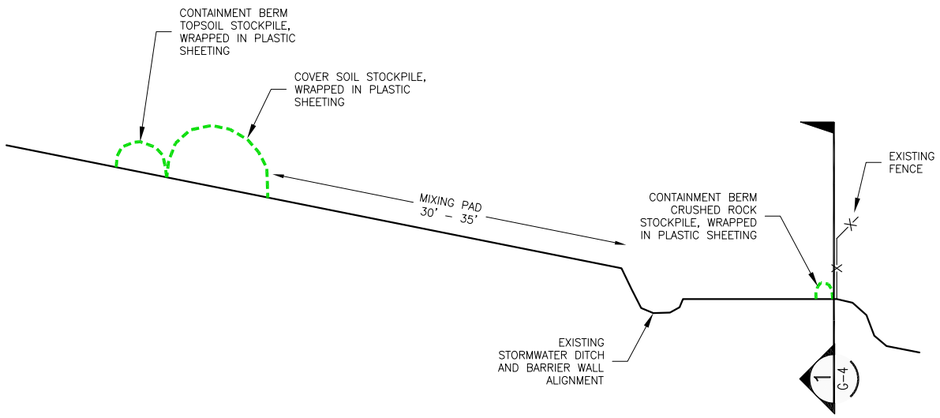
FLOYD | SNIDER
AMEC Geomatrix

EROSION & SEDIMENTATION CONTROL PLAN
ADDENDUM 1

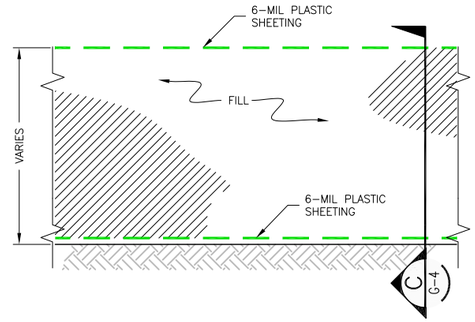
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/18/10
PROJECT NO.: 13488

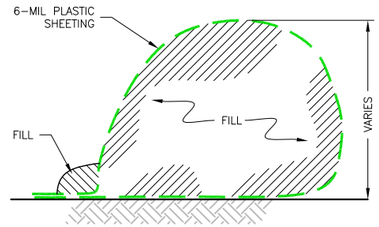
DRAWING
G–3



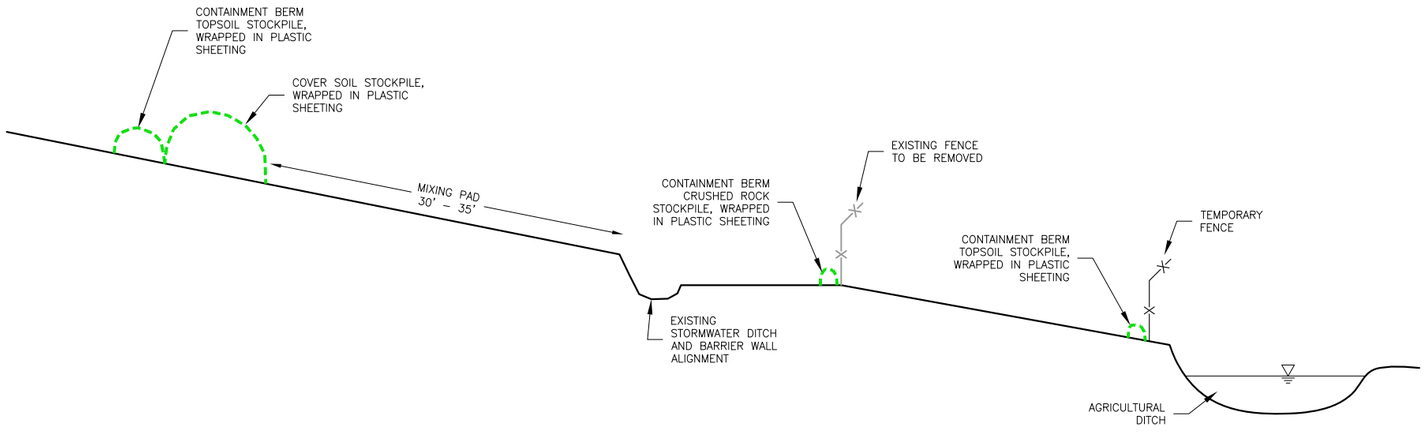
SECTION A
NOT TO SCALE
G-3



GENERAL CONTAINMENT BERM EXTERIOR VIEW 1
NOT TO SCALE
--



GENERAL CONTAINMENT BERM CROSS-SECTION VIEW C
NOT TO SCALE
--



SECTION B
NOT TO SCALE
G-3

NOTES:

1. CONTAINMENT BERMS SHALL BE WRAPPED IN PLASTIC SHEETING AND SECURED FOR THE DURATION OF THE PROJECT TO PREVENT DISCHARGE OF STORMWATER RUNOFF FROM WITHIN THE WORK AREA.
2. CRUSHED ROCK LINING OF THE EXISTING STORMWATER COLLECTION DITCH AT THE TOE OF THE LANDFILL MAY BE USED TO FILL THE PERIMETER CONTAINMENT BERMS. ALONG THE WESTERN BOUNDARY, THE ADJACENT TOPSOIL MAY BE USED TO CONSTRUCT THE CONTAINMENT BERM.
3. CONTAINMENT BERMS SHALL BE MAINTAINED AT A MINIMUM HEIGHT OF 6 INCHES.
4. PLASTIC SHEETING SHALL BE A MINIMUM OF 6-MIL THICK.
5. REMOVE CONTAINMENT BERMS AT THE COMPLETION OF THE PROJECT AND INCORPORATE INTO THE LANDFILL OR DISPOSE OFFSITE.

RECORD APRIL 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	REMOVED DRAIN PIPE	4/12/10	KT

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

FLOYD | SNIDER
AMEC Geomatrix

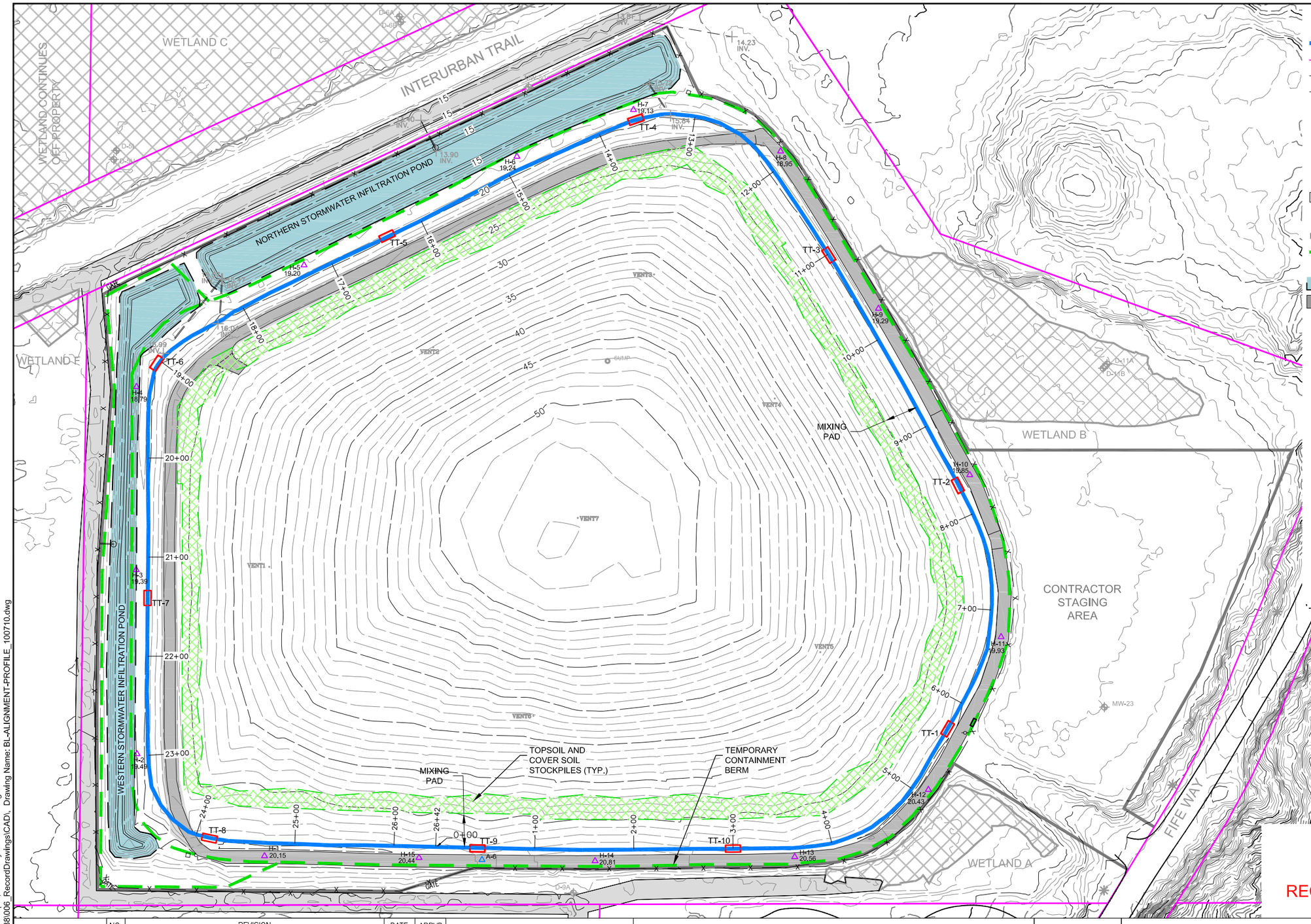
EROSION & SEDIMENTATION CONTROL DETAILS
ADDENDUM 1

DATE: 10/18/10
PROJECT NO.: 13488

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DRAWING
G-4

Plot Date: 10/18/10 - 11:42am, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING G-3-4_B-L_101510.dwg



EXPLANATION

- BARRIER WALL ALIGNMENT
- TAX PARCEL LINE
- FENCE LINE
- 12" DIAMETER CULVERT
- H-10 19.85 — HSA BORING LOCATION AND SURFACE ELEVATION
- MW-13 — MONITORING WELL LOCATION
- VENT3 — VENT LOCATION
- LIGHT POLE
- CULVERT INVERT ELEVATION (NAVD88–FT)
- AGRICULTURAL DITCH
- WETLAND
- APPROXIMATE LIMIT OF WORK AREA
- TEMPORARY CONTAINMENT BERM
- TT-2 — APPROXIMATE LOCATION OF TEST TRENCH
- INFILTRATION POND
- FINAL PERIMETER ROAD

NOTES:

1. EXCAVATE 10 TEST TRENCHES AT LOCATIONS SHOWN. THESE WILL BE INSPECTED BY ENGINEER AND ARCHEOLOGIST. MITIGATE ANY PROBLEMS FOUND FOR BARRIER WALL CONSTRUCTION (E.G. COBBLES AT H–10).
2. SUBSURFACE CONDITIONS ARE KNOWN ONLY AT THE BORING LOCATIONS. VARIATIONS BETWEEN THE GEOLOGIC INTERPRETATION SHOWN ON DRAWINGS C–2 THROUGH C–5 AND ACTUAL SUBSURFACE CONDITIONS MAY EXIST.
3. BARRIER WALL BACKFILL SHALL BE SITE SOIL WITH A MINIMUM OF 3% BENTONITE BY WEIGHT.
4. CONTRACTOR SHALL START BARRIER WALL CONSTRUCTION FROM STA 0+00 TO STA 26+56. THE WALL THICKNESS SHALL BE A MINIMUM OF 2 FEET WIDE.
5. LANDFILL WASTE IS NOT EXPECTED TO BE ENCOUNTERED DURING EXCAVATION. ANY LANDFILL WASTE ENCOUNTERED MUST BE INCORPORATED INTO THE LANDFILL.
6. SPREAD A 6–INCH THICK LAYER OF THE EXCAVATED SOIL OVER THE MIXING PAD AND COVER WITH A LAYER OF 4 OZ/SY GEOTEXTILE AS DEMARCATION. BACKFILL MIX SHALL NOT PENETRATE THIS LAYER.

RECORD OCTOBER 2010

Plot Date: 10/14/10 - 3:30pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_Record\Drawings\CAD\, Drawing Name: BL-ALIGNMENT-PROFILE_100710.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	REVISED BARRIER WALL AND FENCE LINE	4/08/10	KT
4	RECORD DRAWING	10/7/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

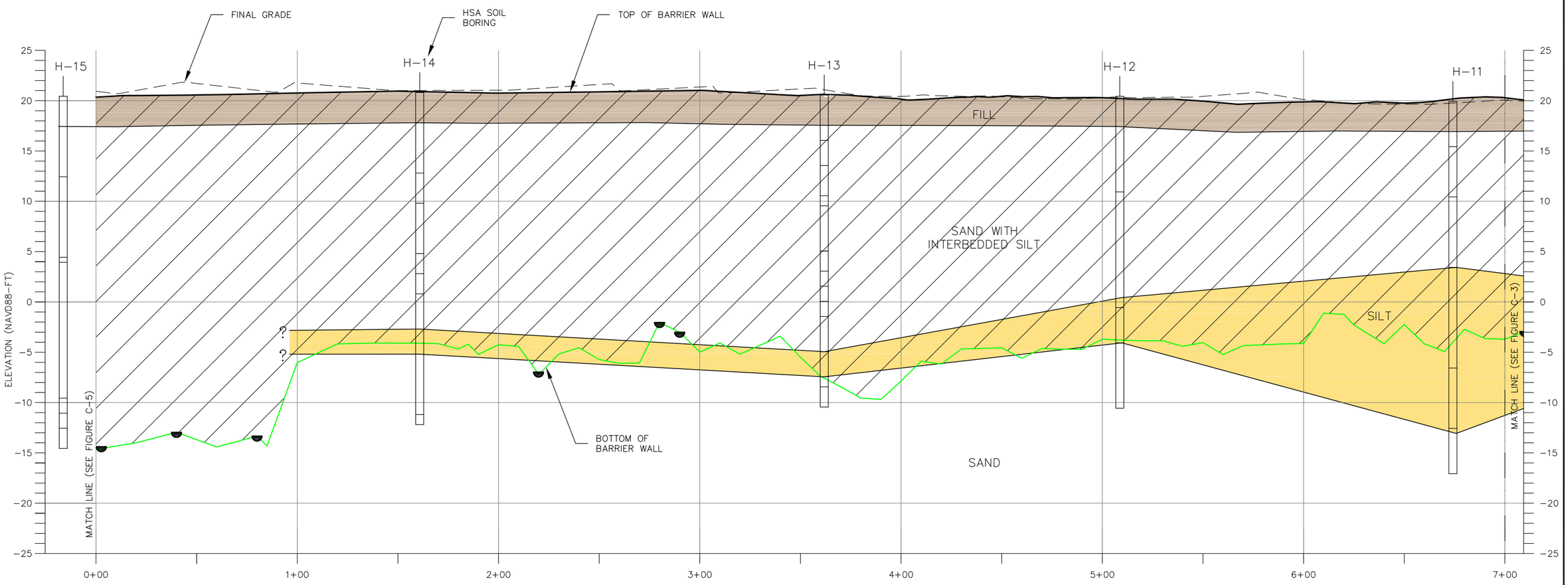
FLOYD | SNIDER
AMEC Geomatrix

BARRIER WALL PLAN
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/14/10
PROJECT NO.: 13488

DRAWING
C–1



EXPLANATION

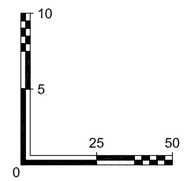
H–14 — HOLLOW STEM AUGER (HSA) BORING LOCATION (SEE C–1 FOR LOCATIONS)

BOTTOM OF BARRIER WALL

LOG

NOTES:

1. THE WALL PROFILES SHOWN ON DRAWINGS C–2 THROUGH C–5 ARE APPROXIMATE. CONSTRUCT BARRIER WALL TO THE MINIMUM DEPTHS INDICATED ON DRAWINGS C–2 THROUGH C–5. FINAL DEPTH SHALL BE DETERMINED BY ENGINEER.
2. PREPARE BENTONITE SLURRY AT AN ON–SITE BATCH PLANT. KEEP TRENCH FULL WITH BENTONITE SLURRY AT ALL TIMES.
3. BENTONITE SLURRY SHALL HAVE A MINIMUM DENSITY OF 66 PCF AND TESTED AT LEAST ONCE FOR EACH BATCH. TEST DENSITY OF THE SLURRY IN THE TRENCH WEEKLY, OR AS REQUIRED BY ENGINEER.
4. BACKFILL MIX SHALL CONTAIN A MINIMUM OF 3% BENTONITE BY WEIGHT, AND MIXED TO A HOMOGENEOUS MIX WITH A SLUMP OF 4 TO 6 INCHES. PERFORM SLUMP TESTS TWICE A DAY OR MORE FREQUENTLY AS REQUIRED BY ENGINEER.
5. COLLECT A PAIR OF BACKFILL CYLINDERS FOR EVERY 200 LINEAR FEET OF BARRIER WALL AND TEST FOR HYDRAULIC CONDUCTIVITY USING TRIAXIAL MACHINE. THE BACKFILL SHALL HAVE A MINIMUM HYDRAULIC CONDUCTIVITY OF $1X10^{-6}$ CM/S.
6. BACKFILL OF THE TRENCH WITH SOIL–BENTONITE SLURRY SHALL LAG BEHIND THE EXCAVATION SUCH THAT THE TOE OF THE BACKFILL IS AT LEAST 15 FT FROM THE TOE OF THE EXCAVATION.
7. PROFILE THE TOP OF THE BACKFILL EVERY 5 FT AT THE END OF EACH SHIFT AND AT THE START OF NEXT SHIFT. EXCAVATE ANY EXCESS MATERIAL AT THE START OF EACH SHIFT.
8. BACKFILL BARRIER WALL TO TOP OF EXISTING PERIMETER ROAD. MEASURE BACKFILL SETTLEMENT DAILY FOR AT LEAST ONE WEEK, AND WEEKLY THEREAFTER. ADD BACKFILL TO ROAD ELEVATION AS NEEDED.
9. PRIOR TO CONSTRUCTION OF LANDFILL CAP, INSTALL A LAYER OF GEOGRID ACROSS THE TOP OF THE BACKFILL AND EXTEND AT LEAST 2 FT BEYOND THE EDGES OF THE BACKFILL. OVERLAP GEOGRID SECTIONS A MINIMUM DISTANCE OF 2 FT. GEOGRID SHALL BE TENSAR BIAXIAL GEOGRID BX–1500 OR APPROVED EQUIVALENT.
10. ENGINEER WILL DETERMINE WHEN LANDFILL CAP MAY BE CONSTRUCTED BASED ON SETTLEMENT MONITORING.
11. INCORPORATE EXCESS BENTONITE SLURRY INTO THE LANDFILL.



APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

RECORD FEBRUARY 2011

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	KT
2	BOTTOM OF WALL AND OBSTRUCTIONS	4/08/10	KT
3	RECORD DRAWING	10/7/10	SB

DRAWN A.S.
DESIGNED K.T.
CHECKED ??
REVIEWED ??

FLOYD | SNIDER
AMEC Geomatrix

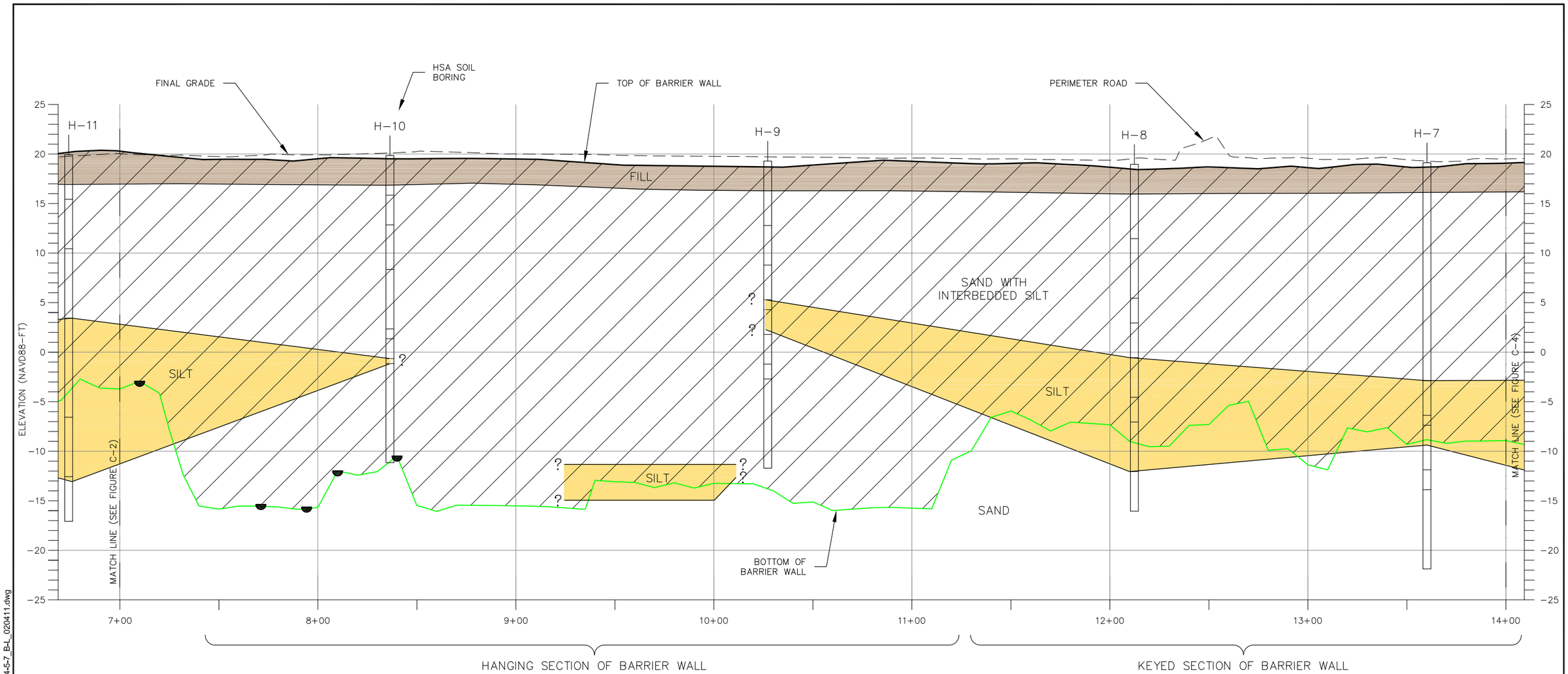
BARRIER WALL PROFILE STA 0+00 - 7+00
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 02/04/11
PROJECT NO.: 13488

DRAWING C–2

Plot Date: 02/04/11 - 4:41pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING C-1-2-3-4-5-7_B-L_020411.dwg



EXPLANATION

H-10 — HOLLOW STEM AUGER (HSA) BORING LOCATION (SEE C-1 FOR LOCATIONS)

BOTTOM OF BARRIER WALL

LOG

10 5 0 25 50

APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

RECORD FEBRUARY 2011

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	KT
2	BOTTOM OF WALL AND OBSTRUCTIONS	4/08/10	KT
3	RECORD DRAWING	10/7/10	SB

DRAWN A.S.
DESIGNED K.T.
CHECKED ??
REVIEWED ??

FLOYD | SNIDER
AMEC Geomatrix

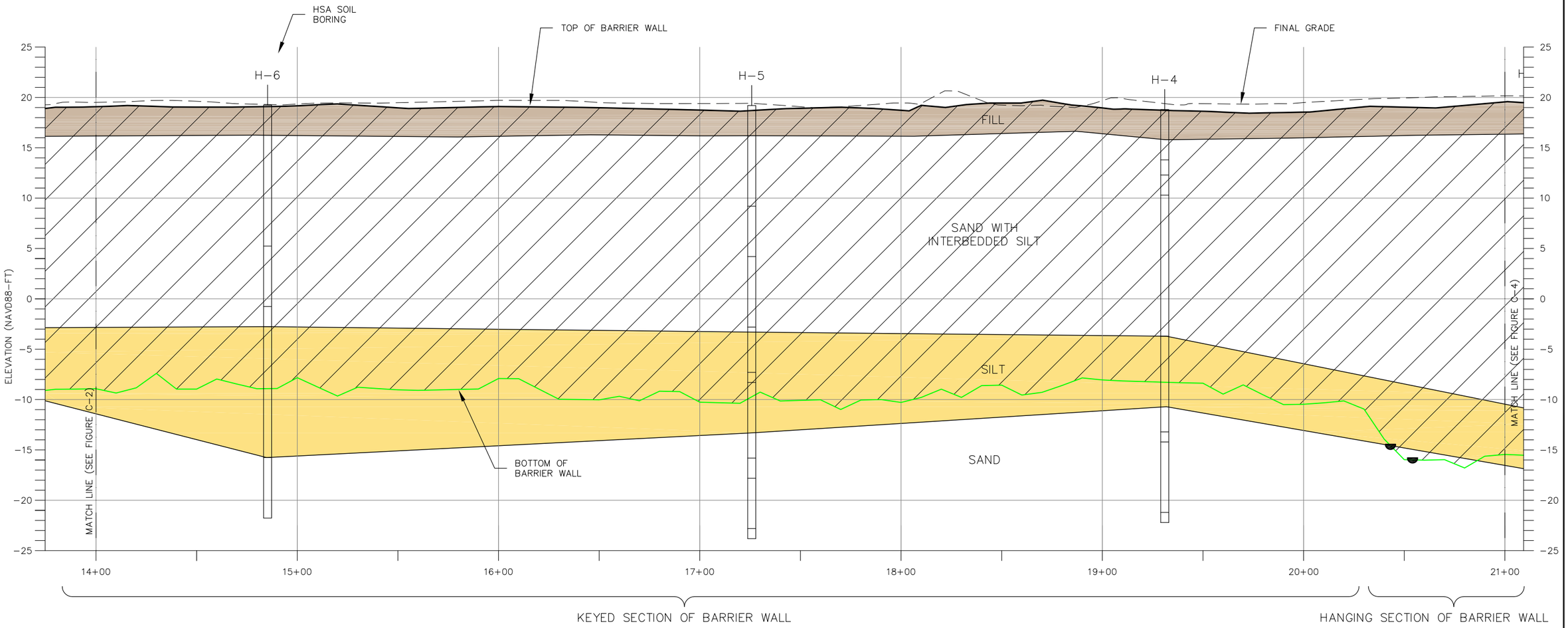
BARRIER WALL PROFILE STA 7+00 - 14+00
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 02/04/11
PROJECT NO.: 13488

DRAWING
C-3

Plot Date: 02/04/11 - 4:42pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING C-1-2-3-4-5-7_B-L_020411.dwg



EXPLANATION

H-10 — HOLLOW STEM AUGER (HSA) BORING LOCATION (SEE C-1 FOR LOCATIONS)

BOTTOM OF BARRIER WALL

LOG

10 5 0 25 50

APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

RECORD FEBRUARY 2011

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	KT
2	BOTTOM OF WALL AND OBSTRUCTIONS	4/08/10	KT
3	RECORD DRAWING	10/7/10	SB

DRAWN A.S.
DESIGNED K.T.
CHECKED ??
REVIEWED ??

FLOYD | SNIDER
AMEC Geomatrix

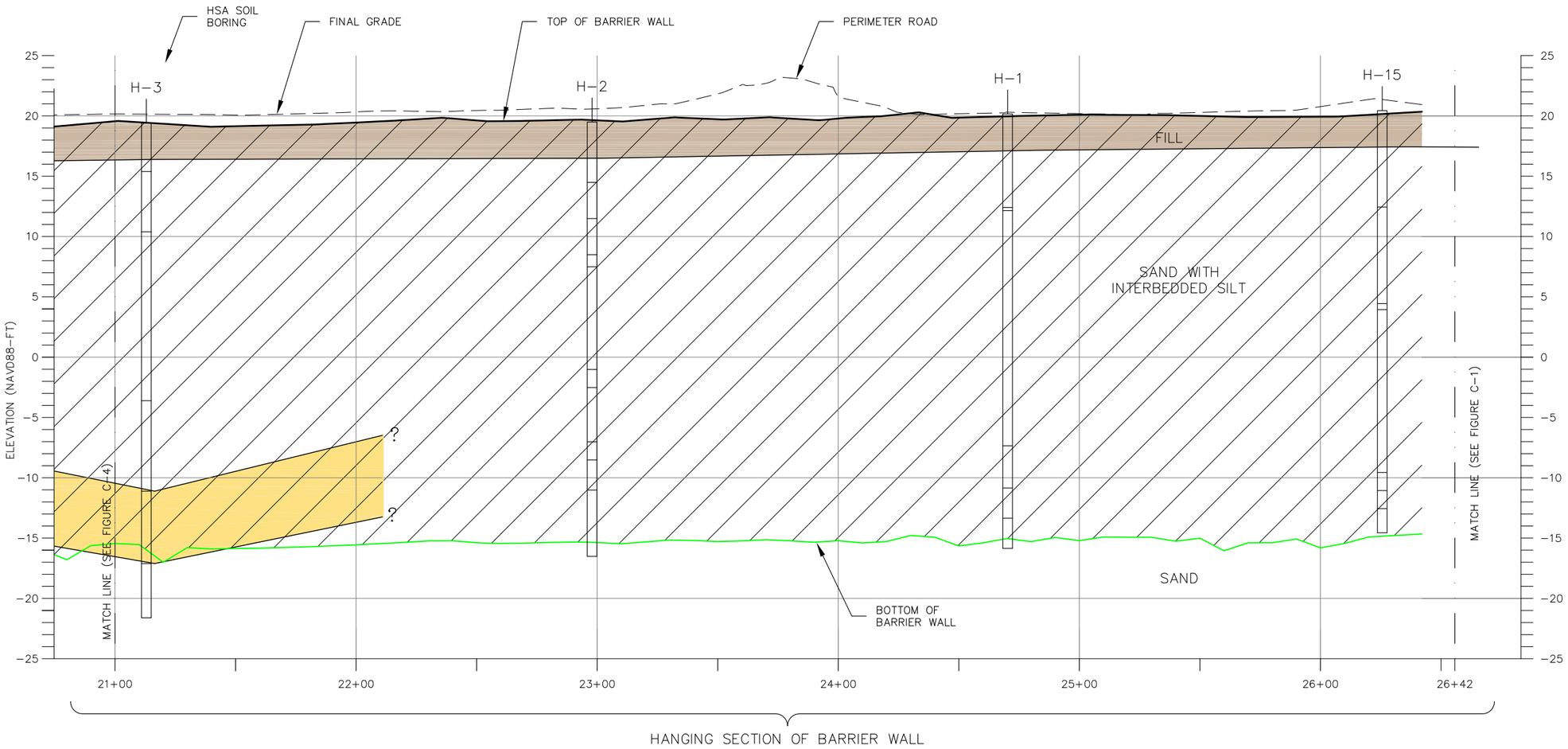
BARRIER WALL PROFILE STA 14+00 - 21+00
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 02/04/11
PROJECT NO.: 13488

DRAWING
C-4

Plot Date: 02/04/11 - 4:42pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_Record\Drawings\CAD\, Drawing Name: DRAWING C-1-2-3-4-5-7_B-L_020411.dwg



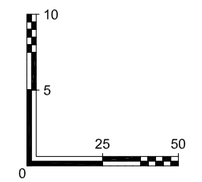
HANGING SECTION OF BARRIER WALL

EXPLANATION

H-10 — HOLLOW STEM AUGER (HSA) BORING LOCATION (SEE C-1 FOR LOCATIONS)

BOTTOM OF BARRIER WALL

LOG



APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 5X

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	KT
2	BOTTOM OF WALL AND OBSTRUCTIONS	4/08/10	KT
3	RECORD DRAWING	10/7/10	SB

DRAWN A.S.
DESIGNED K.T.
CHECKED ??
REVIEWED ??

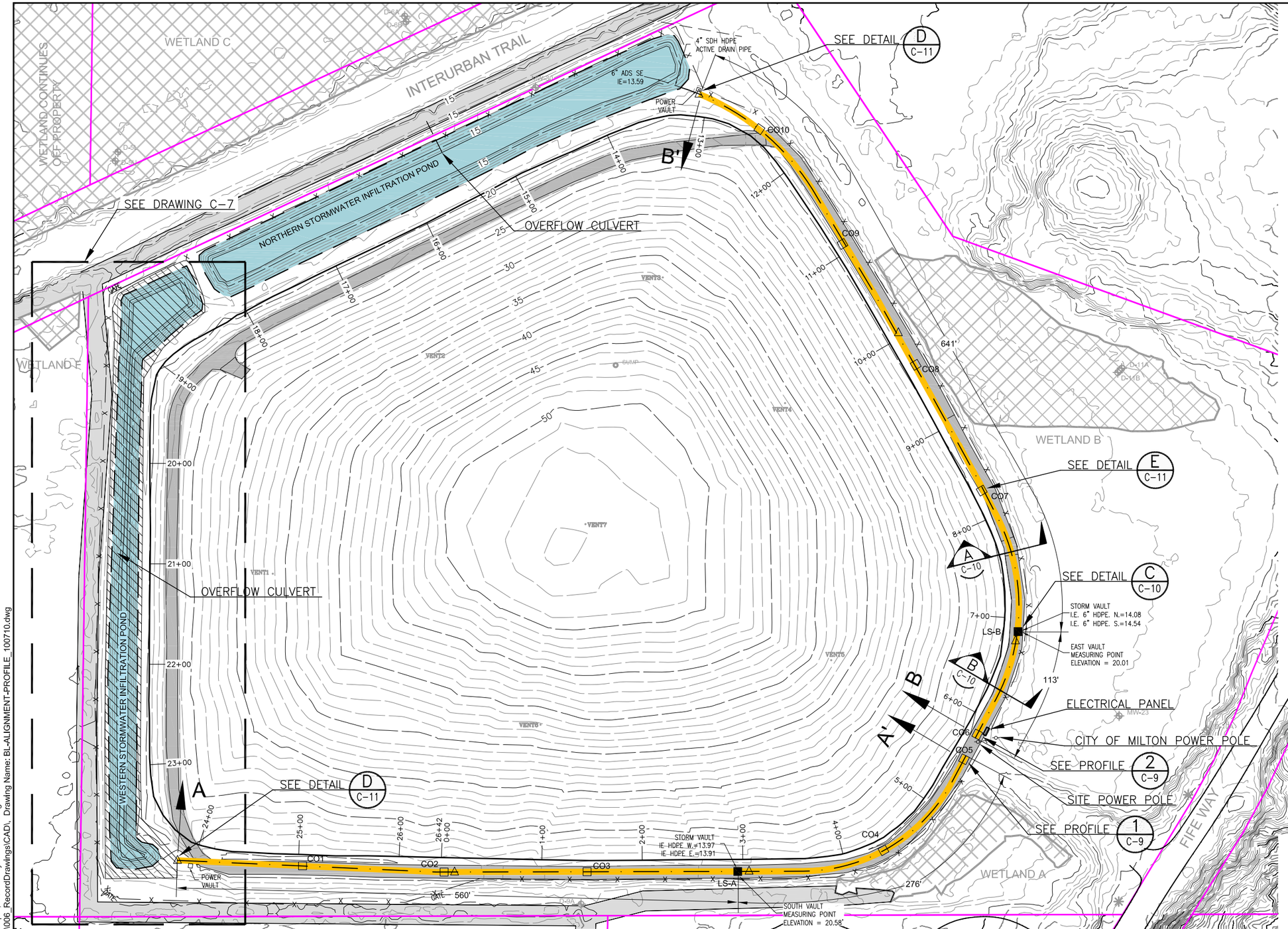
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AMEC Geomatrix

BARRIER WALL PROFILE STA 21+00 - 26+42
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/14/10
PROJECT NO.: 13488
DRAWING C-5

Plot Date: 10/14/10 - 4:07pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: BL-ALIGNMENT-PROFILE_100710.dwg



EXPLANATION

- BARRIER WALL ALIGNMENT
- TAX PARCEL LINE
- FENCE LINE
- EXTENT OF STORMWATER INFILTRATION POND
- 12" DIAMETER CULVERT
- MONITORING WELL LOCATION
- VENT LOCATION
- AGRICULTURAL DITCH
- WETLAND
- APPROXIMATE LOCATION OF GROUNDWATER INTERCEPTION TRENCH
- GRAVITY DRAIN PIPE
- LOCATION OF LIFT STATION
- LOCATION OF CLEANOUT VAULT
- LOCATION OF JUNCTION BOX (J-11 TYPE 2)
- AREA OF TOPSOIL REMOVAL
- INFILTRATION POND
- FINAL PERIMETER ROAD

NOTES:

1. THERE IS KNOWN GROUNDWATER CONTAMINATION ON SOUTH AND WEST SIDES OF THE LANDFILL. IMPLEMENT APPROPRIATE WORKER PROTECTION MEASURES WHEN ENCOUNTERING GROUNDWATER. SOIL CONTAMINATION REQUIRING WORKER PROTECTION HAS NOT BEEN ENCOUNTERED OUTSIDE THE LANDFILL FOOTPRINT.
2. THE INTERCEPTOR TRENCH SYSTEM CONSISTS OF TWO PIPING TRENCHES WITH LIFT STATIONS AND CLEANOUTS, TWO ELECTRICAL TRENCHES, AND TWO INFILTRATION PONDS. THE INFILTRATION POND ON THE NORTH OF LANDFILL ALREADY EXISTS.
3. PIPING TRENCHES AND ELECTRICAL TRENCHES SHALL BE APPROXIMATELY 7 AND 11 FT FROM THE OUTER EDGE OF BARRIER WALL, RESPECTIVELY.
4. THE WORK SEQUENCE AND STEPS SHALL INCLUDE MEASURES TO PREVENT SPREAD OF CONTAMINATION. SUCH MEASURES MAY INCLUDE STRIPPING THE TOP SEVERAL INCHES OF PERIMETER ROAD TO REMOVE SOIL IMPACTED BY BARRIER WALL CONSTRUCTION. INCORPORATE REMOVED SOIL INTO THE LANDFILL.
5. TRANSFER GROUNDWATER FROM EXCAVATION DEWATERING THAT MAY BE REQUIRED INTO NORTH INFILTRATION POND. ANY TREATMENT AND OFFSITE DISPOSAL OF WATER FROM NORTH POND WILL BE DONE BY OTHERS.
6. AT THE COMPLETION OF TRENCH AND INFILTRATION POND CONSTRUCTION, REMOVE SEDIMENT FROM BOTTOM OF NORTH INFILTRATION POND AND INCORPORATE INTO THE LANDFILL. ENGINEER WILL DETERMINE DEPTH OF EXCAVATION AND WHETHER TO PLACE GRAVEL (1 TO 2 INCH DIAMETER) ON THE BOTTOM OF NORTH INFILTRATION POND.

N

0 50 100

APPROXIMATE SCALE IN FEET

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	EAST INTERCEPTION TRENCH AND WEST POND	4/08/10	KT
4	RECORD DRAWING	10/7/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

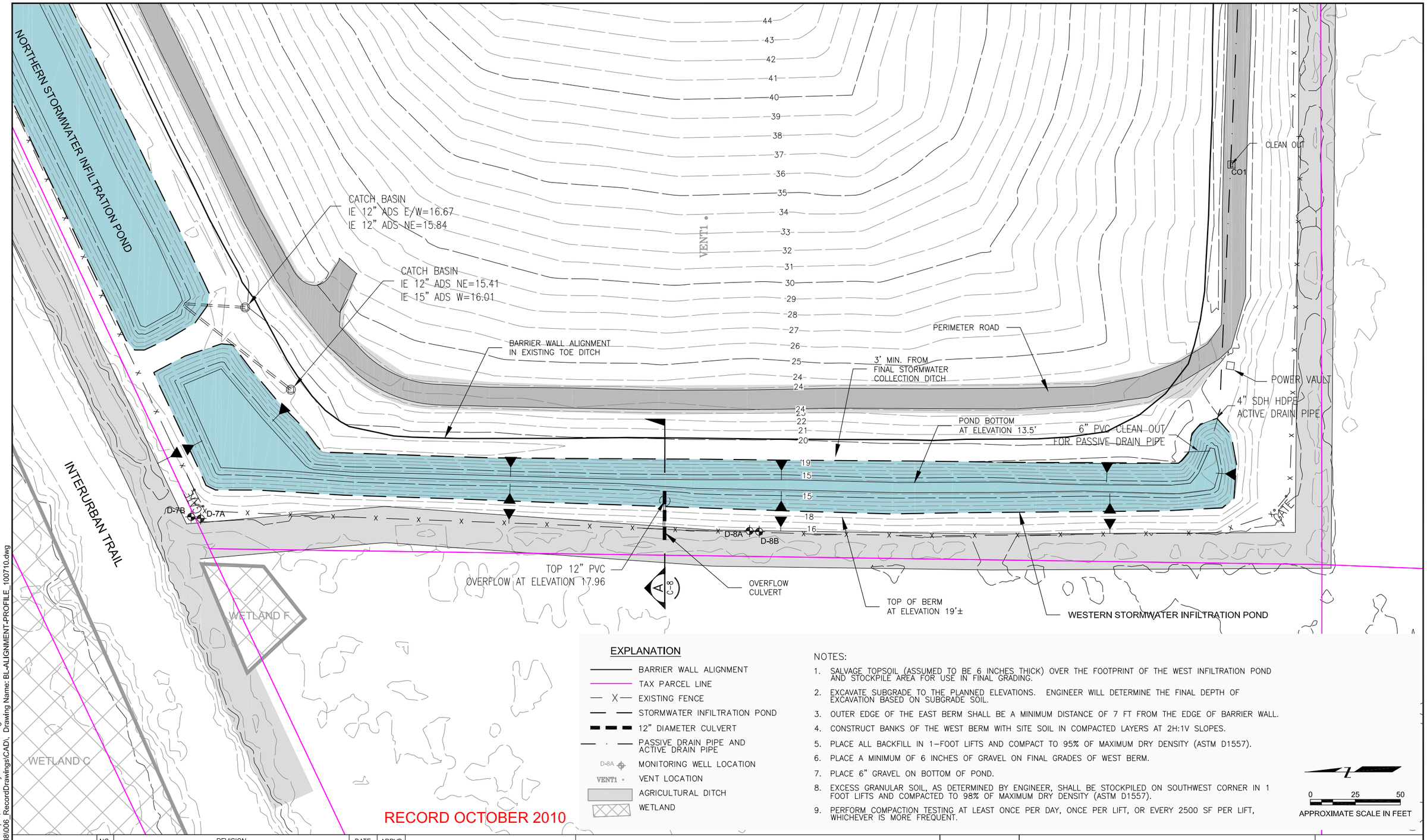
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AMEC Geomatrix

INTERCEPTOR TRENCH SYSTEM
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 11/10/10
PROJECT NO.: 13488
DRAWING C-6

Plot Date: 11/10/10 - 3:35pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_Record\Drawings\CAD\, Drawing Name: BL-ALIGNMENT-PROFILE_100710.dwg



RECORD OCTOBER 2010

EXPLANATION

- BARRIER WALL ALIGNMENT
- TAX PARCEL LINE
- X EXISTING FENCE
- STORMWATER INFILTRATION POND
- 12" DIAMETER CULVERT
- PASSIVE DRAIN PIPE AND ACTIVE DRAIN PIPE
- D-8A MONITORING WELL LOCATION
- VENT1 VENT LOCATION
- AGRICULTURAL DITCH
- WETLAND

NOTES:

1. SALVAGE TOPSOIL (ASSUMED TO BE 6 INCHES THICK) OVER THE FOOTPRINT OF THE WEST INFILTRATION POND AND STOCKPILE AREA FOR USE IN FINAL GRADING.
2. EXCAVATE SUBGRADE TO THE PLANNED ELEVATIONS. ENGINEER WILL DETERMINE THE FINAL DEPTH OF EXCAVATION BASED ON SUBGRADE SOIL.
3. OUTER EDGE OF THE EAST BERM SHALL BE A MINIMUM DISTANCE OF 7 FT FROM THE EDGE OF BARRIER WALL.
4. CONSTRUCT BANKS OF THE WEST BERM WITH SITE SOIL IN COMPACTED LAYERS AT 2H:1V SLOPES.
5. PLACE ALL BACKFILL IN 1–FOOT LIFTS AND COMPACT TO 95% OF MAXIMUM DRY DENSITY (ASTM D1557).
6. PLACE A MINIMUM OF 6 INCHES OF GRAVEL ON FINAL GRADES OF WEST BERM.
7. PLACE 6" GRAVEL ON BOTTOM OF POND.
8. EXCESS GRANULAR SOIL, AS DETERMINED BY ENGINEER, SHALL BE STOCKPILED ON SOUTHWEST CORNER IN 1 FOOT LIFTS AND COMPACTED TO 98% OF MAXIMUM DRY DENSITY (ASTM D1557).
9. PERFORM COMPACTION TESTING AT LEAST ONCE PER DAY, ONCE PER LIFT, OR EVERY 2500 SF PER LIFT, WHICHEVER IS MORE FREQUENT.

0 25 50
APPROXIMATE SCALE IN FEET

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	WEST POND	4/08/10	KT
4	RECORD DRAWING	10/7/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

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AMEC Geomatrix

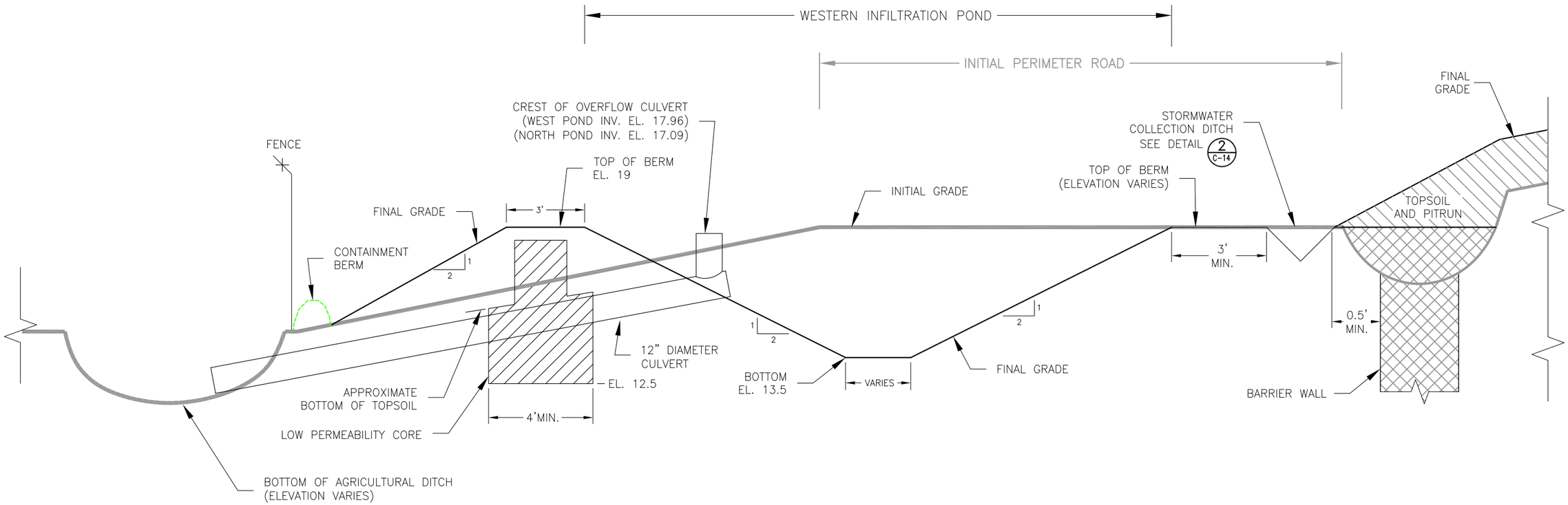
WESTERN INFILTRATION POND PLAN ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/18/10
PROJECT NO.: 13488

DRAWING C–7

Plot Date: 10/18/10 - 1:22pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: BL-ALIGNMENT-PROFILE_100710.dwg



WESTERN INFILTRATION POND (TYP.) — A / C-7

NOT TO SCALE SIDE VIEW

NOTES:

1. CONSTRUCT A CORE FOR THE WEST BERM OF WEST INFILTRATION POND USING FINE-GRAINED PORTION OF SITE SOIL. AUGMENT WITH BENTONITE.
2. THE WEST BERM SHALL BE CONSTRUCTED IN 1-FOOT LIFTS AND COMPACTED TO 95 PERCENT OF MAXIMUM DRY DENSITY (ASTM D1557). PERFORM COMPACTION TESTING AT LEAST ONCE PER DAY, ONCE PER LIFT, OR EVERY 2500 SF PER LIFT, WHICHEVER IS MORE FREQUENT.
3. INSTALL AN OVERFLOW CULVERT (12" HDPE) THROUGH THE WEST BERM AS SHOWN.

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	LOW PERMEABILITY CORE/CURRENT SLOPE IN WESTERN DITCH	4/09/10	KT
4	RECORD DRAWING	10/05/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

FLOYD | SNIDER
AMEC Geomatrix

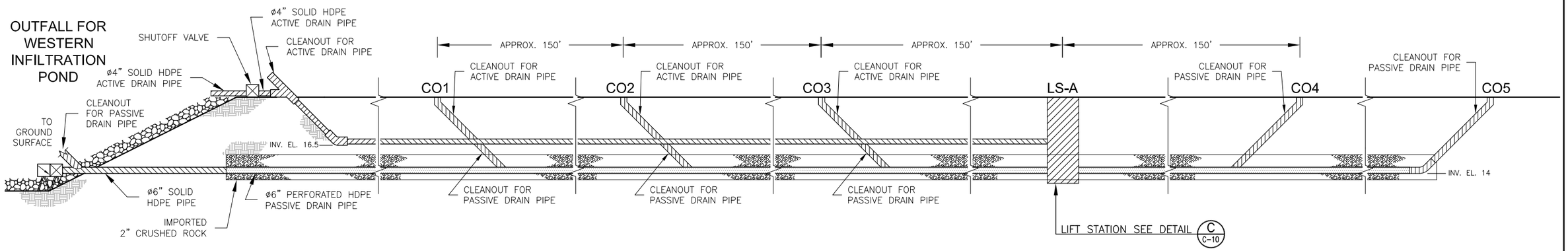
INFILTRATION POND DETAILS
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

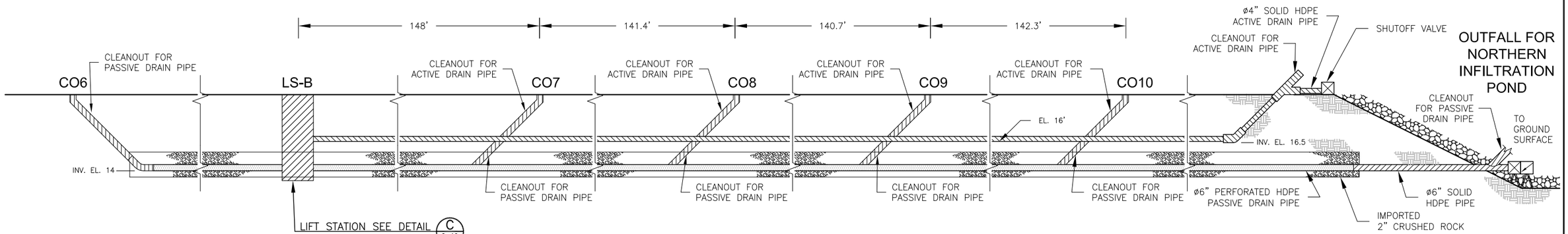
DATE: 11/10/10
PROJECT NO.: 13488

DRAWING
C-8

Plot Date: 11/10/10 - 2:45pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING C-8-9-10-11-P1-E1_B-L_100510.dwg



PROFILE A–A'
NOT TO SCALE
1 C-6



PROFILE B–B'
NOT TO SCALE
2 C-6

NOTES:

1. EXCAVATE PIPING TRENCHES TO THE PLANNED DEPTH. DEWATER AS NEEDED AND TRANSFER TO THE NORTH INFILTRATION POND.
2. SLOPE THE EXCAVATION AS NEEDED FOR SAFE ENTRY. SLOPE SHALL NOT BE STEEPER THAN 1H:1V.
3. INSTALL GRAVITY DRAIN PIPE AT ELEVATION 14 WITH CLEANOUTS APPROXIMATELY EVERY 150 FT AS SHOWN. EMBED PIPE IN 2 FT OF 2–INCH DIAMETER CRUSHED ROCK (BALLAST), WRAPPED IN GEOTEXTILE. GEOTEXTILE SHALL BE 8 OZ/SY, NONWOVEN, WITH AOS 100.
4. PASSIVE DRAIN PIPE SHALL BE 6–INCH DIAMETER, SMOOTH, HDPE, SDR 9, AND PERFORATED WHERE SHOWN. PERFORATIONS SHALL BE ½ INCH DIAMETER, 10 PER LF ALL THE WAY AROUND.
5. PASSIVE DRAIN PIPE SHALL BE SOLID (NON–PERFORATED) WITHIN 20 FT OF THE DISCHARGE POINT IN THE OUTFALL.
6. ACTIVE DRAIN PIPE SHALL BE INSTALLED IN THE SAME TRENCH AS PASSIVE DRAIN PIPE (OFFSET ALIGNMENT) AT ELEVATION 16.5 WITH CLEANOUTS APPROXIMATELY EVERY 150 FT, AS SHOWN.
7. ACTIVE DRAIN PIPE SHALL BE 4–INCH DIAMETER, SMOOTH, HDPE, SDR 7 SOLID PIPE, PRESSURE TESTED TO 100 PSI.
8. BACKFILL TRENCH WITH EXCAVATED SOIL IN 8–INCH LIFTS AND COMPACT TO A FIRM, NON–YIELDING SURFACE.
9. CLEANOUTS FROM BOTH PIPES SHALL DAYLIGHT ON THE GROUND SURFACE AT THE SAME LOCATION AND BE HOUSED INSIDE ONE VAULT. THE SURFACE PROTECTIVE VAULT SHALL HAVE A MINIMUM OF 6 INCHES OF CLEARANCE AROUND THE PIPES AT THE OPENING AND SHALL BE RATED FOR TRUCK TRAFFIC.
10. CLEANOUTS SHALL BE CAPPED WITH TREADED CAPS. ACTIVE DRAIN PIPE CLEANOUT CAPS MUST WITHSTAND A PRESSURE OF 100 PSI.
11. ALL VALVES, FITTINGS, COUPLINGS, ETC., MUST BE COMPATIBLE WITH PIPE MATERIAL AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	AS–BUILT	4/09/10	KT
4	RECORD DRAWING	10/05/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

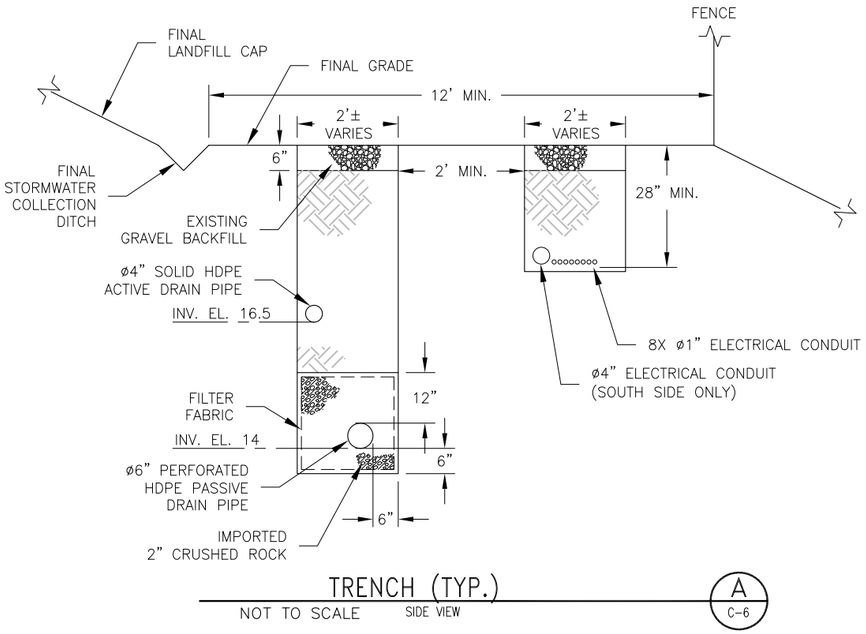
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INTERCEPTOR TRENCH PROFILES
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

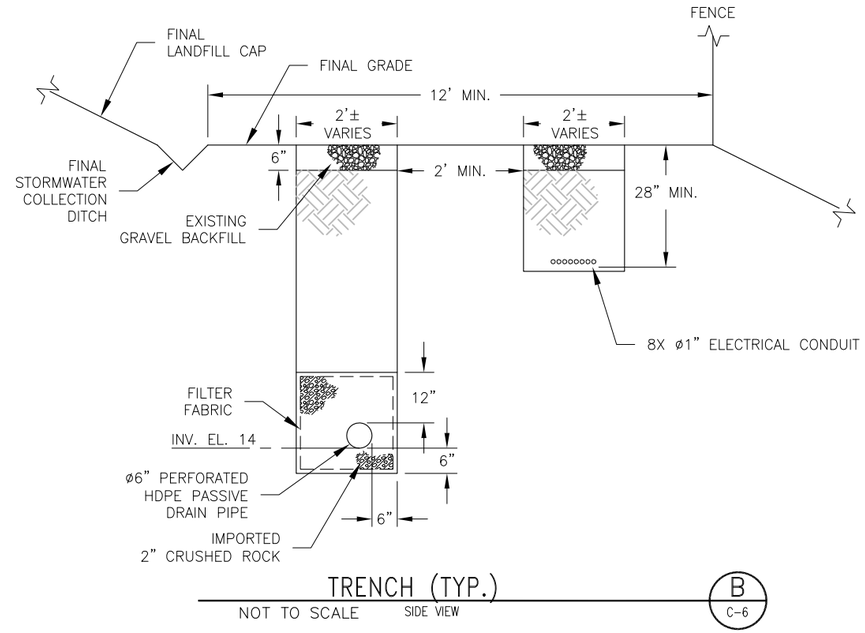
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PROJECT NO.: 13488
DRAWING C–9

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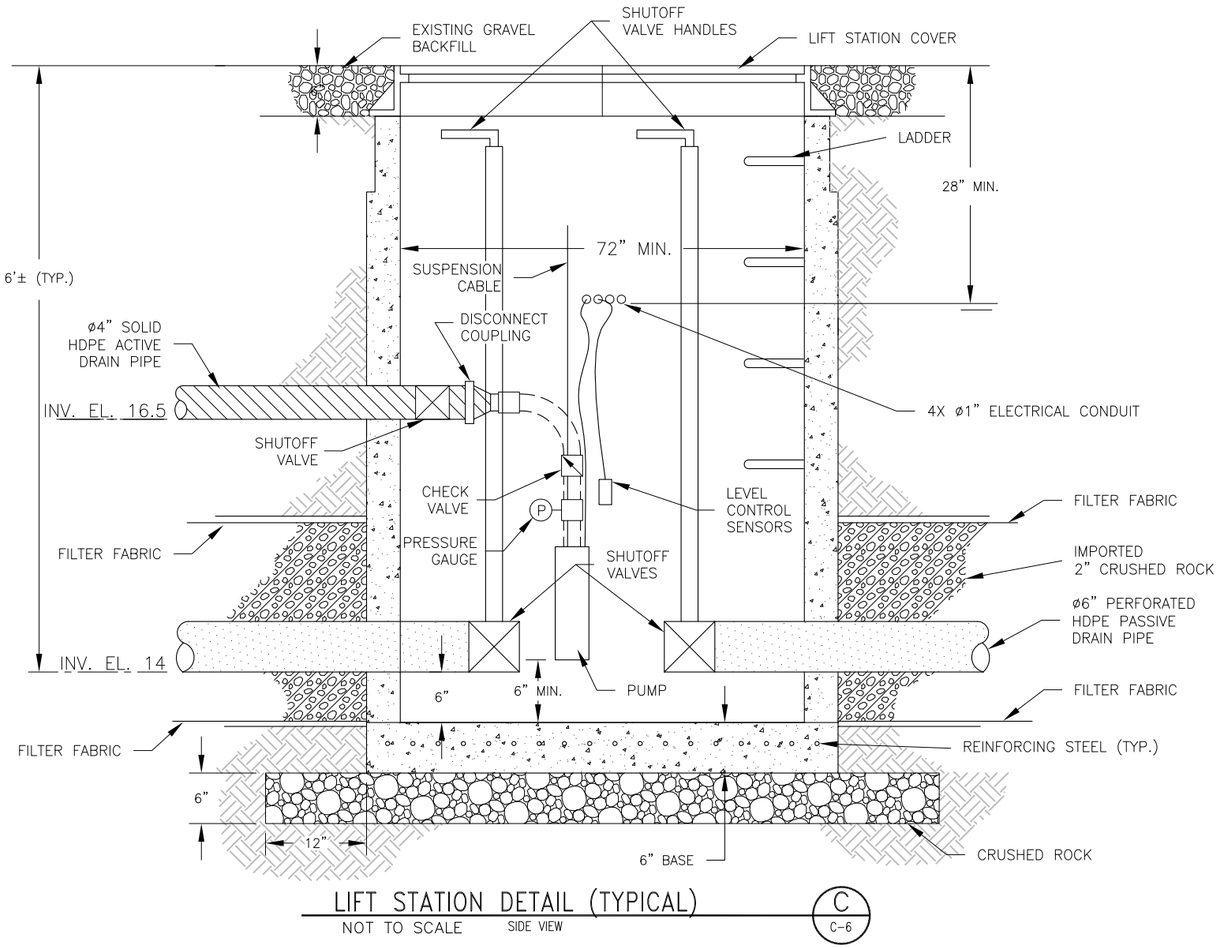
TRENCH (TYP.)
NOT TO SCALE SIDE VIEW

A
C-6



TRENCH (TYP.)
NOT TO SCALE SIDE VIEW

B
C-6



LIFT STATION DETAIL (TYPICAL)
NOT TO SCALE SIDE VIEW

C
C-6

NOTES:

1. INSTALL ELECTRICAL CONDUITS AT A MINIMUM DEPTH OF 2 FT (PER ELECTRICAL CODES). ELECTRICAL CONDUITS SHALL INCLUDE SETS OF 4 INDIVIDUAL CONDUITS INSIDE A 4-INCH DIAMETER CONDUIT FOR FUTURE USE.
2. NUMBER AND LOCATIONS OF JUNCTION BOXES SHALL BE SPECIFIED BY ELECTRICIAN. JUNCTION BOXES MUST BE RATED FOR TRUCK TRAFFIC. TERMINATE THE CONDUITS INSIDE A VAULT AT THE INFILTRATION PONDS FOR FUTURE ACCESS.
3. ELECTRICAL WIRING MUST MEET THE ELECTRICAL LOAD RATING FOR THE PUMPS AND SENSORS.
4. LIFT STATIONS SHALL BE PRECAST CONCRETE WITH MINIMUM INSIDE DIMENSIONS OF 4×6 FT. IT SHALL BE EQUIPPED WITH A LADDER INSIDE AND A SWING TYPE STEEL PLATE. LIFT STATION AND LID SHALL BE RATED FOR TRUCK TRAFFIC.
5. PUMPS SHALL BE SUBMERSIBLE WITH A MINIMUM HEAD OF 20 FT AND DISCHARGE CAPACITY OF 30 GPM.
6. WATER LEVEL SENSORS SHALL BE SUBMERSIBLE WITH A MINIMUM ACCURACY OF 0.1 FT.
7. PRESSURE GAUGE SHALL HAVE A MINIMUM RANGE OF 0 TO 20 PSI AND ACCURACY OF 0.5 PSI.
8. ALL CONNECTIONS INSTRUMENTS AND CONNECTIONS SHALL BE RATED TO WITHSTAND 100 PSI OF PRESSURE.
9. PUMP DISCHARGE PIPE CONNECTION TO THE ACTIVE DRAIN PIPE SHALL ALLOW DISCONNECTION FOR CLEANING.
10. BACKFILL ELECTRICAL TRENCH WITH EXCAVATED SOIL IN 8-INCH LIFTS AND COMPACT TO A FIRM, NON-YIELDING SURFACE.

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	AS-BUILT	4/09/10	KT
4	RECORD DRAWING	10/05/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

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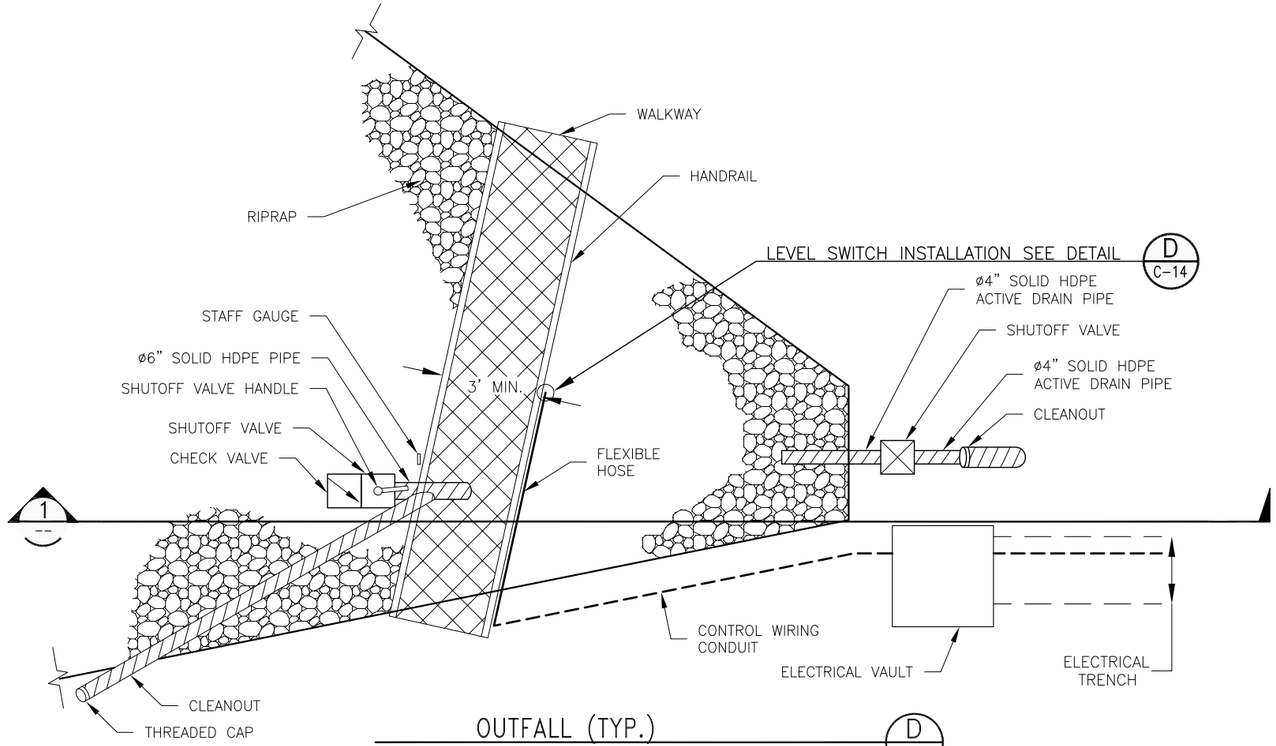
LIFT STATION AND TRENCH DETAILS
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

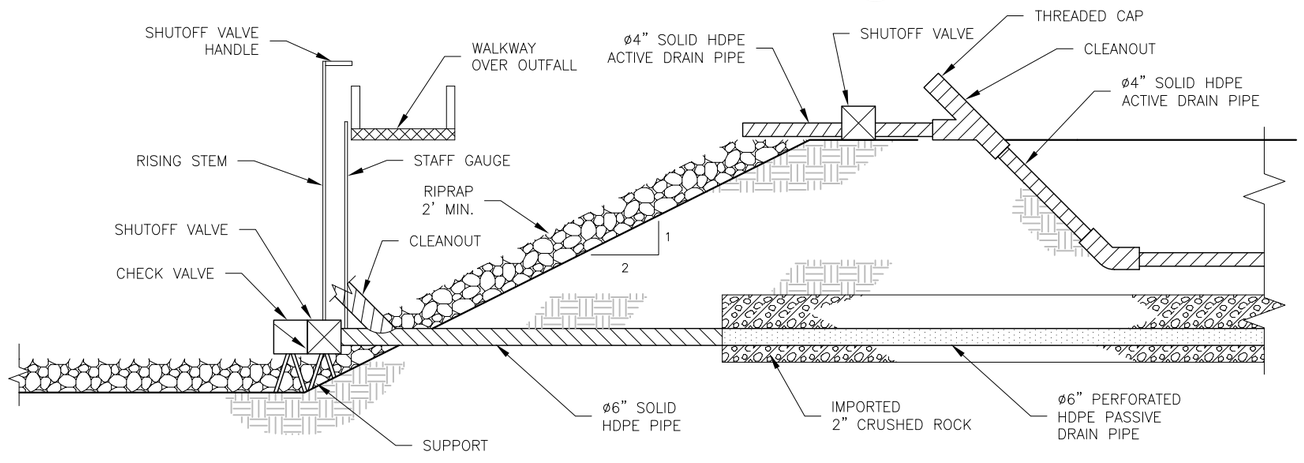
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PROJECT NO.: 13488

DRAWING
C-10

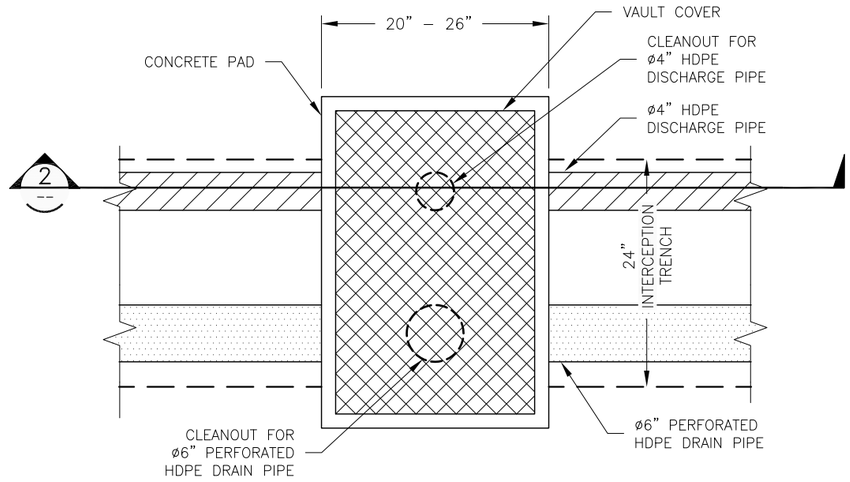
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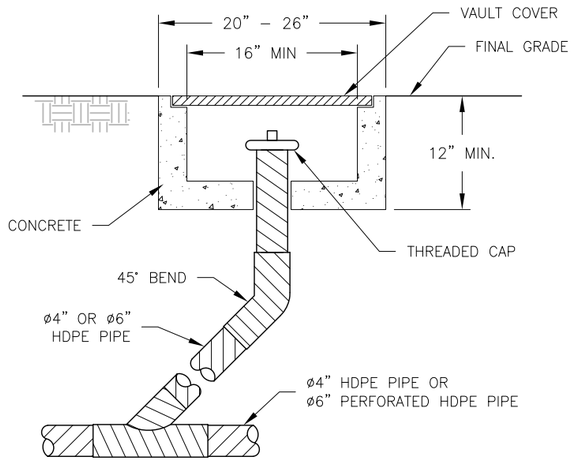
OUTFALL (TYP.)
NOT TO SCALE PLAN VIEW D C-6



OUTFALL (TYP.)
NOT TO SCALE SIDE VIEW 1 --



CLEANOUT VAULT (TYP.)
NOT TO SCALE PLAN VIEW E C-6



CLEANOUT DETAILS (TYP.)
NOT TO SCALE SECTION VIEW 2 --

NOTES:

1. PLACE 2 FT THICK LAYER OF RIPRAP (4 TO 8 INCH DIAMETER ROCK) FROM THE PIPE DISCHARGE POINT TO 10 FT BEYOND TOE OF THE SLOPE.
2. DAYLIGHT ACTIVE DRAIN PIPE AS SHOWN AND SECURE TO GROUND SURFACE.
3. INSTALL PREFAB ALUMINUM WALKWAY WITH MINIMUM WIDTH OF 3 FT AND HANDRAIL HEIGHT OF 3 FT, RATED TO SUPPORT A MINIMUM, NET LOAD OF 600 LBS.
4. SHUTOFF VALVES SHALL BE OF THE DOUBLE DISK, TAPER SEAT TYPE, WITH RISING STEM, UNION BONNET AND HAND WHEEL OR SUITABLE CROSS WHEEL FOR STANDARD KEY OPERATION.
5. THE RISING STEM SHALL BE TALL ENOUGH FOR OPERATION FROM THE OVERLYING WALKWAY.
6. INSTALL A 3×3×3 FT ELECTRICAL VAULT TO TERMINATE ELECTRICAL CONDUITS NEAR THE OUTFALLS. VAULT SHALL BE RATED FOR TRUCK TRAFFIC.

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	AS–BUILT	4/09/10	KT
4	RECORD DRAWING	10/05/10	SB

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DESIGNED MZ
CHECKED KT
REVIEWED LM

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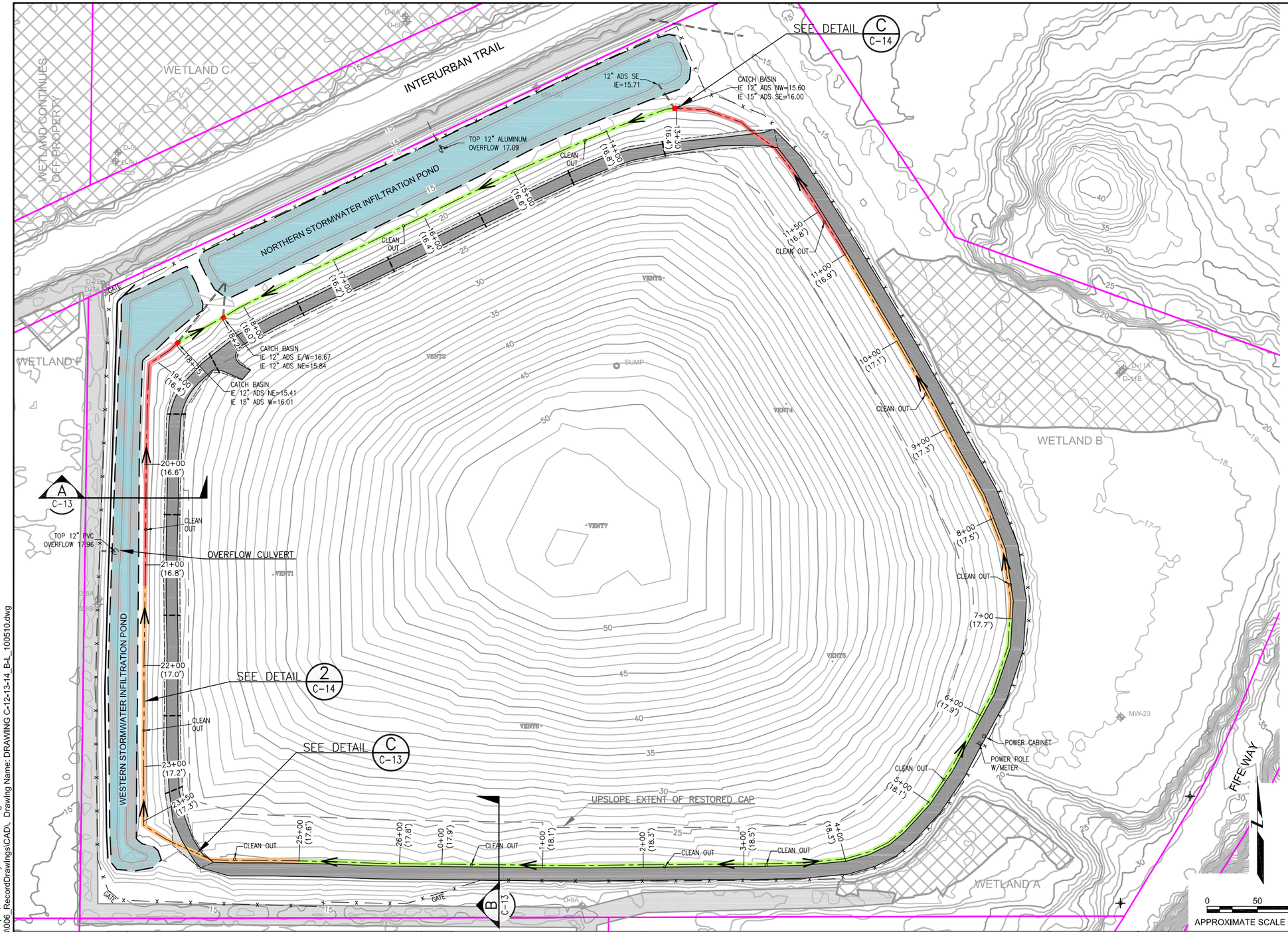
OUTFALL AND CLEANOUT DETAILS
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/18/10
PROJECT NO.: 13488

DRAWING
C–11

Plot Date: 10/18/10 - 1:31pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING C-8-9-10-11-P1-E1_B-L_100510.dwg



EXPLANATION

- FINAL STORMWATER COLLECTION DITCH CL
- 15" PERFORATED PIPE
- 12" PERFORATED PIPE
- 10" PERFORATED PIPE
- FLOW DIRECTION IN STORMWATER DITCH
- 4" DIAMETER SDR13 HDPE PIPE THROUGH PERIMETER ROAD ON LANDFILL
- CATCH BASIN
- TAX PARCEL LINE
- FENCE LINE
- 12" DIAMETER CULVERT
- MW-13 MONITORING WELL LOCATION
- VENT3 VENT LOCATION
- AGRICULTURAL DITCH
- WETLAND
- INFILTRATION POND
- FINAL PERIMETER ROAD
- 8+00 (17.5') WALL STATIONING (APPROXIMATE INVERT ELEVATION OF BOTTOM OF DITCH IN FEET)

NOTES:

1. INCORPORATE AS MUCH OF EXCESS MATERIAL AS POSSIBLE INTO THE LANDFILL. GRADE AND COMPACT EXPOSED SUBGRADE.
2. CAP RESTORATION SHALL MEET THE EXISTING CAP AND EXTEND BEYOND THE BARRIER WALL. REUSE SALVAGED GEOSYNTHETICS MATERIAL TO THE EXTENT POSSIBLE, AND SALVAGED SOIL FROM SITE EARTHWORK TO COMPLETE THE CAP.
3. FINISH GRADE ON THE LANDFILL CAP SHALL BE A SMOOTH GRADE WITHOUT SUDDEN OR STEP CHANGES, EXCEPT NEAR THE ACCESS ROAD ON THE LANDFILL.
4. FINAL STORMWATER COLLECTION DITCH SHALL FOLLOW THE GRADE OF PERIMETER BERM AND BE CONNECTED TO THE THREE EXISTING CULVERTS TO THE NORTHERN INFILTRATION POND.
5. REMOVE GEOTEXTILE FROM THE PERIMETER FENCE AND DISPOSE OFFSITE.
6. INSTALL CHAIN LINK FENCE ALONG THE WEST BERM OF THE WEST INFILTRATION POND AND CONNECT WITH EXISTING PERIMETER FENCE.
7. REMOVE ALL EXCESS MATERIAL AND REMAINING DEBRIS FROM THE WORK AREA AND DISPOSE IN A SOLID WASTE LANDFILL IN ACCORDANCE WITH APPLICABLE REGULATIONS AND STANDARDS.
8. ALL DISTURBED AREAS SHALL BE HYDROSEEDED OR FINISHED AS APPROPRIATE UPON COMPLETION OF CONSTRUCTION ACTIVITIES. HYDROSEED MIXTURE TO BE APPROVED PRIOR TO PLACEMENT. FILL USED IN THE CONTRACTOR STAGING AREA SHALL REMAIN.
9. THE EXTENT OF PERFORATED PIPE AND V-DITCH AS STORMWATER COLLECTION DITCH AND THEIR INVERT ELEVATIONS ARE GENERAL GUIDELINES.
10. THE PRIMARY CONSTRAINTS ARE TO MAINTAIN A FINAL PERIMETER ROAD WIDE ENOUGH FOR VEHICLE TRAFFIC (12' MIN) AND TO KEEP A MINIMUM DISTANCE OF 0.5 FT BETWEEN THE TOP OF THE STORMWATER DITCH AND THE BARRIER WALL. WHERE NOT ENOUGH SPACE IS AVAILABLE FOR THE V-DITCH, BURIED PIPE SHALL BE PLACED AS SHOWN IN DETAIL C, DRAWING C-13, EXCEPT SOLID PIPE MAY BE USED RATHER THAN PERFORATED PIPE.

RECORD OCTOBER 2010

0 50 100
APPROXIMATE SCALE IN FEET

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REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	REVISED FENCE LINE	4/12/10	KT
4	REVISED STORMWATER DITCH ALIGNMENT AND INVERT ELEVATIONS	6/17/10	MZ
5	ISSUED FOR CONSTRUCTION	7/2/10	LM
6	RECORD DRAWING	10/5/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED KS

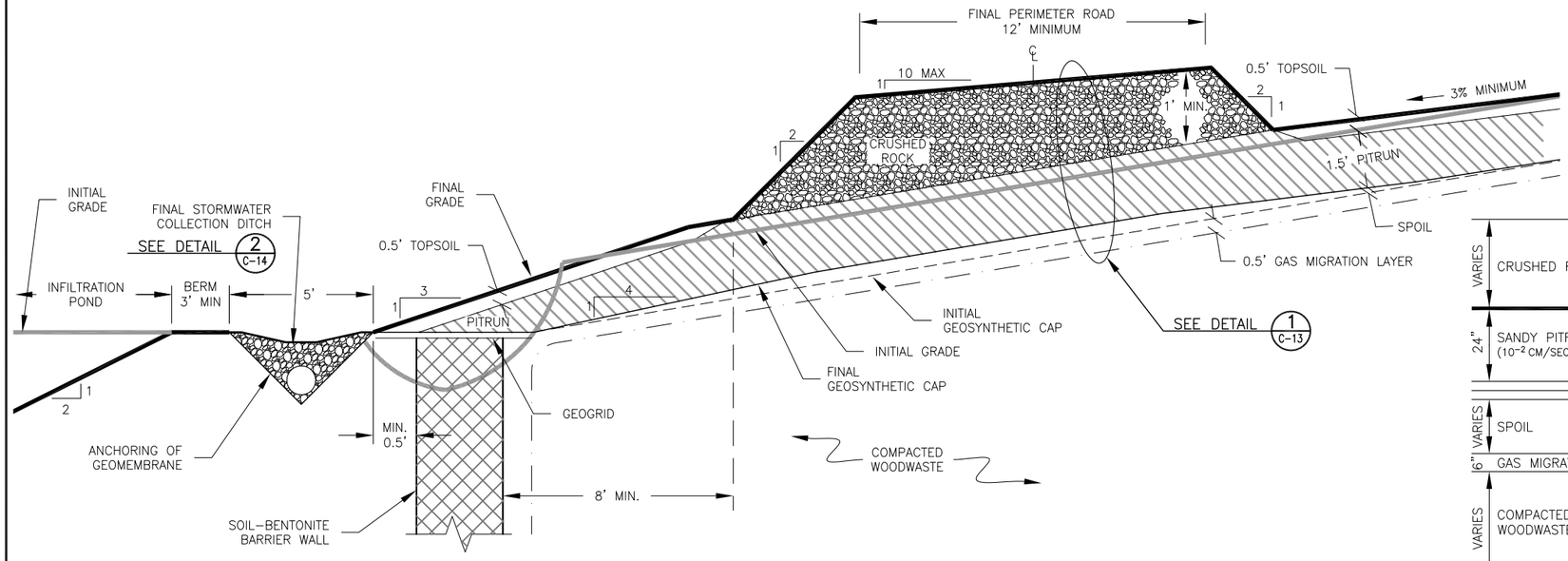
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LANDFILL CAP RESTORATION PLAN
ADDENDUM 1

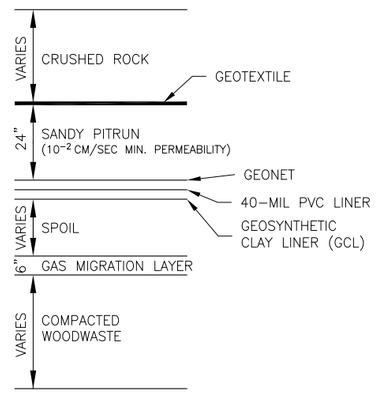
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/19/10
PROJECT NO.: 13488

DRAWING
C-12



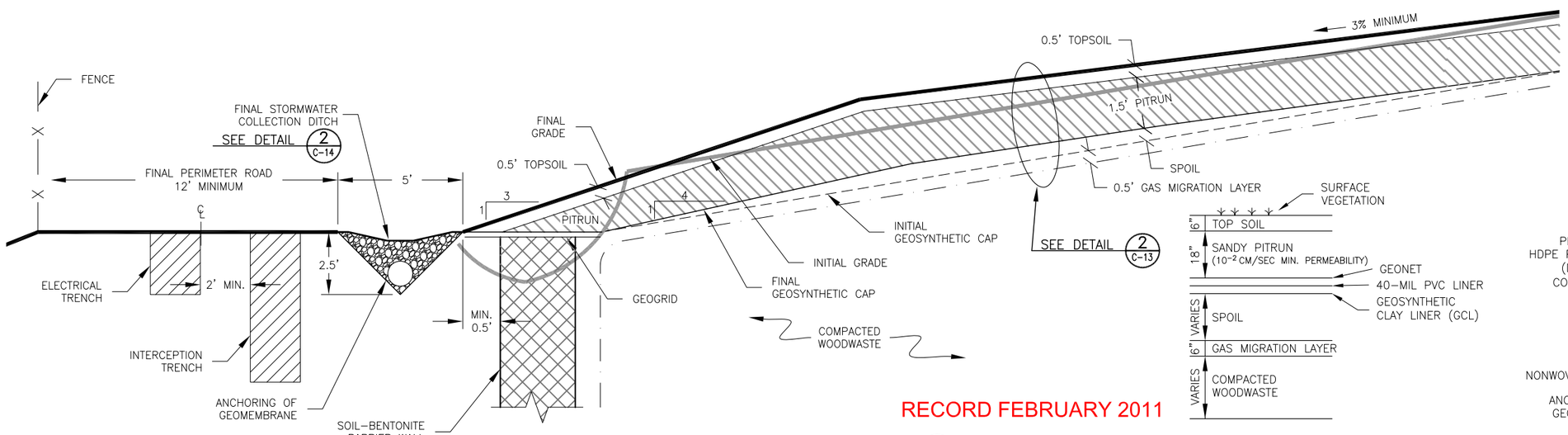
LANDFILL CAP RESTORATION (TYP.) — A C-12
NOT TO SCALE SIDE VIEW



LANDFILL CAP DETAIL — 1 C-13
NOT TO SCALE SIDE VIEW

NOTES:

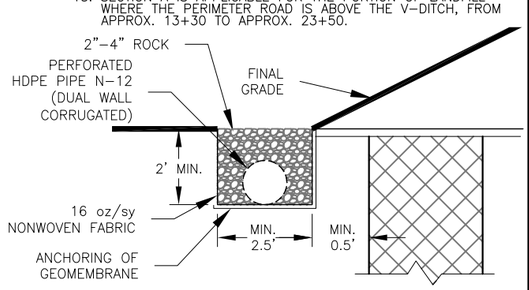
1. RESTORE LANDFILL CAP IN LAYERS FROM BOTTOM UP TO MATCH THE EXISTING CAP. USE MANUFACTURER-APPROVED EQUIPMENT AND TECHNIQUES TO INSTALL GEOSYNTHETIC MATERIAL (GCL, GEOMEMBRANE, AND GEONET).
2. SUBGRADE SURFACE MUST BE FREE OF ROCKS OR OTHER SHARP OBJECTS TO PREVENT DAMAGE TO GEOSYNTHETIC MATERIAL.
3. ANY NEW GCL SHALL BE CLAYMAX 200R OR APPROVED EQUIVALENT. GCL SECTIONS MUST OVERLAP A MINIMUM DISTANCE OF 1 FOOT AND BE SHINGLED TOWARD THE TOE OF THE LANDFILL. REMOVE HYDRATED GCL AND REPLACED WITH DRY GCL. REPAIRS TO THE GCL SHALL BE MADE WITH DRY GCL WITH 1 FOOT MINIMUM OVERLAP.
4. ANY NEW GEOMEMBRANE SHALL BE 40 MIL PVC AND HEAT WELDED PER MANUFACTURER'S RECOMMENDATION. OVERLAPS SHALL BE A MINIMUM OF 2 FT AND BE SHINGLED TOWARD THE TOE OF THE LANDFILL. TEST 100% OF THE BONDS/WELDS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION; REMOVE LEAKY OR DAMAGED SECTIONS AND BOND/WELD PATCHES WITH 2 FOOT MINIMUM OVERLAP.
5. PVC GEOMEMBRANE SHALL BE INSTALLED IN A RELAXED CONDITION, FREE FROM STRESS, TENSION, AND WRINKLES.
6. ANY NEW GEONET SHALL BE GSE HYPERNET HF OR APPROVED EQUIVALENT, WITH A BONDED LAYER OF FILTER GEOTEXTILE FACING UP. SECTIONS SHALL OVERLAP A MINIMUM OF 1 FOOT AND BE SHINGLED TOWARD THE TOE OF THE LANDFILL.
7. TERMINATE THE GCL AT THE FINAL STORMWATER COLLECTION V-DITCH/PERFORATED PIPE. TERMINATE THE GEOMEMBRANE INSIDE STORMWATER DITCH EXCAVATION. GEOMEMBRANE SHALL COVER THE BOTTOM OF STORMWATER DITCH EXCAVATION. TERMINATE THE GEONET AT THE STORMWATER COLLECTION V-DITCH/PERFORATED PIPE SO THAT GEONET DRAINS INTO THE V-DITCH/PERFORATED PIPE.
8. IF POSSIBLE, A DISTANCE OF 1.5 FT SHALL BE MAINTAINED BETWEEN TOP OF THE STORMWATER DITCH AND THE BARRIER WALL. WHERE THIS IS NOT POSSIBLE, A MINIMUM DISTANCE OF 0.5 FT SHALL BE MAINTAINED, OR BURIED PIPE SHALL BE USED AS DIRECTED BY THE CONSTRUCTION MANAGER, DETAIL C.
9. THE SIDEWALL OF V-DITCH SHALL NOT BE STEEPER THAN 1H:1V. GEOSYNTHETICS SHALL NOT BE STEEPER THAN 4H:1V, AND FINAL SOIL COVER AND TOPSOIL SHALL NOT BE STEEPER THAN 3H:1V.
10. PLACE COVER SOIL IN ONE 18-INCH LIFT OVER THE GEONET USING LOW CONTACT PRESSURE EQUIPMENT. CONSTRUCTION EQUIPMENT SHALL NOT OPERATE ON OR ABOVE THE GEOSYNTHETICS UNTIL AT LEAST 15 INCHES OF MATERIAL IS PLACED.
11. TOPSOIL SHALL HAVE A MINIMUM THICKNESS OF 6 INCHES AND SHALL BE TRACK-WALKED WITH LOW PRESSURE TRACKED EQUIPMENT TO ACHIEVE IN FINAL GRADES WITHIN 0.1 FOOT OF THE GRADES SHOWN ON THE PLANS.
12. CONSTRUCT PERIMETER ROAD ON THE LANDFILL BY PLACING 2-INCH DIAMETER CRUSHED ROCK (BALLAST) OVER GEOTEXTILE IN 2 LIFTS AND TRACK-COMPACTING.
13. SALVAGED CRUSHED ROCK FROM THE EXISTING DITCH USED IN CONSTRUCTION OF CONTAINMENT BERMS SHALL BE USED FOR TRANSITION FROM PERIMETER ROAD TO ACCESS ROAD ON LANDFILL. ENGINEER WILL DETERMINE ADDITIONAL USEAGE IN THE FIELD.
14. PERFORATED PIPE FOR STORMWATER DRAINAGE SHALL HAVE SIX 1"ø PERFORATIONS AROUND THE PIPE AT A SPACING OF 6-INCHE O.C. ALONG THE PIPE.
15. SECTION A IS APPLICABLE FOR THE PORTION OF LANDFILL WHERE THE PERIMETER ROAD IS ABOVE THE V-DITCH, FROM APPROX. 13+30 TO APPROX. 23+50.



LANDFILL CAP RESTORATION (TYP.) — B C-12
NOT TO SCALE SIDE VIEW

RECORD FEBRUARY 2011

LANDFILL CAP DETAIL — 2 C-13
NOT TO SCALE SIDE VIEW



STORMWATER DITCH UNDER PERIMETER ROAD — C C-12
NOT TO SCALE SIDE VIEW

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	2	ISSUED FOR CONSTRUCTION	6/29/09	KT
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET	3	REVISED FENCE LINE	4/12/10	KT
	4	REVISED STORMWATER COLLECTION DITCH	6/18/10	MZ
	5	ISSUED FOR CONSTRUCTION	7/2/10	LM
	6	RECORD DRAWING	10/5/10	SB

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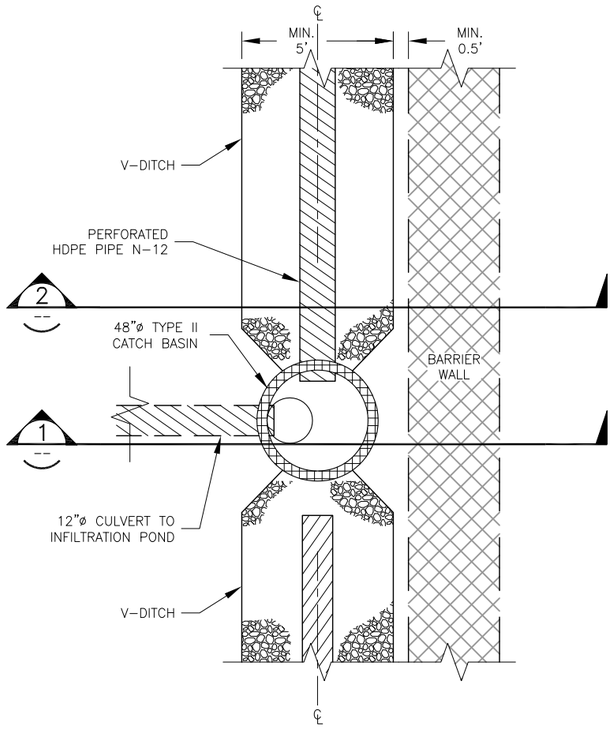
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LANDFILL CAP RESTORATION DETAILS
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

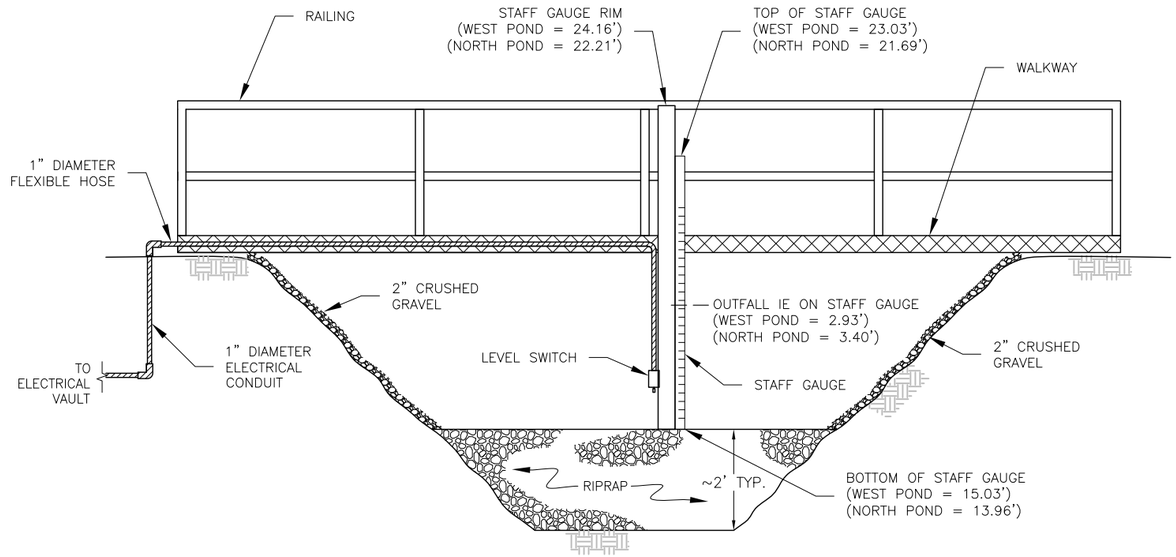
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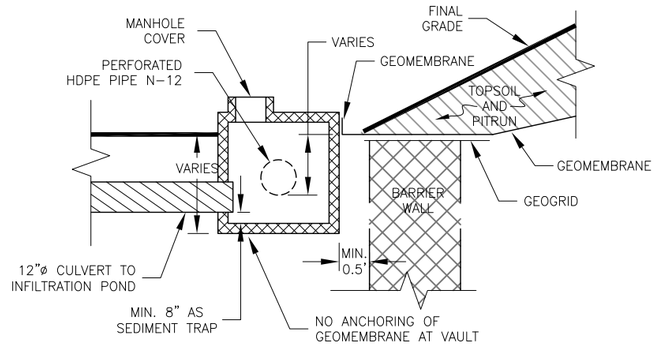
CULVERT CONNECTION (TYP.) — C / C-12

NOT TO SCALE — PLAN VIEW



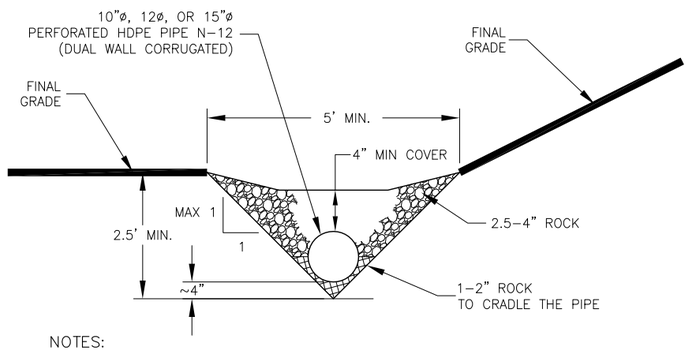
INFILTRATION POND HIGH LEVEL SWITCH INSTALLATION (TYP.) — D / C-11

NOT TO SCALE — SIDE VIEW



CULVERT CONNECTION (TYP.) — 1 / --

NOT TO SCALE — SIDE VIEW



NOTES:

1. CLEANOUTS NEEDED, MAX SPACING = 200 FT. INSERT TEE INTO PERFORATED PIPE WITH 6" MIN. DIAMETER EXTENSION TO SURFACE AND HDPE CAP (PLUG OR SLIP CAP).
2. USE BEDDING MATERIAL TO MAKE INVERTS MATCH AT JOINTS FOR DIFFERENT PIPE DIAMETERS.

V-DITCH (TYP.) — 2 / --

NOT TO SCALE — SIDE VIEW

NOTES:

1. TERMINATE FINAL STORMWATER COLLECTION DITCH INTO VAULT WHERE IT DRAINS TO EXISTING CULVERTS.
2. ADJUST LENGTH OF EXISTING CULVERT AS NEEDED.
3. LOCATIONS OF PENETRATIONS OF CULVERT AND PIPE INTO VAULT SHALL NOT COMPROMISE STRUCTURAL INTEGRITY OF VAULT, AS DETERMINED BY MANUFACTURER.
4. ELEVATION OF VAULT SHALL MAXIMIZE SPACE BELOW THE CULVERT INVERT INSIDE THE VAULT AS SEDIMENT TRAP BUT IT SHALL NOT BE LESS THAN 8 INCHES.
5. WHERE FINAL STORMWATER COLLECTION DITCH DRAINS INTO ONE VAULT FROM BOTH SIDES, THE SAME CONNECTION OF V-DITCH TO VAULT SHALL BE USED ON BOTH SIDES OF VAULT.
6. EXTEND HIGH LEVEL SENSOR CONDUIT TO GROUND SURFACE AND ALONG WALKWAY TO HANG SENSOR. ALTERNATE INSTALLATION MAY BE REQUIRED BY ELECTRICAL CODES.
7. STAFF GAUGE/STILLING WELL TO BE 6"DIA. SCH. 40 PVC PIPE PLACED AT LEAST 1 FT. INTO RIPRAP AND SECURED TO WALKWAY. GRADUATIONS TO BE CUT INTO PIPE AND PAINTED. GRADUATIONS TO BE IN INTERVALS OF 0.1 FT WITH 1 FT. GRADUATIONS NUMBERED FROM TOP OF PIPE. TWO 1/2" DIAMETER HOLES SHALL BE DRILLED INTO OPPOSITE SIDES OF THE PIPE SO THAT THEY ARE 1-2" ABOVE THE RIPRAP.

RECORD OCTOBER 2010

Plot Date: 11/10/10 - 3:12pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_Record\Drawings\CAD\, Drawing Name: DRAWING C-12-13-14_B-L_100510.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	REVISED CULVERT CONNECTION	6/30/10	MZ
5	ISSUED FOR CONSTRUCTION	7/2/10	LM
6	RECORD DRAWING	10/5/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED KS

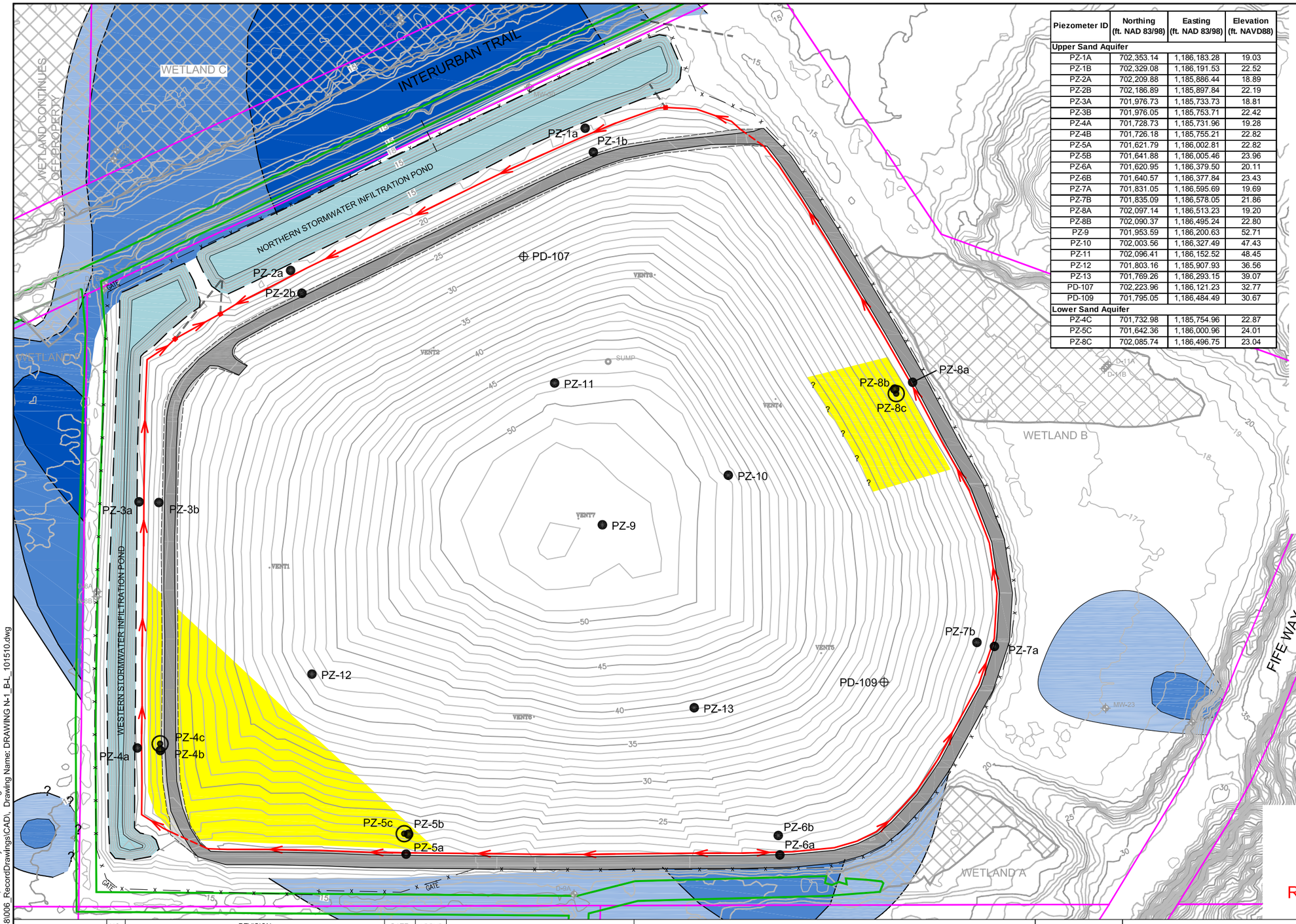
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AMEC Geomatrix

DETAILS
ADDENDUM 1

DATE: 11/10/10
PROJECT NO.: 13488

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DRAWING
C-14



Piezometer ID	Northing (ft. NAD 83/98)	Easting (ft. NAD 83/98)	Elevation (ft. NAVD88)
Upper Sand Aquifer			
PZ-1A	702,353.14	1,186,183.28	19.03
PZ-1B	702,329.08	1,186,191.53	22.52
PZ-2A	702,209.88	1,185,886.44	18.89
PZ-2B	702,186.89	1,185,897.84	22.19
PZ-3A	701,976.73	1,185,733.73	18.81
PZ-3B	701,976.05	1,185,753.71	22.42
PZ-4A	701,728.73	1,185,731.96	19.28
PZ-4B	701,726.18	1,185,755.21	22.82
PZ-5A	701,621.79	1,186,002.81	22.82
PZ-5B	701,641.88	1,186,005.46	23.96
PZ-6A	701,620.95	1,186,379.50	20.11
PZ-6B	701,640.57	1,186,377.84	23.43
PZ-7A	701,831.05	1,186,595.69	19.69
PZ-7B	701,835.09	1,186,578.05	21.86
PZ-8A	702,097.14	1,186,513.23	19.20
PZ-8B	702,090.37	1,186,495.24	22.80
PZ-9	701,953.59	1,186,200.63	52.71
PZ-10	702,003.56	1,186,327.49	47.43
PZ-11	702,096.41	1,186,152.52	48.45
PZ-12	701,803.16	1,185,907.93	36.56
PZ-13	701,769.26	1,186,293.15	39.07
PD-107	702,223.96	1,186,121.23	32.77
PD-109	701,795.05	1,186,484.49	30.67
Lower Sand Aquifer			
PZ-4C	701,732.98	1,185,754.96	22.87
PZ-5C	701,642.36	1,186,000.96	24.01
PZ-8C	702,085.74	1,186,496.75	23.04

EXPLANATION

- TAX PARCEL LINE
- FENCE LINE
- 12" DIAMETER CULVERT
- PD-107 EXISTING UPPER INTERVAL PIEZOMETER
- PZ-8b INSTALLED UPPER INTERVAL PIEZOMETER
- PZ-8c INSTALLED LOWER INTERVAL PIEZOMETER
- MW-13 MONITORING WELL LOCATION
- VENT3 VENT LOCATION
- AGRICULTURAL DITCH
- WETLAND
- FINAL STORMWATER COLLECTION DITCH
- STORMWATER FLOW DIRECTION
- INFILTRATION POND
- FINAL PERIMETER ROAD
- APPROXIMATE AREA OF GAP IN LOWER SILT AQUITARD

DISSOLVED ARSENIC (µg/L)

- < 2 – 5
- 5 – 50
- 50 – 500
- 500 – 5000

NOTES:

1. PIEZOMETERS WILL BE INSTALLED BY OTHERS FOLLOWING COMPLETION OF LANDFILL CAP CONSTRUCTION.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR EXCAVATION AND SUBSEQUENT REPAIR OF LANDFILL CAP ASSOCIATED WITH PIEZOMETER INSTALLATION.
3. DISPOSE OF EXCESS SOIL GENERATED FROM DRILLING OFFSITE.

0 50 100
APPROXIMATE SCALE IN FEET

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	PIEZOMETER SURVEY LOCATIONS	4/08/10	KT
4	RECORD DRAWING	10/15/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

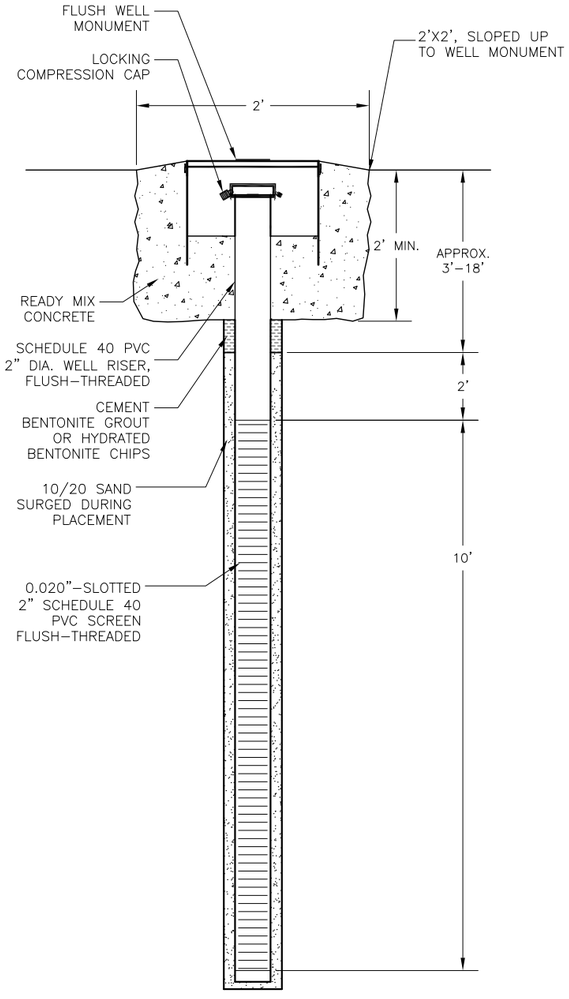
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GROUNDWATER MONITORING NETWORK PLAN ADDENDUM 1

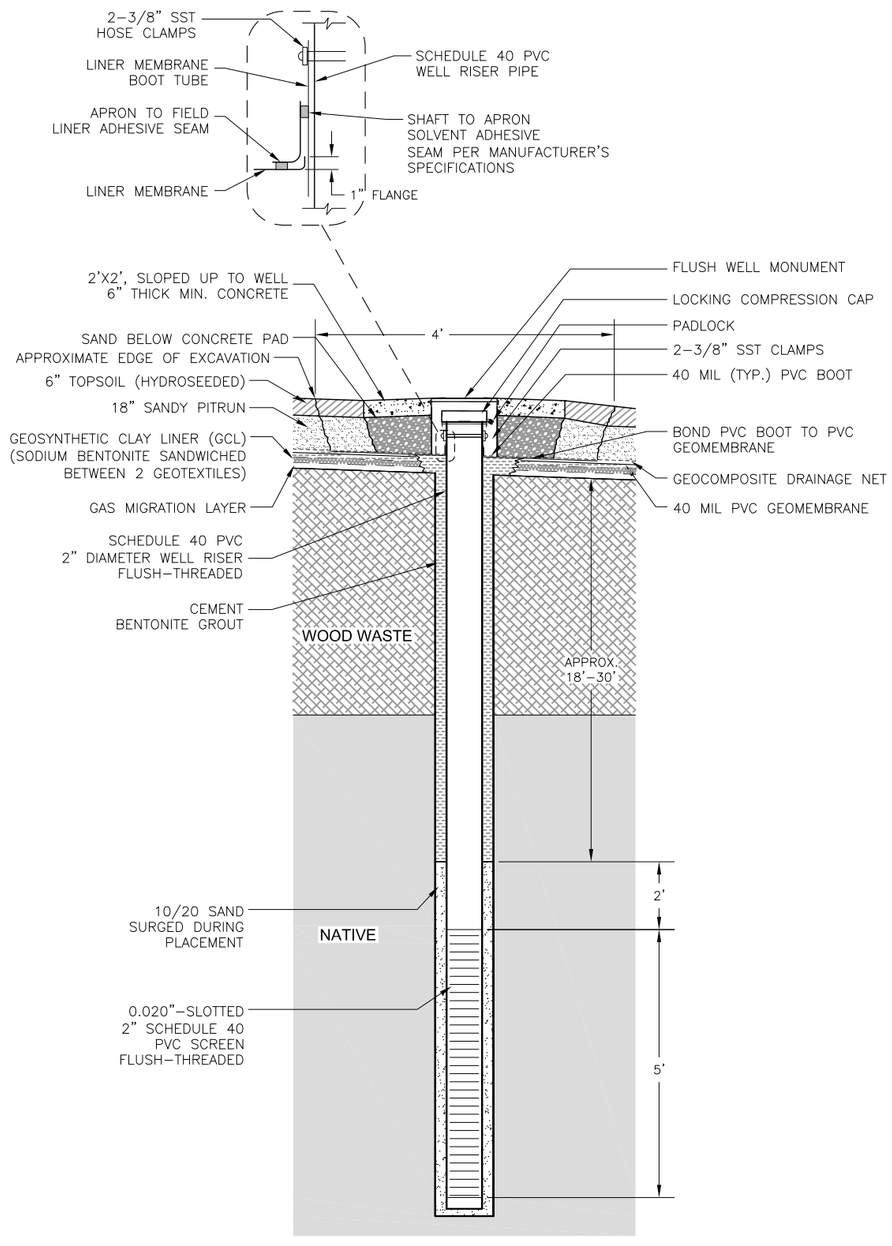
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/21/10
PROJECT NO.: 13488
DRAWING N–1

Plot Date: 10/21/10 - 10:10am, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING N-1_B-L_101510.dwg



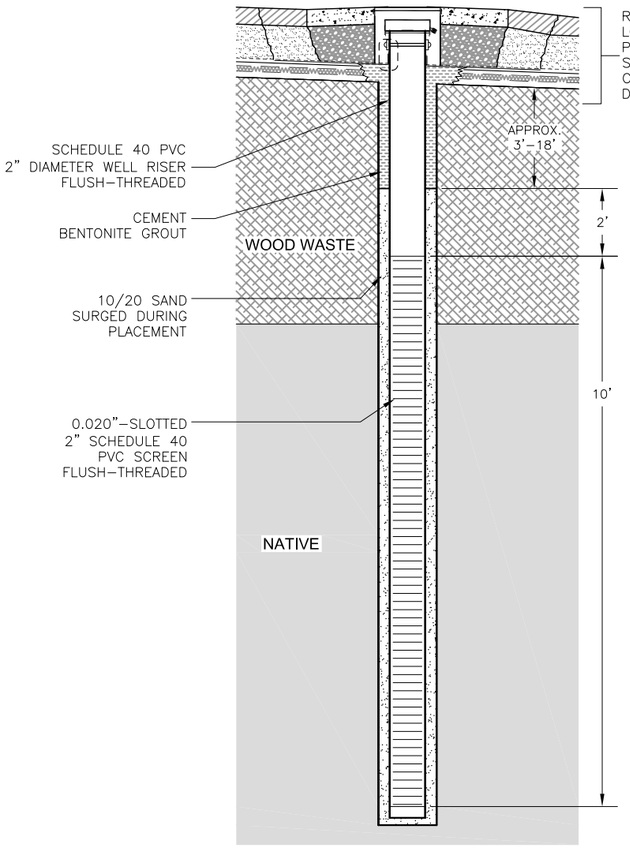
UPPER INTERVAL PIEZOMETER OUTSIDE BARRIER WALL (1 / N–1)
NOT TO SCALE



LOWER INTERVAL PIEZOMETER INSIDE BARRIER WALL (2 / N–1)
NOT TO SCALE

NOTES FOR PIEZOMETERS INSIDE BARRIER WALL

1. HAND–EXCAVATE THE COVER SOIL TO THE EXISTING GEOSYNTHETICS LAYER; APPROXIMATELY 2–FEET DEEP, AND 2–FEET DIAMETER.
2. CUT A 12–INCH DIAMETER OR SQUARE OPENING IN THE GEOSYNTHETICS LAYERS TO THE WOOD WASTE.
3. INSTALL PIEZOMETER AND GROUT THE ANNULAR SPACE UP TO THE GEOSYNTHETICS LAYER IN ACCORDANCE WITH STATE OF WASHINGTON WELL CONSTRUCTION STANDARDS.
4. ENLARGE EXCAVATION TO EXISTING GEOSYNTHETICS LAYER TO 4–FEET DIAMETER.
5. INSTALL A PVC BOOT OVER THE WELL WITH 18–INCHES OF (MIN.) OVERLAP WITH THE EXISTING PVC GEOMEMBRANE. CLEAN THE PVC SURFACES THOROUGHLY AND BOND THE BOOT TO THE GEOMEMBRANE PER THE MANUFACTURER'S RECOMMENDATIONS.
6. INSTALL STAINLESS STEEL HOSE CLAMPS AND MASTIC OVER THE BOOT ON THE WELL PER DETAIL.
7. INSTALL A STEEL, FLUSH, WELL MONUMENT IN GROUT. THE MONUMENT SHALL BE POSITIONED A MINIMUM OF 3–INCHES ABOVE THE GEOMEMBRANE. THE GROUTED AREA SHALL EXTEND AT LEAST 12–INCHES BEYOND THE MONUMENT IN EVERY DIRECTION.
8. BACKFILL THE REMAINDER OF EXCAVATION WITH THE COVER SOIL TO RESTORE TO ITS ORIGINAL CONDITION. ALTERNATIVELY, THE ENTIRE EXCAVATION MAY BE FILLED WITH GROUT.
9. WELL TO BE SURGED DURING PLACEMENT OF SANDPACK TO PREVENT VOIDS IN ANNULAR SPACE.
10. REFER TO WELL LOGS FOR CONSTRUCTION DETAILS FOR EACH INDIVIDUAL PIEZOMETER.



UPPER INTERVAL PIEZOMETER INSIDE BARRIER WALL (3 / N–1)
NOT TO SCALE

RECORD FEBRUARY 2011

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	RECORD DRAWING	10/15/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

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PIEZOMETER CONSTRUCTION DIAGRAMS
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 02/07/11
PROJECT NO.: 13488

DRAWING
N–2

Plot Date: 02/07/11 - 10:58am, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING N-2_B-L_020411.dwg

Equipment

Lift Station A Pump: 1-hp sump pump, 230V, single phase
Lift Station B Pump: 1-hp sump pump, 230V, single phase
Control Panel, 240V, single phase
GFCI receptacle, 120V

Peripherals

LSL-A: Float switch, normally open
LSH-A: Float switch, normally open
LSHH-A: Float switch, normally open
LSLL-A: Float switch, normally closed
LSHH-WP: Float switch, normally open
LSL-B: Float switch, normally open
LSH-B: Float switch, normally open
LSHH-B: Float switch, normally open
LSLL-B: Float switch, normally closed
LSHH-NP: Float switch, normally open

PLC Panel Inputs

Control Power: Rotary On/Off switch for control power
HS-A (Rotary Hand/Off/Auto switch for Lift Station A pump)
Hand: Run pump regardless of LSHH-A, LSLL-A, LSHH-WP, LSL-A and LSH-A states
Auto: Run pump only if the following conditions are met:
- LSHH-A is open
- LSHH-A is closed (only check for low-low alarm condition if pump is running)
- LSHH-WP is open
- LSL-A and LSH-A are both closed

Stop pump when LSL-A and LSH-A are both open
HS-B (Rotary Hand/Off/Auto switch for Lift Station B pump)
Hand: Run pump regardless of LSHH-B, LSHH-NP, LSL-B, and LSH-B states
Auto: Run pump only if the following conditions are met:
- LSHH-B is open
- LSHH-B is closed (only check for low-low alarm condition if pump is running)
- LSHH-NP is open
- LSL-B and LSH-A are both closed

Stop pump when LSL-B and LSH-B are both open
Reset: Momentary button or rotary switch
Clear all alarms by checking states of the following:
- LSHH-A (reset when open)
- LSLL-A (reset when Lift Station A pump not running)
- LSHH-WP (reset when open and Lift Station A pump switch is in the OFF position)
- LSHH-B (reset when open)
- LSLL-B (reset when Lift Station B pump not running and Lift Station B pump switch is in the OFF position)
- LSHH-NP (reset when open)

PLC Signal Inputs

LSL-A: Lift Station A low-level
Connected to switch LSL-A, normally open
LSH-A: Lift Station A high-level
Connected to switch LSL-A, normally open
LSHH-A: Lift Station A high-high
Connected to switch LSHH-A, normally open
LSLL-A: Lift Station A low-low level
Connected to switch LSLL-A, normally closed
LSHH-WP: West Pond high-high
Connected to switch LSHH-WP, normally open
LSL-B: Lift Station B low-level
Connected to switch LSL-B, normally open
LSH-B: Lift Station B high-level
Connected to switch LSL-B, normally open
LSHH-B: Lift Station B high-high
Connected to switch LSHH-B, normally open
LSLL-B: Lift Station B low-low level
Connected to switch LSLL-B, normally closed
LSHH-NP: North Pond high-high
Connected to switch LSHH-NP, normally open

PLC Panel Outputs (Indicators)

CP (Control Power): Lit when control voltage is present, unlit when control voltage is not present
LSA (Lift Station A Pump Running): Lit when Lift Station A pump is running, unlit when Lift Station A pump is not running
LAHH-A (Lift Station A High-High Level): Lights when LSHH-A closes, unlights only after reset
LALL-A (Lift Station A Low-Low Level): Lights when switch LSLL-A closes and Lift Station A pump is running, unlights only after reset
LAHH-WP (West Pond High-High Level): Lights when LSHH-WP closes; unlights only after reset
LSB (Lift Station B Pump Running): Lit when Lift Station B pump is running, unlit when Lift Station B pump is not running
LAHH-B (Lift Station B High-High Level): Lights when LSHH-B closes; unlights only after reset
LALL-B (Lift Station B Low-Low Level): Lights when LSLL-B closes and Lift Station B pump is running, unlights only after reset
LAHH-NP (North Pond High-High Level): Lights when LSHH-NP closes; unlights only after reset

PLC Signal Outputs

LSA: Lift Station A pump run; run when switches LSL-A and LSH-A are both closed, stop when switches LSL-A and LSL-B are both open OR when LSLL-A closes while pump is running
LSB: Lift Station B pump run; run when switches LSL-B and LSH-B are both closed, stop when switches LSL-A and LSL-B are both open OR when LSLL-B closes while pump is running
Alarm 1: Lift Station A High-High Level; Contacts autodialer when LAHH-A is closed
Alarm 2: Lift Station A Low-Low Level: Contacts Autodialer when LSLL-A is closed and Lift Station A pump is running
Alarm 3: West Pond High-High Level; Contacts autodialer when LAHH-WP output is enabled
Alarm 4: Lift Station B High-High Level; Contacts autodialer when LAHH-B output is enabled
Alarm 5: Lift Station B Low-Low Level; Contacts autodialer when LSLL-B is closed and Lift Station Pump B is running
Alarm 6: North Pond High-Level; Contacts autodialer when LAHH-NP output is enabled
Alarm 7: Contacts autodialer upon power failure (may be intrinsic to autodialer)

Alarm Conditions

Lift Station A High-Level - occurs when LSHH-A closes
Lights LAHH-A indicator
Contacts autodialer (Alarm 1)
Lift Station A Low-Low Level - occurs when LSLL-A closes while Lift Station A pump is running
Lights LSLL-A indicator
Shuts off Lift Station A pump
Contacts autodialer (Alarm 2)
West Pond High-High Level - occurs when LSLL-WP closes
Lights LAHH-WP indicator
Shuts off Lift Station A pump
Contacts autodialer (Alarm 3)
Lift Station B High-High Level - occurs when LSHH-B closes
Lights LAHH-B indicator
Contacts autodialer (Alarm 4)
Lift Station B Low-Low Level - occurs when LSLL-B closes while Lift Station B pump is running
Lights LSLL-B indicator
Shuts off Lift Station B pump
Contacts autodialer (Alarm 5)
North Pond High-High Level - occurs when LSHH-NP closes
Lights LAHH-NP indicator
Shuts off Lift Station B pump
Contacts autodialer (Alarm 6)
Power Failure - occurs when control power switch is in ON position and control power is not present
Contacts autodialer (Alarm 7)

Lift Station Switch Elevations

Lift Station A (top of lid elevation 20.62)
LSLL-A: elevation 15.30 (5'-4" below top of lid)
LSL-A: elevation 15.50 (5'-1" below top of lid)
LSH-A: elevation 16.50 (4'-1" below top of lid)
LSHH-A: elevation 16.70 (3'-11" below top of lid)

Lift Station B (top of lid elevation 19.99)
LSLL-B: elevation 15.30 (4'-8" below top of lid)
LSL-B: elevation 15.50 (4'-6" below top of lid)
LSH-B: elevation 16.50 (3'-6" below top of lid)
LSHH-B: elevation 16.70 (3'-3" below top of lid)

NOTES:

1. DESIGN PROGRAMMABLE LOGIC CONTROL (PLC) IN ACCORDANCE WITH THE LOGIC SHOWN.
2. ALL COMPONENTS AND LINES SHALL BE CLEARLY AND PERMANENTLY LABELED.
3. ALL ELECTRICAL AND MECHANICAL INSTALLATION SHALL BE FIELD TESTED AND OPERATED PRIOR TO SYSTEM COMMISSIONING AND ACCEPTANCE BY ENGINEER.
4. ELECTRICAL DESIGN DRAWINGS AND REVISIONS PER ELECTRICIAN SUBMITTAL.

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	RECORD DRAWING	10/21/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

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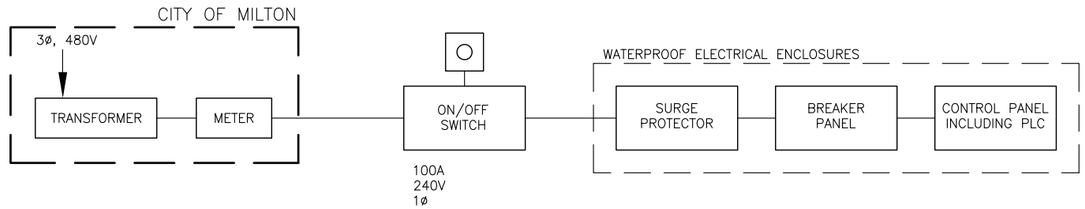
ELECTRICAL ONE-LINE DIAGRAM AND CONTROL DIAGRAMS
ADDENDUM 1

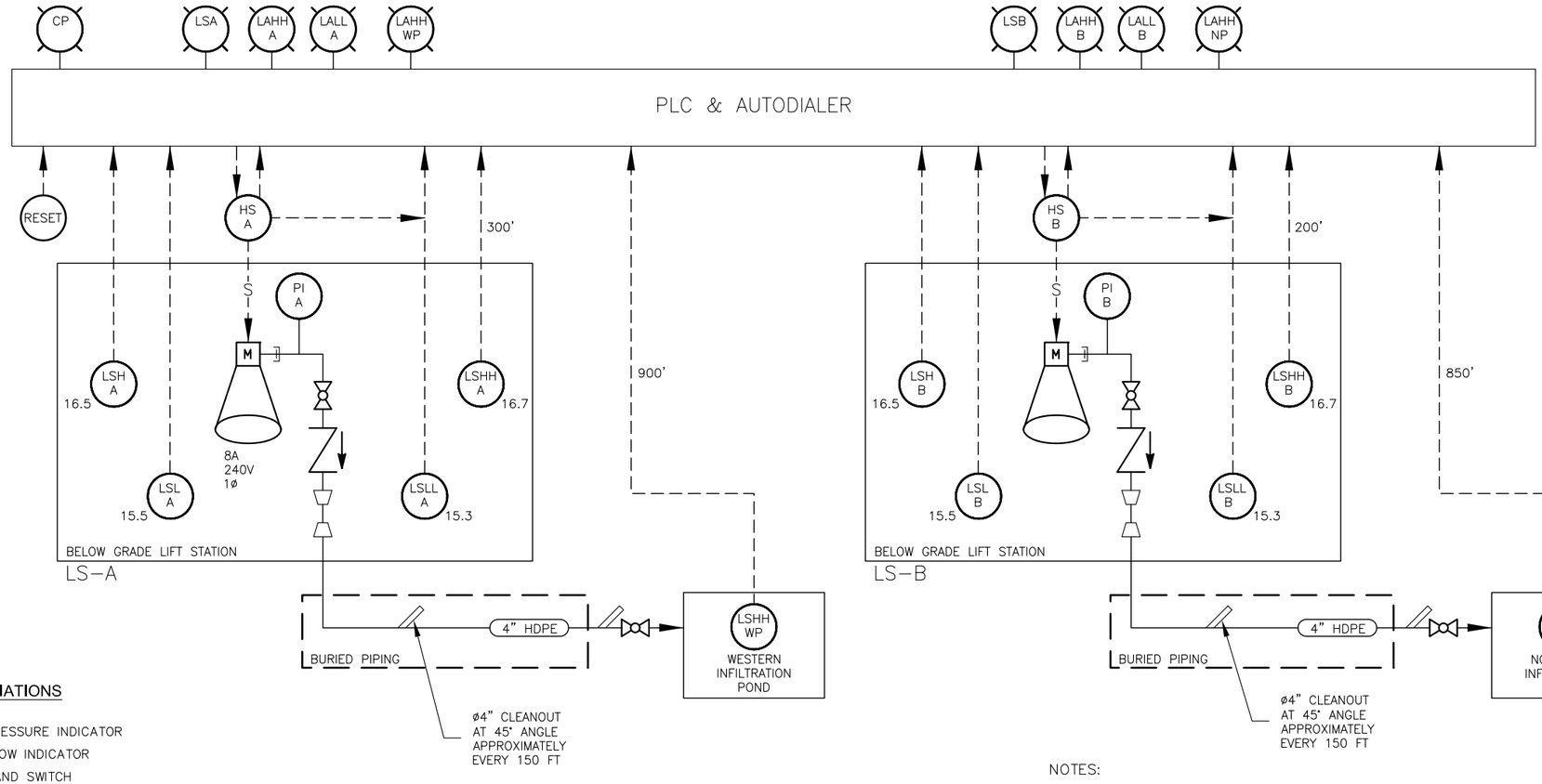
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/21/10
PROJECT NO.: 13488

DRAWING
E-1

Plot Date: 10/21/10 - 1:02pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING C-9-9-10-11-P1-E1_B-L_100510.dwg





EXPLANATION

- SINGLE PHASE
- OPERATOR INTERFACE FUNCTION
- FIELD MOUNTED
- BALL VALVE NORMALLY OPEN
- REDUCER
- CLEANOUT
- QUICK CONNECT COUPLING
- CHECK VALVE
- SUBMERSIBLE SUMP PUMP

ABBREVIATIONS

PI	PRESSURE INDICATOR
FI	FLOW INDICATOR
HS	HAND SWITCH
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGHER HIGH
LAHH	LEVEL ALARM HIGHER HIGH
LSL	LEVEL SWITCH LOW
LSLL	LEVEL SWITCH LOWER LOW
LALL	LEVEL ALARM LOWER LOW
CP	CONTROL PANEL

NOTES:

1. DESIGN AND INSTALL ALL ELECTRICAL EQUIPMENT, SENSORS, AND INSTRUMENTATION SHOWN. POWER SUPPLY WILL BE AVAILABLE UP TO AND INCLUDING THE METER.
2. ON/OFF SWITCH SHALL BE INSTALLED ON THE ELECTRICAL BOX AND MUST BE WEATHERPROOF AND LOCKABLE (LO/TO).
3. EACH PUMP MUST HAVE A SEPARATE BREAKER AND BE LOCKABLE (LO/TO).
4. PLACE CRUSHED ROCK BASE FOR ELECTRICAL BOX IF NEEDED.
5. INSTALL WATERPROOF, LOCKABLE ON/OFF SWITCH FOR THE PUMPS AND SENSORS IN EACH LIFT STATION.
6. ELECTRICAL DESIGN DRAWINGS AND REVISIONS PER ELECTRICIAN SUBMITTAL.

RECORD OCTOBER 2010

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT
3	RECORD DRAWING	10/21/10	SB

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

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PIPING & INSTRUMENTATION DIAGRAM
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 12/10/10
PROJECT NO.: 13488
DRAWING P-1

Plot Date: 12/10/10 - 1:50pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\006_RecordDrawings\CAD\, Drawing Name: DRAWING C-8-9-10-11-P1-E1_B-L_100510.dwg

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

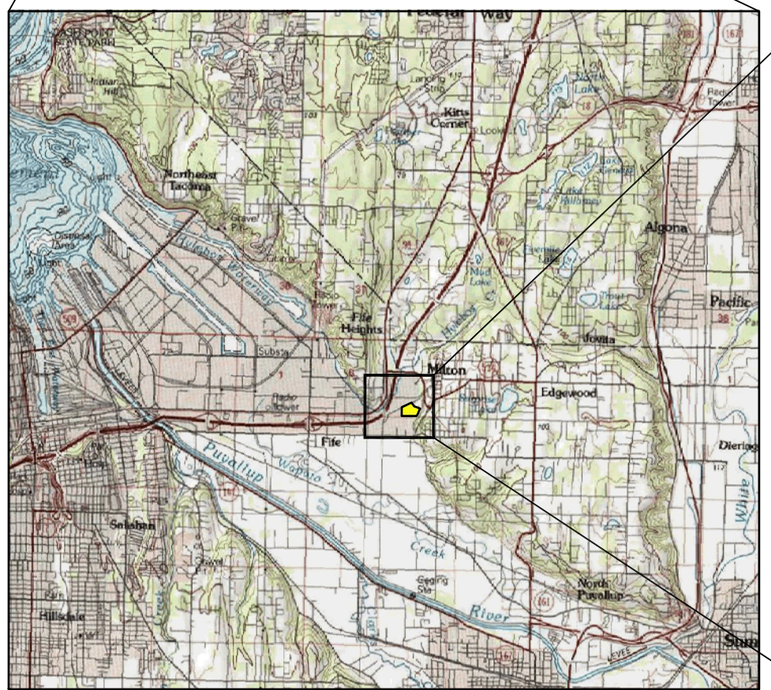
Appendix H
Phase 2 Record Drawings

RECORD DRAWINGS
PHASE 2 PART 1 REMEDIATION CONSTRUCTION
GROUNDWATER RECOVERY AND TREATMENT SYSTEM

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

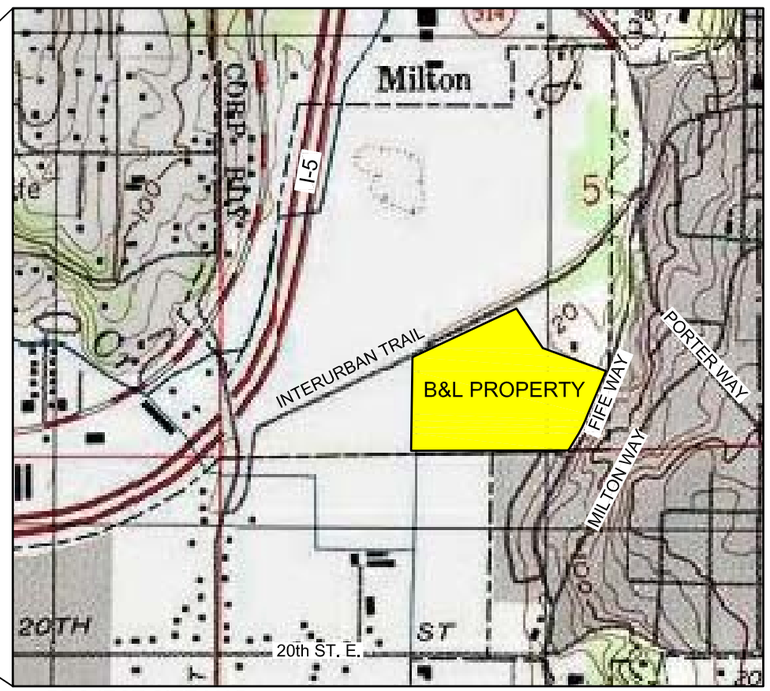


LOCATION MAP



VICINITY MAP

0 1 2
APPROXIMATE SCALE IN MILES



PROJECT SITE MAP

0 500 1000
APPROXIMATE SCALE IN FEET

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR REVIEW	MAR 24	GP
	2	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 21	GP
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET	3	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED GP
CHECKED LDV
REVIEWED WJM

AMEC Geomatrix

COVER SHEET
ADDENDUM 3

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/20/11
PROJECT NO.: SE10160010

DRAWING
G–01

Plot Date: 05/20/11 - 10:36am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-cover.dwg

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G-02	DRAWING INDEX AND GENERAL NOTES
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P&ID-00	P&ID LEGEND
P&ID-01	OXIDATION-PRECIPITATION
P&ID-02	SLUDGE HANDLING
P&ID-03	ADDITIVES
P&ID-04	EFFLUENT POLISHING
P&ID-05	EXTRACTION AND MONITORING WELLS
HYD-01	GWTP HYDRAULIC PROFILE
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M-02	GWTP MECHANICAL LAYOUT - MEZZANINE PLAN
M-03	GWTP MECHANICAL LAYOUT - SECTION A
M-04	GWTP MECHANICAL LAYOUT - SECTION B
M-05	PIPING DETAILS
M-06	PIPING DETAILS
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C-03	PARTIAL SITE PLAN
C-04	PIPING LAYOUT
C-05	WETLAND & EFFLUENT PIPING LAYOUT
C-06	LANDFILL EAST PIPING LAYOUT
C-07	LANDFILL WEST PIPING LAYOUT
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--	NOTES FOR CONTRACTOR MARKUPS
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C-04	PIPING LAYOUT MARKUP
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C-06	PIPING LAYOUT MARKUP
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C-08A	WETLAND WELL VAULT DETAILS MARKUP
C-08B	WETLAND WELL VAULT DETAIL MARKUP
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C-10	OUTSIDE AREA PIPING DETAILS MARKUP
C-12A	PIEZOMETER DETAILS MARKUP
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C-14	LANDFILL EAST PIPING ELEVATION MARKUP
C-15	LANDFILL WEST PIPING ELEVATION MARKUP
C-16	PIEZOMETER CONNECTION MARKUP
C-19	WATER & SEWER CONNECTION MARKUP
C-20B	WATER & SEWER DETAILS MARKUP

SURVEY DRAWINGS	
14203-1	BARGHAUSEN SURVEY SHEET 1
14203-2	BARGHAUSEN SURVEY SHEET 2
BUILDING PAD DRAWINGS	
C-3.02A	BUILDING PAD AS-BUILT PLAN
GP1.1	GEOPIER PLAN
GP0.1	GEOPIER DETAILS
ARCHITECTURAL/STRUCTURAL DRAWINGS	
S-1.0	FOUNDATION PLAN
S-2.0	FOUNDATION NOTES
AS-01	FOOTING PLAN
AS-02	FLOOR PLAN & DETAILS
AS-03	MEZZANINE PLAN
AS-04	ELEVATIONS
AS-05	SECTIONS
AS-06	SECTIONS
AS-07	DETAILS
AS-08	NOTES
AS-09	DETAILS
AS-10	DETAILS
AS-11	DETAILS
AS-12	DETAILS
NUCOR STEEL BUILDING DRAWINGS	
C1	COVER SHEET, NOTES & SPECIFICATIONS
C2	MEZZANINE LOADS
C3	STANDARD WELDS AND LEGEND
F1	ANCHOR BOLT PLAN
F2	ANCHOR DETAILS
E1	ROOF FRAMING PLAN
E2	DETAILS
E3	BRACING PLAN
E4	SECTION
E5	LEFT ENDWALL ELEVATION
E6	FRONT SIDEWALL ELEVATION
E7	RIGHT ENDWALL ELEVATION
E8	BACK SIDEWALL ELEVATION
E9	ROOF SHEETING PLAN/GUTTER SCHEDULE
E10	WALL SHEETING AT LINE 1
E11	WALL SHEETING AT LINE D
E12	WALL SHEETING AT LINE 4
E13	WALL SHEETING AT LINE A
E14	WALL LINER
R1	COLUMN BASE REACTIONS
R2	COLUMN BASE REACTIONS
R3	COLUMN BASE REACTIONS
R4	COLUMN BASE REACTIONS
R5	COLUMN BASE REACTIONS

NUCOR STEEL BUILDING DRAWINGS CONTINUED	
D1	ERECTION NOTES & DETAILS
D2	ERECTION DETAILS
D3	ERECTION DETAILS
D4	ERECTION DETAILS
D5	ERECTION DETAILS
D6	ERECTION DETAILS
D7	ERECTION DETAILS
D7	ERECTION DETAILS
HVAC DRAWINGS	
MECH-1	MAIN FLOOR HVAC PLAN
MECH-2	MEZZANINE HVAC PLAN
FIRE PROTECTION DRAWINGS	
M-01	FIRE ALARM AS-BUILT, MAIN FLOOR
M-02	FIRE ALARM AS-BUILT, MEZZANINE
AS-04	FIRE ALARM AS-BUILT, OUTSIDE ALARMS
FP-01	SPRINKLER PLAN & DETAILS
FP-02	SPRINKLER DETAILS
ELECTRICAL DRAWINGS	
3633-1C	KIOSK #1 ENCLOSURE DRAWING
3633-K1	KIOSK #1 CONTROL DRAWING
3633-2C	KIOSK #2 ENCLOSURE DRAWING
3633-K2	KIOSK #2 CONTROL DRAWING
3633-3C	KIOSK #3 ENCLOSURE DRAWING
3633-K3	KIOSK #3 CONTROL DRAWING
3633-4C	KIOSK #4 ENCLOSURE DRAWING
3633-K4	KIOSK #4 CONTROL DRAWING
3633-5C	KIOSK #5ENCLOSURE DRAWING
3633-K5	KIOSK #5 CONTROL DRAWING
3633-1	PLC LAYOUT AND POWER DIAGRAM
3633-2	PLC INPUTS
3633-3	PLC INPUTS
3633-4	PLC INPUTS
3633-5	PLC INPUTS
3633-6	PLC INPUTS
3633-7	PLC INPUTS
3633-8	PLC INPUTS
3633-9	PLC OUTPUTS
E-1	FIRST FLOOR POWER PLAN
E-2	MEZZANINE POWER PLAN
E-3	FIRST FLOOR LIGHTING PLAN
E-4	MEZZANINE LIGHTING PLAN
E-5	SCHEDULES AND ONE-LINE DIAGRAM
E-01	SINGLE LINE DIAGRAM
E-02	KIOSK DETAILS, CONDUCTOR TABLE, & TELEMETRY

NOTES:

1. GROUND SURFACE CONTOUR LINES WERE OBTAINED FROM LIDAR AND AUGMENTED WITH SOME LAND SURVEYING BY BARGHAUSEN.
2. LIDAR ELEVATIONS ARE GENERALLY ACCURATE TO ±1 FOOT.
3. SITE GROUNDWATER AND LANDFILL WASTE ARE CONTAMINATED WITH ARSENIC. SEE SITE HEALTH AND SAFETY PLAN FOR RELEVANT INFORMATION. ALL WORKERS INVOLVED WITH TRENCHING IN WETLAND AREAS OR LIKELY TO BE EXPOSED TO GROUNDWATER MUST BE CURRENT WITH HAZWOPER-TRAINING AND MEDICAL MONITORING.
4. CONDUCT UNDERGROUND UTILITY LOCATES TO CLEAR EXCAVATION AREAS BEFORE START OF SUBSUFACE CONSTRUCTION.
5. BESIDES CONTRACTOR'S OWN FIELD OFFICE, PROVIDE AN ADDITIONAL FIELD OFFICE TRAILER WITH SPACE AND FURNITURE FOR THE CONSTRUCTION MANAGER, AT LEAST 28 FT LONG, AND CONNECT WITH POWER AND PHONE SERVICES.
6. A POWER POLE WITH METER AND SINGLE PHASE, 240V, SUPPLY IS EXISTING. CONTRACTOR WILL BE RESPONSIBLE FOR ALL OTHER TRANSFORMERS AND LINES NEEDED FOR TEMPORARY AND PERMANENT SERVICE. SEE SHEET C-03 FOR SERVICE LOCATION.
7. CONTRACTOR IS RESPONSIBLE FOR TEMPORARY AND PERMANENT PHONE SERVICE.
8. WATER SUPPLY SHALL BE OBTAINED FROM A CITY OF MILTON FIRE HYDRANT ON FIFE WAY, APPROXIMATELY 0.5 MILE NORTH OF THE SITE.
9. PROVIDE OTHER TEMPORARY FACILITIES FOR THE DURATION OF THE PROJECT.
10. ALL EXCAVATIONS AND TRENCHING WORK SHALL BE PERFORMED IN ACCORDANCE WITH CURRENT WISHA AND OSHA REGULAITONS ON EXCAVATIONS, TRENCHING, AND SHORING.
11. REMOVE ALL EXCESS MATERIAL AND REMAINING DEBRIS FROM THE WORK AREA AND DISPOSE IN ACCORDANCE WITH APPLICABLE REGULATIONS AND STANDARDS.
12. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR EXISTING PROPERTY FEATURES, SUCH AS EXISISTING WELLS, LANDFILL BARRIER WALL, AND LANDFILL CAP. ANY DAMAGE WILL BE REPAIRED TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE, AT THE CONTRACTOR'S SOLE EXPENSE.
13. THESE DRAWINGS ARE TO BE USED IN CONJUNCTION WITH THE WRITTEN SPECIFICATIONS, AND ALL RFQ DOCUMENTS TO DEFINE THE FULL RESPONSIBILITIES OF THE CONTRACTOR. CONTRACTOR IS RESPONSIBLE FOR REVIEWING AND UNDERSTANDING ALL DRAWINGS AND DOCUMENTS. WHERE CONFLICTS EXIST, THE OWNER'S REPRESENTATIVE SHALL BE CONTACTED FOR CLARIFICATION AND RESOLUTION.
14. CONTRACTOR IS RESPONSIBLE FOR COLLECTING ANY ADDITIONAL SURVEY INFORMATION REQUIRED TO PERFORM THE WORK.
15. THESE DRAWINGS CONSTITUE A PARTIAL DESIGN. CONTRACTOR TO COMPLETE A FULL DETAILED-DESIGN TO SUBMIT FOR APPROVAL BY THE OWNER'S REPRESENTATIVE BEFORE WORK BEGINS.

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1			
2			
3			

DRAWN
DESIGNED
CHECKED
REVIEWED

FLOYD | SNIDER
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600 University Street
Suite 600
Seattle, Washington 98101

DRAWING INDEX AND GENERAL NOTES

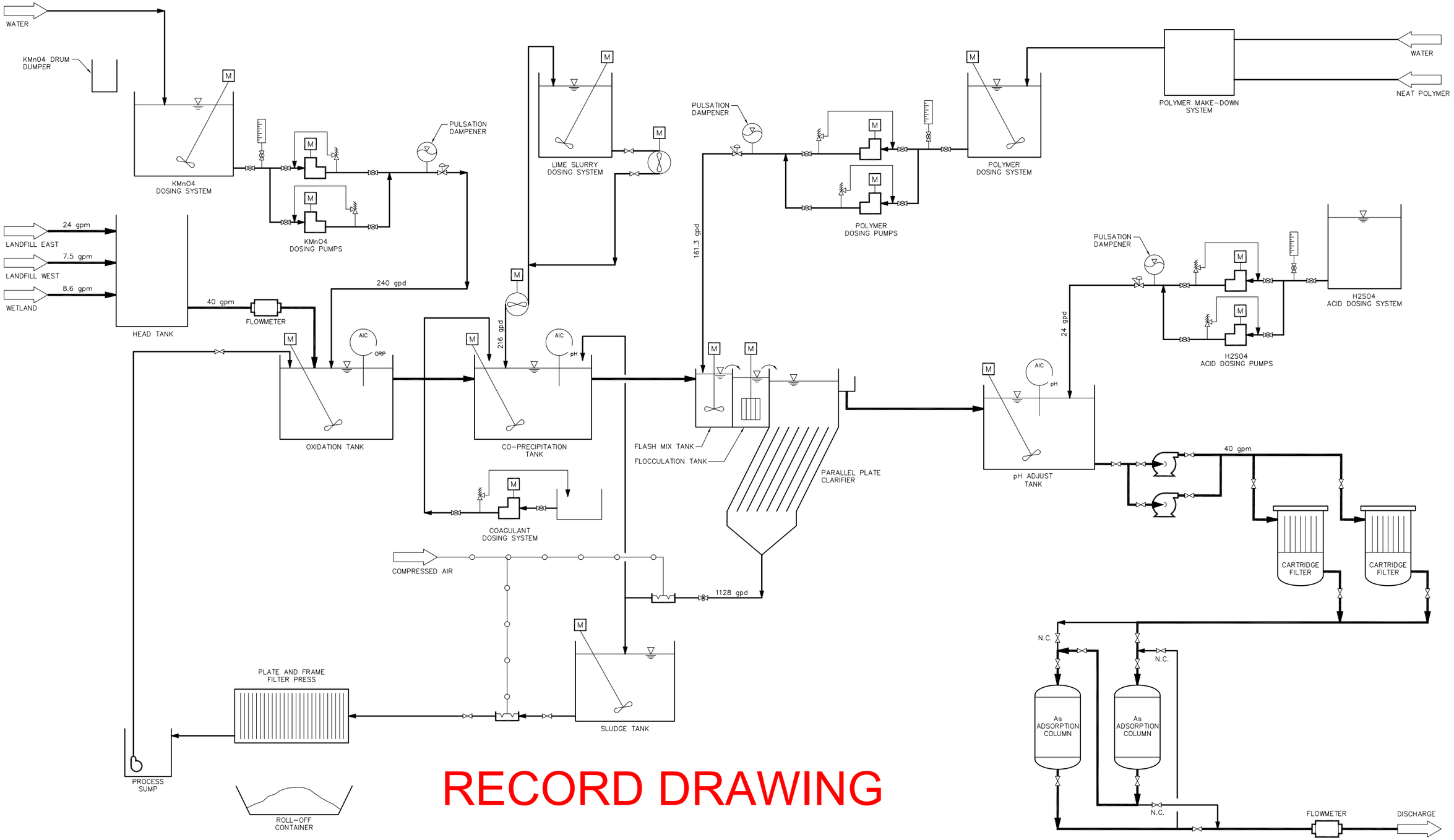
DATE: 05/28/13

PROJECT NO.: SE10160010

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DRAWING
G-02

Plot Date: 05/28/13 - 2:44pm, Plotted by: mike.stenberg
Drawing Path: T:\Larry\, Drawing Name: SE10160010-G2 MDS 052813.dwg



RECORD DRAWING

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR REVIEW	MAR 04	GP
	2	ISSUED FOR SPECIFICATION PACKAGE REVIEW	APR 21	LDV
DATUM	3	ISSUED FOR TENDER	MAY 26	LDV
HORIZONTAL: WASP-NAD83-S FEET	4	ISSUED FOR CONSTRUCTION	JLY 26	LDV
VERTICAL: NAVD88 FEET	5	AS-BUILT	DEC 7	BE

DRAWN PRV
DESIGNED CH
CHECKED GP
REVIEWED WJM/LMM

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PROCESS FLOW DIAGRAM

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 12/07/12
PROJECT NO.: SE10160010
DRAWING PFD-01

Plot Date: 12/07/12 - 2:14pm, Plotted by: adam.stenberg
Drawing Path: S:\13468\008_\from waterfool\, Drawing Name: SE10160010-PFD_APS_120512.dwg

INSTRUMENT IDENTIFICATION

GENERAL INSTRUMENT OR FUNCTION SYMBOLS

	FIELD MOUNTED	PRIMARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR	AUXILIARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR
DISCRETE INSTRUMENTS	X / X–X–X	X / X–X–X	X / X–X–X
SHARED DISPLAY, SHARED CONTROL	X / X–X–X	X / X–X–X	X / X–X–X
COMPUTER FUNCTION	X / X–X–X	X / X–X–X	X / X–X–X
PROGRAMABLE LOGIC CONTROL	X / X–X–X	X / X–X–X	X / X–X–X

NORMALLY INACCESSIBLE OR BEHIND–THE–PANEL DEVICES OR FUNCTIONS ARE DEPICTED BY THE SAME SYMBOLS BUT WITH DASHED HORIZONTAL BARS, i.e.

X / X–X–X X / X–X–X X / X–X–X

ISA INSTRUMENTATION IDENTIFICATION LETTERS

LETTER	FIRST LETTER (S)		SUCCEEDING LETTERS		
	PROCESS OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER FLAME		USERS CHOICE	USERS CHOICE	USERS CHOICE
C	CONDUCTIVITY			CONTROL	
D	DENSITY (S.G)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGE		GLASS	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION/MOISTURE				MIDDLE
N	TURBIDITY		MIDDLE/INTERMEDIATE		
O	USERS CHOICE		ORIFICE		
P	PRESSURE (OR VACUUM)		POINT (TEST CONNECTION)		
Q	QUANTITY OR EVENT	INTEGRATE	INTEGRATE		
R			RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMITTER	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VISCOSITY			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	AS DEFINED				
Y	STATUS			RELAY OR COMPUTE	
Z	POSITION			DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

LINE LEGEND

- PROCESS (CLOSED CONDUIT, DASHED LINE INDICATES ALTERNATE FLOW STREAM)
- PROCESS (OPEN CHANNEL)
- ANALOG SIGNAL (4 TO 20 mAdc, ETC.)
- DISCRETE SIGNAL (ON/OFF, ETC.)
- COMPRESSED AIR
- PNEUMATIC SIGNAL
- FILLED SYSTEM SIGNAL
- HYDRAULIC SYSTEM SIGNAL
- SONIC SIGNAL
- PACKAGED BUILDING OR FACILITY BOUNDARY
- CONNECTING LINES
- NON–CONNECTING LINES
- HEAT TRACE

ABBREVIATIONS & LETTER SYMBOLS

AC	ALTERNATING CURRENT
CCS	CENTRAL CONTROL SYSTEM
CSC	CAR SEAL CLOSED
CSO	CAR SEAL OPEN
CP–X	CONTROL PANEL NO. X
CS	CARBON STEEL
DC	DIRECT CURRENT
DISC	DISCONNECT
ES	EMERGENCY STOP
FOS	FAST–OFF–SLOW
FOSA	FAST–OFF–SLOW–AUTO
FOSR	FAST–OFF–SLOW–REMOTE
FR	FORWARD–REVERSE
GALV	GALVANIZED STEEL
HOA	HAND–OFF–AUTO
HOR	HAND–OFF–REMOTE
LEL	LOWER EXPLOSIVE LIMIT
LCP	LOCAL CONTROL PANEL
LOS	LOCKOUT STOP
LR	LOCAL–REMOTE
MA	MANUAL–AUTO
MC	MODULATE–CLOSE
MCC	MOTOR CONTROL CENTRE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OC	OPEN–CLOSE (D)
OCR	OPEN–CLOSE–REMOTE
OCA	OPEN–CLOSE–AUTO
OO	ON–OFF
OOA	ON–OFF–AUTO
OOR	ON–OFF–REMOTE
OSC	OPEN–STOP–CLOSE
REM	REMOTE
RPU	REMOTE PROCESSING UNIT
SF	SLOWER–FASTER
SS	START–STOP
SSC	SUPERVISORY SET POINT CONTROL
VIB	VIBRATION

PUMP AND COMPRESSOR SYMBOLS

- CENTRIFUGAL PUMP
- CHEMICAL FEED PUMP
- DIAPHRAGM PUMP
- GEAR PUMP OR BLOWER (POSITIVE DISPLACEMENT)
- PISTON PUMP
- PROGRESSIVE CAVITY PUMP
- SUBMERSIBLE SUMP PUMP
- COMPRESSOR (CENTRIFUGAL) BLOWER OR TURBINE
- COMPRESSOR (PISTON)
- PERISTALTIC PUMP

MISCELLANEOUS SYMBOLS

- SIGHT GLASS
- DIAPHRAGM SEAL
- BLIND FLANGE
- AIR GAP
- VENT TO ATMOSPHERE
- RUPTURE DISK
- M — ELECTRIC MOTOR
- PRESSURE GAUGE
- AIR FILTER
- CALIBRATION COLUMN
- CAM–LOCK
- REDUCER
- Y–STRAINER

PRIMARY ELEMENT SYMBOLS

- ORIFICE PLATE
- FLOW TUBE
- VORTEX METER
- ELECTROMAGNETIC FLOWMETER
- PROPELLER OR TURBINE METER
- LEVEL (ULTRASONIC)
- LEVEL (FLOAT)

ACTUATOR SYMBOLS

- P Z — PNEUMATIC W/POSITIONER
- P S — PNEUMATIC W/SOLENOID
- E — ELECTRIC/MOTOR
- E Z — ELECTRIC/MOTOR W/POSITIONER
- EH — ELECTROHYDRAULIC
- H — HYDRAULIC
- P B — PNEUMATIC WITH VOLUME BOOSTER
- S — SOLENOID
- MANUAL

VALVE SYMBOLS

- GATE
- K — KNIFE GATE
- BUTTERFLY
- GLOBE
- BALL
- V — VEE–BALL
- SEAT PORT — ECCENTRIC PLUG
- PLUG OR COCK
- NEEDLE
- DIAPHRAGM
- PINCH
- SWING CHECK
- BALL CHECK
- HOSE VALVE OR BIBB
- PRESSURE RELIEF
- PRESSURE/VACUUM RELIEF VALVE
- AIR AND/OR VACUUM RELEASE
- ACTUATOR — MOTORIZED VALVE
- ACTUATOR — SOLENOID VALVE
- ACTUATOR — TO TEMPERATURE SENSOR — TEMPERATURE SENSING VALVE
- REGULATED SIDE — PRESSURE CONTROL

RECORD DRAWING

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REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
3	ISSUED FOR TENDER	MAY 26	LDV
4	ISSUED FOR CONSTRUCTION	JLY 26	LDV
5	CONTROL CHANGES	DEC 20	
6	CONTROL CHANGES (2)	JAN 10	BE
7	AS–BUILT	DEC 7	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

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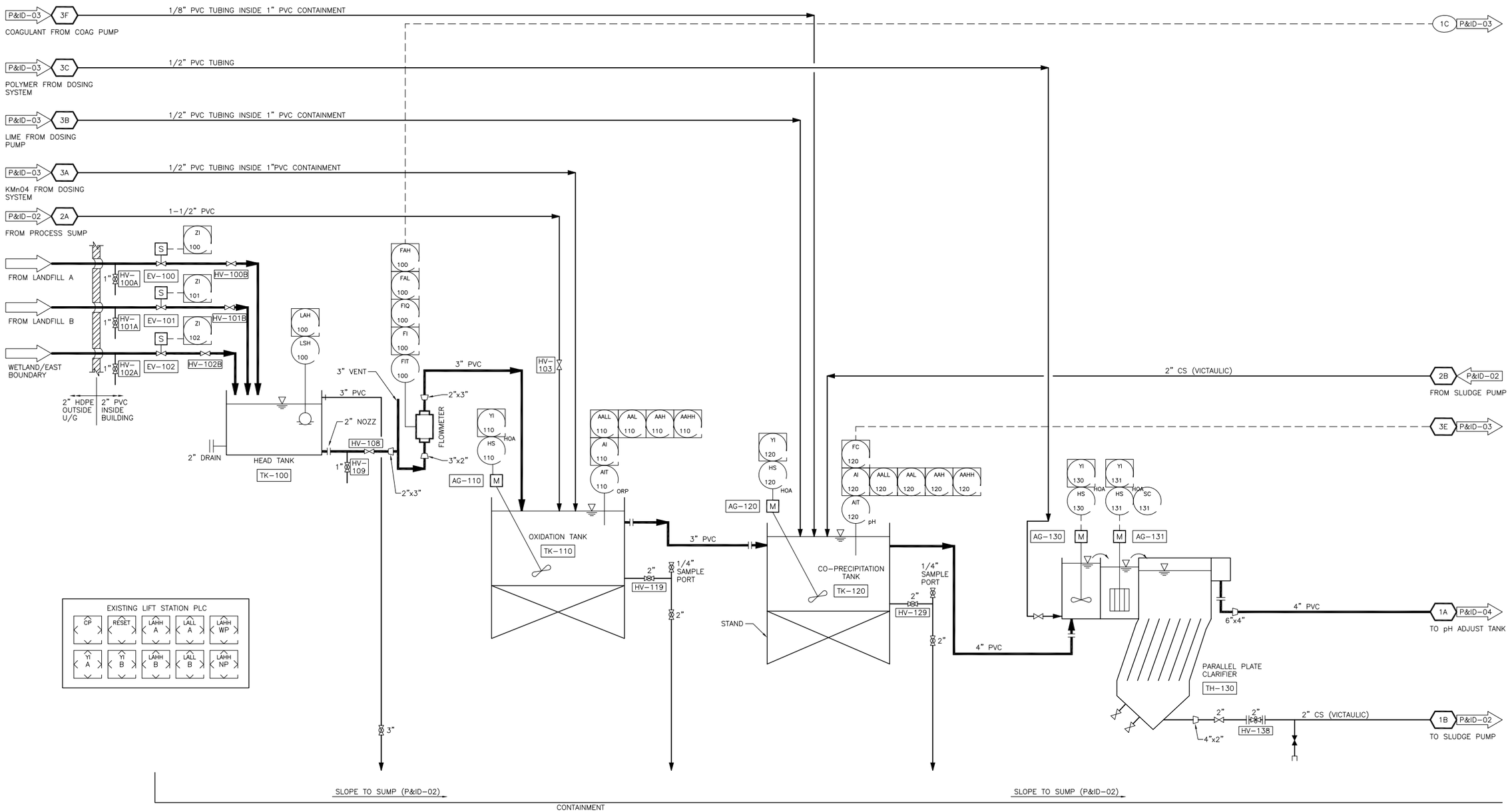
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PIERCE COUNTY, WASHINGTON

DATE: 12/07/12
PROJECT NO.: SE10160010

DRAWING P&ID–00

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REFERENCES:	NO.	REVISION	DATE	APRVD
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	8	AS-BUILT	DEC 7	BE

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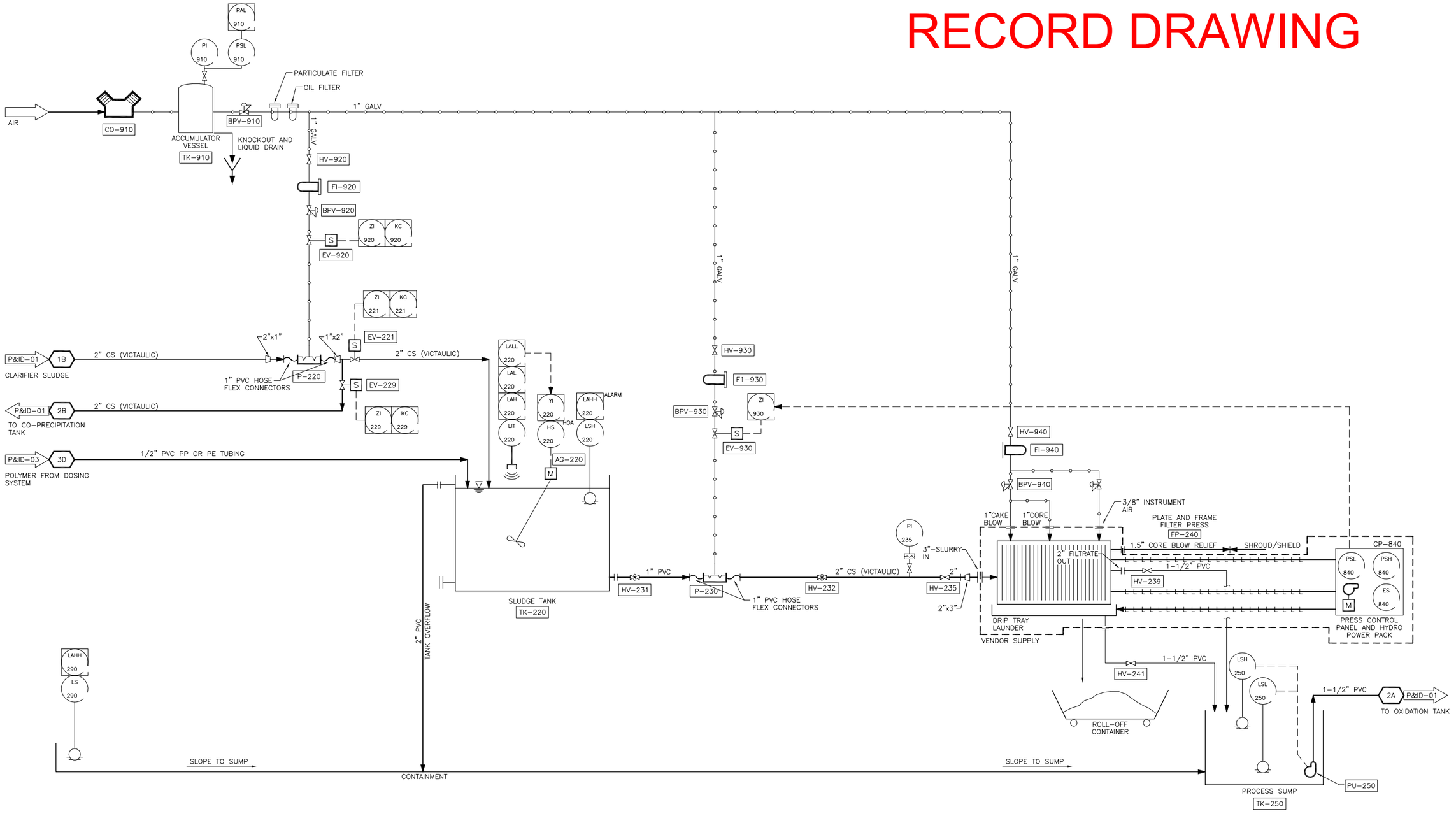
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OXIDATION / PRECIPITATION

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 12/07/12
PROJECT NO.: SE10160010
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DATUM	5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
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VERTICAL: NAVD88 FEET	7	CONTROL CHANGES (2)	JAN 10	BE
	8	AS-BUILT	DEC 7	BE

DRAWN JR
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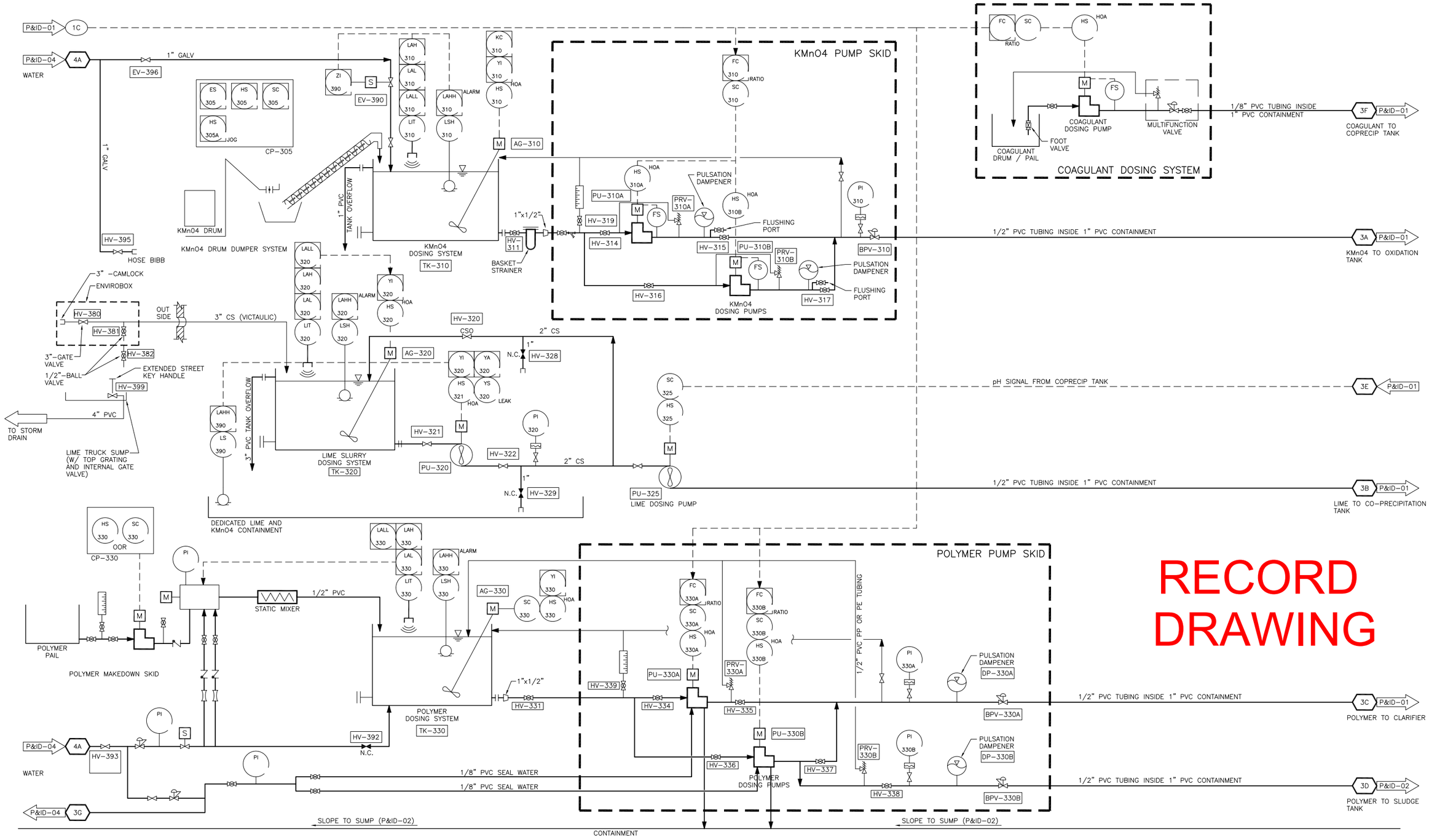
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PIERCE COUNTY, WASHINGTON

DATE: 12/07/12
PROJECT NO.: SE10160010

DRAWING
P&ID-02

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Plot Date: 12/07/12 - 2:12pm, Plotted by: adam.stenberg
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REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
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5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	CONTROL CHANGES	DEC 20	
7	CONTROL CHANGES (2)	JAN 10	BE
8	AS-BUILT	DEC 7	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

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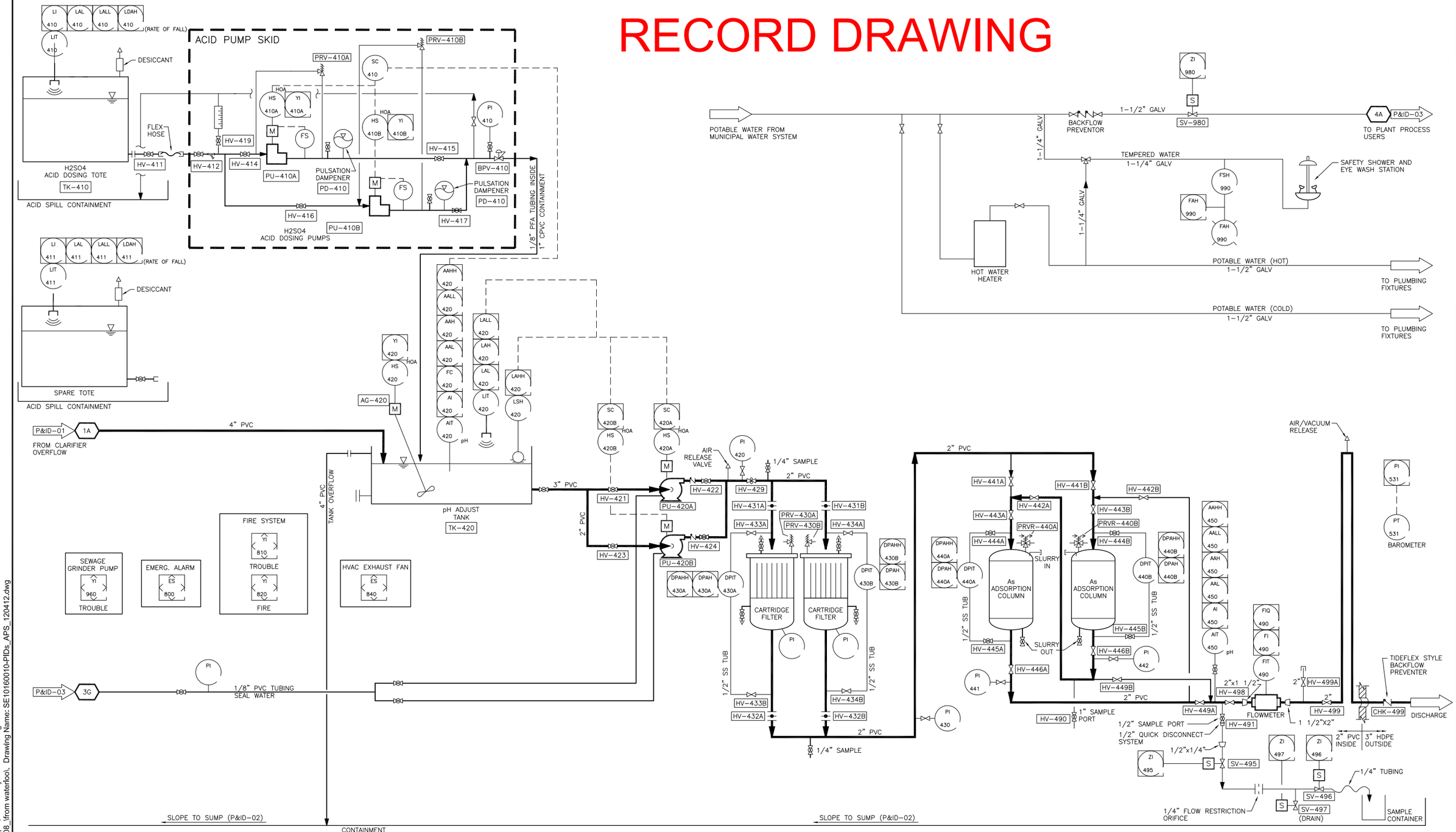
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ADDITIVES

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PIERCE COUNTY, WASHINGTON

DATE: 12/07/12
PROJECT NO.: SE10160010

DRAWING
P&ID-03

RECORD DRAWING



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REFERENCES:
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DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	MATERIAL CHANGE	SEPT 8	LMM
7	CONTROL CHANGES	DEC 20	
8	CONTROL CHANGES (2)	JAN 10	BE
9	AS-BUILT	DEC 7	BE

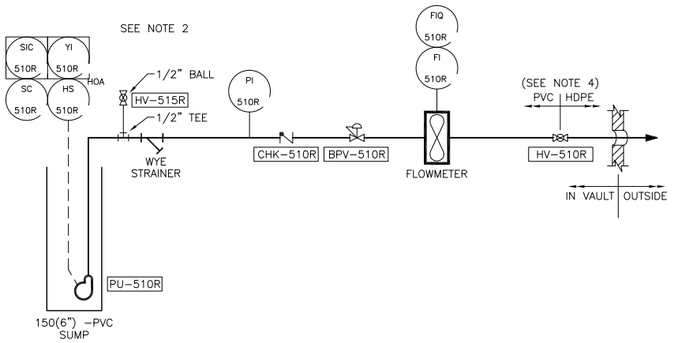
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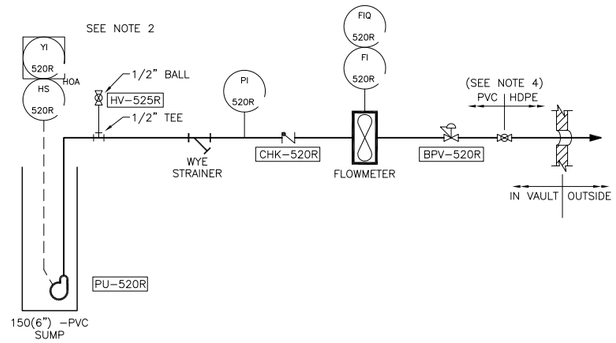
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EFFLUENT POLISHING

B&L WOODWASTE SITE
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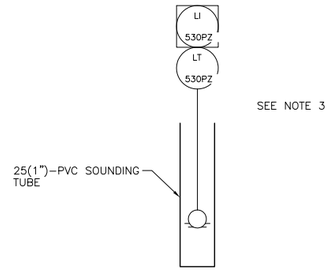
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PROJECT NO.: SE10160010
DRAWING P&ID-04



LANDFILL WELLS DETAIL (TYP OF 11)



AG. FIELD AND WETLAND WELLS DETAIL (TYP OF 10)



PIEZOMETER DETAIL (TYP OF 16)

STATION	COORDS	TERMINATION
R-01	1186310.409 702291.5027 inside	KIOSK 3
R-02	1186467.023 702042.2185 inside	KIOSK 2
R-03	1186327.49 702003.56 inside	KIOSK 2
R-04	1186152.52 702096.41 inside	KIOSK 3
R-05	1186200.63 701953.59 inside	KIOSK 2
R-06	1186293.15 701769.26 inside	KIOSK 2
R-07	1185852.906 701693.703 inside	KIOSK 1
R-08	1185907.93 701803.16 inside	KIOSK 1
R-09	1185776.662 701873.0772 inside	KIOSK 1
R-10	1185842.089 702081.232 inside	KIOSK 1
R-11	1186121.23 702223.96 inside	KIOSK 3

TABLE OF LANDFILL WELLS

STATION	COORDS	TERMINATION
R-12	1186517.737 702182.2116 outside-east	KIOSK 4
R-13	1186579.559 702070.3399 outside-east	KIOSK 4
R-14	1185679.036 702073.3376 outside-west	KIOSK 5
R-15	1185617.392 702077.515 outside-west	KIOSK 5
R-16	1186011.284 702345.452 outside-north	KIOSK 5
R-17	1186126.763 702394.4934 outside-north	KIOSK 5
R-18	1186032.526 702468.6627 outside-north	KIOSK 5
R-19	1185911.289 702509.2755 outside-north	KIOSK 5
R-20	1185980.764 702595.2624 outside-north	KIOSK 5
R-21	1185984.041 702673.8679 outside-north	KIOSK 5

TABLE OF AG. FIELD AND WETLAND WELLS

STATION	COORDS	TERMINATION
PZ-1a	1186183.28 702353.14 perimeter	KIOSK 3
PZ-1b	1186191.53 702329.08 perimeter	KIOSK 3
PZ-2a	1185886.44 702209.88 perimeter	KIOSK 1
PZ-2b	1185897.84 702186.89 perimeter	KIOSK 1
PZ-3a	1185733.73 701976.73 perimeter	KIOSK 1
PZ-3b	1185753.71 701976.05 perimeter	KIOSK 1
PZ-4a	1185731.96 701728.73 perimeter	KIOSK 1
PZ-4b	1185755.21 701726.18 perimeter	KIOSK 1
PZ-4c	1185754.96 701732.98 perimeter	KIOSK 1
PZ-5a	1186002.81 701621.79 perimeter	KIOSK 1
PZ-5b	1186005.46 701641.88 perimeter	KIOSK 1
PZ-5c	1186000.96 701642.36 perimeter	KIOSK 1
PZ-6a	1186379.5 701620.95 perimeter	DIRECT
PZ-6b	1186377.84 701640.57 perimeter	DIRECT
PZ-7a	1186595.69 701831.05 perimeter	DIRECT
PZ-7b	1186578.05 701835.09 perimeter	DIRECT
PZ-8a	1186513.106 702097.0787 perimeter	KIOSK 4
PZ-8b	1186495.24 702090.37 perimeter	KIOSK 4
PZ-8c	1186496.75 702085.74 perimeter	KIOSK 4

TABLE OF PIEZOMETERS

RECORD DRAWING

NOTES:

1. WELL COORDINATES EXPRESSED IN WASHINGTON STATE PLANE COORDINATE SYSTEM. DATUM CITATION IN LOWER LEFT.
2. "R" = STATION NUMBER FOR EACH WELL
3. "PZ" = STATION NUMBER FOR EACH PIEZOMETER
4. INSIDE VAULT USE SCH 80 PVC, OUTSIDE VAULT USE SDR11 HDPE R2, R7, R9 ARE 1.5", ALL OTHERS ARE 1"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
4	ISSUED FOR TENDER	MAY 26	LDV
5	ISSUED FOR CONSTRUCTION	JLY 26	LDV
6	CONTROL CHANGES	DEC 20	
7	CONTROL CHANGES (2)	JAN 10	BE
8	AS-BUILT	DEC 7	BE

DRAWN JR
DESIGNED LDV
CHECKED GP
REVIEWED WJM/LMM

AMEC
Environment & Infrastructure, Inc.
600 University Street
Suite 600
Seattle, Washington 98101

PROCESS FLOW AND INSTRUMENTATION
EXTRACTION AND MONITORING WELLS

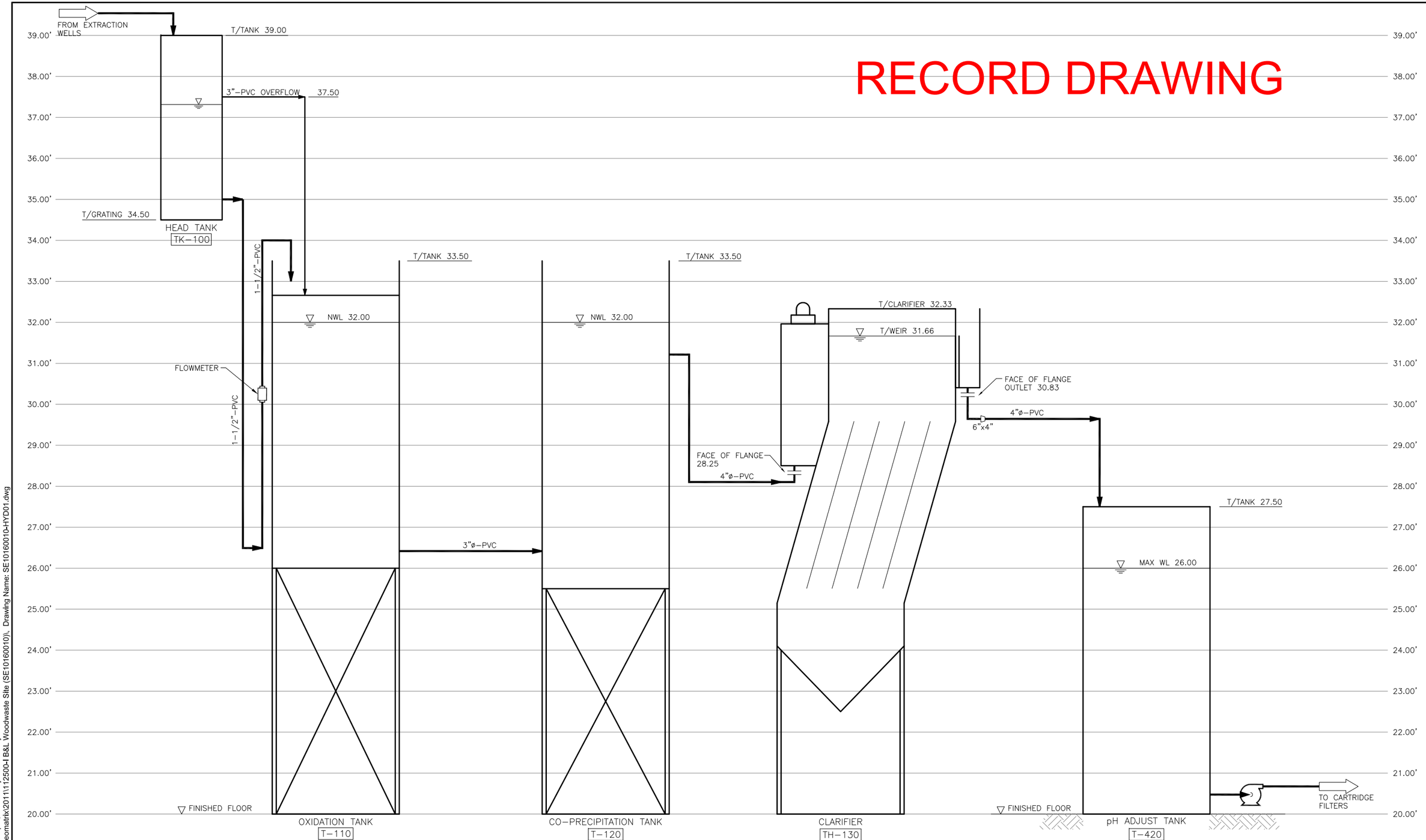
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 12/07/12
PROJECT NO.: SE10160010

DRAWING
P&ID-05

Plot Date: 12/07/12 - 2:13pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\0008_\from waterloo\, Drawing Name: SE10160010-PIDs_APS_120412.dwg

RECORD DRAWING



Plot Date: 05/25/11 - 12:10pm. Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\. Drawing Name: SE10160010-HYD01.dwg

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR REVIEW	FEB 25	WJM
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

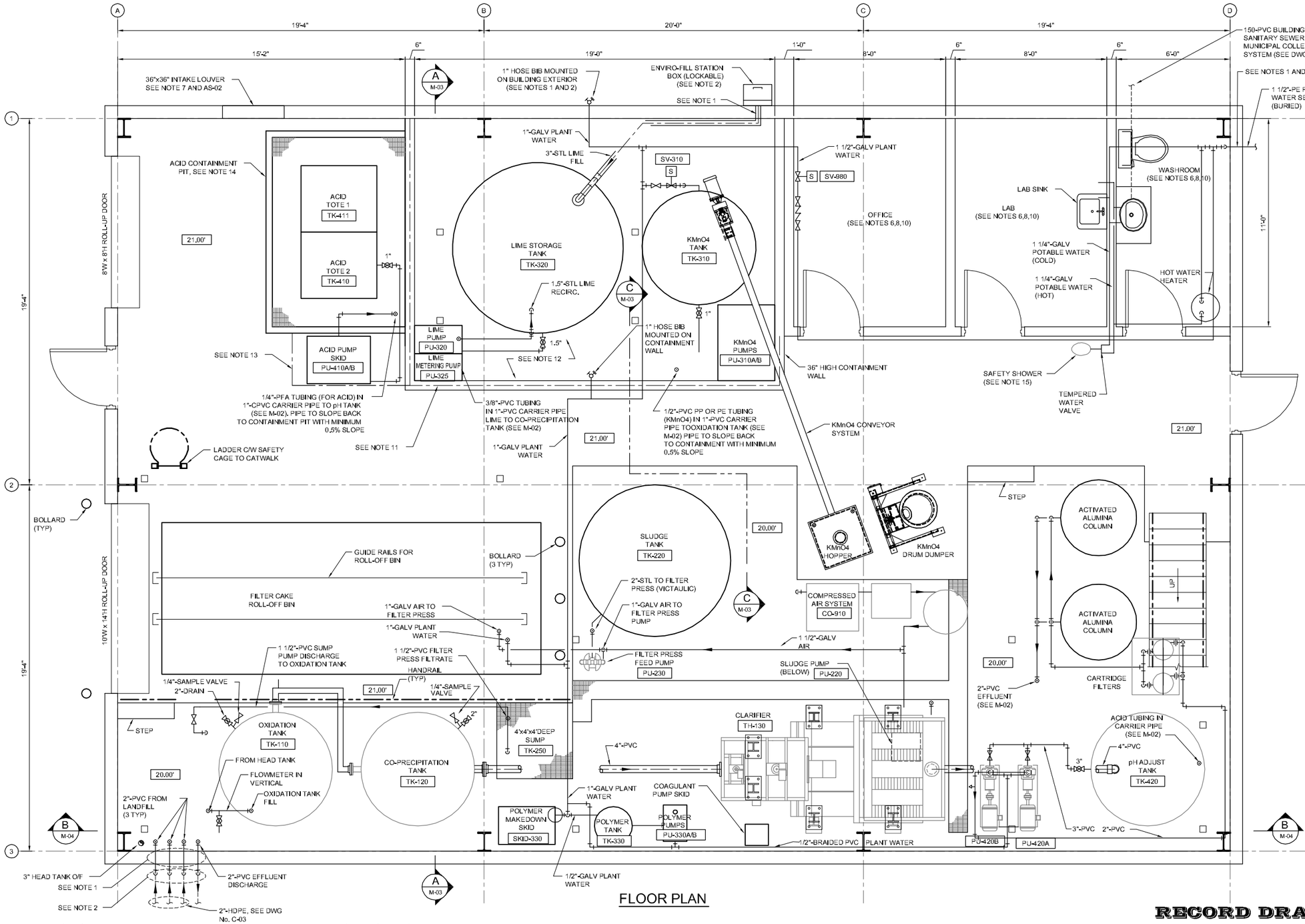
AMEC Geomatrix

GROUNDWATER TREATMENT PLANT HYDRAULIC PROFILE

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/25/11
PROJECT NO.: SE10160010

DRAWING
HYD–01



FLOOR PLAN

NOTES:

1. ALL PROCESS PIPING PENETRATIONS ARE TO PASS THROUGH THE BUILDING WALL EXCEPT THE SANITARY SEWER OUTLET. SUPPLY AND INSTALL FLEXIBLE CONNECTIONS CAPABLE OF PROVIDING MINIMUM OF 6-INCHES OF LINEAR EXPANSION AND CONTRACTION IN EACH LINE.
2. SUPPLY AND INSTALL SUITABLE FREEZE PROTECTION FOR ALL EXTERIOR EXPOSED PROCESS PIPING. EXTEND THERMAL INSULATION AND ELECTRIC HEAT TRACING MINIMUM 12-INCHES BELOW FINISHED GRADE ON BURIED PIPING.
3. LOCATE A MECHANICAL JOINT (GROOVED OR FLANGED) WITHIN 12-INCHES OF EACH CHANGE OF DIRECTION IN LIME SLURRY PIPING, SLUDGE PIPING, AND FILTER FEED PIPING TO ALLOW EASY DISASSEMBLY FOR CLEAN-OUT.
4. ENSURE ALL VALVES AND FIELD INSTRUMENTS CAN BE ACCESSED SAFELY FROM FINISHED FLOOR OR PLATFORM WITH GRATING.
5. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 60°F INSIDE BUILDING MAIN TREATMENT AREA.
6. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 70°F INSIDE OFFICE, LAB AND WASHROOM. LOCATE ROOM THERMOSTATS ON INTERIOR WALL.
7. SUPPLY AND INSTALL MECHANICAL VENTILATION SYSTEM SIZED TO PROVIDE 6 COMPLETE AIR CHANGES PER HOUR OF THE BUILDING MAIN TREATMENT AREA. SYSTEM TO INCLUDE STORM PROOF INTAKE LOUVRE, MANUAL INTAKE DAMPER, EXHAUST FAN, BACKDRAFT EXHAUST DAMPER AND EXHAUST LOUVRE. REFER TO AS-02 AND AS-03 FOR PRELIMINARY SIZE AND LOCATION.
8. SUPPLY AND INSTALL MECHANICAL VENTILATION SIZED TO PROVIDE 12 COMPLETE AIR CHANGES PER HOUR IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. PROVIDE LOCAL WALL SWITCH FOR ON/OFF OPERATION OF EXHAUST FAN. REFER TO AS-02 FOR PRELIMINARY SIZE AND LOCATION.
9. SUPPLY AND INSTALL CEILING OR WALL MOUNTED LIGHT FIXTURES IN MAIN BUILDING TREATMENT AREA. LOCATE LIGHT SWITCHES ON INTERIOR WALLS AT EACH MAN DOOR.
10. SUPPLY AND INSTALL CEILING MOUNTED LIGHT FIXTURES IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. LOCATE LIGHT SWITCH ON WALL INSIDE EACH ROOM ADJACENT TO MAN DOOR.
11. SUPPLY AND INSTALL TRANSPARENT PROTECTIVE BARRIER AND SUPPORT STRUCTURE MOUNTED ON TOP OF CONCRETE CONTAINMENT WALL EXTENDING TO 10 ft ABOVE FINISHED FLOOR LEVEL. PROVIDE REMOVABLE PANELS TO ALLOW QUICK OPERATOR ACCESS TO LIME SLURRY PUMP AND KMnO4 FEED PUMPS.
12. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING TO EXPOSED FLOOR AND WALL SURFACES INSIDE THE CONTAINMENT AREA.
13. SUPPLY AND INSTALL REMOVABLE PVC CURTAIN WITH CORROSION RESISTANT SUPPORT FRAME AROUND ACID FEED SYSTEM. PROTECTIVE CURTAIN TO EXTEND FROM FINISHED FLOOR TO 6ft 6-INCHES ABOVE FINISHED FLOOR.
14. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING OR LINER IN CONTAINMENT SUMP UNDER ACID STORAGE TOTES. MATERIAL MUST BE SUITABLE FOR IMMERSION IN SULPHURIC ACID RANGING FROM 30 TO 95 wt%.
15. SUPPLY AND INSTALL CORROSION RESISTANT EMERGENCY EYEWASH AND SAFETY SHOWER. SUPPLY AND INSTALL TEMPERED WATER VALVE TO BLEND HOT WATER AND COLD WATER TO PRODUCE TEMPERED WATER SUPPLY TO SAFETY SHOWER AND PRESSURE SUSTAINING VALVE IN BUILDING POTABLE WATER SUPPLY DOWNSTREAM OF COLD WATER TAKEOFF FEEDING THE SAFETY SHOWER.

RECORD DRAWING

SCALE BAR 0 2'-6" 5'-0" 7'-6"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP--NAD83--S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD

DRAWN PRV
DESIGNED BE
CHECKED GP
REVIEWED WJM

FLOYD | SNIDER

amec

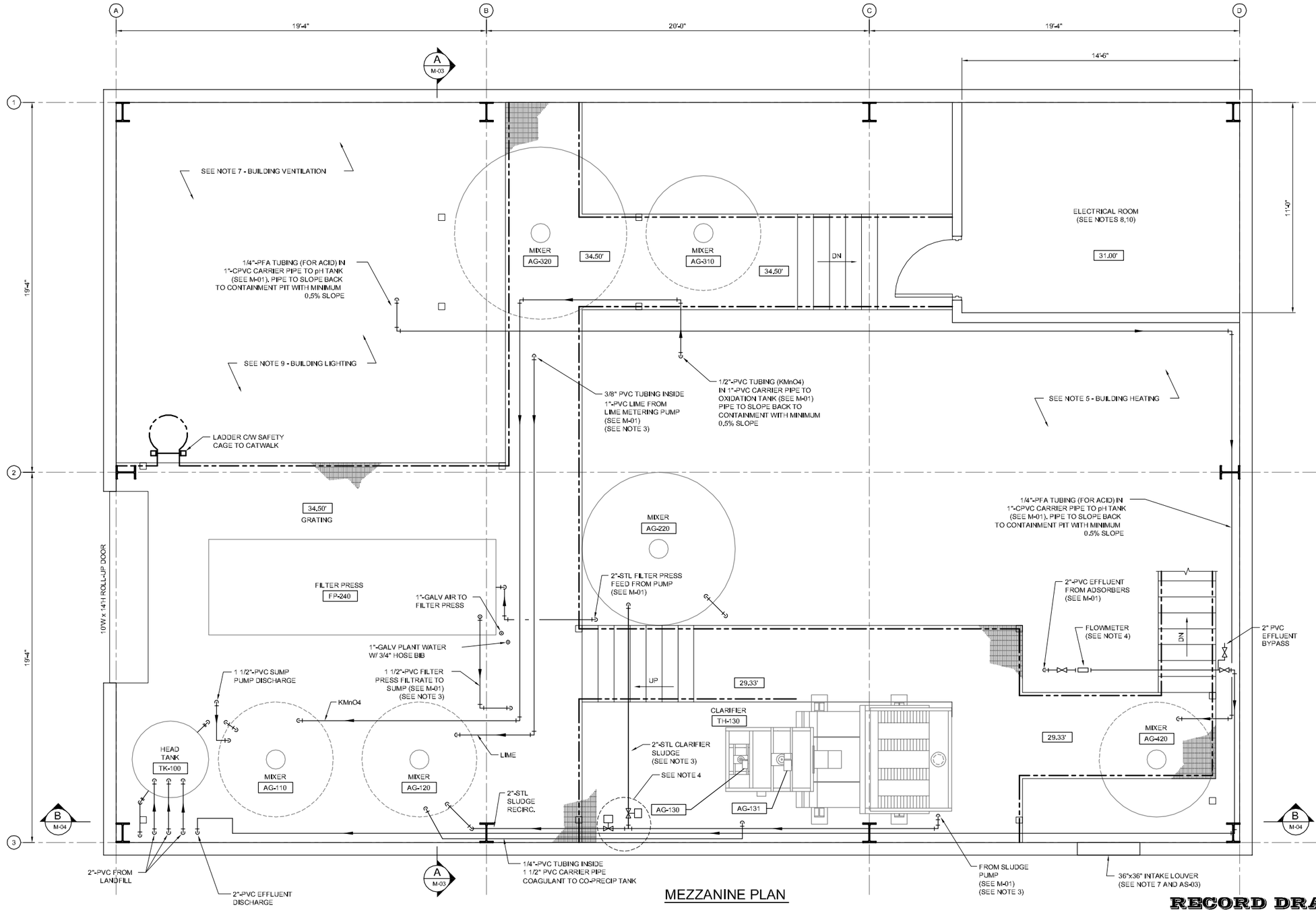
AMEC Environment & Infrastucture
600 University Street
Suite 600
Seattle, Washington 98101

GROUNDWATER TREATMENT PLANT MECHANICAL LAYOUT - FLOOR PLAN

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/24/13
PROJECT NO.: SE10160010
DRAWING M-01

Plot Date: 05/24/13 - 4:19pm, Plotted by: mike.stenberg
Drawing Path: S:\13488\009_AsBuilt\CAD\, Drawing Name: SE10160010-MECH As Built Rev01_052413.dwg



MEZZANINE PLAN

NOTES:

1. ALL PROCESS PIPING PENETRATIONS ARE TO PASS THROUGH THE BUILDING WALL EXCEPT THE SANITARY SEWER OUTLET. SUPPLY AND INSTALL FLEXIBLE CONNECTIONS CAPABLE OF PROVIDING MINIMUM OF 6-INCHES OF LINEAR EXPANSION AND CONTRACTION IN EACH LINE.
2. SUPPLY AND INSTALL SUITABLE FREEZE PROTECTION FOR ALL EXTERIOR EXPOSED PROCESS PIPING. EXTEND THERMAL INSULATION AND ELECTRIC HEAT TRACING MINIMUM 12-INCHES BELOW FINISHED GRADE ON BURIED PIPING.
3. LOCATE A MECHANICAL JOINT (GROOVED OR FLANGED) WITHIN 12-INCHES OF EACH CHANGE OF DIRECTION IN LIME SLURRY PIPING, SLUDGE PIPING, AND FILTER FEED PIPING TO ALLOW EASY DISASSEMBLY FOR CLEAN-OUT.
4. ENSURE ALL VALVES AND FIELD INSTRUMENTS CAN BE ACCESSED SAFELY FROM FINISHED FLOOR OR PLATFORM WITH GRATING.
5. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 60°F INSIDE BUILDING MAIN TREATMENT AREA.
6. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 70°F INSIDE OFFICE, LAB AND WASHROOM. LOCATE ROOM THERMOSTATS ON INTERIOR WALL.
7. SUPPLY AND INSTALL MECHANICAL VENTILATION SYSTEM SIZED TO PROVIDE 6 COMPLETE AIR CHANGES PER HOUR OF THE BUILDING MAIN TREATMENT AREA. SYSTEM TO INCLUDE STORM PROOF INTAKE LOUVRE, MANUAL INTAKE DAMPER, EXHAUST FAN, BACKDRAFT EXHAUST DAMPER AND EXHAUST LOUVRE. REFER TO AS-02 AND AS-03 FOR PRELIMINARY SIZE AND LOCATION.
8. SUPPLY AND INSTALL MECHANICAL VENTILATION SIZED TO PROVIDE 12 COMPLETE AIR CHANGES PER HOUR IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. PROVIDE LOCAL WALL SWITCH FOR ON/OFF OPERATION OF EXHAUST FAN. REFER TO AS-02 FOR PRELIMINARY SIZE AND LOCATION.
9. SUPPLY AND INSTALL CEILING OR WALL MOUNTED LIGHT FIXTURES IN MAIN BUILDING TREATMENT AREA. LOCATE LIGHT SWITCHES ON INTERIOR WALLS AT EACH MAN DOOR.
10. SUPPLY AND INSTALL CEILING MOUNTED LIGHT FIXTURES IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. LOCATE LIGHT SWITCH ON WALL INSIDE EACH ROOM ADJACENT TO MAN DOOR.
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12. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING TO EXPOSED FLOOR AND WALL SURFACES INSIDE THE CONTAINMENT AREA.
13. SUPPLY AND INSTALL REMOVABLE PVC CURTAIN WITH CORROSION RESISTANT SUPPORT FRAME AROUND ACID FEED SYSTEM. PROTECTIVE CURTAIN TO EXTEND FROM FINISHED FLOOR TO 6-ft 6-INCHES ABOVE FINISHED FLOOR.
14. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING OR LINER IN CONTAINMENT SUMP UNDER ACID STORAGE TOTES. MATERIAL MUST BE SUITABLE FOR IMMERSION IN SULPHURIC ACID RANGING FROM 30 TO 95 wt%.
15. SUPPLY AND INSTALL CORROSION RESISTANT EMERGENCY EYEWASH AND SAFETY SHOWER. SUPPLY AND INSTALL TEMPERED WATER VALVE TO BLEND HOT WATER AND COLD WATER TO PRODUCE TEMPERED WATER SUPPLY TO SAFETY SHOWER AND PRESSURE SUSTAINING VALVE IN BUILDING POTABLE WATER SUPPLY DOWNSTREAM OF COLD WATER TAKEOFF FEEDING THE SAFETY SHOWER.

SCALE BAR
0 2'-6" 5'-0" 7'-6"

RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP--NAD83--S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD

DRAWN PRV
DESIGNED BE
CHECKED GP
REVIEWED WJM

FLOYD | SNIDER

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AMEC Environment & Infrastucture
600 University Street
Suite 600
Seattle, Washington 98101

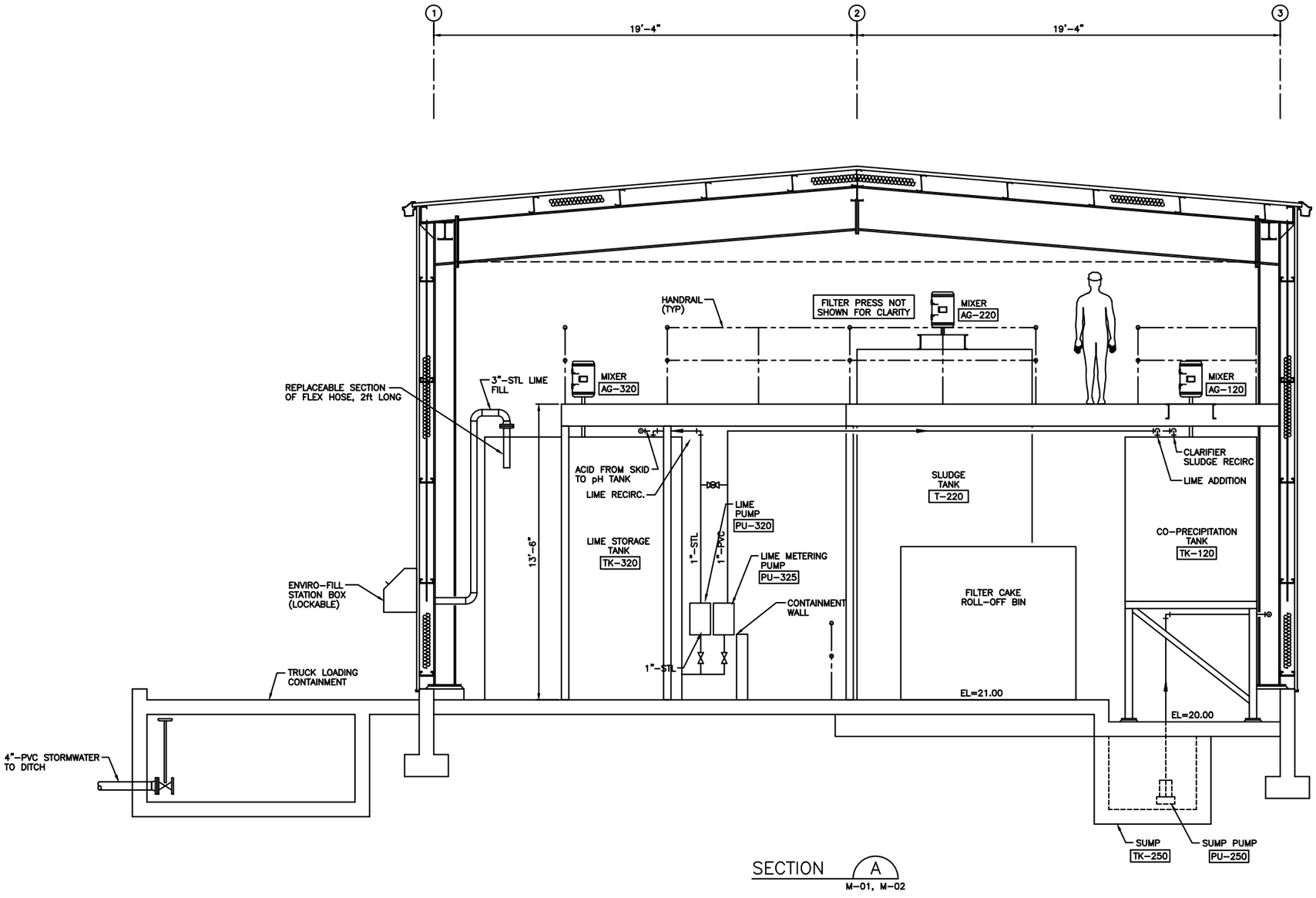
GROUNDWATER TREATMENT PLANT MECHANICAL LAYOUT - MEZZANINE PLAN

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/24/13
PROJECT NO.: SE10160010
DRAWING M–02

Plot Date: 05/24/13 - 4:18pm, Plotted by: mike.stenberg
Drawing Path: S:\13488\009_AsBuilt\CAD\, Drawing Name: SE10160010-MECH As Built Rev01_052413.dwg

RECORD DRAWING



SECTION A
M-01, M-02

SCALE BAR
0 2'-6" 5'-0" 7'-6"

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	-
	2	ISSUED FOR TENDER	05/20/11	WJM
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET	3	TRANSMITTED TO CONTRACTOR	JLY 13	-

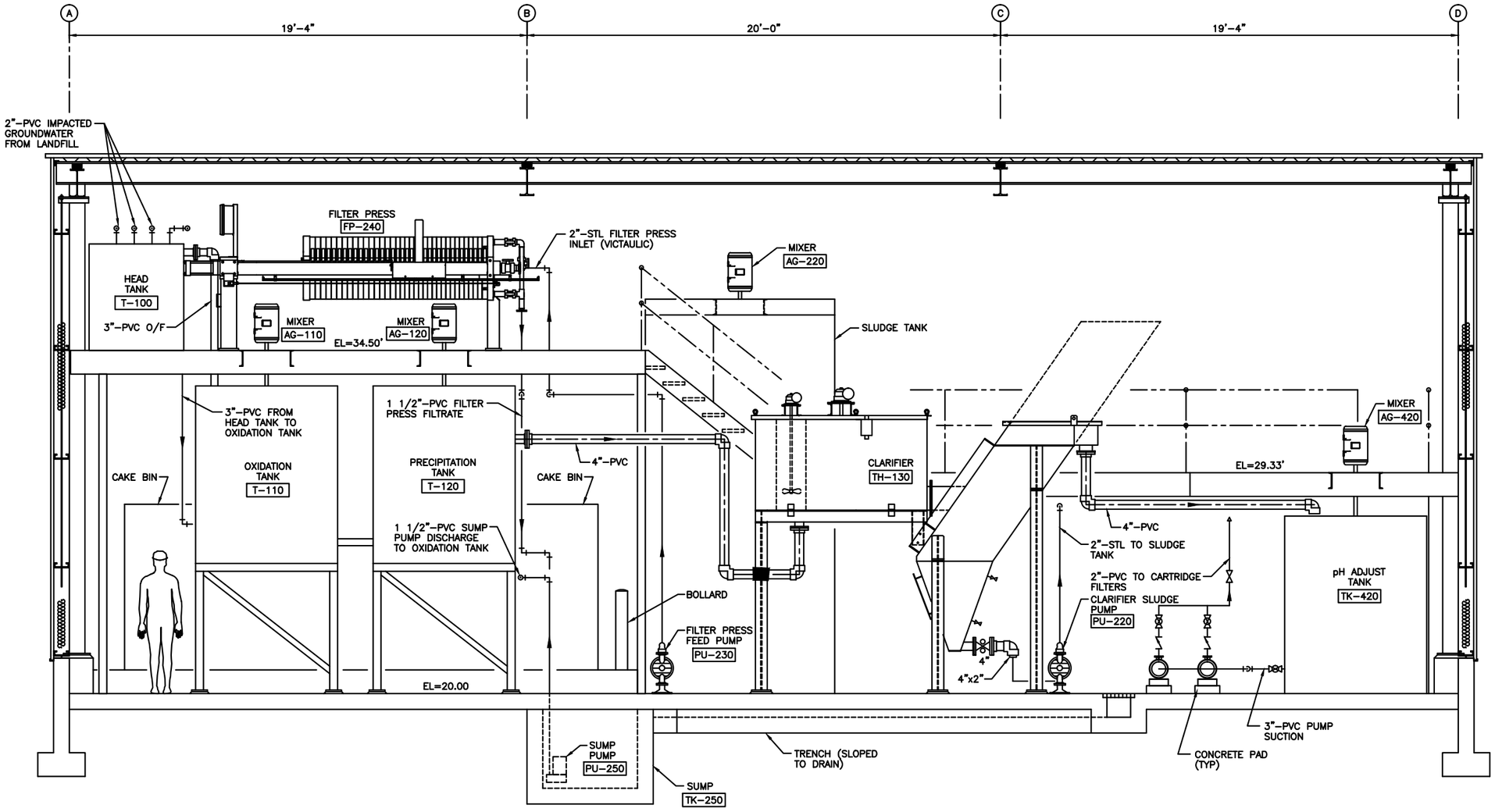
DRAWN PRV
DESIGNED BE
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

GROUNDWATER TREATMENT PLANT
MECHANICAL LAYOUT - SECTION-A

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE:
PROJECT NO.: SE10160010
DRAWING M-03



SECTION B
M-01, M-02

RECORD DRAWING

SCALE BAR
0 2'-6" 5'-0" 7'-6"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	-
2	ISSUED FOR TENDER	05/20/11	WJM
3	TRANSMITTED TO CONTRACTOR	JLY 13	-

DRAWN PRV
DESIGNED BE
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

GROUNDWATER TREATMENT PLANT
MECHANICAL LAYOUT - SECTION-B

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE:
PROJECT NO.: SE10160010
DRAWING M-04

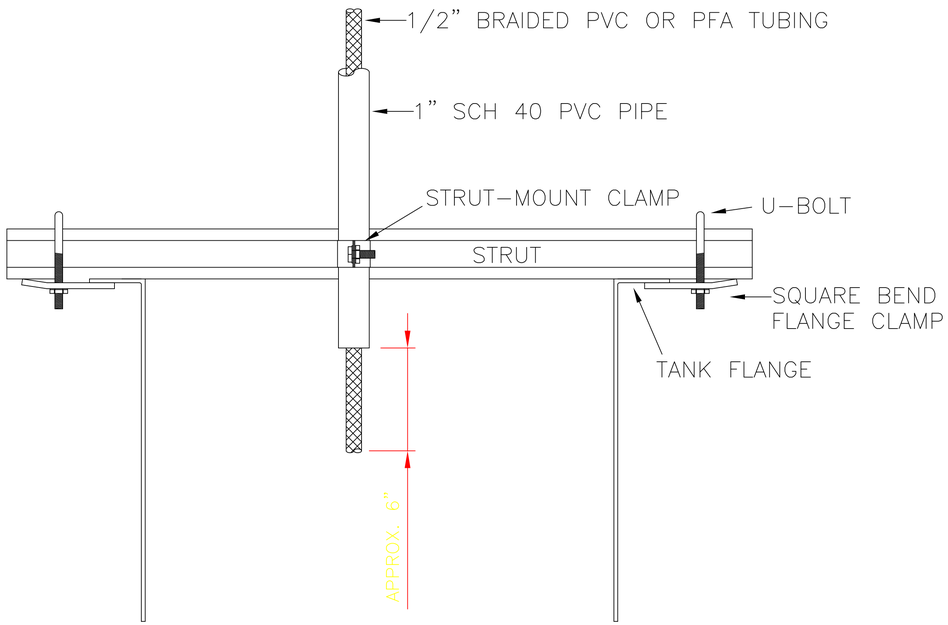
INSTALL PIPE SUPPORTS AT CHANGES IN DIRECTION AND AT SPECIFIED INTERVALS IN STRAIGHT RUNS:

PIPE SIZE AND MATERIAL	SUPPORT INTERVAL, FT.
1" PVC	3.5
1.5" PVC	4.5
2" PVC	5
4" PVC	6.5
1" CS	7
2" CS	10
3" CS	14
1" GALV	7

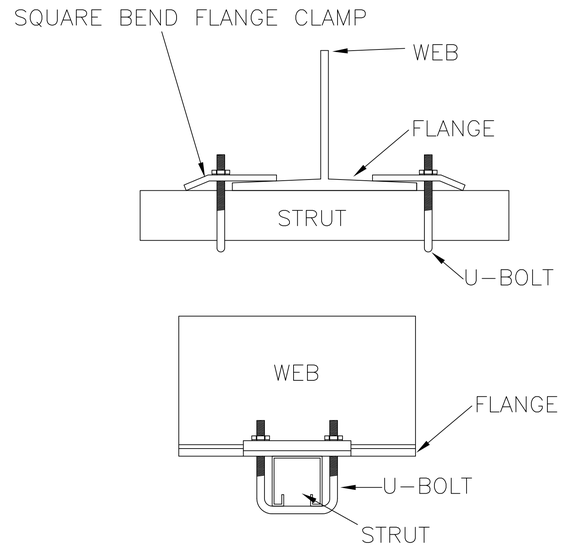
NOTES:

1. ALL 1/2" BRAIDED PVC LINES WILL BE INSTALLED INSIDE 1" PVC CONDUIT. SEE TABLE FOR SUPPORT INTERVALS FOR 1" PVC. ALL SECTIONS OF BRAIDED PVC TUBING WILL BE CONTINUOUS.
2. ALL 1/2" PFA LINES WILL BE INSTALLED INSIDE 1" PVC CONTAINMENT. SEE TABLE FOR SUPPORT INTERVALS FOR 1" PVC. ALL SECTIONS OF PFA TUBING WILL BE CONTINUOUS.
3. LONG RADIUS BENDS WILL BE USED IN 1" PVC LINES SERVING AS CONDUIT FOR 1/2" BRAIDED VINYL TUBING.
4. LONG RADIUS BENDS WILL BE USED IN 1" PVC LINES SERVING AS CONTAINMENT FOR 1/2" PFA TUBING.
5. LONG RADIUS BENDS WILL BE USED IN LINES CARRYING LIME SLURRY, CLARIFIER SLUDGE, OR FILTER PRESS FEED.

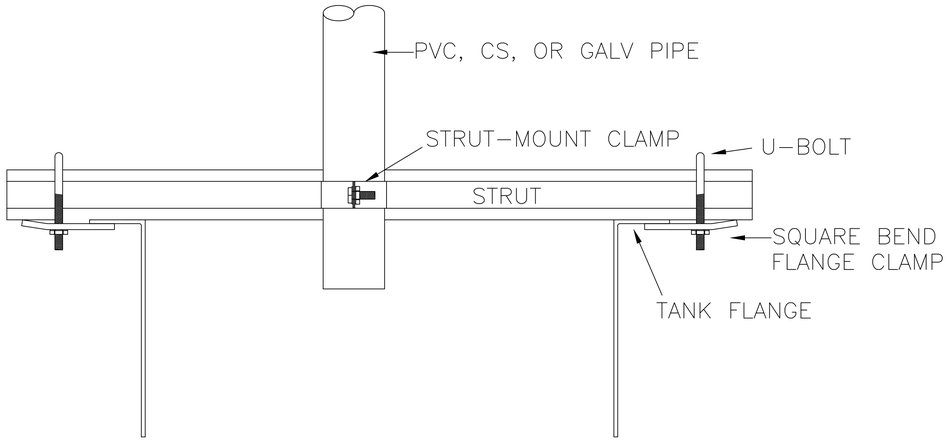
TYPICAL CONNECTION TO OPEN TOP TANK:
FLEXIBLE LINE INSIDE CONTAINMENT OR CONDUIT



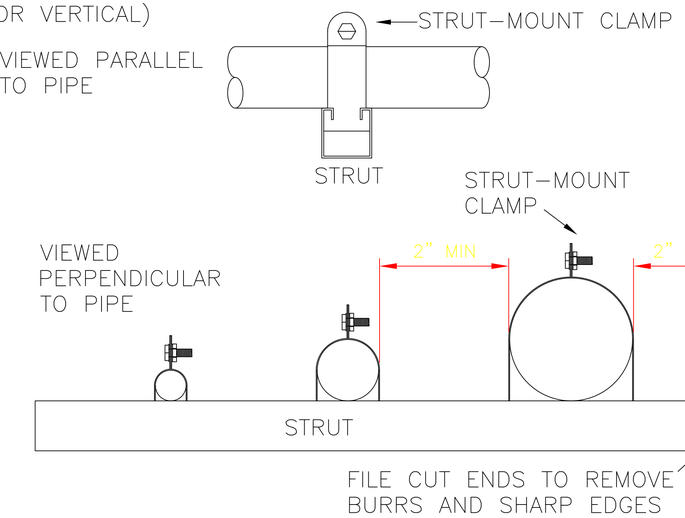
TYPICAL STRUT ATTACHMENT TO I-BEAM



TYPICAL CONNECTION TO OPEN TOP TANK:
PVC, CS, OR GALV PIPE



TYPICAL SURFACE MOUNT (HORIZONTAL OR VERTICAL)



RECORD DRAWING

NOT TO SCALE

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	10/26/11	-
2	ISSUED FOR TENDER	--	--
3	TRANSMITTED TO CONTRACTOR	--	-

DRAWN SMD
DESIGNED SMD
CHECKED --
REVIEWED --

Clearcreek CONTRACTORS Environmental/Civil

JOSEPH M. LUCIA STATE OF WASHINGTON C59741 REGISTERED PROFESSIONAL ENGINEER

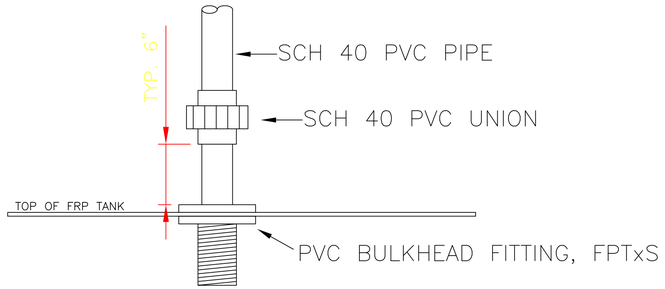
PIPING DETAILS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

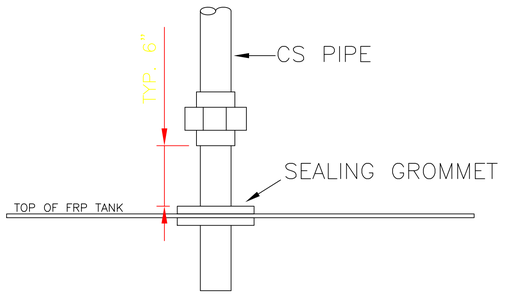
DATE:
PROJECT NO.: SE10160010

DRAWING
M-05

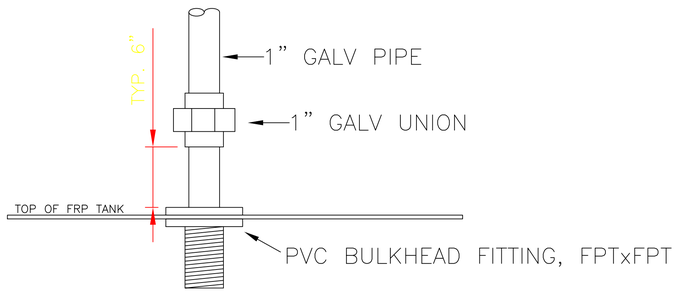
TYPICAL CONNECTION TO TOP OF FRP TANK: PVC PIPE



TYPICAL CONNECTION TO TOP OF FRP TANK: CS PIPE CARRYING LIME SLURRY OR CLARIFIER SLUDGE

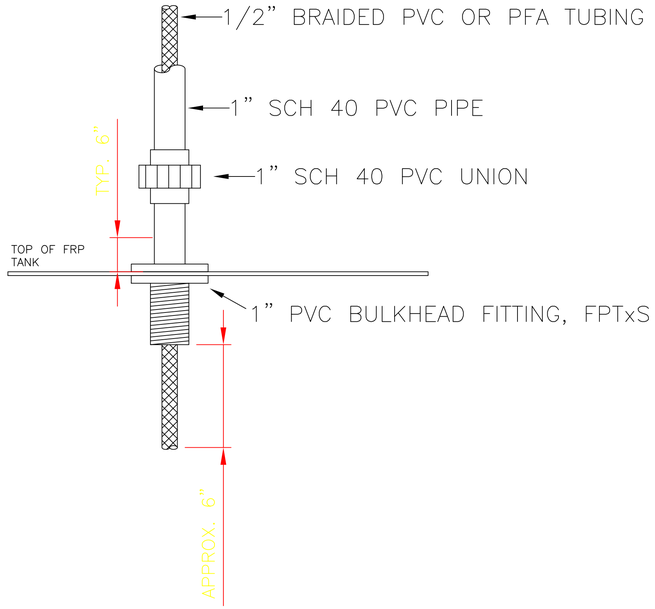


TYPICAL CONNECTION TO TOP OF FRP TANK: GALV PIPE CARRYING POTABLE WATER



NOT TO SCALE

TYPICAL FLEXIBLE LINE INSIDE CONTAINMENT CONDUIT WITH CONNECTION TO TOP OF FRP TANK



RECORD DRAWING

LINE SIZES AND MATERIALS

LINE NO.	FROM COMPONENT NO.	FROM COMPONENT DESECRIPTION	TO COMPONENT NO.	TO COMPONENT DESCRIPTION	LINE CONTENTS	LINE SIZE	LINE MATERIAL
1	TK-110	OXIDATION TANK	DRAIN	DRAIN	PROCESS WATER	2 IN.	PVC
2	TK-110	OXIDATION TANK	TK-120	CO-PRECIPITATION TANK	PROCESS WATER	3 IN.	PVC
3	PU-310A/B	KMnO4 DOSING PUMP	TK-110	OXIDATION TANK	KMnO4 SOLUTION	1/2 IN.	BRAIDED PVC
4	TK-100	HEAD TANK OVERFLOW	TK-110	OXIDATION TANK	PROCESS WATER	3 IN.	PVC
5	TK-100	HEAD TANK	TK-110	OXIDATION TANK	PROCESS WATER	1.5 IN.	PVC
6	TK-100	HEAD TANK	DRAIN	DRAIN	PROCESS WATER	2 IN.	PVC
7	LANDFILL A		TK-100	HEAD TANK	IMPACTED GROUNDWATER	2 IN.	PVC
8	LANDFILL B		TK-100	HEAD TANK	IMPACTED GROUNDWATER	2 IN.	PVC
9	WETLAND EAST BOUNDARY		TK-100	HEAD TANK	IMPACTED GROUNDWATER	2 IN.	PVC
10	TK-250	PROCESS SUMP	TK-100	HEAD TANK	PROCESS WATER	1.5 IN.	PVC
11	FV-120	3-WAY VALVE	TK-120	CO-PRECIPITATION TANK	LIME SLURRY	1 IN.	CS
12	P-220	SLUDGE PUMP	TK-120	CO-PRECIPITATION TANK	CLARIFIER SLUDGE	2 IN.	CS
13	TK-120	CO-PRECIPITATION TANK	TH-130	CLARIFIER	PROCESS WATER	4 IN.	PVC
14	TK-120	CO-PRECIPITATION TANK	DRAIN	DRAIN	PROCESS WATER	2 IN.	PVC
15	PU-320	PERISTALTIC PUMP	FV-120	3-WAY VALVE	LIME SLURRY	1 IN.	CS
16	FV-120	3-WAY VALVE	TK-320	LIME SLURRY DOSING SYSTEM	LIME SLURRY	1 IN.	CS
17	PU-330A/B	POLYMER DOSING PUMP	TH-130	CLARIFIER	POLYMER SOLUTION	1/2 IN.	BRAIDED PVC
18	TH-130	CLARIFIER	TK-420	pH ADJUST TANK	PROCESS WATER	4 IN.	PVC
19	TH-130	CLARIFIER	P-220	SLUDGE PUMP	CLARIFIER SLUDGE	2 IN.	CS
20	TK-910	ACCUMULATOR	P-220	SLUDGE PUMP	COMPRESSED AIR	1 IN.	GALV
21	P-220	SLUDGE PUMP	TK-220	SLUDGE TANK	CLARIFIER SLUDGE	2 IN.	CS
22	PU-330A/B	POLYMER DOSING PUMP	TK-220	SLUDGE TANK	POLYMER SOLUTION	1/2 IN.	BRAIDED PVC
23	TK-220	SLUDGE TANK	P-230	FILTER PRESS FEED PUMP	CLARIFIER SLUDGE	2 IN.	CS
24	TK-220	SLUDGE TANK	DRAIN	DRAIN	CLARIFIER SLUDGE	2 IN.	CS
25	TK-910	ACCUMULATOR	P-230	FILTER PRESS FEED PUMP	COMPRESSED AIR	1 IN.	GALV
26	P-230	FILTER PRESS FEED PUMP	FP-240	FILTER PRESS	FILTER PRESS FEED	2 IN.	CS
27	TK-910	ACCUMULATOR	FP-240	FILTER PRESS CORE BLOW	COMPRESSED AIR	1 IN.	GALV
28	FP-240	FILTER PRESS DRIP TRAY	TK-250	PROCESS SUMP	PROCESS WATER	1.5 IN.	PVC
29	FP-240	FILTER PRESS	TK-250	PROCESS SUMP	PROCESS WATER	1.5 IN.	PVC
30		BACKFLOW PREVENTER	TK-310	KMnO4 DOSING SYSTEM	POTABLE WATER	1 IN.	GALV
31	PU-310A/B	KMnO4 DOSING PUMP	TK-310	KMnO4 DOSING SYSTEM	KMnO4 SOLUTION	1/2 IN.	BRAIDED PVC
32	TK-310	KMnO4 DOSING SYSTEM	PU-310A/B	KMnO4 DOSING PUMP	KMnO4 SOLUTION	1/2 IN.	BRAIDED PVC
33	TK-310	KMnO4 DOSING SYSTEM	DRAIN	DRAIN	KMnO4 SOLUTION	1 IN.	PVC
34	TK-320	LIME SLURRY DOSING SYSTEM	PU-320	PERISTALTIC PUMP	LIME SLURRY	1 IN.	CS
35	TK-320	LIME SLURRY DOSING SYSTEM	DRAIN	DRAIN	LIME SLURRY	2 IN.	CS
36	SKID-330	POLYMER MAKE-DOWN SKID	TK-330	POLYMER DOSING SYSTEM	POLYMER SOLUTION	1/2 IN.	BRAIDED PVC
37		BACKFLOW PREVENTER	TK-330	POLYMER DOSING SYSTEM	POTABLE WATER	1 IN.	GALV
38	PU-330A/B	POLYMER DOSING PUMP	TK-330	POLYMER DOSING SYSTEM	POLYMER SOLUTION	1/2 IN.	BRAIDED PVC
39	TK-330	POLYMER DOSING SYSTEM	PU-330A/B	POLYMER DOSING PUMP	POLYMER SOLUTION	1/2 IN.	BRAIDED PVC
40	TK-330	POLYMER DOSING SYSTEM	DRAIN	DRAIN	POLYMER SOLUTION	2 IN.	PVC
41		POLYMER DRUMS	SKID-330	POLYMER MAKE-DOWN SKID	POLYMER SOLUTION	1/2 IN.	BRAIDED PVC
42		BACKFLOW PREVENTER	SKID-330	POLYMER MAKE-DOWN SKID	POTABLE WATER	1 IN.	GALV
43	PU-410A/B	ACID PUMP SKID	TK-410	ACID DOSING TOTE	ACID	1/2 IN.	PFA
44	TK-410	ACID DOSING TOTE	PU-410A/B	ACID PUMP SKID	ACID	1/2 IN.	PFA
45	PU-410A/B	ACID PUMP SKID	TK-420	pH ADJUST TANK	ACID	1/2 IN.	PFA
46	TK-420	pH ADJUST TANK	PU-420A/B	CENTRIFUGAL PUMPS	PROCESS WATER	2 IN.	PVC
47	TK-420	pH ADJUST TANK	DRAIN	DRAIN	PROCESS WATER	2 IN.	PVC
48	PU-420A/B	CENTRIFUGAL PUMPS		CARTRIDGE FILTER SKID	PROCESS WATER	2 IN.	PVC
49		CARTRIDGE FILTER SKID		As ADSORPTION SKID	PROCESS WATER	2 IN.	PVC
50		As ADSORPTION COLUMN		DISCHARGE	PROCESS WATER	2 IN.	PVC
51	TK-220	SLUDGE TANK	OVERFLOW	OVERFLOW	CLARIFIER SLUDGE	2 IN.	CS
52	TK-910	ACCUMULATOR	FP-240	FILTER PRESS CAKE BLOW IN	COMPRESSED AIR	1 IN.	GALV
53	TK-310	KMnO4 DOSING SYSTEM	OVERFLOW	OVERFLOW	KMnO4 SOLUTION	1 IN.	PVC
54		ENVIROBOX	TK-320	LIME SLURRY DOSING SYSTEM	LIME SLURRY	3 IN.	CS
55	TK-320	LIME SLURRY DOSING SYSTEM	OVERFLOW	OVERFLOW	LIME SLURRY	3 IN.	CS
56		BACKFLOW PREVENTER	TK-120	CO-PRECIPITATION TANK	POTABLE WATER	1 IN.	GALV



NOTES:
CS = SCHEDULE 40 CARBON STEEL
GALV = SCHEDULE 40 GALVANIZED STEEL
PFA = PERFLUOROAKLOXY
PVC = SCHEDULE 40 PVC UNLESS NOTED OTHERWISE

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	10/26/11	-
2	ISSUED FOR TENDER	--	--
3	TRANSMITTED TO CONTRACTOR	--	-

DRAWN SMD
DESIGNED SMD
CHECKED --
REVIEWED --

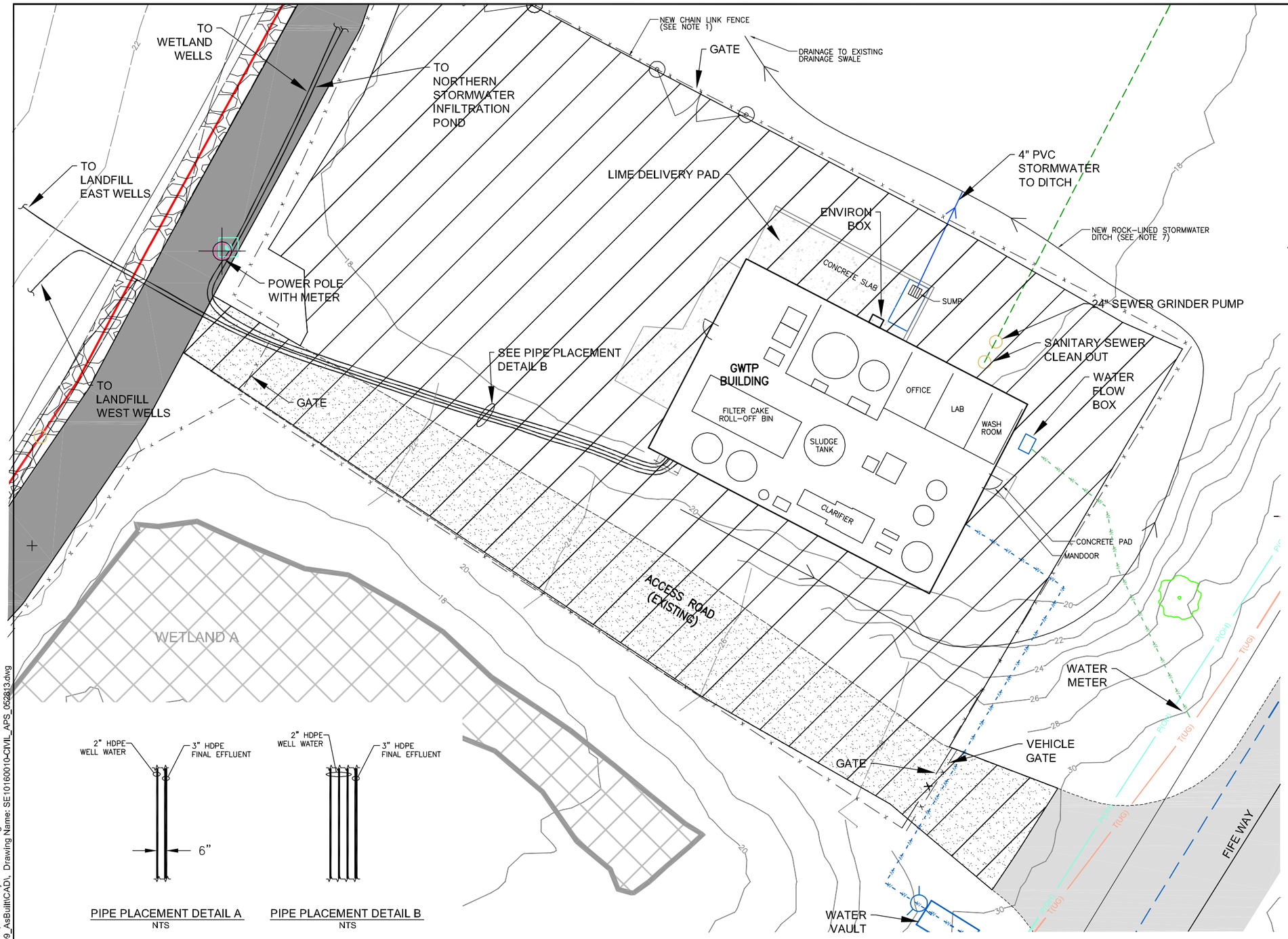
Clearcreek CONTRACTORS Environmental/Civil

PIPING DETAILS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE:
PROJECT NO.: SE10160010

DRAWING M-06



PIPE PLACEMENT DETAIL A
NTS

PIPE PLACEMENT DETAIL B
NTS

LEGEND:

- TAX PARCEL LINE
- EXISTING FENCE LINE
- WETLAND
- STORMWATER COLLECTION DITCH (EXISTING)
- 2" POTABLE WATER LINE
- 6" FIRE WATER LINE
- PERIMETER ROAD (EXISTING)
- HDPE PIPE
- SANITARY SEWER LINE
- DRAIN PIPE

NOTES:

1. NEW FENCE TO MATCH EXISTING.
2. SWINGING CHAIN LINK GATE, FULL WIDTH OF ACCESS ROAD, C/W LOCKING HARDWARE. HEIGHT TO MATCH EXISTING FENCE.
3. HATCHED AREA WILL BE USED AS ACCESS ROAD AND PARKING AREA AROUND BUILDING. SUPPLY AND PLACE 6-INCH THICK, UNIFORM LAYER OF CRUSHED SURFACING MATERIAL MEETING WSDOT 9-03.9(3) "CRUSHED SURFACING - TOP COURSE" WITHIN THE AREA INDICATED. SHAPE CRUSHED SURFACING TO REQUIRED CROWN ELEVATIONS AND CROSS-SLOPE GRADES TO PROMOTE POSITIVE DRAINAGE AWAY FROM BUILDING AREA (GENERALLY TO THE NORTH).
4. PIPING, CONDUIT, TRENCH, AND BACKFILL UNDER EXISING PERIMETER ROAD, ACCESS ROAD AND GRAVEL AREA AROUND BUILDING SHALL BE SUITABLE FOR HEAVY TRUCK TRAFFIC.
5. PIPING AND CONDUIT IS SHOWN TO ILLUSTRATE CONCEPT ONLY. FINAL SPACING AND LOCATION SHALL BE DETERMINED BY CONTRACTOR.
6. RAMMED AGGREGATE PIER FOUNDATIONS WILL BE CONSTRUCTED BY OTHERS TO STABILIZE SOIL BENEATH BUILDING. FINAL BUILDING SIZE, LOCATION, LAYOUT MUST BE SUITABLE FOR LOCATION OF THOSE EXISTING PIERS.
7. EXCAVATE DRAINAGE DITCH AT THE APPROXIMATE LOCATION INDICATED. SLOPE DITCH INVERT SUCH THAT POSITIVE DRAINAGE IS MAINTAINED IN THE DIRECTION SHOWN WITH DISCHARGE POINT LOCATED AS SHOWN. LINE DITCH WITH 2- TO 4-INCH DIAMETER QUARRY SPALLS TO ARMOR DITCH SIDEWALLS.
8. CONTRACTOR TO PROVIDE ADDITIONAL FILL TO COMPENSATE FOR MAXIMUM 6 INCHES OF SETTLEMENT IN HATCHED AREA OUTSIDE OF BUILDING, BEFORE PLACING CRUSHED ROCK SURFACING. UTILIZE RECOVERED FILL FROM EXCAVATION ACTIVITIES FOR BUILDING FOUNDATION ETC WHERE POSSIBLE. PROVIDE IMPORTED MATERIAL TO MATCH EXISTING FILL (WSDOT 9-03.14(2) "SELECT BORROW") WHERE NECESSARY.
9. WHERE NATIVE SOIL IS LESS THAN 2 FT BELOW ANY SUMPS, FOOTINGS, OR OTHER NEW STRUCTURES, OVER EXCAVATE BY A MINIMUM OF 2 FEET AND PLACE AND COMPACT FILL IN SUITABLE LIFTS. FILL MATERIAL SHALL MEET WSDOT 9-03.14(2) "SELECT BORROW". UTILIZE RECOVERED FILL FROM EXCAVATION WHERE POSSIBLE.
10. PROVIDE SUITABLE YARD LIGHTING ABOVE EACH BUILDING DOOR AND FOR PARKING AREA WEST OF BUILDING.
11. TIE BUILDING ROOF GUTTERS AND DOWNSPOUTS INTO NEW STORMWATER DRAINAGE DITCH.

PIPING LOCATIONS BASED ON SURVEY AND CONTRACTOR MARKUPS.

SCALE BAR (1" = 20'-0")

0 20'-0" 40'-0" 60'-0"

RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1			
2			
3			
4			

DRAWN
DESIGNED
CHECKED
REVIEWED

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AMEC Environment & Infrastructure
600 University Street
Suite 600
Seattle, Washington 98101

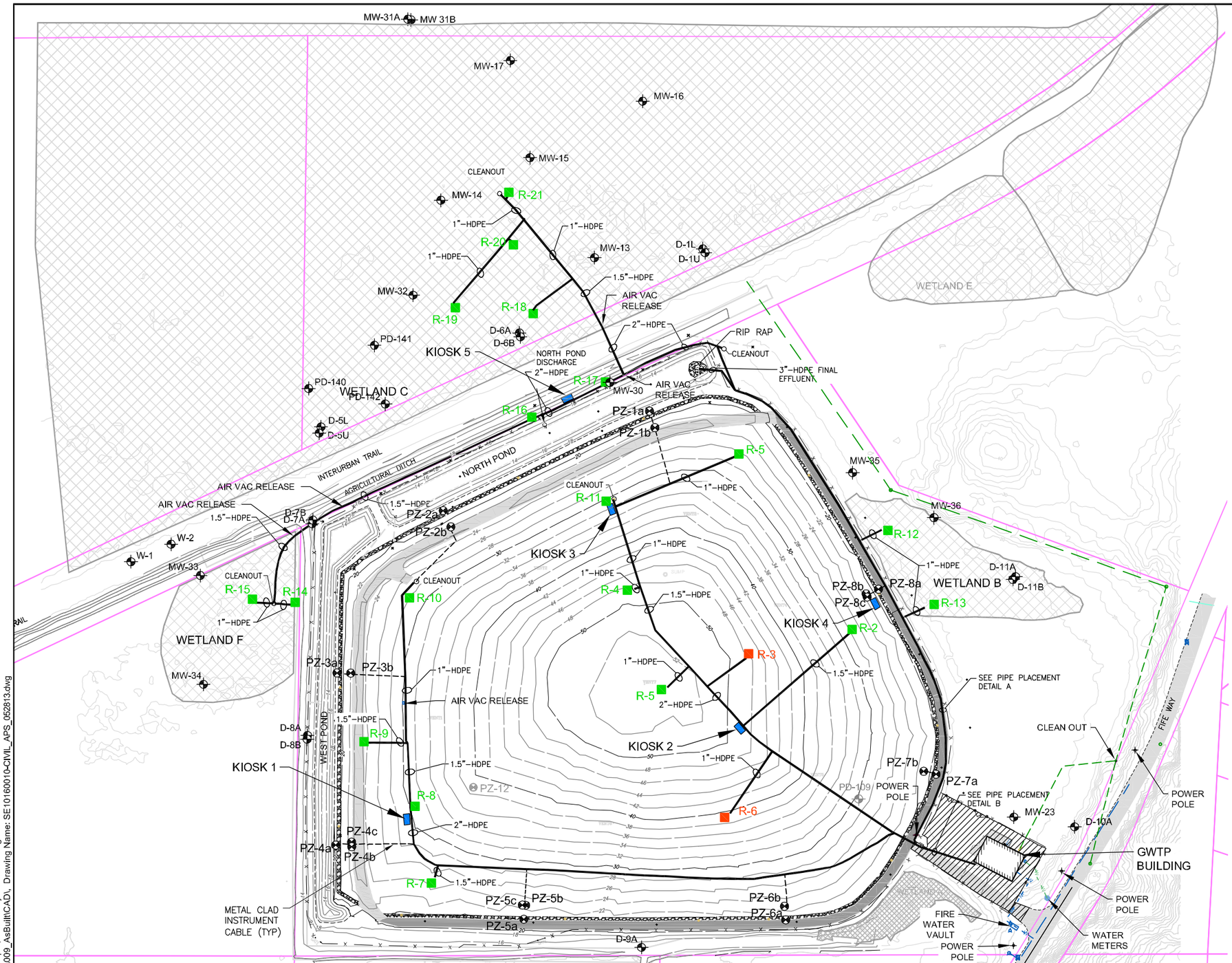
GROUNDWATER TREATMENT PLANT PARTIAL SITE PLAN

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/28/13
PROJECT NO.: SE10160010

DRAWING C-03

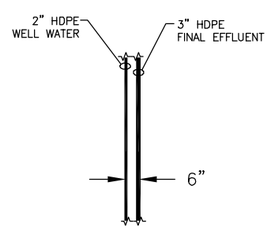
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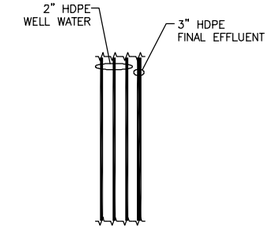
LEGEND:

- TAX PARCEL LINE
- FENCE LINE
- 12" DIAMETER CULVERT
- AGRICULTURAL DITCH
- WETLAND
- STORMWATER COLLECTION DITCH
- PERIMETER ROAD
- GROUNDWATER COLLECTION LINE
- COMMUNICATION LINE
- 2" POTABLE WATER LINE
- 6" FIRE WATER LINE
- WATER LINE
- SANITARY SEWER LINE
- R-5 EXTRACTION WELL
- R-3 EXTRACTION WELL (INACTIVE)
- MW-30 MONITORING WELL
- PZ-8b PIEZOMETER

NOTE:
UNDERGROUND LINE LOCATIONS ARE APPROXIMATE.



PIPE PLACEMENT DETAIL A
NTS



PIPE PLACEMENT DETAIL B
NTS

PIPING LOCATIONS BASED ON SURVEY AND CONTRACTOR MARKUPS.

SCALE BAR (1" = 150'-0")

0 150' 300' 450'

RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1			
2			
3			
4			
5			

DRAWN
DESIGNED
CHECKED
REVIEWED

FLOYD | SNIDER

amec

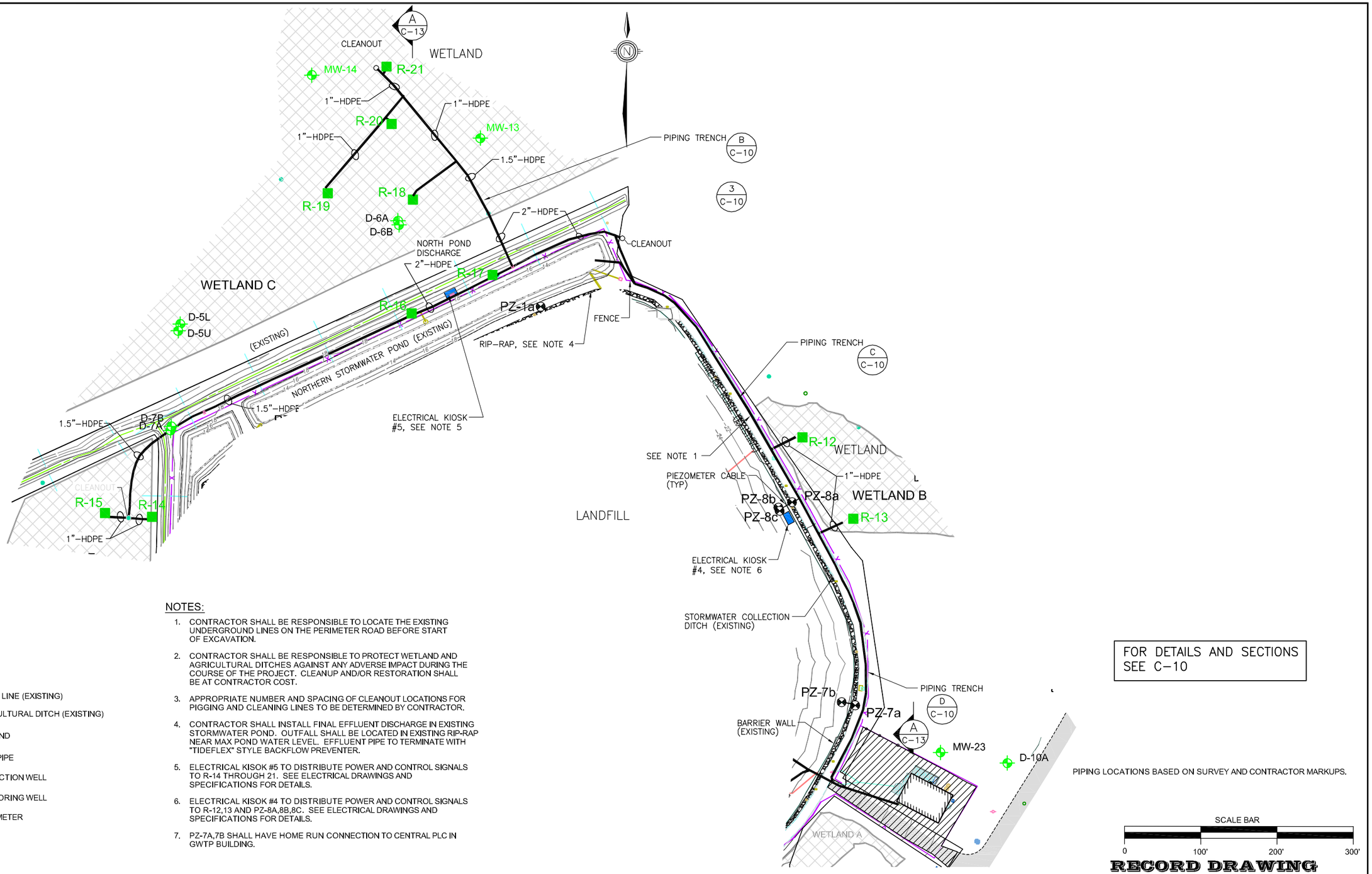
AMEC Environment & Infrastructure
600 University Street
Suite 600
Seattle, Washington 98101

GROUNDWATER RECOVERY AND TREATMENT PLANT PIPING LAYOUT

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/28/13
PROJECT NO.: SE10160010
DRAWING C–04

Plot Date: 05/28/13 - 3:16pm, Plotted by: mike.stenberg
Drawing Path: S:\13488\009_AsBuilt\CAD\, Drawing Name: SE10160010-CIVIL_APS_052813.dwg



LEGEND:

- FENCE LINE (EXISTING)
- AGRICULTURAL DITCH (EXISTING)
- WETLAND
- HDPE PIPE
- R-5 EXTRACTION WELL
- MW-14 MONITORING WELL
- PZ-1a PIEZOMETER
- KIOSK

NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE THE EXISTING UNDERGROUND LINES ON THE PERIMETER ROAD BEFORE START OF EXCAVATION.
2. CONTRACTOR SHALL BE RESPONSIBLE TO PROTECT WETLAND AND AGRICULTURAL DITCHES AGAINST ANY ADVERSE IMPACT DURING THE COURSE OF THE PROJECT. CLEANUP AND/OR RESTORATION SHALL BE AT CONTRACTOR COST.
3. APPROPRIATE NUMBER AND SPACING OF CLEANOUT LOCATIONS FOR PIGGING AND CLEANING LINES TO BE DETERMINED BY CONTRACTOR.
4. CONTRACTOR SHALL INSTALL FINAL EFFLUENT DISCHARGE IN EXISTING STORMWATER POND. OUTFALL SHALL BE LOCATED IN EXISTING RIP-RAP NEAR MAX POND WATER LEVEL. EFFLUENT PIPE TO TERMINATE WITH "TIDEFLEX" STYLE BACKFLOW PREVENTER.
5. ELECTRICAL KISOK #5 TO DISTRIBUTE POWER AND CONTROL SIGNALS TO R-14 THROUGH 21. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR DETAILS.
6. ELECTRICAL KISOK #4 TO DISTRIBUTE POWER AND CONTROL SIGNALS TO R-12,13 AND PZ-8A,8B,8C. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR DETAILS.
7. PZ-7A,7B SHALL HAVE HOME RUN CONNECTION TO CENTRAL PLC IN GWTP BUILDING.

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
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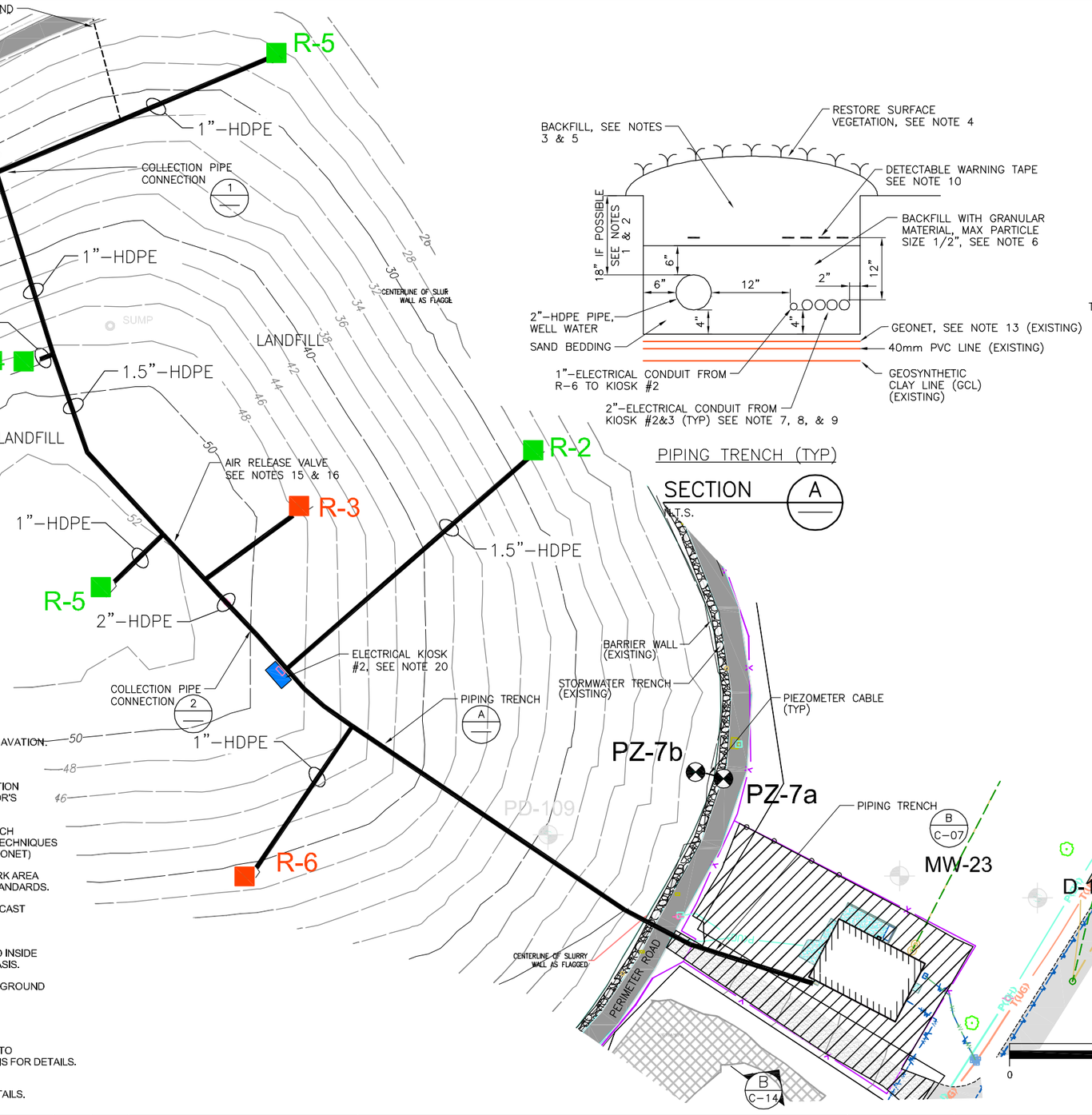
AMEC Environment & Infrastucture
600 University Street
Suite 600
Seattle, Washington 98101

GROUNDWATER RECOVERY AND TREATMENT PLANT
WETLAND WELLS AND FINAL EFFLUENT PIPING LAYOUT

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/28/13
PROJECT NO.: SE10160010
DRAWING C-05

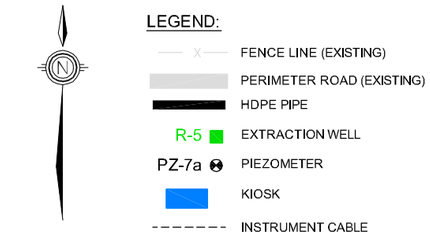
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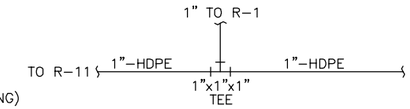


PIPING TRENCH (TYP)

SECTION A

N.T.S.

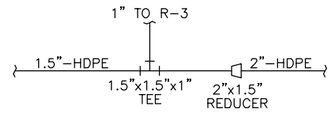




COLLECTION PIPE CONNECTION

DETAIL 1

N.T.S.



COLLECTION PIPE CONNECTION

DETAIL 2

N.T.S.

PIPING LOCATIONS BASED ON SURVEY AND CONTRACTOR MARKUPS.



RECORD DRAWING

NOTES:

1. ALL EXCAVATIONS AND TRENCHING WORK SHALL BE PERFORMED IN ACCORDANCE WITH CURRENT OSHA REGULATIONS ON EXCAVATIONS, TRENCHING, AND SHORING.
2. TRENCH DEPTH TO BE DETERMINED BY ENGINEER BASED ON CAP DEPTH.
3. WHERE INDICATED IN SECTION, TRENCH SHALL BE BACKFILLED WITH TOPSOIL FROM EXCAVATION
4. IN UNIMPROVED AREAS MOUND BACKFILL FOR SETTLEMENT. EXCESS SOILS TO BE SPREAD ADJACENT TO TRENCH. HYDROSEED DISTRURBED AREAS.
5. MATERIAL SHALL FREE FROM VARIOUS TYPES OF WOOD WASTE, CONSTRUCTION DEBRIS OR OTHER EXTRANEOUS OR OBJECTIONABLE MATERIAL.
6. WHERE INDICATED IN SECTION, BACKFILL WITH IMPORTED GRANULAR MATERIAL FREE OF SHARP OBJECTS TO PREVENT DAMAGE TO GEOSYNTHETIC MATERIAL. BACKFILL IN 6" LIFTS
7. BUTT FUSED HDPE PIPE
8. INSTALL ELECTRICAL CONDUIT AT A MINIMUM DEPTH OF 1ft. ONE ELECTRICAL CONDUIT PER WELL 1" IN DIAMETER TO KIOSK.
9. ELECTRICAL WIRING MUST MEET THE ELECTRICAL LOAD RATING FOR THE PUMPS AND ELECTRICAL SPECS.
10. DETECTABLE MARKING TAPE TO BE INSTALLED ABOVE EACH PIPE AND CONDUIT. TAPE SHALL MEET WSDOT M 41-10 SEC 9-15.18
11. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE THE EXISTING UNDERGROUND LINES ON THE PERIMETER ROAD BEFORE START OF EXCAVATION.
12. DEPTH OF EXISTING LANDFILL CAP IS 12 TO 24 INCHES. EXTREME CARE SHALL BE EXERCISED WHEN TRENCHING TO AVOID DAMAGE TO CAP. CAP SYSTEM SHALL BE PROTECTED AND RESTORED TO SATISFACTION OF OWNER'S REPRESETATIVE IN THE EVENT OF DAMAGE AT CONTRACTOR'S FULL EXPENSE.
13. RESTORE LANDFILL CAP IN LAYERS FROM BOTTOM UP TIE INTO AND MATCH THE EXISTING CAP. USE MANUFACTURER APPROVED EQUIPMENT AND TECHNIQUES TO INSTALL CAP COMPONENTS MATERIAL (GCL, GEOMEMBRANE, AND GEONET)
14. REMOVE ALL EXCESS MATERIAL AND REMAINING DEBRIS FROM THE WORK AREA AND DISPOSE IN ACCORDANCE WITH APPLICABLE REGULATIONS AND STANDARDS.
15. AIR RELEASE VALVE SHALL BE INSTALLED AT HIGH POINT OF LINE IN PRECAST CHAMBER. CHAMBER SHALL BE POSITIONED A MINIMUM OF 3" ABOVE GEOMEMBRANE.
16. AIR RELEASE VALVE SHALL DRAIN INTO REMOVABLE CONTAINER PLACED INSIDE THE CHAMBER. OPERATOR SHALL EMPTY CONTAINER ON A REGULAR BASIS.
17. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE THE EXISTING UNDERGROUND LINES ON THE PERIMETER ROAD BEFORE START OF EXCAVATION.
18. APPROPRIATE NUMBER AND SPACING OF CLEANOUT LOCATIONS FOR PIGGING AND CLEANING LINES TO BE DETERMINED BY CONTRACTOR.
19. ELECTRICAL KISOK #3 WILL DISTRIBUTE POWER AND CONTROL SIGNALS TO R-1,4,11 AND PZ-1A,1B. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR DETAILS.
20. ELECTRICAL KIOSK #2 WILL DISTRIBUTE POWER AND CONTROL SIGNALS TO R-2,3,5,6. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR DETAILS.

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1			
2			
3			
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Seattle, Washington 98101

GROUNDWATER RECOVERY AND TREATMENT PLANT LANDFILL EAST WELL PIPING

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

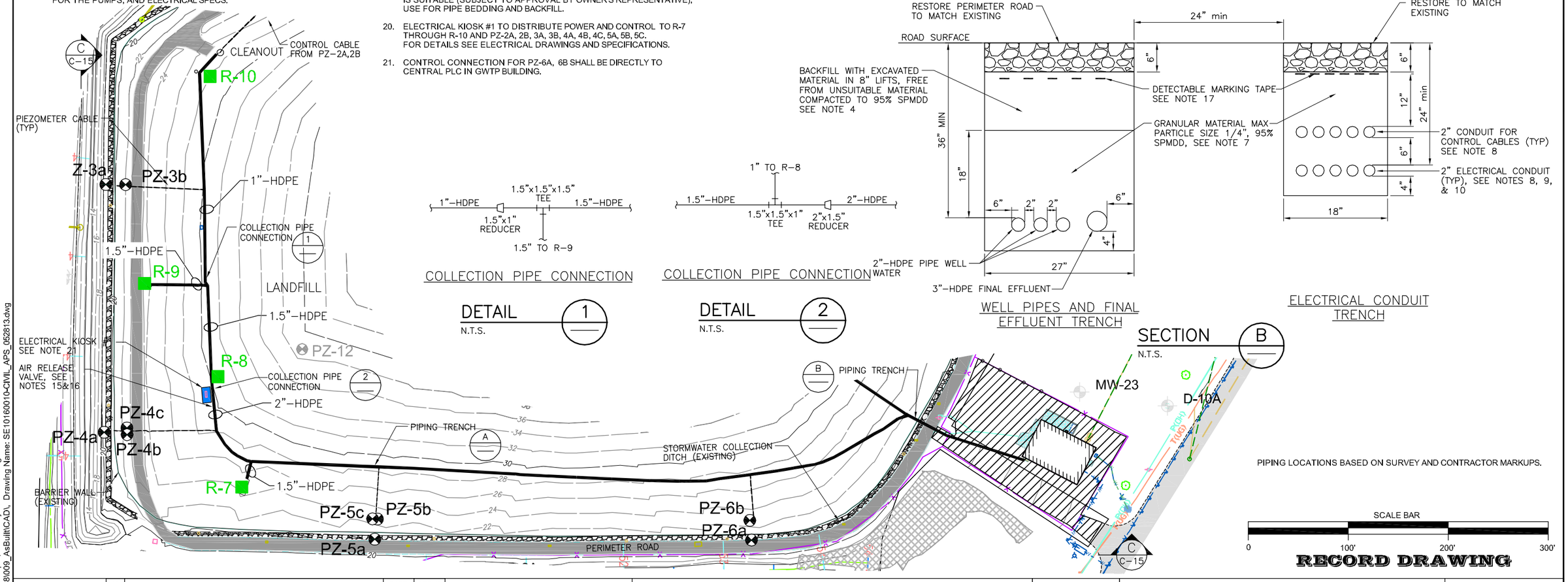
DATE: 05/28/13
PROJECT NO.: SE10160010

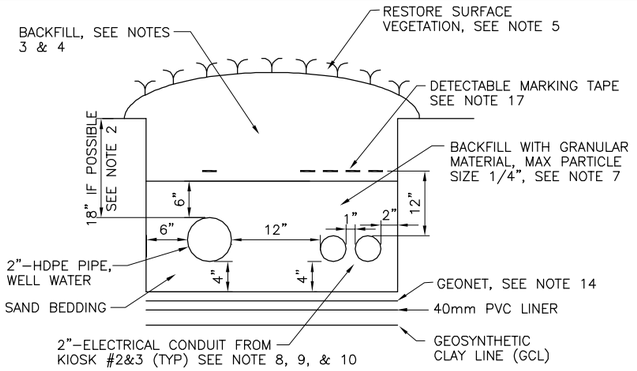
DRAWING C-06

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Drawing Path: S:\13468\009_AsBuiltCAD\, Drawing Name: SE10160010-CIVIL_APS_052813.dwg

NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE THE EXISTING UNDERGROUND LINES ON THE PERIMETER ROAD BEFORE START OF EXCAVATION.
2. ALL EXCAVATIONS AND TRENCHING WORK SHALL BE PERFORMED IN ACCORDANCE WITH CURRENT WISHA AND OSHA REGULATIONS ON EXCAVATIONS, TRENCHING, AND SHORING.
3. WHERE INDICATED IN SECTION, TRENCH SHALL BE BACKFILLED WITH TOPSOIL FROM EXCAVATION
4. MATERIAL SHOULD BE FREE FROM VARIOUS TYPES OF WOOD WASTE, CONSTRUCTION DEBRIS OR OTHER EXTRANEOUS OR OBJECTIONABLE MATERIAL.
5. IN UNIMPROVED AREAS MOUND BACKFILL FOR SETTLEMENT. EXCESS SOILS TO BE SPREAD ADJACENT TO TRENCH. HYDROSEED DISTRURBED AREAS.
6. WHERE INDICATED IN SECTION, BACKFILL WITH IMPORTED GRANULAR MATERIAL FREE OF SHARP OBJECTS TO PREVENT DAMAGE TO GEOSYNTHETIC MATERIAL. BACKFILL IN 6" LIFTS.
7. WHERE INDICATED IN SECTION, BACKFILL WITH IMPORTED GRANULAR MATERIAL IN 6" LIFTS.
8. BUTT FUSED HDPE PIPE
9. INSTALL ELECTRICAL CONDUIT AT A MINIMUM DEPTH OF 2FT (PER ELECTRICAL CODES). ONE ELECTRICAL CONDUIT PER WELL 1" IN DIAMETER.
10. ELECTRICAL WIRING MUST MEET THE ELECTRICAL LOAD RATING FOR THE PUMPS, AND ELECTRICAL SPECS.
11. INSTALL ELECTRICAL AND CONTROL CABLE CONDUITS BY LAYERS PER WELL SECTION (WETLAND WELL: 10 CONDUITS; LANDFIELD EAST WELLS 7 CONDUITS; LANDFIELD WEST WELLS: 4 CONDUITS)
12. DEPTH OF EXISTING LANDFILL CAP IS 12 TO 24 INCHES. EXTREME CARE SHALL BE EXERCISED WHEN TRENCHING TO AVOID DAMAGE TO CAP. CAP SYSTEM SHALL BE PROTECTED AND RESTORED TO SATISFACTION OF OWNER'S REPRESETATIVE IN THE EVENT OF DAMAGE AT CONTRACTOR'S FULL EXPENSE.
13. RESTORE LANDFILL CAP IN LAYERS FROM BOTTOM UP TIE INTO AND MATCH THE EXISTING CAP. USE MANUFACTURER APPROVED EQUIPMENT AND TECHNIQUES TO INSTALL CAP COMPONENTS MATERIAL (GCL, GEOMEMBRANE, AND GEONET)
14. REMOVE ALL EXCESS MATERIAL AND REMAINING DEBRIS FROM THE WORK AREA AND DISPOSE IN ACCORDANCE WITH APPLICABLE REGULATION AND STANDARDS.
15. AIR RELEASE VALVE SHALL BE INSTALLED AT HIGH POINT OF LINE IN PRECAST CHAMBER. CHAMBER SHALL BE POSITIONED A MINIMUM OF 3" ABOVE GEOMEMBRANE.
16. AIR RELEASE VALVE SHALL DRAIN INTO REMOVABLE CONTAINER PLACED INSIDE THE CHAMBER. OPERATOR SHALL EMPTY CONTAINER ON A REGULAR BASIS.
17. DETECTABLE MARKING TAPE TO BE INSTALLED ABOVE EACH PIPE AND CONDUIT. TAPE SHALL MEET WSDOT M 41-10 SEC 9-15.18
18. APPROPRIATE NUMBER AND SPACING OF CLEANOUT LOCATIONS FOR PIGGING AND CLEANING LINES TO BE DETERMINED BY CONTRACTOR.
19. IF EXISTING PIT-RUN FROM TRENCH EXCAVATION IN LANDFILL AREA IS SUITABLE (SUBJECT TO APPROVAL BY OWNER'S REPRESENTATIVE), USE FOR PIPE BEDDING AND BACKFILL.
20. ELECTRICAL KIOSK #1 TO DISTRIBUTE POWER AND CONTROL TO R-7 THROUGH R-10 AND PZ-2A, 2B, 3A, 3B, 4A, 4B, 4C, 5A, 5B, 5C. FOR DETAILS SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS.
21. CONTROL CONNECTION FOR PZ-6A, 6B SHALL BE DIRECTLY TO CENTRAL PLC IN GWTP BUILDING.





PIPING TRENCH
SECTION A
N.T.S.

COLLECTION PIPE CONNECTION
DETAIL 1
N.T.S.

COLLECTION PIPE CONNECTION
DETAIL 2
N.T.S.

WELL PIPES AND FINAL EFFLUENT TRENCH

ELECTRICAL CONDUIT TRENCH
SECTION B
N.T.S.

PIPING LOCATIONS BASED ON SURVEY AND CONTRACTOR MARKUPS.

SCALE BAR
0 100' 200' 300'

RECORD DRAWING

LEGEND:
- FENCE LINE (EXISTING)
- WETLAND
- STABILIZE AREA WITH CRUSHED ROCK (BY OTHERS)
- PERIMETER ROAD (EXISTING)
- HDPE PIPE
- R-7 EXTRACTION WELL
- PZ-3a PIEZOMETER
- MW- 23 MONITORING WELL
- KIOSK
- METAL CLAD INSTRUMENT CABLES

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1		FEB 25	WJM
2		APR 8	WJM
3		MAY 26	WJM
4		JLY 26	LDV

DRAWN
DESIGNED
CHECKED
REVIEWED

FLOYD | SNIDER
amec
AMEC Environment & Infrastucture
600 University Street
Suite 600
Seattle, Washington 98101

GROUNDWATER RECOVERY AND TREATMENT PLANT LANDFILL WEST WELL PIPING

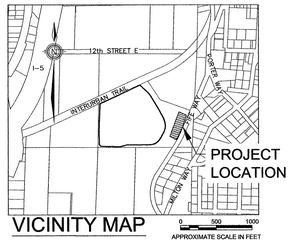
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/28/13
PROJECT NO.: SE10160010

DRAWING C-07

Plot Date: 05/28/13 - 3:14pm, Plotted by: mike.stenberg
Drawing Path: S:\13488\009_AsBuilt\CAD\, Drawing Name: SE10160010-CIVIL_APS_052813.dwg

RECORD DRAWING



Project name: B&L Woodwaste Site Phase II Remediation
Project address: 522 Fife Way, Milton, WA

Engineer name: Brian Taylor
Address: AMEC Geomatrix, Inc.
600 University street, Suite 600
Seattle, WA 98101
Phone: (206) 342-1760

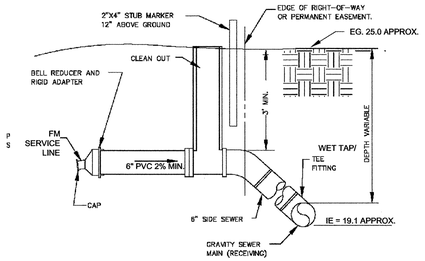
Owner name: B&L Woodwaste Site Custodial Trust
Address: 606 Columbia street NW, Suite 212
Olympia, WA 98501
Phone: (360) 754-2254

Parcel No. (s) 0420053065

Survey: Barghausen Consulting Engineers, Inc.
Kent, WA (425) 251-6222

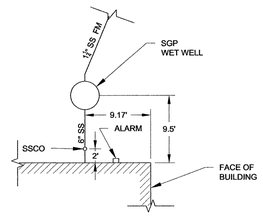
Pierce Co. Benchmark #75-3:
R/R Spike in power pole in SE
quad. of 20th St E and 70th Ave E, City of Fife

Datum: Horizontal: WASP-NAD83-S Feet
Vertical: NAVD88 Feet



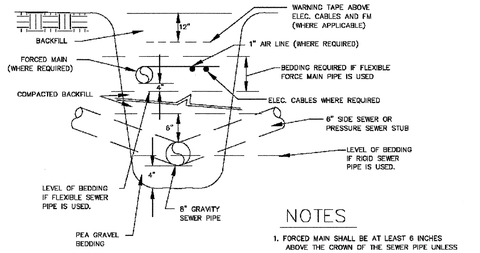
PRESSURE SIDE SEWER STUB TYPE 1
N.T.S.

THIS CONSTRUCTION PLAN WILL EXPIRE ONE YEAR FROM PLAN APPROVAL DATE.



SGP LAYOUT PLAN DETAIL
0 5 10
APPROXIMATE SCALE IN FEET

ELEVATIONS	
FINISH FLOOR (FT)	21.00
WET WELL BASE (FT)	13.71
PUMP OFF (FT)	14.86
PUMP ON (FT)	15.20
ALARM ELEV. (FT)	15.86
INVERT IN ELEV. (FT)	16.31
WET WELL TOP (FT.)	21.40
INVERT OUT ELEV. (FT)	16.78



TYPICAL TRENCH
N.T.S.

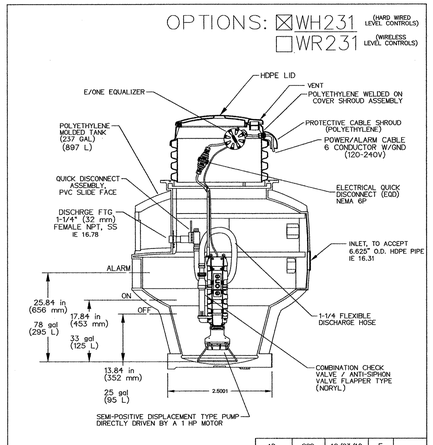
NOTES
1. FORCED MAIN SHALL BE AT LEAST 6 INCHES ABOVE THE CROWN OF THE SEWER PIPE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OR HIS DULY AUTHORIZED REPRESENTATIVE.
2. FORCE MAIN, AIRLINE AND ELECTRICAL CABLES WHERE APPLICABLE SHALL SKIRT AROUND MANHOLE.

CONSTRUCTION NOTES:

1. THE GRINDER SEWER PUMP AND FORCE MAIN SHALL BE INSTALLED IN STRICT ACCORDANCE WITH ALL COUNTY CODES AND THE CONDITIONS OF THE APPROVED DESIGN.
2. HYDROSTATIC TEST OF FORCE MAIN SHALL BE TESTED AT 150 PERCENT OF THE WORKING PRESSURE OR 50 PSI HYDROSTATIC PRESSURE. WHICHEVER IS GREATER, FOR PIPE SIZE UP TO 2-INCH INSIDE DIAMETER. TESTING SHALL BE A MINIMUM OF 10 MINUTE DURATION WITH NO LOSS OF PRESSURE. HYDROSTATIC TESTING WILL INCLUDE THE PUMP CHECK AND BALL VALVES.
3. AN OPERATIONAL CHECK OF THE PUMP, ON/OFF SWITCH, FLOAT AND ALARM SHALL BE REQUIRED AS PART OF THE TESTING PROCEDURES.
4. ALL PIPES IN NON-DRIVING AREAS ARE REQUIRED TO HAVE A MINIMUM OF 3 FEET COVER. ALL PVC GRAVITY MAINS IN RIGHT-OF-WAYS AND DRIVING AREAS ARE REQUIRED TO HAVE A MINIMUM COVER OF 5 FEET. ALL D.I.P. AND CONCRETE PIPES IN DRIVING AREAS OR RIGHT-OF-WAYS ARE REQUIRED TO HAVE A MINIMUM COVER OF 3 FEET.
5. GRAVITY SEWER PIPE SHALL BE CONSIDERED AS PART OF THE RESIDENTIAL SEWER PUMP INSTALLATION. TESTING OF GRAVITY LINES SHALL BE COMPLETED AT THE TIME THE FORCE MAIN IS TESTED.
6. PEA GRAVEL BEDDING WILL BE PLACED 4 INCHES BELOW AND 5 INCHES ABOVE PIPE. NO OTHER BEDDING MATERIAL IS ACCEPTABLE.
7. HYDROSTATIC TESTING WILL BE DONE IN ACCORDANCE WITH THE PIERCE COUNTY UTILITY SANITARY SEWER SPECIFICATIONS, LATEST EDITION.
8. INSPECTION SHALL INCLUDE THE PUMP, FORCE, AND GRAVITY SEWER IN ACCORDANCE WITH THE APPROVED PLANS. NO DEVIATION FROM THE APPROVED PLANS WILL BE ALLOWED WITHOUT PRIOR WRITTEN APPROVAL OF THE UTILITIES DEPARTMENT ENGINEERING SECTION.
9. THE SEWER LINES, FORCE MAIN, AND GRINDER PUMP SHALL REMAIN UNDER THE OWNERSHIP OF THE PROPERTY OWNER WHO SHALL BE RESPONSIBLE FOR THEIR OPERATION AND MAINTENANCE.
10. THE ALARM MUST BE IN A CONSPICUOUS LOCATION AND MUST BE AUDIO VISUAL.
11. ALL UTILITIES CROSSING SEWER LINES MUST HAVE PROPER VERTICAL CLEARANCE. THE STANDARD VERTICAL SEPARATION FOR WATER LINES IS 3 FEET ABOVE THE SEWER LINE AND 1.5 FEET FOR ALL OTHER UTILITIES. CONCRETE ENCASEMENT OF SEWER LINES WILL BE ALLOWED FOR WATER MAINS CROSSING AT LESS THAN 3 FEET BUT NO CLOSER THAN 1.5 FEET. THE SANITARY SEWER ENCASEMENT SHALL BE 10 FEET ON EACH SIDE OF THE CROSSING.
12. PARALLEL SEWER WATER LINES MUST HAVE 10 FEET HORIZONTAL SEPARATION.
13. THE GRINDER PUMP WET WELL SHALL BE INSTALLED ON LEVEL UNDISTURBED SOIL WITH A MINIMUM TOTAL LOAD BEARING CAPACITY OF 2000 POUNDS PER SQUARE FOOT. THE GRINDER PUMP WET WELL SHALL BE SET ON A LAYER OF PEA GRAVEL (PER PIERCE COUNTY DEPARTMENT OF UTILITIES STANDARD SPECIFICATIONS) A MINIMUM OF 12 INCHES COMPACTED DEPTH.
14. CONTRACTOR SHALL PROVIDE ALL FITTINGS, COUPLINGS, AND ADAPTORS NEEDED FOR SEWER PIPING.
15. FORCE MAIN SHALL BE 1¼-INCH DIAMETER HDPE SDR 11. INSTALLATION SHALL BE PER PIERCE COUNTY STANDARD SPECIFICATIONS.
16. INSTALL METALLIC DETECTION STRIP ABOVE BURIED SEWER AND ELECTRIC CABLES
17. SGP ALARM SHALL BE CONNECTED TO GWTP BUILDING CONTROL AND REMOTE AUTO-DIAL SYSTEM.
18. UPON COMPLETION OF EXCAVATION FOR SEWER PUMP WET WELL, THE CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER WHO WILL EVALUATE THE SUBGRADE. ALL LOOSE SOILS, MUD OR DISTURBED SOILS SHALL BE REMOVED PRIOR TO PLACEMENT OF THE PEA GRAVEL. IF THE ENGINEER DETERMINES THAT THE SUBGRADE SOILS ARE UNSUITABLE, ADDITIONAL EXCAVATION AND REPLACEMENT OF NATIVE SOIL WITH PEA GRAVEL WILL BE REQUIRED. THE PEA GRAVEL SHALL EXTEND BEYOND THE EDGE OF THE CONCRETE BALLAST A DISTANCE EQUAL TO THE THICKNESS OF THE BEARING PAD MATERIAL (I.E. A MINIMUM OF 12-INCHES, UNLESS ADDITIONAL OVER-EXCAVATION IS REQUIRED).
19. WHERE THE AGGREGATE COMPRISING THE PREVIOUSLY INSTALLED GEOPIERS IS EXPOSED AT THE BASE OF THE EXCAVATION, THE CONTRACTOR SHALL RE-COMPACT WITH A "JUMPING JACK" TYPE COMPACTOR.

MINIMUM GRINDER PUMP REQUIREMENTS:

1. ESTIMATED OPERATING TOTAL DYNAMIC HEAD = 16 FT. ESTIMATED PUMP DISCHARGE = 14.0 GPM.
2. THE GRINDER PUMP SYSTEM SHALL BE AN INTEGRATED AND A COMPLETE FACTORY-BUILT E-ONE 'WH231-92' SYSTEM CONSISTING OF A POLYETHYLENE WET WELL TANK AND TESTED GRINDER PUMP UNIT, CONSISTING OF A GRINDER PUMP CORE SUITABLY MOUNTED ON AN INTEGRAL STAND OF STAINLESS STEEL, TANK, ELECTRICAL QUICK DISCONNECT (NEMA 6P), PUMP REMOVAL HARNESS, DISCHARGE ASSEMBLY/SHUT-OFF VALVE, ANTI-SIPHON VALVE/CHECK VALVE ASSEMBLY, ELECTRICAL ALARM ASSEMBLY AND ALL NECESSARY INTERNAL WIRING AND CONTROLS.
3. PUMP SHALL BE E-ONE GRINDER PUMP CAPABLE OF DELIVERING 15 GPM AGAINST A RATED TOTAL DYNAMIC HEAD OF 0 FEET (0 PSIG), 11 GPM AGAINST A RATED TOTAL DYNAMIC HEAD OF 92 FEET (40 PSIG), AND 7.8 GPM AGAINST A RATED TOTAL DYNAMIC HEAD OF 185 FEET (80 PSIG). THE PUMP(S) MUST ALSO BE CAPABLE OF OPERATING AT NEGATIVE TOTAL DYNAMIC HEAD WITHOUT OVERLOADING THE MOTOR(S). UNDER NO CONDITIONS SHALL IN-LINE PIPING OR VALVING BE ALLOWED TO CREATE A FALSE APPARENT HEAD.
4. THE MOTOR SHALL BE A 1 HP, 1725 RPM, 240 VOLT 60 HERTZ, 1 PHASE, CAPACITOR START, BALL BEARING, AIR-COOLED INDUCTION TYPE WITH CLASS F INSTALLATION, LOW STARTING CURRENT NOT TO EXCEED 30 AMPERES AND HIGH STARTING TORQUE OF 8.4 FOOT POUNDS.
5. THE ALARM PANEL SHALL BE AN E-ONE SIMPLEX PANEL PROTECTION PACKAGE.



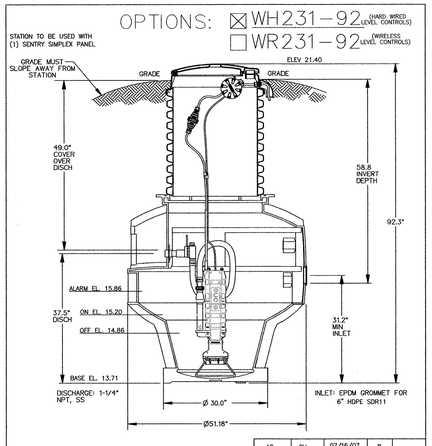
CONCRETE BALLAST MAY BE REQUIRED
SEE INSTALLATION INSTRUCTIONS
FOR DETAILS

AD	SGS	12/23/10	E	
DR BY	CH'D	DATE	ISSUE	SCALE

e/one SEWER SYSTEMS

MODEL WH231 / WR231
DETAIL SHEET

NA0059P02



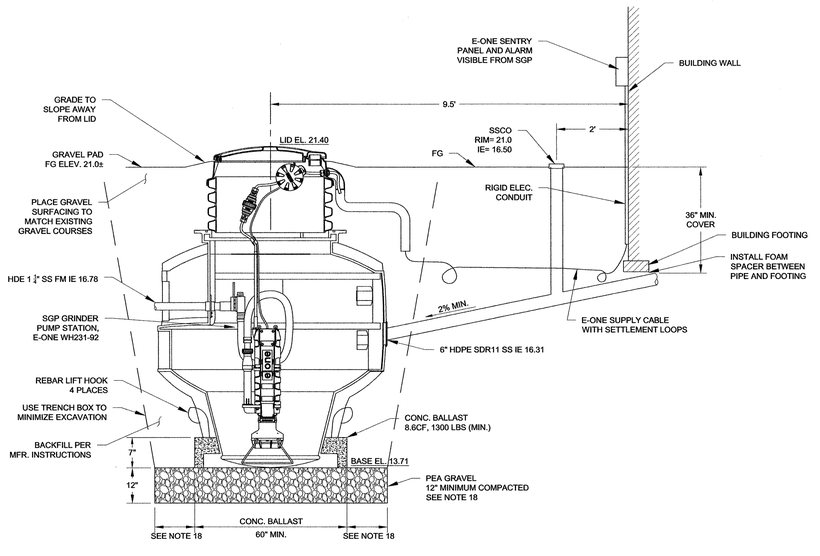
CONCRETE BALLAST MAY BE REQUIRED
SEE INSTALLATION INSTRUCTIONS
FOR DETAILS

AD	CH	07/16/07	B	
DR BY	CH'D	DATE	ISSUE	SCALE

e/one SEWER SYSTEMS

MODEL WH231-92 / WR231-92

NA0059P05



SEWER GRINDER PUMP INSTALLATION
N.T.S.

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	REVISED TO ADDRESS COUNTY COMMENTS	10/26/11	BT
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET				

DRAWN AS
DESIGNED BT
CHECKED BT
REVIEWED LMM

AMEC Geomatrix

AMEC Geomatrix, Inc.
600 University Street
Suite 600
Seattle, Washington 98101

BRIAN L. TAYLOR STATE OF WASHINGTON 35703 REGISTERED PROFESSIONAL ENGINEER

SEWER PLAN AND DETAILS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 10/26/11
PROJECT NO.: SE10160010
DRAWING SS-1

Plot Date: 10/26/11 - 11:13am, Plotted by: mike.stenberg
Drawing Path: S:\1048\6206_\dcm wwtwcon, Drawing Name: SE10160010-CIVIL_C19_MDS_102511.dwg

NOTES FOR CONTRACTOR MARKUP RECORD DRAWINGS

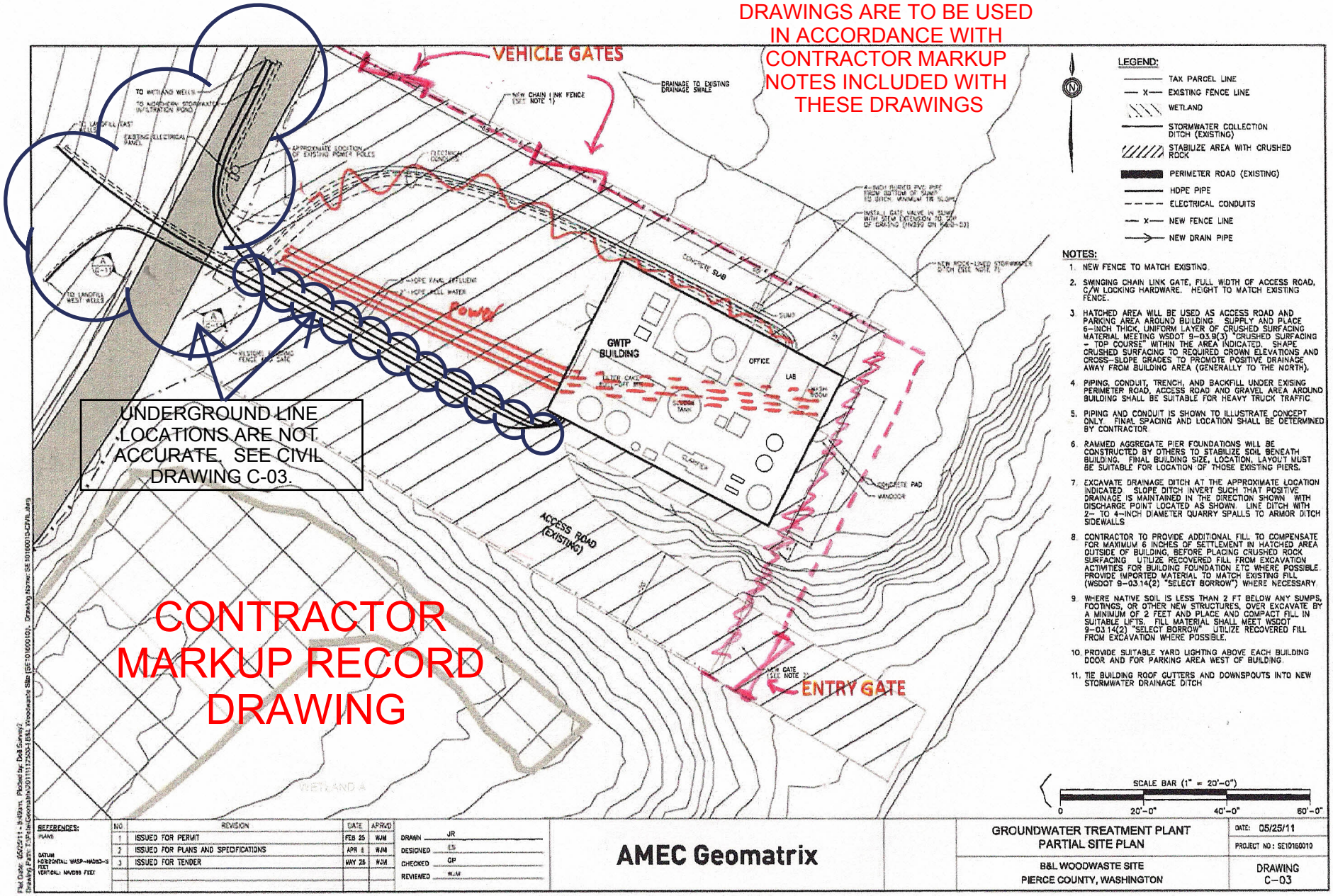
1. Base drawings for Contractor markups were design drawings created prior to facility construction.

2. Contractor markups show significant deviations from the design drawings. Hand markup show actual locations and dimensions, where indicated.

3. Locations drawn in CAD for underground piping, building outline, and other features are not accurate and are shown for clarity.

4. Refer to drafted Civil RECORD DRAWINGS C-03 through C-07 and Survey Drawings for accurate locations of constructed features.

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS



REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR PERMIT	FEB 25	WJM
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET	2	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
	3	ISSUED FOR TENDER	MAY 25	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

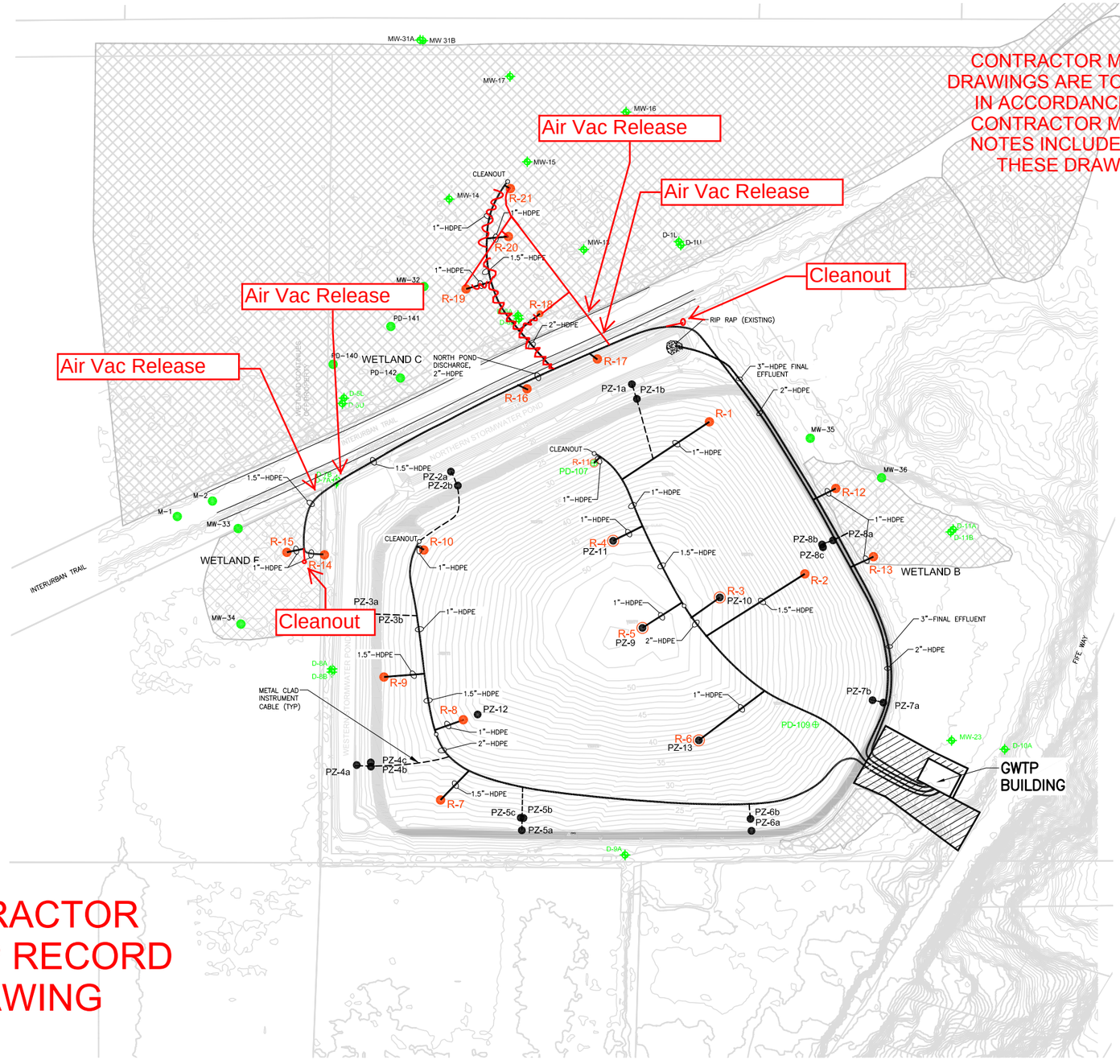
AMEC Geomatrix

GROUNDWATER TREATMENT PLANT
PARTIAL SITE PLAN

DATE: 05/25/11
PROJECT NO: SE10160010

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DRAWING C-03



CONTRACTOR MARKUP RECORD DRAWING

LEGEND:

- TAX PARCEL LINE
- FENCE LINE (EXISTING)
- 12" DIAMETER CULVERT (EXISTING)
- AGRICULTURAL DITCH (EXISTING)
- WETLAND
- FINAL STORMWATER COLLECTION DITCH (EXISTING)
- STABILIZE AREA WITH CRUSHED ROCK
- PERIMETER ROAD (EXISTING)
- R-21 NEW EXTRACTION WELL (BY OTHERS)
- R-11 EXISTING WELL INCLUDED IN EXTRACTION NETWORK (BY OTHERS)
- MONITORING WELL (BY OTHERS)
- PZ-7a PIEZOMETER (BY OTHERS)

NOTES:

1. GREEN WELLS SHOWN FOR INFORMATION ONLY.
2. CONTRACTOR MUST TAKE CARE NOT TO DAMAGE ANY EXISTING WELLS. ANY DAMAGE SHALL BE REPAIRED AT CONTRACTOR'S FULL EXPENSE.
3. WELLS WILL BE DRILLED BY OTHERS.
4. CONTRACTOR SHALL PROVIDE ALL PUMPS, PIPING, VALVES, FITTINGS, CLEANOUTS, POWER, CONTROLS, FOR ALL R LABELED WELLS.
5. CONTRACTOR TO PROVIDE WELL VAULTS FOR ALL WELLS INSIDE LANDFILL AREA. WELL VAULTS FOR WELLS OUTSIDE OF LANDFILL WILL BE BY OTHERS.
6. CONTRACTOR TO PROVIDE CONTROL WIRING FOR ALL PZ LABELED WELLS TO CONNECT TO PLC.
7. APPROPRIATE NUMBER AND SPACING OF CLEANOUT LOCATIONS FOR PIGGING AND CLEANING LINES TO BE DETERMINED BY CONTRACTOR. CLEANOUTS SHALL BE HOUSED IN TAMPER-PROOF VAULTS SUITABLE FOR H-15 AASHTO TRAFFIC RATING. TOP OF VAULTS TO MATCH EXISTING GRADE.

SCALE BAR (1" = 200'-0")

0 200' 400' 600'

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR REVIEW	FEB 25	WJM
2	ISSUED FOR PERMIT	MAR 18	GP
3	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
4	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

GROUNDWATER RECOVERY AND TREATMENT PLANT PIPING LAYOUT

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

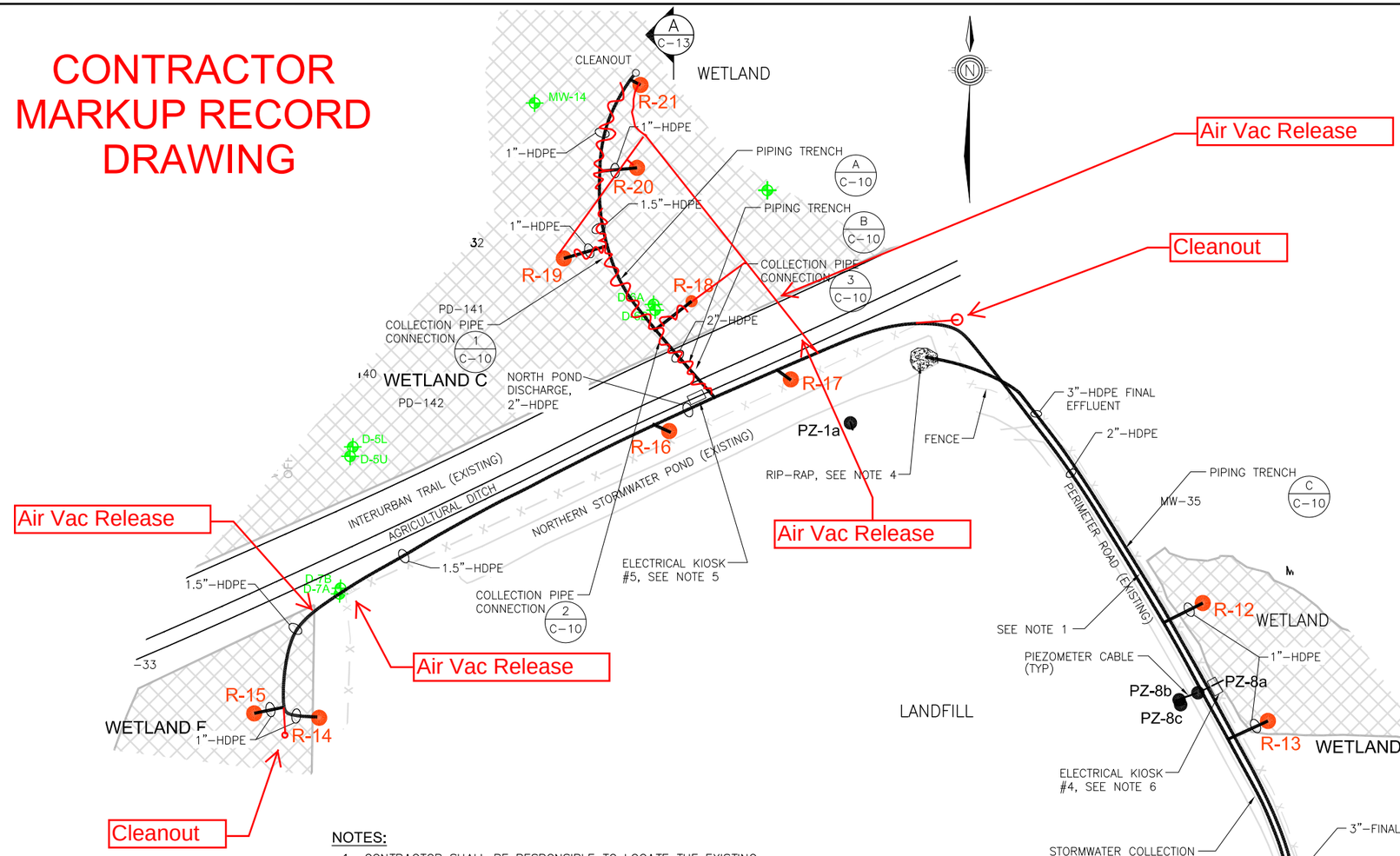
DATE: 05/25/11
PROJECT NO.: SE10160010

DRAWING C-04

Plot Date: 05/25/11 - 1:13pm, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\12500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-CIVIL.dwg

CONTRACTOR MARKUP RECORD DRAWING

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS



FOR DETAILS AND SECTIONS SEE C-10

LEGEND:

- FENCE LINE (EXISTING)
- AGRICULTURAL DITCH (EXISTING)
- WETLAND
- HDPE PIPE
- R-21 NEW EXTRACTION WELL (BY OTHERS)
- R-11 EXISTING WELL INCLUDED IN EXTRACTION NETWORK (BY OTHERS)
- MONITORING WELL (BY OTHERS)
- PZ-7a PIEZOMETER (BY OTHERS)

NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE THE EXISTING UNDERGROUND LINES ON THE PERIMETER ROAD BEFORE START OF EXCAVATION.
2. CONTRACTOR SHALL BE RESPONSIBLE TO PROTECT WETLAND AND AGRICULTURAL DITCHES AGAINST ANY ADVERSE IMPACT DURING THE COURSE OF THE PROJECT. CLEANUP AND/OR RESTORATION SHALL BE AT CONTRACTOR COST.
3. APPROPRIATE NUMBER AND SPACING OF CLEANOUT LOCATIONS FOR PIGGING AND CLEANING LINES TO BE DETERMINED BY CONTRACTOR.
4. CONTRACTOR SHALL INSTALL FINAL EFFLUENT DISCHARGE IN EXISTING STORMWATER POND. OUTFALL SHALL BE LOCATED IN EXISTING RIP-RAP NEAR MAX POND WATER LEVEL. EFFLUENT PIPE TO TERMINATE WITH "TIDEFLEX" STYLE BACKFLOW PREVENTER.
5. ELECTRICAL KISOK #5 TO DISTRIBUTE POWER AND CONTROL SIGNALS TO R-14 THROUGH 21. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR DETAILS.
6. ELECTRICAL KISOK #4 TO DISTRIBUTE POWER AND CONTROL SIGNALS TO R-12,13 AND PZ-8A,8B,8C. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR DETAILS.
7. PZ-7A,7B SHALL HAVE HOME RUN CONNECTION TO CENTRAL PLC IN GWTP BUILDING.

SCALE BAR
0 100' 200' 300'

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR REVIEW	FEB 25	WJM
2	ISSUED FOR PERMIT	MAR 18	GP
3	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
4	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

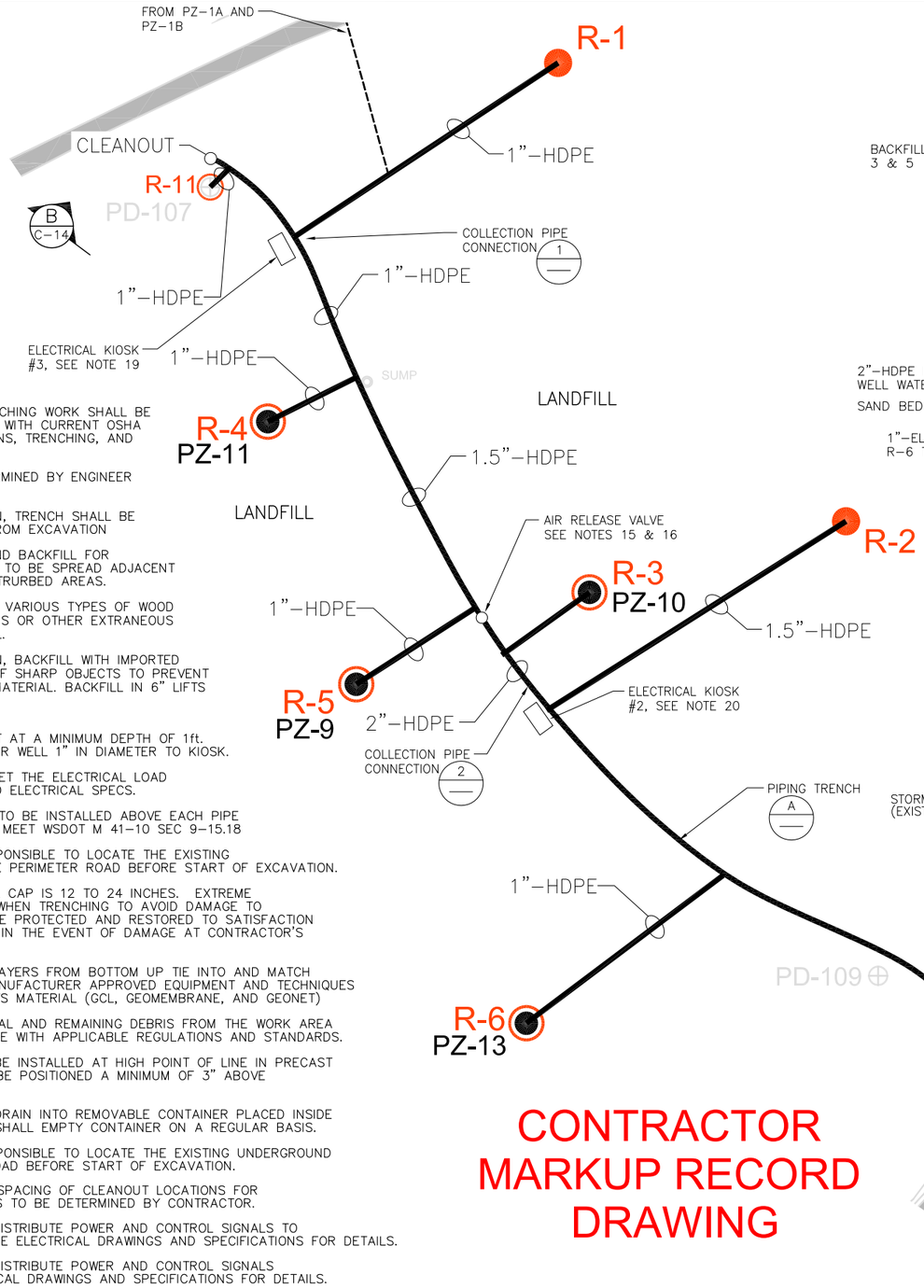
AMEC Geomatrix

GROUNDWATER RECOVERY AND TREATMENT PLANT
WETLAND WELLS AND FINAL EFFLUENT PIPING LAYOUT

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/25/11
PROJECT NO.: SE10160010
DRAWING C-05

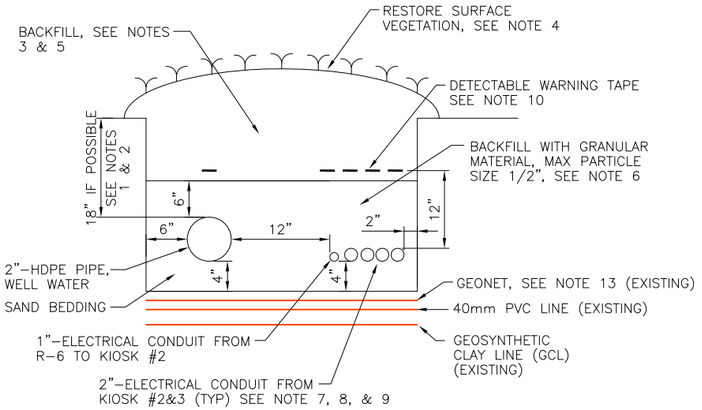
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Drawing Path: T:\Pete\Geomatrix\2011\12500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-CIVIL.dwg



CONTRACTOR MARKUP RECORD DRAWING

NOTES:

1. ALL EXCAVATIONS AND TRENCHING WORK SHALL BE PERFORMED IN ACCORDANCE WITH CURRENT OSHA REGULATIONS ON EXCAVATIONS, TRENCHING, AND SHORING.
2. TRENCH DEPTH TO BE DETERMINED BY ENGINEER BASED ON CAP DEPTH.
3. WHERE INDICATED IN SECTION, TRENCH SHALL BE BACKFILLED WITH TOPSOIL FROM EXCAVATION
4. IN UNIMPROVED AREAS MOUND BACKFILL FOR SETTLEMENT. EXCESS SOILS TO BE SPREAD ADJACENT TO TRENCH. HYDROSEED DISTRURBED AREAS.
5. MATERIAL SHALL FREE FROM VARIOUS TYPES OF WOOD WASTE, CONSTRUCTION DEBRIS OR OTHER EXTRANEOUS OR OBJECTIONABLE MATERIAL.
6. WHERE INDICATED IN SECTION, BACKFILL WITH IMPORTED GRANULAR MATERIAL FREE OF SHARP OBJECTS TO PREVENT DAMAGE TO GEOSYNTHETIC MATERIAL. BACKFILL IN 6" LIFTS
7. BUTT FUSED HDPE PIPE
8. INSTALL ELECTRICAL CONDUIT AT A MINIMUM DEPTH OF 1ft. ONE ELECTRICAL CONDUIT PER WELL 1" IN DIAMETER TO KIOSK.
9. ELECTRICAL WIRING MUST MEET THE ELECTRICAL LOAD RATING FOR THE PUMPS AND ELECTRICAL SPECS.
10. DETECTABLE MARKING TAPE TO BE INSTALLED ABOVE EACH PIPE AND CONDUIT. TAPE SHALL MEET WSDOT M 41-10 SEC 9-15.18
11. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE THE EXISTING UNDERGROUND LINES ON THE PERIMETER ROAD BEFORE START OF EXCAVATION.
12. DEPTH OF EXISTING LANDFILL CAP IS 12 TO 24 INCHES. EXTREME CARE SHALL BE EXERCISED WHEN TRENCHING TO AVOID DAMAGE TO CAP. CAP SYSTEM SHALL BE PROTECTED AND RESTORED TO SATISFACTION OF OWNER'S REPRESETATIVE IN THE EVENT OF DAMAGE AT CONTRACTOR'S FULL EXPENSE.
13. RESTORE LANDFILL CAP IN LAYERS FROM BOTTOM UP TIE INTO AND MATCH THE EXISTING CAP. USE MANUFACTURER APPROVED EQUIPMENT AND TECHNIQUES TO INSTALL CAP COMPONENTS MATERIAL (GCL, GEOMEMBRANE, AND GEONET)
14. REMOVE ALL EXCESS MATERIAL AND REMAINING DEBRIS FROM THE WORK AREA AND DISPOSE IN ACCORDANCE WITH APPLICABLE REGULATIONS AND STANDARDS.
15. AIR RELEASE VALVE SHALL BE INSTALLED AT HIGH POINT OF LINE IN PRECAST CHAMBER. CHAMBER SHALL BE POSITIONED A MINIMUM OF 3" ABOVE GEOMEMBRANE.
16. AIR RELEASE VALVE SHALL DRAIN INTO REMOVABLE CONTAINER PLACED INSIDE THE CHAMBER. OPERATOR SHALL EMPTY CONTAINER ON A REGULAR BASIS.
17. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE THE EXISTING UNDERGROUND LINES ON THE PERIMETER ROAD BEFORE START OF EXCAVATION.
18. APPROPRIATE NUMBER AND SPACING OF CLEANOUT LOCATIONS FOR PIGGING AND CLEANING LINES TO BE DETERMINED BY CONTRACTOR.
19. ELECTRICAL KISOK #3 WILL DISTRIBUTE POWER AND CONTROL SIGNALS TO R-1,4,11 AND PZ-1A,1B. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR DETAILS.
20. ELECTRICAL KIOSK #2 WILL DISTRIBUTE POWER AND CONTROL SIGNALS TO R-2,3,5,6. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR DETAILS.



PIPING TRENCH (TYP)

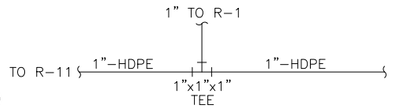
SECTION A

N.T.S.



LEGEND:

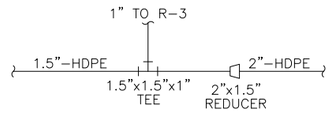
- FENCE LINE (EXISTING)
- PERIMETER ROAD (EXISTING)
- HDPE PIPE
- R-21 NEW EXTRACTION WELL (BY OTHERS)
- R-11 EXISTING WELL INCLUDED IN EXTRACTION NETWORK (BY OTHERS)
- PZ-7a PIEZOMETER (BY OTHERS)
- INSTRUMENT CABLE



COLLECTION PIPE CONNECTION

DETAIL 1

N.T.S.



COLLECTION PIPE CONNECTION

DETAIL 2

N.T.S.

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS

SCALE BAR

0 100' 200' 300'

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR REVIEW	FEB 25	WJM
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET	2	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
	3	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

GROUNDWATER RECOVERY AND TREATMENT PLANT LANDFILL EAST WELL PIPING

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

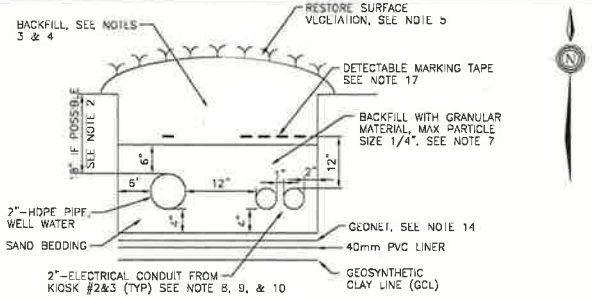
DATE: 05/25/11
PROJECT NO.: SE10160010
DRAWING C-06

Plot Date: 05/25/11 - 1:20pm, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\12500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-CIVIL.dwg

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS

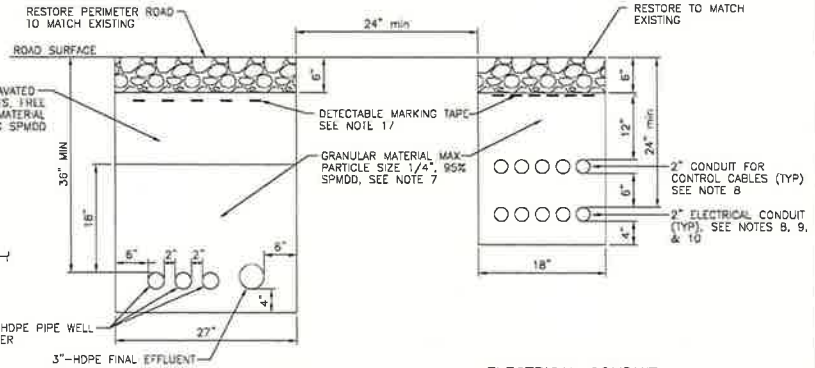
NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE THE EXISTING UNDERGROUND LINES ON THE PERIMETER ROAD BEFORE START OF EXCAVATION.
2. ALL EXCAVATIONS AND TRENCHING WORK SHALL BE PERFORMED IN ACCORDANCE WITH CURRENT WISHA AND OSHA REGULATIONS ON EXCAVATIONS, TRENCHING, AND SHORING.
3. WHERE INDICATED IN SECTION, TRENCH SHALL BE BACKFILLED WITH TOPSOIL FROM EXCAVATION
4. MATERIAL SHOULD BE FREE FROM VARIOUS TYPES OF WOOD WASTE, CONSTRUCTION DEBRIS OR OTHER EXTRANEOUS OR OBJECTIONABLE MATERIAL.
5. IN UNIMPROVED AREAS MOUND BACKFILL FOR SETTLEMENT. EXCESS SOILS TO BE SPREAD ADJACENT TO TRENCH. HYDROSEED DISTRURBED AREAS.
6. WHERE INDICATED IN SECTION, BACKFILL WITH IMPORTED GRANULAR MATERIAL FREE OF SHARP OBJECTS TO PREVENT DAMAGE TO GEOSYNTHETIC MATERIAL. BACKFILL IN 6" LIFTS.
7. WHERE INDICATED IN SECTION, BACKFILL WITH IMPORTED GRANULAR MATERIAL IN 6" LIFTS.
8. BUTT FUSED HDPE PIPE
9. INSTALL ELECTRICAL CONDUIT AT A MINIMUM DEPTH OF 2FT (PER ELECTRICAL CODES). ONE ELECTRICAL CONDUIT PER WELL 1" IN DIAMETER.
10. ELECTRICAL WIRING MUST MEET THE ELECTRICAL LOAD RATING FOR THE PUMPS, AND ELECTRICAL SPECS
11. INSTALL ELECTRICAL AND CONTROL CABLE CONDUITS BY LAYERS PER WELL SECTION (WETLAND WELL: 10 CONDUITS; LANDFIELD EAST WELLS 7 CONDUITS; LANDFIELD WEST WELLS: 4 CONDUITS)
12. DEPTH OF EXISTING LANDFILL CAP IS 12 TO 24 INCHES. EXTREME CARE SHALL BE EXERCISED WHEN TRENCHING TO AVOID DAMAGE TO CAP. CAP SYSTEM SHALL BE PROTECTED AND RESTORED TO SATISFACTION OF OWNER'S REPRESETATIVE IN THE EVENT OF DAMAGE AT CONTRACTOR'S FULL EXPENSE.
13. RESTORE LANDFILL CAP IN LAYERS FROM BOTTOM UP TIE INTO AND MATCH THE EXISTING CAP. USE MANUFACTURER APPROVED EQUIPMENT AND TECHNIQUES TO INSTALL CAP COMPONENTS MATERIAL (GCL, GEOMEMBRANE, AND GEONET)
14. REMOVE ALL EXCESS MATERIAL AND REMAINING DEBRIS FROM THE WORK AREA AND DISPOSE IN ACCORDANCE WITH APPLICABLE REGULATION AND STANDARDS.
15. AIR RELEASE VALVE SHALL BE INSTALLED AT HIGH POINT OF LINE IN PRECAST CHAMBER. CHAMBER SHALL BE POSITIONED A MINIMUM OF 3" ABOVE GEOMEMBRANE.
16. AIR RELEASE VALVE SHALL DRAIN INTO REMOVABLE CONTAINER PLACED INSIDE THE CHAMBER. OPERATOR SHALL EMPTY CONTAINER ON A REGULAR BASIS.
17. DETECTABLE MARKING TAPE TO BE INSTALLED ABOVE EACH PIPE AND CONDUIT. TAPE SHALL MEET WSDOT M 41-10 SEC 9-15.18
18. APPROPRIATE NUMBER AND SPACING OF CLEANOUT LOCATIONS FOR PIGGING AND CLEANING LINES TO BE DETERMINED BY CONTRACTOR.
19. IF EXISTING PIT-RUN FROM TRENCH EXCAVATION IN LANDFILL AREA IS SUITABLE (SUBJECT TO APPROVAL BY OWNER'S REPRESENTATIVE), USE FOR PIPE BEDDING AND BACKFILL.
20. ELECTRICAL KIOSK #1 TO DISTRIBUTE POWER AND CONTROL TO R-7 THROUGH R-10 AND PZ-2A, 2B, 3A, 3B, 4A, 4B, 4C, 5A, 5B, 5C. FOR DETAILS SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS.
21. CONTROL CONNECTION FOR PZ-6A, 6B SHALL BE DIRECTLY TO CENTRAL PLC IN GWTP BUILDING.



PIPING TRENCH

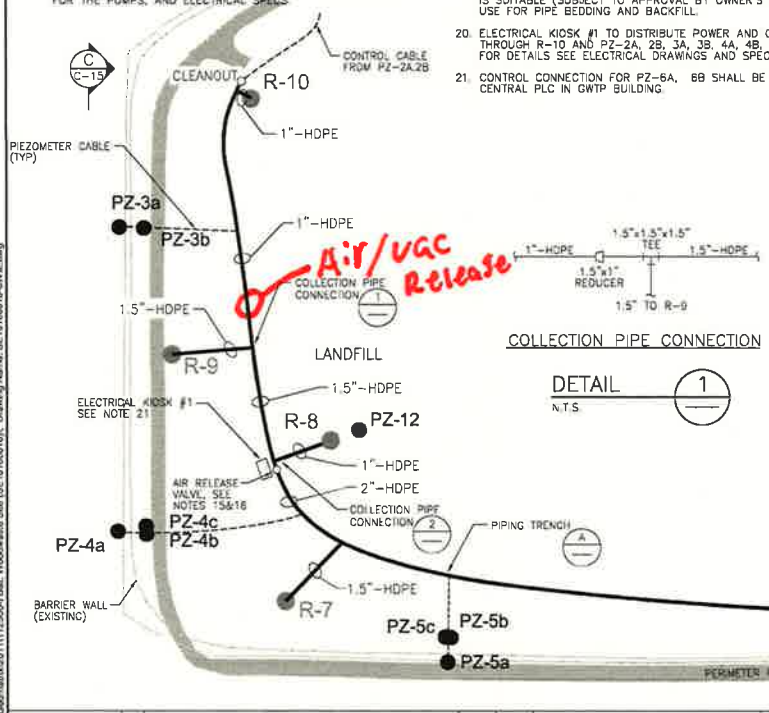
SECTION A
N.T.S.

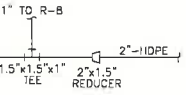


WELL PIPES AND FINAL EFFLUENT TRENCH

ELECTRICAL CONDUIT TRENCH

SECTION B
N.T.S.





COLLECTION PIPE CONNECTION DETAIL 1
N.T.S.

COLLECTION PIPE CONNECTION DETAIL 2
N.T.S.

CONTRACTOR MARKUP RECORD DRAWING

SCALE BAR
0 100' 200' 300'

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR REVIEW	FEB 25	WJM
DATUM HORIZONTAL WASP-NAD83-S FEET VERTICAL NAVD88 FEET	2	ISSUED FOR PLANS AND SPECIFICATIONS	APR 5	WJM
	3	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED CP
REVIEWED WJM

AMEC Geomatrix

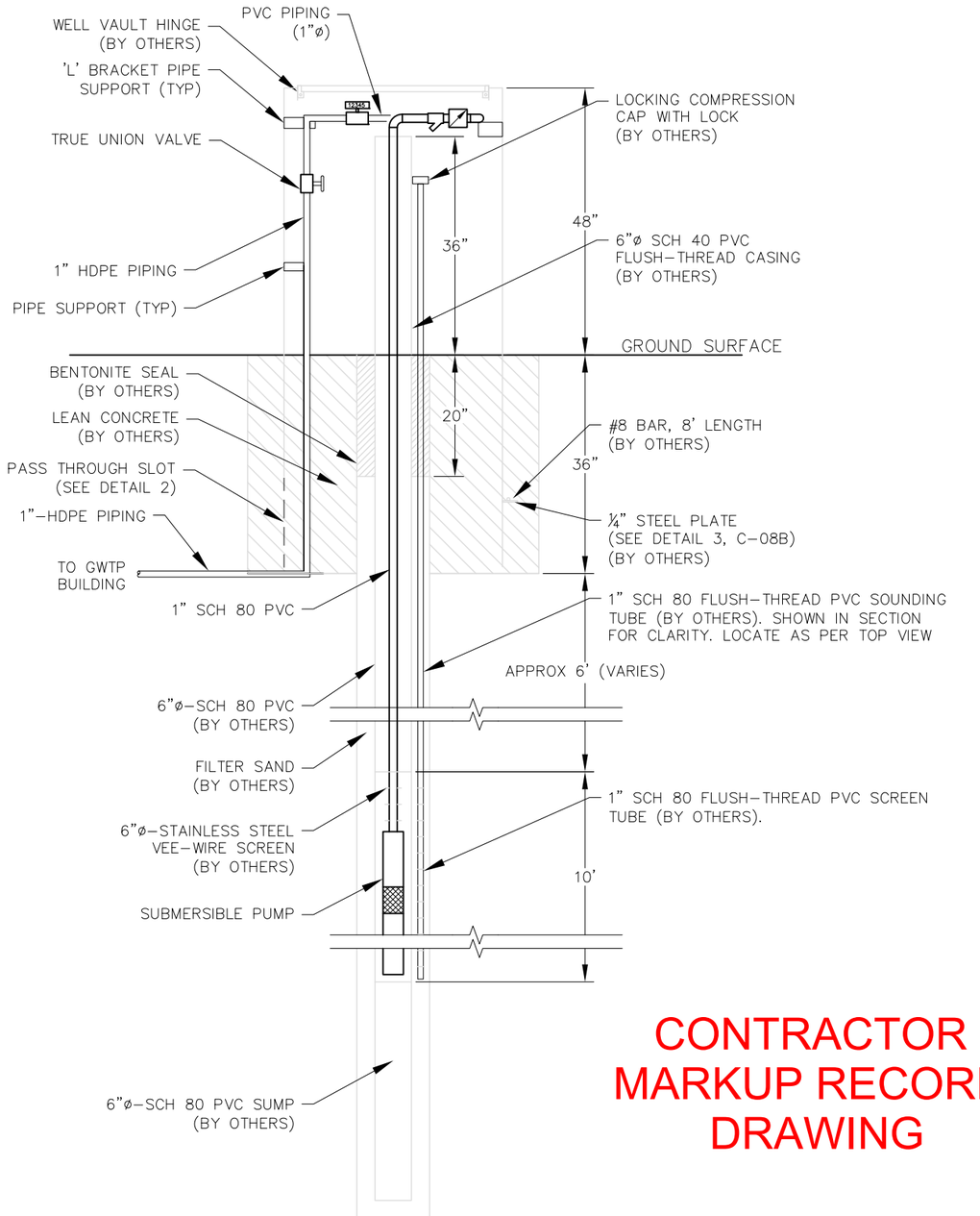
GROUNDWATER RECOVERY AND TREATMENT PLANT LANDFILL WEST WELL PIPING

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/25/11
PROJECT NO.: SE10160010
DRAWING C-07

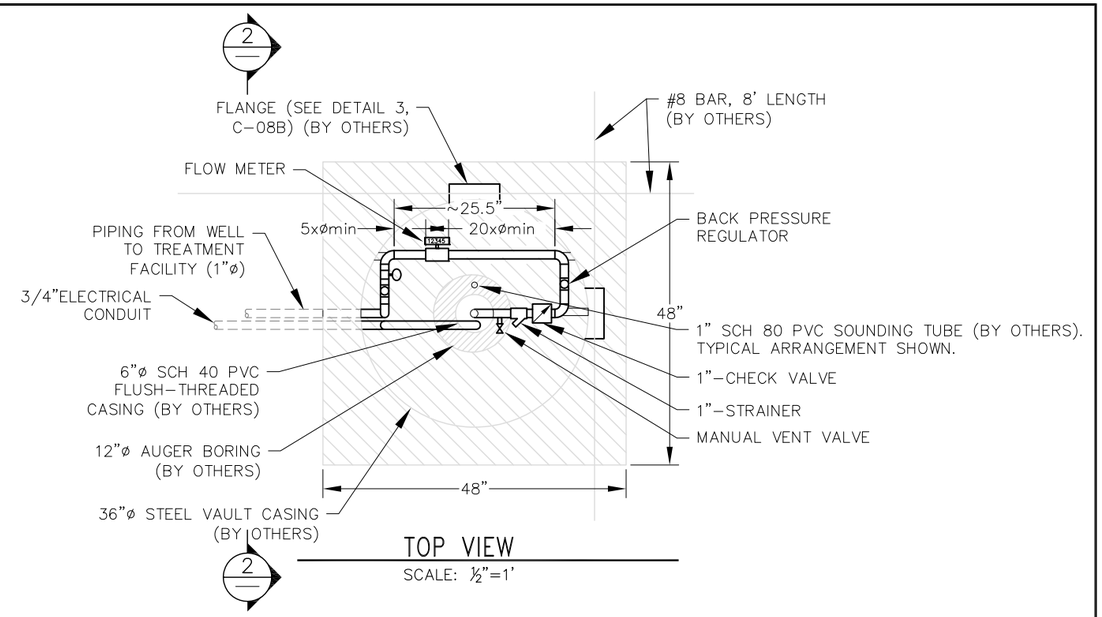
Plot Date: 05/25/11 - 1:21pm, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\11\12500-B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-CIVIL.dwg

LEGEND:
- FENCE LINE (EXISTING)
- WETLAND
- STABILIZE AREA WITH CRUSHED ROCK (BY OTHERS)
- PERIMETER ROAD (EXISTING)
- HDPE PIPE
- R-21 NEW EXTRACTION WELL (BY OTHERS)
- R-11 EXISTING WELL INCLUDED IN EXTRACTION NETWORK (BY OTHERS)
- METAL CLAD INSTRUMENT CABLES



FRONT VIEW

SCALE: ½"=1'



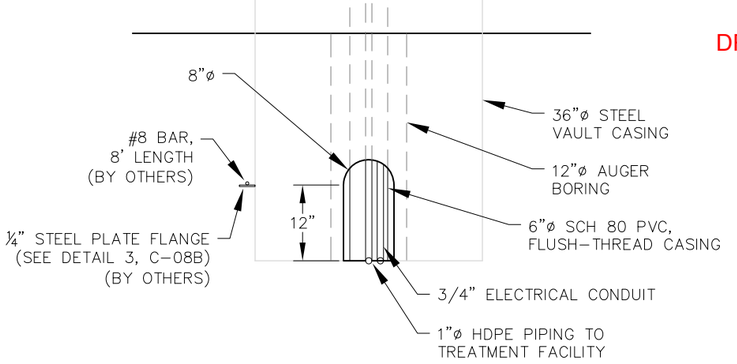
TOP VIEW

SCALE: ½"=1'

NOTES:

1. PIPING AND FITTINGS ARE SCHEDULE 80 PVC, FROM PUMP TO TRUE UNION BALL VALVE, THEN SWITCH TO 1" HDPE SDR 11
2. ALL VALVES, FITTINGS, COUPLING, INSTRUMENTS, ETC., SHALL BE COMPATIBLE WITH PIPE MATERIAL AND INSTALLED PER MANUFACTURE'S RECOMMENDATIONS
3. WELL DRILLING, CASING, SCREEN, SEAL, SOUNDING TUBE, AND VAULT BY OTHERS.
4. INSULATE ABOVE GRADE PIPING WITH SUITABLE FREEZE PROTECTION, MINIMUM 2 INCH CLOSED CELL FOAM INSULATION AND HARD PLASTIC COVER.

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS



PASS THROUGH SLOT DETAIL 2

SCALE: ½"=1'

CONTRACTOR MARKUP RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

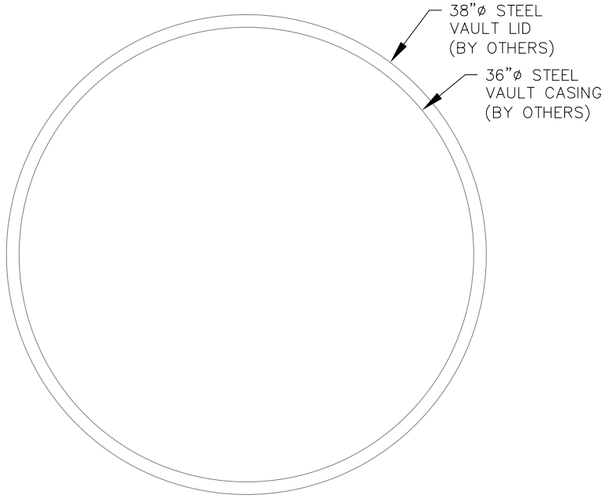
WETLAND WELL VAULT DETAILS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/24/11
PROJECT NO.: 13488
DRAWING C-08A

Plot Date: 05/24/11 - 10:05am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\12500-I B&L Woodwaste Site (SE101600010)\, Drawing Name: SE101600010-C08-09.dwg

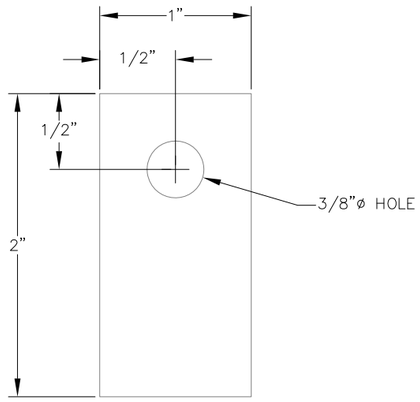
CONTRACTOR MARKUP RECORD DRAWING



STEEL VAULT LID TOP VIEW
SCALE: 1"=1'

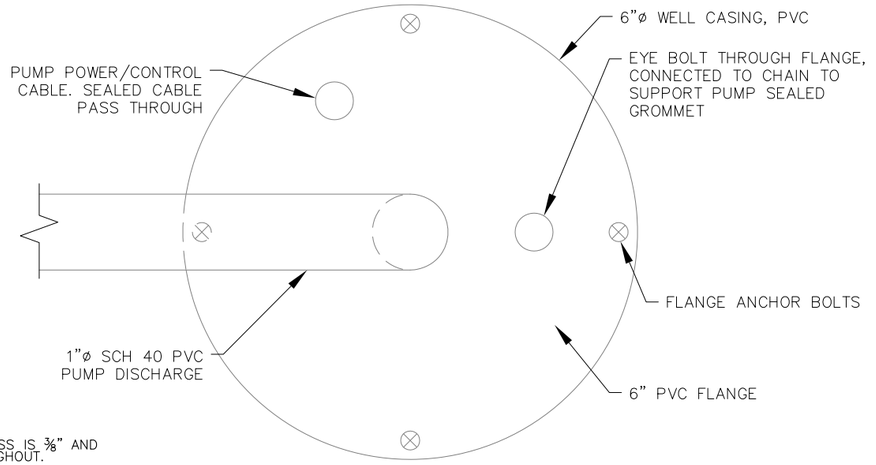
STEEL VAULT LID SIDE VIEW
SCALE: 1"=1'

STEEL VAULT LID SECTION VIEW
SCALE: 1"=1'



CASING FLANGE DETAIL
SCALE: 1"=1"

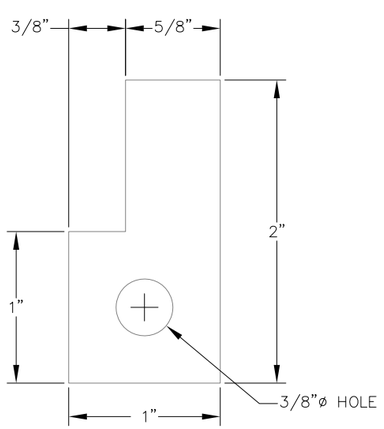
NOTES:
1. FLANGE THICKNESS IS ⅜" AND UNIFORM THROUGHOUT.
2. TWO FLANGES WILL BE WELDED TO THE STEEL VAULT CASING. THEY WILL BE LOCATED OPPOSITE EACH OTHER AND IN LINE WITH WELL VAULT LID FLANGES, TO ALLOW FOR HINGE AND LOCKING TO OCCUR.



WELL CAP FLANGE DETAIL
SCALE: 1"=2"

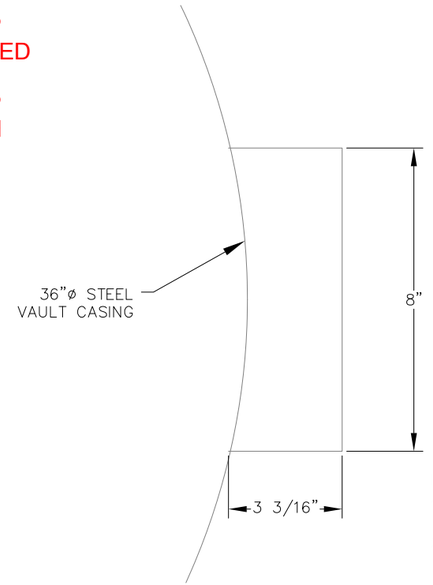
2

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS



LID FLANGE DETAIL
SCALE: 1"=1"

NOTES:
1. FLANGE THICKNESS IS ⅜" AND UNIFORM THROUGHOUT.
2. TWO FLANGES WILL BE WELDED TO VAULT LID. ONE FLANGE WILL ACT AS A HINGE AND THE OTHER WILL SECURE THE VAULT VIA PADLOCK.
3. THE FLANGES WILL BE WELDED OPPOSITE EACH OTHER ON THE VAULT LID.



NOTES:
1. FLANGE THICKNESS IS UNIFORM THROUGHOUT AND ¼" THICK.
2. TWO FLANGES WILL BE WELDED TO THE STEEL VAULT CASING, 90° FROM EACH OTHER. SEE TOP VIEW FOR PLACEMENT.
3. WELL CASING AND VAULT BY OTHERS

REBAR FLANGE DETAIL
SCALE: 1"=4"

3

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

WETLAND WELL VAULT DETAILS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

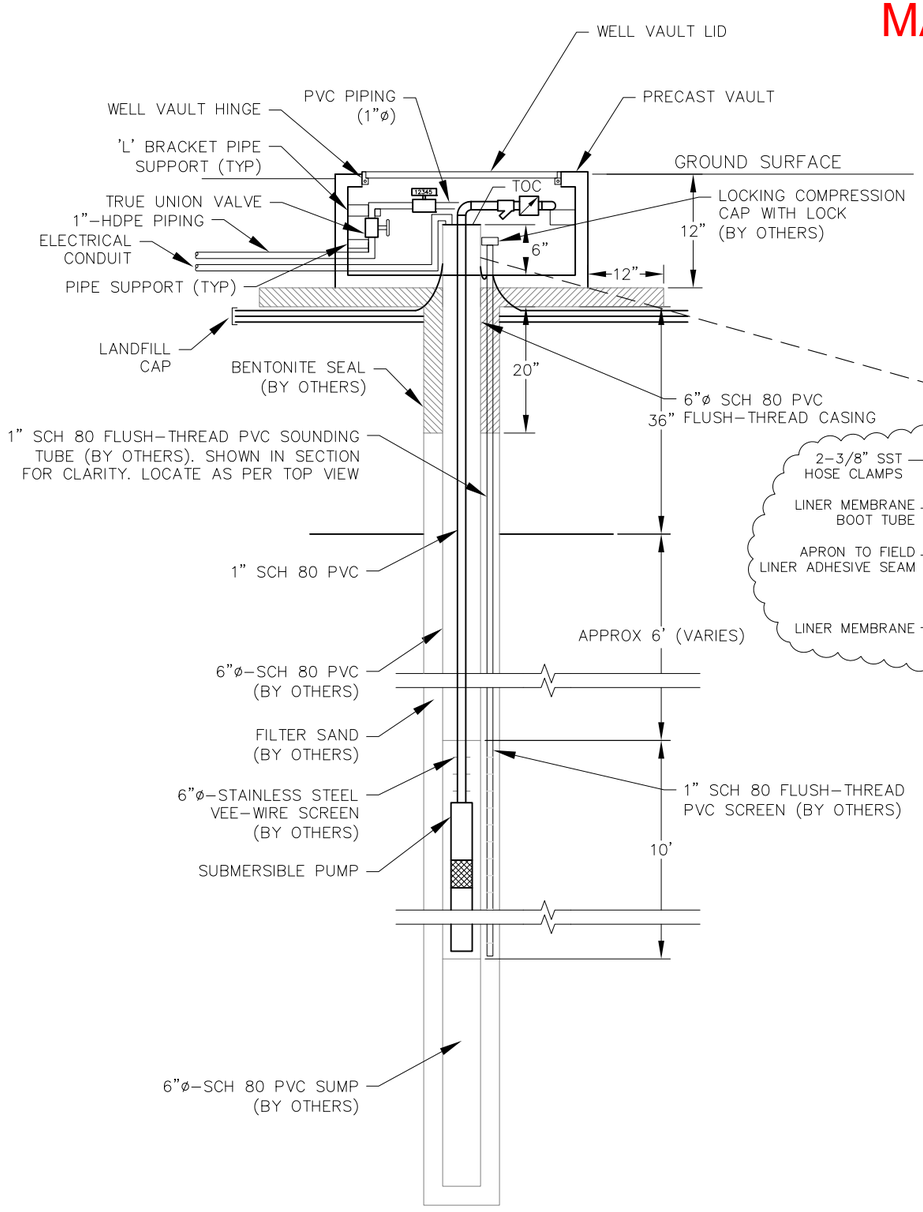
DATE: 05/24/11
PROJECT NO.: 13488

DRAWING
C–08B

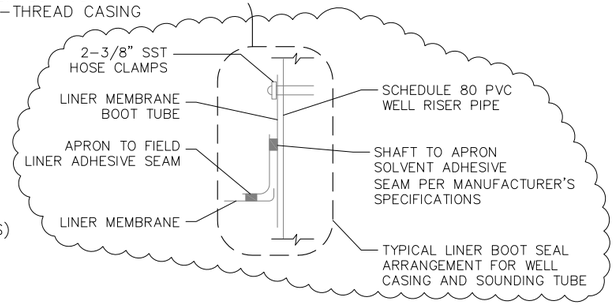
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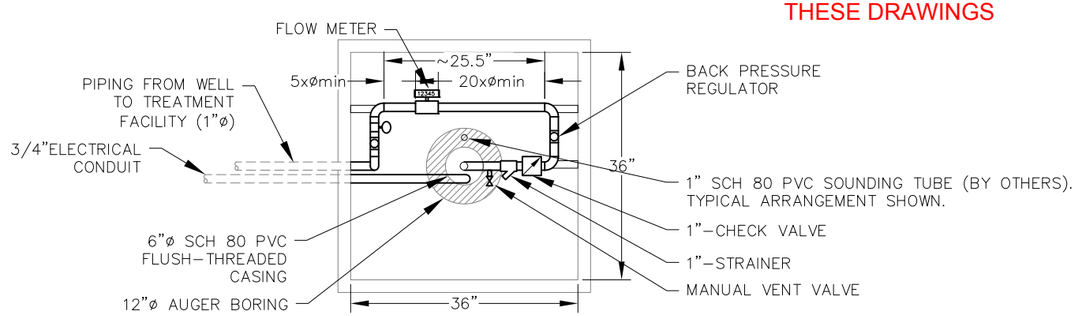
CONTRACTOR MARKUP RECORD DRAWING

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS

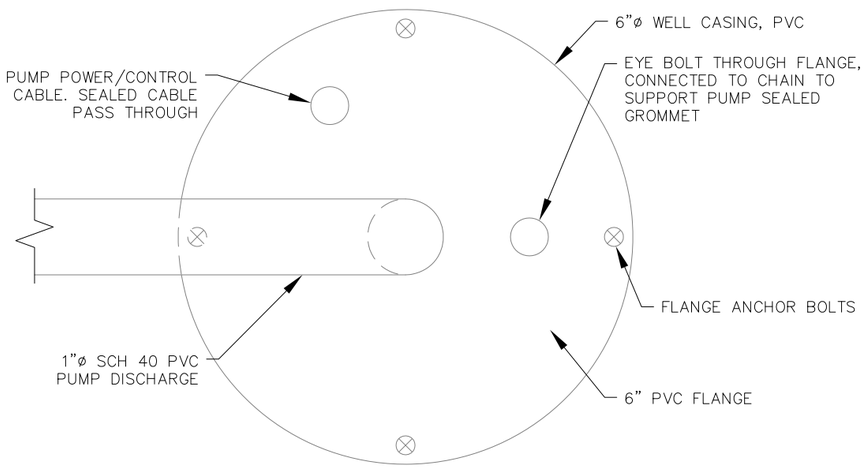


FRONT VIEW
SCALE: ½"=1'





TOP VIEW
SCALE: ½"=1'



WELL CAP FLANGE DETAIL 2
SCALE: 1"=2"

NOTES:

1. PIPING AND FITTINGS ARE SCHEDULE 80 PVC FROM PUMP TO TRUE UNION BALL VALVE, THEN SWITCH TO HDPE SDR 11
2. ALL VALVES, FITTINGS, COUPLING, INSTRUMENTS, ETC., SHALL BE COMPATIBLE WITH PIPE MATERIAL AND INSTALLED PER MANUFACTURE'S RECOMMENDATIONS
3. INSTALL A PRECAST VAULT ON 4" THICK SAND BEDDING
4. BACKFILL THE REMAINDER OF EXCAVATION WITH THE COVER SOIL TO RESTORE TO ITS ORIGINAL CONDITION.
5. WELL DRILLING, CASING, SCREEN, AND SEAL BY OTHERS.
6. CONTRACTOR TO EXCAVATE TO CAP LINER AND CUT HOLE THROUGH CAP LINER BEFORE WELL IS DRILLED (BY OTHERS).
7. AFTER DRILLING AND CASING IS INSTALLED BY OTHERS, CONTRACTOR SHALL SEAL LINER AROUND WELL CASING AND SOUNDING TUBE AS PER TYPICAL DETAIL SHOWN AND MANUFACTURER'S INSTRUCTIONS. CAP LINER BOOT SHALL BE PURCHASED FROM NORTHWEST LINING.
8. WELL VAULT SHALL BE SUITABLE FOR H–15 AASHTO TRAFFIC RATING.
9. WELL VAULT SHALL HAVE DRAIN HOLE THROUGH BOTTOM THAT WILL DRAIN ANY FREE LIQUID TO SAND BEDDING LAYER.
10. IF TALLER VAULT IS REQUIRED AND TOP OF VAULT DOES NOT FIT AT GRADE, MOUND BACKFILL TO PROVIDE GRADUAL SLOPE FROM TOP OF VAULT TO EXISTING GRADE. SLOPE SHALL BE NO GREATER THAN 4:1. PROVIDE TOPSOIL AND HYDROSEED IMPACTED AREA.

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

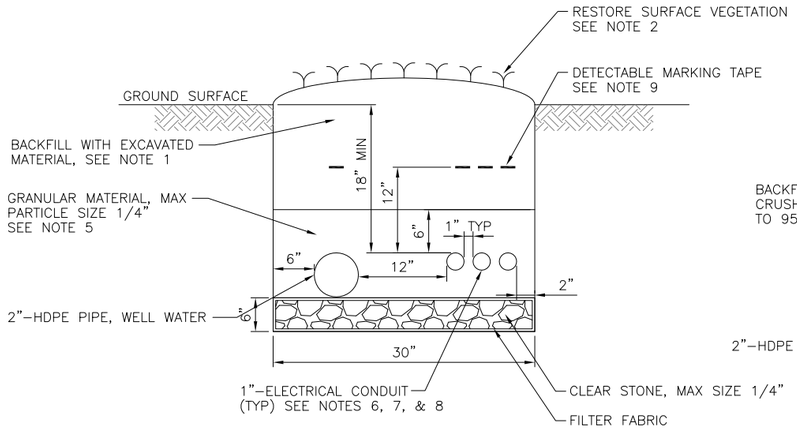
AMEC Geomatrix

LANDFILL WELL VAULT DETAILS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

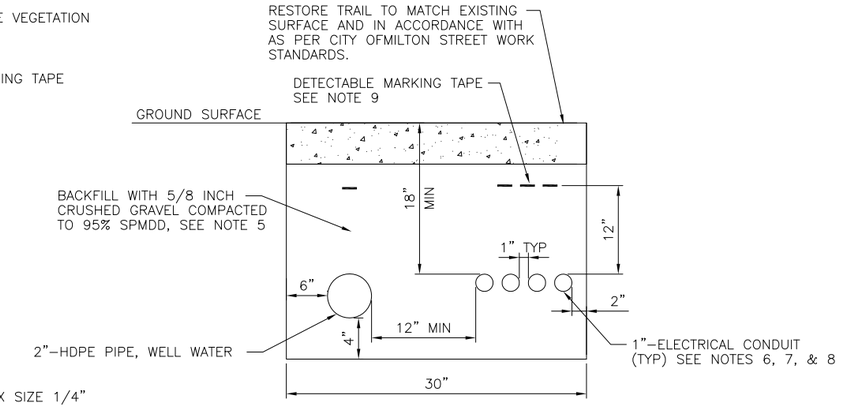
DATE: 05/25/11
PROJECT NO.: 13488
DRAWING C–09

Plot Date: 05/25/11 - 10:56am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\12500-I B&L Woodwaste Site (SE101600010)\, Drawing Name: SE101600010-C08-09.dwg



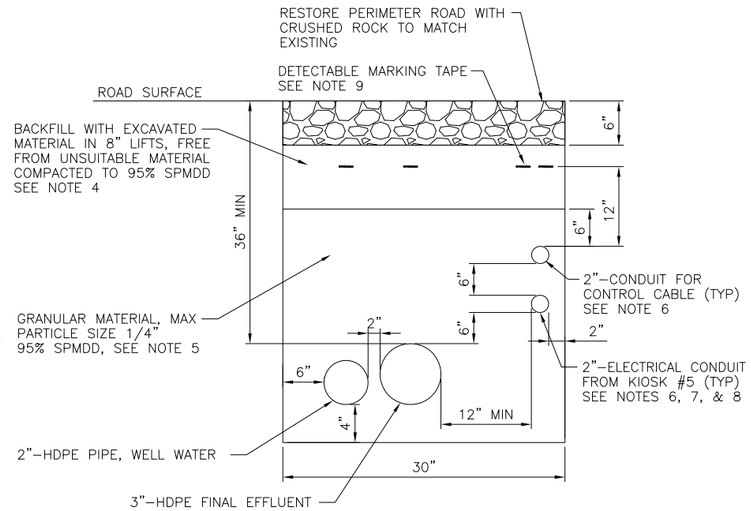
WETLAND AREA PIPING TRENCH

SECTION A
N.T.S. C–05



INTERURBAN TRAIL PIPING TRENCH

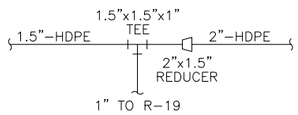
SECTION B
N.T.S. C–05



PIPING TRENCH

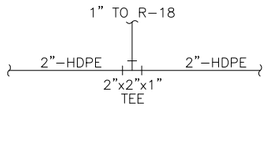
SECTION C
N.T.S. C–05

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS



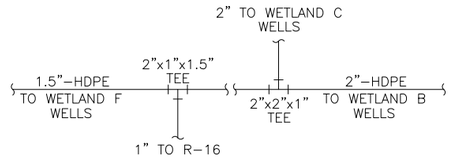
COLLECTION PIPE CONNECTION

DETAIL 1
N.T.S. C–05



COLLECTION PIPE CONNECTION

DETAIL 2
N.T.S. C–05



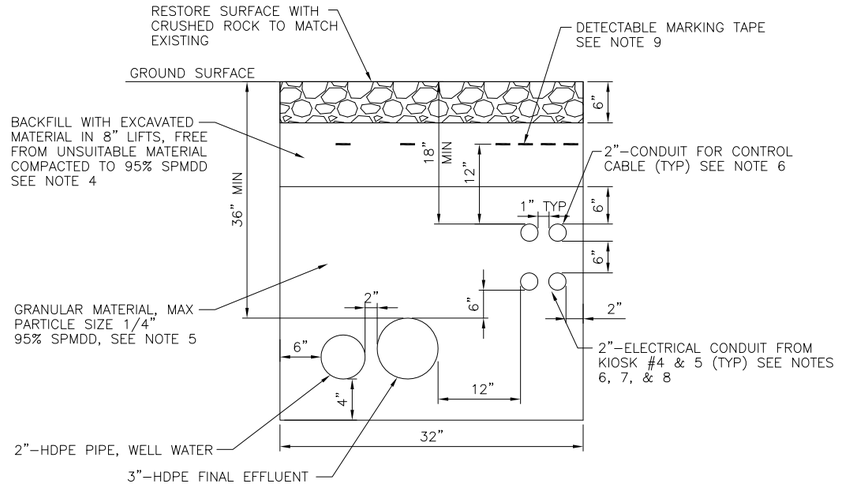
COLLECTION PIPE CONNECTION

DETAIL 3
N.T.S. C–05

NOTES:

1. WHERE INDICATED IN SECTION,TRENCH SHALL BE BACKFILLED WITH WETLAND TOPSOIL FROM EXCAVATION
2. IN UNIMPROVED AREAS MOUND BACKFILL FOR SETTLEMENT
3. TRENCH SIDE SLOPE OR SHORING REQUIREMENTS TO BE DETERMINED BY CONTRACTOR BASED ON FINAL TRENCH DEPTH AND SOIL CONDITIONS. ALL EXCAVATIONS AND TRENCHING WORK SHALL BE PERFORMED IN ACCORDANCE WITH CURRENT OSHA AND WISHA REGULATIONS ON EXCAVATIONS, TRENCHING, AND SHORING.
4. MATERIAL SHALL BE ESSENTIALLY FREE FROM VARIOUS TYPES OF WOOD WASTE, CONSTRUCTION DEBRIS OR OTHER EXTRANEOUS OR OBJECTIONABLE MATERIAL.
5. WHERE INDICATED IN SECTION, BACKFILL WITH IMPORTED GRANULAR MATERIAL IN 6" LIFTS
6. BUTT FUSED HDPE PIPE
7. INSTALL ELECTRICAL CONDUIT AT A MINIMUM DEPTH OF 18 INCHES. ONE ELECTRICAL CONDUIT PER WELL 1" IN DIAMETER.
8. ELECTRICAL WIRING MUST MEET THE ELECTRICAL LOAD RATING FOR THE PUMPS AND ELECTRICAL SPECIFICATIONS.
9. DETECTABLE MARKING TAPE TO BE INSTALLED ABOVE EACH PIPE AND CONDUIT. TAPE SHALL MEET WSDOT M 41–10 SEC 9–15.18
10. DUE TO PRESENCE OF ARSENIC, SUBSURFACE WORK PERFORMED OUTSIDE THE LANDFILL PERIMETER ROAD SHALL BE CONDUCTED IN ACCORDANCE WITH OSHA HAZWOPER REGULATIONS AND A SITE SPECIFIC HEALTH AND SAFETY PLAN.
11. EXCESS SPOILS SHALL BE DISPOSED OF IN AN ENVIRONMENTALLY SOUND MANNER AT AN APPROVED FACILITY.
12. ALL DISTURBED AREAS SHALL BE HYDROSEEDED WITH NATIVE VEGETATION SPECIES.

CONTRACTOR MARKUP RECORD DRAWING



PIPING TRENCH

SECTION D
N.T.S. C–05

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	
1	ISSUED FOR REVIEW	FEB 25	WJM
2	ISSUED FOR PERMIT	MAR 18	GP
3	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
4	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

GROUNDWATER TREATMENT PLANT
WETLAND AND OUTSIDE LANDFILL PIPING DETAILS

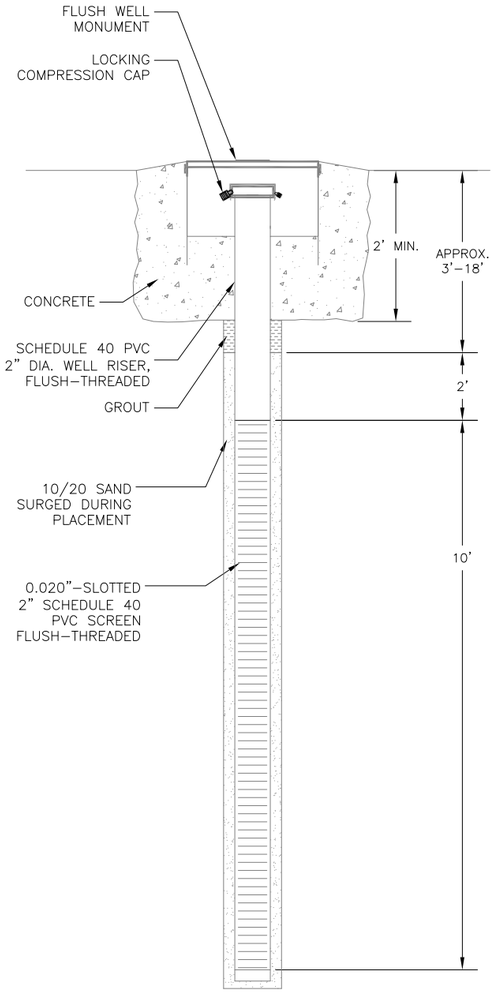
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/25/11
PROJECT NO.: SE10160010
DRAWING C–10

Plot Date: 05/25/11 - 11:03am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\12500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-CIVIL.dwg

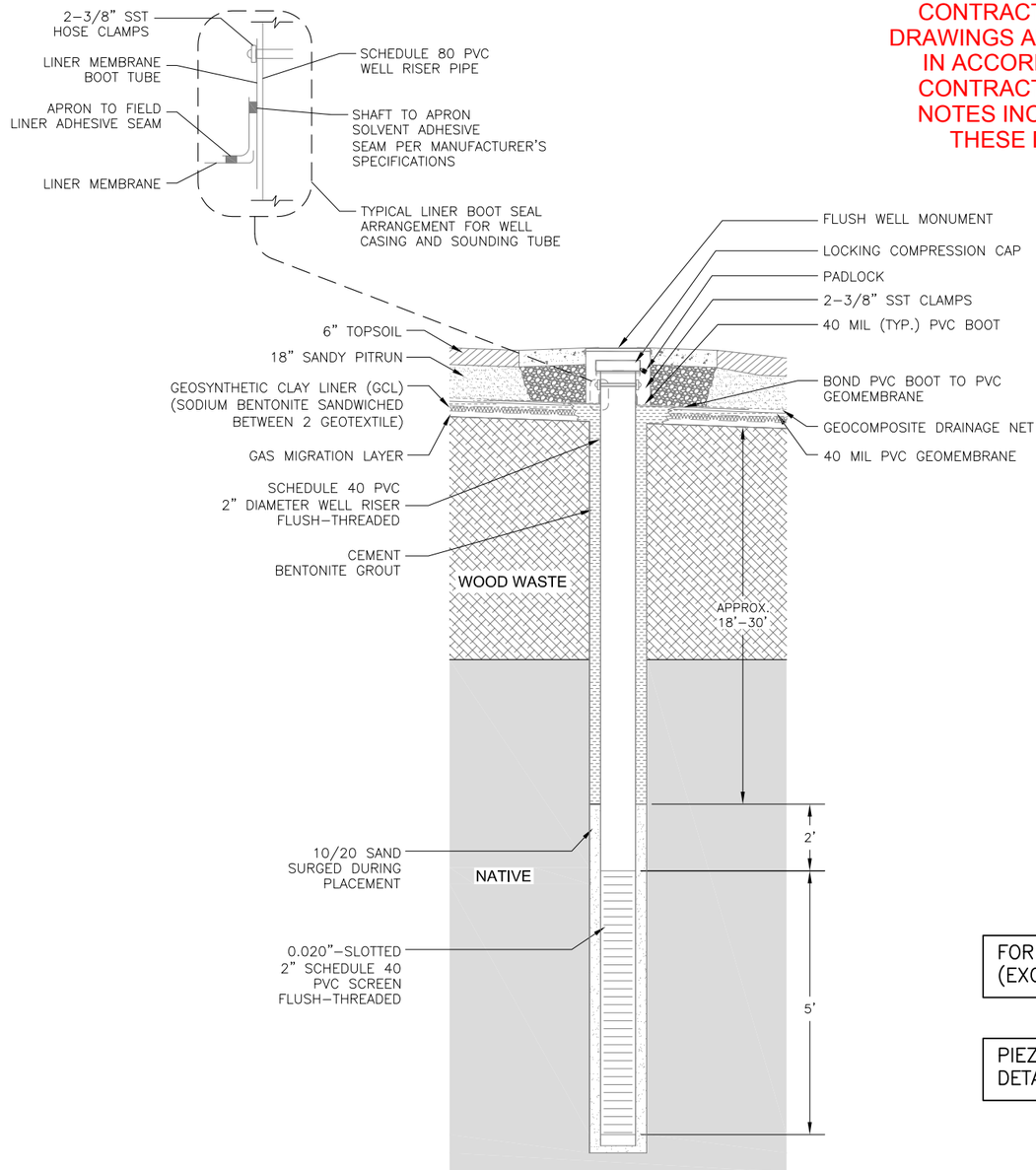
CONTRACTOR MARKUP RECORD DRAWING

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS



UPPER INTERVAL PIEZOMETER OUTSIDE BARRIER WALL (1)

NOT TO SCALE



LOWER INTERVAL PIEZOMETER INSIDE BARRIER WALL (2)

NOT TO SCALE

FOR INFORMATION ONLY (EXCEPT AS NOTED)

PIEZOMETER AND WELL DETAILS SEE C–12B

NOTES:

1. CONNECT CONTROL CABLES TO PIEZOMETERS AS REQUIRED IN P&IDs. INSTALL SEALED CABLE PASS THROUGH IN EXISTING WELL MONUMENT LIDS.

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	ES
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

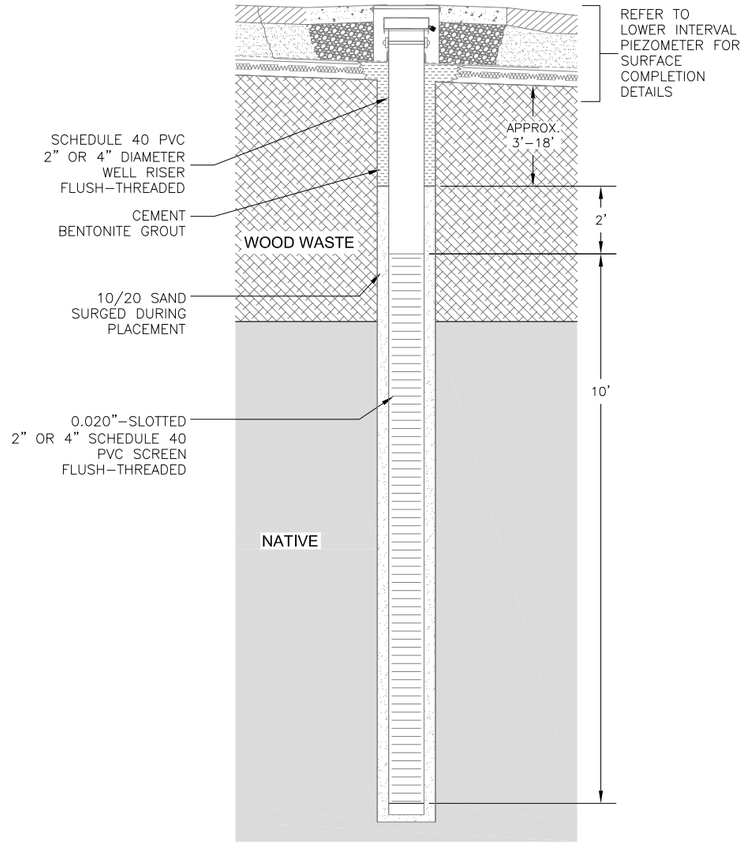
EXISTING PIEZOMETER DETAILS
SHEET 1 of 2

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

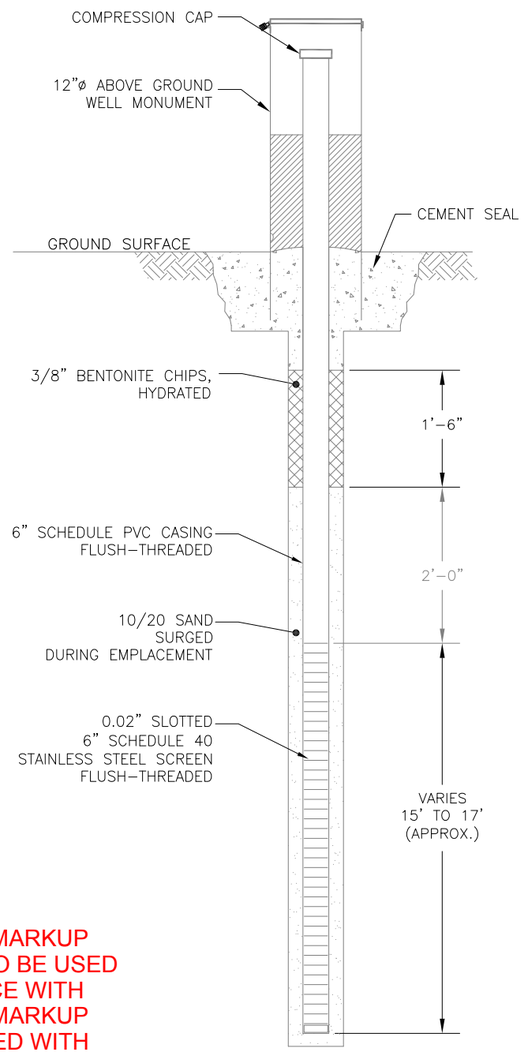
DATE: 05/24/11
PROJECT NO.: SE10160010
DRAWING C–12A

Plot Date: 05/24/11 - 10:58am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-EC01.2 & C12.20.dwg

CONTRACTOR MARKUP RECORD DRAWING



UPPER INTERVAL PIEZOMETER INSIDE BARRIER WALL 3
NOT TO SCALE



PREZOMETER OUTSIDE BARRIER WALL 4
NOT TO SCALE

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS

FOR INFORMATION ONLY (EXCEPT AS NOTED)

NAME	DETAIL	COMMENTS
LOWER SAND AQUIFER		
PZ–4c	DETAIL 2	2–INCH DIAMETER, 0.020–INCH MACHINE–SLOTTED PVC SCREEN
PZ–5c		
PZ–8c		
UPPER SAND AQUIFER		
PZ–1a	DETAIL 1	2–INCH DIAMETER, 0.020–INCH MACHINE–SLOTTED PVC SCREEN
PZ–1b	DETAIL 3	
PZ–2a	DETAIL 1	
PZ–2b	DETAIL 3	
PZ–3a	DETAIL 1	
PZ–3b	DETAIL 3	
PZ–4a	DETAIL 1	
PZ–4b	DETAIL 3	
PZ–5a	DETAIL 1	
PZ–5b	DETAIL 3	
PZ–6a	DETAIL 1	
PZ–6b	DETAIL 3	
PZ–7a	DETAIL 1	
PZ–7b	DETAIL 3	
PZ–8a	DETAIL 1	
PZ–8b	DETAIL 3	
EXISTING PIEZOMETER TO BE USED AS EXTRACTION WELL		
PZ–9/R–5	DETAIL 3, NOTE 2	4–INCH DIAMETER, 0.020–INCH CONTINUOUS–WRAP PVC SCREEN
PZ–10/R–3		4–INCH DIAMETER, 0.020–INCH MACHINE–SLOTTED PVC SCREEN
PZ–11/R–4		
PZ–12/R–8		
PZ–13/R–6		
PD–107/R–11	DETAIL 4, NOTE 2	6–INCH DIAMETER, 0.020–INCH CONTINUOUS–WRAP STAINLESS STEEL
PD–109	DETAIL 4, NOTE 1	6–INCH DIAMETER, 0.020–INCH CONTINUOUS–WRAP STAINLESS STEEL

NOTES:

1. CONTRACTOR TO CONVERT EXISTING PIEZOMETER INTO FLUSH CAPPED WELL SIMILAR TO DETAIL 2
2. CONTRACTOR TO CONVERT EXISTING PIEZOMETER INTO EXTRACTION WELL SEE DRAWING C–09
3. ALL NEW EXTRACTION WELL DRILLING WILL BE BY OTHERS.
4. DECOMMISSIONING OF MONITORING WELL MW–30 WILL BE BY OTHERS.
6. CONNECT CONTROL CABLES TO PIEZOMETERS AS REQUIRED IN P&IDs. INSTALL SEALED CABLE PASS THROUGH IN EXISTING WELL MONUMENT LIDS.

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

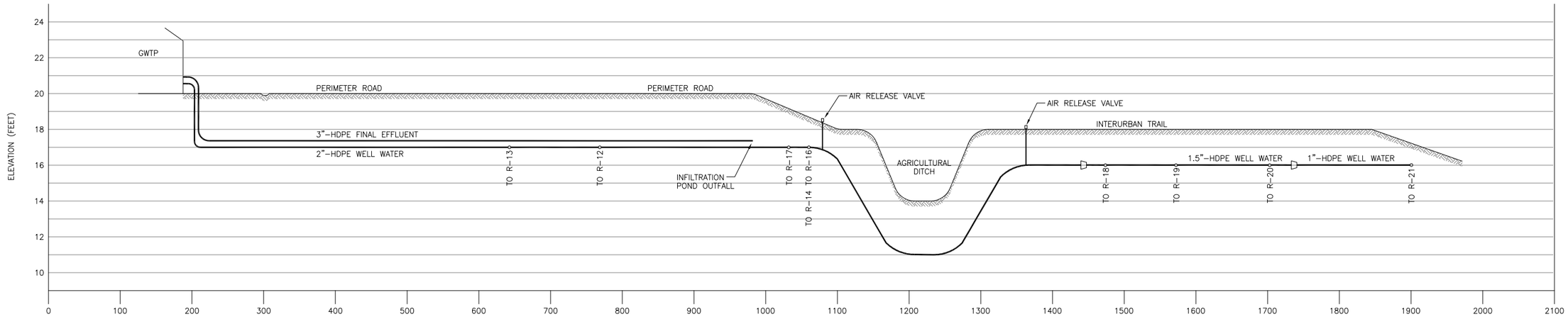
EXISTING PIEZOMETER DETAILS
SHEET 2 of 2

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/24/11
PROJECT NO.: SE10160010
DRAWING C–12B

Plot Date: 05/24/11 - 9:18am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-EC01,2 & C12.20.dwg

CONTRACTOR MARKUP RECORD DRAWING



SECTION A
AS SHOWN C–05

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS

NOTES:
1. PROVIDED TO ILLUSTRATE APPROXIMATE ELEVATION CHANGES ONLY. NOT A TRUE RIGOROUS SECTION.

HORIZONTAL SCALE BAR
0 100' 200' 300'

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

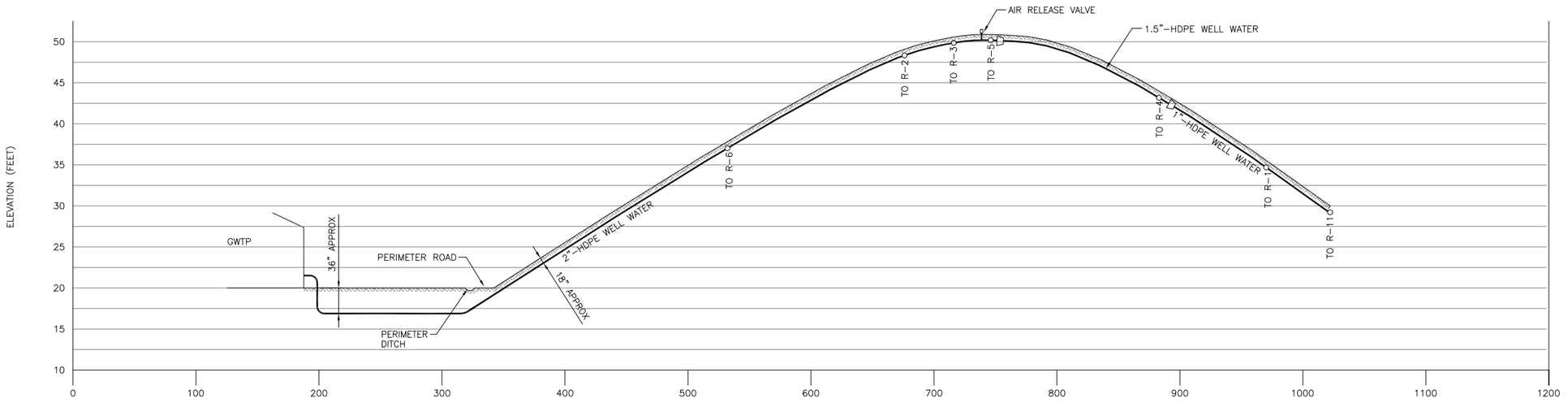
GROUNDWATER RECOVERY AND TREATMENT PLANT
WETLAND AND EAST WELL PIPING ELEVATION

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/24/11
PROJECT NO.: SE10160010
DRAWING C–13

Plot Date: 05/24/11 - 9:41am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\11\2500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-C13-15.dwg

CONTRACTOR MARKUP RECORD DRAWING



SECTION B
AS SHOWN C–06

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS

NOTES:
1. PROVIDED TO ILLUSTRATE APPROXIMATE ELEVATION CHANGES ONLY. NOT A TRUE RIGOROUS SECTION.

HORIZONTAL SCALE BAR
0 100' 200' 300'

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

GROUNDWATER RECOVERY AND TREATMENT PLANT
LANDFILL EAST WELL PIPING ELEVATION

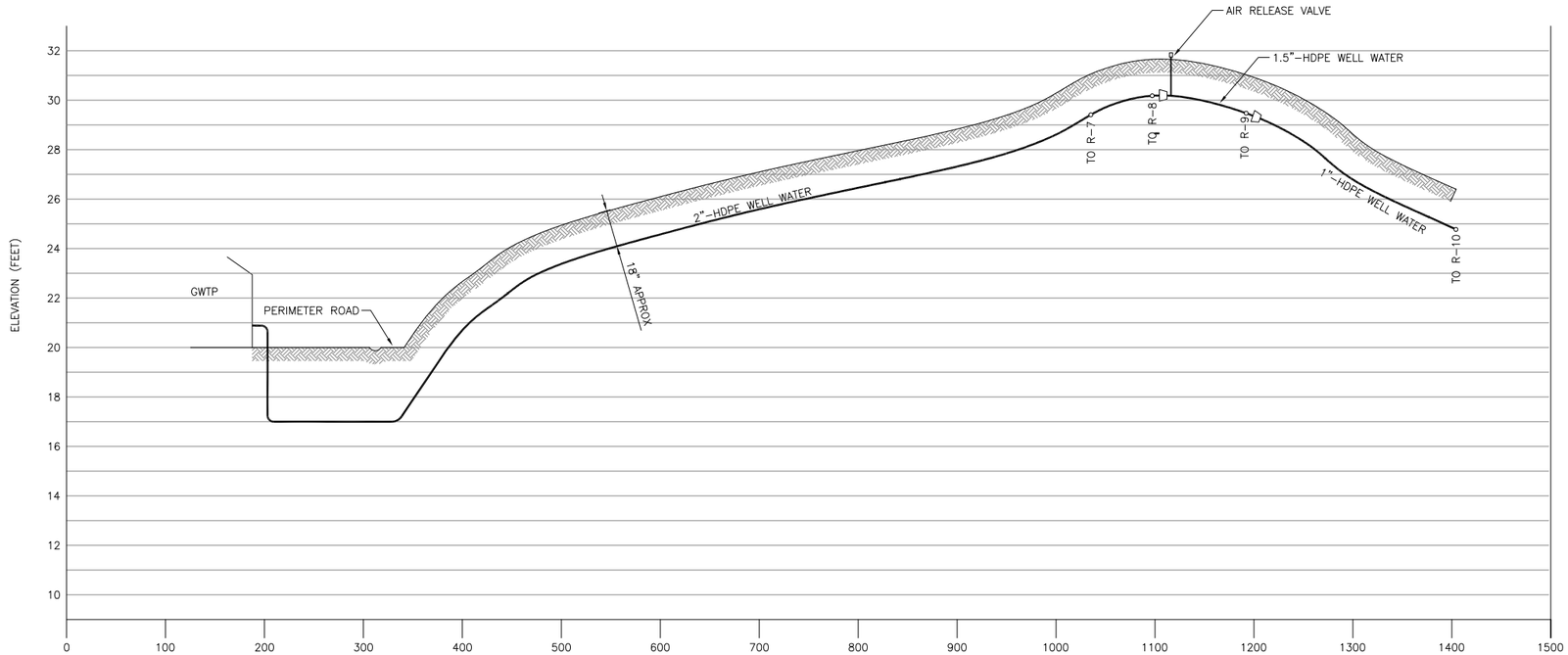
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/24/11
PROJECT NO.: SE10160010

DRAWING C–14

Plot Date: 05/24/11 - 9:41am, Plotted by: Dell Survey2
Drawing Path: T:\Peter\Geomatrix\2011\11\2500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-C13-15.dwg

CONTRACTOR MARKUP RECORD DRAWING



SECTION C
AS SHOWN C–07

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS

NOTES:
1. PROVIDED TO ILLUSTRATE APPROXIMATE ELEVATION CHANGES ONLY. NOT A TRUE RIGOROUS SECTION.

HORIZONTAL SCALE BAR
0 100' 200' 300'

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

GROUNDWATER RECOVERY AND TREATMENT PLANT
LANDFILL WEST WELL PIPING ELEVATION

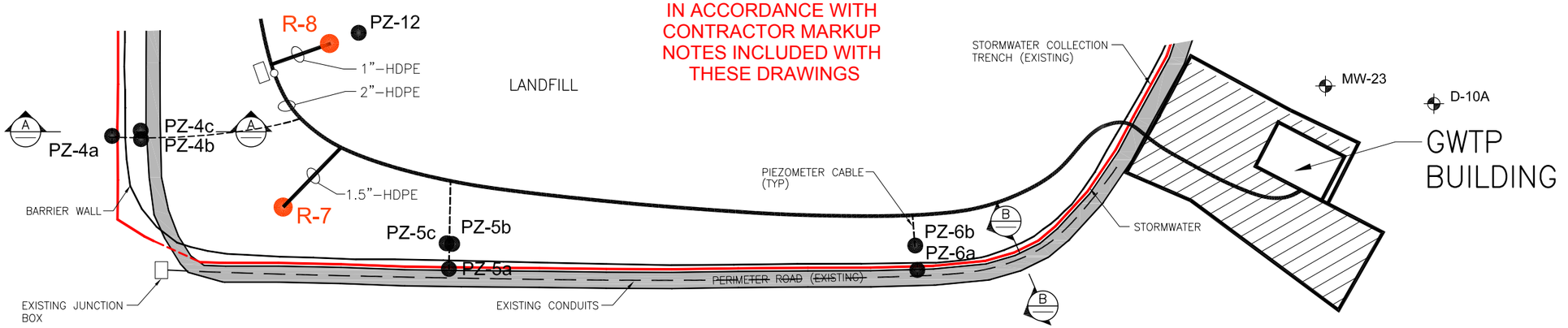
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/24/11
PROJECT NO.: SE10160010

DRAWING C–15

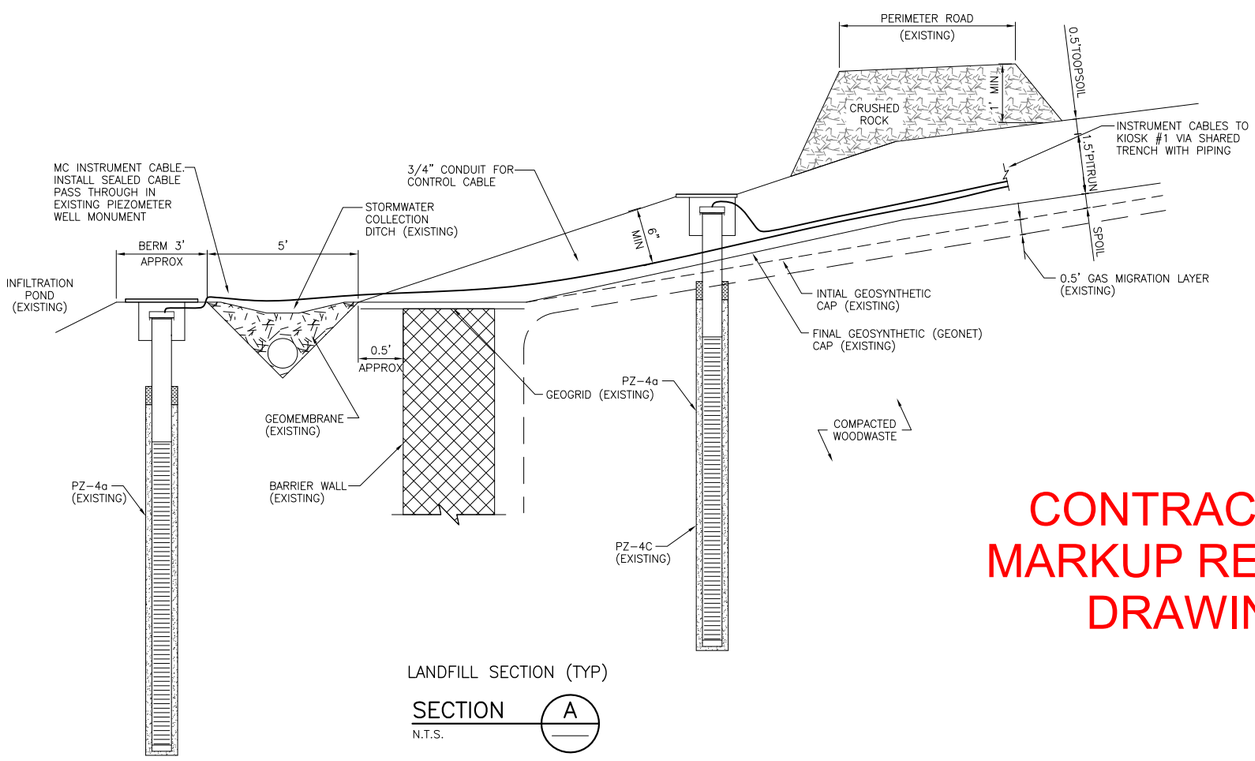
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Drawing Path: T:\PeteGeomatrix\2011\11\2500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-C13-15.dwg

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS



LEGEND:

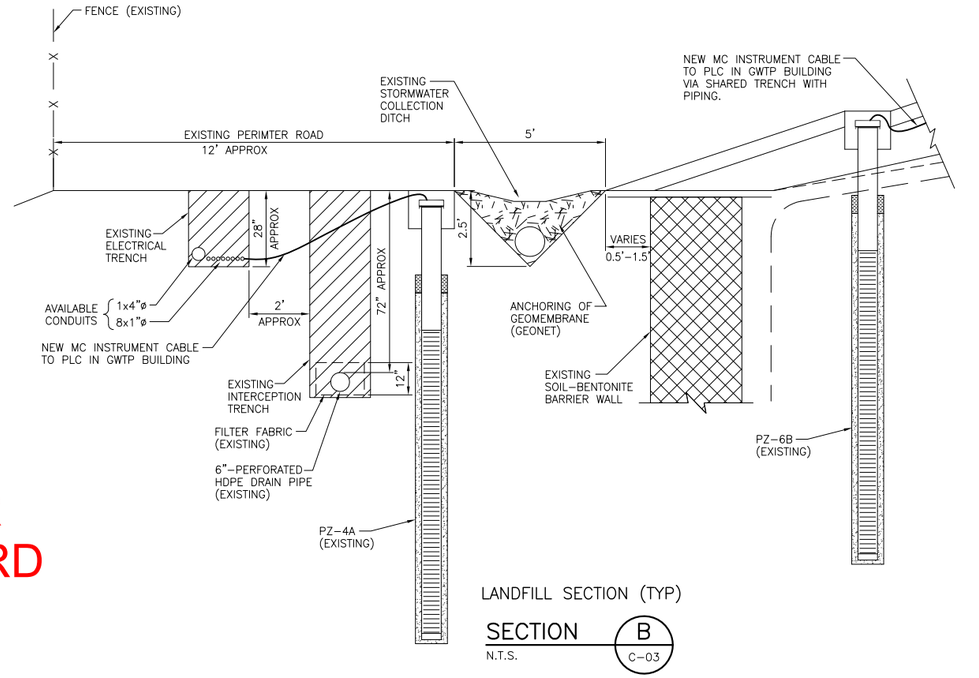
- FENCE LINE
- WETLAND
- STABILIZE AREA WITH CRUSHED ROCK (BY OTHERS)
- PERIMETER ROAD
- HDPE PIPE
- BARRIER WALL
- EXISTING CONDUITS
- STORMWATER COLLECTION TRENCH (EXISTING)
- R-21 NEW EXTRACTION WELL (BY OTHERS)
- R-11 EXISTING WELL INCLUDED IN EXTRACTION NETWORK (BY OTHERS)
- MC INSTRUMENT CABLES



LANDFILL SECTION (TYP)

SECTION A

N.T.S.



LANDFILL SECTION (TYP)

SECTION B

N.T.S.

C-03

CONTRACTOR MARKUP RECORD DRAWING

NOTES:

1. PIEZOMETERS PZ-1A, PZ-2A, PZ-3A, PZ4A, AND PZ-5A SHALL BE CONNECTED AS PER SECTION A
2. WHERE POSSIBLE CONNECT PIEZOMETER PZ-6A THROUGH THE EXISTING AVAILABLE CONDUIT. AS PER SECTIONS B. ADD NEW CONDUIT WHERE NECESSARY.
3. INSTALL NEW INSTRUMENT CABLES FOR EACH PIEZOMETER AS PER P&IDS, WITH SEALED PASS THROUGH ON WELL CAPS AND VAULTS.
4. INSTRUMENT CABLES SHOWN TO ILLUSTRATE CONCEPT ONLY. FINAL PLACEMENT TO BE DETERMINED BY CONTRACTOR TO SUIT SITE CONDITIONS.

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	WJM
2	ISSUED FOR TENDER	MAY 26	WJM

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

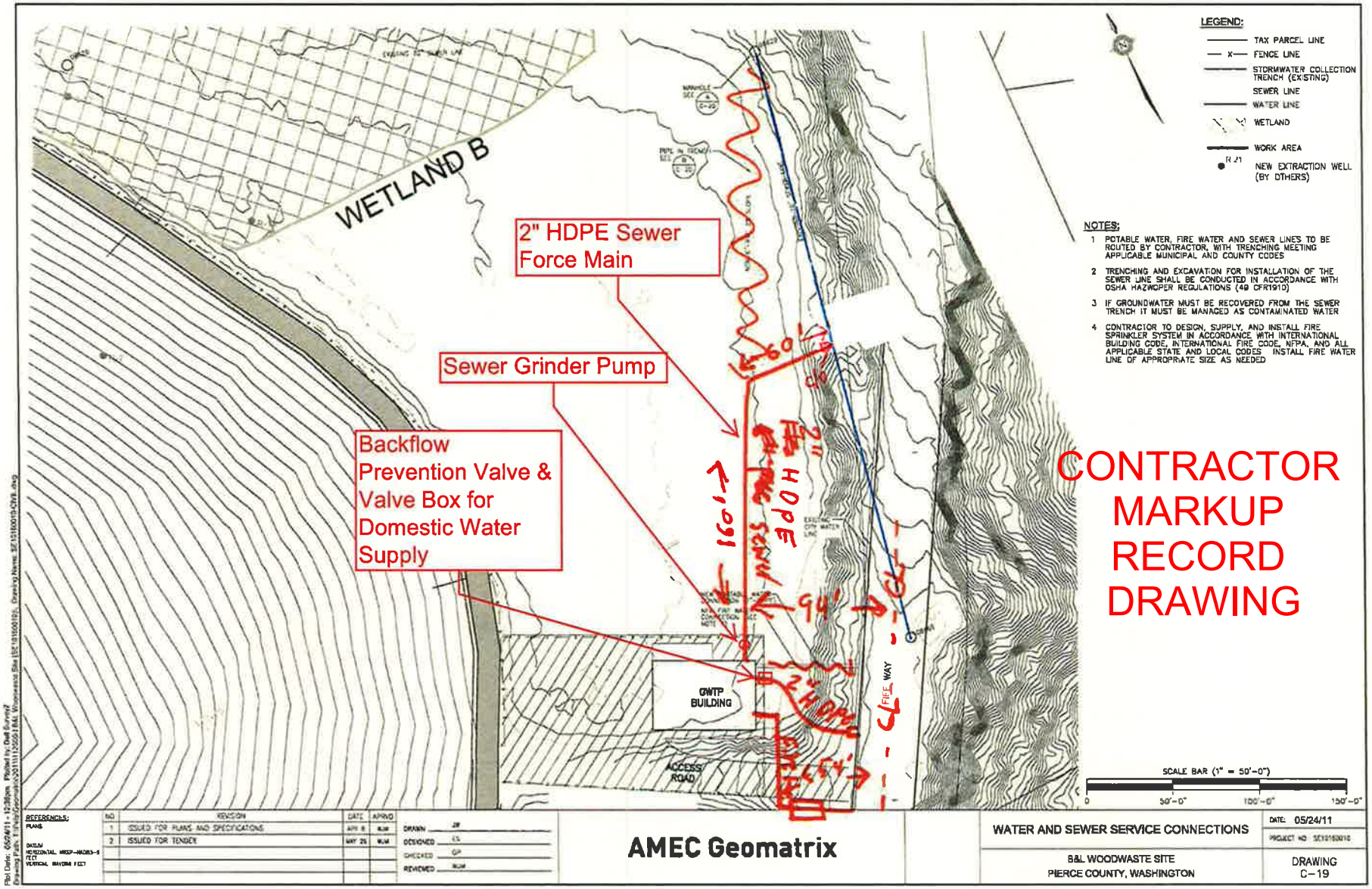
PIEZOMETER CONNECTIONS DETAIL

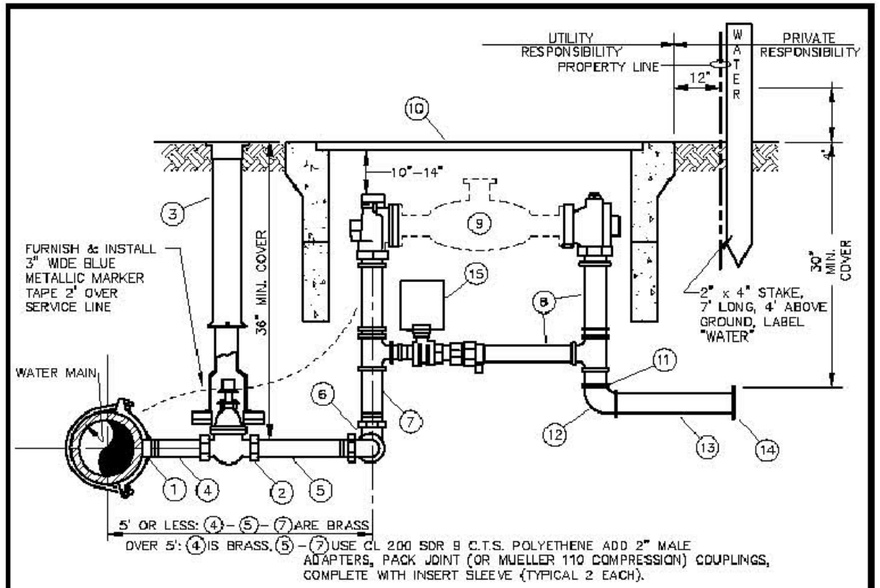
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/25/11
PROJECT NO.: SE10160010
DRAWING C-16

Plot Date: 05/25/11 - 11:08am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\12500-I B&L Woodwaste Site (SE10160010)\ Drawing Name: SE10160010-CIVIL.dwg

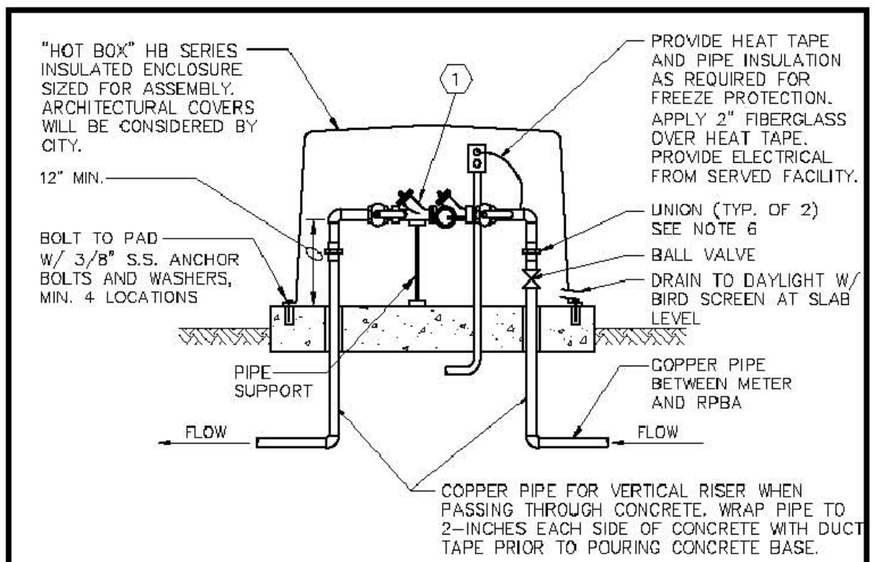
CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS





NO.	ITEM
1	ROMAC STYLE 202S STAINLESS STEEL DOUBLE STRAP TYPE SADDLE
2	2" RESILIENT WEDGE GATE VALVE WITH 2" OPERATING NUT
3	STANDARD CAST-IRON VALVE BOX (RICH NO. 940)
4	BRASS NIPPLE (3" MIN., 6" MAX.)
5	NIPPLE (SEE NOTE ABOVE)
6	BRASS SWING JOINT
7	BRASS NIPPLE (SEE NOTE ABOVE)
8	METER SETTER, 2" FORD VBH66-12B OR MUELLER B2423-2.1512 WITH METER SPACER (LENGTH DETERMINED BY DISTRICT PRIOR TO INSTALLATION)
9	METER (FURNISHED BY CITY) 17 1/4" LONG
10	METER BOX, NO.2 FOG TITE OR BROOKS NO. 65, WITH STEEL TRAFFIC COVER (FURNISH 2 BOXES).
11	1-1/2" OR 2" (MATCH METER SIZE) BRASS NIPPLE
12	1-1/2" OR 2" (MATCH METER SIZE) BRASS 90° EL
13	1-1/2" OR 2" x 12" (MATCH METER SIZE) BRASS NIPPLE
14	1-1/2" OR 2" (MATCH METER SIZE) CAP
15	6" PVC PIPE OVER BY-PASS VALVE.

CITY OF MILTON		
1-1/2" & 2" WATER SERVICE		
REVISION DATE: 3/30/07	SCALE: NONE	DWG. NO. WT-14



(1) WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) WITH TEST COCK PROTECTION AND BRONZE BODY BALL VALVE AT EACH END.

NOTES:

1. CONCRETE TO BE 2500 PSI MIX WITH AIR ENTRAINMENT.
2. COMPLETE ALL WORK IN ACCORDANCE WITH STATE, DISTRICT AND MANUFACTURER STANDARDS.
3. SYSTEM SHALL NOT BE PUT INTO SERVICE UNTIL RPBA IS APPROVED BY THE CITY AND TESTED/CERTIFIED BY A WASHINGTON STATE LICENSED BACKFLOW ASSEMBLY TESTER.
4. RPBA IS CONSIDERED PART OF THE PRIVATE SYSTEM AND SHALL BE MAINTAINED BY THE PROPERTY OWNER WITH ANNUAL CERTIFICATION REQUIRED.
5. DIELECTRIC UNIONS SHALL BE USED TO SEPARATE DISSIMILAR MATERIALS.
6. NO BRANCH CONNECTIONS ALLOWED BETWEEN METER AND RPBA.

CITY OF MILTON		
REDUCED PRESSURE BACKFLOW ASSEMBLY 3/4" TO 2"		
REVISION DATE: 3/30/07	SCALE: NONE	DWG. NO. WT-25

CONTRACTOR MARKUP DRAWINGS ARE TO BE USED IN ACCORDANCE WITH CONTRACTOR MARKUP NOTES INCLUDED WITH THESE DRAWINGS

CONTRACTOR MARKUP RECORD DRAWING

NOTES:

1. CONNECTION TO WATER MAIN AND WATER METER INSTALLATION BY CITY OF MILTON. CONTRACTOR TO AQUIRE PERMIT, AT CONTRACTOR'S EXPENSE, AND COORDINATE.
2. CONTRCATOR TO SUPPLY AND INSTALL BACKFLOW PREVENTION DEVICE AS PER CITY OF MILTON REQUIREMENTS. CONTRACTOR TO DETERMINE FINAL INSTALLATION. PREFERRED INSTALLATION IS IN BUILDING IF ACCEPTABLE TO CITY OF MILTON.

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 8	ES
	2	ISSUED FOR TENDER	MAY 26	WJM
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET				

DRAWN JR
DESIGNED ES
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

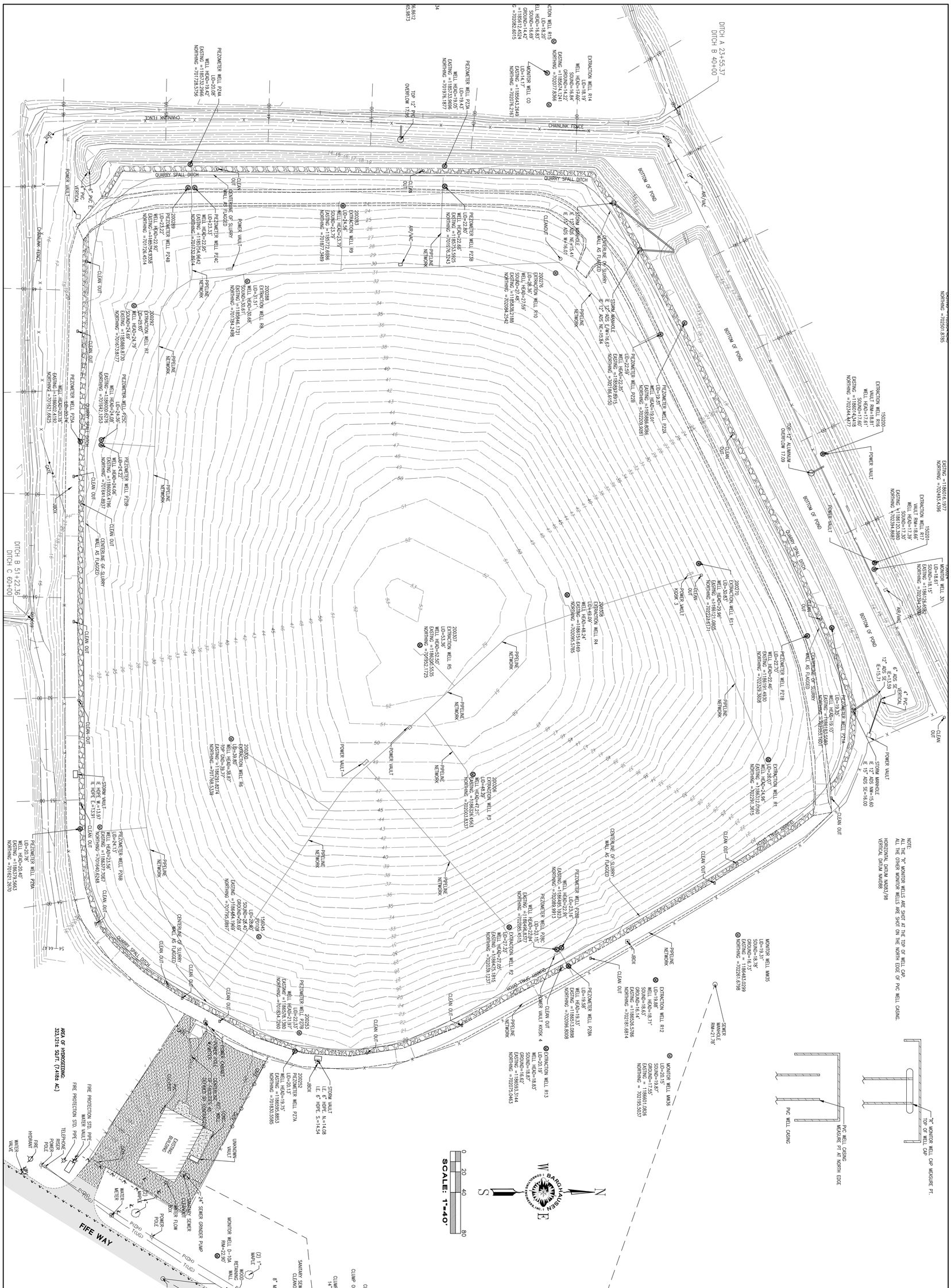
WATER AND SEWER DETAILS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/25/11
PROJECT NO.: SE10160010

DRAWING C-20B

Plot Date: 05/25/11 - 11:14am, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-EC01.2 & C12.20.dwg



No.	Date	By	Ckd.	Appr.	Revision
1	05/17/12	STM	TSL	TSL	ADDED WELL MONITOR DATA POINTS

Job Number **14203**

Sheet **1** of **2**

BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX
CIVIL ENGINEERING, LAND PLANNING,
SURVEYING, ENVIRONMENTAL SERVICES

Designed ____
Drawn BDG
Checked BDG
Approved BDG
Date 9/13/10

Scale:
Horizontal
1"=40'
Vertical
NA

For: FLOYD/SNIDER
C/O KYLE HANSEN
601 UNION STREET, SUITE 600
SEATTLE, WA 98101

Title: B&L WOODWASTE - MAY 2012 AS-BUILTS
PTN OF THE SW1/4 OF SEC. 5 TWP 20N
R. 4 EAST, WILLAMETTER MERIDIAN, CITY OF FIFE
PIERCE COUNTY STATE OF WASHINGTON

File:P:\14000s\14203\survey\14203ASB04.dwg Date/Time:12/19/2012 2:14 PM Scale:1:1 TLANKTREE Xref: ----

VICINITY MAP (NOT TO SCALE)

VIEW OF ROAD

VIEW OF MONITOR WELLS NORTHWEST OF SITE

SEE SHEET 1 OF 2

VIEW OF WEST SIDE

No.	Date	By	Ckd.	Appr.	Revision
1	05/17/12	STM	TSL	TSL	ADDED WELL MONITOR DATA POINTS

Title:
B&L WOODWASTE - MAY 2012 AS-BUILTS
PTN OF THE SW1/4 OF SEC. 5 TWP 20N
R. 4 EAST, WILLAMETTER MERIDIAN, CITY OF FIFE
PIERCE COUNTY STATE OF WASHINGTON

For:
FLOYD/SNIDER
C/O KYLE HANSEN
601 UNION STREET, SUITE 600
SEATTLE, WA 98101

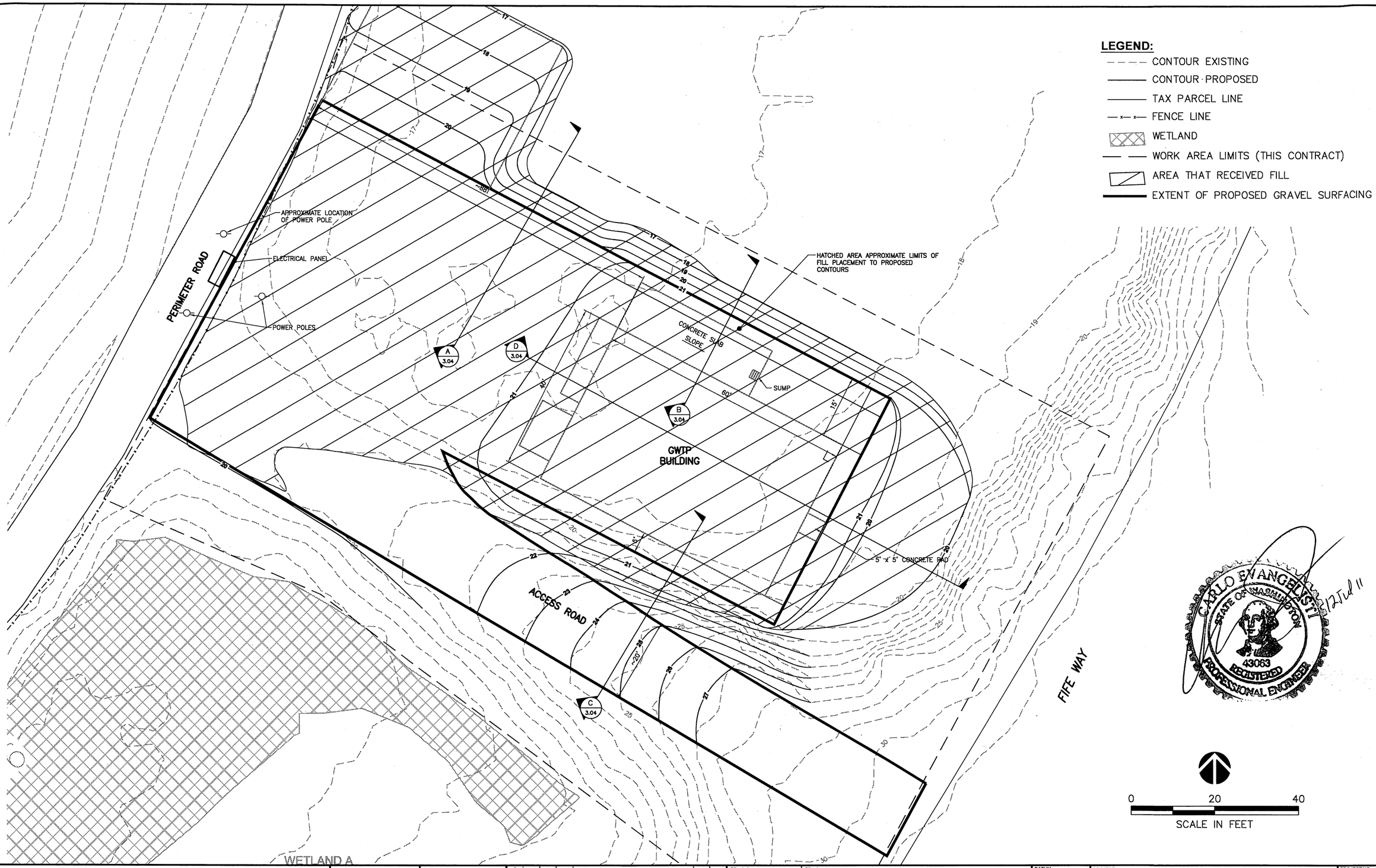
Scale: Horizontal 1"=40' Vertical NA

Designed ——
Drawn BDG
Checked BDG
Approved BDG
Date 9/13/10

BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX
CIVIL ENGINEERING, LAND PLANNING,
SURVEYING, ENVIRONMENTAL SERVICES

Job Number 14203
Sheet 2 of 2

File:P:\14000s\14203\survey\14203ASB04.dwg Date/Time:12/19/2012 2:14 PM Scale:1:1 TLANKTREE Xref: ----



CARLO EVANGELISTI
STATE OF WASHINGTON
43063
REGISTERED
PROFESSIONAL ENGINEER
12/Jul/11

REV	D	M	Y	ISSUE/REVISION DESCRIPTION	ENG.	APPR.
1	15	04	2011	ISSUED FOR CLIENT REVIEW	X.X.	WBL

Client Logo:

Client: B&L CUSTODIAL TRUST

AMEC Earth & Environmental
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201
amec

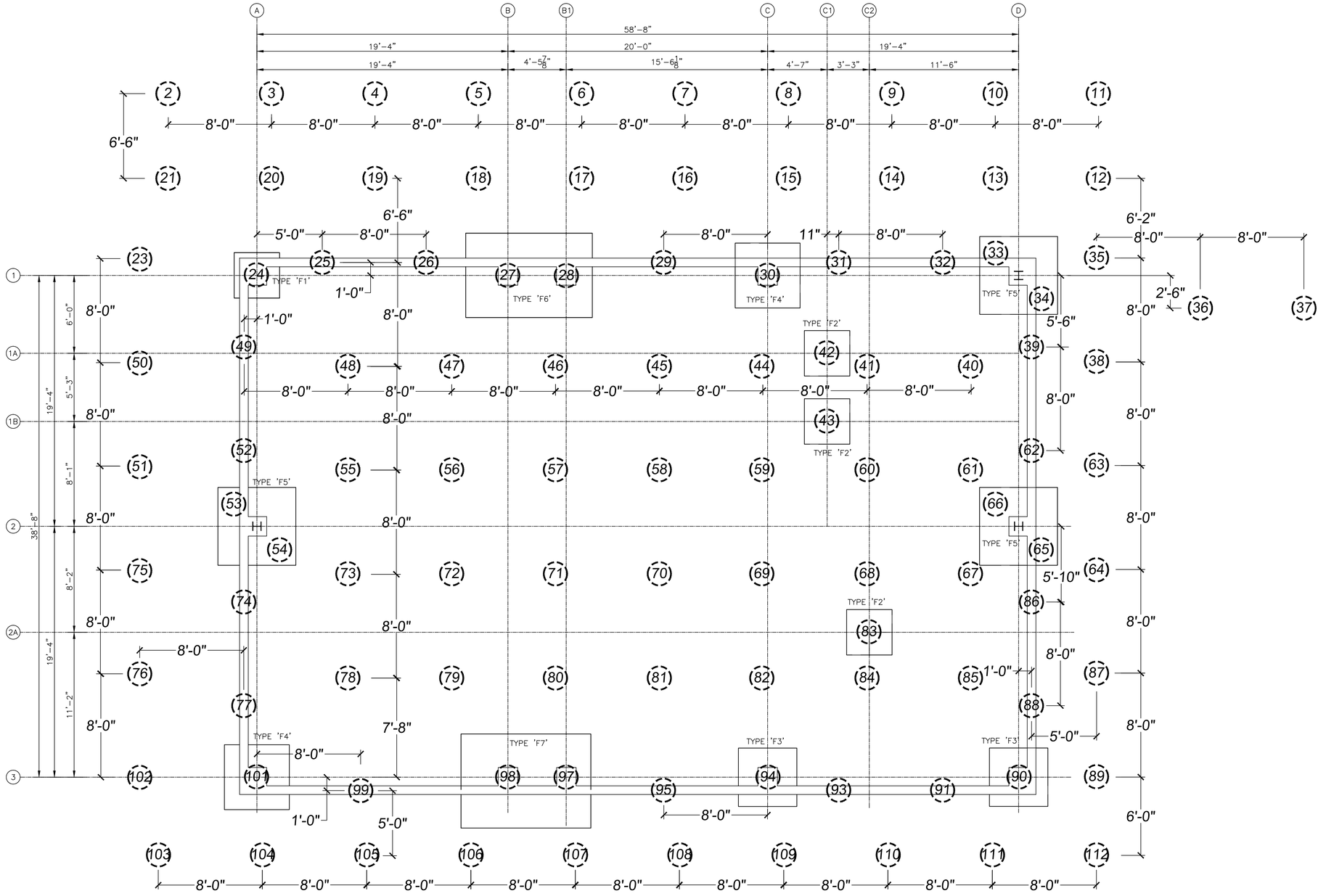
DATUM:	
PROJECTION:	
DRAWN BY:	JRS
REVIEWED BY:	WBL
ORIGINAL SCALE:	AS SHOWN

PROJECT: B&L WOODWASTE EQUIPMENT BUILDING

TITLE: AS-BUILT PLAN

PROJECT NO.:	SE 10160010
REVISION NO.	
DATE:	MAY 2011
DRAWING NO.:	C-3.02A
SHEET NO.:	Sheet 2 of 5

G:_AECOM\projects\SE 10160010\Eng - CAD - AA 12, 2011 11:43am - jeffreyjacobsen



1 FOUNDATION PLAN

1/4" = 1'-0"

NORTH

GEOPIER PLAN NOTES:

1. THIS DRAWING IS BASED ON STRUCTURAL DRAWINGS PROVIDED BY AMEC GEOMATRIX.
2. FOOTING OUTLINES ARE FOR INFORMATION ONLY. SEE STRUCTURAL AND/OR ARCHITECTURAL PLANS FOR FOOTING DIMENSIONS AND DETAILS.
3. FOOTING LOCATIONS SHALL BE IN ACCORDANCE WITH STRUCTURAL AND/OR ARCHITECTURAL DRAWINGS. DIMENSIONS, AND DETAILS.
4. GEOPIER ELEMENTS UNDER FOOTINGS SHALL BE LOCATED IN THE FIELD AS SHOWN ON 4/GP0.1.
5. GEOPIER ELEMENTS UNDER WALLS AND COLUMNS SHALL BE CENTERED UNDER FOOTINGS AS SHOWN, DIMENSIONED FROM CONTROL POINTS ESTABLISHED FROM STRUCTURAL AND/OR ARCHITECTURAL PLANS.

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Geopier is the property of The Geopier Foundation Company, Inc. and is protected under U.S. Patent No. 5249892 and other patents pending.

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED

GEOPIER CONSTRUCTION NOTES & DETAILS

B&L Woodwaste Groundwater Treatment Plant

Pierce County, WA

geopier

GEOPIER NORTHWEST
40 Lake Bellevue, Suite 100
Bellevue, WA 98005

ph: 425-646-2995
fax: 425-646-3118

PROJECT NUMBER
P11-GNW-424

DATE
7/13/2011

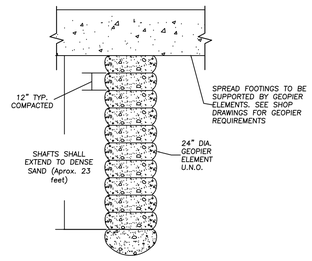
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GP1.1

RAP Element Foundation Construction Notes

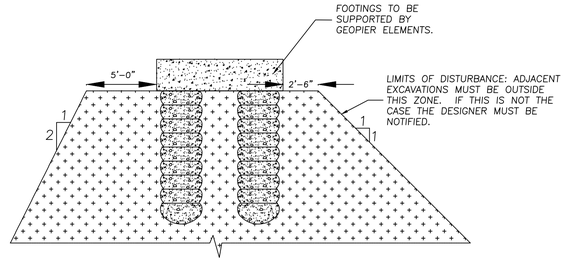
1. *Rammed Aggregate Pier (RAP) foundation support is as designed by Geopier Foundation Company, Inc., Blacksburg, Virginia (Designer).*
2. *RAP element layout is the responsibility of the General Contractor (GC). Geopier element shall be installed in the field within 6–inches of location shown on these plans.*
3. *A qualified, full–time Quality Control (QC) representative provided by the RAP Installer (the Installer) shall be responsible for installation of the RAP elements in accordance with the design, and shall report all Geopier foundation construction activities to the Designer. If authorized by the Owner, the QC representative shall coordinate QC activities with the Testing Agency hired by the Owner. Under no circumstances shall the Testing Agency direct RAP installation procedures.*
4. *RAP elements shall be based on the following criteria unless otherwise approved in writing by the Designer:*
   a. *RAP elements shall be within 3 inches or deeper than the depths shown on the plans.*
   b. *The Displacement Pier Quality Control manual shall govern the mandrel withdrawal procedures unless otherwise approved by the Designer.*
   c. *A bottom Stabilization Test (BST) shall be performed on the first five (5) installed piers (including pre–production piers) to establish acceptance criteria for the maximum allowable deflection of the mandrel under the full–static crowd pressure of the closed–ended mandrel. The BST should be performed in accordance with the following guidelines:*
      1. *BST should be performed by shutting the hammer energy off at the top of a compacted lift in the bottom one–half of the pier.*
      2. *Once the hammer energy is off and the mandrel is resting on top of the last compacted lift, static crowd pressure should be applied to the pier for a period of ten seconds. The corresponding deflection of the mandrel is then noted and recorded.*
      3. *Results of the initial BSTs should be provided to the Designer for review and establishment of acceptance criteria and frequency of BSTs. The frequency of BSTs may vary depending on the soil conditions; however, BSTs shall be performed on no less than 10% of the production piers.*
   d. *RAP element aggregate shall consist of Type I Grade B in accordance with ASTM D–1241–68, except that particles passing the No. 40 sieve shall be eliminated, or shall be other uniform graded aggregate with particle sizes ranging from 0.5 to 1.5 inches selected by the installer and successfully used in the modulus test.*
5. *When obstructions are encountered that cannot be removed with conventional RAP installation equipment, the GC shall be responsible for removing the obstructions. If the GC does not do so in a timely manner that does not interrupt RAP production, the installer may remove obstruction(s) and shall be reimbursed for costs incurred, including labor, equipment, and materials. In the event obstructions are encountered below the design bottom of footing elevation the obstruction shall be removed as outlined above. The resulting excavation shall then be backfilled and compacted in accordance with the project specifications. The area shall be tested by the Owner's Testing Agency and the compaction test results shall be submitted to the Installer and the Designer.*
6. *RAP elements not meeting the requirements defined in the design and modulus test shall be re–installed to meet project requirements unless otherwise approved in writing by the Designer.*
7. *Footing elevations are the responsibility of the Contractor and shall be reported in writing to the Installer's QC representative prior to installing RAP elements.*
8. *Utility locations are the responsibility of the GC. The designer shall be notified of any conflicts with RAP locations shown on the plans. New utilities excavations shall be limited to the zone depicting on Detail 1 on this sheet. If excavations are planned within the RAP "No Dig" zone, the designer should be notified immediately to discuss excavation options.*
9. *RAP elements are located at the intersection of reference grid lines or at the centerline of strip footings unless dimensioned otherwise.*
10. *After completion of RAP installations, the GC is responsible for protection of the work. This includes, but is not limited to, proper site drainage to prevent ponding of water above the RAP elements and appropriate control and coordination of earthwork and any subsequent drill activities such as elevator shaft construction, to prevent damage to installed RAP elements.*
11. *All RAP elements have a minimum nominal top diameter of 24 inches with shafts which shall extend through existing fill to underlying medium dense sand/gravel.*
12. *These drawings are based on the structural drawings provided by AMEC GeoMatrix. The RAP Element Layout Location Plan and Footing Details plan are for RAP Element number, location, and layout only. Footing locations, sizes, and orientation shown on these plans are for information only. Please refer to structural plans for specific foundation dimensions and location. The Designer accepts no responsibility for location of footings shown on these plans. The Designer shall be notified immediately if information on these plans conflicts with structural or architectural drawings.*
13. *The RAP foundation design is based on the geotechnical information provided in the subsurface exploration by AMEC in the report dated 5/3/11. Geopier Foundation Company, Inc., has relied on this information and we have no reason to suspect any of the information in the report is in error. Geopier Foundation Company, Inc. is not responsible for errors or omissions in the report that may affect the parameter values in our design. If the subsurface or site conditions differ from those utilized in the design the Designer shall be notified immediately.*
14. *RAP foundation design loads are based on the design information provided to us by the Structural Engineer. In the event the structural loads vary the Designer shall be notified.*

Concrete Footing Construction Supported by RAP Notes

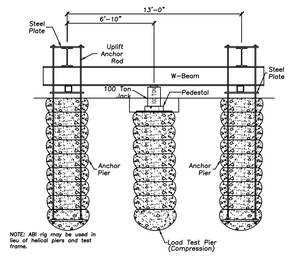
1. *All excavations for footings supported by Rammed Aggregate Piers shall be prepared in the following manner by the GC: Overexcavation below the bottom of footing shall be limited to three inches. This includes limiting the teeth of excavators from overexcavation beyond three inches below the footing elevation.*
2. *Footings shall be poured as soon as possible following footing excavations. It is the contractors responsibility to protect footing bearing surfaces from wet weather and disturbance. A "mud mat" (3 inch thinckness of lean concrete) or compacted crushed rock surface is recommended to protect bearing surfaces.*
3. *Prior to concrete or mud mat placement, the top of the excavated soil and Rammed Aggregate Piers shall be compacted with a standard, hand–operated impact compactor (i.e. jumping jack compactor). Compaction shall be performed over the entire footing subgrade to compact any loose surface soil and loose surface pier aggregate.*
4. *Water shall not be allowed to accumulate in the footing excavations prior to concrete placement or allowed to accumulate over the poured footing.*
5. *Excavation and surface compaction of all footing subgrades shall be the responsibility of the GC.*
6. *The Testing Agency shall inspect each footing and approve it in writing on the same day that the concrete or mud mat is placed in the footing excavation. The approval shall state that all footing bottoms including matrix soils and RAP tops have not been overexcvatated more than three–inches below the bottom of the footing, have been kept free of water accumulation, and have been reasonably densified with a hand–held mechanical impact compactor on the same day that the concrete was placed.*
7. *The GC is responsible for measuring top of footing elevations to accuracy of 0.01 feet. Measurements shall be taken by a licensed professional surveyor before loads are applied to the footings.*
8. *In the event that footing bottom preparations, as described above, are not performed or documented in accordance with this section, any written or implied warranty with respect to Geopier Foundation performance can be considered void.*



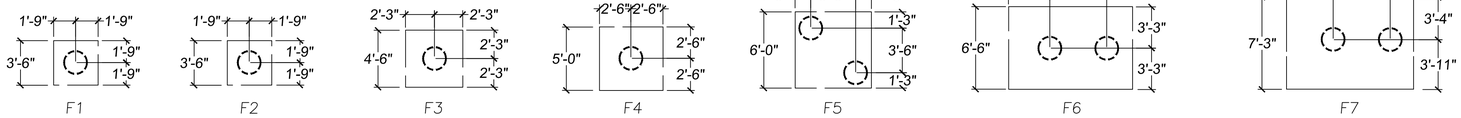
1 TYPICAL GEOPIER ELEMENT
NOT TO SCALE



2 ADJACENT EXCAVATION DETAIL
NOT TO SCALE



3 MODULUS TEST SETUP
NOT TO SCALE



4 GEOPIER LAYOUT UNDER FOOTINGS
NOT TO SCALE

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ZONE	REV	DESCRIPTION	DATE	APPROVED
		REVISIONS		

GEOPIER CONSTRUCTION NOTES & DETAILS

JAMES WALKER JOHNSON — STATE OF WASHINGTON — 23178 — REGISTERED PROFESSIONAL ENGINEER
5-6-11

B&L Woodwaste Groundwater Treatment Plant

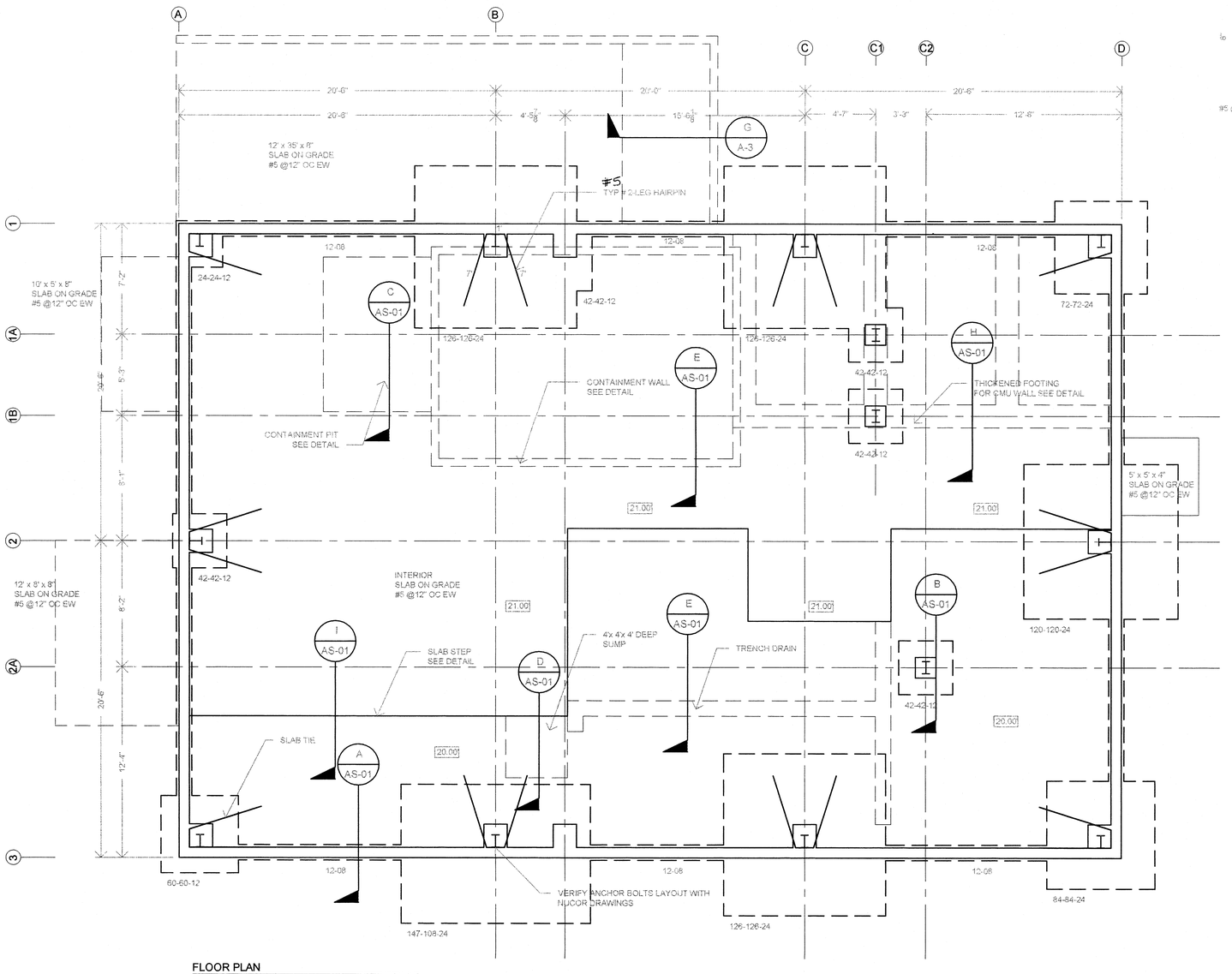
Pierce County, WA

geopier
GEOPIER NORTHWEST
40 Lake Bellevue, Suite 100
Bellevue, WA 98005
ph: 425-646-2995
fax: 425-646-3118

PROJECT NUMBER
P11–GNW–424

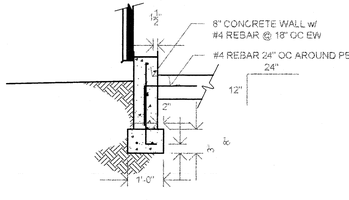
DATE
7/13/2011

SHEET NUMBER
GP0.1

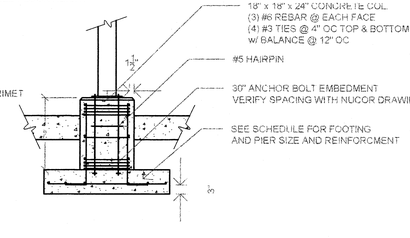


FLOOR PLAN
scale: 1/4" = 1'

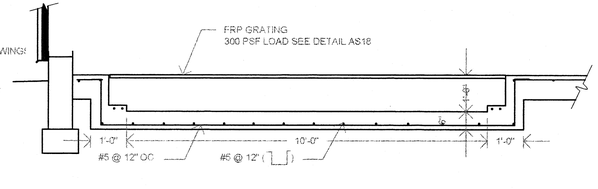
20.00 =DENOTES FINISHED FLOOR HEIGHT



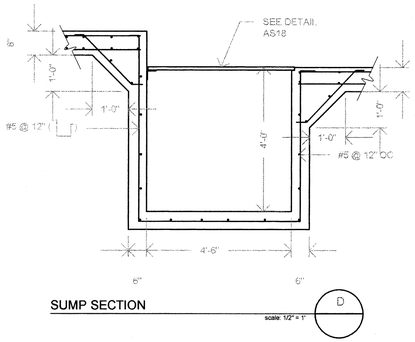
TYPICAL WALL FOUNDATION
scale: 1/2" = 1'
A



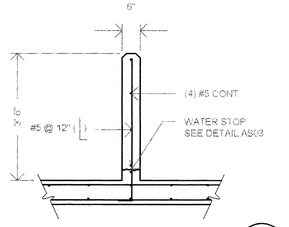
TYPICAL COLUMN FOUNDATION
scale: 1/2" = 1'
B



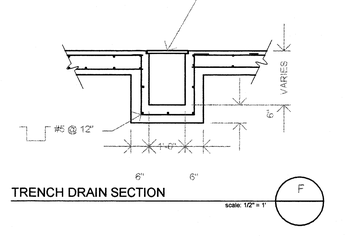
CONTAINMENT SUMP SECTION
scale: 1/2" = 1'
C



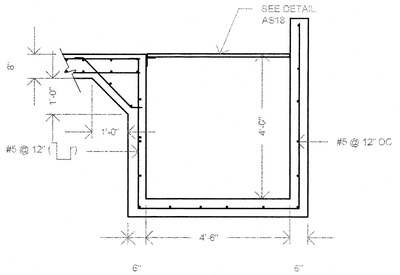
SUMP SECTION
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D



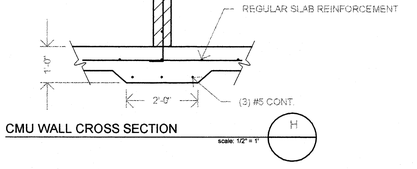
CONTAINMENT WALL SECTION
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E



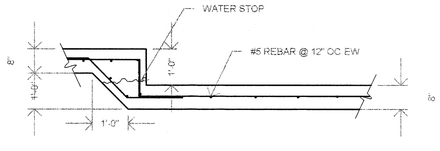
TRENCH DRAIN SECTION
scale: 1/2" = 1'
F



SUMP SECTION
scale: 1/2" = 1'
G



CMU WALL CROSS SECTION
scale: 1/2" = 1'
H



SLAB STEP SECTION
scale: 1/2" = 1'
I

84-84-24	84" X 84" X 24" DEEP CONCRETE FOOTING w/ (10) #6 BARS EACH WAY TOP & BOTTOM	12-08	12" X 8" CONCRETE FOOTINGS w/ (2) #4 BARS CONTINUOUS
120-120-24	120" X 120" X 24" DEEP CONCRETE FOOTING w/ (14) #7 BARS EACH WAY TOP & BOTTOM	24-24-12	24" X 24" X 12" DEEP CONCRETE FOOTING w/ (2) #4 BARS EACH WAY
126-126-24	126" X 126" X 24" DEEP CONCRETE FOOTING w/ (15) #7 BARS EACH WAY TOP & BOTTOM	42-42-12	42" X 42" X 12" DEEP CONCRETE FOOTING w/ (4) #4 BARS EACH WAY
147-108-24	147" X 108" X 24" DEEP CONCRETE FOOTING w/ (19) #7 BARS SHORTWAY & (11) #7 BARS LONGWAY, TOP & BOTTOM	60-60-12	60" X 60" X 24" DEEP CONCRETE FOOTING w/ (3) #6 BARS EACH WAY TOP & BOTTOM
		72-72-24	72" X 72" X 24" DEEP CONCRETE FOOTING w/ (5) #6 BARS EACH WAY TOP & BOTTOM

FOOTING AND PIER SCHEDULE

RECORD DRAWING

Structural Design Associates
2802 Rockefeller Avenue
Everett, WA 98201
PHONE: 425.330.0293 FAX: 425.252.0916
www.strucdes.com

JOSEPH M. LUCIA
STATE OF WASHINGTON
C09741
REGISTERED
PROFESSIONAL ENGINEER

NO. DATE BY REVISION

B & L WOOD WASTE GWTB
MILTON, WA

666

JAN 03 2012

Drawn By: EEO
Checked By: CCC
Date: 09-28-2011

SDA JOB NO.

STRUCTURAL
S -1.0

FOUNDATIONS

1. THE FOUNDATION DESIGN IS BSED ON THE RECOMMENDATION OF THE INTERNATIONAL BUILDING CODE TABLE 1804.2, AS WELL AS THE GEOTECH REPORT. FOUNDATION WORK SHALL BE PERFORMED IN ACCORDANCE WITH CHAPTER 18 OF THIS CODE AND THIS REPORT.

2. THE FOUNDATION DESIGN IS BASED ON THE FOLLOWING VALUES:

ALLOWABLE SOIL BEARING	2500 PSF
SOIL FRICTION	.25
EQUIV. FLUID PRESSURES	
ACTIVE PRESSURE	35 PCF
PASSIVE PRESSURE	150 PCF

(*WALLS RESTRAINED AGAINST ROTATION SHALL BE DESIGNED FOR AN EQUIV. FLUID PRESSURE OF 55 PCF.)

3. ALL FOOTINGS SHALL BE FOUNDED AT LEAST 18" BELOW THE UNDISTURBED GROUND OR TO FROST DEPTH. ALL FOOTINGS SHALL BE FOUNDED ON COMPACTED FILL OR UNDISTURBED NATURAL GRADE UNLESS OTHERWISE NOTED.

4. COMPACTION: MATERIAL FOR FILLING AND BACK FILLING SHALL CONSIST OF THE EXCAVATED MATERIAL AND/OR IMPORTED BORROW AND AND SHALL BE FREE OF ORGANIC MATTER, TRASH, LUMBER, OR OTHER DEBRIS. ALL WALLS SHALL BE ADEQUATLY BRACED PRIOR TO BACKFILLING. FILL AND BACKFILL SHALL BE DEPOSITED IN LAYERS NOT TO EXCEED 8 INCHES THICK, PROPERLY MOISTENED TO APROXIMATE OPTIMUM REQUIREMENTS AND THOROUGHLY ROLLED OR COMPACTED WITH APPROVED EQUIPMENT IN SUCH A MANNER AND EXTENT AS TO PRODUCE A RELATIVE COMPACTION OF 90 % OF MAXIMUM POSSIBLE DENSITY AS DETERMINED BY ASTM D1557. HAND TAMPERS SHALL WEIGH AT LEAST 50 POUNDS EACH AND SHALL HAVE A FACE AREA NOT IN EXCESS OF 64 SQUARE INCHES. HAND TAMPERS MAY BE OPERATED EITHER MANUALLY OR MECHANICALLY AND SHALL BE USED WHERE LARGER POWER DRIVEN COMPACTION EQUIPMENT CANNOT BE USED. FILL OVER 12" DEEP SHALL COMPLY WITH A GEOTECHNICAL REPORT. SEE GEOTECHNICAL REPORT FOR FURTHER DESIGN CRITERIA.

CONCRETE

1. ALL CONCRETE UNLESS OTHERWISE NOTED SHALL BE REGULAR WEIGHT HARD ROCK TYPE (150 PCF0 AGGREGATES SHALL CONFORM TO ASTM C33 WITH PROVEN SHRINKAGE CHARACTERISTICS OF LESS THAN 0.05 %.

2. CONCRETE COMPRESSIVE STRENGTHS AT 28 DAYS (fc) SHALL BE:

SLAB ON GRADE:	2500 PSI (MINIMUM)
CONTINUOUS FOOTINGS:	2500 PSI (MINIMUM)
PAD FOOTINGS:	2500 PSI (MINIMUM)

ALL CONCRETE TO BE 3,000 PSI (MIN.)

3. ALL CONCRETE WITH A DESIGNATED COMPRESSIVE STRENGTH EXCEEDING 2500 PSI SHALL REQUIRE SPECIAL INSPECTION BY AN INSPECTOR APPROVED BY THE BUILDING DEPARTMENT AND THE ENGINEER.

4. CEMENT SHALL CONFORM TO ASTM C150, TYPE I, CSA NORMAL

5. MAXIMUM SLUMP SHALL NOT EXCEED 5 INCHES IN FLATWORK

6. PLACEMENT OF CONCRETE SHALL BE IN CONFORMANCE WITH ACI 301.

7. CONCRETE SHALL BE MAINTAINED IN A MOIST CONDITION FOR A MINIMUM OF (5) DAYS AFTER PLACEMENT. ALTERNATE METHODS WILL BE APPROVED IF SATISFACTORY PERFORMANCE CAN BE ASSURED.

8. KEYED CONSTRUCTION JOINTS SHALL BE USED IN ALL CASES. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED AND ALL LAITANCE SHALL BE REMOVED. ALL VERTICAL JOINTS SHALL BE THOROUGHLY WETTED AND SLUSHED WITH A COAT OF NEAT CEMENT IMMEDIATELY BEFORE PLACING NEW CONCRETE.

9. POUR JOINTS SHALL BE LOCATED TO MINIMIZE EFFECTS FO SHRINKAGE AS WELL AS PLACED AT POINTS OF LOW STRESS. MAXIMUM AREA OF POUR JOINTS IS 400 SF.

10. MINIMUM CONCRETE COVERAGE OF REINFORCING STEELFOR FORMED WORK SHALL BE AS FOLLOWS:
EXPOSED EARTH OR WEATHER: (#5 OR SMALLER): 1-1/2"
EXPOSED EARTH OR WEATHER: (#6 OR LARGER): 2"

*NOTE: CONCRETE CAST AGAINST THE GROUND SHALL HAVE 3' MINIMUM COVERAGE

11. PIPES OTHER THAN ELECTRICAL CONDUITS SHALL NOT BE EMBEDDED IN STRUCTURAL CONCRETE EXCEPT WHERE SPECIFICALLY APPROVED.

12. CONCRETE MIXES SHALL BE PROVIDED IN ACCORDANCE WITH ACI 318 (WHEN STRENGTH DATA FROM TRIAL BATCHES OR FIELD EXPERIENCE ARE NOT AVAILABLE)

CEMENT CONTENT		
	LBS/CUBIC YARD	SACKS PER CY
fc (PSI)	(MINIMUM)	(MINIMUM)
2500(no special inspection) SEE NOTE A	470	5

MIXES SHALL BE PROPORTIONED TO PRODUCE A SLUMP OF 5" OR LESS. NO MORE THAN 1" PLUS TOLERANCE SHALL BE ALLOWED

A) WHERE SPECIAL INSPECTION IS NOT REQUIRED UNDER SECTION 1704.4 OF THE IBC, CONCRETE SHALL HAVE A MINIMUM CEMENT CONTENT OF 5 SACKS PER CUBIC YARD OF CONCRETE.

B) DESIGN MIX (OTHER THAN AS SPECIFIED IN THIS TABLE) SHALL BE SUBMITTED TO THE BUILDING OFFICIAL TWO WEEKS PRIOR TO FIRST USE.

REINFORCING STEEL

1. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60 (fy = 60 ksi) FOR BAR SIZES #5 & LARGER, GRADE 40 (fy = 40 ksi) FOR #3 AND #4 BARS.

2. ALL REINFORCING STEEL SHALL BE LAPPED AS NOTED ON THE PLANS. WHERE LAP OR SPLICE ARE NOT SPECIFICALLY INDICATED ON THE CONSTRUCTION DOCUMENTS, LAPS AND/OR SPLICES SHALL BE 24" AND BE WELL STAGGERED.

3. ANCHOR BOLTS, DOWELS AND OTHER EMBEDDED ITEMS SHALL BE SECURELY TIED IN PLACE BEFORE CONCRETE IS POURED. SLAB ON GRADE REINFORCEMENT SHALL BE PLACED AT MID-DEPTH OF SLAB AND SHALL BE HELD SECURELY IN PLACE WITH MECHANICAL DEVICES DURING PLACING OF THE' CONCRETE.

GENERAL

1. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE CONTRACT DRAWINGS.

2. DURING THE CONSTRUCTION PERIOD THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF THE BUILDING. THE CONTRACTOR SHALL PROVIDE ADEQUATE SHORING, BRACING AND GUYS IN ACCORDANCE WITH ALL NATIONAL , STATE AND LOCAL SAFETY ORDINANCES. ANY DECVIATION MUST BE APPROVED PRIOR TO ERECTION.

3. ALL ERECTION PROCEDURES SHALL CONFORM TO OSHA STANDARDS. ANY DEVIATION MUST BE APPROVED BY OSHA PRIOR TO ERECTION.

4. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR AL CONSTRUCTION PROCEDURES INCLUDINGS LAGGING, SHORING AND PROTECTION OF' ADAJACENT PROPERTY, STRUCTURES, STREETS AND UTILITIES IN ACCORDANCE WITH ALL NATIONAL, STATE AND LOCAL SAFETY ORDINANCES.

5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE WORK WORK OF ALL TRADES AND SHALL CHECK ALL DIMENSIONS. ALL DISPREPANCIES SHALL BE CALLED TO THE ATTENTION OF THE ENGINEER AND BE RESOLVED BEFORE PROCEEDING WITH THE WORK.

6. DRAWINGS INDICATE GENERAL AND TYPICAL DETAILS OF CONSTRUCTION. WHERE CONDITIONS ARE NOT SPECIFICALLY INDICATED BUT ARE OF SIMILAR CHARACTER TO DETAILS SHOWN, SIMILAR DETAILS OF CONSTRUCTION SHALL BE USED SUBJECT TO REVIEW BY THE ENGINEER.

7. ALL DETAILS DESIGNATED AS STANDARD OR TYPICAL SHALL OCCUR IN ADDITION TO ANY OTHER SPECIFIC DETAIL CALLED OUT.

8. COORDINATE WITH MECHANICAL , PLUMBING, AND ELECTRICAL DRAWINGS FOR SIZE AND LOCATION OF ALL OPENINGS REQUIRED FOR DUCTS, PIPES, PIPE SLEEVES, ELECTRICAL CONDUITS, AND OTHER ITEMS TO BE EMBEDDED IN CONCRETE OR OTHERWISE INCORPORATED IN STRUCTURAL WORK.

9. PROVIDE OPENINGS AND SUPPORTS, AS REQUIRED PER STANDARD DETAILS FOR HEATERS, MECHANICAL EQUIPMENT, VENTS, DUCTS PIPING, ETC. ALL SUSPENDED MECHANICAL EQUIPMENT SHALL BE SWAY OR LATERALLY BRACED.

10. ALL INFORMATION SHOWN ON THE DRAWINGS RELATIVE TO EXISTING CONDITIONS IS GIVEN AS THE BEST PRESENT KNOWLEDGE BUT WITHOUT GUARANTEE OF ACCURACY. WHERE ACTUAL CONDITIONS CONFLICT WITH THE DRAWINGS, THEY SHALL BE REPORTED TO THE ENGINEER SO THAT THE PROPER REVISIONS MAY BE MADE. MODIFICATION TO DETAILS OF CONSTRUCTION SHALL NOT BE MADE WITHOUT PRIOR WRITTEN APPROVAL OF THE ENGINEER.

11. ARCHITECTURAL AND MECHANICAL PLANS ARE CONSIDERED A PART OF THE STRUCUTRAL DESIGN DRAWINGS AND ARE TO BE USED TO DEFINE DETAIL CONFIGURATIONS INCLUDING; BUT NOT LIMITED TO RELATIVE LOCATION OF MEMBERS, ELEVATIONS, DIMENSIONS AND LOCATIONS OF ALL OPENINGS, ETC.

12. ALL DESIGN AND WORK IS TO BE IN CONFORMANCE WITH 2009 INTERNATIONAL BUILDING CODE.

RECORD DRAWING

Structural Design Associates
2802 Rockefeller Avenue
Everett, WA 98201
PHONE: 425.330.0293 FAX: 425.252.0916
www.strucdes.com

JOSEPH M. LUCIA
STATE OF WASHINGTON
C39741
REGISTERED
PROFESSIONAL ENGINEER

NO. DATE BY REVISION

B & L WOOD WASTE GWTB
MILTON, WA

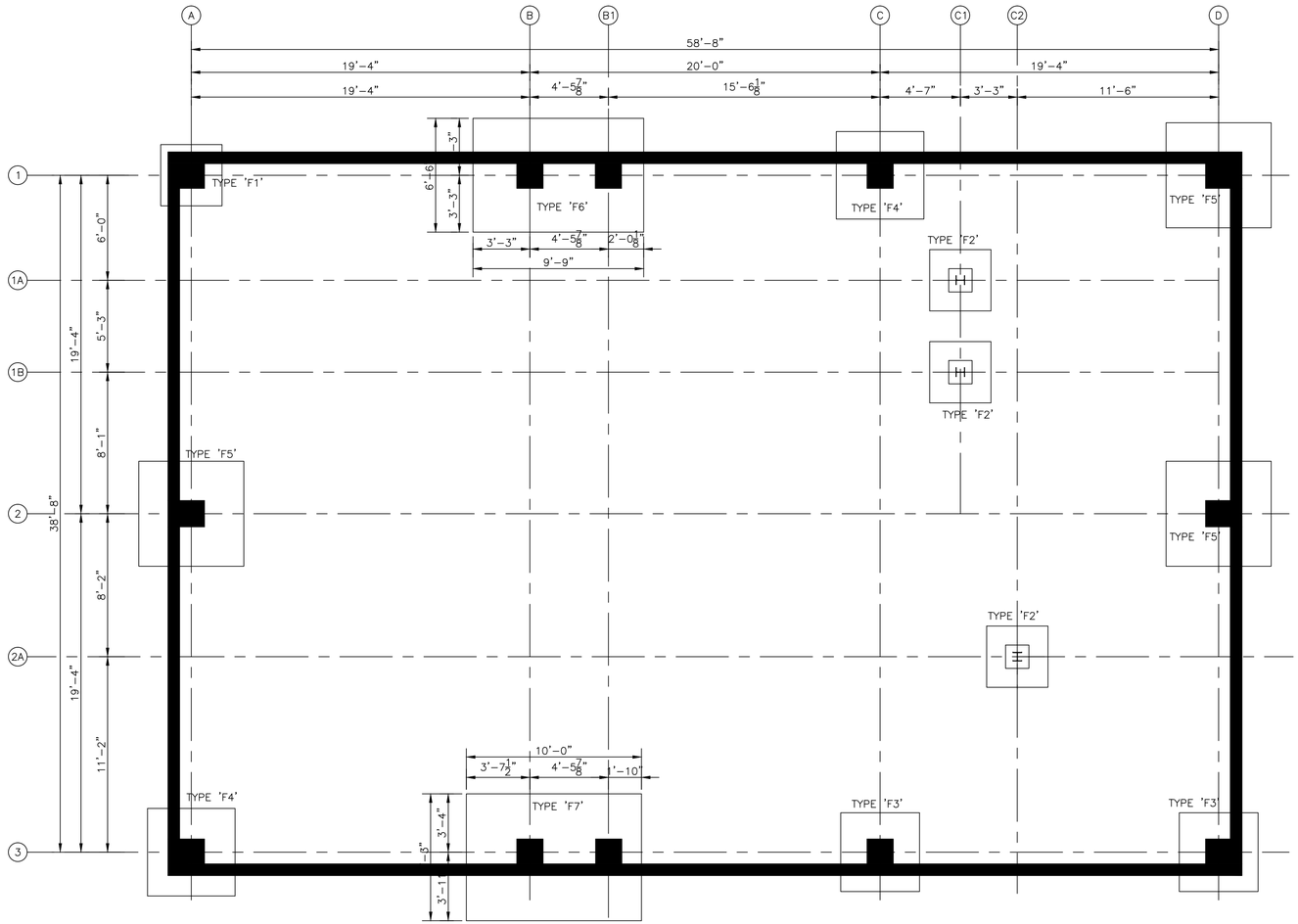
666

JAN 03 2012

Drawn By: EEO
Checked By: CCC
Date: 09-28-2011

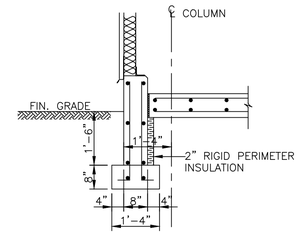
SDA JOB NO.

STRUCTURAL
S -2.0

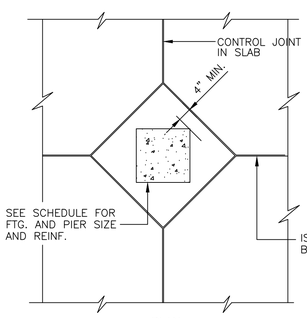


FOUNDATION PLAN
SCALE; 1/4" = 1'-0"

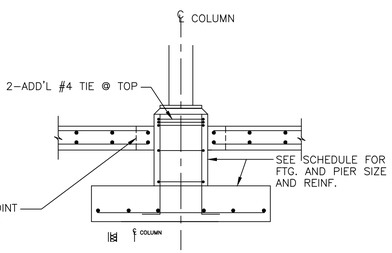
COLUMN FOOTING SCHEDULE							
COLUMN FOOTING				PIER			
NO.	SIZE	TOP OF FOOTING ELEV.	REINFORCING	SIZE	DOWELS	TIE	TIE TYPE
TYPE 'F1'	3'-6"x3'-6"x12"	19'-4"	4-#5 EW	18"x18"	8-#6	#4 @ 12"	
TYPE 'F2'	3'-6"x3'-6"x12"	19'-4"	4-#5 EW	16"x16"	8-#5	#4 @ 12"	
TYPE 'F3'	4'-6"x4'-6"x12"	19'-4"	5-#5 EW	18"x18"	8-#6	#4 @ 12"	
TYPE 'F4'	5'-0"x5'-0"x12"	19'-4"	6-#5 EW	18"x18"	8-#6	#4 @ 12"	
TYPE 'F5'	6'-0"x6'-0"x12"	19'-4"	7-#5 EW	18"x18"	8-#6	#4 @ 12"	
TYPE 'F6'	6'-6"x9'-9"	17'-5"	11-#5 (N-S) 7-#5 (W-E)	2-18"x18"	8-#6	#4 @ 12"	
TYPE 'F7'	7'-3"x10'-0"	16'-5"	11-#5 (N-S) 8-#5 (W-E)	2-18"x18"	8-#6	#4 @ 12"	



TYP. WALL FOUNDATION
SCALE: 1/2"=1'-0"



PLAN



TYP. COLUMN FOUNDATION
SCALE: 1/2"=1'-0"

SCALE BAR
0 2'-6" 5'-0" 7'-6"

RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	-
2	TRANSMITTED TO CONTRACTOR	07/13/11	-
3	CMU WALL TO STRUCTURAL STEEL CONNECTION REVISIONn	01/14/13	JML

DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

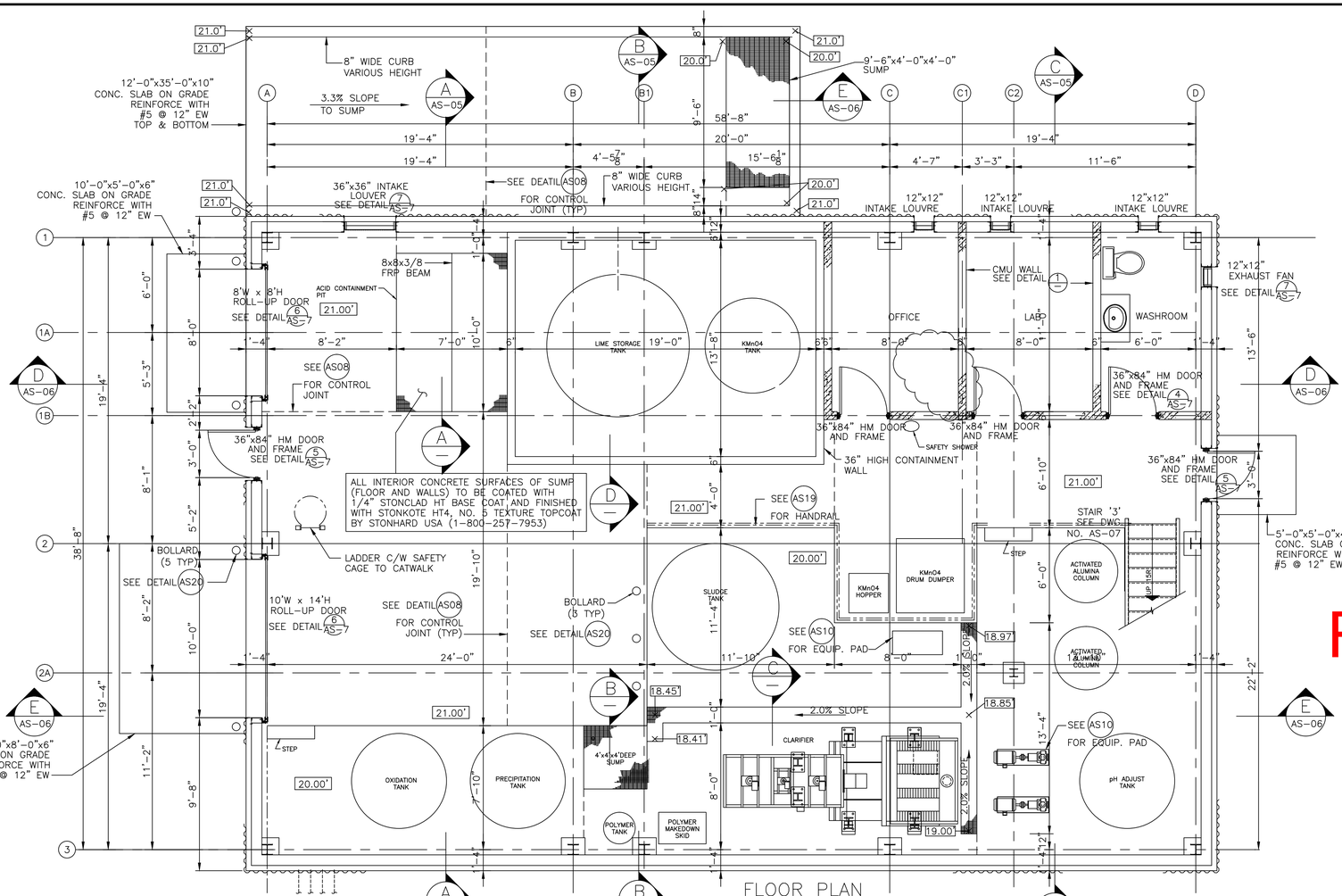
AMEC Geomatrix

JOSEPH M. FISCHER STATE OF WASHINGTON 23314 REGISTERED PROFESSIONAL ENGINEER
01-14-13

GROUNDWATER TREATMENT PLANT
ARCHITECTURAL / STRUCTURAL

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

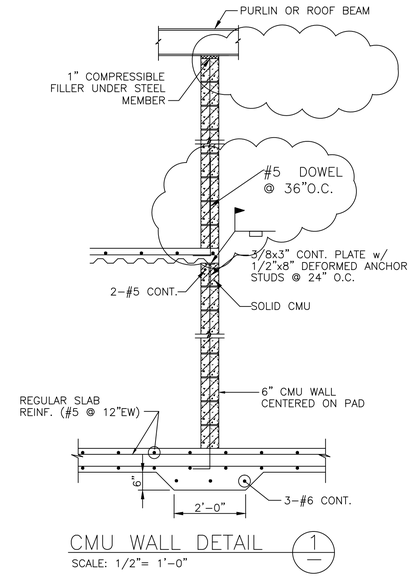
DATE: 01/14/13
PROJECT NO.: SE10160010
DRAWING AS-01



FLOOR PLAN

SCALE: 1/4" = 1'-0"

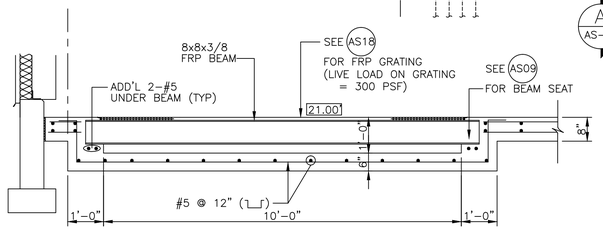
NOTE:- 21.00' DENOTES ELEVATION IN FT.



CMU WALL DETAIL 1

SCALE: 1/2"= 1'-0"

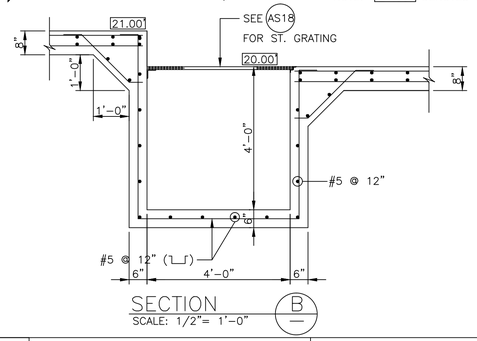
RECORD DRAWING



SECTION A

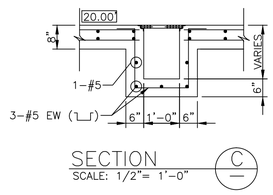
SCALE: 1/2"= 1'-0"

ALL INTERIOR CONCRETE SURFACES OF SUMP (FLOOR AND WALLS) TO BE COATED WITH 1/4" STONCLAD HT BASE COAT AND FINISHED WITH STONKOTE HT4, NO. 5 TEXTURE TOPCOAT BY STONHARD USA (1-800-257-7953)



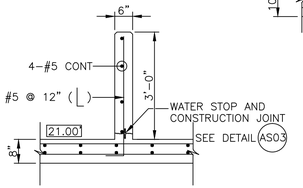
SECTION B

SCALE: 1/2"= 1'-0"



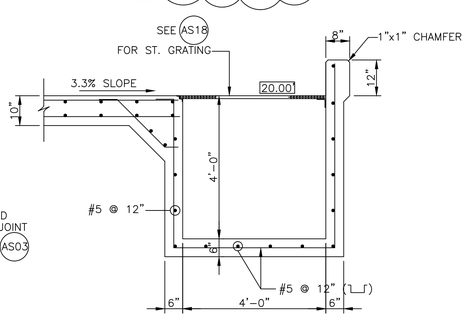
SECTION C

SCALE: 1/2"= 1'-0"



SECTION D

SCALE: 1/2"= 1'-0"



SECTION E

SCALE: 1/2"= 1'-0"

SCALE BAR

0 2'-6" 5'-0" 7'-6"

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	-
	2	TRANSMITTED TO CONTRACTOR	07/13/11	-
DATUM	3	CMU WALL TO STRUCTURAL STEEL CONNECTION REVISIONn	01/14/13	JML
HORIZONTAL: WASP-NAD83-S FEET				
VERTICAL: NAVD88 FEET				

DRAWN YR

DESIGNED YR

CHECKED GP

REVIEWED WJM

AMEC Geomatrix

JOSEPH M. LIEDL — STATE OF WASHINGTON — 23514 — REGISTERED PROFESSIONAL ENGINEER

01-14-13

GROUNDWATER TREATMENT PLANT ARCHITECTURAL / STRUCTURAL

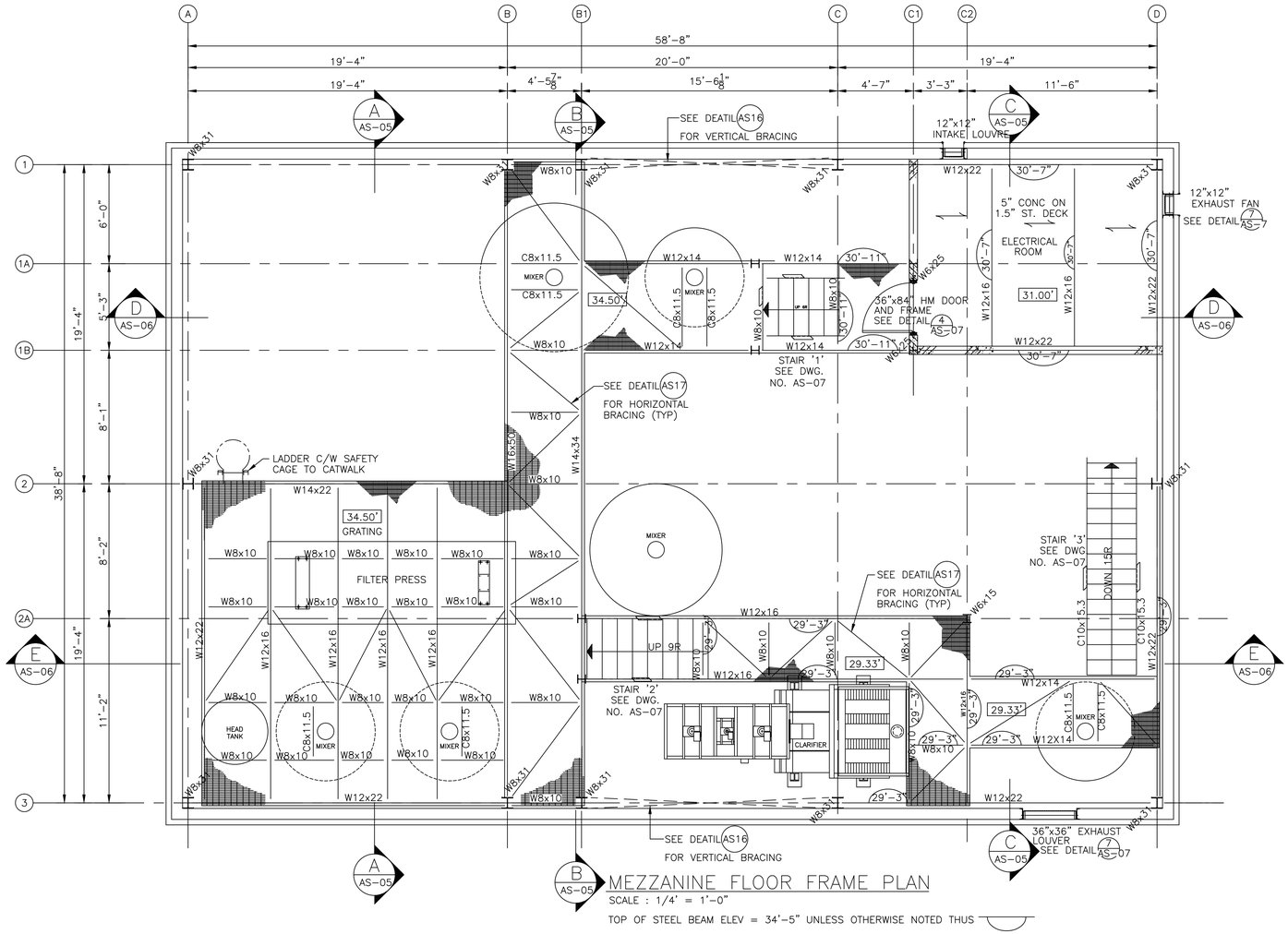
B&L WOODWASTE SITE

PIERCE COUNTY, WASHINGTON

DATE: 01/14/13

PROJECT NO.: SE10160010

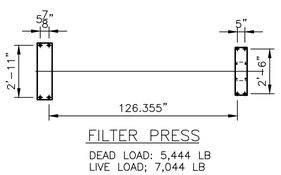
DRAWING AS-02



MEZZANINE FLOOR FRAME PLAN

SCALE : 1/4' = 1'-0"

TOP OF STEEL BEAM ELEV = 34'-5" UNLESS OTHERWISE NOTED THUS



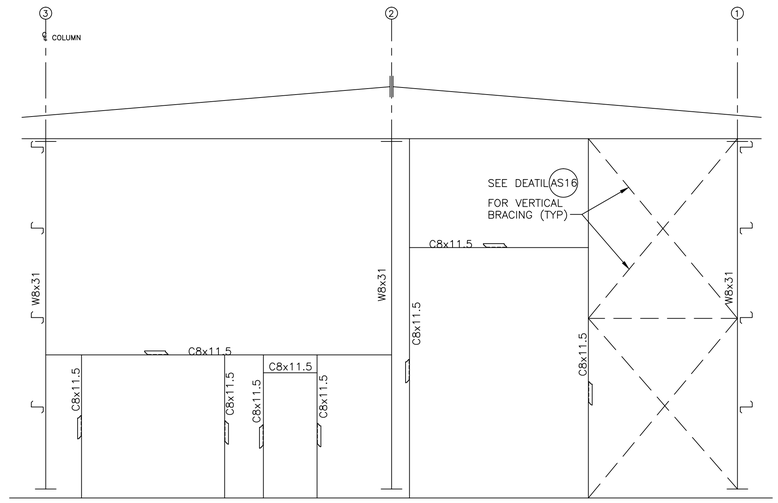
FILTER PRESS

DEAD LOAD: 5,444 LB
LIVE LOAD; 7,044 LB

DESIGN LOADS

UNLESS OTHERWISE NOTED

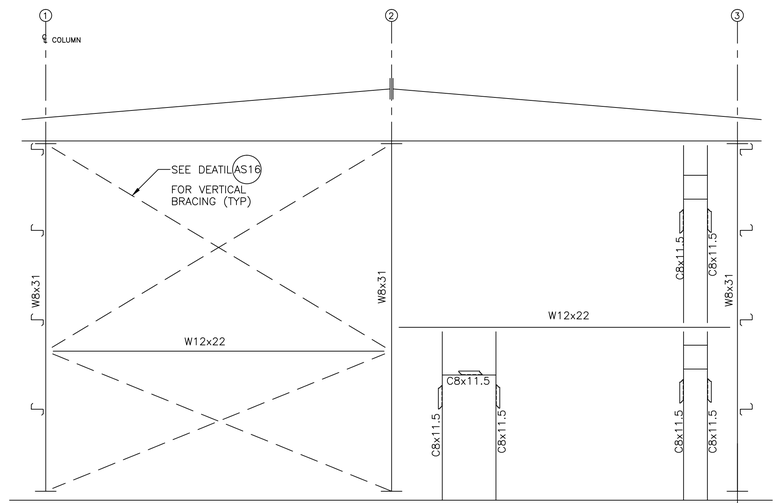
1. IN ELECTRICAL ROOM
   - DEAD LOAD = 80LB/SQ.FT. (20 LB/SQ.FT. PARTITION LOAD INCLUDED)
   - LIVE LOAD = 250 LB/SQ.FT. ON SLAB
2. ON GRATING
   - LIVE LOAD = 100 LB/SQ.FT.
3. SUSPENDED CONCENTRIC LOAD TO BEAMS WITH A SPAN OF 10' OR LONGER = 2 KIP



WEST ELEVATION

SCALE : 1/4' = 1'-0"

NOTE: GIRT AND GAG RODS ARE NOT SHOWN.



EAST ELEVATION

SCALE : 1/4' = 1'-0"

NOTE: GIRT AND GAG RODS ARE NOT SHOWN.

SCALE BAR

0 2'-6" 5'-0" 7'-6"

RECORD DRAWING

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	–
	2	TRANSMITTED TO CONTRACTOR	07/13/11	–
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET	3	CMU WALL TO STRUCTURAL STEEL CONNECTION REVISIONn	01/14/13	JML

DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

JOSEPH M. LIEBLER — STATE OF WASHINGTON — 23314 — REGISTERED PROFESSIONAL ENGINEER

01-14-13

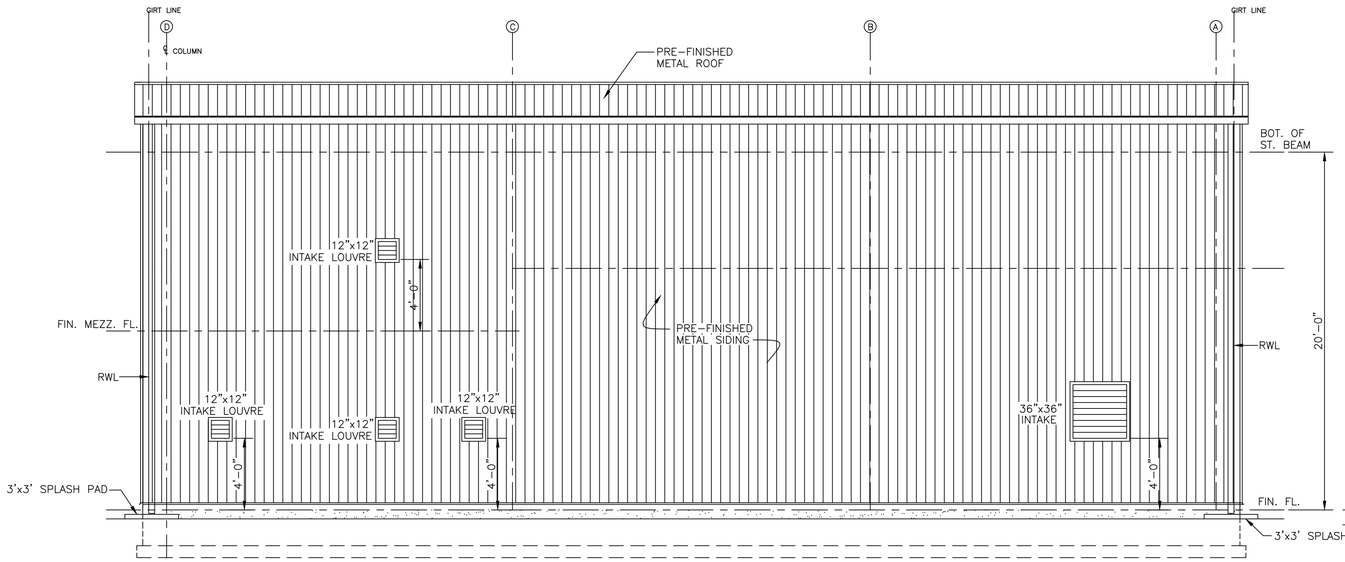
GROUNDWATER TREATMENT PLANT
ARCHITECTURAL / STRUCTURAL

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

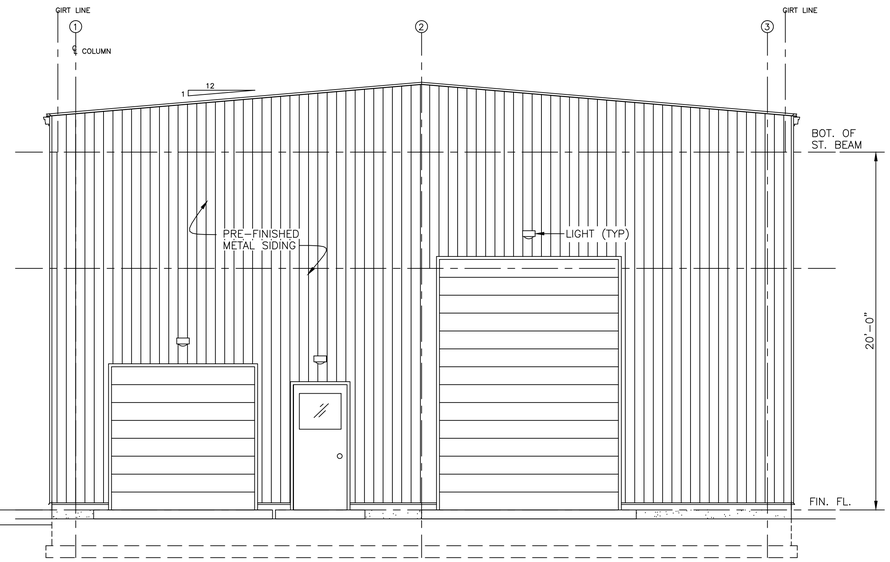
DATE: 01/14/13

PROJECT NO.: SE10160010

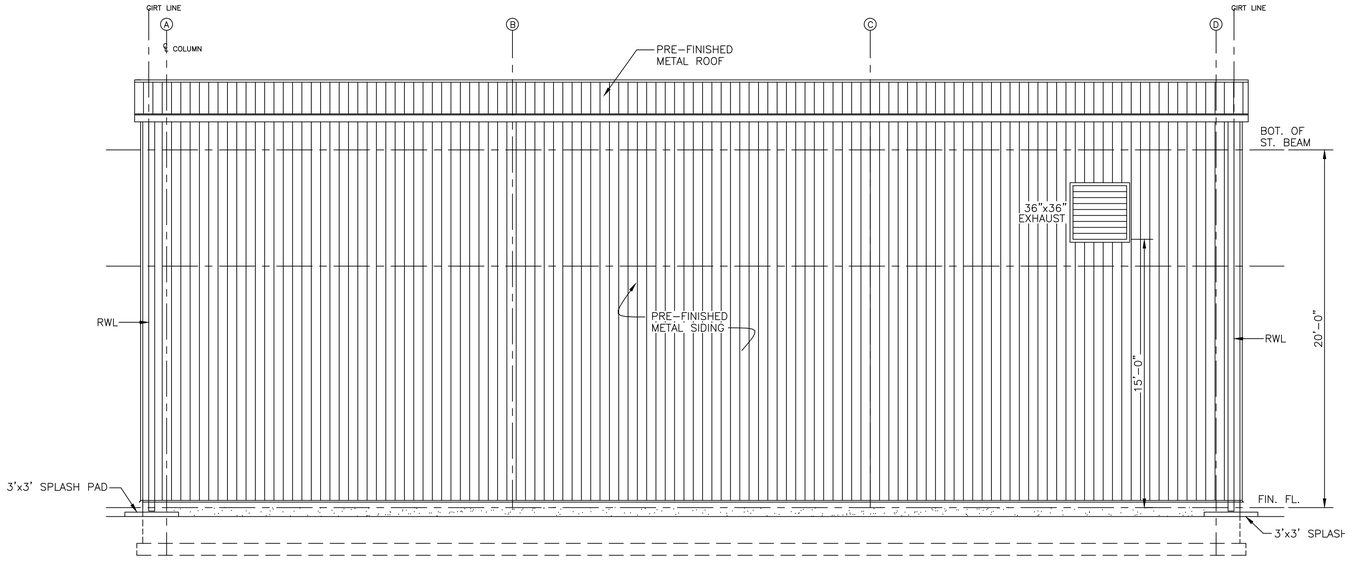
DRAWING
AS-03



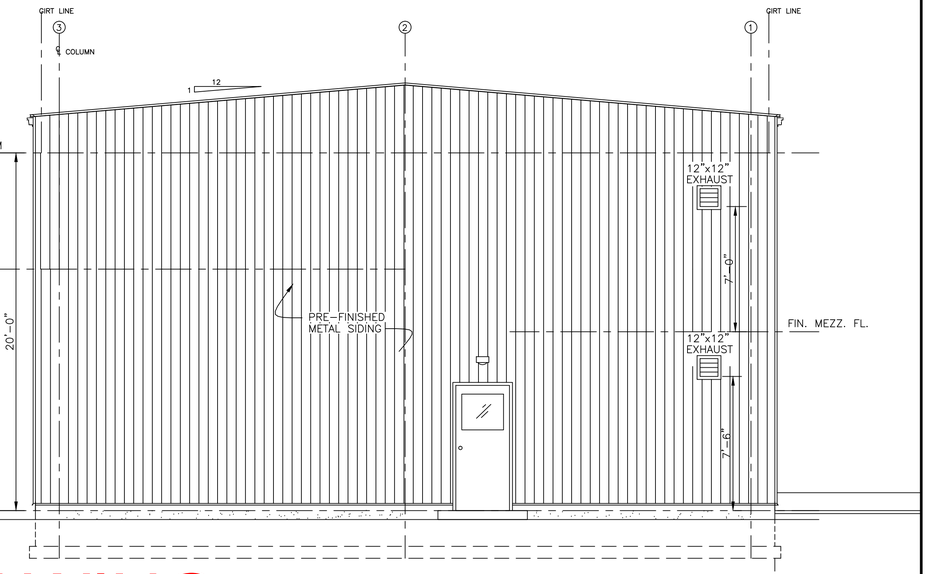
NORTH ELEVATION
SCALE; 1/4" = 1'-0"



WEST ELEVATION
SCALE; 1/4" = 1'-0"



SOUTH ELEVATION
SCALE; 1/4" = 1'-0"



EAST ELEVATION
SCALE; 1/4" = 1'-0"

RECORD DRAWING

SCALE BAR
0 2'-6" 5'-0" 7'-6"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	-
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DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

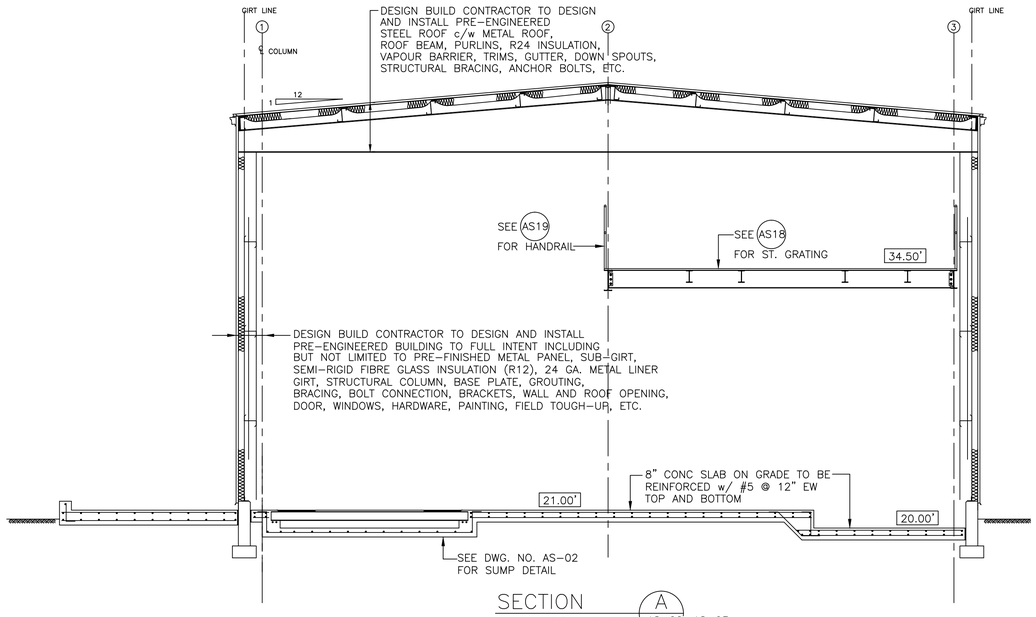
AMEC Geomatrix

JOSEPH M. TRACY
STATE OF WASHINGTON
23314
REGISTERED
PROFESSIONAL ENGINEER
01-14-13

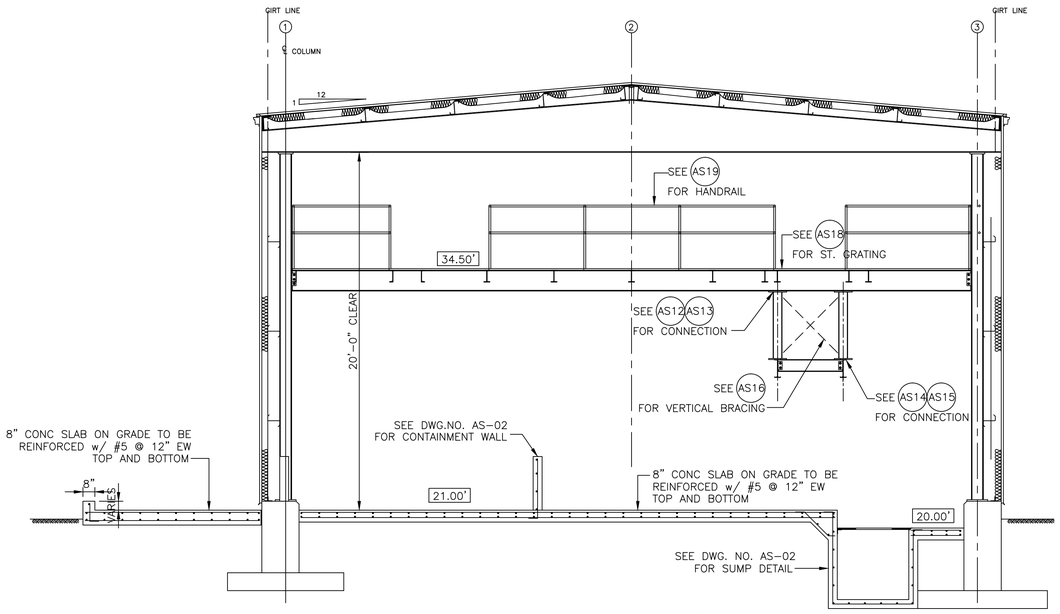
GROUNDWATER TREATMENT PLANT
ARCHITECTURAL / STRUCTURAL

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

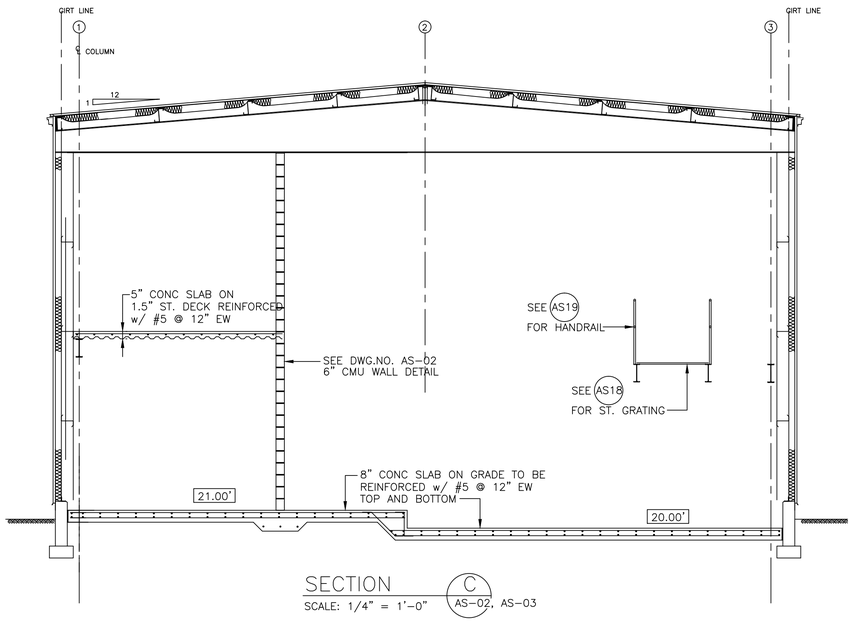
DATE: 01/14/13
PROJECT NO.: SE10160010
DRAWING
AS-04



SECTION A
SCALE: 1/4" = 1'-0"
AS-02, AS-03



SECTION B
SCALE: 1/4" = 1'-0"
AS-02, AS-03



SECTION C
SCALE: 1/4" = 1'-0"
AS-02, AS-03

RECORD DRAWING

SCALE BAR
0 2'-6" 5'-0" 7'-6"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
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DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

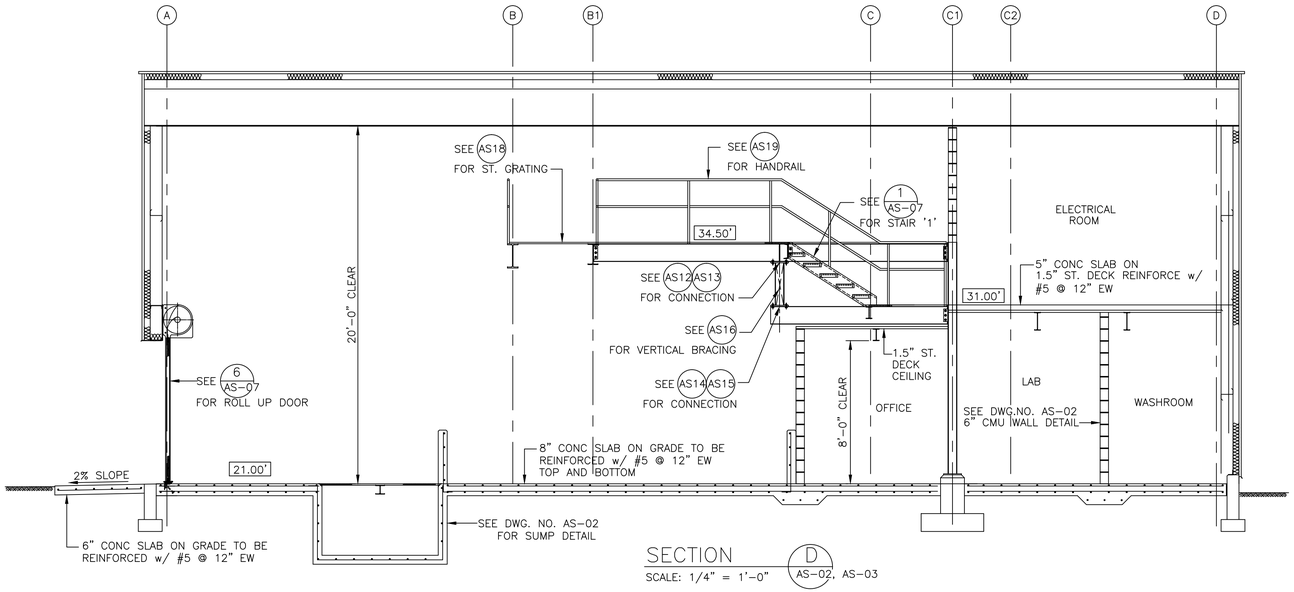
AMEC Geomatrix

JOSEPH M. LACH — STATE OF WASHINGTON — 23314 — REGISTERED PROFESSIONAL ENGINEER
01-14-13

GROUNDWATER TREATMENT PLANT ARCHITECTURAL / STRUCTURAL

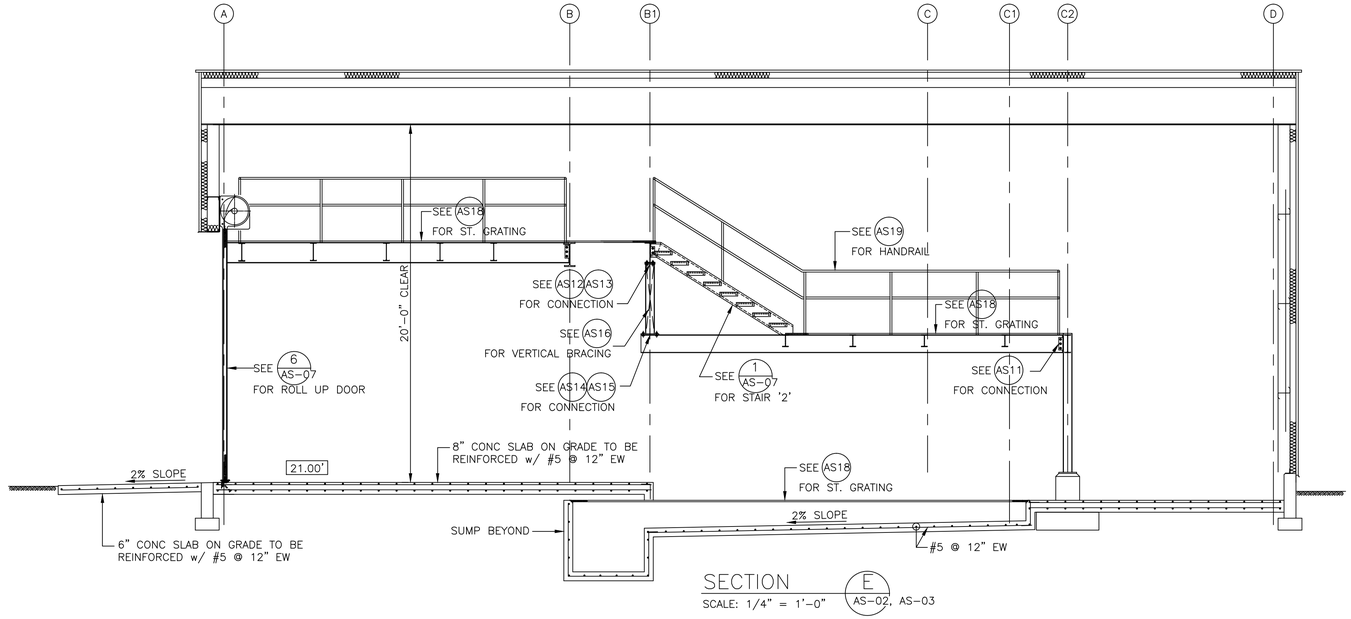
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 01/14/13
PROJECT NO.: SE10160010
DRAWING AS-05



SECTION D
SCALE: 1/4" = 1'-0"
AS-02, AS-03

RECORD DRAWING



SECTION E
SCALE: 1/4" = 1'-0"
AS-02, AS-03

SCALE BAR
0 2'-6" 5'-0" 7'-6"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
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DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

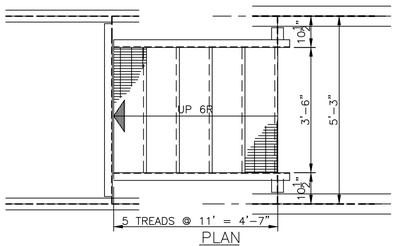
JOSEPH M. LOCATI
STATE OF WASHINGTON
23314
REGISTERED
PROFESSIONAL ENGINEER
01-14-13

GROUNDWATER TREATMENT PLANT
ARCHITECTURAL / STRUCTURAL

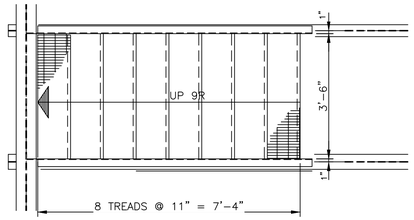
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 01/14/13
PROJECT NO.: SE10160010

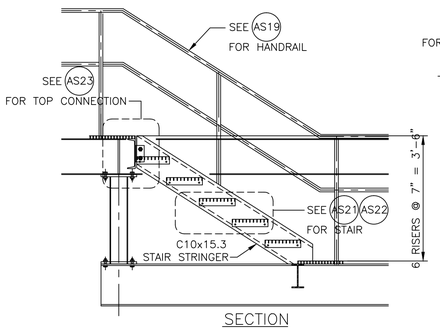
DRAWING
AS-06



PLAN

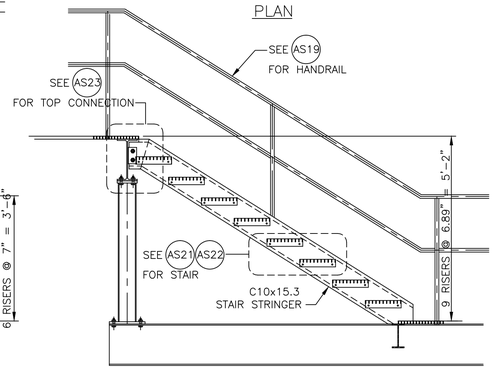


PLAN



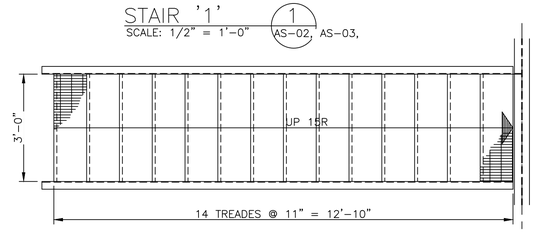
SECTION

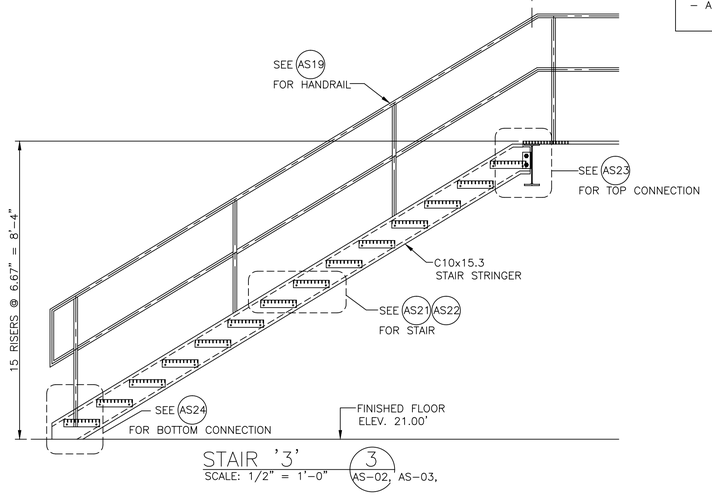
STAIR '1' 1 AS-02, AS-03,
SCALE: 1/2" = 1'-0"



SECTION

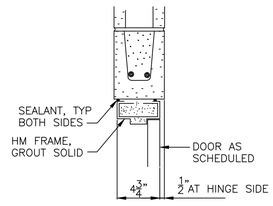
STAIR '2' 2 AS-02, AS-03,
SCALE: 1/2" = 1'-0"



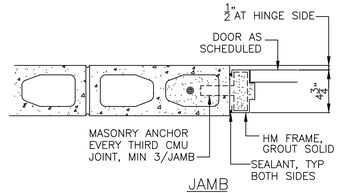


STAIR '3' 3 AS-02, AS-03,
SCALE: 1/2" = 1'-0"

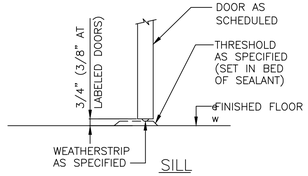
NOTE:-
- ALL STAIR TO BE GALVANIZED
- ALL TREADS TO BE NON-SLIP TREADS



HEAD

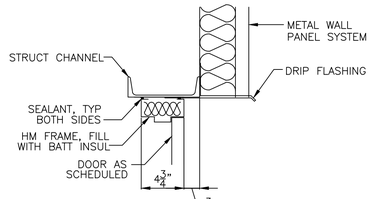


JAMB

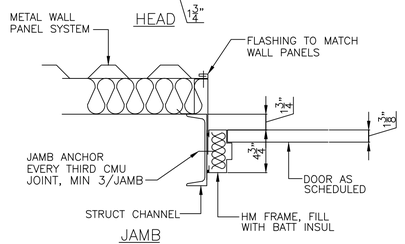


SILL

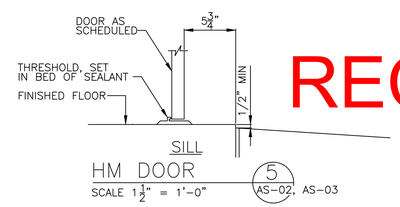
HM DOOR 4 AS-02, AS-03
SCALE 1½" = 1'-0"



HEAD

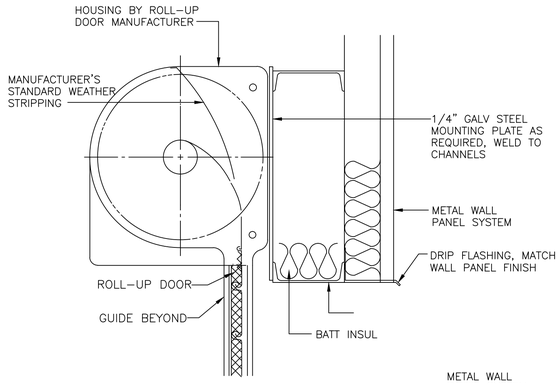


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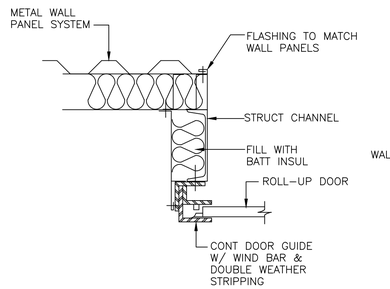


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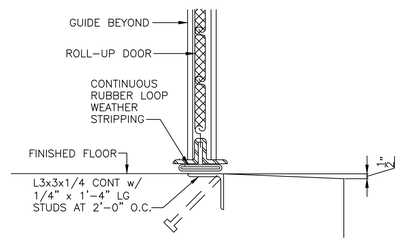
HM DOOR 5 AS-02, AS-03
SCALE 1½" = 1'-0"



HEAD

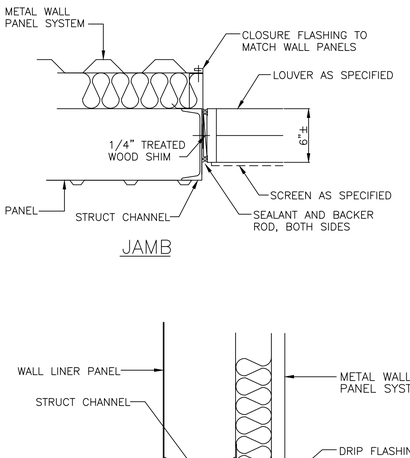


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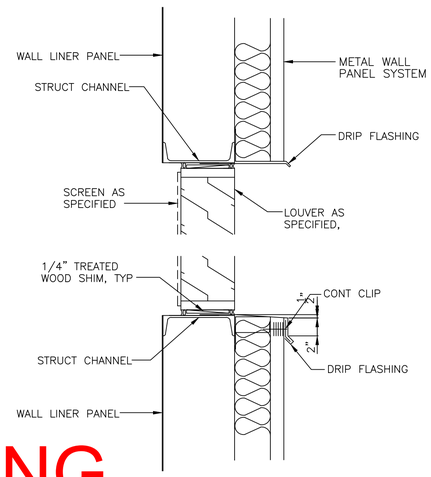


SILL

ROLL UP DOOR 6 AS-02, AS-03
SCALE 1½" = 1'-0"



JAMB



LOUVER 7 AS-02, AS-03
SCALE 1½" = 1'-0"

SCALE BAR
0 2'-6" 5'-0" 7'-6"

RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	-
2	TRANSMITTED TO CONTRACTOR	07/13/11	-
3	CMU WALL TO STRUCTURAL STEEL CONNECTION REVISIONn	01/14/13	JML

DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

JOSEPH M. LOCKER
STATE OF WASHINGTON
23314
REGISTERED
PROFESSIONAL ENGINEER
01-14-13

GROUNDWATER TREATMENT PLANT ARCHITECTURAL / STRUCTURAL

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 01/14/13
PROJECT NO.: SE10160010

DRAWING
AS-07

GENERAL STRUCTURAL NOTES

GENERAL

1. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO LATEST EDITION OF THE INTERNATIONAL BUILDING CODE (IBC).

LOADS

SNOW LOAD	18 PSF
WIND LOAD	85 MPH, EXPOSURE "C"
SEISMIC	SITE CLASS D
	PEAK GROUND ACCELERATION: 0.292g
	SITE COEFFICIENT F_a; 1.035
	SITE COEFFICIENT F_v; 1.619
FLOOR LIVE LOADS	AS NOTED ON DWGS.
EQUIPMENT LOADS	AS NOTED ON DWGS.

FOUNDATIONS

1. REFER TO GEOTECHINICAL INVESTIGATION REPORT (MARCH 25, 2011) PREPARED BY AMEC EARTH & ENVIRONMENTAL INC. AMEC EARTH & ENVIRONMENTAL INC. DOES NOT GUARANTEE THE ACCURACY OF THIS REPORT.
2. FOUNDATIONS OVER STRUCTURAL FILL HAVE BEEN DESIGNED FOR AN ALLOWABLE BEARING PRESSURE OF 1000 PSF.

CONCRETE

1. ALL CAST-IN-PLACE CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI, EXCEPT THAT CONCRETE SPECIFICALLY DETAILED AS CONCRETE FILL SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 2500 PSI. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. REINFORCING STEEL FOR CONCRETE SHALL CONFORM TO ASTM A615, GRADE 60 DEFORMED BARS. FURNISH AND ERECT IN ACCORDANCE WITH ACI MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES, ACI 315.
3. THE MINIMUM REINFORCING FOR ALL CONCRETE WALLS AND SLABS SHALL BE AS FOLLOWS:

WALL THICKNESS	REINF EACH WAY	LOCATION
6"	#4@12"	CENTERED
8"	#5@12"	CENTERED
10"	#4@12"	EACH FACE
12"	#5@12"	EACH FACE

PROVIDE LARGER SIZES AND MORE REINFORCING IN ALL SECTIONS OF CONCRETE WHERE REQUIRED BY THE DETAILS ON THE DRAWINGS OR BY THE SPECIFICATIONS.

4. CLEARANCE FOR REINFORCEMENT BARS, UNLESS SHOWN OTHERWISE, SHALL BE:
   - WHEN PLACED ON GROUND: ——— 3"
   - ALL OTHER CONCRETE SURFACES:
     - #5 BAR OR SMALLER ——— 1 1/2"
     - #6 BAR OR LARGER ——— 2"
5. REFER TO WALL CORNER AND WALL INTERSECTION REINFORCING DETAIL. IN GENERAL, THE WALL CORNER REINFORCING SIZES AND SPACINGS SHALL BE CALLED OUT ON THE PLANS AND REFERENCED TO THESE DETAILS AND THE TYPICAL HORIZONTAL WALL REINFORCING SHALL LAP WITH THE HORIZONTAL REINFORCING.
6. ALL BENDS, UNLESS OTHERWISE SHOWN, SHALL BE A 90 DEGREE STANDARD HOOK AS DEFINED IN LATEST EDITION OF AC1 318.
7. ALL WALL CORNER AND WALL INTERSECTION REINFORCEMENT BARS SHALL BE CONTINUOUS AROUND CORNERS AND THROUGH COLUMNS OR PILASTERS. REINFORCEMENT SHALL BE EXTENDED INTO CONNECTING WALLS AND LAPPED ON THE OPPOSITE FACE OF THE CONNECTING WALLS, AS INDICATED ELSEWHERE ON THIS SHEET.
8. VERTICAL WALL BARS SHALL BE LAPPED WITH DOWELS FROM BASE SLABS AND EXTENDED INTO THE TOP FACE OF ROOF SLABS AND LAPPED WITH TOP SLAB REINFORCEMENT. PROVIDE A MINIMUM OF TWO FULL HEIGHT VERTICAL BARS WITH MATCHING DOWELS AT WALL ENDS, CORNERS AND INTERSECTIONS WITH SIZE TO MATCH TYPICAL VERTICAL REINFORCING STEEL SHOWN OR REQUIRED BY NOTES ABOVE.
9. UNLESS INDICATED OTHERWISE, ALL REINFORCEMENT BENDS AND LAPS, UNLESS OTHERWISE NOTED, SHALL SATISFY THE FOLLOWING MINIMUM REQUIREMENT:

DETAIL OF REINFORCEMENT – LAP LENGTHS					
BAR SIZE		#6 OR SMALLER	#7	#8	#9
CONC DESIGN STRENGTH		4000 PSI			
GR 40	TOP BAR	32 DIA, MIN 1'–6"	2'–6"	3'–3"	4'–0"
	OTHER BAR	22 DIA, MIN 1'–0"	1'–9"	2'–4"	3'–0"
GR 60	TOP BAR	45 DIA, MIN 2'–0"	3'–8"	4'–9"	6'–0"
	OTHER BAR	32 DIA, MIN 1'–6"	2'–8"	3'–6"	4'–4"

MASONRY

1. MORTAR SHALL CONFORM TO ASTM C270, TYPE S. MASONRY CEMENT SHALL NOT BE USED.
2. GROUT SHALL CONFORM TO ASTM C476 AND SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 2000 PSI CONTAINING NO MASONRY CEMENT.
3. CONCRETE BLOCK UNITS SHALL CONFORM TO ASTM C90 GRADE N-1 AND SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 1900 PSI.
4. THE MASONRY ASSEMBLY SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF f'_m =1500 PSI, NO SPECIAL INSPECTION (USE HALF ALLOWABLE DESIGN STRESSES).
5. REINFORCING STEEL FOR MASONRY SHALL CONFORM TO ASTM A615, GRADE 60 FOR DEFORMED BARS.
6. MASONRY WALLS SHALL BE GROUTED AND BE REINFORCED AS SCHEDULED UNLESS OTHERWISE SHOWN:

WALL THICKNESS	VERTICAL REINF	HORIZ REINF
6"	#5 @ 36" OC	2 – #4 @ 4'–0" OC
8"	#6 @ 48" OC	2 – #4 @ 4'–0" OC

7. HORIZONTAL REINFORCING SHALL BE PLACED AT THE BOTTOM OF WALLS, ROOF LEVEL, TOP AND BOTTOM OF ALL OPENINGS. AT THE TOP OF WALLS, AT THE MAXIMUM SPACING INDICATED IN SCHEDULE, AND ELSEWHERE AS INDICATED ON THE DRAWINGS. REINFORCING SHALL BE CONTINUOUS EXCEPT AT THE TOP AND BOTTOM OF OPENINGS WHERE IT SHALL EXTEND A MINIMUM OF 2'–0" BEYOND THE FACE OF THE OPENING OR TERMINATE IN A STANDARD HOOK AS SHOWN IN THE STANDARD DETAIL.

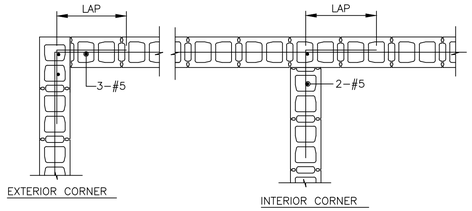
   REINFORCING BARS SHALL BE CONTINUOUS AROUND WALL CORNERS AND THROUGH WALL INTERSECTIONS AND HOOKED @ WALL ENDS PER STANDARD DETAIL. ALL HORIZONTAL BARS SHALL BE PLACED IN A BOND BEAM UNIT.
8. VERTICAL REINFORCING SHALL BE PLACED AT CORNERS, EACH SIDE OF OPENINGS, END WALLS (INCLUDING EACH SIDE OF CONTROL JOINTS), AT MAXIMUM SPACING INDICATED IN THE SCHEDULE, AND ELSEWHERE AS INDICATED ON THE DRAWINGS. BARS SHALL BE CONTINUOUS FROM FOUNDATION TO TOP OF WALL AND LAP SPLICED A MINIMUM OF 2'–6" TO FOUNDATION DOWELS.
9. GROUT ALL REINFORCED CELLS AND THOSE ADDITIONAL CELLS INDICATED IN THE PLANS AND DETAILS.
10. LAP REINFORCING 44 BAR DIAMETERS UNLESS OTHERWISE SHOWN.
11. GROUT ALL CELLS WITH ANCHOR BOLTS.
12. CMU WALL CONTROL JOINTS SHALL BE CONTINUOUS FROM TOP OF FOUNDATION TO TOP OF WALL OR PARAPET.

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A36 UNLESS SHOWN OTHERWISE ON THE PLANS. STRUCTURAL TUBING SHALL CONFORM TO ASTM A-500, GRADE B.
2. ALL STRUCTURAL STEEL SHALL BE FABRICATED AND ERECTED IN CONFORMANCE WITH THE AISC MANUAL OF STEEL CONTRUCTION, LATEST EDITION.
3. ALL BOLTS SHALL BE HIGH STRENGTH BOLTS CONFORMING TO ASTM A325-F(SC) UNLESS SHOWN OTHERWISE. USE DIRECT TENSION INDICATORS AT ALL HIGH STRENGTH BOLTS. BOLTS INDICATED AS MACHINE BOLTS OR ANCHOR BOLTS SHALL CONFORM TO ASTM A307 FOR CARBON STEEL, A193 FOR STAINLESS STEEL AND A153 FOR GALVANIZED STEEL.
4. ALL WELDS SHALL CONFORM TO THE CURRENT EDITION OF AWS D1.1. PERIODIC INSPECTION IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE. ALL WELDING SHALL BE PERFORMED WITH E70XX ELECTRODES EXCEPT THAT E60XX ELECTRODES SHALL BE USED FOR METAL DECKING. ALL WELDS SHALL BE PERFORMED BY CERTIFIED WELDERS.
5. ALL STRUCTURAL STEEL TO BE EMBEDDED IN CONCRETE OR TO RECEIVE FIREPROOFING MATERIAL SHALL BE CLEAN AND FREE OF PAINT, OIL OR DIRT. ALL OTHER STRUCTURAL STEEL SHALL RECEIVE ONE COAT OF RUST INHIBITING PRIMER. SEE SPECIFICATIONS FOR ADDITIONAL PAINTING REQUIREMENTS.
6. SEE THE SPECIFICATIONS FOR ADDITIONAL STRUCTURAL STEEL REQUIREMENTS.

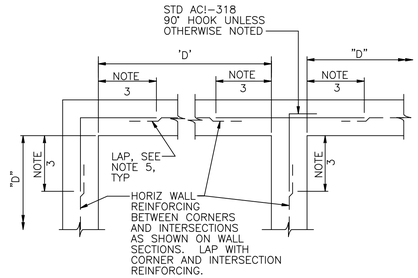
METAL DECKING

1. ROOF DECKING SHALL BE 1 1/2" DEEP x 22 GA (I=0.183 IN /FT, S=0.209 IN /FT) GALV STEEL DECK, FLOOR DECKING SHALL BE 1 1/2" DEEP x 18 GA (I=0.338 IN /FT, S=0.395 IN /FT) AS SPECIFIED. PROVIDE (5) 3/4" DIA PUDDLE WELDS PER 36" PANEL AT ALL SUPPORTS PERPENDICULAR TO DECK RIBS. PROVIDE 3/4" DIA. PUDDLE WELDS AT 12" ON CENTER AT ALL SUPPORTS PARALLEL TO DECK RIBS. SIDE SEAMS SHALL BE BUTTON PUNCHED AT 18" ON CENTER AND AS RECOMMENDED BY THE MANUFACTURER, UNLESS OTHERWISE NOTED.



NOTE:– LAP = 30 BAR DIAMETERS OR 2'–0" MIN. UNLESS OTHERWISE NOTED.

CMU WALL CORNERS (AS01)
NTS



TYPICAL SINGLE MAT CORNER AND INTERSECTION REINFORCING (AS02)
NTS

CORNER AND INTERSECTION REINFORCING DETAILS

1. TYPICAL HORIZONTAL WALL CORNER AND INTERSECTION REINFORCING LAYOUT IS SHOWN TO AVOID CONGESTION AND PERMIT PROPER PLACEMENT, FOR SIZE AND SPACING SEE PLANS. ALL HORIZONTAL REINFORCING AT CORNERS AND INTERSECTIONS SHALL BE FABRICATED AND INSTALLED WITH SPLICES LOCATED WHERE SHOWN REGARDLESS OF BAR SIZE AND SPACING.
2. WHERE THE CORNER OR INTERSECTION REINFORCING SIZE AND SPACING IS NOT SHOWN, NOTED OR TABULATED ON THE PLANS, THE SIZE AND SPACING SHALL BE THE SAME AS THE WALL HORIZONTAL REINFORCING SHOWN ON THE WALL SECTIONS OR AS NOTED FOR THE REINFORCING BETWEEN THE CORNERS OR INTERSECTIONS.
3. EXCEPT WHERE OTHERWISE SHOWN ON THE DRAWINGS, THE LENGTH INDICATED AS "NOTE 3" SHALL BE THE LESSER OF D/4, 10 FEET, OR 1.0 TIMES THE HEIGHT OF THE WALL, EXCEPT THAT IN NO CASE SHALL IT BE LESS THAN 2.0 FEET.
4. D = LENGTH OF WALL PARALLEL TO THE BAR LENGTH IN QUESTION.
5. EXCEPT WHERE OTHERWISE SHOWN ON THE DRAWINGS, THE LENGTH INDICATED AS "NOTE 5" SHALL BE EQUAL TO ONE "LAP LENGTH" AS REQUIRED BY THE GENERAL STRUCTURAL NOTES. USE THE LAP LENGTH AS REQUIRED FOR THE SMALLER OF THE TWO REINFORCING BARS BEING SPLICED.
6. UNLESS OTHERWISE NOTED, "B" AND "C" BARS ARE THE SAME SIZE AND SPACING AND, "F" AND "G" BARS ARE THE SAME SIZE AND SPACING.

RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

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DRAWN YR
DESIGNED YR
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REVIEWED WJM

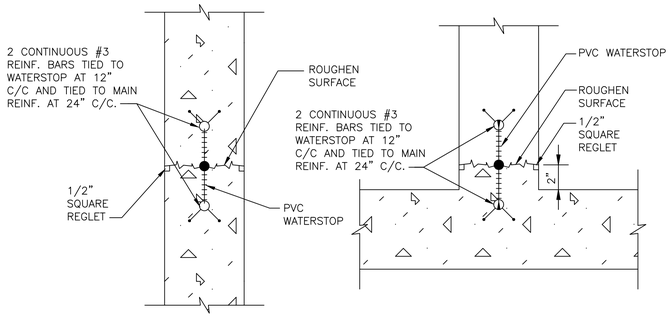
AMEC Geomatrix

JOSEPH M. LIEBER — STATE OF WASHINGTON — 23014 — REGISTERED PROFESSIONAL ENGINEER
01-14-13

GROUNDWATER TREATMENT PLANT ARCHITECTURAL / STRUCTURAL

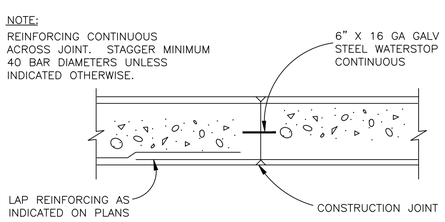
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 01/14/13
PROJECT NO.: SE10160010
DRAWING AS–08



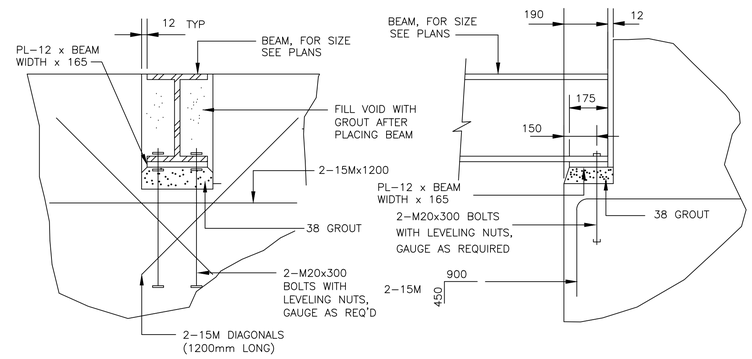
TYPICAL CONSTRUCTION JOINTS
NTS

AS03



SLAB CONSTRUCTION JOINT
NTS

AS06

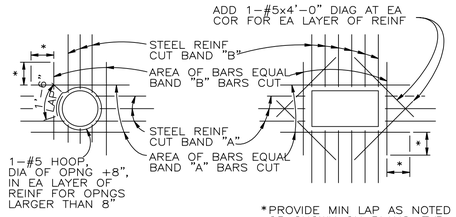


PERPENDICULAR TO WALL

PARALLEL TO WALL

BEAM SEAT DETAIL
NTS

AS09

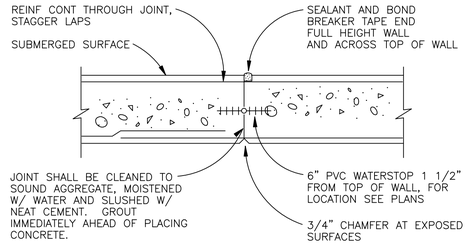


NOTES:

1. TYPICAL FOR ALL OPENINGS IN CONCRETE WALLS AND SLABS UNLESS INDICATED OTHERWISE ON PLANS.
2. DO NOT WELD REINFORCEMENT TO PIPE SLEEVES AND INSERTS.

OPENING REINFORCING
NTS

AS04



VERTICAL CONSTRUCTION JOINT
NTS

AS07

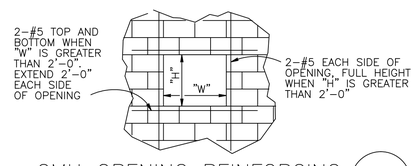
EQUIPMENT PAD
NTS

EQUIPMENT BASE NOTES

1. PAD SIZE SHALL BE A MINIMUM INDICATED OR AS SHOWN ON THE PLANS OR AS INDICATED BY THE MANUFACTURER AND APPROVED BY THE ENGINEER.
2. THE SIZE, NUMBER, TYPE, LOCATION, AND THREAD PROJECTION OF THE ANCHOR BOLTS SHALL BE DETERMINED BY THE EQUIPMENT MANUFACTURER, AND SHALL BE AS APPROVED BY THE ENGINEER. ANCHOR BOLTS SHALL BE HELD IN POSITION WITH A TEMPLATE WHILE CONCRETE FOR PAD IS BEING PLACED.
3. ANCHOR BOLT SLEEVES SHALL BE USED TO PROVIDE THE ANCHOR BOLT A MINIMUM MOVEMENT OF 1/2" IN ALL DIRECTIONS. THE MINIMUM SLEEVE LENGTH SHALL BE 8 TIMES THE BOLT DIAMETER. SLEEVES SHALL BE FILLED WITH NON SHRINK GROUT.
4. ANCHOR BOLT SLEEVES SHALL HAVE A MINIMUM INTERNAL DIAMETER 1" GREATER THAN BOLT DIAMETER AND A MAXIMUM INTERNAL DIAMETER 3" GREATER THAN ANCHOR BOLT DIAMETER. SLEEVES SHALL BE FILLED WITH NON SHRINK GROUT.
5. EQUIPMENT BASES SHALL BE INSTALLED LEVEL UNLESS SPECIFIED OTHERWISE.
6. WHEN REQUIRED ANCHOR BOLT LENGTH EXCEEDS PAD THICKNESS MINUS 1". USE DETAILS OF SLAB BLOCKOUT FOR ANCHOR BOLTS AS SHOWN. PRIOR TO CASTING SLAB CONCRETE.
7. WEDGES OR SHIMS SHALL BE USED TO SUPPORT THE BASE WHILE THE NON-SHRINK GROUT IS PLACED. TEMPORARY LEVELING NUTS SHALL BE BACKED OFF IF LEFT IN. THE WEDGES OR SHIMS SHALL NOT BE EXPOSED TO VIEW.

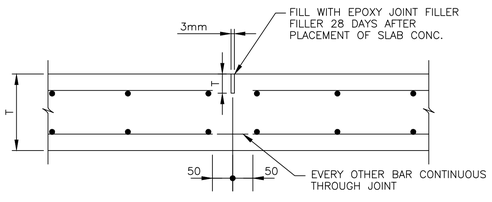
EQUIPMENT PAD DETAILS
NTS

AS10



CMU OPENING REINFORCING
NTS

AS05



NOTE:- CONTRACTOR SHALL USE STRING LINE OR OTHER POSITIVE MEANS TO PLACE REINFORCING AND LOCATE SAWCUT.

SAWN SLAB ON GRADE CONTROL JOINT
NTS

AS08

RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

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DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

JOSEPH M. LOCATELLI, STATE OF WASHINGTON, 23314, REGISTERED PROFESSIONAL ENGINEER
01-14-13

GROUNDWATER TREATMENT PLANT
ARCHITECTURAL / STRUCTURAL

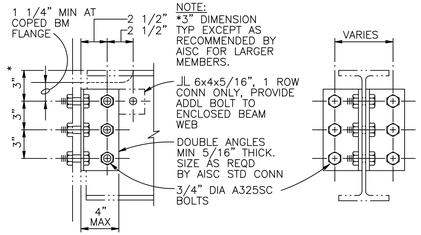
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 01/14/13
PROJECT NO.: SE10160010
DRAWING AS-09

NOMINAL BEAM DEPTH, INCHES	ROWS OF BOLTS	LENGTH (3) OF ANGLE
36	7	1'–8 1/2"
30–33	6	1'–5 1/2"
24–27	5	1'–2 1/2"
16–21	4	11 1/2"
12–15	3	8 1/2"
8–10	2	5 1/2"
6	1	3"

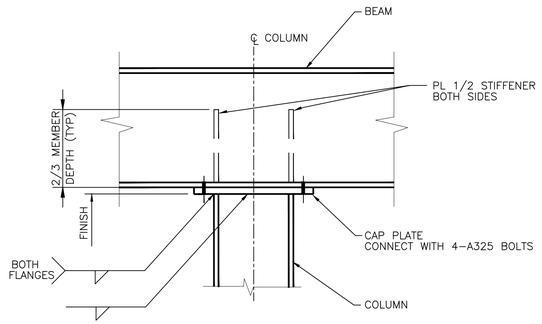
NOTES:

1. NUMBER OF ROWS IS EQUAL TO NUMBER OF BOLTS TO ENCLOSED WEB.
2. ALL FRAMING CONNECT–IONS SHALL CONFORM TO SCHEDULE UNLESS DETAILED OTHERWISE ON FRAMING PLANS.

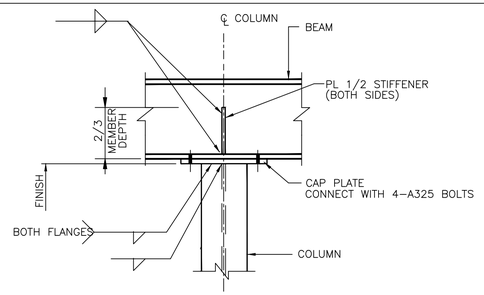


TYPICAL FRAMING CONNECTION (AS11)

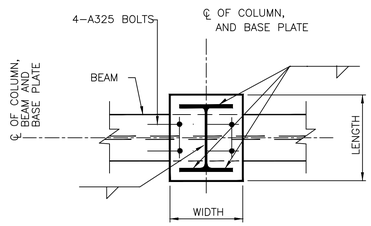
NTS



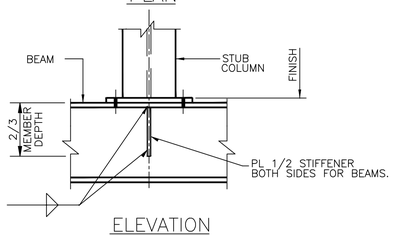
BEAM CONNECTION TO COLUMN CAP PLATE TYPE 'A' (AS12)



BEAM CONNECTION TO COLUMN CAP PLATE TYPE 'B' (AS13)

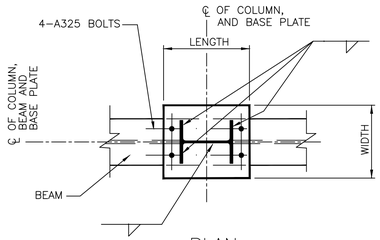


PLAN

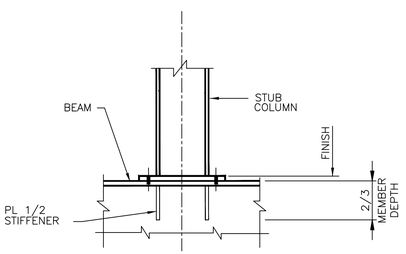


ELEVATION

STUB COLUMN BASE PLATE DETAIL TYPE 'A' (AS14)

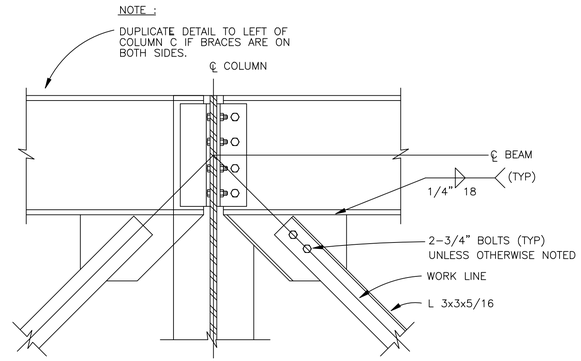


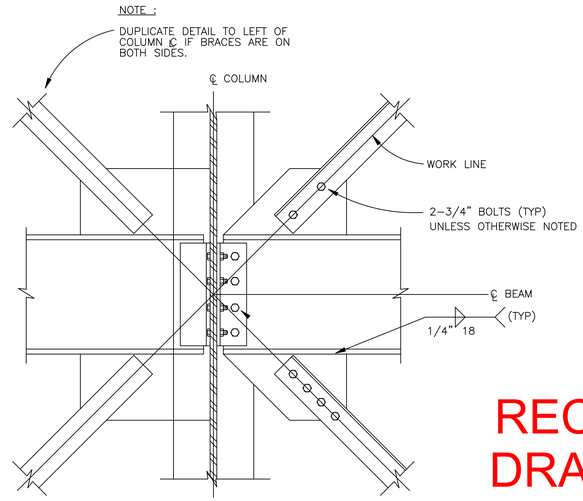
PLAN

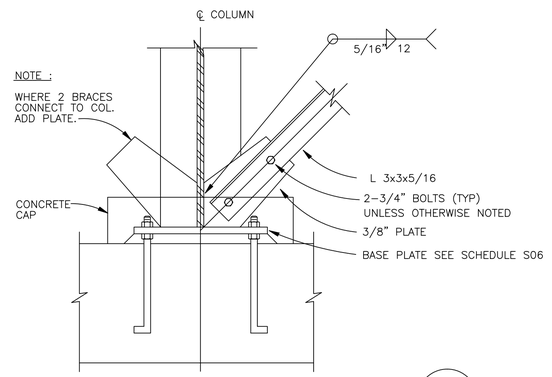


ELEVATION

STUB COLUMN BASE PLATE DETAIL TYPE 'B' (AS15)







VERTICAL BRACING DETAILS (AS16)

NTS

RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	–
2	TRANSMITTED TO CONTRACTOR	07/13/11	–
3	CMU WALL TO STRUCTURAL STEEL CONNECTION REVISIONn	01/14/13	JML

DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

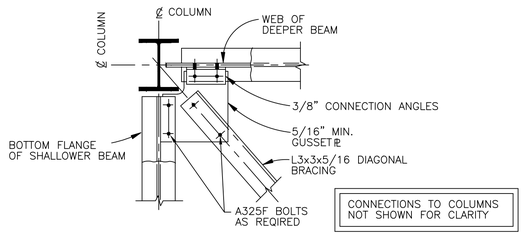
AMEC Geomatrix

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01-14-13

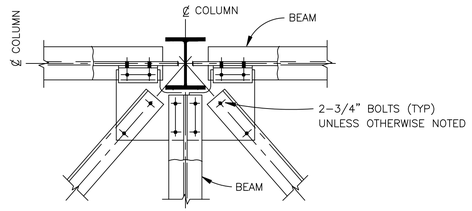
GROUNDWATER TREATMENT PLANT ARCHITECTURAL / STRUCTURAL

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

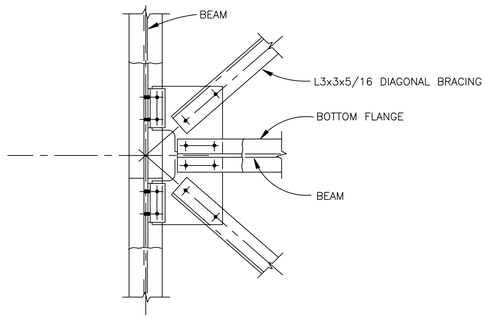
DATE: 05/08/13
PROJECT NO.: SE10160010
DRAWING AS–10



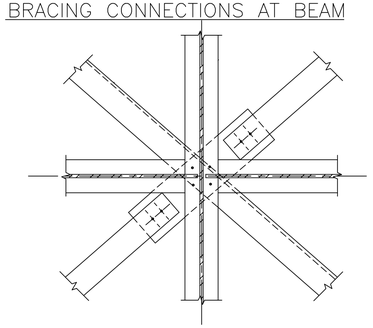
BRACING CONNECTIONS AT CORNERS



BRACING CONNECTIONS AT COLUMNS



BRACING CONNECTIONS AT BEAM



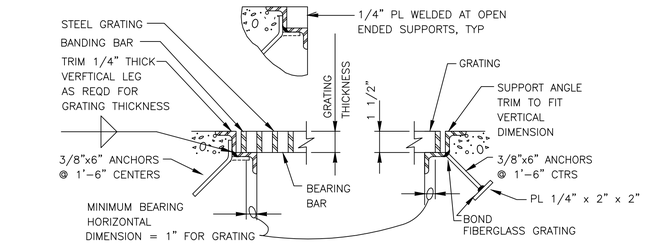
BRACING CONNECTIONS AT BEAM

HORIZONTAL BRACING DETAIL (AS17)

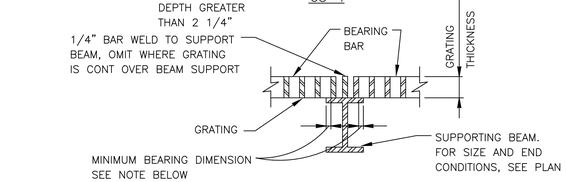
NTS

NOTE:

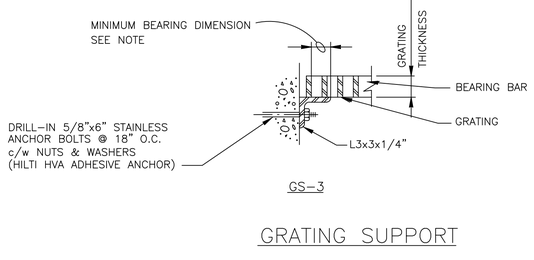
USE 4-3/4" DIA. A325 BOLTS FOR CONNECTION



GS-1



GS-2



GS-3

GRATING SUPPORT

ALL STEEL GRATING TO BE GALVANIZED

FOOT TRAFFIC GRATING THICKNESS TABLE		
MAXIMUM SPAN	STEEL (IN.)	FIBERGLASS (IN.)
3'-6"	1"	1 1/2"
4'-0"	1"	1 1/2"
4'-6"	1"	MAXIMUM ALLOWABLE SPAN IS 4'-0" LIMIT DEFLECTION TO 1/4" MAXIMUM.
5'-0"	1 1/4"	
5'-6"	1 1/4"	
6'-0"	1 1/2"	

HEAVY VEHICULAR TRAFFIC (HS 20-44)	
MAXIMUM SPAN	STEEL (IN.)
1'-8"	2 1/2"x 1/4"

NOTE:

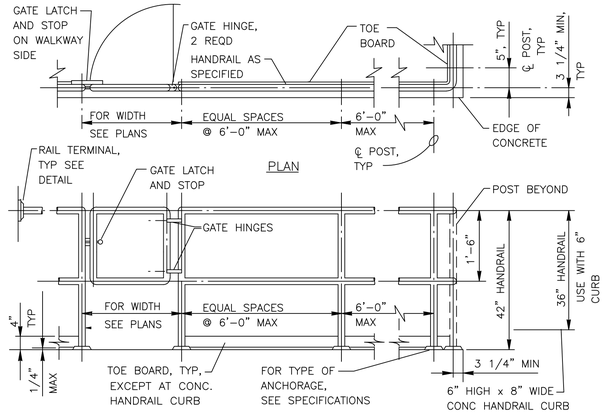
STEEL GRATING BEARING BARS FOR HEAVY VEHICULAR TRAFFIC SHALL BE SPACED AT 1 7/8" OC.

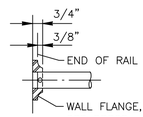
STEEL GRATING NOTES

1. EXTEND GRATING CONTINUOUSLY OVER GATE GUIDES AND GATES.
2. NOTCH GRATING SUPPORTS AT GATES AS REQUIRED.
3. GRATING SPAN ⟷ SEE PLAN.
4. WIDTH OF GRATING SECTIONS SHALL NOT EXCEED 3'-0".
5. SHOP DRAWINGS BASED ON FIELD DIMENSIONS SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO FABRICATION.
6. MATERIAL FOR SUPPORTS OF STEEL GRATING TO BE SAME AS GRATING.
7. UNLESS NOTED OTHERWISE ON PLANS, GRATING THICKNESS SHALL BE AS TABULATED IN "GRATING THICKNESS TABLE" FOR APPLICABLE TRAFFIC.
8. BEARING BAR THICKNESS FOR GRATING TO BE 3/16" MINIMUM.
9. BAND ALL EDGES WITH 3/16" x DEPTH OF BEARING BAR.
10. PROVIDE MISCELLANEOUS GRATING FASTENERS AS REQUIRED.
11. THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRATING SUPPORTS SHALL NOT BE LESS THAN 1/4" NOR GREATER THAN 1/2" AND AS SPECIFIED.
12. ALL GRATING SECTIONS, WHEN IN PLACE, SHALL ALWAYS BE FIRMLY ANCHORED TO THEIR SUPPORTS AS SPECIFIED.

STEEL GRATING (AS18)

NTS

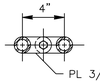




NOTES:

1. FASTEN RAIL TO WALL FLANGE PER MANUFACTURERS RECOMMENDATIONS.
2. WALL FLANGE TO BE MOUNTED TO WALL WITH 2 – 3/8" DIA SST WEDGE ANCHORS.

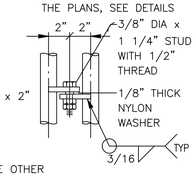
RAIL TERMINAL



NOTE:

AT CONTRACTOR'S OPTION FABRICATE HINGES OR PROVIDE OTHER HINGES AS SPECIFIED. ANODIZE, GALV OR FINISH AFTER ALL WELDING AS SPECIFIED.

PLAN

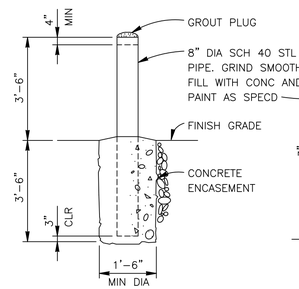


ELEVATION

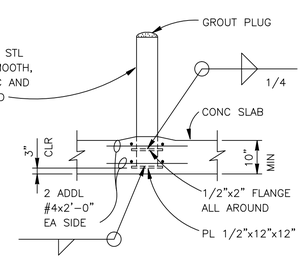
TWO-RAIL HANDRAIL (AS19)

NTS

NOTE:- ALL HANDRAIL TO BE GALVANIZED.



EXTERIOR



INTERIOR

GUARD POST (AS20)

NTS

RECORD DRAWING

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	–
	2	TRANSMITTED TO CONTRACTOR	07/13/11	–
DATUM HORIZONTAL: WASP-NAD83-S FEET VERTICAL: NAVD88 FEET	3	CMU WALL TO STRUCTURAL STEEL CONNECTION REVISIONn	01/14/13	JML

DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

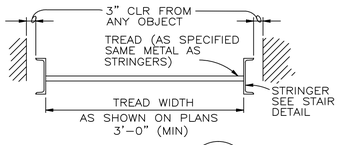
JOSEPH M. LOCKE — STATE OF WASHINGTON — 23314 — REGISTERED PROFESSIONAL ENGINEER
01-14-13

GROUNDWATER TREATMENT PLANT ARCHITECTURAL / STRUCTURAL

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

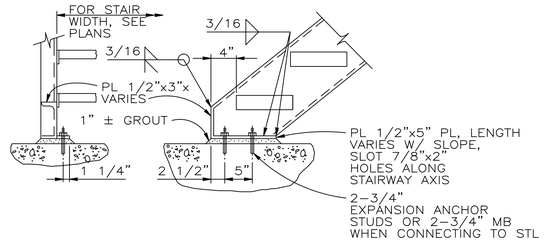
DATE: 01/14/13
PROJECT NO.: SE10160010
DRAWING AS-11

TREAD WIDTH	BEARING BARS	
	ALUMINUM TREAD	STEEL TREAD
2'–3" OR LESS	1"x 3/16"	3/4"x 3/16"
2'–9" OR LESS	1 1/4"x 3/16"	1"x 3/16""
3'–3" OR LESS	1 1/2"x 3/16"	1 1/4"x 3/16"
4'–7" OR LESS	1 3/4"x 3/16"	1 1/2"x 3/16"



STAIR TREADS AS21

NTS

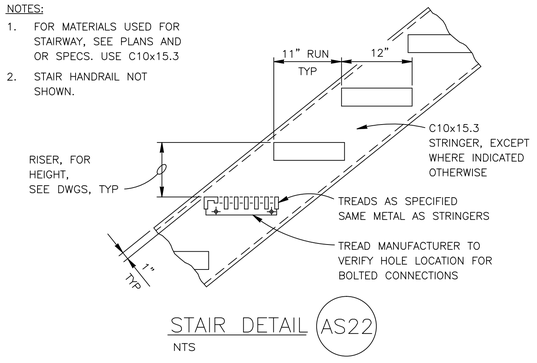


NOTES:
1. USE BASE PL OF SAME METAL AS STRINGER.
2. PROVIDE PROTECTION FOR DISSIMILAR METALS AND CONCRETE AS SPECIFIED.
3. STAIR HANDRAIL NOT SHOWN.

STAIR BOTTOM CONNECTION AS24

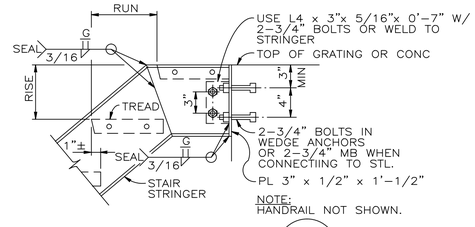
NTS

NOTES:
1. FOR MATERIALS USED FOR STAIRWAY, SEE PLANS AND OR SPECS. USE C10x15.3
2. STAIR HANDRAIL NOT SHOWN.



STAIR DETAIL AS22

NTS



STAIR TOP CONNECTION AS23

NTS

RECORD DRAWING

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	–
2	TRANSMITTED TO CONTRACTOR	07/13/11	–
3	CMU WALL TO STRUCTURAL STEEL CONNECTION REVISIONn	01/14/13	JML

DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

JOSEPH M. LUCAS — STATE OF WASHINGTON — 22314 — REGISTERED PROFESSIONAL ENGINEER
01-14-13

GROUNDWATER TREATMENT PLANT
ARCHITECTURAL / STRUCTURAL

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 01/14/13
PROJECT NO.: SE10160010
DRAWING AS–12

RECORD DRAWING

NUCOR BUILDING SYSTEMS
A DIVISION OF NUCOR CORPORATION

PROJECT NUMBER: U11R0359A
PROJECT NAME: B&L WOODWASTE
PROJECT LOCATION: MILTON, WA COUNTY: PIERCE
CUSTOMER: T&E INTERNATIONAL MARYSVILLE, WA

MBMA MEMBER
CSSBI
CWB CERTIFIED CSA W47.1
CWB CERTIFIED CSA A660
ACCREDITED AC472

NOTES AND SPECIFICATIONS

BUILDING ERECTION NOTES

1) THE GENERAL CONTRACTOR AND/OR ERECTOR IS RESPONSIBLE TO SAFELY AND PROPERLY ERECT THE METAL BUILDING SYSTEM IN CONFORMANCE WITH THESE DRAWINGS, OSHA REQUIREMENTS, AND MBMA STANDARDS PERTAINING TO PROPER ERECTION. THIS INCLUDES, BUT IS NOT LIMITED TO, THE CORRECT USE OF TEMPORARY GUYS AND BRACING WHERE NEEDED FOR SQUARING, PLUMBING, AND SECURING THE STRUCTURAL AND SECONDARY FRAMING. SECONDARY WALL FRAMING MEMBERS (GIRTS OR BAR JOISTS) ARE NOT DESIGNED TO FUNCTION AS A WORK PLATFORM OR PROVIDE SAFETY TIE OFF ATTACHMENT IN ACCORDANCE WITH OSHA REQUIREMENTS. SECONDARY ROOF FRAMING MEMBERS (PURLINS OR BAR JOISTS) ARE NOT DESIGNED TO PROVIDE SAFETY TIE OFF ATTACHMENT IN ACCORDANCE WITH OSHA REQUIREMENTS.

2) ALL HIGH STRENGTH BOLTS ARE TYPE ASTM A325 AND ARE TO BE INSTALLED TO THE "SNUG-TIGHT" CONDITION AS DEFINED BY THE RCSC SPECIFICATION FOR STRUCTURAL JOINTS USING A325 OR A490 BOLTS, 2004 EDITION, SECTION 8.1, UNLESS NOTED OTHERWISE. ALSO, NOTE THAT BOLTS IN STANDARD HOLES DO NOT REQUIRE WASHERS PER THE RCSC SPECIFICATION FOR STRUCTURAL JOINTS USING A325 OR A490 BOLTS, SECTION 6.

3) ALL A307 MACHINE BOLTS ARE TO BE BROUGHT TO A "SNUG TIGHT" CONDITION TO ENSURE THAT THE MATERIALS IN THE JOINT ARE BROUGHT INTO GOOD CONTACT WITH EACH OTHER.

4) WASHERS ARE REQUIRED AT ALL SLOTTED CONNECTIONS AS FOLLOWS:
-HOLE TO SLOT CONNECTION, ONE WASHER REQUIRED ON SLOTTED SIDE.
-SLOT TO SLOT CONNECTION, TWO WASHERS REQUIRED, ONE ON EACH SIDE OF THE CONNECTION. HOWEVER AT LAPPED ZEE MEMBERS, WHETHER PURLINS OR GIRTS, NO WASHERS ARE REQUIRED IN THE 8-BOLT LAPPED REGION.

5) THE METAL BUILDING SUPPLIER SHALL BE NOTIFIED PRIOR TO ANY FIELD MODIFICATIONS. MODIFICATIONS SHALL BE APPROVED BY THE METAL BUILDING SUPPLIER BEFORE WORK IS UNDERTAKEN.

6) ALL WELDING MUST BE PERFORMED BY AWS QUALIFIED WELDERS FOR THE WELDING PROCESSES AND POSITIONS INDICATED. ALL WORK MUST BE COMPLETED AND INSPECTED IN ACCORDANCE WITH THE APPLICABLE AWS SPECIFICATIONS. WELD ELECTRODES USED FOR THE SMAW (OR STICK) WELD PROCESS MUST BE 70 KSI STEEL AND LOW HYDROGEN CONTENT.

7) COMMON ABBREVIATIONS:

a) TYP UNO-TYPICAL UNLESS NOTED OTHERWISE	f) SIM.-SIMILAR
b) SLV-SHORT LEG VERTICAL	g) NIC-NOT IN CONTRACT
c) LLV-LONG LEG VERTICAL	h) SL-STEEL LINE
d) NS & FS-NEAR SIDE AND FAR SIDE	i) N/A-NOT APPLICABLE
e) O.A.L.-OVERALL LENGTH	j) MBS-METAL BUILDING SUPPLIER

8) CONSTRUCTION LOADS SHALL NOT BE PLACED ON ANY STRUCTURAL STEEL FRAMEWORK UNLESS SUCH FRAMEWORK IS SAFELY BOLTED, WELDED, OR OTHERWISE ADEQUATELY SECURED.

9) PURLINS AND GIRTS SHALL NOT BE USED AS AN ANCHORAGE POINT FOR A FALL ARREST SYSTEM UNLESS WRITTEN APPROVAL IS OBTAINED FROM THE METAL BUILDING SUPPLIER.

10) PURLINS MAY ONLY BE USED AS A WALKING/WORKING SURFACE WHEN INSTALLING SAFETY SYSTEMS, AFTER ALL PERMANENT BRIDGING HAS BEEN INSTALLED AND FALL PROTECTION IS PROVIDED.

11) CONSTRUCTION LOADS MAY BE PLACED ONLY WITHIN A ZONE THAT IS WITHIN 8 FEET OF THE CENTER-LINE OF THE PRIMARY SUPPORT MEMBER. CFR BUNDLES SHOULD BE PLACED DIRECTLY OVER THE RIGID FRAMES.

12) ALL LIFTING DEVICES MUST MEET OSHA OR MSHA STANDARDS AND IN NO CASE IS IT ACCEPTABLE TO USE STRUCTURAL MEMBERS SUPPLIED BY THE MBS AS A SPREADER BAR OR LIFTING DEVICE.

GENERAL DESIGN NOTES AND MATERIAL SPECIFICATIONS

1) ALL STRUCTURAL STEEL SECTIONS AND WELDED PLATE MEMBERS ARE DESIGNED IN ACCORDANCE WITH THE AISC "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS-ALLOWABLE STRESS DESIGN", NINTH EDITION, OR THE AISC "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS", THIRTEENTH EDITION, AS REQUIRED BY THE SPECIFIED BUILDING CODE.

2) ALL WELDING OF STRUCTURAL STEEL IS BASED ON AWS D1.1 "STRUCTURAL WELDING CODE", LATEST EDITION.

3) ALL COLD FORMED MEMBERS ARE DESIGNED IN ACCORDANCE WITH AISI "SPECIFICATIONS FOR THE DESIGN OF COLD FORMED STEEL STRUCTURAL MEMBERS", LATEST EDITION.

4) ALL WELDING OF COLD FORMED STEEL IS BASED ON AWS D1.3 "STRUCTURAL WELDING CODE - SHEET STEEL", LATEST EDITION.

5) IF JOISTS ARE INCLUDED WITH THIS PROJECT, THEY ARE SUPPLIED AS A PART OF THE SYSTEMS-ENGINEERED METAL BUILDING AND ARE FABRICATED IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 1926.758 OF THE OSHA SAFETY STANDARD FOR STEEL ERECTION, DATED JANUARY 18, 2001.

6) MATERIAL SPECIFICATIONS:

PLATE AND FLANGE MATERIAL:	
5"-12" WIDE & THRU 1" THICK	A529, GRADE 55
OTHERS	A36
BUILT-UP STRUCTURAL WEB MATERIAL	A1011 SS (OR HSLAS CL1) GR 55
HOT-ROLLED STRUCTURAL	A36 OR A572 GRADE 50 OR A992 GRADE 50
STRUCTURAL TUBE	A500 GRADE B (46 KSI)
STRUCTURAL PIPE	A500 GRADE B (42 KSI)
COLD-FORMED STRUCTURAL	A1011 OR A1039 SS (OR HSLAS CL1) GR 55
RPB ROOF PANELS	A792 GRADE 80
STANDING SEAM ROOF PANELS	A792 GRADE 50, CLASS 1
R-PANEL AND A-PANEL SIDING	A653 GRADE 80, CLASS 1 OR A792 GRADE 80, CLASS 1
ROD BRACING	A529 GRADE 50
CABLE BRACING	A475 COATING CLASS A, GRADE EHS, 7-WIRE
WELDS	AWS D1.1 LATEST EDITION
HIGH-STRENGTH BOLTS	A325 TYPE 1 HEAVY HEX OR A490 TYPE 1 HEAVY HEX
MACHINE BOLTS	A-307 GRADE A HEX

TRADEMARK 2011, NUCOR BUILDING SYSTEMS

PRIMARY AND SECONDARY STEEL PRIMER COLOR: RED

ROOF SHEETING, TYPE: CLASSIC 26 GAGE, FINISH: BURNISHED SLATE

ROOF PANEL CLIP TYPE: [X] N/A [ ] TALL [ ] SHORT [ ] UTILITY [ ] FIXED [ ] FLOATING

THERMAL BLOCKS: [ ] YES [X] NO EPS FOAM SPACER: [ ] YES [X] NO

SEAMING METHOD (FOR CFR ONLY): REFER TO THE DETAIL PAGES FOR ADDITIONAL SEAMING INFORMATION
[ ] "NUCOR ROLL LOCK"™
[ ] "NUCOR VISE LOCK"™
[ ] "NUCOR VISE LOCK 360"™
CLASSIC AND CFR GUTTER HANGERS ARE PROVIDED IN GALVANIZED COLOR ONLY. VR16 GUTTER HANGERS ARE AVAILABLE COLORED.

COMPOSITE ROOF DECK, TYPE: N/A ___ GAGE, FINISH: ___

ROOF DECK ONLY, TYPE: N/A ___ GAGE, FINISH: ___

ROOF LINE TRIM, PAINTED: BURNISHED SLATE

EXTERIOR WALL SHEETING, TYPE: CLASSIC WALL 26 GAGE, FINISH: SAGEBRUSH TAN

EXTERIOR WALL CORNER TRIM FINISH: BURNISHED SLATE

EXTERIOR BASE TRIM, PAINTED: BURNISHED SLATE

FRAMED OPENING TRIM, PAINTED: BURNISHED SLATE

FRAMED OPENING COVER TRIM, PAINTED: BURNISHED SLATE

WALL FRAMED OPENING, SIZES: (1) 10'-0"x14'-0" (1) 8'-0"x8'-0" (2) 3'-5"x7'-2" (2) 3'-0"x3'-0" (6) 1'-0"x1'-0"

INTERIOR WALL SHEETING, TYPE: CLASSIC WALL 26 GAGE, FINISH: POLAR WHITE

INTERIOR CEILING LINER, TYPE: N/A ___ GAGE, FINISH: ___

INTERIOR WALL TRIM, PAINTED: ___

YES	NO	
[X]	[ ]	DOWNSPOUTS PAINTED: SAGEBRUSH TAN GUTTERS PAINTED: BURNISHED SLATE
[X]	[ ]	WALKDOORS, QUANTITY: (2) 3070 PAINTED: WHITE
[ ]	[X]	WINDOWS: ___ PAINTED: ___
[X]	[ ]	INSULATION (NOT BY NBS), ROOF: 2" RIGID BRD WALLS: 2" RIGID BRD
[ ]	[X]	CRANES (SEE CRANE PLAN FOR ADDITIONAL CRANE INFORMATION)
[ ]	[X]	MEZZANINE (SEE MEZZANINE PLAN FOR ADDITIONAL MEZZANINE INFO)
[ ]	[X]	WALL TRANSLUCENT PANELS, LENGTH: ___ QUANTITY: ___
[ ]	[X]	ROOF TRANSLUCENT PANELS, LENGTH: ___ QUANTITY: ___ INSULATED PANELS YES [ ] NO [ ]
[ ]	[X]	PIPE JACKS, SIZE: ___ QUANTITY: ___
[ ]	[X]	ROOF FRAMED OPENINGS, SEE ROOF FRAMING PLAN FOR SIZES
[ ]	[X]	ROOF CURBS (BY NBS), SEE ROOF FRAMING PLAN FOR SIZES
[ ]	[X]	RIDGE VENTS, 10'-0" LONG X [ ] 12" [ ] 9" THROAT. QUANTITY: ___ SINGLE UNITS [ ] CONTINUOUS UNITS [ ]

YES	NO	
[ ]	[X]	FASCIA, PROJECTION: ___ TOP OF FASCIA HEIGHT: ___
		FACE PANEL, TYPE: ___ GAGE, FINISH: ___
		BACK PANEL, TYPE: ___ GAGE, FINISH: ___
		CAP TRIM PAINTED: ___ BASE TRIM PAINTED: ___
		[ ] CLOSED SYSTEM, CLEAR UNDER SOFFIT TRIM: ___
		SOFFIT PANEL, TYPE: ___ GAGE, FINISH: ___
		SOFFIT TRIM AT BUILDING LINE PAINTED: ___
		[ ] OPEN SYSTEM, (NO SOFFIT PANEL PROVIDED)
		CLEAR UNDER FASCIA: ___
[ ]	[X]	PARAPET SYSTEM
		[ ] STRUCTURAL PARAPET [ ] NON-STRUCTURAL PARAPET [ ] NOT BY MBS
		TOP OF PARAPET HEIGHT: ___
		BACKER PANEL, TYPE: ___ GAGE, FINISH: ___
[ ]	[X]	CANOPY (EXPOSED BEAM), PROJECTION: ___ AT EAVE LINE [ ] BELOW EAVE [ ]
		ROOF PANEL, TYPE: ___ GAGE, FINISH: ___
		SOFFIT PANEL, TYPE: ___ GAGE, FINISH: ___
		SOFFIT TRIM AT BUILDING LINE PAINTED: ___
		CLEAR UNDER CANOPY BEAM: ___
[ ]	[X]	BOXED-OUT CANOPY, PROJECTION: ___ [ ] AT EAVE LINE [ ] BELOW EAVE
		ROOF PANEL, TYPE: ___ GAGE, FINISH: ___
		FACE PANEL, TYPE: ___ GAGE, FINISH: ___
		SOFFIT PANEL, TYPE: ___ GAGE, FINISH: ___
		SOFFIT TRIM AT BLDG LINE PAINTED: ___
		CLEAR UNDER SOFFIT: ___ BASE TRIM PAINTED: ___
[ ]	[X]	EAVE EXTENSION (CONCEALED BEAM), PROJECTION: ___
		SOFFIT PANEL, TYPE: ___ GAGE, FINISH: ___
		SOFFIT TRIM AT BUILDING LINE PAINTED: ___
[ ]	[X]	RAKE EXTENSION, PROJECTION: ___
		SOFFIT PANEL, TYPE: ___ GAGE, FINISH: ___
		SOFFIT TRIM AT BUILDING LINE PAINTED: ___
[ ]	[X]	PARTITION WALL SHEETING
		PANEL TYPE: ___ GAGE, FINISH: ___
		PARTITION WALL TRIM COLOR: ___

THE 8'X8' ROLL UP DOOR FRAMED OPENING SUPPLIED ON THIS PROJECT HAS BEEN DESIGNED TO SUPPORT A TOTAL HANGING DEAD WEIGHT OF 640 LBS. IN ADDITION, THE FRAMED OPENING HAS BEEN DESIGNED TO SUPPORT WIND LOAD, NORMAL TO THE DOOR, BASED ON THE STANDARD BUILDING CODE CRITERIA. THE FRAMED OPENING HAS NOT BEEN DESIGNED FOR ANY ADDITIONAL MOMENT OR CATENARY FORCE FROM THE DOOR. ANY CHANGE TO THE INFORMATION SHOWN HERE WOULD REQUIRE AN ENGINEERING INVESTIGATION AND POSSIBLE BUILDING REINFORCEMENT.

THE 10'X14' ROLL UP DOOR FRAMED OPENING SUPPLIED ON THIS PROJECT HAS BEEN DESIGNED TO SUPPORT A TOTAL HANGING DEAD WEIGHT OF 1400 LBS. IN ADDITION, THE FRAMED OPENING HAS BEEN DESIGNED TO SUPPORT WIND LOAD, NORMAL TO THE DOOR, BASED ON THE STANDARD BUILDING CODE CRITERIA. THE FRAMED OPENING HAS NOT BEEN DESIGNED FOR ANY ADDITIONAL MOMENT OR CATENARY FORCE FROM THE DOOR. ANY CHANGE TO THE INFORMATION SHOWN HERE WOULD REQUIRE AN ENGINEERING INVESTIGATION AND POSSIBLE BUILDING REINFORCEMENT.

■ THIS BUILDING SYSTEM DESIGN IS BASED ON UNIFORMLY APPLYING THE CONTRACT-SPECIFIED LIVE LOAD AND ROOF SNOW LOAD. IN ADDITION, THE DESIGN IS BASED ON APPLYING A CODE-DEFINED LIVE LOAD (INCLUDING APPLICABLE REDUCTIONS) AND A CODE-DEFINED SNOW LOAD (BASED ON CONTRACT-SPECIFIED GROUND SNOW) FOR ALL PARTIAL LOADING AND UNBALANCED SNOW LOAD CONDITIONS.

THE RIGID FRAME CONNECTIONS IN THIS PROJECT MUST BE TIGHTENED TO THEIR FULLY-PRETENSIONED STATE USING ANY OF THE ACCEPTABLE METHODS OUTLINED IN THE RCSC SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS, 2004 EDITION. THE SCOPE OF THIS PROJECT PRECLUDES THE USAGE OF SNUG-TIGHT BOLTED CONNECTIONS AND ARE THUS NOT PERMITTED IN THIS CASE.

FOR OCCUPANCY CATEGORY I OR II BUILDINGS, IBC ALLOWS FOR SINGLE STORY BUILDINGS TO HAVE NO LIMIT FOR SEISMIC STORY DRIFT. PLEASE NOTE THAT ANY INTERIOR WALLS, PARTITIONS, CEILINGS, AND EXTERIOR WALLS SHOULD BE DETAILED (BY OTHERS) TO ACCOMMODATE THIS STORY DRIFT.

■ IT IS THE ENGINEER OF RECORDS (NOT NBS) RESPONSIBILITY TO ASSURE THAT THE MEZZANINE LOADS (NOT BY NBS) SHOWN ON PAGE C2 ARE NOT EXCEEDED. ATTACHEMENT AND TRANSFER OF MEZZANINE LOADS INTO THE COLUMNS AND BRACING SYSTEM ARE NOT BY NBS.

⚠ DESIGN CHANGES REVIEW IN FULL

BUILDING LOADS

DESIGN CODE: IBC 2009 BUILDING END USE: 2A
ROOF LIVE LOAD: 20 PSF MBMA OCC. CLASS:
REDUCIBLE PER CODE II - STANDARD BUILDINGS
GROUND SNOW LOAD: 18 PSF SNOW EXP. FACTOR, Ce: 0.90
SNOW IMPORTANCE FACTOR, Is: 1.00

WIND: 85 mph WIND IMPORTANCE FACTOR, Iw: 1.00
EXPOSURE: C WITHIN HURRICANE COASTLINE [ ] YES [X] NO

UL 90 [ ] YES [X] NO
Classic Roof-Const. No. 161; Classic Roof w/ Translucent Panel-Const. No. 167
CFR Roof-Const. No. 552; CFR Roof w/ Translucent Panel-Const. No. 590
Composite CFR Roof-Const. No. 552A; VR16 II Roof-Const. No. 332

SEISMIC INFORMATION Ss:1.197, S1:0.410
Design Sds/Sd1: 0.815/0.435 Site Class: D
Seismic Imp. Factor Ie: 1.00 Seismic Design Category: D
Analysis Procedure: Equivalent Lateral Force Method
Basic SFRS: Ordinary Steel Moment Frames & Ordinary Steel Concentrically - Braced Frames

NOTES:
1) COLLATERAL DEAD LOADS, UNLESS OTHERWISE NOTED, ARE ASSUMED TO BE UNIFORMLY DISTRIBUTED. WHEN SUSPENDED SPRINKLER SYSTEMS, LIGHTING, HVAC EQUIPMENT, CEILINGS, ETC., ARE SUSPENDED FROM ROOF MEMBERS, CONSULT THE M.B.S. IF THESE CONCENTRATED LOADS EXCEED 200 POUNDS, OR IF INDIVIDUAL MEMBERS ARE LOADED SIGNIFICANTLY MORE THAN OTHERS.

2) THE DESIGN OF STRUCTURAL MEMBERS SUPPORTING GRAVITY LOADS IS CONTROLLED BY THE MORE CRITICAL EFFECT OF ROOF LIVE LOAD OR ROOF SNOW LOAD, AS DETERMINED BY THE APPLICABLE CODE.

	BUILDING Main
ROOF DEAD (PSF):	3.00
PRI. COL. (PSF):	3.00
SEC. COL. (PSF):	3.00
SNOW Ct:	1.1
SNOW Cs:	1.00
ROOF SNOW (PSF):	18.00
WIND ENCLOSURE:	Enclosed
GCpi:	+/-0.18
SEISMIC R:	3.25
SEISMIC Cs:	0.251
BASE SHEAR (KIPS):	24.29

FOR BUILDING DEPARTMENT REVIEW
SEP 20 2011
REVISED

ERECTOR NOTE: ALTERNATE FASTENERS HAVE BEEN SUBSTITUTED ON THIS BUILDING. WHERE THE DRAWINGS INDICATE AN H1040 STRUCTURAL FASTENER, X98662 & x98663 (3" WASHERED WALL FASTENERS) HAVE BEEN SUPPLIED. WHERE THE DRAWINGS INDICATE AN H1060 STITCH FASTENER, H1061 (WASHERED WALL FASTENERS) HAVE BEEN SUPPLIED. WHERE THE DRAWINGS INDICATE AN H1030 STRUCTURAL FASTENER, X98661 (3" FASTENERS HAVE BEEN SUPPLIED.

ERECTION MANUALS REQUIRED
(ERECTION MANUALS ARE SHIPPED WITH THE BUILDING IN A WAREHOUSE PACKING CRATE)

[ ] CFR ROOF	[ ] (H9600) OR [ ] (H8250)	[ ] SINGLE CURB (H9850)
[X] CLASSIC ROOF	[X] (H9420) OR [ ] (H8201)	[ ] DOUBLE CURB (H9800)
[X] WALL SHEETING	[X] (H9430) OR [ ] (H8300)	[ ] VR16 II (H9925)

[ ] JOIST BRIDGING PACKET (SENT SEPARATELY BY JOIST MANUFACTURER)

DRAWING INDEX

COVERSHEET C1,C2,C3 A/BOLT DWGS F1, F2
COLUMN BASE REACTIONS R1-R5 (SEPARATE 8 1/2" X 11" SUBMITTAL)
STRUCTURAL/SHEETING DRAWINGS E1,E2,E3,E4,E5,E6,E7,E8,E9,E10,E11,E12,E13,E14
DETAILS D1,D2,D3,D4,D5,D6,D7,D8

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
BRIGHAM CITY, UT 84302
PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: C1 of 3

RUSSELL R. SKEEN
STATE OF WASHINGTON
41179
REGISTERED
PROFESSIONAL ENGINEER
9/20/11

THIS SEAL PERTAINS ONLY TO THE MATERIALS DESIGNED AND SUPPLIED BY NUCOR BUILDING SYSTEMS, A DIVISION OF NUCOR CORPORATION. THE DRAWINGS AND THE METAL BUILDING WHICH THEY REPRESENT ARE THE PRODUCT OF NUCOR BUILDING SYSTEMS. THE REGISTERED PROFESSIONAL ENGINEER WHOSE SEAL APPEARS ON THESE DRAWINGS IS EMPLOYED BY NUCOR BUILDING SYSTEMS AND DOES NOT SERVE AS OR REPRESENT THE PROJECT ENGINEER OF RECORD AND SHALL NOT BE CONSTRUED AS SUCH.

NUCOR
BUILDING SYSTEMS
A DIVISION OF NUCOR CORPORATION

PROJECT NUMBER: U11R0359A
PROJECT NAME: B&L WOODWASTE
PROJECT LOCATION: MILTON, WA COUNTY: PIERCE
CUSTOMER: T&E INTERNATIONAL MARYSVILLE, WA

MBMA MEMBER

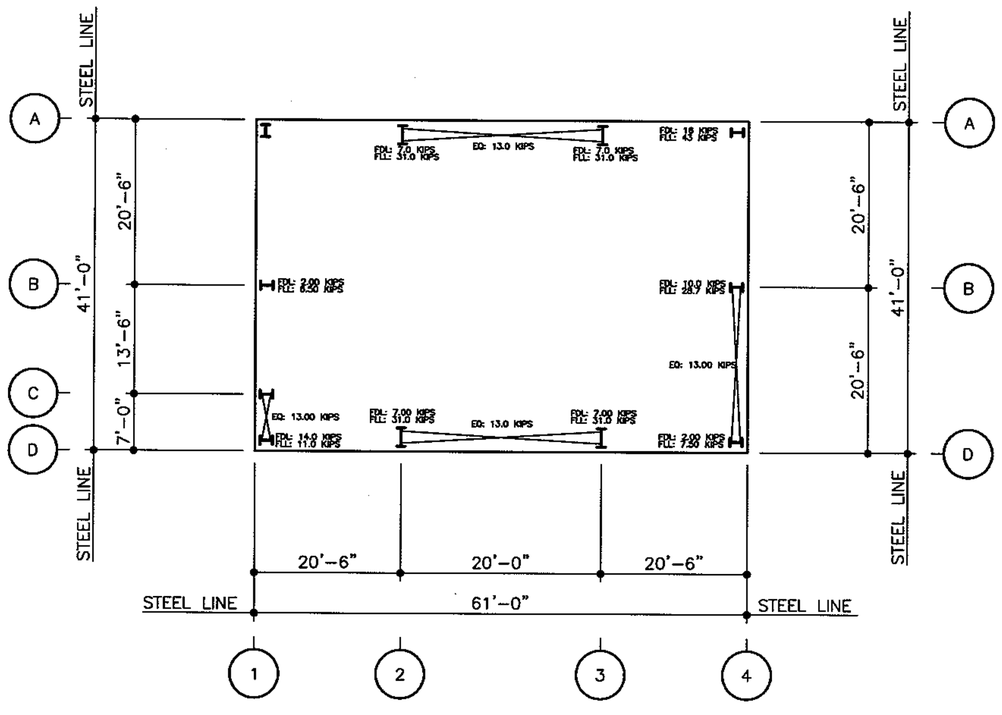
ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

STRUCTURAL TESTS AND INSPECTION:

1) THE SPECIAL INSPECTOR'S DUTIES ARE AS DESCRIBED IN SPECIAL INSPECTION. THE SPECIAL INSPECTOR'S DUTIES ARE AS DESCRIBED IN IBC 1704.3 AND IBC 1705
2) ALL TESTS AND INSPECTIONS SHALL BE PERFORMED BY AN INDEPENDENT TESTING AND INSPECTION AGENCY EMPLOYED BY THE OWNER OR ARCHITECT.
3) THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING THE TEST AND INSPECTION FIRM WITH A SCHEDULE TO FACILITATE THE PROPER COORDINATION OF WORK.
4) PORTIONS OF WORK REQUIRING SPECIAL INSPECTION:

AGENCY RESPONSIBLE FOR INSPECTION AND TESTING TO BE NAMED BY OWNER LATER.

	YES	NO	N/A
A. STRUCTURAL STEEL:			
1. MILL REPORTS AND IDENTIFICATION OF STEEL (AFFIDAVIT OF COMPLIANCE)	☐	■	☐
2. SAMPLING AND TESTING OF SPECIMENS	☐	■	☐
B. WELDING:			
1. ALL STRUCTURAL WELDING (INCLUDES DECKING AND WELDED STUDS), EXCEPT WELDING IN APPROVED SHOPS PER IBC 1704.2.2	■	☐	☐
2. ULTRASONIC TESTING OF FULL PENETRATION WELD CONNECTIONS AT MOMENT FRAMES, BRACED FRAMES, BEAM SPLICES, AND FIELD WELDS.	☐	■	☐
3. STRUCTURAL LIGHT GAGE METAL FRAME WELDING	☐	■	☐
C. BOLTING:			
1. HIGH STRENGTH BOLT A325SC AND A490SC (TORQUE VERIFICATION)	■	☐	☐
2. HIGH STRENGTH BOLT A325N AND A490X (PER COVER SHEET NOTES)	■	☐	☐
3. EXPANSION/ADHESIVE ANCHORS IN CONCRETE OR MASONRY	■	☐	☐



MEZZANINE LOADS ON NUCOR STRUCTURE

VERTICAL LOADS:
FDL: FLOOR DEAD LOAD
FLL: FLOOR LIVE LOAD

HORIZONTAL LOADS:
EQ: MEZZANINE SEISMIC LOAD
EQ LOADS APPLIED TO ROD BRACING

RECORD DRAWING

TRADEMARK 2004, NUCOR BUILDING SYSTEMS

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
BRIGHAM CITY, UT 84302
PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE MILTON, WA
CUSTOMER: T&E INTERNATIONAL MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: C2 of 3

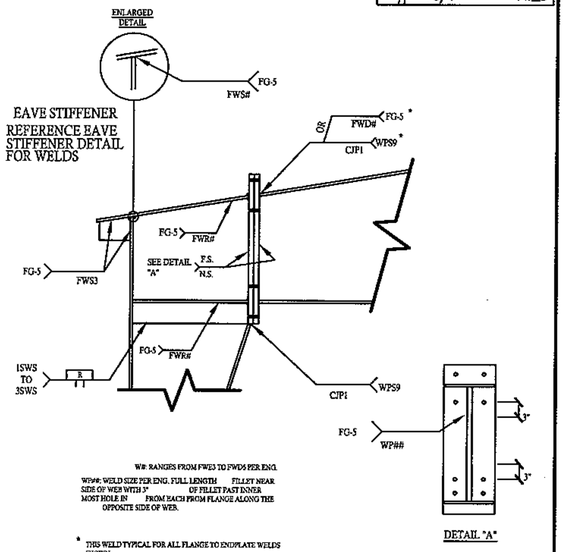
RUSSELL R. SKEEN
STATE OF WASHINGTON
41779
REGISTERED PROFESSIONAL ENGINEER

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RECORD DRAWING

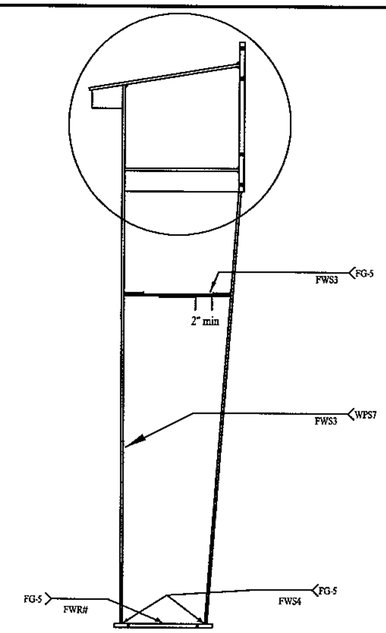
STANDARD WELDS AND LEGEND

Thickest Mat. Joined	Weld
≤1/2"	FW_3
≤3/4"	FW_4
# >3/4"	FW_5



Perpendicular Knee Column

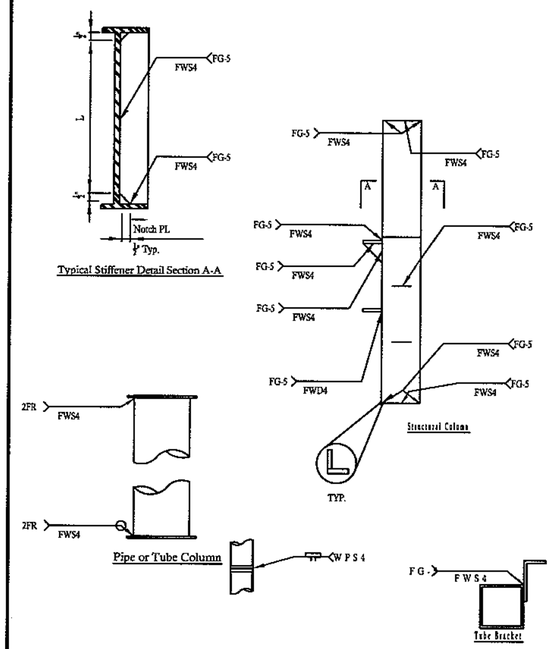
See weld standard sheet for WPS description



Typical Column

See weld standard sheet for WPS description

Thickest Mat. Joined	Weld
≤1/2"	FW_3
≤3/4"	FW_4
# >3/4"	FW_5



Structural Details

See weld standard sheet for WPS description

FWS$ - FILLET WELD, ONE SIDE

$	FILLET LEG
3	3/16"
4	1/4"
5	5/16"

NEAR SIDE WELD: FWS$ $

FAR SIDE WELD: FWS$ $

FWS$ $ FILLET

FWD$ - FILLET WELD, BOTH SIDES

$	FILLET LEG
3	3/16"
4	1/4"
5	5/16"

FWD$ OR FWD$ $ $

FWD$ $ FILLET $ FILLET

FWR_ - Full Length fillet on near side with *(Max. D/5 or 3") fillet return at both ends on opposite side of plate.

$	FILLET LEG
3	3/16"
4	1/4"
5	5/16"

FWR$ OR FWR$ $ $ *(Max. D/5 or 3")

D

WP1$ - Full length fillet on near side of web with 3" of fillet past inner most hole in from each flange along the opposite side of web.

$	FILLET LEG
3	3/16"
4	1/4"
5	5/16"

WP1$ OR WP1$ $ $ 3"OF WELD PAST INNER MOST HOLE IN FROM EACH FLANGE

3" 3"

CJP1 - COMPLETE JOINT PENETRATION, SINGLE BEVEL WELD

NEAR SIDE WELD: CJP1 45° BACK GOUGE

FAR SIDE WELD: CJP1 45° BACK GOUGE CJP1 or CJP2 BACK GOUGE & SQUARE GROOVE WELD (GRIND FLUSH - CJP2) SINGLE BEVEL GROOVE WELD BEVEL SIDE

PURLIN / GIRT / CHANNEL

QTY — SHAPE

(2) 08C060

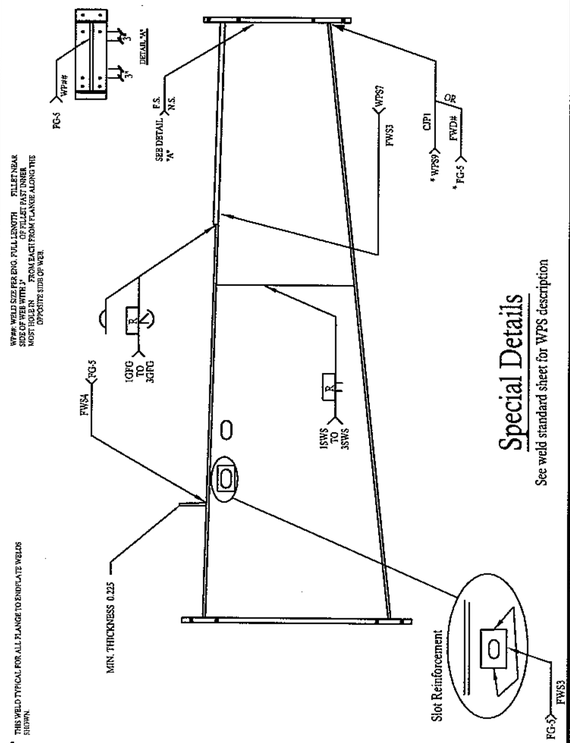
SIZE — THICKNESS — X / 1000

EAVE STRUT

QTY — SHAPE SLOPE

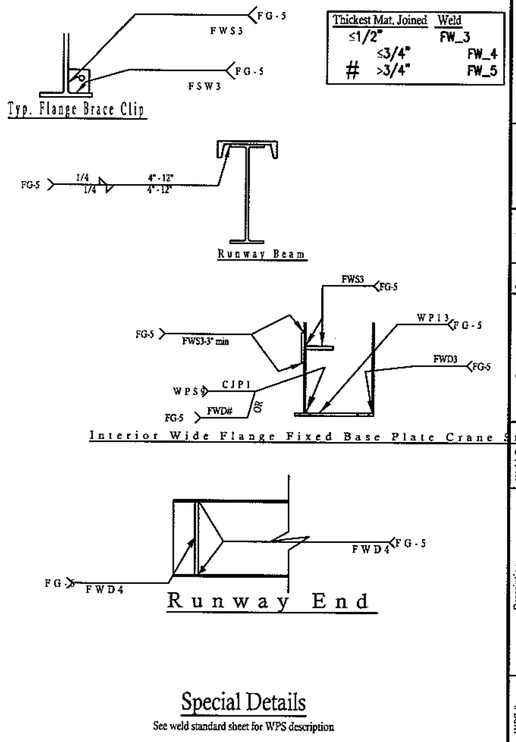
(2) 8E2075

SIZE — THICKNESS — X / 1000



Special Details

See weld standard sheet for WPS description



Special Details

See weld standard sheet for WPS description

Thickest Mat. Joined	Weld
≤1/2"	FW_3
≤3/4"	FW_4
# >3/4"	FW_5

WPS #	Description	Weld Group	Process	Preq	Position	Limitation	Plant Location			
							UT	IN	SC	TX
FG-4	¼" and ⅜" multi-pass fillet weld	AWSD1.1-06	GMAW(¼" multi-pass fillet weld)	PQR	1G	¼" - ⅜"	X	X	X	X
FG-5	⅜" - ½" single-pass fillet weld	AWSD1.1-06	GMAW(⅜" - ½" Single-Pass Fillet Weld	PQR	2F	⅜" - 1"	X	X	X	X
TGFG	¾" through 1" flange-splice	AWSD1.1-06	GMAW(¾" thru 1" Flange splice)	PQR	1G	¾" - 1"	X	X	X	X
2GFG	1¼" flange splice	AWSD1.1-06	GMAW(1¼" Flange Splice)	PQR	1G	1¼" - 1½"	X	X	X	X
3GFG	2" to 3" flange splice	AWSD1.1-06	GMAW(2" - 3" Flange Splice)	PQR	1G-2F	Groove:1/4" Fillet:1/2"	X	X	X	X
2035	2½" to 3½" flange splice	AWSD1.1-06	GMAW(2½" - 3½" Flange Splice)	PQR	1G-2F	Groove:5/16" Fillet:5/8"	X	X	X	X
5GFG	4" flange splice	AWSD1.1-06	GMAW(4" Flange Splice)	PQR	1G-2F	Groove:1"	X	X	X	X
1SWS	web splice for 0.225" through 0.313" thick	AWSD1.1-06	SAW (0.225-0.313" Wide Splice)	PQR	1G	0.375-0.313	X	X	X	X
2SWS	web splice for 0.125" through 0.150" thick	AWSD1.1-06	SAW (0.125-0.150" Wide Splice)	PQR	1G	0.125-0.150	X	X	X	X
3SWS	web splice for 0.175" through 0.250" thick	AWSD1.1-06	SAW (0.175-0.25" Web Splice)	PQR	1G	0.175-0.250	X	X	X	X
2038	web splice for 0.375" through 0.500" thick	AWSD1.1-06	SAW (0.375-0.500" Web Splice	PQR	1G	0.375-0.500	X	X	X	X
2FR	pipe to endplate weld	AWSD1.1-06	GMAW (Pipe-to-Endplate Weld)	PQR	2F Rotated	6" thru 10"	X	X	X	X
FRG-1	Rod to plate/angle weld	AWSD1.1-06	GMAW (Rod-to-Plate Weld)	PQR	1G	Diameter: ¼,¼-⅜,⅜-½	X	X	X	X
WPS4	pipe splice for 0.134" through 0.375" thick	AWSD1.1-06	GMAW (Pipe Splice, 0.134" thru 0.375")	Yes	1G Rotated	Diameter: 8-10"	X	X	X	X
WPS5	pipe splice for 0.375" through 0.500" thick	AWSD1.1-06	GMAW (Pipe Splice, ⅜ thru ½"	Yes	1G Rotated	0.375-0.5" Diameter: 8-10"	X	X	X	X
WPS6	wide-flange beam splice, all sizes	AWSD1.1-06	GMAW (Rotated splice weld)	Yes	1G	0.313-1.50	X	X	X	X
WPS7	flange to web weld made by submerged arc using 60ksi E electrode	AWSD1.1-06	SAW (Autowelder Weld)	Yes	2F	¾" to 1"	X	X	X	X
WPS8	flange to web weld made by submerged arc using 70ksi E electrode	AWSD1.1-06	SAW (Small autowelder weld)	Yes	2F	¾" to 1"	X	X	X	X
WPS9	complete penetration groove weld for tee cons, ¾" thick	AWSD1.1-06	GMAW (Flange to endplate weld)	Yes	1G	¾" thru 1"	X	X	X	X
WPS11	vertical tack-ditters	AWSD1.1 06	GMAW (Vertical tack-ditters)	Yes	3F	¾"-Unlimited	X	X	X	X
WPS-1	Cold-form seam stitch weld	AWS D1.3-98	GMAW (CF seam stitch weld)	PQR	Flat	0.0525"-0.210"	X	X	X	X
WPS-1a	cold-form seam stitch weld (galvanized)	AWS D1.3-98	GMAW (CF seam stitch weld)	PQR	Flat	0.0525"-0.210"	X	X	X	X
WPS-2	cold-form seam weld	AWS D1.3-98	GMAW (CF seam weld)	PQR	Hor.	t1=0.0525-0.215 0*	X	X	X	X
WPS-2a	cold-form seam weld (Galvanized)	AWS D1.3-98	GMAW (CF seam weld)	PQR	Hor.	t1=0.0525-0.2150 0*	X	X	X	X
WPS-3	cold-form seam weld to support steel ≥ 0.3125" thick	AWS D1.3-98	GMAW (CF seam weld to support steel)	PQR	Hor.	t1=0.0525-0.210 t2 ≥0.3125"	X	X	X	X
WPS-3a	cold-form seam weld to support steel ≥0.3125" thick (Galvanized)	AWS D1.3-98	GMAW (CF seam weld to support steel) (galvanized)	PQR	Hor.	t1=0.0525-0.215 t2 ≥0.3125"	X	X	X	X
WPS 4	cold-form tee connection fillet weld	AWS D1.3-98	GMAW (CF tee fillet weld)	PQR	Horiz	t1=0.0525"-0.215 0*	X	X	X	X
WPS 4a	cold-form tee connection fillet weld (Galvanized)	AWS D1.3-98	GMAW (CF tee fillet weld) (galvanized)	PQR	Horiz	t1=0.0525"-0.215 0*	X	X	X	X
WPS 5	cold-form tee connection fillet weld to support steel ≥0.313" thick	AWS D1.3-98	GMAW (CF tee fillet to support steel)	PQR	Horz.	t1=0.0525"-0.215 0*, t2 ≥0.3125"	X	X	X	X
WPS-5a	cold-form tee connection fillet weld to support steel ≥0.313" thick (galvanized)	AWS D1.3-98	GMAW (CF tee fillet to support steel) (galvanized)	PQR	Horz.	t1=0.0525"-0.215 0*, t2 ≥0.3125"	X	X	X	X
WPS-6	cold-form lap fillet weld	AWS D1.3-98	GMAW (CF lap fillet weld)	PQR	Horz.	t1=0.0525"-0.215 0*	X	X	X	X
WPS-6a	cold-form lap fillet weld (Galvanized)	AWS D1.3-98	GMAW (CF lap fillet weld) (galvanized)	PQR	Horz.	t1=0.0525"-0.215 0*	X	X	X	X
WPS-7	cold-form lap fillet weld to support steel ≥0.3125" thick	AWS D1.3-98	GMAW (CF lap fillet to support steel)	PQR	Horz.	t1=0.0525"-0.215 0*, t2 ≥0.3125"	X	X	X	X
WPS-7a	cold-form lap fillet weld to support steel ≥0.3125" thick (galvanized)	AWS D1.3-98	GMAW (CF lap fillet to support steel) (galvanized)	PQR	Horz.	t1=0.0525"-0.215 0*, t2 ≥0.3125"	X	X	X	X

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS–FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
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PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

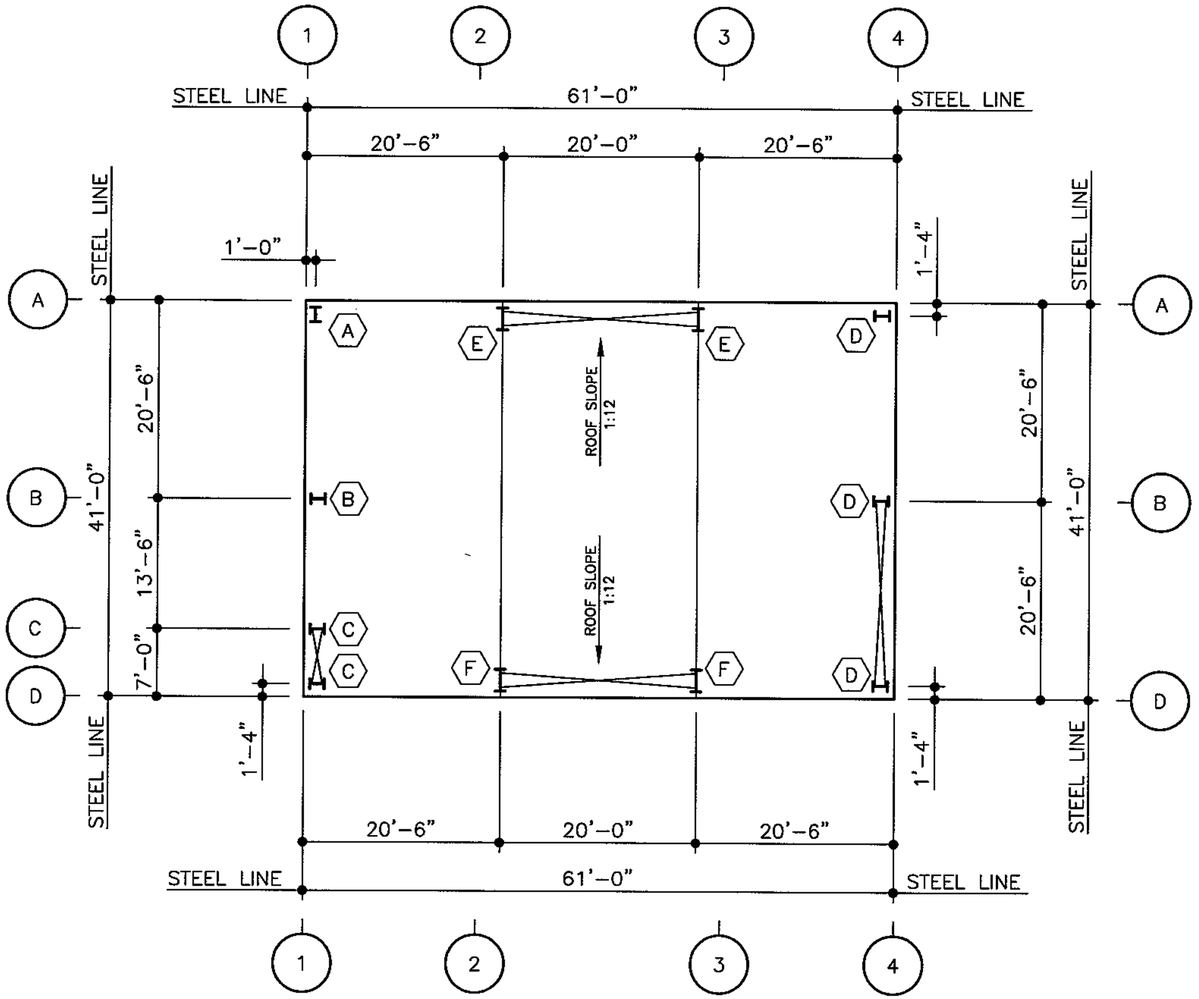
JOB NUMBER: U11R0359A

SHEET NO: C3 of 3

RUSSELL R. SKEEM STATE OF WASHINGTON 41179 REGISTERED PROFESSIONAL ENGINEER

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RECORD DRAWING



ANCHOR BOLT PLAN GENERAL NOTES

1. THE SPECIFIED ANCHOR ROD DIAMETER ASSUMES F1554 GRADE 36 UNLESS NOTED OTHERWISE. ANCHOR ROD MATERIAL OF EQUAL DIAMETER MEETING OR EXCEEDING THE STRENGTH REQUIREMENTS SET FORTH ON THESE DRAWINGS MAY BE UTILIZED AT THE DISCRETION OF THE FOUNDATION DESIGN ENGINEER. ANCHOR ROD EMBEDMENT LENGTH SHALL BE DETERMINED BY THE FOUNDATION DESIGN ENGINEER.

2. METAL BUILDING MANUFACTURER IS NOT RESPONSIBLE FOR PROJECT FOUNDATION DESIGN. THE FOUNDATION DESIGN IS THE RESPONSIBILITY OF A REGISTERED PROFESSIONAL ENGINEER, FAMILIAR WITH LOCAL SITE CONDITIONS.

3. ALL ANCHOR RODS, FLAT WASHERS FOR ANCHOR RODS, EXPANSION BOLTS, AS WELL AS ALL CONCRETE/MASONRY EMBEDMENT PLATES ARE NOT BY METAL BUILDING MANUFACTURER.

4. THIS DRAWING IS NOT TO SCALE.

5. FINISHED FLOOR ELEVATION = 100'-0" UNLESS NOTED OTHERWISE.

6. "SINGLE" CEE COLUMNS SHALL BE ORIENTED WITH THE "TOES" TOWARD THE LOW EAVE UNLESS NOTED OTHERWISE.

7. THE ANCHOR BOLT LOCATIONS PROVIDED BY METAL BUILDING MANUFACTURER SATISFY PERTINENT REQUIREMENTS FOR THE DESIGN OF THE MATERIALS SUPPLIED BY THE METAL BUILDING MANUFACTURER. PLEASE NOTE THAT THESE REQUIREMENTS MAY NOT SATISFY ALL ANCHOR BOLT CONCRETE EDGE DISTANCE REQUIREMENTS DEPENDING ON THE DETAILS OF THE FOUNDATION DESIGN. BECAUSE FOUNDATION DESIGN IS NOT WITHIN THE METAL BUILDING MANUFACTURER SCOPE OF WORK, IT IS THE RESPONSIBILITY OF THE QUALIFIED PROFESSIONAL DESIGNING THE FOUNDATION TO MAKE CERTAIN THAT SUFFICIENT CONCRETE EDGE DISTANCE IS PROVIDED FOR THE ANCHOR BOLTS IN THE DETAILS OF THE FOUNDATION DESIGN.

– CROSS BRACING

BOTTOM OF BASEPLATE
ELEV. = 100'-0"
AT FINISHED FLOOR

ANCHOR BOLT SCHEDULE		
QUANTITY	SIZE	PROJECTION
8	3/4"	3" FROM BOTTOM OF BASE PLATE
28	1"	3" FROM BOTTOM OF BASE PLATE
8	1 1/4"	3" FROM BOTTOM OF BASE PLATE

THE ANCHOR BOLT SETTINGS SHOWN ON THESE DRAWINGS NOT ONLY INDICATE WHERE THE ANCHOR BOLTS ARE TO BE PLACED, BUT ALSO THE FOOTPRINT OF THE METAL BUILDING. IT IS ESSENTIAL THAT THESE BOLT PATTERNS BE FOLLOWED. IN THE EVENT THAT THESE SETTINGS DIFFER FROM THE ARCHITECTURAL FOUNDATION PLANS, THE METAL BUILDING MANUFACTURER MUST BE CONTACTED IMMEDIATELY, BEFORE CONCRETE IS PLACED.

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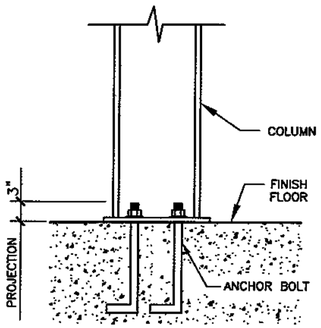
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: F1 of 2

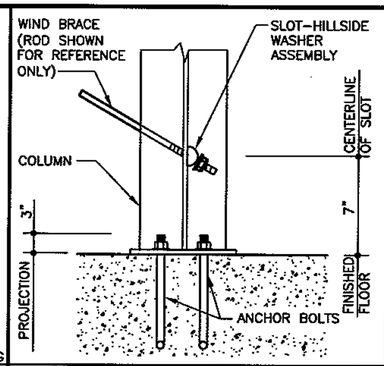
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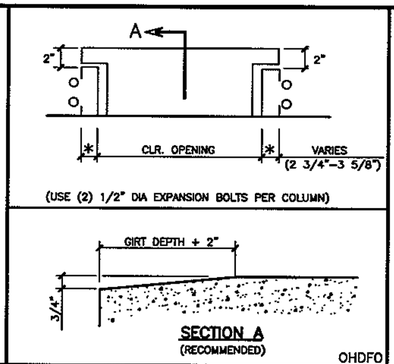


BPFFNG

TYPICAL COLUMN BASE PLATE DETAIL

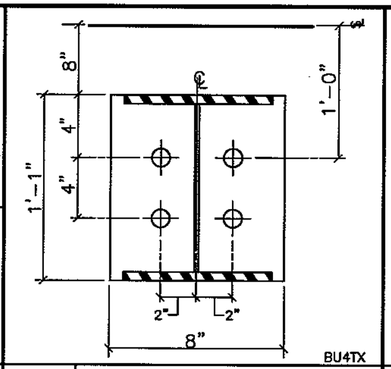


TYPICAL COLUMN BASE PLATE DETAIL AT SLOT-HILLSIDE WASHER LOCATION



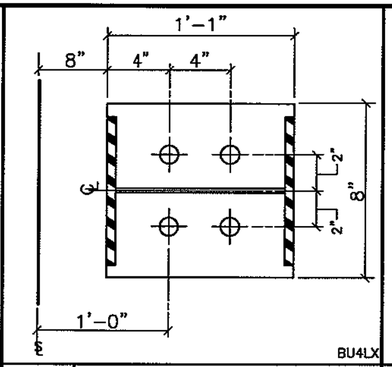
OHDFO

TYPICAL OVERHEAD DOOR FRAMED OPENING



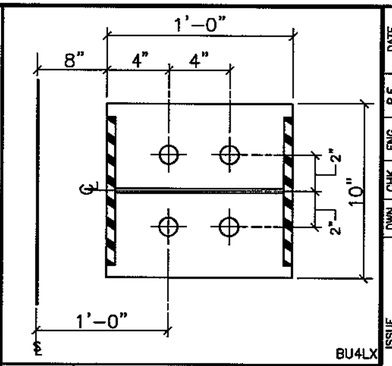
BU4TX

A | (4) 3/4" ø ANCHOR BOLTS WITH A 3" PROJECTION



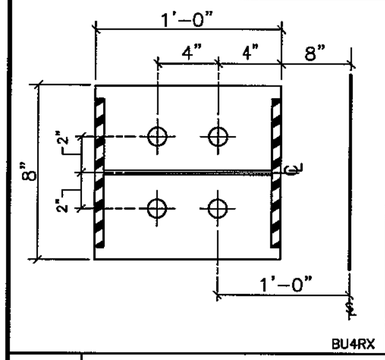
BU4LX

B | (4) 3/4" ø ANCHOR BOLTS WITH A 3" PROJECTION



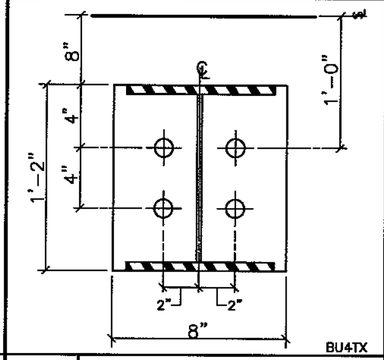
BU4LX

C | (4) 1 1/4" ø ANCHOR BOLTS WITH A 3" PROJECTION



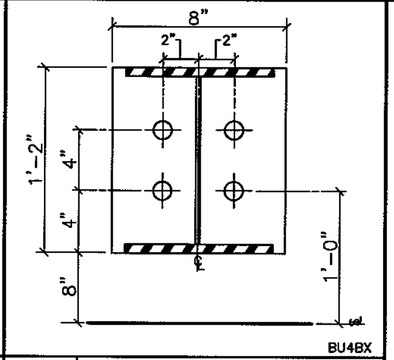
BU4RX

D | (4) 1" ø ANCHOR BOLTS WITH A 3" PROJECTION



BU4TX

E | (4) 1" ø ANCHOR BOLTS WITH A 3" PROJECTION



BU4BX

F | (4) 1" ø ANCHOR BOLTS WITH A 3" PROJECTION

RECORD DRAWING

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REV 1 FOR BLDG DEPT REVIEW	KCN	NDD			9/20/11

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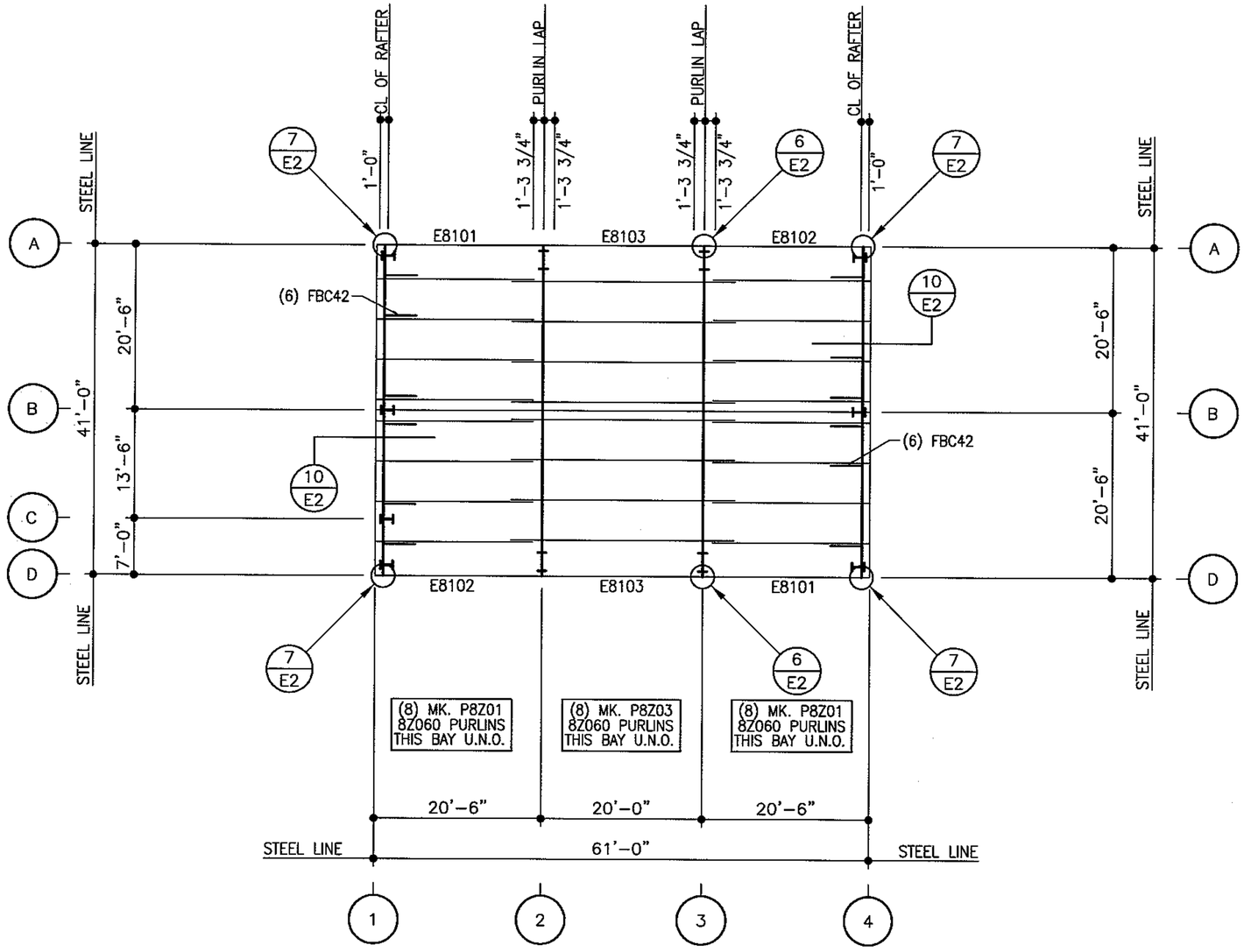
JOB NUMBER: U11R0359A

SHEET NO: F2 of 2

RUSSELL R. SKEEM
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RECORD DRAWING



ROOF FRAMING PLAN

1) PURLIN AND EAVE STRUT CONNECTION BOLT REQUIREMENTS: A307 AND A325 BOLTS ARE BOTH USED. REFER TO THE DETAILS FOR SPECIFIC USAGE REQUIREMENTS.
2) FBC___/FBE___ INDICATES FLANGE BRACING.
3) SEE SHEET E4 FOR MAIN FRAME FLANGE BRACING.
4) ALL EAVE STRUTS ARE 8E060 U.N.O.

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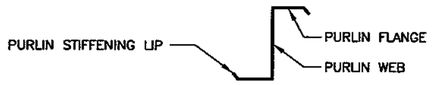
JOB NUMBER: U11R0359A

SHEET NO: E1 of 14

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COLLATERAL DEAD LOADS, UNLESS OTHERWISE NOTED, ARE ASSUMED TO BE UNIFORMLY DISTRIBUTED. WHEN SUSPENDED SPRINKLER SYSTEMS, LIGHTING, HVAC EQUIPMENT, CEILINGS, ETC. ARE SUSPENDED FROM ROOF MEMBERS, CONSULT NUCOR ENGINEERING IF THESE CONCENTRATED LOADS EXCEED 200 POUNDS, OR IF INDIVIDUAL MEMBERS ARE LOADED SIGNIFICANTLY MORE THAN OTHERS.



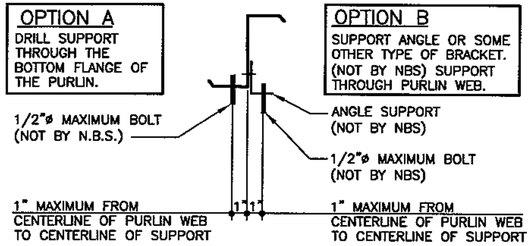
GENERAL RESTRICTION:

UNDER NO CIRCUMSTANCES CAN THE PURLIN STIFFENING LIP BE FIELD MODIFIED FROM THE FACTORY SUPPLIED CONDITION. ALSO DO NOT HANG ANYTHING FROM PURLIN STIFFENING LIP.

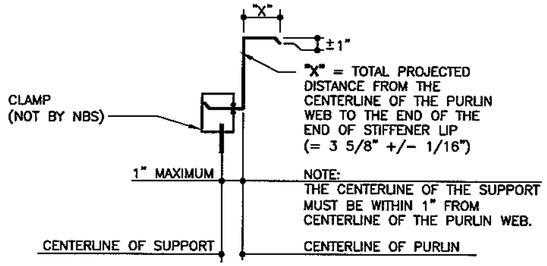
OPTIONS FOR SUPPORT ATTACHMENTS

OPTION A
DRILL SUPPORT THROUGH THE BOTTOM FLANGE OF THE PURLIN.

OPTION B
SUPPORT ANGLE OR SOME OTHER TYPE OF BRACKET. (NOT BY NBS) SUPPORT THROUGH PURLIN WEB.

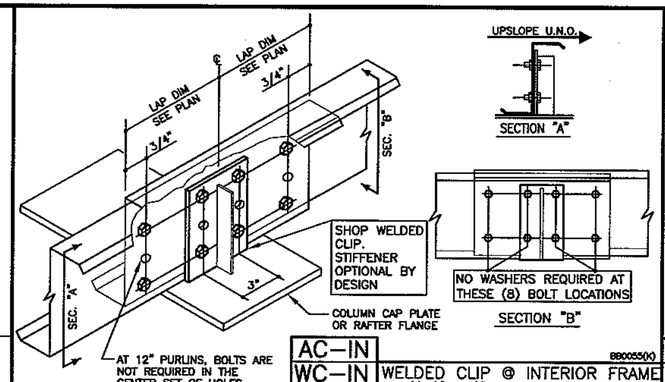


OPTION C:
IF PURLIN FLANGE SUPPORT CLAMPS ARE USED.



BD0130

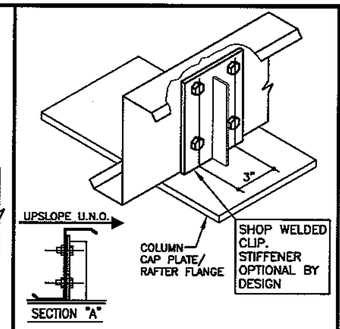
NBS PURLIN SUPPORT METHODS



AC-IN
WC-IN
WS-IN

WELDED CLIP @ INTERIOR FRAME
USE (8) 1/2" x 1 1/4" A307 BOLTS H0500/NUTS H0400 U.N.O.

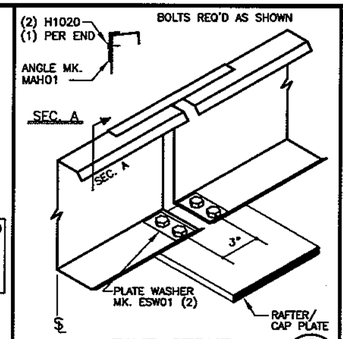
B80055(X)



AC
WC
WS

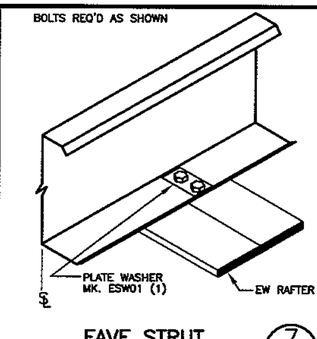
WELDED CLIP @ END FRAME
USE (4) 1/2" x 1 1/4" A307 BOLTS H0500/NUTS H0400 U.N.O.
REFERENCE ERECTOR NOTE FOR TYP. WASHER REQUIREMENTS

B80030(X)



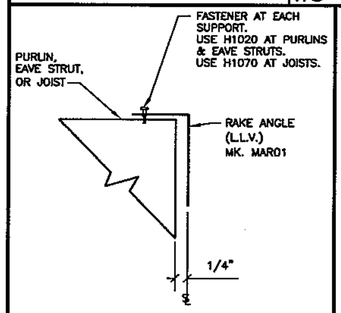
EAVE STRUT (6 / E2)
LOW EAVE BY-PASS SW GIRT CONDITION
USE (4) 1/2"x 2" A325 BOLT H0603/NUT H0300 U.N.O.

BA0020(1-4)(W)



EAVE STRUT (7 / E2)
BYPASS SIDEWALL CONDITION
LOW EAVE BUILT-UP EW CONDITION
USE (2) 1/2" X 2" A325 BOLT H0603/NUT H0300 U.N.O.

BA0030(W)



RAKE ANGLE ATTACHMENT (10 / E2)
AT ENDWALL STEEL LINE

RAKE_ANG BD0120

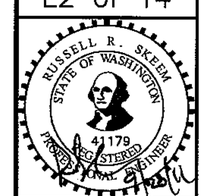
ISSUE	DWN	CHK	ENG	P.E.	DATE
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REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

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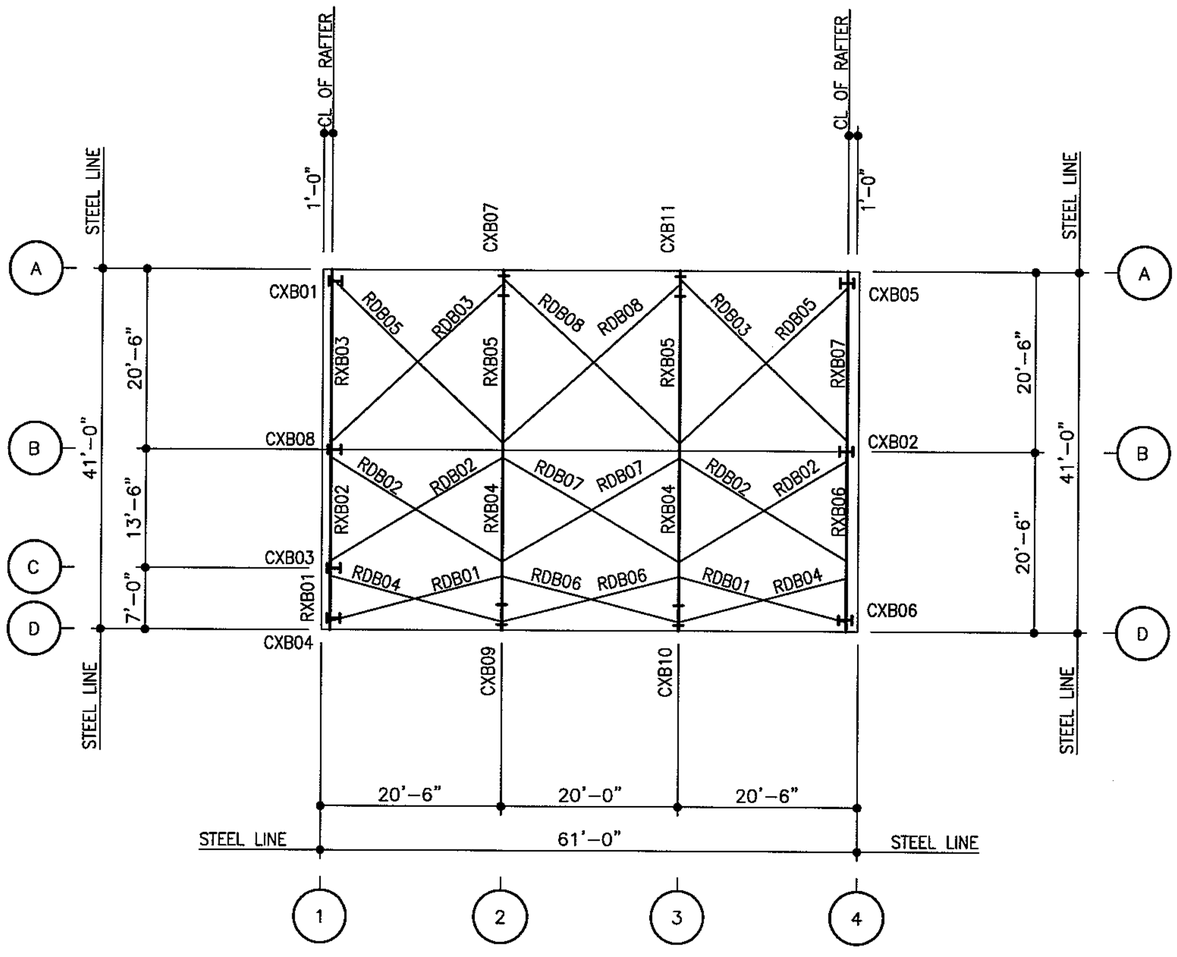
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RECORD DRAWING

RECORD DRAWING



MARK NUMBER AND BRACING PLAN

1) PLACE TAGGED END OF RAFTERS TOWARD THE LOW EAVE.

2) ROD-BRACING: SEE SHEET D1 FOR DETAIL
RDB___ - INDICATES 5/8" ø ROD

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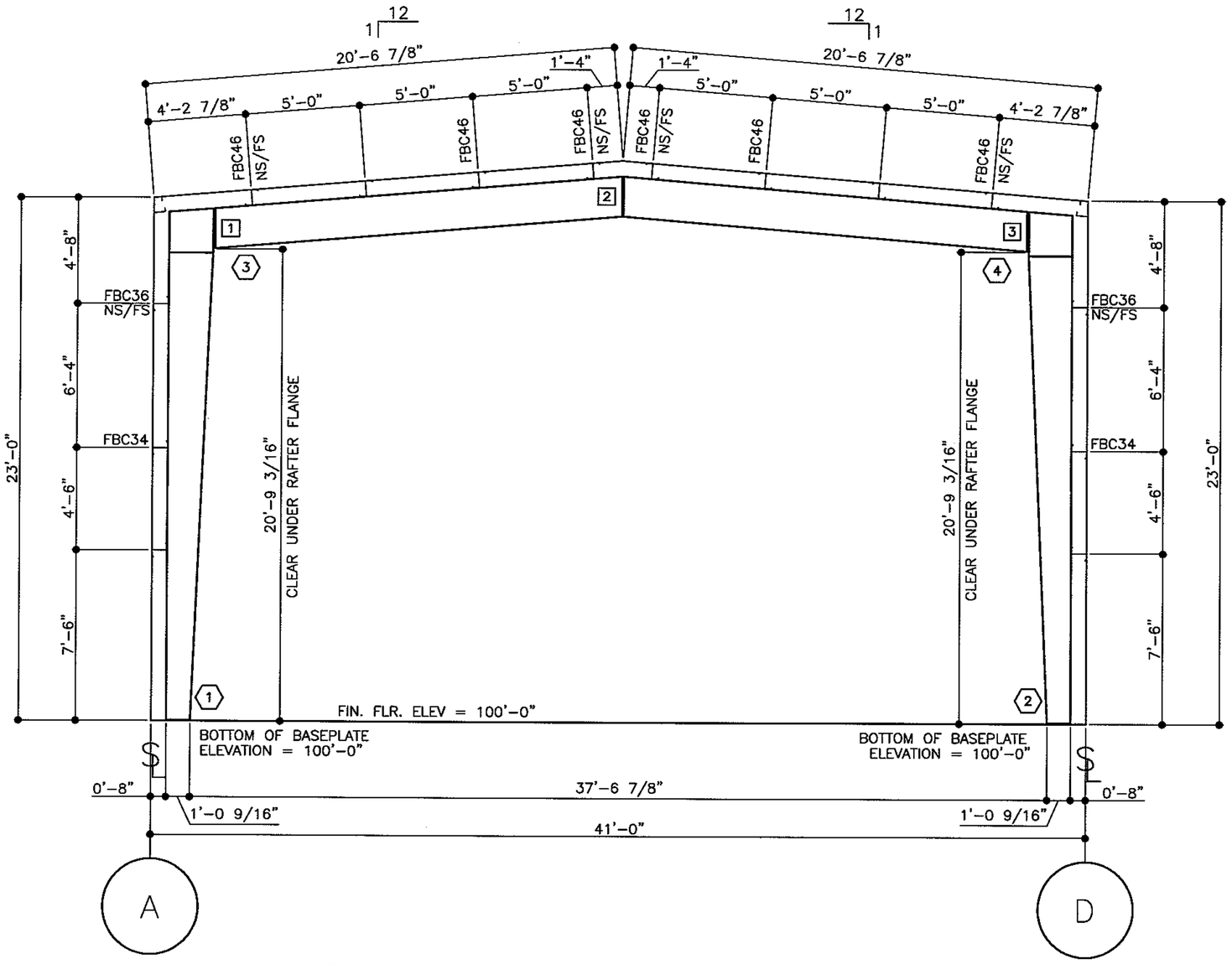
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PROFESSIONAL ENGINEER

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CROSS SECTION @ LINES 2 & 3

RECORD DRAWING

MBR ID	LOW PLATE WIDTH	LOW PLATE THICK	HIGH PLATE WIDTH	HIGH PLATE THICK	OUTSIDE FLANGE WIDTH	OUTSIDE FLANGE THICK	OUTSIDE FLANGE LENGTH	INSIDE FLANGE WIDTH	INSIDE FLANGE THICK	INSIDE FLANGE LENGTH	MEMBER WEB DEPTH1	MEMBER WEB THICK	MEMBER WEB LENGTH	MEMBER WEB DEPTH2
1	8.00	0.50	6.00	0.50	6.00	0.25		6.00	0.31		12.00	0.15		23.00
											23.00	0.19		23.00
2	8.00	0.50	6.00	0.50	6.00	0.25		6.00	0.31		12.00	0.15		23.00
											23.00	0.19		23.00
3	6.00	0.50	6.00	0.38	5.00	0.19		5.00	0.19		21.00	0.15		21.00
4	6.00	0.50	6.00	0.38	5.00	0.19		5.00	0.19		21.00	0.15		21.00

NOTES:

1) FOR COLUMN AND RAFTER MARK NUMBERS, SEE SHEET E3 (MARK NUMBER PLAN).
2) FBC___ INDICATES FLANGE BRACING LOCATIONS. FBD___ INDICATES FLANGE BRACING LOCATIONS ON JOIST ROOFS.
3) NS/FS INDICATES THAT FLANGE BRACING IS REQUIRED ON BOTH SIDES OF THE FRAME LINE. NOTE FOR EXPANDABLE ENDWALL RIGID FRAMES: IF FLANGE BRACING IS REQUIRED ON BOTH SIDES OF AN EXPANDABLE ENDFRAME, THE OPPOSITE SIDE FLANGE BRACE WILL HAVE TO BE INSTALLED AT THE TIME OF EXPANSION. THESE FLANGE BRACES HAVE BEEN PROVIDED, AS REQUIRED, FOR THIS FUTURE CONDITION.
4) IF NS/FS FLANGE BRACING IS NOT INDICATED, ONLY ONE FLANGE BRACE IS REQUIRED AND CAN BE LOCATED ON EITHER SIDE OF THE FRAME.
5) "*" INDICATES THE LONG SIDE OF THE INTERIOR COLUMNS. IF THE INTERIOR COLUMNS ARE REQUIRED, ORIENT AND ERECT THOSE COLUMNS ACCORDINGLY.

NOTE: COLUMNS LOCATED AT THE RIDGE ARE TYPICALLY "FLAT-TOP" COLUMNS, UNLESS INDICATED BY THE "*" SYMBOL.

6) RIGID FRAMES SHALL HAVE 50% OF THEIR BOLTS INSTALLED AND TIGHTENED ON BOTH SIDES OF THE WEB ADJACENT TO EACH FLANGE BEFORE THE HOISTING EQUIPMENT IS RELEASED.

BOLT SCHEDULE

CON ID	BOLT QTY	BOLT DESCRIPTION	BOLT PART#	NUT PART#
1	8	BOLT/NUT 5/8" x 2 1/4" A325	H0610	H0310
2	8	BOLT/NUT 5/8" x 2 1/4" A325	H0610	H0310
3	8	BOLT/NUT 5/8" x 2 1/4" A325	H0610	H0310

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
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PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE MILTON, WA

CUSTOMER: T&E INTERNATIONAL MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: E4 of 14

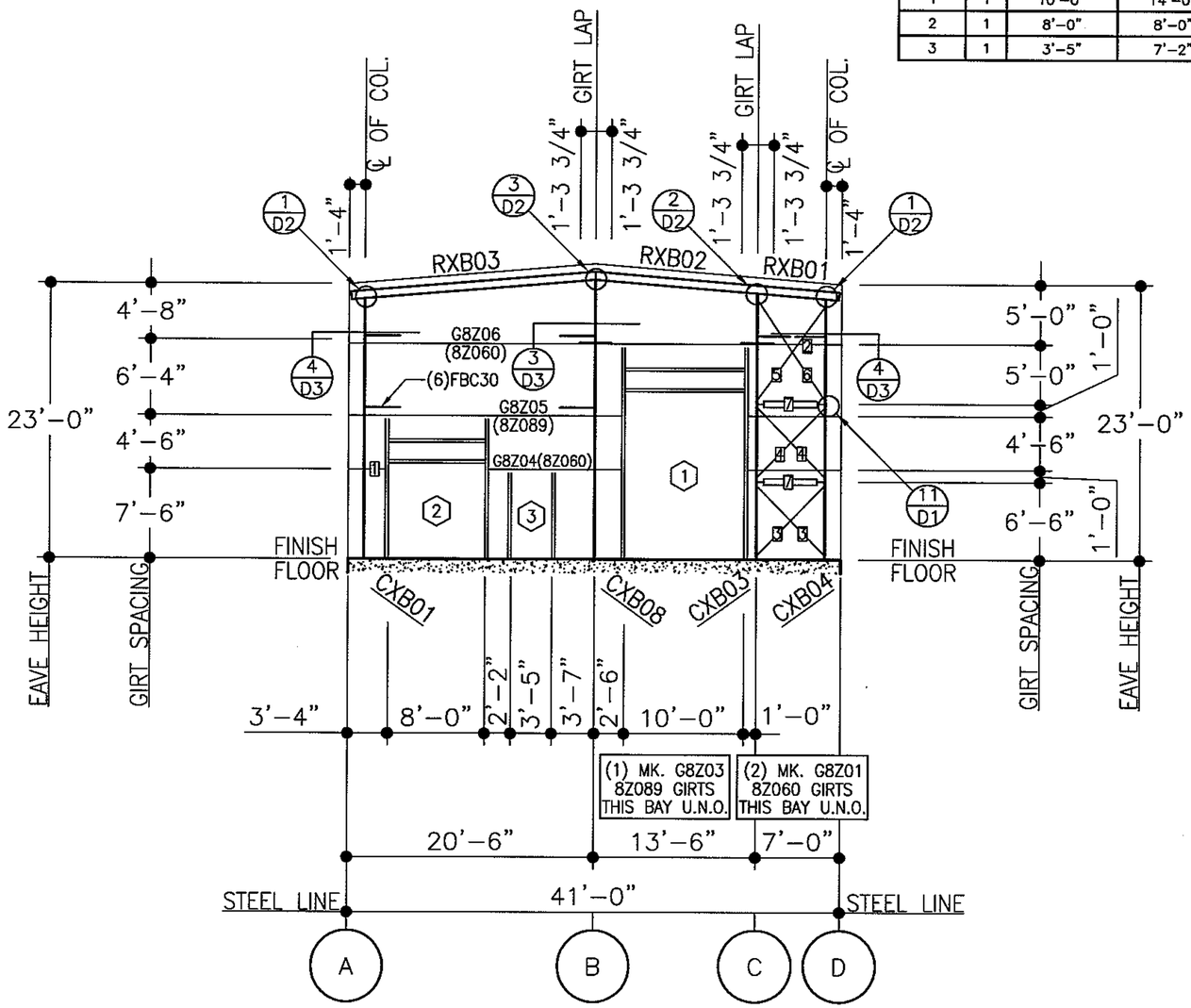
RUSSELL R. SKEEM STATE OF WASHINGTON 41179 REGISTERED PROFESSIONAL ENGINEER

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RECORD DRAWING

FRAMED OPENING SCHEDULE

I.D. NUMBER	QTY.	FRAMED OPENING SIZE		FRAMING MARK NUMBERS			SEE DETAIL	SILL HEIGHT A.F.F.
		WIDTH	HEIGHT	JAMBS	HEADER	ROLL-UP HEADER		
1	1	10'-0"	14'-0"	J8C05(8C089)	H8C01(8C060)	H8C01(8C060)	1/D4	0'-0"
2	1	8'-0"	8'-0"	J8C03(8C089)	H8C03(8C060)	H8C03(8C060)	1/D4	0'-0"
3	1	3'-5"	7'-2"	J8C01(8C060)	HW801	N/A	3/D4	0'-0"



LEFT ENDWALL ELEVATION AT LINE 1

1) RDE__ INDICATES 1" DIA ROD BRACING. SEE SHEET D1 FOR DETAIL.
2) CXB__ INDICATES (F6.25 W150 TD=12.00") COLUMN.
3) RXB__ INDICATES (F5.19 W125 TD=9.88") RAFTER.
4) FIELD LOCATE ROLL-UP HEADER, FIELD DRILL AS REQUIRED.

[1] INDICATES MAR01
[2] INDICATES G8Z02 (8Z060) GIRT.
[3] INDICATES (2) RDE02 DOUBLE ROD BRACING.
[4] INDICATES (2) RDE01 DOUBLE ROD BRACING.
[5] INDICATES (2) RDE04 DOUBLE ROD BRACING.
[6] INDICATES (2) RDE03 DOUBLE ROD BRACING.
[7] INDICATES SKP01 (8S099) BOX STRUT (SEE DETAIL 11/D1).

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS
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FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: E5 of 14

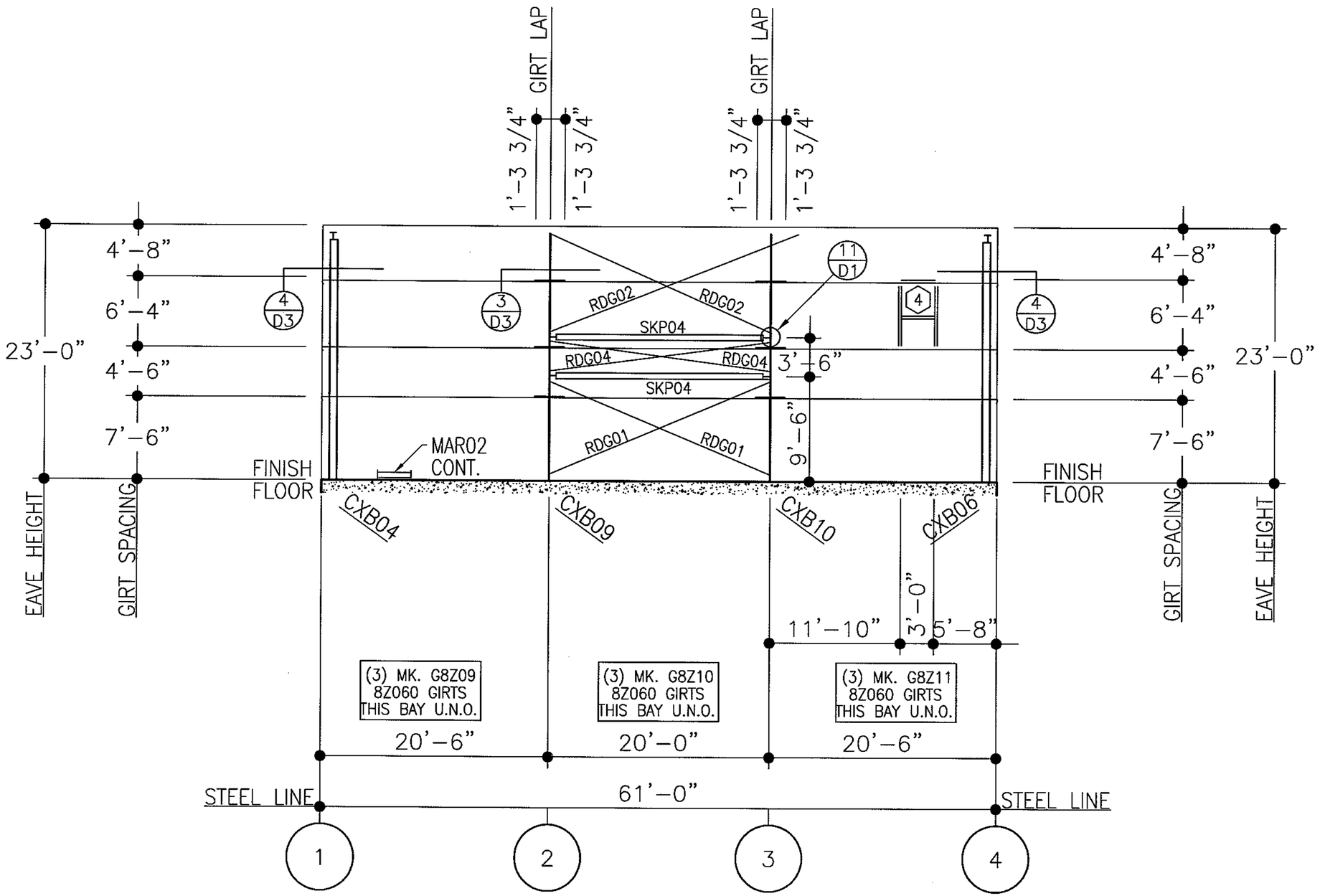
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RECORD DRAWING

FRAMED OPENING SCHEDULE

I.D. NUMBER	QTY.	FRAMED OPENING SIZE		FRAMING MARK NUMBERS			SEE DETAIL	SILL HEIGHT A.F.F.
		WIDTH	HEIGHT	JAMBS	HEADER	SILL		
4	1	3'-0"	3'-0"	J8C11(8C060)	HW802(WRAP)	H8C04(8C060)	2/D4	15'-0"



FRONT SIDEWALL ELEVATION AT LINE D

1) RDG___ INDICATES 1 1/4" DIA ROD BRACING. SEE SHEET D1 FOR DETAIL.
2) SKP___ INDICATES (8S099) BOX STRUT (SEE DETAIL 11/D1)

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS
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BRIGHAM CITY, UT 84302
PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

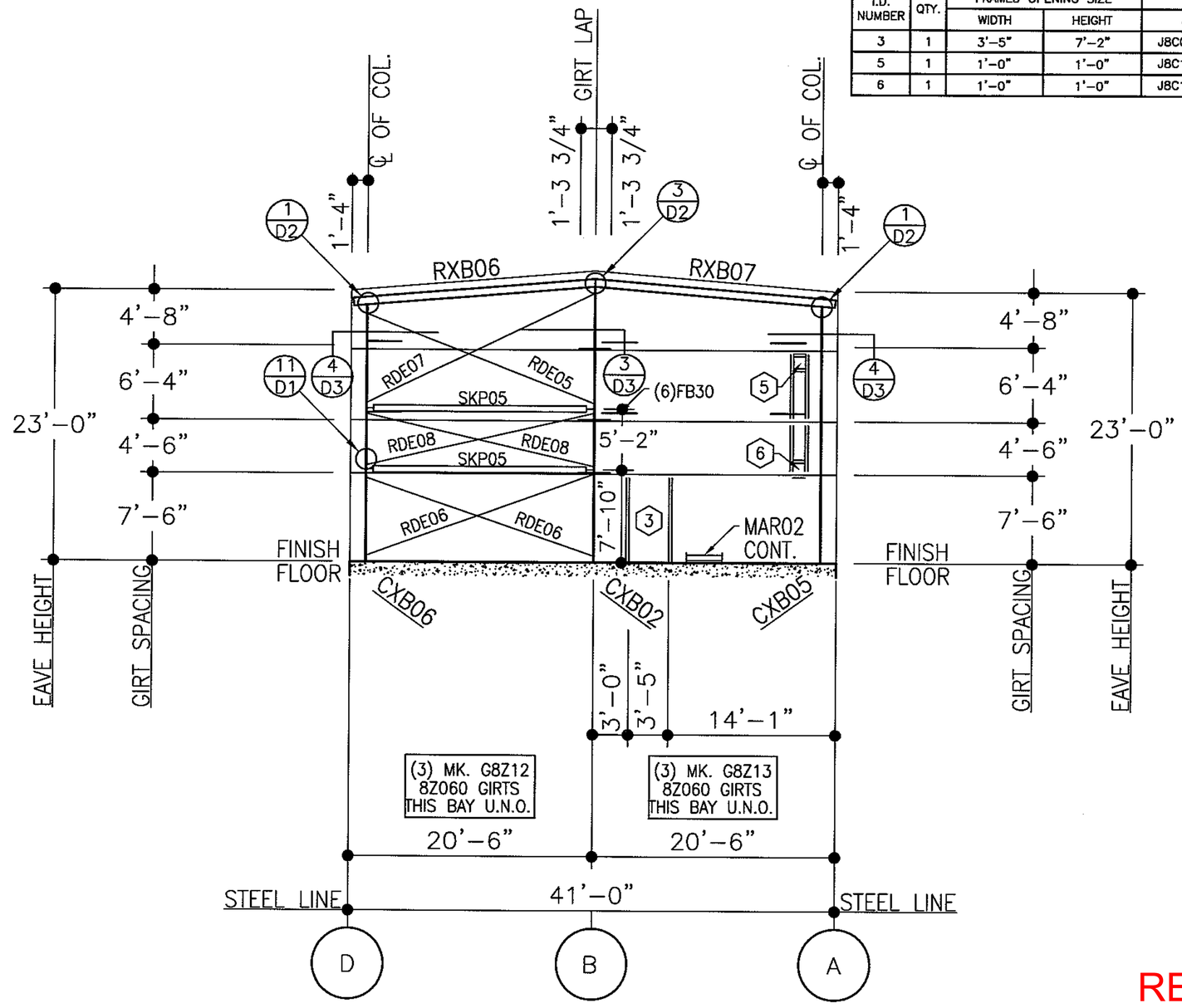
SHEET NO: E6 of 14

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STATE OF WASHINGTON
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FRAMED OPENING SCHEDULE

I.D. NUMBER	QTY.	FRAMED OPENING SIZE		FRAMING MARK NUMBERS			SEE DETAIL	SILL HEIGHT A.F.F.
		WIDTH	HEIGHT	JAMBS	HEADER	SILL		
3	1	3'-5"	7'-2"	J8C01(8C060)	HW801	N/A	3/D4	0'-0"
5	1	1'-0"	1'-0"	J8C16(8C060)	H8C07(8C060)	H8C06(8C060)	2/D4	16'-6"
6	1	1'-0"	1'-0"	J8C15(8C060)	H8C07(8C060)	HW803	2/D4	7'-6"



RIGHT ENDWALL ELEVATION AT LINE 4

1) RDE__ INDICATES 1" DIA ROD BRACING. SEE SHEET D1 FOR DETAIL.
2) CUT AND DRILL GIRTS AS NECESSARY FOR FIELD LOCATED FRAMED OPENINGS.
3) SKP__ INDICATES (8S099) BOX STRUT (SEE DETAIL 11/D1).
4) CXB__ INDICATES (F6.25 W150 TD=12.00") COLUMN.
5) RXB__ INDICATES (F5.19 W125 TD=9.88") RAFTER.

RECORD DRAWING

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM	[illegible]	9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
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PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE MILTON, WA

CUSTOMER: T&E INTERNATIONAL MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: E7 of 14

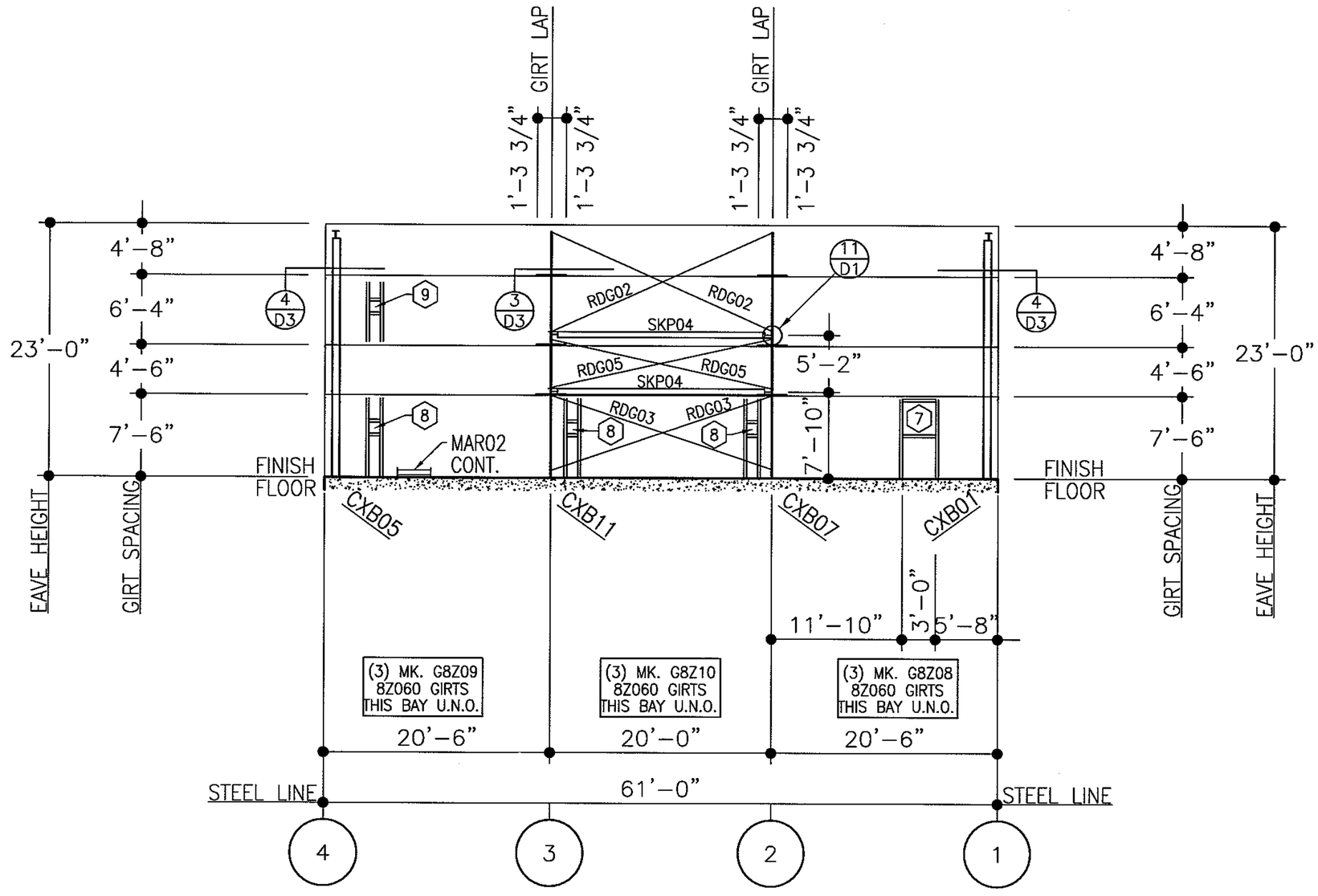
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RECORD DRAWING

FRAMED OPENING SCHEDULE

I.D. NUMBER	QTY.	FRAMED OPENING SIZE		FRAMING MARK NUMBERS			SEE DETAIL	SILL HEIGHT A.F.F.
		WIDTH	HEIGHT	JAMBS	HEADER	SILL		
7	1	3'-0"	3'-0"	J8C07(8C060)	HW802	H8C04(8C060)	2/D4	4'-0"
8	3	1'-0"	1'-0"	J8C09(8C060)	H8C07(8C060)	H8C07(8C060)	2/D4	4'-0"
9	1	1'-0"	1'-0"	J8C13(8C060)	H8C07(8C060)	H8C07(8C060)	2/D4	15'-0"



BACK SIDEWALL ELEVATION AT LINE A

1) RDG__ INDICATES 1 1/4" DIA ROD BRACING. SEE SHEET D1 FOR DETAIL.
2) CUT AND DRILL GIRTS AS NECESSARY FOR FIELD LOCATED FRAMED OPENINGS.
3) SKP__ INDICATES (8S099) BOX STRUT (SEE DETAIL 11/D1).

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

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FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

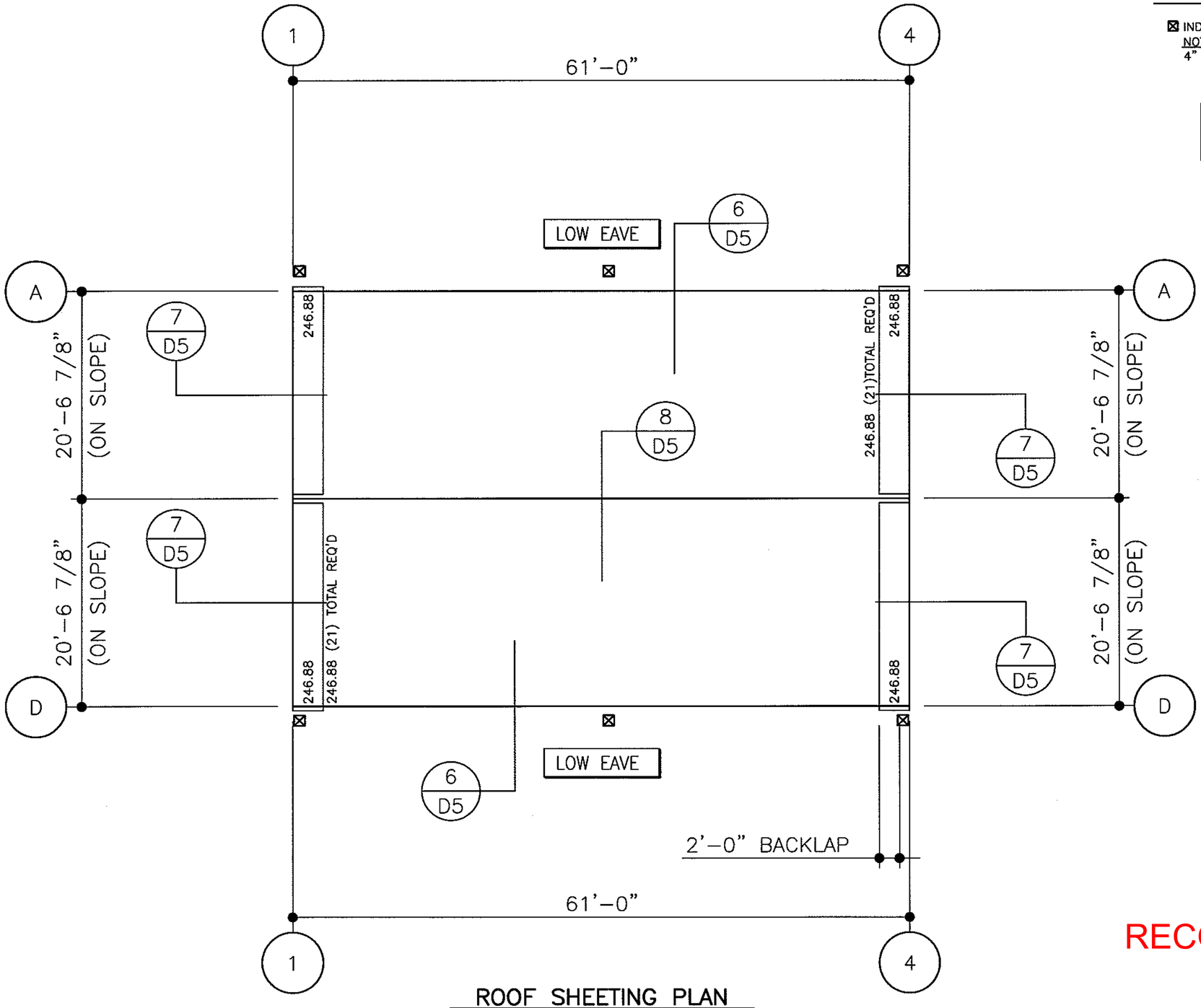
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: E8 of 14

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ROOF SHEETING PLAN

PANELS: 26 GA. CLASSIC – BURNISHED SLATE
NOTE: PRE-DRILLING FOR STRUCTURAL FASTENTERS MAY BE REQUIRED AT PURLIN LAPPS

GUTTER AND DOWNSPOUT SCHEDULE

⊠ INDICATES 4" x 5" DOWNSPOUT. SEE BELOW FOR REQUIREMENTS.
NOTE: DOWNSPOUT LENGTH MAY VARY PER PLANT:
4" x 5" x 10'-0" CORRUGATED DOWNSPOUT = MK. H2305

BUILD. I.D.	MAXIMUM SPACING	QUANTITY PER LOCATION	LOCATIONS	GRID LINE
MAIN	50'-0"	3	3	A
MAIN	50'-0"	3	3	D

RECORD DRAWING

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

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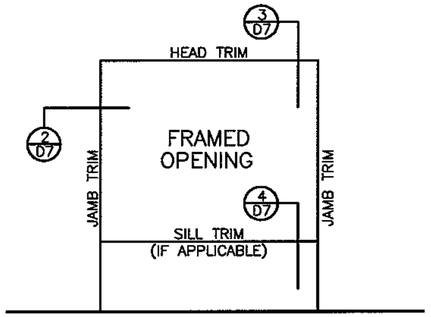
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: E9 of 14

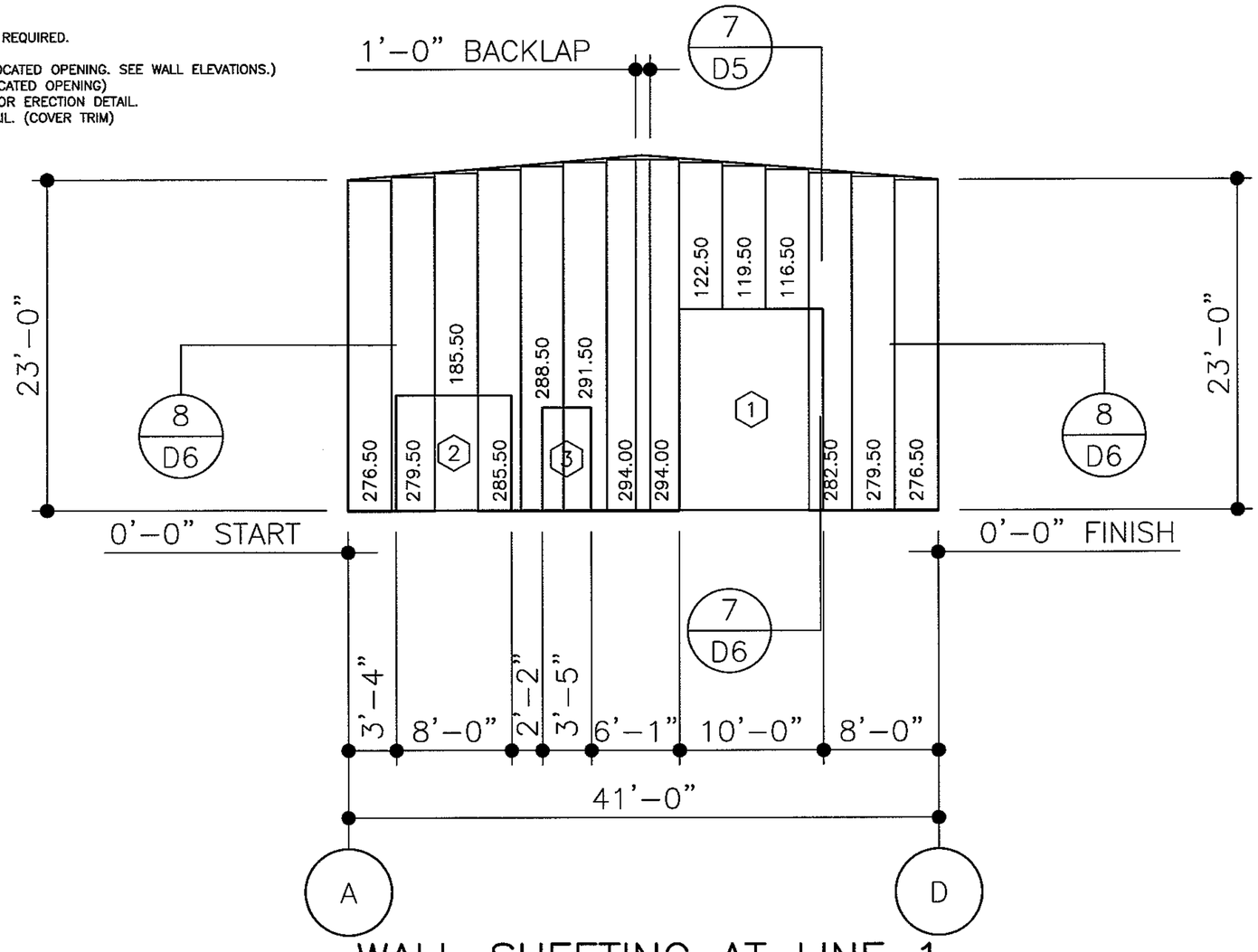
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RECORD DRAWING

ERECTOR NOTES
1.) FIELD CUT PANELS AROUND OPENINGS AS REQUIRED.
2.) I.D. NUMBER FIELD;
(AN I.D. NUMBER INDICATES A FACTORY LOCATED OPENING. SEE WALL ELEVATIONS.)
(THE WORD "FIELD" INDICATES A FIELD LOCATED OPENING)
3.) SEE SHEET D6 FOR NUCOR STANDARD DOOR ERECTION DETAIL.
4.) SEE SHEET D7 FOR CHANNEL COVER DETAIL. (COVER TRIM)



WALL SHEETING AT LINE 1

PANELS: 26 GA. CLASSIC WALL – SAGEBRUSH TAN

FRAMED OPENING SCHEDULE

ID NUMBER	QTY	SIZE		TRIM REQUIREMENTS			COVER TRIM REQ'MENTS	
		WIDTH	HEIGHT	JAMB TRIM	HEAD TRIM	SILL TRIM	JAMB TRIM	HEAD TRIM
1	1	10'-0"	14'-0"	TXP02	TXP03	N/A	CCA03	CCA01
2	1	8'-0"	8'-0"	TXP02	TXP03	N/A	CCA01	CCA01
3	1	3'-5"	7'-2"	TXP02	TXP03	N/A	CCA01	CCE02

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

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PROJECT NAME: B&L WOODWASTE
MILTON, WA
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

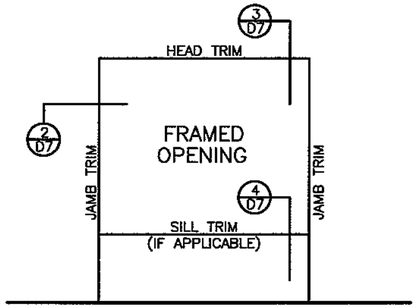
SHEET NO: E10 of 14

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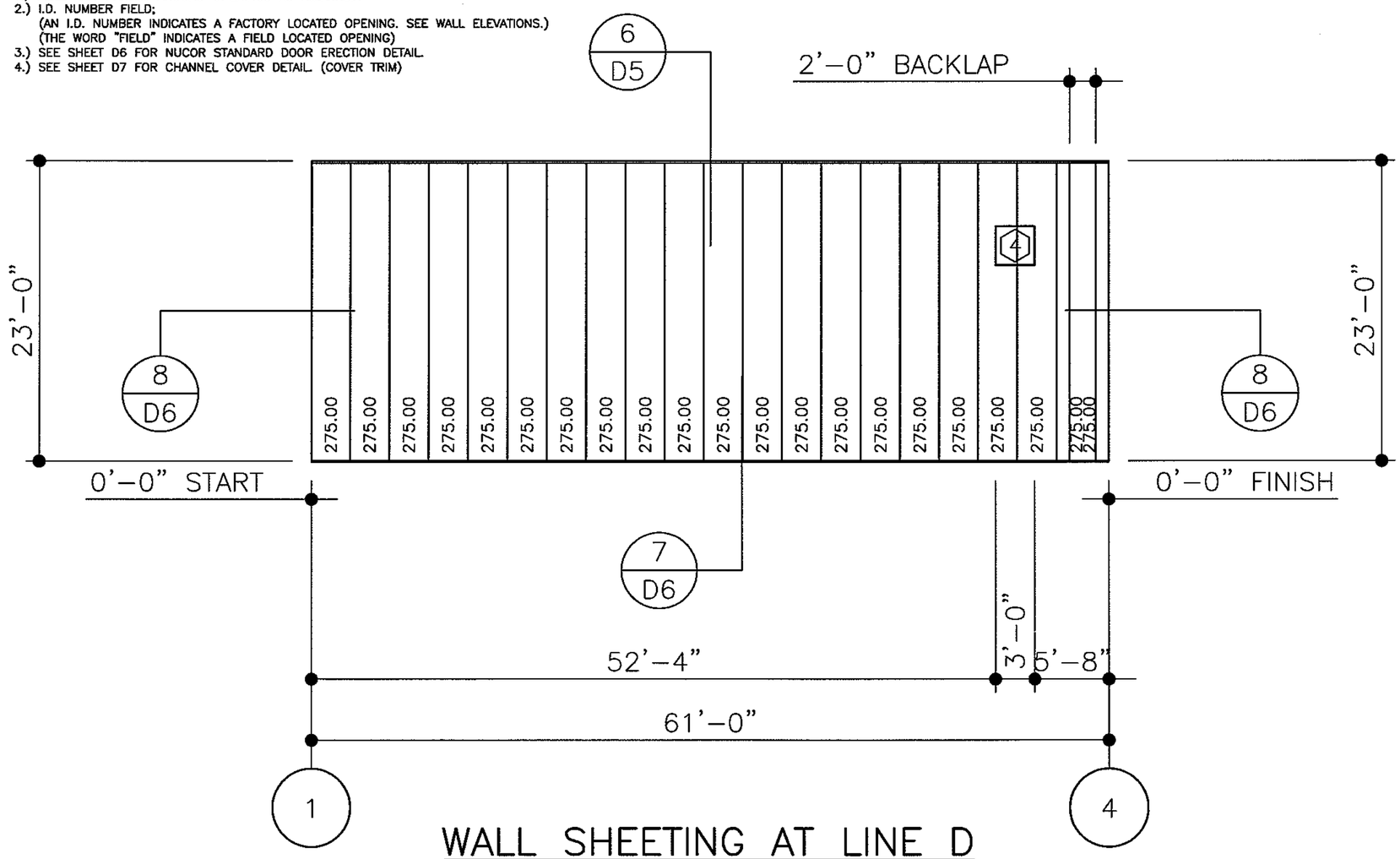
FRAMED OPENING SCHEDULE

ID NUMBER	QTY	SIZE		TRIM REQUIREMENTS			COVER TRIM REQ'MENTS	
		WIDTH	HEIGHT	JAMB TRIM	HEAD TRIM	SILL TRIM	JAMB TRIM	HEAD TRIM
4	1	3'-0"	3'-0"	TXP02	TXP03	STA01	CCA01	CCE02



RECORD DRAWING

ERECTOR NOTES
1.) FIELD CUT PANELS AROUND OPENINGS AS REQUIRED.
2.) I.D. NUMBER FIELD;
(AN I.D. NUMBER INDICATES A FACTORY LOCATED OPENING. SEE WALL ELEVATIONS.)
(THE WORD "FIELD" INDICATES A FIELD LOCATED OPENING)
3.) SEE SHEET D6 FOR NUCOR STANDARD DOOR ERECTION DETAIL.
4.) SEE SHEET D7 FOR CHANNEL COVER DETAIL. (COVER TRIM)



WALL SHEETING AT LINE D

PANELS: 26 GA. CLASSIC WALL – SAGEBRUSH TAN

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	~~ADM~~		9/20/11

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PROJECT NAME: B&L WOODWASTE
MILTON, WA
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

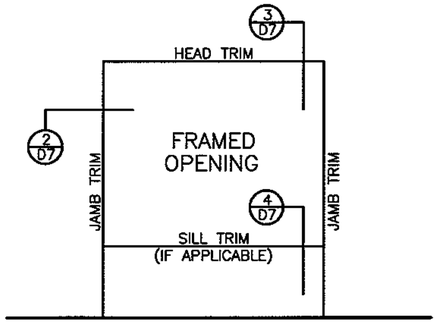
JOB NUMBER: U11R0359A

SHEET NO: E11 of 14

RUSSELL R. SKEEM
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41179
REGISTERED PROFESSIONAL ENGINEER

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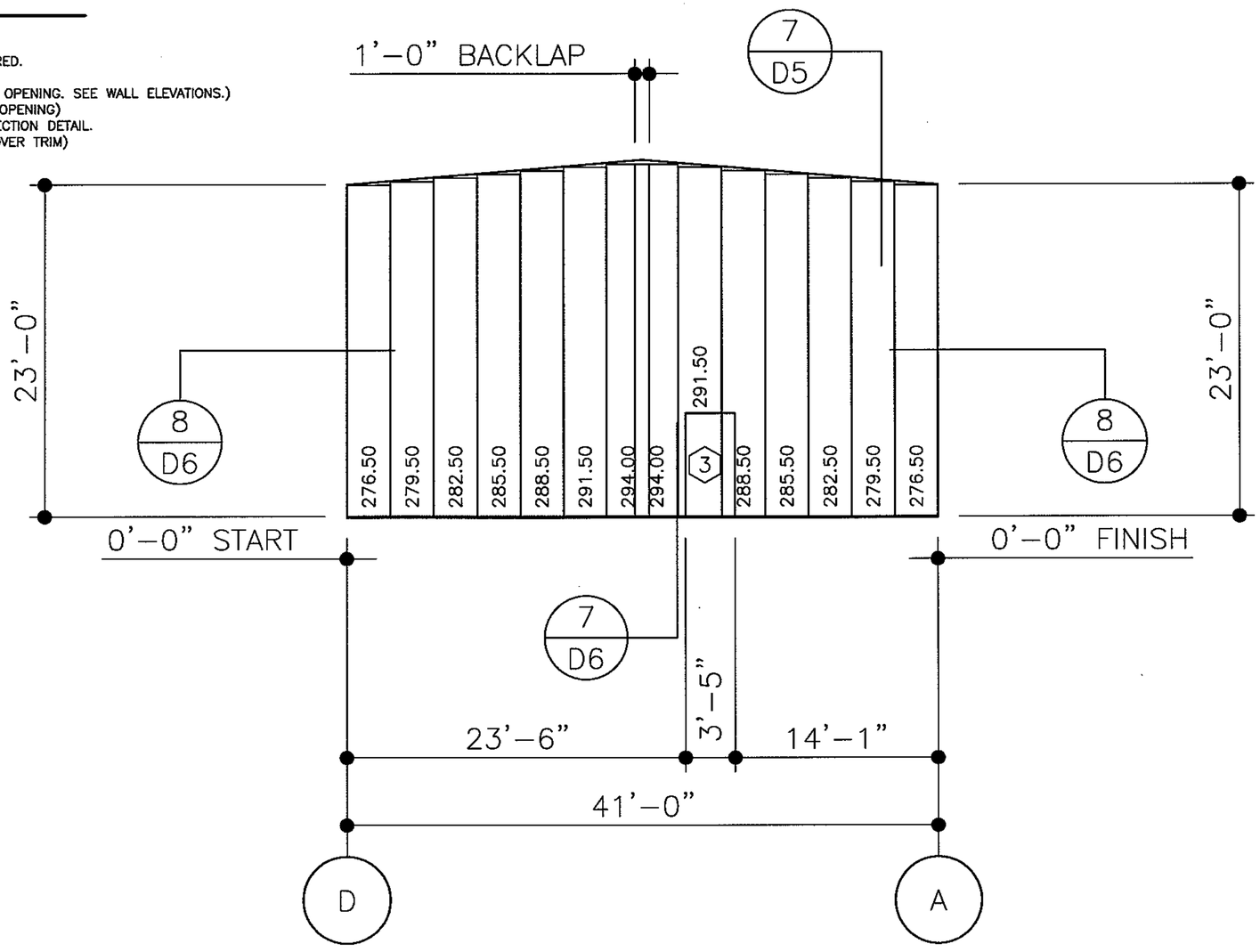
RECORD DRAWING



ERECTOR NOTES
1.) FIELD CUT PANELS AROUND OPENINGS AS REQUIRED.
2.) I.D. NUMBER FIELD;
(AN I.D. NUMBER INDICATES A FACTORY LOCATED OPENING. SEE WALL ELEVATIONS.)
(THE WORD "FIELD" INDICATES A FIELD LOCATED OPENING)
3.) SEE SHEET D6 FOR NUCOR STANDARD DOOR ERECTION DETAIL.
4.) SEE SHEET D7 FOR CHANNEL COVER DETAIL. (COVER TRIM)

FRAMED OPENING SCHEDULE

ID NUMBER	QTY	SIZE		TRIM REQUIREMENTS			COVER TRIM REQ'MENTS	
		WIDTH	HEIGHT	JAMB TRIM	HEAD TRIM	SILL TRIM	JAMB TRIM	HEAD TRIM
3	1	3'-5"	7'-2"	TXP02	TXP03	N/A	CCA01	CCE02
5	1	1'-0"	1'-0"	TXP02	TXP03	STA01	CCA01	CCA01
6	1	1'-0"	1'-0"	TXP02	TXP03	STA01	CCA01	CCA01



WALL SHEETING AT LINE 4

PANELS: 26 GA. CLASSIC WALL – SAGEBRUSH TAN

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	MW		9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
BRIGHAM CITY, UT 84302
PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: E12 of 14

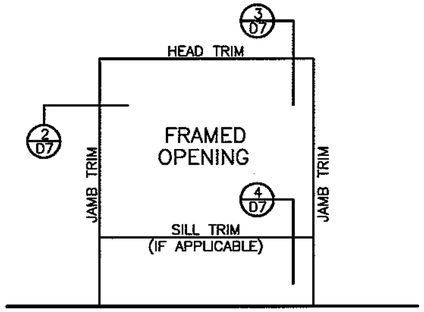
RUSSELL R. SKEEM
STATE OF WASHINGTON
41179
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PROFESSIONAL ENGINEER

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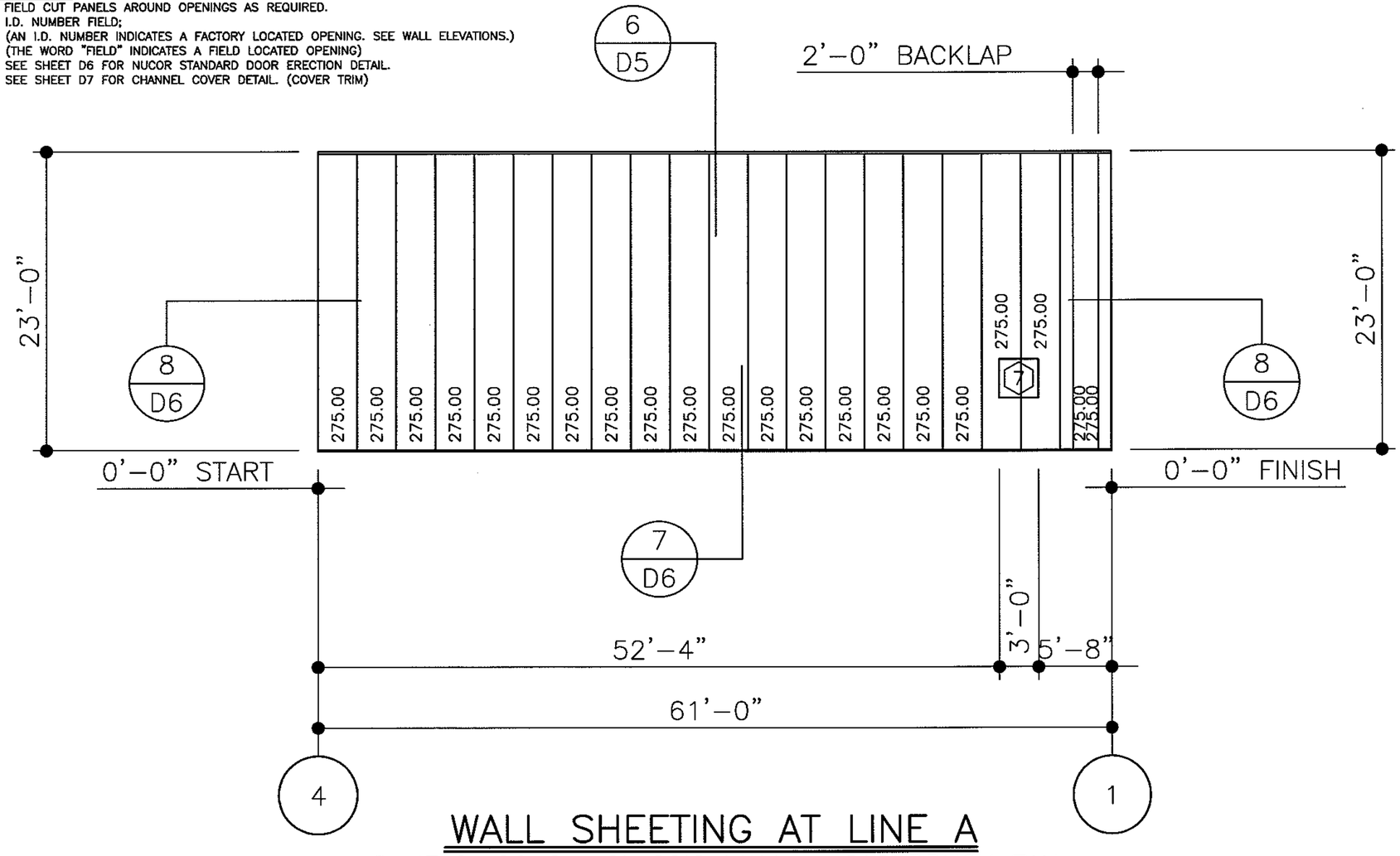
RECORD DRAWING

FRAMED OPENING SCHEDULE

ID NUMBER	QTY	SIZE		TRIM REQUIREMENTS			COVER TRIM REQ'MENTS	
		WIDTH	HEIGHT	JAMB TRIM	HEAD TRIM	SILL TRIM	JAMB TRIM	HEAD TRIM
7	1	3'-0"	3'-0"	TXP02	TXP03	STA01	CCA01	CCE02
8	3	1'-0"	1'-0"	TXP02	TXP03	STA01	CCA01	CCA01
9	1	1'-0"	1'-0"	TXP02	TXP03	STA01	CCA01	CCA01



ERECTOR NOTES
1.) FIELD CUT PANELS AROUND OPENINGS AS REQUIRED.
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WALL SHEETING AT LINE A

PANELS: 26 GA. CLASSIC WALL – SAGEBRUSH TAN

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
BRIGHAM CITY, UT 84302
PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

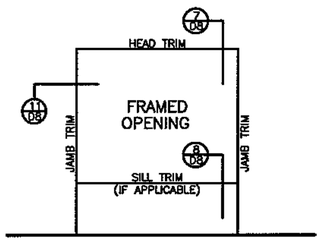
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: E13 of 14

RUSSELL R. SKEEM
STATE OF WASHINGTON
41179
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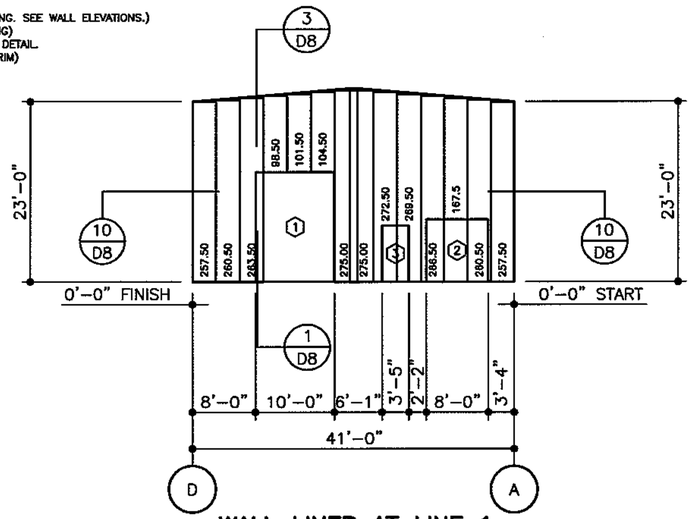


ERECTOR NOTES
1.) FIELD CUT PANELS AROUND OPENINGS AS REQUIRED.
2.) I.D. NUMBER FIELD;
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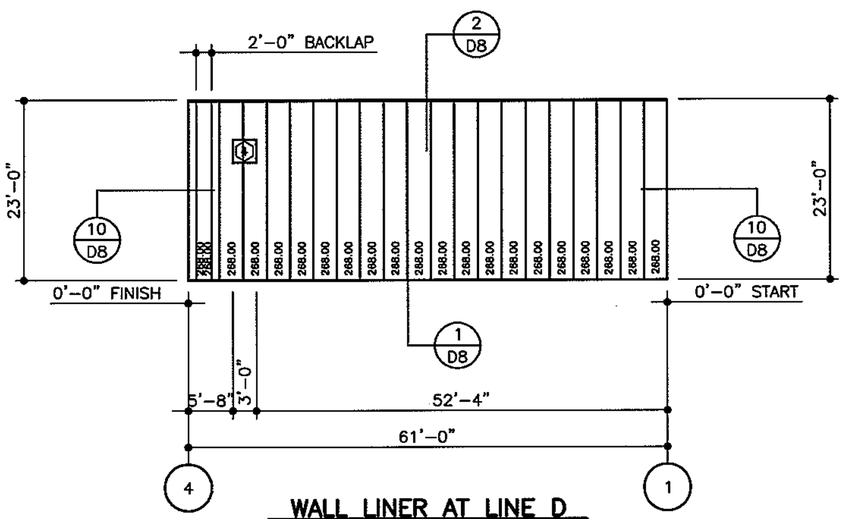
RECORD DRAWING

FRAMED OPENING SCHEDULE

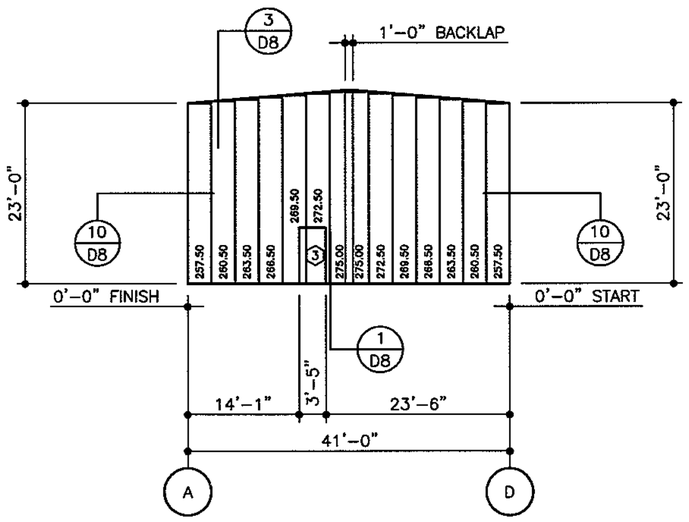
ID NUMBER	QTY	SIZE		TRIM REQUIREMENTS			COVER TRIM REQ'MENTS	
		WIDTH	HEIGHT	JAMB TRIM	HEAD TRIM	SILL TRIM	JAMB TRIM	HEAD TRIM
1	1	10'-0"	14'-0"	HTD05	HTD05	N/A	N/A	N/A
2	1	8'-0"	8'-0"	HTD05	HTD05	N/A	N/A	N/A
3	2	3'-5"	7'-2"	HTD05	HTD05	N/A	N/A	N/A
4	2	3'-0"	3'-0"	HTD05	HTD05	STA01	N/A	N/A
5	6	1'-0"	1'-0"	HTD05	HTD05	STA01	N/A	N/A



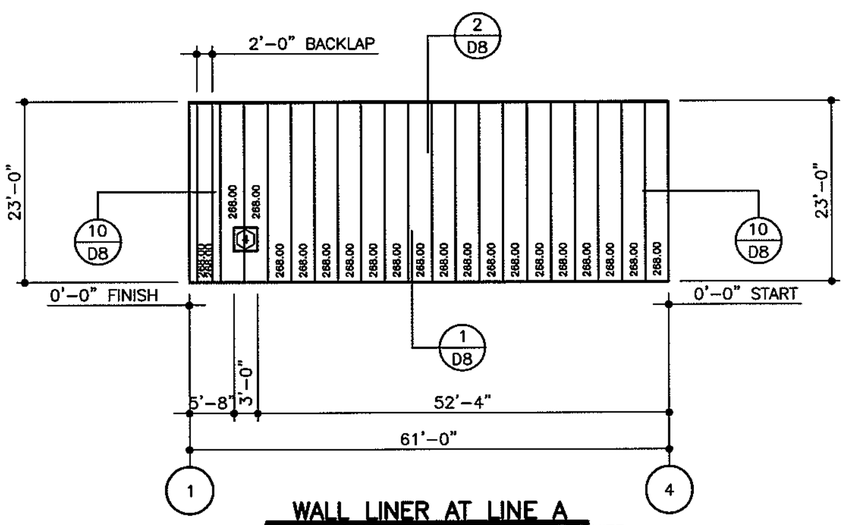
WALL LINER AT LINE 1
PANELS: 26 GA. CLASSIC WALL – POLAR WHITE



WALL LINER AT LINE D
PANELS: 26 GA. CLASSIC WALL – POLAR WHITE



WALL LINER AT LINE 4
PANELS: 26 GA. CLASSIC WALL – POLAR WHITE



WALL LINER AT LINE A
PANELS: 26 GA. CLASSIC WALL – POLAR WHITE

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS–FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
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PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: E14 of 14

RUSSELL R. SKEEM
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REGISTERED
PROFESSIONAL ENGINEER
9/20/11

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NUCOR BUILDING SYSTEMS GROUP

1050 North Watery Lane
Brigham City, UT 84302

Ph: (435) 919-3100
Fax: (435) 919-3101

Version 2.7 (6/24/11) by TLA / DJE

Page: R1 of R5
Date: 9-7-11

GENERAL INFORMATION FOR COLUMN BASE REACTIONS

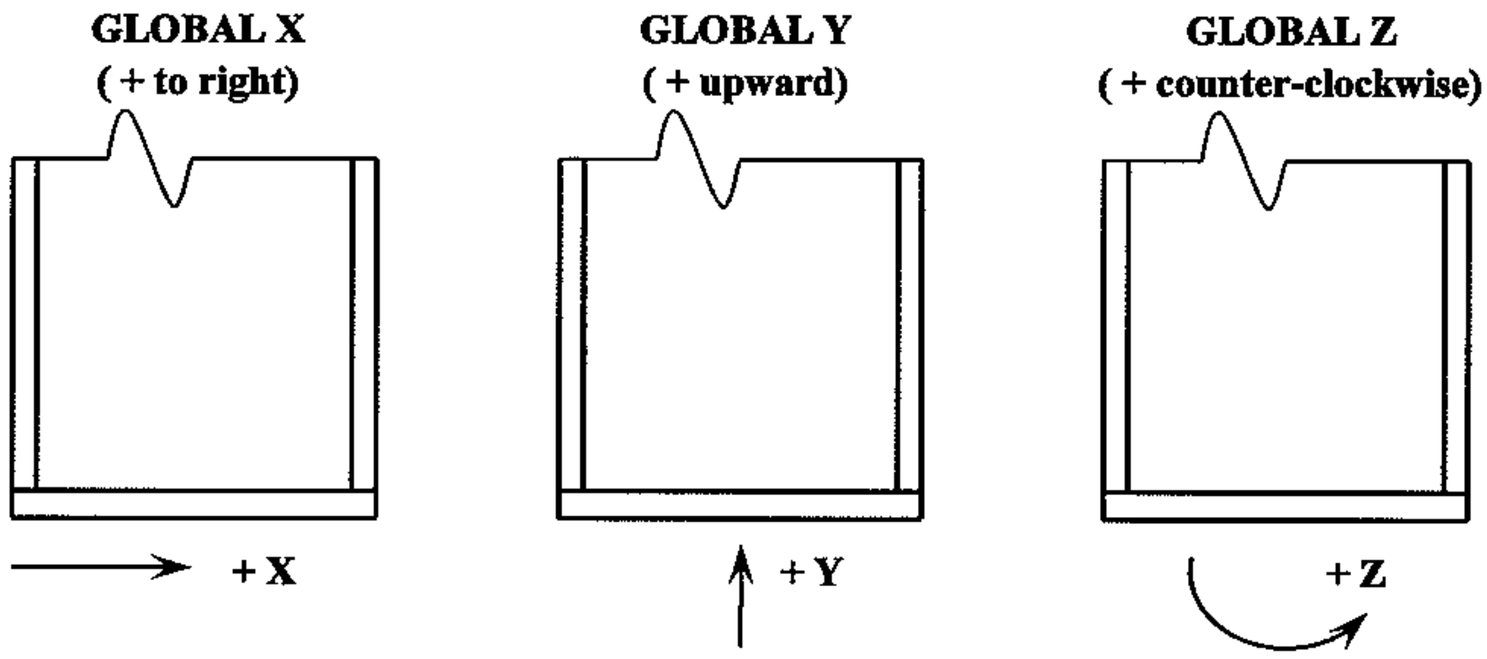
○ FOR REVIEW ◉ FOR CONSTRUCTION

Project Name: B&L WOODWASTE
NBS Project Number: U11R0359A
Customer: T & E INTERNATIONAL, INC.
Nucor Engineer: Andrew Mieler

Column base reactions are included in this packet for a building designed by Nucor Building Systems. These reactions result from frame analysis done by a Nucor Engineer for this specific job. They reflect all loading to which the building may be subject, per the appropriate building code and loading information provided to Nucor Building Systems at the date of design. Reaction packets marked "FOR REVIEW" are subject to change and are usually provided at the request of the customer, although the Nucor Engineer believes he is working with undefined, incomplete or assumed information.

Reactions are provided by load case in order to aid the foundation engineer in determining the appropriate load factors and combinations to be used with either Working Stress or Ultimate Strength design methods. Wind load cases are given for each primary wind direction, and the case which produces the largest reaction at a particular column should be used for design.

Sign conventions for computer generated frame reactions are as follows and should be taken in the sense of the frame sketch given on the reactions sheets.



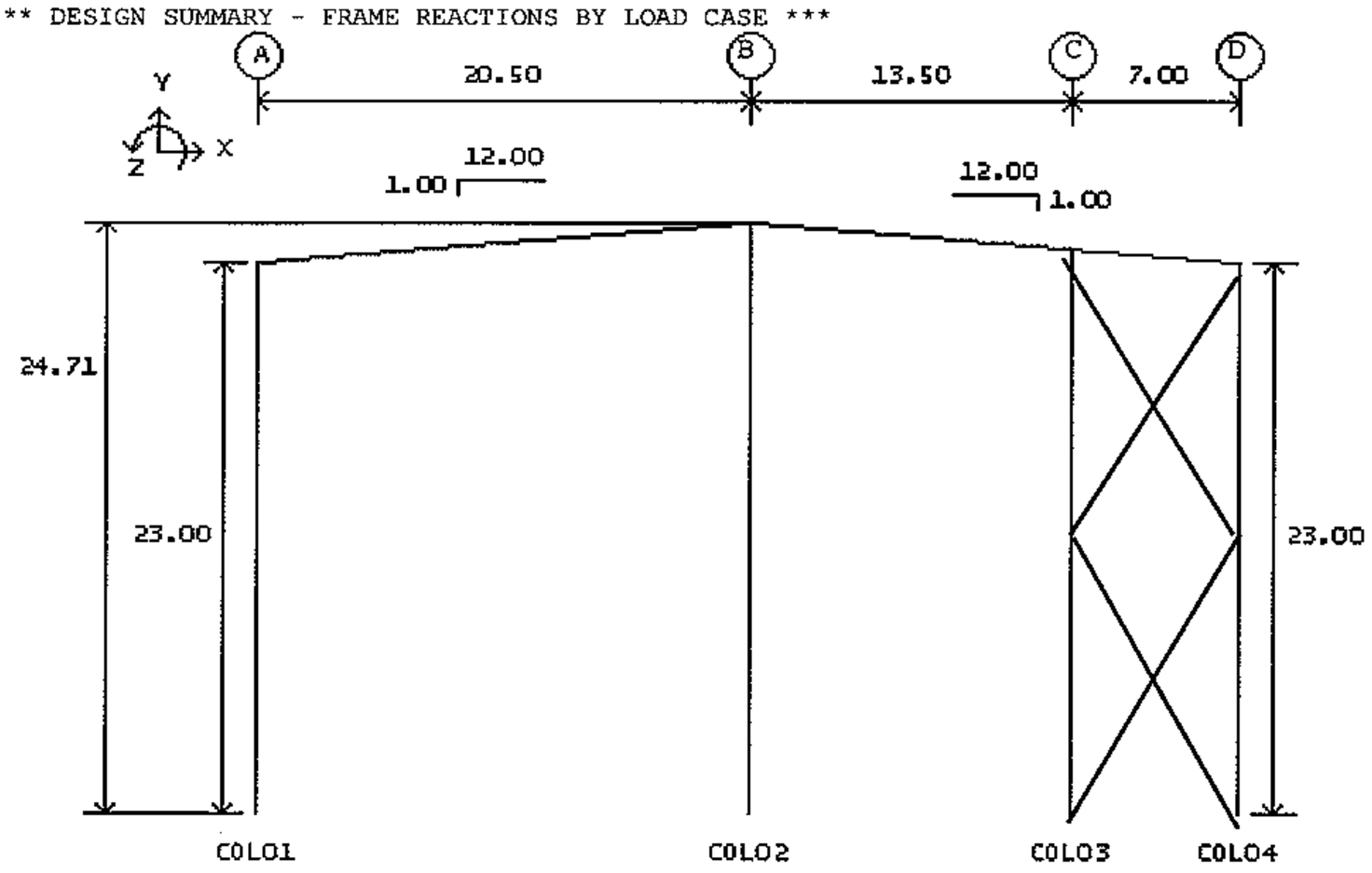
Anchor bolt diameter, grade, location and projection is provided on the Anchor Bolt Plan. Anchor bolt embedment lengths and types are not provided by Nucor Building Systems. This Information is closely related to the complete foundation design which should be done by a Registered Professional Engineer familiar with the local site conditions and construction practices.

RECORD DRAWING

NUCOR BUILDING SYSTEMS
Frame : Frame Line 1
Job Name: B&L WOODWASTE
*** DESIGN SUMMARY - FRAME REACTIONS BY LOAD CASE ***

Job #: U11R0359A
By: adm

Page: _____
Date: 09-07-11
File: E01



Member	X (kips)	Y (kips)	Z (kip-ft)
LOAD CASE 1 - DEAD			
COL01	0	1	0
COL02	0	2	0
COL03	0	1	0
COL04	0	1	0
LOAD CASE 2 - COLLATERAL			
COL01	0	1	0
COL02	0	1	0
COL03	0	1	0
COL04	0	1	0
LOAD CASE 3 - FLOOR DEAD			
COL01	0	0	0
COL02	1	3	0
COL03	0	1	0
COL04	1	5	0
LOAD CASE 4 - ROOF LIVE			
COL01	0	3	0
COL02	0	4	0
COL03	0	4	0
COL04	0	1	0
LOAD CASE 5 - FLOOR LIVE			
COL01	0	0	0
COL02	1	7	0
COL03	0	1	0
COL04	0	12	0
LOAD CASE 6 - SNOW			
COL01	0	2	0
COL02	0	3	0
COL03	0	2	0
COL04	0	1	0
LOAD CASE 7 - USER OVERRIDE SNOW			
COL01	0	3	0
COL02	0	4	0
COL03	0	3	0
COL04	0	1	0
LOAD CASE 8 - WIND CASE 1 TO RIGHT			
COL01	0	-2	0
COL02	0	-3	0
COL03	-7	-24	0
COL04	1	24	0
LOAD CASE 9 - WIND CASE 1 TO LEFT			
COL01	0	-1	0
COL02	0	-2	0
COL03	-1	22	0
COL04	7	-24	0
LOAD CASE 10 - WIND CASE 2 TO RIGHT			
COL01	0	-2	0
COL02	0	-4	0
COL03	-7	-25	0
COL04	1	24	0
LOAD CASE 11 - WIND CASE 2 TO LEFT			
COL01	0	-2	0
COL02	0	-3	0
COL03	-1	21	0
COL04	7	-25	0
LOAD CASE 12 - LONG. WIND 1 TO BACK			
COL01	-2	-3	0
COL02	-2	-4	0
COL03	-1	-3	0
COL04	-1	-1	0
LOAD CASE 13 - LONG. WIND 1 TO FRONT			
COL01	2	-3	0
COL02	2	-4	0
COL03	2	-3	0
COL04	1	-1	0
LOAD CASE 14 - SEISMIC TO RIGHT			
COL01	0	1	0
COL02	0	-1	0
COL03	-20	-54	0
COL04	1	54	0
LOAD CASE 15 - SEISMIC TO LEFT			
COL01	0	-1	0
COL02	0	1	0
COL03	-1	54	0
COL04	20	-54	0
LOAD CASE 16 - ALTERNATE SNOW 1			
COL01	0	2	0
COL02	0	3	0
COL03	0	1	0
COL04	0	1	0
LOAD CASE 17 - ALTERNATE SNOW 2			
COL01	0	1	0
COL02	0	2	0
COL03	0	3	0
COL04	0	1	0

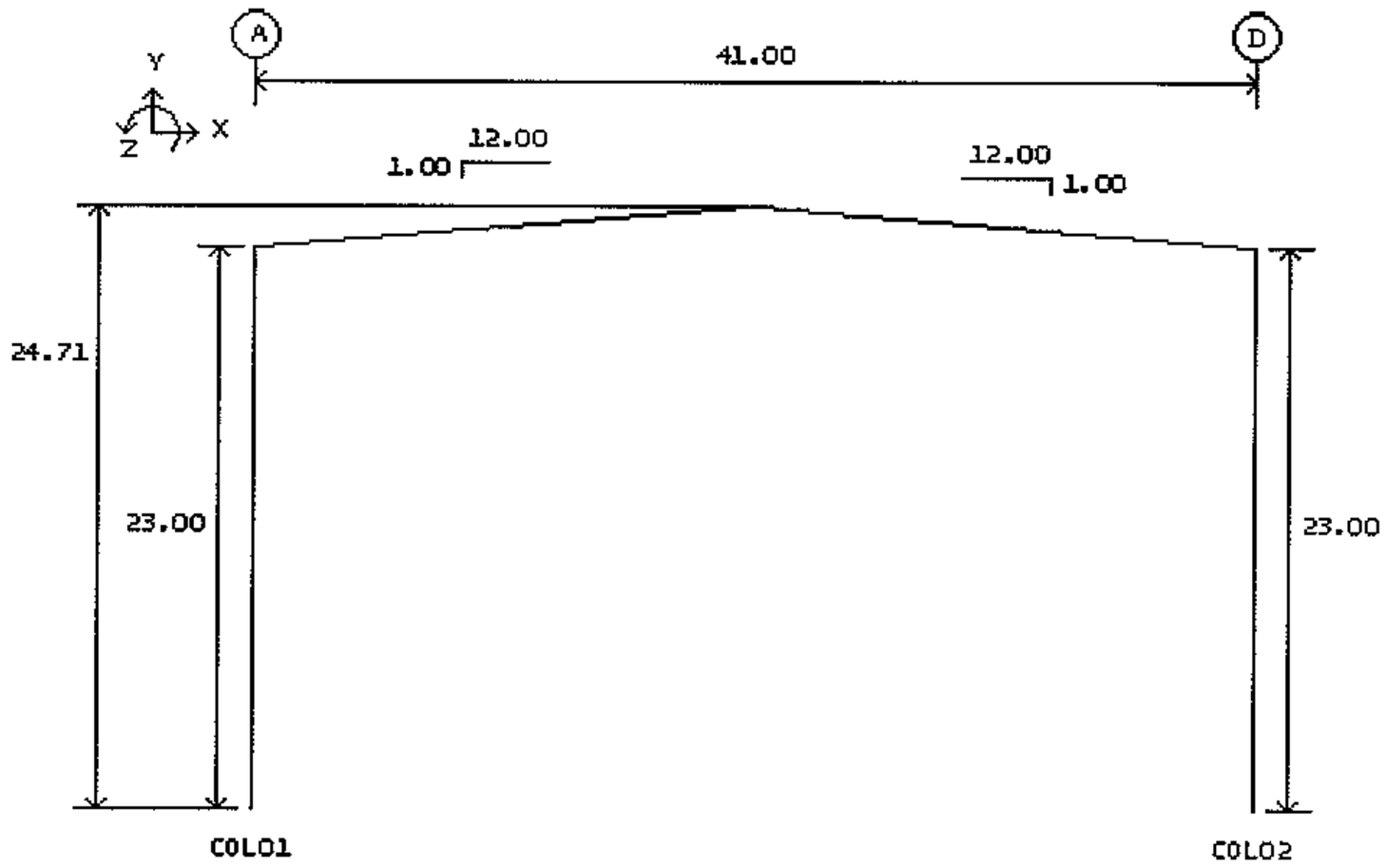
RECORD DRAWING

NUCOR BUILDING SYSTEMS
Frame : Frame Lines 2-3
Job Name: B&L WOODWASTE

Job #: U11R0359A
By: adm

Page:
Date: 09-07-11
File: F01

*** DESIGN SUMMARY - FRAME REACTIONS BY LOAD CASE ***



Member	X (kips)	Y (kips)	Z (kip-ft)
LOAD CASE 1 - DEAD			
COL01	1	3	0
COL02	-1	3	0
LOAD CASE 2 - COLLATERAL			
COL01	1	2	0
COL02	-1	2	0
LOAD CASE 3 - FLOOR DEAD			
COL01	1	8	0
COL02	-1	8	0
LOAD CASE 4 - ROOF LIVE			
COL01	2	9	0
COL02	-2	9	0
LOAD CASE 5 - FLOOR LIVE			
COL01	2	34	0
COL02	-2	34	0
LOAD CASE 6 - SNOW			
COL01	2	6	0
COL02	-2	6	0
LOAD CASE 7 - USER OVERRIDE SNOW			
COL01	2	8	0
COL02	-2	8	0
LOAD CASE 8 - WIND CASE 1 TO RIGHT			
COL01	-4	-5	0
COL02	-2	1	0
LOAD CASE 9 - WIND CASE 1 TO LEFT			
COL01	2	1	0
COL02	4	-5	0
LOAD CASE 10 - WIND CASE 2 TO RIGHT			
COL01	-4	-7	0
COL02	-2	-3	0
LOAD CASE 11 - WIND CASE 2 TO LEFT			
COL01	2	-3	0
COL02	4	-7	0
LOAD CASE 12 - LONG. WIND 1 TO BACK			
COL01	-1	-4	0
COL02	1	-4	0
LOAD CASE 13 - LONG. WIND 1 TO FRONT			
COL01	-1	-4	0
COL02	1	-4	0
LOAD CASE 14 - LONG. WIND 2 TO BACK			
COL01	1	-6	0
COL02	-1	-6	0
LOAD CASE 15 - LONG. WIND 2 TO FRONT			
COL01	1	-6	0
COL02	-1	-6	0
LOAD CASE 16 - LONG. WIND 3 TO BACK			
COL01	1	-2	0
COL02	-1	-2	0
LOAD CASE 17 - LONG. WIND 3 TO FRONT			
COL01	1	-2	0
COL02	-1	-2	0
LOAD CASE 18 - LONG. WIND 4 TO BACK			
COL01	1	-4	0
COL02	-1	-4	0
LOAD CASE 19 - LONG. WIND 4 TO FRONT			
COL01	1	-4	0
COL02	-1	-4	0
LOAD CASE 20 - SEISMIC TO RIGHT			
COL01	-4	-4	0
COL02	-4	4	0
LOAD CASE 21 - SEISMIC TO LEFT			
COL01	4	4	0
COL02	4	-4	0
LOAD CASE 22 - ALTERNATE SNOW 1			
COL01	2	6	0
COL02	-2	4	0
LOAD CASE 23 - ALTERNATE SNOW 2			
COL01	2	4	0
COL02	-2	6	0

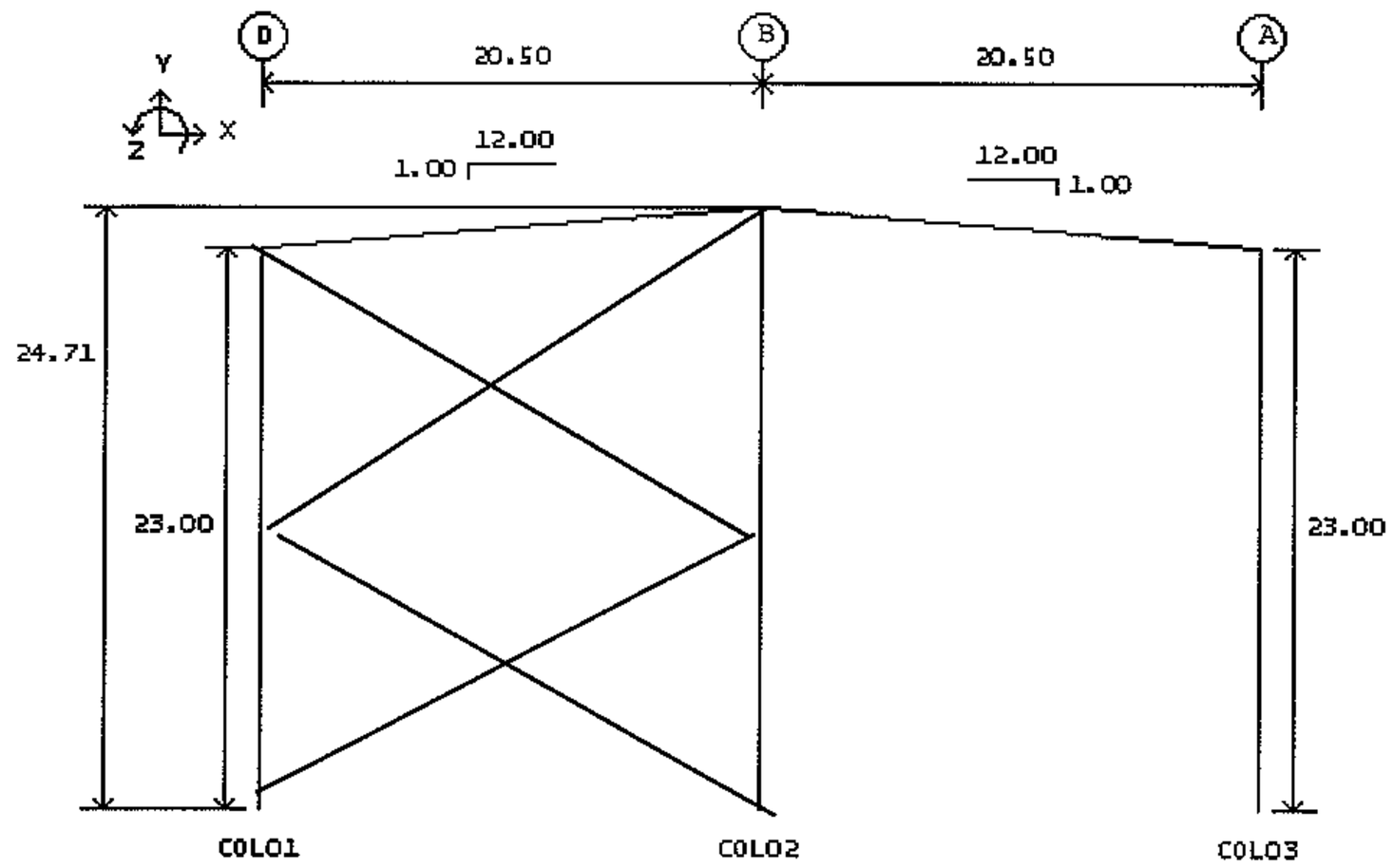
RECORD DRAWING

NUCOR BUILDING SYSTEMS
Frame : Frame Line 4
Job Name: B&L WOODWASTE

Job #: U11R0359A
By: adm

Page: _____
Date: 09-07-11
File: E02

*** DESIGN SUMMARY - FRAME REACTIONS BY LOAD CASE ***



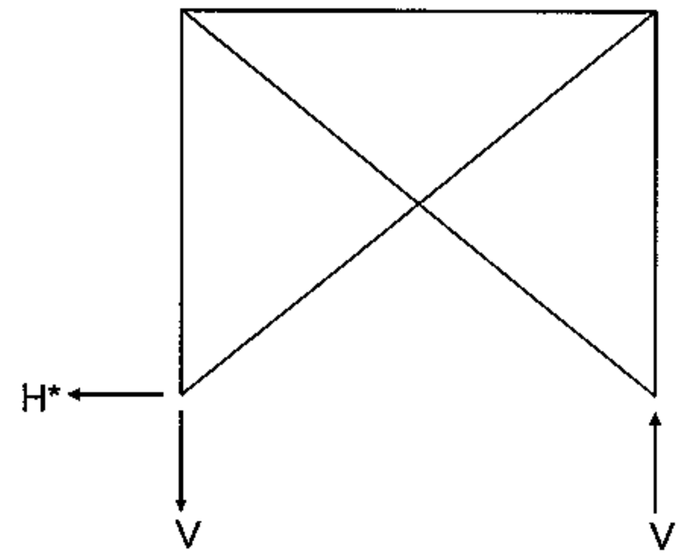
Member	X (kips)	Y (kips)	Z (kip-ft)
LOAD CASE 1 - DEAD			
COL01	0	1	0
COL02	0	2	0
COL03	0	1	0
LOAD CASE 2 - COLLATERAL			
COL01	0	1	0
COL02	0	1	0
COL03	0	1	0
LOAD CASE 3 - FLOOR DEAD			
COL01	1	3	0
COL02	0	11	0
COL03	1	18	0
LOAD CASE 4 - ROOF LIVE			
COL01	0	3	0
COL02	0	4	0
COL03	0	3	0
LOAD CASE 5 - FLOOR LIVE			
COL01	0	9	0
COL02	0	31	0
COL03	2	47	0
LOAD CASE 6 - SNOW			
COL01	0	2	0
COL02	0	3	0
COL03	0	2	0
LOAD CASE 7 - USER OVERRIDE SNOW			
COL01	0	3	0
COL02	0	4	0
COL03	0	3	0
LOAD CASE 8 - WIND CASE 1 TO RIGHT			
COL01	-7	-9	0
COL02	0	6	0
COL03	0	-1	0
LOAD CASE 9 - WIND CASE 1 TO LEFT			
COL01	-1	7	0
COL02	7	-9	0
COL03	0	-2	0
LOAD CASE 10 - WIND CASE 2 TO RIGHT			
COL01	-7	-10	0
COL02	0	5	0
COL03	0	-2	0
LOAD CASE 11 - WIND CASE 2 TO LEFT			
COL01	-1	6	0
COL02	7	-10	0
COL03	0	-3	0
LOAD CASE 12 - LONG. WIND 1 TO BACK			
COL01	-2	-3	0
COL02	-2	-4	0
COL03	-2	-3	0
LOAD CASE 13 - LONG. WIND 1 TO FRONT			
COL01	2	-3	0
COL02	2	-4	0
COL03	2	-3	0
LOAD CASE 14 - SEISMIC TO RIGHT			
COL01	-19	-16	0
COL02	0	16	0
COL03	0	-1	0
LOAD CASE 15 - SEISMIC TO LEFT			
COL01	-1	16	0
COL02	19	-16	0
COL03	0	-1	0
LOAD CASE 16 - ALTERNATE SNOW 1			
COL01	0	2	0
COL02	0	3	0
COL03	0	1	0
LOAD CASE 17 - ALTERNATE SNOW 2			
COL01	0	1	0
COL02	0	3	0
COL03	0	2	0

NUCOR BUILDING SYSTEMS

JOB NAME: B&L Woodwaste JOB NUMBER: U11R0359A ENGINEER: ADM

LONGITUDINAL X-BRACING REACTIONS

(These reactions must be combined with the appropriate longitudinal frame reactions)



Line	Bay	H (KIPS)	V (KIPS)	CASE
A	2-3	4	4	WIND
D	2-3	4	4	WIND
A	2-3	19	15	SEISMIC
D	2-3	19	15	SEISMIC

* - Horizontal bracing reactions are orthogonal to horizontal frame reactions.

RECORD DRAWING

TYPICAL FIELD WELD REQUIREMENTS ERECTOR NOTE:

(UNLESS NOTED OTHERWISE ON DRAWINGS)

ALL FIELD WELDING **MUST BE PERFORMED BY AWS/CWB CERTIFIED WELDERS WHO ARE QUALIFIED** FOR THE WELDING PROCESSES AND POSITIONS INDICATED. ALL WORK MUST BE **COMPLETED AND INSPECTED IN ACCORDANCE WITH THE APPLICABLE AWS/CWB SPECIFICATIONS.** WELD ELECTRODES USED FOR THE SMAW (OR STICK) WELD PROCESS **MUST BE 70 KSI/483 MPa MATERIAL AND LOW HYDROGEN CONTENT.**

GALVANIZED STEEL FIELD WELDING RECOMMENDATIONS

PREPARATION OF WELD AREA

AWS D-19.0, WELDING ZINC COATED STEEL, CALLS FOR WELDS TO BE MADE ON STEEL THAT IS FREE OF ZINC IN THE AREA TO BE WELDED. FOR GALVANIZED STRUCTURAL COMPONENTS, THE ZINC COATING SHOULD BE REMOVED AT LEAST ONE TO FOUR INCHES (2.5-10 CM) FROM EITHER SIDE OF THE INTENDED WELD ZONE AND ON BOTH SIDES OF THE WORKPIECE. GRINDING BACK THE ZINC COATING IS THE PREFERRED AND MOST COMMON METHOD; BURNING THE ZINC AWAY OR PUSHING BACK THE MOLTEN ZINC FROM THE WELD AREA ALSO ARE EFFECTIVE.

TOUCH-UP OF WELD AREA

WELDING ON GALVANIZED SURFACES DESTROYS THE ZINC COATING ON AND AROUND THE WELD AREA. RESTORATION OF THE AREA WILL BE PERFORMED IN ACCORDANCE WITH ASTM A 780, STANDARD PRACTICE FOR REPAIR OF DAMAGED AND UNCOATED AREAS OF HOT-DIP GALVANIZED COATINGS, WHICH SPECIFIES THE USE OF PAINTS CONTAINING ZINC DUST, ZINC-BASED SOLDERS OR SPRAYED ZINC. ALL TOUCHUP AND REPAIR METHODS ARE CAPABLE OF BUILDING A PROTECTIVE LAYER TO THE THICKNESS REQUIRED BY ASTM A 780.

SAFETY & HEALTH

WHEN WELDING DIRECTLY ON GALVANIZED STEEL IS UNAVOIDABLE, OSHA PERMISSIBLE EXPOSURE LIMITS (PELS) MAY BE EXCEEDED AND EVERY PRECAUTION, INCLUDING HIGH-VELOCITY CIRCULATING FANS WITH FILTERS, AIR RESPIRATORS AND FUME-EXTRACTION SYSTEMS SUGGESTED BY AWS, SHOULD BE EMPLOYED. FUMES FROM WELDING GALVANIZED STEEL CAN CONTAIN ZINC, IRON AND LEAD. FUME COMPOSITION TYPICALLY DEPENDS ON THE COMPOSITION OF MATERIALS USED, AS WELL AS THE HEAT APPLIED BY THE PARTICULAR WELDING PROCESS. IN ANY EVENT, GOOD VENTILATION MINIMIZES THE AMOUNT OF EXPOSURE TO FUMES.

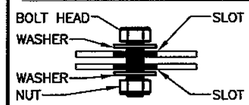
PRIOR TO WELDING ON ANY METAL, CONSULT ANSI/ASC Z-49.1, SAFETY IN WELDING, CUTTING AND ALLIED PROCESSES, WHICH CONTAINS INFORMATION ON THE PROTECTION OF PERSONNEL AND THE GENERAL AREA, VENTILATION AND FIRE PREVENTION.

AG0002

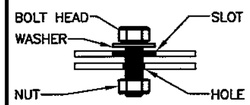
INFORMATION COURTESY OF AMERICAN GALVANIZERS ASSOCIATION

TYPICAL WASHER REQUIREMENTS ERECTOR NOTE

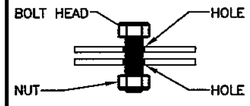
(UNLESS NOTED OTHERWISE ON DRAWINGS)



SLOT TO SLOT CONNECTIONS
WASHERS ARE REQUIRED ON BOTH SIDES OF MATERIAL IF SLOTS ARE USED ON BOTH SIDES. (SEE DETAIL AT RIGHT FOR LAPPED ZEE MEMBERS)



SLOT TO HOLE CONNECTIONS
ONE WASHER REQUIRED ON SLOTTED SIDE ONLY.

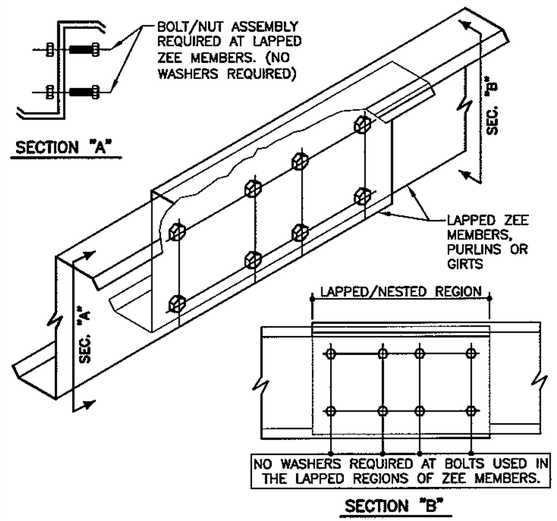


HOLE TO HOLE CONNECTIONS
NO WASHERS ARE REQUIRED WHEN SLOTS ARE NOT USED.

WASHER PART NUMBERS

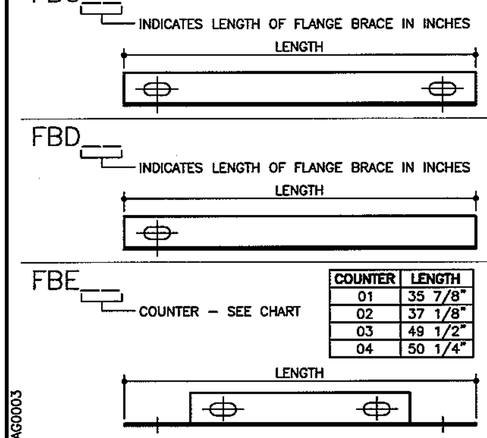
H0200 – 1/2" FLAT WASHER	H0240 – 1" FLAT WASHER
H0210 – 5/8" FLAT WASHER	H0250 – 1 1/8" FLAT WASHER
H0220 – 3/4" FLAT WASHER	H0260 – 1 1/4" FLAT WASHER
H0230 – 7/8" FLAT WASHER	

AG0001



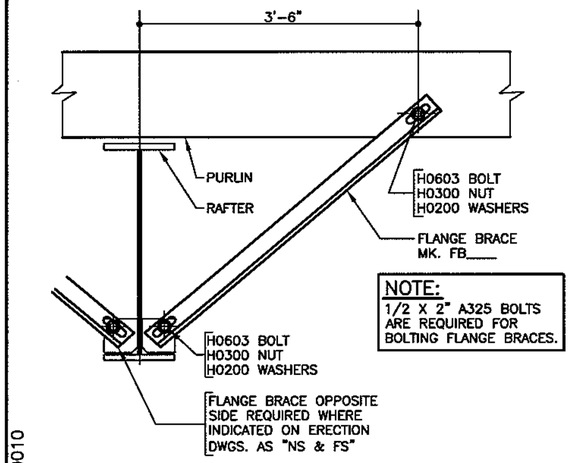
TYPICAL FLANGE BRACE MARK NUMBERS

ACTUAL FLANGE BRACES DO NOT HAVE MARK NUMBERS ON THEM



COUNTER	LENGTH
01	35 7/8"
02	37 1/8"
03	49 1/2"
04	50 1/4"

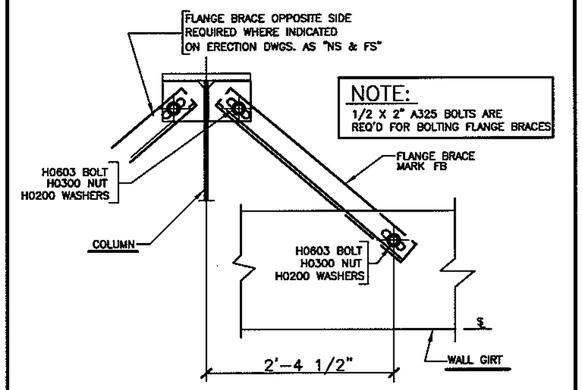
AG0003



TYPICAL FLANGE BRACE AT PURLIN & RAFTER

SEE PLANS AND ELEVATIONS FOR FLANGE BRACE PART MARKS

AG0010



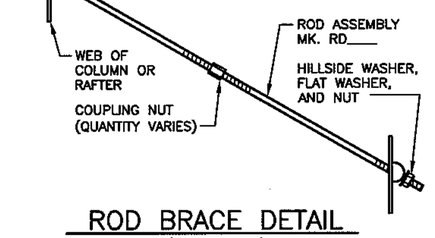
TYP FLANGE BRACE @ BU COL & GIRT

NOTE: SEE PLANS AND ELEVATIONS FOR FLANGE BRACE PART MARKS

AG0030

ROD DIAMETER	MARK NUMBER	HILLSIDE WASHERS	FLAT WASHERS	A307/A325 NUTS	COUPLING NUTS
5/8" ø	RDB___	(2) H0930	(2) H0210	(2) H0310	H0810
3/4" ø	RDC___	(2) H0930	(2) H0220	(2) H0320	H0820
7/8" ø	RDD___	(2) H0930	(2) H0230	(2) H0325	H0830
1" ø	RDE___	(2) H0960	(2) H0240	(2) H0330	H0840
1 1/8" ø	RDF___	(2) H0960	(2) H0250	(2) H0450	H0850
1 1/4" ø	RDG___	(2) H0960	(2) H0260	(2) H0340	H0860

SEE PLANS AND ELEVATIONS FOR BRACING MARK NUMBERS



ROD BRACE DETAIL

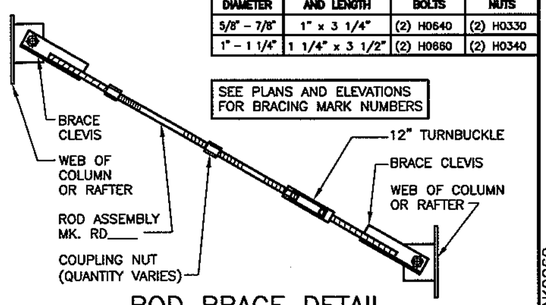
(WEB TO WEB)

AF0010

ROD DIAMETERS	MARK NUMBERS	TURNBUCKLES	COUPLING NUTS	BRACE CLEVIS (AT TURNBUCKLE)	BRACE CLEVIS (AT COUPLING NUT)
5/8"	RDB___	(1) H0710	(1) H0810	(1) BCS02	(1) BCS07
3/4"	RDC___	(1) H0720	(1) H0820	(1) BCS03	(1) BCS08
7/8"	RDD___	(1) H0730	(1) H0830	(1) BCS04	(1) BCS09
1"	RDE___	(1) H0740	(1) H0840	(1) BCL05	(1) BCL06
1 1/8"	RDF___	(1) H0750	(1) H0850	(1) BCL01	(1) BCL03
1 1/4"	RDG___	(1) H0760	(1) H0860	(1) BCL02	(1) BCL04

BRACE CLEVIS BOLT AND NUT PART NUMBERS

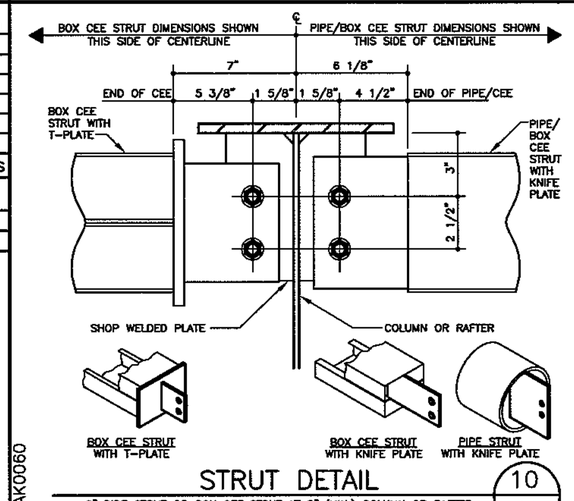
ROD DIAMETER	BOLT DIAMETER AND LENGTH	A325 BOLTS	A325 NUTS
5/8" – 7/8"	1" x 3 1/4"	(2) H0640	(2) H0330
1" – 1 1/4"	1 1/4" x 3 1/2"	(2) H0660	(2) H0340



ROD BRACE DETAIL

(CLEVIS TO CLEVIS)

AF0030

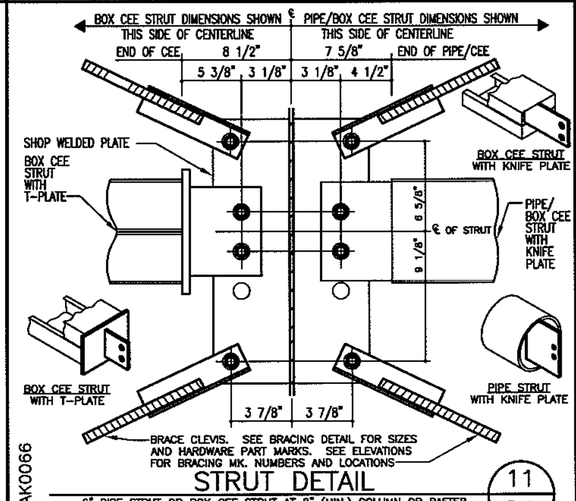


STRUT DETAIL

6" PIPE STRUT OR BOX CEE STRUT AT 8" (MIN.) COLUMN OR RAFTER
NOTE: USE (2) 1" X 3 1/4" A325 BOLTS H0640/NUTS H0330
SEE PLANS & ELEVATIONS FOR MARK NUMBERS AND LOCATIONS

10
D1

AK0060



STRUT DETAIL

6" PIPE STRUT OR BOX CEE STRUT AT 8" (MIN.) COLUMN OR RAFTER
NOTE: USE (2) 1" X 3 1/4" A325 BOLTS H0640/NUTS H0330
SEE PLANS & ELEVATIONS FOR MARK NUMBERS AND LOCATIONS

11
D1

AK0066

RECORD DRAWING

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS–FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM	RAY	9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
BRIGHAM CITY, UT 84302
PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

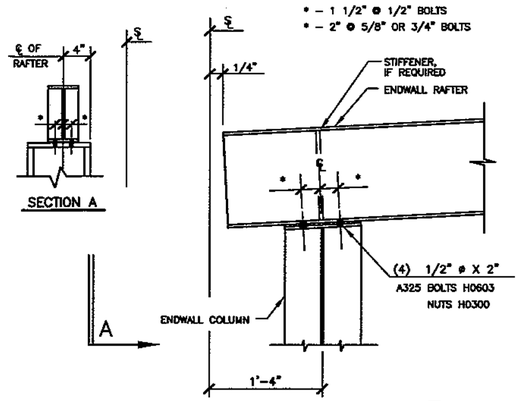
JOB NUMBER: U11R0359A

SHEET NO: D1 of 7

RUSSELL R. SKEEM
STATE OF WASHINGTON
41179
REGISTERED PROFESSIONAL ENGINEER

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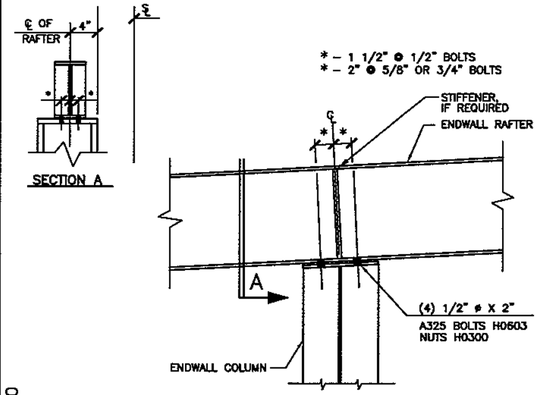
AC0020



EW COL TO RAFTER CONN 1 D2

REFERENCE ERECTOR NOTE FOR TYPICAL WASHER REQUIREMENTS

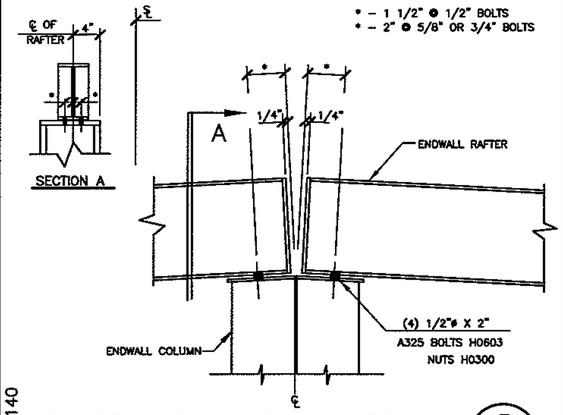
AC0080



EW COL TO RAFTER CONN 2 D2

(CONTINUOUS RAFTER)

AC0140



EW COL TO RIDGE RAF CONN 3 D2

RECORD DRAWING

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS–FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
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PHONE: (435) 919-3100
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PROJECT NAME: B&L WOODWASTE
MILTON, WA

CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: D2 of 7

RUSSELL R. SKEEM
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41179
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PROFESSIONAL ENGINEER

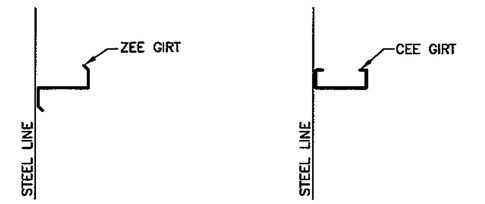
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ERECTOR NOTE:

UNLESS SPECIFICALLY NOTED OTHERWISE, STANDARD ZEE GIRT ORIENTATION IS TO HAVE THE GIRT TOED DOWN AT THE STEEL LINE AS SHOWN IN THE DETAIL BELOW.

UNLESS SPECIFICALLY NOTED OTHERWISE, STANDARD CEE GIRT ORIENTATION IS TO HAVE THE GIRT TOED UP AS SHOWN IN THE DETAIL BELOW. STANDARD CLIP ATTACHMENT IS BELOW THE GIRT, HOWEVER SOME DETAILS REQUIRE THAT THE CLIP BE ABOVE THE GIRT OR THAT THE GIRT BE TOED DOWN.

(REFER TO THE GIRT DETAILS FOR SPECIFIC CONNECTION REQUIREMENTS).

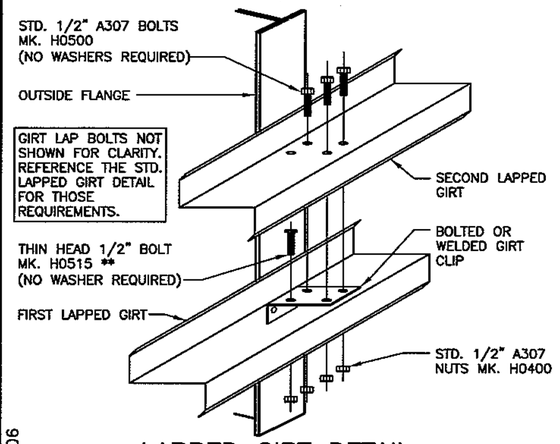


ZEE GIRT ORIENTATION CEE GIRT ORIENTATION

STANDARD GIRT ORIENTATION DETAIL

SEE GIRT DETAILS FOR GIRT CONNECTIONS
(COLUMNS NOT SHOWN)

CC0005

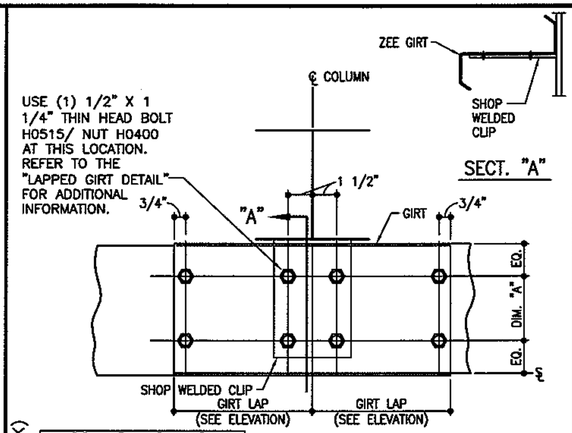


LAPPED GIRT DETAIL

LAPPED GIRTS @ INTERIOR BAY COLUMNS

** THE THIN HEAD 1/2" A307 BOLT MUST BE INSTALLED INTO THE FIRST GIRT AND CLIP OF A LAPPED CONDITION. THE BOLT/NUT ASSEMBLY MUST BE WRENCH TIGHT PRIOR TO THE SECOND LAPPED GIRT BEING INSTALLED.

CC0006



DIM. "A" = 4" AT 8" & 10" GIRTS
= 8" AT 12" GIRTS

SW OR EW GIRT DETAIL

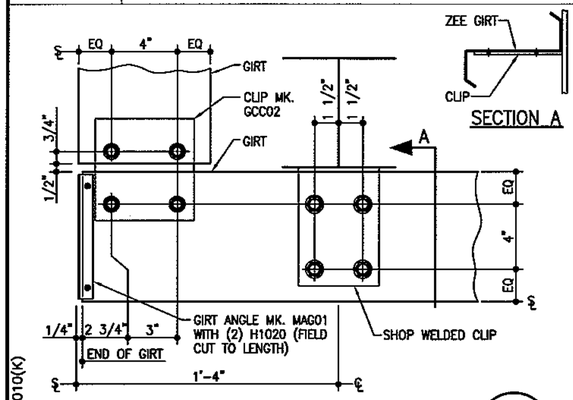
3 / D3

LAPPED BYPASS GIRTS AT INTERIOR BAY COLUMNS
NOTE: USE (7) 1/2"x 1 1/4" A307 BOLTS H0500/NUTS H0400
REFERENCE ERECTOR NOTE FOR TYPICAL WASHER REQUIREMENTS

CC1010(K)

ERECTOR NOTE

GIRT CLIPS ARE FACTORY PUNCHED TO BE USED WITH MULTIPLE GIRT DEPTHS. REFER TO THE STANDARD BOLT PLACEMENT DETAIL(S) FOR PROPER BOLT PLACEMENT.



BYPASS GIRT CORNER DETAIL

4 / D3

LEFT HAND DETAIL SHOWN, RIGHT HAND OPPOSITE
NOTE: USE (8) 1/2" x 1 1/4" A307 BOLTS H0500/NUTS H0400
REFERENCE STANDARD WASHER DETAIL FOR TYPICAL WASHER REQUIREMENTS

CF1010(K)

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD			9/26/11

NUCOR BUILDING SYSTEMS
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PROJECT NAME: B&L WOODWASTE
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CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

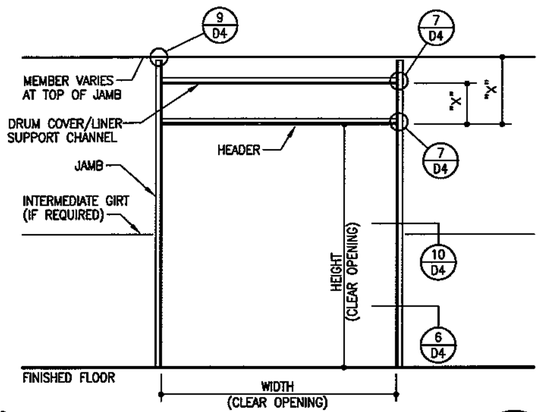
SHEET NO: D3 of 7

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9/26/11

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RECORD DRAWING

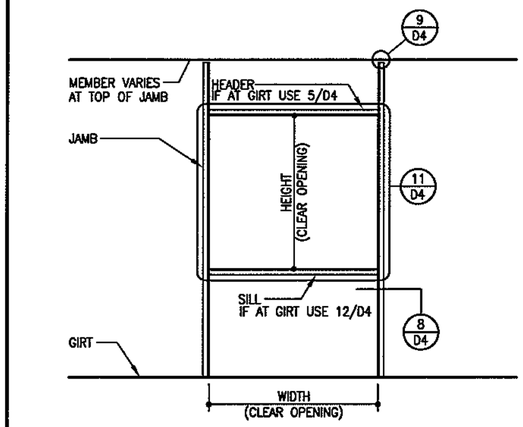
RECORD DRAWING



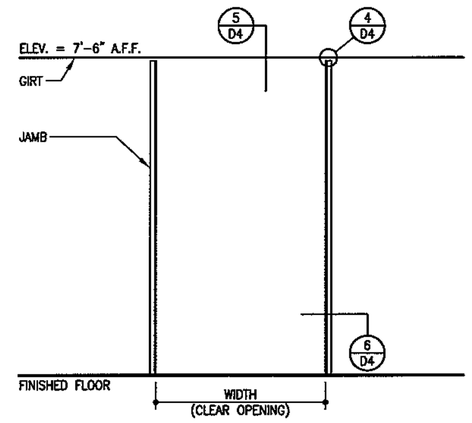
CG0008

ROLL UP DOOR FRAMED OPENING — 1 D4

NOTE: JAMB EXTENSIONS WILL BE SUPPLIED IF DIMENSION "X" IS LESS THAN 3'-0".



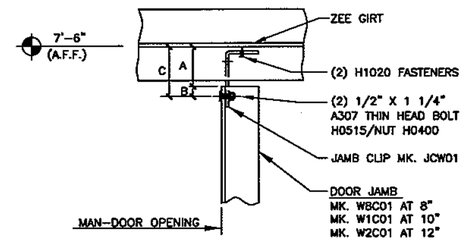
TYPICAL WINDOW/LOUVER FRAMED OPENINGS ABOVE 7'-6" GIRT ELEVATION — 2 D4



CG0004

TYPICAL WALKDOOR FRAMED OPENING — 3 D4

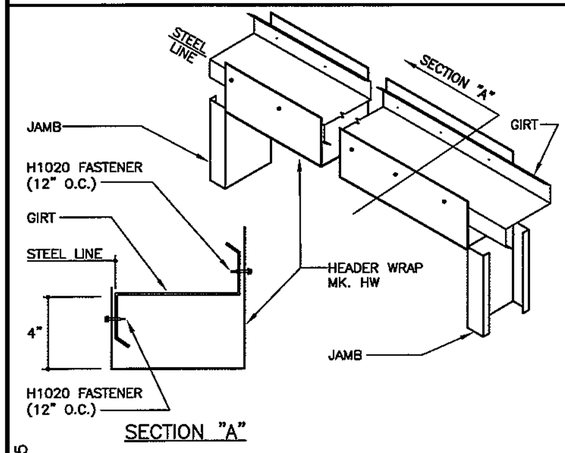
DIM. A= 4" AT 8" & 10" GIRTS
DIM. A= 4-1/4" AT 12" GIRTS
DIM. B= 1" AT 8" & 10" GIRTS
DIM. B= 3/4" AT 12" GIRTS
DIM. C= 5" AT 8" & 10" GIRTS
DIM. C= 5" AT 12" GIRTS



CG0017(8,10,12)

TYPICAL WALKDOOR JAMB DETAIL — 4 D4

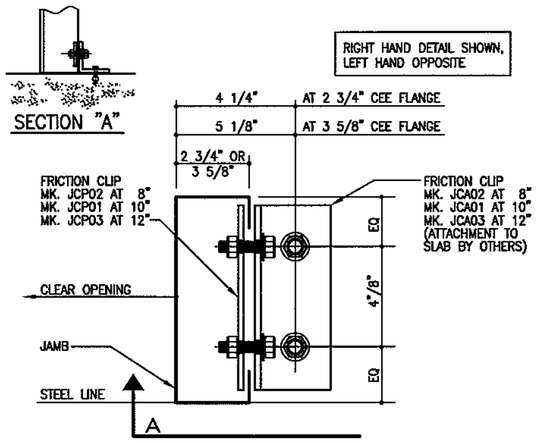
JAMB TO ZEE GIRT WITHOUT INTERMEDIATE GIRT
REFERENCE STANDARD WASHER DETAIL FOR TYPICAL WASHER REQUIREMENTS



SECTION "A"

CG0025

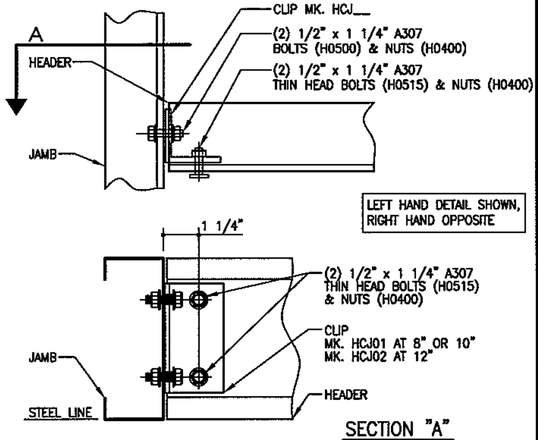
HEADER WRAP DETAIL — 5 D4



CG0030(8,10,12)

JAMB TO FINISHED FLOOR CONNECTION — 6 D4

NOTE: USE (2) 1/2" x 1 1/4" A307 BOLTS H0500/NUTS H0400
REFERENCE STANDARD WASHER DETAIL FOR TYPICAL WASHER REQUIREMENTS



SECTION "A"

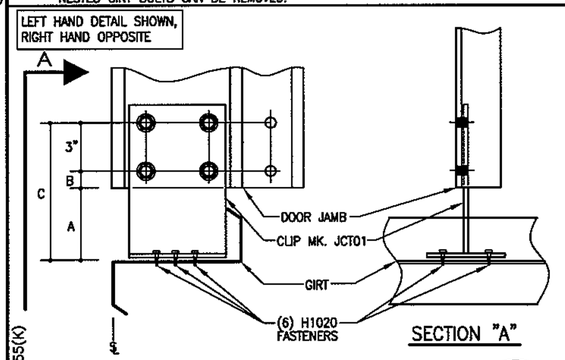
CG0050(8,10,12)

HEADER TO JAMB CONNECTION — 7 D4

NOTE: USE (2) 1/2" x 1 1/4" A307 BOLTS H0500/NUTS H0400
REFERENCE STANDARD WASHER DETAIL FOR TYPICAL WASHER REQUIREMENTS

DIM. A= 4" AT 8" & 10" GIRTS
DIM. A= 4-1/4" AT 12" GIRTS
DIM. B= 1" AT 8" & 10" GIRTS
DIM. B= 3/4" AT 12" GIRTS
DIM. C= 8" AT 8" & 10" GIRTS
DIM. C= 8" AT 12" GIRTS

ERECTOR NOTE:
-PRE-DRILL HOLES AT NESTED ZEE GIRTS & DOUBLE CEE GIRTS IF REQUIRED.
-IF THE T-CLIP IS LOCATED IN THE SAME LOCATION AS NESTED GIRT BOLTS, THE NESTED GIRT BOLTS CAN BE REMOVED.



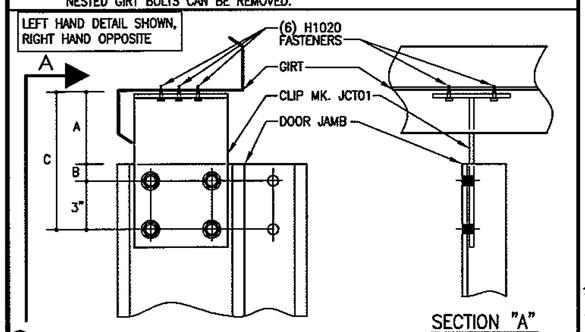
CG0055(K)

JAMB TO GIRT CONNECTION — 8 D4

NOTE: USE (4) 1/2" x 1 1/4" A307 BOLTS H0500/NUTS H0400
REFERENCE STANDARD WASHER DETAIL FOR TYPICAL WASHER REQUIREMENTS

DIM. A= 4" AT 8" & 10" GIRTS
DIM. A= 4-1/4" AT 12" GIRTS
DIM. B= 1" AT 8" & 10" GIRTS
DIM. B= 3/4" AT 12" GIRTS
DIM. C= 8" AT 8" & 10" GIRTS
DIM. C= 8" AT 12" GIRTS

ERECTOR NOTE:
-PRE-DRILL HOLES AT NESTED ZEE GIRTS & DOUBLE CEE GIRTS IF REQUIRED.
-IF THE T-CLIP IS LOCATED IN THE SAME LOCATION AS NESTED GIRT BOLTS, THE NESTED GIRT BOLTS CAN BE REMOVED.

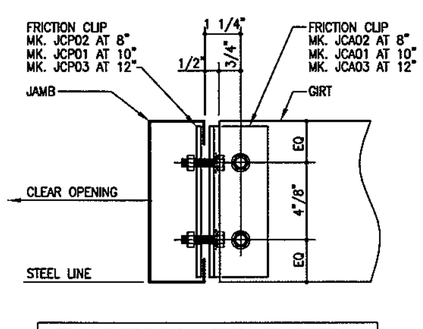


CG0059(K)

DOOR JAMB TO GIRT CONN — 9 D4

NOTE: USE (4) 1/2"X 1 1/4" A307 BOLTS H0500/NUTS H0400
REFERENCE STANDARD WASHER DETAIL FOR TYPICAL WASHER REQUIREMENTS

NOTE:
INSTALL CLIPS ON JAMB BEFORE STANDING JAMB.
USE LEVEL TO ALIGN GIRTS ADJUST CLIP AS REQUIRED.

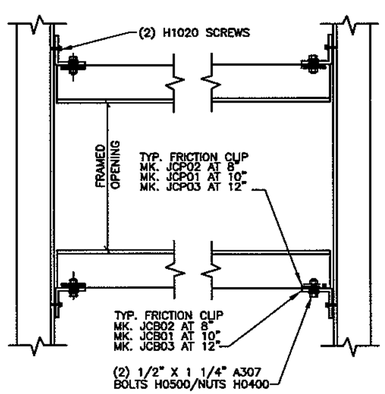


LEFT HAND DETAIL SHOWN, RIGHT HAND OPPOSITE

CG0060(8,10,12)

GIRT TO JAMB CONNECTION — 10 D4

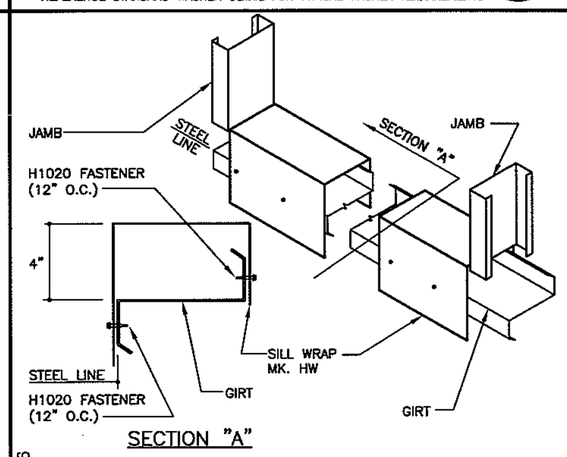
NOTE: USE (4) 1/2" x 1 1/4" A307 BOLTS H0500/NUTS H0400
REFERENCE STANDARD WASHER DETAIL FOR TYPICAL WASHER REQUIREMENTS



CG0053(8,10,12)

FRAMED OPENING DETAIL — 11 D4

SILL & HEADER TO JAMB CONNECTION
REFERENCE ERECTOR NOTE FOR TYPICAL WASHER REQUIREMENTS



SECTION "A"

CG0026

SILL WRAP DETAIL — 12 D4

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/8/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
BRIGHAM CITY, UT 84302
PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

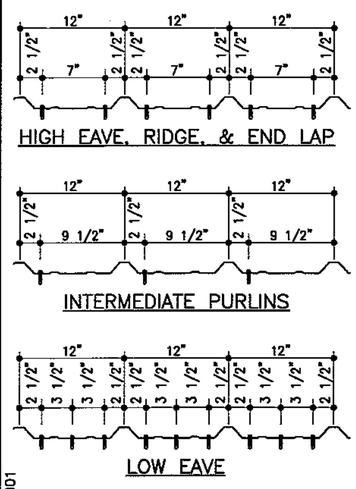
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

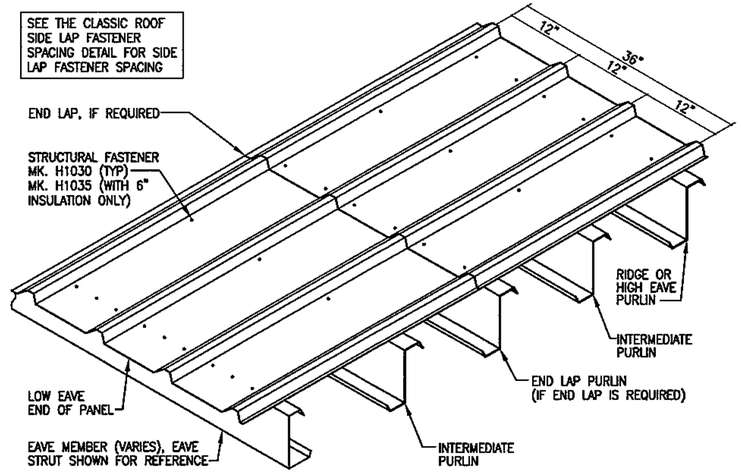
JOB NUMBER: U11R0359A

SHEET NO: D4 of 7

RUSSELL R. SKEEM
STATE OF WASHINGTON
11179
REGISTERED PROFESSIONAL ENGINEER

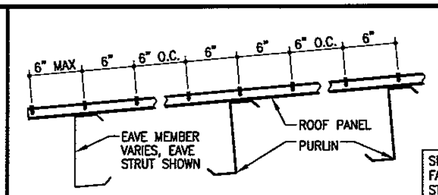
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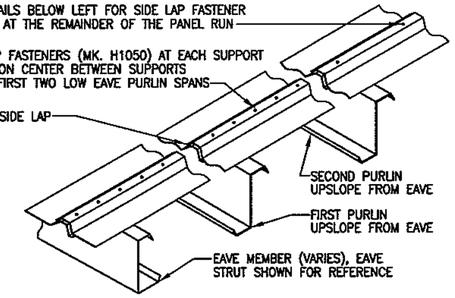
DA0001

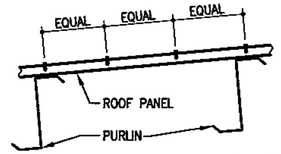
CLASSIC ROOF STRUCTURAL FASTENER SPACING (STANDARD)



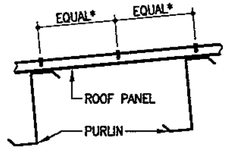
FIRST TWO LOW EAVE SPANS
(EACH SUPPORT AND 6" ON CENTER BETWEEN SUPPORTS)

SEE THE CLASSIC ROOF STRUCTURAL FASTENER SPACING DETAIL FOR STRUCTURAL FASTENER SPACING





SPANS > OR = TO 5'-0"
(EACH SUPPORT AND 1/3 POINTS BETWEEN SUPPORTS)



SPANS LESS THAN 5'-0"

NON-UL 90	EACH SUPPORT AND MIDPOINT BETWEEN SUPPORTS.
UL 90	EACH SUPPORT AND SPACED EQUALLY BETWEEN SUPPORTS. NOT TO EXCEED 20" (1'-8").



SIDE LAP MASTIC DETAIL
(AT FULL LENGTH OF ALL SIDE LAPS)

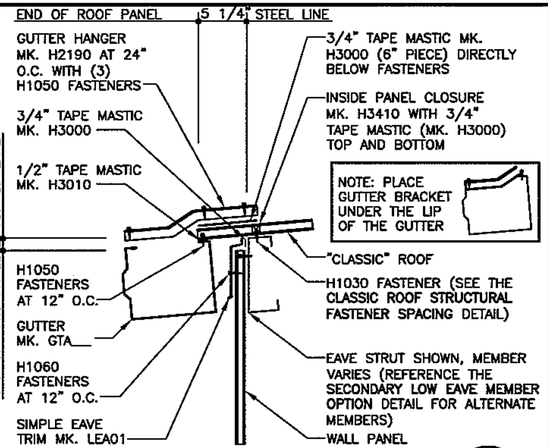
DA0002

CLASSIC ROOF SIDE LAP FASTENER SPACING (STANDARD)

STANDARD FASTENER SCHEDULE

H1000	17-14 x 1 1/4" WITH WASHER SELF TAPPING 3/8"ø HEAD	H1042	12-14 x 7/8" WITHOUT WASHER SELF DRILLING 5/16"ø HEAD	H1070	12-24 x 1 1/2" WITHOUT WASHER SELF DRILLING 3/8"ø HEAD 1/2" THK MAX DRILLING CAPACITY
H1020	1/4-14 x 1 1/4" WITHOUT WASHER SELF DRILLING 3/8"ø HEAD 3/16" THK MAX DRILLING CAPACITY	H1045	12-14 x 2" WITHOUT WASHER SELF DRILLING 5/16"ø HEAD	H1080	11/32" x 1 1/4" WITH WASHER GOOF SCREW SELF TAPPING 3/8"ø HEAD
H1030	12-14 x 1 1/4" WITH WASHER SELF DRILLING 3/8"ø HEAD	H1047	12-14 x 2" WITH WASHER SELF DRILLING 5/16"ø HEAD	H1100	1/8" x 3/16" STAINLESS STEEL BLIND POP RIVET
H1035	12-14 x 1 1/2" WITH WASHER SELF DRILLING 3/8"ø HEAD	H1050	12-14 x 3/4" SHARP POINT WITH WASHER SELF TAPPING 3/8"ø HEAD	H1110	3/8"ø STAINLESS GROMMET FASTENER
H1040	12-14 x 1 1/4" WITHOUT WASHER SELF DRILLING 5/16"ø HEAD	H1060	12-14 x 3/4" SHARP POINT WITHOUT WASHER SELF TAPPING 5/16"ø HEAD	H1220	12-14 x 1" WITHOUT WASHER SELF DRILLING PHILLIPS HEAD
H1041	12-14 x 1 1/4" WITH WASHER SELF DRILLING 5/16"ø HEAD	H1061	12-14 x 3/4" SHARP POINT WITH WASHER SELF TAPPING 5/16"ø HEAD		

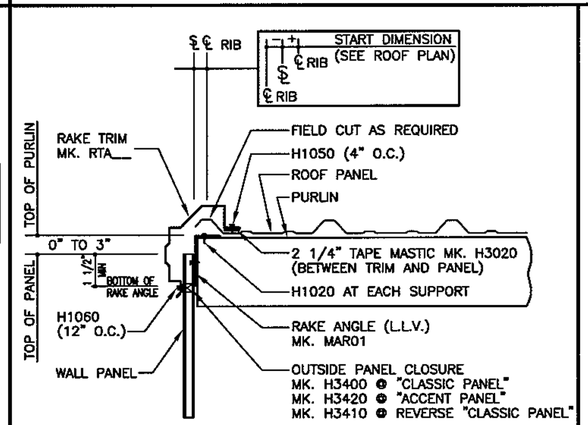
DA00B0



DD0010

EAVE GUTTER DETAIL — 6 / D5

"CLASSIC ROOF"
SEE WALL SHEETING ERECTION NOTES FOR WALL PANEL FASTENER LOCATIONS

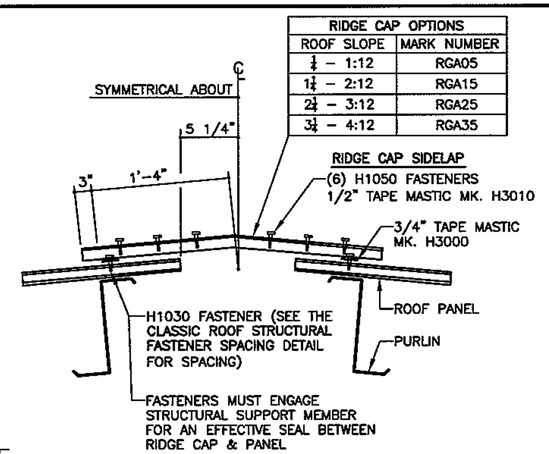


DE0010

SCULPTURED RAKE DETAIL — 7 / D5

"CLASSIC ROOF"
SEE WALL SHEETING ERECTION NOTES FOR WALL PANEL FASTENER LOCATIONS

RIDGE CAP OPTIONS	
ROOF SLOPE	MARK NUMBER
1/4 – 1:12	RGA05
1 1/4 – 2:12	RGA15
2 1/4 – 3:12	RGA25
3 1/4 – 4:12	RGA35



DG0011

RIDGE DETAIL — 8 / D5

"CLASSIC ROOF"
WITH ≤ 60'-0" PANEL RUN AND ≤ 4:12 ROOF SLOPE

RECORD DRAWING

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM	RRS	9/20/11

NUCOR BUILDING SYSTEMS
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PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

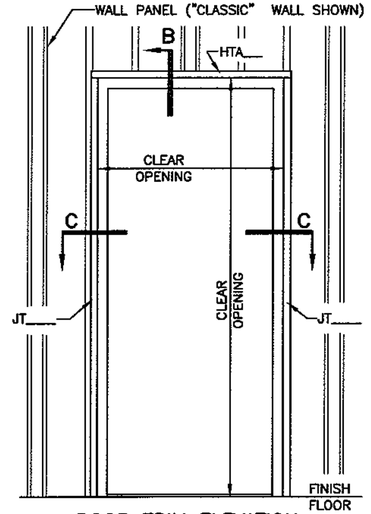
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: D5 of 7

RUSSELL R. SKEEM STATE OF WASHINGTON 41179 REGISTERED PROFESSIONAL ENGINEER

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DOOR TRIM ELEVATION

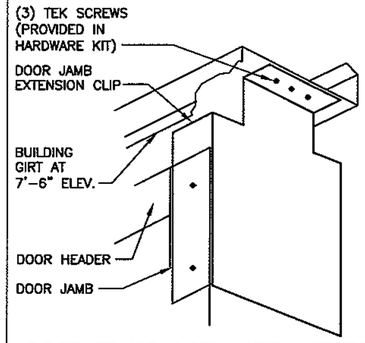
GA0020

KNOCK DOWN DOOR ERECTION DETAILS

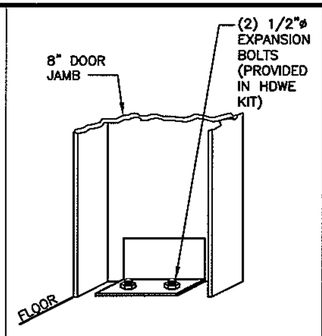
1) USE ONLY WHERE NUCOR KNOCK DOWN DOORS ARE REQUIRED. SEE COVERSHEET (SHEET C1) FOR DOOR REQUIREMENTS.

2) FOLLOW DOOR AND FRAME ASSEMBLY INSTRUCTIONS PACKAGED WITH FRAME KIT.

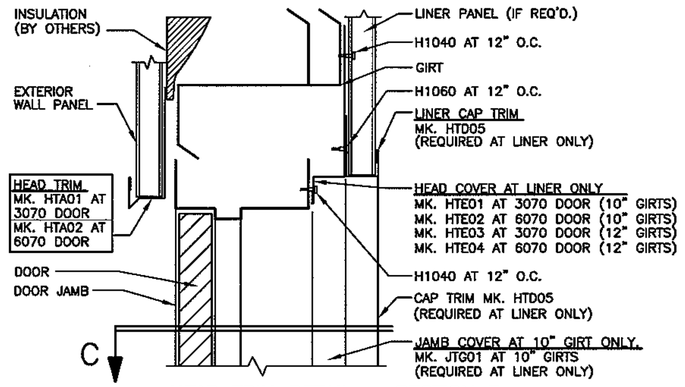
3) HTA___ & JT___ TRIMS ARE FACTORY CUT TO LENGTH.



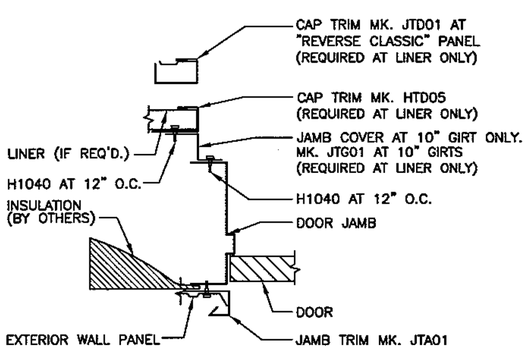
DOOR FRAME INSTALLATION AT TOP



DOOR FRAME INSTALLATION AT BASE

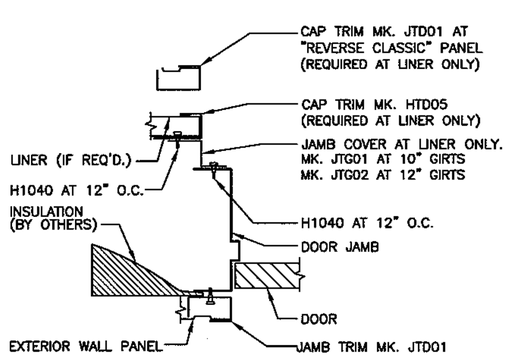


HEAD TRIM DETAIL – SECTION B



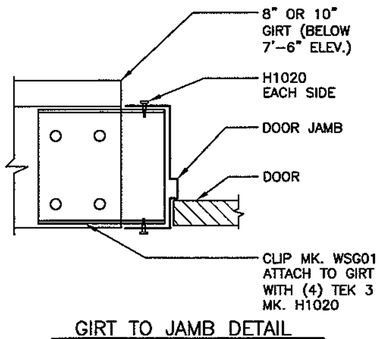
JAMB TRIM DETAIL – SECTION C

"CLASSIC" WALL OR "ACCENT" PANEL WITH "CLASSIC" WALL LINER



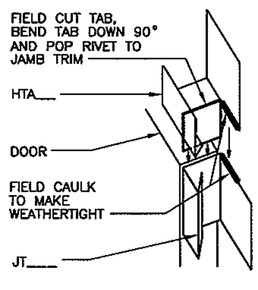
JAMB TRIM DETAIL – SECTION C

"REVERSE CLASSIC" WALL PANEL WITH "CLASSIC" WALL LINER



GIRT TO JAMB DETAIL

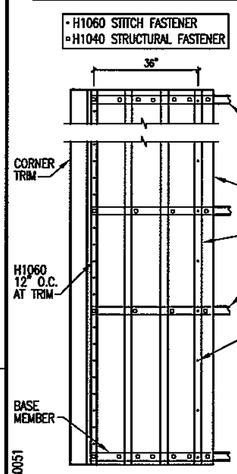
FIELD CUT GIRT TO LENGTH AS REQUIRED.



TRIM CORNER DETAIL

TOP RIGHT CORNER SHOWN

"CLASSIC PANEL" ERECTION NOTES



GA0051

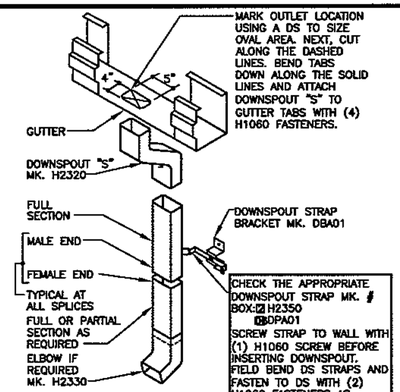
ERECTOR NOTE: 1/2" SIDELAP MASTIC (H3010) IS REQUIRED IN SNOWDRIFT CONDITIONS. REFER TO THE ELEVATIONS FOR LOCATION REQUIREMENTS.

1. BLOCK GIRTS TO "LEVEL" POSITION BEFORE STARTING PANEL ERECTION. MAINTAIN WOOD BLOCKING (NOT BY NUCOR) UNTIL PANEL TO STRUCTURAL FASTENERS ARE INSTALLED.
2. ALIGN AND PLUMB FIRST WALL PANEL.
3. TO PREVENT "OIL-CANNING", ALL PANEL FASTENERS SHOULD START FROM BASE MEMBER AND THEN BE SECURED TO EACH STRUCTURAL GIRT TOWARD THE EAVE.
4. FOUNDATION MUST BE SQUARE, LEVEL AND CORRECT TO THE OUT-TO-OUT STEEL LINE DIMENSIONS.
5. ERECTION CREW IS TO CLEAN ALL WALL PANELS BEFORE LEAVING JOB SITE.
6. ERECTOR IS TO ERECT PANELS SO THAT SIDELAPS ARE AWAY FROM THE MAIN TRAFFIC AREA'S LINE OF SIGHT.
7. STORE PANELS PROPERLY TO PREVENT MOISTURE. SEE ERECTION MANUAL.

USE (4) POP RIVETS MK. H1100 AT ALL ELBOW, "S", AND DOWNSPOUT CONNECTIONS U.N.O.

ERECTOR NOTES:

1. MITERING OF THE "S" WILL BE REQUIRED AT SLOPES OVER 4:12 FOR PROPER LINE UP WITH THE DOWNSPOUT.
2. IF THIS PROJECT CONTRACT SPECIFIES "S" SHAPES AT THE BOTTOM OF THE DOWNSPOUT IN LIEU OF ELBOWS, SEE DETAIL ___/___
3. FIELD WORK (2) ELBOWS AS REQUIRED AT INSET/OUTSET WALL CONDITION.
4. LOCATE DS STRAPS ONE AT EVERY "S", ELBOW AND DS SPLICE.

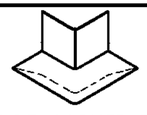


DOWNSPOUT STRAP (MK. # H2350 OR DPA01) AND STRAP BRACKETS (MK. DBA01) ARE ALSO PROVIDED FOR MASONRY WALL APPLICATIONS AS WELL AS FOR ATTACHMENT TO COLUMNS. FASTENERS TO MASONRY ARE NOT PROVIDED BY NUCOR. H1060 FASTENERS ARE PROVIDED FOR COLUMN ATTACHMENT APPLICATIONS, PRE-DRILLING WILL BE REQUIRED.

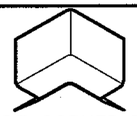
GA0130

STANDARD GUTTER AND DOWNSPOUT DETAIL

REFERENCE GUTTER AND DOWNSPOUT SCHEDULE FOR DOWNSPOUT MARK NUMBERS

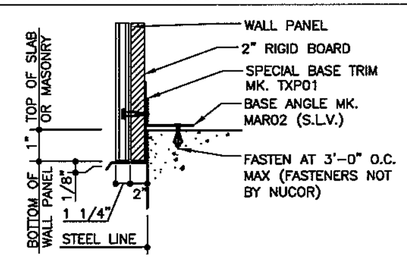


OUTSIDE CORNER TRIM
MK. H4200



INSIDE CORNER TRIM
MK. H4210

ERECTOR NOTE:
UNTIL WALL PANELS ARE INSTALLED, (3) H1040 SCREWS ARE TO BE USED FOR TEMPORARY INSTALLATION OF THE BASE TRIM.



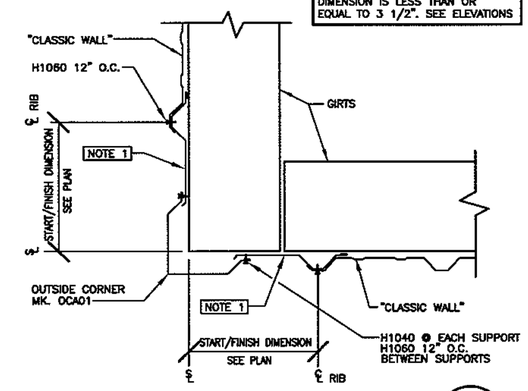
GB0020

SPECIAL BASE TRIM DETAIL

7 / D6

BASE TRIM WITH ANGLE
SEE WALL SHEETING ERECTION NOTES FOR WALL PANEL FASTENER LOCATIONS

NOTE 1
FILLER TRIM MK. MFB01 (SHOWN) IS NOT REQUIRED WHERE START/FINISH DIMENSION IS LESS THAN OR EQUAL TO 3 1/2". SEE ELEVATIONS



GC0021

OUTSIDE CORNER DETAIL

8 / D6

"CLASSIC WALL"

RECORD DRAWING

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM	RRS	9/20/11

NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
BRIGHAM CITY, UT 84302
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FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

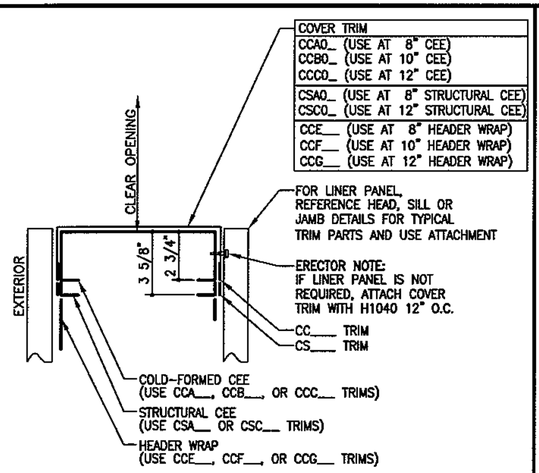
JOB NUMBER: U11R0359A

SHEET NO: D6 of 7

RUSSELL R. SKEEM STATE OF WASHINGTON 41179 REGISTERED PROFESSIONAL ENGINEER

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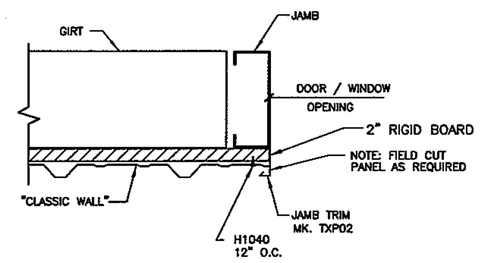
GD0005



FRAMED OPENING COVER TRIM DETAIL

SILL SHOWN, HEAD AND JAMBS SIMILAR

GD0020

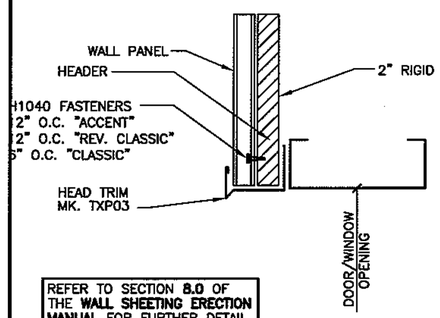


JAMB DETAIL

"CLASSIC WALL"

2 / D7

GD0040



REFER TO SECTION **8.0** OF THE **WALL SHEETING ERECTION MANUAL** FOR FURTHER DETAIL AND PANEL PREPARATION INFORMATION

HEADER DETAIL

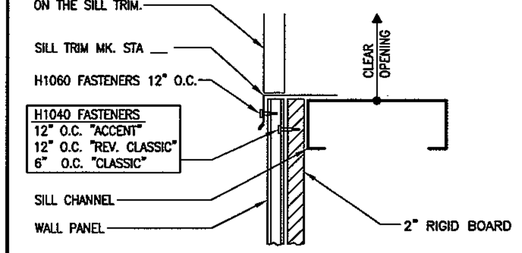
FOR ALL STANDARD WALL PANEL TYPES

3 / D7

GD0070

JAMB TRIM INDICATED BY DASHED LINE. THE SILL TRIM EXTENDS 1" PAST EACH SIDE OF THE OPENING. THE JAMB TRIM THEN RESTS ON THE SILL TRIM.

REFER TO SECTION 8.0 OF THE WALL SHEETING ERECTION MANUAL FOR FURTHER DETAIL AND PANEL PREPARATION INFORMATION



SILL DETAIL

FOR ALL STANDARD WALL PANEL TYPES

4 / D7

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
REV 1 CONST ANCHOR BOLTS	KCN	NDD	ADM	RRS	9/20/11
REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

NUCOR BUILDING SYSTEMS

1050 NO. WATERY LANE
BRIGHAM CITY, UT 84302
PHONE: (435) 919-3100
FAX: (435) 919-3101

PROJECT NAME: B&L WOODWASTE
MILTON, WA

CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

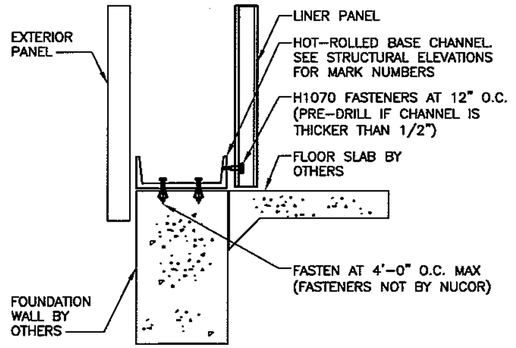
JOB NUMBER: U11R0359A

SHEET NO: D7 of 7

RUSSELL R. SKEEM
STATE OF WASHINGTON
41179
REGISTERED
PROFESSIONAL ENGINEER

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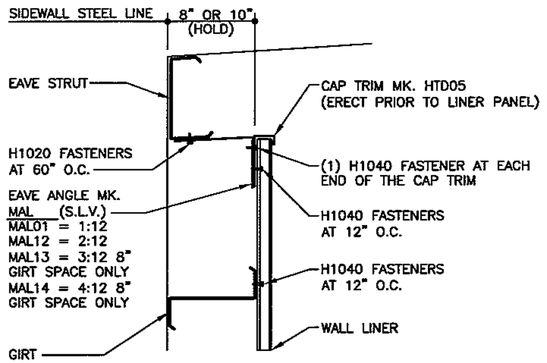
RECORD DRAWING



FINISHED FLOOR BASE DETAIL (1 / D8)

LINER PANEL WITH HOT-ROLLED BASE CHANNEL

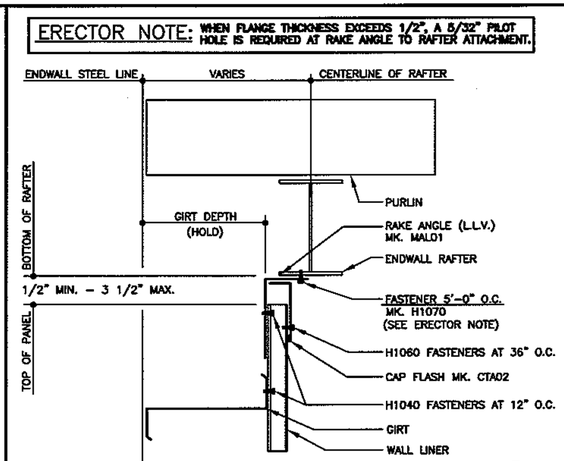
IC0021



LOW EAVE LINER PANEL DETAIL (2 / D8)

FULL HEIGHT LINER (FOR SLOPES <= TO 4:12)

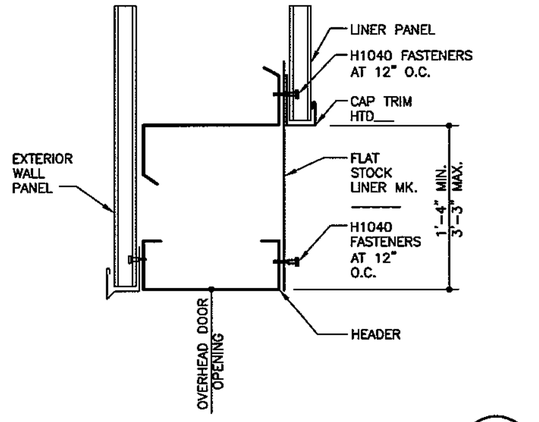
ID0010



LINER PANEL AT RAKE DETAIL (3 / D8)

FULL HEIGHT WALL LINER AT BYPASS ENDWALL GIRTS (POST AND BEAM ENDWALL)

IE0020



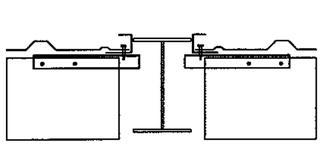
HEADER DETAIL (4 / D8)

AT OVERHEAD DOOR WITH FLAT STOCK LINER

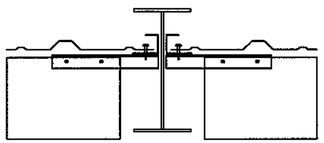
IG0080

ISSUE	DWN	CHK	ENG	P.E.	DATE
ANCHOR BOLTS-FOR CONST.	DEX	JMD	ADM	RRS	8/4/11
FOR BUILDING DEPT. REVIEW	DEX	JMD	ADM	RRS	8/9/11
FINAL ERECTION DRAWINGS	WBB	BKB	ADM	RRS	8/31/11
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REV 1 FOR BLDG DEPT REVIEW	KCN	NDD	ADM		9/20/11

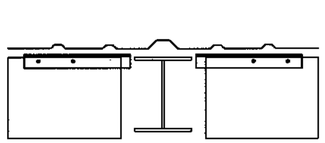
NUCOR BUILDING SYSTEMS
1050 NO. WATERY LANE
BRIGHAM CITY, UT 84302
PHONE: (435) 919-3100
FAX: (435) 919-3101



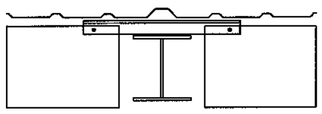
BUILT UP COLUMN
(FLANGE EXTENDS PAST INSIDE FACE OF GIRT)



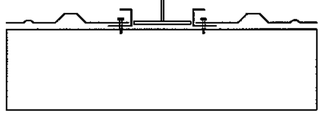
BUILT UP COLUMN
(FLANGE EXTENDS PAST INSIDE FACE OF GIRT)



BUILT UP COLUMN
(FLANGE FLUSH TO INSIDE FACE OF GIRT)



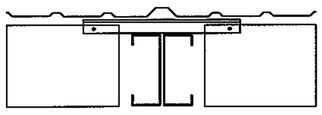
BUILT UP COLUMN
(FLANGE INSET TO INSIDE FACE OF GIRT)



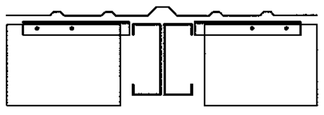
BUILT UP COLUMN OR RAFTER
(GIRT OR PURLIN BYPASSES FRAME)

PARTS LEGEND

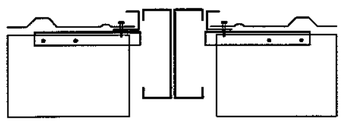
	MAG01 GIRT ANGLE WITH (2) H1020 FASTENERS
	MAG02 GIRT ANGLE WITH (2) H1020 FASTENERS
	HTD___ H1040 EACH SUPPORT, H1060 12" O.C. BETWEEN
	CTA01 CAP TRIM WITH H1100 RIVETS AT 36" O.C.



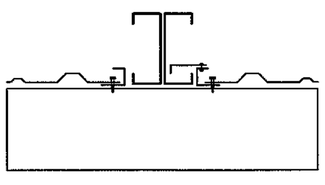
SINGLE OR DOUBLE CEE COLUMN
(FLANGE INSET TO INSIDE FACE OF GIRT)



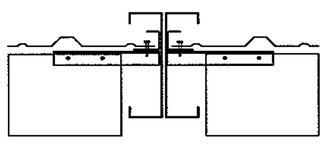
SINGLE OR DOUBLE CEE COLUMN
(FLANGE FLUSH TO INSIDE FACE OF GIRT)



SINGLE OR DOUBLE CEE COLUMN
(FLANGE EXTENDS PAST INSIDE FACE OF GIRT)



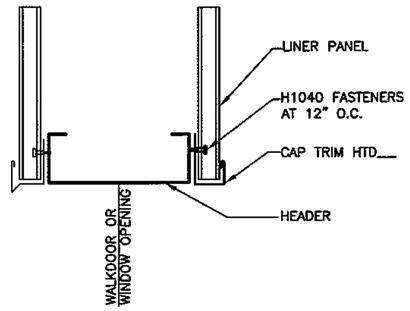
SINGLE CEE COLUMN
(GIRT BYPASSES FRAME)



SINGLE-DOUBLE 12" CEE COLUMN
(FLANGE EXTENDS PAST INSIDE FACE OF GIRT)

"CLASSIC" LINER TERMINATION DETAILS AT INTERMEDIATE COLUMNS (10 / D8)

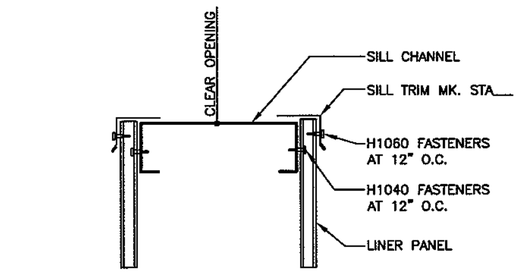
IA0010



HEADER DETAIL (7 / D8)

AT WALKDOOR OR WINDOW WITH LINER PANEL

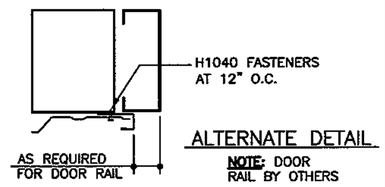
IG0090



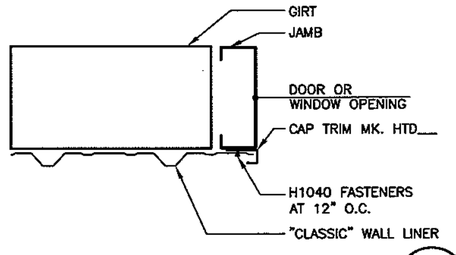
SILL DETAIL (8 / D8)

AT LINER PANEL

IG0100



ALTERNATE DETAIL
NOTE: DOOR RAIL BY OTHERS



JAMB DETAIL (11 / D8)

"CLASSIC" WALL LINER

IG0050

RECORD DRAWING

PROJECT NAME: B&L WOODWASTE
MILTON, WA

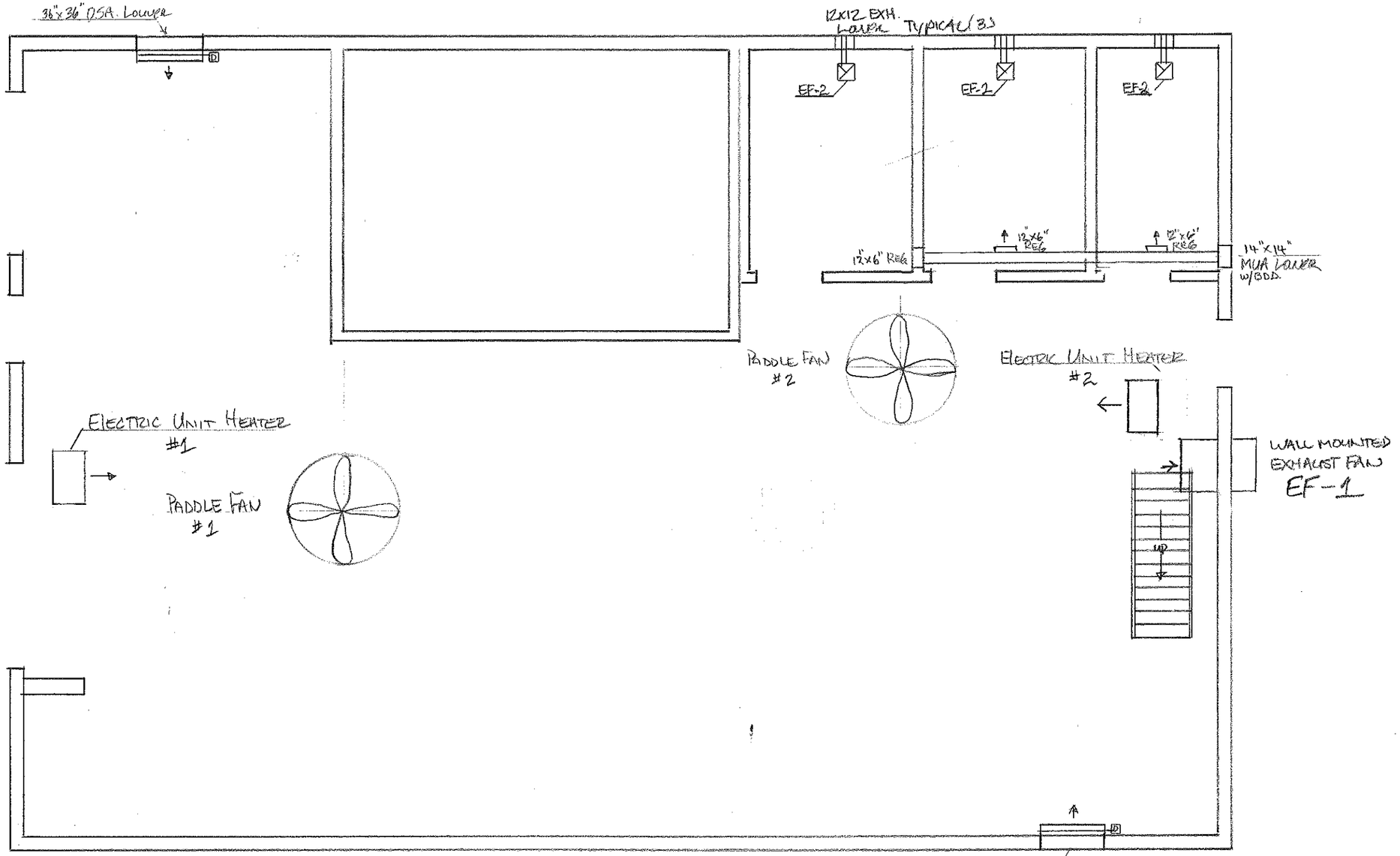
CUSTOMER: T&E INTERNATIONAL
MARYSVILLE, WA

JOB NUMBER: U11R0359A

SHEET NO: D7 of 7

RUSSELL R. SKEEM
STATE OF WASHINGTON
41179
REGISTERED
PROFESSIONAL ENGINEER
9/20/11

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MAIN FLOOR

RECORD DRAWING

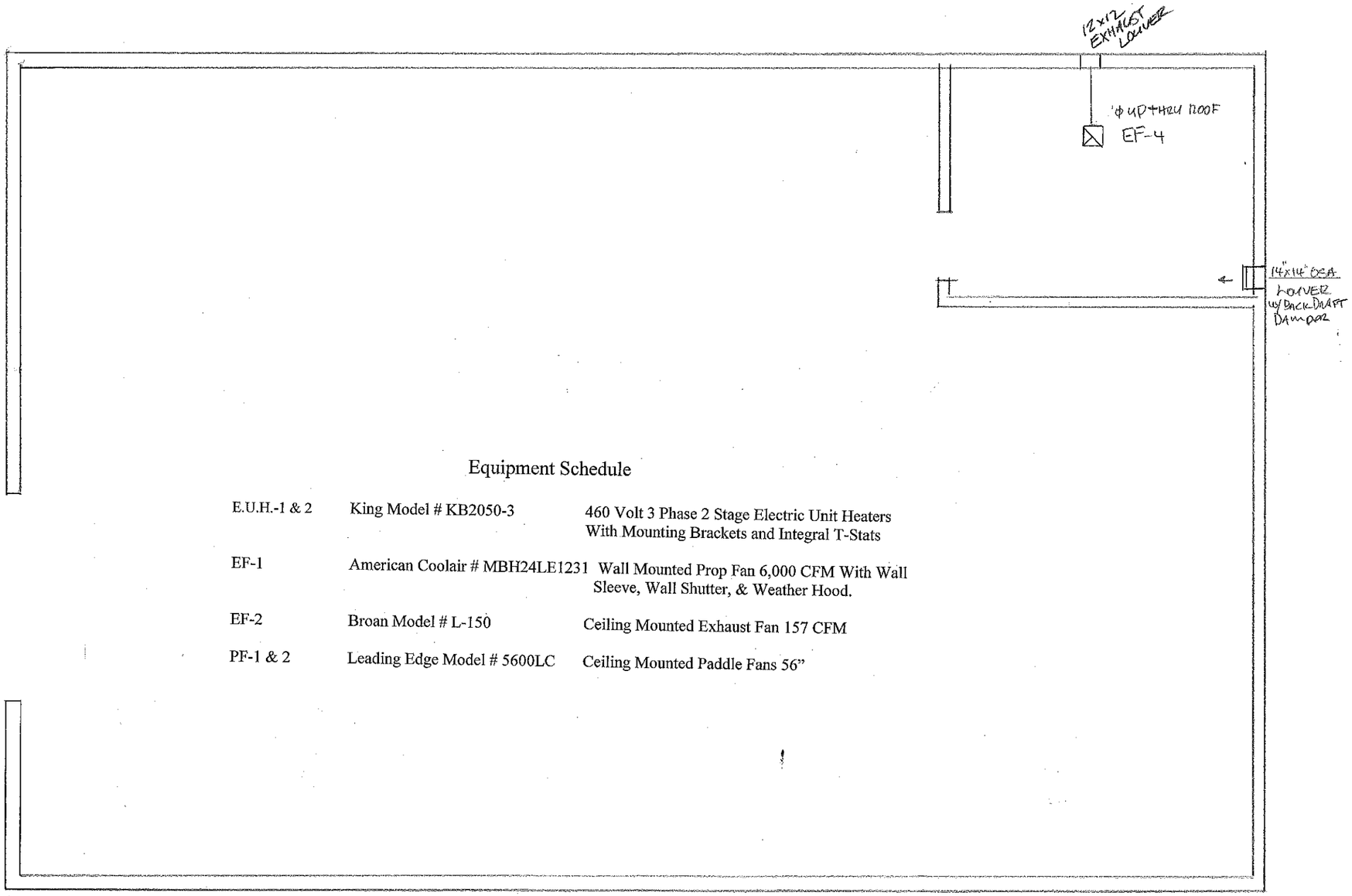
B&L WOODWASTE SITE GROUND WATER TREATMENT PLANT
PIERCE COUNTY, WA.

SCALE: 3/16" = 1'-0"	APPROVED BY:	DRAWN BY KBS.
DATE: 10/24/11		REVISED

EVERGREEN STATE HEAT & AC
2120 PACIFIC
EVERETT, WA. 98201 (LIC.# EVERGSS022OT)

MAIN FLOOR (HVAC PLAN)

DRAWING NUMBER
MECH-1



Equipment Schedule

E.U.H.-1 & 2	King Model # KB2050-3	460 Volt 3 Phase 2 Stage Electric Unit Heaters With Mounting Brackets and Integral T-Stats
EF-1	American Coolair # MBH24LE1231	Wall Mounted Prop Fan 6,000 CFM With Wall Sleeve, Wall Shutter, & Weather Hood.
EF-2	Broan Model # L-150	Ceiling Mounted Exhaust Fan 157 CFM
PF-1 & 2	Leading Edge Model # 5600LC	Ceiling Mounted Paddle Fans 56"

MEZZANINE PLAN

RECORD DRAWING

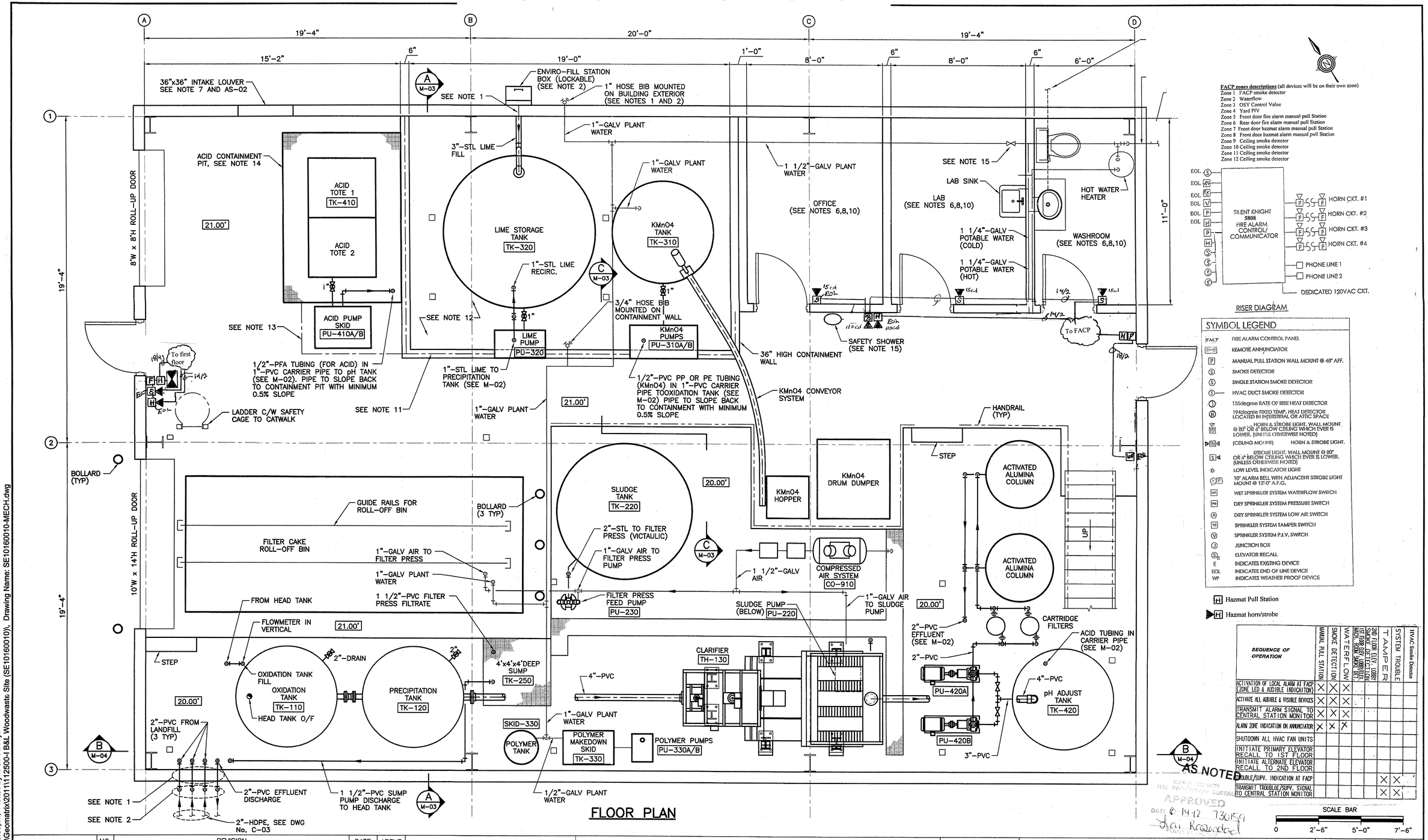
B & L WOODWASTE (GROUND WATER TREATMENT PLANT)
PIERCE, COUNTY. WA.

SCALE: 3/16 = 1'-0"	APPROVED BY:	DRAWN BY K.B.S.
DATE: 10-24-11		REVISED

EVERGREEN STATE HEAT & AC
2120 PACIFIC
EVERETT, WA. 98201 (LIC# EVERGSO22OT)

MEZZANINE (HVAC PLAN) | DRAWING NUMBER: MECH-2

Fire Alarm As-Built



FACP zones descriptions (all devices will be on their own zone)
Zone 1 FACP smoke detector
Zone 2 Waterflow
Zone 3 OSY Control Value
Zone 4 Yard PIV
Zone 5 Front door fire alarm manual pull Station
Zone 6 Rear door fire alarm manual pull Station
Zone 7 Front door hazmat alarm manual pull Station
Zone 8 Front door hazmat alarm manual pull Station
Zone 9 Ceiling smoke detector
Zone 10 Ceiling smoke detector
Zone 11 Ceiling smoke detector
Zone 12 Ceiling smoke detector

RISER DIAGRAM

SYMBOL LEGEND

FACP	FIRE ALARM CONTROL PANEL
ED-05	REMOTE ANNUNCIATOR
P	MANUAL PULL STATION WALL MOUNT @ 48" AFF.
S	SMOKE DETECTOR
S	SINGLE STATION SMOKE DETECTOR
S	HVAC DUCT SMOKE DETECTOR
H	135degree RATE OF RISE HEAT DETECTOR
H	194degree FIXED TEMP. HEAT DETECTOR LOCATED IN INTERSTITIAL OR ATTIC SPACE
F	HORN & STROBE LIGHT, WALL MOUNT @ 80" OR 6" BELOW CEILING WHICH EVER IS LOWER, (UNLESS OTHERWISE NOTED)
F	(CEILING MOUNT) HORN & STROBE LIGHT.
S	STROBE LIGHT, WALL MOUNT @ 80" OR 6" BELOW CEILING WHICH EVER IS LOWER. (UNLESS OTHERWISE NOTED)
	LOW LEVEL INDICATOR LIGHT
F	10" ALARM BELL WITH ADJACENT STROBE LIGHT MOUNT @ 12'-0" A.F.G.
WF	WET SPRINKLER SYSTEM WATERFLOW SWITCH
PS	DRY SPRINKLER SYSTEM PRESSURE SWITCH
A	DRY SPRINKLER SYSTEM LOW AIR SWITCH
TS	SPRINKLER SYSTEM TAMPER SWITCH
V	SPRINKLER SYSTEM P.I.V. SWITCH
J	JUNCTION BOX
E	ELEVATOR RECALL
E	INDICATES EXISTING DEVICE
EOL	INDICATES END OF LINE DEVICE
WP	INDICATES WEATHER PROOF DEVICE

H Hazmat Pull Station

H Hazmat horn/strobe

SEQUENCE OF OPERATION	MANUAL PULL STATION	SMOKE DETECTION	WATERFLOW	1ST FLOOR CITY LOBBY/ELEV. MACH. ROOM SMOKE DET.	2ND FLOOR ELEV. LOBBY SMOKE DETECTION	SYSTEM TROUBLE	TAMPER	HVAC Smoke Detector
ACTIVATION OF LOCAL ALARM AT FACP (ZONE LED & AUDIBLE INDICATION)	X	X	X					
ACTIVATE ALL AUDIBLE & VISIBLE DEVICES	X	X	X					
TRANSMIT ALARM SIGNAL TO CENTRAL STATION MONITOR	X	X	X					
ALARM ZONE INDICATION ON ANNUNCIATOR	X	X	X					
SHUTDOWN ALL HVAC FAN UNITS								
INITIATE PRIMARY ELEVATOR RECALL TO 1ST FLOOR								
INITIATE ALTERNATE ELEVATOR RECALL TO 2ND FLOOR								
TROUBLE/SUPV. INDICATION AT FACP						X	X	
TRANSMIT TROUBLE/SUPV. SIGNAL TO CENTRAL STATION MONITOR						X	X	

AS NOTED

PIERCE COUNTY FIRE PROTECTION BUREAU
APPROVED
DATE 6-14-12 730159
Plans Reviewer

SCALE BAR
0 2'-6" 5'-0" 7'-6"

REFERENCES:	NO.	REVISION	DATE	APRVD
PLANS	1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	–
	2	ISSUED FOR TENDER	05/20/11	WJM
DATUM HORIZONTAL: WASP–NAD83–S FEET VERTICAL: NAVD88 FEET	3	TRANSMITTED TO CONTRACTOR	JLY 13	–

DRAWN PRV
DESIGNED BE
CHECKED GP
REVIEWED WJM

Alarm Communications, Inc.
Prepared By: Ron Murphy (206) 369-5442

GROUNDWATER TREATMENT PLANT
MECHANICAL LAYOUT - FLOOR PLAN

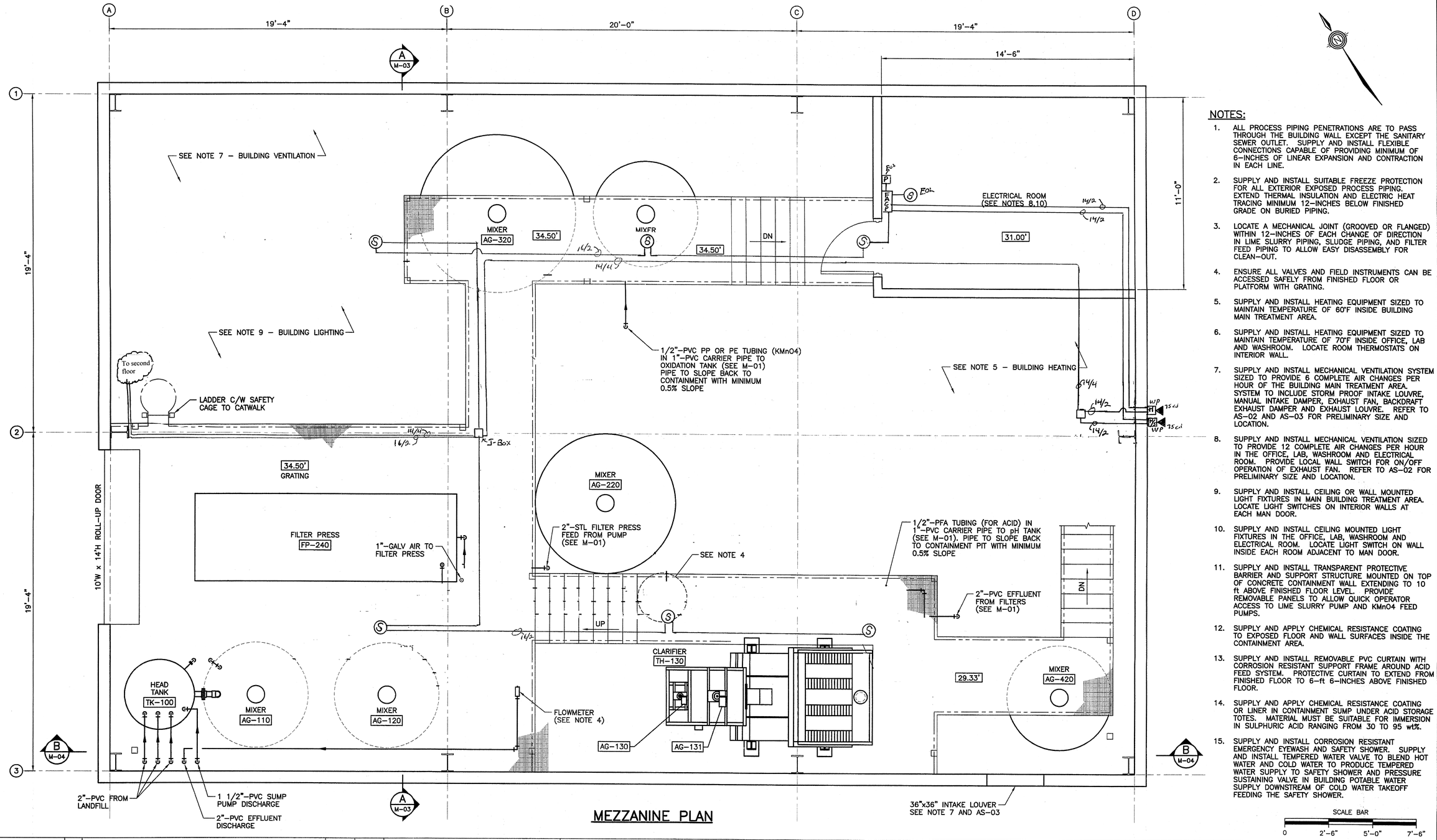
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/15/11
PROJECT NO.: SE10160010

DRAWING M–01

Plot Date: 07/15/11 - 3:50pm, Plotted by: Dell Survey2
Drawing Path: T:\Pete\Geomatrix\2011\112500-I B&L Woodwaste Site (SE10160010)\, Drawing Name: SE10160010-MECH.dwg

Fire Alarm As-Built



MEZZANINE PLAN

NOTES:

1. ALL PROCESS PIPING PENETRATIONS ARE TO PASS THROUGH THE BUILDING WALL EXCEPT THE SANITARY SEWER OUTLET. SUPPLY AND INSTALL FLEXIBLE CONNECTIONS CAPABLE OF PROVIDING MINIMUM OF 6–INCHES OF LINEAR EXPANSION AND CONTRACTION IN EACH LINE.
2. SUPPLY AND INSTALL SUITABLE FREEZE PROTECTION FOR ALL EXTERIOR EXPOSED PROCESS PIPING. EXTEND THERMAL INSULATION AND ELECTRIC HEAT TRACING MINIMUM 12–INCHES BELOW FINISHED GRADE ON BURIED PIPING.
3. LOCATE A MECHANICAL JOINT (GROOVED OR FLANGED) WITHIN 12–INCHES OF EACH CHANGE OF DIRECTION IN LIME SLURRY PIPING, SLUDGE PIPING, AND FILTER FEED PIPING TO ALLOW EASY DISASSEMBLY FOR CLEAN–OUT.
4. ENSURE ALL VALVES AND FIELD INSTRUMENTS CAN BE ACCESSED SAFELY FROM FINISHED FLOOR OR PLATFORM WITH GRATING.
5. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 60°F INSIDE BUILDING MAIN TREATMENT AREA.
6. SUPPLY AND INSTALL HEATING EQUIPMENT SIZED TO MAINTAIN TEMPERATURE OF 70°F INSIDE OFFICE, LAB AND WASHROOM. LOCATE ROOM THERMOSTATS ON INTERIOR WALL.
7. SUPPLY AND INSTALL MECHANICAL VENTILATION SYSTEM SIZED TO PROVIDE 6 COMPLETE AIR CHANGES PER HOUR OF THE BUILDING MAIN TREATMENT AREA. SYSTEM TO INCLUDE STORM PROOF INTAKE LOUVRE, MANUAL INTAKE DAMPER, EXHAUST FAN, BACKDRAFT EXHAUST DAMPER AND EXHAUST LOUVRE. REFER TO AS–02 AND AS–03 FOR PRELIMINARY SIZE AND LOCATION.
8. SUPPLY AND INSTALL MECHANICAL VENTILATION SIZED TO PROVIDE 12 COMPLETE AIR CHANGES PER HOUR IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. PROVIDE LOCAL WALL SWITCH FOR ON/OFF OPERATION OF EXHAUST FAN. REFER TO AS–02 FOR PRELIMINARY SIZE AND LOCATION.
9. SUPPLY AND INSTALL CEILING OR WALL MOUNTED LIGHT FIXTURES IN MAIN BUILDING TREATMENT AREA. LOCATE LIGHT SWITCHES ON INTERIOR WALLS AT EACH MAN DOOR.
10. SUPPLY AND INSTALL CEILING MOUNTED LIGHT FIXTURES IN THE OFFICE, LAB, WASHROOM AND ELECTRICAL ROOM. LOCATE LIGHT SWITCH ON WALL INSIDE EACH ROOM ADJACENT TO MAN DOOR.
11. SUPPLY AND INSTALL TRANSPARENT PROTECTIVE BARRIER AND SUPPORT STRUCTURE MOUNTED ON TOP OF CONCRETE CONTAINMENT WALL EXTENDING TO 10 ft ABOVE FINISHED FLOOR LEVEL. PROVIDE REMOVABLE PANELS TO ALLOW QUICK OPERATOR ACCESS TO LIME SLURRY PUMP AND KMnO4 FEED PUMPS.
12. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING TO EXPOSED FLOOR AND WALL SURFACES INSIDE THE CONTAINMENT AREA.
13. SUPPLY AND INSTALL REMOVABLE PVC CURTAIN WITH CORROSION RESISTANT SUPPORT FRAME AROUND ACID FEED SYSTEM. PROTECTIVE CURTAIN TO EXTEND FROM FINISHED FLOOR TO 6–ft 6–INCHES ABOVE FINISHED FLOOR.
14. SUPPLY AND APPLY CHEMICAL RESISTANCE COATING OR LINER IN CONTAINMENT SUMP UNDER ACID STORAGE TOTES. MATERIAL MUST BE SUITABLE FOR IMMERSION IN SULPHURIC ACID RANGING FROM 30 TO 95 wt%.
15. SUPPLY AND INSTALL CORROSION RESISTANT EMERGENCY EYEWASH AND SAFETY SHOWER. SUPPLY AND INSTALL TEMPERED WATER VALVE TO BLEND HOT WATER AND COLD WATER TO PRODUCE TEMPERED WATER SUPPLY TO SAFETY SHOWER AND PRESSURE SUSTAINING VALVE IN BUILDING POTABLE WATER SUPPLY DOWNSTREAM OF COLD WATER TAKEOFF FEEDING THE SAFETY SHOWER.

SCALE BAR
0 2'–6" 5'–0" 7'–6"

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	–
2	ISSUED FOR TENDER	05/20/11	WJM
3	TRANSMITTED TO CONTRACTOR	JLY 13	–

DRAWN PRV
DESIGNED BE
CHECKED GP
REVIEWED WJM

Alarm Communications, Inc.
Prepared By: Ron Murphy (206) 369-5442

GROUNDWATER TREATMENT PLANT
MECHANICAL LAYOUT - MEZZANINE PLAN

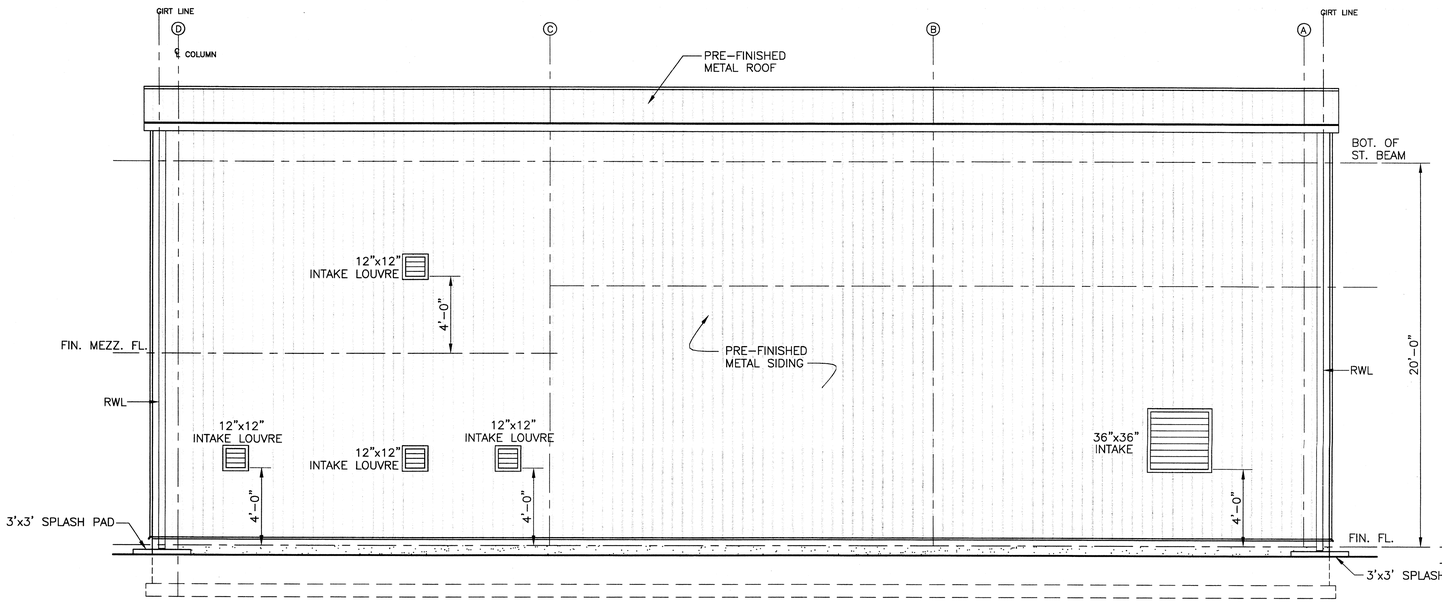
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/15/11
PROJECT NO.: SE10160010

DRAWING M–02

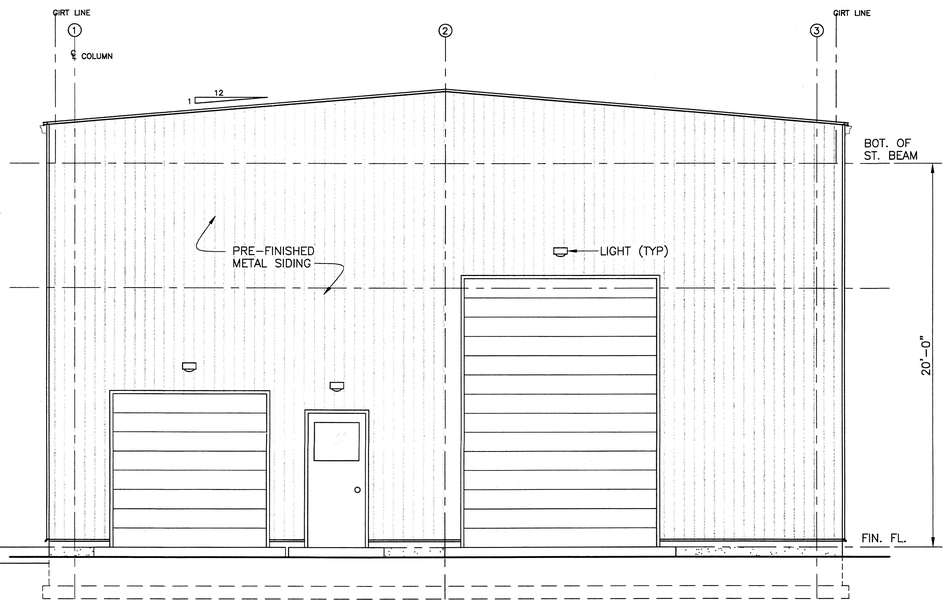
Plot Date: 07/15/11 - 3:50pm, Plotted by: Dell Survey2
Drawing Path: T:\Pete\GeomatrixX2011\112500-I B&L Woodwaste Site (SE10160010), Drawing Name: SE10160010-MECH.dwg

Fire Alarm As-Built



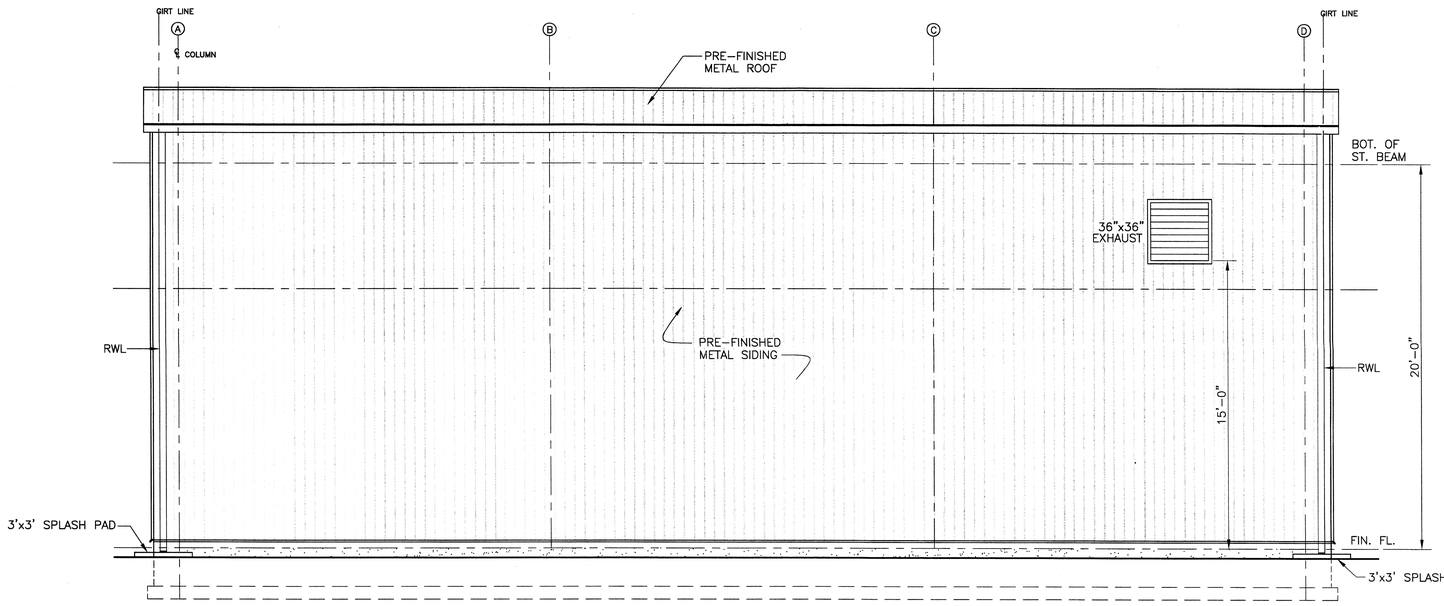
NORTH ELEVATION

SCALE; 1/4" = 1'–0"



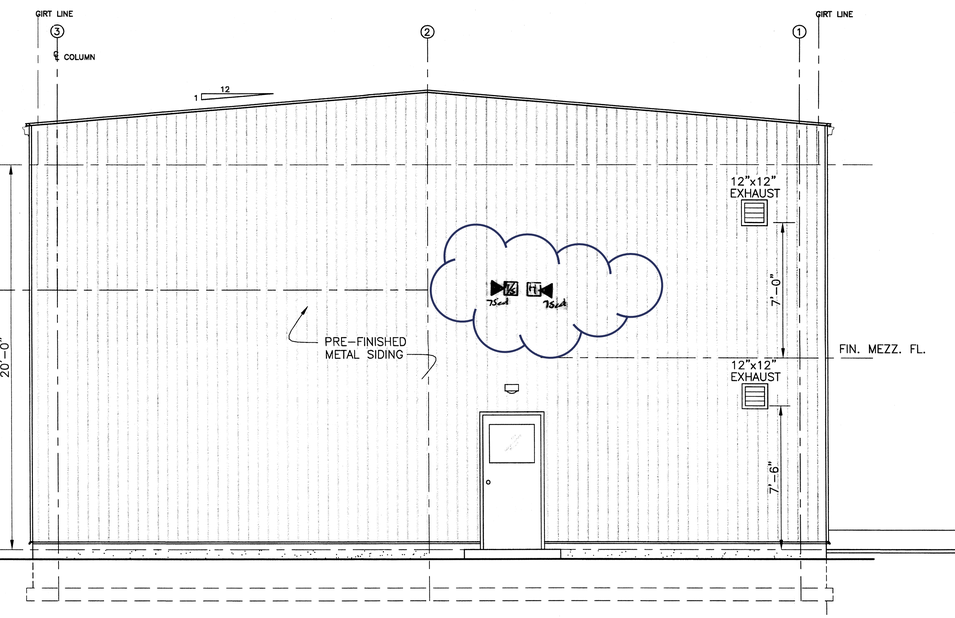
WEST ELEVATION

SCALE; 1/4" = 1'–0"



SOUTH ELEVATION

SCALE; 1/4" = 1'–0"



EAST ELEVATION

SCALE; 1/4" = 1'–0"

NOTE:–

1) DESIGN BUILD CONTRACTOR TO COORDINATE WALL, ROOF, FLOOR AND FOUNDATION PENETRATIONS WITH MECHANICAL, CIVIL, ELECTRICAL, ITC AND VENDOR REQUIREMENTS.

FOR INFORMATION ONLY

DESIGN/BUILD CONTRACTOR TO PROVIDE FINAL DESIGN

SCALE BAR

0 2'–6" 5'–0" 7'–6"

REFERENCES:
PLANS

DATUM
HORIZONTAL:
WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS & SPECIFICATIONS	04/20/11	–
2	TRANSMITTED TO CONTRACTOR	07/13/11	–

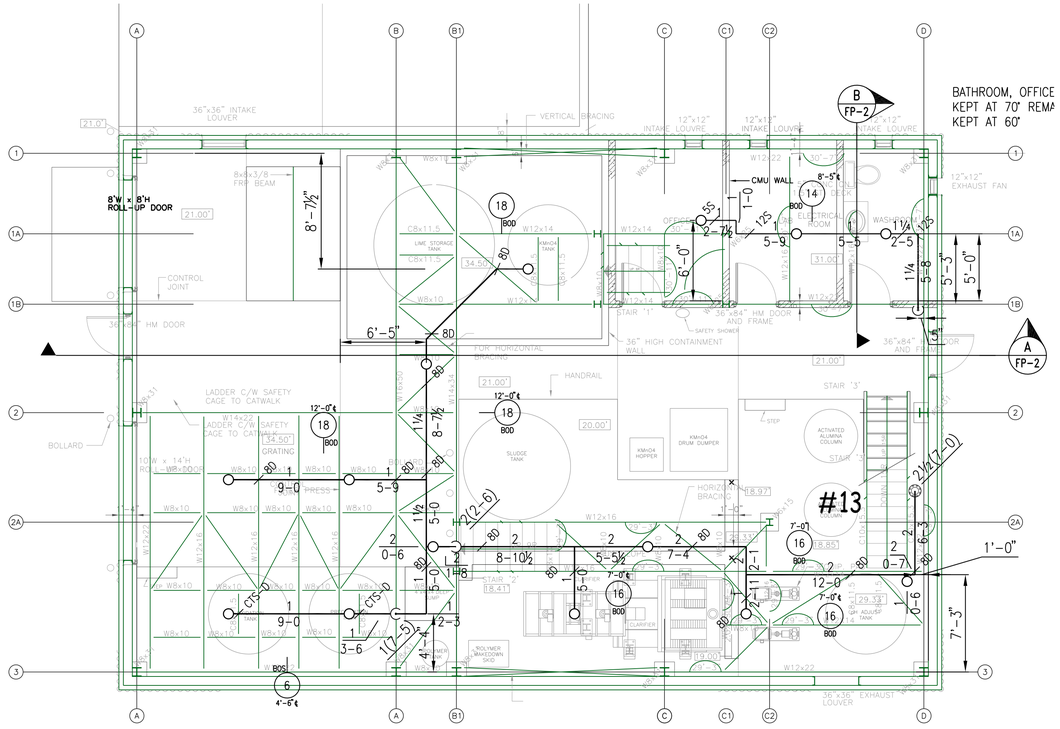
DRAWN YR
DESIGNED YR
CHECKED GP
REVIEWED WJM

AMEC Geomatrix

GROUNDWATER TREATMENT PLANT
ARCHITECTURAL / STRUCTURAL

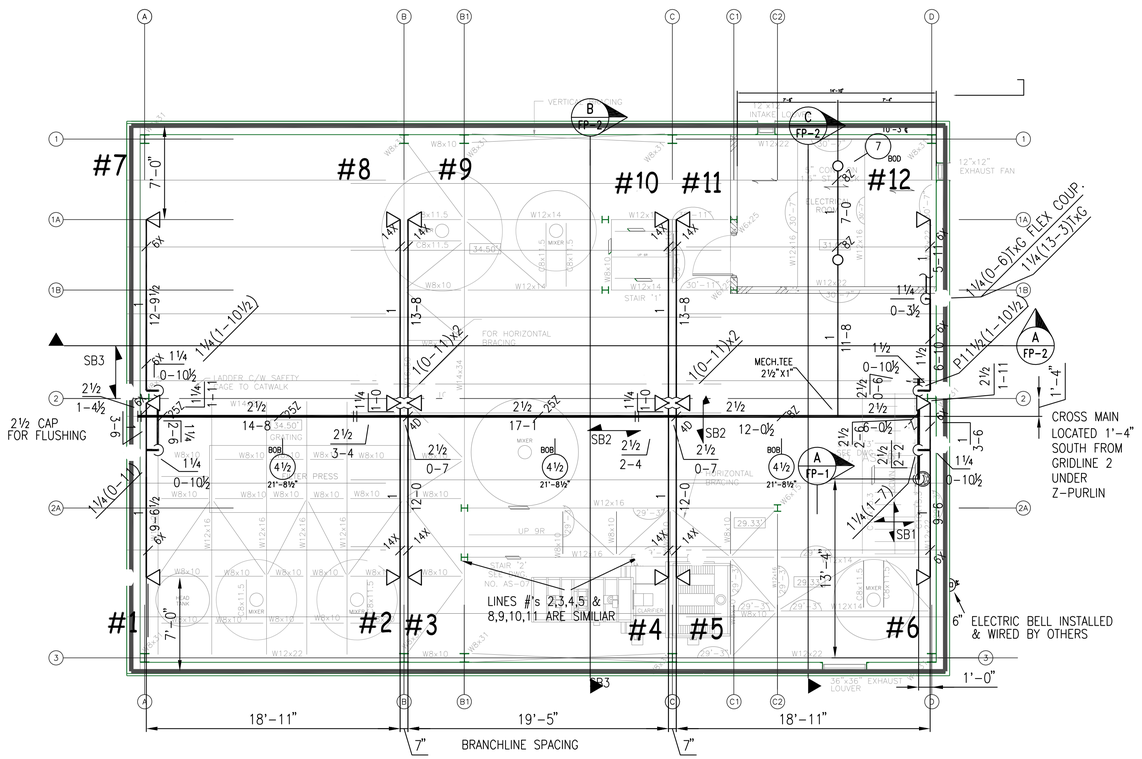
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/05/11
PROJECT NO.: SE10160010
DRAWING AS–04



MEZZANINE SPRINKLER PLAN

SCALE: 3/16"=1'-0"

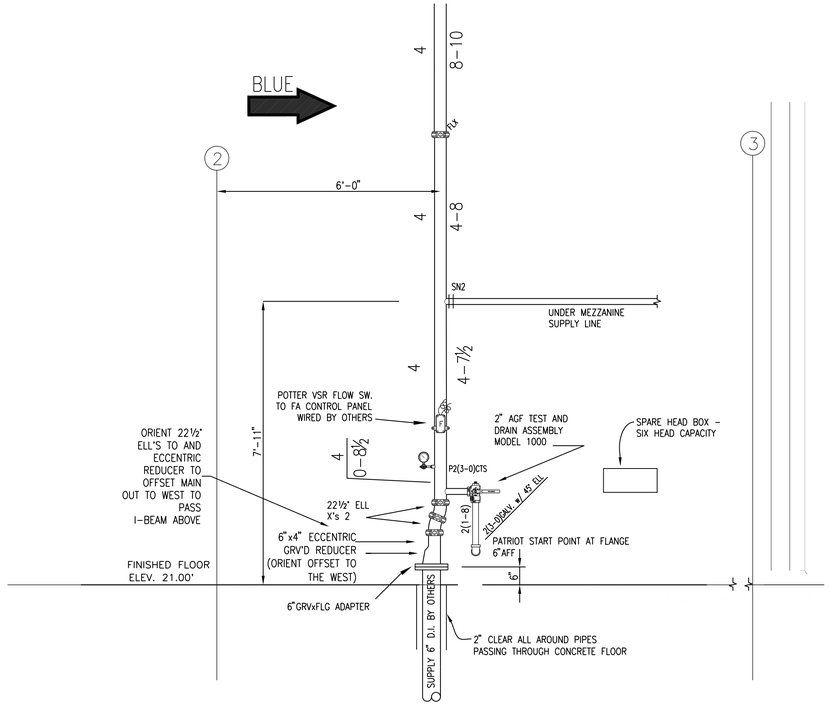


OVERHEAD SPRINKLER PLAN

SCALE: 3/16"=1'-0"

SYMBOLS LEGEND

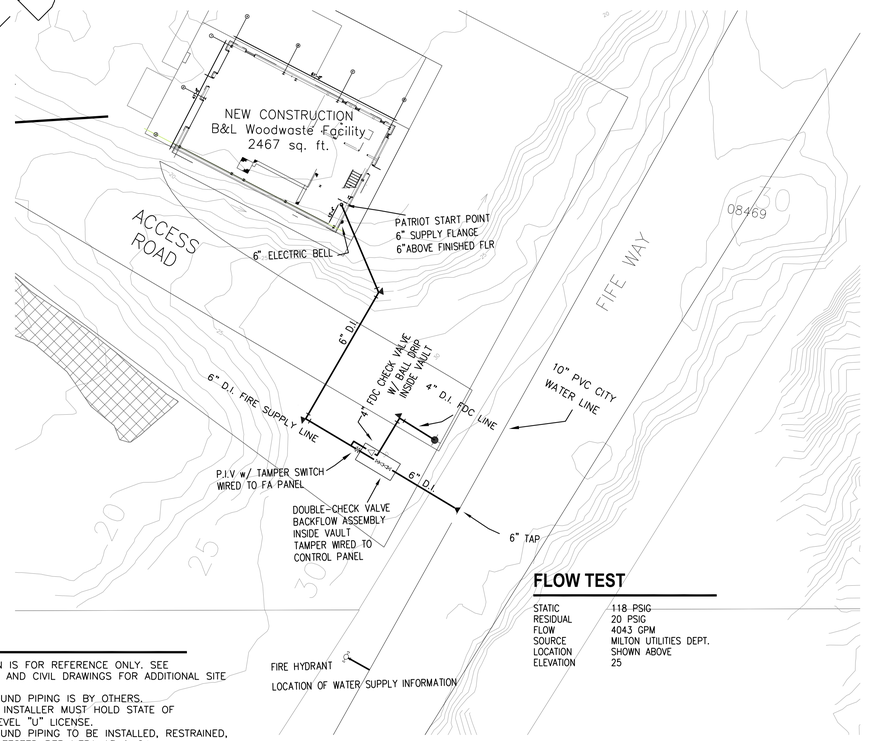
SYMBOL	
10'-0" ℄ / 12 / BOD	DISTANCE FROM STRUCTURE IN INCHES; TO TYPE OF STRUCTURE MEASURED (BOTTOM OF DECK)
10'-1" AFF ℄	DISTANCE FROM CENTERLINE OF PIPE TO FINISHED FLOOR
	4-WAY EARTHQUAKE BRACE SEE DETAIL THIS SHEET
	2-WAY EARTHQUAKE BRACE SEE DETAIL THIS SHEET
2AN	LENGTH AND TYPE (IF NOT TYPICAL)
	HANGER SUPPORT
	PIPE OFFSET DOWN, LEFT TO RIGHT
	PIPE TEE OFFSET DOWN, HORIZ. ON TOP, VERTICAL BELOW
	PIPE OUTLET UP TO ABOVE
10	HYDRAULIC CALCULATION NODE IDENTIFIER



A FP-1 RISER DETAIL

SCALE: ½"=1'-0"

AS-BUILT



FLOW TEST

STATIC	118 PSIG
RESIDUAL	20 PSIG
FLOW	4043 GPM
SOURCE	MILTON UTILITIES DEPT.
LOCATION	SHOWN ABOVE
ELEVATION	25

SITE PLAN

SCALE: 1"=20'

U.G. NOTES

1. THIS SITE PLAN IS FOR REFERENCE ONLY. SEE ARCHITECTURAL AND CIVIL DRAWINGS FOR ADDITIONAL SITE INFORMATION.
2. ALL UNDERGROUND PIPING IS BY OTHERS.
3. UNDERGROUND INSTALLER MUST HOLD STATE OF WASHINGTON LEVEL "U" LICENSE.
4. ALL UNDERGROUND PIPING TO BE INSTALLED, RESTRAINED, FLUSHED, AND TESTED PER NFPA 13 & 24.
5. MINIMUM BURY IS 4'-0".
6. PATRIOT START POINT AT FLANGE INSIDE BUILDING.

HANGER LEGEND

A	"U" HOOK
B	COACH SCREW ROD
D	BM.CLAMP W/ "STRAP
E	EYELET
F	FLUSH SHELL
G	CEILING FLANGE
H	SIDE BEAM BRACKET
K	SHORT CLIP
M	ALL THREAD ROD
N	TOGGLE NUT
P	POWDER DRIVEN STUD
R	EXPANSION BOLT
S	SAMMY EXPRESS
T	
U	
V	
W	
X	BM.CLAMP PARALEL PIPE
Y	
Z	Z-PURLN HANGR (XP-35)

STATE CERTIFICATION

SPRINKLER LEGEND

SPARE STRKS	SPRINKLER ORIFICE SIZES AND TYPE	UPRIGHT	PENDENT	TEE SIZE
½	5/16 3/8 7/16 ½ SPRAY	○	◉	1/2"
		◎	●	1"
¾	17/32 SPRAY	□	▣	3/4"
		▣	■	1"
½	3/8 7/16 ½ SIDEWALL	△	▽	1/2"
		◭	◀	1"
1"	½ DRY TYPE	◇	◈	1"
		◆	◆	1"

2 - WAY EARTHQUAKE BRACE
4 - WAY EARTHQUAKE BRACE
STRUCTURE TO CENTER LINE OF PIPE IN INCHES

TEMP RATING	SPRINKLERS UP AND DOWN	SYMBOL UPRIGHT	SYMBOL DOWNRIGHT
○ 165°	1/2"	◑	◑
◎ 212°	1"	◑	◑
◎ 286°	1/2"	◑	◑
◎ 350°	1"	◑	◑
◎ 500°	1/2"	◑	◑

FITTING LEGEND

P	PIPE-O-LET
F	PLAIN END FIT FITTING
SN	GROOVED SHAPED NIPPLE
TSN	THREADED SHAPED NIPPLE

APPROVAL REQUIRED

PIERCE COUNTY

SPRINKLER HEAD LEGEND

SYM	MANUF	MODEL	TYPE	THREAD SIZE	ORIFICE SIZE	HEAD FINISH	ESCUTCH FINISH	TEMP	QTY
○	RELIABLE	F1FR56	Q.R. UPRIGHT	½"	5.6K	BRONZE	NA	155°	14
◁	RELIABLE	MBEC-14	E.C. SPECIAL APPLCN	¾"	K14	BRONZE	NA	165°	18
							TOTAL		33

QUALITY CONTROL BY	MM	DATE	12/9/11
APPROVED FOR FABRICATION BY		DATE	

GENERAL NOTES

1. ALL MATERIAL AND EQUIPMENT TO BE NEW AND UL LISTED OR FM APPROVED.
2. PIPING DIMENSIONS ARE CENTER TO CENTER EXCEPT RISERS AND DIMENSIONS SHOWN THUSLY (1-6) WHICH ARE END TO END.
3. EARTHQUAKE BRACING SHALL BE PROVIDED IN ACCORDANCE WITH NFPA PAMPHLET NO. 13, 2007 EDITION.
4. PIPE HANGERS AND METHOD OF HANGING TO BE IN ACCORDANCE WITH NFPA PAMPHLET NO. 13, 2007 EDITION.
5. PIPING SHALL BE IN ACCORDANCE WITH NFPA PAMPHLET NO. 13, 2007 EDITION
6. JOINING OF PIPE AND FITTINGS, THREADED & WELDED, SHALL BE IN ACCORDANCE WITH NFPA PAMPHLET NO. 13, 2007 EDITION.
7. OWNER TO PROVIDE ADEQUATE HEAT IN AREAS PROTECTED BY A WET PIPE SPRINKLER SYSTEM TO PREVENT WATER IN PIPES FROM FREEZING.
8. ALL WIRING OF ELECTRICAL DEVICES (IF REQUIRED) TO BE PROVIDED BY OTHERS
9. PAINTING OF PIPE & EQUIPMENT (IF REQUIRED) TO BE PROVIDED BY OTHERS
10. FURRING OF PIPE & EQUIPMENT (IF REQUIRED) TO BE PROVIDED BY OTHERS

DESIGN CRITERIA

BUILDING AND OFFICE SPACES ARE ORDINARY HAZARD GROUP 2 .20 GPM/S.F. OVER REQUIRED AREA.

PIPE NOTES

WET SYSTEM THREADED PIPE IS BLACK SCH. 40
WET SYSTEM WELDED & GROOVED PIPE IS BLACK SCH. 10

REVISIONS

NO	DATE	BY	DESCRIPTION
1	3.7.12	MM	DESIGN AREA = ENTIRE BUILDING W/ 500GPM HOSE ALLOWANCE

CONTRACT WITH:

CLEARCREEK CONTRACTORS
3203 15TH ST
EVERETT, WA, 98201

MARK McCULLOUGH

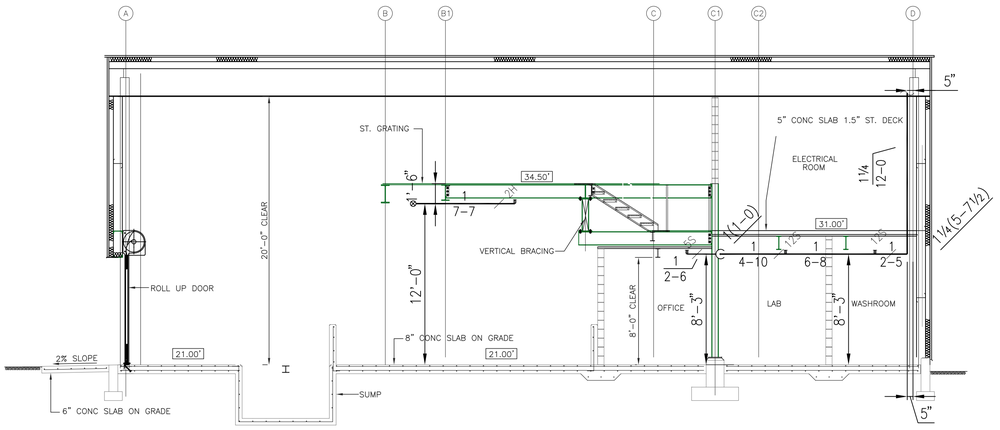
PROJECT NAME:

B&L WOODWASTE FACILITY
NEW CONSTRUCTION SPRINKLER PLAN
FIFE AND PUGET POWER ROAD
TACOMA, WA, 98354

PM: MARK McCULLOUGH
206.423.8120

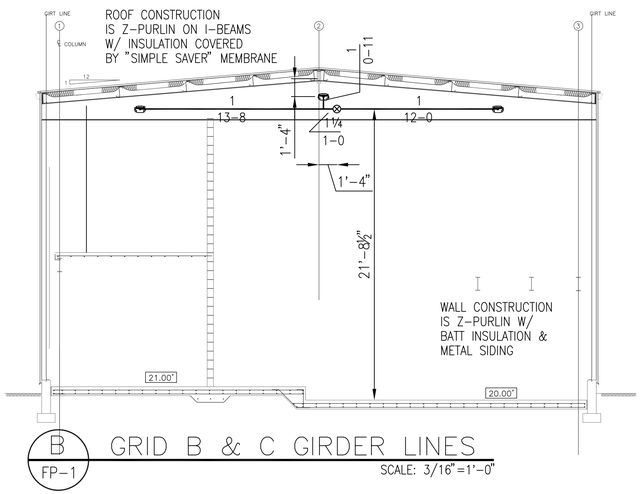
PATRIOT FIRE PROTECTION, INC.
2707 70TH AVENUE EAST
TACOMA, WA 98424
PATRIFP099CF
WWW.PATRIOTFIRE.COM
@patriotfire.com
TEL: (253) 926-2290
FAX: (253) 922-6150

DESIGNER	MANNING	SHEET	FP-1
DATE	3.7.12	1 OF 2	
JOB NO.	11-1820		



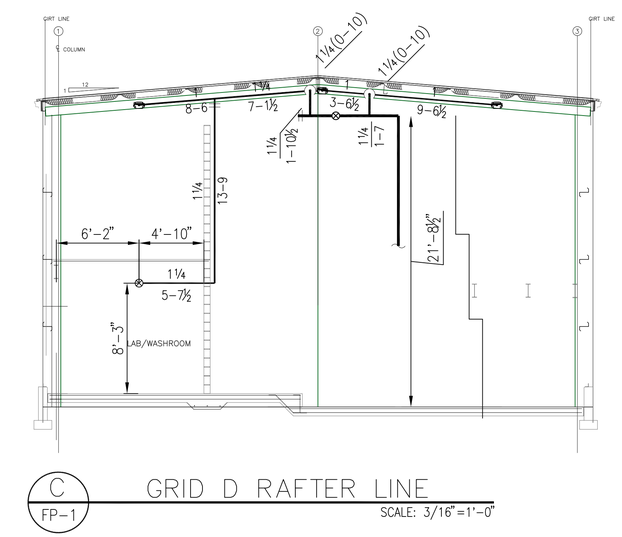
A FP-1 BATH, OFFICE, LAB PIPING

SCALE: 3/16"=1'-0"



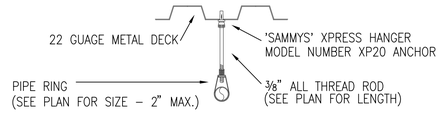
B FP-1 GRID B & C GIRDER LINES

SCALE: 3/16"=1'-0"



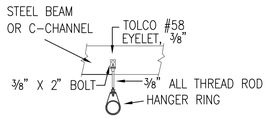
C FP-1 GRID D RAFTER LINE

SCALE: 3/16"=1'-0"



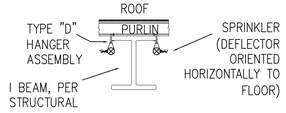
"S" HANGER DETAIL

NO SCALE



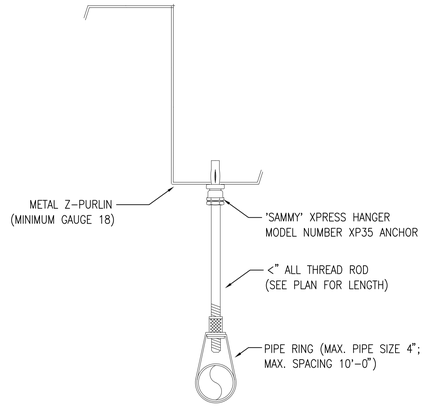
"H" HANGER DETAIL

NO SCALE



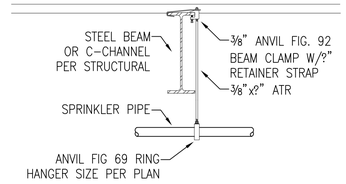
"X" HANGER DETAIL

NO SCALE



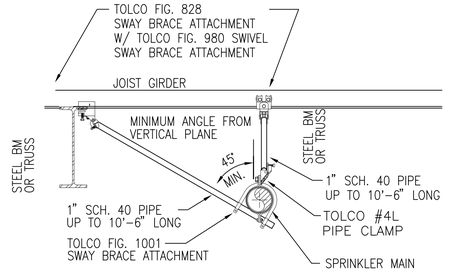
"Z" HANGER DETAIL

NO SCALE

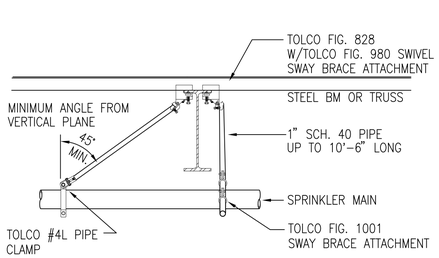


"D" HANGER DETAIL

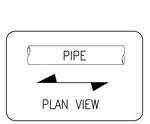
NO SCALE



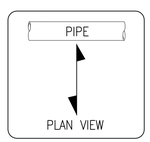
FRONT VIEW



SIDE VIEW



LONGITUDINAL



LATERAL

SWAY BRACE ATTACHMENT DETAIL

NO SCALE

AS-BUILT

HANGER LEGEND

A	"U" HOOK
B	COACH SCREW ROD
D	BM.CLAMP W/ "STRAP
E	EYELET
F	FLUSH SHELL
G	CEILING FLANGE
H	SIDE BEAM BRACKET
K	SHORT CLIP
M	ALL THREAD ROD
N	TOGGLE NUT
P	POWDER DRIVEN STUD
R	EXPANSION BOLT
S	SAMMY EXPRESS
T	
U	
V	
W	
X	BM.CLAMP PARALEL PIPE
Y	
Z	Z-PURLN HANGR(XP-35)

STATE CERTIFICATION

SPRINKLER LEGEND

SPKR SYMBOL	SPRINKLER ORIFICE SIZES AND TYPE		UPRIGHT	PENDENT	TEE SIZE
½"	⅝	⅜ ⅞ 7/16 ½	SPRAY		1/2"
					1"
¾"	17/32		SPRAY		3/4"
					1"
½"	⅜	⅞ 7/16 ½	SIDEWALL		1/2"
					1"
1"	½		DRY TYPE		1"
					1"

2 - WAY EARTHQUAKE BRACE

4 - WAY EARTHQUAKE BRACE

STRUCTURE TO CENTER LINE OF PIPE IN INCHES

TEMP RATING

		SPRINKLERS UP AND DOWN	OPENING UP	SYMBOL	OPENING DOWN
	165°		½"		1"
	212°		1"		1"
	286°		1"		1/2"
	350°		1"		1"
	500°		1/2"		1/2"

FITTING LEGEND

P	PIPE-O-LET
F	PLAIN END FIT FITTING
SN	GROOVED SHAPED NIPPLE
TSN	THREADED SHAPED NIPPLE

APPROVAL REQUIRED

PIERCE COUNTY

SPRINKLER HEAD LEGEND

SYM	MANUF	MODEL	TYPE	THREAD SIZE	ORIFICE SIZE	HEAD FINISH	ESCUTCH FINISH	TEMP	QTY
								TOTAL	

QUALITY CONTROL BY DATE

APPROVED FOR FABRICATION BY DATE

GENERAL NOTES

1. ALL MATERIAL AND EQUIPMENT TO BE NEW AND UL LISTED OR FM APPROVED.
2. PIPING DIMENSIONS ARE CENTER TO CENTER EXCEPT RISERS AND DIMENSIONS SHOWN THUSLY (1-6) WHICH ARE END TO END.
3. EARTHQUAKE BRACING SHALL BE PROVIDED IN ACCORDANCE WITH NFPA PAMPHLET NO. 13, **2007** EDITION.
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7. OWNER TO PROVIDE ADEQUATE HEAT IN AREAS PROTECTED BY A WET PIPE SPRINKLER SYSTEM TO PREVENT WATER IN PIPES FROM FREEZING.
8. ALL WIRING OF ELECTRICAL DEVICES (IF REQUIRED) TO BE PROVIDED BY ___**OTHERS**___
9. PAINTING OF PIPE & EQUIPMENT (IF REQUIRED) TO BE PROVIDED BY ___**OTHERS**___
10. FURRING OF PIPE & EQUIPMENT (IF REQUIRED) TO BE PROVIDED BY ___**OTHERS**___

DESIGN CRITERIA

BUILDING AND OFFICE SPACES ARE ORDINARY HAZARD GROUP 2
.20 GPM/S.F. OVER REQUIRED AREA.

PIPE NOTES

WET SYSTEM THREADED PIPE IS BLACK SCH. 40
WET SYSTEM WELDED & GROOVED PIPE IS BLACK SCH. 10

REVISIONS

NO	DATE	BY	DESCRIPTION
1	3.7.12	MAW	DESIGN AREA = ENTIRE BUILDING W/ 500GPM HOSE ALLOWANCE

CONTRACT WITH:

CLEARCREEK CONTRACTORS
3203 15TH ST
EVERETT, WA, 98201

MARK McCULLOUGH

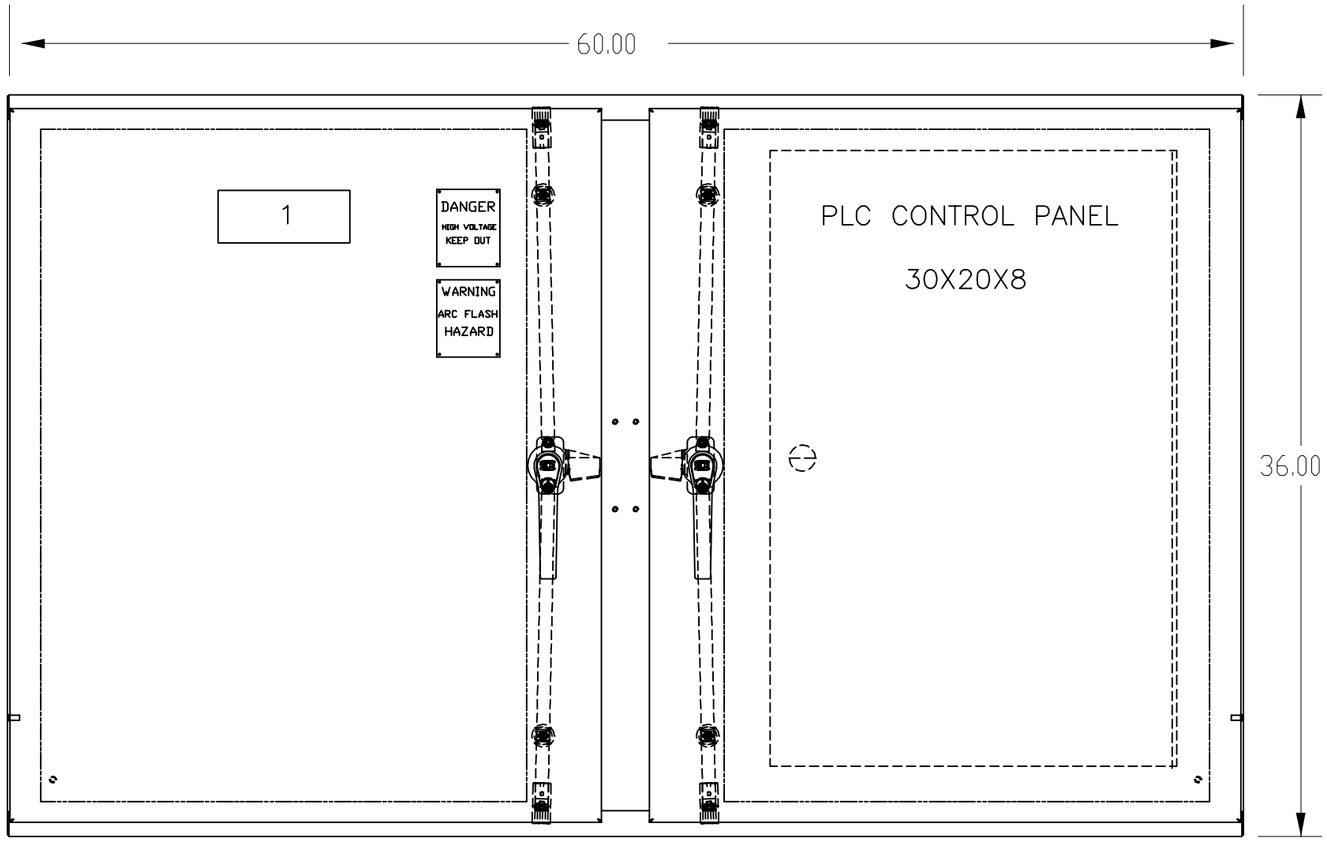
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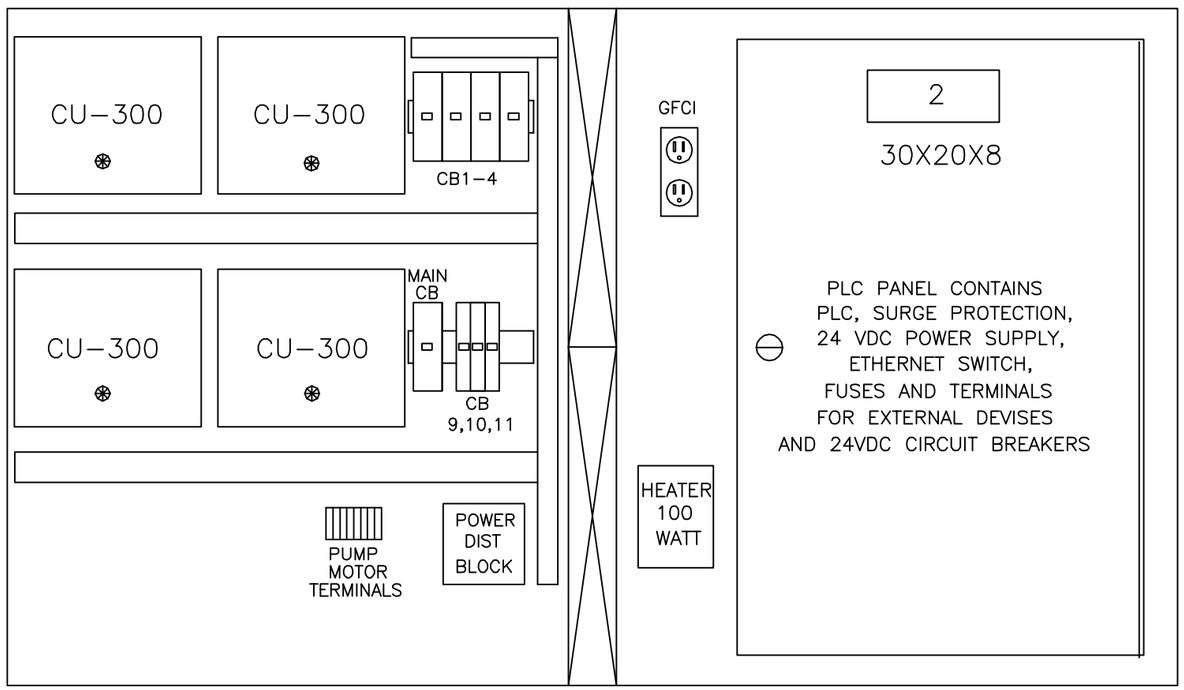
B&L WOODWASTE FACILITY
NEW CONSTRUCTION SPRINKLER PLAN
FIFE AND PUGET POWER ROAD
TACOMA, WA, 98354

PM: MARK McCULLOUGH
206.423.8120

PATRIOT FIRE PROTECTION, INC.
2707 70TH AVENUE EAST
TACOMA, WA 98424
TEL: (253) 926-2290
FAX: (253) 922-6150
PATRIFP099CF
WWW.PATRIOTFIRE.COM
@patriotfire.com

DESIGNER	MANNING/METZGER	SHEET	FP-2
DATE	3.7.12	2 OF 2	
JOB NO.	11-1820		





LIST OF MATERIALS

	ITEM	QTY	DESCRIPTION			MFGR.
	ENC	1	ENCLOSURE		SCE-36EL6012SSWFLP	SAGINAW
	PAN	1	BACKPAN		SCE-60P36	SAGINAW
	MB	1	MAIN BREAKER	30A	60149	SQD
*	PC	4	PUMP CONTROLLER		CU-300	GRUNDFOS
	PB	1	POWER BLOCK		CB-1423570	BUSS
	CB1-4	4	PUMP CB	10A	60144	SQD
	CB5	1	OUTLET CB	15A	60112	SQD
	CB6-10	4	CONTROL CB	2A	60103	SQD
	SP	1	SURGE PROTECTOR		AGSHWCH120NO5XS	AEGIS
	PS	1	24V POWER SUPPLY		PS5R-SE24	IDEC
	ES	1	ETHERNET SWITCH		2891411	PHOENIX
	CR1-4	4	SLAVE RELAYS		RH2BULDC24V	IDEC
	CR1-4	4	RELAY SOCKET		SH2B-05	IDEC
	ENC	1	PLC ENCLOSURE		CSD30208	HOFFMAN
	HEATER	1	KIOSK HEATER		DAHI001A	HOFFMAN
	OUTLET	1	KIOSK OUTLET		7599-W	LEVITON
	CB11	1	SURGE PROTECTOR CB	5A	6106	SQD
			FLEX I/O PLC SYSTEM			
		1	E/IP ADAPTER		1794-AENT	AB
		2	1794-IE8		ANALOG IN CARD	AB
		1	1794-OB32		DIGITAL OUT	AB
		1	1794OE4		ANALOG OUT	AB
		1	1794-IB32		DIGITAL IN	AB
		2	1794-TB2		TERMINAL	AB
		2	1794-TB32		TERMINAL	AB
	FU1-10	12	FUSED TERMINALS		115.663.23	ENT
	FU1-10	10	FUSES		GMA-100-R	BUSS
	TERMS	20	TERMINALS		115.118.11	ENT
		12	GROUND TERMS		165.114.17	ENT

* SUPPLIED BY CUSTOMER

NAMEPLATES

1) KIOSK # 1 CONTROL PANEL
2) PLC CONTROL PANEL

AS-IN FIELD

NOTES

- ⊛ NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- ⊙ TERMINAL INTERNAL TO PANEL.
- ___ DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

SCALE: NONE	PREV. REV:	DRAWN BY: MJ
DATE: 29DEC2011	PAGE:	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
KIOSK #1 ENCLOSURE DRAWING

DOOR,PAN LAYOUT AND PARTS LIST

DRAWING: 3633-1C

230VAC 1Ø 60HZ 3WIRE

TO MAIN DISTRIBUTION PANEL 30 AMP

A
B
N

POWER BLOCK

MAIN BREAKER 30A

A1
B1

CB5 15A
CB6 2A
CB11 5A

A2
A3
38

GFCI OUTLET
ENCLOSURE HEATER

SURGE PROTECTOR AEGIS FILTER
L N G
GND
SPN
SPL

24VDC POWER SUPPLY IDEC PS5R-SE24 3.75 AMPS
L N G
+ -

24VDC BREAKERS
+24
CB7 2A
CB8 2A
CB9 2A
CB10 2A

FIBER TO MAIN PLC PANEL
TX
RX
PHOENIX ETHERNET SWITCH
US GN FG FG
CAT-5

FLEX I/O ETHERNET/IP ADAPTER
1794-AENT SERIES B
-24
B D
C E

CB1 10A
CB2 10A
CB3 10A
CB4 10A

R7A R7B
R8A R8B
R9A R9B
R10A R10B

CU-300 PUMP CONTROLLER
LANDFILL PUMP R-7
CU-300 PUMP CONTROLLER
LANDFILL PUMP R-8
CU-300 PUMP CONTROLLER
LANDFILL PUMP R-9
CU-300 PUMP CONTROLLER
LANDFILL PUMP R-10

1 2
GND
G 3 4
12 13
14 15 16
24VDC + SIG IN GND

P7A P7B
P8A P8B
P9A P9B
P10A P10B

PUMP R7
PUMP R8
PUMP R9
PUMP R10

.50 HP
5.2 FLA.

30 31
32 33
34 35
36 37

CR1 PUMP RUN COMMAND
CR2 PUMP RUN COMMAND
CR3 PUMP RUN COMMAND
CR4 PUMP RUN COMMAND

1794-IE8 SLOT 1 ANALOG IN CARD

FU1 FU2 FU3 FU4 FU5 FU6 FU7
0.1A

PZ2A PZ2B PZ3A PZ3B PZ4A PZ4B PZ4C

1794-IE8 SLOT 2 ANALOG IN CARD

FU8 FU9 FU10

PZ5A PZ5B PZ5C

PUMP CONTROLLER CONTACTS
LANDFILL PUMPS R-7,8,8,10

RUN
FAULT

1794-IB32 SLOT 4 DIG INPUT CARD

PUMP CONTROLLER RUN
RELAYS LANDFILL PUMPS R-7,8,9,10

CR1
CR2
CR3
CR4

1794-OB32 SLOT 3 DIG OUTPUT CARD

1794-OE4 SLOT 0 ANALOG OUT

PUMP CONTROLLER LANDFILL PUMP R-7
R7 SPEED COMMAND
26B 26R

PUMP CONTROLLER LANDFILL PUMP R-8
R8 SPEED COMMAND
27B 27R

PUMP CONTROLLER LANDFILL PUMP R-9
R9 SPEED COMMAND
28B 28R

PUMP CONTROLLER LANDFILL PUMP R-10
R10 SPEED COMMAND
29B 29R

0 (SIGNAL)
1 (COMMON)
4 (SIGNAL)
5 (COMMON)
8 (SIGNAL)
9 (COMMON)
12 (SIGNAL)
13 (COMMON)

AS-BUILT

NOTES

0.1A FUSED TERMINAL

NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.

TERMINAL INTERNAL TO PANEL.

--- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

PACIFIC CREST ELECTRIC

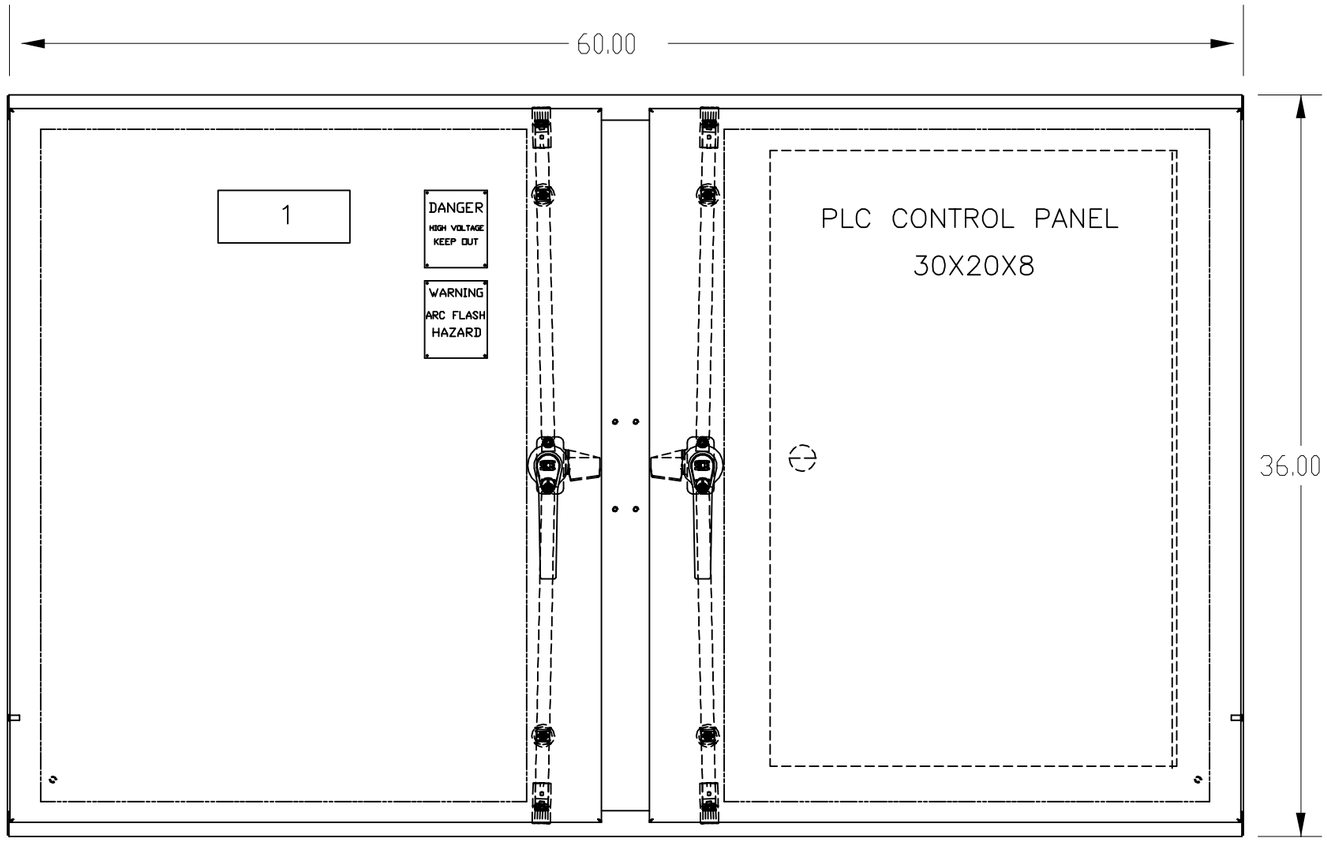
SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

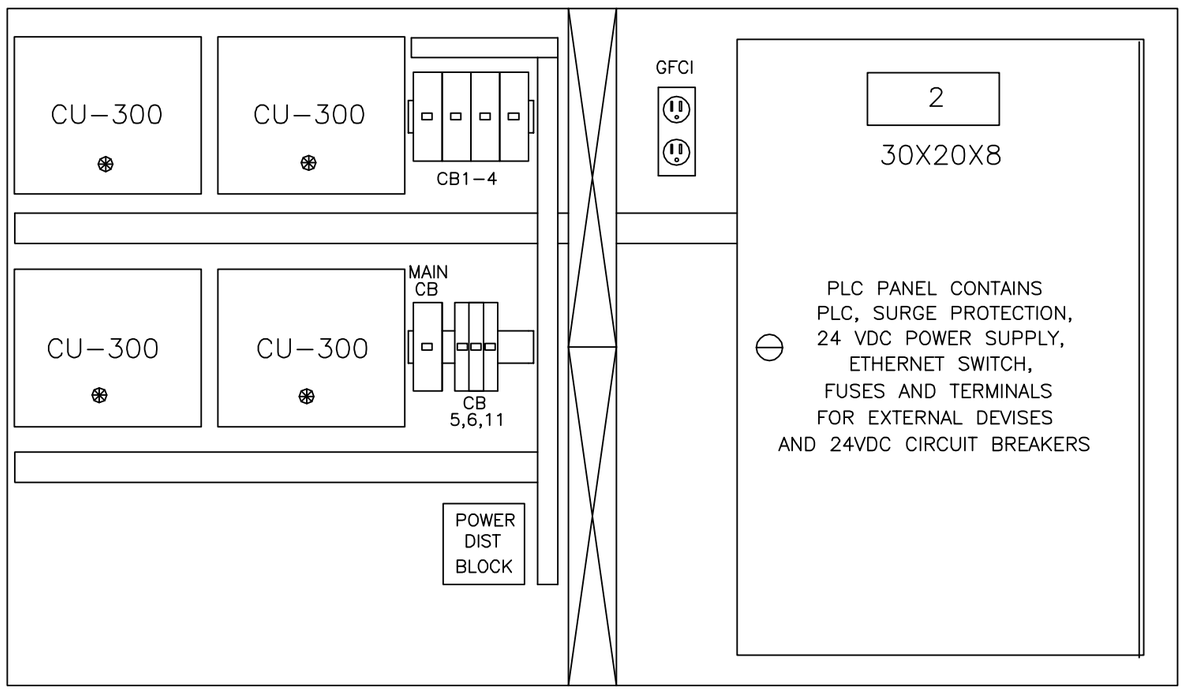
SCALE: NONE	PREV. REV: 21MAR2012	DRAWN BY:MJ
DATE: 24JAN2012	PAGE:	REVISED: 30JAN2013

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
KIOSK # 1 CONTROL DRAWING

POWER DIAGRAM AND SCHEMATIC DIAGRAM

DRAWING: 3633-K1





LIST OF MATERIALS

	ITEM	QTY	DESCRIPTION			MFGR.
	ENC	1	ENCLOSURE		SCE-36EL6012SSWFLP	SAGINAW
	PAN	1	BACKPAN		SCE-60P36	SAGINAW
	MB	1	MAIN BREAKER	30A	60149	SQD
*	PC	4	PUMP CONTROLLER		CU-300	GRUNDFOS
	PB	1	POWER BLOCK		16325-3	BUSS
	CB1-4	4	PUMP CB	10A	60144	SQD
	CB5	1	OUTLET CB	15A	60112	SQD
	CB6-10	5	CONTROL CB	2A	60103	SQD
	CB11	1	SURGE PROTECTOR CB	5A	60106	SQD
	SP	1	SURGE PROTECTOR		AGSHWCH120NO5XS	AEGIS
	PS	1	24V POWER SUPPLY		PS5R-SE24	IDEC
	ES	1	ETHERNET SWITCH		2891411	PHOENIX
	CR1-4	4	SLAVE RELAYS		RH2BULDC24V	IDEC
	CR1-4	4	RELAY SOCKET		SH2B-05	IDEC
	ENC	1	PLC ENCLOSURE		CSD30208	HOFFMAN
	HEATER	1	KIOSK HEATER		DAHI001A	HOFFMAN
	OUTLET	1	KIOSK OUTLET		7599-W	LEVITON
			FLEX I/O PLC SYSTEM			
		1	E/IP ADAPTER		1794-AENT	AB
		1	1794-1B32		DIGITAL IN	AB
		1	1794-IE8		ANALOG IN CARD	AB
		1	1794-OB32		DIGITAL OUT	AB
		1	17940E4		ANALOG OUT	AB
		2	1794-TB2		TERMINAL	AB
		2	1794-TB32		TERMINAL	AB
	FU1-3	4	FUSED TERMINALS		115.661.21	ENT
	FU1-3	3	FUSES		GMA-100-R	BUSS
	TERMS	13	TERMINALS		115.118.11	ENT
		8	GROUND TERMS		165.114.17	ENT

* SUPPLIED BY CUSTOMER

NAMEPLATES

1) KIOSK # 2 CONTROL PANEL
2) PLC CONTROL PANEL

AS-IN FIELD

NOTES

⊛ NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.

⊙ TERMINAL INTERNAL TO PANEL.

--- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

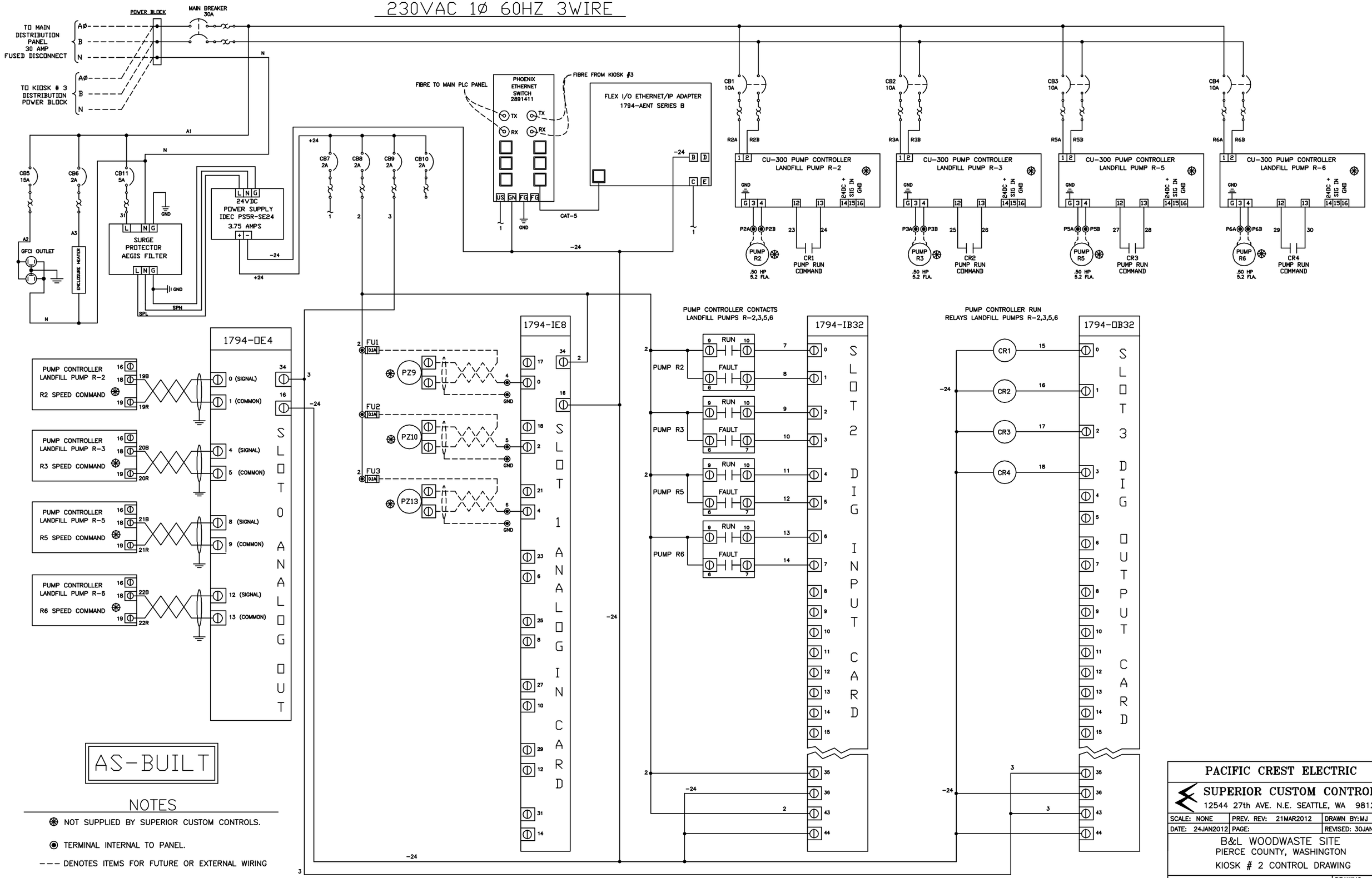
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DATE: 24JAN2011	PAGE:	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
KIOSK #2 ENCLOSURE DRAWING

POWER DIAGRAM AND SCHEMATIC DIAGRAM

DRAWING: 3633-2C

230VAC 1Ø 60HZ 3WIRE



AS-BUILT

NOTES

- ⊛ NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- ◉ TERMINAL INTERNAL TO PANEL.
- --- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

PACIFIC CREST ELECTRIC

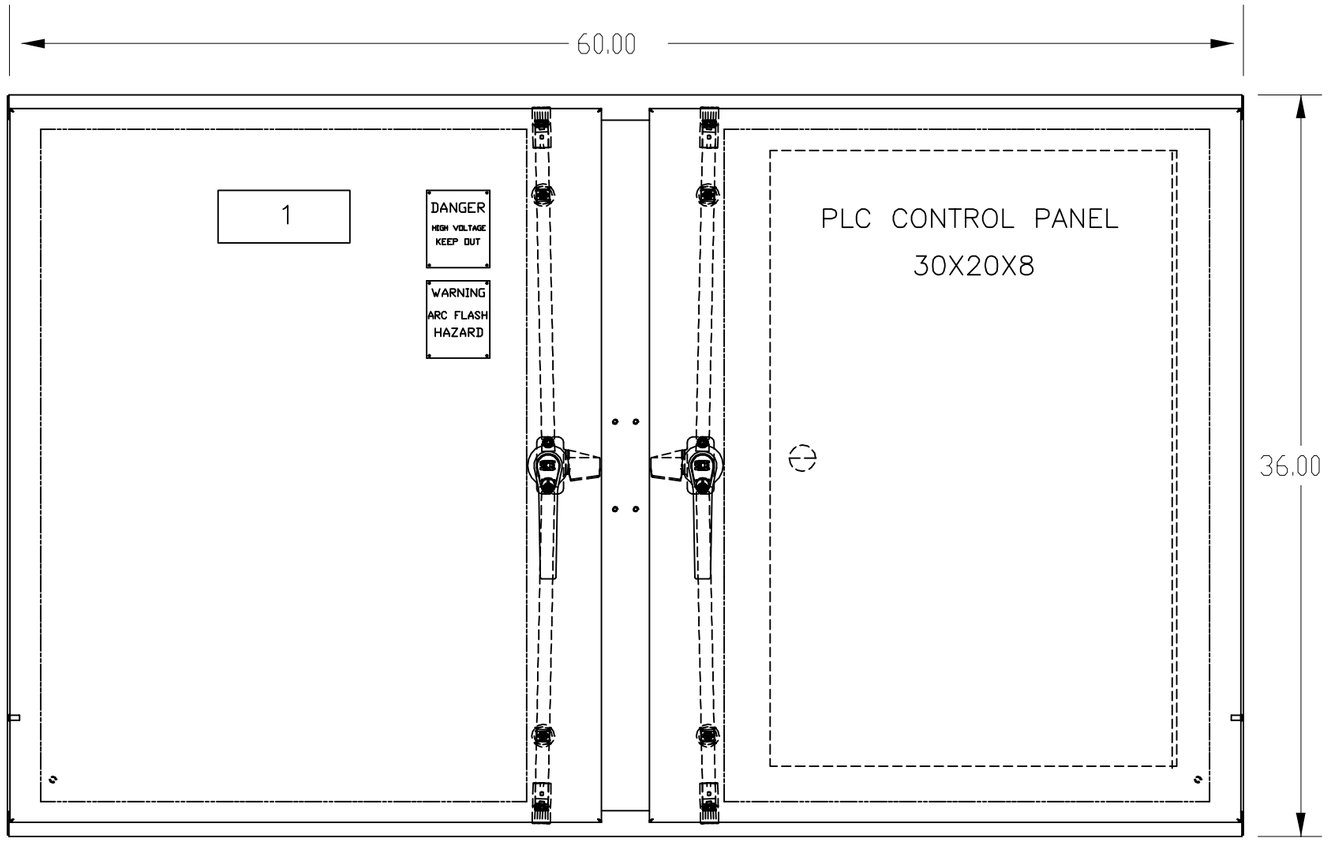
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12544 27th AVE. N.E. SEATTLE, WA 98125

SCALE: NONE	PREV. REV: 21MAR2012	DRAWN BY: MJ
DATE: 24JAN2012	PAGE:	REVISED: 30JAN2013

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PIERCE COUNTY, WASHINGTON
KIOSK # 2 CONTROL DRAWING

POWER DIAGRAM AND SCHEMATIC DIAGRAM

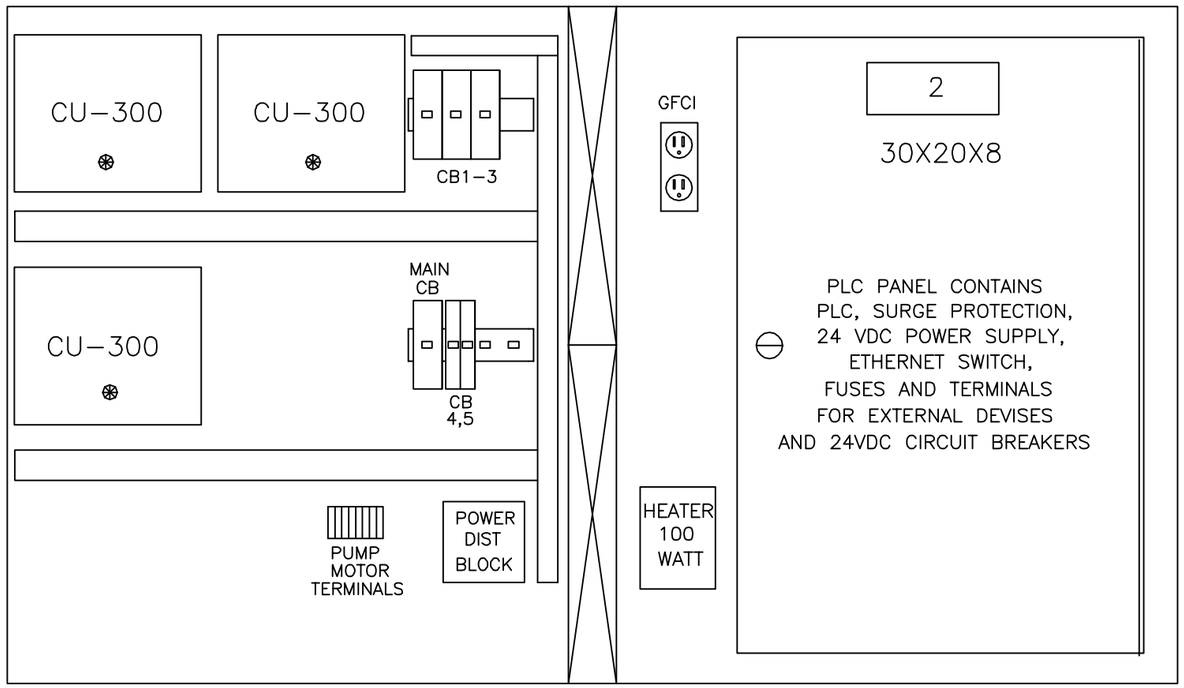
DRAWING: 3633-K2



LIST OF MATERIALS

	ITEM	QTY	DESCRIPTION			MFGR.
	ENC	1	ENCLOSURE		SCE-36EL6012SSWFLP	SAGINAW
	PAN	1	BACKPAN		SCE-60P36	SAGINAW
	MB	1	MAIN BREAKER	30A	60149	SQD
*	PC	3	PUMP CONTROLLER		CU-300	GRUNDFOS
	PB	1	POWER BLOCK		CB-1423570	BUSS
	CB1-3	3	PUMP CB	10A	60144	SQD
	CB4	1	OUTLET CB	15A	60112	SQD
	CB5-9	5	CONTROL CB	2A	60103	SQD
	SP	1	SURGE PROTECTOR		AGSHWCH120NO5XS	AEGIS
	PS	1	24V POWER SUPPLY		PS5R-SE24	IDEC
	ES	1	ETHERNET SWITCH		2891453	PHOENIX
	CR1-3	3	SLAVE RELAYS		RH2BULDC24V	IDEC
	CR1-3	3	RELAY SOCKET		SH2B-05	IDEC
	ENC	1	PLC ENCLOSURE		CSD30208	HOFFMAN
	HEATER	1	KIOSK HEATER		DAHI001A	HOFFMAN
	OUTLET	1	KIOSK OUTLET		7599-W	LEVITON
			FLEX I/O PLC SYSTEM			
		1	E/IP ADAPTER		1794-AENT	AB
		1	1794-IE8		ANALOG IN CARD	AB
		1	1794-OB32		DIGITAL OUT	AB
		1	1794-IB32		DIGITAL IN	AB
		1	1794-OE4		ANALOG OUT	AB
		2	1794-TB2		TERMINAL	AB
		2	1794-TB32		TERMINAL	AB
	FU1-3	4	FUSED TERMINALS		115.661.21	ENT
	FU1-3	3	FUSES		GMA-100-R	BUSS
	TERMS	9	TERMINALS		115.118.11	ENT
		7	GROUND TERMS		165.114.17	ENT

* SUPPLIED BY CUSTOMER



NAMEPLATES

1) KIOSK # 3 CONTROL PANEL
2) PLC CONTROL PANEL

NOTES

- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- --- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

AS-IN FIELD

PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

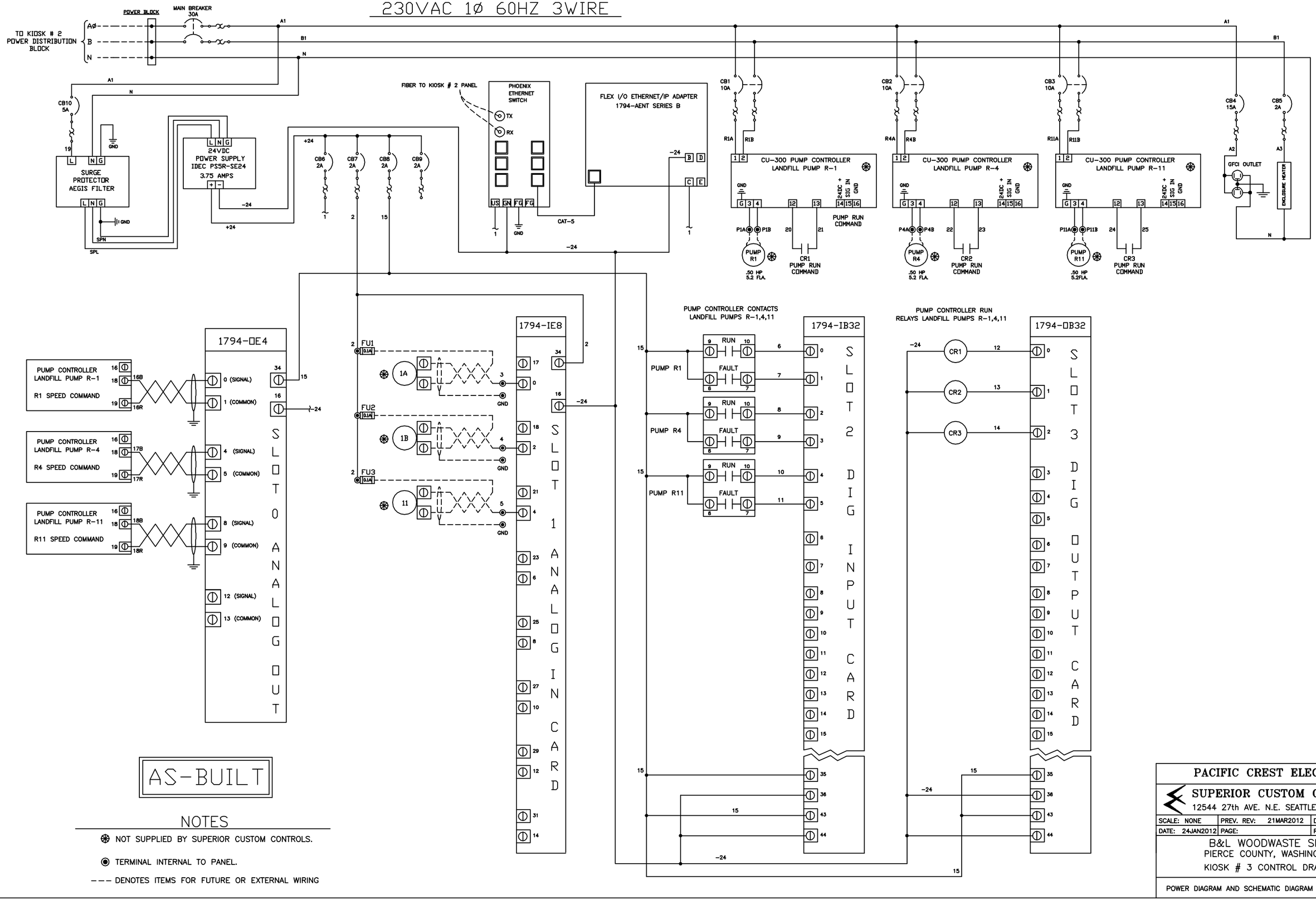
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B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
KIOSK #3 ENCLOSURE DRAWING

DOOR, PAN LAYOUT AND PARTS LIST

DRAWING: 3633-3C

230VAC 1Ø 60HZ 3WIRE



AS-BUILT

NOTES

- ⊛ NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- ◉ TERMINAL INTERNAL TO PANEL.
- – – – DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

PACIFIC CREST ELECTRIC

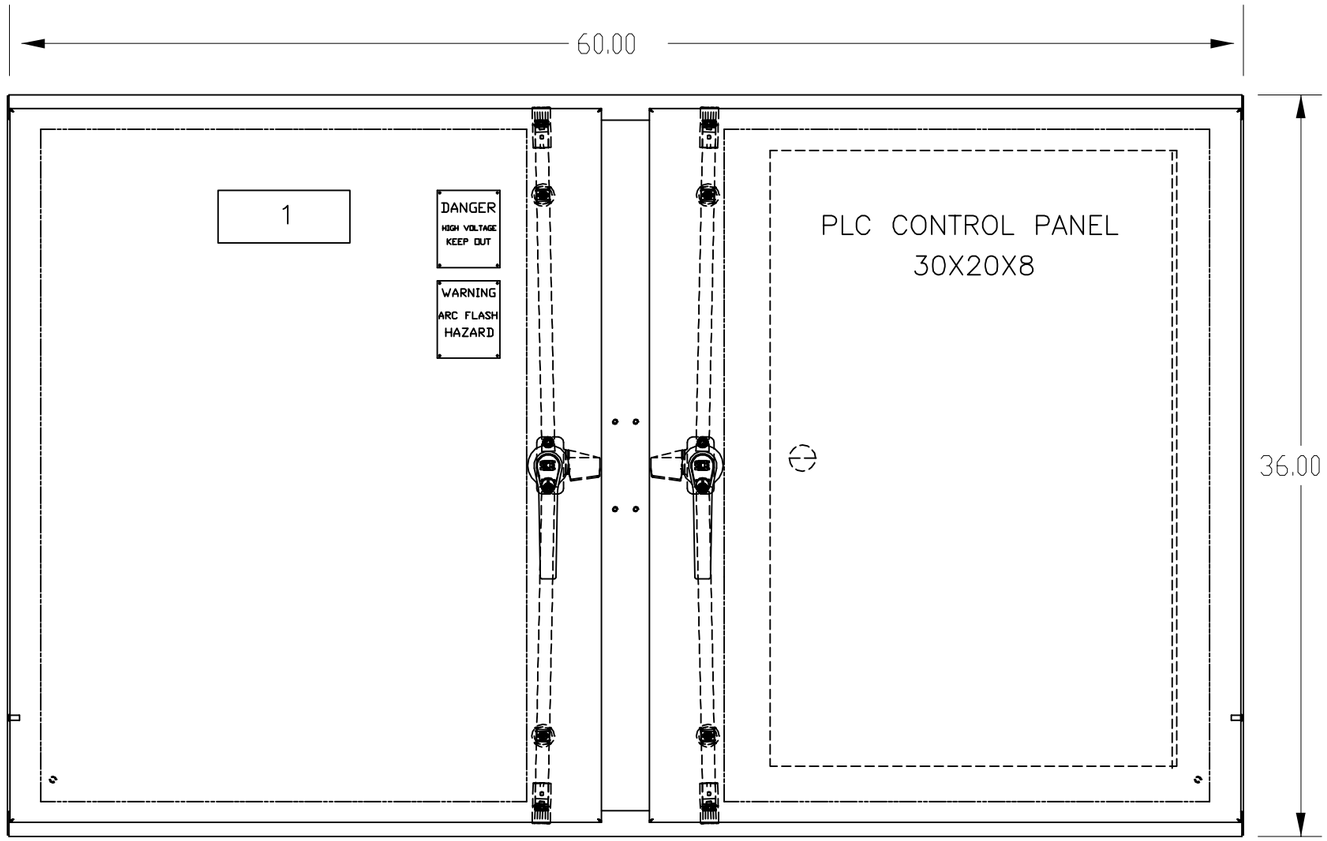
SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

SCALE: NONE	PREV. REV: 21MAR2012	DRAWN BY: MJ
DATE: 24JAN2012	PAGE:	REVISED: 30JAN2013

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
KIOSK # 3 CONTROL DRAWING

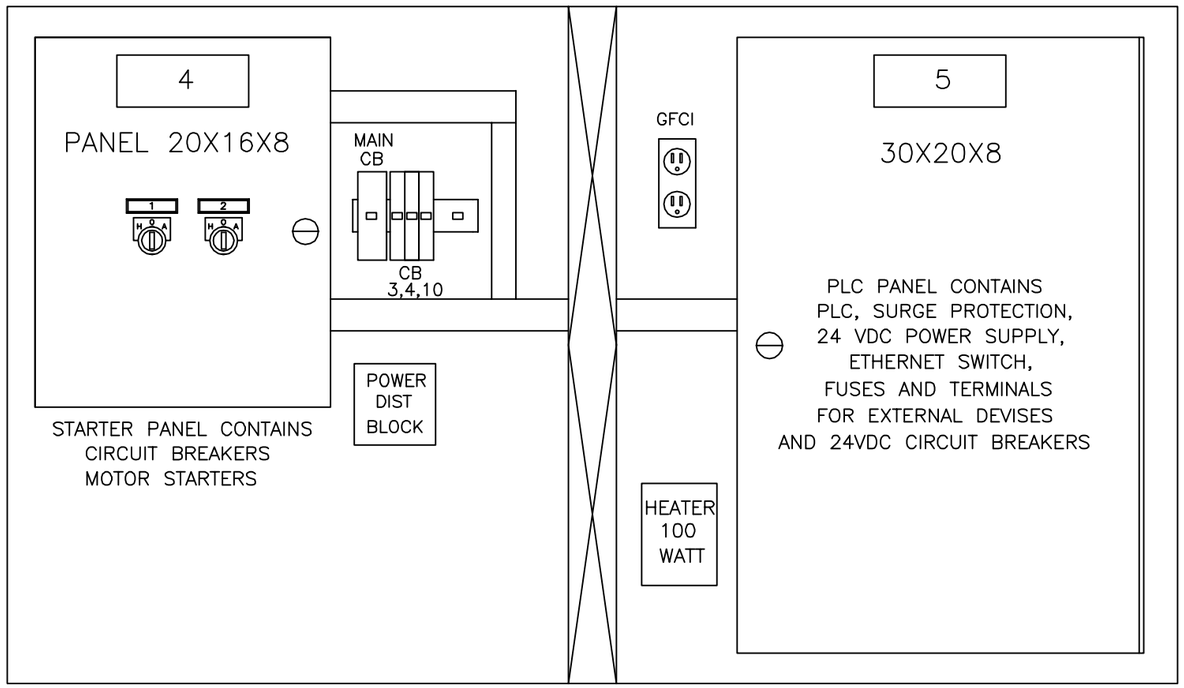
POWER DIAGRAM AND SCHEMATIC DIAGRAM

DRAWING: 3633-K3



LIST OF MATERIALS

ITEM	QTY	DESCRIPTION			MFGR.
ENC	1	ENCLOSURE		SCE-36EL6012SSWFLP	SAGINAW
PAN	1	BACKPAN		SCE-60P36	SAGINAW
MB		MAIN BREAKER	30A	60149	SQD
PB	1	POWER BLOCK		16325-3	BUSS
CB1-2	2	PUMP CB	10A	60144	SQD
CB3	1	OUTLET CB	15A	60112	SQD
CB4-9	6	CONTROL CB	2A	60103	SQD
SP	1	SURGE PROTECTOR		AGSHWCH120N05XS	AEGIS
PS	1	24V POWER SUPPLY		PS5R-SE24	IDEC
ES	1	ETHERNET SWITCH		2891453	PHOENIX
CR1-2	2	SLAVE RELAYS		RH2BULDC24V	IDEC
CR1-2	2	RELAY SOCKET		SH2B-05	IDEC
MS1-2	2	MOTOR STARTER		LC1D12	SQD
OL1-2	2	OVERLOAD		LRD12	SQD
SS1-2	2	HOA SWITCH		ZB5AD3/ZB5AZ103	SQD
ENC	1	PLC ENCLOSURE		CSD30208	HOFFMAN
ENC	1	STARTER ENCLOSURE		CSD20168	HOFFMAN
HEATER	1	KIOSK HEATER		DAHI001A	HOFFMAN
CB10	1	SURGE PROTECTOR CB	5A	60106	SQD
		FLEX I/O PLC SYSTEM			
	1	E/IP ADAPTER		1794-AENT	AB
	1	1794-IE8		ANALOG IN CARD	AB
	1	1794-OB32		DIGITAL OUT	AB
	1	1794-IB32		DIGITAL IN	AB
	1	1794-TB2		TERMINAL	AB
	2	1794-TB32		TERMINAL	AB
FU1-3	4	FUSED TERMINALS		115.661.21	ENT
FU1-3	3	FUSES		GMA-100-R	BUSS
TERMS	9	TERMINALS		115.118.11	ENT
	4	GROUND TERMS		165.114.17	ENT



NAMEPLATES

1) KIOSK # 4 CONTROL PANEL
2) PUMP R12 CONTROL
3) PUMP R13 CONTROL
4) PLC CONTROL PANEL
5) PUMP MOTOR STARTER PANEL

AS-IN FIELD

NOTES

- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- --- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

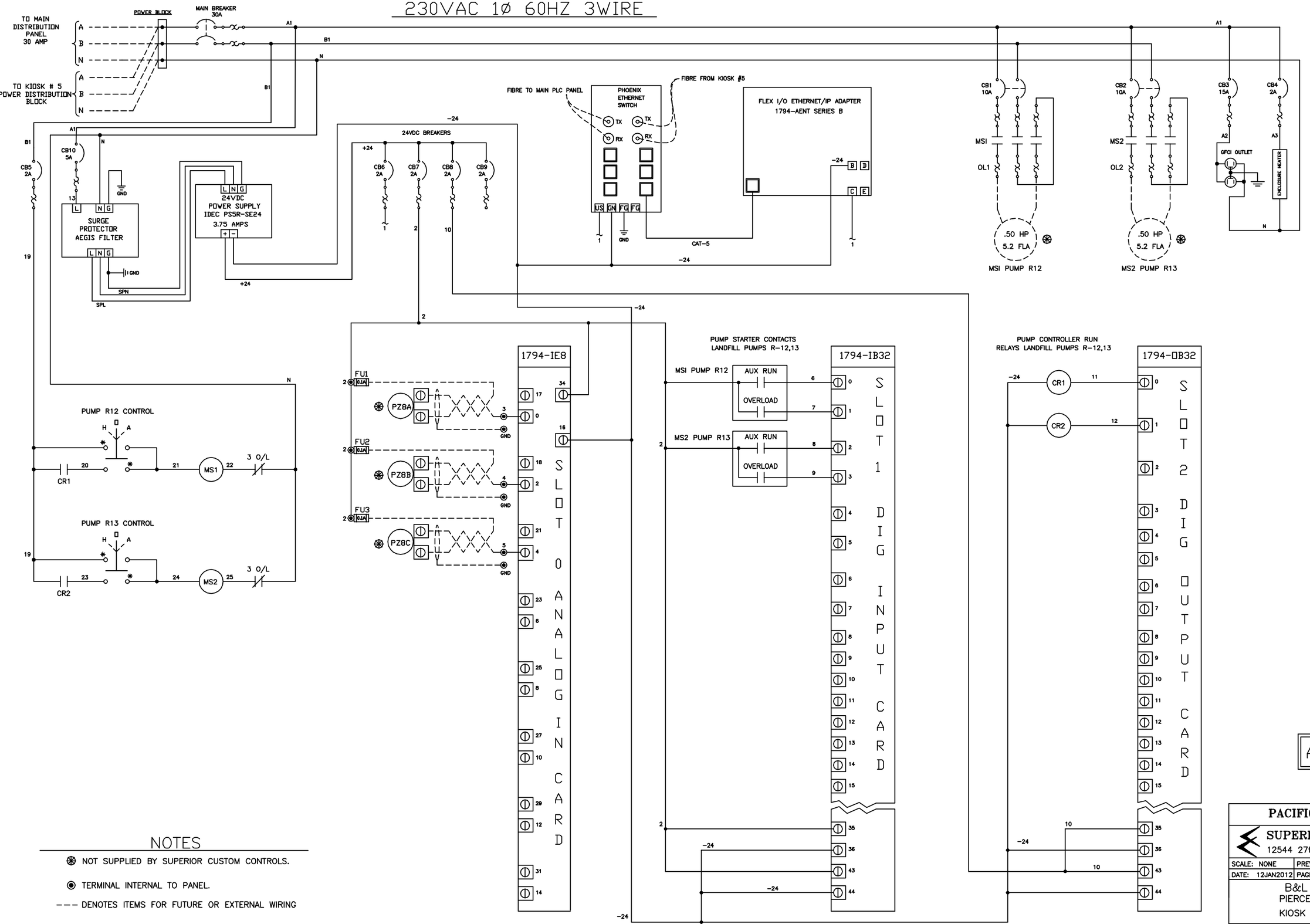
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DATE: 24JAN2011	PAGE:	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
KIOSK #4 ENCLOSURE DRAWING

POWER DIAGRAM AND SCHEMATIC DIAGRAM

DRAWING: 3633-4C

230VAC 1Ø 60HZ 3WIRE



NOTES

- ⊛ NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- ◉ TERMINAL INTERNAL TO PANEL.
- – – – DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

AS-BUILT

PACIFIC CREST ELECTRIC

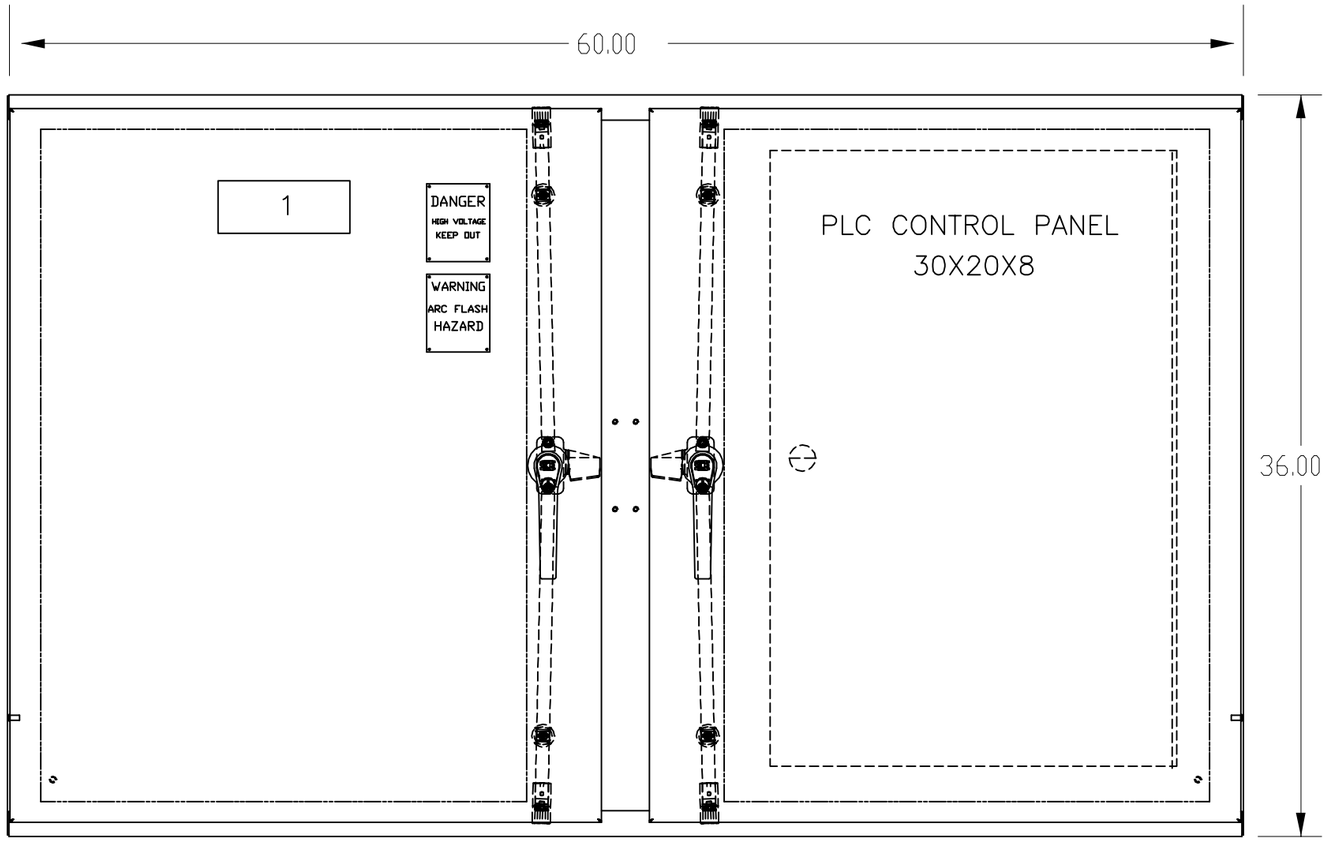
SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

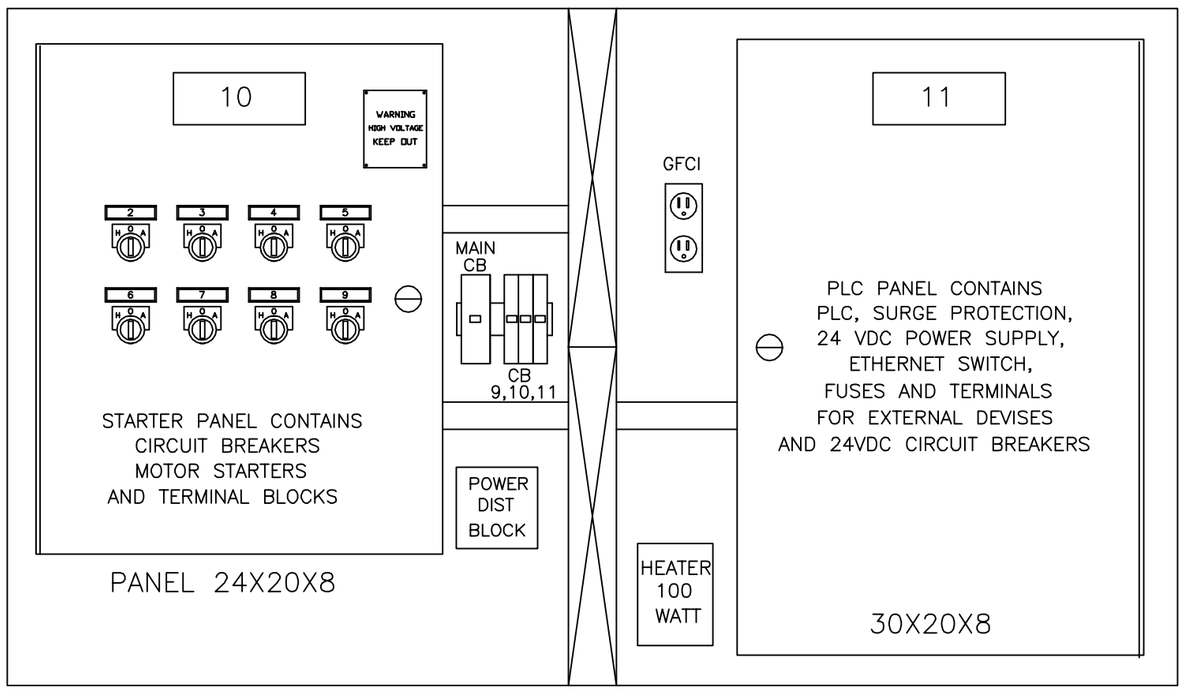
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DATE: 12JAN2012	PAGE:	REVISED: 30JAN2013

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
KIOSK # 4 CONTROL DRAWING

POWER DIAGRAM AND SCHEMATIC DIAGRAM

DRAWING: 3633-K4





LIST OF MATERIALS

ITEM	QTY	DESCRIPTION			MFGR.
ENC	1	ENCLOSURE		SCE-36EL6012SSWFLP	SAGINAW
PAN	1	BACKPAN		SCE-60P36	SAGINAW
MB		MAIN BREAKER	90A	TEB122090	GE
PB	1	POWER BLOCK		CB-1423570	BUSS
CB1-8	8	PUMP CB	10A	60144	SQD
CB9	1	OUTLET CB	15A	60112	SQD
CB10	1	HEATER CB	2A	60106	SQD
CB11	1	PLC CB	5A	60103	SQD
CB12-15	4	CONTROL CB	2A	60103	SQD
CB16	1	SURGE SURPRESSOR CB	5A	60106	SQD
SP	1	SURGE PROTECTOR		AGSHWCH120N05XS	AEGIS
PS	1	24V POWER SUPPLY		PS5R-SE24	IDEC
ES	1	ETHERNET SWITCH		2891453	PHOENIX
CR1-8	8	SLAVE RELAYS		RH2BULDC24V	IDEC
CR1-8	8	RELAY SOCKET		SH2B-05	IDEC
MS1-8	8	MOTOR STARTER		LC1D12	SQD
OL1-8	8	OVERLOAD		LRD10	SQD
SS1-8	8	HOA SWITCH		ZB5AD3/ZB5AZ103	SQD
ENC	1	PLC ENCLOSURE		CSD30208	HOFFMAN
ENC	1	STARTER ENCLOSURE		CSD24208	HOFFMAN
HEATER	1	KIOSK HEATER		DAHI001A	HOFFMAN
TERMS	26	STARTER ENCLOSURE		115.116.07	SQD
		FLEX I/O PLC SYSTEM			
	1	E/IP ADAPTER		1794-AENT	AB
	1	1794-IB32		DIGITAL IN	AB
	1	1794-OB32		DIGITAL OUT	AB
	1	1794-TB2		TERMINAL	AB
	1	1794-TB32		TERMINAL	AB
TERMS	3	TERMINALS		115.118.11	ENT
	3	GROUND TERMINALS		165.114.17	ENT

NAMEPLATES

1) KIOSK # 5 CONTROL PANEL
2) PUMP # R14 CONTROL
3) PUMP # R15 CONTROL
4) PUMP # R16 CONTROL
5) PUMP # R17 CONTROL
6) PUMP # R18 CONTROL
7) PUMP # R19 CONTROL
8) PUMP # R20 CONTROL
9) PUMP # R21 CONTROL
10) PUMP MOTOR STARTER PANEL
11) PLC CONTROL PANEL

AS-IN FIELD

NOTES

- ❀ NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- ⊙ TERMINAL INTERNAL TO PANEL.
- ___ DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

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DATE: 24DEC2011	PAGE:	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
KIOSK #5 ENCLOSURE DRAWING

DOOR, PAN LAYOUT AND PARTS LIST — DRAWING: 3633-5C

230VAC 1Ø 60HZ 3WIRE

TO KIOSK #4 POWER DISTRIBUTION BLOCK

POWER BLOCK

MAIN BREAKER 90A

AØ, B, N, A1, N

FIBRE TO KIOSK # 4 PANEL

PHOENIX ETHERNET SWITCH — TX, RX — US, GN, FG, FG — CAT-5

FLEX I/O ETHERNET/IP ADAPTER 1794-AENT SERIES B — −24, B, D, C, E

CB16 5A — GND

SURGE PROTECTOR AEGIS FILTER — L, N, G — GND

24VDC POWER SUPPLY IDEC PS5R-SE24 3.75 AMPS — L, N, G — + −

CB11 5A

CB12 2A, CB13 2A, CB14 2A, CB15 2A — +24, −24

CB1 10A — MS1 — OL1 — .50 HP 5.2 FLA — PUMP R14

CB2 10A — MS2 — OL2 — .50 HP 5.2 FLA — PUMP R15

CB3 10A — MS3 — OL3 — .50 HP 5.2 FLA — PUMP R16

CB4 10A — MS4 — OL4 — .50 HP 5.2 FLA — PUMP R17

CB5 10A — MS5 — OL5 — .50 HP 5.2 FLA — PUMP R18

CB6 10A — MS6 — OL6 — .50 HP 5.2 FLA — PUMP R19

CB7 10A — MS7 — OL7 — .50 HP 5.2 FLA — PUMP R20

CB8 10A — MS8 — OL8 — .50 HP 5.2 FLA — PUMP R21

CB9 15A — A2 — GFCI OUTLET

CB10 2A — A3 — ENCLOSURE HEATER — N

PUMP R14 CONTROL: H, A, CR1, MS1, 1OL, N

PUMP R15 CONTROL: CR2, MS2, 2OL, N

PUMP R16 CONTROL: CR3, MS3, 3OL, N

PUMP R17 CONTROL: CR4, MS4, 4OL, N

PUMP R18 CONTROL: CR5, MS5, 5OL, N

PUMP R19 CONTROL: CR6, MS6, 6OL, N

PUMP R20 CONTROL: CR7, MS7, 7OL, N

PUMP R21 CONTROL: CR8, MS8, 8OL, N

STARTER AUX CONTACTS LANDFILL PUMPS R14–R21

1794-IB32 SLOT 0 DIG INPUT CARD

	AUX RUN	O.L FAULT	
PUMP R14	28	29	0, 1
PUMP R15	30	31	2, 3
PUMP R16	32	33	4, 5
PUMP R17	34	35	6, 7
PUMP R18	36	37	8, 9
PUMP R19	38	39	10, 11
PUMP R20	40	41	12, 13
PUMP R21	42	43	14, 15

35, 36, 43, 44 — 2, 2, −24

PUMP CONTROLLER RUN RELAYS LANDFILL PUMPS R−14−21

1794-OB32 SLOT 1 DIG OUTPUT CARD

−24	CR1	44, 0
	CR2	45, 1
	CR3	46, 2
−24	CR4	47, 3
	CR5	48, 4
	CR6	49, 5
	CR7	50, 6
−24	CR8	51, 7

13, 13, 13, 14, 15

35, 36, 43, 44 — 2, 2

AS-BUILT

NOTES

- ✱ NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- ◉ TERMINAL INTERNAL TO PANEL.
- – – – DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

SCALE: NONE	PREV. REV: 21MAR2012	DRAWN BY:MJ
DATE: JAN122012	PAGE:	REVISED: 30JAN2013

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
KIOSK # 5 CONTROL DRAWING

POWER DIAGRAM AND SCHEMATIC DIAGRAM — DRAWING: 3633-K5

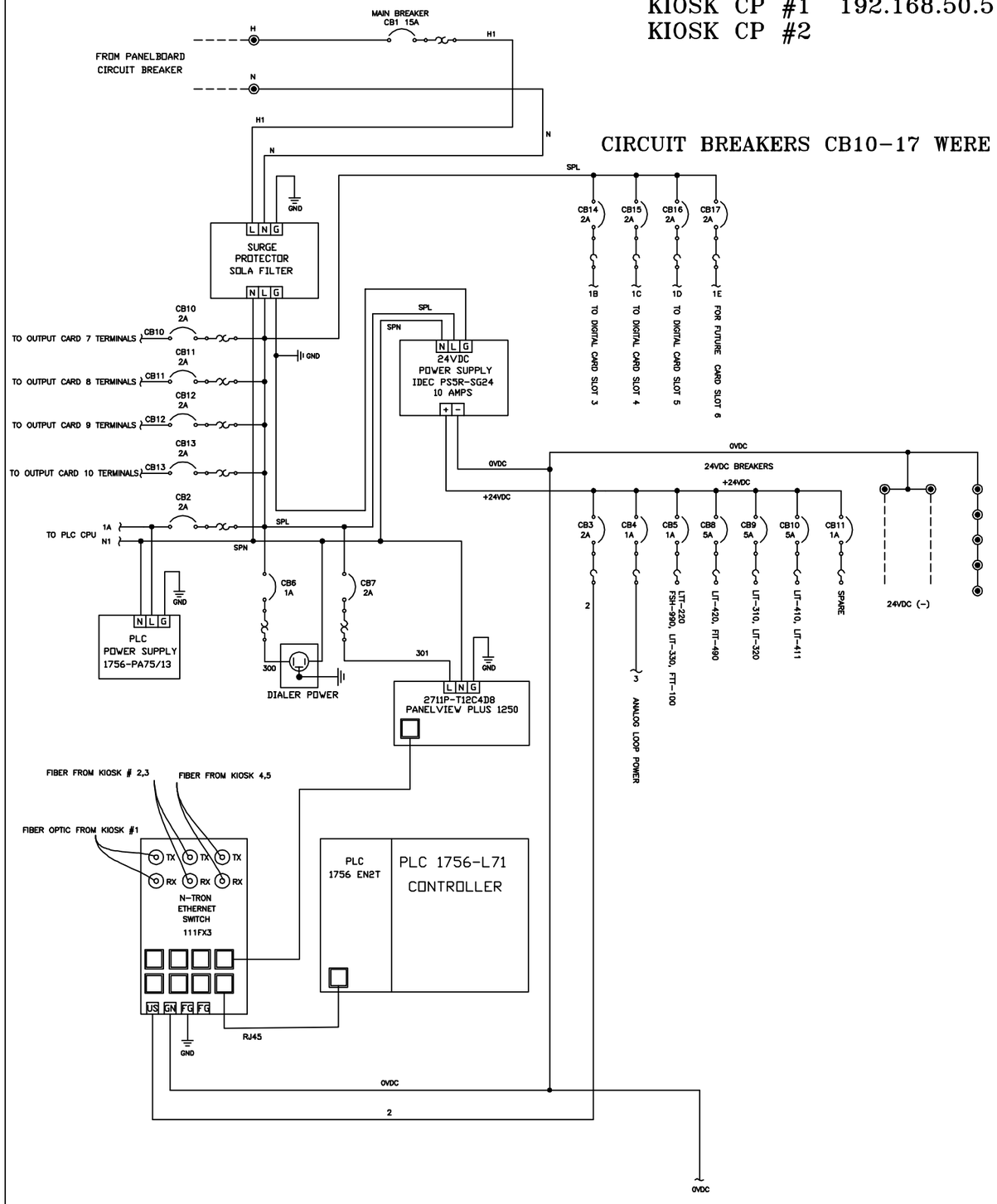
120VAC 1Ø 60HZ

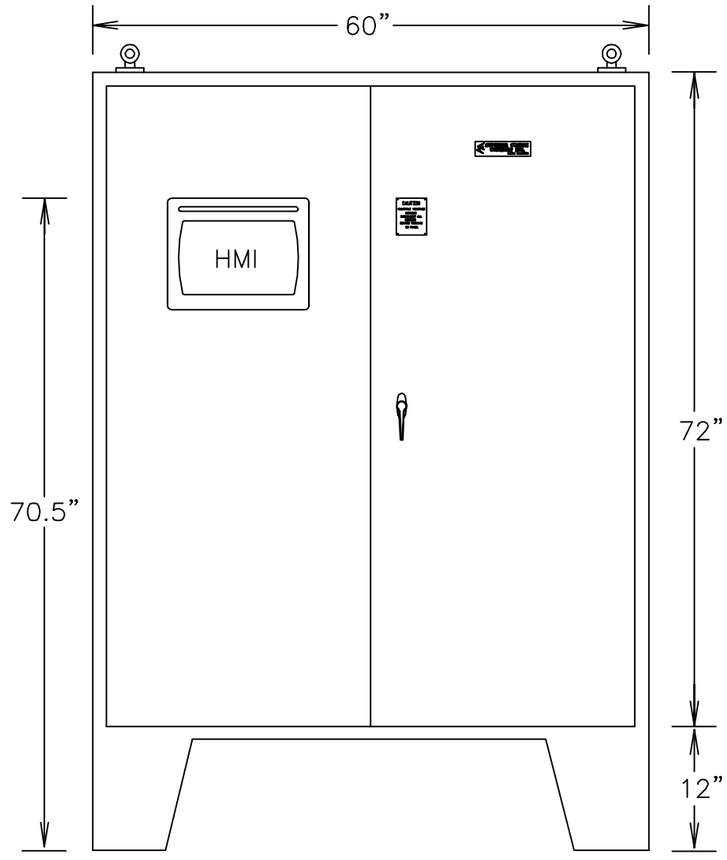
IP ADDRESS LIST

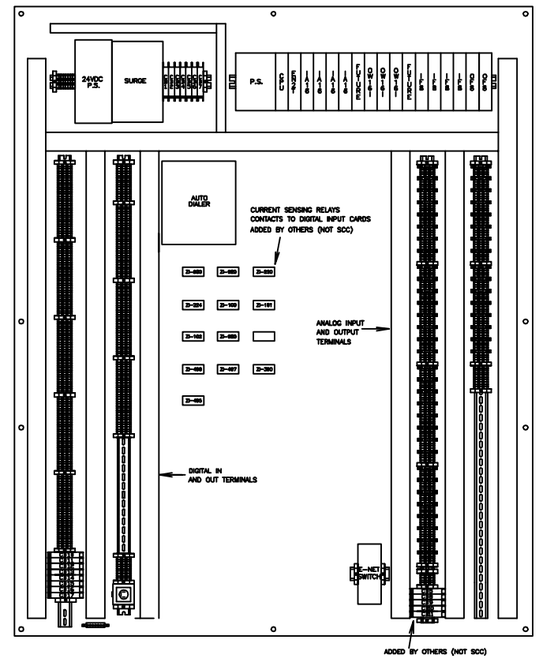
MAIN PLC CP 192.168.50.50
KIOSK CP #1 192.168.50.51
KIOSK CP #2

THIS DRAWING HAS BEEN REDRAWN FROM RED PEN DRAWINGS
SUPERIOR CUSTOM CONTROLS TAKES NON RESPONSIBILITY
FOR THE ACCURACY OF THESE DRAWING DUE TO
CHANGES AND WIRING DONE BY OTHERS

CIRCUIT BREAKERS CB10-17 WERE ADDED IN THE FIELD







LIST OF MATERIALS

ITEM	QTY	DESCRIPTION			MFGR.
ENCL.	1	ENCLOSURE		A726016ULP	HOFFMAN
	1	PAN		A72P60	HOFFMAN
	1	PLC		1756-L71	AB
SL2-5	4	D.I. CARDS		1756-IA16	AB
SL11-14	4	A.I. CARDS		1756-IF8	AB
SL7-9	3	D.O. CARDS		1756-OW16I	AB
SL15,16	2	A.O. CARD		1756-OF8	AB
	1	SLOT RACK		1756-A17	AB
	1	POWER SUPPLY		1756-PA75/13	AB
HMI	1	HMI		2711P-T12C4A8	AB
	1	ETHERNET HUB		711FX3	N-TRON
	1	E-NET I/P ADAPTER		EN2T	AB
CB1	1	MAIN C.B.	1P 15A	60112	SQUARE D
SPD	1	SURGE PROTECTOR	20A	STV 25K-10S	SOLA
24VPS	1	POWER SUPPLY		PS5R-SG24	IDEC
◉	404	TERMINALS	4/6	115.116.11	ENTRELEC
◉	8	TERMINALS	6/8	115.118.11	ENTRELEC
	25	GND. TERMINALS		165.113.16	ENTRELEC
CB4,5,6,11	4	CIRCUIT BREAKER	1P 1A	60101	SQUARE D
CB2,3,7,10	4	CIRCUIT BREAKER	1P 2A	60103	SQUARE D
AD	1	AUTO DIALER		800	SENSAPHONE
FU1-48	48	FUSED DISC. TERM.		115.657.25	ENTRELEC
FU1-48	48	FUSES	.1A	GMA-100-R	BUSSMAN
CB8,9	2	CIRCUIT BREAKER	5A	C60-N 60106	SQUARE D
SL6,10	2	FILLER PLATES			AB
CB10-17	7	CIRCUIT BREAKER	1P 2A	60102	SQUARE D

NOTES

◉ 0.1A FUSED TERMINAL
❋ NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
◉ TERMINAL INTERNAL TO PANEL.
- - - DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

AS-IN FIELD

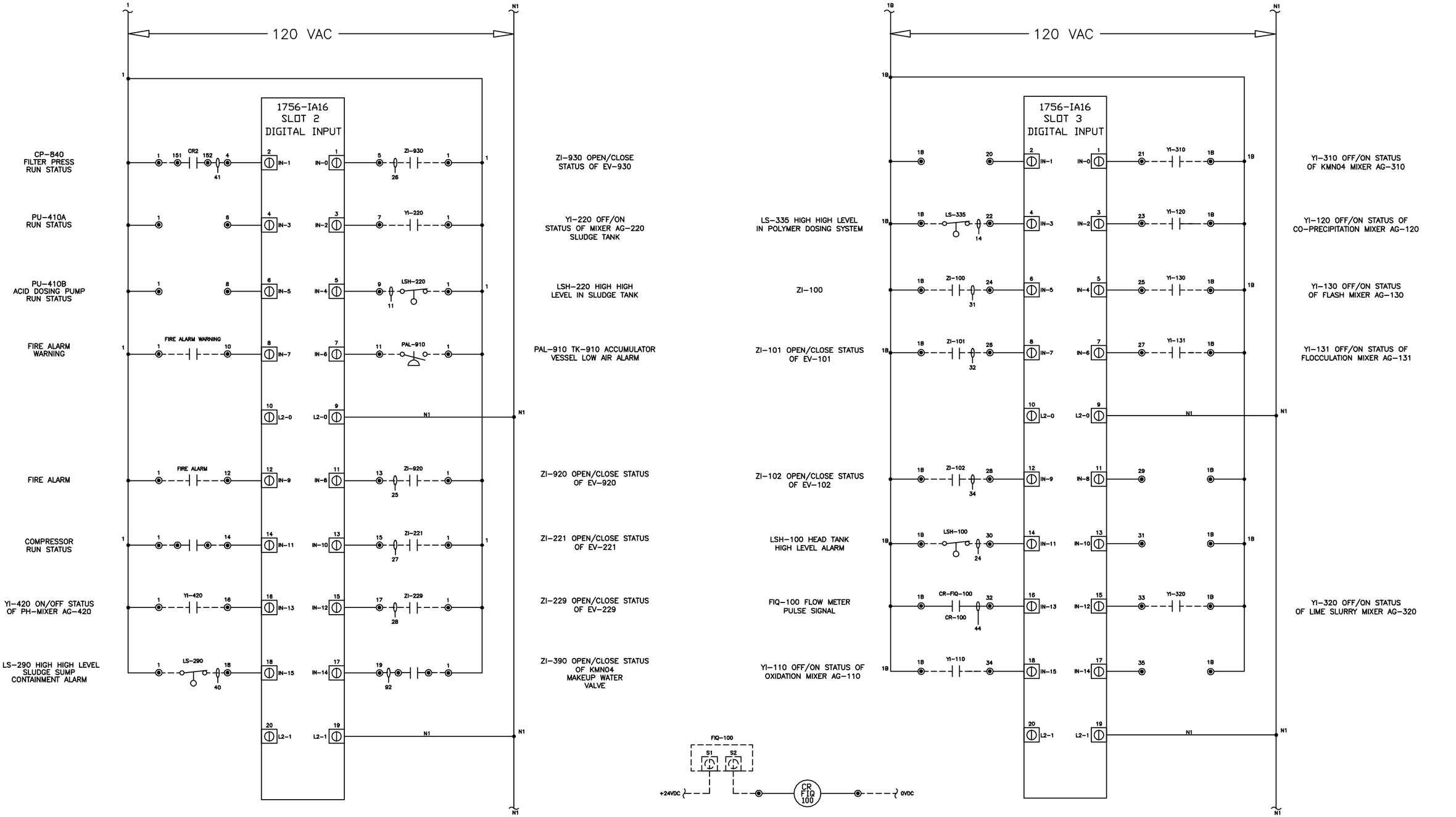
PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

SCALE: NONE	PREV. REV: 30JAN2013	DRAWN BY:MJ/WD
DATE: 24JAN2012	PAGE: 1 OF 6	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
PLC LAYOUT AND POWER DIAGRAM

POWER DIAGRAM, ENCLOSURE LAYOUT AND PARTS LIST	DRAWING: 3633-1



NOTES

- FUSED TERMINAL
- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- --- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

AS-IN FIELD

PACIFIC CREST ELECTRIC

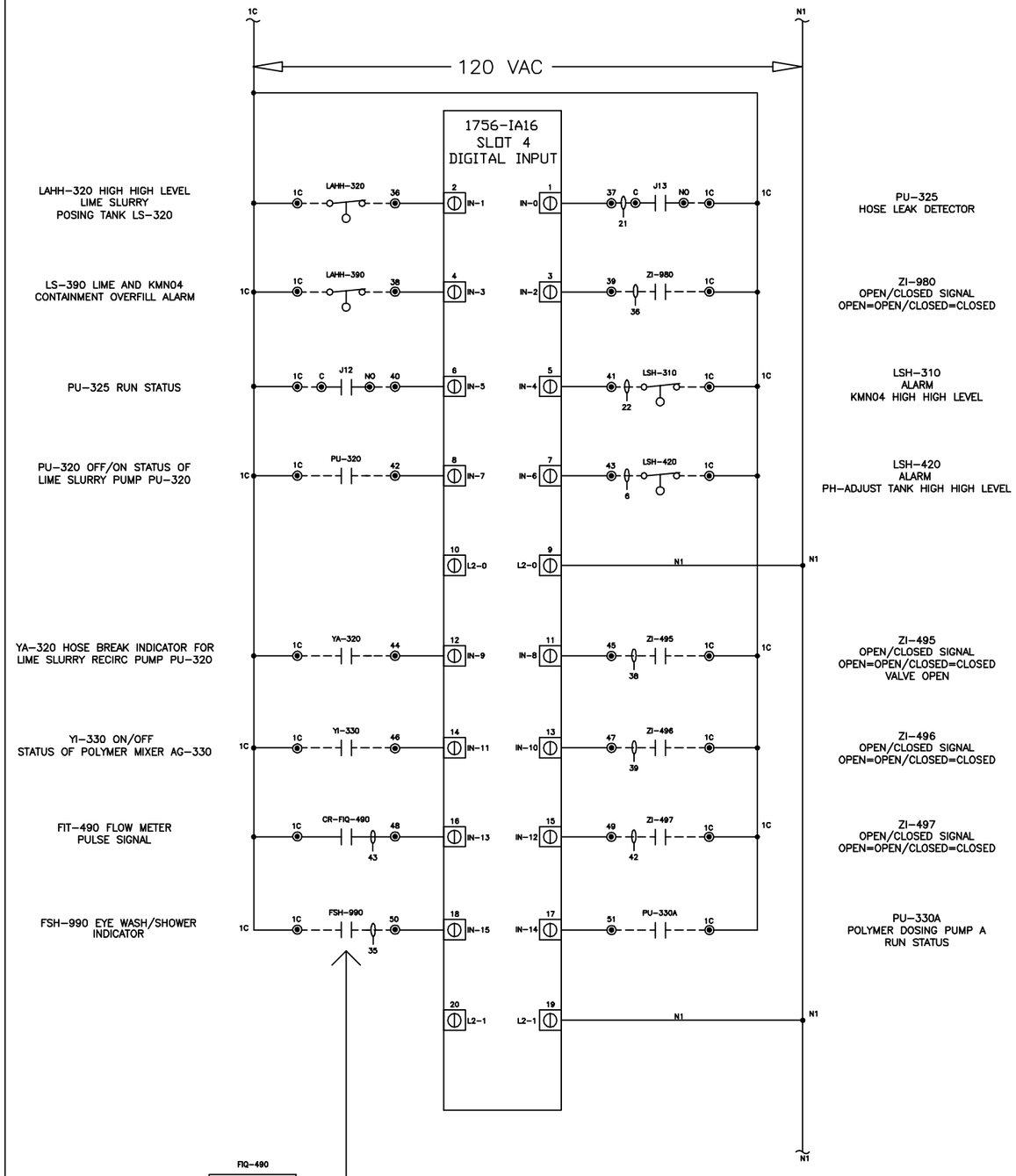
SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

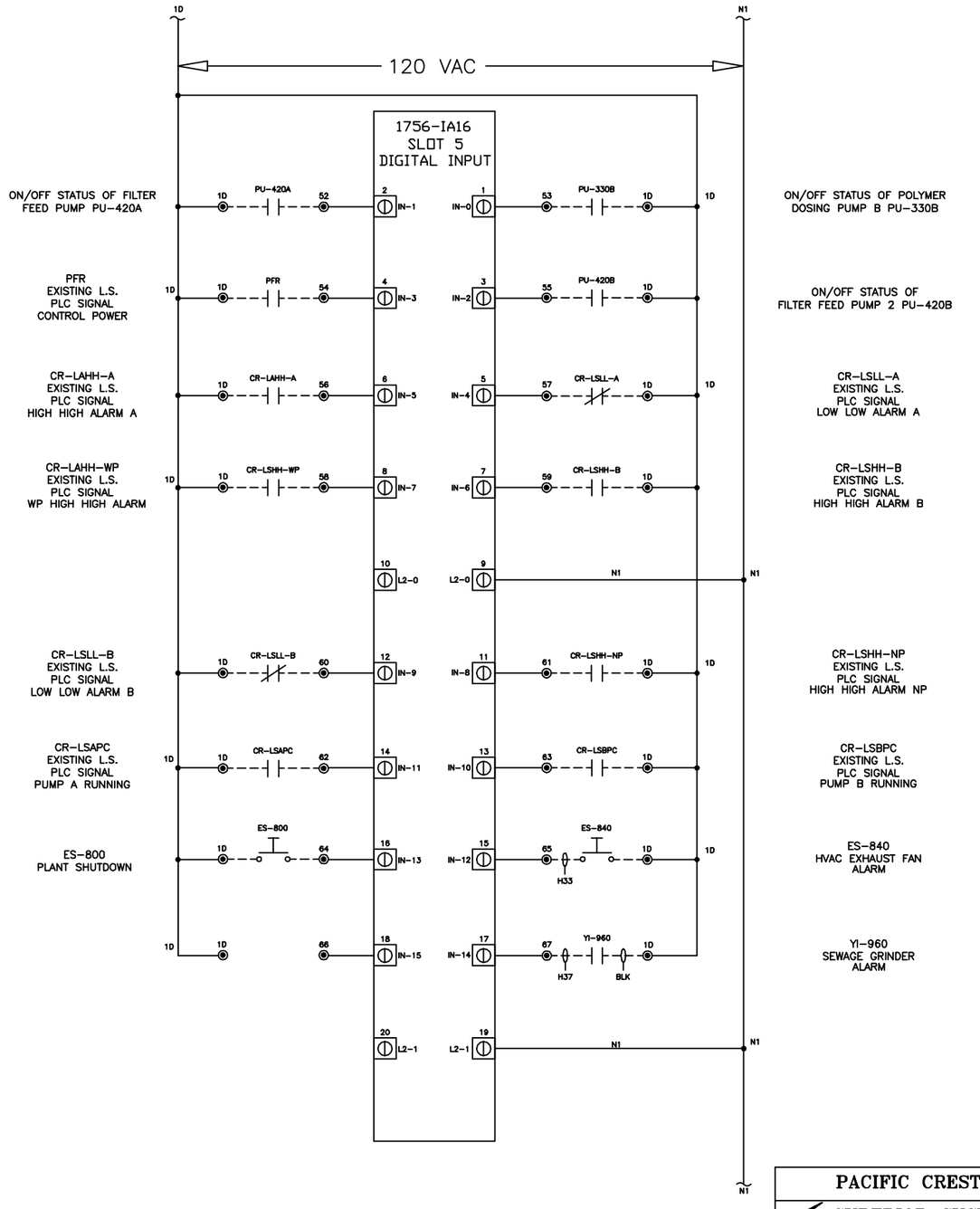
SCALE: NONE	PREV. REV: 20APR2012	DRAWN BY:MJ/WD
DATE: 24JAN2012	PAGE: 2 OF 6	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
PLC INPUTS

DIGITAL INPUT CARDS 2 AND 3

DRAWING: 3633-2





NOTES

- FUSED TERMINAL
- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- --- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

AS-IN FIELD

PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

SCALE: NONE	PREV. REV: 24APR2012	DRAWN BY: MJ/WD
DATE: 24JAN2012	PAGE: 3 OF 6	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
PLC INPUTS

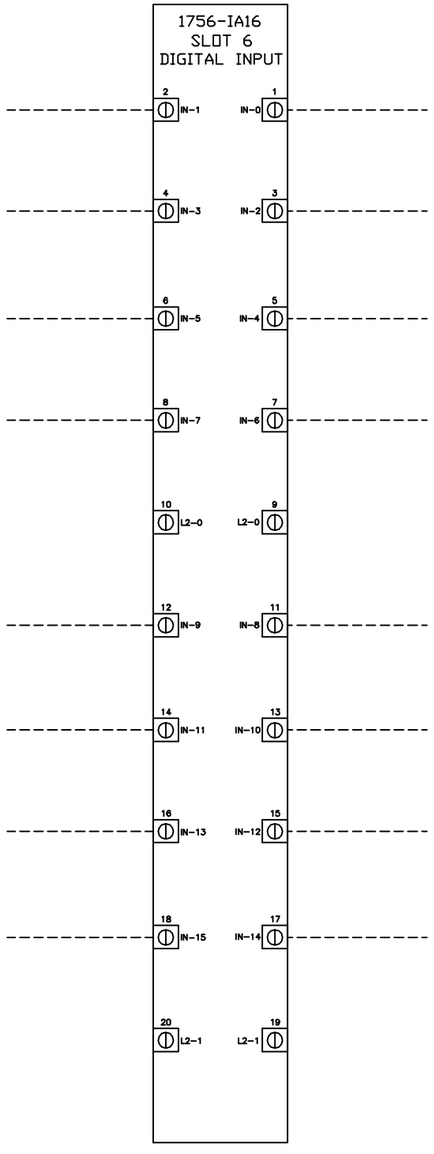
DIGITAL INPUT CARDS 4 & 5

DRAWING: 3633-3

SLOT 6 IN THE PLC RACK IS SPARE OPEN SLOT

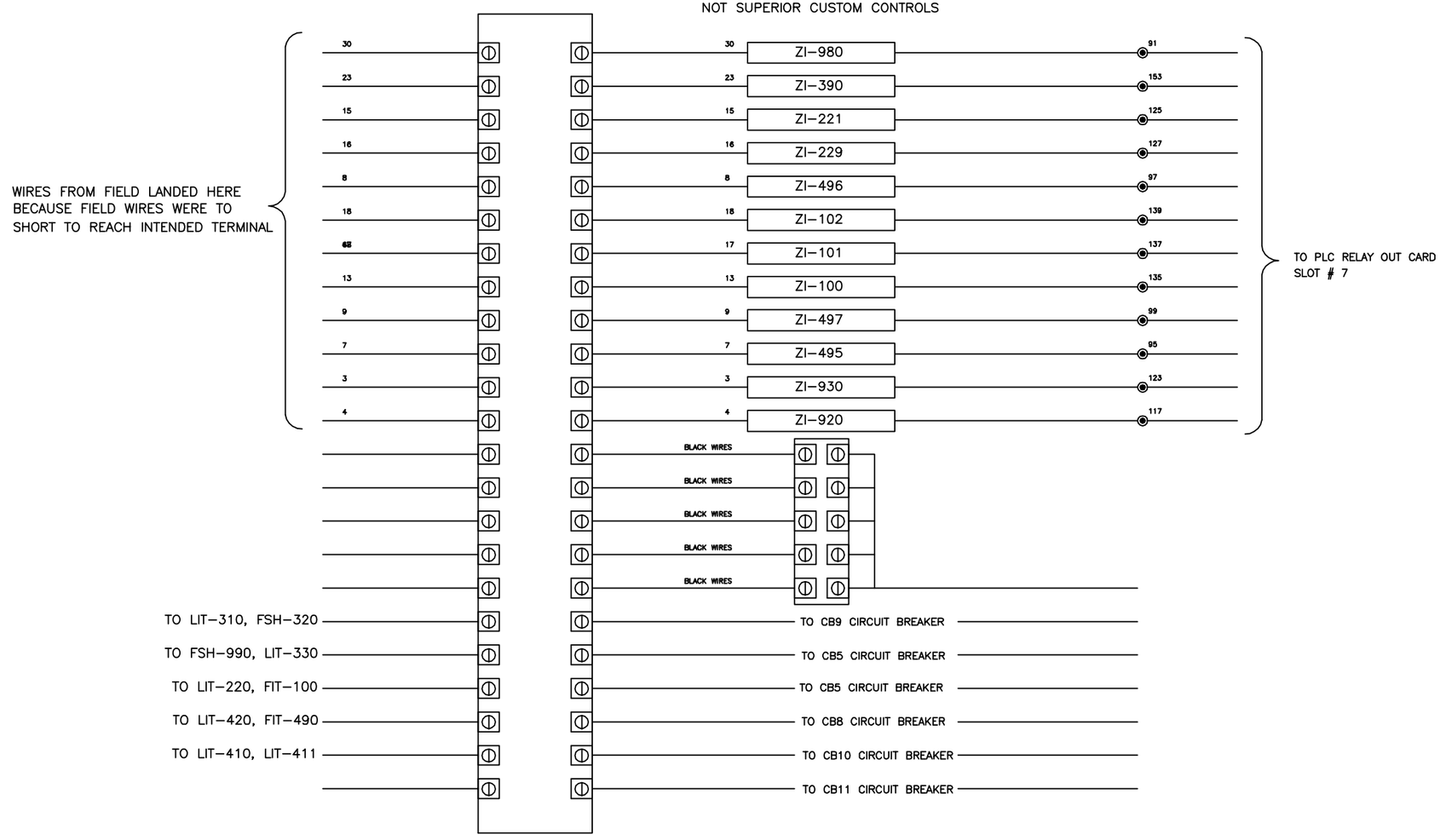
TERMINAL STRIP LOCATED IN CONTROL PANEL
UNMARKED BY CONTRACTOR

THIS CARD NOT INSTALLED AT THIS TIME
DRAWIN AS 1756-IA16 CARD



CURRENT RELAY ADDED BY OTHERS
NOT SUPERIOR CUSTOM CONTROLS

WIRES FROM FIELD LANDED HERE
BECAUSE FIELD WIRES WERE TO
SHORT TO REACH INTENDED TERMINAL



NOTES

- (S1A) FUSED TERMINAL
- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- --- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

THIS DRAWING REDRAWN FROM RED PEN DRAWINGS
SUPERIOR CUSTOM CONTROLS TAKES NON RESPONSIBILITY
FOR THE ACCURACY OF THESE DRAWING DUE TO
CHANGES AND WIRING DONE BY OTHERS

AS-IN FIELD

PACIFIC CREST ELECTRIC

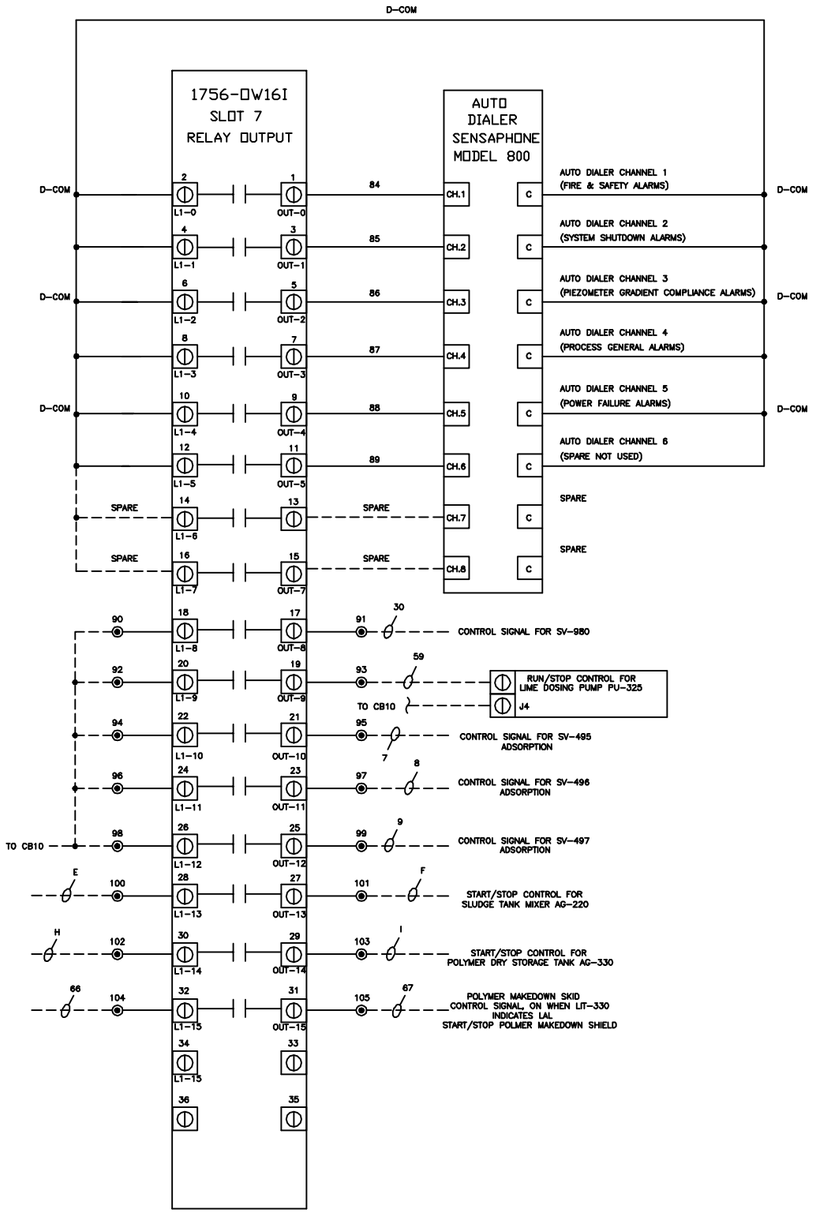
SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

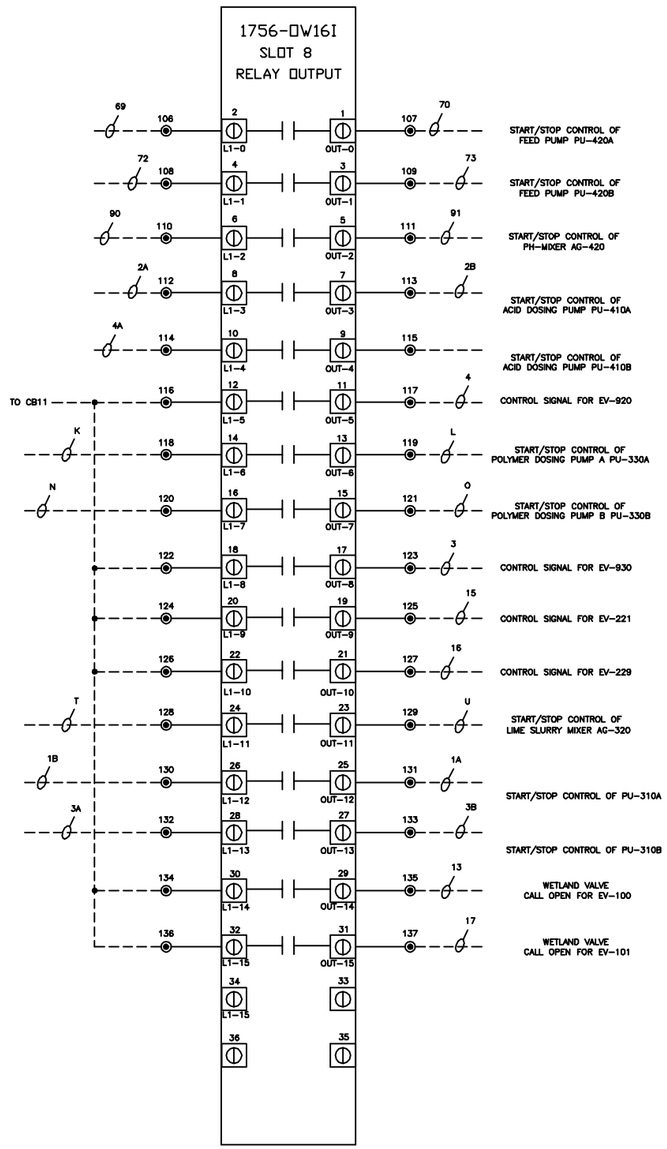
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DATE: 24JAN2012	PAGE: 4 OF 6	REVISED: 19MARCH13

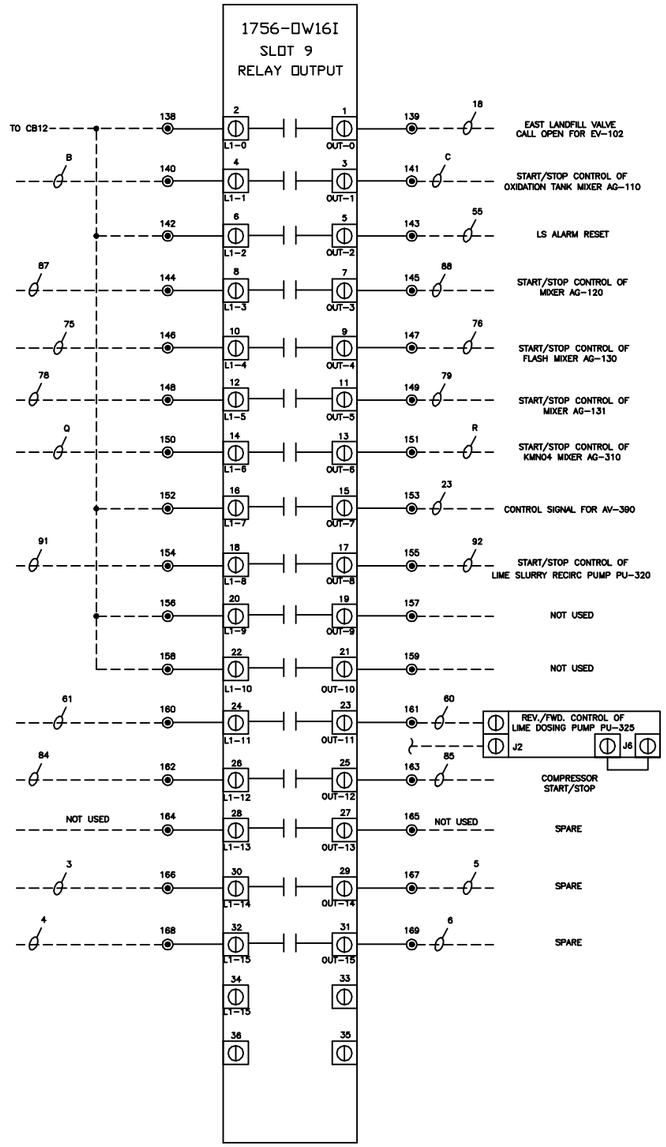
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
PLC INPUTS

DIGITAL INPUT CARD SLOT 6

DRAWING: 3633-4







NOTES

- FUSED TERMINAL
- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- --- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

AS-IN FIELD

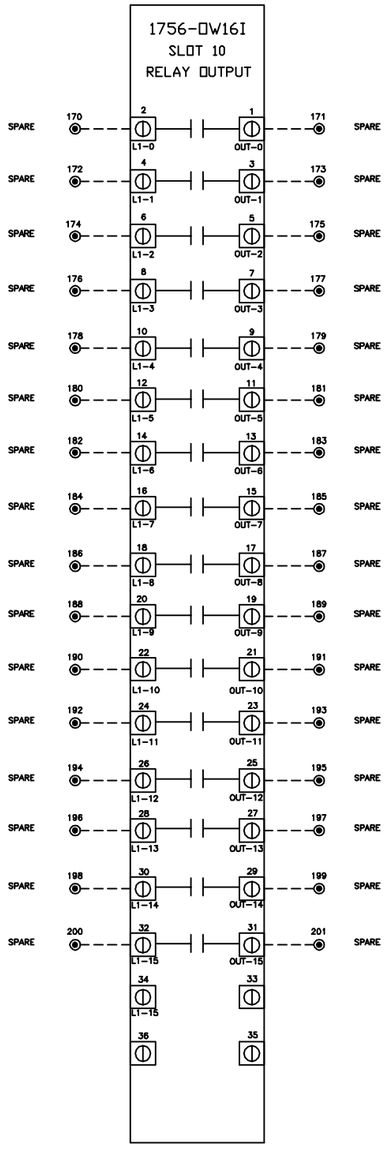
PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

SCALE: NONE	PREV. REV: 24APR2012	DRAWN BY:MJ/WD
DATE: 24JAN2012	PAGE: 4 OF 6	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
PLC OUTPUTS

DIGITAL OUTPUT CARDS SLOTS 7,8,9 | DRAWING: 3633-5



NOTES

- FUSED TERMINAL
- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- --- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

AS-IN FIELD

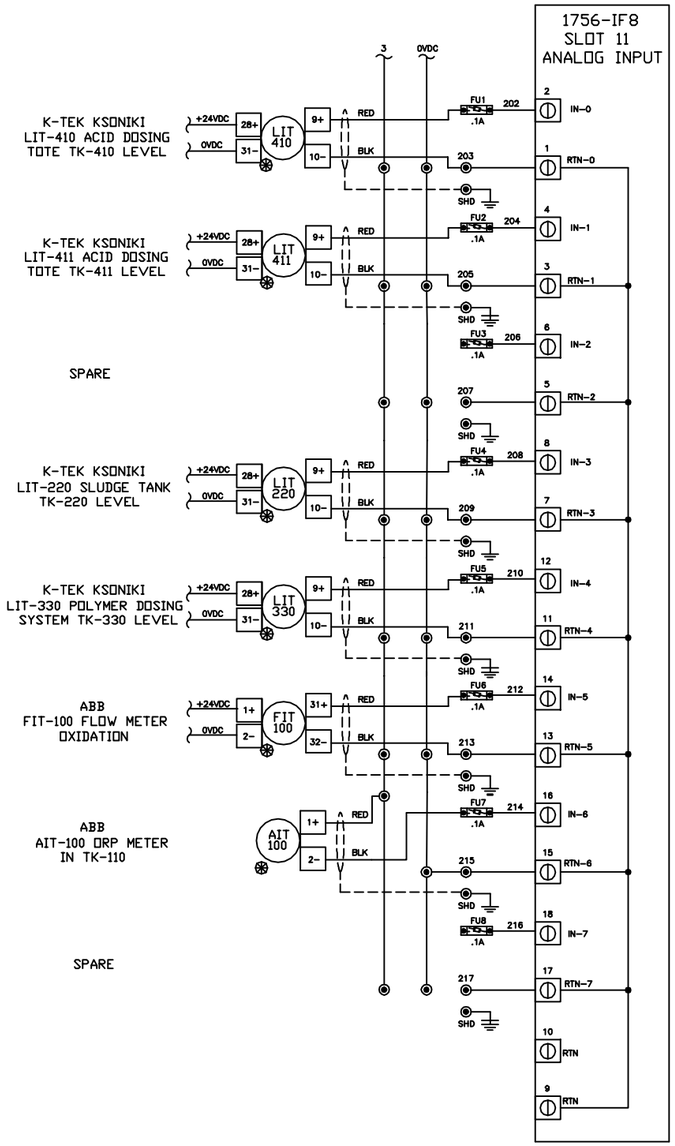
PACIFIC CREST ELECTRIC

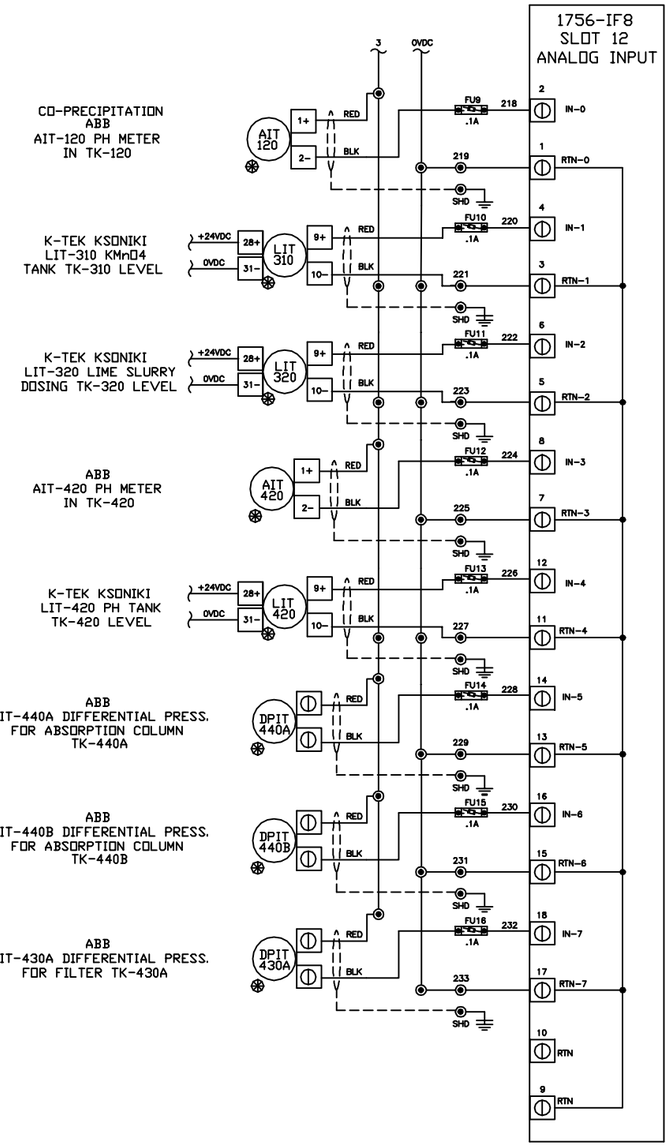
SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

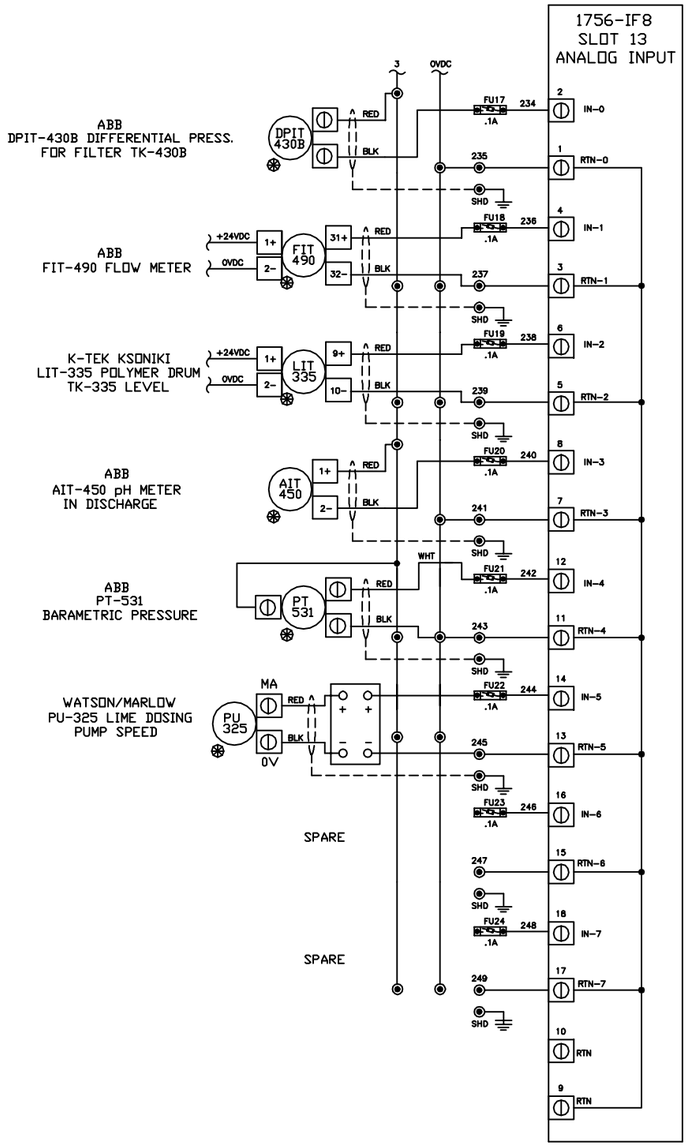
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DATE: 24JAN2012	PAGE: 4 OF 6	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
PLC OUTPUTS

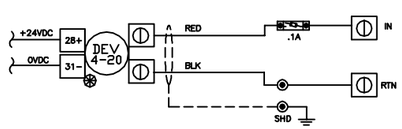
DIGITAL OUTPUT CARD SLOT 10 — DRAWING: 3633-6



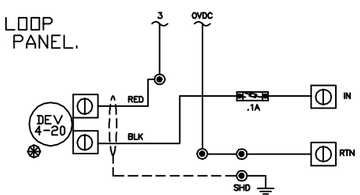




TYPICAL OF A LOOP
POWERED BY IT'S DEVICE



TYPICAL OF A LOOP
POWERED BY THIS PANEL.



ASSUMPTIONS WERE MADE BASED ON THE TYPE OF DEVICE AS TO WETHER OR NOT THE LOOP IS POWERED.
THIS IS DUE TO LIMITED INFORMATION PROVIDED, ON EXTERNAL DEVICES. THE LOOPS ARE NOW DESIGNED TO BE
RE-CONFIGURABLE AT THE TERMINAL STRIPS (AS SHOWN ABOVE) IF NEEDED.

AS-IN FIELD

NOTES

- FUSED TERMINAL
- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- – – DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

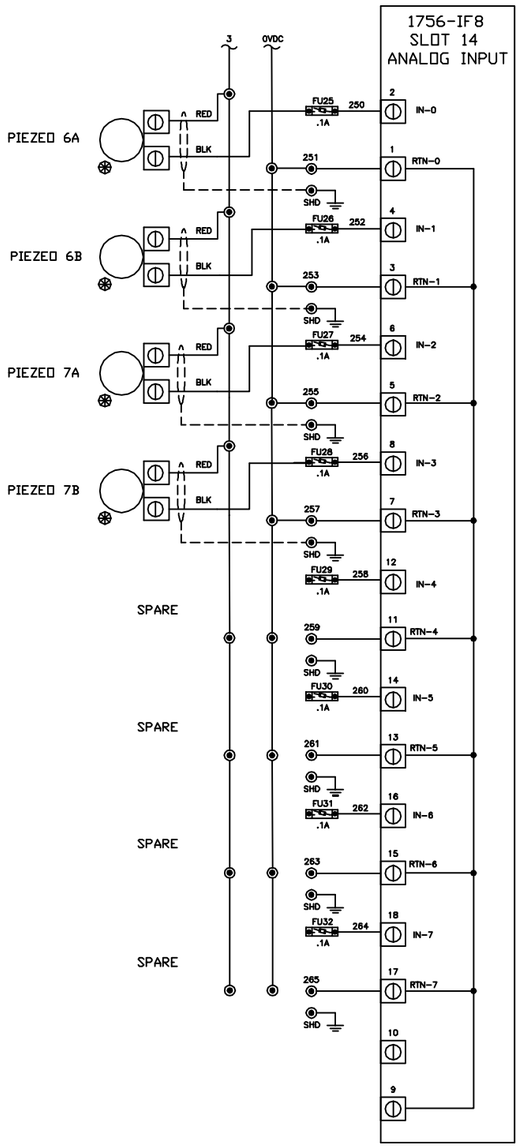
PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

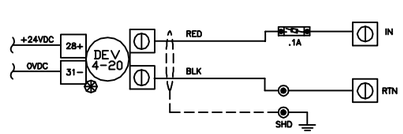
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B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
PLC INPUTS

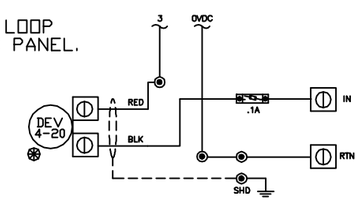
ANALOG INPUT CARDS SLOTS 11,12,13 | DRAWING: 3633-7



TYPICAL OF A LOOP
POWERED BY IT'S DEVICE



TYPICAL OF A LOOP
POWERED BY THIS PANEL.



ASSUMPTIONS WERE MADE BASED ON THE TYPE OF DEVICE AS TO WETHER OR NOT THE LOOP IS POWERED.
THIS IS DUE TO LIMITED INFORMATION PROVIDED, ON EXTERNAL DEVICES. THE LOOPS ARE NOW DESIGNED TO BE RE-CONFIGURABLE AT THE TERMINAL STRIPS (AS SHOWN ABOVE) IF NEEDED.

AS-IN FIELD

NOTES

- FUSED TERMINAL
- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- - - DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

PACIFIC CREST ELECTRIC

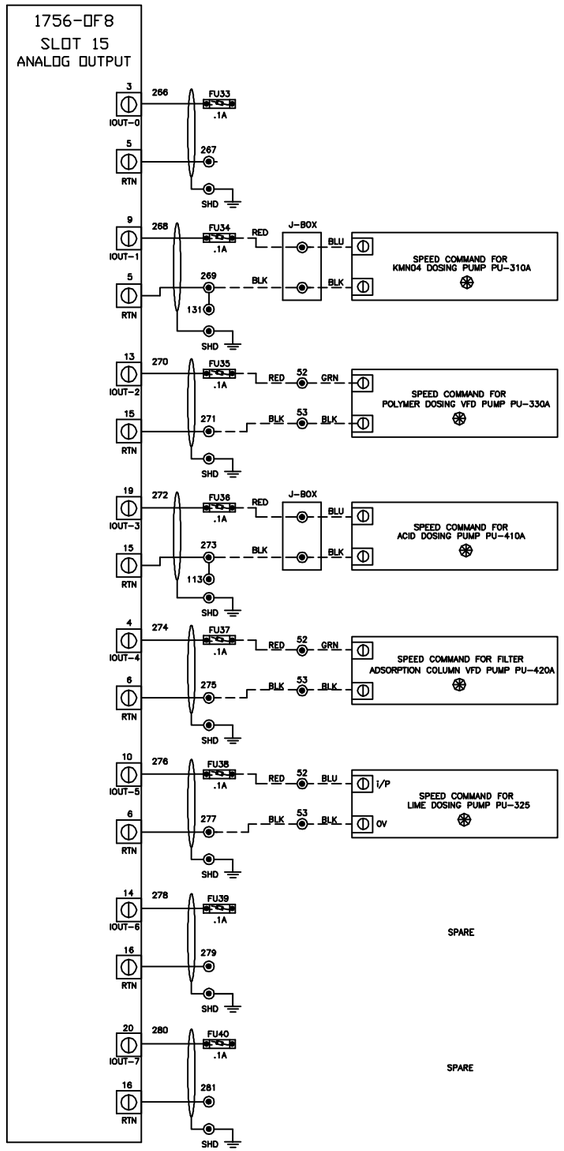
SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

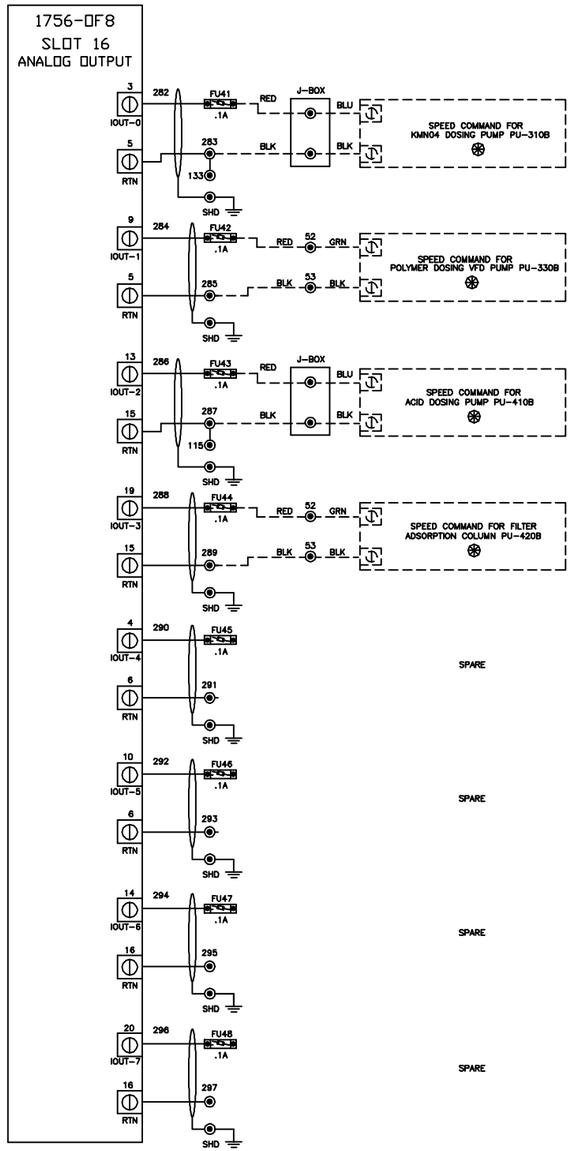
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DATE: 24JAN2012	PAGE: 5 OF 6	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
PLC INPUTS

ANALOG INPUT CARD SLOT 14

DRAWING: 3633-8





NOTES

- [.1A] FUSED TERMINAL
- NOT SUPPLIED BY SUPERIOR CUSTOM CONTROLS.
- TERMINAL INTERNAL TO PANEL.
- --- DENOTES ITEMS FOR FUTURE OR EXTERNAL WIRING

AS-IN FIELD

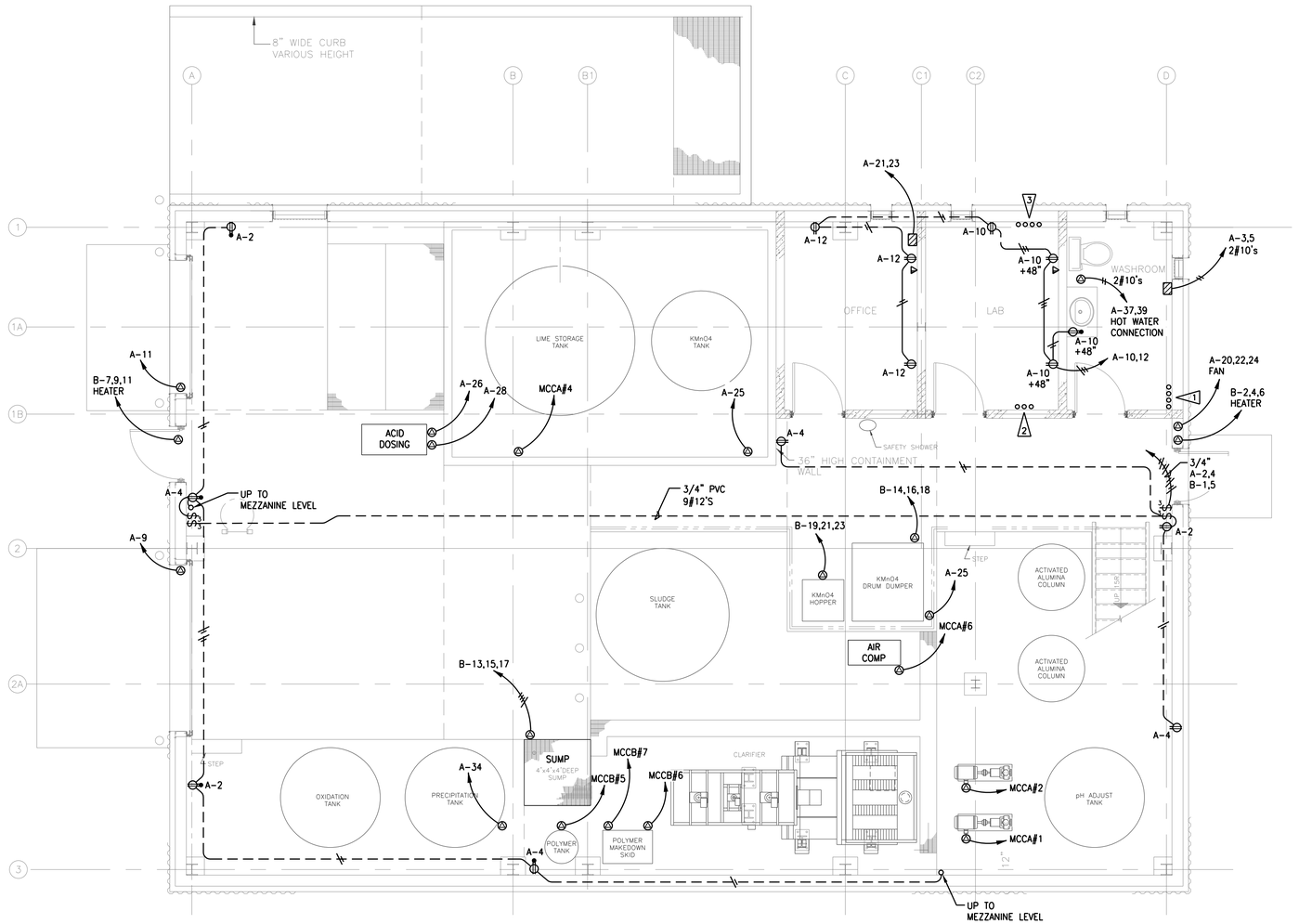
PACIFIC CREST ELECTRIC

SUPERIOR CUSTOM CONTROLS
12544 27th AVE. N.E. SEATTLE, WA 98125

SCALE: NONE	PREV. REV: 20APR2012	DRAWN BY: MJ/WD
DATE: 24JAN2012	PAGE: 6 OF 6	REVISED: 19MARCH13

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON
PLC OUTPUTS

ANALOG OUTPUT CARDS SLOT 15,16 | DRAWING: 3633-9



1 FIRST FLOOR POWER PLAN

SCALE: 1/4"=1'-0"

FLAG NOTES:

1. CONDUIT RISER LOCATION FOR KIOSK POWER AND HOME RUNS TO PANEL A AND 208 VOLT MCC.
2. CONDUIT RISER LOCATION FOR OPTICAL FIBER TO PLC PANEL.
3. CONDUIT RISER LOCATION TO 480 VOLT MCC.

POWER SYMBOLS LEGEND

- 750 WATT FAN FORCED HEATER WITH INTEGRAL THERMOSTAT
- 20 AMP SPEC GRADE DUPLEX
- GFI - 20 AMP SPEC GRADE DUPLEX
- DENOTES CONDUIT UP
- DENOTES CONDUIT DOWN
- PHONE/DATA
- JUNCTION BOX

DRAWING INDEX

SHEET	DESCRIPTION
E-1	FIRST FLOOR POWER PLAN
E-2	MEZZANINE POWER PLAN
E-3	FIRST FLOOR LIGHTING PLAN
E-4	MEZZANINE LIGHTING PLAN
E-5	SCHEDULES AND ONE-LINE DIAGRAM

RECORD DRAWING

0 2' 4' 8'

SCALE: 1/4"=1'-0"

PACIFIC CREST ELECTRIC
425-334-6785
fax 425-397-8157
Jimmy@PacificCrestElectric.com
Post Office Box 99
Lake Stevens, WA 98258
LicPACIFCE939Q1

B & L WOODWASTE SITE
GROUNDWATER TREATMENT PLANT
PIERCE COUNTY, WASHINGTON

ISSUES	
12/14/12	AS-BUILT DRAWINGS

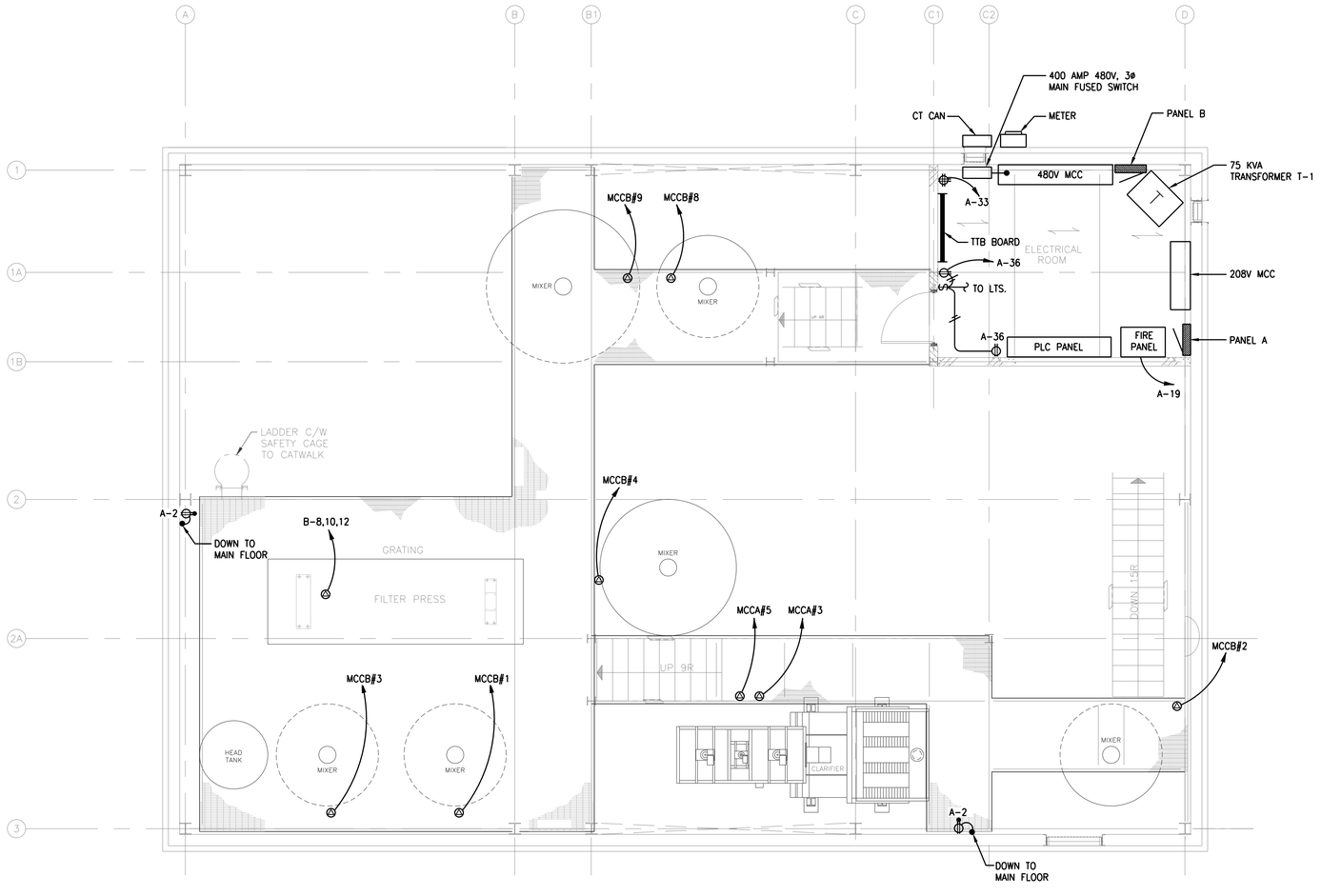
TITLE: FIRST FLOOR POWER PLAN

DATE: OCTOBER 7, 2011

PROJECT NO.: 11-061

SHEET: E-1

DATE: 12/14/2012 8:54:16 AM DWG: E:\Google Drive\R&D Tax\Pacific Crest\11-061 - B&L Woodwaste\Cad\E1-E5_B&L Woodwaste.dwg



1 MEZZANINE POWER PLAN
SCALE: 1/4"=1'-0"

RECORD DRAWING

0 2' 4' 8'
SCALE: 1/4"=1'-0"

PACIFIC CREST ELECTRIC
Post Office Box 99
Lake Stevens, WA 98258
LicPACIFCE939QJ
425-334-6785
fax 425-397-8157
Jimm@PacificCrestElectric.com

B & L WOODWASTE SITE
GROUNDWATER TREATMENT PLANT
PIERCE COUNTY, WASHINGTON

ISSUES	
12/14/12	AS-BUILT DRAWINGS

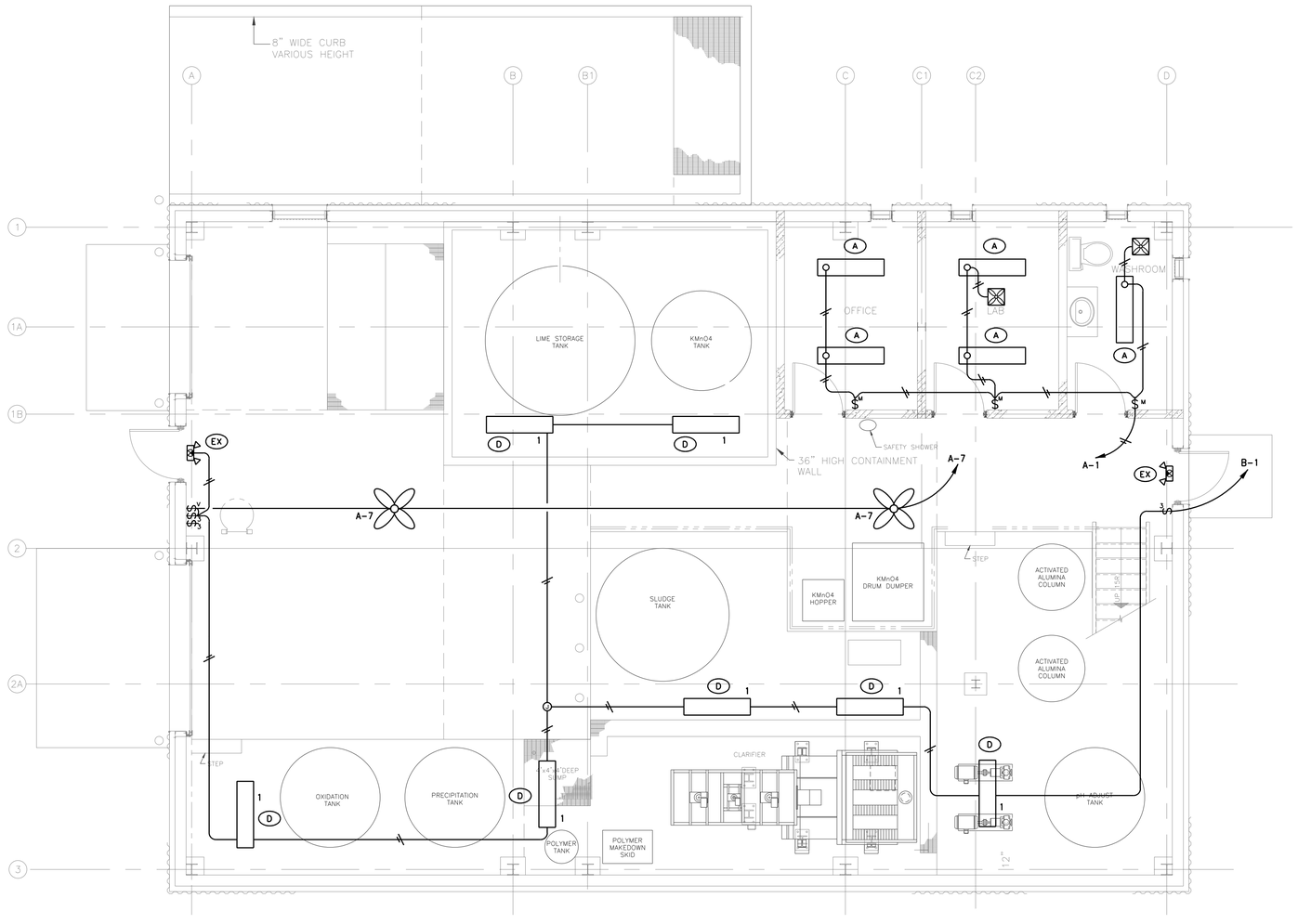
TITLE:
MEZZANINE
POWER PLAN

DATE:
OCTOBER 7, 2011

PROJECT NO.:
11-061

SHEET:
E-2

DATE: 12/14/2012 8:54:18 AM DWG: E:\Google Drive\R&D Files\Pacific Crest\11-061 - B&L Woodwaste\Cad\E1-E5_B&L Woodwaste.dwg



1 FIRST FLOOR LIGHTING PLAN
SCALE: 1/4"=1'-0"

FLAG NOTES:

1. MOUNT TO BOTTOM OF GRATE. TYPICAL ALL TYPE "D" FIXTURES.
2. MOUNT PHOTO EYE FACING SOUTH ABOVE FIXTURE.

FIXTURE SCHEDULE

Fixture Type	QUAN	Type	Description	Watts	# Lamps	Lamp Type	Total Watts
A	5	1x4	Lithonia M232A12MVVOLT GEB1015	32	2	T-8	320
B	8	250 W Low Bay	RAB BLH250P16DLPSQ	250	1	MH	2000
C	8	Wall Pack	RAB WP3H250PSQ	32	4	PL/32	512
D	6	4' Vapor Proof	LNP VT4S-232	32	2	T-8	384
EM	2	Combo Exit/Emerg	Exitronix GVEX-U-BP-WB-WH-EL90	5.4	2	6V	21.6
EX	3	Emergency	Exitronix LL90	5.4	2	6V	32.4
F	2	8' 4 lamp strip	8' 4 Lamp Strip Chain Mtd	32	4	T-8	256

LIGHTING SYMBOLS LEGEND

- (A) 1x4 SURFACE MOUNT WRAP FLUORESCENT FIXTURE
- (B) 64W FLUORESCENT LOW-BAY FIXTURE
- (C) 250W WALL PACK FIXTURE
- (D) 4' (2) LAMP SURFACE MOUNT FLUORESCENT FIXTURES, HINGED AND GASKETED
- (EM) DUAL HEAD EMERGENCY LIGHT
- (EX) COMBINATION DUAL HEAD EMERGENCY LIGHT FIXTURE AND EXIT
- (F) 8' (4) LAMP TB STRIP CHAIN HUNG FIXTURE
- CEILING EXHAUST FAN
- CEILING FAN
- ^{x} LIGHT SWITCH
  M = MOTION
  V = VARIABLE
  3 = 3-WAY

RECORD DRAWING

0 2' 4' 8'
SCALE: 1/4"=1'-0"

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LicPACIFCE939QJ

B & L WOODWASTE SITE
GROUNDWATER TREATMENT PLANT
PIERCE COUNTY, WASHINGTON

ISSUES	
12/14/12	AS-BUILT DRAWINGS

TITLE:
FIRST FLOOR LIGHTING PLAN

DATE:
OCTOBER 7, 2011

PROJECT NO.:
11-061

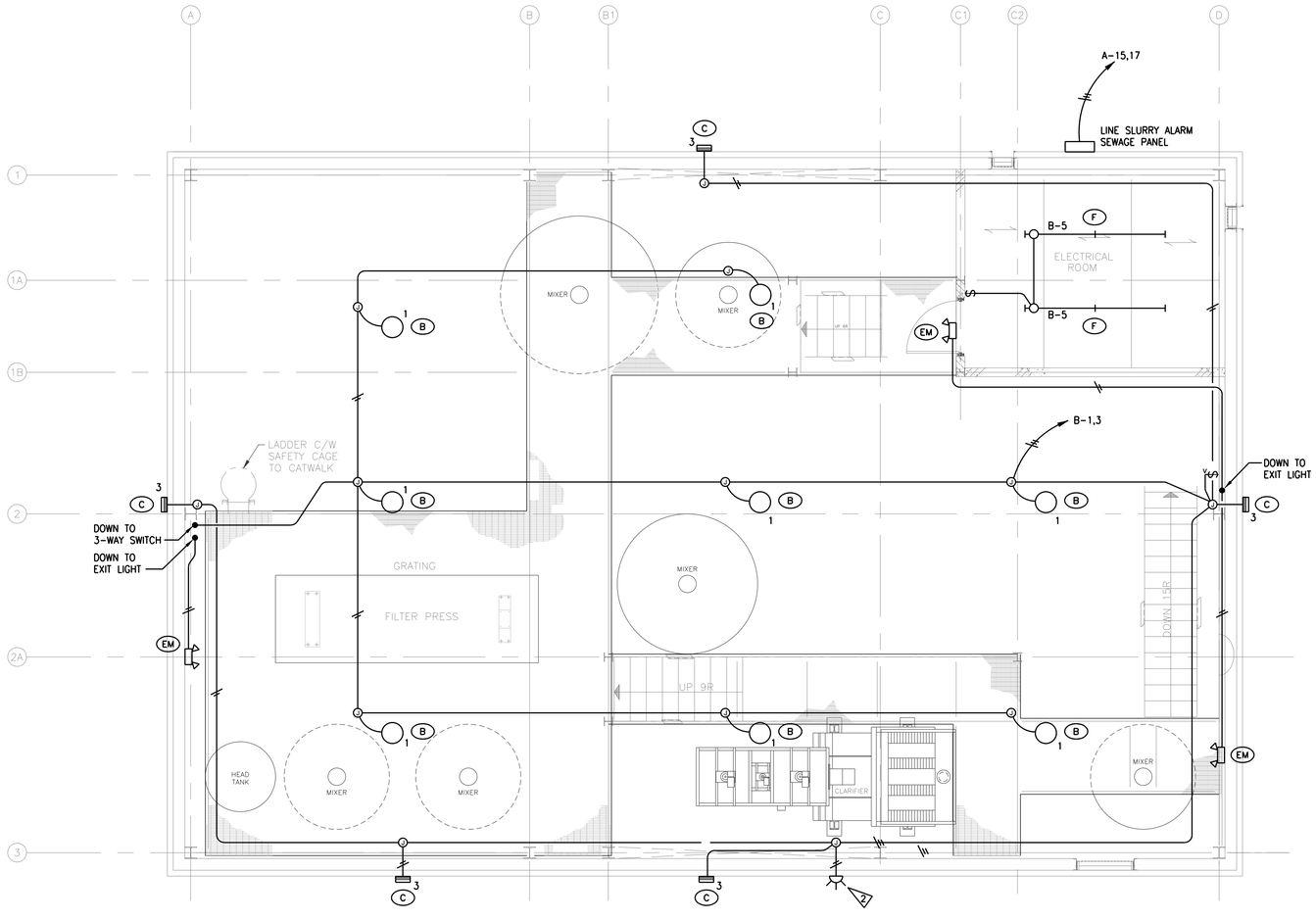
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FLAG NOTES:

1> MOUNT TO BOTTOM OF GRATE. TYPICAL ALL TYPE "D" FIXTURES.

2> MOUNT PHOTO EYE FACING SOUTH ABOVE FIXTURE.



1 MEZZANINE LIGHTING PLAN

SCALE: 1/4"=1'-0"

RECORD DRAWING

0 2' 4' 8'

SCALE: 1/4"=1'-0"

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B & L WOODWASTE SITE
GROUNDWATER TREATMENT PLANT

PIERCE COUNTY, WASHINGTON

ISSUES	
12/14/12	AS-BUILT DRAWINGS

TITLE:

MEZZANINE
LIGHTING PLAN

DATE:
OCTOBER 7, 2011

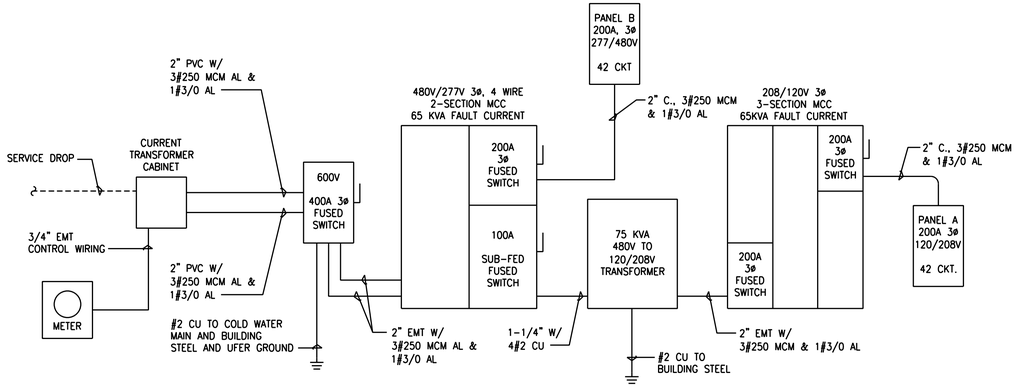
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11-061

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E-4

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RECORD DRAWING



1 ONE-LINE RISER DIAGRAM
SCALE: N.T.S.

Panel A	Section: 1	of 1	Bus: 120/208	Volts	X Main C.B.
Locatio ELEC ROOM	Serving: B&L WOODWASTE		3 PH 4 ˅ ˅ ˅	200 Amps	O Main Lug
Fully Rated SC Rating	O Feed Thru Lugs				O Flush Mt O Top Feed
10000 RMS SYM Amps	O Sub Feed Lugs		O Iso Gnd Bus		X Surface M X Bottom Feed

Load Type	Circuit Description	Conn KVA	AMP	Pole	CKT	PH	CKT	Pole	AMP	Conn KVA	Circuit Description	Load Type
L	OFFICE LIGHTS	0.32	20	1	1	A	2	1	20	0.72	RECEPTACLE MEZZ AND MAIN FLOOR	R
E	BASBOARD HEATER	2.50	20	2	3	B	4	1	20	0.72	RECEPTACLES MEZZ AND MAIN FLOOR	R
E	"	2.50	20	"	5	C	6	1	20	0.00	SPARE	R
L	CEILING FANS	0.20	20	1	7	A	8	1	20	0.18	EXAUST FAN CONTROL PWR	E
E	LARGE ROLL UP DOOR	0.50	20	1	9	B	10	1	20	0.72	OFFICE RECEPTACLES	R
E	SMALL ROLL UP DOOR	0.50	20	1	11	C	12	1	20	0.72	OFFICE RECEPTACLES	R
R	SPARE	0.00	20	1	13	A	14	1	20	0.00	SPARE	R
E	SEWAGE GRINDER PANEL	0.25	20	2	15	B	16	1	20	0.00	SPARE	R
E	"	0.25	20	"	17	C	18	1	20	0.00	SPARE	R
E	FIRE ALARM PANEL	0.10	20	1	19	A	20	3	20	0.75	EXAUST FAN	M
E	BASEBOARD HEATER (OFFICE)	2.50	20	2	21	B	22	"	20	0.75	"	M
E	"	2.50	20	"	23	C	24	"	20	0.75	"	M
E	KMNO4 DOSING PUMP 1	0.20	20	1	25	A	26	1	20	0.18	ACID DOSING PUMP	R
R	BATHROOM GFI	0.18	20	1	27	B	28	1	20	0.18	ACID DOSING PUMP	E
E	LIME DOSING PUMP	0.18	20	1	29	C	30	1	20	0.18	AIR FILTER DRYER	E
R	KMNO4 DOSING PUMP 2	0.18	20	1	31	A	32	1	20	0.00	SPARE	R
R	PHONE BOARD RECEP	0.18	20	1	33	B	34	1	20	0.18	POLYMER SKID	R
L	HEAT TAPE	0.18	20	1	35	C	36	1	20	0.18	ELECTRICAL ROOM RECEPTACLE	R
E	HOT WATER TANK	2.50	20	2	37	A	38	1	20	0.00	SPARE	R
E	"	2.50	20	"	39	B	40	1	20	0.00	"	R
E	PLC POWER	0.50	20	1	41	C	42	1	20	0.00	"	R

Total Receptacle ® Load @ 180VAea, 100% for first 10,000VA & 50% for remainder						3.78	KVA
Total Noncoincident (E) Load	13.02	KVA	(not included in demand load)		Total HVAC (H) Load	13.02	KVA
Total Lighting (L) Load @ .125% 0	0.88	KVA			Total Noncontinuous (N) Load	0.88	KVA
Total Motor (M) Load	2.25	KVA			Largest Motor @.2 HP	2.25	KVA

Total Connected Load	Connected AMP	A	B	C	Minimum Circuit Ampacity
19.93 KVA	Total/Phase	44	93	70	95 AMPS

Panel B	Section: 1	of 1	Bus: 277/480	Volts	X Main C.B.
Locatio ELEC ROOM	Serving: B&L WOODWASTE		3 PH 4 Wire	200 Amps	O Main Lug
Fully Rated SC Rating	O Feed Thru Lugs				O Flush Mt O Top Feed
10000 RMS SYM Amps	O Sub Feed Lugs		O Iso Gnd Bus		X Surface M X Bottom Feed

Load Type	Circuit Description	Conn KVA	AMP	Pole	CKT	PH	CKT	Pole	AMP	Conn KVA	Circuit Description	Load Type
L	LIGHTS HIGH BAY	0.50	20	1	1	A	2	3	60	13.20	HEATER	H
L	EXTERIOR LIGHTS	1.00	20	1	3	B	4	"	60	13.20	"	H
L	LIGHTS HIGH BAY	0.50	20	1	5	C	6	"	60	13.20	"	H
H	HEATER	13.20	60	3	7	A	8	3	20	0.18	FILTER PRESS	M
H	"	13.20	60	"	9	B	10	"	20	0.18	"	M
H	"	13.20	60	"	11	C	12	"	20	0.18	"	M
M	SLUDGE PUMP	1.90	20	3	13	A	14	3	20	0.50	KMNO4 DRUM DUM	M
M	"	1.90	20	"	15	B	16	"	20	0.50	"	M
M	"	1.90	20	"	17	C	18	"	20	0.50	"	M
M	CONVEYOR KMNO4	0.50	20	1	19	A	20	"	20	1.30	SPARE	
M	"	0.50	20	1	21	B	22		20		"	
M	"	0.50	20	1	23	C	24				"	
	SPARE				25	A	26				"	
	"				27	B	28				"	
	"				29	C	30				"	
	" "				31	A	32				"	
	"				33	B	34				"	
	"				35	C	36				"	
	"				37	A	38				"	
	"				39	B	40				"	
	"				41	C	42				"	

Total Receptacle ® Load @ 180VAea, 100% for first 10,000VA & 50% for remainder							KVA
Total Noncoincident (E) Load		KVA	(not included in demand load)		Total HVAC (H) Load	79.20	KVA
Total Lighting (L) Load @ .125% 0	#######	KVA			Total Noncontinuous (N) Load	2.50	KVA
Total Motor (M) Load	9.24	KVA			Largest Motor @.2 HP	9.24	KVA

Total Connected Load	Connected AMP	A	B	C	Minimum Circuit Ampacity
90.94 KVA	Total/Phase	112	110	108	189 Amps

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B & L WOODWASTE SITE
GROUNDWATER TREATMENT PLANT
PIERCE COUNTY, WASHINGTON

ISSUES	
12/14/12	AS-BUILT DRAWINGS

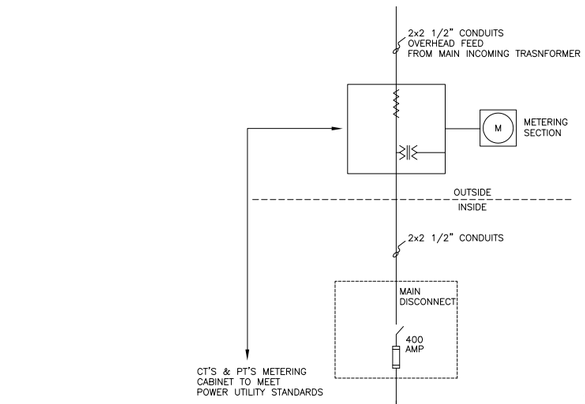
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SCHEDULES AND ONE-LINE DIAGRAM

DATE:
OCTOBER 7, 2011

PROJECT NO.:
11-061

SHEET:
E-5

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CONDUCTOR TABLE

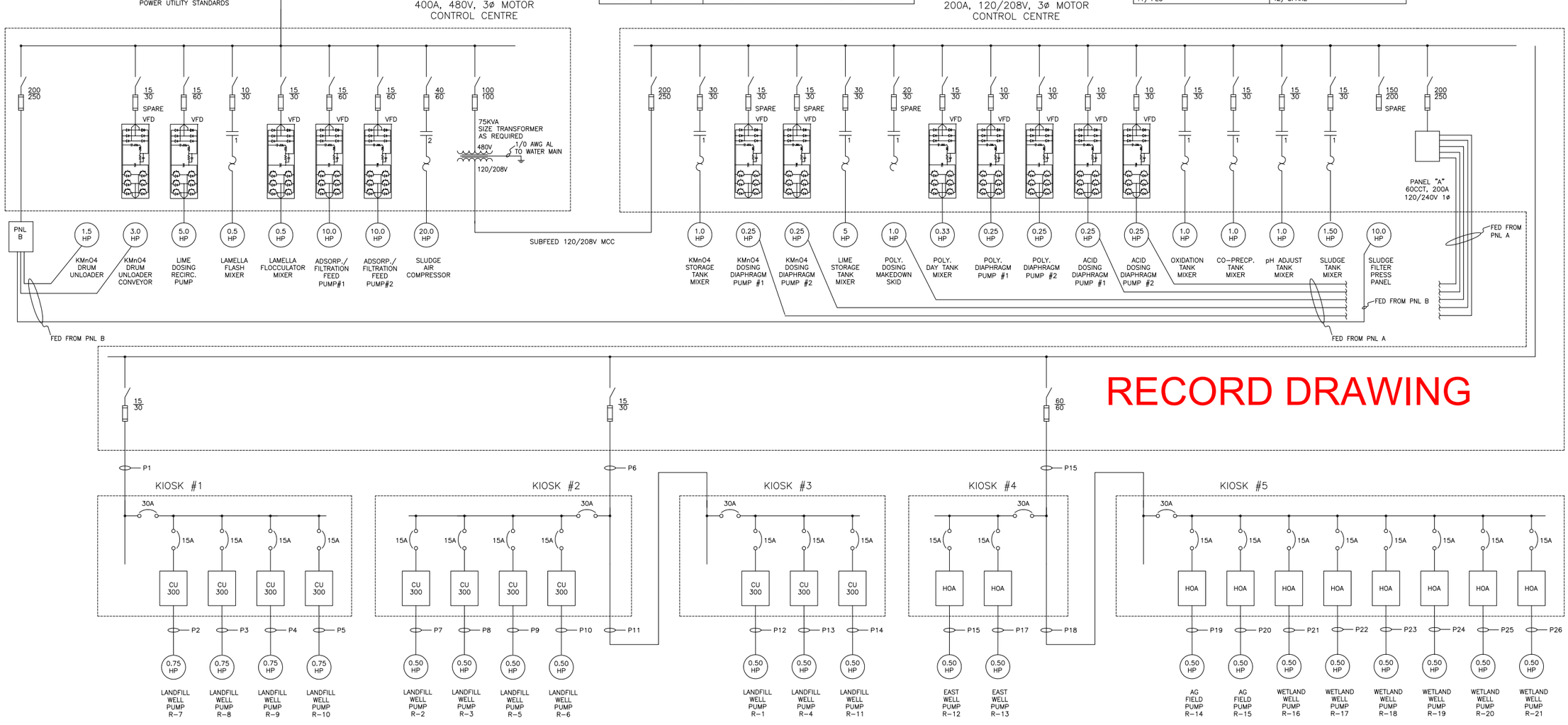
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P1	GWTP	KIOSK#1	1–3C #3 AWG Cu OR 1–3C #1 AWG Al
P2	KIOSK#1	R–7	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P3	KIOSK#1	R–8	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P4	KIOSK#1	R–9	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P5	KIOSK#1	R–10	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P6	GWTP	KIOSK#2	1–3C #3 AWG Cu OR 1–3C #1 AWG Al
P7	KIOSK#2	R–2	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P8	KIOSK#2	R–3	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P9	KIOSK#2	R–5	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P10	KIOSK#2	R–6	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P11	KIOSK#2	KIOSK#3	1–3C #3 AWG Cu OR 1–3C #1 AWG Al
P12	KIOSK#3	R–1	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P13	KIOSK#3	R–4	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P14	KIOSK#3	R–11	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P15	GWTP	KIOSK#4	1–3C #3 AWG Cu OR 1–3C #1 AWG Al
P16	KIOSK#4	R–12	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P17	KIOSK#4	R–13	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P18	KIOSK#4	KIOSK#5	1–3C #3 AWG Cu OR 1–3C #1 AWG Al
P19	KIOSK#5	R–14	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P20	KIOSK#5	R–15	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P21	KIOSK#5	R–16	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P22	KIOSK#5	R–17	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P23	KIOSK#5	R–18	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P24	KIOSK#5	R–19	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P25	KIOSK#5	R–20	1–3C #10 AWG Cu OR 1–3C #8 AWG Al
P26	KIOSK#5	R–21	1–3C #10 AWG Cu OR 1–3C #8 AWG Al

DISTRIBUTION PANEL A

1) OFFICE LTS	2) RECEPS
3) BASEBOARD HEATER, BATHROOM	4) RECEPS
5) BASEBOARD HEATER, LAB	6) FUTURE
7) CEILING FANS	8) EXHAUST FAN CONTROL POWER
9) LARGE ROLL–UP DOOR	10) OFFICE RECEPS
11) SMALL ROLL–UP DOOR	12) OFFICE RECEPS
13) SPARE	14) SPARE
15) SEWAGE GRINDER PANEL	16) SPARE
17) SEWAGE GRINDER PANEL	18) SPARE
19) FIRE PANEL	20) EXHAUST FAN
21) BASEBOARD HEATER, OFFICE	22) EXHAUST FAN
23) BASEBOARD HEATER, OFFICE	24) EXHAUST FAN
25) KMN04 DOSING PUMP #1	26) ACID DOSING PUMP #1
27) BATHROOM GFI RECEP	28) ACID DOSING PUMP #2
29) LIME DOSING PUMP	30) AIR FILTER DRYER
31) KMN04 DOSING PUMP #2	32) FUTURE
33) PHONE BOARD RECEP	34) POLYMER SKID
35) HEAT TAPE	36) ELEC RM RECEP
37) HOT WATER	38) COAGULANT PUMP
39) HOT WATER	40) SPARE
41) PLC	42) SPARE

DISTRIBUTION PANEL B

1) INTERIOR LIGHTS (HIGH BAYS)	2) HEATER, EAST
3) EXTERIOR LIGHTS	4) HEATER, EAST
5) INTERIOR LIGHTS (HIGH BAYS)	6) HEATER, EAST
7) HEATER, WEST	8) FILTER PRESS
9) HEATER, WEST	10) FILTER PRESS
11) HEATER, WEST	12) FILTER PRESS
13) SLUDGE SUM PUMP (TK–250)	14) KMN04 DRUM DUMPER
15) SLUDGE SUMP PUMP (TK–250)	16) KMN04 DRUM DUMPER
17) SLUDGE SUMP PUMP (TK–250)	18) KMN04 DRUM DUMPER
19) KMN04 CONVEYOR	
21) KMN04 CONVEYOR	
23) KMN04 CONVEYOR	



RECORD DRAWING

REFERENCES:	NO.		DATE	APRVD
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DESIGNED JB, TU
CHECKED –
REVIEWED –

AMEC Geomatrix

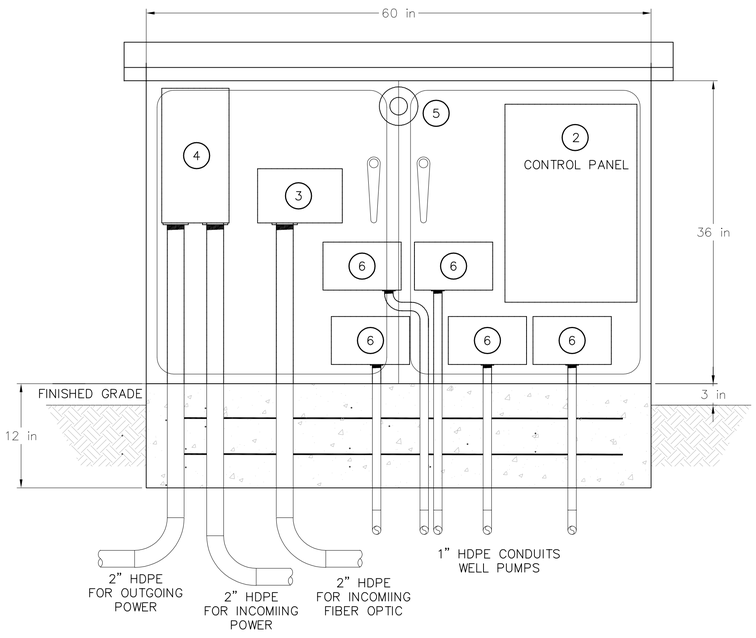
ELECTRICAL SINGLE LINE DIAGRAM

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/19/13
PROJECT NO.: 104–018–E1
DRAWING E–01

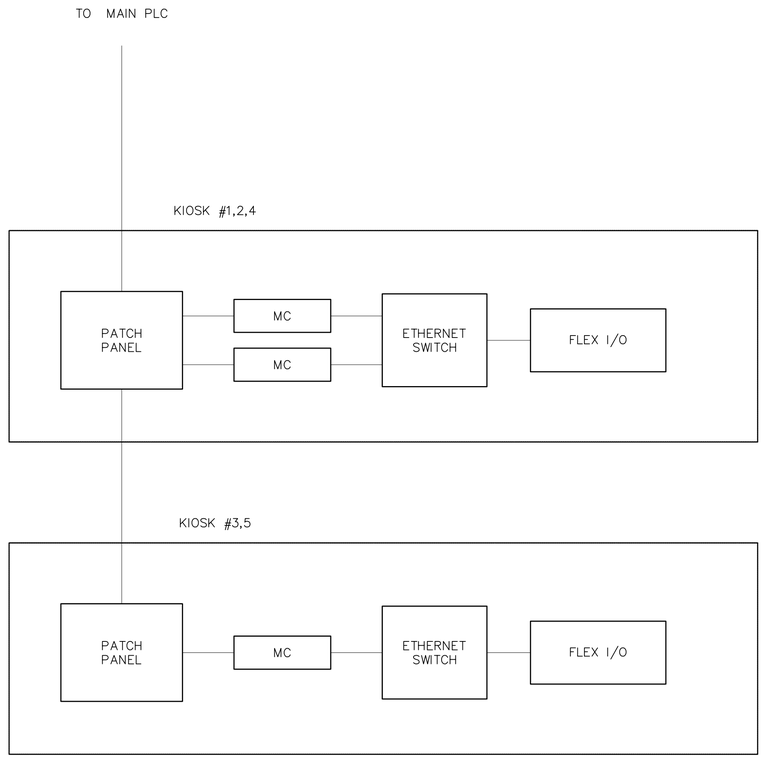
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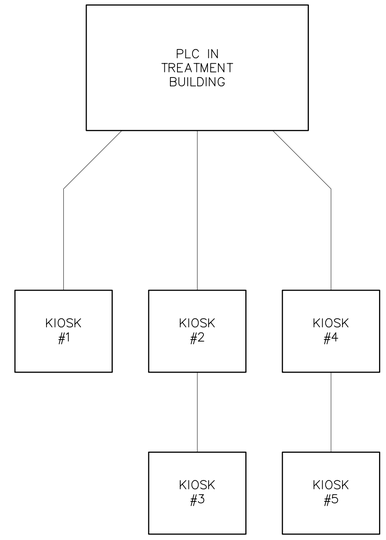


TYPICAL KIOSK

SCALE 1:20



TELEMETRY DIAGRAM



KIOSK MATERIAL LIST				
ITEM	QTY	MANUFACTURER	PART #	DESCRIPTION
1	1	OPEN	36"x72"x12" NEMA 4X SS	PANEL ENCLOSURE c/w BACK PLANE
2	1	OPEN	OPEN	PLC CONTROL PANEL
3	1	OPEN	OPEN	FIBER OPTIC PATCH PANEL
4	1	OPEN	OPEN	120/240V BREAKER PANEL
5	1	OPEN	OPEN	120V LIGHT
6	1	GRUNDFOS	CU-300	PUMP MOTOR CONTROLLER

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR PLANS AND SPECIFICATIONS	APR 13	–
2	ISSUED FOR TENDER	MAY 25	TDU

DRAWN JB
DESIGNED JB,TU
CHECKED –
REVIEWED –

AMEC Geomatrix

KIOSK DETAILS, CONDUCTOR TABLE & TELEMETRY SCHEMATICS

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 05/25/11
PROJECT NO.: SE10160010

DRAWING
E-02

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix I
1994 Closure Report

CLOSURE REPORT
B & L LANDFILL

PREPARED FOR:

ASARCO Incorporated

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PREPARED BY:

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B003

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37190317029

CLOSURE REPORT B & L LANDFILL -
(MAY 6TH, 1994)

00 517-001 16004-0048
ASARCO INCORPORATED
TACOMA PLANT - B&L LANDFILL

16004 8400 00517 001

CLOSURE REPORT B & L LANDFILL - (MAY 6TH, 1994)

ASARCO INCORPORATED
TACOMA PLANT - B&L LANDFILL

00
517
001

CLOSURE REPORT
Hydrometrics, Inc., May 6, 1994
ASARCO Inc./B&L Landfill (MXN copy)

16004-0048-0522

ASARC0219073

16004 0048

CLOSURE REPORT

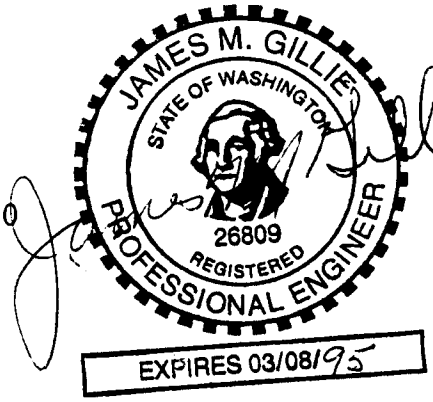
B & L LANDFILL

Prepared for:

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ASARCO Incorporated
P. O. Box 1677
Tacoma WA 98101

Prepared by:

Hydrometrics, Inc.
950 Pacific Avenue Suite 610
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May 11, 1994

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ASARC0219075

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ASARC0219076

1.0 INTRODUCTION

As a result of Enforcement Order No. DE 91TC-S267 issued by the State of Washington Department of Ecology, remedial actions were performed at the B & L Land fill site in Pierce County, Washington, during the period of July, 1992 through November, 1993. This report summarizes those actions and includes a summary of Compliance Monitoring and Construction Monitoring during the remediation/construction phase of the project.

1.1 BACKGROUND

The B & L Landfill functioned as an operating landfill between 1978 and 1984. During this period it received approximately 300,000 - 350,000 cubic yards of crushed ASARCO slag and wood waste from various log sort yards in the Tacoma tideflats. In 1982 the B & L Landfill was listed as a Commencement Bay Nearshore/Tideflats Superfund Site as a source of arsenic, copper and lead to the head of the Hylebos Waterway. In 1985 sampling activities were implemented by the Department of Ecology and continued by the USEPA and the Murray Pacific Corporation through 1990. These activities revealed concentration levels of arsenic above the Dangerous Waste Threshold per 173-303-090(8)(c) WAC. Consequently, a RI/FS of the site was ordered and resulted in an Ecology issued Cleanup Action Plan (CAP). In 1991 an enforcement order was issued by Ecology to develop preliminary designs for the remedial actions identified in the CAP. The Final Engineering Design Report (Hydrometrics, Inc.) was submitted to Ecology in April, 1992 and provided plans and specifications addressing the actions outlined in the CAP as follows:

- Woodwaste consolidation and pile reshaping.
- Construction of impermeable cover over the waste pile.
- Construction of a stormwater detention pond and release structure.
- Installation of a network of groundwater monitoring wells.
- Removal of sediments from the site ditch system.
- Improvement of stormwater monitoring wells.
- Installation of landfill gas control system.
- Erection of a fence around the site.

ASARC0219077

In addition, the Puget Power access road was included in the remediation effort. The Final Engineering Design Report also provided plans which are the basis of the remainder of this report and include:

- Compliance Monitoring Plan - Assures that sampling and analysis followed protocol per 173-340-820 WAC.
- Construction Quality Assurance Plan - Assures that consistent high quality was attained and maintained during remedial action.
- Operation and Maintenance Plan - Provides guidance during the post closure period.

1.2 SCOPE OF SERVICES

Hydrometrics, Inc. performed the following monitoring and oversight services during the construction phase of the B & L Landfill closure:

- Performance Monitoring - As part of Compliance Monitoring during the consolidation phase of the project, performance monitoring was conducted in excavated areas to insure that remediation levels were achieved.
- Construction Monitoring - Conducted as part of Construction Quality Assurance, through all phases of the project to insure that remedial action was in accordance with the plans and specifications.
- Analytical Testing - Conducted as part of Construction Quality Assurance through all phases of the project to insure the quality of material and workmanship.
- As-Built Surveying/Record Drawing Preparation - Survey of actual project configurations and compiled into a set of record drawings.

1.3 CONCLUSION

Performance monitoring of remedial activities at the B&L Landfill indicates that concentration levels of arsenic and lead in residual soils and sediments are well below established remediation levels. A review of analytical data indicates that the average concentration level of arsenic and lead in the perimeter area is 4.7 mg/kg and 4.3 mg/kg, respectively. The average concentration level of arsenic and lead in the Puget Power Road Ditch is 4.6 mg/kg and 4.0 mg/kg, respectively. None of the samples taken from soils on the B&L property which are representative of remaining soils had concentration levels above remediation levels. The data obtained as a result of performance monitoring indicates that excavation depths during remedial activities met remediation levels established in the Cleanup Action Plan (Ecology 1991).

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Construction monitoring of remedial activities indicates that remedial action appears to be in compliance with the plans and specifications as required in the Engineering Design Report for the B&L Landfill.

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2.0 COMPLIANCE MONITORING

In keeping with the requirements of the CAP, Hydrometrics, Inc. performed compliance monitoring during the B & L Landfill remediation. Compliance monitoring was performed in accordance with the Compliance Monitoring Plan (CMP) prepared per WAC 173 - 340 - 820 and outlined in Appendix E, Volume I of the Engineering Design Report. Monitoring during remediation, included protection and performance monitoring. Confirmatory monitoring will be performed in the long term. Samples will be analyzed for total arsenic, lead, nickel and phenol.

2.1 PROTECTION MONITORING

In order to protect human health and the environment Hydrometrics, Inc. performed Protection Monitoring during fill consolidation and cap system construction. Protection Monitoring followed the Site Health & Safety Plan outlined in Appendix C, Volume I of the Engineering Design Report. The primary purpose of Health Protection Monitoring was to prevent over exposure to the substances known or suspected to be present at elevated concentrations at the B & L Landfill site. Site personnel were required to have 40 hours of initial safety training as required by OSHA and follow established work practices which included modified level D protocol for personal protective equipment.

Measures taken to protect the environment included control of dust generation by watering and control of storm water runoff during construction. Control of storm water runoff was accomplished by constructing berms and ditches as necessary to divert runoff to the on-site detention pond. Analytical results of suspended solids in the pond as well as in ditches beyond the pond outfall were reviewed to determine if any modifications to Environmental Protection Monitoring methods were necessary. All suspended solids showing elevated levels were excavated from the pond and ditches and placed in the landfill prior to cap construction.

An additional protection monitoring activity will be performed during the post closure period. Methane gas, which is expelled from the passive gas collection system, will be monitored to insure that it is below the LEL (Lower Explosive Limit) at the edge of the landfill mound.

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2.2 PERFORMANCE MONITORING

CAP requirements for the remediation of the B & L Landfill included consolidation of the fill material into a smaller area and covering with a cap. This required the excavation of surface soils and sediments outside the area of the cap system which contained elevated levels of metals. Performance monitoring was conducted in the excavated areas to insure that the soil and sediment remediation levels were achieved. Collection of soil samples followed the procedure outlined in the CMP and consisted of between 3 and 5 random samples taken within a 100 foot grid system. Sediment sampling also followed the CMP by collecting samples from ditch bottoms and side slopes. In both procedures, if sampling results did not meet the required remediation levels, the areas were excavated further and resampled. B & L Landfill remediation levels are indicated in Table 2-1. A summary of performance sampling as well as analytical reports are provided in Appendix A. Sampling locations are shown on Sheets 7 and 8 of Appendix E.

One small area adjacent to the B & L property contained arsenic concentrations slightly above remediation levels (Figure 2-1). The soils are located in a Pierce County designated wetlands between 6 and 18 inches below the surface. Removal would result in extensive filling/damage to the wetlands because of access requirements. Consequently, it was decided that removal would cause more environmental damage than nonremoval and the soils were left in place.

2.3 CONFIRMATION MONITORING

As directed in the CAP, a confirmation monitoring plan has been implemented at the B&L Landfill site to confirm that ground water and surface water standards are being met. The confirmation monitoring procedure follows the CMP outlined in Section 2.3, Volume I of the Engineering Design Report. Included in the plan are provisions for surface water sampling as well as groundwater sampling.

The final configuration of the landfill cap, as well as surface grading in the perimeter area, directs surface water runoff to their respective detention ponds. Surface drainage is shown on Sheet 2 in Appendix E. Surface water monitoring criteria will be met by collecting surface water samples near the outfall of each pond as well as in the

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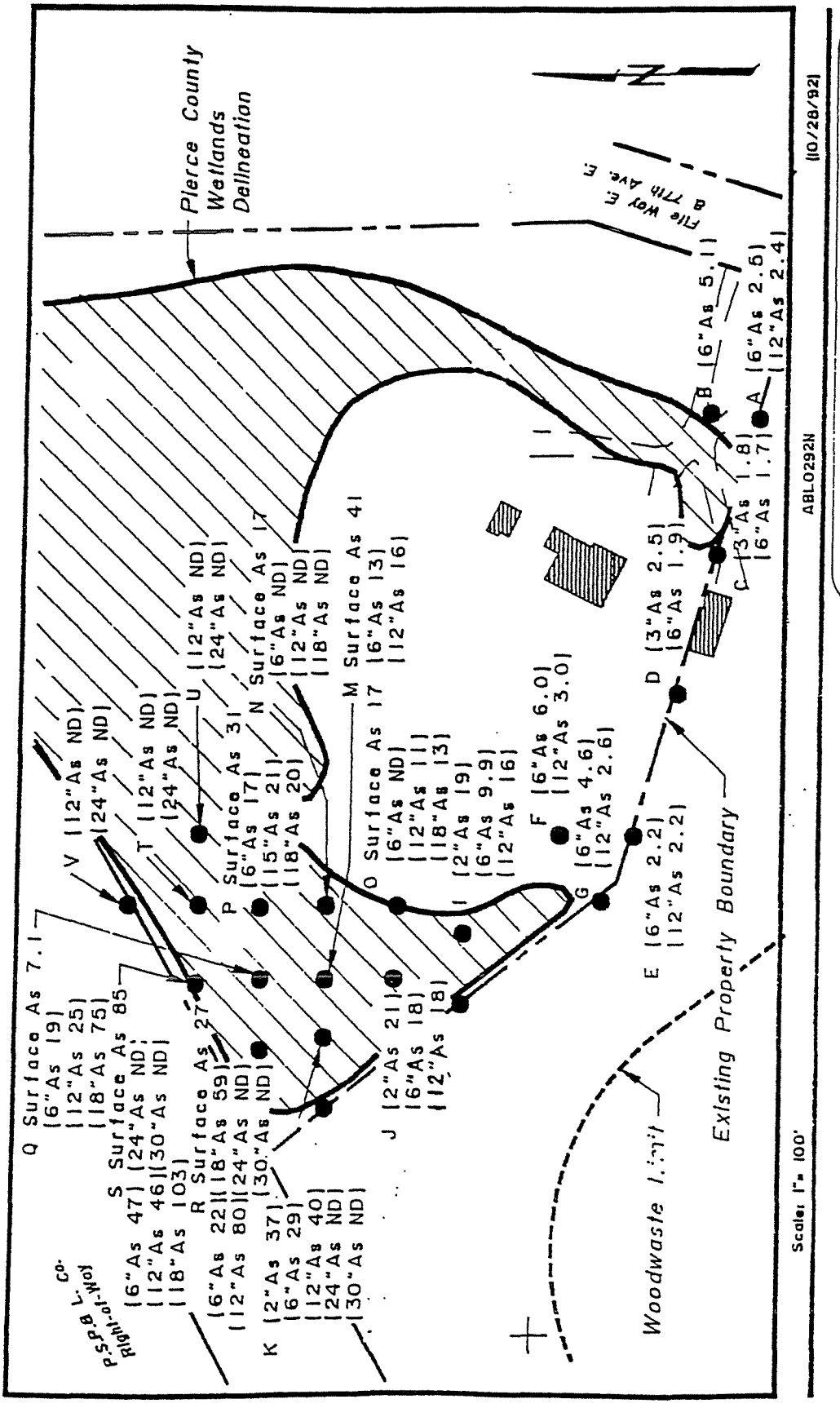


FIGURE 2-1 WETLANDS AREA
Soil Sample Results
Arsenic Values

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external ditch up stream and down stream of the site. Sampling will occur on a quarterly basis for the first year following completion of the remediation. Evaluation of first year results will determine if sampling frequency can be reduced.

Groundwater monitoring will be conducted via a network of groundwater monitoring wells as shown on Sheet 6 in Appendix F. Past investigations resulted in the installation of 8 of the wells and defined two aquifers; the upper sand aquifer and the lower sand aquifer. Hydrometrics has installed 10 additional wells for a network total of 18. Well pairs represent access to the upper and lower sand aquifers and are designated either U & L or A & B, respectively. Ten of the wells monitor groundwater from the upper aquifer and the remaining 8 monitor the lower aquifer. Sheet 6 shows a typical monitoring well detail. Monitoring well test hole logs for wells installed by Hydrometrics are presented in Appendix D.

In addition, groundwater form the City of Milton well located nearest to the site will be included in each round of monitoring.

As stated in the CMP, monitoring wells will be sampled quarterly for two years following the completion of remediation action. After two years the monitoring schedule will be reviewed to determine if the monitoring schedule may be reduced.

Also as stated in the CMP, a statistical comparison of upgradient groundwater quality analysis to downgradient water quality analysis will be made to determine if the site is contributing metals to the groundwater. The Department of Ecology will be notified if statistical analysis indicates elevated concentrations of metals at the downgradient wells. At that time a plan of action will be developed to define the operations that are to be performed as a possible solution to further remediate the site.

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TABLE 2-1 B & L WOODWASTE SITE CLEANUP LEVELS

Parameter	Soil/Fill (mg/kg)	Groundwater (mg/l)	Surface Water (b) (mg/l)	Sediments (mg/kg)
Arsenic(total)	20(a)	.005(a) .0l(c)	.005 .01(c)	20(a)
Copper			.012	390
Lead	250(a)	.005(a)	.003 .01	250(a)
Nickel		.32		
Phenol		9.60	2.56	

(a) MTCA Method A residential cleanup levels. Soil values do not apply to fill materials if the fill is closed as a landfill, but will apply to areas where soil is removed. The site does not qualify as an Industrial Site; therefore, Residential Site requirements apply.

(b) These values represent EPA ambient fresh water quality chronic criteria (assuming hardness - 100 ppm as $CaCO_3$). Actual site surface water hardness will be used to calculate remediation levels for arsenic, copper, and lead, per 173-201-047 WAC.

(c) Practical Quantification Limit (PQL) These values serve as the remediation level where listed. If lower PQLs become technically achievable during the remediation, an evaluation will be made by Ecology to determine whether remediation levels should be correspondingly lowered.

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3.0 CONSTRUCTION MONITORING

The remedial action taken at the B & L Landfill was performed in four phases as described in Section 6.0 Design/Implementation, Volume I of the Engineering Design Report. Phase I included stabilization of the site and construction of a fill water monitoring system. In Phase II, contaminated woodwaste and debris was consolidated into the present mound which covers approximately 14.5 acres. Phase III consisted of construction of a methane gas venting system and construction of the final multi-layered cap system. Phase IV completed the project and included final grade work for storm water drainage, and site revegetation. Phases I and II were complete by the end of 1992. Phases III and IV were completed in the summer and fall of 1993.

3.1 STABILIZATION/FILLWATER MONITORING SYSTEM

During the initial phase of the project, remedial efforts focused on stabilization of the site. Stormwater controls were instituted which included construction of a detention pond and the installation of silt fencing along property boundaries. Initial clearing and grubbing activities were performed to establish a staging/decon area and provide remedial areas for subsequent work. Dewatering systems were installed in work areas, when necessary, to establish control of ground water movement. Early in this phase a series of test pits were dug with in the landfill boundaries to determine the silt layer elevations upon which the fill water monitoring system was constructed.

The fill water monitoring system was constructed in two components as shown on Sheet 4 of Appendix F. The horizontal component consists of three laterals of 6 inch ADS slotted pipe wrapped with geotextile and surrounded by a continuous gravel drainage layer. Trenches were excavated to the silt layer surface and extended from the sump, in the center of the mound, to the edge of the woodwaste limits. The vertical standpipe consists of approximately 40 feet of 12 inch ADS pipe extending from the sump to above the mound surface Extensions were added to the stand pipe as woodwaste consolidation progressed.

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3.2 CONSOLIDATION

In this phase landfill consolidation was performed concurrently with excavation in the perimeter area. Initially, the landfill surface was leveled and scarified with a sheeps foot roller to a depth of 2 feet to allow percolation of water from the saturated woodwaste and gas migration between existing and newly place woodwaste. Landfill consolidation progressed as work areas in the perimeter were stripped of contaminated material. During early consolidation efforts stripped woodwaste was placed at the center of the landfill in 2 - 3 foot lifts and compacted. Depth of placement was later reduced to 1 foot lifts to meet compaction requirements.

3.3 GAS COLLECTION/COVER SYSTEM

Once the excavation was complete the landfill mound was shaped and the gas collection system was installed. Seven gas vent wells were drilled and the vertical and horizontal components installed as shown on Sheet 4 in Appendix F. The installation and final grading of the sand gas migration layer completed the gas collection system and produced a prepared subbase for the multi-layered cap system.

The cap system is made up of five layers as shown on Sheet 3 and consists of a Geosynthetic Clay Liner (GCL), a 40 mill Polyvinyl Chloride (PVC) liner, a Geocomposite drainage net, 18 inches of sandy pit run, and 6 inches of top soil. Environmental Liners, Inc. of Cortez, Colorado were contracted to install the GCL liner and fabricate and install the PVC liner.

The GCL liner consists of a uniform layer of inert sodium bentonite sandwiched between 2 geotextiles. The PVC liner consists of blankets fabricated by the supplier to pre-determined dimensions. Blankets were fabricated from roll stock using a dieelectric welding process. The geocomposite drainage net consists of two extruded strands of high density polyethylene which form a 3 dimensional structure that allows planar water flow. A 6 oz. nonwoven geotextile, heat bonded to one side, provides a barrier between the net and the overlying material. The remainder of the cap system includes 18 inches of sandy pit run of 1×10^{-2} cm/sec minimum permeability and a hydroseeded class A topsoil.

Construction of the geosynthetic cap progressed sequentially from 11,600 East Control Line along both sides of the 10,377 North Control Line as shown on Sheet 5

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in Appendix F. An adequate amount of GCL was first rolled out then subsequent PVC blankets deployed and seamed. A problem arose in the early stages of GCL deployment but was rectified immediately. According to the GCL manufacturers recommendations the GCL requires a minimum 6 inch over lap between adjacent panels to form a proper seal in the event of saturation. However, this only applies if confinement occurs immediately following deployment. Immediate confinement did not occur during the GCL deployment due to the lack of man power and equipment. As a result, contraction occurred in the GCL blankets, between work days, which reduced the lap or separated the panels completely. The problem was solve by increasing the lap to 12 inches to maintain the required lap. The overlying PVC liner prevented GCL saturation due to precipitation.

Geosynthetic liner installation proceeded on both sides of the 10,377 North Control Line to the 12,084 East Control Line. It then proceeded north, along the east side of the 12,084 Control Line, and west, along the north base. Final deployment of the geosynthetic liners progressed north along the west side of the 11,600 East Control Line. During this phase of the cap system installation 16 destructive samples of field seams and 3 non-destructive samples of factory seams were sent in for laboratory analysis of seam strength. Table 3.1 summarizes laboratory results. Analytical reports are provided in Appendix C.

Upon completion of the geosynthetic portion of the cap anchor trenching as well as cover operations began. Cover operations proceeded from the top of the mound downward toward the base. A haul road was constructed with a minimum 3 foot depth, to the top of the mound. Stock piled pit run material was then transported by truck to the top of the mound where it was spread to the required 18-inch depth using a small bulldozer. The cover operation progressed smoothly with one exception. Once the liner was placed in the anchor trench and backfilled, a seal was created along the perimeter of the mound. As cover material was being placed, methane gas, which collected under the PVC liner, was being forced down slope with no means of escape. Consequently, small gas vents were cut in the PVC along the anchor trench. Once the cover material was in place the gas was forced to migrate to the collection system and the vents were patched. The 6-inch top soil layer proceeded in a similar manner and hydroseeding completed the cap.

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TABLE 3-1 SUMMARY OF LABORATORY SEAM ANALYSIS 40 mil PVC B&L LANDFILL CAP

Destructive Sampling of Field Seams					
Sample No.	**Date Seamed**	**Blkt#**	**Shear (a) lb/in width**	**Peel (b) lb/in width**	**Comments**
1	7/9/93	101 & 103	76.3	25.4	Pass
2	7/9/93	201 & 202	79.8	23.7	Pass
3	7/10/93	104 &105	76.7	22.8	Pass
4	7/12/93	205 & 206	76.1	22.7	Pass
5	7/12/93	206 & 111	77.9	21.6	Pass
6	7/12/93	111 & 112	69.6	21.1	Fail (c)
7	7/13/93	206 & 207	84.1	23.0	Pass
8	7/13/93	209 & 210	82.1	23.6	Pass
9	7/14/93	106 & 211	75.6	26.8	Pass
10	7/14/93	208 & 213	80.5	26.8	Pass
11	7/14/93	212 & 213	79.5	22.7	Pass
12	7/17/93	220 & 221	82.6	21.6	Pass
13	7/25/93	225 & 226	79.9	29.0	Pass
14	7/25/93	227 & 228	75.4	29.3	Pass
15	7/25/93	101 & 208	73.7	21.8	Pass
16	7/31/93	113 & 108A	78.1	16.5	Pass

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Non destructive sampling of factory seams.

Blkt#	Shear	Comments
103	76.9	Pass
105	73.6	Pass
112	78.6	Pass

a. Specification requirements for 40 mil. PVC - 73.6 lbs/in width
b. Specification requirements for 40 mil PVC - 10 lbs/in width
c. The value in shear of 69.6 lb/ in width is below the required 73.6 lbs/in width. However, since the value in peel of 21.1 lbs/in remains well above the required 10 lb/in width and based on further testing by tensiometer in the field, the seam was passed.

3.4 COMPLETION

The final phase of the project included all grading work necessary for construction of the perimeter road, access roads and permanent storm water control as well as final clean up and re-vegetation of the perimeter area.

The V ditch, as part of permanent storm water control, was constructed using a PVC diversion liner and a quarry spall liner as shown on Sheet 3 in Appendix F. The V ditch diverts storm water runoff from the mound to the primary pond. Completion of the primary pond as well as construction of the secondary pond occurred in this phase. The secondary pond was necessary since elevations would not allow drainage of the perimeter area into the primary pond. Both ponds are designed to contain runoff from the 200 year-24 hour storm event without over topping their respective stand pipes. In order to meet Pierce County requirements storm water is released from both ponds through control structures as shown on Sheet 3 in Appendix F. Combined flows from both structures remains within the 1 cfs runoff limit for the site.

The perimeter road and all access roads were constructed using a pit run base course and topped with crushed rock. Density reports, presented in Appendix B, indicate that compaction requirements of 95% modified proctor were met on the perimeter road and access road from Fife Way.

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4.0 POST CLOSURE INSPECTION/MAINTENANCE

The overall success of the project is dependent in part on inspection and maintenance of the site during the post closure period. It is imperative that, should any problems arise, they be detected and an appropriate plan of action be implemented. Detection is the key and can occur only with proper inspection procedures. An inspection/maintenance schedule is provided in Table 4.1. An inspection/maintenance checklist is presented in Appendix G.

4.1 INSPECTION PROCEDURE

Perimeter Area:

Beginning at the site entrance, walk the entire perimeter area of the site. Inspect the perimeter drainage area for signs of erosion and note the condition of the vegetative cover. Look for inadequate drainage such as excessive ponding. Note the condition of perimeter ditches and look for obstructions and signs of sediment deposit. Inspect the pond outfalls for signs of erosion. Inspect the secondary pond for signs of erosion and sedimentation. Inspect the secondary pond control structure for obstructions and note its condition. Inspect all ground water monitoring wells.

Mound Area:

Beginning at the security fence gate, walk the entire perimeter road. Note the condition of the perimeter road. Inspect the V ditch for obstructions and sedimentation. Inspect the primary pond for signs of erosion and sedimentation. Inspect the primary pond control structure for obstructions and note its condition.

Beginning at one side of the mound walk the entire mound at approximately 50 foot intervals. Inspect the mound surface for signs of erosion. Note the condition of the vegetative cover. Look for signs of settlement or slope failure. Inspect all gas vents. Note the condition of the mound access road and inspect the fill water monitoring tube.

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TABLE 4-1 INSPECTION/MAINTENANCE SCHEDULE B & L LANDFILL SITE

Surface Drainage

System Component	Defect	Inspection Frequency	Conditions When Maintenance is Needed	Maintenance Required and Results Expected
Open Ditches	Trash & Debris	Once per year	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch slopes	Trash and debris cleared from ditches
	Sediment	Once per year	Accumulated sediment that exceeds 20% of the design depth	Clean/flush ditch of all sediment and debris so that it matches design
	Vegetation	Once per year	Vegetation that reduces free movement of water through ditches	Cut or mow grass/.pull weeds to allow water to flow freely through ditches
	Erosion damage to slopes	See Detention Pond	See Detention Pond	See Detention Pond
	Rock Lining out of Place or Missing (if Applicable)	Once per year	Maintenance person can see filter fabric or native soil beneath rock lining	Replace rocks as shown on design plans
Pipes and Culverts	Sediment & Debris	Once per year	Accumulated sediment that exceeds 20% of the diameter of the pipe	Clean pipe of all sediment and debris.
	Vegetation	Once per year	Vegetation that reduces free movement of water through pipes.	Remove all vegetation so water flows freely through pipes.
	Damaged	Once per year	Protective coating is damaged; rust is causing deterioration to any part of pipe	Repair, replace or recoat pipe.
			Any dent that decreased the end area by more than 20%	Repair or replace pipe

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TABLE 4-1 INSPECTION/MAINTENANCE SCHEDULE B & L LANDFILL SITE
(Continued)

Detention Pond

System Component	Defect	Inspection Frequency	Conditions When Maintenance is Needed	Maintenance Required and Results Expected
Side Slopes	Erosion	Once per year	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion	Stabilize slopes by using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, or compaction
Storage Area	Sediment	Once per year	Accumulated sediment that exceeds 10% of the design pond depth	Cleanout sediment to approximate pond shape and depth; reseed pond if necessary to control erosion
Pond Dikes	Settlements	Once per year	Any part of dike which has settled 4 inches lower than the design elevation	Build dike to the design elevation
Synthetic Liner	Exposed and/or Torn	Once per year	Synthetic membrane liner has been exposed and/or torn to any degree	See Section 3.4.1.

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TABLE 4-1 INSPECTION/MAINTENANCE SCHEDULE B & L LANDFILL SITE (Continued)

Flow Control Structure

System Component	Defect	Inspection Frequency	Conditions When Maintenance is Needed	Maintenance Required and Results Expected
Control Structure	Trash & Debris (includes sediment)	Once or twice per year	Distance between debris build-up and bottom of orifice plate is less than 1.5 feet	Remove all trash and debris
	Structural Damage	Once every twenty years	Structure is not securely attached to manhole wall and outlet pipe structure should support at least 1,000 pounds of up or down pressure	Attach structure securely to pipe
		Once every twenty years	Structure is not in upright position (allow up to 10% from plumb(.	Re-align structure to plumb.
		Once every ten years	Connections to outlet pipe are not watertight and show signs of rust	Repair or replace connections to outlet pipe and make watertight and work as designed.
		Once every twenty years	Any holes-other than designed holes in structure	Repair holes in structure.

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TABLE 4-1 INSPECTION/MAINTENANCE SCHEDULE B & L LANDFILL SITE (Continued)

System Component	Defect	Inspection Frequency	Conditions When Maintenance is Needed	Maintenance Required and Results Expected
Knife Gate (if applicable)	Damaged or Missing	Once per year	Knife gate is not watertight or is missing	Repair/replace knife gate and make watertight and work as designed
		Once per year	Gate is rusted over 50% of its surface area	Repair/replace to meet design standards
Orifice Plate (if applicable)	Damaged or Missing	Once per year	Control device is not working property due to missing, out of place, or bent orifice plate	Repair/replace plate to work as designed
	Obstructions	Once or twice per year	Any trash, debris, sediment, or vegetation blocking the plate.	Free plate of all obstructions, check operation

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TABLE 4-1 INSPECTION/MAINTENANCE SCHEDULE B & L LANDFILL SITE (Continued)

Mound Area

System Component	Defect	Inspection Frequency	Conditions when maintenance is needed	Maintenance required and results expected
Perimeter Road	Erosion	Twice per year	Inaccessibility	Grading
	Settlement	Twice per year	Inaccessibility	Fill & Grade
Mound Area Surface	Insufficient vegetation	Twice per year	Erosion Tendencies	Re vegetate
	Settlement	Twice per year	Excess ponding or liner damage	Repair liner and repair depressions
	Slope failure	Twice per year	Liner exposure or damage	Repair liner & regrade.

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5.0 REFERENCES

Washington Dept. of Ecology, October 1991. Final Cleanup Action Plan, B & L Woodwaste Site

Hydrometrics, Inc. 1992. Engineering Design Report for the B & L Landfill Remediation Vol. I.

_____ Engineering Design Report for the B & L Landfill Remediation Vol.II.

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Appendix A

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APPENDIX A

RESULT SUMMARY/ANALYTICAL REPORTS
PERFORMANCE SAMPLING

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
B & L LANDFILL PROPERTY								
1	10	08-05-92	10.35	composite	C-9		90	7.8
	11	08-05-92	10.06					
	12	08-05-92	10.49					
	10A	08-10-92	8.62	composite	C-13	re-sampled after	3.5	9.5
	11B	08-10-92	8.91			further cleanup		
	12C	08-10-92	8.48					
	11B	08-10-92	8.01	grab		6" below, confirmatory	3.5	13
2	13	08-06-92	4.45	composite	C-12		<2.7	3.9
	14	08-06-92	8.19					
	15	08-06-92	8.38					
	14A	08-26-92	7.67	grab		additional	12	3.6
	14B	08-26-92	7.02	grab			14	4.1
	14C	08-26-92	6.84	grab			12	3.8
3	22	08-14-92	4.70	composite	C-3		<3.9	3.4
	23	08-14-92	8.09	composite	C-3D	duplicate	<3.9	3.0
	24	08-14-92	9.97					
4	16	08-11-92	7.61	composite	C-4		10	12
	17	08-11-92	7.85					
	18	08-11-92	8.11					
	17A	08-11-92	7.01	grab		6" below, confirmatory	3.8	11
5	19A	08-11-92	6.68	grab		)	<3.0	8.9
	19B	08-11-92	5.13	grab		)preliminary, before	<3.0	5.2
	19C	08-11-92	4.82	grab		)any cleanup	<3.0	3.8
	19	08-13-92	6.72	composite	C-5		3.2	8.2
	20	08-13-92	5.90	composite	C-5D	duplicate	<2.6	9.3
	21	08-13-92	5.36					
6	25A	08-14-92	6.91	grab		)	<3.9	3.3
	25B	08-14-92	6.12	grab		)preliminary, before	<3.9	<1.9
	25C	08-14-92	5.74	grab		)any cleanup	12	3.1
	25	08-18-92	6.72	composite	C-6		<2.9	6.1
	26	08-18-92	5.90	composite	C-6D		<2.9	7.1
	27	08-18-92	5.36					
7	28A	08-14-92	9.27	grab		)	<3.9	2.4
	28B	08-14-92	8.63	grab		)preliminary, before	13	5.4
	28C	08-14-92	8.00	grab		)any cleanup	57	4.7
	28	08-20-92	9.96	composite	C-7		9.5	7.1
	29	08-20-92	10.08	composite	C-7D	duplicate	2.0	6.8
	30	08-20-92	10.18					

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS (Continued)

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
8	33A	08-20-92	5.21	grab		)	<2.6	5.9
	33B	08-20-92	4.77	grab		)preliminary, before	3.7	7.2
	33C	08-20-92	4.15	grab		)any cleanup	3.9	6.7
	31	08-20-92	5.82	composite	C-8	re-sampled after	5.8	6.8
	32	08-20-92	5.48			further cleanup		
	33	08-20-92	4.81					
9	34	08-21-92	3.73	composite	C-9		11	5.3
	35	08-21-92	7.65	composite	C-9D	duplicate	7.8	5.5
	36	08-21-92	9.22					
10	37A	08-19-92	14.32	grab		)	5.3	20
	37B	08-19-92	13.74	grab		)	28	14
	37C	08-19-92	13.10	grab		)	490	65
	38A	08-19-92	5.89	grab		)preliminary, before	5.8	16
	38B	08-19-92	5.21	grab		)any cleanup	<3.1	11
	39A	08-19-92	16.21	grab		)	9.5	75
	40A	08-19-92	15.82	grab		)	3.8	28
	41A	08-19-92	15.83	grab		)	21	51
	37	08-24-92	5.31	composite	C-10		<2.3	15
	38	08-24-92	5.44	composite	C-10D	duplicate	<2.3	8.5
	39	08-24-92	15.75					
11	42	08-27-92	-0.54	composite	C-11		<2.8	5.1
	43	08-27-92	3.42	composite	C-11D	duplicate	<2.8	6
	44	08-27-92	-0.08					
12	45	09-3-92	1.63	composite	C-12		<3.8	4.1
	46	09-3-92	-0.70	composite	C-12D	duplicate	<3.8	3.2
	47	09-3-92	-0.80					
13	48	09-13-92	5.88	composite	C-13		<3.8	3.1
	49	09-13-92	7.01	composite	C-13D	duplicate	<3.8	3.5
	50	09-13-92	8.44					
14	51	09-10-92	3.17	composite	C-14		<2.5	4.4
	52	09-10-92	-0.46	composite	C-14D	duplicate	<2.5	3.5
	53	09-10-92	4.41					
	53Z	09-10-92	-1.20					
15	54	09-12-92	-2.00	composite	C-15		<3.0	7.3
	55	09-12-92	-0.37	composite	C-15D	duplicate	<3.1	6.3
	56	09-12-92	2.06					
	56Z	09-12-92	-0.72					
	56Y	09-12-92	3.25					
16	57	09-12-92	1.43	composite	C-16		<2.8	3.6
	58	09-12-92	1.38	composite	C-16D	duplicate	<3.2	3.3
	59	09-12-92	2.64					
17	60	09-11-92	5.44	composite	C-17		<3.3	6.6
	61	09-11-92	9.82	composite	C-17D	duplicate	<3.1	5.9
	62	09-11-92	4.66					
	63	09-11-92	8.51					
	63Z	09-11-92	5.79					

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS (Continued)

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
	L-3-N-50	09-18-92	16.32	grab		)hillside	18	7.3
	L-3-S-50	09-18-92	16.20	grab		)samples	<2.5	8.9
18	64	09-28-92	0.23	composite	C-18		3.3	1.9
	65	09-28-92	0.97	composite	C-18D	duplicate	3.2	2.0
	66	09-28-92	3.19					
	67	09-28-92	6.23					
	68	09-28-92	6.97					
19	69	09-28-92	1.11	composite	C-19		<2.1	<1.1
	70	09-28-92	2.80	composite	C-19D	duplicate	<1.9	<0.97
	71	09-28-92	1.17					
	72	09-28-92	2.65					
20	74	09-18-92	6.91	composite	C-20		3.0	4.2
	75	09-18-92	5.30	composite	C-20D	duplicate	3.2	4.1
	76	09-18-92	5.80					
21	77	09-21-92	5.32	composite	C-21		2.1	1.2
	78	09-21-92	5.06	composite	C-21D	duplicate	2.2	2.3
	79	09-21-92	5.55					
	80	09-21-92	5.55					
	81	09-21-92	7.16					
22	82	09-26-92	7.10	composite	C-22		2.3	1.3
	83	09-26-92	7.78	composite	C-22D	duplicate	3.6	1.2
	84	09-26-92	6.86					
	85	09-26-92	4.11					
	86	09-26-92	3.86					
23						No samples taken , street & tress in area.		
24	88	09-22-92	8.93	composite	C-24		<2.2	1.3
	89	09-22-92	8.47	composite	C-24D	duplicate	<1.9	<0.95
	90	09-22-92	7.18					
	91	09-22-92	8.32					
25	92	09-22-92	7.87	composite	C-25		<2.0	1.6
	93	09-22-92	7.43	composite	C-25D	duplicate	<2.7	<1.3
	94	09-22-92	7.13					
	95	09-22-92	7.23					
26	96	09-23-92	9.51	composite	C-26		3.8	1.7
	97	09-23-92	9.92	composite	C-26D	duplicate	3.0	1.1
	98	09-23-92	9.94					
27	99	09-23-92	9.88	composite	C-27		<2.5	2.5
	100	09-23-92	9.12	composite	C-27D	duplicate	4.5	3.3
	101	09-23-92	9.19					
28	102	09-23-92	10.10	composite	C-28		7.3	1.8
	103	09-23-92	10.72	composite	C-28D	duplicate	5.4	1.9
	104	09-23-92	10.76					
29	105	10-10-92	10.84	composite	C-29		28	2.5
	106	10-10-92	10.30	composite	C-29D	duplicate	25	1.8
	107	10-10-92	10.07					
	105	10-27-92	10.23	composite	C-29	re-sampled after	8.6	2.7
	106	10-27-92	9.72	composite	C-29D	further cleanup	11	0.90
	107	10-27-92	9.43					

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS (Continued)

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
30	108	10-10-92	10.10	composite	C-20		25	2.2
	109	10-10-92	9.52					
	110	10-10-92	9.92					
	108	10-27-92	8.74	composite	C-30A	re-sampled after	26	1.2
	109	10-27-92	8.69			further cleanup		
	110	10-27-92	8.53					
	108	10-30-92	7.40	composite	C-30B	re-sampled after	14	<1.1
	109	10-30-92	7.53	composite	C-30BD	further cleanup	12	<1.3
	110	10-30-92	7.21					
31	111	10-10-92	9.89	composite	C-31		39	1.9
	112	10-10-92	9.53					
	113	10-10-92	9.92					
	111	10-26-92	8.21	composite	C-31A		48	<1.0
	112	10-26-92	7.83	composite	C-31AD	duplicate	4.4	1.4
	113	10-26-92	7.92					
	111	10-29-92	8.21	composite	C-31B	re-sampled after	4.4	1.5
	112	10-29-92	7.83	composite	C-31BD	further cleanup	2.8	2.0
	113	10-29-92	7.92					
32	114	10-12-92	8.68	composite	C-32		<2.1	2.1
	115	10-12-92	8.44	composite	C-32D	duplicate	<1.9	2.8
	116	10-12-92	8.57					
	114	10-26-92	7.95	composite	C-32A	re-sampled after	11	<1.3
	115	10-26-92	8.10			further cleanup		
	116	10-26-92	7.43					
33	117	10-13-92	8.81	composite	C-33		8.9	2.4
	118	10-13-92	8.51					
	119	10-13-92	8.43					
	120	10-13-92	8.24					
34	121	10-13-92	8.51	composite	C-34		24	2.6
	122	10-13-92	8.36					
	123	10-13-92	8.08					
	124	10-13-92	8.35					
	121	10-26-92	7.98	composite	C-34A	re-sampled after	23	1.1
	122	10-26-92	7.43			further cleanup		
	123	10-26-92	7.42					
	124	10-26-92	7.21					
	121	10-29-92	7.98	composite	C-34B	re-sampled after	13	3.1
	122	10-29-92	7.43			further cleanup		
	123	10-29-92	7.42					
	124	10-29-92	7.21					
35	125	10-13-92	7.91	composite	C-35		8.8	1.6
	126	10-13-92	7.66	composite	C-35D	duplicate	13	2.3
	127	10-13-92	8.08					
36	128	10-14-92	7.57	composite	C-36		2.0	1.0
	129	10-14-92	6.93	composite	C-36D	duplicate	1.7	0.87
	130	10-14-92	7.14					

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS (Continued)

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
37	131	10-14-92	7.64	composite	C-37		2.1	1.0
	132	10-14-92	7.64					
	133	10-14-92	7.12					
38	134	10-19-92	6.17	composite	C-38		3.1	1.6
	135	10-19-92	6.80	composite	C-38D	duplicate	3.0	1.5
	136	10-19-92	6.68					
39	137	10-09-92	6.04	composite	C-39		14	3.4
	138	10-09-92	5.93	composite	C-39D	duplicate	4.3	3.4
	139	10-09-92	5.75					
	140	10-09-92	5.40					
40	141	10-08-92	5.46	composite	C-40		<2.1	3.6
	142	10-08-92	5.14	composite	C-40D	duplicate	<1.9	3.5
	143	10-08-92	5.16					
	144	10-08-92	5.50					
	145	10-08-92	6.23					
41	146	10-07-92	5.09	composite	C-41		<3.8	3.4
	147	10-07-92	4.51	composite	C-41D	duplicate		
	148	10-07-92	5.12					
	149	10-07-92	5.02					
	150	10-07-92	4.44					
42	151	10-07-92	7.04	composite	C-42		<2.7	4.3
	152	10-07-92	5.89	composite	C-42D	duplicate	<2.1	2.9
	153	10-07-92	5.67					
	154	10-07-92	5.79					
	155	10-07-92	5.57					
43	156	10-06-92	5.61	composite	C-43		<3.8	4.0
	157	10-06-92	6.16	composite	C-43D	duplicate	<3.8	3.6
	158	10-06-92	6.33					
	159	10-06-92	6.10					
	160	10-06-92	5.76					
44	161	10-06-92	5.82	composite	C-44		<3.8	3.5
	162	10-06-92	5.62	composite	C-44D	duplicate	<3.8	3.2
	163	10-06-92	5.46					
	164	10-06-92	6.58					
	165	10-06-92	5.62					
45	166	10-21-92	4.82	composite	C-45		<2.1	7.8
	167	10-21-92	4.25	composite	C-45D	duplicate	<2.3	6.7
	168	10-21-92	4.10					
	169	10-21-92	16.43					
	170	10-21-92	17.28					
46	171	10-21-92	17.32	composite	C-46		<1.6	15
	172	10-21-92	17.28					
47	173	10-22-92	13.74	composite	C-47		<1.9	6.7
	174	10-22-92	13.21					
	175	10-22-92	18.28					

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS (Continued)

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
YOSHIOKA'S PROPERTY								
	YY1	8-26-92	about 10	grab	500	)	20	25
	YY2	8-26-92	about 10	grab	501	)	17	23
	YY3	8-26-92	about 11	grab	502	)	17	19
	YY4	8-26-92	about 11	grab	503	)	11	14
	YY5	8-26-92	about 11	grab	504	)	9.6	16
	YY6	8-26-92	about 11	grab	505	)	10	15
	YY7	8-26-92	about 12	grab	506	)taken from 6"	3.7	15
	YY8	8-26-92	about 12	grab	507	)depths from	7.4	14
	YY9	8-26-92	about 12	grab	508	)ground surface	7	13
	YY10	8-26-92	about 12	grab	509	) [YY1 to YY15]	4.5	16
	YY11	8-26-92	about 12	grab	5010	)	4.7	13
	YY12	8-26-92	about 12	grab	5011	)	5.3	15
	YY13	8-26-92	about 10	grab	5012	)	5.4	15
	YY14	8-26-92	about 10	grab	5013	)	5.4	12
	YY15	8-26-92	about 10	grab	5014	)	<3.2	11
	YY16	8-26-92		grab	5015	)taken adjacent	4.7	69
	YY17	8-26-92		grab	5016	)to 20th St. E.	<3.2	19
HAZEN'S PROPERTY (OUTSIDE WETLANDS)								
	HZ1	9-16-92		grab	A	6" below ground	<2.5	35
	HZ2	9-16-92				12" below ground	<2.4	22
	HZ3	9-16-92		grab	B	6" below ground	5.1	40
	HZ4	9-16-92	about 16	grab	C	3" below ground	<1.8	16
	HZ5	9-16-92				6" below ground	<1.7	7.2
	HZ6	9-16-92	about 16	grab	D	3" below ground	<2.5	13
	HZ7	9-16-92				6" below ground	<1.9	10
	HZ8	9-16-92	about 15	grab	E	6" below ground	<2.2	32
	HZ9	9-16-92				12" below ground	<2.2	12
	HZ10	9-16-92		grab	F	6" below ground	6.0	8
	HZ11	9-16-92				12" below ground	3.0	12
	HZ12	9-16-92	about 15	grab	G	6" below ground	4.6	16
	HZ13	9-16-92				12" below ground	<2.6	10

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS (Continued)

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
PUGET POWER ROAD DITCH								
PD-1	1A	10-02-92	5.34			)		
	1B		6.60	composite	PPD-1	)ditch bottom	5	4.7
	1C		6.40	duplicate		)	18	3.5
	1S	11-13-92		grab	PPD-1S	ditch side	3.6	2.0
PD-2	2A	10-02-92	6.33			)		
	2B		5.88	composite	PPD-2	)ditch bottom	62	2.8
	2C		6.09			)		
	2AC	10-07-92	about 4.8	grab	PPD-2A	ditch bottom, after further cleanup	<2.6	2.2
	2S	11-13-92		grab	PPD-2S	ditch side	4.6	2.1
PD-3	3A	10-02-92	4.96			)		
	3B		5.04	composite	PPD-3	)ditch bottom	48	2.7
	3C		4.65	duplicate		)	40	2.7
	3AC	10-07-92	about 4.4	grab	PPD-3A	ditch bottom, after further cleanup	3.2	1.9
	3S	11-13-92		grab	PPD-3S	ditch side	4.1	1.6
PD-4	4	10-16-92	4.40	composite	PPD-4	)ditch bottom	<2.9	1.8
	5		5.12			)		
	4S	10-16-92	7.72	grab	PPD-4S	ditch sideslope	28	13
	4AS	10-26-92		grab	PPD-4AS	ditch sideslope, after further cleanup	52	21
	4BS	10-28-92		grab	PPD-4BS	ditch sideslope, after further cleanup	5.6	1.5
PD-5	6	10-16-92	4.43	composite	PPD-5	)ditch bottom	<2.8	2.4
	7		4.21			)		
	6S	10-16-92	6.87	grab	PPD-6S	ditch sideslope	11	9.3
PD-6	8	10-23-92	4.24	composite	PPD-6	)ditch bottom	<1.9	2.9
	9		4.75			)		
	8S	10-16-92	8.12	grab	PPD-8S	ditch sideslope	<3.5	5.7

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS (Continued)

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
PD-7	10 11	10-17-92	4.97 4.48	composite	PPD-7	)ditch bottom)	<3.1	1.9
	10S	10-17-92	7.17	grab	PPD-10S	ditch sideslope	120	27
	10AS	10-26-92		grab	PPD-10AS	ditch sideslope, after further cleanup	<1.9	5.7
PD-8	12 13	10-16-92	4.31 3.94	composite duplicate	PPD-8	)ditch bottom)	11 <3.1	2.2 2.0
	12S	10-17-92	6.61	grab	PPD-12S	ditch sideslope	7.2	5.9
PD-9	14 15	10-17-92	3.94 4.47	composite duplicate	PPD-9	)ditch bottom)	<3.1 <3.0	2.5 <1.5
	14S	10-17-92	8.14	grab	PPD-14S	ditch sideslope	3.7	11
PD-10	16 17	10-17-92	4.52 4.47	composite duplicate	PPD-10	)ditch bottom)	<3.0 <2.9	2.0 2.2
	16S	10-17-92	7.61	grab	PPD-16S	ditch sideslope	3.3	4.1
PD-11	18 19	10-17-92	4.24 3.34	composite	PPD-11	)ditch bottom)	4.2	3.3
	19S	10-17-92	11.88	grab	PPD-19S	ditch sideslope	<2.5	3.1
PD-12	20 21	10-19-92	3.90 3.97	composite duplicate	PPD-12	)ditch bottom)	<2.3 <3.0	2.7 3.6
	21S	10-19-92	7.17	grab	PPD-21S	ditch sideslope	<2.5	5.9
PD-13	22 23	10-19-92	3.24 4.49	composite	PPD-13	)ditch bottom)	<2.2	2.3
	23S	10-19-92	7.72	grab	PPD-23S	ditch sideslope	<2.1	4.5
PD-14	24 25	10-19-92	4.19 4.35	composite	PPD-14	)ditch bottom)	6.5	1.7
	25S	10-19-92	7.94	grab	PPD-25S	ditch sideslope	11	4.9
PD-15	26 27	10-19-92	4.30 4.01	composite duplicate	PPD-15	)ditch bottom)	<1.8 <1.9	1.4 1.3
	27S	10-19-92	7.12	grab	PPD-27S	ditch sideslope	19	11
PD-16	29	10-19-92	4.05	grab	PPD-16	ditch bottom	<2.3	1.9
	29S	10-19-92	7.10	grab	PPD-29S	ditch sideslope	<2.2	12

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS (Continued)

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
PUGET POWER ACCESS ROAD								
	PR-1	12-01-92	about 14	grab	PPR-1		3.1	-
	PR-2	12-01-92	about 14	grab	PPR-2		6.8	-
	PR-3	12-01-92	about 14	grab	PPR-3		18.0	-
	PR-4	12-01-92	about 14	grab	PPR-4		9.3	-
	PR-5	12-01-92	about 14	grab	PPR-5		2.8	-
	PR-6	12-01-92	about 14	grab	PPR-6		12.0	-
	PR-7	12-01-92	about 14	grab	PPR-7		23.0	-
		12-03-92	about 13.75	grab	PPR-7A	re-sampled after further cleanup	8.5	-
	PR-8	12-01-92	about 14	grab	PPR-8		25.0	-
		12-03-92	about 13.75	grab	PPR-8A	re-sampled after further cleanup	8.4	-
	PR-9	12-01-92	about 14	grab	PPR-9		21.0	-
		12-03-92	about 13.75	grab	PPR-9A	re-sampled after further cleanup	10.0	-
	PR-10	12-01-92	about 14	grab	PPR-10		12.0	-

Note: All soil samples were taken near the road centerline, and were only tested for total Arsenic.

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TABLE A-1 SUMMARY OF PERFORMANCE SAMPLING RESULTS (Continued)

AREA	SAMPLING LOCATION	SAMPLING DATE	ELEVATION (ft above MSL)	SAMPLE TYPE	SAMPLE NO.	REMARKS	TOTAL ARSENIC (mg/kg)	TOTAL LEAD (mg/kg)
DITCH ADJOINING APARTMENT COMPLEX								
YD1	A	01-07-93	10.43			)		
	B		10.30	composite	100-C	)ditch bottom	<3.0	<1.5
	C		10.17			)		
	S	01-07-93	11.19	grab	100-S	ditch sideslope	<3.3	<1.6
YD2	A	01-07-93	10.13			)		
	B		10.05	composite	101-C	)ditch bottom	<3.3	<1.6
	C		10.02			)		
	S	01-07-93	11.17	grab	101-S	ditch sideslope	<2.9	<1.4
YD3	A	01-07-93	10.43			)		
	B		10.30	composite	102-C	)ditch bottom	3.6	<1.5
	C		10.17			)		
	S	01-07-93	11.19	grab	102-S	ditch sideslope	<3.1	<1.6

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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: August 6, 1992

Report On: Analysis of Soil Lab No.: 26142

IDENTIFICATION:
Samples received on 08-05-92
Project: B & L Landfill ASBL06

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-6-92
Date Analyzed: 8-6-92

Arsenic, mg/kg	90
Lead, mg/kg	7.8

SOUND ANALYTICAL SERVICES

STAN P. PALMQUIST

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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics
Lab No: 26142qc
Matrix: Soil
Units: mg/kg
Date: August 6, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 5.8
Lead	< 2.9

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Report To: Hydrometrics, Inc. Date: August 7, 1992

Report On: Analysis of Soil Lab No.: 26168

IDENTIFICATION:
Sample received on 08-06-92
Project: B & L Landfill ABLO6
Client ID: ASBL0806012

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-7-92
Date Analyzed: 8-7-92

Arsenic, mg/kg	< 2.7
Lead, mg/kg	3.9

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics
Lab No: 26168mb
Units: mg/kg
Date: August 7, 1992

METHOD BLANKS

Parameter	Blank Value
Arsenic	< 2.7
Lead	< 1.4

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4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: August 11, 1992

Report On: Analysis of Soil Lab No.: 26232

IDENTIFICATION:
Samples received on 08-10-92
P.O. No. 6489
Project: ASBL06 - B & L Landfill

ANALYSIS:

Lab No. 26232-1 Client ID: ASBL-0810-013

ICP Metals Per Method 6010
Date Digested: 8-10-92
Date Analyzed: 8-11-92

Arsenic, mg/kg	< 3.5
Lead, mg/kg	9.5

Lab No. 26232-2 Client ID: ASBL-0810-011B

ICP Metals Per Method 6010
Date Digested: 8-10-92
Date Analyzed: 8-11-92

Arsenic, mg/kg	< 3.5
Lead, mg/kg	13

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 26232qc
Units: mg/kg
Date: August 11, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 3.5
Lead	< 1.7

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Report To: Hydrometrics, Inc. Date: August 12, 1992

Report On: Analysis of Soil Lab No.: 26267

IDENTIFICATION:
Samples received on 08-11-92
Project: ASBL-06 B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-12-92
Date Analyzed: 8-12-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
26267-1	ASBL-0811-C-04	10	12
26267-2	ASBL-0811-17A	3.8	11
26267-3	ASBL-0811-19A	< 3.0	8.9
26267-4	ASBL-0811-19B	< 3.0	5.2
26267-5	ASBL-0811-19C	< 3.0	3.8

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 26267qc
Units: mg/kg
Date: August 12, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 3.0
Lead	< 1.5

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Report To: Hydrometrics, Inc. Date: August 14, 1992

Report On: Analysis of Soil Lab No.: 26349

IDENTIFICATION:
Samples received on 08-13-92
P.O. No. 07204
Project: B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-14-92
Date Analyzed: 8-14-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
26349-1	ASBL-0813-C-05	3.2	8.2
26349-2	ASBL-0813-C-05D	< 2.6	9.3

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Report To: Hydrometrics, Inc. Date: August 14, 1992

Report On: Analysis of Soil Lab No.: 26349

IDENTIFICATION:
Samples received on 08-13-92
P.O. No. 07204
Project: B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-14-92
Date Analyzed: 8-14-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
26349-1	ASBL-0813-C-05	3.2	8.2
26349-2	ASBL-0813-C-05D	< 2.6	9.3

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Report To: Hydrometrics, Inc. Date: August 17, 1992

Report On: Analysis of Soil Lab No.: 26371

IDENTIFICATION:
Samples received on 08-14-92
P.O. No. 07205
Project: ASBL-06

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-14-92
Date Analyzed: 8-17-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
26371-1	ASBL-08-14-C-03	< 3.9	3.4
26371-2	ASBL-08-14-C-03D	< 3.9	3.0
26371-3	ASBL-08-14-025A	< 3.9	3.3
26371-4	ASBL-08-14-025B	< 3.9	< 1.9
26371-5	ASBL-08-14-025C	12	3.1
26371-6	ASBL-08-14-028A	< 3.9	2.4
26371-7	ASBL-08-14-028B	13	5.4
26371-8	ASBL-08-14-028C	57	4.7

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics
Lab No: 26371qc
Matrix: Soil
Units: mg/kg
Date: August 17, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 3.9
Lead	< 1.9

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Report To: Hydrometrics Date: August 19, 1992

Report On: Analysis of Soil Lab No.: 26447

IDENTIFICATION:
Samples received on 08-18-92
Project: Asarco Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-18-92
Date Analyzed: 8-19-92

Lab Sample No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
1	ASBL-92-0818-TEST-1-T	17	20
2	ASBL-920818-TEST-2-W	42	37
3	ASBL-920818-TEST-3-E	7.7	16
4	ASBL-920818C-06	< 2.9	6.1
5	ASBL-920818-C06D	< 2.9	7.1
6	ASBL-92-0818-31A	17	7.6
7	ASBL-92-0818-31B	11	8.1
8	ASBL-92-0818-31C	6.3	6.6

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 26447qc
Matrix: Soil
Units: mg/kg
Date: August 19, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.9
Lead	< 1.5

DUPLICATE

Dup No. 26447-4

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 2.9	< 2.9	0.0
Lead	6.1	6.8	10.9

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 26447-4

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	< 2.9	83	95	87.4	92	10.3
Lead	6.1	90	95	88.3	99	9.5

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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Report To: Hydrometrics Date: August 21, 1992

Report On: Analysis of Soil Lab No.: 26514

IDENTIFICATION:
Sample received on 08-20-92
Project: Arasco B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-20-92
Date Analyzed: 8-21-92

Lab No. 26514-1	Client ID: ASBL-0820 C-070
Arsenic, mg/kg	9.5
Lead, mg/kg	7.1

Lab No. 26514-2	Client ID: ASBL-0820 C-07
Arsenic, mg/kg	2.0
Lead, mg/kg	6.8

Lab No. 26514-3	Client ID: ASBL-0820 C-08
Arsenic, mg/kg	5.8
Lead, mg/kg	6.8

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 26514qc
Units: mg/kg
Date: August 21, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.2
Lead	< 1.1

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Report To: Hydrometrics, Inc. Date: August 24, 1992

Report On: Analysis of Soil Lab No.: 26543

IDENTIFICATION:
Sample received on 08-21-92
Project: Arasco B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-21-92
Date Analyzed: 8-21-92

Lab No. 26543-1	Client ID: Site 9 ASBL-0821-C09
Arsenic, mg/kg	11
Lead, mg/kg	5.3

Lab No. 26543-2	Client ID: Site 9 ASBL-0821-C09D
Arsenic, mg/kg	7.8
Lead, mg/kg	5.5

Lab No. 26543-3	Client ID: Site 11 ASBL082142A
Arsenic, mg/kg	< 3.7
Lead, mg/kg	4.3

Continued . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: Arasco B & L Landfill

Lab No. 26543
August 24, 1992

ICP Metals Per Method 6010
Date Digested: 8-21-92
Date Analyzed: 8-21-92

Lab No. 26543-4	Client ID:	Site 11 ASBL082142B
Arsenic, mg/kg	< 3.7	
Lead, mg/kg	7.2	
Lab No. 26543-5	Client ID:	Site 11 ASBL082142C
Arsenic, mg/kg	< 3.7	
Lead, mg/kg	6.5	
Lab No. 26543-6	Client ID:	Site 11 ASBL082142P
Arsenic, mg/kg	20	
Lead, mg/kg	< 4.2	

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 26453
Matrix: Soil
Units: mg/kg
Date: August 24, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 3.7
Lead	< 1.8

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4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics Date: August 25, 1992

Report On: Analysis of Soil Lab No.: 26576

IDENTIFICATION:
Sample received on 08-24-92
P. O. No. 07212
Project: ASBL06 B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-24-92
Date Analyzed: 8-24-92

Lab No. 26576-1 Client ID: ASBL-0824-C010

Arsenic, mg/kg	< 2.3
Lead, mg/kg	15

Lab No. 26576-2 Client ID: ASBL-0824-C010D

Arsenic, mg/kg	< 2.3
Lead, mg/kg	8.5

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 26576qc
Units: mg/kg
Date: August 25, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.3
Lead	< 1.1

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4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics Date: August 28, 1992

Report On: Analysis of Soil Lab No.: 26689

IDENTIFICATION:
Sample received on 08-27-92
P. O. No. 07216
Project: ASBL06 B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-27-92
Date Analyzed: 8-28-92

Lab No. 26689-1	Client ID: ASBL-0827-C-11
Arsenic, mg/kg	< 2.8
Lead, mg/kg	5.1

Lab No. 26689-2	Client ID: ASBL-0826-C-11-D
Arsenic, mg/kg	< 2.8
Lead, mg/kg	6.0

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 26689qc
Matrix: Soil
Units: mg/kg
Date: August 28, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.8
Lead	< 1.4

DUPLICATE

Dup No. 26689-1

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 2.8	< 2.8	0.0
Lead	5.1	5.2	1.9

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 26689-1

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	< 2.8	100	116	86.2	97	3.0
Lead	5.1	110	116	90.4	110	0

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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Report To: Hydrometrics Date: August 26, 1992

Report On: Analysis of Soil Lab No.: 26612

IDENTIFICATION:
Sample received on 08-25-92
P. O. No. 07213
Project: ASBL06 B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-25-92
Date Analyzed: 8-26-92

Lab No. 26612-1	Client ID: ASBL-0825-C08
Arsenic, mg/kg	< 3.2
Lead, mg/kg	6.7

Lab No. 26612-2	Client ID: ASBL-0825-C08D
Arsenic, mg/kg	< 3.2
Lead, mg/kg	5.2

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics
Lab No: 26612qc
Matrix: Soil
Units: mg/kg
Date: August 26, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 3.2
Lead	< 1.6

DUPLICATE

Dup No. 26612-1

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 3.2	< 3.2	0.0
Lead	6.7	6.0	11.0

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

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ASBL06
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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS
4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 · TELEPHONE (206)922-2310 · FAX (206)922-5047

Report To: Hydrometrics, Inc.
Date: August 31, 1992

Report On: Analysis of Soil
Lab No.: 26668

IDENTIFICATION:
Sample received on 08-26-92
Project: ASBL-01

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 8-27-92
Date Analyzed: 8-28-92

Lab No. 26668-1	Client ID: ASBL-9208-500
Arsenic, mg/kg	20
Lead, mg/kg	25
Lab No. 26668-2	Client ID: ASBL-9208-501
Arsenic, mg/kg	17
Lead, mg/kg	23
Lab No. 26668-3	Client ID: ASBL-9208-502
Arsenic, mg/kg	17
Lead, mg/kg	19
Lab No. 26668-4	Client ID: ASBL-9208-503
Arsenic, mg/kg	11
Lead, mg/kg	14
Lab No. 26668-5	Client ID: ASBL-9208-504
Arsenic, mg/kg	9.6
Lead, mg/kg	16

Continued . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASBL-01

Lab No. 26668
August 31, 1992

ICP Metals Per Method 6010
Date Digested: 8-27-92
Date Analyzed: 8-28-92

Lab No. 26668-6	Client ID: ASBL-9208-505
Arsenic, mg/kg	10
Lead, mg/kg	15
Lab No. 26668-7	Client ID: ASBL-9208-506
Arsenic, mg/kg	3.7
Lead, mg/kg	15
Lab No. 26668-8	Client ID: ASBL-9208-507
Arsenic, mg/kg	7.4
Lead, mg/kg	14
Lab No. 26668-9	Client ID: ASBL-9208-508
Arsenic, mg/kg	7.0
Lead, mg/kg	13
Lab No. 26668-10	Client ID: ASBL-9208-509
Arsenic, mg/kg	4.5
Lead, mg/kg	16
Lab No. 26668-11	Client ID: ASBL-9208-5010
Arsenic, mg/kg	4.7
Lead, mg/kg	13

Continued . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASBL-01

Lab No. 26668
August 31, 1992

ICP Metals Per Method 6010
Date Digested: 8-27-92
Date Analyzed: 8-28-92

Lab No. 26668-12	Client ID:	ASBL-9208-5011
Arsenic, mg/kg	5.3	
Lead, mg/kg	15	
Lab No. 26668-13	Client ID:	ASBL-9208-5012
Arsenic, mg/kg	5.4	
Lead, mg/kg	15	
Lab No. 26668-14	Client ID:	ASBL-9208-5013
Arsenic, mg/kg	5.4	
Lead, mg/kg	12	
Lab No. 26668-15	Client ID:	ASBL-9208-5014
Arsenic, mg/kg	< 3.2	
Lead, mg/kg	11	
Lab No. 26668-16	Client ID:	ASBL-9208-5015
Arsenic, mg/kg	4.7	
Lead, mg/kg	69	
Lab No. 26668-17	Client ID:	ASBL-9208-5016
Arsenic, mg/kg	< 3.2	
Lead, mg/kg	19	

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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: September 4, 1992

Report On: Analysis of soil Lab No.: 26877

IDENTIFICATION:
Samples received on 09-03-92
P.O. No. 07219
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 9-3-92
Date Analyzed: 9-4-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
26877-1	ASBL-920903 C-013	< 3.8	3.1
26877-2	ASBL-920903 C-013D	< 3.8	3.5
26877-3	ASBL-920903 I-2	< 3.8	2.5
26877-4	ASBL-920903 G-2	62	2.0
26877-5	ASBL-920903 B-3	48	4.3
26877-6	ASBL-920903 C-2	53	4.4
26877-7	ASBL-920903 C-12	< 3.8	4.1
26877-8	ASBL-920903 C-12D	< 3.8	3.2

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QUALITY CONTROL REPORT

Total Arsenic & Lead

Client: Hydrometrics, Inc.
Lab No: 26877qc
Matrix: Soil
Units: mg/kg
Date: September 4, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 3.8
Lead	< 1.9

DUPLICATE

Dup No. 26877-4

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	62	61	1.6
Lead	2.0	2.3	14.0

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: September 8, 1992

Report On: Analysis of Soil Lab No.: 26900

IDENTIFICATION:
Samples received on 09-03-92
Project: Asarco ASBL-06 B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 9-4-92
Date Analyzed: 9-8-92

Lab No. 26900-1	Client ID:	ASBL920903-17A
Arsenic, mg/kg	< 3.5	
Lead, mg/kg	8.4	
Lab No. 26900-2	Client ID:	ASBL920903-17B
Arsenic, mg/kg	< 3.5	
Lead, mg/kg	7.0	
Lab No. 26900-3	Client ID:	ASBL920903-17C
Arsenic, mg/kg	< 3.5	
Lead, mg/kg	4.8	
Lab No. 26900-4	Client ID:	ASBL920903-25A
Arsenic, mg/kg	< 3.5	
Lead, mg/kg	3.5	

Continued . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASEV-01
Page 2 of 2
Lab No. 26900
September 8, 1992

ICP Metals Per Method 6010
Date Digested: 9-4-92
Date Analyzed: 9-8-92

Lab No. 26900-5	Client ID: ASBL920903-25B
Arsenic, mg/kg	< 3.5
Lead, mg/kg	5.8

Lab No. 26900-6	Client ID: ASBL920903-25C
Arsenic, mg/kg	< 3.5
Lead, mg/kg	3.5

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 26900qc
Matrix: Soil
Units: mg/kg
Date: September 8, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 3.5
Lead	< 1.8

DUPLICATE

Dup No. 26900-6

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 3.5	< 3.5	0.0
Lead	3.5	3.3	5.9

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 26900-6

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	< 3.5	120	105	114	110	8.7
Lead	3.5	130	105	120	110	16.7

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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RECEIVED SEP 16 1992

Report To: Hydrometrics, Inc. Date: September 11, 1992

Report On: Analysis of Soil Lab No.: 27027

IDENTIFICATION:
Sample received on 09-10-92
Project: Asarco B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 9-10-92
Date Analyzed: 9-11-92

Lab No. 27027-1	Client ID:	ASBL-920910C14
Arsenic, mg/kg		< 2.5
Lead, mg/kg		4.4
Lab No. 27027-2	Client ID:	ASBL-920910C14D
Arsenic, mg/kg		< 2.5
Lead, mg/kg		3.5
Lab No. 27027-3	Client ID:	ASBL-920910 Dirt 1
Arsenic, mg/kg		< 2.5
Lead, mg/kg		2.3

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27027qc
Units: mg/kg
Date: September 11, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.5
Lead	< 1.3

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Report To: Hydrometrics, Inc. Date: September 15, 1992

Report On: Analysis of Soil Lab No.: 27095

IDENTIFICATION:
Samples received on 09-14-92
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 9-14-92
Date Analyzed: 9-15-92

Lab No. 27095-1	Client ID:	ASBL920911 C-17
Arsenic, mg/kg	< 3.3	
Lead, mg/kg	6.6	
Lab No. 27095-2	Client ID:	ASBL920911 C-17D
Arsenic, mg/kg	< 3.1	
Lead, mg/kg	5.9	
Lab No. 27095-3	Client ID:	ASBL920912 C-15
Arsenic, mg/kg	< 3.0	
Lead, mg/kg	7.3	
Lab No. 27095-4	Client ID:	ASBL920912 C-15D
Arsenic, mg/kg	< 3.1	
Lead, mg/kg	6.3	
Lab No. 27095-5	Client ID:	ASBL920912 C-16
Arsenic, mg/kg	< 2.8	
Lead, mg/kg	3.6	

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASBL-06

Lab No. 27095
September 15, 1992

ICP Metals Per Method 6010
Date Digested: 9-14-92
Date Analyzed: 9-15-92

Lab No. 27095-6	Client ID:	ASBL920912 C-16D
Arsenic, mg/kg		< 3.2
Lead, mg/kg		3.3
Lab No. 27095-7	Client ID:	ASBL920914 A-6-A
Arsenic, mg/kg		< 3.0
Lead, mg/kg		2.9
Lab No. 27095-8	Client ID:	ASBL920914 A-6-B
Arsenic, mg/kg		< 3.1
Lead, mg/kg		3.5
Lab No. 27095-9	Client ID:	ASBL920914 A-6-C
Arsenic, mg/kg		< 2.9
Lead, mg/kg		3.9
Lab No. 27095-10	Client ID:	ASBL920914 A-5A
Arsenic, mg/kg		7.9
Lead, mg/kg		10
Lab No. 27095-11	Client ID:	ASBL920914 A-5B
Arsenic, mg/kg		< 2.9
Lead, mg/kg		3.1

Continued . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASBL-06

Lab No. 27095
September 15, 1992

ICP Metals Per Method 6010
Date Digested: 9-14-92
Date Analyzed: 9-15-92

Lab No. 27095-12	Client ID:	ASBL920914 A-5C
Arsenic, mg/kg		< 2.9
Lead, mg/kg		3.0
Lab No. 27095-13	Client ID:	ASBL920914 A-4A
Arsenic, mg/kg		46
Lead, mg/kg		8.8
Lab No. 27095-14	Client ID:	ASBL920914 A-4B
Arsenic, mg/kg		< 3.2
Lead, mg/kg		3.4
Lab No. 27095-15	Client ID:	ASBL920914 A-4C
Arsenic, mg/kg		3.6
Lead, mg/kg		3.0
Lab No. 27095-16	Client ID:	ASBL920914 A-3A
Arsenic, mg/kg		3.4
Lead, mg/kg		4.7
Lab No. 27095-17	Client ID:	ASBL920914 A-3B
Arsenic, mg/kg		< 2.2
Lead, mg/kg		3.4

Continued . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASBL-06

Lab No. 27095
September 15, 1992

ICP Metals Per Method 6010
Date Digested: 9-14-92
Date Analyzed: 9-15-92

Lab No. 27095-18	Client ID:	ASBL920914 A-3C
Arsenic, mg/kg		< 2.4
Lead, mg/kg		3.4
Lab No. 27095-19	Client ID:	ASBL920914 A-2A
Arsenic, mg/kg		7.3
Lead, mg/kg		5.6
Lab No. 27095-20	Client ID:	ASBL920914 A-2B
Arsenic, mg/kg		< 3.2
Lead, mg/kg		4.0
Lab No. 27095-21	Client ID:	ASBL920914 A-2C
Arsenic, mg/kg		< 2.4
Lead, mg/kg		3.8
Lab No. 27095-22	Client ID:	ASBL920914-BA
Arsenic, mg/kg		< 2.1
Lead, mg/kg		4.5
Lab No. 27095-23	Client ID:	ASBL920914-BB
Arsenic, mg/kg		< 3.1
Lead, mg/kg		4.3

Continued . . .

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Hydrometrics, Inc.
Project: ASBL-06

Lab No. 27095
September 15, 1992

ICP Metals Per Method 6010
Date Digested: 9-14-92
Date Analyzed: 9-15-92

Lab No. 27095-24	Client ID:	ASBL920914-BC
Arsenic, mg/kg		< 2.7
Lead, mg/kg		4.2
Lab No. 27095-25	Client ID:	ASBL920914-CA
Arsenic, mg/kg		< 2.6
Lead, mg/kg		5.0
Lab No. 27095-26	Client ID:	ASBL920914-CB
Arsenic, mg/kg		< 2.5
Lead, mg/kg		2.8
Lab No. 27095-27	Client ID:	ASBL920914-CC
Arsenic, mg/kg		< 2.7
Lead, mg/kg		2.8
Lab No. 27095-28	Client ID:	ASBL920914-DA
Arsenic, mg/kg		110
Lead, mg/kg		11
Lab No. 27095-29	Client ID:	ASBL920914-DB
Arsenic, mg/kg		6.1
Lead, mg/kg		2.8

Continued . . .

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Hydrometrics, Inc.
Project: ASBL-06

Lab No. 27095
September 15, 1992

ICP Metals Per Method 6010
Date Digested: 9-14-92
Date Analyzed: 9-15-92

Lab No. 27095-30	Client ID:	ASBL920914-DC
Arsenic, mg/kg	2.9	
Lead, mg/kg	2.6	
Lab No. 27095-31	Client ID:	ASBL920914-EA
Arsenic, mg/kg	5.5	
Lead, mg/kg	2.7	
Lab No. 27095-32	Client ID:	ASBL920914-EB
Arsenic, mg/kg	11	
Lead, mg/kg	2.3	
Lab No. 27095-33	Client ID:	ASBL920914-EC
Arsenic, mg/kg	13	
Lead, mg/kg	2.3	

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27095qc
Matrix: Soil
Units: mg/kg
Date: September 15, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.5
Lead	< 1.3

DUPLICATE

Dup No. 27095-11

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 2.9	< 2.9	0.0
Lead	3.1	3.1	0.0

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27095-11

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	< 2.9	100	110	90.9	91	9.4
Lead	3.1	110	110	97.2	89	21.1

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometric, Inc.
Lab No: 27095qc
Matrix: Soil
Units: mg/kg
Date: September 15, 1992

DUPLICATE

Dup No. 27095-15

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	3.6	3.7	2.7
Lead	3.0	3.4	12.5

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27095-15

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	3.6	78	82	90.7	73	6.6
Lead	3.0	78	82	91.5	73	6.6

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: September 17, 1992

Report On: Analysis of Soil Lab No.: 27145

IDENTIFICATION:
Samples received on 09-16-92
P.O. No. 07227
Project: ASBL-06 Asarco Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 9-16-92
Date Analyzed: 9-17-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27145-1	ASBL-920915-HAZ-A6	< 2.5	35
27145-2	ASBL-920915-HAZ-A12	< 2.4	22
27145-3	ASBL-920915-HAZ-B6	5.1	40
27145-4	ASBL-920915-HAZ-C3	< 1.8	16
27145-5	ASBL-920915-HAZ-C6	< 1.7	7.2
27145-6	ASBL-920915-HAZ-D3	< 2.5	13
27145-7	ASBL-920915-HAZ-D6	< 1.9	10
27145-8	ASBL-920915-HAZ-E6	< 2.2	32
27145-9	ASBL-920915-HAZ-E12	< 2.2	12
27145-10	ASBL-920915-HAZ-F6	6.0	8.0
27145-11	ASBL-920915-HAZ-F12	3.0	12
27145-12	ASBL-920915-HAZ-G6	4.6	16
27145-13	ASBL-920915-HAZ-G12	< 2.6	10
27145-14	ASBL-920915-HAZ-H2	2,300	200

Continued . . . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASBL-06

Lab No. 27145
September 17, 1992

ICP Metals Per Method 6010
Date Digested: 9-16-92
Date Analyzed: 9-17-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27145-15	ASBL-920915-HAZ-H6	450	52
27145-16	ASBL-920915-HAZ-H12	270	32
27145-17	ASBL-920915-HAZ-I2	19	24
27145-18	ASBL-920915-HAZ-I6	9.9	25
27145-19	ASBL-920915-HAZ-I12	16	21
27145-20	ASBL-920915-HAZ-J2	21	62
27145-21	ASBL-920915-HAZ-J6	18	57
27145-22	ASBL-920915-HAZ-J12	18	25
27145-23	ASBL-920915-HAZ-K2	37	53
27145-24	ASBL-920915-HAZ-K6	29	40
27145-25	ASBL-920915-HAZ-L2	290	72
27145-26	ASBL-920915-HAZ-L6	160	55
27145-27	ASBL-920915-HAZ-L12	650	9.3
27145-28	ASBL-920915-HAZ-K12	40	19

SOUND ANALYTICAL SERVICES

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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27145qc
Matrix: Soil
Units: mg/kg
Date: September 17, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.5
Lead	< 1.3

DUPLICATE

Dup No. 27145-11

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	3.0	3.6	18.2
Lead	12	13	8.0

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27145-11

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	3.0	120	100	117	110	8.7
Lead	12	120	100	108	110	8.7

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27145qc
Matrix: Soil
Units: mg/kg
Date: September 17, 1992

DUPLICATE

Dup No. 27145-26

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	160	180	11.8
Lead	55	61	10.3

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27145-26

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	160	370	235	89.4	380	2.7
Lead	55	290	235	100	270	7.1

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: September 21, 1992

Report On: Analysis of Soil Lab No.: 27223

IDENTIFICATION:
Samples received on 09-18-92
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 9-21-92
Date Analyzed: 9-21-92

Lab Sample No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27223-1	ASBL-920918-CL-1	27	22
27223-2	ASBL-920918-CL-2	140	96
27223-3	ASBL-920918-CL-3	68	47
27223-4	ASBL-920918-AC-1, 2 Side	< 3.1	2.9
27223-5	ASBL-920918-AC-D1, 2 Side	< 3.2	2.0
27223-6	ASBL-920918-A-C-1,2	< 3.1	3.8
27223-7	ASBL-920918-A-C-D1,2	< 3.1	3.4
27223-8	ASBL-920918-C-20	< 3.0	4.2
27223-9	ASBL-920918-C-20D	< 3.2	4.1
27223-10	ASBL-920918-L3-N-50	18	7.3
27223-11	ASBL-920918-L35-50	< 2.5	8.9

Continued . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Projet: ASBL-06

Lab No. 27223
September 21, 1992

ICP Metals Per Method 6010
Date Digested: 9-21-92
Date Analyzed: 9-21-92

Lab Sample No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27223-12	ASBL-920918-CL-1-12	6.1	13
27223-13	ASBL-920918-CL-2-12	93	64
27223-14	ASBL-920918-CL-3-12	17	19

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27223qc
Matrix: Soil
Units: mg/kg
Date: September 21, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.5
Lead	< 1.3

DUPLICATE

Dup No. 27223-10

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	18	17	5.7
Lead	7.3	7.9	7.9

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27223-10

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	18	95	75	103	87	8.8
Lead	7.3	80	75	96.9	78	10.1

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: September 23, 1992

Report On: Analysis of Soil Lab No.: 27276

RECEIVED SEP 28 1992

IDENTIFICATION:
Samples received on 09-22-92
P.O. No. 07232

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 9-22-92
Date Analyzed: 9-23-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27276-1	ASBL920921-C-21D	< 2.1	1.2
27276-2	ASBL920921-C-21	< 2.2	2.3
27276-3	ASBL920922-C-24	< 2.2	1.3
27276-4	ASBL920922-C-24D	< 1.9	< 0.95
27276-5	ASBL920922-C-25	< 2.0	1.6
27276-6	ASBL920922-C-25D	< 2.7	< 1.3

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QUALITY CONTROL REPORT

RECEIVED
SEP 28 1992

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27276qc
Units: mg/kg
Date: September 23, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.5
Lead	< 1.3

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Report To: Hydrometrics, Inc. Date: September 24, 1992

Report On: Analysis of Soil Lab No.: 27315

RECEIVED
SEP 28 1992

IDENTIFICATION:
Samples received on 09-23-92
P.O. No. 07234
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 9-23-92
Date Analyzed: 9-23-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27315-1	ASBL920923-HAZ-M-5	41	43
27315-2	ASBL920923-HAZ-M-6	13	26
27315-3	ASBL920923-HAZ-M-12	16	12
27315-4	ASBL920923-HAZ-M-18	10	7.4
27315-5	ASBL920923-HAZ-P-5	31	46
27315-6	ASBL920923-HAZ-P-6	17	13
27315-7	ASBL920923-HAZ-P-12	21	15
27315-8	ASBL920923-HAZ-P-15	20	8.8
27315-9	ASBL920923-HAZ-K-18	7.1	5.1
27315-10	ASBL920923-HAZ-N-5	17	33
27315-11	ASBL920923-HAZ-N-6	ND	6.2
27315-12	ASBL920923-HAZ-N-16	ND	ND

Continued . . . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASBL-06
Page 2 of 3
Lab No. 27315
September 24, 1992

RECEIVED
SEP 28 1992

ICP Metals Per EPA Method 6010
Date Digested: 9-23-92
Date Analyzed: 9-23-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27315-13	ASBL920923-HAZ-N-18	ND	ND
27315-14	ASBL920923-HAZ-O-5	17	77
27315-15	ASBL920923-HAZ-O-6	ND	4.7
27315-16	ASBL920923-HAZ-O-12	11	6.0
27315-17	ASBL920923-HAZ-O-18	13	ND
27315-18	ASBL920923-HAZ-Q-5	31	51
27315-19	ASBL920923-HAZ-Q-6	19	28
27315-20	ASBL920923-HAZ-Q-12	25	21
27315-21	ASBL920923-HAZ-Q-18	75	120
27315-22	ASBL920923-HAZ-J-18	11	17
27315-23	ASBL920923-HAZ-S-5	85	58
27315-24	ASBL920923-HAZ-S-6	47	34
27315-25	ASBL920923-HAZ-S-12	46	16
27315-26	ASBL920923-HAZ-S-18	103	36
27315-27	ASBL920923-HAZ-R-5	27	36
27315-28	ASBL920923-HAZ-R-6	22	14

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASBL-06
Page 3 of 3
Lab No. 27315
September 24, 1992

RECEIVED
SEP 28 1992

ICP Metals Per EPA Method 6010
Date Digested: 9-23-92
Date Analyzed: 9-23-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27315-29	ASBL920923-HAZ-R-12	80	22
27315-30	ASBL920923-HAZ-R-18	59	9.0
27315-31	ASBL920923-HAZ-C-26D	3.8	1.7
27315-32	ASBL920923-HAZ-C-26	3.0	1.1

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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RECEIVED
SEP 28 1992

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27315qc
Matrix: Soil
Units: mg/kg
Date: September 24, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 2.5
Lead	< 1.3

DUPLICATE

Dup No. 27315-12

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 2.5	< 2.5	0.0
Lead	< 1.3	< 1.3	0.0

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27315-12

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	< 2.5	218	228	91	239	9.2
Lead	< 1.3	204	228	89	219	7.1

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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SOUND ANALYTICAL SERVICES, INC.

RECEIVED
SEP 28 1992

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27315qc
Matrix: Soil
Units: mg/kg
Date: September 24, 1992

DUPLICATE

Dup No. 27315-26

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	103	112	8.4
Lead	36	42	15.4

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27315-26

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	103	245	170	84	250	2.0
Lead	36	168	170	78	188	11.2

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: September 28, 1992

Report On: Analysis of Soil Lab No.: 27369

RECEIVED OCT 05 1992

IDENTIFICATION:
Samples received on 09-25-92
P.O. No. 07235

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 9-25-92
Date Analyzed: 9-28-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27369-1	ASBL920925-C-27	< 2.5	2.5
27369-2	ASBL920925-C-27D	4.5	3.3
27369-3	ASBL920925-C-28	7.3	1.8
27369-4	ASBL920925-C-28D	5.4	1.9

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27369qc
Units: mg/kg
Date: September 28, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: September 29, 1992

Report On: Analysis of Soil Lab No.: 27410

RECEIVED
OCT 05 1992

IDENTIFICATION:
Samples received on 09-28-92
P.O. No. 07237

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 9-28-92
Date Analyzed: 9-29-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27410-1	ASBL920926-C-22	2.3	1.3
27410-2	ASBL920926-C-22D	3.6	1.2
27410-3	ASBL920928-C-18	3.3	1.9
27410-4	ASBL920928-C-18D	3.2	2.0
27410-5	ASBL920928-C-19	< 2.1	< 1.1
27410-6	ASBL920928-C-19D	< 1.9	< 0.97

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27410qc
Matrix: Soil
Units: mg/kg
Date: September 29, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

DUPLICATE

Dup No. 27410-6

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 1.9	< 1.9	0.0
Lead	< 0.97	< 0.97	0.0

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: October 5, 1992

Report On: Analysis of Soil Lab No.: 27524

RECEIVED OCT 13 1992

IDENTIFICATION:
Samples received on 10-02-92
P.O. No. 07238
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-2-92
Date Analyzed: 10-5-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27524-1	ASBL921002PPD-1-C	5.0	4.7
27524-2	ASBL921002PPD-1-C-D	18	3.5
27524-3	ASBL921002PPD-2-C	62	2.8
27524-4	ASBL921002PPD-3-C	48	2.7
27524-5	ASBL921002PPD-3-C-D	40	2.7

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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

RECEIVED
OCT 13 1992

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27524qc
Units: mg/l
Date: October 5, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: October 7, 1992

Report On: Analysis of Soil Lab No.: 27586

RECEIVED OCT 13 1992

IDENTIFICATION:
Samples received on 10-06-92
Project: ASBL-06

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-6-92
Date Analyzed: 10-7-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27586-1	ASBL-921006-C44	ND	3.5
27586-2	ASBL-921006-C44D	ND	3.2
27586-3	ASBL-921006-C43	ND	4.0
27586-4	ASBL-921006-C43D	< 3.8	3.6

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

RECEIVED
OCT 13 1992

Client: Hydrometric, Inc.
Lab No: 27586qc
Matrix: Soil
Units: mg/kg
Date: October 7, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

DUPLICATE

Dup No. 27586-2

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	ND	ND	0.0
Lead	3.2	3.4	6.1

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27586-2

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	ND	60	71	84.5	74	20.9
Lead	3.2	70	71	94.1	88	22.8

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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Report To: Hydrometrics, Inc. Date: October 8, 1992

Report On: Analysis of Solids & Soils Lab No.: 27622

RECEIVED
OCT 13 1992

IDENTIFICATION:
Samples received on 10-07-92
P.O. No. 07241
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

Lab No. 27622-1 Client ID: ASBL 921007 C-42

ICP Metals Per EPA Method 6010
Date Digested: 10-7-92
Date Analyzed: 10-8-92

Parameter	Concentration, mg/kg	PQL
Arsenic	ND	2.7
Lead	4.3	1.4

Lab No. 27622-2 Client ID: ASBL 921007 C-42-D

Parameter	Concentration, mg/kg	PQL
Arsenic	ND	2.1
Lead	2.9	1.1

Lab No. 27622-3 Client ID: ASBL 921006 PPD-3A-C

Parameter	Concentration, mg/kg	PQL
Arsenic	3.2	2.4
Lead	1.9	1.2

PQL - Practical Quantitation Limit
ND - Not Detected

Continued . . . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Project: ASBL-06
Page 2 of 2
Lab No. 27622
October 8, 1992

RECEIVED
OCT 13 1992

Lab No. 27622-4 Client ID: ASBL 921006 PPD 2A-C

ICP Metals Per EPA Method 6010
Date Digested: 10-7-92
Date Analyzed: 10-8-92

Parameter	Concentration, mg/kg	PQL
Arsenic	ND	2.6
Lead	2.2	1.3

Lab No. 27622-5 Client ID: ASBL 921006 C-41

Parameter	Concentration, mg/kg	PQL
Arsenic	ND	3.0
Lead	3.4	1.5

Lab No. 27622-6 Client ID: ASBL 921006 C-41-D

Parameter	Concentration, mg/kg	PQL
Arsenic	ND	2.1
Lead	3.2	1.1

PQL - Practical Quantitation Limit
ND - Not Detected

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27622qc
Units: mg/kg
Date: October 8, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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Report To: Hydrometrics, Inc. Date: October 9, 1992

Report On: Analysis of Soil Lab No.: 27650

IDENTIFICATION:
Samples received on 10-08-92
P.O. No. 07242
Project: ASBL-06 Ascarco B & L Landfill

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OCT 14 1992

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-8-92
Date Analyzed: 10-9-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27650-1	ASBL921008-C40	< 2.1	3.6
27650-2	ASBL921008-C40D	< 1.9	3.5

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QUALITY CONTROL REPORT

Total Metals

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OCT 14 1992

Client: Hydrometrics, Inc.
Lab No: 27650qc
Units: mg/kg
Date: October 9, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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Report To: Hydrometrics, Inc. Date: October 12, 1992

Report On: Analysis of Soil Lab No.: 27684

RECEIVED
OCT 14 1992

IDENTIFICATION:
Samples received on 10-09-92
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-9-92
Date Analyzed: 10-12-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27684-1	ASBL921009-C39	14	3.4
27684-2	ASBL921009-C39-D	4.3	3.4

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QUALITY CONTROL REPORT

Total Lead

Client: Hydrometric, Inc.
Lab No: 27684qc
Units: mg/kg
Date: October 12, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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Report To: Hydrometrics, Inc. Date: October 15, 1992

Report On: Analysis of Soil Lab No.: 27776

RECEIVED
OCT 19 1992

IDENTIFICATION:
Samples received on 10-14-92
Project: ASBL-06 Asarco B & L Landfill
P.O. No. 07245

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-14-92
Date Analyzed: 10-15-92

Lab Sample No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
1	ASBL 921014-C-36	2.0	1.0
2	ASBL 921014-C-36D	1.7	0.87
3	ASBL 921014-C-37	2.1	1.0

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27776
Matrix: Soil
Units: mg/kg
Date: October 15, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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Report To: Hydrometrics, Inc. Date: October 15, 1992

Report On: Analysis of Soil Lab No.: 27785

RECEIVED
OCT 19 1992

IDENTIFICATION:
Samples received on 10-15-92
Project: ASBL-06 Asarco B & L Landfill
P.O. No. 07246

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-15-92
Date Analyzed: 10-15-92

Lab Sample No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
1	ASBL 921015-C-38	3.1	1.6
2	ASBL 921015-C-38-D	3.0	1.5

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QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27785
Matrix: Soil
Units: mg/kg
Date: October 15, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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Report To: Hydrometrics, Inc. Date: October 19, 1992

Report On: Analysis of Soil Lab No.: 27835

RECEIVED
OCT 21 1992

IDENTIFICATION:
Samples received on 10-16-92
Project: ASBL-06
P.O. 7247

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-16-92
Date Analyzed: 10-19-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27835-1	ASBL921016PPD C-4	< 2.9	1.8
27835-2	ASBL921010PPD C-5	< 2.8	2.4
27835-3	ASBL921016PPD C-4-S	28	13
27835-4	ASBL921016PPD C-6-S	11	9.3
27835-5	ASBL921016PPD C-8	11	2.2
27835-6	ASBL921016PPD C-8-S	< 3.5	5.7

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OCT 21 1992

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27835qc
Matrix: Soil
Units: mg/kg
Date: October 19, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

DUPLICATE

Dup No. 27835-3

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	28	22	24.0
Lead	13	10	26.1

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27835-3

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	28	110	95	86.3	120	8.7
Lead	13	110	95	102	120	8.7

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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RECEIVED
OCT 22 1992

Report To: Hydrometrics, Inc. Date: October 20, 1992

Report On: Analysis of Soil Lab No.: 27860

IDENTIFICATION:
Samples received on 10-19-92
Project: ASBL-06 Asarco B & L Landfill
P.O. 07249

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-19-92
Date Analyzed: 10-20-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27860-1	ASBL921019PPD C-12	< 2.3	2.7
27860-2	ASBL921019PPD 21-S	< 2.5	5.9
27860-3	ASBL921019PPD C-13	< 2.2	2.3
27860-4	ASBL921019PPD 23-S	< 2.1	4.5
27860-5	ASBL921019PPD C-14	6.5	1.7
27860-6	ASBL921019PPD 25-S	11	4.9
27860-7	ASBL921019PPD C-15	< 1.8	1.4
27860-8	ASBL921019PPD C-15D	< 1.9	1.3
27860-9	ASBL921019PPD 27-S	19	11
27860-10	ASBL921019PPD C-16	< 2.3	1.9
27860-11	ASBL921019PPD 29-S	< 2.2	12

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RECEIVED
OCT 22 1992

Report To: Hydrometrics, Inc. Date: October 20, 1992

Report On: Analysis of Soil Lab No.: 27860

IDENTIFICATION:
Samples received on 10-19-92
Project: ASBL-06 Asarco B & L Landfill
P.O. 07249

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-19-92
Date Analyzed: 10-20-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27860-1	ASBL921019PPD C-12	< 2.3	2.7
27860-2	ASBL921019PPD 21-S	< 2.5	5.9
27860-3	ASBL921019PPD C-13	< 2.2	2.3
27860-4	ASBL921019PPD 23-S	< 2.1	4.5
27860-5	ASBL921019PPD C-14	6.5	1.7
27860-6	ASBL921019PPD 25-S	11	4.9
27860-7	ASBL921019PPD C-15	< 1.8	1.4
27860-8	ASBL921019PPD C-15D	< 1.9	1.3
27860-9	ASBL921019PPD 27-S	19	11
27860-10	ASBL921019PPD C-16	< 2.3	1.9
27860-11	ASBL921019PPD 29-S	< 2.2	12

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RECEIVED OCT 22 1992

Report To: Hydrometrics, Inc. Date: October 20, 1992

Report On: Analysis of Soil Lab No.: 27842

IDENTIFICATION:
Samples received on 10-19-92
Project: ASBL-06 Asarco B & L Landfill
P.O. 07248

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-19-92
Date Analyzed: 10-20-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27842-1	ASBL921017PPD C-7	< 3.1	1.9
27842-2	ASBL921017PPD 10-S	120	27
27842-3	ASBL921017PPD 12-S	7.2	5.9
27842-4	ASBL921017PPD C-8	< 3.1	2.0
27842-5	ASBL921017PPD C-9	< 3.1	2.5
27842-6	ASBL921017PPD C-14-S	3.7	11
27842-7	ASBL921017PPD C-9-D	< 3.0	< 1.5
27842-8	ASBL921017PPD 16-S	3.3	4.1
27842-9	ASBL921017PPD C-10	< 3.0	2.0
27842-10	ASBL921017PPD C-10-D	< 2.9	2.2
27842-11	ASBL921017PPD C-11	4.2	3.3
27842-12	ASBL921017PPD 17-S	< 3.6	6.8
27842-13	ASBL921017PPD C-12	< 3.0	3.6
27842-14	ASBL921017PPD 19-S	< 2.5	3.1

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4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27842qc
Matrix: Soil
Units: mg/kg
Date: October 20, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

DUPLICATE

Dup No. 27842-7

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 3.0	< 3.0	0.0
Lead	< 1.5	< 1.5	0.0

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27842-7

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	< 3.0	85	89	95.5	82	3.6
Lead	< 1.5	96	89	108	90	6.5

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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Report To: Hydrometrics, Inc. Date: October 22, 1992

Report On: Analysis of Soil Lab No.: 27884

RECEIVED
OCT 27 1992

IDENTIFICATION:
Samples received on 10-20-92
P.O. No. 06751
Project: ASBL-06

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-21-92
Date Analyzed: 10-21-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27884-1	ASBL921020SR 1-6	5.0	7.6
27884-2	ASBL921020SR 1-12	2.1	5.8
27884-3	ASBL921020SR 1-18	< 2.3	2.8
27884-4	ASBL921020SR 1-24	5.2	4.7
27884-5	ASBL921020SR 2-6	6.2	8.2
27884-6	ASBL921020SR 2-12	2.3	5.1
27884-7	ASBL921020SR 2-18	< 1.5	3.4
27884-8	ASBL921020SR 2-24	< 1.9	3.6

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RECEIVED
OCT 27 1992

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27884qc
Matrix: Soil
Units: mg/kg
Date: October 22, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

DUPLICATE

Dup No. 27884-8

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 1.9	< 1.9	0.0
Lead	3.6	4.2	15.4

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27884-8

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	< 1.9	45	57	79.0	49	8.5
Lead	3.6	51	57	83.2	58	12.8

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: October 22, 1992

Report On: Analysis of Soil Lab No.: 27920

RECEIVED
OCT 27 1992

IDENTIFICATION:
Samples received on 10-21-92
Project: ASBL-00 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-21-92
Date Analyzed: 10-22-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27920-1	ASBL921021 C-45	< 2.1	7.8
27920-2	ASBL921021 C-45D	< 2.3	6.7
27920-3	ASBL921021 C-46	< 1.6	15

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QUALITY CONTROL REPORT

Total Metals

RECEIVED
OCT 27 1992

Client: Hydrometrics, Inc.
Lab No: 27920qc
Matrix: Soil
Units: mg/kg
Date: October 22, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

DUPLICATE

Dup No. 27920-3

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	ND	ND	0.0
Lead	15	18	18.2

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

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Report To: Hydrometrics, Inc. Date: October 23, 1992

Report On: Analysis of Soil Lab No.: 27956

RECEIVED
OCT 28 1992

IDENTIFICATION:
Sample received on 10-22-92
P.O. No. 06753
Project: ASBL-06 Asarco B & L Landfill
Client ID: ASBL921022 C-47

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-22-92
Date Analyzed: 10-23-92

Compound	Concentration, mg/kg	PQL
Arsenic	ND	1.9
Lead	6.7	0.97

PQL - Practical Quantitation Limit.

ND - Not Detected.

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for STAN P. PALMQUIST

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RECEIVED
OCT 28 1992

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27956qc
Matrix: Soil
Units: mg/kg
Date: October 23, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

DUPLICATE

Dup No. 27956-1

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	ND	ND	0.0
Lead	6.7	5.2	25.2

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27956-1

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	ND	51	58	87.9	56	9.3
Lead	6.7	57	58	86.7	57	---

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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Report To: Hydrometric, Inc.

Date: October 27, 1992

Report On: Analysis of Soil

Lab No.: 28002

RECEIVED
OCT 28 1992

IDENTIFICATION:
Sample received on 10-23-92
Project: ASBL-06 Asarco
Client ID: ASBL921023-C-6

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-26-92
Date Analyzed: 10-27-92

Parameter	Concentration, mg/kg	PQL
Arsenic	ND	1.9
Lead	2.9	0.94

PQL - Practical Quantitation Limit

ND - Not Detected

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QUALITY CONTROL REPORT

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OCT 28 1992

Total Metals

Client: Hydrometrics, Inc.
Lab No: 28002qc
Units: mg/kg
Date: October 27, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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Report To: Hydrometrics, Inc. Date: October 28, 1992

Report On: Analysis of Soil Lab No.: 28028

RECEIVED
OCT 30 1992

IDENTIFICATION:
Samples received on 10-26-92
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-27-92
Date Analyzed: 10-28-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
28028-1	ASBL921026 C-31A	48	< 1.0
28028-2	ASBL921026 C-31AD	4.4	1.4
28028-3	ASBL921026 C-32AD	5.3	1.1
28028-4	ASBL921026 C-32A	11	< 1.3
28028-5	ASBL921026 C-34A	23	1.1

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QUALITY CONTROL REPORT

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OCT 30 1992

Total Metals

Client: Hydrometrics, Inc.
Lab No: 28028qc
Units: mg/kg
Date: October 28, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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Report To: Hydrometrics, Inc.

Date: October 30, 1992

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Report On: Analysis of Soil

Lab No.: 28077

IDENTIFICATION:
Sample received on 10-28-92
Project: Asarco B & L Landfill
Client ID: ASBL-921028 P.P.D.48-5

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-28-92
Date Analyzed: 10-29-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
28077-1	ASBL-821028 P.P.D. 4B-S	5.6	1.5

PQL - Practical Quantitation Limit

ND - Not Detected

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QUALITY CONTROL REPORT

Total Metals

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Client: Hydrometrics, Inc.
Lab No: 28077qc
Units: mg/kg
Date: October 30, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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NOV 06 1992

Report To: Hydrometrics, Inc.

Date: October 30, 1992

Report On: Analysis of Soil

Lab No.: 28128

IDENTIFICATION:
Samples received on 10-29-92
P.O. No. 06760
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-29-92
Date Analyzed: 10-30-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
28128-1	ASBL921029 C-34B	13	3.1
28128-2	ASBL921029 C-31B	4.4	1.5
28128-3	ASBL921029 C-31B-D	2.8	2.0
28128-4	ASBL921029 HAZ-K-24	< 3.1	9.6
28128-5	ASBL921029 HAZK-30	< 2.6	4.2
28128-6	ASBL921029 HAZ-R-24	< 2.6	4.2
28128-7	ASBL921029 HAZ-R-30	2.6	4.8
28128-8	ASBL921029 HAZ-S-24	< 13	< 6.3
28128-9	ASBL921029 HAZ-S-30	< 13	< 6.7
28128-10	ASBL921029 HAZ-Q-24	< 6.0	3.6
28128-11	ASBL921029 HAZ-Q-30	< 2.6	4.7
28128-12	ASBL921029 HAZ-V-12	22	42

Continued . . .

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Hydrometrics, Inc.
Project: ASBL06

Lab No. 28128
October 30, 1992

ICP Metals Per EPA Method 6010
Date Digested: 10-29-92
Date Analyzed: 10-30-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
28128-13	ASBL921029 HAZ-V-24	12	12
28128-14	ASBL921029 HAZ-T-12	< 11	< 5.6
28128-15	ASBL921029 HAZ-T-24	< 16	17
28128-16	ASBL921029 HAZ-U-12	< 9.2	31
28128-17	ASBL921029 HAZ-U-24	< 14	17

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NOV 06 1992

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 28128qc
Matrix: Soil
Units: mg/kg
Date: October 30, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

DUPLICATE

Dup No. 28128-2

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	4.4	5.4	20.4
Lead	1.5	1.8	18.2

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 28128-2

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	4.4	81	82	93.4	93	13.8
Lead	1.5	80	82	95.7	89	10.7

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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NOV 06 1992

Report To: Hydrometrics, Inc. Date: November 2, 1992

Report On: Analysis of Soil Lab No.: 28137

IDENTIFICATION:
Samples received on 10-30-92
P.O. No. 06761
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-30-92
Date Analyzed: 11-2-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
28137-1	ASBL921030 C-30B	22	3.8
28137-2	ASBL921030 C-30BD	17	2.1

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RECEIVED
NOV 06 1992

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 28137qc
Units: mg/kg
Date: November 2, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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Report To: Hydrometrics, Inc. Date: November 4, 1992

Report On: Analysis of Soil Lab No.: 28204

RECEIVED
NOV 05 1992

IDENTIFICATION:
Samples received on 11-03-92
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 11-3-92
Date Analyzed: 11-4-92

Lab Sample No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
28204-1	ASBL 921103 C-30C	14	< 1.1
28204-2	ASBL 921103 C-30CD	12	< 1.3

PQL - Practical Quantitation Limit

ND - Not Detected

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Report To: Hydrometrics, Inc. Date: November 4, 1992

Report On: Analysis of Soil Lab No.: 28204

RECEIVED
NOV 05 1992

IDENTIFICATION:
Samples received on 11-03-92
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 11-3-92
Date Analyzed: 11-4-92

Lab Sample No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
28204-1	ASBL 921103 C-30C	14	< 1.1
28204-2	ASBL 921103 C-30CD	12	< 1.3

PQL - Practical Quantitation Limit

ND - Not Detected

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QUALITY CONTROL REPORT

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Total Metals

Client: Hydrometrics, Inc.
Lab No: 28204qc
Units: mg/kg
Date: November 4, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

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Report To: Hydrometrics, Inc. Date: November 16, 1992

Report On: Analysis of Soil Lab No.: 28451

IDENTIFICATION:
Samples Received on 11-13-92
P.O. No. 06763
Project: ASBL06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 11-13-92
Date Analyzed: 11-16-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
28451-1	ASBL921113PPD 1-S	3.6	2.0
28451-2	ASBL921113PPD 2-S	4.6	2.1
28451-3	ASBL921113PPD 3-S	4.1	1.6

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Report To: Hydrometrics, Inc. Date: January 8, 1993

Report On: Analysis of Soil Lab No.: 29439

IDENTIFICATION:
Samples received on 01-07-93
P.O. No. 06788
Project: ASBL-06 B & L Landfill - Asarco

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 1-7-93
Date Analyzed: 1-8-93

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
29439-1	ASBL-06-9301-100-C	< 3.0	< 1.5
29439-2	ASBL-06-9301-101-C	< 3.3	< 1.6
29439-3	ASBL-06-9301-102-C	3.6	< 1.5
29439-4	ASBL-06-9301-100-S	< 3.3	< 1.6
29439-5	ASBL-06-9301-101-S	< 2.9	< 1.4
29439-6	ASBL-06-9301-102-S	< 3.1	< 1.6

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Report To: Hydrometrics, Inc. Date: January 8, 1993

Report On: Analysis of Soil Lab No.: 29439

IDENTIFICATION:
Samples received on 01-07-93
P.O. No. 06788
Project: ASBL-06 B & L Landfill - Asarco

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 1-7-93
Date Analyzed: 1-8-93

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
29439-1	ASBL-06-9301-100-C	< 3.0	< 1.5
29439-2	ASBL-06-9301-101-C	< 3.3	< 1.6
29439-3	ASBL-06-9301-102-C	3.6	< 1.5
29439-4	ASBL-06-9301-100-S	< 3.3	< 1.6
29439-5	ASBL-06-9301-101-S	< 2.9	< 1.4
29439-6	ASBL-06-9301-102-S	< 3.1	< 1.6

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Report To: Hydrometrics, Inc. Date: September 3, 1992

Report On: Analysis of Soil & Water Lab No.: 26827

IDENTIFICATION:
Samples received on 09-02-92
Project: Arasco ASBL-06 B & L Landfill

ANALYSIS:

ICP Metals Per Method 6010
Date Digested: 9-2-92
Date Analyzed: 9-3-92

Lab No. 26827-1	Client ID: ASBL920902-W1 (water)
Arsenic, mg/l	4.8
Lead, mg/l	0.11
Lab No. 26827-2	Client ID: ASBL920902-14A (soil)
Arsenic, mg/kg	6.0
Lead, mg/kg	3.9
Lab No. 26827-3	Client ID: ASBL920902-14B (soil)
Arsenic, mg/kg	< 3.5
Lead, mg/kg	4.2
Lab No. 26827-4	Client ID: ASBL920902-14C (soil)
Arsenic, mg/kg	< 3.5
Lead, mg/kg	3.0

SOUND ANALYTICAL SERVICES

STAN P. PALMQUIST

This report is issued solely for the use of the person or company to whom it is addressed. This laboratory accepts responsibility only for the due performance of analysis in accordance with industry acceptable practice. In no event shall Sound Analytical Services, Inc. or its employees be responsible for consequential or special damages in any kind or in any amount.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometric, Inc.
Lab No: 26827qc
Matrix: Soil
Units: mg/kg
Date: September 3, 1992

METHOD BLANK

Parameter	Blank Value
Arsenic	< 3.5
Lead	< 1.8

DUPLICATE

Dup No. 26827-4

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	< 3.5	< 3.5	0.0
Lead	3.0	2.7	10.5

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: October 14, 1992

Report On: Analysis of Water Lab No.: 27742

RECEIVED
OCT 16 1992

IDENTIFICATION:
Samples received on 10-13-92
Project: ASBL-06 Asarco B & L Landfill

ANALYSIS:

ICP Metals Per EPA Method 6010
Date Digested: 10-13-92
Date Analyzed: 10-14-92

Lab No.	Client ID	Arsenic, mg/kg	Lead, mg/kg
27742-1	ASBL921010 C29	28	2.5
27742-2	ASBL921010 C29D	25	1.8
27742-3	ASBL921010 C30	25	2.2
27742-4	ASBL921010 C31	39	1.9
27742-5	ASBL921012 C32	< 2.1	2.1
27742-6	ASBL921012 C32D	< 1.9	2.8
27742-7	ASBL921012 C33	8.9	2.4
27742-8	ASBL921013 C34	24	2.6
27742-9	ASBL921013 C35	8.8	1.6
27742-10	ASBL921013 C35D	13	2.3

SOUND ANALYTICAL SERVICES

STAN P. PALMQUIST

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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27742qc
Units: mg/kg
Date: October 14, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	2.5
Lead	ND	1.3

DUPLICATE

Dup No. 27742-10

Parameter	Sample (S)	Duplicate (D)	RPD
Arsenic	13	11	16.7
Lead	2.3	2.3	0.0

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27742-10

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Arsenic	13	66	62	85.5	68	3.0
Lead	2.3	63	62	97.9	63	0.0

%R = Percent Recovery
= [(MS - SR) / SA] x 100

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2] x 100

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SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: October 27, 1992

Report On: Analysis of Water Lab No.: 27979

RECEIVED
OCT 30 1992

IDENTIFICATION:
Samples received on 10-23-92
Project: ASBL-06

ANALYSIS:

Lab No. 27979-1 Client ID: ASBL-9210-1

ICP Metals Per EPA Method 6010
Date Digested: 10-26-92
Date Analyzed: 10-27-92

Parameter	Concentration, mg/l	PQL
Nickel	ND	0.04

GFAA Metals Per EPA 7000 Series Methods
Date Digested: 10-26-92
Date Analyzed: 10-27-92

Parameter	Concentration, mg/l	PQL
Arsenic	ND	0.010
Lead	0.006	0.005

Continued . . . .

This report is issued solely for the use of the person or company to whom it is addressed. This laboratory accepts responsibility only for the due performance of analysis in accordance with industry acceptable practice. In no event shall Sound Analytical Services, Inc. or its employees be responsible for consequential or special damages in any kind or in any amount.

SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc
Project: ASBL-06
Lab No: 27979
October 28, 1992

RECEIVED
OCT 30 1992

Lab No. 27979-2 Client ID: ASBL-9210-2

ICP Metals Per EPA Method 6010
Date Digested: 10-26-92
Date Analyzed: 10-27-92

Parameter	Concentration, mg/l	PQL
Nickel	ND	0.04

GFAA Metals Per EPA 7000 Series Methods
Date Digested: 10-26-92
Date Analyzed: 10-27-92

Parameter	Concentration, mg/l	PQL
Arsenic	0.072	0.010
Lead	ND	0.005

PQL - Practical Quantitation Limit

ND - Not Detected

SOUND ANALYTICAL SERVICES

STAN P. PALMQUIST

This report is issued solely for the use of the person or company to whom it is addressed. This laboratory accepts responsibility only for the due performance of analysis in accordance with industry acceptable practice. In no event shall Sound Analytical Services, Inc. or its employees be responsible for consequential or special damages in any kind or in any amount.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

RECEIVED
OCT 30 1992

Total Metals

Client: Hydrometrics, Inc.
Lab No: 27979qc
Units: mg/l
Date: October 27, 1992

METHOD BLANK

Parameter	Blank Value	PQL
Arsenic	ND	0.010
Lead	ND	0.005
Nickel	ND	0.04

This report is issued solely for the use of the person or company to whom it is addressed. This laboratory accepts responsibility only for the due performance of analysis in accordance with industry acceptable practice. In no event shall Sound Analytical Services, Inc. or its employees be responsible for consequential or special damages in any kind or in any amount.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

TRANSMITTAL MEMORANDUM

DATE: April 26, 1993

TO: Jim Gillie, Hydrometrics, Inc.

PROJECT NAME: ASBL-01 - Test pits near base of mound

LABORATORY NUMBER: 31607

Enclosed are one original and one copy of the Tier I data deliverables package for Laboratory Work Order Number 31607. Two samples were received for analysis at Sound Analytical Services, Inc., on April 23, 1993.

If there are any questions regarding this data package, please do not hesitate to call me at (206) 922-2310.

Sincerely,

Stan P. Palmquist
Project Manager

report is issued solely for the use of the person or company to whom it is addressed. This laboratory accepts responsibility only for the due performance of analysis in accordance with generally acceptable practice. In no event shall Sound Analytical Services

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS
4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Hydrometrics, Inc. Date: April 26, 1993

Report On: Analysis of Water Lab No.: 31607
Page 1 of 2

IDENTIFICATION:
Samples received on 04-23-93
Project: ASBL-01
P. O. No. 04729

ANALYSIS:

Lab Sample No. 31607-1 Client ID: TP-1

ICP Metals Per EPA Method 6010
Date Digested: 4-23-93
Date Analyzed: 4-23-93

Parameter	Concentration, mg/L	PQL
Cadmium	ND	0.005

GFAA Metals Per EPA 7000 Series Methods
Date Digested: 4-23-93
Date Analyzed: 4-23-93

Parameter	Concentration, mg/L	PQL
Arsenic	0.056	0.010
Lead	0.013	0.003

Continued . . . . .

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SOUND ANALYTICAL SERVICES, INC.

Hydrometrics, Inc.
Lab No. 31607
Page 2 of 2
April 27, 1993

Lab Sample No. 31607-2 Client ID: TP-4

ICP Metals Per EPA Method 6010
Date Digested: 4-23-93
Date Analyzed: 4-23-93

Parameter	Concentration, mg/L	PQL
Arsenic	0.77	0.010
Cadmium	ND	0.005

GFAA Lead Per EPA 7000 Series Methods
Date Digested: 4-23-93
Date Analyzed: 4-23-93

Parameter	Concentration, mg/L	PQL
Lead	0.027	0.003

PQL - Practical Quantitation Limit
ND - Not Detected

is report is issued solely for the use of the person or company to whom it is addressed. This laboratory accepts responsibility only for the due performance of analysis in accordance with

ASARC0219223

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Metals

Client: Hydrometrics, Inc.
Lab No: 31607qc
Units: mg/l
Date: April 26, 1993

METHOD BLANK

Parameter	Result	PQL
Arsenic	ND	0.010
Cadmium	ND	0.005
Lead	ND	0.003

ND - Not Detected
PQL - Practical Quantitation Limit

This report is issued solely for the use of the person or company to whom it is addressed. This laboratory accepts responsibility only for the due performance of analy

ASBL06
Ted

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS
4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

TRANSMITTAL MEMORANDUM

DATE: July 13, 1993

TO: Jeff Cross
Hydrometrics, Inc.

PROJECT NAME: B & L Landfill

LABORATORY NUMBER: 33090

Enclosed is one original and one copy of the Tier I data deliverables package for Laboratory Work Order Number 33090. Two samples were received for analysis at Sound Analytical Services, Inc., on June 29, 1993.

If there are any questions regarding this data package, please do not hesitate to call me at (206) 922-2310.

Sincerely,

Stan P. Palmquist
Project Manager

eport is issued solely for the use of the person or company to whom it is addressed. This laboratory accepts responsibility only for the due performance of analysis in accordance with ıy acceptable practice. In no event shall Sound Analytical Services, Inc. or its employees be responsible for consequential or special damages in any kind or in any amount.

Appendix B

ASARC0219226

APPENDIX B

ANALYTICAL REPORTS
DENSITY TESTING
SIEVE ANALYSIS

ASARC0219227

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

FACSMILE TRANSMITTAL SHEET

FAX NO.: (206)922-2938

FROM: CMTL DATE: Dec. 10th, 1992

PROJECT/SUBJECT: B & L LANDFILL PROJECT NO.: T-8507

SENT BY: FRANCES

TO: REMEDIATION SERVICES HYDROMETRICS, INC.

ATTN: Michael

FAX #: (206) 572-5487 TEL.#: ( )

STRUCTIONS:

_____FOR APPROVAL _X_ PER YOUR REQUEST_____FOR YOUR INFORMATION_____REVIEW AND CONTACT ME_____REVIEW AND ANSWER IN WRITING.

COMMENTS:

THERE ARE 6 PAGES, INCLUDING THIS COVER SHEET, WITH THIS TRANSMISSION THEY ARE IDENTIFIED AS: SOIL/AGGREGATE ANALYSIS REPORTS, DATED DECEMBER 7TH, 1992 FOR THE ABOVE PROJECT.

IF YOU DID NOT RECEIVE ALL PAGES INDICATED ABOVE, PLEASE CALL (206)922-0798.

ASARC0219228

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

SOIL/AGGREGATE ANALYSIS REPORT

CLIENT:	Remediation Services Hydrometrics, Inc.	DATE SUBMITTED:	12-07-92
PROJECT:	B & L LANDFILL	PROJECT NO.:	T-8507
ADDRESS:	N/A	REPORT NO.:	6a
CONTRACTOR:	CLIENT	PERMIT NO.:	N/A
MATERIAL TYPE:	SAND	SAMPLED BY:	CLIENT
SOURCE:	LLOYD'S SAND & GRAVEL	DELIVERED BY:	Michael (CLIENT)
LOCATION SAMPLED:	B & L LANDFILL	LAB NO.:	2-831 I.D.NO.: 2
TESTS REQUESTED:	SIEVE ANALYSIS	TECHNICIAN:	T.Nordhaug

SIEVE ANALYSIS

SIEVE ANALYSIS	% PASSING	SPECIFICATIONS
1/2"	100	
3/8"	99.0	
1/4"	97.2	
#4	92.9	
#8	82.5	
#10	79.5	
#16	69.9	
#40	36.4	
#100	4.7	
#200	2.9	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINENESS MODULUS:
SOIL CLASSIFICATIONS:

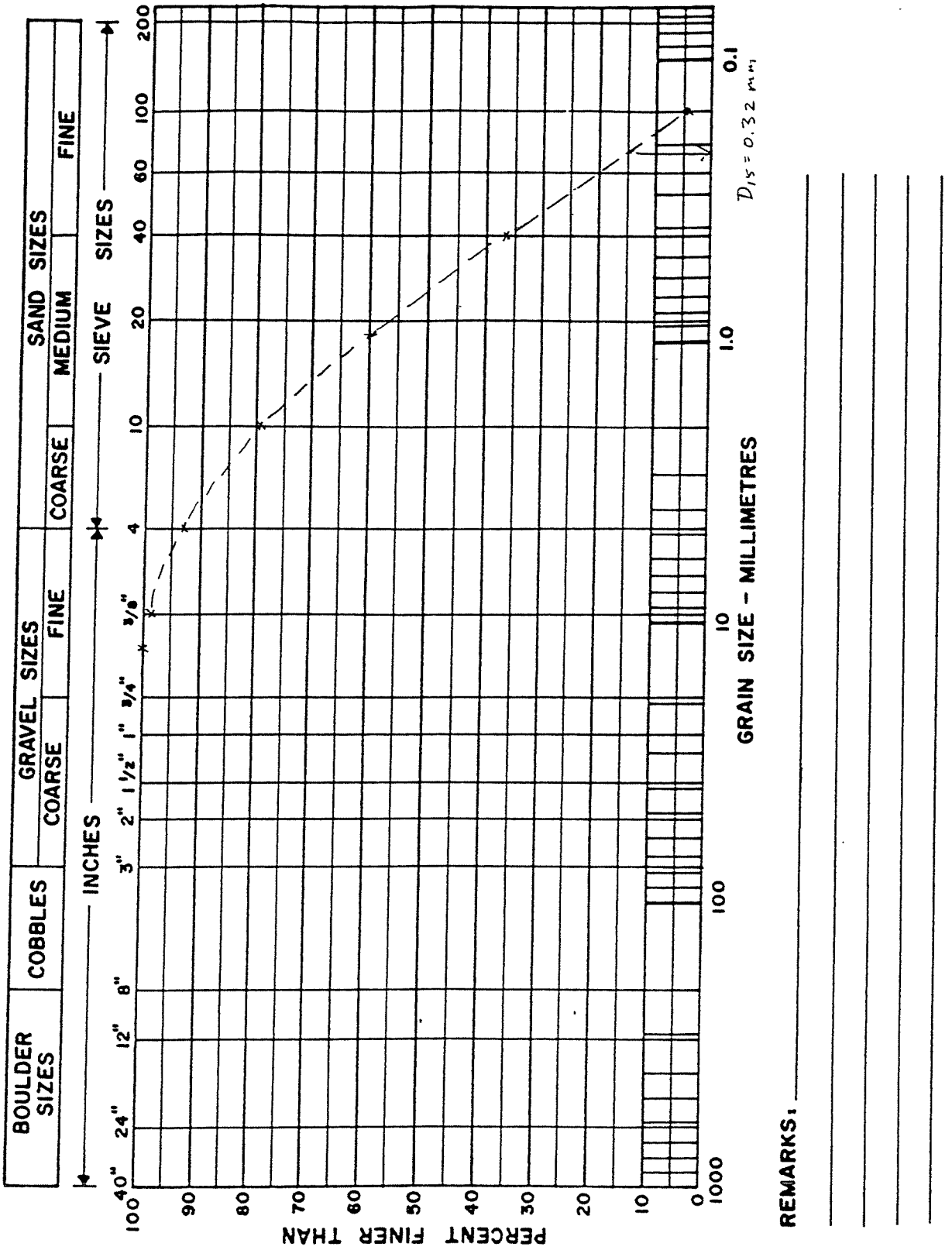
OTHERS:

REMARKS:

TN/fd

ASARC0219229

GRAIN SIZE CURVE
GRANULAR SOILS



Hydrometrics, Inc.	PROJ. NO. ENG.
	PROJECT
	LOCATION
	DETAILS
	DATE SHEET OF

ASARC0219230

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

SOIL/AGGREGATE ANALYSIS REPORT

CLIENT:	Remediation Services Hydrometrics, Inc.	DATE SUBMITTED:	12-07-92
PROJECT:	B & L LANDFILL	PROJECT NO.:	T-8507
ADDRESS:	N/A	REPORT NO.:	6b
CONTRACTOR:	CLIENT	PERMIT NO.:	N/A
MATERIAL TYPE:	SAND	SAMPLED BY:	CLIENT
SOURCE:	LLOYD'S SAND & GRAVEL	DELIVERED BY:	Michael (CLIENT)
LOCATION SAMPLED:	B & L LANDFILL	LAB NO.:	2-282 I.D.NO.: 3
TESTS REQUESTED:	SIEVE ANALYSIS	TECHNICIAN:	T.Nordhaug

SIEVE ANALYSIS

SIEVE ANALYSIS	% PASSING	SPECIFICATIONS
1/2"	100	
3/8"	98.8	
1/4"	96.7	
#4	90.6	
#8	76.3	
#10	71.9	
#16	60.0	
#40	31.2	
#100	7.8	
#200	5.2	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINENESS MODULUS:
SOIL CLASSIFICATIONS:

OTHERS:

REMARKS:

TN/fd

ASARC0219231

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

SOIL/AGGREGATE ANALYSIS REPORT

CLIENT:	Remediation Services Hydrometrics, Inc.	DATE SUBMITTED:	12-07-92
PROJECT:	B & L LANDFILL	PROJECT NO.:	T-8507
ADDRESS:	N/A	REPORT NO.:	6c
CONTRACTOR:	CLIENT	PERMIT NO.:	N/A
MATERIAL TYPE:	SAND	SAMPLED BY:	CLIENT
SOURCE:	LLOYD'S SAND & GRAVEL	DELIVERED BY:	Michael (CLIENT)
LOCATION SAMPLED:	B & L LANDFILL SITE	LAB NO.: 2-833	I.D.NO.: 4
TESTS REQUESTED:	SIEVE ANALYSIS	TECHNICIAN:	T.Nordhaug

SIEVE ANALYSIS

SIEVE ANALYSIS	% PASSING	SPECIFICATIONS
3/8"	100	
1/4"	98.4	
#4	93.5	
#8	80.6	
#10	76.7	
#16	66.1	
#40	35.2	
#100	6.9	
#200	4.3	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINENESS MODULUS:
SOIL CLASSIFICATIONS:

OTHERS:

REMARKS:

TN/fd

ASARC0219232

CLIENT: Remediation Services Hydrometrics, Inc.
PROJECT: B & L LANDFILL
ADDRESS: N/A
CONTRACTOR: CLIENT
MATERIAL TYPE: SAND
SOURCE: LLOYD'S SAND & GRAVEL
LOCATION SAMPLED: B & L LANDFILL
TESTS REQUESTED: Sieve Analysis

DATE SUBMITTED: 12-08-92
PROJECT NO.: T-8507
REPORT NO.: 6e
LAB.NO.: 2-838
I.D.NO.: 6
SAMPLED BY: CLIENT
DELIVERED BY: CLIENT
TECHNICIAN: T.Nordhaug

SIEVE ANALYSIS

SIEVE SIZE	% PASSING	SPECIFICATIONS
3/8"	100	
1/4"	99.2	
#4	96.7	
#8	87.0	
#10	83.6	
#16	73.0	
#40	34.6	
#100	5.6	
#200	3.4	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINENESS MODULUS:
SOIL CLASSIFICATIONS:

OTHERS:

REMARKS:

TN/fd

ASARC0219233

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

SOIL/AGGREGATE ANALYSIS REPORT

CLIENT:	Remediation Services Hydrometrics, Inc.	DATE SUBMITTED:	12-08-92
PROJECT:	B & L LANDFILL	PROJECT NO.:	T-8507
ADDRESS:	N/A	REPORT NO.:	6f
CONTRACTOR:	CLIENT	LAB.NO.:	2-839
MATERIAL TYPE:	SAND	I.D.NO.:	7
SOURCE:	LLOYD'S PIT	SAMPLED BY:	CLIENT
LOCATION SAMPLED:	B & L LANDFILL SITE	DELIVERED BY:	CLIENT
TESTS REQUESTED:	Sieve Analysis	TECHNICIAN:	T.Nordhaug

SIEVE ANALYSIS

SIEVE SIZE	% PASSING	SPECIFICATIONS
1/2"	100	
3/8"	99.0	
1/4"	97.6	
#4	93.8	
#8	84.2	
#10	81.1	
#16	70.5	
#40	34.0	
#100	5.0	
#200	2.6	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINENESS MODULUS:
SOIL CLASSIFICATIONS:

OTHERS:

REMARKS:

TN/fd

ASARC0219234

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

SOIL/AGGREGATE ANALYSIS REPORT

CLIENT:	Remediation SErvices Hydrometrics, Inc.	DATE SUBMITTED:	12-07-92
PROJECT:	B & L LANDFILL	PROJECT NO.:	T-8507
ADDRESS:	N/A	REPORT NO.:	06
CONTRACTOR:	CLIENT	PERMIT NO.:	N/A
MATERIAL TYPE:	SAND	SAMPLED BY:	CLIENT
SOURCE:	LLOYD'S SAND & GRAVEL	DELIVERED BY:	Michael (CLIENT)
LOCATION SAMPLED:	B & L LANDFILL SITE	LAB NO.:	2-830 I.D.NO.: 1
TESTS REQUESTED:	SIEVE ANALYSIS	TECHNICIAN:	T.Nordhaug

SIEVE ANALYSIS

SIEVE ANALYSIS	% PASSING	SPECIFICATIONS
1/2"	100	
3/8"	95.9	
1/4'	92.8	
#4	89.0	
#8	78.2	
#10	74.8	
#16	64.0	
#40	31.9	
#100	5.5	
#200	3.6	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINENESS MODULUS:
SOIL CLASSIFICATIONS:

OTHERS:

REMARKS:

TN/fd

ASARC0219235

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

SOIL/AGGREGATE ANALYSIS REPORT

CLIENT:	Remediation Services Hydrometrics, Inc.	DATE SUBMITTED:	12-07-92
PROJECT:	B & L LANDFILL	PROJECT NO.:	T-8507
ADDRESS:	N/A	REPORT NO.:	6d
CONTRACTOR:	CLIENT	PERMIT NO.:	N/A
MATERIAL TYPE:	SAND	SAMPLED BY:	CLIENT
SOURCE:	LLOYD'S SAND & GRAVEL	DELIVERED BY:	Michael (CLIENT)
LOCATION SAMPLED:	B & L LANDFILL SITE	LAB NO.: 2-834	I.D.NO.: 5
TESTS REQUESTED:	SIEVE ANALYSIS	TECHNICIAN:	T.Nordhaug

SIEVE ANALYSIS

SIEVE ANALYSIS	% PASSING	SPECIFICATIONS
3/8"	100	
1/4"	98.1	
#4	94.2	
#8	81.5	
#10	77.1	
#16	65.2	
#40	33.6	
#100	8.1	
#200	5.3	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINENESS MODULUS:
SOIL CLASSIFICATIONS:

OTHERS:

REMARKS:

TN/fd

ASARC0219236

RECEIVED
JUL 02 1993

PACIFIC TESTING LABORATORIES

TACOMA DIVISION
2402 Pacific Highway East
Tacoma, WA 98424
(206) 922-9299
FAX (206) 922-1512

EXECUTIVE OFFICES
3220 - 17th Avenue West
Seattle, WA 98119-1790
(206) 282-0666
FAX (206) 282-0710

EASTSIDE DIVISION
18939 - 120th Avenue N.E. Suite 107
Bothell, WA 98011
(206) 451-8436
FAX (206) 485-4611

June 25 1993
Certificate No. 9306-6420

Mr. Randy Snyder
HYDROMETRICS, INC.
Seafirst Center
950 Pacific Avenue, #610
Tacoma, WA 98401

Subject: Soil Analysis

Dear Mr. Snyder:

As requested and agreed, Pacific Testing Laboratories analyzed the material sampled for the B & L Landfill. Material was tested in accordance with ASTM D-1557. Please refer to the test results shown below.

Sample Number	Test Results		Oversized Corrected		Material Description
	Max. Dry Density (pcf)	Opt. Moisture (%)	Max. Dry Denisty (pcf)	Opt. Moisture (%)	
1140	123.9	10.6	128.5	9.0	Brown Sand With Some Gravel

See attached for graphic results.

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Thank you for using Pacific Testing Laboratories. If you have any questions, please contact us at (206) 922-9299.

Reviewed by: William B. Throne, Tacoma Office Manager

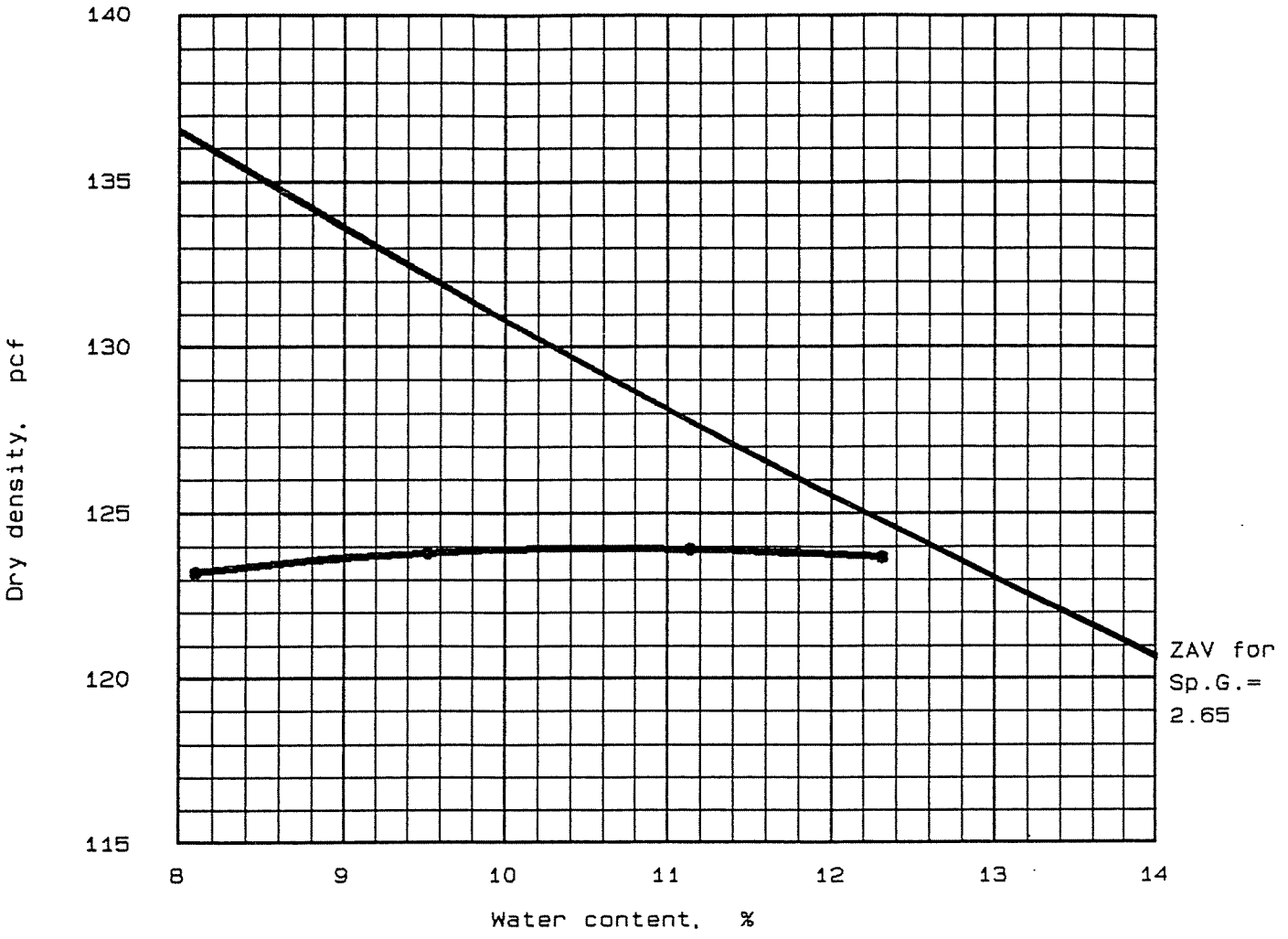
Sincerely,

George Gergis, Assistant Manager
Tacoma Division

JB/lr

ASARC0219238

PROCTOR TEST REPORT



"Modified" Proctor, ASTM D 1557, Method B

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	SW		8.1 %				77.7 %	

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 10.6 % Maximum dry density = 123.9 pcf	Brown SAND with some Gravel.

Certificate No.: 9306-6420 LR No.: 88438

Client: HYDROMETRICS

Location: B & L Landfill
N. Side of SE Access Road

Date: 6-24-1993

Remarks:
Sample #9306-6420-1140

Tested by: J. Graham
Date: 6-23-1993
Checked by: J. Bekey
Date: 6-24-1993

Figure No. _____

PROCTOR TEST REPORT

PACIFIC TESTING LABORATORIES

ASARC0219239

LONE STAR NORTHWEST

6320 GRANDVIEW DRIVE W.
TACOMA, WA 98467
(206) 564-1911

Accepted for use on gas wells around the two slots

11-18-92

Remediation Services
Attn. Mr. Ben Sun

Re: Fife Project

Mr. Sun:

This letter is to confirm a telephone conversation I had with Mr. Mike Urquhart concerning an aggregate product. It was to be used possibly as a filter material. We happen to have two products you may wish to look at. Their gradation is as follows:

SCREEN or SIEVE	#8705-Specially Screened #4 X #8	#8702 #4 X #8 Sand
1/4"	99-100	99-100
#4	92-93	92-93
#6	39	44
#8	3	9
#10	1	5
#16	0.1	1.3

Both materials are readily available and could be delivered with a one-day notice. Prices will be as we quoted Mike over the phone. All numbers given, in the gradation, are the results of many tests. No single test will give you these numbers, but your results should be close.

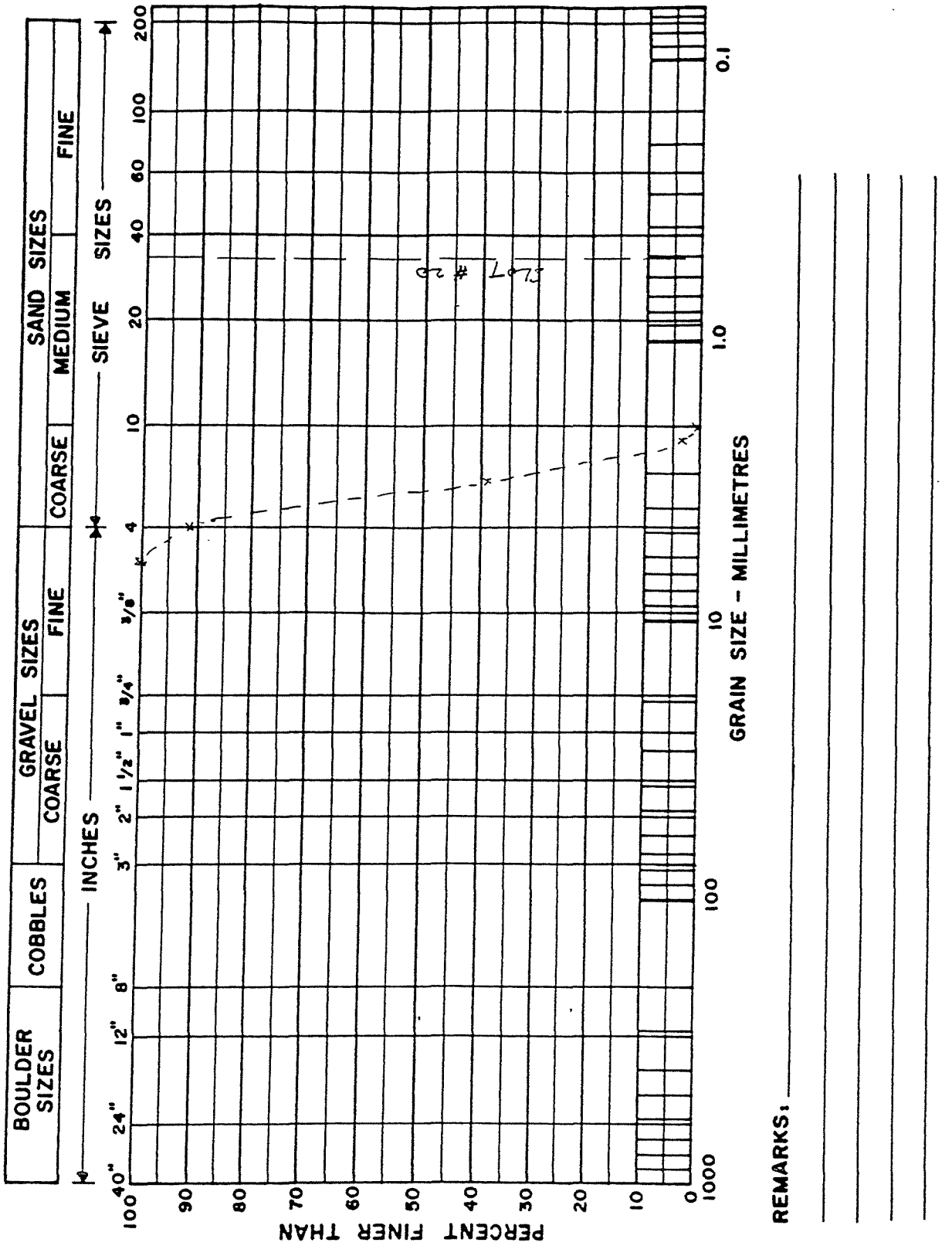
Thank you for your inquiry and we hope to be doing business with you soon!

Gratefully,

Steve Ruff

Steve Ruff
Sales Representative

GRAIN SIZE CURVE
GRANULAR SOILS



Hydrometrics, Inc.	PROJ. NO. ENG.
	PROJECT
	LOCATION
	DETAILS
	DATE SHEET OF

ASARC0219241

CONSTRUCTIO' MATERIALS TESTING LABO ATORIES, INC.

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

SOIL/AGGREGATE ANALYSIS REPORT

CLIENT:	Hydrometric, Inc.	DATE SUBMITTED:	12-15-92
PROJECT:	B & L LANDFILL	PROJECT #:	T-8507
ADDRESS:	N/A	REPORT #:	7a
CONTRACTOR:	CLIENT	LAB #:	2-847
MATERIAL TYPE:	SAND & GRAVEL	I.D. #:	2
SOURCE:	LlOYD'S SAND & GRAVEL	SAMPLED BY:	CLIENT
LOCATION SAMPLED:	UNKNOWN	DELIVERED BY:	CLIENT
TESTS REQUESTED:	Sieve Analysis	TECHNICIAN:	T.Nordhaug

SIEVE ANALYSIS

SIEVE SIZE	% PASSING	SPECIFICATION
1½"	100	
3/4"	97.6	
1/2"	86.1	
3/8"	78.6	
1/4"	70.3	
#4	65.1	
#8	56.7	
#10	54.0	
#16	46.5	
#40	21.2	
#100	2.7	
#200	1.7	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINESS MODULUS:
DUST RATIO:
SOIL CLASSIFICATIONS:

OTHERS:

REMARKS:

TN/fd

ASARC0219242

CONSTRUCTIO. MATERIALS TESTING LAB(ATORIES, INC.

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

RECEIVED
DEC 24 1992

SOIL/AGGREGATE ANALYSIS REPORT

CLIENT:	Hydrometric, Inc.	DATE SUBMITTED:	12-15-92
PROJECT:	B & L LANDFILL	PROJECT #:	T-8507
ADDRESS:	N/A	REPORT #:	07
CONTRACTOR:	CLIENT	LAB #:	2-846
MATERIAL TYPE:	SAND & GRAVEL	I.D. #:	1
SOURCE:	LlOYD'S SAND & GRAVEL	SAMPLED BY:	CLIENT
LOCATION SAMPLED:	UNKNOWN	DELIVERED BY:	CLIENT
TESTS REQUESTED:	Sieve Analysis	TECHNICIAN:	T.Nordhaug

SIEVE ANALYSIS

SIEVE SIZE	% PASSING	SPECIFICATION
2"	100	
1½"	88.5	
3/4"	81.4	
1/2"	74.2	
3/8"	68.5	
1/4"	62.1	
#4	58.3	
#8	51.2	
#10	49.4	
#16	43.4	
#100	3.1	
#200	1.8	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINESS MODULUS:
DUST RATIO:
SOIL CLASSIFICATIONS:

OTHERS:

REMARKS:

TN/fd

ASARC0219243

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

Tacoma

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

SOIL/AGGREGATE ANALYSIS REPORT

CLIENT:	Hydrometrics	DATE:	06-09-93
PROJECT:	B & L LANDFILL	PROJECT NO.:	T-8507
ADDRESS:	N/A	REPORT NO.:	08
CONTRACTOR:	CLIENT	SAMPLED BY:	CLIENT
MATERIAL TYPE:	SAND & GRAVEL	SOURCE:	UNKNOWN
LOCATION SAMPLED:	JOBSITE	LAB.NO.:	3-419 I.D.NO.: #1
TESTS REQESTED:	Sieve Analysis	TECHNICIAN:	T.Nordhaug

SIEVE ANALYSIS

SIEVE SIZE	% PASSING	SPECIFICATIONS
2"	100	
1½"	84.5	
3/4"	72.6	
1/2"	72.0	
3/8"	71.0	
#4	69.1	
#8	67.8	
#10	65.5	
#16	64.7	
#40	61.3	
#100	30.9	
#200	4.4	
	1.3	

ADDITIONAL DATA

SAND EQUIVALENT:
% MOISTURE:
L.A. ABRASION:
DEGRADATION:
% WOOD WASTE:
LOOSE UNIT WEIGHT:
LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
FINENESS MODULUS:
SOIL CLASSIFICATION:

OTHERS:

REMARKS:

TN/fd

ASARC0219244

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

(CMTL, INC.)
A Division of Western Testing Laboratories

4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

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OCT 26 1992

MAXIMUM DENSITY-OPTIMUM MOISTURE DETERMINATION

Client: Hydrometrics, Inc. Date Sampled: 9-28-92

Project: B & L Landfill

Contractor: unknown

Project No.: T 8507 Report No: 03 Test No.: P-1

FIELD DATA:

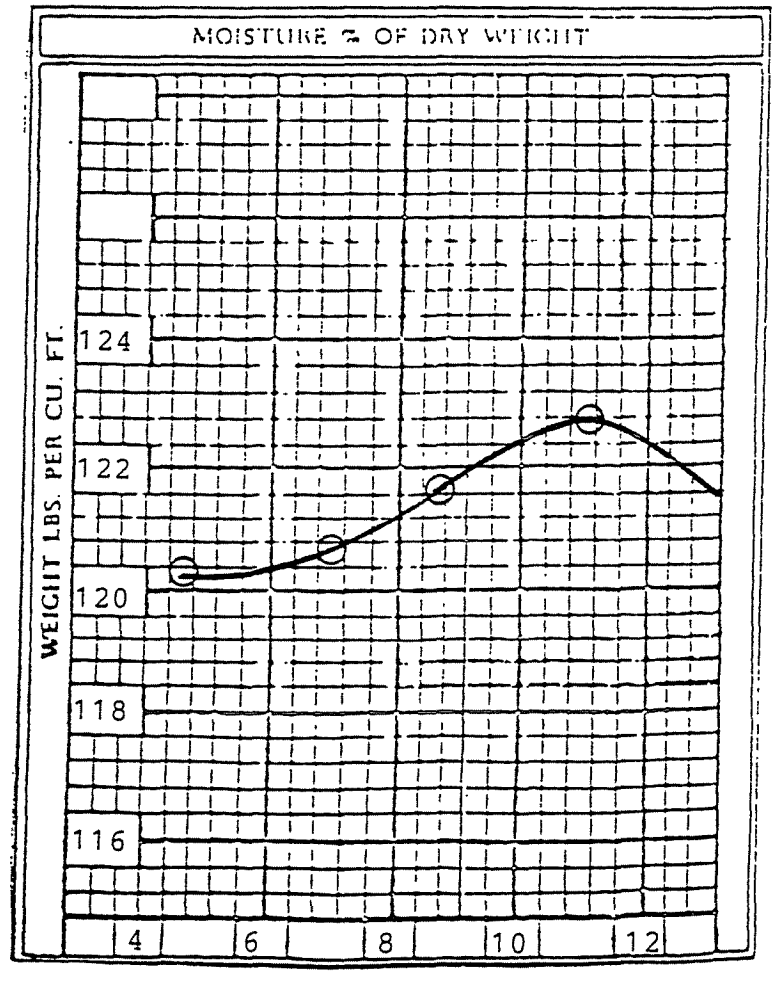
Source of Material: Lloyd's Pit

Location Sampled: same

LABORATORY DATA:

Maximum Density Dry: 122.8 P.C.F.

Optimum Moisture: 11.0 %



Soil Type & Color: Brown sand w/ some gravel (pit run)

Test Specifications: ASTM D 698(D)

Cylinder: 6 "

Hammer: 5½ lbs.

Drops: 12 "

Layers: 3

Blows/Layer: 56

Technician: J. Ross

ASARC0219245

CONSTRUCTIO MATERIALS TESTING LAB RATORIES, INC.

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A Division of Western Testing Laboratories

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Fife, Washington 98424
(206) 922-0798

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OCT 26 1992

LAB#: 2-710

SOIL/AGGREGATE ANALYSIS

CLIENT: Hydrometrics, Inc. DATE: 9-28-92

PROJECT: B & L Landfill REPORT #: 03

CONTRACTOR: NA PROJECT #: T 8507

MATERIAL TYPE: Pit Run Sand & Gravel SOURCE: Lloyd's Pit

TESTS: Wet sieve w/ proctor & permeability TECHNICIAN: JCR

SIEVE ANALYSIS

SIEVE SIZE	% PASSING	SPECS
1½"	100	
3/4"	89.6	
1/2"	83.5	
3/8"	79.7	
1/4"	72.7	
#4	68.9	
#8	59.7	
#10	57.1	
#16	48.9	
#40	21.5	
#100	1.3	
#200	0.3	

ADDITIONAL DATA

SAND EQUIVALENT=

% MOISTURE=

L.A. ABRASION=

DEGRADATION=

% WOOD WASTE=

LOOSE UNIT WEIGHT=

LIQUID LIMIT=

PLASTIC LIMIT=

PLASTICITY INDEX=

REMARKS:

REVIEWED BY:

ASARC0219246

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A Division of Western Testing Laboratories

4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

RECEIVED
OCT 26 1992

SOIL PERMEABILITY

CLIENT Hydrometrics, Inc. DATE SAMPLED 9-28-92

PROJECT B & L Landfill PROJECT NO. T 8507 REPORT NO.: 03

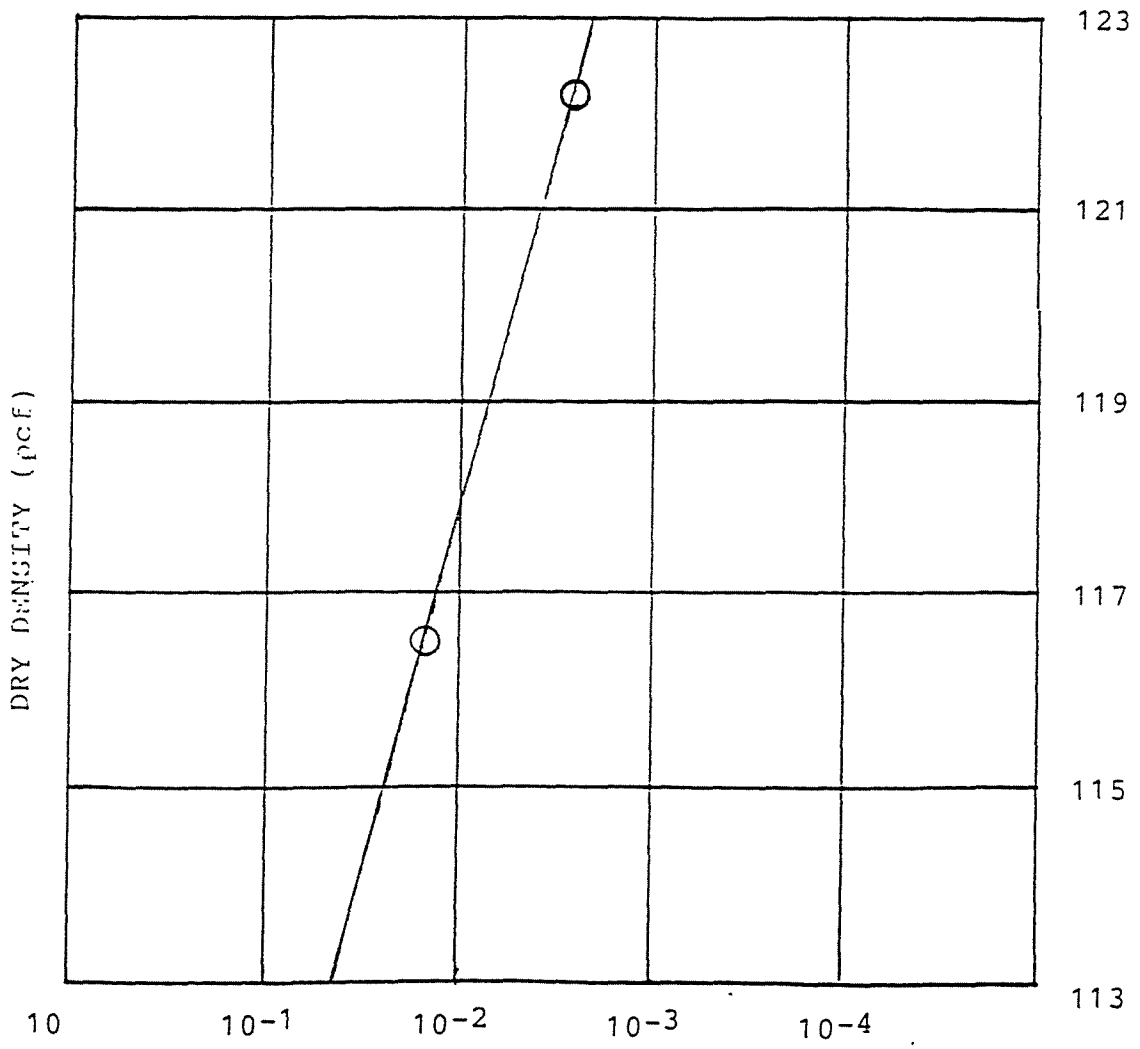
LOCATION SAMPLED Lloyd's Pit DEPTH NA

SOIL CLASS SP DENSITY METHOD D 698 MAX. DENSITY 122.8

OPTIMUM H2O 11.0% PERM. METHOD D 2434 LAB NO. 2-710

10^{-2} @ 95.9% compaction

COEFFICIENT OF PERMEABILITY (cm/sec)



ASARC0219247

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

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NOV 0 2 1992

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4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

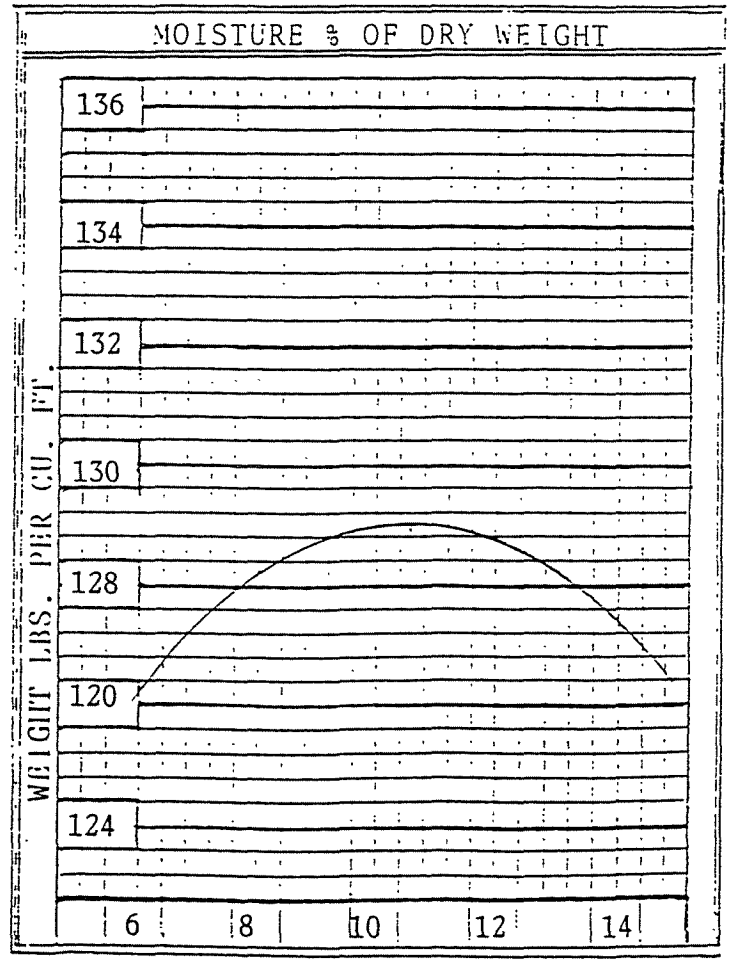
MAXIMUM DENSITY-OPTIMUM MOISTURE DETERMINATION

CLIENT: Hydrometrics, Inc.
DATE SAMPLED: 10-16-92
PROJECT: MISC.TESTING
PROJECT NO.: T-8507
ADDRESS: N/A
REPORT NO.: 04
CONTRACTOR: CLIENT
PROCTOR NO.: P-1

FIELD DATA:
SOURCE OF MATERIAL: LLOYD'S PIT
LOCATION SAMPLED: MANKE PIT

LABORATORY DATA:
MAXIMUM DENSITY DRY: 129.5 P.C.F.
OPTIMUM MOISTURE: 10.5
TYPE & COLOR: BROWN SAND & GRAVEL

TEST SPECIFICATIONS: ASTM D-1557(D)
CYLINDER: 6 "
HAMMER: 10 lbs.
DROPS: 18 "
LAYERS: 5
BLOWS/LAYER: 56
TECHNICIAN: T.Nordhaug
SAMPLED BY: CLIENT
REMARKS: N/A



Material proposed to be used

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

(CMTL, INC.)
4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

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NOV 16 1992

MAXIMUM DENSITY-OPTIMUM MOISTURE DETERMINATION

CLIENT: Hydrometrics, Inc.
DATE SAMPLED: 10-29-92
PROJECT: MISC.TESTING (ASBL-05 PROJECT)
PROJECT NO.: T-8507
ADDRESS: N/A
REPORT NO.: 05
CONTRACTOR: CLIENT
PROCTOR NO.: P-2

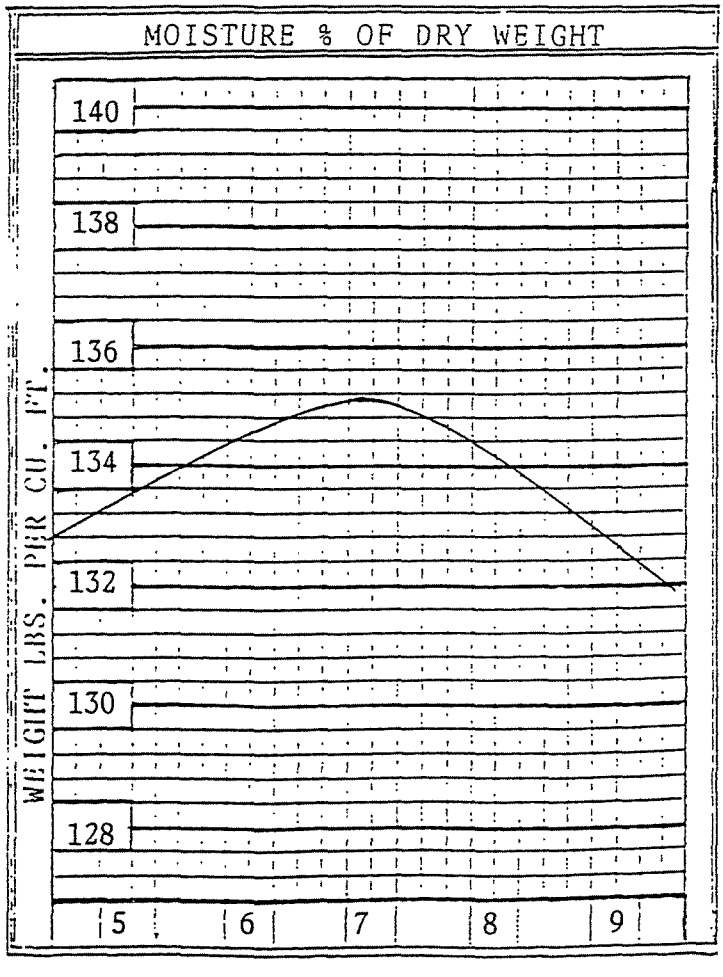
FIELD DATA:

SOURCE OF MATERIAL: UNKNOWN
LOCATION SAMPLED: UNKNOWN

LABORATORY DATA:

MAXIMUM DENSITY DRY: 135.1 P.C.F.
MUM MOISTURE: 6.9
SOIL TYPE & COLOR: GREY SILTY SAND & GRAVEL

TEST SPECIFICATIONS: ASTM D-1557(D)
CYLINDER: 6 "
HAMMER: 10 lbs.
DROPS: 18 "
LAYERS: 5
BLOWS/LAYER: 56
TECHNICIAN: T.Nordhaug
SAMPLED BY: CLIENT
REMARKS: N/A



ASARC0219249

MAILED JUN 24 1993 RECEIVED JUN 28 1993

REPORT NUMBER **LR 88766**

PREVIOUS RPT. NO. _____

PACIFIC TESTING LABORATORIES

Pg 1 of 2

EXECUTIVE OFFICES
3257 16th Ave. W. • Seattle, WA 98119
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(206) 485-4244 • 451-8436 • FAX (206) 485-4611

TACOMA DIVISION
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(206) 922-9299 • FAX (206) 922-1512

PENINSULA DIVISION
10726 Silverdale Way N.W. #105 • Silverdale, WA 98383
(206) 698-6650 • FAX (206) 698-6648

MAILING ADDRESS: Hydrometrics inc
950 Pacific Ave Suite 600
TACOMA WA 98401

ATTENTION: Randy Snyder

PROJECT: B & L Landfill

LOCATION: Milton-Fife WA

PURCH. ORD. NUMBER

REPORTED BY: M. BEVEY DATE: 6-14-93

REVIEWED BY: DATE: 06-16-93

PERMIT NUMBER

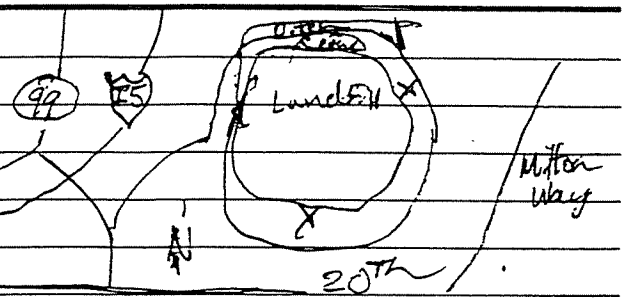
CERTIFICATE NUMBER: 936622

ARCHITECT

ENGINEER: Hydrometrics

CONTRACTOR

PTL Rep Michael Bevey
On Site to perform
T & D test at the
Clients Request.



All tests exceeded
95% compaction
(Proctor # 1107)
Grey Gravely SAND

X There exist some isolated soft spots that need to be corrected as per Randy Snyder's instructions

Setup + Travel + On site time 10:15 – 13:15

ASTM TEST METHOD (AS APPLICABLE) D 2922 * as noted

EQUIPMENT IDENTIFICATION AND S/N (AS APPLICABLE)

WORK CONFORMS YES ☐ NO ☐

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Certified Report by Pacific Testing Laboratories _____ DATE 6/18/93

FIELD CONTACT: Randy Snyder DATE 6/14/93

LR 89-2

ASARC0219250

Client: Hydrometrics Certificate No.: 9306 6420

Project: B&C landfill LR NO: 88766 Date: 6 14 93

Tes By: M BEICEY Page No.: 2

ASTM D-2922, ASTM D-2950, ASTM D-3017

TEST NO:	LOCATION	WD	M %	DD	-	C %	SPC %	P/ F
1	NE- Side Haul Road	157.3	3.6	146.1		100+	95	P
2	N Side (North of Pond	140.7	4.5	134.7		100+	95	P
3	WEST side Haul Rode	145.4	5.1	138.3		100+	95	P
4	South side	145.9	5.3	138.6		100+	95	P
5								
6								
7								
8								
9								
10								
1								
12								
13								
14								

xier Model: 3440

Proctor Method: ASTM D-1557 or ASTM D-698 or RICE

tal No.: 20185

Checked By: [signature] Date: 06-16-93

ndard: 3083 688

Proctor Values

SAMPLE ID 1107 PROCTOR VALUE 132.0 @ 7.2

SAMPLE ID _____ PROCTOR VALUE _____

SAMPLE ID _____ PROCTOR VALUE _____

MPLE ID _____ PROCTOR VALUE _____

REPORT NUMBER **LR 88438**

PREVIOUS RPT. NO. INITIAL

MAILED

JUL 0 6 1993

PACIFIC TESTING LABORATORIES

PACIFIC TESTING LABORATORIES

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PENINSULA DIVISION
10726 Silverdale Way N.W. #105 • Silverdale, WA 98383
(206) 698-6650 • FAX (206) 698-6648

MAILING ADDRESS: Hydrometrics, Inc. Seafirst Center 950 Pacific Ave S. Suite 510, Tacoma WA 98402

ATTENTION: Randy Snyder

PROJECT: B & L Landfill

LOCATION: Fife

PURCH. ORD. NUMBER:

REPORTED BY: J. GRAHAM DATE: 6/22/93

REVIEWED BY: DATE: 06-25-93

PERMIT NUMBER: N/A

CERTIFICATE NUMBER: 9306FA2

ARCHITECT: N/A

ENGINEER: N/A

CONTRACTOR: N/A

Sampled structural fill from the access ramp, SE of the landfill mound. Material was a brown sand w/gravel. Material was to undergo a D1557 proctor test to determine maximum density & optimum moisture. Lab # for sample is 1140.

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JUL 07 1993

ASTM TEST METHOD (AS APPLICABLE): None — N/A

EQUIPMENT IDENTIFICATION AND S/N (AS APPLICABLE): None

WORK CONFORMS YES ☐ NO ☐

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Certified Report by Pacific Testing Laboratories _____ DATE 7/2/93

FIELD CONTACT: _____ DATE _____

ASARC0219252

MAILED

JUN 15 1993

REPORT NUMBER **LR 78638**

PREVIOUS RPT. NO. Initial

RECEIVED

JUN 16 1993

PACIFIC TESTING LABORATORIES

PACIFIC TESTING LABORATORIES

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(206) 485-4244 • 451-8436 • FAX (206) 485-4611

TACOMA DIVISION
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(206) 922-9299 • FAX (206) 922-1512

PENINSULA DIVISION
10726 Silverdale Way N. W. #106 • Silverdale, WA 98383
(206) 698-6650 • FAX (206) 698-6648

MAILING ADDRESS: Hydrometrics, Inc.
950 Pacific Ave. Suite 610
Tacoma, WA 98401
ATTENTION: Randy Snyder

PROJECT: B + L Landfill

LOCATION: Milton

PURCH. ORD. NUMBER:

REPORTED BY: Lisa Ross DATE: 6-3-93

REVIEWED BY: [signature] DATE: 06-04-93

PERMIT NUMBER: —

CERTIFICATE NUMBER: 93d-642

ARCHITECT: —

ENGINEER: —

CONTRACTOR: Remediation Services Hydrometrics

PTL rep on site to pick up two (2) samples of lt gray sand w/rock and take back to PTL lab for proctor analysis as requested by Randy Snyder.
1) sample was taken from north end of landfill on roadway # 1107
2) sample was taken from the south end of landfill on roadway # 1108

ASTM TEST METHOD (AS APPLICABLE): as noted above

EQUIPMENT IDENTIFICATION AND S/N (AS APPLICABLE)

WORK CONFORMS YES ☐ NO ☐

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"This certification attests to the accuracy of the results obtained from the actual test performed and/or observations made within the defined scope of the work. Certification shall not be construed to represent action, approval or acceptance of other associated work or a warranty of design or workability of the specification requirements."

Certified Report by Pacific Testing Laboratories [signature] DATE 6/11/93

FIELD CONTACT: Randy W. Snyder DATE

LR 89-2

ASARC0219253

EPORT NUMBER LR 38766

PREVIOUS RPT. NO. _____

PACIFIC TESTING LABORATORIES

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(206) 485-4244 • 451-8436 • FAX (206) 485-4611

TACOMA DIVISION
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(206) 922-9299 • FAX (206) 922-1512

PENINSULA DIVISION
10726 Silverdale Way N.W. #105 • Silverdale, WA 98383
(206) 698-6650 • FAX (206) 698-6648

MAILING ADDRESS: Hydrometrics inc
900 Pacific Ave Suite 610
TACOMA WA 98401

ATTENTION: Randy Snyder

PROJECT: B & L Landfill

LOCATION: Milton-Fife WA

PURCH. ORD. NUMBER

REPORTED BY: M BEKEY DATE: 6-14-93

REVIEWED BY: DATE:

PERMIT NUMBER:

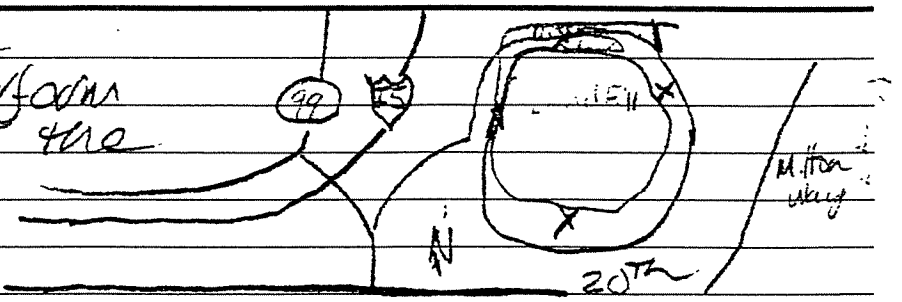
CERTIFICATE NUMBER: 9306(612)

ARCHITECT:

ENGINEER: Hydrometrics

CONTRACTOR:

PTL Rep Michael Bekey
On Site to perform
TPD test at the
Clients Request.



All test exceeded
95% compaction
(proctor # 1107)
Grey Gravely SAND

There exist some isolated soft spots that need to be corrected as per Randy Snyder's instructions

Setup & Trave + onsite time 10:15 - 12:15

ASTM TEST METHOD (AS APPLICABLE)

EQUIPMENT IDENTIFICATION AND S/N (AS APPLICABLE)

WORK CONFORMS YES ☑ NO ☐

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"This certification attests to the accuracy of the results obtained from the actual test performed and/or observations made within the defined scope of the work. Certification shall not be construed to represent action, approval or acceptance of other associated work or a warranty of design or workability of the specification requirements."

Certified Report by Pacific Testing Laboratories _____ DATE _____

FIELD CONTACT: Randy Snyder DATE 6/14/93

LR 89-2

CONSTRUCTION MATERIALS TESTING LABORATORIES, INC.

(CMTL, INC.)
A Division of Western Testing Laboratories

4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

LAB#: 2-671

SOIL/AGGREGATE ANALYSIS

CLIENT: Hydrometrics, Inc. DATE: 9-28-92

PROJECT: B & L Landfill REPORT #: 01

CONTRACTOR: unknown PROJECT #: T 8507

MATERIAL TYPE: Bank Run Sand & Gravel SOURCE: Lloyd's Pit - A

TESTS: Grain Size Analysis TECHNICIAN: JCR

SIEVE ANALYSIS

SIEVE SIZE	% PASSING	SPECS
3"	100	
1½"	81.8	
3/4"	70.8	
1/2"	64.0	
3/8"	60.8	
1/4"	56.8	
#4	53.7	
#8	49.5	
#10	48.4	
#16	45.4	
#40	30.3	
#100	4.9	
#200	2.9	

HYDROMETER ANALYSIS

SMALLER THAN	PERCENT
0.02 mm	2.0%
0.002 mm	1.8%
0.001 mm	1.5%

PARTICLE SIZE

Large Particles (+2mm)	= 51.6%
Coarse Sand(2mm-0.42mm)	= 18.1%
Fine Sand(0.42mm-0.074mm)	= 27.4%
Silt (0.074mm-0.002mm)	= 1.1%
Clay (-0.002mm)	= 1.8%
Colloids (-0.001mm)	=+1.5%

REMARKS: Tested in accordance with AASHTO T 88

REVIEWED BY:

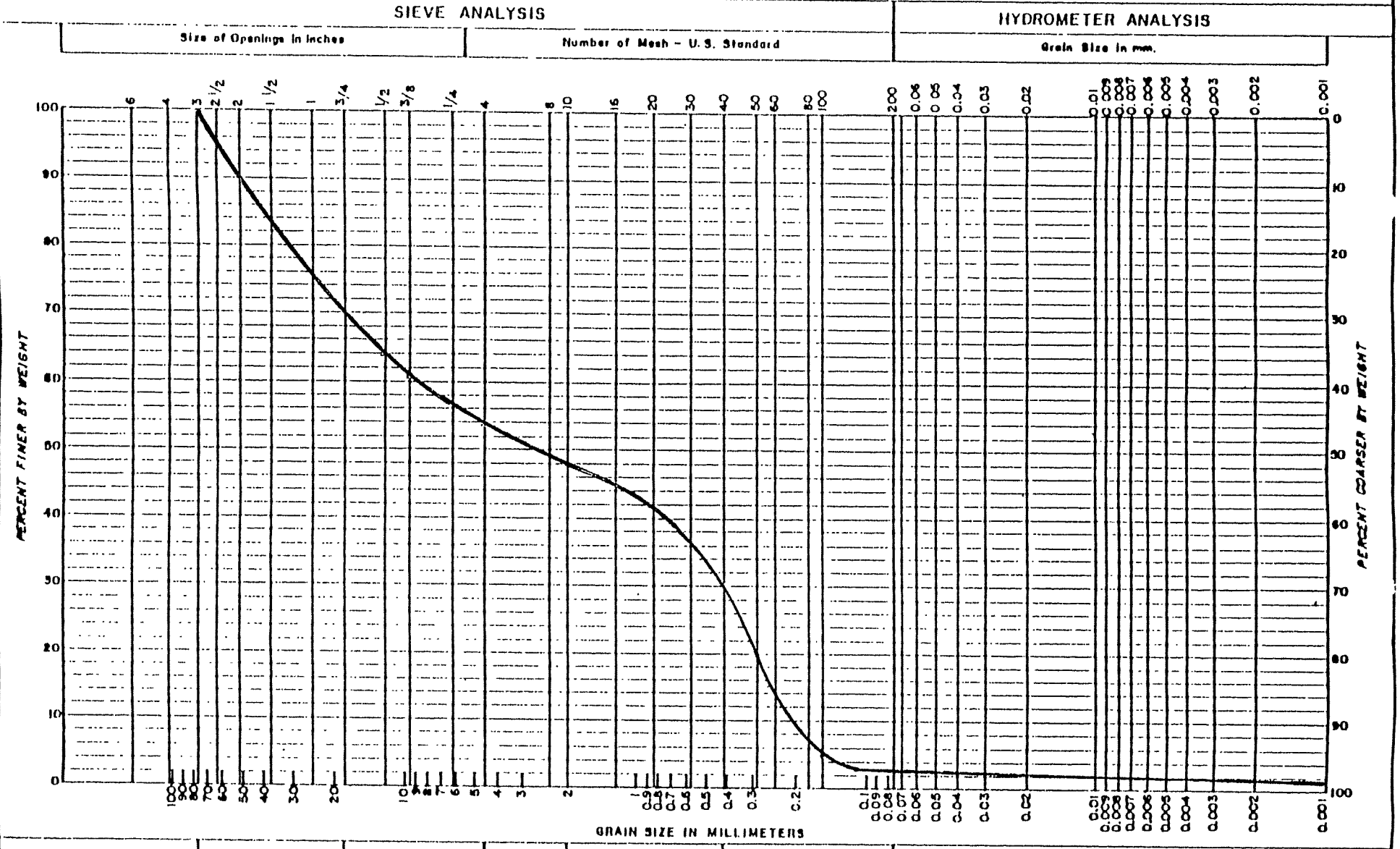
(CMTL, INC.)

A Division of Western Testing Laboratories **GRADATION CURVE**

By JCR Labratory No 2-671

Date 10-1-92 Field No. A

PROJECT: B & L LANDFILL PROJECT NO.: T-8507 REPORT NO: 01.



R6-7700-316 (4/67)

ASARC0219256

CONSTRUCTIO[illegible] MATERIALS TESTING LAB[illegible]RATORIES, INC.

(CMTL, INC.)
A Division of Western Testing Laboratories

4417 Pacific Highway East
Fife, Washington 98424
(206) 922-0798

LAB#: 2-672

SOIL/AGGREGATE ANALYSIS

CLIENT: Hydrometrics, Inc. DATE: 9-28-92

PROJECT: B & L Landfill REPORT #: 1a

CONTRACTOR: unknown PROJECT #: T 8507

MATERIAL TYPE: Bank Run Sand & Gravel SOURCE: Lloyd's Pit - B

TESTS: Grain Size Analysis TECHNICIAN: JCR

SIEVE ANALYSIS

SIEVE SIZE	% PASSING	SPECS
3"	100	
1½"	100	
3/4"	99.0	
1/2"	95.7	
3/8"	90.7	
1/4"	81.7	
#4	74.7	
#8	58.9	
#10	54.4	
#16	41.1	
#40	19.6	
#100	2.3	
#200	1.5	

HYDROMETER ANALYSIS

SMALLER THAN	PERCENT
0.02 mm	1.5
0.002 mm	1.3
0.001 mm	1.0

PARTICLE SIZE

Large Particles (+2mm)	=	45.6%
Coarse Sand(2mm-0.42mm)	=	34.8%
Fine Sand(0.42mm-0.074mm)	=	18.1%
Silt (0.074mm-0.002mm)	=	0.2
Clay (-0.002mm)	=	1.3
Colloids (-0.001mm)	=	+1.0

REMARKS: Tested in accordance with AASHTO T 88

REVIEWED BY:

ASARC0219257

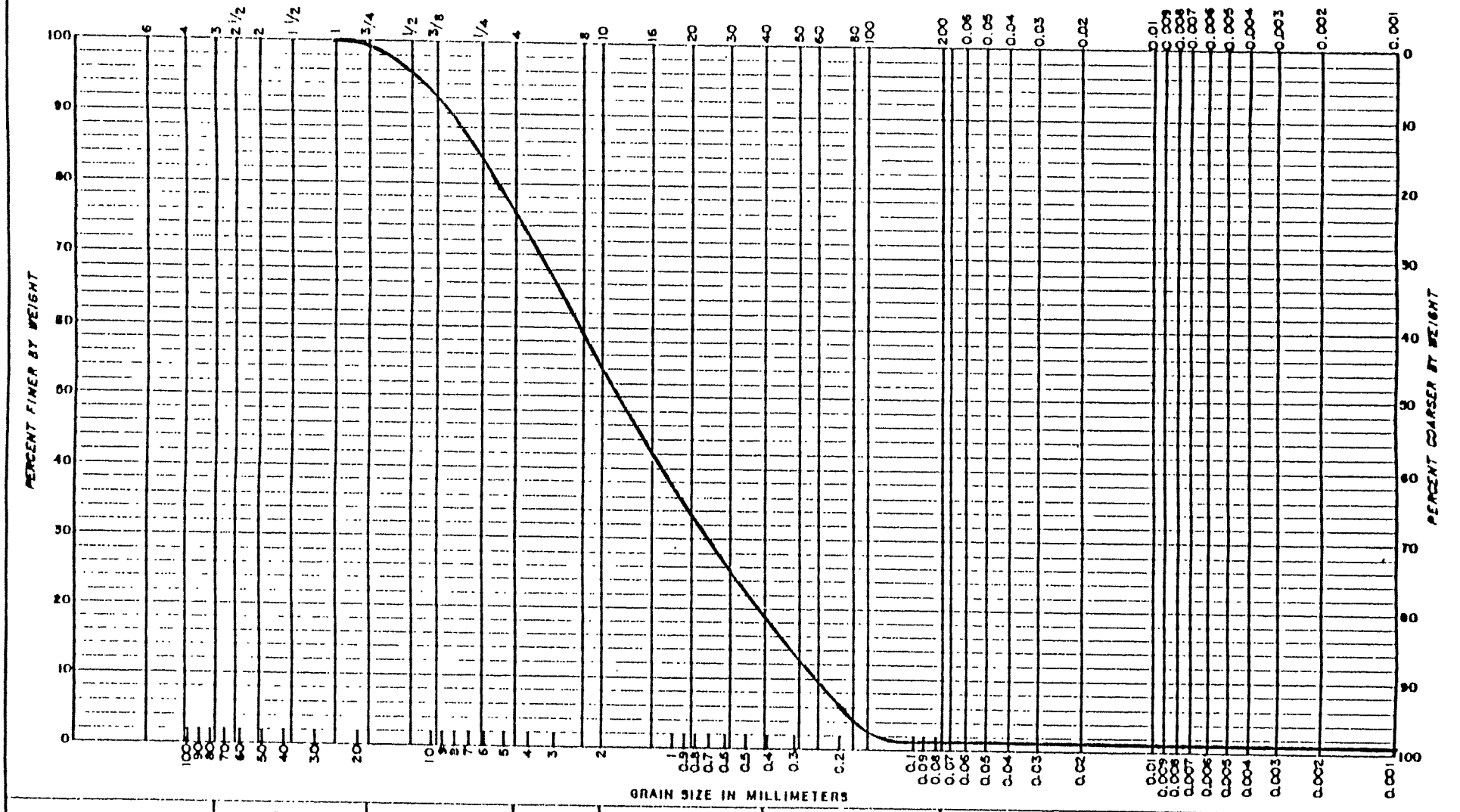
(CMTL, INC.)

A Division of Western Testing Laboratories **GRADATION CURVE**

By JCR Laboratory No. 2-672

Date 10-1-92 Field No. B

PROJECT: B & L LANDFILL PROJECT NO.: T-8507 REPORT NO.: 1a



R6-7700-316 (4/67)

ASARC0219258

Appendix C

matrecon
RESEARCH • CONSULTING • TESTING • NONMETALLIC MATERIALS

M93-277
<2047>

July 15, 1993

RECEIVED
JUL 21 1993

FAX TRANSMITTAL

Mr. Randy W. Snyder
Hydrometrics, Inc.
950 Pacific Avenue, Suite 610
Tacoma, WA 98402

Dear Mr. Synder:

Re: Strength in Shear and T-peel Modes of Three Adhesive-Bonded Field Samples and Two Factory Seam Samples of 40-mil PVC Submitted by Hydrometrics, Inc. (Purchase Order #11174)

Five seam samples were submitted by Hydrometrics on July 13, 1993 from the B & L Landfill Site for strength testing. Three of the seams were adhesive-bonded field samples, and they were given Matrecon Identification Nos. P1033-1 through P1033-3. Two of the seams were dielectrically-welded factory seams, and they were given Matrecon Identification Nos. P1034-1 and P1034-2. The field seam samples were submitted for testing in peel and shear modes; the factory seam samples were submitted for testing in shear mode only. An inventory of the samples presenting the identification notated on the individual samples, the thickness of the geomembrane sheets, the average width of the seam, and the sample size is presented in Table 1.

Testing of seam strength in the shear mode was performed in accordance with ASTM D882 and D3083, as modified in NSF Standard 54 (1991), Annex A, Part 3--Bonded Seam Strength. A 1-in. wide strip specimen was used. The initial grip separation was 4 in. plus the width of the seam, with the seam centered between the grips, and the rate of grip separation was 20 in. per minute (ipm).

The seam strength testing in the peel mode was performed in 180° peel (T-peel) in accordance with ASTM D413 and D4437, as modified by NSF Standard 54 (1991), Annex A, Part 5--Peel Adhesion. In this test, a 1-in. wide strip specimen was used with an initial grip separation of 1 inch. The rate of grip separation was 2 ipm. The reported values are averages determined by drawing on the stress-strain chart the best average line between the maximum and minimum force values across the entire tested area.

The results of testing the adhesive-bonded field seam samples are presented in Tables 2 through 3, and the results of testing the factory seam samples are presented in Table 4. The locus-of-break codes used in reporting the test results are presented in Figure 1.

815 Atlantic Avenue • Alameda, CA 94501 • Tel. 510/521-1762 • Fax: 510/521-4963

ASARC0219260

These samples and the tested specimens will be disposed of after 30 days unless you request otherwise. If you request storage beyond this date, there will be an additional storage fee. If retention of samples is not explicitly agreed to by written contract, Matrecon assumes no responsibility or liability for retention of samples beyond the 30-day retention period.

If you have any questions regarding the test results, please contact Dr. Haxo or myself.

Sincerely,

Paul D. Haxo
Physical Testing Laboratory Manager

PDH/rmr

Attachments: 4 Tables
1 Figure

D\M93-277.002

TABLE 1. INVENTORY OF 40-MIL PVC SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FROM THE B & L LANDFILL SITE

Seam number[a]	Client's notation on individual sample	Type of seam[b]	Sample size[c], in.	Seam width, in.	Liner thickness[d], mil	Date received
P1033-1	Test Seam #1, date seamed 7/9/93; R. P., Blkt #101 & 103, (destructive) B & L Landfill	Field	19.0 x 18.0	5.0	Top sheet: 40.5,40.2 Bottom sheet: 40.8,41.2	7/13/93
P1033-2	Test Seam #2, date seamed 7/9/93; R. P., Blkt #201 & 202, (destructive) B & L Landfill	Field	19.0 x 18.5	5.2	Top sheet: 42.0,42.4 Bottom sheet: 41.5,40.9	7/13/93
P1033-3	Test Seam #3, date seamed 7/10/93, R.P., Blkt #104 & 105, (destructive) B & L Landfill	Field	19.25 x 18.25	5.1	Top sheet: 41.8,42.0 Bottom sheet: 40.1,40.7	7/13/93
P1034-1	Factory seam, Blkt #103, B & L Landfill	Factory	19.25 x 18.0	1.0	Top sheet: 41.0,41.3 Bottom sheet: 41.2,41.6	7/13/93
P1034-2	Blkt #105, 7/10/93, B & L Landfill	Factory	19.25 x 18.25	1.3	Top sheet: 41.6,41.2 Bottom sheet: 41.7,41.4	7/13/93

[a]Matrecon sample identification number.
[b]Field seam samples were adhesive-bonded, and factory seam samples were dielectrically-welded.
[c]First measurement is the sample seam length.
[d]Thickness measurements made at the four corners of each sample.

Matrecon, Inc.
M93-277 <2047>
July 15, 1993

D/M93-277.001

ASARC0219262

TABLE 2. SEAM STRENGTH IN SHEAR AND T–PEEL MODES OF 40–MIL PVC GEOMEMBRANE ADHESIVE–BONDED FIELD SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FOR THE B & L LANDFILL PROJECT

Matrecon ID number		P1033–1			P1033–2		
Client sample identification		Test Seam No. 1, Blkt Nos. 101 and 103, 7/9/93			Test Seam No. 2, Blkt Nos. 201 and 202, 7/9/93		
Thickness, mil							
Top sheet		Average = 40.4			Average = 42.2		
Bottom sheet		Average = 41.0			Average = 41.2		
Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non–FTB	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non–FTB
Shear[b]	1	71.4	SE	...	82.2	SE	...
	2	71.2	SE	...	74.0	SE	...
	3	79.6	SE	...	78.2	SE	...
	4	79.2	SE	...	83.6	SE	...
	5	80.0	SE	...	81.2	SE	...
	Avg. =	76.3			Avg. =	79.8	
	SD =	4.6			SD =	3.8	
	CV =	6.0%			CV =	4.8%	
		Average stress, ppi			Average stress, ppi		
Peel[c]	1	26.4	...	AD	26.8	AD–BRK	...
	2	34.0	SE	...	23.4	...	AD
	3	21.7	...	AD	22.4	...	AD
	4	23.3	...	AD	22.3	...	AD
	5	21.6	...	AD	23.8	...	AD
	Avg. =	25.4			Avg. =	23.7	
	SD =	5.2			SD =	1.8	
	CV =	20.4%			CV =	7.7%	

[a]Locus–of–break codes are presented in Figure 1; FTB = film–tear bond; non–FTB = non–film tear bond.
[b]ASTM D3083/D882, as modified by NSF Standard 54 (1991), Annex A, Part 3.
[c]ASTM D4437/D413, 180°–peel (T–peel), as modified by NSF Standard 54 (1991), Annex A, Part 5.

Matrecon, Inc.
M93–277 <2047>
July 15, 1993

L–1,2,3/93–277_1

ASARC0219263

TABLE 3. SEAM STRENGTH IN SHEAR AND T-PEEL MODES OF 40-MIL PVC GEOMEMBRANE ADHESIVE-BONDED SEAM SAMPLE SUBMITTED BY HYDROMETRICS, INC. FOR THE B & L LANDFILL PROJECT

Matrecon ID number	P1033-3
Client sample identification	Test Seam No. 3, Blkt Nos. 104 and 105, 7/10/93
Thickness, mil	
Top sheet	Average = 41.9
Bottom sheet	Average = 40.4

Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Non-FTB
Shear[b]	1	76.8	SE	...
	2	79.4	SE	...
	3	77.8	SE	...
	4	73.4	SE	...
	5	76.0	SE	...
	Avg. =	76.7		
	SD =	2.2		
	CV =	2.9%		
		Average stress, ppi		
Peel[c]	1	23.6	AD-BRK	...
	2	21.9	...	AD
	3	23.6	AD-BRK	...
	4	22.4	...	AD
	5	22.4	...	AD
	Avg. =	22.8		
	SD =	0.78		
	CV =	3.4%		

[a]Locus-of-break codes are presented in Figure 1; FTB = film-tear bond; non-FTB = non-film tear bond.
[b]ASTM D882, as modified in NSF Standard 54 (1991), Annex A, Part 3.
[c]ASTM D4437/D413, 180°-peel (T-peel) method, as modified in NSF Standard 54 (1991), Annex A, Part 5.

Matrecon, Inc.
M93-277 <2047>
July 15, 1993

L-1,2,3/93-277_3

ASARC0219264

TABLE 4. SEAM STRENGTH IN SHEAR MODES OF 40-MIL PVC GEOMEMBRANE DIELECTRICALLY-WELDED FACTORY SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FOR THE B & L LANDFILL PROJECT

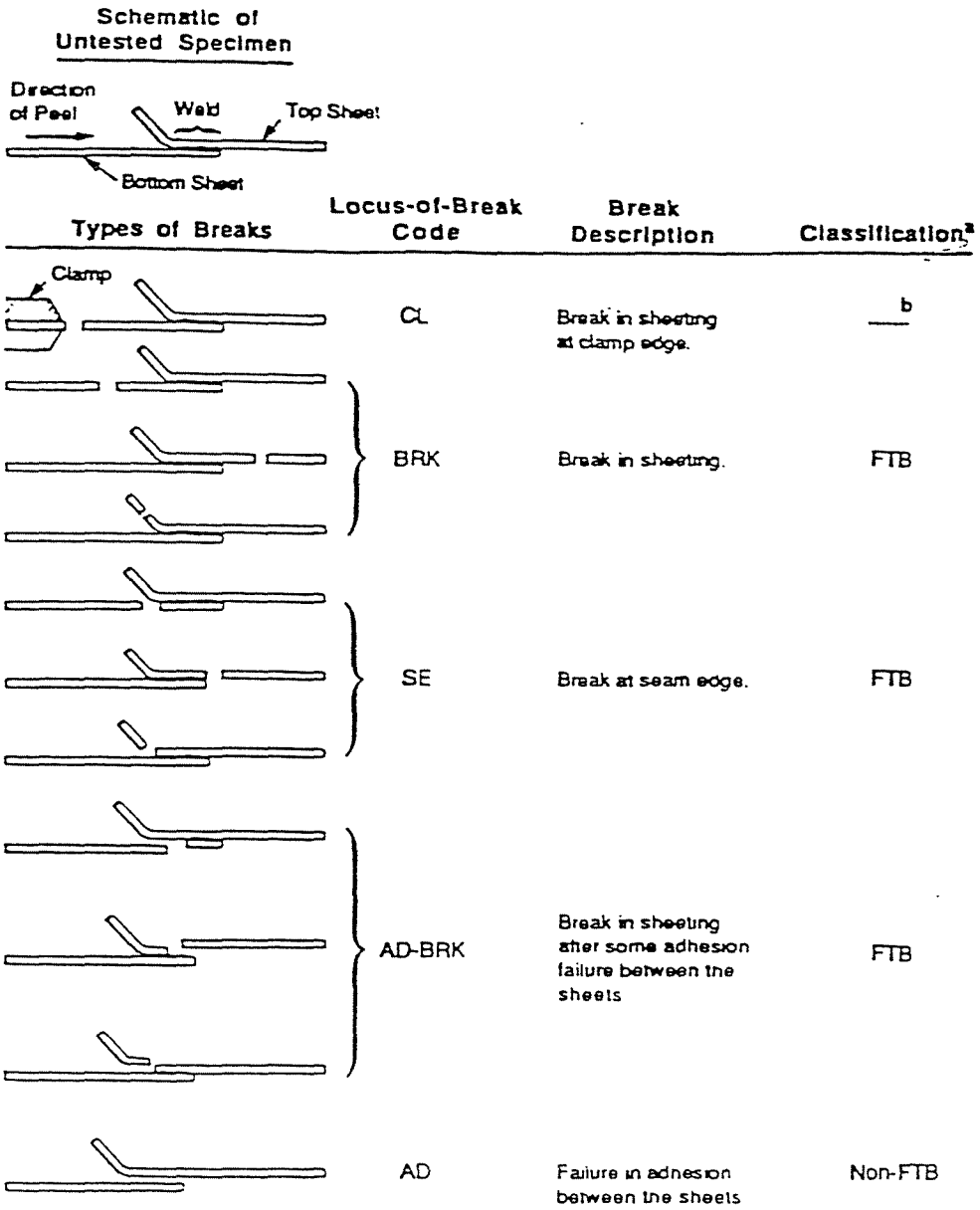
Matrecon ID number		P1034-1			P1034-2		
Client's sample ID		Blkt #103			Blkt #105		
Thickness, mil							
Top sheet		Average = 41.2			Average = 41.4		
Bottom sheet		Average = 41.4			Average = 41.6		
Seam test mode	Specimen Number	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB
Shear[b]	1	78.4	SE	...	73.6	SE	...
	2	76.4	SE	...	76.4	SE	...
	3	79.2	SE	...	72.2	SE	...
	4	76.2	SE	...	73.0	SE	...
	5	74.4	SE	...	73.2	SE	...
		Avg. = 76.9			Avg. = 73.7		
		SD = 1.9			SD = 1.6		
		CV = 2.5%			CV = 2.2%		

[a]Locus-of-break codes are presented in Figure 1; FTB = film-tear bond; non-FTB = non-film tear bond.
[b]ASTM D3080/D882, as modified by NSF Standard 54 (1991), Annex A, Part 3.

Matrecon, Inc.
M93-277 <2047>
July 13, 1993

L123\Seam\93-277_3

ASARC0219265



[a] FTB = Film - Tear Bond

[b] Acceptance of CL - type breaks may depend on whether test values meet a minimum specification value. In general, though, a CL - type break should be considered a "no test". If specimens for a particular sample break consistently at the clamp edge, changes in the testing procedure should be considered, e.g. changing the clamp face, using a dumbell - type specimen

Figure 1. Locus of break for dielectric-or solvent-weld seam of unreinforced liner materials tested for seam strength in shear and peel modes.

ASARC0219266

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RESEARCH • CONSULTING • TESTING • NONMETALLIC MATERIALS

M93-277
<2047>

July 16, 1993

RECEIVED
JUL 21 1993

FAX TRANSMITTAL

Mr. Randy W. Snyder
Hydrometrics, Inc.
950 Pacific Avenue, Suite 610
Tacoma, WA 98402

Dear Mr. Snyder:

Re: Strength in Shear and T-peel Modes of Three Adhesive-Bonded Field Samples and One Factory Seam Sample of 40-mil PVC Submitted by Hydrometrics, Inc. (Purchase Order #11174)

Four seam samples were submitted by Hydrometrics on July 14, 1993 from the B & L Landfill Site for strength testing. Three of the seams were adhesive-bonded field samples, and they were given Matrecon Identification Nos. P1033-4 through P1033-6. One of the seam was dielectrically-welded factory seam, and it was given Matrecon Identification No. P1034-3. The field seam samples were submitted for testing in peel and shear modes; the factory seam sample was submitted for testing in shear mode only. An inventory of the samples presenting the identification notated on the individual samples, the thickness of the geomembrane sheets, the average width of the seam, and the sample size is presented in Table 1.

Testing of seam strength in the shear mode was performed in accordance with ASTM D882 and D3083, as modified in NSF Standard 54 (1991), Annex A, Part 3--Bonded Seam Strength. A 1-in. wide strip specimen was used. In the case of the factory seam sample, the initial grip separation was 4 in. plus the width of the seam in accordance with NSF Standard 54, with the seam centered between the grips, and the rate of grip separation was 20 in. per minute (ipm). In the case of the field seam samples, the initial grip separation was 2-in. plus the width of the seam in order to prevent the specimens from extending to the travel capacity of the testing machine without breaking. This was necessitated by the seam width of the submitted samples.

The seam strength testing in the peel mode was performed in 180° peel (T-peel) in accordance with ASTM D413 and D4437, as modified by NSF Standard 54 (1991), Annex A, Part 5--Peel Adhesion. In this test, a 1-in. wide strip specimen was used with an initial grip separation of 1 inch. The rate of grip separation was 2 ipm. The reported values are averages determined by drawing on the stress-strain chart the best average line between the maximum and minimum force values across the entire tested area.

ASARC0219267

The results of testing the adhesive-bonded field seam samples are presented in Tables 2 and 3, and the results of testing the factory seam sample are presented in Table 4. The locus-of-break codes used in reporting the test results are presented in Figure 1.

These samples and the tested specimens will be disposed of after 30 days unless you request otherwise. If you request storage beyond this date, there will be an additional storage fee. If retention of samples is not explicitly agreed to by written contract, Matrecon assumes no responsibility or liability for retention of samples beyond the 30-day retention period.

If you have any questions regarding the test results, please contact me.

Sincerely,

Paul D. Haxo
Physical Testing Laboratory Manager

PDH/tbm

Attachments: 4 Tables
1 Figure

D\M93-277.004

ASARC0219268

TABLE 1. INVENTORY OF 40-MIL PVC SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FROM THE B & L LANDFILL SITE

Seam number[a]	Client's notation on individual sample	Type of seam[b]	Sample size[c], in.	Seam width, in.	Liner thickness[d], mil	Date received
P1033-4	Test Seam #4, date seamed 7/12/93, R. P., Blkt #205 & 206, (destructive) B & L Landfill	Field	18.0 x 18.0	6.0	Top sheet: 42.5,42.3 Bottom sheet: 41.7,41.8	7/14/93
P1033-5	Test Seam #5, date seamed 7/12/93, R. P., Blkt #206 & 111, (destructive) B & L Landfill	Field	18.0 x 18.0	5.7	Top sheet: 41.5,42.0 Bottom sheet: 41.0,41.4	7/14/93
P1033-6	Test Seam #6, date seamed 7/12/93, R.P., Blkt #111 & 112, (destructive) B & L Landfill	Field	18.0 x 18.5	5.7	Top sheet: 40.5,40.6 Bottom sheet: 41.1,41.4	7/14/93
P1034-3	Factory Test Sample, Blkt #112, B & L Landfill	Factory	18.25 x 16.75	0.7	Top sheet: 41.1,40.7 Bottom sheet: 40.8,41.2	7/14/93

[a]Matrecon sample identification number.
[b]Field seam samples were adhesive-bonded, and the factory seam sample was dielectrically-welded.
[c]First measurement is the sample seam length.
[d]Thickness measurements made at the four corners of each sample.

Matrecon, Inc.
M93-277 <2047>
July 16, 1993

D/M93-277.003

ASARC0219269

TABLE 2. SEAM STRENGTH IN SHEAR AND T-PEEL MODES OF 40-MIL PVC GEOMEMBRANE ADHESIVE-BONDED FIELD SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FOR THE B & L LANDFILL PROJECT

Matrecon ID number		P1033-4			P1033-5		
Client sample identification		Test Seam No. 4, Blkt Nos. 205 and 206, 7/12/93			Test Seam No. 5, Blkt Nos. 206 and 111, 7/12/93		
Thickness, mil							
Top sheet		Average = 42.4			Average = 41.8		
Bottom sheet		Average = 41.8			Average = 41.2		
Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Non-FTB	Maximum stress, ppi	Locus of break[a] FTB	Non-FTB
Shear[b]	1	79.4	SE	...	79.8	SE	...
	2	68.9	SE	...	78.5	SE	...
	3	71.2	SE	...	79.4	SE	...
	4	77.4	SE	...	79.6	SE	...
	5	83.6	SE	...	72.1	SE	...
		Avg. = 76.1			Avg. = 77.9		
		SD = 6.0			SD = 3.3		
		CV = 7.9%			CV = 4.2%		
		Average stress, ppi			Average stress, ppi		
Peel[c]	1	19.6	...	AD	19.8	...	AD
	2	19.4	...	AD	21.6	...	AD
	3	26.1	AD-BRK	...	22.0	AD-BRK	...
	4	27.4	AD-BRK	...	22.4	AD-BRK	...
	5	21.2	...	AD	22.4	...	AD
		Avg. = 22.7			Avg. = 21.6		
		SD = 3.8			SD = 1.1		
		CV = 16.7%			CV = 5.1%		

[a]Locus-of-break codes are presented in Figure 1; FTB = film-tear bond; non-FTB = non-film tear bond.
[b]ASTM D3083/D882, as modified by NSF Standard 54 (1991), Annex A, Part 3.
[c]ASTM D4437/D413, 180°-peel (T-peel), as modified by NSF Standard 54 (1991), Annex A, Part 5.

Matrecon, Inc.
M93-277 <2047>
July 16, 1993

L123/Seam/93-277_4

ASARC0219270

TABLE 3. SEAM STRENGTH IN SHEAR AND T-PEEL MODES OF 40-MIL PVC GEOMEMBRANE ADHESIVE-BONDED SEAM SAMPLE SUBMITTED BY HYDROMETRICS, INC. FROM THE B & L LANDFILL PROJECT

Matrecon ID number	P1033-6
Client sample identification	Test Seam No. 6, Blkt Nos. 111 and 112, 7/12/93
Thickness, mil	
Top sheet	Average = 40.6
Bottom sheet	Average = 41.3

Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB
Shear[b]	1	71.2	SE	...
	2	68.0	SE	...
	3	65.0	SE	...
	4	73.9	SE	...
	5	69.7	SE	...
	Avg. =	69.6		
	SD =	3.3		
	CV =	4.7%		
		Average stress, ppi		
Peel[c]	1	22.9	...	AD
	2	18.7	...	AD
	3	21.1	...	AD
	4	22.4	...	AD
	5	20.5	...	AD
	Avg. =	21.1		
	SD =	1.66		
	CV =	8.1%		

[a]Locus-of-break codes are presented in Figure 1; FTB = film-tear bond; non-FTB = non-film tear bond.
[b]ASTM D882, as modified in NSF Standard 54 (1991), Annex A, Part 3.
[c]ASTM D4437/D413, 180°-peel (T-peel) method, as modified in NSF Standard 54 (1991), Annex A, Part 5.

Matrecon, Inc.
M93-277 <2047>
July 16, 1993

L123/Seam/93-277_5

ASARC0219271

TABLE 4. SEAM STRENGTH IN SHEAR MODE OF 40-MIL PVC GEOMEMBRANE DIELECTRICALLY-WELDED FACTORY SEAM SAMPLE SUBMITTED BY HYDROMETRICS, INC. FROM THE B & L LANDFILL PROJECT

Matrecon ID number	P1034-3
Client sample identification	Factory Test Seam, Blkt No. 112
Thickness, mil	
Top sheet	Average = 40.9
Bottom sheet	Average = 41.0

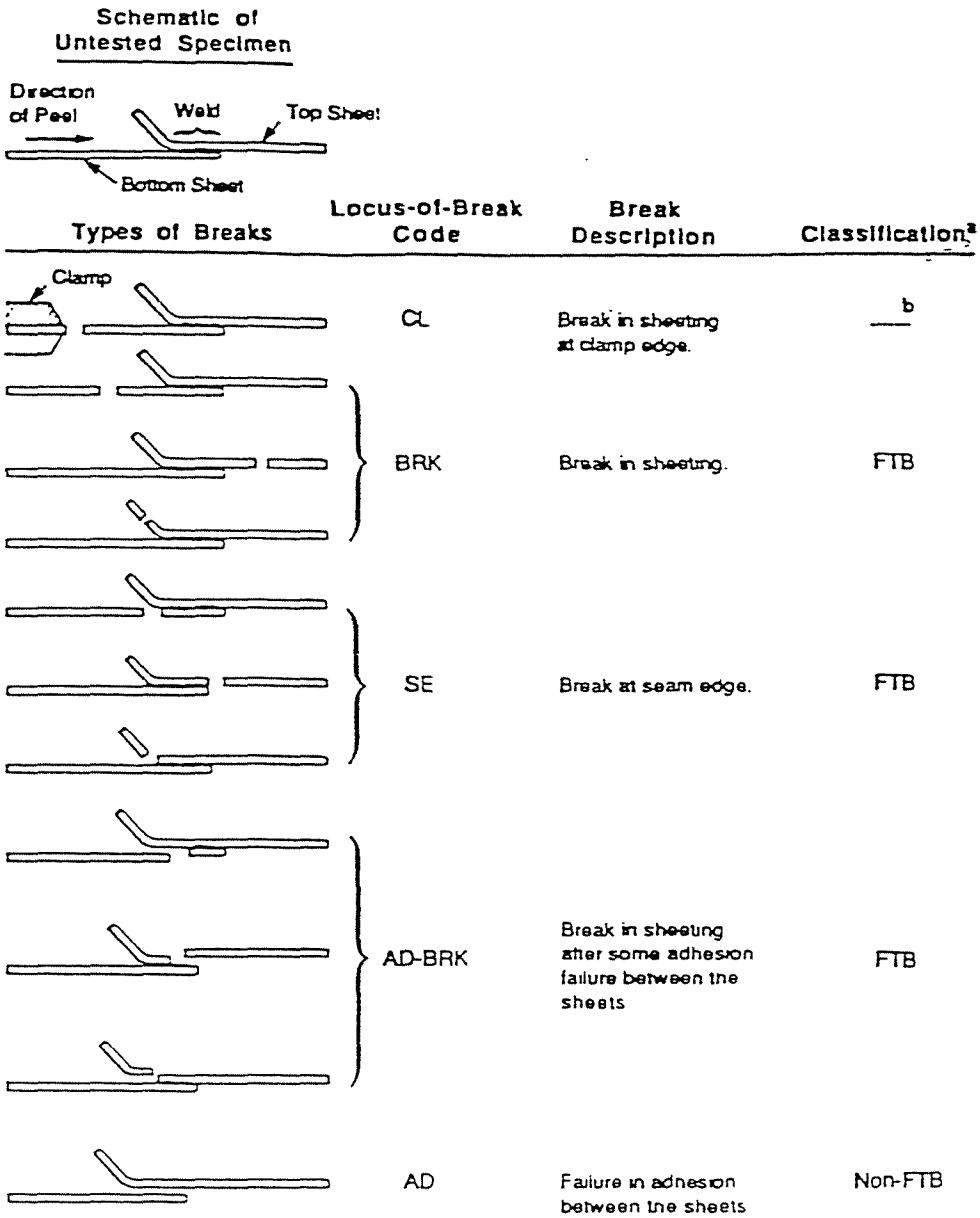
Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Non-FTB
Shear[b]	1	74.6	SE	...
	2	89.8	SE	...
	3	86.0	SE	...
	4	72.3	SE	...
	5	70.4	SE	...
		Avg. = 78.6		
		SD = 8.7		
		CV = 11.1%		

[a]Locus-of-break codes are presented in Figure 1; FTB = film-tear bond; non-FTB = non-film tear bond.
[b]ASTM D882, as modified in NSF Standard 54 (1991), Annex A, Part 3.

Matrecon, Inc.
M93-277 <2047>
July 16, 1993

L123/Seam/93-277_6

ASARC0219272



[a] FTB = Film - Tear Bond

[b] Acceptance of CL - type breaks may depend on whether test values meet a minimum specification value. In general, though, a CL - type break should be considered a "no test". If specimens for a particular sample break consistently at the clamp edge, changes in the testing procedure should be considered, e.g. changing the clamp face, using a dumbell - type specimen

Figure 1. Locus of break for dielectric-or solvent-weld seam of unreinforced liner materials tested for seam strength in shear and peel modes.

ASARC0219273

TECN

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M93-277
<2047>

July 22, 1993

RECEIVED
JUL 26 1993

FAX TRANSMITTAL

Mr. Randy W. Snyder
Hydrometrics, Inc.
950 Pacific Avenue, Suite 610
Tacoma, WA 98402

Dear Mr. Synder:

Re: Strength in Shear and T-peel Modes of Six Adhesive-Bonded Field Seam Samples of 40-mil PVC Submitted by Hydrometrics, Inc. from the B & L Landfill Site (Purchase Order #11174)

Six 40-mil PVC adhesive-bonded field seam samples were submitted by Hydrometrics, Inc. for seam strength testing in shear and peel modes. The samples, which were received by Matrecon on July 20, 1993, were given Matrecon Identification Nos. P1033-7 through P1033-12. An inventory of the samples giving Hydrometrics' identification for the individual samples, the thickness of the geomembrane sheets, the average width of the seam, and the sample size is presented in Table 1.

At the time the samples were received, they still smelled of solvent, and they were heated in a 50°C oven overnight and then allowed to condition at 23°C for a minimum of 4 hours prior to testing. All testing was performed at 23 ± 1°C.

Testing of seam strength in the shear mode was performed in accordance with ASTM D882 and D3083, as modified in NSF Standard 54 (1991), Annex A, Part 3--Bonded Seam Strength. A 1-in. wide strip specimen was used. Because of the width of the seams and to prevent the specimens from having to be regripped after extending to the travel capacity of the testing machine, the initial grip separation of 4 in. plus the width of the seam, which is required by NSF Standard 54, was reduced to 2 in. plus the width of the seam for Test Seam Nos. 7 through 10 (Matrecon ID Nos. P1033-7 through P1033-10). Test specimens were placed in the testing machine such that the seam was centered between the grips, and the rate of grip separation was 20 in. per minute (ipm).

The seam strength testing in the peel mode was performed in 180° peel (T-peel) in accordance with ASTM D413 and D4437, as modified by NSF Standard 54 (1991), Annex A, Part 5--Peel Adhesion. In this test, a 1-in. wide strip specimen was used with an initial grip separation of 1 inch. The rate of grip separation was 2 ipm. The reported values were averages determined by drawing on the stress-strain chart the best average line between the maximum and minimum force values.

ASARC0219274

The results of the seam testing are presented in Tables 2 through 4, and the locus-of-break codes used in reporting the test results are presented in Figure 1.

These samples and the tested specimens will be disposed of after 30 days unless you request otherwise. If you request storage beyond this date, there will be an additional storage fee. If retention of samples is not explicitly agreed to by written contract, Matrecon assumes no responsibility or liability for retention of samples beyond the 30-day retention period.

If you have any questions regarding the test results, please contact Dr. Haxo or myself.

Sincerely,

Paul D. Haxo
Physical Testing Laboratory Manager

PDH/rmr

Attachments: 4 Tables
1 Figure

D\M93-277.006

TABLE 1. INVENTORY OF 40-MIL PVC ADHESIVE-BONDED SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FROM THE B & L LANDFILL SITE

Seam number[a]	Client's notation on individual sample	Sample size[b], in.	Seam width, in.	Liner thickness[c], mil	Date received
P1033-7	Test Seam #7, date seamed 7/13/93, R. P., Blkt #206 & 207, (destructive) B & L Landfill	18 x 18	5.3	Top sheet: 42.6,42.1 Bottom sheet: 40.7,41.7	7/20/93
P1033-8	Test Seam #8, date seamed 7/13/93, R. P., Blkt #209 & 210, (destructive) B & L Landfill	18 x 18	6.3	Top sheet: 43.1,43.3 Bottom sheet: 42.2,41.6	7/20/93
P1033-9	Test Seam #9, date seamed 7/14/93, Blkt #106 & 211, (destructive) B & L Landfill	18 x 18	5.3	Top sheet: 41.6,41.2 Bottom sheet: 42.0,41.8	7/20/93
P1033-10	Test Seam #10, date seamed 7/14/93, Blkt #208-213, (destructive) B & L Landfill	18 x 18	5.6	Top sheet: 43.4,43.3 Bottom sheet: 41.9,41.4	7/20/93
P1033-11	Test Seam #11, date seamed 7/14/93, R. P., Blkt #212-213, (destructive) B & L Landfill	18 x 18	4.6	Top sheet: 42.2,42.8 Bottom sheet: 42.3,41.8	7/20/93
P1033-12	Test Seam #12, date seamed 7/17/93, Blkt #220-221, (destructive) B & L Landfill	17.75 x 18	4.8	Top sheet: 42.1,42.2 Bottom sheet: 41.7,41.3	7/20/93

[a]Matrecon sample identification number.
[b]First measurement is the sample seam length.
[c]Thickness measurements made at the four corners of each sample.

Matrecon
M93-277 <2047>
July 22, 1993
D/M93-277.005

ASARC0219276

TABLE 2. SEAM STRENGTH IN SHEAR AND T-PEEL MODES OF 40-MIL PVC GEOMEMBRANE ADHESIVE-BONDED FIELD SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FOR THE B & L LANDFILL PROJECT

Matrecon ID number		P1033-7			P1033-8		
Client sample identification		Test Seam No. 7, Blkt Nos. 206 and 207, 7/13/93			Test Seam No. 8, Blkt Nos. 209 and 210, 7/13/93		
Thickness, mil							
Top sheet		Average = 42.4			Average = 43.2		
Bottom sheet		Average = 41.2			Average = 41.9		
Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB
Shear[b]	1	85.1	SE	...	81.8	SE	...
	2	79.9	SE	...	77.6	SE	...
	3	85.2	SE	...	84.7	SE	...
	4	83.8	SE	...	88.9	SE	...
	5	86.5	SE	...	77.7	SE	...
	Avg. =	84.1			Avg. =	82.1	
	SD =	2.5			SD =	4.8	
	CV =	3.0%			CV =	5.8%	
		Average stress, ppi			Average stress, ppi		
Peel[c]	1	23.1	...	AD	21.9	...	AD
	2	22.7	...	AD	22.7	...	AD
	3	22.1	...	AD	23.6	...	AD
	4	23.2	...	AD	23.6	AD-BRK	...
	5	23.9	AD-BRK	...	26.4	...	AD
	Avg. =	23.0			Avg. =	23.6	
	SD =	0.7			SD =	1.7	
	CV =	3.0%			CV =	7.2%	

[a]Locus-of-break codes are presented in Figure 1; FTB = film-tear bond; non-FTB = non-film tear bond.
[b]ASTM D3083/D882, as modified by NSF Standard 54 (1991), Annex A, Part 3.
[c]ASTM D4437/D413, 180°-peel (T-peel), as modified by NSF Standard 54 (1991), Annex A, Part 5.

Matrecon, Inc.
M93-277 <2047>
July 22, 1993

L123/Seam/93-277_7

ASARC0219277

TABLE 3. SEAM STRENGTH IN SHEAR AND T-PEEL MODES OF 40-MIL PVC GEOMEMBRANE ADHESIVE-BONDED FIELD SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FOR THE B & L LANDFILL PROJECT

Matrecon ID number		P1033-9			P1033-10		
Client sample identification		Test Seam No. 9, Blkt Nos. 106 and 211, 7/14/93			Test Seam No. 10, Blkt Nos. 208 and 213, 7/14/93		
Thickness, mil							
Top sheet		Average = 41.4			Average = 43.4		
Bottom sheet		Average = 41.9			Average = 41.7		
Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB
Shear[b]	1	66.7	SE	...	82.2	SE	...
	2	77.9	SE	...	82.4	SE	...
	3	76.3	SE	...	75.7	SE	...
	4	76.3	SE	...	81.9	SE	...
	5	80.8	SE	...	80.2	SE	...
		Avg. = 75.6			Avg. = 80.5		
		SD = 5.3			SD = 2.8		
		CV = 7.0%			CV = 3.5%		
		Average stress, ppi			Average stress, ppi		
Peel[c]	1	19.5	...	AD	28.7	AD-BRK	...
	2	19.5	...	AD	30.6	AD-BRK	...
	3	21.4	...	AD	27.7	AD-BRK	...
	4	24.1	...	AD	23.6	...	AD
	5	23.9	...	AD	23.6	AD-BRK	...
		Avg. = 21.7			Avg. = 26.8		
		SD = 2.3			SD = 3.1		
		CV = 10.6%			CV = 11.6%		

[a]Locus-of-break codes are presented in Figure 1; FTB = film-tear bond; non-FTB = non-film tear bond.
[b]ASTM D3083/D882, as modified by NSF Standard 54 (1991), Annex A, Part 3.
[c]ASTM D4437/D413, 180°-peel (T-peel), as modified by NSF Standard 54 (1991), Annex A, Part 5.

Matrecon, Inc.
M93-277 <2047>
July 22, 1993

L123/Seam/93-277_8

ASARC0219278

TABLE 4. SEAM STRENGTH IN SHEAR AND T-PEEL MODES OF 40-MIL PVC GEOMEMBRANE ADHESIVE-BONDED FIELD SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FOR THE B & L LANDFILL PROJECT

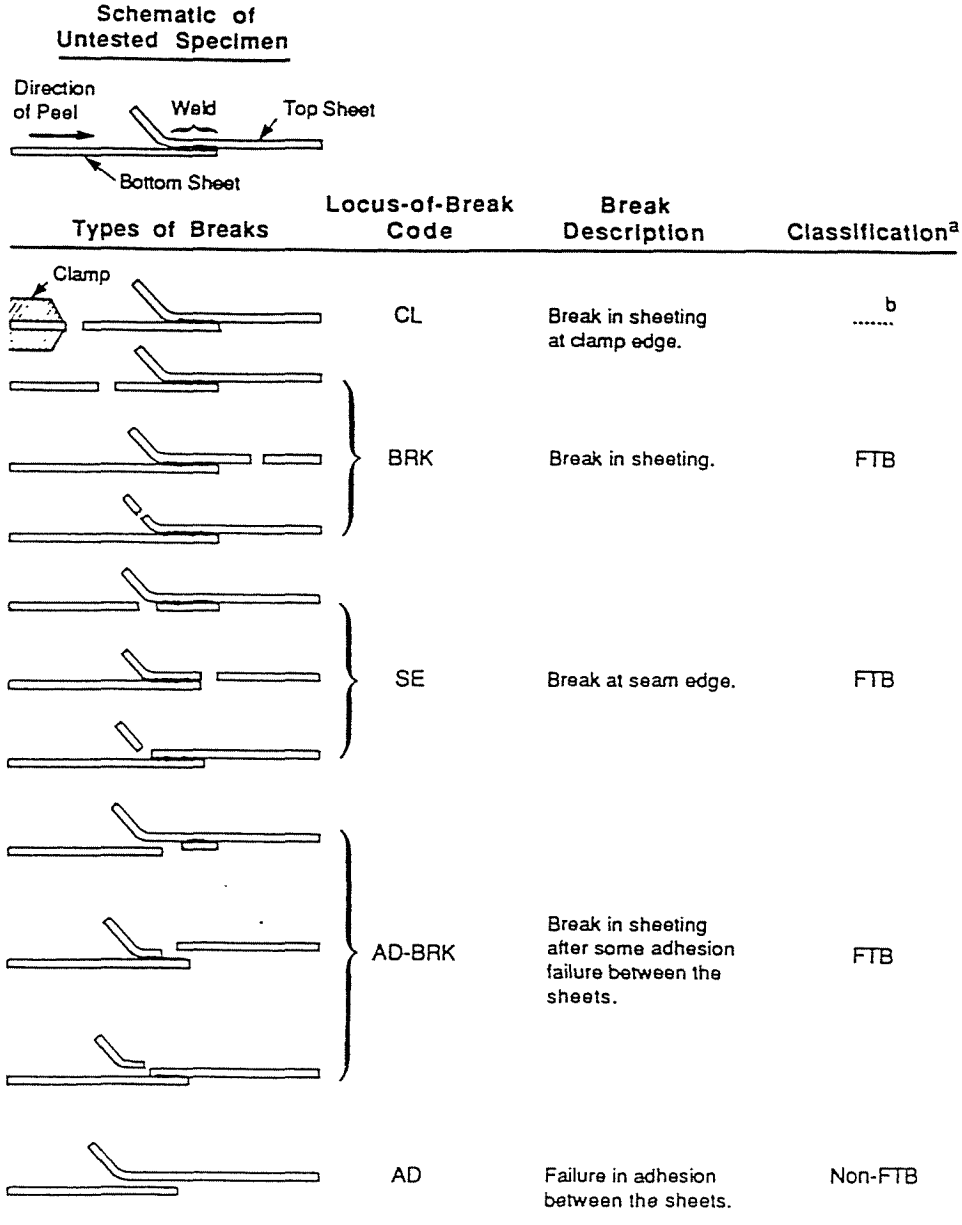
Matrecon ID number		P1033-11			P1033-12		
Client sample identification		Test Seam No. 11, Blkt Nos. 212 and 213, 7/14/93			Test Seam No. 12, Blkt Nos. 220 and 221, 7/17/93		
Thickness, mil							
Top sheet		Average = 42.5			Average = 42.2		
Bottom sheet		Average = 42.1			Average = 41.5		
Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB
Shear[b]	1	83.7	SE	...	76.5	SE	...
	2	81.9	SE	...	83.5	SE	...
	3	74.2	SE	...	86.0	SE	...
	4	85.8	SE	...	85.5	SE	...
	5	72.0	SE	...	81.3	SE	...
	Avg. =	79.5			Avg. = 82.6		
	SD =	6.1			SD = 3.9		
	CV =	7.7%			CV = 4.7%		
		Average stress, ppi			Average stress, ppi		
Peel[c]	1	20.2	...	AD	22.3	...	AD
	2	23.0	...	AD	21.8	...	AD
	3	23.6	...	AD	23.4	...	AD
	4	26.9	AD-BRK	...	20.0	...	AD
	5	19.6	...	AD	20.3	...	AD
	Avg. =	22.7			Avg. = 21.6		
	SD =	2.9			SD = 1.4		
	CV =	12.8%			CV = 6.5%		

[a]Locus-of-break codes are presented in Figure 1; FTB = film-tear bond; non-FTB = non-film tear bond.
[b]ASTM D3083/D882, as modified by NSF Standard 54 (1991), Annex A, Part 3.
[c]ASTM D4437/D413, 180°-peel (T-peel), as modified by NSF Standard 54 (1991), Annex A, Part 5.

Matrecon, Inc.
M93-277 <2047>
July 22, 1993

L123/Seam/93-277_9

ASARC0219279



[a] FTB = Film - Tear Bond.

[b] Acceptance of CL - type breaks may depend on whether test values meet a minimum specification value. In general, though, a CL - type break should be considered a "no test". If specimens for a particular sample break consistently at the clamp edge, changes in the testing procedure should be considered, e.g. changing the clamp face, using a dumbell - type specimen.

Figure 1. Locus-of-break codes for dielectrically-welded, solvent-welded, and adhesive-bonded seams in unreinforced geomembranes tested for seam strength in shear and peel modes.

ASARC0219280

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M93-277
<2047>

August 5, 1993

RECEIVED
AUG 09 1993

FAX TRANSMITTAL

Mr. Randy W. Snyder
Hydrometrics, Inc.
950 Pacific Avenue, Suite 610
Tacoma, WA 98402

Dear Mr. Synder:

Re: Strength in Shear and T-peel Modes of Four Adhesive-Bonded Field Seam Samples of 40-mil PVC Submitted by Hydrometrics, Inc. from the B & L Landfill Site (Purchase Order #11174)

Four 40-mil PVC adhesive-bonded field seam samples were submitted by Hydrometrics, Inc. for seam strength testing in shear and peel modes. The samples, which were received by Matrecon on August 3, 1993, were given Matrecon Identification Nos. P1033-13 through P1033-16. An inventory of the samples giving Hydrometrics' identification for the individual samples, the thickness of the geomembrane sheets, the average width of the seam, and the sample size is presented in Table 1.

At the time the samples were received, they still smelled of solvent, and they were heated in a 50°C oven overnight and then allowed to condition at 23°C for a minimum of 4 hours prior to testing. All testing was performed at 23 ± 1°C.

Testing of seam strength in the shear mode was performed in accordance with ASTM D882 and D3083, as modified in NSF Standard 54 (1991), Annex A, Part 3--Bonded Seam Strength. A 1-in. wide strip specimen was used. Because of the width of the seams and to prevent the specimens from having to be regripped after extending to the travel capacity of the testing machine, the initial grip separation of 4 in. plus the width of the seam, which is required by NSF Standard 54, was reduced to 2 in. for all four samples. The test specimens were placed in the testing machine such that the seam was centered between the grips, and the rate of grip separation was 20 in. per minute (ipm).

The seam strength testing in the peel mode was performed in 180° peel (T-peel) in accordance with ASTM D413 and D4437, as modified by NSF Standard 54 (1991), Annex A, Part 5--Peel Adhesion. In this test, a 1-in. wide strip specimen was used with an initial grip separation of 1 inch. The rate of grip separation was 2 ipm. The reported values were averages determined by drawing on the stress-strain chart the best average line between the maximum and minimum force values.

ASARC0219281

The results of the seam testing are presented in Tables 2 and 3, and the locus-of-break codes used in reporting the test results are presented in Figure 1.

These samples and the tested specimens will be disposed of after 10 days unless you request otherwise. If you request storage beyond this date, there will be an additional storage fee. If retention of samples is not explicitly agreed to by written contract, Matrecon assumes no responsibility or liability for retention of samples beyond the 10-day retention period.

If you have any questions regarding the test results, please contact Dr. Haxo or myself.

Sincerely,

Paul D. Haxo
Physical Testing Laboratory Manager

PDH/rmr

Attachments: 3 Tables
1 Figure

D\M93-277.007

ASARC0219282

TABLE 1. INVENTORY OF 40-MIL PVC ADHESIVE-BONDED SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FROM THE B & L LANDFILL SITE

Seam number[a]	Client's notation on individual sample	Sample size[b], in.	Seam width (avg.), in.	Liner thickness[c], mil	Date received
P1033-13	Destructive Test Seam No. 13, date seamed 7/25/93, Blkt #225 & 226, B & L Landfill	17.8 x 17.9	6.5	Top sheet: 40.3,40.3 Bottom sheet: 40.7,40.7	8/3/93
P1033-14	Destructive Test Seam No. 14, date seamed 7/25/93, Blkt #227 & 228, B & L Landfill	17.9 x 17.7	8.0	Top sheet: 42.0,41.7 Bottom sheet: 41.1,40.7	8/3/93
P1033-15	Destructive Test Seam No. 15, date seamed 7/25/93, Blkt #101 & 228, B & L Landfill	17.9 x 17.9	6.9	Top sheet: 39.8,39.6 Bottom sheet: 42.1,42.0	8/3/93
P1033-16	Destructive Test Seam No. 16, Final, date seamed 7/31/93, Blkt #113 & 108A, B & L Landfill	18.1 x 15.0	5.7	Top sheet: 39.0,39.3 Bottom sheet: 39.6,39.5	8/3/93

[a]Matrecon sample identification number.
[b]First measurement is the sample seam length.
[c]Thickness measurements made at the four corners of each sample.

Matrecon
M93-277 <2047>
August 5, 1993

D/M93-277.008

ASARC0219283

TABLE 2. SEAM STRENGTH IN SHEAR AND T–PEEL MODES OF 40–MIL PVC GEOMEMBRANE ADHESIVE–BONDED FIELD SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FROM THE B & L LANDFILL PROJECT

atrecon ID number ient sample identification		P1033–13 Test Seam No. 13, 7/25/93, Blkt Nos. 225 & 226			P1033–14 Test Seam No. 14, 7/25/93, Blkt Nos. 227 & 228		
Thickness, mil							
Top sheet		Average = 40.3			Average = 41.9		
Bottom sheet		Average = 40.7			Average = 40.9		
Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non–FTB	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non–FTB
Shear[b]	1	82.0	SE	...	73.2	SE	...
	2	80.5	SE	...	85.4	SE	...
	3	75.0	SE	...	71.5	SE	...
	4	81.4	SE	...	74.8	SE	...
	5	80.5	SE	...	72.1	SE	...
		Avg. = 79.9			Avg. = 75.4		
		SD = 2.8			SD = 5.7		
		CV = 3.5%			CV = 7.6%		
		Average stress, ppi			Average stress, ppi		
Peel[c]	1	25.1	...	AD	27.4	...	AD
	2	29.5	AD–BRK	...	27.6	...	AD
	3	24.9	...	AD	30.9	...	AD
	4	30.4	AD–BRK	...	29.6	AD–BRK	...
	5	30.1	AD–BRK	...	31.2	AD–BRK	...
		Avg. = 28.0			Avg. = 29.3		
		SD = 2.8			SD = 1.8		
		CV = 10.0%			CV = 6.1%		

[a]Locus–of–break codes are presented in Figure 1; FTB = film–tear bond; non–FTB = non–film tear bond.
[b]ASTM D3083/D882, as modified by NSF Standard 54 (1991), Annex A, Part 3.
[c]ASTM D4437/D413, 180°–peel (T–peel), as modified by NSF Standard 54 (1991), Annex A, Part 5.

Matrecon, Inc.
M93–277 <2047>
August 5, 1993

L123/Seam/93–277_10

ASARC0219284

TABLE 3. SEAM STRENGTH IN SHEAR AND T-PEEL MODES OF 40-MIL PVC GEOMEMBRANE ADHESIVE-BONDED FIELD SEAM SAMPLES SUBMITTED BY HYDROMETRICS, INC. FROM THE B & L LANDFILL PROJECT

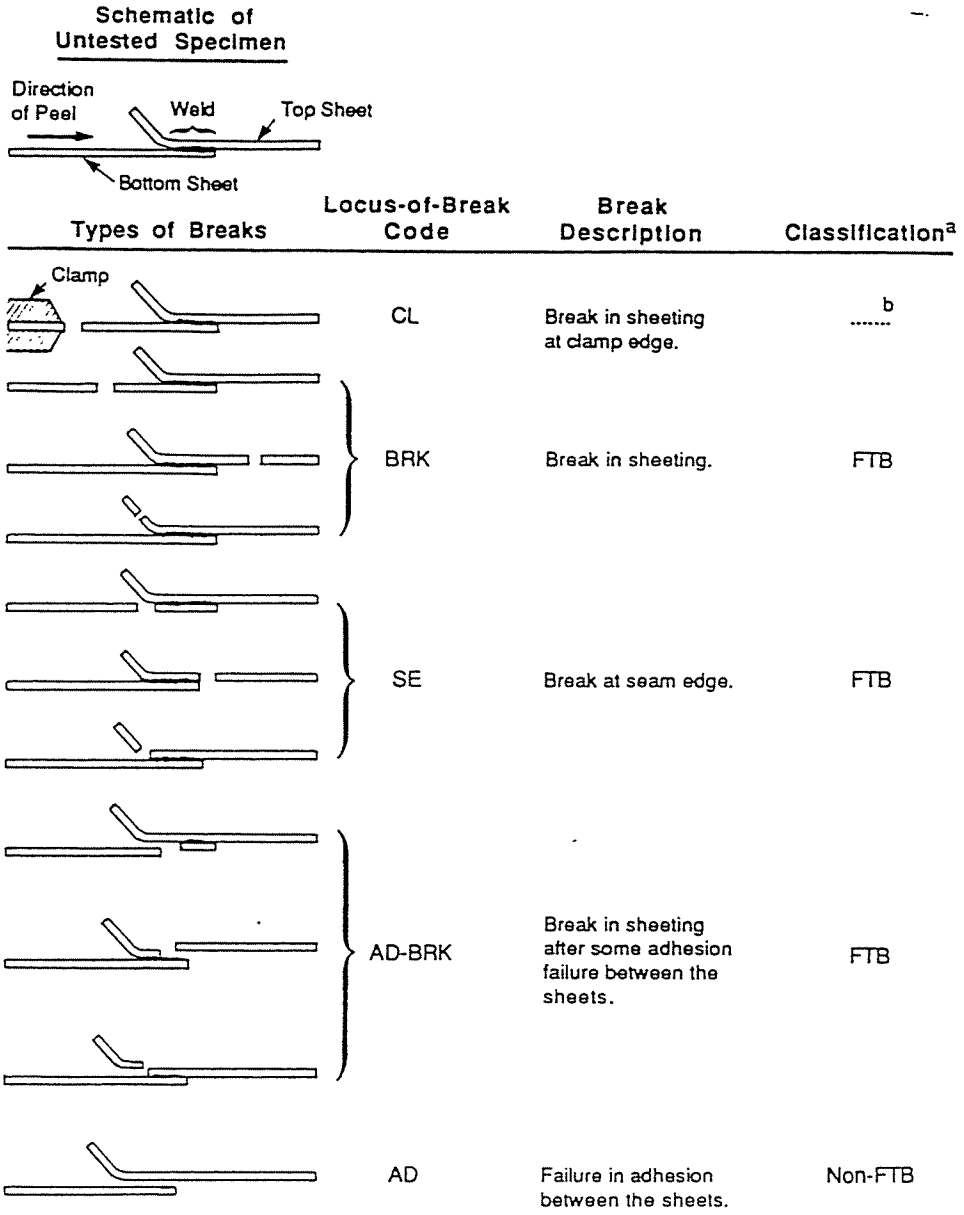
Matrecon ID number		P1033-15			P1033-16		
Client sample identification		Test Seam No. 15, 7/25/93, Blkt Nos. 101 & 228			Test Seam No. 16, 7/31/93, Blkt Nos. 113 & 108A		
Thickness, mil							
Top sheet		Average = 39.7			Average = 39.2		
Bottom sheet		Average = 42.1			Average = 39.6		
Seam test mode	Specimen number	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB	Maximum stress, ppi	Locus of break[a] FTB	Locus of break[a] Non-FTB
Shear[b]	1	73.6	SE	...	75.3	SE	...
	2	78.4	SE	...	81.1	SE	...
	3	67.3	SE	...	71.4	SE	...
	4	76.3	SE	...	85.5	SE	...
	5	72.9	SE	...	77.1	SE	...
		Avg. = 73.7			Avg. = 78.1		
		SD = 4.2			SD = 5.4		
		CV = 5.7%			CV = 6.9%		
		Average stress, ppi			Average stress, ppi		
Peel[c]	1	20.4	...	AD	9.7	...	AD
	2	20.3	...	AD	18.1	...	AD
	3	21.4	...	AD	17.9	...	AD
	4	19.5	...	AD	20.3	...	AD
	5	27.3	AD-BRK	...	16.4	...	AD
		Avg. = 21.8			Avg. = 16.5		
		SD = 3.2			SD = 4.0		
		CV = 14.7%			CV = 24.2%		

[a]Locus-of-break codes are presented in Figure 1; FTB = film-tear bond; non-FTB = non-film tear bond.
[b]ASTM D3083/D882, as modified by NSF Standard 54 (1991), Annex A, Part 3.
[c]ASTM D4437/D413, 180°-peel (T-peel), as modified by NSF Standard 54 (1991), Annex A, Part 5.

Matrecon, Inc.
M93-277 <2047>
August 5, 1993

L123/Seam/93-277_11

ASARC0219285



[a] FTB = Film - Tear Bond.

[b] Acceptance of CL - type breaks may depend on whether test values meet a minimum specification value. In general, though, a CL - type break should be considered a "no test". If specimens for a particular sample break consistently at the clamp edge, changes in the testing procedure should be considered, e.g. changing the clamp face, using a dumbell - type specimen.

Figure 1. Locus-of-break codes for dielectrically-welded, solvent-welded, and adhesive-bonded seams in unreinforced geomembranes tested for seam strength in shear and peel modes.

ASARC0219286

ENVIRONMENTAL LINERS, INC.
2009 NORTH INDUSTRIAL ROAD • CORTEZ, COLORADO 81321 • INTERSTATE 1 800-821-0531
IN COLORADO (303) 565-9540 / 565-4221 / FAX (303) 565-3844

ENVIRONMENTAL LINERS, INC.
FABRICATION
QA/QC
PROCEDURE

I FABRICATION

A. Upon initial set-up, crew chief will examine roll goods and cut a roll width sample to check MIL thickness of material, measure at each edge and center of material. These measurements will be noted on fabricaton log with appropriate roll numbers, should the thickness not be in allowable parameters the roll will be set aside and tagged and reported to the production manager. A test seam will be made at start of each shift and the start of each seam pass. These non-destructive samples will be tested, retained and noted on the production log. If test fails to pass seam requirements, the machine will be adjusted and a new seam sample made and tested until adequate seams are obtained.

As fabrication proceeds, all roll goods will be tested prior to their incorporation into the blanket being fabricated.

B. Prior to and during fabrication, all roll goods are visually inspected for pinholes, manufacturing defects and blemishes.

When any of the above are found production is immediately stopped and material replaced or patched as required. Patches will extend 2"-4" beyond flaw. Each patch will be noted on the fabrication log showing panel number and blanket number. If material can not be patched with in reason, it will be cut out of blanket and new roll goods seamed in.

C. All seams will be continually monitored with physical and visual checks. When required by specifications, an inspection mark will be stamped on the seam, maximum 48" C.C. to certify above checks. If a faulty seam is found, production is immediately stopped, the area patched per above, and machine adjusted and the seam retested.

D. All the above information is catalogued and retained on production logs for each blanket on each given project.

ENVIRO. MENTAL LINERS, I C.
2009 NORTH INDUSTRIAL ROAD • CORTEZ, COLORADO 81321 • INTERSTATE 1-800-821-0531
IN COLORADO (303) 565-9540 / 565-4221 / TELECOPIER (303) 565-8844

B & L LANDFILL
JOB #1522
MATERIAL TYPE: 40 MIL PVC

BLANKET	PASS	TEST	OPERATOR	MACHINE	DATE
101/102/103	2	F.T.B.	NED SNEAK	2	10/29/92
101/102/103	3	F.T.B.	NED SNEAK	2	10/29/92
101/102/103	1	F.T.B.	NED SNEAK	2	10/29/92
101/102/103	3	F.T.B.	NED SNEAK	2	10/29/92
101/102/103	3	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	5	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	4	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	4	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	5	F.T.B.	NED SNEAK	2	10/30/92.
101/102/103	4	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	7	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	9A	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	6	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	8A	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	8B	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	9A	F.T.B.	NED SNEAK	2	10/30/92
101/102/103	9B	F.T.B.	NED SNEAK	2	10/30/92
104 THRU 107	3	F.T.B.	MITCHELL BILLY	1	11/02/92
104 THRU 107	5	F.T.B.	MITCHELL BILLY	1	11/02/92
104 THRU 107	4	F.T.B.	MITCHELL BILLY	1	11/02/92
104 THRU 107	5	F.T.B.	MITCHELL BILLY	1	11/02/92
104 THRU 107	5	F.T.B.	MITCHELL BILLY	1	11/02/92
104 THRU 107	6	F.T.B.	MITCHELL BILLY	1	11/02/92
104 THRU 107	7A	F.T.B.	MITCHELL BILLY	1	11/03/92
104 THRU 107	7B	F.T.B.	MITCHELL BILLY	1	11/03/92
104 THRU 107	8A	F.T.B.	MITCHELL BILLY	1	11/03/92
104 THRU 107	7B	F.T.B.	MITCHELL BILLY	1	11/03/92
104 THRU 107	8A	F.T.B.	MITCHELL BILLY	1	11/03/92
104 THRU 107	8B	F.T.B.	MITCHELL BILLY	1	11/03/92
104 THRU 107	8B	F.T.B.	MITCHELL BILLY	1	11/04/92
104 THRU 107	9B	F.T.B.	MITCHELL BILLY	1	11/04/92
104 THRU 107	9A	F.T.B.	MITCHELL BILLY	1	11/04/92
104 THRU 107	9B	F.T.B.	MITCHELL BILLY	1	11/04/92
108 THRU 113	1	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	2	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	1	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	3	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	2	F.T.B.	WAYNE O'DELL	2	11/02/92
08 THRU 113	3	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	3	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	5	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	4	F.T.B.	WAYNE O'DELL	2	11/02/92

ASARC0219288

F.T.B. Test

BLANKET	PASS	TEST	OPERATOR	MACHINE	DATE
108 THRU 113	4	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	6A	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	5	F.T.B.	WAYNE O'DELL	2	11/02/92
108 THRU 113	6A	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	6B	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	7A	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	6B	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	8A	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	8B	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	7A	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	7B	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	9A	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	8B	F.T.B.	NED SNEAK	2	11/03/92
108 THRU 113	9A	F.T.B.	NED SNEAK	2	11/03/92

F.T.B. - Film Tear Bond

ENVIRONMENTAL LINERS, INC.
2009 NORTH INDUSTRIAL ROAD • CORTEZ, COLORADO 81321 • INTERSTATE 1-800-821-0531
IN COLORADO (303) 565-9540 / 565-4221 / TELECOPIER (303) 565-8844

TECA

RECEIVED
JUL 23 1993

TRANSMITTAL SHEET

To: Hydrometrics, Inc.
2727 Airport Road
Helena, MT 59601

Date July 9, 1993

Attention: Mr. Don Davis

Re: B & L Landfill Phase II

Our Job No. 1522

Gentlemen:
We are submitting ~~xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx~~ the following documents which are:

[ ] Approved
[ ] Approved as Noted
[ ] Not Approved
[X] For Your Approval
[X] For Your Records
[ ] Preliminary
[ ] Revised
[ ] As Built

Number Of Copies	Drawing Number	TITLE OR DESCRIPTION
1		Material Certifications
5		Fluid Systems, Inc., Certificate of Compliance

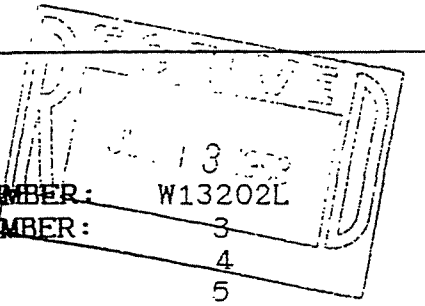
Remarks:

Per Donald R. Haley
ngs
Donald R. Haley
Project Manager

ASARC0219290

ENVIRONMENTAL LINERS, INC.
2009 NORTH INDUSTRIAL ROAD • CORTEZ, COLORADO 81321 • INTERSTATE 1-800-821-0531
IN COLORADO (303) 565-9540 / 565-4221 / TELECOPIER (303) 565-8844

THE FOLLOWING ROLL-NUMBERS REPRESENT
THE MATERIAL FABRICATED INTO BLANKETS FOR
B & L LANDFILL
JOB #1522



MATERIAL TYPE: 40 MIL PVC
(EMBOSSED ON ONE SIDE)

LOT NUMBER:	W13201L	LOT NUMBER:	W13202L	
ROLL NUMBER:	1	ROLL NUMBER:	3	11
	2		4	12
	3		5	13
	4		6	14
			7	15
			8	16
			9	19
			10	20
				23

LOT NUMBER:	W13203L		LOT NUMBER:	W13204L	
ROLL NUMBER:	1	13	ROLL NUMBER:	1	13
	2	14		2	14
	3	15		3	15
	4	16		4	16
	5	17		5	17
	7	18		6	18
	8	19		7	19
	9	20		8	20
	10	21		9	21
	11	22		10	22
	12	23		11	23
				12	

ATTACHED ARE THE MANUFACTURER'S ACTUAL CERTIFICATION TEST RESULTS FOR THE ABOVE LISTED ROLL NUMBERS. THIS IS TO SATISY THE SPECIFICATIONS REQUIREMENTS OF MATERIAL CERTIFICATIONS.

SINCERELY,

ENVIRONMENTAL LINERS, INC.

Donald R. Haley

NALD R. HALEY
JJECT MANAGER

ASARC0219291

NAN YA PLASTICS CORPORATION, AMERICA

SPEC: 40 GA
CUSTOMER: ROCHEUX CA 02
DESCRIPTION: 1.016MM X 92" 56PHR
ORDER: F350208-1
P.O. #: W13201L

TEST REPORT
PVC SHEET FOR POND LINER

DATE: 6-1-93

PROPERTY	TEST METHOD	REQUIRED		RESULTS ROLL NUMBERS #1	#10	#20	#30
Spec. Grav.	ASTM D792	1.20	& Up	1.24			
Thickness	ASTM D1593	38	& Up	41.3			
100% MOD LB/IN	ASTM D882 (Method B)	36	& Up MD	49.84			
			CD	45.05			
Tensile Strength LB/IN	ASTM D882 (Method B)	92	& Up MD	104.4			
			CD	98.5			
Elongation %	ASTM D882	350	& Up MD	408.5			
			CD	457.5			
Graves Tear LB	ASTM D1004	10	& Up MD	15.75			
			CD	15.12			
Water Extract %	ASTM D3083	-0.35	& Down	-0.14			
Volatility %	ASTM D1203	-0.5	& Down	-0.45			
Cold Crack °C	ASTM D1790	-29	& Down	PASS			
Shrinkage %	ASTM D1204	-3	& Down	-3.0			
Resistance to Soil Burial	ASTM D3083			)Formulation Used)Previously Tested)Satisfactorily			
Alkali Resistance	CRD-C872-74						

APPROVED BY _____

9 Peach Tree Hill Road • Livingston, New Jersey 07039 • Phone: (201) 992-1775 • FAX: (201) 992-9794

ASARC0219292

NAN YA PLASTICS CORPORATION, AMERICA

SPEC: 40 GA **TEST REPORT**
CUSTOMER: ROCHEUX CA 02
DESCRIPTION: 1.016MM X 92" 52PHR
ORDER: F350209-1 **PVC SHEET FOR POND LINER** **DATE:** 6-1-93
P.O. #: W13202L

PROPERTY	TEST METHOD	REQUIRED		RESULTS ROLL NUMBERS #1	#10	#20	#30
Spec. Grav.	ASTM D792	1.20 & Up		1.25	1.25	1.25	
Thickness	ASTM D1593	38 & Up		41.7	40.85	41.3	
100% MOD LB/IN	ASTM D882 (Method B)	36 & Up	MD	50.7	48.57	49.77	
			CD	49.03	47.94	48.32	
Tensile Strength LB/IN	ASTM D882 (Method B)	92 & Up	MD	98.38	99.23	98.67	
			CD	92.18	93.75	92.56	
Elongation %	ASTM D882	350 & Up	MD	404.4	413.3	400.4	
			CD	465.5	478.4	469.4	
Graves Tear LB	ASTM D1004	10 & Up	MD	16.0	16.75	16.05	
			CD	15.75	16.0	15.88	
Water Extract %	ASTM D3083	-0.35 & Down		-0.13	-0.18	-0.11	
Volatility %	ASTM D1203	-0.5 & Down		-0.5	-0.47	-0.49	
Cold Crack °C	ASTM D1790	-29 & Down		PASS	PASS	PASS	
Shrinkage %	ASTM D1204	-5 & Down		-2.7	-2.8	-3.0	
Resistance to Soil Burial	ASTM D3083			)Formulation Used)Previously Tested)Satisfactorily			
Alkali Resistance	CRD-C872-74						

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NAN YA PLASTICS CORPORATION, AMERICA

SPEC: 40 GA **TEST REPORT**
CUSTOMER: ROCHEUX CA 02
DESCRIPTION: 1.016MM X 92" 56PHR
ORDER: F350210-1 **PVC SHEET FOR POND LINER** **DATE:** 6-1-93
P.O. #: W13203L

PROPERTY	TEST METHOD	REQUIRED		RESULTS ROLL NUMBERS #1	#10	#20	#30
Spec. Grav.	ASTM D792	1.20 & Up		1.24	1.24	1.24	
Thickness	ASTM D1593	38 & Up		42.7	42.89	42.0	
100% MOD LB/IN	ASTM D882 (Method B)	36 & Up	MD	53.03	52.84	52.74	
			CD	45.90	50.41	48.58	
Tensile Strength LB/IN	ASTM D882 (Method B)	92 & Up	MD	106.9	104.2	102.4	
			CD	97.55	100.3	98.56	
Elongation %	ASTM D882	350 & Up	MD	427.4	434.4	440.1	
			CD	475.5	481.1	471.1	
Graves Tear LB	ASTM D1004	10 & Up	MD	16.75	16.72	16.55	
			CD	16.14	16.22	16.34	
Water Extract %	ASTM D3083	-0.35 & Down		-0.17	-0.13	-0.11	
Volatility %	ASTM D1203	-0.5 & Down		-0.45	-0.48	-0.43	
Cold Crack °C	ASTM D1790	-29 & Down		PASS	PASS	PASS	
Shrinkage %	ASTM D1204	-3 & Down		-3.0	-2.8	-2.56	
Resistance to Soil Burial	ASTM D3083			)Formulation Used)Previously Tested)Satisfactorily			
Alkali Resistance	CRD-C872-74						

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NAN YA PLASTICS CORPORATION, AMERICA

SPEC: 40 GA **TEST REPORT**
CUSTOMER: ROCHEUX CA 02
DESCRIPTION: 1.016MM X 92" 56PHR
ORDER: F350211-1 **PVC SHEET FOR POND LINER** **DATE:** 6-1-93
P.O. #: W13204L

PROPERTY	TEST METHOD	REQUIRED		RESULTS ROLL NUMBERS #1	#10	#20	#30
Spec. Grav.	ASTM D792	1.20 & Up		1.24	1.25	1.24	
Thickness	ASTM D1593	38 & Up		41.4	40.8	41.2	
100% MOD LB/IN	ASTM D882 (Method B)	36 & Up	MD	51.39	51.11	50.85	
			CD	46.05	47.88	46.95	
Tensile Strength LB/IN	ASTM D882 (Method B)	92 & Up	MD	104.5	108.5	105.8	
			CD	103.1	101.3	103.6	
Elongation %	ASTM D882	350 & Up	MD	423.3	430.3	426.5	
			CD	487.3	490.4	481.1	
Graves Tear LB	ASTM D1004	10 & Up	MD	16.76	16.53	16.44	
			CD	16.31	16.11	16.02	
Water Extract %	ASTM D3083	-0.35 & Down		-0.14	-0.18	-0.11	
Volatility %	ASTM D1203	-0.5 & Down		-0.47	-0.45	-0.44	
Cold Crack °C	ASTM D1790	-29 & Down		PASS	PASS	PASS	
Shrinkage %	ASTM D1204	-3 & Down		-2.8	-2.5	-2.64	
Resistance to Soil Burial	ASTM D3083			)Formulation Used)Previously Tested)Satisfactorily			
Alkali Resistance	CRD-C872-74						

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ENVIRONMENTAL LINERS, INC.
2009 NORTH INDUSTRIAL ROAD • CORTEZ COLORADO 81321 • INTERSTATE 1-800-821-0531
IN COLORADO (303) 565-9540 / 565-4221 / TELECOPIER (303) 565-8844

FACTORY SEAM TESTING LOG
B & L LANDFILL
JOB # 1522

MATERIAL TYPE: 40 MIL PVC

BLANKET	ROLL #'S	PASS	TEST RESULT	OPER.	MACHINE	DATE
109, 110	2	1	F.T.B.	NS	2	06/23/93
109, 110	1	2	F.T.B.	NS	2	06/23/93
109, 110	7	1	F.T.B.	NS	2	06/23/93
109, 110	7	3	F.T.B.	NS	2	06/23/93
109, 110	8	2	F.T.B.	NS	2	06/23/93
109, 110	8	4	F.T.B.	NS	2	06/23/93
109, 110	22	3	F.T.B.	NS	2	06/23/93
109, 110	22	6	F.T.B.	NS	2	06/23/93
109, 110	21	4	F.T.B.	NS	2	06/23/93
201 THRU 204	5	1	F.T.B.	MB	2	06/09/93
201 THRU 204	23	2	F.T.B.	MB	2	06/09/93
201 THRU 204	5	1	F.T.B.	MB	2	06/09/93
1 THRU 204	5	4	F.T.B.	MB	2	06/09/93
1 THRU 204	3	2	F.T.B.	MB	2	06/09/93
201 THRU 204	3	3	F.T.B.	MB	2	06/09/93
201 THRU 204	20	4	F.T.B.	MB	2	06/09/93
201 THRU 204	19	3	F.T.B.	MB	2	06/09/93
201 THRU 204	20	4	F.T.B.	MB	2	06/09/93
201 THRU 204	20	1	F.T.B.	MB	2	06/09/93
201 THRU 204	19	2	F.T.B.	MB	2	06/09/93
201 THRU 204	21	2	F.T.B.	MB	2	06/09/93
201 THRU 204	21	3	F.T.B.	MB	2	06/09/93
201 THRU 204	22	1	F.T.B.	MB	2	06/09/93
201 THRU 204	22	4	F.T.B.	MB	2	06/09/93
201 THRU 204	10	3	F.T.B.	MB	2	06/09/93
201 THRU 204	9	4	F.T.B.	MB	2	06/09/93
203, 204	5	3	F.T.B.	MB	2	06/09/93
203, 204	6	4	F.T.B.	MB	2	06/09/93
205 THRU 208	12	1	F.T.B.	RJ	2	06/23/93
205 THRU 208	11	2	F.T.B.	RJ	2	06/23/93
205 THRU 208	7	1	F.T.B.	RJ	2	06/23/93
205 THRU 208	8	2	F.T.B.	RJ	2	06/23/93
206, 210, 211	21	6	F.T.B.	EA	4	06/23/93
6, 210, 211	21	3	F.T.B.	EA	4	06/23/93
6, 210, 211	22	5	F.T.B.	EA	4	06/23/93

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206, 210, 211	22	4	F.T.B.	EA	4	06/23/93
207, 208	4	1	F.T.B.	EA	4	06/23/93
207, 208	3	2	F.T.B.	EA	4	06/23/93
207, 208	5	1	F.T.B.	EA	4	06/23/93
207, 208	5	4	F.T.B.	EA	4	06/23/93
207, 208	6	2	F.T.B.	EA	4	06/23/93
207, 208	6	3	F.T.B.	EA	4	06/23/93
207, 208	11	3	F.T.B.	EA	4	06/23/93
207, 208	5	4	F.T.B.	RJ	2	06/24/93
207, 208	12	4	F.T.B.	RJ	2	06/24/93
209, 212	11	1	F.T.B.	RJ	2	06/24/93
209, 212	2	2	F.T.B.	RJ	2	06/24/93
209, 212	2	4	F.T.B.	RJ	2	06/24/93
209, 212	1	1	F.T.B.	RJ	2	06/24/93
209, 212	1	3	F.T.B.	RJ	2	06/24/93
209, 212	23	3	F.T.B.	RJ	2	06/24/93
209, 212	8	4	F.T.B.	RJ	2	06/24/93
209, 212	12	2	F.T.B.	RJ	2	06/24/93
210, 211	4	3	F.T.B.	EA	4	06/23/93
210, 211	3	4	F.T.B.	EA	4	06/23/93
213, 214, 215	7	4	F.T.B.	EA	4	06/24/93
213, 214, 215	13	4	F.T.B.	EA	4	06/24/93
213, 214, 215	23	1	F.T.B.	RJ	2	06/24/93
213, 214, 215	8	2	F.T.B.	RJ	2	06/24/93
213, 214, 215	10	1	F.T.B.	RJ	2	06/24/93
213, 214, 215	10	3	F.T.B.	RJ	2	06/24/93
213, 214, 215	7	2	F.T.B.	RJ	2	06/24/93
213, 214, 215	9	3	F.T.B.	RJ	2	06/24/93
216, 217	13	2	F.T.B.	MB	2	06/28/93
216, 217	14	1	F.T.B.	MB	2	06/28/93
216, 217	9	1	F.T.B.	MB	2	06/28/93
216, 217	6	1	F.T.B.	MB	2	06/28/93
216, 217	6	4	F.T.B.	MB	2	06/28/93
216, 217	4	2	F.T.B.	MB	2	06/28/93
216, 217	4	3	F.T.B.	MB	2	06/28/93
216, 217	5	3	F.T.B.	MB	2	06/28/93
216, 217	5	2	F.T.B.	MB	2	06/28/93
216, 217	18	4	F.T.B.	MB	2	06/28/93
218, 219	5	3	F.T.B.	MB	2	06/28/93
218, 219	18	1	F.T.B.	MB	2	06/28/93
218, 219	12	1	F.T.B.	MB	2	06/28/93
218, 219	12	4	F.T.B.	MB	2	06/28/93
218, 219	14	3	F.T.B.	MB	2	06/28/93
218, 219	17	4	F.T.B.	EA	4	06/28/93
218, 219	17	6	F.T.B.	EA	4	06/28/93
218, 219	14	5	F.T.B.	EA	4	06/28/93
218, 219	13	5	F.T.B.	EA	4	06/28/93
218, 219	7	6	F.T.B.	EA	4	06/28/93

220, 221	13	2	F.T.B.	EA	4	06/28/93
220, 221	7	1	F.T.B.	EA	4	06/28/93
220, 221	8	1	F.T.B.	EA	4	06/28/93
220, 221	8	4	F.T.B.	EA	4	06/28/93
220, 221	16	2	F.T.B.	EA	4	06/28/93
220, 221	16	3	F.T.B.	EA	4	06/28/93
220, 221	15	4	F.T.B.	EA	4	06/28/93
222, 223	15	1	F.T.B.	MB	2	06/29/93
222, 223	15	4	F.T.B.	MB	2	06/29/93
222, 223	20	2	F.T.B.	MB	2	06/29/93
222, 223	20	3	F.T.B.	MB	2	06/29/93
222, 223	19	3	F.T.B.	MB	2	06/29/93
222, 223	23	4	F.T.B.	MB	2	06/29/93
224, 225	19	2	F.T.B.	MB	2	06/29/93
224, 225	23	1	F.T.B.	MB	2	06/29/93
224, 225	2	1	F.T.B.	MB	2	06/29/93
224, 225	2	4	F.T.B.	MB	2	06/29/93
224, 225	1	2	F.T.B.	MB	2	06/29/93
224, 225	1	3	F.T.B.	MB	2	06/29/93
224, 225	3	3	F.T.B.	MB	2	06/29/93
224, 225	4	4	F.T.B.	MB	2	06/29/93
226, 227	4	1	F.T.B.	EA	4	06/29/93
226, 227	3	2	F.T.B.	EA	4	06/29/93
226, 227	15	1	F.T.B.	EA	4	06/29/93
226, 227	15	4	F.T.B.	EA	4	06/29/93
226, 227	16	2	F.T.B.	EA	4	06/29/93
226, 227	16	3	F.T.B.	EA	4	06/29/93
226, 227	15	4	F.T.B.	EA	4	06/29/93
226, 227	16	3	F.T.B.	EA	4	06/29/93
228, 229	15	1	F.T.B.	EA	4	06/29/93
228, 229	16	2	F.T.B.	EA	4	06/29/93
228, 229	18	1	F.T.B.	EA	4	06/29/93
228, 229	18	1	F.T.B.	MB	2	06/30/93
228, 229	18	4	F.T.B.	MB	2	06/30/93
228, 229	17	2	F.T.B.	MB	2	06/30/93
228, 229	17	3	F.T.B.	MB	2	06/30/93
228, 229	13	3	F.T.B.	MB	2	06/30/93
228, 229	14	4	F.T.B.	MB	2	06/30/93
228, 229	17	2	F.T.B.	ea	4	06/29/93
230, 231	13	2	F.T.B.	MB	2	06/30/93
230, 231	14	1	F.T.B.	MB	2	06/30/93
230, 231	10	1	F.T.B.	MB	2	06/30/93
230, 231	9	2	F.T.B.	MB	2	06/30/93
230, 231	9	3	F.T.B.	MB	2	06/30/93
230, 231	4	3	F.T.B.	MB	2	06/30/93
230, 231	12	4	F.T.B.	EA	4	06/30/93
230, 231	20	4	F.T.B.	EA	4	06/30/93
230, 231	20	1	F.T.B.	EA	4	06/30/93
230, 231	3	3	F.T.B.	MB	2	06/30/93

230, 231	11	3	F.T.B.	MB	2	06/30/93
230, 231	12	4	F.T.B.	MB	2	06/30/93
232	11	2	F.T.B.	EA	4	06/30/93
232	11	3	F.T.B.	EA	4	06/30/93
232	20	4	F.T.B.	EA	4	06/30/93
232	20	1	F.T.B.	EA	4	06/30/93
232	19	3	F.T.B.	EA	4	06/30/93

F.T.B. - FILM TEAR BOND

APPENDIX C

ANALYTICAL REPORTS
FACTORY SEAMS TEST LOGS
FIELD SEAM TEST RESULTS

ASARC0219300

Appendix D

ASARC0219301

APPENDIX D

MONITORING WELL TEST HOLE LOGS

ASARC0219302

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-6A

STATE WA — COUNTY Pierce — LOCATION T 20W R 4E SEC. 5 TRACT SE, SW

SITE DESCRIPTION North of Landfill in wetlands — ELEVATION G.S. — DATE 10/26/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 15' — CASING TYPE AND DESCRIPTION 5' SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED — WELL COMPLETION DESCRIPTION Screen from 10 - 15'

REMARKS (Note bit/auger size) — Sand pack to 7' Bentonite chips to surface

4 1/4" ID 8 1/2" OD Auger

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									0-2.0' Swamp veg. root material
									2.0-3.0' Grey fine-grained sand silts Root material
3			X ASBL-9310-111 1110			3' -1 4'	50%		3.0' Grey silty, fine sand Root material moist
						4.5'-3 5.0'-3 6'-3 -5 8'-7	60%	Add water	5.0'
6			* 112 1120						6.0' Same as above
									7.0' Black to dark grey medium grain sand
									8.0'
9			* 113 1130			9' -- 10'-6 11'-9 -12	100%	65 gallons of water added	9.0' Black fine towed Grained sand
									11.0'
12			* 114 1140			13'-4 -6 -11 15'-12			12.0' Same as above
									14.0'
15			* 115 1150						15.0' Same as above
16			* 116 1200					Heaving sands	16.0' 16.5' Same as above
									17.0' Light brown to grey Organic silt, moldable, with lenses of peat

ASARC0219303

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-68

STATE WA — COUNTY Pierce — LOCATION T 20W R 4E SEC. 5 TRACT SE, SW

SITE DESCRIPTION North of Landfill in wetlands — ELEVATION G.S. — DATE 10/26/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 33' — CASING TYPE AND DESCRIPTION 5' SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED 33' — WELL COMPLETION DESCRIPTION 28-33' 20 Slot PVC screen

REMARKS (Note bit/auger size) — Sand pack to 25' Bentonite chips to surface

4 1/4" ID 8 1/2" OD Auger

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									SAME AS D - 6A
5									
10								Add water	
15								70 gallon water	
16									
17									
20			* ASBL9310 117	1305		19'-- 20' 3 3 21' 5	100%		19.0 Light brown to grey 20.0 Organic silt, peat lenses 21.0 Peat, woody
			* 118	1315		22' 1 23' 12 24' 1	100%		22.0 Same as above 23.0 24.0 Black fine to medium grain sand
25			* 119	1325		27' 12 7 13 28' 14	100%		25.0 Black fine towed sand 27.0 with silt lenses 28.0 Black fine towed sand
30			* 120	1335	---		100%		30.0
33			* 121	1345	---		100%		
35									

ASARC0219304

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-7A

STATE WA — COUNTY Pierce — LOCATION T 20W R 4E SEC. 5 TRACT SE, SW

SITE DESCRIPTION Northwest corner of property — ELEVATION G.S. — DATE 10/25/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 14.5' — CASING TYPE AND DESCRIPTION 2" PVC Sch. 40/

TOTAL DEPTH CASED 14.5' — WELL COMPLETION DESCRIPTION 5' 20 Slot Screen/PVC black to surface

REMARKS (Note bit/auger size) HSA = 4 1/4" ID 8 1/2 OD — Screen from 9.5 - 14.5' 10-20 sand

to 6.5' bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									Fill material large gravels, silty sand, light brown
3			* ASBL-9310 100 0855			3' 3 10 10	60%		3.5' 4.0' Light grey silty sand 4.5' Fine to medium 5.0' Black sand, same gravels
6			* 101 0900			5' 7 6' 6 5 5	80%		6.0' 80% Fine to medium 20% dark black sand 8.0'
9			* 102 0910			8' 9' 4 6 7 8	90%		9.0' Fine 80% to medium 20% sand black 11.0'
12			* 103 0920			11' 12' 3 7 9 14' 11	100%	Heaving sands 60 gallons added	12.0' Medium 70% to fine 30% sand black 14.5'
15									
18									

ASARC0219305

TEST HOLE LOG

PAGE 1 OF 1

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER HOLE NUMBER D-7B

STATE WA COUNTY Pierce LOCATION T 20W R 4E SEC. 5 TRACT SE, SW

SITE DESCRIPTION Northwest corner of landfill property ELEVATION G.S. DATE 10/25/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH 34' CASING TYPE AND DESCRIPTION 5'- 2" PVC 20 slot PVC Black to surface

TOTAL DEPTH CASED 33' WELL COMPLETION DESCRIPTION Set PVC screen from screen

REMARKS (Note bit/auger size) 28 - 33', 1 foot sandpack above screen (10 - 20 sand)

Bentonite chips to surface

Auger - 4 1/4 ID, 8 1/2 OD

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									Same as D-7A
5									
10									
15			* 104 1145			15' 3 7 9	100%	Added 60 gallons water	14.0 15.0 Well sorted medium to fine grained sand 17.0
			* 105			17' 12 15 18 18			18.0 Same as above with small gravels
20			1200			8	40%		20.0 21.0 Same as above
			* 106			20 3 2			22.0 Woody organic material (peat) Grey clayey silt
			107 1210			21 2 23 6 18	100%		
25			* 1220 108			25 10 11	100%		25.0 Same as above 26.0 Well sorted medium to fine grained sand
			1230 109 1240			27 14 18			
30			* 110 1250			30 7 8 3			30.0 Black fine to medium grained sand
			2e * 111 1300			32 19 34 36	100%	Heaving sands No sample	32.0
35									

ASARC0219306

TEST HOLE LOG

HYDROMETRICS

TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER _____ HOLE NUMBER D-8A

STATE WA COUNTY Pierce LOCATION T ____ R ____ SEC. ____ TRACT ____

SITE DESCRIPTION West of landfill by ditch ELEVATION G.S. _____ DATE 11/10/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH 17' CASING TYPE AND DESCRIPTION 2" PVC SCH 40 20 Slot Screen

TOTAL DEPTH CASED 15' WELL COMPLETION DESCRIPTION Screened from 10 - 15'

REMARKS (Note bit/auger size) Sand pack 7 - 15'

4 1/4" ID 8 1/2" OD Auger Bentonite chips to surface

DEPTH	LOG GRAPHICAL	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									0 Light brown fill Medium sand 80% / silt 10%
3			2*20	1320		3' 3 5 7	100%	Add water	3' 1/2" gravels 10%
						5' 7			3' Medium black sand to fine 5'
6			2*21	1335		6' 3 3 2	80%	Add water	6' Medium to fine black sand 1 lense of clay 1" thick at 7.5' 8'
						8' 6			9' Medium to fine black sands
9			2*22	1350		9' 3 3 7	80%	Add water	11'
						11' 8			12' Same
12			2*23	1400		12' 5 15 10	100%	Add water	
						14'10			14'
15			*	1415		15' 6 5 5	80%	Add water	15' Same
						17' 6			17'

ASARC0219307

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-88

STATE WA — COUNTY Pierce — LOCATION T — R — SEC. — TRACT

SITE DESCRIPTION West of landfill — ELEVATION G.S. — DATE 11/11/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 35' — CASING TYPE AND DESCRIPTION 2" PVC SCH 40 20 Slot Screen

TOTAL DEPTH CASED 33' — WELL COMPLETION DESCRIPTION Screened from 28 - 33'

REMARKS (Note bit/auger size) — Sand packed from 25 - 33'

4 1/4" ID 8 1/2" OD Auger — Bentonite chips from 0 - 25'

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									Same as D-8A
5									
10									
15								Add water	
20			* 2 25		0800	18' 4 6 8	80%		18' Medium to coarse grained black sand 80% 20% small gravels 20' 1/4" size
			* 2 26		0815	20' 12 21' 9 10 23' 10 16	80%		21' Medium to coarse black sand 23'
25			* 2 27		0830	24' 21 17 26' 14 16	80%		24' Medium to fine black sand 26'
			* 2 28		0845	27' 21 19 29' 17 22	100%		27' Same 29'
30			* 2 29		0900	30' 9 3 9 32' 12	100%		30' Same 30.5 Wood (log) 31.5 Medium to fine sand black 32'
			* 2 30		0915	35' 10 6 11 16	100%		33' Medium to fine black sand 35'
35									

ASARC0219308

TEST HOLE LOG

PAGE 1 OF 1

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-9A

STATE WA — COUNTY Pierce — LOCATION T — R — SEC. — TRACT

SITE DESCRIPTION South of landfill — ELEVATION G.S. — DATE 11/11/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 16' — CASING TYPE AND DESCRIPTION 2" PVC Sch 40 20 slot screen

TOTAL DEPTH CASED 13.5' — WELL COMPLETION DESCRIPTION Screened from 8.5 - 13.5'

REMARKS (Note bit/auger size) — Sand packs 6 - 13.5'

4 1/4" ID 8 1/2" OD Auger — Bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									0 Medium brown sand 60% 1' 40% small gravels
			ASBL 9311						
3			* 231		1230	3' 10 10 9	100%		3' Black silt 3' Fine sand 30% and silt 50% (black) Some wood
						5' 6		Water	5'
6			* 232		1245	6' 6 9 10	100%	Add water	6' Fine sand (80%) Silt (20%) black
						8' 10			8'
9			* 233		1300	9' 3 3 3	100%	Add water	9' Same as above 10' Medium to fine grained black sand
						11' 3			11' Some wood
12			* 234		1315	12' 3 3 4	100%		12' Same 13.5' Grey clay, stiff 14' with wood peat mix
13.5									
						14' 5			14' Grey silty clay
15			* 235		1320	14' 3 3 3	100%	Add water	16' Stiff high organics Wood, peat
						16' 3			

ASARC0219309

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER _____ HOLE NUMBER D-9B

STATE WA COUNTY Pierce LOCATION T ____ R ____ SEC. ____ TRACT ____

SITE DESCRIPTION South of landfill ELEVATION G.S. _____ DATE 11/11/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH _____ CASING TYPE AND DESCRIPTION 2" SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED _____ WELL COMPLETION DESCRIPTION _____

REMARKS (Note bit/auger size)

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0		ABANDONED WELL						Water flowing out of casing (stick up 2.5') Could not complete abandoned	Same as D-9A
5									
10									
15									16'
			ASBL 9311 * 236	1445	18' 5 12 12	100%		Add water	18' Grey silt 90%, some clay 10% Dense
20					20' 13				20'
			* 237	1500	21' 5 8 8	100%		Add water	21' Grey silt some organic material 23' Organic material saturated
25			* 238	1515	23' 12 24' 15 16 21	100%			24' Medium to fine black/grey sand, gravels to 3/4" size 26'
			* 239	1530	26' 32 29' 35 27' 25 30 18	100%		Add water	27' Same with 3" gravels 29'
30					28' 21				
33									
35									

ASARC0219310

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-10A

STATE WA — COUNTY Pierce — LOCATION T — R — SEC. — TRACT

SITE DESCRIPTION East of landfill by Fife Way — ELEVATION G.S. — DATE 11/09/93

RECORDED BY V.S. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 15' — CASING TYPE AND DESCRIPTION 2" SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED 15' — WELL COMPLETION DESCRIPTION Sand pack from 8 - 15'

REMARKS (Note bit/auger size) — Screened from 10 - 15'/Bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0			ASBL-9311						Sand & gravel, clay lenses, slightly dense, loose, brown with blue-grey, wood debris (trace)
			200		0800	3' 1 2 5	5%		
						5' 3 3 5		6.5'	
5						6' 5 5 5		7.5'	
			201		0805	8' 8 14 14	5%		
						9' 13 25 28			
						11'			
			202		0810	12' -- -- --	5%	9.0'	
10						14' -- --		9.5'	Blue-grey, silty sand, some gravel, damp, medium stiff
			203		0815		25%	12.0'	Clay, brown, some sand, little gravel
15									Sand, some gravel, brown
									Wet
									Coarse sand, gravel, some silt, wet

ASARC0219311

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-10B

STATE WA — COUNTY Pierce — LOCATION T — R — SEC. — TRACT

SITE DESCRIPTION East of landfill by Fife Way — ELEVATION G.S. — DATE 11/09/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH — CASING TYPE AND DESCRIPTION

TOTAL DEPTH CASED — WELL COMPLETION DESCRIPTION

REMARKS (Note bit/auger size)

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
									Same as D-10A
0									Same as D - 10A
5		ABANDONED HOLE							
10								Water	
15			X ASBL-9311	1130		15' 6, 12, 14, 17' 20	50%		15' Coarse grey-black sands 50% 50% gravels well rounded up to 3/4" in size
			205	1145		18' 14, 24, 20' 30	100%		17'
20			X 206						18' Same as above
			X 207	1200		21 12, 23' 30, 23' 30	100%		20' 3/4" gravels
25			X 208	1215		24 30, 25' 32, 26' 26	100%		21' Same as above
									23' 2" gravels
									24' 3 " gravels
									26' Coarse grey-black sand
									28' Auger Refusal
30									30'
35									

ASARC0219312

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-11A

STATE WA — COUNTY Pierce — LOCATION T — R — SEC. — TRACT

SITE DESCRIPTION Just south of Hazen property — ELEVATION G.S. — DATE 11/09/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 15' — CASING TYPE AND DESCRIPTION 2" SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED 15' — WELL COMPLETION DESCRIPTION Screened from 10 - 15'

REMARKS (Note bit/auger size) — Sand packed 7 - 15', Bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									0
3			X ASBL 9311		1600	3 6			Fill material, brown silt 30% gravels
			209			5 6	50%	3'	Brown medium grained sand 50%, 40% fine sand 10% gravels
						5 3		5'	
6			* 210		1615	6 5		6.5'	Black medium to fine grained sand
						7	80%	Water	
						8			
						8 12		8'	
9			* 211		1630	9 - 4		Heaving sands 9'	Same as above
						7	100%	11'	
						11 8			
12			* 212		1645	12 6		Added 45 gallons 12'	Same as above
						6	80%		
						12		14'	
						15			
15			* 213		1700			15'	

ASARC0219313

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-11B

STATE WA — COUNTY Pierce — LOCATION T — R — SEC. — TRACT

SITE DESCRIPTION South of Hazen property — ELEVATION G.S. — DATE 11/10/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 34' — CASING TYPE AND DESCRIPTION 2" SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED 30' — WELL COMPLETION DESCRIPTION Screen 25 - 30

REMARKS (Note bit/auger size) Sand pack 23 - 30' Bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION		DESCRIPTION AND CLASSIFICATION
0										Same as D - 11A
5										
10										
15									17'	
			ASBL 9311 * 214		0900	18' 7 15 15 20' 18	50%	Add water	18'	Black/grey sands
20									20'	Medium to fine grain
			* 215		0915	21' 4 9 13 23' 15	60%	Add water	21'	Same as above
									23'	
25			* 216		0930	24' 9 12 16 26' 15	80%		24'	Black/grey medium to fine grained sand 60%
									26'	40% gravels rounded 1/2" size
									27'	Black sand medium to fine
									28'	Reddish-brown medium grained sand
									29'	
30			* 217		0945	27' 6 8 15 29' 22	80%	Add water	30'	Grey medium to fine grained sand
			* 218		1000	30' 15 17 27 32' 30	80%	Add water	32'	
									33'	Black/grey medium to fine grained sand
35			* 219		1015	33' 5 9 19 35' 24			35'	

ASARC0219314

Appendix E

APPENDIX E

CONSTRUCTION PHOTOGRAPHS

ASARC0219316

B & L Landfill
July 1992

Photograph 1
Southeast View



Photograph 2
West View



Photograph 3
South View from
Puget Power Road



ASARC0219317

Perimeter Area
Remedial Activities



Photograph 7
Initial stripping of
woodwaste
East Side



Photograph 8
Continued stripping of
woodwaste
East Side



Photograph 9
Clean Pitrun Backfill

ASARC0219318

Perimeter Area
Remedial Activities

Photograph 10
continued stripping of
woodwaste
East Side



Photograph 11
Continued stripping of
woodwaste
East Side



Photograph 12
Continued stripping of
woodwaste
East Side



ASARC0219319



Photograph 4
Silt Fencing
West Side



Photograph 5
Silt Fencing
Dewatering System
S.W.Corner



Photograph 6
Initial shaping of
the Mound

ASARC0219320

Perimeter Area
Remedial Activities



Photograph 13
Completed Perimeter
East Side



Photograph 14
Placement of clean fill material over stripped areas
East Side



Photograph 15
placement of clean fill material over stripped areas
East Side

ASARC0219321

Photograph 16
Silt layer test pits



Photograph 17
construction of
Fillwater monitoring sump



Photograph 18
Lateral trenching



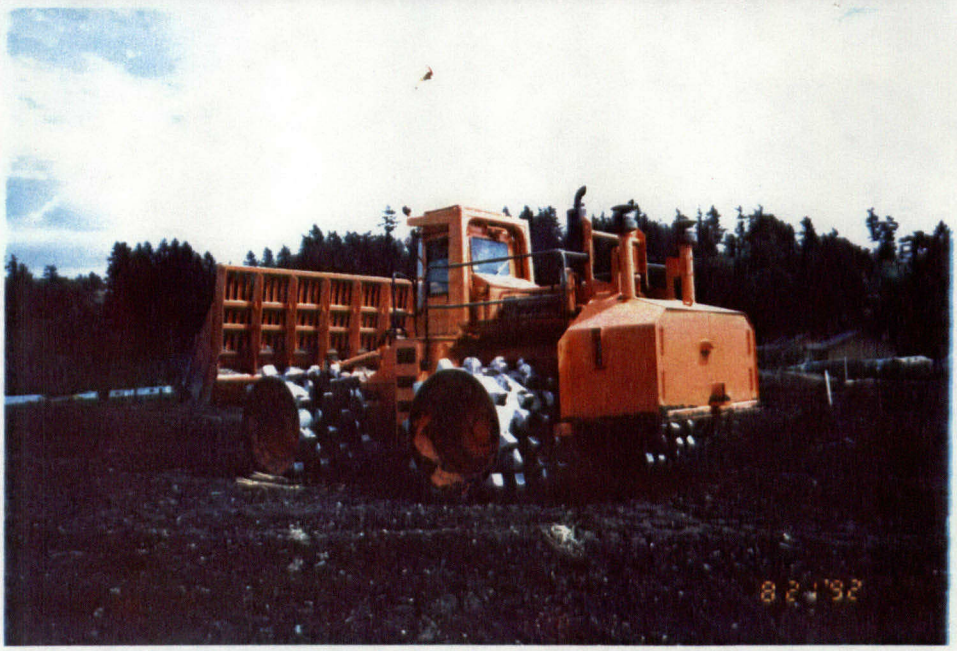
ASARC0219322



Photograph 19
Loading stripped material for transport to center of mound



Photograph 20
Depositing material near center of mound



Photograph 21
Consolidation effort with sheeps foot roller

ASARC0219323

Photograph 22
Lateral trenching, with 6"ADS pipe, 4.5 oz. non-woven geotextile



Photograph 23
1 1/2" drain rock backfill



Photograph 24
Completed lateral



ASARC0219324



Photograph 25
Installation of 6 inches of sand gas migration layer



Photograph 26
Installation of 6 inches of sand gas migration layer



Photograph 27
Steel wheel rolling of gas migration layer (synthetic liner subbase)



Photograph 28
GCL Deployment



Photograph 29
PVC Deployment

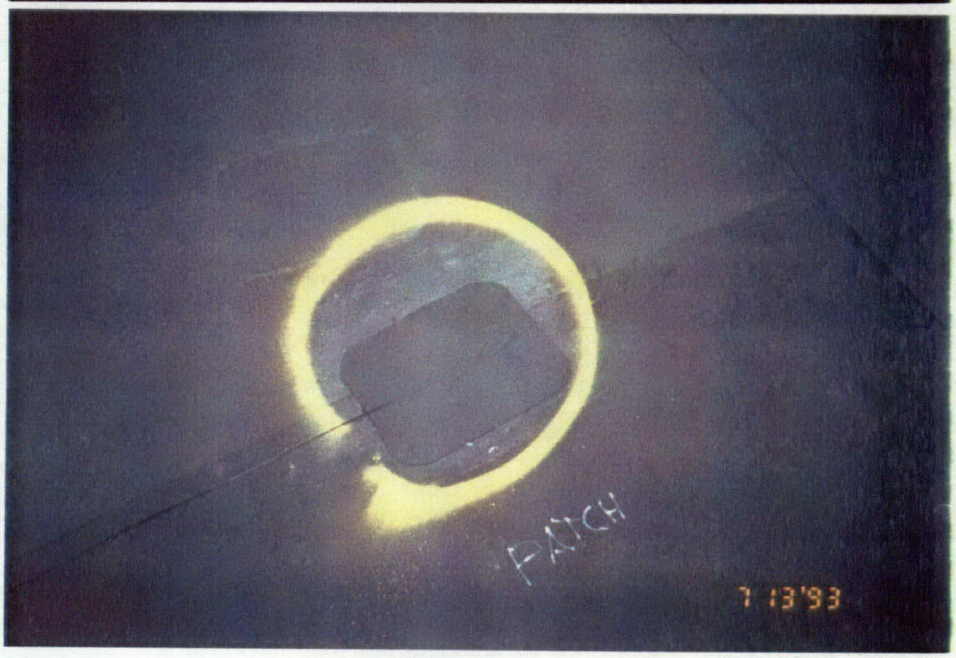


Photograph 30
PVC Seaming Process

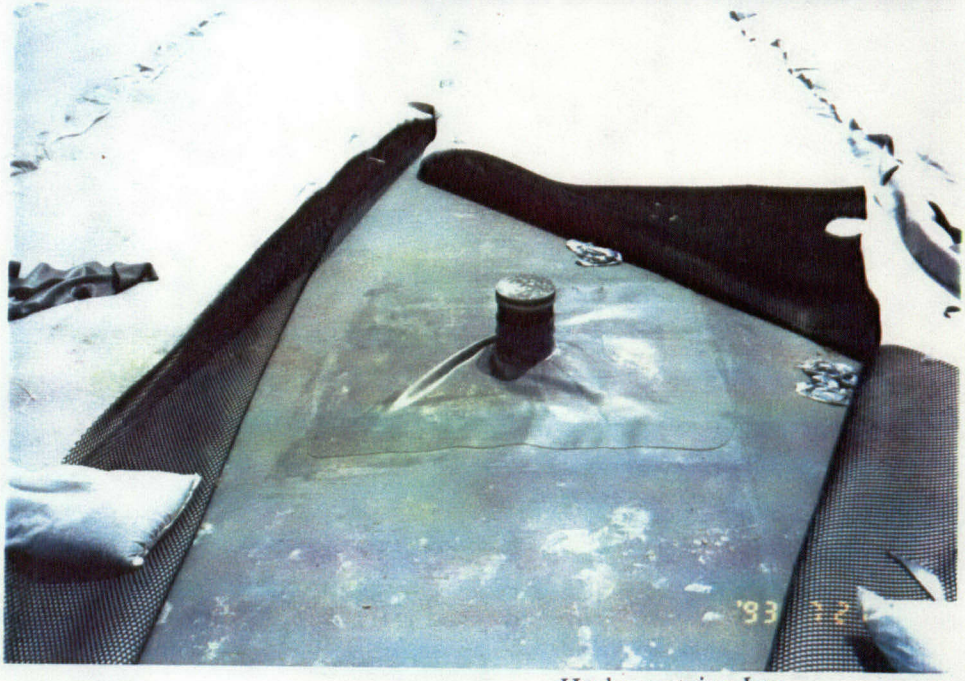
ASARC0219326



Photograph 31
Typical Destructive Sample with Patch (field seam)



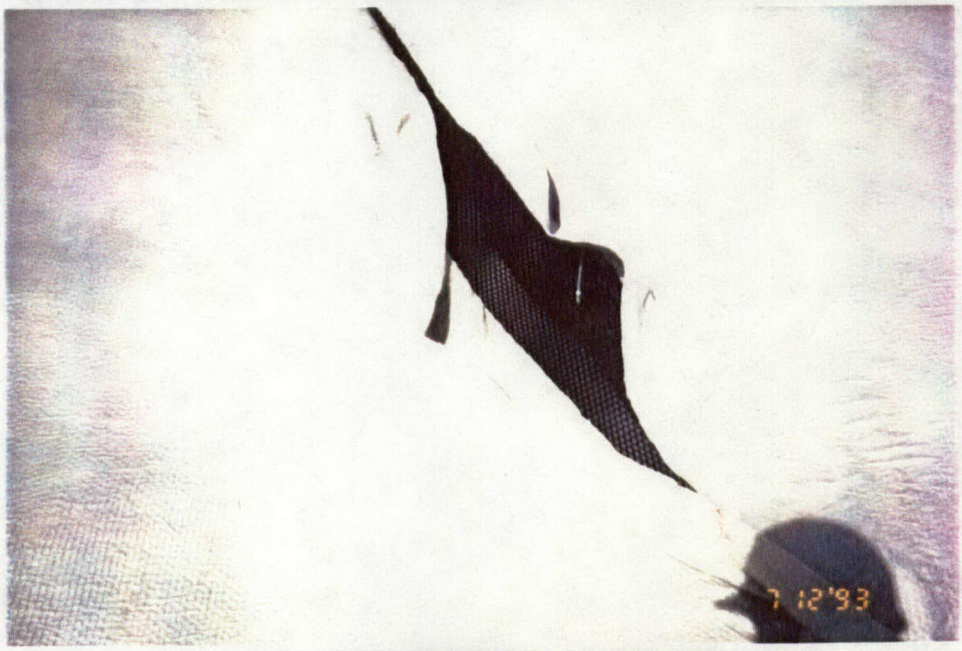
Photograph 32
Typical repair patch



Photograph 33
Typical penetration pipe boot



Photograph 34
Geonet deployment



Photograph 35
Typical overlap & tie

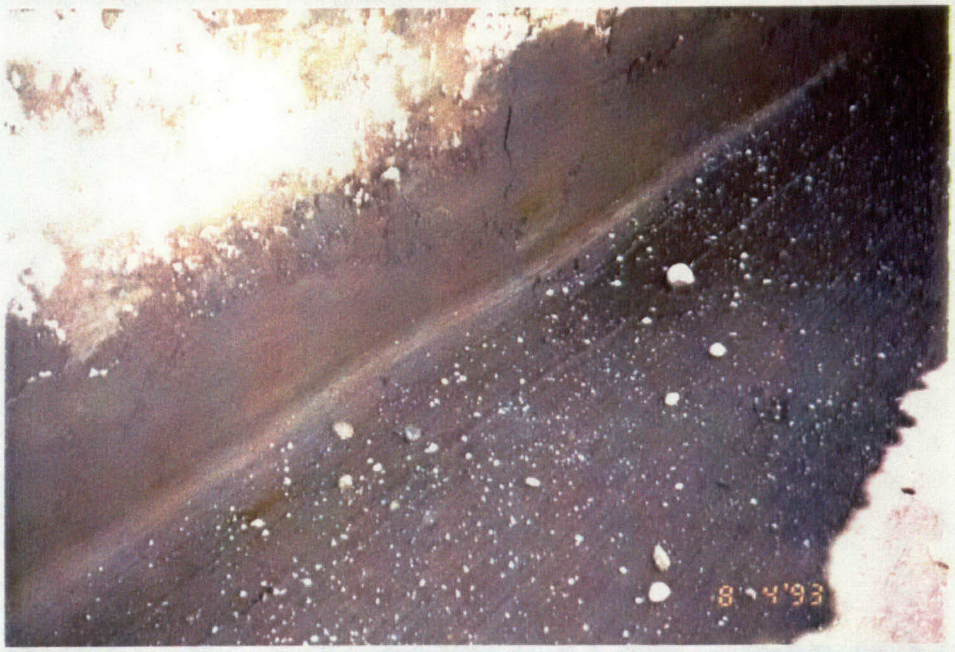


Photograph 36
GCL in anchor trench
South Side

ASARC0219328



Photograph 37
PVC in anchor trench & backfill
South Side



Photograph 38
Clay layer at anchor trench bottom
South Side



Photograph 39
Completed backfill anchor trench
West Side

Photograph 40
3-foot min. haul road over the top of the mound



Photograph 41
Final grading of Pitrun drainage material



Photograph 42
Placement of class A topsoil



ASARC0219330



Photograph 43
Completed V-Ditch prior to placement of quarry spalls South Side



Photograph 44
Quarry spalls liner placement



Photograph 45
Quarry spalls liner placement



Photograph 46
Completed V-Ditch at pond inlet location
West end of Pond



Photograph 47
Completed V-Ditch at pond inlet location
West end of pond



Photograph 48
Completed V-Ditch South-east side

Photograph 49
Final grade work on primary pond



Photograph 50
Shaping of secondary pond



Photograph 51
Perimeter road construction South Side



Photograph 52
Perimeter road compaction
East side



Photograph 53
Mound hydroseeding



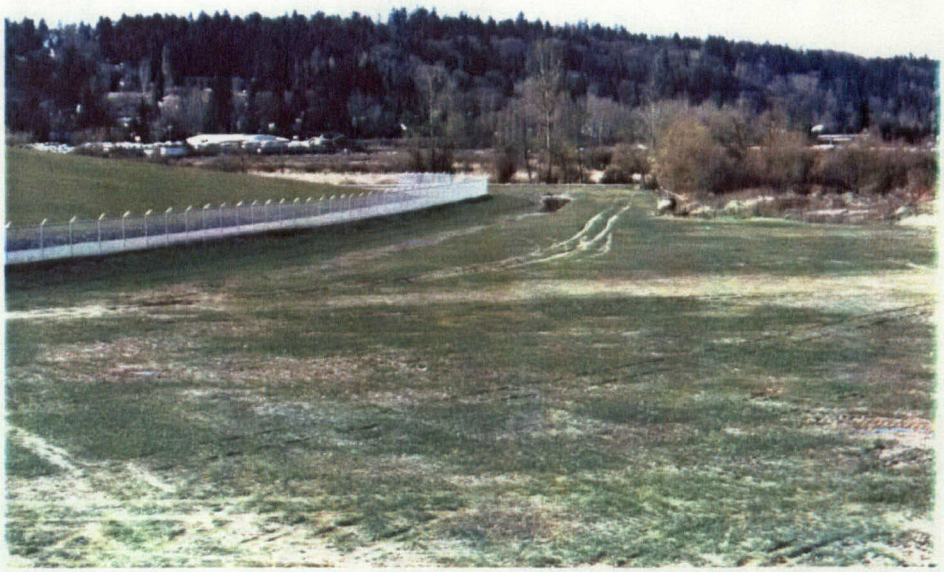
ASARC0219334



Photograph 54
View of Landfill from Fife Way entrance



Photograph 55
View of south side of landfill from Fife Way



Photograph 56
View of East side of landfill from Fife Way



Photograph 57
View of mound access road from Puget Power Road



Photograph 58
View from Perimeter Road South Side



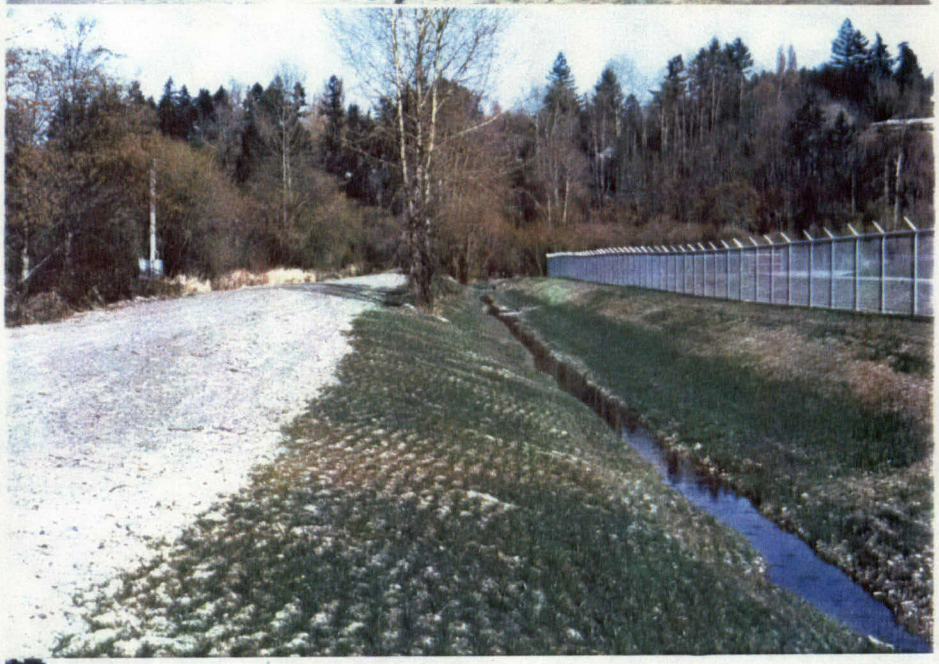
Photograph 59
View from Perimeter Road at base of mound access road North Side

ASARC0219336

Photograph 60
Primary Pond
East end



Photograph 61
Puget Power Road and ditch
North Side



Photograph 62
Secondary Pond
North end



Appendix F

ASARC0219338

APPENDIX F

RECORD DRAWINGS

ASARC0219339

B & L LANDFILL REMEDIATION

Parcel No. 042005-3-065
Portion of the SE1/4, SW1/4, of Sec.5 T.20 N. R.4 E. W.M.
Pierce County, Washington

ASARCO Incorporated

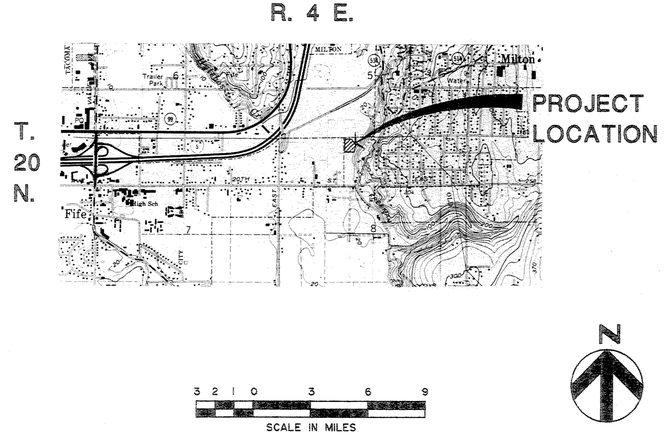
North 51st and Baltimore
Tacoma, Washington 98401
Tom Aldrich
(206) 756-0203

1993

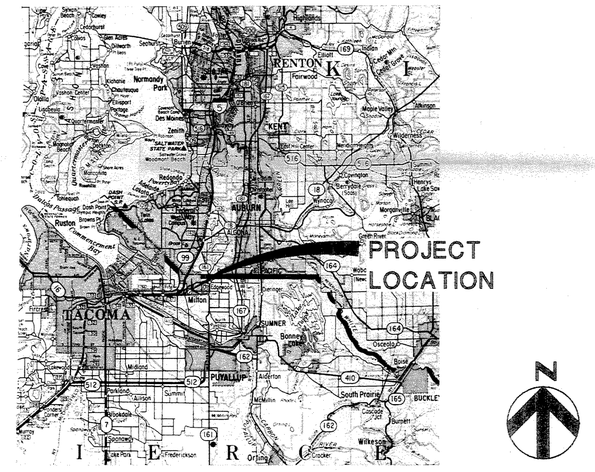
Hydrometrics, Inc.

Consulting Scientists & Engineers
950 Pacific Ave, Seafirst Center, Suite 610
Tacoma, Washington 98402
(206) 572-5481

Vicinity Map



Location Map



Drawing List

1. COVER SHEET
2. POST REMEDIATION SITE CONFIGURATION
3. CROSS SECTION DETAILS
4. FILL WATER MONITORING SYSTEM, GAS COLLECTION SYSTEM
5. 40 MIL PVC LINER DETAIL, GEOSYNTHETIC CAP DETAIL
6. GROUND WATER MONITORING NETWORK
7. CONFIRMATORY SOIL SAMPLING LOCATIONS
8. CONFIRMATORY SOIL SAMPLING LOCATIONS II

11,400.0 E | 11,600.0 E | 11,800.0 E | 12,000.0 E | 12,200.0 E | 12,400.0 E

11,000.0 N | 10,800.0 N | 10,600.0 N | 10,400.0 N | 10,200.0 N | 10,000.0 N

INV. (EL. 10.07)

INV. ORIFICE 11.04
CRST. STND PIPE (EL. 12.63)

INV. (EL. 12.42)

INV. (EL. 9.94)

CRST. STND. PIPE (EL. 13.63)

INV. ORIF. (EL. 10.63)

INV. PIPE (EL. 12.10)

PUGET POWER ACCESS ROAD (PRIVATE)

SECONDARY ROAD

PRIMARY ROAD

S.S. (EL. 18.23)

HIGH POINT (EL. 13.38)

INV. (EL. 11.89)

INV. (EL. 11.96)

INV. (EL. 12.63)

INV. (EL. 12.45)

GAS VENT NO. 3 (EL. 39.28)

GAS VENT NO. 2 (EL. 37.48)

FILL WATER MONITORING WELL (EL. 47.93)

GAS VENT NO. 4 (EL. 37.83)

HIGH POINT (EL. 51.82)

WOODWASTE LIMIT

GAS VENT NO. 7 (EL. 54.53)

GAS VENT NO. 1 (EL. 34.60)

GAS VENT NO. 5 (EL. 37.87)

GAS VENT NO. 6 (EL. 39.20)

HIGH POINT (EL. 16.15)

PIPE WAY

CONTROL POINT
PK 2-12
N. 10539.6300
E. 12621.9000
EL. 43.44

CONTROL POINT
PK 2-11
N. 10226.3700
E. 12461.6300
EL. 28.92

LEGEND

- FENCE LINE
- ACCESS ROAD
- ℄ PUGET POWER ROAD
- ℄ DITCH
- VENT NO. 1 EL. 35.3
- MW II-A (EL. 16.4)
- S.S. (EL. 18.21)
- CONTROL POINT
- EXISTING PROPERTY BOUNDARY
- CONC. PAVEMENT
- CULVERT
- CULVERT & STAND PIPE
- FLOW LINE
- WOODWASTE LIMIT

N

SCALE

50' 0 50' 100'

CONTOUR INTERVAL 2FT.

B & L Landfill Remediation
Pierce County, Washington

POST REMEDIATION SITE CONFIGURATION

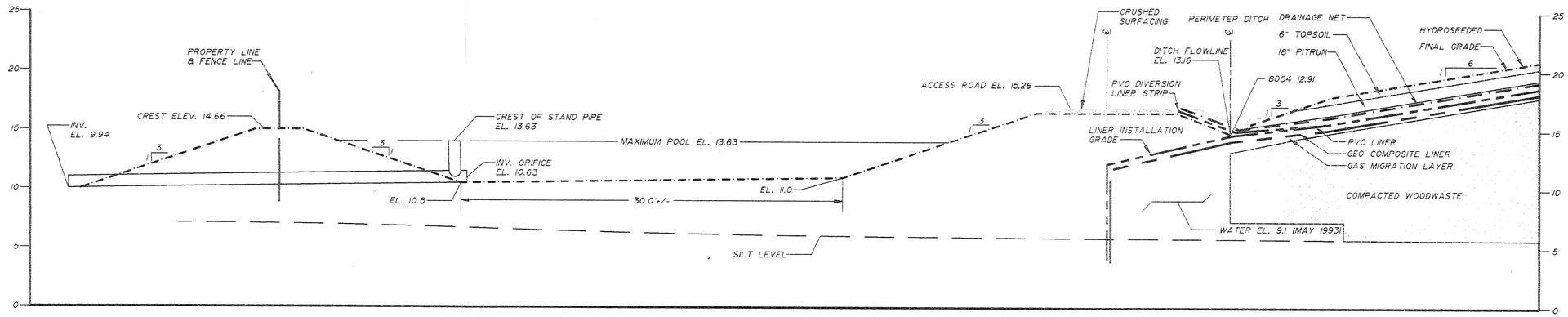
Designed: AS BUILT
Drawn By: S.T.P.
Checked By: R.J.S./J.G.N.
Approved By: J.M.G.
Date: 4/27/94
Rev. Date: NA
Project No.: ASBL06

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950 Pacific Ave, Seafirst Center, Suite 610
Tacoma, Washington 98402
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SHEET 2

BLABOIR4

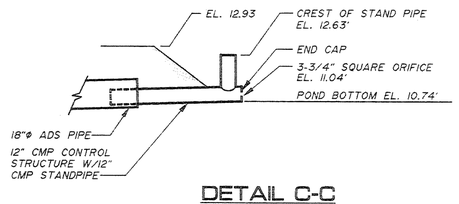
ASARC0219341



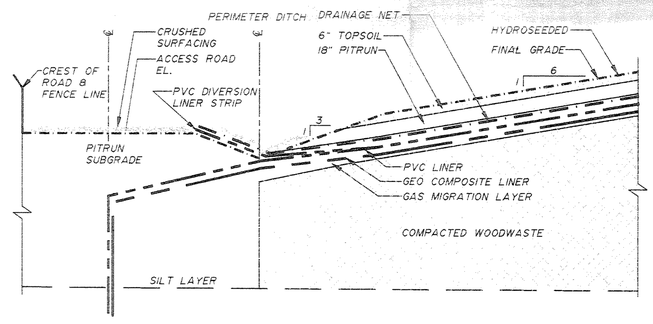
SECTION A-A
PRIMARY DETENTION POND
NOT TO SCALE



SECTION B-B
SECONDARY POND
NOT TO SCALE



DETAIL C-C
SECONDARY POND OUTLET
NOT TO SCALE



SECTION D-D
LANDFILL PERIMETER
NOT TO SCALE

B & L Landfill Remediation
Pierce County, Washington

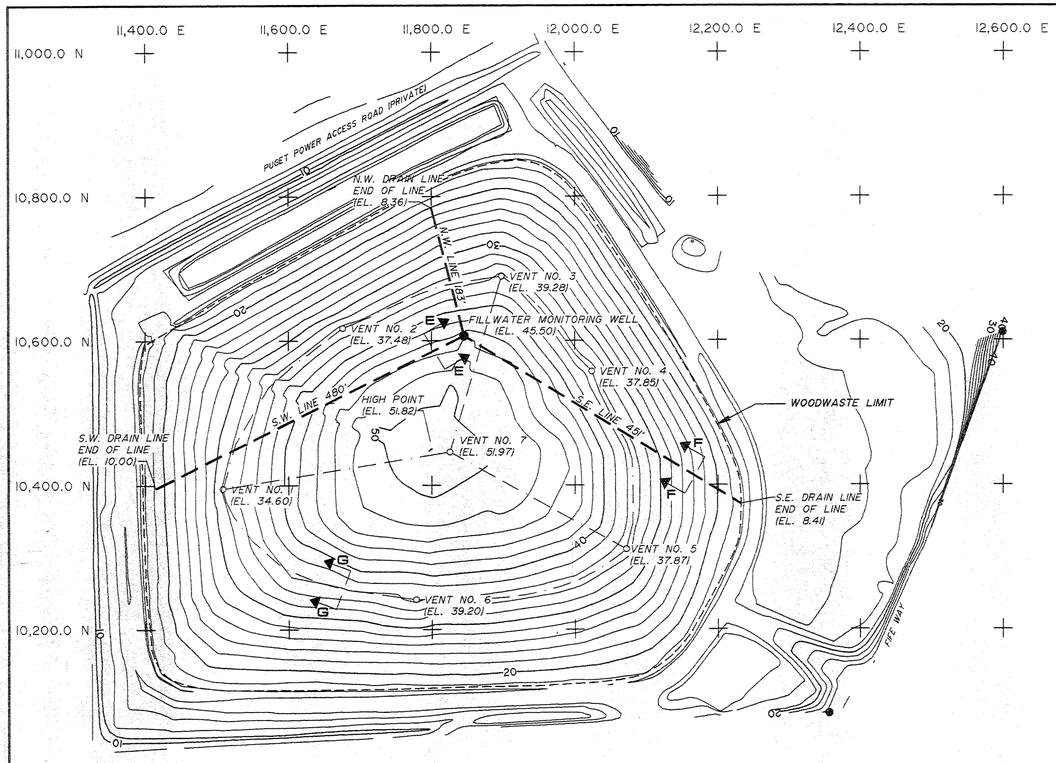
CROSS SECTION DETAILS

Designed: AS BUILT
Drawn By: S.T.P.
Checked By: R.J.S./J.G.K.
Approved By: J.G.
Date: 4/27/94
Rev. Date: 5/9/94
Project No.: ASTA05

SHEET
3

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(206) 572-5481

BL ASARC0219342



PLAN VIEW

LEGEND

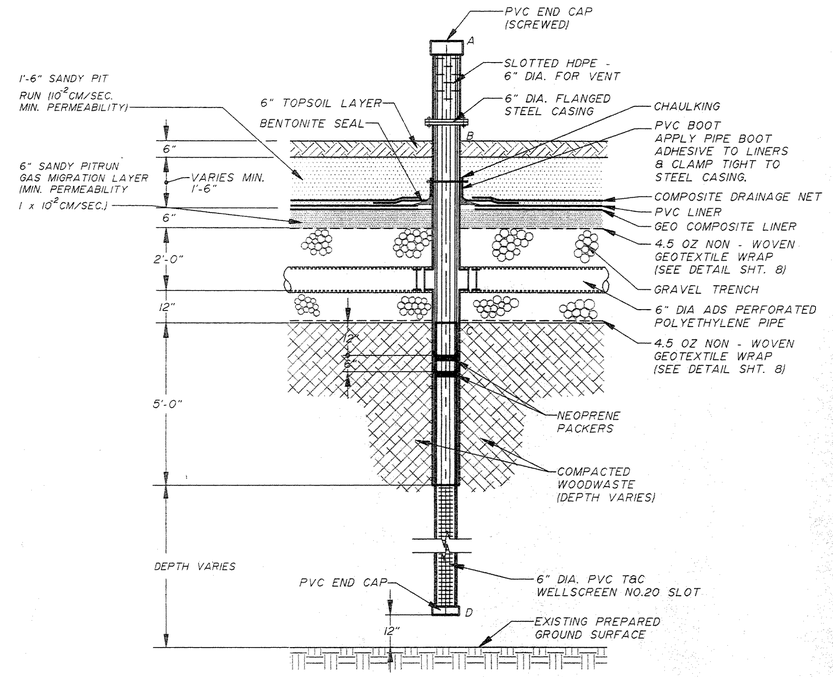
- FILLWATER MONITORING LINE
- WOODWASTE LIMIT
- GAS VENT PIPING
- VENT NO. 5 (EL. 37.87)
- FILL WATER MONITORING WELL (EL. 45.5)

N

SCALE

100' 0 100' 200'

CONTOUR INTERVAL 2FT.

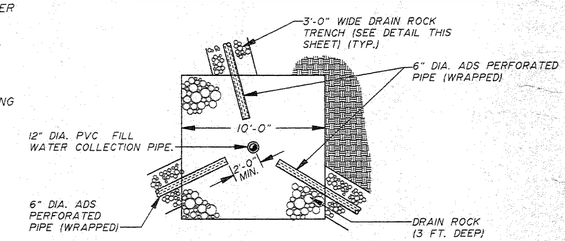


TYPICAL GAS COLLECTION VENT AND TRENCH SECTION

NOT TO SCALE

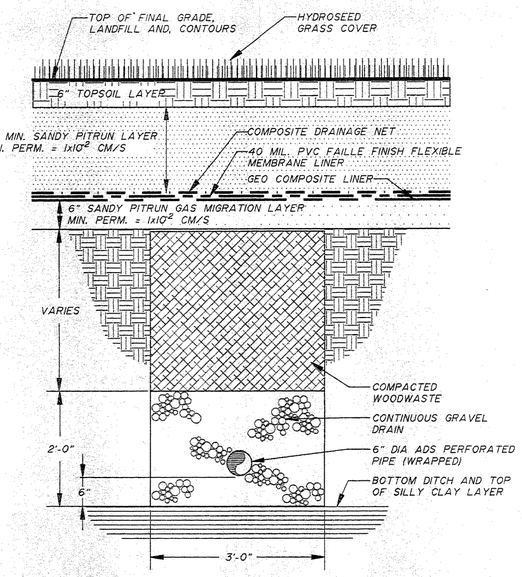
GAS VENT ELEVATION TABLE

GAS VENT NO.	A	B	C	D
GAS VENT NO. 1	34.60	31.32	27.50	10.00
GAS VENT NO. 2	37.48	33.75	30.80	10.00
GAS VENT NO. 3	39.28	35.32	30.50	10.00
GAS VENT NO. 4	37.83	34.08	30.50	10.00
GAS VENT NO. 5	37.87	34.40	30.95	10.00
GAS VENT NO. 6	39.20	35.29	30.54	10.00
GAS VENT NO. 7	54.53	50.99	47.45	9.00



FILL WATER MONITORING SUMP

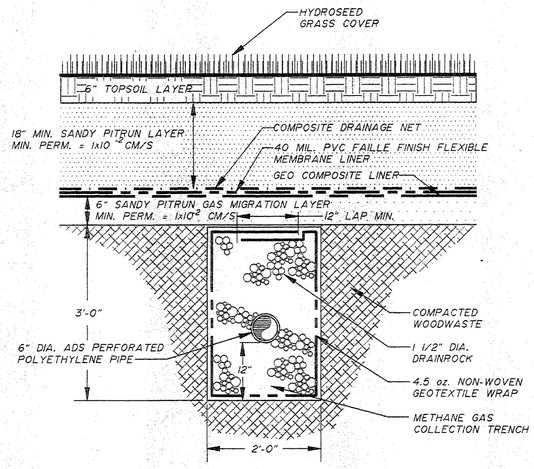
NOT TO SCALE



DETAIL F-F

TYPICAL COLLECTION TRENCH

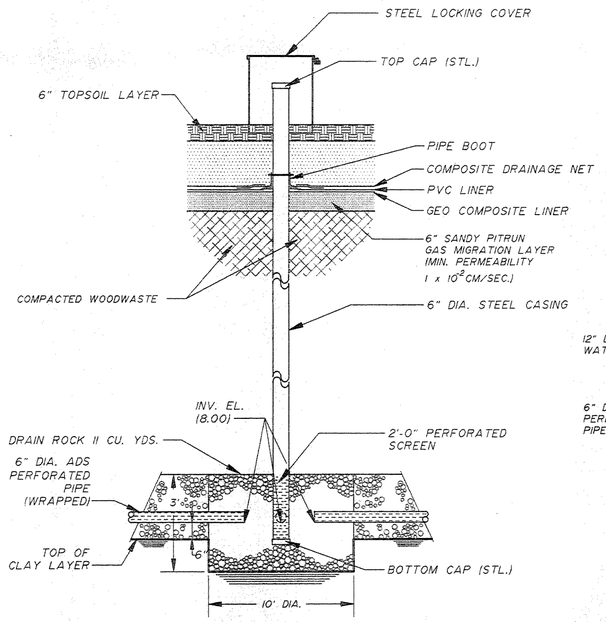
NOT TO SCALE



DETAIL G-G

LANDFILL CAP SECTION AND GAS COLLECTION PIPE NETWORK

NOT TO SCALE



DETAIL E-E

COMPLETION DIAGRAM OF FILL WATER MONITORING SUMP

NOT TO SCALE

B & L Landfill Remediation
Pierce County, Washington

FILL WATER MONITORING SYSTEM
GAS COLLECTION SYSTEM

Designed: AS BUILT
Drawn By: S.T.R.
Checked By: R.E.B./J.G.N.
Approved By: J.M.O.
Date: 6/8/94
Rev. Date: 7/7/94
Project No.: 458L06

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Consulting Scientists and Engineers
950 Pacific Ave, Seafirst Center, Suite 610
Tacoma, Washington 98402
(206) 572-5481

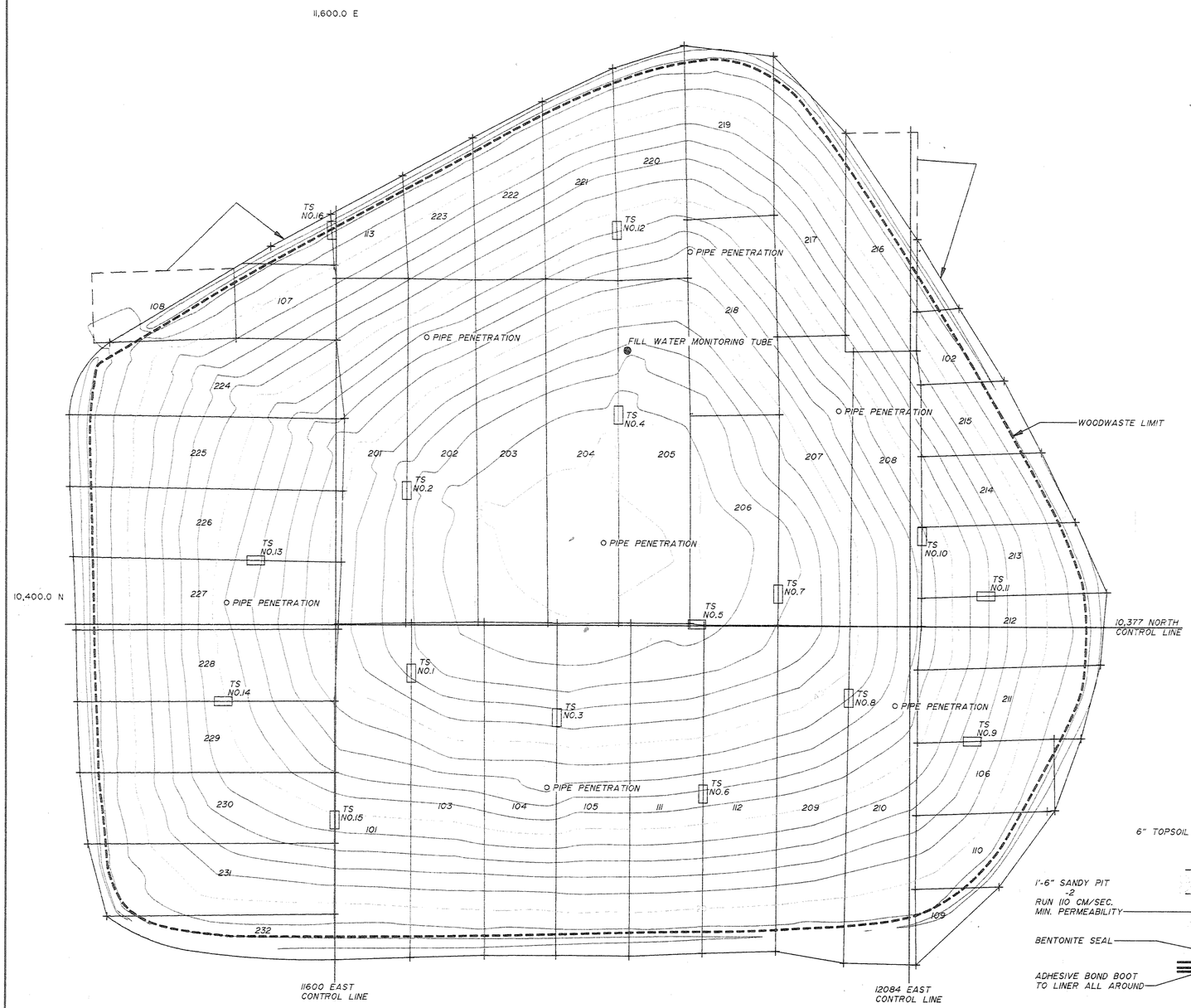
SHEET 4

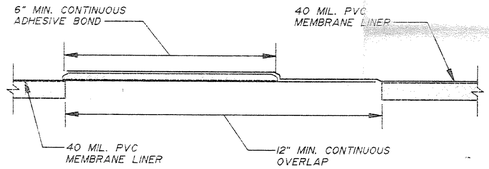
BLAB03R4

ASARC0219343

LEGEND

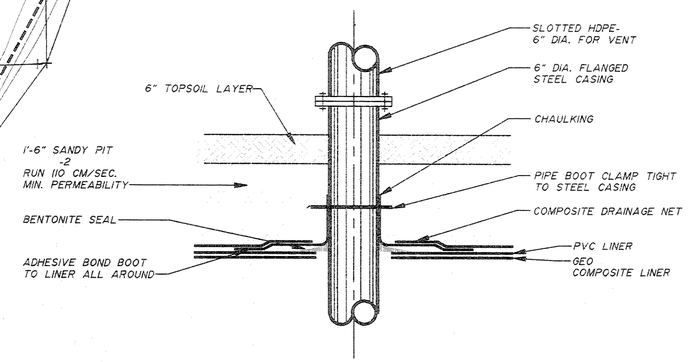
- ○ — PIPE PENETRATION
- TS NO.16 — DESTRUCTIVE SAMPLE LOCATION
- WOODWASTE LIMIT
- 210 — BLANKET NO.
- ⊛ — FILL WATER MONITORING TUBE





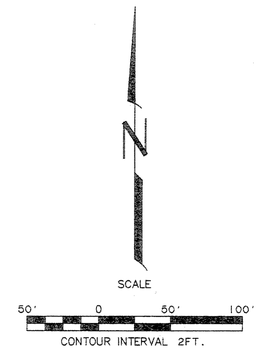
TYPICAL LINER FIELD SEAM DETAIL

NOT TO SCALE



TYPICAL PIPE BOOT DETAIL

SCALE: 1" = 1'-0"



B & L Landfill Remediation
Pierce County, Washington

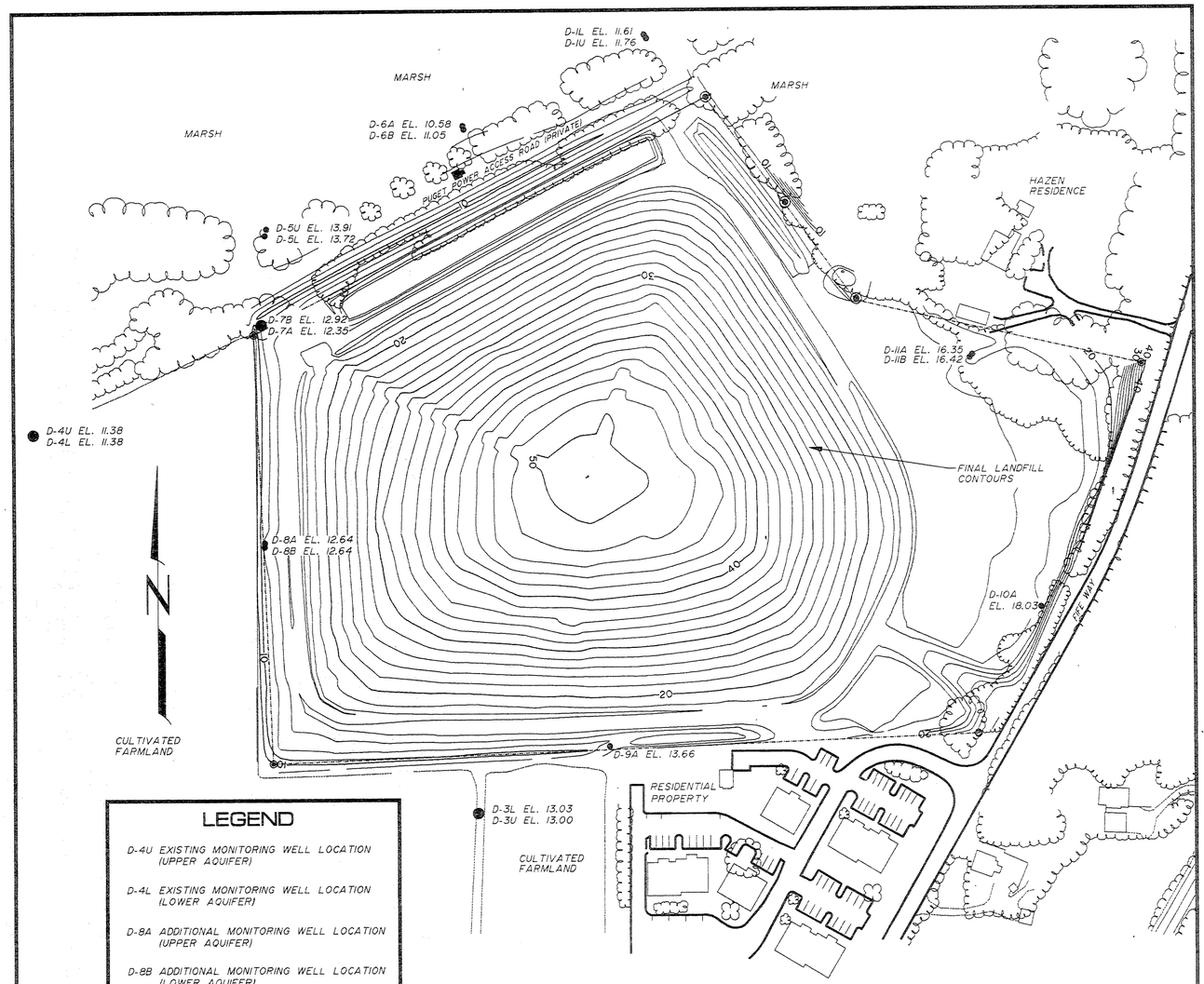
40 MIL PVC LINER DETAIL
GEOSYNTHETIC CAP DETAIL

Designed: AS BUILT
Drawn: By:S.T.R.
Checked By:R.J.S./J.G.N.
Approved: By:J.M.G.
Date: 5/2/94
Rev. Date: NA
Project No.: ASBL06

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Consulting Scientists and Engineers
950 Pacific Ave, Seafirst Center, Suite 610
Tacoma, Washington 98402
(206) 572-5481

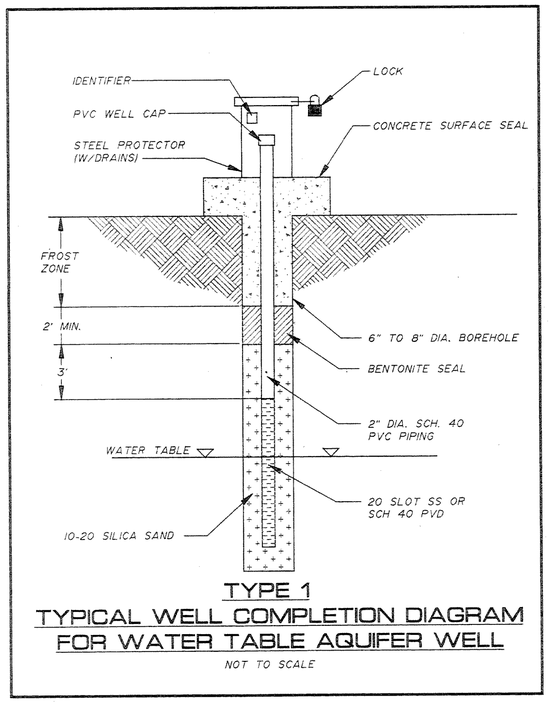
SHEET 5

ASARC0219344



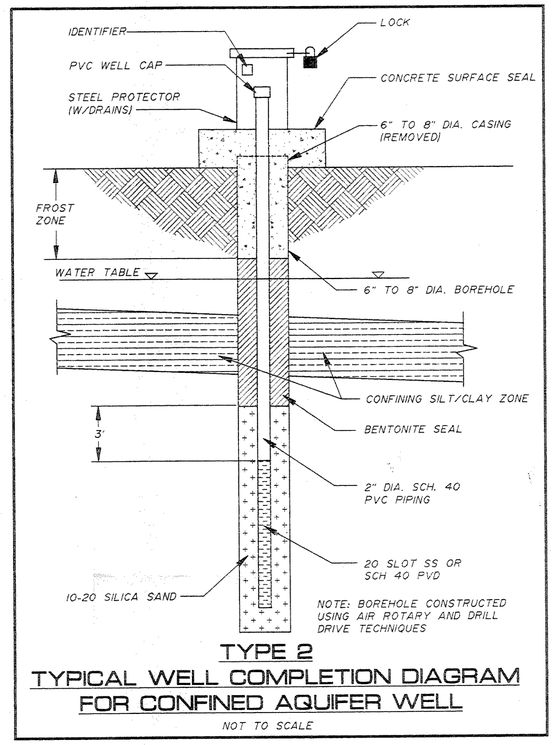
MONITORING WELL LOCATION MAP

SCALE: 1" = 100'



TYPE 1
TYPICAL WELL COMPLETION DIAGRAM FOR WATER TABLE AQUIFER WELL

NOT TO SCALE



TYPE 2
TYPICAL WELL COMPLETION DIAGRAM FOR CONFINED AQUIFER WELL

NOT TO SCALE

THESE PLANS MEET THE MIN. REQ'MTS. OF PIERCE COUNTY ORD. 90-132.

NAME

DATE

ALL WORK IN THE PUBLIC RIGHT-OF-WAY REQ'S. A PERMIT FROM THE PIERCE COUNTY PUBLIC WORKS DEPT.

FOR INSPECTIONS PLEASE CALL _____ AT 591-7250.

DATUM

NGVD

B & L Landfill Remediation
Pierce County, Washington

GROUND WATER MONITORING NETWORK

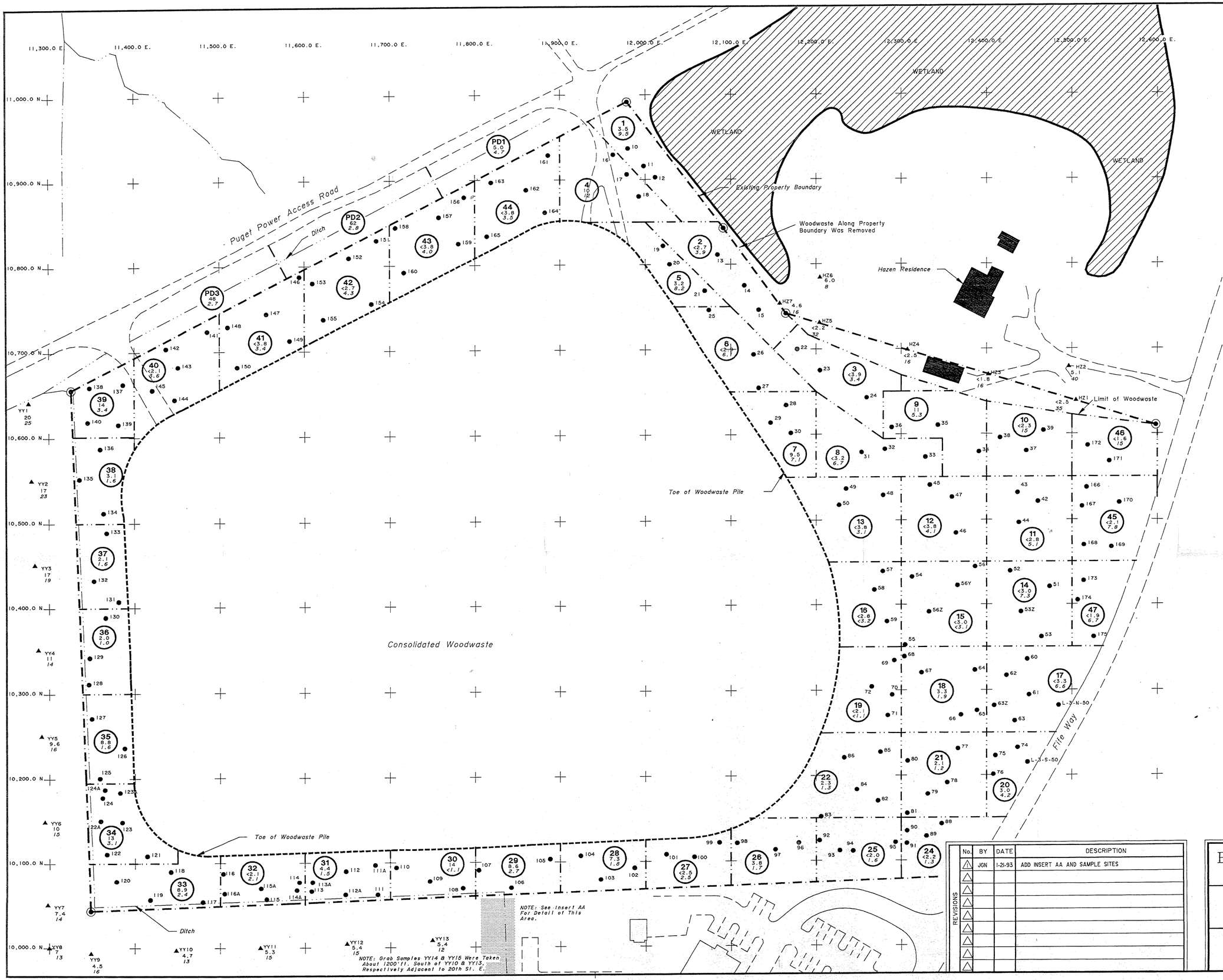
Designed: AS BUILT
Drawn By: S.T.R.
Checked By: R.J.S./J.G.N.
Approved By: J.M.G.
Date: 4/27/94
Rev. Date: 7/7/94
Project No.: ASBL06

Hydrometrics, Inc.
Consulting Scientists and Engineers
950 Pacific Ave, Seafirst Center, Suite 610
Tacoma, Washington 98402
(206) 572-5481

SHEET 6

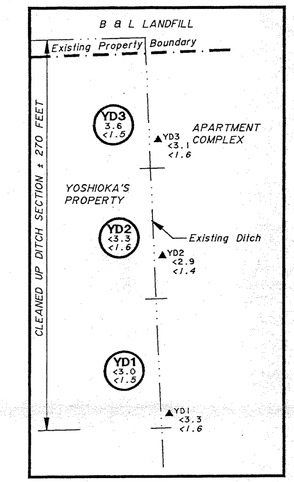
BLAB05R4

ASARC0219345



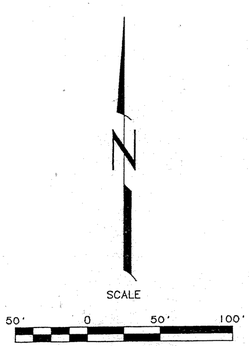
LEGEND

- Roadway
- Property Boundary
- Toe Of Woodwaste Pile
- Ditch
- ●69 Grab Sample: SAMPLE NUMBER (Before Compositing)
- ▲YY3 20 25 Grab Sample: SAMPLE NUMBER, Total Arsenic (ppm), Total Lead (ppm)
- 13 <2.3 3.2 Composite Sample: SAMPLE NUMBER, Total Arsenic (ppm), Total Lead (ppm)
- Composite Sample Site Boundary
- Wetland Area



INSERT AA

Scale: 1" = 50'



REVISIONS	No.	BY	DATE	DESCRIPTION
	1	JGN	1-21-93	ADD INSERT AA AND SAMPLE SITES

B & L Landfill Remediation
Pierce County, Washington

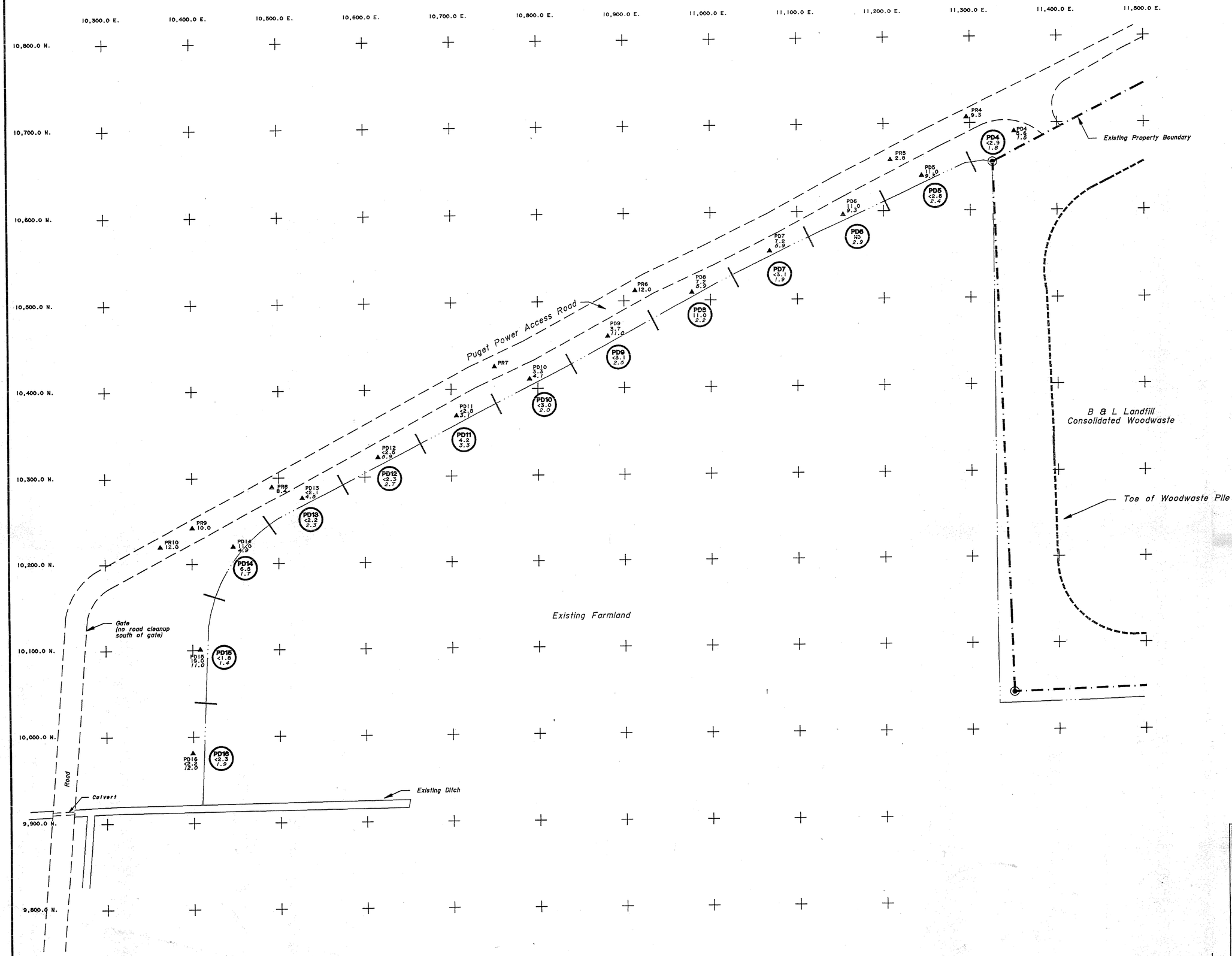
Confirmatory Soil Sampling Locations

Designed: LH
Drawn By: JGN
Checked By: B.C.S.
Approved By: B.C.S.
Date: 10/29/92
Rev. Date: 1/21/93
Project No: ASBL06

SHEET 7

Hydrometrics, Inc.
Consulting Scientists and Engineers
950 Pacific Ave, Seafirst Center, Suite 610
Tacoma, Washington 98402
(206) 572-5481

ASARC0219346



LEGEND

- Roadway
- Property Boundary
- Toe Of Woodwaste Pile
- Grab Sample: SAMPLING LOCATION / Total Arsenic (mg/kg) / Total Lead (mg/kg) — ▲PD6 9.8 11.8
- Composite Sample: SAMPLING AREA / Total Arsenic (mg/kg) / Total Lead (mg/kg) — 13 <2.3 3.2
- Composite Sample Area Boundary

Notes

1. This drawing should be read in conjunction with sheet 101.
2. The ditch and soil sampling locations are approximate only.

N

SCALE
50' 0 50' 100'

DRAFT

B & L Landfill Remediation
Pierce County, Washington

Confirmatory Soil Sampling Locations II

Designed: L.H.
Drawn: Byr.C.S.K.
Checked: Byr.K.C.S.
Approved: Byr.K.C.S.
Date: 8/28/92
Rev. Date: NA
Project No.: ASRL.06

SHEET 8

Hydrometrics, Inc.
Consulting Scientists and Engineers
950 Pacific Ave, Seafirst Center, Suite 610
Tacoma, Washington 98402
(206) 572-5481

ASARC0219347

Appendix G

APPENDIX G

INSPECTION/MAINTENANCE CHECKLIST

ASARC0219349

INSPECTION/MAINTENANCE CHECKLIST
CLOSURE CAP/SURFACE WATER MANAGEMENT FACILITIES
B & L LANDFILL PROJECT

INSPECTED BY:_____ **INSPECTION DATE:**_____

SURFACE DRAINAGE (PERIMETER AREA)

1. Perimeter Area Surface Comments

- ☐ Vegetation_____
- ☐ Erosion_____

****

2. Open Ditches Comments

- ☐ Trash & Debris_____
- ☐ Sediment_____
- ☐ Vegetation_____
- ☐ Erosion_____
- ☐ Other_____

****

3. Pipes and Culverts Comments

- ☐ Sediment & Debris_____
- ☐ Vegetation_____

ASARC0219350

☐ Damage_____

4. Detention Pond Comments

☐ Side Slopes (Erosion)_____

☐ Storage Area (Sediment)_____

☐ Pond Dikes (Settlement)_____

****

5. Control Structure Comments

☐ Trash & Debris_____

☐ Sediment_____

☐ Damage_____

SURFACE DRAINAGE (MOUND AREA)

1. Perimeter Road Comments

☐ Condition_____

☐ Settlement_____

****

2. V-Ditch Comments

☐ Trash & Debris_____

☐ Sediment_____

☐ Drainage_____

****

3. Detention Pond Comments

☐ Side Slopes(Erosion)_____

☐ Storage Area(Sediment)_____

ASARC0219351

☐ Pond Dikes(Settlement)_____

4. Control Structure Comments

☐ Trash & Debris_____

☐ Sediment_____

☐ Damage_____

****

5. Mound Area Surface Comments

☐ Vegetation_____

☐ Erosion_____

☐ Settlement_____

☐ Slope Failure(Liner Exposure)_____

****

6. Gas Vents Comments

☐ _____

****

7. Mound Access Road Comments

☐ Condition_____

☐ Settlement_____

INSPECTION SUMMARY

_____

_____

_____

_____

_____

_____

ASARC0219352

LOOSE DOCUMENTS

Hydrometrics, Inc.

950 Pacific Avenue • Suite 610 • Tacoma, WA 98402 • (206) 572-5481 • FAX (206) 572-5487

RECEIVED
AUG 1 2 1994
HELLER EHRMAN

August 10, 1994

Mr. Tom Aldrich
ASARCO Incorporated
PO Box 1677
Tacoma, WA 98401

Re: Closure Report
B & L Landfill
Pierce County, WA

Dear Tom:

In accordance with Enforcement Order No: DE 91TC-5267 issued by the State of Washington Department of Ecology, Hydrometrics, Inc. is pleased to present the Closure Report for the B & L Landfill.

Please call us at (206) 572-5481 if you have any questions.

Very truly yours,

HYDROMETRICS, INC.

James M Gillie

James M. Gillie
Project Manager

Attachment

cc: Mike Thorp, Heller, Ehrman, White & McAuliffe
Marcia Newlands, Heller, Ehrman, White & McAuliffe
Chuck Shenk, Murray Pacific Corp.
Don Robbins, ASARCO Incorporated
Dave Neubauer, Executive Bark, Inc.

B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix J
Interceptor Trench Operating Procedures

OPERATION PROCEDURES
INTERCEPTOR TRENCH LIFT STATIONS
B&L Woodwaste Site
Pierce County, Washington

1.0 OPERATION PROCEDURES, GENERAL

OVERVIEW

Introduction

This procedure outlines startup, shutdown, and maintenance procedures for routine interceptor trench lift station operation.

Pre-requisites to This Procedure

To do this procedure you must:

- Be fully trained for interceptor trench lift station operations or be training in the area with someone who has been fully trained.
- Be familiar with all aspects of this operating procedure.
- Be HAZWOPER trained and current with annual training updates.

In This Procedure

Following is a list of topics in this Procedure:

Description		See Page
Safety Considerations		2
2.0	System Description	3
3.0	Routine Startup	5
4.0	Routine Shutdown	6
5.0	Startup After Power Failure	7
6.0	Startup After Shutdown for Alarm	8
7.0	Pump Maintenance	9

SAFETY CONSIDERATIONS

Health and Safety Plan (HASP)	The HASP prepared for the B&L Woodwaste Site provides plans and requirements to protect the health and safety of workers involved in the operation and maintenance of the interceptor trench lift stations. All workers must be familiar with and sign the HASP prior to performing any work described in this procedure. Specific requirements for PPE are included in the HASP. If there are any discrepancies between PPE requirements included in these procedures and PPE requirements specified in the HASP, the requirements specified in the HASP shall be followed.
Level of Hazard	**Low** The interceptor trench lift stations contain groundwater potentially contaminated with low concentrations of arsenic. Due to the presence of Dangerous Waste within the closed landfill, all personnel working at the site must be fully trained in accordance with 29 CFR 1910 and WISHA regulations. Forty-hour Hazardous Waste Operations Training with yearly eight hour refresher training is required for anyone performing work at the B&L Woodwaste Site interceptor trench lift stations.

2.0 SYSTEM DESCRIPTION

Overview	There are two interceptor trench lift stations, Lift Station A and Lift Station B. Water entering Lift Station A is pumped to the West Pond. Water entering Lift Station B is pumped to the North Pond. The pumps in Lift Station A and Lift Station B are controlled by float switches in the respective lift stations. The pumps are operated from a control panel, described below. The locations of the two lift stations and the control panels are shown on Drawing C-6 (attached). The Process and Instrumentation Diagram is included as Drawing P-1 (attached).

Control Panel Information

The control panel contains the following switches and indicators, shown on Figure 1:

Control Power Switch: Power to control panel.

HS-A Switch: Rotary hand/off/auto switch for Lift Station A pump; controls pump operation for Lift Station A, which discharges to West Pond. OFF deactivates pump; HAND places pump in continuous, manual operation; AUTO places pump in automatic operation.

HS-B Switch: Rotary hand/off/auto switch for Lift Station B pump; controls pump operation for Lift Station B, which discharges to North Pond. OFF deactivates pump; HAND places pump in continuous, manual operation; AUTO places pump in automatic operation.

Lamp Test Switch: Momentary button switch; lights all indicators while pressed.

Reset Switch: Momentary button switch; clears alarms if alarm conditions do not exist.

Silence Switch: Momentary button switch; shuts off audible alarm.

CP Indicator: Lit when control voltage is present.

LSA Indicator: Lit when Lift Station A pump is running.

LAHH-A Indicator: Lit when Lift Station A high-high level alarm condition exists. This alarm condition is for operator notification only, and will not affect the operation of the Lift Station A pump.

LALL-A Indicator: Lit when Lift Station A low-low level alarm condition exists. This alarm is automatically lit only when Lift Station A pump is running (HAND or AUTO).

LAHH-WP Indicator: Lit when West Pond high-high level condition exists. This alarm condition will prevent the Lift Station A pump from running when HS-A is in the AUTO position.

LSB Indicator: Lit when Lift Station B is running.

LAHH-B Indicator: Lit when Lift Station B high-high level condition exists. This alarm condition is for operator notification only, and will not affect the operation of the Lift Station B pump.

LALL-B Indicator: Lit when Lift Station B low-low level condition exists. This alarm is automatically lit only when Lift Station B pump is running (HAND or AUTO).

LAHH-NP Indicator: Lit when North Pond high-high level condition exists. This alarm condition will prevent the Lift Station B pump from running when HS-B is in the AUTO position.

Visual Alarm: Flashes red when any alarm indicator is lit, until Reset switch is pressed.

Audible Alarm: Buzzes when any alarm indicator is lit, until Silence or Reset switch is pressed.

3.0 ROUTINE STARTUP

Start-up Information

When starting up the system pay close attention to the operating conditions to ensure all components are operating properly.

Procedure

Step	Startup
1	Turn the Control Power switch to the ON position. Indicator CP should light. If indicator CP does not light, then there is no power to the control panel. If there is no power to the control panel, turn all switches to the OFF position and determine the reason for absence of power.
2	Verify that alarm indicators LAHH-A, LALL-A, LAHH-WP LAHH-B, LALL-B, and LAHH-NP are not lit. If an alarm indicator is lit, note which indicator(s) is lit, then press the Reset switch.
3	Turn the HS-A switch to the AUTO position.
4	Turn the HS-B switch to the AUTO position.

Upon Completion

Follow good housekeeping practices.

Replace any tools or equipment used during this procedure. Remove any trash, etc. from the control panel and lift station areas and place in proper receptacles for disposal.

4.0 ROUTINE SHUTDOWN

Shutdown Information

Routine shutdown will be necessary in order to do maintenance on the system.

Procedure

Step	Shutdown
1	Turn the lift station pumps off by turning the HS-A and HS-B switches to the OFF position.
2	Record time of shut down and relevant observations.

Upon Completion

Follow good housekeeping practices.

Replace all tools and equipment used during this procedure. Remove any trash, etc. from the control panel and lift station areas and place in proper receptacles for disposal.

5.0 STARTUP AFTER POWER FAILURE

Start-up Information

Close attention must be paid to each component of the system during the start-up after a power failure.

Procedure

Step	Startup After Power Failure
1	Turn Control Power, HS-A, and HS-B switches to the OFF position.
2	Follow the routine startup procedure above (Section 3.0).

Upon Completion

Follow good housekeeping practices.

Replace all tools and equipment used during this procedure. Remove any trash, etc. from the control panel and lift station areas and place in proper receptacles for disposal.

6.0 STARTUP AFTER SHUTDOWN FOR ALARM

Start-up Information

Close attention must be paid to each component of the system during the startup after a shutdown due to an alarm.

Procedure

Step	Startup After Shutdown for Alarm
1	Note which alarm indicator(s) are lit.
2	Press Reset switch. Note which alarm indicator(s) re-light when Reset switch is released. Record alarm conditions in the log book.
3	Assess and correct the alarm condition that caused the shutdown. If the condition causing the alarm cannot be corrected (e.g., high level in infiltration pond), the system cannot be restarted and will be left in alarm condition.
4	If the alarm condition has been corrected, turn Control Power, HS-A, and HS-B switches to the OFF position.
5	Follow the routine startup procedure above (Section 3.0).

Upon Completion

Follow good housekeeping practices.

Replace all tools and equipment used during this procedure. Remove any trash, etc. from the control panel and lift station areas and place in proper receptacles for disposal.

7.0 PUMP MAINTENANCE

Pump Information

The pumps located in Lift Station A and Lift Station B must be maintained to ensure performance. Routine maintenance requirements are addressed by this procedure. The pump intakes and in-line Y-strainers should be inspected and cleaned if necessary.

Tools/Supplies

Pipe Wrench
Slip Joint Pliers

Personal Protective Equipment

Safety Glasses	Nitrile Gloves

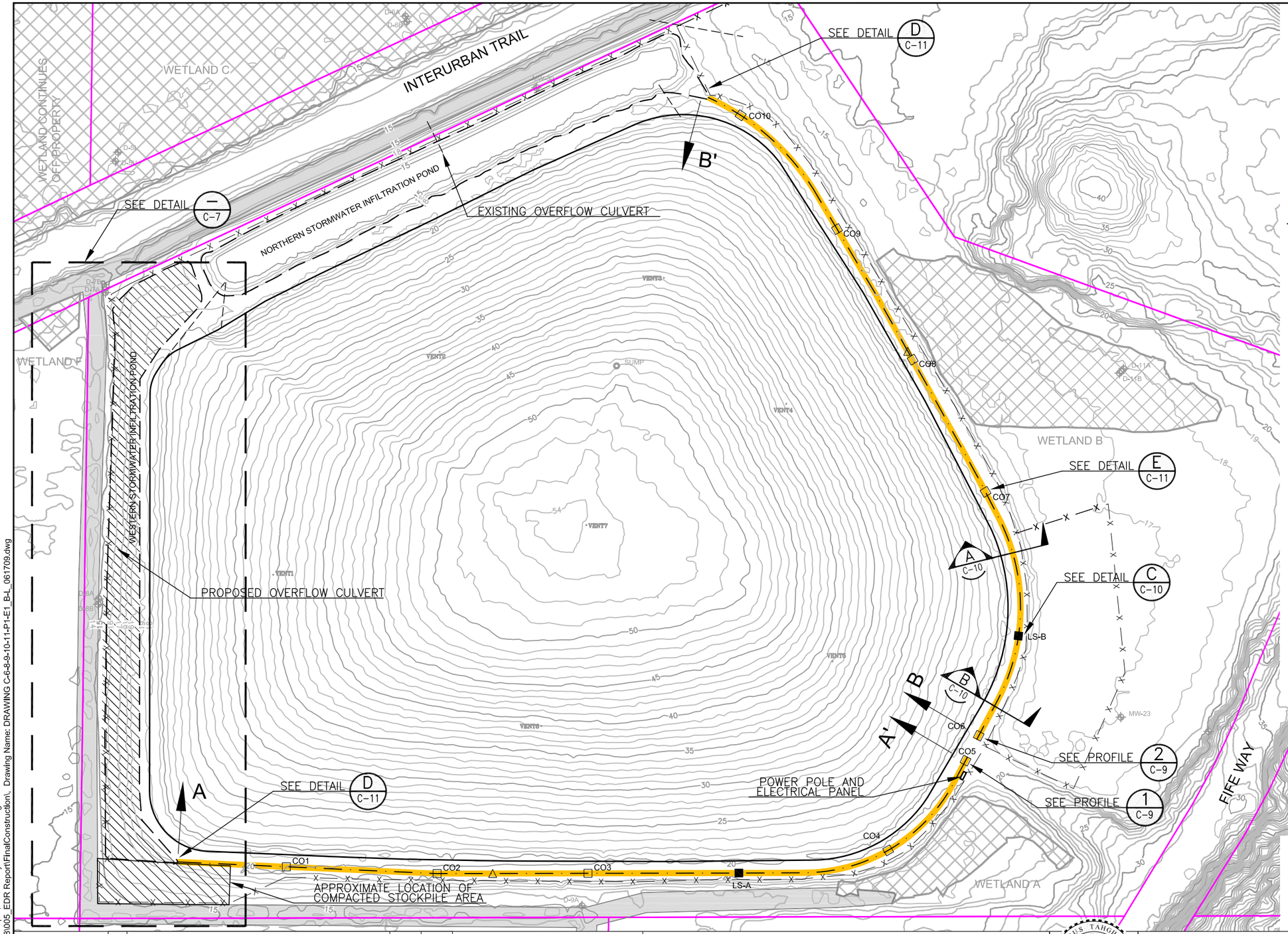
Procedure

Step	Pump Maintenance
1	After donning the above PPE, open the lift station vault lid.
2	Disconnect pump discharge line.
3	Lift pump to allow access to intake screen on underside of pump. Wipe or brush screen to clear mud or debris that may be present.
4	Reconnect pump discharge line.
5	Remove, clean, and reinstall Y-strainer.

Upon Completion

Follow good housekeeping practices. Remove any trash, used PPE, mud/debris from maintenance, etc. from the work area and place in proper receptacles for disposal.

DRAWINGS AND FIGURES



EXPLANATION

- BARRIER WALL ALIGNMENT
- TAX PARCEL LINE
- FENCE LINE
- APPROXIMATE EXTENT OF STORMWATER INFILTRATION POND
- 12" DIAMETER CULVERT
- MONITORING WELL LOCATION
- VENT LOCATION
- AGRICULTURAL DITCH
- WETLAND
- APPROXIMATE LOCATION OF GROUNDWATER INTERCEPTION TRENCH
- GRAVITY DRAIN PIPE
- APPROXIMATE LOCATION OF LIFT STATION
- APPROXIMATE LOCATION OF CLEANOUT VAULT
- APPROXIMATE LOCATION OF JUNCTION BOX
- AREA OF TOPSOIL REMOVAL

NOTES:

1. THERE IS KNOWN GROUNDWATER CONTAMINATION ON SOUTH AND WEST SIDES OF THE LANDFILL. IMPLEMENT APPROPRIATE WORKER PROTECTION MEASURES WHEN ENCOUNTERING GROUNDWATER. SOIL CONTAMINATION REQUIRING WORKER PROTECTION HAS NOT BEEN ENCOUNTERED OUTSIDE THE LANDFILL FOOTPRINT.
2. THE INTERCEPTOR TRENCH SYSTEM CONSISTS OF TWO PIPING TRENCHES WITH LIFT STATIONS AND CLEANOUTS, TWO ELECTRICAL TRENCHES, AND TWO INFILTRATION PONDS. THE INFILTRATION POND ON THE NORTH OF LANDFILL ALREADY EXISTS.
3. PIPING TRENCHES AND ELECTRICAL TRENCHES SHALL BE APPROXIMATELY 7 AND 11 FT FROM THE OUTER EDGE OF BARRIER WALL, RESPECTIVELY.
4. THE WORK SEQUENCE AND STEPS SHALL INCLUDE MEASURES TO PREVENT SPREAD OF CONTAMINATION. SUCH MEASURES MAY INCLUDE STRIPPING THE TOP SEVERAL INCHES OF PERIMETER ROAD TO REMOVE SOIL IMPACTED BY BARRIER WALL CONSTRUCTION. INCORPORATE REMOVED SOIL INTO THE LANDFILL.
5. TRANSFER GROUNDWATER FROM EXCAVATION DEWATERING THAT MAY BE REQUIRED INTO NORTH INFILTRATION POND. ANY TREATMENT AND OFFSITE DISPOSAL OF WATER FROM NORTH POND WILL BE DONE BY OTHERS.
6. AT THE COMPLETION OF TRENCH AND INFILTRATION POND CONSTRUCTION, REMOVE SEDIMENT FROM BOTTOM OF NORTH INFILTRATION POND AND INCORPORATE INTO THE LANDFILL. ENGINEER WILL DETERMINE DEPTH OF EXCAVATION AND WHETHER TO PLACE GRAVEL (1 TO 2 INCH DIAMETER) ON THE BOTTOM OF NORTH INFILTRATION POND.

N

0 50 100

APPROXIMATE SCALE IN FEET

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP–NAD83–S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD
1	ISSUED FOR AGENCY REVIEW	6/16/09	
2	ISSUED FOR CONSTRUCTION	6/29/09	KT

DRAWN AS
DESIGNED MZ
CHECKED KT
REVIEWED LM

FLOYD | SNIDER
AMEC Geomatrix

KOOROSH TAHGHIGHI
STATE OF WASHINGTON
32240
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES

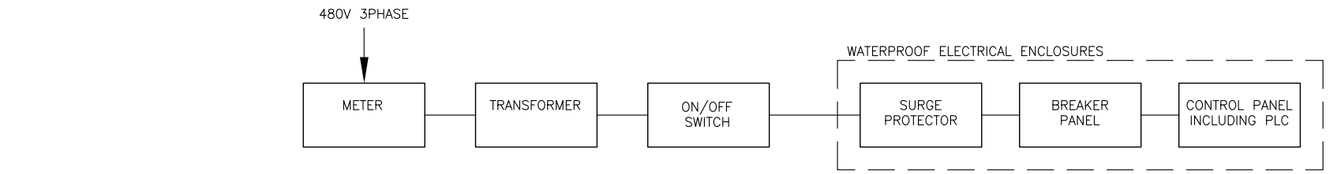
INTERCEPTOR TRENCH SYSTEM
ADDENDUM 1

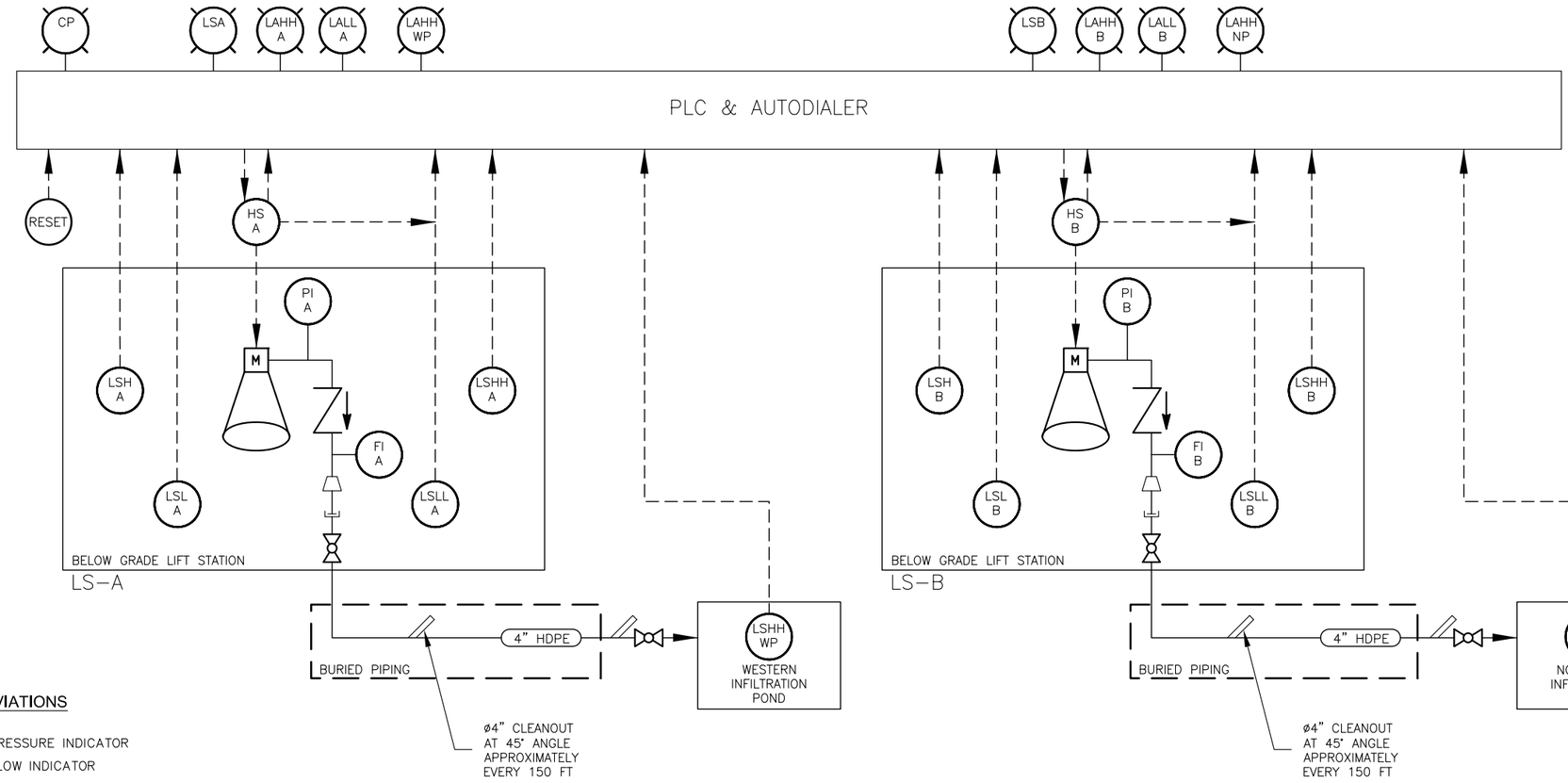
B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 07/02/09
PROJECT NO.: 13488

DRAWING
C–6

Plot Date: 07/02/09 - 3:45pm Plotted by: adam.stenberg
Drawing Path: S:\13488\005_EDR Report\FinalConstruction\ Drawing Name: DRAWING C-6-8-9-10-11-P1-E1_B4L_061709.dwg





EXPLANATION

- OPERATOR INTERFACE FUNCTION
- FIELD MOUNTED
- BALL VALVE NORMALLY OPEN
- REDUCER
- CLEANOUT
- QUICK CONNECT COUPLING
- CHECK VALVE
- SUBMERSIBLE SUMP PUMP

ABBREVIATIONS

PI	PRESSURE INDICATOR
FI	FLOW INDICATOR
HS	HAND SWITCH
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGHER HIGH
LAHH	LEVEL ALARM HIGHER HIGH
LSL	LEVEL SWITCH LOW
LSLL	LEVEL SWITCH LOWER LOW
LALL	LEVEL ALARM LOWER LOW
CP	CONTROL PANEL

DRAFT
CONSTRUCTION

NOTES:

1. DESIGN AND INSTALL ALL ELECTRICAL EQUIPMENT, SENSORS, AND INSTRUMENTATION SHOWN. POWER SUPPLY WILL BE AVAILABLE UP TO AND INCLUDING THE METER.
2. ON/OFF SWITCH SHALL BE INSTALLED ON THE ELECTRICAL BOX AND MUST BE WEATHERPROOF AND LOCKABLE (LO/TO).
3. EACH PUMP MUST HAVE A SEPARATE BREAKER AND BE LOCKABLE (LO/TO).
4. PLACE CRUSHED ROCK BASE FOR ELECTRICAL BOX IF NEEDED.
5. INSTALL WATERPROOF, LOCKABLE ON/OFF SWITCH FOR THE PUMPS AND SENSORS IN EACH LIFT STATION.

REFERENCES:
PLANS

DATUM
HORIZONTAL: WASP-NAD83-S FEET
VERTICAL: NAVD88 FEET

NO.	REVISION	DATE	APRVD

DRAWN ??
DESIGNED ??
CHECKED ??
REVIEWED ??

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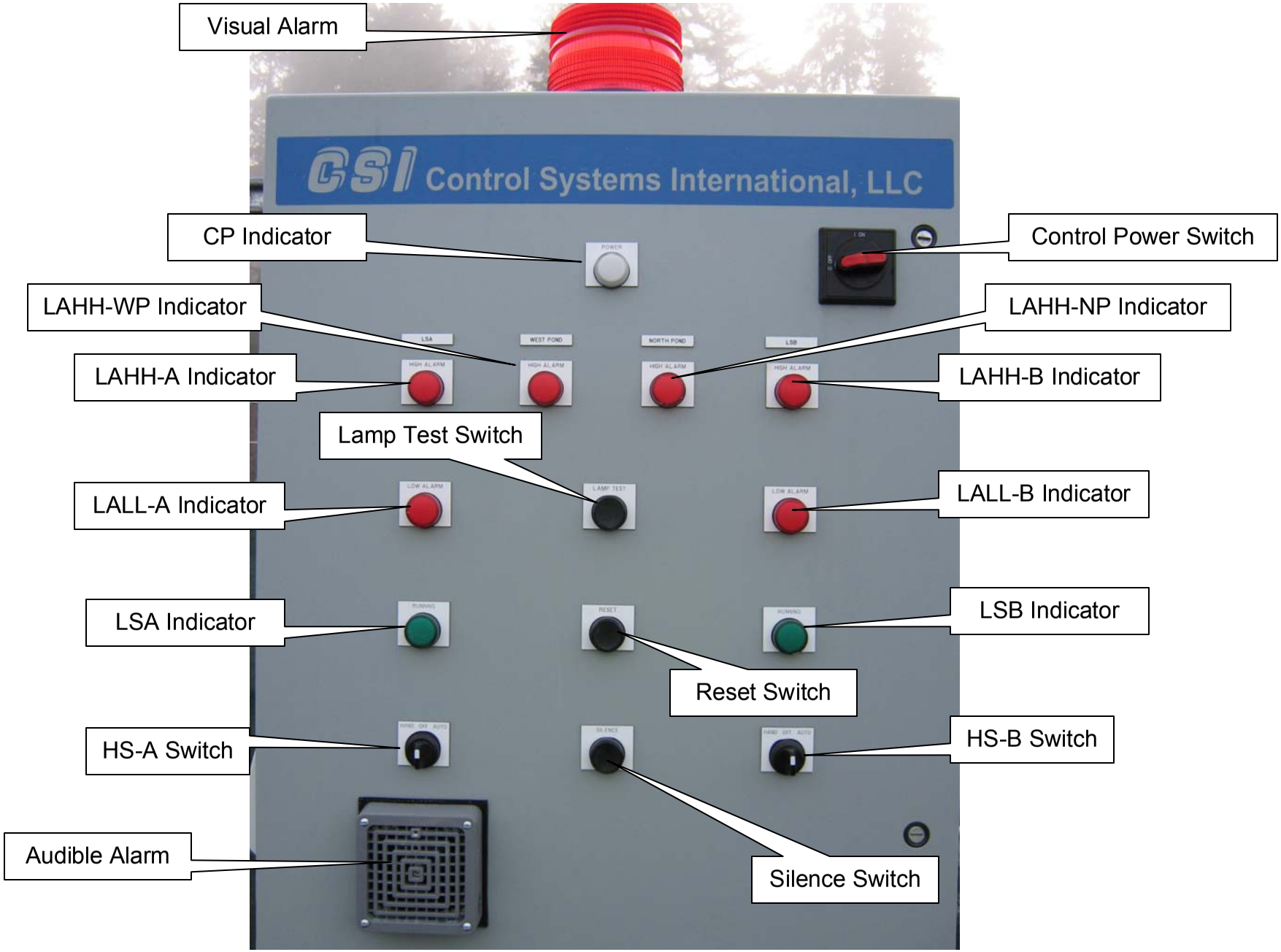
PIPING & INSTRUMENTATION DIAGRAM
ADDENDUM 1

B&L WOODWASTE SITE
PIERCE COUNTY, WASHINGTON

DATE: 04/23/09
PROJECT NO.: 13488
DRAWING P-1

Plot Date: 04/23/09 - 4:57pm, Plotted by: adam.stenberg
Drawing Path: S:\13488\005_EDR Report\, Drawing Name: DRAWING C-6_B-L_040309.dwg

Figure 1. Control Panel. B&L Woodwaste Site, Pierce County, Washington



B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix K
Outside Area In-situ Groundwater Remediation System Maintenance and Monitoring Plan
(Reserved)

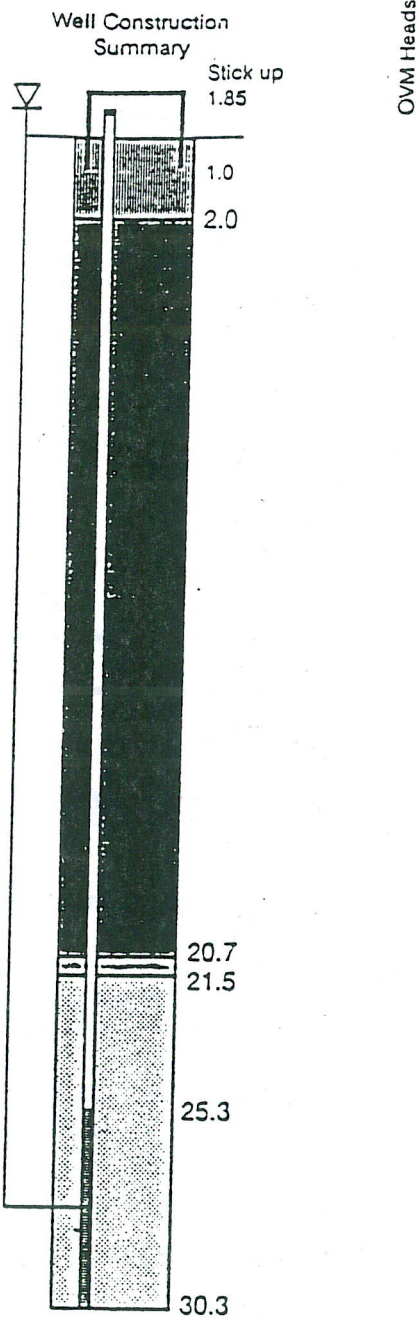
B&L Woodwaste Site
Pierce County, Washington

Operations, Monitoring, and Maintenance Plan

Appendix L
Recovery Well and Landfill Piezometer Boring Logs

Equipment Nodwell B-61 Track Rig

Land Surface Elevation 9.98 feet Date 9/18/89



*Water levels indicated are for 11/13/89

OVM Headspace (ppm)	Blows per Foot	Depth (feet)	Sample	
		0		Swamp vegetation and root zone 0-1 feet.
	21			GRAY SAND (SP) medium dense, moist to wet; very fine grained, trace silt and organics.
		5		
	24			
	31			Becomes dark gray, medium dense, saturated; fine to medium grained.
		10		
	57			
		15		
	12			MEDIUM BROWN-GRAY ORGANIC SILT (OL) stiff, moist; slightly plastic.
	14			DARK BROWN TO BLACK PEAT (PT) stiff, moist; fibrous to moderately woody, with thin sand and silt interbeds.
	20			
	14			
	21			GRAY SAND (SP) medium dense, saturated; fine grained, trace silt and organics.
	25			
	31			Becomes fine to medium grained sand.
		30		Boring terminated at 30 feet on 9/18/89.
		35		
		40		

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Log of Boring D-1L

B & L Landfill
Milton, Washington

PLATE **B10**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15.243.101	SES	AMG	30 November 89		

Well MW-18 was converted to Well W-3

HYDROMETRICS INC.
Consulting Scientists and Engineers
Tacoma, Washington

MW-18

Hole Name: MW-18

Date Hole Started: 10/4/01 Date Hole Finished: 10/4/01

Client: ASARCO, Inc.
Project: B&L Contingency Plan (1227 52.105)
County: Pierce State: Washington
Property Owner: Pierce County
Legal Description: R04E, T20N, SQ05 SW SW
Descriptive Location: marsh northwest of landfill

Recorded By: John Mefford
Drilling Company: Hydrometrics, Inc.
Driller: Jeff Cross
Drilling Method: hollow stem auger
Drilling Fluids Used: none
Purpose of Hole: groundwater monitoring
Target Aquifer: shallow alluvial
Hole Diameter (in): 7 7/8"
Total Depth Drilled (ft): 15.5

WELL COMPLETION	Y/N	DESCRIPTION	INTERVAL
Well Installed?	Y	2-inch, flush threaded, Sch 40, PVC	0.0-15.5'
Surface Casing Used?	Y	6' x 6" steel casing w/ locking lid	+2.83-6.0'
Screen/Perforations?	Y	0.020-inch slot, Sch 40 PVC	10.0-15.0'
Sand Pack?	Y	10/20 Colorado silica sand	8.0-15.0'
Annular Seal?	Y	bentonite chips, med.	3.0-8.0'
Surface Seal?	Y	concrete	0.0-3.0'
DEVELOPMENT/SAMPLING			
Well Developed?	N		
Water Samples Taken?	N		
Boring Samples Taken?	Y	EDXRF analyses (Cu, As, Pb, Fe)	2.0-15.5'

Static Water Level Below MP: 3.85 ft
Date: 10/5/01
MP Description: top of PVC riser
MP Height Above or Below Ground (ft): 2.58 ft

Surface Casing Height (ft): 2.83 ft
Riser Height (ft): 2.58 ft
Ground Surface Elevation (ft): 9.69
MP Elevation (ft): 12.27

Remarks: Drilled w/ a Piper 2000 using a 7 7/8 OD/ 4 1/4 ID hollow stem auger. Sampled w/ a 2" OD split spoon under a 140-lb hammer, 30" drop. Samples obtained for XRF analyses.

DEPTH	SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (feet)	DRILLING AND GEOTECHNICAL NOTES
	MW-18-1	SS		0.80	2.0 - 3.5'
	MW-18-2	SS	1/1/3	1.00	4.0 - 5.5'
	MW-18-3	SS	4/6/7	0.95	6.0 - 7.5'
	MW-18-4	SS	8/13	1.60	8.0 - 9.5' Duplicate MW-18-4D
	MW-18-5	SS	10/11/14	1.50	10.0 - 11.5'
	MW-18-6	SS	-/-/-	0.60	12.0 - 13.5'
	MW-18-7	NR			14.0 - 15.5'

GRAPHICS

GEOLOGICAL DESCRIPTION

0.0 - 4.0'
TOPSOIL
brown in upper 0.4", olive gray in remainder; clayey to silt; moist in upper portion, very moist in lower portion
[Shallow Alluvium]

4.0 - 8.0'
SILT
olive gray, wet
[Shallow Alluvium]

6.0 - 8.0'
olive gray, some carbonaceous material, wet

8.0 - 12.0'
SILT, sandy
dark gray, with quartz, feldspars; wet
[Shallow Alluvium]

10.0 - 12.0'
dark gray, very fine grained, wet

12.0 - 14.0'
SAND
dark gray, saturated
[Shallow Alluvium]

GEOTECH 1227.GPJ HYD-TUC.GDT 8/2/02

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Boring Location: W-2

Drill Date: September 16, 2009
Logged By: John LaManna
Drilled By: Lynn Goble/ Cascade Drilling
Ground Surf Elev. & Datum: 0.2-0.4 below road **Drill Type:** Geoprobe 7730 DT **Client:** B&L Custodial Trust
Coordinate System: NAV83 **Sample Method:** 5'x1.5" Dia. Direct-Push **Project:** B&L RIM
Latitude/Northing: NA **Boring Diameter:** 2" **Task Number:**
Longitude/Easting: NA **Boring Depth (ft bgs):** 25' bgs **Site Location:** B&L Woodwaste
Casing Elevation: NA **Groundwater ATD (ft bgs):** 5' bgs

Remarks: Gravel, lightly vegetated ground surface.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0-1	SP/SM	Yellowish brown, moist, poorly graded fine SAND (5% gravel, 5-10% silt, trace roots). FILL.	Flush Mount; Concrete
		1-3	PT/OL	Dark brown to black, moist, PEAT or organic SILT (<5% sand and gravel).	
		5-6	CL	Gray, damp to wet, CLAY or silty CLAY, soft, plastic.	Bentonite
		7-9	SP/SM	Dark gray, wet, poorly graded fine SAND (10% silt, no gravel), non-plastic, dilatancy is fast.	
		9-11	SM	Dark gray, wet, silty SAND, no gravel, trace peat (15-20% silt).	1" Sch 40 PVC Riser Pipe
		11-12	SP	Dark gray, wet, poorly graded fine SAND, no gravel (5% silt).	
		12-13	ML	Brownish gray, sandy SILT, non-plastic.	
		13-14	SP/SM	Dark gray, wet, poorly graded fine SAND, no gravel (10% silt).	
		14-16	SM	Dark gray, wet, silty fine SAND, no gravel, some sandy SILT beds, trace peat (15-20% silt).	3" Slotted PVC Pre-Pack Sand Well Screen
		17-19	SP/SM	Dark gray, wet, poorly graded fine SAND with silt (10-15%), no gravel.	
		19-21	SM/ML	Dark gray, wet, silty fine SAND and sandy SILT, non-plastic.	
		21-22	CL/PT	Gray, moist/wet, very soft-soft, CLAY, high plasticity. Small lense of black peat from 21.8 to 22' bgs.	

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring Location: W-1

Drill Date: September 16, 2009
Logged By: John LaManna
Drilled By: Lynn Goble/ Cascade Drilling
Drill Type: Geoprobe 7730 DT
Sample Method: 5'x1.5" Dia. Direct-Push
Boring Diameter: 2"
Boring Depth (ft bgs): 25' bgs
Groundwater ATD (ft bgs): 5' bgs

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste

Ground Surf Elev. & Datum: NA
Coordinate System: NAV83
Latitude/Northing: NA
Longitude/Easting: NA
Casing Elevation: NA

Remarks: Shrubby/Vegetated

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–5	SP/SM	Olive brown, moist, poorly graded fine SAND (5% med/coarse sand, 10% gravel, 10% silt). FILL.	Flush Mount; Concrete
		2	OL/PT	Organic SILT/PEAT in shoe.	
		5–6	CL	Gray, wet, CLAY, very soft with 0.2' thick layer of peat at 5.5' bgs.	
		6–9	SP	Dark gray, wet, poorly graded fine SAND, no gravel (<5% silt, alluvium, 5 to 10% med. sand).	Bentonite
		9–14	SP	Same as above.	1" Sch 40 PVC Riser Pipe
		14–20	SP	Same as above w/trace gravel of andesite.	3" Slotted PVC Pre-Pack Sand Well Screen
		20–21	SW	Dark gray, wet, well graded fine to coarse SAND (5% fine rounded gravel, <5% silt, alluvium).	
		21–22	PT	Dark brown PEAT at contact.	
		22–25	CL	Grayish brown, moist, CLAY, soft to medium stiffness, faint bedding - massive. Trace brown PEAT.	

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Drill Date: September 12, 2011
Logged By: Kristin Anderson
Drilled By: David Gose / Cascade Drilling

Extraction Well ID: R-21

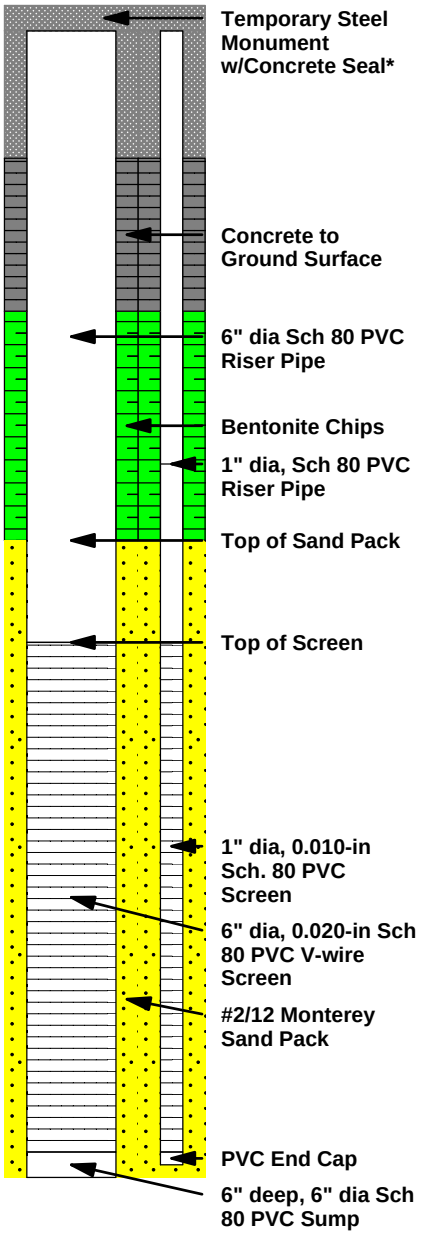
Ground Surf Elev. & Datum: 12.99 ft NAVD88
Coordinate System: NAD83
Latitude/Northing: 702667.83 ft
Longitude/Easting: 1185981.56 ft
Casing Elevation: 15.46 ft NAVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 20'
Groundwater ATD (ft bgs): 5.5'

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation
*Refer Phase 2 Record Drawings for suface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		0-0.5 ft of hog fuel, geotextile membrane (temporary road) and grass. Cut through fabric to begin boring.
2 4 5		3	ML/ OL-OH	Very moist, dark brown PEAT and SILT. 6" lense of very moist, dark brown SILT at 3.25 ft.
		4	SP	Grades to moist, gray, poorly-graded fine SAND with trace silt at 3.5 ft.
2 2 3		5		Very moist with no silt at 5 ft. Wet at 5.75 ft
		6	SM	Wet, dark gray SILTY SAND at 6 ft.
2 4 4		7		Dark gray-brown at 7.5 ft.
		8	SP	Grades to wet, dark gray-brown, poorly graded fine SAND at 8 ft.
5 6 9		10		Same as above. Grades to medium at 11.5 ft.
8 8 10		13		Same as above
8 10 16		15		Same as above. Trace siilt at 16.5 ft.
4 5 6		17		Same as above. Scattered small silty lenses starting at 17.5 ft.
4 6 7		18	ML/ OL-OH	Same as above.
		19	ML	1" lense of black-brown SILT and PEAT at 19.25 ft. Light gray, plastic SILT below.



Notes:
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Drill Date: September 14, 2011
Logged By: Kristin Anderson
Drilled By: David Gose / Cascade Drilling

Extraction Well ID: R-20

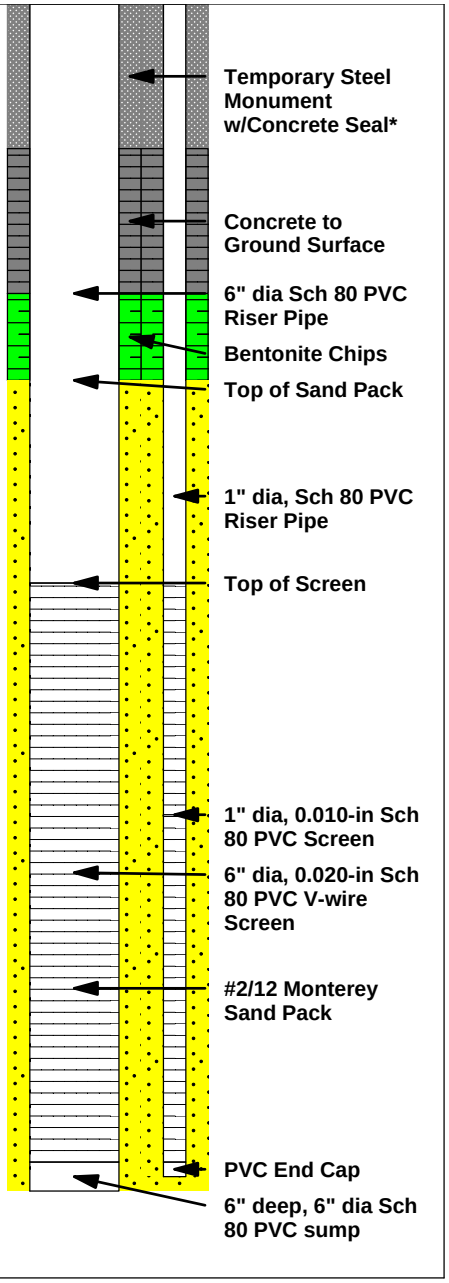
Ground Surf Elev. & Datum: 12.80 ft NAVD88
Coordinate System: NAD83
Latitude/Northing: 702592.48 ft
Longitude/Easting: 1185988.02 ft
Casing Elevation: 15.92 ft NAVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 18'
Groundwater ATD (ft bgs): 3.25'

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
*Refer to Phase 2 Record Drawings for suface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		0-0.5 ft of hog fuel, geotextile membrane (temporary road) and grass. Cut through fabric to begin boring.
		2	ML/ OL-OH	Very moist, black-brown PEAT and SILT to 2.75 ft.
3 3 3		3	ML/ SP	Very moist, gray SILT interbedded with SAND from 2.75-3.25 ft.
		4	SP	Wet, gray, poorly-graded fine SAND at 3.25 ft.
3 3 4		5		Same as above.
4 4 4		8		Same as above.
3 5 6		11		Same as above.
6 9 11		13		Same as above. Coarsens to medium and darkens to dark gray at 14 ft.
6 5 7		15	SM	Same as above. 1" lense of SILTY SAND at 15.5 ft.
		16	SP	
3 5 5		17		Same as above. Grades to fine at 17 ft.
		18	ML	Grades to gray plastic SILT at 17.25 ft. 3" lense of dense woody material (tree root?) at 17.5 ft, silt continues below.



Notes:
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Drill Date: September 15, 2011
Logged By: Dean Brame
Drilled By: David Gose/ Cascade Drilling

Extraction Well ID: R-19

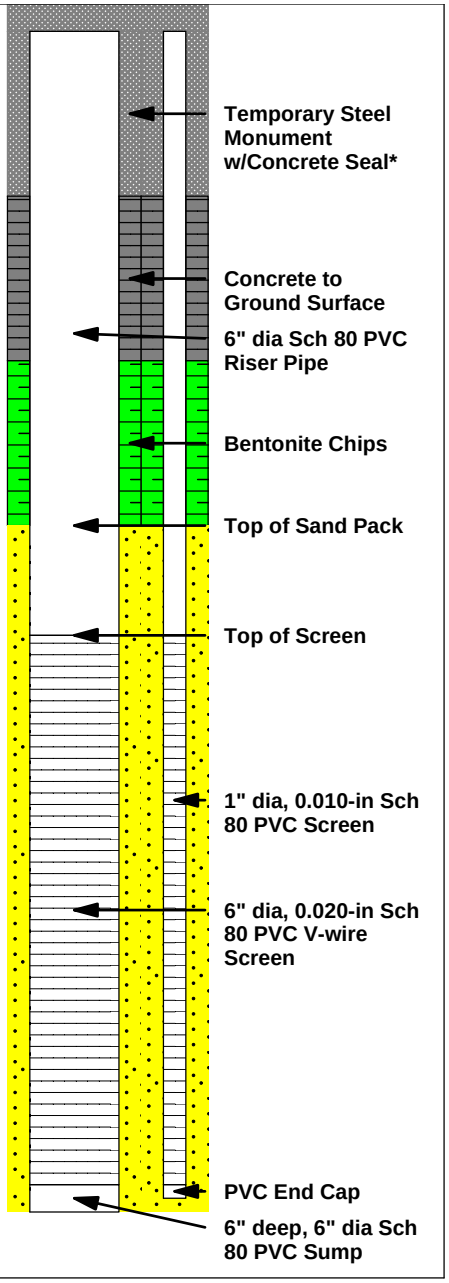
Ground Surf Elev. & Datum: 12.67 ft NAVD88
Coordinate System: NAD83
Latitude/Northing: 702501.88 ft
Longitude/Easting: 1185904.48 ft
Casing Elevation: 15.69 ft NAVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 18.5'
Groundwater ATD (ft bgs): 3'

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
*Refer to Phase 2 Record Drawings for surface monument completion detail.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	EXTRACTION WELL DETAIL
		0		0-0.5 ft of hog fuel, geotextile membrane (temporary road) and grass. Cut through fabric to begin boring.	
1		2	OL-OH	Wet, dark brown PEAT	
1		3	ML	Grades to moist, very soft gray SILT.	
1		5		Wet at 5 ft, stiff at 6 ft.	
2		6	SP	Grades to moist, fine dark gray SAND.	
4					
3		8		Same as above, wet at 7.5 ft	
3		10		Same as above.	
4					
3		13	OL-OH	Same as above to 13 ft. 2" lense of PEAT at 13 ft. Moist and medium-grained SAND below.	
7			SP		
8		15		Same as above, wet at 15 ft.	
5					
10					
15		17	ML	Grades to fine at 17.5 ft.	
9					
11		18		Grades to moist, soft gray SILT at 17.8 ft.	
11					



Notes:
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Extraction Well ID: R-18

Drill Date: September 12, 2011
Logged By: Kristin Anderson
Drilled By: David Gose/ Cascade Drilling

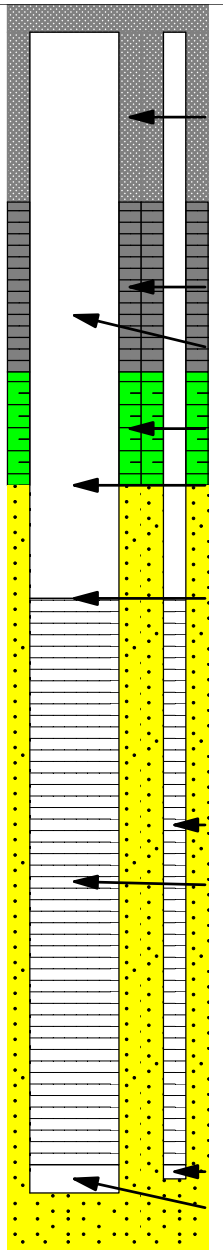
Ground Surf Elev. & Datum: 13.43 ft NAVD88
Coordinate System: NAD83
Latitude/Northing: 702493.44 ft
Longitude/Easting: 1186016.20
Casing Elevation: 16.18 ft NAVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 18.5'
Groundwater ATD (ft bgs): 3.25'

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
*Refer to Phase 2 Record Drawings for surface monument completion detail.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		0-0.5 ft of hog fuel, geotextile membrane (temporary road) and grass. Cut through fabric to begin boring.
3 5 5		3	SM	Very moist, gray SILTY SAND.
			SP	Grades to very moist, fine, poorly-graded clean SAND at 3 ft. Wet at 3.25 ft.
4 4 4		5		Wet, dark gray, fine poorly-graded SAND with trace silt.
4 7 7		8		Same as above. Grain size begins to coarsen at 8.5 ft
11 7 8		10		Same as above. Grain size continues to coarsen at 10.75 ft.
6 10 11		13		Same as above.
7 11 16		14		Same as above. Grain size coarsens to medium at 15 ft.
8 14 16		16		Same as above. Becomes fine with trace silt at 16.5 ft.
3 4 5		17		Same as above, no silt.
		18	ML	Abrupt contact with gray-brown plastic SILT at 18 ft.



EXTRACTION WELL DETAIL

- Temporary Steel Monument w/Concrete Seal*
- Concrete to Ground Surface
- 6" dia Sch 80 PVC Riser Pipe
- Bentonite Chips
- Top of Sand Pack
- Top of Screen
- 1" dia, 0.010-in Sch 80 PVC Screen
- 6" dia, 0.020-in Sch 80 PVC V-wire Screen
- PVC End Cap
- 6" deep, 6" dia Sch 80 PVC Sump

Notes:
FT BGS = feet below ground surface
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USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Extraction Well ID: R-17

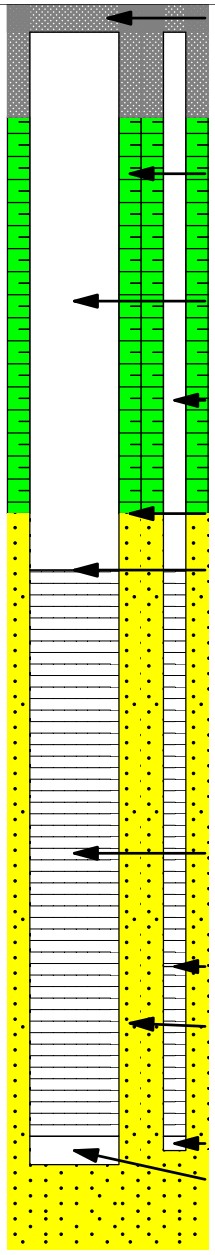
Drill Date: July 22, 2011
Logged By: Kristin Anderson
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 22 '
Groundwater ATD (ft bgs): 10'

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 702394.87 ft
Longitude/Easting: 118610.40 ft
Casing Elevation: 17.39 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: NA
*Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
5, 7, 26		0–3	SP-SM	Dry, light brown poorly-graded fine SAND with SILT and rounded to sub-angular GRAVEL
6, 7, 13		3–5	SM	Grades to moist, light brown SILTY SAND with GRAVEL at 3.5 ft. Larger gravels (~1.5" dia) at 4 ft. Gray with no gravel at 5 ft.
18, 50/6"		5–6	SP-SM	Abrupt contact with moist, brown poorly-graded fine SAND with SILT and GRAVEL at 5.5 ft
		6–8	SM	Same as above at 7.5 ft.
4, 6, 7		8–10	SP	2" lense of gray SILTY SAND at 8 ft underlain by moist, dark brown, poorly-graded fine SAND with trace silt.
7, 9, 11		10–13		Same as above. Wet from 10-10.5 ft, moist at 10.5 ft.
6, 7, 9		13–15		Same as above. Trace fine gravel at 13 ft.
17, 20, 21		15–16	SP	Same as above. Wet from 15 to 15.5 ft. 4" lense of black-brown medium SAND at 16 ft.
		16–17	SM	
10, 10, 11		17–19	SW	Wet, black-brown, well-graded medium and fine SAND with trace silt. Same as above at 19 ft.
8, 10, 10		19–20	SP	Grades to wet, black-brown, poorly-graded, medium-coarse SAND at 19.5 ft.
12, 16, 16		20–22		Same as above.



Notes:
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Extraction Well ID: R-16

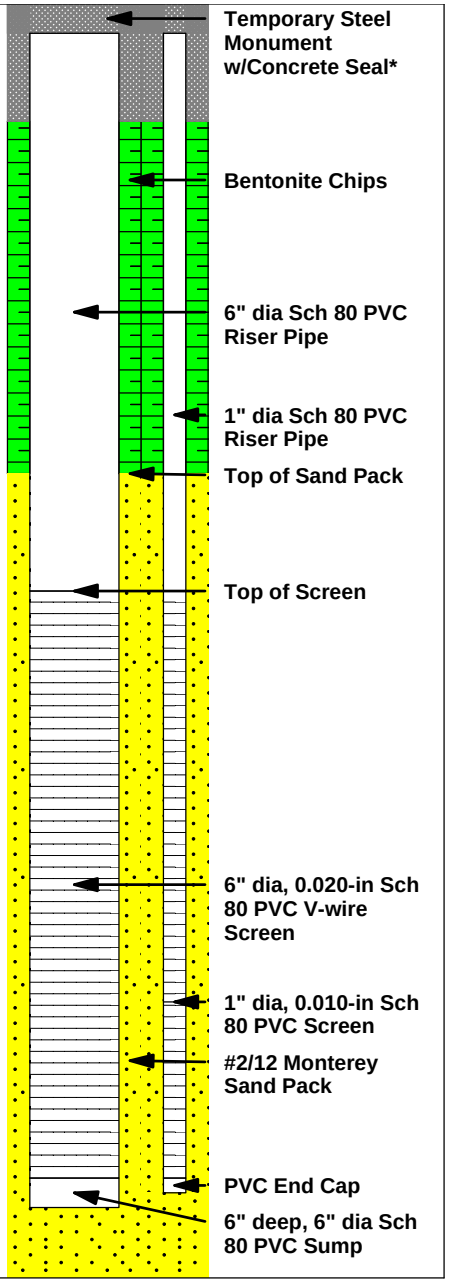
Drill Date: July 21, 2011
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 20.5'
Groundwater ATD (ft bgs): 5'

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 702344.45 ft
Longitude/Easting: 1186014.34 ft
Casing Elevation: 17.61 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" diameter for well installation.
*Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
19, 20, 26		0–1	SM	Dry, light brown silty fine SAND with fine gravels. Trace roots.
15, 19, 20		2–4		No recovery. Mostly sluff from surface. Coarse gravels in sampler.
15, 15/6		5–6		Same as above, becoming gray and moist. Coarsening with depth. Wet at 5' bgs.
3, 5, 6		7–8	SP-SM	Wet, dark gray poorly graded medium SAND with silt and fine gravel.
5, 6, 7		9–12	SM	Wet, dark gray silty fine SAND.
8, 6, 6		13–14	SM	Same as above.
8, 10, 15		15–17		Same as above. Coarsening slightly with depth.
8, 9, 13		18	SP	Wet, dark gray with red grains, poorly graded medium SAND.
8, 9, 13		19–20		Same as above. Coarsening with depth.
		21		



Notes:
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Drill Date: August 4, 2011
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling

Extraction Well ID: R-15

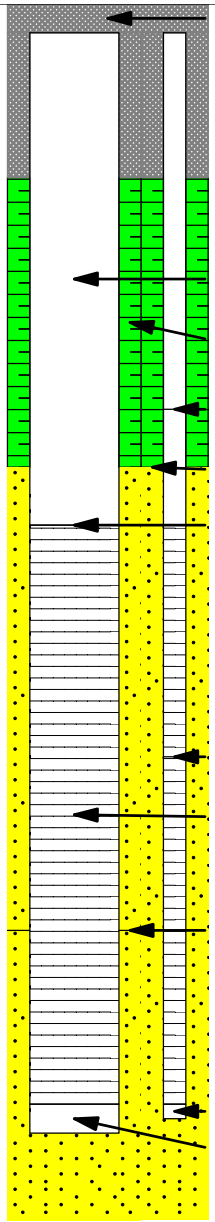
Ground Surf Elev. & Datum: 14.42 ft NAVD88
Coordinate System: NAD83
Latitude/Northing: 702082.60 ft
Longitude/Easting: 1185612.45 ft
Casing Elevation: 16.83 ft NAVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18"Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 18'
Groundwater ATD (ft bgs): 2.5'

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation
*Refer to Phase 2 Record drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Advance to 2.5' bgs to collect first sample.
4 7 8		2	ML / SM	Moist, dark brown and gray SILT. Wood fragments. / Wet, gray silty fine SAND.
5 5 7		5	SP	Wet, gray poorly graded fine to medium SAND. Trace silt.
3 3 7		8	SP/SM	Wet to moist, dark gray poorly graded fine SAND mixed with fine silty SAND.
5 5 7		10	SP	Wet, dark gray poorly graded fine to medium SAND. Little silt.
5 10 10		13		Same as above.
7 8 18		15		Same as above.
3 3 3		17		



EXTRACTION WELL DETAIL

- Temporary Steel Monument w/Concrete Seal*
- 6" dia Sch 80 PVC Riser Pipe
- Bentonite Chips
- 1" dia, Sch 80 PVC Riser Pipe
- Top of Sand Pack
- Top of Screen
- 1" dia, 0.010-in Sch 80 PVC Screen
- 6" dia, 0.020-in Sch 80 PVC V-wire Screen
- #2/12 Monterey Sand Pack
- PVC End Cap
- 6" deep, 6" dia Sch 80 PVC Sump

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Extraction Well ID: R-14

Drill Date: August 5, 2011
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling

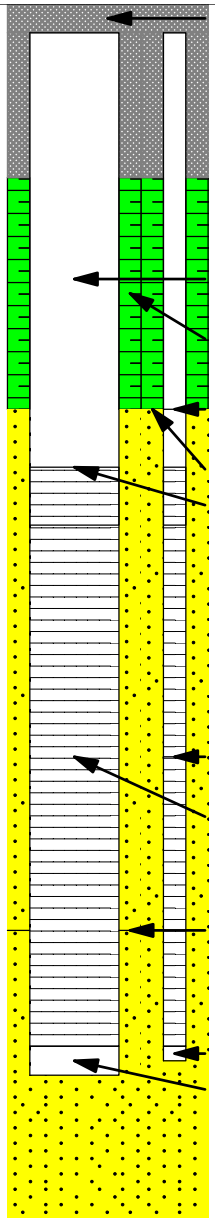
Ground Surf Elev. & Datum: 14.22 ft NAVD88
Coordinate System: NAD83
Latitude/Northing: 702077.84 ft
Longitude/Easting: 1185674.12 ft
Casing Elevation: 17.02 ft NAVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18"Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 18'
Groundwater ATD (ft bgs): 2.5'

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation
*Refer to Phase 2 Record drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
				Advance to 2.5' bgs to collect first sample.
4 6 8			SP-SM	Wet, gray poorly graded SAND with silt.
5 6 7			SP	Wet, gray poorly graded fine SAND. Little to no silt.
6 6				Same as above.
7 7 9 13			SP	Same as above. Trace brown silt clasts.
5 5 15			SM	Same as above. Increasing silt with depth. Wet, gray silty fine SAND. 1/2 inch peat layer at 13.75' bgs. Same as above. Silt laminations throughout. Thin lense of peat from 16.2 to 16.5' bgs.
			ML	Moist, gray SILT.



EXTRACTION WELL DETAIL

Notes:
FT BGS = feet below ground surface
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USCS = Unified Soil Classification System
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Extraction Well ID: R-13

Drill Date: July 18, 2011
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling

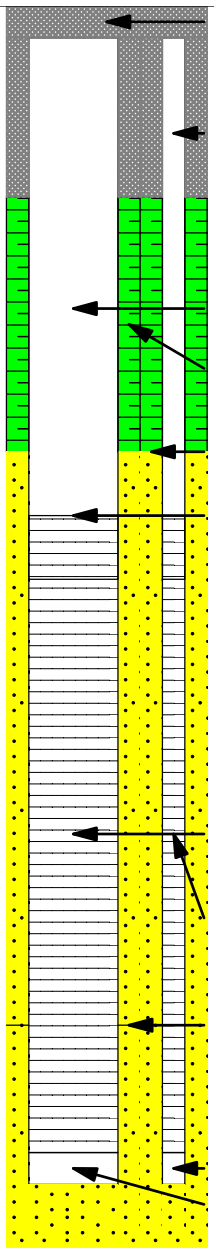
Ground Surf Elev. & Datum: 16.62 ft NAVD88
Coordinate System: NAD83
Latitude/Northing: 702075.15 ft
Longitude/Easting: 1186593.31 ft
Casing Elevation: 18.83 ft NAVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18"Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 16.5 '
Groundwater ATD (ft bgs): 1.5'

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation
*Refer to Phase 2 Record drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
				Advance to 2.5' bgs to collect first sample.
5 6 7			ML	Wet, gray sandy SILT with rounded gravels.
			SP	Wet, medium gray poorly graded fine and medium SAND, trace gravels, little to no silt.
10 12 15				Same as above.
10 20				Same as above.
21				
15 18 23			SP	Same as above. Coarsening with depth.
8 14 20				Same as above, no gravel and no silt.
8 9 12				Same as above.



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Drill Date: July 19, 2011
Logged By: Kristin Anderson
Drilled By: David Gose / Cascade Drilling

Extraction Well ID: R-12

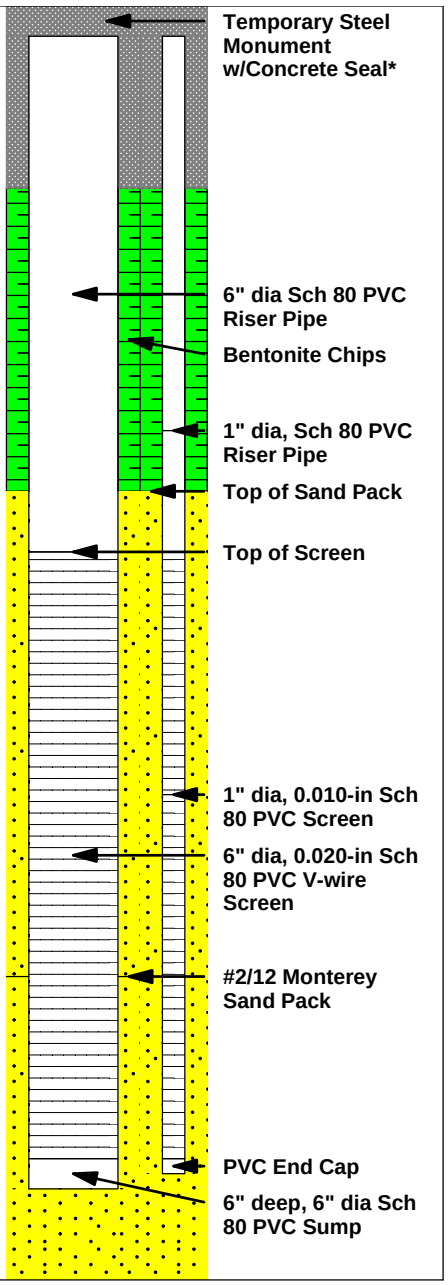
Ground Surf Elev. & Datum: 16.14 ft NAVD88
Coordinate System: NAD83
Latitude/Northing: 702181.68 ft
Longitude/Easting: 11886526.59 ft
Casing Elevation: 18.71 ft NAVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 18'
Groundwater ATD (ft bgs): 2.5'

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
*Refer to Phase 2 Record drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
19 24 14		0	SM	Moist, gray fine SILTY SAND with GRAVEL, rooty.
5 6 6		3		Same as above with larger gravels at 3 ft. Very moist, medium SILTY SAND with GRAVEL and black wood fragments below.
4 9 10		5		Same as above. Grades to wet and gray-brown at 5.75 ft. Larger cobbles at 6 ft.
9 10 10		8		Same as above, gravels of varying sizes. Wood chunk with diameter > sampler at 8.5 ft.
9 14 19		10	SP	Very moist, gray, poorly-graded coarse SAND with fine GRAVEL. No silt. Wood chunks and increased gravel at 10.75 ft.
17 50/6"		13		Wet, gray, poorly-graded coarse SAND with GRAVEL and trace silt. Gravel coarsens slightly (~1/2" dia) at 13.5 ft. No wood fragments.
13 20 21		15		Same as above to 16 ft.
16 20 28		16	ML	Moist, light brown plastic SILT with SAND. Wet at 16.5 ft. Same as above. Red-brown at 17 ft.



Notes:
FT BGS = feet below ground surface
ppm = parts per million
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Drill Date: July 29, 2011
Logged By: Dean Brame
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 37'
Groundwater ATD (ft bgs): 15'

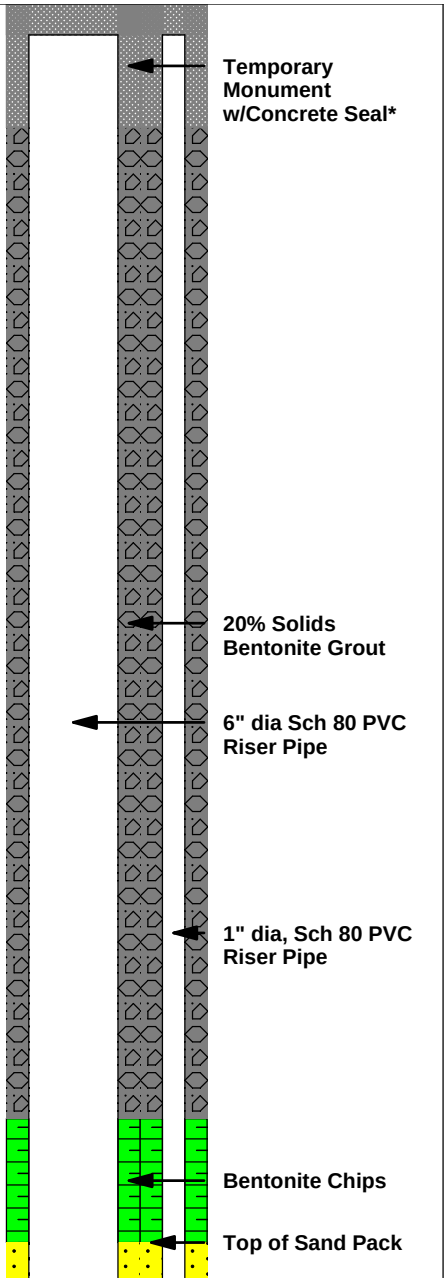
Extraction Well ID: R-10

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 702084.25 ft
Longitude/Easting: 1185838.22 ft
Casing Elevation: 27.48 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
* Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Removed 3 ft of landfill cap with cookie cutter and hand shovel. Began borehole with auger at 3 ft.
13 13 10		3	SW	Dark gray, loose, dry SAND with GRAVEL.
		4	Wood waste	Dark brown WOODWASTE mixture of wood fragments, organic silt, sand and gravel. ~50% woodwaste and 10% slag.
10 10 9		6	SP	Light gray, loose, dry poorly graded medium SAND with minor small gravel.
4 4 6		8	Wood waste	Dark brown WOODWASTE mixture of wood fragments, organic silt, sand and gravel. ~5% small rounded gravel and slag.
15 30 26		11	SP	Same as above. 6" lense of light gray, loose, dry well-graded SAND.
		12	Wood waste	
4 4 5		13	CL	Moist with trace slag at 13 ft. Lense of llight gray, soft (4" ribbon), moist CLAY 13.8-14 ft.
		14	Wood waste	
6 5 4		15		Hard, coarse and wet with small rounded gravel 15.3-15.5 ft. Moist with light grayish-brown silt and ~25% peat at 15.5 ft.
9 11 14		17	SM	Grades to brown, wet SILTY SAND with ~20% wood fibers and 10% slag at 17.5 ft.
		18	SP	Light gray, moist, fine SAND.
		20		Same as above, wet 20-23 ft, ~5% wood fibers.



EXTRACTION WELL DETAIL

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Drill Date: July 29, 2011
Logged By: Dean Brame
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 37'
Groundwater ATD (ft bgs): 15'

Extraction Well ID: R-10

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 702084.25 ft
Longitude/Easting: 1185838.22 ft
Casing Elevation: 27.48 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
* Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	EXTRACTION WELL DETAIL
		21		Medium dense and moist with trace silt at 21 ft.	
		22			
12		23		Same as above, loose.	Top of Screen
12					
17		24			
		25			
7					
10		26		Dark gray and wet at 25.5 ft.	
17		27			
13		28		Same as above.	6" dia, 0.020-in Stainless V-wire Screen
15					
17		29			
		30			#2/12 Monterey Sand Pack
4					
4		31		Same as above. Yellowish-brown wood fibers 31-31.3 ft. Lense of light gray, moist hard SILT 31.3-31.5 ft.	1" dia, 0.010-in Sch 80 PVC screen
4					
		32			
		33		Same as above to 33 ft.	PVC End Cap
			CL	Grades to light grayish brown, moist, soft CLAY at 33 ft. Dark brown wood fibers at 33.2 ft.	
		34			2' deep, 6" dia Stainless Sump
		35			
10			ML	Light gray SILT 35-36 ft. Sandy with trace wood fibers/roots at 36 ft.	
10		36			
10					
		37			

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Drill Date: July 28, 2011
Logged By: Dean Brame
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 31.5'
Groundwater ATD (ft bgs): 8'

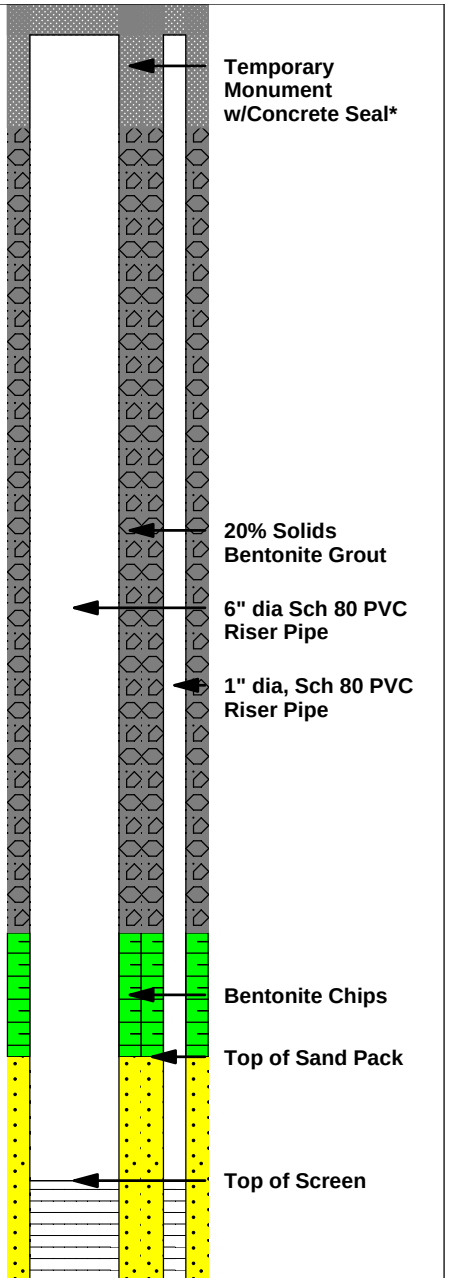
Extraction Well ID: R-9

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 701877.35 ft
Longitude/Easting: 1185772.70 ft
Casing Elevation: 23.79 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
* Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Removed 3 ft of landfill cap with cookie cutter. Began borehole with auger at 3 ft.
10 17 12		3	SM	Brown, loose, dry SILTY SAND with 20% small GRAVEL.
		4	SP	Gray, loose, moist poorly graded SAND with trace small gravel. Geotextile membrane at 4 ft.
18 20 16		5	Wood waste	Moist WOODWASTE mixture of wood fragments, organic silt, sand and gravel. >50% organics.
		6	SW	Dark gray, loose, moist well graded SAND with few wood fragments.
5 5 5		8		
		9	Wood waste	Very wet WOODWASTE mixture of wood fragments, organic silt, sand and gravel. >50% organics, trace slag.
2 2 3		10		Same as above. Water has dark orange tint.
		11	SP	6" lense of dark gray, wet, poorly graded loose fine SAND at 11 ft.
		12	Wood waste	
11 8 8		13	SM	Dark gray, wet, loose poorly-graded fine SILTY SAND.
		15		
8 10 10		16	SM	Same as above. 1" lense of fine, wet SILTY SAND at 16 ft.
		17	SM	
10 20 20		18		Same as above.
		19		
7		20	ML	Light gray, wet, soft SILT 20-20.5 ft.



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Drill Date: July 28, 2011
Logged By: Dean Brame
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 31.5'
Groundwater ATD (ft bgs): 8'

Extraction Well ID: R-9

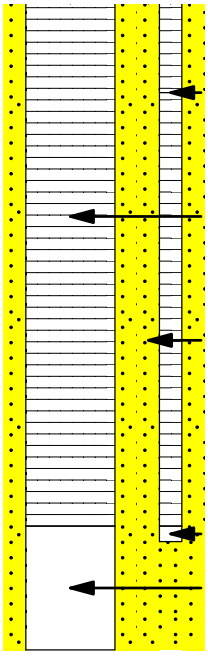
Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 701877.35 ft
Longitude/Easting: 1185772.70 ft
Casing Elevation: 23.79 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
* Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
12 20		21	SP	Grades to dark gray, loose, wet poorly graded fine SAND.
		22		
5 8 7		23		Grades to medium at 22.5 ft.
		24		
8 8 9		25		Same as above. Wood fibers from 25.5 to 28.5 ft.
		26		
		27		
10 20 15		28		Fine with trace wood fibers at 27.5 ft.
		29		
		30		
7 14 16		31		Grades to medium at 30.5 ft. About 6" of sand heave at bottom of 12" boring.

EXTRACTION WELL DETAIL



1" dia, 0.010-in Sch 80 PVC screen
6" dia, 0.020-in Stainless V-wire Screen
#2/12 Monterey Sand Pack
PVC End Cap
2' deep, 6" dia Stainless Sump

Notes:
FT BGS = feet below ground surface
ppm = parts per million
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Drill Date: July 26, 2011
Logged By: Dean Brame
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 37'
Groundwater ATD (ft bgs): 16'

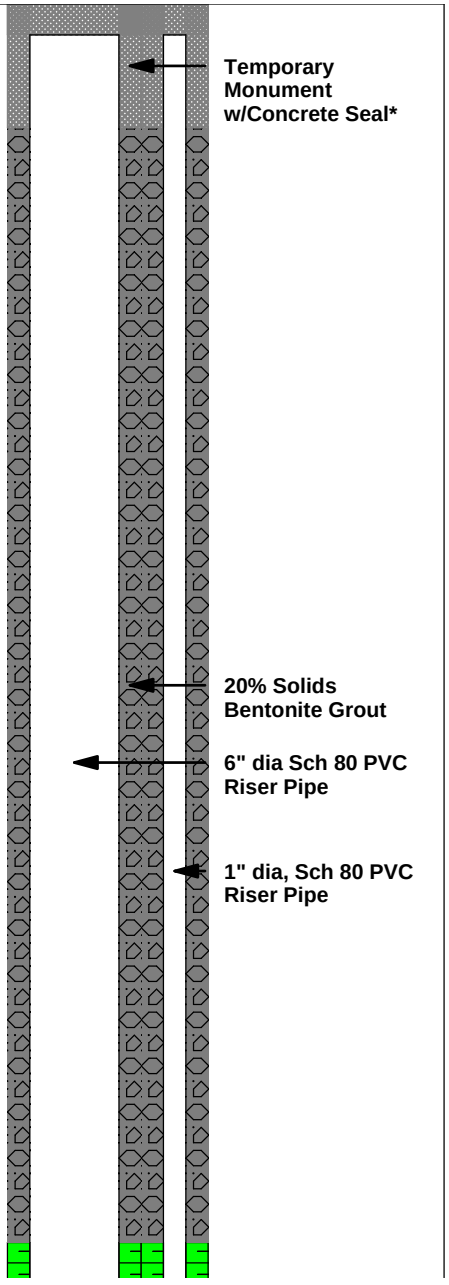
Extraction Well ID: R-8

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 701784.25 ft
Longitude/Easting: 1185846.17 ft
Casing Elevation: 30.61 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
* Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Removed 3 ft of landfill cap with cookie cutter. Began borehole with auger at 3 ft.
15		3	SP	Light brown, poorly graded, dry fine SAND. Gray with small gravel at 3.5 ft.
20		4	ML	3" lense of dry SILT at 4.1 ft.
20		5	SP	Same as above to 5.5 ft
7		6	ML	Dark brown, moist SILT with wood fragments.
3		7		
4		8		Same as above to 8 ft. Light gray from 8 to 8.5 ft.
4				
3		9	Wood waste	Moist, very dark brown WOODWASTE mixture of wood fragments, silt, sand and gravel. ~80% organics.
6		10		
6		11		Very dark brown to black with a few 1/2" to 1" pieces of slag.
7				
8				Moist with purple staining at bottom of interval.
		12		
6		13	SP	Same as above. More slag and few small rounded gravels. 1/2" lense of light gray, moist fine SAND at 13 ft.
8			Wood waste	
11		14		
		15		Purple staining 15-15.2 ft. 10" piece of wood from 15.2-16 ft.
20				
6			SM	1" lense of fine, wet SILTY SAND at 16 ft.
10		16		
		17	Wood waste	
16				
2		18	ML	Gray fine SANDY SILT.
7		19	SP	Poorly graded, wet fine SAND at 18.8 ft
10		20		Medium with few small gravels at 20 ft.



Notes:
FT BGS = feet below ground surface
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▼ = denotes groundwater table

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Extraction Well ID: R-8

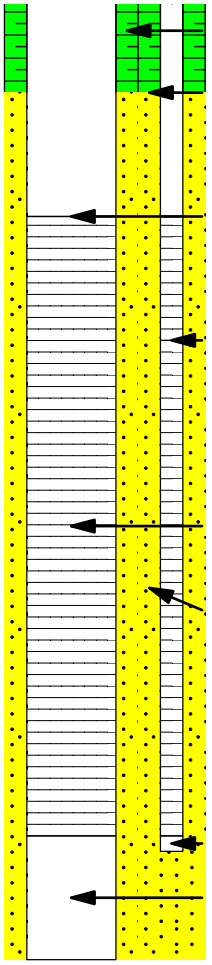
Drill Date: July 26, 2011
Logged By: Dean Brame
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 37'
Groundwater ATD (ft bgs): 16'

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 701784.25 ft
Longitude/Easting: 1185846.17 ft
Casing Elevation: 30.61 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
* Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
10 17		21		
		22	Wood waste	Wet, light brown WOODWASTE mixture of wood fragments, organic silt and sand from 22.5-23 ft.
		23	SM	Gray, moist fine SILTY SAND. 1/4" oxidation line at 23.9 ft.
		24		
		25		Same as above.
		26		
		27		
		28		Same as above, wet.
		29		
		30		
5 11 11		31	SP	Gray, wet, poorly graded medium SAND.
		32		
5 7 7		33		Fine and very wet at 32.5 ft. 2" band of medium SAND with small gravel 33.3-33.5 ft.
		34	CL	Greenish-gray, moist, soft CLAY (forms 3" ribbon).
		35		Same as above to 35.3 ft
3 7		36	ML	Light gray SILT. Light brown with few oxidation streaks 35.6-36 ft.
			OL-OH	Dark brown peaty ORGANIC SOIL (~80% peat) with SILT 36-36.5 ft. Sand heave following 12" boring.
		37		



Notes:
FT BGS = feet below ground surface
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Drill Date: July 25, 2011
Logged By: Kristin Anderson
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 27'
Groundwater ATD (ft bgs): 12.5'

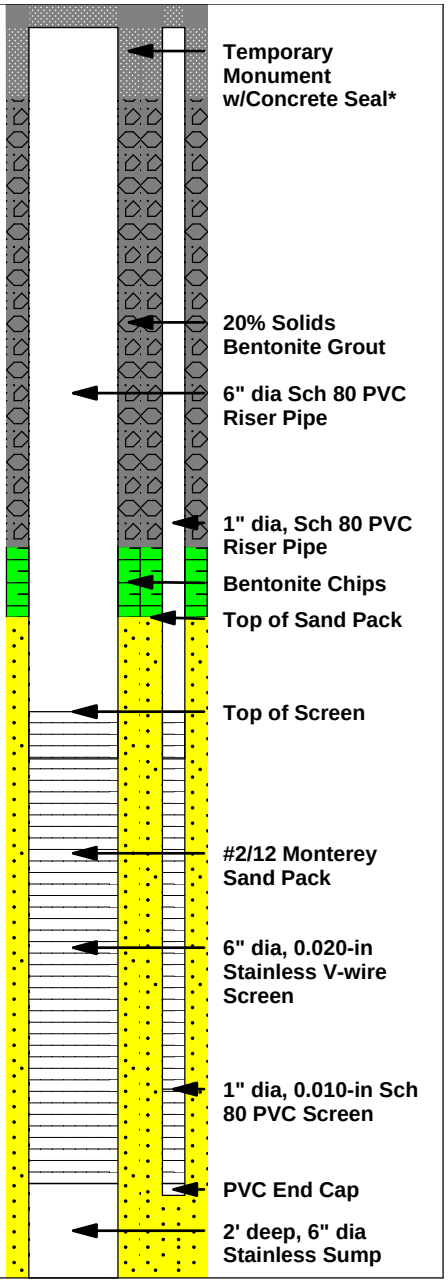
Extraction Well ID: R-7

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 701673.82 ft
Longitude/Easting: 1185869.87 ft
Casing Elevation: 24.69 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
* Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Removed 3 ft of landfill cap with cookie cutter. Began borehole with auger at 3 ft.
15 22 17		3	SP-SM	Moist, gray well graded medium-coarse SAND with SILT and small GRAVEL. Black material (possible slag) at 4.5 ft
7 6 3		6	SM	Same as above. Moist, brown fine SILTY SAND and GRAVEL at 6 ft. Some wood fragments and fabric debris.
3 2 3		8	SP-SM/ SM	Moist, gray poorly graded medium SAND with SILT interbedded with brown, fine SILTY SAND. Wood fragments in silty lenses.
7 8 12		10	SM	Moist, brown fine SILTY SAND. Dense, some wood fragments.
		11	SP-SM	3" lense of gray SAND with SILT at 11.25 ft.
10 10 20		12	SM SP	Wet, dark gray poorly graded medium-coarse SAND. no silt, trace small gravels.
15 16 18		15		Same as above. 3" lense of brown SILTY SAND with wood fragments at 15.5 ft.
7 17 12		18		Same as above. Some wood fragments from 18-18.5 ft.
10 17 21		20		Same as above. Very few wood fragments.
6 10 11		23		Same as above. Increasing gravel content from 22.5 to 23 ft.
10 15 19		25		Same as above. Larger gravels (~1" dia) from 24.75 to 25.25 ft.
10 10 12		26		Same as above. Small gravels at 27 ft.



Notes:
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Monitoring Well ID: R-6

Drill Date: October 5, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

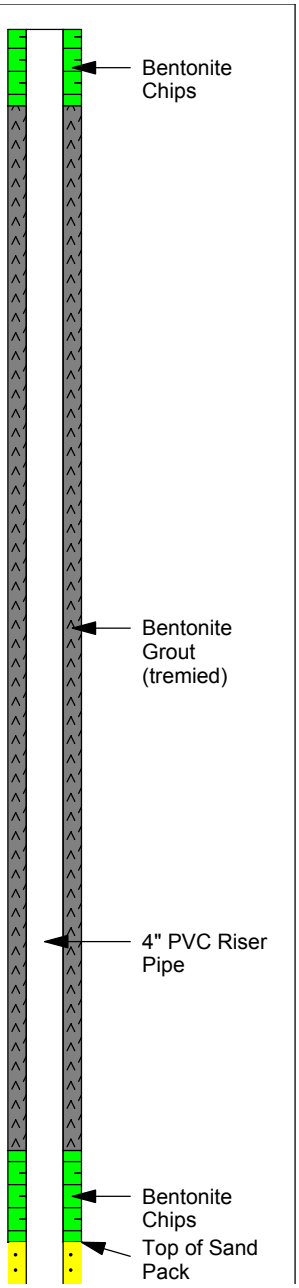
Ground Surf Elev. & Datum: 39.77 ft NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701769.255
Longitude/Easting: 1186293.154
Casing Elevation: 38.87 ft NAVD88

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 36 ft bgs
Groundwater ATD (ft bgs): 28 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resurveyed in 2012. Refer to Drawing C-09 in Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–5	SP	Yellowish brown, dry to moist, poorly graded fine and medium SAND with gravel (5 to 10%) and trace silt (FILL). Geotextile liner at 2.0' bgs.	
5 6 10		5–10	SP/SM	Very dark gray mixture of most, poorly graded fine and medium SAND and some woodwaste.	
8 11 12		10–15	Wood waste	Dark, brownish gray, moist, WOODWASTE mixture consisting of wood fragments, peat, sand, and silt.	
8 10 13		15–20	Wood waste	Same as above. Some gravel. WOODWASTE.	
50/5"		20–25	Wood waste	Same as above. WOODWASTE.	



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: R-6

Drill Date: October 5, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

Ground Surf Elev. & Datum: 39.77 ft NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701769.255
Longitude/Easting: 1186293.154
Casing Elevation: 38.87 ft NAVD88

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 36 ft bgs
Groundwater ATD (ft bgs): 28 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resurveyed in 2012. Refer to Drawing C-09 in Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
12 18 20		25 26 27 28		No recovery.	Top of Screen
21 30 50		29 30	CL	Dark, grayish brown, wet, clayey SILT with fine sand. Trace wood fibers.	
30 32 40		31 32	SM	Dark grayish brown, wet, silty fine SAND with some undecayed wood fragments.	#2/12 Monterey Sand Pack 4" PVC Screen (0.020-inch)
28 33 42		33 34	ML/OL	Grayish, wet, sandy SILT with wood fibers.	
9 16 17		35	SP	Very dark gray, wet, poorly graded fine SAND.	
		36	ML	Brown, moist, non plastic SILT.	End Cap
			PT	Dark brown PEAT.	

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: R-5

Drill Date: October 8, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

Ground Surf Elev. & Datum: 52.15 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701953.593
Longitude/Easting: 1186200.628
Casing Elevation: 52.50'

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 58 ft bgs
Groundwater ATD (ft bgs): 44.5 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resurveyed in 2012. Refer to Drawing C-09 in Phase II Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–5	SP	Yellowish brown, dry, poorly graded fine and medium SAND with less than 5% silt and 5 to 10% gravel (FILL). Geotextile liner at 2.3' bgs.	Bentonite Chips
8 8 16		5–10	Wood waste	Dark brown, moist, WOODWASTE/PEAT consisting of 50 to 70% woodpieces, silt, sand and gravel.	
5 5 5		10–15			
9 10 26		15–20		Same as above. Some slag.	
7 8 9		20–25	Wood waste	Same as above. Gravel is black and has luster. Possible slag.	Bentonite Grout (tremied)

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: R-5

Drill Date: October 8, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

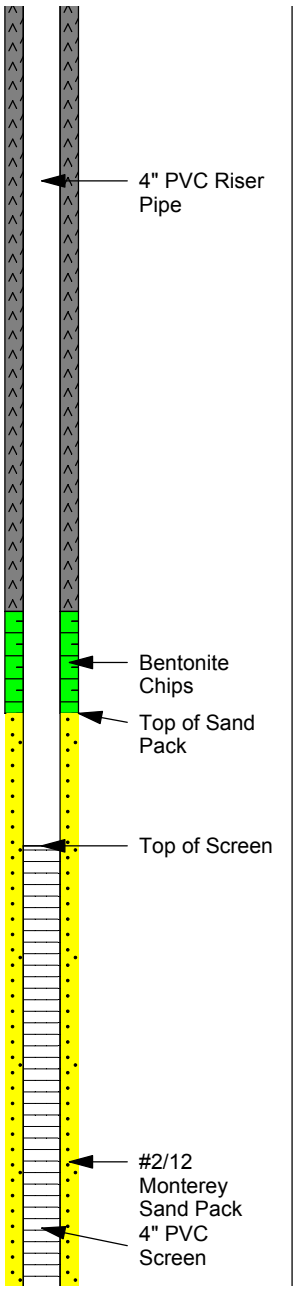
Ground Surf Elev. & Datum: 52.15 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701953.593
Longitude/Easting: 1186200.628
Casing Elevation: 52.50'

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 58 ft bgs
Groundwater ATD (ft bgs): 44.5 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resurveyed in 2012. Refer to Drawing C-09 in Phase II Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
10 10 11		25–26			
11 10 13		30–31		Same as above. Woodwaste.	
23 50		35–36		Same as above. Moist. Wood pieces--possible log fragments.	
8 13 22		40–41	Wood waste	Same as above. Moist. Woodwaste.	
13 20 23		45–46	ML/SM	Dark gray, wet, SILT, non-plastic, becomes silty SAND, interbedded with poorly graded SAND with silt, fine.	
13 18 19		49–50			



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: R-5

Drill Date: October 8, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

Ground Surf Elev. & Datum: 52.15 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701953.593
Longitude/Easting: 1186200.628
Casing Elevation: 52.50'

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 58 ft bgs
Groundwater ATD (ft bgs): 44.5 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resurveyed in 2012. Refer to Drawing C-09 in Phase II Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
18 25 50		51	SP-SM	Dark gray, wet, poorly graded fine SAND and silty SAND.	(0.020-inch) continuous-wrap
13 28 33		52			
30 35 19		53			
10 12 17		54	ML	Dark gray SILT. Trace peat.	
9 8 20		55	SP	Dark gray, wet, poorly graded fine SAND, little silt.	
		56			
		57	CL/PT	Gray laminated silty CLAY, plastic with layers of dark brown peat. Clay is medium stiff. Approx 20% peat beds.	End Cap
		58			

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: R-4

Drill Date: October 8, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

Ground Surf Elev. & Datum: 48.11 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 702096.408
Longitude/Easting: 1186152.518
Casing Elevation: 48.28'

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 54 ft bgs
Groundwater ATD (ft bgs): 34 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resureyed in 2012. Refer to Drawing C-09 in Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0	SP	Yellowish brown, moist, poorly graded fine and medium SAND with less than 5% silt and 5 to 10% gravel (FILL).	Bentonite Chips
		2		Geotextile liner at 2.0.	
8 10 12		6	Wood waste	Dark brown, moist, WOODWASTE, mixture of wood fragments, organic silt, sand and gravel. Greater than 50% organics, 5% gravel.	
6 8 9		10		Same as above, with 5% gravel.	
8 9 13		15		Same as above. Gravel stuck in shoe of liner.	
6 18 24		20	Wood waste	Same as above. WOODWASTE.	Bentonite Grout (tremied)
		25			

Notes:
ft bgs = feet below ground surface
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▼ = denotes groundwater table

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Monitoring Well ID: R-4

Drill Date: October 8, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

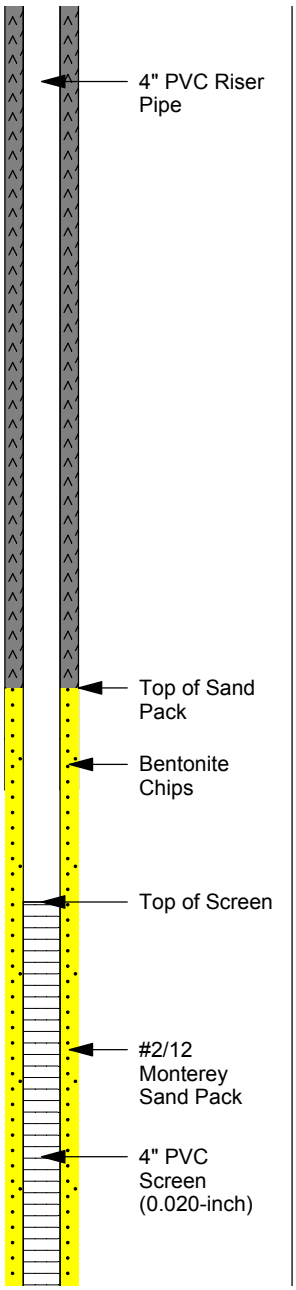
Ground Surf Elev. & Datum: 48.11 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 702096.408
Longitude/Easting: 1186152.518
Casing Elevation: 48.28'

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 54 ft bgs
Groundwater ATD (ft bgs): 34 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resureyed in 2012. Refer to Drawing C-09 in Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
12 16 19		25–30		Same as above. WOODWASTE.	
7 7 7		30–35	SW/SM	Black to very dark brownish gray, moist, well graded SAND, with silt 10 to 20%, gravel 5 to 10% and fine grained organics.	
5 6 7		35–40	Wood waste	Dark brown, wet, WOODWASTE.	
6 9 10		40–45	ML/SM	Dark gray, wet, sandy SILT. Non plastic, trace peat. Silty fine SAND in shoe.	
10 11 10		45–47	SM	Dark gray, wet, poorly graded, silty fine SAND. Trace peat.	
7 15 17		47–50	SP	Dark gray, wet, poorly graded, fine SAND with 5% silt. Trace peat.	
10 16 19		48–49			
12 18		49–50			



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: R-4

Drill Date: October 8, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

Ground Surf Elev. & Datum: 48.11 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 702096.408
Longitude/Easting: 1186152.518
Casing Elevation: 48.28'

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 54 ft bgs
Groundwater ATD (ft bgs): 34 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resureyed in 2012. Refer to Drawing C-09 in Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
24 7 8 9 7 7 12		51 52 53 54	ML/PT	Interbedded, dark brown PEAT and gray highly plastic, medium stiff, CLAY.	End Cap

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: R-3

Drill Date: October 7, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

Ground Surf Elev. & Datum: 47.23 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 702003.556
Longitude/Easting: 1186327.494
Casing Elevation: 47.43

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 47.5 ft bgs
Groundwater ATD (ft bgs): 34 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resurveyed in 2012. Refer to Drawing C-09 in Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0	SP	Yellowish brown, moist, poorly graded fine and medium SAND with less than 5% silt and 5 to 10% rounded gravel (FILL).	Bentonite Chips
		2		Geotextile liner at 2.0.	
		5	SP	Layer of gray poorly graded fine and medium SAND.	
11 13 14		6	Wood waste	Dark brown, moist, WOODWASTE, mixture of wood fragments, organic silt, sand and gravel. Greater than 50% organic silt, 15 to 20% gravel.	
8 8 13		10		Same as above, with 15 to 20% gravel.	
7 8 16		15		Same as above. Dark brown woody material. Some obvious vesicular slag with 10 to 20% gravel.	Bentonite Grout (tremied)
10 15 13		20	Wood waste	Same as above. Woodwaste.	4" PVC Riser Pipe
		25			

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
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Monitoring Well ID: R-3

Drill Date: October 7, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

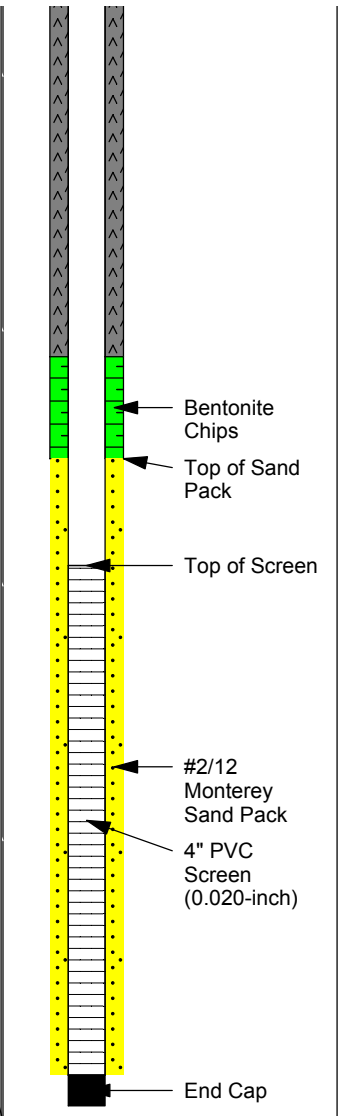
Ground Surf Elev. & Datum: 47.23 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 702003.556
Longitude/Easting: 1186327.494
Casing Elevation: 47.43

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 47.5 ft bgs
Groundwater ATD (ft bgs): 34 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: Well was converted to a recovery well and resurveyed in 2012. Refer to Drawing C-09 in Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
13 15 22		25–26		No recovery.	
50/6"		30–31		No recovery.	
29 50/4"		34–36		No recovery.	
8 22 18		40–41		No recovery.	
27 40		44–45	SM/SP	Dark brown, silty SAND and poorly graded fine SAND	
26 4 9 22 26		45–47	CL/PT	Gray, silty CLAY, medium plasticity with dark brown, fibrous PEAT.	



Notes:
ft bgs = feet below ground surface
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Extraction Well ID: R-2

Drill Date: August 1, 2011
Logged By: Kristin Anderson
Drilled By: David Gose/ Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8" and 12"
Boring Depth (ft bgs): 32'
Groundwater ATD (ft bgs): 10.5'

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 702039.12 ft
Longitude/Easting: 1186475.18 ft
Casing Elevation: 27.05 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling, 12" auger for well installation.
*Refer to Phase 2 Record Drawings for surface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	EXTRACTION WELL DETAIL
5 6 8		0-3	SP	Removed 2.5 ft of landfill cap removed with cookie cutter. Began borehole with auger at 2.5 ft. Dry, brown poorly graded medium SAND with trace silt. 3" lense of WOODWASTE at 2.75 ft.	Temporary Monument w/Concrete Seal*
7 7 7		3-6	Wood waste	Moist, dark brown WOODWASTE mixture of wood fragments, organic silt, sand and gravel at 3.25 ft. >50% organics.	
7 7 6		6-9		Same as above.	
5 6 10		9-11		Same as above.	20% Solids Bentonite Grout 6" dia Sch 80 PVC Riser Pipe
3 3 8		11-13		Same as above. Wet at 10.5 ft.	
3 4 12		13-16		Same as above. Moist at 13 ft.	
5 11 12		16-18	ML Wood waste	Same as above. Grades to very moist, light gray SILT with fine sand at 15.75 ft.	1" dia, Sch 80 PVC Riser Pipe Bentonite Chips Top of Sand Pack
12 13 18		18-21	SP-SM SM SP-SM	Wet, dark brown WOODWASTE misture of wood fragments, organic silt, sand and gravel. >50% organics. 3" lense of gray SILT at 17.75 ft. Wet, brown poorly graded medium SAND with SILT and GRAVEL at 18 ft. Slight wood fragments.	Top of Screen #2/12 Monterey Sand Pack
5 10 14		21-24	SP	Wet, brown SILTY SAND. Grades to wet, gray poorly graded medium SAND with SILT and GRAVEL at 20.5 ft. Same as above at 23 ft.	6" dia, 0.020-in Stainless V-wire Screen
12 18 20 14 16 20		24-28		Grades to wet, gray poorly-graded fine SAND at 23 ft. Same as above. Trace gravel at 25.5 ft.	1" dia, 0.010-in Sch 80 PVC Screen
12 13 21		28-32		Same as above.	PVC End Cap 2' deep, 6" dia Stainless Sump

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Extraction Well ID: R-1

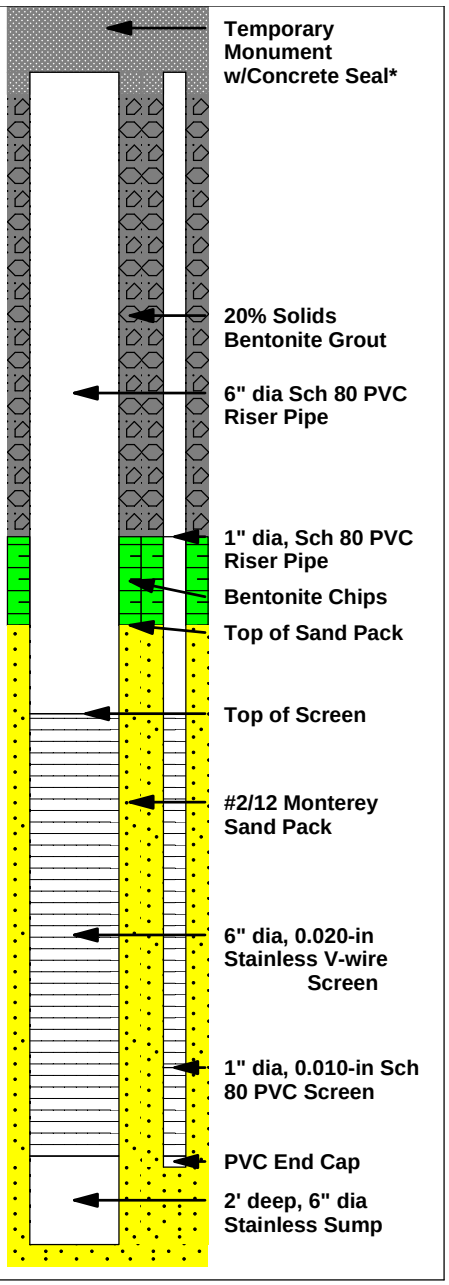
Drill Date: August 1, 2011
Logged By: Kristin Anderson
Drilled By: David Gose/ Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split-spoon
Boring Diameter: 8" and 12 "
Boring Depth (ft bgs): 28.0'
Groundwater ATD (ft bgs): 17.5'

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 702291.36 ft
Longitude/Easting: 1186312.02 ft
Casing Elevation: 24.96 ft NAVD88

Client: 24.96 ft NGVD88
Project: B&L RIM TRUST
Task Number: Task No. 1422
Site Location: Pierce County, WA

Remarks: 8" diameter auger for sampling and 12" diameter auger for well installation.
* Refer to Phase 2 Record Drawings for suface monument completion details.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Removed 2 ft of landfill cap with cookie cutter. Began borehole with auger at 2 ft.
10 11 12		2	SP-SM	Dry, brown, poorly graded medium SAND with SILT and small (1/4"dia) GRAVEL. Color grades to gray at 2.5 ft, moist at 3 ft.
3 4 5		5		Same as above.
		6	Wood waste	Abrupt contact at 5.5 ft with moist, dark brown WOODWASTE mixture of wood fragments, organic silt, sand and gravel. >50% organics.
		8		No recovery- rock blocking sampler.
12 11 1		10		No recovery- wood fragments blocking sampler.
7 3 2		12		No recovery- wood fragments blocking sampler.
3 4 7		15		Moist, dark brown WOODWASTE mixture of wood fragments, organic silt, sand and gravel. >50% organics.
6 5 10		17	SP	6" lense of wet, dark brown poorly graded fine SAND with trace silt.
		18		Very moist, dark brown poorly graded fine SAND. Trace wood fragments at 17.5 ft. No silt or gravel.
4 5 13		20		Wet, dark brown poorly graded medium SAND. Trace wood fragments. Color grades to red-brown at 21 ft.
7 14 21		23		Same as above. No wood fragments.
18 20 21		25		Same as above.
6 6 12		27		Same as above.
		28	SM	Grades to wet, gray SANDY SILT at 27.75 ft.



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-12

Drill Date: October 6, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling

Ground Surf Elev. & Datum: 36.40 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701803.159
Longitude/Easting: 1185907.933
Casing Elevation: 36.56

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 39.7 ft bgs
Groundwater ATD (ft bgs): 29.5 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
10 10 12		0–5	SP	Dark brown, dry to moist, poorly graded fine and medium SAND (FILL). Geotextile liner at 2.0.	Bentonite Chips
		4–5	SP/SM	Dark gray to black, moist, poorly graded, fine SAND with silt and gravel. Dark brown wood fragments--possible WOODWASTE.	
5 7 10		9–10	ML	Dark gray and dark brown, moist, SILT and sandy SILT with gravel.	
		10–15	OL/SM	Very dark brown to black, moist, organic SILT with sand and gravel and 5 to 10% WOODWASTE.	Bentonite Grout (tremied)
6 7 8		15–20	Wood waste	Very dark brown moist WOODWASTE mixture of wood pieces, silt, sand, and gravel.	
8 12 13		20–25	Wood waste	Same as above. WOODWASTE.	4" PVC Riser Pipe

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
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Monitoring Well ID: PZ-12

Drill Date: October 6, 2009
Logged By: John LaManna
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 39.7 ft bgs
Groundwater ATD (ft bgs): 29.5 ft bgs

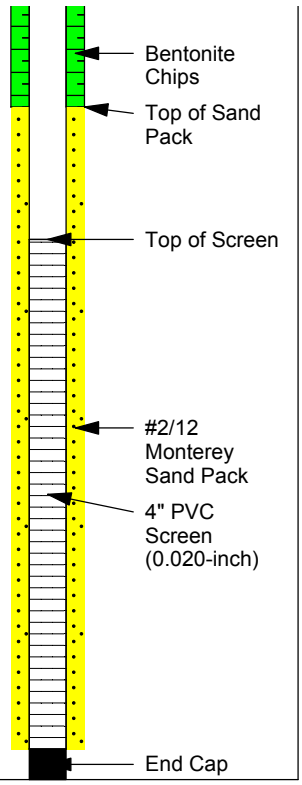
Ground Surf Elev. & Datum: 36.40 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701803.159
Longitude/Easting: 1185907.933
Casing Elevation: 36.56

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
50/6"		25	Wood waste	Same as above. WOODWASTE.
		26		
		27		
		28		
		29		
		30		
10			SM	Dark gray, wet, silty fine SAND with trace undecayed coarse
13		31		wood fragments. Possible woodwaste.
24		32		
		33		
		34		
		35		
10			SP	Very dark gray, wet, poorly graded, fine and medium SAND.
17		36		
20				
17		37		
36			SP-SM	Very dark gray, wet, poorly graded, fine SAND with silt (10 to
50		38		15%).
8				
10		39	CL	Gray silty, moist, CLAY with decayed wood pieces.
12		40		

MONITORING WELL DETAIL



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-8c

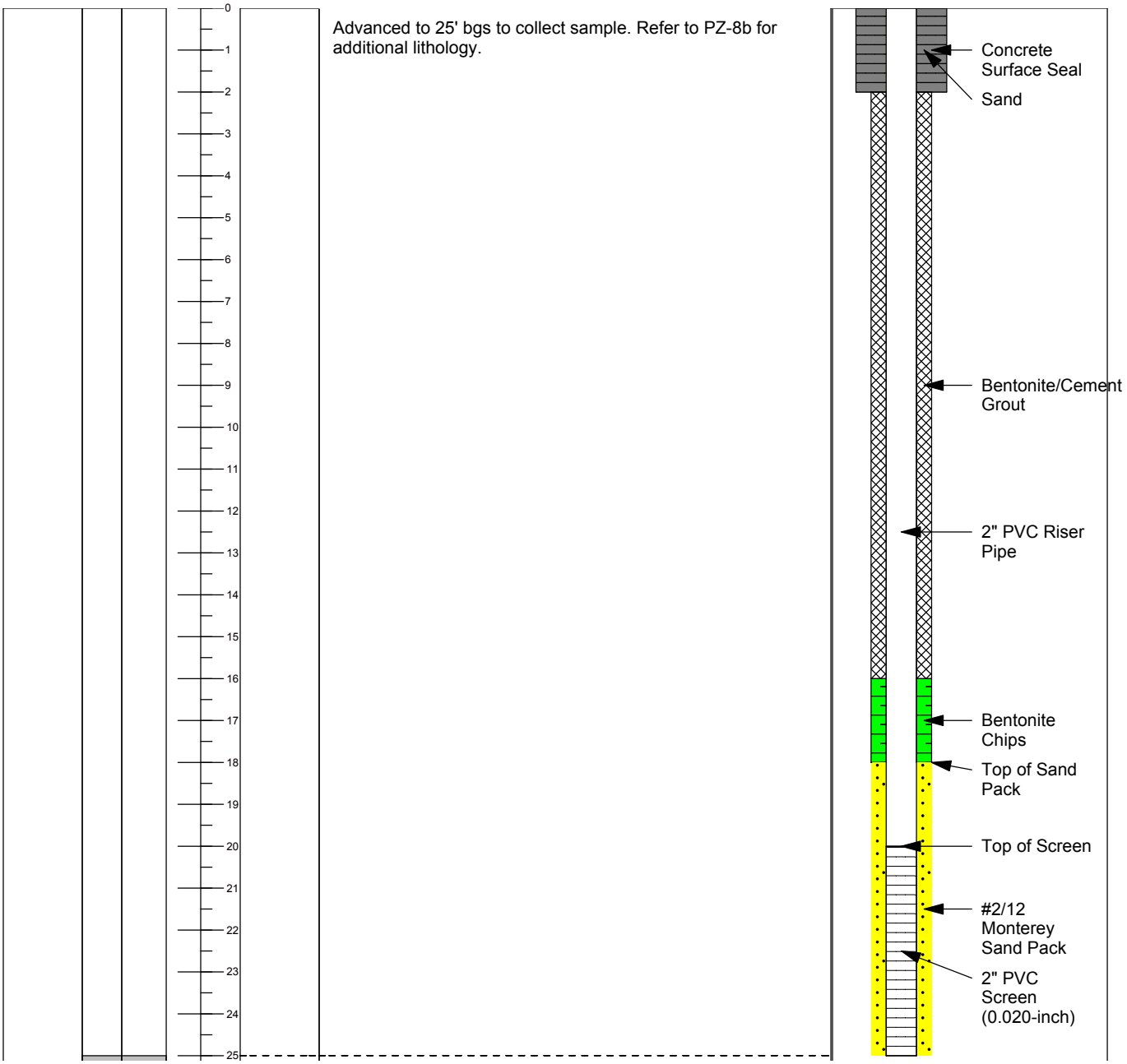
Drill Date: November 13, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 26.5 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 702085.738
Longitude/Easting: 1186496.747
Casing Elevation: 23.94 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL



Advanced to 25' bgs to collect sample. Refer to PZ-8b for additional lithology.

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-8c

Drill Date: November 13, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 26.5 ft bgs
Groundwater ATD (ft bgs): NA

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 702085.738
Longitude/Easting: 1186496.747
Casing Elevation: 23.94 NAVD88

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
6 23		25 26	SP	Brown, wet, poorly graded, SAND with silt. Grading to bluish gray.	

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-8b

Drill Date: November 12, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 20 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 702090.371
Longitude/Easting: 1186495.242
Casing Elevation: 22.91 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: The existing well was damaged during Phase 2 construction and decommissioned on 8/11/2012. A new PZ-8b well was installed in the same location. Survey and construction data reflect new well.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0		Advanced to 5' to collect samples.	Flush-mount steel casing monument
		1			
		2			Sand cap
		3		Geotextile liner underlying landfill cap at 3'.	2" PVC Riser Pipe
		4			Bentonite Chips
5 3 4		5			
		6	SM	Brown, moist, silty SAND with gravel. Grading to silty SAND/clayey SILT. Liner at 6.1'.	
		7			
		8			
		9			
9 10 10		10	SM/SP	Same as above. Wet. Turns to bluish gray, poorly graded, SAND with silt and gravel.	#2/12 Monterey Sand Pack
		11			2" PVC Screen (0.020-inch) 5-15 ft
		12			
5 7 8		13	SP	Same as above. Little silt.	
		14			
8 19 22		15		Same as above. No silt	Sand Pack
		16		Same as above. Geotextile line at 17.2', possibly carried down from above.	
8 13 24		17			
		18			Bentonite Chips
6 9 22		19		Same as above.	
16		20			

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-8b

Drill Date: November 12, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 20 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 702090.371
Longitude/Easting: 1186495.242
Casing Elevation: 22.91 ft NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks: The existing well was damaged during Phase 2 construction and decommissioned on 8/11/2012. A new PZ-8b well was installed in the same location. Survey and construction data reflect new well.

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-8a

Drill Date: December 18, 2009
Logged By: Erin Murray
Drilled By: Steve Choate / Cascade Drilling

Ground Surf Elev. & Datum: 19.60 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 702097.143
Longitude/Easting: 1186513.228
Casing Elevation: 19.33 NAVD88

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 14 ft bgs
Groundwater ATD (ft bgs): NA

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0		Advanced to 14' bgs to set well. Refer to PZ-8b for lithology.	TOC; Concrete Surface Seal; Bentonite Chips; Top of Sand Pack; Top of Screen; 2" PVC Riser Pipe; #2/12 Monterey Sand Pack; 2" PVC Screen (0.020-inch)
		1			
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-7b

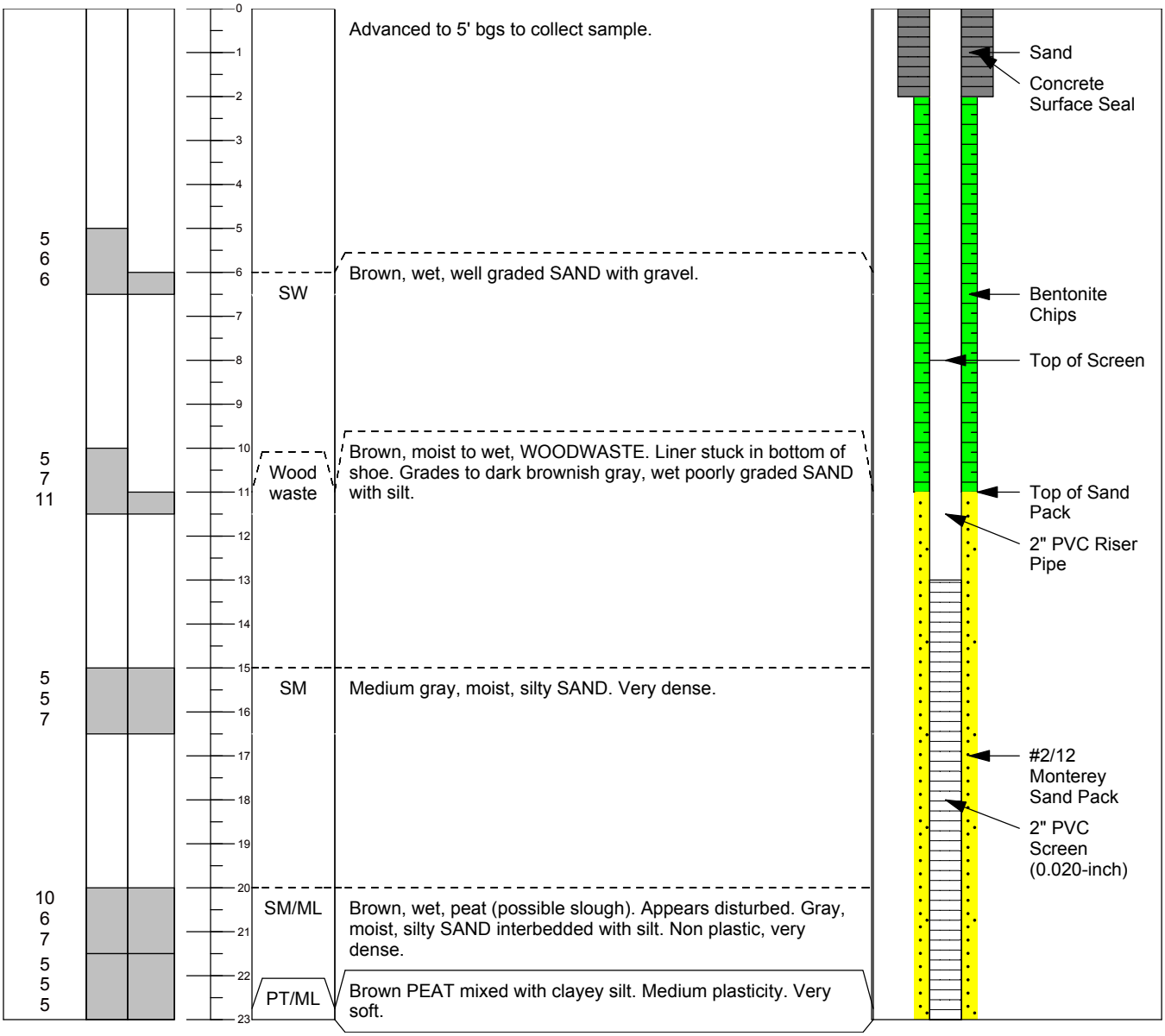
Drill Date: November 13, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 23 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701835.085
Longitude/Easting: 1186578.046
Casing Elevation: 21.97 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0		Advanced to 5' bgs to collect sample.	Sand; Concrete Surface Seal
5 6 6		6	SW	Brown, wet, well graded SAND with gravel.	Bentonite Chips; Top of Screen
5 7 11		10	Wood waste	Brown, moist to wet, WOODWASTE. Liner stuck in bottom of shoe. Grades to dark brownish gray, wet poorly graded SAND with silt.	Top of Sand Pack; 2" PVC Riser Pipe
5 5 7		15	SM	Medium gray, moist, silty SAND. Very dense.	#2/12 Monterey Sand Pack; 2" PVC Screen (0.020-inch)
10 6 7		20	SM/ML	Brown, wet, peat (possible slough). Appears disturbed. Gray, moist, silty SAND interbedded with silt. Non plastic, very dense.	
5 5 5		22	PT/ML	Brown PEAT mixed with clayey silt. Medium plasticity. Very soft.	



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-7a

Drill Date: December 17, 2009
Logged By: Brett Beaulieu
Drilled By: Steve Choate / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 21.5 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 20.08 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701831.046
Longitude/Easting: 1186595.689
Casing Elevation: 19.75 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
4 7 7		0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	ML SM	Advanced to 20' bgs to collect sample. Refer to PZ-7b for lithology. Dark gray, wet, soft, SILT. Plastic. Trace organic material and fine sand. Grading to gray, moist, silty SAND.	TOC Concrete Surface Seal Bentonite Chips Top of Sand Pack 2" PVC Riser Pipe Top of Screen #2/12 Monterey Sand Pack 2" PVC Screen (0.020-inch)

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-6b

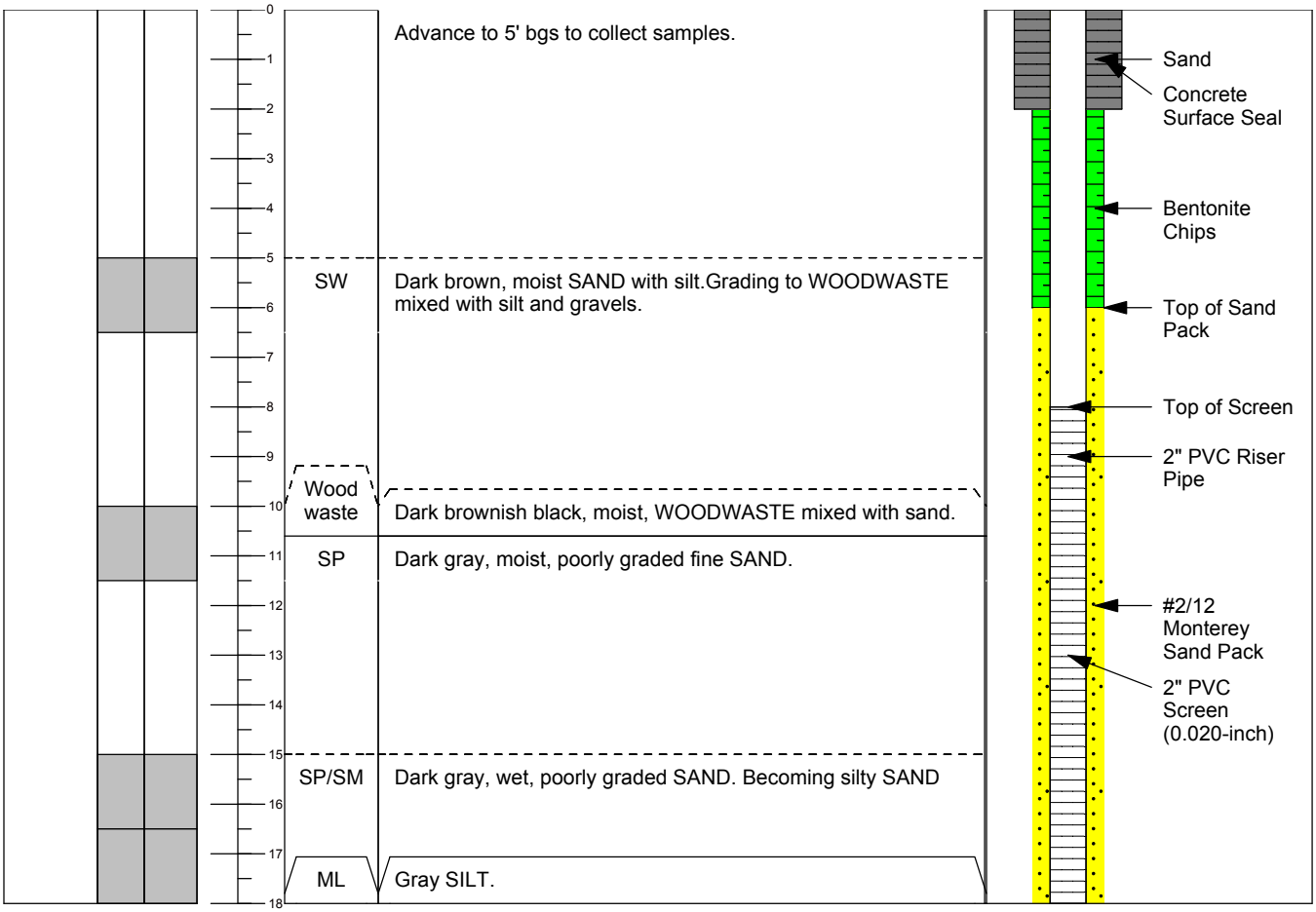
Drill Date: November 9, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 18 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701640.57
Longitude/Easting: 1186377.841
Casing Elevation: 23.56 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-6a

Drill Date: December 17, 2009
Logged By: Brett Beaulieu
Drilled By: Steve Choate / Cascade Drilling

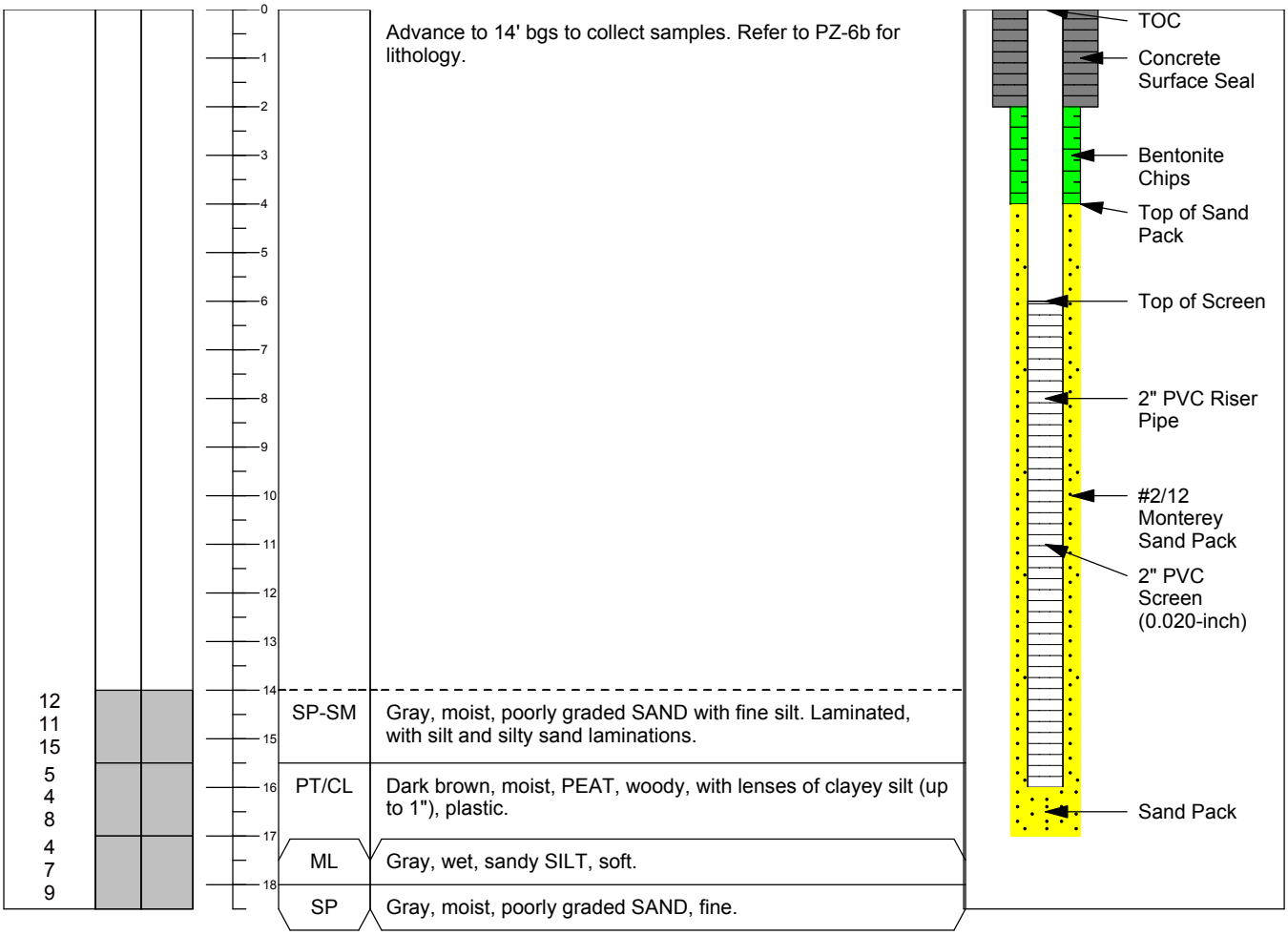
Ground Surf Elev. & Datum: 20.56 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701620.947
Longitude/Easting: 1186379.5
Casing Elevation: 20.40 NAVD88

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 18.5 ft bgs
Groundwater ATD (ft bgs): NA

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–14		Advance to 14' bgs to collect samples. Refer to PZ-6b for lithology.	TOC; Concrete Surface Seal; Bentonite Chips; Top of Sand Pack; Top of Screen; 2" PVC Riser Pipe; #2/12 Monterey Sand Pack; 2" PVC Screen (0.020-inch); Sand Pack
12 11 15		14–15	SP-SM	Gray, moist, poorly graded SAND with fine silt. Laminated, with silt and silty sand laminations.	
5 4 8		15–16	PT/CL	Dark brown, moist, PEAT, woody, with lenses of clayey silt (up to 1"), plastic.	
4 7 9		16–18	ML	Gray, wet, sandy SILT, soft.	
		16–18	SP	Gray, moist, poorly graded SAND, fine.	



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-5c

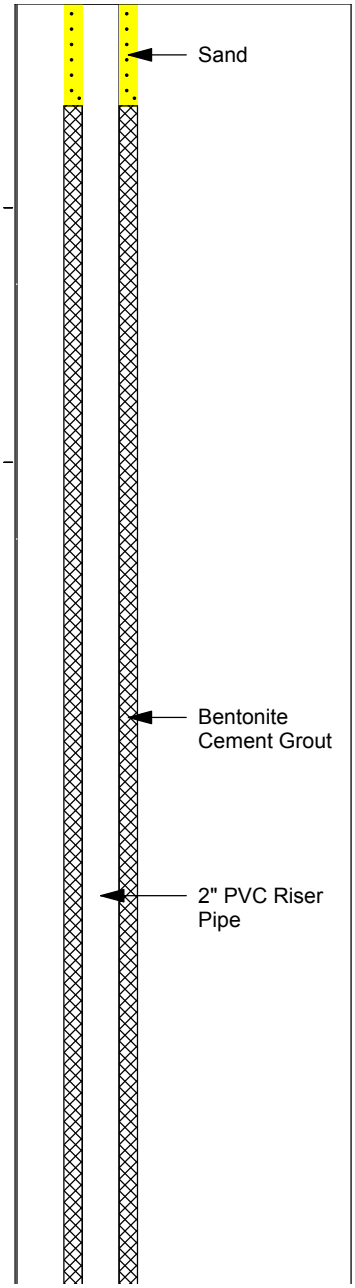
Drill Date: November 10, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 35.5 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701642.36
Longitude/Easting: 1186000.959
Casing Elevation: 24.08 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0		Advance to 4' bgs to collect samples.	
3 7 11		4	SW-SM	Brown, moist, well graded SAND with silt and gravel. Woodwaste scattered throughout. Grading to silty SAND.	
9 13 22		9	SP	Dark gray, moist, poorly graded SAND with trace silt.	
		11		Advance to 29' to collect sample.	



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-5c

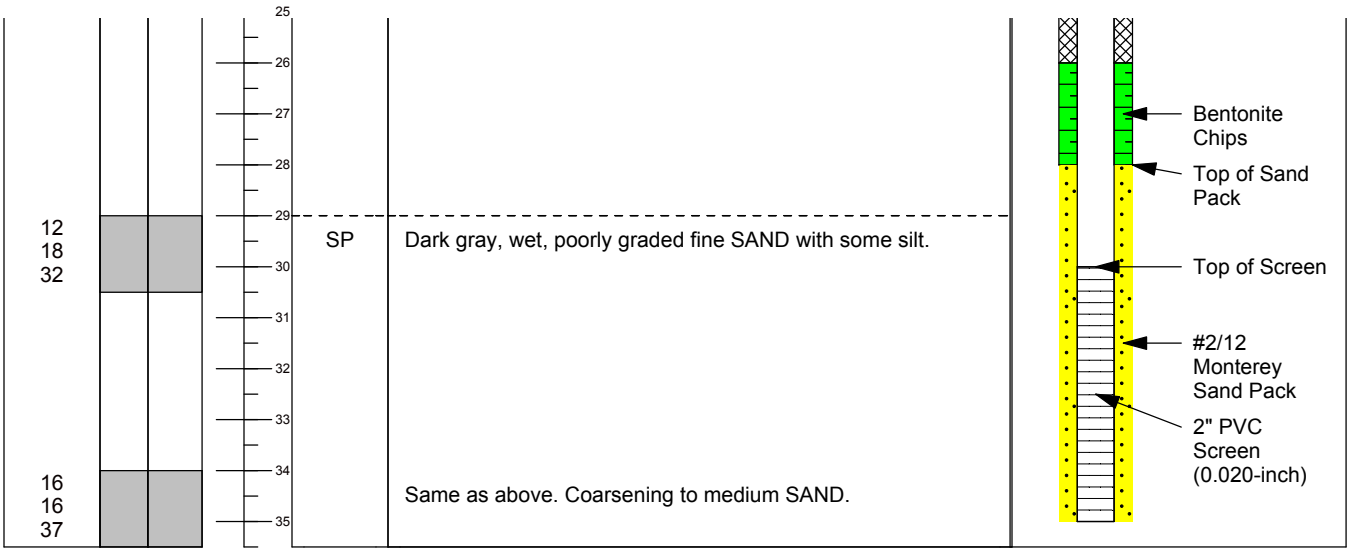
Drill Date: November 10, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 35.5 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701642.36
Longitude/Easting: 1186000.959
Casing Elevation: 24.08 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
12 18 32		29	SP	Dark gray, wet, poorly graded fine SAND with some silt.	
16 16 37		34		Same as above. Coarsening to medium SAND.	



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-5b

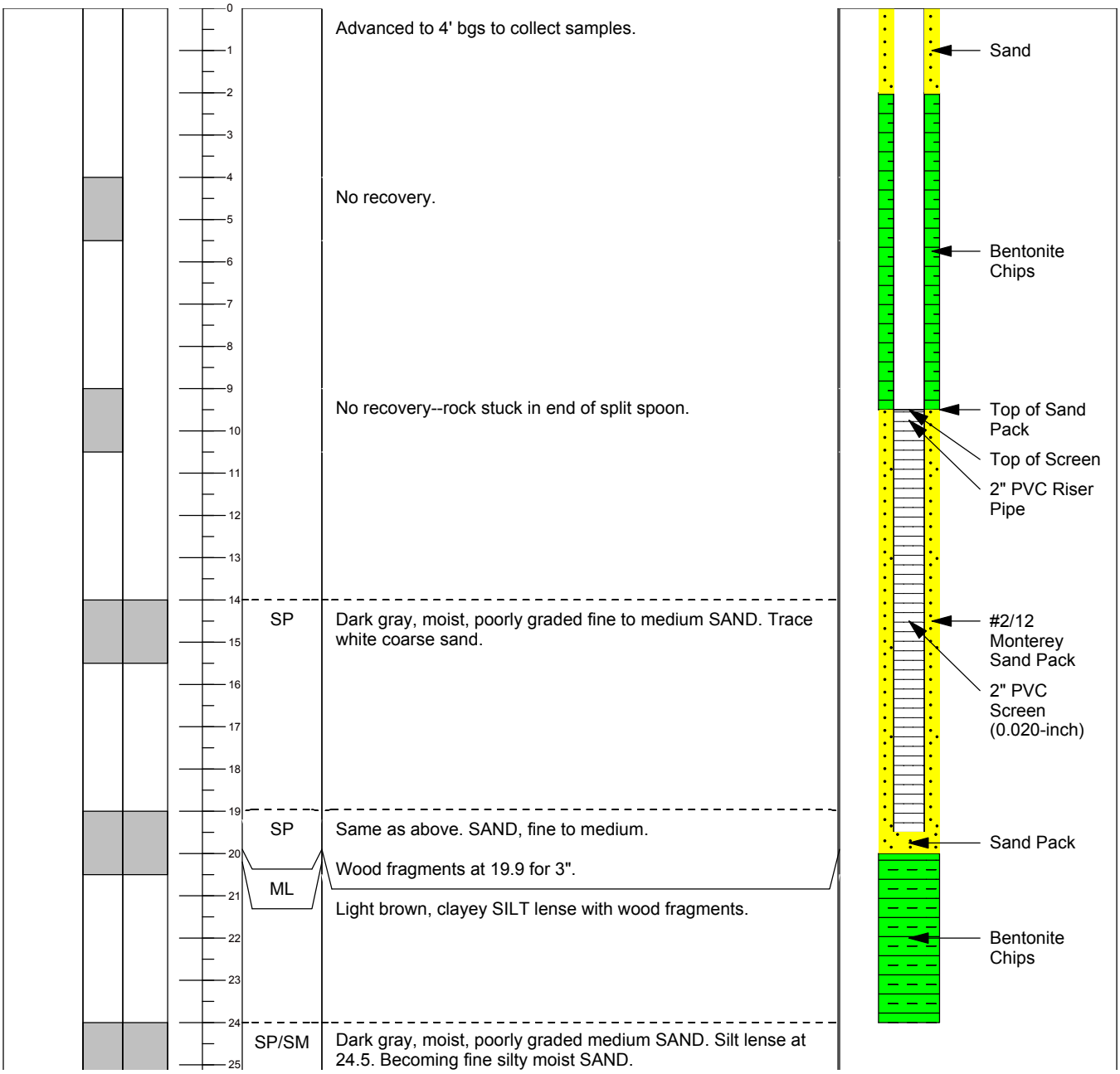
Drill Date: November 9, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 25.5 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701641.884
Longitude/Easting: 1186005.46
Casing Elevation: 24.05 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-5b

Drill Date: November 9, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 25.5 ft bgs
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701641.884
Longitude/Easting: 1186005.46
Casing Elevation: 24.05 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		25			

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-5a

Drill Date: December 17, 2009
Logged By: Brett Beaulieu
Drilled By: Steve Choate / Cascade Drilling

Ground Surf Elev. & Datum: 20.49 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701621.787
Longitude/Easting: 1186002.807
Casing Elevation: 20.16 NAVD88

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 20 ft bgs
Groundwater ATD (ft bgs): 10'

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–17		Advanced to 17' bgs to collect samples. Refer to PZ-5c for lithology.	TOC; Concrete Surface Seal; Bentonite Chips; Top of Sand Pack; Top of Screen; 2" PVC Riser Pipe; #2/12 Monterey Sand Pack; 2" PVC Screen (0.020-inch)
20 35 46		17–18	SW	Gray, wet, well graded SAND fine to medium, with trace gravels up to 1/2". White grains in layers from 18' to 18.5'.	
20 6 50		18–20		Same as above. Some wood chips and stray gravels.	

Notes:
ft bgs = feet below ground surface
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Monitoring Well ID: PZ-4c

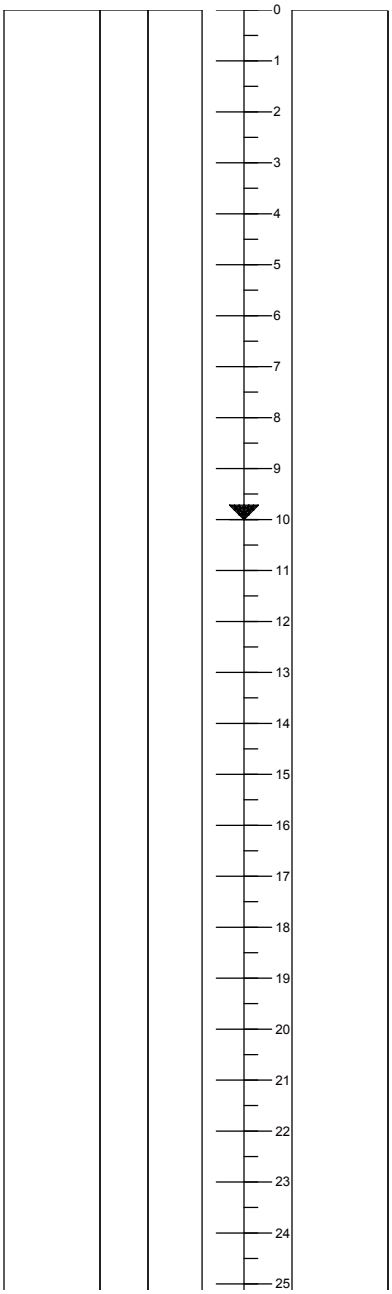
Drill Date: November 11, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 38.5 ft bgs
Groundwater ATD (ft bgs): 10'

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701732.979
Longitude/Easting: 1185754.957
Casing Elevation: 22.95 NAVD88

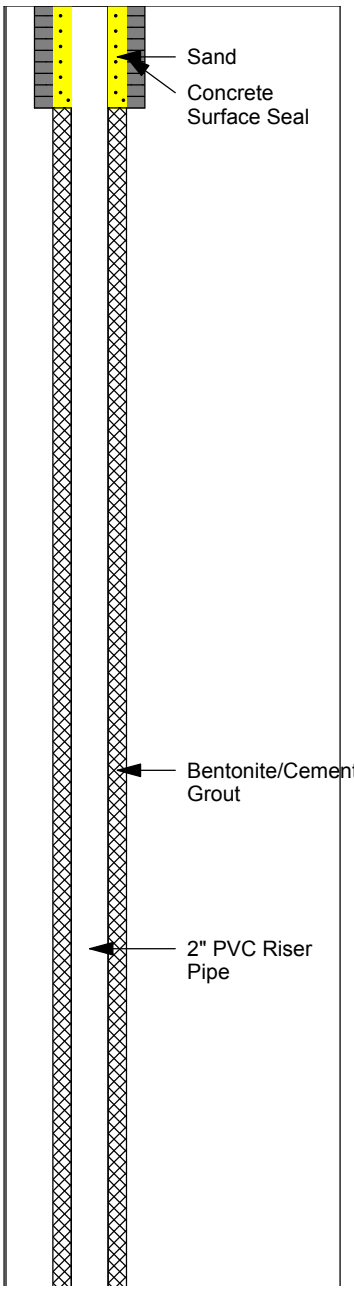
Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL



Advanced to 32' to collect samples. Refer to PZ-4a for geology.



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-4c

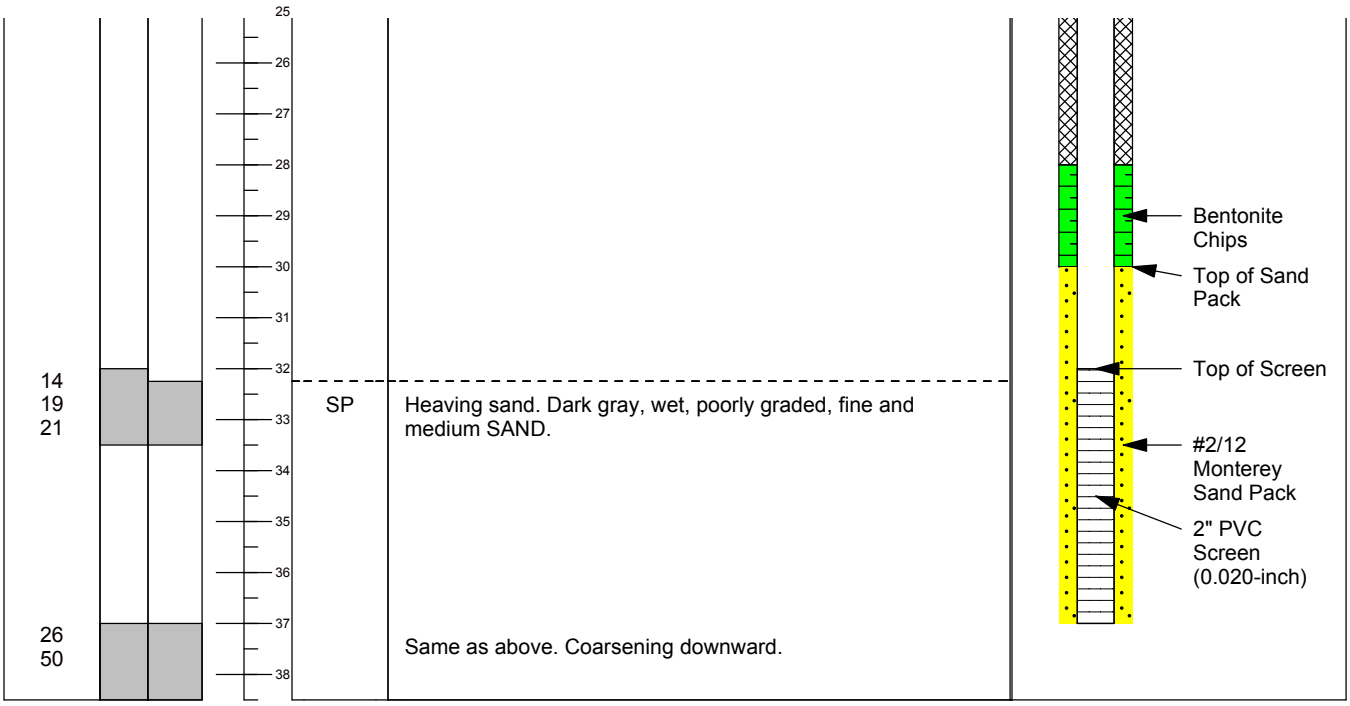
Drill Date: November 11, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 38.5 ft bgs
Groundwater ATD (ft bgs): 10'

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701732.979
Longitude/Easting: 1185754.957
Casing Elevation: 22.95 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
14 19 21		32	SP	Heaving sand. Dark gray, wet, poorly graded, fine and medium SAND.	Bentonite Chips Top of Sand Pack Top of Screen #2/12 Monterey Sand Pack 2" PVC Screen (0.020-inch)
26 50		37		Same as above. Coarsening downward.	



Notes:
ft bgs = feet below ground surface
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Monitoring Well ID: PZ-4b

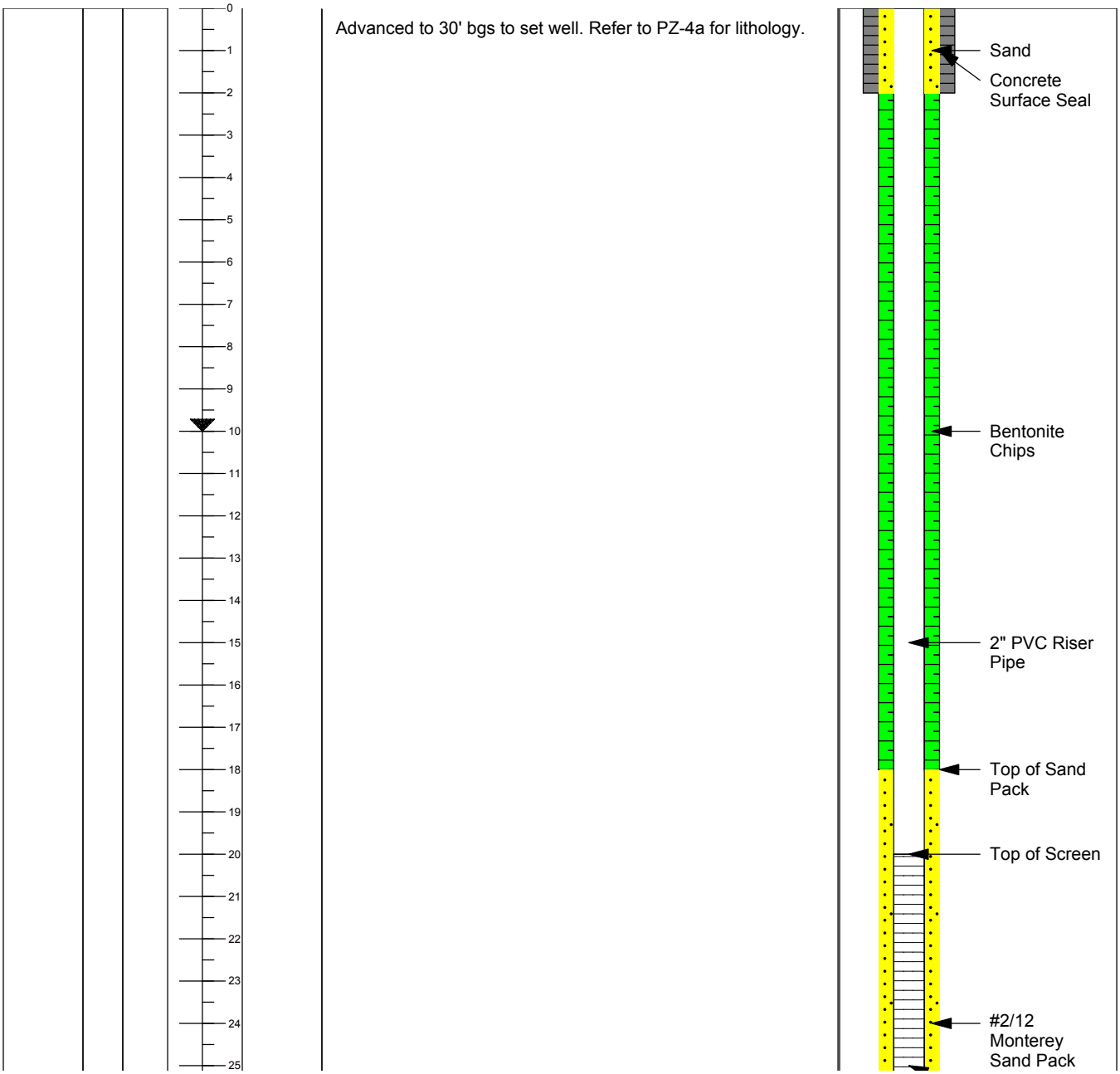
Drill Date: November 10, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 30 ft bgs
Groundwater ATD (ft bgs): ~10' bgs

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701726.184
Longitude/Easting: 1185755.207
Casing Elevation: 22.92 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–25		Advanced to 30' bgs to set well. Refer to PZ-4a for lithology.	



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-4b

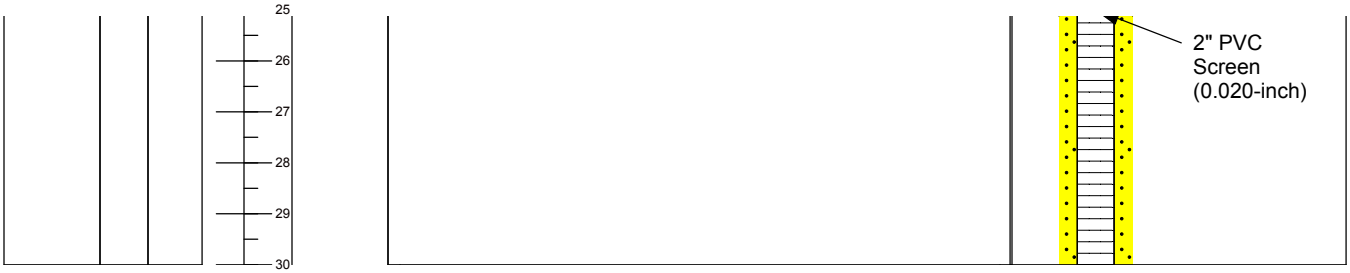
Drill Date: November 10, 2009
Logged By: Erin Murray
Drilled By: Dave Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 30 ft bgs
Groundwater ATD (ft bgs): ~10' bgs

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701726.184
Longitude/Easting: 1185755.207
Casing Elevation: 22.92 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-4a

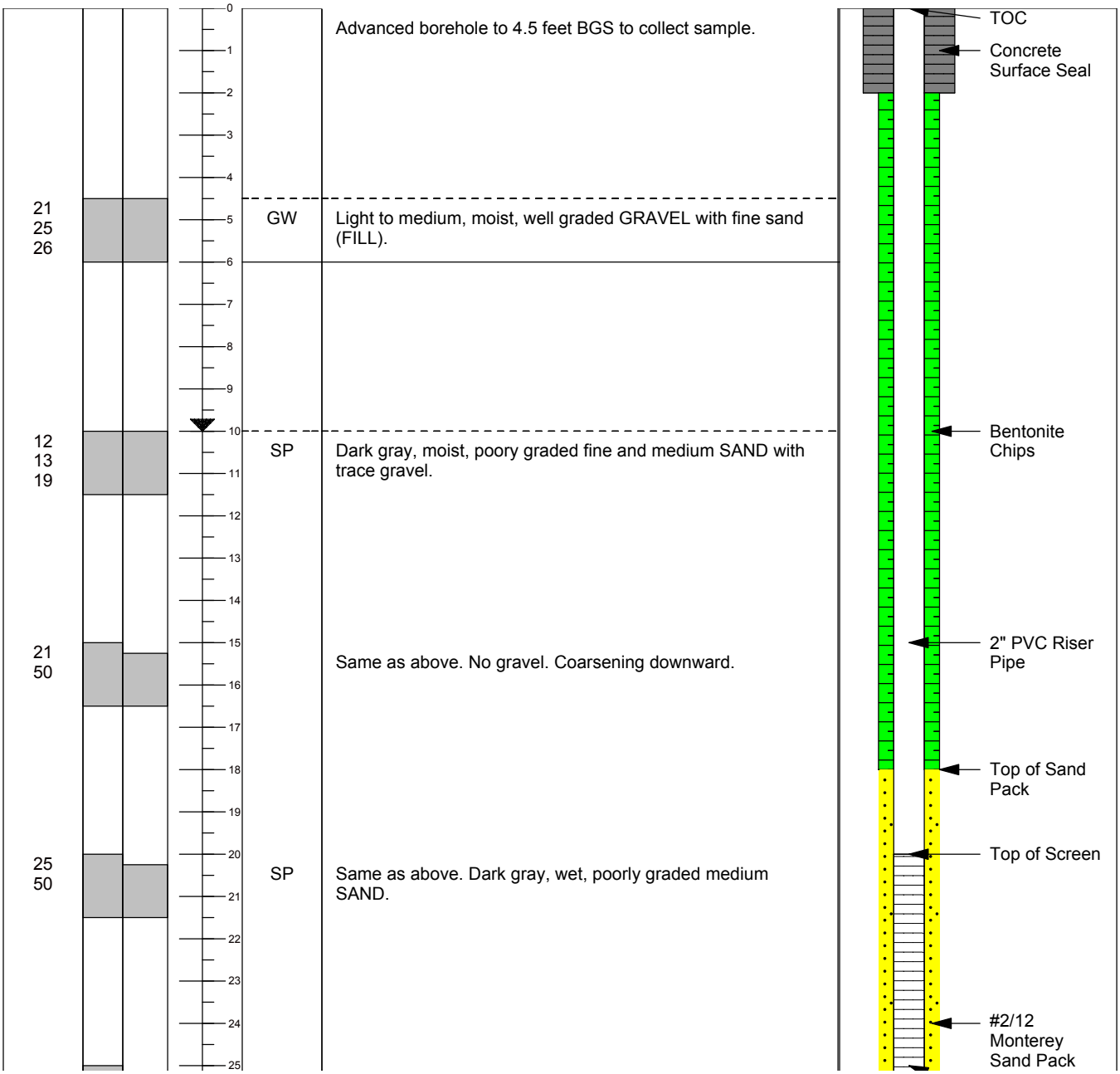
Drill Date: November 10, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 31.5 ft bgs
Groundwater ATD (ft bgs): 10' bgs

Ground Surf Elev. & Datum: 19.73 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701728.726
Longitude/Easting: 1185731.963
Casing Elevation: 19.42 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
				Advanced borehole to 4.5 feet BGS to collect sample.	
21 25 26		5	GW	Light to medium, moist, well graded GRAVEL with fine sand (FILL).	
12 13 19		10	SP	Dark gray, moist, poory graded fine and medium SAND with trace gravel.	
21 50		15		Same as above. No gravel. Coarsening downward.	
25 50		20	SP	Same as above. Dark gray, wet, poorly graded medium SAND.	



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-4a

Drill Date: November 10, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Ground Surf Elev. & Datum: 19.73 NAVD88
Drill Type: CME 75
Client:
Coordinate System: NAD83/98
Sample Method: 18" D&M Split-spoon
Project: B&L RIM TRUST
Latitude/Northing: 701728.726
Boring Diameter: 8 1/4"
Task Number: Task No. 1323
Longitude/Easting: 1185731.963
Boring Depth (ft bgs): 31.5 ft bgs
Site Location: Milton, WA
Casing Elevation: 19.42 NAVD88
Groundwater ATD (ft bgs): 10' bgs

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
12 19 25		25 26 27 28 29 30 31	SP	Same as above. Same as above. SAND.	2" PVC Screen (0.020-inch)

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-3b

Drill Date: November 11, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 26 ft bgs
Groundwater ATD (ft bgs): ~9'BGS

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701976.047
Longitude/Easting: 1185753.709
Casing Elevation: 22.66 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–19		Advanced to 20' BGS to collect sample. Refer to PZ-3a for lithology for 0' to 20' BGS.	Sand; Concrete Surface Seal; Bentonite Chips; 2" PVC Riser Pipe; Top of Sand Pack; Top of Screen; #2/12 Monterey Sand Pack; 2" PVC Screen (0.020-inch)
9 13 15		20	SP	Medium brownish gray, wet, poorly graded SAND with little silt. Wood chunks at top of interval.	
4 7 9		22			
9 9		23		Same as above. Coarsening downward.	
10		24–25		Gray, moist, clayey SILT grading to brown PEAT mixed with	

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-3b

Drill Date: November 11, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 26 ft bgs
Groundwater ATD (ft bgs): ~9'BGS

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 701976.047
Longitude/Easting: 1185753.709
Casing Elevation: 22.66 NAVD88

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
9		25 – 26	ML/PT	silt.	

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-3a

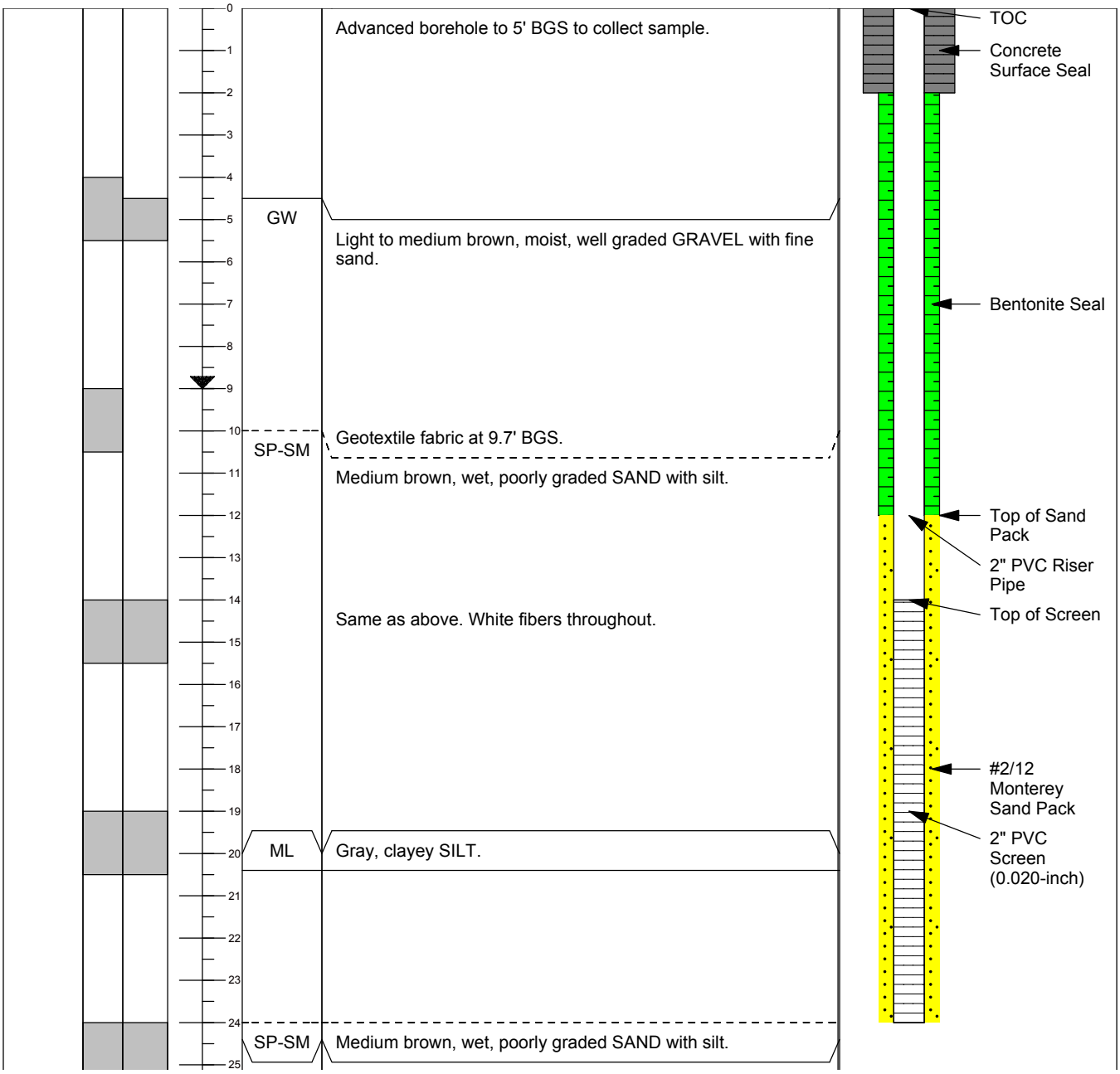
Drill Date: November 11, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 25.5 ft bgs
Groundwater ATD (ft bgs): 9' bgs

Ground Surf Elev. & Datum: 19.12 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701976.729
Longitude/Easting: 1185733.733
Casing Elevation: 19.05 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-3a

Drill Date: November 11, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling

Ground Surf Elev. & Datum: 19.12 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 701976.729
Longitude/Easting: 1185733.733
Casing Elevation: 19.05 NAVD88

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 25.5 ft bgs
Groundwater ATD (ft bgs): 9' bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		25	ML/PT	Gray, wet, clayey SILT mixed with brown, moist PEAT.	

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-2b

Drill Date: November 12, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 25 ft bgs
Groundwater ATD (ft bgs): 15' bgs

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 702186.888
Longitude/Easting: 1185897.843
Casing Elevation: 22.35 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
5 7 9		0–5		Advanced borehole to 5 feet BGS to collect sample.	Sand Concrete Surface Seal
		5–6	SW	Brown, moist, well graded SAND with gravel (30%). Grading to bluish gray.	
		6–7	ML/SM	Geotextile liner at 5.4' Medium brown, dry to moist, silty SAND/clayey SILT mixed with wood debris. Woodwaste stuck in bottom of sampler.	Bentonite Seal
4 5 6		10–11	Wood	Wood	
		11–12	ML/SM	Gray, moist, clayey SILT. Interbeded wood chunks. Grading to bluish, moist, silty SAND.	Top of Sand Pack 2" PVC Riser Pipe Top of Screen
6 7 7 7 7 15		15–18	SM/SP	Gray, wet, silty fine SAND grading to poorly graded fine SAND with silt. Same as above. SAND.	
16 20 29 9 13		18–22	SP	Gray, wet, silty, poorly graded medium, SAND. Coarsening downward. No recovery. Only 1" of gray, wet, poorly graded medium SAND in sampler.	#2/12 Monterey Sand Pack 2" PVC Screen (0.020-inch)
16 50 19 26 49 11		24–25	Peat	Wood chips for 2" and then clayey/silty PEAT.	

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-2a

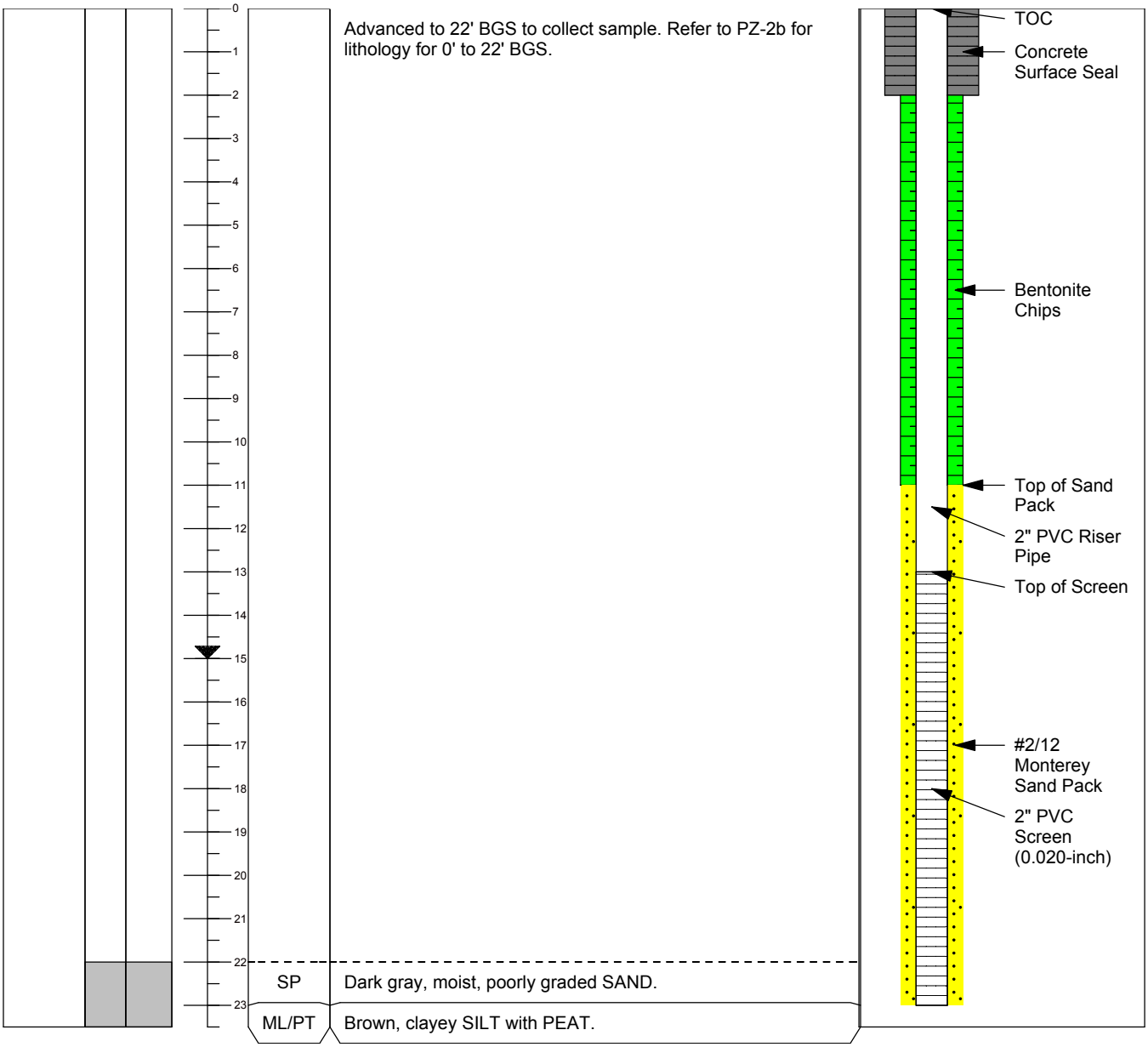
Drill Date: December 18, 2009
Logged By: Erin Murray
Drilled By: Steve Choate / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 23.5 ft bgs
Groundwater ATD (ft bgs): ~ 15 ft bgs

Ground Surf Elev. & Datum: 19.33 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 702209.884
Longitude/Easting: 1185886.441
Casing Elevation: 19.01 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PZ-1b

Drill Date: November 12, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 28 ft bgs
Groundwater ATD (ft bgs): 15' bgs

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 702329.084
Longitude/Easting: 1186191.532
Casing Elevation: 22.46 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0		Advanced borehole to 5' BGS to collect sample.	Sand; Concrete Surface Seal
		1			
		2			
		3			
		4			
		5			
		6		No recovery. Woodwaste stuck in bottom of sampler.	
		7			
		8			
		9			Bentonite Chips
		10		Black, moist, WOODWASTE.	
		11	Wood waste	Gray, moist, clayey SILT. Organics throughout.	
		12	ML	Grades to gray, wet, poorly graded silty SAND.	
		13	SM	Dark gray, wet, poorly graded fine SAND.	2" PVC Riser Pipe
		14			
		15			Top of Sand Pack
		16			Top of Screen
		17			
		18			
		19			
17 14 14		20	SP	Same as above. Coarsening downward becoming medium SAND.	#2/12 Monterey Sand Pack
		21			
17 25 26		22			
18 20 27		23		Same as above. Sample is not cohesive and appears disturbed-possible heaved sample.	2" PVC Screen (0.020-inch)
		24			
		25			

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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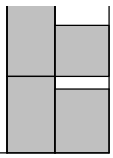
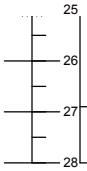
Monitoring Well ID: PZ-1b

Drill Date: November 12, 2009
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 28 ft bgs
Groundwater ATD (ft bgs): 15' bgs

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83/98
Latitude/Northing: 702329.084
Longitude/Easting: 1186191.532
Casing Elevation: 22.46 NAVD88

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
8 9 10				Same as above. Medium SAND. Wet.	
			PT	Brown, moist to dry, PEAT.	

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
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Monitoring Well ID: PZ-1a

Drill Date: December 18, 2009
Logged By: Erin Murray
Drilled By: Steve Choate / Cascade Drilling

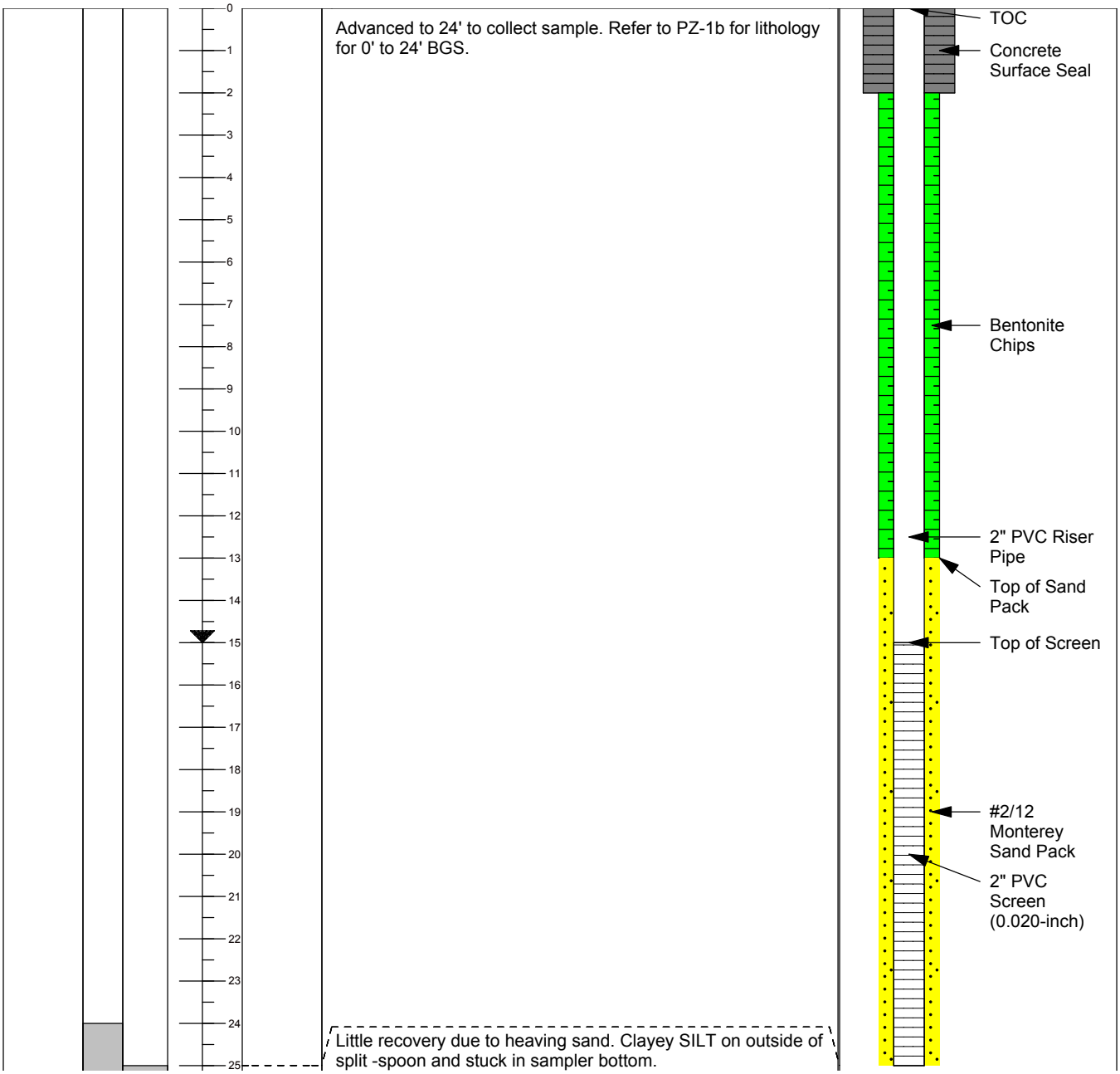
Ground Surf Elev. & Datum: 19.360 NAVD 88
Coordinate System: NAD83/98
Latitude/Northing: 702353.137
Longitude/Easting: 1186183.277
Casing Elevation: 19.10 NAVD 88

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 27 ft bgs
Groundwater ATD (ft bgs): ~ 15 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
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Monitoring Well ID: PZ-1a

Drill Date: December 18, 2009
Logged By: Erin Murray
Drilled By: Steve Choate / Cascade Drilling

Ground Surf Elev. & Datum: 19.360 NAVD 88
Coordinate System: NAD83/98
Latitude/Northing: 702353.137
Longitude/Easting: 1186183.277
Casing Elevation: 19.10 NAVD 88

Drill Type: CME 75
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 27 ft bgs
Groundwater ATD (ft bgs): ~ 15 ft bgs

Client:
Project: B&L RIM TRUST
Task Number: Task No. 1323
Site Location: Milton, WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		25	ML	Brownish, clayey SILT mixed with PEAT and sand.	
		26	ML/PT		
		27			

Notes:
ft bgs = feet below ground surface
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Boring Location: PD-216

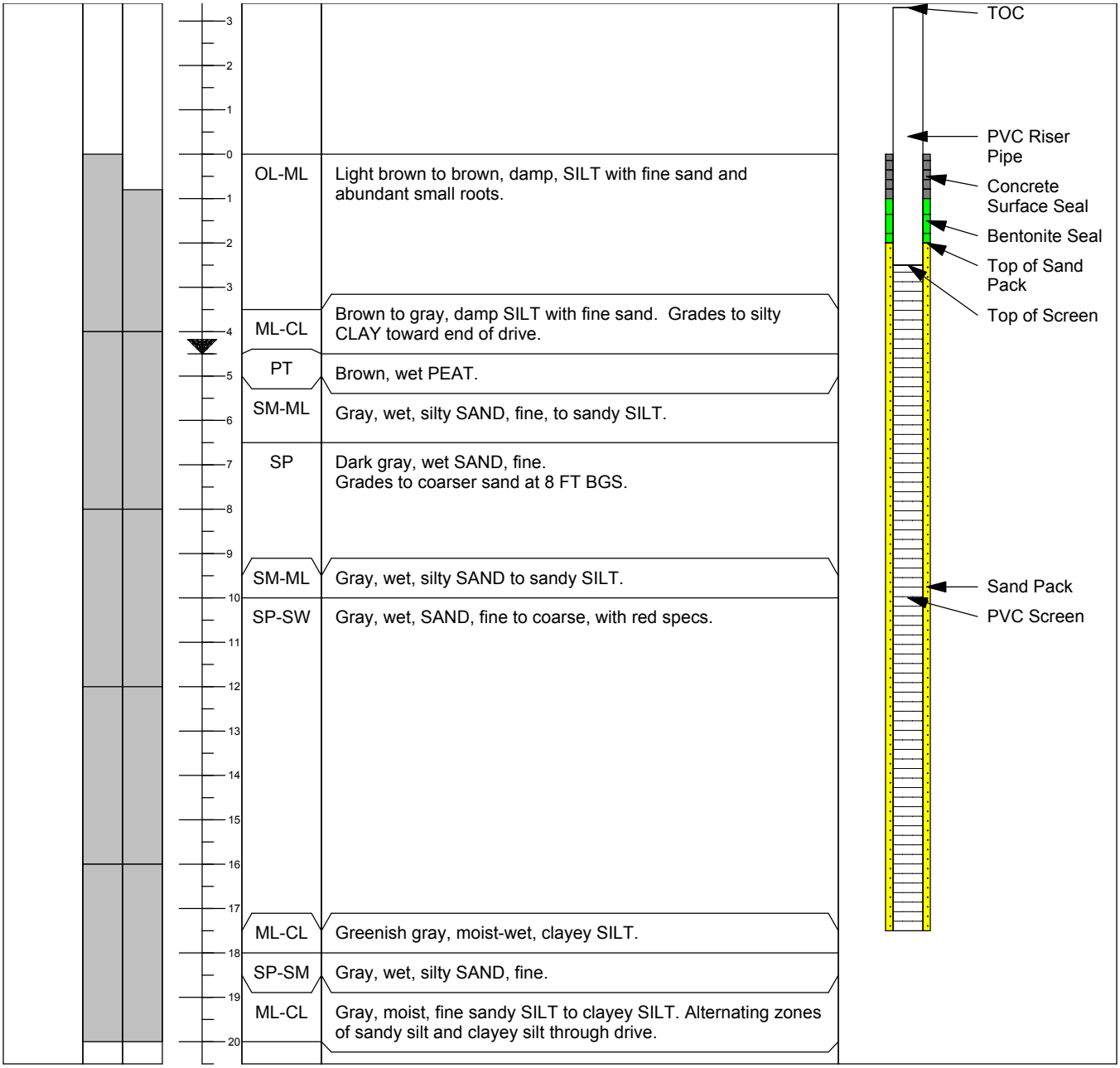
Drill Date: September 30, 2008
Logged By: Chris Gardner
Drilled By: ESN Northwest
Drill Type: Geoprobe
Sample Method: Stanley BR-187
Boring Diameter: 2.0"
Boring Depth (ft bgs): 20 FT BGS
Groundwater ATD (ft bgs): 4.5 FT BGS

Ground Surf Elev. & Datum: 17.36 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 700921
Longitude/Easting: 1185663
Casing Elevation: 20.45, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0	OL-ML	Light brown to brown, damp, SILT with fine sand and abundant small roots.	
		4	ML-CL	Brown to gray, damp SILT with fine sand. Grades to silty CLAY toward end of drive.	
		5	PT	Brown, wet PEAT.	
		6	SM-ML	Gray, wet, silty SAND, fine, to sandy SILT.	
		7	SP	Dark gray, wet SAND, fine. Grades to coarser sand at 8 FT BGS.	
		9	SM-ML	Gray, wet, silty SAND to sandy SILT.	
		10	SP-SW	Gray, wet, SAND, fine to coarse, with red specs.	
		17	ML-CL	Greenish gray, moist-wet, clayey SILT.	
		18	SP-SM	Gray, wet, silty SAND, fine.	
		19	ML-CL	Gray, moist, fine sandy SILT to clayey SILT. Alternating zones of sandy silt and clayey silt through drive.	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-215

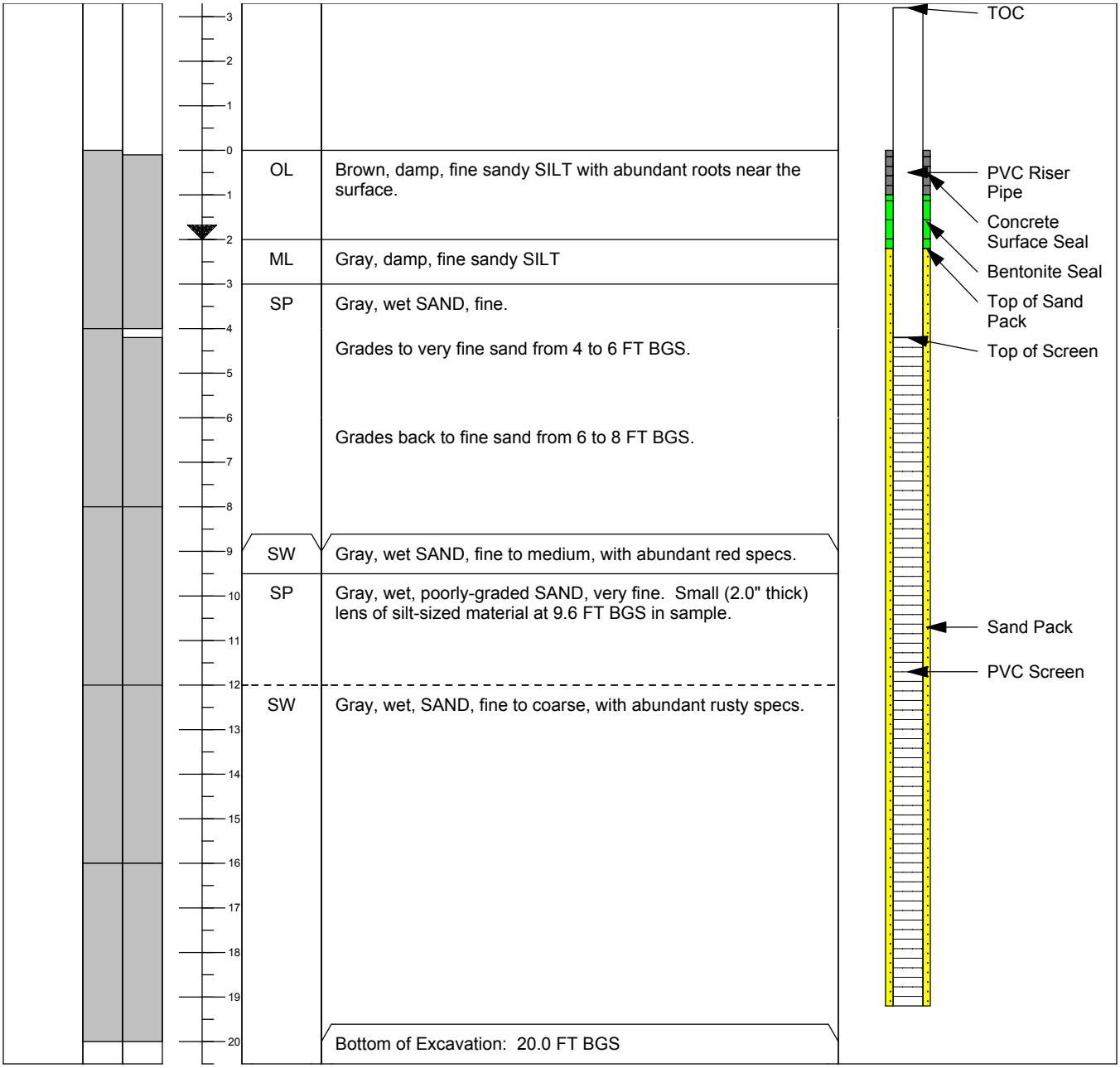
Drill Date: October 1, 2008
Logged By: Chris Gardner
Drilled By: ESN Northwest
Drill Type: Geoprobe
Sample Method: Stanley BR-187
Boring Diameter: 2.0"
Boring Depth (ft bgs): 20 FT BGS
Groundwater ATD (ft bgs): 2 FT BGS

Ground Surf Elev. & Datum: 16.61 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701559
Longitude/Easting: 1185851
Casing Elevation: 19.32, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0	OL	Brown, damp, fine sandy SILT with abundant roots near the surface.	
		2	ML	Gray, damp, fine sandy SILT	
		3	SP	Gray, wet SAND, fine.	
		4		Grades to very fine sand from 4 to 6 FT BGS.	
		6		Grades back to fine sand from 6 to 8 FT BGS.	
		9	SW	Gray, wet SAND, fine to medium, with abundant red specs.	
		10	SP	Gray, wet, poorly-graded SAND, very fine. Small (2.0" thick) lens of silt-sized material at 9.6 FT BGS in sample.	
		12	SW	Gray, wet, SAND, fine to coarse, with abundant rusty specs.	
		20		Bottom of Excavation: 20.0 FT BGS	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-214

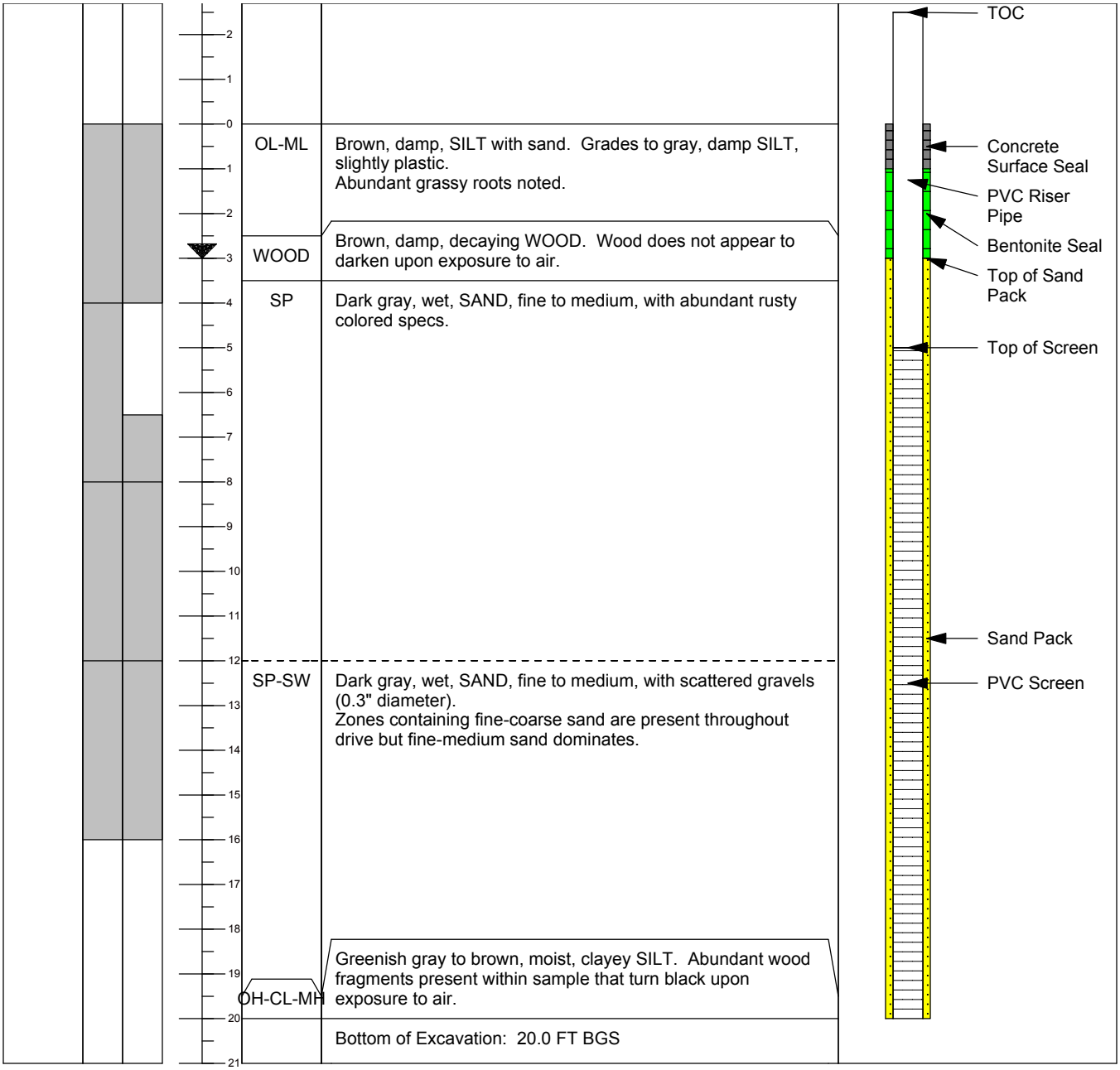
Drill Date: October 1, 2008
Logged By: Chris Gardner
Drilled By: ESN Northwest
Drill Type: Geoprobe
Sample Method: Stanley BR-187
Boring Diameter: 2.0"
Boring Depth (ft bgs): 20 FT BGS
Groundwater ATD (ft bgs): 3 FT BGS

Ground Surf Elev. & Datum: 15.56 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701843
Longitude/Easting: 1185673
Casing Elevation: 17.67, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0	OL-ML	Brown, damp, SILT with sand. Grades to gray, damp SILT, slightly plastic. Abundant grassy roots noted.	
		3	WOOD	Brown, damp, decaying WOOD. Wood does not appear to darken upon exposure to air.	
		4	SP	Dark gray, wet, SAND, fine to medium, with abundant rusty colored specs.	
		12	SP-SW	Dark gray, wet, SAND, fine to medium, with scattered gravels (0.3" diameter). Zones containing fine-coarse sand are present throughout drive but fine-medium sand dominates.	
		19	OH-CL-MH	Greenish gray to brown, moist, clayey SILT. Abundant wood fragments present within sample that turn black upon exposure to air.	
		20		Bottom of Excavation: 20.0 FT BGS	



Notes:
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ppm = parts per million
USCS = Unified Soil Classification System
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Boring Location: PD-213

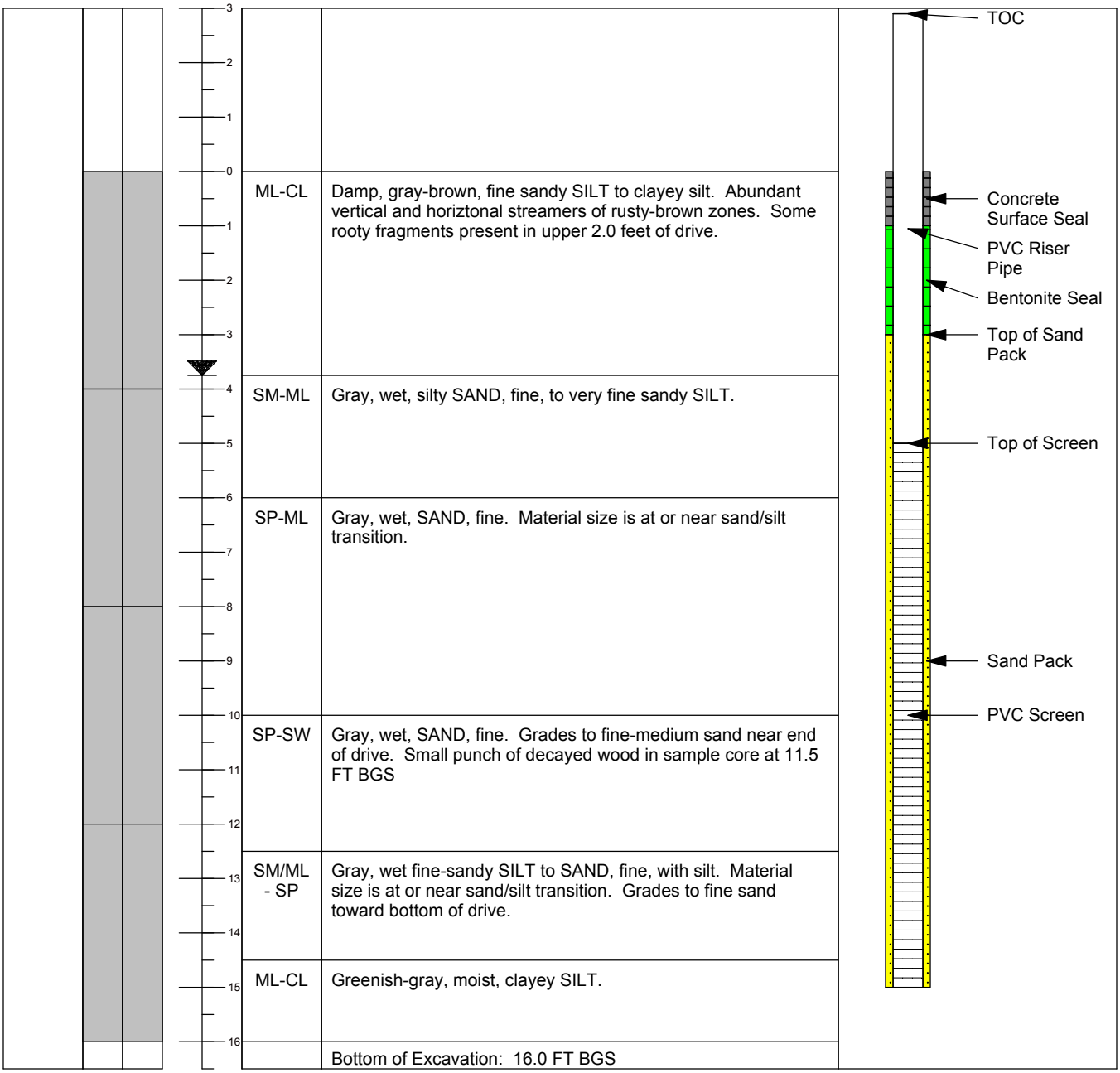
Drill Date: September 25, 2008
Logged By: Chris Gardner
Drilled By: ESN Northwest
Drill Type: Geoprobe
Sample Method: Stanley BR-187
Boring Diameter: 2.0"
Boring Depth (ft bgs): 16 FT BGS
Groundwater ATD (ft bgs): 3.75 FT BGS

Ground Surf Elev. & Datum: 15.72 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701412
Longitude/Easting: 1185013
Casing Elevation: 18.25, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0			
		4	ML-CL	Damp, gray-brown, fine sandy SILT to clayey silt. Abundant vertical and horiztonal streamers of rusty-brown zones. Some rooty fragments present in upper 2.0 feet of drive.	
		4	SM-ML	Gray, wet, silty SAND, fine, to very fine sandy SILT.	
		6	SP-ML	Gray, wet, SAND, fine. Material size is at or near sand/silt transition.	
		10	SP-SW	Gray, wet, SAND, fine. Grades to fine-medium sand near end of drive. Small punch of decayed wood in sample core at 11.5 FT BGS	
		13	SM/ML - SP	Gray, wet fine-sandy SILT to SAND, fine, with silt. Material size is at or near sand/silt transition. Grades to fine sand toward bottom of drive.	
		15	ML-CL	Greenish-gray, moist, clayey SILT.	
		16		Bottom of Excavation: 16.0 FT BGS	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-212

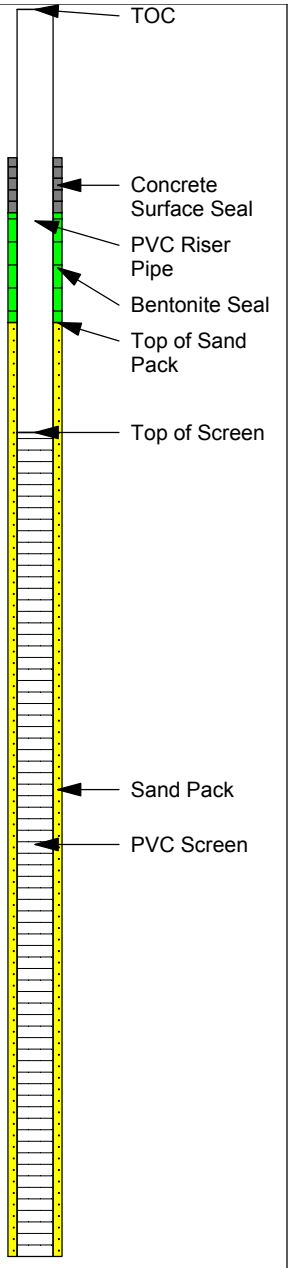
Drill Date: September 30, 2008
Logged By: Chris Gardner
Drilled By: ESN Northwest
Drill Type: Geoprobe
Sample Method: Stanley BR-107 Hmr
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20.0 FT BGS
Groundwater ATD (ft bgs): 5.0 FT BGS

Ground Surf Elev. & Datum: 15.46 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702003
Longitude/Easting: 1185274
Casing Elevation: 17.79, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0	OL	Brown, damp organic SILT with abundant roots.	
		2	ML-CL	Gray, damp slightly sandy SILT. Becomes moist and plastic toward end of drive, grading to silty clay. Zones of dark brown to rusty colored material noted.	
		5	SP	Gray, wet SAND, fine.	
		6	SP-ML	Gray, wet SAND, very fine, to fine sandy SILT. Sand is clean but particle size is at the sand/silt transition.	
		14	SP-SW	Dark gray, wet, SAND, fine, grading to fine-medium sand with increasing depth. Rusty specs noted in sample material from 14.5 - 20 FT BGS.	
		20		Bottom of Excavation: 20.0 FT BGS	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-211

Drill Date: August 18, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Geoprobe/Direct Push
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20.0 FT BGS
Groundwater ATD (ft bgs): 6 FT BGS

Ground Surf Elev. & Datum: 13.99 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 703281
Longitude/Easting: 1185150
Casing Elevation: 16.77, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–5		No recovery from ground surface to 5.5 FT BGS.	TOC; Concrete Surface Seal; Bentonite Seal; PVC Riser Pipe; Top of Sand Pack
		6–8	ML-SM	Silty organic material with vegetation and roots. Grades to dark gray clayey SILT to silty SAND, very fine.	Top of Screen
		9–10	SP	Dark gray, wet, SAND, fine	
		11		Grades to Dark gray, wet, SAND, fine to medium.	Sand Pack; PVC Screen
		12–15		Grades to dark brown, wet, poorly-graded SAND, fine to medium, with red and white specks.	
		15–16	SM	Dark gray, wet, silty SAND, fine.	
		16	ML	Dark gray, wet, clayey SILT (Aquitard material).	
		17	PT	Dark brown, wet PEAT.	
		18	ML	Gray, dry, clayey SILT with some vegetation	
		19	ML-PT	Dark brown, interbedded PEAT and SILT.	
		20		Bottom of Excavation: 20.0 FT BGS	

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-210

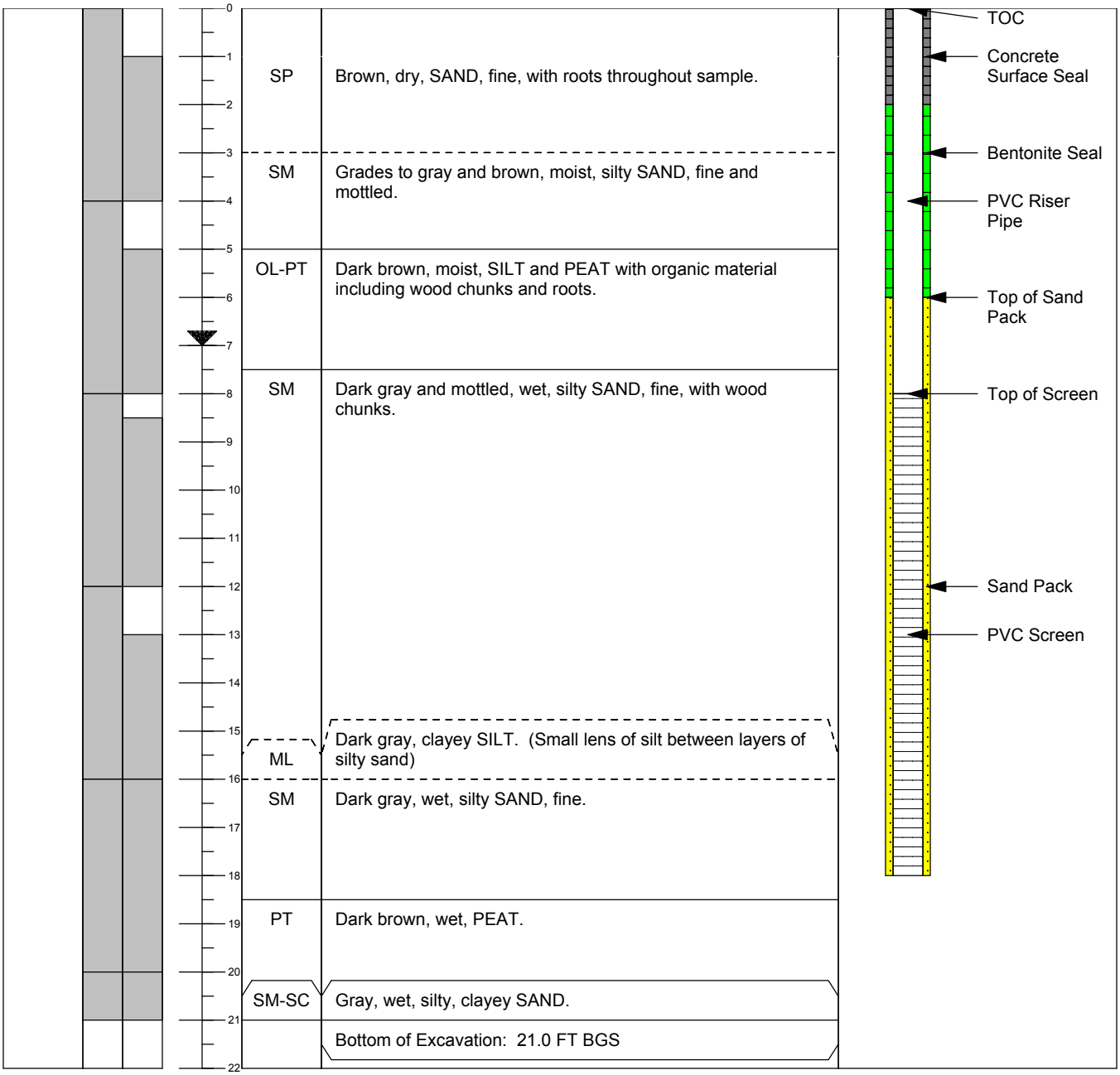
Drill Date: August 16, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Geoprobe/Direct Push
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 21.0 FT BGS
Groundwater ATD (ft bgs): 7 FT BGS

Ground Surf Elev. & Datum: 15.71 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 703818
Longitude/Easting: 1185260
Casing Elevation: 19.15 FT, NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–7	SP	Brown, dry, SAND, fine, with roots throughout sample.	TOC; Concrete Surface Seal; Bentonite Seal; PVC Riser Pipe
		3–5	SM	Grades to gray and brown, moist, silty SAND, fine and mottled.	
		5–7	OL-PT	Dark brown, moist, SILT and PEAT with organic material including wood chunks and roots.	Top of Sand Pack
		7–15	SM	Dark gray and mottled, wet, silty SAND, fine, with wood chunks.	Top of Screen; Sand Pack; PVC Screen
		15–16	ML	Dark gray, clayey SILT. (Small lens of silt between layers of silty sand)	
		16–19	SM	Dark gray, wet, silty SAND, fine.	
		19–20	PT	Dark brown, wet, PEAT.	
		20–21	SM-SC	Gray, wet, silty, clayey SAND.	
		21		Bottom of Excavation: 21.0 FT BGS	



Notes:
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Boring Location: PD-204

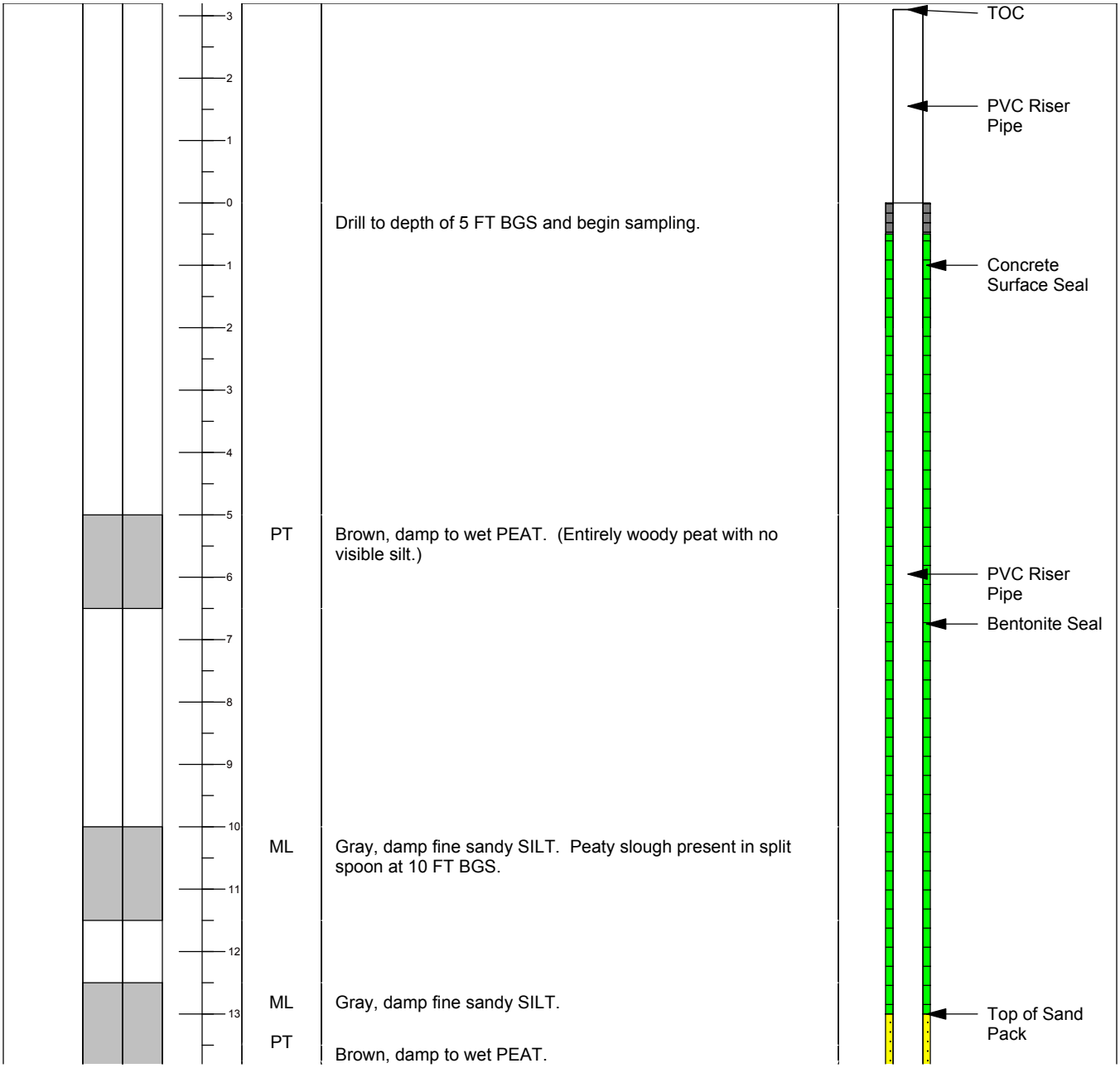
Drill Date: September 25, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling
Drill Type: CME 55 Ltd Access
Sample Method: 3.0" D&M w/ 140lb Ham
Boring Diameter: 2 inches
Boring Depth (ft bgs): 26.5 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 14.94 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702917
Longitude/Easting: 1186546
Casing Elevation: 17.57, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0		Drill to depth of 5 FT BGS and begin sampling.	
		5	PT	Brown, damp to wet PEAT. (Entirely woody peat with no visible silt.)	
		10	ML	Gray, damp fine sandy SILT. Peaty slough present in split spoon at 10 FT BGS.	
		13	ML	Gray, damp fine sandy SILT.	
			PT	Brown, damp to wet PEAT.	



Notes:
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USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-204

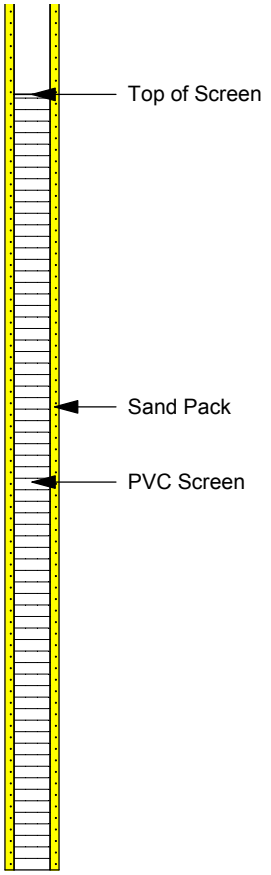
Drill Date: September 25, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling
Drill Type: CME 55 Ltd Access
Sample Method: 3.0" D&M w/ 140lb Ham
Boring Diameter: 2 inches
Boring Depth (ft bgs): 26.5 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 14.94 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702917
Longitude/Easting: 1186546
Casing Elevation: 17.57, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		14	ML/CL	Olive gray, damp clayey SILT.	
		15	ML/CL	Olive gray, damp clayey SILT.	
		16	PT	Brown, damp PEAT	
		17	OH-PT	Light gray, damp clayey SILT. Grades to peat at 16.5 FT BGS.	
		18	PT-CL-OH	Light brown, damp to moist, PEAT and peaty SILT grading to light gray clayey SILT.	
		19	ML	Moist, fine sandy SILT to silty SAND, fine.	
		20	ML/SM	Gray, damp fine-sandy SILT to silty SAND, fine. Material is at sand/silt transition in size.	
		23	ML/SM	Gray, damp fine-sandy SILT to silty SAND, fine. Material is at sand/silt transition in size.	
		25	ML/SM	Gray, damp fine-sandy SILT to silty SAND, fine. Material is at sand/silt transition in size.	
		27		Bottom of Excavation: 26.5 FT BGS	



Notes:
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Boring Location: PD-203

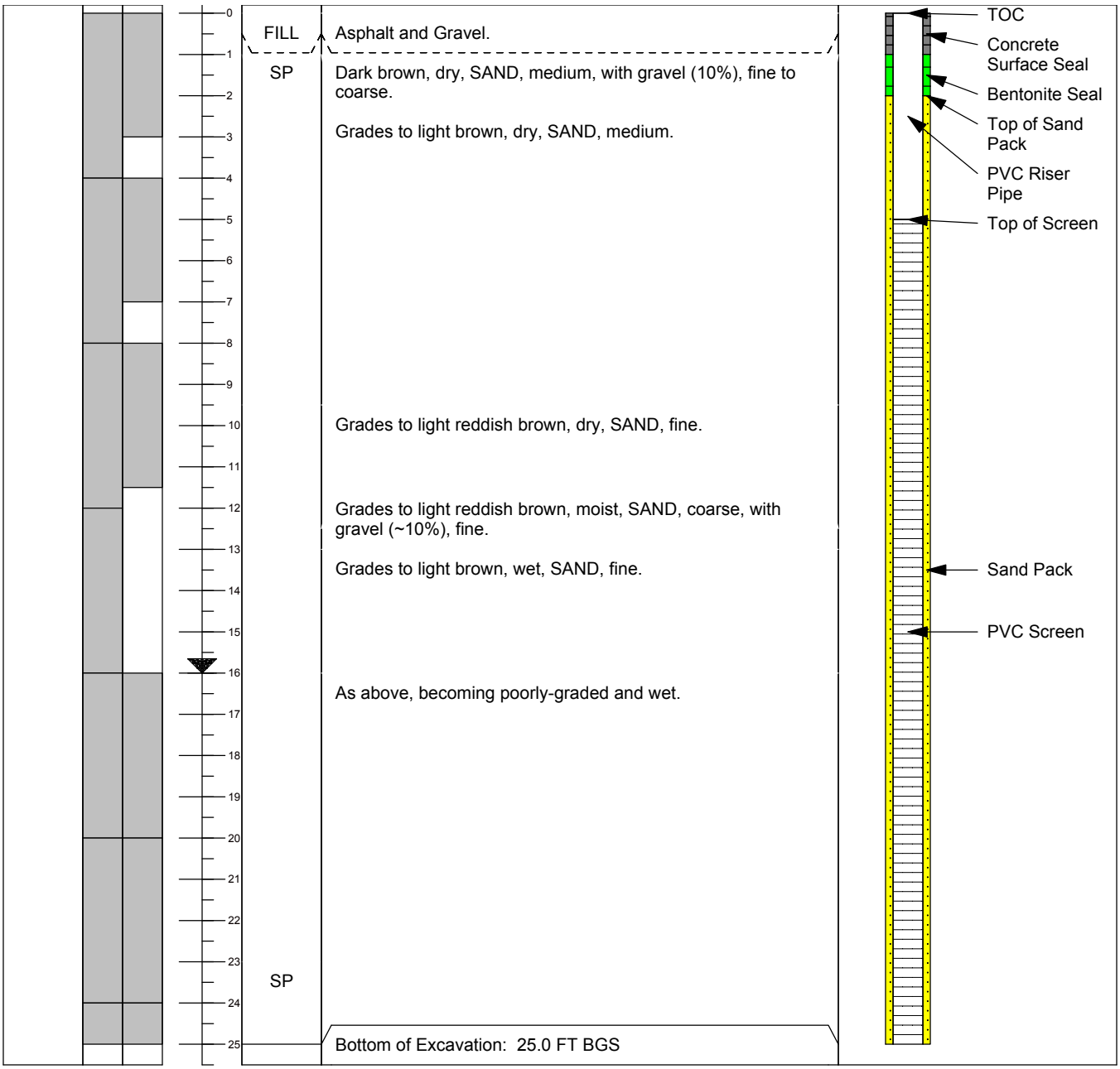
Drill Date: August 27, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Geoprobe/Direct Push
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 25.0 FT BGS
Groundwater ATD (ft bgs): 16 FT BGS

Ground Surf Elev. & Datum: 37.90 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 700960
Longitude/Easting: 1186419
Casing Elevation: 37.90 FT, NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–1	FILL	Asphalt and Gravel.	TOC; Concrete Surface Seal
		1–2	SP	Dark brown, dry, SAND, medium, with gravel (10%), fine to coarse.	
		2–3		Grades to light brown, dry, SAND, medium.	Bentonite Seal
		3–4			Top of Sand Pack
		4–5			PVC Riser Pipe
		5–6			Top of Screen
		6–7			
		7–8			
		8–9			
		9–10			
		10–11		Grades to light reddish brown, dry, SAND, fine.	
		11–12			
		12–13		Grades to light reddish brown, moist, SAND, coarse, with gravel (~10%), fine.	
		13–14		Grades to light brown, wet, SAND, fine.	Sand Pack
		14–15			
		15–16			PVC Screen
		16–17		As above, becoming poorly-graded and wet.	
		17–18			
		18–19			
		19–20			
		20–21			
		21–22			
		22–23			
		23–24	SP		
		24–25			
		25		Bottom of Excavation: 25.0 FT BGS	



Notes:
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Boring Location: PD-202

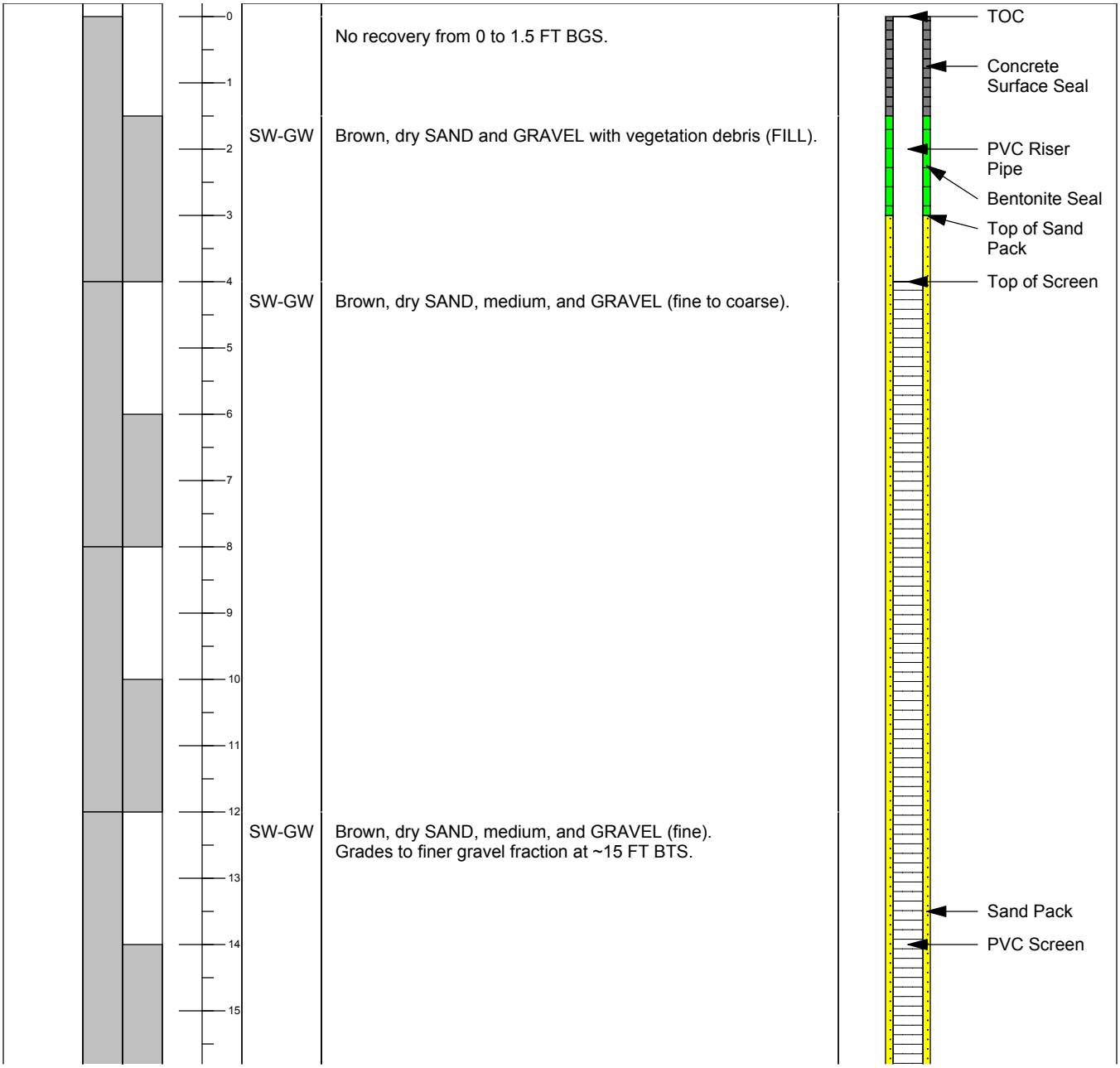
Drill Date: August 26, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Geoprobe/Direct Push
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 29.0 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 56.31 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702529
Longitude/Easting: 1187128
Casing Elevation: 56.31, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0		No recovery from 0 to 1.5 FT BGS.	
		2	SW-GW	Brown, dry SAND and GRAVEL with vegetation debris (FILL).	
		4	SW-GW	Brown, dry SAND, medium, and GRAVEL (fine to coarse).	
		12	SW-GW	Brown, dry SAND, medium, and GRAVEL (fine). Grades to finer gravel fraction at ~15 FT BTS.	



Notes:
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USCS = Unified Soil Classification System
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Boring Location: PD-202

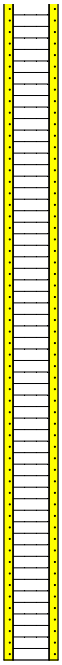
Drill Date: August 26, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Geoprobe/Direct Push
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 29.0 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 56.31 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702529
Longitude/Easting: 1187128
Casing Elevation: 56.31, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		16			
		17			
		18	SW	Grades to brown, moist, SAND, fine, with no gravel present.	
		19		Grades to brown, moist, SAND, medium, with no gravel present.	
		20		Grades to brown, moist, SAND, fine, with no gravel present.	
		21			
		22			
		23			
		24		Grades to brown, moist, SAND, fine, with trace gravel, fine.	
		25			
		26			
		27			
		28			
		29		Grades to brown, moist, SAND, fine, with no gravel present.	
				Bottom of Excavation: 29.0 FT BGS	
		30			



Notes:
FT BGS = feet below ground surface
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USCS = Unified Soil Classification System
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Boring Location: PD-201

Drill Date: August 26, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Geoprobe
Sample Method: Dual Tube
Boring Diameter: 2.0"
Boring Depth (ft bgs): 27 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 40.05 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 703536
Longitude/Easting: 1187255
Casing Elevation: 40.05, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–4	GP	Brown, dry, gravelly topsoil (FILL). No recovery	TOC; Concrete Surface Seal
		4–5	SW	Brown , dry, SAND, fine, with gravel (10%).	
		5–8	SM	Grades to reddish-brown and light brown, moist, silty SAND, motteled.	Bentonite Seal; PVC Riser Pipe
		8–11	SC	Reddish-brown and light brown, dry, clayey silty SAND, with gravel (5%).	Top of Sand Pack
		11–12	SM	Dry, silty sand lens with gravel.	
		12–13	SC	Grades to reddish brown and light brown clayey silty SAND. Then grades to light brown, dry, silty SAND	Top of Screen
		14	SP	Lens of dry, light brown, SAND, fine.	
		15	SM	Grades to light brown, slightly moist, silty SAND.	
		16–17	SP	Light brown, wet, SAND, fine.	
		18–24	SM	Light brown and reddish brown, dry to moist, silty SAND, fine, mottled.	Sand Pack; PVC Screen
		24		Becomes wet at 24 FT BGS.	
		25–26	SC	At 26 FT BGS grades to light brown clayey silty SAND. At 27 FT BGS becomes hard, compacted, reddish colored, dry, silty SAND (sandstone like). Hit refusal at 27 FT BGS.	
		27–28		Bottom of Excavation: 27 FT BGS	

Notes:
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ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-200

Drill Date: August 18, 2008
Logged By: Erin Murray
Drilled By: Cascade Drilling
Drill Type: Geoprobe/Direct Push
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 24.0 FT BGS
Groundwater ATD (ft bgs): 6 FT BGS

Ground Surf Elev. & Datum: 12.86 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 703432
Longitude/Easting: 1185702
Casing Elevation: 15.86, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–24	PT/ML	Silty organic matter at surface. Brown, moist, PEAT with silt.	TOC; Concrete Surface Seal; Bentonite Seal; Top of Sand Pack; PVC Riser Pipe
		4	ML	Gray, SILT with organic material.	Top of Screen
		8	SM	Gray, moist, poorly-graded silty SAND, fine.	Sand Pack; PVC Screen
		15	SP	Gray, moist to wet, poorly-graded SAND, fine to medium.	
		18	ML-PT	Alternating layers of Silty/Clayey material and Peaty material.	
		21	PT	Brown, wet, PEAT.	
		24		Bottom of Excavation: 24.0 FT BGS	

Notes:
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ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Monitoring Well ID: PD-142

Drill Date: August 16, 2011
Logged By: Dean Brame
Drilled By: David Gose / Cascade Drilling

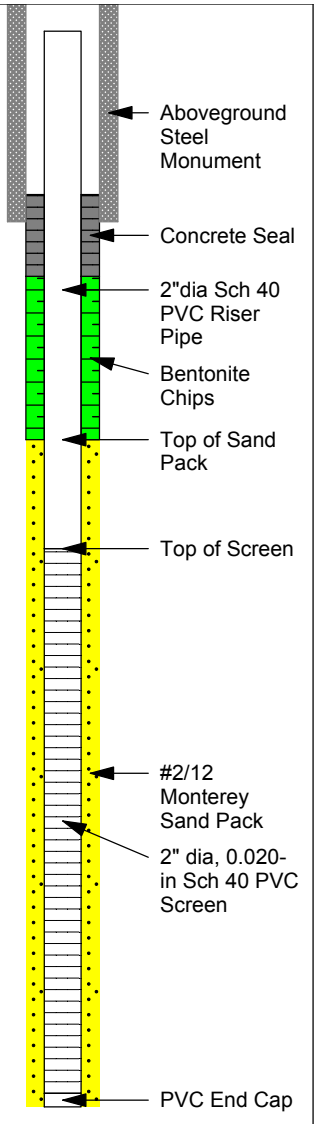
Ground Surf Elev. & Datum: 13.42' NAVD88
Coordinate System: NAD83
Latitude/Northing: 702353.88'
Longitude/Easting: 1185808.55'
Casing Elevation: 15.68'

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 16.5'
Groundwater ATD (ft bgs): 2.5'

Client: B&L RIM TRUST
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, Washington

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
2 2 3		3	OL-OH	Hog fuel, geotextile membrane (temporary road) and grass. Wet, dark brown PEAT 2.5-3 ft.	
2 4 3		5	ML	Wet, soft, gray SILT. At 5.5 ft, moist and firm.	
3 5 9		8	SP	Moist, fine, poorly graded, gray SAND.	
7 10 11		11		At 11 ft, grain size increases slightly.	
5 7 7		13		At 13.5 ft, wet with wood fragments.	
5 7 4		16	ML	Moist, soft, gray SILT.	



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PD-141

Drill Date: August 16, 2011
Logged By: Dean Brame
Drilled By: David Gose / Cascade Drilling

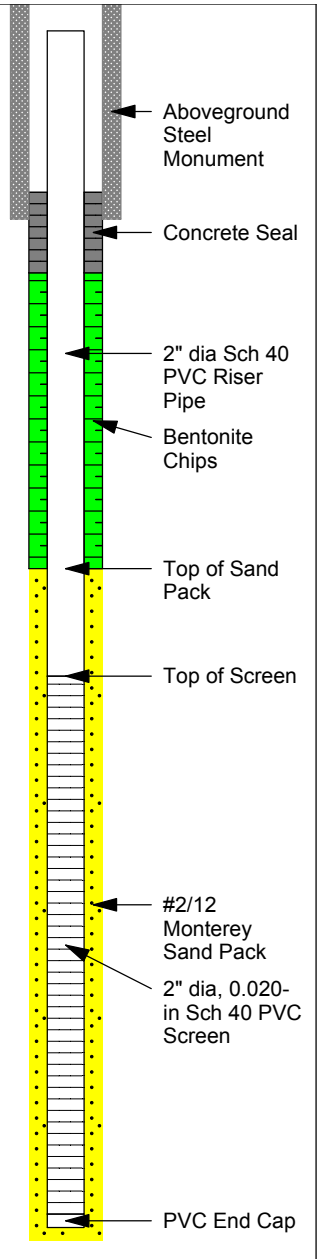
Ground Surf Elev. & Datum: 15.55' NAVD88
Coordinate System: NAD83
Latitude/Northing: 702435.23'
Longitude/Easting: 1185792.59'
Casing Elevation: 15.51'

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 19.5'
Groundwater ATD (ft bgs): 2.5'

Client: B&L RIM TRUST
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, Washington

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
1 1 1		3	OL-OH	Wet, dark brown PEAT	
			ML	Moist, very soft, gray SILT	
2 5 7		5		At 5 ft., very wet. At 5.8 ft, 2" lense of PEAT. At 6 ft, firm.	
6 7 7		8	SP	Wet, fine, poorly graded, dark gray SAND	
3 5 5		10			
5 6 7		13		At 13.5 ft. 2" band of PEAT; medium gray SAND.	
9 13 15		15			
9 11 10		17			
5 10 15		19		At 19 ft, 2" lense of PEAT.	
			ML	Moist, firm, gray SILT.	



Notes:
ft bgs = feet below ground surface
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▼ = denotes groundwater table

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Monitoring Well ID: PD-140

Drill Date: August 16, 2011
Logged By: Dean Brame
Drilled By: David Gose / Cascade Drilling

Ground Surf Elev. & Datum: 13.58' NAVD88
Coordinate System: NAD83
Latitude/Northing: 702410.08
Longitude/Easting: 1185716.42
Casing Elevation: 15.53'

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 16.5'
Groundwater ATD (ft bgs): 2.5'

Client: B&L RIM TRUST
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County, Washington

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
1 1 1		3	OL-OH	Hog fuel, geotextile membrane (temporary road) and grass. Wet, dark brown PEAT. (0.2 ft)	Aboveground Steel Monument Concrete Seal 2" dia Sch 40 PVC Riser Pipe Bentonite Chips Top of Sand Pack
2 4 6		6	ML	Wet, soft gray SILT. At 6 ft, 1" lense of PEAT.	
1 5 7		8	SP	Wet, fine, poorly graded dark gray SAND. At 7.5 ft, gray.	Top of Screen
6 6 7		11		At 10 ft, moist.	#2/12 Monterey Sand Pack 2" dia, 0.020-in Sch 40 PVC Screen
4 5 6		14		At 13.7 ft, increases to medium SAND.	
6 6 4		16	ML	At 15 ft, fine SAND with few interbedded 1/2" layers of PEAT. Moist, firm gray SILT.	PVC End Cap

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: PD-132

Drill Date: October 17, 2008
Logged By: Brett Beaulieu
Drilled By: Casey Goble/Cascade Drilling

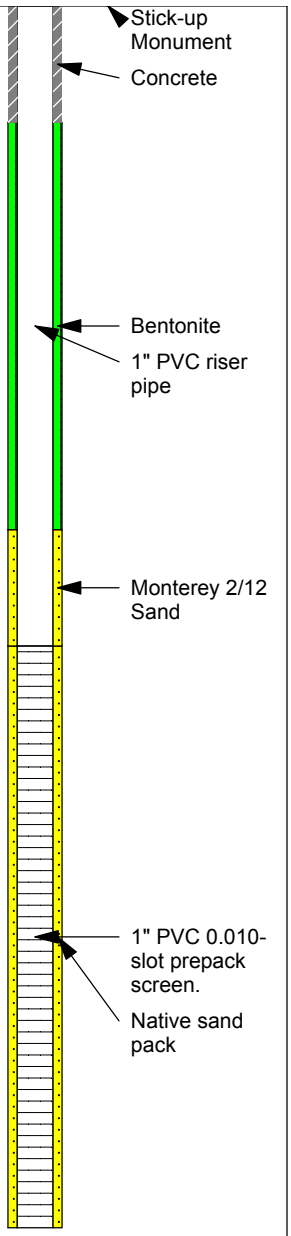
Ground Surf Elev. & Datum: 12.942 NAVD88
Coordinate System: NAD83/98
Latitude/Northing: 702939.63
Longitude/Easting: 1185948.77
Casing Elevation: 15.352 NAVD88

Drill Type: Geoprobe 6620DT track rig
Sample Method: Dual Tube 2"X4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 22 ft bgs
Groundwater ATD (ft bgs): surface

Client: B&L RIM TRUST
Project: B&L RIM
Task Number:
Site Location: B&L Landfill
Milton, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–5	OL	Dark brown, wet, organic silt with peat, roots, wood chunks, <10% mineral silt. No recovery (some loss is compaction).	
		5–7	ML SM	Dark grey, wet, silt with <5% organics (roots), plastic. Grades to dark grey, wet silty sand, fine, coarsening downward. Grades to dark grey, wet, poorly graded sand, fine, <5% silt.	
		7–15	SP	Same as above, wet, fine. Same as above, at 14.5' bgs becomes well-graded, wet, dark grey sand, fine to medium.	
		15–20	SW	Same as above, fining slightly at 20' bgs.	
		20–21	ML/SM	Grey silt with sand, trace organics, then grey silty sand, fine,	
		21–22	CL	Light grey, clayey silt, moist, high plasticity.	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Monitoring Well ID: PD-131

Drill Date: October 20, 2008
Logged By: Brett Beaulieu
Drilled By: Casey Goble/Cascade Drilling

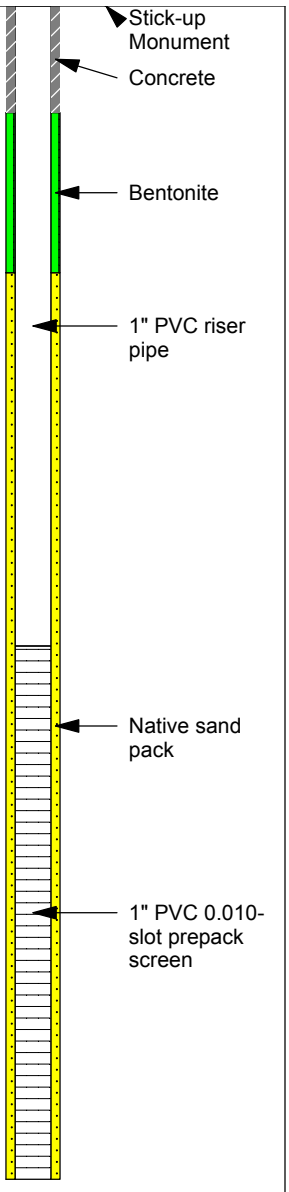
Ground Surf Elev. & Datum: 12.502 (NAVD88)
Coordinate System: NAD83/98
Latitude/Northing: 702938.18
Longitude/Easting: 1185889.61
Casing Elevation: 14.532 (NAVD88)

Drill Type: Geoprobe 6620DT track rig
Sample Method: Dual Tube 2"X4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 23 ft bgs
Groundwater ATD (ft bgs): above ground

Client: B&L RIM TRUST
Project: B&L RIM
Task Number:
Site Location: B&L Landfill Milton, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–23	OL/PT SM	Dark brown organic silt, fibrous, grading to grey with white grains, fine, silty sand, silt 20%, wet. No recovery	
			ML	Light grey silt, highly plastic, wet, grades to medium plasticity. ,	
			SM	Grey, wet, silty sand, fine, silt 30%,wet, silt decreases with depth. Grades to grey, wet poorly graded sand with silt, fine, silt <10%.	
			SP	Dark grey, wet, poorly graded sand, fine, silt <5%, trace medium white grains (ash/felsic).	
				Same as above, coarsening downward grades to dark grey well graded sand, fine to medium with trace coarse grains, rounded.	
			SW	Same as above, with no noticeable coarsening.	
			SM	Grey, wet, silty sand, fine, no plasticity.	
			CL/PT/OL CL	Grey, moist, silt, plastic, grading to dark brown (oxidizes to black) woody peat, then grades to brown organic silt with peat. The last 2" consist of grey, moist, silt, plastic.	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Monitoring Well ID: PD-130

Drill Date: October 20, 2008
Logged By: Brett Beaulieu
Drilled By: Casey Goble/Cascade Drilling

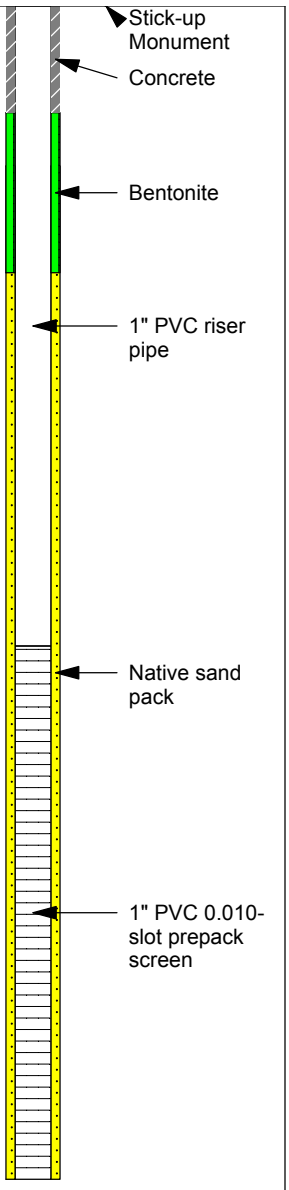
Ground Surf Elev. & Datum: 12.802 (NAVD88)
Coordinate System: NAD83/98
Latitude/Northing: 702935.61
Longitude/Easting: 1185819.20
Casing Elevation: 15.187 (NAVD88)

Drill Type: Geoprobe 6620DT track rig
Sample Method: Dual Tube 2"X4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 24 ft bgs
Groundwater ATD (ft bgs): 0

Client: B&L RIM TRUST
Project: B&L RIM
Task Number:
Site Location: B&L Landfill
Milton, WA

Remarks: Partly cloudy, 50s.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0–4	OL/PT	Grey and brown, wet organic silt, some silt lenses, wood chunks, grades to wet, dark brown peat that oxidizes to black.
		2–4		No recovery
		4–6	SP-SM	Grey, wet poorly graded sand with silt, fine, with peat lenses. Underlain by grey-olive grey, moist clayey silt, highly plastic, trace organic matter, becomes low to medium plasticity, silt. Grades to grey, wet silty sand (15-25% silt).
		6–7	CL	
		7–8	ML	
		8–9	SM	
		8–9		No recovery
		9–12	SP	Wet, grey, poorly graded sand, fine, silt <5%, wood chunk at 11.5' bgs, slightly coarser below 11.5' bgs.
		12–14		No recovery
		12–14		Same as above with SM deposit from 14-14.5' bgs. SM is grey-brown silty sand with organics (roots), 25% silt. Grades to SW, dark grey, well graded sand, fine to medium, trace coarse grains.
		14–15	SM	
		15–20	SW	
		17–20		Same as above, fine to medium well-graded sand.
		20–21	SM	Abrupt contact, silty sand, fine, sand, some plasticity.
		21–24	ML/CL OL/PT	Grades from grey stiff silt, moderate plasticity to soft clayey silt that is highly plastic. Dark brown, moist, woody peat lense, for 3" interbedded; becomes brown, moist organic silt for 3", then grey,moist clayey silt for 8", trace organics, highly plastic.



Notes:
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Monitoring Well ID: PD-122

Drill Date: October 21, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling

Ground Surf Elev. & Datum: 13.863 NAVD 88
Coordinate System: NAD83/98
Latitude/Northing: 702915.1
Longitude/Easting: 1185924.2
Casing Elevation: 13.863 NAVD 88

Drill Type: Geoprobe 6620DT track rig
Sample Method: Dual Tube 2"X4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 21 ft bgs
Groundwater ATD (ft bgs): 0

Client: B&L RIM TRUST
Project: B&L RIM
Task Number:
Site Location: B&L Landfill
Milton, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–22		No samples collected. Refer to boring logs for PD-105 and PD-106 for lithology.	Stick-up Monument; Concrete; Bentonite; 1" PVC riser pipe; Native sand pack; 1" PVC 0.010-slot prepack screen

Notes:
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ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Monitoring Well ID: PD-121

Drill Date: October 21, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling

Ground Surf Elev. & Datum: 13.934 NAVD 88
Coordinate System: NAD83/98
Latitude/Northing: 702915.6
Longitude/Easting: 1185934.5
Casing Elevation: 13.934 NAVD 88

Drill Type: Geoprobe 6620DT track rig
Sample Method: Dual Tube 2"X4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 21 ft bgs
Groundwater ATD (ft bgs): 0

Client: B&L RIM TRUST
Project: B&L RIM
Task Number:
Site Location: B&L Landfill
Milton, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–22		No samples collected. Refer to boring logs for PD-105 and PD-106 for lithology.	Stick-up Monument; Concrete; Bentonite; 1" PVC riser pipe; Native sand pack; 1" PVC 0.010-slot prepack screen

Notes:
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Monitoring Well ID: PD-120

Drill Date: October 21, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling

Ground Surf Elev. & Datum: 13.856 NAVD 88
Coordinate System: NAD83/98
Latitude/Northing: 702915.1
Longitude/Easting: 1185943.9
Casing Elevation: 13.856 NAVD 88

Drill Type: Geoprobe 6620DT track rig
Sample Method: Dual Tube 2"X4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 21 ft bgs
Groundwater ATD (ft bgs): 0

Client: B&L RIM TRUST
Project: B&L RIM
Task Number:
Site Location: B&L Landfill
Milton, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0–22		No samples collected. Refer to boring logs for PD-105 and PD-106 for lithology.	Stick-up Monument; Concrete; Bentonite; 1" PVC riser pipe; Native sand pack; 1" PVC 0.010-slot prepack screen

Notes:
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ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-109

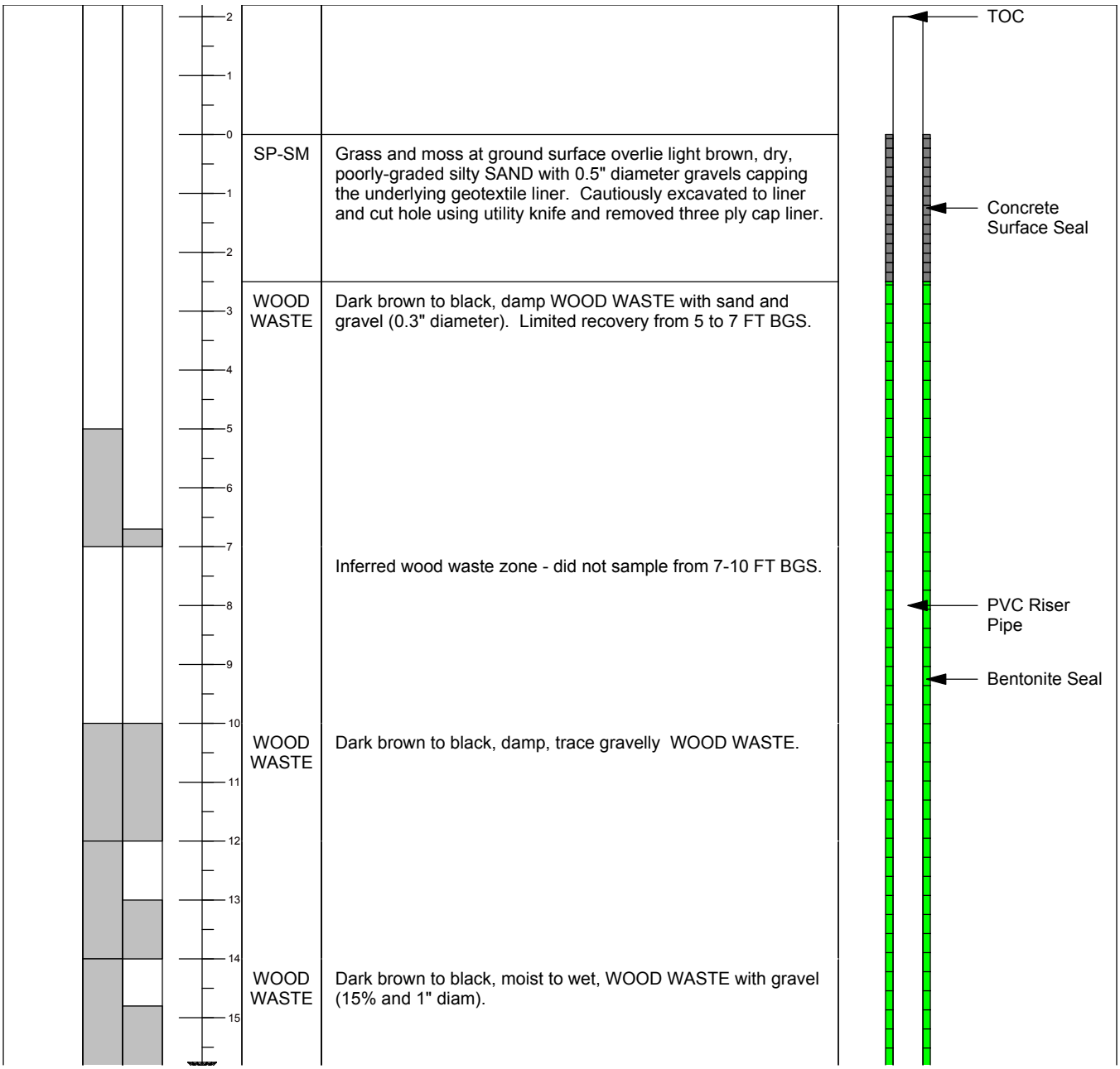
Drill Date: August 19, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling
Drill Type: CME Track Rig
Sample Method: 140 lbs auto hammer
Boring Diameter: 4.25/8"; 12" final
Boring Depth (ft bgs): 30 FT BGS
Groundwater ATD (ft bgs): 16 FT BGS

Ground Surf Elev. & Datum: 28.92 FT NAVD88
Coordinate System: NAD 83/98
Latitude/Northing: 701795
Longitude/Easting: 1186484
Casing Elevation: 30.67 FT NAVD88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number: Task No. 1308
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
			SP-SM	Grass and moss at ground surface overlie light brown, dry, poorly-graded silty SAND with 0.5" diameter gravels capping the underlying geotextile liner. Cautiously excavated to liner and cut hole using utility knife and removed three ply cap liner.	
			WOOD WASTE	Dark brown to black, damp WOOD WASTE with sand and gravel (0.3" diameter). Limited recovery from 5 to 7 FT BGS.	
				Inferred wood waste zone - did not sample from 7-10 FT BGS.	
			WOOD WASTE	Dark brown to black, damp, trace gravelly WOOD WASTE.	
			WOOD WASTE	Dark brown to black, moist to wet, WOOD WASTE with gravel (15% and 1" diam).	



Notes:
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Boring Location: PD-109

Drill Date: August 19, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling

Ground Surf Elev. & Datum: 28.92 FT NAVD88
Coordinate System: NAD 83/98
Latitude/Northing: 701795
Longitude/Easting: 1186484
Casing Elevation: 30.67 FT NAVD88

Drill Type: CME Track Rig
Sample Method: 140 lbs auto hammer
Boring Diameter: 4.25/8"; 12" final
Boring Depth (ft bgs): 30 FT BGS
Groundwater ATD (ft bgs): 16 FT BGS

Client: B&L Custodial Trust
Project: B&L RIM
Task Number: Task No. 1308
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		16	WOOD WASTE	Brown, wet decaying WOOD WASTE which turns dark gray upon exposure to air. Gravel now absent in sample material.	Top of Sand Pack
		17	ML	Gray, damp, slightly sandy SILT.	
		18	ML/SM	Gray, moist, sandy SILT to very silty SAND, fine. Material size is at or near sand/silt transition.	Top of Screen
		19			
		20	ML	Gray, damp to moist, trace gravelly sandy SILT with scattered wood fragments. Material size is at or near sand/silt transition.	
		21			
		22		Grades to damp to moist sandy SILT without wood fragments.	Sand Pack
		23			PVC Screen
		24			
		25			
		26			
		27	WOOD WASTE	Moist, decaying WOOD WASTE.	
		28	ML-CL	Olive gray, moist, clayey SILT with wood fragments. Resembles aquitard layer observed in boreholes PD-108 and PD-107.	
		29	ML-CL-PT	Olive gray, moist to wet, clayey SILT grading to brown clayey SILT with abundant peat fragments near end of drive.	
		30		Bottom of Excavation: 30.0 FT BGS	

Notes:
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Boring Location: PD-107

Drill Date: August 18, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling

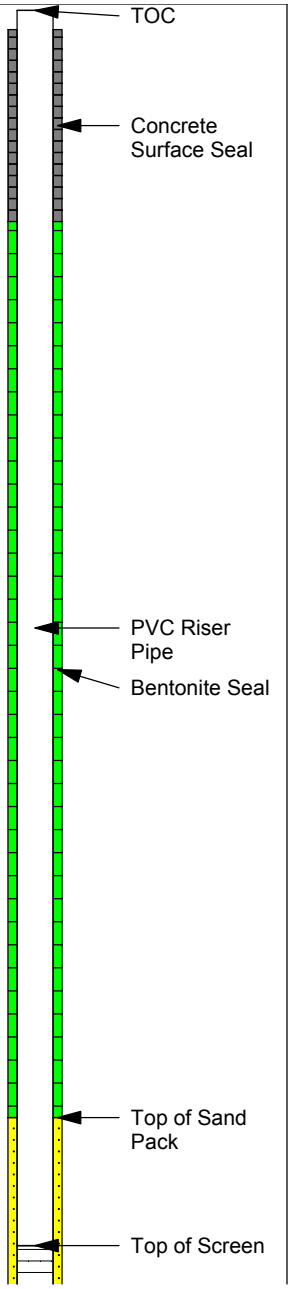
Ground Surf Elev. & Datum: 30.58 FT NAVD88
Coordinate System: NAD 83/98
Latitude/Northing: 702224
Longitude/Easting: 1186121
Casing Elevation: 32.77 FT NAVD88

Drill Type: CME 75
Sample Method: Split spoon /140lb Hmr
Boring Diameter: 8"/12" final
Boring Depth (ft bgs): 38 FT BGS
Groundwater ATD (ft bgs): 18 FT BGS

Client: B&L Custodial Trust
Project: B&L RIM
Task Number: Task No. 1308
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Excavated cautiously down to 2' bgs and cut through geotex, PVC and cap liner.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0		Advanced boring to 5 FT BGS and began sampling.	
		5	WOOD WASTE	Dark brown to black, damp, WOOD WASTE with gravel (1" diameter). Approximately 6" recovery.	
		7		No samples collected from 7 to 10 FT BGS.	
		10	WOOD WASTE	Dark brown to black, damp, WOOD WASTE with scattered gravels (1" diameter). 70% wood; 30% gravels.	
		12		Same material noted above. Wood fragments turn dark gray upon exposure to air.	
		15	WOOD WASTE	Continuous layer of WOOD WASTE (no sand or gravel noted).	
		16	GW	Dark gray, moist, GRAVEL with sand, fine to coarse, and slag. Gravels ~ 0.5" maximum in size. Odor noted in sample.	
		17	WOOD WASTE	Brown to dark brown, damp to moist, WOOD WASTE.	
		19	SM-ML	Dark gray, moist, fine sandy SILT grading to SAND, fine.	



Notes:
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Boring Location: PD-107

Drill Date: August 18, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling

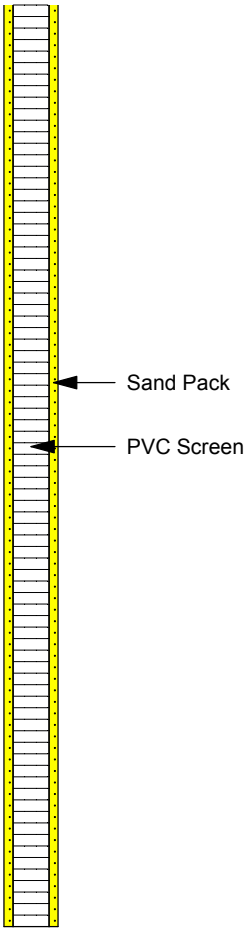
Ground Surf Elev. & Datum: 30.58 FT NAVD88
Coordinate System: NAD 83/98
Latitude/Northing: 702224
Longitude/Easting: 1186121
Casing Elevation: 32.77 FT NAVD88

Drill Type: CME 75
Sample Method: Split spoon /140lb Hmr
Boring Diameter: 8"/12" final
Boring Depth (ft bgs): 38 FT BGS
Groundwater ATD (ft bgs): 18 FT BGS

Client: B&L Custodial Trust
Project: B&L RIM
Task Number: Task No. 1308
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Excavated cautiously down to 2' bgs and cut through geotex, PVC and cap liner.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		20	ML	Gray, moist, fine sandy SILT. Wood waste slough from 20 - 21 FT BGS in sampler.	
		22	SP	Dark gray, wet, SAND, fine. Very consistent material throughout drive.	
		25	SP-SM-ML	Dark gray, wet, SAND, fine, to fine sandy SILT. Alternating zones of sand-dominant and silt-dominant material from 25 to 32.75 FT BGS.	
		32	WOOD WASTE	Brown, wet, WOOD WASTE. Turns dark brown when exposed to air.	
		33	SP	Dark gray, wet SAND with rusty red specs.	
		34	ML-CL	Dark gray, moist SILT. Grades to dark gray to brown, damp to moist clayey SILT with scattered wood fragments at ~35 FT BGS that extends to bottom of excavation.	
		38		Bottom of Excavation: 38.0 FT BGS	



Notes:
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Boring Location: PD-106

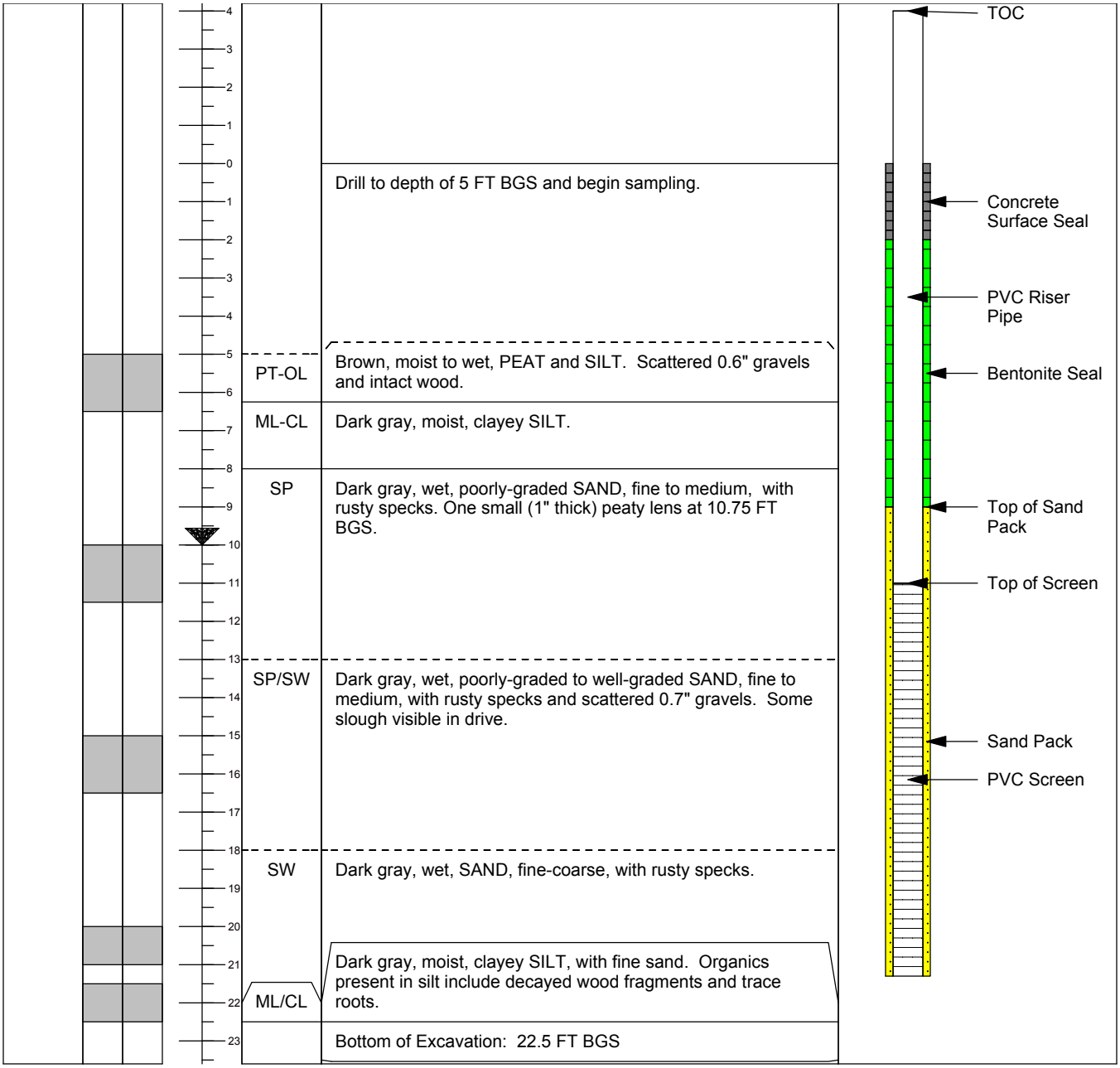
Drill Date: September 23, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling
Drill Type: CME 55 Ltd Access
Sample Method: 3.0" D&M w/ 140lb Hammer
Boring Diameter: 2 inches
Boring Depth (ft bgs): 22.5 FT BGS
Groundwater ATD (ft bgs): 10 FT BGS

Ground Surf Elev. & Datum: 14.16 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702915
Longitude/Easting: 1185954
Casing Elevation: 16.74, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0		Drill to depth of 5 FT BGS and begin sampling.	
		5	PT-OL	Brown, moist to wet, PEAT and SILT. Scattered 0.6" gravels and intact wood.	
		7	ML-CL	Dark gray, moist, clayey SILT.	
		8	SP	Dark gray, wet, poorly-graded SAND, fine to medium, with rusty specks. One small (1" thick) peaty lens at 10.75 FT BGS.	
		13	SP/SW	Dark gray, wet, poorly-graded to well-graded SAND, fine to medium, with rusty specks and scattered 0.7" gravels. Some slough visible in drive.	
		18	SW	Dark gray, wet, SAND, fine-coarse, with rusty specks.	
		21	ML/CL	Dark gray, moist, clayey SILT, with fine sand. Organics present in silt include decayed wood fragments and trace roots.	
		22.5		Bottom of Excavation: 22.5 FT BGS	



Notes:
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Boring Location: PD-105

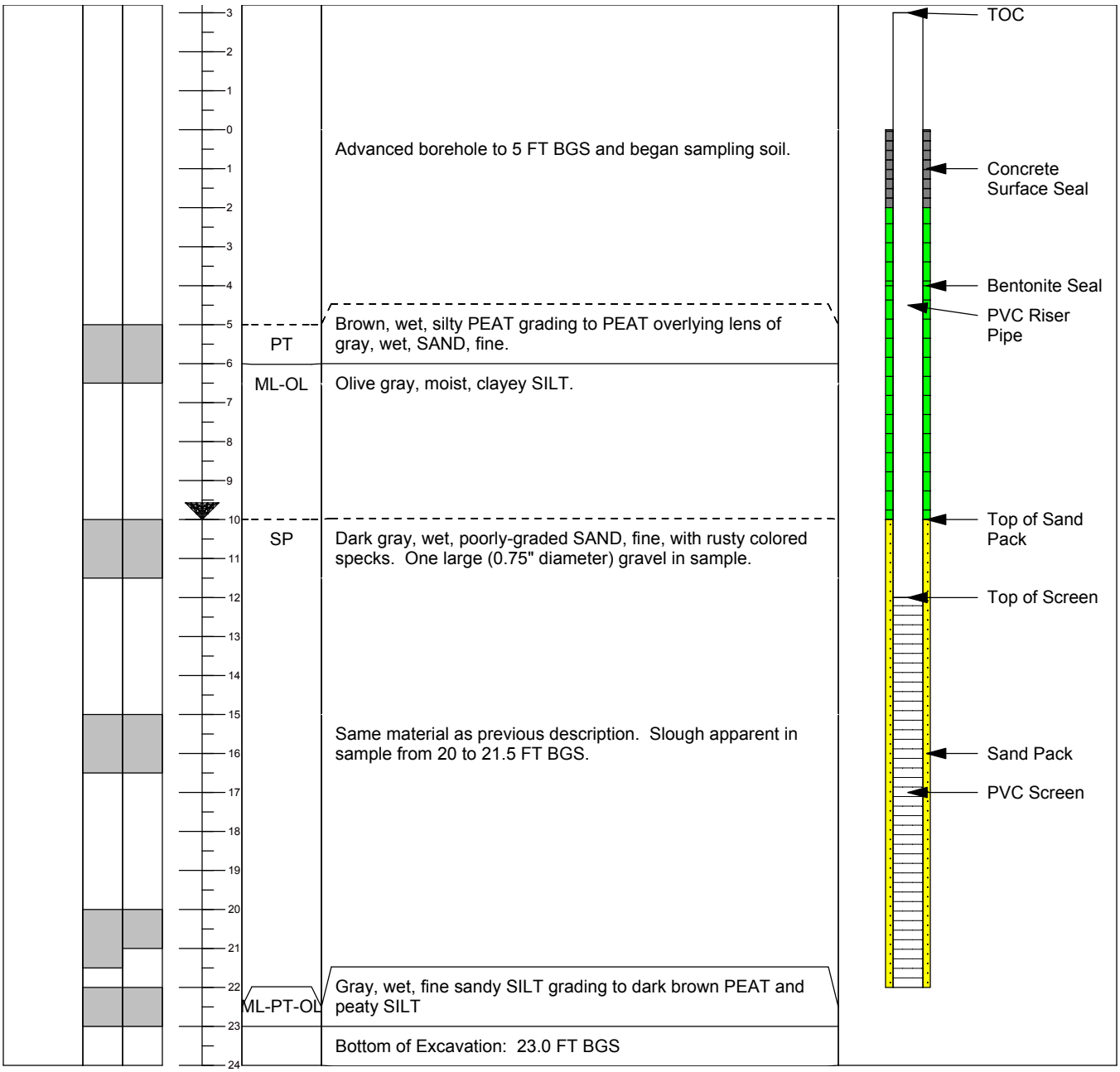
Drill Date: September 23, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling
Drill Type: CME 55 Ltd Access
Sample Method: 3.0" D&M w/ 140lb Hmr
Boring Diameter: 0.7 FT
Boring Depth (ft bgs): 23 FT BGS
Groundwater ATD (ft bgs): 10 FT BGS

Ground Surf Elev. & Datum: 13.51 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702914
Longitude/Easting: 1185900
Casing Elevation: 16.16, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)



Notes:
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Boring Location: PD-104

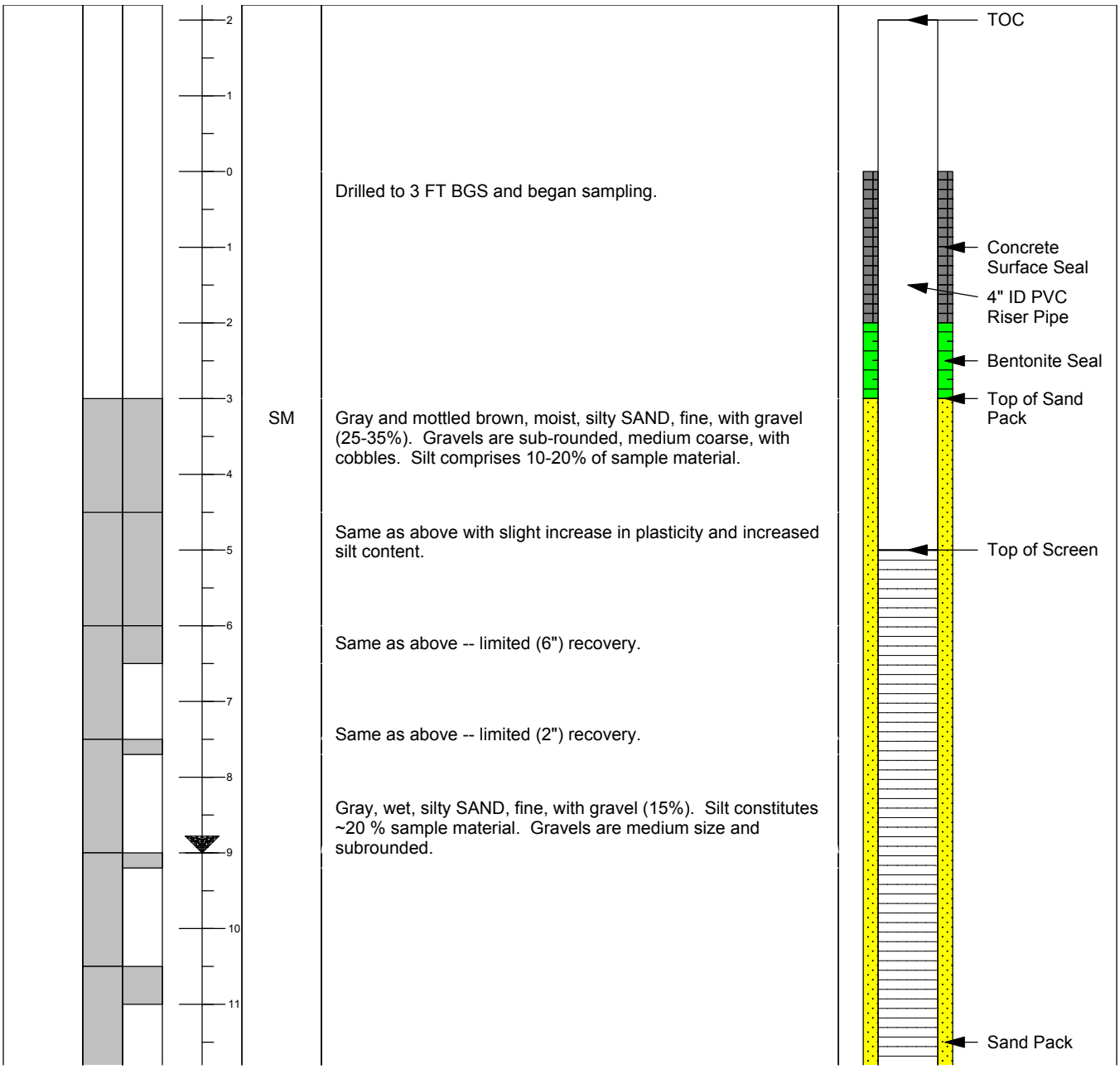
Drill Date: September 22, 2008
Logged By: Brett Beaulieu
Drilled By: Cascade Drilling
Drill Type: CME 55 Ltd Access
Sample Method: 3.0" D&M w/ 140lb Hmr
Boring Diameter: 0.7 FT
Boring Depth (ft bgs): 20 FT BGS
Groundwater ATD (ft bgs): 9 FT BGS

Ground Surf Elev. & Datum: 16.95 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701842
Longitude/Easting: 1186655
Casing Elevation: 18.76, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0		Drilled to 3 FT BGS and began sampling.	
		3	SM	Gray and mottled brown, moist, silty SAND, fine, with gravel (25-35%). Gravels are sub-rounded, medium coarse, with cobbles. Silt comprises 10-20% of sample material.	
		5		Same as above with slight increase in plasticity and increased silt content.	
		6		Same as above -- limited (6") recovery.	
		7		Same as above -- limited (2") recovery.	
		8		Gray, wet, silty SAND, fine, with gravel (15%). Silt constitutes ~20 % sample material. Gravels are medium size and subrounded.	



Notes:
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Boring Location: PD-104

Drill Date: September 22, 2008
Logged By: Brett Beaulieu
Drilled By: Cascade Drilling
Drill Type: CME 55 Ltd Access
Sample Method: 3.0" D&M w/ 140lb Hmr
Boring Diameter: 0.7 FT
Boring Depth (ft bgs): 20 FT BGS
Groundwater ATD (ft bgs): 9 FT BGS

Ground Surf Elev. & Datum: 16.95 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701842
Longitude/Easting: 1186655
Casing Elevation: 18.76, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		12	SP	Dark gray, wet, poorly-graded SAND, fine, with trace coarse sand. Sand unit is interbedded with two distinct 1-2" tihck lenses of gray, wet, plastic SILT with CLAY. Final 5" of drive contain woody material (~5%).	PVC Screen
		13	PT	1" thick lens of PEAT.	
		14	SP	Dark gray, wet. poorly-graded SAND.	
		15	SM	Dark gray, wet, poorly-graded SAND with varying silt. Silt content ranges from 5-25%. Sand content grows coarser around 16 and 18 FT BGS. 10% gravel noted in sample at 18 FT BGS.	
		16			
		17			
		18			
		19	SM/ML	Dark gray, wet, SILT with sand. Alternates between sand rich/silt rich composition throughout interval between 19 and 23.5 FT BGS. Trace woody material noted at ~23 FT BGS.	
		20			
		21			
		22			
		23	PT	Dark reddish brown, wet, PEAT with seeds. Turns black upon exposure to air.	
		24	ML/OL	Light gray to brown clayey SILT expressing high plasticity. 5-10% woody organic debris, some organic silt present.	
		25		Bottom of Excavation: 24.0 FT BGS	

Notes:
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Boring Location: PD-103

Drill Date: August 20, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling

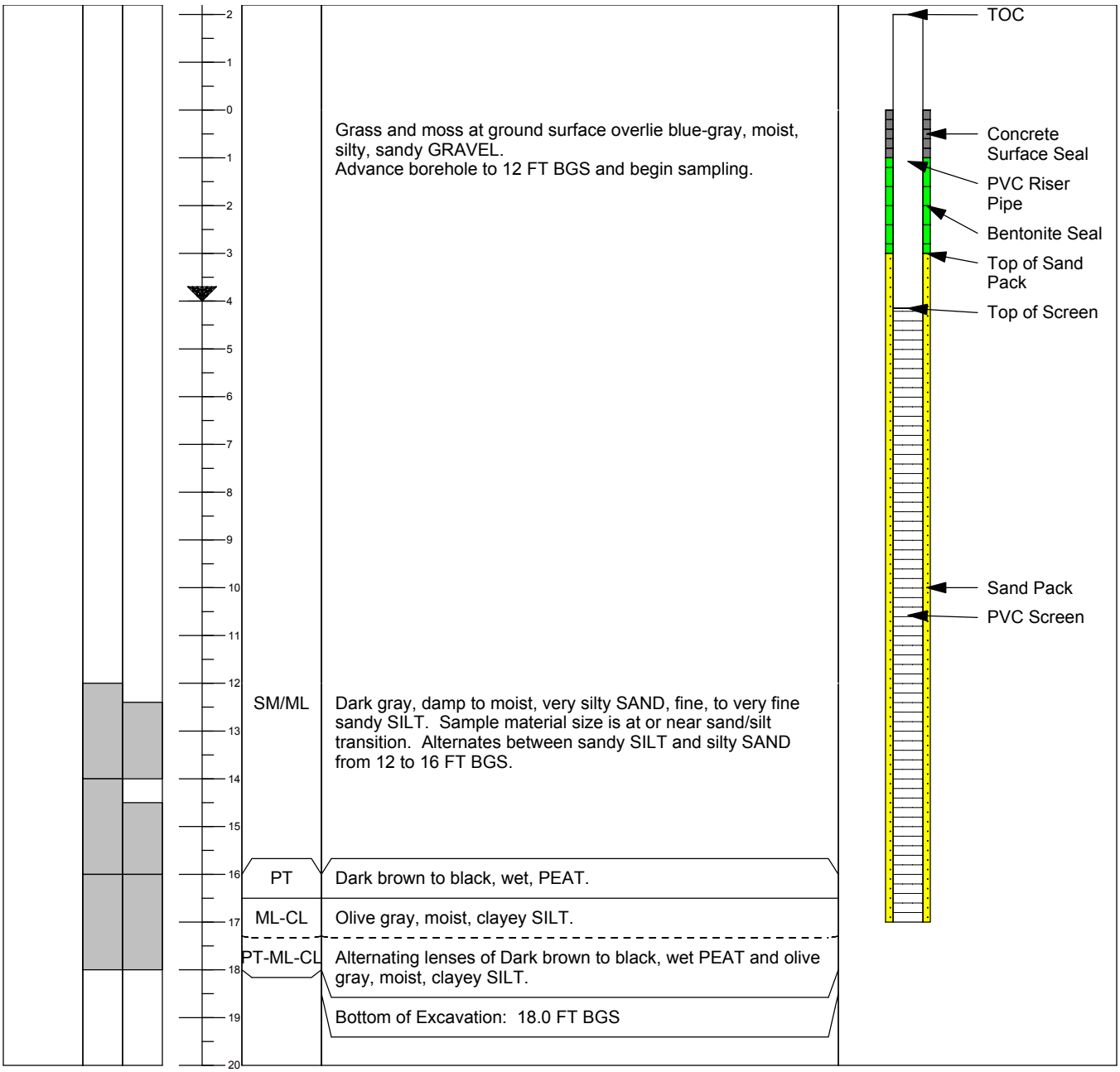
Ground Surf Elev. & Datum: 17.10 FT NAVD88
Coordinate System: NAD 83/98
Latitude/Northing: 701645
Longitude/Easting: 1186604
Casing Elevation: 18.62 FT NAVD88

Drill Type: CME 75
Sample Method: Split spoon /140lb Hmr
Boring Diameter: 8"/12" final
Boring Depth (ft bgs): 18 FT BGS
Groundwater ATD (ft bgs): 4 FT BGS

Client: B&L Custodial Trust
Project: B&L RIM
Task Number: Task No. 1308
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-101

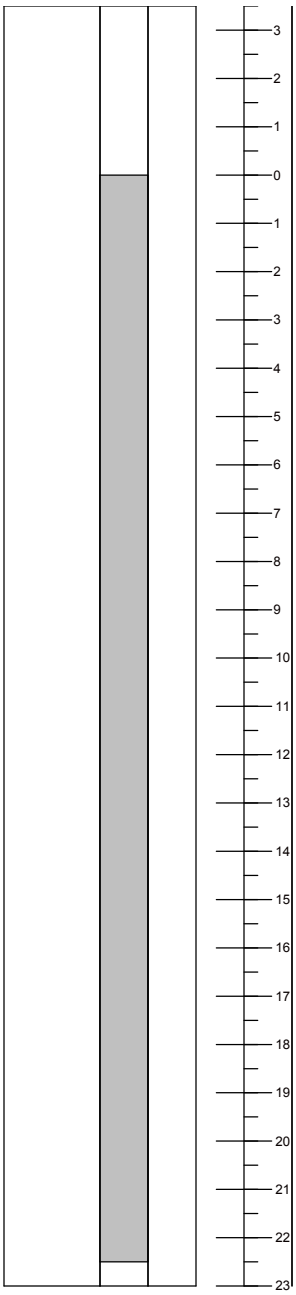
Drill Date: September 25, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling
Drill Type: CME 55 Ltd Access
Sample Method: 3.0" D&M w/ 140lb Hmr
Boring Diameter: 0.9 Feet
Boring Depth (ft bgs): 22.5 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 14.15 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702916
Longitude/Easting: 1186071
Casing Elevation: 17.01, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

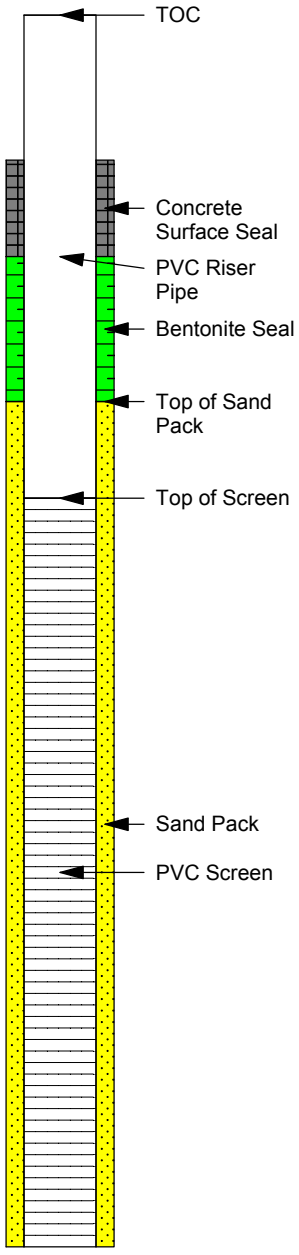
Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	**WELL COMPLETION DETAIL (If Applicable)**



Did not sample soil during boring installation.
Refer to log for PD-71 for geologic reference of this boring.
4" ID well installed at this location.

Bottom of Excavation: 22.5 FT BGS



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-82

Drill Date: August 11, 2008
Logged By: John Lamanna
Drilled By: Eli Floyd / Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Direct Push, 2" X 4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20.0 FT BGS
Groundwater ATD (ft bgs): 4-8 FT BGS

Ground Surf Elev. & Datum: 17.37 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701641
Longitude/Easting: 1186614
Casing Elevation: 20.45, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–7	SW-SM	Brown, dry-moist, well-graded SAND with gravel (10-15%) and silt (~5%). Grades dark to blueish-gray color and increasing gravel content (~30%) with increasing depth. Grows wet and siltier (~15% silt) at 4 FT BGS.	PVC Riser Pipe; Concrete Surface Seal; Bentonite Seal; Top of Sand Pack; Top of Screen; Sand Pack; PVC Screen
		7–10	SM	Dark gray to dark brown, wet, silty SAND, fine. Piece of undecayed wood noted at 9.8 FT BGS.	
		10–12	ML	Grades to dark brown, wet, sandy silt.	
		12–17	SM	Dark gray, wet, silty SAND, fine, with silt (15-25%). Small beds of sandy silt noted noted through drive.	
		17–18	ML	ML: Very dark gray SILT.	
		18–19	PT	PT: Dark brown PEAT.	
		19–20	CL	CL: CLAY, soft, laminated.	
		20	CL-PT	CL-PT: PEAT and CLAY with organic material *10-15%).	
				Bottom of Excavation: 20.0 FT BGS	

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-81

Drill Date: August 11, 2008
Logged By: John Lamanna
Drilled By: Eli Floyd / Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Direct Push, 2" X 4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20.0 FT BGS
Groundwater ATD (ft bgs): 4-8 FT BGS

Ground Surf Elev. & Datum: 17.39 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701642
Longitude/Easting: 1186595
Casing Elevation: 20.57, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–4	GW	Grayish brown, moist to wet, well-graded GRAVEL with sand (35%) and <5% silt. Tree roots noted at 0-0.2 FT BGS and trace brick fragments noted at 0.7 FT BGS.	PVC Riser Pipe; Concrete Surface Seal; Bentonite Seal; Top of Sand Pack; Top of Screen; Sand Pack; PVC Screen
		4–6	NA	No recovery.	
		6–8	SM	Dark gray, wet, silty SAND, fine, with organic fragments (5%). Sandy silt layer noted from 9.6 to 9.9 FT BGS.	
		8–15	ML	Dark gray, moist - wet, SILT with sand (15-30%), fine and dark brown clay (5-10%), soft.	
		15–20	PT	Dark brown to black, wet, PEAT. Turns black upon exposure to air. Bedding noted 18.5 - 19.5 FT BGS.	
		20		Bottom of Excavation: 20.0 FT BGS	

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-80

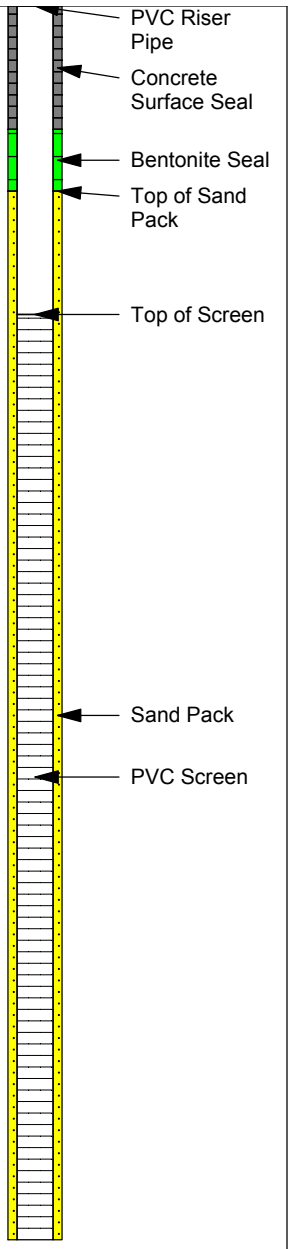
Drill Date: August 11, 2008
Logged By: Brett Beaulieu
Drilled By: Eli Floyd / Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Direct Push, 2" X 4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20.0 FT BGS
Groundwater ATD (ft bgs): 3.0

Ground Surf Elev. & Datum: 16.93 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701660
Longitude/Easting: 1186590
Casing Elevation: 20.36, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–4	SW-SM	Brown, dry, SAND with gravel (30%) and silt (<15%).	
		1–4	SW	Gray, moist, well-graded SAND, fine-medium, with gravel (30%), medium-coarse, and silt (<10%).	
		4–8	NA	No recovery.	
		8–16	SM	Dark brownish gray, wet, silty SAND, fine. >15% silt noted. Low plasticity / high dilatency silt with large chunks of woody debris and organic fines noted in sample.	
		14–15	PT	Wet, very transmissive zone observed from 14 to 15 FT BGS.	
		16		Dark reddish brown PEAT with woody debris.	
		16–17	ML	Light gray, moist, SILT, plastic, with sand (<15%). Organic fines and woody debris noted in sample.	
		17–18	PT/ML	Alternating 2" thick layers of the peat and silt described above.	
		18–19	PT	Dark reddish brown PEAT with woody debris, seeds, and roots. Trace silt noted 17.5 - 18.0 FT BGS.	
		20		Bottom of Excavation: 20.0 FT BGS	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-71

Drill Date: September 24, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling
Drill Type: CME 55 Ltd Access
Sample Method: 3.0" D&M w/ 140lb Hmr
Boring Diameter: 2 inches
Boring Depth (ft bgs): 21.5 FT BGS
Groundwater ATD (ft bgs): 10 FT BGS

Ground Surf Elev. & Datum: 14.41 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702923
Longitude/Easting: 1186058
Casing Elevation: 14.41, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–24	PT-OL	Drill to depth of 5 FT BGS and begin sampling.	TOC; Concrete Surface Seal; Bentonite Seal; Top of Sand Pack; PVC Riser Pipe; Top of Screen
		5	PT-OL	Brown, moist PEAT grading to peaty SILT.	
		6	ML	Gray, moist, slightly sandy SILT.	
		10	SP	Dark gray, moist SAND, fine to medium. Rusty colored grains noted.	Sand Pack; PVC Screen
		15	SP-SW	Dark gray, wet, SAND, fine to medium. (Majority of sample appears to be disturbed slough).	
		18	NA	No recovery.	
		20	SW	Dark gray, wet, SAND, fine to coarse, with gravel.	
		21	ML	Gray, wet, fine sandy SILT with scattered wood fragments.	
		22	PT-OL	Brown, wet, PEAT with peaty SILT.	
		23		Bottom of Excavation: 21.5 FT BGS	

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-70

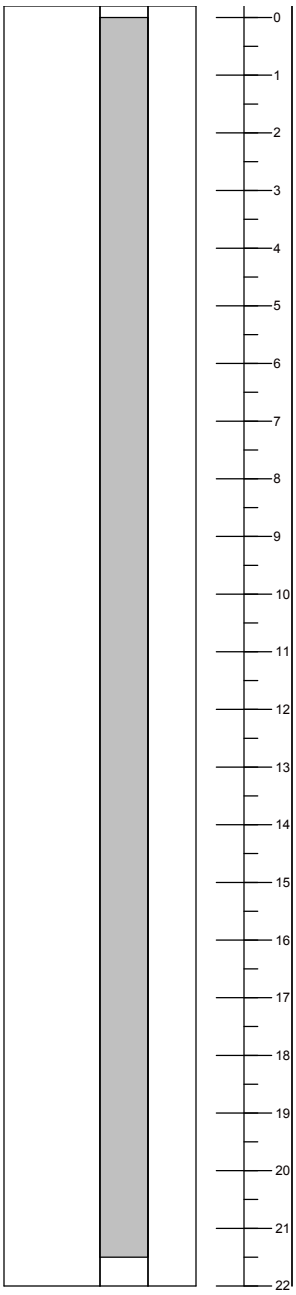
Drill Date: September 24, 2008
Logged By: Chris Gardner
Drilled By: Cascade Drilling
Drill Type: CME 55 Ltd Access
Sample Method: 3.0" D&M w/ 140lb Hmr
Boring Diameter: 0.7 FT
Boring Depth (ft bgs): 21.5 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 14.28 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702918
Longitude/Easting: 1186061
Casing Elevation: 14.28, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

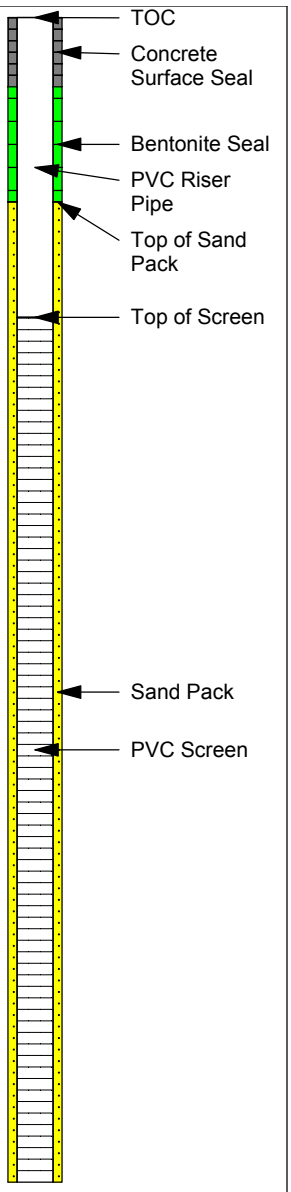
Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)



Refer to boring log of PD-71 for geologic reference.
No samples collected.
Drilled to depth of 21.5 FT BGS and proceeded with installation of groundwater monitoring well.

Bottom of Excavation: 21.5 FT BGS



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
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Boring Location: PD-65

Drill Date: August 26, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Geoprobe/Direct Push
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 24.0 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 30.92 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701320
Longitude/Easting: 1186546
Casing Elevation: 30.92 FT, NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–8	TOPSOIL	Dark brown, dry, topsoil, grass, woody fragments, and roots. No recovery from 2.5 to 8 FT BGs.	TOC Concrete Surface Seal PVC Riser Pipe Bentonite Seal Top of Sand Pack Top of Screen
		8–9	PT	Dark brown, damp, PEAT with vegetation and woody debris.	
		9–12	SM	Brown, moist, silty SAND with trace 1/4 in. pebbles.	
		12–24	SP	Brown, wet, SAND, fine to medium, and gravel (10%), fine to coarse. No recovery from 14.5 to 16 FT BGS. Brown, wet, SAND, fine to medium, with gravel (10%). Brown, wet, SAND, fine to medium. Gravel not present.	Sand Pack PVC Screen
		24–25		Bottom of Excavation: 24.0 FT BGS	

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-64

Drill Date: August 11, 2008
Logged By: John Lamanna
Drilled By: Eli Floyd / Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Direct Push, 2" X 4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20.0 FT BGS
Groundwater ATD (ft bgs): 7-8 FT BGS

Ground Surf Elev. & Datum: 19.54 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701620
Longitude/Easting: 1186657
Casing Elevation: 22.29, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–7	SW	Brown to dark brown, dry to moist, well-graded SAND with gravel (FILL).	PVC Riser Pipe; Concrete Surface Seal; Bentonite Seal; Top of Sand Pack
		7–8	GW	Gray, moist, well-graded GRAVEL with sand (30-40%) and silt (<5%) (FILL). Trace asphalt and brick fragments and tree roots.	
		8–10	GW-GM	Gray, moist, well-graded GRAVEL with sand (30-40%) and silt (5-10%). Grades to dark gray - grayish brown color and shows slight increase in silt content with increasing depth. Partially-decayed wood fragments noted at 5.6 FT BGS.	Top of Screen
		10–11	SP	Dark gray to black, moist to wet, poorly-graded SAND, fine-medium. <5% silt noted.	
		11–12	SM/ML	Dark gray, wet, silty SAND, fine, and sandy silt. No gravel noted. Disturbed sample.	Sand Pack
		12–13	SP	Dark gray, wet, SAND, fine to medium. Possibly heave.	PVC Screen
		13–14	SM-ML	Dark gray to grayish-brown, wet, silty SAND, fine, grading with increasing depth to sandy SILT, soft, with organic flecks (5-10%). Silt grows clayey and peaty near end of drive.	
		14–16	CL	Pinkish-gray to brown, wet, CLAY, medium plasticity and soft, with peat.	
		16–19	PT	Dark reddish brown, wet, PEAT. Turns black upon exposure to air. One large rounded gravel in sample.	
		20		Bottom of Excavation: 20.0 FT BGS	

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
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Boring Location: PD-63C

Drill Date: August 12, 2008
Logged By: Brett Beaulieu
Drilled By: Eli Floyd / Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Direct Push, 2" X 4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20.0 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 16.75 FT, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701678
Longitude/Easting: 1186546
Casing Elevation: 19.50, FT NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Driller unable to set well on first attempt due to heave.
10 gal water added to reduce heave and enable installation of well.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–1	SW	Brown, dry-moist, well-graded SAND, fine-medium, with gravel (20%) and silt (<15%).	PVC Riser Pipe; Concrete Surface Seal
		1–4	SM-SW	Light gray, moist, silty SAND with gravel. (>30% silt and >30% rounded gravel) Grades to gray, moist to wet, well-graded SAND, fine-medium, with silt (<10%) and gravel (10%).	Bentonite Seal; Top of Sand Pack
		4–8	SM	Dark brownish gray, wet, silty SAND with woody debris (5%). Silt component varies from 15-30% depending on depth and expresses high dilatency and transmissivity.	Top of Screen
		8–9	ML	Dark, grayish-brown, moist, plastic SILT with sand (~49%) and organics (~5%).	
		9–14	SM	Dark grayish-brown, wet, silty SAND (15-25% silt). Grows finer from 14.5 FT BGS downward.	Sand Pack; PVC Screen
		14–15	ML	Dark, grayish-brown, moist, plastic SILT with sand (~49%) and organics (~5%).	
		15–16	PT/OL	Dark reddish-brown PEAT with wood fragments. Grades downward to 2-inch layer of plastic organic silt.	
		16–17	ML	Gray, moist, plastic SILT with organics.	
		17–20	PT	Dark reddish-brown PEAT with wood fragments. Grades downward to plastic organic silt.	
		20–21		Bottom of Excavation: 20.0 FT BGS	

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
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Boring Location: PD-63B

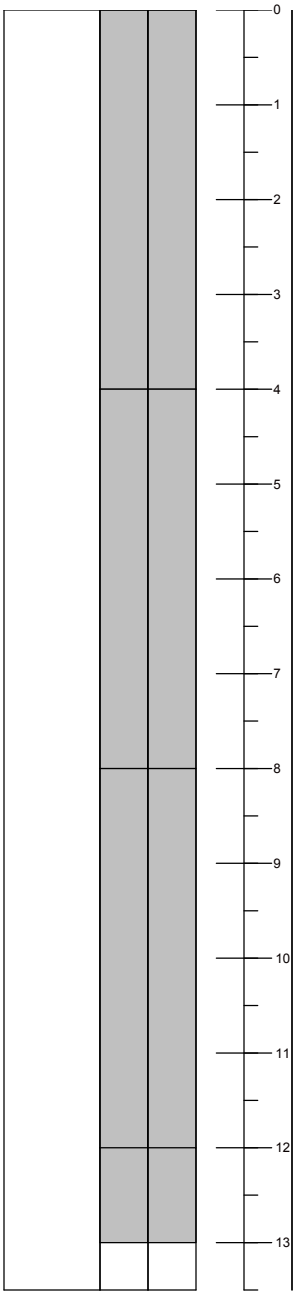
Drill Date: August 12, 2008
Logged By: Brett Beaulieu
Drilled By: Eli Floyd / Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Direct Push, 2" X 4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 13
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 16.77 NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701681
Longitude/Easting: 1186548
Casing Elevation: 18.85 NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Sunny

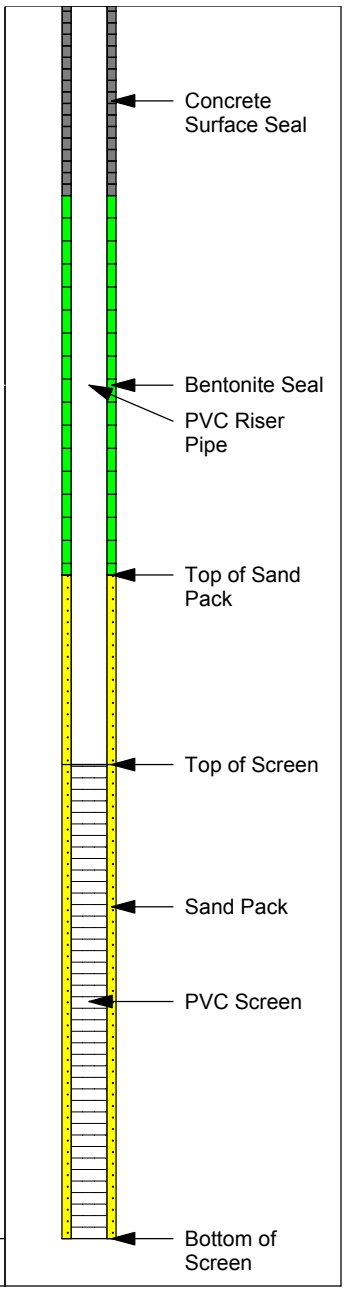
SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	**WELL COMPLETION DETAIL (If Applicable)**



Did not sample. Advanced borehole to target depth and proceeded with well installation.

Refer to log of PD-63c for geologic reference.

Bottom of Excavation: 13.0 FT BGS



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-63a

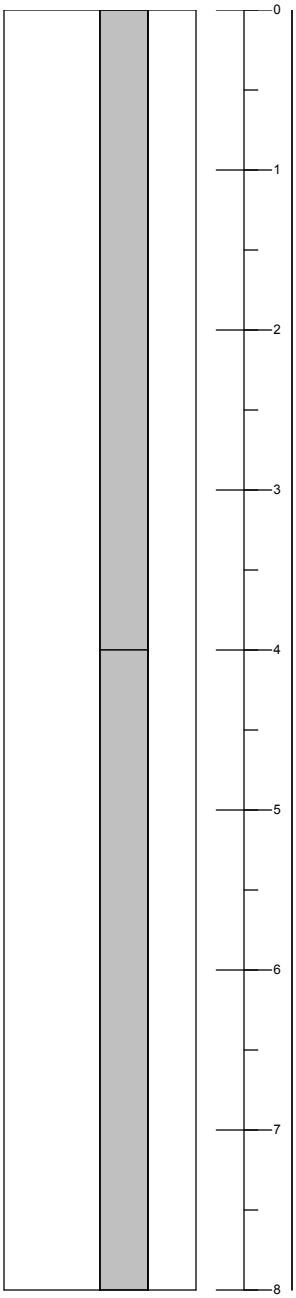
Drill Date: August 12, 2008
Logged By: Brett Beaulieu
Drilled By: Eli Floyd / Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Direct Push, 2" X 4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 7.5 FT BGS
Groundwater ATD (ft bgs): NA

Ground Surf Elev. & Datum: 16.73 FT, NAVD88
Coordinate System: NAD 83/98
Latitude/Northing: 701674
Longitude/Easting: 1186543
Casing Elevation: 19.75 FT, NAVD88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Sunny

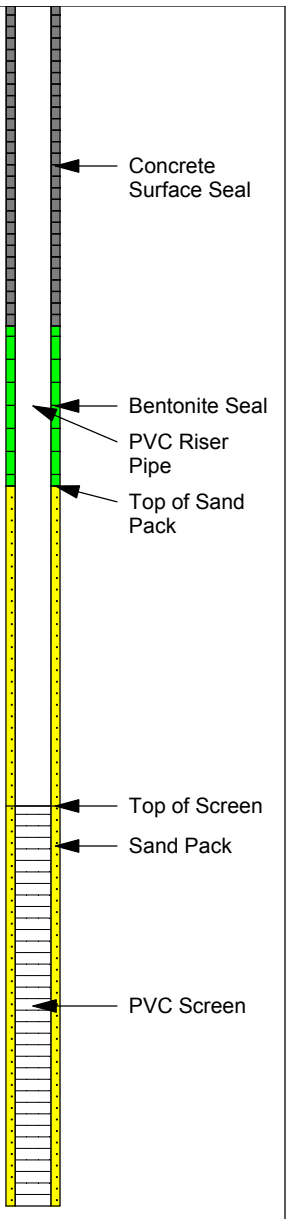
SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)



Did not sample. Advanced borehole to target depth and proceeded with well installation.

Refer to log of PD-63c for geologic reference.

Bottom of Excavation: 7.5 FT BGS



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-62

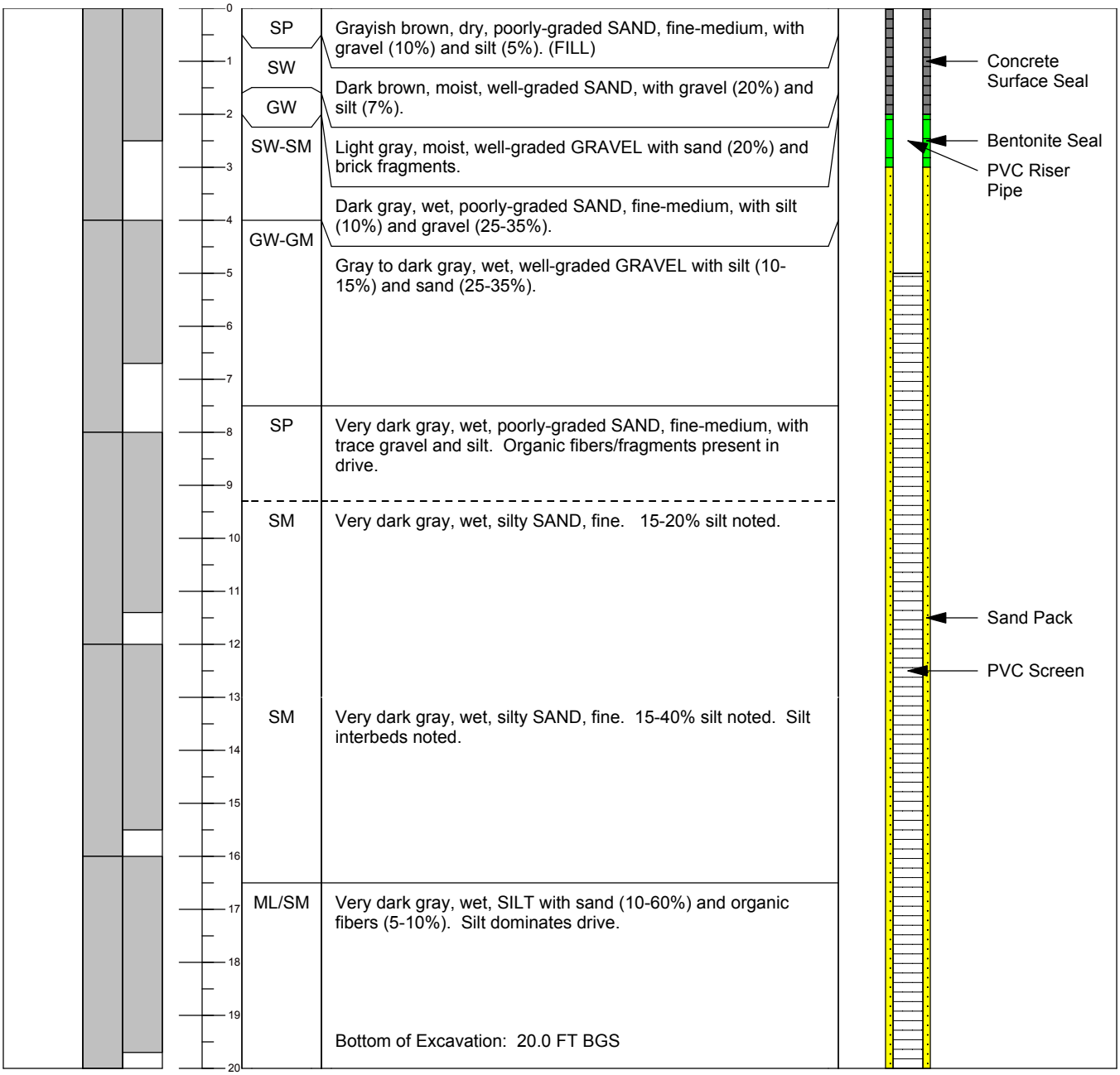
Drill Date: August 11, 2008
Logged By: John LaManna
Drilled By: Eli Floyd / Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Direct Push, 2" X 4'
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20.0 FT BGS
Groundwater ATD (ft bgs): 5.5 FT BGS

Ground Surf Elev. & Datum: 17.64 NAVD88
Coordinate System: NAD 83/98
Latitude/Northing: 701825
Longitude/Easting: 1186617
Casing Elevation: 20.37 NAVD88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–20	SP	Grayish brown, dry, poorly-graded SAND, fine-medium, with gravel (10%) and silt (5%). (FILL)	
			SW	Dark brown, moist, well-graded SAND, with gravel (20%) and silt (7%).	
			GW	Light gray, moist, well-graded GRAVEL with sand (20%) and brick fragments.	
			SW-SM	Dark gray, wet, poorly-graded SAND, fine-medium, with silt (10%) and gravel (25-35%).	
			GW-GM	Gray to dark gray, wet, well-graded GRAVEL with silt (10-15%) and sand (25-35%).	
			SP	Very dark gray, wet, poorly-graded SAND, fine-medium, with trace gravel and silt. Organic fibers/fragments present in drive.	
			SM	Very dark gray, wet, silty SAND, fine. 15-20% silt noted.	
			SM	Very dark gray, wet, silty SAND, fine. 15-40% silt noted. Silt interbeds noted.	
			ML/SM	Very dark gray, wet, SILT with sand (10-60%) and organic fibers (5-10%). Silt dominates drive.	
				Bottom of Excavation: 20.0 FT BGS	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-61

Drill Date: August 8, 2008
Logged By: John LaManna
Drilled By: Eli Floyd / Cascade Drilling

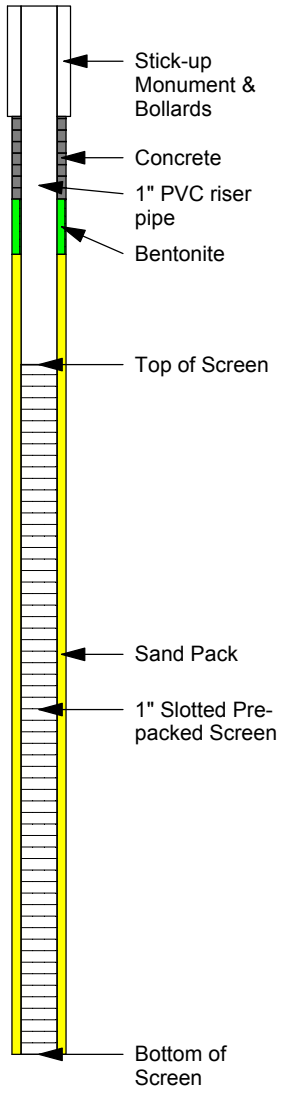
Ground Surf Elev. & Datum: 24.22, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702088
Longitude/Easting: 1186909
Casing Elevation: 27.29, NAVD 88

Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 FT BGS
Groundwater ATD (ft bgs): 6-8 FT BGS

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste Pierce County, WA

Remarks: This is the second attempt. Refusal at 8 ft bgs on first attempt.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0		Ground Surface	
		0–7	SW	Brown, dry grading down to moist, well-graded SAND with gravel (15-25%), silt approximately 5%.	
		7–10	SP	Dark grayish-brown, wet, poorly-graded SAND with gravel, fine and medium. Gravel approximately 5%, silt 5%.	
		10–11	GW	Dark, grayish-brown, wet, well-graded GRAVEL with sand, fine and course. Sand less than 15%, silt less than 5%.	
		11–12	SP	Dark grayish-brown, wet, poorly-graded SAND, fine and medium. Trace gravel; silt less than 5%.	
		12–20	SW	Grades to dark, grayish-brown, wet, well-graded SAND with gravel, fine and course. Gravel 15-35%, silt 2-5%. Stratified with 0.3-0.4 ft thick layers. Grades to dark grayish brown, wet, well-graded SAND with gravel (25-40%). Silt less than 5%.	
		20		Bottom of Excavation: 20.0 FT BGS	



Notes:
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Boring Location: PD-60

Drill Date: August 7, 2008
Logged By: John LaManna
Drilled By: Casey Goble / Cascade Drilling

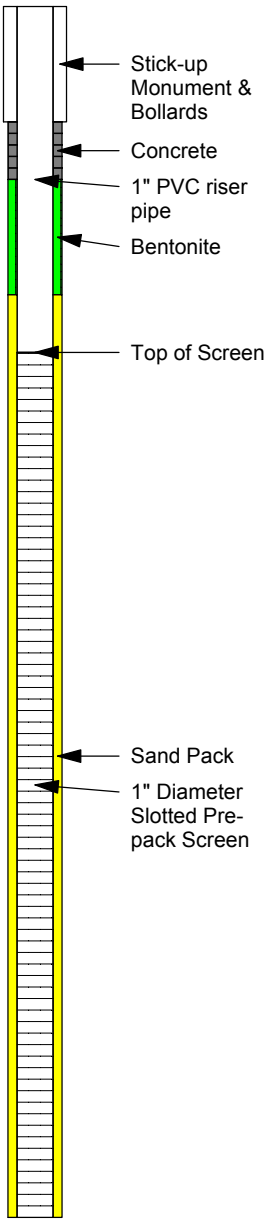
Ground Surf Elev. & Datum: 17.10, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701995
Longitude/Easting: 1186678
Casing Elevation: 20.13, NAVD 88

Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 19 FT BGS
Groundwater ATD (ft bgs): 6.5 FT BGS

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0	GP	Ground surface.	
		1	GP	Gray, dry, poorly-graded GRAVEL with sand.	
		1	SM	Dark blue-gray, moist, silty SAND with gravel. Some olive-gray mottling noted.	
		5		Dark gray, moist, silty SAND with gravel. Some dark grayish mottling noted. Grades to wet at 6.5 FT BGS.	
		13	ML-OL	Dark grayish-brown, wet, SILT or ORGANIC SILT, massive. Wood fibers observed from 15-17 FT BGS.	
		17	PT	Black, wet, PEAT-Wood Fibers.	
		18	CL	Dark brown CLAY, very soft, massive, with trace peat fibers.	
		19	PT	Dark brown, wet, PEAT-Wood Fibers. Sample material turns black following exposure to air.	



Notes:
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Boring Location: PD-52c

Drill Date: August 19, 2008
Logged By: Erin Murray
Drilled By: Eli Floyd / Cascade Drilling

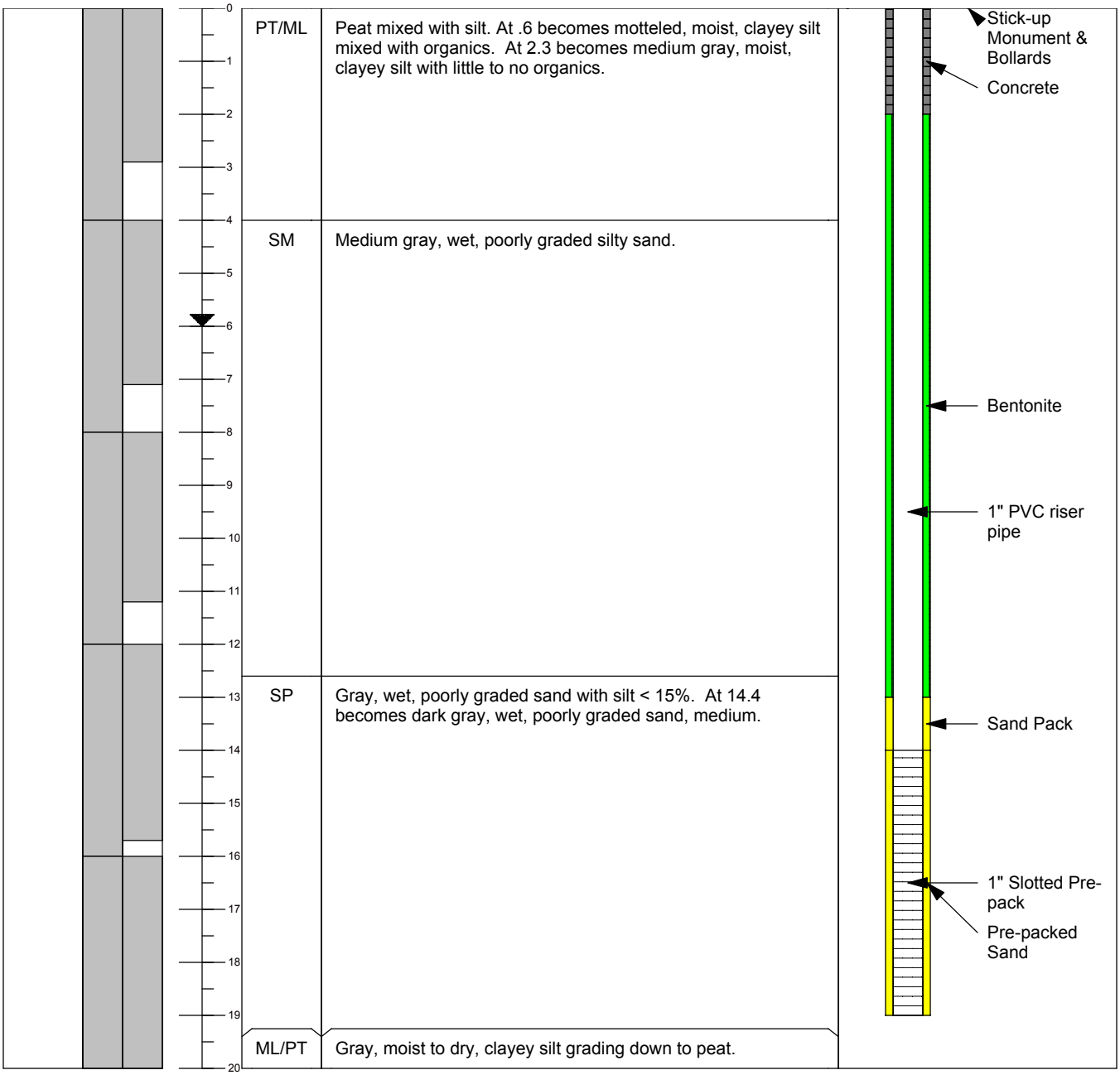
Ground Surf Elev. & Datum: 12.389, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702494.381
Longitude/Easting: 1185673.518
Casing Elevation: 15.039, NAVD 88

Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 ft bgs
Groundwater ATD (ft bgs): 6' bgs

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Deep well screen. Third of three.
Cloudy, warm.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–4	PT/ML	Peat mixed with silt. At .6 becomes motteled, moist, clayey silt mixed with organics. At 2.3 becomes medium gray, moist, clayey silt with little to no organics.	
		4–12	SM	Medium gray, wet, poorly graded silty sand.	
		12–19	SP	Gray, wet, poorly graded sand with silt < 15%. At 14.4 becomes dark gray, wet, poorly graded sand, medium.	
		19–20	ML/PT	Gray, moist to dry, clayey silt grading down to peat.	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring Location: PD-52b

Drill Date: August 19, 2008
Logged By: Erin Murray
Drilled By: Eli Floyd / Cascade Drilling

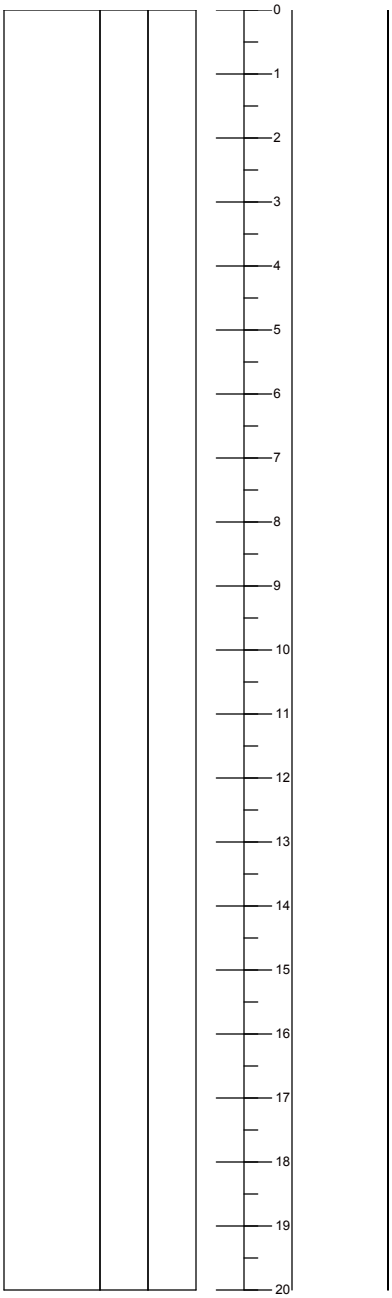
Ground Surf Elev. & Datum: 12.299, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702497.933
Longitude/Easting: 1185674.567
Casing Elevation: 15.104, NAVD 88

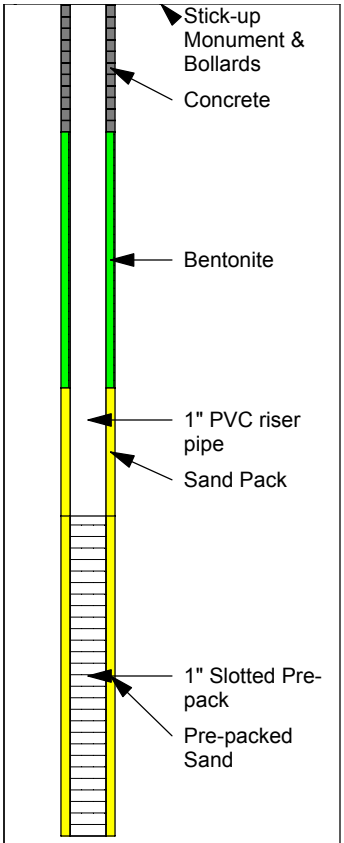
Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 13 ft bgs
Groundwater ATD (ft bgs): Unknown

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Intermediate well screen. 2 of 3.
No logging was done.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)





Notes:
FT BGS = feet below ground surface
ppm = parts per million
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▼ = denotes groundwater table

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Boring Location: PD-52a

Drill Date: August 19, 2008
Logged By: Erin Murray
Drilled By: Eli Floyd / Cascade Drilling

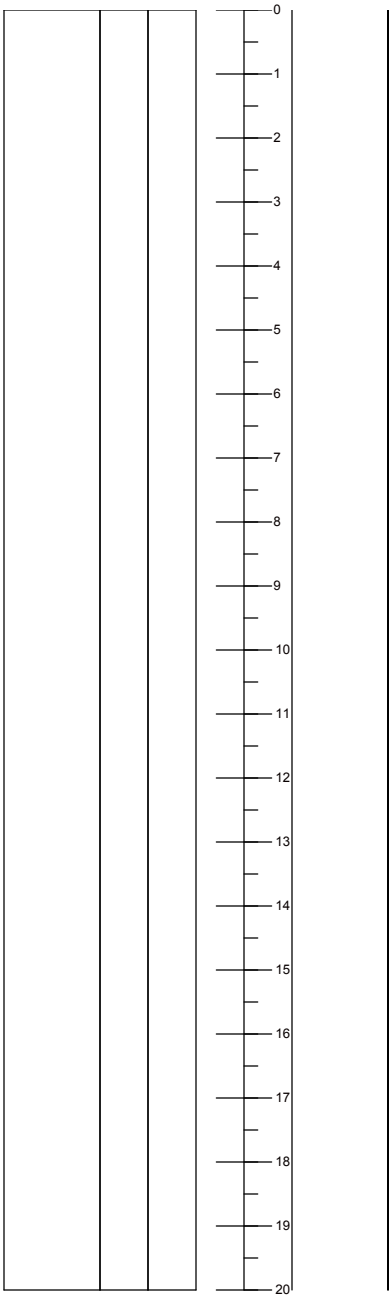
Ground Surf Elev. & Datum: 12.499, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702501.017
Longitude/Easting: 1185675.209
Casing Elevation: 15.044, NAVD 88

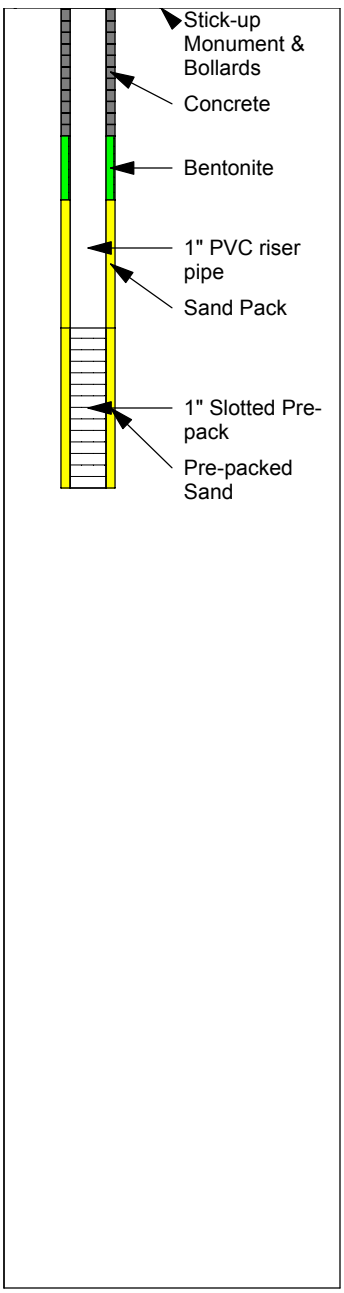
Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 7.5 ft bgs
Groundwater ATD (ft bgs): Unknown

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Shallow well screen. First of three.
No logging was done.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)





Notes:
FT BGS = feet below ground surface
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Boring Location: PD-51

Drill Date: August 19, 2008
Logged By: Erin Murray
Drilled By: Eli Floyd / Cascade Drilling

Ground Surf Elev. & Datum: 12.129, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702695.029
Longitude/Easting: 1185752.702
Casing Elevation: 15.199, NAVD 88

Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 ft bgs
Groundwater ATD (ft bgs): 6' bgs

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:
Sunny, hot.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–1	ML	Medium brown/mottled, moist, clayey silt mixed with organics.	Stick-up Monument & Bollards; Concrete
		1–2	PT	Peat with lense of silty clay at 2.3.	Bentonite
		3–4	ML	Medium gray, moist, clayey silt.	Sand Pack
		4–5	ML/SM	Dark bluish gray, wet, poorly graded, clayey silt. Grading down to wet, silty sand.	
		6–14	SM	Dark gray, wet, poorly graded silty sand, fine. At 1.4' bgs is a lense of woody debris.	1" PVC riser pipe; 1" Slotted Pre-pack; Pre-packed Sand
		14–16	SP	Dark gray, wet, poorly graded sand, medium.	
		16–17	ML	Gray, moist, clayey silt.	
		17–20	PT/ML/PT	Peat grading down to clayey silt and back to peat.	

Notes:
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Boring Location: PD-50

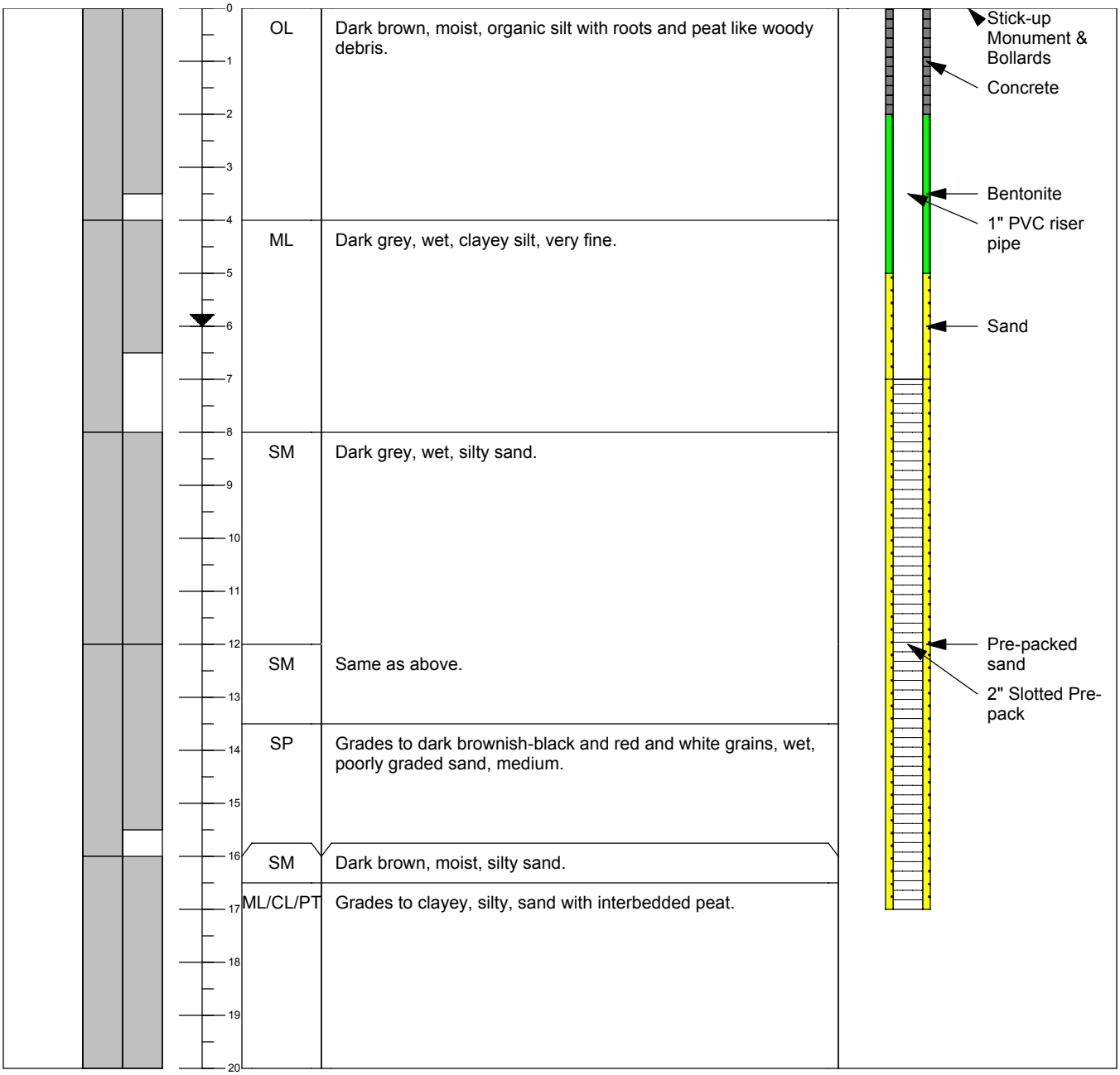
Drill Date: August 19, 2008
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 ft bgs
Groundwater ATD (ft bgs): 6' bgs

Ground Surf Elev. & Datum: 12.296
Coordinate System: NAV83/98
Latitude/Northing: 702820.184
Longitude/Easting: 1185778.645
Casing Elevation: 14.766

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Boring log and groundwater sample in wetland.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–4	OL	Dark brown, moist, organic silt with roots and peat like woody debris.	
		4–8	ML	Dark grey, wet, clayey silt, very fine.	
		8–12	SM	Dark grey, wet, silty sand.	
		12–14	SM	Same as above.	
		14–16	SP	Grades to dark brownish-black and red and white grains, wet, poorly graded sand, medium.	
		16–17	SM	Dark brown, moist, silty sand.	
		17–20	ML/CL/PT	Grades to clayey, silty, sand with interbedded peat.	



Notes:
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Boring Location: PD-40

Drill Date: August 6, 2008
Logged By: Brett Beaulieu
Drilled By: Eli Floyd / Cascade Drilling

Ground Surf Elev. & Datum: 19.670 NAVD88
Coordinate System: NAD 83/98
Latitude/Northing: 701719.308704
Longitude/Easting: 1186767.139073
Casing Elevation: 22.531 NAVD88

Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 ft bgs
Groundwater ATD (ft bgs): 10' bgs

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks:

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–8	SM	Light brown, dry, silty sand with gravel, fine. Gravel, medium-coarse, approximately 25% rounded.	
		1–4	SW/SM	Dark grey, moist, silt, plastic, trace fine sand, woody debris <5%.	
		8–12	ML	Dark grey, moist, silt, plastic, trace fine sand, woody debris <5%	
		12–14	ML	Same as above, increasing woody content.	
		14–15	PT	Dark reddish brown woody peat with wood debris.	
		15–16	ML/CL	Light grey, clayey silt, trace organics and wood debris.	
		16–18	PT	Dark reddish brown, wet, peat, with solid wood up to 3", fades to grey-green in air, some organic silt.	
		18–19	SM	Grey and brown, wet, silty sand with gravel, fine to medium, gravel fine to medium and rounded, some woody debris.	
		19–20	PT	Dark reddish brown, wet, peat, fades to grey-green in air, some organic silt.	

Notes:
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Boring Location: PD-38

Drill Date: August 7, 2008
Logged By: Brett Beaulieu
Drilled By: Casey Goble / Cascade Drilling

Ground Surf Elev. & Datum: 18.998, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 701806.207
Longitude/Easting: 1186803.104
Casing Elevation: 21.635, NAVD 88

Drill Type: Truck Geoprobe 6600
Sample Method: Dual Tube/Macro Core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 ft bgs
Groundwater ATD (ft bgs): 10' bgs

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste Pierce County, WA

Remarks: Driller reports difficulty with 3 1/4" dual-tube due to large cobbles. Switched to 2" x 5' macro core. Log is a composite of two drives. 5 gallons of water added during piezometer installation.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–5	SM	Light brown, dry, silty sand with gravel and fines. Gravel rounded and angular 25%. Broken cobbles. Grades down to darker brown, moist, then mottled gray, silty sand with gravel and fines. Trace coarse sand. Gravel rounded 30% with > 15% silt.	Stick-up Monument & Bollards; Concrete; Bentonite; 1" PVC riser pipe; Sand Pack
		5–10	ML	Brownish gray, moist, silt with organics. 5% woody debris.	
		10–12	SM	Brownish gray, moist, silty sand with gravels and fines. Gravel 15%, silt 15%. Medim stiff. Cobbles at 11'. Becoming very stiff at 11.5, orange and gray mottled.	
		12–15	ML	Gray, dry, very stiff/hard silt with gravel (20%), fine and medium, plastic, with rounded cobbles.	1" Slotted Pre-pack; Pre-packed Sand
		15–20	SM	Light brownish gray, moist, silty sand with gravel (30%). Medium dense, fine to coarse with mottled brown and gray sections. Wet sandy sections at 18' for 4 to 6".	

Notes:
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Boring Location: PD-6

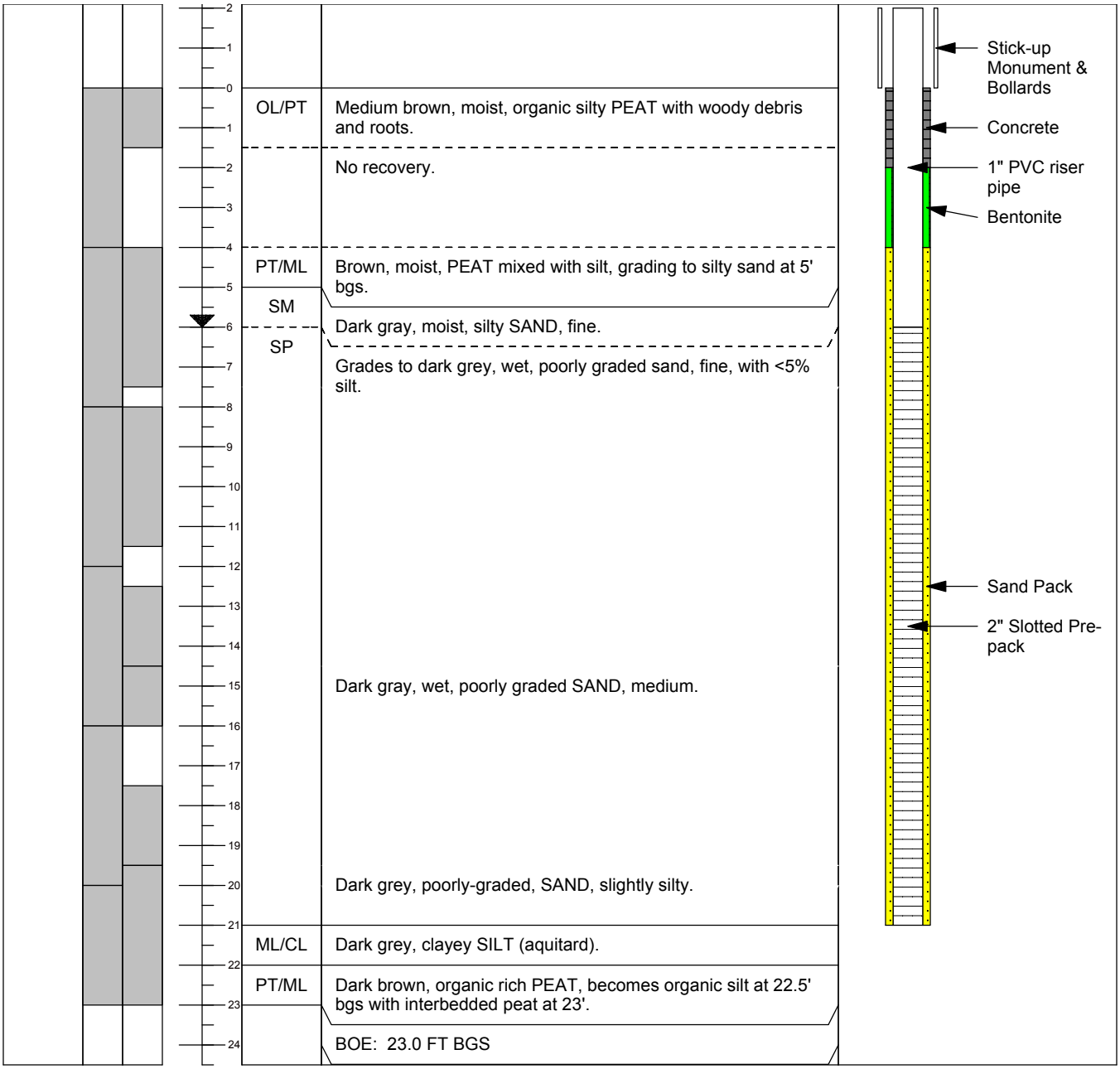
Drill Date: August 15, 2008
Logged By: Lisa Meoli
Drilled By: Eli Floyd/Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 23 FT BGS
Groundwater ATD (ft bgs): 6 FT BGS

Ground Surf Elev. & Datum: 12.81 NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 703003.1
Longitude/Easting: 1185989.1
Casing Elevation: 15.64 NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Boring log and groundwater sample in wetland.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0	OL/PT	Medium brown, moist, organic silty PEAT with woody debris and roots.	
		2		No recovery.	
		4	PT/ML	Brown, moist, PEAT mixed with silt, grading to silty sand at 5' bgs.	
		5	SM		
		6		Dark gray, moist, silty SAND, fine.	
		7	SP	Grades to dark grey, wet, poorly graded sand, fine, with <5% silt.	
		15		Dark gray, wet, poorly graded SAND, medium.	
		20		Dark grey, poorly-graded, SAND, slightly silty.	
		21	ML/CL	Dark grey, clayey SILT (aquitard).	
		22	PT/ML	Dark brown, organic rich PEAT, becomes organic silt at 22.5' bgs with interbedded peat at 23'.	
		23		BOE: 23.0 FT BGS	



Notes:
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USCS = Unified Soil Classification System
= denotes groundwater table

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Boring Location: PD-4

Drill Date: August 14, 2008
Logged By: Erin Murray
Drilled By: Eli Floyd / Cascade Drilling
Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 24 FT BGS
Groundwater ATD (ft bgs): Unknown

Ground Surf Elev. & Datum: 12.29 NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702994.8
Longitude/Easting: 1185895.9
Casing Elevation: 15.30 NAVD 88

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Boring log and groundwater sample in wetland.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–1	PT	Dark brown, moist, silty peat, wood.	Concrete Surface Seal
		1–4	PT		3/8" dia. bentonite chips
		4–5	SM	Dark brown peat mixed with silt <15%	2" PVC riser pipe
		5–6	SM/SP	Grades to silty sand with organic debris interbedded; grading down to fine sandy silt.	Sand Pack
		6–7		Medium gray, poorly graded sand, fine and medium, silt < 5%.	
		7–11	SM/SP	Medium and dark gray, wet, poorly graded sand, fine and medium, little silt.	
		11–13	SM/SP	Medium and dark gray, wet, poorly graded sand, fine and medium, little silt.	Pre-Pack Well Screen
		13–15	SP	Dark gray, poorly graded clean sand, medium, no silt.	
		15–20	SP	Liner stuck in sampler but fine and medium sand in top and bottom of liner based on observation.	
		20–21		Dark gray, poorly graded clean sand, medium, no silt.	
		21–22	SM	Medium and dark gray, wet, poorly graded sand, fine and medium, little silt.	
		22–23	ML	Medium gray, clayey silt.	
		23–24	PT	Peat interbedded with clayey silt.	
				Bottom of Excavation: 22.0 FT BGS	

Notes:
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ppm = parts per million
USCS = Unified Soil Classification System
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Boring Location: PD-1c

Drill Date: August 15, 2008
Logged By: Erin Murray
Drilled By: Eli Floyd / Cascade Drilling

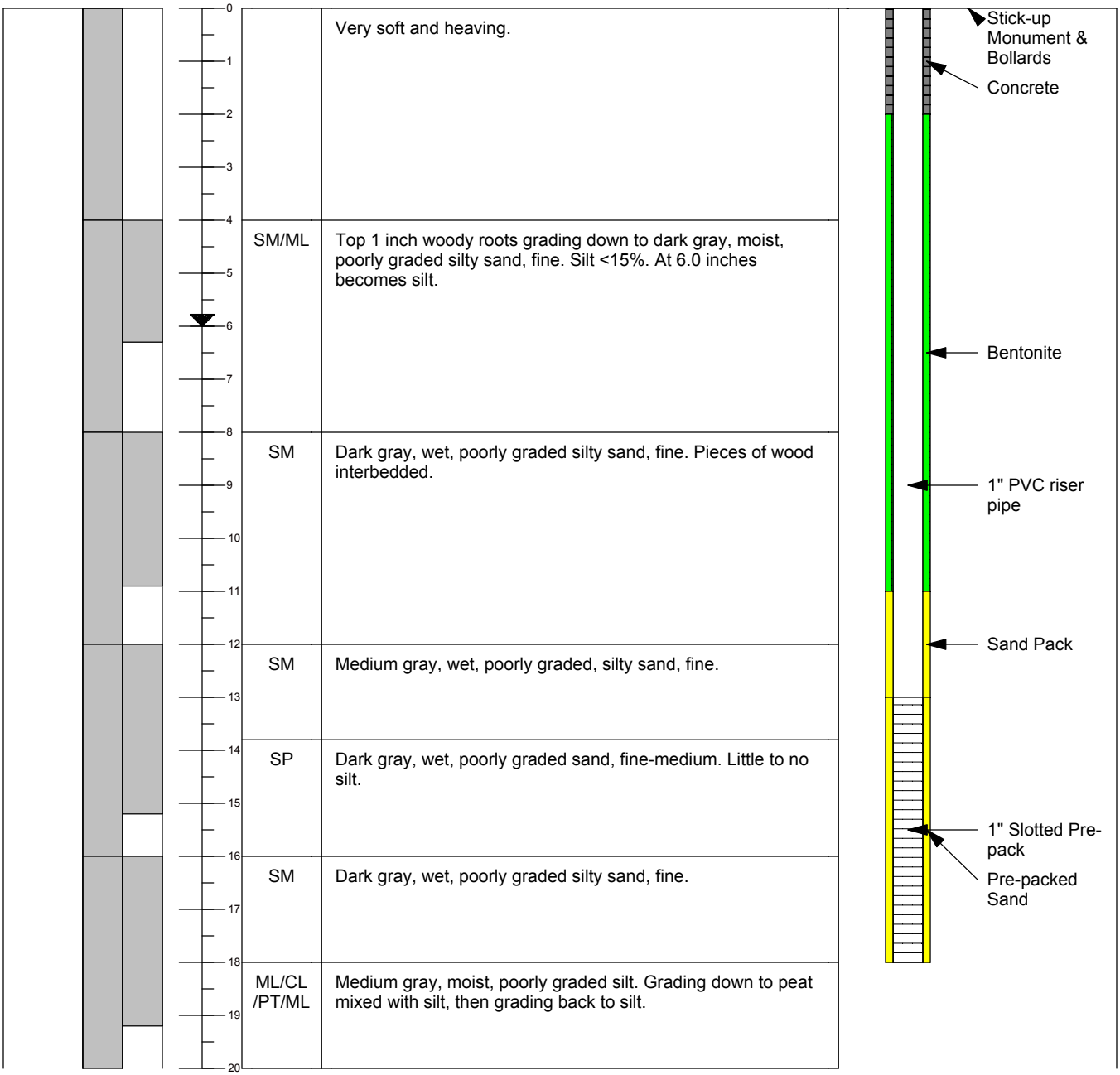
Ground Surf Elev. & Datum: 12.617, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702948.758
Longitude/Easting: 1185722.528
Casing Elevation: 15.932, NAVD 88

Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 24 ft bgs
Groundwater ATD (ft bgs): 6' bgs

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Deep well screen. Third of three.
Sunny, hot.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		0–4		Very soft and heaving.	Stick-up Monument & Bollards; Concrete
		4–8	SM/ML	Top 1 inch woody roots grading down to dark gray, moist, poorly graded silty sand, fine. Silt <15%. At 6.0 inches becomes silt.	Bentonite
		8–12	SM	Dark gray, wet, poorly graded silty sand, fine. Pieces of wood interbedded.	1" PVC riser pipe
		12–14	SM	Medium gray, wet, poorly graded, silty sand, fine.	Sand Pack
		14–16	SP	Dark gray, wet, poorly graded sand, fine-medium. Little to no silt.	
		16–18	SM	Dark gray, wet, poorly graded silty sand, fine.	1" Slotted Pre-pack; Pre-packed Sand
		18–20	ML/CL /PT/ML	Medium gray, moist, poorly graded silt. Grading down to peat mixed with silt, then grading back to silt.	



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring Location: PD-1c

Drill Date: August 15, 2008
Logged By: Erin Murray
Drilled By: Eli Floyd / Cascade Drilling

Ground Surf Elev. & Datum: 12.617, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702948.758
Longitude/Easting: 1185722.528
Casing Elevation: 15.932, NAVD 88

Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 24 ft bgs
Groundwater ATD (ft bgs): 6' bgs

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste Pierce County, WA

Remarks: Deep well screen. Third of three.
Sunny, hot.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)
		20	PT/ML/PT	Large woody chunks. At 21.0 mottled gray and brown clayey silt with interbedded organics. At 21.3 turns to peat and then grades to clayey silt with medium plasticity.	
		21			
		22			
		23			
		24			

Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring Location: PD-1b

Drill Date: August 15, 2008
Logged By: Erin Murray
Drilled By: Eli Floyd / Cascade Drilling

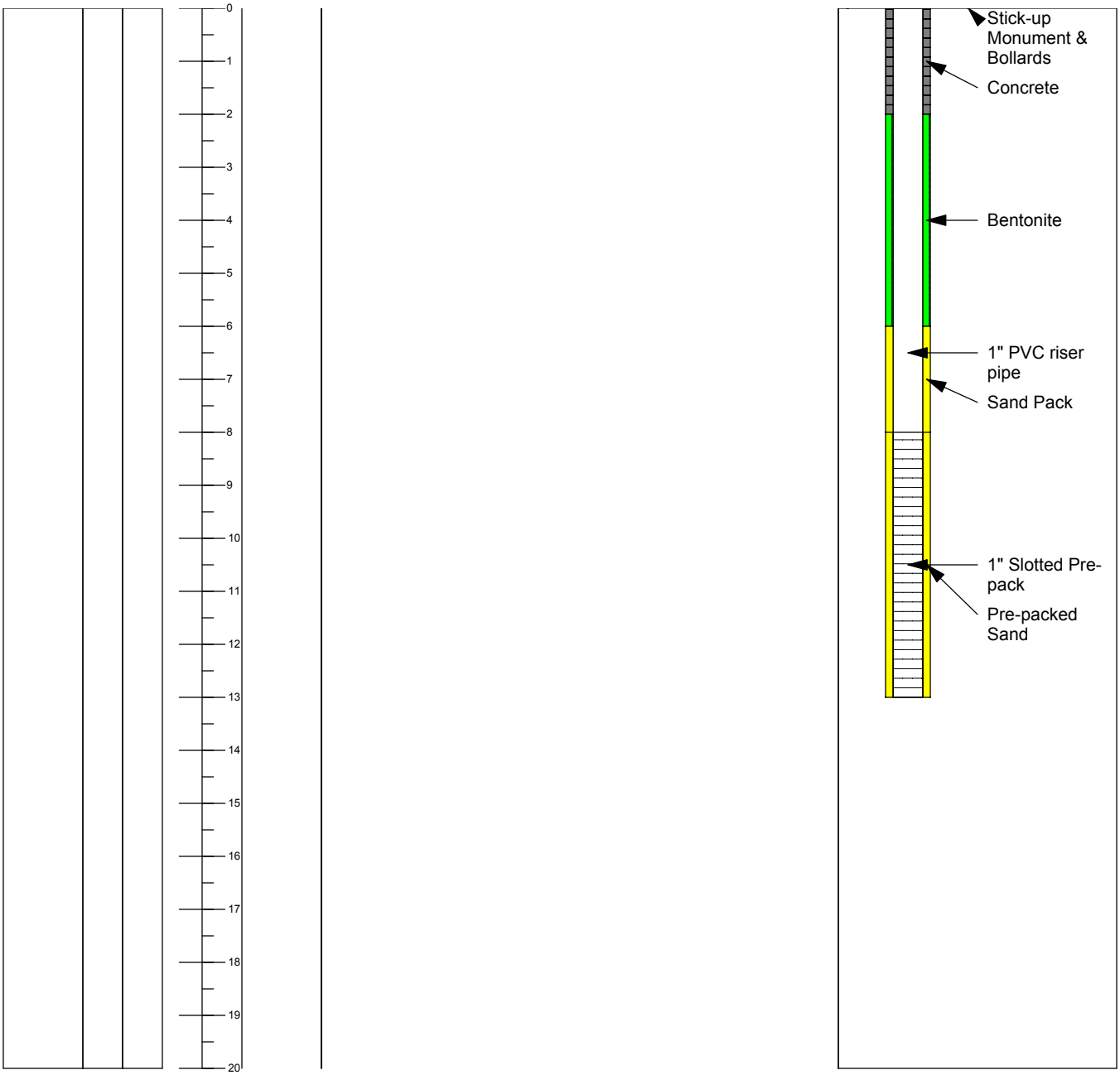
Ground Surf Elev. & Datum: 12.617, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702948.583
Longitude/Easting: 1185725.946
Casing Elevation: 15.732, NAVD 88

Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 13 ft bgs
Groundwater ATD (ft bgs): Unknown

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Intermediate well screen. 2 of 3.
No logging was done.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring Location: PD-1a

Drill Date: August 15, 2008
Logged By: Erin Murray
Drilled By: Eli Floyd / Cascade Drilling

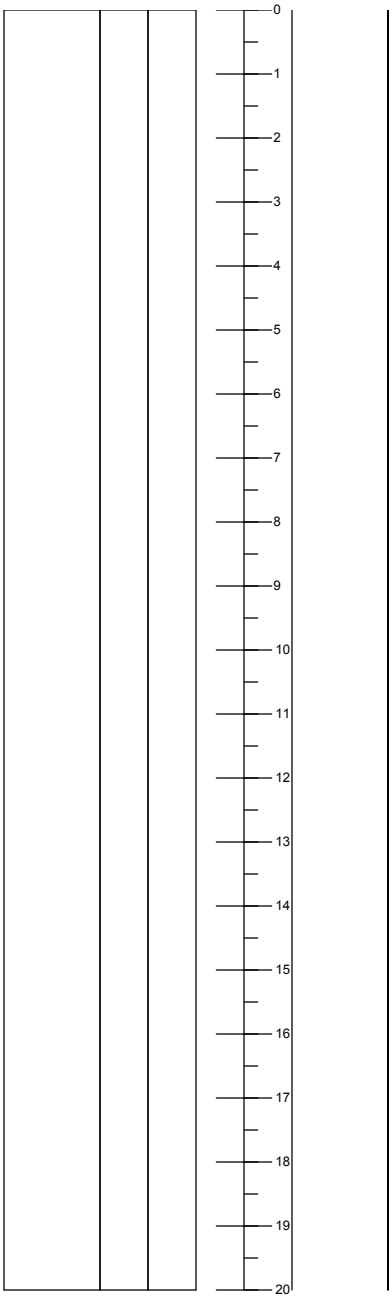
Ground Surf Elev. & Datum: 12.667, NAVD 88
Coordinate System: NAD 83/98
Latitude/Northing: 702948.758
Longitude/Easting: 1185729.253
Casing Elevation: 16.167, NAVD 88

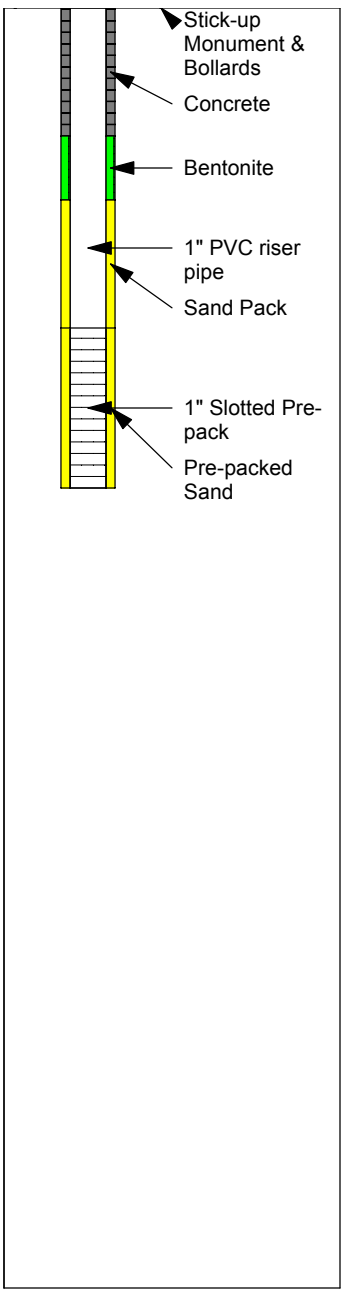
Drill Type: Track Geoprobe 6620DT
Sample Method: Dual Tube
Boring Diameter: 2 inches
Boring Depth (ft bgs): 7.5 ft bgs
Groundwater ATD (ft bgs): Unknown

Client: B&L Custodial Trust
Project: B&L RIM
Task Number:
Site Location: B&L Woodwaste
Pierce County, WA

Remarks: Shallow well screen. First of three.
No logging was done.

SAMPLE ID	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	WELL COMPLETION DETAIL (If Applicable)





Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-36

Drill Date: July 20, 2011
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling

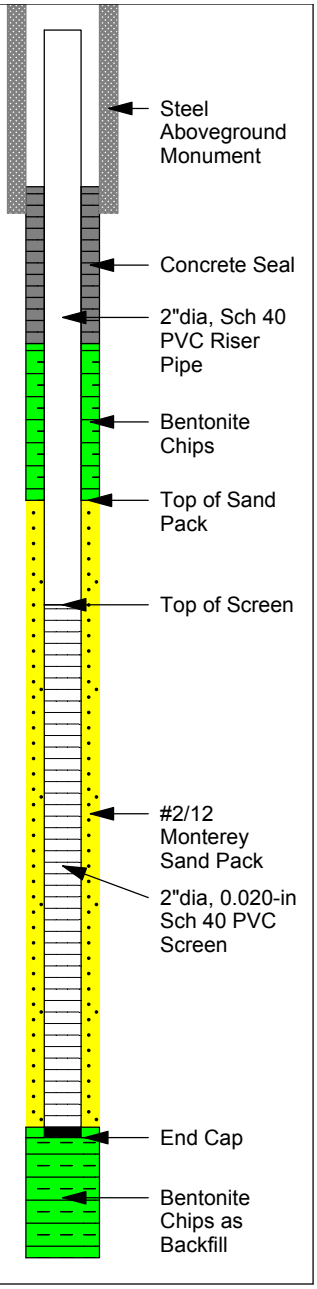
Ground Surf Elev. & Datum: 17.55 ft NGVD88
Coordinate System: NAD 83/98
Latitude/Northing: 702,195.50 ft
Longitude/Easting: 1,186,601.08 ft
Casing Elevation: 20.15 ft NGVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 21'
Groundwater ATD (ft bgs): 0'

Client: B&L Custodial Trust
Project: B&L-RIM
Task Number: 1422
Site Location: Pierce Co., WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
15 15 15		0	SM	Wet, brown silty fine SAND with small and large gravels, roots, and grasses.
		1	SW-SM	Wet, medium brown with orange mottling well graded fine to coarse SAND with silt and small to large gravels.
10 15 20		3		
		5		Same as above. No organge mottling.
7 20 26		8	SP	Wet, dark gray poorly graded medium to coarse SAND. No silt.
18 50/6		10		Same as above.
		11	SW-SM	Grades to wet, light to medium gray well graded SAND with silt and small gravels.
1 7 7		13		Same as above. Becoming less coarse with depth.
1 3 9		15		Same as above.
		16	SP	Wet, light brown poorly graded fine SAND, little silt. Trace small gravels.
20 50/6		18	SM	Wet, light brown fine silty SAND.
		19	ML/SM	Grades to clayey SILT and fine silty SAND.



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-35

Drill Date: July 20, 2011
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling

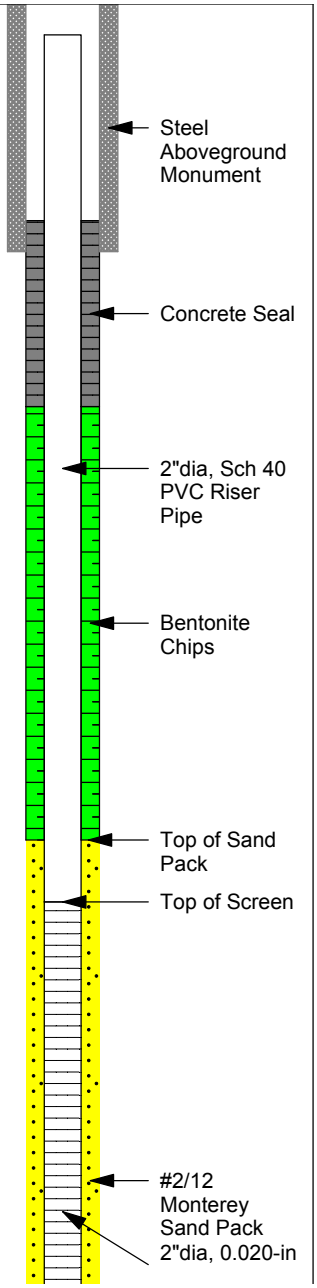
Ground Surf Elev. & Datum: 16.73 ft NGVD88
Coordinate System: NAD 83/98
Latitude/Northing: 702,261.68 ft
Longitude/Easting: 1,186,483.03 ft
Casing Elevation: 19.31 ft NGVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 24.5'
Groundwater ATD (ft bgs): 0'

Client: B&L Custodial Trust
Project: B&L-RIM
Task Number: 1422
Site Location: Pierce Co., WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
22 50/6		0	SM	Wet, brown silty fine SAND with gravels, roots.
16 10 6		3	SW-SM	Moist to wet grayish blue well graded SAND with silt and gravel.
		4	ML	Moist dark brown SILT with fine sand and gravels.
4 5 4		5		Same as above. Small to large gravels.
3 3 5		8		Same as above. No gravels. Small pieces of wood.
		9	SP	Wet, dark gray to black poorly graded fine and medium SAND.
		11	PT	Moist, light brown SILT becoming moist dark brown PEAT.
1 2 5		13	SP	Wet, dark gray poorly graded fine and medium SAND, sily and some gravels.
		15	SW-SM	Wet, medium bluish gray well graded fine to coarse SAND with silt and gravel.
		16	SP	Wet, dark gray poorly graded fine to medium SAND, trace small gravels.



MONITORING WELL DETAIL

Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-35

Drill Date: July 20, 2011
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling

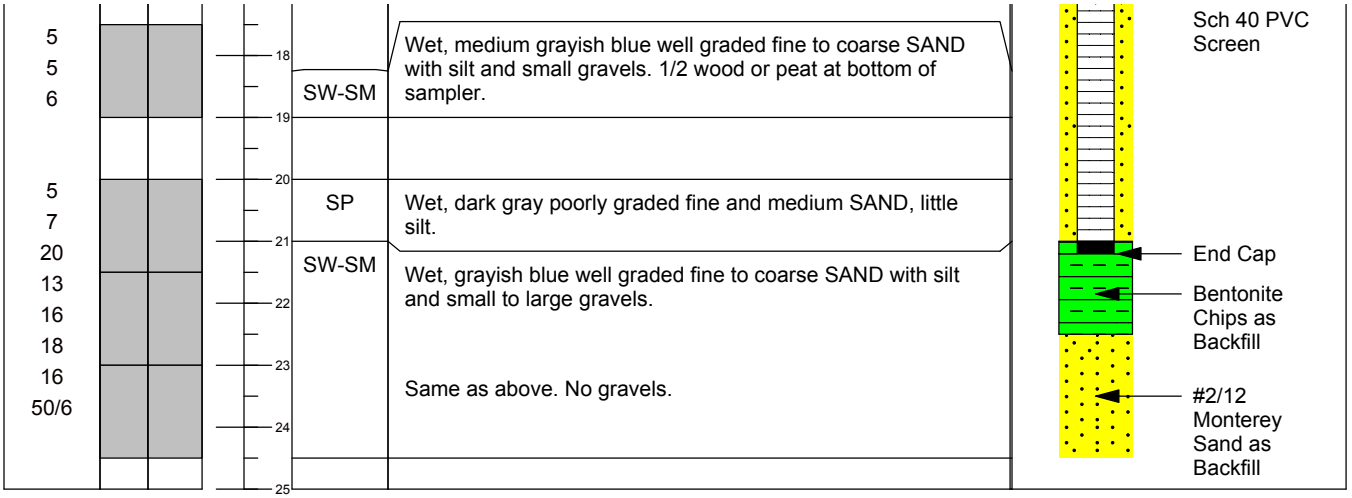
Ground Surf Elev. & Datum: 16.73 ft NGVD88
Coordinate System: NAD 83/98
Latitude/Northing: 702,261.68 ft
Longitude/Easting: 1,186,483.03 ft
Casing Elevation: 19.31 ft NGVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 24.5'
Groundwater ATD (ft bgs): 0'

Client: B&L Custodial Trust
Project: B&L-RIM
Task Number: 1422
Site Location: Pierce Co., WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
5 5 6		18 19	SW-SM	Wet, medium grayish blue well graded fine to coarse SAND with silt and small gravels. 1/2 wood or peat at bottom of sampler.	Sch 40 PVC Screen
5 7 20		20 21	SP	Wet, dark gray poorly graded fine and medium SAND, little silt.	End Cap
13 16 18		22 23	SW-SM	Wet, grayish blue well graded fine to coarse SAND with silt and small to large gravels.	Bentonite Chips as Backfill
16 50/6		24 25		Same as above. No gravels.	#2/12 Monterey Sand as Backfill



Notes:
ft bgs = feet below ground surface
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Monitoring Well ID: MW-34

Drill Date: August 4, 2011
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling

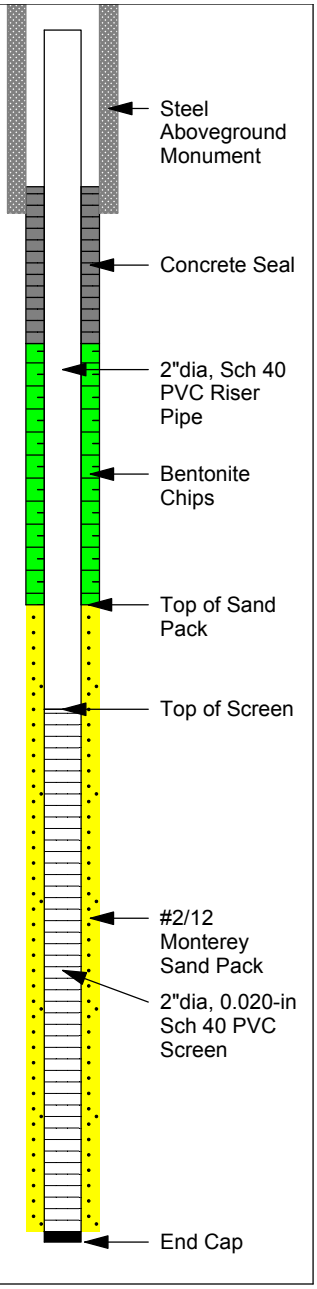
Ground Surf Elev. & Datum: 14.54 ft NGVD88
Coordinate System: NAD 83/98
Latitude/Northing: 701,965.99 ft
Longitude/Easting: 1,185,536.69 ft
Casing Elevation: 17.04 ft NGVD88

Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 20.5'
Groundwater ATD (ft bgs): 3'

Client: B&L Custodial Trust
Project: B&L-RIM
Task Number: 1422
Site Location: Pierce Co., WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
				Drilled through agricultural field topsoil to begin sampling at 2.5 ft.
1 4 5		3	ML	Moist to wet, dark gray SILT.
3 5 5		5	SP	Wet, dark gray poorly graded fine to medium SAND.
15 15 15		8		Same as above. Grain size coarsening with depth.
4 2 7		10	SP	Same as above.
7 8 8		13	SP	Same as above. Heaving sand. Very wet.
15 20/6		15		Same as above.
1 4 5		18	SP	Same as above.



Notes:
ft bgs = feet below ground surface
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Monitoring Well ID: MW-33

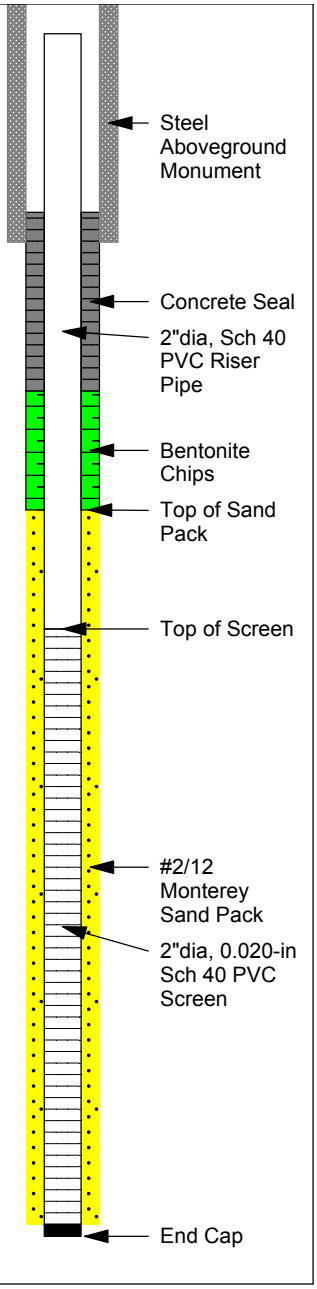
Drill Date: August 4, 2011
Logged By: Erin Murray
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8 1/4"
Boring Depth (ft bgs): 17'
Groundwater ATD (ft bgs): 2.5'

Ground Surf Elev. & Datum: NA
Coordinate System: NAD 83/98
Latitude/Northing: 702,122.29 ft
Longitude/Easting: 1,185,530.73 ft
Casing Elevation: 18.50 ft NGVD88

Client: B&L Custodial Trust
Project: B&L-RIM
Task Number: 1422
Site Location: Pierce Co., WA

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Drilled through agricultural field topsoil to begin sampling at 2.5 ft.
2 3 4		3	ML	Wet, dark brown SILT.
		4	SM	Wet, dark gray fine silty SAND. Small chunks of wood fragments.
4 4 5		5		Same as above. No wood debris.
6 7 8		8	SP	Wet, dark gray poorly graded medium SAND, little silt.
4 7 9		10	SP-SM	Wet, dark gray poorly graded fine SAND with silt becoming fine SAND.
8 8 9		13	SP	Wet, dark gray poorly graded fine SAND. No silt.
4 5 8		15		Same as above.
2 2 4		16	SM	Wet, dark gray fine silty SAND.
		17	ML	Moist, dark gray SILT.



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-32

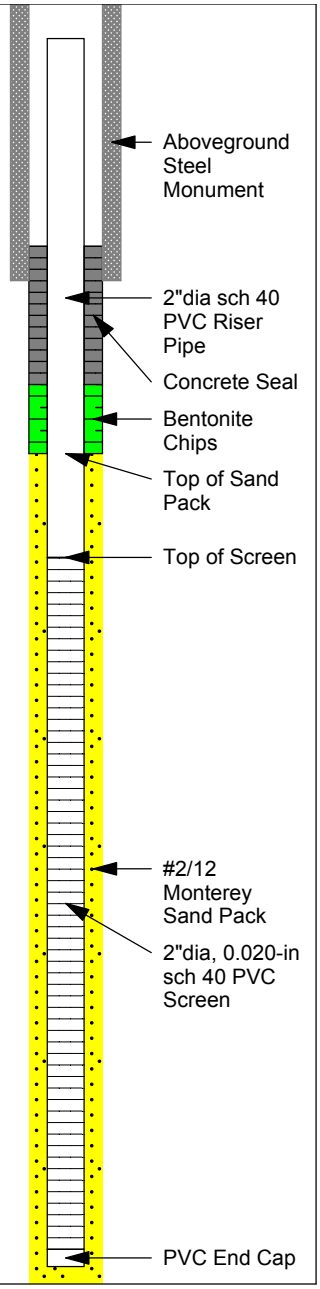
Drill Date: August 14, 2011
Logged By: Kristin Anderson
Drilled By: David Gose / Cascade Drilling
Drill Type: Hollow Stem Auger
Sample Method: 2"x18" Split Spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 15'
Groundwater ATD (ft bgs): 2.5'

Client:
Project: B&L RIM TRUST
Task Number: Task 1422
Site Location: Pierce County WA

Ground Surf Elev. & Datum: NA
Coordinate System: NAD83
Latitude/Northing: 702520.47 ft
Longitude/Easting: 1,185,843.15 ft
Casing Elevation: 15.99 ft NAVD 88

Remarks:

BLOW COUNT	DRIVEN / RECOVERED	DEPTH (ft bgs)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS	MONITORING WELL DETAIL
		0		0-0.5 ft of hog fuel, geotextile membrane (temporary road) and grass. Cut through fabric to begin boring.	
2		2	ML/ OL-OH	Very moist, black-brown PEAT and SILT from 2.5-3 ft.	
3		3	ML	Grades to gray SILT.	
4		4	Wood	3" lense of WOOD fragments at 3.25 ft; very moist, gray, poorly-graded fine SAND below	
			SP		
1		5	ML/ OL-OH	Gray-brown SILT and PEAT from 5.5-6 ft.	
2		6	SP	Very moist, gray, poorly-graded fine SAND.	
3		7			
4		8		Very moist to wet, no silt.	
4					
4		9			
2		10		Same as above.	
2					
3		11			
3		12		Same as above.	
3					
5		13			
4				Same as above.	
8		14			
11		15			



Notes:
ft bgs = feet below ground surface
USCS = Unified Soil Classification System
▼ = denotes groundwater table

Log of Soil Boring and Well Installation MW-31B

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Floyd Snider
Boring MW-31B Date 3-23-07 Sheet 1 of 2
Job MPC-B&L
Logged By Brett Beaulieu Weather Overcast, 50s
Drilled By Cascade, Steve
Drill Type/Method Track-Mounted Hollow Stem Auger
Sampling Method 3" x 18" Split Spoon
Bottom of Boring 40 FT BGS ATD Water Level Depth 0 BGS
Ground Surface Elevation Approx. 11 FT NAVD 88

Obs. Well Install. ~~Yes~~ No

SAMPLE ID	Blow Count N/6"	RECOVERY From	RECOVERY To	GRAPHIC RECOVERY		USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.	WELL CONSTRUCTION
					0 ▽			Concrete Grout, Riser
					1		Same as MW-13A and FS-104.	
					2			
					3			
					4			
					5			
					6			
					7			
					8			
					9			
					10			
					11			
					12			
					13			
					14			
					15			
					16			
					17			
					18			
					19			
					20			

Recovery
Subsample for Analysis
Driven Interval

▽ Groundwater Observed At Time of Drilling

Log of Soil Boring and Well Installation MW-31B

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Floyd Snider
Boring MW-31B Date 3-23-07 Sheet 2 of 2
Job MPC-B&L
Logged By Brett Beaulieu Weather Overcast, 50s
Drilled By Cascade, Steve
Drill Type/Method Track-Mounted Hollow Stem Auger
Sampling Method 3" x 18" Split Spoon
Bottom of Boring 22 FT BGS ATD Water Level Depth 0 BGS
Obs. Well Install. ~~Yes~~ No
Ground Surface Elevation Approx. 11 FT NAVD 88

SAMPLE ID	Blow Count N/6"	RECOVERY From	RECOVERY To	GRAPHIC RECOVERY	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
					SW	Same as MW-31A and FS-104
	12 12 15				ML/PT	Light grey and light brown SILT and sandy SILT, plastic, dense, moist, trace woody material. Interbedded with dark brown PEAT and wood, moist.
	15 15 50"/6					
	15 20 24					
	22 20 26				ML	Light grey sandy SILT, moist.
	25 30 22				SP	Dark grey, poorly-graded SAND, fine, wet.
						Bottom of Boring at 40 Feet.

WELL CONSTRUCTION: Concrete Grout; Native Sand; Riser; 0.010 Slot Screen

Recovery
Subsample for Analysis
Driven Interval

▽ Groundwater Observed At Time of Drilling

Log of Soil Boring and Well Installation MW-31A

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Floyd Snider
Boring MW-31A Date 3-23-07 Sheet 1 of 2
Job MPC-B&L
Logged By Brett Beaulieu Weather Overcast, 50s
Drilled By Cascade, Steve
Drill Type/Method Track-Mounted Hollow Stem Auger
Sampling Method No Samples Collected*
Bottom of Boring 22 FT BGS ATD Water Level Depth 0 BGS
Ground Surface Elevation Approx. 11 FT NAVD 88

Obs. Well Install. ~~Yes~~ No

SAMPLE ID	Blow Count N/6"	RECOVERY From	RECOVERY To	GRAPHIC RECOVERY	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
					SW	Brown, well-graded, silty gravelly SAND (FILL). Medium, wet.
					PT	Dark brown PEAT (>90% organic). Woody, wet.
					OL	4" organic SILT (OL) lense @ 4 Ft. BGS
					PT	Dark brown PEAT (>90% organic). Woody, wet.
					ML	Grey plastic SILT. Wet.
					SM	Grey silty SAND. Fine, medium dense, wet to moist. Finely laminated. Decreasing silt content with depth.
					SP	Grey, poorly-graded SAND. Fine, medium dense. (Grades to)
					SW	Grey, well-graded SAND, fine to medium, medium dense.

Disturbed Recovery

WELL CONSTRUCTION: Concrete Grout; Bentonite Chips; Silica Sand; Riser; 0.010 Slot Screen

Recovery
Subsample for Analysis
Driven Interval

▽ Groundwater Observed At Time of Drilling

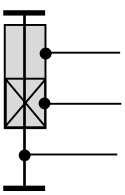
* Lithology from FS-104 (9-13-06 direct-push boring).

Log of Soil Boring and Well Installation MW-31A

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Floyd Snider
Boring MW-31A Date 3-23-07 Sheet 2 of 2
Job MPC-B&L
Logged By Brett Beaulieu Weather Overcast, 50s
Drilled By Cascade, Steve
Drill Type/Method Track-Mounted Hollow Stem Auger
Sampling Method No Samples Collected*
Bottom of Boring 22 FT BGS ATD Water Level Depth 0 BGS
Obs. Well Install. ~~Yes~~ No
Ground Surface Elevation Approx. 11 FT NAVD 88

SAMPLE ID	Blow Count N/6"	RECOVERY From	RECOVERY To	GRAPHIC RECOVERY			USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.	WELL CONSTRUCTION
						20			
						21	SW	Grey, well-graded SAND, fine to medium, medium dense.	Silica Sand; 0.010 Slot Screen
						22		Bottom of Boring at 22 Feet.	
						23			
						24			
						25			
						26			
						27			
						28			
						29			
						30			
						31			
						32			
						33			
						34			
						35			
						36			
						37			
						38			
						39			
						40			



▽ Groundwater Observed At Time of Drilling

Well was repaired in 2012 after sustaining surface damage during Phase II construction. New casing elevation is 18.15 ft NGVD88; elevation of screened interval is unchanged.

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Floyd Snider

Boring FS-109/MW-30 Date 9/14/06 Sheet 1 of 1

Job B&L Landfill Job No. MPC B&L

Logged By Brett Beaulieu Weather Cloudy, High 50s

Drilled By Cascade Drilling

Drill Type/Method Track-Mounted LAR GeoProbe

Sampling Method Continuous Soil Core Sleeves, 4'

Bottom of Boring 21 Ft BGS (-7 Ft) ATD Water Level Depth 5 Ft BGS (9 Ft)

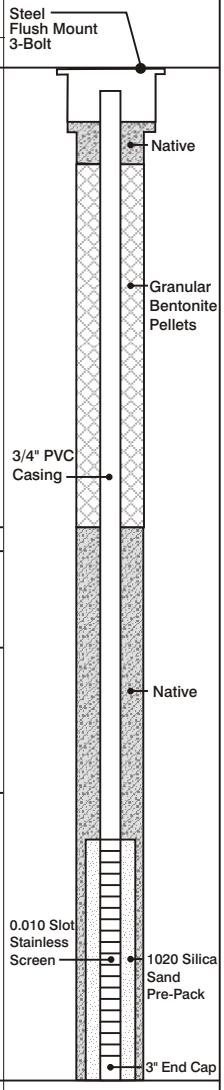
Ground Surface Elevation 14 Ft

Obs. Well Install. ~~Yes~~ No

SAMPLE ID	Blow Count N/12"	RECOVERY From	RECOVERY To	GRAPHIC RECOVERY	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
					SW-SM	Brown, fine to medium, well-graded SAND with silt and gravel (Fill). Dry. Grey and wet below 5 Ft.
					ML	Grey SILT. Moist.
					ML	Dark grey, sandy SILT. Wet.
					SP-SM	Dark grey, fine, poorly-graded SAND with SILT. Coarsens with depth. Wet.
					SW	Drak grey, fine to medium, well-graded SAND. Coarsens with depth. Wet.
						Bottom of boring at 21 feet.

Note: Ecology Well # ALN 117.

Subsurface geology based on FS-7 (Floyd Snider 2006.



▽ Groundwater Observed At Time of Drilling

FLOYD | SNIDER
strategy ▪ science ▪ engineering

B&L Landfill
Groundwater Alternatives Evaluation
Milton, WA

Figure A.6
Well Construction Details
MW-30

HYDROMETRICS INC.
Consulting Scientists and Engineers
Tacoma, Washington

MW-23

Hole Name: MW-23

Date Hole Started: 3/25/01 Date Hole Finished: 4/1/02

Client: ASARCO, Inc.
Project: B&L Contingency Plan (1227 52.105)
County: Pierce State: Washington
Property Owner: Executive Bark Inc.
Legal Description: R04E, T20N, SQ08 NW NW
Descriptive Location: east of landfill

Recorded By: Bob Miller
Drilling Company: Hydrometrics, Inc.
Driller: Jeff Cross
Drilling Method: hollow stem auger
Drilling Fluids Used: mud
Purpose of Hole: groundwater monitoring
Target Aquifer: shallow alluvial
Hole Diameter (in): 7 7/8"
Total Depth Drilled (ft): 20.5

WELL COMPLETION	Y/N	DESCRIPTION	INTERVAL
Well Installed?	Y	2-inch, flush threaded, Sch 40, PVC	0.0-17.28'
Surface Casing Used?	Y	6' x 6" steel casing w/ locking lid	+3.52-5.0
Screen/Perforations?	Y	0.020-inch slot, Sch 40 PVC	7.28-17.28'
Sand Pack?	Y	10/20 Colorado silica sand	6.0-17.28'
Annular Seal?	Y	bentonite chips, med.	1.0-6.0'
Surface Seal?	Y	concrete	0.0-3.0'
DEVELOPMENT/SAMPLING			
Well Developed?	N		
Water Samples Taken?	N		
Boring Samples Taken?	Y	EDXRF analyses (Cu, As, Pb, Fe)	0.0-20.5'

Static Water Level Below MP: 2.65 ft
Date: 4/3/02
MP Description: top of PVC riser
MP Height Above or Below Ground (ft): 3.22 ft

Surface Casing Height (ft): 3.52 ft
Riser Height (ft): 3.22 ft
Ground Surface Elevation (ft): 13.94
MP Elevation (ft): 17.16

Remarks: Drilled w/ a Piper 2000 using a 7 7/8 OD/ 4 1/4 ID hollow stem auger. Sampled w/ a 2" OD split spoon under a 140-lb hammer, 30" drop. Samples obtained for XRF analyses.

DEPTH	SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (feet)	DRILLING AND GEOTECHNICAL NOTES
	MW-23-1	SS	6/20/14	1.00	0.0 - 1.5'
	MW-23-2	SS	7/9/11	0.30	1.5 - 3.0'
	MW-23-3	SS	4/30/50	1.00	3.0 - 4.5' Duplicate Sample: MW-23-3D
	MW-23-4	SS	8/8/16/24	2.00	4.0 - 6.0' Using 3 inch spoon and B-61 Drill Rig
5					
	MW-23-5	SS		0.00	6.0 - 8.0' No Sample
	MW-23-6	SS	1/2/2/1	2.00	8.0 - 10.0'
10					
	MW-23-7	SS	1/2/1/1	2.00	10.0 - 12.0' Water at 10 feet. Stratigraphy Change in Drive. MW-23-7A: 10-10.5 ft. MW-23-7B: 10.5-12.0 ft.
	MW-23-8	SS	1/2/2/3	2.00	12.0 - 14.0' MW-23-8D 14:45 Duplicate
15	MW-23-9a	SS	2/2/2/2	2.00	14.5 - 16.0' Stratigraphy change in drive. MW-23-9a: 14-14.5 ft. MW-23-9b: 14.5-16 ft.
	MW-23-10	SS	1/1/1/2	2.00	16.5 - 18.5'
	MW-23-11	SS	1/1/1/1	2.00	18.5 - 20.5'
20					

GRAPHICS



GEOLOGICAL DESCRIPTION

0.0 - 5.5'
GRAVEL,
sandy, silty, well graded, backfill placed during soil consolidation of landfill.
[Road Base Fill]

5.5 - 10.0'
SILT,
dark brown, very low density.
[Recent Alluvium]

10.0 - 10.5'
SILT AND SAND,
with some minor amounts of gravel, gray, saturated.
[Recent Alluvium]

10.5 - 12.0'
SILT
soft, dark brown, with occasional wood chips.
[Recent Alluvium]

12.0 - 16.0'
SILT
soft, gray, with occational organic debris and wood chips, sandier and wet at 12-12.5 and 14.14.5.
[Recent Alluvium]

16.0 - 16.5'
SOIL-LOAM
buried soil horizon, moist but not saturated.
[Recent Alluvium]

16.5 - 18.5'
SILT,
very soft, saturated, gray, with 1-2 inch horizons of peat or wood debris at 17.5 and 18.4 feet, general black-brown color.
[Recent Alluvium]

Continued Next Page

GEOTECH 1227.GPJ TUC-TUC.GDT 8/1/02

HYDROMETRICS INC.

Consulting Scientists and Engineers
Tacoma, Washington

MW-23

Hole Name: MW-23

Date Hole Started: 3/25/01 Date Hole Finished: 4/1/02

(Continued)

DEPTH	SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (feet)	DRILLING AND GEOTECHNICAL NOTES	GRAPHICS	GEOLOGICAL DESCRIPTION
							18.5 - 20.5' **PEAT** moist but not saturated, highly organic, includes wood, grass, seeds and other well preserved vegetation, extremely low density. [Recent Alluvium]
25							
30							
35							
40							
45							
50							

GEOTECH 1227.G... rYD-TUC.GDT 8/1/02

HYDROMETRICS INC.

Consulting Scientists and Engineers
5219 N Shirley St. Tacoma, Washington

Monitor Well Log

Hole Name: MW-17

Date Hole Started: 9/17/98 Date Hole Finished: 9/17/98

Client: Asarco
Project: B & L Landfill
County: Pierce State: WA
Property Owner: Berry Farms
Legal Description: Acreage south of 12th St
Descriptive Location: 30' west of HP-109

Recorded By: JS
Drilling Company: Hydrometrics
Driller: JN
Drilling Method: Hollow Stem Auger
Drilling Fluids Used: None
Purpose of Hole: Install Monitor Well
Target Aquifer: First Water
Hole Diameter (in): 8"
Total Depth Drilled (ft): 15

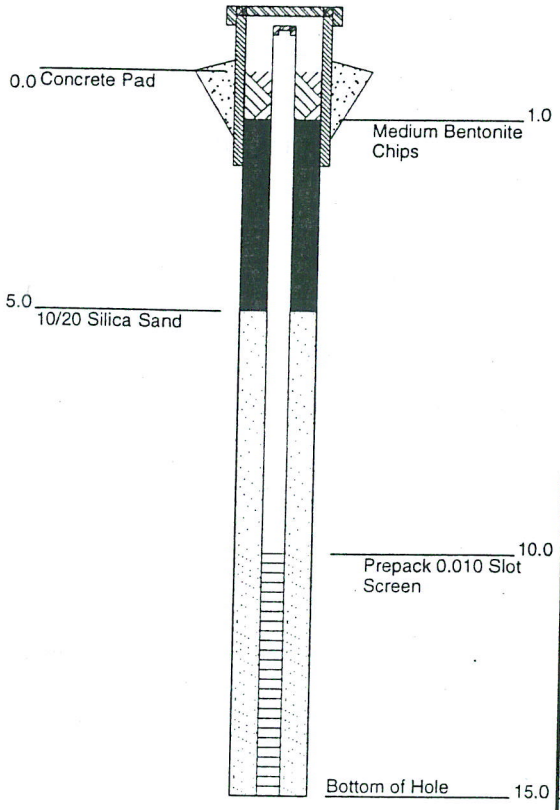
WELL COMPLETION	Y/N	DESCRIPTION	INTERVAL
Well Installed?	Y	2-inch, flush threaded, Sch 40, PVC	+2.5 - 15.0
Surface Casing Used?	Y	6" Steel Monument	+2.5 - 2.5
Screen/Perforations?	Y	0.010-inch slot, Sch 40, PVC	10.0 - 15.0
Sand Pack?	Y	10\20 Silica Sand	4.0 - 15.0
Annular Seal?	Y	Bentonite Chips	1.0 - 4.0
Surface Seal?	N		0.0 - 1.0
DEVELOPMENT/SAMPLING			
Well Developed?	N		
Water Samples Taken?	N		
Boring Samples Taken?	Y	None	

Static Water Level Below MP:
Date:
MP Description:
MP Height Above or Below Ground (ft):

Surface Casing Height (ft): +2.5
Riser Height (ft): +2.5
Ground Surface Elevation (ft):
MP Elevation (ft): 11.74

Remarks: Drilled using 4 1/4" HSA with a Piper 2000 drill rig mounted on a Ford F-250 pickup. Drilled with teflon plug in lead auger (no samples collected). Well set using a prepacked screen (010 factory slot, filter pack 10/20 silica sand). Cuttings left on site.

WELL CONSTRUCTION



GRAPHICS

GEOLOGICAL DESCRIPTION

0.0 - 2.0'
PEAT (PT)

2.0 - 6.0'
SILT (OH)

6.0 - 15.0'
SAND (SW)

STANDARD 054. , HYD-TUC.GDT 04/27/01

HYDROMETRICS INC.

Consulting Scientists and Engineers
5219 N Shirley St. Tacoma, Washington

Monitor Well Log

Hole Name: MW-16

Date Hole Started: 9/17/98 Date Hole Finished: 9/17/98

Client: Asarco
Project: B & L Landfill
County: Pierce State: WA
Property Owner: Berry Farms
Legal Description: Acreage south of 12th St
Descriptive Location: 50' NW of HP-107

Recorded By: JS
Drilling Company: Hydrometrics
Driller: JN
Drilling Method: Hollow Stem Auger
Drilling Fluids Used: None
Purpose of Hole: Install Monitor Well
Target Aquifer: First Water
Hole Diameter (in): 8"
Total Depth Drilled (ft): 15

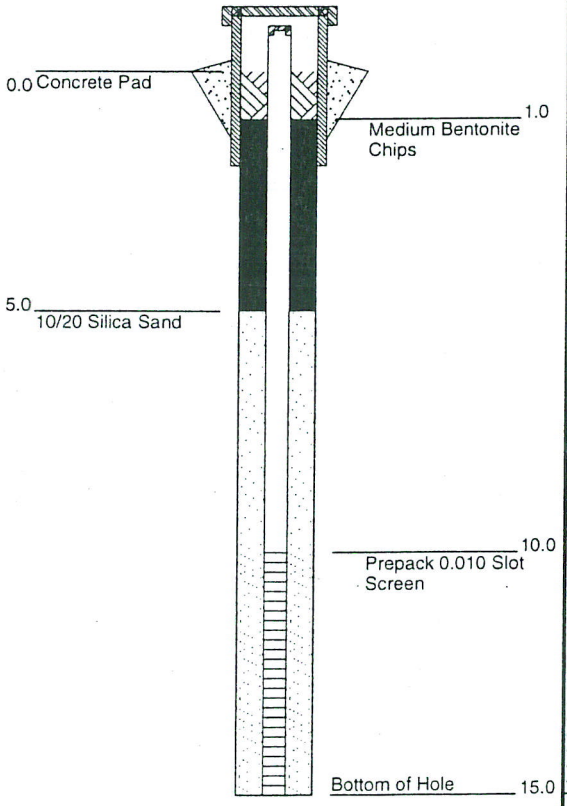
WELL COMPLETION	Y/N	DESCRIPTION	INTERVAL
Well Installed?	Y	2-inch, flush threaded, Sch 40, PVC	+2.5 - 15.0
Surface Casing Used?	Y	6" Steel Monument	+2.5 - 2.5
Screen/Perforations?	Y	0.010-inch slot, Sch 40, PVC	10.0 - 15.0
Sand Pack?	Y	10\20 Silica Sand	4.0 - 15.0
Annular Seal?	Y	Bentonite Chips	1.0 - 4.0
Surface Seal?	N		0.0 - 1.0
DEVELOPMENT/SAMPLING			
Well Developed?	N		
Water Samples Taken?	N		
Boring Samples Taken?	Y	None	

Static Water Level Below MP:
Date:
MP Description:
MP Height Above or Below Ground (ft):

Surface Casing Height (ft): +2.5
Riser Height (ft): +2.5
Ground Surface Elevation (ft):
MP Elevation (ft): 12.19

Remarks: Drilled using 4 1/4" HSA with a Piper 2000 drill rig mounted on a Ford F-250 pickup. Drilled with teflon plug in lead auger (no samples collected). Well set using a prepacked screen (010 factory slot, filter pack 10/20 silica sand). Cuttings left on site. Drilled with no samples obtained. Lithology derived from well D-6A.

WELL CONSTRUCTION



GRAPHICS

GEOLOGICAL DESCRIPTION

0.0 - 2.0'
PEAT (PT)

2.0 - 6.0'
SILT (OH)

6.0 - 15.0'
SAND (SW)

STANDARD 0541.GPJ HYD-TUC.GDT 04/27/01

HYDROMETRICS INC.

Consulting Scientists and Engineers
5219 N Shirley St. Tacoma, Washington

Monitor Well Log

Hole Name: MW-15

Date Hole Started: 9/17/98 Date Hole Finished: 9/17/98

Client: Asarco
Project: B & L Landfill
County: Pierce State: WA
Property Owner: Berry Farms
Legal Description: Acreage south of 12th St
Descriptive Location: 10' north of HP-110

Recorded By: JS
Drilling Company: Hydrometrics
Driller: JN
Drilling Method: Hollow Stem Auger
Drilling Fluids Used: None
Purpose of Hole: Install Monitor Well
Target Aquifer: First Water
Hole Diameter (in): 8"
Total Depth Drilled (ft): 15

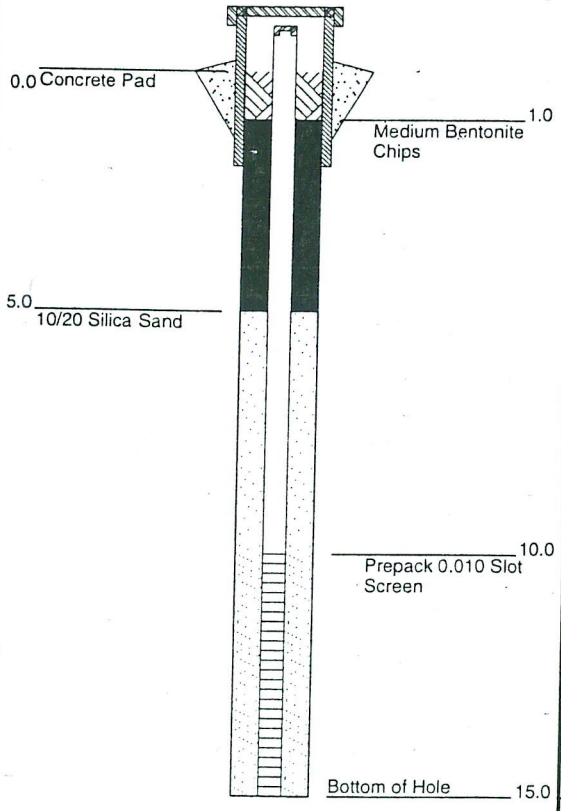
WELL COMPLETION	Y/N	DESCRIPTION	INTERVAL
Well Installed?	Y	2-inch, flush threaded, Sch 40, PVC	+2.5 - 15.0
Surface Casing Used?	Y	6" Steel Monument	+2.5 - 2.5
Screen/Perforations?	Y	0.010-inch slot, Sch 40, PVC	10.0 - 15.0
Sand Pack?	Y	10\20 Silica Sand	4.0 - 15.0
Annular Seal?	Y	Bentonite Chips	1.0 - 4.0
Surface Seal?	N		0.0 - 1.0
DEVELOPMENT/SAMPLING			
Well Developed?	N		
Water Samples Taken?	N		
Boring Samples Taken?	Y	None	

Static Water Level Below MP:
Date:
MP Description:
MP Height Above or Below Ground (ft):

Surface Casing Height (ft): +2.5
Riser Height (ft): +2.5
Ground Surface Elevation (ft):
MP Elevation (ft): 11.89

Remarks: Drilled using 4 1/4" HSA with a Piper 2000 drill rig mounted on a Ford F-250 pickup. Drilled with teflon plug in lead auger (no samples collected). Well set using a prepacked screen (010 factory slot, filter pack 10/20 silica sand). Cuttings left on site. Drilled with no samples obtained. Lithology derived from well D-6A.

WELL CONSTRUCTION



GRAPHICS

GEOLOGICAL DESCRIPTION

0.0 - 2.0'
PEAT (PT)

2.0 - 6.0'
SILT (OH)

6.0 - 15.0'
SAND (SW)

STANDARD 0541... HYD-TUC.GDT 04/27/01

HYDROMETRICS INC.

Consulting Scientists and Engineers
5219 N Shirley St. Tacoma, Washington

Monitor Well Log

Hole Name: MW-14

Date Hole Started: 9/16/98 Date Hole Finished: 9/16/98

Client: Asarco
Project: B & L Landfill
County: Pierce State: WA
Property Owner: Berry Farms
Legal Description: Acreage south of 12th St
Descriptive Location: 80' south of HP-118

Recorded By: JS
Drilling Company: Hydrometrics
Driller: JN
Drilling Method: Hollow Stem Auger
Drilling Fluids Used: None
Purpose of Hole: Install Monitor Well
Target Aquifer: First Water
Hole Diameter (in): 8"
Total Depth Drilled (ft): 15

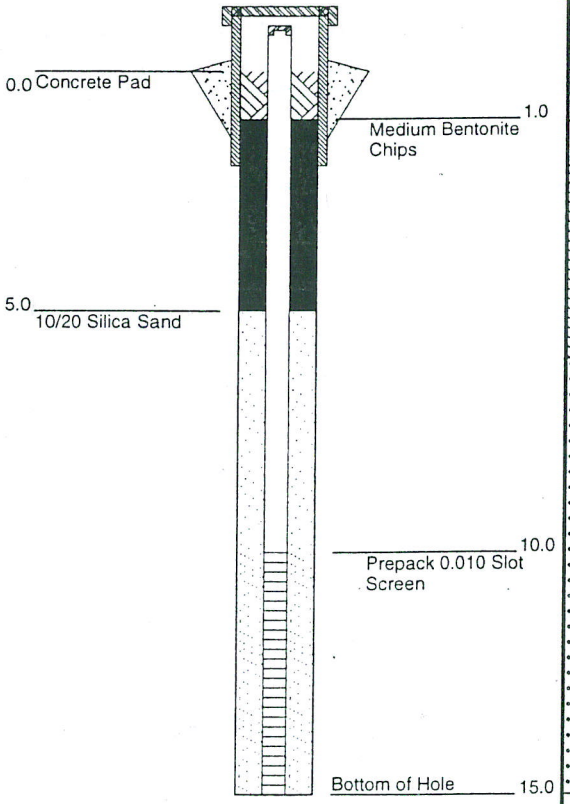
WELL COMPLETION	Y/N	DESCRIPTION	INTERVAL
Well Installed?	Y	2-inch, flush threaded, Sch 40, PVC	+2.5 - 15.0
Surface Casing Used?	Y	6" Steel Monument	+2.5 - 2.5
Screen/Perforations?	Y	0.010-inch slot, Sch 40, PVC	10.0 - 15.0
Sand Pack?	Y	10\20 Silica Sand	4.0 - 15.0
Annular Seal?	Y	Bentonite Chips	1.0 - 4.0
Surface Seal?	N		0.0 - 1.0
DEVELOPMENT/SAMPLING			
Well Developed?	N		
Water Samples Taken?	N		
Boring Samples Taken?	Y	None	

Static Water Level Below MP:
Date:
MP Description:
MP Height Above or Below Ground (ft):

Surface Casing Height (ft): +2.5
Riser Height (ft): +2.5
Ground Surface Elevation (ft):
MP Elevation (ft): 11.85

Remarks: Drilled using 4 1/4" HSA with a Piper 2000 drill rig mounted on a Ford F-250 pickup. Drilled with teflon plug in lead auger (no samples collected). Well set using a prepacked screen (010 factory slot, filter pack 10/20 silica sand). Cuttings left on site. Drilled with no samples obtained. Lithology derived from well D-6A.

WELL CONSTRUCTION



GRAPHICS

GEOLOGICAL DESCRIPTION

0.0 - 2.0'
PEAT (PT)

2.0 - 6.0'
SILT (OH)

6.0 - 15.0'
SAND (SW)

STANDARD 0541.GPJ HYD-TUC.GDT 04/27/01

HYDROMETRICS INC.

Consulting Scientists and Engineers
5219 N Shirley St. Tacoma, Washington

Monitor Well Log

Hole Name: MW-13

Date Hole Started: 9/16/98 Date Hole Finished: 9/16/98

Client: Asarco
Project: B & L Landfill
County: Pierce State: WA
Property Owner: Berry Farms
Legal Description: Acreage south of 12th St
Descriptive Location: Midway between D-6 and D-1 series wells 20' north.
Recorded By: JS
Drilling Company: Hydrometrics
Driller: JN
Drilling Method: Hollow Stem Auger
Drilling Fluids Used: None
Purpose of Hole: Install Monitor Well
Target Aquifer: First Water
Hole Diameter (in): 8"
Total Depth Drilled (ft): 15

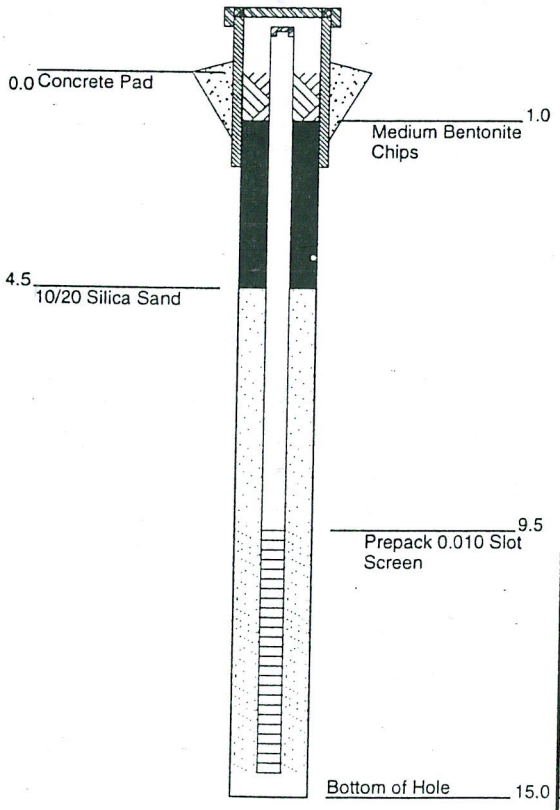
WELL COMPLETION	Y/N	DESCRIPTION	INTERVAL
Well Installed?	Y	2-inch, flush threaded, Sch 40, PVC	+2.5 - 14.5
Surface Casing Used?	Y	6" Steel Monument	+2.5 - 2.5
Screen/Perforations?	Y	0.010-inch slot, Sch 40, PVC	9.5 - 14.5
Sand Pack?	Y	10\20 Silica Sand	4.5 - 14.5
Annular Seal?	Y	Bentonite Chips	1.0 - 4.5
Surface Seal?	Y	Concrete	0.0 - 1.0
DEVELOPMENT/SAMPLING			
Well Developed?	N		
Water Samples Taken?	N		
Boring Samples Taken?	Y	None	

Static Water Level Below MP:
Date:
MP Description:
MP Height Above or Below Ground (ft):

Surface Casing Height (ft): +2.5
Riser Height (ft): +2.5
Ground Surface Elevation (ft):
MP Elevation (ft): 11.97

Remarks: Drilled using 4 1/4" HSA with a Piper 2000 drill rig mounted on a Ford F-250 pickup. Drilled with teflon plug in lead auger (no samples collected). Well set using a prepacked screen (010 factory slot, filter pack 10/20 silica sand). Cuttings left on site. Drilled with no samples obtained. Lithology derived from well D-6A.

WELL CONSTRUCTION



GRAPHICS

GEOLOGICAL DESCRIPTION

0.0 - 2.0'
PEAT (PT)

2.0 - 6.0'
SILT (OH)

6.0 - 15.0'
SAND (SW)

STANDARD 0541 ...YD-TUC.GDT 04/27/01

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER HOLE NUMBER D-11B

STATE WA COUNTY Pierce LOCATION T R SEC. TRACT

SITE DESCRIPTION South of Hazen property ELEVATION G.S. DATE 11/10/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH 34' CASING TYPE AND DESCRIPTION 2" SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED 30' WELL COMPLETION DESCRIPTION Screen 25 - 30

REMARKS (Note bit/auger size) Sand pack 23 - 30' Bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									Same as D - 11A
5									
10									
15									
			ASBL 9311						17'
			* 214	0900	18'	7 15 15 18	50%	Add water	18' Black/grey sands
20					20'				Medium to fine grain
									20'
			* 215	0915	21'	4 9 13 15	60%		21' Same as above
					23'			Add water	23'
25			* 216	0930	24'	9 12 16 18	80%		24' Black/grey medium to fine grained sand 60%
					26'				40% gravels rounded 1/2" size
									26'
									27' Black sand medium to fine
									28' Reddish-brown medium grained sand
									29'
30			* 217	0945	27'	6 9 15 22	80%	Add water	30' Grey medium to fine grained sand
					29'				
			* 218.	1000	30'	15 17 27 30	80%	Add water	32'
					32'				33' Black/grey medium to fine grained sand
35			* 219	1015	33'	5 6 19 24			35'
					35'				

TEST HOLE LOG

PAGE 1 OF 1

HYDROMETRICS

TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER HOLE NUMBER 0-11A

STATE WA COUNTY Pierce LOCATION T R SEC. TRACT

SITE DESCRIPTION Just south of Hazen property ELEVATION G.S. DATE 11/09/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH 15' CASING TYPE AND DESCRIPTION 2" SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED 15' WELL COMPLETION DESCRIPTION Screened from 10 - 15'

REMARKS (Note bit/auger size) Sand packed 7 - 15', Bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									0
3			X ASBL 9311 209	1600	3	6 5 6	50%		Fill material, brown silt 30% gravels
					5	3			3' Brown medium grained sand 50%, 40% fine sand 10% gravels
6			* 210	1615	6	5 7 8	80%	Water	5' 6.5' Black medium to fine grained sand
					8	12			8'
9			* 211	1630	9	- 4 7	100%	Heaving sands	9' Same as above
					11	8			11'
12			* 212	1645	12	6 6 12 15	80%	Added 45 gallons	12' Same as above
									14'
15			* 213	1700					15'

Well was repaired in 2012 after sustaining damage during Phase II construction. New casing elevation is 22.90 ft NGVD88; elevation of screened interval is unchanged.

TEST HOLE LOG

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER 0-10A

STATE WA — COUNTY Pierce — LOCATION T — R — SEC. — TRACT

SITE DESCRIPTION East of landfill by Fife Way — ELEVATION G.S. — DATE 11/09/93

RECORDED BY V.S. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 15' — CASING TYPE AND DESCRIPTION 2" SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED 15' — WELL COMPLETION DESCRIPTION Sand pack from 8 - 15'

REMARKS (Note bit/auger size) — Screened from 10 - 15'/Bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0			ASBL-9311						Sand & gravel, clay lenses, slightly dense, loose, brown with blue-grey, wood debris (trace)
			200		0800	3' 1 2	5%		
						5' 3 3		6.5'	
5						6' 3 5			
			201		0805	8' 8 8	5%	7.5'	
						9' 14 14			
						11' 13 25			
						28			
10			202		0810	12' —	5%	9.0'	
						—		9.5'	Blue-grey, silty sand, some gravel, damp, medium stiff
						14' —			
			203		0815		25%	12.0'	Clay, brown, some sand, little gravel
15									Sand, some gravel, brown
									Wet
									Coarse sand, gravel, some silt, wet

TEST HOLE LOG

PAGE 1 OF 1

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER HOLE NUMBER 0-9A

STATE WA COUNTY Pierce LOCATION T R SEC. TRACT

SITE DESCRIPTION South of landfill ELEVATION G.S. DATE 11/11/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH 16' CASING TYPE AND DESCRIPTION 2" PVC Sch 40 20 slot screen

TOTAL DEPTH CASED 13.5' WELL COMPLETION DESCRIPTION Screened from 8.5 - 13.5'

REMARKS (Note bit/auger size) Sand packs 6 - 13.5'

4 1/4" ID 8 1/2" OD Auger Bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0			AS8L 9311 * 231	1230	3' 10 10 9	100%			0 Medium brown sand 60% 1' 40% small gravels 3' Black silt
3					5' 6			Water Silt	3' Fine sand 30% and silt 50% (black) Some wood 5'
6			* 232	1245	6' 6 9 10	100%		Add water	6' Fine sand (80%) Silt (20%) black 8'
9			* 233	1300	8' 10 9' 3 3 3	100%		Add water	9' Same as above 10' Medium to fine grained black sand 11' Some wood
12			* 234	1315	11' 3 12' 3 3 4	100%			12' Same 13.5' Grey clay, stiff 14' with wood peat mix
13.5					14' 5				14' Grey silty clay
15			* 235	1320	14' 3 3 3	100%		Add water	16' Stiff high organics Wood, peat
					16' 3				

TEST HOLE LOG

PAGE 1 OF 1

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-88

STATE WA — COUNTY Pierce — LOCATION T — R — SEC. — TRACT

SITE DESCRIPTION West of landfill — ELEVATION G.S. — DATE 11/11/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 35' — CASING TYPE AND DESCRIPTION 2" PVC SCH 40 20 Slot Screen

TOTAL DEPTH CASED 33' — WELL COMPLETION DESCRIPTION Screened from 28 - 33'

REMARKS (Note bit/auger size) — Sand packed from 25 - 33'

4 1/4" ID 8 1/2" OD Auger — Bentonite chips from 0 - 25'

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									Same as D-8A
5									
10									
15								Add water	
20			* 2 25		0800	18' 4 6 9	80%		18' Medium to coarse grained black sand 80% 20% small gravels 20' 1/4" size
			* 2 26		0815	20' 12 21' 8 10 10 23' 16	80%		21' Medium to coarse black sand 23'
25			* 2 27		0830	24' 21 17 14 26' 16	80%		24' Medium to fine black sand 26'
			* 2 28		0845	27' 21 19 17 29' 22	100%		27' Same 29'
30			* 2 29		0900	30' 9 3 9 32' 12	100%		30' Same 30.5 Wood (log) 31.5 Medium to fine sand black 32'
			* 2 30		0915	35' 10 9 11 16	100%		33' Medium to fine black sand 35'
35									

TEST HOLE LOG

PAGE 1 OF 1

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 — JOB NUMBER — HOLE NUMBER D-8A

STATE WA — COUNTY Pierce — LOCATION T — R — SEC. — TRACT

SITE DESCRIPTION West of landfill by ditch — ELEVATION G.S. — DATE 11/10/93

RECORDED BY J.C. — DRILL METHOD HSA — DRILLER Rich C. — DRILLING CO. Bortec

TOTAL DEPTH 17' — CASING TYPE AND DESCRIPTION 2" PVC SCH 40 20 Slot Screen

TOTAL DEPTH CASED 15' — WELL COMPLETION DESCRIPTION Screened from 10 - 15'

REMARKS (Note bit/auger size) — Sand pack 7 - 15'

4 1/4" ID 8 1/2" OD Auger — Bentonite chips to surface

DEPTH	LOG GRAPHICAL	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									0 Light brown fill Medium sand 80% / silt 10%
3			2* 20	1320	3'	3 5 7	100%	Add water	3' 1/2" gravels 10% 3' Medium black sand to fine
					5'	7			5'
6			2* 21	1335	6'	3 3 2	80%	Add water	6' Medium to fine black sand 1 lense of clay 1" thick at 7.5'
					8'	6			8'
9			2* 22	1350	9'	3 3 7	80%	Add water	9' Medium to fine black sands 11'
					11'	8			12' Same
12			2* 23	1400	12'	5 15 10	100%	Add water	14'
					14'	10			15' Same
15			*	1415	15'	6 5 5	80%	Add water	17'
					17'	6			

TEST HOLE LOG

PAGE 1 OF 1

HYDROMETRICS

TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER HOLE NUMBER D-7B

STATE WA COUNTY Pierce LOCATION T 20W R 4E SEC. 5 TRACT SE, SW

SITE DESCRIPTION Northwest corner of landfill property ELEVATION G.S. DATE 10/25/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH 34' CASING TYPE AND DESCRIPTION 5' - 2" PVC 20 slot PVC Black to surface

TOTAL DEPTH CASED 33' WELL COMPLETION DESCRIPTION Set PVC screen from screen

REMARKS (Note bit/auger size) 28 - 33', 1 foot sandpack above screen (10 - 20 sand)

Bentonite chips to surface

Auger - 4 1/4 ID, 8 1/2 OD

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									Same as D-7A
5									
10									
15			*		15'	3	100%	60 Added gallons water	14.0
			104			7			15.0 Well sorted medium to fine grained sand
			1145			9			17.0
			*		17'	12 15			18.0 Same as above with small gravels
			105		18	18			20.0
20			1200			8	40%		21.0 Same as above
			*		20	3 2			22.0 Woody organic material (peat) Grey clayey silt
			106		21	2			
			107		23	6	100%		
			1210			18			
25			*		25	10	100%		25.0 Same as above
			1220			11			26.0 Well sorted medium to fine grained sand
			108						
			1230		27	14			
			109			18			
			1240						
30			*		30	7			30.0 Black fine to medium grained sand
			110			8 3			
			1250		32	19	100%		32.0
			2e		34				
35			*						
			111		36		100%	Heaving sands	
			1300					No sample	

TEST HOLE LOG

PAGE 1 OF 1

HYDROMETRICS — TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER _____ HOLE NUMBER 0-7A

STATE WA COUNTY Pierce LOCATION T 20W R 4E SEC. 5 TRACT SE, SW

SITE DESCRIPTION Northwest corner of property ELEVATION G.S. _____ DATE 10/25/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH 14.5' CASING TYPE AND DESCRIPTION 2" PVC Sch. 40/

TOTAL DEPTH CASED 14.5' WELL COMPLETION DESCRIPTION 5' 20 Slot Screen/PVC black to surface

REMARKS (Note bit/auger size) HSA = 4 1/4" ID 8 1/2 OD Screen from 9.5 - 14.5' 10-20 sand

to 6.5' bentonite chips to surface

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									Fill material large gravels, silty sand, light brown
3			* ASBL-9310 100 0855		3'	3 10 10	60%		3.5' 4.0' Light grey silty sand 4.5' Fine to medium 5.0' Black sand, same gravels
6			* 101 0900		5' 6' 8'	7 6 5 5 8	80%		6.0' 80% Fine to medium 20% dark black sand 8.0'
9			* 102 0910		9' 11'	4 6 7 8	90%		9.0' Fine 80% to medium 20% sand black 11.0'
12			* 103 0920		12' 14'	3 7 9 11	100%	Heaving sands 60 gallons added	12.0' Medium 70% to fine 30% sand black 14.5'
15									
18									

TEST HOLE LOG

HYDROMETRICS

TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER HOLE NUMBER D-68

STATE WA COUNTY Pierce LOCATION T 20N R 4E SEC. 5 TRACT SE, SW

SITE DESCRIPTION North of Landfill in wetlands ELEVATION G.S. DATE 10/26/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH 33' CASING TYPE AND DESCRIPTION 5' SCH 40 PVC 20 Slot Screen

TOTAL DEPTH CASED 33' WELL COMPLETION DESCRIPTION 28-33' 20 Slot PVC screen

REMARKS (Note bit/auger size) Sand pack to 25' Bentonite chips to surface

4 1/4" ID 8 1/2" OD Auger

DEPTH	GRAPHICAL LOG	WELL ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT CORE RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0									SAME AS D - 6A
5									
10								Add water	
15									
16								70 gallon water	
17									
20			* AS8L9310 117	1305	19'-- 20' 21'	3 3 5	100%		19.0 Light brown to grey 20.0 Organic silt, peat lenses 21.0 Peat, woody
			* 118	1315	22' 23' 24'	1 12 1	100%		22.0 Same as above 23.0 24.0 Black fine to medium grain sand
25			* 119	1325	25' 27' 28'	12 7 13 14	100%		25.0 Black fine towed sand 27.0 with silt lenses
28									28.0 Black fine towed sand
30			* 120	1335	—		100%		30.0
33			* 121	1345	—		100%		
35									

TEST HOLE LOG

PAGE 1 OF 1

HYDROMETRICS

TACOMA, WASHINGTON

PROJECT ASBL01 JOB NUMBER HOLE NUMBER 0-6A

STATE WA COUNTY Pierce LOCATION T 20W R 4E SEC. 5 TRACT SE, SW

SITE DESCRIPTION North of Landfill in wetlands ELEVATION G.S. DATE 10/26/93

RECORDED BY J.C. DRILL METHOD HSA DRILLER Rich C. DRILLING CO. Bortec

TOTAL DEPTH 15' CASING TYPE AND DESCRIPTION 5' SCH 40 PVC 20 Slot Screen

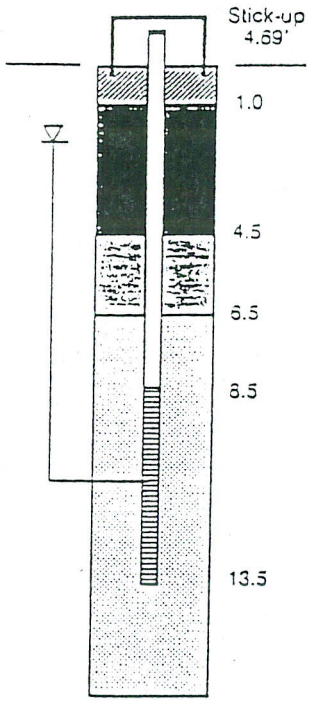
TOTAL DEPTH CASED WELL COMPLETION DESCRIPTION Screen from 10 - 15'

REMARKS (Note bit/auger size) Sand pack to 7' Bentonite chips to surface

4 1/4" ID 8 1/2" OD Auger

DEPTH	GRAPHICAL LOG	WELL	ELEVATION	SAMPLE	SAMPLE TYPE	TIME	HAMMER BLOWS	PERCENT RECOVERY	NOTES ON: WATER LEVELS, DRILLING FLUID, DRILLING RATE, WELL COMPLETION	DESCRIPTION AND CLASSIFICATION
0										0-2.0' Swamp veg. root material
										2.0-3.0' Grey fine-grained sand silts Root material
3				X ASBL-9310-119-1110		3'-1 4'-1		50%		3.0' Grey silty, fine sand Root material moist
						4.5'-3 5.0'-3 6'-3 -3 -3		60%	Add water	5.0'
6				112 * 1120		8'-7				6.0' Same as above
										7.0' Black to dark grey medium grain sand
										8.0'
9				* 113 1130		9'-- 10'-6 11'-9 -12		100%	65 gallons of water added	9.0' Black fine towed Grained sand
										11.0'
12				* 114 1140		13'-4 -9 -11 15'-12				12.0' Same as above
										14.0'
15				* 115 1150						15.0' Same as above
16				* 116 1200					Heaving sands	16.0' 16.5' Same as above
										17.0' Light brown to grey Organic silt, moldable, with lenses of peat

Well Construction Summary



Equipment All Terrain B-50

Land Surface Elevation 9.58 feet Date 7/25/90

Blows per Foot	Depth (feet)	Sample	
	0		DARK BROWN TO BLACK ORGANIC SILT (OL) soft, wet; with some fibrous organics and clay.
16			
	5		DARK GRAY-BROWN SILTY SAND (SM) loose to medium dense, moist; with some organics, fine to very fine grained.
35			
66			DARK BROWN-GRAY SAND (SP) dense, saturated; fine grained, with some silt.
	10		
			Becomes dark gray, fine to medium grained.
45			
			Becomes siltier.
67	15		
			DARK BROWN ORGANIC SILT (OH) stiff, wet to saturated; with some organics.
24			
			Boring terminated at 16.5 feet on 7/25/90.
	20		
			Groundwater encountered at approximately 4 feet.
	25		
	30		
	35		
	40		

* Water levels indicated are for 8/13/90.

*Blow counts indicated are for a 3-inch split barrel sampler using a 140-pound hammer with a 30-inch drop.

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Log of Boring D-5U

B&L Landfill
Milton, Washington

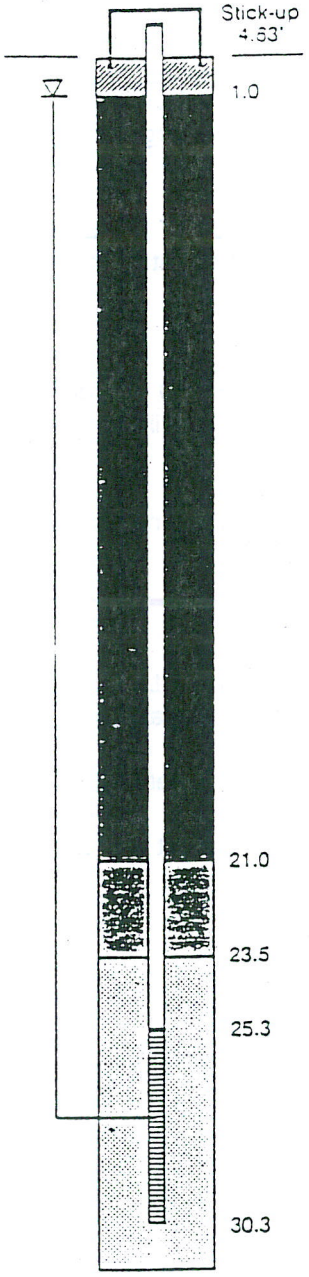
PLATE
B14

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15.243.101	SES	AMA	5 September 90		

Equipment All Terrain B-50

Land Surface Elevation 9.86 feet Date 7/24/90

Well Construction Summary



* Water levels indicated are for 8/13/90.

*Blow counts indicated are for a 3-inch split barrel sampler using a 140-pound hammer with a 30-inch drop.

Blows per Foot	Depth (feet)	Sample	
30	0		DARK BROWN TO BLACK ORGANIC SILT (OL) soft, wet; with some organics and clay.
45	5		DARK GRAY-BROWN SILTY SAND (SM) medium dense, wet; very fine to fine grained, with some organics. Becomes gray, saturated at 4.0 feet.
74			DARK BROWN TO GRAY SAND (SP) dense, saturated; fine grained, with trace organics and silt.
84	10		
85			Becomes dark gray, fine to medium grained.
18	15		
17			BROWN ORGANIC SILT (OH) stiff, wet to saturated; with some interlayered peat and woody organics.
11	20		Trace to some fine sand.
45			DARK GRAY SAND (SP) medium dense, saturated; with occasional silt interbed; fine grained, trace organics.
64	25		
65			
70	30		Boring terminated at 30.75 feet on 7/24/90. Groundwater encountered at approximately 4 feet.
	35		
	40		

PL

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Log of Boring D-5L

B&L Landfill
Milton, Washington

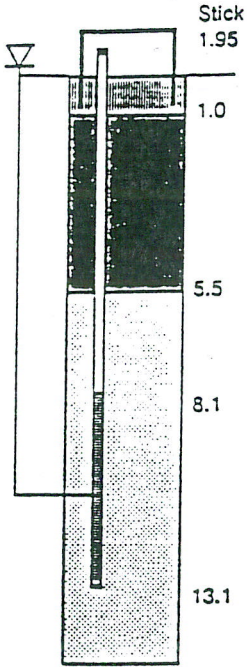
B15

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15.243.101	SES	AMJ	5 September 90		

Equipment Nodwell B-61 Track Rig

Land Surface Elevation 9.95 feet Date 9/19/89

Well Construction Summary



*Water levels indicated are for 11/13/89

OVM Headspace (ppm)	Blows per Foot	Depth (feet)	Sample	
		0		Swamp vegetation and root zone 0-1'.
				GRAY SAND (SP) medium dense, moist to wet; very fine grained, trace silt and organics.
		5		
				Becomes dark gray, medium dense, saturated, fine to medium grained.
	33	10		
		15		Boring terminated at 15 feet on 9/19/89.
		20		
		25		
		30		
		35		
		40		

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Log of Boring D-1U

B & L Landfill
Milton, Washington

B9

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15.243.101	SES	Amg	30 November 89		