PACIFIC groundwater GROUP

PRELIMINARY PUBLIC REVIEW DRAFT
REMEDIAL INVESTIGATION REPORT
EPHRATA LANDFILL

December 10, 2010

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EPHRATA LANDFILL

Prepared for:

Grant County Department of Public Works
P.O. Box 37
Ephrata, WA 98823-0037
and
City of Ephrata
121 Alder Street
Ephrata, WA 98823

Prepared by:

Pacific Groundwater Group
2377 Eastlake Avenue East, Suite 200
Seattle, Washington 98102
206.329.0141
www.pgwg.com

December 10, 2010
JE0714
Ephrata_RI_Report_PreliminaryPublicReview.doc

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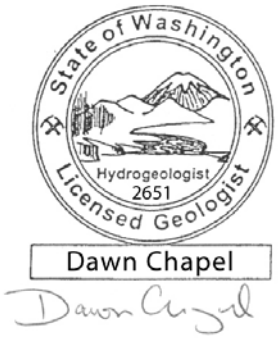
ACRONYMS AND ABBREVIATIONS

1,1-DCA	1,1-dichloroethane
1,2-DCA	1,2-dichloroethane
1,2-DCP	1,2-dichloropropane
1,1,1-TCA	1,1,1-tetrachloroethane
1,1,2-TCA	1,1,2-tetrachloroethane
AO	Agreed Order
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
Bureau	Federal Bureau of Reclamation
CA	chloroethane
CFC 11	trichlorofluoromethane
CFC 12	dichlorodifluoromethane
City	City of Ephrata
cis-1,2-DCE	cis-1,2-dichloroethene
CLARC	Ecology's Cleanup Levels and Risk Calculations
COC	contaminants of concern
County	Grant County
CRB	Columbia River Basalt
DNAPL	dense non-aqueous phase liquid
Ecology	Washington State Department of Ecology
EIM	Ecology's Environmental Information Management
EPA	Environmental Protection Agency

FS	Feasibility Study
GWCL	Washington State groundwater contaminant levels
Health District	Grant County Health District
IRAP	Interim Remedial Action Plan
LNAPL	light non-aqueous phase liquid
MCL	Federal maximum contaminant level
ug/L	micrograms-per-liter
mg/L	milligrams-per-liter
MIBK	methyl isobutyl ketone
MTCA	Model Toxic Control Act
ppbv	parts-per-billion by volume
PCE	tetrachloroethene
PID	photo ionization detector
PGG	Pacific Groundwater Group
PLP	Potentially Liable Parties
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act (RCRA)
RA	Risk Assessment
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
Site	Ephrata Landfill
SVOC	semi-volatile organic compound
TDS	total dissolved solids
TCE	trichloroethene
USDA-SCS	US Department of Agriculture- Soil Conservation Service
VC	vinyl chloride
VOC	volatile organic compound
WAC	Washington Administrative Code

SIGNATURE

This report, and Pacific Groundwater Group's work contributing to this report, were reviewed by the undersigned and approved for release.



Dawn Chapel
Hydrogeologist
Washington State Hydrogeologist No. 2651

Charles E. Ellingson
Principal Hydrogeologist
Washington State Hydrogeologist No. 631

1.0 EXECUTIVE SUMMARY

A remedial investigation (RI) was conducted at Ephrata Landfill in Grant County, Washington. Interim remedial actions were also conducted concurrent with the RI investigation. The RI, and a Feasibility Study (FS), are being performed by Grant County and the City of Ephrata to measure the nature and extent of contamination, assess risks to human health and the environment, and to recommend a remedy for cleanup to comply with the Model Toxics Control Act (MTCA), Chapter 70.105D RCW, and its implementing regulations, Chapter 173-340 WAC. The State, County, and City negotiated Agreed Order DE 3810 in 2006 to perform the RI/FS.

The contamination is primarily derived from waste deposited in the permitted, but unlined, older landfill (original landfill), and possibly from other on-site activities. Ephrata Landfill (site) remains permitted by the Grant County Health District to dispose of municipal solid waste in a newer lined landfill cell (new landfill) that also lies within the site.

The site is located about three miles south of the City of Ephrata on the east side of Highway 28 in the western portion of Section 33, Township 21 North, Range 26 East, Willamette Meridian (**Figure 1**). Refuse disposal began in about 1942.

In addition to landfilling activities, approximately 2350 drums of industrial waste were buried at the north end of the original landfill in 1975. Drums were stacked in three tiers on a 1-foot layer of soil above a relatively flat bedrock shelf and later covered with approximately 10 to 12 feet of overburden (**Figures 2 and 4**). Between May 13 and June 23, 2008, the drums were excavated and disposed as an interim remedial action required by the Agreed Order. Leakage of contaminants from the drums was noted in surrounding soils and about 200 drums were observed to be breached when removed, but the drums as a collective volume were still 80 to 85 percent full when examined after removal.

Other interim remedial actions conducted pursuant to the Agreed Order, and concurrent with the RI, are capping and subsequent closure of the original landfill, landfill gas venting and incineration, extraction of polluted groundwater and light non-aqueous phase liquid (LNAPL), and treatment of contaminated groundwater at one off-site residential drinking water well. These interim remedial actions have either removed contaminant sources or reduced contaminant migration from the site and will contribute to reducing contamination in groundwater over time.

Groundwater plays a prominent role in the movement of contaminants, and water supply wells are potential points of exposure of humans to the contaminants. Thus the RI focused on groundwater occurrence, movement, and use. Using direct evidence where possible and indirect evidence where direct evidence was not available, the RI found that sources of groundwater contamination at the site are as follows (in order of decreasing importance based on impacts to groundwater migrating off-site):

- Leakage of contaminants from drums
- Leaching of landfill refuse from the original landfill[1]
- A suspected off-site PCE source east of the site
- Potential diffusion of contaminants from landfill gas associated with the original landfill
- Historic releases of contaminants in the vicinity of the maintenance shop
- A suspected off-site nitrate source west of the site

Because of the diverse nature of the sources, the "contaminants of concern" are also diverse, and include solvents; fuel constituents; paint constituents; pesticides; landfill leachate salts, metals and nitrate; and breakdown products from the source contaminants. Although the entire list of contaminants of concern (COCs) is long, only a few COCs with low-level concentrations were observed migrating off-site, with one exception. The exception is the Roza aquifer immediately north of the site (within 1000 feet) where several COCs with higher concentrations were detected. Persistent and mobile organic contaminants observed migrating off-site include chlorinated solvents (chloroethenes and chlorothanes) and their breakdown products like vinyl chloride and the pesticide 1,2-dichloropropane. Additional COCs were observed in the Roza aquifer immediately north of the site.

Six basalt aquifers, one sandstone aquifer, and one sand-and-gravel aquifer were identified within 400 feet of ground surface (**Figures 4, 5, and 6**). Aquifer characterization is based on surveying, testing and sampling of more than 50 monitoring wells and sampling of 23 off-site residential water supply wells. In addition, 66 soil samples and 22 landfill gas samples were analyzed for contamination because soil and landfill gas can affect groundwater contamination. Historic trends in groundwater levels and contamination were studied using solid-waste facility groundwater monitoring data from 1989 to the present.

The source of most groundwater in the area is leakage from the West Canal of the Columbia Basin Irrigation Project and natural discharge from the base of Beezley Hills, about one-half mile northwest of the site (**Figure 1**). Excess irrigation also contributes, as well as leakage from the Oasis Park Ponds. Recharge from precipitation is low. The groundwater generally moves east and south from the West Canal and Beezley Hills through the aquifers, and discharges to Moses Lake, pumping wells, and ultimately the Columbia River. In addition to the horizontal movement, the groundwater moves downward through "aquitards" that separate the aquifers. The aquitards inhibit vertical groundwater movement. Boreholes that are open to more than one aquifer provide high capacity conduits for vertical movement. Although the general flow directions are east and south, local flow directions are very complex, particularly in two key shallow layers (the "P2" and "Roza" aquifers) where northward movement occurs.

The moving groundwater has apparently carried contamination from the sources noted above and created groundwater contaminant plumes within different parts of the aquifers.

[1] The relative importance of landfill refuse leaching is based on COCs detected in the Interflow Aquifer around the immediate perimeter of the original landfill, which might include impacts from other on-Site sources. The Interflow aquifer discharges into the Outwash aquifer downgradient (southward) of the landfill (see Section 7.1.3)

Natural attenuation appears to be reducing contaminant concentrations, including contaminant destruction through anaerobic degradation (reductive dechlorination) in the area of highest contaminant concentration at the north end of the original landfill. A biodegradation screening tool suggests that there is strong to adequate evidence for anaerobic biodegradation (reductive dechlorination).

The following four groundwater contaminant plumes were identified:

1. A northerly plume was found migrating downward from the P1 and P2 zones at the north end of the site, then generally northward off-site in the Roza aquifer, and then downward to the Interflow aquifer northeast of the site (red dashed lines[2] on **Figures 8, 9, 10, and 11**). The source of this plume is dominantly contaminants associated with the former drum cache with the potential for relatively low secondary contributions from original landfill refuse and possibly releases into soil near the shop; although RI data indicates groundwater impacts from shop area soils are relatively insignificant.

   The concentrations of organic contaminants in this plume are highest in the P1 zone immediately south of the former drum cache where LNAPL was observed in P1 groundwater. Concentrations in the P2 near the former drum cache are also high. The lateral extent of contaminants in the P1 and P2 is limited to within a few hundred feet or less of the former drum cache. The dominant pathway is expected to be vertically downward to the underlying Roza aquifer, in particular in areas where the zone between the P2 and the Roza is fractured and weathered. A pathway from the P2 to the Roza also likely occurs at the Hole, which may act as a local groundwater-sink for groundwater in the P2. Migration of this plume off-site occurs northward in the Roza aquifer. Total VOCs were as high as 600 ug/L 1000 feet north of the original landfill (MW-44b).

   VOCs appear to attenuate rapidly in this plume. Concentrations of VOCs decrease by several orders of magnitude within a short vertical and horizontal distance from the P1 and P2 by the former drum cache area. There is also strong to adequate evidence (based on a biodegradation screening tool) that reductive dechlorination is plausible in the P1 and P2 zone by the former drum cache (MW-32a, MW-33p2, MW-34p1, MW-35p2), in the Roza aquifer by the shop (MW-3b and MW-7b), and in the Roza aquifer north of the site (MW-44b). With distance from these areas, the geochemical conditions change and become less favorable for anaerobic biodegradation.

   Although natural attenuation is active, this plume has carried chlorinated ethanes, chlorinated ethenes, and 1,2-DCP to some off-site residential wells northeast of the original landfill, four of which have contaminant levels above "screening levels" used to identify COCs for the RI (the screening levels are related to, but not necessarily equal to cleanup levels). One off-site well (Whitson) also has low-level concentrations of benzene and 1,2-dichlorobenzene, and contains vinyl chloride slightly above the federal drinking water level. The drillers' log for the

[2] Plume delineations in figures are defined as approximate areas where one or more VOCs in groundwater exceed RI screening levels.

Whitson well indicates an open borehole through multiple aquifers. The Whitson well may therefore carry contaminants down to deeper aquifers.

2. A diffuse low-level plume of chlorinated ethenes, chlorinated ethanes[3] and landfill leachate salts, metals, and nitrate underlies the original landfill and extends radially outward (in the direction of groundwater flow) to the west, south, and east in the Interflow aquifer (southern red dashed line on **Figure 11**). The Interflow aquifer subcrops[4] and discharges to the Outwash aquifer south of the original landfill and may contribute to low level VOCs detected in the Outwash aquifer south of the original landfill **(Figure 12**). Vertical migration of this plume may also occur to the deeper Frenchman Springs aquifer. A few VOCs were detected in the Frenchman Springs aquifer along the west boundary of the original landfill (MW-28d). Historically, vertical pathways to the Frenchman Springs may have occurred through the landfill's old water supply well, about 600 feet upgradient (north) of MW-28d.

   The source of the Interflow aquifer plume is assumed to be dominantly landfill leachate from the original landfill, based on the presence of elevated leachate salts in the plume; however, little data is available that measures contaminant concentrations in landfill leachate that are not also unequivocally affected by contaminants associated with the former drum cache. Therefore, uncertainty remains as to how much of the Interflow aquifer plume is due to landfill leachate. Landfill gas from the original landfill may also contribute to contaminants in this plume, including possible diffusion of contaminants to the Outwash sand-and-gravel. Geochemical conditions within this plume are not as favorable for anaerobic biodegradation as the northerly plume described above; however, attenuation of landfill gas contaminants may explain the *absence* of several landfill gas contaminants in the Outwash aquifer. This plume has not likely caused contamination of drinking water wells.

3. A separate plume of tetrachloroethene (PCE) was found in the Ringold aquifer from a suspected off-site source north or northeast of the site near Dodson Road (dark-green dashed line on **Figure 11**). Concentrations of PCE in this plume are low, but may contribute to contamination in the Outwash aquifer south of the original landfill (red dashed lines on **Figure 12** -the Ringold aquifer may discharge into the Outwash aquifer between those dashed lines). Although groundwater elevations were not measured from the Ringold Aquifer, the groundwater flow direction is likely southward or eastward in the direction of regional flow, with discharge into the overlying Outwash Aquifer or downward to basalt aquifers. South of the original landfill, this plume may combine in the Outwash aquifer with the Interflow aquifer plume discussed above. The Ringold plume may be responsible for contamination of at least four off-site private wells near Dodson Road plus the Bolyard shallow well and possibly the Roland and Gutierrez-ACE909 wells, at concentrations above the screening level for PCE, but below the federal drinking water limit. Geochemical conditions for anaerobic biodegradation are not likely as favorable in this plume as the northerly plume described above.

[3] 1,2-DCP was also detected west (MW-5c) and east (MW-2c) of the landfill.
[4] Intersects the side slopes of the subsurface bedrock.

4. A plume of nitrate and elevated total dissolved solids likely originates from chicken manure or other localized agricultural sources near the landfill entrance road. Off-site monitoring well MW-21c has nitrate at nine times the Federal drinking water limit, which is the highest concentration of nitrate of any well sampled in the vicinity. Elevated nitrate concentrations also occur elsewhere but are not identified as separate plumes.

A risk assessment is being conducted at this time to establish contaminant concentrations that protect human health and the environment (cleanup levels). The risk assessment is being conducted concurrently with a feasibility study which will evaluate management and engineering alternatives necessary to meet cleanup levels in a reasonable time frame. Washington State Department of Ecology will then publish a Cleanup Action Plan that establishes the cleanup levels and required remedial actions.

2.0 INTRODUCTION

The purpose of this report is to document a remedial investigation (RI) conducted at the Ephrata Landfill (site), located in Grant County, Washington (**Figure 1**). The RI was prepared by Pacific Groundwater Group (PGG) for Grant County (County) and the City of Ephrata (City). Following completion of the RI, Parametrix, Inc will prepare a risk assessment (RA) and feasibility study (FS). AECOM Inc. served as independent consultant to the City. The County and City were identified by Washington State as Potentially Liable Parties (PLPs) for contamination at the site on January 10, 2005. The State and PLPs subsequently negotiated Agreed Order (AO) DE 3810 to perform the RI/FS and interim actions[5].

The RI/FS (the RI, RA and FS, collectively) is being performed to describe the nature and extent of contamination, assess risks to human health and the environment, and recommend a remedy for cleanup in compliance with requirements of the Model Toxics Control Act (MTCA), Chapter 70.105D, Revised Code of Washington (RCW), and its implementing regulations, Chapter 173-340 Washington Administrative Code (WAC). During the FS, the PLPs will evaluate options for implementing the remedial actions.

MTCA is used by the State to enforce and guide cleanup of solid waste facilities undergoing corrective action as defined in Criteria for Municipal Solid Waste Landfills (Chapter 173-351 WAC). At the Ephrata Landfill, contamination is derived from releases associated with waste deposited in the permitted, but older, unlined portions of the landfill (original landfill), and possibly from other on-site activities. Ephrata Landfill remains permitted by the Grant County Health District to dispose of municipal solid waste in a newer, lined landfill cell (new landfill) that also lies within the site (permit 2010-10).

2.1 REPORT ORGANIZATION

This report is divided into the following sections:

[5] Ecology Site Facility Site ID #592.

Summary of Site Background: A brief background summary of the site and Interim Remedial Actions already performed is provided as Sections 2 (Introduction), 3 (Site Background) and 4 (Interim Remedial Action).

Investigation Findings: The main text provides more detailed descriptions of the work performed and site characterization as Sections 5 (Work Performed), Section 6 (Geology), Section 7 (Hydrogeology), Section 8 (Background Chemistry), and Section 9 (Contamination).

Future Work: Future work planned for the site is provided in Section 10 (Future Work).

References: Citations noted throughout the document are provided in Section 11 (References).

Tables: Tables are referenced in the text but are located at the end of the main text. Some detailed tables are provided in appendices.

Figures: Figures are also referenced in the text but are located after the tables.

Appendices: Appendices are used to provide the data used for this RI. The Phase 1 RI report (PGG, 2009b) is provided as **Appendix A**. Some data from the Phase 1 report is also presented in the main text and figures of this RI report. Other appendices include tables of chemistry data collected since the Phase 1 RI report, boring logs, geophysical logs, and groundwater hydrographs for recently installed RI monitoring wells (2008 to 2009).

Raw chemistry data were received in digital form for this project, reviewed for quality, and then loaded into a local database. Phase 1 data (**Appendix A**) have been loaded into Ecology's Environmental Information Management (EIM) system. Phase 2 data will also be loaded into Ecology's EIM system. The data tables for this report reflect the content of the local database. The laboratory reports are not provided in this report. Data are or will be available to the public through Ecology's EIM (http://www.ecy.wa.gov/eim/).

Elevations used in the RI were established by Grant County Public Works and are referenced to the NGVD[6] 1929 datum.

As a basis for this report, at least two samples have been collected from each RI well and the data from the (minimum) two rounds are consistent, except near the former drum cache light non-aqueous phase liquid (LNAPL) area, where groundwater chemistry varied significantly between sampling events. In most cases concentrations of contaminants near the drum cache decreased between sampling rounds (Section 9). The addition of up to two more samples is not expected to change the conclusions of this report. However, if changes are necessary, an addendum will be submitted.

[6] National geodetic vertical datum (NGVD)

3.0 SITE BACKGROUND

The site is located about three miles south of the City of Ephrata on the east side of Highway 28 in the western portion of Section 33, Township 21 North, Range 26 East, Willamette Meridian (**Figure 1**). The City began operating the original landfill in approximately 1942 and owned and operated it until 1974. The City owned part of the property set aside for the landfill and leased additional property from the United States Bureau of Reclamation. In 1974, the City and the County entered into the first of a series of agreements under which the County leased the landfill and operated the facility. In 1990, the Bureau of Reclamation transferred its landfill property to the County. In 1994, the City deeded its landfill property to the County. A new lined landfill cell on the site remains the primary solid waste disposal facility for Grant County and additional lined cells are anticipated to serve that purpose in the future.

Operation of the landfill first began with filling in the northwest portion of the original landfill including disposal in a depression now called the Hole, and expanded south and east as an unlined landfill until the new lined landfill was opened in 2004 (**Figure 1**). Burning was allowed in the early years of dump operation, but the practices were not documented. Unintentional fires have also occurred more recently in the original landfill. The new landfill is physically separated from and located to the south of the original landfill. The original landfill was permitted by Grant County Health District first under Chapter 173-304 WAC and then under Chapter 173-351 WAC. The new landfill is permitted under Chapter 173-351 WAC. Current solid-waste-related facilities at the site consist of the original landfill, which was capped in 2008, the new lined landfill, recycling facilities, leachate pond, a maintenance shop and office, a truck scale, electric power, a deep water supply well, two lysimeters, numerous landfill gas and groundwater monitoring wells, and a landfill gas collection system and flare permitted under Ecology Approval Order Number 09AQ-E290. The County has recently acquired additional land parcels to the east and is planning changes to site access for the new landfill off Dodson Road (**Figure 1**).

The following provides a timeline of landfill activities, waste drum disposal activity, environmental events and investigations at the site. Refer to Section 5 (Remedial Investigation Work) for more detailed discussion of the most recent work.

1937: Land Classification Map by U.S. Bureau of Reclamation defines pre-waste soil conditions and topography.

1942: Landfilling begins. Filling began in the northwest and expanded south and east as an unlined landfill.

1950's: The water table elevation increases 30 feet in response to completion of the West Canal and importation of irrigation water. This work was part of the federal Columbia Basin Irrigation Project (Walters and Grolier, 1960).

1975: Approximately 2350 drums of industrial waste are disposed of at the north end of the original landfill.

1984: Ecology submits a Preliminary Assessment to the U.S. Environmental Protection Agency (EPA) and recommends a follow-up Site Investigation.

1987: The EPA conducts a preliminary Site Investigation and intends no follow-up investigation.

Ecology completes a Phase I Site Inspection Report stating that further actions should be based on near-future groundwater monitoring to be developed by the County.

1989: Groundwater and landfill gas monitoring begins at the site.

1990: Black and Veatch Inc. and Pacific Groundwater Group publish the first Hydrogeologic Assessment Report that documents anomalous groundwater quality (B&V and PGG, 1990a). Numerous groundwater monitoring reports are submitted to Grant County Health District and Ecology starting at this time.

Black and Veatch Inc. and Pacific Groundwater Group publish a Phase 2 investigation report on the "Roza Aquifer" that delineates and describes contamination in that aquifer (B&V and PGG, 1990b).

1993: The landfill's old, contaminated water supply well is decommissioned and replaced.

2000: County proposes corrective action in letter to Ecology.

2000-02: Pacific Groundwater Group installs numerous additional monitoring wells and two extraction wells and performs testing of the Roza aquifer.

2004: The new landfill opens and waste placement in the old unlined landfill ceases.

2006: AO No. DE 3810 among Washington State Department of Ecology, Grant County, and the City of Ephrata is completed and signed (Ecology, 2006).

The RI/FS Work Plan (PGG and Parametrix, 2006) is approved.

The Interim Remedial Action Plan (IRAP, Parametrix, 2006) is approved.

2007-08: Phase 1 RI work is conducted (Section 5) and interim actions are initiated (Section 4), including capping of the original landfill (Parametrix, 2009a) and drum removal (Parametrix, 2009b).

2009: Phase 1 RI report (PGG, 2009a) is submitted to Ecology and approved. The Phase 1 RI report identifies the need for additional work to delineate the extent of groundwater contamination.

Phase 2 Work Plan (PGG, 2009b) is submitted to Ecology and approved.

Phase 2 RI work is conducted (Section 5).

Continuing: Limited RI and interim action work continues, consisting of groundwater sample collection until all RI wells have been sampled four times, groundwater pump-and-treat to reduce contaminant sources, and point-of-use water treatment at the Whitson residence. A few RI wells will continue to be sampled quarterly for performance monitoring and off-site contaminant migration monitoring.

4.0 INTERIM REMEDIAL ACTIONS AND RESPONSE ACTIONS

Interim Remedial Actions were required by the AO to either remove sources of known contamination or reduce potential for future groundwater transport of contamination off-site. The Interim Remedial Action Plan (Parametrix, 2006) provided plans for the work, which were approved by Ecology.

An additional response action (point-of-use water treatment at the Whitson residence) was designed and implemented during the RI. However, the initial water treatment system was not effective. The County has since agreed, on an interim basis, to reimburse the Whitsons for the purchase of bottled water (for consumption as suggested by the Health District) and to continue monitoring their water supply.

Interim Remedial Actions that have been performed at the site are:

- **Drum Removal (Section 4.1).** Removal and disposal of 2353 buried industrial waste drums and contaminated soil at the north end of the site (Former Drum Cache).
- **Landfill Capping and Gas Collection (Section 4.2).** Landfill capping and construction of a landfill gas and surface water control system
- **Groundwater and LNAPL Extraction (Sections 4.3 and 4.4).** Extraction of contaminated groundwater from the Hole beneath the original landfill. Extraction of contaminated groundwater and disposal of LNAPL from the vicinity of the former drum cache.

Response Actions are:

- **Point of Use Groundwater Treatment (Section 4.5).** Water treatment and supplied bottled water for consumption at the Whitson residence, where chlorinated VOCs were detected at concentrations above the drinking water standards used by Grant County Health District.

The following subsections describe each of these actions.

4.1 DRUM REMOVAL

Between May 13 and June 23, 2008, 2353 fifty-five-gallon drums of industrial waste were excavated and removed from the north end of the original landfill (**Figure 2**). The drums were disposed at the site in 1975 (Ecology, 1987). Drums were stacked in three tiers on a 1-foot thick layer of soil above a relatively flat basalt bedrock shelf and covered with approximately 10 to 12 feet of overburden (**Figures 3 and 4**).

The drums contained solids and liquids and were (as a collective) about 80 to 85 percent full when removal. About eight percent (195 drums) of the drums were observed to be breached when removed and prior leaks were inferred from the condition of the drums and surrounding interstitial liquids and soils (Parametrix, 2009b and PGG, 2008b).

Between July 3 and August 4, 2008 the soils beneath and adjacent to the former drum cache footprint were sampled and analyzed, then removed to the extent feasible. Twelve soil samples were collected from the layer of soil directly below the drums to identify

contaminants released from the drums (PGG, 2009a - presented as **Appendix A** to this report).

Additional soil was then excavated and vacuumed (e.g. with a heavy duty vactor truck) to the top of bedrock and 10 to 40 feet laterally away from the former drum footprint. Some soil remained in crevices and depressions in the bedrock. Twelve residual soil samples (soils remaining at the bottom and sides of the excavation) were collected to characterize contamination pathways potentially leading to groundwater. Most of residual soil samples were collected from locations of expected high concentrations (e.g. crevices and depressions where suspected contaminated soils had been removed). A few samples (SS-6, SS-7, and "16,-B" in **Figure 2** were collected in areas of expected low concentrations). Residual soil sample results are discussed in Section 9 (Contamination).

During drum and soil removal, liquids were encountered both in the soils surrounding the bottom tier of drums and as horizontal seepage into the bottom of the excavation from three discrete locations (northwest, northeast, and south, **Appendix A**). The largest seep was observed in the northeast corner of the excavation and a monitoring well was later installed at this location (MW-32a). The source of the seeps is shallow groundwater in the P1 zone (see Section 7.1.1). A brown floating oil phase was observed on most liquids. Liquids were managed, sampled, and removed (to the extent practical) from the excavation during the drum and soil removal. A total of 4,062 gallons[7] of liquid were eventually removed from the drum excavation and disposed off-site.

As mentioned, a heavy-duty Vactor truck was used to vacuum as much soil and rock as feasible from the basalt surface to reveal rock fissures and expose remaining soil for sampling. The excavation was then surveyed with laser scanning equipment to provide elevation data for the site investigation (**Figure 2**). Prior to backfilling, an 18 inch thick layer of drain rock was placed in the northeast and northwest corners of the excavation to accommodate future monitoring/extraction wells[8]. Backfilling was completed by August 11, 2008.

4.2 LANDFILL CAPPING AND GAS COLLECTION

A landfill cap and gas collection and flaring system was constructed over the original landfill in 2008 after backfilling the drum cache excavation (**Figure 1** and Parametrix, 2009a). The cap consists of a prepared subgrade, 6 inches of gravel bedding, a geomembrane (30 mil PVC), and rock armor from 8 to 26 inches thick depending on location. Forty-three landfill gas wells that penetrate the refuse were installed prior to capping and were sealed to the geomembrane cap. The gas wells are manifolded together and lead to a common flare. The system is not under vacuum but passively flows by naturally occurring gas pressure within the landfill. The cap extends over the former drum cache. Runoff from the top of the geomembrane is directed to stormwater infiltration ponds remote from known sources of contamination; however, a small portion of the cap unavoidably grades to a closed depression just north of the former drum cache. As a result of low precipita-

[7] A field estimate of 8,000 gallons, later determined to be erroneous, was reported in the Phase 1 RI report (Appendix A) based on field dipstick measurements of the water depth in the collection tank which was not level. Disposal records indicate 4,062 gallons were actually removed.
[8] A monitoring well (MW-32a) was installed in the northeast corner in November 2008.

tion and high evapotranspiration, very little runoff is expected from the geomembrane, and no runoff is expected from the coarse rock armor (cobbles on the slopes). The cap does not cover the flat area near the shop and scales.

Landfill gas occurrence, chemistry, relation to groundwater chemistry, and response to capping are discussed in Section 9 (Contamination).

4.3 GROUNDWATER EXTRACTION

As required by the Agreed Order and approved plans, groundwater was extracted from the Hole (EW-1) continuously for about two months during the spring of 2008 (4/30/2008 to 6/20/2008, **Appendix A**) and over about one and a half months (7/10/09 to 8/26/09) in summer of 2009 (**Appendix G**). The objectives of groundwater extraction from the Hole were to lower the water table at the bottom of the refuse and thus reduce leaching of refuse to groundwater, to evaluate drawdown data to interpret hydraulic continuity, and to remove pollutants from groundwater. Well EW-1 (**Figure 2**) was pumped, and flow, water level, and chemistry measurements were collected in accordance with the Interim Remedial Action Plan (Parametrix, 2006) and the Sampling and Analysis Plan (PGG, 2007b)

The Hole is a 20 foot deep depression in the basalt surface beneath the original landfill (**Figure 2**). Extraction well EW-1 was installed near the center of the Hole in the fall of 2000. W-9 and W-12 are two nearby monitoring wells installed in the Hole during the Phase 1 RI Work. Logs of these wells indicate about 50 to 55 feet of refuse mixed with gravel, cobbles, and sand before encountering the basalt surface within the depression (**Appendix B**). Water level measurements indicate the lower 5 to 7 feet of soil/refuse within this depression are saturated with groundwater. The area of saturation in the Hole is about 1.5 acres and the volume of saturated refuse is about 8000 cubic yards. Previous groundwater sampling results from EW-1 in 2001 (PGG, 2002) indicated elevated concentrations of volatile organic compounds (VOCs) and inorganic leachate indicator parameters.

Extracted water was diverted to an on-site evaporation pond (**Figure 1**). Eight groundwater samples were collected over the duration of the two month extraction period in 2008 at roughly one week intervals (**Appendix A**). Samples were analyzed in the field for pH, specific conductance, temperature, and oxidation reduction potential. Dissolved oxygen, and hydrogen sulfide were also analyzed during a few of the sampling events. Samples for each event were collected for laboratory analysis of VOCs, metals, and inorganic compounds; one event included analysis of water treatment parameters (**Appendix A**).

A total of 85,325 gallons was extracted from the Hole over the two month period in 2008, with an average pumping rate of about 1 gallon-per-minute (gpm). A constant drawdown of about 1foot in EW-1 was achieved after the first few days of pumping. Similarly, a constant drawdown of about 0.25 feet in W-12 was achieved after the first few days. No drawdown response was observed in EW-2 (Roza aquifer well). An attempt to increase the pumping rate in EW-1 on June 19, 2008 resulted in the pump malfunctioning. The pump was subsequently pulled and replaced.

Extraction resumed from EW-1 for 47 days in the summer of 2009. The water is disposed by evaporation and limited storage is available. Therefore the system is designed to be operated only in spring and summer. However, repeated pump failures, presumably caused by high concentrations of total dissolved solids in the groundwater, precluded extended operation of the electric submersible pump.

A modification to the Interim Action Plan was proposed by PGG and approved by Ecology to expand the area of groundwater extraction following discovery of high concentrations of VOCs and LNAPL in shallow groundwater seeping into the south margin of the drum cache excavation (PGG, 2009c). The primary purpose of the modification was to allow extraction of highly contaminated shallow groundwater near the former drum cache. Well MW-34p1 was selected for pumping because it contained comparatively higher concentrations of groundwater contaminants than other wells and was estimated to have a sustainable pumping rate of about 0.5 gpm. Well MW-34p1 and MW-36p1 both exhibited measurable thicknesses of LNAPL, although MW-36p1 has not been considered for groundwater pumping because the groundwater yield was estimated to be too low to pump. As part of the modified plan, LNAPL was extracted from both wells using hydrocarbon-absorbing socks (see subsection 4.4 for LNAPL discussion and **Appendix C** for presentation of water level and LNAPL thickness data). Between August 26 and September 2, 2009, about 750 gallons of contaminated groundwater was extracted from MW-34p1 at a rate of 0.3 to 0.4 gpm and discharged to the evaporation pond. Drawdown in MW-34p1 was approximately 1 foot and LNAPL thickness increased from about 0.1 to 0.25 feet. No other wells were monitored. The submersible stainless steel pump failed repeatedly during the week, and long-term extraction was deferred until an alternative pumping system could be installed.

Groundwater pumping from MW-34p1 resumed in June 2010 using a pneumatic pump as discussed further below.

4.4 LNAPL EXTRACTION AND MANAGEMENT

LNAPL occurs in the P1 shallow groundwater zone immediately south of the former drum cache (MW-34p1 and MW-36p1). It has not been observed in any other monitoring wells.

LNAPL thickness in MW-34p1 and MW-36p1 increased from a thin sheen in June 2009 to maximum thicknesses of 1.0 foot in MW-36p1 and 0.14 feet in MW-34p1 in August/September 2009 (although pumping-induced LNAPL thickness increased to 0.25 foot in MW-34p1 as mentioned above). LNAPL thicknesses in both wells have since reduced to a thin sheen by February 2010 and have remained so through March 2010. LNAPL thickness was greatest in the summer 2009 when the P1 groundwater elevation was reduced through pumping, which suggests a correlation between LNAPL thickness and groundwater elevation; although, additional data would be required to establish the degree to which they are related (**Appendix C**).

LNAPL in both wells has been managed with hydrocarbon-absorbing socks since March 2009. Estimated total LNAPL removed through March 2010 was 3 gallons from MW-34p1 and 8 gallons from MW-36p1. The socks are replaced as they become saturated with hydrocarbon. Removed socks are placed in heavy duty plastic garbage bags which

are then contained in a labeled, lidded 55-gallon metal drum near the shop. The socks will be disposed by a County contractor as dangerous waste any time a drum is accumulated (filled). LNAPL chemistry is discussed in Section 9 (Contamination).

Given the short groundwater extraction period in 2009 and the variability of LNAPL thicknesses over time, future LNAPL accumulation is difficult to predict. The failed MW-34p1 pump was replaced with a pneumatic pump for the summer 2010 season. In order to address the uncertainty about changing LNAPL thickness and groundwater depression for 2010, the monitoring frequency was increased and at least two feet of groundwater are being maintained over the pump intake to prevent LNAPL discharge to the evaporation pond. Current practice is to collect LNAPL with adsorbent socks as mentioned. LNAPL management will continue consistent with the 2009 Quality Assurance and Sampling and Analysis Plan (PGG, 2009c), with temporary adaptations (e.g. increase monitoring) when warranted due to changing conditions and uncertainty, as long as needed.

4.5 POINT-OF-USE GROUNDWATER TREATMENT

An interim action to treat water from a residential well (**Appendix D**) northeast of the original landfill (Whitson well; **Table 2** and **Figures 1 and 2**) began in October of 2009 as a result of samples collected for the RI (Section 5.3). Untreated samples contained 12 detectable VOCs. Vinyl chloride was the only VOC with concentrations that exceeded the federal drinking water maximum contaminant level (MCL) of 2 micrograms per liter (ug/L) (Section 9). Grant County Health District recommended that the water not be consumed without treatment (Grant County Health District letter to Whitsons dated August 10, 2009). Grant County provided bottled water and funded installation of a water treatment system consisting of a softener, activated carbon filter, and ultraviolet (UV) oxidation.

In late 2009, PGG resampled the water and analyses indicated that it still contained VOCs, with vinyl chloride above the Federal MCL in one of two post-treatment samples. Grant County Health District recommended resumption of bottled water for drinking and cooking, and investigation of alternative treatment or better maintenance (Grant County Health District letter to Whitsons dated January 29, 2010).

5.0 REMEDIAL INVESTIGATION WORK PERFORMED

This section briefly summarizes hydrogeologic work performed to meet the requirements of solid waste permitting and other investigative work before the RI, and then describes the work performed for the RI. Hydrogeologic work on interim actions conducted concurrent with the RI (see Section 4.0 above) is also listed if it resulted in data useful to the RI. Section 6 (Geology), Section 7 (Hydrogeology), and Section 9 (Contamination) interpret the information gathered during these investigations.

5.1 WORK PRIOR TO THE RI

Grant County began hydrogeologic monitoring of the site in 1989 pursuant to solid waste regulations (WAC 173-304 and later WAC 173-351). The solid waste regulations require that hydrogeologic work be performed to monitor groundwater between municipal solid waste landfills and the point of compliance defined for solid waste purposes. Grant County has done the following work beginning in 1989:

- Installed, surveyed, and hydraulically tested 21groundwater monitoring wells for the original and new landfills (**Table 1**). Wells MW-1a through MW-23a were installed between 1989 and 2002.
- Sampled groundwater quarterly for monitoring parameters defined in WAC 173-351, which include all of the contaminants of concern (COCs) defined for the RI. Monitoring wells were added over time, so there are more samples and data for older wells (PGG, 2010a).
- Reported quarterly and annually as required by WAC 173-351.
- Decommissioned (sealed) the original water supply well (33E1) because it was contaminated and not sealed properly. Also decommissioned MW-8b as ordered by Ecology.
- Drilled a replacement water supply well (**Figure 1**, well 33M1).

Starting in 2000 (prior to the AO) and continuing through the effective date of the AO (January 30, 2007), the County voluntarily performed preliminary investigations which also supported compliance with solid waste regulations. Work was performed consistent with a Corrective Action Plan (PGG, 2000) that was submitted to Ecology; however, most activities were implemented starting in 2007 under the AO. The following voluntary corrective action work was completed:

- Installed, surveyed, and hydraulically tested monitoring wells MW-17a through MW-19b (**Table 1**).
- Installed, surveyed, and hydraulically tested extraction wells EW-1 and EW-2 (PGG, 2002).
- Performed 26-hour and 30-hour aquifer pumping tests using wells EW-1 and EW-2 (respectively) while measuring responses in several monitoring wells.

Geologic, hydrologic, and water quality data from the solid waste and corrective action work prior to the AO are used throughout this report where appropriate. However, since the RI is intended to represent the current conditions and the remedial actions are based in part on expected future environmental and health risks, pre-RI data are only cited in cases where they contribute to our understanding of current and/or future conditions (e.g. boring logs, a water quality trend).

The RI work continued in phases when the AO took effect in January 2007.

5.2 PHASE 1 RI WORK

Phase 1 of the RI consisted of the field work specified in the Work Plan referenced in the AO plus hydrogeologic work related to the interim actions reported above in Section 4.

Phase 1 work was performed in 2007 and 2008. As required by the AO, Phase 1 data were reported in a Phase 1 report (**Appendix A**) and used to identify that additional work (Phase 2) was needed to characterize the nature and extent of contamination at the site.

Phase 1 soil work consisted of excavating 14 test pits and 16 sonic borings (T- and B- series explorations, **Figure 2** and **Appendices A and B**) to bedrock at the northwest end of the site (near the shop) to investigate potential "hot spots" in soil overlying known groundwater contamination in the shop area. From those explorations, 91 soil samples were collected for field screening analyses and a subset of 40 samples were submitted for laboratory analysis of selected inorganics, metals, and VOCs (**Appendix A**).

Soil work also included collecting soil samples directly below the former buried drum cache (S-series samples, **Appendix A** and **Figure 2**) and sampling of residual soil once the drum excavation had been expanded and contaminated soil removed to the extent feasible (SS-series, **Appendix A** and **Figure 2**).

Geologic data from Phase 1 borings are considered in results of Sections 6 and 7 (Geology and Hydrogeology), and Phase 1 soil chemistry data are considered in Section 9 (Contamination).

Phase 1 soil gas work consisted of sampling landfill gas from 43 existing landfill gas collection wells (**Figure 1**, GE- series) and 14 temporary probes within test pits (T-series, **Figure 2 and Appendix A**). All samples were collected prior to construction of the landfill cap, and were analyzed in the field for methane concentration and total VOCs using a field photoionization detector. A total of 18 samples were selected for laboratory analysis of VOCs using EPA Method 8260 (one sample was damaged and was not analyzed). Gas chemistry data are considered in Section 9 (Contamination).

Phase 1 groundwater work consisted of installation and sample collection from four new monitoring wells and one boring around the perimeter of the original and new landfills (MW-24a through MW-28d, plus boring B-27, **Table 1**, **Appendix B** and **Figure 1**), 10 new monitoring wells near the former drum cache (MW-29b through MW-38p2, **Table 1**, **Appendix B** and **Figure 2**), and two new monitoring wells within the Hole (W-9 and W-12, **Table 1**, **Appendix B** and **Figure 2**). Wells MW-24a, MW-25a, and MW-26a originally targeted the Interflow aquifer; however, that aquifer was absent (eroded away) at these locations and thus these wells were completed at the bottom of the Outwash aquifer. MW-28d was completed in the Frenchman Springs unit south (regionally downgradient) of the former water supply well (33E1) that is suspected of causing vertical migration of contaminants from the Roza aquifer into the Frenchman Springs unit (see Section 6 for description of geology).

The 10 wells near the former drum cache were installed to investigate shallow groundwater observed during the drum removal. They were specified in a Work Plan specific to that task (PGG, 2008b) and not in the original RI Work Plan. Wells MW-34p1 and MW-36p1 were constructed with 4-inch diameter casings (the rest are 2-inch diameter) for potential future use as extraction wells. The groundwater chemistry data are considered in Section 9 (Contamination).

Selected monitoring wells across the site were geophysically logged to assist in stratigraphic correlations (**Appendix E**).

5.3 PHASE 2 WORK PERFORMED

The Phase 2 RI investigation scope was described in the Remedial Investigation Phase 2 Work Plan (PGG, 2009b) and a letter to Ecology (PGG, 2009d). The work was required because groundwater contamination was not fully delineated at the completion of Phase 1 work.

Seventeen new monitoring wells were installed to better understand groundwater contamination north of the original landfill. These wells were then hydraulically tested, surveyed, and sampled (MW-39p2 through MW-55c[9], **Table 1**, **Figure 1**, and **Appendices B and F**). In addition, groundwater from 20 private residential wells (**Figure 1** and **Table 2**), the City's irrigation well, and two City Reclamation Facility (CRF) monitoring wells (**Figure 1**) were sampled, some more than once. Neva Lake, a groundwater-dependent lake southeast of the new landfill (**Figure 1**), was also sampled at this time (two sampling events). The Phase 2 data are considered in Section 9 (Contamination) and Section 4.5 discusses point-of-use treatment of the Whitson private well to remove VOCs.

A second round of landfill gas samples was also collected during Phase 2. Samples were collected from four GE-series gas vents and the collection header near the flare (composite sample). They were analyzed with lower detection limits than the samples collected during Phase 1, to allow better assessment of the potential for landfill gas contribution to VOC groundwater contamination. This round of samples was collected after construction of the landfill cap.

Analytical data from Phase 2 are reported by "round" in **Appendices H through M.** Data quality review is documented for all Phase 2 sample rounds in **Appendix N**. Data is discussed in Section 9 (Contamination).

5.4 DATA VALIDATION

Data collected for the RI (soil, gas, and groundwater) have been validated in accordance with the work plans, including both laboratory and field quality assurance quality control procedures as outlined in the RI/FS sampling and analysis plans (PGG, 2007a, 2007b, 2008b, 2009b, and 2009c). **Appendix N** contains the Phase 2 RI data validation. Phase 1 RI data validation was reported in the Phase 1 RI Report (**Appendix A**).

Historical groundwater data associated with solid waste monitoring presented in this report rely on standard quality control/quality assurance procedures of the analytical laboratories including laboratory blanks, duplicates, matrix spikes, and surrogate analyses in addition to field trip blanks for VOCs.

6.0 SITE GEOLOGY

The site lies within the Quincy basin of the Columbia Plateau physiographic province. The plateau is characterized by a thick sequence of fine-grained and dense (hard) basalt flows, collectively known as the Columbia River Basalt Group (CRB). The CRB is di-

[9] MW-55c has not been sampled because the well has been dry.

vided into three formations (from youngest to oldest): Saddle Mountain, Wanapum, and Grande Ronde Basalts. The Wanapum Basalt crops out (i.e. formation is exposed at the ground surface) in the study area and the Grande Ronde crops out in the Beezley Hills to the northwest where tectonic warping and folding have uplifted the basalt sequence (**Figure 3**). The basalt units beneath the site appear to be nearly flat-lying. Sedimentary rocks interbedded (among layers having different characteristics) with the basalt flows are collectively known as the Ellensburg Formation and consist of fluvial (associated with flowing water) and lacustrine (associated with lakes) sediments and layers of volcanic ash. The Vantage Interbed (part of the Ellensburg Formation) crops out near Ephrata but occurs at a depth of about 300 feet below ground surface (bgs) at the site. During the wetter Pliocene period the ancestral Columbia River and its tributaries deposited hundreds of feet of sediments over the top of the basalt flows. These deposits consisted of fine grained lake sediments and stream deposits and are collectively referred to as the Ringold Formation.

After tectonic deformation and deposition of the Ringold, major flooding and erosion occurred during the Pleistocene (the Missoula Floods) as a result of ice-dam breakup in the headwaters of the Columbia River drainage. A major temporary channel developed through the Grande Coulee that opens onto the plains near Ephrata. Flow through this channel eroded the Ringold and basalt formations, dispersed across the plains, and deposited coarse gravels and sands referred to as Outwash deposits.

Subsections below discuss the following geologic layers:

- *Loess:* a thin layer of wind-blown silt.
- *Alluvium:* fine grained sediments in low-lying areas.
- *Outwash:* coarse sand, gravel and cobbles associated with the Missoula Flood deposits.
- *Ringold Formation:* moderately consolidated claystone, siltstone and sandstone.
- *Wanapum Basalt:* fine-grained, dense basalt flows with permeable weathered zones. The Roza and Frenchman Springs members are present at the site.
- *Vantage Interbed:* ash-rich siltstone approximately 25 feet thick that separates the Wanapum from the Grande Ronde.
- *Grande Ronde Formation:* fine-grained, dense basalt flows with permeable weathered zones below the Vantage Formation.

The following subsections describe these geologic layers in greater detail. The occurrence of groundwater and the properties of the rocks that affect groundwater are discussed in Section 7 (Hydrogeology).

6.1 LOESS

Loess was deposited in a thin layer across the top of the preexisting land surface and currently overlies either basalt, outwash, or alluvium. The loess is wind-blown, loose, yellow-brown, silt. It has infiltrated pores and is mixed with underlying rocks and soils. Excavations and borings indicate thicknesses of 0 to 4 feet. It is not shown on maps or cross sections because it is so thin. The loess is not saturated with groundwater, except possibly within the draw northeast of the site (**Figure 1**). The soils at that location may be loess, alluvium, or a mixture of those sediments.

6.2 ALLUVIUM

Alluvium was deposited in drainages west of the site along SR28 and east of the site within the low area occupied by Neva Lake (**Figure 3**). The alluvium may reflect late-glacial epoch deposition as well as minor deposition under the current arid climate. The alluvium is silt with minor sand and clay as identified in the local soil survey (USDA-SCS, 1984). It lies at ground surface except where overlain by loess. The "clay pond" between the original landfill and SR28 was a borrow pit for alluvium used in construction. Well MW-18a penetrated 35 feet of fine-grained alluvium between depths of 0 and 35 feet bgs along the entrance road north of the clay pond. The alluvium is shown in cross section A-A' of **Figure 4**. The alluvium overlies outwash.

6.3 OUTWASH

The outwash gravel and sand deposit (Outwash) occurs extensively in the Ephrata Landfill area. It is exposed at land surface in many areas and underlies the landfill itself except where the fill lies directly on basalt. It has been, and continues to be, excavated to construct landfill cells. The Outwash is a gray, dry to saturated, gravel and sand with cobbles and a trace of silt. USDA-SCS (1984) describes the deposit as extremely gravely coarse sand. The deposit is not well-layered based on outcrop (exposed part of a formation) observations.

It was deposited during glacial outburst floods, filling depressions in the eroded basalt surface below. A deep, steep-sided channel ("buried coulee") was backfilled with Outwash deposits west of the site, and a gentler and broader swale was backfilled east of the site, trending southwest-northeast (**Figure 7**). The Hole was partly filled with Outwash but still partly retained a topographic depression until filled with refuse.

Observed Outwash thickness ranges from zero at basalt outcrops to 106 feet at the location of well MW-25a at the south end of the site. It overlies basalt in most areas, and the Ringold Formation along the east and south margins of the site (**Figures 3, 4, 5, and 6**).

An extensive shallow water-table aquifer occurs in the Outwash where the layer extends to below about 1190 feet elevation (Section 7.1.5).

6.4 RINGOLD FORMATION

The Ringold Formation is a widespread sequence of partially cemented clay, silt, sand, and gravel (conglomerate) that is found in the lowland areas including the Quincy Basin and an exposure on the east slope of the Beezley Hills east of the City (**Figure 3**). These sediments typically consist of well-stratified siltstone/claystone, altered mudstone and sand, fine- to coarse-grained sand, and granule-to-cobble conglomerate (Grolier and Bingham, 1971).

The Ringold Formation was encountered as a claystone/siltstone/sandstone that underlies Outwash in on-site wells MW-24a and MW-25a at the south end of the new landfill. It is also recorded in many drillers' logs from private wells near Dodson Road east of the site. It underlies Outwash and overlies basalt (**Figures 5 and 6**).

6.5 WANAPUM BASALT

A thick sequence of basalt flows forms the shallowest "bedrock" below the site and throughout the Columbia Basin. Hundreds of separate basalt flows poured out of fissures in the eastern part of the basin and covered 63,000 square miles, building up a thickness of up to 6,000 feet over 10 to 15 million years.

Individual basalt flows typically exhibit a three-layer profile: a columnar base characterized by dense (hard) basalt with honey-comb shaped vertical joints (the colonnade), a fractured and blocky mid-section (the entablature[10]), and an upper vesicular crust. The base may also include weathered basalt that resulted from rapid cooling, mixed with any sediments present at the time of emplacement. Sediments, residual soil and weathered basalt between individual flows are referred to as interflow zones. The upper and lower interflow zones form the permeable horizons within the basalt where aquifers may form. Vertical fractures within the denser columnar basalt provide limited vertical hydraulic connection between aquifers.

The CRB and interbedded Ellensburg Formation (subsection 6.6) experienced folding and faulting prior to deposition of the Outwash. Local expressions of folding include the east flank of the Beezley Hills (west of the site and City of Ephrata) which is a monocline (a step-like fold in rock layers) with its downwarped limb to the east and south. Although regionally folded and faulted, the basalts are relatively flat-lying below the site and no faults were interpreted from the RI boring data.

The depth to the top of basalt is of significant interest to land use, construction, and drilling, and plays an important role in limiting aquifer extents and groundwater flow directions. It is a surface formed by water erosion primarily during glacial outburst floods emitting from the Grande Coulee north of Soap Lake. **Figure 7** shows basalt outcrops and elevation contours for the top of basalt. The site is shown to occupy a broad ridge of basalt that slopes gently downward to the south, from a high of 1280 feet above sea level. West of the ridge, the top of basalt drops steeply into a buried coulee approximately along the alignment of SR28. East of the site a broader low area trends southwest-northeast. The two low areas join south of the site where the top of basalt elevation is about 1040 feet above sea level. The low areas contain saturated Ringold Formation and Outwash (Section 7).

The CRB is divided into only three formations – the Saddle Mountains, Wanapum, and Grande Ronde. Each may be hundreds or thousands of feet thick, and comprise many basalt flows. They are separated by major members of the sedimentary Ellensburg Formation (Section 6.5). The Wanapum Basalt is the only CRB formation to outcrop near the site and it extends to 353 feet and 342 feet depth at MW-28d and 33E1 (respectively), the only on-site wells to completely penetrate it. Thus the Wanapum Basalt is the primary basalt formation of interest to the RI.

The Wanapum Basalt is divided into "members", two of which occur below the site: the Roza and Frenchman Springs. The Roza outcrops in the high area at the north end of the original landfill and extends down to the Interflow aquifer (Section 7). It is composed of

[10] Basalt flow layer characterized by irregular to random pattern of cooling joints, typically directly above the columnar layer.

up to four basalt flows (Columbia Basin Groundwater Management Area, 2009). The Frenchman Springs member occurs below the Interflow aquifer and above the Vantage Interbed (Section 6.5). The Frenchman Springs member may be composed of up to 15 separate basalt flows, and thus numerous interflow zones that can act as aquifers (Columbia Basin Groundwater Management Area, 2009).

Data to confirm identification of the basalt members were generated by geophysical measurements in several boreholes (**Appendix E**). The Roza Member exhibits transitional-to-reverse magnetic polarity, whereas the Frenchman Springs Member has normal polarity[11]. Significant increases or decreases in the signal recorded on the magnetic log may indicate passage across a contact between two oppositely magnetized basalt members. Significant decreases in the magnetic signal in MW-4c (~135 feet below measuring point (bmp)), MW-16d (~80 feet bmp), and MW-5c (~110 feet bmp) were interpreted to represent a transition from Roza basalt (above) to Frenchman Springs basalt (below) at the depth indicated. A significant decrease in magnetic signal was also observed in well MW-21c (~85 feet bmp). This decrease correlates with the contact between overlying outwash gravels and basalt.

The geophysical data generally support the interpretation that the "Roza Aquifer" as used in this report (Section 7) does indeed occur within the Roza member, and that the "Interflow Aquifer" as used in this report (Section 7) occurs at the contact of the Roza and Frenchman Springs basalt members; however, at well MW-5c and MW-21c, the geophysical data suggest that the Interflow Aquifer occurs within the Frenchman Springs basalt member (i.e. below the contact).

6.6 VANTAGE MEMBER OF THE ELLENSBURG FORMATION

The Vantage Member of the Ellensburg Formation is the sedimentary interbed occurring between the Wanapum Basalt and the Grande Ronde Basalt (**Figure 5**). It may consist of interbedded sandstone, siltstone, claystone, and tuff (Grolier and Bingham, 1978). The Vantage interbed was described as a light gray clay in MW-28d at 353 feet bgs, and as a brown, tan and gray-green, soft, gritty siltstone (ash) in 33E1 from 342 to 369 feet bgs.

6.7 GRANDE RONDE BASALT

The Grande Ronde Basalt occurs below the Vantage interbed. Like the younger Wanapum basalt, it is composed of many members and individual basalt flows. The landfill water supply well (33M1) was drilled in 1993, and penetrates the Grande Ronde from 369 feet (bottom of the Vantage interbed) to 640 feet bgs. The Grande Ronde was described as a relatively porous, fractured, and weathered formation within the open interval below the Vantage.

[11] Each basalt layer retains the magnetic polarity of the earth's magnetic field at the time the basalt flow occurred. Different layers may be distinguished today because they retain different polarities from the time of deposition.

7.0 HYDROGEOLOGY

Groundwater plays a prominent role in the movement of contaminants, and water supply wells are potential points of exposure of humans to the contaminants. Thus the RI has focused on groundwater occurrence, movement, and use. This section discusses the physical aspects of site aquifers, aquitards, groundwater flow paths, and hydraulic gradients, whereas Sections 8 and 9 discuss groundwater chemistry. The aquifers are discussed in the general order that groundwater moves through them from the north end of the original landfill (P1/P2, Roza, Interflow, Ringold, and Outwash). The Frenchman Springs and Grande Ronde aquifers do not fit easily into that scheme and are discussed last.

7.1 AQUIFERS AND AQUITARDS

Area aquifers include saturated portions of the Outwash sand-and-gravel, a permeable water bearing sandstone associated with the Ringold Formation and weathered and fractured zones within basalt layers. Aquitards are low permeability strata that restrict water movement between aquifers. Basalt aquitards are typically dense (hard), non-weathered columnar basalt sections within individual basalt flows. Low permeability sedimentary layers in the alluvium, Ringold and Ellensburg sediments also act as aquitards. Aquifer and aquitard thicknesses, depths, and extents vary across the site.

The great differences in permeability between basalt aquifers and basalt aquitards promote horizontal movement of groundwater and contaminants. Vertical movement is concentrated where aquitards are thin and weathered, such as between the P1 and P2 zones near the former drum cache and between the P2 and the Roza in the Hole. Diffuse vertical movement also occurs slowly through vertical fractures in the basalt aquitards. Aquitard properties have not been directly measured for the RI, but are inferred from geologic logging of boreholes, observations of geologic material at the land surface, groundwater levels, and distribution of contaminants.

The following sections describe local and regional aquifers and associated aquitards as they relate to the site.

7.1.1 P1 and P2 Zones

The P1 and P2 zones are saturated shallow basalt interflow zones that occur where the top of the Roza member of the Wanapum basalt (an erosional surface) is at 1230 feet elevation or higher (**Figures 8 and 9**). The P1 and P2 are separated by about 10 feet of dense basalt. The bottom of P1 is the top of a columnar basalt formation that forms the shelf where the drum cache was buried and possibly another shelf underlying the maintenance shop area. Water was observed above the basalt in some shop area test pits at about the same elevation as shallow groundwater in the drum cache excavation. Five new monitoring wells were installed in the P1 zone[12] and nine new wells were installed in the P2 zone[13], many near the former drum cache (**Table 1** and **Figures 2, 8, and 9**). The P1 and P2 zones were first monitored during the RI.

[12] MW-32a, MW-34p1, MW-36p1, MW-37p1, MW-41a
[13] MW-33p2, MW-35p2, MW38p2, MW-39p2, MW-40p2, MW-43p2, MW-46p2, MW-49p2, MW-52p2

The principal interest in these discontinuous water-bearing zones is their potential for connecting chemical source areas to more significant aquifers, such as the Roza. These zones would not normally be considered aquifers but they have the potential to supply small volumes of groundwater to wells (typically less than 1 gpm) or to transport chemicals to deeper aquifers. Short term aquifer pumping tests in these wells indicate low transmissivity where the unit is entirely basalt (**Table 4**). The median transmissivity measured in the P1 and P2 wells is 13 gallons per day per foot (gpd/ft) with a maximum of 380 gpd/ft and a minimum of 2 gpd/ft. MW-32a and MW-41a are screened where the P1 zone contacts overlying sediments, and have very high specific capacities that likely do not reflect basalt transmissivity.

Figures 8 and 9 show the P1 and P2 zone estimated extents, bottom elevation, thickness, groundwater flow directions, and the approximate extent of groundwater contamination in those zones. Whereas P1 occurs only below the north end of the site and nearby areas north of the original landfill, P2 was encountered in borings throughout the broad ridge of basalt on which the original landfill was developed. The top of basalt in the Hole is below the elevation of the P1 and P2 zones. Borings in several locations around the Hole intersected P1 and P2, yet neither zone was evident in borings within the Hole. The P1 and P2 zones are therefore interpreted to subcrop into the Hole (intersect the side slopes), although only the P2 appears to be conductive near the subcrop location[14] (**Figure 4**).

The bottom of P1 appears to slope consistently downward from the northwest to the area of the former drum cache (**Figure 8**). The bottom of P2 slopes downward to the northeast in the vicinity of the drum cache. These slopes may affect groundwater and contaminant movement (Section 9) since groundwater elevations in a number of wells are within the physical limits of the zones (i.e.: they may be unconfined and possibly perched in some locations).

The P1 and P2 zones are not used as water supply aquifers near the site nor are any water supply wells known to be open boreholes through these zones (**Table 2**).

7.1.2 Roza Aquifer

The next aquifer below P2 is the Roza aquifer (**Figures 4, 5, and 6**). The Roza aquifer is generally separated from the P2 by about 20 feet of dense basalt; although, in some areas the intervening basalt is relatively soft and weathered or as thin as 5 feet or less (MW-42b and MW-43p2). The Roza is a confined basalt aquifer within an interflow zone that is limited to the north end of the site. The Roza aquifer is highly heterogeneous and laterally discontinuous. It is bounded to the west of the original landfill in the vicinity of MW-18a by alluvial silt within a buried coulee that appears to truncate the aquifer (**Figure 4**). East and south of the shop area the Roza aquifer transmissivity is significantly reduced due to variations in basalt hydraulic conductivity and aquifer thickness[15] (**Figure 10**). The Roza aquifer lies below the bottom of the Hole.

The alluvial silt that occupies the upper 35 feet of the buried coulee west of the site appears to abut the Roza aquifer subcrop and limit groundwater discharge from the Roza

[14] The P1 was not observed about 100 feet west of the Hole during drilling of decommissioned well MW-8b (Figure 2).
[15] The aquifer thicknesses decreases and appears to eventually pinch-out to the east and south.

aquifer into the outwash aquifer that underlies the silt (**Figure 4**). Groundwater elevations in the Roza aquifer would otherwise likely be lower[16], and contamination in the Outwash aquifer west of the site would likely be greater (see Section 9).

Twelve monitoring wells and one extraction well are completed in the Roza aquifer[17] (**Table 1**). Short term aquifer pumping tests of wells near the former drum cache indicate very low transmissivity (10 gpd/ft or less, **Table 4**) whereas the area below the shop (EW-2, MW-3b, MW-7b, and MW-9) has much higher transmissivity (8,850 gpd/ft to 177,000 gpd/ft, **Table 4**). Other areas to the north have transmissivities between those two extremes. These data indicate the Roza is highly heterogeneous.

The Roza aquifer extends to the north beyond areas explored for the RI. It is not used locally for water supply aquifer (**Table 2**); however, based on the driller's log (**Appendix B**), the Whitson well (**Figures 2 and 6**) is an open borehole through multiple Wanapum basalt aquifers, and likely penetrates the Roza.

Groundwater elevations in wells completed in the Roza aquifer are typically 20 feet above the physical limits of the aquifer. This relationship suggests that the slope of the aquifer (**Figure 10**) is not likely to influence groundwater flow as much as it may in the shallower P1 and P2 layers that are generally unconfined and possibly perched.

7.1.3 Interflow Aquifer

The Interflow aquifer is a confined basalt aquifer that occurs below the Roza but above the Frenchman Springs. It is separated from the Roza by about 50 feet of dense basalt with a top elevation ranging from about 1120 to 1170 feet. The aquifer occurs over a wider elevation range than the other basalt aquifers studied for the RI, and likely represents more than one interflow. Significant differences in water levels between wells screened within the Interflow stratigraphic horizons (Section 7.2.3) suggests multiple interflow zones within the larger aquifer.

The Interflow Aquifer underlies the entire northern part of the site (north of the green hatched area of **Figure 11**), but to the south appears to sub-crop into the Outwash aquifer or Ringold Formation south of the original landfill in the vicinity of the new landfill (**Figures 5 and 11[18]**). To the southeast and southwest, the Interflow aquifer also likely sub-crops into either the Outwash or Ringold aquifers (**Figure 6**). It is also possible that this aquifer underlies the Ringold Formation east of the site (this uncertainty is represented by the question marks on **Figure 6**, and the green hatched area on **Figure 11**).

Twelve monitoring wells are screened in the Interflow aquifer[19] (**Table 1**). Short term aquifer pumping tests indicate that the aquifer has moderate transmissivity of about 5,000 gpd/ft below the original landfill at MW-5c and MW-6c, and low transmissivity (median

[16] Groundwater elevations in the Roza aquifer are about 50 feet higher than the Outwash aquifer.
[17] MW-3b, MW-7b, MW-8b (decom.), MW-9b, MW-19b, MW-29b, MW-30b, MW-31b, MW-42b, MW-44b, MW-48b, MW-51b, EW-2
[18] Figure 11 has a different format than figures 8, 9, and 10 because the Interflow aquifer is more extensive and complex. The green hatched area of Figure 11 is a zone within which the aquifer subcrops because of an eroded basalt surface, and it also reflects uncertainty in the extent of the aquifer.
[19] MW-2c, MW-4c, MW-5c, MW-6c, MW-20c, MW-21c, MW-22c, MW-45c, MW-47c, MW-50c, MW-54c, MW-55c (dry).

of 25 gpd/ft) at MW-4c and north of the original landfill (**Table 4**). The lower transmissivity to the north may represent conditions deeper in the aquifer system[20]; however, based on drilling observations, it more likely represents a horizontal transition to lower permeability in the aquifer system towards the north.

Water levels in wells completed in the Interflow aquifer are typically 20 to 30 feet above the physical limits of the aquifer-implying the aquifer is confined. This aquifer is targeted for water supply by some wells east of the site (**Table 2**, **Figure 6**). Although available records are not definitive, it is likely that the Moore (private) well southwest of the site is also open to the Interflow Aquifer.

Long term groundwater level monitoring indicates groundwater levels in the Interflow aquifer are similar to the Outwash aquifer, suggesting hydraulic connection between the two.

7.1.4 Ringold Aquifer

The Ringold Formation (present south of the site and east along Dodson road) is composed of partially cemented sediments above basalt that form both aquifers and aquitards near the site. At the south end of the site (**Figure 5**) the Ringold is characterized by low permeable interbeds of silty sandstone, siltstone, and claystone at least 70-ft thick (MW-24a and MW-25 a, **Appendix B**), forming an aquitard below the Outwash aquifer. Drillers' logs from supply wells east of the site near Dodson road (**Figure 6** and **Table 2**) describe a sandstone aquifer above basalt targeted for water supply (interpreted as the Ringold); therefore, the Ringold may be an aquifer east of the site[21]. A number of the logs also record clay (interpreted as the Ringold aquitard) over the sandstone. Although not confirmed by RI data[22], the Ringold aquifer may also occur below the Ringold aquitard at the south end of the site, like it does east of the site. Available data suggest the Interflow aquifer subcrops into the Outwash aquifer just above the top of the Ringold aquitard at the south end of the site (**Figure 5**). Thus the Ringold aquitard does not appear to inhibit groundwater discharging from the Interflow aquifer to the Outwash aquifer at the south end of the site.

Figure 11 shows the estimated extent of the Ringold Formation in the basalt erosional channel east and south of the site. Based on the Ringold aquifer's physical proximity to the Interflow aquifer and the Outwash Aquifer (discussed below), and the fact that they all have similar groundwater elevations (**Figures 5 and 6**), these three aquifers appear to be hydraulically connected.

7.1.5 Outwash Aquifer

The Outwash aquifer is an unconfined aquifer composed of saturated sands and gravels that overlie the basalt bedrock or the Ringold Formation (at the south end of the site and

[20] Interflow aquifer wells MW-45c and MW-54c have the lowest measured transmissivity and they are completed deeper in the interflow aquifer; however, a higher permeability zone in the Interflow aquifer was not observed during the drilling of these wells (Appendix B).
[21] No monitoring wells were completed in the Ringold aquifer; therefore aquifer characteristics have not been measured.
[22] Borings were not drilled through the entire thickness of the Ringold at the south end of the landfill (see well logs for MW-24a and MW-25a in Appendix B)

eastward towards Dodson road). The aquifer occurs south, east, and west of the site where the top of basalt decreases to less than 1190 feet (**Figures 4, 5, 6, and 12**). Eleven Outwash Aquifer monitoring wells provide water level and chemistry data for this aquifer[23]. Most of the wells are screened at the water table; however, wells MW-24a, MW-25a, and MW-26a are screened near the bottom of the Outwash aquifer, which has a saturated thickness of 55 to 60 feet at the south end of the site. Wells MW-10a and MW-11a are water table wells near wells MW-25a and MW-24a, respectively. MW-10a/MW-25a and MW-11a/MW-24a are considered nested pairs reflecting groundwater elevations and water quality at the top and bottom of the Outwash Aquifer. Short term aquifer pumping tests indicate high transmissivity (**Table 4**). An average transmissivity of 60,000 gpd/ft is estimated based on prior hydrogeologic work (B & V and PGG, 1990b) and tests for the RI. This estimate could be low due to minimal drawdown during testing.

Groundwater in the bottom of the Hole occurs in saturated sands-and-gravels mixed with refuse above bedrock (**Figure 12**); however, it is hydraulically separate from saturated sands-and-gravels of the Outwash aquifer. The Outwash aquifer extends to the northeast where it underlies and is recharged by reclaimed water infiltration from the City of Ephrata Water Reclamation Facility (**Figure 12**).

The Outwash Aquifer is not currently targeted for water supply because of its high vulnerability to contamination from surface sources. It is sealed-off in most wells reviewed as part of the RI except for the Bolyard shallow well (**Figure 12**), which is completed in the Outwash aquifer.

7.1.6 Frenchman Springs Aquifer and Vantage Interbed

The Frenchman Springs aquifer is a relatively permeable basalt interflow zone (occurrence varies spatially) separated from the Interflow aquifer by about 150 feet of dense basalt (**Figures 4, 5, and 6**). The top elevation of this zone ranges from 925 to 975 feet above sea level. Wet zones were identified during drilling in that elevation range in water supply wells 33E1, 33M1, and 32A2 (Atkins New). A new monitoring well, MW-28d, was installed in the Frenchman Springs as part of the Phase 1 RI work. MW-28d was installed near the northwest corner of the original landfill in the vicinity of potential sources of contamination and the old landfill supply well 33E1, which was an open borehole until May 1986[24]. Vertical migration of contaminants might have occurred through the old supply well that likely penetrated the Roza, Interflow, and deeper Frenchman Springs aquifer.

Although short term aquifer testing of MW-28d indicates a low transmissivity of only about 8 gpd/ft (**Table 4**), the number of water supply wells screened in this aquifer suggests the transmissivity is sufficient for water supply elsewhere. The water level in MW-28d is 150 feet above the well screen, indicating that the Frenchman Springs is a confined aquifer.

[23] MW-1a, MW-6a, MW-10a MW-11a, MW-14a MW-17a, MW-18a, MW-23a, MW-24a, MW-25a, MW-26a
[24] In May 1986, the old well seal was extended downward by cementing; however, because of continued contamination in the well, the old supply well was pressure grouted and decommissioned in 1993.

The Vantage Interbed forms a laterally extensive regional aquitard between the overlying Frenchman Springs aquifer and the deeper Grande Ronde basalt aquifers (**Figure 5**). The Vantage aquitard is an ash-rich siltstone about 25 feet thick.

7.1.7 Grande Ronde Aquifer

The Grande Ronde aquifer is characterized for the RI as a combination of transmissive interflow zones below the Vantage Interbed. The many interflows occur over thousands of feet of layered basalt, but only the upper few hundred feet have been penetrated by wells in the vicinity of the site[25]. The landfill supply well (33M1), City Irrigation well, and Olivares private well are open to various portions of this thick aquifer. No monitoring wells were installed in this aquifer. Well 33M1 was drilled in 1993, and penetrates the Grande Ronde from 369 feet (bottom of the Vantage interbed) to 640 feet bgs. The well was installed to develop a water supply for the landfill without interfering with environmental monitoring or remediation. It is open to the Grande Ronde formation below 395 feet bgs and had a static water level of 481 feet bgs (implying an unsaturated zone may exist below the Vantage interbed). The Grande Ronde was described in the 1993 well log as a relatively porous, fractured, and weathered formation within the open interval.

7.2 GROUNDWATER RECHARGE, FLOW, AND DISCHARGE

Groundwater flows into the aquifers beneath the site mainly from lateral groundwater movement from the northwest. Sources include natural groundwater discharge from the base of Beezley Hills near Oasis Park, leakage from the West Canal and ponds at Oasis Park (about ½ mile north-northwest of site; **Figure 1**), excess irrigation, and to a small extent precipitation. Precipitation in the Ephrata area averages less than 8 inches per year and almost all of it is lost to the atmosphere via evapotranspiration. Thus groundwater recharge from infiltration of precipitation is relatively small.

The West Canal of the Columbia Basin Irrigation Project is managed by the U.S. Bureau of Reclamation (the Bureau). The Bureau recently installed piezometers and an "interceptor well" near the Oasis Park and began pumping from the interceptor well in 2008 to reduce groundwater pressures on the canal liner. The well was operated more consistently in 2009 and a second Interceptor well was installed in late 2009 (personal communication with Carl Williams, U.S. Bureau of Reclamation in October 2009). Drawdown and recovery of groundwater levels in the piezometers precede drawdown and recovery of water levels in on-site Roza wells near the landfill's shop area (MW-3b, MW-7b and MW-9b) (**Figure 13**). The hydraulic response suggests a high permeability (and low storage) connection between groundwater at the two locations. Furthermore, the groundwater elevation in the Bureau's piezometers are at least 20 feet higher than the groundwater elevations measured in the landfill's monitoring wells, indicating the West Canal area is a significant source of groundwater recharge.

Large scale irrigated agriculture is widespread in the Beezley Hills immediately west of the canal. East of the canal and north of the original landfill, irrigation is currently limited to a single circle (owned by the City) near the City's Reclamation Facility (CRF)

[25] Based on nearby wells identified in the RI as penetrating the Grande Ronde (33M1, City Irrigation, and Olivares).

(**Figure 1**). In the 1980s, currently unused land directly west of the City's irrigation circle was under irrigated agricultural use. Irrigated agriculture in the site vicinity is based on groundwater (the canal water is used downstream). Pumping groundwater for irrigation removes water from deep aquifers and recharges shallow aquifers below the irrigated fields to the extent that excess water is applied and does not run off or evaporate. In the case of the City's current circle, water is extracted from multiple aquifers in the Wanapum and Grande Ronde, and excess water recharges shallow basalt aquifers (possibly the P2 and/or Roza[26]) and the Outwash aquifer.

Groundwater flow directions on site vary somewhat with location and over time, particularly in shallow basalt aquifers. Therefore, the distribution of groundwater contaminants in each aquifer is useful to augment understanding of groundwater movement. **Figures 8 through 13** present hydrogeologic maps with approximate contaminant plume boundaries for each aquifer. Plume boundaries are defined as areas where at least one volatile organic compound (VOC) had concentrations above RI screening levels (see Section 9.1). The boundaries are provided to aid the discussion of groundwater flow and contaminant pathways. Section 9 provides a more thorough discussion of groundwater contamination. Groundwater elevations and flow directions presented in the hydrogeologic maps are based on measurements collected over a 1 month period (December 15, 2009 to January 15, 2010)[27]. Although measurements between some wells may have been collected up to a month apart, groups of wells (e.g. the drum area and shop area) were all collected within two weeks of each other. Observations of seasonal variability to date, suggest the time of measurement differences do not affect flow direction interpretations significantly.

The following subsections describe groundwater flow (recharge, movement, and discharge) in each aquifer described above. The order of presentation follows that of the aquifer descriptions above.

7.2.1 Groundwater Flow in P1 and P2

Inflow to the P1 and P2 aquifers appears to occur primarily from leakage from the West Canal of the Columbia Basin Irrigation Project and natural groundwater discharge from the base of the Beezley Hills near Oasis Park (**Figure 1**). A spring was reported near Oasis Park prior to construction of the canal (personal communication with Bill Sangster of City of Ephrata Public Works, May 2009).

Additional recharge to the P1 might be by septic drainfield discharge. In the area of known P1 occurrence (**Figure 8**), the only drainfield is at the landfill office/shop. The landfill's drainfield likely only discharges up to a few hundred gpd, but might be locally significant[28]. Saturation in the P1 at the shop could be due at least in part to that discharge; however, well MW-41a was drilled substantially north of the drainfield and the groundwater elevation there is consistent with the regional gradient in this aquifer dis-

[26] The P1 zone does not likely extend as far north as the City's irrigation circle (Figure 8)
[27] Groundwater elevations were collected at the time of groundwater sampling and not all wells were sampled during a single field mobilization. All wells were sampled between December 15, 2009 and January 15, 2010
[28] The groundwater elevation in MW-41a by the shop (interpreted as spanning both the P1 and the Outwash) is generally 1foot higher or more than other P1 wells.

cussed below. Saturation above rock at the shop could therefore also be explained by the regional flow.

The net effect of groundwater recharge to the P1 zone is a hydraulic gradient and groundwater flow direction generally from northeast to southwest (see arrow on **Figure 8**). The large-scale direction may actually be northwest to southeast[29], but the network of wells is not sufficient to distinguish that detail on a large scale. The winter[30] groundwater elevation at the US Bureau of Reclamation piezometer (PZ-3) near Oasis Park was about 1279 feet above sea level while groundwater elevations on site (in the P1) varied from 1256 (north of the shop) to 1251 feet (**Figure 8**).

The network of P1 and P2 wells near the former drum cache allows limited analysis of local groundwater flow direction at that location. At the cache, the horizontal component of groundwater flow within P1 was south at a gradient of about 0.03 (**Figure 8**); however, there appears to be a strong downward flow component. The vertical downward gradient between P1 and P2 by the former drum cache is about 1.5 (high). A value greater than 1 suggests that water in P1 is perched. Also, downward flow is confirmed by the limited lateral spread of contamination in P1 near the drums (red dashed line on **Figure 8**), and extensive contamination of the underlying P2 zone (red dashed line on **Figure 9**). Saturated portions of the P1 zone near the shop also contain contamination (**Figure 8**) and have groundwater elevations that exceed that of groundwater elevations near the former drum cache. Lateral discharge of groundwater from P1 into other aquifers appears minimal.

Recharge to P2 occurs from the overlying P1, and, where P1 is absent, directly from the other recharge sources discussed above. The groundwater elevation in P2 is second highest of all the aquifers investigated in the RI, but the distribution is complex, with areas of high groundwater elevation (MW-46p2 and MW-40p2) and areas of low groundwater elevation (MW-49p2, MW-52p2, MW43p2 -**Figure 9** and **Appendix F**). Areas of high groundwater elevation may occur where downward flow from the P1 is greatest, where aquifer transmissivity is low, or, if P2 is perched, where the bottom of the aquifer is relatively high. Areas of low groundwater elevation more likely occur where recharge is low, downward flow to the Roza aquifer is high, and/or transmissivity is high.

Large scale horizontal groundwater flow direction appears to be southeast (possibly from canal leakage recharge and natural recharge from the Beezley Hills); however, the local flow direction in the P2 near the former drum cache (based on measurements in MW-33p2, MW-35p2, and MW-38p2[31]) was northerly, with some component to the west and east (see arrows on **Figure 9**). Note the northerly flow direction in the P2 near the drums is opposite to the flow direction in the overlying P1 zone.

[29] The bottom of the P1 zone appears to slope from the northwest, near sources of recharge (West Canal/Oasis Park), to the southeast, near the former drum cache (see Figure 8)...Because the P1 may be perched, this structural slope may influence flow directions. Also, the groundwater elevation in the furthest northwestern P1 monitoring well (MW-41a) is higher (up to 1 to 2 feet higher) than P1 monitoring well to the southeast (MW-34p1, MW-361p, MW-37p1, and MW-32a). Although continued monitoring will be required to know if this is true throughout the year.

[30] Bureau data from December 2009 was not available for this report so on-Site December 2009 water levels are compared to Bureau water levels from December 2008

[31] P2 monitoring wells do not occur south of this well grouping and therefore flow directions further south can not be assessed; however the aquifer eventually pinches out or subcrops to the south (Figure 9).

Discharge from the P2 zone might occur laterally to the Outwash aquifer above the water table. However given the 40 to 50 foot groundwater elevation difference between the P2 and the Outwash aquifer, hydraulic continuity is not direct. Local discharge from the P2 zone might also occur laterally into the Hole. Groundwater elevations in the Hole are generally slightly lower than groundwater elevations in the P2. In addition, downward flow is indicated by contamination in the Roza aquifer and a downward vertical gradient of about 0.2 between the P2 and the Roza. Downward flow from the P2 to the Roza is inferred to be greatest in areas where the basalt separating the two units is thin and/or highly fractured and/or weathered, which may create preferential flow pathways. The extent of contamination in P2 (see red dashed line on **Figure 9**) is somewhat larger than the P1 indicating some lateral spreading.

7.2.2 Groundwater Flow in the Roza Aquifer

Within the area investigated for the RI, recharge to the Roza aquifer apparently occurs primarily from downward leakage from the P2 zone, including leakage from the area of high groundwater elevation near Oasis Park. Downward leakage from groundwater in the Hole also recharges the Roza aquifer locally.

The Roza aquifer has a long record of water level measurements (**Figure 13**) as a result of groundwater monitoring for solid waste permit compliance. The record indicates about 1 foot of seasonal water level variation with the highest water levels occurring in summer when irrigation water is conveyed and applied. In 2008 the historical annual pattern changed, and small abrupt water level decline is observed in summer. This drawdown presumably resulted from the 2008 start-up of the US Bureau's interceptor well (TW-1) at the west canal (**Figure 1**).

The long term hydrographs for the Roza aquifer wells near the shop show the groundwater elevation in MW-9b is typically slightly lower than MW-7b and MW-3b indicating a southward groundwater flow direction in this area (top half **Figure 13**); however, the hydraulic gradient is almost flat in this area (average gradient is 8.1×10^{-4}) and as such flow directions can be variable and subject to limitations in measurement accuracy. Contrary to the typical historical condition, during certain times in 2008 and 2009 groundwater elevations in MW-3b and MW-7b were slightly lower than at MW-9b, indicating a northward flow direction. **Figure 14** presents a plot of groundwater flow direction azimuth (0 to 360 degrees) versus time based on a three-point calculation using wells MW-3b, MW-7b, and MW-9b. The recent change in groundwater flow is evident in the change from historic azimuths near 180 degrees (south), to azimuths near 0/360 degrees (north) in 2008 and 2009.

The recent change to a northward flow direction in the Roza aquifer in the vicinity of the shop is likely in response to pumping of the US Bureau's interceptor well (**Figure 15**). The interceptor pumping rate averages about 300 gpm during the irrigation season (March to October) and 100 gpm during the winter season (November to February) with groundwater discharged back into the canal approximately 200 yards downstream. Continued operation of the Interceptor well (and possibly a second pumping well that is

planned[32]) will likely continue to influence the flow direction in the Roza aquifer by the shop, and possibly elsewhere.

The average horizontal groundwater seepage velocity in the Roza aquifer between MW-3b, MW-7b, and MW-9b near the maintenance shop is estimated to be 450 ft/year (historically the flow direction has been southward). This estimate is based on an average hydraulic conductivity of 308 ft/day, an average horizontal hydraulic gradient[33] of 8.0×10^{-4}, and an estimated effective porosity of 0.2. The hydraulic conductivity was derived using an average transmissivity of 23,000 gpd/ft (PGG, 2002) estimated from a constant rate aquifer pumping test performed in the Roza aquifer by the maintenance shop (PGG, 2002) and an aquifer thickness of 10 feet.

In the vicinity of the former drum cache, the net direction of groundwater flow in the Roza aquifer is north-northwest, and north of the original landfill near MW-44b, the direction is northeast. This interpretation is based on both measured groundwater elevations and the shape of the Roza contaminant plume (red dashed line on **Figure 10**). Between July 2009 and December 2010 groundwater elevations decreased south of the former drum cache (MW-29b and MW-30b) resulting in a temporary shift to a southward flow direction in that area (**Appendix F**)[34]. Continued monitoring will be required to assess seasonal changes in flow directions by the former drum cache.

The calculated horizontal groundwater seepage velocity near the former drum cache is very low (0.9 ft/yr). The seepage velocity was calculated using the average horizontal gradient there (0.006), an average hydraulic conductivity of 0.1 ft/day (wells MW-29b, MW-30b, and MW-31b), and a porosity of 0.2.

The calculated horizontal groundwater seepage velocity north of the original landfill is 2 ft/yr based on the gradient between wells MW-44b, MW-48b, and MW-51b (one measurement of 0.02), a hydraulic conductivity of 0.06 ft/day[35] (MW-44b only), and a porosity of 0.2. Hydraulic conductivities trend higher from the drum area (MW-29b, 30b, and 31b) to the north (MW-51b) (**Table 4**), and seepage velocities may also increase. Changing the hydraulic conductivity to that of MW-51b (17 ft/day), a seepage velocity of 620 ft/yr is calculated. These calculations and hydraulic conductivity trends (**Table 4**) suggest increasing seepage velocity in the Roza aquifer moving north from the former drum cache.

The groundwater elevation from well MW-53a is plotted along with Roza aquifer groundwater elevations on **Figure 10**. Well MW-53a screens alluvial silt or loess above basalt in a draw eroded into the basalt northeast of the site. The elevation of basalt in the bottom of the draw (~1210 ft) is at or near the top elevation of the Roza aquifer predicted for that location, and it is below the measured groundwater elevation in well MW-51b.

[32] A second interceptor well was scheduled to be installed late 2009 (personal communication Carl Williams US Bureau, October 2009)
[33] Average horizontal hydraulic gradients used in seepage velocity calculations are calculated from multiple snapshot water level measurements collected from wells cited.
[34] Recent measurements in June 2010 indicated groundwater flow directions had shifted back to a northwest direction.
[35] Hydraulic conductivity value calculated using an average aquifer thickness (north of the landfill) of 15 feet.

Therefore portions of the Roza aquifer may subcrop into the draw and groundwater may discharge into the overlying sediments.

Limited discharge from the Roza aquifer also occurs downward to the Interflow aquifer under a vertical gradient of 0.9, and laterally to the Outwash (above the water table in the Outwash); however, the Roza aquifer appears rather isolated hydraulically from underlying and surrounding aquifers. Long-term monitoring has shown groundwater elevations measured in the Roza aquifer monitoring wells to be about 50 feet higher than the groundwater elevations in the Interflow and Outwash aquifers (**Figure 13**). The higher groundwater elevations are caused by a poor hydraulic connection between the Roza aquifer and the Outwash and Interflow aquifers. The poor hydraulic connection is a result of an underlying aquitard (dense basalt) and pinch-outs in the Roza aquifer to the south and east, and by the presence of silt abutting the Roza aquifer where it subcrops into the buried coulee to the west.

The Whitson private well (**Table 2**, **Figure 2**) is an open borehole that likely penetrates through the Roza to the Frenchman Springs aquifer. Given downward gradients observed in the basalt aquifers, Roza groundwater probably discharges to lower aquifers through the Whitson well (Section 7.1.2).

7.2.3 Groundwater Flow in the Interflow Aquifer

Recharge to the Interflow aquifer likely occurs through limited downward flow from the Roza aquifer, through the Interflow aquifer's hydraulic interaction with the Outwash aquifer, and from recharge in areas of the Beezley Hills where the Interflow aquifer outcrops. Water levels have been monitored in several Interflow aquifer wells since the late 1980s (**Figure 13**). The data show seasonal variation of 3 to 4 feet, maxima in fall, and a slow rising trend since 2001.

Groundwater elevations in Interflow aquifer wells around the perimeter of the original landfill (except for MW-4c and MW-20c) indicate a very low gradient with flow directions generally to the south. The calculated horizontal groundwater seepage velocity based on representative gradients of 0.0002 to 0.0004, an average hydraulic conductivity of 15 ft/day[36], and a porosity of 0.2, is about 5 to 10 ft/yr.

The groundwater elevation in MW-4c (northeast corner of original landfill) is generally 0.5 feet lower than the other Interflow aquifer wells around the original landfill perimeter. MW-4c might be affected by off-site irrigation pumping that does not affect the other Interflow aquifer wells.

The groundwater elevation in MW-20c, located northwest of the site near Oasis Park (**Figure 11**) is more similar to the Roza aquifer wells; however the well log indicates that MW-20c is screened in the Interflow aquifer stratigraphic horizon. Although MW-20c is located 1/3-mile up-gradient in the flow field from the on-site Interflow aquifer wells, the 50 foot water level difference between this well and other Interflow aquifer wells suggests a discontinuity in the aquifer, a misidentification of the aquifer, or a groundwater source to the northwest. The high groundwater elevation in MW-20c may be related to its

[36] Average hydraulic conductivity is based on the median measured value from landfill perimeter wells (B&V and PGG, 1990b)

close proximity to the West Canal and Oasis Park (i.e. recharge from West Canal leakage and Oasis Park).

RI work indicates groundwater elevations in Interflow aquifer monitoring wells north of the site (MW-45c, MW-47c, MW-50c, and MW-54c) are about 10 feet or more lower than groundwater elevations measured in the on-site Interflow aquifer monitoring wells. The lower groundwater elevations to the north could reflect strong downward vertical gradients, or larger off-site irrigation pumping effects. Transmissivity (**Table 4)** does not clearly increase to the north.

The overall pattern of groundwater flow inferred for the Interflow aquifer is thus from a high near MW-20c, with most flow occurring towards the east where groundwater elevations are lowest. Groundwater flow in the Interflow aquifer beneath the original landfill is southward discharging to the Outwash aquifer or Ringold Formation. Contaminant distribution corroborates the above understanding of Interflow aquifer groundwater flow. Red dashed lines on **Figure 11** show the approximate outline of groundwater contamination plumes in the Interflow aquifer. One Interflow aquifer plume lies below the original landfill and extends southward in the direction of groundwater flow. A separate Interflow aquifer plume extends east from the Whitson property (northeast of the original landfill). Contaminants in the Roza aquifer are thought to discharge through the open borehole of the Whitson well and contribute to contamination in the Interflow aquifer further east. Diffuse downward leakage from the Roza aquifer could also explain the contamination in the Interflow aquifer northeast of the site. A third plume shown on **Figure 11** is within the Ringold aquifer, thought to be associated with a separate off-site source (see Section 9).

Discharge from the Interflow aquifer occurs laterally into the Outwash aquifer and possibly the Ringold where present along the south, east, and west margins of the local Interflow aquifer (**Figures 5, 6, and 11**). Limited downward flow into the Frenchman Springs aquifer is also likely, and would occur under a vertical hydraulic gradient of about 0.3. Discharge also occurs from pumping wells and possibly by downward flow in open boreholes.

7.2.4 Groundwater Flow in the Ringold Formation

The portion of the Ringold Formation of interest to this project is not exposed at ground surface and appears to be surrounded by saturated basalt and outwash. Recharge and discharge from the Ringold is therefore likely dominated by interactions with the Interflow and Outwash aquifers. Where it is present, the clay unit at the top of the Ringold Formation likely inhibits rapid vertical exchange of water between the Ringold aquifer and the overlying Outwash aquifer. No monitoring wells are screened in the Ringold Formation and thus no detailed water level data or seepage velocities are available. The dominant groundwater flow direction in the Ringold may be southward in the direction of regional groundwater flow and along the northeast-southwest trending erosional basalt channel in which the Ringold occurs (yellow lines on **Figure 11**).

7.2.5 Groundwater Flow in the Outwash Aquifer

The Outwash aquifer is recharged by the same processes as the P1 and P2 zones (canal leakage, excess irrigation, on-site septic systems, and limited precipitation). In addition,

the Outwash aquifer receives an average recharge of about 400 gpm flow from the City of Ephrata Water Reclamation Facility northeast of the site (Gray and Osborne, Inc. 1996). The aquifer is also recharged by groundwater discharge from the Interflow aquifer and probably the Ringold aquifer. Recharge from the shallow basalt aquifers (P1, P2, and Roza) is probably very limited based on those aquifers' physical isolation from the Outwash.

Groundwater elevations, seasonal variations, and gradual increasing trends in the Outwash aquifer monitoring wells are similar to those observed in the Interflow aquifer (**Figure 13**). Groundwater flow is generally towards the south with an average horizontal seepage velocity estimated to be about 12 ft/year. This estimate is based on an average gradient of 3.6×10^{-5} (between MW-1a, MW-10a, and MW-17a and between MW-6a, MW-10a, and MW-11a), an average hydraulic conductivity of 130 ft/day calculated from aquifer tests performed during earlier site investigations (B & V and PGG, 1990b) and more recent RI work, and an estimated porosity of 0.2. The small differences in groundwater elevations in Outwash wells mean that gradient calculations are subject to significant error, which can result in errors in seepage rate calculations.

Upward vertical gradients are observed in the Outwash aquifer at the south end of the new landfill. The difference in groundwater elevations between monitoring well pair MW-10a (shallow) and MW-25a (deep) at the southwest corner of the new landfill and well pair MW-11a (shallow) and MW-24a (deep) at the southeast corner of the new landfill are about 0.5 and 0.8 feet respectively (**Figure 12**). The shallow wells are completed near the top of the Outwash aquifer and the deeper wells are completed near the bottom of the Outwash aquifer just above the Ringold Formation. The difference in groundwater elevations indicates a relatively steep upward vertical gradient of about 0.017. Steep vertical gradients are not expected in aquifers with high transmissivities, such as the Outwash aquifer. The upward vertical gradients in the Outwash aquifer may be related to groundwater discharge from the Interflow and/or Ringold aquifers. Alternatively, the difference in groundwater elevations may be due to a possible error in the deeper well's surveyed measuring point.

A plume boundary is drawn on **Figure 12** along with groundwater elevation and aquifer data for the Outwash. The plume does not occur directly below the original landfill, but is limited to areas south of the original landfill and appears to align with the channelized shape of the Outwash aquifer there. This plume is discussed in detail in Section 9.

Groundwater discharge from the Outwash aquifer probably occurs laterally to adjacent aquifers to the south and east. Downward leakage to low groundwater-elevation basalt aquifers such as the Frenchman Springs is also possible.

7.2.6 Groundwater Flow in the Frenchman Springs Aquifer

Groundwater likely enters the relatively deep Frenchman Springs aquifer through outcrops in the Beezley Hills and through downward leakage from the Interflow aquifer. Open boreholes (such as Whitson and Roland – **Table 2**), may also concentrate downward flow. The horizontal groundwater flow direction was not established in this deep aquifer through on-site measurements, but is predicted to be southeast based on regional work (Walters and Grolier, 1960) and the relationship between recharge areas (to the northwest) and discharge areas (to the southeast).

Because the Vantage Interbed aquitard underlies the Frenchman Springs aquifer, exchange of groundwater between the Frenchman Springs and Grande Ronde aquifers is highly restricted. The relative lack of vertical groundwater flow causes movement within this aquifer to be mostly horizontal. Discharge from this aquifer likely occurs far away at regional hydrologic sinks such as Moses Lake and the Columbia River. Discharge also occurs through pumping wells.

7.2.7 Groundwater Flow in the Grand Ronde Aquifer

Because the overlying Vantage interbed restricts downward flow of groundwater into the Grande Ronde aquifer, recharge is concentrated in areas where the aquifer is exposed at ground surface such as the Beezley Hills (**Figure 3**). Vertical downward flow through the Vantage interbed is widespread but extremely slow.

Groundwater elevations in the three local wells open to this aquifer are not consistent. The landfill supply well 33M1 is open to the Grande Ronde from 395 to 640 feet bgs. The static water level in that well is 418 ft bgs, which is 49 feet below the bottom of the Vantage interbed. The low water level is likely caused by an unsaturated zone below the Vantage, but could also be explained by downward gradients within the Grande Ronde. The upper portions of the Grande Ronde did not produce water during drilling of 33M1 and the upper portions of the formation were therefore interpreted to be unsaturated. In contrast, high static water levels are observed in the City irrigation well (37 ft bgs) and the Olivares residential well (33 ft bgs). The estimated elevations of the static water levels in the three wells vary considerably (791, 1192, and 1187 feet above sea level, respectively)[37]. The two higher groundwater elevations are *above* the groundwater elevations in the overlying Frenchmen Springs. If those higher elevations are real, they imply an upward vertical gradient and the potential for upward groundwater flow across the Vantage interbed, instead of the downward flow that is verified in the shallower zones.

The Grande Ronde aquifer is protected from groundwater contamination as a result of the overlying Vantage interbed. Therefore the RI did not seek to resolve the uncertainty in groundwater flow directions within that aquifer.

8.0 BACKGROUND CHEMISTRY

Background chemistry data for soil and groundwater are characterized in the subsections below. Background concentrations of VOCs are assumed to be zero or below laboratory reporting limits.

8.1 BACKGROUND GROUNDWATER CHEMISTRY (INORGANIC PARAMETERS)

Background groundwater chemistry in the Ephrata area is controlled by the mineralogical composition of the rock and soil in contact with the groundwater and the age of the groundwater (1989, Steinkampf). Over time, dissolution, precipitation, and other chemical processes lead to distinct groundwater chemical compositions (Hem, 1985). Land use, mainly agricultural practices, also influence groundwater chemistry in the area

[37] Groundwater elevations from all three wells are based on static water levels collected at time of drilling.

(1989, Steinkampf). Background chemistry defined for the Ephrata area is assumed to include groundwater impacts from surrounding agricultural practices.

Up to 26 wells sampled in the general area of the site and former drum cache were used to characterize the inorganic background groundwater chemistry, including major cations and anions, nitrate, which is elevated in the Ephrata region due to agricultural practices (**Table 5**, 2008, S.S. Papadopulos & Associates, Inc. and 1989, Steinkampf), and arsenic, which could be naturally elevated. Naturally elevated arsenic concentrations are common in volcanic areas of the Western United States (Welch et al, 1988). The wells chosen for background characterization include site monitoring wells and sampled private wells that do not have detections of VOCs and are therefore not likely impacted by the site[38]. Chemical data used for background characterization are from samples collected since 2001 (the number of sampling events per well varies from 1 to 37). Background statistical summaries in **Table 5** were calculated using the maximum concentration observed since 2001 from each well. More than half the wells used to define background are completed in the Interflow aquifer; therefore background chemistry for individual aquifers was not included in this analysis.

The relative percentage of the major cations and anions for background wells is visually displayed in a Trilinear Diagram (**Figure 16**). The diagram shows that background groundwater chemistry is relatively high in bicarbonate and calcium, moderate in magnesium, and relatively low in chloride, sulfate, sodium and potassium. Total dissolved solids are generally less than 500 milligrams per liter (mg/L). This composition is typical for this area (1989, Steinkampf).

Background concentrations were calculated only for inorganic contaminants of concern (**Table 5**). Inorganic COCs are nitrate, arsenic, chloride, iron, manganese, and sulfate. In accordance with WAC 173-340-709, background concentrations are defined as the upper 90th percentile for log-normally distributed data, the upper 80th percentile for normally distributed data, or four times the 50th percentile for either distribution if this value is lower. A Shapiro-Wilk W-test for normality was performed to assess the most appropriate distribution (normal or log-normal) to use for each parameter (**Table 5**).

8.1.1 Background Nitrate in Groundwater

Nitrate concentrations from 26 background wells ranged from less than 0.01 mg/L to 8.8 mg/L with a 50th percentile of 2.8 mg/L (**Table 5**), which is similar to other studies in this area (2008, S.S. Papadopulos & Associates, Inc. and 1989, Steinkampf). A normal distribution is estimated for nitrate and background is defined as 4.1 mg/L (80th percentile). The dataset includes nitrate measured from four nearby wells along Dodson road (SG011, SG012, SG015, SG024 and SG044 in **Figure 1**) for the Columbia Basin Groundwater Management Area study on nitrate (2008, S.S. Papadopulos & Associates, Inc.). The dataset also includes nitrate measured in the City's reclamation wells (City MW-1 and City-MW-3) in September 2009 (data provided by City of Ephrata Public Works).

[38] A few monitoring wells in the "background" dataset had low level detections of acetone, methylene chloride, carbon disulfide, and/or toluene during one or more past sampling events that are likely related to laboratory contaminants. A few other low level VOCs were detected at Atkins Old and MW-16d prior to 2001, but these detections were either flagged as suspect by the lab or detections of these VOCs have not occurred since 2001.

Background nitrate concentrations greater than 5 mg/L generally occurred in wells less than 200 feet deep and in wells located east of the site. Elevated nitrate also occurred in the City's reclamation monitoring wells (City MW-1 and City MW-3) northeast of the site. In September 2009, the City measured nitrate concentrations in groundwater of 8 mg/L and 8.8 mg/L in MW-1 and MW-3 and more recently (June 2010) 5.7 mg/L and 5.4 mg/L respectively (personal communication with Troy Zerb June 2010, City of Ephrata Reclamation Facility). Total nitrogen in the effluent (before infiltration) is typically 4 to 8 mg/L (personal communication with Troy Zerb June 2010, City of Ephrata Reclamation Facility). Some of the elevated nitrate in groundwater may be related to infiltration of reclaimed water at the City's reclamation facility.

8.1.2 Background Arsenic in Groundwater

Arsenic concentrations from 19 background wells ranged from less than 0.2 ug/L to 4.3 ug/L with a 50th percentile of 2 ug/L (**Table 5**). A normal distribution is estimated for arsenic and background is defined as 3.0 ug/L (80th percentile).

Arsenic concentrations in almost all Outwash aquifer monitoring wells were generally slightly greater than the background value of 3.0 ug/L. Arsenic concentrations in the Outwash aquifer monitoring wells generally ranged from 2 to 8 ug/L, with an average of 4.2 ug/L. Elevated arsenic was also detected in the Bolyard-shallow private well (10 ug/L), which is also completed in the Outwash aquifer approximately 1,500 feet east of the new landfill.

Outwash aquifer wells were not included in the background groundwater characterization because of low-level concentrations of tetrachloroethene (PCE) were detected in these wells. The elevated arsenic in the Outwash aquifer is likely naturally occurring.

8.1.3 Background Chloride, Iron, Manganese, Sulfate, TDS, Alkalinity, and Carbon Dioxide in Groundwater

Chloride concentrations from 16 background wells ranged from 3.7 mg/L to 18 mg/L with a 50th percentile of 8.5 mg/L (**Table 5**). A normal distribution is estimated for chloride and background is defined as 13.2 mg/L (80th percentile).

Dissolved iron concentrations from 16 background wells were less than the laboratory detection limit, except for one detected concentration of 50 ug/L. Background is therefore defined as the laboratory reporting limit (50 ug/L).

Dissolved manganese concentrations from 17 background wells ranged from less than 1 to 91 ug/L with a 50th percentile of 8 ug/L (**Table 5**). A log-normal distribution is estimated for dissolved manganese and background is defined as 32 ug/L (four times the 50th percentile).

Sulfate concentrations from 17 background wells ranged from 9.2 to 67.8 mg/L with a 50th percentile of 34.6 mg/L (**Table 5**). A normal distribution is estimated for sulfate and background is defined as 50.9 mg/L (80th percentile).

Total dissolved solids (TDS) from 15 background wells ranged from 189 to 358 mg/L with a 50th percentile of 248 mg/L (**Table 5**). A log normal distribution is estimated and background is defined as 307 mg/L (90th percentile).

Background concentrations of carbon dioxide and alkalinity are not COCs but are defined for assessing biodegradation scores for groundwater (see Section 9.4). Carbon dioxide concentrations from 9 background wells ranged from 0.47 to 9.2 mg/L with a 50th percentile of 2.4 mg/L (**Table 5**). Alkalinity (as $CaCO_3$) concentrations from 16 background wells ranged from 104 mg/L to 219 mg/L with a 50th percentile of 153 mg/L. For the biodegradation assessment, the background concentrations of these two parameters are defined as the maximum concentration observed in background.

8.2 BACKGROUND SOIL CHEMISTRY (RCRA METALS)

Soil samples were collected in September 2006 for characterization of background RCRA[39] metal concentrations. RCRA metals are arsenic, barium, cadmium, lead, mercury, selenium and silver. Soils were collected at on-site locations not expected to be impacted by landfill activities. Five soil samples were collected from unsaturated sand and gravel deposits (Outwash) in undisturbed cutbanks between the old and new landfills and five samples were collected from silt deposits (Loess) at the surface of bedrock north of the original landfill (**Table 6**).

Metal concentrations were generally slightly higher in the silt deposits compared to the sand and gravel deposits. Except for one sample (S-2) with elevated barium (640 mg/kg) metal concentrations were fairly consistent between samples (**Table 6**) and do not display a log-normal or normal distribution. Background concentrations are therefore defined as the maximum concentration observed (**Table 6**).

9.0 CONTAMINATION

This section is organized into the following subsections:

- Contaminants of Concern (COCs)
- Contaminant Sources and Release Mechanisms
- Natural Attenuation Processes
- Biodegradation and Geochemistry at the Site
- Nature and Extent of Groundwater Contamination

9.1 CONTAMINANTS OF CONCERN

COCs are chemical parameters that exceed RI screening levels (**Table 7**). RI screening levels are equal to the Department of Ecology's Cleanup Levels and Risk Calculations (CLARC) Method B values from MTCA (WAC 173-340) and state groundwater con-

[39] Resource Conservation and Recovery Act (RCRA)

taminant levels (GWCL; WAC 173-200) [40]. State GWCLs are used as screening levels for inorganic parameters that exceed GWCLs but do not have established MTCA Method-B levels.

MTCA Method-B levels and modified Method-B levels are used in combination with points-of-compliance within corrective action programs to define the extent of cleanups, while the GWCLs are the threshold concentrations that establish a corrective action requirement under the solid waste permitting regulation WAC 173-351 (and State waste discharge permit programs). The RI screening levels may be adjusted during the development of cleanup levels in the Feasibility Study in accordance with WAC 173-340-720 (4).

The list of COCs include those identified in the original RI/FS Work Plan (PGG 2006), additional organics detected at least once in shallow groundwater above screening levels near the former drum cache, and a few detected organic constituents with no established screening level (**Table 7**).

9.1.1 Organic COCs

The organic COCs for groundwater identified in the RI Work Plan (PGG and Parametrix, 2006) include chemicals in the following groups of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOC) (**Table 7**):

- Chlorinated ethenes
- Chlorinated ethanes
- Chlorinated methanes
- Benzene, toluene, ethylbenzene, and xylene (BTEX)
- Dichlorobenzenes
- 1,2 Dichloropropane (1,2-DCP)
- Bis(2-ethylhexyl) Phthalate (SVOC)

Additional VOCs were detected above screening levels in shallow groundwater (P1 and/or P2 zone near the former drum cache) and were thus added to the COC list during the RI; VOCs that were detected at least once above screening levels are included. These new COCs are:

- Ketones: 2-Butanone, 4-methyl-2-pentanone, and acetone
- Additional chlorinated ethanes: 1,1,1-Trichloroethane (1,1,1-TCA) and 1,1,2-Trichloroethane (1,1,2-TCA)
- 1,2,4-Trimethylbenzene
- Chloroform
- Naphthalene

Ketones account for more than half the total VOC mass in most of the shallow groundwater wells near the former drum cache. Ketones have not been detected above RI screening levels at other site wells, indicating that they have not migrated far from the drum area.

[40] Federal Maximum Contaminant Levels (40 CFR 141.61) are used for VOC screening if Federal MCL values are lower than MTCA Method-B

The following VOCs have no established screening levels but were detected in at least one well. They therefore were added to the COC list:

- n-Butylbenzene
- sec-Butylbenzene
- 1,3-Dichlorobenzene
- 2-Hexanone
- 4-Isopropyltoluene
- Bromobenzene
- n-Propylbenzene

9.1.2 Inorganic COCs

Inorganic COCs in groundwater are:

- arsenic
- iron
- manganese
- chloride
- TDS
- nitrate
- sulfate

Groundwater concentrations of arsenic and nitrate, however, are elevated in the Ephrata area due to natural background (arsenic) and agricultural practices (nitrate) as described in Section 8.1.

Impacted wells generally have higher TDS and relatively more chloride compared to the background wells (**Figure 17**). TDS in impacted wells is generally greater than 1000 mg/L.

9.2 CONTAMINANT SOURCES AND RELEASE MECHANISMS

Historical and current sources of contamination and their release mechanisms differ because completed and ongoing interim actions have either removed sources or eliminated release mechanisms (Section 4). Interim Actions included drum and soil removal, capping of the original landfill, installation of a gas collection system for the original landfill, groundwater pump and treat (two seasons from the Hole and MW-34p1), and LNAPL extraction. These actions will contribute to reducing contamination in groundwater over time.

Remaining sources that may continue to contribute to groundwater contamination are characterized in this subsection.

Site sources and potential release mechanisms that may contribute to future groundwater contamination include (ranked in order of decreasing significance[41]):

SOURCE	RANK	ORGANIC COC	INORGANIC COC
Former Drum Cache (Residual Contamination)	1	Yes (high)	Unknown
Leachate	2	Probably (low to moderate)	Yes (low to moderate)
Off-site (East)	3	Yes - PCE (low)	Not Apparent
Landfill Gas	4	Probably (low)	No
Shop Area	5	Yes - PCE (low)	Probably
Off-site (West)	6	No	Yes - Nitrate

Potential release mechanisms that may contribute to future groundwater contamination from sources include:

- Mobilization of residual contaminants associated with the formerly buried drums via dissolution into groundwater
- Leaching of landfill refuse from the original landfill (including saturated refuse in the Hole)
- Diffusion of original landfill gas
- Mobilization of potential historic releases of contaminants in the vicinity of the maintenance shop via dissolution from soil into groundwater

Numerous soil and gas samples were collected and analyzed in an off-site lab as part of the source area investigation, including 40 soil samples from test pits and borings excavated at the north end of the original landfill and 18 gas samples collected from the original landfill's gas collection wells[42] and temporary probes installed in the test pits (**Figures 1 and 2**). Twelve residual soil samples were also collected from locations identified as potential pathways leading from the excavated drum cache (**Figure 2**). The source area investigative work is described further in the Phase 1 RI Report (**Appendix A**).

Many of the VOCs found in residual contaminants beneath the former drum cache, soils mixed with landfill refuse, soils near the shop, and landfill gas are the same VOCs that are detected in groundwater monitoring wells. Although the potential sources contain similar VOCs, the sources differ greatly in other characteristics. For instance, concentra-

[41] Ranking is based on the extent to which sources likely contribute to exceedances of groundwater screening levels off-Site. Leachate ranking is based on exceedance of COCs in the Interflow aquifer around the perimeter of the original landfill; however, some of the COCs detected in the Interflow aquifer may originate from other sources.
[42] A few additional gas samples were collected as part of the Phase 2 work in 2009 after the landfill cap was installed. These included four gas extraction wells and a composite gas sample near the flare system.

tions of VOCs in residual contaminants beneath the former drum cache are orders of magnitude higher than the other sources, suggesting drum area residual contamination is the largest source of contamination in that area. However, landfill refuse and gas cover a much larger area and may contribute to a more diffuse low-level contaminant plume (see Section 9.5.3).

On-site groundwater is likely impacted by more than one source (see relative importance ranking above). The high concentration of VOCs in shallow groundwater (P1 and P2 zone) in the vicinity of the former drum cache is direct evidence that this source has a relatively high impact on groundwater quality in that area. Unambiguous evidence of landfill leachate and landfill gas contributing to VOCs in groundwater is not available because of the possibility of drum related contaminants mixing with groundwater impacted by these sources[43]. In contrast to the ambiguity of VOC sources, elevated leachate indicator parameters (e.g. chloride) in groundwater around the original landfill is unambiguous evidence that landfill leachate impacts groundwater.

Although landfill gas chemical releases to groundwater cannot be distinguished from other sources, it might contribute to VOC contamination in shallow groundwater below the original landfill by diffusion to groundwater in the Hole or to groundwater in the P1 zone (where in contact with overlying refuse). Diffusion of landfill gas to basalt aquifers below the P1 is unlikely because of the presence of intervening low permeable basalt aquitards. Landfill gas might also contribute to groundwater contamination in the Outwash aquifer. However, the Outwash aquifer is located east, west, and south of the original landfill footprint and VOC concentrations are low in this aquifer and may include other diffuse sources (see Section 9.5.7).

The low concentration of VOCs in shallow groundwater (P1 and P2 zone) in the vicinity of the maintenance shop indicates impacts to groundwater quality from potential releases near the maintenance shop are relatively low.

The following subsections characterize these contaminant sources.

9.2.1 Residual Contaminants associated with Former Drum Cache (Soils and LNAPL)

Contaminant sources and release mechanisms that may contribute to ongoing groundwater contamination beneath the former drum cache include mobilization of contaminants from residual contaminated soils/refuse and LNAPL in shallow groundwater zones by the former drum cache. The high concentration of contaminants measured in shallow groundwater (P1 and P2 zones) by the former drum cache is direct evidence of this source's contribution to contamination in shallow groundwater.

Residual Contaminated Soil

The character of contaminated soils left within the excavation of the former drum cache (residual soil) is based on twelve soil samples collected after soils below the drums were investigated and removed to the extent practical (**Figure 2**). Samples were collected from locations of expected high concentrations at the end of observable contaminant pathways

[43] VOCs detected in groundwater in the Hole may be from leaching of landfill refuse, diffusion of landfill gas and/or contaminants migrating from the former drum cache.

and within bedrock joints (all within the excavation). Therefore, the residual samples likely represent maximum residual soil concentrations at the bottom of the drum removal excavation. However, residual contamination likely extends beyond the footprint of the drum excavation towards the south[44], where the presence of landfill refuse made further excavation of contaminated soils infeasible (**Appendix A**). Residual soil samples were analyzed for VOCs, SVOCs[45], polychlorinated biphenyls (PCBs), select metals, chloride, nitrate, nitrate+nitrite, nitrite, and sulfate. Analytical data tables are presented in the Phase 1 RI Report (**Appendix A**).

Organic contaminants detected in residual soil samples included VOCs, SVOCs (mainly phthalates and naphthalenes); and PCBs (aroclor 1242). Pesticides and herbicides were not analyzed since they were not detected in the soils sampled directly below the drum cache (**Appendix A**).

VOCs were the dominant class of organic contaminants in the residual soils, with total VOCs ranging from less than 1 milligram per kilogram (mg/Kg) to about 4,500 mg/Kg. The maximum residual contamination occurred within fracture fillings in the top of the basalt surface below the center of the drum excavation (SS-5 and SS-8, **Figure 2**) and at the two sampling stations along the southern edge of the excavation (SS-1 and SS-2, **Figure 2**). Contaminant concentrations were lowest (single digit mg/Kg or less) along the north, east, and western edges of the excavation (except for SS-6 in the northwest corner where concentrations were double digit mg/Kg). The dominant VOCs detected were total BTEX and trimethylbenzene (1,2,4 and 1,3,5) compounds. Toluene was the dominant BTEX compound; benzene was not detected. Ketones were not detected in the most contaminated soils; although detection limits were elevated for these samples. Chlorinated ethanes and chlorinated ethenes generally accounted for less than 2 percent of the total VOC mass detected in residual soils. Tetrachloroethene (PCE) and trichloroethene (TCE) were detected in a few of the most contaminated soils at concentrations ranging from less than 0.01 mg/Kg to about 30 mg/Kg, except for sample SS-2 (southern margin of excavation) where PCE was detected at 250 mg/Kg. 1,1,1-TCA was detected in a few of the most contaminated soils at concentrations ranging from less than 0.01 mg/Kg to 48 mg/Kg (SS-2).

Total SVOCs ranged from less than 1 mg/Kg to 340 mg/Kg and PCBs ranged from less than 1 mg/Kg to 310 mg/Kg.

A few RCRA metals in the residual soils were higher than background concentrations (Section 8). Arsenic was detected at 20 mg/Kg in SS-5 (background concentrations range from 1.4 to 3.2 mg/Kg). Cadmium was detected at 0.6 and 0.7 mg/Kg in SS-1 and SS-5 respectively (background concentrations range from 0.04 to 0.12 mg/Kg). Chromium was detected at 80 mg/Kg in SS-8 (background concentrations range from 3 to 15 mg/Kg). Lead was detected at values ranging from 9 to 11 mg/Kg in SS-2, SS-5, SS-7 and SS-8 (background concentrations range from 3 to 5.4 mg/Kg). Mercury was detected at values ranging from 0.08 to 0.15 mg/Kg in SS-2, SS-5, SS-6 and SS-8. Background mercury in soils (0.003 to 0.0092 mg/Kg) is below the practical quantification limit (PQL) (**Table 6**).

[44] During the removal action, about eight percent of the druTotms (195 drums) were noted to have been breached (see Section 4.1). Contaminants that leaked from the drums may have migrated beyond the footprint of the excavation and contribute to residual contamination.
[45] Semi-volatile organic compounds

The mechanism of release from residual soils is desorption of contaminants from the soil into groundwater, and likely diffusion of VOCs into soil gas, then groundwater. Diffusion of contaminants to ground surface with soil gas is also possible; however this pathway has likely been reduced with the recent capping of the original landfill which included the area of the former drum cache.

Complete residual soil data can be found in the Phase 1 RI Report (**Appendix A**).

Light Non-Aqueous Phase Liquid (LNAPL)

LNAPL, characterized as a brown oily phase floating on groundwater, was observed in the drum excavation (Section 4.4) and in the P1 shallow groundwater zone immediately south of the former drum cache (MW-34p1 and MW-36p1, **Figure 2**). LNAPL has not been detected elsewhere and is therefore not thought to have migrated beyond the former drum cache area. Since observations first began in these wells (March 2009), LNAPL thicknesses increased from non-measurable (thin sheen) in June of 2009 to a maximum thickness of 1.0 ft in MW-36p1 and 0.14 ft in MW-34p1 by August/September of 2009. LNAPL thicknesses in both wells decreased back to non-measurable (thin sheen) as of February 2010 (latest measurement). The variable thickness is likely related to seasonal changes in P1 groundwater elevations and groundwater gradients in the immediately vicinity of these wells. The highest measured LNAPL thickness occurred when MW-34p1 and MW-36p1 groundwater elevations were lowest (**Appendix C**).

LNAPL management is an ongoing Interim Remedial Action (Section 4.4). LNAPL has been collected from both wells with absorbent socks since March 2009. Estimated total LNAPL removed as of March 2010 is three gallons from MW-34p1 and eight gallons from MW-36p1. A plan to manage a thicker layer of LNAPL was developed in 2009 and will be finalized and implemented if warranted by increasing LNAPL thickness in the future (see Section 4.4).

An LNAPL sample was collected from MW-36p1 with a disposable bailer in July 2009 and analyzed for VOCs (EPA method 8260B). Laboratory reporting limits were high (2,500 ppm to 12,000 ppm) and therefore the detected VOCs only represent the most abundant VOCs in the sample (**Table 8**). The total detected VOCs (262,300 mg/Kg) are many orders of magnitude higher than any other source and accounted for 26 percent of the total LNAPL mass with toluene accounting for 15 percent of the total mass. Other detected VOCs included xylenes (7.4 percent), ethylbenzene (1.8 percent), trimethylbenzene (1.37 percent), propylbenzene (0.36 percent) and PCE (0.3 percent). The remaining 74 percent of the LNAPL mass is unaccounted hydrocarbons and other VOCs below detection limit. A groundwater sample collected from MW-36p1 in November 2008 for hydrocarbon analysis indicated 6.2 mg/L total hydrocarbons with a dominance of diesel and motor oil range hydrocarbons (see Table 14 in the Phase 1 RI Report, **Appendix A**).

No dense non-aqueous phase liquids (DNAPL) have been detected. DNAPL was not observed in wells or in the drum excavation, and concentrations of DNAPL contaminants in groundwater generally decrease with depth, rather than increasing as would be the case if DNAPL were present. Furthermore, concentrations of DNAPL contaminants detected in groundwater (PCE, TCE, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,-

dichloroethane, and 1,2-dichloroethane) were typically less than 0.1 percent of saturation[46] with the highest concentrations near the former drum cache.

The mechanism of release from the LNAPL source is dissolution of contaminants from the LNAPL phase by groundwater, and diffusion of VOCs into soil gas, then groundwater. Diffusion of contaminants to ground surface with soil gas is also possible.

9.2.2 Landfill Refuse and The Hole

The original unlined landfill covers approximately 42 acres and has an estimated volume of 1.8 million cubic yards (includes refuse and soils mixed in the landfill). Leaching of contaminants from refuse may continue to be a source of groundwater contamination, although leaching rates have decreased since the original landfill was capped in 2008. Leachate generation rates prior to capping (based on volumes collected in lysimeters) are estimated to be about 0.2 in/year. Leachate volumes collected from landfill lysimeters (**Figure 1**) were less in 2009 (265 gallons) compared to average values before 2009 (340 gallons), suggesting leachate generation rates have decreased since capping.

Refuse in the Hole will likely continue to be saturated with shallow groundwater and COCs may continue to leach into groundwater. The Hole is a 20 foot deep depression in the basalt surface beneath the original landfill. The bottom 5 to 7 feet of refuse and soil are saturated with groundwater. The area of refuse saturation is approximately 1-acre and the volume of saturated refuse is estimated to be 8,000 cubic yards (**Figure 2**). Groundwater in the Hole is likely derived from shallow groundwater sources upgradient of the original landfill (such as seepage from the P2 zone and possibly the P1 zone).

Leaching from original landfill refuse and groundwater in the Hole is further characterized below.

9.2.2.1 Landfill Refuse

Characterization of landfill refuse in the original landfill is based on eight borings (borings B-9 through B-16, **Figure 2**) drilled through refuse to the top of bedrock in the northwest corner of the original landfill during the source area investigation completed in 2007 (PGG, March 2008a and RI Phase 1 Report of **Appendix A**). Borings were drilled using a sonic drill rig with continuous soil sampling. Soils mixed with refuse were selected for laboratory analysis from discrete depths, based on field PID[47] readings. Soils were analyzed for COCs indentified in the original work plan. Ketones (acetone, 2-butanone, and MIBK), which were not part of the original COC list, were not analyzed in soils mixed with refuse and therefore cannot be compared directly to ketones detected in the drum area soils. However, acetone and 2-butanone were detected in landfill gas samples suggesting ketones also occur in landfill refuse. Three borings (B-9, B-12, and B-13) encountered groundwater in the Hole and monitoring wells were installed in B-9 and B-12 (the wells are called W-9 and W-12).

[46] PCE and 1,1,1-trichloroethane concentrations in one sample from the P1 zone (B-22-p1) were at 0.35 percent and 0.3 percent saturation respectively (see phase 1 report in Appendix A) and 1,1-dichloroethane concentrations were at 0.13 percent saturation during second sampling event (Round 4) for MW-34p1 (see Appendix H).

[47] A Photo ionization detector (PID) for measuring total VOCs was used to screen soils for sample selection. Soils with the highest PID readings were chosen for laboratory analysis (see PGG, August 2007a Task 3 and Task 4 SAP).

Total VOCs from soils mixed with landfill refuse ranged from 0.009 to 9.6 mg/Kg. Concentrations varied between borings and with depth at a particular boring. The highest concentrations were observed in B-12-48 (48 feet deep, immediately above groundwater, in B-12). In all but two samples (B-9-30 and B-12-48), the dominant VOC class detected was total BTEX, with xylenes typically being dominant. Chlorinated ethenes (PCE, TCE, cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride) were also present in seven of the eight borings and were the dominant VOC class in B-9-30 and B-14-28. The only chlorinated ethane detected was chloroethane (CA) in two borings (B-10-9 and B-14-28). Other detections in landfill refuse soils included 1,4-dichlorobenzene and methylene chloride.

Elevated concentrations of arsenic above background (3.2 mg/kg) were detected in a number of landfill soil samples. Concentrations above background ranged from 3.4 to 17.3 mg/kg.

Characterization of original landfill refuse as a potential source is also based on samples of landfill leachate (**Table 9**). Leachate from the southeast corner of the original landfill is collected in three lysimeters with a collection footprint of 20 foot by 40 foot each beneath the refuse (**Figure 1**). The lysimeters were installed in the late 1990s and discharge to two manholes (Lysimeter1 and Lysimeter2 in **Figure 1**). Leachate samples are collected annually from effluent in the two lysimeter manholes and analyzed for select inorganic parameters as part of Solid Waste Monitoring (WAC 173-351). The landfill leachate has high concentrations of metals and inorganic parameters (**Table 9**) including elevated chloride (2,810 mg/L average concentration) and total dissolved solids (5,470 mg/L average concentration). The leachate is not routinely analyzed for organic parameters. One leachate sample was analyzed for VOCs in 2000 and contained low level VOC concentrations; however, the one-year accumulation time in the lysimeter manhole renders VOC concentrations from that sample suspect. It is possible that, over time, VOCs in the collected water volatilized and that the concentrations remaining in water may represent lower concentrations than are in the leachate prior to draining into the lysimeters.

9.2.2.2 Groundwater in the Hole

Routine monitoring of groundwater in the Hole (EW-1) indicates the lower 5 to 7 feet of soil/refuse within the Hole is saturated with groundwater over an area of about 1 acre. (**Figure 2**). Groundwater in the hole is also monitored by wells W-9 and W-12. Water level measurements in W-9 are generally about 0.1 ft lower than W-12 and EW-1 indicating a westward flow direction in the Hole; however, the groundwater gradient within the Hole is fairly flat.

Groundwater in the Hole has high concentrations (well above background) of leachate indicator parameters (e.g. TDS, chloride, sulfate, iron, manganese, and sodium) as well as elevated concentrations of VOCs. Elevated leachate indicator parameters suggest leaching of landfill refuse is active in the Hole; however, groundwater from the drum cache area in the P2 zone may discharge to the Hole as well and detected VOCs could originate from the former drum cache area.

During the 2008 groundwater extraction period (see Section 4.3) total VOCs in the groundwater at the Hole increased from 45 ug/L to a relatively constant value of 125 to 150 ug/L. Similar concentrations were observed during the 2009 groundwater extraction

period (143 ug/L total VOCs). The VOCs detected with the highest concentrations were vinyl chloride, cis-1,2-DCE, 1,1-DCA, and acetone, followed by chloroethane, benzene, 1,4-dichlorobenzene, and 1,2-DCP. These are generally similar to the highest concentrations of VOCs detected in the Roza aquifer by the shop (MW-3b and MW-7b)[48]; however, most concentrations are higher in the Roza aquifer by the shop, indicating groundwater in the Hole cannot be the sole source of contamination to the Roza aquifer by the shop

Although the Hole cannot be the sole source of contamination in Roza aquifer groundwater by the shop, it likely contributes based on groundwater gradients and chloride concentrations. The groundwater elevation in the Hole is similar to, but generally slightly higher (0.4 feet) than the Roza aquifer by the shop indicating a gradient towards the Roza, and both display similar seasonal responses, suggesting a hydraulic connection. Furthermore, chloride concentrations in the Roza aquifer by the shop are noticeably elevated (1000 to 1500 mg/L) which suggests some impact from landfill leaching (see Section 9.2.2.1).

9.2.3 Landfill Gas

Landfill gas has been shown to contaminate groundwater with VOCs under other arid landfills (Bentley and Smith, undated) where leachate generation is minimal.

Landfill gas was sampled during both RI phases. The Phase 1 samples were collected in 2007 before the original landfill was capped and the Phase 2 samples were collected in 2009 after the original landfill was capped. Gas samples from both phases were analyzed for volatile organic compounds (VOCs).

The Phase 1 samples were analyzed using EPA Method 8260B (**Appendix A**) while the Phase 2 samples were analyzed using EPA Method TO-15 (**Table 10**). Method 8260B was developed for analyzing liquids and solids, while method TO-15 was developed for analyzing vapors. Both methods use gas chromatography and mass spectrometry (GC/MS); however, the TO-15 method reporting limits are one to two orders magnitude lower than those for method 8260B.

Phase 1 (2007) gas sampling consisted of 18 samples collected at discrete locations. Fourteen samples were collected from original landfill gas collection wells (GE-series) and four samples were collected from temporary test pits (T-series). Twelve VOCs were detected in the Phase 1 gas samples:

- 1,1-DCA
- 1,2,4-trimethylbenzene
- chloroethane (CA)
- cis-1,2-DCE
- dichlorodifluoromethane (CFC 12)
- ethylbenzene
- o-xylene
- p-isopropyltoluene
- toluene

[48] This comparison is based on RI data (collected since 2008).

- trichlorofluoromethane (CFC 11)
- vinyl chloride (VC)
- total xylenes

Total VOCs ranged from below detection to about 20,000 ppbv (parts-per-billion volume). Stations with the highest total VOC concentrations occurred mainly along the southern portion of the original landfill (See Figure 9 in the Phase 1 Data Report, **Appendix A**). These higher concentrations may be related to the younger age of the refuse at the southern end of the landfill compared to the northern end. Parameters with the highest observed concentrations were toluene, xylenes, ethylbenzene, CFC 12 and vinyl chloride. Chloroethane was noticeably higher in GE-7 compared to other stations. GE-7 is located near the former drum cache (**Figure 2**) and the elevated concentration may be related to vapors from groundwater contamination in the underlying shallow groundwater in this area. Chloroethane is the dominant VOC in shallow groundwater monitoring well MW-33p2 (located about 80 feet from GE-7). The results of the Phase 1 gas samples, including tables and figures, are presented in the Phase 1 RI Data Report (**Appendix A**).

Phase 2 (2009) gas sampling consisted of four discrete samples collected from original landfill gas collection wells (GE-17, GE-19, GE-29 and GE-8 in **Figure 1**) and one composite sample collected from the discharge pipe leading to the flare in the southeast corner of the original landfill. Twenty-four VOCs were detected in the Phase 2 gas samples (**Table 10**). The following VOCs were detected, in addition to those listed above for Phase 1:

- 1,2-dichloro-1,1,2,2-tetrafluoroethane
- 1,4-dichlorobenzene
- 1,3,5-trimethylbenzene
- 2-butanone
- 4-ethyltoluene
- acetone
- benzene
- chlorobenzene
- Styrene
- TCE
- PCE
- xylene isomers, M+P

Total VOCs were noticeably higher in the Phase 2 samples compared to the Phase 1 samples with summed values ranging from about 32,000 to 64,000 ppbv. Similar to the Phase 1 samples, the highest concentrations were detected at the south end of the original landfill and in the composite gas sample. The parameters with the highest observed concentrations in the Phase 2 samples were toluene, xylenes, ethylbenzene, and vinyl chloride. 1,2,4-trimethylbenzene was also prominent and acetone and 2-butanone were noticeably high in GE-17. A plot of the average VOC concentrations from Phase 1 and Phase 2 samples show that the concentrations of toluene, xylenes, and ethylbenzene in the Phase 2 samples are much higher than the Phase 1 samples (**Figure 18**). The increase in gas concentrations is likely related to vapors being trapped under the cap and captured in the gas collection system, rather than dispersing as they escape to the atmosphere. CFC-11,

CFC-12, 1,1-DCA, and chloroethane were noticeably lower in the Phase 2 samples (**Figure 18**). However, the differing sample sets introduces uncertainty.

PCE and TCE were detected at three of the four discrete sample stations and in the composite gas. PCE gas concentrations ranged from 55 to 300 ppbv and TCE gas concentrations ranged from 49 to 250 ppbv. PCE and TCE were not detected in the Phase 1 gas samples likely due to higher laboratory reporting limits.

Gas contaminants can enter groundwater by soil-gas to water diffusion or by advection with infiltrating water. Equilibrium between the two phases occurs when the rate of contaminant entering water equals the rate of contaminant volatizing from the water. Henry's law is used to describe the equilibrium relationship in a two-phase system that ignores adsorption to soil (Kuo, 1999):

$$C_{air} = H*C_{water}$$

Where: C_{air} = concentration of contaminant in gas (ug/L)
C_{water} = concentration of contaminant in water (ug/L)
H = Henry's gas constant (unitless) – specific for each compound

Gas-to-groundwater equilibrium calculations for the VOCs detected in 2009 show that VOC concentrations in landfill gas are high enough to contribute to groundwater contamination by diffusion to aquifers (**Table 11)**; however, the VOC concentrations in the landfill gas are not high enough to be the only source of contamination, nor does the gas contain all the VOCs that are detected in groundwater.

Although landfill gas impacts to groundwater cannot be distinguished from other sources, diffusion of landfill gas to groundwater could be occurring beneath the original landfill at discrete locations where groundwater is in contact with landfill refuse (in the Hole and the P1 zone) Diffusion of landfill gas to deeper basalt aquifers is not likely because of the presence of intervening basalt aquitards. Landfill gas might also contribute to groundwater contamination in the Outwash aquifer. However, the Outwash aquifer is located east, west, and south of the original landfill footprint and impacts are relatively low in this aquifer (most of the VOCs detected in landfill gas were not detected in the Outwash aquifer). Impacts to the Outwash aquifer may result from other diffuse sources (see Section 9.5.7).

9.2.4 Soils and Refuse in Vicinity of Shop

The shop area in the northwest corner of the site has been used as the maintenance and staging area since operations started in the 1940s. Activities and facilities around the shop (**Figure 2**) are[49]:

- Maintenance: fixing, cleaning, and lubricating of machine parts and vehicles

[49] Listed shop area activities and facilities are based on personal observations and conversations with landfill personnel.

- Shop Building: bathroom, shower, office, and storage of tools and equipment
- Concrete pad (east side of shop): parking and machine/vehicle maintenance
- Fuel tanks: above ground diesel and gasoline south of shop (underground pre-1999 with distribution pipes to pump station on concrete pad)
- Outside storage: vehicles and landfill equipment in vicinity of shop
- Fee collection station: scale house and scale north of shop
- Septic drainfield: bathroom and sinks drain to drainfield north of shop
- Stormwater drains: drains concrete pad and scale house north of shop
- Recycling area: glass, cardboard, batteries and motor oil south of shop

Many of the above facilities and activities can potentially contribute to soil and groundwater contamination. The shop area soils were investigated as part of the source area study completed in 2007 (PGG, March 13, 2008a and Phase 1 RI Data Report, **Appendix A**). Twenty-one borings and test pits were drilled to bedrock through soils, refuse, or soil/refuse mix in the vicinity of the shop (B-1 through B-8 and T-1 through T-13 in **Figure 2**). Samples for laboratory analysis were collected at discrete depths based on field PID readings. All samples were collected above water if water was encountered and analyzed for COCs indentified in the original work plan. Ketones (acetone, 2-butanone, and MIBK), which were not part of the original COC list, were not analyzed.

Observations during the soil exploration include:

- Bedrock occurred 5 to 10 feet below ground surface at all excavations.
- Landfill refuse was observed to extend beyond the footprint of the capped landfill at stations T-12 and T-13 (**Figure 2**). The refuse is about 5 feet thick on top of bedrock at these stations. The area of uncapped refuse is estimated to be 0.3 acres (**Figure 2**).
- Soils north of the shop and scale-house consisted of sand and gravel mixed with construction material such as metal, glass, asphalt, and wood.
- Construction material was more abundant and charred in the vicinity of T-5 and an old metal tank resembling a fuel tank was excavated from near the bottom of T-5.
- Water above bedrock was encountered north of the shop at T-4, T-5, T-7, and T-9 (a septage odor was noticed in T-4, closest to landfill's drainfield). A monitoring well (MW-41a) has since been installed at the top of bedrock north of the shop.
- Soils northwest, southwest, and west of the shop appeared relatively clean.
- An old fuel pipe distribution line was severed 2.5 feet below ground surface at B-2 near the shop's concrete pad (**Figure 2**). Pipe removal, soil investigation, and soil excavation were completed on September 18, 2007 (PGG, October 26, 2007b). Soils were excavated to bedrock (about 3 feet below ground surface) and residual soils and top-of-rock were sampled and analyzed for VOCs, polycyclic aromatic hydrocarbons (PAHs), total lead, NWTPH-Dx[50], and NWTPH-G[51].

Important observations of soil analytical results are:

- Contaminated soils (detected VOCs other than low level concentrations of methylene chloride) extend north, east, and southeast of the shop and cover approximate 1.5 acres (**Figure 2**).

[50] NWTPH-DX = Northwest Total Petroleum Hydrocarbon as Diesel
[51] NWTPH-G = Northwest Total Petroleum Hydrocarbon as Gasoline

- Total VOCs from shop area soils were low to modest, ranging from not detected to 16.6 mg/Kg (see Figure 8 in Phase 1 RI Data Report – **Appendix A**). The highest concentrations occurred where abundant refuse was observed (T-12, T-13, and T-5).
- In general, there was more total BTEX in most soil samples than other groups of VOCs.
- A number of soil samples collected north of the shop, outside the footprint of the landfill, had low level detections of PCE (0.001 to 0.04 mg/Kg) and total BTEX (0.003 to 0.03 mg/Kg).
- A comparatively high concentration of PCE (4 mg/Kg) was found in T-13-5.5 (5.5 feet below ground surface)
- Elevated concentrations of TCE (up to 1.1 mg/Kg) and cis-1,2-DCE (up to 1.0 mg/Kg) were detected in soils at station T-5 north of the shop.
- Low level concentrations of methylene chloride (0.005 mg/Kg or less) were detected in soils northwest, west, and southwest of the shop.
- In addition to low level concentrations of fuel compounds, likely related to the severed pipe at B-2, there were a few low level detections of acetone (0.02 to 0.04 mg/Kg), 2-butonane (0.006 to 0.007 mg/Kg), and PCE (0.002 to 0.04 mg/Kg) in the sampled soils near the concrete pad.

The VOCs detected in soils around the shop area were also detected in the P1, P2, and Roza aquifers near the shop area; however, not all constituents detected in the Roza aquifer were detected in the shop area soils. VOCs detected in the P1 and P2 north of the shop (MW-41a and MW-40p2) are relatively low and limited to PCE and TCE (about 1 ug/L or less). While this suggests contamination in the shop area soils may contribute to groundwater contamination in the underlying Roza, it does not appear to be a significant source of contamination.

9.2.5 Potential Off-Site Sources

Potential off-site sources of inorganic and organic COCs include non-point source and point-source land use activities. Off-site activities that could potentially contribute to groundwater contamination include:

- Area wide crop irrigation (current and historic)
- Chicken farm northwest of site
- Private septic systems east of site
- Releases or spills on private properties
- Unknown contaminated sites upgradient of site

Nitrate concentrations greater than 3 mg/L may be indicative of anthropogenic sources leaching to groundwater (Madison and Brunett, 1984). Background nitrate concentrations in groundwater around the site ranged from less than 0.02 to 8.8 with a mean of about 2.8 mg/L (see Section 8). Anthropogenic sources include fertilizers applied to crops and human and animals wastes. Most background wells with elevated nitrate northeast of the site also have elevated chloride, which could indicate fertilizers and septage sources.

The highest nitrate concentration in groundwater occurred in off-site monitoring well MW-21c west of the original landfill and south of the old chicken farm along State Route

28 (**Figure 1**). Nitrate concentrations at MW-21c steadily increased from about 30 mg/L in 2001 when monitoring first began to 92 mg/L in 2009.

A number of private wells sampled east and northeast of the site also had low level concentrations of PCE below the federal drinking water standard (5 ug/L) that cannot be easily explained by groundwater pathways leading from the site (see Section 9.5.7). Potential off-site sources of PCE may be historic spills of solvents or disposal of solvents to septic systems on private parcels. Other sites with activities that could potentially release PCE to the environment include the Ephrata Raceway Park (operating since 1970 and located approximately 1.3 miles northeast) and the Port of Ephrata Airport/Industrial Park (located approximately 2 miles northeast) (**Figure 1**).

The City of Ephrata Water Reclamation Facility discharges reclaimed water into the ground north of the residences where PCE has been detected. The facility monitors influent water quality, effluent water quality, and groundwater quality regularly (City of Ephrata Discharge Monitoring Report, 2010). The facility monitors influent water for the following parameters:

- pH - daily
- Biological oxygen demand (BOD) – weekly
- Total suspended solids (TSS) – weekly
- Nitrate - weekly
- Total nitrogen – three times per week

Effluent water is monitored for the following parameters:

- pH – daily
- Residual chlorine – daily
- Coagulants – daily
- Total coliform - daily
- Turbidity - daily
- BOD – weekly
- TSS – weekly
- TDS – bi-weekly
- Nitrate – three times per week
- Total Nitrogen – three times per week

Shallow groundwater is monitored quarterly (from up to five monitoring wells around the facility) for the following parameters:

- Static water level
- Temperature
- Conductivity
- Nitrate
- Total coliform
- pH
- Sulfate
- TDS

- Total nitrogen
- Ammonia

Although PCE is not one of the facility's regular monitoring parameters, PCE was not detected in samples collected for the RI in the City's MW-1 and MW-3 reclamation facility monitoring wells. Based on that data, the facility is not likely a source of PCE contamination in groundwater at this time or in the recent past.

9.3 NATURAL ATTENUATION PROCESSES

Natural attenuation consists of the physical and chemical processes that reduce contaminant concentrations without the action of humans. The processes include destructive attenuation processes that reduce the overall contaminant mass (degradation) and non-destructive attenuation processes that lower contaminant concentrations in groundwater (dispersion, mixing, sorption, and volatilization). Both types of natural processes reduce concentrations of contaminants in groundwater.

This section provides a summary of the processes involved followed by a qualitative evaluation of biodegradation at the site[52]. Quantification of natural attenuation will be conducted for the FS. More detailed descriptions of the processes can be found in *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater* (U.S., EPA, 1998).

9.3.1 Dispersion and Mixing

Two types of dispersive processes cause contaminant concentrations to decrease with distance from a source; mechanical dispersion and molecular diffusion. Mechanical dispersion results when contaminants move through the aquifer at different velocities along adjacent groundwater flow. Mechanical dispersion results in mixing and dilution of contaminants along the flow path. Molecular diffusion is the flux of molecules from higher concentrations to lower concentrations due to a concentration gradient. The result is a gradual mixing and dilution of contaminants. If groundwater recharge occurs, mixing of native groundwater with the added water will further reduce concentrations.

9.3.2 Sorption

Many contaminants are temporarily removed from solution by sorption (adhering) onto the aquifer matrix (soil or rock). This results in slowing (retarding) contaminant transport relative to the average groundwater flow velocity, a reduction in groundwater contaminant concentrations, and a spreading-out of the passing of the plume in time. For many contaminants at low concentrations, equilibrium partitioning between solid and water phases can be characterized linearly:

$$C_{solid} = Kd * C_{water}$$

[52] Methods for evaluating natural attenuation were derived from U.S. EPA 1998 Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. Geochemical indicators for evaluating natural attenuation in the EPA document are similar to those used in Ecology's guidance on evaluating natural attenuation of petroleum contaminated groundwater (Ecology, 2005).

Linear equilibrium means that the concentration in aqueous phase is linearly proportional to the concentration in the solid phase. Kd is known as the partitioning coefficient and individual constituents have different propensities for partitioning to solids as described by the K_d. For example, dichlorobenzenes partition more readily to solids than vinyl chloride.

Partitioning of organic contaminants is almost exclusively onto the organic carbon fraction (f_{oc}) of an aquifer if the organic carbon fraction constitutes at least 1% of the aquifer, in which case Kd can be estimated by (Fetter, 1999):

$$Kd = K_{oc} * f_{oc}$$

Where K_{oc} is the soil organic carbon-water partitioning coefficient

However, sorption to basalt aquifers may be less than this model predicts if Ecology's default parameters (CLARC database) are used because these aquifers lack native organic material. Sorption to palagonite and clay minerals in weathered interflow zones may be a more important mechanism.

9.3.3 Volatilization

Volatilization is the process of contaminants evaporating into the gas phase and thus removing contaminants from groundwater. Volatilization occurs where contaminants are within or close to the unsaturated zone. Partitioning is a function of a constituent's volatility and solubility in water. Equilibrium between a gas and aqueous phase is described by Henry's Law:

$$C_{air} = H * C_{water}$$

Henry's law states that the concentration in air is proportional to the concentration in water. Henry's gas constant (H) is specific for individual constituents and ranges over several orders of magnitude. Individual constituents vary in their tendency to volatize from groundwater. For example the gas constant for toluene is two orders of magnitude higher than acetone, and therefore toluene will more readily evaporate.

Two phase gas-to-groundwater calculations were performed for VOCs detected in landfill gas (Section 9.2.3).

9.3.4 Biodegradation

Many organic contaminants naturally degrade by biotic and abiotic degradation processes. Biological degradation tends to dominate in most groundwater systems.

Complete biodegradation of organic compounds results in the transformation of contaminants into relatively non-harmful byproducts such as carbon dioxide, chloride, methane, and water. However, intermediate byproducts of these transformations (such as vinyl chloride) may accumulate and be more hazardous than the original compounds. The process is driven by the biological respiration of indigenous bacteria in the subsurface. While fuel hydrocarbons are biodegraded through use as a primary substrate (electron

donor), chlorinated aliphatic hydrocarbons may undergo biodegradation under three different circumstances:

- Use of organic compound as an electron donor
- Use of organic compound as an electron acceptor
- Co-metabolism

The first two mechanisms are reduction-oxidation reactions (redox) and involve the transfer of electrons from a donor compound (compound becomes oxidized) to an acceptor compound (compound becomes reduced). Redox reactions can occur under aerobic (oxygen-rich) and anaerobic (oxygen-depleted) conditions. Electron donors include natural organic material, fuel compounds (BTEX), ketones, and less chlorinated ethenes and ethanes. Electron acceptors include elements or compounds in relatively oxidized states. Naturally occurring electron acceptors include dissolved oxygen, nitrate, manganese (IV), iron (III), sulfate, and carbon dioxide. Each electron acceptor is active over a certain range of geochemical conditions, for instance, once oxygen and nitrate are depleted, chlorinated ethenes and ethanes can also act as electron acceptors.

The third mechanism, co-metabolism, involves the fortuitous degradation of an organic compound as a result of enzymes produced during the direct oxidation of another organic compound.

Toluene, ethylbenzene, and xylenes are highly biodegradable, while benzene is moderately-to-highly biodegradable (Aronson and Howard, 1997). Ketones are also degraded by direct oxidation. The process requires an electron acceptor and once dissolved oxygen is depleted (generally below 0.5 mg/L), anaerobic respiration dominates with the following electron acceptors being depleted in the following order: nitrate (denitrification), iron (III) reducing, sulfate reducing, and carbon dioxide (methanogenisis). Chlorinated ethenes and ethanes can also act as electron acceptors in iron (III) reducing, sulfate reducing, and methanogenic conditions and be transformed through the process of reductive dechlorination:

- PCE transformation pathway: PCE to TCE to DCE to VC to ethene to ethane
- 1,1,1-TCA transformation pathway: 1,1,1-TCA to 1,1-DCA to CA
- 1,1,2-TCA transformation pathway: 1,1,2-TCA to 1,2-DCA to CA

Reductive dechlorination is the dominant degradation process for the highly chlorinated compounds such as tetrachloroethene (PCE), trichloroethene (TCE), and tetrachlroethane (TCA) and requires a strong reducing environment (no free oxygen) with an available supply of electron donors. During the transfer of electrons, the chlorine atoms are stripped from the parent products (PCE, TCE, and TCA) and the compounds are reduced to less chlorinated daughter products: dichloroethene (DCE), vinyl chloride (VC), dichloroethane (DCA) and chloroethane (CA). Reductive dechlorination of the daughter products occur at much slower rates and can therefore accumulate in groundwater. However, biodegradation of DCE and VC can also occur under aerobic or nitrate-reducing conditions through the process of direct oxidation (electron donor) and chloroethane can rapidly degrade via abiotic mechanisms (U.S. EPA, 1998).

Reductive dechlorination requires an electron donor (carbon substrate) to drive the reaction. The presence of native organic matter[53] or fuel compounds (BTEX) therefore creates favorable conditions for reductive dechlorination.

Biodegradation of other organic compounds may also follow one of the three biodegradation mechanisms described above (direct oxidation, reductive dechlorination, or cometabolism).

Abiotic degradation processes may also attenuate chlorinated organic compounds. For example, 1,1,1-TCA abiotically degrades to 1,1-DCE, which can then biodegrade to vinyl chloride (Fetter, 1999).

9.4 BIODEGRADATION AND REDOX CONDITIONS AT THE SITE

Biodegradation of organic compounds can cause measurable changes in the geochemistry of groundwater. Groundwater chemical data can therefore be used to assess natural biodegradation and the reductive-oxidation (redox) state of the aquifer, which can in turn help with evaluating remedial solutions. A screening method has been developed for evaluating anaerobic biodegradation (reductive dechlorination) of chlorinated compounds (U.S. EPA, 1998). Based on that method, strong geochemical evidence for reductive dechlorination includes:

- low concentrations of dissolved oxygen (<0.5 mg/L)
- low concentrations of nitrate (<2 mg/L)
- low concentrations of sulfate (<20 mg/L)
- low oxidation reduction potential (ORP <50 mV)
- elevated concentrations of dissolved iron (>1000 ug/L)
- elevated total organic carbon (TOC >20 mg/L)
- elevated concentrations of ethene (>10 ug/L)
- elevated concentrations of ethane (>100 ug/L)
- elevated concentrations of methane (>500 ug/L)
- elevated alkalinity (>2 times above background)
- elevated concentrations of carbon dioxide (>2 times above background)
- elevated concentrations of chloride (>2 times above background)
- elevated concentrations of total BTEX (>100 ug/L)
- detection of DCE (with 80 percent of total DCE being cis-1,2-DCE)
- detection of 1,1-DCA
- detection of chloroethane (CA)

Application of the biodegradation screening method to the site[54] shows there is strong to adequate evidence for anaerobic degradation (reductive dechlorination) occurring in the P1 and P2 zone by the former drum cache, in the Roza aquifer by the shop, and in the Roza aquifer north of the site at MW-44b (**Table 12**). Biodegradation rates for the site will be assessed in the Feasibility Study.

[53] Native organic material is generally limited in the aquifers studied for the RI.
[54] Elevated chloride at the Site is believed to be mainly due to landfill leaching and cannot be differentiated from a biodegradation source. Therefore chloride concentrations were not included in the analysis.

Biodegradation reactions can significantly alter the redox state in groundwater, which in turn affects the mobility, degradation, and solubility of many contaminants. The five main redox states in groundwater from oxidized to most reduced (Jurgens et al, 2009) are as follows:

- Oxygen reducing (aerobic)
- Nitrate reducing (anaerobic)
- Manganese reducing (anaerobic)
- Iron/sulfate reducing (anaerobic)
- Carbon dioxide reducing (anaerobic - methane producing)

The predominant redox state of groundwater can be assessed using standard water-quality data (Jurgens et al, 2009). The method involves assessing concentrations of dissolved oxygen, nitrate, manganese, iron, and sulfate. Application of this method indicates the following redox zones at the site (**Table 12**):

- Carbon dioxide reducing (methane producing): Most contaminated portions of P1 and P2 zones near the former drum cache (MW-34p1, MW-33p2, MW-35p2) and Roza aquifer north of site (MW-44b)
- Iron and/or sulfate reducing: Roza aquifer north side of shop (MW-3b and MW-7b) and P1 zone at top of rock within former drum cache excavation (MW-32a)
- Manganese reducing: Portions P1, P2, and Roza aquifer
- Nitrate and/or manganese reducing: Roza aquifer south of shop (MW-9b)
- Nitrate reducing: Portions of Interflow aquifer
- Oxygen reducing: Outwash aquifer and generally less contaminated portions of basalt aquifers

9.5 NATURE AND EXTENT OF GROUNDWATER CONTAMINATION

The following subsections characterize the nature and extent of groundwater contamination in each aquifer in more detail, including contaminant concentrations and trends, sources and pathways of groundwater contaminants, and attenuation mechanisms.

Analytical data presented in this section include groundwater samples collected during RI Phase 1 (**Appendix A**) and RI Phase 2 (**Appendices H through M).** At least two samples were collected from all RI wells. Geochemical summaries for the RI period (2008 to February 2010) were compiled for each well where VOCs were detected and screened against RI screening levels (**Tables 13 through 21).**

Spatial distributions of total VOCs in each aquifer are visually displayed in pie-chart maps (**Figures 19-23**). Similar maps display the spatial distribution of total chlorinated ethanes and total chlorinated ethenes (**Figures 24-33**). *The data used in these maps are from single sampling events*[55]*, as indicated on the figures, and do not necessarily represent maximum concentrations. Maximum, minimum, and average concentrations are pre-*

[55] No single sampling event included all monitoring wells. Sample dates (events) for individual wells are noted on Figures 19 through 33. Monitoring well data include Round 4 (March 2009) or Round 6 (Dec. 2009-Jan. 2010) data, except MW-34p1, which displays Round 3 (Nov. 2008) data. Round 3 data for MW-34p1 had the lowest laboratory reporting limits and therefore offered the best resolution of detected VOCs.

sented in RI screening tables (**Tables 13 through 21**). The statistical summaries presented in Tables 13 through 21 are calculated from data collected during the RI (**Table 3**).

Short-term changes in total VOCs observed during the RI are shown in **Figures 34-36**. Long-term changes in total VOCs are shown in **Figure 37**. Long-term changes in ketone and BTEX compounds for select wells are shown in **Figures 38 and 39**.

Long-term geochemical trends presented in **Figures 37-39** include analytical data from solid waste monitoring conducted prior to the RI investigation.

9.5.1 Shallow Groundwater above Roza Aquifer

The highest concentrations of total VOCs in groundwater occurred on the north end of the site near the former drum cache in the shallow P1 and P2 groundwater zones where several VOCs exceeded RI screening levels (**Tables 13 and 14**). Maximum concentrations in P1 and P2 (total VOCs in excess of 100,000 ug/L) occurred immediately south-southwest (within 75 feet) of the former drum Cache. LNAPL was observed in MW-34p1 and MW-36p1 immediately south-southwest of the former drum cache and therefore the highest VOC concentrations measured in groundwater may contain droplets of LNAPL and may not be an accurate measure of dissolved phase concentrations. Total VOCs decreased by many orders of magnitude within a relatively short horizontal distance (about 300 feet or less) and vertical distance (within 50 feet) from the former drum cache indicating much of the contaminant mass has not migrated far from this source. Furthermore, discounting data from the LNAPL wells, total VOCs decreased significantly between sampling events in most P1 and P2 monitoring wells (**Figures 34 and 35**), as is described in the following subsection.

The following sections describe the nature and extent of contamination in the P1 and P2 zones in more detail.

9.5.1.1 P1 Shallow Groundwater Zone

This subsection describes the nature and extent of groundwater contamination in the P1 zone based on the following observations:

- Groundwater monitoring and other observations from P1 monitoring wells (MW-34p1, MW-36p1, MW-37p1, MW-32a, and MW-41a)
- One-time groundwater samples collected from the P1 zone during drilling of other aquifer monitoring wells[56]: B-19-p1 (MW-29b), B-22-p1 (MW-30b), B-32-p1 (MW-43p2), and B-36-p1 (MW-47c)
- Observations of the P1 zone being thin to absent at particular locations during drilling of other aquifer monitoring wells

Two to three samples were collected from each P1 monitoring well (excluding MW-36p1)[57]. One-time samples were collected at the time of drilling from B-series borings.

[56] Analytical tables for one-time samples collected during time of Phase 1 drilling (B-19 and B-22) are presented in Tables 16 and 17 of the Phase 1 RI Report (Appendix A). Analytical tables for one-time samples collected during drilling of Phase 2 drilling (B-32 and B-36) are presented in Appendix L.

Organic Contaminants

The highest concentration of total VOCs in groundwater occurred in the P1 zone immediately south-southwest of the former drum cache where LNAPL was observed in contact with groundwater (LNAPL was observed at stations MW-34p1, MW-36p1 and B-22-p1 in **Figures 2 and 19**). The concentration of total VOCs detected in groundwater in contact with LNAPL (B-22-p1 and MW-34p1) was over 200,000 ug/L (**Figure 19 and Table 13**). These concentrations, however, may include non-aqueous phase VOCs and therefore may not be an accurate measure of aqueous concentrations. The horizontal extent of groundwater contamination in the P1 zone away from the LNAPL area is fairly limited. Concentrations were two to three orders of magnitude lower within 120 feet northeast and southeast of the LNAPL area (MW-32a, MW-37p1, and B-19-p1), VOCs were not detected in the P1 zone 300 feet to the northwest (B-32-p1), and the P1 was not observed during drilling 1000 feet to the north (Location C, **Figure 1**) or 400 feet to the east (Location D, **Figure 1**). This spatial distribution indicates contamination within the P1 zone is limited to the immediate vicinity of the former drum cache (**Figures 8 and 19**).

The dominant two classes of VOCs detected in the P1 zone where groundwater was observed in contact with LNAPL (B-22-p1 and MW-34p1) were ketone (acetone, 2-butanone, MIBK, and 2-hexanone) and BTEX compounds (**Figure 19 and Table 13**). Approximately 95 percent of the VOCs detected in these two samples were in these two classes of VOCs with acetone and toluene being the main two constituents.

Relatively high concentrations (ranging from about 3,000 to 9,000 ug/L) of chlorinated ethanes (2 to 3 percent of total VOCs) and chlorinated ethenes (less than 2 percent of total VOCs) were also detected in B-22-p1 and MW-34p1 (**Figures 24 and 29**), as well as 1,2-DCP, trimethylbenzenes, dichlorobenzenes, and methylene chloride. Other VOCs detected included naphthalene, propylbenzenes, butylbenzenes, bromobenzene, chloroform, styrene, and 1,1,2-trichlorotrifluoroethane. Concentrations of these other VOCs ranged from about 400 ug/L to less than 1 ug/L

Within a few hundred feet from of the LNAPL area, VOC concentrations were two to three orders of magnitude less, and ketone and BTEX compounds were significantly less dominant (less than 10 percent of the total VOCs detected at MW-37p1 and B-19-p1). Except for chloroethane, the highest concentrations of each VOC constituent (generally greater than 500 ug/L) occurred where groundwater was observed in contact with LNAPL (B-22-p1 and MW-34p1).

In addition to the large spatial variability in VOC concentrations, significant decreases were observed in MW-32a and MW-37p1, while a significant increase was observed in MW-34p1 (**Figure 34**):

- Total VOCs in MW-32a decreased from over 1,585 ug/L in November 2008 to 300 ug/L in March 2009 and then increased to about 670 ug/L in December 2009. The increase in December 2009 was due to significant increases in ketone and BTEX com-

[57] A groundwater sample was not collected from MW-36p1 due to the presence of LNAPL. The presence of LNAPL would likely lead to measured groundwater concentrations not representative of aqueous phase concentrations. Instead an LNAPL sample was collected from MW-36p1 (see Section 9.2.1)

pounds (mainly acetone, toluene and xylenes). All other classes of VOCs in MW-32a decreased over the course of the three sampling events.

- Total VOCs in MW-37p1 decreased from 145 ug/L in November 2008 to 135 ug/L in March 2009 to 45 ug/L in December 2009. The largest decrease occurred in the concentrations of 1,2-DCP, chlorinated ethanes, and chlorinated ethenes.
- Total VOCs in MW-34p1 almost doubled from 266,674 ug/L in November 2008 to 513,100 ug/L in March 2009[58], with the largest increase being acetone (120,000 ug/L to 270,000 ug/L). The well was not sampled in December 2009. Because of the presence of LNAPL in this well, the observed increase is not a reliable indicator of dissolved phase concentrations.

There is strong evidence that natural attenuation is reducing VOC concentrations in the P1 zone by the former drum cache. Evidence includes significant decreases in VOC concentrations within a short distance; high concentrations of organic breakdown products; and a strong reducing environment (**Table 12**).

The redox environment in the P1 zone by the former drum cache is methane producing (MW-34p1) to iron-sulfate reducing (MW-32a) with low concentrations of oxygen (less than 0.5 mg/L) and high concentrations of carbon dioxide (up to 406 mg/L) and methane (up to 7,080 ug/L). These geochemical conditions are characteristic of active anaerobic biodegradation of organic compounds (**Table 12**).

Ketone and BTEX compounds attenuate quickly with distance from the LNAPL area. Concentrations decrease from over 100,000 ug/L in the LNAPL area (B-22-p1 and MW-34p1), to less than 50 ug/L about 100 feet southeast (B-19-p1), less than 5 ug/L about 170 feet northeast (MW-37p1), and below detection about 400 feet northwest (B-32-p1). The dominant attenuation process may be biodegradation; although volatilization may also contribute.

Chlorinated ethenes and ethanes (PCE, TCE, and TCA) also appear to be degrading through the process of reductive dechlorination near the former drum cache (MW-34p1, MW-32a, B-22-p1 and B-19-p1). In addition to the P1 having a highly reducing environment, there is a large source of electron donors available (BTEX and ketone compounds) to drive reductive dechlorination reactions (Section 9.4). Relatively high concentrations of intermediate breakdown products indicate complete transformation of the chlorinated ethenes and ethanes is limited. Intermediate breakdown products of chlorinated ethenes (cis-1,2-DCE and vinyl chloride) and chlorinated ethanes (DCA and chloroethane) account for 50 to 100 percent of the total ethenes and ethanes (**Figures 24 and 29**).

Natural attenuation also appears to be reducing the concentration of other VOCs within a relatively short distance from the LNAPL area, including concentrations of dichlorobenzenes and trimethylbenzenes.

[58] Laboratory reporting limits were three orders of magnitude higher in the March 2009 sample and a number of constituents detected in November 2008 were below detection in the March 2009 sample.

Inorganic Contaminants

Elevated concentrations of inorganic parameters occur in one or more P1 wells[59]. Inorganic parameters exceeding RI screening levels during one or more sampling events are (**Table 13**):

- MW-34p1 (arsenic, chloride, iron, manganese, and TDS)
- MW-32a (arsenic, iron, manganese, and TDS)
- MW-37p1 (arsenic, sulfate, and TDS)
- MW-41a (arsenic, iron, sulfate, and TDS)

Although some elevation of redox-sensitive inorganic parameters is expected where biodegradation of organics is occurring, significantly high concentrations of chloride, TDS and other landfill leachate indicator parameters (calcium, barium, nickel, potassium, sodium, iron and manganese) occurred in MW-34p1, suggesting some leaching of original landfill refuse occurs south of the former drum cache. Arsenic concentrations were also above background (3.0 ug/L) in MW-34p1 (18.9 ug/L) and MW-32a (16.4 ug/L). This may result from enhanced arsenic solubility under reduced redox conditions. Damp to moist refuse 24 feet thick was observed within five feet of the P1 zone at MW-34p1. Concentrations of these parameters are significantly less in MW-32a and MW-37p1 (immediately north of landfill refuse).

P1 Contaminant Pathway

Contaminants in the P1 zone by the former drum cache originate largely from mobilization of residual contaminants associated with the former drum cache. Based on chloride concentrations, secondary contributions from original landfill refuse are likely where overlying refuse occurs, but VOCs from the overlying refuse are likely minor in comparison.

The groundwater flow direction in the P1 zone by the former drum cache (based on measurements in MW-32a, MW-34p1, MW-36p1, and MW-37p1) was measured to be towards the southwest, possibly along a perching horizon (**Figure 8**). However, the dominant contaminant pathway in the P1 appears to be vertically downward to the underlying P2 zone. Horizontal contaminant pathways do not appear to extend very far north, northwest, northeast or east of the former drum cache (VOCs are either not detected or the zone is not present). Contaminants do not likely migrate horizontally to the south-southwest in the direction of groundwater flow because the bottom of the perching horizon appears to rise above the projected potentiometric surface (**Figure 8**).

Approximately 700 feet northwest of the former drum cache, near the shop area, low level concentrations of PCE (1.8 ug/L) and TCE (0.2 ug/L) were detected in the P1 zone (saturated soils above rock); however, there does not appear to be a direct pathway from the former drum cache to the P1 zone by the shop. The groundwater elevation in the P1 zone at the shop (MW-41a) is higher than at the former drum cache, and VOCs were not detected in the P1 zone mid-way between the former drum cache and MW-41a (sample B-32-p1). Elevated concentrations of chloride (196 mg/L) and TDS (1,850 mg/L) in

[59] Inorganic parameters were not measured in B-series samples collected during drilling.

MW-41a suggests the source of low level PCE and TCE may be leaching from nearby landfill refuse and/or contaminated soils by the shop (Section 9.2).

9.5.1.2 P2 Shallow Groundwater Zone

This subsection describes the nature and extent of groundwater contamination in the P2 zone based on the following observations:

- Groundwater monitoring and other observations from P2 monitoring wells (MW-33p2, MW-35p2, MW-38p2, MW-39p2, MW-43p2, MW-46p2, MW-49p2, and MW-52p2).
- One-time groundwater samples collected from the P2 zone during drilling of Roza aquifer monitoring wells near former drum cache: B-22-p2 (MW-30b) and B-26-p2 (MW-31b)

Two to three samples were collected from all P2 monitoring wells. One-time samples were collected during drilling of the B-series borings.

Organic Contaminants

VOCs detected in the P2 zone near the former drum cache were similar to those detected in the overlying P1 (**Figures 20, 25, 30 and Table 14**). The highest concentrations of total VOCs (105,766 ug/L) occurred south of the former drum cache in the boring (sample B-22-p2) where LNAPL was observed in the overlying P1 (sample B-22-p1). Within 70 feet of this boring, total VOCs in the P2 decrease by several orders of magnitude (MW-33p2 and MW-35p2). Relatively high concentrations of total VOCs (up to 36,000 ug/L) were also detected in the P2 zone immediately northwest (within 75 feet) of the former drum cache (MW-38p2 and sample B-26-p2).

Within a few hundred feet northwest (MW-43p2) and east (MW-39p2) of the former drum cache, total VOCs in P2 decrease substantially compared to the wells discussed above (**Figure 20**). North of the site (about 1000 feet) VOCs were not detected in the P2 zone[60] (MW-46p2, MW-49p2, and MW-52p2), and in the vicinity of the maintenance shop, about 700 feet northwest of the former drum cache, total VOCs in P2 (MW-40p2) were less than 0.5 ug/L (with PCE, toluene, and isopropyltoluene being the only VOCs detected). This spatial distribution indicates the extent of groundwater contamination within the P2 zone does not extend very far from the former drum cache area. A dashed line delineates the P2 plume on **Figure 9**.

As with the overlying P1 zone, the two dominant classes of VOCs detected in P2 wells with the highest concentrations (total VOCs in excess of 10,000 ug/L) were ketone and BTEX compounds (sample B-22-p2, sample B-26-p2, MW-35p2, and MW-38p2). Over 70 percent of the VOCs detected in groundwater from these borings and wells were dominated by these two VOC classes with acetone and toluene being the two dominant constituents detected. Within a few hundred feet or less from these wells, the concentrations of ketone and BTEX compounds were two to three orders of magnitude less and accounted for 25 percent or less of the total VOCs (MW-33p2, MW-43p2, and MW-39p2).

[60] Low levels of toluene and/or acetone detected (near laboratory detection limits) in MW-49p2 and MW-52p2 during a single sampling event are likely laboratory contaminants.

While the highest *total* VOCs occurred south-southwest of the former drum cache (sample B-22-p2) where concentrations of ketone and BTEX compounds were highest, the highest concentrations of chlorinated ethanes, chlorinated ethenes, and 1,2-DCP occur northwest of the former drum cache in MW-38p2 (**Figures 20, 25, 30 and Table 14**). MW-38p2 is located within 20 feet of the northwest corner of the former drum cache (**Figure 2**) and concentrations of total chlorinated ethanes, total chlorinated ethenes, and 1,2-DCP were all in excess of 1,000 ug/L.

In addition to the large spatial variability in VOC concentrations, there were significant variations in concentrations over time between sampling events in MW-33p2, MW-35p2, MW-38p2, MW-39p2, and MW-43p2 (**Figure 35**). In most wells VOC concentrations decreased significantly over time; however, some of the observed decreases in MW-35p2 and MW-38p2 were due to changes in laboratory reporting limits:

- Total VOCs in MW-35p2 decreased from about 54,890 ug/L in November 2008, to 6,390 ug/L in March 2009, to 4,470 ug/L in December 2009. All VOCs showed significant decreases, with the largest decrease being ketone compounds (total ketones decreased from 39,000 ug/L to below 2,000 ug/L).
- Total VOCs in MW-38p2 decreased from about 24,570 ug/L in November 2008 to 14,680 ug/L in March 2009, but then increased to about 35,910 ug/L in December 2009. The decrease between November 2008 and March 2009 was dominantly in ketone compounds and the increase between March and December 2009 was dominantly in BTEX compounds. Most other VOC constituents showed an increase in concentrations between all three sampling events.
- Total VOCs in MW-33p2 decreased from about 1,275 ug/L in November 2008, to 790 ug/L in March 2009, to 250 ug/L in December 2009. All VOCs showed significant decreases; the largest decrease was in the concentration of chloroethane (from 840 ug/L to 130 ug/L).
- Total VOCs in MW-43p2 decreased from about 140 ug/L to 40 ug/L between September 2009 to December 2009. The largest decrease was also in the concentration of chloroethane (from 100 ug/L to 11 ug/L).
- Total VOCs in MW-39p2 decreased from over 10 ug/L in August 2009 to less than 4 ug/L in December 2009.

As with the overlying P1 zone, there is strong evidence that natural attenuation is reducing the concentrations of VOCs in the P2 zone by the former drum cache. Evidence includes significant decreases in VOC concentrations within a short distance; high concentrations of organic breakdown products; and a strong reducing environment immediately south-southwest of the former drum cache (**Table 12**).

The redox environment in P2 is methane-producing immediately south-southwest of the former drum cache (MW-33p2 and MW-35p2) with low concentrations of oxygen (less than 1 mg/L), high concentrations of carbon dioxide (up to 258 mg/L), and high concentrations of methane (up to 3,290 ug/L). Northwest (MW-38p2 and MW-43p2) and east (MW-39p2) of the former drum cache the redox environment becomes aerobic with moderate concentrations of dissolved oxygen (1 to 3 mg/L), low to moderate concentrations of carbon dioxide (less than 42 mg/L), and low concentrations of methane (less than 260 ug/L). This distribution indicates anaerobic biodegradation in the P2 zone may be most active south-southwest of the former drum cache.

As with the overlying P1 zone, ketone and BTEX compounds appear to attenuate quickly in P2 within a short distance of the former drum cache. Concentrations decrease from a maximum of over 10,000 ug/L within 75 feet of the former drum cache (sample B-22-p2, sample B-26-p2, MW-35p2, MW-38p2) to less than 100 ug/L about 100 feet south of the former drum cache (MW-33p2), to less than 10 ug/L about 300 feet northwest of the former drum cache (MW-43p2), and to less than 10 ug/L about 400 feet east of the former drum cache (MW-39p2).

The geochemical condition in the P2 zone immediately south-southwest of the former drum cache (MW-33p2 and MW-35p2) appears favorable for reductive dechlorination (see Section 9.4). In addition to having a highly reducing environment, there is a large source of electron donors available (BTEX and ketone compounds) to drive the reaction. However, as with the overlying P1 zone, concentrations of chlorinated breakdown daughter products (cis-1,2-DCE, vinyl chloride, DCA, and chloroethane) are relatively high (one to three orders of magnitude higher than the original parent products), indicating incomplete transformation.

Significantly higher concentrations of chlorinated parent products occurred in the P2 zone immediately northwest of the former drum cache (MW-38p2), suggesting both a closer proximity to source and less reductive dechlorination. Concentrations of PCE (24 ug/L), TCE (180 ug/L), and 1,1,1-TCA (2,700 ug/L) were all higher in MW-38p2 compared to other P2 wells or borings. Furthermore, chloroethane, a breakdown product of chlorinated ethanes which was significantly high in other P2 wells, was not detected in MW-38p2. The redox environment at MW-38p2 is aerobic (2 mg/L dissolved oxygen) and concentrations of carbon dioxide and methane were an order of magnitude less than the P2 wells south of the former drum cache, indicating much less biodegradation occurs in the P2 at this location. Concentrations of 1,1-DCE; however, were significantly higher in MW-38p2 (up to 470 ug/L) compared to other P1 and P2 wells (less than 150 ug/L), suggesting abiotic degradation of 1,1,1-TCA may be an important degradation mechanism at this location (see Section 9.3.4).

Inorganic Contaminants

Elevated concentrations of inorganic parameters occurred in one or more P2 wells. Metals and inorganic parameters exceeding RI screening levels in on-site P2 wells[61] during one or more sampling events are (**Table 14**):

- MW-33p2 (arsenic, chloride, iron, manganese, and TDS)
- MW-35p2 (arsenic, chloride, manganese, and TDS)
- MW-38p2 (arsenic, manganese, and TDS)
- MW-39p2 (arsenic, chloride, iron, nitrate, and TDS)
- MW-43p2 (arsenic)
- MW-40p2 (arsenic)

Significantly high concentrations of nitrate (17.8 ug/L) occurred in MW-39p2 in August 2008, shortly after the well was installed, but then decreased to 0.82 mg/L by December 2009. The decrease may be related to cessation of nearby irrigation[62].

[61] Arsenic concentrations exceed RI screening levels in off-Site P2 wells (MW-46p2, MW-49p2, and MW-52p2), but concentrations are below background. No other parameters exceed RI screening levels in off-Site P2 wells.

Concentrations of chloride, TDS, and other landfill leachate indicator parameters were significantly higher in P2 wells located beneath original landfill refuse (MW-33p2 and MW-35p2) compared to wells immediately outside the footprint of the original landfill to the north (MW-38p2 and MW-43p2). Furthermore, the highest concentrations of leachate indicator parameters did not occur where VOC concentrations were highest, but rather where the overlying refuse was thickest (MW-33p2, 27 feet thick). This suggests some impacts from landfill leaching south of the former drum cache.

P2 Contaminant Pathway

Most of the contaminants observed in the P2 near the former drum cache likely originate from contaminants in the overlying P1 zone. Vertical leakage from the P1 to the P2 appears to occur in the immediate vicinity of the former drum cache (compare dashed plume boundaries on **Figures 8 and 9**).

The groundwater flow direction in P2 by the former drum cache was measured (MW-33p2, MW-35p2, and MW-38p2) to be northward possibly along a perching horizon (**Figure 9**). Horizontal contaminant pathways in the P2 likely extend northward, in the direction of groundwater flow; however, contaminants appear to attenuate rapidly. Groundwater contaminants may also discharge where the P2 zone subcrops (south, east, and west **Figure 9**); however, given the limited horizontal extent of contamination observed in the P2 zone and downward vertical gradients, the dominant pathway is likely vertically downward to the underlying Roza aquifer, and possibly indirectly via the Hole. Concentrations of organic contaminants in the underlying Roza aquifer were orders of magnitude less than the overlying P2, indicating attenuation occurs with vertical migration.

Approximately 700 feet northwest of the former drum cache, near the shop, low level concentrations of PCE (0.2 ug/L) were detected in the P2 zone (MW-40p2). The source is likely localized leaching of landfill refuse and/or soils by the shop. Low level concentrations of PCE (up to 1.8 ug/L) were also detected in the overlying P1 zone by the shop area (MW-41a).

9.5.2 Roza Aquifer

This subsection describes the nature and extent of groundwater contamination in the Roza aquifer based on the following observations:

- Long time groundwater monitoring and other observations (as early as 1989) from solid waste monitoring wells (MW-3b, MW-7b, MW-9b, MW-19b).
- Groundwater monitoring and other observations from recently installed RI monitoring wells (MW-29b, MW-30b, MW-31b, MW-42b, MW-44b, MW-48b, MW-53a[63] and MW-51b).
- Observations of the Roza aquifer being thin to absent at particular locations during drilling of other aquifer monitoring wells.

[62] Irrigation to landfill poplar trees along the northeast fence line ceased in 2008.
[63] MW-53a is completed on top of basalt, but is interpreted as a local discharge area for the Roza aquifer.

Organic Contaminants

Organic contaminants in the Roza aquifer occur on the north end of the original landfill and extend at least 1000 feet north, but not more than 2000 feet north, of the former drum cache (**Figures 10 and 21**). Maximum concentrations of total VOCs in the Roza aquifer (in excess of 500 ug/L) were orders of magnitude less than the maximum concentrations observed in the overlying P1 and P2 zones near the former drum cache (in excess of 100,000 ug/L). Nonetheless, a number of VOCs detected in the Roza aquifer exceed RI screening levels (**Tables 15 and 16**).

The highest concentrations of total VOCs in the Roza aquifer[64] did not occur near the former drum cache, but rather 1000 feet north of the former drum cache in MW-44b and 300 feet northwest of the former drum cache in MW-42b (total VOCs detected during the RI were about 500 and 600 ug/L at MW-42b and MW-44b respectively). Total VOCs were lower, but also elevated, in the Roza aquifer immediately north of the maintenance shop in MW-3b and MW-7b (total VOCs detected during the RI were about 200 ug/L) and south of the shop (MW-9b) total VOCs were even lower (total VOCs averaged about 40 ug/L during the RI). Groundwater contamination in the Roza aquifer does not appear to extend significantly beyond the wells mentioned above (dashed line on **Figure 10**). Within a few hundred feet south and east, the aquifer appears to pinch out (MW-5c, MW-28d, MW-2c, and MW-4c) and to the west (within a few hundred feet) the aquifer likely subcrops into a buried coulee with silt deposits that limit discharge from the Roza (cross section B-B' in **Figure 5**). North and northwest of the shop area (within a few hundred feet), VOCs are not detected in the Roza (MW-48b and MW-19b). VOCs are also not detected in the Roza 2,000 feet north of the former drum cache (about 1,000 feet north of MW-44b) in MW-51b (**Figure 21**).

Organic contaminants in the Roza aquifer likely extend further east-northeast (beyond MW-44b) towards the Whitson property and the north-south oriented draw in the bedrock upland (**Figure 10**). Low to moderate concentrations of VOCs were detected in the Whitsons' private well (total VOCs detected in the Whitson well during the RI ranged from about 20 to 30 ug/L). The Whitsons' well extends to a depth of 294 feet with no casing beyond a 19 foot surface seal and the boring may intersect multiple aquifers; including the Roza aquifer. Thus the concentrations in the Whitson well are not those of the Roza aquifer, but groundwater impacts observed in this well are primarily attributed to the influence of the Roza groundwater given the relatively low VOC concentrations observed in the lower aquifers. As a result of the mixed nature of water from the Whitson well, data are not included on **Figures 10, 21, 26, and 31**. Low concentrations of VOCs (total VOCs less than 3 ug/L) were also detected in groundwater above rock in the bedrock draw (MW-53a)[65], which was interpreted as hydraulically connected to Roza groundwater.

VOCs detected in the Roza aquifer were generally similar to those detected in the overlying P1 and P2 zones; with the exception that BTEX and ketone compounds do not domi-

[64] Reported concentrations are the maximum's observed during the RI investigation period (2008 to 2009). Historically, higher concentrations have been detected in Roza aquifer wells MW-3b, MW-7b, and MW-9b by the shop. See text for discussion on geochemical trends.

[65] PCE and arsenic exceed RI screening levels in MW-53a (Table 15). Arsenic was 3 times above background in MW-53a.

nate the mass of contaminants as they did in the most contaminated portions of the P1 and P2. The dominant class of VOCs detected in most Roza aquifer wells were chlorinated ethanes (mainly 1,1-DCA and chloroethane), chlorinated ethenes (mainly cis-1,2-DCE and vinyl chloride), and 1,2-DCP. BTEX (mainly benzene), acetone, dichlorobenzenes, bromobenzene, chlorobenzene, and methylene chloride were also commonly present in most wells, but at lower concentrations.

There were significant differences in the detected VOCs and their relative concentrations between Roza aquifer wells, which may indicate different contaminant pathways, different degrees of degradation, and proximity to contaminant source. Single wells or groups of wells with unique or similar VOCs are:

MW-42b, MW-3b, and MW-7b

VOC constituents detected in MW-42b, MW-3b and MW-7b were similar, suggesting a common pathway. All three wells have relatively high concentrations of chlorinated ethane breakdown products (1,1-DCA and chloroethane), chlorinated ethene breakdown products (cis-1,2-DCE; and vinyl chloride) and 1,2-DCP (**Figure 21 and Tables 15 and 16**). However, the concentrations of chlorinated ethane breakdown products and 1,2-DCP were 2 to 3 times higher in MW-42b compared to MW-3b and MW-7b.

PCE concentrations were also higher in MW-42b (4.0 ug/L) compared to MW-3b and MW-7b (0.2 ug/L or less); however, concentrations of PCE breakdown products (TCE, cis-1,2-DCE and vinyl chloride) were either similar to or higher in MW-3b and MW-7b compared to MW-42b (**Figure 31 and Tables 15 and 16**). This suggests additional degradation of chlorinated ethenes occurs along this pathway and/or additional sources of chlorinated ethenes impacting the Roza aquifer near MW-3b and MW-7b. Elevated chloride in MW-3b and MW-7b suggests additional impacts from landfill leachate. VOCs exceeding RI screening levels in these wells include 1,2-DCP, benzene, 1,4-dichlorobenzene, 1,2-DCA, chloroethane, PCE, TCE, and vinyl chloride (**Table 15 and 16**). Methylene chloride also exceeded RI screening level in MW-42b.

MW-29b

VOCs detected in MW-29b were similar to those detected in the group of wells above with relatively high concentrations of chlorinated ethane breakdown products (1,1-DCA and chloroethane), chlorinated ethene breakdown products (cis-1,2-DCE; and vinyl chloride) and 1,2-DCP. However, unlike the wells above, the concentration of chloroethane (breakdown product of 1,1-DCA) in MW-29b was an order of magnitude less than the concentrations of 1,1-DCA. Also, the concentration of 1,2-DCP was substantially higher than the wells above (**Tables 15 and 16**). These differences suggest less complete breakdown of chlorinated ethanes and closer proximity to the 1,2-DCP source.

As with the other Roza aquifer wells near the former drum cache (MW-30b and MW-31b), elevated concentrations of toluene (up to 20 ug/L) and acetone (11 ug/L) were also detected in MW-29b; however, large fluctuations in the concentration of toluene occurred between sampling events in MW-29b (see geochemical trends below).

VOCs exceeding RI screening levels in MW-29b are 1,2-DCP, benzene, 1,4-dichlorobenzene, 1,2-DCA, PCE, TCE, and vinyl chloride (**Table 16**).

MW-44b

VOCs detected in MW-44b were similar to the wells above with relatively high concentrations of chlorinated ethane breakdown products (1,1-DCA and chloroethane) and 1,2-DCP (**Figure 26**). In contrast, the concentrations of chlorinated ethenes were significantly lower (about 5 times less, **Figure 31**), while the concentrations of benzene and dichlorobenzenes were significantly higher (2 to 5 times higher, **Tables 15 and 16**). The concentration of 1,2-dichlorobenzene (20 ug/L) in MW-44b was also higher than concentrations detected in any P2 monitoring well. These differences suggest a unique pathway (or different paths within a common plume) may contribute to contamination in the Roza aquifer north of the former drum cache compared to the Roza aquifer northwest of the former drum cache (MW-42b, MW-3b and MW-7b).

VOCs exceeding RI screening levels in MW-44b are 1,2-DCP, benzene, 1,4-dichlorobenzene, 1,2-DCA, chloroethane, vinyl chloride, and methylene chloride (**Table 15**).

MW-30b and MW-31b

Roza aquifer wells immediately southwest (MW-30b) and northwest (MW-31b) of the former drum cache have significantly lower concentrations of most VOC constituents compared to the wells above (**Figures 21, 26 and 31**), including chlorinated ethanes, chlorinated ethenes, and 1,2-DCP. The lower concentrations indicate vertical migration from the overlying P2 is limited in this area. However, relatively higher concentrations of toluene (up to 35 ug/L in MW-30b), acetone (up to 78 ug/L in MW-31b), and 1,1,1-TCA (up to 4.5 ug/L in MW-30b) occurred in both wells, suggesting proximity to the source. 1,1,1-TCA, the parent product for 1,1-DCA and chloroethane, was not detected in any other Roza well, suggesting these wells are located closer to the source of 1,1,1-TCA.

VOCs exceeding RI screening levels in MW-30b are PCE, TCE, and vinyl chloride. Vinyl chloride is the only VOC exceeding RI screening levels in MW-31b.

MW-9b

MW-9b is unique in having the highest concentration of PCE observed in any of the Roza aquifer wells (PCE as high as 6.5 ug/L was detected in MW-9b during the RI, **Table 15**). PCE concentrations were significantly higher than concentrations in the Roza aquifer north of the shop in MW-3b and MW-7b (as high as 0.2 and 0.5 ug/L respectively). PCE concentrations in MW-9b were also significantly higher than concentrations observed in other wells located along potential groundwater pathways leading from the former drum cache including: the P1 zone (<0.2 ug/L) midway between former drum cache and the shop (sample B-32-p1), the P2 zone (1.1 ug/L) midway between former drum cache and the shop (MW-43p2), groundwater in the Hole (0.7 ug/L), and the Roza aquifer (4 ug/L) midway between former drum cache and the shop (MW-42b). This suggests a PCE source near the northwest corner of the original landfill; possibly contaminated soils and refuse near the shop and/or landfill refuse (see Section 9.2).

Similar to the Roza aquifer north of the shop, the dominant VOCs detected in MW-9b were chlorinated ethene breakdown products, chlorinated ethane breakdown products, and 1,2-DCP; however, overall concentrations were about four times lower in MW-9b.

Furthermore, chlorinated ethanes (in particular chloroethane) make up a smaller percentage of the total VOCs in MW-9b (less than 15 percent) compared to most other Roza aquifer wells (30 to 80 percent of total VOCs).

VOCs exceeding RI screening levels in MW-9b are 1,2-DCP, 1,2-DCA, PCE, TCE, and vinyl chloride.

In addition to the spatial variability in VOC concentrations between wells there were a few significant changes in concentrations during the 2008 to 2009 RI investigation. A few short-term and long-term changes also occurred historically in long-term solid waste monitoring wells. These changes are discussed in more detail below under geochemical trends.

A strong reducing environment with relatively high concentrations of methane and carbon dioxide occurs in the Roza aquifer north of the shop (MW-3b and MW-7b) and north of the site (MW-44b), indicating anaerobic biodegradation of organic contaminants is active at these locations (**Table 12**). Concentrations of methane were particularly high in MW-44b (5,760 ug/L) compared to any other Roza or P2 monitoring well, and benzene (an electron donor) was present at both locations.

The redox environment north of the shop (MW-3b and MW-7b) is highly reducing (iron-sulfate reducing) while south of the shop (MW-9b) the aquifer is moderately reducing (nitrate reducing) (**Table 12**). Furthermore, the concentration of benzene was about five times lower in MW-9b. These differences may explain why PCE persists in MW-9b. Reductive dechlorination more readily occurs in highly reducing environments with an available source of electron donors (see Section 9.3.4).

Inorganic Contaminants

Elevated concentrations of inorganic parameters occurred in one or more Roza aquifer wells. Metals and inorganic parameters exceeding RI screening levels in Roza aquifer wells during one or more RI sampling events are (**Tables 15 and 16**):

- MW-3b (arsenic, chloride, iron, manganese, sulfate, and TDS)
- MW-7b (arsenic, chloride, iron, manganese, sulfate, and TDS)
- MW-9b (arsenic, chloride, manganese, sulfate, nitrate, and TDS)
- MW-29b (arsenic, chloride, iron, and TDS)
- MW-30b (arsenic, iron)
- MW-31b (arsenic)
- MW-42b (arsenic, chloride, sulfate, TDS)
- MW-44b (arsenic, chloride, iron, manganese, TDS)
- MW-19b (arsenic, sulfate, and TDS)

Except MW-3b, MW-9b and MW-44b, all arsenic concentrations are below the background concentration (3.0 ug/L).

Nitrate concentrations were significantly higher in MW-9b (as high as 21.6 mg/L) compared to other Roza aquifer wells (less than 1 mg/L) and may be related to a local nearby source (possibly the shop's septic system, landfill refuse, or off-site agricultural sources). A significant increase in nitrate concentration first occurred in MW-9b in 2006 and con-

centrations have been relatively high (> 7 mg/L) since then (see geochemical trends below).

Significantly high concentrations of chloride (>1,000 mg/L) and TDS (> 3,000 mg/L), and other landfill leachate indicator parameters occurred in all three Roza aquifer wells near the former shop (MW-3b, MW-7b, and MW-9b). This suggests some impact from landfill leaching; possibly via groundwater in the Hole (EW-1). Moderately high concentrations of chloride and TDS also occurred in MW-29b, MW-42b and MW-44b, while significantly lower concentrations occur in MW-30b and MW-31b.

Geochemical Trends

Significant decreases in VOC concentrations were observed between sampling events in all three Roza monitoring wells near the former drum cache (MW-29b, MW-30b, and MW-31b) during the RI investigation (**Figure 36**):

- Total VOCs in MW-31b decreased from a high of 104 ug/L in November 2008, to a low of 8 ug/L in March 2009, and increased to 26 ug/L in December 2009.
- Total VOCs in MW-30b decreased from a high of 72 ug/L in November 2008, to 17 ug/L in March 2009, to a low of 4.5 ug/L in December 2009.
- Total VOCs in MW-29b decreased from a high of 294 ug/L in November 2008, to 270 ug/L in March 2009, to a low of 194 ug/L in December 2009.

In all three wells, the largest decreases occurred in concentrations of toluene and/or acetone; however, there were also significant decreases in 1,2-DCP (from 120 ug/L to 62 ug/L) and 1,1-DCA (79 ug/L to 51 ug/L) in MW-29b.

Long term groundwater monitoring of the Roza aquifer near the shop (MW-3b, MW-7b, and MW-9b) shows a significant short-term increase in VOC concentrations occurred there in 1997 and again between 2003 and 2005 (**Figure 37**). During these events, the concentration of total VOCs in both wells increased rapidly by about two orders of magnitude (in excess of 10,000 ug/L) and then decreased back to previous concentrations (total VOCs generally less than 300 ug/L) within about 1 year. In between events, and since the last event, VOC concentrations have remained fairly steady in both these wells (i.e. not trending, but some seasonal variability occurs).

The largest increase during both historical events was in BTEX (mainly toluene) and/or ketone (mainly acetone) compounds (**Figures 38 and 39**). Other VOCs that showed significant increases (greater than 100 ug/L) during one or both events included:

- Chlorinated ethanes (1,1,1-TCA; 1,1-DCA; 1,2-DCA; chloroethane)
- vinyl chloride
- 1,2-DCP
- 1,2,4 and 1,3,5 trimethylbenzene

VOCs that were not detected before the short-term events decreased to below detection shortly after the event:

- 1,1,1-TCA (below detection after 2001)
- 1,2,4-trimethylbenzene (below detection after 2006)

- 1,3,5-trimethylbenzene (below detection after 2005)
- Toluene, ethylbenzene, and xylenes (below detection after 2005 or 2006)
- Ketone compounds (below detection after 2005)

The sudden short-term increase in VOC concentrations would suggest a possible mobilization of free product or other residual contaminant above an unconfined water table; however, the Roza aquifer is confined. Also, free product was not observed during the drilling of monitoring wells north of the shop (MW-3b, MW-7b, MW-40p2 and MW-41a). The short-term increase may be related to mobilization and transport of contaminants from residual LNAPL or possibly a ruptured drum(s) in the former drum cache. The sudden increase in VOCs observed in MW-3b and MW-7b was not observed in other monitoring wells, indicating fairly local events.

Long term groundwater monitoring also shows a slow decreasing trend in VOC concentrations in the Roza aquifer south of the shop (MW-9b). The concentration of total VOCs in MW-9b has decreased from over 100 ug/L in 1997 to less than 50 ug/L in 2009 (**Figure 37**), with the largest decrease being concentrations of 1,1-DCA (from 25 ug/L to 1.8 ug/L) and 1,2-DCP (from 42 ug/L to 2 ug/L).

A more pronounced decreasing trend recently occurred in MW-9b during the 2009 monitoring period, with total VOCs (chlorinated ethenes, chlorinated ethanes, and 1,2-DCP) decreasing by about 50 percent during 2009 (**Figure 37**). The decrease in VOC concentrations appears to correlate with a decrease in chloride concentrations in this well. Chloride concentrations decreased from historical concentrations greater than 1,000 mg/L to a minimum of 357 mg/L in October 2009.

Nitrate concentrations have also significantly increased in MW-9b since 2006 to a peak of 21.6 mg/L in March 2009. Nitrate concentrations in MW-9b have generally fluctuated seasonally between 7 and 15 mg/L since 2006. Prior to 2006, nitrate concentrations were generally less than 2 mg/L in MW-9b.

Some of the recent geochemical changes observed in MW-9b may be related to recent changes in groundwater flow directions in the Roza aquifer by the shop. Groundwater flow directions have historically been southward, but northward flow directions were recently measured (2008 and 2009) and may be in response to a new off-site "interception" well installed northwest of the site near Oasis Park (**Figure 1** and Section 7.2).

Roza Aquifer Contaminant Pathway

Most of the contaminants observed in the Roza aquifer likely originate from contaminants in the overlying P2 zone with additional contaminants originating from the Hole . Vertical leakage of contaminants from the P2 to the Roza aquifer occurs within a few hundred feet of the former drum cache and may also occur indirectly via the Hole[66]. Although downward flow from the P2 to the Roza is indicated throughout the area, the area near wells MW-30b and MW-31b is not on a prominent contaminant pathway either as a result of little downward leakage from the P2 occurring there and/or low Roza aquifer

[66] Detected VOCs in the Hole were generally similar to VOCs detected in Roza aquifer wells north of the Hole; however, the concentrations of VOCs in the Hole are generally slightly less (see Figure 21) indicating that leakage from the Hole cannot be the only source.

transmissivity (Section 7.1.2). VOC concentrations in MW-30b and MW-31b are relatively low but impacts from the former drum cache are indicated by the presence of toluene and acetone. Landfill leaching from the original landfill also likely contributes to contamination in the Roza aquifer; including leaching by groundwater in the Hole (EW-1). The relative contribution of VOCs from landfill refuse is likely low, but cannot be quantified because of the mixing of sources.

The extent of groundwater contaminants in the Roza aquifer on-site is limited to the northern part of the site where the aquifer occurs (**Figure 10**). The aquifer pinches out to the south and east (MW-5c, MW-28d, MW-2c, and MW-4c) and to the west the aquifer likely subcrops into a buried coulee near the property boundary where silt deposits limit discharge from the Roza (cross-section B-B' in **Figure 5**). Vertical migration from the Roza aquifer to the Interflow aquifer may occur beneath much of the northern half of the original landfill; however, maximum concentrations of VOCs in the underlying Interflow aquifer were about an order of magnitude less, indicating the contaminant mass attenuates with vertical migration.

Contaminant migration off-site occurs in an apparently narrow plume to the north-northeast towards MW-44b (**Figure 10**). The dominant VOCs migrating off-site in the Roza aquifer (MW-44b) are chlorinated ethanes (1,1-DCA and chloroethane), benzene, 1,2-dichlorobenzene, and 1,2-DCP. This plume extends east-northeast (beyond MW-44b) towards the Whitson property and the north-south oriented draw in the bedrock upland. Similar VOCs, but at significantly lower concentrations, were detected in the Whitson well; however, slightly higher concentrations of PCE, TCE and vinyl chloride were also detected, suggesting the Roza aquifer at location MW-44b does not represent the entire pathway and source to the Whitson well .

North of the site, there is little vertical migration of contaminants from the Roza aquifer to the Interflow aquifer[67] (MW-45c, MW-50c, and MW-54c); however, low concentrations of a few VOCs were detected in a few private Interflow aquifer wells northeast of the sitel (see Section 9.5.4). Vertical migration of contaminants to these private wells may be occurring further east near the Whitson property with possible preferential vertical flow occurring through the Whitson well, which is apparently open to multiple basalt aquifers below the Roza (**Figure 6**).

Contaminant migration in the Roza aquifer south of the original landfill appears to be minimal. Within a few hundred feet south and east of the north end of the original landfill, the Roza aquifer appears to pinch out; to the west, the aquifer likely subcrops into a buried coulee with silt deposits that limit discharge. A few low level VOCs (below RI screening levels) were detected in the Outwash aquifer immediately west of the original landfill (MW-17a and MW-18a in **Figure 23 and Table 19**) which may be related to diffuse pathways leading from the Roza aquifer. Vertical migration of contaminants to the underlying Interflow aquifer may also occur beneath the original landfill where the Roza aquifer is present (**Figure 10**).

[67] Very low levels of PCE (0.031ug/L), cis-1,2-DCE (0.2 ug/L) and vinyl chloride (0.023 ug/L) were detected in MW-45c and very low levels of TCE (0.027 ug/L) were detected in MW-54c during a single sampling event. All concentrations are below MTCA method-B screening levels.

9.5.3 Interflow Aquifer

This subsection describes the nature and extent of groundwater contamination in the Interflow aquifer based on the following observations:

- Long term groundwater monitoring and other observations (as early as 1990) from Solid Waste Interflow Aquifer monitoring wells (MW-2c, MW-4c, MW-5c, MW-6c, MW-20c, MW-21c, MW-22c)
- Groundwater monitoring and other observations from recently installed RI Interflow Aquifer monitoring wells (MW-45c, MW-47c, MW-50c, and MW-54c)
- Groundwater samples and geologic well logs for private wells likely completed in the Interflow aquifer (Abrams, Pashkovsky-ABX965, Pashkovsky-ACX157, Perez, Gutierrez-ABO220, Gutierrez-ACE908, Bohr, Gutierrez-ACE909, Moore)

Private wells were sampled once in 2009, except Abrams which was sampled twice in 2009 for confirmation and Moore which was also sampled for VOCs in the past (1994 and 1995).

Groundwater contaminants in the Interflow aquifer appear to occur as two separate plumes following two different pathways (**Figures 11, 22, 27 and 32**). The two plumes are distinguished by differing groundwater chemistries and different pathways. The main plume (Interflow Aquifer Plume beneath the Landfill) occurs directly below the original landfill and may extend a short distance further south before discharging into the Out-wash aquifer and/or the Ringold Formation (red dashed line beneath original landfill on **Figure 11**). The Landfill plume is characterized as having several VOCs (including PCE) and high concentrations of chloride. A separate plume occurs 500 to 1000 feet northeast of the original landfill (Interflow Aquifer Plume northeast of Landfill) and may extend eastward towards Dodson road (red dashed line northeast of original landfill on **Figure 11**). This plume is characterized as having only a few VOCs (mainly 1,2-DCP and 1,1-DCA) with chloride concentrations typical of background.

The main plume beneath the original landfill does not appear to extend significantly north of the site. Except for very low concentrations of few VOCs (less than 0.05 ug/L) in MW-45c and MW-54c, VOCs were not detected in Interflow aquifer wells north of the site (MW-45c, MW-47c, MW-20c, and MW-50c). Very low concentrations of cis-1,2-DCE (0.2 ug/L), PCE (0.031 ug/L), and vinyl chloride (0.023 ug/L) were detected in MW-45c and a single low level detection of TCE occurred in MW-54c (0.027 ug/L); all of which are below RI screening levels (**Tables 17 and 18**). VOCs were also not detected in Interflow aquifer wells between the two delineated plumes (MW-4c and Gutierrez-ABO220). This suggests the two plumes are separate with different pathways. The nature and extent of contamination in each plume is described further below.

9.5.3.1 Interflow Aquifer Plume beneath Landfill

The nature and extent of groundwater contaminants in the Interflow aquifer beneath the original landfill is based on landfill perimeter wells MW-2c, MW-4c, MW-5c, and MW-22c. These wells are sampled regularly as part of the Landfill's solid waste monitoring program.

Organic Contaminants (Interflow Aquifer Plume beneath Landfill)

The concentration of total VOCs in the Interflow aquifer around the perimeter of the original landfill varied from a maximum of 30 ug/L along the western perimeter (MW-5c) to 10 ug/L or less along the eastern perimeter (MW-2c and MW-6c). The concentration of total VOCs along the southern perimeter was about 15 ug/L (MW-22c). VOCs were not detected in the northeast corner (MW-4c). Higher concentrations may occur beneath the landfill itself.

Detected VOCs include chlorinated ethenes (PCE, TCE, 1,1-DCE, and cis-1,2-DCE), chlorinated ethanes (1,1-DCA), and CFC-11 (**Table 17**). Additional VOCs detected in one or more wells include vinyl chloride (MW-5c), 1,2-DCP (MW-2c and MW-5c), 1,2-DCA (MW-5c), and chloroform (MW-2c and MW-5c). Except for CFC-11, these VOCs are similar to those detected in the overlying P1, P2 and Roza aquifers. CFC-11 is a common landfill contaminant that was not generally detected in the overlying P1, P2, or Roza aquifers[68], suggesting additional landfill-related contaminants are impacting the Interflow aquifer beneath the original landfill. Concentrations of CFC-11 were highest (5 ug/L) in MW-2c (eastern perimeter) and MW-22c (southern perimeter) and account for about 30 percent of the total VOCs in both these wells. Notably, chloroethane, dichlorobenzenes, BTEX, and ketone compounds, which were common VOCs in portions of the overlying P1, P2 and Roza aquifers, are not detected in the Interflow aquifer.

VOCs exceeding RI screening levels in these wells are (**Table 17**):

- MW-5c (PCE, TCE, vinyl chloride, 1,2-DCP, and 1,2-DCA)
- MW-2c, MW-6c, and MW-22c (PCE and TCE)

PCE was prevalent in these wells, with concentrations ranging from 12 ug/L along the western perimeter of the original landfill (MW-5c) to 5 ug/L along the southern perimeter (MW-22c) to about 1 to 2 ug/L along eastern (MW-2c) and southeastern (MW-6c) perimeters. PCE concentrations in MW-5c were about twice as high as those observed in the overlying Roza aquifer 500 feet to the north (6.5 ug/L in MW-9b), suggesting MW-5c is located closer to the source or on a different contaminant pathway. Elevated concentrations of PCE in the P1 and P2 near the former drum cache (MW-34p1, MW-32a, and MW-38p2) are a potential source about 850 feet northeast of MW-5c (**Figure 1**); however, observations in surrounding wells indicate most of the PCE near the former drum cache degrades to cis-1,2-DCE and vinyl chloride within a relatively short vertical and horizontal distance (within a few hundred feet). These observations suggest either an unidentified pathway leads from the former drum cache or an additional source of PCE contributes to groundwater contamination in the Interflow aquifer; possibly landfill leaching with a source concentrated along the western side of the original landfill, and possible downward leakage from the decommissioned landfill supply well 33E1.

There is little evidence of anaerobic biodegradation occurring in the Interflow aquifer. Concentrations of methane and dissolved carbon dioxide are low and chlorinated breakdown products, vinyl chloride and chloroethane, which were prevalent in overlying aquifers, are either not detected or occur at significantly lower concentrations relative to parent compounds (**Table 12**). The redox environment in the Interflow aquifer is either

[68] CFC-11 was detected in MW-39p2 during one sampling event at the laboratory reporting limit (0.2 ug/L).

aerobic or slightly reducing (nitrate reducing), which is not favorable for anaerobic degradation of highly chlorinated ethenes and ethanes (see Section 9.3) and likely contributes to the persistence of PCE in the aquifer.

Inorganic Contaminants (Interflow Aquifer Plume beneath Landfill)

Elevated concentrations of chloride (approximately 500 to 750 mg/L) and associated TDS (approximately 1500 to 2000 mg/L) occurred in MW-2c, MW-5c, and MW-6c, suggesting impacts from landfill leaching. Moderately high concentrations also occurred in MW-22c. In all four wells the concentrations display slow increasing trends (see next section).

Elevated concentrations of nitrate also occurred in MW-5c (up to 12 mg/L), MW-2c (up to 8.8 mg/L), and MW-6c (up to 25 mg/L), as well as in off-site monitoring well MW-21c (up to 97 mg/L). MW-21c also has elevated TDS (up to 900 mg/L); however, MW-21c is likely impacted by other off-site sources (PGG, 2010a).

Metals and inorganic parameters exceeding RI screening levels in Interflow aquifer wells during one or more RI sampling events are (**Table 17**):

- MW-5c and MW-6c (chloride, nitrate, TDS)
- MW-2c (chloride, and TDS)
- MW-22c (TDS)
- MW-6c (chloride, nitrate, TDS)

In addition, all Interflow aquifer monitoring wells exceeded the arsenic screening level but were below the background concentration (3.0 mg/L).

Geochemical Trends (Interflow Aquifer Plume beneath Landfill)

Long term monitoring of the Interflow aquifer around the perimeter of the original landfill shows the concentrations of most VOCs are either quasi-steady (i.e. not trending, but some variability occurs) or slightly decreasing. A notable exception is PCE and cis-1,2-DCE in MW-5c, which have both increased from 2 ug/L or less in 1989 to 12 ug/L in 2008. Concentrations of both were slightly less in 2009.

Long-term monitoring shows slow increasing trends in chloride and other inorganic constituents in MW-2c, MW-5c, and MW-22c (PGG, 2010a). Chloride concentrations in MW-2c and MW-5c have increased from about 100 mg/L in 1991 to over 600 mg/L in 2009. The slow increase in concentrations indicates an inorganic contaminant plume, likely associated with landfill leaching, is expanding in the Interflow Aquifer around the original landfill.

A more sudden increase in concentrations of select inorganic constituents occurred in MW-6c in 2003 (up to an order of magnitude increase) and may be due to water application to a landfill fire upgradient of the well in March 2002 (PGG, 2010a). Constituents with increasing concentrations included barium, calcium, chloride, cobalt, copper, sodium, magnesium, manganese, nickel, potassium, nitrate and corresponding TDS. The concentrations of most constituents stabilized by 2005, but have not decreased back to pre-2003 levels. Natural flow rates in the Interflow aquifer are low (5 to 10 ft/yr, see Section 7.2.3) and therefore recovery to previous concentrations may be slow. A similar,

but much more diffuse response (more gradual or sporadic increase with much lower concentrations) was also observed in MW-22c, south of the original landfill (**Figure 1**).

Contaminant Pathway (Interflow Aquifer Plume beneath Landfill)

Groundwater contaminants observed in the Interflow aquifer beneath the original landfill likely originate from contaminants in the overlying Roza aquifer and/or from additional leaching of original landfill refuse. Although downward flow from the Roza to the Interflow is limited (the Roza was interpreted as being rather hydraulically isolated from the underlying aquifers), Vertical pathways to the Interflow aquifer may occur where basalt aquitards are thin, weathered, or through vertical fractures. Vertical pathways may have also preferentially occurred historically through the old water supply well at the northwest end of the original landfill (33E1, **Figure 1 and Figure 2**).

Groundwater contaminants in this plume do not appear to extend significantly past the original landfill (**Figure 11**). Within 1000 feet to the north, VOCs are either not detected (MW-47c) or a few constituents occur at very low concentrations below RI screening levels (MW-45c). Within 1500 feet to the northwest (MW-20c) and 800 feet to the west (MW-21c), VOCs are not detected. VOCs are also not detected at the northeast corner of the original landfill (MW-4c). VOCs were not detected in the Moore well (likely completed in the Interflow aquifer) approximately 2,500 feet southwest of the original landfill. Plume extension beyond the original landfill towards the south is also limited by the fact that the Interflow aquifer subcrops into the Outwash aquifer and/or Ringold Formation south of the original landfill (**Figure 11**).

The groundwater flow direction in the Interflow aquifer beneath the original landfill is towards the south in the direction of regional groundwater flow (**Figure 11**). The dominant migration pathway for groundwater contaminants in the Interflow aquifer beneath the original landfill is likely southward before discharging where the aquifer subcrops into the Outwash aquifer or Ringold Formation (**Figure 11** and **Section 7**). Some vertical migration to the underlying Frenchman Spring aquifer may also occur.

9.5.3.2 Interflow Aquifer Plume Northeast of Landfill

The nature and extent of organic contaminants in the Interflow aquifer plume northeast of the original landfill is based on eight recently sampled private wells (Abrams, Bohr, Pashkovsky-ABX965, Pashkovsky-ACX157, Perez, Gutierrez-ACE908, Gutierrez-ABO220, and Gutierrez-ACE909) (**Figure 11**). Based on geologic well logs, these wells are believed to be completed within the Interflow aquifer (**Table 2 and Appendix B**).

Organic Contaminants (Interflow Aquifer Plume northeast of Landfill)

One or more VOCs were detected in five of the eight private wells completed in the Interflow aquifer northeast of the original landfill (Abrams, Pashkovsky-ABX965, Pashkovsky-ACX157, Perez, and Gutierrez-ACE909). Total VOCs in these wells ranged from 6 ug/L (Perez) to 0.2 ug/L (Gutierrez-ACE909). Except for the Gutierrez-ACE909 well, the dominant VOCs detected in these wells were 1,2-DCP (0.7 to 2.9 ug/L) and 1,1-DCA (0.3 to 2.1 ug/L). Low levels of cis-1,2-DCE were also detected in the Pashkovsky-ACX157 well (0.4 ug/L) and low levels of cis-1,2-DCE and 1,2-DCA were detected the Perez well (0.8 ug/L and 0.2 ug/L respectively). A single low level detection of PCE (0.2

ug/L) was the only VOC detected in the Gutierrez-ACE909 well and may be related to a low level PCE plume identified in the Ringold Formation further east along Dodson road (see Ringold Section 9.5.7 below).

Two VOCs exceed RI screening levels in one or more private wells completed in the Interflow aquifer (**Table 21**):

- 1,2-DCP (Abrams, Pashkovsky-ACX157, and Perez)
- PCE (Gutierrez-ACE909)

All VOCs detected in private wells within this plume are below Federal drinking water standards (40 CFR 141.61). Analytical results have been provided to private well owners and Grant County Health District. Note that the Whitson well, which is nearby and does exceed one Federal drinking water MCL, is not grouped within this plume (Section 9.5.5).

Inorganic Contaminants

Elevated arsenic concentrations (above RI screening levels) occurred in most private wells (**Table 21** and **Appendix M**); however, concentrations were all below background (3.0 ug/L) except the Gutierrez-ACE909 well which was only slightly above background (3.5 ug/L)[69].

Nitrate concentrations were also elevated in most private wells; however, concentrations were all below the RI screening level of 10 mg/L except the Spencer well which was only slightly above the screening level (10.6 mg/L).

All other inorganic parameters analyzed in private wells were below RI screening levels (**Table 21** and **Appendix M**).

Contaminant Pathway (Interflow Aquifer northeast of Landfill)

The source of low level groundwater contamination in the Interflow aquifer northeast of the original landfill is likely from contaminant migration in the Roza aquifer north of the site (MW-44b), where elevated concentrations of 1,2-DCP (up to 27 ug/L) and 1,1-DCA (up to 53 ug/L) were observed; however, the migration appears to be concentrated near the Whitson well and minimal at MW-45c, MW-50c, and MW-54c.

A potential pathway to the private wells may be through the uncased Whitson well, which is open to the Roza, Interflow, and Frenchman Springs aquifers (cross-section C-C' in **Figure 6**). The Whitson well is located between MW-44b and the other private wells, and several VOCs were detected in the Whitson well, including elevated concentrations of 1,2-DCP and 1,1-DCA (see Frenchman Springs Section 9.5.5 below). Groundwater mixing between multiple aquifers in the Whitson well may be contributing to contamination in the Interflow aquifer; however, given the downward vertical gradients measured in the basalt aquifers, the Whitson well would be expected to act more as a drain for groundwater in the Interflow aquifer rather than a source.

[69] Arsenic concentrations were also slightly above background (3.0 ug/L) in MW-54c (3.1 ug/L) which is located outside this plume.

The extent of groundwater contamination in the Interflow aquifer northeast of the original landfill does not appear to extend significantly to the north or south. VOCs are not detected in private wells to the south (**Figure 22**), including the Gutierrez-ABO220 well (Interflow aquifer), the Gutierrez-ACE908 well (Interflow aquifer), the Bolyard-Deep well (unknown aquifer), and the Country Boys well (unknown aquifer). A single low level detection of PCE in two southern wells (the Gutierrez-ACE909 and the Bolyard-Shallow wells) may be related to a low level PCE plume identified in the Ringold Formation towards Dodson road (see Ringold Section 9.5.7 below). Also, except for a single low level detection of TCE below RI screening levels in MW-54c (0.027 ug/L), VOCs have not been detected in the Interflow aquifer to the north (Bohr, MW-50c, MW-54c, and City Irrigation well, **Figure 22**). Towards the east, the Interflow aquifer may subcrop and discharge into the Outwash aquifer or Ringold Formation (cross-section C-C' in **Figure 6**).

Many of the eastern private wells (east of C.3 Rd NW in **Figure 11**) are completed in sandstone of the Ringold Formation (cross-section C-C' in **Figure 6**). Sampled private wells completed in the Ringold Formation east of C.3 Rd NW had low level detections of PCE that may originate from a separate off-site source (see Section 9.5.7 below). 1,1-DCA and 1,2-DCP, which were the dominant class of VOCs detected in the Interflow aquifer northeast of the original landfill, were not detected in these wells, suggesting groundwater contaminants in the Interflow aquifer northeast of the original landfill do not extend to these wells.

9.5.4 Below the Interflow Aquifer (Frenchman Springs Aquifer)

This subsection describes the nature and extent of contamination below the Interflow aquifer in the Wanapum Formation based on groundwater samples collected from the following wells:

- Frenchman Springs aquifer (MW-28d, Whitson, Atkins New/Murphy, and Roland, Bolyard-Deep)
- Below the Interflow but above Frenchman Springs (MW-16d).

MW-16d is a long term monitoring well (since 2001) associated with the landfill's solid waste monitoring program. MW-28d is a recently installed RI monitoring well (2008). Whitson, Roland, Bolyard-Deep, and Atkins New/Murphy are private wells sampled in 2009 as part of the RI investigation, although Atkins New/Murphy was also sampled once before in 1989.

Groundwater contamination below the Interflow appears to be largely limited to low-to-moderate concentrations of VOCs detected in two Frenchman Springs wells (MW-28d and Whitson). At both locations preferential vertical pathways through open boreholes may have contributed to VOCs migrating to the Frenchman Springs[70]. VOCs are not detected in the Atkins New/Murphy well about 1000 feet north of MW-28d (**Figure 22**) and, except for a single low level PCE detection (0.2 ug/L), VOCs were not detected in

[70] The preferential pathway at the Whitson well may be the Whitson well itself. The preferential pathway at MW-28d may have been through the open borehole of the landfill's old water supply well about 600 feet upgradient of MW-28d (33E1 in Figure 1).

the Roland well about 1600 feet east of the Whitson well. South of Whitson (a little less than 1 mile) VOCs were not detected in the Bolyard-Deep[71] well.

MW-28d is located along the western perimeter of the original landfill about 600 feet downgradient (south) of the Landfill's old water supply well (33E1 in **Figure 1**). Historically, the old water supply well may have acted as a conduit for groundwater contaminants in upper aquifers (Section 7.1.6). The old supply well was decommissioned in 1993.

The concentration of total VOCs detected in MW-28d from three sampling events (Rounds 1, 3, and 4) was low, ranging from 4 to 6 ug/L (**Figure 36**). VOCs detected during all three events are similar to those detected in the overlying Interflow aquifer (MW-5c), but with lower concentrations: 1,2-DCP, 1,1-DCA, TCE, cis-1,2-DCE, and PCE. Vinyl chloride was also detected once near laboratory reporting limits during the Round 1 RI sampling event (Appendix A) and toluene was detected near laboratory reporting limits during the Round 4 sampling event (Appendix H).

The Whitson well is located about 500 feet northeast of the landfill's property boundary (**Figure 1**) and is open to a depth of 294 feet that correlates to the Frenchman Springs. The well log indicates the Whitson well is uncased and likely open to upper basalt aquifers, including the Interflow and Roza. The Roza aquifer is known to have high concentrations of VOCs approximately 700 feet west of the Whitson well (**Figure 21**). The Whitson well is currently still being used for non-consumptive uses with a recently installed treatment system at the well head (Section 4.5).

The concentration of total VOCs detected in the Whitson well from three sampling events ranged from 22 to 32 ug/L (**Figure 36**). Thirteen VOCs were detected in the Whitson well: 1,2-DCP, benzene, 1,2-dichlorobenzene, 1,1-DCA, 1,2-DCA, chloroethane, 1,1-DCE, cis-1,2-DCE, PCE, TCE, vinyl chloride, acetone, and toluene. Many of the same VOCs, but at higher concentrations, are detected in the Roza aquifer approximately 700 feet west of the Whitson well (MW-44b in **Figure 21**). The exceptions are PCE, TCE, and vinyl chloride, which were higher in the Whitson well, suggesting the Roza aquifer at location MW-44b does not represent the entire pathway and source to the Whitson well.

A single low level detection of PCE (0.2 ug/L) was also detected in the Roland private well about 1500 feet east of the Whitson well. Based on its drilled depth (248 feet), the Roland well is interpreted to be completed in the Frenchman Springs aquifer; however the source of PCE in the Roland well may be related to vertical migration from a low level PCE plume identified in the Ringold Formation along Dodson road (see Ringold Section 9.5.7). The well log for the Roland well indicates the Ringold aquifer is present above basalt at this location[72].

VOCs exceeding RI screening levels in wells completed in the Frenchman Springs (**Tables 18 and 21**) are:

[71] A well log for the Bolyard-Deep well was not found in Ecology's well log database; however the depth of the well was measured in the field to be about 255 feet, which would stratigraphically place it in the Frenchman Springs aquifer.

[72] The Roland well log indicates a 5-foot water bearing sandstone unit above basalt.

- MW-28d (PCE)
- Whitson (1,2-DCP, benzene, 1,2-DCA, PCE, and vinyl chloride)
- Roland (PCE)

VOCs are not detected below the Interflow aquifer along the southern boundary of the original landfill in MW-16d (**Figure 22**). MW-16d is located next to Interflow aquifer well MW-22c where VOCs have been detected (total VOCs about 15 ug/L); however MW-16d is completed about 40 feet deeper (**Appendix B**), suggesting vertical migration of contaminants does not occur at this location.

Concentrations of inorganic constituents measured in MW-28d, Whitson, Roland, and MW-16d are below RI screening levels except for arsenic, which was above the RI screening level (0.058 ug/L) but below site background concentration (3.0 ug/L). Chloride concentrations are also slightly elevated (about 100 mg/L) in MW-28d and Whitson (**Tables 18 and 21**), but below the RI screening level (250 mg/L).

As with the overlying Interflow aquifer, there is little evidence of biodegradation occurring in the Frenchman Springs aquifer at MW-28d[73] (**Figure 1)**. Concentrations of methane and dissolved carbon dioxide were low and chlorinated breakdown products, vinyl chloride and chloroethane, which were prevalent in P1, P2 and Roza aquifer, were either not detected or occurred at significantly lower concentrations relative to parent compounds in MW-28d (**Table 18**). The redox environment in the Frenchman Springs at MW-28d is slightly reducing (nitrate reducing), which is not favorable for anaerobic degradation of highly chlorinated ethenes and ethanes (see Section 9.3) and likely contributes to the persistence of PCE in the aquifer at this location.

Contaminant Pathway (Frenchman Springs)

Groundwater contamination below the Interflow aquifer appears to be largely limited to low-to-moderate concentrations of VOCs detected in two Frenchman Springs aquifer wells (MW-28d and Whitson). Both wells are located near groundwater contamination in upper aquifers and at locations where preferential vertical pathways through open boreholes may have contributed to VOCs migrating downward to the Frenchman Springs aquifer. The VOCs detected in these wells therefore probably represent maximum concentrations in the Frenchman Springs.

VOCs were not detected in the Frenchman Springs 1000 feet north of MW-28d (Atkins New/Murphy well) and, except for a single low level PCE detection (0.2 ug/L), VOCs were not detected in the Frenchman Springs 1600 feet east of the Whitson well (Roland well). South of Whitson (a little less than 1 mile) VOC were not detected in the Bolyard-Deep well.

9.5.5 Grande Ronde Formation

Groundwater contaminants have not been detected in the deeper Grand Ronde Formation beneath the site. Groundwater samples were collected from the landfill's on-site water supply well (33E1; completed in the Grande Ronde) in 1993 and 2004 and VOCs were not detected. In addition, a nearby private off-site well east-northeast of the original land-

[73] Biodegradation parameters were not measured in private off-Site wells

fill (Olivares, **Figure 1**) appears to be completed in the upper portion of the Grande Ronde and a sample collected from this well in 2009 had no detections of VOCs (**Figure 22**). North of the site, VOCs were also not detected in a 2009 sample collected from the City's Irrigation well[74] (**Figure 22**). The City's Irrigation well appears to be completed through both the Wanapum and Grande Ronde Formations (**Table 2** and well logs in **Appendix D**).

9.5.6 Ringold

A number of private wells east-northeast of the original landfill are completed in a sandstone aquifer below a clay unit (cross section C-C' **Figure 6**). The sandstone and clay are different layers within the Ringold Formation (Section 6.4). Private wells completed in the Ringold generally occur east of C.3.Rd NW and towards Dodson road (**Figure 11**). Groundwater samples collected from four private wells east of C.3 Rd NW[75] (Massey, Sanchez, Spencer, and Manship) had low to moderate concentrations of PCE (0.5 to 3.9 ug/L) in exceedance of RI screening levels (**Table 21**). A low level detection of TCE (0.4 ug/L) also occurred in the Massey well. Other VOCs observed in other plumes were not detected in these wells[76]. The concentration of PCE detected in these wells was higher than PCE concentrations in private wells closer to the landfill property (**Figure 32**). This pattern of PCE contamination suggests a possible off-site source of PCE (Section 9.2.5).

Inorganic constituents in the Massey, Sanchez, Spencer, and Manship wells were all below RI screening level or below site background concentrations (arsenic). One exception was elevated nitrate in Spencer (10.6 mg/L) which was slightly above the screening level (**Table 21**).

Contaminant Pathway (Ringold)

The origin of groundwater and contaminants in the Ringold aquifer, upgradient of the private wells that have been sampled, is not well known (Section 7.2.4). From the sampled wells, the Ringold Formation appears to extend south-southwest, within a basalt erosional channel, towards the south end of the site (**Figure 11**). The Ringold was encountered at the south end of the new landfill during drilling of MW-24a and MW-25a; however, at this location the Ringold does not appear to be a significant water bearing unit (low permeability), the unit was characterized as inter-bedded fine-grained sandstone, siltstone, and clay (see well logs **Appendix B**).

Groundwater contaminants in the Ringold may discharge vertically downward to underlying basalt aquifers or upward to the overlying Outwash aquifer. Low level concentrations of PCE were detected in the Outwash aquifer south of the original landfill (0.1 to 0.6 ug/L) and the highest concentration was observed furthest from the site and closest to Dodson road (the Bolyard shallow well, **Figure 33**). Furthermore, upward groundwater vertical gradients were measured in the Outwash aquifer at the south end of the site sug-

[74] A single low level detection of methylene chloride (0.9 ug/L) from the City's Irrigation well is like a laboratory contaminant.
[75] Well logs for Massey, Sanchez and Manship indicate wells completed in Ringold sandstone. A well log for Spencer was not found in Ecology's well log database, but is assumed to also be completed in the sandstone.
[76] Low level detections of acetone (near reporting limits) in Manship and Sanchez were flagged by the lab as being out of calibration and therefore not likely representative of groundwater concentrations.

gesting upward flow from the Ringold into the Outwash. These observations suggest PCE in the Ringold may be migrating to the Outwash aquifer south and south-east of the site.

9.5.7 Outwash Aquifer

A few low level VOCs were detected in the Outwash aquifer west, south and east of the original landfill. The nature and extent of contamination in the Outwash aquifer is based on groundwater samples collected from the following wells:

- Solid Waste monitoring wells: MW-1a, MW-6a, MW-10a, MW-11a, MW-14a, and MW-23a.
- Corrective action monitoring wells: MW-17a and MW-18a
- Recently installed RI wells: MW-24a, MW-25a, and MW-26a
- Private off-site wells: Bolyard-Shallow, City MW-2, and City MW-3

Except for the City's Reclamation Facility wells (City MW-2 and City MW-3), which are located about 4,000 feet northeast of the original landfill, all sampled wells are located west, south, and southeast of the original landfill where the Outwash aquifer increases in saturated thickness (**Figure 12**).

Low level concentrations of VOCs were detected in all Outwash aquifer wells except the City's wells[77] to the northeast, indicating impacts to the Outwash aquifer occur west, south, and southeast of the original landfill (**Figure 23**). Total VOCs in these wells were very low, generally ranging from less than 0.1 ug/L to 1 ug/L. VOCs detected are PCE in all wells and TCE in wells along the western side of the site (**Figure 23**). Additional VOCs were detected at low levels southwest of the original landfill (MW-14a), and west of the shop (MW-17a and MW-18a). Additional VOCs in these wells included 1,1-DCE and CFC-11 in MW-14a and 1,1-DCA in MW-17a and MW-18a. A very low-level detection of cis-1,2-DCE also occurred in MW-17a (0.024 ug/L) and MW-18a (0.094 ug/L) during the Round 2 sampling event (July 2008).

The detection of CFC-11 in MW-14a suggests landfill impact to that well. Low level detections of 1,1-DCA west of the shop in MW-17a and MW-18a also suggest impacts from groundwater contaminants possibly discharging from the Roza aquifer.

The concentrations of PCE in the Outwash aquifer south of the original landfill are fairly uniform (0.1 to 0.6 ug/L) suggesting a diffuse and/or distant source. It is also the only VOC exceeding RI screening levels in Outwash aquifer wells (**Tables 19 and 20**):

- PCE exceeds RI screening levels in the following wells: MW-1a, MW-6a, MW-10a, MW-11a, MW-14a, MW-23a, MW-24a, MW-25a, MW-26a, and Bolyard-shallow.

The highest concentrations of PCE detected in the Outwash aquifer (0.6 ug/L) occurred east of the site (about 1500 feet east of on-site wells) in the off-site Bolyard-shallow well (**Figure 33**), suggesting a possible off-site source. Although above the RI screening level (0.081 ug/L), the concentration of PCE in the Bolyard-shallow well is well below the Federal drinking water standard (5 ug/L). It is our understanding the Bolyard-shallow

[77] Very low levels of methylene chloride and carbon disulfide were detected in City MW-2 and may be laboratory contaminants.

well is exclusively used for lawn irrigation and filling spray irrigation trucks and that domestic water is supplied by the Bolyard-Deep well (**Figure 1**).

Except for arsenic, inorganic constituents in the Outwash aquifer are all below RI screening levels[78]. Arsenic concentrations are slightly above site background concentrations (3.0 ug/L) in all Outwash aquifer wells; however, the site background concentration for arsenic was developed from groundwater chemistry data collected from basalt aquifers (see Section 8). Slightly higher concentrations may naturally occur in the Outwash aquifer.

Arsenic concentrations were notably higher in MW-11a (up to 11 ug/L) compared to other Outwash aquifer wells (generally below 6 ug/L) and have slowly increased since monitoring first began in this well 1999 (see Geochemical trends below).

Geochemical Trends

Low concentrations of VOCs detected in the Outwash aquifer are close to laboratory reporting limits. Detections of VOCs in the Outwash aquifer were uncommon in the past, but since 2008 lower laboratory reporting limits for EPA method 8260 (reporting limit of 0.2 ug/L) and RI-related analyses using Select Ion Monitoring (reporting limit of 0.02 ug/L) have resulted in more frequent detections.

When detected, the concentrations of VOCs have been fairly consistent in Outwash aquifer wells and do not show any trends. Relatively low laboratory reporting limits were achieved for a few sampling events in the late 1990's and into early 2001 and similar VOC and concentrations were detected during that time in some of the Outwash monitoring wells. This suggests long-term stability in the low level VOCs detected in the Outwash aquifer.

A few inorganic constituents display slow increasing trends in some of the Outwash aquifer wells, including chloride, calcium, and magnesium. The trends have been observed since monitoring first began (late 1990s) and may be related to impacts from the original landfill (PGG, 2010a) or possibly off-site agricultural activities.

Contaminant Pathway (Outwash Aquifer)

Potential sources contributing to groundwater contamination in the Outwash aquifer at the south end of the site:

- Contaminants discharging from the Interflow Aquifer plume beneath the original landfill
- Diffusion of landfill gas from the original landfill
- Off-site source (PCE)

Although the Interflow aquifer likely subcrops and discharges into the Outwash aquifer and/or Ringold Formation in a relatively short distance southeast, south, and southwest of the original landfill, a number of VOCs detected in the Interflow aquifer plume beneath

[78] TDS was slightly above the RI screening level (500 mg/L) in MW-1a during a single sampling event (534 mg/L – October 2009). The concentration of TDS in MW-1a is typically about 300 mg/L.

the original landfill (1,2-DCP, 1,1-DCA, 1,2-DCA, cis-1,2-DCE, and vinyl chloride) were not detected in the Outwash aquifer south of the original landfill. Also, given the uniform distribution of low level concentrations of PCE detected in Outwash aquifer wells south of the original landfill, a more diffuse source/pathway may exist for the Outwash aquifer at this location.

Diffusion of landfill gas is a potential source. Landfill gas had PCE concentrations as high as 300 ppbv and two phase equilibrium calculations indicate the gas concentrations are high enough to explain the PCE groundwater concentrations detected in the Outwash aquifer (**Table 11**); however, other VOCs detected in landfill gas were not detected in the Outwash aquifer.

The source of PCE in the Outwash aquifer south of the original landfill may be PCE detected in the Ringold Formation northeast of the site. As explained above (Section 9.5.7) PCE in the Ringold is likely derived from an off-site source and may migrate southward and discharge upward into the overlying Outwash aquifer south of the original landfill.

Groundwater contaminants in the Outwash aquifer west and southwest of the original landfill (MW-18a, MW-17a, and MW-14a) include additional VOCs (CFC-11, 1,1-DCE, 1,1-DCA, and cis-1,2-DCE) likely derived from on-site sources.

The groundwater flow direction in the Outwash aquifer is generally towards the south; however, the gradient is relatively flat resulting in very low groundwater velocities (12 ft/yr, **Figure 12** and Section 7.2.5). The extent of PCE in the Outwash aquifer south of existing monitoring wells is not known; however, VOCs were not detected in Neva Lake, which is located approximately 0.3 miles downgradient of the new landfill and is an expression of the water table in the Outwash aquifer.

9.5.8 Neva Lake

Contaminants were not detected in Neva Lake; the closest surface water feature downgradient of the site (approximately 0.3 miles southeast). Surface water samples were collected near the bottom of the lake at the north end in August 2009 and February 2010 and VOCs were not detected in either sample (**Appendix M**).

Except for arsenic and total dissolved solids (TDS), the concentration of inorganic constituents were all below RI screening levels. Arsenic concentrations were above background (3.0 ug/L) in the summer sample but below background in the winter sample. TDS concentrations were slightly above RI screening levels in both samples.

10.0 FUTURE WORK

The nature and extent of contamination in soil, gas, and groundwater, and the sources contributing to the contamination, are relatively well characterized. With the exception of low-level PCE concentrations in groundwater south and east of the original landfill, the extent of COCs in groundwater have been delineated to below RI screening levels and to a degree of detail that should be sufficient for the purposes of the RI/FS.

Remaining tasks include continuation of interim actions, continued groundwater monitoring, completing the FS, publication of a Cleanup Action Plan by the State, and final remedial actions. These tasks are summarized below.

10.1 INTERIM REMEDIAL ACTIONS AND RESPONSE ACTIONS

Shallow groundwater extraction and LNAPL management near the former drum cache will continue as an interim remedial action in accordance with the shallow groundwater extraction plan (PGG, 2009c). Point-of-use treatment of water from the Whitson private well, with bottled water supplied for direct consumption, will continue as a response action.

10.2 CONTINUED GROUNDWATER MONITORING

Quarterly sampling of RI wells with fewer than four samples will continue until all RI wells have four quarterly samples. Most RI monitoring wells currently have three or more samples. RI monitoring will then continue at select locations and wells to monitor the performance of remedial measures (including drum removal) and to protect human health and the environment.

Quarterly sampling of solid waste monitoring wells will continue in accordance with the solid waste sampling and analysis plan (PGG and Parametrix, 2004) with the exception that site-wide water level gauging of all monitoring wells will be performed quarterly.

10.2.1 Off-Site Contaminant Migration Monitoring

Contaminant migration to the north will be monitored in selected wells at two well nests plus the Whitson well. The western nest (MW-47c, MW-48b, and MW-49p2) is essentially uncontaminated; however, given the recently measured northward flow directions in the Roza aquifer by the shop, there is concern for future northward migration in the Roza aquifer at this location. The eastern nest (MW-44b, MW-45c, and MW-46p2) has contamination in the Roza aquifer that is likely contributing to low level VOCs detected in some private wells northeast of the original landfill, possibly by vertical migration of contaminants in the off-site Whitson well. The following wells are proposed for continued RI monitoring of off-site contaminant migration:

- MW-48b
- MW-46p2, MW-44b, MW-45c
- Whitson well

10.2.2 On-Site Performance Monitoring

Monitoring will be required to assess the performance of interim actions already performed, and future remedial actions based on the FS and Cleanup Action Plan. Groundwater quality will likely continue to improve following removal of drums and contaminated soils. Since the dominant pathway from the P1 zone is vertically downward to the P2 zone, performance monitoring will focus on monitoring groundwater quality in the

underlying P2 zone. The following wells are proposed for monitoring the response of groundwater to drum removal:

- Former Drum Cache Area (P2 wells): MW-33p2, MW-35p2, and MW-38p2

Additional monitoring will likely be required based on future remedial actions. Also, solid waste monitoring data (gas and groundwater) has been, and will continue to be, very useful in tracking long-term changes in groundwater and landfill gas quality.

10.3 FEASIBILITY STUDY

The purpose of the FS will be to develop and evaluate cleanup alternatives to enable a cleanup action to be selected for the site. The study will involve identifying and screening various technologies, development of remedial alternatives, and evaluation of the remedial alternatives (PGG and Parametrix, 2010b).

The hydrogeologic and contaminant characterization presented in this report will be used to facilitate FS screening and evaluations.

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APPENDIX A
PHASE 1 RI REPORT

APPENDIX B
SITE BORING LOGS

APPENDIX C
2009 GROUNDWATER LEVELS AND LNAPL DATA FROM MW-34P1 AND MW-36P1

APPENDIX D
PRIVATE WELL DRILLERS' LOGS

APPENDIX E
GEOPHYSICAL LOGGING OF BOREHOLES

APPENDIX F
HYDROGRAPHS (RI WELLS)

APPENDIX G
GROUNDWATER EXTRACTION (EW-1) 2009
ANALYTICAL RESULTS

APPENDIX H
PHASE 2 GROUNDWATER ANALYTICAL RESULTS (ROUND 4)

APPENDIX I
PHASE 2 GROUNDWATER ANALYTICAL RESULTS (ROUND 5)

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APPENDIX L
PHASE 2 DRILLING GROUNDWATER ANALYTICAL RESULTS

APPENDIX M
PRIVATE WELLS AND NEVA LAKE ANALYTICAL RESULTS

APPENDIX N
PHASE 2 RI ANALYTICAL DATA QA/QC REPORTS

Table 1. Site Monitoring Wells

Well Designation	MW-1a (OW)	MW-2c (IF)	MW-3b (Roza)	MW-4c (IF)	MW-5c (IF)	MW-6a (OW)	MW-6c (IF)	MW-7b (Roza)	MW-8b (Roza)	MW-9b (Roza)	MW-10a (OW)	MW-11a (OW)	MW-12 (decom.)	MW-13 (decom.)	MW-14a (OW)	B-15 (no well)	MW-16d (BIF)	MW-17a (OW)	MW-18a (OW)
Northing	10913	12237	13510	12739	12769	11496	11496	13548	13062	13284	9531	9555	11522	10870	10870	10884	11400	12454	13364
Easting	20087	20103	19137	20101	18789	20089	20089	18893	19406	18862	18796	20095	18807	18793	18813	19424	19484	17983	18493
Ground Elevation (atd)	1221.6	1239.8	1261.8	1255.3	1273.4	1227.7	1227.7	1261.0	1277.0	1267.0	1240.0	1211.0	1261.0	1255.0	1255.0	1240.9	1230.8	1226.5	1238.5
Top of Steel Casing Elevation	1223.46	1242.51	1264.95	1258.01	1275.85	1229.68	1229.63	1263.97	N/A	1270.17	1242.75	1213.50	N/A	N/A	1258.44	N/A	1234.51	1226.62	1238.79
Top PVC Elevation	1222.44	1241.51	1263.83	1257.12	1274.90	1228.79	tbd	1263.02	N/A	1269.20	1242.70	1213.65	N/A	N/A	1258.58	N/A	1234.02	1226.31	1238.22
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	<1160	1226	1259	1247	1245	1165	1165	1251	1261	1247	1178	< 1173	1200	N/A	1178	1154	1176	<1165	<1171
Top of screen(ft below ground)	35	96	56	122	142	38	68	49	70	56	48	20	N/A	N/A	65	N/A	99	51	52
Bot of screen (ft below ground)	47	106	61	132	152	53	78	59	80	66	63	37	N/A	N/A	80	N/A	109	61	62
Pump set (ft below top of PVC)	42	96	57	123	143	46	69	50	N/A	55	66	38	N/A	N/A	78	N/A	111	55	57
Specific capacity (gpm/ft)	very high	moderate	1.40	<0.2	3.75	12.00	very high	N/A	N/A	0.30	high	very high	N/A	N/A	very high	N/A	very low	5.00	21.00
Target flow rate (gpm)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	N/A	1.00	1.00	1.00	N/A	N/A	1.00	N/A	pump dry	1.00	1.00

Well Designation	MW-19b (Roza)	MW-20c (IF)	MW-21c (IF)	MW-22c (IF)	MW-23a (OW)	MW-24a (OW)	MW-25a (OW)	MW-26a (OW)	B-27 (no well)	MW-28d (FS)	MW-29b (Roza)	MW-30b (Roza)	MW-31b (Roza)	MW-32a (p1)	MW-33p2 (P2)	MW-34p1 (P1)	MW-35p2 (P2)	MW-36p1 (P1)	MW-37p1 (P1)
Northing	13898	14708	12470	11397	9545	9616	9596	11465	13068	12689	12924	12981	13133	13012	12925	12959	13041	12986	13019
Easting	18109	18493	17984	19471	19458	20090	18797	20588	18679	18689	19749	19543	19573	19722	19591	19633	19504	19546	19797
Ground Elevation (atd)	1242.2	1254.3	1226.8	1231.2	1228.2	1211.6	1241.2	1206.1	1273.4	1275.0	1279.0	1284.0	1272.7	1272.2	1285.9	1280.3	1281.0	1283.8	1273.7
Top of Steel Casing Elevation	1242.57	1254.50	1226.79	1234.18	1231.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation	1242.16	1254.04	1226.50	1234.21	1231.23	1214.63	1244.81	1209.19	N/A	1278.17	1285.18	1288.12	1274.89	1276.47	1291.67	1285.93	1286.97	1288.99	1275.58
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	1231	1229	1139	1176	<1142	<1054	<1108	1141	1231	1246	1254	1254	1273	1252	1252	1256	1261	1258	1255
Top of screen(ft below ground)	19	89	110	58	45	75	74	54	N/A	333	63	65	63	16	43	28	43	32	18
Bot of screen (ft below ground)	29	99	120	68	60	85	89	64	N/A	353	68	75	73	21	53	34	53	37	23
Pump set (ft below top of PVC)	27	94	115	70	62	N/A	N/A	N/A	N/A	346	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Specific capacity (gpm/ft)	very low	0.0	0.6	very high	very high	very high	very high	very high	N/A	0.0	very low	very low	very low	high	very low	high	very low	N/A	very low
Target flow rate (gpm)	pump dry	0.5	1.0	1.0	1.0	1.0	1.0	1.0	N/A	0.5	0.5	0.5	0.2	1.0	0.25/bail	1.0	bail	N/A	bail

FS = Frenchman Springs Aquifer
IF = Interflow Aquifer
OW = Outwash Aquifer
MW = groundwater monitoring well, GP = gas monitoring probe, GE = gas extraction well
Elevations in feet above mean sea level (NGVD 1929)
N/A = not available or not applicable
Well Logs in Appendix B

Table 1. Site Monitoring Wells

Well Designation	MW-38p2 (P2)	MW-39p2 (P2)	MW-40p2 (P2)	MW-41a (P1)	MW-42b (Roza)	MW-43p2 (P2)	MW-44b (Roza)	MW-45c (IF)	MW-46p2 (P2)	MW-47c (IF)	MW-48b (Roza)	MW-49p2 (P2)	MW-50c (IF)	MW-51b (Roza)	MW-52p2 (p2)	MW-53a (p1)	MW-54c (IF)	MW-55c (dry)	W-9 (hole)
Northing	13071	12846	13552	13547	13318	13326	13946	13949	13942	14141	14135	14129	14849	14844	14840	14879	15215	15210	13183..75
Easting	19598	20080	19069	19068	19442	19428	19763	19757	19771	19200	19197	19195	19851	19849	19847	20558	21693	21693	19168
Ground Elevation (atd)	1272.4	1260.1	1260.3	1260.3	1278.0	1278.0	1263.8	1263.8	1263.8	1275.9	1275.9	1275.9	1256.0	1256.0	1256.0	1224.6	1230.8	1230.8	1275.6
Top of Steel Casing Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation	1278.0	1262.6	1262.9	1263.4	1280.8	1281.1	1266.1	1266.5	1265.8	1278.3	1278.7	1278.5	1258.4	1258.6	1258.7	1227.1	1233.5	1233.4	1280.1
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	1260	1253	1253	1253	1270	1276	1264	1262	1261	1274	1274	1275	1256	1256	1255	1211	1231	1231	1229
Top of screen(ft below ground)	33	25	21	5	55	43	48	148	26	150	62	43	103	42	33	9	142	65	37
Bot of screen (ft below ground)	43	35	31	10	65	53	58	158	36	165	72	48	113	56	43	14	152	75	47
Pump set (ft below top of PVC)	No Pump	No Pump	No Pump	No Pump	64	No Pump	56	158	No Pump	163	71	No Pump	No Pump	No Pump	No Pump	No Pump	No Pump	No Pump	N/A
Specific capacity (gpm/ft)	very low	very low	very low	very high	low	very low	very low	very low	very low	moderate	moderate	very low	moderate	very high	very low	moderate	very low	dry well	N/A
Target flow rate (gpm)	bail	0.25/bail	0.1	1.0	0.8	0.25/bail	0.5	0.5	0.5	1.0	1.0	0.5	1.0	1.0	0.25/bail	1.0	pump dry	dry well	N/A

Well Designation	W-12 (hole)	EW-1 (hole)	EW-2 (Roza)	33M1 (Supply Well)	Section 4 Pond	33F1 (Paris/ Abrams)	32R (Moore)	32A1 (Atkins Old)	32A2 (Atkins new/ Murphy)	GP-1 (decom.)	GP-2	GP-3 (decom.)	GP-4	GP-5	GP-6	GP-7	GP-8	GP-9	GP-10
Northing	13191	13107	13323	11704	N/A	13103	N/A	14663	N/A	12198	12903	12841	11921	13254	12843	11843	10843	9843	9537
Easting	19271	19226	18931	18869	N/A	21254	N/A	18504	N/A	19117	19012	19489	18831	18829	20095	20100	20102	20102	19152
Ground Elevation (atd)	1282.0	1285.6	1260.9	1272.0	N/A	1221.8	N/A	N/A	N/A	1277.1	1284.7	1276.6	1272.4	1268.5	1256.0	1234.0	1222.0	1214.0	1234.0
Top of Steel Casing Elevation	N/A	1287.7	1263.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation	1286.5	1290.7	1263.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	1223.3	1250.0	1247.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	1184.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	1227	1228	1258	1211	N/A	1187	1150 ?	N/A	N/A	1242	1239	1258	<1252	<1248	1250	<1218	<1200	<1200	<1200
Top of screen(ft below ground)	44	56	56	N/A	N/A	N/A	N/A	N/A	N/A	32	33	14	14	14	4	4	4	4	4
Bot of screen (ft below ground)	54	60	65	N/A	N/A	N/A	N/A	N/A	N/A	42	38	19	19	19	15	16	22	14	34
Pump set (ft below top of PVC)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Specific capacity (gpm/ft)	N/A	very high	moderate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Target flow rate (gpm)	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

FS = Frenchman Springs Aquifer
IF = Interflow Aquifer
OW = Outwash Aquifer
MW = groundwater monitoring well, GP = gas monitoring probe, GE = gas extraction well
Elevations in feet above mean sea level (NGVD 1929)
N/A = not available or not applicable
Well Logs in Appendix B

Table 1. Site Monitoring Wells

Well Designation	GP-11	GP-12	GE-1	GE-2	GE-3	GE-4	GE-5	GE-6	GE-7	GE-8	GE-9	GE-10	GE-11	GE-12	GE-13	GE-14	GE-15	GE-16	GE-17
Northing	10470	11470	12944	13019	13053	13180	12973	12825	12875	12676	12724	12587	12402	12188	11961	11812	11747	11896	11740
Easting	18791	18795	18905	19003	19142	19311	19404	19458	19653	19671	19865	19926	19927	19927	19881	19854	19765	19673	19614
Ground Elevation (atd)	1250.0	1263.0	1291.0	1289.0	1288.0	1286.0	1291.5	1299.0	1285.0	1294.5	1282.0	1274.0	1267.0	1265.0	1268.0	1270.0	1272.0	1279.5	1272.0
Top of Steel Casing Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	<1200	<1200	<1258	<1259	<1248	<1246	<1246.5	<1264	<1250	<1259.5	1262	<1254	<1234	<1240	<1243	<1235	<1244	<1234.5	<1238
Top of screen(ft below ground)	4.0	4.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	41.0
Bot of screen (ft below ground)	50.0	63.0	33.0	30.0	40.0	40.0	45.0	35.0	35.0	35.0	25.0	20.0	33.0	25.0	25.0	35.0	28.0	45.0	34.0

Well Designation	GE-18	GE-19	GE-20	GE-21	GE-22	GE-23	GE-24	GE-25	GE-26	GE-27	GE-28	GE-29	GE-30	GE-31	GE-32	GE-33	GE-34	GE-35	GE-36
Northing	11743	11732	11746	11882	12019	12155	12291	12550	12809	12854	12665	12703	12626	12532	12459	12336	12221	12075	12053
Easting	19469	19319	19169	19107	19044	18982	18919	18943	18968	19163	19107	19302	19477	19806	19644	19825	19662	19783	19553
Ground Elevation (atd)	1244.0	1275.0	1279.5	1286.0	1293.0	1294.5	1290.0	1293.0	1295.5	1302.0	1302.0	1305.0	1303.0	1287.0	1295.0	1281.0	1288.0	1281.5	1288.0
Top of Steel Casing Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	<1204	<1233	<1229.5	<1231	<1248	<1254.5	<1240	<1240	<1267.5	<1252	<1259	<1255	<1268	<1250	1265	<1244	<1240	<1231.5	<1245
Top of screen(ft below ground)	16.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Bot of screen (ft below ground)	40.0	42.0	50.0	55.0	45.0	40.0	50.0	53.0	28.0	50.0	43.0	50.0	35.0	37.0	37.0	37.0	48.0	50.0	43.0

Well Designation	GE-37	GE-38	GE-39	GE-40	GE-41	GE-42	GE-43
Northing	11909	12265	12445	12218	12485	12300	12027
Easting	19411	19509	19390	19302	19195	19119	19244
Ground Elevation (atd)	1284.5	1294.0	1302.0	1298.0	1305.5	1302.0	1294.0
Top of Steel Casing Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	<1239.5	<1244	<1254	<1248	<1264.5	<1252	<1249
Top of screen(ft below ground)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Bot of screen (ft below ground)	45.0	50.0	48.0	50.0	41.0	50.0	45.0

FS = Frenchman Springs Aquifer
IF = Interflow Aquifer
OW = Outwash Aquifer
MW = groundwater monitoring well, GP = gas monitoring probe, GE = gas extraction well
Elevations in feet above mean sea level (NGVD 1929)
N/A = not available or not applicable
Well Logs in Appendix B

Table 2. Private Off-Site Wells Sampled

Currrent Owner	Well Log[1]	Well Unique #	Sample ID	Sample Date	Well Log Name	Elevation[2] (ft asl)	Well Depth (ft)	Construction Date	Casing Depth (ft)	DTW[3] (ft)	WLE[4] (ft asl)	Aquifer Completion
Abrams (33F1)	Yes		Abrams	7/14/2009 & 8/6/2009	Douglas Paris	1222	120	7/19/1982	34	30	1192	Interflow
Bohr	Yes		Bohr	11/25/2009	Jerry Wilson	1236	221	10/1/1987	55	45	1191	Interflow
Bolyard	No		Bolyard - Deep	7/9/2009	NO LOG (depth field measured)	1223	255	unknown	unknown	66 & decreasing	1157 & rising	Frenchman Springs
Bolyard	Yes		Bolyard - Shallow	7/9/2009	Bolyard, Darrell B.	1226	70	9/6/1986	66	40	1186	Outwash
City of Ephrata	Yes		City Irrigation	10/15/2009	Ralph Abelson (1953)	1229	580	1953	34	37.22	1191.78	Wanapum/Grand Ronde
City of Ephrata	Yes		City MW-3	10/15/2009	EPHRATA TREATMENT PLANT MW-3	1249	63	10/13/1992	40	47	1202	Outwash
City of Ephrata	Yes		City MW-2	10/15/2009	EPHRATA TREATMENT PLANT MW-2	1236	46	10/14/1992	26	35	1201	Outwash
Country Boys	No		Country Boys	7/9/2009	NO LOG	1258	unknown	unknown	unknown	unknown	unknown	unknown
Gutierrez and Castillo	Yes	ACE909	Gutierrez-ACE909	7/14/2009	SALUD GUTIERREZ	1217	100	7/17/1996	86	33	1184	Interflow
Gutierrez, Hector (Field)	Yes	ABO220	Gutierrez-ABO220	7/14/2009	JAMES GROSS	1209	72	4/10/1995	34	24	1185	Interflow
Gutierrez, Hector (Home)	Yes	ACE908	Gutierrez-ACE908	7/14/2009	VICENTE MURFIN	1216	145	7/17/1996	66	37	1179	Interflow Aquifer
Manship	Yes		Manship	11/24/2009 & 2/17/2010	Rickie Sievers	1272	160	7/21/1983	115	100	1172	Ringold
Massey	Yes	ACK784	Massey	2/16/2010 & 3/24/2010	Advantage Homes (SALBASA)	1240	127	5/27/1997	114	52	1188	Ringold
Moore	No		Moore	6/16/2009	NO LOG (Info provide by owner)	1250	157	1975 or 1976	unknown	86	1164	Interflow
Murphy	No		Atkins New	6/16/2009	Owner's Log copied by PGG in 1989	1240	308	unknown	unknown	unknown	unknown	Frenchman Springs
Olivares	Yes	ABX964	Olivares	9/1/2009	VICTOR PASHKOSKY	1220	420	7/13/1995	420	33	1187	Grand Ronde
Pashkosky, Leonid	Yes	ABX965	Pashkosky - ABX965	9/1/2009	LEONID PASHKOSKY	1219	120	7/13/1995	77	31	1188	Interflow
Pashkovsky, Vladimir	Yes	ACX157	Pashkovsky - ACX157	9/1/2009	Vladimir Pashkovsky	1220	180	6/27/1994	48	42	1178	Ringold/Interflow
Perez	Yes		Perez	10/13/2009	Edward Gates	1218	120	4/4/1983	24	40	1178	Interflow
Roland	Yes		Roland	9/23/2009	Mike Rolland	1217	248	6/1/1983	70	80	1137	Frenchman Springs
Sanchez	Yes	ABM415	Sanchez	11/24/2009 & 2/17/2010	VINCENT SANCHEZ	1273	185	6/21/1994	156	86	1187	Ringold
Spencer	No		Spencer	12/2/2009	NO LOG	1263	unknown	unknown	unknown	unknown	unknown	unknown
Whitson	Yes	ACK773	Whitson	July-09 and Oct-09	TODD/NICOLE ANDERSON	1230	294	4/21/1997	None	117 & decreasing	1113 & rising	Frenchman Springs

1. Well logs in Appendix D
2. Except City of Ephrata Wells (City MW-2 and City MW-3), Abrams (aka Paris), Moore, and Whitson which were surveyed, elevations (feet above average sea level) were estimated from one of two methods:
   a. U.S. Bureau of Reclamation 1937 Columbia Basin Project Land Classification Map for Section 33, T21N R26E (2-ft contours)
   b. U.S. Geological Survey Digital Elevation Model (DEM), Ephrata , WA Quadrangle
3. DTW = Depth to water reported on driller's log (except Whitson and Bolyard-Deep, which were measured on 7/9/2009)
4. Water Level Elevation (feet above average sea level). Based on estimate of landsurface elevaton and depth to water reported on drillers' log

Table 3. RI Groundwater Sampling Events and Analytical Parameters

Sample Event	Event Date	MW-1a	MW-2c	MW-3b	MW-4c	MW-5c	MW-6a	MW-6c	MW-7b	MW-8b	MW-9b	MW-10a	MW-11a	MW-14a	MW-16d	MW-17a	MW-18a	MW-19b	MW-20c	MW-21c	MW-22c	MW-23a	MW-24a	MW-25a	MW-26a	MW-28d	MW-29b	MW-30b	MW-31b	MW-32a	MW-33p2	MW-34p1	MW-35p2	MW-36p1	MW-37p1	MW-38p2	MW-39p2	MW-40p2	MW-41a	MW-42b	MW-43p2	MW-44b	MW-45c	MW-46p2	MW-47c	MW-48b	MW-49p2	MW-50c	MW-51b	MW-52p2	MW-53a	MW-54c	MW-55c	EW-2	EW-1	Private Wells	Neva Lake
GW Round 1	Mar-April 08																																																									
GW Round 2	July 08																																																										
GW Round 3	Oct-Nov 08																																																									
GW Round 4	Mar 09																																																										
GW Round 5	Sept 09																																	LNAPL sample only																												
GW Round 6	Dec 09-Jan 10																																																									
GW Round 7	Feb 10																																																										
GW Extraction (Hole)	2008 and 2009																																																									
Off-Site[1]	2009 and 2010																																																									

Parameters	**Standard Parameters**	VOC (8260)	SIM-VOC[3] (8260)	Total Metals[4] (SW 6010)	Dissolved Arsenic (SW 7060)	Nitrate (Calculated)	Nitrate+Nitrite (EPA 353.2)	Nitrite (EPA 353.2)	Alkalinity (SM 2320)	Bicarbonate (SM2320)	Carbonate (SM2320)	Chloride (EPA 325.2)	Sulfate (EPA 375.2)	Total Dissolved Solids (EPA 325.2)	Total Organic Carbon[5] (EPA 415.1)	**Natural Attenuation Parameters**	Methane/Ethane/Ethene (RSK 175)	Dissolved Carbon Dioxide (RSK SOP-175)	Total Kjeldahl Nitrogen (EPA 351.4)	**Water Treatment Parameters**	Pesticides/Herbicides (SW 8081)	Aldehydes (8315A)	Biological Oxygen Demand (405.1)	**Standard Field Parameters**[6]	Static Water Level (Field Probe)	pH	Specific Conductance	Oxidation Reduction Potential (ORP)	Dissolved Oxygen (field color kits)
All Sample Events[2]																														
One Event per Well																														
One Event (EW-1 and EW-2)																														

1. Most off-Site samples collected one-time, except confirmation samples from Whitson, Massey, Abrams, Manship, Sanchez and Neva Lake (See Table 2 for information on Off-Site wells)
2. Off-Site wells associated with the City's Reclamation Facility and the City's Irrigation well only analyzed for VOC (8260)
3. SIM-VOC = 1,1-DCE, PCE, TCE and VC
4. Total Metals: Fe, Mn, Mg, Ca, K, and Na
5. Total Organic Carbon not measured during GW Round 7
6. Static water levels, oxidation reduction potential, and dissolved oxygen not measured in off-Site samples (except for water levels in Whitson and Bolyard-Deep)

Table 4. Estimated Aquifer Transmissivities

Well	Aquifer	T gpd/ft	Notes
MW-28d	Frenchman Springs	8	RI Investigation
MW-45c	Interflow	4.8	RI Investigation
MW-47c	Interflow	230	RI Investigation
MW-4c	Interflow	190	Phase 2 Investigation Report (1990)
MW-50c	Interflow	25	RI Investigation
MW-54c	Interflow	1	RI Investigation
MW-55c	Interflow	NA	Dry well
MW-5c	Interflow	5,160	Phase 2 Investigation Report (1990)
MW-6c	Interflow	>2,000	Phase 2 Investigation Report (1990)
MW-23a	Outwash	very high	RI Investigation - No measurable DD at 5gpm
MW-24a	Outwash	66,000	Estimated thickness = 60-ft (150 ft/dy)
MW-26a	Outwash	very high	RI Investigation - No measurable DD at 5gpm
MW-53a	Outwash	180	Top of Rock in Bedrock Draw (silt)
MW-6a	Outwash	112200	Phase 2 Investigation Report (1990)
MW-34p1	p1	380	RI Investigation
MW-37p1	p1	123	RI Investigation
MW-41p1	p1	20,000	Top of Rock north of Shop (Outwash/Refuse)
MW-33p2	p2	2.6	RI Investigation
MW-35p2	p2	1.2	very low T
MW-38p2	p2	2	very low T
MW-39p2	p2	11.8	RI Investigation
MW-40p2	p2	2.44	RI Investigation
MW-43p2	p2	very low	RI Investigation - Pumped dry in 3 minutes (5-ft DD) at 0.5 gpm
MW-46p2	p2	20	RI Investigation
MW-49p2	p2	12.5	RI Investigation
MW-52p2	p2	85	RI Investigation
MW-8b	Roza	0.5	Phase 2 Investigation Report (1990)
MW-31b	Roza	3	RI Investigation
MW-44b	Roza	6.7	RI Investigation
MW-30b	Roza	7	RI Investigation
MW-29b	Roza	10.5	RI Investigation
MW-42b	Roza	25	RI Investigation
MW-48b	Roza	780	RI Investigation
MW-51b	Roza	3070	RI Investigation
MW-9b	Roza	8850	Extraction Well Pump Test Report (2002)
EW-2	Roza	10800	Extraction Well Pump Test Report (2002)
MW-7b	Roza	63000	Extraction Well Pump Test Report (2002)
MW-3b	Roza	177000	Extraction Well Pump Test Report (2002)

T = Transmissitity (gallons-per-day per foot)

Wells without measured T-values are not shown (Seee Table 1 for complete list of Site wells)

Table 5. Background Inorganic Chemicals in Groundwater

Constituent	Units	No. Wells[1]	p-value (normal-dist.)[2]	p-value (log normal dist.)[2]	Min	Max	Mean	50th Percentile	80th Percentile	90th Percentile	Background[3]	Assumed Distribution
Nitrate	mg/L as N	26	0.0080	0.0002	<0.01	8.8	2.8	2.8	4.1	6.6	4.1	normal
Arsenic	ug/L	19	0.5339	0.0136	<0.2	4.3	2.0	2.0	3.0	3.5	3.0	normal
Chloride	mg/L	16	0.2174	0.1587	3.7	18.0	9.2	8.5	13.2	14.3	13.2	normal
Dissolved Iron	ug/L	16	NA	NA	<50	50	NA	NA	NA	NA	50	NA
Dissolved Manganese	ug/L	17	0.0005	0.0061	<1	91	19	8	36	43	32	log normal
Sulfate	mg/L	17	0.8384	0.1035	9.2	67.8	37.4	34.6	50.9	54.0	50.9	normal
Total Dissolved Solids	mg/L	15	0.6068	0.9668	189	358	254	248	282	307	307	log normal
Alkalinity as CaCO3	mg/L	16	NA	NA	104	219	160	153	215	218	219	NA
Carbon Dioxide	mg/L	9	NA	NA	0.47	9.20	3.00	2.40	4.64	5.60	9.20	NA

Notes

1. Not all wells were measured for select parameters (e.g. only 11 of the 26 background wells were tested for carbon dioxide)
2. p-values are from Shapiro-Wilk W test for non-normality. A low p-value (<0.05) rejectes these data as being from a normal or log normal distribution
   For the purposes of defining background, a normal or log normal distribution was assumed (which ever test had the higher p-value)
3. Background defined as 90th percentile for log normal distribution or 80th percentile for normal distribution except following:
   dissolved iron which was below detection in all but one well and therefore is set equal to the lab reporting limit
   dissolved manganese which was set to four times the 50th percentile (lower than the 80th or 90th percentile) in accordance with WAC 173-340-709
   alkalinity and carbon dioxide which are not RI COCs but are defined for assessing biodegradation scores (see Section 9.4).

NA = not applicable (background = maximum value or reporting limit as decribed above)

Up to 26 wells were used to characterize background:

Well	Description	AQUIFER
SG011	Columbia Basin GWMA Study	unknown
SG012	Columbia Basin GWMA Study	unknown
SG015	Columbia Basin GWMA Study	unknown
SG024	Columbia Basin GWMA Study	unknown
SG044	Columbia Basin GWMA Study	unknown
Olivares	Private well	Grande Ronde
Atkins New	Private well	Interflow
Atkins Old	Private well	Interflow
Bohr	Private well	Interflow
Bolyard Deep	Private well	Interflow
Country Boys	Private well	Interflow
Gutierrez-ABO220	Private well	Interflow
Gutierrez-ACE908	Private well	Interflow
Moore	Private well	Interflow
MW-16d	Ephrata Landfill Monitoring Well	Interflow(Deep)
MW-20c	Ephrata Landfill Monitoring Well	Interflow
MW-47c	Ephrata Landfill Monitoring Well	Interflow
MW-4c	Ephrata Landfill Monitoring Well	Interflow
MW-50c	Ephrata Landfill Monitoring Well	Interflow
City MW-1	City of Ephrata Reclamation Monitoring Well	OW
City MW-3	City of Ephrata Reclamation Monitoring Well	OW
City MW-5	City of Ephrata Reclamation Monitoring Well	OW
MW-49p2	Ephrata Landfill Monitoring Well	P1
MW-52p2	Ephrata Landfill Monitoring Well	P2
MW-48b	Ephrata Landfill Monitoring Well	Roza
MW-51b	Ephrata Landfill Monitoring Well	Roza

Table 6. Background RCRA Metals in Soils

	Constituent	RCRA Metals Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Sample name								
Outwash	S-1	1.4	54	0.043	3.0	3.0	0.0088[J]	<0.045[U]	0.091
Outwash	S-2	1.7	640	0.047	3.9	3.8	0.0097[J]	<0.045[U]	0.14
Outwash	S-3	2.7	57	0.049	6.4	3.8	0.0082[J]	<0.045[U]	0.077
Outwash	S-4	2.3	65	0.045	5.8	4.2	0.0072[J]	<0.045[U]	0.071
Outwash	S-5	2.0	58	0.038	4.6	3.4	0.0031[J]	<0.045[U]	0.070
Loess	S-6	2.9	110	0.10	9.3	4.6	0.0070[J]	<0.045[U]	0.063
Loess	S-7	2.7	110	0.11	12	4.7	0.0099[J]	<0.045[U]	0.075
Loess	S-8	2.1	100	0.11	15	4.4	0.0096[J]	<0.045[U]	0.092
Loess	S-9	3.2	120	0.11	15	5.4	0.0087[J]	<0.045[U]	0.070
Loess	S-10	2.2	98	0.12	14	5.1	0.0092[J]	<0.045[U]	0.074
	Background[A]	3.2	640	0.12	15	5.4	0.01	0.045	0.14

[A] Background defined as the maximum observed concentration or the quantification limit if not quanitified by the lab.

[J]Analyte detected below quantitation limit. Maximum defined as maximum quanitification limit.

Outwash	Arsenic mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Lead mg/kg	Mercury mg/kg	Selenium mg/kg	Silver mg/kg
min	1.4	54	0.038	3	3	0	0	0.07
max	2.7	640	0.049	6.4	4.2	0	0	0.14

Loess	Arsenic mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Lead mg/kg	Mercury mg/kg	Selenium mg/kg	Silver mg/kg
min	2.1	98	0.1	9.3	4.4	0	0	0.063
max	3.2	120	0.12	15	5.4	0	0	0.092

Table 7. Site Contaminants of Concern

Original COCs			Additional COCs
Inorganics	**Organics**	**Metals**	**Organics**
Chloride	1,2-Dichloroethane (EDC)	Arsenic	1,1,1-Trichloroethane
Sulfate	1,1-Dichloroethane	Iron	1,1,2-Trichloroethane
Total Dissolved Solids (TDS)	Chloroethane	Manganese	
Nitrate			1,2,4-Trimethylbenzene
	Tetrachloroethene (PCE)		
	Trichloroethene (TCE)		2-Butanone
	1,1-Dichloroethene		4-Methyl-2-pentanone (MIBK)
	cis-1,2-Dichloroethene		Acetone
	trans-1,2-Dichloroethene		
	Vinyl Chloride		Chloroform
	Chloromethane		Naphthalene
	Dichloromethane (Methylene Chloride)		
	Trichlorofluoromethane		
	1,2-Dichloropropane		
			Organics without Screening Levels
	Benzene		n-Butylbenzene
	Toluene		sec-Butylbenzene
	Ethylbenzene		1,3-Dichlorobenzene
	Xylene (m, p, o)		2-Hexanone
			4-Isopropyltoluene
	1,2-Dichlorobenzene		Bromobenzene
	1,4-Dichlorobenzene		n-Propylbenzene
	Bis(2-ethylhexyl) Phthalate		

NOTE:
Original COC organic and inorganic parameters are those that exceeded RI screening levels (MTCA-B WAC 173-340 and GWQS WAC 173-200) most recently during routine groundwater sampling except 1,1-dichloroethene, chloromethane, and toluene, which have exceeded MTCA-B levels at least 5 times in the past or were considered important parameters for undertanding fate and transport.

Additional COC organic parameters are those that exceeded screening levels in at least one RI well installed in the vicinity of the former drum cache. These parameters have not exceeded screening levels in other site monitoring wells. The exception includes one low level detection in 2008 of 1,1,2-Trichloroethane in EW-1 (the Hole).

Organics without established screening levels are those that have been detected in at least one RI well installed in the vicinity of the former drum cache. A few low level detections also occurred in Roza aquifer wells MW-3b, MW-7b, MW-42b and MW-44b.

Table 8 LNAPL Analytical Results (VOCs)

Constituent	Units	Result	Detection Limit
1,1,1,2-Tetrachloroethane	mg/kg	U	2500
1,1,1-Trichloroethane	mg/kg	U	2500
1,1,2,2-Tetrachloroethane	mg/kg	U	2500
1,1,2-Trichloro-1,2,2-trifluoroethane	mg/kg	U	5000
1,1,2-Trichloroethane	mg/kg	U	2500
1,1-Dichloroethane	mg/kg	U	2500
1,1-Dichloroethene	mg/kg	U	2500
1,1-Dichloropropene	mg/kg	U	2500
1,2,3-Trichlorobenzene	mg/kg	U	12000
1,2,3-Trichloropropane	mg/kg	U	5000
1,2,4-Trichlorobenzene	mg/kg	U	12000
1,2,4-Trimethylbenzene	mg/kg	**8,800**	2500
1,2-Dibromo-3-chloropropane	mg/kg	U	12000
1,2-Dichlorobenzene	mg/kg	U	2500
1,2-Dichloroethane	mg/kg	U	2500
1,2-Dichloropropane	mg/kg	U	2500
1,3,5-Trimethylbenzene	mg/kg	**4,900**	2500
1,3-Dichlorobenzene	mg/kg	U	2500
1,3-Dichloropropane	mg/kg	U	2500
1,4-Dichlorobenzene	mg/kg	U	2500
2,2-Dichloropropane	mg/kg	U	2500
2-Butanone	mg/kg	U	12000
2-Chloroethylvinylether	mg/kg	U	12000
2-Chlorotoluene	mg/kg	U	2500
2-Hexanone	mg/kg	U	12000
4-Chlorotoluene	mg/kg	U	2500
4-Isopropyltoluene	mg/kg	U	2500
4-Methyl-2-Pentanone (MIBK)	mg/kg	U	12000
Acetone	mg/kg	U	12000
Acrolein	mg/kg	U	120000
Acrylonitrile	mg/kg	U	12000
Benzene	mg/kg	U	2500
Bromobenzene	mg/kg	U	2500
Bromochloromethane	mg/kg	U	2500
Bromodichloromethane	mg/kg	U	2500
Bromoethane	mg/kg	U	5000
Bromoform	mg/kg	U	2500
Bromomethane	mg/kg	U	2500
Carbon Disulfide	mg/kg	U	2500
Carbon Tetrachloride	mg/kg	U	2500
Chlorobenzene	mg/kg	U	2500
Chloroethane	mg/kg	U	2500
Chloroform	mg/kg	U	2500
Chloromethane	mg/kg	U	2500
cis-1,2-Dichloroethene	mg/kg	U	2500
cis-1,3-Dichloropropene	mg/kg	U	2500
Dibromochloromethane	mg/kg	U	2500
Dibromomethane	mg/kg	U	2500
Ethylbenzene	mg/kg	**18,000**	2500

Table 8 LNAPL Analytical Results (VOCs)

Constituent	Units	Result	Detection Limit
Ethylene Dibromide	mg/kg	U	2500
Hexachlorobutadiene	mg/kg	U	12000
Hexane	mg/kg	U	12000
Isopropylbenzene	mg/kg	U	2500
m,p-Xylene	mg/kg	**57,000**	2500
Methyl Iodide	mg/kg	U	2500
Methyl tert-Butyl Ether	mg/kg	U	2500
Methylene Chloride	mg/kg	U	5000
Naphthalene	mg/kg	U	12000
n-Butylbenzene	mg/kg	U	2500
n-Propylbenzene	mg/kg	**3,600**	2500
o-Xylene	mg/kg	**17,000**	2500
sec-Butylbenzene	mg/kg	U	2500
Styrene	mg/kg	U	2500
tert-Butylbenzene	mg/kg	U	2500
Tetrachloroethene	mg/kg	**3,000**	2500
Toluene	mg/kg	**150,000**	2500
trans-1,2-Dichloroethene	mg/kg	U	2500
trans-1,3-Dichloropropene	mg/kg	U	2500
trans-1,4-Dichloro-2-butene	mg/kg	U	12000
Trichloroethene	mg/kg	U	2500
Trichlorofluoromethane	mg/kg	U	2500
Vinyl Acetate	mg/kg	U	12000
Vinyl Chloride	mg/kg	U	2500

LNAPL (collected from MW-36p1)
U = constituent not detected
Bold = VOC detected

Table 9. Leachate Geochemistry

Constituent	Units	Lysimeter 2
Alkalinity (as CaCO3)	mg/L	1,015.00
Ammonia as Nitrogen, Total	mg/L as N	9.56
Antimony, Dissolved	ug/L	60.00
Antimony, Total	ug/L	50U
Arsenic, Dissolved	ug/L	36.75
Arsenic, Total	ug/L	58.00
Barium, Dissolved	ug/L	518.50
Barium, Total	ug/L	457.40
Beryllium, Dissolved	ug/L	1U
Beryllium, Total	ug/L	1U
Bicarbonate As CaCO3	mg/L	1,015.00
Biochemical Oxygen Demand (BOD)	mg/L	8.82
Cadmium, Dissolved	ug/L	2U
Cadmium, Total	ug/L	6.00
Calcium, Dissolved	mg/L	41.20
Calcium, Total	mg/L	157.77
Carbonate as CaCO3	mg/L	1.00
Carbonate as CO3	mg/L	1U
Chemical Oxygen Demand (COD)	mg/L	814.25
Chloride	mg/L	2,845.22
Chromium, Dissolved	ug/L	20.00
Chromium, Total	ug/L	38.00
Cobalt, Dissolved	ug/L	7.67
Cobalt, Total	ug/L	17.00
Copper, Dissolved	ug/L	5.25
Cyanide, Total	ug/L	9.29
Hydroxide (as CaCO3)	mg/L	1U
Iron, Dissolved	ug/L	760.00
Iron, Total	ug/L	2,130.00
Lead, Dissolved	ug/L	20U
Lead, Total	ug/L	20U
Magnesium, Dissolved	mg/L	11.15
Magnesium, Total	mg/L	587.44
Manganese, Dissolved	ug/L	211.00
Manganese, Total	ug/L	168.00
Nickel, Dissolved	ug/L	187.50
Nickel, Total	ug/L	226.00
Nitrate as Nitrogen	mg/L as N	0.30
Nitrate+Nitrite as Nitrogen	mg/L as N	0.66
Nitrite as Nitrogen	mg/L as N	0.63
Potassium, Dissolved	mg/L	3.25
Potassium, Total	mg/L	259.56
Selenium, Dissolved	ug/L	7.00
Selenium, Total	ug/L	5.00

Notes
Results are averages of annual samples collected from Lysimeter 2
0.2U = Parameter not detected at laboratory limit (0.2)

Table 9. Leachate Geochemistry

Constituent	Units	Lysimeter 2
Silver, Dissolved	ug/L	3U
Silver, Total	ug/L	3U
Sodium, Dissolved	mg/L	7.40
Sodium, Total	mg/L	1,266.89
Sulfate	mg/L	125.47
Thallium, Dissolved	ug/L	0.2U
Thallium, Total	ug/L	0.2U
Total Dissolved Solids	mg/L	5,133.00
Total Organic Carbon	mg/L	249.60
Vanadium, Dissolved	ug/L	15.00
Vanadium, Total	ug/L	43.40
Zinc, Dissolved	ug/L	147.50
Zinc, Total	ug/L	80.00

FIELD PARAMETERS	UNITS	Lysimeter 2
Temperature	degrees F	63.70
Specific Conductance @ 25C	umhos/cm	5,715.00
pH	std. units	7.50

Notes
Results are averages of annual samples collected from Lysimeter 2
1U = Parameter not detected at laboratory limit (1.0)

Table 10. Landfill Gas Analytical Results (2009)

Volatile Organic Compound (VOC)	Units	COMPOSITE GAS	GE-17	GE-19	GE-29	GE-8
1,1,1-Trichloroethane (TCA)	ppbv	110U	100U	100U	61U	160U
1,1,2,2-Tetrachloroethane	ppbv	110U	100U	100U	61U	160U
1,1,2-Trichloroethane	ppbv	110U	100U	100U	61U	160U
1,1,2-Trichlorotrifluoroethane	ppbv	110U	100U	100U	61U	160U
1,1-Dichloroethane	ppbv	**96**	**250**	100U	**45**	**83**
1,1-Dichloroethene	ppbv	110U	100U	100U	61U	160U
1,2,4-Trichlorobenzene	ppbv	270U	260U	260U	150U	400U
1,2,4-Trimethylbenzene	ppbv	**1200**	**1400**	**1800**	**730**	**760**
1,2-Dibromoethane (EDB)	ppbv	110U	100U	100U	61U	160U
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ppbv	110U	100U	**64**	**36**	160U
1,2-Dichlorobenzene	ppbv	110U	100U	100U	61U	160U
1,2-Dichloroethane (EDC)	ppbv	160U	160U	160U	91U	240U
1,2-Dichloropropane	ppbv	160U	160U	160U	91U	240U
1,3,5-Trimethylbenzene	ppbv	**640**	**640**	**730**	**340**	**450**
1,3-Dichlorobenzene	ppbv	220U	210U	210U	120U	320U
1,4-Dichlorobenzene	ppbv	**380**	**230**	**450**	**160**	**160**
2-Butanone (MEK)	ppbv	**200**	**3000**	520U	**650**	810U
2-Hexanone	ppbv	550U	520U	520U	300U	810U
4-Ethyltoluene	ppbv	**1500**	**1700**	**1700**	**810**	**920**
4-Methyl-2-pentanone (MIBK)	ppbv	550U	520U	520U	300U	810U
Acetone	ppbv	**290**	**1800**	520U	300U	810U
Benzene	ppbv	**660**	**850**	**680**	**730**	**670**
Benzyl chloride	ppbv	550U	520U	520U	300U	810U
Bromodichloromethane	ppbv	110U	100U	100U	61U	160U
Bromoform	ppbv	110U	100U	100U	61U	160U

110U = Parameter not detected at laboratory limit (110)
VOC method TO-15 ran for all VOCs.
Bold = VOC detected

Table 10. Landfill Gas Analytical Results (2009)

Volatile Organic Compound (VOC)	Units	COMPOSITE GAS	GE-17	GE-19	GE-29	GE-8
Bromomethane	ppbv	220U	210U	210U	120U	320U
Carbon Disulfide	ppbv	550U	520U	520U	300U	810U
Carbon Tetrachloride	ppbv	110U	100U	100U	61U	160U
Chlorobenzene	ppbv	**46**	**34**	**120**	**55**	**160**
Chloroethane	ppbv	**93**	210U	**160**	**130**	**170**
Chloroform	ppbv	110U	100U	100U	61U	160U
Chloromethane	ppbv	220U	210U	210U	120U	320U
cis-1,2-Dichloroethene	ppbv	**710**	**720**	**530**	**83**	**270**
cis-1,3-Dichloropropene	ppbv	110U	100U	100U	61U	160U
Dibromochloromethane	ppbv	110U	100U	100U	61U	160U
Dichlorodifluoromethane (CFC 12)	ppbv	**210**	**390**	160U	**520**	**390**
Dichloromethane (Methylene Cl)	ppbv	110U	**66**	100U	**45**	160U
Ethylbenzene	ppbv	**4500**	**4700**	**4900**	**3100**	**3600**
Hexachlorobutadiene	ppbv	220U	210U	210U	120U	320U
o-Xylene	ppbv	**3000**	**3300**	**3700**	**1800**	**2100**
Styrene	ppbv	**320**	**420**	**280**	**180**	160U
Tetrachloroethene (PCE)	ppbv	**300**	**300**	**130**	**55**	160U
Toluene	ppbv	**14000**	**13000**	**10000**	**4600**	**4400**
trans-1,2-Dichloroethene	ppbv	110U	100U	100U	61U	160U
trans-1,3-Dichloropropene	ppbv	110U	100U	100U	61U	160U
Trichloroethene (TCE)	ppbv	**170**	**250**	**120**	**49**	160U
Trichlorofluoromethane (CFC 11)	ppbv	**150**	**100**	100U	**89**	**130**
Vinyl Acetate	ppbv	1100U	1000U	1000U	610U	1600U
Vinyl Chloride	ppbv	**1400**	**2200**	210U	**2700**	**1700**
Xylene Isomers, M+P	ppbv	**11000**	**13000**	**12000**	**6500**	**7300**
Xylenes, Total	ppbv	**14000**	**16000**	**16000**	**8300**	**9400**

110U = Parameter not detected at laboratory limit (110)
VOC method TO-15 ran for all VOCs.
Bold = VOC detected

Table 11. Two Phase Gas to Water Partitioning Results (2009)

				Water concentrations in equilibrium with Landfill Gas				
Constituent	Units	MW	H*	COMPOSITE GAS	GE-17	GE-19	GE-29	GE-8
1,1-Dichloroethane	ug/L in Water	99	0.23	1.70	4.43	ND	0.80	1.47
1,2,4-Trimethylbenzene	ug/L in Water	120.19	NA	NA	NA	NA	NA	NA
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ug/L in Water	187.38	NA	ND	ND	NA	NA	ND
1,3,5-Trimethylbenzene	ug/L in Water	120.19	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	ug/L in Water	147	0.10	23.05	13.95	27.30	9.71	9.71
2-Butanone (MEK)	ug/L in Water	72.11	0.0019	309.48	4,642.27	ND	1,005.83	ND
4-Ethyltoluene	ug/L in Water	120.19	NA	NA	NA	NA	NA	NA
Acetone	ug/L in Water	58.08	0.0016	434.15	2,694.71	ND	ND	ND
Benzene	ug/L in Water	78.11	0.23	9.31	11.99	9.59	10.29	9.45
Chlorobenzene	ug/L in Water	112.6	0.15	1.40	1.03	3.64	1.67	4.86
Chloroethane	ug/L in Water	64.5	0.46	0.54	ND	0.93	0.75	0.99
cis-1,2-Dichloroethene	ug/L in Water	97	0.17	17.00	17.24	12.69	1.99	6.47
Dichlorodifluoromethane (CFC 12)	ug/L in Water	121	122.95	0.01	0.02	ND	0.02	0.02
Dichloromethane (Methylene Cl)	ug/L in Water	84.9	0.10	ND	2.31	ND	1.58	ND
Ethylbenzene	ug/L in Water	106.2	0.32	60.83	63.53	66.23	41.90	48.66
o-Xylene	ug/L in Water	106.17	0.21	61.28	67.41	75.58	36.77	42.90
Styrene	ug/L in Water	104.15	0.11	12.77	16.76	11.17	7.18	ND
Tetrachloroethene (PCE)	ug/L in Water	165.8	0.75	2.72	2.72	1.18	0.50	ND
Toluene	ug/L in Water	92.1	0.27	195.00	181.07	139.28	64.07	61.28
Trichloroethene (TCE)	ug/L in Water	131.5	0.42	2.18	3.20	1.54	0.63	ND
Trichlorofluoromethane (CFC 11)	ug/L in Water	137.4	2.37	0.36	0.24	ND	0.21	0.31
Vinyl Chloride	ug/L in Water	62.5	1.11	3.23	5.08	ND	6.23	3.92
Xylene Isomers, M+P	ug/L in Water	106.2	0.21	229.67	271.43	250.55	135.72	152.42
Xylenes, Total	ug/L in Water	106.2	0.21	292.31	334.07	334.07	173.30	196.26

NOTES

Henry's Law: Cw = Ca/H*

Where H* is Henry's dimensionless gas constant

Cw = water concentrations (ug/L)

Ca = gas concentration (ug/L)

NA = Henry constant not available

ND = constituent not detected

Values of H* obtained from EPA On-line Tools for Site Assessment Calculation or Practical Design Calcualtions for Groundwater and Soil (Kuo, 1999)

Converting gas concentrations from ppbv to ug/L:

Using : PV=nRK (ideal gas)

Where P = atm, V = Liter, n = moles, R = gas constant = (L*atm)/(mole*K) = 0.0820574587 , K = Kelvin

$ppbv_{(air)} = ug/L_{(air)}*(RK)/(P*MW)*1g/1{,}000{,}000ug*10^{9}ppb$

Where MW = molecular weight (grams/mole)

$u/L_{(air)} = ppbv_{(air)}*MW/24{,}4000$

Table 12. Anaerobic Biodegradation Screening

Location	Well	Aquifer	DO mg/L	NO3 mg/L-N	SO4 mg/L	Fe ug/L	Alk mg/L	ORP mV	BTEX ug/L	TOC mg/L	Ethene ug/L	Methane ug/L	CO2 mg/L	cis-1,2-DCE % total DCE	1,1-DCA ug/L	CA ug/L	Screening Score	Score Interpretation	REDOX ENV
Drum Area	MW-29b	Roza	2	0.679	71.9	150	232	-169	26.2	22.2	1.7	59	17.8	96%	73	11	12	Limited	O2
Drum Area	MW-30b	Roza	0.35	0.169	55.2	80	140	-21	40.2	2.17	1.1U	32	3.73	77%	4.6	1	10	Limited	Mn
Drum Area	MW-31b	Roza	0.5	0.01U	39.7	50U	123	-72	0.6	1.63	1.5	41	1.34	ND	0.2U	0.2U	3	Inadequate	O2
Drum Area	MW-32a	P1	0.35	0.025	11.7	11300	726	-61	912.1	114	9.4	380	154	88%	180	1U	21	Strong	Fe/SO4
Drum Area	MW-33p2	P2	0.9	0.014	19.9	8450	1020	-102	230.8	103	32.1	3,290	258	97%	52	840	26	Strong	CH4
Drum Area	MW-34p1	P1	0	0.13	18.2	116000	1040	-89	73050	1060	253	7,080	406	97%	5100	120	28	Strong	CH4
Drum Area	MW-35p2	P2	NM	0.015	14.1	90	860	-63	12981	80.6	43.6	1,800	161	94%	1000	880	22	Strong	CH4
Drum Area	MW-37p1	P1	NM	8.97	150	50U	451	16	5.4	7.89	1.1U	0.7U	120	70%	28	1U	5	Inadequate	NM
Drum Area	MW-38p2	P2	2	0.01U	158	270	524	-93	3489	35.1	48.2	260	41.4	63%	1400	1U	13	Limited	O2
Drum Area - East	MW-39p2	P2	1	0.823	95.6	50U	695	251	0.3	13.8	1.1U	118	42	100%	0.3	0.4	10	Limited	O2
Drum Area - West	MW-42b	Roza	0.5	0.023	95.2	50U	721	57	2.3	32.1	1.1U	30.8	100	90%	43	330	12	Limited	O2
Drum Area - West	MW-43p2	P2	3	0.253	52.6	50U	283	321	ND	6.87	1.1U	0.7U	4	93%	5.8	100	8	Limited	O2
Landfill - South	MW-10a	Outwash	9	4.92	36.1	50U	211	245	ND	2.03	1.1U	0.7U	16	ND	0.2U	0.2U	-3	Inadequate	O2
Landfill - South	MW-11a	Outwash	8	6.35	49.4	50U	191	160	ND	1.83	1.1U	0.7U	15	ND	0.2U	0.2U	-3	Inadequate	O2
Landfill - South	MW-14a	Outwash	7	3.88	61.5	50U	199	176	ND	1.5U	1.1U	0.7U	5.5	ND	0.2U	0.2U	-3	Inadequate	O2
Landfill - South	MW-1a	Outwash	7	4.77	45.5	50U	217	158	ND	1.93	1.1U	0.7U	18	ND	0.2U	0.2U	-3	Inadequate	O2
Landfill - South	MW-23a	Outwash	7	4.74	34.7	50U	217	185	ND	2.08	1.1U	0.7U	15	ND	0.2U	0.2U	-3	Inadequate	O2
Landfill - South	MW-24a	Outwash	7	5.4	38.3	50U	208	168	0.4	1.66	1.1U	0.7U	19	ND	0.2U	0.2U	-2	Inadequate	O2
Landfill - South	MW-25a	Outwash	7	5.06	36.3	50U	207	185	ND	1.87	1.1U	0.7U	18	ND	0.2U	0.2U	-3	Inadequate	O2
Landfill - South	MW-26a	Outwash	7	3.69	35.6	50U	223	91	ND	1.98	1.1U	0.7U	18	ND	0.2U	0.2U	-3	Inadequate	O2
Landfill Perimeter	MW-16d	BIF	0.4	0.01U	63	100	144	-32	ND	1.77	1.1U	1.5	9.2	ND	0.2U	0.2U	6	Limited	Fe/SO4
Landfill Perimeter	MW-22c	Interflow	6	8.41	42	50U	204	111	ND	1.5U	1.1U	0.7U	8.9	51%	4.5	0.2U	-1	Inadequate	O2
Landfill Perimeter	MW-28d	BIF	0.3	1.86	49.9	50U	129	18	ND	1.71	1.1U	9.1	2.6	100%	0.4	0.2U	8	Limited	NO3
Landfill Perimeter	MW-2c	Interflow	3	8.41	55.7	50U	76.3	95	ND	3.63	1.1U	0.7U	5.8	87%	3.5	0.2U	4	Inadequate	O2
Landfill Perimeter	MW-4c	Interflow	0.1	0.01U	33.4	50U	126	64	ND	1.5U	1.1U	0.7U	1.2	ND	0.2U	0.2U	5	Inadequate	Suboxic
Landfill Perimeter	MW-5c	Interflow	0.1	10	173	50U	198	143	ND	7.33	1.1U	0.7U	11	100%	1.9	0.2U	7	Limited	NO3
Landfill Perimeter	MW-6a	Outwash	6	5.49	48.8	50U	222	168	ND	2.25	1.1U	1.9	38	ND	0.2U	0.2U	-2	Inadequate	O2
Landfill Perimeter	MW-6c	Interflow	0.1	17.8	167	50U	341	120	ND	14	1.1U	1	41	78%	2	0.2U	6	Limited	NO3
Offsite - East	MW-17a	Outwash	2	2.06	39.7	50U	194	114	ND	1.5U	1.1U	0.7U	15	ND	0.3	0.2U	2	Inadequate	O2
Offsite - East	MW-18a	Outwash	7	1.71	69.7	50U	200	162	ND	1.58	1.1U	0.7U	11	ND	0.6	0.2U	-1	Inadequate	O2
Offsite - East	MW-21c	Interflow	4	87.9	76.5	50U	115	27	ND	1.73	1.1U	12.5	4.8	ND	0.2U	0.2U	1	Inadequate	O2
Offsite - North	MW-19b	Roza	0.2	0.045	559	60	128	94	ND	2.02	1.1U	0.7U	18	ND	0.2U	0.2U	5	Inadequate	Mn
Offsite - North	MW-20c	Interflow	5	0.909	28.4	50U	156	130	ND	1.5U	1.1U	15.8	4.6	ND	0.2U	0.2U	2	Inadequate	O2
Offsite - North	MW-44b	Roza	0.3	0.01U	29.1	290	624	37	42	40.9	4.8	5760	80	89%	39	450	19	Adequate	CH4
Offsite - North	MW-45c	Interflow	0.6	2.78	37	50U	119	2	ND	4.78	1.1U	0.7U	1.8	90%	0.2U	0.2U	3	Inadequate	NO3
Offsite - North	MW-46p2	P2	NM	0.074	99.5	50U	126		ND	1.83	1.1U	0.7U	NM	ND	0.2U	0.2U	2	Inadequate	NM
Offsite - North	MW-47c	Interflow	2.5	1.54	33.5	50U	151	155	ND	4.65	1.1U	0.7U	2.5	ND	0.2U	0.2U	0	Inadequate	O2
Offsite - North	MW-48b	Roza	8	3.3	21.4	50U	179	371	ND	1.5U	1.1U	0.7U	4.7	ND	0.2U	0.2U	-3	Inadequate	O2
Offsite - North	MW-49p2	P2	2	0.013	52.3	50U	108	317	0.7	1.5U	1.1U	0.7U	1.3	ND	0.2U	0.2U	2	Inadequate	O2
Offsite - North	MW-50c	Interflow	0.4	0.01U	50.8	50U	124	-126	ND	2.47	1.1U	0.7U	1	ND	0.2U	0.2U	7	Limited	Suboxic

Table 12. Anaerobic Biodegradation Screening

Location	Well	Aquifer	DO mg/L	NO3 mg/L-N	SO4 mg/L	Fe ug/L	Alk mg/L	ORP mV	BTEX ug/L	TOC mg/L	Ethene ug/L	Methane ug/L	CO2 mg/L	cis-1,2-DCE % total DCE	1,1-DCA ug/L	CA ug/L	Screening Score	Score Interpretation	REDOX ENV
Offsite - North	MW-51b	Roza	3	0.846	39.1	50U	151	131	ND	5.28	1.1U	0.7U	2.4	ND	0.2U	0.2U	2	Inadequate	O2
Offsite - North	MW-52p2	P2	5	0.01U	26.3	50U	125	245	0.2	5.12	1.1U	0.7U	0.47	ND	0.2U	0.2U	2	Inadequate	O2
Offsite - North	MW-53a	Above Rock	6	3.38	66.4	50U	192	164	ND	7.23	1.1U	0.7U	6.2	100%	1.3	0.2U	1	Inadequate	O2
Offsite - North	MW-54c	Interflow	4.5	0.02U	63.5	50U	131	-15	ND	NM	1.1U	0.7U	0.23	ND	0.2U	0.2U	3	Inadequate	O2
Shop Area	MW-3b	Roza	0.1	0.011	1040	8670	1220	-30	3.9	70	3.2	410	260	97%	10	74	19	Adequate	Fe/SO4
Shop Area	MW-40p2	P2	1.5	1.74	142	180	133	120	0.2	2.74	1.1U	0.7U	1.5	ND	0.2U	0.2U	0	Inadequate	O2
Shop Area	MW-41a	P1	1.5	3.17	317	1770	486	-54	ND	14.3	1.1U	32.6	19	ND	0.2U	0.2U	6	Limited	O2
Shop Area	MW-7b	Roza	0.1	0.01U	706	2870	1050	-12	3.4	51.6	2.6	201	220	94%	17	100	19	Adequate	Fe/SO4
Shop Area	MW-9b	Roza	0.2	9.82	731	50U	855	146	0.6	39.8	1.1U	16.4	140	99%	5.2	1.8	13	Limited	NO3-Mn

Notes

#U = Undetected; associated number is lab reporting limit (e.g. 1.1U)

ND = constituents not detected for calculation

BG = Background

ORP = oxidation reduction potential

TOC = Total Organic Carbon

BTEX = total benzene, toluene, ethylbenzene, and xylenes

Ethane was not detected at concentrations > 100 ug/L in any well

Chloride not included in screening due to potential elevated concentrations from landfill leachate

NM = Not Measured

Constituent	Units	Score
Dissolved Oxygen (Colorimetric)	mg/L	< 0.5 = 3 or > 5 = -3
Nitrate as Nitrogen	mg/L as N	< 1 = 2
Iron, Dissolved	ug/L	> 1000 = 3
Sulfate	mg/L	< 20 = 2
Methane	ug/L	> 500 = 3
ORP (Flow Through Cell)	mV	< 50 = 1 or < -100 =2
TOC	mg/L	> 20 = 2
Carbon dioxide	mg/L	> 2 x BG (18 mg/L) = 1
Alkalinity	mg/L	> 2 x BG (438 mg/L) =1
Total BTEX	ug/L	> 100 ug/L = 2
Dichloroethene (DCE)	ug/L	> 80% cis = 2
1,1-Dichloroethane (1,1-DCA)	ug/L	Detect = 2
Chloroethane (CA)	ug/L	Detect = 2
Ethene	ug/L	>10 = 2
Ethane	ug/L	>100 = 3

Anaerobic Biodegradation Score (from U.S. EPA, 1998 600/R-98/128)

Score	Interpretation for anaerobic biodegradation (reductive dechlorination)
0-5	Inadequate evidence
6-14	Limited evidence
15-20	Adequate evidence
>20	Strong evidence

REDOX ZONE	Explanation
O2	Aerobic (oxygen rich)
Suboxic	Low oxygen, additional data needed to define redox zone
NO3	Nitrate reducing
Mn	Manganese reducing
Fe/SO4	Iron and/or Sulfate reducing
CH4	Carbon dioxide reducing /methane producing

(from Jurgens et al, 2009)

Table 13. P1 Zone (RI Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-32a			MW-34p1			MW-37p1			MW-41a		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,2-Dichloropropane	ug/L	12-DCP	0.64	MTCA-B car	**73**	**12**	**41**	**810**	**810**	**810**	**54**	**20**	**41**	0.2U	0.2U	0.2U
n-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	**8.3**	**8.3**	**8.3**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	1U	1U	1U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Benzene	ug/L	BTEX	0.8	MTCA-B car	**2.1**	**0.9**	**1.5**	**250**	**250**	**250**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	BTEX	800	MTCA-B non-car	**120**	**25**	**57**	**5,200**	**4,200**	**4,700**	**0.4**	**0.4**	**0.4**	0.2U	0.2U	0.2U
o-Xylene	ug/L	BTEX	16,000	MTCA-B non-car	**150**	**16**	**70**	**4,400**	**3,700**	**4,050**	**0.3**	**0.3**	**0.3**	0.2U	0.2U	0.2U
Toluene	ug/L	BTEX	640	MTCA-B non-car	**560**	**2**	**219**	**85,000**	**59,000**	**72,000**	**5.4**	**3**	**4.2**	0.2U	0.2U	0.2U
Xylene Isomers, M+P	ug/L	BTEX	1,600	MTCA-B non-car	**230**	**70**	**150**	**12,000**	**9,600**	**10,800**	**0.7**	**0.7**	**0.7**	0.4U	0.4U	0.4U
1,2-Dichlorobenzene	ug/L	DCB	600	FED MCL	**0.3**	**0.3**	**0.3**	**86**	**86**	**86**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	DCB	NA		0.2U	0.2U	0.2U	**5.7**	**5.7**	**5.7**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	DCB	1.8	MTCA-B car	**0.3**	**0.3**	**0.3**	**36**	**36**	**36**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	Ethane	200	FED MCL	**73**	**17**	**52**	**2,900**	**2,000**	**2,450**	**24**	**2.3**	**13.8**	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L	Ethane	0.77	MTCA-B car	0.2U	0.2U	0.2U	**33**	**33**	**33**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	Ethane	1600	MTCA-B non-car	**180**	**65**	**114**	**6,400**	**5,100**	**5,750**	**28**	**7.9**	**21.3**	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	Ethane	0.48	MTCA-B car	**6.4**	**3.8**	**4.8**	**1,000**	**1,000**	**1,000**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	Ethane	15	MTCA-B car	**1.9**	**0.8**	**1.4**	**120**	**120**	**120**	**6.2**	**0.6**	**3.4**	0.2U	0.2U	0.2U
1,1-Dichloroethene	ug/L	Ethene	7	FED MCL	**5**	**1.7**	**3.2**	**50**	**50**	**50**	**6.4**	**1.7**	**4.3**	0.02U	0.02U	0.02U
cis-1,2-Dichloroethene	ug/L	Ethene	70	FED MCL	**21**	**11**	**15**	**5,200**	**1,800**	**3,500**	**11**	**3.7**	**8.6**	0.02U	0.02U	0.02U
Tetrachloroethene (PCE)	ug/L	Ethene	0.081	MTCA-B car	**20**	**0.63**	**7.34**	**21**	**21**	**21**	**8.8**	**1.9**	**6.1**	**1.8**	**1.3**	**1.6**
trans-1,2-Dichloroethene	ug/L	Ethene	100	FED MCL	**0.078**	**0.078**	**0.078**	**16**	**16**	**16**	**0.02**	**0.02**	**0.02**	0.02U	0.02U	0.02U
Trichloroethene (TCE)	ug/L	Ethene	0.49	MTCA-B car	**11**	**0.72**	**5.86**	**20**	**20**	**20**	**7.1**	**2.2**	**5.4**	**0.2**	**0.2**	**0.2**
Vinyl Chloride	ug/L	Ethene	0.029	MTCA-B car	**42**	**9.8**	**23**	**750**	**750**	**750**	**0.58**	**0.082**	**0.39**	0.02U	0.02U	0.02U
2-Butanone	ug/L	Ketone	4800	MTCA-B non-car	**24**	5U	NC	**77,000**	**38,000**	**57,500**	5U	5U	5U	5U	5U	5U
2-Hexanone	ug/L	Ketone	NA		5U	5U	5U	**1,000**	**1,000**	**1,000**	5U	5U	5U	5U	5U	5U
4-Methyl-2-Pentanone (MIBK)	ug/L	Ketone	640	MTCA-B non-car	**9.7**	5U	NC	**45,000**	**17,000**	**31,000**	5U	5U	5U	5U	5U	5U
Acetone	ug/L	Ketone	800	MTCA-B non-car	**210**	5U	NC	**270,000**	**120,000**	**195,000**	5U	5U	5U	5U	5U	5U
Methylene Chloride	ug/l	MC	5	FED MCL	**0.8**	**0.8**	**0.8**	**780**	**780**	**780**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit, otherwise lowest reporting limit presented as min and average not calculated (NC)
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

Table 13. P1 Zone (RI Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-32a			MW-34p1			MW-37p1			MW-41a		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,1,2-Trichlorotrifluoroethane	ug/L	Other	240000	MTCA-B non-car	**6.2**	**1.3**	**4.5**	**33**	**33**	**33**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	Other	NA		**1.4**	**1.4**	**1.4**	1U	1U	1U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	**7.3**	**7.3**	**7.3**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Disulfide	ug/L	Other	800	MTCA-B non-car	**0.3**	**0.3**	**0.3**	1U	1U	1U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	Other	100	FED MCL	0.2U	0.2U	0.2U	1U	1U	1U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	Other	7.2	MTCA-B car	**2.1**	**2.1**	**2.1**	**58**	**58**	**58**	**2.4**	**0.9**	**1.9**	0.2U	0.2U	0.2U
Isopropylbenzene (Cumene)	ug/L	Other	800	MTCA-B non-car	**6.2**	**1.2**	**3.2**	**110**	**110**	**110**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl tert-Butyl Ether	ug/L	Other	24	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.5U	0.5U	0.5U
Naphthalene	ug/L	Other	160	MTCA-B non-car	**6.4**	**5.1**	**5.7**	**210**	**210**	**210**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Propylbenzene	ug/L	Other	NA		**9**	**1.5**	**4.6**	**150**	**150**	**150**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichlorofluoromethane	ug/l	Other	2400	MTCA-B non-car	0.2U	0.2U	0.2U	1.2U	1.2U	1.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,4-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	**49**	**13**	**26**	**500**	**500**	**500**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	**23**	**5**	**11**	**220**	**220**	**220**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

					MW-32a			MW-34p1			MW-37p1			MW-41a		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Arsenic, Dissolved[1]	ug/L	Inorganic	0.058	MTCA-B car	16.4	14.9	15.7	18.9	18.9	18.9	2.9	1.1	2	0.8	0.8	0.8
Chloride	mg/L	Inorganic	250	GWCL	121	45.9	82.4	982	903	943	92.9	77.5	85.1	196	196	196
Iron, Dissolved	ug/L	Inorganic	300	GWCL	15,300	11,300	13,300	116,000	116,000	116,000	50U	50U	50U	9,220	1,770	5,495
Manganese, Dissolved	ug/L	Inorganic	2200	MTCA-B non-car	9,370	7,590	8,480	15,000	15,000	15,000	284	199	242	756	174	465
Nitrate as Nitrogen	mg/L as N	Inorganic	10	FED MCL	0.025	0.025	0.025	0.13	0.13	0.13	8.97	5.59	7.74	3.17	1.92	2.55
Sulfate	mg/L	Inorganic	250	GWCL	143	11.7	79.2	18.9	18.2	18.6	368	143	220	675	317	496
Total Dissolved Solids	mg/L	Inorganic	500	GWCL	1,510	860	1,230	3,360	3,350	3,355	1,150	820	985	1,850	821	1,336

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit, otherwise lowest reporting limit presented as min and average not calculated (NC)
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Site background concentration for dissolved arsenic is 3.0 ug/L (see text for details)

Table 14. P2 Zone (RI Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-33p2			MW-35p2			MW-38p2			MW-39p2			MW-40p2			MW-43p2		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,2-Dichloropropane	ug/L	12-DCP	0.64	MTCA-B car	**34**	**3.5**	**19**	**17**	**17**	**17**	**1,100**	**970**	**1,020**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**13**	**12**	**12.5**
n-Butylbenzene	ug/L	BB	NA		**0.2**	0.2U	NC	1U	1U	1U	1U	1U	1U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	BB	NA		**0.4**	0.2U	NC	1U	1U	1U	1U	1U	1U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Benzene	ug/L	BTEX	0.8	MTCA-B car	**55**	**16**	**42**	**110**	**61**	**84**	**150**	**89**	**116**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	BTEX	800	MTCA-B non-car	**70**	**7.6**	**39**	**760**	**510**	**623**	**1,300**	**200**	**697**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	BTEX	16000	MTCA-B non-car	**2.4**	**1.8**	**2.1**	**620**	**290**	**463**	**2,000**	**470**	**1,133**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Toluene	ug/L	BTEX	640	MTCA-B non-car	**10**	**5.8**	**7.9**	**11,000**	**2,200**	**5,167**	**18,000**	**2,900**	**8,700**	**0.3**	0.2U	NC	**0.2**	0.2U	NC	0.2U	0.2U	0.2U
Xylene Isomers, M+P	ug/L	BTEX	1600	MTCA-B non-car	**100**	**10**	**55**	**1,300**	**600**	**913**	**4,000**	**300**	**1,867**	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
1,2-Dichlorobenzene	ug/L	DCB	600	FED MCL	**17**	**8.4**	**11.6**	**9.5**	**9.5**	**9.5**	**7.2**	**7.2**	**7.2**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	0.2U	NC
1,3-Dichlorobenzene	ug/L	DCB	NA		**0.4**	**0.4**	**0.4**	1U	1U	1U	1U	1U	1U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	DCB	1.8	MTCA-B car	**29**	**12**	**18**	**7**	**7**	**7**	**2.8**	**2.8**	**2.8**	**0.3**	0.2U	NC	0.2U	0.2U	0.2U	**0.3**	0.2U	NC
1,1,1-Trichloroethane	ug/l	Ethane	200	FED MCL	0.2U	0.2U	0.2U	**2.1**	**2.1**	**2.1**	**2,700**	**210**	**1,370**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L	Ethane	0.77	MTCA-B car	0.2U	0.2U	0.2U	1U	1U	1U	**15**	**15**	**15**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	Ethane	1600	MTCA-B non-car	**71**	**17**	**47**	**1,000**	**95**	**398**	**3,300**	**1,400**	**2,300**	**0.6**	**0.3**	**0.43**	0.2U	0.2U	0.2U	**6.9**	**5.8**	**6.4**
1,2-Dichloroethane (EDC)	ug/L	Ethane	0.48	MTCA-B car	**5.6**	**1**	**3.2**	**14**	**14**	**14**	**440**	**140**	**280**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**1**	**1**	**1**
Chloroethane	ug/L	Ethane	15	MTCA-B car	**840**	**130**	**497**	**1,600**	**560**	**1,013**	1U	1U	1U	**0.4**	0.2U	NC	0.2U	0.2U	0.2U	**100**	**11**	**56**
1,1-Dichloroethene	ug/L	Ethene	7	FED MCL	**0.54**	**0.11**	**0.3**	**1.3**	**0.7**	**1.0**	**470**	**300**	**357**	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**0.6**	**0.45**	**0.53**
cis-1,2-Dichloroethene	ug/L	Ethene	70	FED MCL	**7.9**	**2.3**	**4.7**	**19**	**15**	**17**	**820**	**500**	**613**	**2**	**1.3**	**1.67**	0.02U	0.02U	0.02U	**8.6**	**6.6**	**7.6**
Tetrachloroethene (PCE)	ug/L	Ethene	0.081	MTCA-B car	**2.6**	**0.33**	**1.2**	**3.2**	**0.6**	**1.875**	**24**	**21**	**22.5**	**1.8**	**0.8**	**1.23**	**0.22**	**0.2**	**0.21**	**1.1**	**0.56**	**0.83**
trans-1,2-Dichloroethene	ug/L	Ethene	100	FED MCL	**1.7**	**1.3**	**1.5**	**3.5**	**3.2**	**3.4**	**9.1**	**4**	**6.55**	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**0.3**	**0.027**	**0.164**
Trichloroethene (TCE)	ug/L	Ethene	0.49	MTCA-B car	**5.2**	**1.6**	**2.9**	**4.2**	**0.8**	**2.5**	**180**	**19**	**100**	**0.5**	**0.3**	**0.38**	0.02U	0.02U	0.02U	**0.7**	**0.42**	**0.56**
Vinyl Chloride	ug/L	Ethene	0.029	MTCA-B car	**22**	**4.7**	**11**	**47**	**22**	**35**	**1,000**	**620**	**833**	**0.3**	**0.29**	**0.295**	0.02U	0.02U	0.02U	**0.4**	**0.038**	**0.219**
2-Butanone	ug/L	Ketone	4800	MTCA-B non-car	2.5U	2.5U	2.5U	**9,000**	250U	NC	**2,600**	500U	NC	5U	5U	5U	5U	5U	5U	5U	5U	5U
2-Hexanone	ug/L	Ketone	NA		2.5U	2.5U	2.5U	**340**	250U	NC	**73**	**73**	**73**	5U	5U	5U	5U	5U	5U	5U	5U	5U
4-Methyl-2-Pentanone (MIBK)	ug/L	Ketone	640	MTCA-B non-car	**5.3**	2.5U	NC	**3,700**	250U	NC	**1,000**	500U	NC	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acetone	ug/L	Ketone	800	MTCA-B non-car	**19**	**19**	**19**	**26,000**	500U	NC	**12,000**	1000U	NC	**7.7**	5U	**NC**	5U	5U	5U	**6.5**	5U	NC
Methylene Chloride	ug/L	MC	5	FED MCL	**15**	**5.1**	**10.0**	**25**	**25**	**25**	**230**	200U	NC	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	**1.3**	0.5U	NC

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit, otherwise lowest reporting limit presented as min and average not calculated (NC)
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

Table 14. P2 Zone (RI Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-33p2			MW-35p2			MW-38p2			MW-39p2			MW-40p2			MW-43p2		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,1,2-Trichlorotrifluoroethane	ug/L	Other	240000	MTCA-B non-car	0.2U	0.2U	0.2U	2U	2U	2U	1U	1U	1U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	Other	NA		**0.5**	**0.3**	**0.4**	1U	1U	1U	2U	2U	2U	0.2U	0.2U	0.2U	**0.8**	0.2U	NC	**0.4**	0.2U	NC
Bromobenzene	ug/L	Other	NA		**1.6**	**1.1**	**1.4**	1U	1U	1U	**3.2**	**3.2**	**3.2**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Disulfide	ug/L	Other	800	MTCA-B non-car	**0.2**	0.2U	NC	1U	1U	1U	1U	1U	1U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	Other	100	FED MCL	**5.6**	**2**	**3.5**	**2.4**	**2.4**	**2.4**	**1.2**	**1.2**	**1.2**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	Other	7.2	MTCA-B car	0.2U	0.2U	0.2U	1U	1U	1U	**230**	**89**	**140**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Isopropylbenzene (Cumene)	ug/L	Other	800	MTCA-B non-car	**3.5**	**0.6**	**2.1**	1U	1U	1U	**21**	**21**	**21**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl tert-Butyl Ether	ug/L	Other	24	MTCA-B car	**0.4**	**0.4**	**0.4**	1U	1U	1U	1U	1U	1U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Naphthalene	ug/L	Other	160	MTCA-B non-car	**10**	**1.8**	**5.9**	**34**	**34**	**34**	**12**	**12**	**12**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Propylbenzene	ug/L	Other	NA		**2**	**0.5**	**1.3**	**22**	20U	NC	**14**	**14**	**14**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichlorofluoromethane	ug/L	Other	2400	MTCA-B non-car	0.2U	0.2U	0.2U	1U	1U	1U	1U	1U	1U	**0.2**	0.2U	NC	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,4-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	**33**	**5**	**19**	**150**	**80**	**113**	**300**	**38**	**153**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	**6.8**	**0.4**	**3.6**	**54**	**25**	**42**	**160**	**27**	**94**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Arsenic, Dissolved[3]	ug/L	Inorganic	0.058	MTCA-B car	6.8	2	4.4	3	3	3	2.8	2.8	2.8	3.6	2.5	3.1	1.4	1.4	1.4	1.4	1.1	1.3
Chloride	mg/L	Inorganic	250	GWCL	1370	1290	1317	953	853	903	213	179	196	327	279	303	44	36	40	90	46	68
Iron, Dissolved	ug/L	Inorganic	300	GWCL	8450	90	4270	90	90	90	270	270	270	400	400	400	180	180	180	50U	50U	50U
Manganese, Dissolved	ug/L	Inorganic	2200	MTCA-B non-car	13400	12300	12850	8730	8730	8730	4020	4020	4020	147	29	102	293	50	147	462	138	300
Nitrate as Nitrogen	mg/L as N	Inorganic	10	FED MCL	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.01	0.02	17.80	0.82	10.04	4.48	1.74	2.90	0.25	0.03	0.14
Sulfate	mg/L	Inorganic	250	GWCL	47	17	28	14	9	11	158	67	124	96	86	92	142	112	126	53	46	49
Total Dissolved Solids	mg/L	Inorganic	500	GWCL	3340	2980	3160	2040	2040	2040	874	860	867	1270	1240	1253	463	412	435	462	438	450

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit, otherwise lowest reporting limit presented as min and average not calculated (NC)
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Following inorganic parameters only measured once in MW-35p2: Arsenic, iron, manganese, TDS
2. Following inorganic parameters only measured once in MW-38p2: Arsenic, iron, and manganese
3. Site background concentration for dissolved arsenic is 3.0 ug/L (see text for details)

Table 15. Roza Aquifer (Solid Waste Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-3b			MW-7b			MW-9b			MW-19b		
Organic Parameters	Units	Group	RI Screen Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,2-Dichloropropane	ug/L	12-DCP	0.64	MTCA-B car	**12**	**8.5**	**10.68**	**12**	**6.9**	**9.44**	**4.4**	**2**	**3.05**	0.2U	0.2U	NC
n-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
sec-Butylbenzene	ug/L	BB	NA		**0.2**	**0.2**	**0.20**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
Benzene	ug/L	BTEX	0.8	MTCA-B car	**8**	**1.5**	**3.34**	**3.4**	**1.1**	**2.00**	**0.7**	**0.3**	**0.50**	0.2U	0.2U	NC
Ethylbenzene	ug/L	BTEX	800	MTCA-B non-car	**0.2**	**0.2**	**0.20**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
o-Xylene	ug/L	BTEX	16000	MTCA-B non-car	**0.3**	**0.2**	**0.23**	**0.3**	**0.2**	**0.23**	0.2U	0.2U	0.2U	0.2U	0.2U	NC
Toluene	ug/L	BTEX	640	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
Xylene Isomers, M+P	ug/L	BTEX	10000	FED MCL	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	NC
1,2-Dichlorobenzene	ug/L	DCB	600	FED MCL	**4.9**	**1.5**	**2.54**	**5.2**	**2.2**	**3.49**	**0.4**	**0.2**	**0.30**	0.2U	0.2U	NC
1,3-Dichlorobenzene	ug/L	DCB	NA		**0.3**	**0.3**	**0.30**	**0.3**	**0.2**	**0.23**	0.2U	0.2U	0.2U	0.2U	0.2U	NC
1,4-Dichlorobenzene	ug/L	DCB	1.8	MTCA-B car	**3**	**1.5**	**1.99**	**3.3**	**1.8**	**2.41**	**0.9**	**0.2**	**0.59**	0.2U	0.2U	NC
1,1,1-Trichloroethane	ug/l	Ethane	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
1,1,2-Trichloroethane	ug/L	Ethane	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
1,1-Dichloroethane	ug/L	Ethane	1600	MTCA-B non-car	**15**	**9.8**	**11.85**	**27**	**16**	**19.13**	**5.9**	**1.8**	**4.10**	0.2U	0.2U	NC
1,2-Dichloroethane (EDC)	ug/L	Ethane	0.48	MTCA-B car	**1.8**	**1.3**	**1.59**	**2.7**	**1.8**	**2.29**	**0.8**	**0.3**	**0.53**	0.2U	0.2U	NC
Chloroethane	ug/L	Ethane	15	MTCA-B car	**170**	**27**	**69.25**	**150**	**42**	**88.50**	**1.8**	**0.5**	**1.13**	0.2U	0.2U	NC
1,1-Dichloroethene	ug/L	Ethene	7	FED MCL	**1**	**0.7**	**0.81**	**1.1**	**0.7**	**0.89**	**0.3**	**0.16**	**0.21**	0.02U	0.02U	NC
cis-1,2-Dichloroethene	ug/L	Ethene	70	FED MCL	**84**	**12**	**32.13**	**29**	**10**	**19.00**	**18**	**5.5**	**11.76**	0.02U	0.02U	NC
Tetrachloroethene (PCE)	ug/L	Ethene	0.081	MTCA-B car	**0.21**	**0.027**	**0.09**	**0.47**	**0.063**	**0.20**	**6.5**	**1.9**	**4.56**	0.02U	0.02U	NC
trans-1,2-Dichloroethene	ug/L	Ethene	100	FED MCL	**1**	**0.5**	**0.70**	**0.8**	**0.6**	**0.69**	**0.3**	**0.2**	**0.23**	0.2U	0.2U	NC
Trichloroethene (TCE)	ug/L	Ethene	0.49	MTCA-B car	**3.8**	**0.56**	**1.22**	**1.3**	**0.4**	**0.79**	**1.6**	**0.5**	**1.11**	0.02U	0.02U	NC
Vinyl Chloride	ug/L	Ethene	0.029	MTCA-B car	**56**	**16**	**29.22**	**23**	**12**	**17.33**	**15**	**4**	**9.69**	0.02U	0.02U	NC
2-Butanone	ug/L	Ketone	4800	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	NC
2-Hexanone	ug/L	Ketone	NA		2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	NC
4-Methyl-2-Pentanone (MIBK)	ug/L	Ketone	640	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	NC
Acetone	ug/L	Ketone	800	MTCA-B non-car	**18**	**5.2**	**9.33**	**4.3**	**4.2**	**4.27**	**5.4**	**3.4**	**4.27**	**7.2**	2.5U	NC

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
NA = No Screening Level Available
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit, otherwise lowest reporting limit presented as min and average not calculated (NC
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

Table 15. Roza Aquifer (Solid Waste Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-3b			MW-7b			MW-9b			MW-19b		
Organic Parameters	Units	Group	RI Screen Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Methylene Chloride	ug/l	MC	5	FED MCL	**3.6**	**1.7**	**2.33**	**4.2**	**2.2**	**3.33**	**0.6**	**0.5**	**0.57**	0.5U	0.5U	NC
1,1,2-Trichlorotrifluoroethane	ug/L	Other	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
4-Isopropyltoluene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
Bromobenzene	ug/L	Other	NA		**0.6**	**0.2**	**0.28**	**0.7**	**0.3**	**0.47**	0.2U	0.2U	0.2U	0.2U	0.2U	NC
Carbon Disulfide	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
Chlorobenzene	ug/L	Other	100	FED MCL	**1.4**	**0.6**	**0.96**	**1.4**	**0.7**	**1.00**	**0.2**	**0.2**	**0.20**	0.2U	0.2U	NC
Chloroform	ug/L	Other	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
Isopropylbenzene (Cumene)	ug/L	Other	800	MTCA-B non-car	**0.2**	**0.2**	**0.20**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
Methyl tert-Butyl Ether	ug/L	Other	24	MTCA-B car	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NC
Naphthalene	ug/L	Other	160	MTCA-B non-car	**0.6**	**0.6**	**0.60**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	NC
n-Propylbenzene	ug/L	Other	NA		**0.3**	**0.3**	**0.30**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
Trichlorofluoromethane	ug/l	Other	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
1,2,4-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC
1,3,5-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NC

					MW-3b			MW-7b			MW-9b			MW-19b		
Inorganic Parameters	Units	Group	Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Arsenic, Dissolved[1]	ug/L	Inorganic	0.058	MTCA-B car	4.00	1.00	2.51	2.00	0.80	1.22	9.70	1.90	4.60	0.20	0.2U	NC
Chloride	mg/L	Inorganic	250	GWCL	1,470	1,000	1,214	1,260	930	1,050	1160	357	841.25	22.2	20.0	21.4
Iron, Dissolved	ug/L	Inorganic	300	GWCL	9,100	8,320	8,660	3,320	2,870	2,993	50U	50U	50U	60	50U	NC
Manganese, Dissolved	ug/L	Inorganic	2200	MTCA-B non-car	21,100	18,800	20,275	18,200	16,100	16,775	6,660	2,780	4,520	245	40	109
Nitrate as Nitrogen	mg/L	Inorganic	10	FED MCL	0.01	0.01	0.01	0.19	0.01	0.07	21.60	5.86	12.51	0.05	0.01	0.03
Sulfate	mg/L	Inorganic	250	GWCL	1,420	790	1,168	1,140	706	921	900	376	694	710	543	615
Total Dissolved Solids	mg/L	Inorganic	500	GWCL	5,200	3,680	4,600	4,040	3,140	3,655	3,720	2,080	3,093	1,120	890	1,039

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit, otherwise lowest reporting limit presented as min and average not calculated (NC)
NA = No Screening Level Available
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Site background concentration for dissolved arsenic is 3.0 ug/L (see text for details)

Table 16. Roza Aquifer (RI Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-29b			MW-30b			MW-31b			MW-42b			MW-44b			MW-53a[1]		
Organic Parameters	Units	Group	RI Scrn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,2-Dichloropropane	ug/L	12-DCP	0.64	MTCA-B car	**120.00**	**62.00**	**97.33**	**0.20**	**0.20**	**0.20**	0.2U	0.2U	0.2U	**26.00**	**24.00**	**25.00**	**27.00**	**21.00**	**24.00**	**0.40**	**0.30**	**0.35**
n-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.20**	**0.20**	**0.20**	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.30**	**0.20**	**0.25**	**0.70**	**0.70**	**0.70**	0.2U	0.2U	0.2U
Benzene	ug/L	BTEX	0.8	MTCA-B car	**3.40**	**1.60**	**2.50**	**0.20**	**0.20**	**0.20**	0.2U	0.2U	0.2U	**2.00**	**1.30**	**1.65**	**39.00**	**34.00**	**36.50**	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	BTEX	800	MTCA-B non-car	**1.90**	**1.90**	**1.90**	**1.60**	**1.60**	**1.60**	**1.40**	**1.40**	**1.40**	**0.50**	**0.50**	**0.50**	**2.10**	**1.30**	**1.70**	0.2U	0.2U	0.2U
o-Xylene	ug/L	BTEX	16000	MTCA-B non-car	**1.50**	**0.20**	**0.85**	**1.50**	**1.50**	**1.50**	**0.90**	**0.90**	**0.90**	**0.80**	**0.40**	**0.60**	**0.70**	**0.40**	**0.55**	0.2U	0.2U	0.2U
Toluene	ug/L	BTEX	640	MTCA-B non-car	**20.00**	**0.40**	**7.33**	**35.00**	**1.40**	**15.40**	**11.00**	**0.60**	**5.80**	0.2U	0.2U	0.2U	**0.40**	**0.30**	**0.35**	0.2U	0.2U	0.2U
Xylene Isomers, M+P	ug/L	BTEX	1600	MTCA-B non-car	**4.30**	**4.30**	**4.30**	**3.40**	**3.40**	**3.40**	**2.00**	**2.00**	**2.00**	**0.50**	**0.50**	**0.50**	**0.60**	**0.60**	**0.60**	0.4U	0.4U	0.4U
1,2-Dichlorobenzene	ug/L	DCB	600	FED MCL	**13.00**	**5.80**	**8.40**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**5.00**	**4.50**	**4.75**	**20.00**	**19.00**	**19.50**	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	DCB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.40**	**0.40**	**0.40**	**1.10**	**1.10**	**1.10**	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	DCB	1.8	MTCA-B car	**3.20**	**1.50**	**2.35**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**4.60**	**4.20**	**4.40**	**9.20**	**8.90**	**9.05**	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	Ethane	200	FED MCL	0.2U	0.2U	0.2U	**4.50**	**1.10**	**2.67**	**0.40**	**0.40**	**0.40**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.40**	0.2U	NC
1,1,2-Trichloroethane	ug/L	Ethane	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	Ethane	1600	MTCA-B non-car	**79.00**	**51.00**	**67.67**	**4.60**	**1.40**	**3.20**	**1.60**	**1.10**	**1.35**	**43.00**	**43.00**	**43.00**	**53.00**	**39.00**	**46.00**	**1.30**	**0.90**	**1.10**
1,2-Dichloroethane (EDC)	ug/L	Ethane	0.48	MTCA-B car	**7.50**	**5.10**	**6.70**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**6.20**	**5.30**	**5.75**	**2.60**	**2.40**	**2.50**	0.2U	0.2U	0.2U
Chloroethane	ug/L	Ethane	15	MTCA-B car	**11.00**	**6.50**	**8.75**	**1.00**	**1.00**	**1.00**	**0.30**	**0.30**	**0.30**	**330.00**	**320.00**	**325.00**	**450.00**	**440.00**	**445.00**	0.2U	0.2U	0.2U
1,1-Dichloroethene	ug/L	Ethene	7	FED MCL	**1.20**	**0.76**	**0.99**	**0.30**	**0.06**	**0.17**	**3.20**	**0.06**	**1.55**	**4.20**	**4.10**	**4.15**	**0.86**	**0.70**	**0.78**	0.02U	0.02U	0.02U
cis-1,2-Dichloroethene	ug/L	Ethene	70	FED MCL	**27.00**	**18.00**	**23.33**	**1.00**	**0.40**	**0.70**	**0.06**	**0.06**	**0.06**	**38.00**	**37.00**	**37.50**	**7.40**	**5.50**	**6.45**	**0.053**	**0.022**	**0.038**
Tetrachloroethene (PCE)	ug/L	Ethene	0.081	MTCA-B car	**1.10**	**0.60**	**0.85**	**0.50**	**0.03**	**0.21**	0.02U	0.02U	0.02U	**4.00**	**3.60**	**3.80**	0.02U	0.02U	0.02U	**0.15**	0.02U	NC
trans-1,2-Dichloroethene	ug/L	Ethene	100	FED MCL	**1.00**	**0.40**	**0.70**	0.02U	0.02U	0.02U	**1.40**	**1.40**	**1.40**	**1.20**	**1.00**	**1.10**	**1.80**	**1.70**	**1.75**	0.02U	0.02U	0.02U
Trichloroethene (TCE)	ug/L	Ethene	0.49	MTCA-B car	**3.30**	**1.80**	**2.60**	**0.50**	**0.07**	**0.29**	**0.38**	**0.05**	**0.17**	**2.20**	**1.80**	**2.00**	**0.10**	**0.10**	**0.10**	**0.083**	0.02U	NC
Vinyl Chloride	ug/L	Ethene	0.029	MTCA-B car	**23.00**	**13.00**	**17.67**	**2.40**	**0.04**	**0.91**	**5.10**	**0.50**	**3.07**	**9.40**	**8.70**	**9.05**	**2.00**	**1.80**	**1.90**	0.02U	0.02U	0.02U
2-Butanone	ug/L	Ketone	4800	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	**17.00**	**17.00**	**17.00**	5U	5U	5U	5U	5U	5U	5U	5U	5U
2-Hexanone	ug/L	Ketone	NA		2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
4-Methyl-2-Pentanone (MIBK)	ug/L	Ketone	640	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	**4.10**	**4.10**	**4.10**	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acetone	ug/L	Ketone	800	MTCA-B non-car	**11.00**	**11.00**	**11.00**	**14.00**	**14.00**	**14.00**	**78.00**	**78.00**	**78.00**	**8.00**	**6.40**	**7.20**	**12.00**	**5.80**	**8.90**	5U	5U	5U

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit, otherwise lowest reporting limit presented as min and average not calculated (NC
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. MW-53a is located in a bedrock depression (draw) approximately 1200 feet northeast of MW-44b and may be a discharge point for the Roza

Table 16. Roza Aquifer (RI Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-29b			MW-30b			MW-31b			MW-42b			MW-44b			MW-53a[1]		
Organic Parameters	Units	Group	RI Scrn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Methylene Chloride	ug/l	MC	5	FED MCL	**2.80**	**1.40**	**2.23**	**0.50**	**0.50**	**0.50**	0.5U	0.5U	0.5U	**7.10**	**6.70**	**6.90**	**12.00**	**12.00**	**12.00**	0.5U	0.5U	0.5U
1,1,2-Trichlorotrifluoroethane	ug/L	Other	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**3.6**	**0.2**	**1.90**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	Other	NA		**0.4**	**0.4**	**0.4**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.5**	**0.4**	**0.45**	**3.2**	**3.1**	**3.15**	0.2U	0.2U	0.2U
Carbon Disulfide	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	**0.2**	0.2U	NC	**0.3**	**0.3**	**0.30**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	Other	100	FED MCL	**2.5**	**1**	**1.6**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**1.2**	**1**	**1.10**	**2.1**	**2**	**2.05**	0.2U	0.2U	0.2U
Chloroform	ug/L	Other	7.2	MTCA-B car	0.2U	0.2U	0.2U	**0.2**	0.2U	NC	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Isopropylbenzene (Cumene)	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**2.6**	**1.1**	**1.85**	0.2U	0.2U	0.2U
Methyl tert-Butyl Ether	ug/L	Other	24	MTCA-B car	NM	NM	NM	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	NM	NM	NM
Naphthalene	ug/L	Other	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Propylbenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.7**	**0.2**	**0.45**	0.2U	0.2U	0.2U
Trichlorofluoromethane	ug/L	Other	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,4-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.2**	**0.2**	**0.20**	**1.7**	**1.7**	**1.70**	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

					MW-29b			MW-30b			MW-31b			MW-42b			MW-44b			MW-53a[1]		
Inorganic Parameters	Units	Group	RI Scrn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Arsenic, Dissolved[2]	ug/L	Inorganic	0.058	MTCA-B car	1.80	1.80	1.80	1.50	0.60	1.05	0.40	0.40	0.40	1.50	1.40	1.45	4.30	3.90	4.10	9	9	9
Chloride	mg/L	Inorganic	250	GWCL	466	309	389	12	9	10	6	6	6	348	329	339	484	431	458	16.7	16.0	16.4
Iron, Dissolved	ug/L	Inorganic	300	GWCL	320	150	235	10,200	80	5,140	270	270	270	120	120	120	640	290	465	50U	50U	50U
Manganese, Dissolved	ug/L	Inorganic	2200	MTCA-B non-car	988	882	935	308	302	305	91	84	88	1,650	1,350	1,500	3,120	2,890	3,005	8.0	7.0	7.5
Nitrate as Nitrogen	mg/L	Inorganic	10	FED MCL	0.68	0.13	0.35	0.17	0.02	0.09	0.02	0.02	0.02	0.02	0.02	0.02	0.01U	0.01U	0.01U	3.38	3.30	3.34
Sulfate	mg/L	Inorganic	250	GWCL	84	72	77	55	38	49	46	40	42	264	95	180	34	29	32	69	66	67
Total Dissolved Solids	mg/L	Inorganic	500	GWCL	1,140	1,050	1,087	288	245	260	248	234	240	1,520	1,350	1,435	1,360	1,350	1,355	358	353	356

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit, otherwise lowest reporting limit presented as min and average not calculated (NC)
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. MW-53a is located in a bedrock depression (draw) approximately 1200 feet northeast of MW-44b and may be a discharge point for the Roza
2. Site background concentration for dissolved arsenic is 3.0 ug/L (see text for details)

Table 17. Interflow Aquifer (Solid Waste Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-5c			MW-2c			MW-4c			MW-6c			MW-22c			MW-21c		
Organic Parameters	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,2-Dichloropropane	ug/L	12-DCP	0.64	MTCA-B car	**1.9**	**1.4**	**1.69**	**0.3**	**0.2**	**0.25**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Benzene	ug/L	BTEX	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	BTEX	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	BTEX	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Toluene	ug/L	BTEX	640	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Xylene Isomers, M+P	ug/L	BTEX	1600	MTCA-B non-car	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
n-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichlorobenzene	ug/L	DCB	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	DCB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	DCB	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	Ethane	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L	Ethane	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	Ethane	1600	MTCA-B non-car	**2**	**1.5**	**1.74**	**3.5**	**2.8**	**3.21**	0.2U	0.2U	0.2U	**2.1**	**1.2**	**1.70**	**4.5**	**3.2**	**3.88**	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	Ethane	0.48	MTCA-B car	**1.4**	**1.1**	**1.29**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	Ethane	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethene	ug/L	Ethene	7	FED MCL	**0.076**	**0.05**	**0.06**	**0.064**	**0.046**	**0.06**	0.02U	0.02U	0.02U	**0.14**	**0.085**	**0.11**	**0.71**	**0.4**	**0.54**	0.02U	0.02U	0.02U
cis-1,2-Dichloroethene	ug/L	Ethene	70	FED MCL	**12**	**8.6**	**10.03**	**0.3**	**0.3**	**0.30**	0.2U	0.2U	0.2U	**0.46**	**0.3**	**0.36**	**0.6**	**0.4**	**0.50**	0.02U	0.02U	0.02U
Tetrachloroethene (PCE)	ug/L	Ethene	0.081	MTCA-B car	**12**	**8.1**	**10.12**	**2**	**1.2**	**1.51**	0.02U	0.02U	0.02U	**1.7**	**0.9**	**1.28**	**5.4**	**3.6**	**4.39**	0.02U	0.02U	0.02U
trans-1,2-Dichloroethene	ug/L	Ethene	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.5**	0.2U	NC	0.2U	0.2U	0.2U
Trichloroethene (TCE)	ug/L	Ethene	0.49	MTCA-B car	**2.3**	**1.5**	**1.83**	**0.65**	**0.4**	**0.54**	0.02U	0.02U	0.02U	**0.56**	**0.3**	**0.43**	**1.7**	**1.2**	**1.47**	0.02U	0.02U	0.02U
Vinyl Chloride	ug/L	Ethene	0.029	MTCA-B car	**0.4**	**0.27**	**0.338**	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
2-Butanone	ug/L	Ketone	4800	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
2-Hexanone	ug/L	Ketone	NA		2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
4-Methyl-2-Pentanone (MIBK)	ug/L	Ketone	640	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
Acetone	ug/L	Ketone	800	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	3U	3U	3U	3U	3U	3U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
Methylene Chloride	ug/l	MC	5	FED MCL	**0.8**	**0.5**	**0.60**	**0.5**	**0.5**	**0.50**	**0.6**	0.5U	NC	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Elevated dissolved iron in MW-54c may be drilling related. Second sampling event (Round 7) was below detected (50 ug/L).

Table 17. Interflow Aquifer (Solid Waste Monitoring Wells)
Groundwater Statistical Summary and RI Screening

					MW-5c			MW-2c			MW-4c			MW-6c			MW-22c			MW-21c		
Organic Parameters	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,1,2-Trichlorotrifluoroethane	ug/L	Other	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Disulfide	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	Other	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	Other	7.2	MTCA-B car	**0.6**	**0.5**	**0.56**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.2**	**0.2**	**0.20**	**1.1**	**1**	**1.05**	0.2U	0.2U	0.2U
Isopropylbenzene (Cumene)	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl tert-Butyl Ether	ug/L	Other	24	MTCA-B car	NM	NM	NM	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	NM	NM	NM	0.2U	0.2U	0.2U	NM	NM	NM
Naphthalene	ug/L	Other	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Propylbenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichlorofluoromethane	ug/l	Other	2400	MTCA-B non-car	**0.2**	**0.2**	**0.20**	**4.9**	**2.6**	**3.81**	0.2U	0.2U	0.2U	**0.5**	**0.2**	**0.36**	**5.5**	**3.4**	**4.60**	0.2U	0.2U	0.2U
1,2,4-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

					MW-5c			MW-2c			MW-4c			MW-6c			MW-22c			MW-21c[3]		
Inorganic Parameters	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Arsenic, Dissolved[2]	ug/L	Inorganic	0.058	MTCA-B car	1.50	0.60	1.20	2.20	0.60	1.13	0.30	0.20	0.29	3.00	1.00	1.57	2.30	1.00	1.60	1.1	0.5	0.8
Chloride	mg/L	Inorganic	250	GWCL	661	494	565	757	659	721	11	10	10	682	599	634	164	110	136	24	22	23
Iron, Dissolved	ug/L	Inorganic	300	GWCL	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U
Manganese, Dissolved	ug/L	Inorganic	2200	MTCA-B non-car	1	1	1	8	4	6	30	29	29	24	19	22	2	2	2	180	139	152.6
Nitrate as Nitrogen	mg/L as N	Inorganic	10	FED MCL	12.00	9.80	10.73	8.76	7.31	8.02	0.07	0.07	0.07	24.80	17.70	20.58	10.40	7.58	9.18	97.50	64.40	85.38
Sulfate	mg/L	Inorganic	250	GWCL	242	173	188	57	41	51	37	30	33	167	59	78	49	28	39	77	19	63
Total Dissolved Solids	mg/L	Inorganic	500	GWCL	1,860	1,460	1,678	2,110	1,340	1,720	211	167	191	1,980	1,520	1,779	626	517	584	907	708	792

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NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Elevated dissolved iron in MW-54c may be drilling related. Second sampling event (Round 7) was below detected (50 ug/L).
2. Site background concentration for dissolved arsenic is 3.0 ug/L (see text for details)
3. Elevated nitrate and total dissolved solids in MW-21c are likely from an off-Site agricultural source (see text).

Table 18. Interflow Aquifer (RI Monitoring Wells) and Below Interflow Aquifer Monitoring Wells
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					RI INTERFLOW AQUIFER MONITORING WELLS						BELOW INTERFLOW MONITORING WELLS					
					MW-45c			MW-54c			MW-16d			MW-28d		
Organic Parameters	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,2-Dichloropropane	ug/L	12-DCP	0.64	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	**0.3**	**0.37**
Benzene	ug/L	BTEX	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	BTEX	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	BTEX	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Toluene	ug/L	BTEX	640	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	0.2U	NC
Xylene Isomers, M+P	ug/L	BTEX	10000	FED MCL	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
n-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichlorobenzene	ug/L	DCB	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	DCB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	DCB	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	Ethane	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L	Ethane	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	Ethane	1600	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	**0.3**	**0.33**
1,2-Dichloroethane (EDC)	ug/L	Ethane	0.48	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	Ethane	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethene	ug/L	Ethene	7	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
cis-1,2-Dichloroethene	ug/L	Ethene	70	FED MCL	**0.2**	0.2U	NC	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**2.1**	**1.5**	**1.77**
Tetrachloroethene (PCE)	ug/L	Ethene	0.081	MTCA-B car	**0.031**	0.2U	NC	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**2.4**	**1.2**	**1.80**
trans-1,2-Dichloroethene	ug/L	Ethene	100	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichloroethene (TCE)	ug/L	Ethene	0.49	MTCA-B car	0.02U	0.02U	0.02U	**0.027**	0.02U	NC	0.02U	0.02U	0.02U	**0.4**	**0.3**	**0.34**
Vinyl Chloride	ug/L	Ethene	0.029	MTCA-B car	**0.023**	0.2U	NC	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**0.028**	0.02U	NC
2-Butanone	ug/L	Ketone	4800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
2-Hexanone	ug/L	Ketone	NA		5U	5U	5U	5U	5U	5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
4-Methyl-2-Pentanone (MIBK)	ug/L	Ketone	640	MTCA-B non-car	5U	5U	5U	5U	5U	5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
Acetone	ug/L	Ketone	800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	**8**	2.5U	NC	2.5U	2.5U	2.5U

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FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

Table 18. Interflow Aquifer (RI Monitoring Wells) and Below Interflow Aquifer Monitoring Wells
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					RI INTERFLOW AQUIFER MONITORING WELLS						BELOW INTERFLOW MONITORING WELLS					
					MW-45c			MW-54c			MW-16d			MW-28d		
Organic Parameters	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Methylene Chloride	ug/l	MC	5	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	**0.7**	0.5U	NC	0.5U	0.5U	0.5U
1,1,2-Trichlorotrifluoroethane	ug/L	Other	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Disulfide	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	Other	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	Other	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Isopropylbenzene (Cumene)	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl tert-Butyl Ether	ug/L	Other	24	MTCA-B car	0.5U	0.5U	0.5U	NM	NM	NM	NM	NM	NM	0.2U	0.2U	0.2U
Naphthalene	ug/L	Other	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Propylbenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichlorofluoromethane	ug/l	Other	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,4-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

					MW-45c			MW-54c			MW-16d			MW-28d		
Inorganic Parameters	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Arsenic, Dissolved[2]	ug/L	Inorganic	0.058	MTCA-B car	1.20	1.00	1.10	3.10	1.00	2.05	2.00	0.30	0.60	0.60	0.60	0.60
Chloride	mg/L	Inorganic	250	GWCL	68	67	68	10	6	8	37	21	31	103	93	99
Iron, Dissolved[1]	ug/L	Inorganic	300	GWCL	50U	50U	50U	2,200	50U	1,125	100	60	87	50U	50U	50U
Manganese, Dissolved	ug/L	Inorganic	2200	MTCA-B non-car	21	11	16	57	52	55	91	88	90	15	15	15
Nitrate as Nitrogen	mg/L as N	Inorganic	10	FED MCL	2.99	2.78	2.89	0.01U	0.01U	0.01U	0.01	0.01	0.01	1.86	0.59	1.24
Sulfate	mg/L	Inorganic	250	GWCL	40	37	39	64	40	52	63	49	58	56	45	50
Total Dissolved Solids	mg/L	Inorganic	500	GWCL	314	284	299	382	216		356	267	318	429	364	396

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Elevated dissolved iron in MW-54c may be drilling related. Second sampling event (Round 7) was below detected (50 ug/L).
2. Site background concentration for dissolved arsenic is 3.0 ug/L (see text for details)

Table 19. Outwash Aquifer (Solid Waste Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-1a			MW-6a			MW-10a			MW-11a			MW-14a			MW-17a			MW-18a		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
1,2-Dichloropropane	ug/L	12-DCP	0.64	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
n-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Benzene	ug/L	BTEX	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	BTEX	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	BTEX	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Toluene[1]	ug/L	BTEX	640	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Xylene Isomers, M+P	ug/L	BTEX	1600	MTCA-B non-car	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
1,2-Dichlorobenzene	ug/L	DCB	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	DCB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	DCB	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	Ethane	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L	Ethane	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	Ethane	1600	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.300**	**0.200**	**0.267**	**0.700**	**0.300**	**0.486**
1,2-Dichloroethane (EDC)	ug/L	Ethane	0.48	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	Ethane	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethene	ug/L	Ethene	7	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**0.066**	**0.051**	**0.059**	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
cis-1,2-Dichloroethene	ug/L	Ethene	70	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**0.024**	**0.024**	**0.024**	**0.094**	**0.094**	**0.094**
Tetrachloroethene (PCE)	ug/L	Ethene	0.081	MTCA-B car	**0.120**	**0.087**	**0.098**	**0.110**	**0.096**	**0.102**	**0.400**	**0.190**	**0.237**	**0.310**	**0.200**	**0.268**	**0.200**	**0.140**	**0.180**	**0.067**	**0.031**	**0.050**	**0.036**	**0.026**	**0.032**
trans-1,2-Dichloroethene	ug/L	Ethene	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichloroethene (TCE)	ug/L	Ethene	0.490	MTCA-B car	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**0.045**	**0.038**	**0.041**	0.02U	0.02U	0.02U	**0.150**	**0.098**	**0.123**	**0.038**	**0.022**	**0.030**	**0.042**	**0.031**	**0.037**
Vinyl Chloride	ug/L	Ethene	0.029	MTCA-B car	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
2-Butanone	ug/L	Ketone	4800	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
2-Hexanone	ug/L	Ketone	NA		2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
4-Methyl-2-Pentanone (MIBK)	ug/L	Ketone	640	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
Acetone[1]	ug/L	Ketone	800.0	MTCA-B non-car	**5.3**	2.5U	NC	**6.2**	2.5U	NC	**16.0**	3U	NC	**6.0**	3U	NC	**2.7K**	3U	NC	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
2.7K - Detected constituent with unknown bias
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Detections of acetone, toluene, and methylene chloride were likely related to laboratory contaminants. Later confirmation samples were below detection

Table 19. Outwash Aquifer (Solid Waste Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-1a			MW-6a			MW-10a			MW-11a			MW-14a			MW-17a			MW-18a		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Methylene Chloride[1]	ug/l	MC	5.0	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	**0.5**	0.5U	NC	0.5U	0.5U	0.5U	**1.0**	0.5U	1.0
1,1,2-Trichlorotrifluoroethane	ug/L	Other	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Disulfide	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	Other	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	Other	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Isopropylbenzene (Cumene)	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl tert-Butyl Ether	ug/L	Other	24	MTCA-B car	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Naphthalene	ug/L	Other	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Propylbenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichlorofluoromethane	ug/l	Other	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.90**	**0.40**	**0.66**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,4-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

					MW-1a			MW-6a			MW-10a			MW-11a			MW-14a			MW-17a			MW-18a		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg	max	min	avg
Arsenic, Dissolved[2]	ug/L	Inorganic	0.058	MTCA-B car	5.8	2.7	3.7	5.2	3.7	4.2	5.5	4.0	5.0	8.1	7.0	7.7	4.9	3.0	3.7	4.9	4.2	4.6	5.3	4.3	4.8
Chloride	mg/L	Inorganic	250	GWCL	18.7	8.6	13.4	22.1	12.8	17.4	21.0	16.1	18.5	44.7	35.7	40.9	15.7	13.5	14.3	31.4	14.0	22.2	46.6	31.6	37.9
Iron, Dissolved	ug/L	Inorganic	300	GWCL	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U
Manganese, Dissolved	ug/L	Inorganic	2200	MTCA-B non-car	1U	1U	1U	1.0	1U	NC	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	4.0	1U	NC
Nitrate as Nitrogen	mg/L	Inorganic	10	FED MCL	5.1	1.1	3.8	5.5	1.4	4.5	5.0	4.1	4.8	7.0	5.6	6.2	4.6	3.9	4.2	5.8	2.1	3.6	3.9	1.3	2.0
Sulfate	mg/L	Inorganic	250	GWCL	50.7	36.1	43.7	50.0	30.7	44.5	47.6	36.1	41.4	49.4	38.2	45.6	61.5	48.8	57.1	41.0	30.0	37.1	69.7	43.0	48.8
Total Dissolved Solids	mg/L	Inorganic	500	GWCL	534	302	369	376	214	335	385	286	355	395	362	380	365	312	348	398	306	345	446	329	372

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Detections of acetone, toluene, and methylene chloride were likely related to laboratory contaminants. Later confirmation samples were below detection
2. Site background concentration for dissolved arsenic is 3.0 ug/L (see text for details)

Table 20. Outwash Aquifer (RI Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-24a			MW-25a			MW-26a		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg
1,2-Dichloropropane	ug/L	12-DCP	0.64	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
n-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Benzene	ug/L	BTEX	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	BTEX	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	BTEX	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Toluene[1]	ug/L	BTEX	640	MTCA-B non-car	**1.200**	0.2U	NC	**1.300**	0.2U	NC	**1.200**	0.2U	NC
Xylene Isomers, M+P	ug/L	BTEX	1600	MTCA-B non-car	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
1,2-Dichlorobenzene	ug/L	DCB	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	DCB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	DCB	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	Ethane	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L	Ethane	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	Ethane	1600	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	Ethane	0.48	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	Ethane	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethene	ug/L	Ethene	7	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
cis-1,2-Dichloroethene	ug/L	Ethene	70	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
Tetrachloroethene (PCE)	ug/L	Ethene	0.081	MTCA-B car	**0.320**	**0.180**	**0.238**	**0.200**	**0.130**	**0.168**	**0.120**	**0.086**	**0.107**
trans-1,2-Dichloroethene	ug/L	Ethene	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.02U	0.02U	0.02U
Trichloroethene (TCE)	ug/L	Ethene	0.490	MTCA-B car	**0.071**	0.02U	NC	**0.077**	**0.026**	**0.044**	0.02U	0.02U	0.02U
Vinyl Chloride	ug/L	Ethene	0.029	MTCA-B car	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
2-Butanone	ug/L	Ketone	4800	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
2-Hexanone	ug/L	Ketone	NA		2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
4-Methyl-2-Pentanone (MIBK)	ug/L	Ketone	640	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
Acetone	ug/L	Ketone	800.0	MTCA-B non-car	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
Methylene Chloride	ug/l	MC	5.0	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Detections of toluene likely related to laboratory contaminants. Later confirmation samples were below detection

Table 20. Outwash Aquifer (RI Monitoring Wells)
Groundwater Statistical Summary and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					MW-24a			MW-25a			MW-26a		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg
1,1,2-Trichlorotrifluoroethane	ug/L	Other	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Disulfide	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	Other	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	Other	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Isopropylbenzene (Cumene)	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl tert-Butyl Ether	ug/L	Other	24	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Naphthalene	ug/L	Other	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Propylbenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichlorofluoromethane	ug/l	Other	2400.00	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,4-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

					MW-24a			MW-25a			MW-26a		
Constituent	Units	Group	RI Scn Level	Source	max	min	avg	max	min	avg	max	min	avg
Arsenic, Dissolved[1]	ug/L	Inorganic	0.058	MTCA-B car	4.8	3.4	4.3	4.3	4.0	4.2	2.5	2.1	2.4
Chloride	mg/L	Inorganic	250	GWCL	45.7	25.9	35.5	21.3	16.3	18.9	26.7	10.3	15.9
Iron, Dissolved	ug/L	Inorganic	300	GWCL	50U	50U	50U	50U	50U	50U	50U	50U	50U
Manganese, Dissolved	ug/L	Inorganic	2200	MTCA-B non-car	1U	1U	1U	1U	1U	1U	2.0	1U	NC
Nitrate as Nitrogen	mg/L as N	Inorganic	10	FED MCL	5.8	4.7	5.3	5.3	4.7	5.0	4.9	3.7	4.3
Sulfate	mg/L	Inorganic	250	GWCL	47	38	44	43	36	41	53	36	41
Total Dissolved Solids	mg/L	Inorganic	500	GWCL	397	388	394	381	357	371	423	347	378

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
NM = Parameter not analyzed
NC = Average not calculated if constituent only detected once above the lowest reporting limit
Maximum, mininum and average results are same if constituent only detected once and it was below the lowest reporting limit
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. Site background concentration for dissolved arsenic is 3.0 ug/L (see text for details)

Table 21. Private Off-Site Wells
Groundwater Analytical Results and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					INTERFLOW AQUIFER					FRENCHMAN SPRINGS AQUIFER		OUTWASH AQUIFER	RINGOLD AQUIFER			
Organic Parameters	Units	Group	RI Scn Level	Source	Abrams	Pashkovsky (ABX965)	Pashkovsky (ACX157)	Perez	Gutierrez (ACE909)	Roland	Whitson	Bolyard (Shallow)	Manship	Massey	Sanchez	Spencer[1]
1,2-Dichloropropane	ug/L	12-DCP	0.64	MTCA-B car	**0.7**	**0.4**	**1.7**	**2.9**	0.2U	0.2U	**5**	0.2U	0.2U	0.2U	0.2U	0.2U
n-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	BB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Benzene	ug/L	BTEX	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.9**	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	BTEX	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	BTEX	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Toluene	ug/L	BTEX	640	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Xylene Isomers, M+P	ug/L	BTEX	1600	MTCA-B non-car	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
1,2-Dichlorobenzene	ug/L	DCB	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.3**	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	DCB	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	DCB	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	Ethane	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L	Ethane	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	Ethane	1600	MTCA-B non-car	**0.7**	**0.3**	**1.2**	**2.1**	0.2U	0.2U	**6.8**	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	Ethane	0.48	MTCA-B car	0.2U	0.2U	0.2U	**0.2**	0.2U	0.2U	**0.6**	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	Ethane	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**2.7**	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethene	ug/L	Ethene	7	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.2**	0.2U	0.2U	0.2U	0.2U	0.2U
cis-1,2-Dichloroethene	ug/L	Ethene	70	FED MCL	0.2U	0.2U	**0.4**	**0.8**	0.2U	0.2U	**2.9**	0.2U	0.2U	0.2U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	Ethene	0.081	MTCA-B car	0.2U	0.2U	0.2U	0.2U	**0.2**	**0.2**	**0.4**	**0.6**	**0.8**	**3.9**	**0.5**	**1.8**
trans-1,2-Dichloroethene	ug/L	Ethene	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichloroethene (TCE)	ug/L	Ethene	0.49	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.3**	0.2U	0.2U	**0.4**	0.2U	0.2U
Vinyl Chloride	ug/L	Ethene	0.029	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**5**	0.2U	0.2U	0.2U	0.2U	0.2U

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
6.9Q = Parameter outside acceptance criteria for intial or continuing calibration
NM = Parameter not analyzed
Maximum concentrations are shown for private wells that were sampled twice (Abrams, Manship, Massey, and Whitson)
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. A well log for the Spencer well was not found in Ecology's well log database; however, based on surrounding well logs it is believed to be completed in the Ringold Formation

Table 21. Private Off-Site Wells
Groundwater Analytical Results and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					INTERFLOW AQUIFER					FRENCHMAN SPRINGS AQUIFER		OUTWASH AQUIFER	RINGOLD AQUIFER			
Organic Parameters	Units	Group	RI Scn Level	Source	Abrams	Pashkovsky (ABX965)	Pashkovsky (ACX157)	Perez	Gutierrez (ACE909)	Roland	Whitson	Bolyard (Shallow)	Manship	Massey	Sanchez	Spencer[1]
2-Butanone	ug/L	Ketone	4800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
2-Hexanone	ug/L	Ketone	NA		5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
4-Methyl-2-Pentanone (MIBK)	ug/L	Ketone	640	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acetone	ug/L	Ketone	800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	**6**	5U	**6.9Q**	5U	**6Q**	5U
Methylene Chloride	ug/l	MC	5	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	**1**	0.5U	0.5U	0.5U	0.5U	0.5U
1,1,2-Trichlorotrifluoroethane	ug/L	Other	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Disulfide	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	Other	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	Other	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Isopropylbenzene (Cumene)	ug/L	Other	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl tert-Butyl Ether	ug/L	Other	24	MTCA-B car	0.5U	0.5U	0.5U	NM	0.5U	0.5U	0.5U	0.5U	NM	NM	NM	NM
Naphthalene	ug/L	Other	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Propylbenzene	ug/L	Other	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Trichlorofluoromethane	ug/l	Other	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,4-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	TMB	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
6.9Q = Parameter outside acceptance criteria for intial or continuing calibration
NM = Parameter not analyzed
Maximum concentrations are shown for private wells that were sampled twice (Abrams, Manship, Massey, and Whitson)
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. A well log for the Spencer well was not found in Ecology's well log database; however, based on surrounding well logs it is believed to be completed in the Ringold Formation.

Table 21. Private Off-Site Wells
Groundwater Analytical Results and RI Screening
(only wells with VOC detections and/or exceedance of inorganic RI screening levels are shown - see Appendices for complete analytical data)

					INTERFLOW AQUIFER					FRENCHMAN SPRINGS AQUIFER		OUTWASH AQUIFER	RINGOLD AQUIFER			
Inorganic Parameters	Units	Group	RI Scn Level	Source	Abrams	Pashkovsky (ABX965)	Pashkovsky (ACX157)	Perez	Gutierrez (ACE909)	Roland	Whitson	Bolyard (Shallow)	Manship	Massey	Sanchez	Spencer[1]
Arsenic, Dissolved[2]	ug/L	Inorganic	0.058	MTCA-B car	1.9	2.6	2.9	2	3.5	NM	0.8	10	2	3	0.8	1.2
Chloride	mg/L	Inorganic	250	GWCL	27.7	31.4	22	44.4	22.4	27.9	87.5	41.9	23.5	44	31.8	40.6
Iron, Dissolved	ug/L	Inorganic	300	GWCL	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U
Manganese, Dissolved	ug/L	Inorganic	2200	MTCA-B non-car	1U	1U	1U	1U	1U	1U	1U	1U	1U	9	2	1U
Nitrate as Nitrogen	mg/L as N	Inorganic	10	FED MCL	6.67	7.47	4.93	9.96	4.8	4.34	5.81	3.75	5.85	4.18	7.39	10.6
Sulfate	mg/L	Inorganic	250	GWCL	66.4	66.7	41.2	72.8	47	42.7	32.3	55.1	29.6	42.3	26.5	40.6
Total Dissolved Solids	mg/L	Inorganic	500	GWCL	398	388	315	414	404	364	376	440	298	335	309	NM

Bold = Detected VOC
Shaded = Concentration exceeds RI Screening Level
NA = No established screening level
0.2U = Parameter not detected at laboratory limit (0.2)
6.9Q = Parameter outside acceptance criteria for intial or continuing calibration
NM = Parameter not analyzed
Maximum concentrations are shown for private wells that were sampled twice (Abrams, Manship, Massey, and Whitson)
RI Scn Level = RI screening levels based on one of the following four sources:
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
1. A well log for the Spencer well was not found in Ecology's well log database; however, based on surrounding well logs it is believed to be completed in the Ringold Formation.
2. Site background concentration for dissolved arsenic is 3.0 ug/L (see text for details)

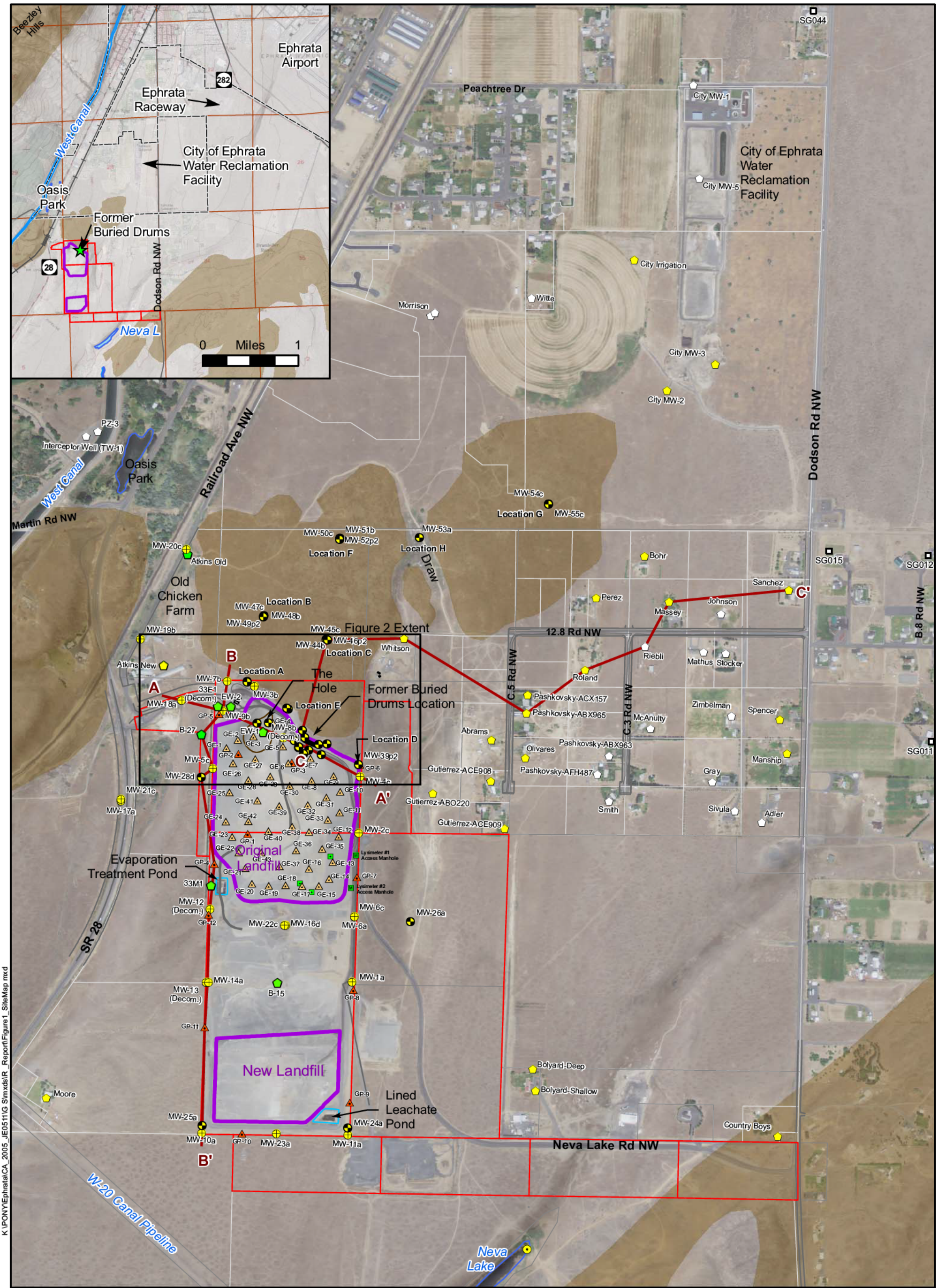


Figure 1
Ephrata Landfill Site Map

Ephrata Landfill
RIFS

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MW 19b
Atkins New
MW 18a
MW 45c
MW 46p2
MW 44b
Whitson
MW 7b
MW 40p2
MW 41a
MW 3b
T-1
T-2
T-3
T-4
T-5
T-6
T-7
T-8
T-9
T-10
T-11
T-12
T-13
60261
B 1
Scale
Shop
Concrete Pad
Maintenance Shop Area
B 2
B 3
B 4
B 5
B 6
B 7
B 8
B 10
B 11
B 12
B 13
B 14
B 15
B 16
B 23
B 27
11905
33E1 (Decom.)
EW 2
MW 9b
GP 5
Fuel Tanks
Recycling
W 9
W 12
GE 4
EW 1
The Hole
GE 3
GE 2
GE 1
GP 2
GE 27
GE 26
GE 28
GE 29
GE 5
GE 6
GE 7
GE 8
GE 9
GP 3
MW 43p2
MW 42b
MW 31b
MW 38p2
MW 35p2
MW 8b (Decom.)
MW 36p1
MW 30b
MW 34p1
MW 33p2
MW 32a
MW 37p1
MW 29b
MW 39p2
GP 6
MW 4c
MW 5c
MW 28d
A
A'
B
C
D
D'
1260
1280
1240
1220
1180
1200
1160
1250

Former Buried Drums Location

Former Buried Drums Location Detail
MW-31b
MW-38p2
MW-35p2
MW-32a
MW-37p1
MW-36p1
MW-30b
MW-34p1
MW-33p2
MW-29b
0 Feet 75

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Quarterly Monitoring Well (MW)
Remedial Investigation Monitoring Well (MW)
Gas Extraction (GE)
Gas Probe (GP)
Other Wells
Sampled Off-site Wells
Other Off-site Wells

Soil Sample Locations
Boring
Test Pits
Initial Sample of Soils Directly Below Drum Cache
Residual Sample of Soils after Soil Removal

Drum Cache Outline
Laser Survey Elevation Range
High : 1258.01
Low : 1252.18

Extent of Soil Removal to Bedrock
Capped Unlined Landfill Extent
Approximate Area of Landfill Refuse Not Capped
Approximate Area of Contaminated Soils Not Capped
Approximate Extent of Saturation Above Bedrock
County Owned Parcels
Cross-Section Alignments

Top of Basalt Elevation Contours
20-foot Contour
10-foot Contour
20-foot Depression Contour
10-foot Depression Contour

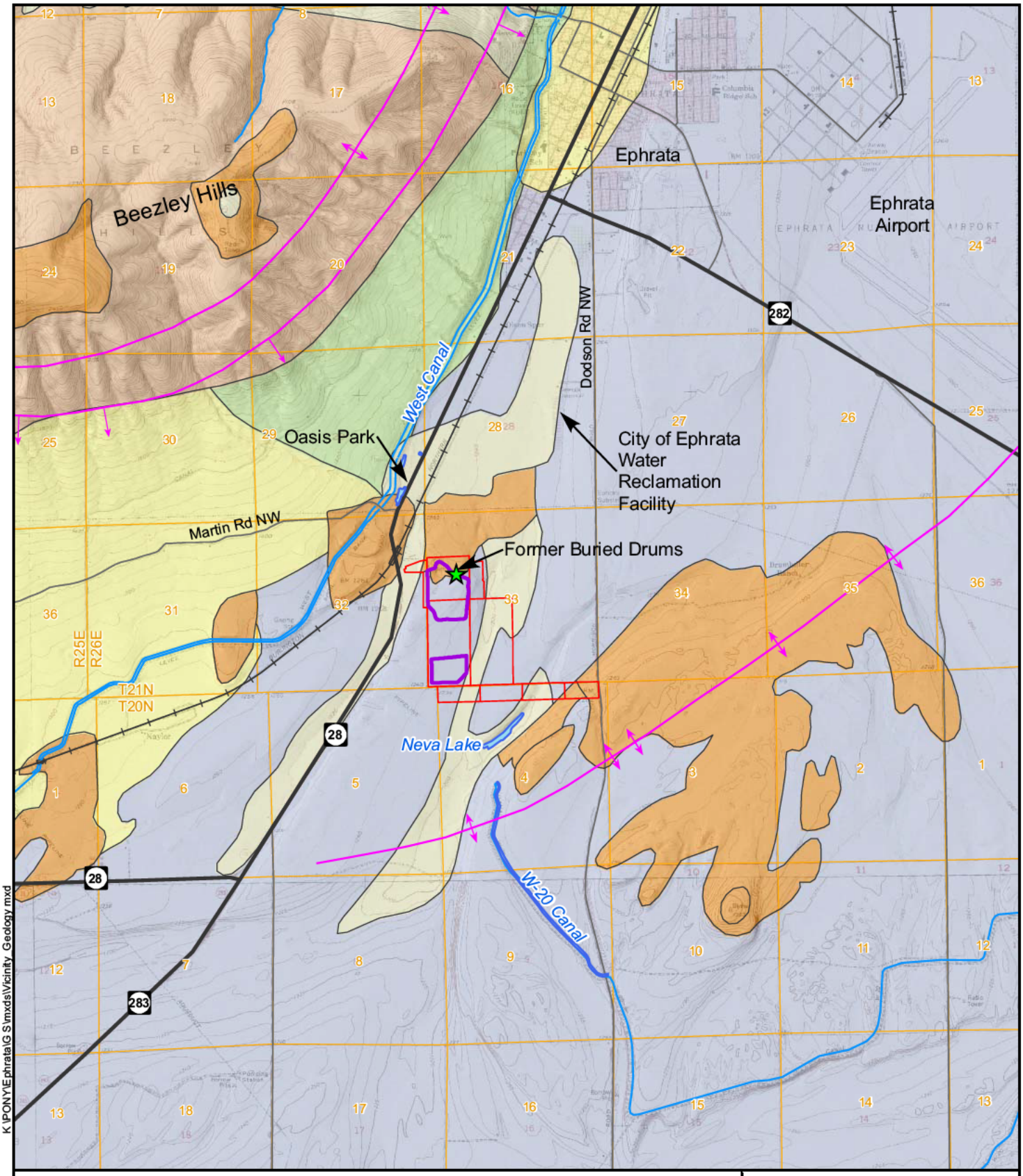
0 Feet 150
2009 NAIP Orthophoto
N

Figure 2

North End of Ephrata Landfill

Ephrata Landfill
RIFS

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Geologic Units

- Quaternary alluvium and loess
- Quaternary landslide deposits
- Pleistocene Missoula glacial lake outburst flood deposits
- Pliocene to Miocene continental sedimentary rocks (Ringold Formation)
- Wanapum Basalt
- Grande Ronde Basalt
- Anticline
- Monocline, anticlinal bend

- Landfill Extents
- County Owned Parcels

0 Feet 5,000

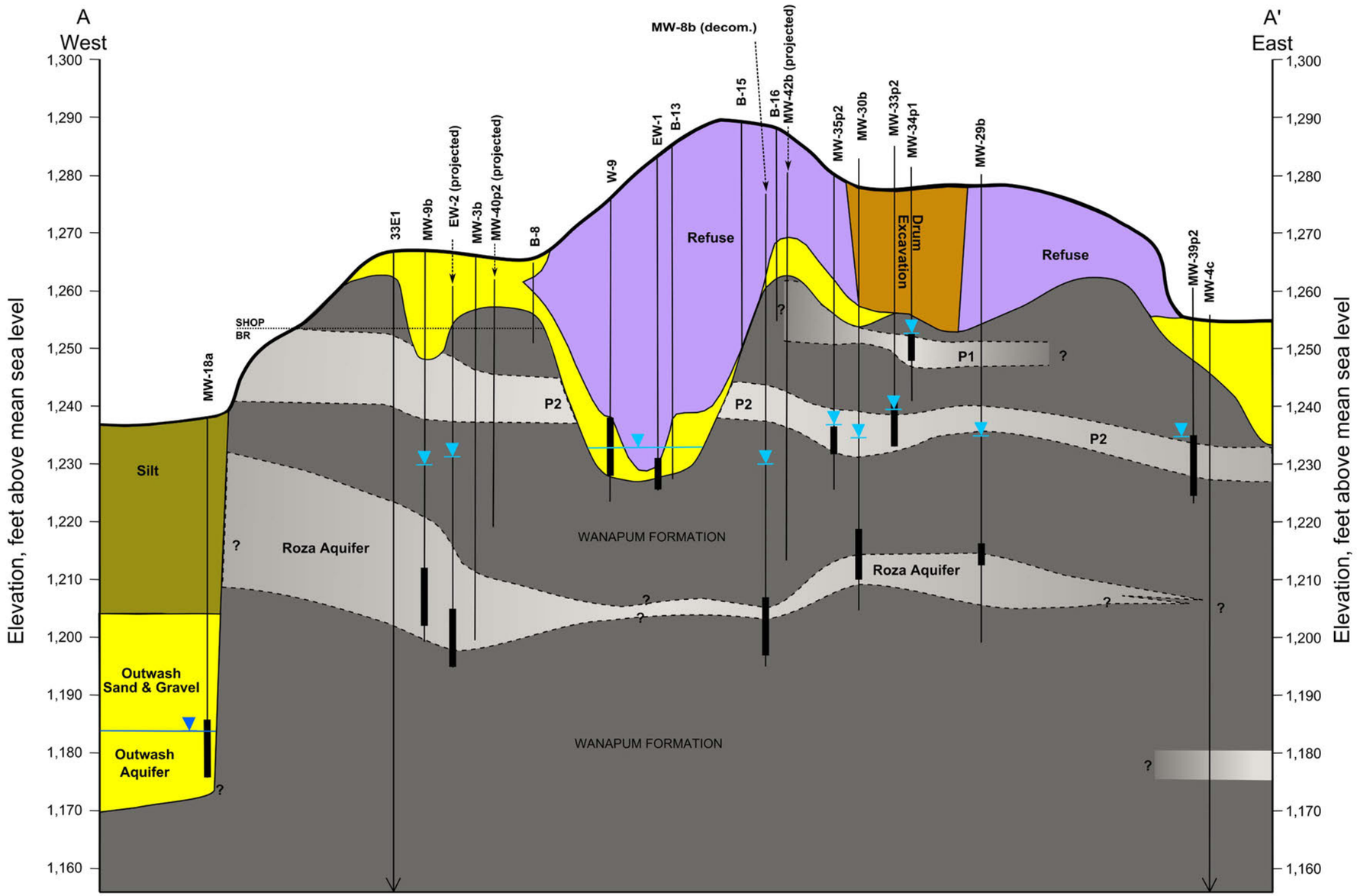
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Figure 3

Geologic Map

Ephrata Landfill
RIFS

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LEGEND

- Drum Excavation
- Refuse
- Silt
- Outwash
- Basalt
- Soft, weathered Basalt

Well ID

- Static Water Level
- Screen

Vertical Exaggeration = 10x

0 — 400 ft

Figure 4
East-West Hydrogeologic Cross Section (A-A')

See Figure 1 for section alignment

Ephrata Landfill RI

Filename: X-section Across The Hole_NEW2010.svg

PgG

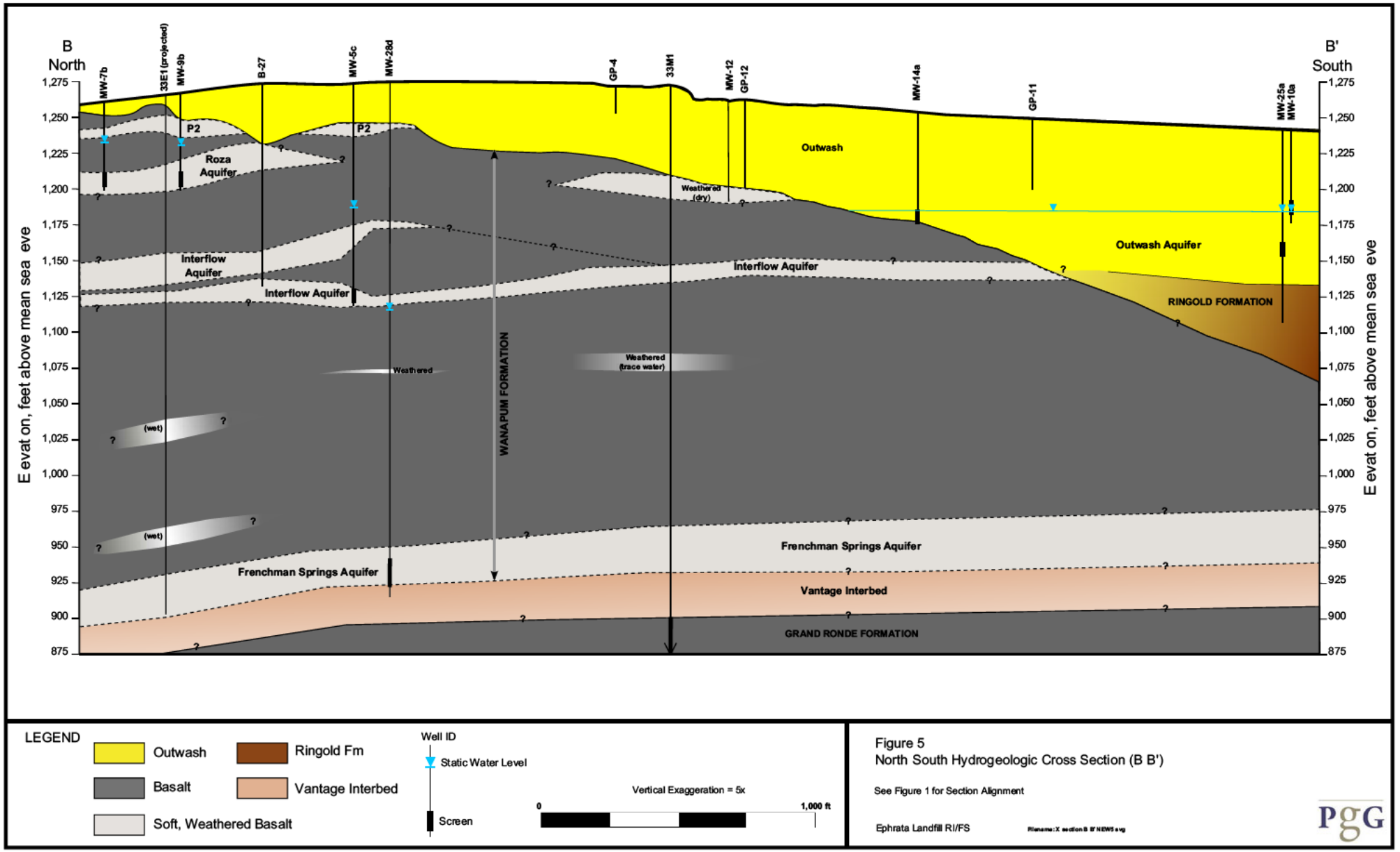


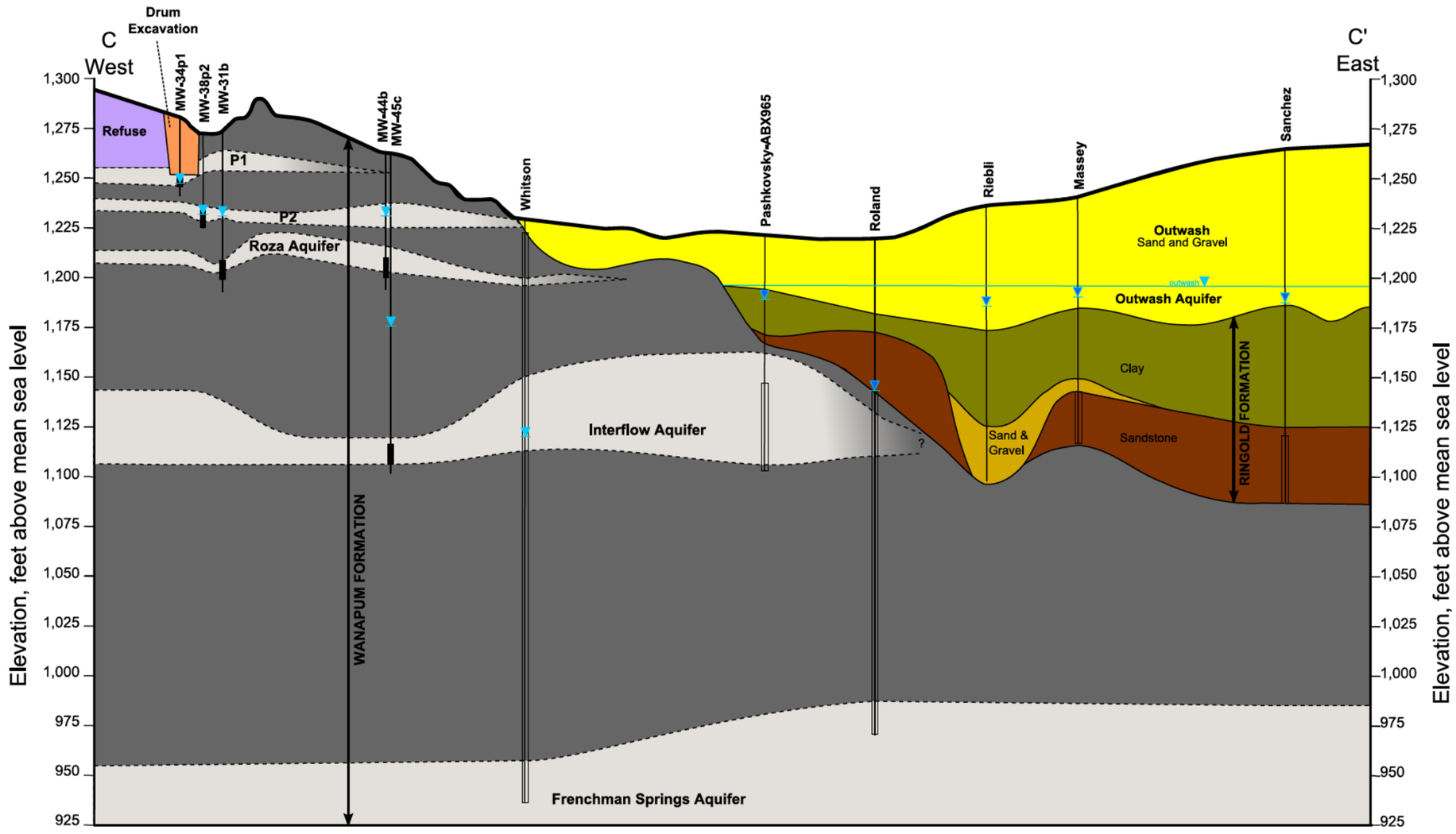
Figure 5
North South Hydrogeologic Cross Section (B B')

See Figure 1 for Section Alignment

Ephrata Landfill RI/FS

Filename: X section B B' NEW5.svg

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LEGEND

- Refuse
- Outwash — Sand and Gravel
- Ringold Fm — Clay
- Ringold Fm — Sand and Gravel
- Ringold Fm — Sandstone
- Basalt
- Soft, Weathered Basalt

Well ID
- Static Water Level
- ATD: At Time of Drilling
- Cased
- Uncased (Open Hole)
- Screen

Vertical Exaggeration = 5x

0 — 500 ft

Figure 6
West-East Hydrogeologic Cross Section (C-C')

See Figure 1 for Section Alignment

Ephrata Landfill RI/FS

Filename: X-section C-C'.svg

PgG

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City MW-5
City Irrigation
City of Ephrata Water Reclamation Facility
Witte
Morrison
City MW-3
City MW-2
West Canal
Railroad Ave NW
PZ-3
Interceptor Well (TW-1)
Oasis Park
Martin Rd NW
MW-54c
MW-55c
MW-53a
MW-50c
MW-51b
MW-52p2
MW-20c
Atkins Old
Draw
Bohr
SG015
Sanchez
Perez
Massey
Johnson
Old Chicken Farm
MW-47c
MW-48b
MW-49p2
MW-45c
MW-44b
MW-46p2
Whitson
12.8 Rd NW
Riebli
Mathus
Stocker
Dodson Rd NW
Maintenance Shop Area
Atkins New
MW-19b
MW-7b
33E1 (Decom.)
EW-2
MW-3b
MW-18a
MW-9b
MW-8b
EW-1 (Decom.)
Former Buried Drums Location
B-27
Roland
Pashkovsky-ACX157
Pashkovsky-ABX965
C.5 Rd NW
C.3 Rd NW
McAnulty
Zimbelman
Spencer
Abrams
Olivares
Pashkovsky-ABX963
Manship
Gray
Pashkovsky-AFH487
Gutierrez-ACE908
MW-39p2
MW-4c
MW-5c
MW-28d
The Hole
Gutierrez-ABO220
Smith
Sivula
Adler
MW-21c
MW-17a
Gutierrez-ACE909
MW-2c
Evaporation Treatment Pond
Lysimeter #1 Access Manhole
Original Landfill
Lysimeter #2 Access Manhole
33M1
MW-12 (Decom.)
MW-6c
MW-26a
MW-22c
MW-16d
MW-6a
SR 28
MW-1a
MW-14a
MW-13 (Decom.)
B-15
New Landfill
Lined Leachate Pond
Bolyard-Deep
Bolyard-Shallow
Moore
Country Boys
MW-25a
MW-24a
MW-10a
MW-23a
MW-11a
Neva Lake Rd NW
W-20 Canal Pipeline
Neva Lake

Top of Basalt Elevation Contour
20-ft Contour
20-ft Contour Infered
20-foot Depression Contour
Basalt Outcrops

Quarterly Monitoring Well (MW)
Remedial Investigation Monitoring Well (MW)
Other Wells
Sampled Off-site Wells
Other Off-site Wells
Landfill Extents
County Owned Parcels

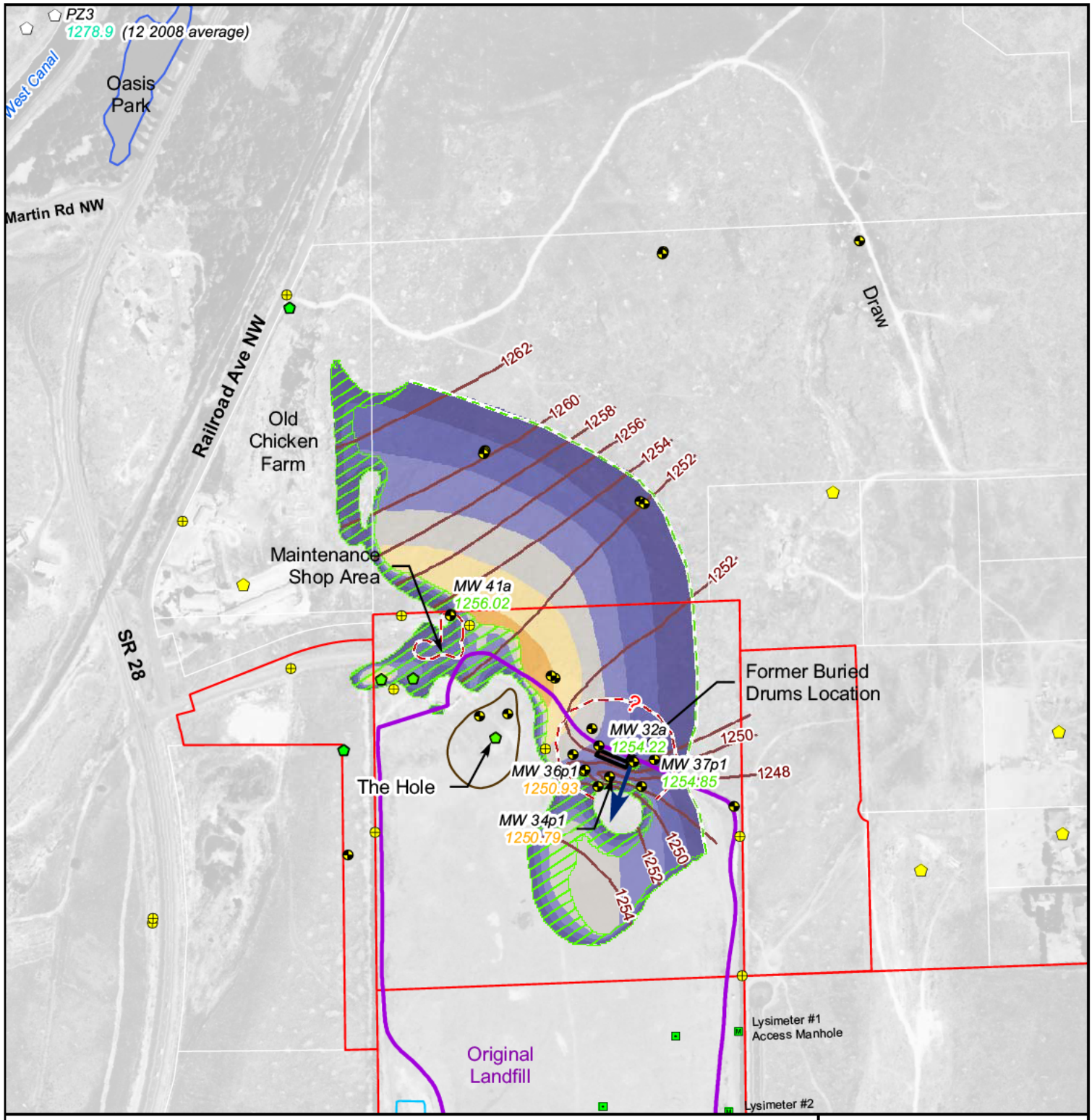
0 Feet 500

N

Figure 7
Top of Basalt

Ephrata Landfill
RIFS

PgG



Aquifer Subcrop Zone (Approximate)
Aquifer Pinches Out (Dashed where Infered)
Aquifer Bottom Elevation Contour (Feet)
1232.92 Groundwater Elevations 1-13-2010
1215.74 Groundwater Elevations 12-29-2009
Groundwater Flow Direction
Aproximate Extent of Groundwater Contamination (VOCs Above RI Screening Levels)
Quarterly Monitoring Well (MW)
Remedial Investigation Monitoring Well (MW)
Other Wells
Sampled Off-site Wells
Other Off-site Wells
Landfill Extents
County Owned Parcels

Estimated P1 Zone Extent and Thickness (Feet)
0 - 2
2.1 - 4
4.1 - 6
6.1 - 8
8.1 - 10
10.1 - 12
12.1 - 14
14.1 - 16

N

0 Feet 500

Figure 8
Hydrogeologic Map P1 Zone

Ephrata Landfill RIFS

PgG

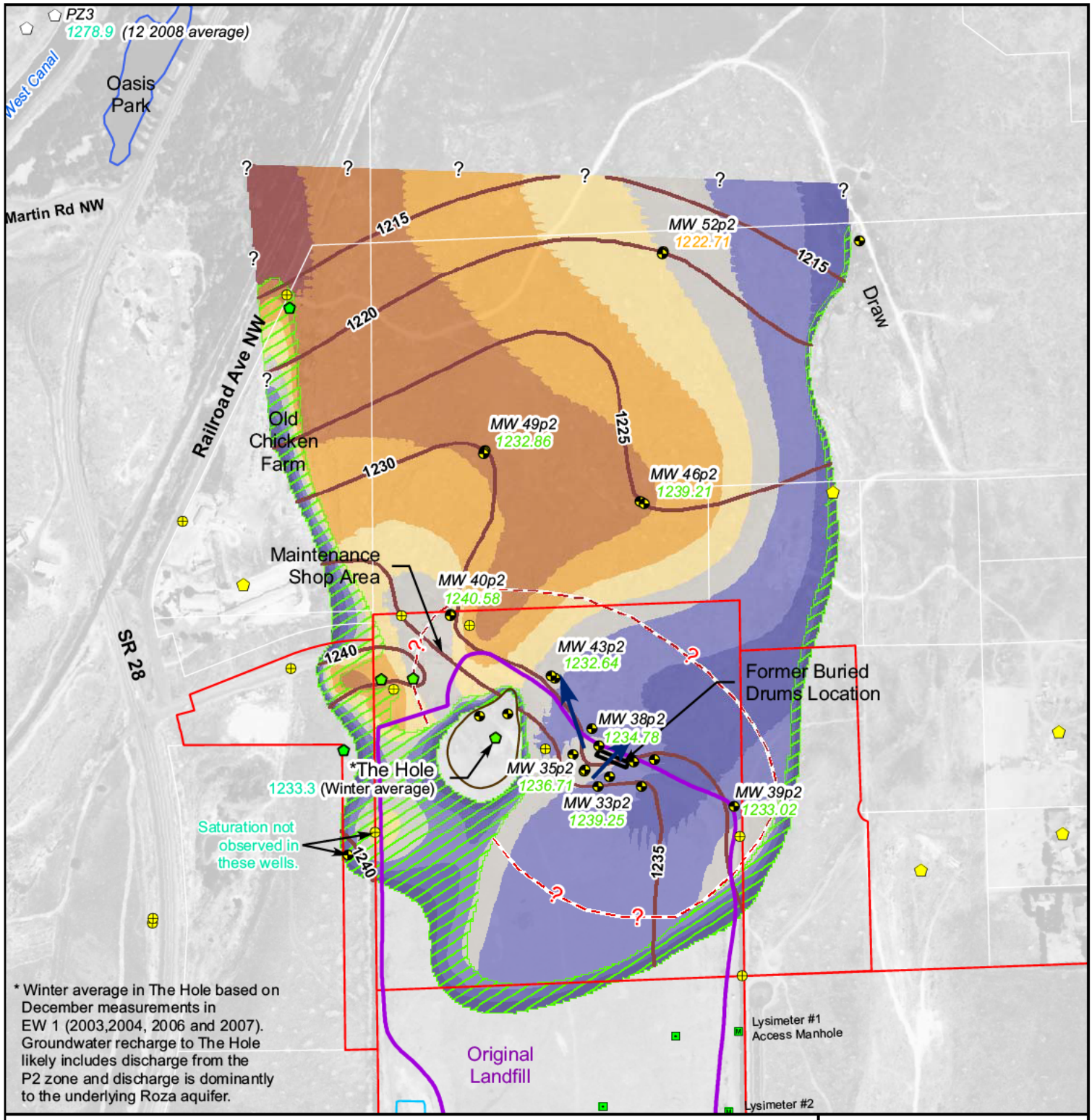


Figure 9

Hydrogeologic Map P2 Zone

Ephrata Landfill RIFS

PgG

West Canal

Railroad Ave NW

PZ3
1278.9 (12 2008 average)

Oasis Park

Old Chicken Farm

MW 19b
1231.34

MW 48b
1229.87

MW 44b
1232.71

MW 51b
1215.7

MW 53a
1215.35

Draw

12.8 Rd NW

C.5 Rd NW

C.3 Rd NW

Pinch Out or Subcrop (Approximate)

Maintenance Shop Area

MW 7b
1232.66

MW 3b
1232.66

MW 42b
1233.03

MW 9b
1232.65

MW 31b
1234.39

MW 30b
1231.71

MW 29b
1232.43

Former Buried Drums Location

*The Hole
1233.3 (Winter average)

1195
1200
1205
1210
1215

Evaporation Treatment Pond

Original Landfill

Lysimeter #1
Access Manhole

Lysimeter #2
Access Manhole

SR 28

Aquifer Subcrop Zone (Approximate)
Aquifer Pinches Out (Dashed where Infered)
Aquifer Bottom Elevation Contour (Feet)
Aproximate Extent of Groundwater Contamination (VOCs Above RI Screening Levels)
1232.92 Groundwater Elevations 1-13-2010
1215.74 Groundwater Elevations 12-29-2009
1231.34 Groundwater Elevations 12-15-2009
Groundwater Flow Direction
Quarterly Monitoring Well (MW)
Remedial Investigation Monitoring Well (MW)
Other Wells
Sampled Off-site Wells
Other Off-site Wells
Landfill Extents
County Owned Parcels

Estimated Roza Aquifer Extent and Thickness (Feet)
0 - 2
2.1 - 4
4.1 - 6
6.1 - 8
8.1 - 10
10.1 - 12
12.1 - 14
14.1 - 16
16.1 - 18
18.1 - 20
20.1 - 22
22.1 - 24

* Winter average in The Hole based on December measurements in EW 1 (2003,2004, 2006 and 2007). Groundwater recharge to The Hole likely includes discharge from the P2 zone and discharge is dominantly to the underlying Roza aquifer.

0 Feet 500 N

Figure 10

Hydrogeologic Map
Roza Aquifer

Ephrata Landfill
RIFS

PGG

City MW-5
City of Ephrata Water Reclamation Facility
City Irrigation
Witte
Morrison
West Canal
City MW-3
City MW-2
Railroad Ave NW
PZ3
1278.9 (12 2008 average)
Interceptor Well (TW-1)
Oasis Park
MW 54c
Static Water Level Not Measured
MW-55c
Martin Rd NW
MW 50c
1176.06
MW-51b
MW-52p2
MW-53a
Draw
SG015
Bohr
MW 20c
1235.13
Atkins Old
Sanchez
Perez
Massey
Johnson
Old Chicken Farm
MW 47c
1173.62
MW-48b
MW-49p2
MW 45c
1173.28
MW-46p2
MW-44b
12.8 Rd NW
Riebli
Mathus
Stocker
MW-19b
Whitson
Maintenance Shop Area
Roland
Atkins New
MW-7b
33E1 (Decom.)
EW-2
MW-3b
Former Buried Drums Location
C.5 Rd NW
Pashkovsky-ACX157
Zimbelman
Spencer
Pashkovsky-ABX965
McAnulty
C.3 Rd NW
Dodson Rd NW
MW-18a
MW-9b
MW-8b (Decom.)
EW-1
Abrams
Pashkovsky-ABX966
B-27
Olivares
Manship
MW 5c
1186.83
MW-39p2
Pashkovsky-AFH487
Gray
Gutierrez-ACE908
MW 4c
1186.28
MW-28d
MW 21c
1186.72
The Hole
Gutierrez-ABO220
Smith
Sivula
Adler
MW-17a
Gutierrez-ACE909
Evaporation Treatment Pond
MW 2c
1186.72
Lysimeter #1 Access Manhole
Original Landfill
Lysimeter #2 Access Manhole
33M1
MW-12 (Decom.)
MW 6c
1186.53
MW-26a
SR 28
Minimum Possible Interflow Aquifer Extent
MW 22c
1186.79
MW-16d
MW-6a
MW-1a
MW-14a
MW-13 (Decom.)
B-15
Maximum Possible Interflow Aquifer Extent
Interflow Not Likely Present
Bolyard-Deep
Bolyard-Shallow
New Landfill
Lined Leachate Pond
Moore
Country Boys
MW-25a
MW-24a
MW-10a
MW-23a
MW-11a
Neva Lake Rd NW
W-20 Canal Pipeline
Neva Lake

Outwash Water Table / Top of Basalt Contact
Interflow Subcrop Zone (Approximate)
Ringold Formation Extent
Basalt Outcrops
1232.92 Groundwater Elevations 1-13-2010
1215.74 Groundwater Elevations 12-29-2009
1231.34 Groundwater Elevations 12-15-2009
Groundwater Flow Direction
Quarterly Monitoring Well (MW)
Remedial Investigation Monitoring Well (MW)
Other Wells
Sampled Off-site Wells
Other Off-site Wells
Landfill Extents
County Owned Parcels

Approximate Extent of Groundwter Contamination (VOCs' Above RI Screening Levels)
Interflow Aquifer Plume
Ringold Aquifer Plume (PCE)

0 Feet 750
N

Figure 11
Hydrogeologic Map
Interflow Aquifer

Ephrata Landfill
RIFS
PgG

City MW-5
City of Ephrata Water Reclamation Facility
City Irrigation
Witte
Morrison
West Canal
City MW-3
City MW-2
Railroad Ave NW
PZ3
1278.9 (12 2008 average)
Interceptor Well (TW-1)
Oasis Park
MW-54c
MW-55c
Martin Rd NW
MW-53a
MW-50c
MW-51b
MW-52p2
SG015
Behr
MW-20c
Atkins Old
Draw
Sanchez
Perez
Massey
Johnson
Old Chicken Farm
MW-47c
MW-48b
MW-49p2
MW-45c
MW-46p2
MW-44b
Whitson
12.8 Rd NW
Riebli
Mathus
Stocker
Dodson Rd NW
MW-19b
Maintenance Shop Area
Atkins New
Roland
C.5 Rd NW
Pashkovsky-ACX157
Zimbelman
Spencer
MW-7b
33E1 (Decom.)
EW-2
MW-3b
Former Buried Drums Location
MW-18a
1186.78
MW-9b
MW-8b (Decom.)
EW-1
Pashkovsky-ABX965
McAnulty
C.3 Rd NW
Abrams
Olivares
Pashkovsky-ABX96
Manship
B-27
MW-39p2
Gutierrez-ACE908
Pashkovsky-AFH487
Gray
MW-5c
MW-4c
MW-28d
The Hole
Gutierrez-ABO220
Smith
Sivula
Adler
MW-21c
Gutierrez-ACE909
MW-17a
1186.69
Evaporation Treatment Pond
MW-2c
Lysimeter #1 Access Manhole
Original Landfill
Lysmeter #2 Access Manhole
33M1
MW-6c
MW-12 (Decom.)
MW-26a
1186.64
SR 28
MW-22c
MW-16d
MW-6a
1186.71
MW-1a
1186.67
MW-14a
1186.59
MW-13 (Decom.)
B-15
Flat Water Table Gradient (Flow Directions Variable)
Bolyard-Deep
New Landfill
Bolyard-Shallow
Lined Leachate Pond
Moore
Country Boys
MW-25a
1187.12
MW-24a
1187.48
Neva Lake Rd NW
MW-10a
1186.67
MW-23a
1186.65
MW-11a
1186.67
W-20 Canal Pipeline
Neva Lake

Outwash Water Table / Top of Basalt Contact
Basalt Outcrops
Aproximate Extent of Groundwater Contamination (VOCs (PCE Only) Above RI Screening Levels)
1232.92 Groundwater Elevations 1-13-2010
1231.34 Groundwater Elevations 12-15-2009

Quarterly Monitoring Well (MW)
Remedial Investigation Monitoring Well (MW)
Other Wells
Sampled Off-site Wells
Other Off-site Wells
Landfill Extents
County Owned Parcels

Estimated Outwash Aquifer Extent and Thickness (Feet)
0 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
> 61

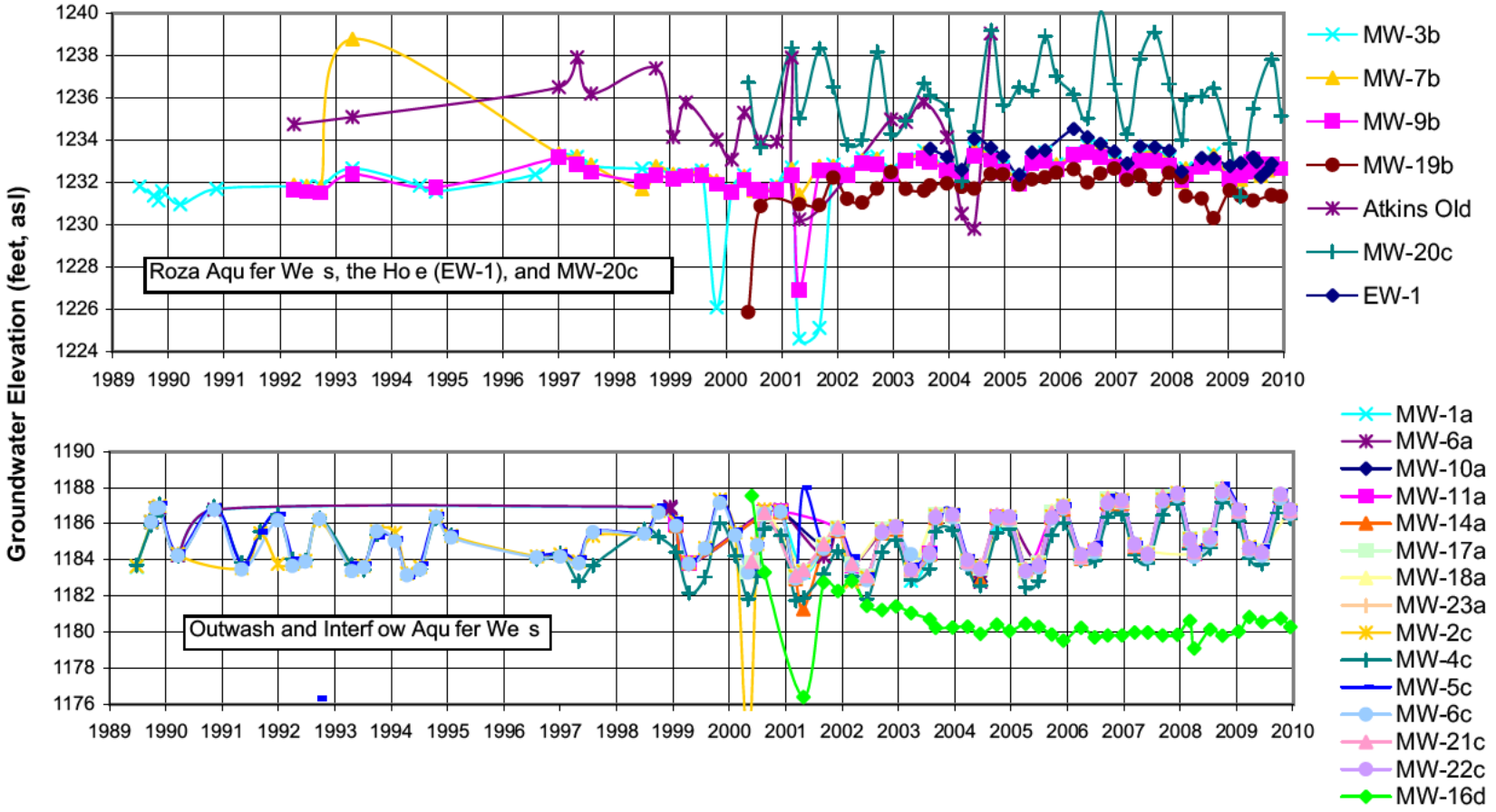
0 Feet 750
N

Figure 12

Hydrogeologic Map Outwash Aquifer

Ephrata Landfill
RIFS

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Top graph shows hydrographs for Roza Aqu fer we s, the Ho e (EW-1), and MW-20C MW-20c ocated near source of Recharge (West Cana /Oas s Park and Beez ey H s)

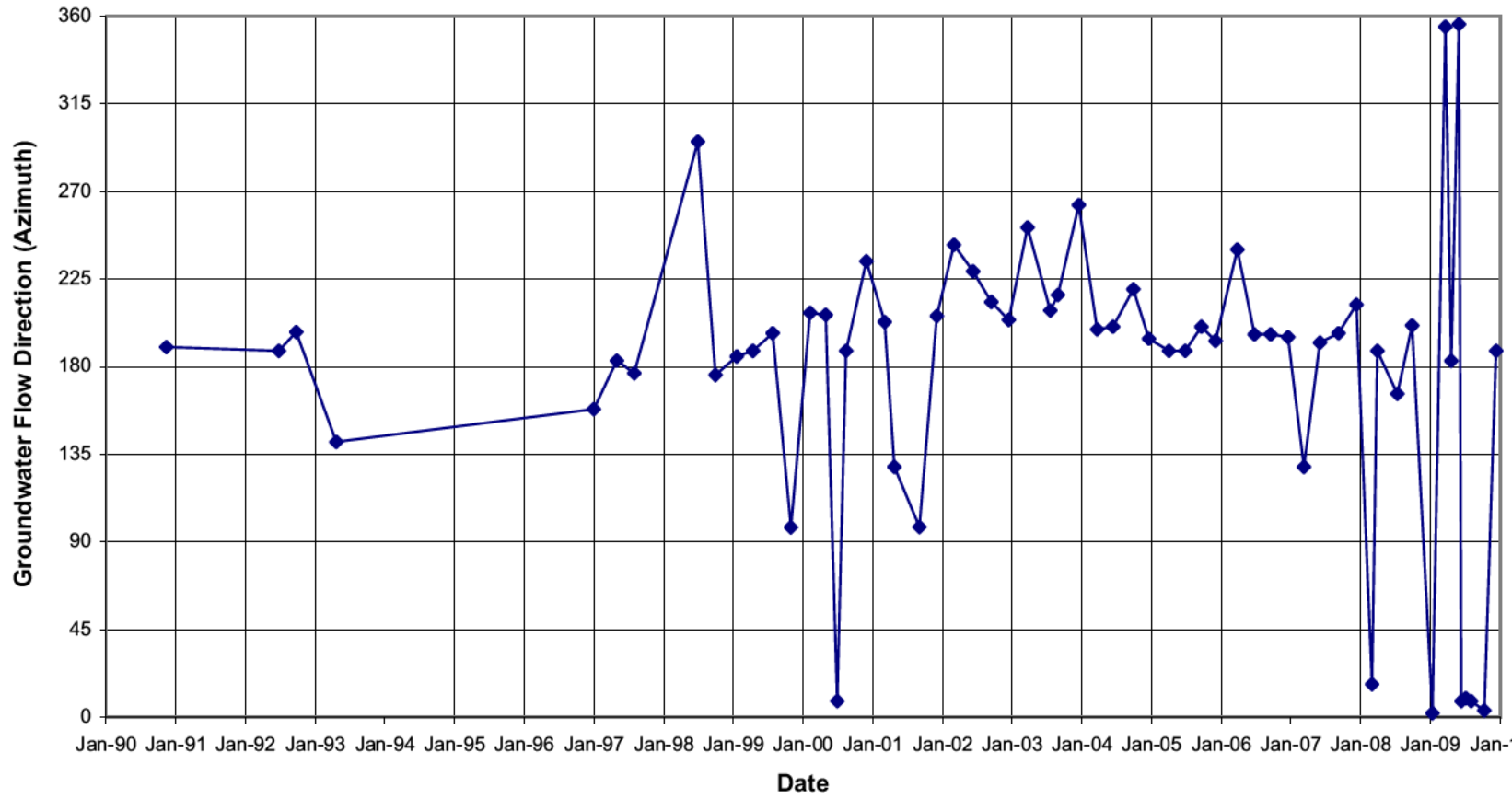
Bottom graph shows hydrographs from Outwash and Interf ow we s.

Access no onger ava ab e for water eve measurements at Atk ns We as of 12/2004 .

Figure 13. Long-Term Groundwater Hydrographs

Ephrata Landf RI

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Azimuth (degrees)

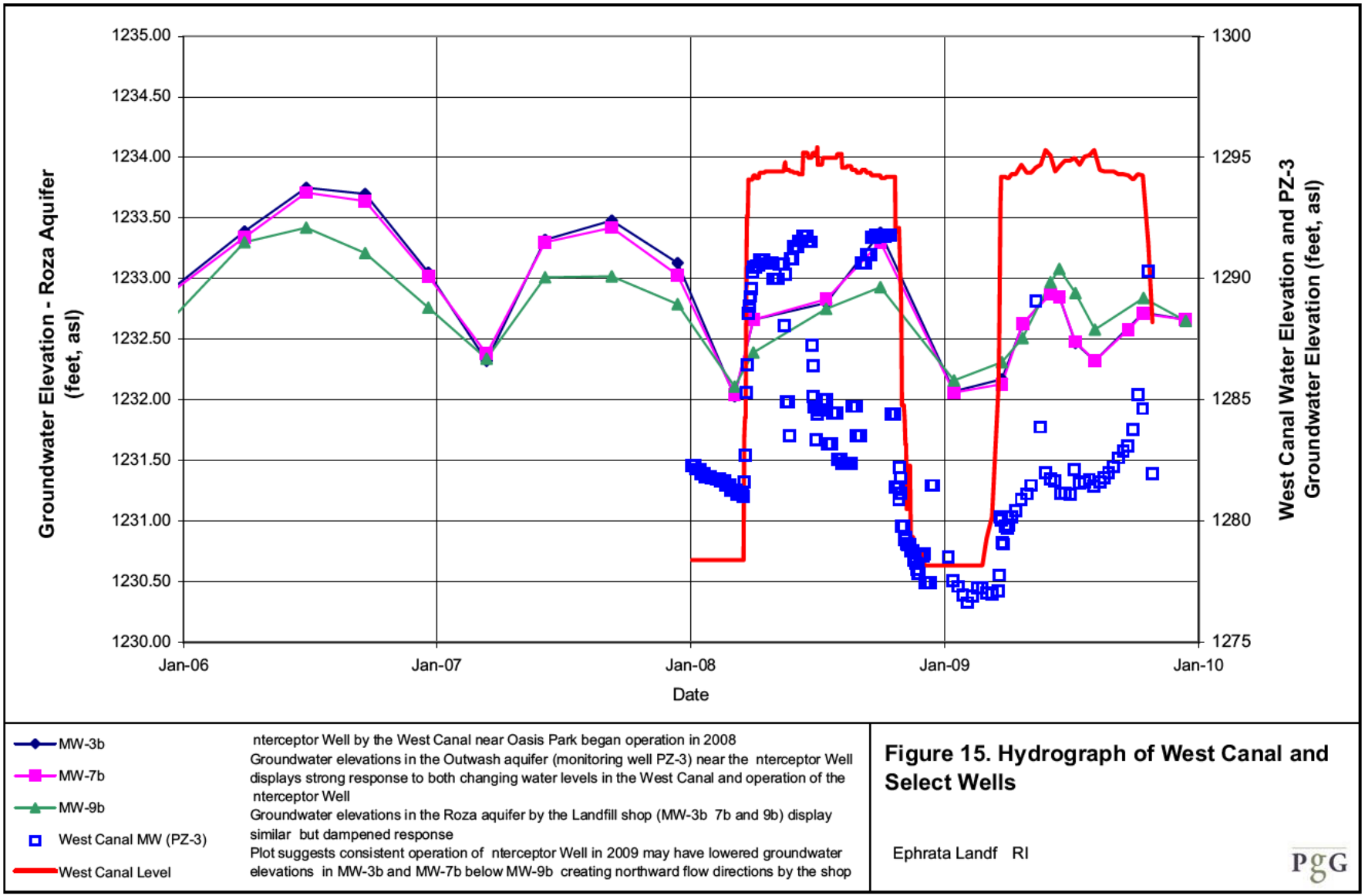
Groundwater flow direction calculated from measured groundwater elevations in MW-3b, MW-7b and MW-9b.

Historically the flow direction in the Roza by the shop was generally towards the south (180-degrees). Recently in 2008 and 2009 northward flow directions have been measured (0 and 360 degrees). See text for explanation.

Figure 14. Groundwater Flow Direction vs Time (Roza Aquifer by Shop)

Ephrata Landfill

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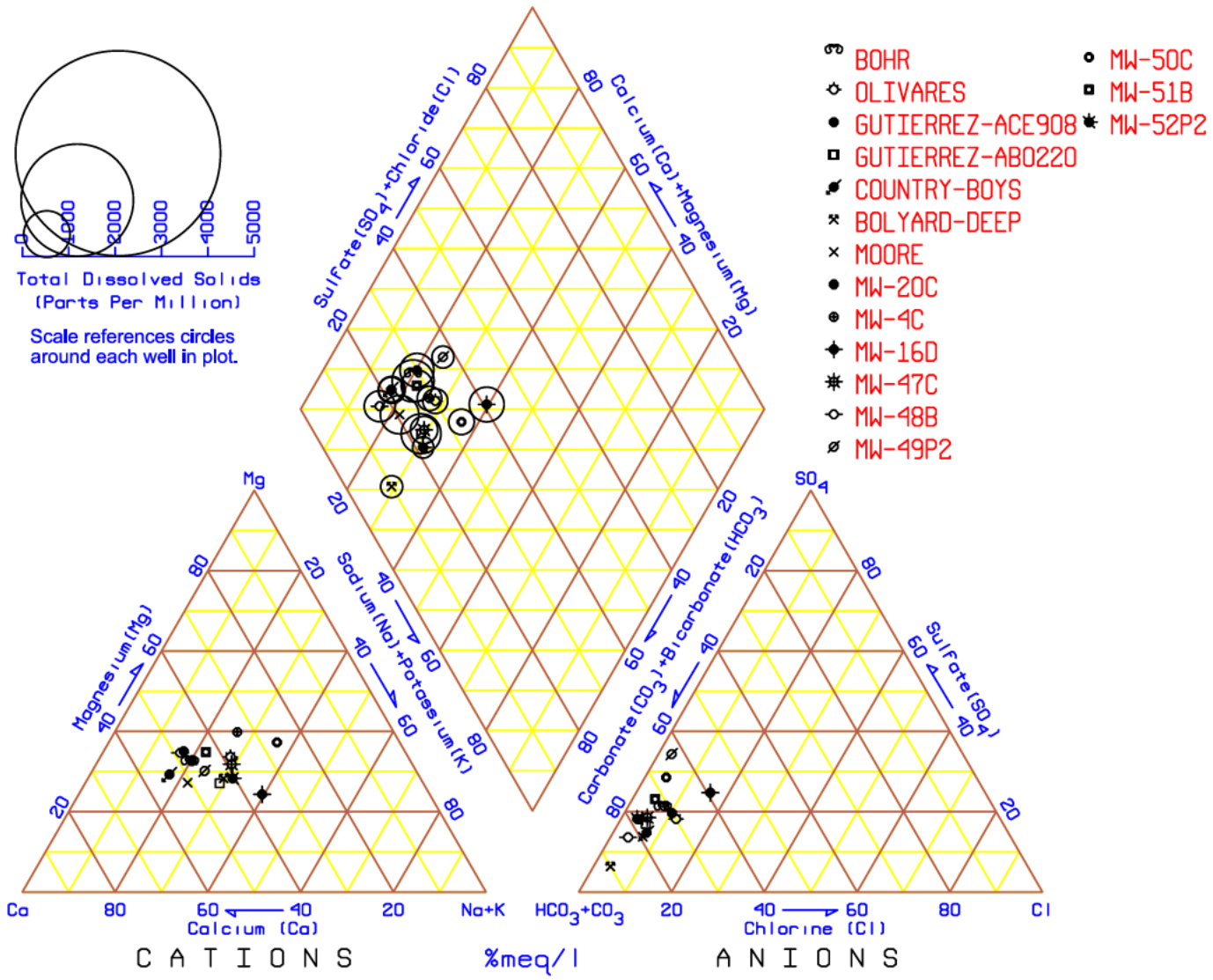


nterceptor Well by the West Canal near Oasis Park began operation in 2008
Groundwater elevations in the Outwash aquifer (monitoring well PZ-3) near the nterceptor Well displays strong response to both changing water levels in the West Canal and operation of the nterceptor Well
Groundwater elevations in the Roza aquifer by the Landfill shop (MW-3b 7b and 9b) display similar but dampened response
Plot suggests consistent operation of nterceptor Well in 2009 may have lowered groundwater elevations in MW-3b and MW-7b below MW-9b creating northward flow directions by the shop

Figure 15. Hydrograph of West Canal and Select Wells

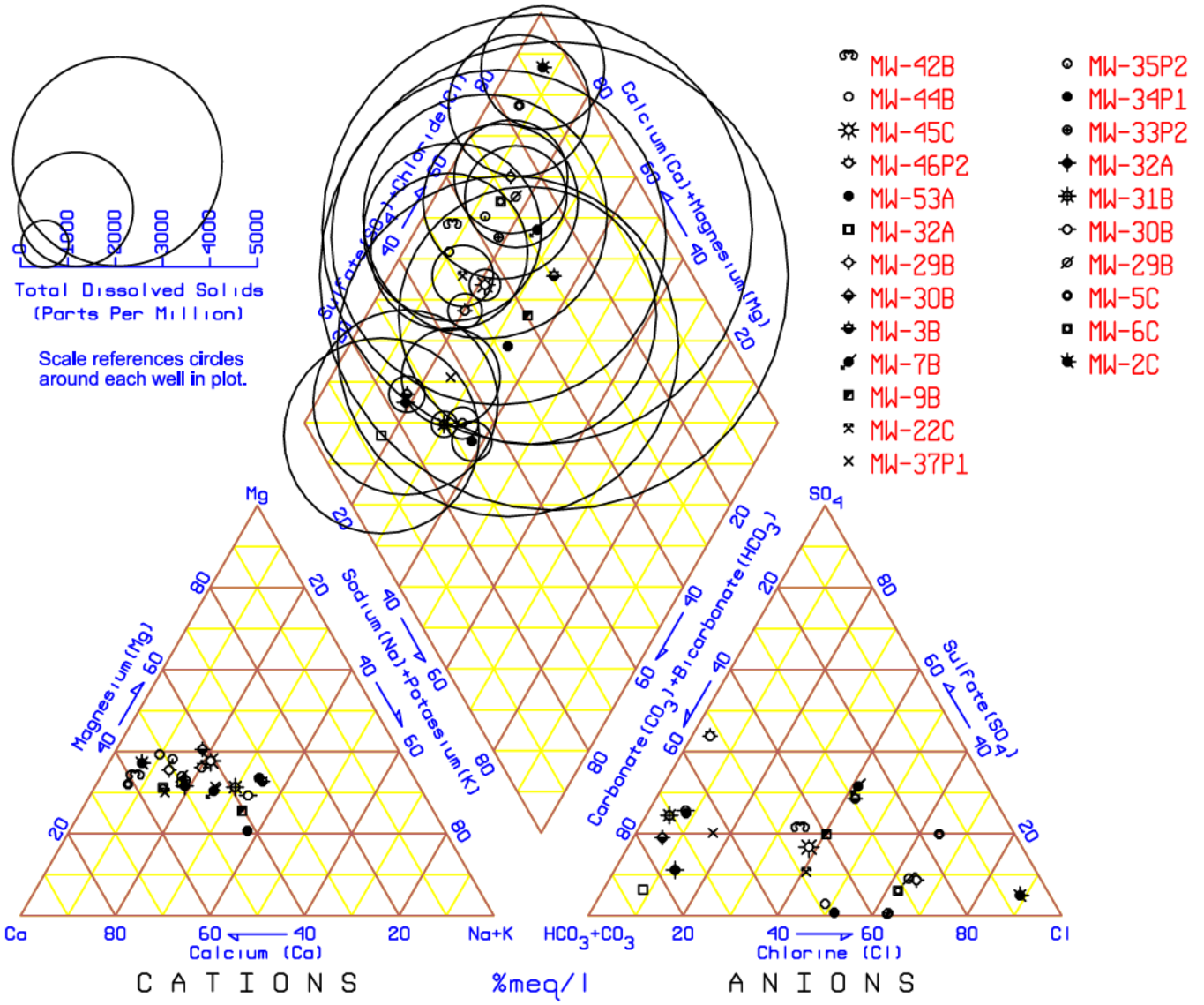
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Background groundwater characterized by relatively high bicarbonate and calcium.

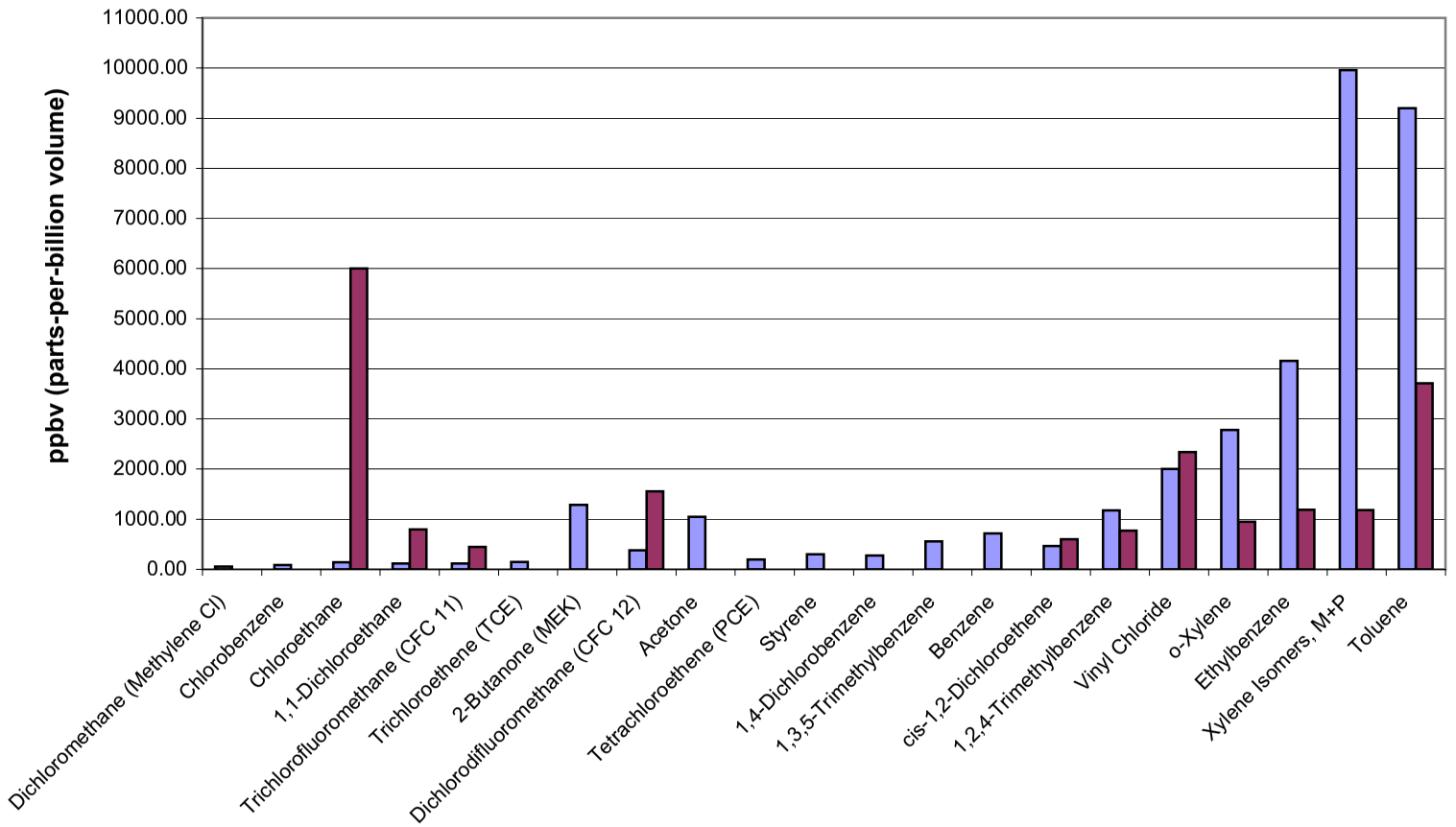
Figure 16
Trilinear Diagram
Ephrata (Background Wells)



Impacted groundwater characterized by relatively high chloride and calcium compared to background wells and over all higher TDS.

Figure 17
Trilinear Diagram
Ephrata (Impacted Monitoring Wells)

PgG



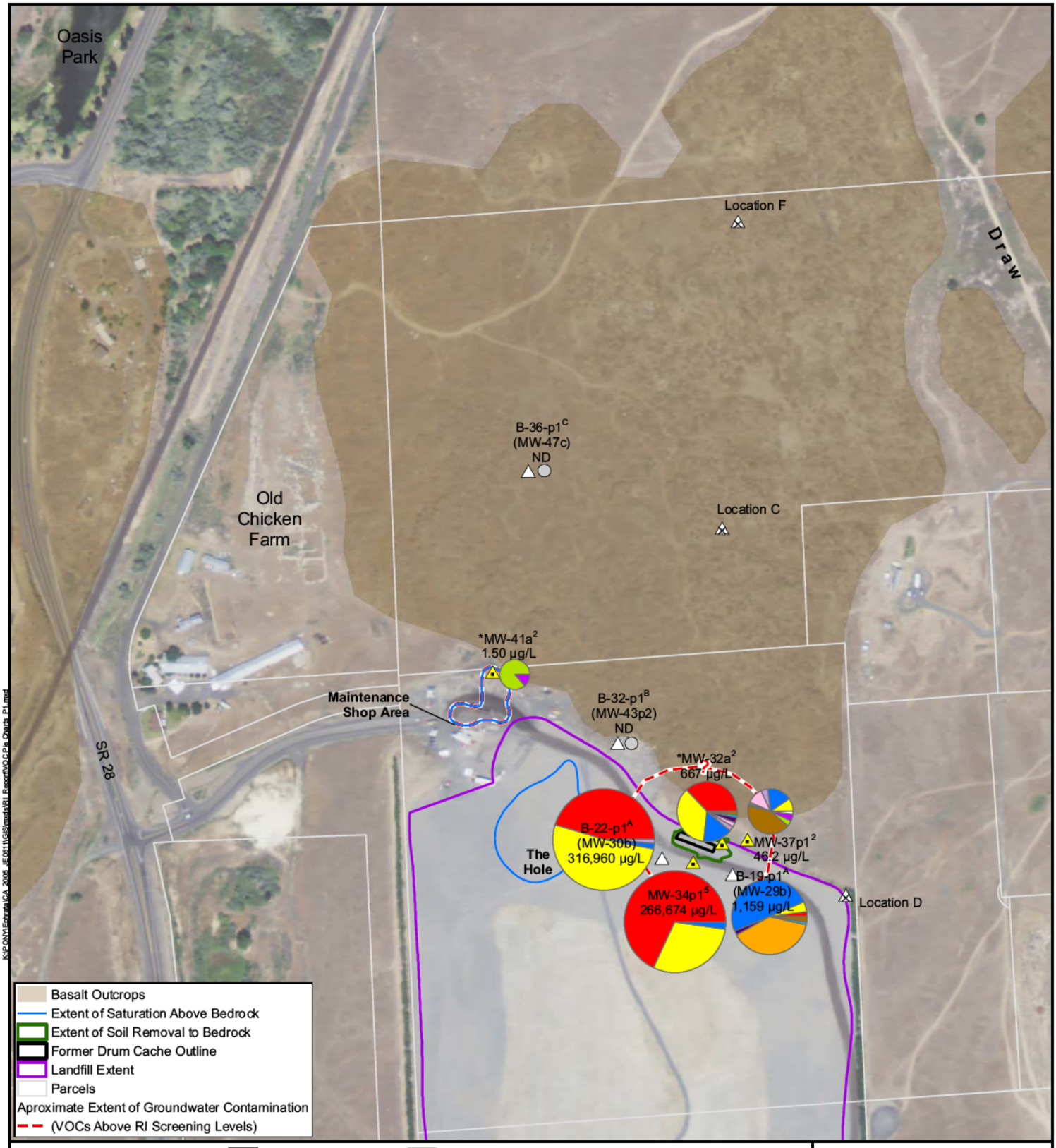
2009 Average
2007 Average

2007 gas samp es co ected before andf capp ng.
2009 gas samp es co ected after andf capp ng.
Xy enes, to uene, and ethy benzene s gn f cant y h gher n 2009 samp es nd cat ng these gases are accumu at ng under the cap and be ng captured by the gas extract on system.
H gher concentrat ons of ch oroethane n 2007 was from one we (GE-7) near the former drums.

Figure 18. Average VOCs in Landfill Gas (2007 and 2009)

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Total VOCs (µg/L)

> 100,000
>10,000 to 100,000
>1,000 to 10,000
>100 to 1,000
>10 to 100
>0 to 10
= Not detected (ND)

MW-37p1[2] - Well ID[Sample Date]
46.2 µg/L - Total VOCs

- Ketone
- BTEX
- Dichloroethane (1,1 & 1,2)
- Trichloroethane (1,1,1 & 1,1,2)
- Dichloroethene (1,1, cis-1,2 & trans-1,2)
- Trimethylbenzene (1,2,4 & 1,3,5)
- Methylene Chloride
- Chloroethane
- Vinyl Chloride
- 1,2-Dichloropropane
- Isopropyltoluene
- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- Dichlorobenzene (1,2, 1,3 & 1,4)
- Chloroform
- Naphthalene
- Styrene
- Bromobenzene
- 1,1,2-Trichlorotrifluoroethane
- Chlorobenzene
- Trichlorofluoromethane
- Butylbenzene
- Carbon Disulfide

- P1 Zone Monitoring Well
- [2] [5] Round 6 (Dec 2009 - Jan 2010) Round 3 (Nov 2008)
- B-series Sampled During Drilling of Monitoring Well
- [A] [B] [C] (Oct 2008) (Aug 2009) (Sept 2009)
- P1 Not Observed During Drilling

Refer to tables for laboratory results.

* MW-32a and MW-41a completed on top of basalt (interpreted as the P1 Zone).

0 Feet 400

2009 NAIP Orthophoto

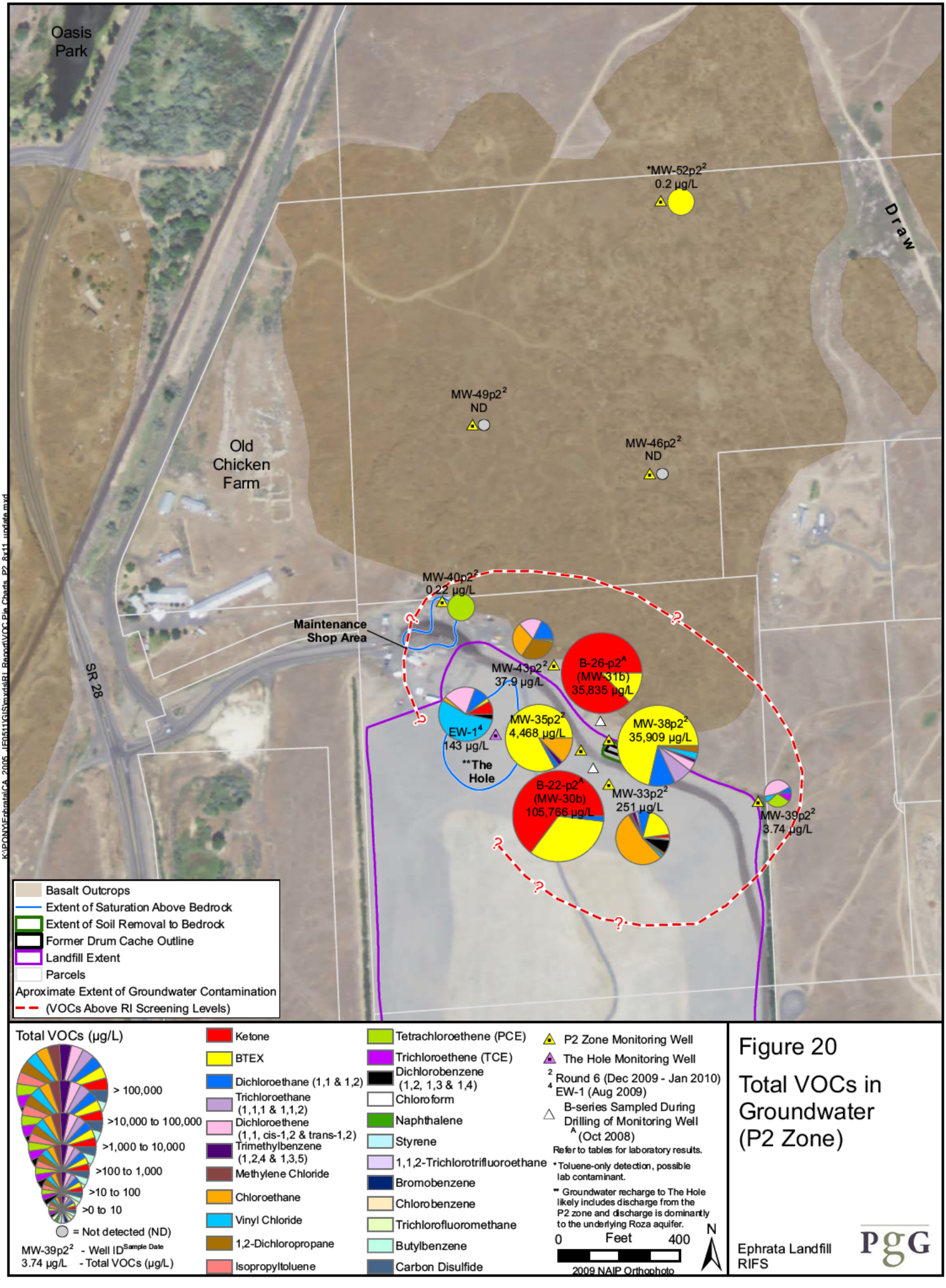
N

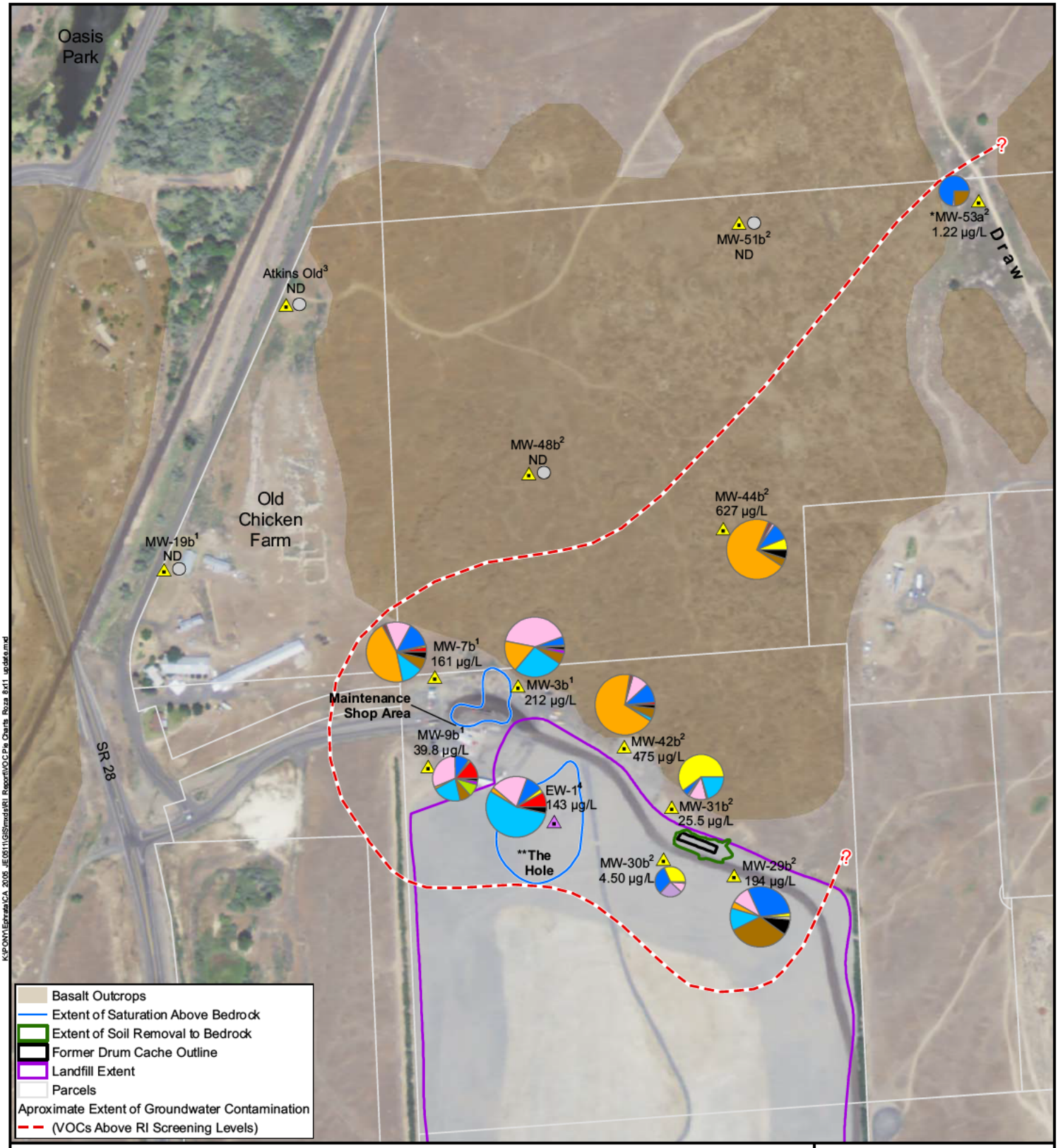
Figure 19

Total VOCs in Groundwater (P1 Zone)

Ephrata Landfill
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Oasis Park
Old Chicken Farm
Draw
SR 28
Maintenance Shop Area
*MW-52p2 2
0.2 µg/L
MW-49p2 2
ND
MW-46p2 2
ND
MW-40p2 2
0.22 µg/L
MW-43p2 2
37.9 µg/L
B-26-p2^
(MW-31b)
35,835 µg/L
EW-1 4
143 µg/L
**The Hole
MW-35p2 2
4,468 µg/L
MW-38p2 2
35,909 µg/L
B-22-p2^
(MW-30b)
105,766 µg/L
MW-33p2 2
251 µg/L
MW-39p2 2
3.74 µg/L
Basalt Outcrops
Extent of Saturation Above Bedrock
Extent of Soil Removal to Bedrock
Former Drum Cache Outline
Landfill Extent
Parcels
Aproximate Extent of Groundwater Contamination
(VOCs Above RI Screening Levels)
Total VOCs (µg/L)
> 100,000
>10,000 to 100,000
>1,000 to 10,000
>100 to 1,000
>10 to 100
>0 to 10
= Not detected (ND)
MW-39p2 2 - Well ID Sample Date
3.74 µg/L - Total VOCs (µg/L)
Ketone
BTEX
Dichloroethane (1,1 & 1,2)
Trichloroethane (1,1,1 & 1,1,2)
Dichloroethene (1,1, cis-1,2 & trans-1,2)
Trimethylbenzene (1,2,4 & 1,3,5)
Methylene Chloride
Chloroethane
Vinyl Chloride
1,2-Dichloropropane
Isopropyltoluene
Tetrachloroethene (PCE)
Trichloroethene (TCE)
Dichlorobenzene (1,2, 1,3 & 1,4)
Chloroform
Naphthalene
Styrene
1,1,2-Trichlorotrifluoroethane
Bromobenzene
Chlorobenzene
Trichlorofluoromethane
Butylbenzene
Carbon Disulfide
P2 Zone Monitoring Well
The Hole Monitoring Well
2 Round 6 (Dec 2009 - Jan 2010)
4 EW-1 (Aug 2009)
B-series Sampled During Drilling of Monitoring Well
A (Oct 2008)
Refer to tables for laboratory results.
* Toluene-only detection, possible lab contaminant.
** Groundwater recharge to The Hole likely includes discharge from the P2 zone and discharge is dominantly to the underlying Roza aquifer.
0 Feet 400
2009 NAIP Orthophoto
N
Figure 20
Total VOCs in Groundwater (P2 Zone)
Ephrata Landfill RIFS
PgG



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Total VOCs (µg/L)

- > 100,000
- >10,000 to 100,000
- >1,000 to 10,000
- >100 to 1,000
- >10 to 100
- >0 to 10
- = Not detected (ND)

MW-9b[1] - Well ID[Sample Date]
39.8 µg/L - Total VOCs (µg/L)

- Ketone
- BTEX
- Dichloroethane (1,1 & 1,2)
- Trichloroethane (1,1,1 & 1,1,2)
- Dichloroethene (1,1, cis-1,2 & trans-1,2)
- Trimethylbenzene (1,2,4 & 1,3,5)
- Methylene Chloride
- Chloroethane
- Vinyl Chloride
- 1,2-Dichloropropane
- Isopropyltoluene
- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- Dichlorobenzene (1,2, 1,3 & 1,4)
- Chloroform
- Naphthalene
- Styrene
- 1,1,2-Trichlorotrifluoroethane
- Bromobenzene
- Chlorobenzene
- Trichlorofluoromethane
- Butylbenzene
- Carbon Disulfide

- Roza Zone Monitoring Well
- The Hole Monitoring Well

[1] Round 4 (March 2009)
[2] Round 6 (Dec 2009 - Jan 2010)
[3] Private (March 2007)
[4] EW-1 (Aug 2009)

Refer to tables for laboratory results.

* MW-53a completed on top of basalt (interpreted as discharge area for Roza aquifer)

** Groundwater recharge to The Hole likely includes discharge from the P2 zone and discharge is dominantly to the underlying Roza aquifer.

0 Feet 400

2009 NAIP Orthophoto

N

Figure 21

Total VOCs in Groundwater (Roza Aquifer)

Ephrata Landfill RIFS

PgG

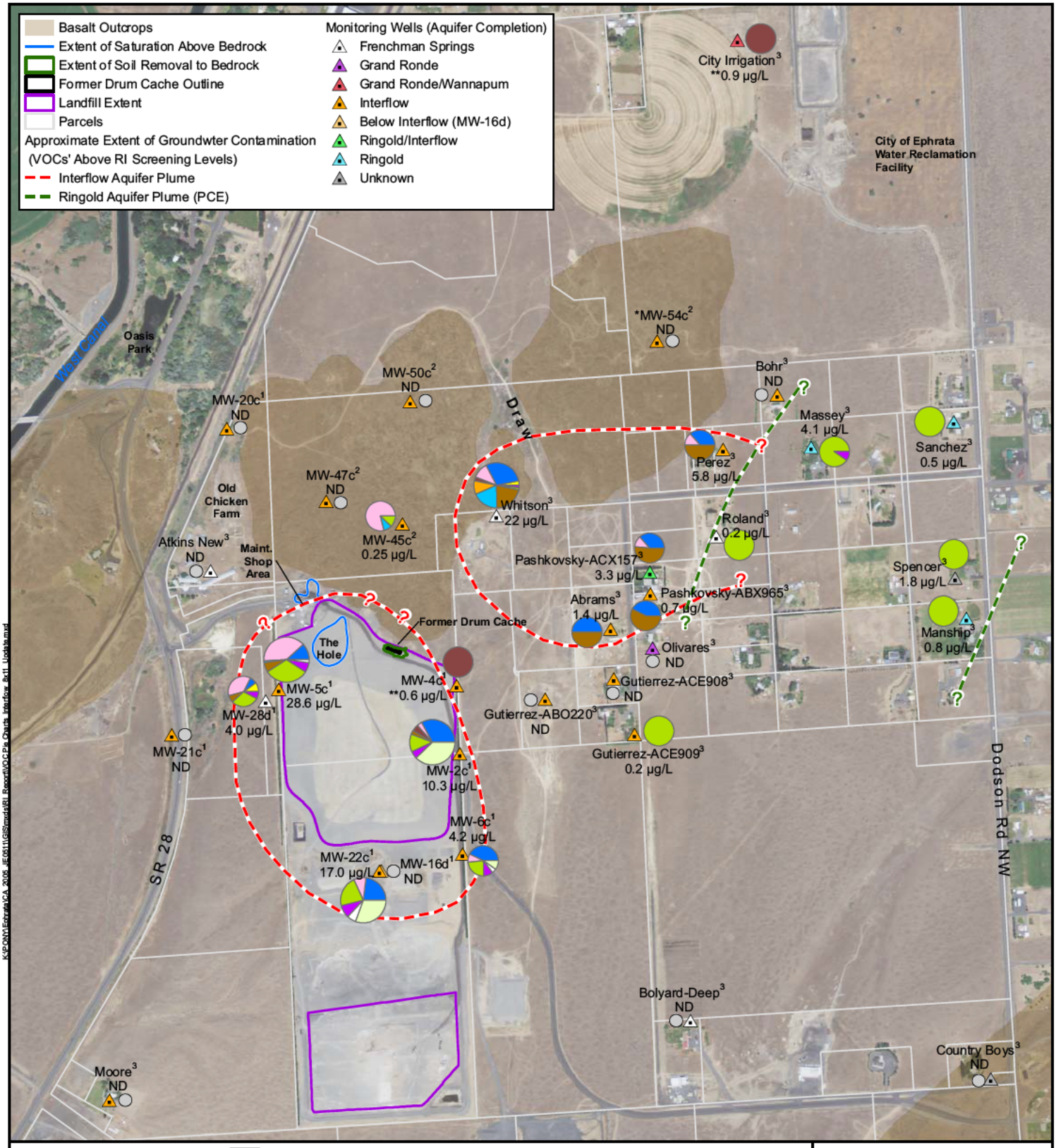


Figure 22
Total VOCs in Groundwater (Ringold, Interflow Aquifer and Deeper Aquifers)

Ephrata Landfill
RIFS

PGG

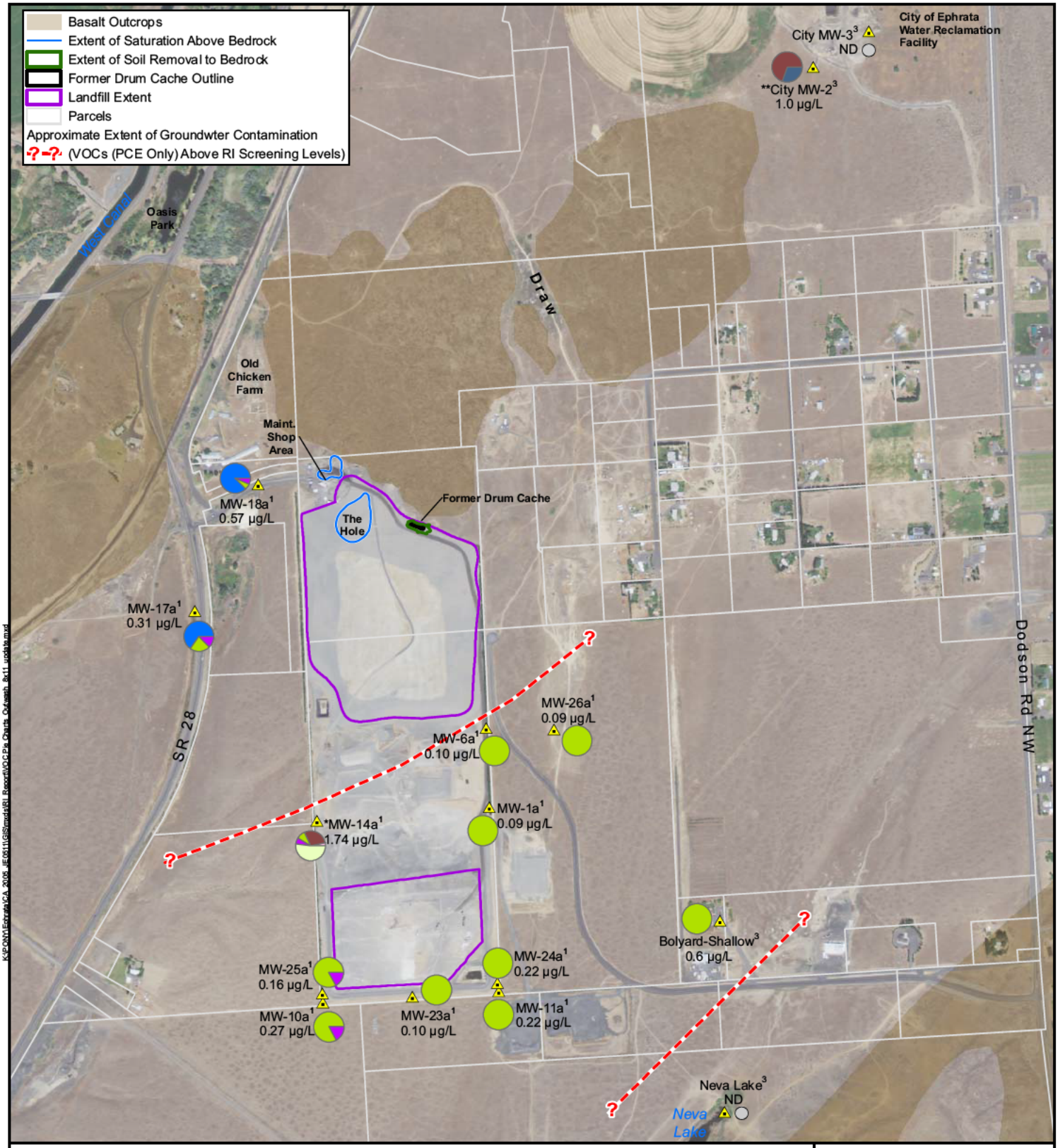


Figure 23

Total VOCs in Groundwater (Outwash Aquifer)

Ephrata Landfill RIFS

PgG

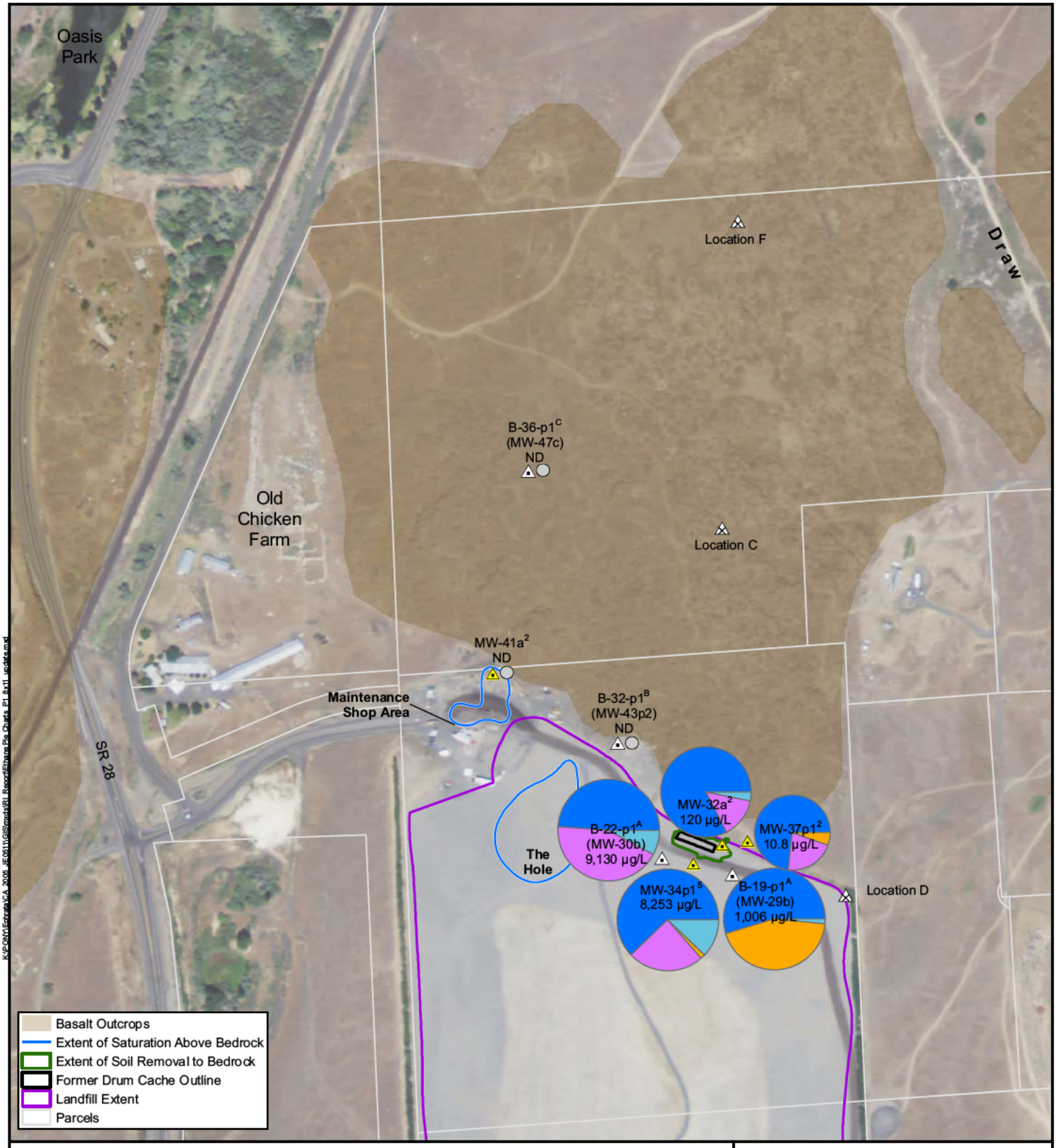
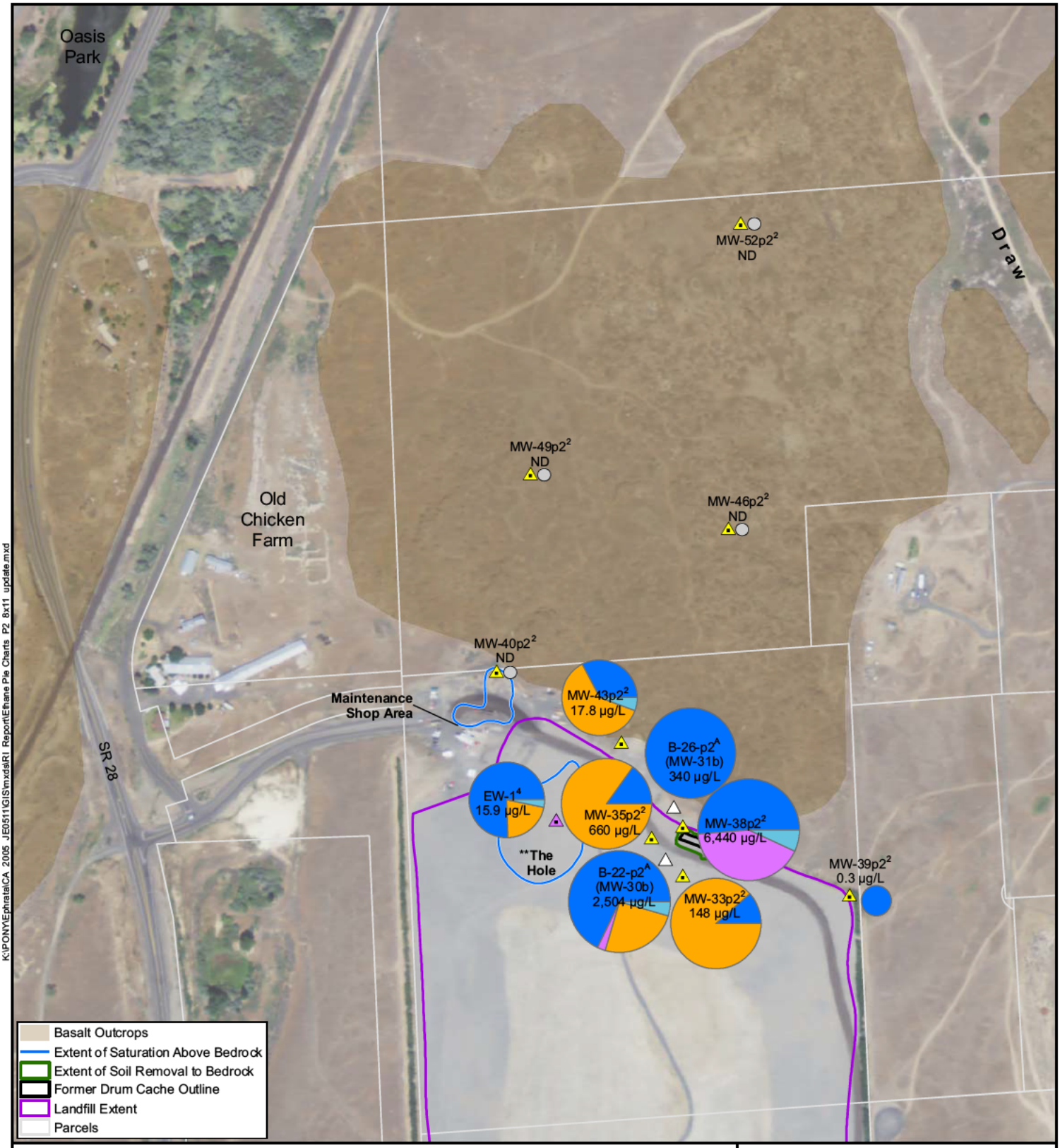


Figure 24

Total Chlorinated Ethanes in Groundwater (P1 Zone)

Ephrata Landfill
RIFS

PGG



Total Ethanes (µg/L)

- > 1,000
- >100 to 1,000
- >10 to 100
- >5 to 10
- >1 to 5
- >0 to 1
- = Not detected (ND)

MW-39p2² - Well ID[Sample Date]
0.3 µg/L - Total Ethanes (µg/L)

- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- 1,1-Dichloroethane
- 1,2-Dichloroethane (EDC)
- Chloroethane

- P2 Zone Monitoring Well
- The Hole Monitoring Well
- ² Round 6 (Dec 2009 - Jan 2010)
- ⁴ EW-1 (Aug 2009)
- B-series Sampled During Drilling of Monitoring Well
- ᴬ (Oct 2008)

Refer to tables for laboratory results.

** Groundwater recharge to The Hole likely includes discharge from the P2 zone and discharge is dominantly to the underlying Roza aquifer.

0 Feet 400

2009 NAIP Orthophoto

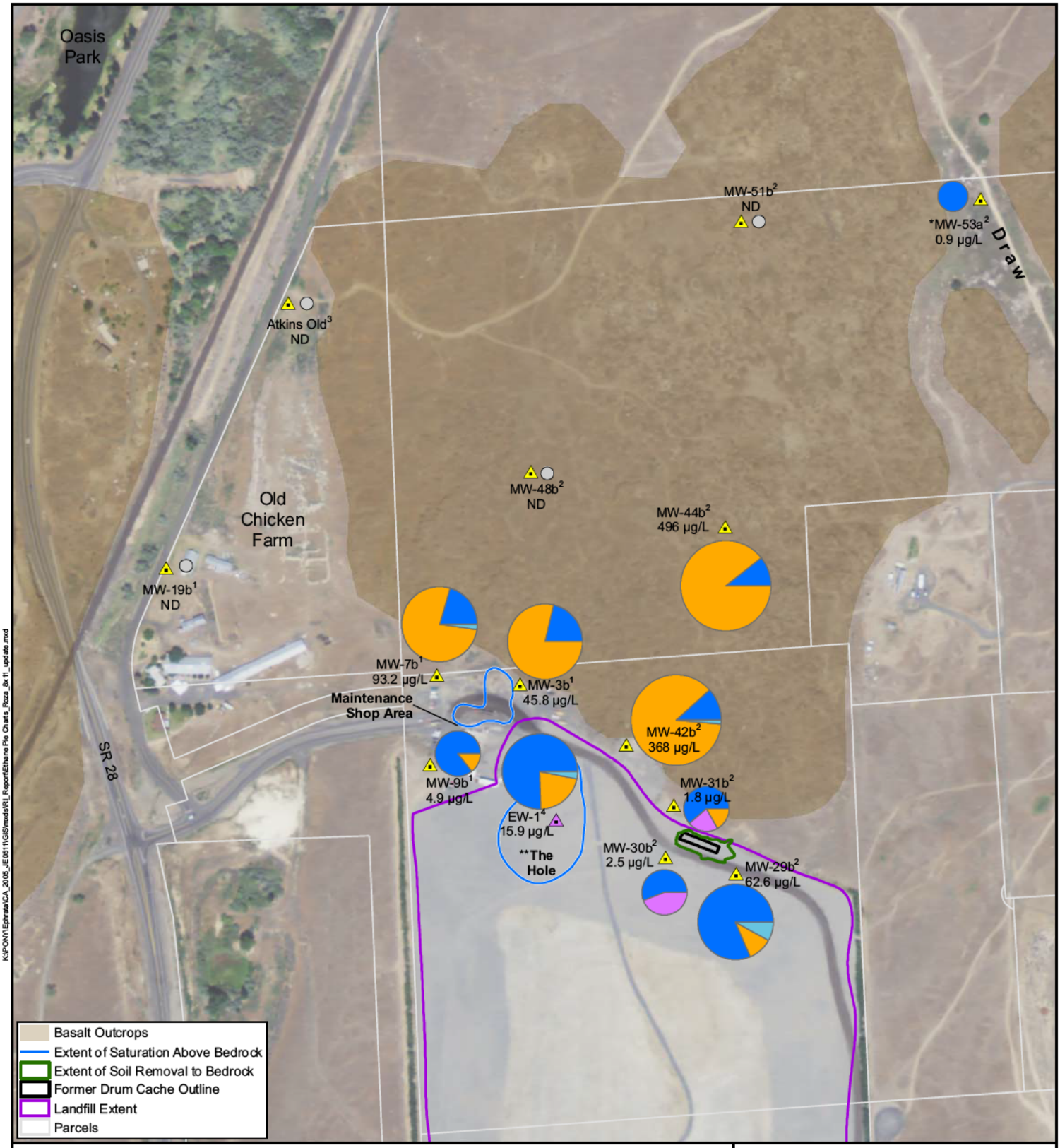
N

Figure 25

Total Chlorinated Ethanes in Groundwater (P2 Zone)

Ephrata Landfill
RIFS

PgG



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Figure 26

Total Chlorinated Ethanes in Groundwater (Roza Aquifer)

Ephrata Landfill
RIFS

PgG

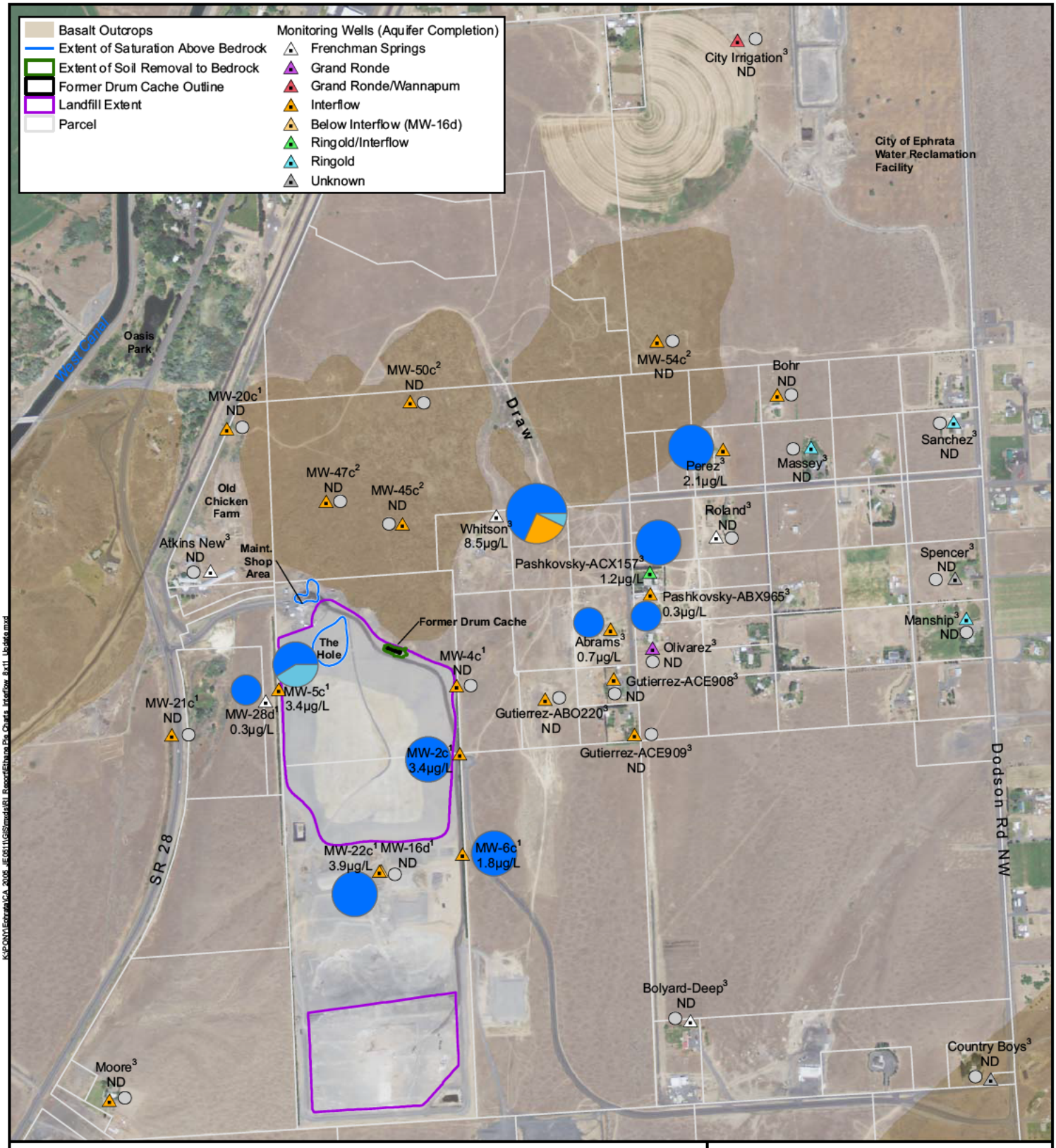
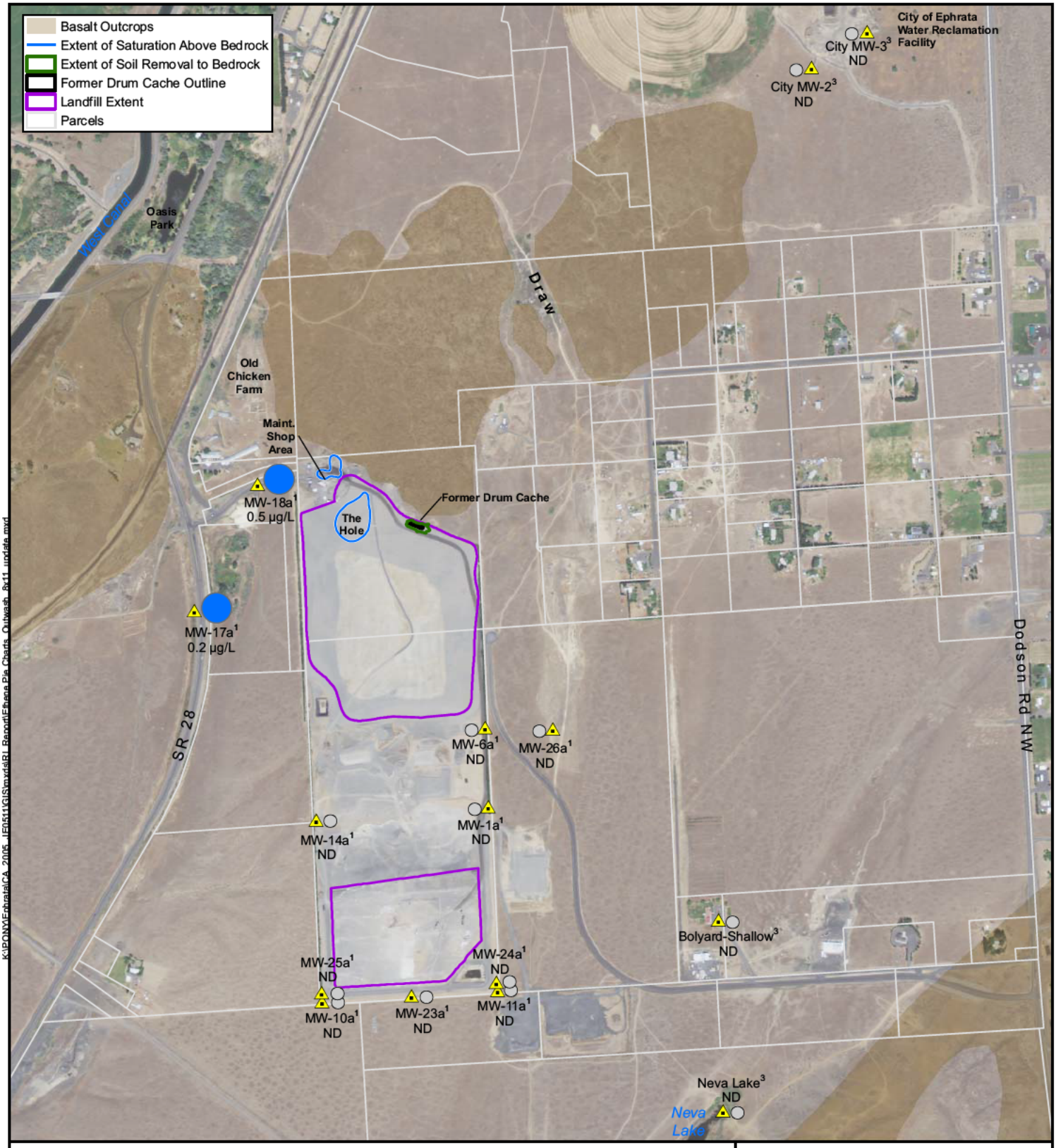


Figure 27

Total Chlorinated Ethanes in Groundwater (Ringold, Interflow Aquifer and Deeper Aquifers)

Ephrata Landfill
RIFS

PGG



Total Ethanes (µg/L)

> 1,000

>100 to 1,000

>10 to 100

>5 to 10

>1 to 5

>0 to 1

= Not detected (ND)

MW-18a[1] - Well ID[Sample Date]
0.5 µg/L - Total Ethanes (µg/L)

1,1,1-Trichloroethane

1,1,2-Trichloroethane

1,1-Dichloroethane

1,2-Dichloroethane (EDC)

Chloroethane

Outwash Aquifer Monitoring Well

[1] Round 4 (March 2009)
[3] Private (Various Dates 2009-2010)

*Methylene Chloride (0.5 µg/L) not normally detected in MW-14a; may be lab contaminant.

** Methylene Chloride and Carbon Disulfide only detection, possible lab or field collection contaminant.

Refer to tables for laboratory results.

0 Feet 1,000

2009 NAIP Orthophoto

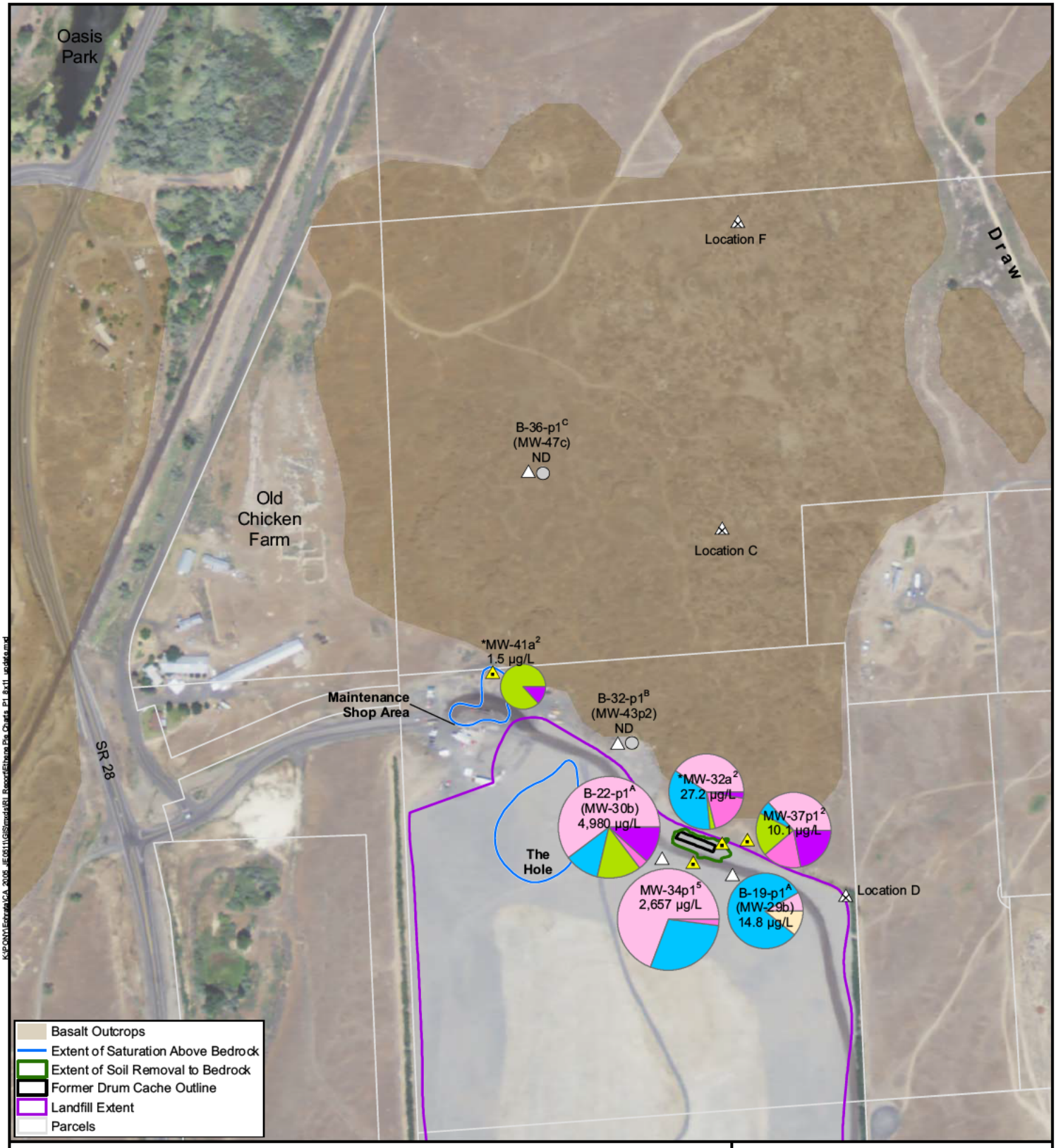
N

Figure 28

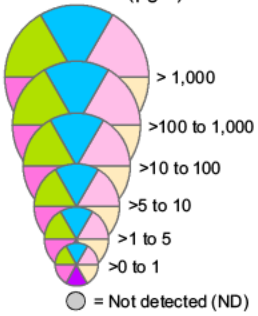
Total Chlorinated Ethanes in Groundwater (Outwash Aquifer)

Ephrata Landfill
RIFS

PGG



Total Ethenes (µg/L)



= Not detected (ND)

$MW\text{-}32a^{2}$ - Well ID (Sample Date)
27.2 µg/L - Total Ethenes (µg/L)

- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- 1,1-Dichloroethene
- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Vinyl Chloride

- P1 Zone Monitoring Well
  - 2 Round 6 (Dec 2009 - Jan 2010)
  - 5 Round 3 (Nov 2008)
- B-series Sampled During Drilling of Monitoring Well
  - A (Oct 2008)
  - B (Aug 2009)
  - C (Sept 2009)
- P1 Not Observed During Drilling

Refer to tables for laboratory results.

* MW-32a and MW-41a completed on top of basalt (interpreted as the P1 Zone).

0 Feet 400

2009 NAIP Orthophoto

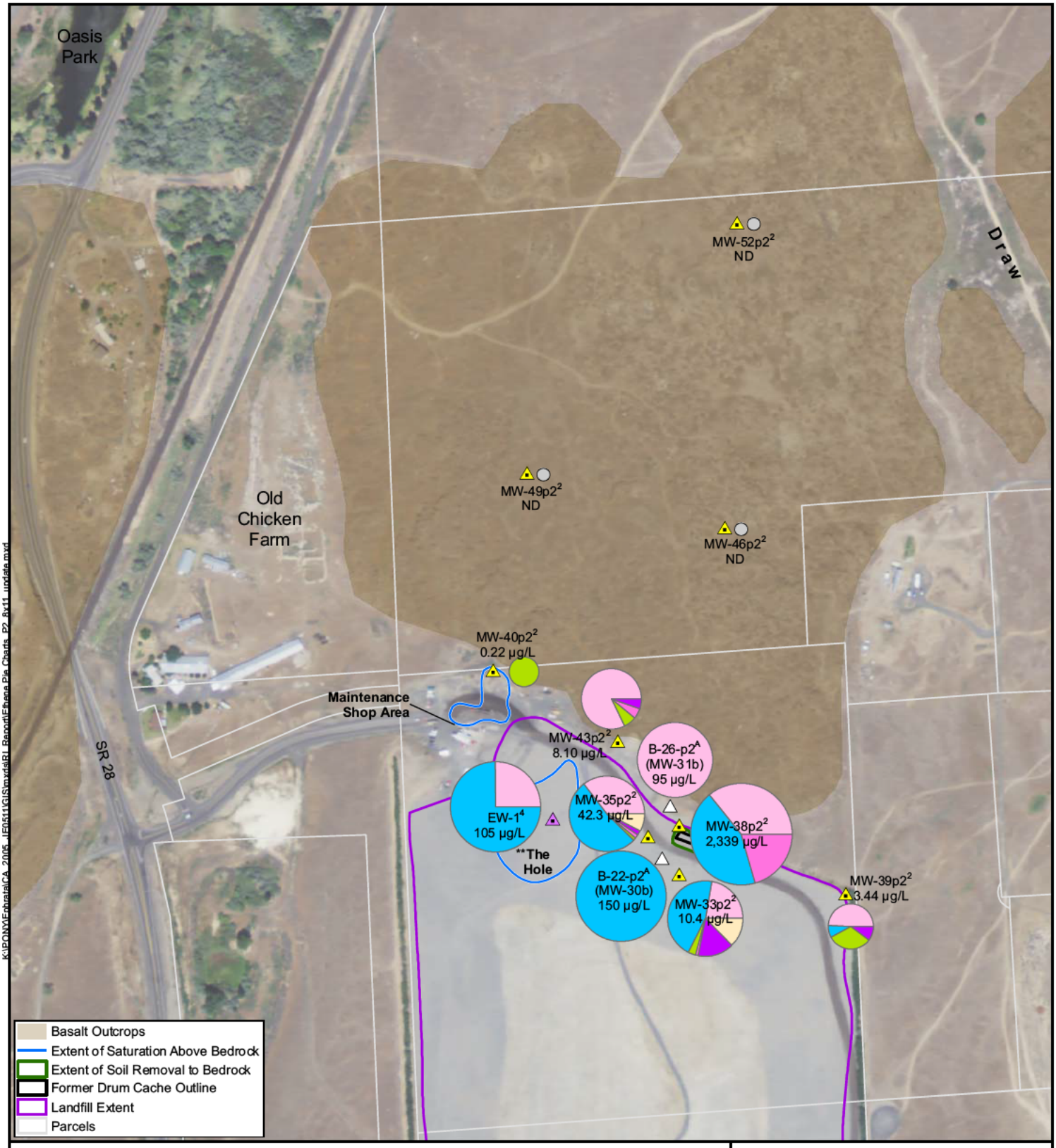
N

Figure 29

Total Chlorinated Ethenes in Groundwater (P1 Zone)

Ephrata Landfill
RIFS

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Figure 30

Total Chlorinated Ethenes in Groundwater (P2 Zone)

Ephrata Landfill
RIFS

PGG

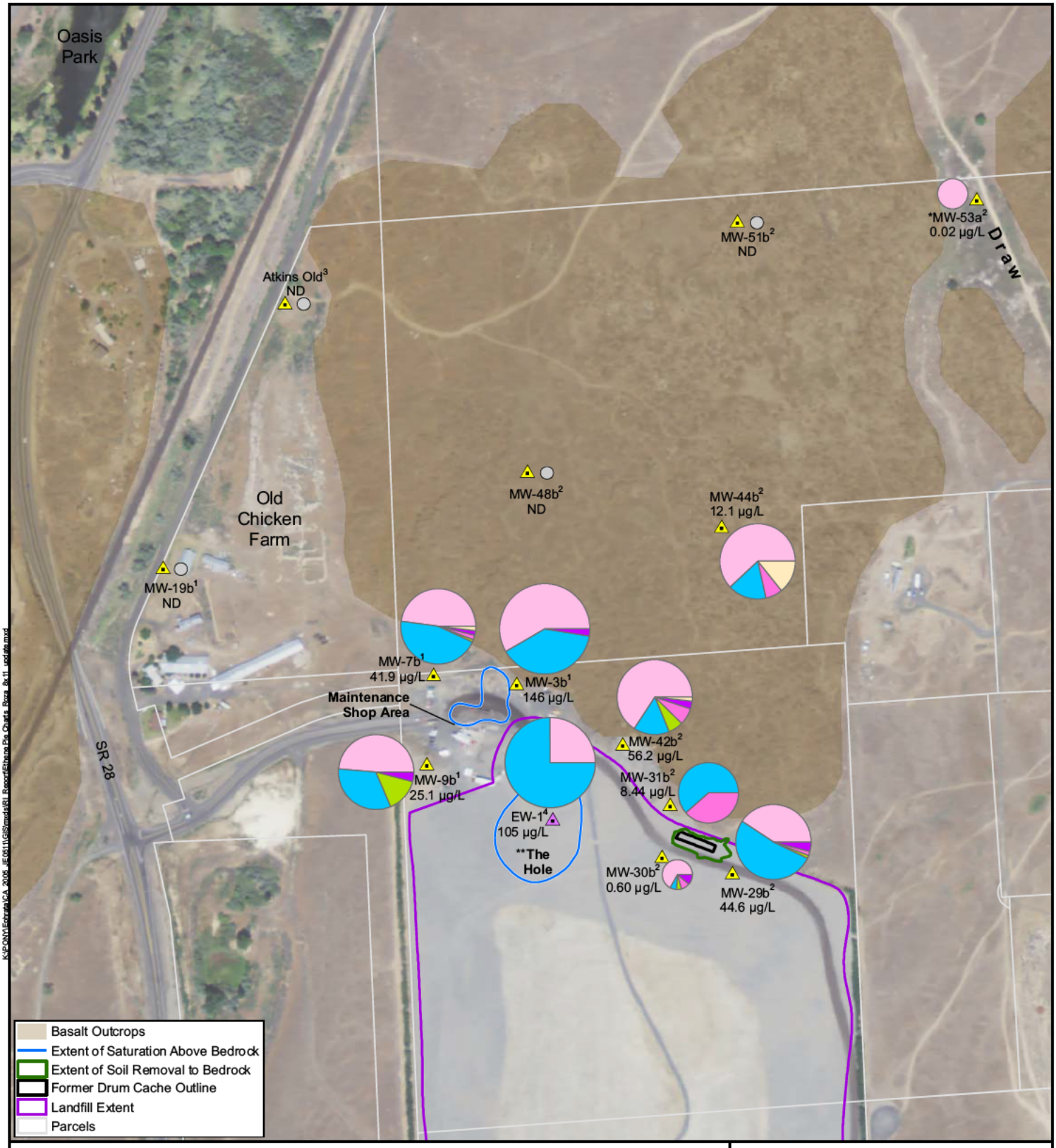


Figure 31

Total Chlorinated Ethenes in Groundwater (Roza Aquifer)

Ephrata Landfill
RIFS

PGG

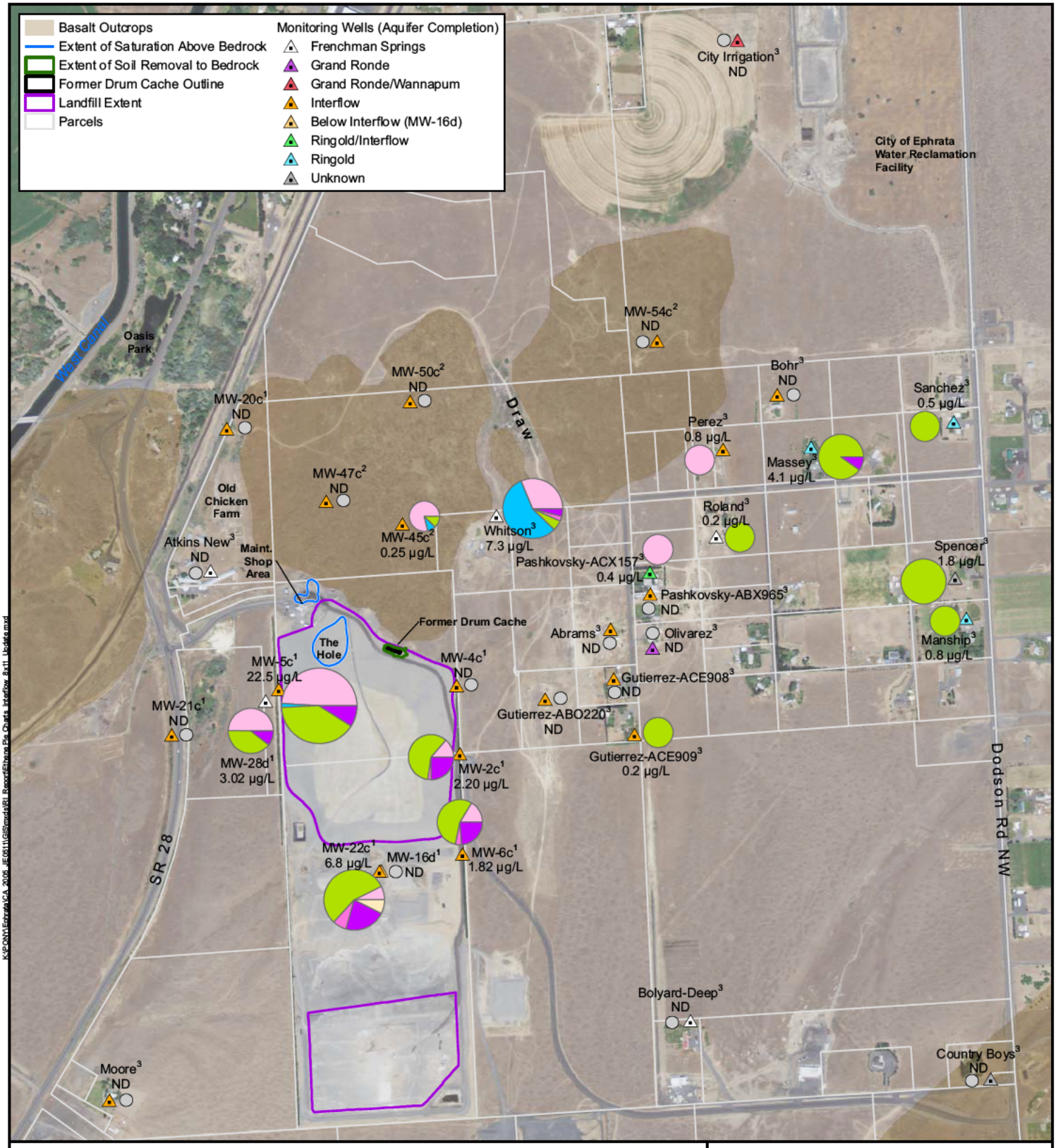
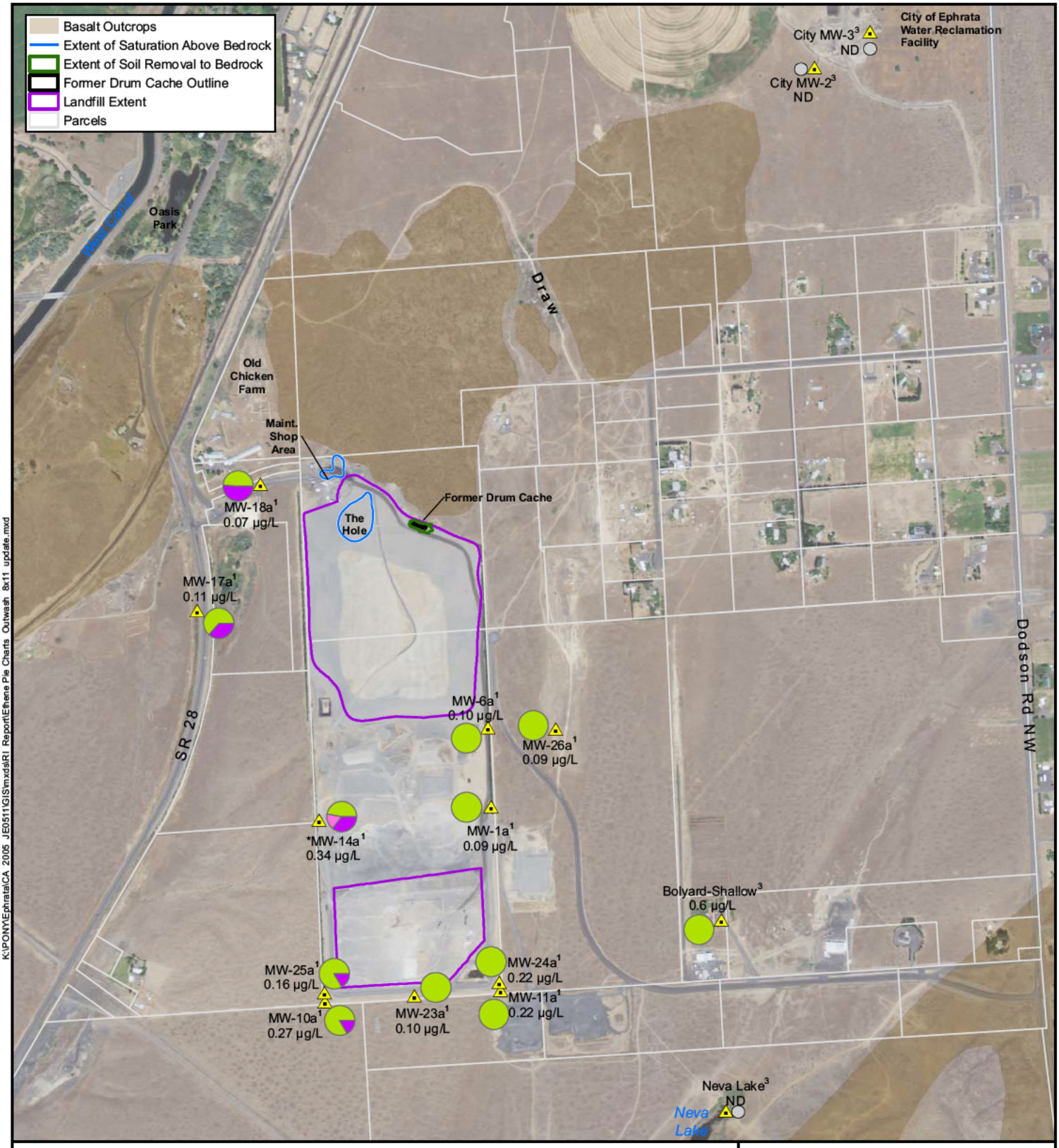


Figure 32

Total Chlorinated Ethenes in Groundwater (Ringold, Interflow Aquifer and Deeper Aquifers)

Ephrata Landfill
RIFS

PgG



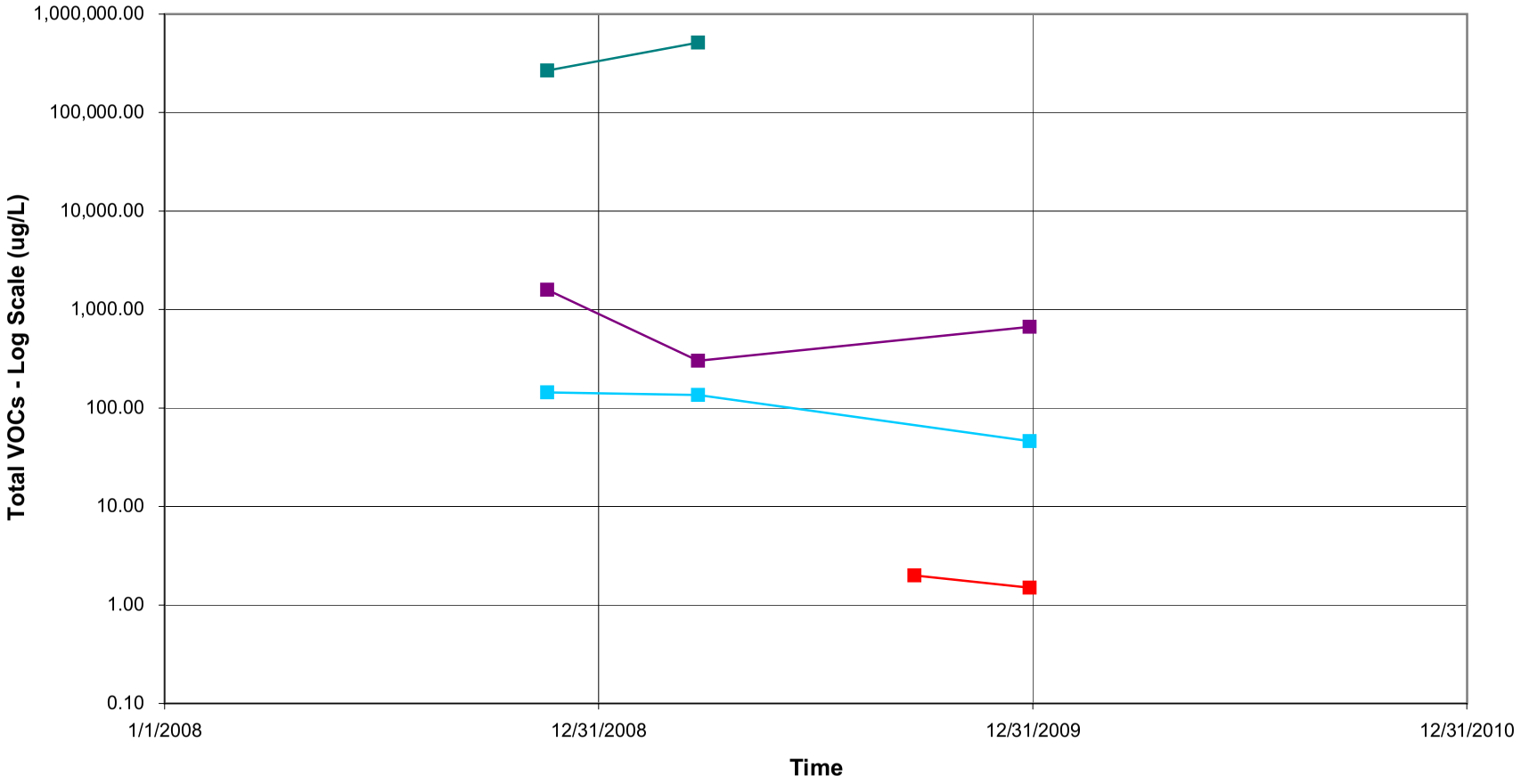
K:\PONY\Ephrata\CA 2005 JE05111G\SVmxds\RI Report\Ethene Pie Charts Outwash 8x11 update.mxd

Figure 33

Total Chlorinated Ethenes in Groundwater (Outwash Aquifer)

Ephrata Landfill
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MW-34p1 MW-37p1 MW-32a MW-41a

MW-32a and MW-41a occur ontop of rock nterpreted as the bottom of P1 zone.

Figure 34. Total VOC Time Series (P1 Wells)

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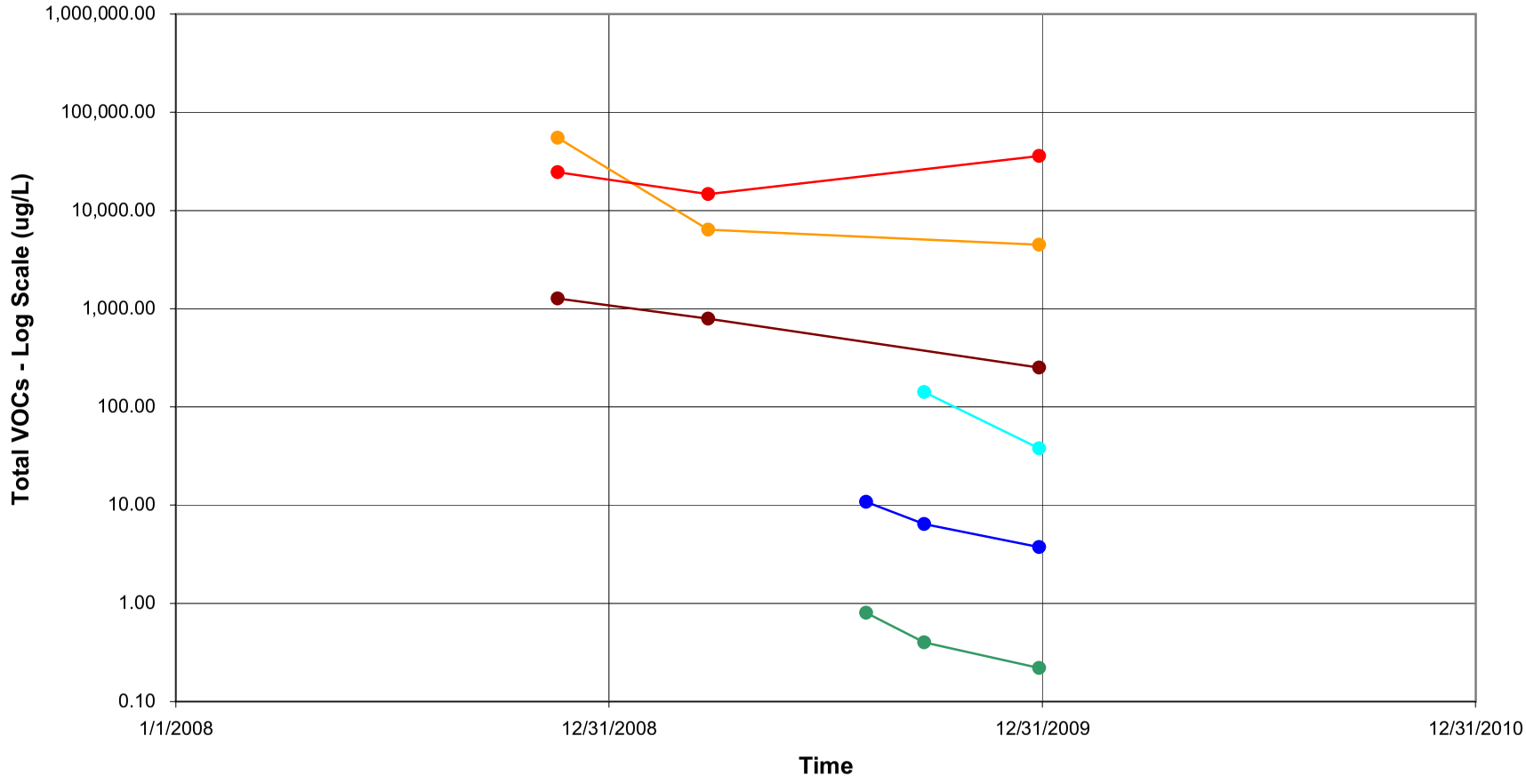
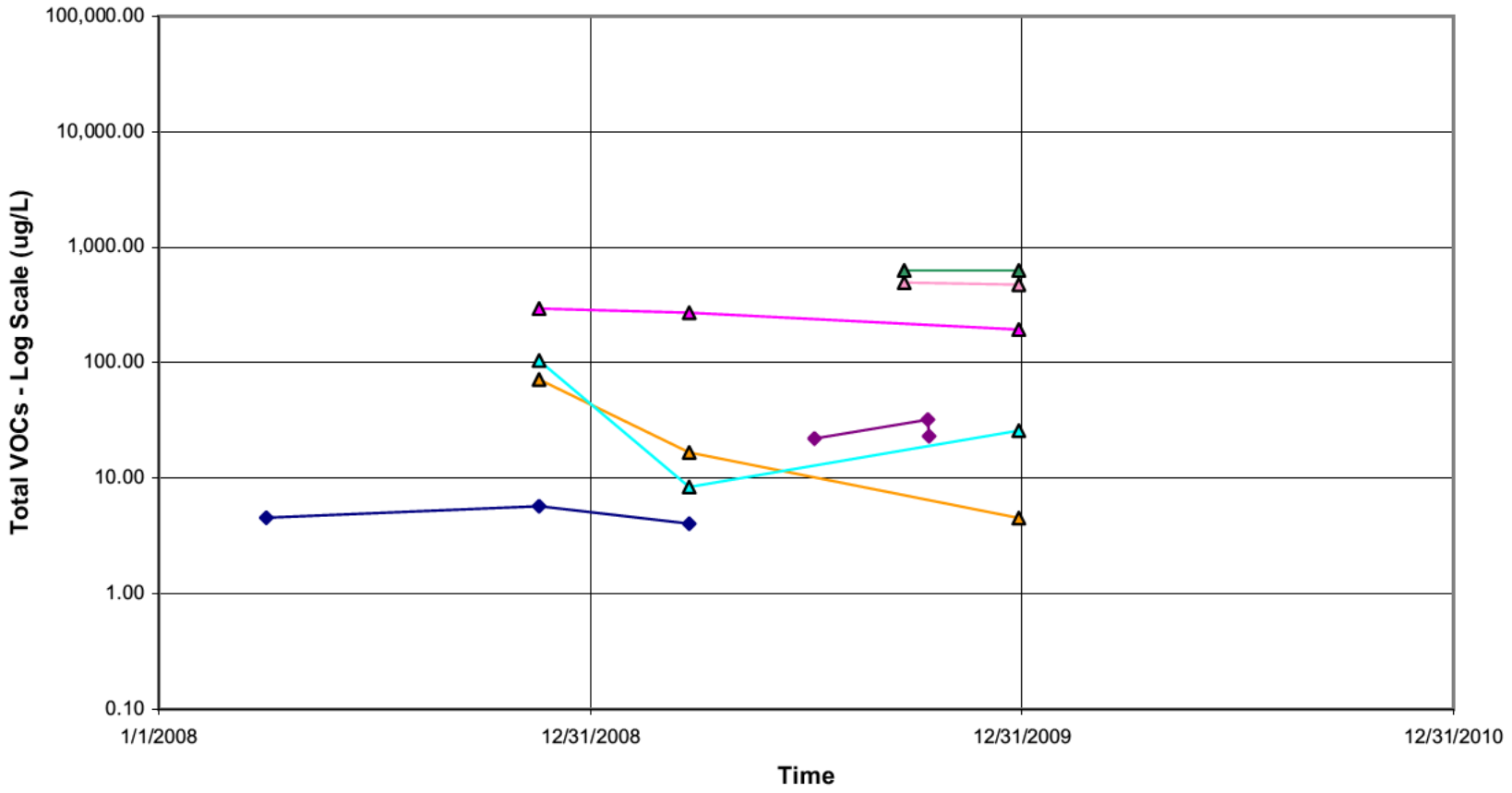


Figure 35. Total VOC Time Series (P2 Wells)

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MW-29b
MW-30b
MW-31b
MW-42b
MW-44b
MW-28d (Frenchman Spr ngs)
Wh tson (Frenchman Spr ngs)

Figure 36. Total VOC Time Series
(Roza and Frenchman Springs Aquifer - RI Wells)

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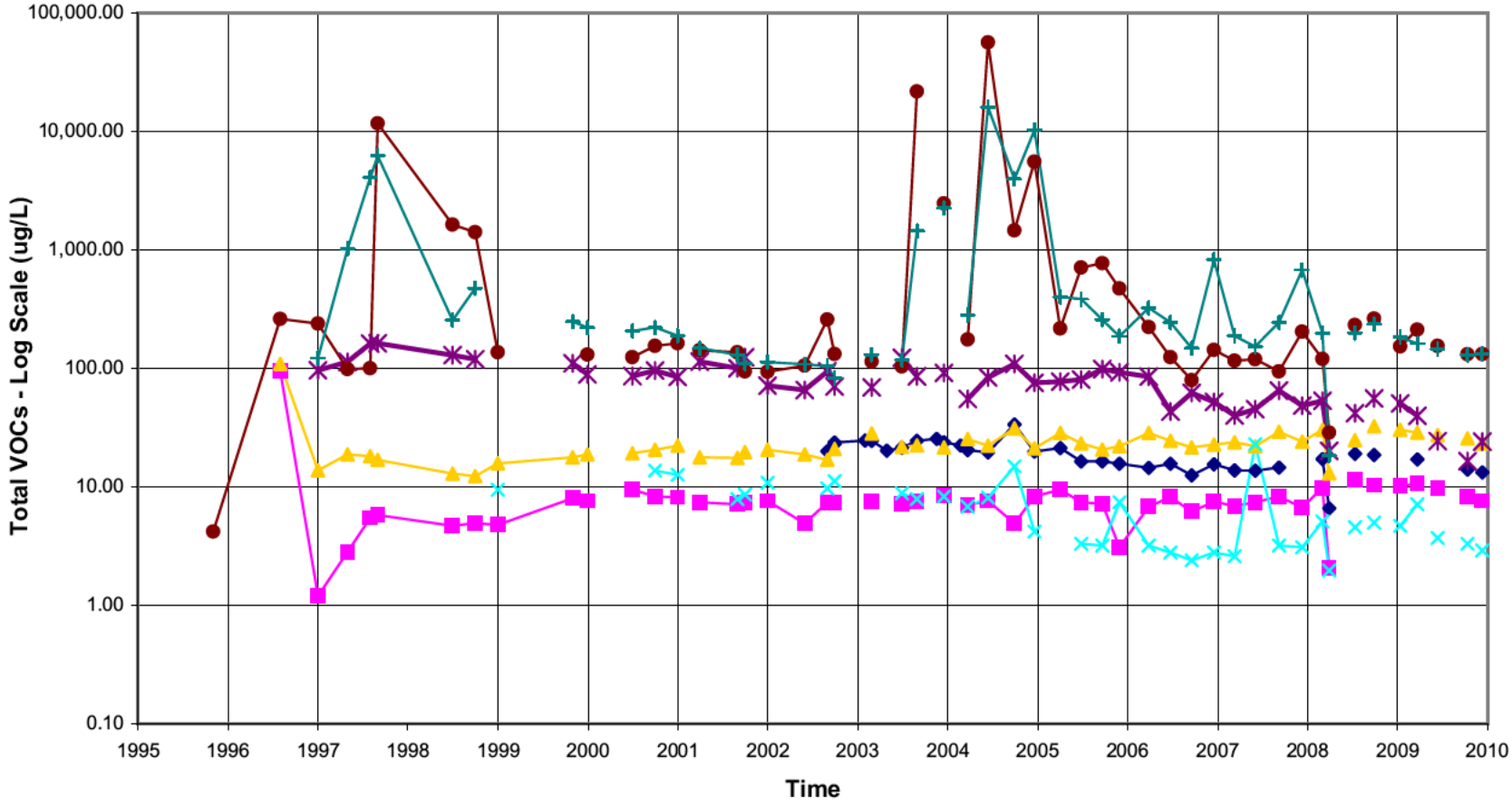
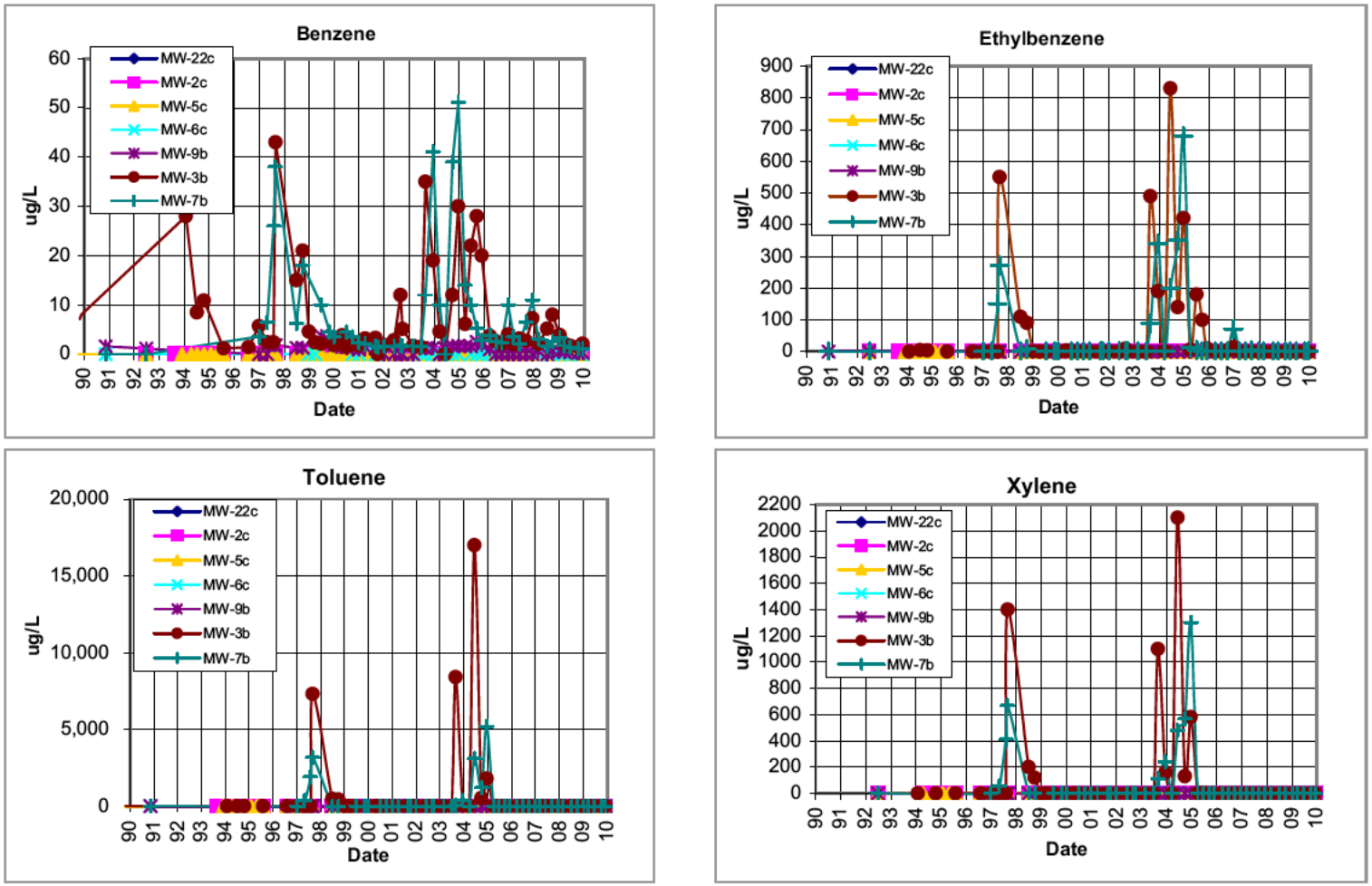


Figure 37. Total VOC Time Series (Select Long Term Monitoring Wells)

Ephrata RI Report
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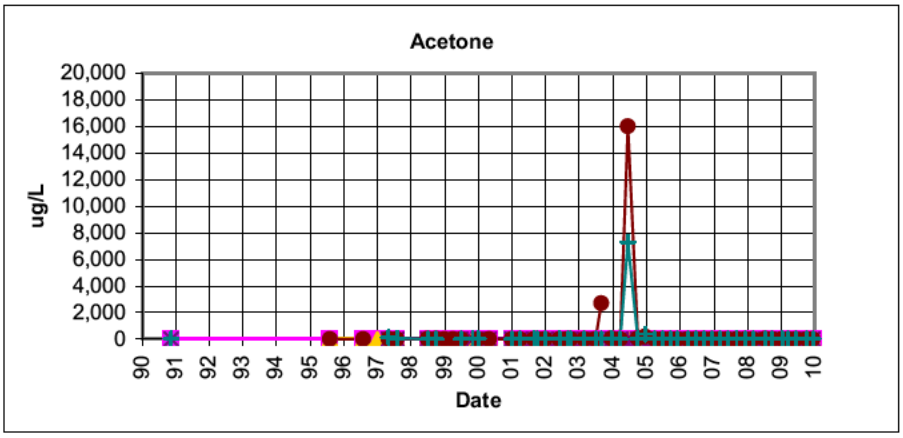


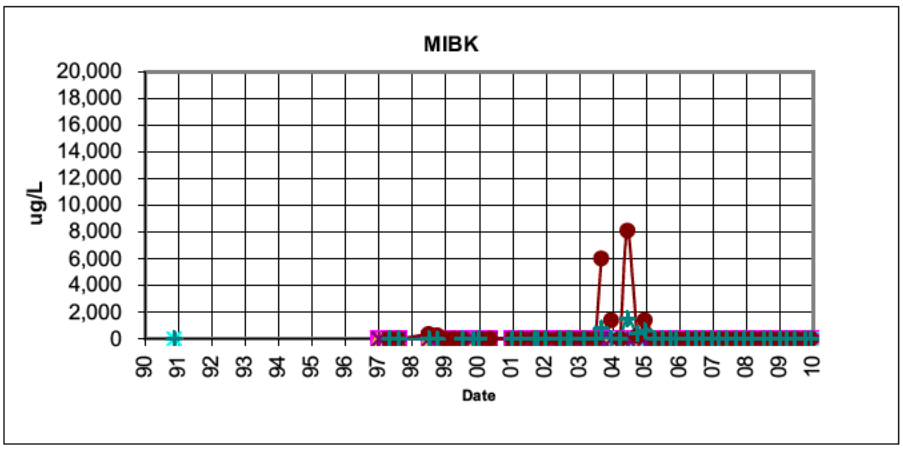
Notable increase in BTEX compounds observed in MW-3b and MW-7b in 1997-1998 and 2003-2005 may be related to mobilization of a smear zone in the overlying soils by these wells spill events by these wells or possibly a ruptured drum(s) from the former drum cache A similar response was not observed in MW-9b suggesting a different pathway and or source contributes to contamination observed in MW-9b

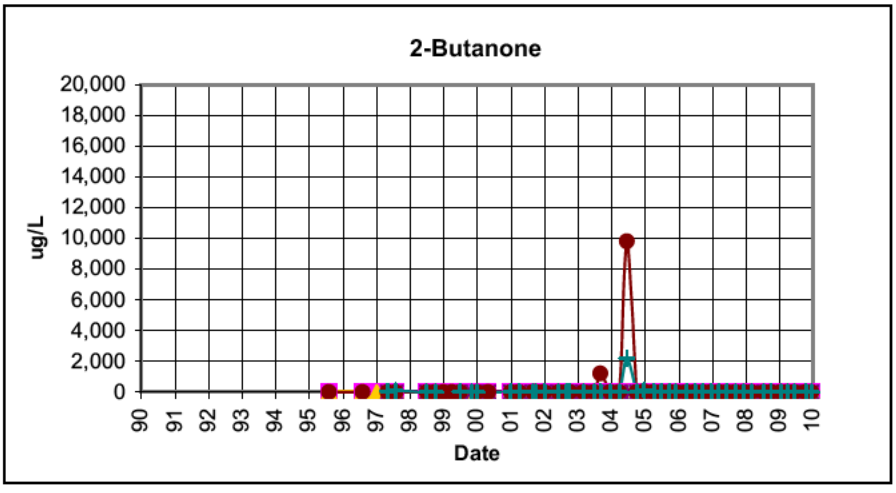
Figure 38. BTEX vs Time
(Select Long Term Monitoring Wells)

Ephrata RI Report
JE0714

PgG







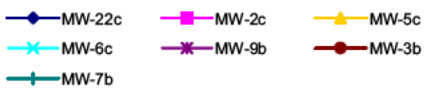


Figure 39. Ketones vs Time
(Select Long Term Monitoring Wells)

Ephrata RI Report
JE0714

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PHASE 1 REMEDIAL INVESTIGATION DATA REPORT
EPHRATA LANDFILL CORRECTIVE ACTION

March 20, 2009

PHASE 1 REMEDIAL INVESTIGATION DATA REPORT
EPHRATA LANDFILL CORRECTIVE ACTION

Prepared for:

Grant County Department of Public Works
P.O. Box 37
Ephrata, WA 98823-0037
And
City of Ephrata
121 Alder Street
Ephrata, WA 98823

Prepared by:

Pacific Groundwater Group
2377 Eastlake Avenue East, Suite 200
Seattle, Washington 98102
206.329.0141
www.pgwg.com

March 20, 2009
JE0714
Phase 1 RI
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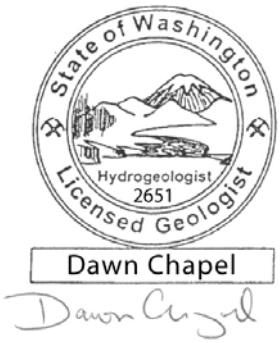
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SIGNATURE

This report, and Pacific Groundwater Group's work contributing to this report, were reviewed by the undersigned and approved for release.



Dawn Chapel
Hydrogeologist
Washington State Hydrogeologist No. 2651

Charles E. Ellingson
Principal Hydrogeologist
Washington State Hydrogeologist No. 631

1.0 PURPOSE

The purpose of this report is to summarize Phase 1 remedial investigation (RI) work for the Ephrata Landfill sufficiently to determine whether further field work (Phase 2) will be required under the Model Toxics Control Act (MTCA). To facilitate this determination, a preliminary analysis of conditional point of compliance and groundwater cleanup levels is provided in this report. This report is not a full analysis of the Phase 1 RI and does not address options for remediation. The final RI report will incorporate full analysis of RI work, which will then be used for the FS phase of the project.

Sections 2, 3, and 4 of this report provide a brief introduction of the RI, a preliminary cleanup level analysis, and a summary of major findings respectively. Following these sections are more detailed discussions of the site conceptual model (Section 5); and a summary of soil (Section 6), gas (Section 7), and groundwater (Sections 8 and 9) analytical results.

2.0 INTRODUCTION

A Remedial Investigation and Feasibility Study (RI/FS) is being conducted at the Ephrata Landfill (site) in Grant County, Washington (**Figure 1**). The RI/FS is being performed by Parametrix, Inc. and Pacific Groundwater Group for Grant County (County) and the City of Ephrata (City) (the Potentially Liable Parties or PLPs).

Some time prior to 1983[1], a basalt aquifer, now called the Roza aquifer, became contaminated with inorganic and organic contaminants. Groundwater at the site was routinely monitored starting in 1989. The purpose of the RI/FS is to further characterize the extent of contamination, sources of contamination, develop objectives for any remediation undertaken, assess remedial measures in light of those objectives, and to select a final remedy for achieving those remedial objectives in compliance with the requirements of MTCA. The RI/FS Work Plan, site background, and contaminants of concern (COCs) are described in more detail in the *Final Remedial Investigation/Feasibility Study (RI/FS) Work Plan Ephrata Landfill Corrective Action* (PGG and PMX, 2006).

Phase 1 RI work was conducted in 2007 and 2008 and consisted of sub-tasks to investigate soil, gas, and groundwater at the site. Four interim remedial actions were also performed during this time:

1. Removal of approximately 2,300 buried drums at the north end of the site and removal of soils and liquids from beneath the removed drums.
2. Extraction of contaminated groundwater from the Hole (shallow groundwater in a basalt depression below the landfill)
3. Landfill capping
4. Landfill gas collection system and flare installation and operation

[1] A groundwater sample from the old supply well was analyzed in 1983. The analyses suggest groundwater contamination existed at that time.

This document summarizes the results of the investigation of soil, gas, and groundwater (including groundwater from the Hole) and provides a preliminary groundwater clean up level analysis for determining whether further field work (Phase 2) will be required under the Model Toxics Control Act (MTCA). Drum removal, landfill capping, and landfill gas management are not discussed except in the context of soil, gas, and groundwater data interpretation. Soil, gas and groundwater sample locations are shown in **Figures 1 and 2**.

Soil work consisted of a number of test pits and borings (T- and B- series samples) excavated to bedrock at the northwest end of the landfill property with selected soil samples submitted for laboratory analyses of COCs (**Figure 2**). Soil work also included sampling soils directly below the former buried drum cache (S-series samples) and sampling of residual soil after the soil below the drum cache was removed (SS-series) (**Figure 2**).

Gas work consisted of sampling landfill gas from existing landfill gas extraction wells and a number of temporary probes within test pits (**Figure 1**). Select gas samples were submitted for laboratory analysis of volatile organic compounds (VOCs).

Groundwater work consisted of drilling and testing four new monitoring wells around the site, ten new monitoring wells near the former drum cache area at the north end of the landfill, and two new monitoring wells within the saturated basalt depression beneath the landfill (the Hole) (**Figures 1 and 2**). The addition of ten new monitoring wells near the former drum cache site was beyond the scope of work identified in the original RI/FS Work Plan. The extra work was conducted to investigate shallow groundwater observed during the drum removal and soil-below-drums investigation. The new monitoring wells are collectively referred to as RI wells to contrast them with the existing site monitoring wells. Existing and new monitoring well information is summarized in **Table 1**. Three of four groundwater sampling events planned for the RI are presented in this report (the fourth event is schedule to take place in spring 2009).

Groundwater work for the RI also consisted of extracting and sampling groundwater from the Hole during the spring of 2008 (extraction well EW-1 in **Figures 1 and 2**)

3.0 PRELIMINARY CLEAN UP STANDARD ANALYSIS

This preliminary analysis of groundwater cleanup standards is provided to assess which MTCA cleanup levels and points of compliance are appropriate at the site and to facilitate determining whether further field work (Phase 2) will be required to select the cleanup action to be implemented at the site.

The analysis in this section indicates that MTCA Method-A provides an acceptable set of cleanup levels for the site and that exceedences of those levels for contaminants in groundwater at the proposed conditional points of compliance are limited to the northwest corner of the landfill. No exceedences of MTCA Method-A cleanup levels occur either in the regional downgradient groundwater flow direction (i.e., the south end of the site) or in the deepest monitored aquifer (Frenchman Springs). Additional characterization may; however, be required along the northern conditional point of compliance as described below.

3.1 PROPOSED CONDITIONAL POINT OF COMPLIANCE

The County property boundaries would be appropriate as the site's conditional point of compliance (CPOC) (**Figure 3**). Based on the southerly regional groundwater flow direction (see Section 5.2.3), the southern property boundary is a downgradient boundary, the east and west boundaries are roughly parallel to regional groundwater flow, and the northern boundary is upgradient. The Roza aquifer at the northern property boundary; however, appears to be downgradient of a contaminant source at the northwest corner and may be related to local groundwater flow directions that differ from the regional southerly flow direction. Groundwater gradients in the Roza aquifer at the northwest corner are fairly flat and occasional northward flow directions have been measured. Northward flow directions have also been measured twice in the P2 zone near the former drum cache (see Section 5.2.3). The Roza aquifer, and overlying saturated zones, is limited in extent, occurring only at the north end of the landfill and groundwater in these zones eventually discharges to the regional groundwater system (either to the Interflow aquifer or the Outwash aquifer).

The County property boundary is also within the 1000-ft minimum distance required for water supply wells located near solid waste landfills (WAC 173-160-171), except along the southern half of the eastern boundary, where the property boundary is located about 300-ft east of the 1000-ft restriction (**Figure 3**). As described below, COC concentrations comply along the western, eastern, and southern property boundaries.

The concept of establishing a CPOC coincident with the County property boundary is further discussed in the following sections, as part of the context for proposed cleanup levels.

3.2 DISCUSSION OF PROPOSED GROUNDWATER CLEAN UP LEVELS

Long term groundwater monitoring of the Outwash, Roza, and Interflow aquifers was used to establish initial Contaminants of Concern (COCs) in the original RI/FS Work Plan (PGG and PMX, 2006). The initial COCs (**Table 2**) were identified based on exceedances of MTCA Method-B or the State Groundwater Contaminant Levels (GWCL). MTCA Method-B levels are considered the most conservative human health screening concentrations and are protective of human health for any land use (unrestricted). MTCA Method-B is often used as a screening level concentration because if concentrations at the Point of Compliance (POC) do not exceed MTCA Method-B, then no further action is usually warranted. If MTCA Method-B exceedances occur, then it is usually necessary to establish a cleanup standard, or cleanup concentration at the POC.

As described in the RI/FS Work Plan (PGG and PMX, 2006), cleanup levels will be developed for groundwater, and remediation levels may be developed for gas and soil (if applicable) as potential sources of groundwater contamination. This analysis addresses only groundwater cleanup levels. The following points provide the context for the proposed cleanup levels for the site COCs:

- The site is a publicly-owned municipal solid waste landfill regulated under Washington State solid waste regulations. The remedy will include a restrictive covenant indicating the presence of landfill refuse and contaminants and the need to maintain engineered and institutional controls that prevent risks to human health and the environment, including a 1000-ft minimum distance restriction on water supply wells (required under WAC-173-160-171).

- MTCA Method-A is applicable where few COCs pose a threat and to sites that are undergoing routine cleanup, including cleanup of solid wastes.

- Significant sources of groundwater contamination have been eliminated at the site via the Interim Corrective Actions, including the removal of more than 2300 drums of waste and associated soils and capping the original landfill. It is anticipated that the elimination of these sources will reduce concentrations of COCs in groundwater relative to current concentrations.

- The highest concentrations of COCs occur in weathered basalt zones (P1 and P2 zones) above the Roza aquifer in the immediate vicinity of the former drum cache at the north end of the landfill. Contamination in the P1 and P2 zones may be a continuing source of contamination to the deeper aquifers. The P1 and P2 zones are limited to the northern part of the site where the top of the Wanapum basalt elevation is approximately 1230-ft or higher (**Figure 1**). The extent of contamination in these zones north of the former drum cache (where the basalt elevation increases) may require additional characterization.

- Current concentrations of COCs in groundwater can be used to determine that the extent of contamination has been sufficiently characterized at the CPOC boundary if the groundwater data represents a fully-developed groundwater plume (i.e. not growing or changing with time). The concentration of COCs, based on monitoring since 1989, is quasi-steady (i.e. not trending, but some variability occurs) at all locations except MW-5c[2] suggesting a fairly stable plume. Furthermore, at all locations, the effects of the interim actions will likely decrease concentrations of COCs (the time frame for reduction is likely to be years). Thus, new COCs are unlikely to be identified in the future as a result of increasing concentrations at the CPOC.

It is appropriate to use MTCA Method-A cleanup levels because only a few COCs exceed screening levels at the proposed conditional point of compliance monitoring wells. These exceedences include the following:

- In Outwash aquifer monitoring wells at or inside the CPOC, PCE is the only COC exceeding screening levels. Thus, only one COC poses a potential threat to human health or

[2] A slow increasing trend in PCE and TCE has been observed in MW-5c (Interflow aquifer) since 2000. PCE has increased slowly from about 7 ug/L to a maximum of 12 ug/L and TCE has increased slowly from about 1 to a maximum of 2.3 ug/L. Chloride concentrations also show an increasing trend in Interflow aquifer wells around the landfill (MW-2c, MW-5c, and MW-22c); which may indicate a growing leachate plume. Not all wells have been monitored long enough to indicate time trends.

the environment through that pathway, and the use of MTCA Method-A is therefore appropriate.

- Along the northern CPOC in the Roza aquifer, seven organic COCs exceed screening levels. While slightly more exceedences have been noted, we propose to use MTCA Method-A cleanup levels for plume delineation and monitoring in the Roza aquifer and shallow basalt zones (P1 and P2) north of the northern CPOC (**Figure 3**). Method-A is appropriate because contamination along this northern pathway is limited in extent. Migration to the regional groundwater flow system is via the Interflow aquifer and or the Outwash aquifer, where high rates of dilution and other chemical processes (e.g. sorption and degradation) reduce the concentrations of contaminants. These reduced concentrations are eventually expressed in the southern monitoring wells located within the regional groundwater flow system.

- In Interflow aquifer monitoring wells, five organic COCs and nitrate exceed screening levels near the western CPOC (monitoring well MW-5c, about 120-ft within the CPOC) and two organic COCs are in exceedence near the eastern CPOC (monitoring well MW-2c about 480-ft within the CPOC). Thus, only a few COCs pose a potential threat to human health or the environment through that pathway and the use of MTCA Method-A is therefore appropriate.

- Along the northern part of the western CPOC boundary in the Frenchman Springs aquifer (MW-28d), PCE is the only COC exceeding screening levels. Thus, only one COC poses a potential threat to human health or the environment through that pathway, and the use of MTCA Method-A is therefore appropriate.

3.3 ASSESSMENT OF GROUNDWATER CLEANUP STANDARD

This section provides a cleanup standard assessment (cleanup level at the proposed conditional point of compliance [CPOC] wells) (**Table 3**). This assessment indicates that compliance with the proposed clean up levels is met at the east, west, and south CPOC boundaries, but that further characterization may be required at the northern boundary.

Cleanup levels in Table 3 are from MTCA Method-A Table 720-1 (WAC 173-340-720), the Federal MCL (40 CFR 141.61), or the State Department of Health (WAC 256-290-310 primary MCLs). If a detected COC is listed in multiple sources, the most stringent level is used in accordance with WAC 173-340-720(3). If a detected COC is not listed in one of these sources, MTCA Method-B is used. Comparisons to the cleanup levels for each aquifer at the CPOC are:

- Outwash aquifer monitoring wells at or within the CPOC are MW-1a, MW-10a, MW-11a, MW-14a, MW-18a, MW-23a, MW-24a, MW-25a, and MW-26a. These wells are located near the west, east, and south CPOC boundaries (**Figure 3**). There are no exceedences of MTCA Method-A cleanup levels in these monitoring wells (**Table 3**).

- Roza aquifer monitoring wells at the CPOC are MW-3b and MW-7b along the northwestern boundary (**Figure 3**). Four COCs exceed MTCA Method-A cleanup levels in these Roza aquifer wells: 1,2 dichloropropane, benzene, chloroethane, and vinyl chloride (**Table 3**). The extent of contamination in the Roza aquifer, the upper saturated basalt zones (P1 and P2) and the underlying Interflow aquifer, may need further characterization along the northern CPOC. Contamination along this northern pathway; however, is likely expressed in southern monitoring wells as this northern source enters the regional groundwater flow system with its southerly flow.
- The Interflow aquifer monitoring wells near the CPOC are MW-2c and MW-4c within 480-ft of the eastern boundary and MW-5c within 120-ft of the western boundary (**Figure 3**). PCE, vinyl chloride (slightly) and nitrate (slightly) exceed MTCA Method-A cleanup levels at MW-5c and no parameters exceed MTCA Method-A cleanup levels at MW-2c and MW-4c (**Table 3**). Contamination along this pathway is likely expressed in Outwash aquifer monitoring wells because the Interflow aquifer is truncated (eroded) in the subsurface east, west, and south of the site and discharges into the Outwash aquifer. As noted above, there are no exceedences of MTCA Method-A in the Outwash aquifer. Also, COCs have not been detected in Interflow aquifer well MW-21c (about 800-ft west-southwest of MW-5c, **Figure 1**).
- The Frenchman Springs aquifer monitoring well (MW-28d) is located at the CPOC along the western boundary downgradient of potential sources and pathways (i.e. the annulus of old water supply well 33E1, **Figure 1**). There are no exceedences of MTCA Method-A cleanup levels in the Frenchman Springs aquifer (**Table 3**).

4.0 SUMMARY OF PHASE 1 RI FINDINGS

Significant findings for the Phase 1 RI investigation are presented in this section.

4.1 HYDROGEOLOGY

- Shallow groundwater occurs in basalt zones (P1 and P2) above the Roza aquifer near the base elevation of the former drum cache. The extent of shallow groundwater towards the north-northwest is not known; however, the West Canal and Oasis Park about ½ mile north-northwest of the site may be the recharge source for these water bearing zones.
- Groundwater flow directions on site are generally towards the south, but local deviations were measured near the former drum cache. Flow directions near the former drum cache were measured towards the southwest in P1, and towards the north in P2 and the Roza aquifer.
- The Ringold Formation (siltstone) occurs at the south end of the landfill and forms an aquitard at least 70-ft thick between the overlying Outwash aquifer and

the underlying basalt aquifers; however, the Interflow aquifer likely truncates into the Outwash aquifer above the Ringold. The Ringold has not been observed at other locations on site or to the immediate east and west.

- The Interflow aquifer subcrops into the Outwash aquifer along subsurface erosional basalt surfaces east, west and south of the landfill.
- The Vantage Interbed (siltstone) occurs below the Frenchman Springs aquifer and forms an aquitard about 25-ft thick between the overlying Wanapum basalt aquifer system monitored on site and the deeper underlying Grand Ronde basalt aquifer system.

4.2 CONTAMINANT DISTRIBUTION

- Volatile Organic Compounds (VOCs) identified as Contaminants of Concern (COCs) in the original RI/FS Work Plan include the following groups (**Table 2**):
    - Chlorinated ethenes
    - Chlorinated ethanes
    - Chlorinated methanes
    - Benzene, toluene, ethylbenzene, and xylene (BTEX)
    - Dichlorobenzenes
    - 1,2 Dichloropropane

  Additional VOCs in shallow groundwater near the former drum cache that have been retained for further evaluation are: 1,1,2-trichloroethane; 1,2,4-trimethylbenzene; 2-butanone, 4-methyl-2-pentanone, and acetone (ketones); chloroform; methylene chloride; and naphthalene (**Table 2**). Ketones account for more than half the total VOCs in most of the shallow groundwater wells near the former drum cache. These additional VOCs have not been detected above MTCA screening concentrations at other site wells or at the Conditional Point of Compliance wells, indicating that these constituents have not migrated far from the drum area.
- The highest concentrations of VOCs in groundwater occur on the north end of the site by the former buried drum cache in the P1 and P2 zones (total VOCs in excess of 100,000 ug/L). Total VOC concentrations decrease substantially in the basalt below P1 and P2, with maximum concentrations in the Roza aquifer on the order of 100 ug/L, maximum concentrations in the Interflow aquifer on the order of 10 ug/L, and maximum concentrations in the Frenchman Springs aquifer on the order of 1 ug/L. Total detectable VOC concentrations are lowest in the Outwash aquifer - on the order of 0.1 to 1 ug/L.
- Total VOCs in groundwater from the Hole (EW-1) are on the order of 100 ug/L.

4.3 SOURCES AND PATHWAYS

The highest concentrations of groundwater contaminants are located at the north end of the landfill. Source areas and potential release mechanisms contributing to groundwater contamination include:

- Mobilization of residual contaminants from the formerly buried drums
- Leaching of landfill refuse (including saturated refuse in the Hole)
- Diffusion of landfill gas, and
- Mobilization of potential historic releases of materials in the vicinity of the maintenance shop in the northwest corner of the site.

The following paragraphs summarize results from the RI investigation with regards to these sources of groundwater contamination and potential pathways:

- VOCs detected in the Roza aquifer near the shop, in groundwater in the Hole, and in the Interflow aquifer around the boundary of the landfill, are also detected in shallow groundwater near the former drum cache at higher concentrations (as much as 1000 times higher). The high concentration of VOCs in shallow groundwater below the former drum cache is direct evidence of that source's contribution to groundwater contamination; however, additional analyses of contaminant transport, transformation, and degradation processes would be required to assess the relative importance of different VOC sources.
- Chloride concentrations in the Roza aquifer near the shop, in groundwater in the Hole, and in the Interflow aquifer around the boundary of the landfill are elevated. Chloride concentrations are 900 to 1000 mg/L in the Roza aquifer near the shop (MW-3b, MW-7b, and MW-9b), 2000 mg/L in groundwater in the Hole, and 500 to 700 mg/L in the Interflow aquifer around the landfill (MW-2c, MW-5c, and MW-6c). The chloride concentrations in shallow groundwater near the former drum cache are similar or lower (50 to 900 mg/L, with one well above 1000 mg/L at MW-33p2). Background chloride concentrations are about 20 mg/L. The site-wide elevated chloride concentrations suggest some impact from leaching of landfill refuse; however, this does not necessarily implicate the landfill as an important source of COCs.
- The groundwater flow directions and spatial distribution of VOC concentrations in the shallow groundwater near the former drum cache indicates contaminants migrate southwest in P1 and vertically down to P2. Migration in P2 appears to be northward with limited vertical migration downward to the Roza aquifer near the former drum cache. The observation that there is limited vertical migration is based on the fact that COC concentrations measured in the underlying Roza aquifer are about 1000 times less than the overlying P2 aquifer. Groundwater flow directions in the Roza aquifer near the former drum cache is also northwards. These northward flow directions in the P2 and Roza aquifer have only been

measured twice (November 2008 and January 2009), but are considered local deviations from the regional southward flow direction.

- VOC concentrations in the Roza aquifer northwest and southwest of the former drum cache (MW-30b and MW-31b) are not high enough to explain the VOC concentrations in the Roza aquifer by the shop to the northwest. However, there may be a pathway from the former drum cache area to the northwest within the overlying P2 zone.
- Many of the organic contaminants found in soils mixed with landfill refuse and beneath the former drum cache are the same contaminants that are detected in groundwater monitoring wells. This suggests releases from the former drum cache, and leaching of landfill refuse, are both potential sources of groundwater contamination. Site wide elevated chloride concentrations suggest some impact from leaching of landfill refuse; however, this does not necessarily implicate the landfill as an important source of COCs.
- A number of soil samples collected near the shop but outside the footprint of the landfill had low level (single to double digit ug/Kg) detections of PCE and BTEX, suggesting a historic release. An isolated detection of elevated TCE and cis-1,2-dichloroethene (100 to 1,000 ug/Kg range) also occurred north of the shop, suggesting a local source. These COCs have also been detected in groundwater near the shop area.
- Gas VOC concentrations in the refuse are high enough to contribute to groundwater contamination, if diffusion to the aquifer occurs. However, the VOC concentrations in the landfill gas are not high enough to be the only source of contamination, nor does the gas contain all the VOCs that are detected in groundwater.
- Results of the investigation do not indicate the presence of dense non-aqueous phase liquids (DNAPL). DNAPL was not observed in wells or in the drum excavation, and concentrations in groundwater generally decrease with depth, rather than increasing as would be the case if DNAPL were present. Furthermore, concentrations of PCE, TCE, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,-dichloroethane, and 1,2-dichloroethane are all less than 0.1% of saturation[3] in groundwater with the highest concentrations near the former drum cache.

4.4 CONCENTRATIONS AT THE CONDITIONAL POINT OF COMPLIANCE

Concentrations at the Conditional Point of Compliance (CPOC) are compared to MTCA Method-A clean up levels for groundwater as discussed in Section 3.

- Four COCs detected in Roza aquifer wells at the CPOC north of the shop are above MTCA Method-A cleanup levels (**Table 3**): 1,2-dichloroethane, benzene, chloroethane, and vinyl chloride. Roza aquifer wells MW-3b and MW-7b are lo-

[3] PCE and 1,1,1-trichloroethane concentrations in one sample from the P1 zone were at 0.35% and 0.3% saturation respectively (sample B-22-P1).

cated at the northern boundary of the county property and may be considered CPOC wells even though they are at the upgradient edge of the landfill when considered in a regional context (**Figure 3**).

- Two organic COCs detected in Interflow aquifer well MW-5c (western boundary) are above MTCA Method-A cleanup levels (**Table 3**): tetrachloroethene (PCE) and vinyl chloride. Nitrate is also detected slightly above the MTCA Method-A cleanup level in MW-5c. The extent of a groundwater plume in the Interflow aquifer east and west of the landfill is likely very limited because groundwater flow directions are southward and the aquifer truncates into the Outwash aquifer. Interflow aquifer well MW-21c is located outside the property boundary about 720-ft west-southwest of MW-5c and does not have detectable COCs (**Figure 1**).
- All other CPOC wells do not have COCs detected above MTCA Method-A (**Table 3**).

4.5 DATA GAPS

The nature and extent of groundwater contamination, and the sources contributing to the contamination, are fairly well characterized. Contaminant plume migration downgradient to the south and offsite does not appear to pose a threat to human health or the environment because COC concentrations in groundwater at the downgradient CPOC wells are either non-detect or well below MTCA Method-A cleanup levels.

The extent of plume migration north of the northern CPOC boundary; however, may require further characterization. The northern CPOC boundary is currently monitored in the northwest corner within the Roza aquifer (MW-3b and MW-7b); four COCs exceed MTCA Method-A in these wells (**Figure 3** and **Table 3**). The groundwater flow direction in the Roza aquifer in the northwest corner is typically towards the south; however, fairly flat groundwater gradients occur in this area and variations in flow directions have been measured in the past, including a few northward flow directions. To the northwest of this boundary, COCs are not detected in offsite Roza aquifer wells MW-19b and Atkins Old or in Interflow aquifer well MW-20c. MW-19b is located about 800-ft west-northwest of the CPOC, and Atkins Old and MW-20c are located about 1200-ft north-northwest of the CPOC (**Figure 1**).

The current precision of plume delineation might be sufficient as the basis for upcoming risk management decisions; however, the northern CPOC boundary may require further characterization because the extent of migration to the north is not well documented and it may extend beyond the property owned by the County. Furthermore, the extent of plume migration north of the northern CPOC boundary is not fully characterized in the P1 and P2 shallow groundwater zones. Near the former drum cache a number of COCs exceed MTCA Method-A in the P1 and P2 zones; however, these wells are located about 500-ft south of the northern CPOC boundary. Two rounds of groundwater level measurements (November 2008 and January 2009) indicate a northward flow direction in the P2 zone, which may carry contaminants to the northern CPOC boundary and may also be the dominant pathway to the Roza aquifer towards the northwest at MW-3b and MW-7b.

The following sections describe in more detail the site conceptual model and RI data (soil, gas, and groundwater).

5.0 SITE CONCEPTUAL MODEL

Findings from the Phase 1 work were used to update and expand the site conceptual model. The updated geologic and hydrogeologic conceptual models are summarized first. These models are then used in combination with soil, gas, and groundwater data to develop the conceptual model of the nature and extent of contamination at the site.

5.1 GEOLOGIC CONCEPTUAL MODEL

The site lies within the Quincy basin of the Columbia Plateau physiographic province. The plateau is characterized by a thick sequence of fine-grained and dense (hard) basalt flows, collectively known as the Columbia River Basalt Group. The younger flows comprise the Yakima Basalt Subgroup, which is present in the Ephrata area and is divided into three formations (from youngest to oldest), Saddle Mountain, Wanapum, and Grande Ronde Basalts. The Wanapum Basalt crops out in the study area and the Grand Ronde crops out in the Breezley Hills to the northwest where tectonic warping and folding have uplifted the basalt sequence (**Figure 4**). The basalt units at the landfill itself appear to be nearly flat-lying. Sedimentary rocks interbedded with the basalt flows are collectively known as the Ellensburg Formation and consist of fluvial and lacustrine sediments and layers of volcanic ash. The Vantage Interbed crops out near Ephrata but occurs at a depth of about 300-ft beneath the Wanapum Basalt at the site. During the wetter Pliocene period the ancestral Columbia River and its tributaries deposited hundreds of feet of sediments over the top of the basalt flows. These deposits consisted of fine grained lake sediments and stream deposits and are collectively referred to as the Ringold Formation.

After tectonic deformation and deposition of the Ringold, major flooding and erosion occurred during the Pleistocene (the Missoula Floods) as a result of ice-dam breakup in the headwaters of the Columbia River drainage. A major temporary channel developed through the Grand Coulee which opens onto the plains near Ephrata. Flow through this channel eroded the Ringold and basalt formations, dispersed across the plains, and deposited coarse gravels and sands referred to as Outwash deposits.

The geology of the site consists of the following geologic units in descending order:

- *Outwash:* coarse sand, gravel and cobbles of variable thickness associated with the Missoula Flood deposits
- *Ringold Formation:* moderately consolidated claystone, siltstone and sandstone
- *Wanapum Formation:* fine-grained, dense basalt flows with permeable weathered zones
- *Vantage Interbed:* Ash-rich siltstone approximately 25 feet thick that separates the Wanapum from the Grand Ronde
- *Grand Ronde Formation:* fine-grained, dense basalt flows with permeable weathered zones below the Vantage Formation

A north-south cross section shows the distribution of these units below the site (**Figure 5**). An erosional unconformity defines the top of the Wanapum Formation. Wanapum basalt crops out along the northern boundary of the site at an elevation of about 1260-ft and slopes towards the south, east and west where it becomes buried by Outwash deposits (up to 100 feet thick). Near the south end of the site the Wanapum is overlain by the Ringold Formation (as indicated by MW-24a and MW-25a well logs); however, beneath most of the site and towards the immediate east and west the Ringold Formation appears to be absent.

Individual basalt flows typically exhibit a three-tier profile: a colonnade at the base characterized by dense (hard) basalt with honey-comb shaped vertical cracks, a fractured and blocky mid-section or entablature, and an upper vesicular crust. Sediments and weathered basalt between individual flows are referred to as interflow zones. The upper vesicular crust and interflow zones form the permeable horizons within the basalt where aquifers form. Vertical fractures within the denser colonnade basalt provide limited vertical hydraulic connection between aquifers.

A number of permeable weathered zones (interflow contacts characterized by soft basalt, porous basalt, and or red-silty-clayey basalt) occur within the Wanapum and form aquifers of variable thickness and transmissivity. Three main weathered zones have been identified in the Wanapum beneath the site. These include the Roza weathered zone; the Interflow weathered zone; and deeper Frenchman Springs weathered zone at the contact between the Wanapum Formation and the Vantage Interbed (**Figure 5**). Approximately 50 feet of hard basalt separates the Roza from the Interflow; while over 150 feet of hard basalt separates the deeper Frenchman Springs from the Interflow. Based on well logs, the Roza weathered zone is limited to the north end of the site, while the Interflow and Frenchman Springs weathered zones are more laterally extensive.

Two weathered basalt zones above the Roza were identified during the RI investigation in the vicinity of the former buried drum cache (informally referred to as P1 and P2 zones). **Figure 6** shows an east-west cross section across the north end of the site and the stratigraphic location of these two zones. P2 occurs approximately 20 feet above the Roza and P1 occurs approximately 10 feet above P2. P1 is at the top of the hard basalt that formed the base of the former drum cache. The P1 and P2 zones likely sub-crop south, east and west of the former drum cache where the top of basalt decreases in elevation, but may extend northward where the basalt is higher in elevation.

Below the Wanapum at a depth of at least 300 feet below ground surface, the Vantage Interbed forms a low permeable stratum that separates the overlying Wanapum Formation from the deeper Grand Ronde Formation. The Vantage Interbed, as identified in MW-28d and new water supply well 33M1 (**Figure 5**), is an ash-rich siltstone approximately 25 feet thick.

The top of the Wanapum basalt beneath the site is an eroded irregular surface (**Figure 1).** Two subsurface depressions about 10 to 20 feet deep occur in the basalt surface beneath the old land-fill. The larger depression has been called the Hole and is saturated with groundwater at an elevation of about 1233 feet (or approximately the bottom 5 to 7 feet of the depression). The smaller depression occurs about 150 feet south of the former drum cache and does not appear to be saturated. The basalt surface beneath the site slopes towards the south to an elevation interpreted to be as low as 1050 feet; however, the top of basalt is overlain by the Ringold Formation

at the south end of the site and no borings at the south end of the site have penetrated below the Ringold. The Ringold occurs at an elevation of about 1120 feet at the south end of the site (or a depth of about 90 feet below ground surface); is at least 70 feet thick; and forms a low permeable layer between the Wanapum basalt and overlying Outwash at the south end of the site (**Figure 5**).

The bedrock surface maintains a variable, but not sloping, elevation across the site to the west, where it drops rapidly at the edge of a buried north-south trending scour channel (coulee) along Hwy 28. Just west of the landfill this channel is filled with about 35 feet of silt and clay over gravel in the vicinity of MW-18a (**Figures 1 and 6**). To the east, the bedrock surface slopes more gradually down to an elevation of at least 1140 feet (or a depth of about 65 feet below ground surface). Where the bedrock slopes to below approximately 1130 feet elevation, the Interflow aquifer is likely truncated and sub-crops into the Outwash (**Figure 5**).

The Outwash varies in thickness from less than a few feet near the north end of the site to over 90 feet towards the south end. Where the underlying bedrock surface occurs at an elevation less than approximately 1180 feet, the Outwash is saturated with groundwater.

5.2 HYDROGEOLOGIC CONCEPTUAL MODEL

The following sections characterize the site aquifers, aquitards, groundwater flow paths and gradients.

5.2.1 Site Aquifers

Three aquifers have historically been monitored at the site: the Outwash aquifer, the Roza aquifer, and the Interflow aquifer (**Figure 5)**. The three aquifers were identified in the original hydrogeologic assessment as the upper-most aquifers below the site that could transmit contaminants from the landfill past the point of compliance established for solid waste monitoring purposes (B&V and PGG, 1990a and 1990b). Most of the surrounding water supply wells occur in the deeper basalt aquifers (Interflow, Frenchman Springs or Grand Ronde); however, the well log for at least one nearby well east of the landfill indicates an Outwash aquifer completion.

Deeper basalt aquifers (greater than 300 ft below ground surface) occur within the Frenchman Springs member (decommissioned 33E1, 32A2, and MW-28d) of the Wanapum Basalt and within the even deeper Grand Ronde Basalt beneath the Vantage Interbed, as indicated by deep water supply wells (decommissioned 33E1; Atkins New (32A2) and 33M1). The first Frenchman Springs monitoring well MW-28d was installed in November 2007 as part of Phase 1 RI work.

Relatively permeable and saturated weathered basalt zones (P1 and P2) above the Roza aquifer were identified beneath the site during Phase 1 RI work in the vicinity of the former drum cache. A number of new monitoring wells were completed in these units.

Aquifer Extent and Transmissivity

The Outwash aquifer is an unconfined aquifer that occurs in saturated sands and gravels that overlie the bedrock surface on the south end of the site, to the west in the buried coulee, and to the east. Three new Outwash aquifer monitoring wells were installed as part of the Phase 1 RI work (MW-24a, MW-25a, and MW-26a, **Figure 1**). These wells were originally proposed to target the Interflow aquifer at the south end of the site and east of the site; however, the Interflow aquifer did not occur at these locations (it was eroded away). These wells were therefore completed as Outwash aquifer monitoring wells near the top of bedrock. Short term aquifer pumping tests of the new Outwash aquifer monitoring wells indicates high transmissivity (no drawdown was observed when the wells were pumped at 5 gallons per minute).

The Outwash aquifer is screened and sampled by the a-series wells (e.g. MW-24a).

The P1 and P2 zones are saturated shallow basalt interflows that appear to be limited to the north end of the site where the top of the Wanapum basalt (an erosional surface) is approximately at 1230 feet elevation or higher. The bottom of P1 is the top of the colonnade that forms the basalt shelf where the former drum cache was buried and may also form a subsurface basalt shelf in the vicinity of the maintenance shop. Water was observed on top of the basalt in some of the excavated test pits near the shop at about the same elevation as was observed in the former drum cache. The well logs for Roza aquifer wells near the shop (MW-3b, MW-7b, and MW-9b) also suggest P2, and possibly P1, may occur in this area; however, no monitoring wells have been constructed in these upper zones near the shop. Four new monitoring wells were installed in the P1 zone (MW-32a, MW-34p1, MW-36p1, and MW-37p1) and three new wells were installed in the P2 zone (MW-33p2, MW-35p2, and MW38p2) near the former drum cache. Short term aquifer pumping tests in these wells indicate very low transmissivity (less than about 10 gpd/ft) except at MW-34p1 (about 400 gpd/ft).

P1 and P2 are screened and sampled by the p1 and p2-series wells. MW-32a is screened in washed gravel backfill at the top of rock in the northeast corner of the former drum cache and the top of rock is interpreted as the P1 weathered contact at this location.

The Roza aquifer is a confined basalt aquifer limited to the north end of the site and is highly heterogeneous and laterally discontinuous. The aquifer is bounded to the west of the landfill in the vicinity of MW-18a by silt within the buried coulee that appears to truncate the aquifer. East and south of the shop area the aquifer reduces to very low transmissivity, due to variations in hydraulic conductivity and aquifer thickness. Three new Roza aquifer monitoring wells were installed around the former drum cache (MW-29b, MW-30b, and MW-31b). Short term aquifer pumping tests of these wells indicate very low transmissivity (less than 10 gpd/ft) compared to high transmissivities calculated from a pump test of EW-2 in the vicinity of MW-3b, MW-7b, and MW-9b (6,300 gpd/ft to 188,000 gpd/ft). The northern extent of the Roza aquifer is not defined.

The Roza aquifer is screened and sampled by the b-series wells (e.g. MW-7b).

The Interflow aquifer is a confined basalt aquifer that occurs below the Roza aquifer with a top elevation ranging from about 1120 to 1170 feet. It underlies the entire northern part of the site, but to the south appears to sub-crop into the Outwash aquifer or Ringold Formation just north of

the new landfill cell near MW-14a (**Figure 5**). To the southeast and southwest, the Interflow aquifer also likely sub-crops into the Outwash aquifer. The eastern subcrop is implied by the fact that the Interflow aquifer was not encountered east of MW-6c during drilling of MW-26a.

Calculated hydraulic conductivity for the Interflow aquifer ranges from 1 ft/day to greater than 28 ft/day with aquifer thicknesses of 11 to 20 feet.

The Interflow aquifer is screened and sampled by the c-series wells (e.g. MW-4c).

The Frenchman Springs aquifer is a relatively permeable zone that occurs over 150 feet below the Interflow aquifer. The top elevation of this zone ranges from 925 to 975 feet. A relatively permeable wet zone was identified in that stratigraphic position in 33E1, 33M1, and 32A2. A new monitoring well was installed in the Frenchman Springs as part of the Phase 1 RI work (MW-28d). MW-28d was installed in the northwest corner of the landfill near potential sources of contamination and the old landfill supply well 33E1. Vertical migration may have occurred through the old supply well which penetrated the Roza aquifer, Interflow aquifer, and deeper Frenchman Springs with an open borehole until May 1986. At that time the well seal was extended downward by cementing; however, the well was later pressure grouted and decommissioned in 1993 because of continued evidence of contamination. Short term aquifer testing of MW-28d indicates a low transmissivity (about 10 gpd/ft).

The Frenchman Springs aquifer is currently monitored by MW-28d.

5.2.2 Site Aquitards

Aquitards are low permeable strata between aquifers and they do not easily transmit water. Basalt aquitards are typically dense (hard), non-weathered basalt, interpreted as the colonnade sections within individual basalt flows. Aquitard thicknesses vary between the site aquifers. P1 and P2 are separated by about 10-ft of dense basalt; P2 and the Roza aquifers are separated by about 20-ft of dense basalt; the Roza and Interflow aquifers are separated by about 50-ft of dense basalt; and the Interflow and Frenchman Springs aquifer are separated by over 150-ft of dense basalt (**Figures 5 and 6**). This anisotropic sequence of basalt aquifers and aquitards promotes horizontal migration. Vertical migration through vertical fractures in the basalt aquitards is also possible, but less dominant where a thick sequence of aquitards separates the aquifers.

The Ringold Formation at the south end of the site (**Figure 5**), is a very fine silty sandstone, siltstone, and claystone at least 70-ft thick. The Ringold aquitard separates the overlying Outwash aquifer from the underlying basalt aquifers within the Wanapum Formation. It appears that the Interflow aquifer subcrops into the Outwash aquifer just above the top of the Ringold aquitard; the Ringold aquitard may not play a significant role in groundwater flow at the site (**Figure 5**). Furthermore, long term groundwater level monitoring on site indicates groundwater levels in the Interflow aquifer are similar to the Outwash aquifer and show identical seasonal variations, suggesting hydraulic connection between the two aquifers. The deeper Frenchman Springs; however, likely occurs well below (75 feet or more) the Ringold aquitard (**Figure 5**).

The Vantage Interbed forms a laterally extensive regional aquitard between the overlying Frenchman Springs aquifer and the deeper Grand Ronde basalt aquifers (**Figure 5**). The Van-

tage aquitard is characterized as ash-rich siltstone about 25-ft thick. As described below, the groundwater level in the underlying Grand Ronde basalt is about 300-ft lower than the overlying Frenchman Springs and well below the Vantage Interbed.

5.2.3 Groundwater Gradients and Flow Directions

Groundwater flows into the aquifers beneath the site mainly from lateral groundwater movement from the north. Sources to the north include leakage from the West Canal and Oasis Park (about ½ mile north-northwest of the site), precipitation, and irrigation.

Historical water level monitoring within the Outwash, Roza, and Interflow aquifers indicate horizontal groundwater gradients are relatively flat (10^{-5} to 10^{-4}) with general site-wide groundwater flow directions in all three aquifers towards the south. However, variable groundwater flow directions are documented as is common in locations with very low hydraulic gradients. For example, the dominant flow direction in the Interflow and Outwash aquifers is south, but flow directions vary from south-southeast to south-southwest directions, and occasionally more easterly or westerly. Similar variations are measured in the Roza aquifer by the maintenance shop with flow directions dominantly south-southwest but with occasional variations to the west, east, and even north. The variations in all three aquifers appear to be somewhat seasonal with more easterly directions generally occurring when water levels are low and more westerly directions generally occurring when water levels are high.

Recent RI work (only two complete synoptic water level data sets collected in November 2008 and January 2009) also indicates local deviations from southward flow directions in the vicinity of the former drum cache.

Southwest flow directions were measured in P1, while northward flow directions were measured in the underlying P2 and Roza aquifer in the vicinity of the former drum cache (**Figure 7**). The local variations in the P1 and P2 flow directions may be related to perched flow on dense basalt with the perching horizon controlling the flow direction, or to highly anisotropic aquifer conditions. The northward flow direction in the Roza aquifer near the former drum cache is likely due to the higher transmissivity of the Roza aquifer to the northwest (in the vicinity of the shop area) acting as a drain. Continued monitoring of water levels in these wells will indicate whether there are seasonal variations to these flow directions. The horizontal groundwater gradients in P1, P2 and the Roza aquifer in the vicinity of the former drum cache are about two orders of magnitude higher (10^{-2}) than site wide gradients. The higher gradients likely reflect the low transmissivities in this area.

Groundwater elevations collected from all Roza aquifer monitoring wells in January 2009 indicated a northwestward flow direction in the Roza aquifer across the north end of the site (**Figure 7**). The northward direction is different from long term monitoring (1990 to present) of Roza aquifers wells near the shop (MW-3b, MW-7b, and MW-9b). Groundwater levels in these wells are typically very similar to each other, with gradients on the order of 10^{-4}, but with MW-9b almost always slightly lower (indicating a southward flow direction). Only three times since water levels were first collected has a northward flow direction been measured in the Roza aquifer near the shop (July 2000, March 2008, and January 2009).

Groundwater elevations throughout the basalt aquifer sequences indicate a downward gradient from P1 through the Roza, Interflow, and Frenchman Springs aquifers. Downward gradients between P1 and P2 by the former drum cache are about 1.5. A value greater than 1 suggests perched conditions in P1. Furthermore, P2 does not appear to be fully saturated, also implying perched conditions in the overlying P1. Pumping in P2 may therefore not affect P1.

Downward gradients between P2 and the Roza aquifer are about 0.2, between the Roza and Interflow aquifer they are about 0.9, and between the Interflow and Frenchman Springs they are about 0.3. Vertical gradients between aquifers are commonly higher than horizontal gradients within aquifers as a result of intervening low permeability aquitards.

Groundwater elevations in the much deeper Grand Ronde basalt aquifer system (as measured in 33M1) are about 300 feet lower than the overlying Frenchman Springs aquifer and well below the Vantage Interbed, indicating a substantial unsaturated zone below the Vantage Interbed. The Vantage Interbed forms a regional aquitard separating the groundwater flow system in the overlying Wanapum from the deeper regional groundwater flow system in the Grand Ronde.

Unlike on site, groundwater elevations in the Interflow aquifer to the northwest (MW-20c, **Figure 7**) are as high as those in the Roza aquifer. The 45-foot water level difference between this well and onsite Interflow aquifer wells suggests a discontinuity in the aquifer, a misidentification of the aquifer, or a groundwater source to the north. The high groundwater elevation in MW-20c may be related to its close proximity to the West Canal and Oasis Park (ie: source of recharge) (**Figure 4**). The elevation of the pond at Oasis Park (about 1280 feet) is above all the groundwater elevations observed in all aquifers on site and in MW-20c. Willows and cattails grow across Railroad Avenue and towards Oasis Park from MW-20c, suggesting shallow groundwater. The well log for MW-20c shows the well to be completed within a highly weathered basalt interval at the typical elevation for the Interflow aquifer. The well log also shows fifty-five feet of highly weathered soft basalt followed by 10-ft of hard, moderately weathered, basalt above the Interflow aquifer with wet conditions throughout the entire thickness. In contrast, about 60-ft of dry hard basalt occurs above the Interflow aquifer in MW-5c (about 2000-ft southeast of MW-20c towards the landfill, **Figure 7**). This difference suggests the Interflow aquifer in the vicinity of MW-20c does not have a significant confining layer above it and leakage from the West Canal and Oasis Park may cause high groundwater levels.

5.3 CONTAMINANT CONCEPTUAL MODEL

The following sections summarize the site contaminants of concern, contaminant sources, and contaminant pathways and extent of migration. This summary is followed by sections that present the soil, gas and groundwater data. This summary and preliminary analysis is based on the data set available to date. The final RI report may include additional analyses and findings not presented in this data report.

5.3.1 Site Contaminants of Concern

Contaminants of concern (COCs) include those listed in the RI/FS Work Plan and additional organic parameters identified during the Phase 1 RI (**Table 2**). The later group includes 1,1,2-

trichloroethane; 1,2,4-trimethylbenzene; 2-butanone, 4-methyl-2-pentanone, and acetone (ketones); chloroform; methylene chloride; and naphthalene.

5.3.2 Contaminant Sources

The highest concentrations of groundwater contaminants are located at the north end of the landfill. Sources and release mechanisms that could potentially contribute to groundwater contamination include:

- Mobilization of residual contamination from the former buried drums
- Leaching of landfill refuse (including saturated refuse in the Hole)
- Diffusion of landfill gas, and
- Mobilization of potential historic releases of materials in the vicinity of the maintenance shop in the northwest corner of the site.

Many of the VOCs found in soils beneath the former drum cache and in soils mixed with landfill refuse are the same contaminants that are detected in groundwater monitoring wells. This suggests releases from the former drum cache and leaching of landfill refuse are both potential sources of groundwater contamination. The VOC concentrations in soils beneath the former drum cache are many orders of magnitude higher than VOC concentrations in the soils mixed with landfill refuse (**Figure 8**), suggesting drum area soils may be a potentially larger source of contribution than refuse in the landfill. The relative magnitude of each potential source's contribution to groundwater contamination would require additional investigation.

VOCs detected in the Roza, Interflow, and Outwash aquifers are also detected in the shallow groundwater (P1 and P2) near the former drum cache. The concentrations measured in the P1 and P2 are orders of magnitude higher than the other aquifers. The high concentration of VOCs in shallow groundwater below the former drum cache is direct evidence of that source's contribution to groundwater contamination; however, additional analyses of contaminant transport, transformation, and degradation processes would be required to further assess VOC sources and pathways.

VOCs detected in the Roza aquifer north of the shop (MW-3b, and MW-7b) differ from those in the Roza aquifer south of the shop (MW-9b), and suggest a different pathway, degradation process and/or source (eg PCE concentrations are an order of magnitude higher south of the shop). VOCs detected in groundwater in the Hole are similar to those detected in the Roza aquifer by the shop; however, concentrations are generally lower and some parameters differ, indicating groundwater from the Hole cannot be the only source of contamination in the Roza aquifer. Again, additional analyses of contaminant transport, transformation, and degradation processes would be required to assess VOC sources and pathways.

Chloride concentrations in the Roza aquifer near the shop, in groundwater in the Hole, and in the Interflow aquifer around the boundary of the landfill are all elevated, suggesting some impact from leaching of landfill refuse. Chloride concentrations in landfill leachate measured on site

range from 3000 to 4000 mg/L. Chloride concentrations are 900 to 1000 mg/L in the Roza aquifer near the shop (MW-3b, MW-7b, and MW-9b), 2000 mg/L in groundwater in the Hole, and 500 to 700 mg/L in the Interflow aquifer around the landfill (MW-2c, MW-5c, and MW-6c). The chloride concentrations in shallow groundwater near the former drum cache are of similar or lower magnitude (50 to 900 mg/L, with one well above 1000 mg/L at MW-33p2). Background chloride concentrations are about 20 mg/L. The site-wide elevated chloride concentrations suggest some impact from leaching of landfill leachate; however, this does not necessarily implicate the landfill as an important source of VOC contamination in groundwater.

Gas VOC concentrations are high enough to contribute to groundwater contamination if diffusion to an aquifer occurs. However, landfill gas cannot be the only source of VOC contamination on site because the VOC concentrations in gas are not high enough to be the only source to groundwater and the gas does not contain all the VOCs that are detected in groundwater.

A number of soil samples collected near the shop but outside the footprint of the landfill had low level (single to double digit ug/Kg) detections of PCE and BTEX, suggesting a historic release. An isolated detection of elevated TCE and cis-1,2-dichloroethene (100 to 1,000 ug/Kg range) also occurred north of the shop, suggesting a local source in this area. These COCs have also been detected in groundwater near the shop area.

5.3.3 Contaminant Pathways and Extent

Groundwater pathways from these northern sources are vertically downward to the first basalt aquifers (P1 and P2); except for leaching from refuse where P1 and P2 don't exist, such as in the Hole. Contaminant pathways in P1 and P2 are horizontal within the water-bearing zones and vertically downward to the underlying Roza aquifer. The horizontal direction is substantially more transmissive than the vertical pathway. Similarly, pathways in the Roza aquifer are horizontal and vertically down to the Interflow aquifer. Pathways in the Interflow aquifer are southward with discharge to the Outwash aquifer and potentially downward to the deeper Frenchman Springs. Vertical pathways between basalt aquifers are through weathered basalt zones and/or vertical joints, and historically through the annulus of the old water supply well 33E1 at the northwest end of the landfill (**Figure 1**). The anisotropic sequence of basalt aquifers and aquitards promotes horizontal contaminant migration and high dilution rates within the deeper aquifers. The high transmissivity of the Outwash aquifer also promotes high dilution rates.

The regional groundwater flow direction on site is towards the south; however, local variations in groundwater flow directions, and potential contaminant pathways, occur in the vicinity of the former drum cache. The flow direction in P1 is to the southwest, while flow in the underlying P2 and the Roza aquifers is to the north (based on two round of groundwater level measurements; November 2008 and January 2009). The northward flow direction in the Roza aquifer near the former drum cache may be due to the higher transmissivity of the Roza aquifer to the northwest (in the vicinity of the shop area) acting as a drain.

The highest concentrations of VOCs in groundwater occur on the north end of the site near the former drum cache in the P1 and P2 zones (total VOCs in excess of 100,000 ug/L). Total VOC concentrations decrease substantially in the basalt below P1 and P2, with maximum concentra-

tions in the Roza aquifer on the order of 100 ug/L, maximum concentrations in the Interflow aquifer on the order of 10 ug/L, and maximum concentrations in the Frenchman Springs aquifer on the order of 1 ug/L. Total detectable VOC concentrations are lowest in the Outwash aquifer - on the order of 0.1 to 1 ug/L.

The highest VOC concentrations in P2 are directly below the highest concentrations in P1, southwest of the former drum cache; however, the highest concentrations in the underlying Roza do not occur directly below the highest concentrations in overlying P2. The highest VOC concentrations in the Roza aquifer near the former drum cache were detected southeast of the drum cache in MW-29b (**Figure 2**). The well log for MW-29b indicates soft weathered basalt between the Roza aquifer and the overlying P2 zone at this location compared to hard unweathered basalt southwest and northwest of the former drum cache at MW-30b and MW-31b (**Figure 2**). This soft weathered basalt may represent a preferential pathway from the P2 to the Roza aquifer immediately southeast of the former drum cache compared to the immediate west. The vertical separation between P1 and P2 is only about 10 feet, while the vertical separation between P2 and the Roza aquifer is about 20 feet.

VOC concentrations detected in the Roza aquifer southwest and northwest of the former drum cache (MW-30b and MW-31b) are lower than the concentrations detected in the Roza aquifer north of the shop (MW-3b and MW-7b), suggesting a direct pathway via the Roza aquifer from the former drum cache area to the shop is not likely. The VOC concentrations from a single sample collected from de-commissioned Roza aquifer well MW-8b in 1990 are also not high enough to suggest a direct path (total VOCs were 3 ug/L). MW-8b is also located between the former drum cache and shop area wells (**Figure 2**). A contaminant pathway to MW-3b and 7b may exist within the P2 zone towards these wells and then vertically downward through soft fractured basalt. Boring logs from MW-3b, 7b and 9b indicate damp weathered zones above the Roza suggesting P2 may be saturated with groundwater in this area. P1 may form the top of rock beneath the shop area. Saturation was observed in a few locations above rock immediately north of the shop at elevations similar to those observed for P1 in the vicinity of the former drum cache. The presence of P1 and P2 in this area, and the extent of contamination, if any, in the shop area is not known.

P1 and P2 may sub-crop into the Hole and contribute to contamination in groundwater in the Hole (**Figure 6**). Groundwater elevations in P1 and P2 are above the groundwater elevation in the Hole. The flow direction in P1 appears to be towards the southwest, in the direction of the Hole, but the well log for abandoned well MW-8b near the Hole describes hard dry basalt where P1 would be expected; it is therefore not clear whether P1 sub-crops into the Hole. The flow direction in P2 is to the north, not in the direction of the Hole; however, the well log for abandoned well MW-8b describes 7 ft of weathered moist basalt with a field PID reading of 40 parts-per-million at the P2 stratigraphic position. It is likely that P2 sub-crops into the Hole. In addition to advection with groundwater, vapor contaminant transport in P2 towards the Hole is a possible transport mechanism. P2 does not appear to be fully saturated.

The following sections describe in more detail the analytical results of the soil, gas, and groundwater investigation.

6.0 SOIL DATA

Soil work for the RI focused on two possible contaminant sources: the northwest corner of the landfill/maintenance shop area and soils below the excavated drum cache on the north end of the landfill[4]. Soils from the northwest corner of the landfill and shop area were collected in August and September 2007 from 14 test-pits (T-series sample ID's) and 16 sonic borings (B-series sample ID's) excavated and drilled to bedrock[5] (**Figures 2 and 8**). Boring and test pit logs are provided in **Appendix A**. Two of the borings in the area of the Hole encountered groundwater near the top of bedrock and were completed as monitoring wells (W-9 and W-12, **Figure 2**). A total of 91 soil samples were collected for field screening analyses and a subset of 40 samples were submitted for laboratory analyzes of selected inorganics, metals, and volatile organic compounds (VOCs).

Soils below the excavated drum cache were collected in two phases. The first phase consisted of 13 samples collected in July 2008 from soils directly below the removed drum cache (**Figure 2**; S-series sample ID's). Sample locations were spaced uniformly below the drum cache footprint. The purpose of this first soil sampling phase was to document contaminants released from the drum cache. Phase 1 soils were analyzed for selected inorganics, metals, herbicides, pesticides, PCBs, VOCs, and semi-volatile organics (SVOCs).

After sampling soils from directly below the excavated drum cache, soils were removed vertically to bedrock and laterally until PID readings were within background ranges or excavation was no longer feasible. After soil removal, a total of 12 residual soil samples (**Figure 2 and 8**, SS-series and "16,-B" sample ID's) were collected at locations of expected high concentration at the end of observable contaminant pathways and within joints between basalt columns. All residual samples were collected at the top of bedrock in August 2008 and analyzed for selected inorganics, metals, PCBs, VOCs, and SVOCs[6]. The purpose of this second soil sampling phase was to document maximum concentrations of contaminants remaining below and around the drum excavation.

Both phases of soil samples from below the excavated drum cache were analyzed for the full suite of EPA method 8260 VOCs, while test-pit and borings soil samples collected from the northwest corner of the landfill were analyzed for a subset of VOCs based on groundwater contaminants of concern (COCs) identified in the RI/FS Work Plan (**Table 2**). Some of the contaminants detected in the soils below the excavated drum cache (such as ketones, methylbenzenes, and some chlorinated organic compounds) were not analyzed in soils collected from the northwest corner of the landfill; therefore not all VOC constituents from the two potential sources can be directly compared. However; the extensive groundwater dataset is consistent across site and can be used to address different sources.

[4] Liquids and seeps encountered during the drum excavation and soils-below-drums investigation are discussed in the Groundwater Data section below.

[5] Test pit T-14 was not excavated to bedrock due to limits of backhoe

[6] Herbicides and pesticides were not detected during the first phase of soils sampled directly below the former drum cache; they are also not a COC in groundwater. Therefore, herbicides and pesticides were *not* analyzed during the residual soil sampling phase.

Laboratory detection limits for the first phase of soils collected below the excavated drum cache (S-series) and for the most contaminated residual samples (SS-series) were one to two mg/Kg (parts-per-million), while detection limits for other soil samples (northwest corner of landfill and less contaminated SS-series samples) were generally one to two ug/Kg (parts-per-billion). Soil samples with the higher detection limits may not indicate the full suite of contaminants present.

6.1 SOIL ANALYTICAL RESULTS

The summed-total VOCs (ug/Kg) for soils collected from test pits, borings and residual soils below the former drum cache are shown in **Figure 8**. Since the test pits and borings were only analyzed for a subset of VOCs based on original groundwater COCs (**Table 2**), only that subset of VOCs are shown on the figure so that they can be compared with the former drum cache area soil samples. For example, ketones (acetone, MIBK, 2-butanone, and 2-hexanone) were detected at high concentrations from the former drum cache area soils, but these compounds were not analyzed for the test pit and boring soil samples and are therefore not depicted on **Figure 8**. For detailed laboratory soil results refer to **Tables 4-7**.

Soil analytical results for samples collected near the former drum cache and for samples collected in the northwest corner of the landfill property are discussed separately below.

6.1.1 Analytical Results near Former Drum Cache

The analytical results for soil samples collected directly below the drums (soil-below-drums) and final residual soil samples are summarized in **Tables 4 and 5. Figure 2** shows the location of the soil samples. Results of the two soil sampling events are discussed below.

6.1.1.1 Soil below Drums

Total VOCs in the soil-below-drums ranged from 200 mg/Kg to nearly 15,000 mg/Kg (1.5 percent). The sum of benzene, ethylbenzene, toluene, and xylene (total BTEX) was the highest class of VOCs in all but one sample. Toluene was generally the dominant constituent whereas benzene was detected in only one soil sample (near the detection limit). Ketones (acetone, 2-butanone, and 4-methyl-2-pentanone (MIBK)) were the next most prominent contaminant class. Chlorinated ethenes, chlorinated ethanes, and methyl benzenes were also present (**Table 5**). Elevated concentrations of the following chlorinated organic compounds were detected at discrete locations: trichloroethene (TCE) was detected in sample S-10 at 1,000 mg/Kg; tetrachloroethene (PCE) was detected in sample S-4 at 1,400 mg/Kg; and 1,1,1-trichloroethane was detected in sample S-3-B at 2,600 mg/Kg.

PCBs (aroclor-1242) were detected in the soil-below-drums samples with concentrations ranging from 14 mg/Kg at station S-1 to 240 mg/Kg at station S-11 (**Table 5**). A lower concentration of aroclor-1260 (3.3 mg/Kg) was also detected at station S-6. Detected SVOCs were mainly phthalates in the single to double digit mg/Kg range, with one sample in the triple digit range; bis(2-ethylhexyl)phthalate was detected at 150 mg/Kg in sample S-3-B (**Table 5**). Pesticides and herbicides were not detected in the soil-below-drum samples.

Contaminants were distributed in two areas of relatively high concentrations. One area occurred near S-3 through S-5 and another area occurred near S-8 through S-12 (**Figure 2**). These two areas are separated from each other by relatively lower concentrations observed in S-6 and S-7. S-6 and S-7 are located on a high in the underlying bedrock that may have acted to separate contaminants in the two local maxima. The bedrock elevation in the drum excavation was surveyed with a high resolution laser scan allowing for small scale (0.5-ft vertical relief) topographic features to be discerned (**Figure 2**).

6.1.1.2 Residual Soil

Total VOCs in the residual soil samples were orders of magnitude less than the soil-below-drums samples, with values ranging from less than 1 mg/Kg to about 4,500 mg/Kg. The maximum residual contamination occurred within fracture fillings in the top of the basalt surface in the center of the drum excavation (SS-5 and SS-8) and at the two stations along the southern edge of the excavation (SS-1 and SS-2). Contaminant concentrations were lowest (single digit mg/Kg or less) along the north, east, and western edges of the excavation (except for SS-6 in the northwest where concentrations were double digit mg/Kg). The highest residual contamination occurred along the southern edge of the excavation at station SS-2 (**Figure 8**). Sample SS-2 was collected from a low, narrow, basalt colonnade joint channel surrounded by areas of higher basalt colonnade. Released contaminants may have been concentrated in these low-lying narrow joint channels.

Similar to the soil-below-drums, total BTEX was the highest class of VOCs with toluene being the dominant constituent. Benzene was not detected in the residual samples, but this may be related to high detection limits for the most contaminated samples. Ketones were less prominent, but this too may be due to elevated detection limits. Chlorinated ethenes, chlorinated ethanes, and methylbenzenes were also present (**Table 5**). Concentrations of tetrachloroethene (PCE) and trichloroethene (TCE) were noticeably higher at station SS-2 (250 mg/Kg and 25 mg/Kg respectively) compared to most other samples, although PCE was detected in SS-8 (11 mg/Kg) and TCE was detected in SS-5 (29 mg/Kg).

PCBs (aroclor-1242) were detected in 9 of the 12 residual soil samples with concentrations ranging from less than 1 mg/Kg at SS-9 and 16, -B to 310 mg/Kg at SS-10 (**Table 5**). Lower concentrations of aroclor-1254 and aroclor-1260 were also detected in a few samples; with all but one sample being less than 1 mg/Kg (aroclor-1254 was detected at 10 mg/Kg in sample SS-1).

Detected SVOCs were mainly phthalates in the single to double digit mg/Kg range, except at station SS-2 where bis(2-ethylhexyl)phthalate was detected at 260 mg/Kg.

6.1.2 Analytical Results at Northwest End of Landfill Property

Soil samples collected at the northwest end of the landfill property were collected above the water table, therefore migration from the drums to these soils via groundwater is not possible and as such they represent a different potential source of contamination than the former drum cache. Although the drum area soils were in contact with shallow groundwater, mobilized contaminants

from the drum area would only occur below or near the water table, except for limited vapor migration.

The analytical results for soil samples collected from exploratory borings and test pits at the northwest end of the landfill are summarized in **Tables 6 and 7**. **Figure 8** shows sample locations and total summed VOCs.

Total VOCs ranged from non-detect to 16,610 ug/Kg (or 16.6 mg/Kg). These low to modest concentrations vary from station to station and with depth at a particular station. Fourteen different VOCs were detected: 1,2-dichloropropane; 1,4-dichlorobenzene; benzene; chloroethane; cis-1,2-dichloroethane; ethylbenzene; methylene chloride; o-xylene; tetrachloroethene; toluene; trans-1,2-dichloroethene; trichloroethene; vinyl chloride; and total xylene.

The highest soil VOC concentrations were found in excavations where abundant refuse was observed. Generally, soils excavated outside the footprint of the landfill consisted of sand and gravel with some metal, glass, asphalt, and wood. Within the footprint of the landfill, and in the vicinity of T-12 and T-13 just north of the footprint, the excavated material was dominantly household refuse with a strong garbage odor. Metal, glass, asphalt and wood were also noticeably more abundant and charred in the vicinity of T-5 north of the shop.

In general total BTEX was the highest class of VOCs detected in soil samples. Other key observations are as follows:

- Low levels of methylene chloride was the only constituent detected in soil samples northwest, west, and southwest of the shop (**Figure 8**).

- Trichloroethene (TCE) and cis-1,2-dichloroethene were the only VOCs detected at T-5 north of the shop in a location that may have had a stormwater feature at one time (dark rectangular area viewed on a low resolution 1976 air photo). The concentrations of these contaminants are in the 100 to 1000 ug/Kg range of magnitude (or 0.1 to 1 mg/Kg) compared to the 1 to 10 ug/Kg range (or 0.001 to 0.01 mg/Kg) from surrounding soils (**Figure 8** and **Table 7**).

- A number of soil samples collected north of the shop, outside the footprint of the landfill, had low level (single to double digit ug/Kg) detections of PCE and BTEX.

- Tetrachloroethene (PCE); cis-1,2-dichloroethene; and 1,4-dichlorobenzene were the dominant VOCs detected at station T-13 east of the shop near the recycling storage shed. This test pit had the highest total VOC concentrations of all soils in the northwest part of the site. The log for T-13 shows abundant refuse (**Appendix A**).

Most of detected VOCs in soils from the northwest end of the landfill property are also in soils near the former drum cache, and similar to those detected in groundwater. This indicates that releases from the former drum cache and leaching of landfill refuse are both potential sources of groundwater contamination.

7.0 GAS DATA

Gas work for the RI focused on assessing possible groundwater contamination from gas migration associated with decomposing landfill refuse. Contaminants can diffuse or advect with migrating landfill gas (which is largely methane and carbon dioxide) with subsequent diffusion into the underlying groundwater.

Gas sampling consisted of field screening 43 landfill gas extraction wells (GE-series) and 14 temporary gas probes installed in test pits (T-series) for methane concentration and total VOCs with a field PID. The field screening was then used to select 18 gas samples for laboratory analysis of individual VOCs (EPA method 8260). Originally 20 samples were collected for laboratory analysis, but sample bags from GE-29 and GE-35 ruptured in shipment.

7.1 GAS ANALYTICAL RESULTS

Gas analytical results are summarized in **Table 8** and detected VOCs are summarized in **Table 9**. The laboratory units in **Table 8** are ug/L, which is not the same as parts-per-billion in air. The detected VOCs are converted to parts-per-billion gas in **Table 9** using the Ideal Gas Law[7] and molecular weight of the constituent.

The summed-total VOC concentrations range from about 1,000 to 26,000 ppbv, or 1 to 26 ppmv (**Figure 9**). These concentrations are within the normal concentration range reported for municipal solid waste landfills (Tchobanoglous, Theisen and Vigil, 1993) and there do not appear to be any significant "hot-spots" in the gas data. Nonetheless, these concentrations are high enough to contaminate groundwater (Bentley and Smith, undated). Furthermore, advective flow and diffusion carrying the gas downward to the water table can result in gas concentrations higher at depth than in the landfill refuse itself (Bentley and Smith, undated).

Twelve different VOCs were detected in the gas samples: 1,1-dichloroethane; 1,2,4-trimethylbenzene; chloroethane; cis-12-dichloroethene; dichlorodifluoromethane (CFC 12); ethylbenzene; o-xylene; p-isopropyltoluene; toluene; trichlorofluoromethane (CFC 11); vinyl chloride; and total xylene. Parameters most commonly detected and with the highest observed concentrations were dichlorodifluoromethane (CFC 12); toluene; ethylbenzene; vinyl chloride; and total xylene.

At most stations the sum of benzene, toluene, ethylbenzene, and xylene (BTEX) was the dominant VOC gas (although benzene was not detected in the landfill gas samples); followed by vinyl chloride and CFC's. Stations with the highest total VOC concentrations occur mainly along the southern area of the landfill (**Figure 9**). 1,2,4-trimethylbenzene, p-isopropyltoluene, and cis-12-dichloroethene were only detected at the southern end of the landfill (GE-19 and GE-17). These higher concentrations and additional constituents may be related to the younger age of the refuse at the southern end of the landfill compared to the northern end.

[7] Ideal Gas Law states PV=nRK where P is atmospheric pressure, V is volume, R is gas constant, K is temperature and n is the number of moles. To convert from ug/L to ppb: ppb = C*24,000/MW (where P = 1 atm, K = 22 degrees Celsius, C = concentration in ug/L, and MW = molecular weight)

1,1-dichloroethane and chloroethane were detected in GE-7 near the former drum cache. These VOCs were not detected in any of the other gas samples and may be related to releases from the drums. Both these constituents were detected in the shallow groundwater samples near the former drum cache (see groundwater data section below). VOCs were not detected at T-14 (test pit closest to the former drum cache); however, T-14 was only excavated about 10 feet due to limitation of the back-hoe, whereas GE-7 was installed at a depth of 45 feet.

The presence of VOCs in the landfill gas suggests that active gas extraction may be useful as a remedial measure to reduce groundwater VOC contamination. Gas extraction from wells along the southern boundary could be particularly valuable because of its upgradient proximity to the new active landfill. The gas wells were connected to a flare as part of the 2008 cap construction. The flare was started in January of 2009. Landfill gas flows to the flare because pressure within the landfill is slightly higher than the atmospheric pressure at the flare outlet. Although the landfill gas system could be converted to an active system (gas withdrawn under vacuum) by the addition of a blower, high soil permeability at this site raises the potential for starting a landfill fire by introducing oxygen into the waste; the higher the vacuum, the greater the potential for air infiltration and fires. The potential to further reduce any landfill gas contribution to groundwater VOC contamination by activating the gas system has not been estimated. If gas system activation is considered, the potential groundwater VOC reductions will need to be weighed against the potential for starting subsurface fires.

8.0 GROUNDWATER DATA

Groundwater work for the RI focused on assessing the nature and extent of groundwater contamination in different aquifers within the regulatory framework of MTCA (see Section 3 above). To meet these objectives, four new monitoring wells were installed and tested around the perimeter of the site as described in the original RI/FS Work Plan. Ten new monitoring wells were also installed and tested near the former drum cache. The objective of installing the ten new wells near the former drum cache was to investigate shallow groundwater observed above the Roza aquifer during the drum removal and soil-below-drums investigation. The new monitoring wells are referred to as RI wells to contrast them with the existing site monitoring wells (**Figure 1**). RI well logs are provided in the **Appendix A**. New and existing wells are also summarized in **Table 1**.

Three of four groundwater sampling events planned for the RI are presented in the following sections (the fourth event is scheduled to take place in spring 2009). The sampling events included testing all RI and existing site monitoring wells for COCs identified in the original RI/FS Work Plan, which include VOCs and select inorganic compounds and metals. In addition to these parameters, each well was sampled once for natural attenuation parameters: dissolved carbon dioxide, methane, ethane, and ethene. Field parameters collected during sampling were pH, specific conductance, and temperature. Oxidation reduction potential, dissolved oxygen, and hydrogen sulfide field parameters were also collected at least once. Dissolved oxygen and hydrogen sulfide were measured with colorimetric kits. Specific conductance, pH, and oxidation reduction potential were measured with a Horiba U2 Multi-Meter probe or a Hanna HI multi-parameter meter.

Sampling events took place in April, July and November 2008. The ten new RI monitoring wells near the former buried drum site were not installed until fall 2008 and were therefore only sampled during the third sampling event in November 2008. Furthermore, not all drum area wells were sampled for the full suite of COCs due to very low well yields. All drum area wells were; however, sampled for the full suite of VOC method 8260 parameters (except MW-36p1 as discussed below). Five groundwater samples were also collected for VOC method 8260 analysis during drilling of the ten drum area wells from intervals above the well completion depths. These data are also summarized.

Groundwater work for the RI also consisted of managing, extracting, and sampling interstitial liquids and seeps of shallow groundwater within the drum excavation during drum removal and soil-below-drums investigation. These data are summarized below.

Finally, work for the RI also consisted of extracting and sampling groundwater from the Hole during the spring of 2008 as part of the Interim Corrective Actions agreement (EW-1 in **Figures 1 and 2**). These data are also summarized.

The following sections summarize the results of three rounds of groundwater sampling; analytical results for the interstitial and seeps sampled during the drum investigation; and analytical results for groundwater sampled from EW-1.

8.1 GROUNDWATER ANALYTICAL RESULTS

Analytical results for the three sampling events and samples collected during drilling of drum area wells are summarized in **Tables 10-17** and total VOCs for each aquifer are summarized in **Figures 10-14**.

Total detectable VOCs are highest at the north end of the landfill and within the shallowest portions of the basalt near the former drum cache. P1 and P2 have maximum total VOC concentrations on the order of 100,000 ug/L. Total VOC concentrations decrease substantially in the basalt below P1 and P2, with maximum concentration in the Roza aquifer on the order of 100 ug/L, maximum concentrations in the Interflow aquifer on the order of 10 ug/L, and maximum concentrations in the Frenchman Springs aquifer on the order of 1 ug/L. Total detectable VOC concentrations are lowest in the Outwash aquifer - on the order of 0.1 to 1 ug/L.

In general, the groundwater chemistry for each well was fairly consistent between sampling events. The following sections summarize the groundwater chemistry for each aquifer and comparison to MTCA Method-A cleanup levels.

8.1.1 Outwash Aquifer

Total VOCs from eleven samples collected from Outwash aquifer wells during the Round 2 sampling event ranged from 0.07 ug/L (MW-17a along Hwy 28) to 1.2 ug/L (MW-23a[8] at south end

[8] The total VOC for MW-23a is dominated by Bromoform which was detected at 1.1 ug/L during the second sampling event.

of site) (**Figure 10**). VOCs detected in Outwash aquifer wells from all three sampling events typically included tetrachloroethene (PCE) in most wells. Trichloroethene (TCE) was also detected in a number of wells on the west side of the landfill. The concentrations of PCE and TCE were slightly above the laboratory reporting limits, with PCE concentrations ranging from about 0.03 ug/L to 0.3 ug/L and TCE concentrations range from about 0.02 ug/L to 0.1 ug/L. A few other VOCs at similar low concentrations were detected during one or more of the three sampling events in MW-14a, MW-17a, and MW-18a and include one or more of the following: 1,1-dichloroethene, 1,1-dichloroethane, and trichlorofluoromethane. Bromoform was also detected in MW-17a, MW-25a and MW-26a during the first sampling event at concentrations of 0.2 to 0.5 ug/L and in MW-23a at 1.1 ug/L during the second sampling event. Most of these constituents were previously not detected in the Outwash aquifer during routine landfill monitoring; likely because laboratory reporting limits were typically 1ug/L for VOCs. For the RI investigation, selected ion monitoring (SIM) VOC analysis was requested for selected parameters, thus providing lower laboratory reporting limits of 0.02 ug/L. Also medium-level laboratory reporting limits for the normal VOC-8260B were requested. Standard-level laboratory reporting limits are 1 ug/L for most VOCs, while medium-level limits are 0.2 ug/L for most VOCs. The lower reporting limits were requested for the RI in order to compare to screening levels identified in the RI/FS Work Plan.

Inorganic chemistry for the Outwash aquifer wells is fairly consistent across the site, with low total dissolved solids and relatively low chloride. A plot of relative percentage of major cations and anions (Trilinear Diagram) for each well is shown in **Figure 15**. The relative position of the overall ion combination is presented in the upper diamond. Three groups of water types are apparent in the upper diagram, with the Outwash aquifer wells plotting in the group towards the middle left indicating relatively low levels of chloride and sulfate compared to the other anions. Water chemistry from surface water at Oasis Park and West Canal also plot with this group (water quality samples for surface water were collected in June 2005).

All detected COCs in the Outwash aquifer monitoring wells are well below MTCA Method-A cleanup levels (**Table 3**).

8.1.2 P1 Zone

Total VOCs from five samples collected in P1 near the former drum cache ranged from 144 ug/L (MW-37p1) to 316,960 ug/L (B-22-P1, groundwater sample during drilling of MW-30b). MW-37p1 is located about 100-ft upgradient (northeast) from the former drum cache and B-22-P1 is located about 75-ft downgradient to the south (**Figure 11**). During sampling of B-22-P1 a floating, brown, liquid phase was noted in the water sample. A floating, brown, phase was also noted in MW-36p1 (also south of the former drum cache and immediately north of B-22-P1). MW-36p1 was not sampled for the full suite of COCs due to the presence of a floating phase. Instead, a Keck Instrument, Inc. KIR-89 Interface Probe was used to measure the product level and thickness which was found to be non-measurable, indicating insignificant thickness (i.e. sheen). A sample was collected for hydrocarbon analysis, which indicated a dominance of diesel and motor oil range hydrocarbons (**Table 14**). Chemical sorbent pads attached to a cable line were lowered to the top of the water column to help absorb any free product in this well. The sorbent

pad will be pulled during the 4th groundwater sampling event (Spring 2009) and replaced with new absorbent, if adsorbed free product is observed.

The second highest total VOCs were collected from MW-34p1 (266,676 ug/L), also south of the former drum cache. Floating product was not observed in the water sample collected from this well (a sheen was also not observed). Both MW-34p1 and MW-36p1 were constructed as 4-inch diameter wells for possible future groundwater extraction. Short term pumping tests indicate MW-34p1 is completed in a fairly high water production zone compared to the other drum area wells, making this well a good candidate for extraction (transmissivity of about 400 gpd/ft versus 10 gpd/ft or less for the other wells).

The two highly contaminated samples collected south of the drum cache (MW-34p1 and B-22-P1) were dominated by ketones and total benzene, toluene, ethylbenzene, and xylene (BTEX, mainly toluene). Relatively high concentrations of chlorinated ethenes and ethanes were also present with the dominant constituents (greater than 1,000 ug/L) in both wells being 1,1-dichloroethane, 1,1,1-trichloroethane, and cis-1,2-dichloroethene. 1,2-dichloroethane (EDC) was also detected at concentrations greater than 1,000 ug/L in MW-34p1 and methylene chloride and 1,2,4-trimethylbenzene were detected at concentrations greater than 1,000 ug/L in B-22-P1. High concentrations of trichloroethene (TCE) (580 ug/L) and tetrachloroethene (PCE) (700 ug/L) were also detected in B-22-P1 and elevated concentrations of vinyl chloride, methylbenzenes and 1,2-dichloropropane were detected in both wells (**Tables 15 and 17**).

Total VOCs from three samples collected northeast (MW-32a[9] and MW-37p1) and southeast (B-19-P1, collected during drilling of MW-29b) of the former drum cache were two orders of magnitude lower in concentration than the samples above (**Figure 11**):

- Total VOCs from MW-32a (northeast corner of the former drum cache excavation) were 1,584 ug/L.
- Total VOCs from MW-37p1 (about 75-ft northeast of MW-32a) were 144 ug/L
- Total VOCs from B-19-P1 (collected during drilling of MW-29b, southeast of the former drum cache) were 1,159 ug/L.

BTEX compounds were the dominant class of VOCs in MW-32a followed by chlorinated ethenes and ethanes. Both samples collected northeast of the former drum cache (MW-32a, and MW-37p1) had similar detected ethenes and ethanes including 1,1-dichloroethane, 1,1,1-trichloroethane, 1,2-dichloropropane, cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene. MW-32a also had relatively high concentrations of methylbenzenes and vinyl chloride. Notably, ketones were not detected in either of the northeastern wells. Moderate concentrations of ketones and BTEX compounds were detected to the southeast in B-19-P1 and the dominant VOCs were 1,1-dichloroethane and chloroethane (**Table 17**).

[9] MW-32a was installed in the furthest northeast corner of the former drum cache excavation at bedrock to monitor the largest seep entering the excavation from the northeast. The top of bedrock in the former drum cache excavation is interpreted to be the P1 zone.

Low concentrations of acetone (20 ug/L) and toluene (1 ug/L) were detected in a groundwater sample collected from a wet zone above the P1 northwest of the former drum cache (B-26-P0, **Figure 11**). This zone has been named "P0" and is about 5-ft above P1 and 25-ft above P2 at this location. Concentrations of acetone and toluene were three orders of magnitude higher in P2 at this location. Although the elevation of P0 is located above the elevation of a known source, vapor transport from the deeper P2 zone may be the source of the detections in P0.

The groundwater flow direction in P1 in the vicinity of the former drum cache, based on 2 rounds of measurements, is towards the southwest (**Figure 7**). MW-37p1 is located about 100-ft upgradient of the former drum cache and the detection of total VOCs in the 100 ug/L range suggests either groundwater flow directions change periodically, there has been vapor contaminant migration, or another possible source of contaminants may exist towards the northeast.

Analysis of samples for inorganic parameters was limited to sampling MW-34p1, MW-32a, and MW-37p1 due to low well yields (**Table 15**). High concentrations of chloride, alkalinity, total iron, total manganese, and total dissolved solids (TDS) were detected in MW-34p1. A plot of relative percentage of major cations and anions (**Figure 15**) show MW-32a plotting in the same group as the Outwash aquifer wells and MW-34p1 plotting close to this group but slightly closer to the group with moderate to high relative chloride and sulfate concentrations (not all ions were analyzed for MW-37p1).

Many of the VOCs detected in P1 wells south of the former drum cache are above MTCA Method-A clean up levels. A few VOCs above MTCA Method-A clean up levels also occur in upgradient well MW-37p1. However, all former drum cache area wells are located within the proposed conditional point of compliance (**Figure 3**).

8.1.3 P2 Zone

Total VOCs from five samples collected from P2 near the former drum cache ranged from 1,274 ug/L (MW-33p2) to 105,766 ug/L (B-22-P2, groundwater sample collected from P2 during drilling of MW-30b). Both samples are located south of the former drum cache, with MW-33p2 located further from the drum cache (**Figure 12**). The highest VOC concentrations sampled in P2 (B-22-P2) occurred in the same boring where the highest VOC concentrations were detected in overlying P1 (B-22-P1). The lowest total VOC concentrations were sampled from MW-33p2, immediately southeast of B-22-P1. Relatively higher VOC concentrations were detected in samples collected northwest of the former drum cache in MW-38p2 (24,570 ug/L) and B-26-P2 (35,835 ug/L; sample from P2 during drilling of MW-31b) (**Figure 12**). These concentrations suggest migration initially southward from the drum cache in P1, then downward to P2, and then northward in P2.

Two rounds of groundwater level measurements collected from P2 monitoring wells indicate that the groundwater flow direction in P2 in the vicinity of the former drum cache is towards the north (**Figure 7**). This may explain the higher VOC concentrations in the two wells northwest of the former drum cache compared with MW-33p2 south of the former drum cache. The extent of northward transport is not known.

Similar to conditions in P1, the VOCs detected in P2 wells are dominated by ketones and BTEX compounds, except for MW-33p2 to the far south where the dominant VOC was chloroethane followed by BTEX compounds and noticeably less ketone (**Figure 12**). Relatively high concentrations of other VOCs include 1,1-dichloroethane, 1,2-dichloropropane, trimethylbenzenes, and vinyl chloride (**Tables 15 and 17**).

Select inorganic chemistry from samples collected from MW-33p2 and MW-35p2 indicate high concentrations of chloride, alkalinity, total iron and total manganese. A plot of relative percentage of major cations and anions show MW-33p2 and MW-35p2 plotting with the moderate to high chloride and sulfate group (**Figure 15**).

Many of the VOCs detected in P2 wells are above MTCA Method-A clean up levels. As mentioned above, all former drum cache area wells are located within the proposed conditional point of compliance boundary (**Figure 3**).

8.1.4 Roza Aquifer

Total VOCs from seven samples collected from Roza aquifer wells during the Round 2 and Round 3 RI sampling events ranged from non-detect off-site to the northwest (MW-19b) to 294 ug/L about 100-ft southeast of the former drum cache (MW-29b) (**Figure 13**). Total VOCs detected in Roza aquifer wells immediately southwest and northwest of the former drum cache (MW-30b and MW-31b respectively) were less than the total VOCs detected in Roza aquifer wells further northwest (north of the maintenance shop, MW-3b, and MW-7b). The total VOCs detected in MW-30b and MW-31b were 72 ug/L and 104 ug/L respectively, while the total VOCs detected in MW-3b and MW-7b were 238 and 203 ug/L respectively. Furthermore, the VOCs detected MW-3b and MW-7b are noticeably different from MW-30b and MW-31b, but more similar to MW-29b, with elevated concentrations of chloroethane, vinyl chloride, dichlorobenzenes, 1,2-dichloropropane and methylene chloride (**Table 15**). These constituents were either non-detect or at very low concentrations in MW-30b and MW-31b. VOCs detected in MW-30b were dominated by BTEX and ketones with moderate concentrations of chlorinated ethenes and ethanes, and VOCs detected in MW-31b were dominated by ketones (**Figure 13**).

The well logs for the Roza aquifer wells (see **Appendix A**) in the vicinity of the former drum cache indicate soft basalt between the Roza aquifer and overlying P2 at MW-29b, while hard basalt separates the two zones at MW-30b and MW-31b. The harder basalt on the west side of the former drum cache may limit vertical migration of contaminants down to the Roza aquifer more than the soft basalt on the east side.

Based on two rounds of measurements, the groundwater flow direction in the Roza aquifer in the vicinity of the former drum cache is towards the north (similar to overlying P2). However, given the chemistry described above, and the very low transmissivity of the Roza aquifer in this area, contaminant transport towards the north may be more prevalent within the overlying P2 than in the Roza aquifer.

The VOCs detected in the Roza aquifer south of the maintenance shop (MW-9b) are noticeably different from other Roza aquifer wells. For example, the highest concentrations of PCE detected

in the Roza aquifer are detected in MW-9b (7 ug/L). PCE is typically non-detect north of the maintenance shop (MW-3b and MW-7b) and was low or non-detect in the vicinity of the drums (MW-29b, MW-30b, and MW-31b). This suggests a difference in contaminant migration pathway, degradation process, and/or source to the Roza aquifer south of the shop.

Inorganic chemistry indicates high concentrations of chloride in MW-3b, MW-7b, and MW-9b (about 1000 mg/L). Moderate to low concentrations of chloride were detected near the former drum cache in MW-29b (300 mg/L), MW-30b (10.4 mg/L), and MW-31b (5.7 mg/L). Low chloride concentrations are also detected in off-site well MW-19b (21.4 mg/L).

Roza aquifer wells with the highest chloride concentrations (MW-3b, MW-7b, and MW-9b) also had relatively high concentrations of alkalinity, total iron, total manganese, and sulfate, except for total iron in MW-9b, which was relatively low. A plot of relative percentage of major cations and anions shows the most contaminated Roza aquifer wells (MW-3b, MW-7b, MW-9b and MW-29b) plotting with the moderate to high chloride and sulfate group, and the least contaminated Roza aquifer wells (MW-30b and MW-31b) plotting with the low chloride and sulfate group (**Figure 15**). The offsite Roza aquifer well (MW-19b, northwest of site) plots in the high chloride and sulfate group because of relatively high sulfate (600 mg/L), even though chloride is very low.

A few VOCs detected in the proposed conditional point of compliance Roza aquifer wells (MW-3b and MW-7b) are above MTCA Method-A cleanup levels (**Table 3**). They include: 1,2-dichloropropane, benzene, chloroethane, and vinyl chloride.

8.1.5 Interflow Aquifer

Total VOCs from six samples collected from Interflow aquifer wells during Round 2 RI sampling event ranged from non-detect (MW-4c and off site wells MW-20c and MW-21c) to 30 ug/L (MW-5c) (**Figure 14**). MW-5c is located along the west side of the original landfill.

Low level VOCs detected in Interflow aquifer wells MW-2c, MW-5c, MW-6c and MW-22c include 1,1-dichloroethene, 1,1-dichloroethane, trichloroethene (TCE), cis-1,2-dichloroethene, and tetrachloroethene (PCE) (**Tables 11,13 and 15**). Low concentrations of vinyl chloride and 1,2-dichloroethane also occur in MW-5c. Notably, ketones and BTEX are not detected.

Inorganic chemistry indicates moderate concentrations of inorganic constituents except for moderately high concentrations of chloride in MW-2c (712 ug/L), MW-5c (494 ug/L), and MW-6c (641 ug/L), which is likely related to landfill leachate (which contains 3000 to 4000 mg/L chloride as measured in on site landfill leachate). A plot of relative percentage of major cations and anions (**Figure 15**) show the most contaminated wells with the highest chloride concentrations plotting in the high chloride and sulfate group (MW-2c, MW-5c, and MW-6c). MW-22c plots in the moderate chloride and sulfate group, and MW-4c and MW-20c (non-contaminated Interflow aquifer wells) plot in the low chloride and sulfate group similar to Outwash aquifer wells and surface water at Oasis Park and West Canal (**Figure 15**). Landfill leachate samples (lysimeters) plot slightly right of the groundwater dataset with high chloride but less calcium and more sodium and potassium (**Figure 15**).

PCE, vinyl chloride and nitrate are the only COCs above MTCA-Method-A in the Interflow Aquifer at the proposed conditional point of compliance (MW-5c in **Table 3**). Boring logs suggest the Interflow aquifer sub-crops into the Outwash aquifer east, west and south of the site. Given the southerly groundwater flow direction (**Figure 7**) and truncation of the Interflow aquifer, the extent of offsite migration in the Interflow aquifer is likely quite limited.

8.1.6 Below the Interflow

Total VOCs detected in MW-16d (below the Interflow aquifer but above the Frenchman Springs) were zero (non-detect) for all three RI sampling events. MW-16d is located next to MW-22c and immediately south of the original landfill (**Figure 14**). Total VOCs detected in MW-28d (Frenchman Springs aquifer) during Round 3 RI sampling were 6 ug/L. MW-28d is located along the west side of the original landfill and just west of MW-5c (**Figure 14**).

The Frenchman Springs aquifer well (MW-28d) was sampled twice (Round 1 and Round 3). The dedicated pump failed during the Round 2 sampling event. The list of VOCs detected in the Frenchman springs aquifer (**Tables 11 and 15**) was similar to the list in the overlying Interflow aquifer, but concentrations were lower: 1,2-dichloropropane, 1,1-dichloroethane, trichloroethene (TCE), cis-1,2-dichloroethene, and tetrachloroethene (PCE).

MW-16d and MW-28d have low to moderate concentrations of most inorganic parameters although chloride was slightly elevated (100 mg/L, Round 3) in MW-28d. A plot of relative percentage of major cations and anions (**Figure 15**) show MW-28d plotting with the moderate to high chloride and sulfate group. MW-16d plots with the low chloride to sulfate group, but on the high end.

MW-28d is located at the CPOC and all COCs are below MTCA Method-A clean up levels (**Table 3**).

8.2 INTERSTITIAL LIQUID AND SEEPS IN DRUM CACHE

Liquids encountered in the drum excavation, but outside the drum cache area, are categorized as either “interstitial liquid” or “seepage”. The term “interstitial liquid” is reserved for liquids observed between the drums and within the soil directly below the drums at the time of drum and soil removal. The term “seepage” is used for shallow groundwater that was observed entering the excavation from surrounding soil and rock after drum and soil removal. Some of the interstitial liquid was likely derived from seepage. Interstitial liquid and seep sample locations are shown in **Figure 16** and analytical results are presented in **Tables 18 and 19**.

Interstitial liquids were collected four times during the drum removal and soil investigation (May-July 2008). One sample was initially collected on 5/22/08 (sample ID P1) during the drum removal phase from drum grid location 3C. Two samples were later collected on 6/3/08 (sample ID 3C-1 and 6B) from temporary sumps installed during the drum removal. A third sample (sample ID 3C-2) was collected from the “3C” sump towards the end of the drum removal phase on 6/20/08. The fourth interstitial liquid sample (sample ID 3C-3) was collected on 7/2/08 from the sump during the soil-below-drums sampling phase. Liquids were regularly pumped from the

sumps during the drum removal and soil investigation phase. About 8,000 gallons of liquid were eventually pumped from the excavation.

Upon removal of drums and soil, shallow groundwater from a source outside the drum cache footprint was observed entering the excavation predominantly from the east (from under the "ramp"). This zone of shallow groundwater has since been interpreted as the P1 zone (see above). Limited inflow from a broad area to the north as well as one location to the south was also observed. Flows from the north and south largely depleted over the course of pumping and excavating, whereas flow from the east persisted. Samples of shallow groundwater "seepage" were collected on 8/1/08 for laboratory analysis from each of the three inflow areas; north (SS-4 Seep), east (SS-9-Seep), and south (SS-1-Seep); before the excavation was backfilled (**Figure 16**). A monitoring well was later installed in the vicinity of the eastern seep (MW-32a) and sampled on 11/20/08.

Although sampling methods and locations differed between samples, total VOC concentration in liquids decreased substantially over time as drums and highly contaminated interstitial liquid was removed (**Figure 17**). Total VOCs in three samples of liquids collected from the 3C sump decreased from 2,800,000 ug/L on 6/3/2008 to 550,000 ug/L on 7/2/08 after completion of the drum removal. Similarly, seep samples collected from the eastern side of the excavation decreased from 32,000 ug/L from the sample collected on 8/1/2008 before backfilling to 1,600 ug/L from the sample collected from MW-32a on 11/20/2008. The reduced contaminant concentrations over that period may be explained by dilution from shallow groundwater entering the excavation.

Ketones dominated the contaminant mass in all liquid samples collected while the excavation was open, followed by methylene chloride, toluene, and xylene. Ketones were not detected in the eastern seep after backfilling (MW-32a on 11/20/2008); however, toluene and xylene were still dominant contaminants.

Inorganic contaminants were also prevalent in the liquids. Chloride from the 3C sump decreased from 788 mg/L to 450 mg/L over the one-month sampling interval, suggesting drum contents did contain chloride at concentrations above local groundwater concentration. The chloride concentrations from the eastern seep also decreased from 225 mg/L on 8/1/2008 to 45 mg/L on 11/20/2008.

The reduced concentrations may be explained by removal of source contamination (i.e. drums and associated wastes and impacted soils) and increased dilution with shallow groundwater.

9.0 GROUNDWATER EXTRACTED FROM THE HOLE

The Hole is a 20-ft depression in the basalt surface beneath the original landfill (**Figure 1**). Extraction well EW-1 was installed near the center of the Hole in the fall of 2000. W-9 and W-12 are two nearby monitoring wells installed in the Hole during the Phase 1 RI Work (**Figure 1**). The well logs for W-9 and W-12 are provided in **Appendix A** and indicate about 50 to 55 feet of refuse mixed with gravel, cobbles, and sand before encountering the basalt surface within the

depression. Routine water level measurements indicate the lower 5 to 7 feet of soil/refuse within this depression is saturated with groundwater. Previous groundwater sampling of EW-1 in 2001 (PGG, 2002) indicates the aquifer contains high concentrations of leachate indicator parameters (e.g., total dissolved solids (TDS), chloride, sulfate, iron, manganese, and sodium) as well as elevated concentrations of volatile organic compounds (VOCs).

As part of the Interim Corrective Action Plan for the site, groundwater was extracted from the Hole continuously for about two months during the spring of 2008 (4/30/2008 to 6/20/2008). The objective of groundwater extraction from the Hole is to lower the water table at the bottom of the refuse and thus reduce leaching of refuse to groundwater, and to evaluate drawdown data to interpret hydraulic continuity. The Roza aquifer is stratigraphically below the saturated outwash/refuse in the Hole, and the two zones are separated by an aquitard.

Transducers were installed in EW-1, W-12 (90-ft northeast of EW-1), and EW-2 (Roza aquifer well about 370-ft northwest of the Hole) to measure groundwater levels during the extraction period and to assess hydraulic responses. A flow meter was installed at EW-1 to measure extraction flow rates and total volume. Extracted water was diverted to an on-site evaporation pond. Eight groundwater samples were collected over the duration of the two month extraction period at roughly one week intervals. Samples were analyzed in the field for pH, specific conductance, temperature, and oxidation reduction potential. Dissolved oxygen, and hydrogen sulfide were also analyzed during a few of the sampling events. Samples for each event were collected for laboratory analysis of VOCs, metals, and inorganic compounds, one event included analysis of water treatment parameters. Analytical results are summarized below.

9.1 GROUNDWATER EXTRACTED FROM THE HOLE ANALYTICAL RESULTS

Time series of analytical results are presented in **Tables 20 and 21**. The total summed VOCs increased from 45 ug/L upon startup (April 30) to relatively constant values of between 125 to 150 ug/L by May 15 when about 25,000 gallons had been extracted (**Figure 18**). The dominant VOCs detected were vinyl chloride, cis-1,2-dichloroethene, 1,1-dichloroethane, and acetone, followed by chloroethane, benzene, 1,4-dichlorobenzene, and 1,2-dichloropropane (**Table 21**).

A total of 85,325 gallons was extracted from the Hole over the two month period, with an average pumping rate of about 1 gallon-per-minute (gpm). A constant drawdown of about 1-ft in EW-1 was achieved after the first couple days of pumping. Similarly, a constant drawdown of about 0.25-ft in W-12 was achieved after the first couple days. No drawdown response was observed in EW-2 (Roza aquifer well). An attempt to increase the pumping rate on June 19th resulted in the pump malfunctioning. The pump was subsequently pulled and replaced under warranty.

Inorganic chemistry (**Table 20**) results showed relatively constant high concentrations of chloride (2100 to 2300 mg/L). Sulfate concentrations were also high starting at about 1000 mg/L at the beginning of the extraction period on April 30 and reaching a constant value of 1400 mg/L on May 22. Total iron concentrations were also high starting at 26,400 ug/L on May 22 and reaching a relatively constant concentration of about 36,000 ug/L on April 30. Total manganese

(23,000 to 27,000 ug/L) and total sodium (977 to 1270 ug/L) concentrations were also high, but with no noticeable trends.

10.0 REFERENCES

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Table 1. New and Existing Wells

Well or Boring Designation	MW-1a (outwash)	MW-2c (interflow)	MW-3b (Roza)	MW-4c (interflow)	MW-5c (interflow)	MW-6a (outwash)	MW-6c (interflow)	MW-7b (Roza)	MW-8b (Roza)	MW-9b (Roza)	MW-10a (outwash)	MW-11a (outwash)	MW-12 (decom.)	MW-13 (decom.)	MW-14a (outwash)	B-15	MW-16D (BIF)	MW-17A (outwash)	MW-18A (outwash)
Northing	10913	12237	13510	12739	12769	11496	11496	13548	13062	13284	9531	9555			10870	10884	11400	12454	13364.3
Easting	20087	20103	19137	20101	18789	20089	20089	18893	19406	18862	18796	20095			18813	19424	19484	17983	18492.6
Ground Elevation (atd)	1221.6	1239.8	1261.8	1255.3	1273.4	1227.7	1227.7	1261	1277	1267	1240	1211	1261	1255	1255	1240.9	1230.8	1226.5	1238.5
Scribe Elevation	1222.38	1241.41	1263.91	1256.92	1274.86	1228.63	1228.63	1262.93	N/A	1267.16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top of Steel Casing Elevation	1223.46	1242.51	1264.95	1258.01	1275.85	1229.68	1229.63	1263.97	N/A	1270.17	1242.75	1213.5			1258.44		1234.51	1226.62	1238.79
Top PVC Elevation - pre 10-1-89	1223.06	1241.88	1263.77	1257.46	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation - post 10-1-89	1222.36	1241.48	1263.77	1257.09	1274.895	1228.685	1228.645	1263.03	1279.02	1269.17	1242.56	1213.56			1258.58	N/A	1233.93	1226.26	1238.11
Top PVC Elevation - post 11-1-02	1222.44	1241.51	1263.83	1257.12	1274.9	1228.79	tbd	1263.02	N/A	1269.2	1242.7	1213.65			1258.58		1234.02	1226.31	1238.22
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	<1160	1226	1259	1247	1245	1165	1165	1251	1261	1247	1178	< 1173	1200		1178	1154	1176	<1165	<1171
top of screen depth (ft below ground)	35.0	96.0	56.0	122.0	142.0	38.0	68.0	49.0	70.0	56.0	47.5	19.5	N/A	N/A	65.0	N/A	98.5	50.5	52.0
bot of screen depth (ft below ground)	47.0	106.0	61.0	132.0	152.0	53.0	78.0	59.0	80.0	66.0	62.5	36.5	N/A	N/A	80.0	N/A	108.5	60.5	62.0
pump set depth (feet below top of PVC)	42.0	96.0	57.0	123.0	143.0	46.0	69.0	50.0	N/A	55.0	65.5	38.0	N/A	N/A	78.0	N/A	111.0	55.0	57.0
specific capacity (gpm/ft)	N/A	N/A	1.4	<0.2	3.8	12.0	very high	N/A	N/A	0.3	moderate	very high	N/A	N/A	very high	N/A	very low	5.0	21.0
target purge and sample flow rate (gpm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	N/A	1.0	1.0	1.0	N/A	N/A	1.0	N/A	<0.5	1.0	1.0

Well or Boring Designation	MW-19b (Roza)	MW-20c (interflow)	MW-21c (interflow)	MW-22c (interflow)	MW-23a (outwash)	MW-24a (outwash)	MW-25a (outwash)	MW-26a (outwash)	B-27	MW-28d (FS)	MW-29b (Roza)	MW-30b (Roza)	MW-31b (Roza)	MW-32a (P1)	MW-33p2 (P2)	MW-34p1 (P1)	MW-35p2 (P2)	MW-36p1 (P1)	MW-37p1 (P1)
Northing	13898	14707.9	12470.0	11397.1	9544.9	9615.88	9596.36	11464.93	13068.08	12689.25	12923.6	12981	13133.29	13011.62	12925.29	12959.45	13041.35	12985.64	13019.411
Easting	18109	18493.2	17984.0	19471.0	19458.5	20090.16	18796.79	20588.13	18678.75	18689.13	19748.84	19542.7	19573.43	19722	19591.21	19633.47	19503.9	19545.87	19796.59
Ground Elevation (atd)	1242.2	1254.3	1226.8	1231.2	1228.2	1211.59	1241.19	1206.12	1273.43	1274.95	1279	1284	1272.7	1272.2	1285.9	1280.3	1281	1283.8	1273.7
Scribe Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top of Steel Casing Elevation	1242.57	1254.50	1226.79	1234.18	1231.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation - pre 10-1-89	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation - post 10-1-89	1241.94	1254.02	1226.33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation - post 11-1-02	1242.16	1254.04	1226.50	1234.21	1231.23	1214.63	1244.81	1209.19	N/A	1278.17	1285.18	1288.12	1274.89	1276.47	1291.67	1285.93	1286.97	1288.99	1275.58
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	1231	1229	1139	1176.0	<1142	<1054	<1108	1141	1231	1246	1254	1253.5	1272.7	1252.2	1252.4	1255.8	1261	1257.8	1254.7
top of screen depth (ft below ground)	19.0	88.5	109.5	58.0	45.0	74.75	74	53.5	N/A	333	62.5	65	63	16	43	28	43	32	17.5
bot of screen depth (ft below ground)	29.0	98.5	119.5	68.0	60.0	84.75	89	63.5	N/A	353	67.5	75	73	20.7	53	34	53	37	22.6
pump set depth (feet below top of PVC)	27.0	94.0	115.0	70.0	62.0	N/A	N/A	N/A	N/A	346	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
specific capacity (gpm/ft)	very low	0.04	0.6	very high	very high	very high	very high	very high	N/A	0.03	very low	very low	very low	high	very low	high	very low	N/A	very low
target purge and sample flow rate (gpm)	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	N/A	0.5	0.2	0.2	0.2	1.0	0.1	1.0	0.1	N/A	0.1

Well or Boring Designation	MW-38p2 (P2)	W-9 (hole)	W-12 (hole)	EW-1 (hole)	EW-2 (Roza)	33M1 supply well	Section 4 Pond	33F1 (Paris)	32R (Moore)	32A1 (Atkins'old)	32A2 (Atkins'new)	GP-1 (decom.)	GP-2	GP-3 (decom.)	GP-4	GP-5	GP-6
Northing	13070.7	13183..75	13190.7	13106.7	13323			13103		14663		12198	12903	12841		13254	12842.66
Easting	19597.7	19167.9	19270.7	19225.9	18931			21254		18503.9		19117	19012	19489		18829	20094.82
Ground Elevation (atd)	1272.4	1275.6	1282.0	1285.6	1260.85	1272	N/A	1221.8	N/A	N/A		1277.1	1284.7	1276.6	1272.4	1268.5	1256
Scribe Elevation	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
Top of Steel Casing Elevation	N/A	N/A	N/A	1287.70	1263.35		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation - pre 10-1-89	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation - post 10-1-89	N/A	N/A	N/A	1287.70	1263.35		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
Top PVC Elevation - post 11-1-02	1278.0	1280.1	1286.5	1290.65													N/A
Well Seal Elevation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1223.31	1250.03	1247.49		N/A	N/A	N/A	N/A	N/A	N/A
Control Hub Elevation	N/A	N/A	N/A	N/A	N/A		1184.78	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
Basalt Surface Elevation	1259.9	1228.6	1227.5	1227.6	1258	1194	N/A	1187	1150 ?	N/A		1242	1239	1258	<1252	<1248	1250
top of screen depth (ft below ground)	33.0	37.0	44.0	55.6	55.5		N/A	N/A	N/A	N/A		32.0	33.0	14.0	14.0	14.0	4.0
bot of screen depth (ft below ground)	43.0	47.0	54.0	60.2	65.4		N/A	N/A	N/A	N/A		42.0	38.0	19.0	19.0	19.0	15.0
pump set depth (feet below top of PVC)	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
specific capacity (gpm/ft)	very low	N/A	N/A	very high			N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
target purge and sample flow rate (gpm)	0.1	N/A	N/A	1.0	1.0	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A

Table 1. New and Existing Wells

Well or Boring Designation	GP-7	GP-8	GP-9	GP-10	GP-11	GP-12	GE-1	GE-2	GE-3	GE-4	GE-5	GE-6	GE-7	GE-8	GE-9	GE-10	GE-11	GE-12	GE-13
Northing	11843	10843	9843	9537	10470	11470	12944	13019	13053	13180	12973	12825	12875	12676	12724	12587	12402	12188	11961
Easting	20100	20102	20102	19152	18791	18795	18905	19003	19142	19311	19404	19458	19653	19671	19865	19926	19927	19927	19881
Ground Elevation (atd)	1234.0	1222.0	1214.0	1234.0	1250.0	1263.0	1291.0	1289.0	1288.0	1286.0	1291.5	1299.0	1285.0	1294.5	1282.0	1274.0	1267.0	1265.0	1268.0
Scribe Elevation																			
Top of Steel Casing Elevation																			
Top PVC Elevation																			
Well Seal Elevation																			
Control Hub Elevation																			
Basalt Surface Elevation	<1218	<1200	<1200	<1200	<1200	<1200	<1258	<1259	<1248	<1246	<1246.5	<1264	<1250	<1259.5	1262	<1254	<1234	<1240	<1243
top of screen depth (ft below ground)	4.0	4.0	4.0	4.0	4.0	4.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
bot of screen depth (ft below ground)	16.0	22.0	14.0	34.0	50.0	63.0	33.0	30.0	40.0	40.0	45.0	35.0	35.0	35.0	25.0	20.0	33.0	25.0	25.0

Well or Boring Designation	GE-14	GE-15	GE-16	GE-17	GE-18	GE-19	GE-20	GE-21	GE-22	GE-23	GE-24	GE-25	GE-26	GE-27	GE-28	GE-29	GE-30	GE-31	GE-32
Northing	11812	11747	11896	11740	11743	11732	11746	11882	12019	12155	12291	12550	12809	12854	12665	12703	12626	12532	12459
Easting	19854	19765	19673	19614	19469	19319	19169	19107	19044	18982	18919	18943	18968	19163	19107	19302	19477	19806	19644
Ground Elevation (atd)	1270.0	1272.0	1279.5	1272.0	1244.0	1275.0	1279.5	1286.0	1293.0	1294.5	1290.0	1293.0	1295.5	1302.0	1302.0	1305.0	1303.0	1287.0	1295.0
Scribe Elevation																			
Top of Steel Casing Elevation																			
Top PVC Elevation																			
Well Seal Elevation																			
Control Hub Elevation																			
Basalt Surface Elevation	<1235	<1244	<1234.5	<1238	<1204	<1233	<1229.5	<1231	<1248	<1254.5	<1240	<1240	<1267.5	<1252	<1259	<1255	<1268	<1250	1265
top of screen depth (ft below ground)	8.0	8.0	8.0	41.0	16.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
bot of screen depth (ft below ground)	35.0	28.0	45.0	34.0	40.0	42.0	50.0	55.0	45.0	40.0	50.0	53.0	28.0	50.0	43.0	50.0	35.0	37.0	37.0

Well or Boring Designation	GE-33	GE-34	GE-35	GE-36	GE-37	GE-38	GE-39	GE-40	GE-41	GE-42	GE-43
Northing	12336	12221	12075	12053	11909	12265	12445	12218	12485	12300	12027
Easting	19825	19662	19783	19553	19411	19509	19390	19302	19195	19119	19244
Ground Elevation (atd)	1281.0	1288.0	1281.5	1288.0	1284.5	1294.0	1302.0	1298.0	1305.5	1302.0	1294.0
Scribe Elevation											
Top of Steel Casing Elevation											
Top PVC Elevation											
Well Seal Elevation											
Control Hub Elevation											
Basalt Surface Elevation	<1244	<1240	<1231.5	<1245	<1239.5	<1244	<1254	<1248	<1264.5	<1252	<1249
top of screen depth (ft below ground)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
bot of screen depth (ft below ground)	37.0	48.0	50.0	43.0	45.0	50.0	48.0	50.0	41.0	50.0	45.0

Elevations in feet above mean sea level
scribe elevations are based on Jan 1990 survey
Well seal at 32A1 is about 7 feet below ground surface
N/A = not available or not applicable
Post 11-1-02 survey reflects most recent survey completed by County in October 2002 or survey work by County for RI

Table 2. Site Contaminants of Concern

Original COCs		
Inorganics	**Organics**	**Metals**
Chloride	1,2-Dichloroethane (EDC)	Arsenic
Sulfate	1,1-Dichloroethane	Iron
Total Dissolved Solids (TDS)	Chloroethane	Manganese
Nitrate		
	Tetrachloroethene (PCE)	
	Trichloroethene (TCE)	
	1,1-Dichloroethene	
	cis-1,2-Dichloroethene	
	trans-1,2-Dichloroethene	
	Vinyl Chloride	
	Chloromethane	
	Dichloromethane (Methylene Chloride)	
	Trichlorofluoromethane	
	1,2-Dichloropropane	
	Benzene	
	Toluene	
	E hylbenzene	
	Xylene (m, p, o)	
	1,2-Dichlorobenzene	
	1,4-Dichlorobenzene	
	Bis(2-ethylhexyl) Phthalate	

NOTE:
Original COC organic and inorganic parameters were those that exceeded MTCA-B clean up levels or State GWCL most recently during routine groundwater sampling except 1,1-dichloroethene; chloromethane; and toluene which have exceeded MTCA-B levels at least 5 times in the past or were considered important parameters for undertanding fate and transport.

Additional COCs
Organics
1,1,2-Trichloroethane
1,2,4-Trimethylbenzene
2-Butanone
4-Methyl-2-pentanone (MIBK)
Acetone
Chloroform
Methylene Chloride
Naphthalene

NOTE:
New Additional COC organic parameters are those that exceeded screening levels in at least one of the new RI wells installed in the vicinity of the former drum cache. These paramters have not exceeded MTCA-A or MTCA-B in other site monitoring wells or at the Conditional Point of Compliance.

Table 3. Exceedences of Clean Up Levels (MTCA Method-A) for Groundwater in CPOC Wells

MTCA-A COMPARISON OF CONCENTRATIONS (Exceedences Shaded)

						Outwash Aquifer Wells									Interflow Aquifer Wells			Roza Aquifer Wells		Frenchman Springs
Volatile Organic Compounds	Units	MTCA-A[1]	MTCA-A Source	MTCA-B[2]	MTCA-B Source	MW-1a	MW-10a	MW-11a	MW-14a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-3b	MW-7b	MW-28d
1,1-Dichloroethane	ug/L	1600	MTCA-B non Car	1600	MTCA-B non-car	1U	1U	1U	1U	1U	1U	1U	1U	1U	3.3	0.2U	1.6	15	21	0.4
1,1-Dichloroethene	ug/L	7	FED MCL	7	FED MCL	0 02U	0.02U	0.02U	0.066	0.02U	0.02U	0.02U	0.02U	0 02U	0.064	0.02U	0.076	1	1.1	0.02U
1,2-Dichlorobenzene	ug/L	600	FED MCL	600	FED MCL	1U	1U	1U	1U	1U	1U	1U	1U	1U	0 2U	0.2U	1U	4.2	4.5	0.2U
1,2-Dichloroethane (EDC)	ug/L	5	MTCA-A Table	0.48	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	0 2U	0.2U	1 2	1.8	2.4	0.2U
1,2-Dichloropropane	ug/L	5	FED MCL	0.64	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2	0.2U	1.4	9.9	6.9	0.4
1,4-Dichlorobenzene	ug/L	75	FED MCL	1 8	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	0 2U	0.2U	1U	2.7	2.9	0.2U
Acetone	ug/L	800	MTCA-B non Car	800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	3U	3U	5U	18	5U	3U
Benzene	ug/L	5	MTCA-A Table	0 8	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	0 2U	0.2U	1U	5.2	1.6	0.2U
Bromoform	ug/L	5 5	FED MCL	5 5	MTCA-B car	1U	1U	1U	1U	1U	1U	1.1	1U	1U	0 2U	0.2U	1U	1U	1U	0.2U
Chlorobenzene	ug/L	100	FED MCL	100	FED MCL	1U	1U	1U	1U	1U	1U	1U	1U	1U	0 2U	0.2U	1U	1.1	1.1	0.2U
Chloroethane	ug/L	15	MTCA-B Car	15	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	0 2U	0.2U	1U	140	130	0.2U
cis-1,2-Dichloroethene	ug/L	70	FED MCL	70	FED MCL	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.3	0.2U	8 8	12	10	2.1
Methylene Chloride	ug/l	5	MTCA-A Table	5	FED MCL	2U	2U	2U	2U	2U	2U	2U	2U	2U	0 5U	0.5U	2U	3.2	4	0.5U
Tetrachloroethene (PCE)	ug/L	5	MTCA-A Table	0.081	MTCA-B car	0 087	0.21	0.31	0.2	0.035	0.12	0 23	0.2	0.12	2	0.02U	14	0.027	0 063	2.4
Trichloroethene (TCE)	ug/L	5	MTCA-A Table	0.49	MTCA-B car	0 02U	0 038	0.02U	0.15	0.042	0.02U	0.02U	0.043	0 02U	0.65	0.02U	2.3	0.56	0.62	0.4
Trichlorofluoromethane	ug/l	2400	MTCA-B non Car	2400	MTCA-B non-car	1U	1U	1U	1U	1U	1U	1U	1U	1U	4.9	0.2U	1U	1U	1U	0.2U
Vinyl Chloride	ug/L	0 2	MTCA-A Table	0.029	MTCA-B car	0 02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0 02U	0.02U	0.02U	0.39	23	17	0.02U

						Outwash Aquifer Wells									Interflow Aquifer Wells			Roza Aquifer Wells		Frenchman Springs
Inorganic Compounds	Units	MTCA-A[1]	MTCA-A Source	MTCA-B[2]	MTCA-B Source	MW-1a	MW-10a	MW-11a	MW-14a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-3b	MW-7b	MW-28d
Arsenic, Dissolved	ug/L	10	WAC 256-290-310	10	WAC 256-290-310	3.7	4.9	7 5	4.4	5.1	3.8	3.4	4	2.5	0 5U	0 3	0.6	1	1U	NA
Nitrate	mg/L as N	10	WAC 256-290-310	10	WAC 256-290-310	3.32	4.89	6.7	4.41	1.34	5 08	4.73	5.3	4.08	7 35	0.068	10 2	0.01U	0 01U	2.1

MTCA-A EXCEEDENCE FACTORS[3] (factor above the MTCA-A clean up level shaded)

	Outwash Aquifer Wells									Interflow Aquifer Wells			Roza Aquifer Wells		Frenchman Springs
Volatile Organic Compounds	MW-1a	MW-10a	MW-11a	MW-14a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-3b	MW-7b	MW-28d
1,1-Dichloroethane										0 00		0.00	0.01	0.01	0.00
1,1-Dichloroethene										0 01		0.01	0.14	0.16	
1,2-Dichlorobenzene													0.01	0.01	
1,2-Dichloroethane (EDC)												0.24	0.36	0.48	
1,2-Dichloropropane												0.28	1.98	1.38	0.08
1,4-Dichlorobenzene													0.04	0.04	
Acetone													0.02		
Benzene													1.04	0.32	
Bromoform						0 20									
Chlorobenzene													0.01	0.01	
Chloroethane													9.33	8.67	
cis-1,2-Dichloroethene										0 00		0.13	0.17	0.14	0.03
Methylene Chloride													0.64	0.80	
Tetrachloroethene (PCE)	0.02	0.04	0.06	0.04	0.01	0 02	0 05	0.04	0.02	0.40		2.80	0.01	0.01	0.48
Trichloroethene (TCE)		0.01		0.03	0.01			0.01		0.13		0.46	0.11	0.12	0.08
Trichlorofluoromethane										0 00					
Vinyl Chloride												1.95	115.00	85.00	

	Outwash Aquifer Wells									Interflow Aquifer Wells			Roza Aquifer Wells		Frenchman Springs
Inorganic Compounds	MW-1a	MW-10a	MW-11a	MW-14a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-3b	MW-7b	MW-28d
Arsenic, Dissolved	0.37	0.49	0.75	0.44	0.51	0 38	0 34	0.40	0.25		0.03	0.06	0.10		
Nitrate	0.33	0.49	0.67	0.44	0.13	0 51	0.47	0.53	0.41	0.74	0.01	1.02			0.21

Shaded values are greater than MTCA-Method-A cleanup levels
Parameters listed are COCs with health-based standards.
Wells listed are outermost set of monitoring wells within the CPOC (see Figure 3)
##U = Detection Limit/Undetected
Round 2 groundwater data used (except Round 3 data for MW-28d)
NA = Not Analyzed

1 Note:
MTCA A uses most stringent value of Method-A Table, Fed MCL (40 CFR 141.61), or State Department of Health (WAC 256-290-310)
If not in any of these sources uses MTCA-B

2 Note:
MTCA B uses most stringent value of Method-B Table, Fed MCL (40 CFR 141.61), or State Department of Health (WAC 256-290-310)

3 Note: Exceedence Factor (EF) is the factor the concentration exceeds MTCA Method-A (e.g. the exceedence factor for 1,2-Dichloropropane at 9.9 ug/L is 9 9/5 = 1.98). EF values greater than 1 are above MTCA Method-A cleanup levels

Table 4. Soils from Former Drum Area - Analytical Results

		Soil Below Drums													Residual Soil									
BTEX	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
Benzene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.4	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Ethylbenzene	mg/kg	5.3U	350	160	240	150	420	860	820	85	50	240	340	590	190	0.074U	0.068	340	0.0014	0.083U	120	30	0.0059	88	0.59	0.098
o-Xylene	mg/kg	37	370	240	370	160	390	870	540	150	32	220	240	770	160	0.074U	0.074	340	0.0014U	0.083U	120	29	0.0066	100	0.65	0.15
Toluene	mg/kg	28	1300	540	900	860	2400	4200	1700	290	200	2000	2900	2900	790	0.31	0.29	1700	0.0088	0.22	660	31	0.027	230	3.1	0.55
Xylene Isomers, M+P	mg/kg	84	1000	640	1100	470	1200	2300	1400	420	100	670	990	2000	500	0.13	0.19	1100	0.0033	0.24	370	87	0 02	280	2	0.38

		Soil Below Drums													Residual Soil									
Cyanide	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
Total Cyanide	mg/kg	4.49	221	1.04	13.8	4.42	0.403	1.17	0.519	0.662		156		33												

		Soil Below Drums													Final Soil Confirmation									
Herbicides	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
2,4,5-T	mg/kg	0.0091U	0.09U	0.091U	0.09U	0.0097U	0.0098U	0.091U	0.092U	0.0091U		0.0096U		0.09U												
2,4,5-TP (Silvex)	mg/kg	0.0091U	0.09U	0.091U	0.09U	0.0097U	0.0098U	0.091U	0.092U	0.0091U		0.0096U		0.09U												
2,4-D	mg/kg	0.036U	0.36U	0 37U	0.36U	0.039U	0.039U	0.36U	0.37U	0 036U		0.038U		0.36U												
2,4-DB	mg/kg	0.18U	1.8U	1.8U	1.8U	0.2U	0.2U	1.8U	1 8U	0.18U		0.19U		1.8U												
Dalapon	mg/kg	0.036U	0.36U	0 37U	0.36U	0.039U	0.039U	0.36U	0.37U	0 036U		0.038U		0.36U												
Dicamba	mg/kg	0.018U	0.18U	0.18U	0.18U	0 02U	0.2Y	0.18U	0.18U	0 018U		0.019U		0.18U												
Dichloroprop	mg/kg	0.036U	0.36U	0 37U	0.36U	0.039U	0.039U	0.36U	0.37Y	0 036U		0.038U		0.36U												
Dinoseb	mg/kg	0.018U	0.18U	0.18U	0.18U	0 02U	0 02U	0.18U	0.18U	0 018U		0.019U		0.18U												
MCPA	mg/kg	9.1U	90U	91U	90U	9.7U	9.8U	91U	92U	9.1U		9.6U		90U												

		Soil Below Drums													Residual Soil									
Inorganics	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
Chloride	mg/kg	138	285	440	239	134	67.4	176	87.2	184		283		262	84.8	106		173	95.7	26	106	23.6	61.4	157	61.6	28.7
Nitrate	mg-N/kg	0.14	0.53U	0.1U	0.46	0.2	0.11	0.76	0.09	0.15		1.19		0.11U	0.29	0.52U		0.13	0.12U	0.23U	0.22U	0.12U	5.96	0.21U	0.23U	1.06
Nitrate+Nitrite	mg-N/kg	0.14	0.53U	0.48	0.81	0.2	0.11	0.76	0.26	0.34		1.32		0.11U	0.29	0 52U		0.13	0.12U	0.23U	0.22U	0.12U	5.96	0.21U	0.23U	1.06
Nitrite	mg-N/kg	0.11U	0.53U	1.58	0.35	0.11U	0.11U	0.5U	0.17	0.19		0.13		0.11U	0.1U	0.52U		0.11U	0.12U	0.23U	0.22U	0.12U	0.1U	0.21U	0.23U	0.1U
Sulfate	mg/kg	130	114	81.9	510	90.1	57	30.4	70.7	65.5		74.1		38.1	25 5	37.7		32.4	93.4	110	31.6	105	83.5	23.7	31.7	74 2

		Soil Below Drums													Residual Soil									
Metals	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
Antimony	mg/kg	10U	10U	10U	5U	10U	10U	10U	10U	10U		10U		10U	10U	10U		10U	10U	10U	10U	6U	10U	10U	10U	10U
Arsenic, Total	mg/kg	10U	10U	10U	5U	10U	10U	10U	10U	10U		10U		10U	10U	10U		10U	10U	10U	20	6U	10U	10U	10U	10U
Barium	mg/kg	65.1	71.8	48	51	70.1	45.1	69.3	67.2	69.9		84.4		66.2	57 9	49.8		66.1	77 2	106	135	24.1	69.3	98.7	41.1	65 2
Beryllium	mg/kg	0.3U	0.3U	0.3U	0.1U	0.3	0.3U	0.3U	0 3U	0.3U		0 3U		0.3U	0.3U	0.3U		0.3U	0 5	0.6	0.4	0.1U	0 2U	0.3U	0.3U	0.3U
Cadmium	mg/kg	0.5U	0.5U	0.7	0.4	0.6U	0.6U	0.5U	0.6	0.5U		0.6U		0.5U	0.7	0.5U		0.5U	0.6U	0.6U	0.6	0.2U	0 5U	0.5U	0.5U	0.5U
Chromium	mg/kg	7	12	5	5	20	35	14	16	15		19		13	6	2		11	1U	1U	9	0.6U	5	80	2	2
Copper	mg/kg	81.9	813	130	60	71.6	24.4	31	39.4	36.6		197		112	306	22.6		19 3	31 9	31.2	55.9	8.5	32.1	34.3	32.7	18 9
Lead	mg/kg	12	73	28	11	30	86	54	20	26		13		14	6	5U		11	6U	6U	8	2U	8	9	5U	5U
Mercury	mg/kg	0.06	0.12	0.05U	0.05	0.09	0.08	0.25	0.13	0.15		0 06		0.15	0.05U	0.05U		0.08	0.05U	0.04U	0.13	0.09	0.04U	0.15	0.04U	0.04U
Nickel	mg/kg	9	9	8	6	12	7	9	7	8		8		11	8	11		16	13	14	63	6	12	9	7	8
Selenium	mg/kg	10U	10U	10U	5U	10U	10U	10U	10U	10U		10U		10U	10U	10U		10U	10U	10U	10U	6U	10U	10U	10U	10U
Silver	mg/kg	0 8U	0.8U	0.8U	0.3U	0.8U	0.9U	0.8U	0 8U	0.8U		0 8U		0.8U	0.8U	0.8U		0.8U	0.9U	0.9U	0 8U	0.3U	0.7U	0.8U	0.8U	0.8U
Thallium	mg/kg	10U	10U	10U	5U	10U	10U	10U	10U	10U		10U		10U	10U	10U		10U	10U	10U	10U	6U	10U	10U	10U	10U
Zinc	mg/kg	124	345	113	94	169	161	214	117	188		754		260	99	68		111	78	79	91	14	98	218	57	63

		Soil Below Drums													Residual Soil									
Volatile Organic Compounds	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
1,1,1,2-Tetrachloroethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
1,1,1-Trichloroethane	mg/kg	5.3U	90	23	27	9.6	2600E	400	49	7	7	48	160	120	22	0.074U	0.068U	48	0.0014U	0.083U	15U	22	0.0068	9.2U	0.079	0.065U
1,1,2,2-Tetrachloroethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
1,1,2-Trichloro-1,2,2-trifluoroetha	mg/kg	11U	11U	11U	11U	13U	130	120	10U	12U	11U	11U	11U	11U	26U	0.15U	0.14U	46U	0.0028U	0.17U	30U	2 8U	0.0024U	18U	0.14U	0.13U
1,1,2-Trichloroethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
1,1-Dichloroethane	mg/kg	5.3U	8.2	5.5U	5.4U	6.4U	71	45	4.5J	6.2U	5.4U	5.7U	24	8	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0016	9.2U	0 071U	0.065U
1,1-Dichloroethene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
1,1-Dichloropropene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
1,2,3-Trichlorobenzene	mg/kg	27U	27U	27U	27U	32U	31U	30U	26U	31U	27U	28U	28U	28U	64U	0.37U	0 34U	110U	0.0069U	0.42U	76U	6 9U	0.0059U	46U	0.35U	0.32U
1,2,3-Trichloropropane	mg/kg	11U	11U	11U	11U	13U	12U	12U	10U	12U	11U	11U	11U	11U	26U	0.15U	0.14U	46U	0.0028U	0.17U	30U	2 8U	0.0024U	18U	0.14U	0.13U

Table 4. Soils from Former Drum Area - Analytical Results

		Soil Below Drums													Residual Soil									
Volatile Organic Compounds	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
1,2,4-Trimethylbenzene	mg/kg	32	310	100	110	92	270	500	340	120	16	150	58	500	110	0.074U	0.068U	240	0.0014U	0.16	130	43	0.0077	99	0.82	0.16
1,2-Dibromo-3-chloropropane	mg/kg	27U	27U	27U	27U	32U	31U	30U	26U	31U	27U	28U	28U	28U	64U	0.37U	0 34U	110U	0.0069U	0.42U	76U	6 9U	0.0059U	46U	0.35U	0.32U
1,2-Dichloroethane	mg/kg	5.3U	26	5.5U	5.4	6.4U	6.3U	6.3	5 2U	6.2U	5.4U	5.7U	16	6.4	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
1,2-Dichloropropane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	9.3	120	25	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0016	9.2U	0 071U	0.065U
1,3,5-Trimethylbenzene	mg/kg	21	170	49	59	49	140	260	180	61	8	85	29	260	64	0.074U	0.068U	130	0.0014U	0.083U	58	21	0.0036	47	0.41	0.081
1,3-Dichloropropane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
2,2-Dichloropropane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
2-Butanone	mg/kg	27U	84	790	500	91	100	1100	97	31U	50	190	460	340	64U	9.7	11	110U	0 0069	0.42U	76U	6 9U	0.062	46U	1.3	0.32U
2-Chloroethylvinylether	mg/kg	27U	27U	27U	27U	32U	31U	30U	26U	31U	27U	28U	28U	28U	64U	0.37U	0 34U	110U	0.0069U	0.42U	76U	6 9U	0.0059U	46U	0.35U	0.32U
2-Chlorotoluene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
2-Hexanone	mg/kg	27U	27U	27U	27U	32U	31U	30U	1200	31U	27U	28U	28U	28U	64U	0.37U	0 34U	110U	0.0069U	0.42U	76U	6 9U	0.0059U	46U	0.35U	0.32U
4-Chlorotoluene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
4-Isopropyltoluene	mg/kg	5.3U	8.6	5.5U	5.4U	6.4U	6.9	15	7.7	6.2U	5.4U	5.7U	5.7U	12	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.5	0.0012U	9.2U	0 071U	0.065U
4-Methyl-2-Pentanone (MIBK)	mg/kg	27U	170	280	120	40	360	1000	180	36	27U	100	260	950	64U	0.54M	0.76M	110U	0.0069U	0.42U	76U	6 9U	0.063	46U	0.52	0.32U
Acetone	mg/kg	28	210	2900	1200	99	1300	1000	640	87	270	520	960	360	64U	25	22	110U	0.05	0.48	76U	6 9U	0.14	46U	3	0.32U
Acrolein	mg/kg	270U	270U	270U	270U	320U	310U	300U	260U	310U	270U	280U	280U	280U	640U	3.7U	3.4U	1100U	0 069U	4.2U	760U	69U	0.059U	460U	3.5U	3.2U
Acrylonitrile	mg/kg	27U	27U	27U	27U	32U	31U	30U	26U	31U	27U	28U	28U	28U	64U	0.37U	0 34U	110U	0.0069U	0.42U	76U	6 9U	0.0059U	46U	0.35U	0.32U
Benzene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.4J	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Bromobenzene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U

		Soil Below Drums													Residual Soil									
Volatile Organic Compounds	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
Bromochloromethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Bromodichloromethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Bromoethane	mg/kg	11U	11U	11U	11U	13U	12U	12U	10U	12U	11U	11U	11U	11U	26U	0.15U	0.14U	46U	0.0028U	0.17U	30U	2 8U	0.0024U	18U	0.14U	0.13U
Bromoform	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Bromomethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Carbon Disulfide	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.011	0.083U	15U	1.4U	0.0017	9.2U	0 071U	0.065U
Carbon Tetrachloride	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Chlorobenzene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Chloroethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Chloroform	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	12	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Chloromethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
cis-1,2-Dichloroethene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	8.8	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
cis-1,3-Dichloropropene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Dibromochloromethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Dibromomethane	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Ethylbenzene	mg/kg	5.3U	350	160	240	150	420	860	820	85	50	240	340	590	190	0.074U	0.068	340	0.0014M	0.083U	120	30	0.0059	88	0.59	0.098
Ethylene Dibromide	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Hexane	mg/kg														64U	0 37U	0.34U	110U	0.0069U	0.42U	76U	6.7U	0.0059U	46U	0.35U	0.32U
Isopropylbenzene	mg/kg	5.3U	49	14	18	15	36	86	67	12	5.4U	28	14	130	15	0.074U	0.068U	34	0.0014U	0.083U	15U	5	0.0012U	9.5	0.077	0.065U
Methyl Iodide	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Methyl tert-Butyl Ether	mg/kg														13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Methylene Chloride	mg/kg	11U	61	58B	51	22	110	73	27	16B	55	63	470	480	41B	0.15U	0.14U	60B	0.0028U	0.23B	42B	2.8U	0.0096B	24B	0.18B	0.25
n-Butylbenzene	mg/kg	5.3U	24M	8.9M	10M	6.4U	18M	32M	22M	10M	5.4U	11M	5.7U	26M	14	0.074U	0.068U	23U	0.0014U	0.7	15U	3.8M	0.0012U	9 8M	0.084M	0.065U
n-Propylbenzene	mg/kg	5.3U	100	28	34	33	80	180	120	29	5.4U	58	20	230	36	0.074U	0.068U	84	0.0014U	0.083U	32	12	0.0022	24	0.18	0.065U
o-Xylene	mg/kg	37	370	240	370	160	390	870	540	150	32	220	240	770	160	0.074U	0.074	340	0.0014U	0.083U	120	29	0.0066	100	0.65	0.15
sec-Butylbenzene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.31	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Styrene	mg/kg	5.3U	59	83	92	6.4U	50	99	370	17	5.4U	62	110	360	54	0.074U	0.068U	40M	0.0014U	0.083U	15U	1.4U	0.0012U	23	0 071U	0.065U
tert-Butylbenzene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Tetrachloroethene (PCE)	mg/kg	5.2J	32	8.2	11	27	130	1400E	83	35	5J	21	34	56	20	0.074U	0.068U	250	0.0014U	0.083U	15U	5.3	0.0024	11	0 071U	0.065U
Toluene	mg/kg	28	1300E	540	900	860	2400E	4200ES	1700E	290	200	2000E	2900ES	2900ES	790	0.31	0.29	1700	0.0088	0.22	660	31	0.027	230	3.1	0.55
trans-1,2-Dichloroethene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
trans-1,3-Dichloropropene	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
trans-1,4-Dichloro-2-butene	mg/kg	27U	27U	27U	27U	32U	31U	30U	26U	31U	27U	28U	28U	28U	64U	0.37U	0 34U	110U	0.0069U	0.42U	76U	6 9U	0.0059U	46U	0.35U	0.32U
Trichloroethene (TCE)	mg/kg	5.3U	1000	49	160	18	150	200	16	6.2U	4.1J	26	160	130	13U	0.074U	0.068U	25	0.0014U	0.083U	29	1.4U	0.0025	9.2U	0.071U	0 065U
Trichlorofluoromethane (CFC 11)	mg/kg	5 3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Vinyl Acetate	mg/kg	27U	27U	27U	27U	32U	31U	30U	26U	31U	27U	28U	28U	28U	64U	0.37U	0 34U	110U	0.0069U	0.42U	76U	6 9U	0.0059U	46U	0.35U	0.32U
Vinyl Chloride	mg/kg	5.3U	5.5U	5.5U	5.4U	6.4U	6.3U	5.9U	5 2U	6.2U	5.4U	5.7U	5.7U	5.6U	13U	0.074U	0.068U	23U	0.0014U	0.083U	15U	1.4U	0.0012U	9.2U	0 071U	0.065U
Xylene Isomers, M+P	mg/kg	84	1000	640	1100	470	1200	2300	1400	420	100	670	990	2000	500	0.13	0.19	1100	0 0033	0.24	370	87	0 02	280	2	0.38

Table 4. Soils from Former Drum Area - Analytical Results

		Soil Below Drums												Residual Soil										
Hydrocarbons	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
Diesel Range Hydrocarbons	mg/kg															50U										15
Gasoline	mg/kg															20U										
Motor Oil	mg/kg															100U										40

		Soil Below Drums												Residual Soil										
Other	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
Total Solids	Percent	91.5	92.3	89.4	91.6	84.9	86.7	91.5	91.1	92 2		88.8		90.9	91 8	95.6		91.4	85 9	84.8	87.8	86.6	98	93.2	85 9	94.4

		Soil Below Drums												Residual Soil										
PCBs	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
Aroclor 1016	mg/kg	1.4U	210U	88U	43U	5.7U	37U	8.7U	8.7U	2.4U		4 8U		34U	8.8U	0.032U		9.2U	0 031U	0.36U	54U	9.6U	0.19U	52U	0.31U	0.064U
Aroclor 1221	mg/kg	1.4U	210U	88U	43U	5.7U	37U	8.7U	8.7U	2.4U		4 8U		34U	8.8U	0.032U		9.2U	0 031U	0.36U	54U	9.6U	0.19U	52U	0.31U	0.064U
Aroclor 1232	mg/kg	1.4U	210U	88U	43U	5.7U	37U	8.7U	8.7U	2.4U		4 8U		34U	8.8U	0.032U		9.2U	0 031U	0.36U	54U	9.6U	0.19U	52U	0.31U	0.064U
Aroclor 1242	mg/kg	14	470	240	94	28	170	25	83	23		29		180	85	0.032U		38	0.031U	3.4	310	55	1.5	210	0.81	0.52
Aroclor 1248	mg/kg	1.4U	210U	88U	43U	5.7U	37U	8.7U	8.7U	2.4U		4 8U		34U	8.8U	0.032U		9.2U	0.031U	0.36U	54U	9.6U	0.19U	52U	0.31U	0.064U
Aroclor 1254	mg/kg	1.4U	210U	88U	43U	5.7U	37U	8.7U	8.7U	2.4U		4 8U		34U	10	0.032U		9.2U	0 031U	0.56	54U	9.6U	0 25	52U	0.31U	0.064U
Aroclor 1260	mg/kg	1.4U	210U	88U	43U	5.7U	37U	8.7U	8.7U	3.3		4 8U		34U	8.8U	0.032U		9.2U	0 031U	0.38	54U	9.6U	0.19U	52U	0.31U	0.064U

		Soil Below Drums												Residual Soil										
Pesticides	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
4,4-DDD	mg/kg	0.072U	0.43U	0.44U	0.41U	0.12U	0.45U	0.41U	0.43U	0.22U		0.23U		0.43U												
4,4-DDE	mg/kg	0.072U	0.43U	0.44U	0.41U	0.12U	0.45U	0.41U	0.43U	0.22U		0.23U		0.43U												
4,4-DDT	mg/kg	0.072U	0.43U	0.44U	0.41U	0.12U	0.45U	0.41U	0.43U	0.22U		0.23U		1.6Y												
Aldrin	mg/kg	0.036U	0.21U	0 22U	0.21U	0.058U	0 22U	0.2U	0.22U	0.11U		0.12U		0.21U												
alpha Chlordane	mg/kg	0.036U	0.21U	0 22U	0.21U	0.058U	0 22U	0.2U	0.22U	0.11U		0.12U		0.21U												
alpha-BHC	mg/kg	0.036U	0.21U	0 22U	0.21U	0.058U	0 22U	0.2U	0.22U	0.11U		0.12U		0.21U												
beta-BHC	mg/kg	0.036U	0.21U	0 22U	0.21U	0.058U	0 22U	0.2U	0.22U	0.11U		0.12U		0.21U												
delta-BHC	mg/kg	0.036U	0.21U	0 22U	0.21U	0.058U	0 22U	0.2U	0.22U	0.11U		0.12U		0.21U												
Dieldrin	mg/kg	0.072U	0.43U	0.44U	0.41U	0.12U	1.7Y	0.41U	0.43U	0.22U		0.23U		0.43U												
Endosulfan I	mg/kg	0.036U	0.21U	0 22U	0.21U	0.058U	0 22U	0.2U	0.22U	0.11U		0.12U		0.21U												
Endosulfan II	mg/kg	0.072U	2.4Y	1.5Y	0.41U	0.12U	0.45U	0.41U	0.43U	0.22U		0.23U		0.43U												
Endosulfan Sulfate	mg/kg	0.072U	0.43U	0.44U	0.41U	0.12U	0.45U	0.41U	0.43U	0.22U		0.23U		0.43U												
Endrin	mg/kg	0.072U	0.43U	0.44U	0.41U	0.12U	0.45U	0.41U	0.43U	0.22U		0.23U		0.43U												
Endrin Aldehyde	mg/kg	0.072U	4.8Y	3Y	0.41U	0.12U	3Y	0.41U	0.43U	0.22U		1.4Y		3.4Y												
Endrin Ketone	mg/kg	0.072U	0.43U	0.44U	0.41U	0.12U	0.45U	0.41U	0.43U	0.22U		0.23U		0.43U												
gamma Chlordane	mg/kg	0.036U	0.21U	4.3Y	0.21U	0.058U	2.9Y	0.2U	0.22U	0.11U		0.12U		0.21U												
gamma-BHC (Lindane)	mg/kg	0.036U	0.21U	0 22U	0.21U	0.4Y	1.6Y	0.2U	0.22U	0.11U		0.12U		0.21U												
Heptachlor	mg/kg	0.21Y	0.21U	0 22U	0.21U	0.058U	2.6Y	0.2U	0.22U	0.71Y		1.1Y		2.6Y												
Heptachlor Epoxide	mg/kg	0.036U	0.21U	0 22U	0.21U	0.058U	0 22U	0.2U	0.22U	0.11U		0.12U		0.21U												
Methoxychlor	mg/kg	0.36U	2.1U	2.2U	2.1U	0 58U	2.2U	2U	2 2U	1.1U		1 2U		2.1U												
Toxaphene	mg/kg	3.6U	21U	22U	21U	5.8U	22U	20U	22U	11U		12U		21U												

		Soil Below Drums												Residual Soil										
Semi VOA	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
1,2,4-Trichlorobenzene	mg/kg	0.07U	0.6	0.1	0.076	0.11	3.2	0 21	2.8	0.57		0.55		0.55	0.55	0.064U	0.062U	1 2	0.065U	0.066U	0 21	0.36	0.064U	0.99	0 058U	0.065U
1,2-Dichlorobenzene	mg/kg	0.07U	1.1	0.14	0.078	0.077U	0.79	0 22	0.37	0.17		0.43		0.86	3 8	0.064U	0.062U	0.54	0.065U	0.066U	0.2	0.13	0.064U	0.28	0 058U	0.065U
1,3-Dichlorobenzene	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.12	0.28	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
1,4-Dichlorobenzene	mg/kg	0.07U	0 36	0 074	0.069U	0.077U	0.15	0.07U	0.1	0 072U		0.15		0.33	1.8	0.064U	0.062U	0.16	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
1-Methylnaphthalene	mg/kg	0.23	4.3	1.1	0.58	0.62	4.2	1.3	2.1	2		0.84		2.5	4.1	0.064U	0.19	6 5	0.065U	0.066U	6.2	0.79	0.064U	4.3	0 058U	0.065U
2,2-Oxybis(1-Chloropropane)	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
2,4,5-Trichlorophenol	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
2,4,6-Trichlorophenol	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
2,4-Dichlorophenol	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
2,4-Dimethylphenol	mg/kg	0.6	1.3Y	0.42Y	0 33Y	0 25Y	2.1Y	0.36Y	0.95Y	0.64Y		0.52Y		1.3Y	0.19Y	0.064U	0.062U	0.46Y	0.065U	0.066U	0.51Y	0.07Y	0.064U	1.1Y	0 058U	0.065U
2,4-Dinitrophenol	mg/kg	0.7U	0.7U	0.7U	0.69U	0.77U	0.78U	0.7U	0.84U	0.72U		0.76U		0.7U	0.67U	0.64U	0.62U	1.1U	0.65U	0.66U	0.72U	0.59U	0.64U	1.3U	0.58U	0.65U
2,4-Dinitrotoluene	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
2,6-Dinitrotoluene	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
2-Chloronaphthalene	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
2-Chlorophenol	mg/kg	0.07U	0.17	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.51		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
2-Methylnaphthalene	mg/kg	0.38	9	1.9	1.1	1.2	8.6	2.3	4	3.7		1.6		4.5	6 2	0.064U	0.14	9.7	0.065U	0.066U	13	1.3	0.064U	7	0 058U	0.065U

Table 4. Soils from Former Drum Area - Analytical Results

		Soil Below Drums												Residual Soil									
Semi VOA	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
2-Methylphenol	mg/kg	0.07U	0.72	0.92	0.78	0.87	2.6	0.72	2.2	3		0.8		2.8	0 067U	0.064U	0.062U	0.61M	0.065U	0.066U	1.8M	0.059U	0.064U	2.7	0 058U	0.065U
2-Nitroaniline	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0 3U	0.32U	0.67U	0.29U	0.32U
2-Nitrophenol	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.32U
3,3-Dichlorobenzidine	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
3-Nitroaniline	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0 3U	0.32U	0.67U	0.29U	0.32U
4,6-Dinitro-2-Methylphenol	mg/kg	0.7U	0.7U	0.7U	0.69U	0.77U	0.78U	0.7U	0.84U	0.72U		0.76U		0.7U	0.67U	0.64U	0.62U	1.1U	0.65U	0.66U	0.72U	0.59U	0.64U	1.3U	0.58U	0.65U
4-Bromophenyl-phenylether	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
4-Chloro-3-methylphenol	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
4-Chloroaniline	mg/kg	0.35U	0.35U	0 35U	0.35U	0.39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0 32U	0.31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
4-Chlorophenyl-phenylether	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
4-Methylphenol	mg/kg	0.07U	5	1.8	0.81	1	3.6	0.79	0.95	0.23		1.5		17	0.42Y	0.064U	0.07	4 5	0.065U	0.066U	2.4	0.059U	0.065	1.9	0 058U	0.065U
4-Nitroaniline	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0 3U	0.32U	0.67U	0.29U	0.32U
4-Nitrophenol	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0 3U	0.32U	0.67U	0.29U	0.32U
Acenaphthene	mg/kg	0.07U	0.11	0 07U	0.069U	0.077U	0.13	0.07U	0.11	0.078		0.076U		0.11	0.14	0.064U	0.062U	0.15	0 065U	0.066U	0.2	0.059U	0.064U	0.14	0 058U	0.065U
Acenaphthylene	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Anthracene	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Benzo(a)anthracene	mg/kg	0.07U	0.1	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Benzo(a)pyrene	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.082	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Benzo(b)fluoranthene	mg/kg	0.07U	0.11	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.12	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Benzo(g,h,i)perylene	mg/kg	0.07U	0.07U	0.16	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Benzo(k)fluoranthene	mg/kg	0.07U	0.088	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.11	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Benzoic Acid	mg/kg	0.7U	0 95	0.7U	0.69U	1	0.78U	2.4	0.84U	0.72U		0.76U		1.6	3.3Y	0.64U	0.62U	6.4Y	0.65U	0.66U	2.9Y	2.6Y	0.64U	7.2Y	0.58U	0.65U
Benzyl Alcohol	mg/kg	0.07U	0.19Y	0.64	0.26	0.14	0.27M	0.094M	0.084U	0.078M		0.21		1.2M	0 067U	0.064U	0.062U	0.43M	0 065U	0.066U	0.22Y	0.059U	0.064U	0 32Y	0 058U	0.32U
bis(2-Chloroethoxy) Methane	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0 27Y	0 058U	0.065U
Bis-(2-Chloroethyl) Ether	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
bis(2-Ethylhexyl)phthalate	mg/kg	67	67	30	19	84	150	80	32	60	10	23		64	24	0.064U	0.062U	260	0 065U	14	86	24	0.5	95	0.59	0.45
Butylbenzylphthalate	mg/kg	0.5	5.4	11	2.2	2.1	5.3	4.1	1.9	3.2		4.6		32	12	0.064U	0.062U	19	0.065U	0.32	4.6	3.5	0.15	9.8	0.098	0.065U
Carbazole	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Chrysene	mg/kg	0.07U	0.18	0 07U	0.069U	0.077U	0.078U	0.07U	0.1	0 072U		0.076U		0.13	0.068	0.064U	0.062U	0.12	0 065U	0.066U	0.1	0.059U	0.064U	0.13U	0 058U	0.065U
Dibenz(a,h)anthracene	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Dibenzofuran	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.14	0.059U	0.064U	0.13U	0 058U	0.065U
Diethylphthalate	mg/kg	0.17	0.62	0.36	0.26	9	4.6	1.7	0.21	1.2		0.9		0.55	0.89	0.064U	0.062U	3.4	0.065U	0.066U	1.3	0.059U	0.064U	4.3	0 058U	0.065U
Dimethylphthalate	mg/kg	0.07U	5.2	3.5	2.7	0.48	8.4	0 52	11	0.24		2.9		25	0.23	0.064U	0.064	0.11U	0.065U	0.066U	0.72	0.059U	0.064U	5.4	0 058U	0.065U
Di-n-Butylphthalate	mg/kg	0.071	0.75	1.5	0.66	0.82	3.1	1	1.9	1.4		2.2		1.5	1.4	0.064U	0.062U	2.1	0.065U	0.1	0.78	0.86	0.064U	2.9	0 058U	0.065U
Di-n-Octyl phthalate	mg/kg	1.6	0 23	0 07U	0.093	1.3	2.4	1.1	0.64	1.1		0.48		1.2	0.62	0.064U	0.062U	4 2	0 065U	0.066U	1.2	0.41	0.064U	2.2	0 058U	0.065U
Fluoranthene	mg/kg	0.07U	0.13	0 092	0.069U	0.077U	0.13	0.072	0.2	0.1		0.076U		0.13	0.077	0.064U	0.062U	0.17	0 065U	0.066U	0.095	0.059U	0.064U	0.28	0 058U	0.065U
Fluorene	mg/kg	0.07U	0 28	0 07U	0.069U	0.077U	0.12	0.082	0.12	0.074		0.076U		0.29	0.27	0.064U	0.062U	0 2	0 065U	0.066U	0.41	0.059U	0.064U	0.24	0 058U	0.065U
Hexachlorobenzene	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.11	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Hexachlorobutadiene	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Hexachlorocyclopentadiene	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
Hexachloroethane	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Indeno(1,2,3-cd)pyrene	mg/kg	0.07U	0.07U	0 07U	0.069U	0.077U	0.078U	0.07U	0.084U	0 072U		0.076U		0.07U	0 067U	0.064U	0.062U	0.11U	0 065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
Isophorone	mg/kg	0.42	38	7.2	0.72	0.38	5.5	5	2.1	0.83		21		26	0 067U	0.064U	0.062U	0.11U	0.065U	0.066U	0.34Y	0.06Y	0.064U	1.1	0 058U	0.065U
Naphthalene	mg/kg	0.74	27	5.4	3.2	3.2	32	4.5	22	14	7.1	11		20	19	0.064U	0.39	28	0.065U	0.066U	13	6.2	0.064U	25	0 058U	0.065U
Nitrobenzene	mg/kg	0.1Y	2.3Y	1.2Y	0.74Y	0 25Y	2Y	0.07U	2Y	1.4Y		2 2Y		0.07U	1Y	0.064U	0.062U	1.7Y	0.065U	0.066U	0.072U	0.059U	0.064U	0.13U	0 058U	0.065U
N-Nitroso-Di-N-Propylamine	mg/kg	0.35U	0.35U	0 35U	0.35U	0 39U	0 39U	0.35U	0.42U	0.36U		0.38U		0.35U	0.33U	0.32U	0 31U	0.57U	0.33U	0.33U	0.36U	0.3U	0.32U	0.67U	0.29U	0.32U
N-Nitrosodiphenylamine	mg/kg	0.07U	0 28	0.13	0.069U	0.31	1.8	0.62	1	0.74		2.7		0.51M	0.14	0.064U	0.062U	1.6	0.065U	0.066U	0 26	0.097	0.085M	0.7	0 058U	0.065U
Pentachlorophenol	mg/kg	0.35U	0 36	1.4	0.35U	0.39U	0.43	0 55	1.8	0.36U		0.38U		1.8	0.73	0 32U	0.31U	1 3	0.33U	0.33U	0.46	0.3U	0.32U	0.87	0.29U	0.32U
Phenanthrene	mg/kg	0.07U	0 32	0.19	0.1	0.13	0.39	0.2	0.43	0.25		0.18		0.39	0.45	0.064U	0.062U	0.55	0.065U	0.066U	0 25	0.12	0.064U	0.77	0 058U	0.065U
Phenol	mg/kg	0.07U	3.9	3.2	0.92	0.36	2.1	0.69	2.6	0.4		1.6		4.8	0 092Y	0.064U	0.062U	0.71Y	0.065U	0.066U	0.32Y	0.066Y	0.064U	2 3M	0 058U	0.065U
Pyrene	mg/kg	0.07U	0 27	0 087	0.069U	0.077U	0 088	0.084	0.19	0.08		0.076U		0.13	0.077	0.064U	0.062U	0.11U	0 065U	0.066U	0.2	0.059U	0.064U	0.36	0 058U	0.065U

		Soil Below Drums												Residual Soil									
Total Solids	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
	Percent	91.5	92.3	89.4	91.6	84.9	86.7	91.5	91.1	92 2		88.8		90.9	91 8	95.6		91.4	85 9	84.8	87.8	86.6	98	93.2	85.9	94.4

Notes
Blank = Not analyzed
##U = Detection Limit/Undetected
##Y = High Detection Limit due to chromatographic interference/Undetected
##E = Estimated concentration calculated for an analyte response above the valid instrument calibration range (dilution required)
##ES = Same as E flag but alos indicates the analyte saturated the detector (dilustion is required)
##M = Estimated value for analyte detected and confirmed by analyst but with low spectral match parameters
##J = Estiamted concentration when the value is less than lab's established reporting limits
##B = Analyte deteced in an associated Method Blank at concentration greater than one-half lab's reporting limit or 5% of the regulatory limit or 5% of analyte concentration

Table 5. Detected VOCs in Soils from Former Drum Area

Deteced VOCs Soil-Below-Drums														
Volatile Organic Compounds	**Units**	**S-1**	**S-10**	**S-11**	**S-12**	**S-2**	**S-3-B**	**S-4**	**S-5**	**S-6**	**S-7-A**	**S-8**	**S-8-D**	**S-9**
1,1,1-Trichloroethane	mg/kg		90	23	27	9.6	2600	400	49	7	7	48	160	120
1,1,2-Trichloro-1,2,2-trifluoroetha	mg/kg						130	120						
1,1-Dichloroethane	mg/kg		8.2				71	45	4.5				24	8
1,2,4-Trimethylbenzene	mg/kg	32	310	100	110	92	270	500	340	120	16	150	58	500
1,2-Dichloroethane	mg/kg		26		5.4			6.3					16	6.4
1,2-Dichloropropane	mg/kg											9.3	120	25
1,3,5-Trimethylbenzene	mg/kg	21	170	49	59	49	140	260	180	61	8	85	29	260
2-Butanone	mg/kg		84	790	500	91	100	1100	97		50	190	460	340
2-Hexanone	mg/kg								1200					
4-Isopropyltoluene	mg/kg		8.6				6.9	15	7.7					12
4-Methyl-2-Pentanone (MIBK)	mg/kg		170	280	120	40	360	1000	180	36		100	260	950
Acetone	mg/kg	28	210	2900	1200	99	1300	1000	640	87	270	520	960	360
Benzene	mg/kg												5.4	
Chloroform	mg/kg												12	
cis-1,2-Dichloroethene	mg/kg												8.8	
Ethylbenzene	mg/kg		350	160	240	150	420	860	820	85	50	240	340	590
Isopropylbenzene	mg/kg		49	14	18	15	36	86	67	12		28	14	130
Methylene Chloride	mg/kg		61	58	51	22	110	73	27	16	55	63	470	480
n-Butylbenzene	mg/kg		24	8.9	10		18	32	22	10		11		26
n-Propylbenzene	mg/kg		100	28	34	33	80	180	120	29		58	20	230
o-Xylene	mg/kg	37	370	240	370	160	390	870	540	150	32	220	240	770
Styrene	mg/kg		59	83	92		50	99	370	17		62	110	360
Tetrachloroethene (PCE)	mg/kg	5.2	32	8.2	11	27	130	1400	83	35	5	21	34	56
Toluene	mg/kg	28	1300	540	900	860	2400	4200	1700	290	200	2000	2900	2900
Trichloroethene (TCE)	mg/kg		1000	49	160	18	150	200	16		4.1	26	160	130
Xylene Isomers, M+P	mg/kg	84	1000	640	1100	470	1200	2300	1400	420	100	670	990	2000

Detected VOCs Residual Drum Soils													
Volatile Organic Compounds	**Units**	**SS-1**	**SS-10**	**SS-11**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**16-B**
1,1,1-Trichloroethane	mg/kg	22			48				22	0.0068		0.079	
1,1-Dichloroethane	mg/kg									0.0016			
1,2,4-Trimethylbenzene	mg/kg	110			240		0.16	130	43	0.0077	99	0.82	0.16
1,2-Dichloropropane	mg/kg									0.0016			
1,3,5-Trimethylbenzene	mg/kg	64			130			58	21	0.0036	47	0.41	0.081
2-Butanone	mg/kg		9.7	11		0.0069				0.062		1.3	
4-Isopropyltoluene	mg/kg								1.5				
4-Methyl-2-Pentanone (MIBK)	mg/kg		0.54	0.76						0.063		0.52	
Acetone	mg/kg		25	22		0.05	0.48			0.14		3	
Carbon Disulfide	mg/kg					0.011				0.0017			
Ethylbenzene	mg/kg	190		0.068	340	0.0014		120	30	0.0059	88	0.59	0.098
Isopropylbenzene	mg/kg	15			34				5		9.5	0.077	
Methylene Chloride	mg/kg	41			60		0.23	42		0.0096	24	0.18	0.25
n-Butylbenzene	mg/kg	14					0.7		3.8		9.8	0.084	
n-Propylbenzene	mg/kg	36			84			32	12	0.0022	24	0.18	
o-Xylene	mg/kg	160		0.074	340			120	29	0.0066	100	0.65	0.15
sec-Butylbenzene	mg/kg						0.31						
Styrene	mg/kg	54			40						23		
Tetrachloroethene (PCE)	mg/kg	20			250				5.3	0.0024	11		
Toluene	mg/kg	790	0.31	0.29	1700	0.0088	0.22	660	31	0.027	230	3.1	0.55
Trichloroethene (TCE)	mg/kg				25			29		0.0025			
Xylene Isomers, M+P	mg/kg	500	0.13	0.19	1100	0.0033	0.24	370	87	0.02	280	2	0.38

Notes:
##U = Detection Limit/Undetected
##Y = High Detection Limit due to chromatographic interference/Undetected

Table 6. Soils from Exploratory Borings - Analytical Results

VOCs		B-1-4.5	B-4-1	B-4-3	B-4-5	B-4-16	B-5-14	B-5-20	B-6-8	B-6-20	B-7-14	B-8-4.5	B-9-15	B-9-20	B-9-25	B-9-30	B-9-34	B-9-38	B-10-7	B-10-9	B-10-15	B-10-20
1,1-Dichloroethane	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	U	n/a	n/a	U	n/a	n/a	n/a	U	U	n/a
1,1-Dichloroethene	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	U	n/a	n/a	U	n/a	n/a	n/a	U	U	n/a
1,2-Dichlorobenzene	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	U	n/a	n/a	U	n/a	n/a	n/a	U	U	n/a
1,2-Dichloroethane	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	U	n/a	n/a	U	n/a	n/a	n/a	U	U	n/a
1,2-Dichloropropane	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.0038	U	n/a	n/a	U	n/a	n/a	n/a	U	U	n/a
1,4-Dichlorobenzene	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	0.01	n/a	n/a	U	n/a	n/a	n/a	0.0018	0.002	n/a
Benzene	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.012	0.0024	n/a	n/a	0.0084	n/a	n/a	n/a	0.0092	0.073	n/a
Chloroethane	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	U	n/a	n/a	U	n/a	n/a	n/a	0.0023	U	n/a
Chloromethane	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	U	n/a	n/a	U	n/a	n/a	n/a	U	U	n/a
cis-1,2-Dichloroethene	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.043	U	n/a	n/a	0.0067	n/a	n/a	n/a	0.0029	0.039	n/a
Ethylbenzene	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.0065	0.057	n/a	n/a	0.0039	n/a	n/a	n/a	0.024	0.023	n/a
Methylene Chloride	mg/kg	0.0023	n/a	n/a	n/a	U	n/a	0.0035	n/a	0.005	0.0023	U	0.005	n/a	n/a	U	n/a	n/a	n/a	U	U	n/a
o-Xylene	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.0056	0.033	n/a	n/a	0.0043	n/a	n/a	n/a	0.024	0.026	n/a
Tetrachloroethene (PCE)	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.019	U	n/a	n/a	0.0047	n/a	n/a	n/a	U	U	n/a
Toluene	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.016	0.01	n/a	n/a	0.0064	n/a	n/a	n/a	0.015	0.041	n/a
trans-1,2-Dichloroethene	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	U	n/a	n/a	U	n/a	n/a	n/a	U	0.0015	n/a
Trichloroethene (TCE)	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.015	U	n/a	n/a	0.002	n/a	n/a	n/a	U	0.0029	n/a
Trichlorofluoromethane (CFC 11)	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	U	n/a	n/a	U	n/a	n/a	n/a	U	U	n/a
Vinyl Chloride	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.069	U	n/a	n/a	0.033	n/a	n/a	n/a	U	0.011	n/a
Xylene Isomers, M+P	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	0.016	0.15	n/a	n/a	0.0074	n/a	n/a	n/a	0.047	0.03	n/a
Total VOCs	mg/kg	0.0023				0.00		0.0035		0.005	0.0023	0.21	0.27			0.08				0.13	0.25	

Inorganics		B-1-4.5	B-4-1	B-4-3	B-4-5	B-4-16	B-5-14	B-5-20	B-6-8	B-6-20	B-7-14	B-8-4.5	B-9-15	B-9-20	B-9-25	B-9-30	B-9-34	B-9-38	B-10-7	B-10-9	B-10-15	B-10-20
Arsenic, Total	mg/kg	2.8	n/a	n/a	n/a	0.8	n/a	1.2	n/a	0.5	0.8	14.4	1.8	n/a	n/a	1.4	n/a	n/a	n/a	2	17.3	n/a
Iron, Total	mg/kg	27400	n/a	n/a	n/a	36900	n/a	34100	n/a	35500	36200	59400	30700	n/a	n/a	38500	n/a	n/a	n/a	39500	132000	n/a
Manganese, Total	mg/kg	385	n/a	n/a	n/a	434	n/a	371	n/a	396	389	378	359	n/a	n/a	382	n/a	n/a	n/a	446	867	n/a
Chloride	mg/kg	241	n/a	n/a	n/a	144	n/a	220	n/a	142	180	410	572	n/a	n/a	163	n/a	n/a	n/a	102	744	n/a
Sulfate	mg/kg	828	n/a	n/a	n/a	693	n/a	930	n/a	677	822	2540	343	n/a	n/a	241	n/a	n/a	n/a	382	152	n/a
Nitrate	mg/kg	4.37	n/a	n/a	n/a	2.38	n/a	0.9	n/a	0.73	4.14	U	U	n/a	n/a	0.56	n/a	n/a	n/a	0.23	U	n/a
Nitrate+Nitrite	mg/kg	4.37	n/a	n/a	n/a	2.38	n/a	0.9	n/a	0.73	4.14	U	U	n/a	n/a	0.56	n/a	n/a	n/a	0.23	U	n/a
Nitrite	mg/kg	U	n/a	n/a	n/a	U	n/a	U	n/a	U	U	U	U	n/a	n/a	U	n/a	n/a	n/a	U	U	n/a
Total Solids	%	70.1	n/a	n/a	n/a	95.4	n/a	96.4	n/a	96.6	96.1	76.2	78.1	n/a	n/a	94.1	n/a	n/a	n/a	85.1	71.1	n/a

Field Parameters		B-1-4.5	B-4-1	B-4-3	B-4-5	B-4-16	B-5-14	B-5-20	B-6-8	B-6-20	B-7-14	B-8-4.5	B-9-15	B-9-20	B-9-25	B-9-30	B-9-34	B-9-38	B-10-7	B-10-9	B-10-15	B-10-20
PID[a]	ppm	0.2	0.7	0.2	0.2	0.2	0.4	0.4	0.2	0.2	0.4	2.5	3.6	1.1	3	3.8	0.7	0.5	1.1	2.6	8.2	1.2
Specific Conductance[b]	umhos/cm	87	34	93	49	73	63	116	1760	85	160	1010	510	155	265	259	1264	1775	120	275	300	1070
Temperature[a]	°C	20.3	22.2	22.5	21.2	21.5	16.6	19.7	24.9	26.1	28.3	22.6	19	18.3	18.2	18.9	18.9	18.4	16	18	18.2	17.7

Exploratory Boring nomenclature: B-"boring#"-"depth in feet"
n/a = not analyzed; U = not detected
VOC = volatile organic compound; PID = photoionization detector
a. PID and temperature measurements made in the headspace of a covered glass jar half full of the soil sample
b. Specific conductance of a deionized-water extract. Extract created in glass jar 1/2 full of soil sample and full of deionized water

Table 6. Soils from Exploratory Borings - Analytical Results

VOCs		B-11-9	B-11-20	B-11-25	B-11-32	B-11-38	B-11-44	B-11-46.5	B-12-10	B-12-15	B-12-30	B-12-48	B-13-7	B-13-19	B-13-24	B-13-29	B-13-37	B-13-44	B-13-46	B-13-54
1,1-Dichloroethane	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
1,1-Dichloroethene	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
1,2-Dichlorobenzene	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
1,2-Dichloroethane	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
1,2-Dichloropropane	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
1,4-Dichlorobenzene	mg/kg	0.016	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
Benzene	mg/kg	U	n/a	n/a	n/a	0.04	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	0.086	n/a	n/a	n/a
Chloroethane	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
Chloromethane	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
cis-1,2-Dichloroethene	mg/kg	U	n/a	n/a	n/a	0.007	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	0.0074	n/a	n/a	n/a
Ethylbenzene	mg/kg	0.012	n/a	n/a	n/a	0.0052	n/a	n/a	0.22	n/a	n/a	0.9	U	n/a	n/a	n/a	0.011	n/a	n/a	n/a
Methylene Chloride	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	0.0055	n/a	n/a	n/a
o-Xylene	mg/kg	0.004	n/a	n/a	n/a	0.0064	n/a	n/a	0.2	n/a	n/a	1.1	U	n/a	n/a	n/a	0.0043	n/a	n/a	n/a
Tetrachloroethene (PCE)	mg/kg	U	n/a	n/a	n/a	0.0021	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	0.01	n/a	n/a	n/a
Toluene	mg/kg	U	n/a	n/a	n/a	0.021	n/a	n/a	0.33	n/a	n/a	3.2	0.18	n/a	n/a	n/a	0.04	n/a	n/a	n/a
trans-1,2-Dichloroethene	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
Trichloroethene (TCE)	mg/kg	U	n/a	n/a	n/a	0.0019	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	0.0026	n/a	n/a	n/a
Trichlorofluoromethane (CFC 11)	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
Vinyl Chloride	mg/kg	U	n/a	n/a	n/a	0.0085	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	0.058	n/a	n/a	n/a
Xylene Isomers, M+P	mg/kg	0.016	n/a	n/a	n/a	0.01	n/a	n/a	0.48	n/a	n/a	4.4	0.097	n/a	n/a	n/a	0.01	n/a	n/a	n/a
Total VOCs	mg/kg	0.05				0.10			1.23			9.60	0.28				0.23			

Inorganics		B-11-9	B-11-20	B-11-25	B-11-32	B-11-38	B-11-44	B-11-46.5	B-12-10	B-12-15	B-12-30	B-12-48	B-13-7	B-13-19	B-13-24	B-13-29	B-13-37	B-13-44	B-13-46	B-13-54
Arsenic, Total	mg/kg	0.7	n/a	n/a	n/a	6.2	n/a	n/a	2	n/a	n/a	8.4	1.2	n/a	n/a	n/a	8.2	n/a	n/a	n/a
Iron, Total	mg/kg	26900	n/a	n/a	n/a	65100	n/a	n/a	25800	n/a	n/a	58000	30500	n/a	n/a	n/a	75500	n/a	n/a	n/a
Manganese, Total	mg/kg	296	n/a	n/a	n/a	937	n/a	n/a	233	n/a	n/a	561	298	n/a	n/a	n/a	704	n/a	n/a	n/a
Chloride	mg/kg	77.6	n/a	n/a	n/a	582	n/a	n/a	1150	n/a	n/a	550	366	n/a	n/a	n/a	427	n/a	n/a	n/a
Sulfate	mg/kg	421	n/a	n/a	n/a	1180	n/a	n/a	16700	n/a	n/a	1090	679	n/a	n/a	n/a	1270	n/a	n/a	n/a
Nitrate	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
Nitrate+Nitrite	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
Nitrite	mg/kg	U	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	U	U	n/a	n/a	n/a	U	n/a	n/a	n/a
Total Solids	%	88.6	n/a	n/a	n/a	90.9	n/a	n/a	76.6	n/a	n/a	89.3	92.9	n/a	n/a	n/a	91.6	n/a	n/a	n/a

Field Parameters		B-11-9	B-11-20	B-11-25	B-11-32	B-11-38	B-11-44	B-11-46.5	B-12-10	B-12-15	B-12-30	B-12-48	B-13-7	B-13-19	B-13-24	B-13-29	B-13-37	B-13-44	B-13-46	B-13-54
PID[a]	ppm	5.6	1.6	2.4	2.1	2	1.3	1.5	10.8	4.8	3	17.3	81	5.6	14.2	4.9	6.6	2.3	2.2	2.1
Specific Conductance[b]	umhos/cm	333	260	1570	660	1030	1000	294	2150	1151	732	525	1610	710	930	450	1060	560	1060	630
Temperature[a]	°C	17.3	14.5	17	15	15	14	15	22.1	21	20.8	23	20	21	20	22	21	21	21	21

Exploratory Boring nomenclature: B-"boring#"-"depth in feet"
n/a = not analyzed; U = not detected
VOC = volatile organic compound; PID = photoionization detector
a. PID and temperature measurements made in the headspace of a covered glass jar half full of the soil sample
b. Specific conductance of a deionized-water extract. Extract created in glass jar 1/2 full of soil sample and full of deionized water

Table 6. Soils from Exploratory Borings - Analytical Results

VOCs		B-14-5	B-14-15	B-14-23	B-14-28	B-15-14	B-15-22	B-15-31	B-15-36	B-16-8	B-16-14	B-16-19	B-16-24
1,1-Dichloroethane	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
1,1-Dichloroethene	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
1,2-Dichlorobenzene	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
1,2-Dichloroethane	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
1,2-Dichloropropane	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
1,4-Dichlorobenzene	mg/kg	n/a	n/a	n/a	U	n/a	n/a	0.13	0.0029	n/a	0.0021	n/a	U
Benzene	mg/kg	n/a	n/a	n/a	0.0071	n/a	n/a	U	0.016	n/a	U	n/a	U
Chloroethane	mg/kg	n/a	n/a	n/a	0.003	n/a	n/a	U	U	n/a	U	n/a	U
Chloromethane	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
cis-1,2-Dichloroethene	mg/kg	n/a	n/a	n/a	0.049	n/a	n/a	U	0.0042	n/a	U	n/a	U
Ethylbenzene	mg/kg	n/a	n/a	n/a	0.004	n/a	n/a	0.29	0.018	n/a	0.0084	n/a	U
Methylene Chloride	mg/kg	n/a	n/a	n/a	U	n/a	n/a	0.14	0.0038	n/a	U	n/a	U
o-Xylene	mg/kg	n/a	n/a	n/a	0.0054	n/a	n/a	0.15	0.025	n/a	0.0066	n/a	0.0033
Tetrachloroethene (PCE)	mg/kg	n/a	n/a	n/a	0.0014	n/a	n/a	U	0.0031	n/a	U	n/a	U
Toluene	mg/kg	n/a	n/a	n/a	0.0096	n/a	n/a	U	0.017	n/a	0.0071	n/a	0.0013
trans-1,2-Dichloroethene	mg/kg	n/a	n/a	n/a	0.0019	n/a	n/a	U	U	n/a	U	n/a	U
Trichloroethene (TCE)	mg/kg	n/a	n/a	n/a	0.0032	n/a	n/a	U	U	n/a	U	n/a	U
Trichlorofluoromethane (CFC 11)	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
Vinyl Chloride	mg/kg	n/a	n/a	n/a	0.069	n/a	n/a	U	0.02	n/a	U	n/a	0.0025
Xylene Isomers, M+P	mg/kg	n/a	n/a	n/a	0.0052	n/a	n/a	0.6	0.031	n/a	0.015	n/a	0.0016
Total VOCs	mg/kg				0.16			1.31	0.14		0.04		0.01

Inorganics		B-14-5	B-14-15	B-14-23	B-14-28	B-15-14	B-15-22	B-15-31	B-15-36	B-16-8	B-16-14	B-16-19	B-16-24
Arsenic, Total	mg/kg	n/a	n/a	n/a	3.4	n/a	n/a	1.7	3.7	n/a	0.9	n/a	1.1
Iron, Total	mg/kg	n/a	n/a	n/a	70200	n/a	n/a	34300	49500	n/a	29400	n/a	33400
Manganese, Total	mg/kg	n/a	n/a	n/a	750	n/a	n/a	395	498	n/a	346	n/a	391
Chloride	mg/kg	n/a	n/a	n/a	547	n/a	n/a	638	411	n/a	1850	n/a	164
Sulfate	mg/kg	n/a	n/a	n/a	681	n/a	n/a	909	985	n/a	112	n/a	506
Nitrate	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
Nitrate+Nitrite	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
Nitrite	mg/kg	n/a	n/a	n/a	U	n/a	n/a	U	U	n/a	U	n/a	U
Total Solids	%	n/a	n/a	n/a	85.9	n/a	n/a	86.6	88.8	n/a	91.5	n/a	92.5

Field Parameters		B-14-5	B-14-15	B-14-23	B-14-28	B-15-14	B-15-22	B-15-31	B-15-36	B-16-8	B-16-14	B-16-19	B-16-24
PID[a]	ppm	9	7.4	1.3	2.5	26.4	3	9	4.2	3.7	7.2	2.2	1.6
Specific Conductance[b]	umhos/cm	470	750	155	220	1470	480	770	590	2380	2230	233	288
Temperature[a]	°C	15	18	20	18	23	25	26	24	22	22	22	24

Exploratory Boring nomenclature: B-"boring#"-"depth in feet"
n/a = not analyzed; U = not detected
VOC = volatile organic compound; PID = photoionization detector
a. PID and temperature measurements made in the headspace of a covered glass jar half full of the soil sample
b. Specific conductance of a deionized-water extract. Extract created in glass jar 1/2 full of soil sample and full of deionized water

Table 7. Soils from Test Pits - Analytical Results

VOCs		T-1-3.5	T-1-9.5	T-2-5	T-2-6.5	T-3-3	T-3-5	T-3-7.3	T-4-2.5	T-4-4	T-5-1	T-5-2	T-5-3.5	T-5-5	T-5-5.5	T-5-6	T-5-6.5	T-5-7	T-5-7.2	T-5-8	T-6-2.8	T-6-4	T-6-7.3	T-7-2.3	T-7-6.5
1,1-Dichloroethane	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
1,1-Dichloroethene	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
1,2-Dichlorobenzene	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
1,2-Dichloroethane (EDC)	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
1,2-Dichloropropane	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
1,4-Dichlorobenzene	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
Benzene	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	0.0052	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	0.014	n/a	0.0079	n/a
Chloroethane	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
Chloromethane	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
cis-1,2-Dichloroethene	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.8	1	0.047	n/a	U	n/a	U	n/a
Ethylbenzene	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	0.0016	n/a	U	n/a
Methylene Chloride	mg/kg	n/a	0.0026	n/a	0.0027	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
o-Xylene	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
Tetrachloroethene (PCE)	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	0.047	n/a	0.0025	n/a
Toluene	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	0.0015	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	0.0072	n/a	0.0037	n/a
trans-1,2-Dichloroethene	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
Trichloroethene (TCE)	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.95	1.1	0.63	n/a	U	n/a	U	n/a
Trichlorofluoromethane (CFC 11)	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
Vinyl Chloride	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	U	n/a	U	n/a
Xylene Isomers, M+P	mg/kg	n/a	U	n/a	U	n/a	n/a	U	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U	n/a	0.0025	n/a	0.002	n/a
Total VOCs	mg/kg		0.0026		0.0027			0.0		0.0067								1.75	2.1	0.677		0.0723		0.0161	

Inorganics		T-1-3.5	T-1-9.5	T-2-5	T-2-6.5	T-3-3	T-3-5	T-3-7.3	T-4-2.5	T-4-4	T-5-1	T-5-2	T-5-3.5	T-5-5	T-5-5.5	T-5-6	T-5-6.5	T-5-7	T-5-7.2	T-5-8	T-6-2.8	T-6-4	T-6-7.3	T-7-2.3	T-7-6.5
Arsenic, Total	mg/kg	n/a	0.8	n/a	1.7	n/a	n/a	2.6	n/a	5.4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4.6	3.4	8.8	n/a	14.8	n/a	4.8	n/a
Iron, Total	mg/kg	n/a	36200	n/a	34000	n/a	n/a	28700	n/a	24600	n/a	n/a	n/a	n/a	n/a	n/a	n/a	74900	35800	38400	n/a	95200	n/a	25700	n/a
Manganese, Total	mg/kg	n/a	419	n/a	431	n/a	n/a	375	n/a	390	n/a	n/a	n/a	n/a	n/a	n/a	n/a	560	443	450	n/a	607	n/a	366	n/a
Chloride	mg/kg	n/a	U	n/a	U	n/a	n/a	95.9	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	266	117	65.5	n/a	51.2	n/a	116	n/a
Sulfate	mg/kg	n/a	45.5	n/a	37.9	n/a	n/a	158	n/a	16200	n/a	n/a	n/a	n/a	n/a	n/a	n/a	668	551	367	n/a	746	n/a	19400	n/a
Nitrate	mg/kg	n/a	0.26	n/a	0.61	n/a	n/a	20.9	n/a	10.9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	0.68	5.64	n/a	2.21	n/a	77.6	n/a
Nitrate+Nitrite	mg/kg	n/a	0.26	n/a	0.61	n/a	n/a	21.1	n/a	11.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	0.83	5.8	n/a	2.21	n/a	78.1	n/a
Nitrite	mg/kg	n/a	U	n/a	U	n/a	n/a	0.17	n/a	0.16	n/a	n/a	n/a	n/a	n/a	n/a	n/a	U	0.15	0.16	n/a	U	n/a	0.52	n/a
Total Solids	%	n/a	96.2	n/a	96.8	n/a	n/a	94.4	n/a	82.6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	79.4	81.9	83.6	n/a	81.5	n/a	68.7	n/a

Field Parameters		T-1-3.5	T-1-9.5	T-2-5	T-2-6.5	T-3-3	T-3-5	T-3-7.3	T-4-2.5	T-4-4	T-5-1	T-5-2	T-5-3.5	T-5-5	T-5-5.5	T-5-6	T-5-6.5	T-5-7	T-5-7.2	T-5-8	T-6-2.8	T-6-4	T-6-7.3	T-7-2.3	T-7-6.5
PID[a]	ppm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Specific Conductance[b]	umhos/cm	46	35	33	46	1043	277	404	1667	1854	72	1480	2161	852	186	374	456	346	678	388	1905	643	162	2286	475
Temperature[a]	°C	32.6	32.6	33	33.4	28.8	29.5	29.7	33.5	33.6	19.8	19.6	21.4	21.4	21.3	21.9	22.4	23.1	24.8	25.6	25.6	25.4	25.8	27.5	28.3

Test Pit nomenclature: T-"test pit#"-"depth in feet"
n/a = not analyzed; U = not detected
VOC = volatile organic compound; PID = photoionization detector
a. PID and temperature measurements made in the headspace of a covered glass jar half full of the soil sample
b. Specific conductance of a deionized-water extract. Extract created in glass jar 1/2 full of soil sample and full of deionized water

Table 7. Soils from Test Pits - Analytical Results

VOCs		T-8-4	T-8-7.3	T-9-5	T-9-6.4	T-10-4.2	T-11-4	T-12-2.3	T-12-4	T-12-5	T-12-5.5	T-12-7	T-13-2	T-13-4	T-13-5.5	T-13-6
1,1-Dichloroethane	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
1,1-Dichloroethene	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
1,2-Dichlorobenzene	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
1,2-Dichloroethane (EDC)	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
1,2-Dichloropropane	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
1,4-Dichlorobenzene	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	2.2	1.5	0.049
Benzene	mg/kg	0.0016	n/a	n/a	U	0.017	0.01	n/a	n/a	U	U	0.23	n/a	U	U	0.0062
Chloroethane	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
Chloromethane	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
cis-1,2-Dichloroethene	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	2.8	0.028
Ethylbenzene	mg/kg	U	n/a	n/a	U	0.0014	0.0026	n/a	n/a	0.39	0.26	0.42	n/a	0.11	1	0.012
Methylene Chloride	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
o-Xylene	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	0.21	U	0.15	n/a	0.15	1.4	0.012
Tetrachloroethene (PCE)	mg/kg	0.0013	n/a	n/a	U	0.008	0.011	n/a	n/a	U	U	U	n/a	0.36	4	0.033
Toluene	mg/kg	0.0014	n/a	n/a	U	0.0081	0.0093	n/a	n/a	0.09	0.15	0.26	n/a	0.1	2.3	0.021
trans-1,2-Dichloroethene	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
Trichloroethene (TCE)	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	0.13	n/a	U	0.63	0.0032
Trichlorofluoromethane (CFC 11)	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	U	U
Vinyl Chloride	mg/kg	U	n/a	n/a	U	U	U	n/a	n/a	U	U	U	n/a	U	0.28	0.0033
Xylene Isomers, M+P	mg/kg	U	n/a	n/a	U	U	0.0014	n/a	n/a	0.37	0.23	0.4	n/a	0.26	2.7	0.022
Total VOCs	mg/kg	0.0043				0.0345	0.0343			1.06	0.64	1.59		3.18	16.61	0.1897

Inorganics		T-8-4	T-8-7.3	T-9-5	T-9-6.4	T-10-4.2	T-11-4	T-12-2.3	T-12-4	T-12-5	T-12-5.5	T-12-7	T-13-2	T-13-4	T-13-5.5	T-13-6
Arsenic, Total	mg/kg	3.8	n/a	n/a	2.6	2.8	6.6	n/a	n/a	1.5	4.4	8.3	n/a	1.7	4.3	0.8
Iron, Total	mg/kg	52600	n/a	n/a	35900	48400	52000	n/a	n/a	31800	57700	98700	n/a	43300	27000	56600
Manganese, Total	mg/kg	521	n/a	n/a	461	535	514	n/a	n/a	334	497	1880	n/a	477	292	611
Chloride	mg/kg	35.2	n/a	n/a	10.6	32.5	38.8	n/a	n/a	222	122	120	n/a	151	298	220
Sulfate	mg/kg	325	n/a	n/a	30.4	1560	7900	n/a	n/a	369	482	326	n/a	258	305	490
Nitrate	mg/kg	26.8	n/a	n/a	1.29	65.3	37	n/a	n/a	0.21	U	U	n/a	0.82	U	U
Nitrate+Nitrite	mg/kg	27	n/a	n/a	1.29	65.6	37.2	n/a	n/a	0.21	U	U	n/a	1.01	U	U
Nitrite	mg/kg	0.18	n/a	n/a	U	0.29	0.2	n/a	n/a	U	U	U	n/a	0.19	U	U
Total Solids	%	87.4	n/a	n/a	95.4	91.7	92.8	n/a	n/a	88	85.5	82.4	n/a	92.1	82.5	90.2

Field Parameters		T-8-4	T-8-7.3	T-9-5	T-9-6.4	T-10-4.2	T-11-4	T-12-2.3	T-12-4	T-12-5	T-12-5.5	T-12-7	T-13-2	T-13-4	T-13-5.5	T-13-6
PID[a]	ppm	0	0	0	0	0	0	0	1.808	15.63	162.1	164.3	0	2.736	44.7	14.48
Specific Conductance[b]	umhos/cm	515	372	150	99	1046	2153	210	384	210	217	275	72	342	469	383
Temperature[a]	°C	26.3	26.7	29.8	30.1	36.2	36.2	37.2	36.7	36.9	36.9	36.9	36.7	36.6	36.5	36.2

Test Pit nomenclature: T-"test pit#"-"depth in feet"
n/a = not analyzed; U = not detected
VOC = volatile organic compound; PID = photoionization detector
a. PID and temperature measurements made in the headspace of a covered glass jar half full of the soil sample
b. Specific conductance of a deionized-water extract. Extract created in glass jar 1/2 full of soil sample and full of deionized water

Table 8. Landfill Gas - Analytical Results

		Gas Extraction Wells																								
VOCs		GE-1	GE-2	GE-3	GE-4	GE-5	GE-6	GE-7	GE-8	GE-9	GE-10	GE-11	GE-12	GE-13	GE-14	GE-15	GE-16	GE-17	GE-18	GE-19	GE-20	GE-21	GE-22	GE-23	GE-24	GE-25	GE-26	GE-27
1,1,1,2-Tetrachloroethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,1,1-Trichloroethane (TCA)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,1,2,2-Tetrachloroethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,1,2-Trichloroethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,1-Dichloroethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	3.26	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,1-Dichloroethene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,1-Dichloropropene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,2,3-Trichlorobenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,2,3-Trichloropropane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,2,4-Trichlorobenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,2,4-Trimethylbenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	3.84	U	U	n/a	U	n/a	U	n/a	n/a
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,2-Dibromoethane (EDB)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,2-Dichlorobenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,2-Dichloroethane (EDC)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,2-Dichloropropane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,3,5-Trimethylbenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,3-Dichlorobenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,3-Dichloropropane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1,4-Dichlorobenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
1-Chlorohexane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
2,2-Dichloropropane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
2-Butanone (MEK)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
2-Chlorotoluene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
2-Hexanone	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
4-Chlorotoluene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
4-Methyl-2-pentanone (MIBK)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Acetone	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Benzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Bromobenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Bromochloromethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Bromodichloromethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Bromoform	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Bromomethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Carbon disulfide	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Carbon tetrachloride	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Chlorobenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Chloroethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	16	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Chloroform	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Chloromethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
cis-1,2-Dichloroethene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	2.42	U	U	U	U	n/a	U	n/a	U	n/a	n/a
cis-1,3-Dichloropropene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Dibromochloromethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Dibromomethane	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Dichlorodifluoromethane (CFC 12)	ug/L	n/a	n/a	U	n/a	n/a	n/a	4.29	n/a	n/a	n/a	n/a	n/a	n/a	U	3.24	n/a	4.85	U	8.24	15.8	U	n/a	U	n/a	2.36	n/a	n/a
Dichloromethane (Methylene Cl)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Ethylbenzene	ug/L	n/a	n/a	2.34	n/a	n/a	n/a	4.61	n/a	n/a	n/a	n/a	n/a	n/a	U	4.6	n/a	5.37	2.47	12.8	4.32	U	n/a	6.42	n/a	4.18	n/a	n/a
Hexachlorobutadiene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Isopropylbenzene (Cumene)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Methyl tert-butyl ether	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Naphthalene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
n-Butylbenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
n-Propylbenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
o-Xylene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	2.74	n/a	3.44	U	8.8	3.16	U	n/a	2.74	n/a	U	n/a	n/a
p-Isopropyltoluene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	2.05	3.88	U	U	n/a	U	n/a	U	n/a	n/a
sec-Butylbenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Styrene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
tert-Butylbenzene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Tetrachloroethene (PCE)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Toluene	ug/L	n/a	n/a	7.04	n/a	n/a	n/a	4.46	n/a	n/a	n/a	n/a	n/a	n/a	U	20.1	n/a	23.9	U	41	9.2	3 98	n/a	U	n/a	U	n/a	n/a
trans-1,2-Dichloroethene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
trans-1,3-Dichloropropene	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Trichloroethene (TCE)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	U	U	n/a	U	n/a	U	n/a	n/a
Trichlorofluoromethane (CFC 11)	ug/L	n/a	n/a	U	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	U	U	U	2.9	U	n/a	U	n/a	U	n/a	n/a
Vinyl chloride	ug/L	n/a	n/a	6.04	n/a	n/a	n/a	16.9	n/a	n/a	n/a	n/a	n/a	n/a	U	U	n/a	3.36	2.25	U	U	U	n/a	2.32	n/a	3.2	n/a	n/a
Xylene Isomers, M+P	ug/L	n/a	n/a	4.71	n/a	n/a	n/a	7.5	n/a	n/a	n/a	n/a	n/a	n/a	U	11.7	n/a	14	5.39	32	5.78	U	n/a	8.26	n/a	4.1	n/a	n/a
Total VOCs	ug/L			20.13				57.02								42.38		57.34	12.16	110.56	41.16	3.98		19.74		13.84		

Field Parameters		GE-1	GE-2	GE-3	GE-4	GE-5	GE-6	GE-7	GE-8	GE-9	GE-10	GE-11	GE-12	GE-13	GE-14	GE-15	GE-16	GE-17	GE-18	GE-19	GE-20	GE-21	GE-22	GE-23	GE-24	GE-25	GE-26	GE-27
Hydrogen Sulfide (H_2S)	ppm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methane	%	11	18	49	47	51	46	39	49	44	33	33	51	52	57	58	45	57	61	43	20	33	52	55	25	23	35	41
Oxygen (O_2)	%	0.6	0.6	0.6	0.6	0.6	0.6	1.7	0.6	1.1	0.7	0.6	0.6	0.8	0.6	0.6	0.6	0.6	0.6	0.6	0.8	0.7	0.6	0.6	0.6	0.7	0.6	0.6
PID	ppm	1.5	1 9	5.4	3.0	2.2	1.2	4.0	3.5	0.9	1.7	2.1	2.1	7.1	13.6	18.0	5.7	16.1	11.8	19.9	13.0	18.4	5.0	5.1	3.1	2.7	2.4	2.6

Notes: For gas extraction wells GE-29 and GE-35, gas samples were collected for laboratory analysis, however, the tedlar bag ruptured during transport to the lab and the sample was lost.
Sample nomenclature: samples were collected from gas extraction wells (GE) and test pits (T)
n/a = not analyzed; U = not detected; VOC = volatile organic compound; PID = photoionization detector

Table 8. Landfill Gas - Analytical Results

		Gas Extraction Wells															
VOCs		GE-28	GE-29	GE-30	GE-31	GE-32	GE-33	GE-34	GE-35	GE-36	GE-37	GE-38	GE-39	GE-40	GE-41	GE-42	GE-43
1,1,1,2-Tetrachloroethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,1,1-Trichloroethane (TCA)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,1,2,2-Tetrachloroethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,1,2-Trichloroethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,1-Dichloroethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,1-Dichloroethene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,1-Dichloropropene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,2,3-Trichlorobenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,2,3-Trichloropropane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,2,4-Trichlorobenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,2,4-Trimethylbenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,2-Dibromoethane (EDB)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,2-Dichlorobenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,2-Dichloroethane (EDC)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,2-Dichloropropane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,3,5-Trimethylbenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,3-Dichlorobenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,3-Dichloropropane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1,4-Dichlorobenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
1-Chlorohexane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
2,2-Dichloropropane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
2-Butanone (MEK)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
2-Chlorotoluene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
2-Hexanone	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
4-Chlorotoluene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
4-Methyl-2-pentanone (MIBK)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Acetone	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Benzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Bromobenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Bromochloromethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Bromodichloromethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Bromoform	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Bromomethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Carbon disulfide	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Carbon tetrachloride	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Chlorobenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Chloroethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Chloroform	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Chloromethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
cis-1,2-Dichloroethene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
cis-1,3-Dichloropropene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Dibromochloromethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Dibromomethane	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Dichlorodifluoromethane (CFC 12)	ug/L	n/a	n/a	n/a	30.5	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Dichloromethane (Methylene Cl)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Ethylbenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Hexachlorobutadiene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Isopropylbenzene (Cumene)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Methyl tert-butyl ether	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Naphthalene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
n-Butylbenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
n-Propylbenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
o-Xylene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
p-Isopropyltoluene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
sec-Butylbenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Styrene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
tert-Butylbenzene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Tetrachloroethene (PCE)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Toluene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	3.9	n/a	n/a	U	n/a	n/a	n/a
trans-1,2-Dichloroethene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
trans-1,3-Dichloropropene	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Trichloroethene (TCE)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Trichlorofluoromethane (CFC 11)	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Vinyl chloride	ug/L	n/a	n/a	n/a	3.16	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Xylene Isomers, M+P	ug/L	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	U	n/a	n/a	U	n/a	n/a	n/a
Total VOCs	ug/L				33.66						3.9			0.0			

Field Parameters		GE-28	GE-29	GE-30	GE-31	GE-32	GE-33	GE-34	GE-35	GE-36	GE-37	GE-38	GE-39	GE-40	GE-41	GE-42	GE-43
Hydrogen Sulfide (H_2S)	ppm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methane	%	27	48	50	48	54	44	55	53	55	48	53	52	50	42	53	51
Oxygen (O_2)	%	0.6	0.8	0.6	0.7	0.6	1.1	0.6	0.6	0.5	0.6	0.6	0 6	0.07	0.6	0.6	0.6
PID	ppm	2.5	3.3	2.8	1.0	2.4	3.6	4.4	4.8	4.6	15.4	3.3	2.4	6.8	1.5	4.2	4.2

Notes: For gas extraction wells GE-29 and GE-35, gas samples were collected for laboratory analysis, however, the tedlar bag ruptured during transport to the lab and the sample was lost.
Sample nomenclature: samples were collected from gas extraction wells (GE) and test pits (T)
n/a = not analyzed; U = not detected; VOC = volatile organic compound; PID = photoionization detector

Table 8. Landfill Gas - Analytical Results

		Test Pits (Temporary Probes)													
VOCs		T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	T-13	T-14
1,1,1,2-Tetrachloroethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,1,1-Trichloroethane (TCA)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,1,2,2-Tetrachloroethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,1,2-Trichloroethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,1-Dichloroethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,1-Dichloroethene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,1-Dichloropropene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,2,3-Trichlorobenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,2,3-Trichloropropane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,2,4-Trichlorobenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,2,4-Trimethylbenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,2-Dibromoethane (EDB)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,2-Dichlorobenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,2-Dichloroethane (EDC)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,2-Dichloropropane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,3,5-Trimethylbenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,3-Dichlorobenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,3-Dichloropropane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1,4-Dichlorobenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
1-Chlorohexane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
2,2-Dichloropropane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
2-Butanone (MEK)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
2-Chlorotoluene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
2-Hexanone	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
4-Chlorotoluene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
4-Methyl-2-pentanone (MIBK)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Acetone	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Benzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Bromobenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Bromochloromethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Bromodichloromethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Bromoform	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Bromomethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Carbon disulfide	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Carbon tetrachloride	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Chlorobenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Chloroethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Chloroform	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Chloromethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
cis-1,2-Dichloroethene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
cis-1,3-Dichloropropene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Dibromochloromethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Dibromomethane	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Dichlorodifluoromethane (CFC 12)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	5.73	4.98	U
Dichloromethane (Methylene Cl)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Ethylbenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Hexachlorobutadiene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Isopropylbenzene (Cumene)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Methyl tert-butyl ether	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Naphthalene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
n-Butylbenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
n-Propylbenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
o-Xylene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
p-Isopropyltoluene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
sec-Butylbenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Styrene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
tert-Butylbenzene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Tetrachloroethene (PCE)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Toluene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
trans-1,2-Dichloroethene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
trans-1,3-Dichloropropene	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Trichloroethene (TCE)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Trichlorofluoromethane (CFC 11)	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	2.17	U
Vinyl chloride	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	11.3	U
Xylene Isomers, M+P	ug/L	n/a	n/a	n/a	n/a	U	n/a	n/a	n/a	n/a	n/a	n/a	U	U	U
Total VOCs	ug/L					0.0							5.7	18.5	

Field Parameters		T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8	T-9	T-10	T-11	T-12	T-13	T-14
Hydrogen Sulfide (H_2S)	ppm	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	3	3	n/a
Methane	%	0	0	0	0	0	0	0	0	0	0	0	5	12	n/a
Oxygen (O_2)	%	20.6	20.5	20.6	19.2	14.5	15.9	20.4	10.2	16.3	20	17.88	1.3	0.8	n/a
PID	ppm	0.225	0.206	0.184	0.102	1.45	0.111	0.161	0.057	0.103	0.057	0.25	4.8	5.33	3.3

Notes: For gas extraction wells GE-29 and GE-35, gas samples were collected for laboratory analysis, however, the tedlar bag ruptured during transport to the lab and the sample was lost.
Sample nomenclature: samples were collected from gas extraction wells (GE) and test pits (T)
n/a = not analyzed; U = not detected; VOC = volatile organic compound; PID = photoionization detector

Table 9. Detected VOCs in Landfill Gas

VOCs (ppbv air)[1]	GE-3	GE-7	GE-14	GE-15	GE-17	GE-18	GE-19	GE-20	GE-21	GE-23	GE-25	GE-31	GE-37	GE-40	T-5	T-12	T-13
1,1-Dichloroethane	U	790	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
1,2,4-Trimethylbenzene	U	U	U	U	U	U	768	U	U	U	U	U	U	U	U	U	U
Chloroethane	U	6144	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	587	U	U	U	U	U	U	U	U	U	U	U	U
Dichlorodifluoromethane (CFC 12)	U	851	U	643	962	U	1634	3134	U	U	468	6050	U	U	U	1137	988
Ethylbenzene	529	1042	U	1040	1214	558	2893	976	U	1451	945	U	U	U	U	U	U
o-Xylene	U	U	U	619	777	U	1989	714	U	619	U	U	U	U	U	U	U
p-Isopropyltoluene	U	U	U	U	U	367	694	U	U	U	U	U	U	U	U	U	U
Toluene	1835	1162	U	5238	6228	U	10684	2397	1037	U	U	U	1016	U	U	U	U
Trichlorofluoromethane (CFC 11)	U	U	U	U	U	U	U	507	U	U	U	U	U	U	U	U	379
Vinyl chloride	2319	6490	U	U	1290	864	U	U	U	891	1229	1213	U	U	U	U	4339
Xylene Isomers, M+P	1064	1695	U	2644	3164	1218	7232	1306	U	1867	927	U	U	U	U	U	U
Total VOCs	5747	18174		10183	14222	3007	25893	9034	1037	4828	3568	7263	1016			1137	5706

U = analyte non-detect

1. ppbv air calculated using Ideal Gas Law and Molecular Weight of Constituent (see text)

Table 10. Groundwater (Round 1) - Analytical Results

		Outwash Aquifer											Interflow Aquifer							Roza Aquifer				Below Interflow	Frenchman Springs
Volatile Organic Compounds (VOCs)	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
1,1,1,2-Tetrachloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
1,1,1-Trichloroethane	ug/l	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
1,1,2,2-Tetrachloroethane	ug/L	0.02U	0.02U	0 02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0 02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0 02U	0.02U
1,1,2-Trichloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
1,1,2-Trichlorotrifluoroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
1,1-Dichloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0 3	0.7	0.2U	0.2U	0.2U	0.2U	3.3	0.2U	1.8	2.1	0.2U	0.2U	4	13	18	5.6	0.2U	0.2U	0.3
1,1-Dichloroethene	ug/L	0.02U	0.02U	0 02U	0.02U	0.051	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.046	0 02U	0.05	0.11	0.02U	0.02U	0.58	0 8	0 83	0.21	0.02U	0 02U	0.02U
1,1-Dichloropropene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
1,2,3-Trichlorobenzene	ug/L	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0 5U
1,2,3-Trichloropropane	ug/L	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0 5U
1,2,4-Trichlorobenzene	ug/L	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0 5U
1,2,4-Trimethylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
1,2-Dibromo-3-chloropropane	ug/L	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0 5U
1,2-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	1.6	5.2	0.4	0.2U	0.2U	0 2U
1,2-Dichloroethane (EDC)	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	1.4	0.2U	0.2U	0.2U	0.2U	1 8	2.4	0.7	0.2U	0.2U	0 2U
1,2-Dichloropropane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2	0.2U	1.7	0.2U	0.2U	0.2U	0.2U	10	8.1	3	0.2U	0.2U	0.4
1,3,5-Trimethylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
1,3-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.3	0.2U	0.2U	0.2U	0 2U
1,3-Dichloropropane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
1,4-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	1 8	3.3	0.9	0.2U	0.2U	0 2U
2,2-Dichloropropane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
2-butanone	ug/L	2.5U	2.5U	2.5U	2.5U	2 5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2 5U	2.5U	2.5U	2.5U	2 5U
2-Chloroethylvinylether	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
2-Chlorotoluene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
2-Hexanone	ug/L	2.5U	2.5U	2.5U	2.5U	2 5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2 5U	2.5U	2.5U	2.5U	2 5U
4-Chlorotoluene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
4-Isopropyltoluene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
4-Methyl-2-pentanone (MIBK)	ug/L	2.5U	2.5U	2.5U	2.5U	2 5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2 5U	2.5U	2.5U	2.5U	2 5U
Acetone	ug/L	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3.4	3U	3U	3U
Acrolein	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acrylonitrile	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Benzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	2.1	3.1	0.7	0.2U	0.2U	0 2U
Bromobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2	0.7	0.2U	0.2U	0.2U	0 2U
Bromochloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Bromodichloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Bromoethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Bromoform	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0 2	0.2U	0.2U	0.2U	0.2	0.5	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Bromomethane	ug/L	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0 5U
Carbon Disulfide	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Carbon Tetrachloride	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Chlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 8	1.4	0.2	0.2U	0.2U	0 2U
Chloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	29	120	0.8	0.2U	0.2U	0 2U
Chloroform	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.6	0.2	0.2U	0.2U	1	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Chloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
cis-1,2-Dichloroethene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.3	0.2U	11	0.4	0.2U	0.2U	0.5	21	14	15	0.2U	0.2U	1.7
cis-1,3-Dichloropropene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Dibromochloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Dibromomethane	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Ethylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Ethylene Dibromide (EDB)	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Hexachlorobutadiene	ug/L	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0 5U
Isopropylbenzene (Cumene)	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Methyl iodide	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Methylene Chloride	ug/l	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5	0.5U	0.5U	0.5U	0.5U	1 9	4	0.6	0.5U	0.5U	0 5U
Naphthalene	ug/L	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0 5U	0.5U	0.5U	0.5U	0 5U
n-Butylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
n-Propylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
o-Xylene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.3	0.2U	0.2U	0.2U	0 2U
sec-Butylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U

Table 10. Groundwater (Round 1) - Analytical Results

		Outwash Aquifer											Interflow Aquifer							Roza Aquifer				Below Interflow	Frenchman Springs
Volatile Organic Compounds (VOCs)	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
Styrene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
tert-Butylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Tetrachloroethene (PCE)	ug/L	0.12	0.1	0.19	0.28	0.14	0.031	0.026	0.09	0.32	0.14	0.12	1.5	0 02U	11	1.4	0.02U	0.02U	4.5	0.039	0.066	5.7	0.02U	0 02U	1.8
Toluene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.4	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
trans-1,2-Dichloroethene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 5	0.7	0 2	0.2U	0.2U	0 2U
trans-1,3-Dichloropropene	ug/L	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
trans-1,4-Dichloro-2-butene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Trichloroethene (TCE)	ug/L	0.02U	0.02U	0.04	0.02U	0.098	0.02U	0.031	0.02U	0.02U	0.029	0.02U	0.5	0 02U	1.7	0.46	0.02U	0.02U	1.5	0.85	0.43	1 2	0.02U	0 02U	0.3
Trichlorofluoromethane	ug/l	0.2U	0.2U	0.2U	0.2U	0.6	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	4	0.2U	0.2	0.5	0.2U	0.2U	5.1	0.2U	0 2U	0.2U	0.2U	0.2U	0 2U
Vinyl Acetate	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Vinyl Chloride	ug/L	0.02U	0.02U	0 02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0 02U	0.27	0.02U	0.02U	0.02U	0.02U	27	17	13	0.02U	0 02U	0.028
Xylene Isomers, M+P	ug/L	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
Inorganics	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
Chloride	mg/L	15.2	16.8	16.1	35.7	14.3	14	37	13.8	43	17	12	659	20U	517	603	4.8	22.1	110	1470	993	1160	20	37.4	93
Sulfate	mg/L	50.7	50	46.4	48.1	61.2	31	45	46.2	43	43	41	55 9	33	175	60.5	26.3	65.8	43.3	1420	834	851	571	52.4	56
Total Dissolved Solids	mg/L	352	337	338	366	338	306	405	325	394	368	370	1820	192	1730	1880	240	788	517	5200	3500	3720	890	356	364
Nitrate as Nitrogen	mg/L as N	4.77	5.49	4.92	6.35	3.88	2.06	1.71	4.74	NA	NA	4.17	8.41	0 01U	10	17.8	0.909	87.9	8.41	0.011	0.01U	9.82	0.045	0 01U	0.585
Nitrite as Nitrogen	mg/L as N	0.034	0.039	0 036	0.041	0.031	0.021	0.012	0.035	NA	NA	0.031	0.049	0 01U	0.051	0.064	0.017	0.088	0.047	0.01U	0.01U	0.28	0.01U	0 01U	0.252
Nitrate+Nitrite as Nitrogen	mg/L as N	4.8	5.53	4.96	6.39	3.91	2.08	1.72	4.77	NA	NA	4.2	8.46	0 01U	10.1	17.9	0.926	88	8.46	0.011	0.01U	10.1	0.045	0 01U	0.837
Total Kjeldahl Nitrogen	mg/L as N	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0 86	0.6U	0.6U	0.6U	7.24	2 32	2.78	0.6U	0.6U	0.6U
Alkalinity (as CaCO3)	mg/L	220	195	205	191	199	194	200	207	182	198	235	76 5	128	183	349	165	117	224	1180	1030	898	138	169	127
Bicarbonate As CaCO3	mg/L	220	195	205	191	199	194	200	207	182	198	235	76 5	128	183	349	165	117	224	1180	1030	898	138	169	127
Calcium, Total	mg/L	53.3	48	51.5	48.8	55	52	58.1	46.1	44.1	49.6	55.5	224	22	267	269	37.2	106	93.4	455	564	561	159	37.9	50.9
Carbonate as CO3	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Hydroxide (as CaCO3)	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Total Organic Carbon	mg/L	1.5U	1.5U	1.5U	1.5U	1 5U	1.5U	1.58	1.5U	1.66	1.87	1.98	2.48	1.5U	6.65	13.8	1.5U	1.5U	1.5U	75	49.3	52 5	1.53	2.38	1.71
Magnesium, Total	mg/L	21.3	17.9	20	18.5	21.2	14 9	21.9	18.8	18.7	19.3	21.2	84.7	15.4	83	89.8	16.3	40.7	30.1	274	229	223	66.8	15.6	28.2
Potassium, Total	mg/L	8.5	8.9	9.7	9.9	2.7	4 8	4.9	9.3	9.3	9	7.5	5.5	10.1	7.5	9.4	4.4	6.2	3.1	33.6	15	31	6.1	3.6	7.6
Sodium, Total	mg/L	32.1	32.7	32.2	43.5	27.3	23 2	29.7	30.6	48.9	31.9	32	33	14.2	31.2	73.5	13.6	22.2	32.5	516	341	448	20.6	46	20.3
Iron, Total	ug/L	50U	50U	50U	50U	50U	50U	50U	50U	160	50U	50	50U	50U	50U	50U	80	50U	50U	7790	3100	100U	190	1850	70
Manganese, Total	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	14	6	1	1U	27	1U	26	4	169	1U	16600	15800	8650	304	166	28
Arsenic, Dissolved	ug/L	3	5U	4	7	3	4.6	4.7	3	4.8	4.2	2.5	1U	1U	1U	1	2	1U	1	4	2	2	1U	2	0.6

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
Natural Attenuation	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
Carbon dioxide	mg/L	18	38	16	15	5.5	NS	NS	15	19	18	18	5.8	1.2	11	41			8.9						2.6
Ethane	ug/L	1.2U	1.2U	1.2U	1.2U	1 2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.2U	1.6	1.2U	1.2U	1.2U	1 2U
Ethene	ug/L	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	3 2	2.6	1.1U	1.1U	1.1U	1.1U
Methane	ug/L	0.7U	1.9	0.7U	0.7U	0.7U	0.7U	0.7U	0.7U	0.7U	0.7U	0.7U	0.7U	0.7U	0.7U	1	15.8	12.5	0.7U	410	201	16.4	0.7U	1.5	9.1

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
Field Paramters	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
Hydrogen Sulfide	mg/L	0	0	0	0	0	0	NS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxidation Reduction Potential	mV	-135	-92	-87	-100	-70	-152	107	-78	-142	-127	-80	-97	-126	-70	15	-114	-105	-120	-113	-76	-49	8	-235	-271
pH	std. units	7.12	6.86	7.12	7.14	7.45	7.23	6.7	7.09	7.06	7.06	7.09	6.98	7.94	7.08	6 94	7.6	7.36	7.29	6.56	6.63	6.6	6.75	7.14	7.6
Specific Conductance @ 25C	umhos/cm	612	579	582	647	568	520	620	567	694	614	636	2510	355	2440	2860	395	1170	990	7870	5740	5750	1340	454	709
Temperature, 0 F	0 F	57 09	57.69	58.442	57 52	61.68	57.34	60.62	59.07	59.43	60 24	58.6	63.54	61.52	65.17	57.9	57.07	58 91	60.71	59.2	58.21	60.71	55.454	62.4	66.29

Notes:
##U = Detection Limit/Undetected
Blank = Not Sampled
NA = Not Analyzed by Lab

Table 11. Detected VOCs in Groundwater (Round 1)

				Outwash Aquifer											Interflow Aquifer							Roza Aquifer				Below Interflow	Frenchman Springs
Volatile Organic Compounds	Units	MTCA-B	MTCA-A	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
1,1-Dichloroethane	ug/L	1600	1600						0.3	0.7					3.3		1.8	2.1			4	13	18	5.6			0.3
1,1-Dichloroethene	ug/L	7	7					0.051							0.046		0.05	0.11			0.58	0.8	0.83	0.21			
1,2-Dichlorobenzene	ug/L	600	600																			1.6	5.2	0.4			
1,2-Dichloroethane (EDC)	ug/L	0.48	5														1.4					1.8	2.4	0.7			
1,2-Dichloropropane	ug/L	0.64	5												0.2		1.7					10	8.1	3			0.4
1,3-Dichlorobenzene	ug/L	NA	NA																				0.3				
1,4-Dichlorobenzene	ug/L	1.8	75																			1.8	3.3	0.9			
Acetone	ug/L	800	800																					3.4			
Benzene	ug/L	0.8	5																			2.1	3.1	0.7			
Bromobenzene	ug/L	NA	NA																			0.2	0.7				
Bromoform	ug/L	5.5	80						0.2				0.2	0.5													
Chlorobenzene	ug/L	100	100																			0.8	1.4	0.2			
Chloroethane	ug/L	15	15																			29	120	0.8			
Chloroform	ug/L	7.2	80														0.6	0.2			1						
cis-1,2-Dichloroethene	ug/L	70	70												0.3		11	0.4			0.5	21	14	15			1.7
Methylene Chloride	ug/l	5	5														0.5					1.9	4	0.6			
o-Xylene	ug/L	16000	16000																				0.3				
Tetrachloroethene (PCE)	ug/L	0.081	5	0.12	0.1	0.19	0.28	0.14	0.031	0.026	0.09	0.32	0.14	0.12	1.5		11	1.4			4.5	0.039	0.066	5.7			1.8
Toluene	ug/L	640	1000									0.4															
trans-1,2-Dichloroethene	ug/L	100	100																			0.5	0.7	0.2			
Trichloroethene (TCE)	ug/L	0.49	5			0.04		0.098		0.031			0.029		0.5		1.7	0.46			1.5	0.85	0.43	1.2			0.3
Trichlorofluoromethane	ug/l	2400	2400					0.6							4		0.2	0.5			5.1						
Vinyl Chloride	ug/L	0.029	0.2														0.27					27	17	13			0.028

Notes
Blank = Non-Detect
NS = Not Sampled
NA = MCL not available

MTCA A uses most stringent value of Method-A Table, Fed MCL (40 CFR 141.61), or State Department of Health Primary MCL (WAC 256-290-310)
If not in any of these sources uses MTCA-B

MTCA B uses most stringent value of Method-B Table, Fed MCL (40 CFR 141.61), or State Department of Health Primary MCL (WAC 256-290-310)

Table 12. Groundwater (Round 2) - Analytical Results

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
Organic Compounds (VOCs)	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
1,1,1,2-Tetrachloroethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
1,1,1-Trichloroethane	ug/l	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
1,1,2,2-Tetrachloroethane	ug/L												0.02U	0.02U					0.02U						
1,1,2,2-Tetrachloroethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U			1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
1,1,2-Trichloroethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
1,1,2-Trichlorotrifluoroethane	ug/L	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	0.2U	0.2U	2U	2U	2U	2U	0.2U	2U	2U	2U	2U	2U	
1,1-Dichloroethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	3.3	0.2U	1 6	1.7	1U	1U	4.4	15	21	4.9	1U	1U	
1,1-Dichloroethene	ug/L	0.02U	0.02U	0.02U	0.02U	0.066	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.064	0.02U	0.076	0.14	0.02U	0.02U	0.71	1	1.1	0.34	0.02U	0.02U	
1,1-Dichloropropene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
1,2,3-Trichlorobenzene	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	0.5U	0.5U	5U	5U	5U	5U	0.5U	5U	5U	5U	5U	5U	
1,2,3-Trichloropropane	ug/L	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	0.5U	0.5U	2U	2U	2U	2U	0.5U	2U	2U	2U	2U	2U	
1,2,4-Trichlorobenzene	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	0.5U	0.5U	5U	5U	5U	5U	0.5U	5U	5U	5U	5U	5U	
1,2,4-Trimethylbenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
1,2-Dibromo-3-chloropropane	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	0.5U	0.5U	5U	5U	5U	5U	0.5U	5U	5U	5U	5U	5U	
1,2-Dichlorobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	4.2	4.5	1U	1U	1U	
1,2-Dichloroethane (EDC)	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1 2	1U	1U	1U	0.2U	1.8	2.4	1U	1U	1U	
1,2-Dichloropropane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2	0.2U	1.4	1U	1U	1U	0.2U	9.9	6 9	3.4	1U	1U	
1,3,5-Trimethylbenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
1,3-Dichlorobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
1,3-Dichloropropane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
1,4-Dichlorobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	2.7	2 9	1U	1U	1U	
2,2-Dichloropropane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
2-butanone	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	2.5U	2.5U	5U	5U	5U	5U	2.5U	5U	5U	5U	5U	5U	
2-Chloroethylvinylether	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	1U	1U	5U	5U	5U	5U	1U	5U	5U	5U	5U	5U	
2-Chlorotoluene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
2-Hexanone	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	2.5U	2.5U	5U	5U	5U	5U	2.5U	5U	5U	5U	5U	5U	
4-Chlorotoluene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
4-Isopropyltoluene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
4-Methyl-2-pentanone (MIBK)	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	2.5U	2.5U	5U	5U	5U	5U	2.5U	5U	5U	5U	5U	5U	
Acetone	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	3U	3U	5U	5U	5U	5U	3U	18	5U	5U	5U	5U	
Acrolein	ug/L	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	5U	5U	10U	10U	10U	10U	5U	10U	10U	10U	10U	10U	
Acrylonitrile	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	1U	1U	5U	5U	5U	5U	1U	5U	5U	5U	5U	5U	
Benzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	5.2	1 6	1U	1U	1U	
Bromobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Bromochloromethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Bromodichloromethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Bromoethane	ug/L	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	0.2U	0.2U	2U	2U	2U	2U	0.2U	2U	2U	2U	2U	2U	
Bromoform	ug/L	1U	1U	1U	1U	1U	1U	1U	1.1	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Bromomethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.5U	0.5U	1U	1U	1U	1U	0.5U	1U	1U	1U	1U	1U	
Carbon Disulfide	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Carbon Tetrachloride	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Chlorobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1.1	1.1	1U	1U	1U	
Chloroethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	140	130	1.8	1U	1U	
Chloroform	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	1.1	1U	1U	1U	1U	1U	
Chloromethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
cis-1,2-Dichloroethene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.3	0.2U	8 8	1U	1U	1U	0.5	12	10	13	1U	1U	
cis-1,3-Dichloropropene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Dibromochloromethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Dibromomethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Ethylbenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Ethylene Dibromide (EDB)	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Hexachlorobutadiene	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	0.5U	0.5U	5U	5U	5U	5U	0.5U	5U	5U	5U	5U	5U	
Isopropylbenzene (Cumene)	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	

Table 12. Groundwater (Round 2) - Analytical Results

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
Organic Compounds (VOCs)	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
Methyl iodide	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Methylene Chloride	ug/l	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	0.5U	0.5U	2U	2U	2U	2U	0.5U	3.2	4	2U	2U	2U	
Naphthalene	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	0.5U	0.5U	5U	5U	5U	5U	0.5U	5U	5U	5U	5U	5U	
n-Butylbenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
n-Propylbenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
o-Xylene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
sec-Butylbenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Styrene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
tert-Butylbenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
Tetrachloroethene (PCE)	ug/L	0.087	0.11	0.21	0.31	0.2	0.052	0.035	0.12	0.23	0.2	0.12	2	0.02U	14	1.7	0.02U	0.02U	5.6	0.027	0.063	7.6	0.02U	0.02U	
Toluene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
trans-1,2-Dichloroethene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
trans-1,3-Dichloropropene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.2U	0.2U	1U	1U	1U	1U	0.2U	1U	1U	1U	1U	1U	
trans-1,4-Dichloro-2-butene	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	1U	1U	5U	5U	5U	5U	1U	5U	5U	5U	5U	5U	
Trichloroethene (TCE)	ug/L	0.02U	0.02U	0.038	0.02U	0.15	0.022	0.042	0.02U	0.02U	0.043	0.02U	0.65	0.02U	2 3	0.56	0.02U	0.02U	1.7	0.56	0.62	1.6	0.02U	0.02U	
Trichlorofluoromethane	ug/l	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	4.9	0.2U	1U	1U	1U	1U	5.5	1U	1U	1U	1U	1U	
Vinyl Acetate	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	1U	1U	5U	5U	5U	5U	1U	5U	5U	5U	5U	5U	
Vinyl Chloride	ug/L	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.39	0.02U	0.02U	0.02U	0.02U	23	17	17	0.02U	0.02U	
Xylene Isomers, M+P	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	0.4U	0.4U	1U	1U	1U	1U	0.4U	1U	1U	1U	1U	1U	

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
Organic Compounds (Semi-Volatiles)	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
1,2,4-Trichlorobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
1,2-Dichlorobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	2.4	2 9	1U	1U	1U	
1,3-Dichlorobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
1,4-Dichlorobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1.5	1 8	1U	1U	1U	
1-Methylnaphthalene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
2,2-Oxybis(1-Chloropropane)	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
2,4,5-Trichlorophenol	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
2,4,6-Trichlorophenol	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
2,4-Dichlorophenol	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
2,4-Dimethylphenol	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
2,4-Dinitrophenol	ug/L	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	
2,4-Dinitrotoluene	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
2,6-Dinitrotoluene	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
2-Chloronaphthalene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
2-Chlorophenol	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
2-Methyl-4,6-dinitrophenol	ug/L	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	
2-Methylnaphthalene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
2-Methylphenol	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
2-Nitroaniline	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
2-Nitrophenol	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
3,3'-Dichlorobenzidine	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
3-Nitroaniline	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
4-Bromophenyl Phenyl Ether	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
4-Chloro-3-methylphenol	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
4-Chloroaniline	mg/Kg	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
4-Chlorophenyl Phenyl Ether	ug/l	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
4-Methylphenol	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
4-Nitroaniline	ug/Kg	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
4-Nitrophenol	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
Acenaphthene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Acenaphthylene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Anthracene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	

Table 12. Groundwater (Round 2) - Analytical Results

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
Organic Compounds (Semi-Volatiles)	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
Benz(a)anthracene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Benzo(a)pyrene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Benzo(b)fluoranthene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Benzo(g,h,i)perylene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Benzo(k)fluoranthene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Benzoic Acid	ug/L	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	
Benzyl Alcohol	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
Bis(2-chloroethoxy)methane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Bis(2-chloroethyl) Ether	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Bis(2-ethylhexyl) Phthalate	ug/L	1U	3.6B	1U	1U	1U	1U	23	9.5B	1U	1U	5.3	1U	1U	1U	1U	1U	1U	6.3	1U	3 3	1U	1U	1U	
Butylbenzyl Phthalate	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Carbazole	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Chrysene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Dibenz(a,h)anthracene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Dibenzofuran	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Diethyl Phthalate	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	2.6	2.2	1U	1U	1U	
Dimethyl Phthalate	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Di-n-butyl Phthalate	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Di-n-octyl Phthalate	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Fluoranthene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Fluorene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Hexachlorobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Hexachlorobutadiene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Hexachlorocyclopentadiene	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
Hexachloroethane	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Indeno(1,2,3-cd)pyrene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Isophorone	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Naphthalene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Nitrobenzene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
N-Nitrosodi-n-propylamine	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
N-Nitrosodiphenylamine	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Pentachlorophenol	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	
Phenanthrene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Phenol	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	
Pyrene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
Inorganics	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
Alkalinity (as CaCO3)	mg/L	204	172	200	188	184	206	187	213	223	208	225	76.4	126	183	354	157	112	219	1080	928	834		126	
Arsenic, Dissolved	ug/L	3.7	4.3	4.9	7.5	4.4	4.8	5.1	3 8	3.4	4	2.5	0.5U	0.3	0.6	1	1.3	1.1	1.8	1	1U	1.9		0.3	
Bicarbonate As CaCO3	mg/L	204	172	200	188	184	206	187	213	223	208	225	76.4	126	183	354	157	112	219	1080	928	834		126	
Calcium, Total	mg/L	42.9	44	46	46.3	51.5	60.2	53.2	44.1	45.9	50.7	50 8	244	24.1	244	264	38.7	118	105	387	516	429		33.8	
Carbonate as CO3	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	
Chloride[1]	mg/L	12.1	22.1	18	39.2	15	17	36	15	25.9	21	13	680	9.7	530	642	6.1	24	120	1000	930	930	22	21	
Hydroxide (as CaCO3)	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	
Magnesium, Total	mg/L	18.2	16.5	18.7	18.4	19.9	16.3	20.8	18.8	20.8	20.5	21.5	91.9	16.6	80 9	93	16.4	44.5	33.2	245	215	177		14.7	
Manganese, Total	ug/L	1U	1U	1U	1U	1	1U	1U	1U	10	9	5	2	28	1U	18	1U	171	1U	14800	14200	6080		69	
Nitrate as Nitrogen	mg/L as N	3.3	5.34	4.86	6.66	4.38	2.06	1.34	5.05	4.7	5.27	4.06	7.31	0.068	10 2	18.8	1.14	97.5	7.58	0.01U	0.01U	11.5		0.01U	
Nitrate+Nitrite as Nitrogen	mg/L as N	3.32	5.37	4.89	6.7	4.41	2.07	1.34	5.08	4.73	5.3	4.08	7.35	0.068	10 2	18.9	1.14	97.6	7.62	0.01U	0.01U	11.7		0.01U	
Nitrite as Nitrogen	mg/L as N	0.022	0.03	0.028	0.036	0.026	0.014	0.01U	0.029	0.026	0.033	0.025	0.038	0.05U	0.045	0.054	0.01U	0.065	0.036	0.01U	0.01U	0.24		0.01U	
Potassium, Total	mg/L	7.11	8.21	8.28	9.12	2.28	5.15	4.63	8.53	8.51	8.94	7.11	5.5	10.4	6.53	8.87	4.19	6.05	3.13	37	13 9	25.4		2 92	
Sodium, Total	mg/L	29.2	25.3	29.9	40.7	24.3	21.1	29.3	29	39.9	27.9	31 2	32.8	14	29.7	76.1	13	22.4	32.3	526	306	397		28.5	
Sulfate[1]	mg/L	39.5	49.6	42	46.9	57	30	43	43	47.4	43	38	56	30	190	58.9	28	76	40	790	760	900	710	58	
Total Dissolved Solids	mg/L	326	328	352	386	346	331	350	364	397	379	355	2080H	211H	1690	1810	246	857	608H	3680	3140	3280		267	
Total Kjeldahl Nitrogen	mg/L as N	0.6U	0.93	0.6U	0 6U	1.04	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.6U	0.74	1.04	0.6U	0.6U	0.6U	4.16	1 8	2.3		0.6U	
Total Organic Carbon	mg/L	1.83	2	1.8	1.54	1.5U	1.5U	1.5U	1.73	1.9	1.86	1.76	2.99	1.5U	6.55	12.6	1.5U	1.5U	1.5U	57.2	42	39.9		1.5U	

Table 12. Groundwater (Round 2) - Analytical Results

Natural Attenuation	Units	Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
		MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
Carbon dioxide[2]	mg/L						15	11									4.6	4.8		260	220	140	18	9.2	

Field Parameters	Units	Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells				Below Interflow	Frenchman Springs
		MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
Dissolved Oxygen	mg/L	7	6	9	8	7	2	7	7	7	7	7	3	0.1	0.1	0.1	5	4	6	0.1	0.1	0.2	0.2	0.4	
Oxidation Reduction Potential	mV	68	52	72	87	85	-78	-66	-63	57	-98	20	60	-113	35	25	-54	21	63	-80	-49	29	48	-174	
pH	std. units	7.03	6.63	7.15	7.06	7.58	7.23	7.36	7.17	6.93	7.09	7.24	7	7.89	7 3	6.86	7.52	7.5	7.28	6.76	6.7	6.8	6.78	6 86	
Specific Conductance @ 25C	umhos/cm	534	543	627	639	596	591	647	626	640	668	633	2530	351	2570	2880	420	1250	1030	6370	5590	5860	1350	439	
Temperature, 0 F	0 F	59.18	60.08	61.16	59.36	62.96	59.18	60.44	61.34	59.72	60.8	58.82	64.58	63.5	66.74	60.62	58.64	61.7	63.86	61.7	59.54	62.6	57.56	65 84	

Blank = Not Sampled

##U = Detection Limit/Undetected

#H = sample exceeds holding time by factor of 2

#B = Analyte detected in method blank at concentration greater than 1/2 the reporting limit or 5% of the reulatory limit or 5% of the analytic concentration in sample

1 Chloride and sulfate analyzed by On Site Environmental for all samples except MW-11a, MW-1a, MW24a, MW-6a, and MW-6c

2 Dissolved CO2 analyzed by Test American for 9 wells that were not analyzed for dissolved CO2 during RI Round 1 sampling event.

Table 13. Detected VOCs in Groundwater (Round 2)

				Outwash Aquifer Wells											Interflow Aquifer Wells								Roza Aquifer Wells				Below Interflow	Frenchman Springs
Volatile Organic Compounds	Units	MTCA-B	MTCA-A	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-16d	MW-28d
1,1-Dichloroethane	ug/L	1600	1600												3.3		1.6	1.7			4.4	15	21	4.9			NS
1,1-Dichloroethene	ug/L	7	7					0.066							0.064		0.076	0.14			0.71	1	1.1	0.34			NS
1,2-Dichlorobenzene	ug/L	600	600																			4.2	4.5				NS
1,2-Dichloroethane (EDC)	ug/L	0.48	5														1.2					1.8	2.4				NS
1,2-Dichloropropane	ug/L	0.64	5												0.2		1.4					9.9	6.9	3.4			NS
1,4-Dichlorobenzene	ug/L	1.8	75																			2.7	2.9				NS
Acetone	ug/L	800	800																			18					NS
Benzene	ug/L	0.8	5																			5.2	1.6				NS
Bromoform	ug/L	5.5	80																								NS
Chlorobenzene	ug/L	100	100																			1.1	1.1				NS
Chloroethane	ug/L	15	15																			140	130	1.8			NS
Chloroform	ug/L	7.2	80																		1.1						NS
cis-1,2-Dichloroethene	ug/L	70	70												0.3		8.8				0.5	12	10	13			NS
Methylene Chloride	ug/l	5	5																			3.2	4				NS
Tetrachloroethene (PCE)	ug/L	0.081	5	0.087	0.11	0.21	0.31	0.2	0.052	0.035	0.12	0.23	0.2	0.12	2		14	1.7			5.6	0.027	0.063	7.6			NS
Trichloroethene (TCE)	ug/L	0.49	5			0.038		0.15	0.022	0.042			0.043		0.65		2.3	0.56			1.7	0.56	0.62	1.6			NS
Trichlorofluoromethane	ug/l	2400	2400												4.9						5.5						NS
Vinyl Chloride	ug/L	0.029	0.2														0.39					23	17	17			NS

Notes:
Blank = Non-Detect
NS = Not Sampled

MTCA A uses most stringent value of Method-A Table, Fed MCL (40 CFR 141.61), or State Department of Health Primary MCL (WAC 256-290-310)
If not in any of these sources uses MTCA-B

MTCA B uses most stringent value of Method-B Table, Fed MCL (40 CFR 141.61), or State Department of Health Primary MCL (WAC 256-290-310)

Table 14. Groundwater (Round 3) - Analytical Results

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells							P1 Aquifer Wells				P2 Aquifer Wells			Below Interflow	Frenchman Springs
Organic Compounds (VOCs)	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-36p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
1,1,1,2-Tetrachloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	4.5	0.2U	73	2000		24	0.2U	2.1	210E	0.2U	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.02U	0.02U	0.02U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	0.02U	0.2U	0.2U	1U	1U		0.02U	0.2U	1U	1U	0.2U	0.02U
1,1,2-Trichloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	33		1U	0.2U	1U	15	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	2U	0.2U	0.2U	6.2	33		2U	0.2U	2U	2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.6	0.2U	0.2U	0.2U	0.2U	3.4	0.2U	2	2	0.2U		4.5	13	27	5.9	0.2U	73	4.6	0.2U	180	5100		28	52	1000	1400	0.2U	0.4
1,1-Dichloroethene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.02U	0.02U	0.02U	0.2U	0.2U	0.2U	0.2U	0.2U		0.6	0.8	0.9	0.3	0.2U	1.2	0.3	0.064	1.7	50		4.8	0.11	1.3	300E	0.2U	0.02U
1,1-Dichloropropene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	0.5U	0.5U	0.5U	0.5U	5U	0.5U	0.5U	5U	5U		5U	0.5U	5U	5U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	0.5U	0.5U	0.5U	0.5U	2U	0.5U	0.5U	2U	2U		2U	0.5U	2U	2U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	0.5U	0.5U	0.5U	0.5U	5U	0.5U	0.5U	5U	5U		5U	0.5U	5U	5U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	49	500		1U	33	110	38	0.2U	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	0.5U	0.5U	0.5U	0.5U	5U	0.5U	0.5U	5U	5U		5U	0.5U	5U	5U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	4.9	4.4	0.3	0.2U	5.8	0.2U	0.2U	1U	86		1U	9.3	9.5	7.2	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	1.4	0.2U	0.2U		0.2U	1.7	2.7	0.8	0.2U	7.5	0.2U	0.2U	6.4	1000		1U	2.9	14	140	0.2U	0.2U
1,2-Dichloropropane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2	0.2U	1.9	0.2U	0.2U		0.2U	10	8.2	4.4	0.2U	120	0.2	0.2U	73	810		54	20	17	1100	0.2U	0.4
1,3,5-Trimethylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	23	220J		1U	6.8	47	27	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.3	0.2	0.2U	0.2U	1U	0.2U	0.2U	1U	5.7		1U	0.4	1U	1U	0.2U	0.2U
1,3-Dichloropropane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	3	2.9	0.8	0.2U	1U	0.2U	0.2U	1U	36		1U	13	7	2.8	0.2U	0.2U
2,2-Dichloropropane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
2-butanone	ug/L	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U		2.5U	2.5U	2.5U	2.5U	2.5U	5U	2.5U	17	5U	38000		5U	2.5U	9000	2600ES	2.5U	2.5U
2-Chloroethylvinylether	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U	1U	1U	1U	5U	1U	1U	5U	5U		5U	1U	5U	5U	1U	1U
2-Chlorotoluene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
2-Hexanone	ug/L	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U		2.5U	2.5U	2.5U	2.5U	2.5U	5U	2.5U	2.5U	5U	1000ES		5U	2.5U	340	73	2.5U	2.5U
4-Chlorotoluene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
4-Isopropyltoluene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	3.6	1.4	1U		1U	0.5	1U	1U	0.2U	0.2U
4-Methyl-2-pentanone (MIBK)	ug/L	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U		2.5U	2.5U	2.5U	2.5U	2.5U	5U	2.5U	4.1	5U	17000		5U	2.5U	3700ES	1000ES	2.5U	2.5U
Acetone	ug/L	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U		3U	7.2	4.2	3U	3U	5U	14	78	5U	120000		5U	19	26000	12000	3U	3U
Acrolein	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U		5U	5U	5U	5U	5U	10U	5U	5U	10U	10U		10U	5U	10U	10U	5U	5U
Acrylonitrile	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U	1U	1U	1U	5U	1U	1U	5U	5U		5U	1U	5U	5U	1U	1U
Benzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	8	2.6	0.7	0.2U	1U	0.2	0.2U	2.1	250J		1U	55	81	89	0.2U	0.2U
Bromobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.6	0.6	0.2U	0.2U	1U	0.2U	0.2U	1U	7.3		1U	1.6	1U	3.2	0.2U	0.2U
Bromochloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Bromodichloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Bromoethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	2U	0.2U	0.2U	2U	2U		2U	0.2U	2U	2U	0.2U	0.2U
Bromoform	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Bromomethane	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	0.5U	0.5U	0.5U	0.5U	1U	0.5U	0.5U	1U	1U		1U	0.5U	1U	1U	0.5U	0.5U
Carbon Disulfide	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2	0.3	1U	1U		1U	0.2	1U	1U	0.2U	0.2U
Carbon Tetrachloride	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Chlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	1.4	1.2	0.2U	0.2U	1	0.2U	0.2U	1U	1U		1U	2	2.4M	1.2M	0.2U	0.2U
Chloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	170	150	1.8	0.2U	11	1	0.2U	1U	120		1U	840	880	1U	0.2U	0.2U
Chloroform	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.6	0.2	0.2U	1.1	0.2U	0.2U	0.2U	0.2U	1U	0.2	0.2U	2.1	58		2.4	0.2U	1U	89	0.2U	0.2U
Chloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
cis-1,2-Dichloroethene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.3	0.2U	12	0.4	0.2U		0.6	16	12	18D3	0.2U	27	1	0.02U	12	1800		11	3.8	19	500E	0.2U	2.1
cis-1,3-Dichloropropene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Dibromochloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Dibromomethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Ethylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2	0.2U	0.2U	0.2U	1.9	1.6	0.2U	120	4200		1U	70	600	200E	0.2U	0.2U
Ethylene Dibromide (EDB)	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Hexachlorobutadiene	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	0.5U	0.5U	0.5U	0.5U	5U	0.5U	0.5U	5U	5U		5U	0.5U	5U	5U	0.5U	0.5U
Hexane	ug/L									0.2U	0.2U	0.2U												1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U		0.2U
Isopropylbenzene (Cumene)	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	6.2	110		1U	3.5	1U	21	0.2U	0.2U
Methyl iodide	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U	1U	1U	1U	1U
Methyl tert-Butyl Ether	ug/L									0.2U	0.2U	0.2U												1U	0.2U	0.2U	1U	1U		1U	0.4	1U	1U		0.2U
Methylene Chloride	ug/l	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	3.6	4.2	0.6	0.5U	2.8	0.5	0.5U	2U	780J		2U	10	25	230ES	0.5U	0.5U
Naphthalene	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	0.6	0.5U	0.5U	0.5U	5U	0.5U	0.5U	5.7	210ES		5U	10	34	12	0.5U	0.5U
n-Butylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	8.3		1U	0.2	1U	1U	0.2U	0.2U
n-Propylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.3	0.2U	0.2U	0.2U	1U	0.2U	0.2U	9	150		1U	2	22	14	0.2U	0.2U
o-Xylene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.3	0.2	0.2U	0.2U	1.5	1.5	0.2U	150	3700		1U	2.4	620	470E	0.2U	0.2U
sec-Butylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Styrene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
tert-Butylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	0.2U	0.2U	0.2U	0.3	0.2U	0.2U	0.2U	0.2U	0.18	0.2	0.1	1.6	0.2U	12	1.5	0.2U		5.4	0.2U	0.2U	6.5	0.2U	1.1	0.5	0.02U	20	21		7.7	0.7	3.2	24	0.2U	2.4
Toluene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	1.2	1.3	1.2	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	20	35	0.6	560	59000		5.4	5.8	11000	2900	0.2U	0.2U
trans-1,2-Dichloroethene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.8	0.7	0.3	0.2U	1U	0.2U	0.2U	1U	16		1U	1.7	3.5	4	0.2U	0.2U
trans-1,3-Dichloropropene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U		0.2U	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1U		1U	0.2U	1U	1U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U	1U	1U	1U	5U	1U	1U	5U	5U		5U	1U	5U	5U	1U	1U
Trichloroethene (TCE)	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.071	0.077	0.02U	0.6	0.2U	1.9	0.5	0.2U		1.6	0.7	0.4	1.4	0.2U	3.3	0.5	0.052	11	20		7.1	1.8	4.2	180E	0.2U	0.4
Trichlorofluoromethane	ug/l	0.2U	0.2U	0.2U	0.2U	0.6	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	4.2	0.2U	0.2	0.4	0.2U		4.8	0.2U	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	1.2Y		1U	0.2U	1U	1U	0.2U	0.2U
Vinyl Acetate	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U	1U	1U	1U	5U	1U	1U	5U	5U		5U	1U	5U	5U	1U	1U
Vinyl Chloride	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.02U	0.02U	0.02U	0.2U	0.2U	0.4	0.2U	0.2U		0.2U	18	14	14	0.2U	13	2.4	0.5	42	750		0.082	6.2	47	620	0.2U	0.02U
Xylene Isomers, M+P	ug/L	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U		0.4U	0.4U	0.4U	0.4U	0.4U	4.3	3.4	0.4U	230	9600		2U	100	1300	300	0.4U	0.4U

		Outwash Aquifer Wells											Interflow Aquifer Wells							Roza Aquifer Wells							P1 Aquifer Wells				P2 Aquifer Wells			Below Interflow	Frenchman Springs
Natural Attenuation		MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-36p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Carbon dioxide	mg/L																							17.8	3.73	1.34	154	406			258	161	41.4		
Ethane	ug/L																							1.2U	1.2U	1.2U	1.2U	1.2U		1.2U	2.4	1.2U	1.2U		
Ethene	ug/L																							1.7	1.1U	1.5	9.4	253		1.1U	32.1	43.6	48.2		
Methane	ug/L																							59.1	32	40.6	380	7080		0.7U	3290	1800	260		

Table 14. Groundwater (Round 3) - Analytical Results

		Outwash Aquifer Wells										Interflow Aquifer Wells						Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
Inorganics		MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-36p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Alkalinity (as CaCO3)	mg/L	195	185	207	190	185	201	193	208	208	207	223	76.3	122	194	347	159		204	1140	948	832	118	232	140	123	726	1040			1020	860		144	129
Ammonia as Nitrogen, Total	mg/L as N	0.05U	0.05U	0.05U	0.05U	0.05U	0.01U	0.05U	0.05U				0.01U	0.01U	0.05U	0.05U	0.05U		0.05U	3.37	0.043	0.05U	0.01U											0.05U	
Arsenic, Dissolved	ug/L	4.8	4.3	5.3	7.6	4.9	4.8	5.2	3.9				0.6	0.3	1.2	1.8	1.2		1.7	2.5	0.8	2.1	0.2U											0.3	
Bicarbonate As CaCO3	mg/L	195	185	207	190	185	201	193	208	208	207	223	76.3	122	194	347	159		204	1140	948	832	118	232	140	123	726	1040			1020	860		144	129
Calcium, Total	mg/L	46.8	52.2	50.2	52.3	52.3	62.1	53.5	51.7	50.3	51.3	54.8	264	24.6	291	291	38.3		112	447	558	514	175	158	37.2	40.2	152	327	136		584	399	153	37.7	63.3
Carbonate as CO3	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U			1U	1U		1U	1U
Chloride	mg/L	11.6	16.7	17.1	38.7	14.2	19.1	31.6	17.1	27.2	16.3	10.3	712	10.7	494	641	5.9		148	**1060**	**946**	**948**	21.4	309	10.4	5.7	45.9	903	77.5		1290	853	213	35.6	100
Hydroxide (as CaCO3)	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U			1U	1U		1U	1U
Iron, Total	ug/L	50U	50U	50U	50U	50U	50U	50U	50U	140	480	270	50U	50U	50U	50U	50U		50U	7450	2800	100U	80	3400	11100	27200	5180	107000	420		126000	20700	17800	400	90
Magnesium, Total	mg/L	18	18	18.8	19.5	19.4	17.1	20.2	19.6	21.4	20.7	21.5	96.4	17.3	89.2	93.5	16.5		35	261	222	189	72	63.9	18.1	20.4	63	189	51		255	183	52.2	15.2	35.4
Manganese, Total	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	7	6	6	6	27	1U	17	1U		2	15600	14400	6140	276	1450	460	512	3650	10900	252		12600	11400	2840	77	16
Nitrate as Nitrogen	mg/L as N	2.84	5.4	4.53	6.99	3.97	5.57	1.42	5.28	5.4	5.06	3.69	8.76	0.01U	11.9	19.8	1.19		9.32	0.01U	0.192	12.1	0.037	0.679	0.169	0.01U	0.025	0.13	8.97		0.014	0.015	0.01U	0.01U	1.86
Nitrate+Nitrite as Nitrogen	mg/L as N	2.85	5.43	4.56	7.03	4	5.6	1.43	5.31	5.43	5.08	3.71	8.81	0.01U	12	19.9	1.2		9.36	0.01U	0.206	12.3	0.037	0.694	0.169	0.021	0.025	0.13	9.02		0.014	0.015	0.02	0.01U	2.1
Nitrite as Nitrogen	mg/L as N	0.015	0.028	0.028	0.036	0.026	0.034	0.014	0.03	0.026	0.025	0.02	0.045	0.01U	0.051	0.054	0.012		0.038	0.01U	0.014	0.247	0.01U	0.015	0.1U	0.026	0.01U	0.1U	0.054		0.01U	0.01U	0.02	0.01U	0.237
Potassium, Total	mg/L	8.1	9.7	9.1	10.8	3	5.5	4.9	9.7	9.5	9.2	7.5	6.1	12.2	8	10.2	4.4		3.5	42	16	28	6.1	13.8	7.8	7.5	24.7	67	7.3		29	14	10.5	3.5	8.1
Sodium, Total	mg/L	28.6	29.2	31.2	43.5	25.7	22.2	28.8	27.6	42.9	32.8	31.7	32.5	15.2	33	79.1	13.2		32.3	**533**	**317**	**402**	20.1	71.6	24.5	23.1	67.3	347	126		262	215	98.4	37	20.3
Sulfate	mg/L	41	47.7	38.9	39.4	60.1	38.3	44.9	45	38.3	36.3	35.6	53.3	32.5	182	59.5	30		42	**883**	**746**	**777**	599	71.9	55.2	39.7	11.7	18.2	150		19.9	14.1	158	63	49.9
Total Dissolved Solids	mg/L	302	338	286	362	312	335	330	343	388	357	347	2110	188	1860	1980	216		626	3940	3260	3240	1000	1050	248	238	860	3360					874	286	429
Total Organic Carbon	mg/L	2.35	2.22	1.79	1.95	1.5U	1.73	2.61	2.22				3.72	1.5U	7.75	14	1.5U		1.5U	50.4	38.3	37.2	1.75											1.77	

		Outwash Aquifer Wells										Interflow Aquifer Wells						Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
Hydrocarbons		MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-36p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Diesel Range Hydrocarbons	mg/L																												2.6						
Gasoline Range Hydrocarbons	mg/L																												1						
Motor Oil	mg/L																												2.6						

		Outwash Aquifer Wells										Interflow Aquifer Wells						Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
Field Parameters		MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-36p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Dissolved Oxygen	mg/L																							2	0.35	0.5	0.35	0U							0.3
Oxidation Reduction Potential	mV									169	188	159												-35	6	154	-52	-74		111	43	-39	78		75
pH	std. units	7.28	6.73	7.27	7.35	7.54	5.18	7.36	7.15	5.11	5.46	4.81	7.03	7.99	7.15	6.94	5.62		7.21	6.56	6.58	6.64	6.77	5.38	5.5	5.1	5.11	6.25		4.9	5.85	5.15	5.44	6.88	5.92
Specific Conductance @ 25C	umhos/cm	450	480	510	570	480	480	510	520	671	596	617	2370	290	2400	2580	330		930	5420	4690	5010	1190	1870	526	450	1590	5130		1610	5480	5190	1880	370	744
Temperature, 0 F	0 F	60.1	60.3	62.6	60.1	65.3	57.9	58.8	62.1	54.5	57.92	57.2	64.9	62.4	66	59.9	58.28		60.6	60.1	59	62.78	58.64	58.64	58.46	53.96	65.48	64.22		55.04	59	60.26		62.24	66.92

Notes
##U = Detection Limit/Undetected
##E = Result estimated concentration for analyte above valid instrument calibration range (dilution value not reported because undetected)
##ES = Result estimated concentration for analyte above valid instrument calibration range and the analyte response saturated the detector (dilution value not reported because undetected) .
##Y = Detection limit/Undeteced at higher detection limit due to chromatographic interference
##J = Estimated concentration less than lab's established reporting limits
##M = Estimated value for analyte deteced and confirmed by analyst but with low spectral match parameters
Blank = Not Analyzed

Table 15. Detected VOCs in Groundwater (Round 3)

				Outwash Aquifer Wells											Interflow Aquifer Wells						Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
Organic Compounds (VOCs)	Units	MTCA-B	MTCA-A	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-22c	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
1,1,1-Trichloroethane	ug/L	200	200																							4.5		73	2000	24		2.1	210E		
1,1,2-Trichloroethane	ug/L	0.77	5																										33				15		
1,1,2-Trichlorotrifluoroethane	ug/L	240000	240000																									6.2	33						
1,1-Dichloroethane	ug/L	1600	1600							0.6					3.4		2	2		4.5	13	27	5.9		73	4.6		180	5100	28	52	1000	1400		0.4
1,1-Dichloroethene	ug/L	7	7																	0.6	0.8	0.9	0.3		1.2	0.3	0.064	1.7	50	4.8	0.11	1.3	300E		
1,2,4-Trimethylbenzene	ug/L	400	400																									49	500		33	110	38		
1,2-Dichlorobenzene	ug/L	600	600																		4.9	4.4	0.3		5.8				86		9.3	9.5	7.2		
1,2-Dichloroethane (EDC)	ug/L	0.48	5														1.4				1.7	2.7	0.8		7.5			6.4	1000		2.9	14	140		
1,2-Dichloropropane	ug/L	0.64	5												0.2		1.9				10	8.2	4.4		120	0.2		73	810	54	20	17	1100		0.4
1,3,5-Trimethylbenzene	ug/L	400	400																									23	220J		6.8	47	27		
1,3-Dichlorobenzene	ug/L	NA	NA																		0.3	0.2							5.7		0.4				
1,4-Dichlorobenzene	ug/L	1.8	75																		3	2.9	0.8						36		13	7	2.8		
2-butanone	ug/L	4800	4800																								17		38000			9000	2600ES		
2-Hexanone	ug/L	NA	NA																										1000ES			340	73		
4-Isopropyltoluene	ug/L	NA	NA																								3.6	1.4			0.5				
4-Methyl-2-pentanone (MIBK)	ug/L	640	640																								4.1		17000			3700ES	1000ES		
Acetone	ug/L	800	800																		7.2	4.2				14	78		120000		19	26000	12000		
Benzene	ug/L	0.8	5																		8	2.6	0.7			0.2		2.1	250J		55	81	89		
Bromobenzene	ug/L	NA	NA																		0.6	0.6							7.3		1.6		3.2		
Carbon Disulfide	ug/L	800	800																							0.2	0.3				0.2				
Chlorobenzene	ug/L	100	100																		1.4	1.2			1						2	2.4M	1.2M		
Chloroethane	ug/L	15	15																		170	150	1.8		11	1			120		840	880			
Chloroform	ug/L	7.2	80														0.6	0.2		1.1						0.2		2.1	58	2.4			89		
cis-1,2-Dichloroethene	ug/L	70	70												0.3		12	0.4		0.6	16	12	18		27	1		12	1800	11	3.8	19	500E		2.1
Ethylbenzene	ug/L	800	700																		0.2				1.9	1.6		120	4200		70	600	200E		
Isopropylbenzene (Cumene)	ug/L	800	800																									6.2	110		3.5		21		
Methyl tert-Butyl Ether	ug/L	24	20	NS	NS	NS	NS	NS	NS	NS	NS				NS	NS	NS	NS	NS	NS	NS	NS	NS	NS							0.4			NS	
Methylene Chloride	ug/l	5	5																		3.6	4.2	0.6		2.8	0.5			780J		10	25	230ES		
Naphthalene	ug/L	160	160																		0.6							5.7	210ES		10	34	12		
n-Butylbenzene	ug/L	NA	NA																										8.3		0.2				
n-Propylbenzene	ug/L	NA	NA																		0.3							9	150		2	22	14		
o-Xylene	ug/L	16000	16000																		0.3	0.2			1.5	1.5		150	3700		2.4	620	470E		
sec-Butylbenzene	ug/L	NA	NA																		0.2														
Tetrachloroethene (PCE)	ug/L	0.081	5				0.3					0.18	0.2	0.1	1.6		12	1.5		5.4			6.5		1.1	0.5		20	21	7.7	0.7	3.2	24		2.4
Toluene[1]	ug/L	640	1000									1.2	1.3	1.2											20	35	0.6	560	59000	5.4	5.8	11000	2900		
trans-1,2-Dichloroethene	ug/L	100	100																		0.8	0.7	0.3						16		1.7	3.5	4		
Trichloroethene (TCE)	ug/L	0.49	5									0.071	0.077		0.6		1.9	0.5		1.6	0.7	0.4	1.4		3.3	0.5	0.052	11	20	7.1	1.8	4.2	180E		0.4
Trichlorofluoromethane	ug/l	2400	2400					0.6							4.2		0.2	0.4		4.8														
Vinyl Chloride	ug/L	0.029	0.2														0.4				18	14	14		13	2.4	0.5	42	750	0.082	6.2	47	620		
Xylene Isomers, M+P	ug/L	10000	10000																						4.3	3.4		230	9600		100	1300	300		

Notes:
Blank = Non-Detect
NS = Not Sampled
##E = Result estimated concentration for analyte above valid instrument calibration range (dilution value not reported because undetected)
##ES = Result estimated concentration for analyte above valid instrument calibration range and the analyte response saturated the detector (dilution value not reported because undetected)
##J = Estimated concentration less than lab's established reporting limits
##M = Estimated value for analyte deteced and confirmed by analyst but with low spectral match parameters
NA = MCL not available
1. Tolunene was detected in MW-24a, MW-25a ,and MW-26a. These wells were sampled after the drum area wells with the same pump and despite thorough decon, the detections may be due to residual from drum area wells.

MTCA A uses most stringent value of Method-A Table, Fed MCL (40 CFR 141.61), or State Department of Health Primary MCL (WAC 256-290-310)
If not in any of these sources uses MTCA-B

MTCA B uses most stringent value of Method-B Table, Fed MCL (40 CFR 141.61), or State Department of Health Primary MCL (WAC 256-290-310)

Table 16. Groundwater during Drilling of Former Drum Cache Area Wells - Analytical Results

Field Parameters	Units	MW-29b B-19-30 (P1)	MW-30b B-22-32.5 (P1)	MW-30b B-22-51 (P2)	MW-31b B-26-45 (P2)	MW-31b B-26-P0[1]
Temperature, 0 F	0 F		62.6	63.32	53.06	66.2
pH	std. units	6.75	6.42	6.56	7.5	7.66
Specific Conductance @ 25C	umhos/cm	5480	5390	4500	1180	350

Volatile Organic Compounds	ug/L	MW-29b B-19-30 (P1)	MW-30b B-22-32.5 (P1)	MW-30b B-22-51 (P2)	MW-31b B-26-45 (P2)	MW-31b B-26-P0[1]
1,1,1,2-Tetrachloroethane	ug/L	1U	50U	50U	50U	1U
1,1,1-Trichloroethane	ug/l	1U	3900	64	50U	1U
1,1,2,2-Tetrachloroethane	ug/L	1U	50U	50U	50U	1U
1,1,2-Trichloroethane	ug/L	1U	68	50U	50U	1U
1,1,2-Trichlorotrifluoroethane	ug/L	2U	100U	100U	100U	2U
1,1-Dichloroethane	ug/L	550	4400	1700	340	1U
1,1-Dichloroethene	ug/L	1U	150	50U	50U	1U
1,1-Dichloropropene	ug/L	1U	50U	50U	50U	1U
1,2,3-Trichlorobenzene	ug/L	5U	250U	250U	250U	5U
1,2,3-Trichloropropane	ug/L	2U	100U	100U	100U	2U
1,2,4-Trichlorobenzene	ug/L	5U	250U	250U	250U	5U
1,2,4-Trimethylbenzene	ug/L	18	1400	310	50U	1U
1,2-Dibromo-3-chloropropane	ug/L	5U	250U	250U	250U	5U
1,2-Dichlorobenzene	ug/L	4.6	50U	50U	50U	1U
1,2-Dichloroethane (EDC)	ug/L	16	710	110	50U	1U
1,2-Dichloropropane	ug/L	26	360	62	160	1U
1,3,5-Trimethylbenzene	ug/L	2.2	620	120	50U	1U
1,3-Dichlorobenzene	ug/L	1U	50U	50U	50U	1U
1,3-Dichloropropane	ug/L	1U	50U	50U	50U	1U
1,4-Dichlorobenzene	ug/L	4.9	50U	50U	50U	1U
2,2-Dichloropropane	ug/L	1U	50U	50U	50U	1U
2-butanone	ug/L	5U	30000	13000	6900	5U
2-Chloroethylvinylether	ug/L	5U	250U	250U	250U	5U
2-Chlorotoluene	ug/L	1U	50U	50U	50U	1U
2-Hexanone	ug/L	5U	650	570	250U	5U
4-Chlorotoluene	ug/L	1U	50U	50U	50U	1U
4-Isopropyltoluene	ug/L	1U	50U	50U	50U	1U
4-Methyl-2-pentanone (MIBK)	ug/L	5U	22000	17000	3800	5U
Acetone	ug/L	25	86000	37000	20000	20
Acrolein	ug/L	10U	500U	500U	500U	10U
Acrylonitrile	ug/L	5U	250U	250U	250U	5U
Benzene	ug/L	19	220	92	50U	1U
Bromobenzene	ug/L	1U	50U	50U	50U	1U
Bromochloromethane	ug/L	1U	50U	50U	50U	1U
Bromodichloromethane	ug/L	1U	50U	50U	50U	1U
Bromoethane	ug/L	2U	100U	100U	100U	2U
Bromoform	ug/L	1U	50U	50U	50U	1U
Bromomethane	ug/L	1U	50U	50U	50U	1U
Carbon Disulfide	ug/L	1U	50U	50U	50U	1U
Carbon Tetrachloride	ug/L	1U	50U	50U	50U	1U
Chlorobenzene	ug/L	1.3	50U	50U	50U	1U
Chloroethane	ug/L	440	52	630	50U	1U
Chloroform	ug/L	1U	230	50U	50U	1U
Chloromethane	ug/L	1U	50U	50U	50U	1U
cis-1,2-Dichloroethene	ug/L	1.2	3000	50U	95	1U
cis-1,3-Dichloropropene	ug/L	1U	50U	50U	50U	1U
Dibromochloromethane	ug/L	1U	50U	50U	50U	1U
Dibromomethane	ug/L	1U	50U	50U	50U	1U
Ethylbenzene	ug/L	16	5600	1400	150	1U
Ethylene Dibromide (EDB)	ug/L	1U	50U	50U	50U	1U
Hexachlorobutadiene	ug/L	5U	250U	250U	250U	5U
Hexane	ug/L	1	50U	50U	50U	1U
Isopropylbenzene (Cumene)	ug/L	1.5	220	50U	50U	1U
Methyl iodide	ug/L	1U	50U	50U	50U	1U
Methyl tert-Butyl Ether	ug/L	1U	50U	50U	50U	1U
Methylene Chloride	ug/l	3.3	2800	100U	100U	2U
Naphthalene	ug/L	5U	250U	250U	250U	5U
n-Butylbenzene	ug/L	1U	50U	50U	50U	1U
n-Propylbenzene	ug/L	1.1	390	58	50U	1U
o-Xylene	ug/L	5.8	6200	1700	190	1U
sec-Butylbenzene	ug/L	1U	50U	50U	50U	1U
Styrene	ug/L	1U	160	50U	50U	1U
tert-Butylbenzene	ug/L	1U	50U	50U	50U	1U
Tetrachloroethene (PCE)	ug/L	1U	700	50U	50U	1U
Toluene	ug/L	4.5	130000	28000	3800	1
trans-1,2-Dichloroethene	ug/L	1.6	50U	50U	50U	1U
trans-1,3-Dichloropropene	ug/L	1U	50U	50U	50U	1U
trans-1,4-Dichloro-2-butene	ug/L	5U	250U	250U	250U	5U
Trichloroethene (TCE)	ug/L	1U	580	50U	50U	1U
Trichlorofluoromethane	ug/l	1U	50U	50U	50U	1U
Vinyl Acetate	ug/L	5U	250U	250U	250U	5U
Vinyl Chloride	ug/L	12	550	150	50U	1U
Xylene Isomers, M+P	ug/L	4.8	16000	3800	400	2U

##U = Detection Limit/Undetected

1. P0 = wet zone about 5-ft above P1 zone at this location

Table 17. Detected VOCs in Groundwater (Drilling of Former Drum Cache Area Wells)

Volatile Organic Compound	Units	MW-29b B-19-30 (P1)	MW-30b[1] B-22-32.5 (P1)	MW-30b B-22-51 (P2)	MW-31b B-26-45 (P2)	MW-31b B-26-P0[2]
1,1,1-Trichloroethane	ug/l		3,900	64		
1,1,2-Trichloroethane	ug/L		68			
1,1-Dichloroethane	ug/L	550	4,400	1,700	340	
1,1-Dichloroethene	ug/L		150			
1,2,4-Trimethylbenzene	ug/L	18	1,400	310		
1,2-Dichlorobenzene	ug/L	5				
1,2-Dichloroethane (EDC)	ug/L	16	710	110		
1,2-Dichloropropane	ug/L	26	360	62	160	
1,3,5-Trimethylbenzene	ug/L	2	620	120		
1,4-Dichlorobenzene	ug/L	5				
2-butanone	ug/L		30,000	13,000	6,900	
2-Hexanone	ug/L		650	570		
4-Methyl-2-pentanone (MIBK)	ug/L		22,000	17,000	3,800	
Acetone	ug/L	25	86,000	37,000	20,000	20
Benzene	ug/L	19	220	92		
Chloroethane	ug/L	440	52	630		
Chloroform	ug/L		230			
cis-1,2-Dichloroethene	ug/L	1	3,000		95	
Ethylbenzene	ug/L	16	5,600	1,400	150	
Hexane	ug/L	1				
Isopropylbenzene (Cumene)	ug/L	2	220			
Methylene Chloride	ug/l	3	2,800			
n-Propylbenzene	ug/L	1	390	58		
o-Xylene	ug/L	6	6,200	1,700	190	
Styrene	ug/L		160			
Tetrachloroethene (PCE)	ug/L		700			
Toluene	ug/L	5	130,000	28,000	3,800	1
trans-1,2-Dichloroethene	ug/L	2				
Trichloroethene (TCE)	ug/L		580			
Vinyl Chloride	ug/L	12	550	150		
Xylene Isomers, M+P	ug/L	5	16,000	3,800	400	

1. Floating phase observed in sample
2. P0 = wet zone about 5-ft above P1 zone at this location
Blank = Non-Detect

Table 18. Liquid Samples from Drum Excavation - Analytical Results

Inorganics	Units	P1	P1,2,3	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
Alkalinity (as CaCO3)	mg/L					915	923	1190	419	741
Bicarbonate As CaCO3	mg/L					915	923			
Bicarbonate as HCO3	mg/L							1190	419	741
Bromide	mg/L		1.6	5U	5U	1.3	2U	1U	1U	1U
Carbonate as CO3	mg/L					1U	1U	1U	1U	1U
Chloride	mg/L		1420	1430	788	483	450	1020	285	224
Cyanide, Total	ug/L			124	1260	610	150	34	23	252
Fluoride	mg/L		0.2U	5U	5U	0.5U	2U	1U	1U	1U
Nitrate as Nitrogen	mg/L as N		0.2U	3.2	1U	0.5U	2U	0.01U	0.014	0.04
Nitrate+Nitrite as Nitrogen	mg/L as N							0.016	0.014	0.271
Nitrite as Nitrogen	mg/L as N		0.2U	5U	5U	0.5U	2U	0.015	0.01U	0.231
Sulfate	mg/L		135	164	166	108	91.9	19 9	34 2	18.8

Metals	Units	P1	P1,2,3	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
Aluminum	mg/L		8.6							
Antimony, Total	ug/L		100U	100U	50U	50U	50U	50U	50U	50U
Arsenic, Total	ug/L		100U	100U	50U	50U	50U	50U	50U	60
Barium, Total	ug/L		1750					745	178	1040
Beryllium, Total	ug/L		2U	2U	1U	1U	1U	1U	1U	3
Boron	mg/L		1.38							
Cadmium, Total	ug/L		19	48	2	3	2U	5	2U	4
Calcium, Total	mg/L		556	785	482	392	377			
Chromium, Total	ug/L		400	430	34	283	60	19	10	60
Cobalt, Total	ug/L		358							
Copper, Dissolved	ug/L		113	119	1700	896	244	3110	36	3590
Iron, Total	ug/L		199000	124000	56400	43400	56700			
Lead, Total	ug/L		320	90	50	20U	20U	40	20U	80
Magnesium, Total	mg/L		204	256	211	163	151			
Manganese, Total	ug/L		17800	15800	8020	15600	14600			
Mercury	mg/L		0.002U	0.002U	0 002	0.0004	0.0015	0.0005	0.0001U	0 0006
Molybdenum	mg/L		0 01U							
Nickel, Total	ug/L		160	130	50	100	90	90	50	110
Potassium, Total	mg/L		241	207	154	68.1	61.1			
Selenium, Total	ug/L		100U	100U	50U	50U	50U	50U	50U	50U
Silver, Total	ug/L		6U	6U	3U	3U	3U	3U	3U	3U
Sodium, Total	mg/L		251	647	281	206	176			
Strontium	mg/L		2.64							
Thallium, Total	ug/L			100U	50U	50U	50U	50U	50U	50U
Tin	mg/L		0 02U							
Titanium	mg/L		0.8							
Vanadium, Total	ug/L		30							
Zinc, Dissolved	ug/L		28000	6020	1610	1790	260	270	60	690

Organic Compounds (Hydrocarbon)	Units	P1	P1,2,3	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
Diesel Range Hydrocarbons	mg/L		990	980	39	30	9			
Gasoline Range Hydrocarbons	mg/L							210	6 3	98
Motor Oil	mg/L		1600	2200	14	5U	5U			

Organic Compounds (PCB)	Units	P1	P1,2,3	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
Aroclor 1016	ug/L			2000U	10U	3U	6.7U	10U	50U	100U
Aroclor 1221	ug/L			2000U	10U	3U	6.7U	10U	50U	100U
Aroclor 1232	ug/L			2000U	10U	3U	6.7U	10U	50U	100U
Aroclor 1242	ug/L			12000	48	16	65	45	160	340
Aroclor 1248	ug/L			2000U	10U	3U	6.7U	10U	50U	100U
Aroclor 1254	ug/L			2000U	10U	3U	6.7U	10U	50U	100U
Aroclor 1260	ug/L			10000	10U	3U	6.7U	10U	50U	100U

Organic Compounds (SVOC)	Units	P1	P1,2,3	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
1,2,4-Trichlorobenzene	ug/L			130000	20U	6.2U	3U	10U	1U	1U
1,2-Dichlorobenzene	ug/L			6000	20U	6.2	3U	66	1U	2 9
1,3-Dichlorobenzene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
1,4-Dichlorobenzene	ug/L			2800	20U	6.2U	3U	29	1U	2 2
1-Methylnaphthalene	ug/L			27000	20U	11U	3U	29	1U	16
2,2-Oxybis(1-Chloropropane)	ug/L			5000U	20U	6.2U	3U	10U	1U	1U

Table 18. Liquid Samples from Drum Excavation - Analytical Results

Organic Compounds (SVOC)	Units	P1	P1,2,3	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
2,4,5-Trichlorophenol	ug/L			25000U	100U	31U	15U	50U	5U	5U
2,4,6-Trichlorophenol	ug/L			25000U	100U	31U	15U	50U	5U	5U
2,4-Dichlorophenol	ug/L			25000U	100U	31U	15U	50U	5U	5U
2,4-Dimethylphenol	ug/L			5000U	200	180	5.8	160	2.6	64
2,4-Dinitrophenol	ug/L			50000U	200U	62U	30U	100U	10U	10U
2,4-Dinitrotoluene	ug/L			25000U	100U	31U	15U	50U	5U	5U
2,6-Dinitrotoluene	ug/L			25000U	100U	31U	15U	50U	5U	5U
2-Chloronaphthalene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
2-Chlorophenol	ug/L			5000U	20U	6.2U	3U	25U	1U	1U
2-Methyl-4,6-dinitrophenol	ug/L			50000U	200U	62U	30U	100U	10U	10U
2-Methylnaphthalene	ug/L			58000	20U	6.2U	3U	43	1.1	24
2-Methylphenol	ug/L			6400	1400		52	310	55	79
2-Nitroaniline	ug/L			25000U	100U	31U	15U	50U	5U	5U
2-Nitrophenol	ug/L			25000U	100U	75	15U	50U	5U	5U
3,3'-Dichlorobenzidine	ug/L			25000U	100U	31U	15U	50U	5U	5U
3-Nitroaniline	ug/L			25000U	100U	31U	15U	50U	5U	5U
4-Bromophenyl Phenyl Ether	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
4-Chloro-3-methylphenol	ug/L			25000U	100U	31U	15U	50U	5U	5U
4-Chloroaniline	ug/L			25000U	100U	31U	15U	50U	5U	5U
4-Chlorophenyl Phenyl Ether	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
4-Methylphenol	ug/L			16000	1800		53	3700	67	710
4-Nitroaniline	ug/L			25000U	100U	31U	15U	50U	5U	5U
4-Nitrophenol	ug/L			25000U	100U	31U	15U	50U	5U	5U
Acenaphthene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Acenaphthylene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Anthracene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Benz(a)anthracene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Benzo(a)pyrene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Benzo(b)fluoranthene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Benzo(g,h,i)perylene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Benzo(k)fluoranthene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Benzoic Acid	ug/L			84000U	9100		380	3000	1700	660
Benzyl Alcohol	ug/L			25000U	210	270	15U	90	20	7 9
Bis(2-chloroethoxy)methane	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Bis(2-chloroethyl) Ether	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Bis(2-ethylhexyl) Phthalate	ug/L			730000	250	14	3U	36	10	48
Butylbenzyl Phthalate	ug/L			83000	10	6.2U	3U	19	2 9	12
Carbazole	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Chrysene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Dibenz(a,h)anthracene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Dibenzofuran	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Diethyl Phthalate	ug/L			2700	1100		16	150	6.1	37
Dimethyl Phthalate	ug/L			28000	630	490	23	1100	600	170
Di-n-butyl Phthalate	ug/L			34000	20U	6.2U	3U	12	1.6	5.6
Di-n-octyl Phthalate	ug/L			34000	20U	21	3U	10U	1U	1U
Fluoranthene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Fluorene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Hexachlorobenzene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Hexachlorobutadiene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Hexachlorocyclopentadiene	ug/L			25000U	100U	31U	15U	50U	5U	5U
Hexachloroethane	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Indeno(1,2,3-cd)pyrene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
Isophorone	ug/L			69000	670		77	380	24	250
Naphthalene	ug/L			300000	88	87	5.8	140	4 8	150
Nitrobenzene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U
N-Nitrosodi-n-propylamine	ug/L			27000U	100U	31U	15U	50U	5U	5U
N-Nitrosodiphenylamine	ug/L			15000	20U	6.2U	3U	10U	1U	8.8U
Pentachlorophenol	ug/L			25000U	100U	31U	15U	50U	5U	10
Phenanthrene	ug/L			5000U	20U	6.2U	3U	10U	1U	1.4
Phenol	ug/L			8600	880		59	700	190	230
Pyrene	ug/L			5000U	20U	6.2U	3U	10U	1U	1U

Organic Compounds (VOC)	Units	P1	P1,2,3	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
1,1,1,2-Tetrachloroethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
1,1,1-Trichloroethane	ug/L	13000		8100	2200	2400	1400	3400	200U	490
1,1,2,2-Tetrachloroethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
1,1,2-Trichloroethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
1,1,2-Trichlorotrifluoroethane	ug/L	8000U		400U	400U	2000U	1300	1000U	400U	200U
1,1-Dichloroethane	ug/L	21000		3600	2600	1700	1300	2700	200U	420

Table 18. Liquid Samples from Drum Excavation - Analytical Results

Organic Compounds (VOC)	Units	P1	P1,2,3	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
1,1-Dichloroethene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
1,1-Dichloropropene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
1,2,3-Trichlorobenzene	ug/L	20000U		1000U	1000U	5000U	2500U	2500U	1000U	500U
1,2,3-Trichloropropane	ug/L	8000U		400U	400U	2000U	1000U	1000U	400U	200U
1,2,4-Trichlorobenzene	ug/L	20000U		1100	1000U	5000U	2500U			
1,2,4-Trimethylbenzene	ug/L	4000U		10000	920	1000U	500	500U	200U	400
1,2-Dibromo-3-chloropropane	ug/L	20000U		1000U	1000U	5000U	2500U	2500U	1000U	500U
1,2-Dichlorobenzene	ug/L	4000U		200U	200U	1000U	500U			
1,2-Dichloroethane (EDC)	ug/L	4000U		610	690	1000U	500U	1400	200U	100U
1,2-Dichloropropane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	130
1,3,5-Trimethylbenzene	ug/L	4000U		3900	420	1000U	500U	500U	200U	180
1,3-Dichlorobenzene	ug/L	4000U		200U	200U	1000U	500U			
1,3-Dichloropropane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
1,4-Dichlorobenzene	ug/L	4000U		200U	200U	1000U	500U			
2,2-Dichloropropane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
2-butanone	ug/L	790000		1400000	1100000	210000	120000	30000	5800	2700
2-Chloroethylvinylether	ug/L	20000U		1000U	1000U	5000U	2500U	2500U	1000U	500U
2-Chlorotoluene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
2-Hexanone	ug/L	20000U		3700	2600	5000U	2500U	2500U	1000U	500U
4-Chlorotoluene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
4-Isopropyltoluene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
4-Methyl-2-pentanone (MIBK)	ug/L	590000		190000	200000	45000	38000	12000	1100	1200
Acetone	ug/L	1100000		4100000	960000	670000	300000	140000	18000	8000
Acrolein	ug/L	40000U		2000U	2000U	10000U	5000U	5000U	2000U	1000U
Acrylonitrile	ug/L	20000U		1000U	1000U	5000U	2500U	2500U	1000U	500U
Benzene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Bromobenzene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Bromochloromethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Bromodichloromethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Bromoethane	ug/L	8000U		400U	400U	2000U	1000U	1000U	400U	200U
Bromoform	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Bromomethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Carbon Disulfide	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Carbon Tetrachloride	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Chlorobenzene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Chloroethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Chloroform	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Chloromethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
cis-1,2-Dichloroethene	ug/L	4000U		330	710	5900	6400	1200	200U	100U
cis-1,3-Dichloropropene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Dibromochloromethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Dibromomethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Ethylbenzene	ug/L	5200		9400	3500	3400	2400	1900	200U	1300
Ethylene Dibromide (EDB)	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Hexachlorobutadiene	ug/L	20000U		1000U	1000U	5000U	2500U			
Hexane				200U	200U	1000U	500U	500U	200U	100U
Isopropylbenzene (Cumene)	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Methyl iodide	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Methylene Chloride	ug/L	170000		29000	410000	63000	42000	30000	12000	330
Naphthalene	ug/L	20000U		6500	1000U	5000U	2500U			
n-Butylbenzene	ug/L	4000U		350	200U	1000U	500U	500U	200U	100U
n-Propylbenzene	ug/L	4000U		1900	280	1000U	500U	500U	200U	100U
o-Xylene	ug/L	5800		7300	4200	2600	1800	1900	200U	1500
sec-Butylbenzene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Styrene	ug/L	4000U		5000	200U	1000U	500U	740	200U	100U
tert-Butylbenzene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Tetrachloroethene (PCE)	ug/L	4000U		580	780	1000U	500U	500U	200U	100U
Toluene	ug/L	100000		110000	100000	35000	21000	37000	200U	11000
trans-1,2-Dichloroethene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
trans-1,3-Dichloropropene	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
trans-1,4-Dichloro-2-butene	ug/L	20000U		1000U	1000U	5000U	2500U	2500U	1000U	500U
Trichloroethene (TCE)	ug/L	4000U		790	1500	20000	10000	940	200U	150
Trichlorofluoromethane	ug/L	4000U		200U	200U	1000U	500U	500U	200U	100U
Vinyl Acetate	ug/L	20000U		1000U	1000U	5000U	2500U	2500U	1000U	500U
Vinyl Chloride	ug/L	4000U		200U	200U	1000U	480	500U	200U	100U
Xylene Isomers, M+P	ug/L	14000		18000	12000	7100	4900	5000	200U	4100

Note
P1, 2, 3 = A composite sample from same location
P1 = Single sample from same location
Blank = Not Sampled
##U = Detection Limit/Undetected

Table 19. Detected VOCs in Liquid sampled from Drum Excavation

Organic Compounds (VOC)	Units	P1	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
1,1,1-Trichloroethane	ug/l	13,000	8,100	2,200	2,400	1,400	3,400		490
1,1,2-Trichlorotrifluoroethane	ug/L					1,300			
1,1-Dichloroethane	ug/L	21,000	3,600	2,600	1,700	1,300	2,700		420
1,2,4-Trichlorobenzene	ug/L		1,100				NS	NS	NS
1,2,4-Trimethylbenzene	ug/L		10,000	920		500			400
1,2-Dichloroethane (EDC)	ug/L		610	690			1,400		
1,2-Dichloropropane	ug/L								130
1,3,5-Trimethylbenzene	ug/L		3,900	420					180
2-butanone	ug/L	790,000	1,400,000	1,100,000	210,000	120,000	30,000	5,800	2,700
2-Hexanone	ug/L		3,700	2,600					
4-Methyl-2-pentanone (MIBK)	ug/L	590,000	190,000	200,000	45,000	38,000	12,000	1,100	1,200
Acetone	ug/L	1,100,000	4,100,000	960,000	670,000	300,000	140,000	18,000	8,000
cis-1,2-Dichloroethene	ug/L		330	710	5,900	6,400	1,200		
Ethylbenzene	ug/L	5,200	9,400	3,500	3,400	2,400	1,900		1,300
Methylene Chloride	ug/l	170,000	29,000	410,000	63,000	42,000	30,000	12,000	330
Naphthalene	ug/L		6,500				NS	NS	NS
n-Butylbenzene	ug/L		350						
n-Propylbenzene	ug/L		1,900	280					
o-Xylene	ug/L	5,800	7,300	4,200	2,600	1,800	1,900		1,500
Styrene	ug/L		5,000				740		
Tetrachloroethene (PCE)	ug/L		580	780					
Toluene	ug/L	100,000	110,000	100,000	35,000	21,000	37,000		11,000
Trichloroethene (TCE)	ug/L		790	1,500	20,000	10,000	940		150
Vinyl Chloride	ug/L					480			
Xylene Isomers, M+P	ug/L	14,000	18,000	12,000	7,100	4,900	5,000		4,100

Organic Compounds (SVOC)	Units	P1	6B	3C-1	3C-2	3C-3	SS-1 SEEP	SS-4 SEEP	SS-9 SEEP
1,2,4-Trichlorobenzene	ug/L	NS	130,000						
1,2-Dichlorobenzene	ug/L	NS	6,000		6.2		66		2.9
1,4-Dichlorobenzene	ug/L	NS	2,800				29		2.2
1-Methylnaphthalene	ug/L	NS	27,000				29		16
2,4-Dimethylphenol	ug/L	NS		200	180	5.8	160	2.6	64
2-Methylnaphthalene	ug/L	NS	58,000				43	1.1	24
2-Methylphenol	ug/L	NS	6,400	1,400	NS	52	310	55	79
2-Nitrophenol	ug/L	NS			75				
4-Methylphenol	ug/L	NS	16,000	1,800	NS	53	3,700	67	710
Benzoic Acid	ug/L	NS		9,100	NS	380	3,000	1,700	660
Benzyl Alcohol	ug/L	NS		210	270		90	20	7.9
Bis(2-ethylhexyl) Phthalate	ug/L	NS	730,000	250	14		36	10	48
Butylbenzyl Phthalate	ug/L	NS	83,000	10			19	2.9	12
Diethyl Phthalate	ug/L	NS	2,700	1,100	NS	16	150	6.1	37
Dimethyl Phthalate	ug/L	NS	28,000	630	490	23	1,100	600	170
Di-n-butyl Phthalate	ug/L	NS	34,000				12	1.6	5.6
Di-n-octyl Phthalate	ug/L	NS	34,000		21				
Isophorone	ug/L	NS	69,000	670	NS	77	380	24	250
Naphthalene	ug/L	NS	300,000	88	87	5.8	140	4.8	150
N-Nitrosodiphenylamine	ug/L	NS	15,000						
Pentachlorophenol	ug/L	NS							10
Phenanthrene	ug/L	NS							1.4
Phenol	ug/L	NS	8,600	880	NS	59	700	190	230

Blank = Non-Detect
NS=Not Sampled

Table 20. Groundwater EW-1 (Hole) - Analytical Results

Field Parameters	Units	EW-1 2008 1	EW-1 2008 2	EW-1 2008 3	EW-1 2008 4	EW-1 2008 5	EW-1 2008 6	EW-1 2008 7	EW-1 2008 8
Dissolved Oxygen	mg/L					0.1	0.1		
Hydrogen Sulfide	mg/L		0	0.01	0.01		0	0.01	
Oxidation Reduction Potential	mV	-23	-17	-63	-49	21	-249	-226	-96
pH	std. units	6.4	6.25	6.65	6.64	7.6	6.65	6 6	6.6
Specific Conductance @ 25C	umhos/cm	8100	9700	10200	10400	10200	10110	9900	10000
Temperature, ˚F	˚F	64.22	67.82	68.72	74.12	71.96	73.22	70.88	72.5
Water Level Elevation	feet	1233.04	1232.62		1232.41	1232.46	1232.49	1232.48	1232.3

Geochemical Indicators	Units	EW-1 2008 1	EW-1 2008 2	EW-1 2008 3	EW-1 2008 4	EW-1 2008 5	EW-1 2008 6	EW-1 2008 7	EW-1 2008 8
Total Dissolved Solids	mg/L	6420	6560	6430	6810	7240	6960	7100	6320
Total Organic Carbon	mg/L	115	136	110	107	109	108	107	104

Inorganics	Units	EW-1 2008 1	EW-1 2008 2	EW-1 2008 3	EW-1 2008 4	EW-1 2008 5	EW-1 2008 6	EW-1 2008 7	EW-1 2008 8
Alkalinity (as CaCO3)	mg/L	1340	1300	1250	1250	1270	1300	1270	1320
Bicarbonate as CaCO3	mg/L	1340	1300	1250	1250	1270	1300	1270	1320
Carbonate as CO3	mg/L	1U	1U	1U	1U	1U	1U	1U	1U
Hydroxide (as CaCO3)	mg/L	1U	1U	1U	1U	1U	1U	1U	1U
Nitrate as Nitrogen	mg/L as N	0.017	0.05U	0.01U	0.2U	0.2U	0.2U	0.012	0.01U
Nitrate+Nitrite as Nitrogen	mg/L as N	0.017	0.05U	0.01U	0.2U	0.2U	0.2U	0.012	0.01U
Nitrite as Nitrogen	mg/L as N	0.01U	0.01	0.01U	0.01U	0.01U	0.021	0.01U	0.01U
Chloride	mg/L	2300	2300	2300	2300	2100	2200	2200	2200
Sulfate	mg/L	1100	1000	1200	1200	1400	1400	1400	1400

Metals	Units	EW-1 2008 1	EW-1 2008 2	EW-1 2008 3	EW-1 2008 4	EW-1 2008 5	EW-1 2008 6	EW-1 2008 7	EW-1 2008 8
Antimony, Dissolved	ug/L		250U						
Arsenic, Dissolved	ug/L	11.3	9	13.9	11.9	10	11	13.4	14
Barium, Dissolved	ug/L		270						
Beryllium, Dissolved	ug/L		5U						
Cadmium, Dissolved	ug/L		10U						
Calcium, Total	mg/L	628	627	600	565	596	603	646	637
Chromium, Dissolved	ug/L		20U						
Cobalt, Dissolved	ug/L		90						
Copper, Dissolved	ug/L		10U						
Iron, Total	ug/L	26400	29800	34300	33700	36200	35200	35700	36000
Lead, Dissolved	ug/L		100U						
Magnesium, Total	mg/L	377	370	380	368	397	394	416	423
Manganese, Total	ug/L	26800	26600	25400	24500	25600	23400	23200	23600
Nickel, Dissolved	ug/L		50U						
Potassium, Total	mg/L	211	233	270	238	230	233	237	223
Selenium, Dissolved	ug/L		2U						
Silver, Dissolved	ug/L		20U						
Sodium, Total	mg/L	1270	1210	1050	980	977	1030	1120	1130
Thallium, Dissolved	ug/L		1						
Vanadium, Dissolved	ug/L		20U						
Zinc, Dissolved	ug/L		120						

Volatile Organic Compounds	Units	EW-1 2008 1	EW-1 2008 2	EW-1 2008 3	EW-1 2008 4	EW-1 2008 5	EW-1 2008 6	EW-1 2008 7	EW-1 2008 8
1,1,1,2-Tetrachloroethane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
1,1,1-Trichloroethane	ug/l	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.02U	0.02U	0.02U	0.2U	0.028	0.02	0.025	0.02U
1,1,2-Trichloroethane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.8
1,1,2-Trichlorotrifluoroethane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
1,1-Dichloroethane	ug/L	3.5	10	15	13	14	15	16	14
1,1-Dichloroethene	ug/L	0.16	0.2	0.4	0.43	0.4	0.46	0.44	0.39
1,1-Dichloropropene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
1,2,3-Trichlorobenzene	ug/L	0.5U	0.5U	0.5U	2.5U	0.5U	0.5U	2.5U	0.5U
1,2,3-Trichloropropane	ug/L	0.5U	0.5U	0.5U	2.5U	0.5U	0.5U	2.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	0.5U	0.5U	0.5U	2.5U	0.5U	0.5U	2.5U	0.5U

Table 20. Groundwater EW-1 (Hole) - Analytical Results

Volatile Organic Compounds	Units	EW-1 2008 1	EW-1 2008 2	EW-1 2008 3	EW-1 2008 4	EW-1 2008 5	EW-1 2008 6	EW-1 2008 7	EW-1 2008 8
1,2,4-Trimethylbenzene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.5U	0.5U	0.5U	2.5U	0.5U	0.5U	2.5U	0.5U
1,2-Dichlorobenzene	ug/L	0.2U	0 8	1.2	1	1.1	1	1 2	0.9
1,2-Dichloroethane (EDC)	ug/L	0.2	0.4	0.6	1U	0.6	0.6	1U	0.6
1,2-Dichloropropane	ug/L	0.5	0 6	0.9	1	1.2	1.4	1 6	1.5
1,3,5-Trimethylbenzene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
1,3-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
1,3-Dichloropropane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
1,4-Dichlorobenzene	ug/L	0.4	2.1	3.4	3	3	2.9	2 8	2.3
2,2-Dichloropropane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
2-Butanone	ug/L	2.5U	2.5U	2.5U	12U	2.5U	2.5U	12U	2.5U
2-Chloroethylvinylether	ug/L	1U	1U	1U	5U	1U	1U	5U	1U
2-Chlorotoluene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
2-Hexanone	ug/L	2.5U	2.5U	2.5U	12U	2.5U	2.5U	12U	2.5U
4-Chlorotoluene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
4-Isopropyltoluene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
4-Methyl-2-Pentanone (MIBK)	ug/L	2.5U	2.5U	2.5U	12U	2.5U	2.5U	12U	2.5U
Acetone	ug/L	15	12	11	18	14	9.1	26	12
Acrolein	ug/L	5U	5U	5U	25U	5U	5U	25U	5U
Acrylonitrile	ug/L	1U	1U	1U	5U	1U	1U	5U	1U
Benzene	ug/L	0.8	2.2	3	2.4	2.6	2.6	2.7	2.5
Bromobenzene	ug/L	0.2U	0.2U	0.2	1U	0.2U	0.2U	1U	0.2U
Bromochloromethane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Bromodichloromethane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Bromoethane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Bromoform	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Bromomethane	ug/L	0.5U	0.5U	0.5U	2.5U	0.5U	0.5U	2.5U	0.5U
Carbon Disulfide	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Carbon Tetrachloride	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Chlorobenzene	ug/L	0.2U	0.5	0.6	1U	0.6	0.6	1U	0.5
Chloroethane	ug/L	1.1	2.8	3.3	3.8	4	4.2	4.4	3.1
Chloroform	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Chloromethane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.3
cis-1,2-Dichloroethene	ug/L	6.2	16	25	24	30	31	31	29
cis-1,3-Dichloropropene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Dibromochloromethane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Dibromomethane	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Ethylbenzene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Ethylene Dibromide (EDB)	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Hexachlorobutadiene	ug/L	0.5U	0.5U	0.5U	2.5U	0.5U	0.5U	2.5U	0.5U
Hexane	ug/L	0.2U	0.2U	0.4U	1U	0.3	0.3	1U	0.2U
Isopropylbenzene (Cumene)	ug/L	0.2U	0.2	0.3	1U	0.3	0.3	1U	0.3
Methyl Iodide	ug/L	1U	1U	1U	5U	1U	1U	5U	1U
Methyl tert-Butyl Ether	ug/L	0.5	0.8	1.1	1U	0.9	0.9	1.2	1
Methylene Chloride	ug/l	0.6	0.9	0.9	2.5U	0.9	1	2.5U	0.6
Naphthalene	ug/L	0.5U	0.5U	0.5U	2.5U	0.5U	0.5U	2.5U	0.5U
n-Butylbenzene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
n-Propylbenzene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
o-Xylene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
sec-Butylbenzene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Styrene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
tert-Butylbenzene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Tetrachloroethene (PCE)	ug/L	0.02U	0.02U	0.027	0.2U	0.049	0.058	0.067	0.065
Toluene	ug/L	0.2U	0.2U	0.2	1U	0.2U	0.2U	1U	0.2U
trans-1,2-Dichloroethene	ug/L	0.2U	0.5	0.8	1U	0.8	0.8	1U	0.8
trans-1,3-Dichloropropene	ug/L	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	1U	1U	1U	5U	1U	1U	5U	1U
Trichloroethene (TCE)	ug/L	0.044	0.35	0.8	0.86	0.88	0.88	0.88	0.76
Trichlorofluoromethane	ug/l	0.2U	0.2U	0.2U	1U	0.2U	0.2U	1U	0.2U
Vinyl Acetate	ug/L	1U	1U	1U	5U	1U	1U	5U	1U
Vinyl Chloride	ug/L	16	38	51	57	65	65	63	55
Xylene Isomers, M+P	ug/L	0.4U	0.4U	0.4U	2U	0.4U	0.4U	2U	0.4U

Table 20. Groundwater EW-1 (Hole) - Analytical Results

Water Treatment	Units	EW-1 2008 1	EW-1 2008 2	EW-1 2008 3	EW-1 2008 4	EW-1 2008 5	EW-1 2008 6	EW-1 2008 7	EW-1 2008 8
4,4-DDD	ug/L		0.1U						
4,4-DDE	ug/L		0.1U						
4,4-DDT	ug/L		0.1U						
Aldrin	ug/L		0.05U						
alpha Chlordane	ug/L		0.05U						
alpha-BHC	ug/L		0.05U						
beta-BHC	ug/L		0.17U						
Biochemical Oxygen Demand (BOD)	mg/L		2U						
delta-BHC	ug/L		0.05U						
Dieldrin	ug/L		0.1U						
Endosulfan I	ug/L		0.05U						
Endosulfan II	ug/L		0.1U						
Endosulfan Sulfate	ug/L		0.1U						
Endrin	ug/L		0.1U						
Endrin Aldehyde	ug/L		0.1U						
Endrin Ketone	ug/L		0.1U						
gamma Chlordane	ug/L		0.05U						
gamma-BHC (Lindane)	ug/L		0.05U						
Heptachlor	ug/L		0.05U						
Heptachlor Epoxide	ug/L		0.05U						
Methoxychlor	ug/L		0.5U						
Ortho-Phosphorus	mg-P/L		0.004						
Total Phosphorus	mg-P/L		0.03						
Toxaphene	ug/L		5U						

Notes
Blank = Not analyzed
##U = Detection Limit/Undetected
Sample Event Dates

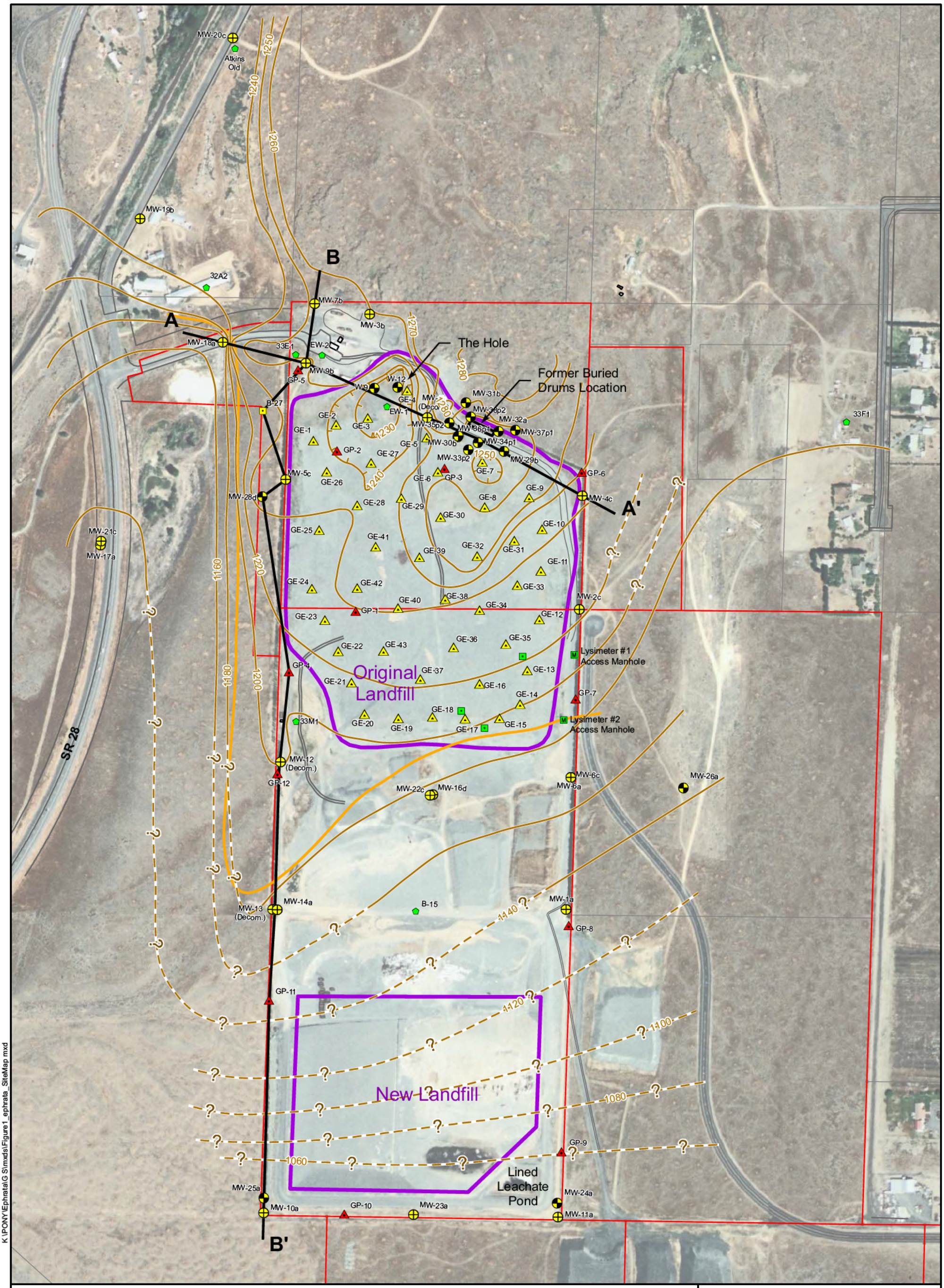
EW-1 2008 1	4/30/08
EW-1 2008 2	5/1/08
EW-1 2008 3	5/8/08
EW-1 2008 4	5/15/08
EW-1 2008 5	5/22/08
EW-1 2008 6	5/28/08
EW-1 2008 7	6/4/08
EW-1 2008 8	6/12/08

Table 21. Detected VOCs in Groundwater from EW-1 (Hole)

Volatile Organic Compounds	Units	EW-1 2008 1	EW-1 2008 2	EW-1 2008 3	EW-1 2008 4	EW-1 2008 5	EW-1 2008 6	EW-1 2008 7	EW-1 2008 8
1,1,2,2-Tetrachloroethane	ug/L					0.03	0.02	0.03	
1,1,2-Trichloroethane	ug/L								0.80
1,1-Dichloroethane	ug/L	3.50	10.00	15.00	13.00	14.00	15.00	16.00	14.00
1,1-Dichloroethene	ug/L	0.16	0.20	0.40	0.43	0.40	0.46	0.44	0.39
1,2-Dichlorobenzene	ug/L		0.80	1.20	1.00	1.10	1.00	1.20	0.90
1,2-Dichloroethane (EDC)	ug/L	0.20	0.40	0.60		0.60	0.60		0.60
1,2-Dichloropropane	ug/L	0.50	0.60	0.90	1.00	1.20	1.40	1.60	1.50
1,4-Dichlorobenzene	ug/L	0.40	2.10	3.40	3.00	3.00	2.90	2.80	2.30
Acetone	ug/L	15.00	12.00	11.00	18.00	14.00	9.10	26.00	12.00
Benzene	ug/L	0.80	2.20	3.00	2.40	2.60	2.60	2.70	2.50
Bromobenzene	ug/L			0.20					
Chlorobenzene	ug/L		0.50	0.60		0.60	0.60		0.50
Chloroethane	ug/L	1.10	2.80	3.30	3.80	4.00	4.20	4.40	3.10
Chloromethane	ug/L								0.30
cis-1,2-Dichloroethene	ug/L	6.20	16.00	25.00	24.00	30.00	31.00	31.00	29.00
Hexane	ug/L					0.30	0.30		
Isopropylbenzene (Cumene)	ug/L		0.20	0.30		0.30	0.30		0.30
Methyl tert-Butyl Ether	ug/L	0.50	0.80	1.10		0.90	0.90	1.20	1.00
Methylene Chloride	ug/l	0.60	0.90	0.90		0.90	1.00		0.60
Tetrachloroethene (PCE)	ug/L			0.03		0.05	0.06	0.07	0.07
Toluene	ug/L			0.20					
trans-1,2-Dichloroethene	ug/L		0.50	0.80		0.80	0.80		0.80
Trichloroethene (TCE)	ug/L	0.04	0.35	0.80	0.86	0.88	0.88	0.88	0.76
Vinyl Chloride	ug/L	16.00	38.00	51.00	57.00	65.00	65.00	63.00	55.00
TOTAL	ug/L	45.00	88.35	119.73	124.49	140.66	138.12	151.31	126.42

Notes:
Blank = Non-Detect
Sample Event Dates

EW-1 2008 1	4/30/08
EW-1 2008 2	5/1/08
EW-1 2008 3	5/8/08
EW-1 2008 4	5/15/08
EW-1 2008 5	5/22/08
EW-1 2008 6	5/28/08
EW-1 2008 7	6/4/08
EW-1 2008 8	6/12/08



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Quarterly Monitoring Well (MW)
Remedial Investigation Monitoring Well (MW)
Gas Extraction (GE)
Gas Probe (GP)
Other Well
Boring
Lysimeter
Access Manhole

Cross-Section Alignment
County Owned Parcels
Landfill Extents
Outwash Water Table / Top of Basalt Contact

Basalt Elevation Contours (December 2008)
10-foot Contour
5-foot Contour
10-foot Depression Contour
5-foot Depression Contour

0 Feet 400

N

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Figure 1
Site Map

Ephrata Landfill
RIFS

PgG

MW-7b
T-1
T-3
T-5
MW-3b
T-9
T-2
T-6
T-4
T-8
T-11
T-7
T-10
T-12
B-1
Maintenance
Shop Area
B-3
B-2
33E1
EW-2
B-5
MW-9b
T-13
GP-5
B-4
B-11
B-10
B-6
B-8
B-7
W-9
W-12
GE-4
B-14
1240
1250
1260
1270
1280
The
Hole
B-13
EW-1
1230
1240
B-15
MW-31b
Former Buried
Drums Location
B-27
GE-3
MW-8b
MW-38p2
B-16
MW-35p2
SS-4
SS-3
SS-6
SS-7
S-4
S-5
SS-5
S-3
S-7
S-9
16-B
MW-37p1
S-2
S-6
MW-32a
SS-8
S-8
S-10
S-11
S-12
GE-2
MW-30b
MW-36p1
SS-2
GE-5
T-14
SS-1
SS-9
SS-11
MW-34p1
SS-10
GE-1
B-23
MW-33p2
MW-29b
GP-2
1250
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Quarterly Monitoring Well (MW)
Remedial Investigation Monitoring Well (MW)
Gas Extraction (GE)
Gas Probe (GP)
Other Well

Soil Sample Locations
Boring
Test Pits
Phase I Drum Sample
Phase III Drum Sample

Extent of Saturation Above Bedrock
Extent of Soil Removal to Bedrock
Drum Cache Outline
Landfill Extents
County Owned Parcels

Laser Survey Elevation Range
High : 1258.01 feet
Low : 1252.18 feet

Basalt Elevation Contours
(December 2008)
10-foot Contour
5-foot Contour
10-foot Depression Contour
5-foot Depression Contour

0 Feet 100
2006 NAIP Orthophoto
N

Figure 2

Ephrata Landfill Map
(North End)

Ephrata Landfill
RIFS

PgG

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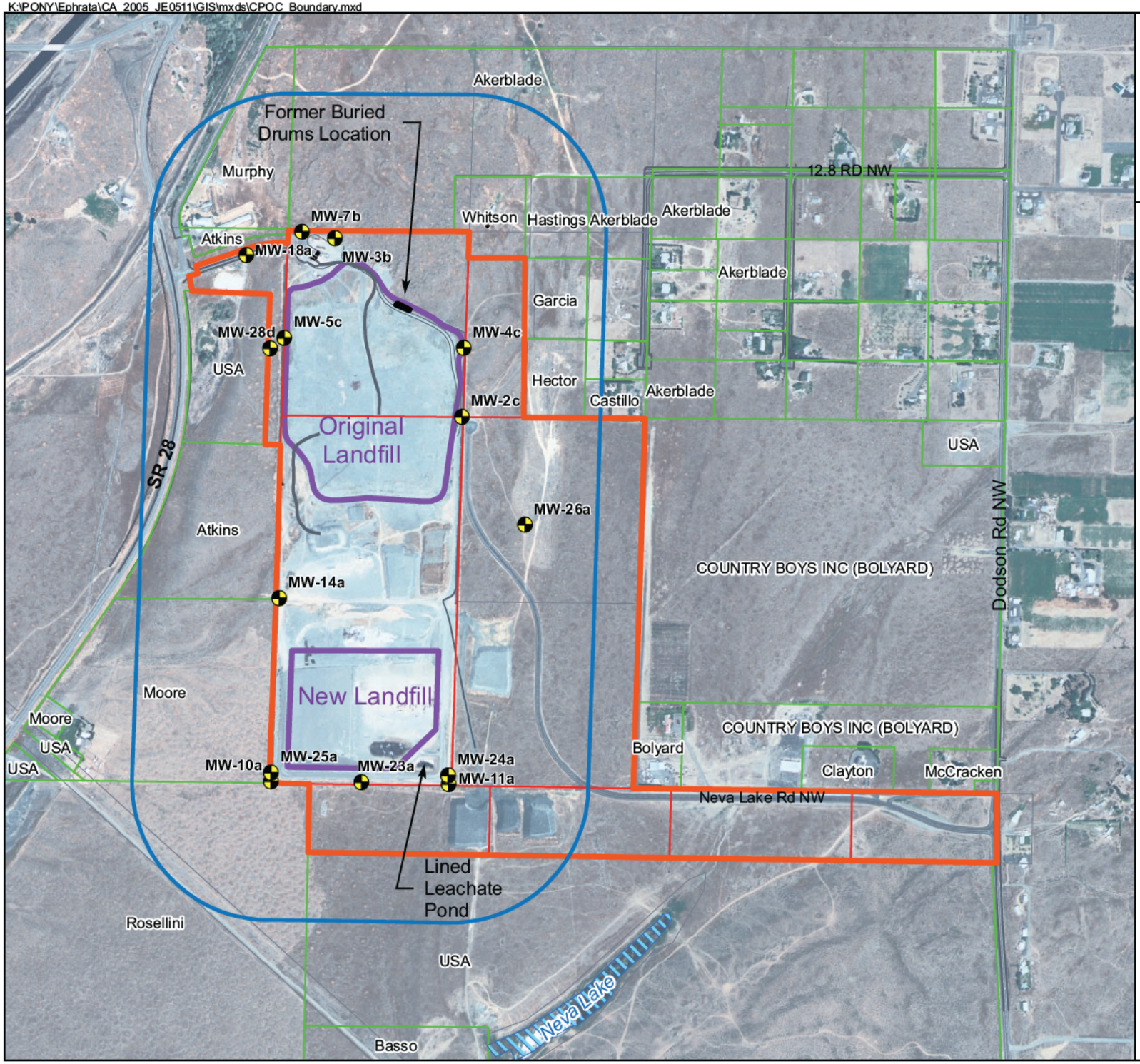


Figure 3

Conditional Point of Compliance Boundary

Ephrata Landfill
RIFS

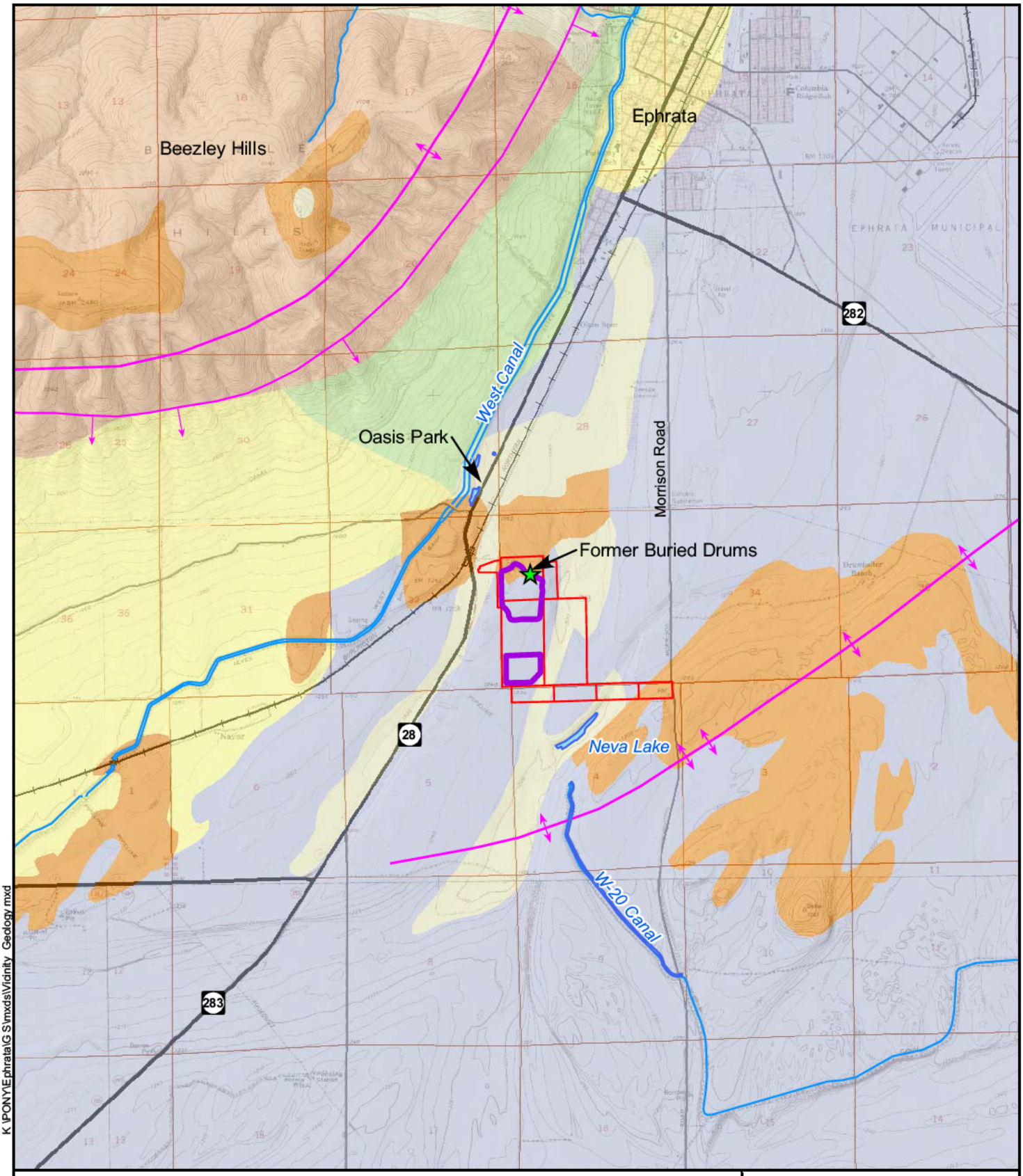
PgG

- CPOC Monitoring Wells
- Well Restriction Boundary
- CPOC Boundary (1000 ft per WAC 173 160 171)
- County Owned Parcels
- Surrounding Parcels
- Landfill Extents

0 Feet 1,000

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Geologic Units

- Quaternary alluvium and loess
- Quaternary landslide deposits
- Pleistocene Missoula glacial lake outburst flood deposits
- Pliocene to Miocene continental sedimentary rocks (Ringold Formation)
- Wanapum Basalt
- Grande Ronde Basalt
- Anticline
- Monocline, anticlinal bend

Landfill Extents

County Owned Parcels

0 Feet 5,000

N

Figure 4

Geologic Map

Ephrata Landfill
RIFS

PgG

B North

B' South

elevation, feet above mean sea level

1,275 1,250 1,225 1,200 1,175 1,150 1,125 1,100 1,075 1,050 1,025 1,000 975 950 925 900 875

MW-7b 33E1 (projected) MW-9b B-27 MW-5c MW-28d GP-4 33M1 MW-12 GP-12 MW-14a GP-11 MW-25a MW-10a

Sand & Grvl
Hard Basalt
Soft Weathered Basalt
Decreased Weathering
Soft Weathered Basalt
Soft to Hard Moderately Weathered Basalt
Hard Basalt
Weathered Basalt
Roza Aquifer
Damp Soft & Hard Dry Basalt
Dry Sand & Grvl
Hard Basalt
Damp Soft Basalt
Damp Weathered Basalt
Moist Soft Basalt
Hard Basalt
Damp Clay
Soft Moist Red Basalt
Red Medium Weathered Basalt
Interflow Aquifer
Wet
Reddish Weathered Basalt
Weathered Basalt w/ some Sand & Silt
Slightly Weathered Basalt
Red-Brown Strongly Weathered Basalt (water)
Rust Brown-Orange Weathered Basalt (trace water)
Outwash
Reddish-brown Weathered Basalt
Outwash Aquifer
Gray Clay
WANAPUM FORMATION
RINGOLD FORMATION
Strongly Fractured Vesicular Basalt (Water)
Hard Basalt w/some Weathering
Light Gray Clay
Frenchman Springs
Soft Gritty Siltstone (Ash)
Vantage Interbed
Hard Slightly Porous and Fractured Basalt
GRAND RONDE FORMATION

LEGEND

Outwash
Ringold Fm
Basalt
Vantage Interbed
Soft, Weathered Basalt

Well ID
Static Water Level
Screen

Vertical Exaggeration = 5x

0 1,000 ft

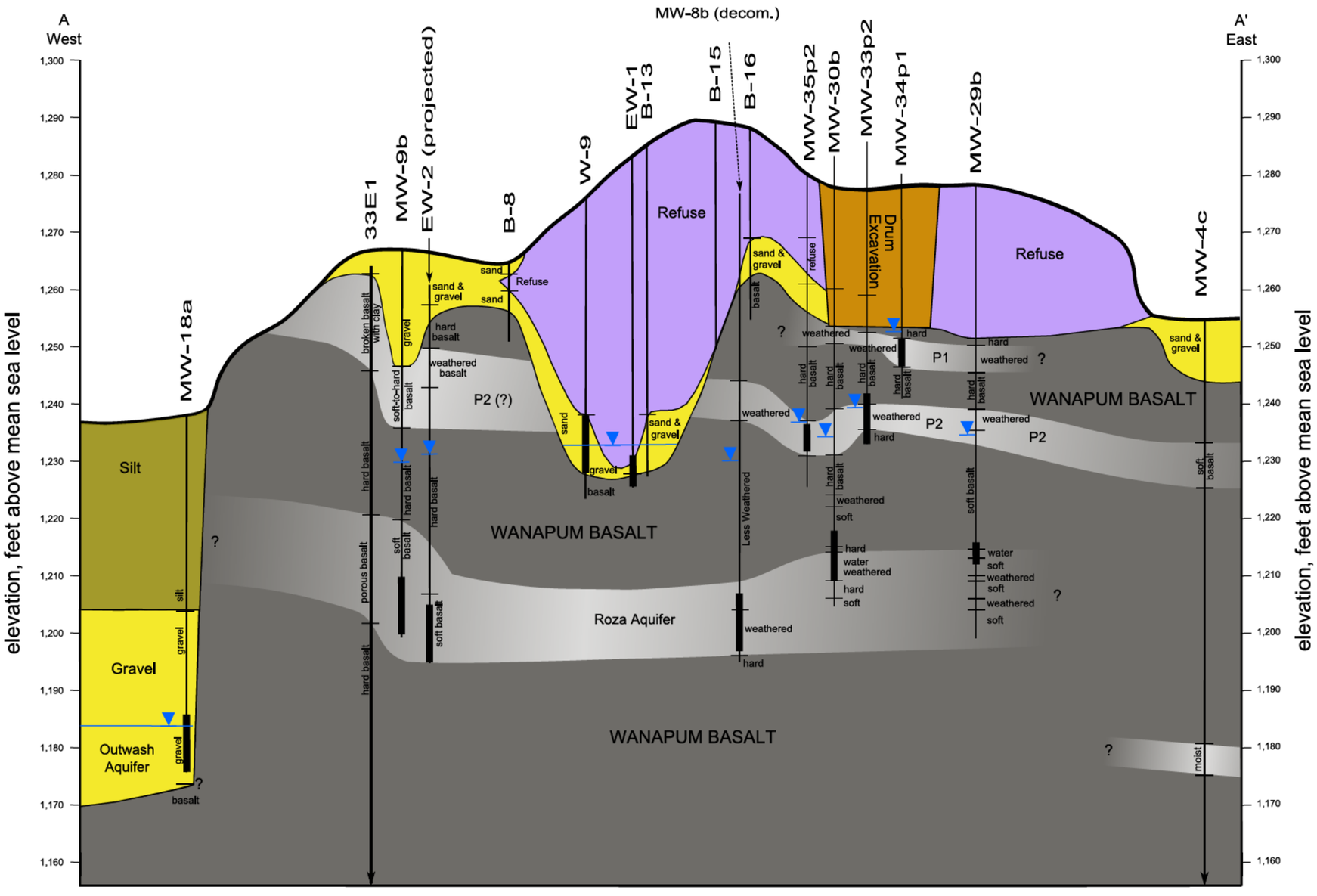
Figure 5
North-South Hydrogeologic Cross Section (B-B')

See Figure 1 for Section Alignment

Ephrata Landfill RI/FS

Filename: X-section B-B' NEW3.svg

PgG



LEGEND

- Refuse
- Outwash
- Drum Excavation
- Basalt
- Soft, weathered Basalt
- Silt

Well ID

Static Water Level

Screen

Vertical Exaggeration = 10x

0 — 400 ft

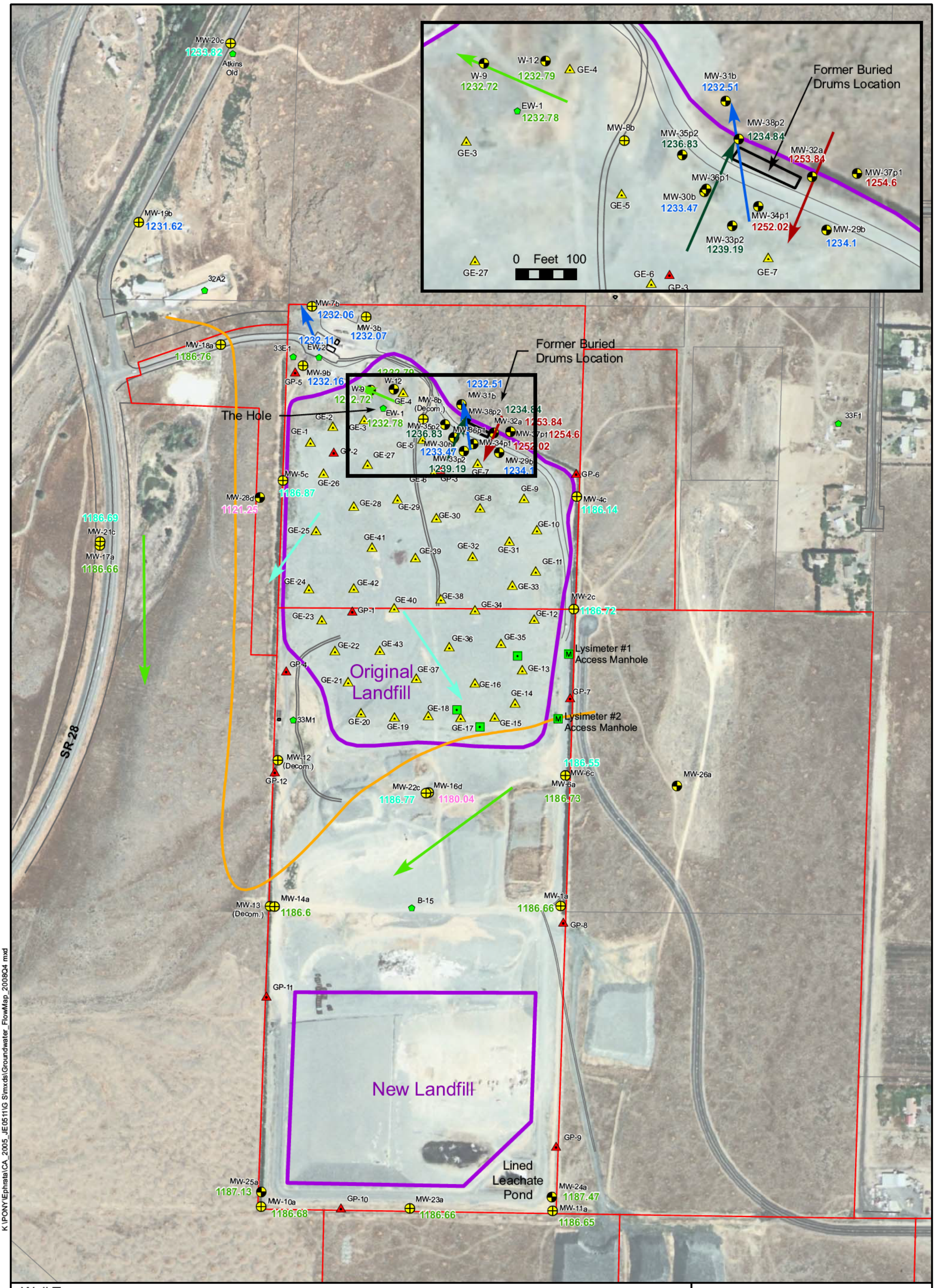
Figure 6
East-West Hydrogeologic Cross Section (A-A')

See Figure 1 for section alignment

Ephrata Landfill RI/FS

Filename: X-section Across The Hole_NEW_v2.svg

PgG



Well Type
- Quarterly Monitoring Well (MW)
- Remedial Investigation Monitoring Well (MW)
- Gas Extraction (GE)
- Gas Probe (GP)
- Other Well
- County Owned Parcels
- Landfill Extents
- Lysimeter
- Access Manhole

Outwash Water Table / Top of Basalt Contact

Approximate Flow Direction

Outwash | Interflow (Not MW 4c) | Roza | P1 | P2

2006 NAIP Orthophoto

0 Feet 400

N

Figure 7

Groundwater Flow Map (January 2009)

Ephrata Landfill
RFIS

PgG

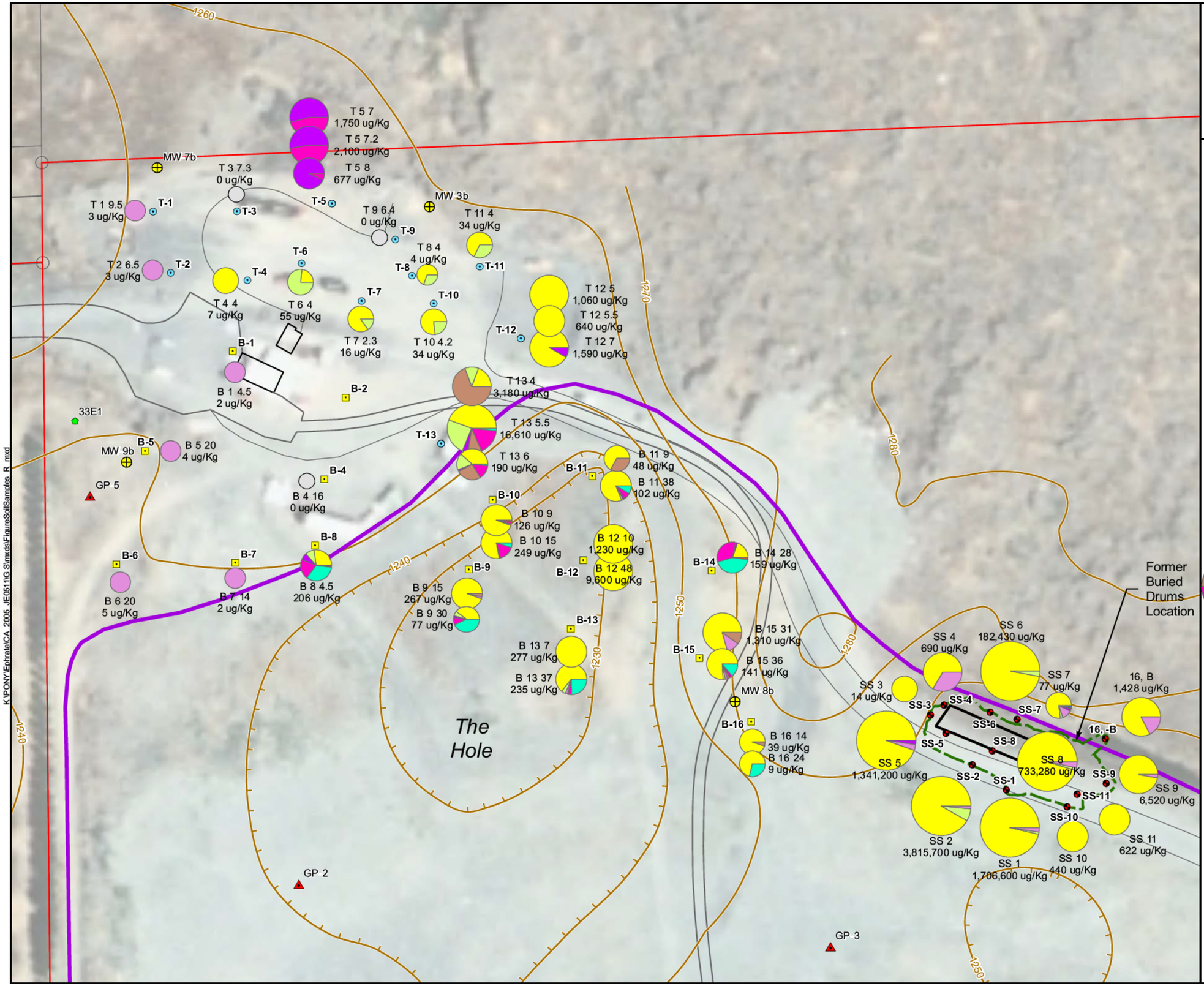
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Figure 8

Soil VOC Data

Ephrata Landfill
RIFS

PgG



Soil Sample Locations
- Test Pits
- Borings
- Residual Soil Below Drums

Well Type
- Quarterly Monitoring Well (MW)
- Gas Probe (GP)
- Other Well

- Extent of Soil Removal to Bedrock
- Former Drum Cache Outline
- Landfill Extent

Basalt Elevation Contours (December 2008)
- 10-foot Contour
- 10-foot Depression Contour

Total VOC (ug/Kg)

B 12 10
1230 ug/Kg

Station IDs (last number for B-series and T-series refers to depth in feet)
B = Boring
T = Test Pit
SS = Residual Soil below Drums

- > 50,000 ug/Kg
- 10,000 to 50,000 ug/Kg
- 1,000 to 10,000 ug/Kg
- 100 to 1,000 ug/Kg
- 5 to 100 ug/Kg
- < 5 ug/Kg
- = 0.0 ug/Kg

- BTEX
- Tetrachloroethene (PCE)
- Methylene Chloride
- Trichloroethene (TCE)
- Dichlorobenzene (1,2 & 1,4)
- 1,2 Dichloroethene (cis & trans)
- Vinyl Chloride
- 1,2 Dichloropropane
- Chloroethane
- 1,1 Dichloroethane

Only VOCs analyzed from the B series and T series are shown. Additional VOCs (e.g Ketones) were analyzed for the SS series but are not shown or included in sums.

Refer to tables for detailed laboratory results.

0 Feet 100 N

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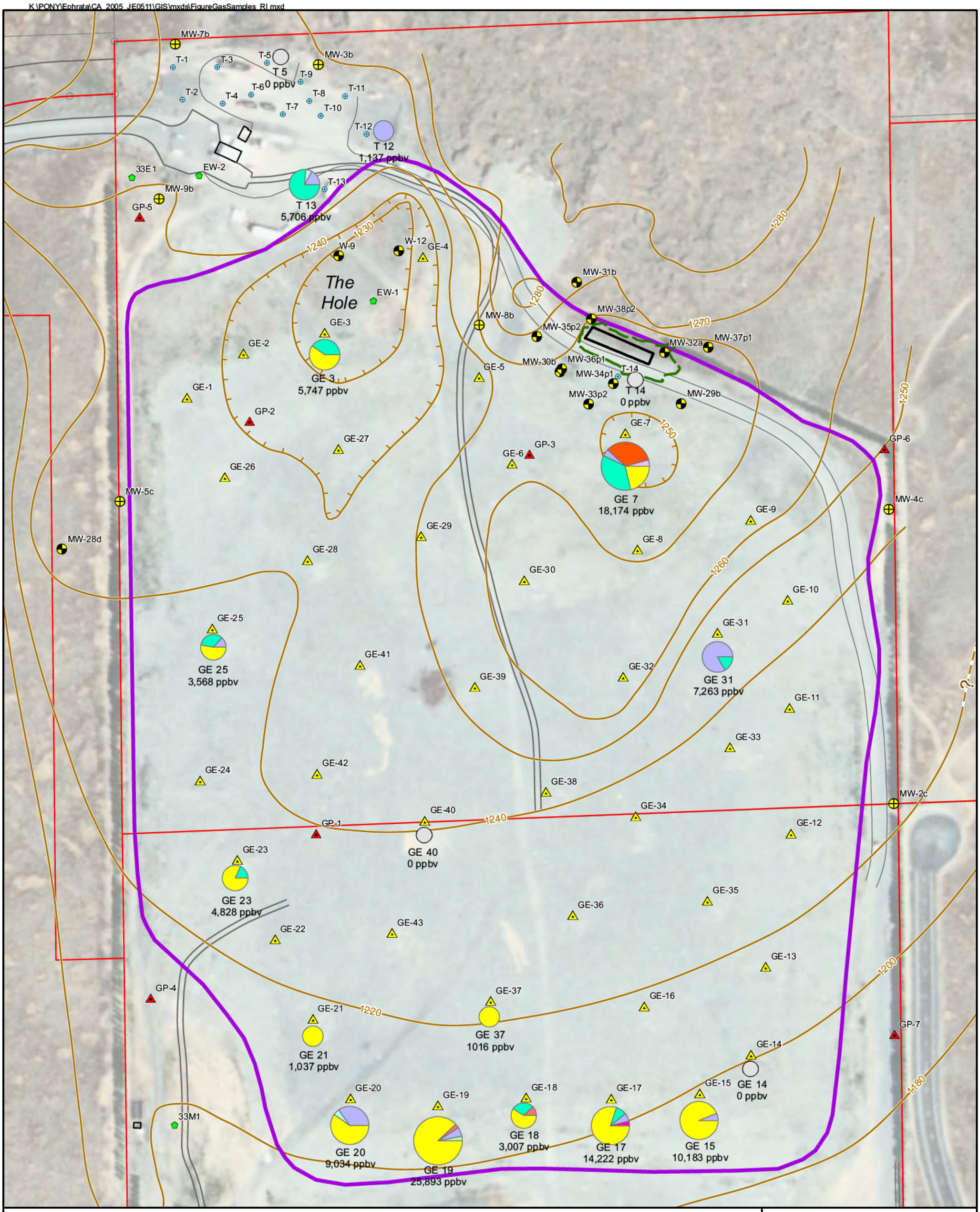


Figure 9

Gas VOC Data

Ephrata Landfill
RIFS

PgG

MW-19b
MW-7b
MW-3b
MW-18a
MW-9b
The Hole
MW-31b
EW-1
MW-38p2
MW-32a
MW-36p1
MW-37p1
MW-35p2
MW-30b
MW-34p1
MW-33p2
MW-29b
MW-5c
MW-28d
MW-4c
MW-21c
MW-17a
MW-2c
MW-16d
MW-22c
MW-6c
MW-6a
MW-26a
MW-14a
MW-1a
MW-25a
MW-10a
MW-23a
MW-24a
MW-11a

MW 18a
0.077 ug/L

EW 1
136 ug/L

MW 17a
0.074 ug/L

MW 6a
0.11 ug/L

MW 26a
0.12 ug/L

MW 14a
0.416 ug/L

MW 1a
0.087 ug/L

MW 24a
0 .23 ug/L

MW 25a
0.243 ug/L

MW 10a
0.248 ug/L

MW 23a
1 ug/L

MW 11a
0.31 ug/L

1220
1250
1240
1280
1270
1230
1260
1200
1180
1160
1140
1120
1100
1080
1060

N
0
500
Feet
2006 NAIP Orthophoto

Quarterly Monitoring Well (MW)
Remedial Investigation Monitoring Well (MW)
Extent of Soil Removal to Bedrock
Former Drum Cache Outline
Landfill Extent
Basalt Elevation Contours (December 2008)
10-foot Contour
10-foot Depression Contour

Total VOC (ug/L)

> 100,000 ug/L
10,000 to 100,000 ug/L
1000 to 10,000 ug/L
100 to 1000 ug/L
10 to 100 ug/L
< 10 ug/L
0.0 ug/L

- Ketone (Acetone, 2 Butanone, 2 Hexanone, MIBK)
- BTEX
- Dichloroethane (1,1 & 1,2)
- Trichloroethane (1,1,1 & 1,1,2)
- Dichloroethene (1,1, 1,2 cis, & 1,2 trans)
- Methylene Chloride
- Trimethylbenzene (1,2,4 & 1,3,5)
- Chloroethane
- 1,2 Dichloropropane
- Vinyl Chloride
- Other Benzenes (Bromobenzene, Isopropylbenzene (Cumene), n Butylbenzene, n Propylbenzene)
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- Chloroform
- Naphthalene
- Chlorobenzenes (Chlorobenzene; Dichlorobenzene (1,2; 1,3 & 1,4))
- Styrene
- 1,1,2 Trichlorotrifluoroethane & Trichlorotrifluoromethane
- 4 Isopropyltoluene
- Bromoform
- Carbon Disulfide
- Chloromethane

MW 30b
72 ug/L

Well ID (last number refers to aquifer)
Summed Total VOC Concentration

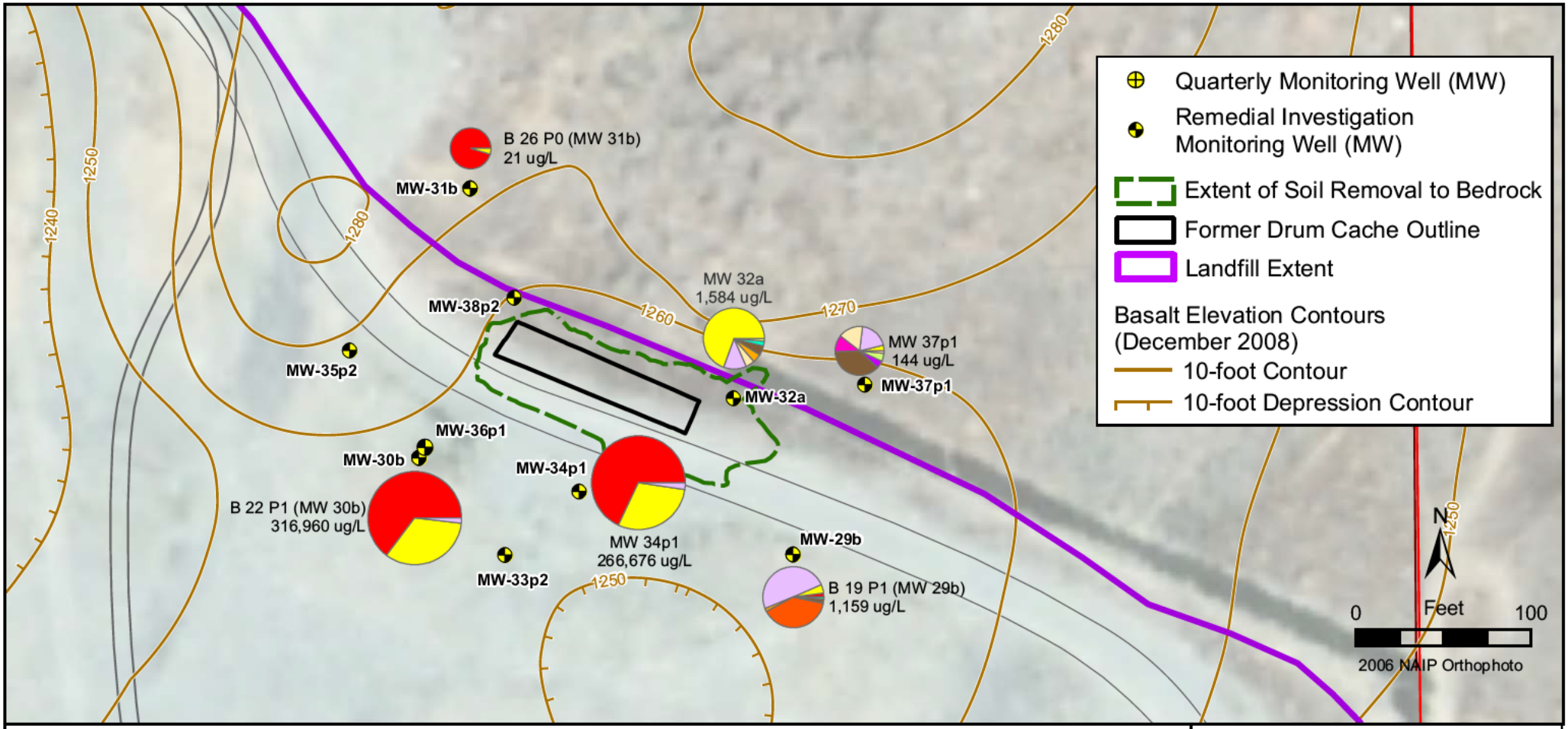
Data presented collected during Round 2 sampling event.
Refer to tables for detailed laboratory results.

Figure 10

Groundwater VOC Data Outwash Aquifer

Ephrata Landfill
RIFS

PgG



Total VOC (ug/L)

- > 100,000 ug/L
- 10,000 to 100,000 ug/L
- 1000 to 10,000 ug/L
- 100 to 1000 ug/L
- 10 to 100 ug/L
- < 10 ug/L
- 0.0 ug/L

- Ketone (Acetone, 2 Butanone, 2 Hexanone, MIBK)
- BTEX
- Dichloroethane (1,1 & 1,2)
- Trichloroethane (1,1,1 & 1,1,2)
- Dichloroethene (1,1, 1,2 cis, & 1,2 trans)
- Methylene Chloride
- Trimethylbenzene (1,2,4 & 1,3,5)
- Chloroethane
- 1,2 Dichloropropane
- Vinyl Chloride
- Other Benzenes (Bromobenzene, Isopropylbenzene (Cumene), n Butylbenzene, n Propylbenzene)
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- Chloroform
- Naphthalene
- Chlorobenzenes (Chlorobenzene; Dichlorobenzene (1,2; 1,3 & 1,4))
- Styrene
- 1,1,2 Trichlorotrifluoroethane & Trichlorotrifluoromethane
- 4 Isopropyltoluene
- Bromoform
- Carbon Disulfide
- Chloromethane

a = Outwash aquifer
p0 = Above P1 zone
p1= P1 Zone

MW 30b — Well ID (last number refers to aquifer)
72 ug/L — Summed Total VOC Concentration

Data presented collected during drilling and Round 3 sampling event. Refer to tables for detailed laboratory results.

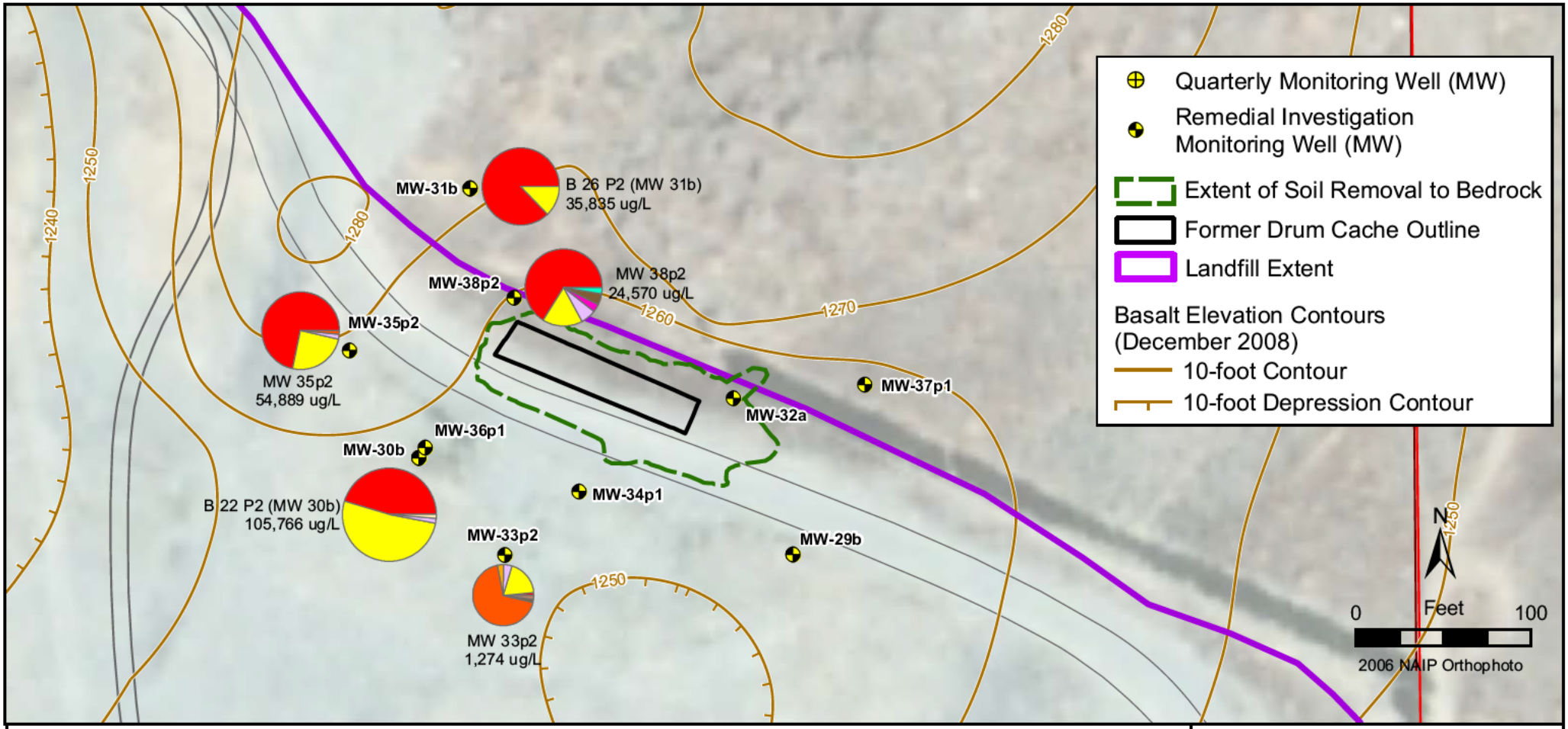
MW 32a at top of basalt, interpreted as P1

Figure 11

Groundwater VOC Data P1 Zone

Ephrata Landfill
RIFS

PgG



Total VOC (ug/L)

- > 100,000 ug/L
- 10,000 to 100,000 ug/L
- 1000 to 10,000 ug/L
- 100 to 1000 ug/L
- 10 to 100 ug/L
- < 10 ug/L
- 0.0 ug/L

- Ketone (Acetone, 2 Butanone, 2 Hexanone, MIBK)
- BTEX
- Dichloroethane (1,1 & 1,2)
- Trichloroethane (1,1,1 & 1,1,2)
- Dichloroethene (1,1, 1,2 cis, & 1,2 trans)
- Methylene Chloride
- Trimethylbenzene (1,2,4 & 1,3,5)
- Chloroethane
- 1,2 Dichloropropane
- Vinyl Chloride
- Other Benzenes (Bromobenzene, Isopropylbenzene (Cumene), n Butylbenzene, n Propylbenzene)
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- Chloroform
- Naphthalene
- Chlorobenzenes (Chlorobenzene; Dichlorobenzene (1,2; 1,3 & 1,4))
- Styrene
- 1,1,2 Trichlorotrifluoroethane & Trichlorotrifluoromethane
- 4 Isopropyltoluene
- Bromoform
- Carbon Disulfide
- Chloromethane

MW 30b
72 ug/L

Well ID (last number refers to aquifer)
Summed Total VOC Concentration

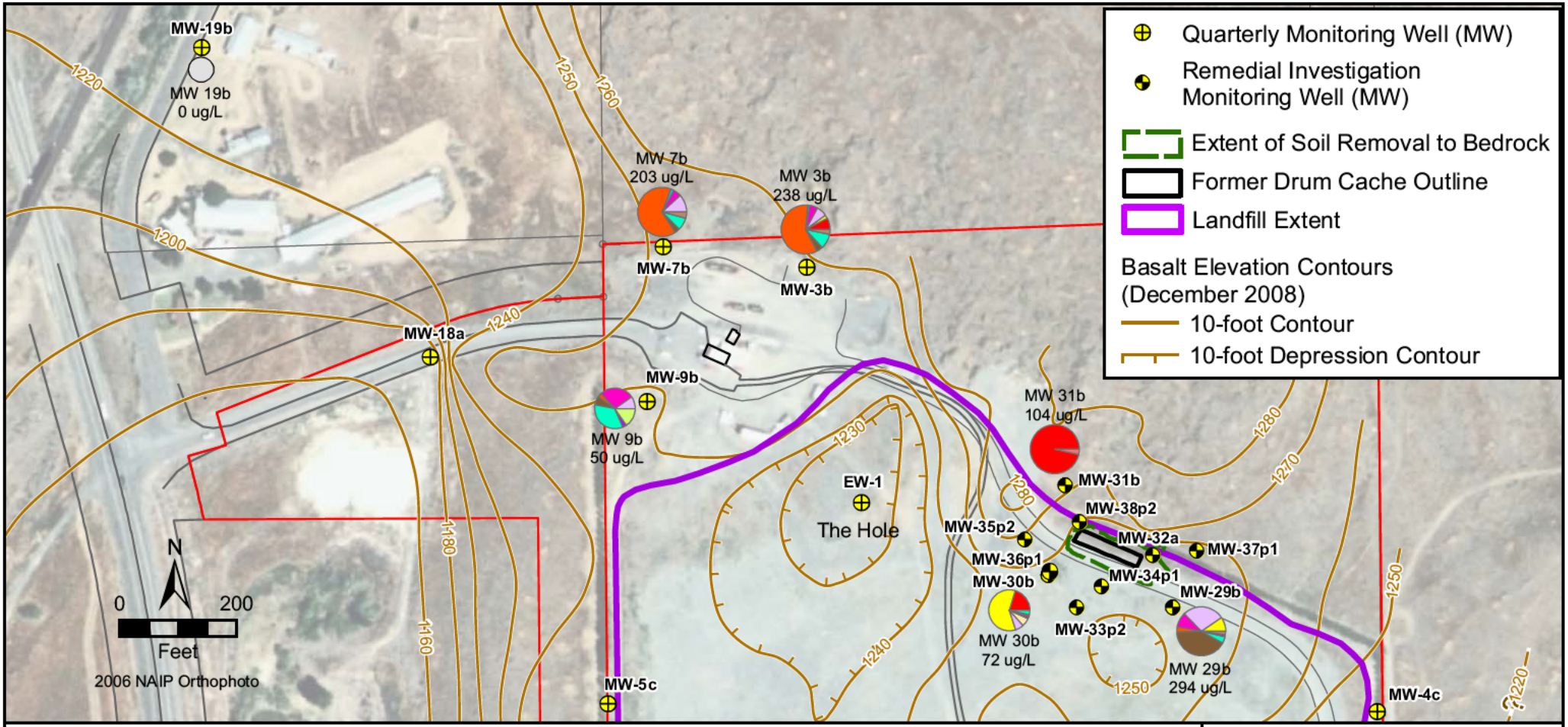
Data presented collected during drilling and Round 3 sampling event.
Refer to tables for detailed laboratory results.

Figure 12

Groundwater VOC Data P2 Zone

Ephrata Landfill
RIFS

PgG



Total VOC (ug/L)

- > 100,000 ug/L
- 10,000 to 100,000 ug/L
- 1000 to 10,000 ug/L
- 100 to 1000 ug/L
- 10 to 100 ug/L
- < 10 ug/L
- 0.0 ug/L

- Ketone (Acetone, 2 Butanone, 2 Hexanone, MIBK)
- BTEX
- Dichloroethane (1,1 & 1,2)
- Trichloroethane (1,1,1 & 1,1,2)
- Dichloroethene (1,1, 1,2 cis, & 1,2 trans)
- Methylene Chloride
- Trimethylbenzene (1,2,4 & 1,3,5)
- Chloroethane
- 1,2 Dichloropropane
- Vinyl Chloride
- Other Benzenes (Bromobenzene, Isopropylbenzene (Cumene), n Butylbenzene, n Propylbenzene)
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- Chloroform
- Naphthalene
- Chlorobenzenes (Chlorobenzene; Dichlorobenzene (1,2; 1,3 & 1,4))
- Styrene
- 1,1,2 Trichlorotrifluoroethane & Trichlorotrifluoromethane
- 4 Isopropyltoluene
- Bromoform
- Carbon Disulfide
- Chloromethane

MW 30b
72 ug/L

Well ID (last number refers to aquifer)
Summed Total VOC Concentration

Data presented collected during Round 2 and Round 3 sampling events.
Refer to tables for detailed laboratory results.

Figure 13

Groundwater VOC Data
Roza Aquifer

Ephrata Landfill
RIFS

PgG

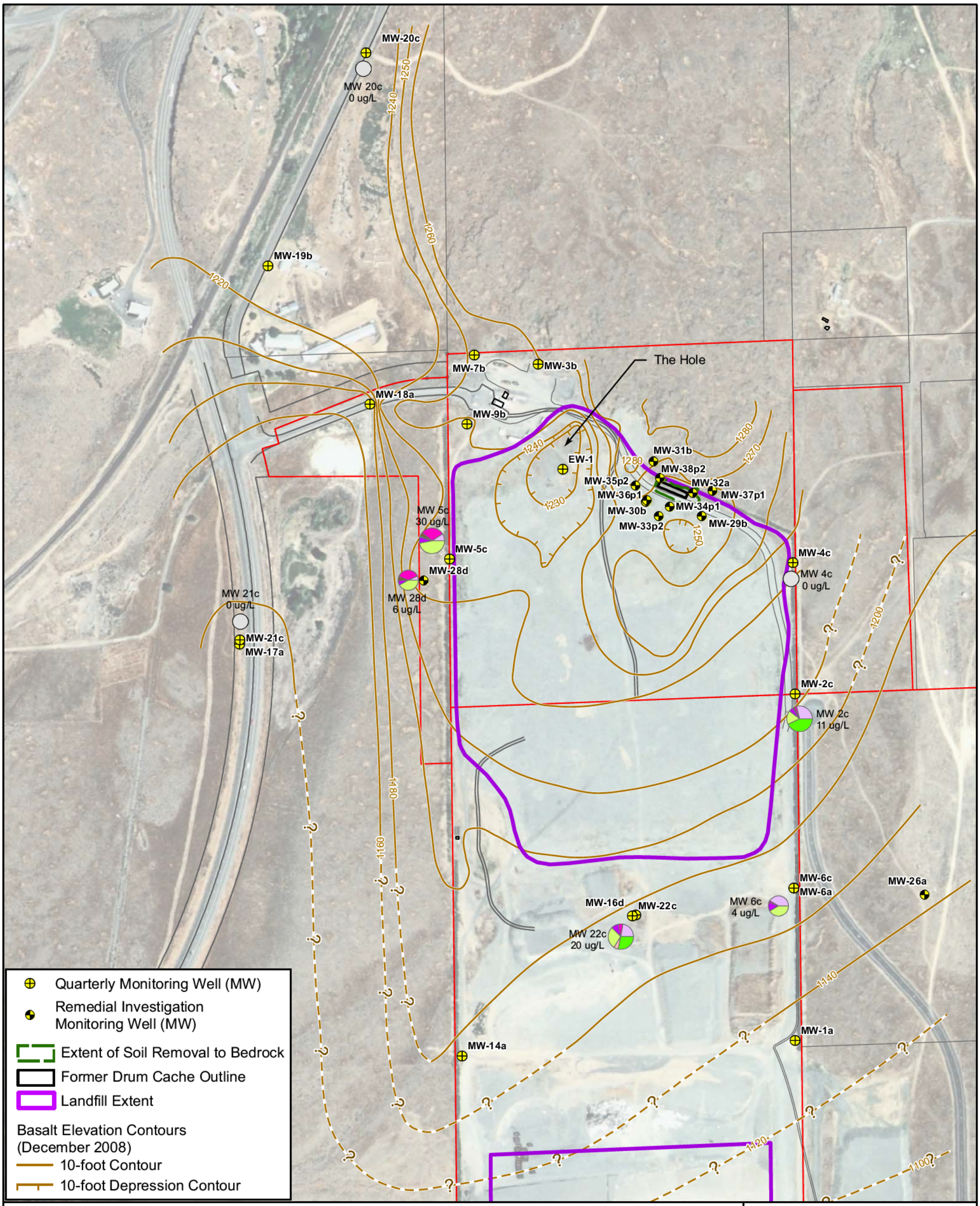


Figure 14

Groundwater VOC Data
Interflow and
Below Interflow Aquifers

Ephrata Landfill
RIFS

PgG

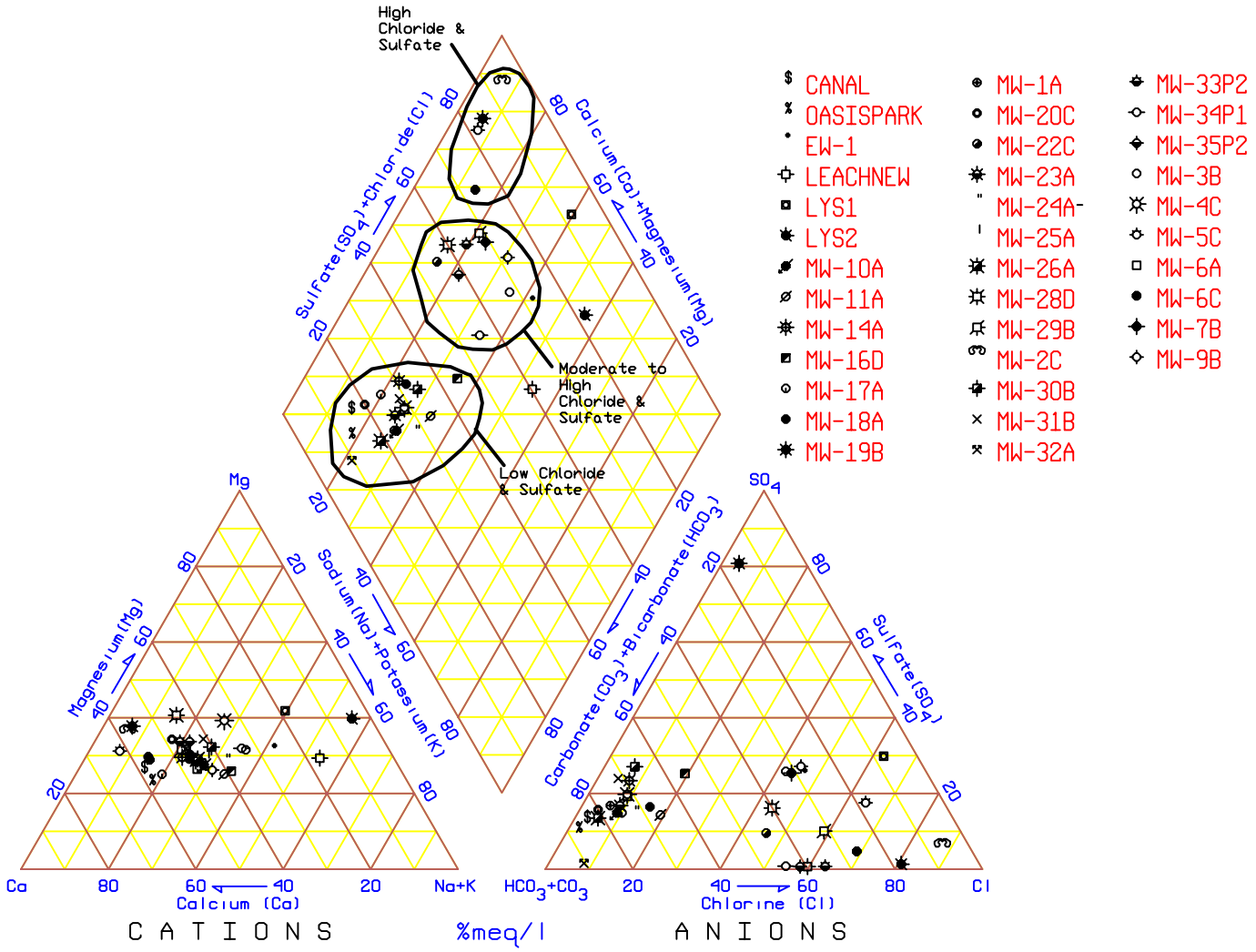
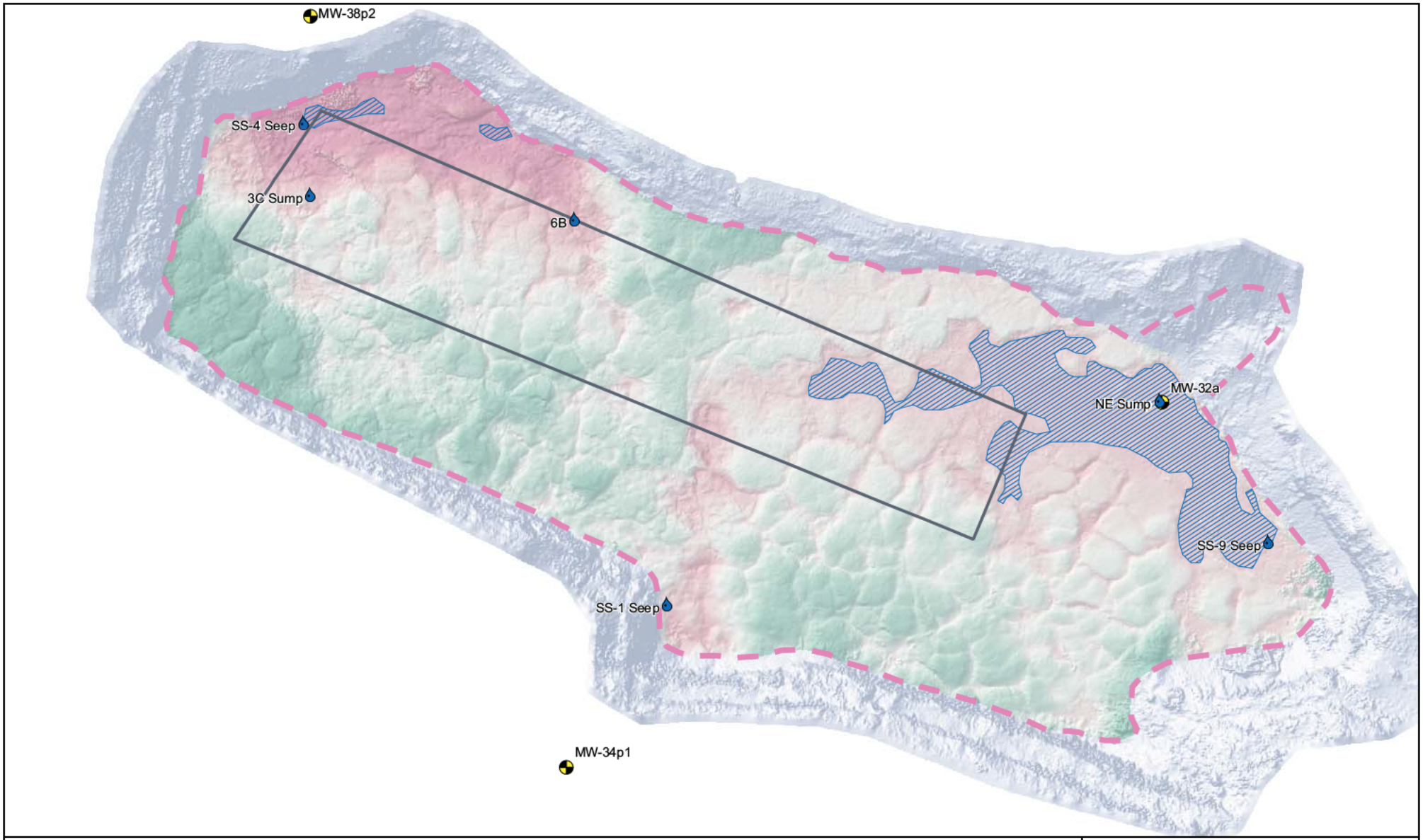


Figure 15
Trilinear Diagram

Ephrata Landfill RI/FS

PgG



Liquid Sample Location

Remedial Investigation Monitoring Well (MW)

Extent of Soil Removal to Bedrock

Drum Cache Outline

Standing Liquid (at time of survey)

Laser Survey Elevation Range

High : 1258.01 feet

Low : 1252.18 feet

N

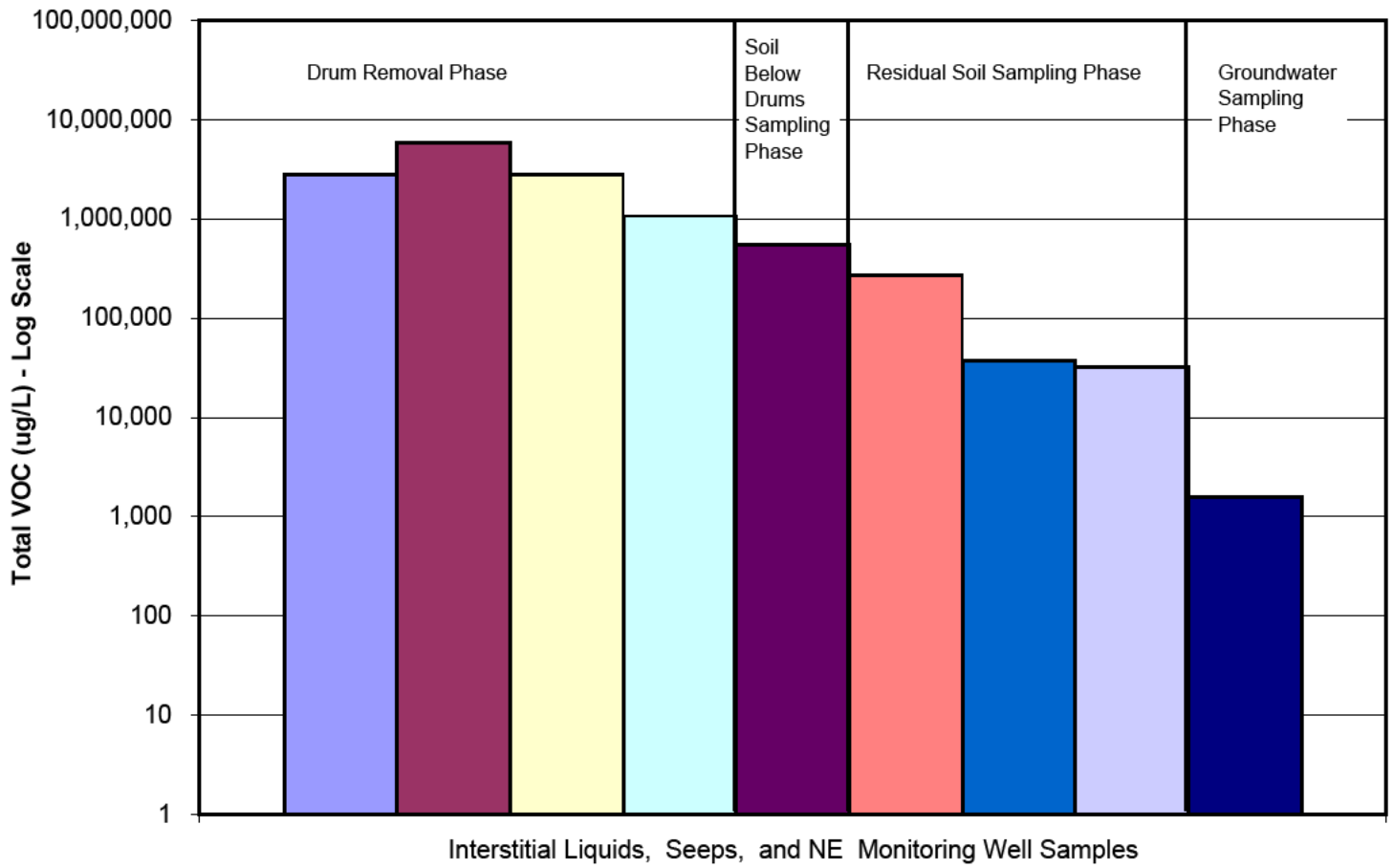
0 Feet 20

Figure 16

Liquid Sample Locations in Drum Excavation

Ephrata Landfill
RIFS

PgG



LEGEND

Sample Station (Sample Date) - See Figure 11 for Locations

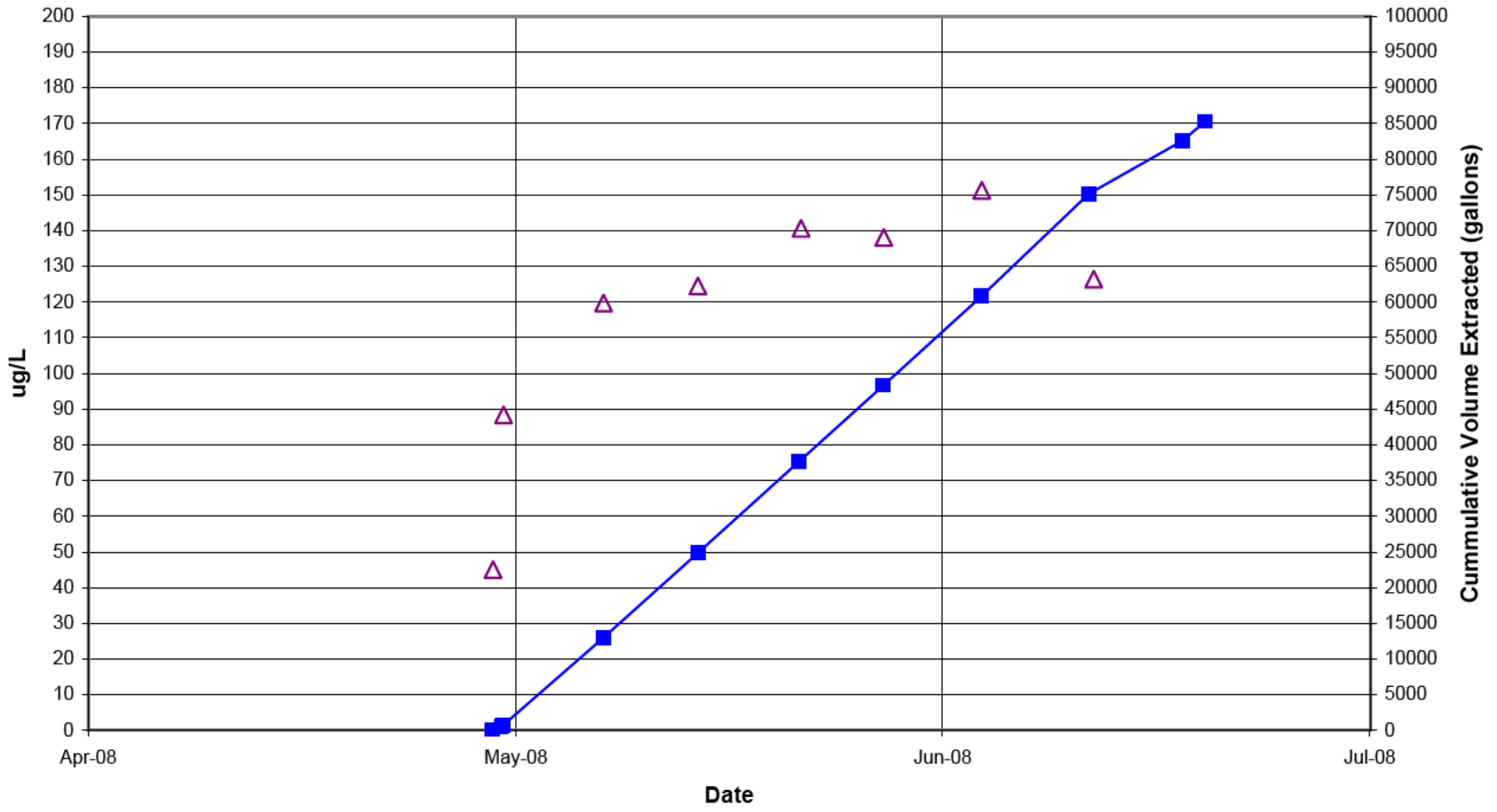
- P1 (5/22/08)
- 6B (6/3/08)
- 3C-1 (6/3/08)
- 3C-2 (6/20/08)
- 3C-3 (7/2/08)
- SS-1 Seep (8/1/08)
- SS-4 Seep (8/1/08)
- SS-9 Seep (8/1/08)
- MW-32a - NE Well (11/20/08)

Total VOC concentrations decreased from a maximum of 6,000,000 ppb during drum removal phase to 1600 ppb after soils removed and excavation backfilled (groundwater sample phase)

Figure 17
Total VOCs in Drum Excavation Liquids over Time

Ephrata Landfill RI/FS
JE0714

PgG



Legend

Total VOC

Cummulative Extraction Volume

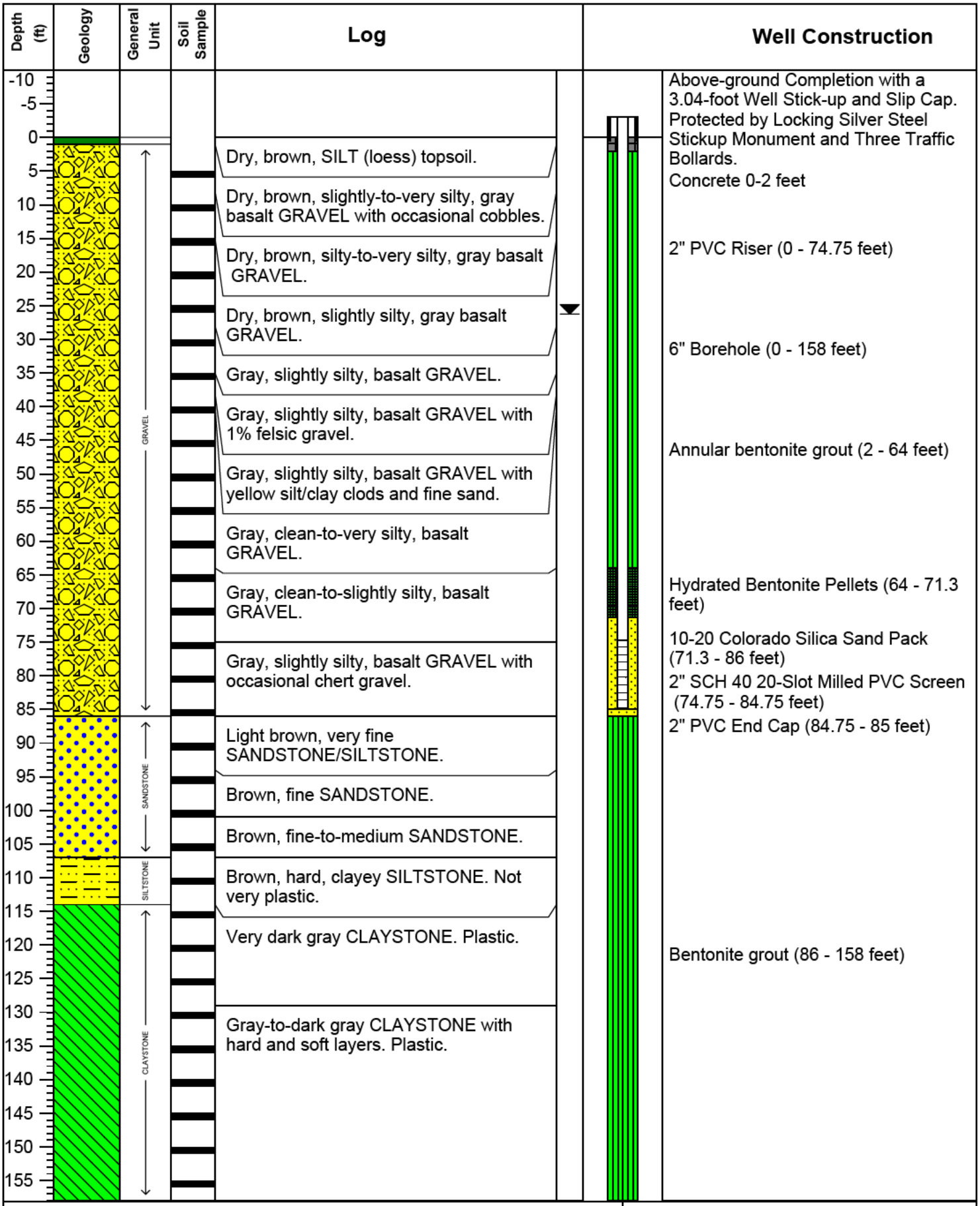
VOC concentrations gradually increased until about 25,000 gallons was extracted from the Hole and then remained fairly stable afterwards

Figure 18
Total VOC Time Series (EW-1)

Ephrata Landfill RI/FS
JE0714

PgG

APPENDIX A
BORING LOGS



Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Charles Ellingson
Location: SE1/4 of SW1/4 Section 33 T21N R26E

Well Name: MW-24
Ecology ID: BAM 087
MP Elevation: 1213.76 feet asl
Datum:
Installed: 11/1/2007
DTW: 26.24 BMP on 12/14/2007
Page 1 of 1

Figure A1

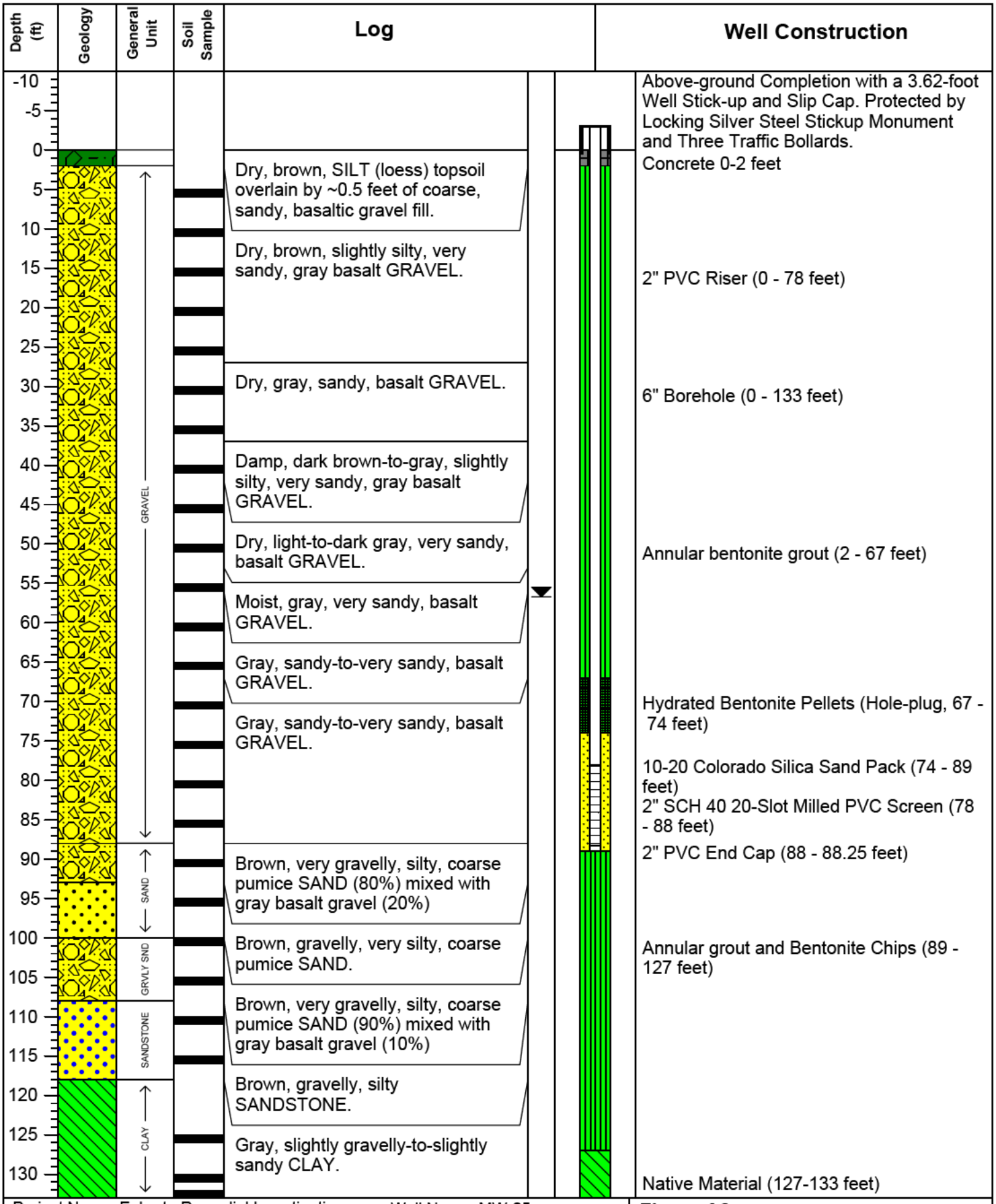
GEOLOGIC LOG AND AS-BUILT FOR WELL MW-24a

Ephrata Landfill

Ephrata, Washington

JE0714a, 11/2007

PgG

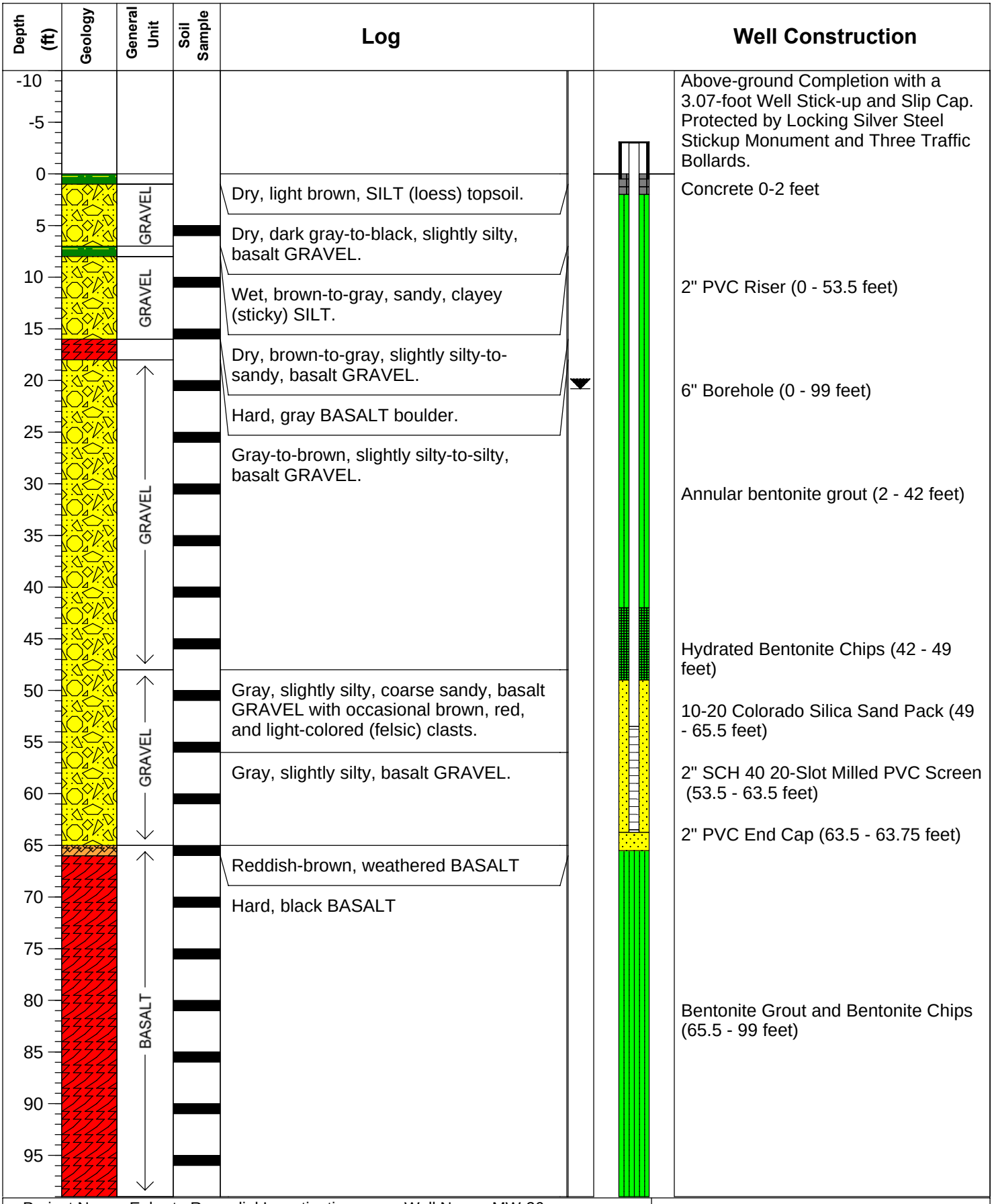


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter
Location: SW1/4 of SW1/4 Section 33 T21N R26E

Well Name: MW-25
Ecology ID: BAM 088
MP Elevation: 1244.22 feet asl
Datum:
Installed: 11/5/2007
DTW: 56.70 BMP on 12/14/2007
Page 1 of 1

Figure A2
GEOLOGIC LOG AND AS-BUILT FOR WELL MW-25a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

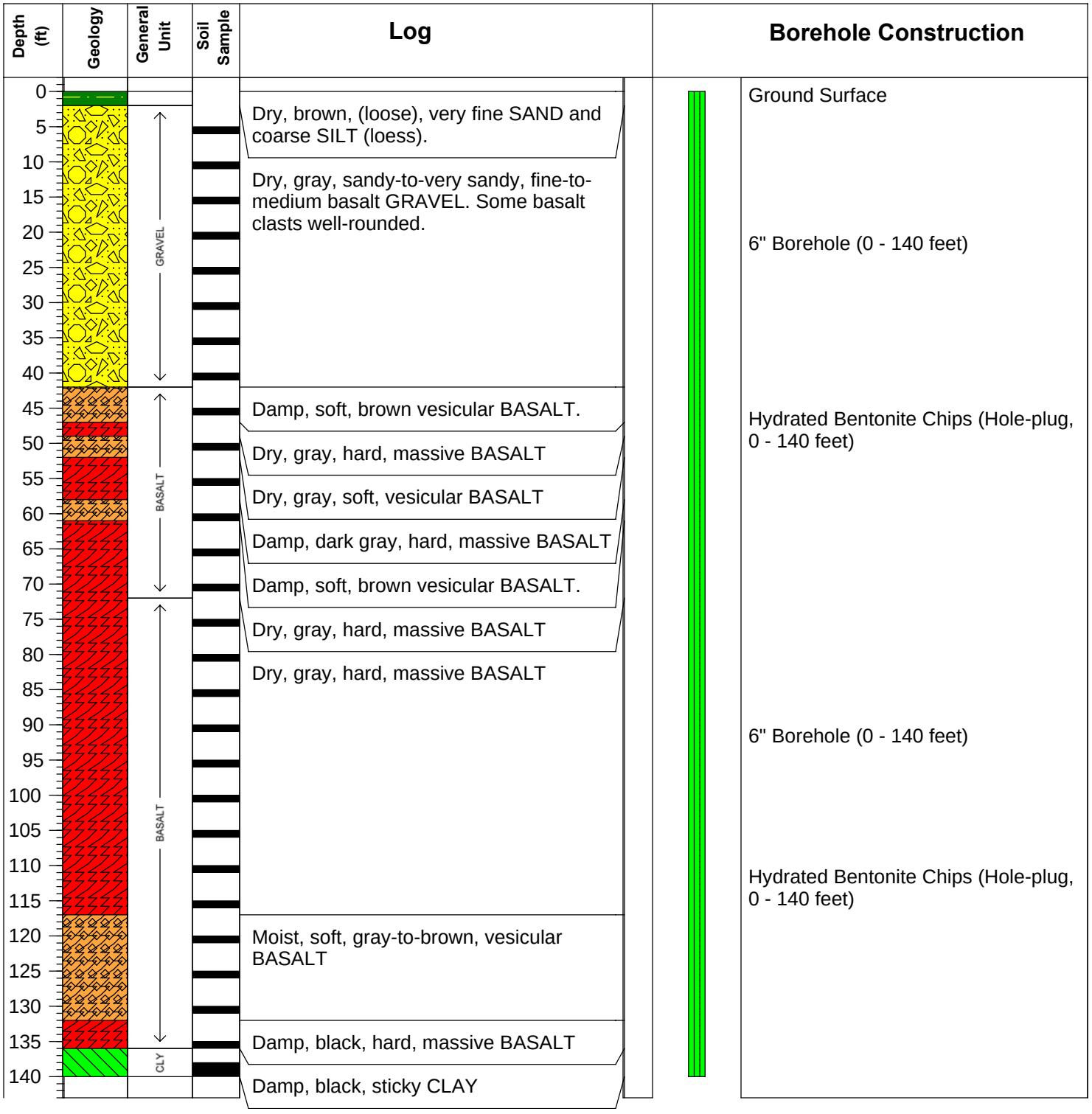


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: NE1/4 of SW1/4 Section 33 T21N R26E

Well Name: MW-26
Ecology ID: BAM 086
MP Elevation: 1208.51 feet asl
Datum:
Installed: 11/9/2007
DTW: 20.80 BMP on 12/14/2007

Figure A3
GEOLOGIC LOG AND AS-BUILT FOR WELL MW-26a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG



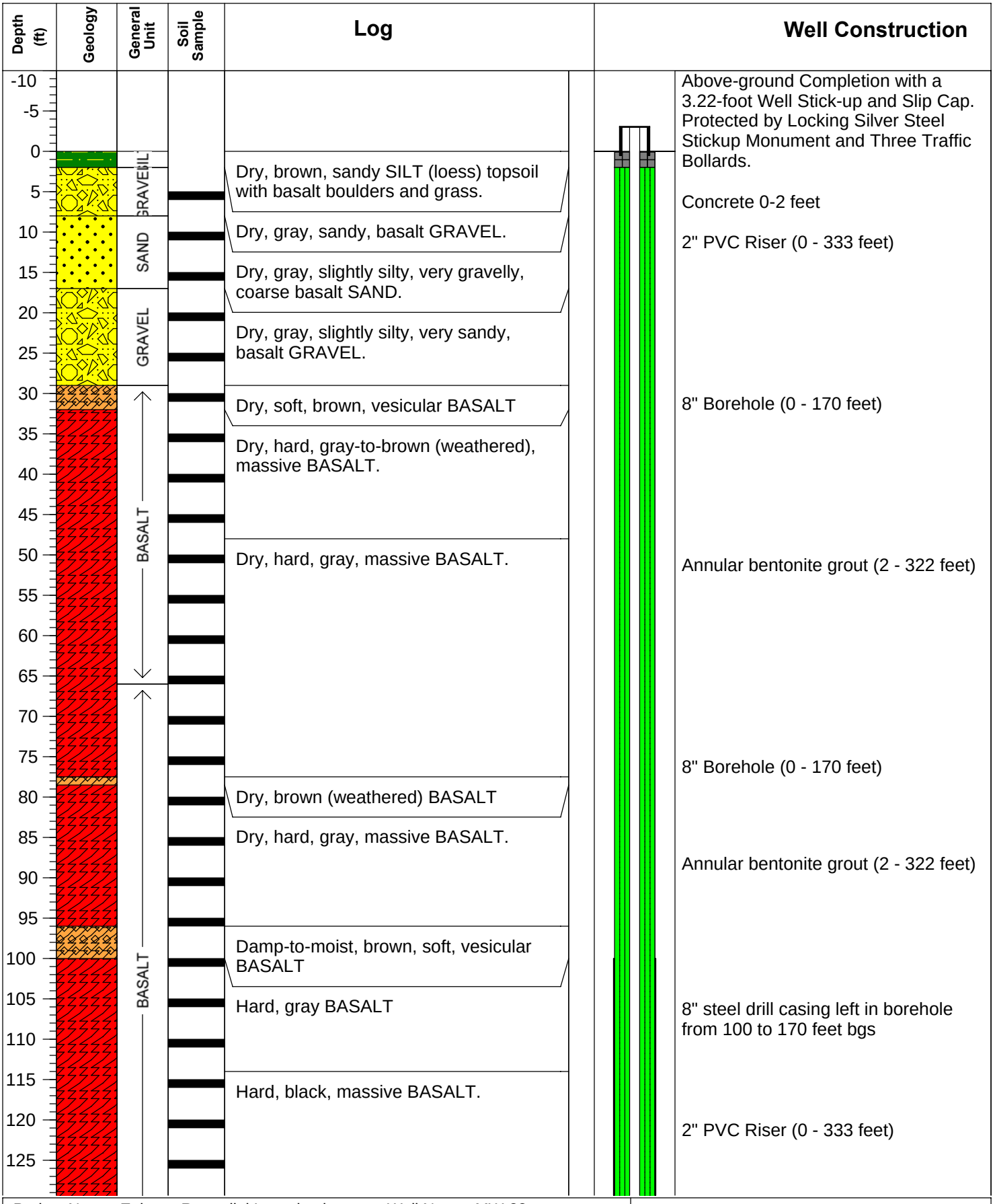
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Boring Name: B-27
Ground Elevation: 1273.43 feet asl

Datum:
Drilled: 11/13/2007
Page 1 of 1

Figure A4
GEOLOGIC LOG FOR BORING B-27
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

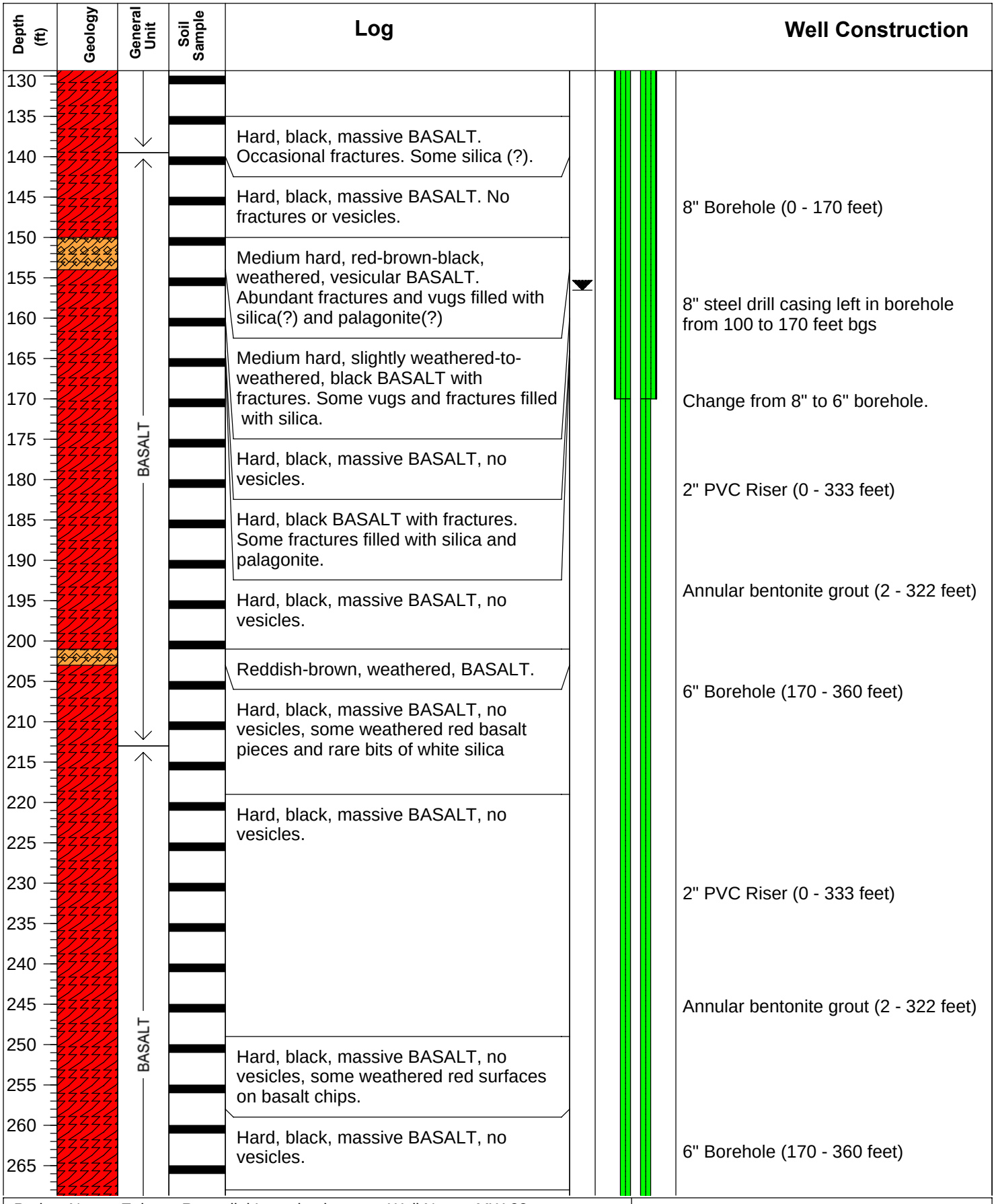


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter & Charles Ellingson
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Well Name: MW-28
Ecology ID: BAM 089
MP Elevation: 1277.96 feet asl
Datum:
Installed: 11/27/2007
DTW: 156.54 BMP on 12/14/2007

Figure A5
GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

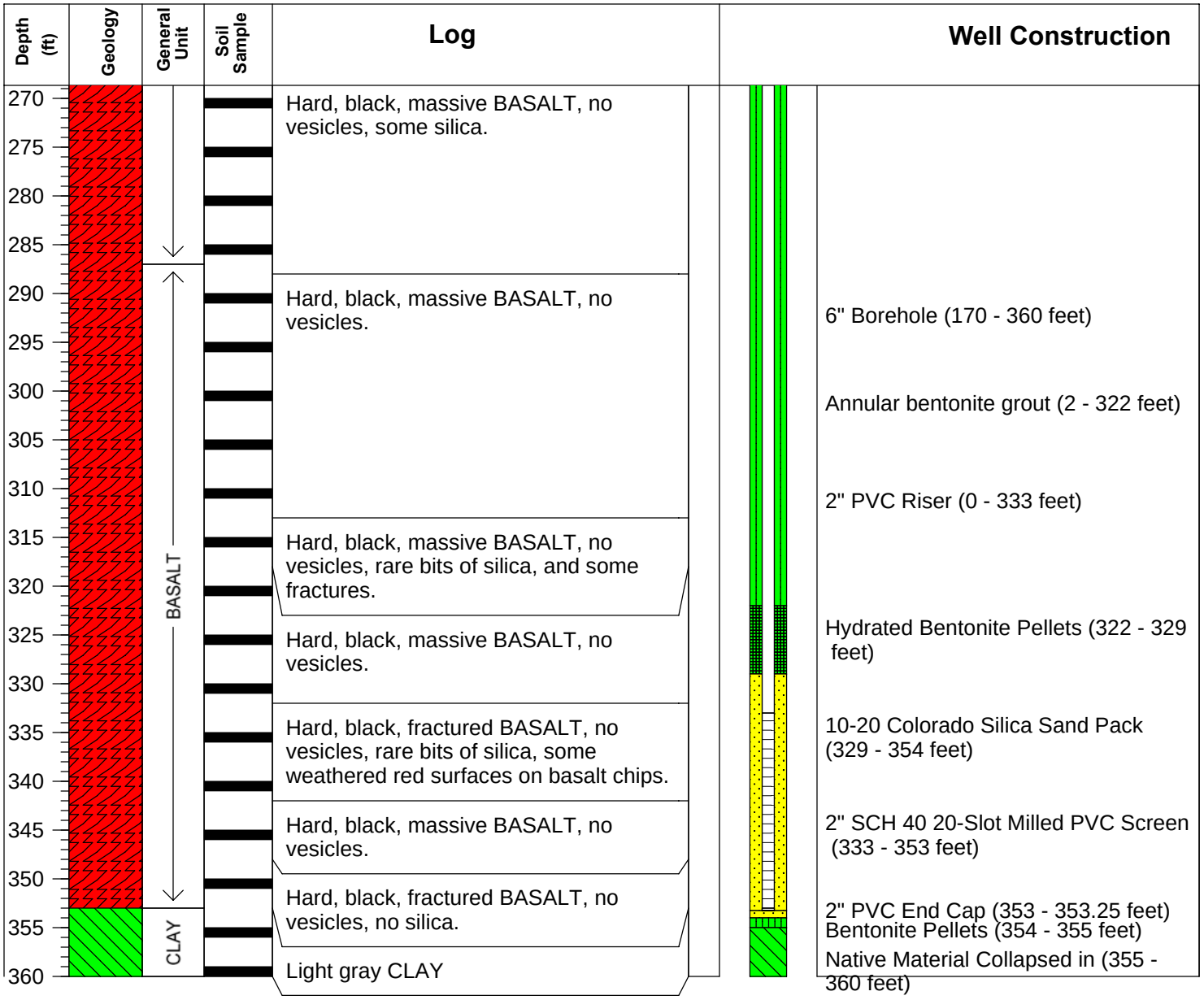


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter & Charles Ellingson
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Well Name: MW-28
Ecology ID: BAM 089
MP Elevation: 1277.96 feet asl
Datum:
Installed: 11/27/2007
DTW: 156.54 BMP on 12/14/2007

Figure A5
GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG



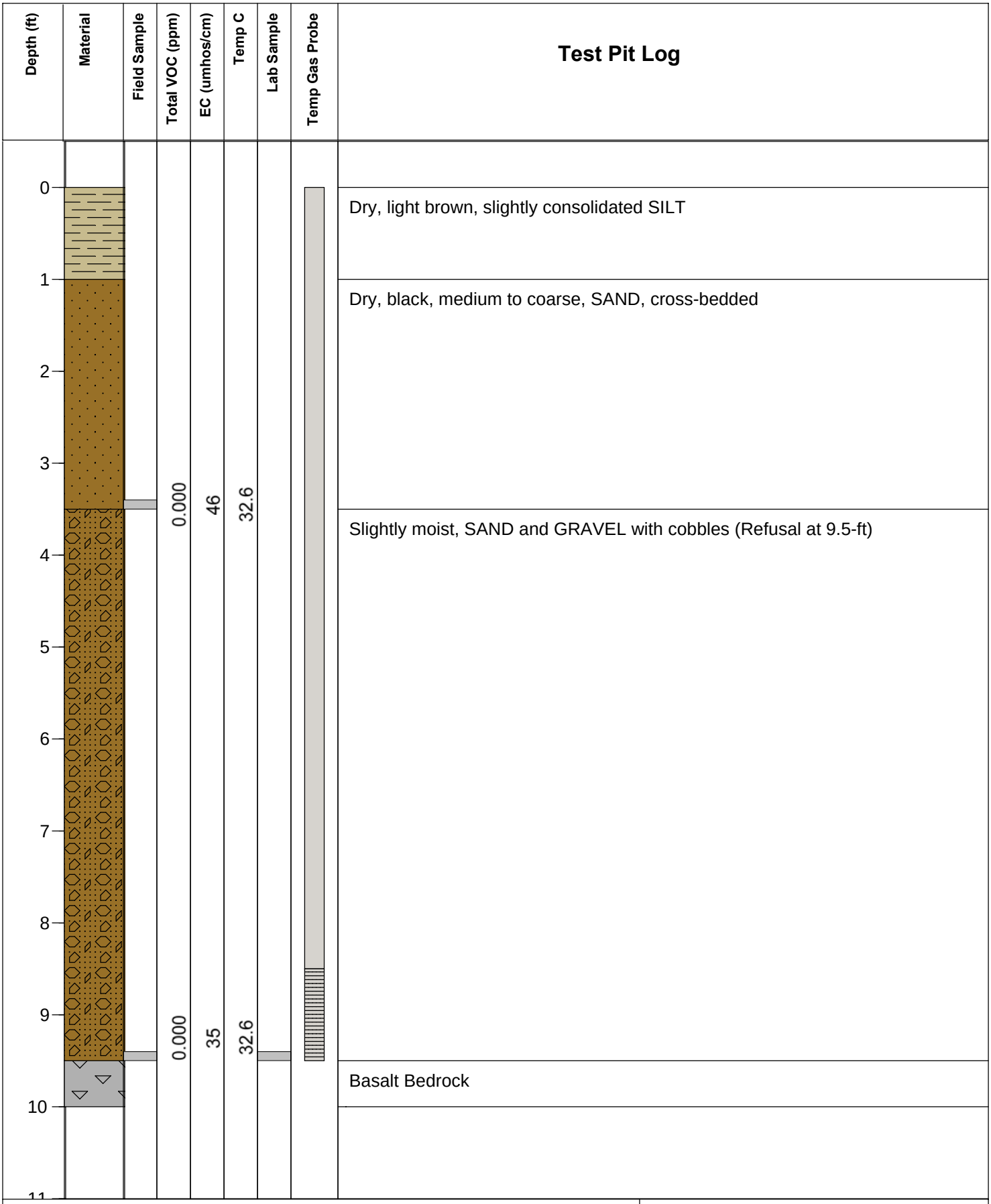
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter & Charles Ellingson
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Well Name: MW-28
Ecology ID: BAM 089
MP Elevation: 1277.96 feet asl
Datum:
Installed: 11/27/2007
DTW: 156.54 BMP on 12/14/2007

Figure A5
GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

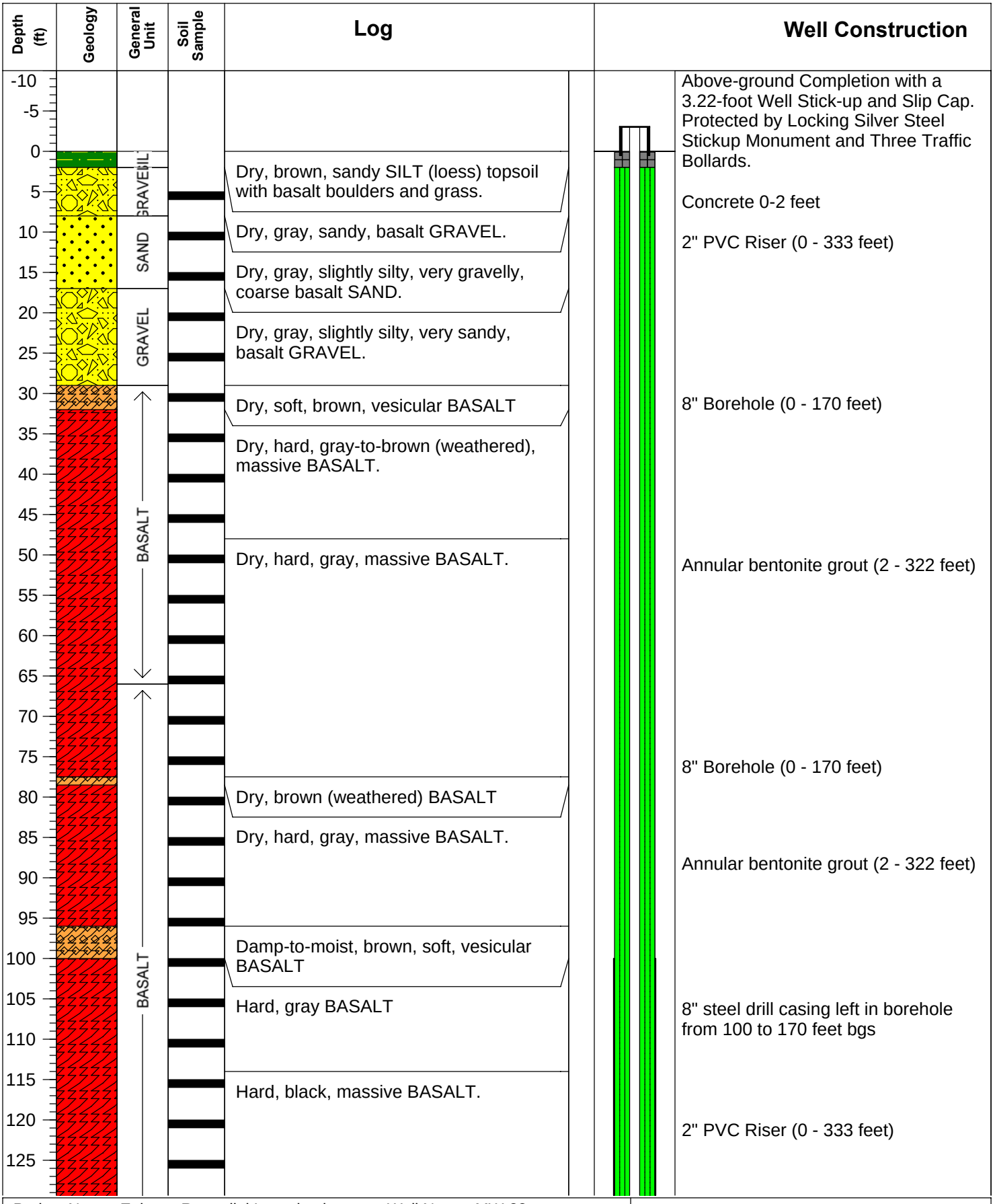
Test Pit Log



Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-1
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A6 (DRAFT)
T-1
Test Pit
Ephrata Landfill RI/FS
JE0714, T-1.ldf, 8/2006

PgG



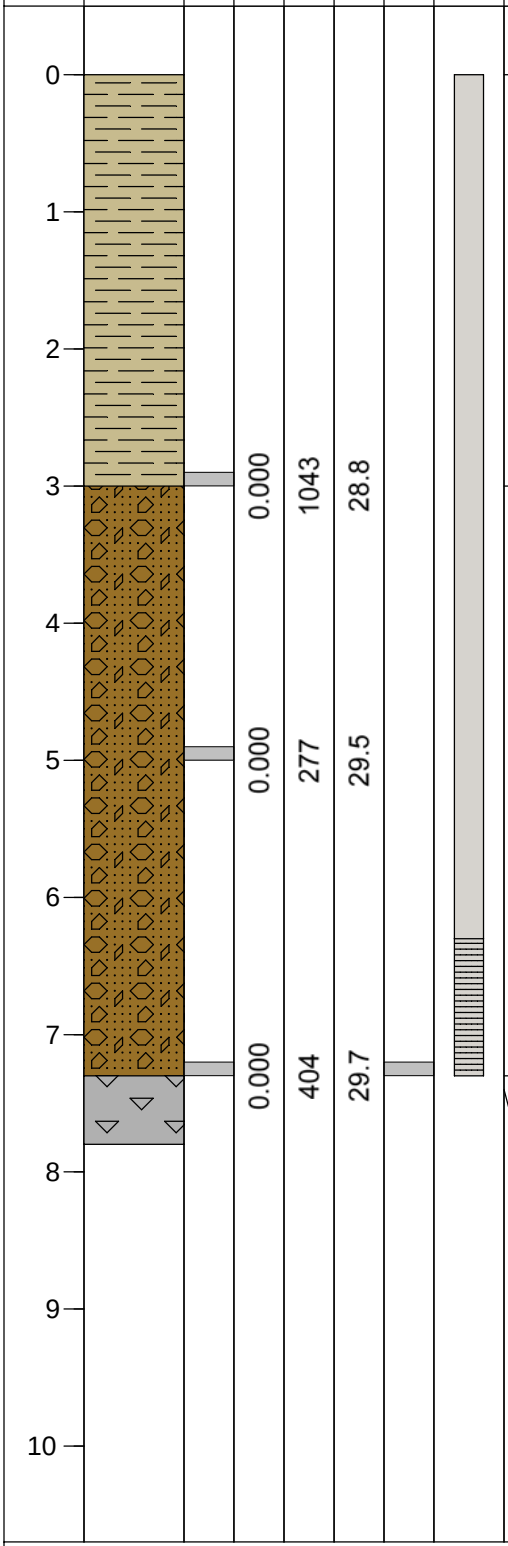
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter & Charles Ellingson
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Well Name: MW-28
Ecology ID: BAM 089
MP Elevation: 1277.96 feet asl
Datum:
Installed: 11/27/2007
DTW: 156.54 BMP on 12/14/2007

Figure A5
GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

Test Pit Log



Dry, light brown, slightly consolidated SILT with some cobbles

Slightly moist, SAND and GRAVEL with cobbles (Refusal at 7.3-ft)
Some rusty scrap metal at 3.5-ft

Moist to wet at 6.5-ft

Basalt Bedrock (Bottom of Pit 7.3 ft)

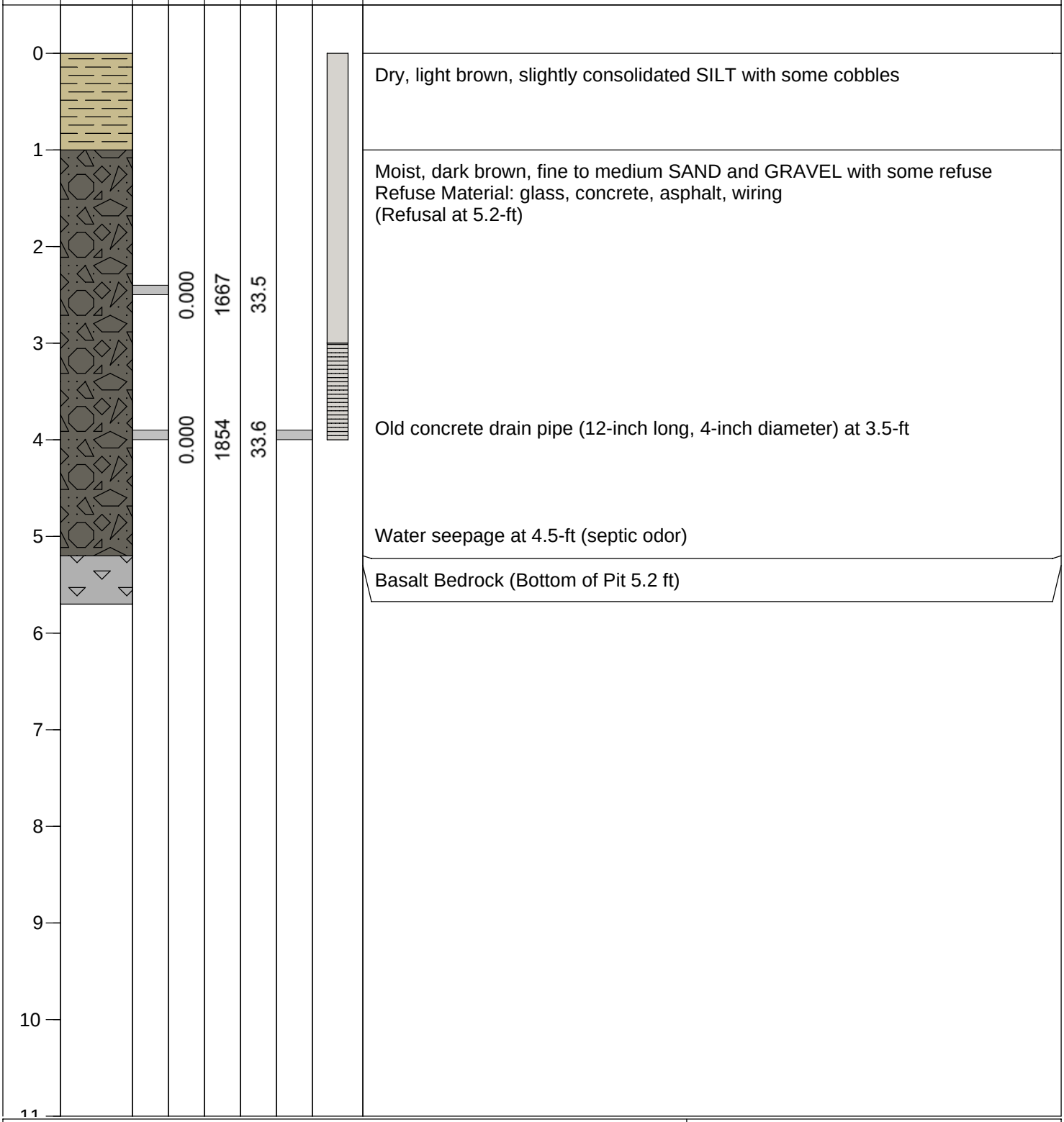
Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-3
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A8
T-3
Test Pit

Ephrata Landfill RI/FS
JE0714, T-3.ldf, 8/2006

PgG

Test Pit Log

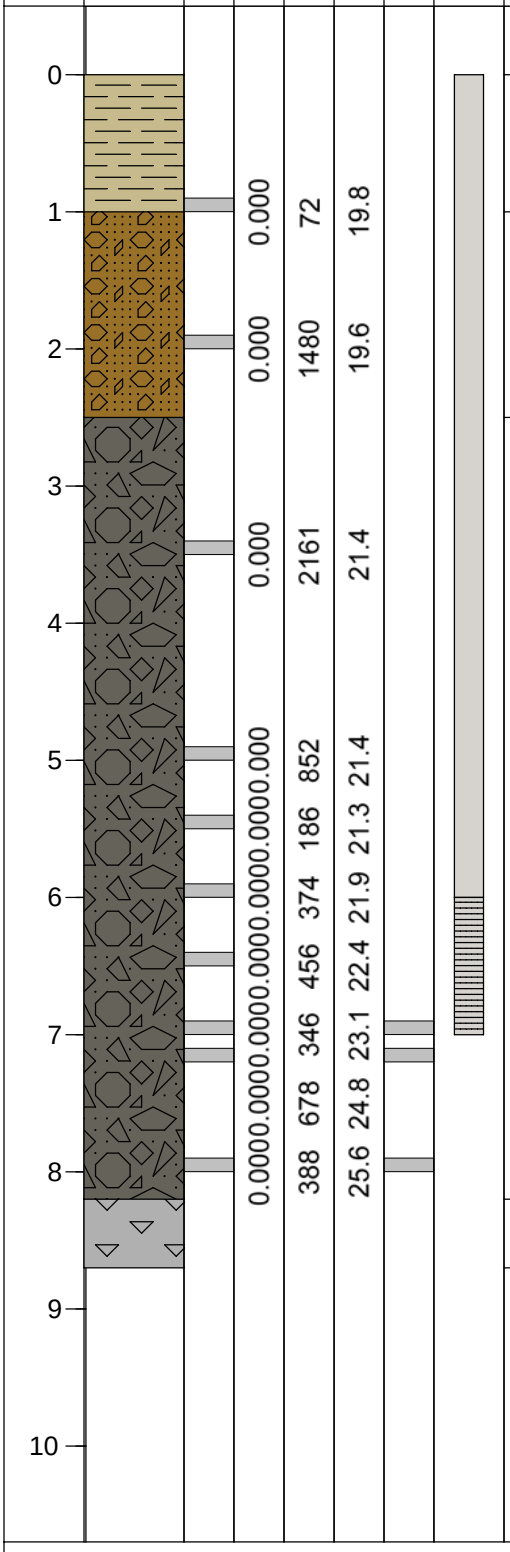


Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-4
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A9
T-4
Test Pit
Ephrata Landfill RI/FS
JE0714, T-4.ldf, 8/2006

PgG

Test Pit Log



Dry, light brown, slightly consolidated SILT

Dry, light brown, silty SAND and GRAVEL with cobbles

Damp, dark brown and black charred REFUSE mixed with Sand and Gravel
Refuse Material: glass, metal, concrete, tile, and wood

Old metal that resembles a fuel tank with slight fuel odor at 7.2-ft
Water seepage at 7.3-ft

Basalt Bedrock

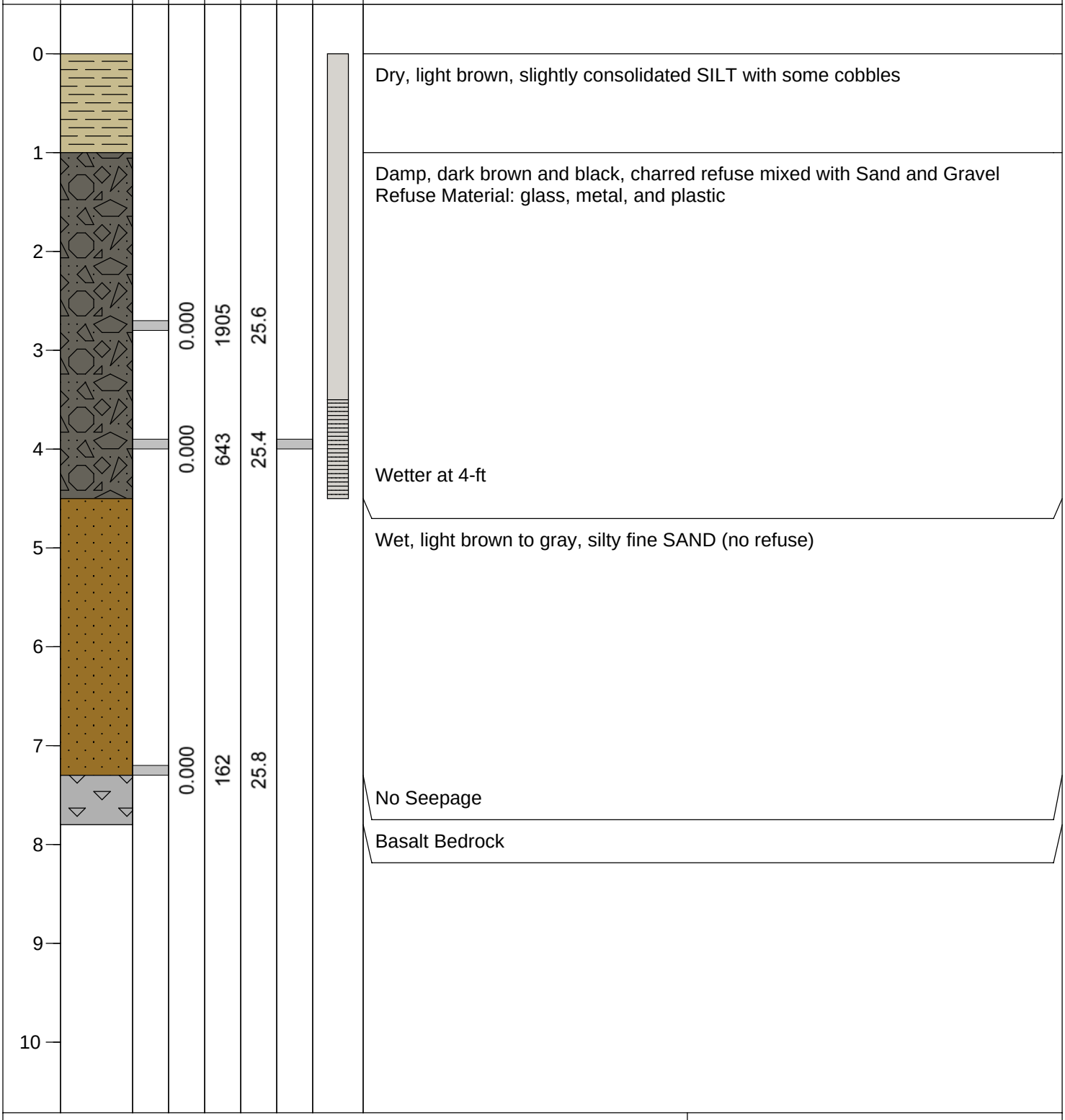
Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-5
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A10
T-5
Test Pit

Ephrata Landfill RI/FS
JE0714, T-5.ldf, 8/2006

PgG

Test Pit Log



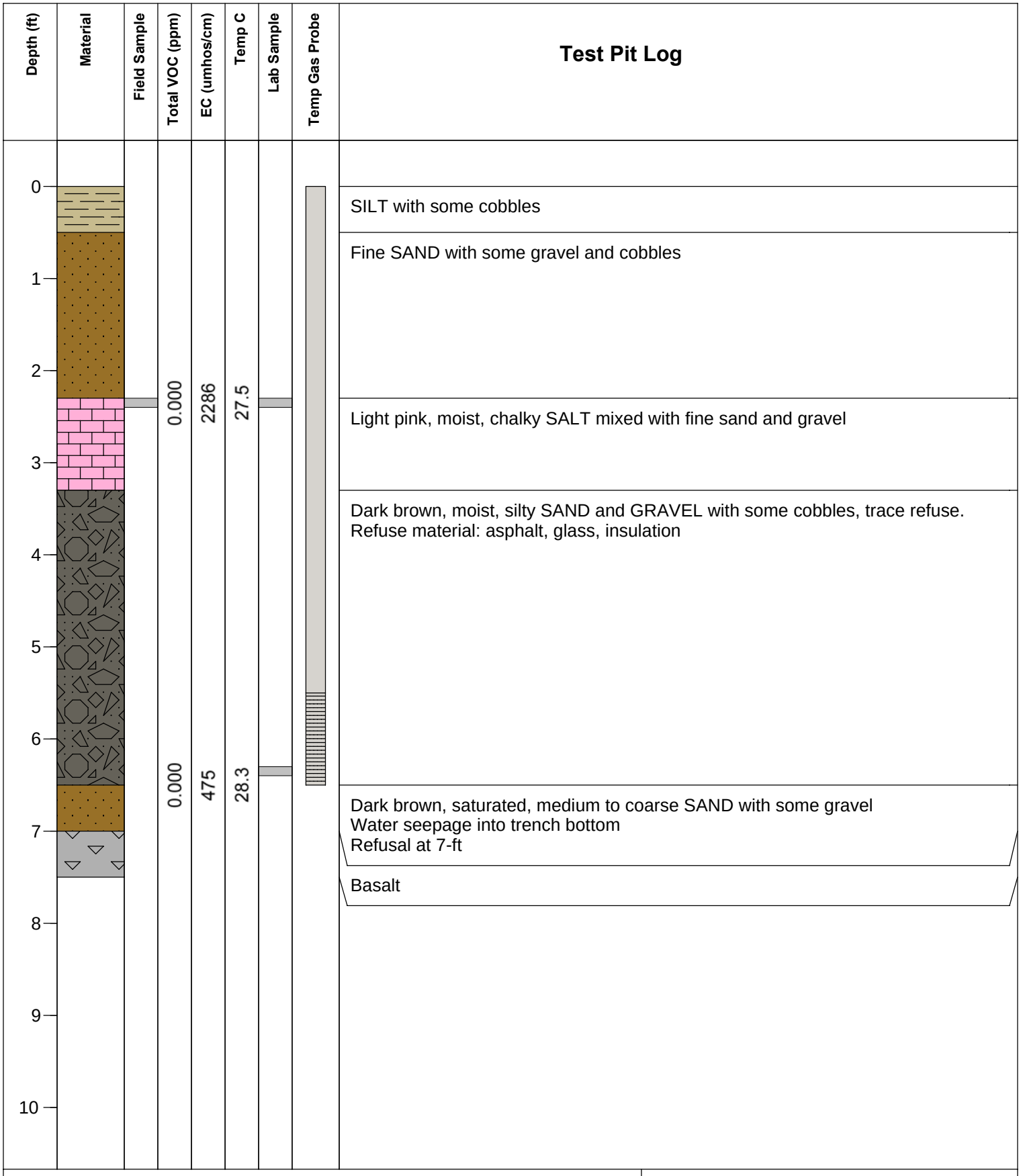
Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-6
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A11
T-6
Test Pit

Ephrata Landfill RI/FS
JE0714, T-6.ldf, 8/2006

PgG

Test Pit Log

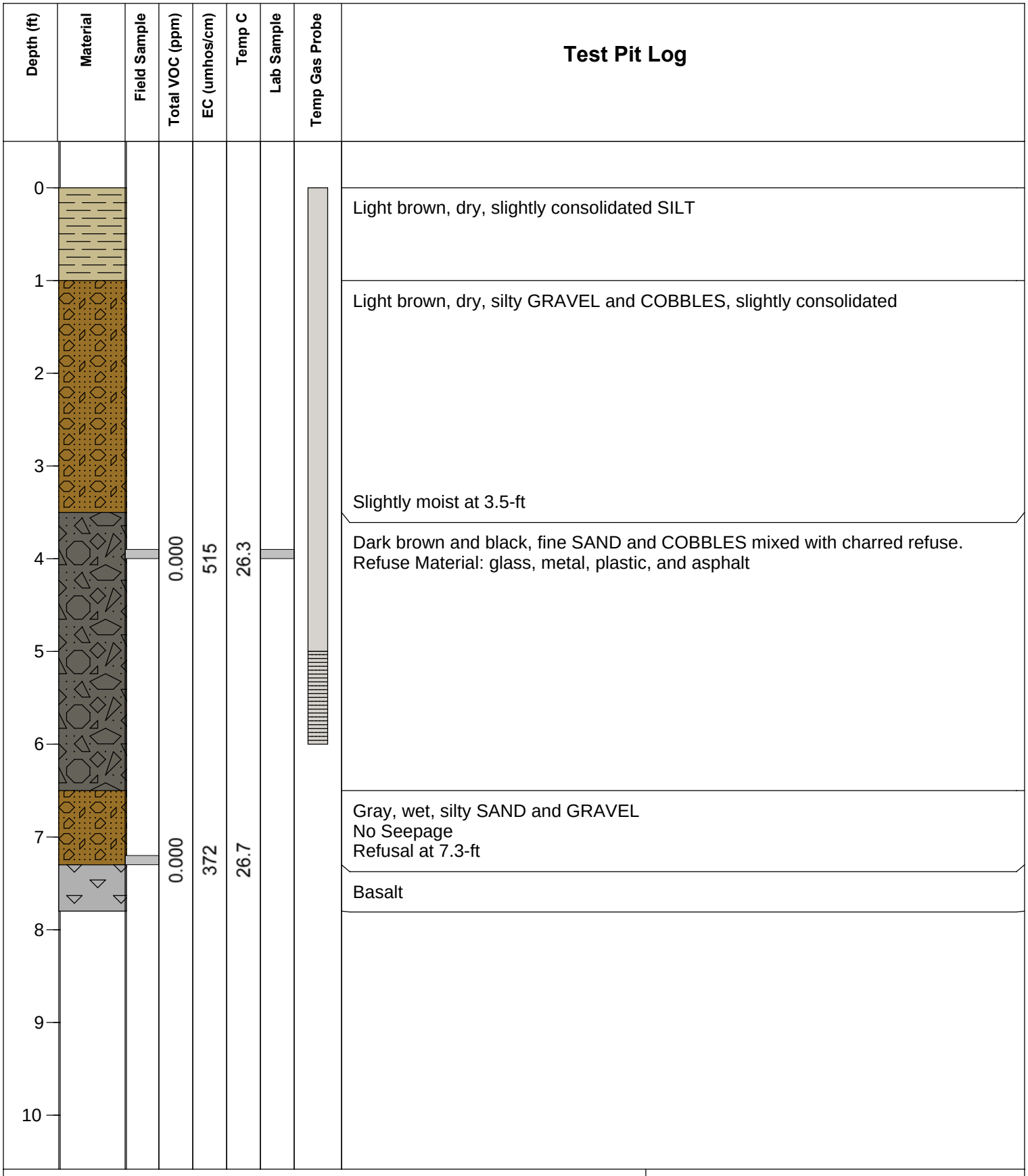


Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-7
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A12
T-7
Test Pit

Ephrata Landfill RI/FS
JE0714, T-7.ldf, 8/2006

PgG



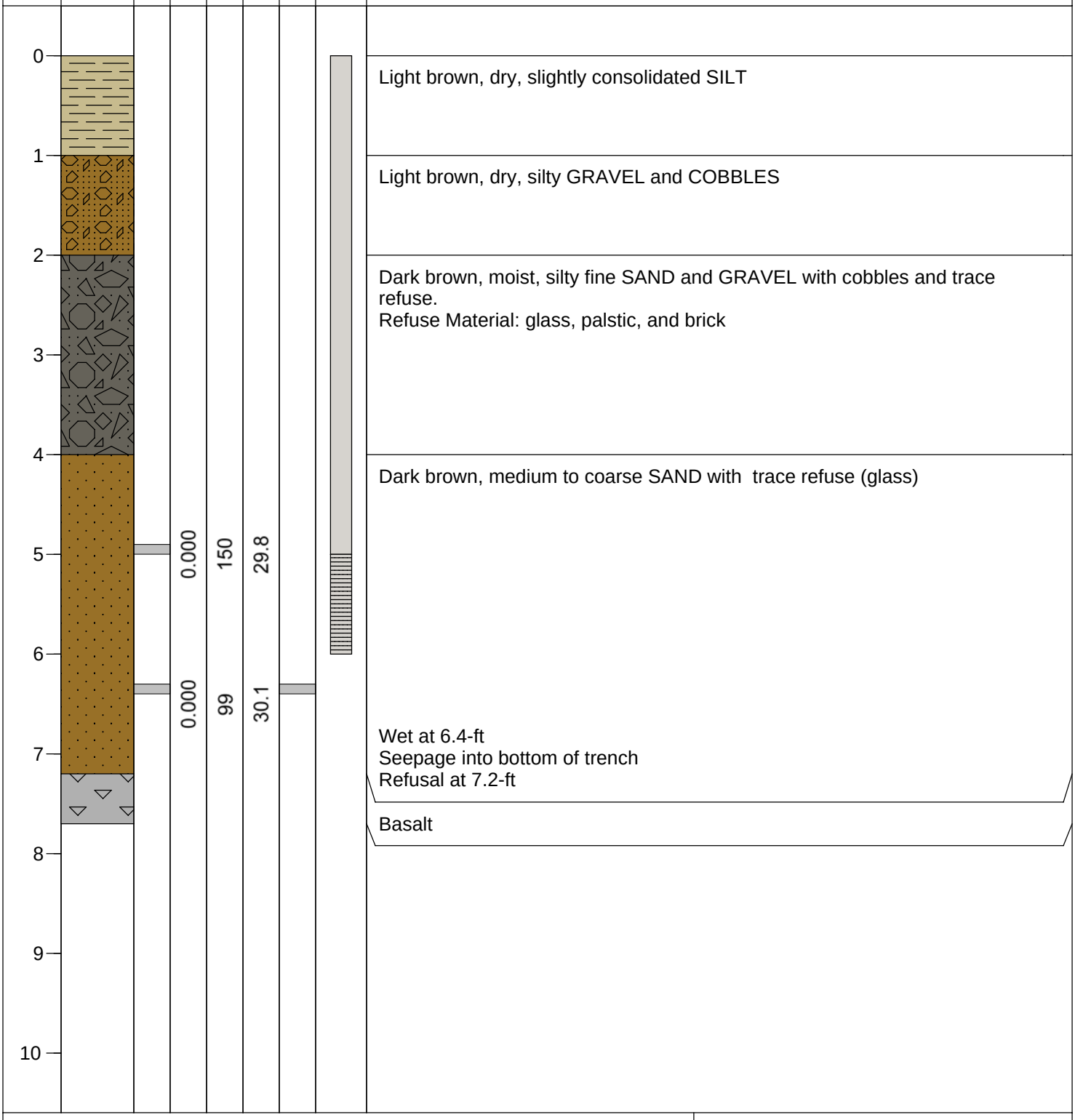
Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-8
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A13
T-8
Test Pit

Ephrata Landfill RI/FS
JE0714, T-8.ldf, 8/2006

PgG

Test Pit Log

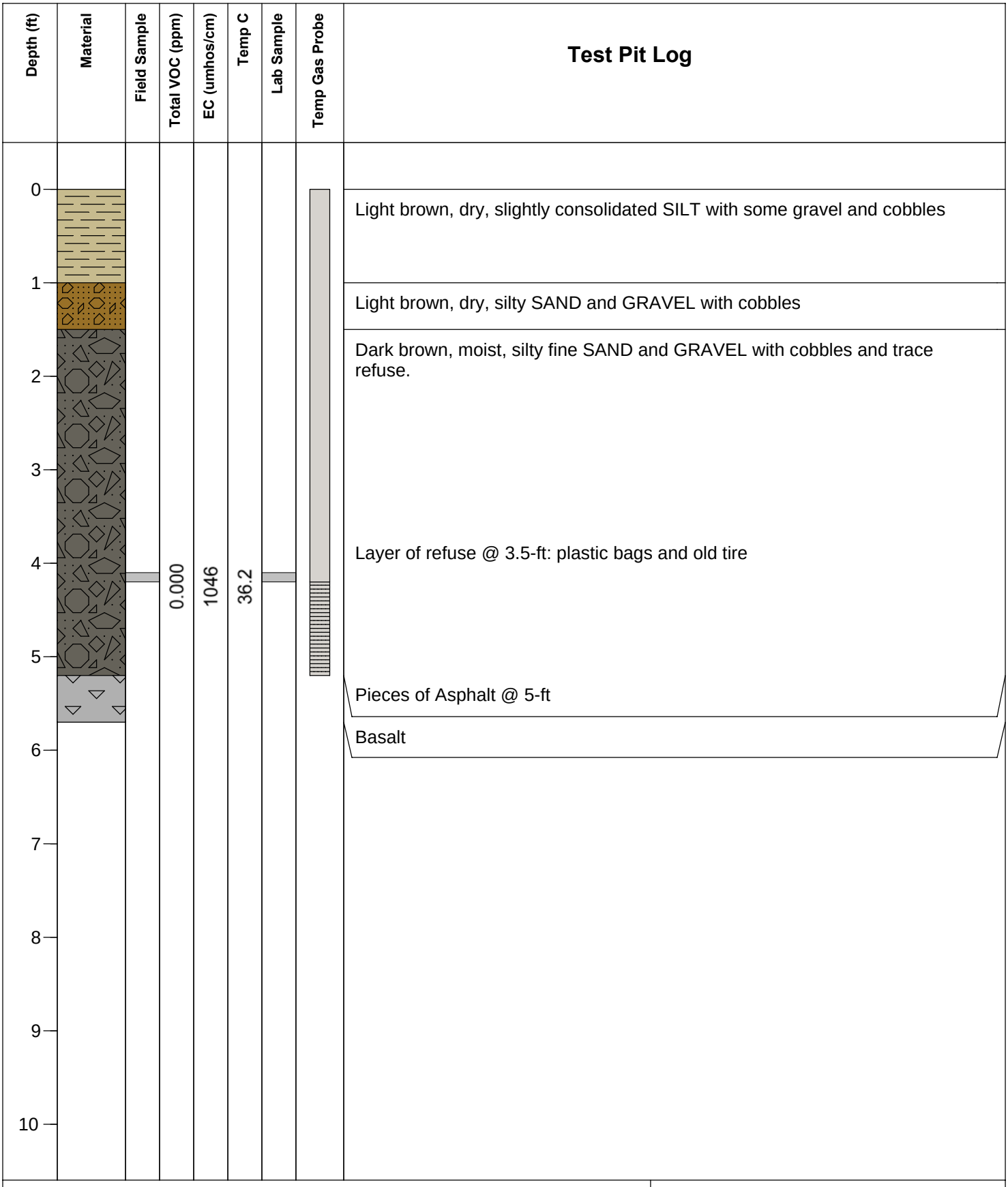


Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-9
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A14
T-9
Test Pit
Ephrata Landfill RI/FS
JE0714, T-9.ldf, 8/2006

PgG

Test Pit Log



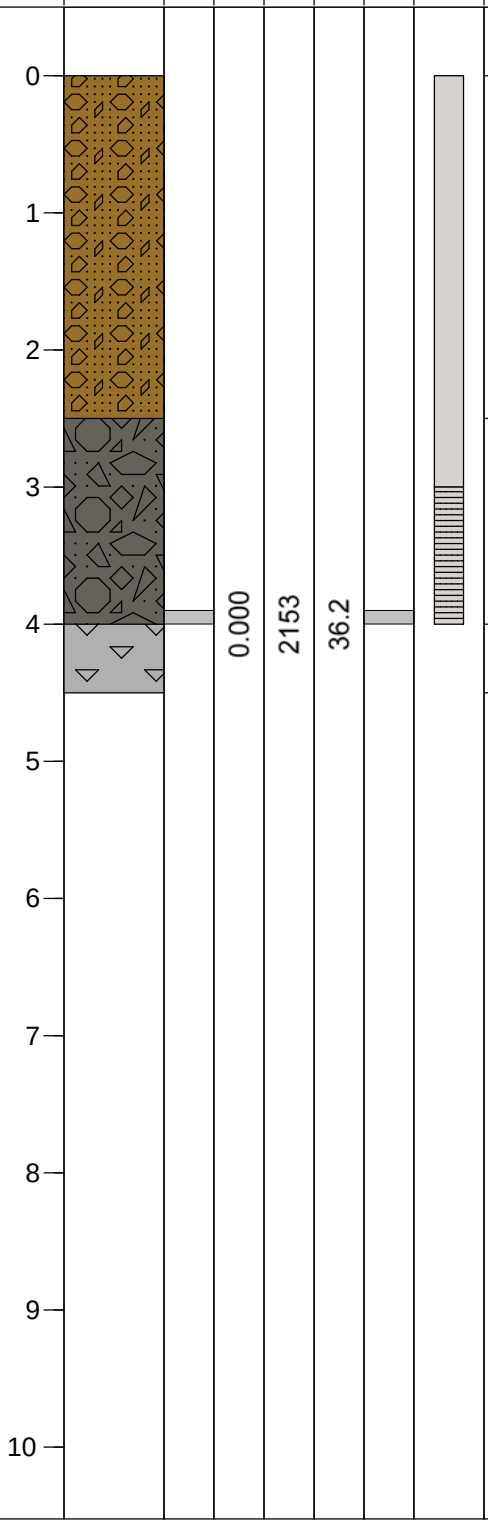
Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-10
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A15
T-10
Test Pit

Ephrata Landfill RI/FS
JE0714, T-10 ldf, 8/2006

PgG

Test Pit Log



Light brown, dry, fine SAND and GRAVEL with cobbles and trace refuse (glass)

Dark brown, slightly moist, SAND and GRAVEL with cobbles and some refuse. Refuste material: brick, asphalt, metal, and rubber.

More moist at bottom of pit

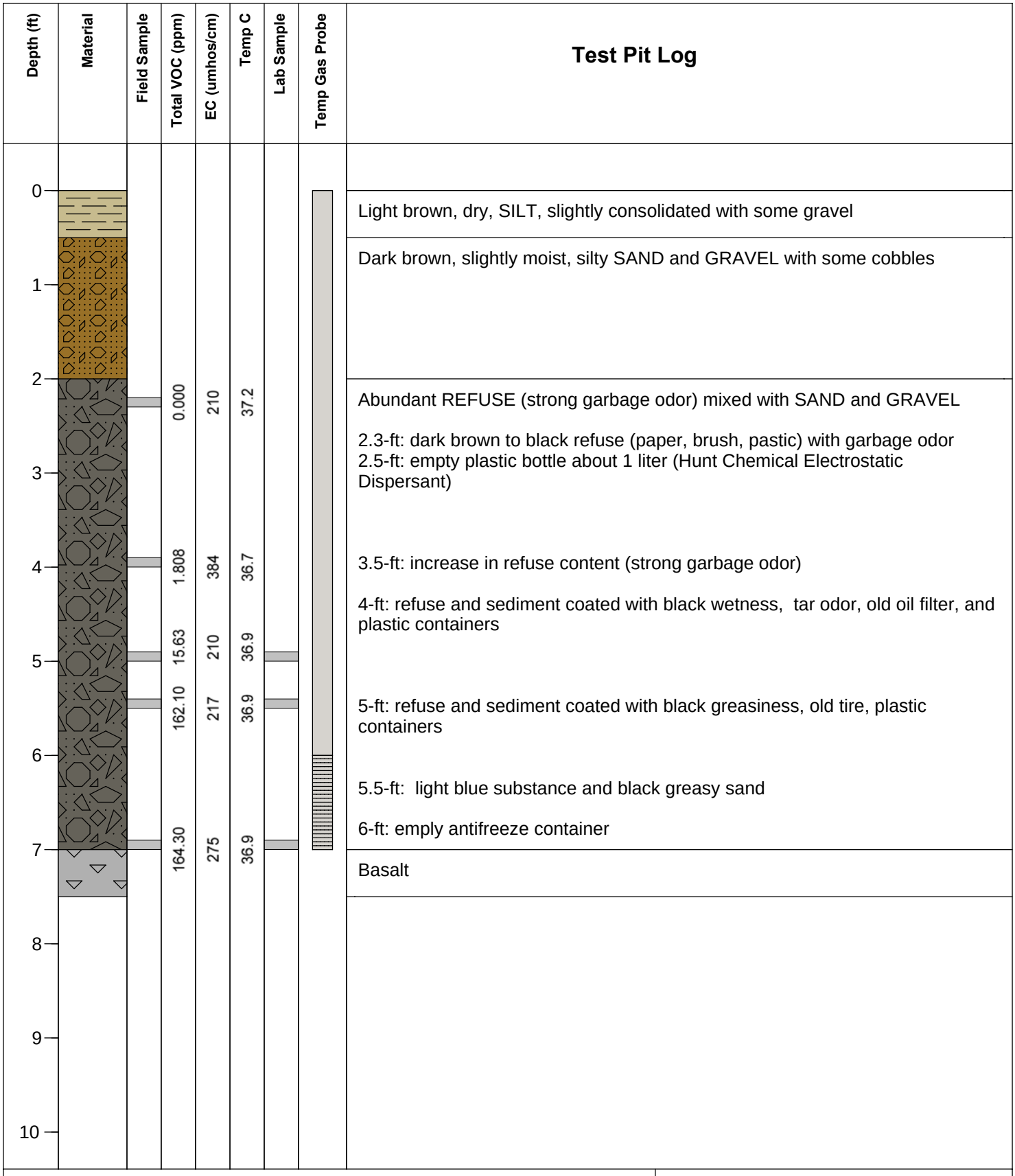
Basalt

Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-11
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A16
T-11
Test Pit

Ephrata Landfill RI/FS
JE0714, T-11.ldf, 8/2006

PgG



Test Pit Log

Light brown, dry, SILT, slightly consolidated with some gravel

Dark brown, slightly moist, silty SAND and GRAVEL with some cobbles

Abundant REFUSE (strong garbage odor) mixed with SAND and GRAVEL

2.3-ft: dark brown to black refuse (paper, brush, pastic) with garbage odor
2.5-ft: empty plastic bottle about 1 liter (Hunt Chemical Electrostatic Dispersant)

3.5-ft: increase in refuse content (strong garbage odor)

4-ft: refuse and sediment coated with black wetness, tar odor, old oil filter, and plastic containers

5-ft: refuse and sediment coated with black greasiness, old tire, plastic containers

5.5-ft: light blue substance and black greasy sand

6-ft: emply antifreeze container

Basalt

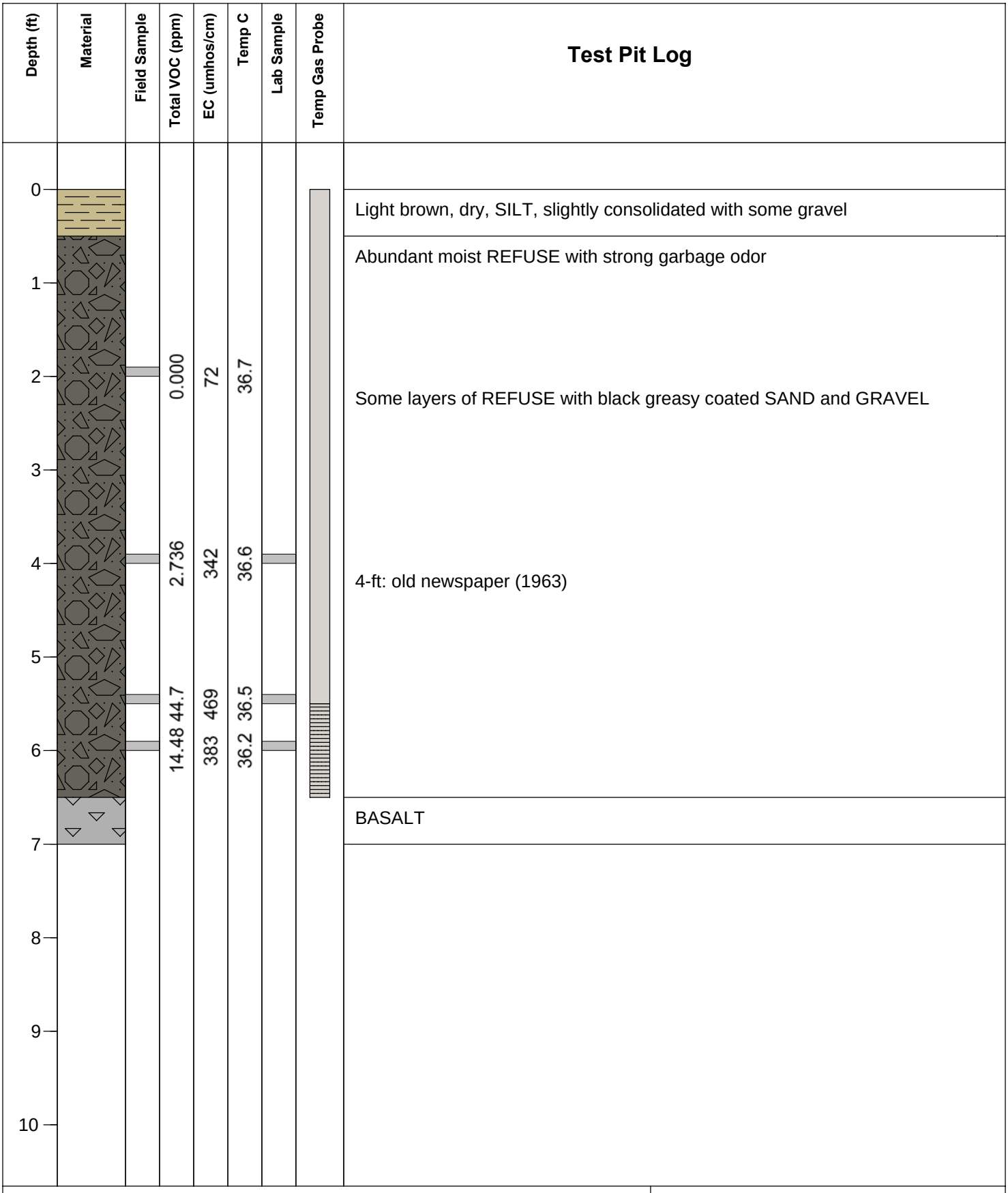
Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-12
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A17
T-12
Test Pit

Ephrata Landfill RI/FS
JE0714, T-12.ldf, 8/2006

PgG

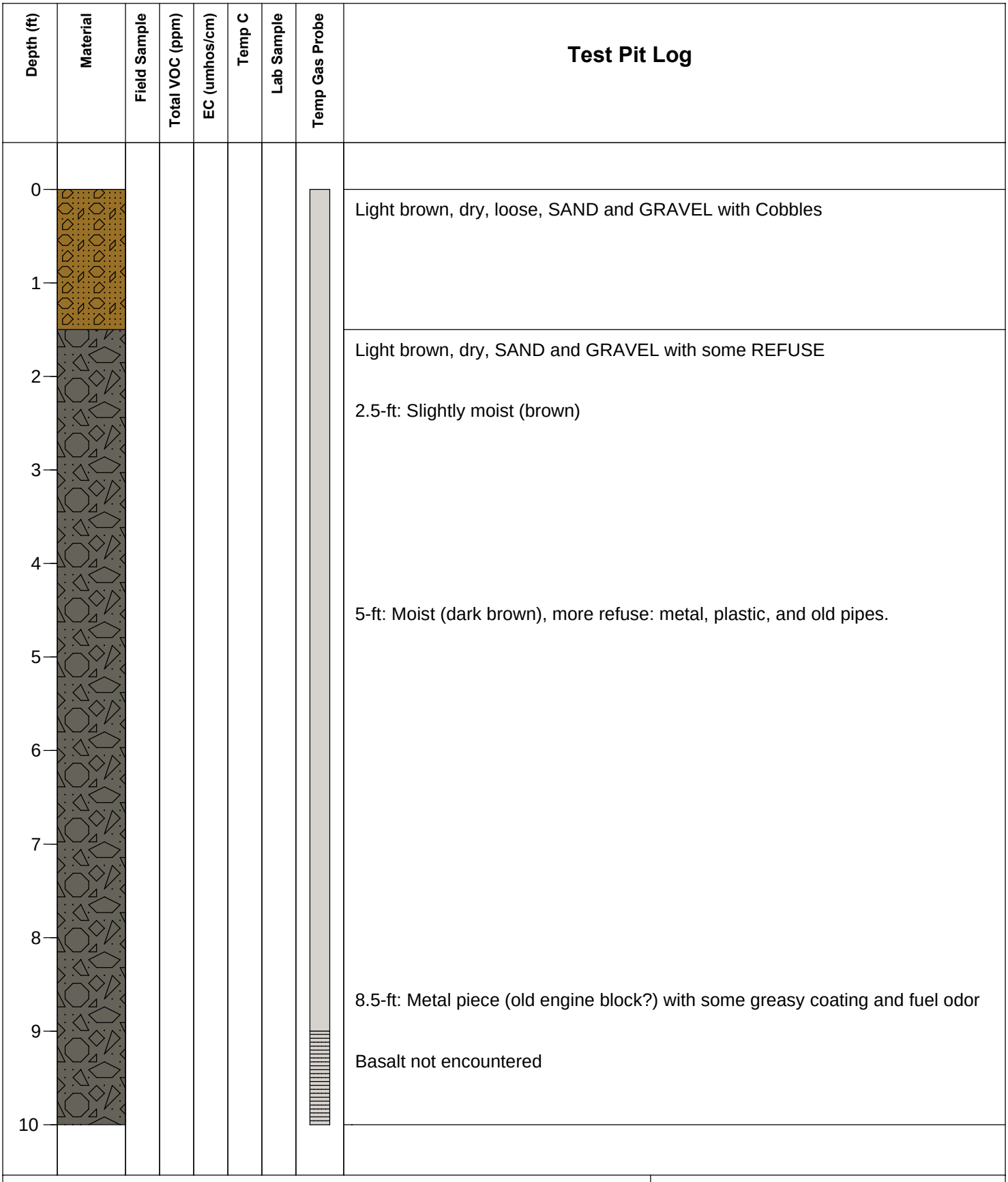
Test Pit Log



Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-13
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A18
T-13
Test Pit
Ephrata Landfill RI/FS
JE0714, T-13 ldf, 8/2006

PgG

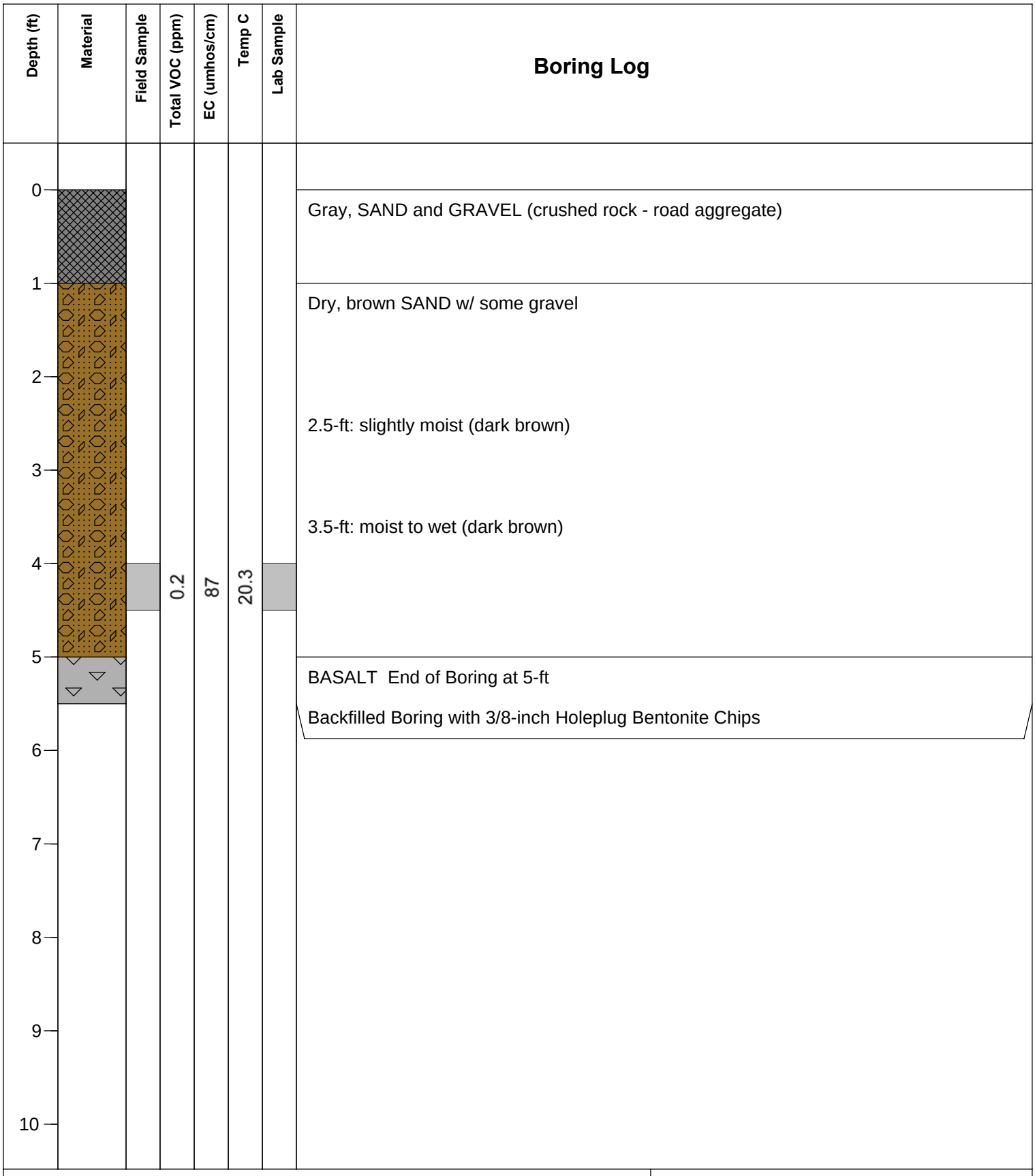


Project Name:	Ephrata Landfill RI/FS	Test Pit Name:	T-14
Excavation Method:	Grant County Tractor Backhoe	Elevation (ft):	1260
Excavator:	Jesse	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A19
T-14
Test Pit

Ephrata Landfill RI/FS
JE0714, T-14.ldf, 8/2006

PgG



Project Name:	Ephrata Landfill RI/FS	Boring Name:	B-1
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft):	1260
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A20
B-1
Exploratory Boring

Ephrata Landfill RI/FS
JE0714, B-1.ldf, 8/2007

PgG

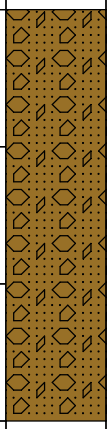
Depth (ft)	Material	Field Sample	Total VOC (ppm)	EC (umhos/cm)	Temp C	Lab Sample	Boring Log
0							
1							Brown, moist, loose, gravelly SAND
2			550	114	23.4		Black, moist, SAND and GRAVEL w/ strong fuel odor and piece of 2-inch metal pipe w/ yellow plastic coating (old fuel pipe). Stopped boring and backfilled with 3/8-inch Holeplug bentonite chips. Bottom of Boring at 2.5-ft
3							
4							
5							
6							
7							
8							
9							
10							

Project Name: Ephrata Landfill RI/FS
Drilling Method: Sonic Drill Rig / 6-inch Core
Driller: Boart Longyear/Ken Phillips
Consulting Firm: PGG
Logged by: Dawn Chapel
Location: Ephrata Landfill (North West Corner)

Boring Name: B-2
Elevation (ft): 1260
Datum:

Figure A21
B-2
Exploratory Boring
Ephrata Landfill RI/FS
JE0714, B-2.ldf, 8/2007

PgG

Depth (ft)	Material	Field Sample	Total VOC (ppm)	EC (umhos/cm)	Temp C	Lab Sample	Boring Log
0							Brown, loose, SAND and GRAVEL.
1							
2							
3							Hit water line at about 3-ft and abandoned boring.
4							
5							
6							
7							
8							
9							
10							

Project Name: Ephrata Landfill RI/FS
Drilling Method: Sonic Drill Rig / 6-inch Core
Driller: Boart Longyear/Ken Phillips
Consulting Firm: PGG
Logged by: Dawn Chapel
Location: Ephrata Landfill (North West Corner)

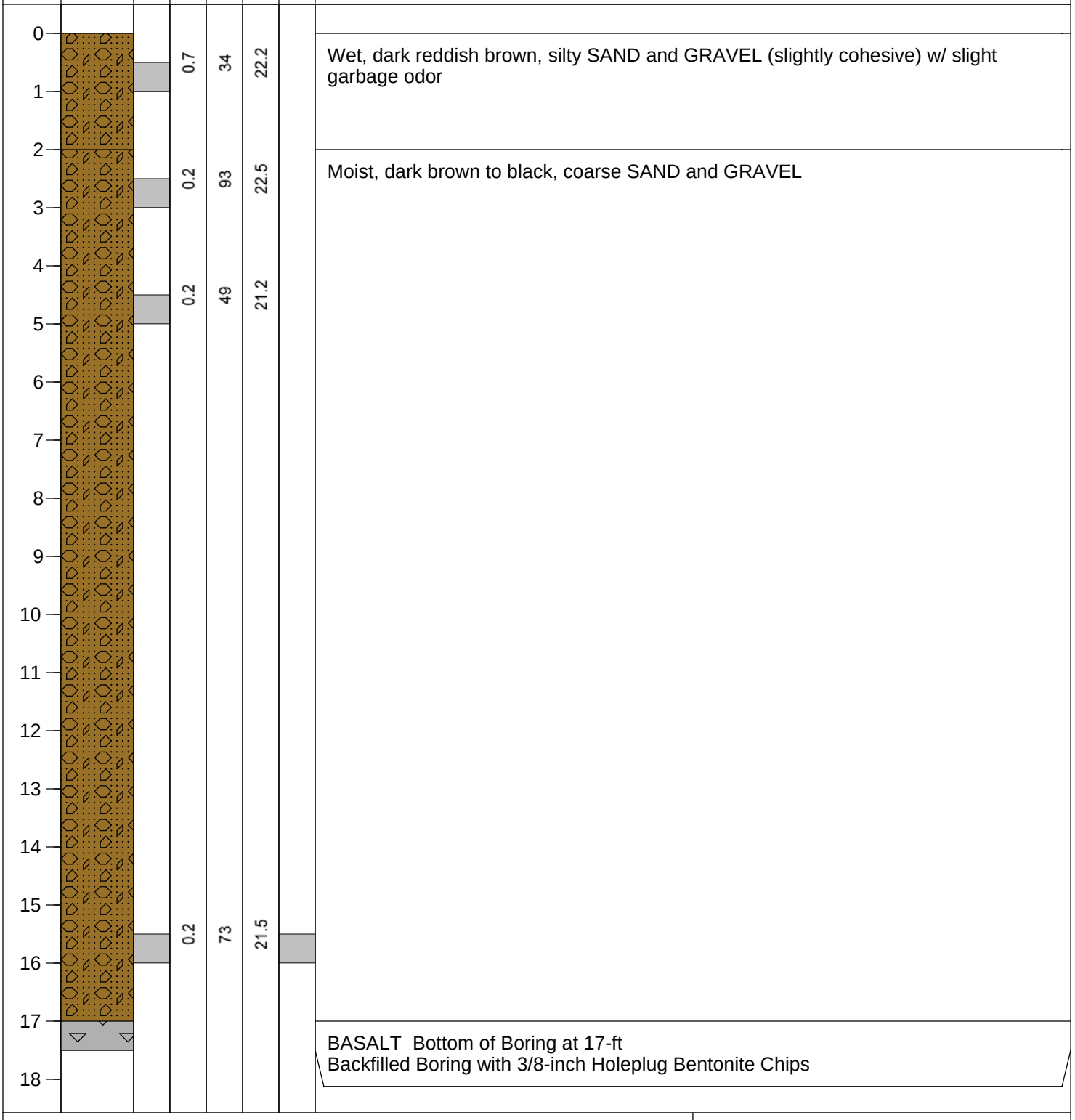
Boring Name: B-3
Elevation (ft): 1260
Datum:

Figure A22
B-3
Exploratory Boring

Ephrata Landfill RI/FS
JE0714, B-3.ldf, 8/2007

PgG

Boring Log

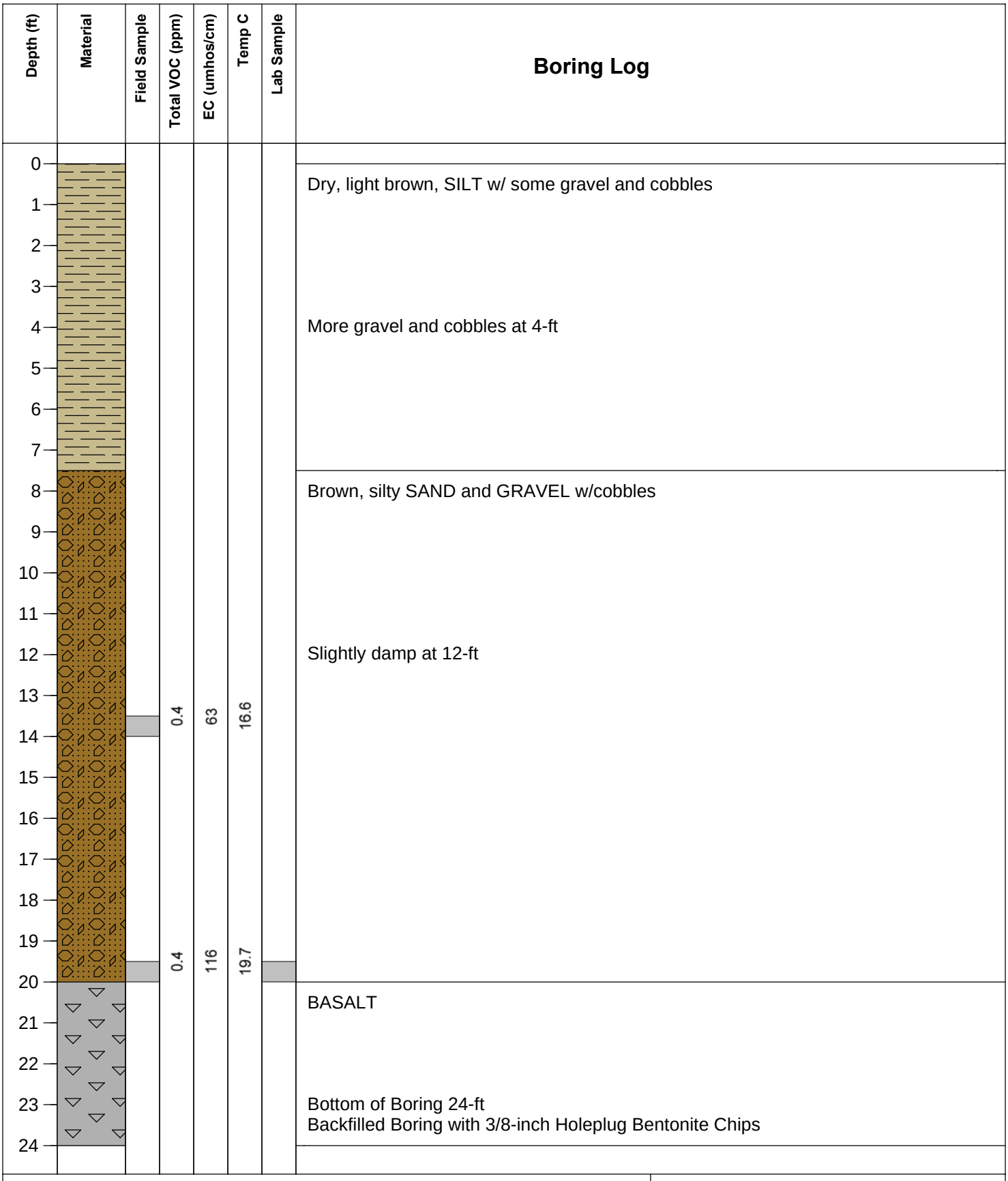


Project Name:	Ephrata Landfill RI/FS	Boring Name:	B-4
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft):	1260
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A23
B-4
Exploratory Boring

Ephrata Landfill RI/FS
JE0714, B-4.ldf, 8/2007

PgG

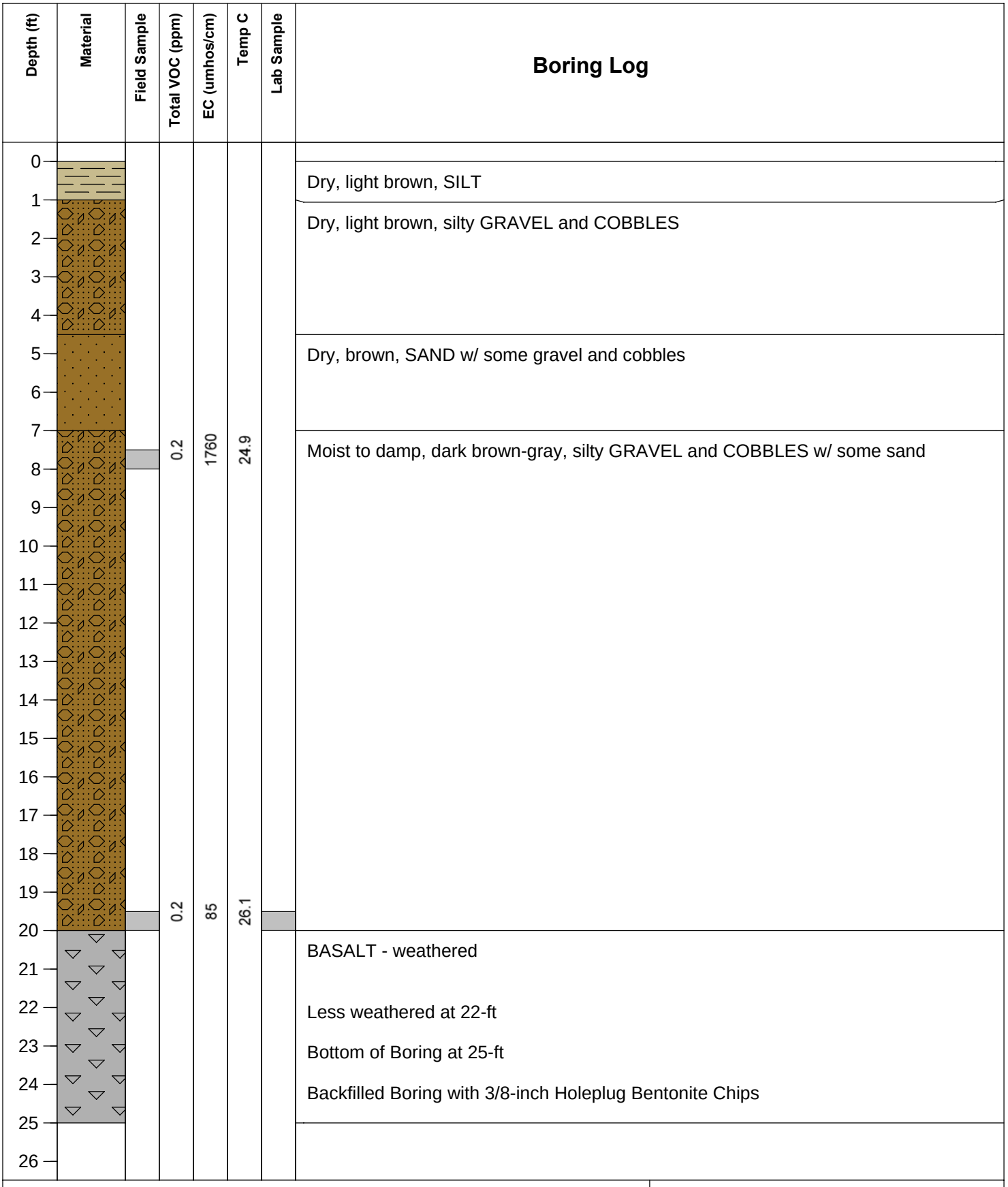


Project Name:	Ephrata Landfill RI/FS	Boring Name:	B-5
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft):	1267.54
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A24
B-5
Exploratory Boring

Ephrata Landfill RI/FS
JE0714, B-5.ldf, 8/2007

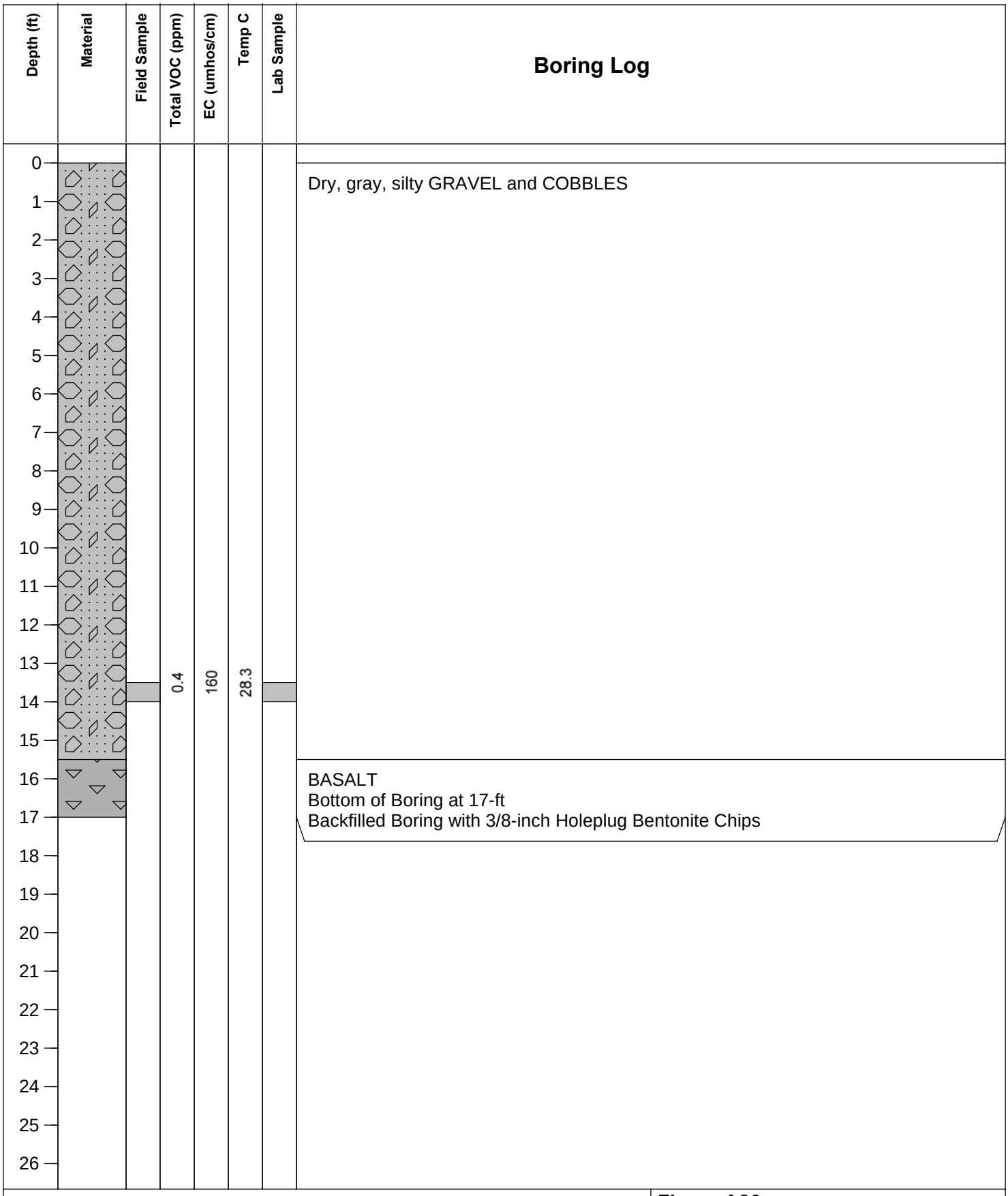
PgG



Project Name:	Ephrata Landfill RI/FS	Boring Name:	B-6
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft):	1268.74
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A25
B-6
Exploratory Boring
Ephrata Landfill RI/FS
JE0714, B-6.ldf, 8/2007

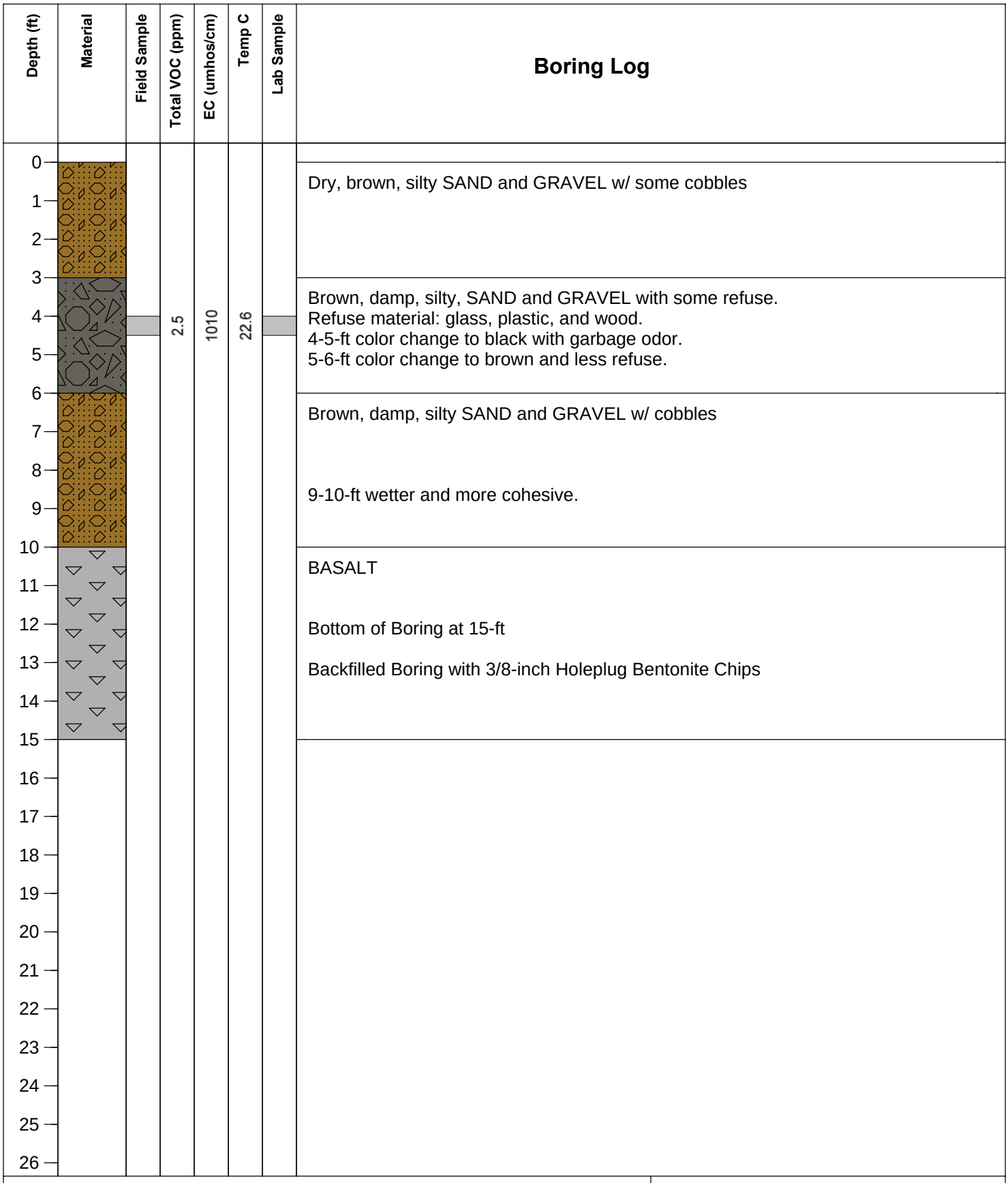
PgG



Project Name:	Ephrata Landfill RI/FS	Boring Name: B-7	
Drilling Method:	Sonic Drill Rig / 4-inch Core	Elevation (ft): 1265.61	
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A26
B-7
Exploratory Boring
Ephrata Landfill RI/FS
JE0714, B-7.ldf, 8/2007

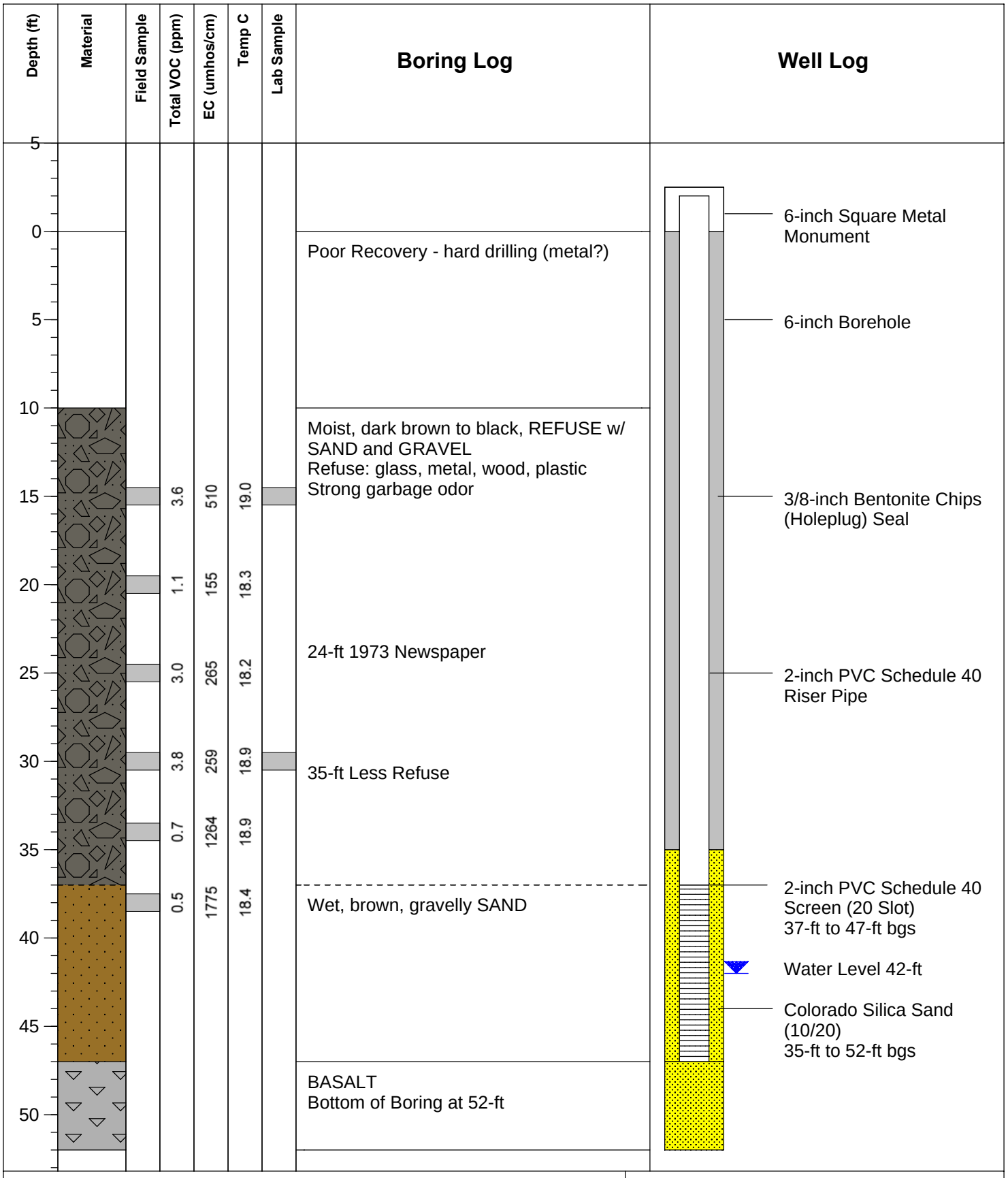
PgG



Project Name:	Ephrata Landfill RI/FS	Boring Name: B-8	
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft): 1265.76	
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A27
B-8
Exploratory Boring
Ephrata Landfill RI/FS
JE0714, B-8.ldf, 8/2007

PgG



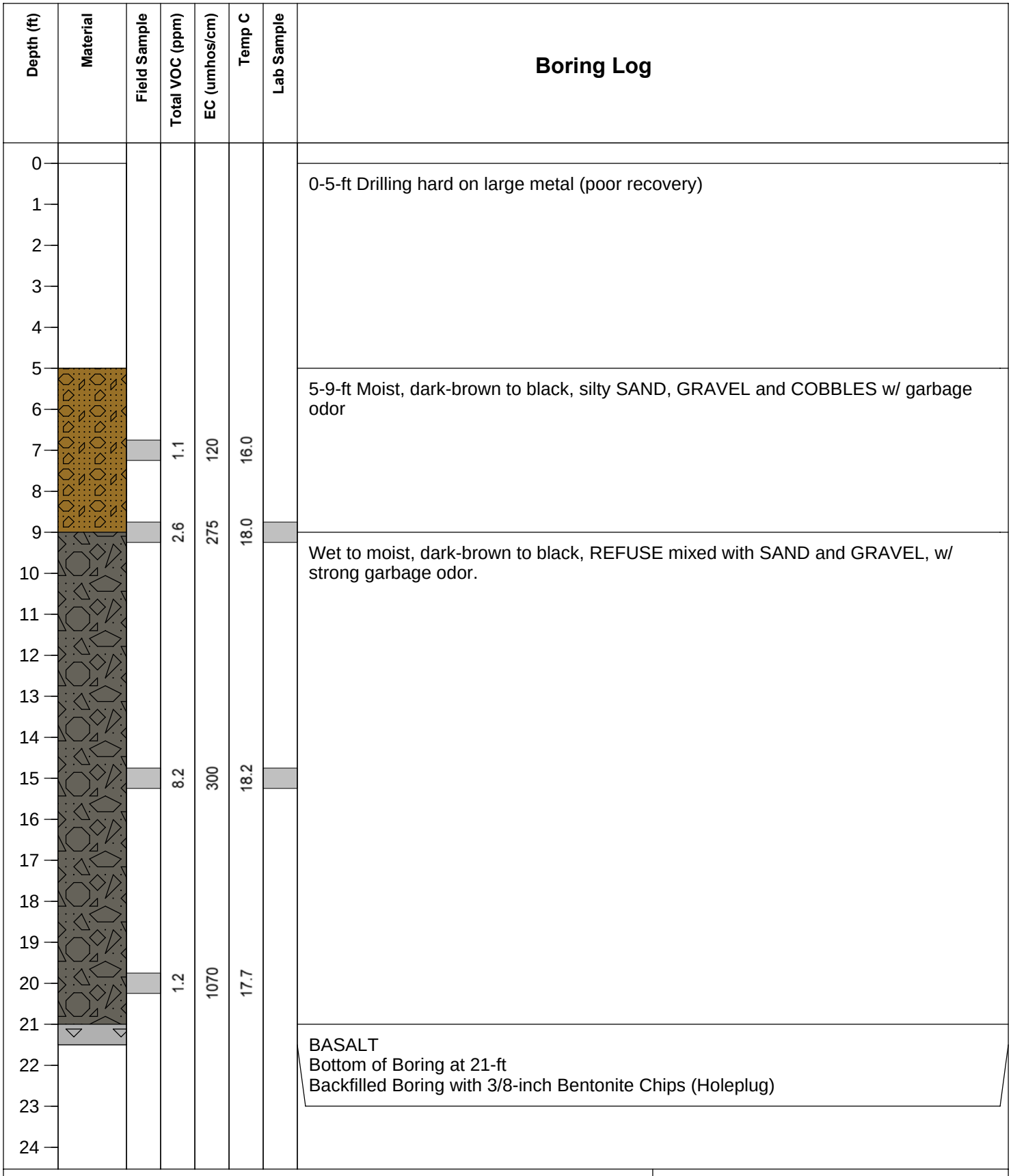
Project Name: Ephrata Landfill RI/FS
Drilling Method: Sonic Drill Rig / 6-inch Core
Driller: Boart Longyear/Ken Phillips
Consulting Firm: PGG
Logged by: Dawn Chapel
Location: Ephrata Landfill (North West Corner)

Boring Name: B-9
Unique Well ID: BAM067
MP Elv (ft): 1280.06
Grnd Elv (ft): 1275.6 (atd)
Datum:

Figure A28
B-9 (W-9)
Exploratory Boring / Monitoring Well

Ephrata Landfill RI/FS
JE0714, B-9.ldf, 8/2007

PgG

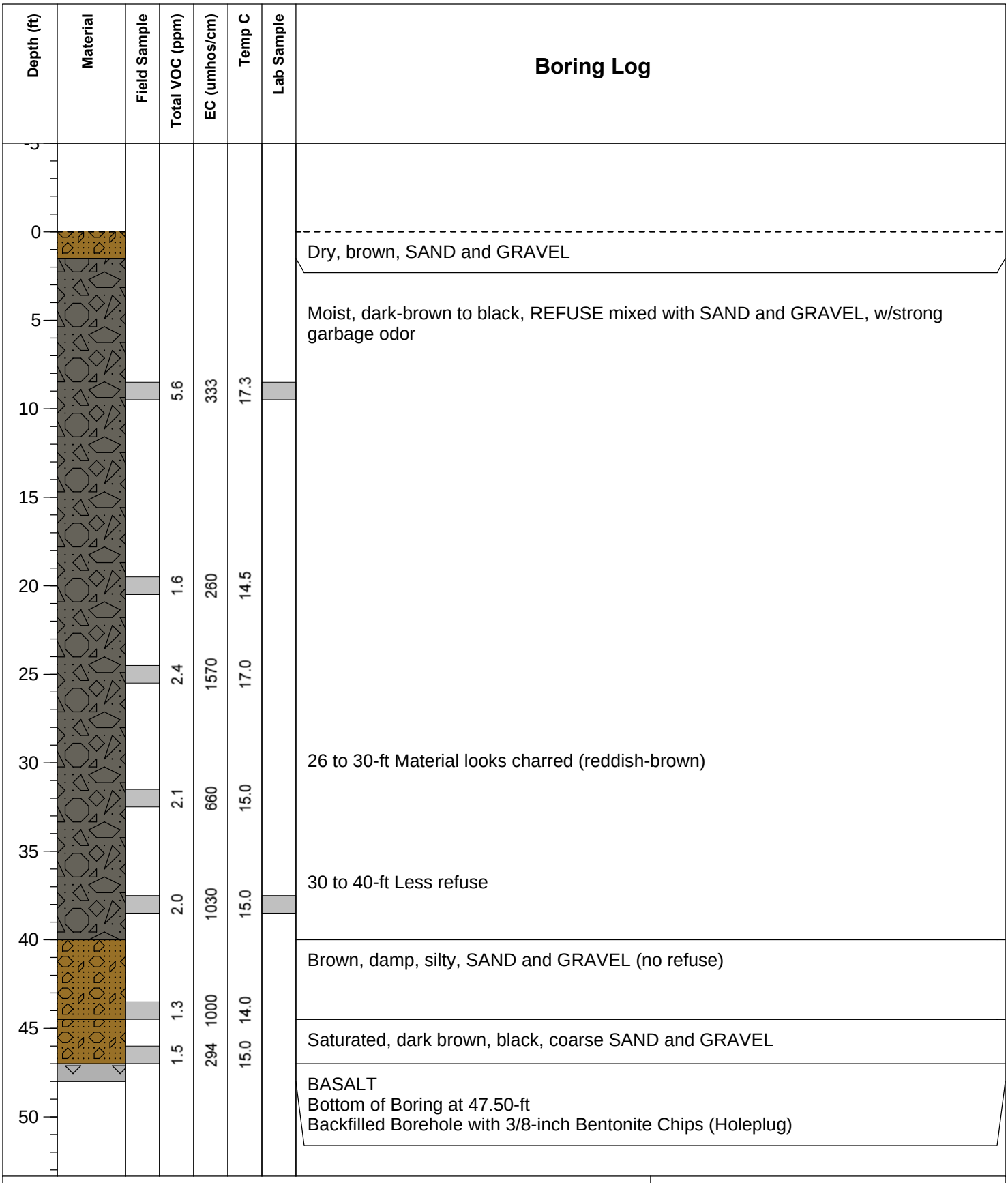


Project Name:	Ephrata Landfill RI/FS	Boring Name:	B-10
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft):	1269.35
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A29
B-10
Exploratory Boring

Ephrata Landfill RI/FS
JE0714, B-10.ldf, 10/2007

PgG

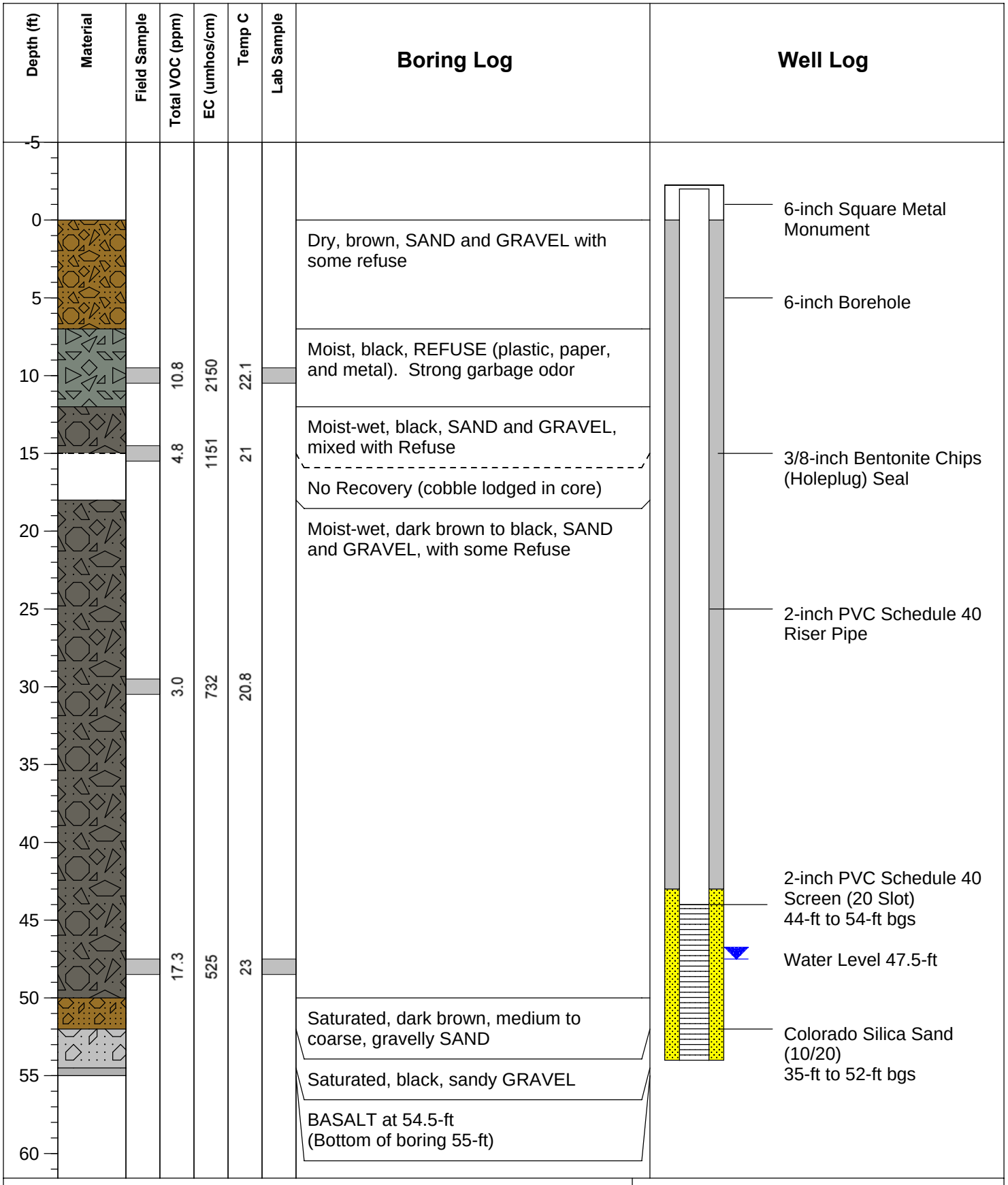


Project Name:	Ephrata Landfill RI/FS	Boring Name:	B-11
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft):	1276.12
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A30
B-11
Exploratory Boring

Ephrata Landfill RI/FS
JE0714, B-11.ldf, 10/2007

PgG



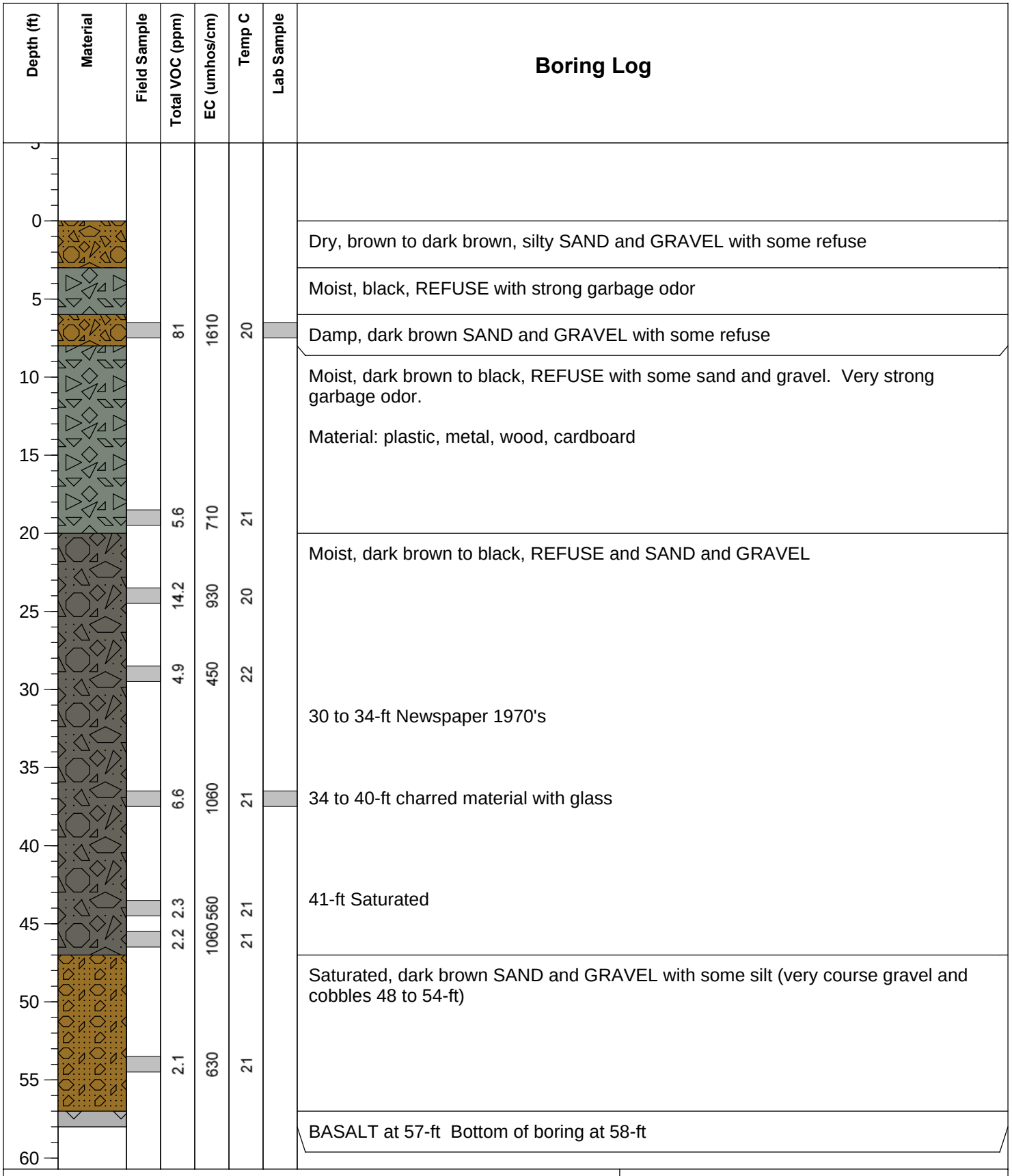
Project Name: Ephrata Landfill RI/FS
Drilling Method: Sonic Drill Rig / 6-inch Core
Driller: Boart Longyear/Ken Phillips
Consulting Firm: PGG
Logged by: Dawn Chapel
Location: Ephrata Landfill (North West Corner)

Boring Name: B-12
Unique Well ID: BAM068
MP Elv (ft) 1286.53
Grnd Elv (ft): 1281.96 (atd)
Datum:

Figure A31
B-12 (W-12)
Exploratory Boring / Monitoring Well

Ephrata Landfill RI/FS
JE0714, B-9.ldf, 8/2007

PGG



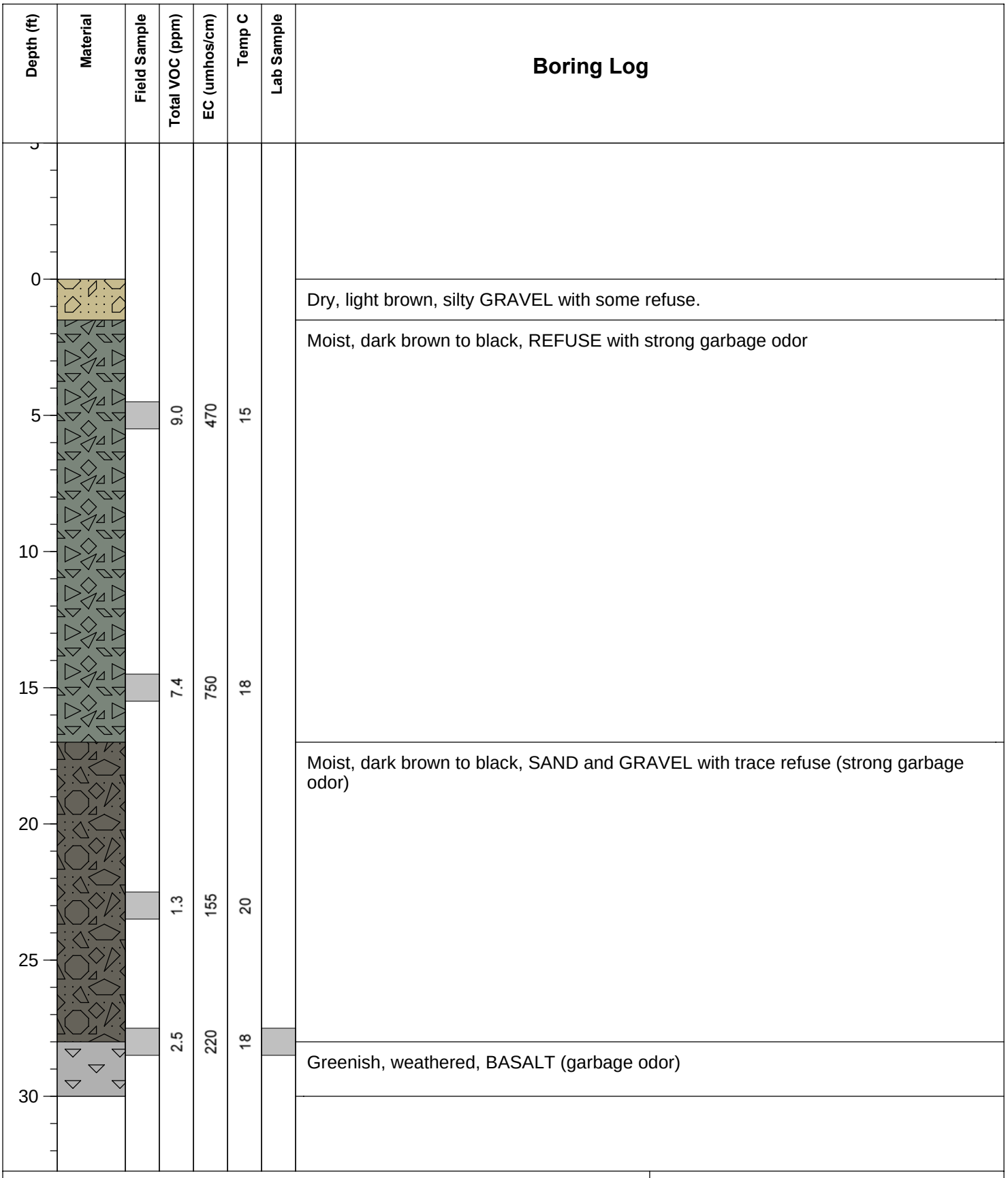
Project Name: Ephrata Landfill RI/FS
Drilling Method: Sonic Drill Rig / 6-inch Core
Driller: Boart Longyear/Ken Phillips
Consulting Firm: PGG
Logged by: Dawn Chapel
Location: Ephrata Landfill (North West Corner)

Boring Name: B-13
Elevation (ft): 1284.94
Datum:

Figure A32
B-13
Exploratory Boring

Ephrata Landfill RI/FS
JE0714, B-13.ldf, 10/2007

PgG

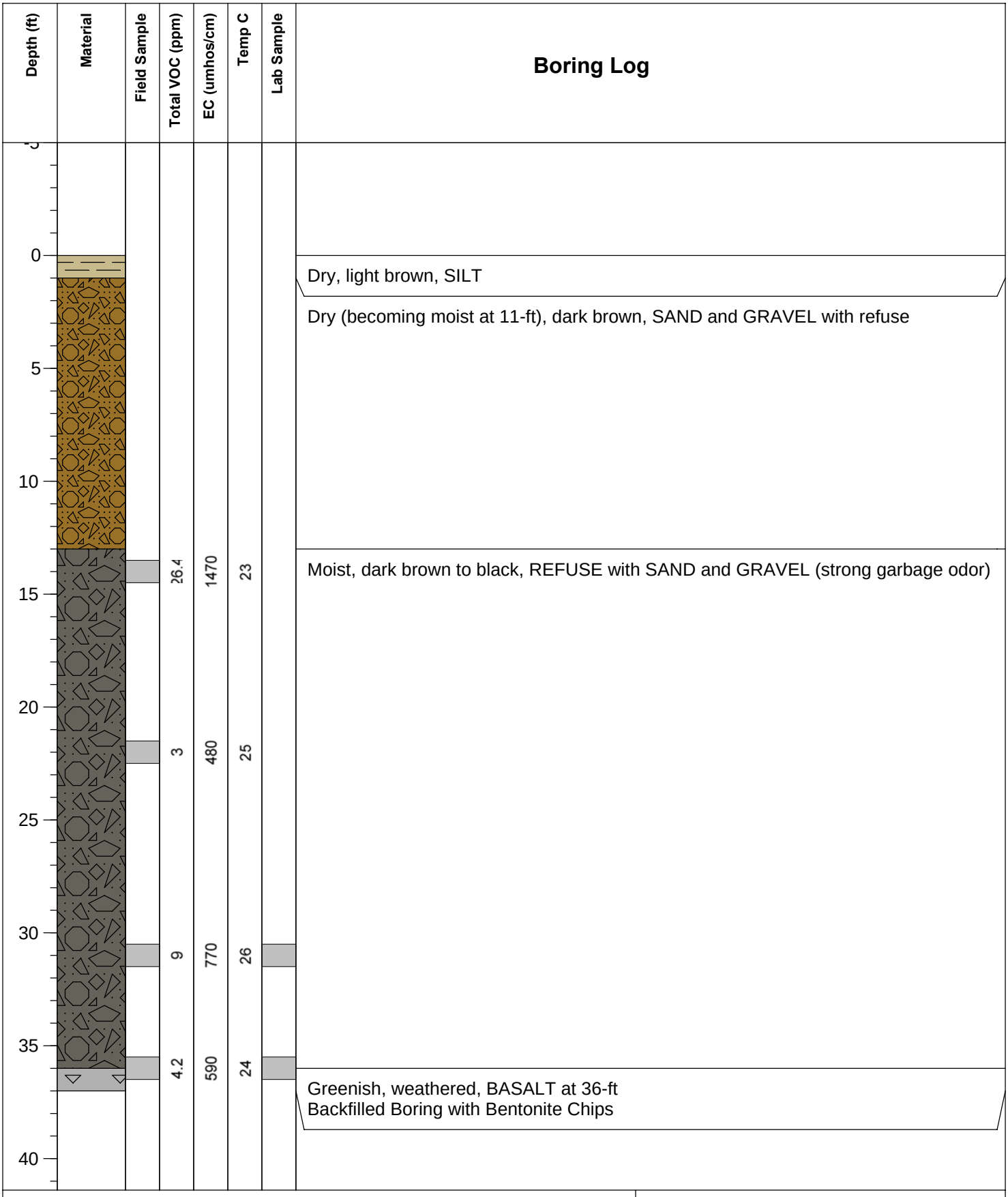


Project Name:	Ephrata Landfill RI/FS	Boring Name:	B-14
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft):	1284.03
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A33
B-14
Exploratory Boring

Ephrata Landfill RI/FS
JE0714, B-14.ldf, 10/2007

PgG

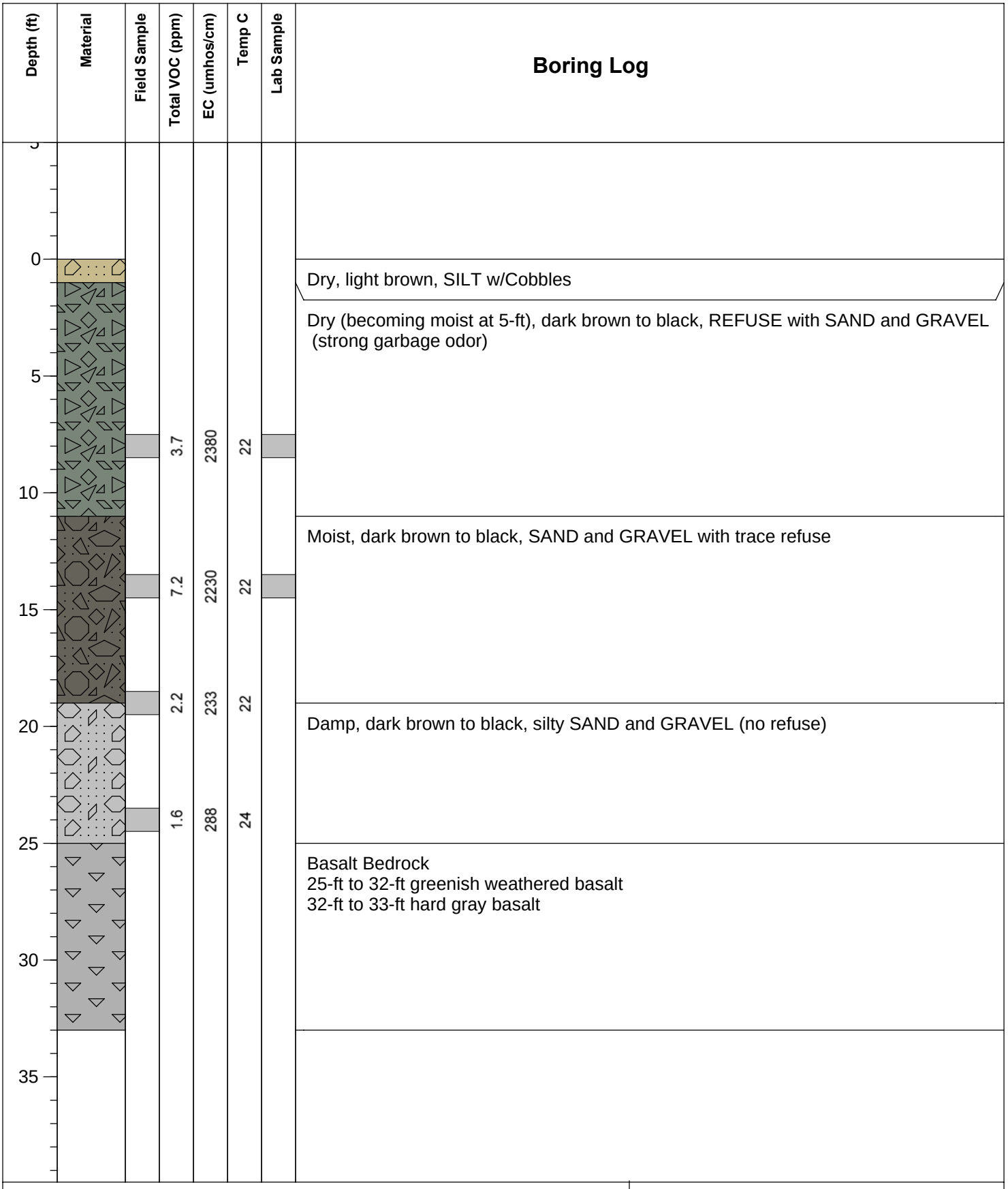


Project Name:	Ephrata Landfill RI/FS	Boring Name:	B-15
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft):	1288.68
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A34
B-15
Exploratory Boring

Ephrata Landfill RI/FS
JE0714, B-15.ldf, 10/2007

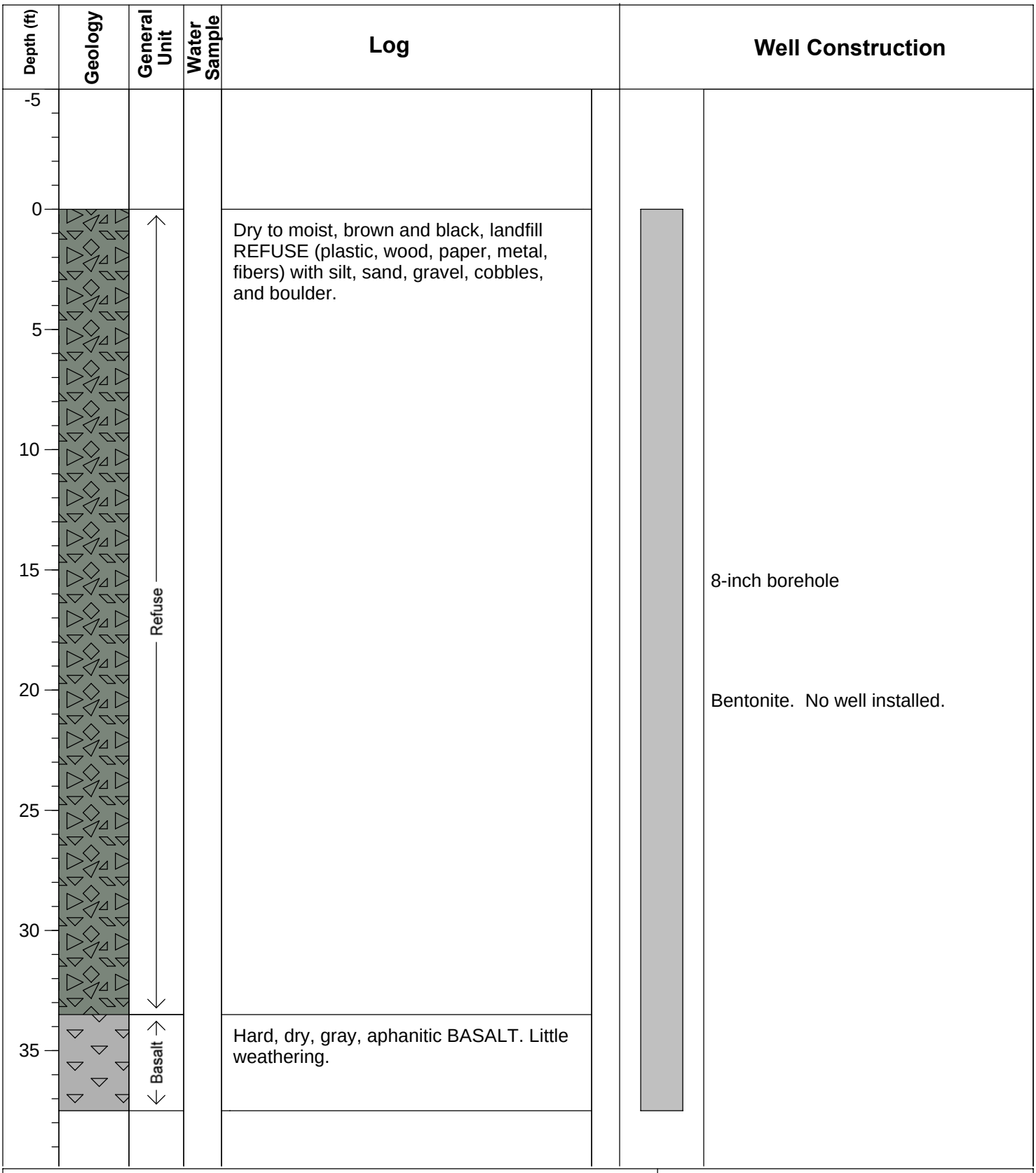
PgG



Project Name:	Ephrata Landfill RI/FS	Boring Name:	B-16
Drilling Method:	Sonic Drill Rig / 6-inch Core	Elevation (ft):	1288.52
Driller:	Boart Longyear/Ken Phillips	Datum:	
Consulting Firm:	PGG		
Logged by:	Dawn Chapel		
Location:	Ephrata Landfill (North West Corner)		

Figure A35
B-16
Exploratory Boring
Ephrata Landfill RI/FS
JE0714, B-16.ldf, 10/2007

PgG

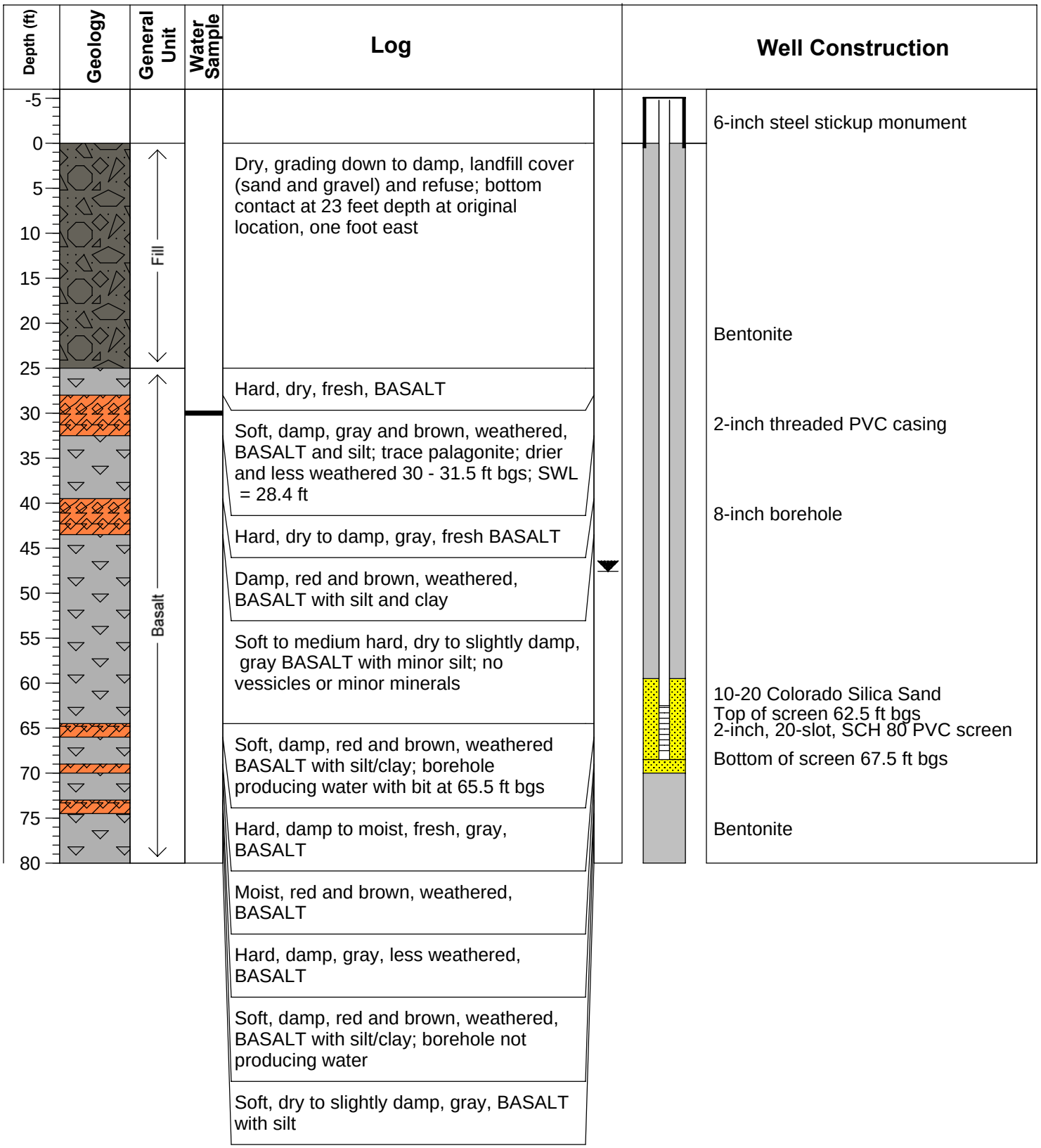


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Charles Ellingson
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: No Well
Ecology ID: N/A
MP Elevation: N/A
Datum:
Installed: 10/6/2008

Figure A36
B-23
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

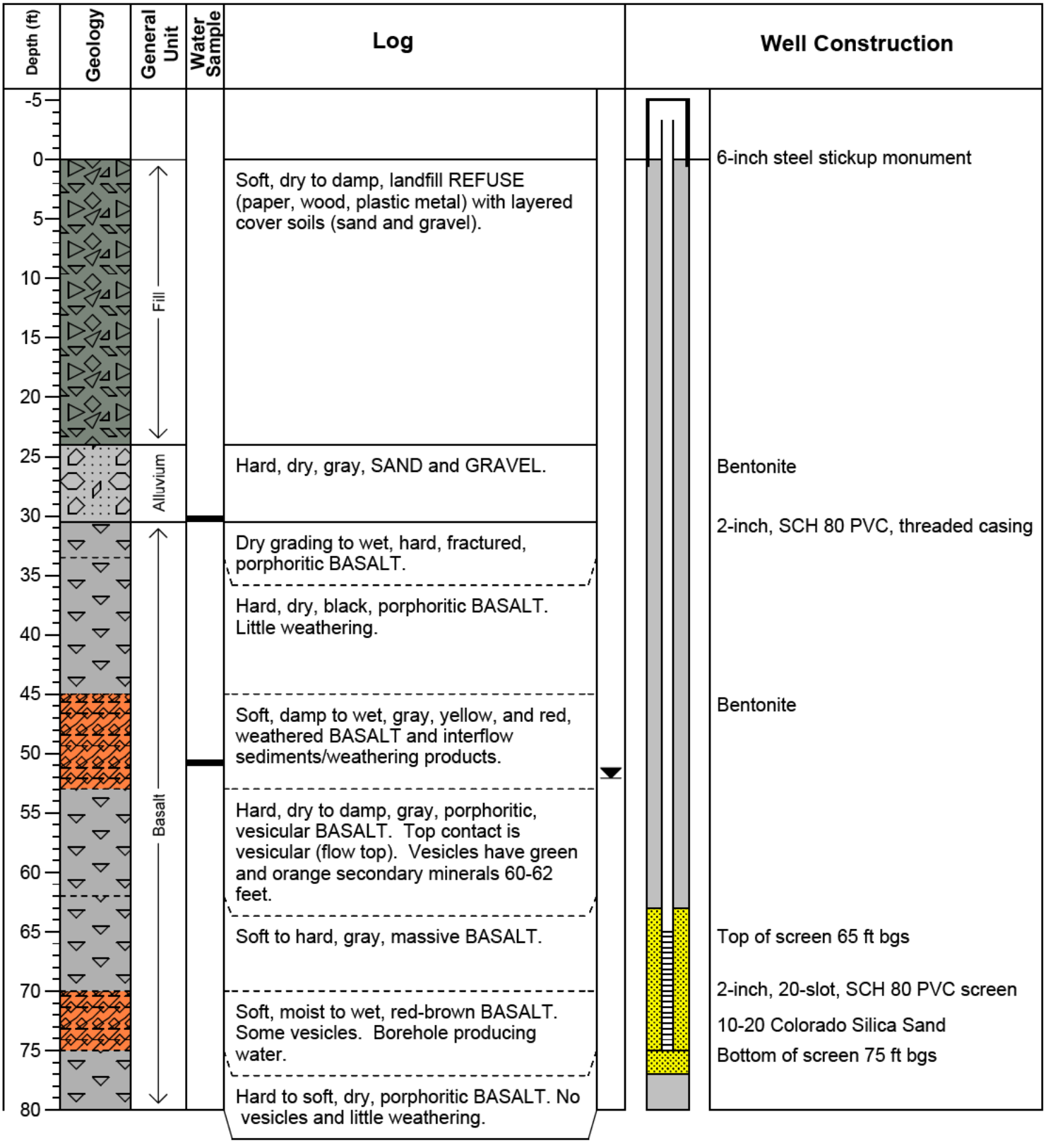


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-29b
Ecology ID: BAS-433
MP Elevation: 1285.18
Datum:
Installed: 10/09/2008
DTW: 50.60 BMP on 11/17/2008

Figure A37
MW-29b (B-19)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

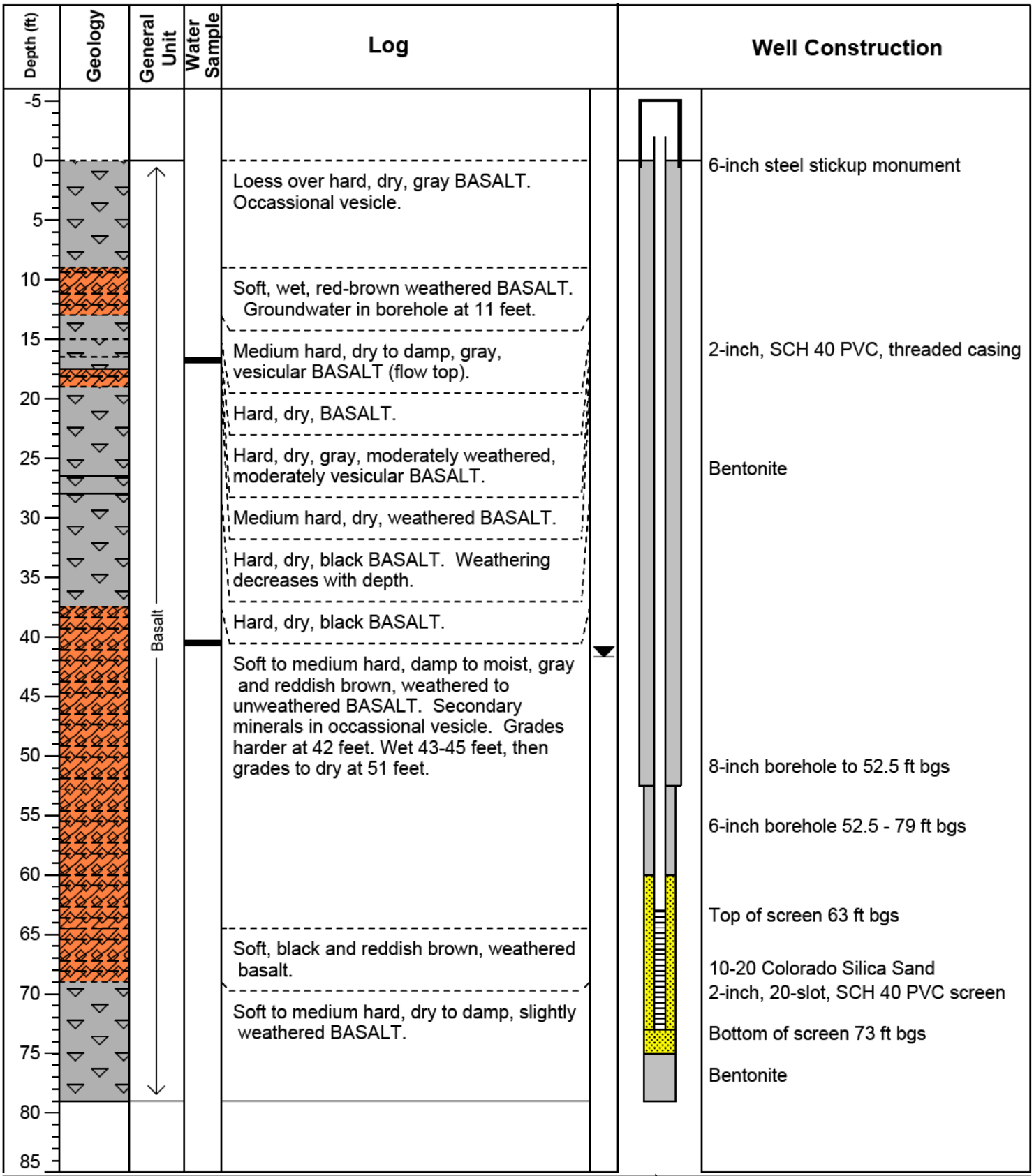


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-30b
Ecology ID: BAS-435
MP Elevation: 1288.12
Datum:
Installed: 10/14/2008
DTW: 53.87 BMP on 11/17/2008

Figure A38
MW-30b (B-22)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

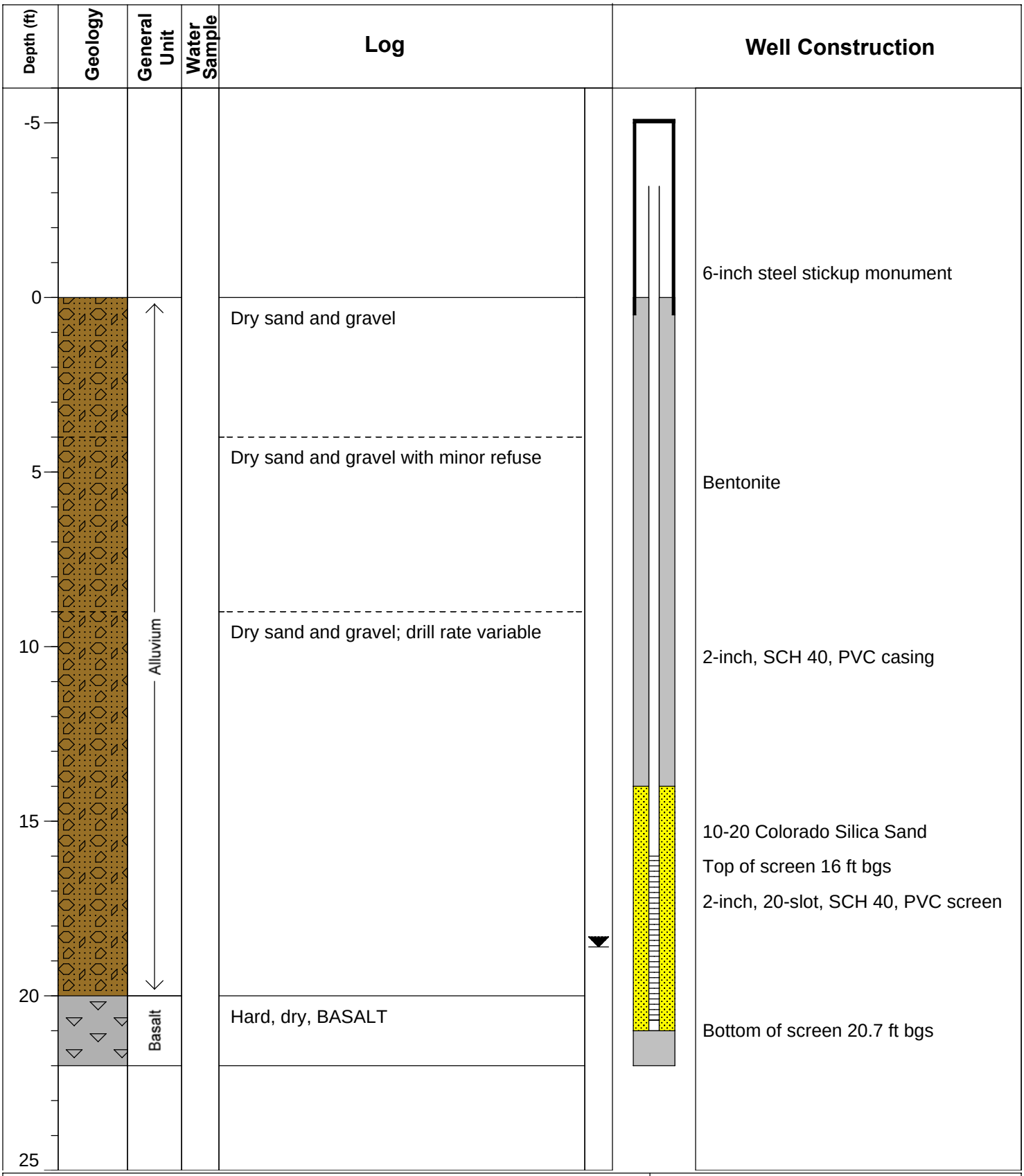


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-31b
Ecology ID: BAS-256
MP Elevation: 1274.89
Datum:
Installed: 10/19/2008
DTW: 41.69 BMP on 11/17/2008

Figure A39
MW-31b (B-26)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

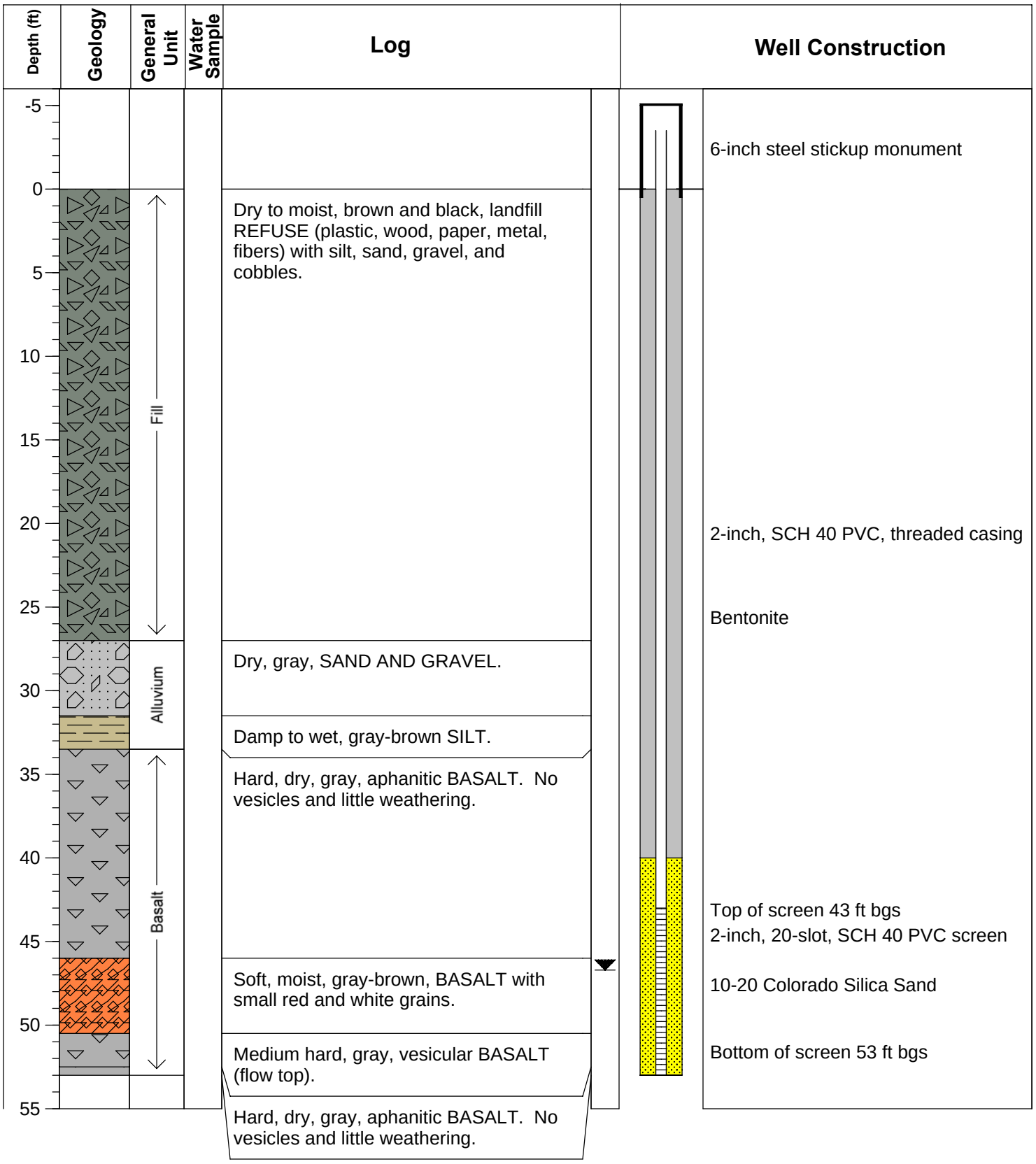


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Trevor Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-32a
Ecology ID: BAS-255
MP Elevation: 1276.47
Datum:
Installed: 11/27/2007
DTW: 22.73 BMP on 11/17/2008

Figure A40
MW-32a (B-17)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

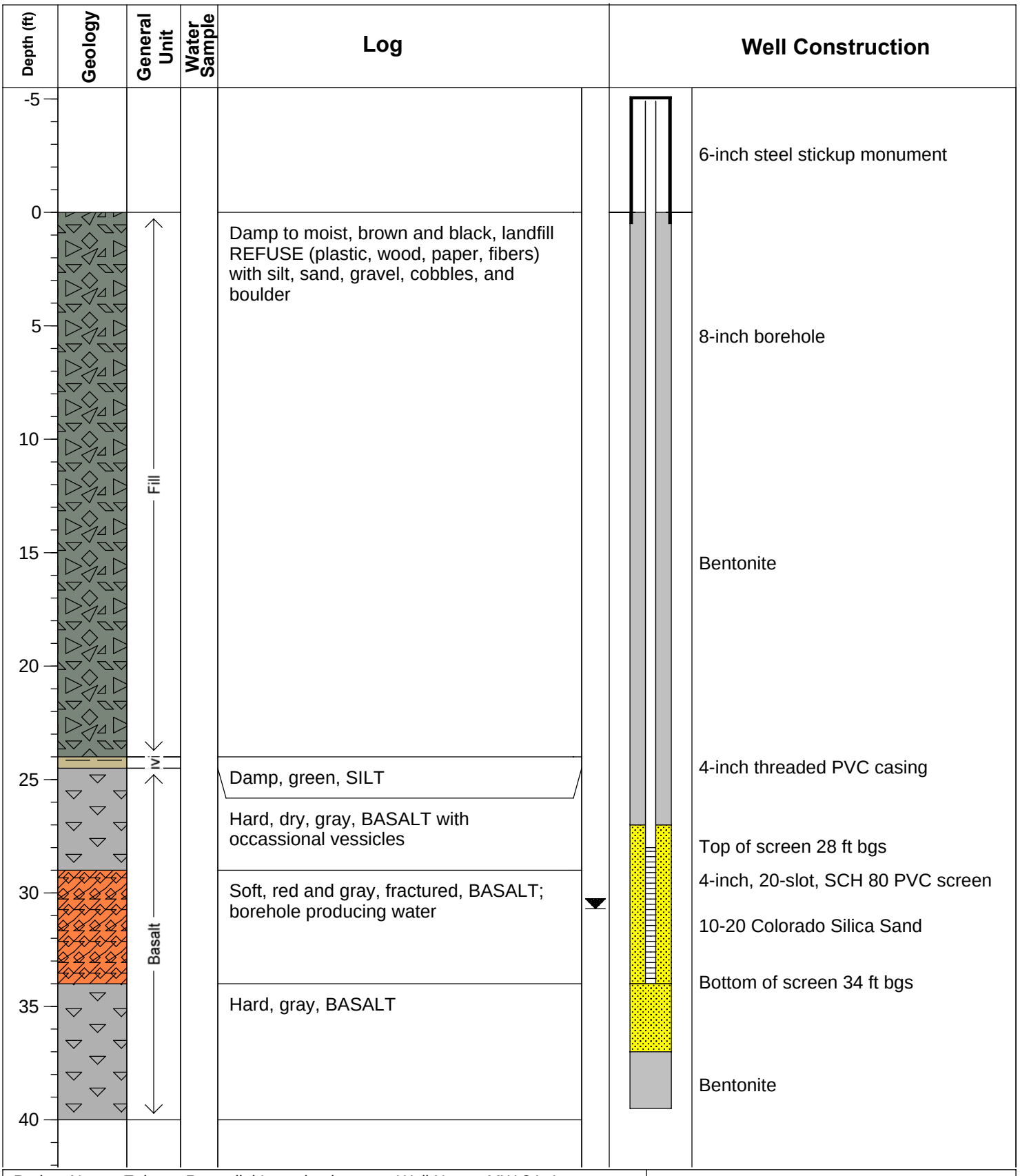


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Charles Ellingson
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-33p2
Ecology ID: BAS-432
MP Elevation: 1291.67
Datum: NAVD 88
Installed: 10/8/2008
DTW: 52.33 BMP on 11/17/2008

Figure A41
MW-33p2 (B-21)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

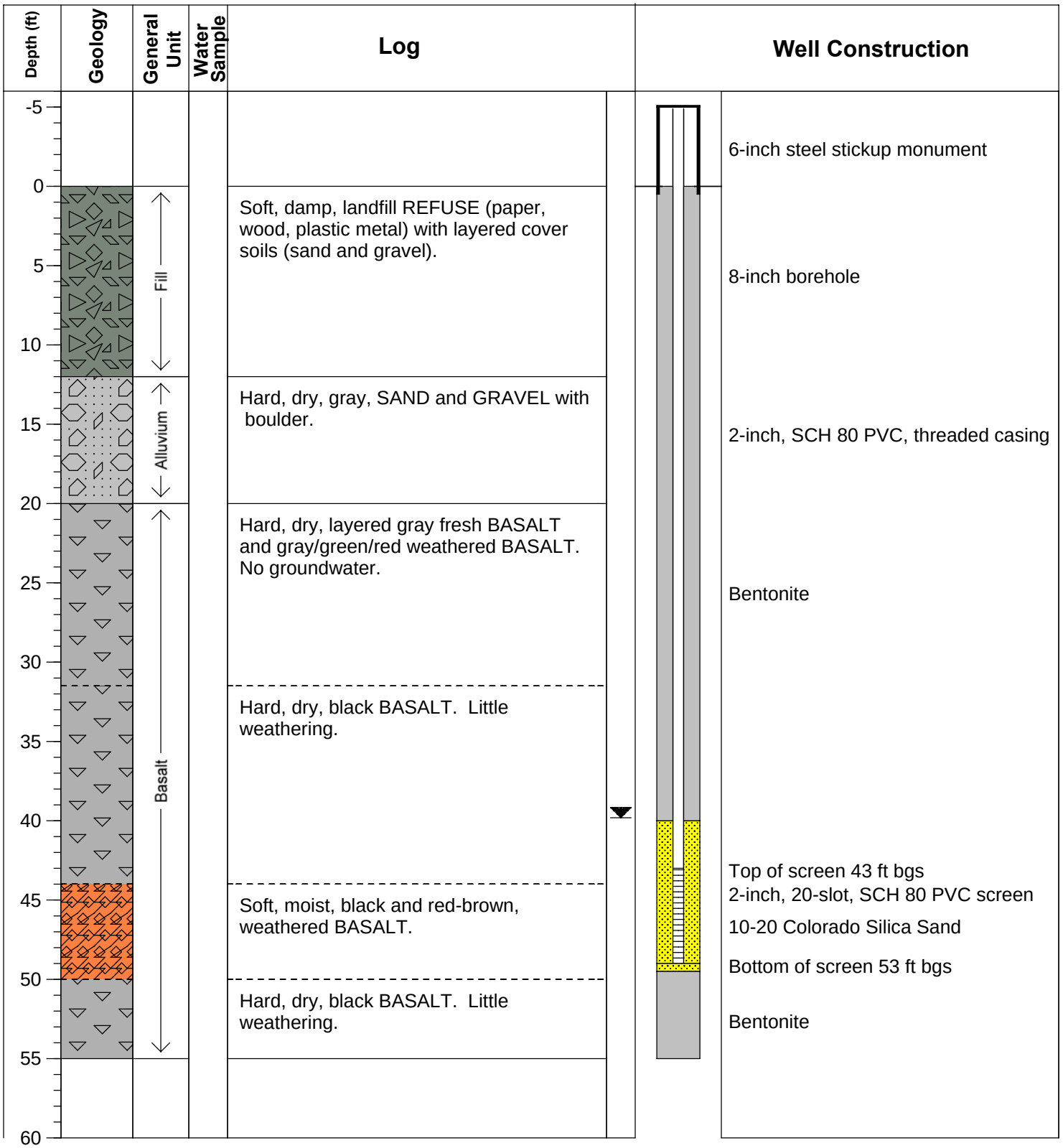


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-34p1
Ecology ID: BAS-434
MP Elevation: 1285.93
Datum:
Installed: 10/13/2008
DTW: 33.34 BMP on 11/17/2008

Figure A42
MW-34p1 (B-20)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

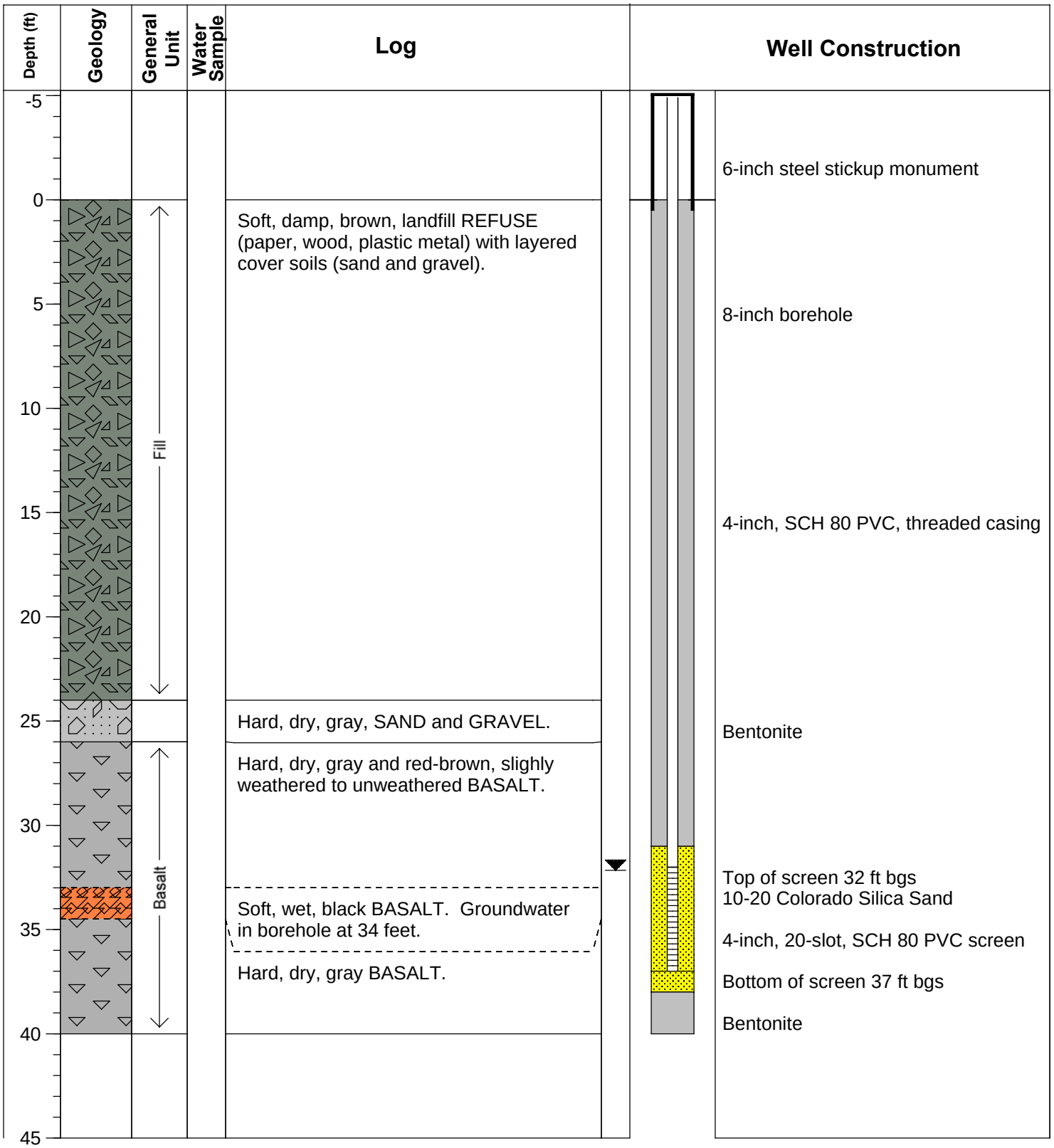


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-35p2
Ecology ID: BAS-436
MP Elevation: 1286.97
Datum:
Installed: 10/15/2008
DTW: 50.15 BMP on 11/17/2008

Figure A43
MW-35p2 (B-25)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

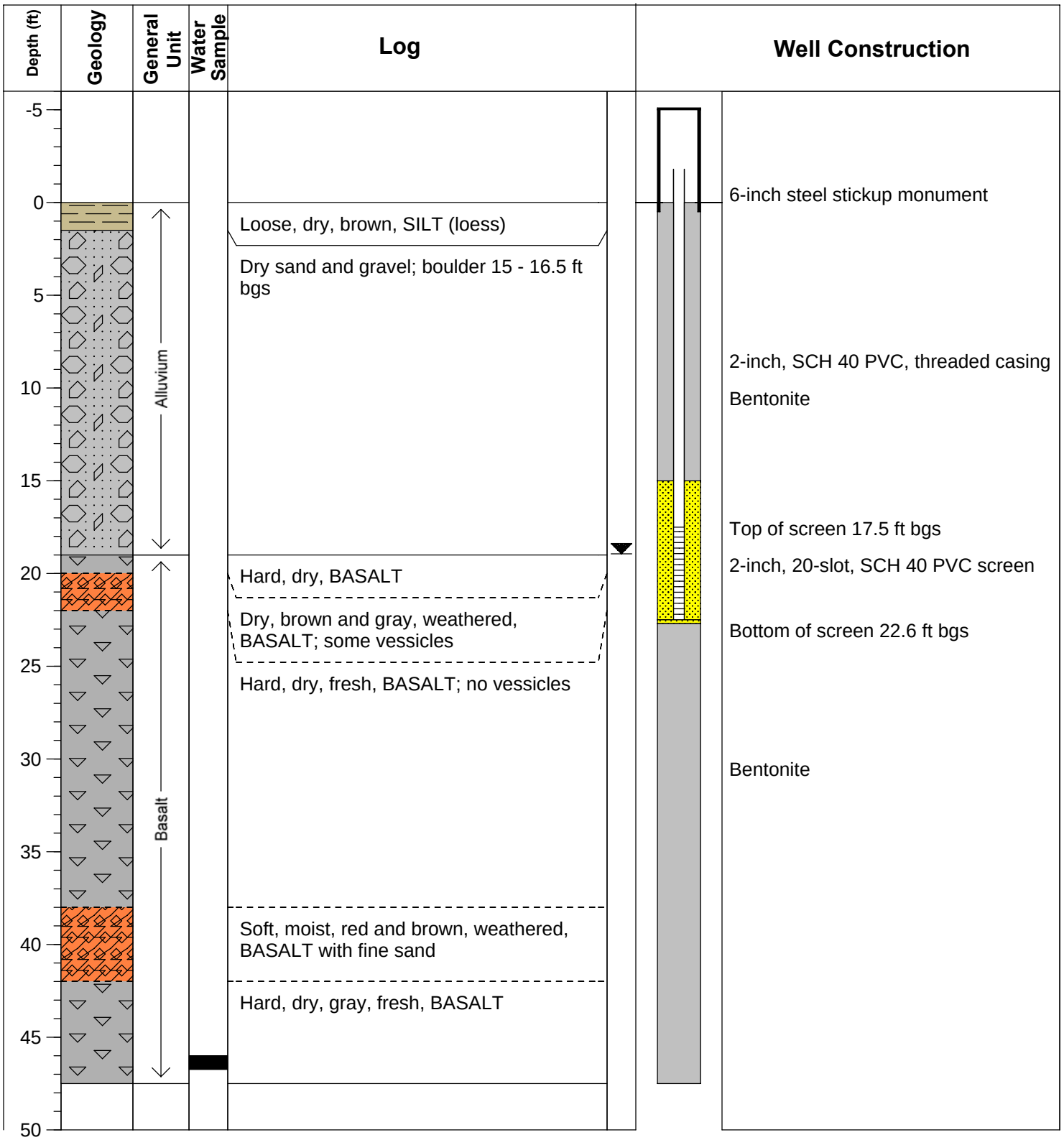


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-36p1
Ecology ID: BAS-437
MP Elevation: 1288.99
Datum:
Installed: 10/16/2008
DTW: 37.35 BMP on 11/17/2008

Figure A44
MW-36p1 (B-27)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

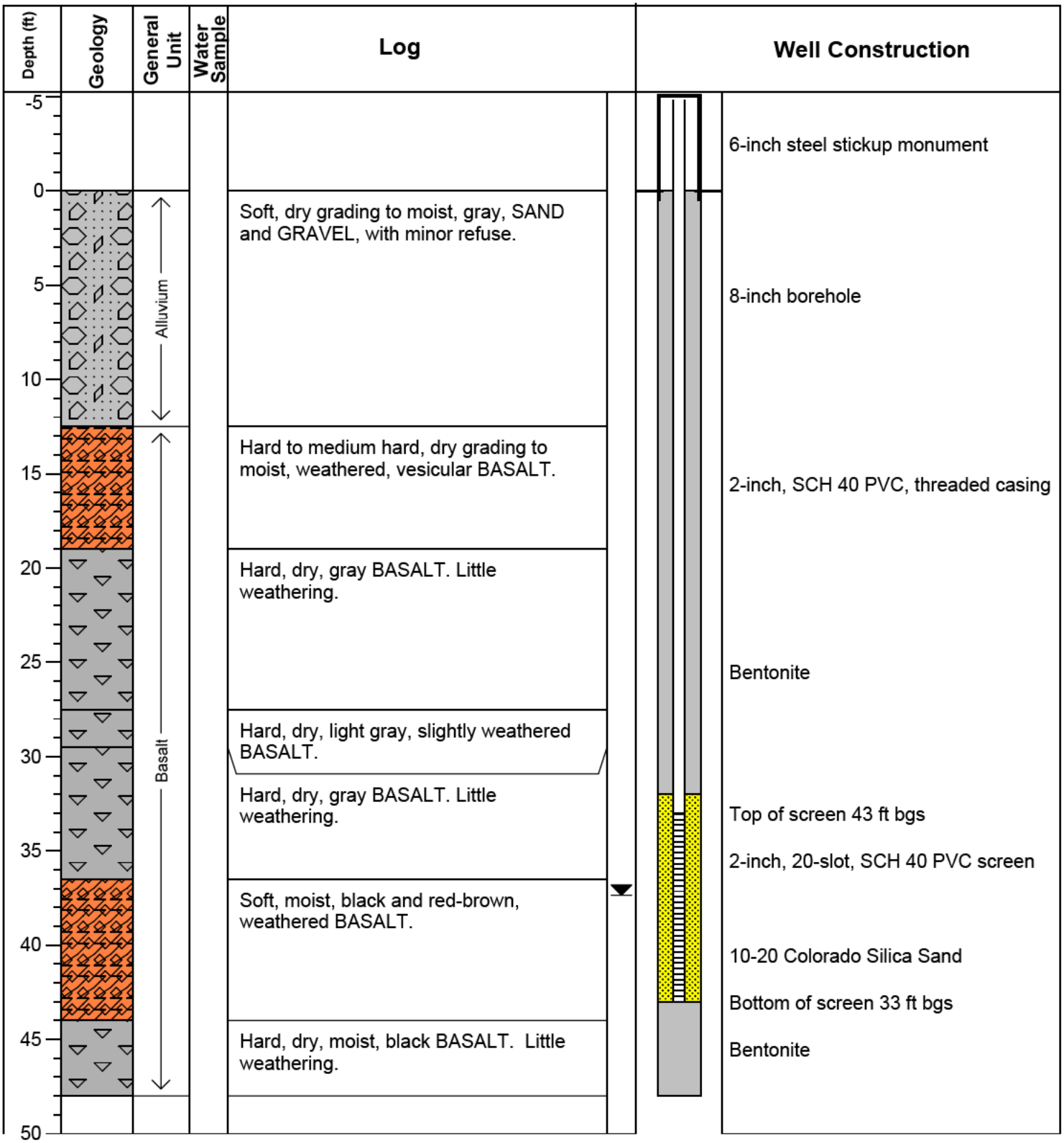


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Trevor Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-37p1
Ecology ID: BAS-253
MP Elevation: 1275.58
Datum:
Installed: 10/18/2008
DTW: 20.82 BMP on 11/17/2008

Figure A45
MW-37p1 (B-18)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-38p2
Ecology ID: BAS-254
MP Elevation: 1277.97
Datum:
Installed: 10/15/2008
DTW: 42.96 BMP on 11/17/2008

Figure A46
MW-38p2 (B-24)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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APPENDIX B
QUALITY ASSURANCE QUALITY CONTROL[10]

[10] QA/QC review has not been performed on Round 3 groundwater data, but will be for the final RI report.

Appendix B1: Quality Assurance /Quality Control for Laboratory Analyses of Test Pit Soil Samples (Source Area Investigation)

Quality Assurance/Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Analytical Resources, Inc. (ARI) was the analytical laboratory for this data set.

Twenty-five soil samples from test pits and one trip blank were submitted to the lab as part of Task 3 of the RI/FS Work Plan. The test pit samples were collected August 14 & 15, 2007 and submitted to ARI one day after the day of sampling.

The laboratory performed QA/QC analyses on soil samples separately for VOCs, total metals, and conventionals (i.e. total solids, chloride, nitrate, nitrite, and sulfate).

The analytical results were found to be generally acceptable with respect to the QA/QC program. A few quality control issues were found associated with the soil samples. Some MS/MSD, internal standards, method blanks, and lab control samples were found above or below the control limit of the lab. Large degrees of chemical heterogeneity were also found in the field duplicate samples; however, this could be due to real heterogeneity between the field samples and not laboratory error.

These results were generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1985) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses (**Table B1**):

1. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results. The methods used correspond to those requested on Chain-of-Custody (COC) forms.

2. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

3. Surrogate Spikes: ACCEPTABLE

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample. Surrogates were added to all samples for all VOC analyses. The surrogate percent recovery ranges were within the acceptable ranges.

4. Internal Standards: ACCEPTABLE

Exception: T-6-4 and T-11-4

Internal standards are compounds at known concentrations added to every sample prior to analysis used for monitoring instrument performance and quantitation of target compounds. The recommended internal standards are fluorobenzene, d5-chlorobenzene, and d4-1, 4-dichlorobenzene.

The internal standard associated with both runs of sample T-6-4 yielded recoveries out of control for the internal standard d4-1,4 dichlorobenzene. Since the results were similar on the duplicate run, it was determined to have been caused by the nature of the sample matrix. All QC was within control.

The internal standard associated with the Matrix Spike Duplicate (for sample T-11-4) yielded recoveries out of control for d4-1,4 dichlorobenzene. Since this internal standard was in control for the Matrix Spike, and all other associated QC was within control, the organics lab supervisor at ARI determined that no corrective action would be taken.

5. Lab Control Sample: ACCEPTABLE

Exception: one analyte slightly outside of the control limits as described below.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

Four LCS and LCS duplicate (LCSD) soil samples were run for all VOC analytes. One of the four runs had a single analyte recovery slightly outside of the laboratory quality control limits:

- *Tetrachloroethene* (1% above in LCS);

As the out of control percent recovery for the above analyte is relatively small and since this is within the accepted marginal exceedance, no corrective action was taken.

One LCS soil sample was run for total metals. All analyte recoveries were within the laboratory quality control limits.

6. Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exceptions: Total metals MS/MSD of T-5-7, T-3-7.3, T-4-4, T-11-4; sulfate MS/MSD for T-5-7;

Matrix Spikes/Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

MS/MSD were run for VOC analyses on four soil samples (T-5-7, T-4-4, T-11-4, and T-12-5). MS/MSD were also run for total metal and conventional analyses on four soil sample (T-5-7, T-3-7.3, T-4-4, T-11-4). MS/MSD indicate acceptable recovery of analytes and acceptable relative percent differences (RPDs) for all analyses except for the following:

- For samples T-5-7, T-3-7.3, T-4-4, T-11-4 the MS/MSD control limits for arsenic, iron and manganese were generally not met because the sample concentrations were too high.

- For sample T-5-7, the MS/MSD percent recovery was lower than the control limit. This was determined to have been caused by the nature of the sample matrix itself by the inorganics lab supervisor at ARI. As such, no corrective action was deemed necessary.

7. Method Blanks: ACCEPTABLE

Exception: Methylene chloride in T-1-9.5 and T-2-6.5

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20. Lab contamination was found in only one instance. Methylene chloride was detected in the method blank analysis at a level of 2.1 μg/kg. The concentrations of methylene chloride in samples T-1-9.5 and T-2-6.5 are 2.6 and 2.7 μg/kg, respectively, and have been marked with a "B" flag. The "B" flag means "Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample."

8. Method Detection Limits: ACCEPTABLE

Method reporting limits were found to be lower or equivalent to Method Detection Limits (MDLs) or Practical Quantitation Limits (PQLs) for all analyses except those where sample concentrations required dilution or re-extraction. These procedures result in elevated detection limits, possibly

above MTCA cleanup levels. MDLs are not always achievable. Because the reported detection limits are within lab internal controls, reporting limits are considered acceptable.

9. Field Blanks: NOT APPLICABLE

No soil sample field blanks were collected during this round of sampling.

10. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

11. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

Appendix B2: Quality Assurance /Quality Control for Laboratory Analyses of Exploratory Boring Soil Samples (Source Area Investigation)

Quality Assurance/Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Analytical Resources, Inc. (ARI) was the analytical laboratory for this data set.

Twenty-two soil samples from the exploratory borings and four trip blanks were submitted to the lab as part of Task 3 of the RI/FS Work Plan. The soil boring samples were collected September 17 to 21, 2007 and submitted to ARI one day after the day of sampling.

The analytical results were found to be generally acceptable with respect to the QA/QC program. A few quality control issues were found associated with the soil samples. Some MS/MSD and internal standards were found above or below the control limit of the lab.

These results were generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1985) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses (**Table B2**):

1. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results. The methods used correspond to those requested on Chain-of-Custody (COC) forms.

2. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

3. Surrogate Spikes: ACCEPTABLE

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample. Surrogates were added to all samples for all VOC analyses. The surrogate percent recovery ranges were within the acceptable ranges.

4. Internal Standards: ACCEPTABLE

Exception: B-13-37

Internal standards are compounds at known concentrations added to every sample prior to analysis used for monitoring instrument performance and quantitation of target compounds. The recommended internal standards are fluorobenzene, d5-chlorobenzene, and d4-1, 4-dichlorobenzene.

The internal standard 1,4-difluorobenzene yielded a recovery that was out of control low for sample B-13-37. The sample was reanalyzed to similar effect. It was determined that this was due to matrix effect by the lab supervisor.

5. Lab Control Sample: ACCEPTABLE

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

Ten LCS and LCS duplicate (LCSD) soil samples were run for the VOC analytes. None of the ten runs had any analyte recoveries outside of the laboratory quality control limits.

Four LCS soil samples were run for total metals. All analyte recoveries were within the laboratory quality control limits.

6. Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exceptions: Total metals MS/MSD of B-12-10 and B-16-14

Matrix Spikes/Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

MS/MSD were run for VOC analyses on two soil samples (B-8-4.5 and B-12-48). MS/MSD were run for total metals on two soil samples (B-12-10, B-16-14). MS/MSD were run for conventional analyses on four soil samples (B-11-38, B-13-7, B-15-31, B-7-14). MS/MSD indicate acceptable recovery of analytes and acceptable relative percent differences (RPDs) for all analyses except for the following:

- For samples B-12-10 and B-16-14 the MS/MSD control limits for iron and manganese were generally not met because the sample concentrations were too high.

- For sample B-16-14, the MS control limit for arsenic was not met. A second run duplicated the out of control result. However, since all other QC was within control, the inorganics lab supervisor at ARI deemed that no corrective action was necessary.

7. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20. Lab contamination was not found.

8. Method Detection Limits: ACCEPTABLE

Method reporting limits were found to be lower or equivalent to Method Detection Limits (MDLs) or Practical Quantitation Limits (PQLs) for all analyses except those where sample concentrations required dilution or re-extraction. These procedures result in elevated detection limits, possibly above MTCA cleanup levels. MDLs are not always achievable. Because the reported detection limits are within lab internal controls, reporting limits are considered acceptable.

9. Field Blanks: NOT APPLICABLE

No soil sample field blanks were collected during this round of sampling.

10. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

11. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

Appendix B3: Quality Assurance /Quality Control for Laboratory Analyses of Soil-below-Drums Samples.

Quality Assurance/Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Analytical Resources, Inc. (ARI) was the analytical laboratory for this data set.

Eighteen soil samples from soil below the drum cache were submitted to the lab as part of Task 2a of the RI/FS Work Plan. The soil samples were collected July 3, 2008 and submitted to ARI on the day of sampling.

The laboratory performed QA/QC analyses on soil samples separately for VOCs, SVOCs, herbicides, pesticides, PCBs, total metals, and conventionals (i.e. total solids, chloride, nitrate, nitrite, and sulfate).

The analytical results were found to be generally acceptable with respect to the QA/QC program. Samples had a very heavy hydrocarbon background, which presented difficulties for this analysis. Reporting Limits have been elevated in cases where dilutions were required to quantify detections within an acceptably reportable range.

These results were generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1985) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses (**Table B3**):

1. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results. The methods used correspond to those requested on Chain-of-Custody (COC) forms.

2. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

3. Sample Surrogate Spikes: ACCEPTABLE

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample. Surrogates were added to all samples for all VOC, SVOC, pesticide, herbicide, and PCB analyses.

For VOCs, surrogate recovery was within acceptable ranges.

For SVOCs, S-9 and S-10 were out of control low for d5-Nitrobenzene, Surrogates were diluted out of the final run in these samples and S-3-B DL. All other SVOC surrogates were recovered within acceptable ranges.

For pesticides, Decachlorobiphenyl was recovered out of control high for 2 samples. All samples were non-detect for pesticides, so surrogate recovery is irrelevant. Tetrachlorometaxylene was not recovered due to interference from PCBs (Aroclors).

For herbicides, the surrogate on the second column failed low for the run of sample "S-2-1" due to co-elution with an unidentifiable peak. The surrogate was recovered out of control at a high bias on one column for sample "S-4." The sample had no detections, so it is not relevant to the sample result. The surrogate was recovered out of control at a high bias on one column for sample "S-3-8." The sample had no detections, so it is not relevant to the sample result. The surrogate was recovered out of control at a low bias for sample "S-10" due to matrix interference.

For PCBs, recovery of the surrogate Tetrachlorometaxylene was affected by the nature of the sample matrix in two instances where it is out of control.

Decachlorobiphenyl was out of control high for one sample. Surrogates were diluted out of select samples.

4. Lab Control Samples: ACCEPTABLE

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water).

Two sets of LCS and LCS duplicate (LCSD) soil samples were run for all VOC, SVOC, and PCB analytes, and one set of LCS and LCDS soils samples for pesticide and herbicide analytes.

For VOCs, spike, duplicate spike, surrogate recoveries and calculated RPD were all within acceptable ranges.

For SVOCs during the 7/19/08 analysis, Benzoic acid was out of control low in the spike and duplicate spike probably due to sulfate in the extraction process. Surrogate recovery was within acceptable ranges.

For PCBs and pesticides, spike, duplicate spike, surrogate recoveries and calculated RPD were all within acceptable ranges.

For herbicides, Dinoseb recovery was out of control low in the spike and duplicate spike. Dinoseb is a known poor performer. Surrogate recovery was within acceptable ranges.

5. Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Matrix Spikes/Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

MS/MSD were run for VOCs on sample S-2, Total metals on sample S-1, and select Conventionals on samples S-1, S-2, and S-12.

For VOCs, MS/MSD indicate acceptable recovery of analytes and acceptable RPD for all analyses.

For Total metals, MS recovery was out of control low for Antimony and Copper. RPD is within an acceptable range except for Copper. As all other QC measures were within control, no corrective action was deemed necessary.

6. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20. Method Blanks were run for VOCs, SVOCs, pesticidies, herbicides, PCBs, and Total metals.

All Method Blank spikes, duplicate spikes, and surrogates were recovered within acceptable ranges. One exception is a detection of Methylene Chloride slightly above the detection limit. Samples S-6 and S-11 are "B" Qualified

7. Method Detection Limits: ACCEPTABLE

Method reporting limits were found to be lower or equivalent to Method Detection Limits (MDLs) or Practical Quantitation Limits (PQLs) for all analyses except those where sample concentrations required dilution or re-extraction. These procedures result in elevated detection limits. MDLs are not always achievable. Because the reported detection limits are within lab internal controls, reporting limits are considered acceptable.

8. Field Blanks: NOT APPLICABLE

No soil sample field blanks were collected during this round of sampling.

9. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

10. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

Appendix B4: Quality Assurance /Quality Control for Laboratory Analyses of Residual Drum Soils

Quality Assurance/Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Analytical Resources, Inc. (ARI) was the analytical laboratory for this data set.

Twelve soil samples from soil below the drum cache were submitted to the lab as part of Task 2a, Phase 3 of the RI/FS Work Plan. The soil samples were collected on three occasions. Sample '16, -B, at rock' was collected July 22, 2008 and submitted to ARI on the following day. Samples SS-1 to SS-9 were collected on August 1, 2008 and submitted to ARI on the same day. Samples SS-10 and SS-11 were collected on August 5, 2008 and submitted to ARI on the following day. Trips Blanks were included with VOC samples collected on July 22, and August 1, 2008.

The laboratory performed QA/QC analyses on soil samples separately for VOCs, SVOCs, PCBs, Total Metals, and Conventionals (i.e. total solids, chloride, nitrate, nitrite, and sulfate). Additionally, QA/QC analyses were performed on sample '16, -B, at rock' for TPH-D, and SS-10 for TPH-HCID.

The analytical results were found to be generally acceptable with respect to the QA/QC program. Some samples had a very heavy hydrocarbon background, which presented difficulties for this analysis. Reporting Limits have been elevated in cases where dilutions were required to quantify detections within an acceptably reportable range.

These results were generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1985) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses (**Table B4**):

1. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results. The methods used correspond to those requested on Chain-of-Custody (COC) forms.

2. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

3. Sample Surrogate Spikes: ACCEPTABLE

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample. Surrogates were added to all samples for all VOC, SVOC, PCB, and TPH analyses.

For VOCs, surrogate recovery was within acceptable ranges.

For SVOCs, 2-Fluorophenol and d5-Phenol were out of control low in the final run of sample SS-6. A Re-extraction was ruled out by Lab QA Supervisor. The surrogate 2-Fluorophenol was recovered low in the final run of SS-2. A Re-extraction was ruled out by Lab QA Supervisor. Surrogates were diluted beyond recovery for the final run of three samples. All other SVOC surrogates were recovered within acceptable ranges.

For PCBs, recovery of the surrogate Tetrachlorometaxylene was affected by the nature of the sample matrix in instances where it is out of control. For samples '16, -B, at rock' and SS-1, Tetrachlorometaxylene was out of control for one GC column. For sample SS-2 both columns were out of control high for Tetrachlorometaxylene due to the enhanced Matrix Effect. Surrogates were diluted out of select samples in order to quantify detections.

For TPH-D and TPH-HCID surrogate o-Terphenyl was recovered in range.

4. Lab Control Samples: ACCEPTABLE

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water).

LCS and LCS duplicate (LCSD) soil samples were run for all VOC, SVOC, and PCB analytes. An LCS was run for TPH-D analysis.

For VOCs, spike, duplicate spike, surrogate recoveries and calculated RPD were all within acceptable ranges for each sample batch.

For SVOCs, spike, duplicate spike, surrogate recoveries and calculated RPD were all within acceptable ranges for each sample batch. Duplicate spikes were not run for the batch that includes SS-10 and SS-11.

For PCBs, spike, duplicate spike, surrogate recoveries and calculated RPD were all within acceptable ranges for each sample batch. Duplicate spikes were not run on the batch that includes ’16, -B, at rock’.

For TPH-D, spike and surrogate recoveries were within acceptable ranges.

5. Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Matrix Spikes/Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

MS/MSD were run for Conventionals on select samples. All spikes and spike duplicates were within acceptable ranges. The RPD calculation for Nitrate-Nitrite was out of range high due to very low concentration in the samples.

6. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20. Method Blanks were run for VOCs, SVOCs, PCBs, Total metals, and TPH analyses.

All Method Blank spikes, duplicate spikes, and surrogates were recovered within acceptable ranges. One exception is a detection of Methylene Chloride above the detection limit on 8/4/08 for VOC samples in batch ni72. Samples SS-1 through SS-9 are "B" Qualified for detections of Methylene Chloride.

7. Trip Blanks: ACCEPTABLE

Trip Blanks included with VOC samples collected on July 22, and August 1, 2008 had no analyte detections and surrogate recovery within an acceptable range.

8. Method Detection Limits: ACCEPTABLE

Method reporting limits were found to be lower or equivalent to Method Detection Limits (MDLs) or Practical Quantitation Limits (PQLs) for all analyses except those where sample concentrations required dilution or re-extraction. These procedures result in elevated detection limits. MDLs are not always achievable. Because the reported detection limits are within lab internal controls, reporting limits are considered acceptable.

9. Field Blanks: NOT APPLICABLE

No soil sample field blanks were collected during this round of sampling.

10. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

11. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

Appendix B5: Quality Assurance /Quality Control for Laboratory Analyses of Gas Samples

Quality Assurance/Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Test America, Inc. was the analytical laboratory for this data set.

Four gas samples collected from gas probes installed in test pits and 14 gas samples from gas extraction wells were submitted to the lab as part of Task 3 of the RI/FS Work Plan. In addition, one field blank sample and two field duplicates (one known and one blind) were also submitted to the lab for analysis. All the landfill gas samples were collected September 5 to 6, 2007 except for one (T-14) which was collected on September 19, 2007. All landfill gas samples were submitted to Test America one to two days after the day of sampling.

The laboratory performed QA/QC analyses on the gas samples for volatile organic compounds using the EPA 8260B method.

The analytical results were found to be generally acceptable with respect to the QA/QC program. No quality control issues were found associated with the gas samples.

These results were generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1985) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses (**Table B5**):

1. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results. The methods used correspond to those requested on Chain-of-Custody (COC) forms.

2. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

3. Surrogate Spikes: ACCEPTABLE

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample. Surrogates were added to all samples for all VOC analyses. The surrogate percent recovery ranges were within the acceptable ranges.

4. Internal Standards: NOT APPLICABLE

Internal standards are compounds at known concentrations added to every sample prior to analysis used for monitoring instrument performance and quantitation of target compounds. The recommended internal standards are fluorobenzene, d5-chlorobenzene, and d4-1, 4-dichlorobenzene.

Test America did not report the use of internal standards in their analyses of the gas samples.

5. Lab Control Sample: ACCEPTABLE

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand, DI water, or clean air). The LCS results are normally used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

Three LCS and LCS duplicate (LCSD) gas samples were run for the VOC analytes. None of these runs had any analyte recoveries outside of the laboratory quality control limits.

6. Matrix Spikes/Matrix Spike Duplicate (MS/MSD): NOT APPLICABLE

Matrix Spikes/Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

Test America did not report MS/MSD analyses for the VOC analyses on the gas samples.

7. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20. Lab contamination was not found.

8. Method Detection Limits: ACCEPTABLE

Method reporting limits were found to be lower or equivalent to Method Detection Limits (MDLs) or Practical Quantitation Limits (PQLs) for all analyses except those where sample concentrations required dilution or re-extraction. These procedures result in elevated detection limits, possibly above MTCA cleanup levels. MDLs are not always achievable. Because the reported detection limits are within lab internal controls, reporting limits are considered acceptable.

9. Field Blanks: ACCEPTABLE

One field blank sample of ambient air was collected during this round of sampling. Of all the VOCs analyzed, none were detected.

10. Standard Reference: NOT APPLICABLE

Analyses of standard reference materials were not performed by Test America.

11. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

Appendix B6: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Round 1 RI Groundwater Samples

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. Analytical laboratories for this data set include Analytical Resources, Inc. (ARI); On Site Environmental; and Test America.

Groundwater samples were collected from 24 wells on April 1 to April 4, 2008 as part of the first of four rounds associated with the RI groundwater sampling program (PGG, 2007). Wells sampled include eighteen monitoring wells that are already routinely sampled in accordance with WAC 173-351 (quarterly), one monitoring well that is not routinely sampled, four new monitoring wells recently installed for the RI (November 2007), and one groundwater extraction well (EW-2). Samples collected from the new RI wells, and the one monitoring well that is not routinely sampled, were analyzed for the full suite of RI parameters as described in the SAP/QAPP (PGG, 2007). Samples collected from wells that are routinely monitored in accordance with WAC 173-351 were only analyzed for RI parameters that are not already included in the quarterly monitoring. For RI purposes the quarterly data from the existing WAC 173-351 wells will supplement the RI groundwater dataset and be included in the QA/QC assessment. Quarterly data to supplement this first round of the RI dataset were sampled on March 5 to March 6, 2008 (1st Quarter). **Table B6** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the March 2008 WAC-173-351 dataset and the April 2008 RI dataset.

1. March 2008 Quarterly Sampling Event

Eighteen water samples, one matrix spike sample, one matrix spike duplicate sample, and two trips blank samples were submitted to ARI laboratory as part of the routine WAC 173-351 quarterly monitoring. Samples were collected March 5 to March 6, 2008 (ARI ID ML56 and ML76).

The laboratory performed QA/QC analyses on water samples separately for VOCs, total metals, dissolved metals, and conventionals (e.g. alkalinity, total dissolved solids, chloride, nitrate, nitrite, sulfate, and total organic carbon).

The analytical results were found to be generally acceptable with respect to the QA/QC program. For ARI batch ML56, the lab narrative noted that Chloroethane had a Relative Percent Difference out of the control range with a high bias in the Closing Calibration. As the samples had no detections for this compound, there was no effect on data integrity.

These results were generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results.

b. Holding Times: ACCEPTABLE

Exception: BOD for EW-2

BOD was run a few hours over holding time from sample collected for EW-2 (lab batch ARI MQ18), otherwise, the holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample. The following surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene. The following surrogates were added to EW-2 sample for pesticides analysis: decachlorobiphenyl and tetrachlorometaxylene. The surrogate percent recovery ranges were within the acceptable ranges for all laboratory samples associated with the March 2008 sampling event.

d. Lab Control Sample: ACCEPTABLE

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

One LCS water sample was run for each laboratory run of VOC analytes. A second LCSD (duplicate) was also run on VOCs associated with ARI lab batch ML76. LCS and LCSD water sample was also run for pesticide analysis of EW-2, and LCS water samples were run for each laboratory run of total metals, dissolved metals, and conventionals.

All Lab Control analyte recoveries were within the laboratory quality control limits.

e. Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Matrix Spikes/Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

MS/MSD were run for VOCs analyses and MS were also for total metals, dissolved metals and conventionals.

The MS/MSD indicated acceptable percent recovery of analytes and acceptable relative percent differences (RPDs) for all analyses.

f. Lab Replicates: ACCEPTABLE

Laboratory replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

LR were performed on total and dissolved metals for MW-14a and conventionals for MW14a, MW-1a, MW2c and MW22c.

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

g. Field Trip Blanks: ACCEPTABLE

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks were run for VOC analyses. VOCs were not detected.

h. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20. Lab contamination was not found. All blanks resulted in non-detects.

i. Reported Detection Limits: ACCEPTABLE

Reported detection limits (RDLs) were found to be equivalent to levels previously negotiated with the lab for all analyses

except those where sample concentrations required dilution or re-extraction.

Sample MW-3b was diluted by a factor of three for reanalysis of chloroethane, cis-12-dichloroethene, and vinyl chloride and MW-7b was diluted by a factor of ten for reanalysis of chloroethane, 11-dichloroethane, and vinyl chloride. These procedures result in elevated detection limits, possibly above MTCA cleanup levels; however, these constituents were detected in the samples.

Reporting limits, which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the reported detection limits are within lab internal controls, the reporting limits are considered acceptable.

j. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

k. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

2. April 2008 RI Sampling Event

Three laboratories were utilized for the April 2008 RI sampling event. ARI performed analyses for VOCs, methane, ethene, ethane, metals and conventions (ARI ID MQ19, MQ70, MW90, and MQ91). On Site Environmental performed analyses for chloride and sulfate (On Site ID 0804-053). Test America performed analyses for dissolved CO2 (Test American ID E8D040298 and E8D040307).

Twenty-three water samples, one matrix spike sample, one matrix spike duplicate sample, three trips blank samples, and one field duplicate water sample were submitted to ARI laboratory. Five water samples, one matrix spike sample, and one matrix spike duplicate sample were submitted to On Site Environmental. Twenty-three water samples and one field duplicate water sample were submitted to Test America. All samples were received in good order except for the following:

Due to a miscue with the sample shipment, ARI received samples for ARI ID MQ70 one day later than expected. This resulted in nitrate analyses being out of holding time for MW-24a and MW-25a. The analysis was requested to not be run on these samples.

A shipment to Test America for analysis of dissolved CO_2 was sent overnight on Friday and was not received by the lab until Monday. The temperature of the cooler by Monday was too warm and considered out of control. The analysis was requested to not be run on these samples, which included MW-9b, MW-17a, MW-21c, MW-20c, MW-19b, MW7b, MW-3b, MW-30 (field duplicate) and MW-16d. These wells will be samples for dissolved CO_2 during the next sampling round.

The laboratories performed QA/QC analyses on water samples separately for VOCs, total metals, dissolved metals, conventionals, and dissolved CO_2.

The analytical results were found to be generally acceptable with respect to the QA/QC program. For ARI batch MQ19, the lab narrative noted that Iodomethane was recovered high in the Closing Calibration. As the samples themselves had no detections there was no effect on data integrity.

These results were generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results.

b. Holding Times: ACCEPTABLE

Exception: Total Kjeldahl Nitrogen (TKN).

The holding times were met for all analyses except for unpreserved TKN samples that were later preserved in the lab (see next section). These include the following samples: MW4c, MW2c, MW6c, MW6a, MW-1a, MW-11a, MW-23a, MW-10a, MW-23a, MW-10a, MW-14a, MW-5c, MW-9b, MW-17a, MW-21c, MW-20c, MW-19b, MW-7b, MW-3b, MW-16d. All wells were re-sampled for TKN the following round.

c. Preservative: ACCEPTABLE

Exception: All analyses for Total Kjeldahl Nitrogen (TKN).

Sample preservatives were met for all bottles except TKN. TKN samples were collected in unpreserved sample bottles due to bottle order error by the laboratory. A non-preserved sample would cause the concentration to be biased high. TKN analyses were performed on the unpreserved samples MW-28d, MW-24a, MW-25a, MW-26a, and MW-22c with an undetected result and considered sound. For the remaining samples a preservative was added by the lab three days after receipt and 1 week prior to the analysis. Technically, this qualifies as being run outside the holding time. TKN will be collected in preserved sample bottles during the next sampling event and datasets compared for validity.

d. Surrogate Spikes: ACCEPTABLE

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample. The following surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-toluene, bromo-fluorobenzene, and d4-12-dichlorobenzene. The following surrogates were added to all samples for VOC-SIM analyses: d4-12-dichloroethane and d8-toluene. Propane was added as a surrogate to all samples for methane, ethene and ethane (MEE).

The surrogate percent recovery ranges were within the acceptable ranges for all laboratory samples associated with the April 2008 sampling event.

e. Lab Control Sample: ACCEPTABLE

Exception: 2-Chloroethylvinylether biased high in LCS and corresponding RPD.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

One LCS and LCSD (duplicate) water samples were run for each laboratory run of VOC, VOC-SIMs, MEE and dissolved CO^2. LCS water samples were also run for each laboratory run of total metals, dissolved metals, conventionals (except ARI ID MW90), chloride, and sulfate.

All the Lab Control analyte recoveries were within the laboratory quality control limits and relative percent difference (RPD) except for the compound 2-chloroethyvinylether, which was recovered high in the LCS and corresponding relative percent difference (RPD) between the LCS and LCSD. The high bias with the LCS was still within ARI's Marginal Exceedance range, and the

LCSD recovery was well within control. Furthermore, since all samples were non-detects of this compound, no corrective action was taken.

f. Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: 2-Chloroethylvinylether biased high in MS/MSD. TKN biased low.

Matrix Spikes/Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

MS/MSD were run for VOCs, VOC-SIMs, and MEE on MW-17a. MS were also run for total metals, dissolved metals, and conventionals on MW-17a. An MS was also run for TKN on MW-24a, for nitrate on MW-4, for chloride on MW-17a, and sulfate on MW-17a.

The MS/MSD indicated acceptable percent recovery of analytes and acceptable relative percent differences (RPDs) for all analyses except for the following:

The compound 2-chloroethyvinylether recovery in the VOC MS/MSD run was biased high. Since all samples were non-detects of this compound, no corrective action was taken.

TKN recovery was biased low. The laboratory sites matrix effects. TKN samples are being collected again during the second round of sampling due to preservative and holding time issues (see above).

g. Lab Replicates: ACCEPTABLE

Laboratory replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

LR were performed on total and dissolved metals for MW-14a. LR were performed on conventionals for MW-28d, MW-24a, MW-4c, MW-17a. LR were performed on chloride and sulfate for MW-17a.

The relative percent difference between the original results and the LR results were all within control limits established by the labs.

h. Field Trip Blanks: ACCEPTABLE

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Field blanks were run for VOC, VOC-SIMs, and MEE analyses. Target analytes were not detected in any trip blanks.

i. Field Duplicate

One field duplicate was collected from MW-3b (labeled MW-30 on COC) for analysis of VOC-SIM, MEE, nitrate, nitrite, and TKN.

Relative percent differences (RPDs) were all acceptable (less than 20%).

j. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratories to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20. Lab contamination was not found. All blanks resulted in non-detects.

k. Reported Detection Limits: ACCEPTABLE

Reported detection limits (RDLs) were found to be equivalent to levels previously negotiated with the lab for all analyses except those where sample concentrations would have required dilution or re-extraction.

Five VOC-SIM samples were flagged “E” because of high concentrations: MW-22c for

tetrachloroethene (PCE), MW-5c for PCE, MW-9b for PCE and vinyl chloride, MW-7b for vinyl chloride, and MW-3b for vinyl chloride. Normally the lab would follow-up with a standard level VOC run (which would lower the RDL value), however these wells are routinely sampled at the standard level with the quarterly WAC 173-351 sampling and therefore a reanalysis was not perused.

Reporting limits, which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the reported detection limits are within lab internal controls, the reporting limits are considered acceptable.

l. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed by ARI for the conventional analytes. The percent recoveries were found to be within the control limits established by the lab.

m. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

Appendix B7: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Round 2 RI Groundwater Samples

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. Analytical laboratories for this data set include Analytical Resources, Inc. (ARI); On Site Environmental; and Test America.

Groundwater samples were collected from 23 wells on July 14 to July 16, 2008 as part of the second of four rounds associated with the RI groundwater sampling program (PGG, 2007). Wells sampled include eighteen monitoring wells that are already routinely sampled in accordance with WAC 173-351 (quarterly), two monitoring wells that are not routinely sampled, and three new monitoring wells recently installed for the RI (November 2007). A sample was not collected from the Frenchman Springs RI Monitoring well MW-28b due to pump failure. **Table B7** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the Round 2 RI dataset.

1. RI Round 2 Sampling Event

Twenty-three water samples, one matrix spike sample, one matrix spike duplicate sample, one field duplicate and three trips blank samples were submitted to ARI laboratory (ARI ID NG04, NG06, and NF59) for analyses of VOCs, SIM-VOCs, semi-volatiles, and inorganic compounds. Eighteen of the twenty-three water samples and one field duplicate were submitted to On Site Environmental for analyses of chloride and sulfate (On Site ID 0807-095 and 0807-122). Nine of the twenty-three water samples and one field duplicate were submitted to Test America for analysis of dissolved carbon dioxide (Test America ID LRG 0146).

The laboratories performed standard QA/QC analyses on the water samples and were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Table B2**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results.

b. Holding Times: ACCEPTABLE

Exception: nitrate and TDS

The holding times for nitrate analyses were exceeded by a factor of 1.2 for the following wells: MW-6a, MW-6c, MW-1a, MW-24a, and MW-11a.

The holding times for TDS analyses were exceeded by a factor of 3.3 for the following wells: MW-22c, MW-2c, and MW4c. The lab narrative indicates the original run was not reportable due to a failing method blank. The subsequent run had a compliant method blank but was performed after the holding time had technically expired.

Samples with holding times exceeded by a factor of 2 are qualified with "H" in result tables.

c. Surrogate Spikes: ACCEPTABLE

Exception: d4-12-dichloroethane was recovered high in trip blank during SIM-VOC analysis.

Surrogate spikes are known concentrations of compounds not normally found in

samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene. The following two surrogates were added to all samples for SIM-VOC analyses: d4-12-dichloroethane and d8-toluene. The following eight surrogates were added to all samples for semi-volatile analyses: d5-nitrobenzene, d14-p-terphenyl, d5-phenol, 246-tribromophenol, 2-fluorobiphenyl, d4-12-dichlorobenzene, 2-fluorophenol, d4-2-chlorophenol.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC and semi-volatile analyses as 3 to 4 standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the laboratory limits for all samples associated with the sampling event except the following.

The trip blank for SIM-VOC analysis had a high recovery of the surrogate d4-12-dichloroethane in lab batch ARI ng06. As the sample had no detections for the compound, it is considered irrelevant to the sample data.

d. Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: SIM-VOC recovered high, TKN recovered low.

Matrix Spikes/Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

MS/MSD analyses were run for VOCs, SIM-VOCs, and semi-volatiles. MS analyses were also run for metals and inorganic parameters.

The MS/MSD indicated acceptable percent recovery of all analytes except the following.

For ARI lab batch ID ng04, SIM-VOC recoveries were all biased high by a factor of about 1.2 (except for cis-12-dichloroethane) and the TKN recovery was biased low by a factor of 1.4.

ARI uses MS and MSD recoveries as advisory and not to assess the acceptability of an analytical batch, therefore no corrective actions were taken.

The relative percent differences (RPD) were all within laboratory limits or less than 20% if limits are not established by the lab except for 3,3-Dichlorobenzidine (RPD = 26.8%).

e. Method Blanks: ACCEPTABLE

Exception: Bis(2-ethylhexyl) phthalate and methylene chloride.

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20. Lab contamination was not found.

All blanks resulted in non- detects except the following.

Bis(2-ethylhexyl) phthalate was detected at the reporting detection limit (RDL) in ARI lab batch ID ng04.

Bis(2-ethylhexyl) phthalate was detected at RDL and methylene chloride was detected

slightly above the RDL in ARI lab batch ID nf59.

Samples with detectable bis(2-ethylhexyl) phthalate or methylene chloride from these lab batches are qualified with "B" in the results table.

f. Field Trip Blanks: ACCEPTABLE

Exception: Acetone and Toluene

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks for VOC and SIM-VOC analyses were run. No analytes were detected except for acetone detected just above the RDL and toluene at the RDL in ARI lab batch ID nf59. Since no samples from this batch had detectable concentrations of acetone or toluene, no action was taken.

g. Reported Detection Limits: ACCEPTABLE

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses except for VOC analyses from ARI lab batch ID's ng04 and ng06. For these batches a 5-mL purge volume method was used, rather than a 20-mL purge volume, which raises the RDL by an order of magnitude. This results in some detection limits possibly above the MTCA cleanup levels. See results table.

a. Field Duplicate

One field duplicate was collected from MW-3b (labeled MW-30 on COC) for analysis of all parameters.

Relative percent differences (RPDs) were all acceptable (less than 20%).

h. Lab Replicates: ACCEPTABLE

Laboratory replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

LR analyses were performed on total and dissolved metals for MW-14a and conventionals for MW14a and MW-23a MW-17a.

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

i. Lab Control Sample: ACCEPTABLE

Exception: TDS failed by 1%

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

LCS and LCSD (duplicate) water samples were run for VOC and SVOCs for each laboratory run. LCS water samples were also run for SVOCs, metals, and conventionals for each laboratory run. LCSD was also run for SVOCs for ARI lab batch ID ng06.

All the LCS and LCSD analyte recoveries were within the laboratory quality control limits except for TDS which failed by 1%. No action was taken by the lab.

The relative percent differences (RPD) between LCS and LCSD analyses were all

below 20% except hexachloroetheane (RPD = 28.9%)

j. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

k. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.o

l. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarize above include the following.

ARI lab batch ID ng04 and ng06 narrative indicated chloromethane and trichlorofluoromethane were recovered high in the closing calibration on 07/21/08. As the samples had no detection for these compounds, no action was taken. ARI lab batch ID ng06 also indicated a high chrysene recovery in internal standard associated with sample MW-3b. As the sample had no detections for this compound, no action was taken.

Table B1. Quality Assurance Quality Control Summary for Soils (Source Area Test Pits)

Lab Data Batch -------->	**ARI LL31**	**ARI LL32**	**ARI LL52**	**ARI LL64**
METHODOLOGY				
Method	Good	Good	Good	Good
Date Sampled	ok	ok	ok	ok
Date Extracted	n/a	n/a	n/a	n/a
Date Analyzed	ok	ok	ok	ok
Holding Time	ok	ok	ok	ok
Acceptability	YES	YES	YES	YES
SURROGATE SPIKES				
Surrogate Used	Yes (four of them)	Yes (four of them)	Yes (four of them)	Yes (four of them)
Sample Spike Recovery	fine	fine	fine	fine
Control Spike Recovery				
Acceptability	Good	Good	Good	Good
MS/DMS				
MS Recovery	Fine except for chloroethane, iron, manganese, and sulfate	Fine except for arsenic, iron, and manganese	Fine except for dichlorobenzene and iron	Fine except for dichlorobenzene, chloromethane, & vinyl chloride, and tetrachloroethene as well as arsenic, iron, and manganese
DMS Recovery	Fine	Fine	Fine	Fine except for tetrachloroethene, chloromethane, & vinyl chloride
RPD	Fine except for chloroethane	Fine except for arsenic	Fine	Fine
Acceptability	Fine	Fine	Fine	Fine
METHOD BLANK	YES	YES	YES	YES
Detections	none	none except for methylene chloride	none	none
Surrogate Recovery	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES
TRIP BLANK	None	None	YES	None
Detections			none	
Acceptability			fine	
MDLs				
Regulation/Method				
Lab				
Acceptability	OK	OK	OK	OK
FIELD DUPLICATES	none	none	none	YES
Sample:				T-12-7, 51-1, 51-2, 51-3, 51-4
RPD				Significant sample heterogeneity
Acceptability				Not acceptable test
LAB DUPLICATES				
Sample	not done	not done	not done	not done
RPD				
Acceptability				
LAB CONTROL	YES	YES	YES	YES
Spike Recovery	fine	fine	fine	fine
Surrogate Recovery	fine	fine	fine	fine
Spike Dupl. Recovery	fine	fine	fine	fine except for tetrachloroethene
RPD	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES
STANDARD REFERENCE	Done for conventionals	Done for conventionals	Done for conventionals	Done for conventionals
Recovery	good	good	good	good
FIELD BLANKS	none	none	none	none
COC	YES	YES	YES	YES
Acceptability	fine	fine	fine	fine

Table B2. Quality Assurance Quality Control Summary for Soils (Source Area Exploratory Borings)

Lab Data Batch -------->	ARI LQ08	ARI LQ36	ARI LQ53	ARI LQ61
METHODOLOGY				
Method	Good	Good	Good	Good
Date Sampled	ok	ok	ok	ok
Date Extracted	n/a	n/a	n/a	n/a
Date Analyzed	ok	ok	ok	ok
Holding Time	ok	ok	ok	ok
Acceptability	YES	YES	YES	YES
SURROGATE SPIKES				
Surrogate Used	Yes (four of them)	Yes (four of them)	Yes (four of them)	Yes (four of them)
Sample Spike Recovery	fine	fine	out of control for B-13-37	fine
Control Spike Recovery				
Acceptability	Good	Good	Good	Good
MS/DMS				
MS Recovery	Fine	Fine	B-12-10 sample conc. Too high for Fe and Mn	B-16-14 sample conc. Too high for Fe and Mn and out of control for As.
DMS Recovery	Fine	Fine	Fine	Fine
RPD	Fine	Fine	Fine	Fine
Acceptability	Fine	Fine	Fine	Fine
METHOD BLANK				
Detections	YES	YES	YES	YES
Surrogate Recovery	none	none	none	none
Acceptability	fine	fine	fine	fine
	YES	YES	YES	YES
TRIP BLANK	Yes	Yes	Yes	Yes
Detections	none	none	none	none
Acceptability	Fine	Fine	Fine	Fine
MDLs				
Regulation/Method				
Lab	OK	OK	OK	OK
Acceptability				
FIELD DUPLICATES	not done	not done	not done	not done
Sample:				
RPD				
Acceptability				
LAB DUPLICATES	none	none	none	none
Sample				
RPD				
Acceptability				
LAB CONTROL	YES	YES	YES	YES
Spike Recovery	fine	fine	fine	fine
Surrogate Recovery	fine	fine	fine	fine
Spike Dupl. Recovery	fine	fine	fine	fine
RPD	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES
STANDARD REFERENCE	Done for conventionals	Done for conventionals	Done for conventionals	Done for conventionals
Recovery	good	good	good	good
FIELD BLANKS	none	none	none	none
COC	YES	YES	YES	YES
Acceptability	fine	fine	fine	fine

Table B3. Quality Assurance Quality Control Summary for Soil-Below-Drums Samples

Dataset from ARI -------->	ne08	Dataset from ARI -------->	ne09
CHAIN OF CUSTODY	YES	**CHAIN OF CUSTODY**	YES
Acceptability	Fine	Acceptability	Fine
METHODOLOGY		**METHODOLOGY**	
Method	Good	Method	Good
Date Sampled	ok	Date Sampled	ok
Date Extracted	n/a	Date Extracted	n/a
Date Analyzed	ok	Date Analyzed	ok
Holding Time	ok	Holding Time	ok
Acceptability	YES	Acceptability	YES
Semivolatiles (ne08)		**Volatiles (ne09)**	
SURROGATE SPIKES		**SURROGATE SPIKES**	
Surrogate Used	Yes (4 acid compounds and 4 base compounds)[1]	Surrogate Used	Yes (4 compounds)[2]
Sample Surrogate Recovery	Fine (S-9 and S-10 out of control LOW for d5-Nitrobenzene then samples required dilution and surrogate compound ND due to dilition. Since only one surrogate, no "J" qualifier neccessary)	Sample Surrogate Recovery	Fine
Acceptability	Good	Acceptability	Good
METHOD BLANK		**METHOD BLANK**	
Detections	None	Detections	One (7/08/08: Metylene Chloride, slightly above DL, affects samples S-6 and S-11, which are "B" Qualified)
Surrogate Recovery	Fine	Surrogate Recovery	Fine
Acceptability	**Good**	Acceptability	**Good**
LAB CONTROL		**LAB CONTROL**	
Spike Recovery	Fine (7/19/08 analysis only: Benzoic acid out of control low likely due to sulfate in extraction process)	Spike Recovery	Fine
Spike Dupl. Recovery	Fine (7/19/08 analysis only: Benzoic acid out of control low likely due to sulfate in extraction process)	Spike Dupl. Recovery	Fine
Surrogate Recovery	Fine	Surrogate Recovery	Fine
RPD	Fine	RPD	Fine
Acceptability	**Good**	Acceptability	**Good**
Herbicides (ne08)		**MS/MSD**	sample S-2
SURROGATE SPIKES		MS Recovery	Fine
Surrogate Used	Yes (2,4-Dichlorophenylacetic Acid)	DMS Recovery	Fine
Surrogate Recovery	Fine (out of limit for 3 samples, but all ND)	RPD	Fine
Acceptability	**Good**	Acceptability	**Good**
METHOD BLANK			
Detections	None		
Surrogate Recovery	Fine		
Acceptability	**Good**		
LAB CONTROL			
Spike Recovery	Fine (except Dinoseb, known poor performer)		
Spike Dupl. Recovery	Fine (except Dinoseb, known poor performer)		
Surrogate Recovery	Fine		
RPD	Fine (except Dinoseb, known poor performer)		
Acceptability	**Good**		
Pesticides (ne08)			
SURROGATE SPIKES			
Surrogate Used	Yes (Decachlorobiphenyl and Tetrachlorometaxylene)		
Sample Surrogate Recovery	Fine (Decachlorobiphenyl out of control HIGH for 2 samples, samples ND so irrelevant. Surrogate not recovered (NR) for Tetrachlorometaxylene due to intereference from Aroclors)		
Acceptability	**Good**		
METHOD BLANK			
Detections	None		
Surrogate Recovery	Fine		
Acceptability	**Good**		
LAB CONTROL			
Spike Recovery	Fine		
Spike Dupl. Recovery	Fine		
Surrogate Recovery	Fine		
RPD	Fine		
Acceptability	**Good**		

Table B3. Quality Assurance Quality Control Summary for Soil-Below-Drums Samples

PCBs (ne08)			
SURROGATE SPIKES			
Surrogate Used	Yes (Decachlorobiphenyl and Tetrachlorometaxylene)		
Sample Surrogate Recovery	Fine (Decachlorobiphenyl out of control high for one sample and Tetrachlorometaxylene out of control high for two samples, due sample matrix influences)		
Acceptability	**Good**		
METHOD BLANK			
Detections	None		
Surrogate Recovery	Fine		
Acceptability	**Good**		
LAB CONTROL			
Spike Recovery	Fine		
Spike Dupl. Recovery	Fine		
Surrogate Recovery	Fine		
RPD	Fine		
Acceptability	**Good**		
TOTAL METALS (ne08)			
MS/DMS			
MS Recovery	Fine (except low for antimony and copper)		
DMS Recovery	Not Performed		
RPD	NA		
Blank Spike	Fine		
Method Blank	Fine		
Acceptability	**Good**		
CONVENTIONALS (ne08)			
MS/DMS			
MS Recovery	Fine (Total Cyanide out of limit due to sample dilution)		
DMS Recovery	Fine (Total Cyanide out of limit due to sample dilution)		
RPD	Fine		
Standard Refrence Results	Fine		
Acceptability	**Good**		
TRIP BLANK	None	**TRIP BLANK**	None
FIELD BLANKS	None	**FIELD BLANKS**	None
MDLs		**MDLs**	
Acceptability	OK	Acceptability	OK
[1] 2,4,6-Tribromophenol 2-Fluorobiphenyl 2-Fluorophenol d14-p-Terphenyl d4-1,2-Dichlorobenzene d4-2-Chlorophenol d5-Nitrobenzene d5-Phenol		[2] d4-1,2-Dichloroethane d8-Toluene Bromofluorobenzene d4-1,2-Dichlorobenzene	

Table B4. Quality Assurance Quality Control Summary for Residual Drum Soils

Dataset from ARI --------> sample names	nh08 (16, -B at rock)	ni71 and ni72 (SS-1 to SS-9)	nj40 and nj41 (SS-10 and SS-11)
CHAIN OF CUSTODY	YES	YES	YES
Acceptability	Fine	Fine	Fine
METHODOLOGY			
Method	Good	Good	Good
Date Sampled	ok	ok	ok
Date Extracted	n/a	n/a	n/a
Date Analyzed	ok	ok	ok
Holding Time	ok	ok	ok
Acceptability	YES	YES	YES
Semivolatiles			
SURROGATE SPIKES			
Surrogate Used	Yes (4 acid compounds and 4 base compounds)[1]	Yes (4 acid compounds and 4 base compounds)[1]	Yes (4 acid compounds and 4 base compounds)[1]
Sample Surrogate Recovery	Fine	Fine (out of control LOW for 2-Fluorophenol in 2 samples and d5-Phenol in one sample re-extraction was ruled out by Lab QA Supervisor)	Fine
Acceptability	Good	Good	Good
METHOD BLANK			
Detections	None	None	None
Surrogate Recovery	Fine	Fine	Fine
Acceptability	**Good**	**Good**	**Good**
LAB CONTROL			
Spike Recovery	Fine	Fine	Fine
Spike Dupl. Recovery	Fine	Fine	n/a
Surrogate Recovery	Fine	Fine	Fine
RPD	Fine	Fine	n/a
Acceptability	**Good**	**Good**	**Good**
PCBs			
SURROGATE SPIKES			
Surrogate Used	Yes (Decachlorobiphenyl and Tetrachlorometaxylene)	Yes (Decachlorobiphenyl and Tetrachlorometaxylene)	Yes (Decachlorobiphenyl and Tetrachlorometaxylene)
Sample Surrogate Recovery	Fine (Tetrachlorometaxylene out of control high for one GC column)	Fine (Tetrachlorometaxylene out of control high for one sample for one GC column, and for a second sample due to enhanced Matrix Effect)	Fine
Acceptability	**Good**	**Good**	**Good**
METHOD BLANK			
Detections	None	None	None
Surrogate Recovery	Fine	Fine	Fine
Acceptability	**Good**	**Good**	**Good**
LAB CONTROL			
Spike Recovery	Fine	Fine	Fine
Spike Dupl. Recovery	n/a	Fine	Fine
Surrogate Recovery	Fine	Fine	Fine
RPD	n/a	Fine	Fine
Acceptability	**Good**	**Good**	**Good**
TOTAL METALS			
MS Recovery	n/a	n/a	n/a
DMS Recovery	n/a	n/a	n/a
RPD	n/a	n/a	n/a
Method Blank	Fine	Fine	Fine
Lab Control Blank Spike	Fine	Fine	Fine
Acceptability	**Good**	**Good**	**Good**
CONVENTIONALS			
MS/DMS			
MS Recovery	Fine	Fine	Fine
DMS Recovery	Fine	Fine	Fine
RPD	Fine	Fine (Nitrate+Nitrite high RPD due to low concentration)	Fine
Method blank	Fine	Fine	Fine
Standard Refrence Results	Fine	Fine	Fine
Acceptability	**Good**	**Good**	**Good**

Table B4. Quality Assurance Quality Control Summary for Residual Drum Soils

Dataset from ARI --------> sample names	nh08 (16, -B at rock)	ni71 and ni72 (SS-1 to SS-9)	nj40 and nj41 (SS-10 and SS-11)
Volatiles			
SURROGATE SPIKES			
Surrogate Used	Yes (4 compounds)[2]	Yes (4 compounds)[2]	Yes (4 compounds)[2]
Sample Surrogate Recovery	Fine	Fine	Fine
Acceptability	Good	Good	Good
TRIP BLANK			
Detections	None	None	n/a
Surrogate Recovery	Fine	Fine	n/a
Acceptability	**Good**	**Good**	n/a
METHOD BLANK			
Detections	None	Methylene Chloride in 8/04/08 MBs (sample detects are "B" qualified)	None
Surrogate Recovery	Fine	Fine	Fine
Acceptability	**Good**	**Good**	**Good**
LAB CONTROL			
Spike Recovery	Fine	Fine	Fine
Spike Dupl. Recovery	Fine	Fine	Fine
Surrogate Recovery	Fine	Fine	Fine
RPD	Fine	Fine	Fine
Acceptability	**Good**	**Good**	**Good**
FIELD BLANKS	None	None	None
MDLs			
Acceptability	OK	OK	OK
TPH-D			
SURROGATE SPIKES			
Surrogate Used	o-Terphenyl	n/a	n/a
Sample Surrogate Recovery	Fine	n/a	n/a
Acceptability	**Good**	n/a	n/a
METHOD BLANK			
Detections	None	n/a	n/a
Surrogate Recovery	Fine	n/a	n/a
Acceptability	**Good**	n/a	n/a
LAB CONTROL			
Spike Recovery	Fine	n/a	n/a
Surrogate Recovery	Fine	n/a	n/a
Acceptability	**Good**	n/a	n/a
TPH-HCID			
SURROGATE SPIKES			
Surrogate Used	n/a	n/a	o-Terphenyl
Sample Surrogate Recovery	n/a	n/a	Fine
Acceptability	n/a	n/a	**Good**
METHOD BLANK			
Detections	n/a	n/a	None
Surrogate Recovery	n/a	n/a	Fine
Acceptability	n/a	n/a	**Good**
	[1] 2,4,6-Tribromophenol 2-Fluorobiphenyl 2-Fluorophenol d14-p-Terphenyl d4-1,2-Dichlorobenzene d4-2-Chlorophenol d5-Nitrobenzene d5-Phenol		

Table B5. Quality Assurance Quality Control Summary for Gas

Dataset from Test America----->		BQIO129	BQIO463
METHODOLOGY			
Method		Fine	Fine
Date Sampled		Good	Good
Date Extracted		Good	Good
Date Analyzed		Good	Good
Holding Time		Good	Good
Acceptability		Fine	Fine
SURROGATE SPIKES			
Surrogate Used		Yes	Yes
Sample Spike Recovery		Fine	Fine
Control Spike Recovery		Fine	Fine
Acceptability		Fine	Fine
MS/MSD		none	none
MS Recovery			
DMS Recovery			
RPD			
Acceptability			
METHOD BLANK		Yes	Yes
Detections		none	none
Surrogate Recovery		Yes	Yes
Acceptability		Yes	Yes
TRIP BLANK		none	none
Detections			
Acceptability			
MDLs			
Regulation/Method			
Lab		Fine	Fine
Acceptability			
FIELD DUPLICATES		Yes	none
Sample:			
RPD		Fine	
Acceptability		Yes	
LAB DUPLICATES		Yes	none
Sample		ok	
RPD		Good	
Acceptability		Fine	
LAB CONTROL		Yes	Yes
Spike Recovery		Fine	Fine
Surrogate Recovery		Fine	Fine
Spike Dupl. Recovery		Fine	Fine
RPD		Fine	Fine
Acceptability		Yes	Yes
STANDARD REFERENCE		None	None
Recovery			
FIELD BLANKS		Fine	none
COC		YES	YES
Acceptability		Fine	Fine

Table B6. Quality Assurance Quality Control Summary for Groundwater (Round 1)

Lab Data Batch -------->	ARI ML56 (Q12008)	ARI ML76 (Q12008)	ARI MQ18 (RI) EW-2	ARI MQ19 (RI) MW-28d	ARI MQ70 (RI)	ARI ARI MQ90 (RI)	ARI MQ91 (RI)	On Site 0804-053 (RI)	Test America E8D040298 (RI)	Test America E8D040307 (RI)
METHODOLOGY										
Method	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Date Sampled	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Date Analyzed	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Holding Time	ok	ok	BOD few hours outside holding time.	ok	ok	TKN samples	TKN samples	ok	ok	ok
Preservative	ok	ok	ok	TKN not preserved	ok	TKN not preserved	TKN not preserved	ok	ok	ok
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
SURROGATE SPIKES										
Surrogate Used	Yes (4 for VOC)	Yes (4 for VOC)	Yes (2 for Pesticides)	Yes (4 for VOC, 2 for VOC-SIM, 1 for MEE)	Yes (4 for VOC, 2 for VOC-SIM, 1 for MEE)	Yes (2 for VOC-SIM, 1 for MEE)	Yes (4 for VOC, 2 for VOC-SIM, 1 for MEE)	None	None	None
Sample Spike Recovery	fine	fine	fine	fine	fine	fine	fine	NA	NA	NA
Control Spike Recovery	fine	fine	fine	fine	fine	fine	fine	NA	NA	NA
Acceptability	Good	Good	Good	Good	Good	Good	Good	NA	NA	NA
MS/MSD										
MS Recovery	Fine	Fine	None	None	TKN biased Low	Fine	2-Chloroethylvinylether biased high	Fine	None	None
MSD Recovery	Fine	Fine	None	None	TKN biased Low	None	2-Chloroethylvinylether biased high	None	None	None
RPD	Fine	Fine	NA	NA	NA	NA	Out of Control	NA	NA	NA
Acceptability	Fine	Fine	NA	NA	Fine (Wells being resampled)	Fine	Fine	Fine	NA	NA
METHOD BLANK	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Detections	none	none	none	none	none	none	none	none	none	none
Surrogate Recovery	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
TRIP BLANK	YES (VOC)	YES (VOC)	None	YES (VOC and VOC-SIM)	None	YES (VOC-SIM and MEE)	YES (VOC, VOC-SIM, MEE)	None	None	None
Detections	none	none	NA	none	NA	none	none	NA	NA	NA
Acceptability	Fine	Fine	NA	Fine	NA	Fine	Fine	NA	NA	NA
RDL										
Regulation/Method										
Lab	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
FIELD DUPLICATES	not done	not done	not done	not done	not done	not done	Yes	not done	not done	not done
Sample:							MW-3b			
RPD							Less than 20%			
Acceptability							YES			
LAB DUPLICATES	YES (metals & conventionals)	YES (metals & conventionals)	none	YES (conventionals)	YES (conventionals)	YES (conventionals)	YES (metals & conventionals)	YES (chloride & sulfate)	none	none
Sample	MW-14a & MW-1a	MW-2c & MW-22c	NA	MW-28d	MW-24a	MW-4c	MW-17a & MW-17a	MW-17a	NA	NA
RPD	fine	fine	NA	fine	fine	fine	fine	fine	NA	NA
Acceptability	YES	YES	NA	YES	YES	YES	YES	YES	NA	NA
LAB CONTROL	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Spike Recovery	fine	fine	fine	fine	fine	fine	2-Chloroethylvinylether biased high	fine	fine	fine
Surrogate Recovery	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine
Spike Dupl. Recovery	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine
RPD	fine	fine	fine	fine	fine	fine	high	fine	fine	fine
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
STANDARD REFERENCE	Done for conventionals	Done for conventionals	None	Done for conventionals	Done for conventionals	Done for conventionals	Done for conventionals	None	None	None
Recovery	good	good	NA	good	good	good	good	NA	NA	NA
COC	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Acceptability	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine

Table B7. Quality Assurance Quality Control Summary for Groundwater (Round 2)

Lab Data Batch -------->	Lab Batch ARI NG04	Lab Batch ARI NG06	Lab Batch ARI NF59	Lab Batch On Site 0807-095	Lab Batch On Site 0807-122	Lab Batch Test America LRG 0146
METHODOLOGY						
Method	Good	Good	Good	Good	Good	Good
Date Sampled	ok	ok	ok	ok	ok	ok
Date Analyzed	ok	ok	ok	ok	ok	ok
Holding Time	Nitrate holding time exceeded by a factor of 1.2 for MW-6a, MW-6c, MW-1a, MW-24a, and MW-11a	ok	TDS holding time exceeded by factor of 3.3	ok	ok	ok
Preservative	ok	ok	ok	ok	ok	ok
Acceptability	YES	YES	YES	YES	YES	YES
SURROGATE SPIKES						
Surrogate Used	Yes (4 for VOC and 2 for SIM-VOA and 8 for SVOCs)	Yes (4 for VOC and 2 for SIM-VOA and 8 for SVOCs)	Yes (4 for VOC and 2 for SIM-VOA and 8 for SVOCs)	None	None	None
Sample Spike Recovery	fine	fine	fine	na	na	na
Control Spike Recovery	fine	High recovery in TB for d4-1,2-Dichloroethane	fine	na	na	na
Acceptability	YES	YES No detects in Samples	YES	na	na	na
MS/MSD	Yes (VOCs, SIM VOAs, SVOCs, MS for Metals, and MS for Conventionals)	Yes (VOCs, TKN)	None	Yes (Chloride and Sulfate)	Yes (Chloride and Sulfate)	None
MS Recovery	SIM-VOA recovered high by factor of 1.2 (except cis-12-dichloroethane); TKN recovered low by factor of 1.4	fine	na	fine	fine	na
MSD Recovery	SIM-VOA recovered high by factor of 1.2 (except cis-12-dichloroethane)	fine	na	fine	fine	na
RPD	Good, except 3,3-Dichlorobenzidine (RPD = 26.8%)	fine	na	fine	fine	na
Acceptability	YES	YES	na	YES	YES	na
METHOD BLANK	Yes (VOCs - 2 batches, SIM-VOAs, SVOCs, Metals, and Conventionals)	Yes (VOCs, SIM-VOAs - 2 batches, SVOCS, Metals, Conventionals)	Yes (VOCs, SIM-VOAs, SVOCs, Metals, Conventionals)	Yes (Chloride and Sulfate)	Yes (Chloride and Sulfate)	Yes
Detections	Bis(2-ethylhexyl) phthalate detected at RDL	none	Methlene chloride detected slightly above RDL; bis(2-ethylhexyl) phthalate detected at RDL	None	None	None
Surrogate Recovery	fine	fine	fine	na	na	na
Acceptability	YES	YES	YES	YES	YES	YES
TRIP BLANK	Yes (one for VOC and one for SIM-VOA)	YES (one for VOC and SIM-VOA)	Yes (one for VOC and SIM-VOA)	No	No	NO
Detections	none	none	Acetone detected just above RDL and Toluene detected at RDL	na	na	na
Acceptability	YES	YES	YES	na	na	na
RDL	High on VOCs (5-mL purge volume used)	High on VOCs (5-mL purge volume used)				
Regulation/Method	ok	ok	ok	ok	ok	ok
Lab	ok	ok	ok	ok	ok	ok
Acceptability	YES	YES	YES	YES	YES	YES
FIELD DUPLICATES	none	One Duplicate	none	none	none	Yes
Sample:	NA	MW-3b (labeled as MW-30)	NA	NA	NA	MW-3b (Labeled MW-30)
RPD	NA	0 to 15%	NA	NA	NA	less than 4%
Acceptability	NA	YES	NA	NA	NA	YES
LAB DUPLICATES	YES (metals and conventionals)	Yes (Conventionals)	No	No	No	No
Sample	MW-14a (metals and conventionals) MW-23a (conventionals)	MW-17a	na	na	na	na
RPD	fine	fine	na	na	na	na
Acceptability	YES	YES	na	na	na	na
LAB CONTROL	Yes (LCS and LCSD for VOCs and SIM-VOA; LCS for SVOCs, Metals, and TDS)	YES (LCS and LCSD for VOCs, SIM-VOAs, and SVOCs; LCS for Metals and TDS)	Yes (LCS and LCSD for VOCs and SIM-VOAs; LCS for SVOC and TDS)	Yes (LCS for Chloride and Sulfate)	Yes (LCS for Chloride and Sulfate)	Yes
Spike Recovery	TDS failed by 1%	TDS failed by 1%	fine	fine	fine	fine
Surrogate Recovery	fine	fine	fine	na	na	na
Spike Dupl. Recovery	fine	fine	fine	Not Done	Not Done	fine
RPD	good	Good except Hexachloroetheane (RPD = 28.9%)	Good	na	na	Good
Acceptability	YES	YES	YES	YES	YES	YES
STANDARD REFERENCE	Done for conventionals	Done for conventionals	Done for conventionals	No	No	NO
Recovery	good	good	good	na	na	na
COC	yes	yes	yes	yes	yes	yes
Acceptability	YES	YES	YES	YES	YES	YES
LAB REPORT	Cover Report	Cover Report	Cover Report	Cover Report	Cover Report	Cover Report
Additional Information	Chloromethane and Trichlorofluoromethane were recovered high in Closing Calibration on 07/21/08	Chloromethane and Trichlorofluoromethane were recovered high in Closing Calibration on 07/21/08. High Chrysene recovery in internal standard associated with sample MW-3b	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES	YES	YES

P 206.329.0141 | **F** 206.329.6968

2377 Eastlake Avenue East | Seattle, WA 98102

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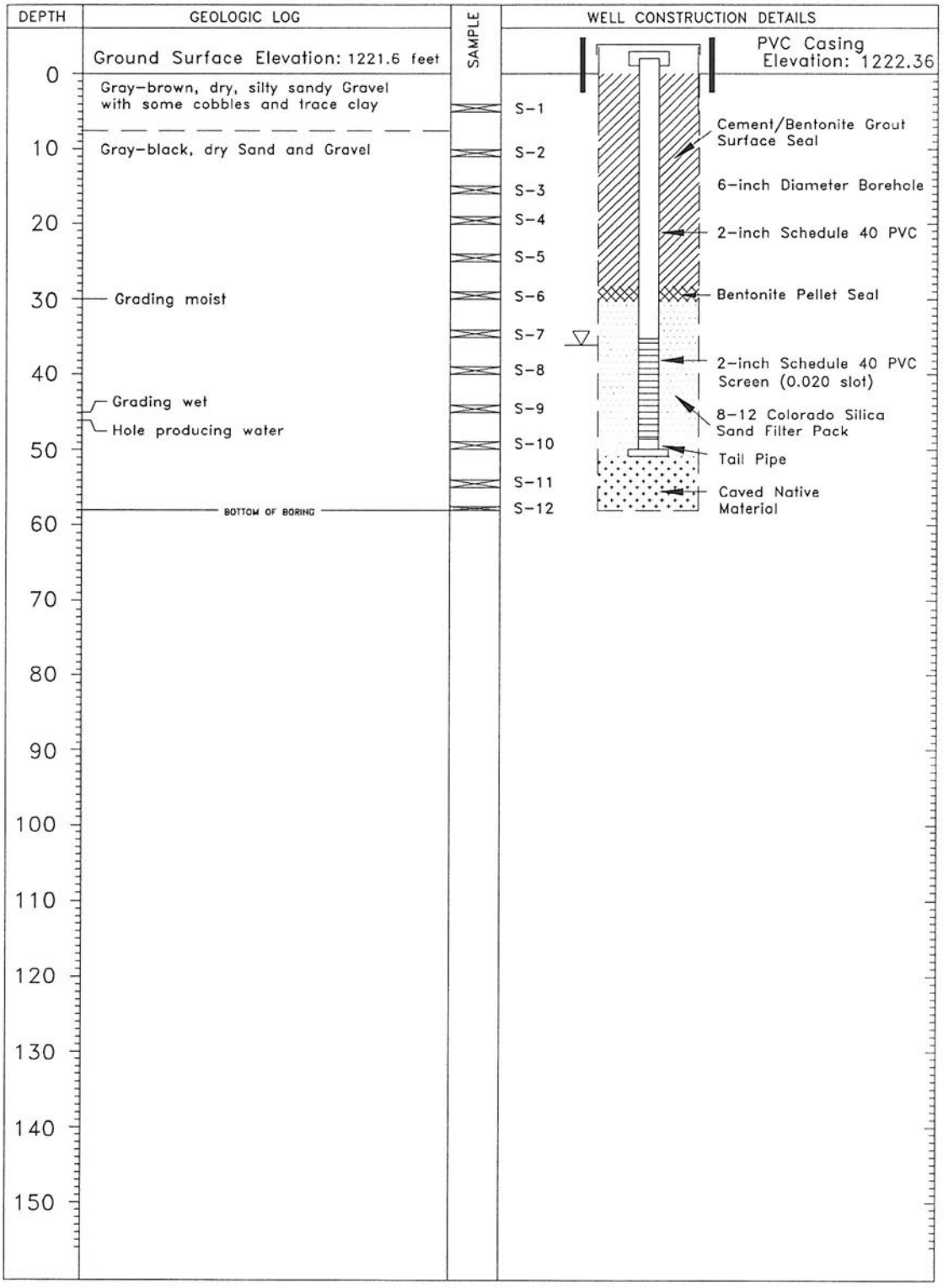
P 360.570.8244 | **F** 360.570.0064

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MW-1 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



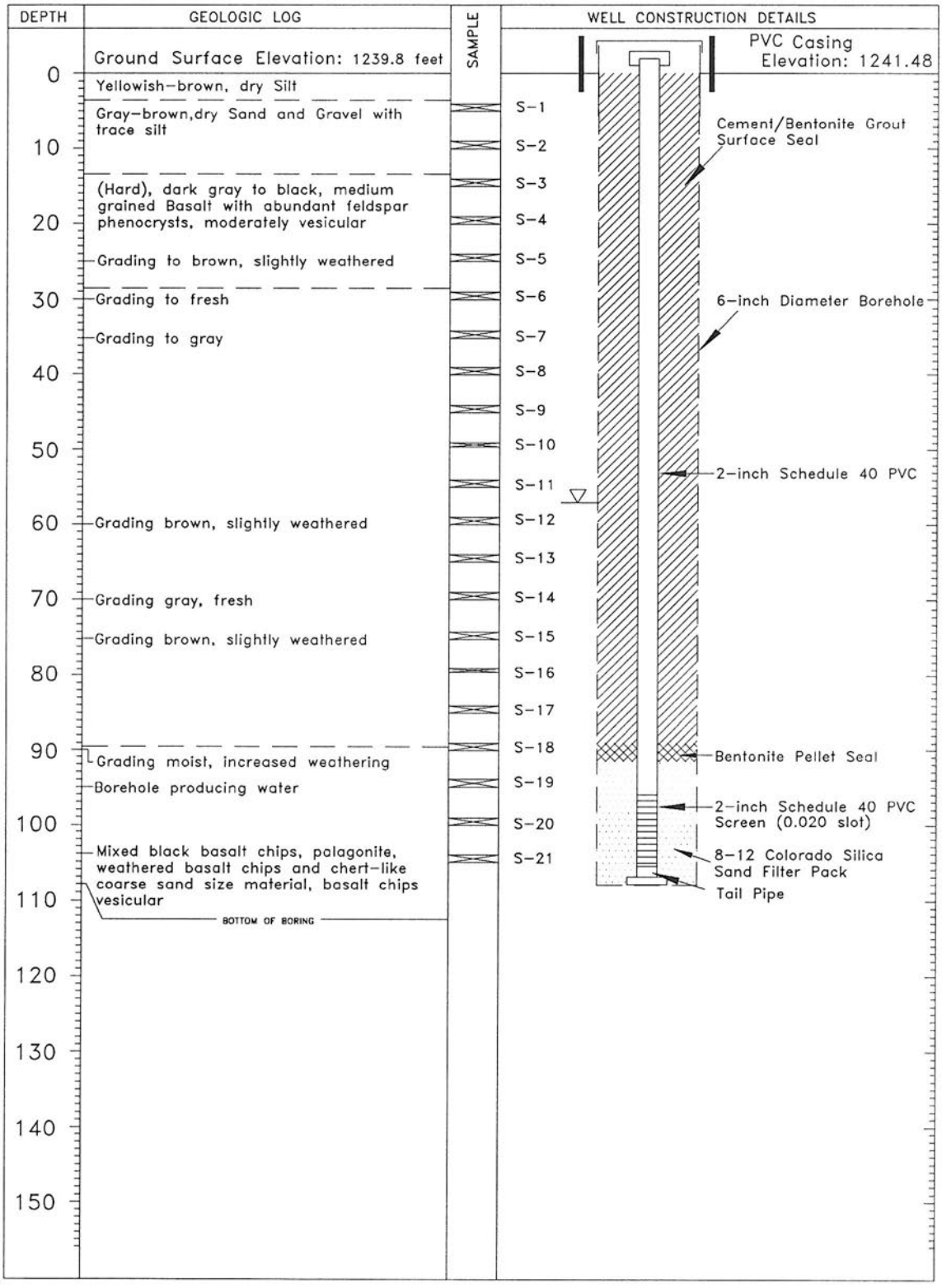
Blowback Sample of Cuttings
Push Sample (Thin Walled Tube)
* No Recovery

PACIFIC GROUNDWATER GROUP
JE8902

PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW-1
DRILLING METHOD: Air Rotary
DRILLER: Chuck Ketvirtis
FIRM: Soil Sampling Service
CONSULTING FIRM: BVWST and PGG
REPRESENTATIVE: Janette Black

LOCATION: NW ¼ SW ¼ ,SEC. 33, T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION: 1186.87 (Nov. 1989)
INSTALLED: 6/1/89
DEVELOPED: 7/6/89
START CARD NO.:

MW-2 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



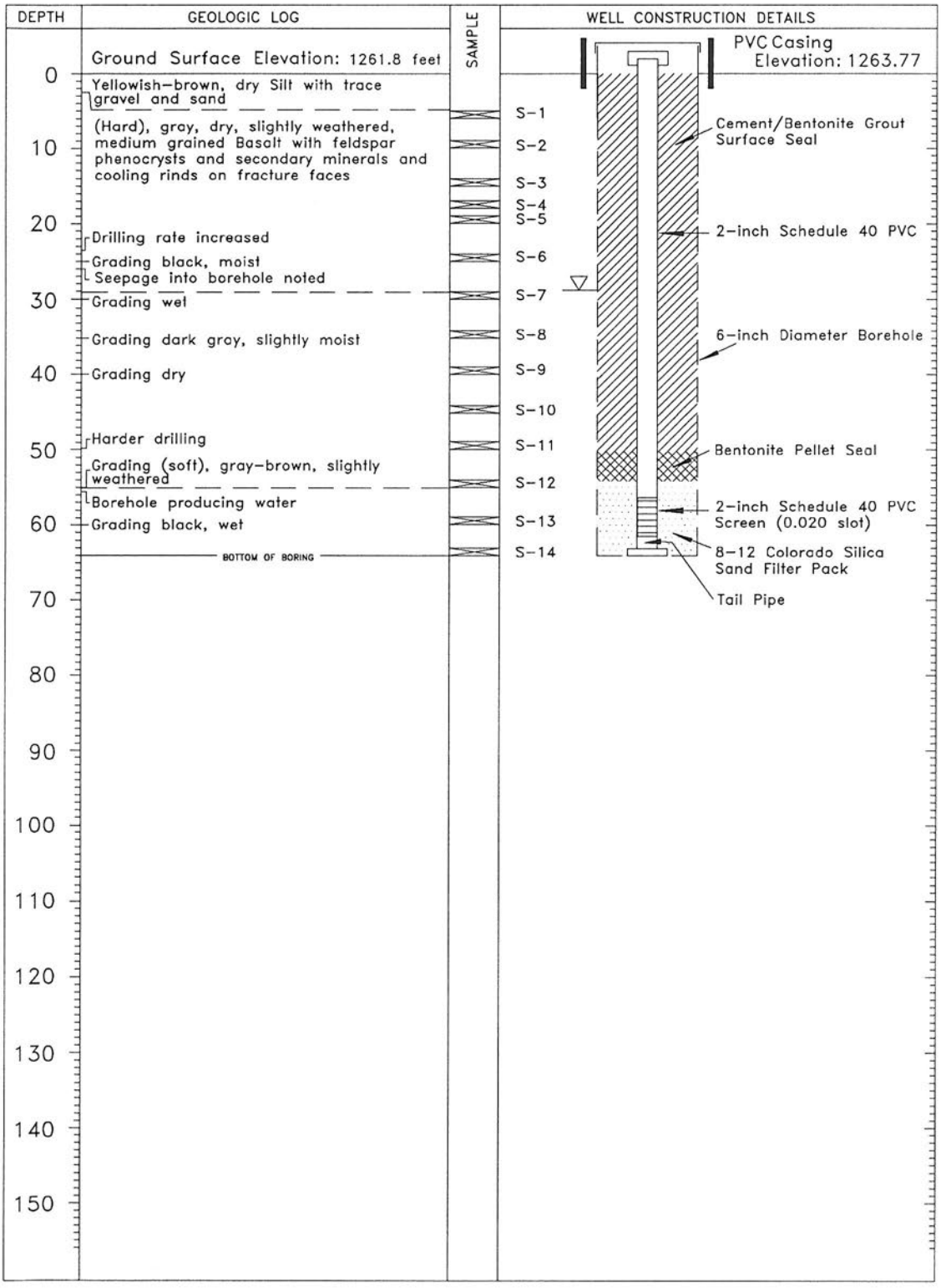
Blowback Sample of Cuttings
Push Sample (Thin Walled Tube)
* No Recovery

PACIFIC GROUNDWATER GROUP
JE8902

PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW-2
DRILLING METHOD: Air Rotary
DRILLER: Chuck Ketvirtis
FIRM: Soil Sampling Service
CONSULTING FIRM: BVWST and PGG
REPRESENTATIVE: Rajeev Dwivedi

LOCATION: SW ¼ NW ¼, SEC. 33, T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION: 1186.99 (Nov. 1989)
INSTALLED: 6/3/89
DEVELOPED: 7/6/89
START CARD NO.:

MW-3 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



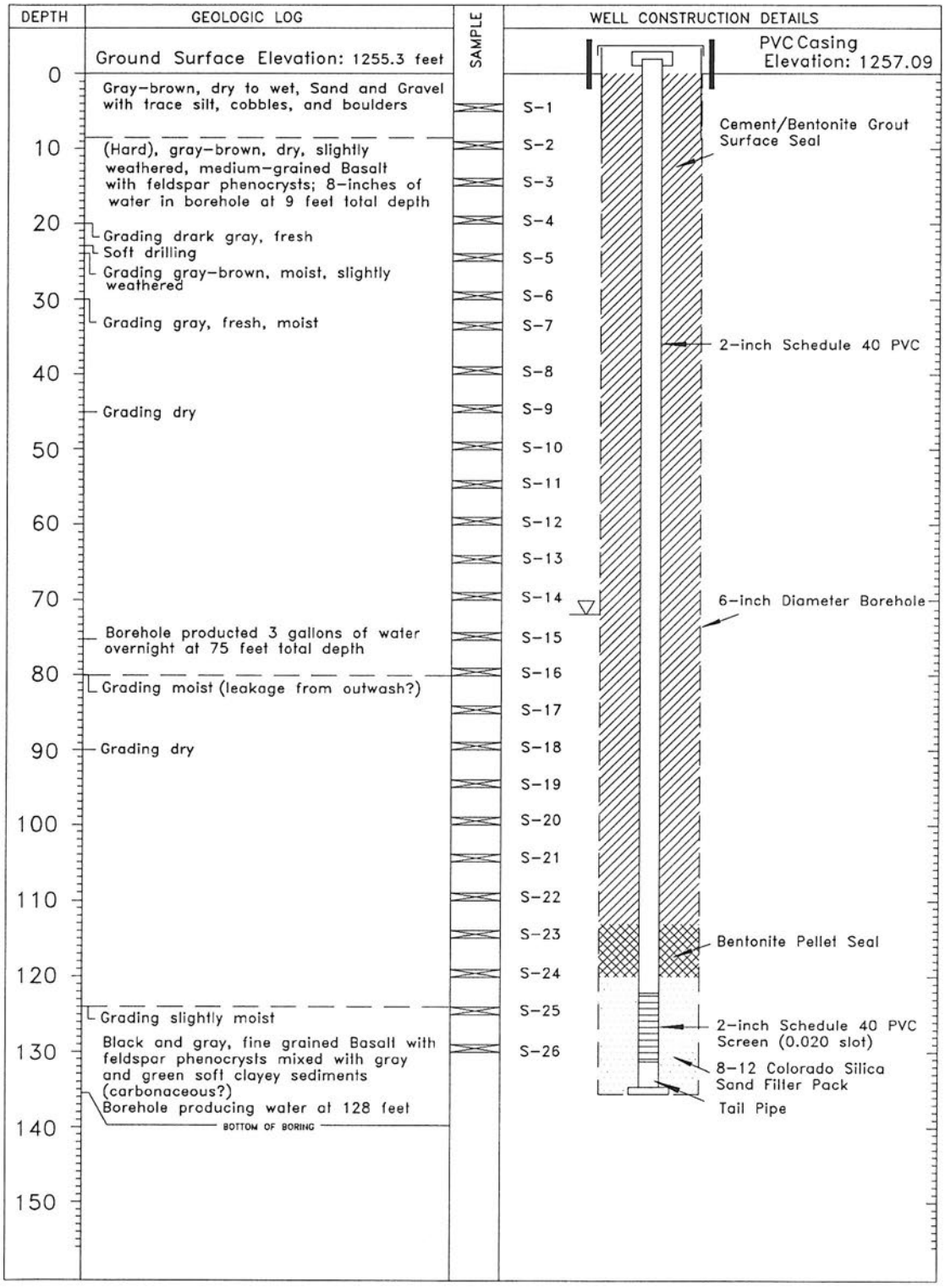
Blowback Sample of Cuttings
Push Sample (Thin Walled Tube)
* No Recovery

PACIFIC GROUNDWATER GROUP
JE8902

PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW-3
DRILLING METHOD: Air Rotary
DRILLER: Chuck Ketvirtis
FIRM: Soil Sampling Service
CONSULTING FIRM: BVWST and PGG
REPRESENTATIVE: Rajeev Dwivedi

LOCATION: SW ¼ NW ¼, SEC. 33, T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION: 1231.60 (Nov. 1989)
INSTALLED: 6/8/89
DEVELOPED: 7/6/89
START CARD NO.:

MW-4 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



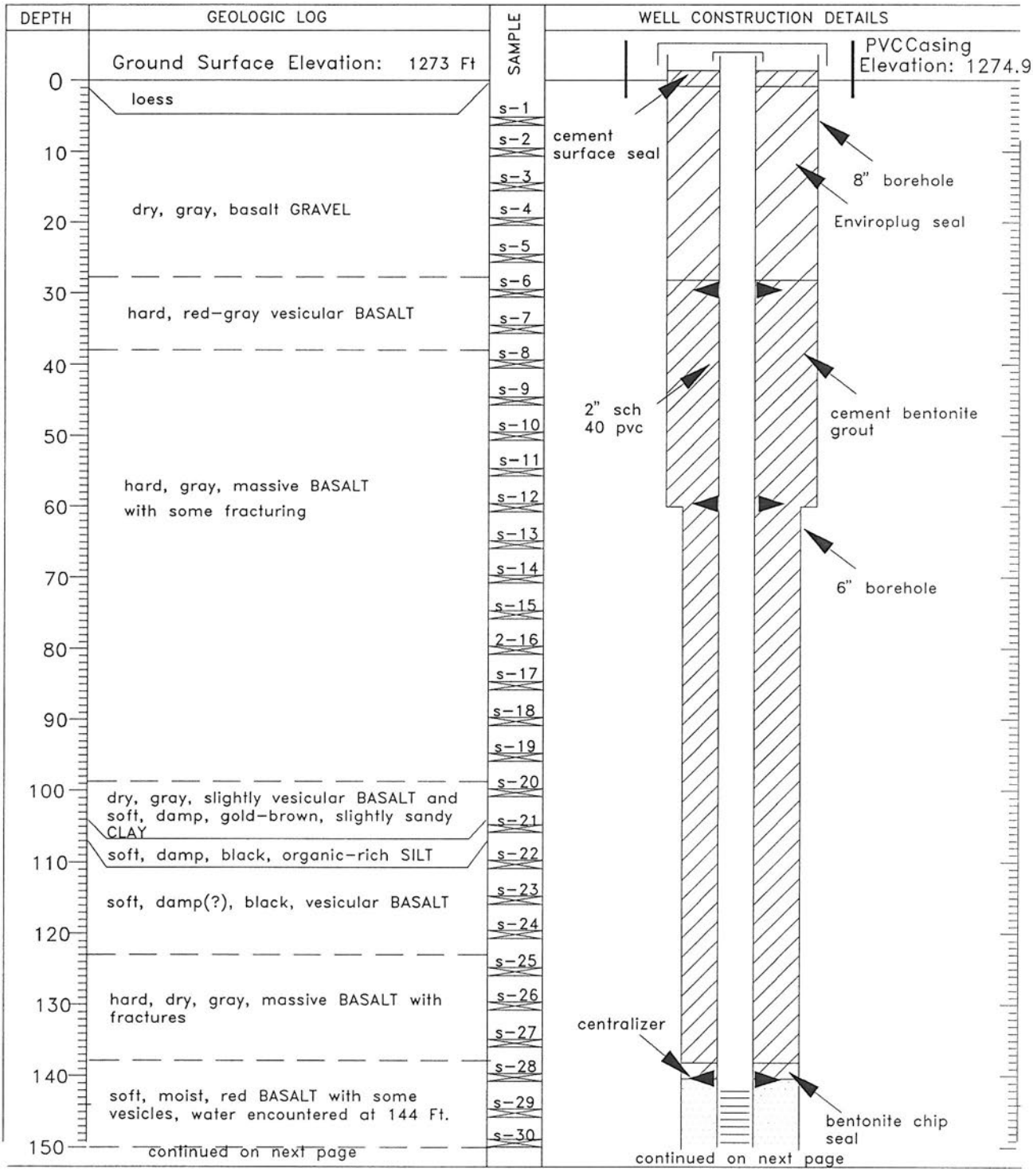
Blowback Sample of Cuttings
Push Sample (Thin Walled Tube)
* No Recovery

PACIFIC GROUNDWATER GROUP
JE8902

PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW-4
DRILLING METHOD: Air Rotary
DRILLER: Chuck Ketvirtis
FIRM: Soil Sampling Service
CONSULTING FIRM: BVWST and PGG
REPRESENTATIVE: Rajeev Dwivedi

LOCATION: SW ¼ NW ¼, SEC. 33, T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION: 1187.08
INSTALLED: 6/10/89
DEVELOPED: 7/6/89
START CARD NO.:

MW-5 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



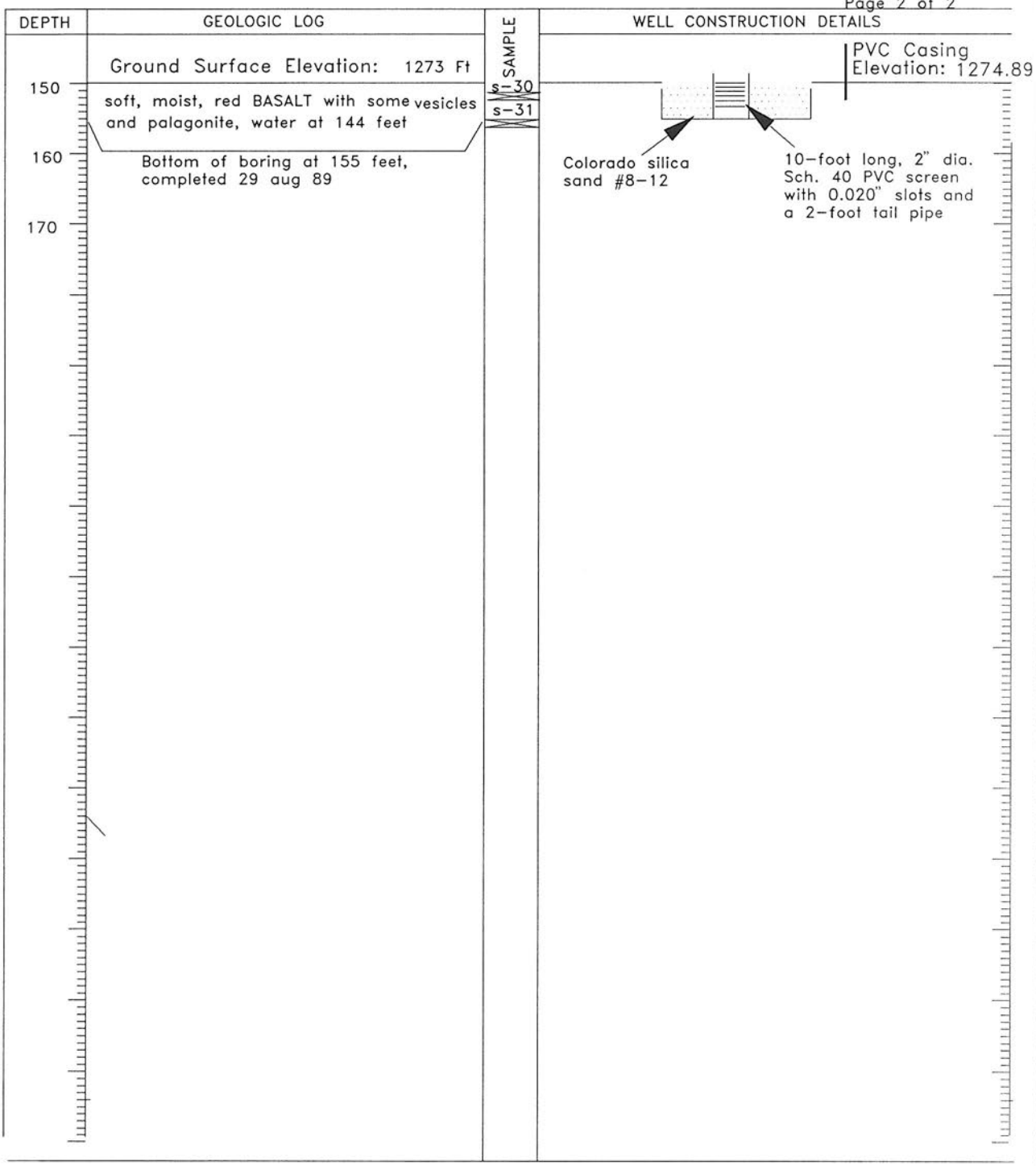
Blowback Sample of Cuttings
Push Sample (Thin Walled Tube)
* No Recovery

PACIFIC GROUNDWATER GROUP
JE8902

PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW-5
DRILLING METHOD: Air Rotary
DRILLER: Chuck Ketvirtis
FIRM: Soil Sampling Service
CONSULTING FIRM: BVWST and PGG
REPRESENTATIVE: Charles Ellingson and Russell Prior

LOCATION: SW ¼ NW ¼, SEC. 33, T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION: 1187.13
INSTALLED: 29 Aug 89
DEVELOPED: Sept 89
START CARD NO.:

MW-5 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



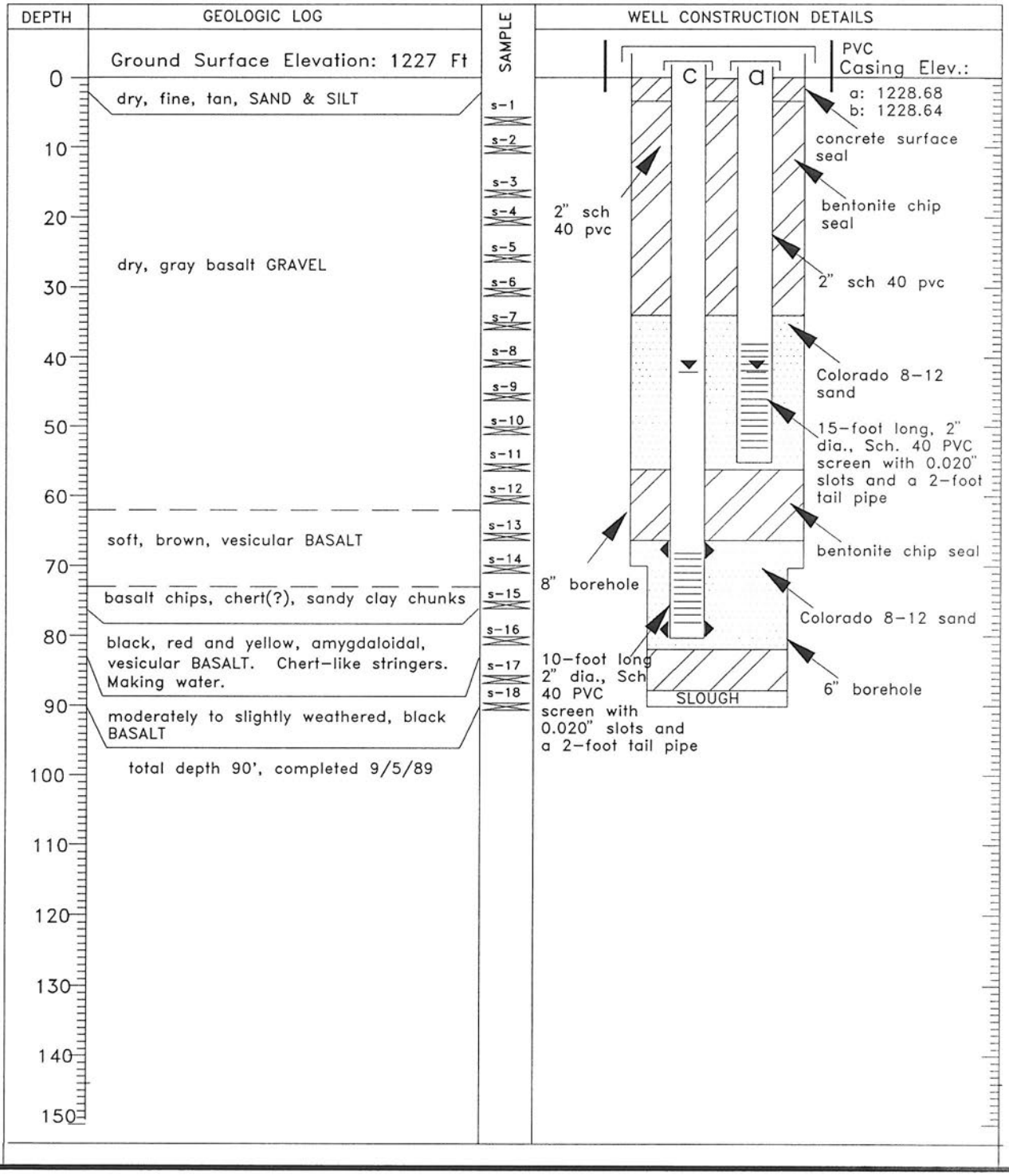
Blowback Sample of Cuttings
Push Sample (Thin Walled Tube)
* No Recovery

PACIFIC GROUNDWATER GROUP
JE8902

PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW-5
DRILLING METHOD: Air Rotary
DRILLER: Chuck Ketvirtis
FIRM: Soil Sampling Service
CONSULTING FIRM: BVWST and PGG
REPRESENTATIVE: Charles Ellingson and Russell Prior

LOCATION: SW¼ NW¼, SEC. 33, T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION: 1187.13
INSTALLED: 29 Aug 89
DEVELOPED: Sept 89
START CARD NO.:

MW-6 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



Blowback Sample of Cuttings

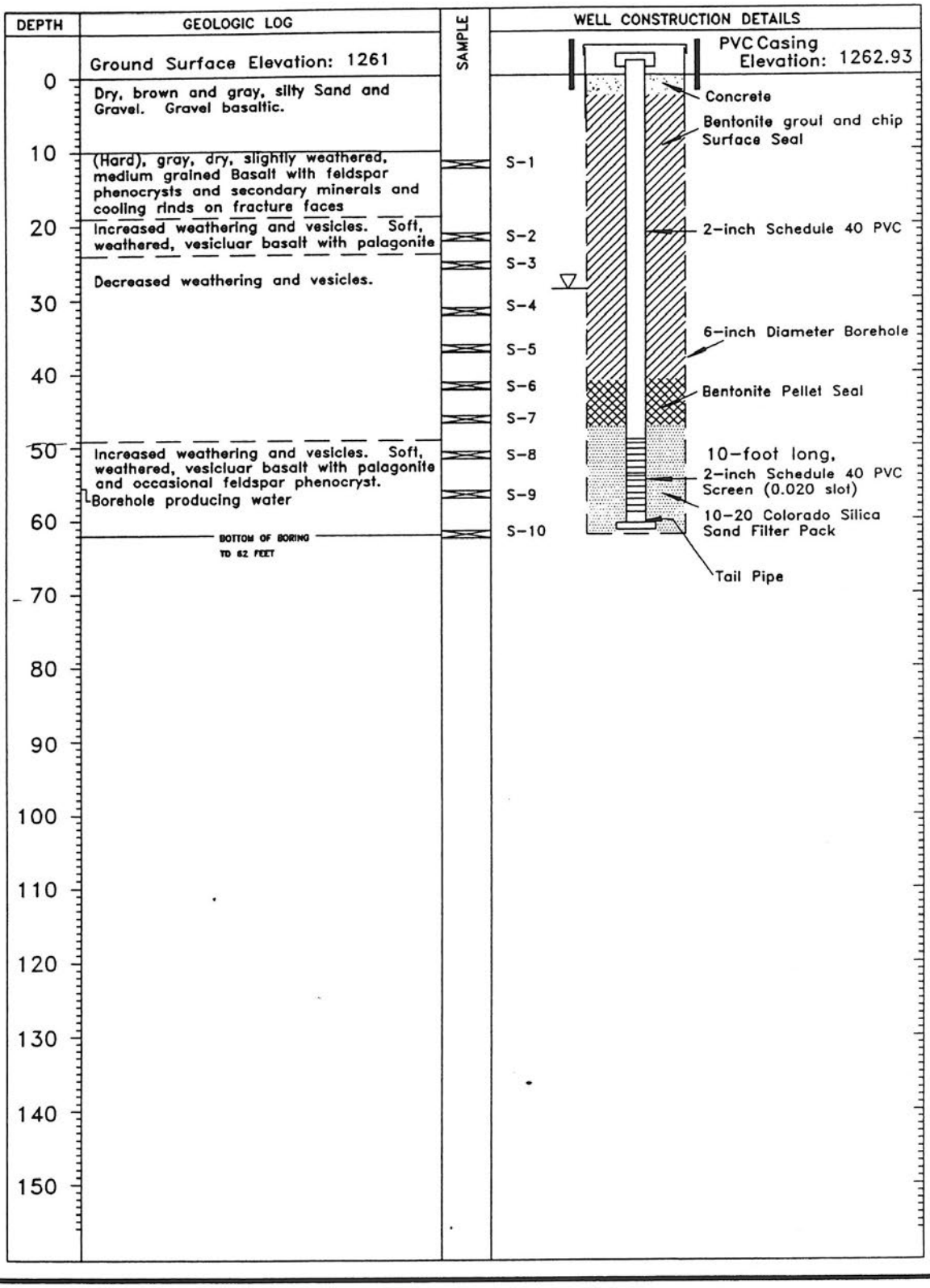
PACIFIC GROUNDWATER GROUP
JE8902

PROJECT NAME: Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW-6
DRILLING METHOD: Air Rotary
DRILLER: Chuck Ketvirtis
FIRM: Soil Sampling Service
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Russ Prior, Charles Ellingson

LOCATION: NW¼ SW¼ Section 33,T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION: 1186.89 (a), 1186.88 (c)
INSTALLED: 8/31 - 9/5/89 (Nov. 1989)
DEVELOPED: Sept. 1989
START CARD NO.:

ACAD 10 C:\JOBS\JE8902\dwg\MW-6log.dwg

MW-7 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



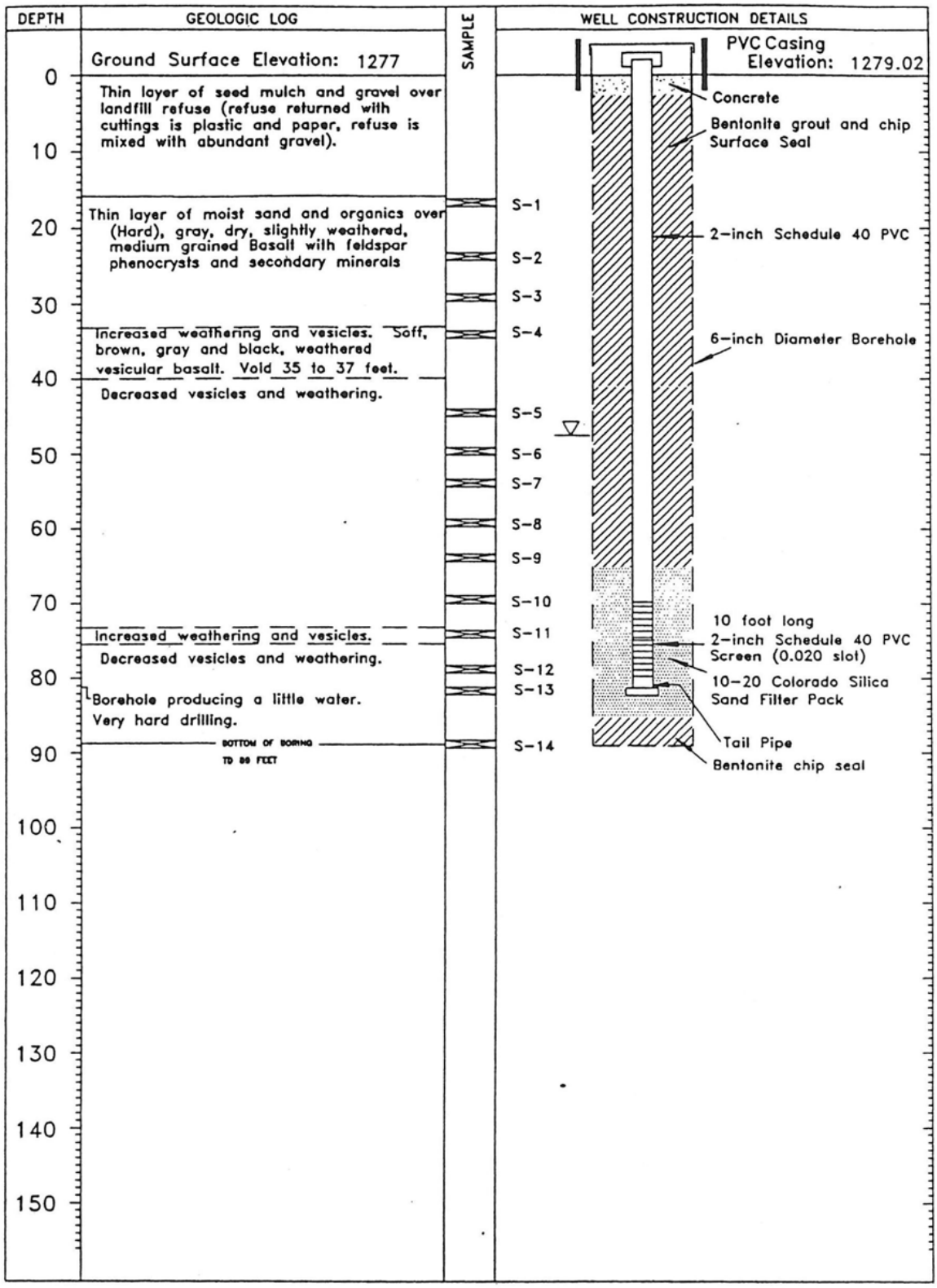
Blowback Sample of Cuttings
Push Sample (Thin Walled Tube)
* No Recovery

Pacific Groundwater Group

PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Harold Niswander
FIRM: Soil Sampling Service
CONSULTING FIRM: BVWST and PGG
REPRESENTATIVE: Charles Ellingson

LOCATION: SW ¼ NW ¼, SEC. 33, T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: Oct 10, 1990
DEVELOPED:
START CARD NO.:

MW-8 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



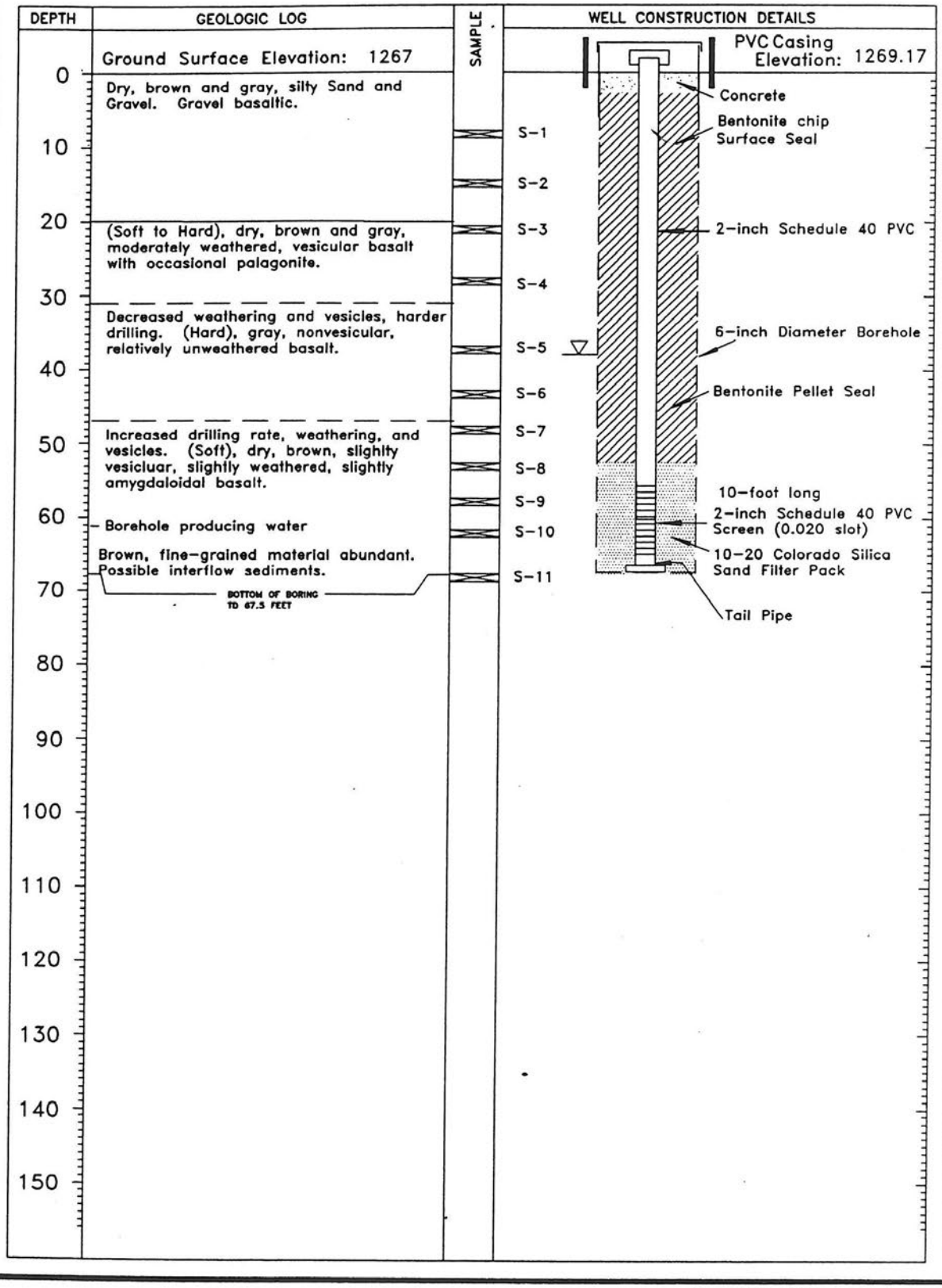
Blowback Sample of Cuttings
Push Sample (Thin Walled Tube)
* No Recovery

Pacific Groundwater Group

PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW-8
DRILLING METHOD: Air Rotary
DRILLER: Harold Niswander
FIRM: Soil Sampling Service
CONSULTING FIRM: BVWST and PGG
REPRESENTATIVE: Charles Ellingson

LOCATION: SW ¼ NW ¼, SEC. 33, T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: Oct 17, 1990
DEVELOPED:
START CARD NO.: 075075

MW-9 GEOLOGIC LOG AND WELL CONSTRUCTION DETAILS



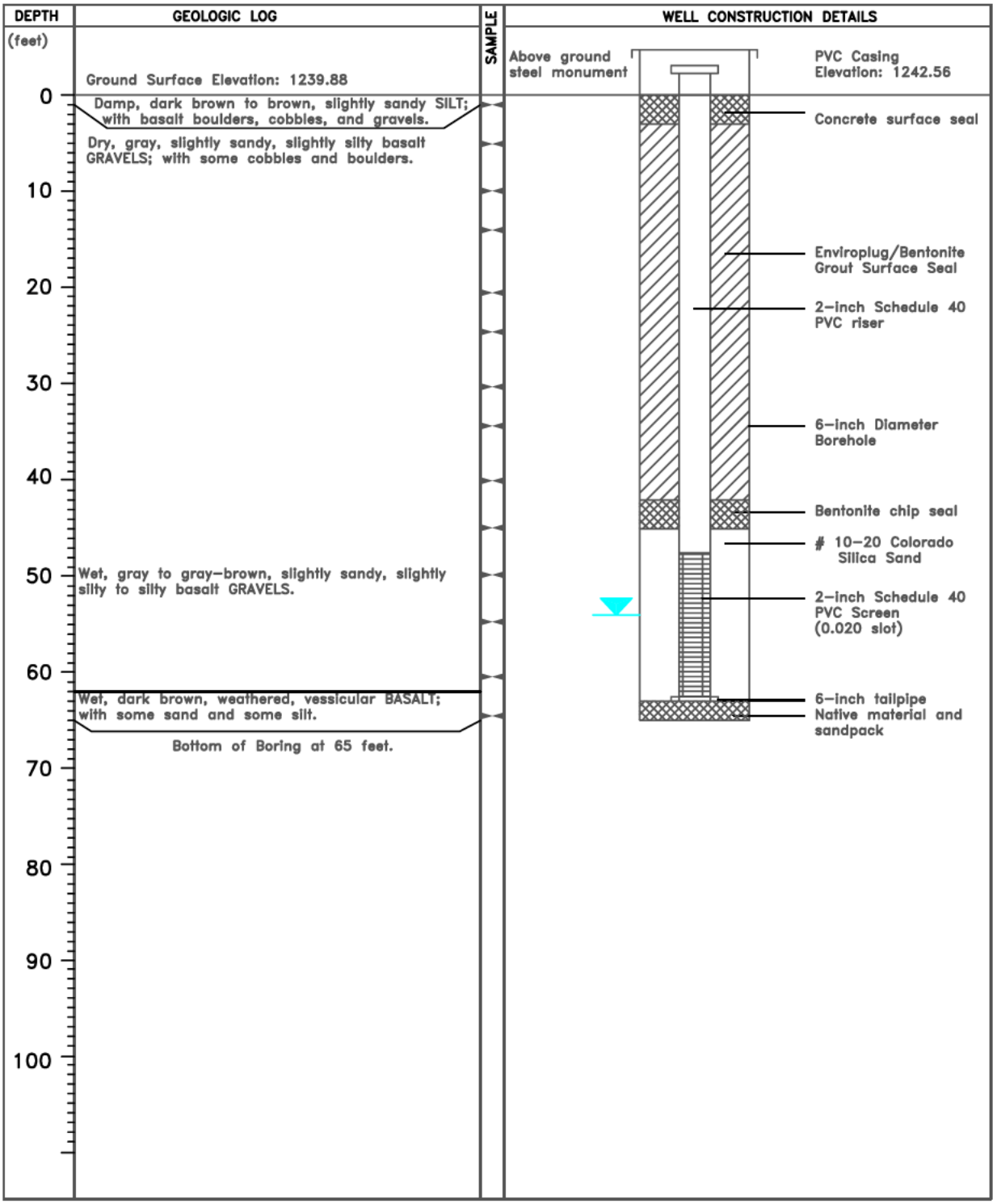
Blowback Sample of Cuttings
Push Sample (Thin Walled Tube)
* No Recovery

Pacific Groundwater Group

PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW-9
DRILLING METHOD: Air Rotary
DRILLER: Harold Niswander
FIRM: Soil Sampling Service
CONSULTING FIRM: BVWST and PGG
REPRESENTATIVE: Charles Ellingson

LOCATION: SW ¼ NW ¼, SEC. 33, T21N, R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: Oct 18, 1990
DEVELOPED:
START CARD NO.: 075075

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–10A



* Sample Submitted for Grain Size Analysis

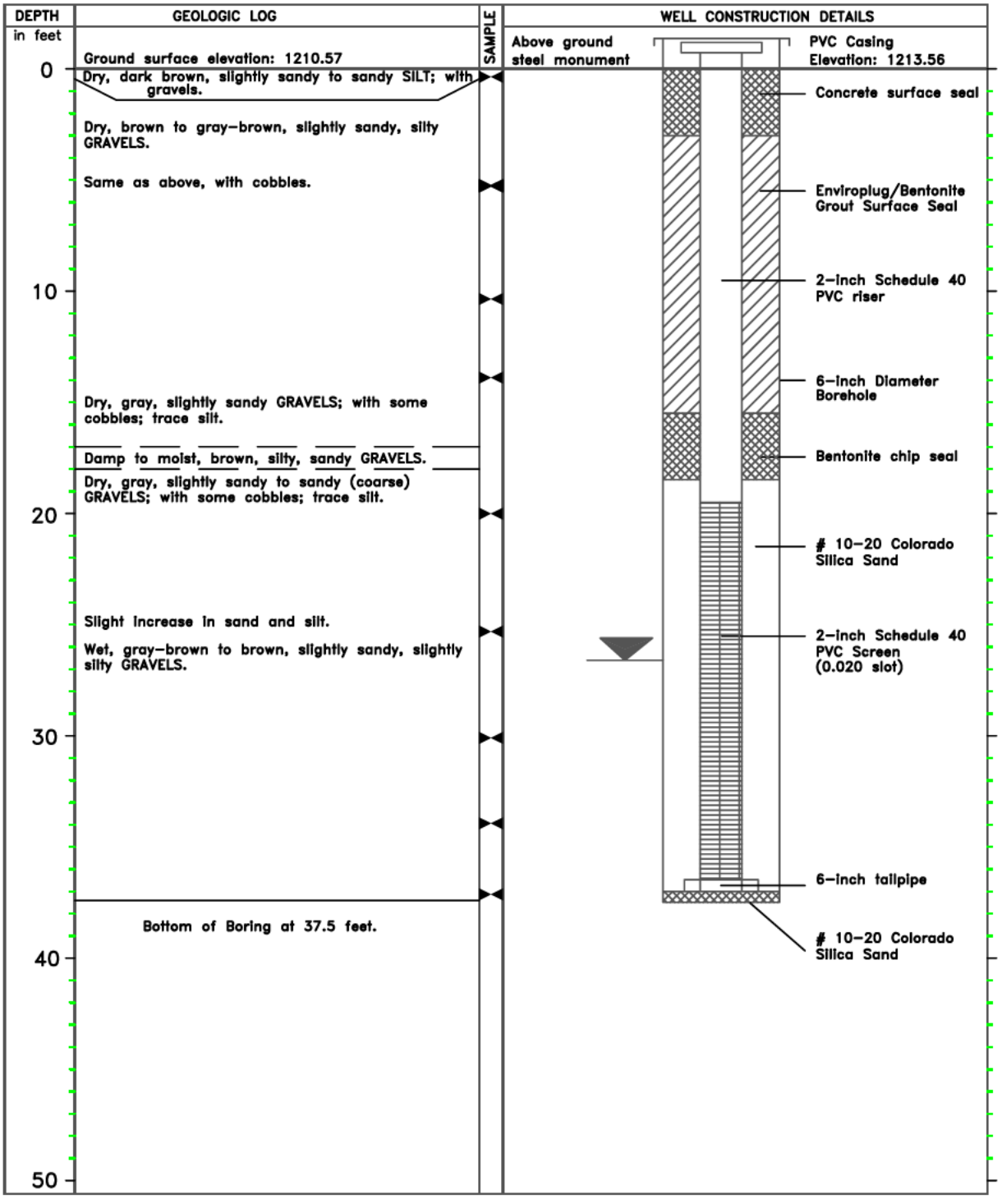
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–10A
DRILLING METHOD: Air Rotary
DRILLER: Ron Sink
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Chad Allen Bring

LOCATION: SW¼ SW¼ Sec. 33, T21N, R26E

DATUM: NGVD
WATER LEVEL ELEVATION: 1186.76
INSTALLED: 12/15/98
DEVELOPED: 12/18/98
DOE unique well ID: AEK 279

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–11A



* Sample Submitted for Grain Size Analysis

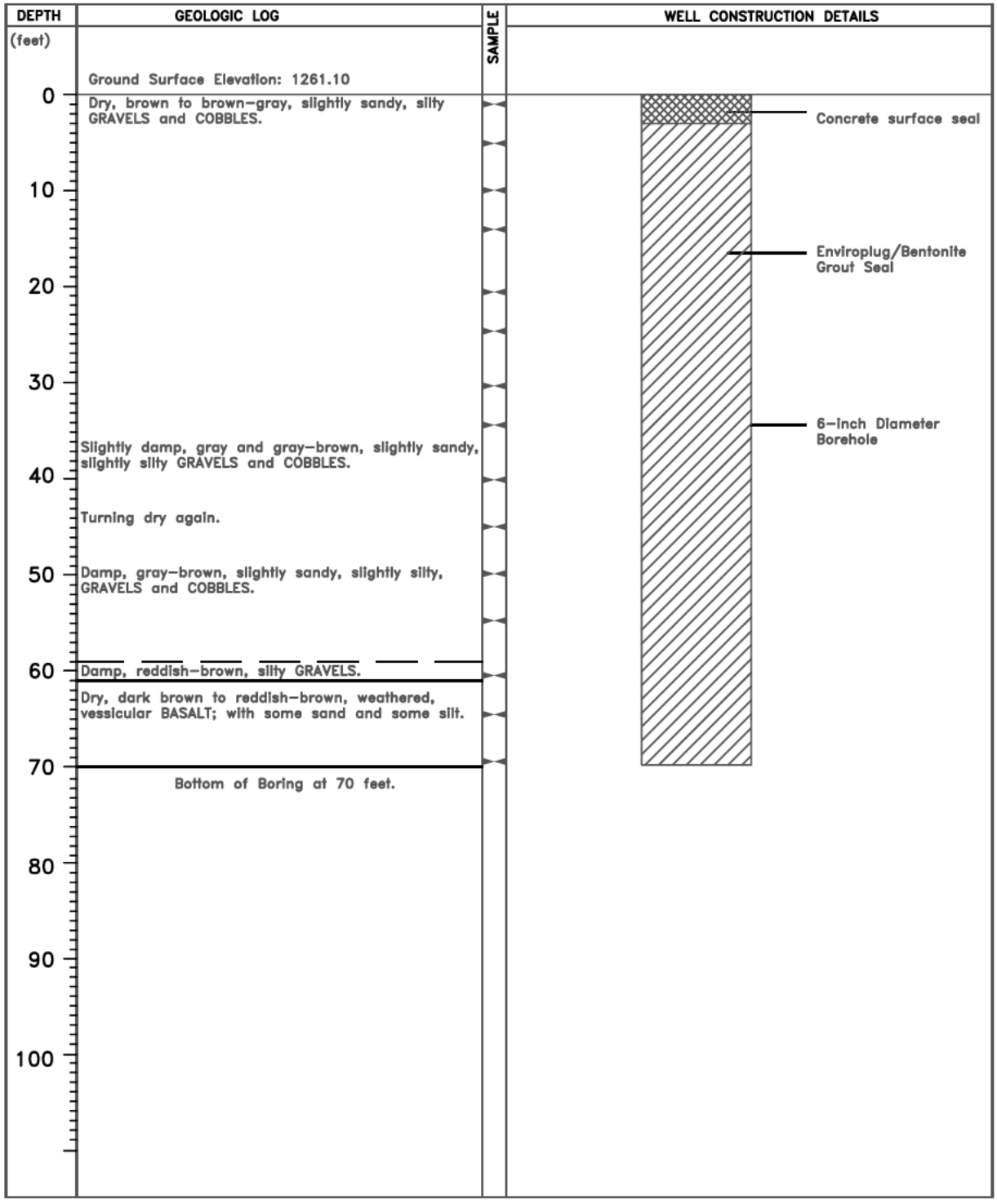
PROJECT NAME: Grant County – Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–11A
DRILLING METHOD: Air Rotary
DRILLER: Ron Sink
FIRM: Enviromental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Chad Allen Bring

LOCATION: SW¼ SW¼ Sec. 33, T21N, R26E

DATUM: NGVD
WATER LEVEL ELEVATION: 1186.81
INSTALLED: 12/16/98
DEVELOPED: 12/16/98
DOE unique well ID: AEK 280

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–12A



* Sample Submitted for Grain Size Analysis

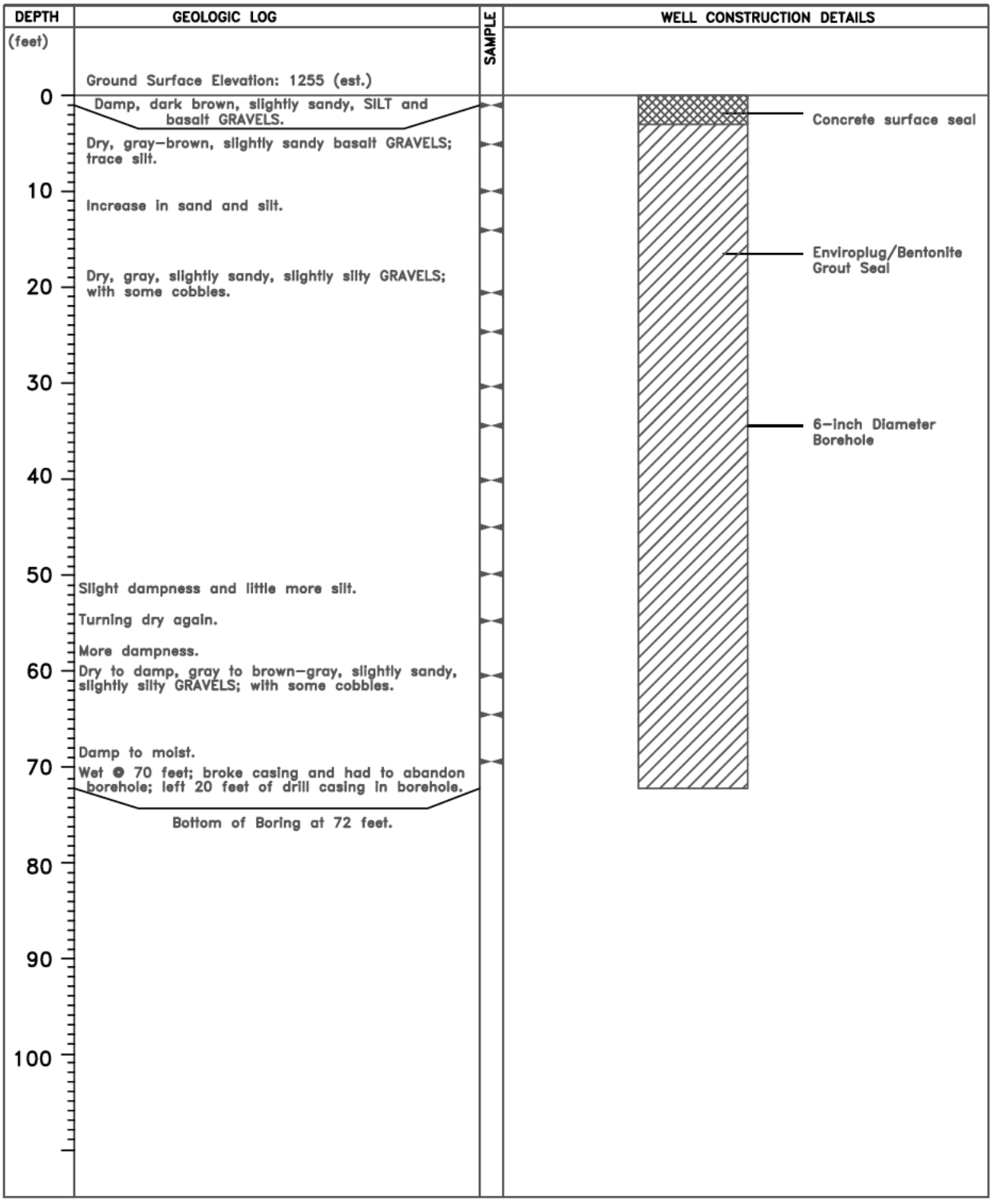
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–12A
DRILLING METHOD: Air Rotary
DRILLER: Ron Sink
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Chad Allen Bring

LOCATION: SW¼ SW¼ Sec. 33, T21N, R26E

DATUM: NGVD
WATER LEVEL ELEVATION: N/A dry hole
INSTALLED: Abandoned
DEVELOPED: Abandoned
DOE unique well ID: N/A

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–13A



* Sample Submitted for Grain Size Analysis

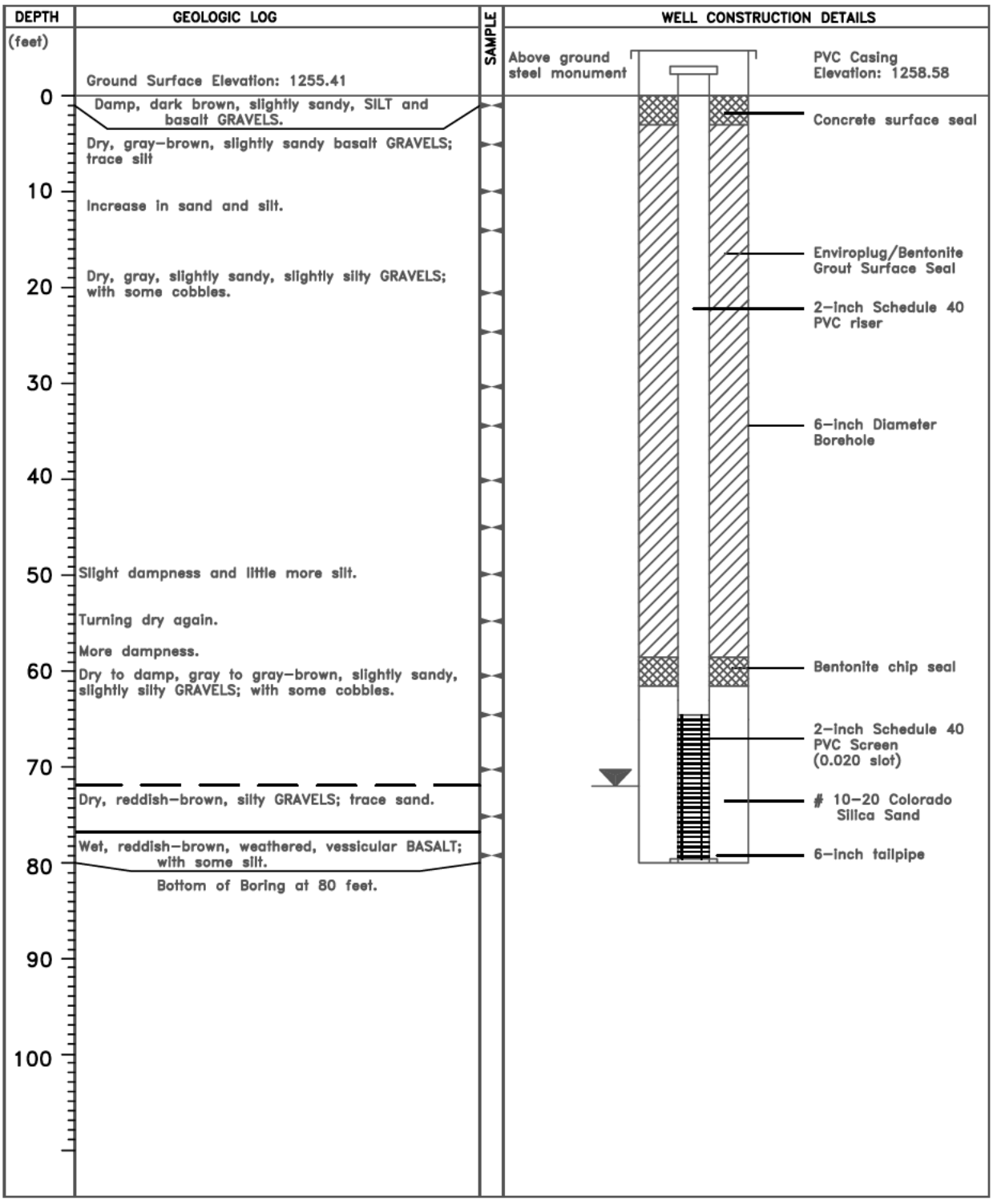
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–13A
DRILLING METHOD: Air Rotary
DRILLER: Ron Sink
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Chad Allen Bring

LOCATION: SW¼ SW¼ Sec. 33, T21N, R26E

DATUM: NGVD
WATER LEVEL ELEVATION: N/A
INSTALLED: Abandoned
DEVELOPED: Abandoned
DOE unique well ID: N/A

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–14A



* Sample Submitted for Grain Size Analysis

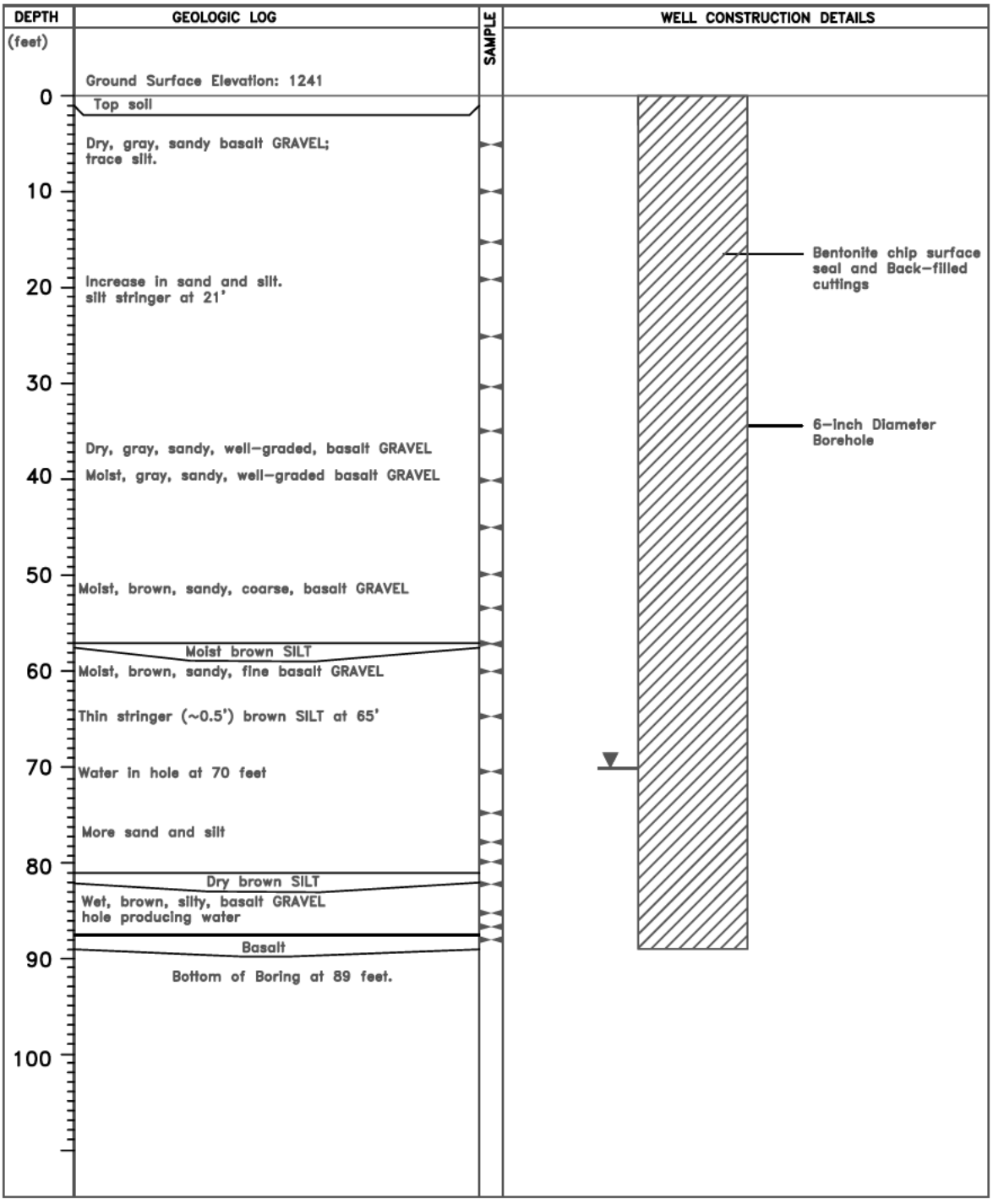
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–14A
DRILLING METHOD: Air Rotary
DRILLER: Ron Sink
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Chad Allen Bring

LOCATION: SW¼ SW¼ Sec. 33, T21N, R26E

DATUM: NGVD
WATER LEVEL ELEVATION: 1186.83
INSTALLED: 12/18/98
DEVELOPED: 12/18/98
DOE unique well ID: AEK 281

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
B–15



* Sample Submitted for Grain Size Analysis

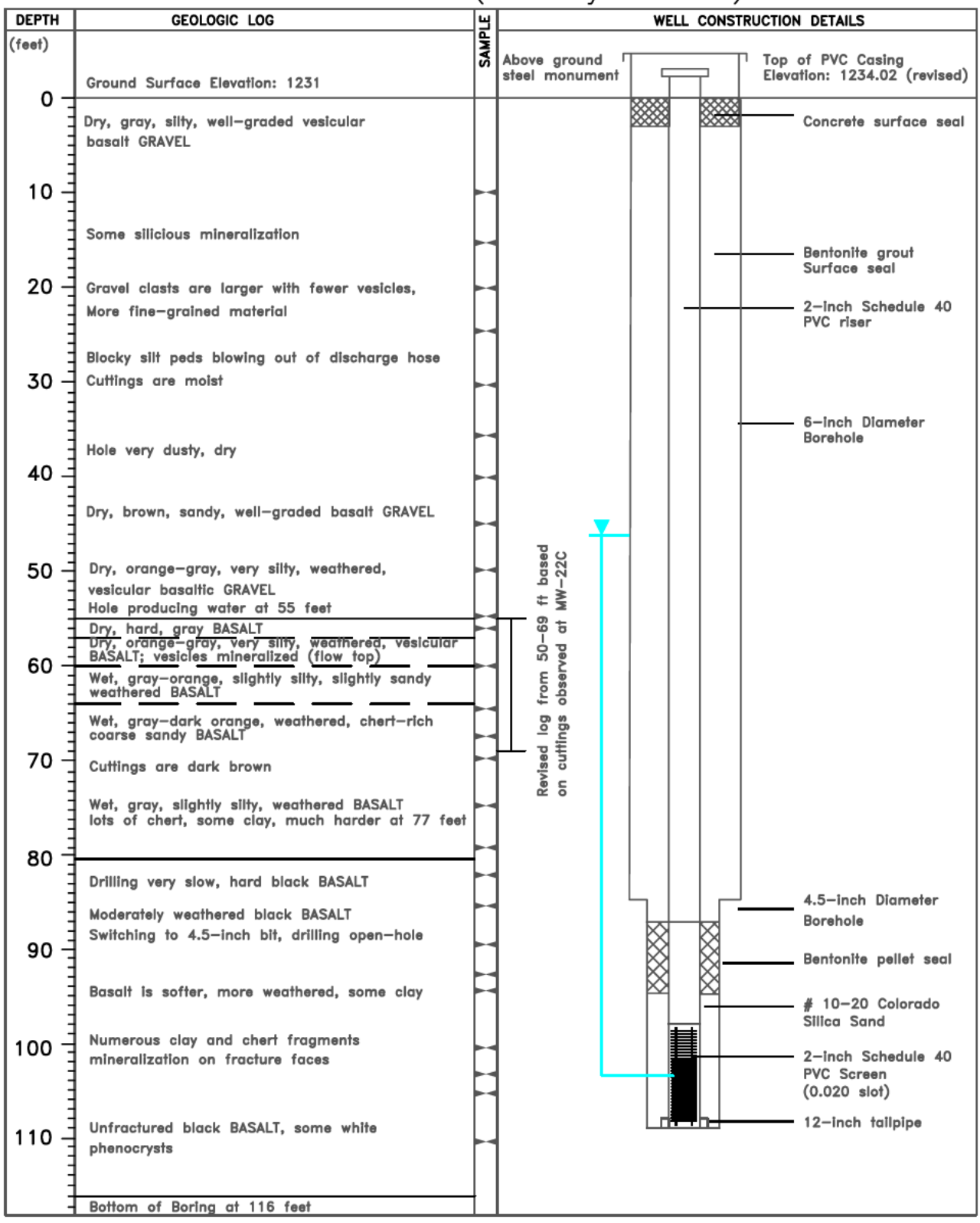
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: B–15
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Joy Gillick

LOCATION: 10883.9 N, 19424.2 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1170 (est.)
INSTALLED: Abandoned
DEVELOPED: Abandoned
DOE unique well ID: N/A

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–16D (formerly MW–16C)

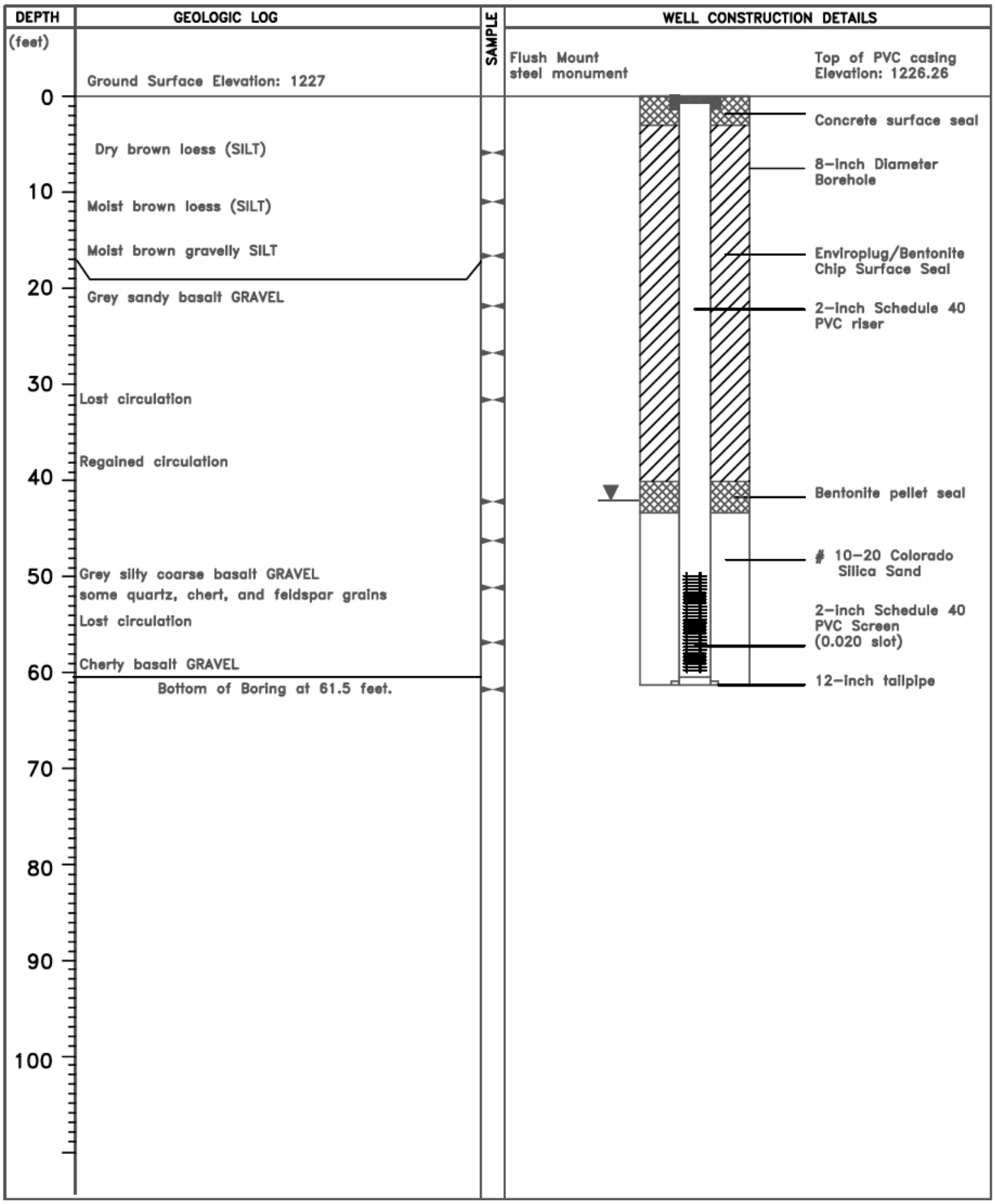


NOTE: Geologic log reflects revised stratigraphy from 50–69 feet based on MW–22C.

PROJECT NAME: Grant County Ephrata Landfill
LOCATION: 11399.8 N, 19483.6 E
WELL INDENTIFICATION NUMBER: MW–16D (previously MW–16C)
DRILLING METHOD: Air Rotary
DATUM: NGVD
DRILLER: Dan Claassen
WATER LEVEL ELEVATION: 1187.92 (6/22/00)
FIRM: Environmental West Exploration, Inc.
INSTALLED: 4/25/00
CONSULTING FIRM: Pacific Groundwater Group, Inc.
DEVELOPED: 4/26/00
REPRESENTATIVE: Joy Gillick
DOE unique well ID: AFF 555

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–17a



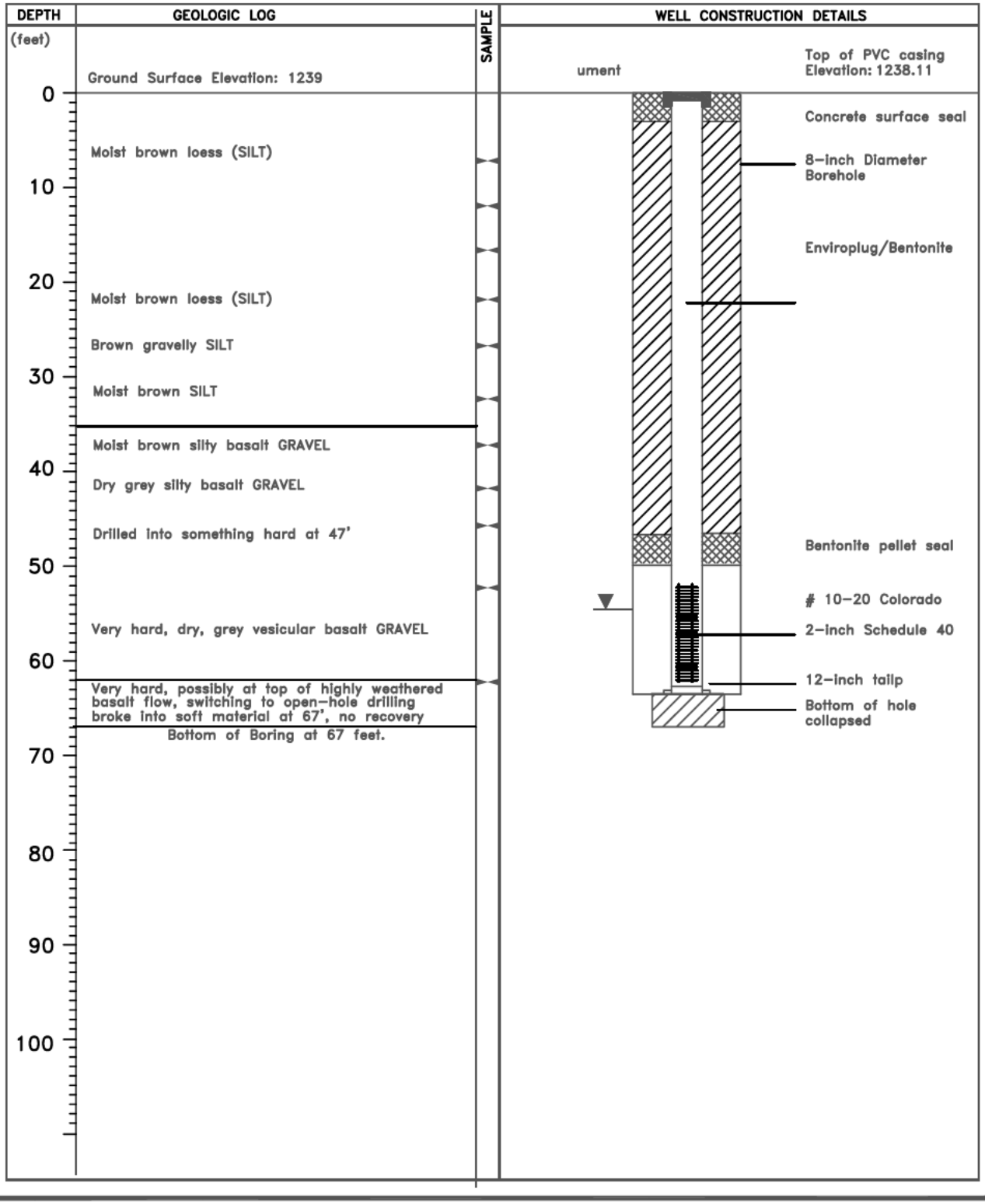
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–17a
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Joy Gillick

LOCATION: 12454.2 N, 17982.8 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1184 (6/22/00)
INSTALLED: 4/27/2000
DEVELOPED: 5/4/2000
DOE unique well ID: AFF 555

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–18a



PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–18a
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Joy Gillick

LOCATION: 13364.3 N, 18492.6 E

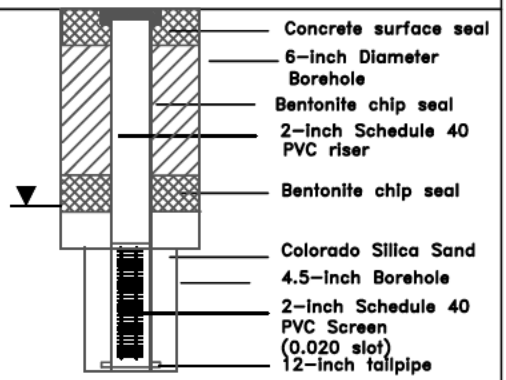
DATUM: NGVD
WATER LEVEL ELEVATION: 1184 (6/22/00)
INSTALLED: 4/27/2000
DEVELOPED: 5/4/2000
DOE unique well ID: AFF 557

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–19b

DEPTH (feet)	GEOLOGIC LOG	SAMPLE
0	Ground Surface Elevation: 1242	
	Top soil	
	Moist, gray, silty, vesicular basalt GRAVEL	
	Water at 7 feet	
10	Wet, brown, silty, well–graded basalt GRAVEL	
	Dry at 12 feet, wet again at 13 feet	
	Weathered, fractured, soft BASALT	
20	Hole producing lots of water	
	Hit soft spot at 29 feet	
	Weathered, soft BASALT	
30	secondary mineralization on fracture faces	
	Bottom of Boring at 32 feet.	
40		
50		
60		
70		
80		
90		
100		

WELL CONSTRUCTION DETAILS



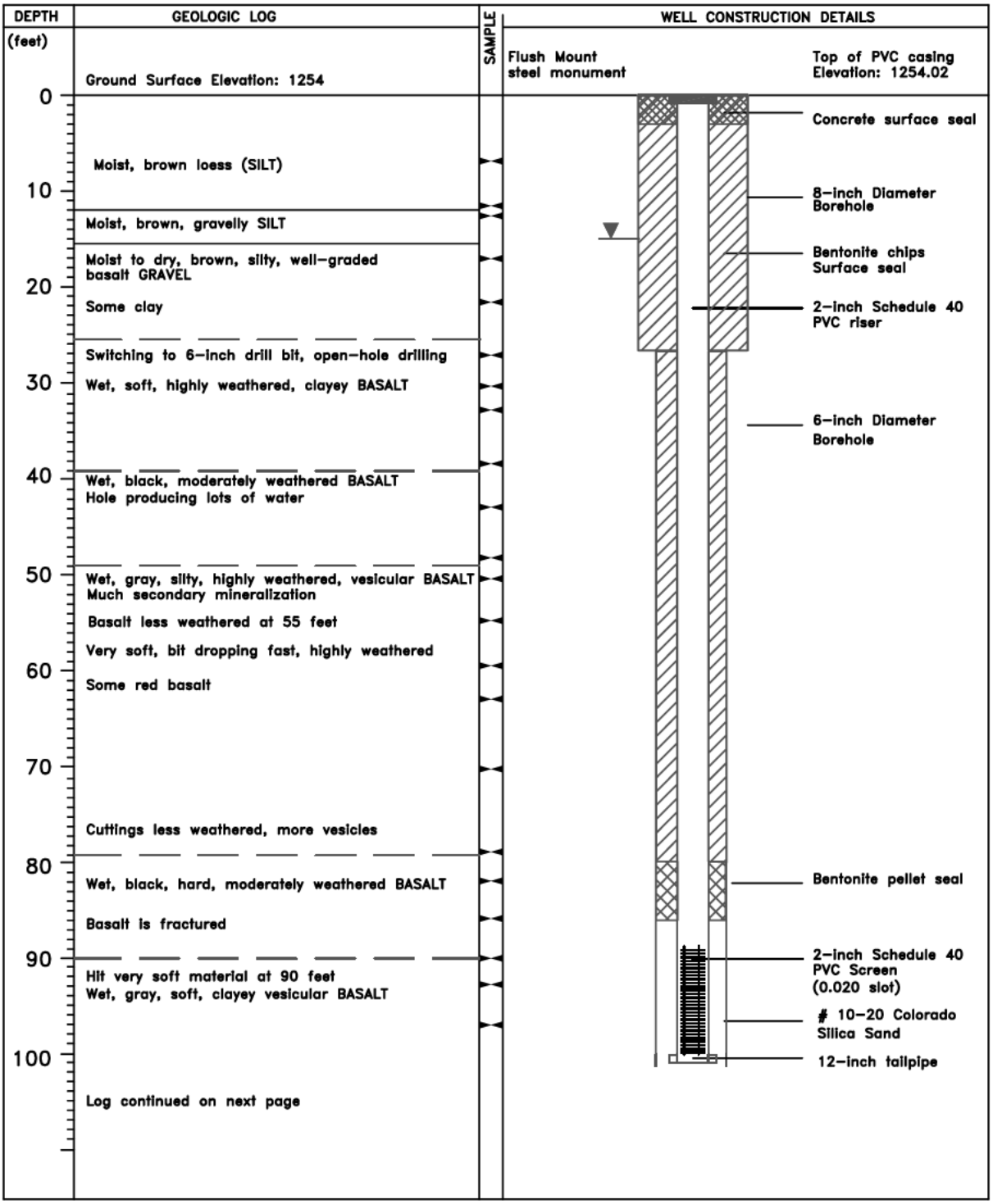
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–19a
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Joy Gillick

LOCATION: 13899.0 N, 18109.7 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1226.0 (6/22/00)
INSTALLED: 4/28/2000
DEVELOPED: 5/2/2000
DOE unique well ID: AFF 558

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–20c



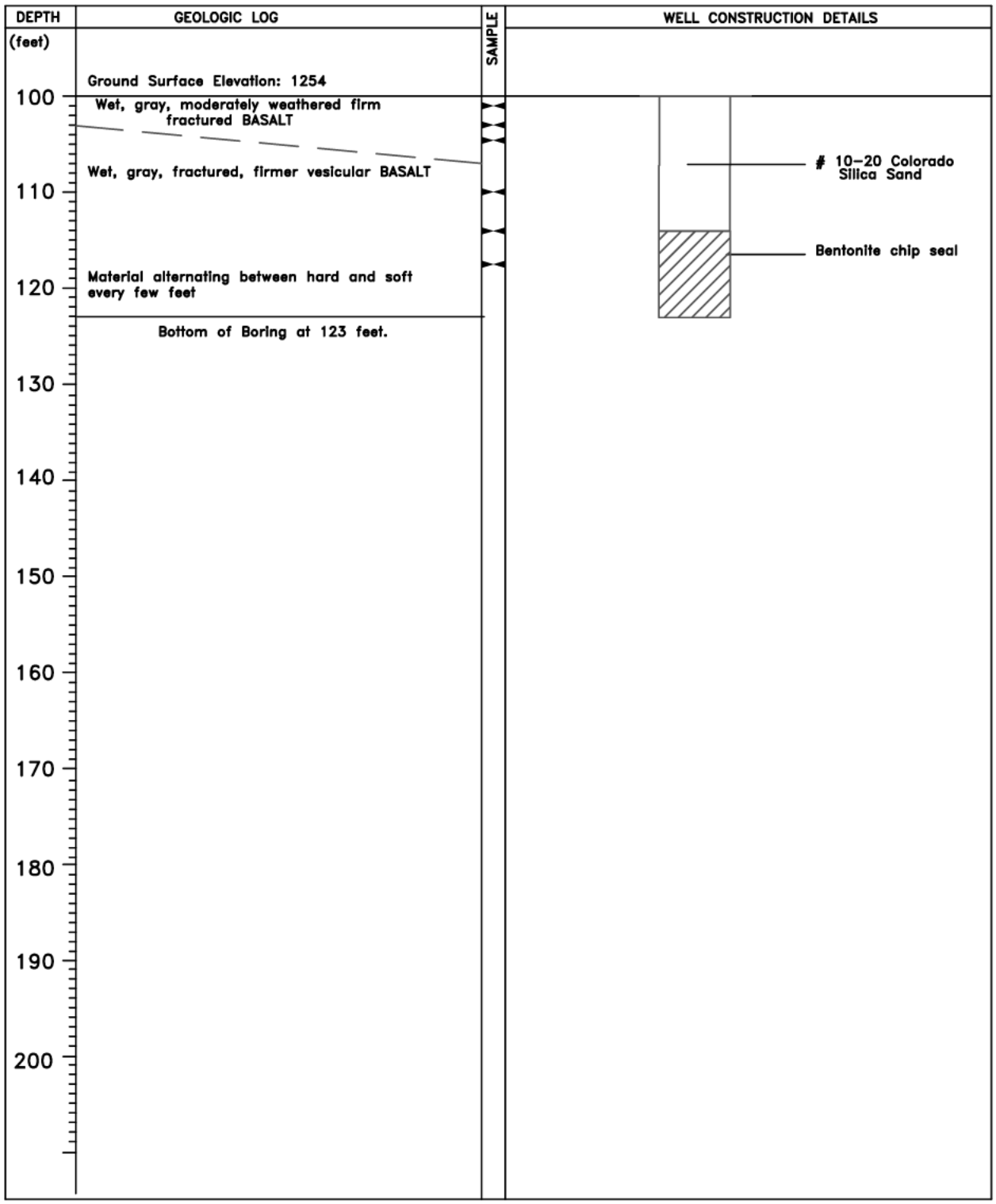
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–20c
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Joy Gillick

LOCATION: 14707.7 N, 18493.2 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1237.18 (6/22/00)
INSTALLED: 5/1/00
DEVELOPED: 5/4/2000
DOE unique well ID: AFF 559

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–20c



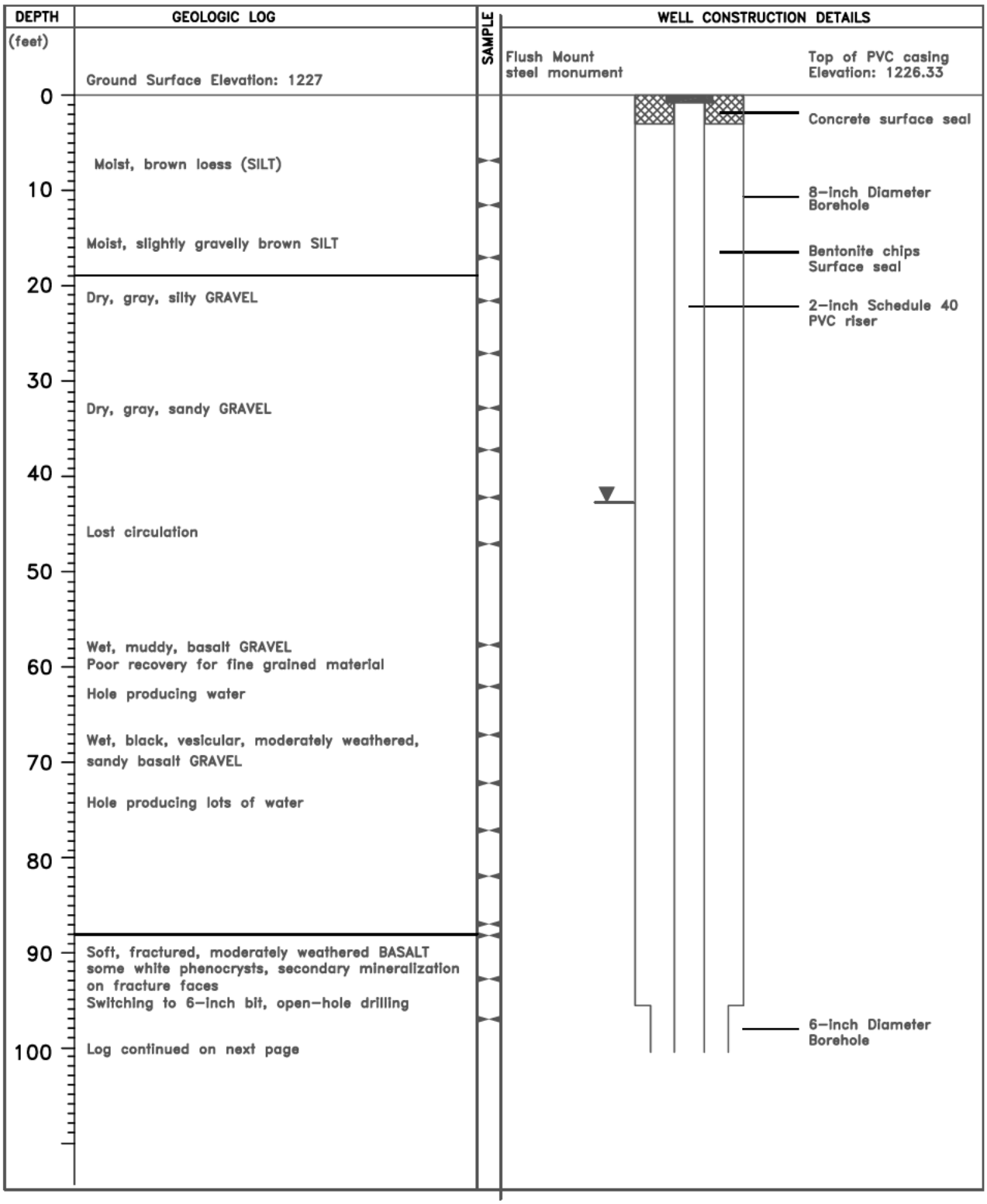
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–20c
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Joy Gillick

LOCATION: 14707.7 N, 18493.2 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1237.18 (6/22/00)
INSTALLED: 5/1/00
DEVELOPED: 5/4/2000
DOE unique well ID: AFF 559

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–21c



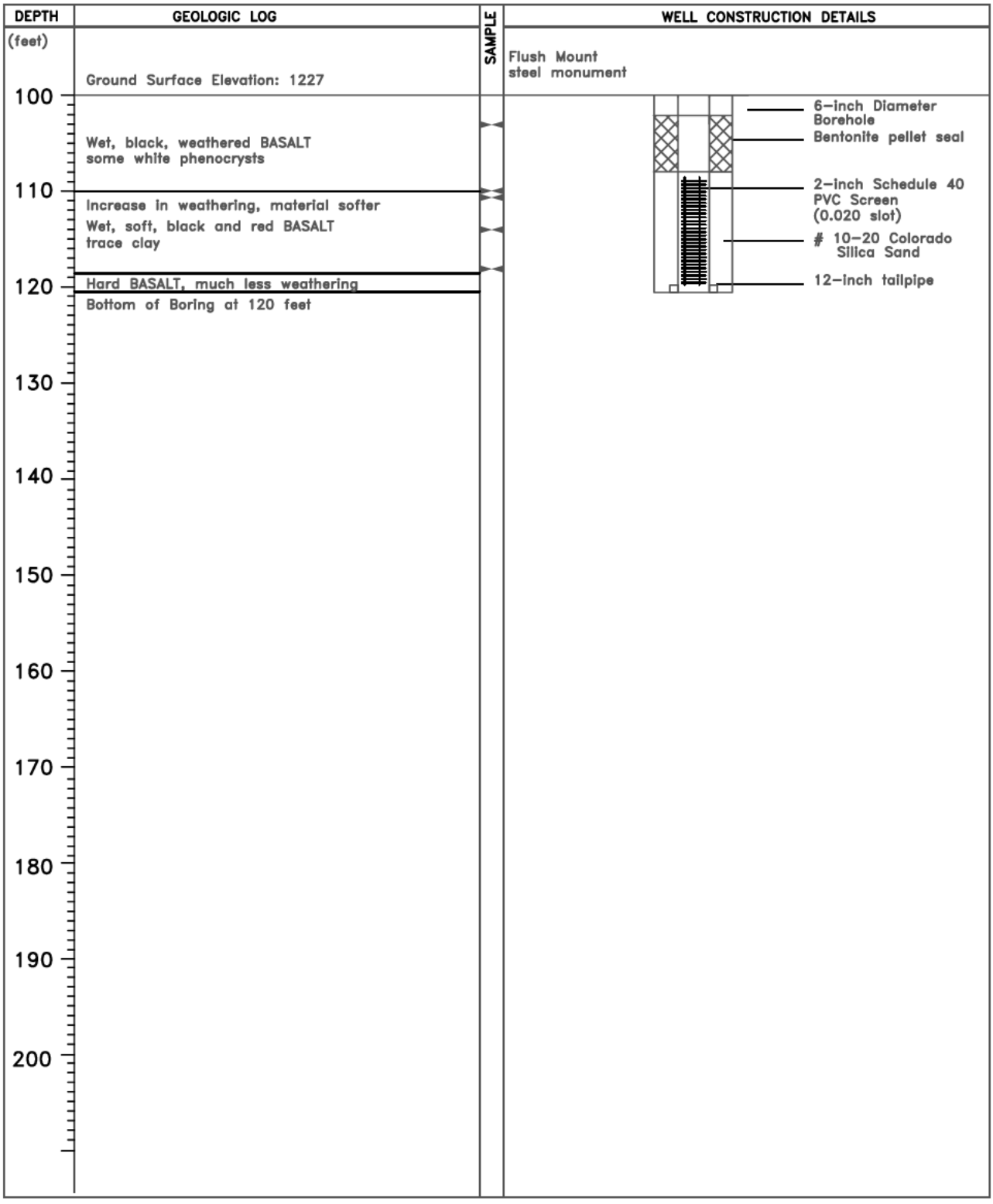
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–21c
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Joy Gillick

LOCATION: 12470.0 N, 17984.0 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1184.21 (6/22/00)
INSTALLED: 5/2/00
DEVELOPED: 5/4/2000
DOE unique well ID: AFF 560

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–21c



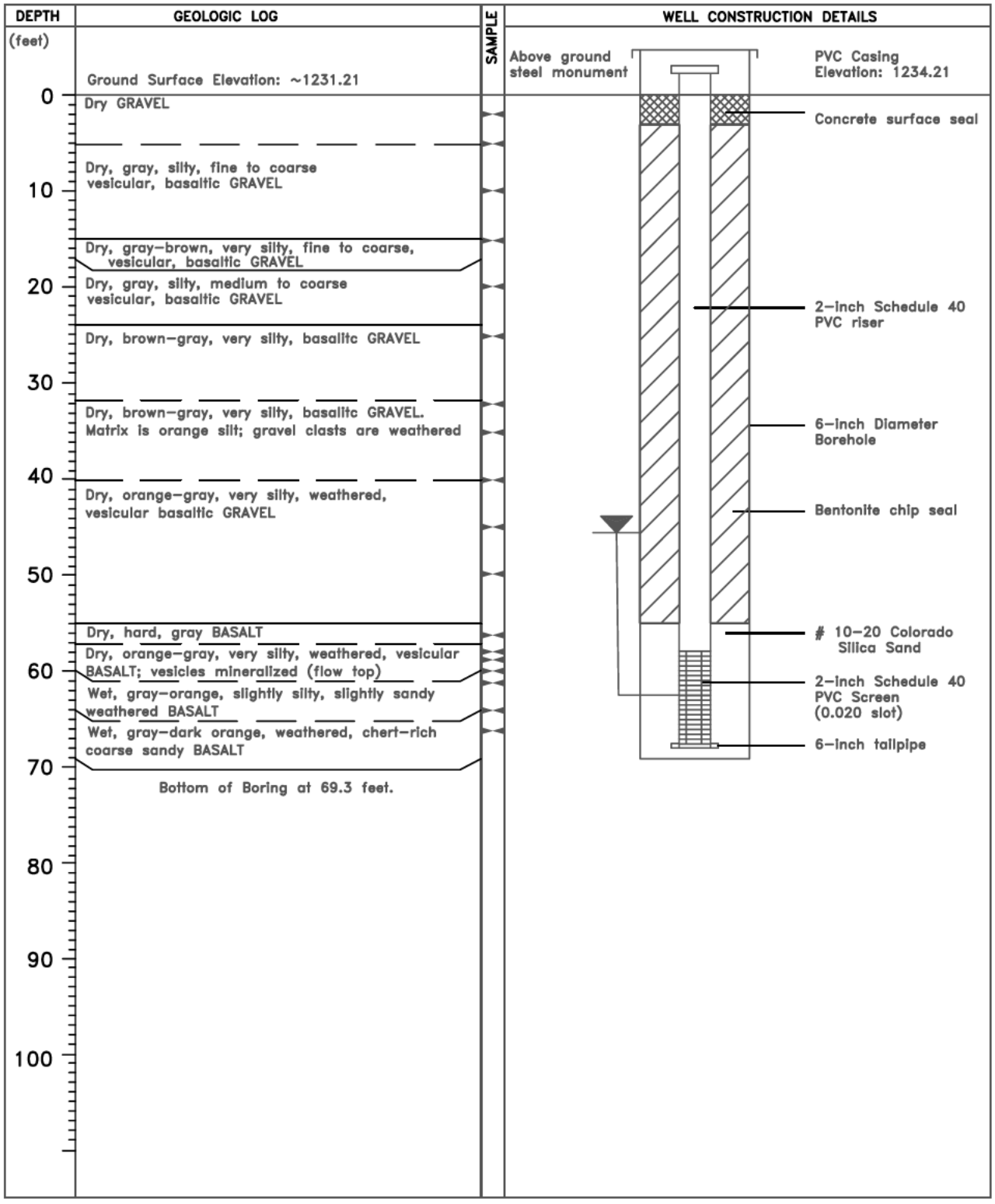
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–21c
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Joy Gillick

LOCATION: 12470.0 N, 17984.0 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1165
INSTALLED: 5/2/2000
DEVELOPED: 5/4/2000
DOE unique well ID: AFF 560

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–22C



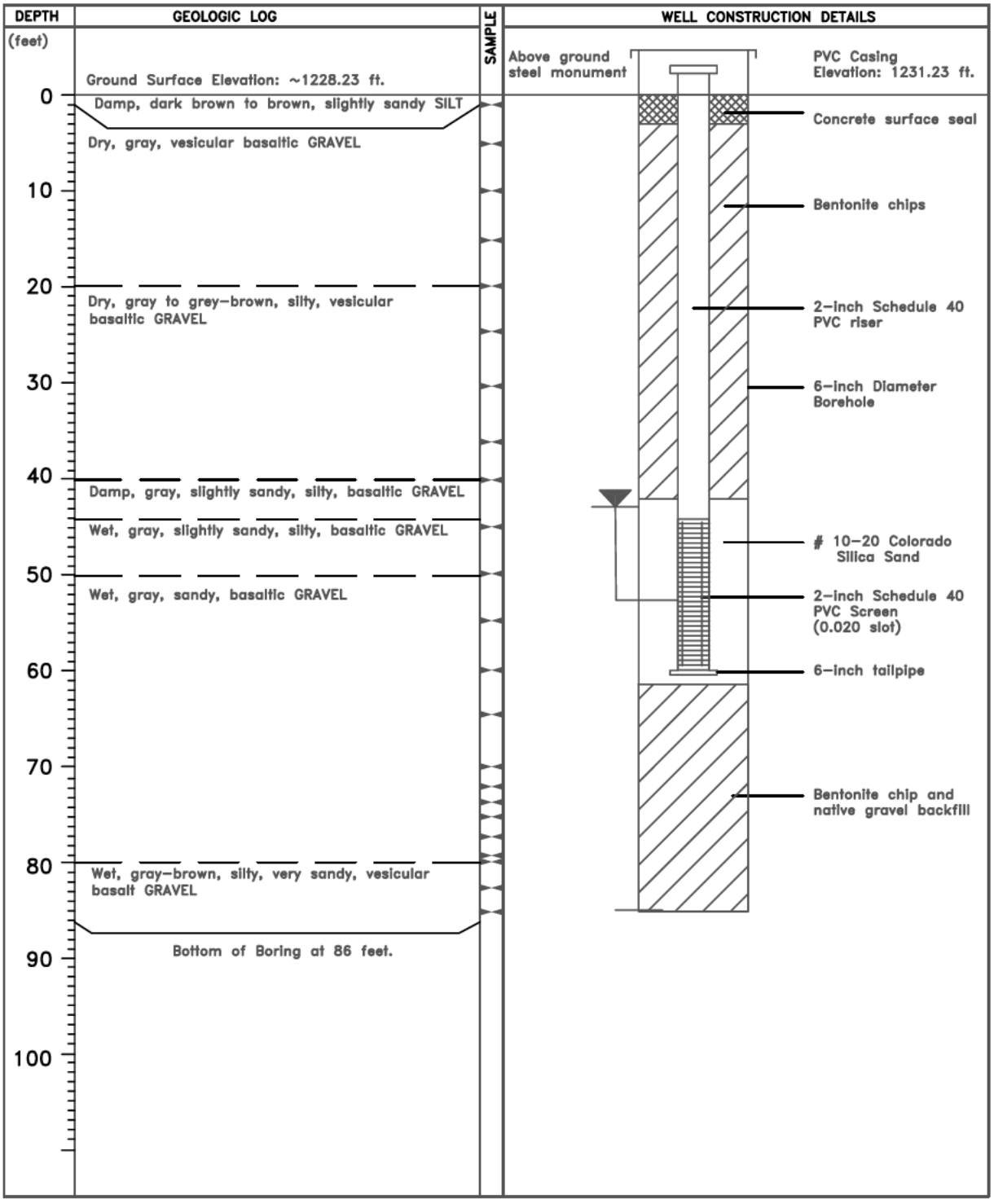
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–22C
DRILLING METHOD: Air Rotary
DRILLER: Ron Sink
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Crispin Prahl

LOCATION: 11397.1 N, 19471.0 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1185.6 feet
INSTALLED: 9/9/02
DEVELOPED: 9/10/02
DOE unique well ID: AGS–148

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL MW–23A

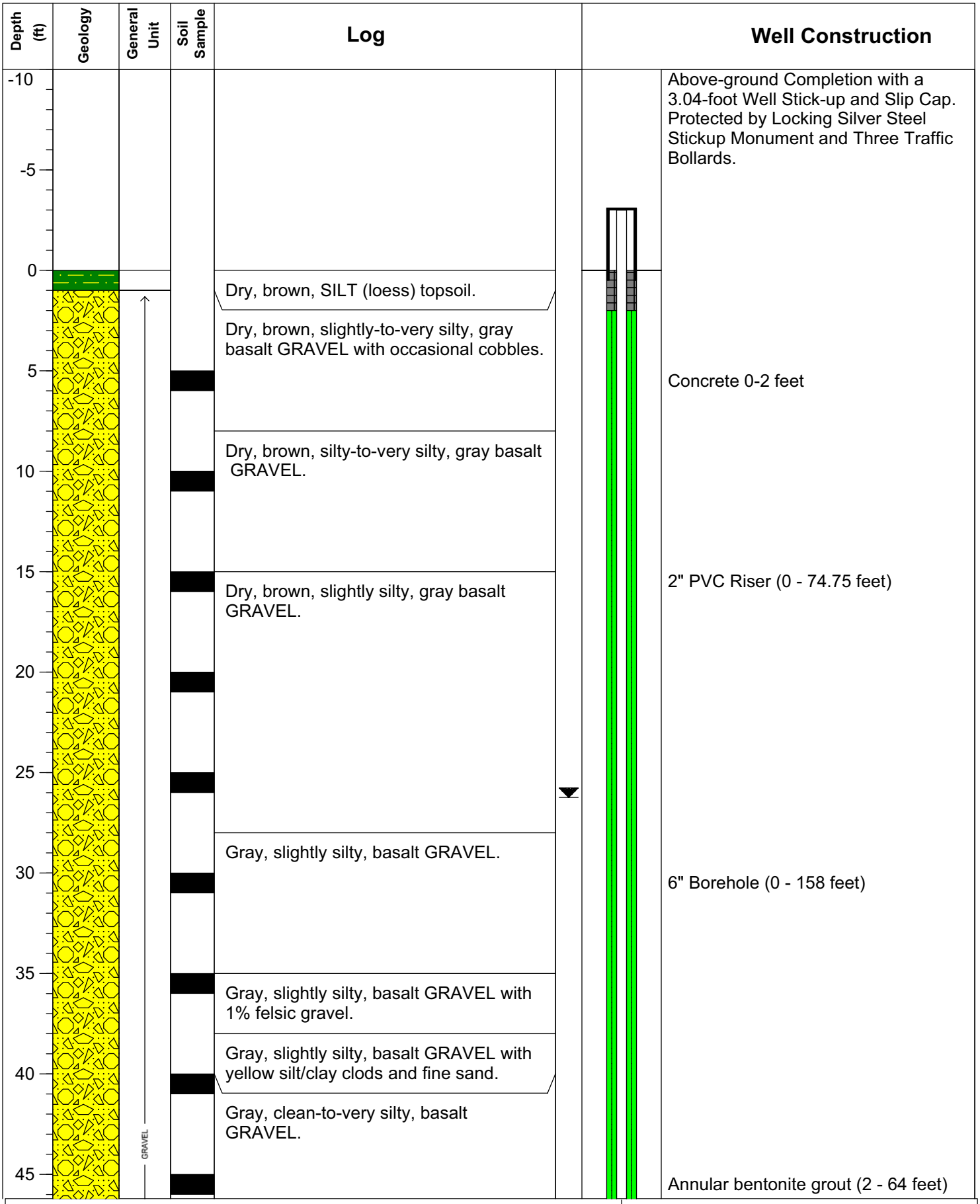


PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: MW–23A
DRILLING METHOD: Air Rotary
DRILLER: Ron Sink
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Crispin Prahl

LOCATION: 9544.9 N, 19458.5 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1185.6 feet
INSTALLED: 9/10/02
DEVELOPED: 9/10/02
DOE unique well ID: AGS–167

Pacific Groundwater Group

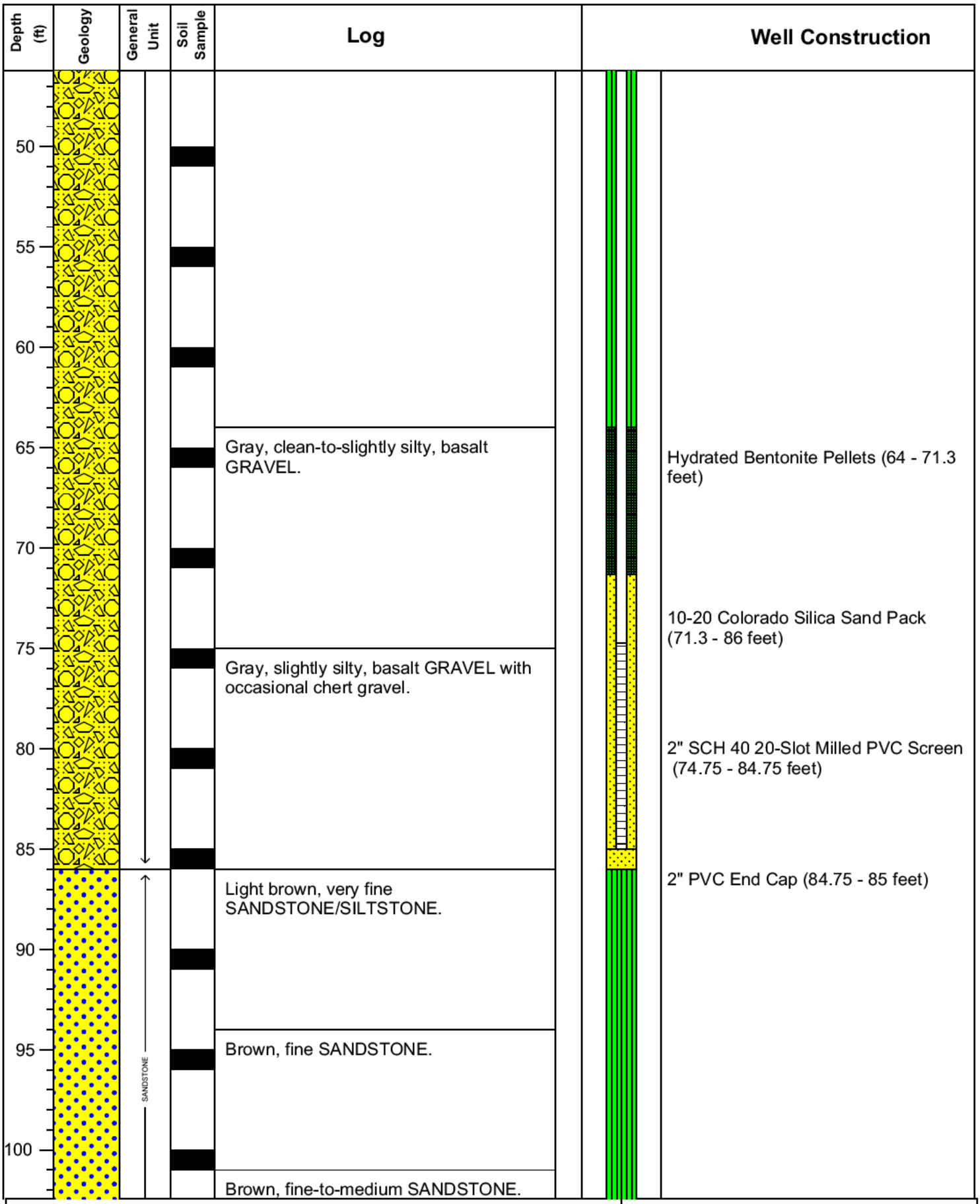


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Charles Ellingson
Location: SE1/4 of SW1/4 Section 33 T21N R26E

Well Name: MW-24
Ecology ID: BAM 087
MP Elevation: 1213.76 feet asl
Datum: Sea level
Installed: 11/1/2007
DTW: 26.24 BMP on 12/14/2007

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-24a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

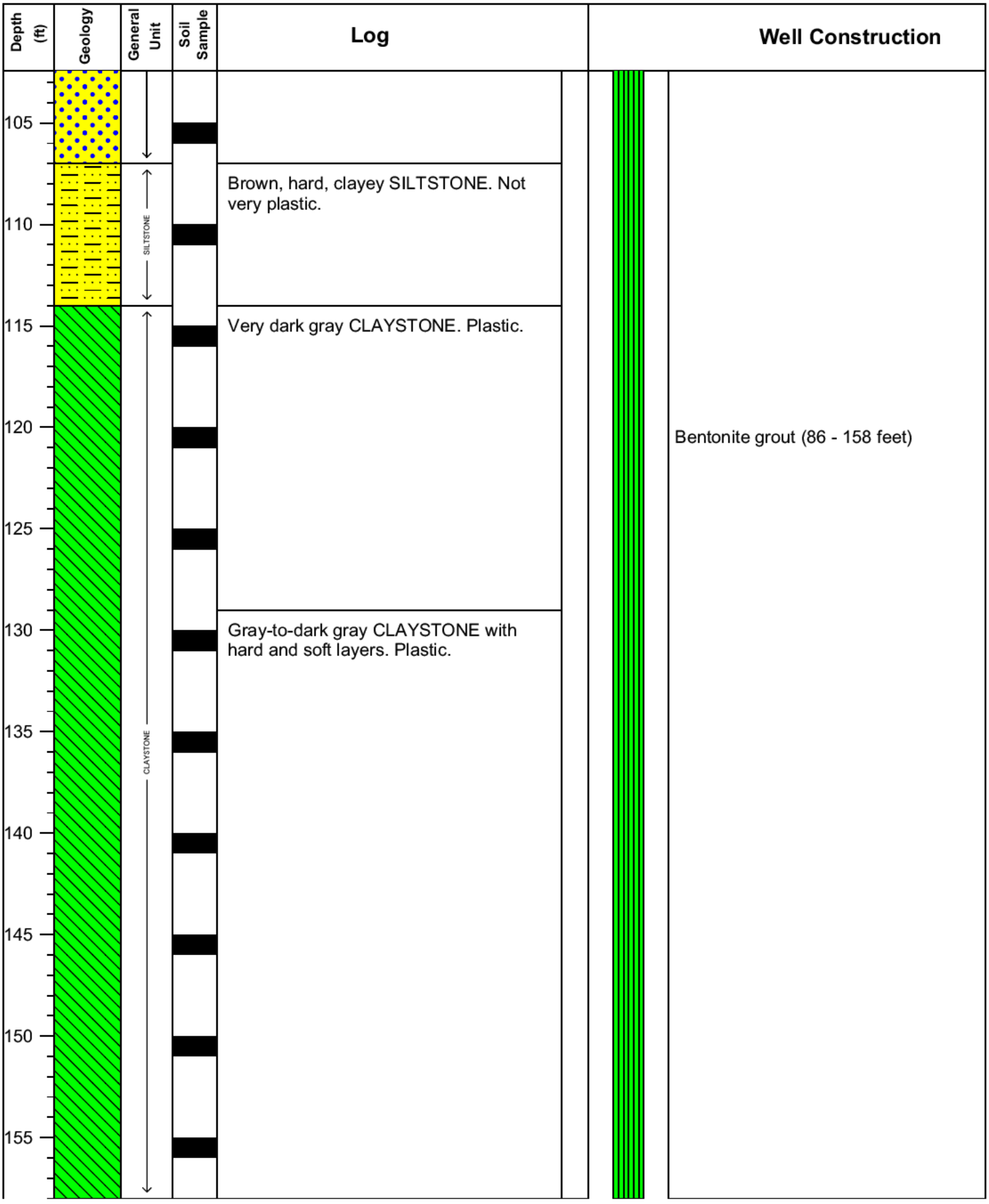


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Charles Ellingson
Location: SE1/4 of SW1/4 Section 33 T21N R26E

Well Name: MW-24
Ecology ID: BAM 087
MP Elevation: 1213.76 feet asl
Datum: Sea level
Installed: 11/1/2007
DTW: 26.24 BMP on 12/14/2007

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-24a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

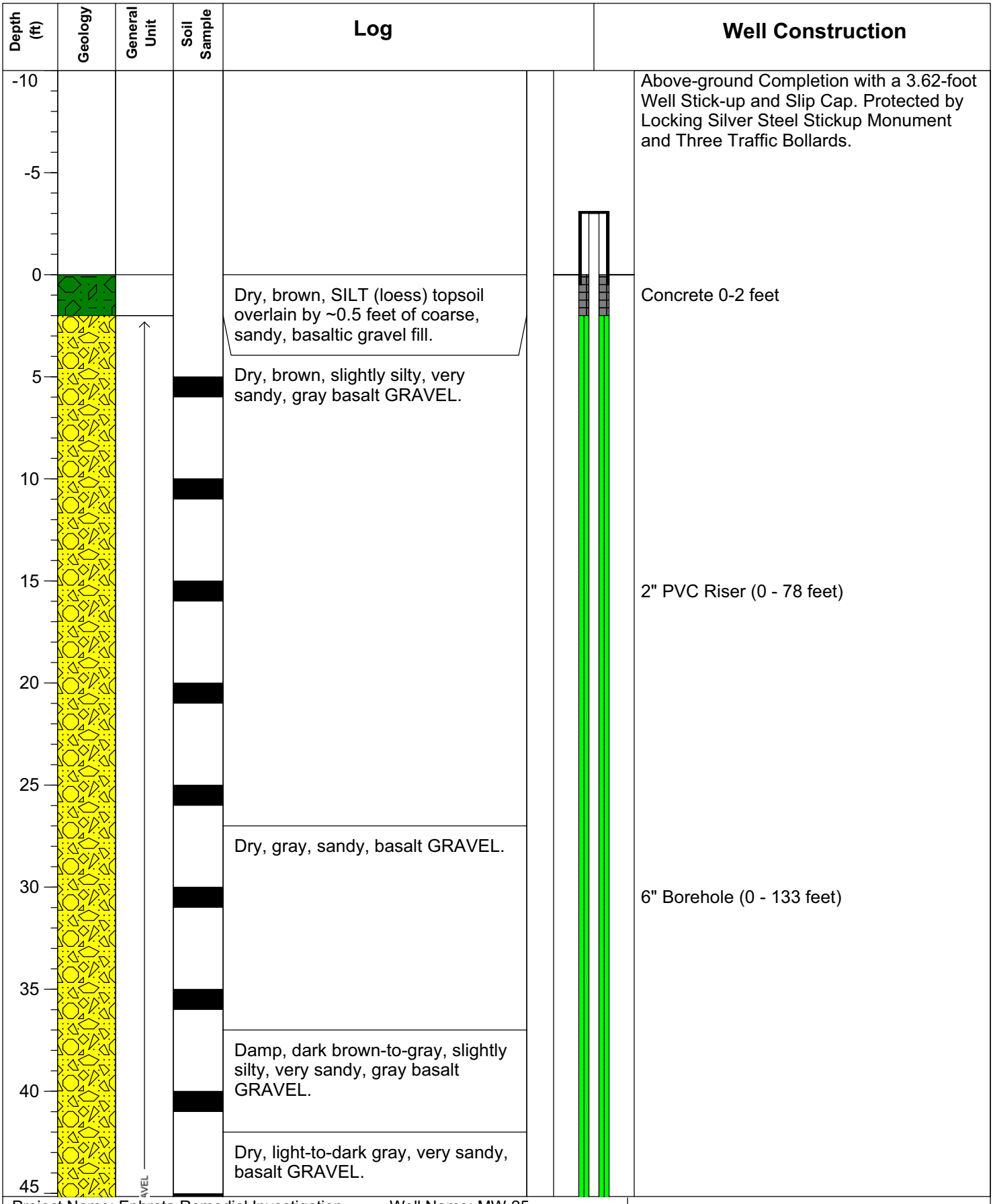


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Charles Ellingson
Location: SE1/4 of SW1/4 Section 33 T21N R26E

Well Name: MW-24
Ecology ID: BAM 087
MP Elevation: 1213.76 feet asl
Datum: Sea level
Installed: 11/1/2007
DTW: 26.24 BMP on 12/14/2007

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-24a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

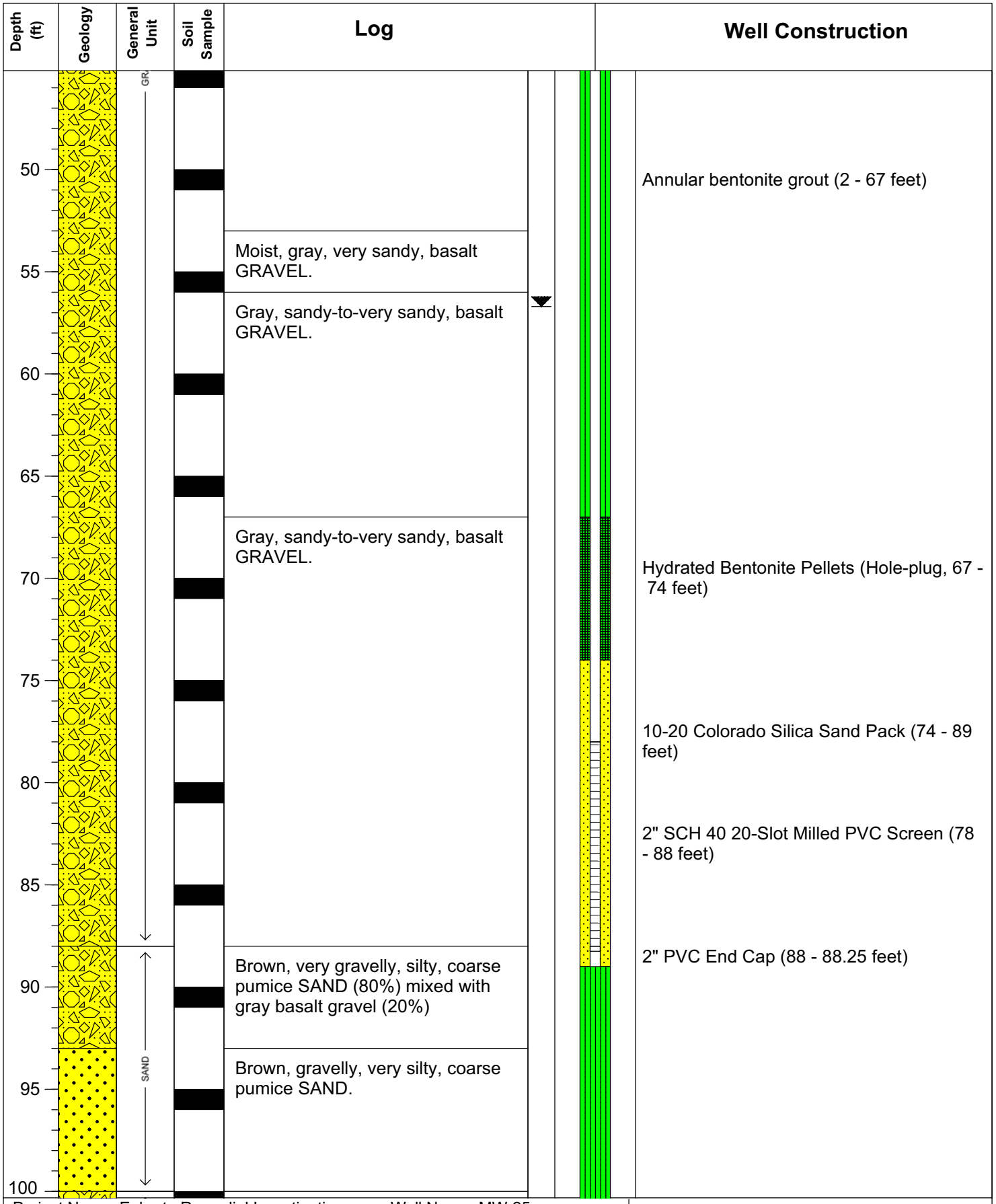
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Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter
Location: SW1/4 of SW1/4 Section 33 T21N R26E

Well Name: MW-25
Ecology ID: BAM 088
MP Elevation: 1244.22 feet asl
Datum: Sea level
Installed: 11/5/2007
DTW: 56.70 BMP on 12/14/2007

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-25a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

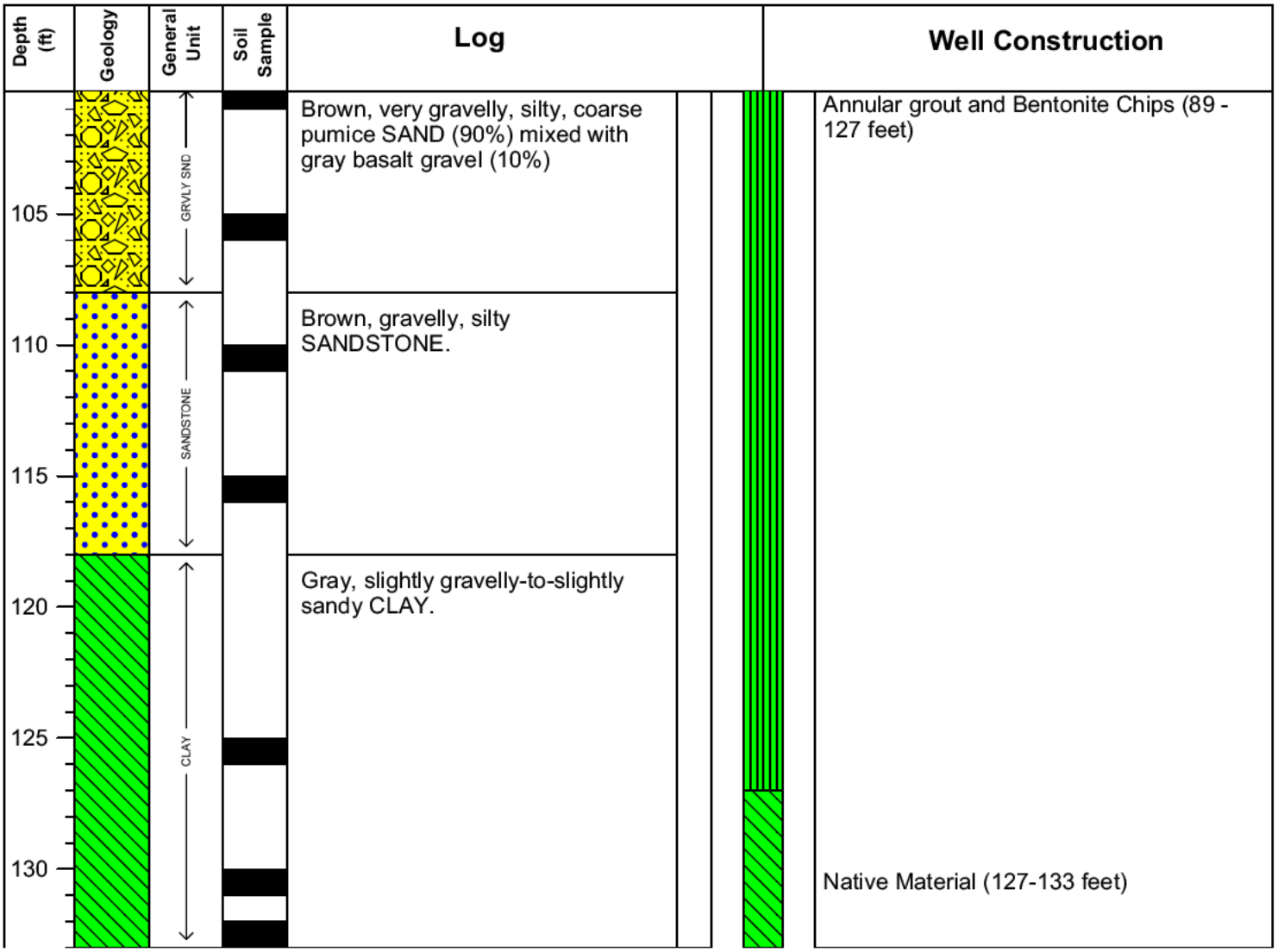


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter
Location: SW1/4 of SW1/4 Section 33 T21N R26E

Well Name: MW-25
Ecology ID: BAM 088
MP Elevation: 1244.22 feet asl
Datum: Sea level
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DTW: 56.70 BMP on 12/14/2007

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-25a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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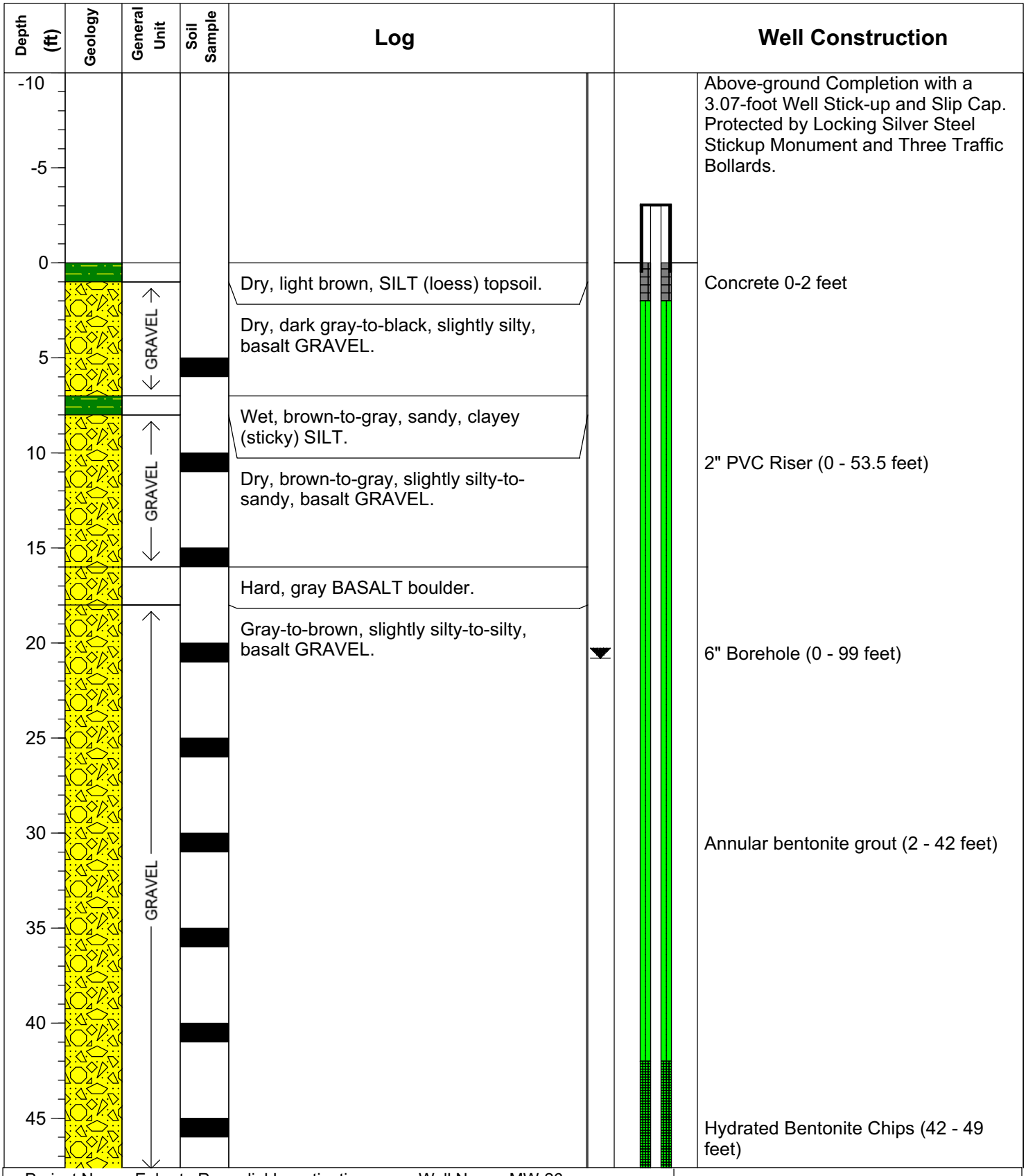


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
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Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter
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Installed: 11/5/2007
DTW: 56.70 BMP on 12/14/2007

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-25a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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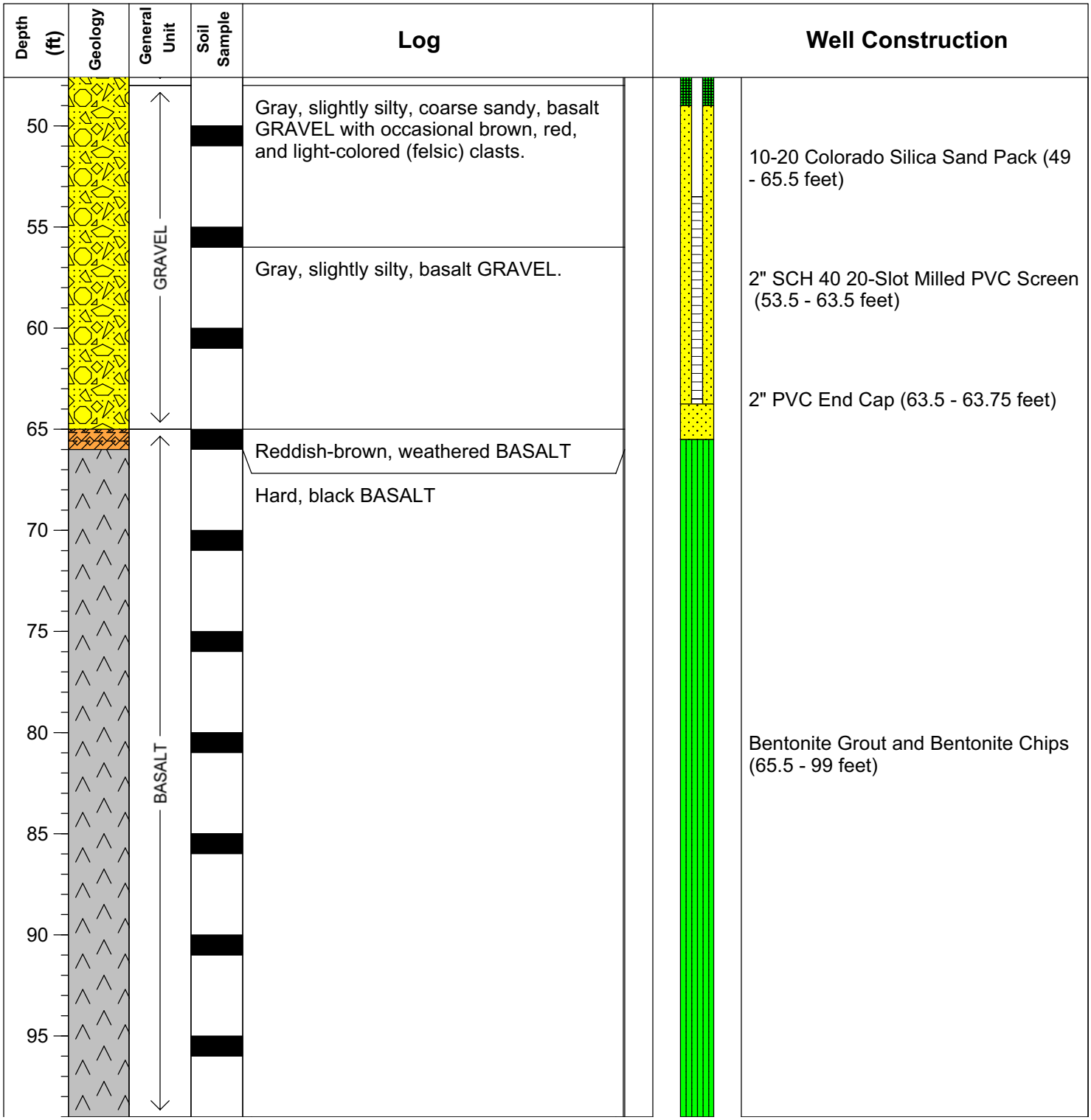


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: NE1/4 of SW1/4 Section 33 T21N R26E

Well Name: MW-26
Ecology ID: BAM 086
MP Elevation: 1208.51 feet asl
Datum: Sea level
Installed: 11/9/2007
DTW: 20.80 BMP on 12/14/2007

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-26a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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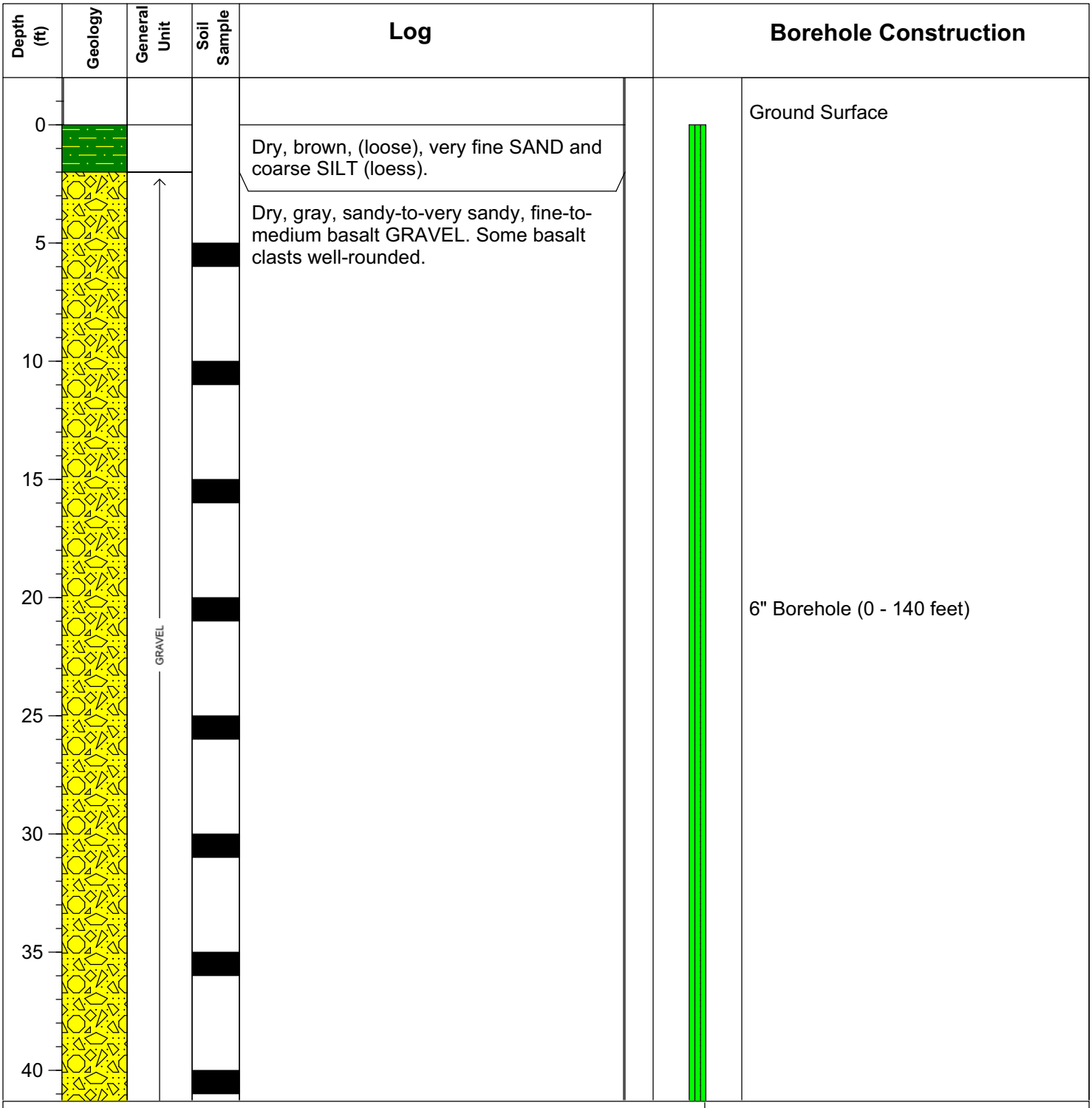


Project Name: Ephrata Remedial Investigation
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GEOLOGIC LOG AND AS-BUILT FOR WELL MW-26a
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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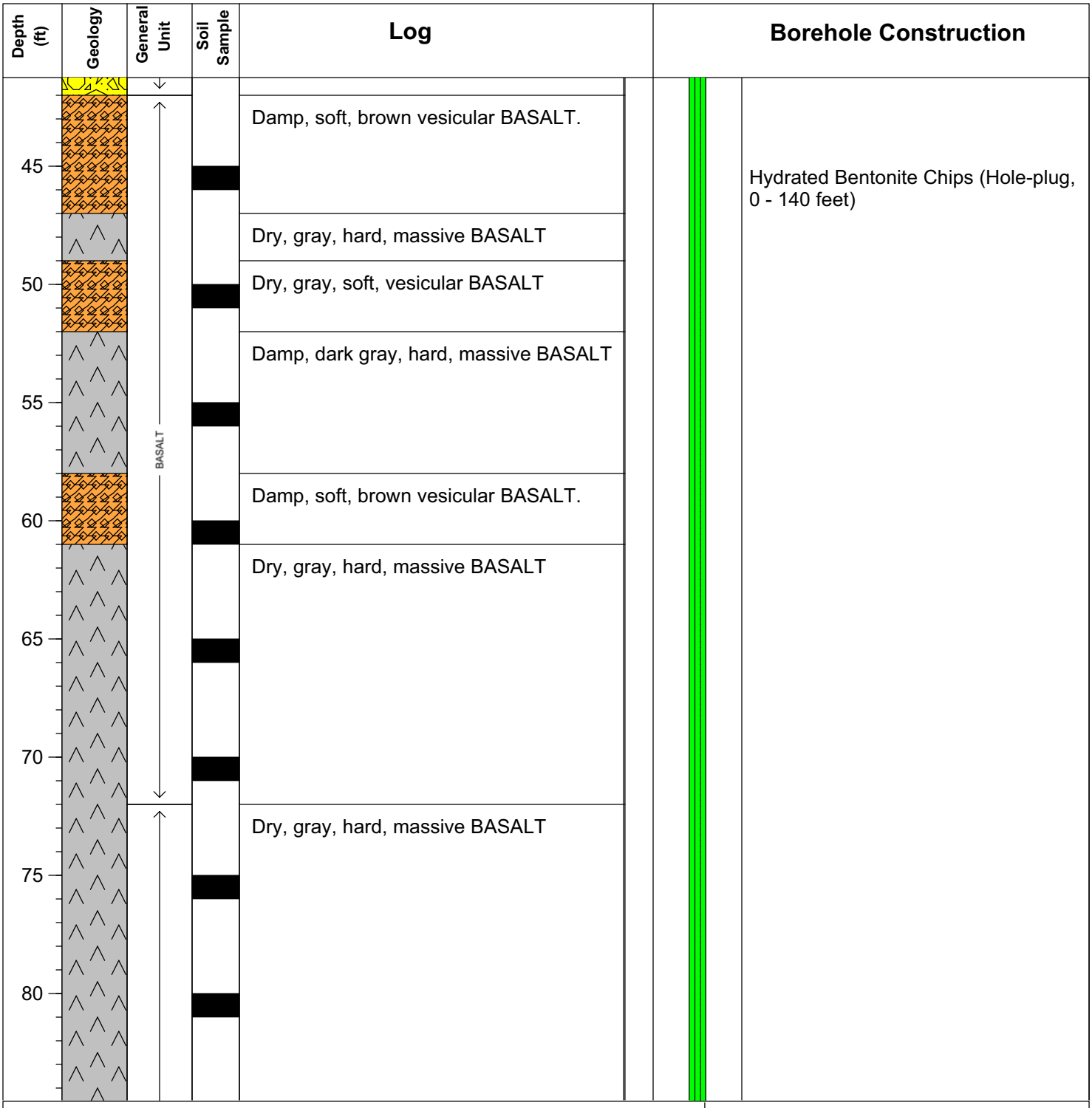
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Boring Name: B-27
Ground Elevation: 1273.43 feet asl

Datum: Sea level
Drilled: 11/13/2007

GEOLOGIC LOG FOR BORING B-27
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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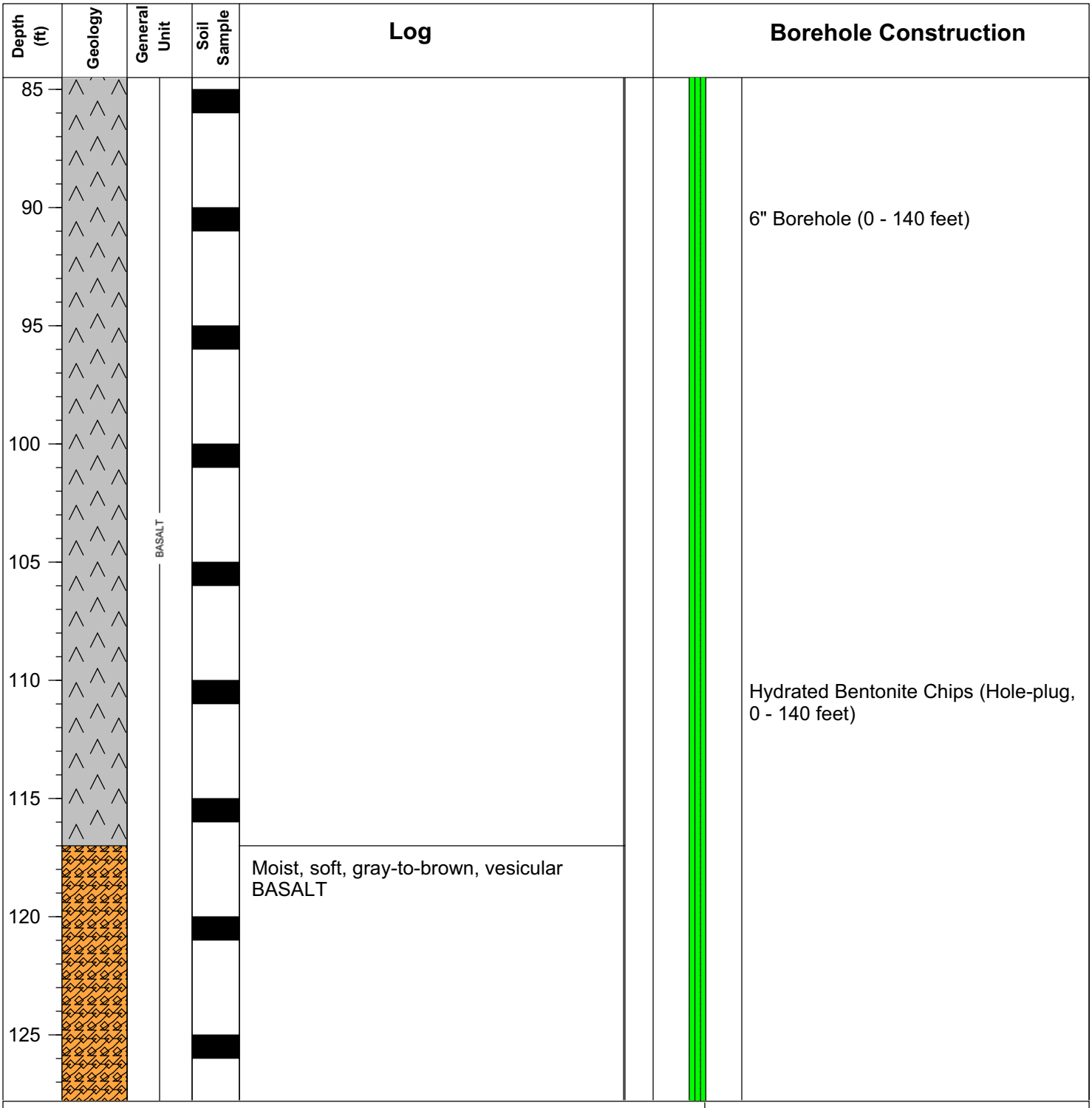
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Boring Name: B-27
Ground Elevation: 1273.43 feet asl

Datum: Sea level
Drilled: 11/13/2007

GEOLOGIC LOG FOR BORING B-27
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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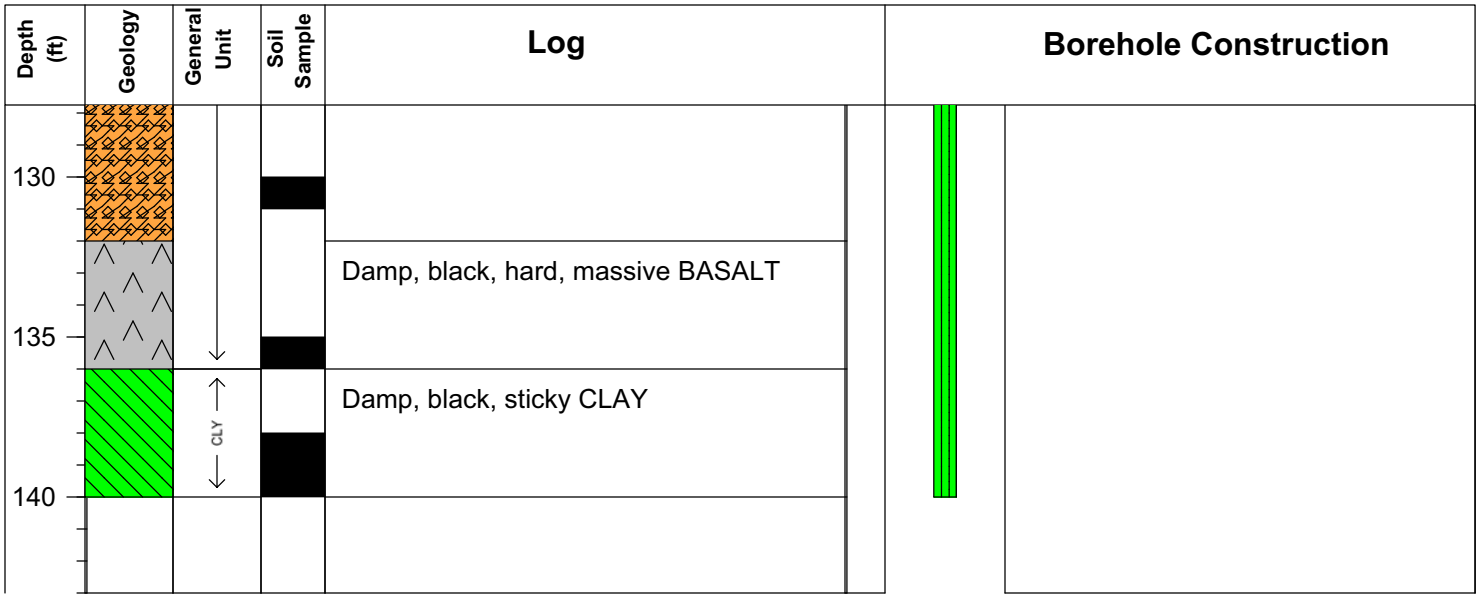
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Boring Name: B-27
Ground Elevation: 1273.43 feet asl

Datum: Sea level
Drilled: 11/13/2007

GEOLOGIC LOG FOR BORING B-27
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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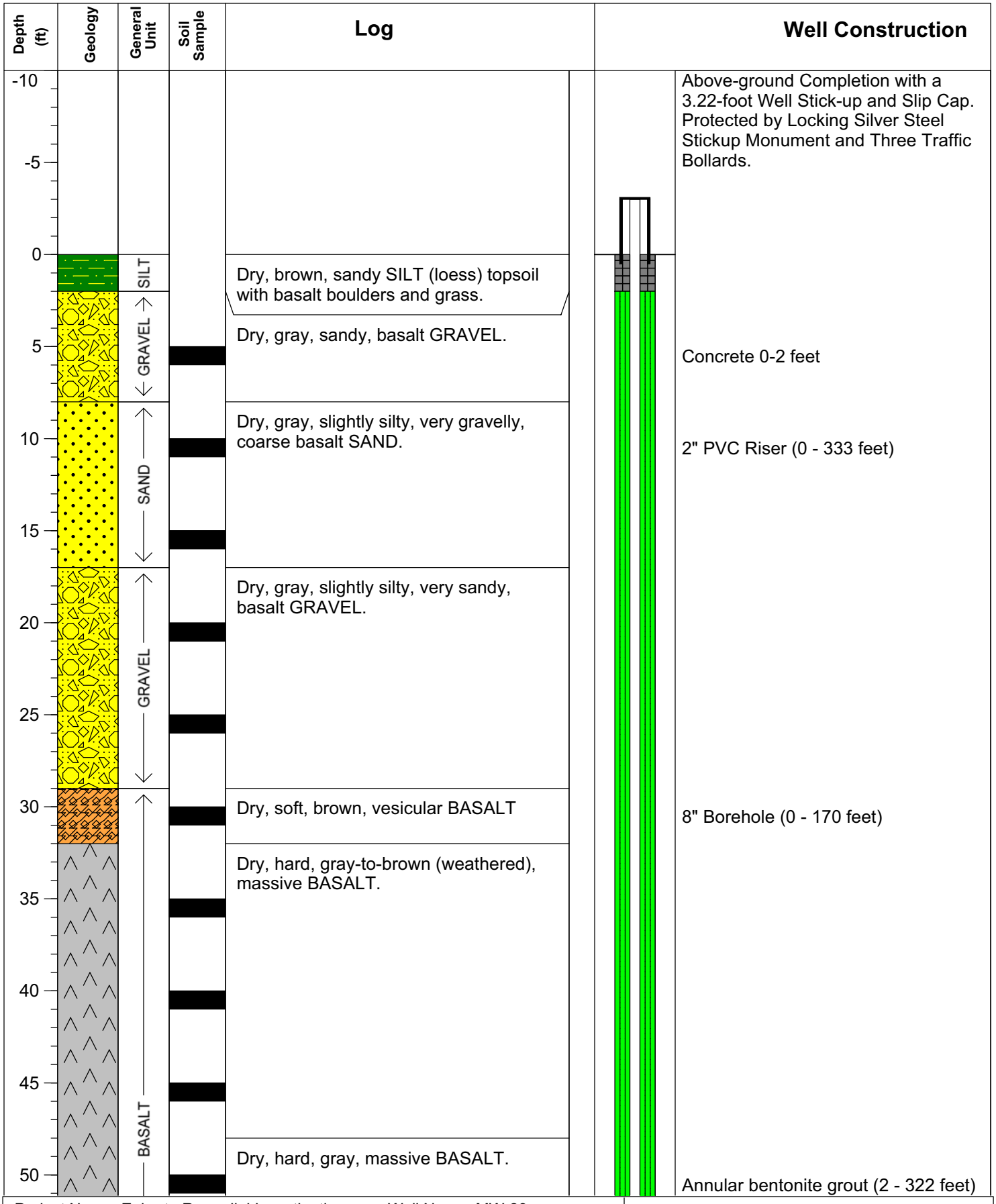
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Boring Name: B-27
Ground Elevation: 1273.43 feet asl

Datum: Sea level
Drilled: 11/13/2007
Page 4 of 4

GEOLOGIC LOG FOR BORING B-27
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

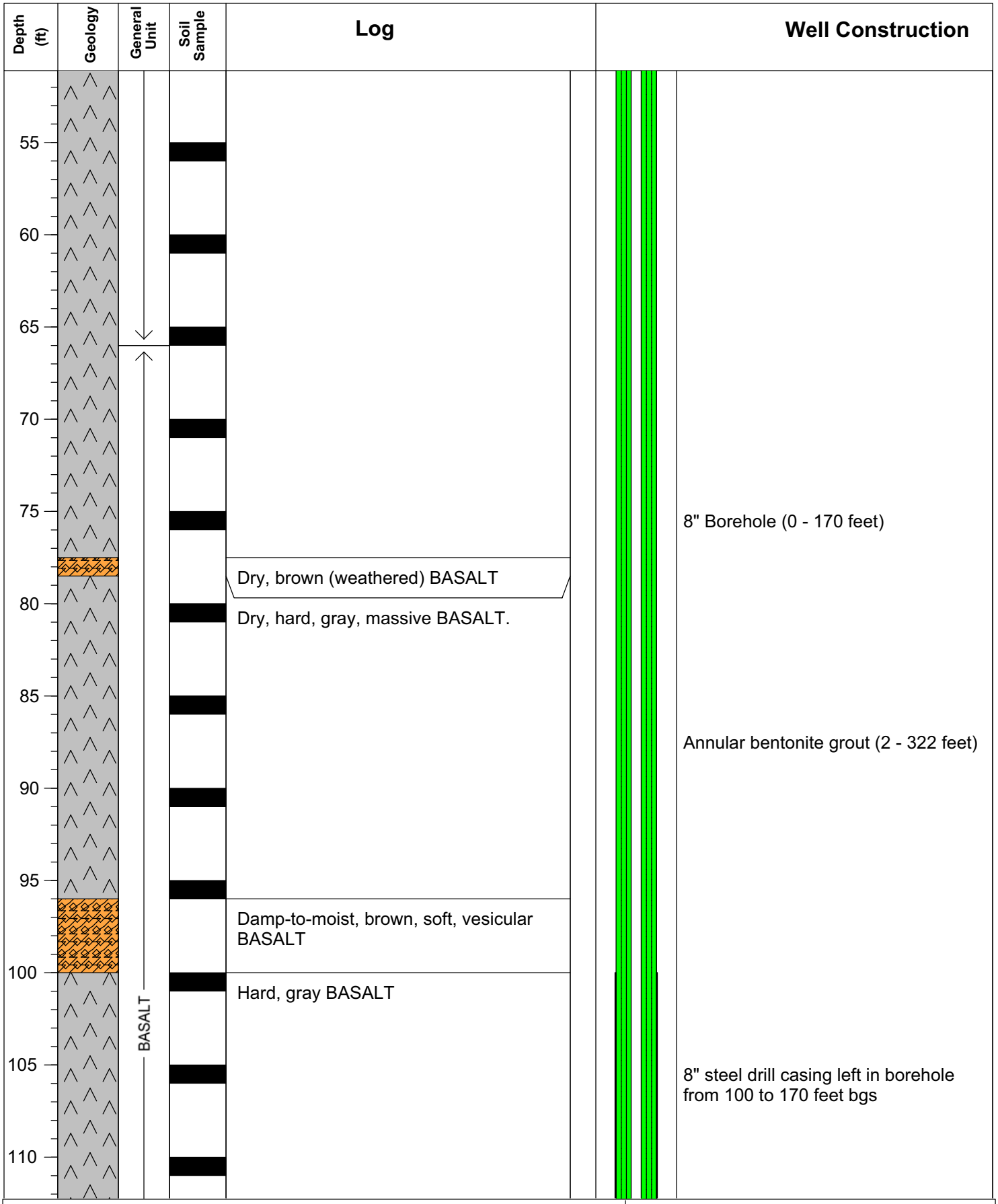


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter & Charles Ellingson
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Well Name: MW-28
Ecology ID: BAM 089
MP Elevation: 1277.96 feet asl
Datum: Sea level
Installed: 11/27/2007
DTW: 156.54 BMP on 12/14/07

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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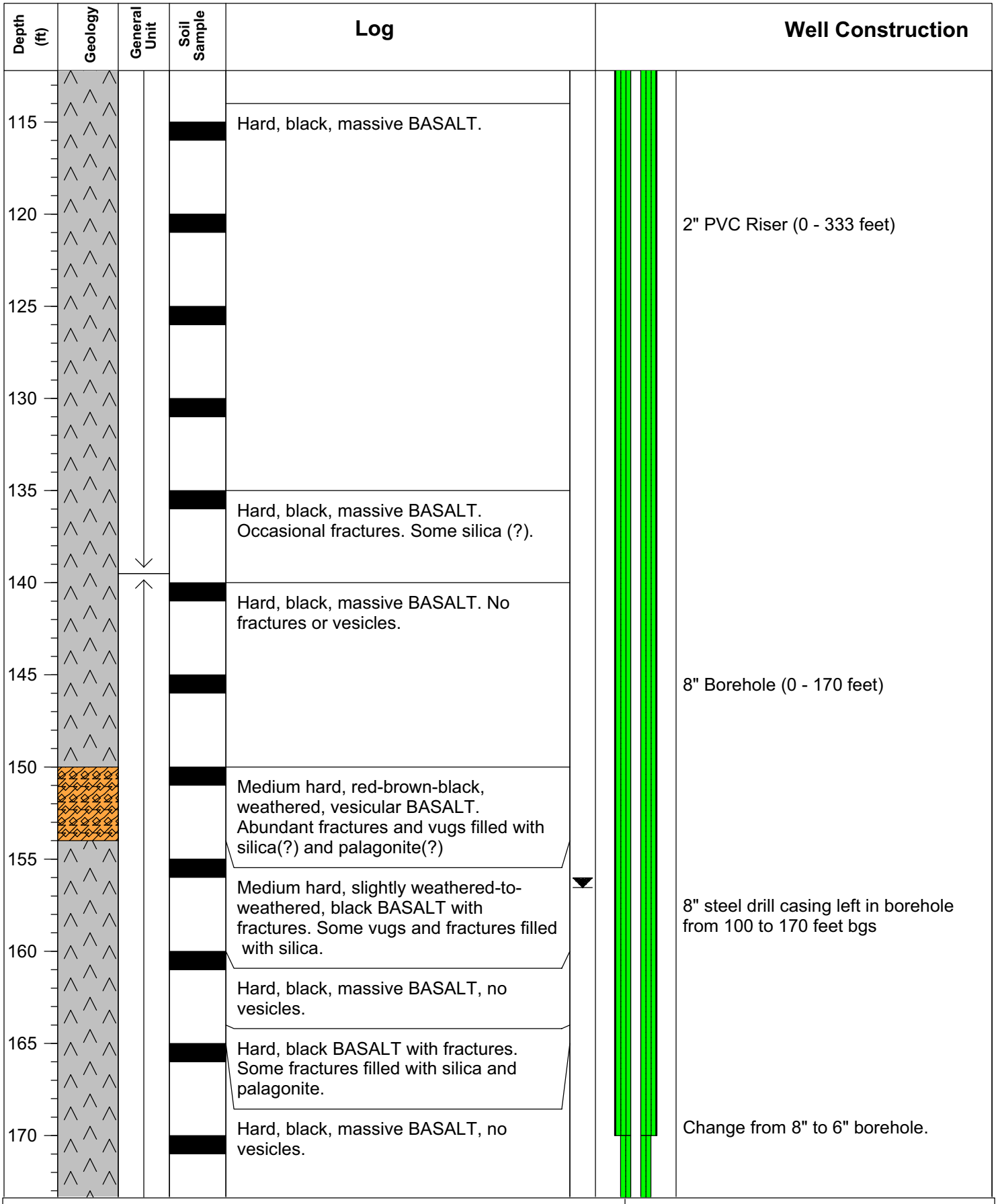


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter & Charles Ellingson
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Well Name: MW-28
Ecology ID: BAM 089
MP Elevation: 1277.96 feet asl
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GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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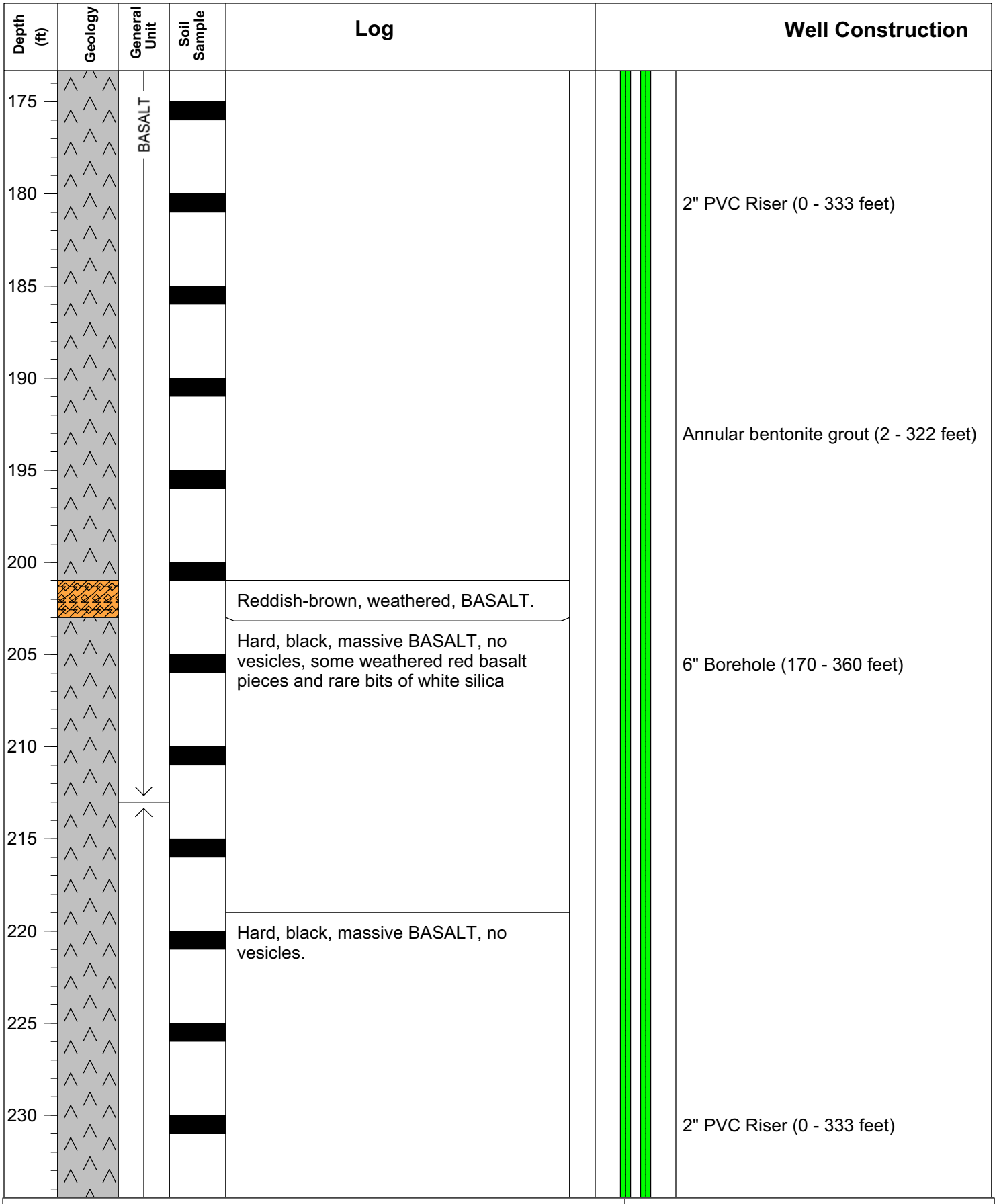


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter & Charles Ellingson
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Well Name: MW-28
Ecology ID: BAM 089
MP Elevation: 1277.96 feet asl
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GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

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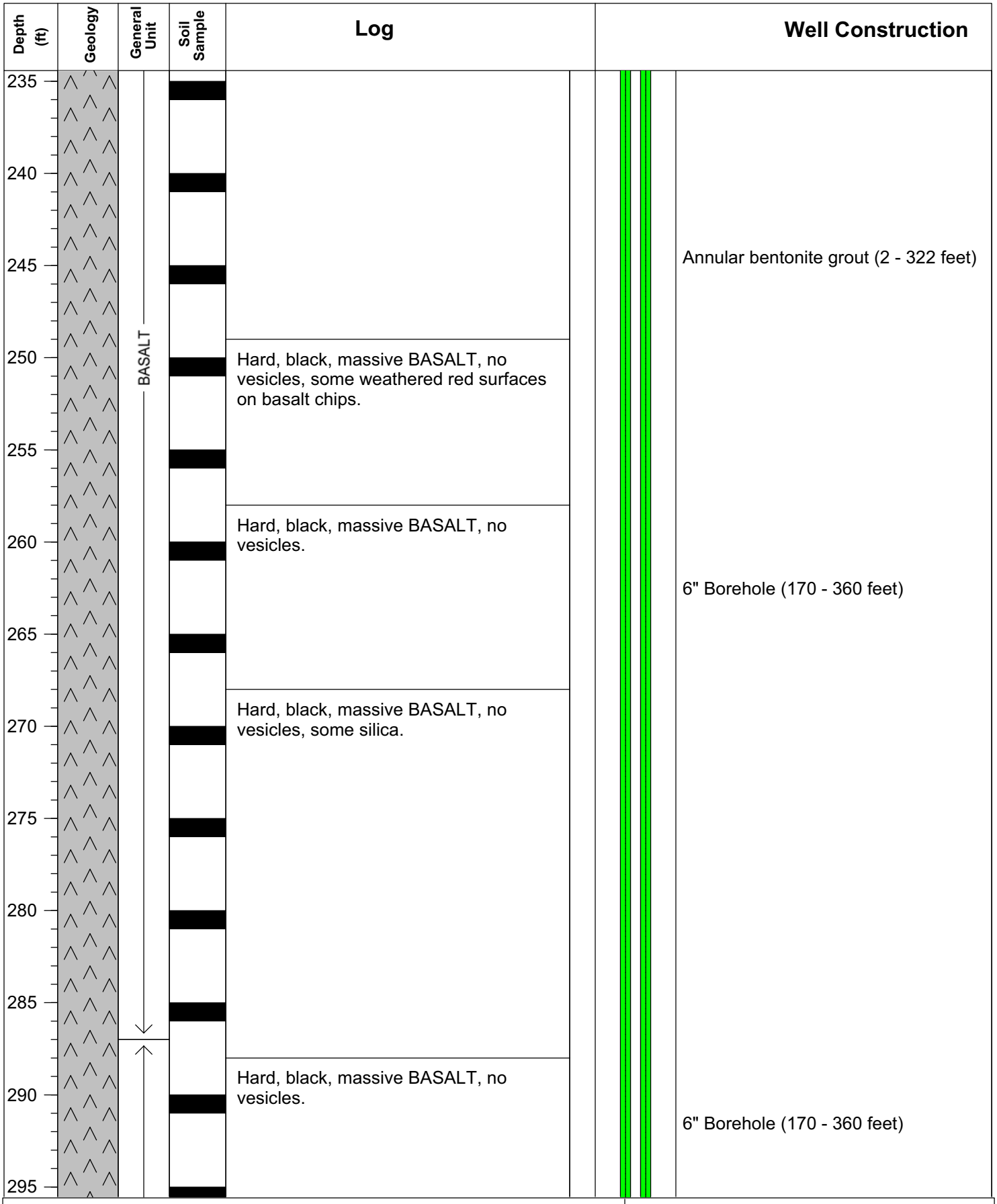


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
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Consulting Firm: Pacific Groundwater Group
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GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

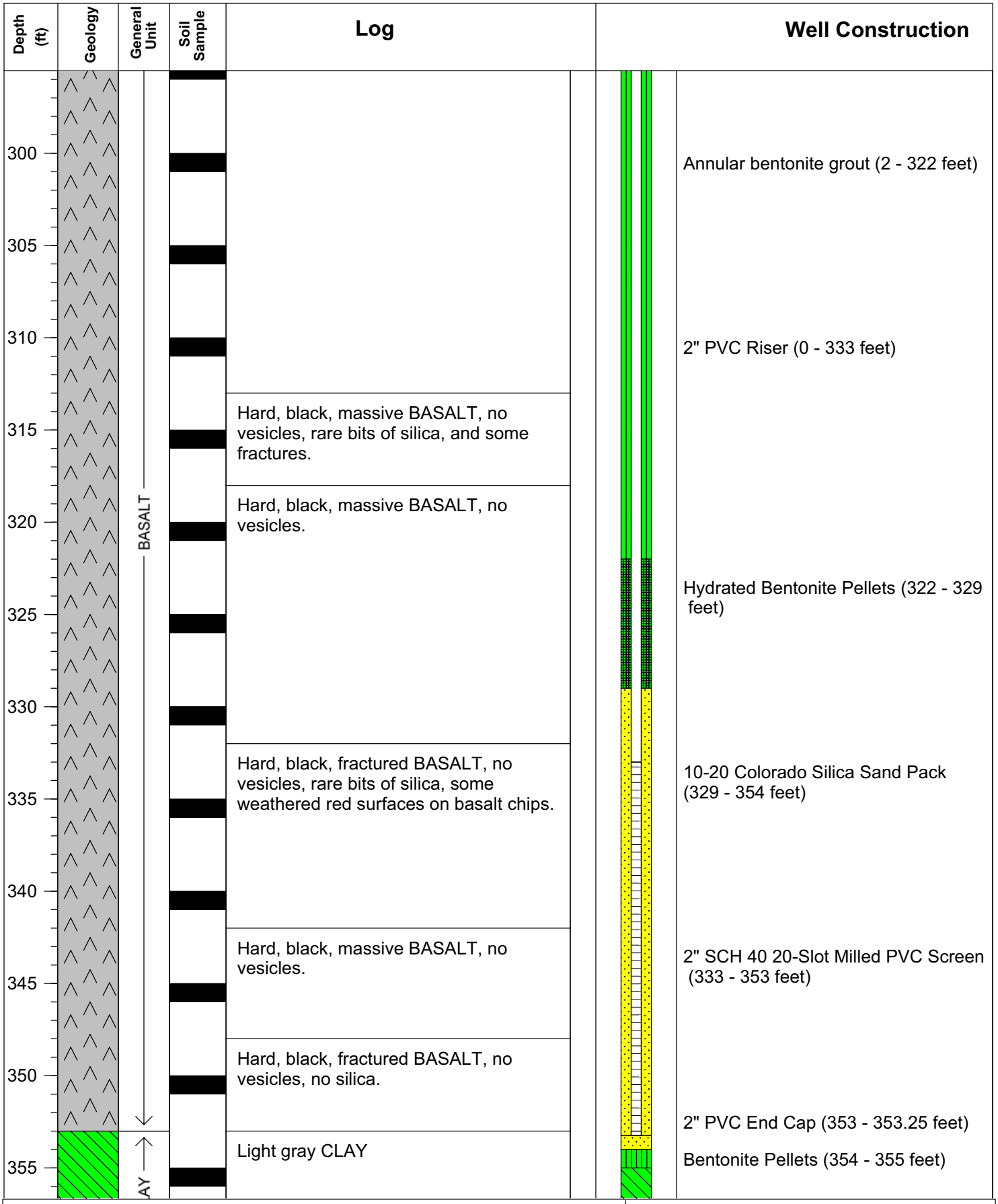


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter & Charles Ellingson
Location: SE1/4 of NE1/4 Section 32 T21N R26E

Well Name: MW-28
Ecology ID: BAM 089
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Datum: Sea level
Installed: 11/27/2007
DTW: 156.54 BMP on 12/14/07

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG



Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary
Driller: John
Firm: Boart/Longyear
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Witter & Charles Ellingson
Location: SE1/4 of NE1/4 Section 32 T21N R26E

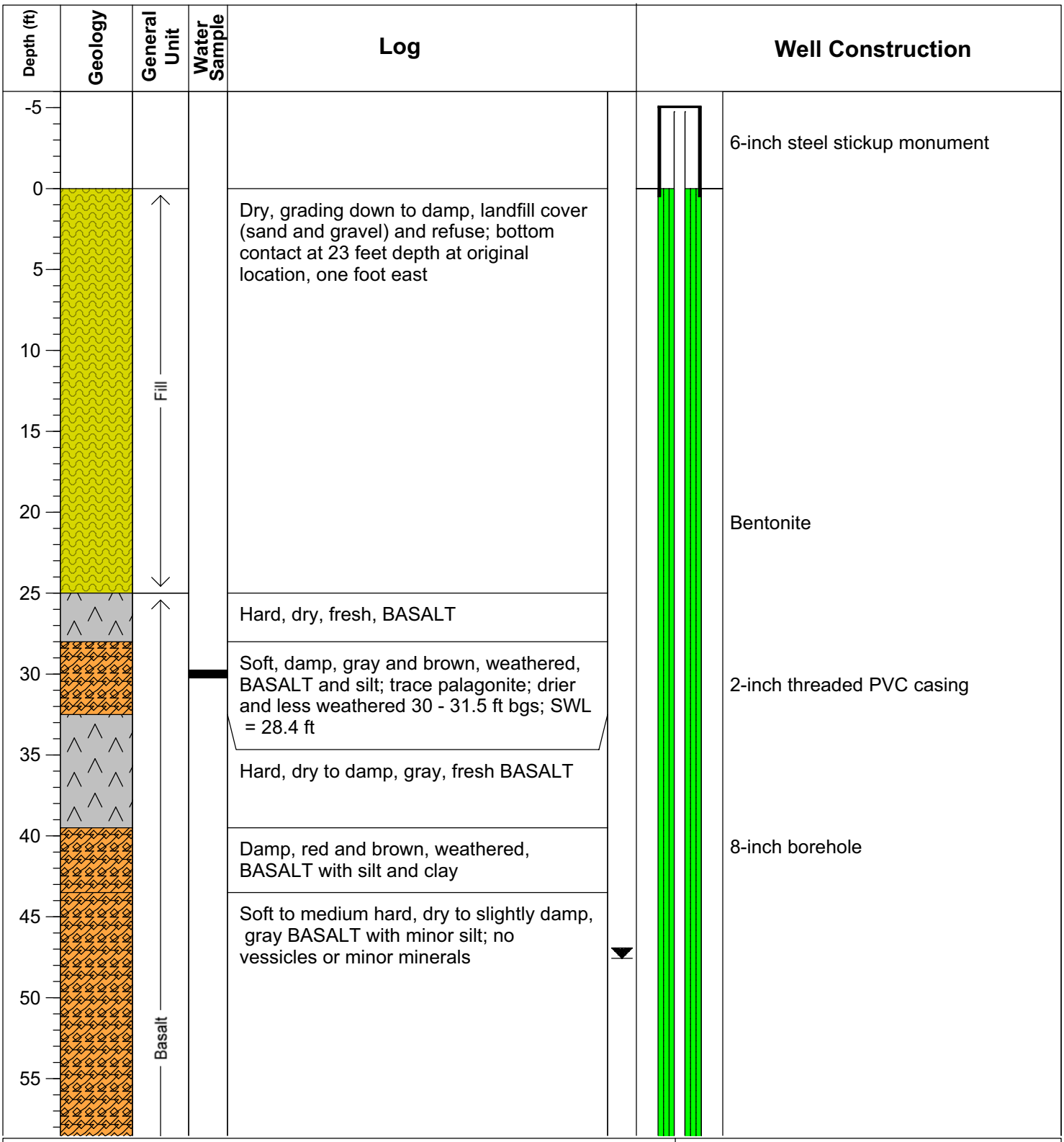
Well Name: MW-28
Ecology ID: BAM 089
MP Elevation: 1277.96 feet asl
Datum: Sea level
Installed: 11/27/2007
DTW: 156.54 BMP on 12/14/07

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d
Ephrata Landfill
Ephrata, Washington
JE0714a, 11/2007

PgG

Depth (ft)	Geology	General Unit	Soil Sample	Log	Well Construction
360		CL			Native Material Collapsed in (355 - 360 feet)

Project Name: Ephrata Remedial Investigation Drilling Method: Air Rotary Driller: John Firm: Boart/Longyear Consulting Firm: Pacific Groundwater Group Logged by: Jeff Witter & Charles Ellingson Location: SE1/4 of NE1/4 Section 32 T21N R26E	Well Name: MW-28 Ecology ID: BAM 089 MP Elevation: 1277.96 feet asl Datum: Sea level Installed: 11/27/2007 DTW: 156.54 BMP on 12/14/07 Page 7 of 7	**GEOLOGIC LOG AND AS-BUILT FOR WELL MW-28d** Ephrata Landfill Ephrata, Washington JE0714a, 11/2007 PgG

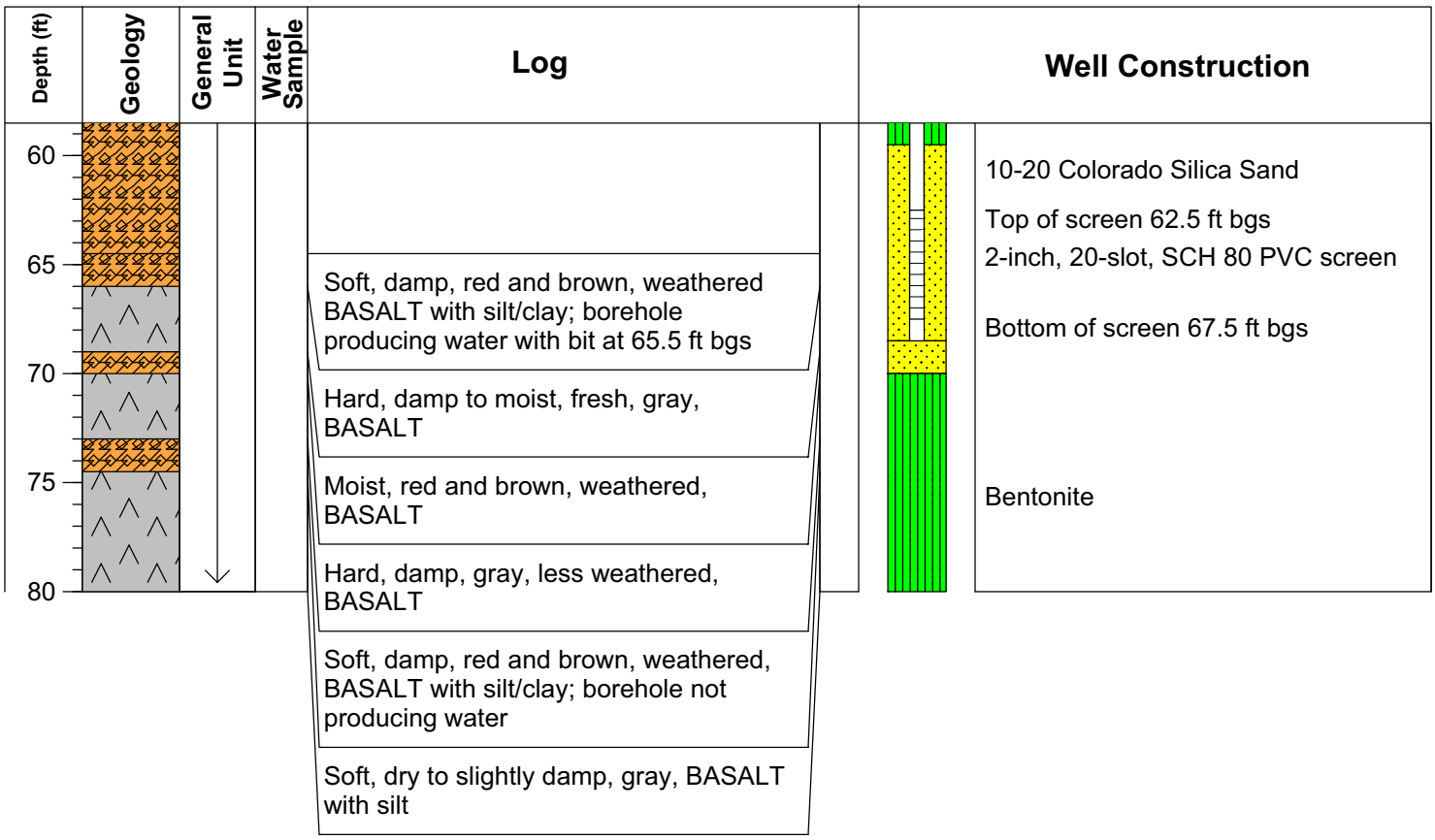


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: SW1/4 NW1/4 of Section 33 T21N R26E

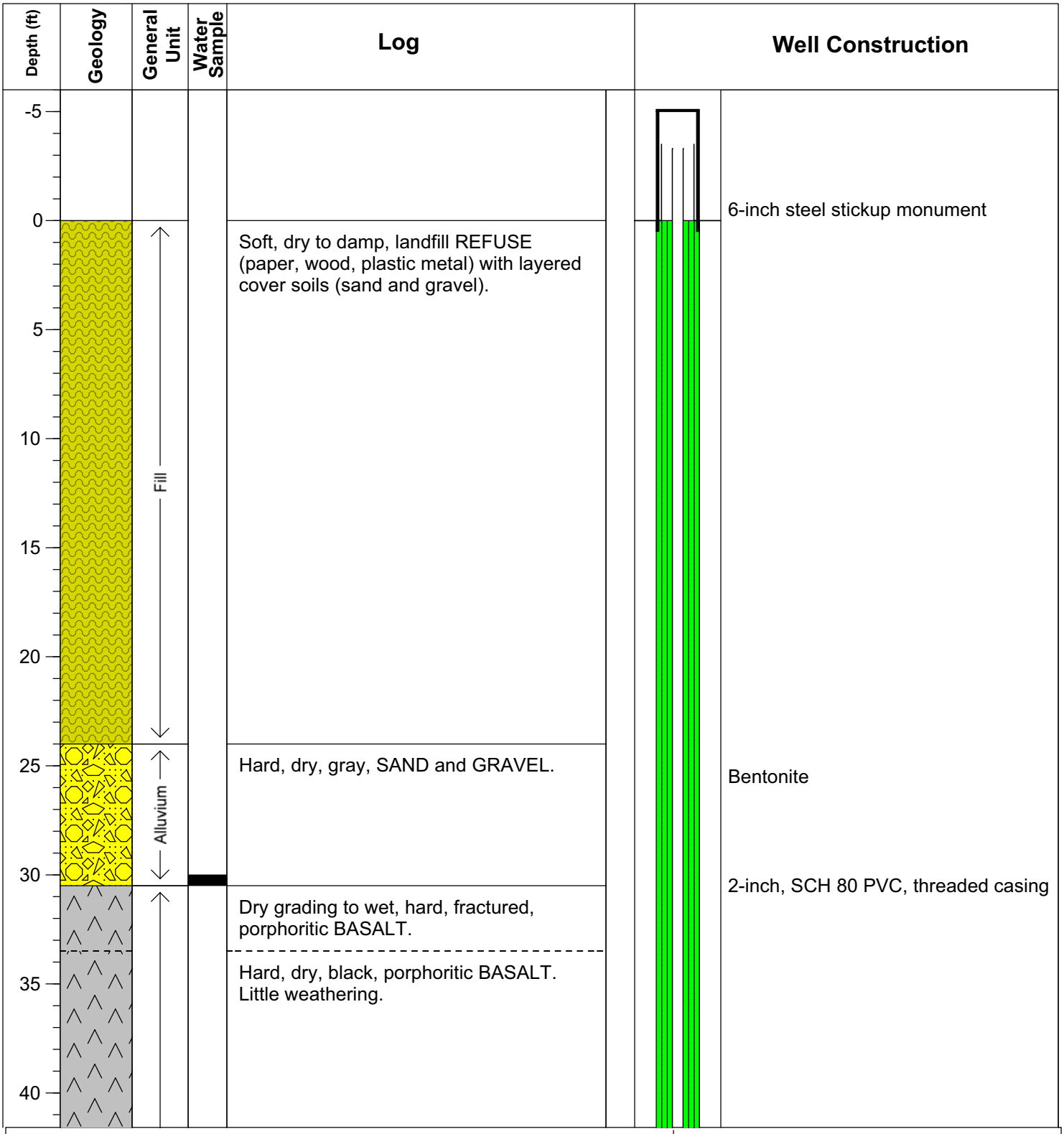
Well Name: MW-29b
Ecology ID: BAS-433
MP Elevation: 1285.18
Datum:Sea level
Installed: 10/09/2008
DTW: 50.60 BMP on 11/17/2008

MW-29b (B-19)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG



Project Name: Ephrata Remedial Investigation	Well Name: MW-29b	**MW-29b (B-19)**
Drilling Method: Air Rotary 8-inch tubex	Ecology ID: BAS-433	**Drum Area Exploration**
Driller: Tim Smith	MP Elevation: 1285.18	Ephrata Landfill
Firm: Environmental West Drilling	Datum:Sea level	Ephrata, Washington
Consulting Firm: Pacific Groundwater Group	Installed: 10/09/2008	JE0714, 12/2008
Logged by: Dawn Chapel	DTW: 50.60 BMP on 11/17/2008	PgG
Location: SW1/4 NW1/4 of Section 33 T21N R26E	Page 2 of 2	

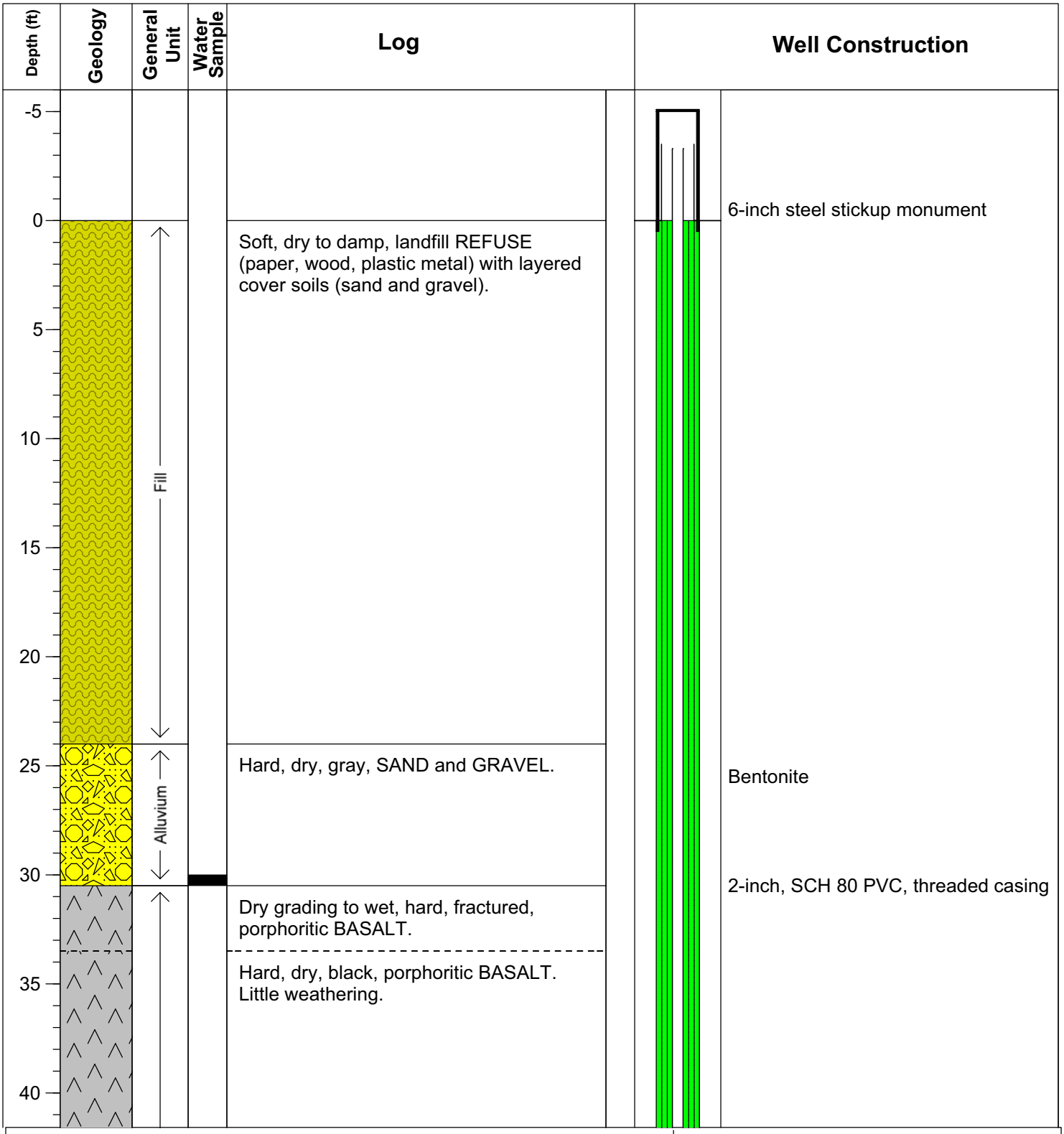


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-30b
Ecology ID: BAS-435
MP Elevation: 1288.12
Datum: Sea level
Installed: 10/14/2008
DTW: 53.87 BMP on 11/17/2008

MW-30b (B-22)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

PgG

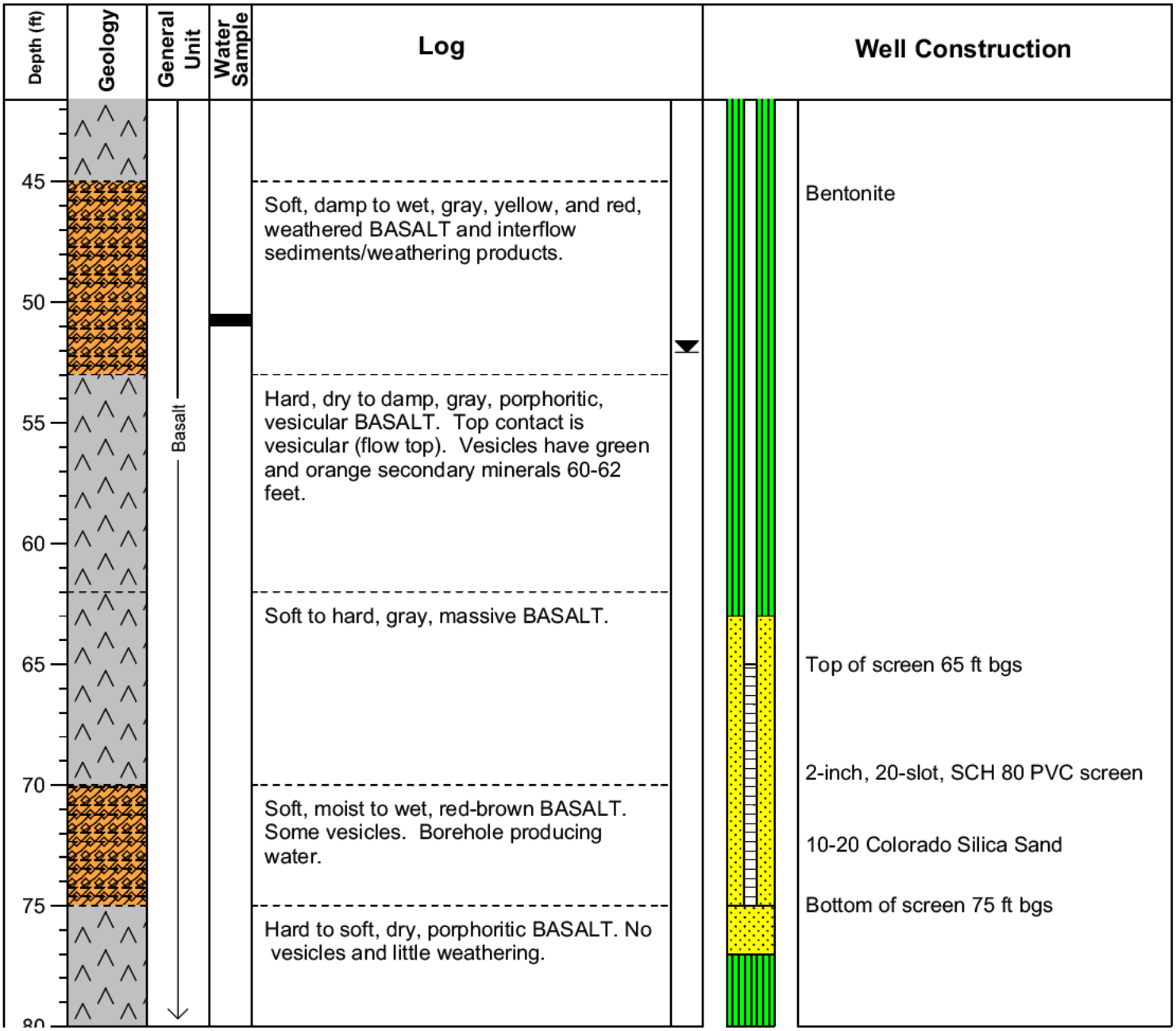


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-30b
Ecology ID: BAS-435
MP Elevation: 1288.12
Datum: Sea level
Installed: 10/14/2008
DTW: 53.87 BMP on 11/17/2008

MW-30b (B-22)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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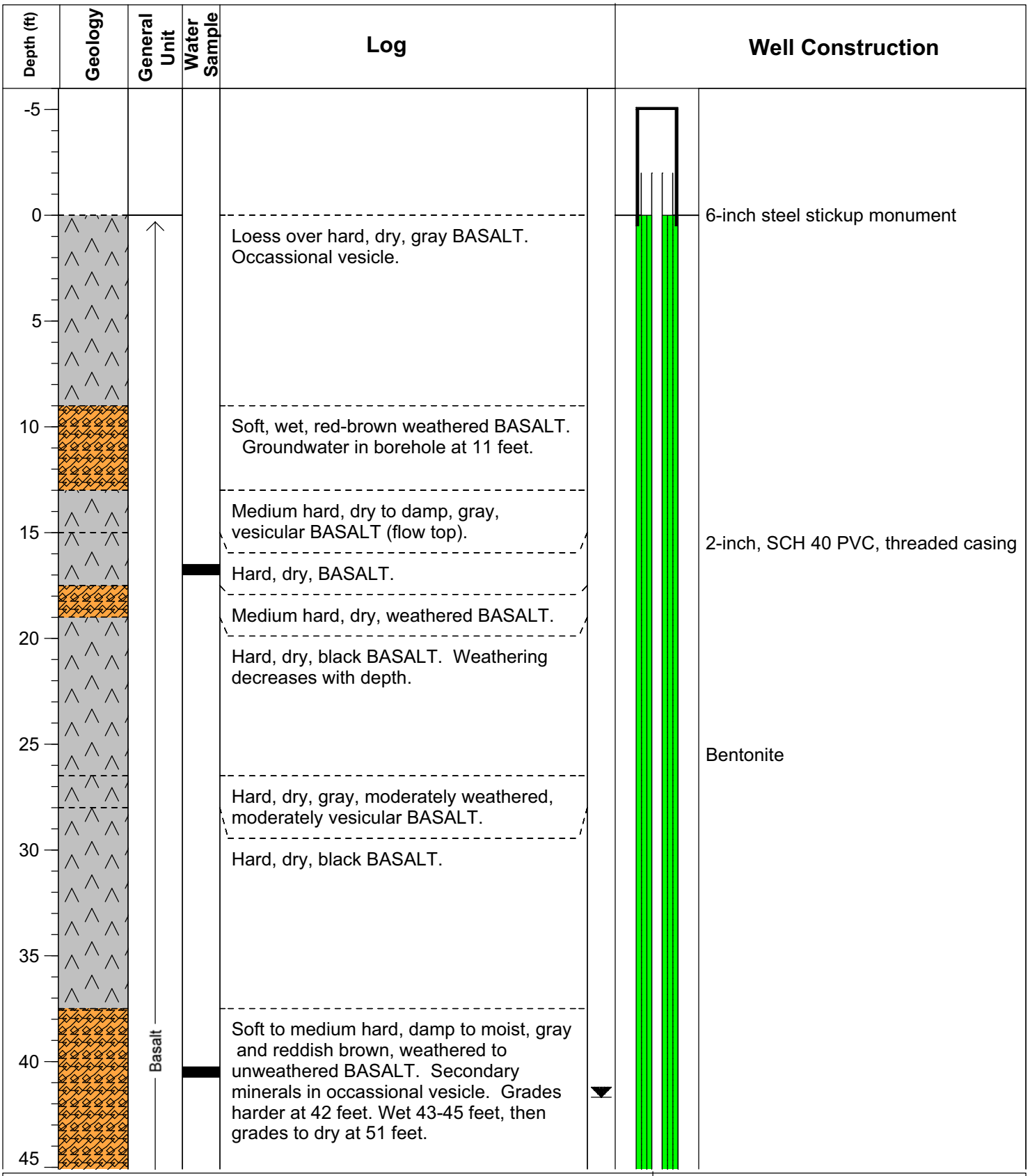


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

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MW-30b (B-22)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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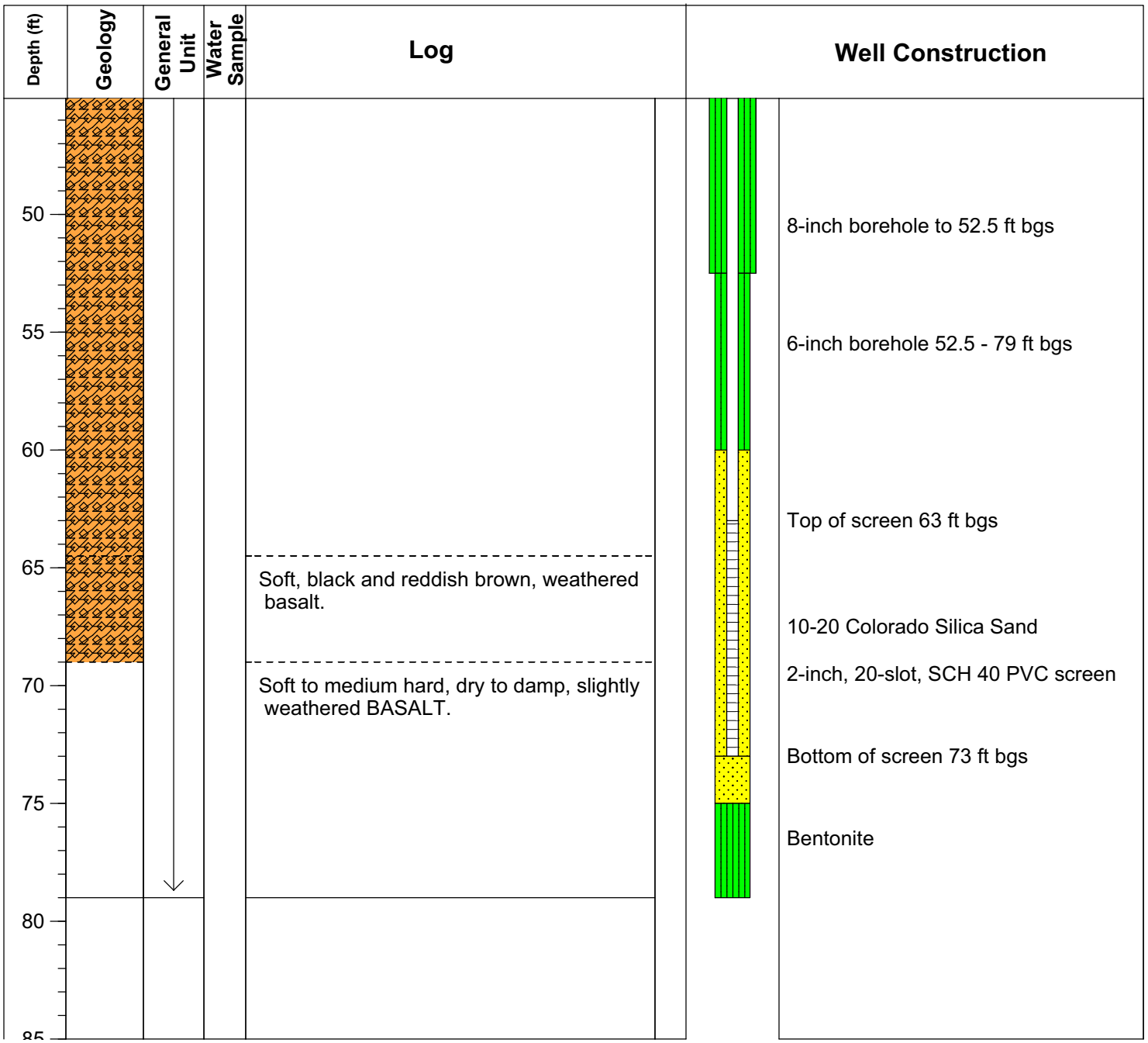


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-31b
Ecology ID: BAS-256
MP Elevation: 1274.89 ft
Datum: Sea level
Installed: 10/19/2008
DTW: 41.69 BMP on 11/17/2008

MW-31b (B-26)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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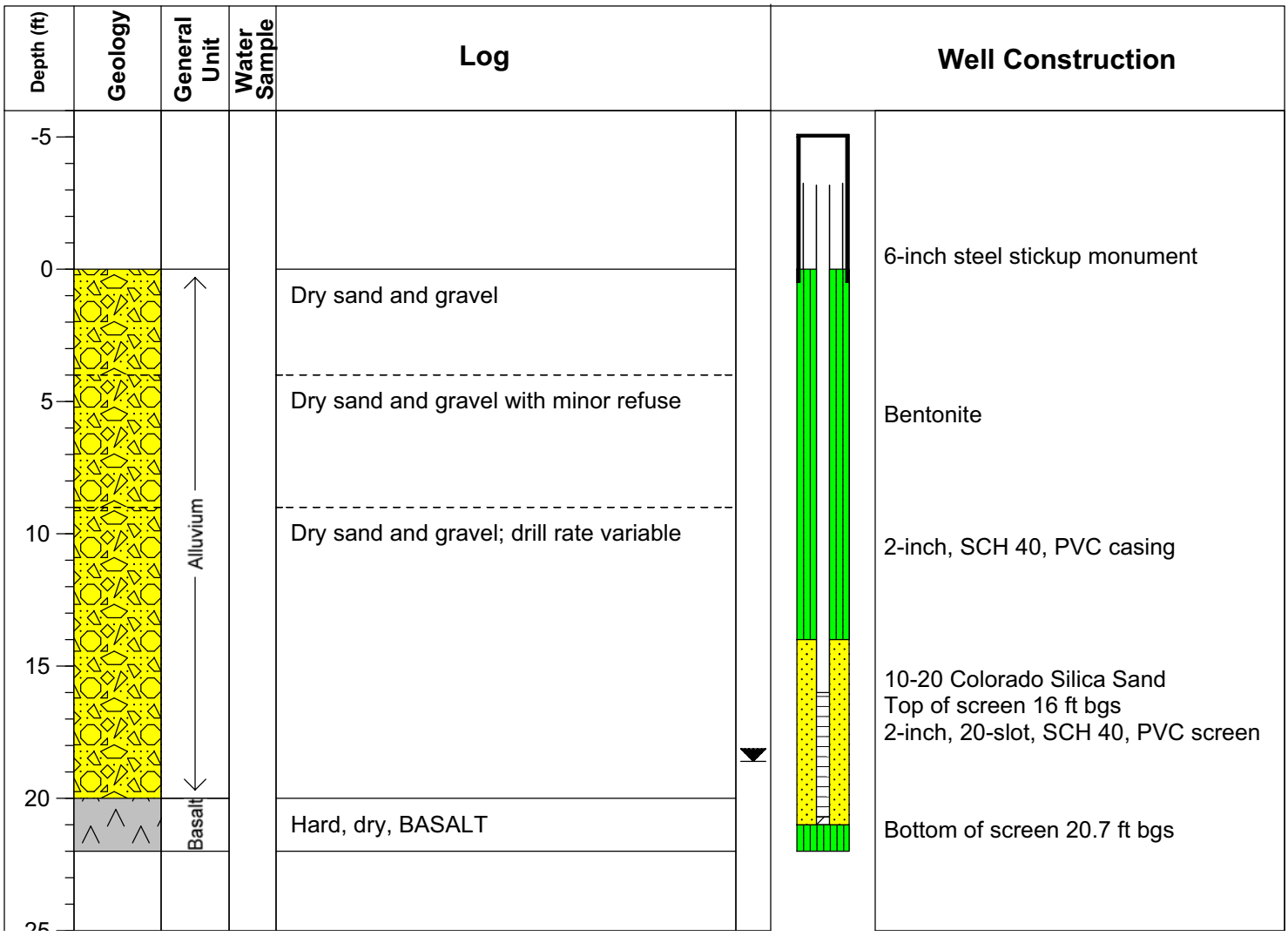


Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-31b
Ecology ID: BAS-256
MP Elevation: 1274.89 ft
Datum: Sea level
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DTW: 41.69 BMP on 11/17/2008

MW-31b (B-26)
Drum Area Exploration
Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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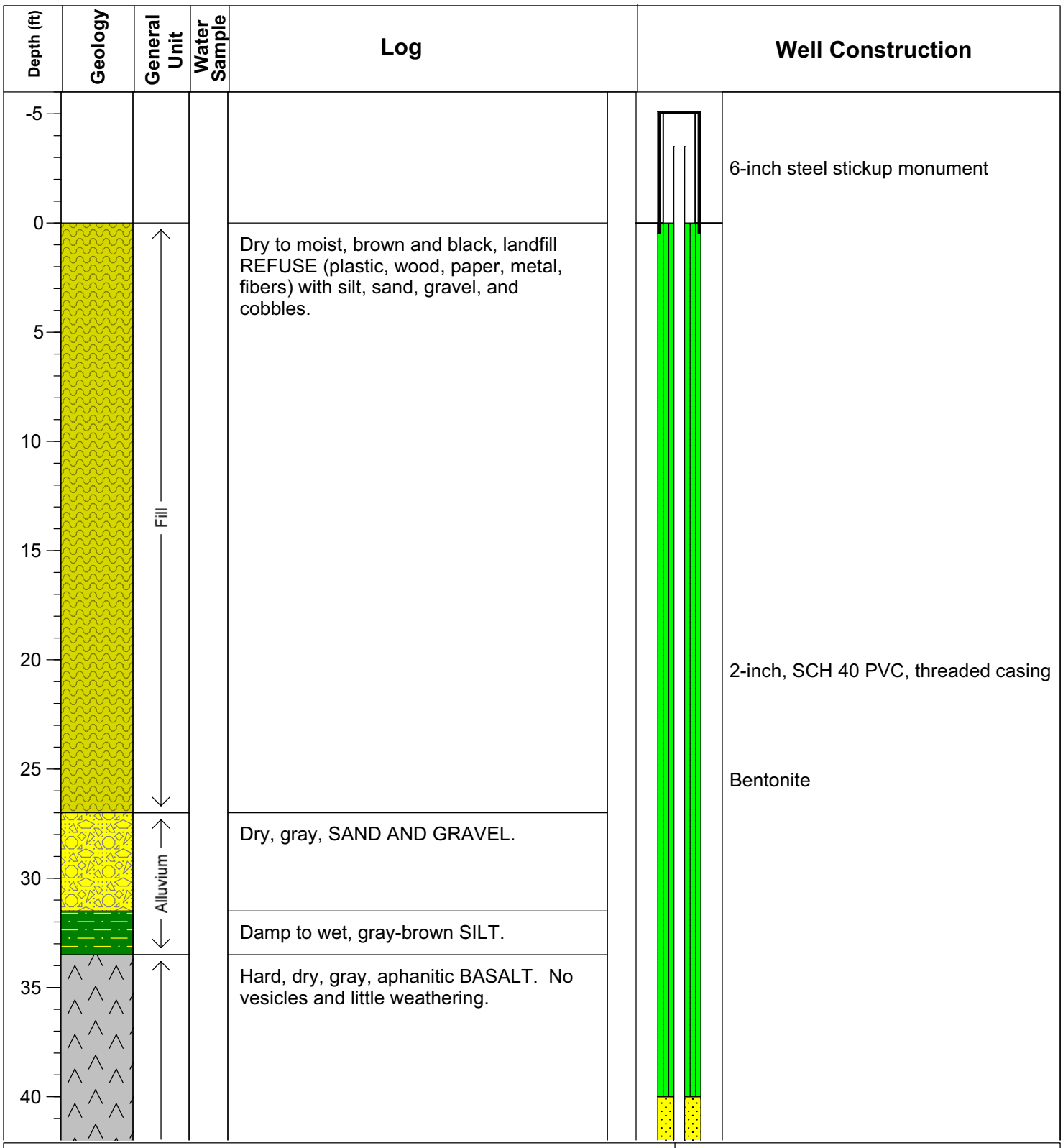
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Trevor Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-32a
Ecology ID: BAS-255
MP Elevation: 1276.47 ft
Datum: Sea level
Installed: 11/27/2007
DTW: 22.73 BMP on 11/17/2008

GEOLOGIC LOG AND AS-BUILT WELL MW-32a (B-17)

Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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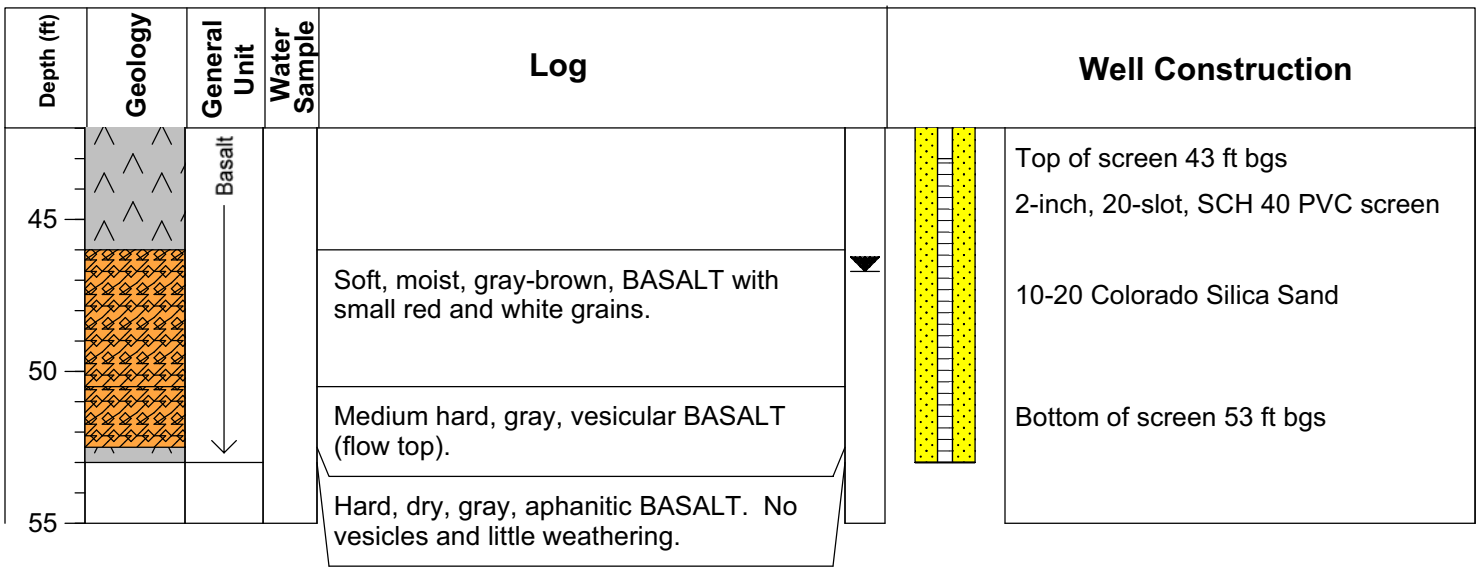
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Charles Ellingson
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-33p2
Ecology ID: BAS-432
MP Elevation: 1291.67 FT
Datum: Sea level
Installed: 10/8/2008
DTW: 52.33 BMP on 11/17/2008

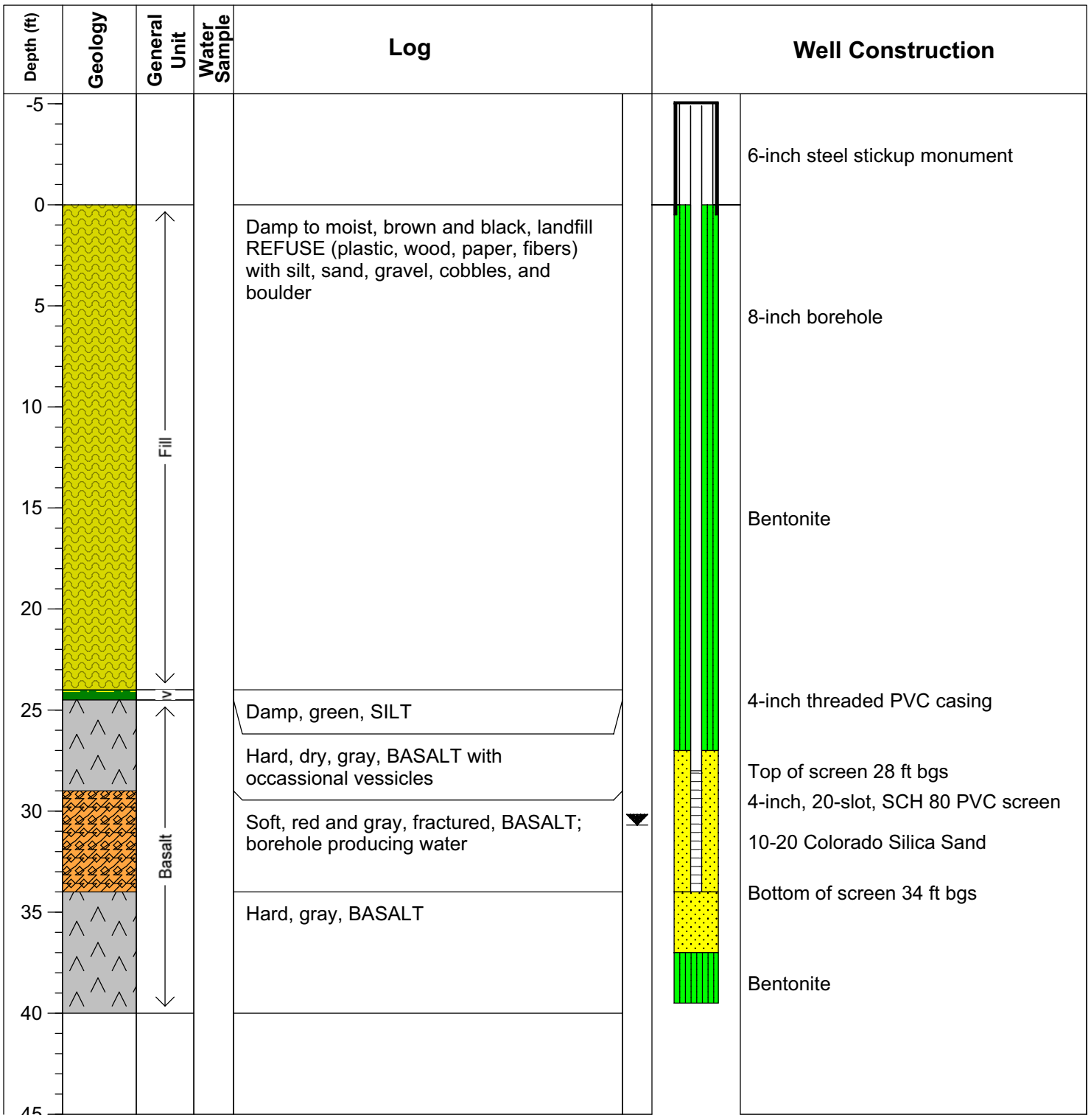
GEOLOGIC LOG AND AS-BUILT WELL MW-33p2 (B-21)

Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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Project Name: Ephrata Remedial Investigation Drilling Method: Air Rotary 8-inch tubex Driller: Tim Smith Firm: Environmental West Drilling Consulting Firm: Pacific Groundwater Group Logged by: Charles Ellingson Location: SW1/4 NW1/4 of Section 33 T21N R26E	Well Name: MW-33p2 Ecology ID: BAS-432 MP Elevation: 1291.67 FT Datum: Sea level Installed: 10/8/2008 DTW: 52.33 BMP on 11/17/2008 Page 2 of 2	**GEOLOGIC LOG AND AS-BUILT WELL MW-33p2 (B-21)** Ephrata Landfill Ephrata, Washington JE0714, 12/2008



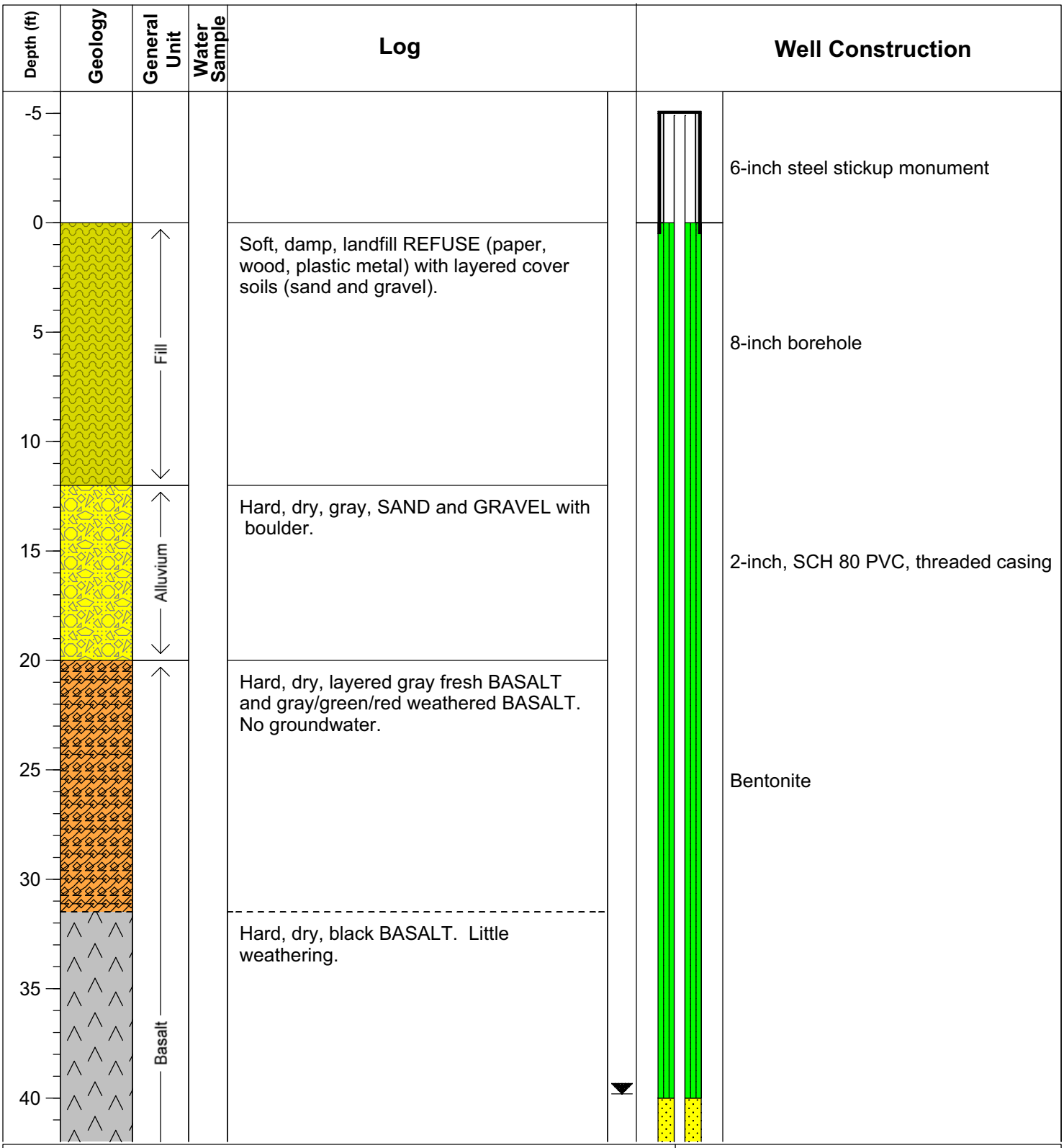
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-34p1
Ecology ID: BAS-434
MP Elevation: 1285.93 ft
Datum: Sea level
Installed: 10/13/2008
DTW: 33.34 BMP on 11/17/2008

GE0LOGIC LOG AND AS-BUILT WELL MW-34p1 (B-20)

Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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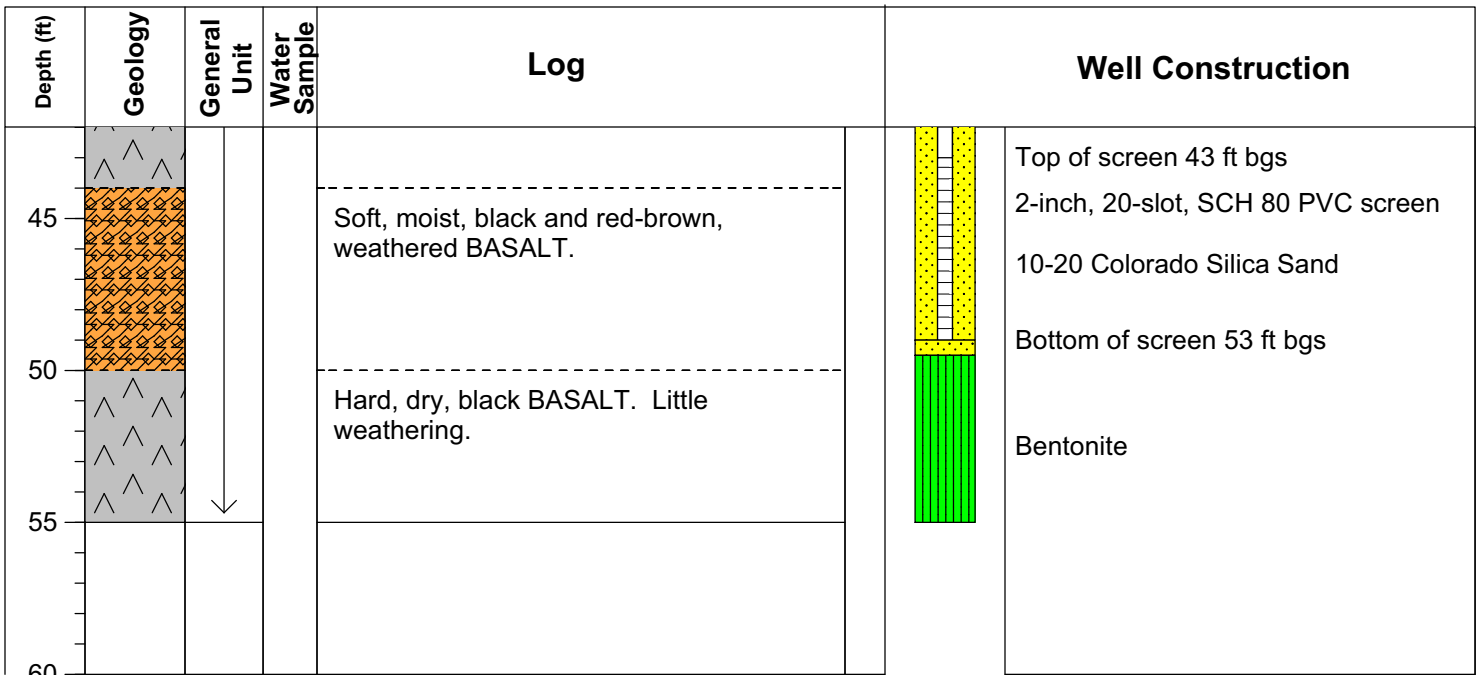
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-35p2
Ecology ID: BAS-436
MP Elevation: 1286.97 ft
Datum: Sea level
Installed: 10/15/2008
DTW: 50.15 BMP on 11/17/2008

GEOLOGIC LOG AND AS-BUILT
WELL MW-35p2 (B-25)

Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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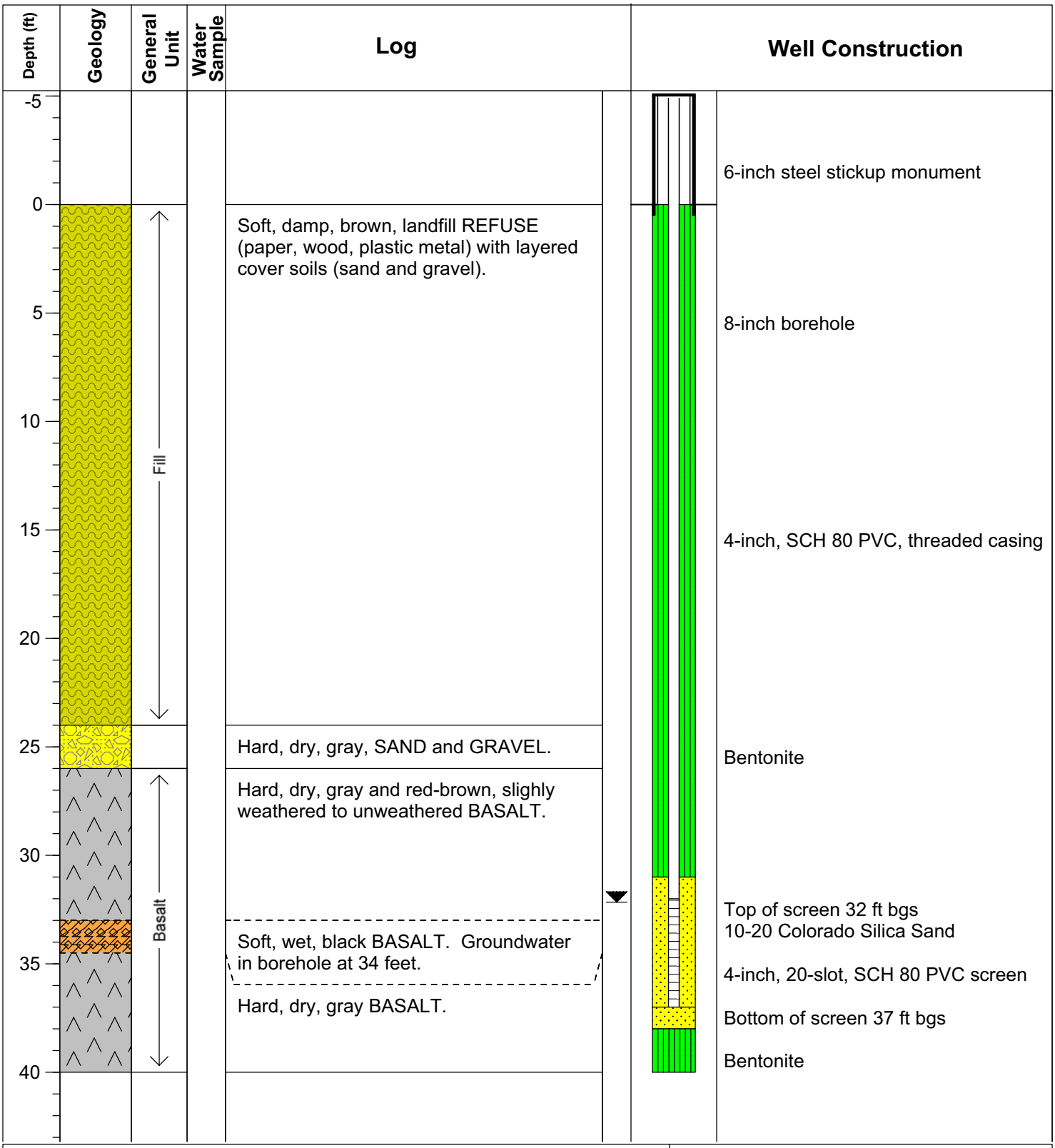
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-35p2
Ecology ID: BAS-436
MP Elevation: 1286.97 ft
Datum: Sea level
Installed: 10/15/2008
DTW: 50.15 BMP on 11/17/2008

GEOLOGIC LOG AND AS-BUILT WELL MW-35p2 (B-25)

Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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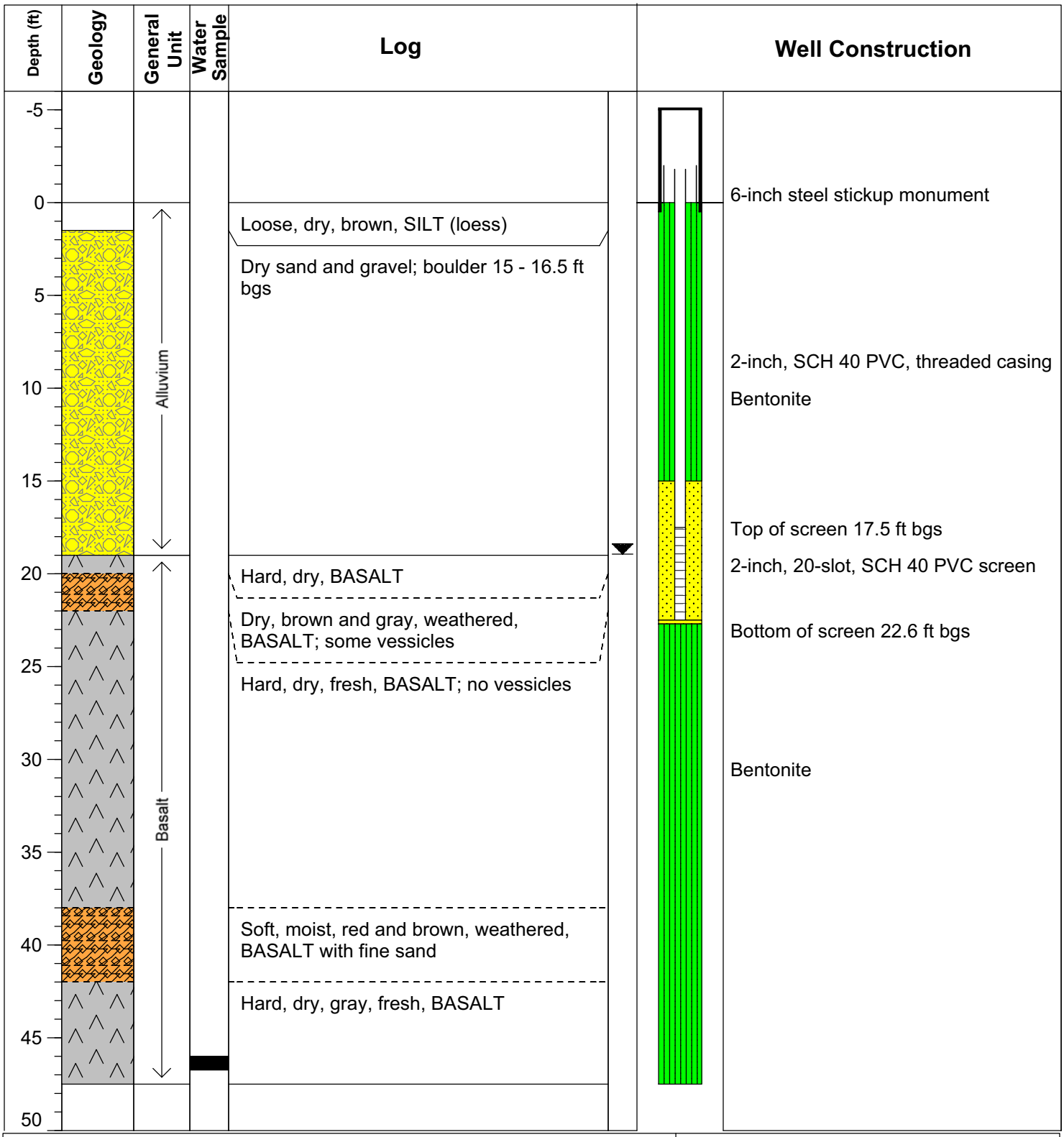
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-36p1
Ecology ID: BAS-437
MP Elevation: 1288.99 ft
Datum: Sea level
Installed: 10/16/2008
DTW: 37.35 BMP on 11/17/2008

GEOLOGIC LOG AND AS-BUILT WELL MW-36p1 (B-27)

Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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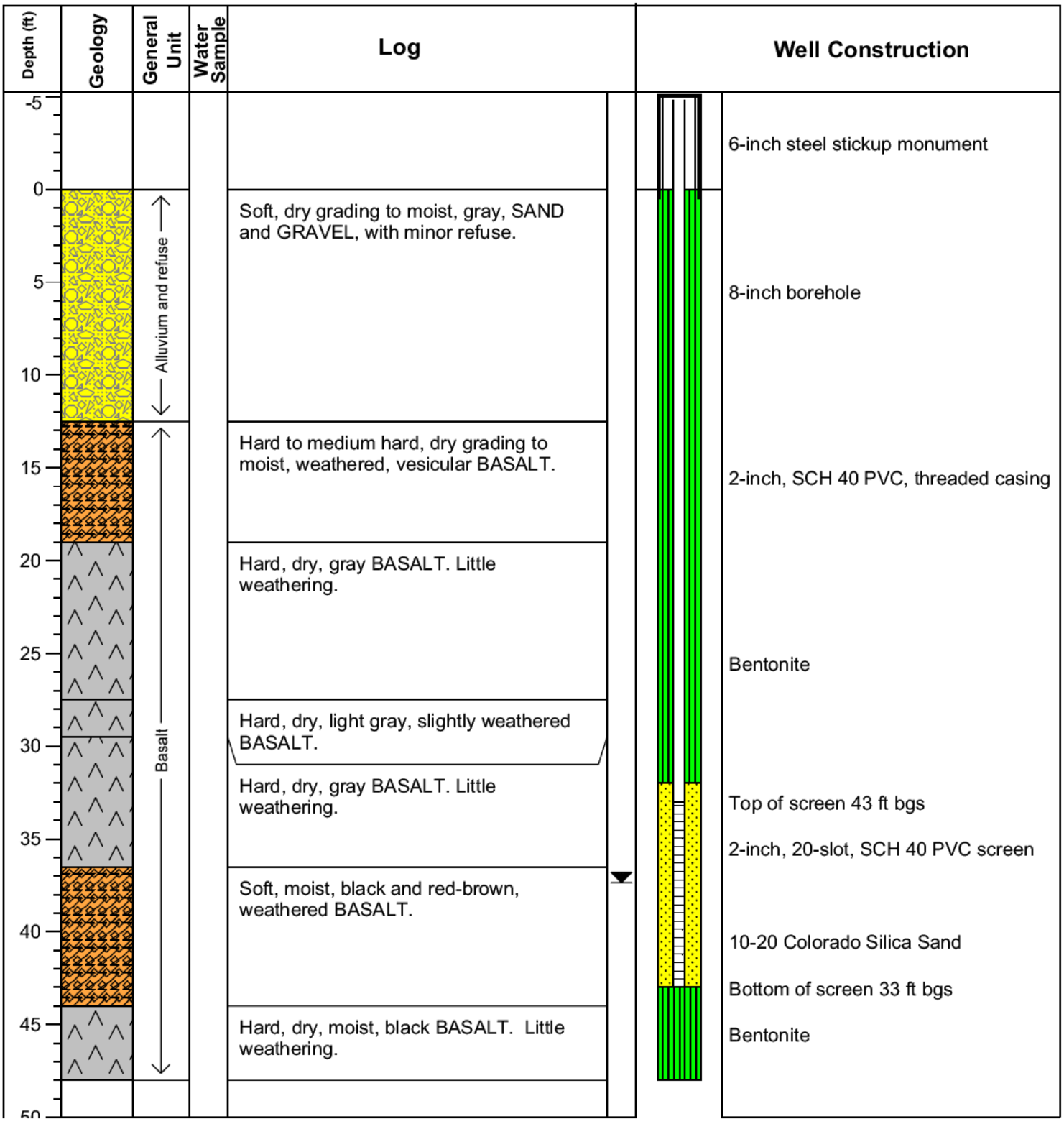
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Trevor Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-37p1
Ecology ID: BAS-253
MP Elevation: 1275.58 ft
Datum: Sea level
Installed: 10/18/2008
DTW: 20.82 BMP on 11/17/2008

GEOLOGIC LOG AND AS-BUILT
WELL MW-37p1 (B-18)

Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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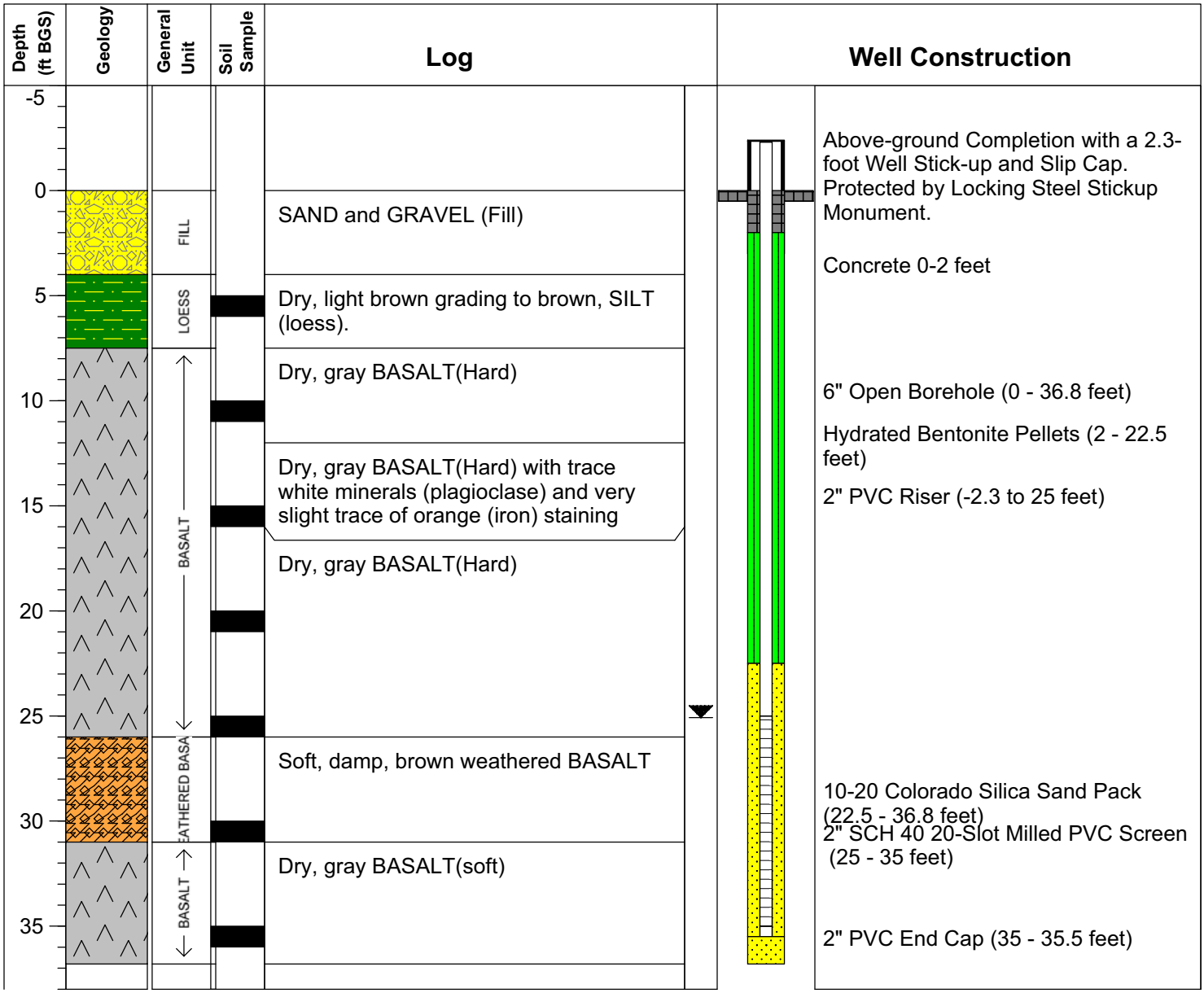
Project Name: Ephrata Remedial Investigation
Drilling Method: Air Rotary 8-inch tubex
Driller: Tim Smith
Firm: Environmental West Drilling
Consulting Firm: Pacific Groundwater Group
Logged by: Jeff Parker
Location: SW1/4 NW1/4 of Section 33 T21N R26E

Well Name: MW-38p2
Ecology ID: BAS-254
MP Elevation: 1277.97 ft
Datum: Sea level
Installed: 10/15/2008
DTW: 42.96 BMP on 11/17/2008

GEOLOGIC LOG AND AS-BUILT WELL MW-38p2 (B-24)

Ephrata Landfill
Ephrata, Washington
JE0714, 12/2008

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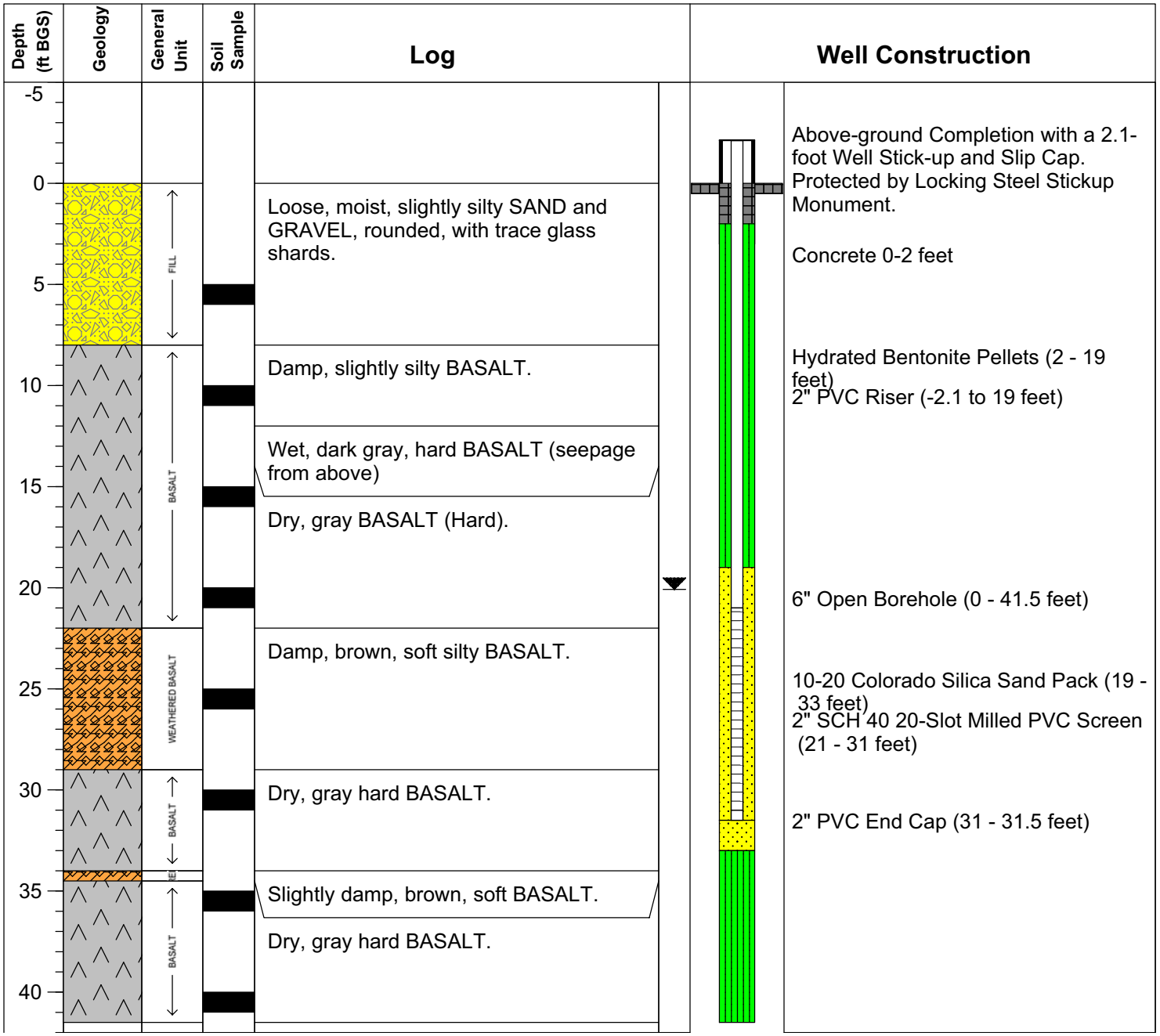


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: SW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-39-P2
Ecology ID: BBH633
MP Elevation: 1262.56 feet
Datum: Sea level
Installed: 8/4/09
DTW: 27.38 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-39-P2
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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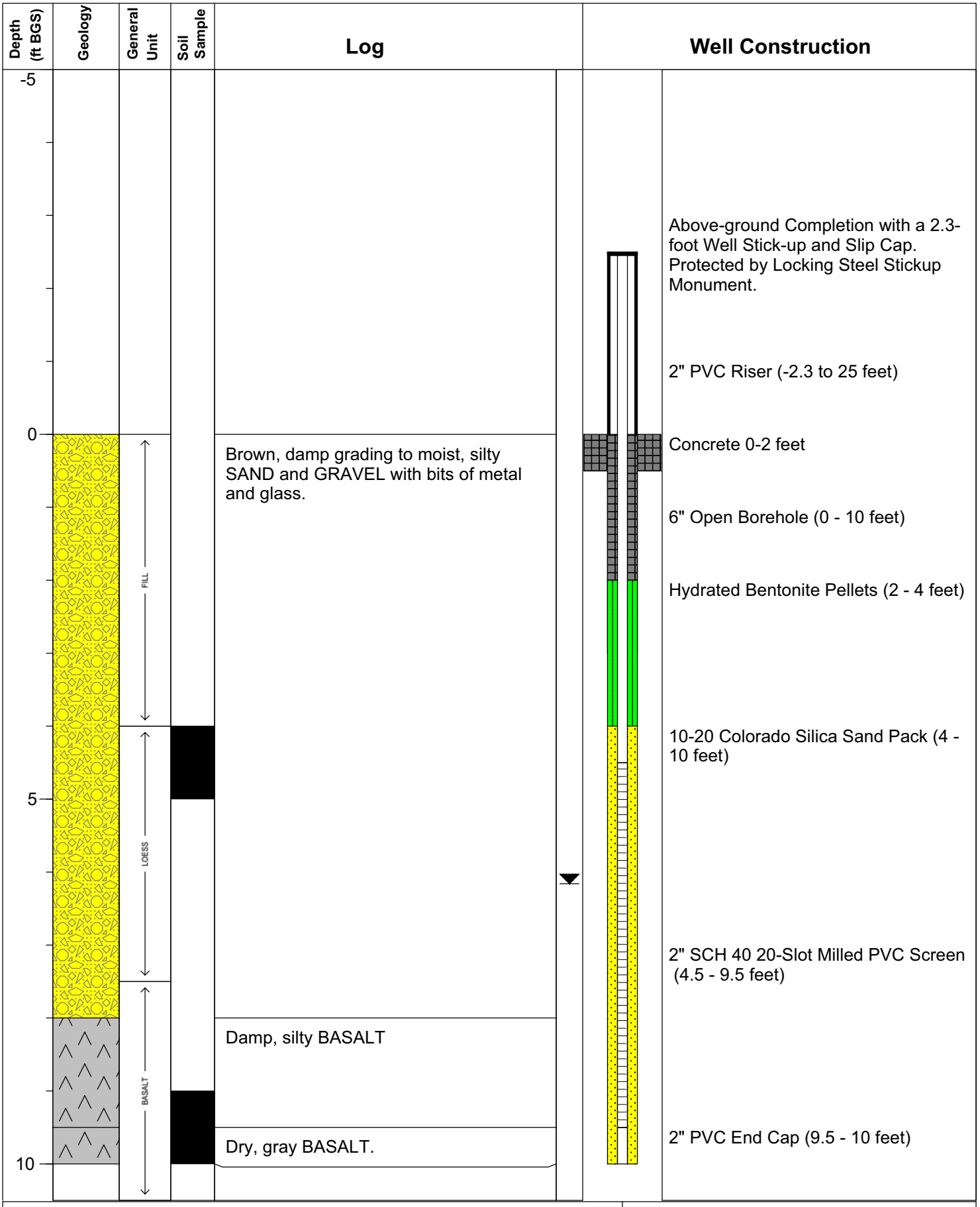


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: SW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-40-P2
Ecology ID: BBH634
MP Elevation: 1262.87 feet
Datum: Sea level
Installed: 8/5/09
DTW: 22.19 BMP on 9/23/09
Page 1 of 1

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-40-P2
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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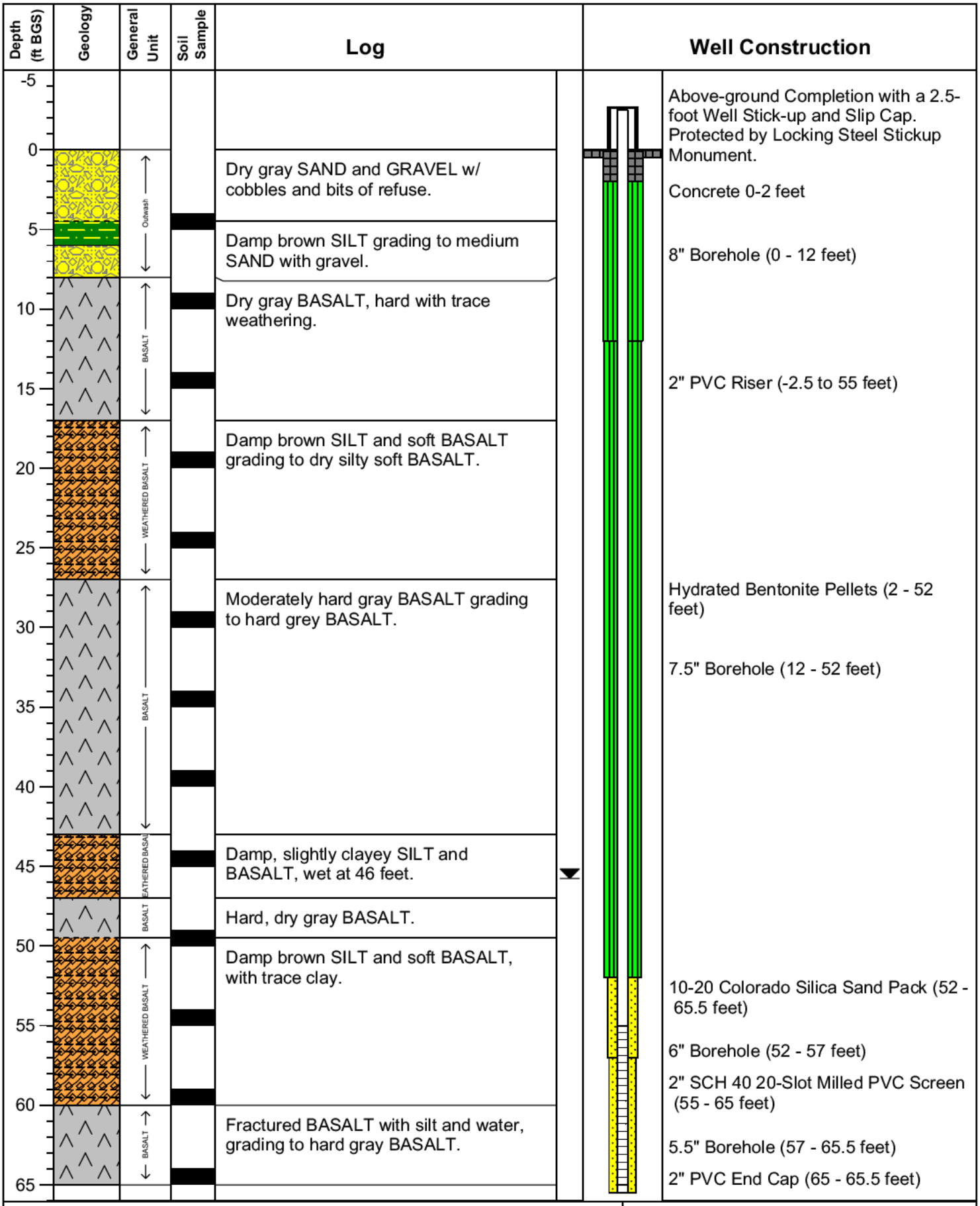


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: SW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-41-a
Ecology ID: BBH635
MP Elevation: 1263.38 feet
Datum: Sea level
Installed: 8/5/09
DTW: 8.64 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-41a
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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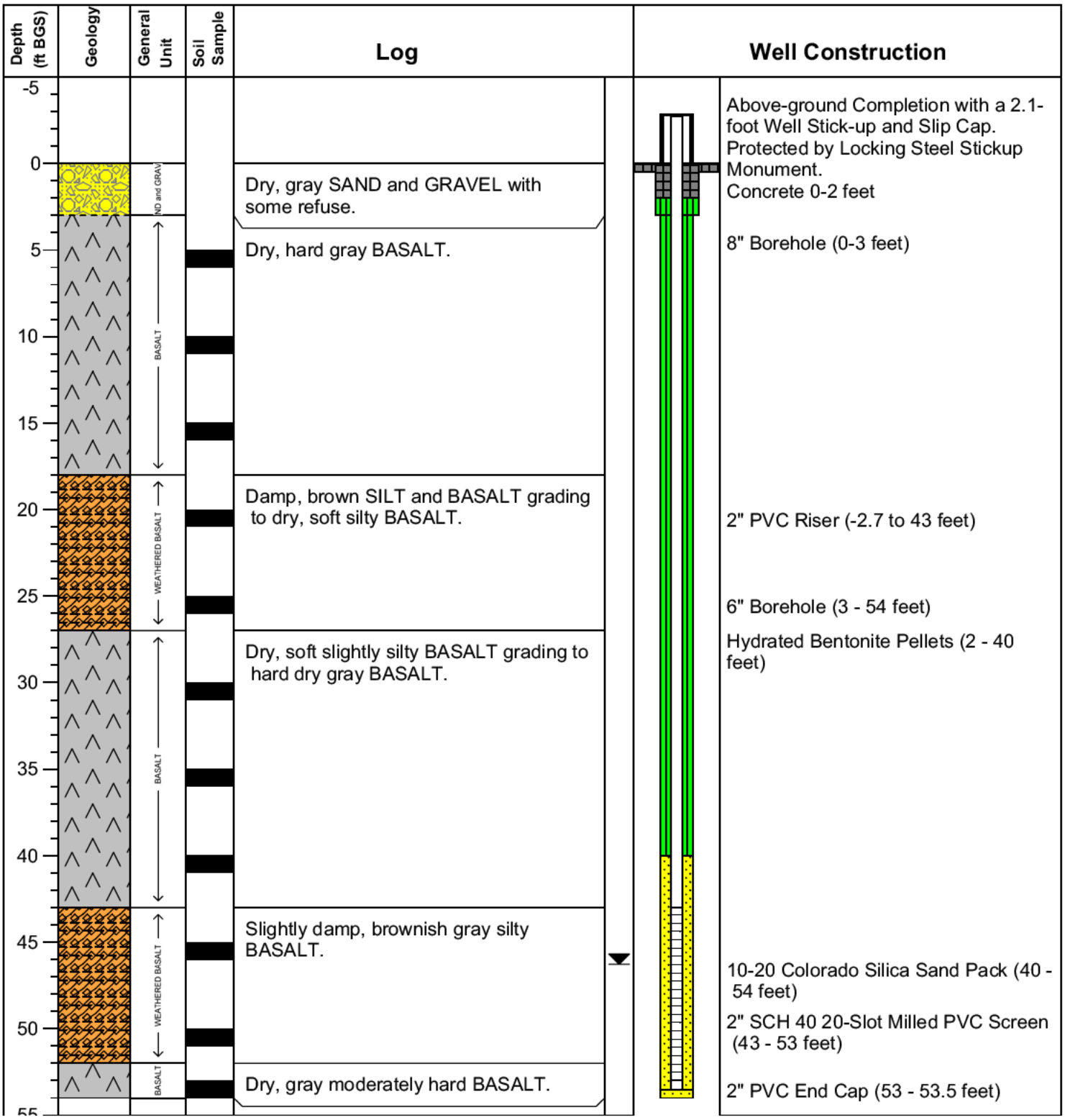


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: SW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-42-B
Ecology ID: BBH636
MP Elevation: 1280.76 feet
Datum: Sea level
Installed: 9/2/09
DTW: 45.77 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-42-B
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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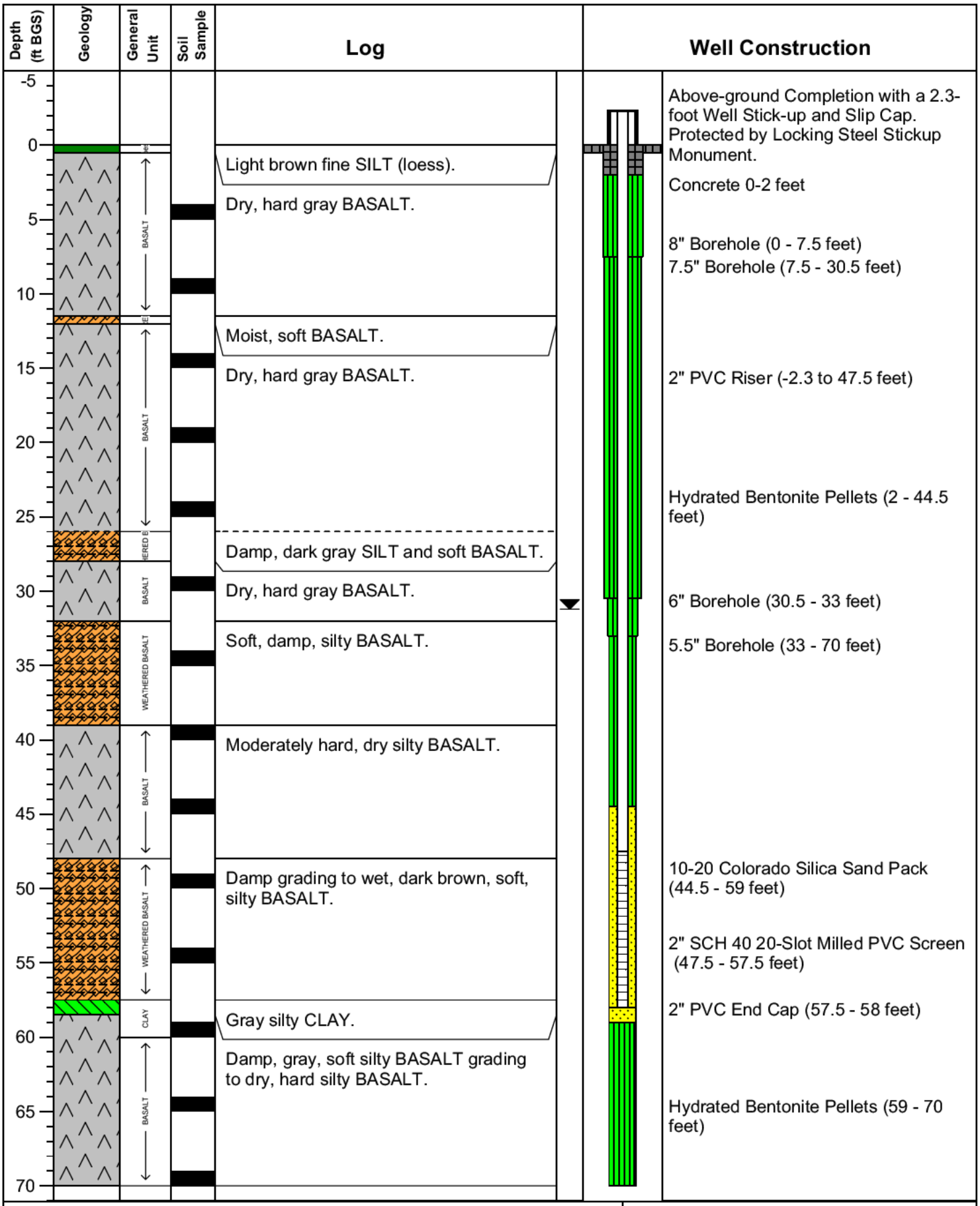


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: SW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-43-P2
Ecology ID: BBH637
MP Elevation: 1281.07 feet
Datum: Sea level
Installed: 9/3/09
DTW: 48.99 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-43-P2
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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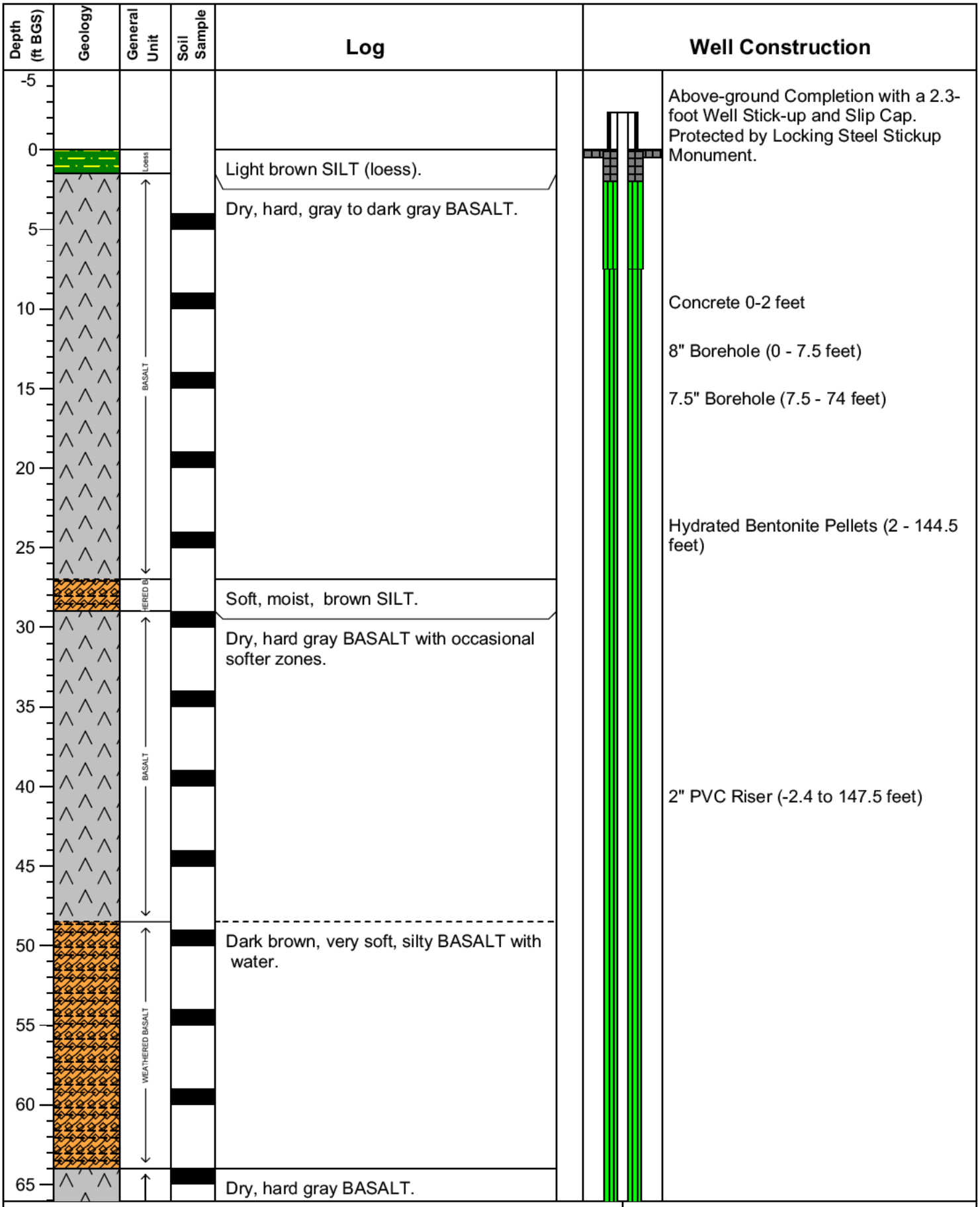


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-44-B
Ecology ID: BBH638
MP Elevation: 1266.09 feet
Datum: Sea level
Installed: 9/4/09
DTW: 33.54 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-44-B
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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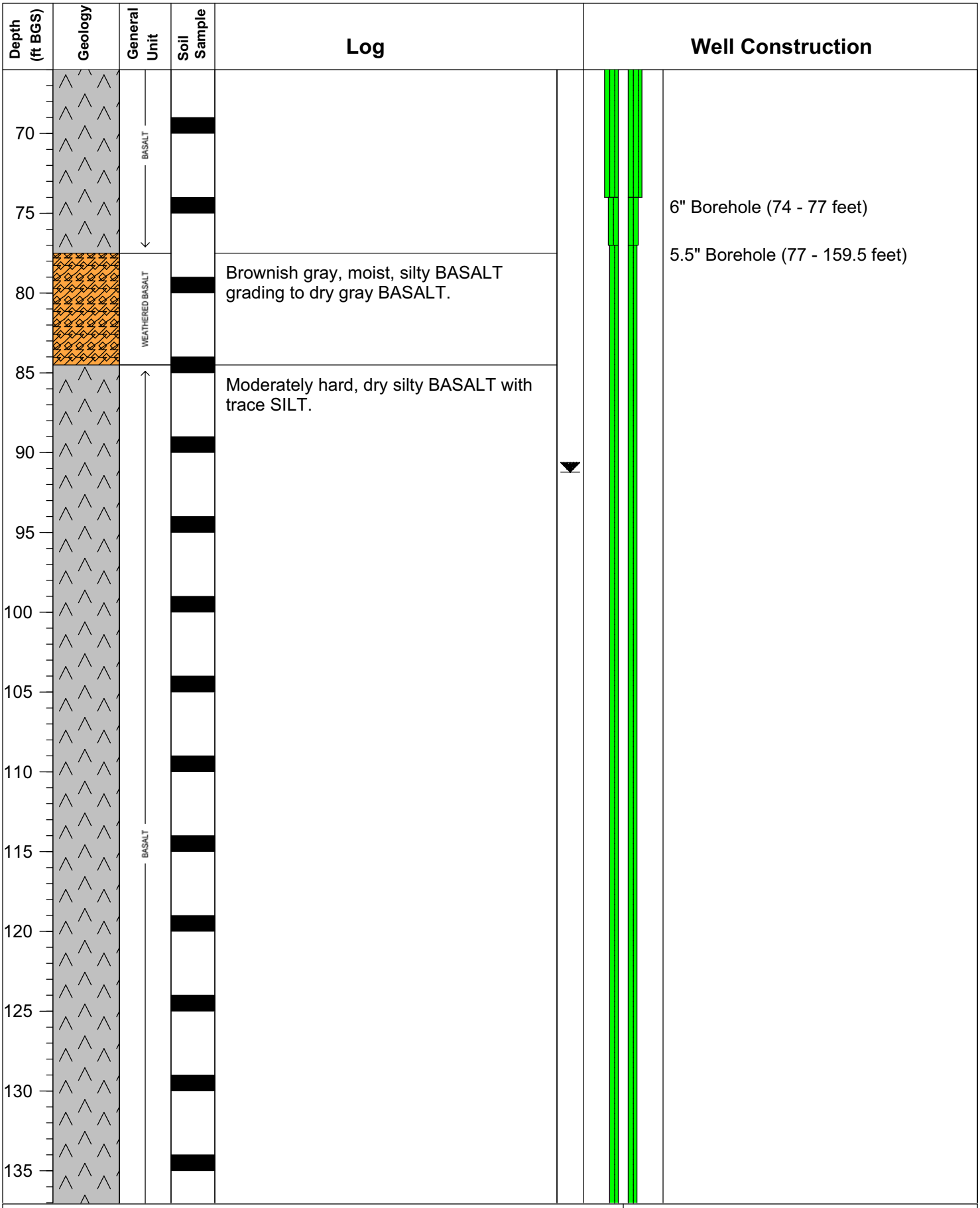


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-45-C
Ecology ID: BBH639
MP Elevation: 1266.47 feet
Datum: Sea level
Installed: 9/9/09
DTW: 93.58 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-45-C
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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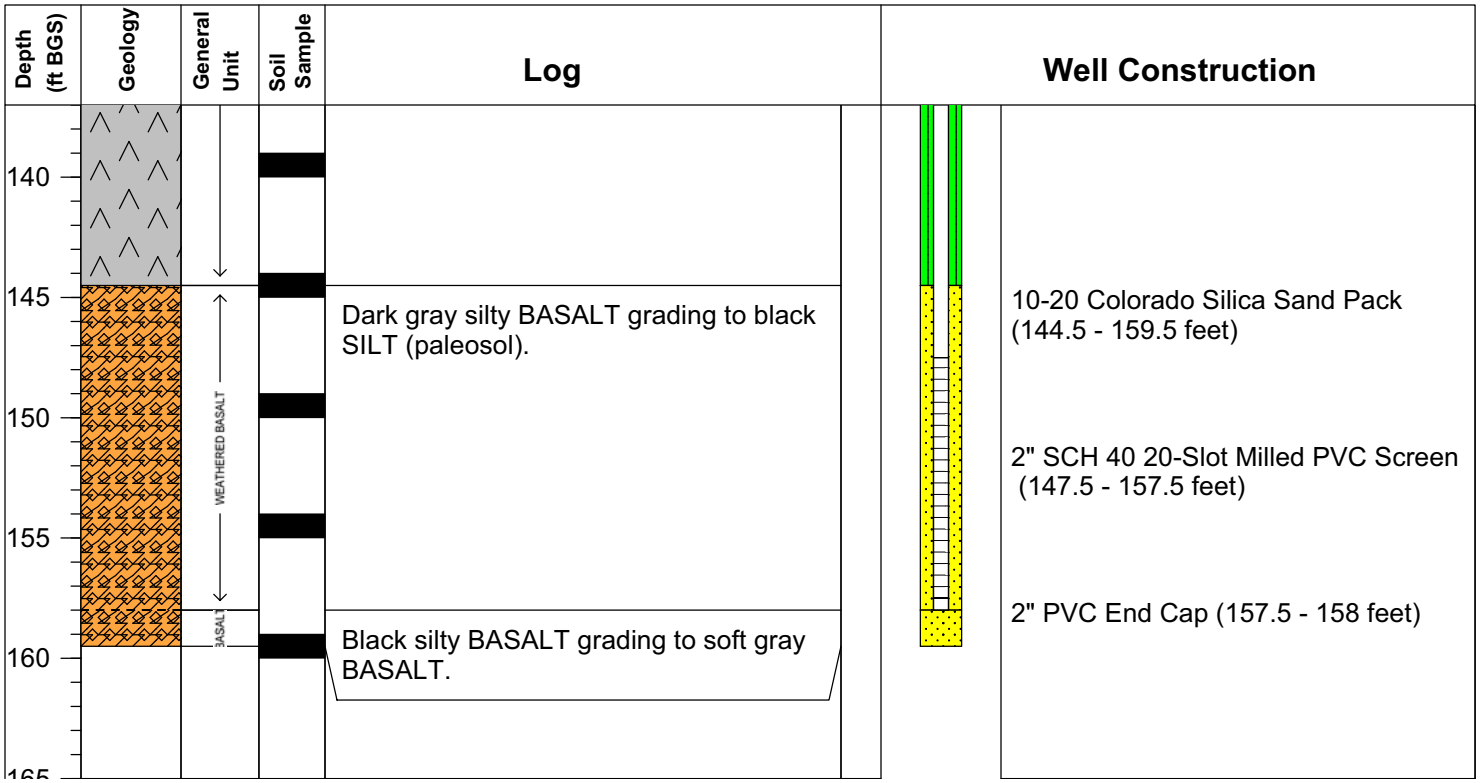


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-45-C
Ecology ID: BBH639
MP Elevation: 1266.47 feet
Datum: Sea level
Installed: 9/9/09
DTW: 93.58 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-45-C
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

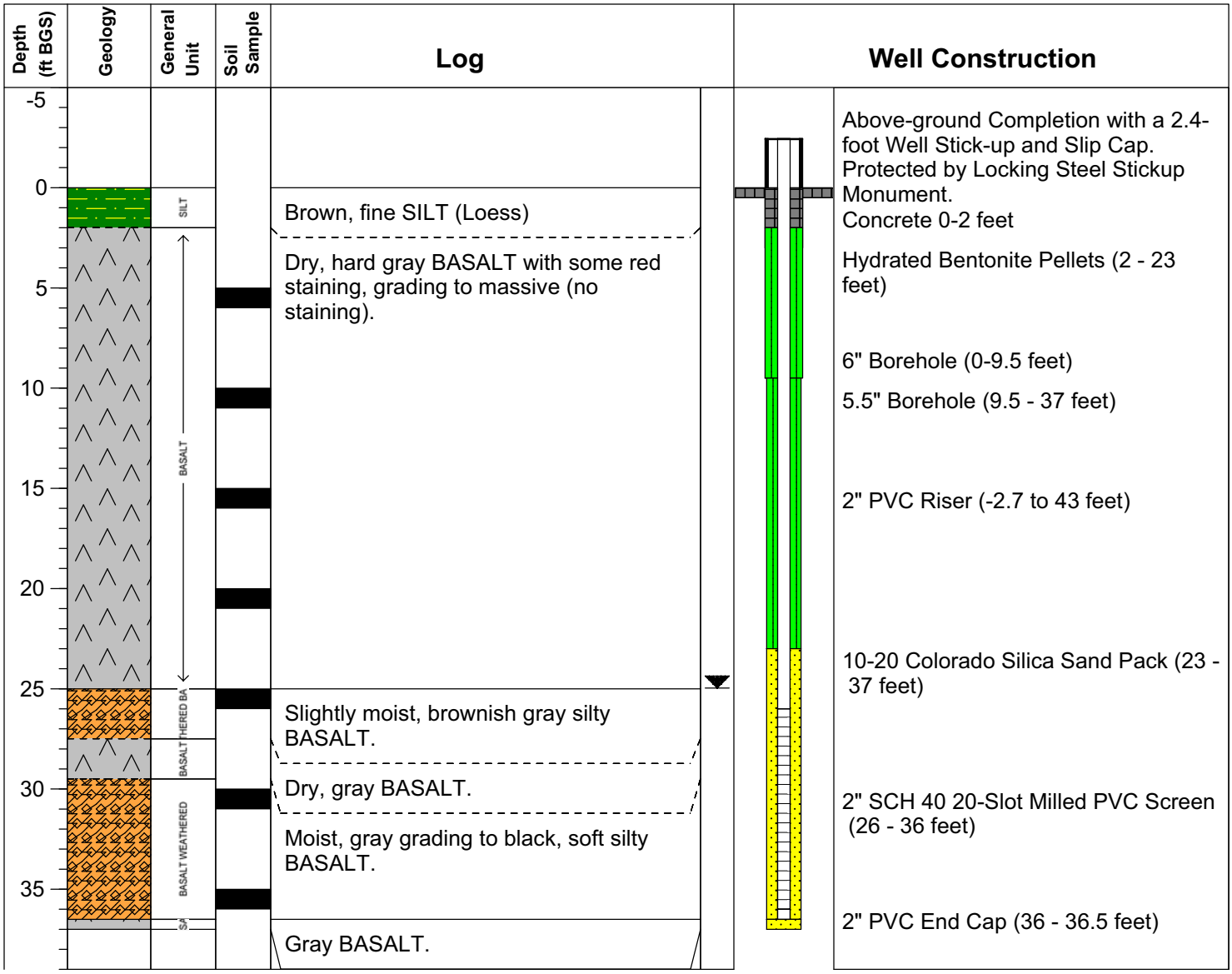
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Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-45-C
Ecology ID: BBH639
MP Elevation: 1266.47 feet
Datum: Sea level
Installed: 9/9/09
DTW: 93.58 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-45-C
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

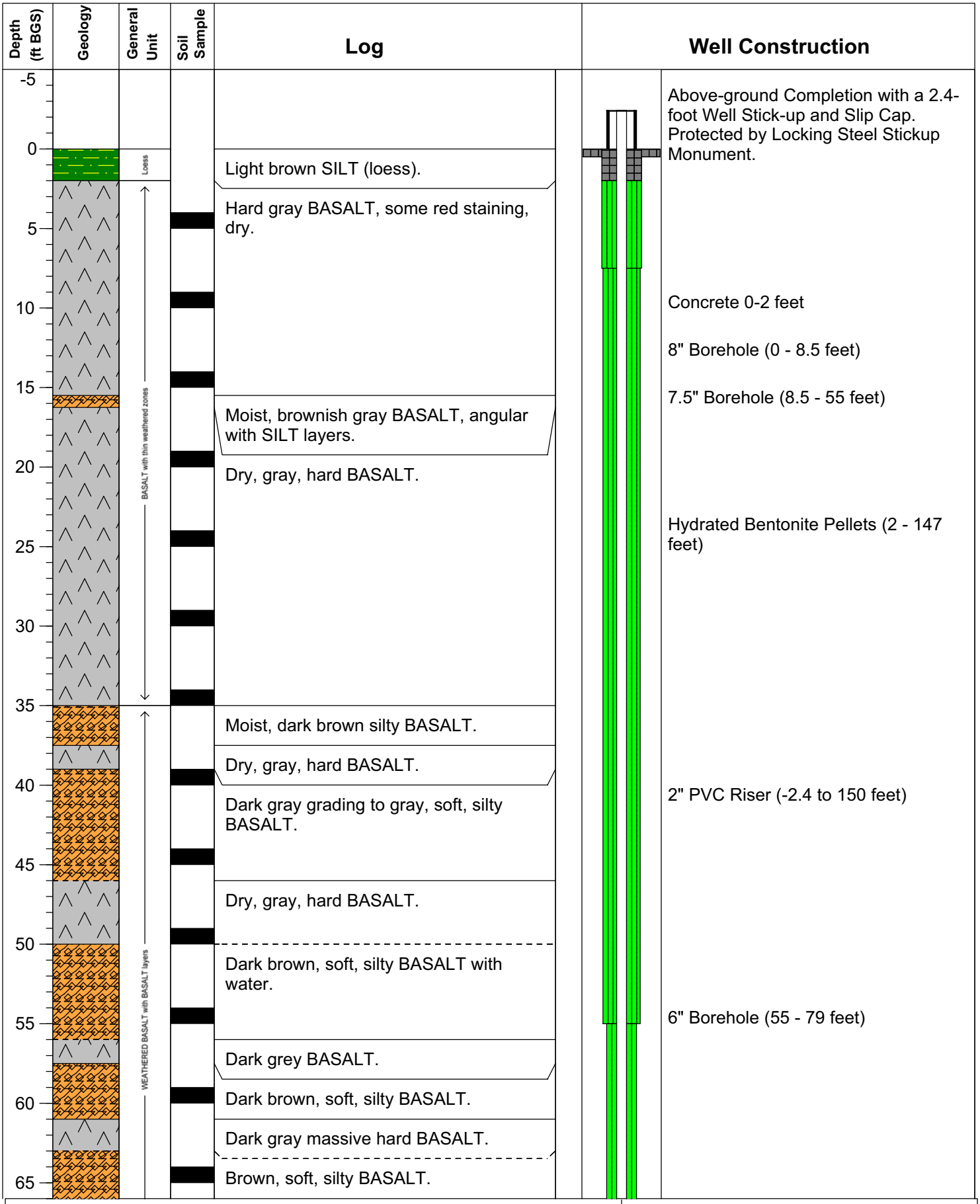


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-46-P2
Ecology ID: BBH640
MP Elevation: 1265.78 feet
Datum: Sea level
Installed: 9/10/09
DTW: 27.41 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-46-P2
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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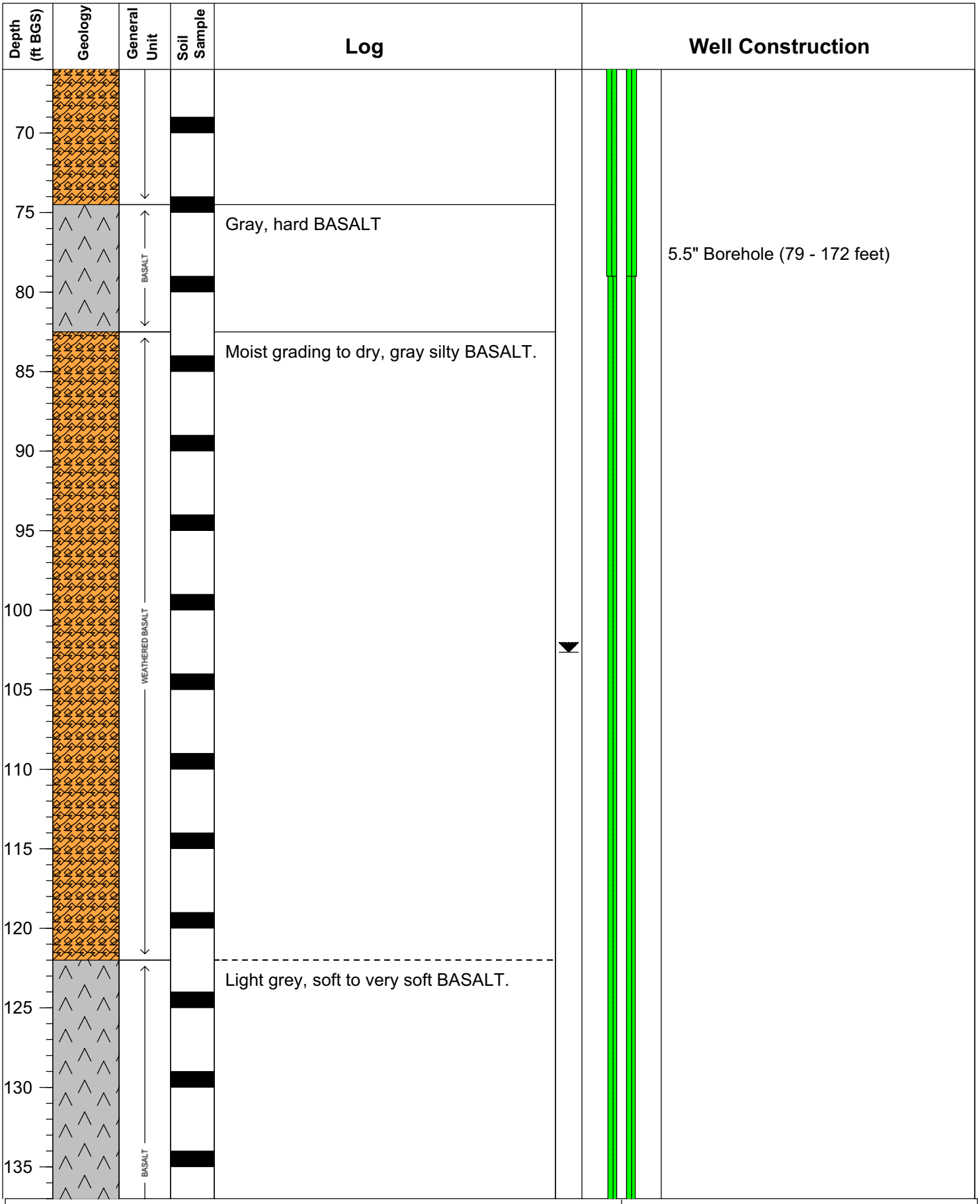


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-47-C
Ecology ID: BBH641
MP Elevation: 1278.27 feet
Datum: Sea level
Installed: 9/11/09
DTW: 105.06 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-47-C
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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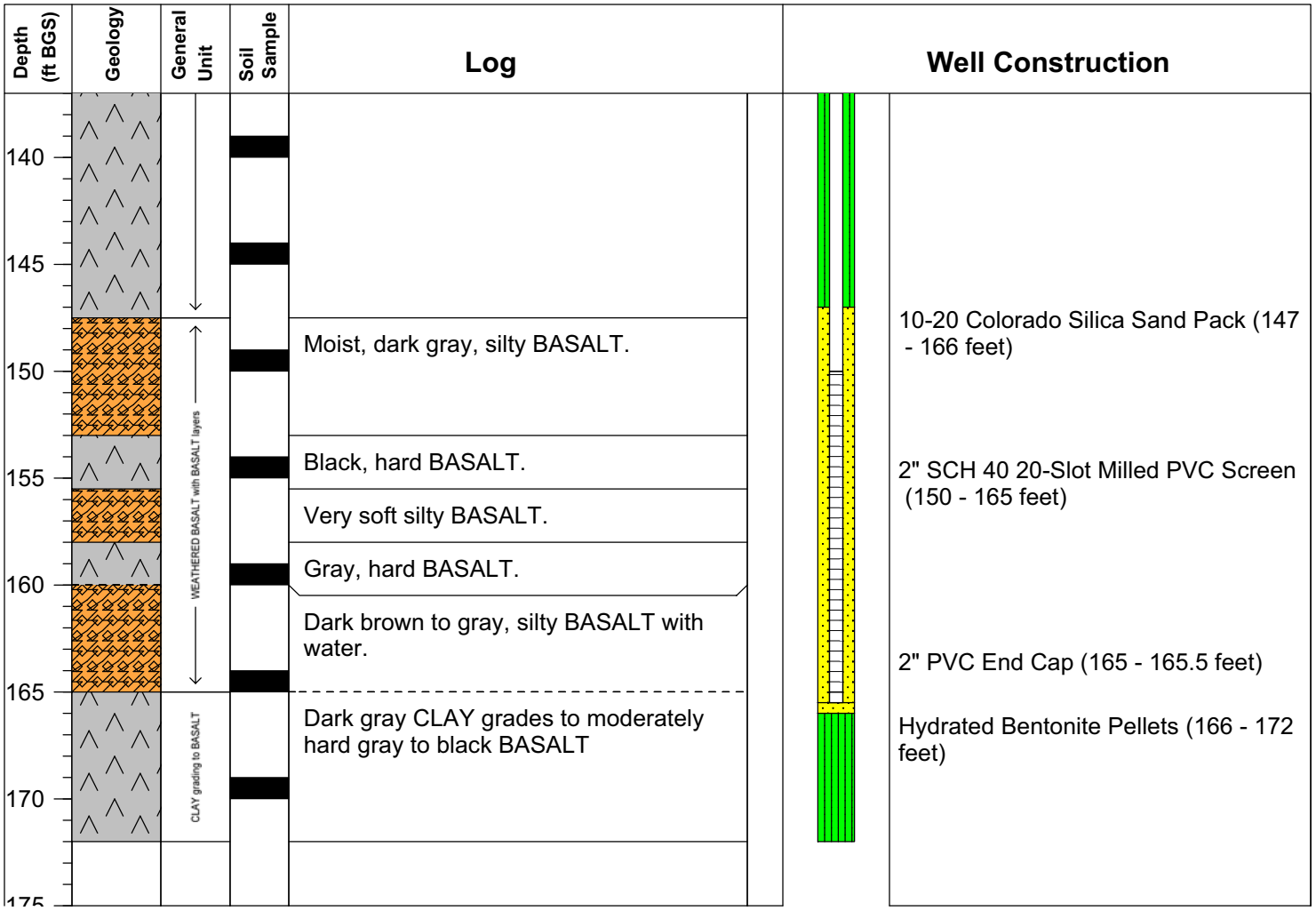


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-47-C
Ecology ID: BBH641
MP Elevation: 1278.27 feet
Datum: Sea level
Installed: 9/11/09
DTW: 105.06 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-47-C
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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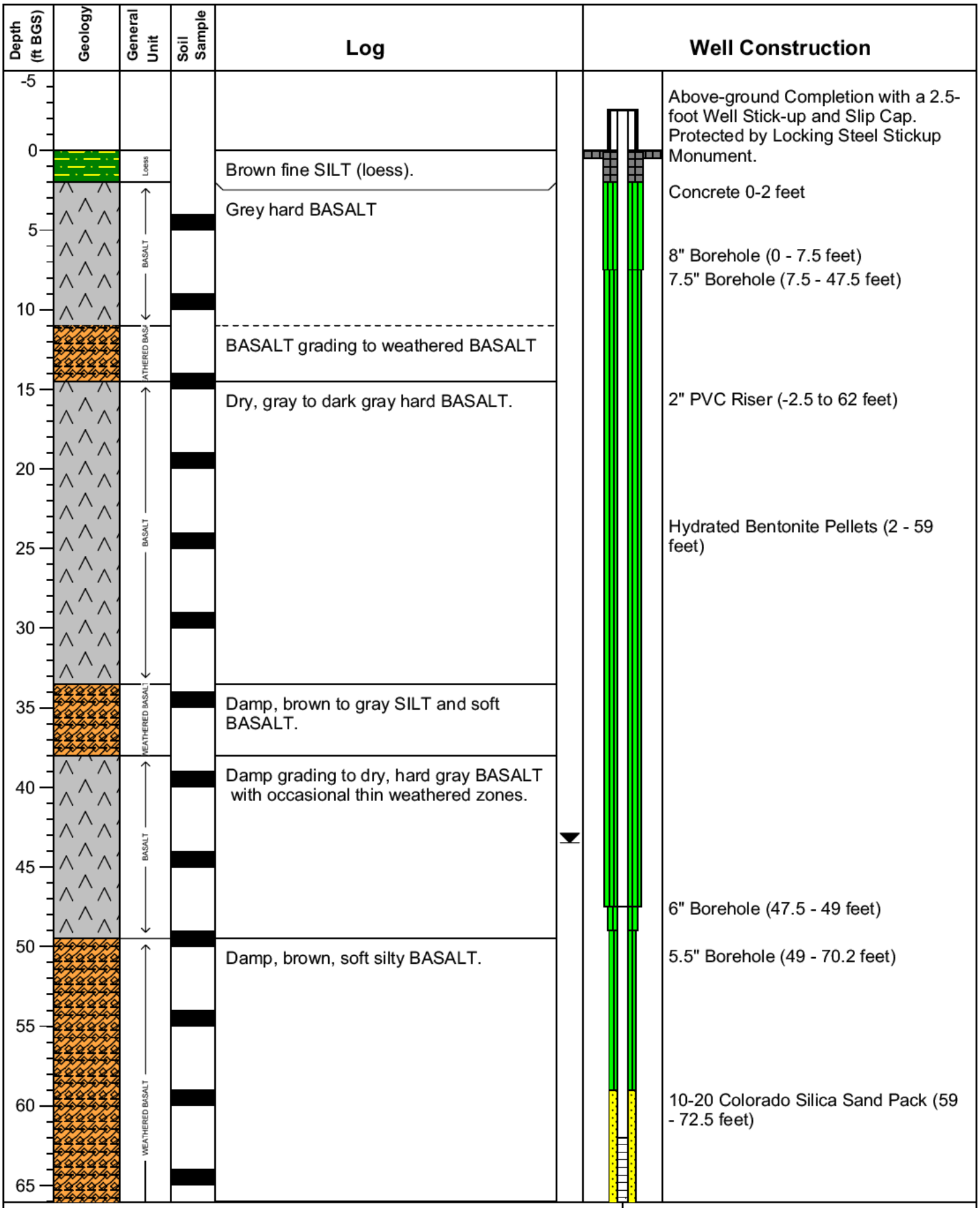


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-47-C
Ecology ID: BBH641
MP Elevation: 1278.27 feet
Datum: Sea level
Installed: 9/11/09
DTW: 105.06 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-47-C
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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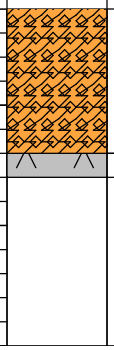
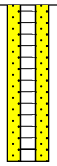


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-48-B
Ecology ID: BBH642
MP Elevation: 1278.65 feet
Datum: Sea level
Installed: 9/12/09
DTW: 46.01 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-48-B
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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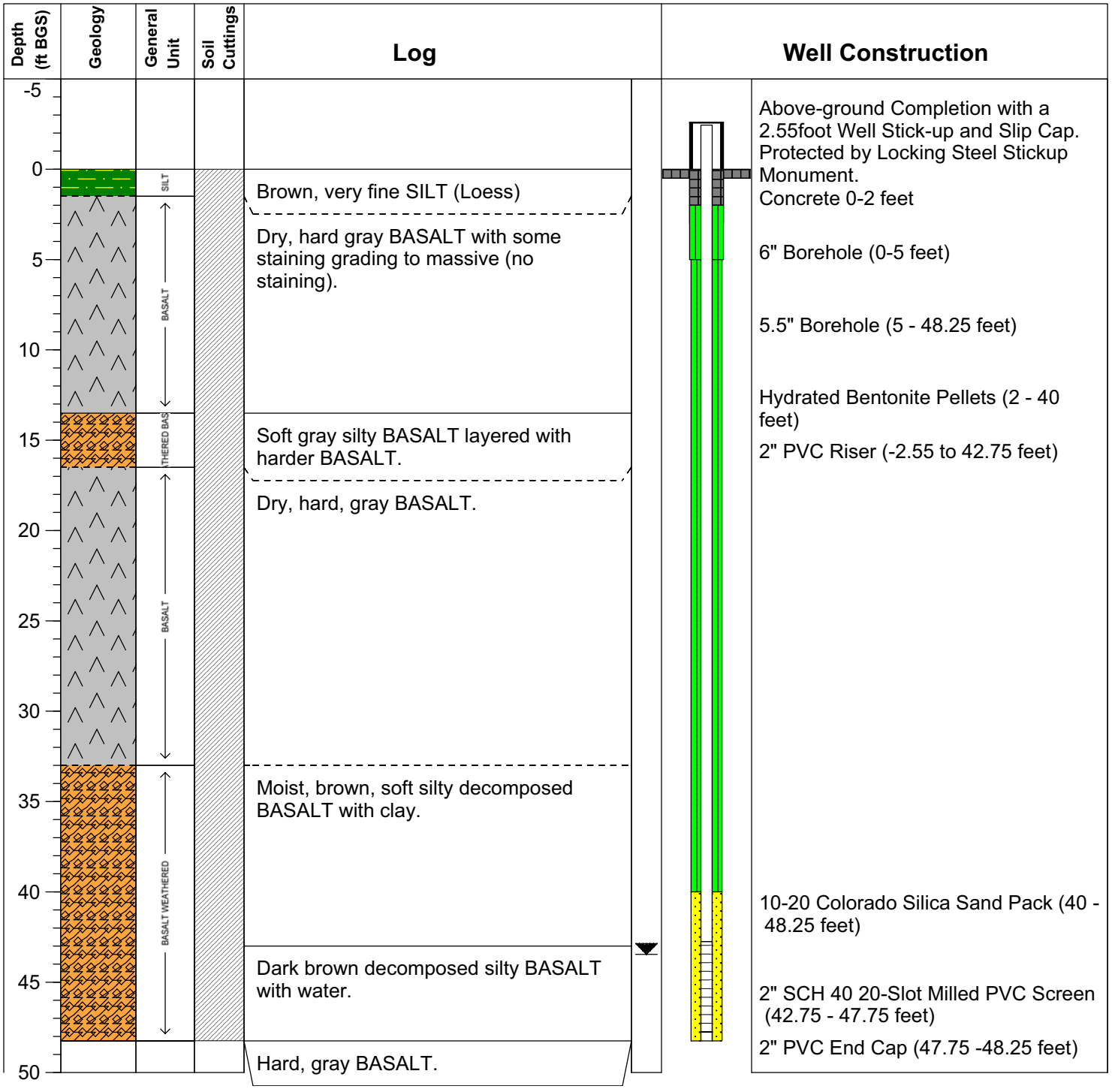
Depth (ft BGS)	Geology	General Unit	Soil Sample	Log	Well Construction
70 75 80				Brown, very soft, silty BASALT, lots of water. Orange clayey SILT grading to black BASALT.	 2" SCH 40 20-Slot Milled PVC Screen (62 - 72 feet) 2" PVC End Cap (72 - 72.5 feet)

Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-48-B
Ecology ID: BBH642
MP Elevation: 1278.65 feet
Datum: Sea level
Installed: 9/12/09
DTW: 46.01 BMP on 9/23/09

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-48-B
Ephrata Landfill
Ephrata, Washington
JE0714a, 09/2009

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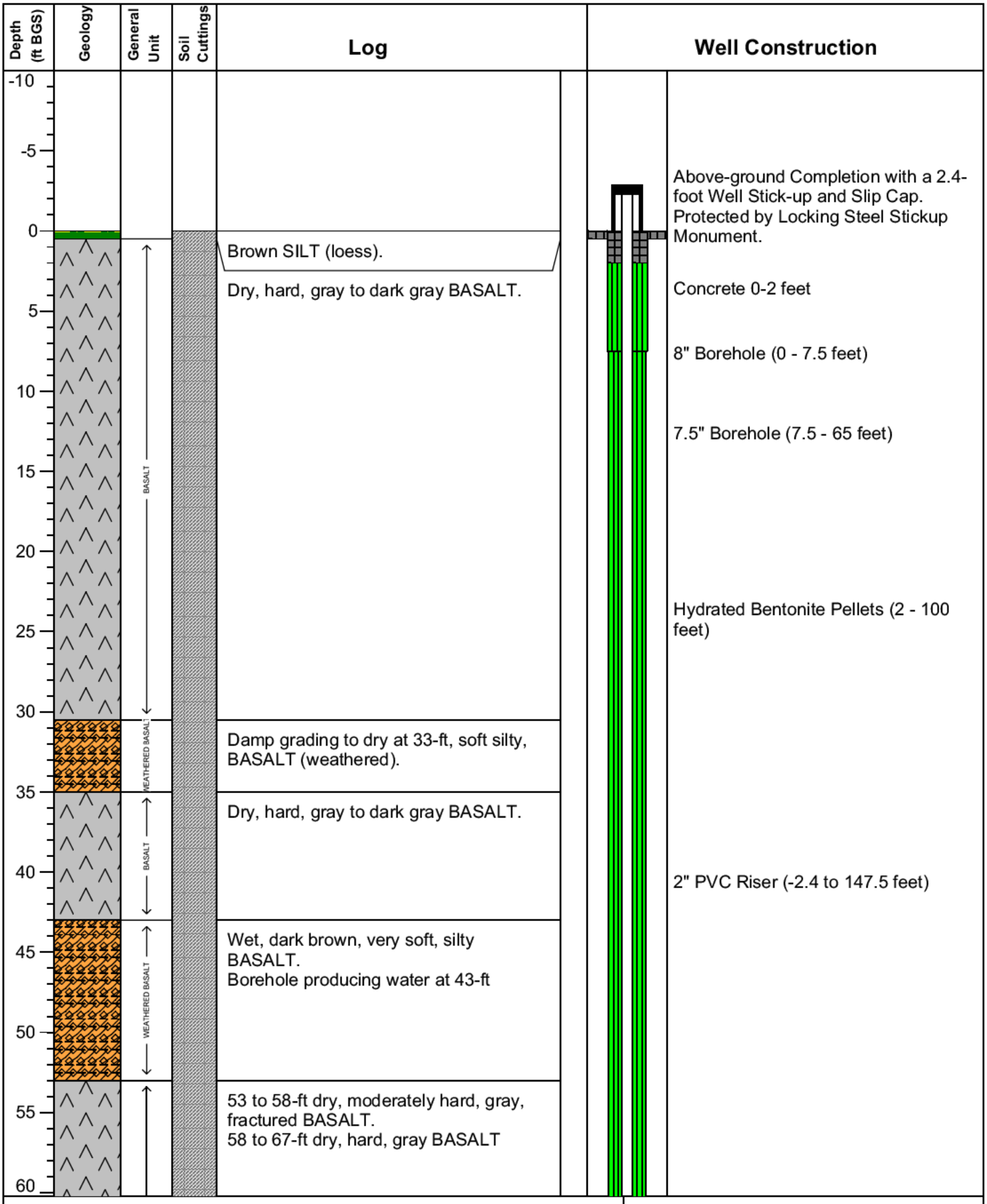


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-49p2
Ecology ID: BBH643
Top PVC Elevation: 1278.47-ft
Surface Elevation: 1275.92-ft
Datum: Sea level
Installed: 9/13/2009
DTW: 46.02-ft (below MP)
Page 1 of 1

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-49p2
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

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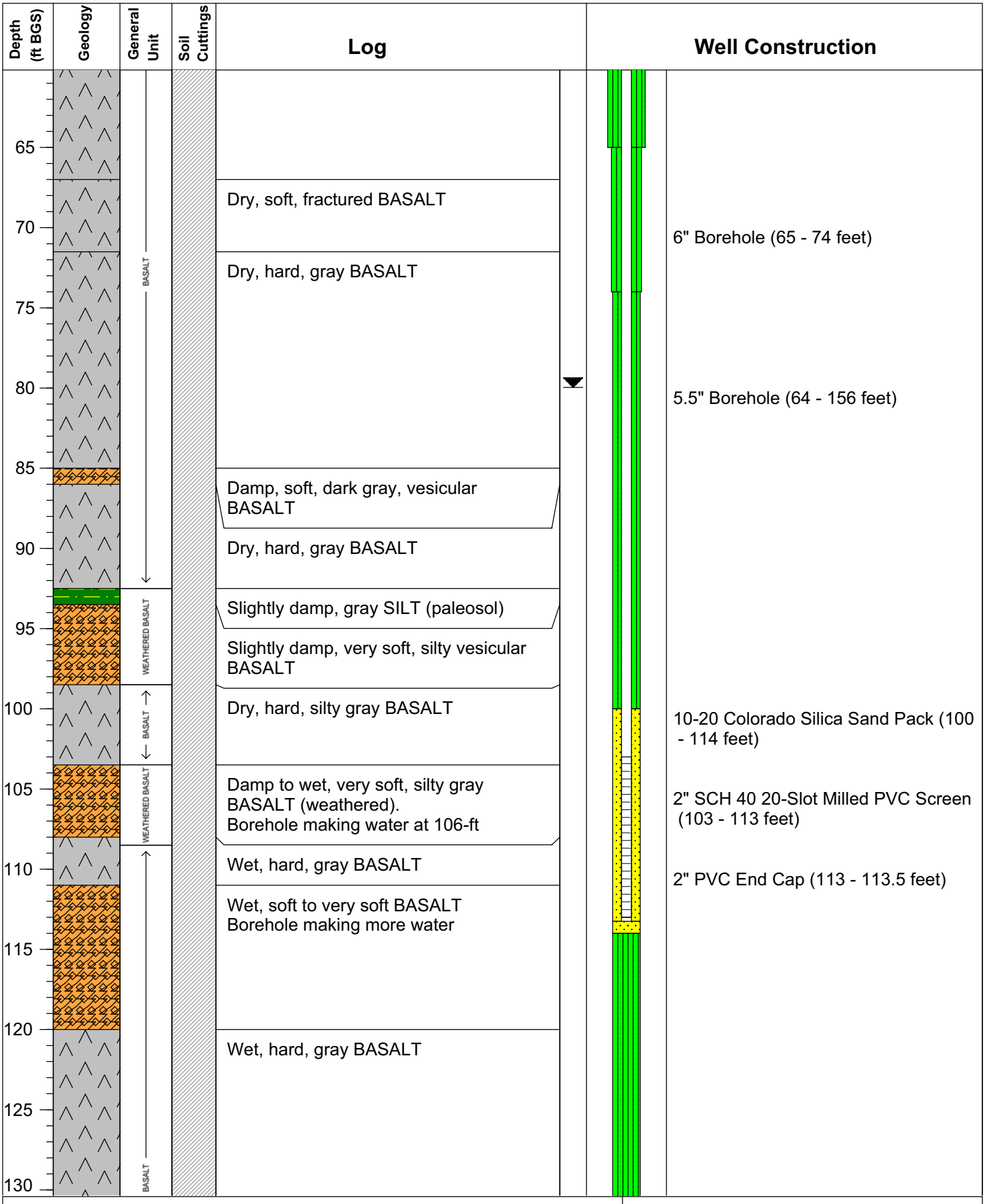


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-50C
Ecology ID: BBH820
Top PVC Elevation: 1258.42-ft
Surface Elevation: 1256.02-ft
Datum: Sea level
Installed: 11/24/2009
DTW: 82.36-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-50C
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

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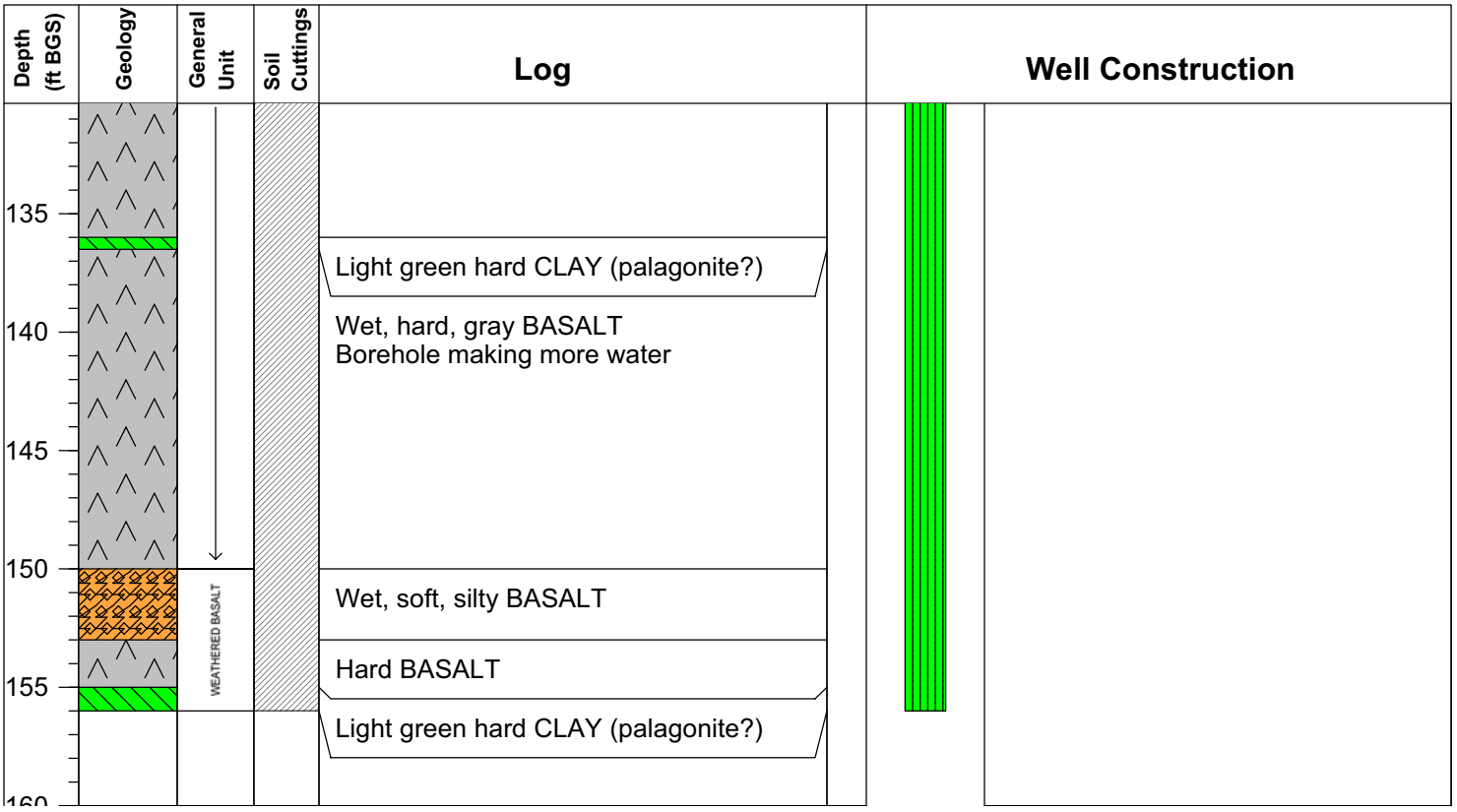


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-50C
Ecology ID: BBH820
Top PVC Elevation: 1258.42-ft
Surface Elevation: 1256.02-ft
Datum: Sea level
Installed: 11/24/2009
DTW: 82.36-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-50C
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

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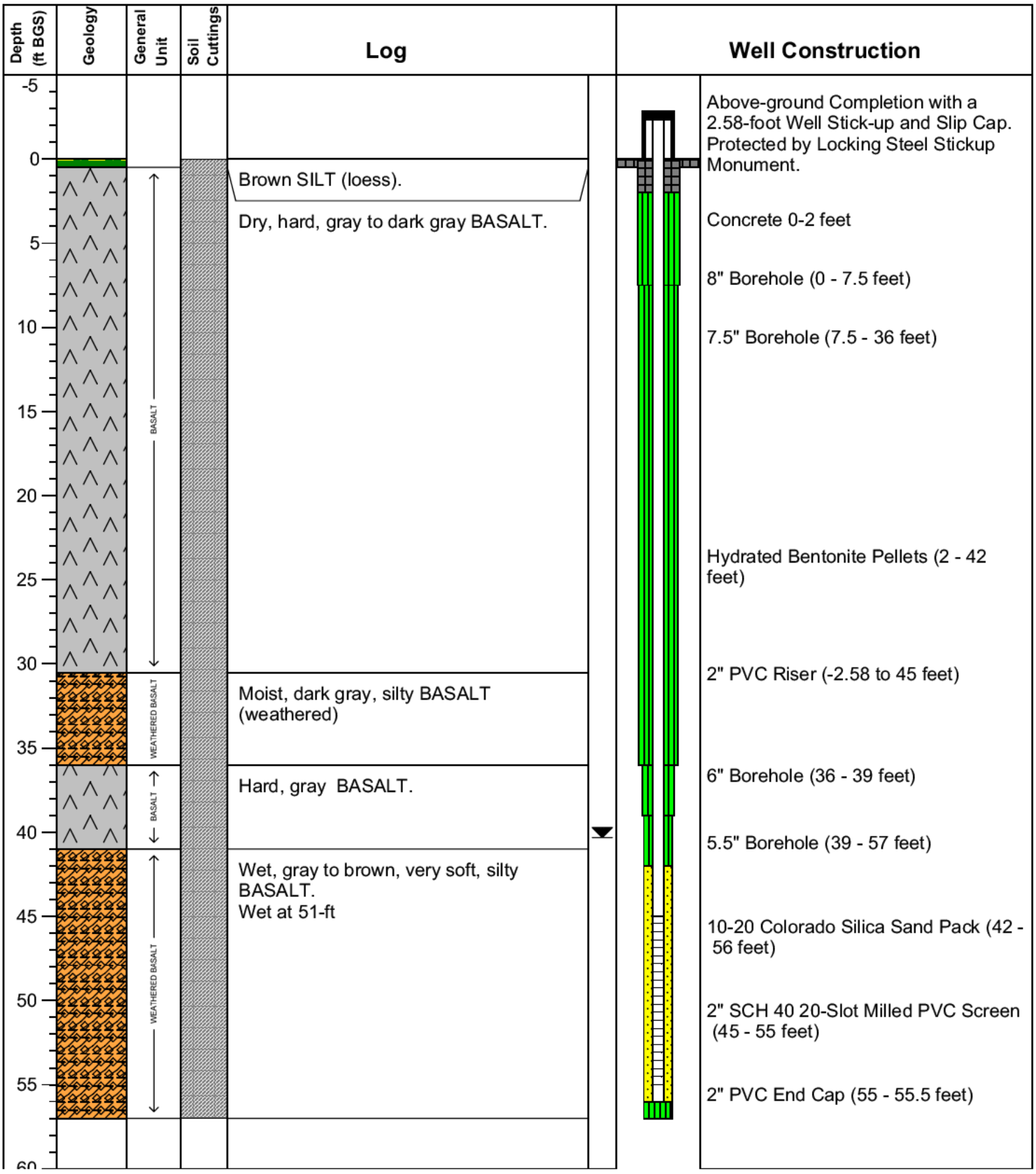


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-50C
Ecology ID: BBH820
Top PVC Elevation: 1258.42-ft
Surface Elevation: 1256.02-ft
Datum: Sea level
Installed: 11/24/2009
DTW: 82.36-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-50C
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

PgG

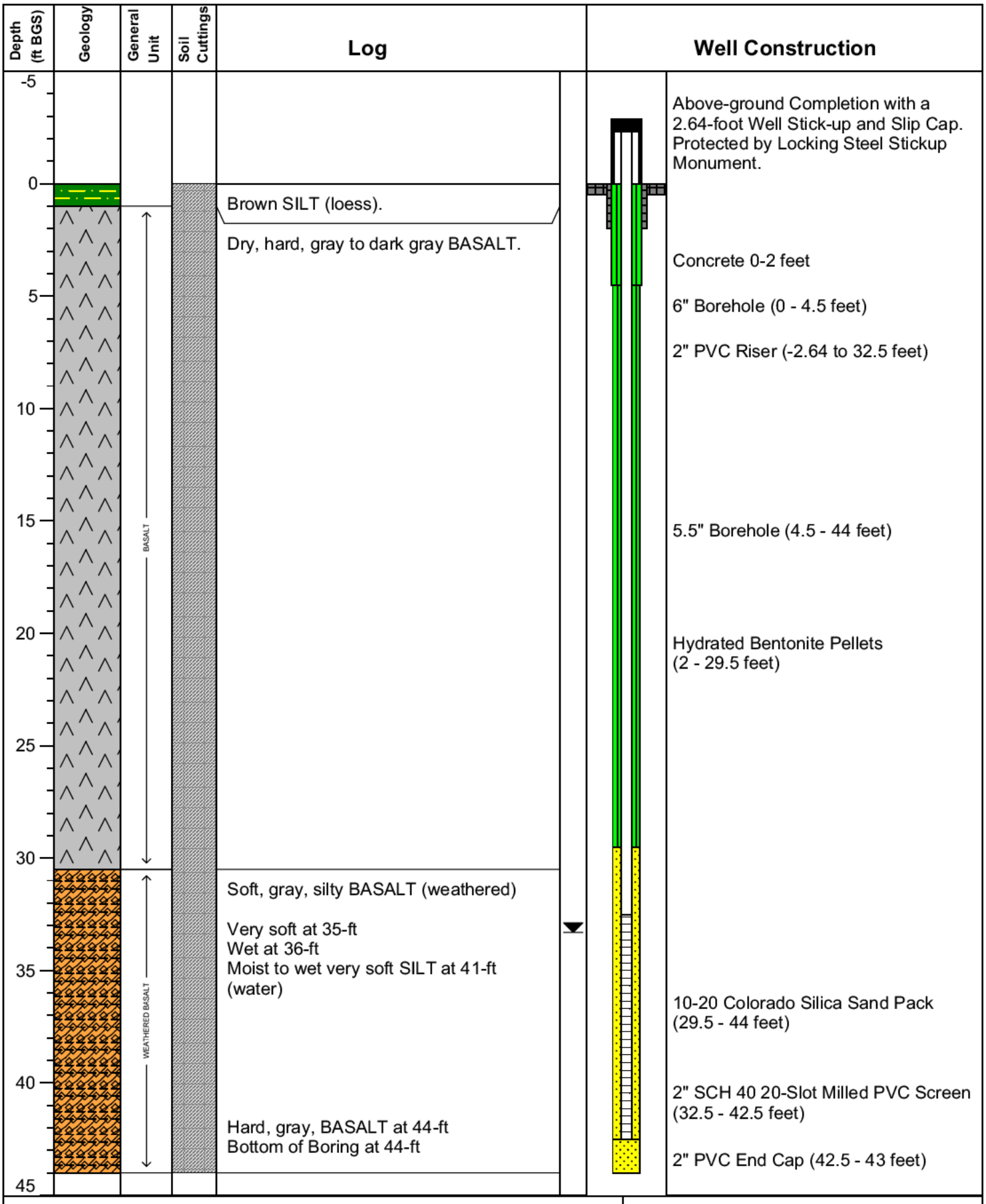


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel and Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-51B
Ecology ID: BBH821
Top PVC Elevation: 1258.60-ft
Surface Elevation: 1256.02-ft
Datum: Sea level
Installed: 11/30/2009
DTW: 42.9-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-51B
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

PgG

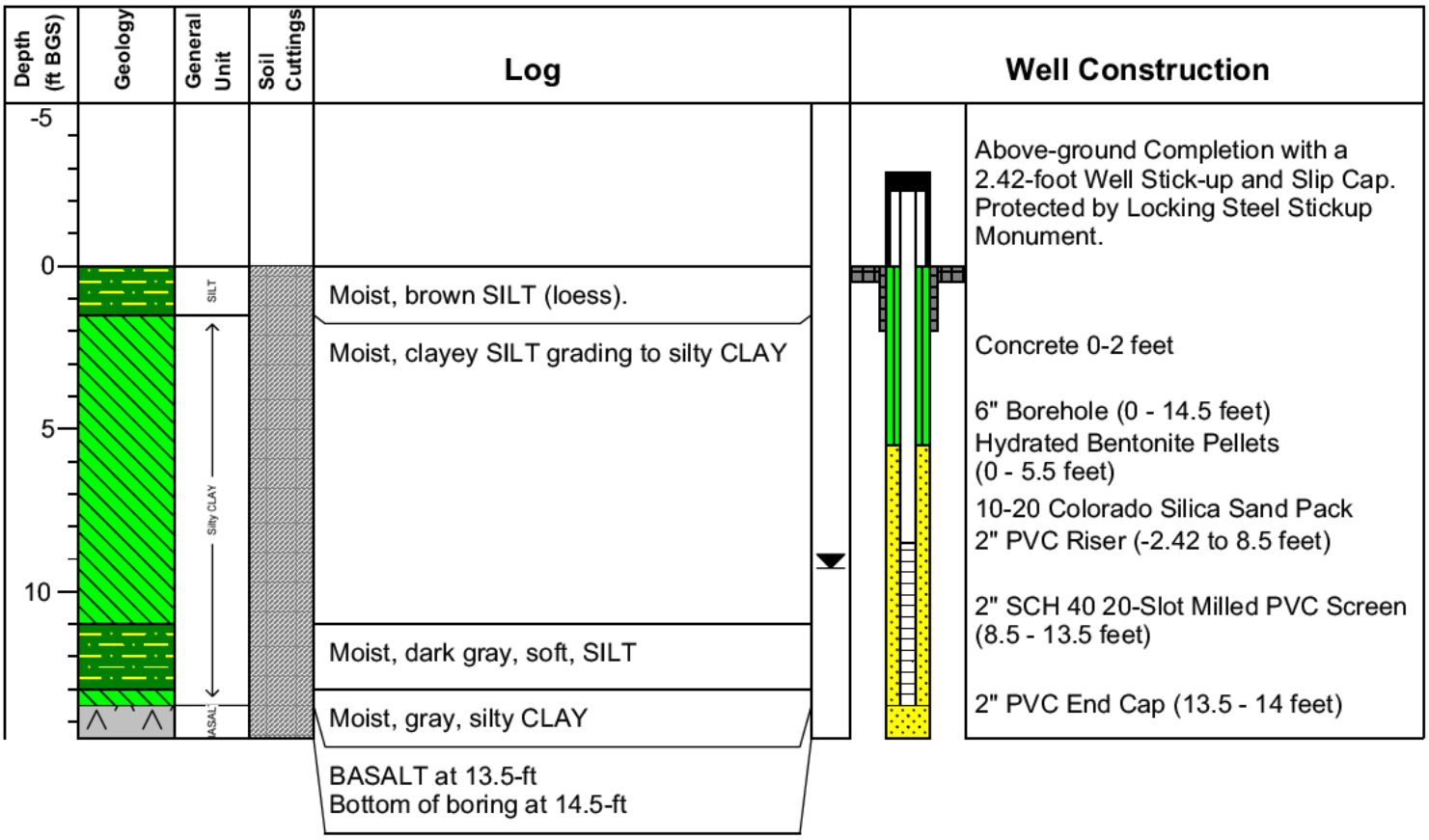


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NW1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-52p2
Ecology ID: BBH822
Top PVC Elevation: 1258.66-ft
Surface Elevation: 1256.02-ft
Datum: Sea level
Installed: 11/30/2009
DTW: 35.95-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-52p2
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

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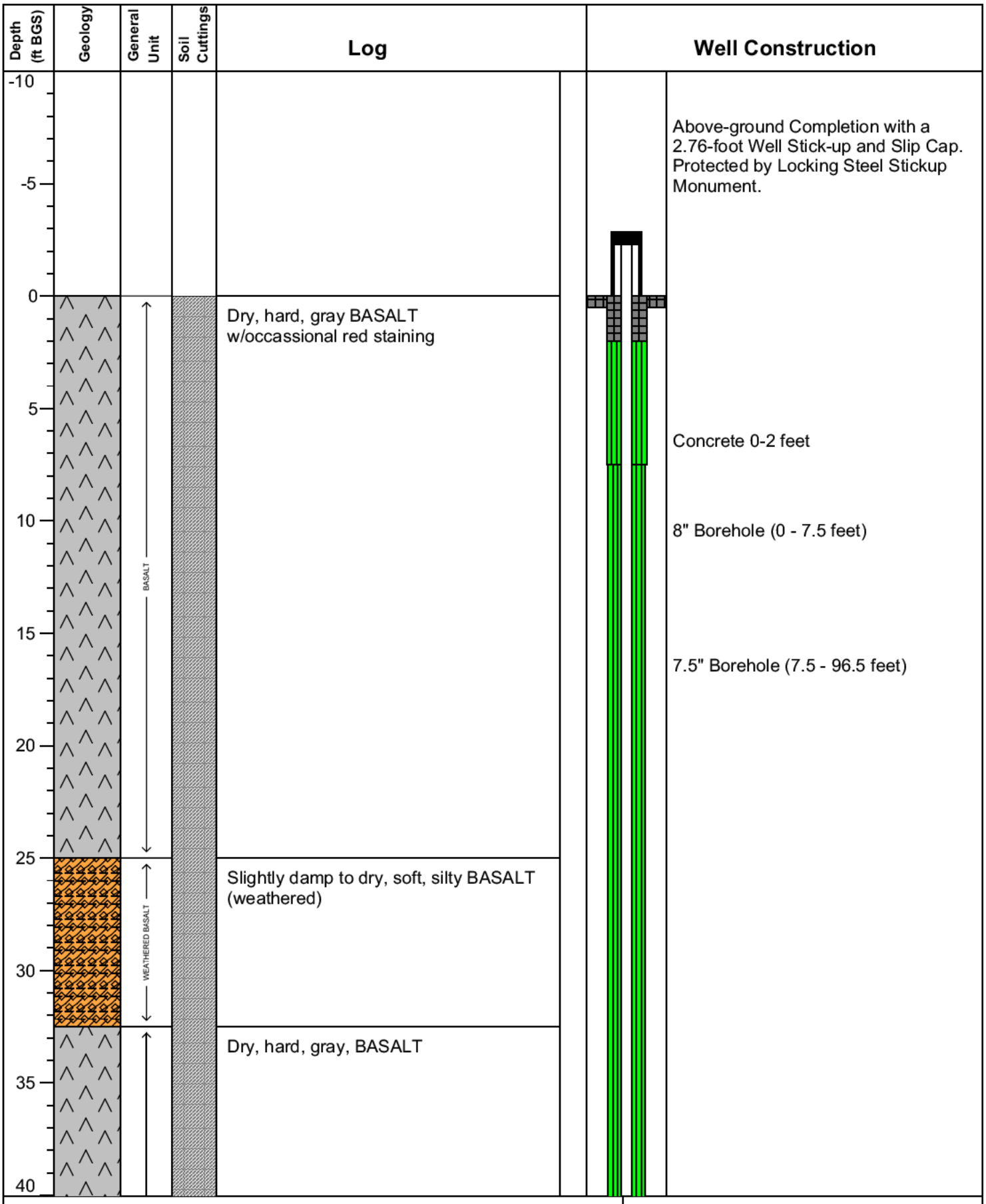


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly
Location: NE1/4 of NW1/4 Section 33 T21N R26E

Well Name: MW-53A
Ecology ID: BBH823
Top PVC Elevation: 1227.05-ft
Surface Elevation: 1224.63-ft
Datum: Sea level
Installed: 12/03/2009
DTW: 11.7-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-53A
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

PgG

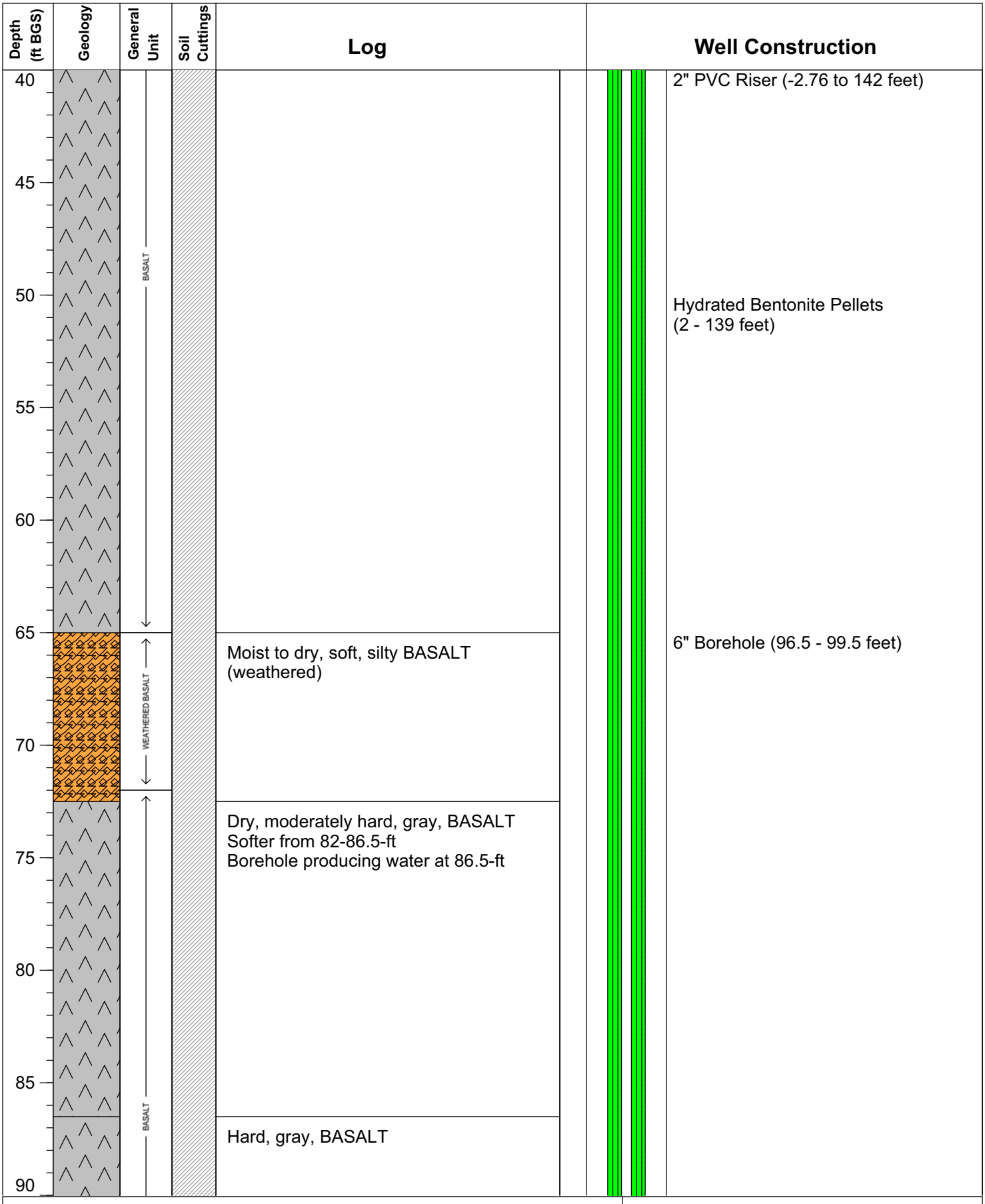


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly and Jeff Parker
Location: SW1/4 of SE1/4 Section 28 T21N R26E

Well Name: MW-54C
Ecology ID: BBH818
Top PVC Elevation: 1233.53-ft
Surface Elevation: 1230.77-ft
Datum: Sea level
Installed: 12/03/2009
DTW: 103.74-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-54C
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

PgG

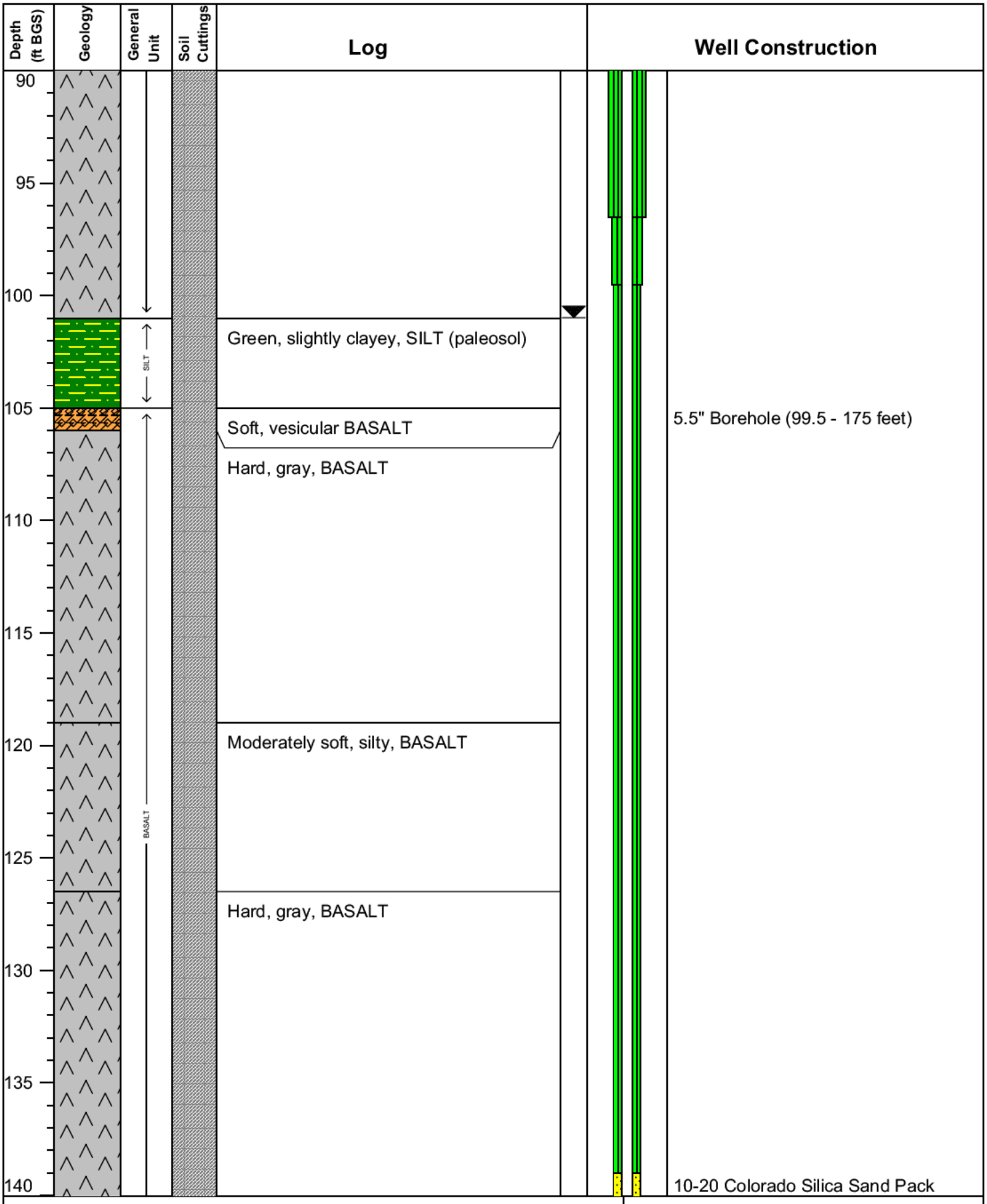


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly and Jeff Parker
Location: SW1/4 of SE1/4 Section 28 T21N R26E

Well Name: MW-54C
Ecology ID: BBH818
Top PVC Elevation: 1233.53-ft
Surface Elevation: 1230.77-ft
Datum: Sea level
Installed: 12/03/2009
DTW: 103.74-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-54C
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

PgG

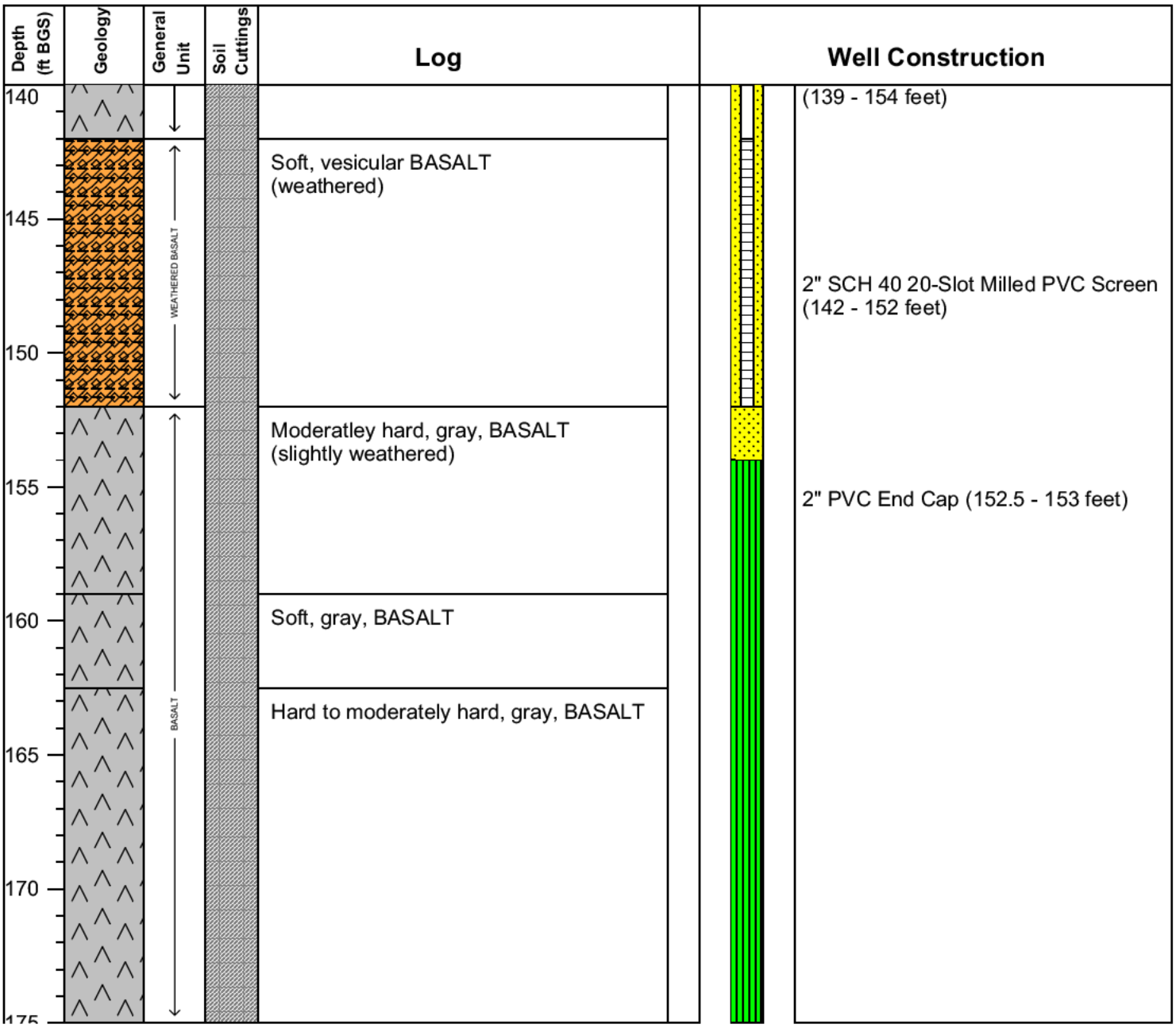


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly and Jeff Parker
Location: SW1/4 of SE1/4 Section 28 T21N R26E

Well Name: MW-54C
Ecology ID: BBH818
Top PVC Elevation: 1233.53-ft
Surface Elevation: 1230.77-ft
Datum: Sea level
Installed: 12/03/2009
DTW: 103.74-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-54C
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

PgG

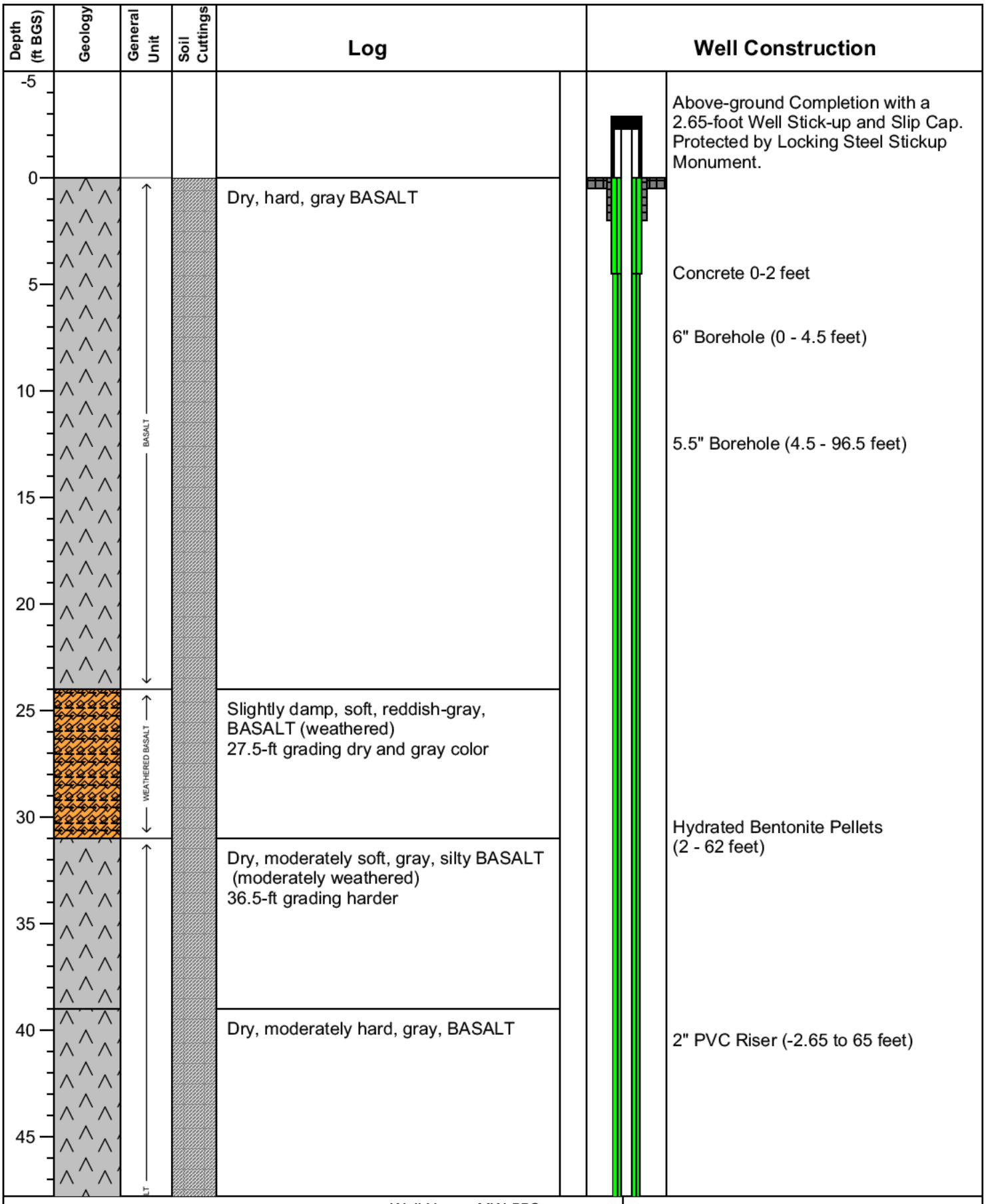


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Doug Kelly and Jeff Parker
Location: SW1/4 of SE1/4 Section 28 T21N R26E

Well Name: MW-54C
Ecology ID: BBH818
Top PVC Elevation: 1233.53-ft
Surface Elevation: 1230.77-ft
Datum: Sea level
Installed: 12/03/2009
DTW: 103.74-ft (below MP)

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-54C
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

PgG

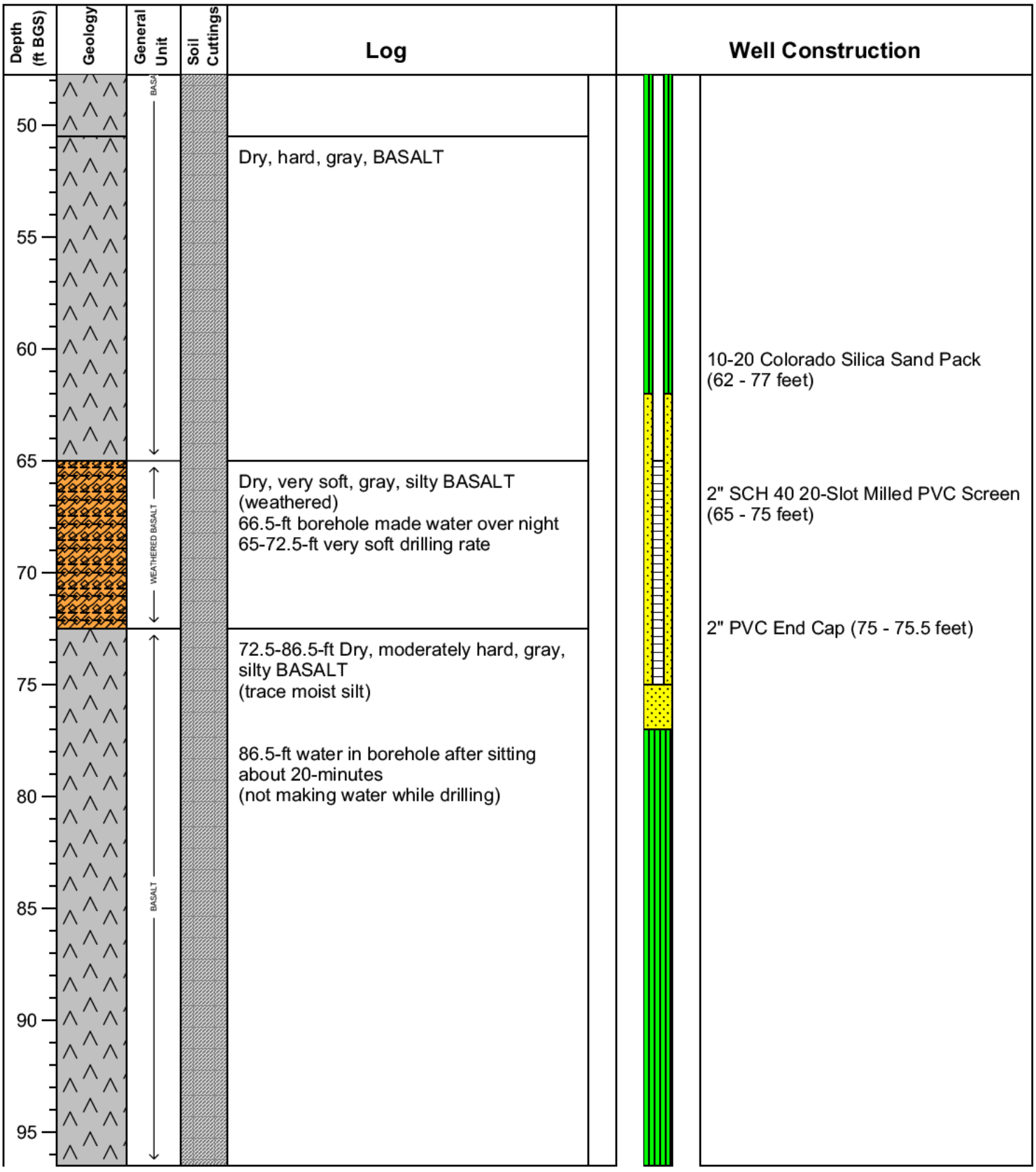


Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: SW1/4 of SE1/4 Section 28 T21N R26E

Well Name: MW-55C
Ecology ID: BBH819
Top PVC Elevation: 1233.42-ft
Surface Elevation: 1230.77-ft
Datum: Sea level
Installed: 12/08/2009
DTW: Dry Well

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-55C
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

PgG



Project Name: Ephrata RI Phase 2
Drilling Method: Air Rotary
Driller: Tim
Environmental West
Consulting Firm: Pacific Groundwater Group
Logged by: Dawn Chapel
Location: SW1/4 of SE1/4 Section 28 T21N R26E

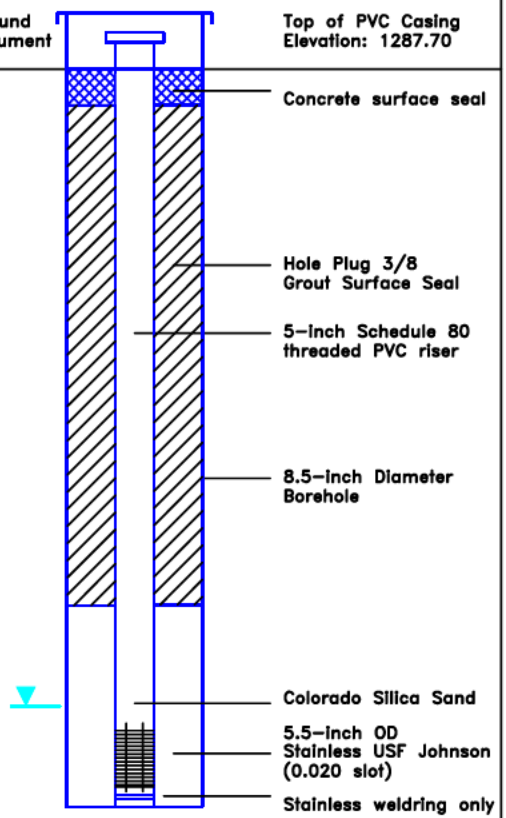
Well Name: MW-55C
Ecology ID: BBH819
Top PVC Elevation: 1233.42-ft
Surface Elevation: 1230.77-ft
Datum: Sea level
Installed: 12/08/2009
DTW: Dry Well

GEOLOGIC LOG AND AS-BUILT FOR WELL MW-55C
Ephrata Landfill
Ephrata, Washington
JE0714a, 12/2009

PgG

GRANT COUNTY – EPHRATA LANDFILL
WELL EW–1

DEPTH (feet)	GEOLOGIC LOG	% LEL	SAMPLE
	Ground Surface Elevation: 1286		
0	Refuse with gravel/cobble/sand slow drilling	0	
	Very smelly discharge down wind		
	Increased cuttings		
10	Drilling rate increases, more dry rock and dust, more dry refuse	0	
20	Shredded tires in returns	0	
	Fast drilling through dry refuse with gravel cover		
	Little return	0	
30	Shredded, damp, black coarse–sand sized fragments 60% gravel plus glass, wood, wire, ceramic		
	Hard, fast drilling, driller says not rock		
40	No circulation	0	
	Refuse with gravel		
50	Gravelly silt with refuse		
	no refuse		
60	Basalt		
	Bottom of Boring at 60.3 feet.		
70			
80			
90			
100			



PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: EW–1
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Charles Ellingson

LOCATION: 13106.72 N, 19225.94 E

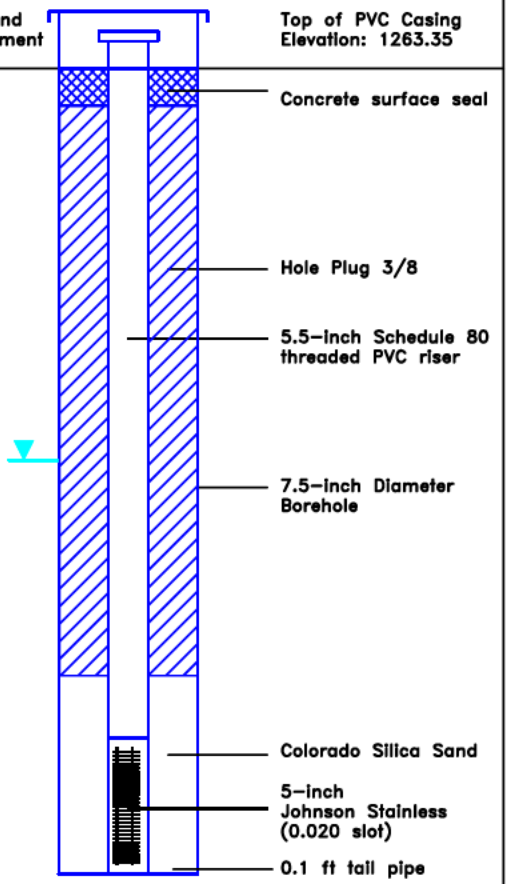
DATUM: NGVD
WATER LEVEL ELEVATION: 1232.1
INSTALLED: 9/25/00
DEVELOPED:
DOE unique well ID:

Pacific Groundwater Group

GRANT COUNTY – EPHRATA LANDFILL
WELL EW–2

DEPTH (feet)	GEOLOGIC LOG	% LEL	SAMPLE
0	Ground Surface Elevation: 1260.85		
	Silty sand and gravel		
	Basalt Hard, slow drilling	0	
10			
	Weathered vesicular basalt		
20	Hard, dry, fresh, massive basalt no weathered faces, no phenocrysts		
30			
40			
50	Drill rate increases Hole making water at 55 feet		
	Roza interflow Moderately soft, brown, weathered vesicular basalt – numerous weathered faces		
60			
	Bottom of Boring at 65.9 feet.		
70			
80			
90			
100			

WELL CONSTRUCTION DETAILS



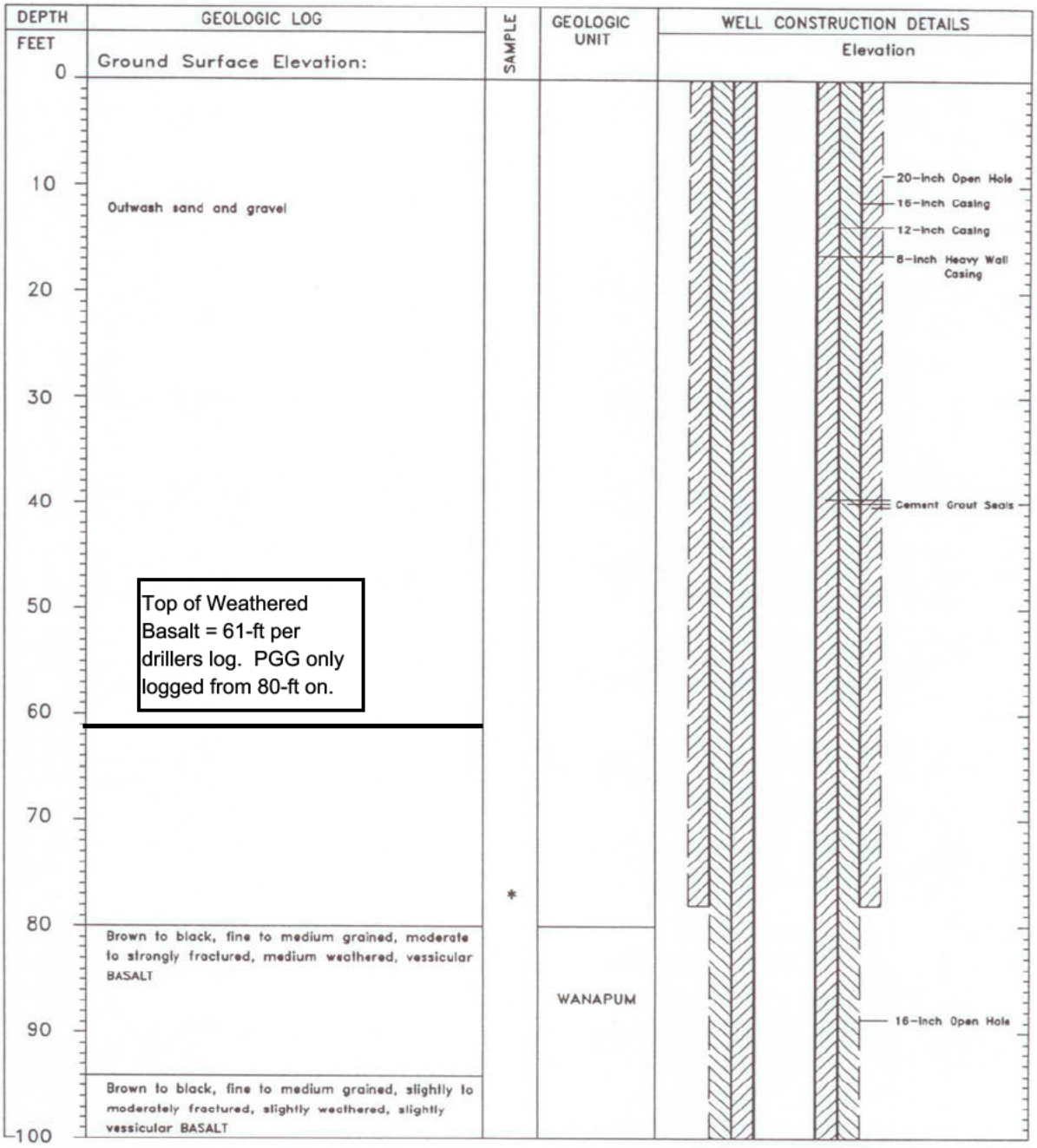
PROJECT NAME: Grant County Ephrata Landfill
WELL INDENTIFICATION NUMBER: EW–2
DRILLING METHOD: Air Rotary
DRILLER: Dan Claassen
FIRM: Environmental West Exploration, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Charles Ellingson

LOCATION: 13323.49 N, 18931.03 E

DATUM: NGVD
WATER LEVEL ELEVATION: 1231.66
INSTALLED: 9/26/00
DEVELOPED:
DOE unique well ID:

Pacific Groundwater Group

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1



* Water quality sample collected

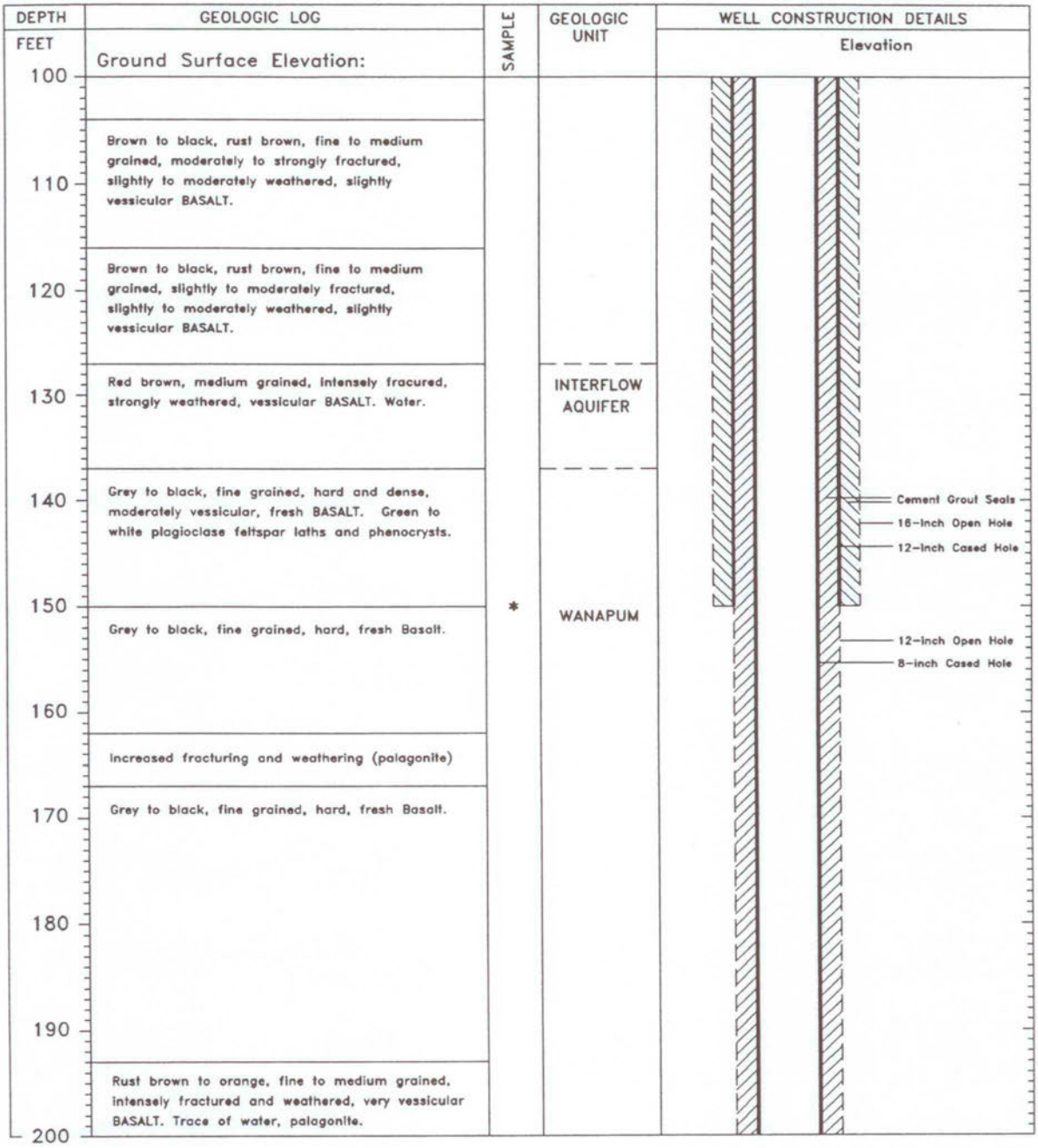
FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1



* Water quality sample collected

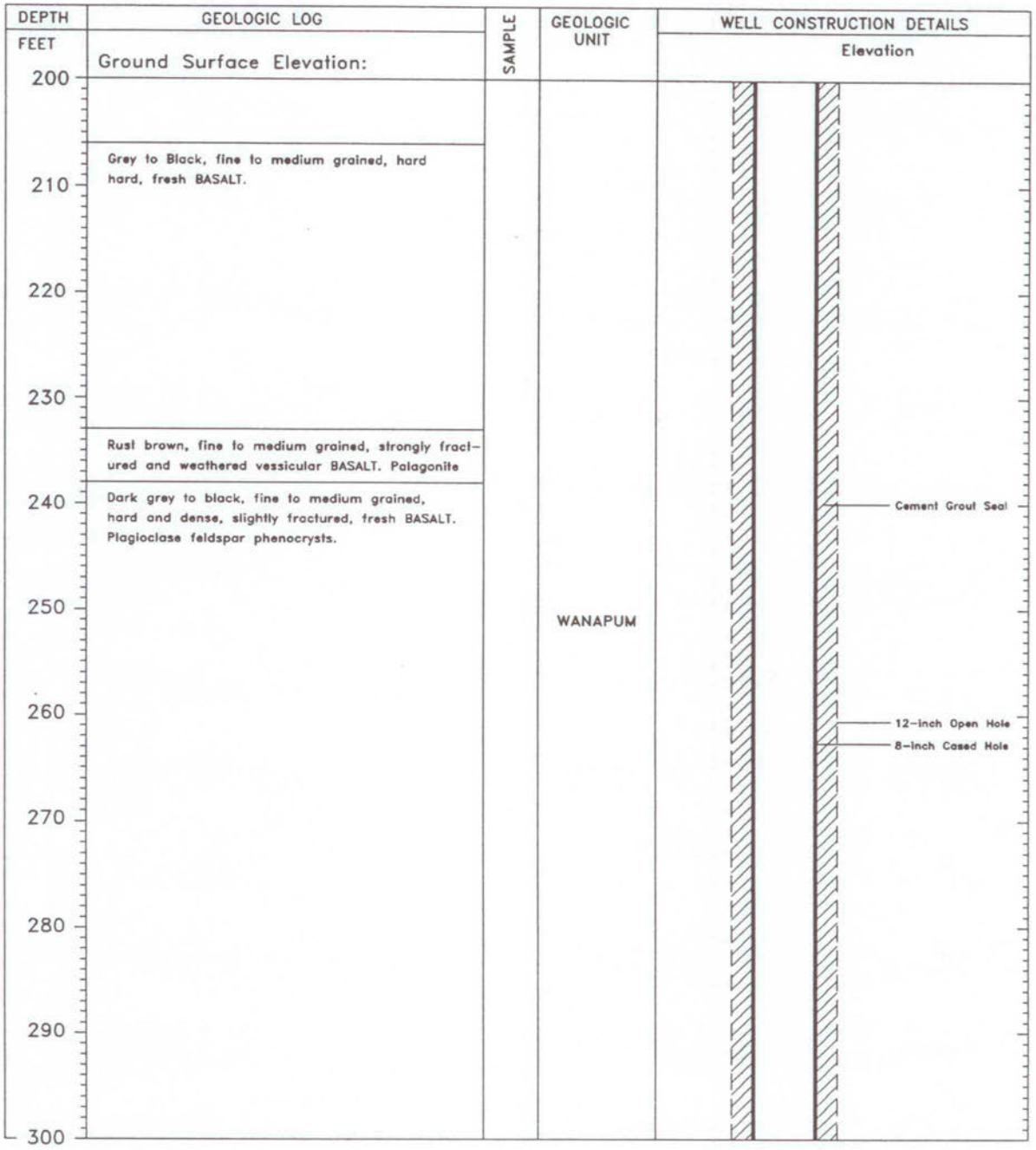
FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1



* Water quality sample collected

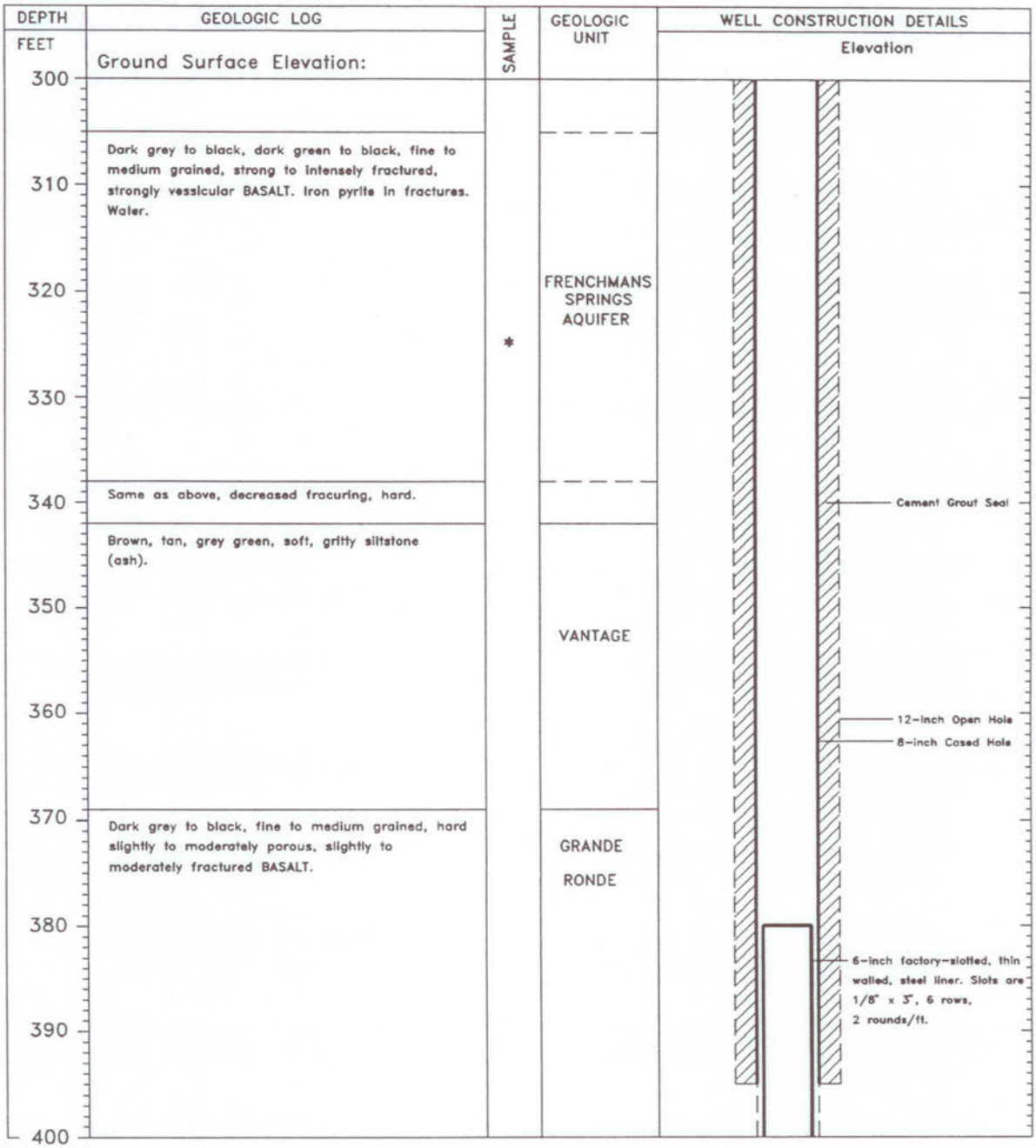
FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1



* Water quality sample collected

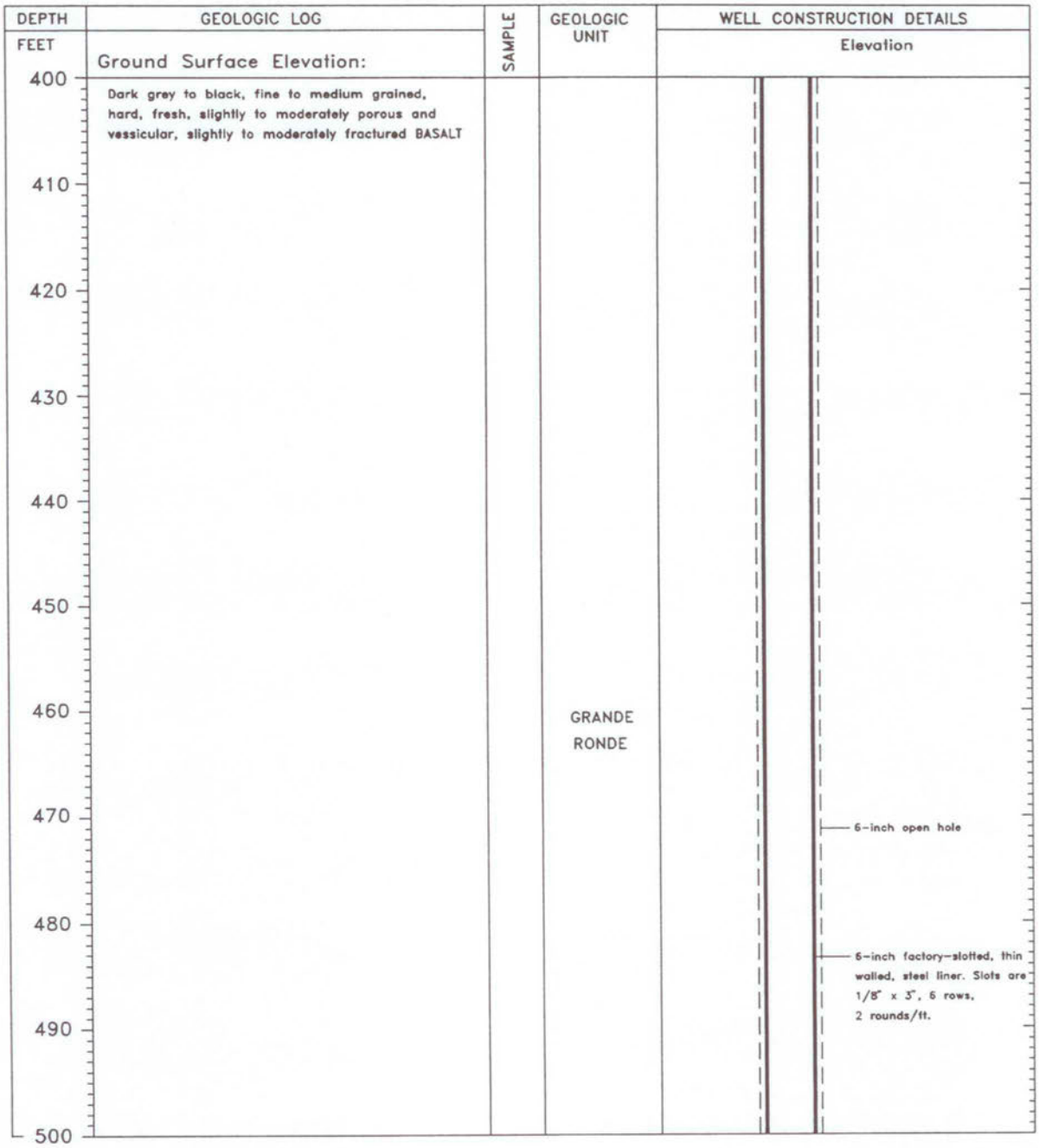
FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1



* Water quality sample collected

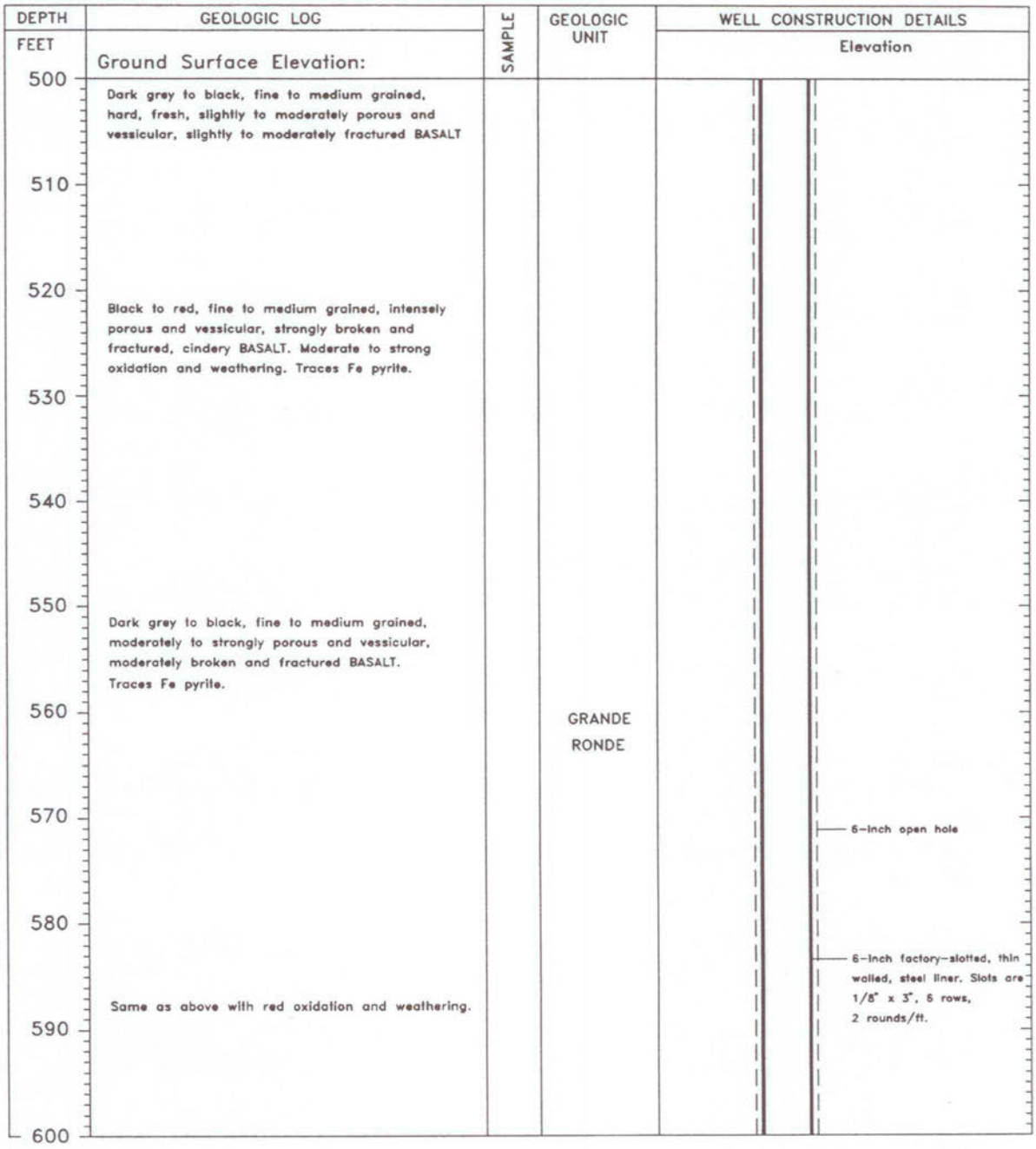
FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1



* Water quality sample collected

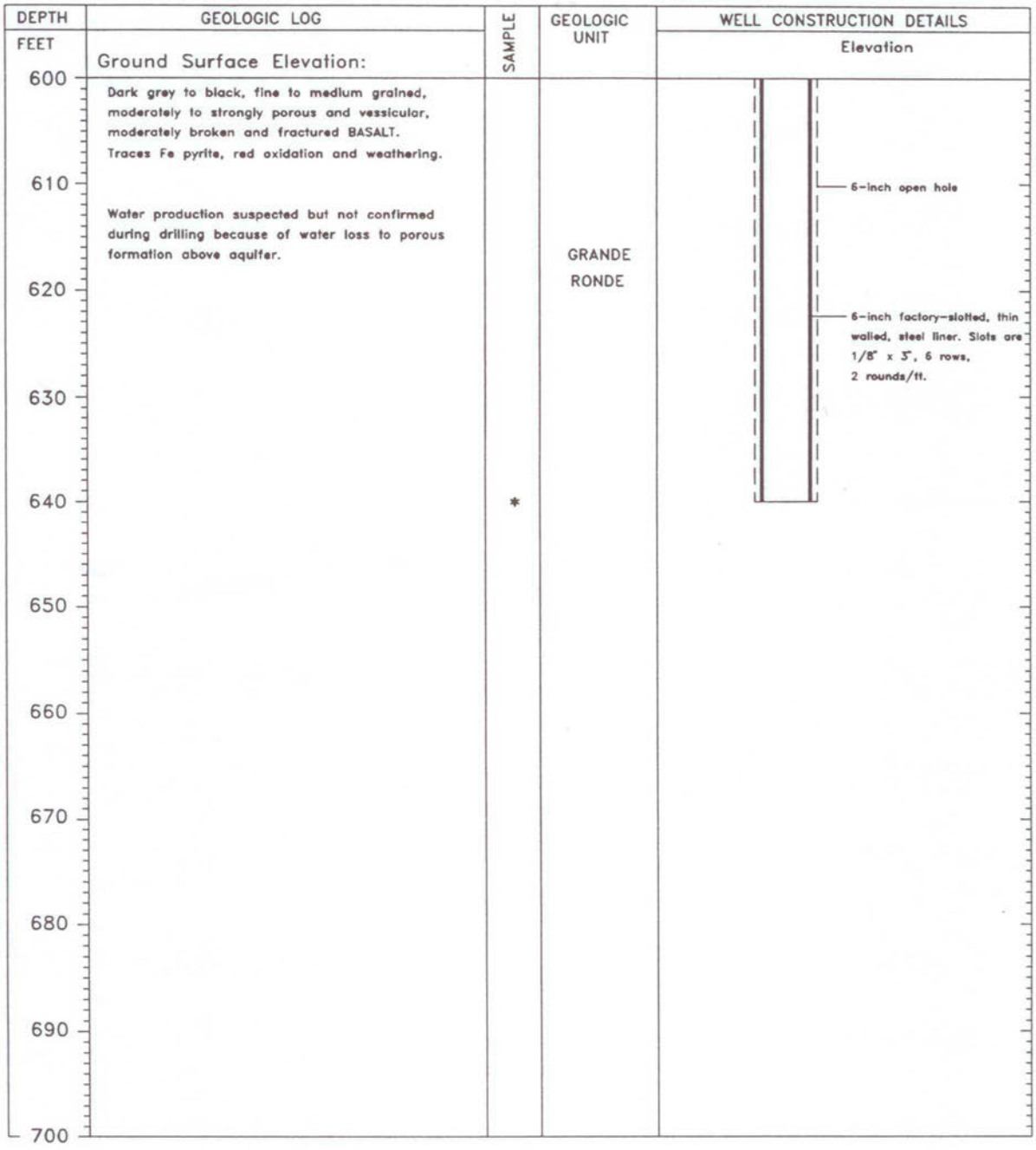
FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1



* Water quality sample collected

FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

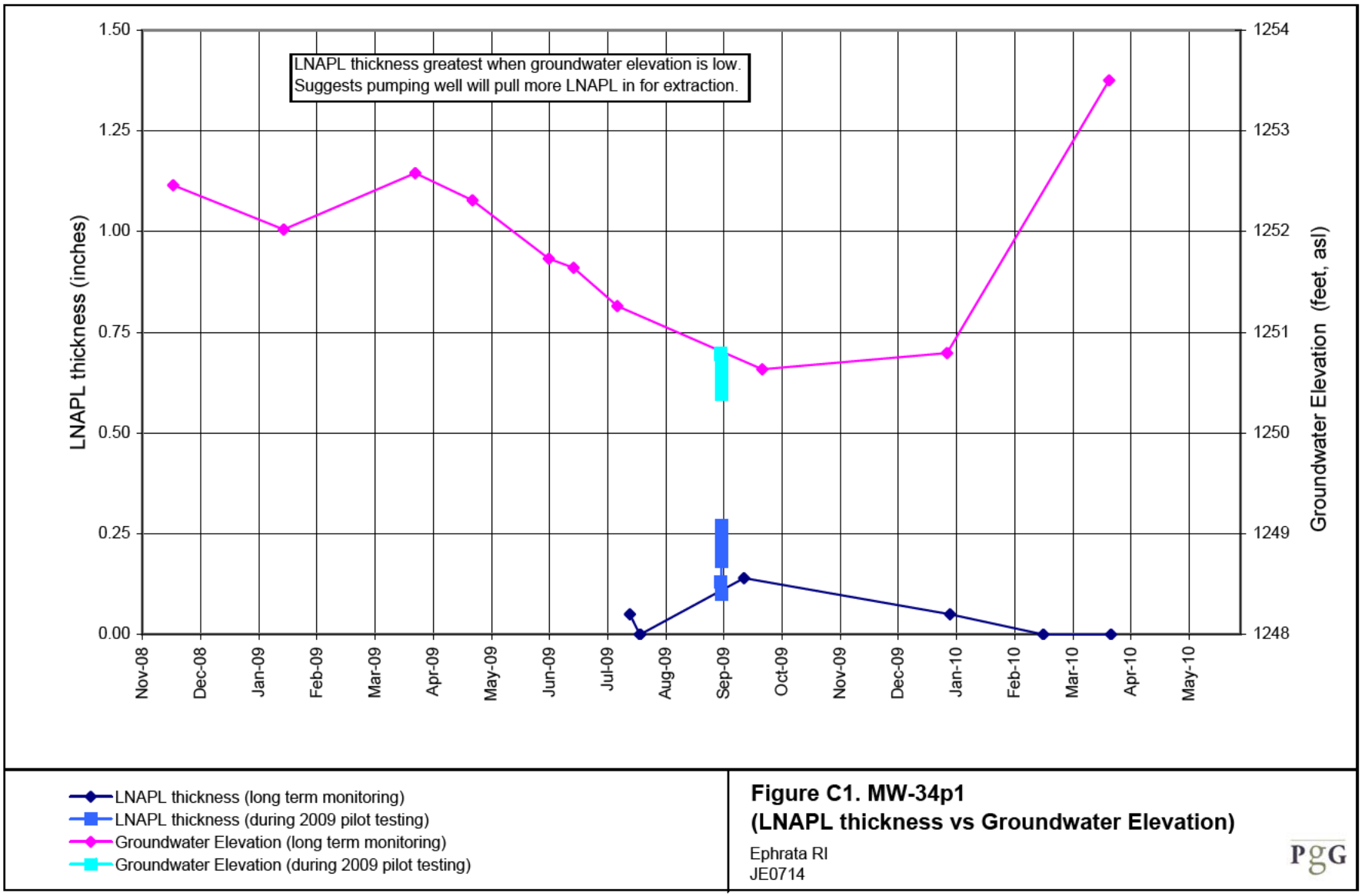


Figure C1. MW-34p1
(LNAPL thickness vs Groundwater Elevation)

Ephrata RI
JE0714

PgG

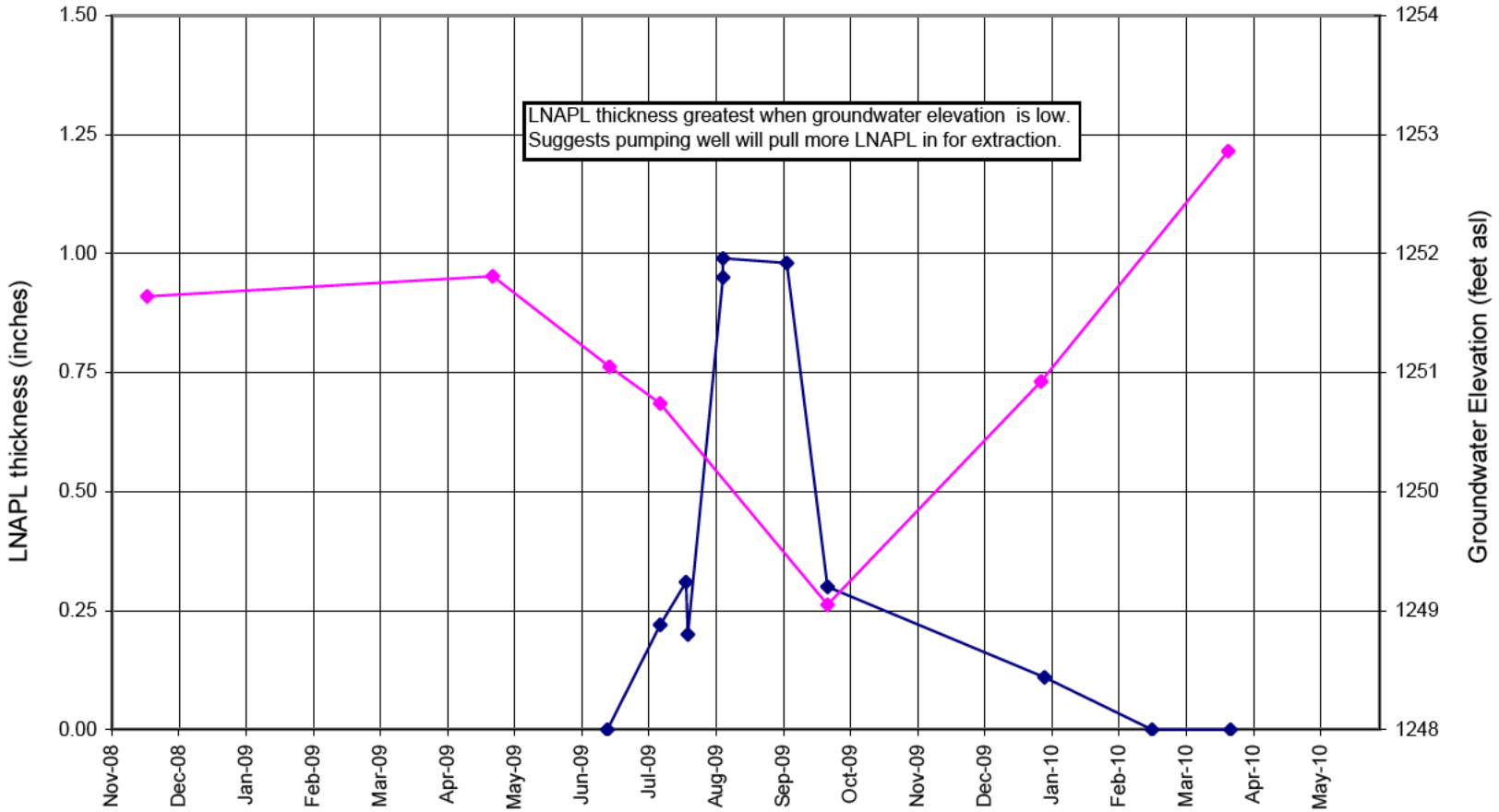


Figure C2. MW-36p1
(LNAPL thickness vs Groundwater Elevation)

Ephrata RI
JE0714

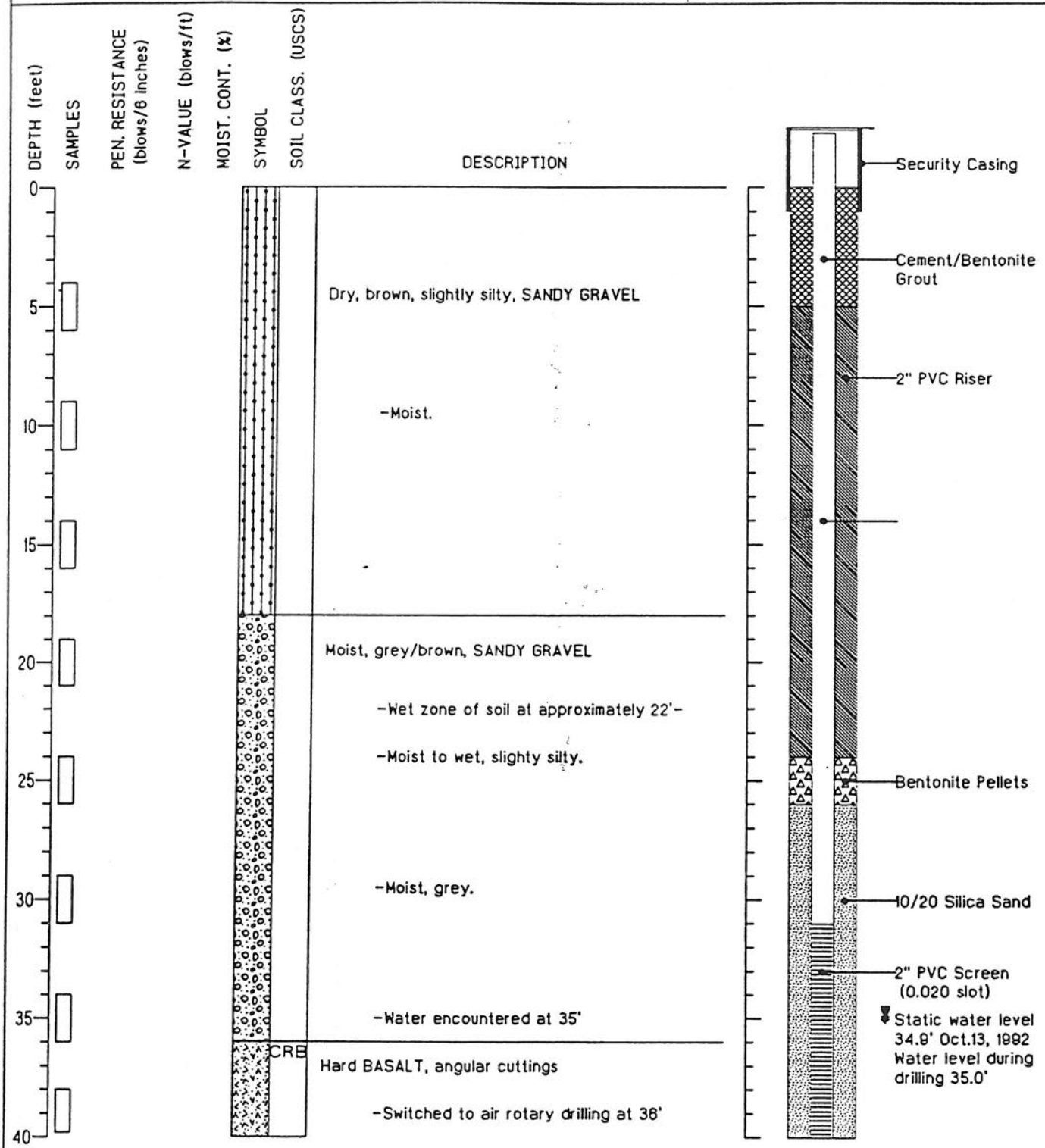
PgG

HONG WEST & ASSOCIATES, INC.

WELL LOG

DRILLING COMPANY: Layne Environmental
DRILLING METHOD: Dual-wall percussion/air-rotary
SAMPLING METHOD: Grab

TOTAL DEPTH: 46.0 Feet
SURFACE ELEVATION: 1234.28 Feet
MEASURING POINT EL.: 1236.39 Feet



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated.

PROJECT: Ephrata WWTP

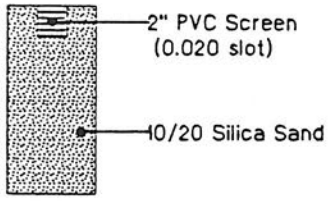
LOCATION: Ephrata, Washington
DATE COMPLETED: October 13, 1992
LOGGED BY: DLH

WELL: MW-2

PROJECT NUMBER: 91014

HONG WEST & ASSOCIATES, INC.
WELL LOG

DEPTH (feet)	SAMPLES	PEN. RESISTANCE (blows/6 inches)	N-VALUE (blows/ft)	MOIST. CONT. (%)	SYMBOL	SOIL CLASS. (USCS)	DESCRIPTION
40					CRB		Hard grey BASALT, angular cuttings.
							-3 to 4 small fracture zones indicated by drill action. (Red-brown clay in one zone).
45							-Bottom of borehole @ 46 feet-
50							
55							
60							
65							
70							
75							
80							



PROJECT: Ephrata WWTP

LOCATION: Ephrata, Washington
DATE COMPLETED: October 13, 1992
LOGGED BY: DLH

WELL: MW-2

PROJECT NUMBER: 91014

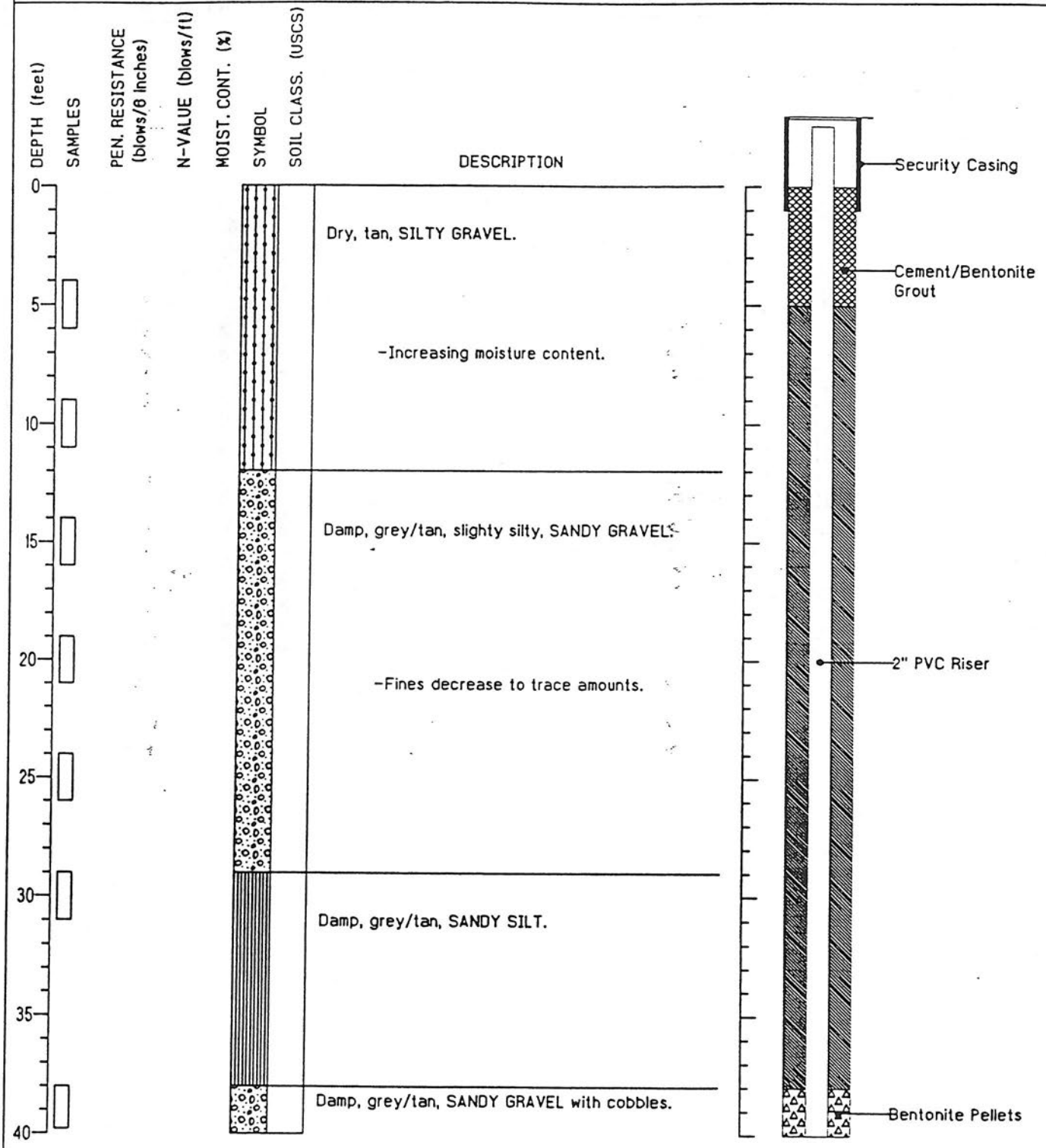
PAGE: 2 OF 2

HONG WEST & ASSOCIATES, INC.

WELL LOG

DRILLING COMPANY: Layne Environmental
DRILLING METHOD: Dual-wall percussion
SAMPLING METHOD: Grab and Dames & Moore

TOTAL DEPTH: 63.0 Feet
SURFACE ELEVATION: 1246.86 Feet
MEASURING POINT EL.: 1249.23 Feet



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated.

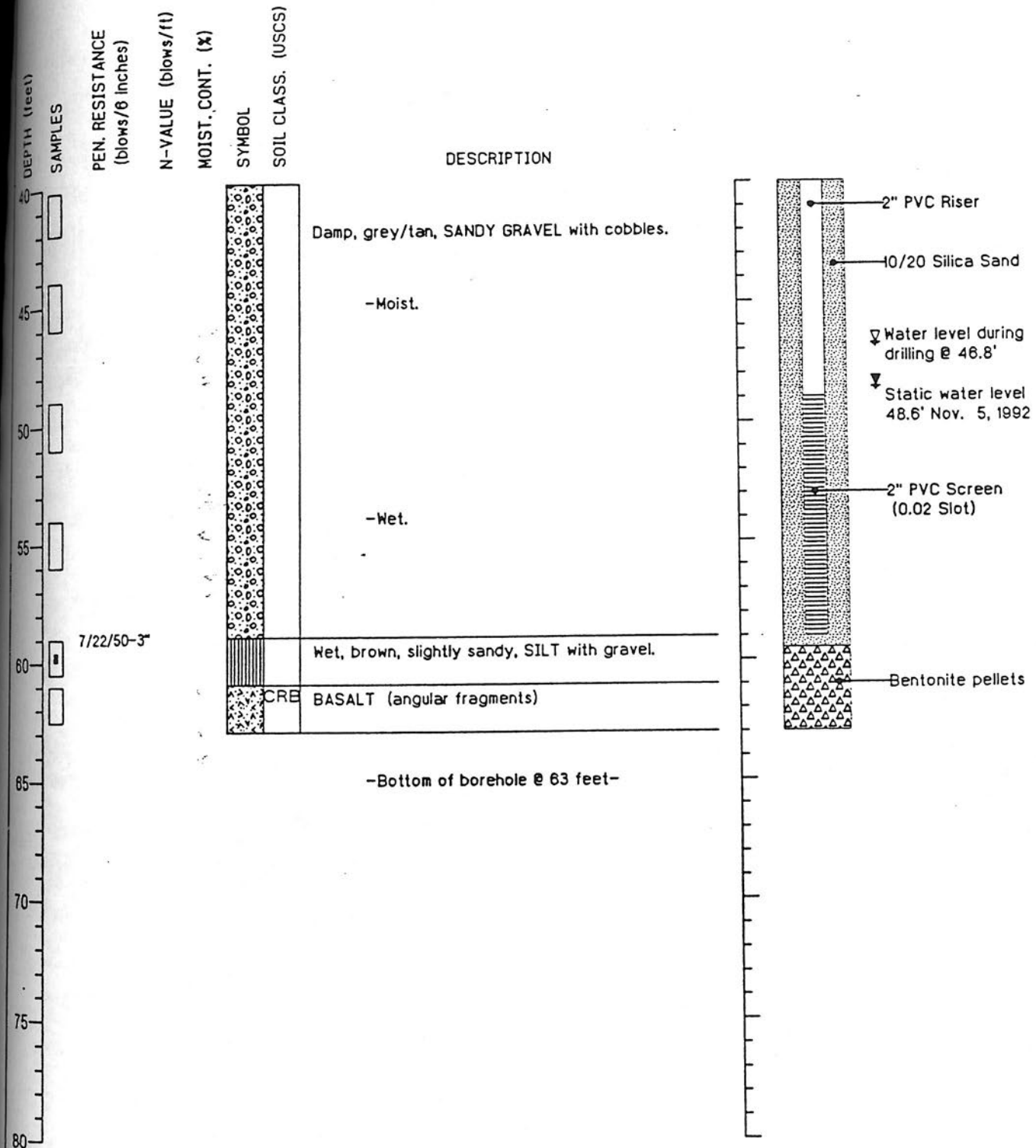
PROJECT: Ephrata WWTP

LOCATION: Ephrata, Washington
DATE COMPLETED: October 15, 1992
LOGGED BY: DLH

WELL: MW-3

PROJECT NUMBER: 91014

HONG WEST & ASSOCIATES, INC.
WELL LOG



PROJECT: Ephrata WWTP

WELL: MW-3

LOCATION: Ephrata, Washington

PROJECT NUMBER: 91014

DATE COMPLETED: October 15, 1992

LOGGED BY: DLH

21/26-21H1. Roy Behm. About 500 N. and 300 ft W. of E¼ corner. ;itude about 1,252 ft. Drilled 1914.

Material	Thickness (feet)	Depth (feet)
:l.	8	8
ıvel, coarse.	32	40
ırdpan".	120	160
ıd; water.	3	163

ɜing: 10-inch.

21/26-22E2. E.P. Calkins. About) ft N. and 1,000 ft E. of W¼ cor- . Altitude about 1,265 ft. illed, 1912.

ıvel.	35	35
ırdpan".	115	150
ıd.	20	170
ırdpan" and gravel. .	125	295

ɜing: 8-inch.

21/26-22G1. City of Ephrata. About .00 ft S. and 1,850 ft W. of NE cor- . Altitude about 1,323 ft. Drilled C. E. Miller.

ıvel and boulders . .	130	130
ɜalt, soft, decomposed, ɔd.	67	197
y, white; gravel . .	50	247
record.	38	285

21/26-22N1. Manuel Berschauer. ut 200 ft N. and 475 ft E. of SW ner. Altitude about 1,278 ft. lled by Bach Drilling Co..

ılders and soil. . .	20	20
vel, mixed with clay	51	71
alt, broken. . . .	20	91
alt, and sandstone .	133	224

ɜing: 6-inch.

21/26-23L1. Ephrata Airport. About ft SW of center ¼ corner. Altitude ut 1,260 ft. Drilled by G. C. f, 1940.

l and boulders. . . .	2	2
vel, cemented	3	5
vel, boulders	17	22
y and gravel.	8	30
y.	6	36
merock".	5	41
y, brown.	10	51

21/26-23L1.--Continued.

Materials	Thickness (feet)	Depth (feet)
Boulders.	4	55
Clay, yellow.	89	144
Gravel; water	6	150
Clay, white.	9	159
Basalt, black.	15	174
Basalt, hard, gray. . .	2	176
Basalt, black.	1	177
Basalt, hard, gray. . .	72	249
Basalt, gray.	11	260
Basalt, black	5	265
Clay, blue.	1	266
Basalt, broken, black; water, small quantity.	33	299
Basalt, black.	26	325
Basalt, gray	46	371
Basalt, "honeycomb", black; water.	4	375
Basalt, black; water. .	45	420
Basalt, black; water, crevices at 421,424 ft	5	425

Casing: 6-inch.

21/26-28H1. City of Ephrata, (sewage plant). About 1,200 ft N. and 850 ft W of E¼ corner. Altitude about 1,242 ft. Drilled by Erdman Drilling Co., 1947.

Gravel.	40	40
Clay, sandy	110	150
"Hardpan".	26	176
Sand.	2	178

Casing: 8-inch.

City irrigation

21/26-28K1. Ralph Abelson. About 100 ft S. and 1,150 ft E. of center of section. Altitude about 1,230 ft. Drilled by Brown Drilling Co., 1953.

Topsoil.	3	3
Gravel.	31	34
Basalt, black.	25	59
Basalt, broken.	90	149
Basalt, medium hard . .	76	225
Basalt, black	83	308
Basalt, hard.	8	316
Basalt, black.	14	330
Basalt, medium hard . .	12	342
Basalt, black.	15	357
Basalt, hard.	10	367

21/26-28K1.--Continued.

Materials	Thickness (feet)	Depth (feet)
Basalt, black.	10	377
Basalt, hard.	20	397
Basalt, black.	27	424
Basalt, hard.	2	426
Shale, blue(tested 120 gpm).	26	452
Basalt, hard.	6	458
Shale.	25	483
Basalt, hard.	45	528
Basalt, medium hard. . .	7	535
Basalt, black.	37	572
Basalt, medium hard. . .	8	580

650

Casing: 10-inch.

Rock Wtr Domestic

21/26-28K2. Ralph Abelson. About 800 ft S. and 150 ft E. of center of section. Altitude about 1,230 ft. Drilled by Brown Drilling Co., 1952.

Topsoil.	3	3
Gravel.	21	24
Basalt, black.	1	25
Basalt.	19	44
Basalt, black.	5	49
Clay and gravel.	11	60
Basalt, brown.	10	70
Basalt, gray.	11	81
Basalt, brown.	13	94
Basalt, gray.	7	101
Cracked "rock" and clay	3	104
"Clay rock".	14	118
Clay.	11	129
"Clay rock".	6	135
Basalt, black.	56	191
Basalt, broken	4	195
Basalt.	5	200
Basalt, broken.	2	202
Basalt, porous, black. .	8	210
Basalt, black.	11	221
Basalt, porous, black. .	19	240
Clay, yellow.	4	244

1206

Casing: 10-inch.

21/26-31C1. Dr. J. S. Lingenfelter. About 924 ft S. and 2,112 ft E. of NW corner. Altitude about 1,400 ft. Drilled by Durand & Son, 1952.

Soil.	4	4
"Hardpan".	36	40

21/26-31C1.--Continued.

Materials	Thickness (feet)	Depth (feet)
Basalt, broken.	5	45
Basalt, hard, gray. . . .	45	90
"Mud and rock".	6	96
Basalt, soft.	4	100
Basalt, blue.	8	108
Basalt, hard, gray. . . .	104	212
Basalt, medium, broken. .	18	230
Clay and gravel.	7	237
Basalt, soft, brown . . .	6	243
Basalt, blue.	19	262
Basalt, broken and mud. .	2	264
Basalt, blue.	101	365
Basalt, gray.	35	400

Casing: 6-inch.

21/28-19F1. Christopher Loan. About 900 ft N. and 100 ft W. of the center of section. Altitude about 1,162 ft. Drilled by Tony Dick, 1939.

Gravel.	3	3
Basalt; water at 26 and 60 ft.	89	92
Basalt, cavernous; water.	1	93

Casing: 6-inch.

21/28-21A1. R. C. Major. About 350 ft S. and 350 ft W. of NE corner. Altitude about 1,286 ft. Drilled by Radke & Son, 1953.

Silt, sand, and clay. . .	48	48
Basalt, black.	37	85
Basalt; water.	8	93

~1990's deepened to 400-FT
Always caved in ~ 180-FT
Put liner in, but still problem.

Table 1.--Records of wells.--Continued

Well no.	Owner or tenant	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Depth of casing (feet)	Water-bearing material	Water level: Depth below land surface (feet)	Water level: Date	Type of pump and hp	Use	Remarks
T. 21 N., R. 26 E.--Con.												
16B2	Unknown	1,312	Dr	252	9	50	..	9	1936	..	..	
16B3	City of Ephrata, well 2	1,345	Dr	260	12	180	Basalt	23.5	3- -41	T, 50	PS	C, L.
16B4	Mrs. C.L. Catlow	1,290±	Dr	100	10	20	..	29	1953	N	N	
16J1	Ben Harvill	1,278	Dr	92	10	10	Sand, gravel	56.19	9-23-40	P	S	
21E1	City of Ephrata, well 4	1,490	Dr	618	20	275	Basalt	184 245.55	12-17-52 6-12-58	..	PS	Dd 29 ft after pumping 4 hours at 1,190 gpm. C, L.
21G1	Ray Behm	1,241	Dr	..	..	..	Sand(?)	57.48 33.30	11-10-49 4-16-58	P	Irr	Hydrograph in fig. 21.
21G2	. .do. .	1,241	Dr	..	6	..	..	33.33	4-26-58	J	D	
21H1	. .do. .	1,252	Dr	163	10	94	Sand	82.61 42.83	9-26-49 4-28-58	J	D	L.
22E1	E. P. Calkins	1,251	Dr	133	8	29	.do.	70	9- -49	T, 15	D,Irr	
22E2	. . .do. . .	1,265	Dr	295	8	..	..	80	9- -49	J, 1	D	Cp, L.
22G1	City of Ephrata	1,323	Dr	285	10	..	Gravel	130 138.43	1916 5-10-51	N	N	Deepened in 1936. L, Rwl.
22N1	Manuel Berschaver	1,278	Dr	224	6	71	Basalt	70 80	1956 1958	J, 2	D, S	L.
23L1	Ephrata Airport	1,260	Dr	425	6	180	. do .	83.77	9-25-40	..	De	L.
26B1	Elizabeth Fleming	1,273	Du, Dr	100	30-6	81	Gravel	..	..	N	De	Formerly domestic and stock well.
28E1	J. B. McGrath	1,252	Du, Dr	318	8	..	Basalt	168.17	9-18-40	N	De	Basalt at 50 ft.
28H1	City of Ephrata, sewage plant	1,242	Dr	178	8	153	Sand	70	9- -47	T, 3	Ind	L.
28K1	Ralph Abelson	1,230	Dr	580	10	34	Basalt	37.22 22.92	9-14-53 4-28-58	N	N	L.
28K2	. . .do. . .	1,230	Dr	244	10	24	. do .	66.70 64.14	9-14-53 4-28-58	N	N	L.
29F1	Paul Patrick	1,542	Dr	300+	..	..	. do . (?)	..	..	J, 1½	D, S	
31C1	Dr. J. S. Lingenfelter	1,400	Dr	400	..	..	Basalt	282 106.15	1952 4-28-58	S, 5	D, S	L.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

59878

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W091453.
UNIQUE WELL I.D. # ACK 773.
Water Right Permit No. _____

(1) OWNER: Name Todd Anderson Address 3057 Valley Rd NE #18 Mc.L.

(2) LOCATION OF WELL: County Grant. 1/4 NW 1/4 Sec 33 T. 21 N., R 26 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one) 1
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled _____ feet. Depth of completed well _____ ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: _____" Diam. from _____ ft. to _____ ft.
Welded ☐ _____" Diam. from _____ ft. to _____ ft.
Liner installed ☐ _____" Diam. from _____ ft. to _____ ft.
Threaded ☐

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. ____ Slot size _____ from _____ ft. to _____ ft.
Diam. ____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 19 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 149 ft. below top of well Date 4-21-97
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? _____
Yield: 30 gal./min. with Air Lift ft. drawdown after 2 hrs.
" Pump " 7½ gpm. " 4. "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Dirt.	0	2
Basalt Grey	2	30
Basalt Black Soft	30	34
Basalt Black Form	34	40
Basalt Grey	40	69
Basalt Black	69	73
Basalt Grey Hard.	73	114
Basalt Black.	114	121
Basalt Grey	121	153
Basalt Red.	153	165
Basalt Red Black yellow shale	165	167
Basalt Black	167	172
Basalt Red	172	175
Basalt Black	175	191
Basalt Grey	191	206
Basalt Black + Brown	206	224
Basalt Grey	224	273
Basalt Red n Brown + yellow shale.	273	292
Basalt Grey.	292	294

RECEIVED
APR 28 1997
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 4-15-97 19. Completed 4-21-97 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Joy Drilling Co (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address Moses Lake Wash.
(Signed) Jerry Stiens (WELL DRILLER) License No. 0469
Contractor's Registration No. Joy DRICI37014 Date _____, 19 97

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93) * * f

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No. .....

(1) OWNER: Name Darrell B. Bolyard Address P.O. Box 73, Ephrata, WA 98823

(2) LOCATION OF WELL: County GRANT — S603¼ SE ¼ Sec. 33 T. 21 N., R. 26E W.M.
Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 70 ft. Depth of completed well 67 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 66 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
Static level 40 ft. below top of well Date 9/06/86
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: 50 gal./min. with ft. drawdown after hrs.
" ESTIMATED AIRLIFT " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

10/3/86 DD

(10) WELL LOG:
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Boulders	0	25
Gravel	25	40
Gravel w/water	40	70
NO PVC Liner Installed		
6" Drive shoe utilized		

RECEIVED
OCT 2 1986

Work started 9/05, 19 86 Completed 9/06, 19 86

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PONDEROSA DRILLING & DEVELOPMENT INC.
(Person, firm, or corporation) (Type or print)
Address E. 6010 Broadway, Spokane, WA 99212

[Signed] James M. Doyle (Well Driller)
James M. Doyle
License No. 1287 Date 9/06, 19 86

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No. .....

(1) **OWNER:** Name Edward Gates Address 236 8th NW Ephrata Wash.

(2) **LOCATION OF WELL:** County Grant — NE ¼ NE ¼ Sec. 33 T. 21 N., R. 26E W.M.

Bearing and distance from section or subdivision corner

(3) **PROPOSED USE:** Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) .....
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6" inches.
Drilled 120 ft. Depth of completed well 120 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 6" Diam. from +1 ft. to 24 ft.
Threaded ☐ ." Diam. from ft. to ft.
Welded ☐ ." Diam. from ft. to ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☑
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☑ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☑ No ☐ To what depth? 24 ft.
Material used in seal Bentonight.
Did any strata contain unusable water? Yes ☑ No ☐
Type of water? Good Depth of strata 105
Method of sealing strata off Casing

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level .... 1140 ft.
Static level 40 ft. below top of well Date 4/4/83
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" Air Pump 40 GpM. "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG:**
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top soil Brown Sandy	0	2
Basalts Boulders & Gravel	2	18
Hard Black Basalts	18	105
Med Soft Black & Brown	105	115
Porous Basalts Water		
Hard Black Basalts	115	120

Work started 4/4, 19 83 Completed 4/4, 19 83

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Evergreen Well Drilling
(Person, firm, or corporation) (Type or print)

Address Rt 2 Box 243A Moses Lake

[Signed] E. Kent Hellyer
(Well Driller)

License No. 591 Date 4/10, 19 83

4/21/83

(USE ADDITIONAL SHEETS IF NECESSARY)
Ephrata

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

36050

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W046 783
UNIQUE WELL I.D. # AAD 220
Water Right Permit No. _____

(1) **OWNER:** Name James Gross Address 525 H St SE Quincy, Wa

LOCATION OF WELL: County Grant SE 1/4 NW 1/4 Sec 32 T. 21 N., R 26 E W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address) 2 miles S. Ephrata, Wash. Dodson Rd.

(3) **PROPOSED USE:** ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) **TYPE OF WORK:** Owner's number of well (If more than one) 1
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☒ Driven ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches. Drilled 72 feet. Depth of completed well 72 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 6 " Diam. from -1 ft. to 34 ft.
Welded ☒ _____ " Diam. from _____ ft. to _____ ft.
Liner installed ☐ _____ " Diam. from _____ ft. to _____ ft.
Threaded ☐

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) **PUMP:** Manufacturer's Name _____
Type: _____ H.P. _____

(8) **WATER LEVELS:** Land-surface elevation above mean sea level _____ ft.
Static level 24 ft. below top of well Date 4/10/95
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test 20 gal./min. with 0 ft. drawdown after 1 hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☒

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil	0	6'
Sand, Gravel & Boulders	6'	31'
Basalt Rock	31'	72'

RECEIVED
MAY - 5 1995
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 4/5 19 95 Completed 4/10 19 95

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Close Well Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address PO Box 125 Quincy Wa 98848
(Signed) _____ (WELL DRILLER) License No. 701
Contractor's Registration No. CLOSE-WW-910-50 Date 4/10 19 95

(USE ADDITIONAL SHEETS IF NECESSARY)

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ECY 050-1-20 (9/93) * * f

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

36317

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. WO47580
UNIQUE WELL I.D. # ACE909
Water Right Permit No. Soap Lake Wa.

(1) OWNER: Name Salud Gutierrez Address 726 Main St. #21 Po Box 497 98851

(2) LOCATION OF WELL: County Grant SE 1/4 NW 1/4 Sec 33 T. 21 N., R 26E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned [ ] New well [X] Method: Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 100 feet. Depth of completed well 100 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +2 ft. to 86 ft.
Welded [ ] _____ " Diam. from _____ ft. to _____ ft.
Liner installed [ ]
Threaded [ ] _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes [ ] No [X]
Type of perforator used
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type _____ Model No.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes [X] No [ ] To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? _____ Depth of strata _____
Method of sealing strata off

(7) PUMP: Manufacturer's Name Grundfos
Type: Sub. H.P. 2

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 33 ft. below top of well Date 4-18-96
Artesian pressure _____ lbs. per square inch Date
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 45 gal./min. with stem set at 95 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date
Temperature of water _____ Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Cobbles	0	28
Gravel & Sand	28	57
Yellow Clay	57	73
Blue Clay	73	84
Fractured Basalt & Water	84	100

RECEIVED
JUL 17 1996
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 4-18, 19. Completed 4-18, 1996

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Mathews Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 9455 Stonecrest Rd Malaga Wa.
(Signed) Mathews (WELL DRILLER) License No. 1267
Contractor's Registration No. MATHEDC176K Date 4-18, 1996

(USE ADDITIONAL SHEETS IF NECESSARY)

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ECY 050-1-20 (9/93) * * f

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

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Second Copy — Owner's Copy
Third Copy — Driller's Copy

36316

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W047579
UNIQUE WELL I.D. # ACE908
Water Right Permit No. _____

(1) **OWNER:** Name Vicente Martin Address 246 Columbia Rd, Ephrata

(2) **LOCATION OF WELL:** County Grant SE 1/4 NW 1/4 Sec 33 T. 21 N., R 26 E W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address) _____

(3) **PROPOSED USE:** ☒ Domestic ☐ Irrigation ☐ DeWater ☐ Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) _____
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 145 feet. Depth of completed well 145 ft.

(6) **CONSTRUCTION DETAILS:**
Casing Installed: 6 " Diam. from +2 ft. to 66 ft.
Welded ☐ Liner installed ☐ Threaded ☐ " Diam. from _____ ft. to _____ ft.
" Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. ____ Slot size _____ from _____ ft. to _____ ft.
Diam. ____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) **PUMP:** Manufacturer's Name _____
Type: _____ H.P. _____

(8) **WATER LEVELS:** Land-surface elevation above mean sea level _____ ft.
Static level 37 ft. below top of well Date 4-3-96
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 32 gal./min. with stem set at 140 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil	0	1
Cobbles	1	23
Sand & Gravel	23	59
Fractured Basalt	59	66
Red Basalt	66	84
Black Basalt	84	125
Fractured Red Basalt & Water	125	137

RECEIVED
JUL 17 1996
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 4-1 , 19. Completed 4-2 , 19 96

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME MATHEWS Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 9455 Stonecrest Rd. M.L. Wa.
(Signed) Mike Mathews (WELL DRILLER) License No. 1267
Contractor's Registration No. MATHEDC167BC Date 4-2 , 19 96

(USE ADDITIONAL SHEETS IF NECESSARY)

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ECY 050-1-20 (9/93) * * f

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

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Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No. .....

(1) OWNER: Name Douglas J. Paris Address Star Route 1, 309 Q st. SE Quincy, WA 98848

LOCATION OF WELL: County Grant — SE ¼ NW ¼ Sec 33 T 21 N., R 26E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic XX Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well XX Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary XX Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 120 ft. Depth of completed well 120 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 34 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded XX " Diam. from ft. to ft.

Perforations: Yes ☐ No XX
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No XX
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No XX Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes XX No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No XX
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ... 1200 ft.
Static level 30 ft. below top of well Date 7/19
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No XX If yes, by whom?
Yield: 22+ gal./min. with ft. drawdown after hrs.
" Air Test " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No XX

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top Soil	0	2
Basalt Boiulders & Sand	2	30
Basalt Cobble & Gravel & Sand	30	35
Basalt Fractured w/seams of brown & white clay	35	80
Basalt Hard Black	80	95
Basalt Fractured w/Water	95	120
120' PVC Liner installed		
Drive shoe installed		

Work started July 16, 1982 Completed July 19, 1982

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PONDEROSA DRILLING & DEVELOPMENT, INC.
(Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway Spokane, WA 99206

[Signed] Keith Vermillion
Keith Vermillion (Well Driller)

License No. 1045 Date July 19, 1982

ECY 050-1-20

7/26/82 KD

(USE ADDITIONAL SHEETS IF NECESSARY)

Ephrata

3

43463

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. WQ 58905
UNIQUE WELL I.D. # ABX 965
Water Right Permit No.

(1) OWNER: Name Ted Aid Pashkosky Address 420 85th Pl. S.W. apt #L Everette Wa 98204

(2) LOCATION OF WELL: County Grant SW 1/4 SE 1/4 Sec 33 T. 21 N., R. 26 E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☒ Domestic ☐ Irrigation ☐ DeWater ☐ Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 120 feet. Depth of completed well 120 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 6" Diam. from +2 ft. to 77 ft.
Welded ☒ Liner installed ☐ Threaded ☐ " Diam. from ft. to ft.
" Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name Gould Fox
Type: Sub. H.P. 1

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 31 ft. below top of well Date 7-13-95
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 20 gal./min. with stem set at 118 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil	0	1
Cobbles	1	23
Gravel	23	36
Brown Clay	36	55
Fractured Brown Basalt & Water	55	83
Black Basalt	83	114
Fractured Basalt & Water	114	118
Black Basalt	118	120

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SEP 12 1995
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 7-13 19. Completed 7-13 19 95

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Mathews Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 9455 Stonecrest Rd. NE Mt.
(Signed) Mitch Mathews (WELL DRILLER) License No. 1267
Contractor's Registration No. MATHEDC117BC Date 7-13 19 95

(USE ADDITIONAL SHEETS IF NECESSARY)

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ECY 050-1-20 (9/93) * * f

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

43462

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W058904
UNIQUE WELL I.D. # ABX964
Water Right Permit No. _____

(1) **OWNER:** Name Victor Paskosky Address 814 Locust St Everette Wa. 98201

(2) **LOCATION OF WELL:** County Grant SW 1/4 SE 1/4 Sec 33 T. 21 N., R 26 E W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address) Leslie Rd Ephrata, Wa.

(3) **PROPOSED USE:** [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) **TYPE OF WORK:** Owner's number of well (If more than one) 1
Abandoned [ ] New well [X] Deepened [ ] Reconditioned [ ] Method: Dug [ ] Cable [ ] Rotary [X] Bored [ ] Driven [ ] Jetted [ ]

(5) **DIMENSIONS:** Diameter of well 6 inches. Drilled 420 feet. Depth of completed well 420 ft.

(6) **CONSTRUCTION DETAILS:**
Casing Installed: Welded [ ] Liner installed [X] Threaded [ ]
6 " Diam. from +2 ft. to _____ ft.
4 " Diam. from -8 ft. to 420 ft.
_____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes [ ] No [X]
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name _____
Type _____ Model No. _____
Diam. ____ Slot size _____ from _____ ft. to _____ ft.
Diam. ____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes [ ] No [X] Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes [X] No [ ] To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) **PUMP:** Manufacturer's Name Crombie
Type: Sub H.P. _____

(8) **WATER LEVELS:** Land-surface elevation above mean sea level _____ ft.
Static level 33 ft. below top of well Date 7-13-95
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 15 gal./min. with stem set at 410 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes [ ] No [X]

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil	0	1
cobbles	1	7
Cemented gravel	7	12
Sand & gravel	12	44
Brown Clay	44	72
Brown Fractured Basalt Water	72	78
Black Basalt	78	121
Red Basalt	121	127
Black Basalt	127	237
Red Basalt	237	239
Black Basalt	239	301
Blue Clay	301	333
Black Basalt	333	420

RECEIVED
SEP 12 1995
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 7-12 19. Completed 7-13 19 95

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Mathews Drilling & Const (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 9455 Stonecrest Rd. Mt. Vernon Wa.
(Signed) Mark Mathews (WELL DRILLER) License No 1267
Contractor's Registration No MATHEDC117BC Date 7-13 19 95

(USE ADDITIONAL SHEETS IF NECESSARY)

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ECY 050-1-20 (9/93) * * f

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Third Copy — Driller's Copy

58130

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. WQ88490
UNIQUE WELL I.D. # ACX 167
Water Right Permit No. 48823

(1) OWNER: Name Vladimir Pashkovsky Address 12679 Rd C.5 NW Ephrata Wa.

(2) LOCATION OF WELL: County Grant SW 1/4 SE 1/4 Sec 33 T. 21 N., R 26E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Rd C.6

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one) _____
Abandoned [ ] New well [X] Method: Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 180 feet. Depth of completed well 50 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +2 ft. to 48 ft.
Welded [X] Liner installed [X] Threaded [ ] _____ " Diam. from _____ ft. to _____ ft.
_____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes [ ] No [X]
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name _____
Type _____ Model No. _____
Diam. ____ Slot size _____ from _____ ft. to _____ ft.
Diam. ____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes [ ] No [X] Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes [X] No [ ] To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 42 ft. below top of well Date 6-
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 10 gal./min. with stem set at 170 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil	0	1
Cobbles	1	16
Pea gravel	16	24
Brown Clay & gravel	24	29
Brown Clay	29	48
Soft Sand Stone & water	48	61
Black Basalt	61	122
Brown Basalt	122	128
Black Basalt	128	180

AUG 29 1997
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 6-24 19. Completed 6-27 19 97

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Matthews Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 9455 Stonecrest Rd Mt. Ver
(Signed) Mitch Matthews (WELL DRILLER) License No. 1267
Contractor's Registration No. MATHEDC117BS Date 6-27 19 97

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93) * * f

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name Mike Rolland Address Ephrata , Wa. 98823

(2) LOCATION OF WELL: County Grant NE ¼ SE ¼ Sec. 28 T. 21 N., R. 26 W.M.

Bearing and distance from section or subdivision corner Approx. 1 1/2 Miles South Ephrata off Dodson Road

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....

New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches. Drilled 248 ft. Depth of completed well 248 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 10" Diam. from 0 ft. to 40 ft.
Threaded ☐ 8" Diam. from 0 ft. to 70 ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level... 1260 ft.
Static level 80 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

9/12/83

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Overburden and Boulders	0	35
Brown Clay	35	40
Red Hard Sand Innerbed	40	58
Red Sand and Clay	58	65
Brown and Red Sand Innerbed H2O	65	70
Fractured Black Basalt	70	75
Hard Black and Brown Basalt	75	83
Soft Black Basalt	83	107
Hard Black Basalt	107	125
Black Basalt & Gray Clay Seams	125	135
Hard Black & Brown Basalt	135	150
Porous Black Basalt	150	165
Hard Black & Brown Basalt	165	210
Bl. Basalt & Gray Clay Seams	210	230
Broken Black Basalt H2O	230	248

* Water in 65'-75' Area would have required the use of a screen. Owner requested more and better water. Deepen to water 230'-248' Area, Broken Black Basalt, caving.

RECEIVED
SEP 10 1983
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 5, 1983. Completed 6, 1983

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Myrick's Well Drilling, Inc. (Person, firm, or corporation) (Type or print)

Address P.O. Box 485 - Quincy, Wa. 98848

[Signed] James Myrick (Well Driller)

License No. 850 Date 8-10, 1983

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

46265

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 406290

UNIQUE WELL I.D. # ACK 784

(Sabalsa)

Water Right Permit No. _____

(1) OWNER: Name Advantage Homes. Address 2135 W Broadway M. L. Wa.

(2) LOCATION OF WELL: County Grant. _____ 1/4 NE 1/4 Sec 33 T. 21 N., R 26 E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Lot # 17 Curlew Estates.

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one) 1

Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 127 feet. Depth of completed well 127 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 114 ft. (shoe)
Welded ☒ Liner installed ☐ Threaded ☐ " Diam. from ____ ft. to ____ ft.
" Diam. from ____ ft. to ____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. ____ Slot size _____ from _____ ft. to _____ ft.
Diam. ____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft. ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 52 ft. below top of well Date 5-27-97
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? _____
Yield: 40 gal./min. with air lift ft. drawdown after 2 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water 63 Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Dirt & Boulders	0	4
Gravel & Boulders	4	16
Gravel	16	55
Clay Brown	55	91
Sand	91	98
Sandstone w Clay	98	111
Sandstone	111	124
Basalt	124	127

RECEIVED
JUN - 6 1997

Work Started 5-23-97 19. Completed 5-27-97 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Joy Drilling Co (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address Moses Lake Wa.

(Signed) Jim Stone (WELL DRILLER) License No. 0469

Contractor's Registration No. JOYDRC137OH Date 5-28-97 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93) * * f

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W044621
UNIQUE WELL I.D. # ABM 415
Water Right Permit No. _____

(1) OWNER: Name Vincent Sanchez Address 131 B ST NE Quincy

LOCATION OF WELL: County Grant _____ 1/4 NE 1/4 Sec 33 T. 21 N., R 26 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one) 1
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 187 feet. Depth of completed well 185 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 6" Diam. from +1 ft. to 156 ft.
Welded ☐ Liner installed ☐ Threaded ☐ _____" Diam. from _____ ft. to _____ ft.
_____" Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 Ft ft.
Material used in seal Bentonite.
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 86 ft. below top of well Date 6-22-94
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? _____
Yield: 20 gal./min. with _____ ft. drawdown after 3 hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water 65 Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Dirt & Boulders.	0	4
Gravel w Boulders	4	38
Gravel	38	85
Clay Brown.	85	148
Sandstone Brown w/Gravel	148	175
Clay ten.	175	178
Sandstone Green	178	185
Basalt Black	185	187

Work Started 6-20-94 19. Completed 6-21-94 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Joy Drilling CO (PERSON, FIRM OR CORPORATION) (TYPE OR PRINT)
Address Moses Lake Wa.
(Signed) Jim Stone (WELL DRILLER) License No. 0469
Contractor's Registration No. JoyDRO137014 Date 6-22 19 94

(USE ADDITIONAL SHEETS IF NECESSARY)

ECL 050-1-20 (2/93) * * 1

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No. .....

(1) OWNER: Name Rickie Sievers Address Star Rt 1 490 Rd K NW

LOCATION OF WELL: County Grant — SE ¼ NE ¼ Sec 33 T. 21 N., R. 26 E W.M.

Bearing and distance from section or subdivision corner Lot 2 - Moses Lake Plat 2

(2) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(3) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☑ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☑ Jetted ☐

(4) DIMENSIONS: Diameter of well 8" inches. Drilled 160 ft. Depth of completed well 160 ft.

(5) CONSTRUCTION DETAILS:

Casing installed: ..." Diam. from +1 ft. to 115 ft.
Threaded ☐ ..." Diam. from ... ft. to ... ft.
Welded ☑ 8" Diam. from ... ft. to ... ft.

Perforations: Yes ☐ No ☑
Type of perforator used ...
SIZE of perforations ... in. by ... in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name ...
Type ... Model No ...
Diam. ... Slot size ... from ... ft. to ... ft.
Diam. ... Slot size ... from ... ft. to ... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel: ...
Gravel placed from ... ft. to ... ft.

Surface seal: Yes ☑ No ☐ To what depth? 20' ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? ... Depth of strata ...
Method of sealing strata off ...

(6) PUMP: Manufacturer's Name ...
Type: ... H.P. ...

(7) WATER LEVELS: Land-surface elevation above mean sea level ... 1250' ft.
Static level Art 100 ft. below top of well Date 7-21-83
Artesian pressure ... lbs. per square inch Date ...
Artesian water is controlled by ... (Cap, valve, etc.)

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? ...
Yield: ... gal./min. with ... ft. drawdown after ... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ...
Bailer test ... gal./min. with ... ft. drawdown after ... hrs.
Artesian flow ... g.p.m. Date ...
Temperature of water ... Was a chemical analysis made? Yes ☐ No ☐

8/22/83

(10) WELL LOG: 715'N - 157'W of E ¼ Cor

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
6" Minus open work Gravel	0	68
3" Gravel Brown Clay	68	102
Tan Sandstone	102	115
Brown Sandstone	115	160

RECEIVED
AUG 19 1983
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 7-18, 1983 Completed 7-21, 1983

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME D & F Drilling (Person, firm, or corporation) (Type or print)
Address 265 Bench
[Signed] ... (Well Driller)
License No. 016 Date 7-23, 1983

(USE ADDITIONAL SHEETS IF NECESSARY)
Ephrata SW

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No. .....

(1) OWNER: Name Jerry Wilson Address 1112 S. Central Sp. 18 Quincy, WA. 98848

(2) LOCATION OF WELL: County GRANT — X ¼ NE ¼ Sec. 33 T. 21 N., R. 29 E W.M.

...ing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic [X] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well [X] Method: Dug [ ] Bored [ ]
Deepened [ ] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 221 ft. Depth of completed well 221 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 55 ft.
Threaded [ ] " Diam. from ... ft. to ... ft.
Welded [X] " Diam. from ... ft. to ... ft.

Perforations: Yes [ ] No [X]
Type of perforator used ...
SIZE of perforations ... in. by ... in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

Screens: Yes [ ] No [X]
Manufacturer's Name ...
Type ... Model No. ...
Diam. ... Slot size ... from ... ft. to ... ft.
Diam. ... Slot size ... from ... ft. to ... ft.

Gravel packed: Yes [ ] No [X] Size of gravel: ...
Gravel placed from ... ft. to ... ft.

Surface seal: Yes [X] No [ ] To what depth? 20 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? ... Depth of strata ...
Method of sealing strata off ...

(7) PUMP: Manufacturer's Name NONE
Type: ... H.P. ...

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
Static level 45 ft. below top of well Date 10-2-87
Artesian pressure ... lbs. per square inch Date ...
Artesian water is controlled by ... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [X] If yes, by whom? ...
Yield: ... gal./min. with ... ft. drawdown after ... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ...
Bailer test ... gal./min. with ... ft. drawdown after ... hrs.
Artesian flow ... g.p.m. Date ...
Temperature of water ... Was a chemical analysis made? Yes [ ] No [X]

10/8/87

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Soil	0	1
GRAVEL & BOLDERS	1	26
GRAVEL	26	51
BR BROKEN BASALT	51	67
HARD GREY "	67	144
BR. BROKEN "	144	151
GREY BASALT	151	202
BR. BROKEN "	202	218
HARD GREY "	218	231

RECEIVED
OCT 8 1987
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started SEPT 30, 1987 Completed OCT. 1, 1987

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME L & L DRILLING INC (Person, firm, or corporation) (Type or print)
Address Box 167 Wilson Creek
[Signed] Larry Webley (Well Driller)
License No. 0518 Date Oct. 5, 1987

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

Table E1. Summary of Borehole Geophysics Measurements
Ephrata Landfill

Well	Total Depth feet bgs	Geophysical Method		
		Natural Gamma	**Conductivity**	**Magnetics**
MW-2c	106	x	x	x
MW-4c	132	x	x	x
MW-5c	152	x	x	x
MW-6c	78	x	x	x
MW-7b	59	x	x	x
MW-16d	110	x	x	x
MW19b	29	x	x	x
MW-20c	98.5	x	x	x
MW21c	119.5	x	x	x
MW-28d	353	x		

Northwest Geophysical Associates, Inc.

1600 SW Western Boulevard, Suite 200
PO Box 1063, Corvallis, OR 97339-1063
Phone: (541) 757-7231 FAX: (541) 757-7331
www.nga.com info@nga.com

March 10, 2008
NGA Ref: 667

Jeff Witter
Pacific Groundwater Group
2377 Eastlake Avenue East
Seattle Washington, 98102

Re: ***Borehole Geophysical Logging***
Ephrata Landfill
Ephrata, Washington

Dear Dr. Witter,

Northwest Geophysical Associates, Inc. (NGA) conducted a borehole geophysical logging program at the Ephrata Landfill in Ephrata, Washington, as part of Pacific Groundwater Group's groundwater investigation for that facility. The survey included conductivity, magnetic, and gamma logging in 10 boreholes inside of and adjacent to the landfill site. Borehole locations are shown on Figure 1. Field work was conducted February 26-28, 2008. Combined gamma, conductivity, and magnetic logs for each location are presented in Attachment A (Geophysical Borehole Logs).

FIELD SURVEY

NGA logged borehole geophysical data using Mt. Sopris, Inc. natural gamma (model # 2PGA), conductivity (2EMA), and magnetic (2DVA deviation probe) probes connected to a 200 meter wire line winch and MGX II logging controller.

Prior to conducting the survey, the winch cable and probes were decontaminated with an alconox solution and brush and rinsed with deionized water to ensure they were contamination free. This decontamination procedure was also employed between each borehole log, ensuring that no cross-borehole contamination took place as a result of the borehole geophysical logging investigation.

In each of the ten boreholes NGA collected three logs, running the gamma, magnetometer, and conductivity probes down and up the borehole individually. All data reported in the Attachment were acquired running the probe up, from bottom to top, to assure proper depth registration with the cable taut. All depths are referenced to the top of the PVC casing.

The magnetic/deviation probe contains a three axis fluxgate magnetometer. The probe is not oriented and is allowed to spin in the borehole. We have vectorally combined the two

horizontal components and reported the resulting magnitude of the horizontal field as well as the magnitude of the vertical field. Magnetic data units are Gauss (Gs), where 1 Gauss=10^5 nanotesla (nT). The 1 nT is equal to 1 gamma. The ambient geomagnetic field, using the International Geomagnetic Reference Field (IGRF-10), for Ephrata, WA, is: horizontal intensity=0.19069 Gs; vertical intensity 0.51426 Gs; declination=16° 34'; inclination=69° 39'. Deviations from those values represent an anomalous field due to the basalts, although not necessary the local basalt. Abrupt or rapid changes occurring over 10 to feet or less are likely due to the basalt surrounding the boring.

The EMD Induction (Conductivity) probe was run on the 0-1000 milliSiemen/meter (mS/m) scale throughout the survey. It was calibrated prior to logging the first boring and again prior to logging on the third day. Calibration was done using the Geonics calibration coil and the procedures established in the manual. Other conductivity logs were adjusted by applying a constant shift to obtain a reading of approximately 3 mS/m in the basalt section.

NGA used Advanced Logistic Technology WELLCAD version 4.2 software to display the geophysical log data and produce combined logs which are presented in Attachment A. The WELLCAD log software was used to combine and format log data from common boreholes.

Combined logs for all boreholes, except MW-28d, display data to the expected maximum depth of the cased borehole (minus probe length). During data collection in MW-28d (the deepest boring at 355 feet) a series of tight, obstructive sections were encountered between 16 and 24 feet below the top of borehole casing. The shorter gamma probe tool was able to descend past this obstructive section while the longer conductivity and magnetometer tools were not. The resulting combined log displays combined data to a depth of approximately 20 feet, after which only gamma probe data could be acquired to a borehole maximum depth of approximately 355 feet.

CLOSURE

Northwest Geophysical Associates, Inc. performed this work in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty, express or implied, beyond exercise of reasonable care and professional diligence, is made. This report is intended for use only in accordance with the purposes of the study described within.

We appreciate the opportunity to work with Pacific Groundwater Group on this project. If you have questions or need additional information, please call at your convenience.

Sincerely,

Northwest Geophysical Associates, Inc.



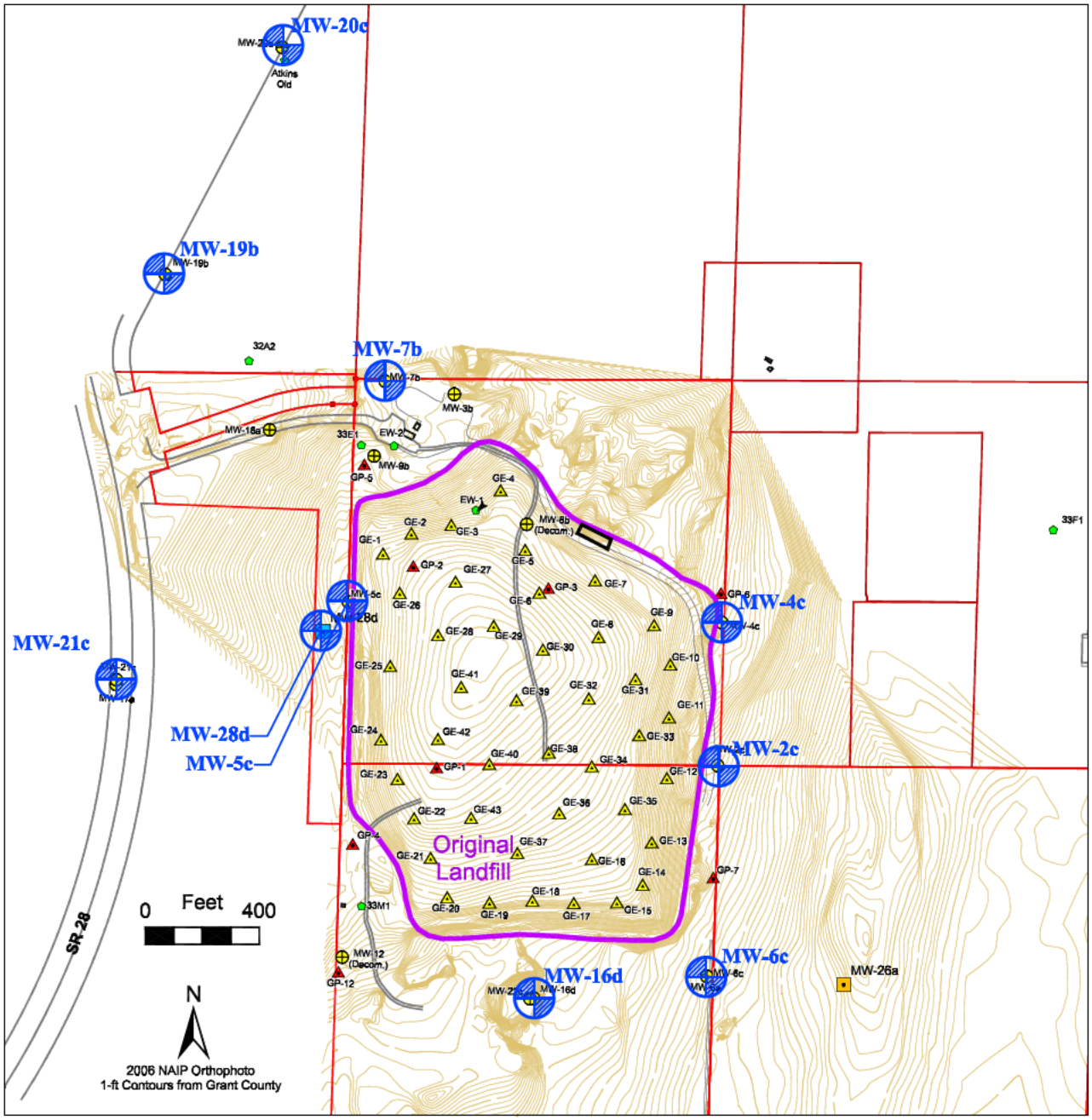
Rowland B. French, Ph.D., L.G.
President



Neil McKay
Project Geophysicist

Enclosures: Figure 1
Attachment A – Geophysical Borehole Logs

File: NGA_Ephrata_rpt01.doc
NGA Project: 667



LEGEND

Well Type

- Geophysical Log Location
- Monitoring Well (MW)
- Gas Extraction (GE)
- Gas Probe (GP)
- Other Well

Proposed Monitoring Wells

- Frenchman Springs Aquifer Well
- Interflow Aquifer Well

- County Owned Parcels
- Landfill Extents

FIGURE 1

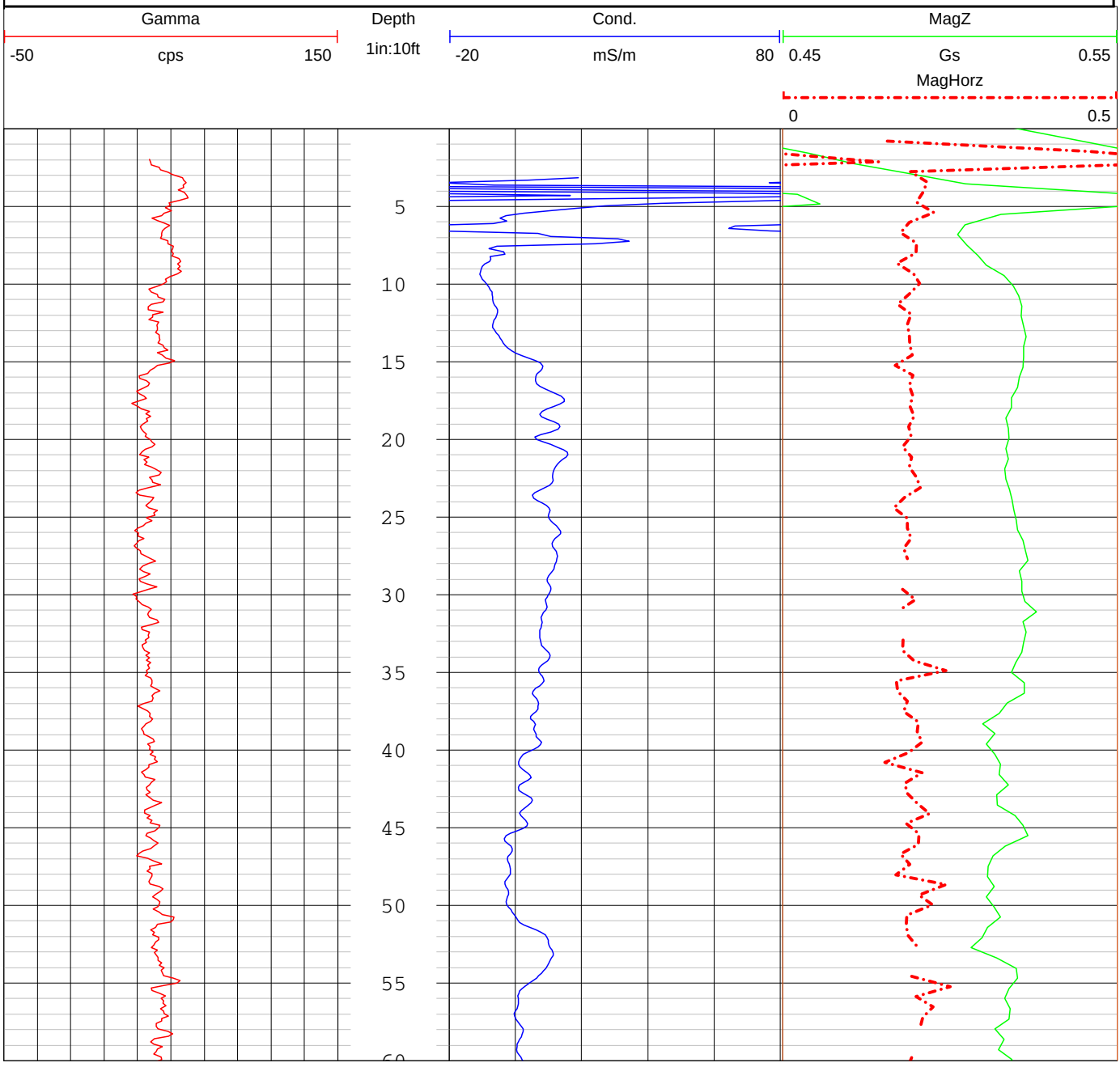
Site Map

Geophysical Borehole Logging
Ephrata Landfill
Ephrata, Washington

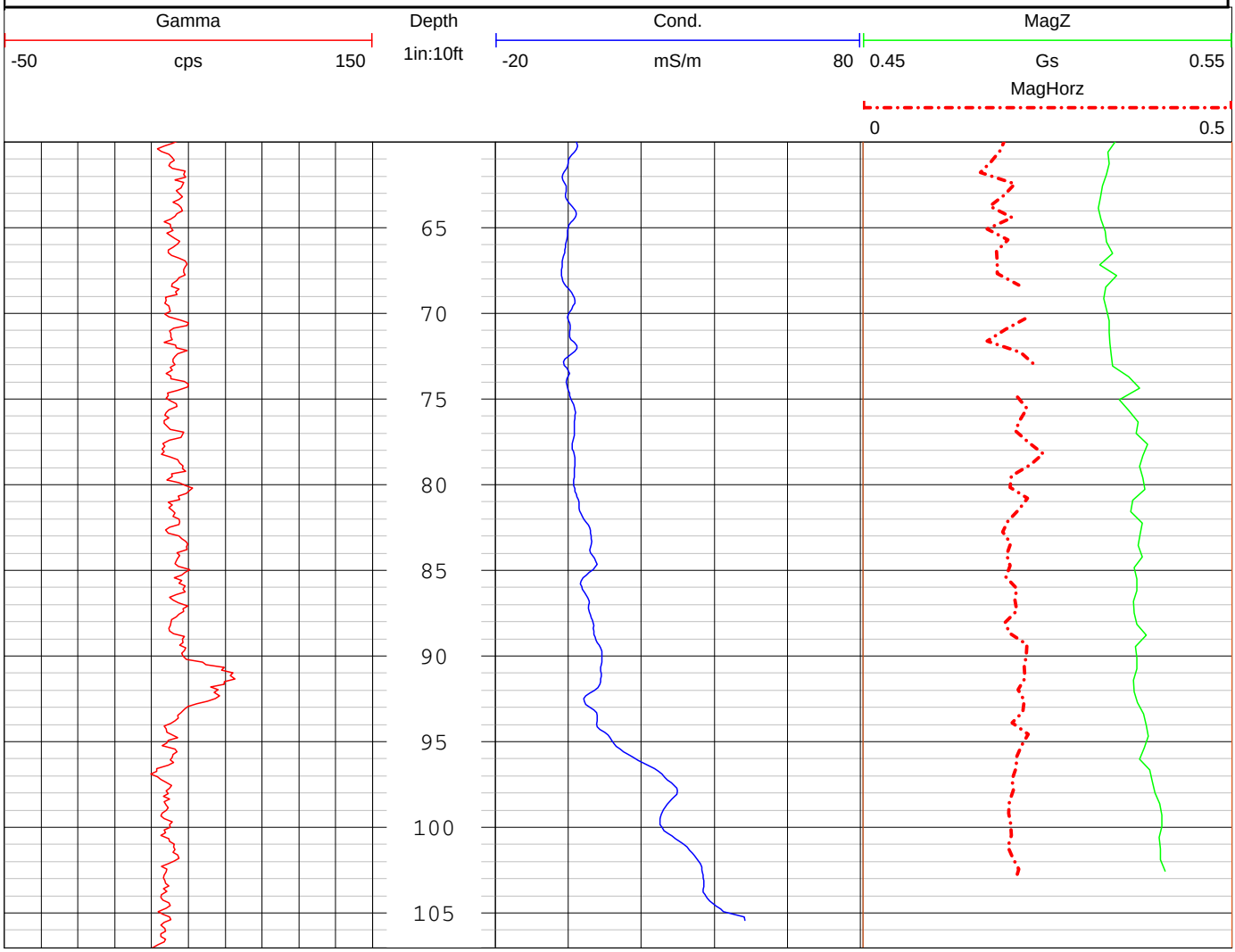
Prepared by:
Northwest Geophysical Associates, Inc.
P.O. Box 1063, Corvallis, Oregon 97339

NGA Project #: 667
FILE: NGA_Fig1_Logged Wells.DWG
DATE: MARCH 2008
REVISION: A–07–MARCH–2008

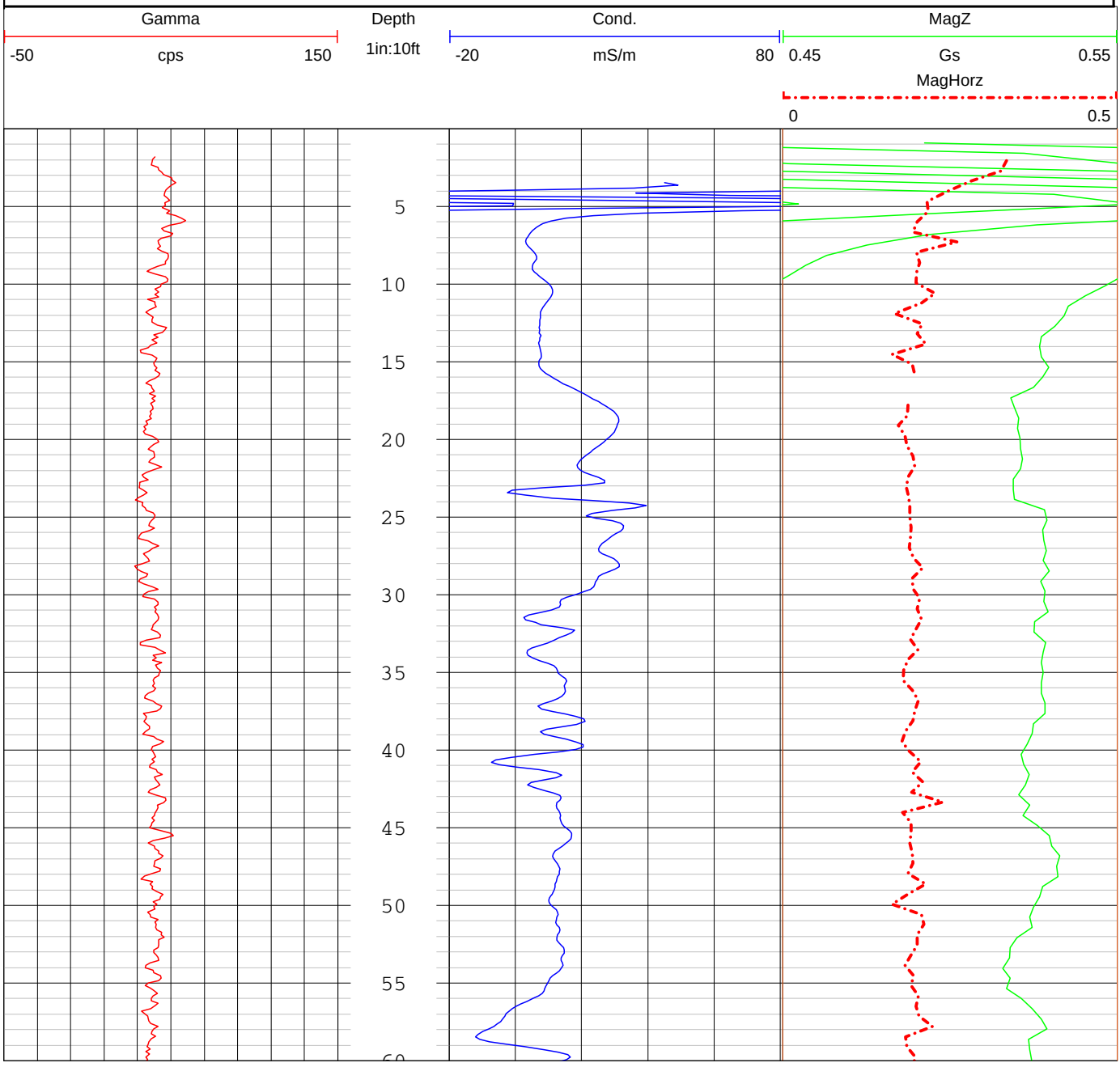
COMPANY: Northwest Geophysical Associates, Inc.			
Location: EPHRATA LANDFILL			
Well	MW-2c	Page 1 of 2	Date 27-FEB-2008



COMPANY: Northwest Geophysical Associates, Inc.			
Location: EPHRATA LANDFILL			
Well	MW-2c	Page 2 of 2	Date 27-FEB-2008



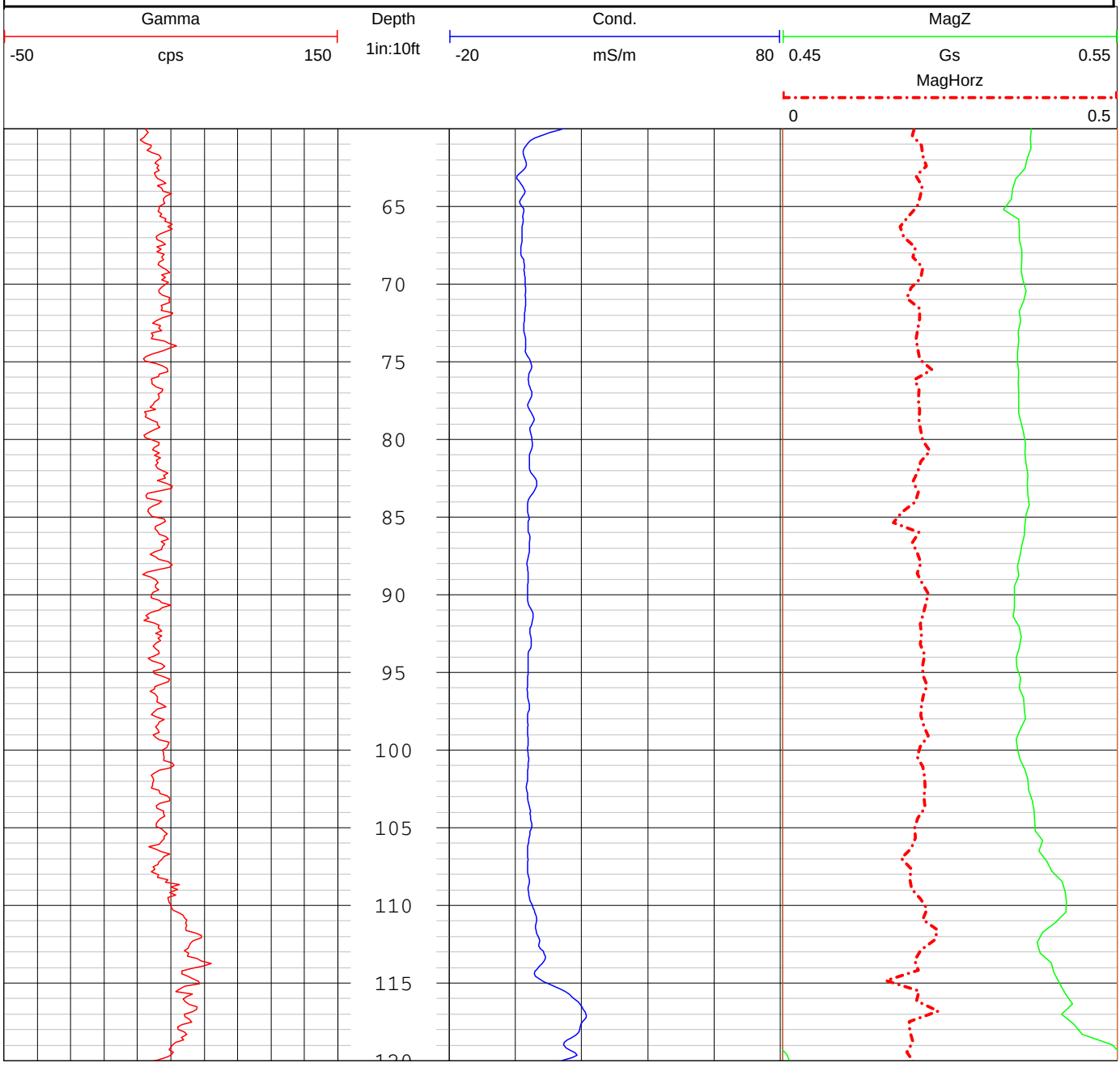
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Well	MW-4c	Page 1 of 3	Date 28-FEB-2008



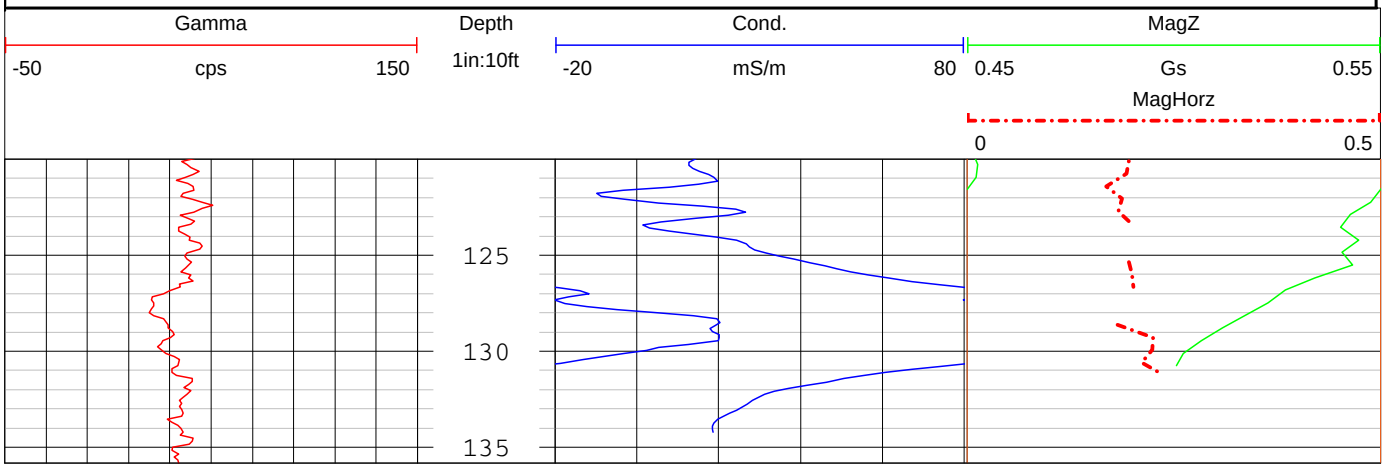
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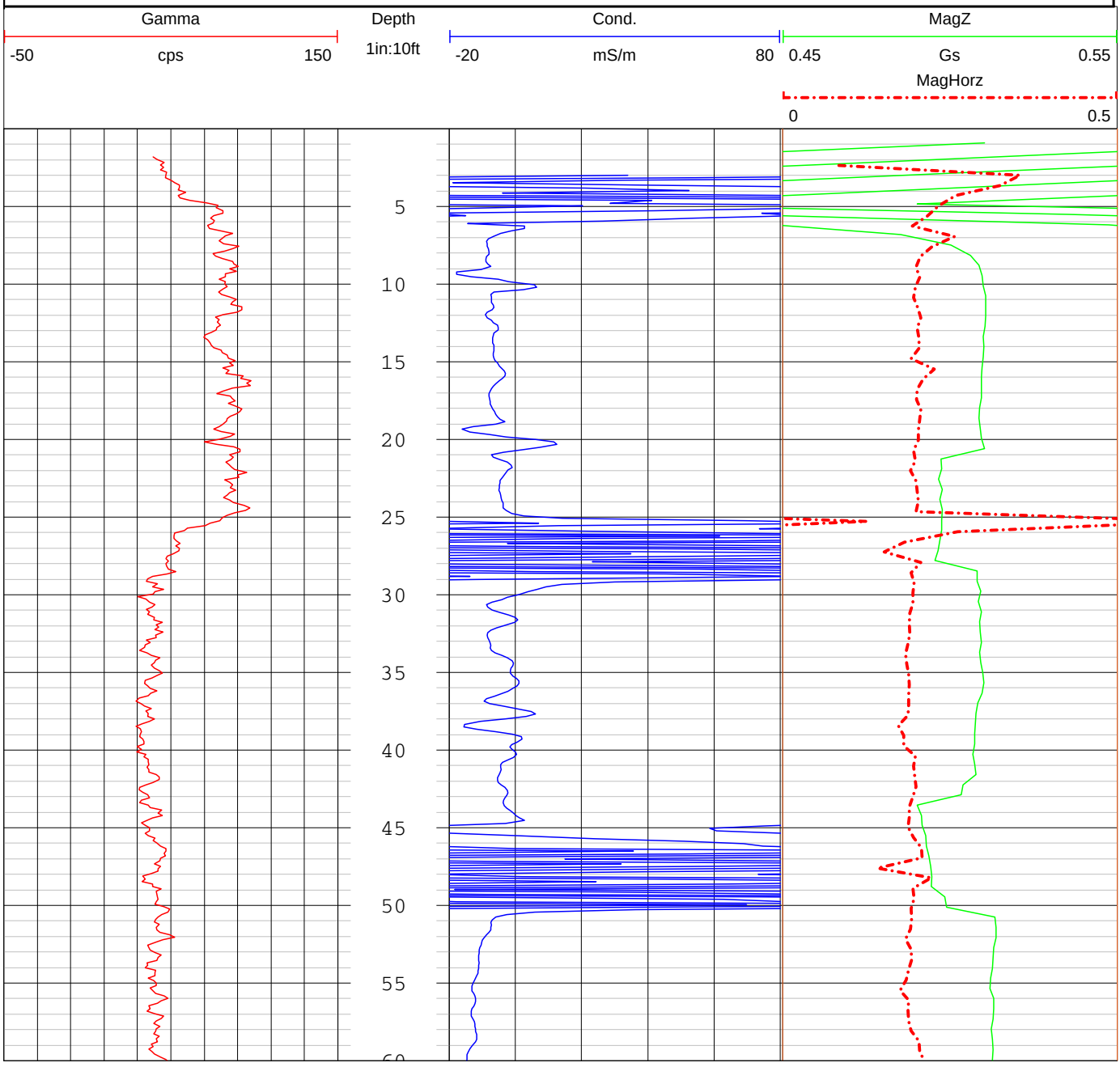
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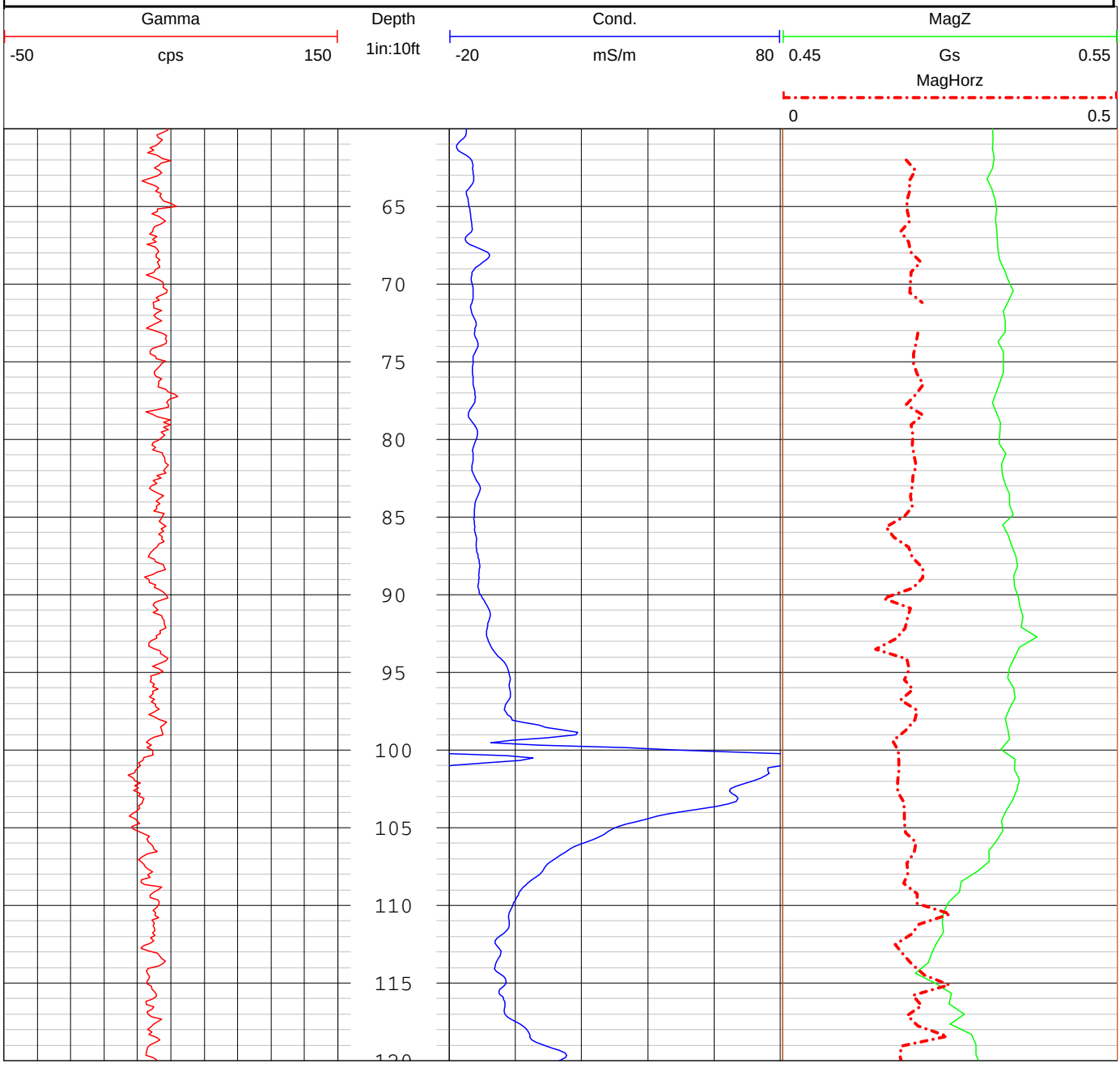
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Well	MW-4c	Page 3 of 3	Date 28-FEB-2008



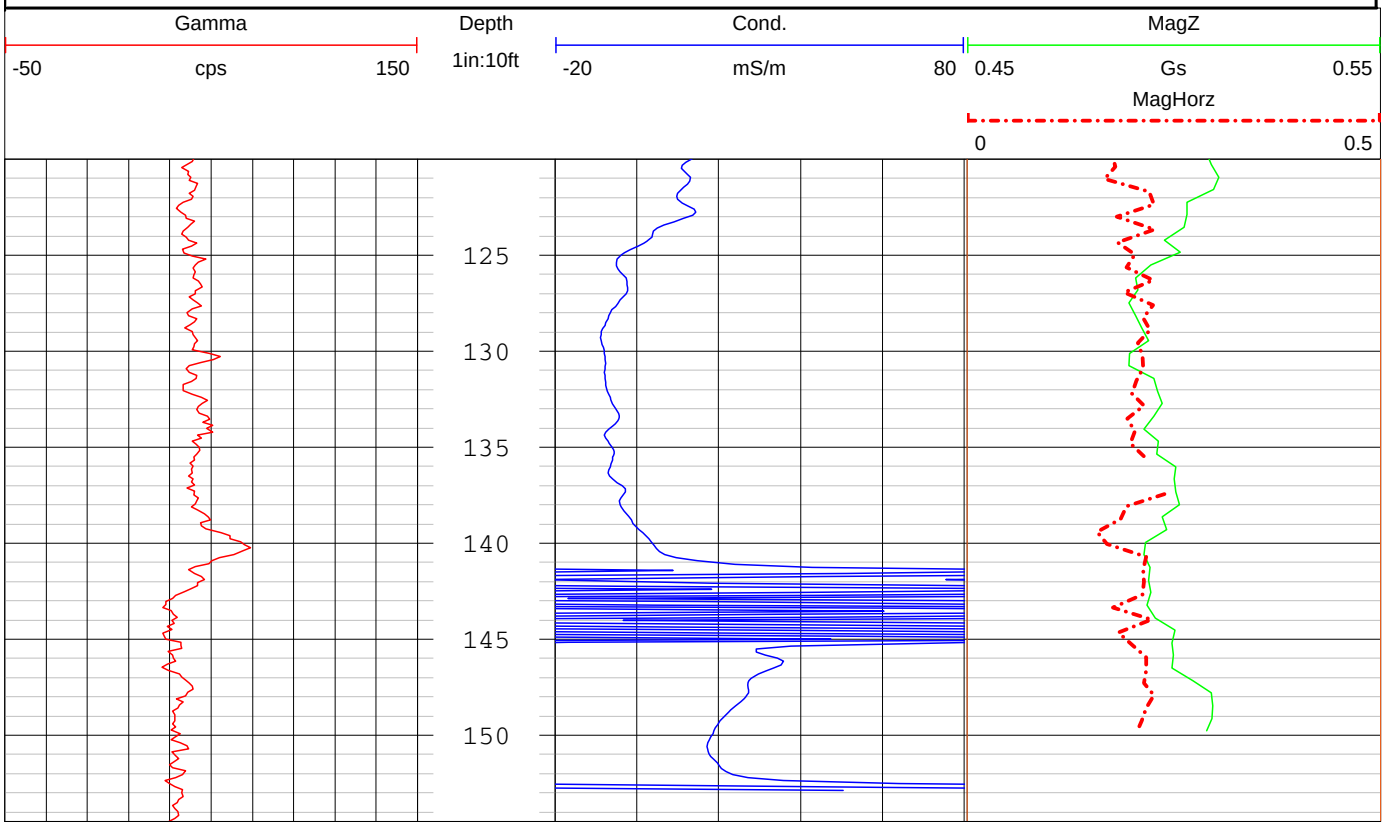
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Well	MW-5c	Page 1 of 3	Date 28-FEB-2008



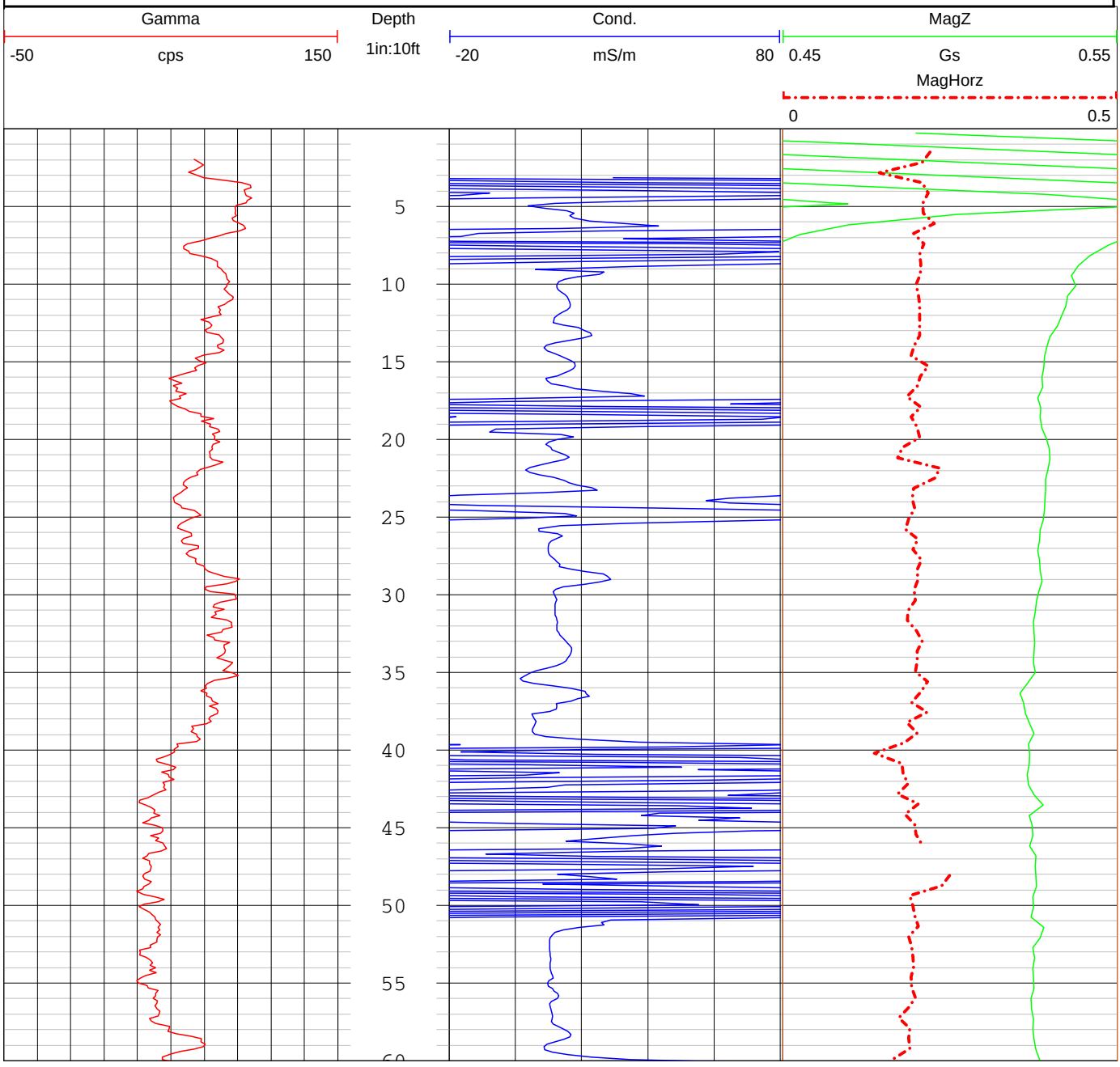
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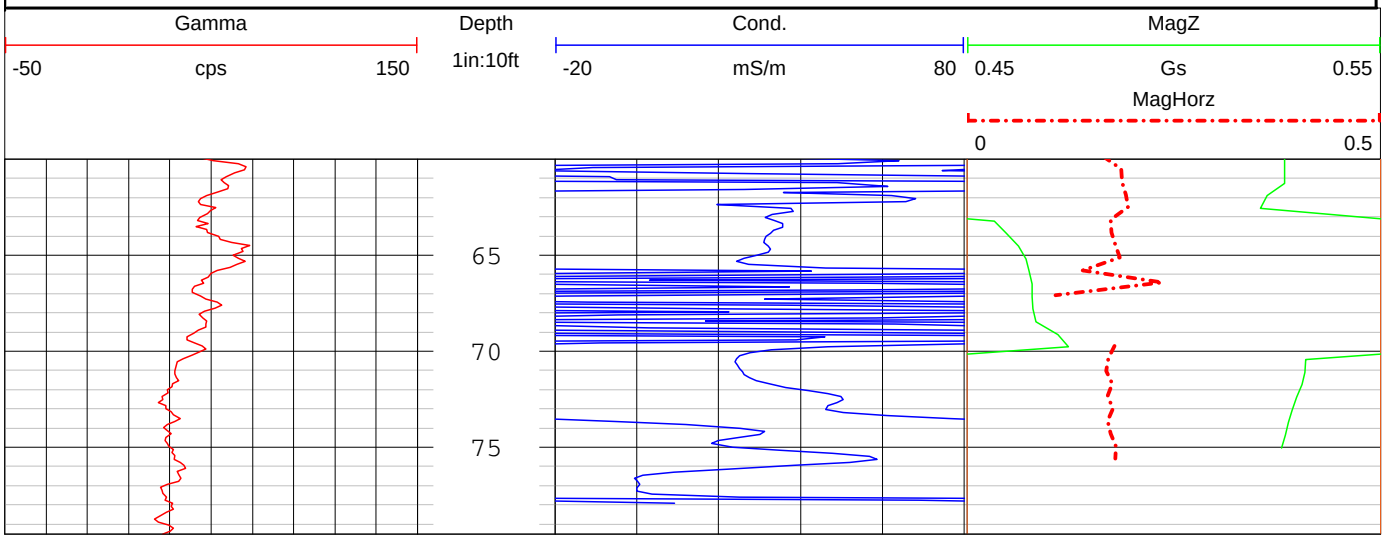
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Well	MW-5c	Page 3 of 3	Date 28-FEB-2008



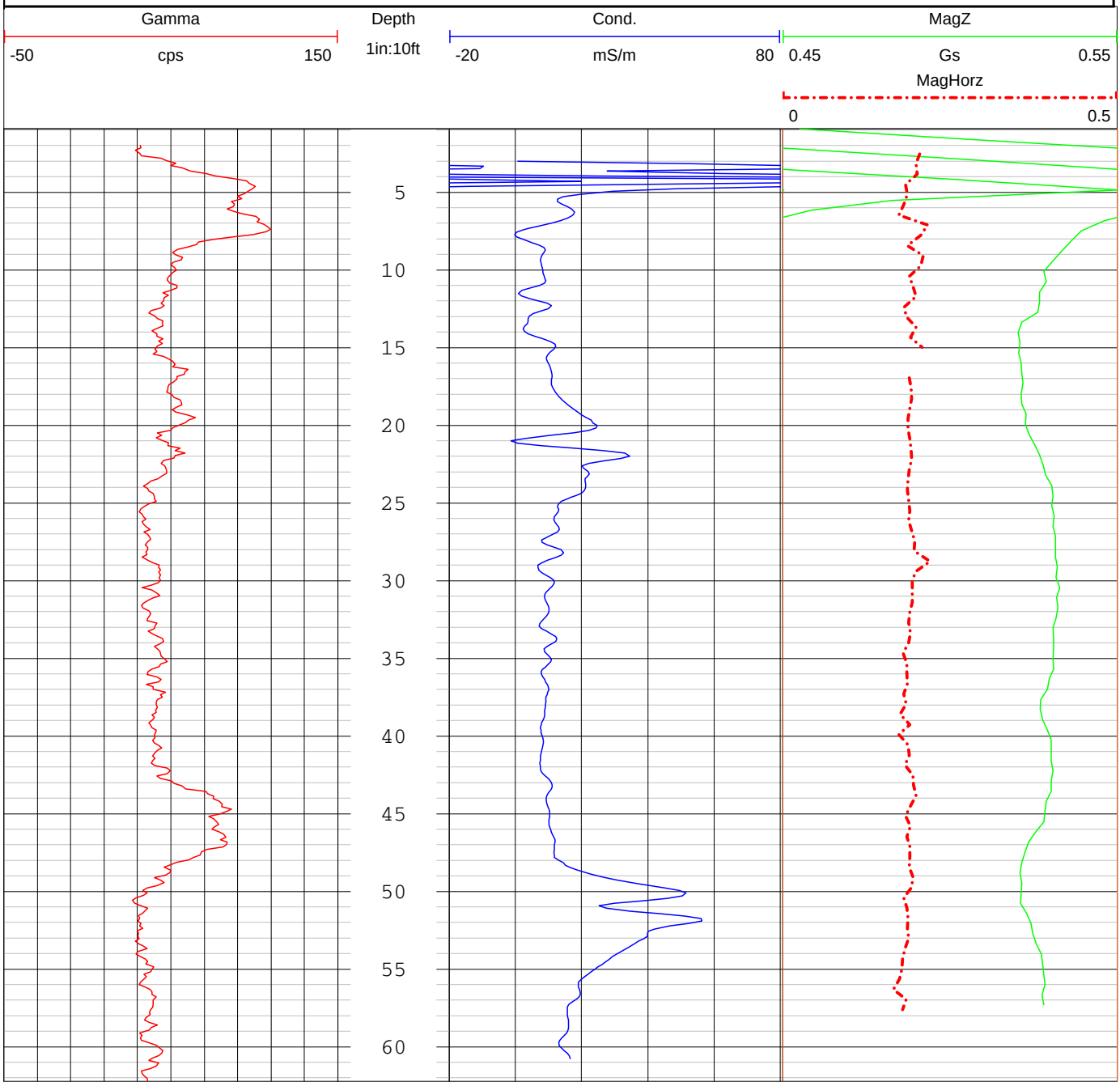
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Well	MW-6c	Page 1 of 2	Date 27-FEB-2008



COMPANY: Northwest Geophysical Associates, Inc.			
Location: EPHRATA LANDFILL			
Well	MW-6c	Page 2 of 2	Date 27-FEB-2008



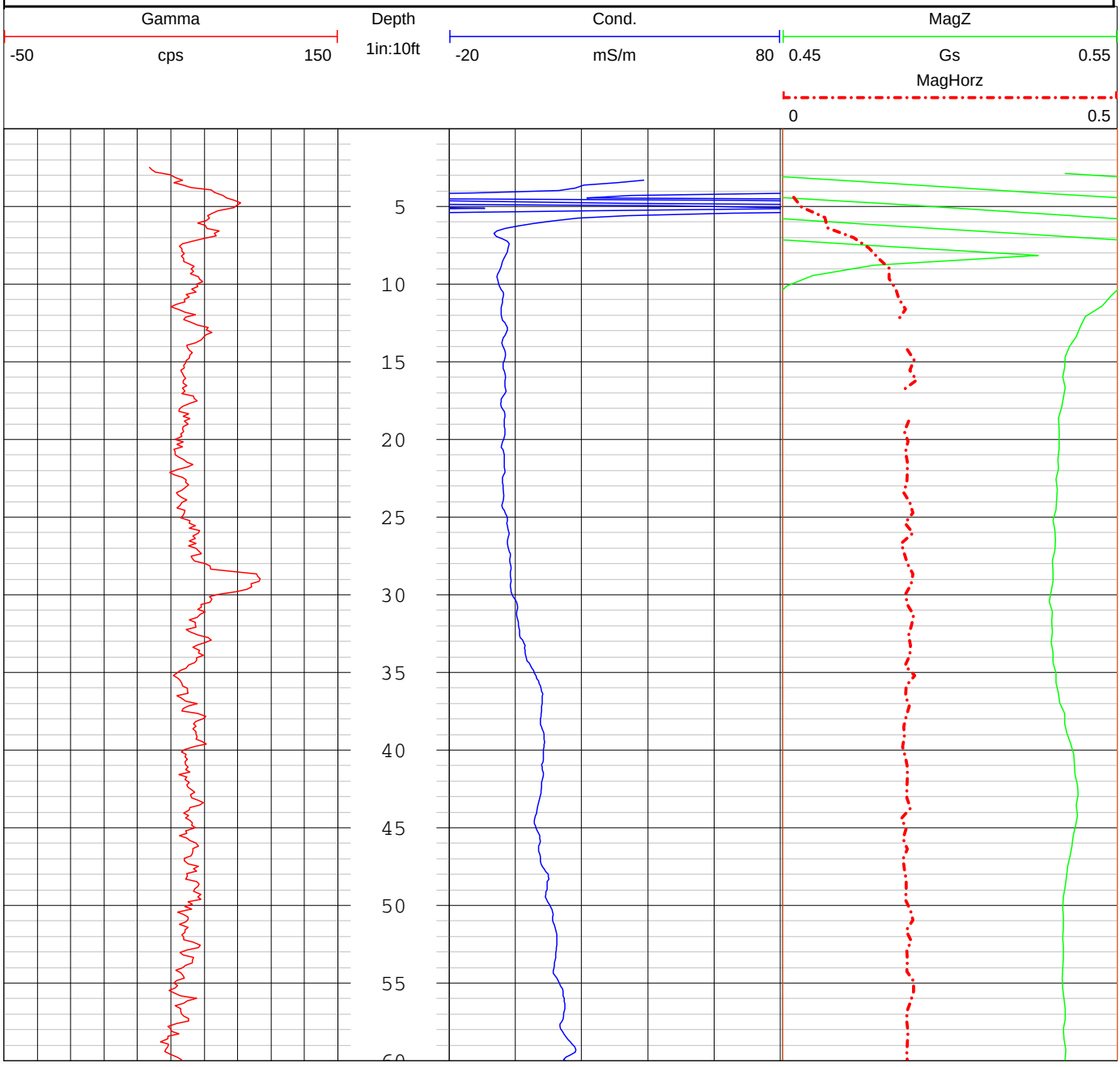
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Well	MW-7b	Page 1 of 1	Date 28-FEB-2008



COMPANY: Northwest Geophysical Associates, Inc.

Location: EPHRATA LANDFILL

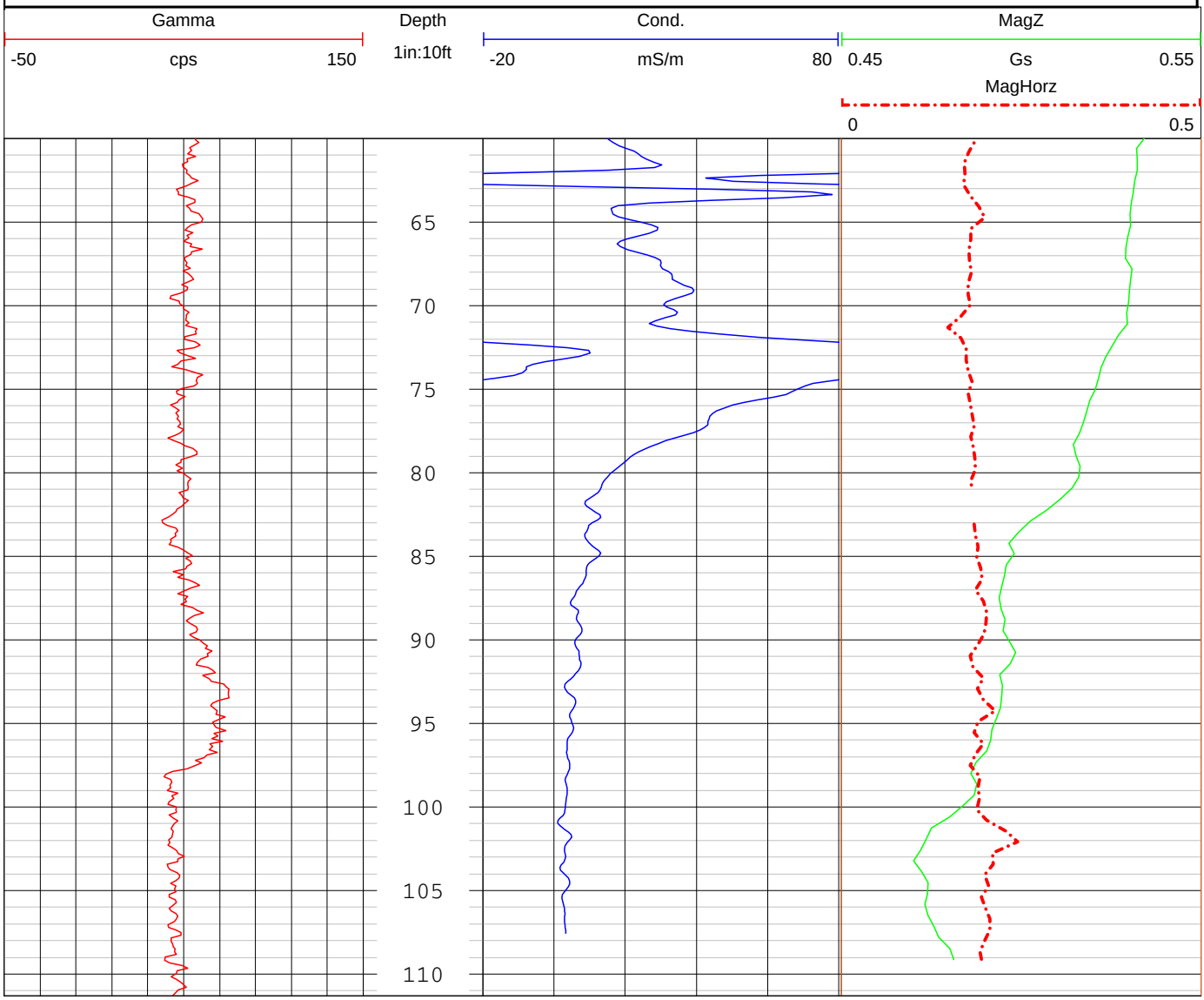
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COMPANY: Northwest Geophysical Associates, Inc.

Location: EPHRATA LANDFILL

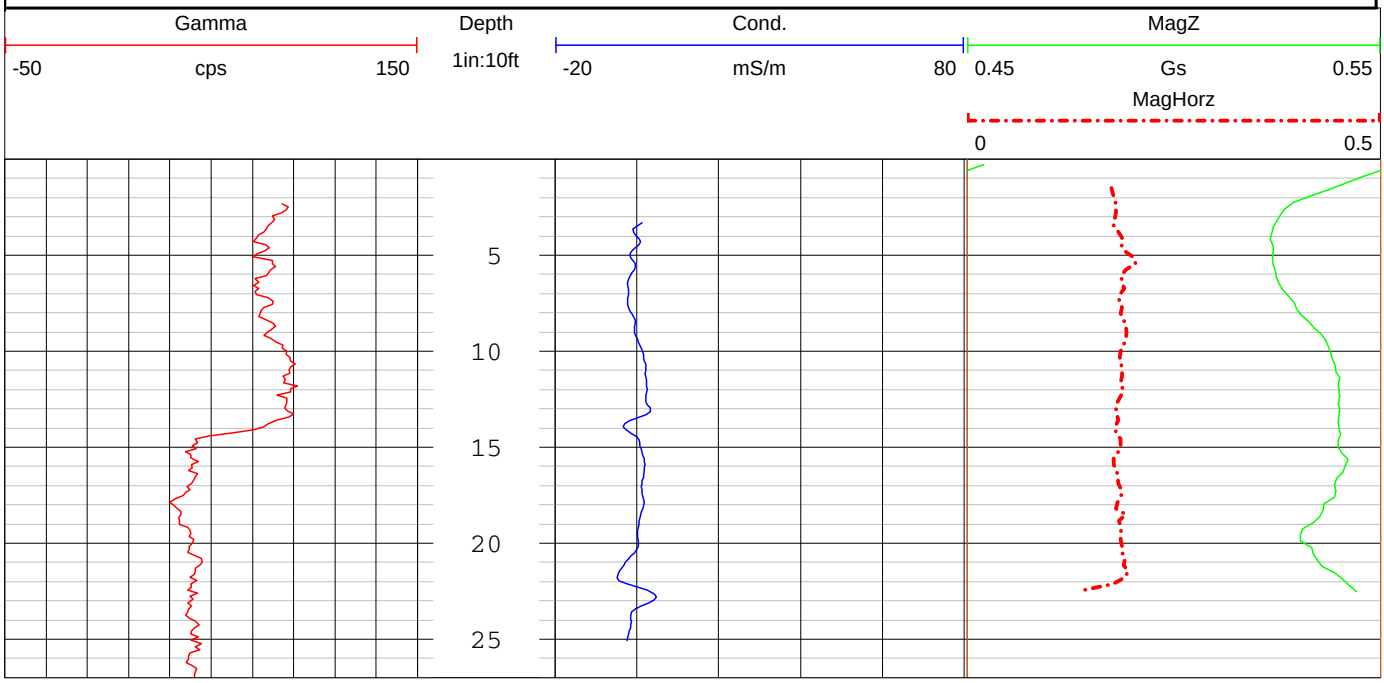
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COMPANY: Northwest Geophysical Associates, Inc.

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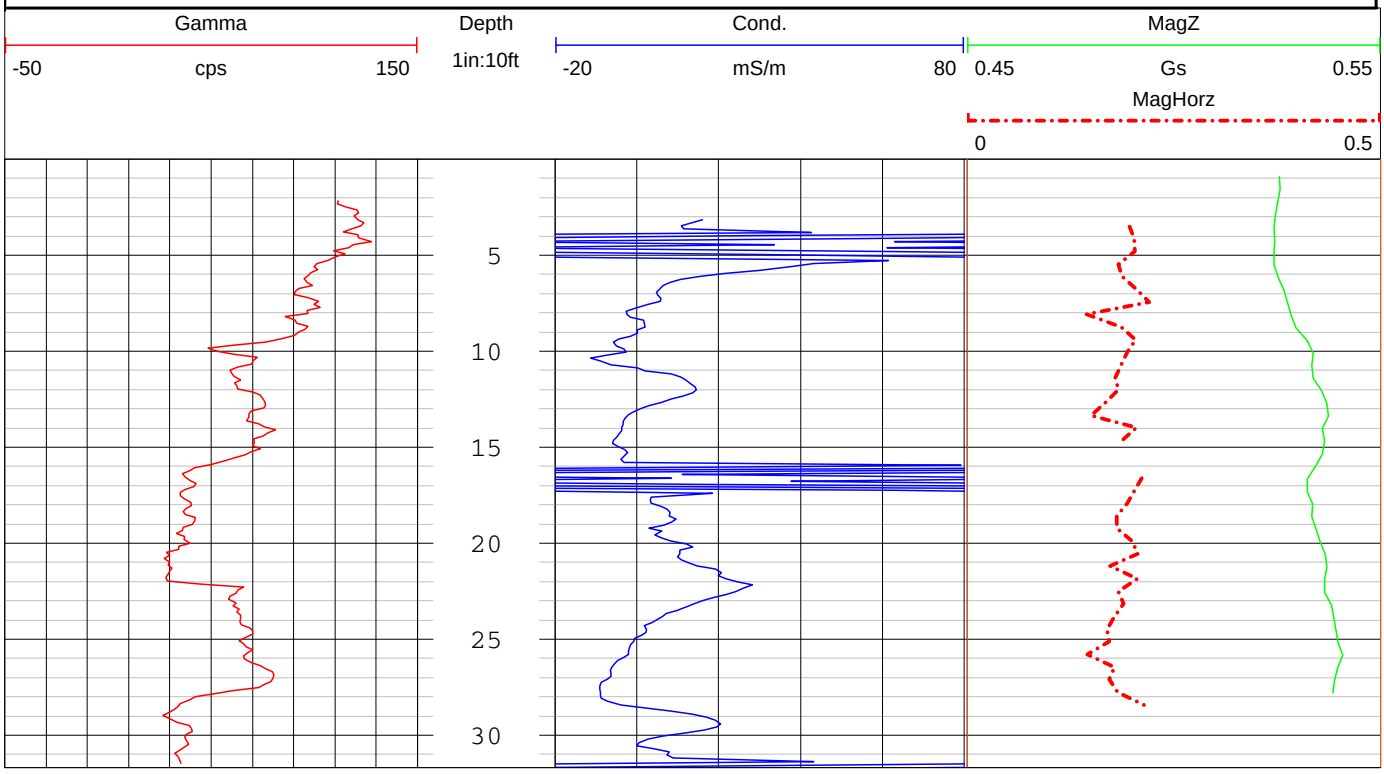
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COMPANY: Northwest Geophysical Associates, Inc.

Location: EPHRATA LANDFILL

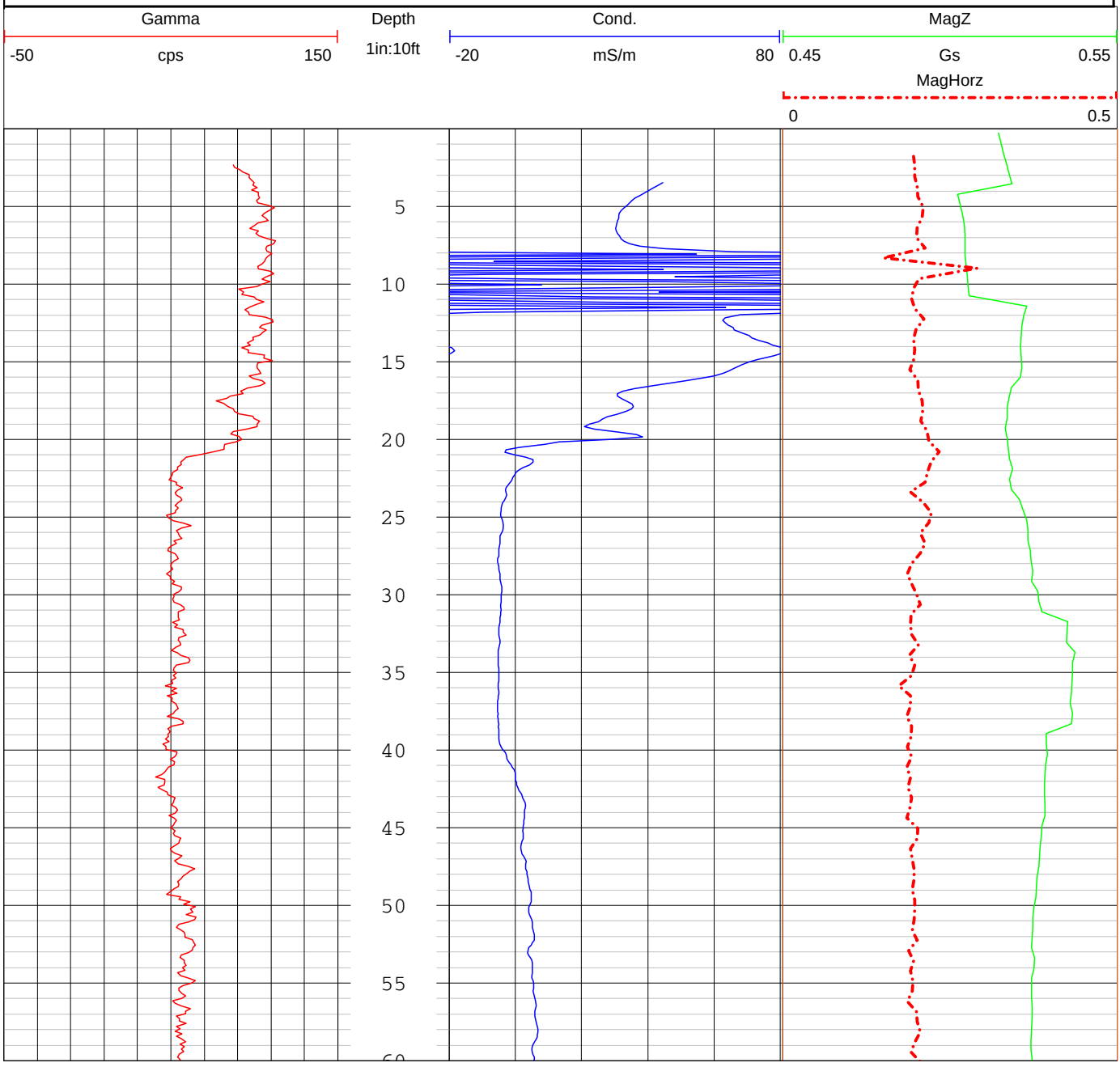
Well	MW-20c	Page 1 of 1	Date 26-FEB-2008



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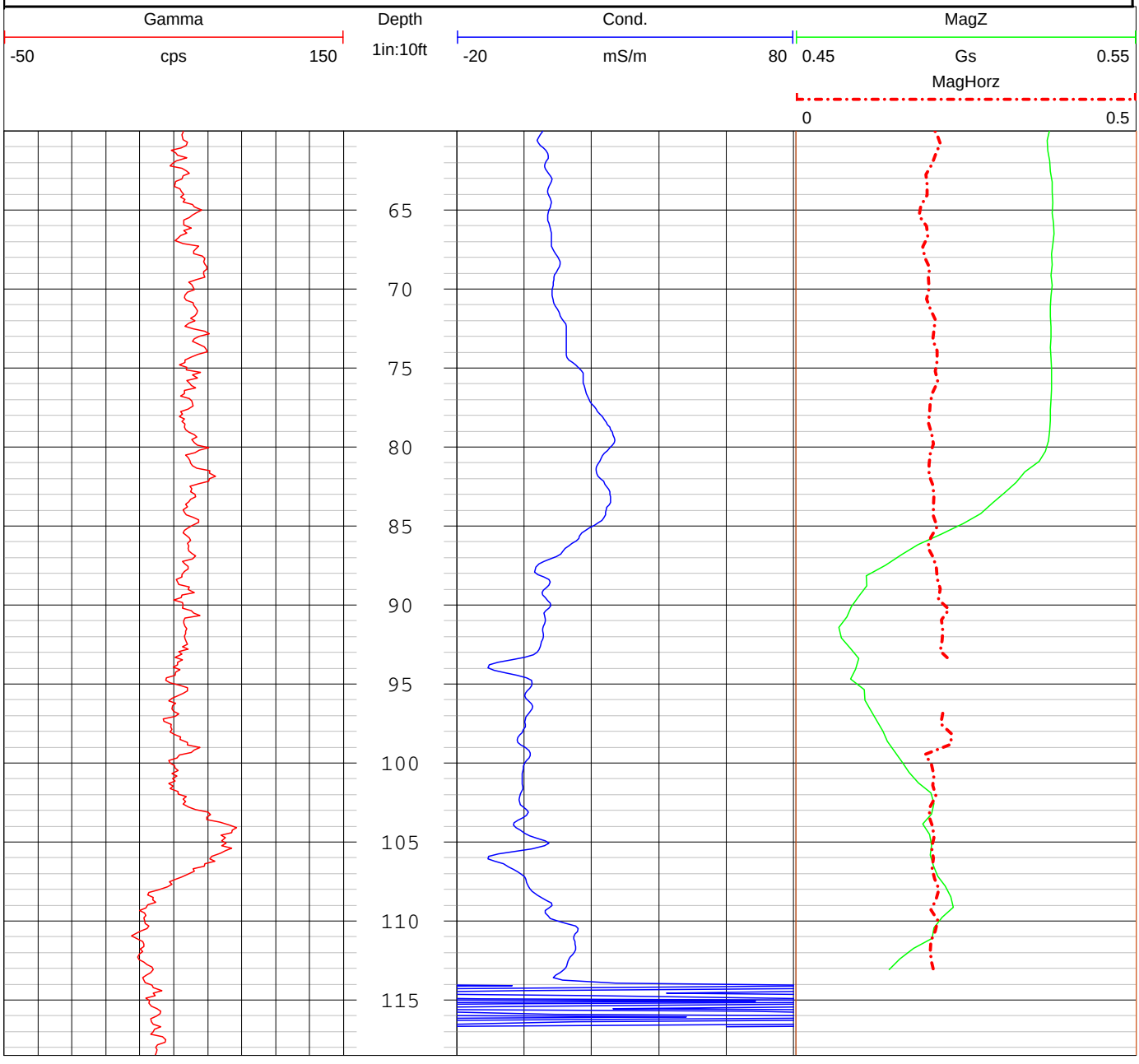
Well	MW-21c	Page	1 of 2	Date	27-FEB-2008



COMPANY: Northwest Geophysical Associates, Inc.

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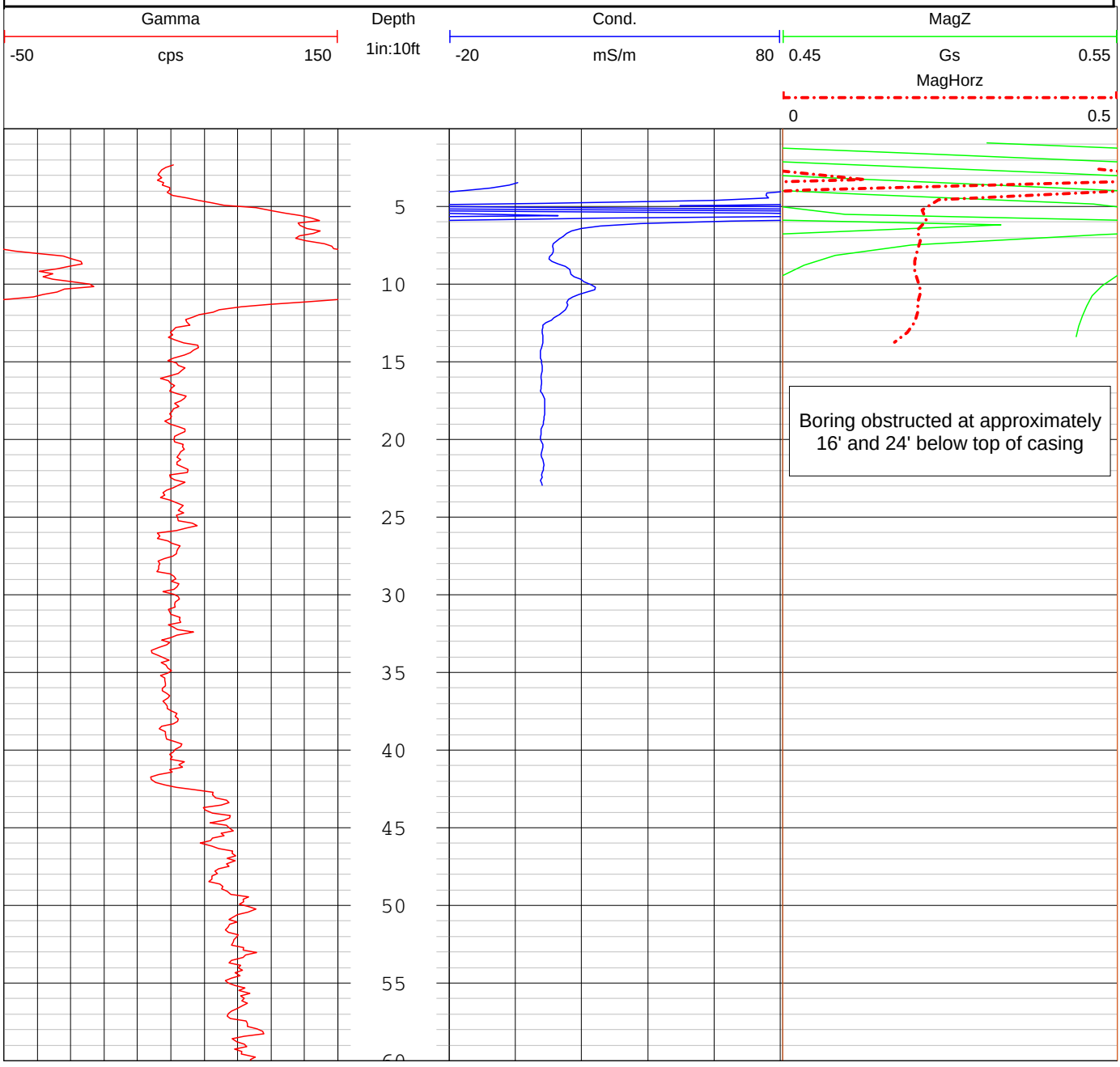
Well	MW-21c	Page	2 of 2	Date	27-FEB-2008



COMPANY: Northwest Geophysical Associates, Inc.

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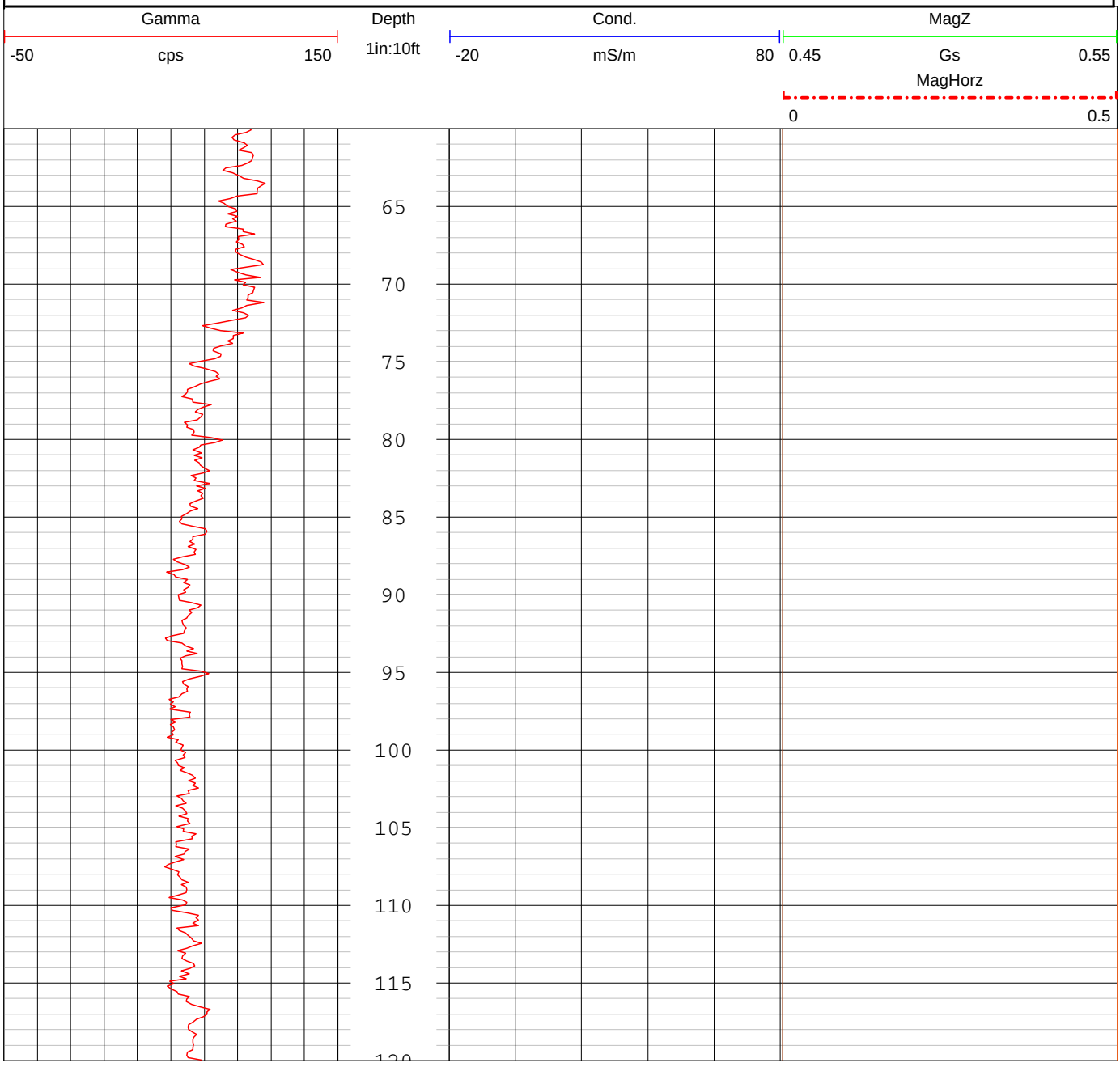
Well	MW-28d	Page 1 of 6	Date 28-FEB-2008



COMPANY: Northwest Geophysical Associates, Inc.

Location: EPHRATA LANDFILL

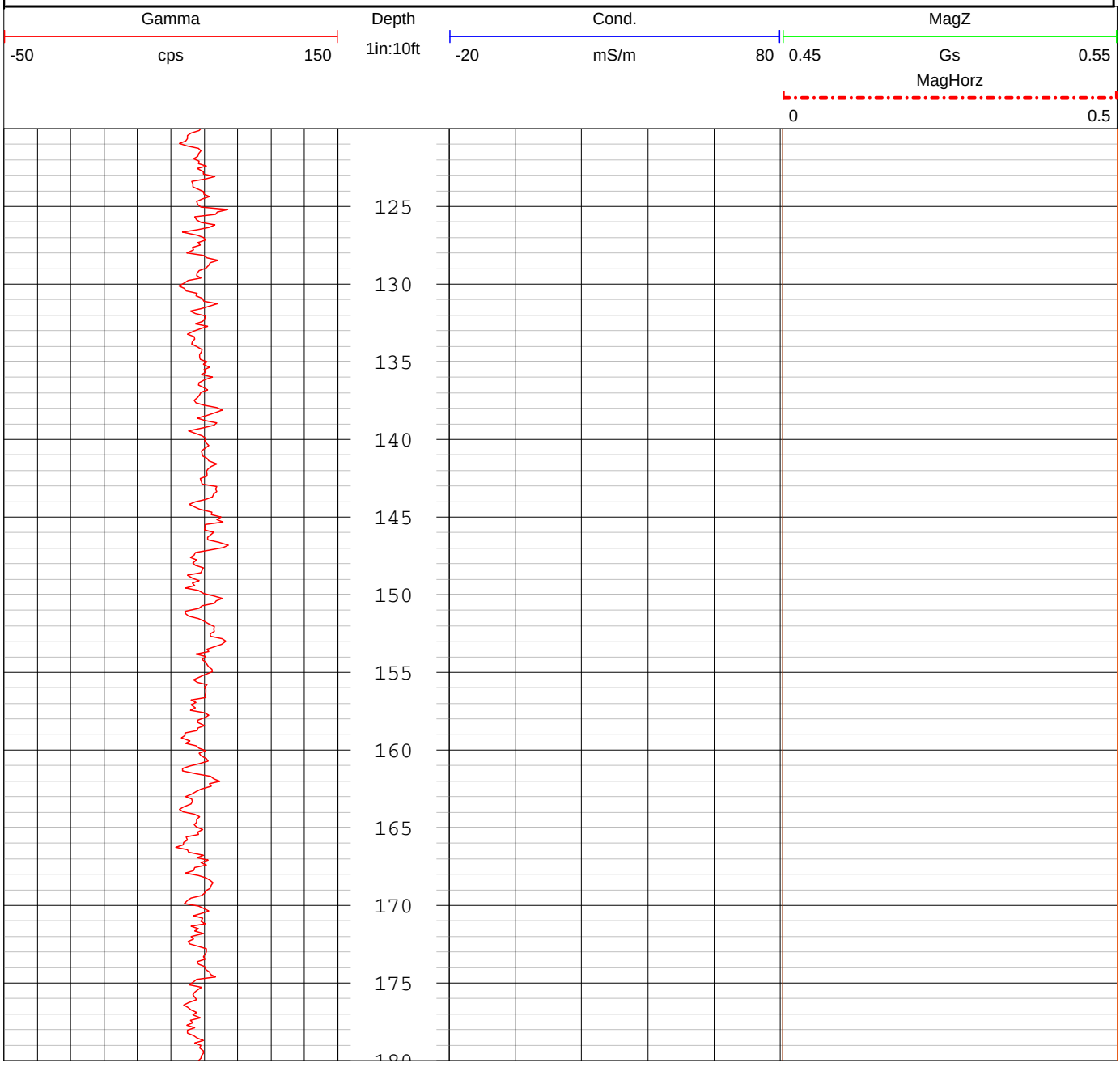
Well	MW-28d	Page	2 of 6	Date	28-FEB-2008



COMPANY: Northwest Geophysical Associates, Inc.

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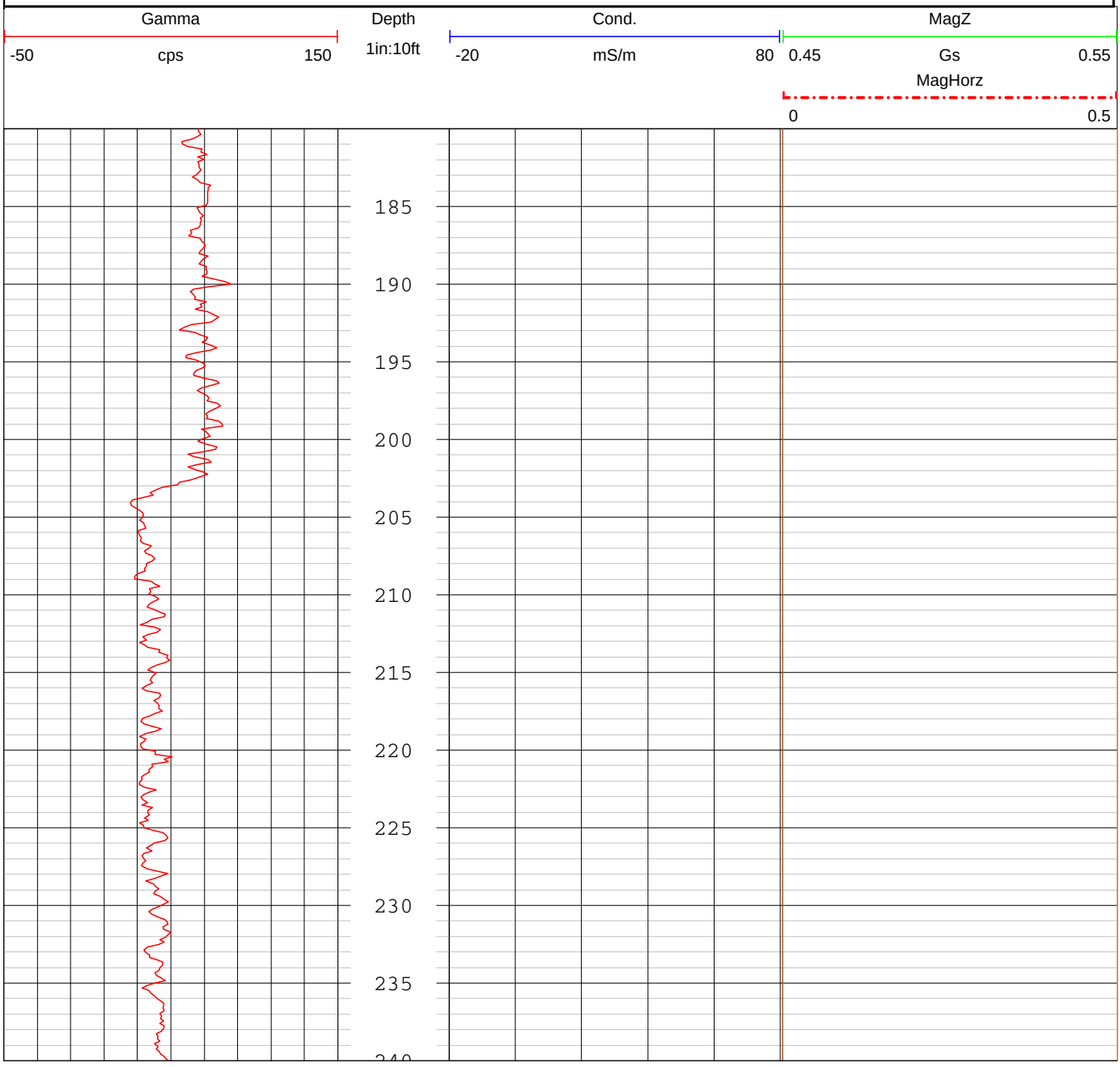
Well	MW-28d	Page	3 of 6	Date	28-FEB-2008



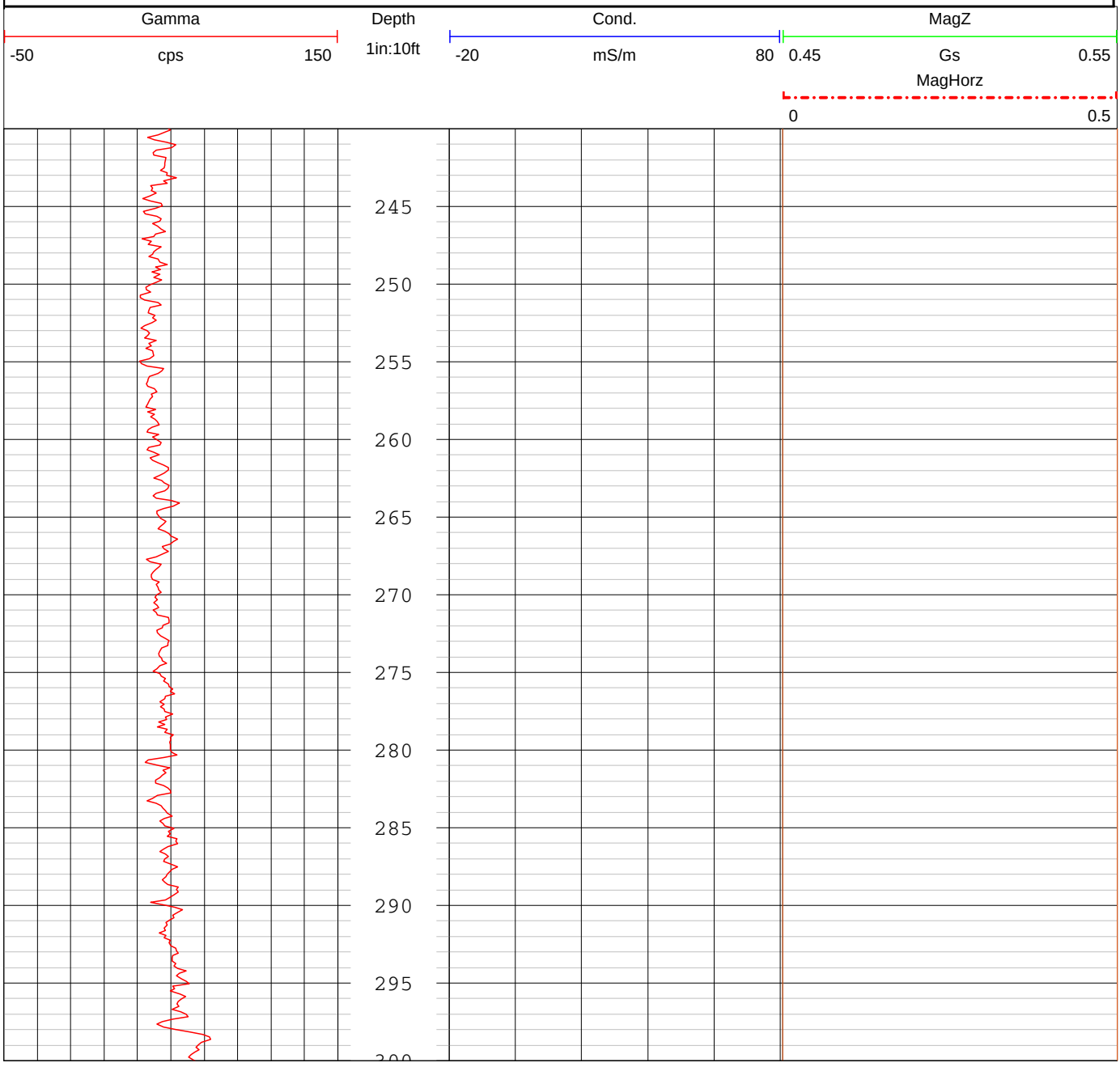
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Location: EPHRATA LANDFILL

Well	MW-28d	Page	4 of 6	Date	28-FEB-2008



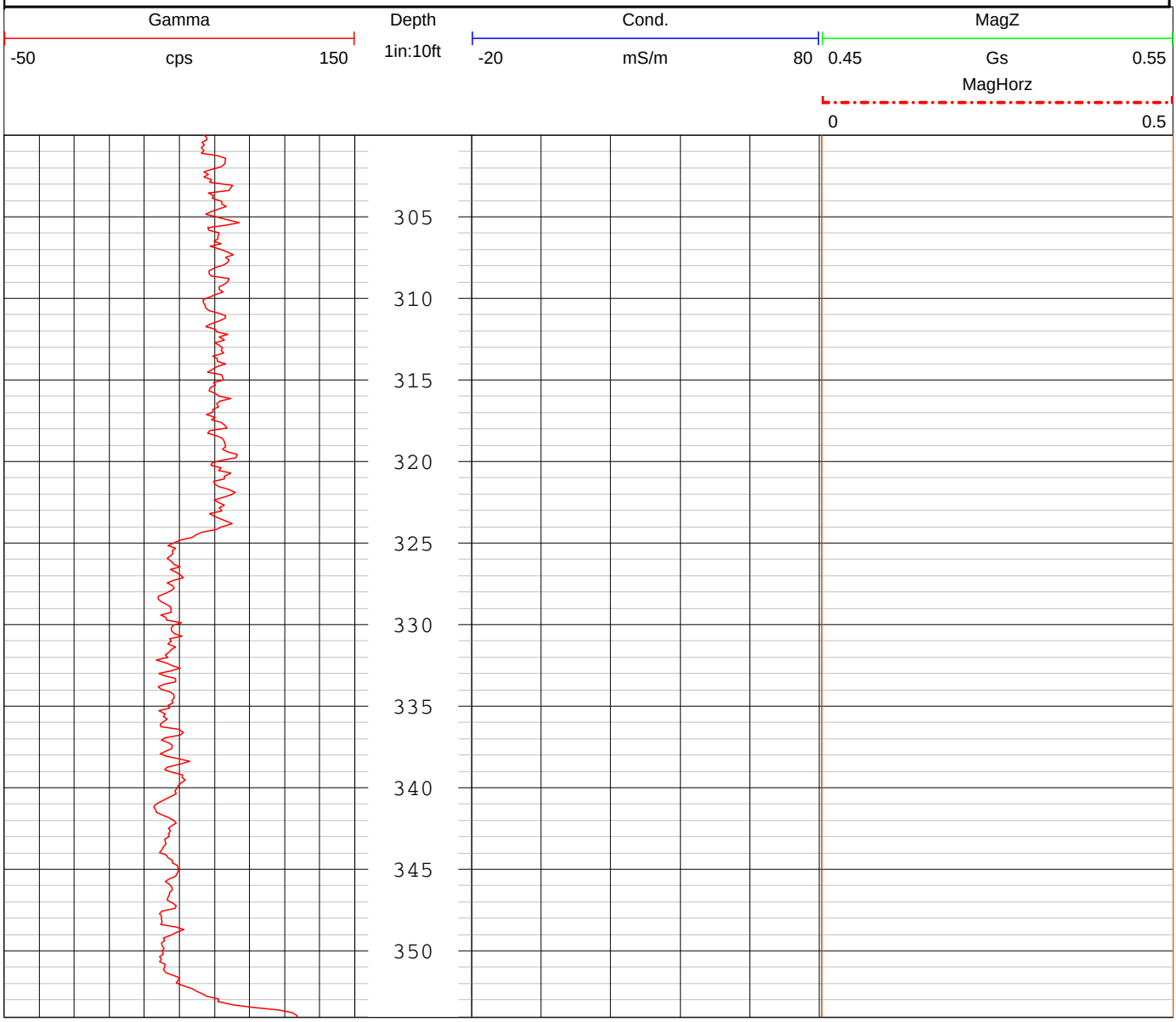
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Well	MW-28d	Page 5 of 6	Date 28-FEB-2008

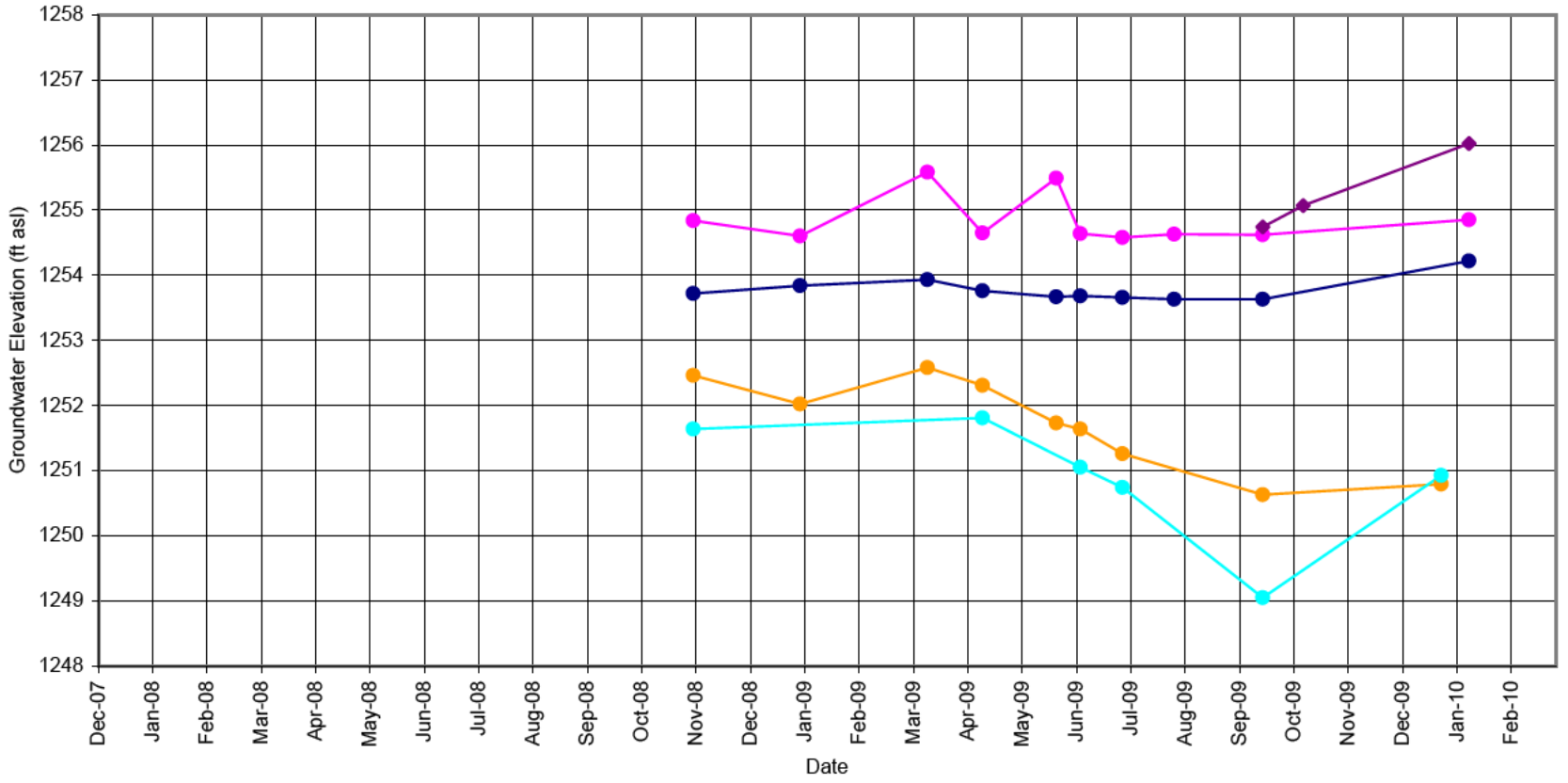


COMPANY: Northwest Geophysical Associates, Inc.

Location: EPHRATA LANDFILL

Well	MW-28d	Page	6 of 6	Date	28-FEB-2008





MW-32a MW-37p1

MW-34p1 MW-36p1

MW-41a

Groundwater elevations in MW-34p1 and MW-36p1 are corrected if LNAPL was measured:

Corrected Elv = Measured Elv + $(\rho_{LNAPL}/\rho_{Water})$*LNAPL thickness

Where $\rho_{LNAPL}/\rho_{Water}$ is the ratio of the average density of LNAPL to the density of water = 0.87/1.0

Figure F1. Hydrograph (RI Wells) (P1 Zone)

Ephrata RI
JE0714

PgG

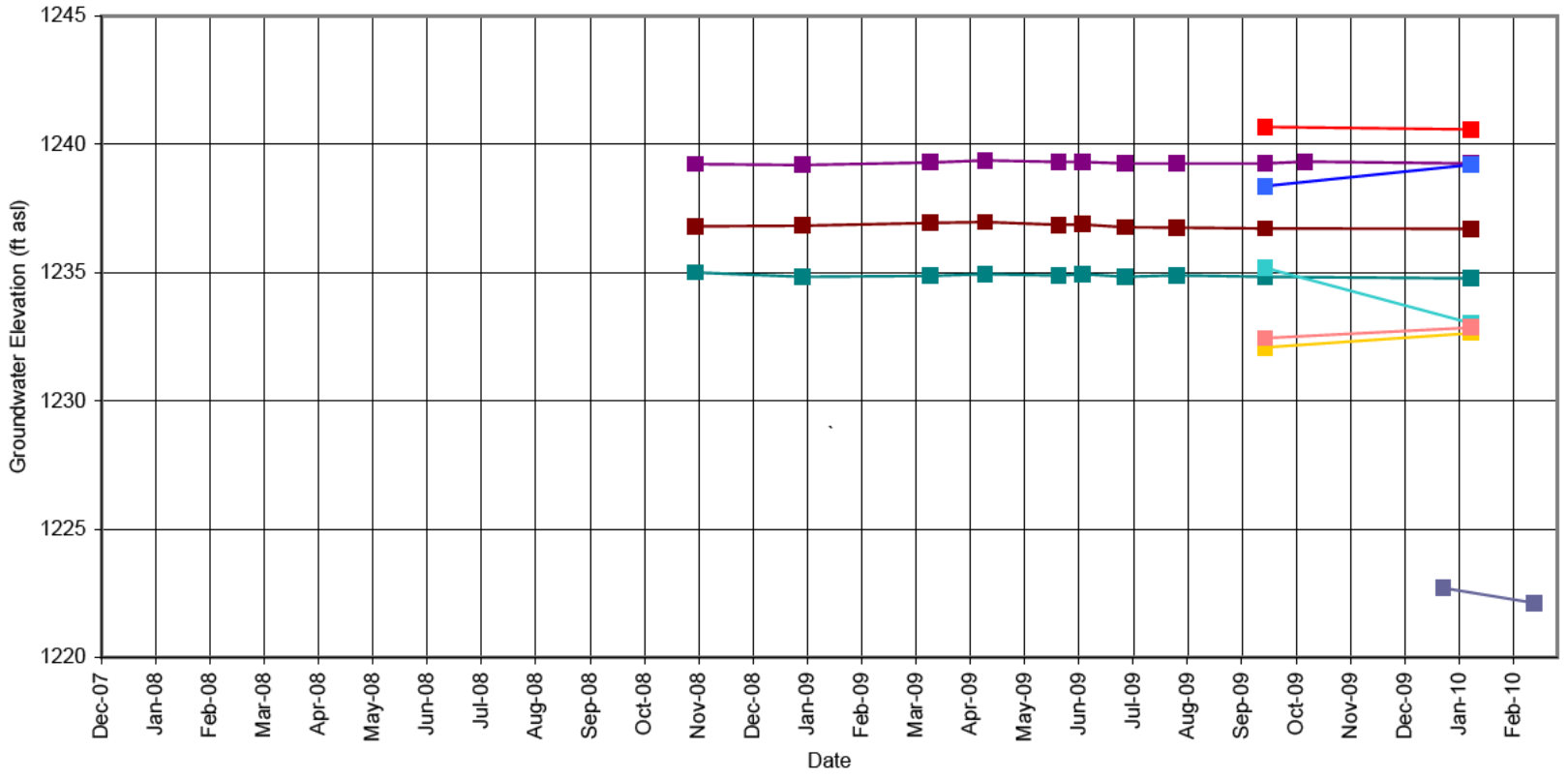
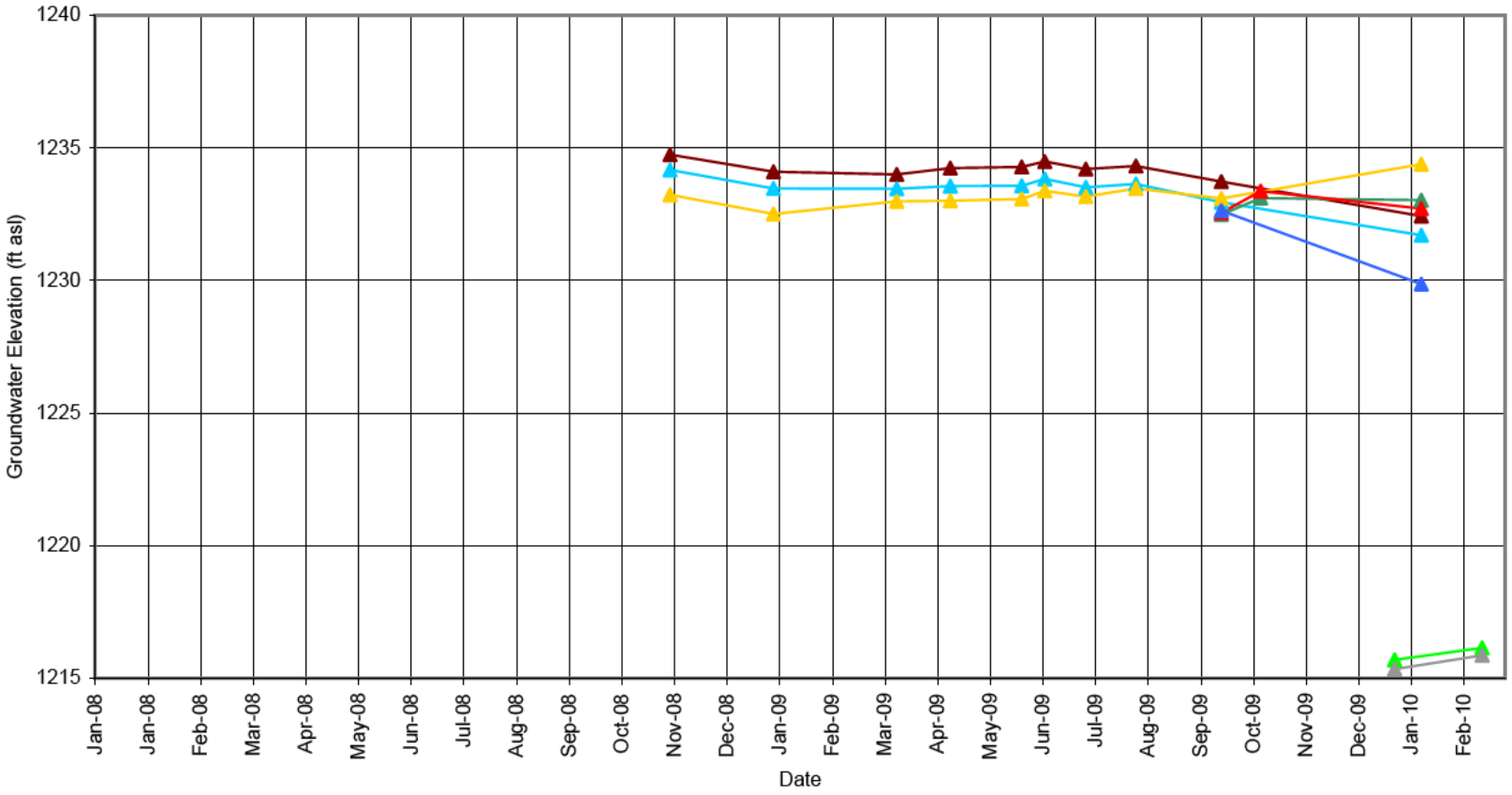


Figure F2. Hydrograph (RI Wells) (P2 Zone)

Ephrata RI
JE0714

PgG



MW-29b MW-30b MW-31b MW-42b
MW-44b MW-48b MW-51b MW-53a

Groundwater in the Roza may discharge towards a bedrock draw (erosional channel) northeast of Landfil (see Figure 10). Groundwater elevations in MW-51b (near draw) and MW-53a (at top of rock in the draw) are about 15-ft lower than other Roza wells.

Figure F3. Hydrograph (RI Wells) (Roza Aquifer)

Ephrata RI
JE0714

PgG

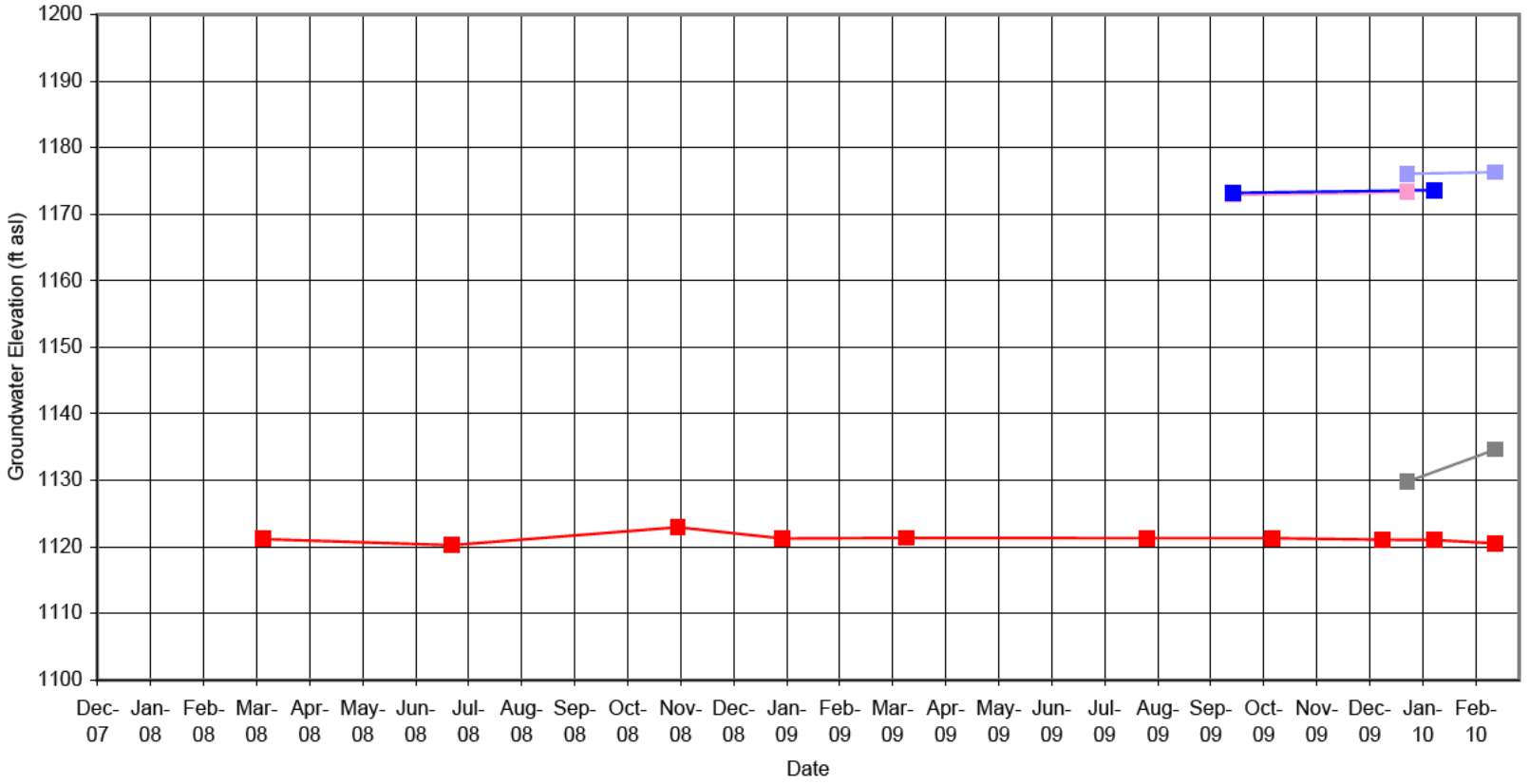


Figure F4. Hydrograph (RI Wells)
(Interflow and Frenchman Springs Aquifer)

Ephrata RI
JE0714

PgG

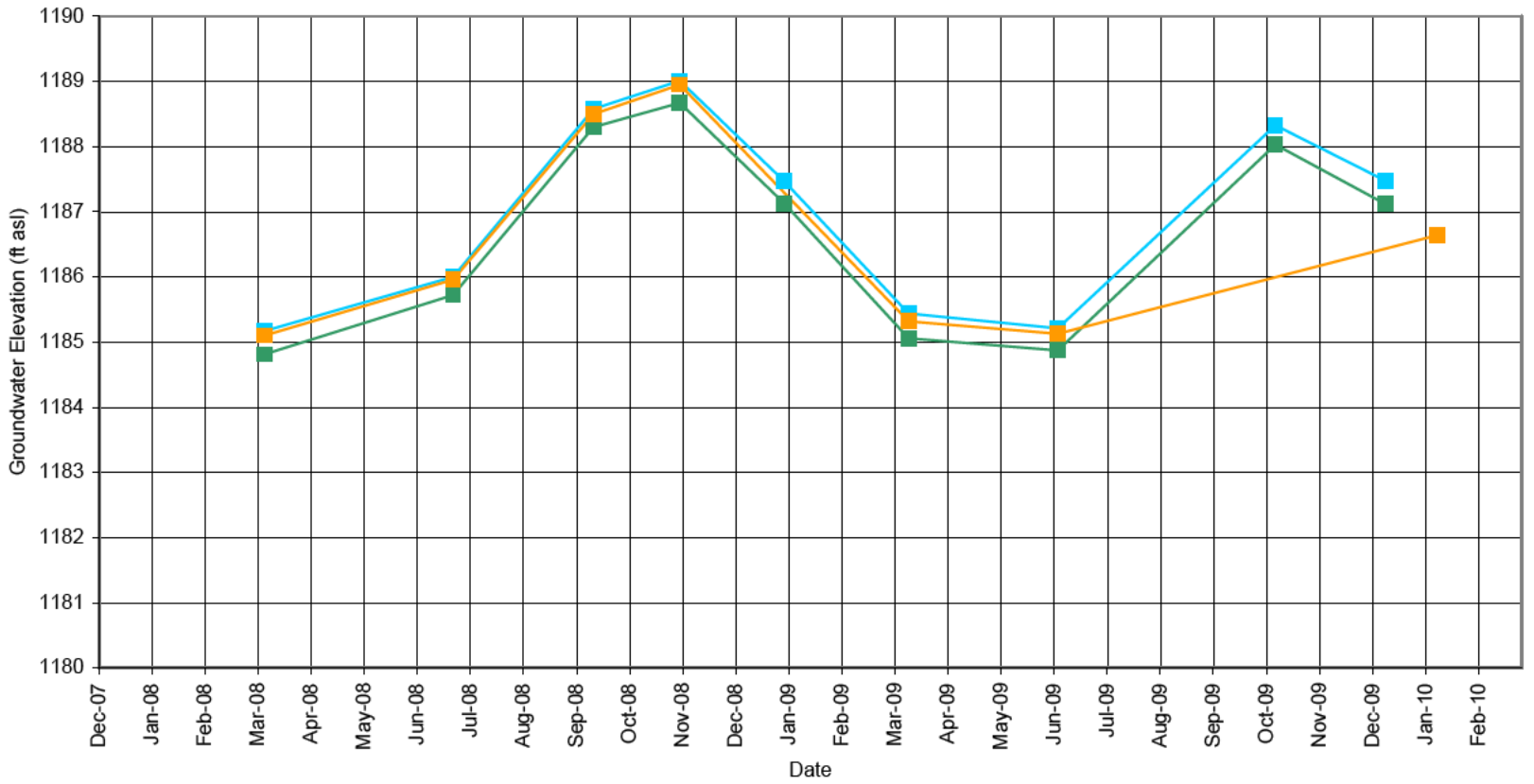


Figure F5. Hydrograph (RI Wells) (Outwash Aquifer)

Ephrata RI
JE0714

PgG

Table G1. Groundwater Extraction from the Hole (EW-1) - Analytical Results (2009)

Organic Parameters	Units	RI Screening Level	Source	Result
1,1,1,2-Tetrachloroethane	ug/L	1.7	MTCA-B car	0.2U
1,1,1-Trichloroethane	ug/l	200	FED MCL	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.22	MTCA-B car	0.2U
1,1,2-Trichloroethane	ug/L	0.77	MTCA-B car	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	240000	MTCA-B non-car	0.2U
1,1-Dichloroethane	ug/L	1600	MTCA-B non-car	**12**
1,1-Dichloroethene	ug/L	7	FED MCL	**0.4**
1,1-Dichloropropene	ug/L			0.2U
1,2,3-Trichlorobenzene	ug/L			0.5U
1,2,3-Trichloropropane	ug/L	0.0063	MTCA-B car	0.5U
1,2,4-Trichlorobenzene	ug/L	70	FED MCL	0.5U
1,2,4-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.031	MTCA-B car	0.5U
1,2-Dichlorobenzene	ug/L	600	FED MCL	**1.1**
1,2-Dichloroethane (EDC)	ug/L	0.48	MTCA-B car	**0.5**
1,2-Dichloropropane	ug/L	0.64	MTCA-B car	**1**
1,3,5-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U
1,3-Dichlorobenzene	ug/L			0.2U
1,3-Dichloropropane	ug/L			0.2U
1,4-Dichlorobenzene	ug/L	1.8	MTCA-B car	**3.4**
2,2-Dichloropropane	ug/L			0.2U
2-butanone	ug/L	4800	MTCA-B non-car	5U
2-Chloroethylvinylether	ug/L			1U
2-Chlorotoluene	ug/L	160	MTCA-B non-car	0.2U
2-Hexanone	ug/L			5U
4-Chlorotoluene	ug/L			0.2U
4-Isopropyltoluene	ug/L			0.2U
4-Methyl-2-pentanone (MIBK)	ug/L	640	MTCA-B non-car	5U
Acetone	ug/L	800	MTCA-B non-car	**11**
Acrolein	ug/L	160	MTCA-B non-car	5U
Acrylonitrile	ug/L	0.081	MTCA-B car	1U
Benzene	ug/L	0.8	MTCA-B car	**2.7**
Bromobenzene	ug/L			**0.2**
Bromochloromethane	ug/L			0.2U
Bromodichloromethane	ug/L	0.71	MTCA-B car	0.2U
Bromoethane	ug/L			0.2U
Bromoform	ug/L	5.5	MTCA-B car	0.2U

Bold = VOC detection

Shaded = Exceedance of RI Screening Level

0.2U = Parameter not detected at laboratory limit (0.2)

Sample collected 8/6/2009 after four weeks of extraction (approximately 23,500 gallons total)

Table G1. Groundwater Extraction from the Hole (EW-1) - Analytical Results (2009)

Organic Parameters	Units	RI Screening Level	Source	Result
Bromomethane	ug/L	11	MTCA-B non-car	0.5U
Carbon Disulfide	ug/L	800	MTCA-B non-car	0.2U
Carbon Tetrachloride	ug/L	0.34	MTCA-B car	0.2U
Chlorobenzene	ug/L	100	FED MCL	**0.7**
Chloroethane	ug/L	15	MTCA-B car	**3.4**
Chloroform	ug/L	7.2	MTCA-B car	0.2U
Chloromethane	ug/L	3.4	MTCA-B car	0.5U
cis-1,2-Dichloroethene	ug/L	70	FED MCL	**26**
cis-1,3-Dichloropropene	ug/L			0.2U
Dibromochloromethane	ug/L	0.52	MTCA-B car	0.2U
Dibromomethane	ug/L	80	MTCA-B non-car	0.2U
Ethylbenzene	ug/L	800	MTCA-B non-car	**0.4**
Ethylene Dibromide (EDB)	ug/L	0.00051	MTCA-B car	0.2U
Hexachlorobutadiene	ug/L	0.56	MTCA-B car	0.5U
Hexane	ug/L			0.5U
Isopropylbenzene (Cumene)	ug/L	800	MTCA-B non-car	**0.4**
Methyl iodide	ug/L			1U
Methyl tert-Butyl Ether	ug/L			**0.9**
Methylene Chloride	ug/l	5	FED MCL	**0.6**
Naphthalene	ug/L	160	MTCA-B non-car	0.5U
n-Butylbenzene	ug/L			0.2U
n-Propylbenzene	ug/L			0.2U
o-Xylene	ug/L	16000	MTCA-B non-car	**0.3**
sec-Butylbenzene	ug/L			0.2U
Styrene	ug/L	1.5	MTCA-B car	0.2U
tert-Butylbenzene	ug/L			0.2U
Tetrachloroethene (PCE)	ug/L	0.081	MTCA-B car	0.2U
Toluene	ug/L	640	MTCA-B non-car	0.2U
trans-1,2-Dichloroethene	ug/L	100	FED MCL	**0.8**
trans-1,3-Dichloropropene	ug/L			0.2U
trans-1,4-Dichloro-2-butene	ug/L			1U
Trichloroethene (TCE)	ug/L	0.49	MTCA-B car	**0.9**
Trichlorofluoromethane	ug/l	2400	MTCA-B non-car	0.2U
Vinyl Acetate	ug/L	8000	MTCA-B non-car	1U
Vinyl Chloride	ug/L	0.029	MTCA-B car	**77**
Xylene Isomers, M+P	ug/L	1600	MTCA-B non-car	0.4U

Bold = VOC detection
Shaded = Exceedance of RI Screening Level
0.2U = Parameter not detected at laboratory limit (0.2)
Sample collected 8/6/2009 after four weeks of extraction (approximately 23,500 gallons total)

Table G1. Groundwater Extraction from the Hole (EW-1) - Analytical Results (2009)

Inorganic Parameters	Units	RI Screening Level	Source	Result
Nitrate as Nitrogen	mg/L as N	10	FED MCL	0.2U
Arsenic, Dissolved[1]	ug/L	0.058	MTCA-B car	6
Total Dissolved Solids	mg/L	500	GWCL	6830
Chloride	mg/L	250	GWCL	2340
Nitrate+Nitrite as Nitrogen	mg/L as N	10	FED MCL	0.2U
Nitrite as Nitrogen	mg/L as N	1	FED MCL	0.2U
Sulfate	mg/L	250	GWCL	1410
Iron, Dissolved	ug/L	300	GWCL	3880
Manganese, Dissolved	ug/L	2200	MTCA-B non-car	23100

Field parameters	Units	Result
pH	std. units	6.8
Specific Conductance @ 25C	umhos/cm	1147
Temperature, 0 F	0 F	72.5

Bold = VOC detection
Shaded = Exceedance of RI Screening Level
0.2U = Parameter not detected at laboratory limit (0.2)
Sample collected 8/6/2009 after four weeks of extraction (approximately 23,500 gallons total)
1. Site background concentration for dissolved arsenic is 3.4 ug/L (see text for details)

Table H1a. Groundwater (Round 4) - Analytical Results for Outwash and Interflow Aquifer Wells

		Outwash Aquifer Wells											Interflow Aquifer Wells						
	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c
Volatile Organic Compounds (VOCs)																			
1,1,1,2-Tetrachloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
1,1,2-Trichloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2	0.5	0.2U	0.2U	0.2U	0.2U	3.4	0.2U	2	1.8	0.2U	0.2U	3.9
1,1-Dichloroethene	ug/L	0.02U	0.02U	0.02U	0.02U	0.059	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.056	0.02U	0.066	0.085	0.02U	0.02U	0.5
1,1-Dichloropropene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	1.4	0.2U	0.2U	0.2U	0.2U
1,2-Dichloropropane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.3	0.2U	1.9	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichloropropane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2,2-Dichloropropane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-butanone	ug/L	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
2-Chloroethylvinylether	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
2-Chlorotoluene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-Hexanone	ug/L	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
4-Chlorotoluene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Methyl-2-pentanone (MIBK)	ug/L	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U
Acetone	ug/L	2.5U	2.5U	2.8K	2.5U	2.7K	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.5U	2.6K	2.5U	2.9K	2.5U	2.5U	2.5U
Acrolein	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U

Notes:

Shaded cells for visual aid, no significance in terms of analytical results

Blank = Not Measured

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#K = Detected constituents with unknown bias; associated number is the concentration measured in the sample (e.g. 2.6K)

K flag for samples MW-34p1 and MW-35p2 for nitrate, nitrite, and nitrate+nitrite due to strong matrix interference per laboratory

K flag for acetone and methylene chloride due to low level detections of these compounds in associated trip blank.

Table H1a. Groundwater (Round 4) - Analytical Results for Outwash and Interflow Aquifer Wells

		Outwash Aquifer Wells											Interflow Aquifer Wells						
	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c
Volatile Organic Compounds (VOCs) continued																			
Acrylonitrile	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Benzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromochloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromodichloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoform	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromomethane	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Carbon Disulfide	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Tetrachloride	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.6	0.2	0.2U	0.2U	1.1
Chloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.3M	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
cis-1,2-Dichloroethene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.3	0.2U	11	0.3	0.2U	0.2U	0.5
cis-1,3-Dichloropropene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromochloromethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromomethane	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylene Dibromide (EDB)	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Hexachlorobutadiene	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Isopropylbenzene (Cumene)	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl iodide	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Methylene Chloride	ug/l	0.5U	0.5U	0.5U	0.5U	0.5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5	0.6	0.5U	0.5U	0.5U	0.5U	0.5U
Naphthalene	ug/L	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Butylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
n-Propylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Styrene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

Notes:

Shaded cells for visual aid, no significance in terms of analytical results

Blank = Not Measured

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#K = Detected constituents with unknown bias; associated number is the concentration measured in the sample (e.g. 2.6K)

K flag for samples MW-34p1 and MW-35p2 for nitrate, nitrite, and nitrate+nitrite due to strong matrix interference per laboratory

K flag for acetone and methylene chloride due to low level detections of these compounds in associated trip blank.

Table H1a. Groundwater (Round 4) - Analytical Results for Outwash and Interflow Aquifer Wells

		Outwash Aquifer Wells											Interflow Aquifer Wells						
	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c
Volatile Organic Compounds (VOCs) continued																			
tert-Butylbenzene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	0.088	0.096	0.22	0.22	0.16	0.067	0.036	0.097	0.22	0.13	0.086	1.5	0.02U	11	1.2	0.02U	0.02U	4.4
Toluene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,2-Dichloroethene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.5
trans-1,3-Dichloropropene	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Trichloroethene (TCE)	ug/L	0.02U	0.02U	0.045	0.02U	0.12	0.038	0.037	0.02U	0.02U	0.026	0.02U	0.54	0.02U	2	0.43	0.02U	0.02U	1.5
Trichlorofluoromethane	ug/l	0.2U	0.2U	0.2U	0.2U	0.9	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	3.9	0.2U	0.2	0.4	0.2U	0.2U	5.2
Vinyl Acetate	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Vinyl Chloride	ug/L	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.38	0.02U	0.02U	0.02U	0.02U
Xylene Isomers, M+P	ug/L	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U

		Outwash Aquifer Wells											Interflow Aquifer Wells						
	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c
Inorganic Parameters																			
Alkalinity (as CaCO3)	mg/L	227	195	212	193	193	200	203	216	193	214	244	74.6	116	196	347	157	118	224
Ammonia as Nitrogen, Total	mg/L as N	0.012	0.023	0.105	0.047	0.02	0.017	0.08	0.075	0.038	0.026	0.014	0.049	0.047	0.087	0.02	0.022	0.085	0.028
Antimony, Dissolved	ug/L	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U
Arsenic, Dissolved	ug/L	2.9	4.1	5	7.8	3.2	4.9	4.9	3.8	4.7	4.3	2.1	0.5U	0.3	1.4	1.3	1.3	0.7	1
Barium, Dissolved	ug/L	15	14	13	18	46	16	14	16	49	22	26	43	64	53	216	5	127	52
Beryllium, Dissolved	ug/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Bicarbonate as HCO3	mg/L	227	195	212	193	193	200	203	216	193	214	244	74.6	116	196	347	157	118	224
Cadmium, Dissolved	ug/L	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U
Calcium, Total	mg/L	55.7	49.4	50.1	49.1	55.2	61.2	60.2	45.3	42.9	46.7	59.4	235	22.2	279	274	37.8	113	106
Carbonate as CO3	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Chloride	mg/L	18.7	18.5	19.4	43.9	15.7	27	46.6	15.9	45.7	21.3	17.3	748	10.6	661	682	5.9	23.6	135
Chromium, Dissolved	ug/L	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Cobalt, Dissolved	ug/L	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	6	3U	3U	3U
Copper, Dissolved	ug/L	2	2U	2U	4	2U	2U	2U	2U	5	2U	2	2U	2U	2U	13	2U	2U	2U
Hydroxide (as CaCO3)	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U

Notes:

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K flag for samples MW-34p1 and MW-35p2 for nitrate, nitrite, and nitrate+nitrite due to strong matrix interference per laboratory

K flag for acetone and methylene chloride due to low level detections of these compounds in associated trip blank.

Table H1a. Groundwater (Round 4) - Analytical Results for Outwash and Interflow Aquifer Wells

		Outwash Aquifer Wells											Interflow Aquifer Wells						
	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c
Inorganic Parameters continued																			
Iron, Dissolved	ug/L	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U
Iron, Total	ug/L	50U	50U	50U	50U	190	50U	50U	50U	230	1000	90	50U	50U	50U	50U	50U	50U	50U
Lead, Dissolved	ug/L	20U	20U	20U	20U	20U	20U	20U	20U	20U	20U	20U	20U	20U	20U	20U	20U	20U	20U
Magnesium, Total	mg/L	22	18.6	19.2	18.4	21	16.7	23.2	18	18.4	18.8	22.4	88.1	15.5	86.2	90.4	16.2	41.5	33.1
Manganese, Dissolved	ug/L	1U	1U	1U	1U	1U	1U	4	1U	1U	1U	2	1U	29	1U	19	1U	180	1U
Manganese, Total	ug/L	1U	1U	1U	1U	6	2	3	1U	5	15	3	1U	26	1U	19	1U	180	1U
Nickel, Dissolved	ug/L	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	50	10U	10U	10U
Nitrate as Nitrogen	mg/L as N	5.07	5.12	4.93	6.01	4.49	3.49	2.87	4.6	5.8	4.72	4.85	8.33	0.01U	11.1	22.5	1.17	84.9	9.73
Nitrate+Nitrite as Nitrogen	mg/L as N	5.07	5.12	4.93	6.01	4.49	3.51	2.87	4.6	5.8	4.72	4.88	8.33	0.01U	11.1	22.5	1.18	85	9.73
Nitrite as Nitrogen	mg/L as N	0.01U	0.01U	0.01U	0.01U	0.01U	0.022	0.01U	0.01U	0.01U	0.01U	0.027	0.01U	0.01U	0.01U	0.01	0.011	0.062	0.01U
Potassium, Total	mg/L	8.1	8.7	8.5	9.4	2.1	5.1	4.7	8.3	8.4	8	7.5	4.8	9.2	6.9	8.5	4	6.1	2.9
Selenium, Dissolved	ug/L	0.9	0.9	0.8	0.8	2U	1	2U	0.8	0.7	0.8	2U	2U	0.5U	2U	2U	0.5U	4	2U
Silver, Dissolved	ug/L	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U	3U
Sodium, Total	mg/L	30.6	31.3	29.1	41.4	23	22.5	29.7	25.7	42.1	28.9	31.9	30	12.8	29	69	12.7	21.2	32
Sulfate	mg/L	49.5	39	43.2	46.6	49.5	39.8	48	44.2	47	43.2	36.3	40.5	34.6	187	76.8	30.1	19.4	31.6
Thallium, Dissolved	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Total Dissolved Solids	mg/L	394	350	369	395	362	362	389	368	397	381	395	1350	167	1530	1520	251	720	526
Total Organic Carbon	mg/L	2.43	2.3	2.17	1.81	1.5U	1.77	2.71	2.12	1.95	2.11	2.89	3.29	1.5U	7.85	15.4	1.5U	1.5U	1.5U
Vanadium, Dissolved	ug/L	22	15	19	22	58	27	23	20	25	19	25	11	3U	23	17	40	23	28
Zinc, Dissolved	ug/L	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U

		Outwash Aquifer Wells											Interflow Aquifer Wells						
	Units	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c
Field Parameters																			
Dissolved Oxygen	mg/L	8.61	8.23	9.35	8.03	11.61	4.76	6.04	8.58	8.1	9.79	8.61	3.88	4.02	2.04	3.24	6.1	4.09	8.02
Oxidation Reduction Potential	mV	158	168	245	160	176	114	162	185	168	185	91	95	64	143	120	130	27	111
pH	std. units	7	6.6	6.4	7	6.9	6.8	7.1	7	7	6.3	6.8	7.1	7.5	6.8	6.9	7.2	7.1	6.9
Specific Conductance @ 25C	umhos/cm	650	590	630	660	580	600	760	590	680	620	710	270	350	2700	3000	410	1200	1100
Temperature, 0 F	0 F	57.2	57.92	58.28	58.1	60.98	58.46	59.18	58.64	58.28	59.36	57.2	63.86	61.52	65.12	58.82	58.1	59.72	61.16

Notes:
Shaded cells for visual aid, no significance in terms of analytical results
Blank = Not Measured
#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)
#K = Detected constituents with unknown bias; associated number is the concentration measured in the sample (e.g. 2.6K)
K flag for samples MW-34p1 and MW-35p2 for nitrate, nitrite, and nitrate+nitrite due to strong matrix interference per laboratory
K flag for acetone and methylene chloride due to low level detections of these compounds in associated trip blank.

Table H1b. Groundwater (Round 4) - Analytical Results for Roza, P1, P2, Below Interflow, and Frenchman Springs Aquifer Wells

		Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
	Units	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Volatile Organic Compounds (VOCs)																
1,1,1,2-Tetrachloroethane	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	0.6U	0.2U	0.2U	0.2U	1U	2.4	1U	67	2900	15	5U	50U	1200	0.2U	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	2000U	0.02U	0.02U	50U	100U	0.02U	0.2U
1,1,2-Trichloroethane	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	0.6U	0.2U	0.2U	0.2U	2U	2U	2U	6.1	4000U	2U	10U	100U	200U	0.2U	0.2U
1,1-Dichloroethane	ug/L	9.8	19	4.2	0.2U	79	3.6	1.6	65	6400	28	71	95	2200	0.2U	0.3
1,1-Dichloroethene	ug/L	1	0.8	0.2	0.02U	1	0.14	1.4	2.9	2000U	6.4	0.54	50U	300	0.02U	0.02U
1,1-Dichloropropene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L	1.5U	0.5U	0.5U	0.5U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L	1.5U	0.5U	0.5U	0.5U	2U	2U	2U	2U	4000U	2U	10U	100U	200U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	1.5U	0.5U	0.5U	0.5U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	16	2000U	1U	5U	150	120	0.2U	0.2U
1,2-Dibromo-3-chloropropane	ug/L	1.5U	0.5U	0.5U	0.5U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L	1.6	3.1	0.2	0.2U	6.4	1U	1U	1U	2000U	1U	17	50U	100U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	0.6U	2.2	0.2U	0.2U	7.5	1U	1U	4.2	2000U	1U	5.6	50U	260	0.2U	0.2U
1,2-Dichloropropane	ug/L	12	10	3.1	0.2U	110	1U	1U	39	2000U	50	34	50U	970	0.2U	0.3
1,3,5-Trimethylbenzene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	5	2000U	1U	5U	54	100U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
1,3-Dichloropropane	ug/L	0.6U	0.2U	0.2U	0.2U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	2	2.3	0.6	0.2U	1.5	1U	1U	1U	2000U	1U	29	50U	100U	0.2U	0.2U
2,2-Dichloropropane	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
2-butanone	ug/L	7.5U	2.5U	2.5U	2.5U	5U	5U	5U	5U	77000	5U	25U	250U	500U	2.5U	2.5U
2-Chloroethylvinylether	ug/L	3U	1U	1U	1U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	1U	1U
2-Chlorotoluene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
2-Hexanone	ug/L	7.5U	2.5U	2.5U	2.5U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	2.5U	2.5U
4-Chlorotoluene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
4-Isopropyltoluene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
4-Methyl-2-pentanone (MIBK)	ug/L	7.5U	2.5U	2.5U	2.5U	5U	5U	5U	5U	45000	5U	25U	250U	500U	2.5U	2.5U
Acetone	ug/L	7.5U	4.3	5.4K	2.5U	11	10U	10U	10U	270000	10U	50U	500U	1000U	2.5U	2.5U
Acrolein	ug/L	15U	5U	5U	5U	10U	10U	10U	10U	20000U	10U	50U	500U	1000U	5U	5U

Notes:

Shaded cells for visual aid, no significance in terms of analytical results

Blank = Not Measured

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#K = Detected constituents with unknown bias; associated number is the concentration measured in the sample (e.g. 2.6K)

K flag for samples MW-34p1 and MW-35p2 for nitrate, nitrite, and nitrate+nitrite due to strong matrix interference per laboratory

K flag for acetone and methylene chloride due to low level detections of these compounds in associated trip blank.

Table H1b. Groundwater (Round 4) - Analytical Results for Roza, P1, P2, Below Interflow, and Frenchman Springs Aquifer Wells

		Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
	Units	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Volatile Organic Compounds (VOCs) continued																
Acrylonitrile	ug/L	3U	1U	1U	1U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	1U	1U
Benzene	ug/L	2.2	1.7	0.5	0.2U	1.6	1U	1U	1.5	2000U	1U	55	110	110	0.2U	0.2U
Bromobenzene	ug/L	0.6U	0.4	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Bromochloromethane	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Bromodichloromethane	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Bromoethane	ug/L	0.6U	0.2U	0.2U	0.2U	2U	2U	2U	2U	4000U	2U	10U	100U	200U	0.2U	0.2U
Bromoform	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Bromomethane	ug/L	1.5U	0.5U	0.5U	0.5U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.5U	0.5U
Carbon Disulfide	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Carbon Tetrachloride	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Chlorobenzene	ug/L	0.6	0.9	0.2U	0.2U	1.4	1U	1U	1U	2000U	1U	5.6	50U	100U	0.2U	0.2U
Chloroethane	ug/L	36	72	0.7	0.2U	1U	1U	1U	1.9	2000U	6.2	520	1600	100U	0.2U	0.2U
Chloroform	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	2.4	5U	50U	100	0.2U	0.2U
Chloromethane	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
cis-1,2-Dichloroethene	ug/L	84	20	12	0.2U	25	1U	1U	21	5200	11	7.9	50U	520	0.2U	1.5
cis-1,3-Dichloropropene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Dibromochloromethane	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Dibromomethane	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Ethylbenzene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	25	5200	1U	5U	760	590	0.2U	0.2U
Ethylene Dibromide (EDB)	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Hexachlorobutadiene	ug/L	1.5U	0.5U	0.5U	0.5U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	0.5U	0.5U
Isopropylbenzene (Cumene)	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	2.3	2000U	1U	5U	50U	100U	0.2U	0.2U
Methyl iodide	ug/L	3U	1U	1U	1U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	1U	1U
Methylene Chloride	ug/l	2K	3.3K	0.5U	0.5U	2.5	2U	2U	2U	4000U	2U	15	100U	200U	0.5U	0.5U
Naphthalene	ug/L	1.5U	0.5U	0.5U	0.5U	5U	5U	5U	5.1	10000U	5U	25U	250U	500U	0.5U	0.5U
n-Butylbenzene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
n-Propylbenzene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	3.3	2000U	1U	5U	50U	100U	0.2U	0.2U
o-Xylene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	16	4400	1U	5U	480	930	0.2U	0.2U
sec-Butylbenzene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Styrene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U

Notes:

Shaded cells for visual aid, no significance in terms of analytical results

Blank = Not Measured

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#K = Detected constituents with unknown bias; associated number is the concentration measured in the sample (e.g. 2.6K)

K flag for samples MW-34p1 and MW-35p2 for nitrate, nitrite, and nitrate+nitrite due to strong matrix interference per laboratory

K flag for acetone and methylene chloride due to low level detections of these compounds in associated trip blank.

Table H1b. Groundwater (Round 4) - Analytical Results for Roza, P1, P2, Below Interflow, and Frenchman Springs Aquifer Wells

		Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
	Units	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Volatile Organic Compounds (VOCs) continued																
tert-Butylbenzene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	0.21	0.6	4.2	0.02U	0.85	0.11	0.02U	1.4	2000U	8.8	2.6	50U	100U	0.02U	1.5
Toluene	ug/L	0.6U	0.2U	0.2U	0.2U	1.6	9.8	1U	2	85000	1U	5U	2300	5200	0.2U	0.4
trans-1,2-Dichloroethene	ug/L	1	0.8	0.2	0.2U	1	1U	1.4	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
trans-1,3-Dichloropropene	ug/L	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	3U	1U	1U	1U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	1U	1U
Trichloroethene (TCE)	ug/L	3.8	0.83	1	0.02U	2.7	0.31	0.38	0.02U	2000U	6.9	5.2	50U	100U	0.02U	0.32
Trichlorofluoromethane	ug/l	0.6U	0.2U	0.2U	0.2U	1U	1U	1U	1U	2000U	1U	5U	50U	100U	0.2U	0.2U
Vinyl Acetate	ug/L	3U	1U	1U	1U	5U	5U	5U	5U	10000U	5U	25U	250U	500U	1U	1U
Vinyl Chloride	ug/L	68	22	8.3	0.02U	17	0.3	3.6	18	2000U	0.52	22	50U	880	0.02U	0.02U
Xylene Isomers, M+P	ug/L	1.2U	0.4U	0.4U	0.4U	2U	2U	2U	2U	12000	2U	10U	840	1300	0.4U	0.4U

		Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
	Units	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Inorganic Parameters																
Alkalinity (as CaCO3)	mg/L	1290	982	857	119	243	148	123	1020	1280	468	1050	784		146	127
Ammonia as Nitrogen, Total	mg/L as N	3.25	0.166	0.09	0.056	0.06	0.015	0.028	0.897	33.3	0.061	0.338	0.01U		0.018	0.015
Antimony, Dissolved	ug/L	100U	100U	50U	50U	50U	50U	50U	50U	100U	50U	100U			50U	50U
Arsenic, Dissolved	ug/L	2.4	0.9	9.4	0.2U	1.8	0.6	0.4	14.9	18.9	1.1	6.8			0.3	0.5U
Barium, Dissolved	ug/L	134	105	68	29	179	79	55	310	605	129	1110			36	57
Beryllium, Dissolved	ug/L	2U	2U	1U	1U	1U	1U	1U	1U	2U	1U	2U			1U	1U
Bicarbonate as HCO3	mg/L	1290	982	857	119	243	148	123	1020	1280	468	1050	784		146	127
Cadmium, Dissolved	ug/L	4U	4U	2U	2U	2U	2U	2U	2U	4U	2U	4U			2U	2U
Calcium, Total	mg/L	554	596	449	172	167	34.4	31	236	363	112	510	369	194	39.7	57.1
Carbonate as CO3	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U
Chloride	mg/L	1240	1110	1090	22.2	392	12.1	6	121	982	84.8	1290	953	179	33.4	103
Chromium, Dissolved	ug/L	10U	10U	5U	5U	5U	5U	5U	5U	10U	5U	10U			5U	5U
Cobalt, Dissolved	ug/L	6U	13	16	3U	3U	3U	3U	22	46	3U	59			3U	3U
Copper, Dissolved	ug/L	4U	4U	27	3	2U	2U	2U	2U	4U	2U	4U			2U	2U
Hydroxide (as CaCO3)	mg/L	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U	1U

Notes:

Shaded cells for visual aid, no significance in terms of analytical results

Blank = Not Measured

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#K = Detected constituents with unknown bias; associated number is the concentration measured in the sample (e.g. 2.6K)

K flag for samples MW-34p1 and MW-35p2 for nitrate, nitrite, and nitrate+nitrite due to strong matrix interference per laboratory

K flag for acetone and methylene chloride due to low level detections of these compounds in associated trip blank.

Table H1b. Groundwater (Round 4) - Analytical Results for Roza, P1, P2, Below Interflow, and Frenchman Springs Aquifer Wells

		Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
	Units	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Inorganic Parameters																
Iron, Dissolved	ug/L	9100	2900	50U	50U	150	80	50U	11300	116000	50U	8450			60	50U
Iron, Total	ug/L	8700	2800	50U	70	440	3360	4870	11000	121000	240	35600	54200	98000	2620	650
Lead, Dissolved	ug/L	40U	40U	20U	20U	20U	20U	20U	20U	40U	20U	40U			20U	20U
Magnesium, Total	mg/L	311	233	180	69.6	70.3	16.4	15.1	91.4	225	49.6	210	175	81.9	16	31.5
Manganese, Dissolved	ug/L	20200	16200	6660	62	988	308	91	7590	15000	284	12300			91	15
Manganese, Total	ug/L	19900	15900	6170	114	979	319	162	7250	15200	261	11900	11400	3360	223	22
Nickel, Dissolved	ug/L	50	50	80	70	20	10U	10U	10U	70	10U	160			10U	10U
Nitrate as Nitrogen	mg/L as N	0.01U	0.013	21.6	0.029	0.257	0.016	0.018	0.01U	0.05UK	8.66	0.01U	0.02UK	0.011	0.01U	1.27
Nitrate+Nitrite as Nitrogen	mg/L as N	0.01U	0.013	21.9	0.029	0.27	0.016	0.018	0.01U	0.05UK	9.59	0.01U	0.02UK	0.011	0.01U	1.5
Nitrite as Nitrogen	mg/L as N	0.01U	0.01U	0.255	0.01U	0.013	0.01U	0.01U	0.01U	0.095K	0.926	0.01U	0.039K	0.01U	0.01U	0.234
Potassium, Total	mg/L	39	16	24.8	5.7	14.1	7.4	6.4	31	66.9	8.7	23	14.8	20.3	3.3	7.7
Selenium, Dissolved	ug/L	2U	2U	3	0.5U	3.7	0.5U	0.5	0.7	2	1.5	4			0.5U	2U
Silver, Dissolved	ug/L	6U	6U	3U	3U	3U	3U	3U	3U	6U	3U	6U			3U	3U
Sodium, Total	mg/L	578	360	359	18.6	58.5	31	23.3	84.9	387	70.4	208	104	77	49.4	19.7
Sulfate	mg/L	1340	978	846	655	76.1	54.7	40.9	143	18.9	143	17.4	8.8	147	48.8	45
Thallium, Dissolved	ug/L	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U			0.2U	0.2U
Total Dissolved Solids	mg/L	4970	3840	3400	1040	1140	288	234	1320	3350	820	3340			346	394
Total Organic Carbon	mg/L	64	49.2	43.6	1.98	108	1.5U	5.04	21.8	1060	5.84	90	67		2.85	2.14
Vanadium, Dissolved	ug/L	6	6U	21	3U	6	3U	3U	4	7	3	6			3U	6
Zinc, Dissolved	ug/L	20U	20U	10U	10U	10U	10U	10U	10U	20U	10U	20U			10U	10U

		Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
	Units	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Field Parameters																
Dissolved Oxygen	mg/L	4.92	4.32	1.68	6.02	8.72	1.7	1.64	4.42	1.64	6.52	3.3	4.33	7.76	2.7	1.27
Oxidation Reduction Potential	mV	-30	-12	146	94	-169	-21	-72	-61	-89	16	-102	-63	-93	-32	18
pH	std. units	6.1	6.4	6.4	6.6	6.8	6.6	7.5	6.1	5.9	6.3	6.1	6.3	6.4	6.6	7.1
Specific Conductance @ 25C	umhos/cm	7600	6100	5600	140	1900	520	400	2400	5700	1500	5600	4300	1800	440	700
Temperature, 0 F	0 F	59.36	59	60.8	56.3	65.66	65.3	59.36	67.28	68.18	62.6	66.74	64.22	61.52	61.88	66.38

Notes:
Shaded cells for visual aid, no significance in terms of analytical results
Blank = Not Measured
#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)
#K = Detected constituents with unknown bias; associated number is the concentration measured in the sample (e.g. 2.6K)
K flag for samples MW-34p1 and MW-35p2 for nitrate, nitrite, and nitrate+nitrite due to strong matrix interference per laboratory
K flag for acetone and methylene chloride due to low level detections of these compounds in associated trip blank.

Table H2a. Groundwater (Round 4) - Detected VOCs and Inorganic Compounds Relative to RI Screening Levels for Outwash and Interflow Aquifer Wells

	Units	Screening Level	Source	Outwash Aquifer Wells											Interflow Aquifer Wells						
				MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c
Volatile Organic Compounds (VOCs)																					
1,1-Dichloroethane	ug/L	1600	MTCA-B non-car						0.2	0.5					3.4		2	1.8			3.9
1,1-Dichloroethene	ug/L	7	FED MCL					0.059							0.056		0.066	0.085			0.5
1,2-Dichloroethane (EDC)	ug/L	0.48	MTCA-B car														1.4				
1,2-Dichloropropane	ug/L	0.64	MTCA-B car												0.3		1.9				
Acetone	ug/L	800	MTCA-B non-car			2.8K		2.7K								2.6K		2.9K			
Chloroform	ug/L	7.2	MTCA-B car														0.6	0.2			1.1
cis-1,2-Dichloroethene	ug/L	70	FED MCL												0.3		11	0.3			0.5
Methylene Chloride	ug/l	5	FED MCL					0.5							0.5	0.6					
Tetrachloroethene (PCE)	ug/L	0.081	MTCA-B car	0.088	0.096	0.22	0.22	0.16	0.067	0.036	0.097	0.22	0.13	0.086	1.5		11	1.2			4.4
Trichloroethene (TCE)	ug/L	0.49	MTCA-B car			0.045		0.12	0.038	0.037			0.026		0.54		2	0.43			1.5
Trichlorofluoromethane	ug/l	2400	MTCA-B non-car					0.9							3.9		0.2	0.4			5.2
Vinyl Chloride	ug/L	0.029	MTCA-B car														0.38				

Notes:
Shaded = Detectetion above RI screening Level
Blank = Non-Detect
2.6K = Detected constituents with unknown bias. Acetone and methylene chloride detected near the reporting limit in the trip blank associated with these samples
NM = not measured
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
NA = No established screening level

Table H2a. Groundwater (Round 4) - Detected VOCs and Inorganic Compounds Relative to RI Screening Levels for Outwash and Interflow Aquifer Wells

	Units	Screening Level	Source	Outwash Aquifer Wells											Interflow Aquifer Wells						
	Units	Screening Level	Source	MW-1a	MW-6a	MW-10a	MW-11a	MW-14a	MW-17a	MW-18a	MW-23a	MW-24a	MW-25a	MW-26a	MW-2c	MW-4c	MW-5c	MW-6c	MW-20c	MW-21c	MW-22c
Inorganic Parameters																					
Alkalinity (as CaCO3)	mg/L	NA		227	195	212	193	193	200	203	216	193	214	244	74.6	116	196	347	157	118	224
Ammonia as Nitrogen, Total	mg/L as N	NA		0.012	0.023	0.105	0.047	0.02	0.017	0.08	0.075	0.038	0.026	0.014	0.049	0.047	0.087	0.02	0.022	0.085	0.028
Arsenic, Dissolved[1]	ug/L	0.058	MTCA-B car	2.9	4.1	5	7.8	3.2	4.9	4.9	3.8	4.7	4.3	2.1		0.3	1.4	1.3	1.3	0.7	1
Barium, Dissolved	ug/L	1000	GWCL	15	14	13	18	46	16	14	16	49	22	26	43	64	53	216	5	127	52
Bicarbonate as HCO3	mg/L	NA		227	195	212	193	193	200	203	216	193	214	244	74.6	116	196	347	157	118	224
Calcium, Total	mg/L	NA		55.7	49.4	50.1	49.1	55.2	61.2	60.2	45.3	42.9	46.7	59.4	235	22.2	279	274	37.8	113	106
Chloride	mg/L	250	GWCL	18.7	18.5	19.4	43.9	15.7	27	46.6	15.9	45.7	21.3	17.3	748	10.6	661	682	5.9	23.6	135
Cobalt, Dissolved	ug/L	NA																6			
Copper, Dissolved	ug/L	590	MTCA-B non-car	2			4					5		2				13			
Iron, Total	ug/L	300	GWCL					190				230	1000	90							
Magnesium, Total	mg/L	NA		22	18.6	19.2	18.4	21	16.7	23.2	18	18.4	18.8	22.4	88.1	15.5	86.2	90.4	16.2	41.5	33.1
Manganese, Dissolved	ug/L	2200	MTCABnon-carcin							4				2		29		19		180	
Manganese, Total	ug/L	2200	MTCABnon-carcin					6	2	3		5	15	3		26		19		180	
Nickel, Dissolved	ug/L	320	MethB non-carc.															50			
Nitrate as Nitrogen	mg/L as N	10	FED MCL	5.07	5.12	4.93	6.01	4.49	3.49	2.87	4.6	5.8	4.72	4.85	8.33		11.1	22.5	1.17	84.9	9.73
Nitrate+Nitrite as Nitrogen	mg/L as N	10	FED MCL	5.07	5.12	4.93	6.01	4.49	3.51	2.87	4.6	5.8	4.72	4.88	8.33		11.1	22.5	1.18	85	9.73
Nitrite as Nitrogen	mg/L as N	1	FED MCL						0.022					0.027				0.01	0.011	0.062	
Potassium, Total	mg/L	NA		8.1	8.7	8.5	9.4	2.1	5.1	4.7	8.3	8.4	8	7.5	4.8	9.2	6.9	8.5	4	6.1	2.9
Selenium, Dissolved	ug/L	50	FED MCL	0.9	0.9	0.8	0.8		1		0.8	0.7	0.8							4	
Sodium, Total	mg/L	NA		30.6	31.3	29.1	41.4	23	22.5	29.7	25.7	42.1	28.9	31.9	30	12.8	29	69	12.7	21.2	32
Sulfate	mg/L	250	GWCL	49.5	39	43.2	46.6	49.5	39.8	48	44.2	47	43.2	36.3	40.5	34.6	187	76.8	30.1	19.4	31.6
Total Dissolved Solids	mg/L	500	GWCL	394	350	369	395	362	362	389	368	397	381	395	1350	167	1530	1520	251	720	526
Total Organic Carbon	mg/L	NA		2.43	2.3	2.17	1.81		1.77	2.71	2.12	1.95	2.11	2.89	3.29		7.85	15.4			
Vanadium, Dissolved	ug/L	110	MethB non-carc.	22	15	19	22	58	27	23	20	25	19	25	11		23	17	40	23	28

Notes:
Shaded = Detectetion above RI screening Level
Blank = Non-Detect
NM = not measured
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
NA = No established screening level
1. Site background concentration for dissolved arsenic is 3.4 ug/L (see text for details)

Table H2b. Groundwater (Round 4) - Detected VOCs and Inorganic Compounds Relative to RI Screening Levels for Roza, P1, P2, Below Interflow, and Frenchman Springs Aquifer Wells

		Screening		Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
	Units	Level	Source	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Volatile Organic Compounds (VOCs)																		
1,1,1-Trichloroethane	ug/l	200	FED MCL						2.4		67	2900	15			1200		
1,1,2-Trichlorotrifluoroethane	ug/L	240000	MTCA-B non-car								6.1							
1,1-Dichloroethane	ug/L	1600	MTCA-B non-car	9.8	19	4.2		79	3.6	1.6	65	6400	28	71	95	2200		0.3
1,1-Dichloroethene	ug/L	7	FED MCL	1	0.8	0.2		1	0.14	1.4	2.9		6.4	0.54		300		
1,2,4-Trimethylbenzene	ug/L	400	MTCA-B non-car								16				150	120		
1,2-Dichlorobenzene	ug/L	600	FED MCL	1.6	3.1	0.2		6.4						17				
1,2-Dichloroethane (EDC)	ug/L	0.48	MTCA-B car		2.2			7.5			4.2			5.6		260		
1,2-Dichloropropane	ug/L	0.64	MTCA-B car	12	10	3.1		110			39		50	34		970		0.3
1,3,5-Trimethylbenzene	ug/L	400	MTCA-B non-car								5				54			
1,4-Dichlorobenzene	ug/L	1.8	MTCA-B car	2	2.3	0.6		1.5						29				
2-butanone	ug/L	4800	MTCA-B non-car									77000						
4-Methyl-2-pentanone (MIBK)	ug/L	640	MTCA-B non-car									45000						
Acetone	ug/L	800	MTCA-B non-car		4.3	5.4K		11				270000						
Benzene	ug/L	0.8	MTCA-B car	2.2	1.7	0.5		1.6			1.5			55	110	110		
Bromobenzene	ug/L	NA			0.4													
Chlorobenzene	ug/L	100	FED MCL	0.6	0.9			1.4						5.6				
Chloroethane	ug/L	15	MTCA-B car	36	72	0.7					1.9		6.2	520	1600			
Chloroform	ug/L	7.2	MTCA-B car										2.4			100		
cis-1,2-Dichloroethene	ug/L	70	FED MCL	84	20	12		25			21	5200	11	7.9		520		1.5
Ethylbenzene	ug/L	800	MTCA-B non-car								25	5200			760	590		
Isopropylbenzene (Cumene)	ug/L	800	MTCA-B non-car								2.3							
Methylene Chloride	ug/l	5	FED MCL	2K	3.3K			2.5						15				
Naphthalene	ug/L	160	MTCA-B non-car								5.1							
n-Propylbenzene	ug/L	NA									3.3							
o-Xylene	ug/L	16000	MTCA-B non-car								16	4400			480	930		
Tetrachloroethene (PCE)	ug/L	0.081	MTCA-B car	0.21	0.6	4.2		0.85	0.11		1.4		8.8	2.6				1.5
Toluene	ug/L	640	MTCA-B non-car					1.6	9.8		2	85000			2300	5200		0.4
trans-1,2-Dichloroethene	ug/L	100	FED MCL	1	0.8	0.2		1		1.4								
Trichloroethene (TCE)	ug/L	0.49	MTCA-B car	3.8	0.83	1		2.7	0.31	0.38			6.9	5.2				0.32
Trichlorofluoromethane	ug/l	2400	MTCA-B non-car															
Vinyl Chloride	ug/L	0.029	MTCA-B car	68	22	8.3		17	0.3	3.6	18		0.52	22		880		
Xylene Isomers, M+P	ug/L	1600	MTCA-B non-car									12000			840	1300		

Notes:
Shaded = Detectetion above RI screening Level
Blank = Non-Detect
NM = not measured
2.6K = Detected constituents with unknown bias. Acetone and methylene chloride detected near the reporting limit in the trip blank associated with these samples.
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
NA = No established screening level

Table H2b. Groundwater (Round 4) - Detected VOCs and Inorganic Compounds Relative to RI Screening Levels for Roza, P1, P2, Below Interflow, and Frenchman Springs Aquifer Wells

		Screening		Roza Aquifer Wells							P1 Aquifer Wells			P2 Aquifer Wells			Below Interflow	Frenchman Springs
	Units	Level	Source	MW-3b	MW-7b	MW-9b	MW-19b	MW-29b	MW-30b	MW-31b	MW-32a	MW-34p1	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-16d	MW-28d
Inorganic Parameters																		
Alkalinity (as CaCO3)	mg/L	NA		1290	982	857	119	243	148	123	1020	1280	468	1050	784	NM	146	127
Ammonia as Nitrogen, Total	mg/L as N	NA		3.25	0.166	0.09	0.056	0.06	0.015	0.028	0.897	33.3	0.061	0.338		NM	0.018	0.015
Arsenic, Dissolved[1]	ug/L	0.058	MTCA-B car	2.4	0.9	9.4		1.8	0.6	0.4	14.9	18.9	1.1	6.8	NM	NM	0.3	
Barium, Dissolved	ug/L	1000	GWCL	134	105	68	29	179	79	55	310	605	129	1110	NM	NM	36	57
Bicarbonate as HCO3	mg/L	NA		1290	982	857	119	243	148	123	1020	1280	468	1050	784	NM	146	127
Calcium, Total	mg/L	NA		554	596	449	172	167	34.4	31	236	363	112	510	369	194	39.7	57.1
Chloride	mg/L	250	GWCL	1240	1110	1090	22.2	392	12.1	6	121	982	84.8	1290	953	179	33.4	103
Cobalt, Dissolved	ug/L	NA			13	16					22	46		59	NM	NM		
Copper, Dissolved	ug/L	590	MTCA-B non-car			27	3								NM	NM		
Iron, Dissolved	ug/L	300	GWCL	9100	2900			150	80		11300	116000		8450	NM	NM	60	
Iron, Total	ug/L	300	GWCL	8700	2800		70	440	3360	4870	11000	121000	240	35600	54200	98000	2620	650
Magnesium, Total	mg/L	NA		311	233	180	69.6	70.3	16.4	15.1	91.4	225	49.6	210	175	81.9	16	31.5
Manganese, Dissolved	ug/L	2200	MTCABnon-carcin	20200	16200	6660	62	988	308	91	7590	15000	284	12300	NM	NM	91	15
Manganese, Total	ug/L	2200	MTCABnon-carcin	19900	15900	6170	114	979	319	162	7250	15200	261	11900	11400	3360	223	22
Nickel, Dissolved	ug/L	320	MethB non-carc.	50	50	80	70	20				70		160	NM	NM		
Nitrate as Nitrogen	mg/L as N	10	FED MCL		0.013	21.6	0.029	0.257	0.016	0.018			8.66			0.011		1.27
Nitrate+Nitrite as Nitrogen	mg/L as N	10	FED MCL		0.013	21.9	0.029	0.27	0.016	0.018			9.59			0.011		1.5
Nitrite as Nitrogen	mg/L as N	1	FED MCL			0.255		0.013				0.095K	0.926		0.039K			0.234
Potassium, Total	mg/L	NA		39	16	24.8	5.7	14.1	7.4	6.4	31	66.9	8.7	23	14.8	20.3	3.3	7.7
Selenium, Dissolved	ug/L	50	FED MCL			3		3.7		0.5	0.7	2	1.5	4	NM	NM		
Sodium, Total	mg/L	NA		578	360	359	18.6	58.5	31	23.3	84.9	387	70.4	208	104	77	49.4	19.7
Sulfate	mg/L	250	GWCL	1340	978	846	655	76.1	54.7	40.9	143	18.9	143	17.4	8.8	147	48.8	45
Total Dissolved Solids	mg/L	500	GWCL	4970	3840	3400	1040	1140	288	234	1320	3350	820	3340	NM	NM	346	394
Total Organic Carbon	mg/L	NA		64	49.2	43.6	1.98	108		5.04	21.8	1060	5.84	90	67	NM	2.85	2.14
Vanadium, Dissolved	ug/L	110	MethB non-carc.	6		21		6			4	7	3	6	NM	NM		6

Notes:
Shaded = Detectetion above RI screening Level
Blank = Non-Detect
NM = not measured
K flag for samples MW-34p1 and MW-35p2 for nitrate, nitrite, and nitrate+nitrite due to strong matrix interference per laboratory
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
NA = No established screening level
1. Site background concentration for dissolved arsenic is 3.4 ug/L (see text for details)

Table I. Groundwater (Round 5) - Analytical Results for Locations A-E (see Figure 1 of main report)

				LOCATION A		LOCATION B			LOCATION C			LOC. D	LOCATION E	
	Units	Screening Level	Source	MW-40p2	MW-41a	MW-47c	MW-48b	MW-49p2	MW-44b	MW-45c	MW-46p2	MW-39p2	MW-42b	MW-43p2
Volatile Organic Compounds (VOCs)														
1,1,1,2-Tetrachloroethane	ug/L	1.7	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.22	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	1600	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	**39**	0.2U	0.2U	**0.6**	**43**	**6.9**
1,1-Dichloroethene	ug/L	7	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	**0.7**	0.2U	0.2U	0.2U	**4.2**	**0.6**
1,1-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L	NA		0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L	0.0063	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	70	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	**1.7M**	0.2U	0.2U	0.2U	**0.2**	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.031	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	**19**	0.2U	0.2U	0.2U	**5**	**0.4**
1,2-Dichloroethane (EDC)	ug/L	0.48	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	**2.4**	0.2U	0.2U	0.2U	**6.2**	**1**
1,2-Dichloropropane	ug/L	0.64	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	**21**	0.2U	0.2U	0.2U	**26**	**13**
1,3,5-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	**1.1**	0.2U	0.2U	0.2U	**0.4**	0.2U
1,3-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	**8.9**	0.2U	0.2U	**0.3**	**4.6**	**0.3**
2,2-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-butanone	ug/L	4800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
2-Chloroethylvinylether	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
2-Chlorotoluene	ug/L	160	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-Hexanone	ug/L	NA		5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
4-Chlorotoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**
4-Methyl-2-pentanone (MIBK)	ug/L	640	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)
#Y = Undetected at elevated detection limit; associated number is raised reporting limit
##M = Result estimated concentration for analyte detected but with low spectral match.
Bold results = VOC detection
Shaded = concentration above RI screening levels
Blank = not measured
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
NA = no established screening level

Table I. Groundwater (Round 5) - Analytical Results for Locations A-E (see Figure 1 of main report)

				LOCATION A		LOCATION B			LOCATION C			LOC. D	LOCATION E	
	Units	Screening Level	Source	MW-40p2	MW-41a	MW-47c	MW-48b	MW-49p2	MW-44b	MW-45c	MW-46p2	MW-39p2	MW-42b	MW-43p2
Volatile Organic Compounds (VOCs) continued														
Acetone	ug/L	800	MTCA-B non-car	5U	5U	5U	5U	**5**	**12**	5U	5U	5U	**8**	**6.5**
Acrolein	ug/L	160	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acrylonitrile	ug/L	0.081	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Benzene	ug/L	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	**39**	0.2U	0.2U	0.2U	**1.3**	0.2U
Bromobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	**3.1**	0.2U	0.2U	0.2U	**0.5**	0.2U
Bromochloromethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromodichloromethane	ug/L	0.71	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	**0.3**	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoform	ug/L	5.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromomethane	ug/L	11	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Carbon Disulfide	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Tetrachloride	ug/L	0.34	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	**2.1**	0.2U	0.2U	0.2U	**1.2**	0.2U
Chloroethane	ug/L	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	**450**	0.2U	0.2U	**0.4**	**330**	**100**
Chloroform	ug/L	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloromethane	ug/L	3.4	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
cis-1,2-Dichloroethene	ug/L	70	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	**5.5**	0.2U	0.2U	**2**	**38**	**8.6**
cis-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromochloromethane	ug/L	0.52	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromomethane	ug/L	80	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	**2.1**	0.2U	0.2U	0.2U	**0.5**	0.2U
Ethylene Dibromide (EDB)	ug/L	0.00051	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Hexachlorobutadiene	ug/L	0.56	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Hexane	ug/L	NA		0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Isopropylbenzene (Cumene)	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	**2.6**	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl iodide	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Methyl tert-Butyl Ether	ug/L	24	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Methylene Chloride	ug/l	5	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	**12**	0.5U	0.5U	0.5U	**6.7**	**1.3**

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#Y = Undetected at elevated detection limit; associated number is raised reporting limit

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table I. Groundwater (Round 5) - Analytical Results for Locations A-E (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION A		LOCATION B			LOCATION C			LOC. D	LOCATION E	
				MW-40p2	MW-41a	MW-47c	MW-48b	MW-49p2	MW-44b	MW-45c	MW-46p2	MW-39p2	MW-42b	MW-43p2
Volatile Organic Compounds (VOCs) continued														
Naphthalene	ug/L	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	**0.2**	0.2U	0.2U	0.2U	0.2U	0.2U
n-Propylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	**0.7**	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	**0.7**	0.2U	0.2U	0.2U	**0.8**	0.2U
sec-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	**0.7**	0.2U	0.2U	0.2U	**0.3**	0.2U
Styrene	ug/L	1.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
tert-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	**0.3**	0.2U	0.2U	0.2U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	0.081	MTCA-B car	**0.2**	**1.8**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**1.8**	**4**	**1.1**
Toluene	ug/L	640	MTCA-B non-car	**0.2**	0.2U	0.2U	0.2U	**0.7**	**0.3**	0.2U	0.2U	**0.3**	0.2U	0.2U
trans-1,2-Dichloroethene	ug/L	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	**1.8**	0.2U	0.2U	0.2U	**1.2**	**0.3**
trans-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.4Y	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Trichloroethene (TCE)	ug/L	0.49	MTCA-B car	0.2U	**0.2**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.5**	**2.2**	**0.7**
Trichlorofluoromethane	ug/l	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.2**	0.2U	0.2U
Vinyl Acetate	ug/L	8000	MTCA-B non-car	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Vinyl Chloride	ug/L	0.029	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	**1.8**	0.2U	0.2U	**0.3**	**9.4**	**0.4**
Xylene Isomers, M+P	ug/L	1600	MTCA-B non-car	0.4U	0.4U	0.4U	0.4U	0.4U	**0.6**	0.4U	0.4U	0.4U	**0.5**	0.4U

	Units	Screening Level	Source	LOCATION A		LOCATION B			LOCATION C			LOC. D	LOCATION E	
				MW-40p2	MW-41a	MW-47c	MW-48b	MW-49p2	MW-44b	MW-45c	MW-46p2	MW-39p2	MW-42b	MW-43p2
Other Organic Compounds														
Ethane	ug/L	NA			2.9	1.2U		1.2U		1.2U	1.2U		1.2U	
Ethene	ug/L	NA			1.1U	1.1U		1.1U		1.1U	1.1U		1.1U	
Methane	ug/L	NA			32.6	0.7U		0.7U		0.7U	0.7U		30.8	
Total Organic Carbon	mg/L	NA		2.74	14.3	1.5U	1.5U	1.5U	40.9	1.5U	1.83	13.8	32.1	6.87

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#Y = Undetected at elevated detection limit; associated number is raised reporting limit

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table I. Groundwater (Round 5) - Analytical Results for Locations A-E (see Figure 1 of main report)

				LOCATION A		LOCATION B			LOCATION C			LOC. D	LOCATION E	
	Units	Screening Level	Source	MW-40p2	MW-41a	MW-47c	MW-48b	MW-49p2	MW-44b	MW-45c	MW-46p2	MW-39p2	MW-42b	MW-43p2
Inorganic Parameters														
Alkalinity (as CaCO3)	mg/L	NA		133	486	151	179	108	624	119	126	695	721	283
Arsenic, Dissolved[1]	ug/L	0.058	MTCA-B car	1.4	0.8	1.7	1.6		4.3	1.2	0.7	3.6	1.5	1.4
Arsenic, Total	ug/L	0.058	MTCA-B car					1.2						
Bicarbonate as HCO3	mg/L	NA		133	486	151	179	108	624	119	126	695	721	283
Carbonate as CO3	mg/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Chloride	mg/L	250	GWCL	35.7	196	7.6	5	3.7	484	67.4	7.1	279	329	45.6
Carbon dioxide	mg/L	NA				2.5				1.8	1		100	
Hydroxide (as CaCO3)	mg/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Iron, Dissolved	ug/L	300	GWCL	50U	9220	50U	50U		290	50U	50U	400	50U	50U
Iron, Total	ug/L	300	GWCL					9230						
Manganese, Dissolved	ug/L	2200	MTCA-B non-car	99	756	21	11		3120	21	53	131	1350	462
Manganese, Total	ug/L	2200	GWCL					126						
Nitrate as Nitrogen	mg/L as N	10	FED MCL	2.49	1.92	1.54	3.3	0.09	0.01U	2.78	0.05U	11.5	0.023	0.027
Nitrate+Nitrite as Nitrogen	mg/L as N	10	FED MCL	2.99	2.2	1.64	3.32	0.09	0.01U	3.03	0.05U	11.6	0.023	0.065
Nitrite as Nitrogen	mg/L as N	1	FED MCL	0.499	0.275	0.101	0.021	0.01U	0.01U	0.251	0.05U	0.085	0.01U	0.038
Sulfate	mg/L	250	GWCL	124	675	33.5	21.4	44.2	29.1	37	117	86.4	95.2	45.6
Total Dissolved Solids	mg/L	500	GWCL	429	1850	253	254	200	1360	314	305	1250	1350	462

				LOCATION A		LOCATION B			LOCATION C			LOC. D	LOCATION E	
	Units	Screening Level	Source	MW-40p2	MW-41a	MW-47c	MW-48b	MW-49p2	MW-44b	MW-45c	MW-46p2	MW-39p2	MW-42b	MW-43p2
Field Parameters														
Dissolved Oxygen	mg/L	NA		1.5	1.5				1	1		1	1	3
pH	std. units	NA		8.06	7.3	7.86	7.7	7.4	7.12	7.8	8.15	7.86	7.11	7.9
Specific Conductance @ 25C	umhos/cm	NA		648	2610	396	420	318	2500	535	499	2210	2270	774
Temperature, 0 F	0 F	NA		68	68.18	71.96	60.8			63.86	64.4	62.78	66.2	68.72
Groundwater Elevation	feet	NA		1240.68	1254.74	1173.21	1232.64	1232.45	1232.55	1172.89	1238.37	1235.18	1232.49	1232.08

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

1. Site background concentration for dissolved arsenic is 3.4 ug/L (see text for details)

Table J1a. Groundwater (Round 6) - Analytical Results for Locations A-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION A		LOCATION B			LCOATION C			LOC D	LOCATION F			LOC. G	LOC. H
				MW-41a	MW-40p2	MW-49p2	MW-48b	MW-47c	MW-46p2	MW-44b	MW-45c	MW-39p2	MW-52p2	MW-51b	MW-50c	MW-54c	MW-53a
Volatile Organic Compounds (VOCs)																	
1,1,1,2-Tetrachloroethane	ug/L	1.7	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.22	MTCA-B car	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
1,1,2-Trichloroethane	ug/L	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	1600	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**53**	0.2U	**0.3**	0.2U	0.2U	0.2U	0.2U	**0.9**
1,1-Dichloroethene	ug/L	7	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**0.86**	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
1,1-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L	NA		0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L	0.0063	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	70	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.031	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**20**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	0.48	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**2.6**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloropropane	ug/L	0.64	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**27**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.3**
1,3,5-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**1.1**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**9.2**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2,2-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-butanone	ug/L	4800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
2-Chloroethylvinylether	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
2-Chlorotoluene	ug/L	160	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-Hexanone	ug/L	NA		5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
4-Chlorotoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table J1a. Groundwater (Round 6) - Analytical Results for Locations A-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION A		LOCATION B			LCOATION C			LOC D	LOCATION F			LOC. G	LOC. H
				MW-41a	MW-40p2	MW-49p2	MW-48b	MW-47c	MW-46p2	MW-44b	MW-45c	MW-39p2	MW-52p2	MW-51b	MW-50c	MW-54c	MW-53a
Volatile Organic Compounds (VOCs) continued																	
4-Methyl-2-pentanone (MIBK)	ug/L	640	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acetone	ug/L	800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	**5.8**	5U	5U	5U	5U	5U	5U	5U
Acrolein	ug/L	160	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acrylonitrile	ug/L	0.081	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Benzene	ug/L	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**34**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**3.2**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromochloromethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromodichloromethane	ug/L	0.71	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.3**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoform	ug/L	5.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromomethane	ug/L	11	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Carbon Disulfide	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Tetrachloride	ug/L	0.34	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**2**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**440**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloromethane	ug/L	3.4	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
cis-1,2-Dichloroethene	ug/L	70	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**7.4**	**0.2**	**1.7**	0.02U	0.02U	0.02U	0.02U	**0.022**
cis-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromochloromethane	ug/L	0.52	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromomethane	ug/L	80	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**1.3**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylene Dibromide (EDB)	ug/L	0.00051	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Hexachlorobutadiene	ug/L	0.56	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Isopropylbenzene (Cumene)	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**1.1**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl iodide	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Methylene Chloride	ug/l	5	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	**12**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)
Bold results = VOC detection
Shaded = concentration above RI screening levels
Blank = not measured
FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)
GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)
MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)
MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)
NA = no established screening level

Table J1a. Groundwater (Round 6) - Analytical Results for Locations A-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION A		LOCATION B			LCOATION C			LOC D	LOCATION F			LOC. G	LOC. H
				MW-41a	MW-40p2	MW-49p2	MW-48b	MW-47c	MW-46p2	MW-44b	MW-45c	MW-39p2	MW-52p2	MW-51b	MW-50c	MW-54c	MW-53a
Volatile Organic Compounds (VOCs) continued																	
Naphthalene	ug/L	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
n-Propylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.2**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.7**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Styrene	ug/L	1.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
tert-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	0.081	MTCA-B car	**1.3**	**0.22**	0.02U	0.02U	0.02U	0.02U	0.02U	**0.031**	**1.1**	0.02U	0.02U	0.02U	0.02U	0.02U
Toluene	ug/L	640	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	0.2U	0.2U	**0.2**	0.2U	0.2U	0.2U	0.2U
trans-1,2-Dichloroethene	ug/L	100	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**1.7**	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
trans-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4M**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Trichloroethene (TCE)	ug/L	0.49	MTCA-B car	**0.2**	0.02U	0.02U	0.02U	0.02U	0.02U	**0.1**	0.02U	**0.35**	0.02U	0.02U	0.02U	0.02U	0.02U
Trichlorofluoromethane	ug/l	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Vinyl Acetate	ug/L	8000	MTCA-B non-car	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Vinyl Chloride	ug/L	0.029	MTCA-B car	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	**2**	**0.023**	**0.29**	0.02U	0.02U	0.02U	0.02U	0.02U
Xylene Isomers, M+P	ug/L	1600	MTCA-B non-car	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U

	Units	Screening Level	Source	LOCATION A		LOCATION B			LCOATION C			LOC D	LOCATION F			LOC G	LOC H
				MW-41a	MW-40p2	MW-49P2	MW-48B	MW-47C	MW-46p2	MW-44b	MW-45c	MW-39p2	MW-52p2	MW-51b	MW-50c	MW-54c	MW-53a
Other Organic Parameters																	
Ethane	ug/L	NA			1.2U	1.2U	1.2U			31.7		1.2U	1.2U	1.2U	1.2U	1.2U	1.2U
Ethene	ug/L	NA			1.1U	1.1U	1.1U			4.8		1.1U	1.1U	1.1U	1.1U	1.1U	1.1U
Methane	ug/L	NA			0.7U	0.7U	0.7U			5760		118	0.7U	0.7U	0.7U	0.7U	0.7U
Total Organic Carbon	mg/L	NA		12.3	3.64	4.76	9.72	4.65		40	4.78	27.7	5.12	5.28	2.47		7.23

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

##M = Result estimated concentration for analyte detected but with low spectral match.

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table J1a. Groundwater (Round 6) - Analytical Results for Locations A-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION A		LOCATION B			LCOATION C			LOC D	LOCATION F			LOC. G	LOC. H
				MW-41a	MW-40p2	MW-49p2	MW-48b	MW-47c	MW-46p2	MW-44b	MW-45c	MW-39p2	MW-52p2	MW-51b	MW-50c	MW-54c	MW-53a
Inorganic Parameters																	
Alkalinity (as CaCO3)	mg/L	NA		251	122	99.6	178	145	124	608	113	686	118	165	124	131	185
Arsenic, Dissolved[1]	ug/L	0.058	MTCA-B car	0.8	1U	0.7	1.5	1.6		3.9	1	3.1	0.7	1.1	0.6	3.1	9
Bicarbonate As CaCO3	mg/L	NA		251	122	99.6	178	145	124	608	113	686	118	165	124	129	185
Calcium, Total	mg/L	NA		121	61.9	28.7	43.5	31.3	48	265	36.7	251	22.5	36	18.6	35.6	47.6
Carbon dioxide	mg/L	NA		19	1.5	1.3	4.7			80		42	0.47	2.4	1	0.23	6.2
Carbonate as CaCO3	mg/L	NA		1U	1U	1U	1U	1U	1U	1U		1U					
Carbonate as CO3	mg/L	NA									1U		1U	1U	1U	2	1U
Chloride	mg/L	250	GWCL			3.2	5.8	7.4	6.4	431	68		3.7	7.9	6	9.6	16
Hydroxide (as CaCO3)	mg/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Iron, Dissolved[2]	ug/L	300	GWCL	1770	180	50U	50U	50U		640	50U	50U	50U	50U	330	2200	50U
Magnesium, Total	mg/L	NA		42.1	28.5	11.5	18.8	15.5	24.1	124	20.5	134	9.53	17.7	15.9	17.6	14.3
Manganese, Dissolved	ug/L	2200	MTCA-B non-car	174	293	8	11	36		2890	11	29	27	9	45	57	8
Nitrate as Nitrogen	mg/L as N	10	FED MCL	3.17	1.74	0.013	3.51	2.13	0.074	0.01U	2.99	0.823	0.01U	0.846	0.01U	0.02U	3.38
Nitrate+Nitrite as Nitrogen	mg/L as N	10	FED MCL	3.2	2.01	0.013	3.51	2.14	0.074	0.01U	3.02	0.856	0.01U	0.846	0.01U	0.097	3.38
Nitrite as Nitrogen	mg/L as N	1	FED MCL	0.034	0.27	0.01U	0.05U	0.011	0.01U	0.01U	0.027	0.033	0.01U	0.01U	0.01U	0.104	0.01U
Potassium, Total	mg/L	NA		29.5	10.2	3.5	5.31	5.77	9.55	14.5	7.28	16.9	5.54	6.73	8.4	18.2	2.91
Sodium, Total	mg/L	NA		66.1	27.1	15.4	14	23.5	19.9	49.3	17.6	60.3	16.6	17.3	24.3	56	47.5
Sulfate	mg/L	250	GWCL	317	142	52.3	28.2	34	99.5	34.2	40.2	95.6	26.3	50.9	50.8	63.5	66.4
Total Dissolved Solids	mg/L	500	GWCL	821	412	175	284	236	319	1350	284	1240	185	270	228	382	353
Total Kjeldahl Nitrogen	mg/L as N	NA		0.9	0.3U	0.3U	0.3U	0.3U	0.3U	1.96	0.35	1.63		0.3U	0.3U		0.3U

	Units	Screening Level	Source	LOCATION A		LOCATION B			LCOATION C			LOC D	LOCATION F			LOC G	LOC H
				MW-41a	MW-40p2	MW-49P2	MW-48B	MW-47C	MW-46p2	MW-44b	MW-45c	MW-39p2	MW-52p2	MW-51b	MW-50c	MW-54c	MW-53a
Field Parameters																	
Depth to Water	feet	NA		7.36	22.29	45.61	48.8	104.67	26.57	33.4	93.19	29.54	35.95	42.9	82.36	103.74	11.7
Dissolved Oxygen	mg/L	NA		2	1.5	2	8	2.5		0.3	0.6	1.5	5	3	0.4	4.5	6
Oxidation Reduction Potential	mV	NA		-54	120	317	371	155		37	2	251	245	131	-126	-15	164
pH	std. units	NA		7	7.8	7.29	7.25	4.53	7.14	6.47	8.1	6.7	7.6	8.32	8.03	8.69	7.22
Specific Conductance @ 25C	umhos/cm	NA			768	360	492	420	540	2730	509	2710	294	395	300	343	551
Temperature, 0 F	0 F	NA		49.3	54.7	57.9	55.4	61.3	51.8	52.88	62.78	59	56.3	58.1	60.4	65.3	55.2

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC); MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

1. Site background concentration for dissolved arsenic is 3.4 ug/L (see text for details)

2. Elevated dissolved iron in MW-50c and MW-54c may be drilling related. Second sampling event (Round 7) was below detected (50 ug/L).

Table J1b. Groundwater (Round 6) - Analytical Results for Former Drum Area and East of Landfill Area (MW-26a)

	Units	Screening Level	Source	FORMER DRUM AREA										East of Landfill
				MW-32a	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-43p2	MW-29b	MW-30b	MW-31b	MW-42b	MW-26a
Volatile Organic Compounds (VOCs)														
1,1,1,2-Tetrachloroethane	ug/L	1.7	MTCA-B car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	200	FED MCL	**17**	**2.3**	0.2U	20U	**2700**	0.2U	0.2U	**1.1**	**0.4**	0.2U	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.22	MTCA-B car	0.02U	0.02U	0.02U	0.02U	2U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U
1,1,2-Trichloroethane	ug/L	0.77	MTCA-B car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	240000	MTCA-B non-car	**1.3**	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	1600	MTCA-B non-car	**98**	**7.9**	**17**	**100**	**3300**	**5.8**	**51**	**1.4**	**1.1**	**43**	0.2U
1,1-Dichloroethene	ug/L	7	FED MCL	**5**	**1.7**	**0.13**	**0.67**	**470**	**0.45**	**0.76**	**0.056**	**3.2**	**4.1**	0.02U
1,1-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L	NA		0.5U	0.5U	0.5U	50U	380U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L	0.0063	MTCA-B car	0.5U	0.5U	0.5U	50U	380U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	70	FED MCL	0.5U	0.5U	0.5U	50U	380U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L	400	MTCA-B non-car	**13**	0.2U	**5**	**80**	**300**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.031	MTCA-B car	0.5U	0.5U	0.5U	50U	380U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L	600	FED MCL	**0.3**	0.2U	**8.4**	20U	150U	0.2U	**13**	0.2U	0.2U	**4.5**	0.2U
1,2-Dichloroethane (EDC)	ug/L	0.48	MTCA-B car	**3.8**	0.2U	**1**	20U	**440**	**1**	**5.1**	0.2U	0.2U	**5.3**	0.2U
1,2-Dichloropropane	ug/L	0.64	MTCA-B car	**12**	**20**	**3.5**	20U	**990**	**12**	**62**	0.2U	0.2U	**24**	0.2U
1,3,5-Trimethylbenzene	ug/L	400	MTCA-B non-car	**5.1**	0.2U	**0.4**	**25**	**160**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	NA		0.2U	0.2U	**0.4**	20U	150U	0.2U	0.2U	0.2U	0.2U	**0.4**	0.2U
1,3-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	1.8	MTCA-B car	**0.3**	0.2U	**12**	20U	150U	0.2U	**3.2**	0.2U	0.2U	**4.2**	0.2U
2,2-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-butanone	ug/L	4800	MTCA-B non-car	**24**	5U	5U	500U	3800U	5U	5U	5U	5U	5U	5U
2-Chloroethylvinylether	ug/L	NA		1U	1U	1U	100U	750U	1U	1U	1U	1U	1U	1U
2-Chlorotoluene	ug/L	160	MTCA-B non-car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-Hexanone	ug/L	NA		5U	5U	5U	500U	3800U	5U	5U	5U	5U	5U	5U
4-Chlorotoluene	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	NA		0.2U	0.2U	**0.3**	20U	150U	0.2U	0.2U	0.2U	**0.2**	0.2U	0.2U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

##E = Result estimated concentration for analyte above valid instrument calibration range (dilution value not reported because undetected)

##Q = VOC detection in sample; continuing lab calibration low for this compound; method allows up to 20% of compounds to be out of control

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

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MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table J1b. Groundwater (Round 6) - Analytical Results for Former Drum Area and East of Landfill Area (MW-26a)

	Units	Screening Level	Source	FORMER DRUM AREA										East of Landfill
				MW-32a	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-43p2	MW-29b	MW-30b	MW-31b	MW-42b	MW-26a
Volatile Organic Compounds (VOCs) continued														
4-Methyl-2-pentanone (MIBK)	ug/L	640	MTCA-B non-car	**9.7**	5U	**5.3**	500U	3800U	5U	5U	5U	5U	5U	5U
Acetone	ug/L	800	MTCA-B non-car	**210**	5U	5U	500U	3800U	5U	5U	5U	5U	**6.4**	5U
Acrolein	ug/L	160	MTCA-B non-car	5U	5U	5U	500U	3800U	5U	5U	5U	5U	5U	5U
Acrylonitrile	ug/L	0.081	MTCA-B car	1U	1U	1U	100U	750U	1U	1U	1U	1U	1U	1U
Benzene	ug/L	0.8	MTCA-B car	**0.9**	0.2U	**16**	**61**	**150**	0.2U	**3.4**	0.2U	0.2U	**2**	0.2U
Bromobenzene	ug/L	NA		0.2U	0.2U	**1.1**	20U	150U	0.2U	**0.4**	0.2U	0.2U	**0.4**	0.2U
Bromochloromethane	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromodichloromethane	ug/L	0.71	MTCA-B car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoethane	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	**0.2**	0.2U
Bromoform	ug/L	5.5	MTCA-B car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromomethane	ug/L	11	MTCA-B non-car	0.5U	0.5U	0.5U	50U	380U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Carbon Disulfide	ug/L	800	MTCA-B non-car	**0.3**	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Tetrachloride	ug/L	0.34	MTCA-B car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	100	FED MCL	0.2U	0.2U	**3**	20U	150U	0.2U	**2.5**	0.2U	0.2U	**1**	0.2U
Chloroethane	ug/L	15	MTCA-B car	**0.8Q**	**0.6Q**	**130Q**	**560Q**	150U	**11Q**	**6.5Q**	0.2U	**0.3Q**	**320**	0.2U
Chloroform	ug/L	7.2	MTCA-B car	0.2U	**0.9**	0.2U	20U	**230**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloromethane	ug/L	3.4	MTCA-B car	0.5U	0.5U	0.5U	50U	380U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
cis-1,2-Dichloroethene	ug/L	70	FED MCL	**11**	**3.7**	**2.3**	**15E**	**820**	**6.6**	**18**	**0.4**	**0.056**	**37**	0.02U
cis-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromochloromethane	ug/L	0.52	MTCA-B car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromomethane	ug/L	80	MTCA-B non-car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	800	MTCA-B non-car	**26**	**0.4**	**7.6**	**510**	**1300**	0.2U	0.2U	0.2U	**1.4**	0.2U	0.2U
Ethylene Dibromide (EDB)	ug/L	0.00051	MTCA-B car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Hexachlorobutadiene	ug/L	0.56	MTCA-B car	0.5U	0.5U	0.5U	50U	380U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Isopropylbenzene (Cumene)	ug/L	800	MTCA-B non-car	**1.2**	0.2U	**0.6**	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl iodide	ug/L	NA		1U	1U	1U	100U	750U	1U	1U	1U	1U	1U	1U
Methylene Chloride	ug/l	5	FED MCL	**0.8**	0.5U	**5.1**	50U	380U	0.5U	**1.4**	0.5U	0.5U	**7.1**	0.5U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

##E = Result estimated concentration for analyte above valid instrument calibration range (dilution value not reported because undetected)

##Q = VOC detection in sample; continuing lab calibration low for this compound; method allows up to 20% of compounds to be out of control

Bold results = VOC detection

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MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table J1b. Groundwater (Round 6) - Analytical Results for Former Drum Area and East of Landfill Area (MW-26a)

	Units	Screening Level	Source	FORMER DRUM AREA										East of Landfill
				MW-32a	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-43p2	MW-29b	MW-30b	MW-31b	MW-42b	MW-26a
Volatile Organic Compounds (VOCs) continued														
Naphthalene	ug/L	160	MTCA-B non-car	**6.4**	0.5U	**1.8**	50U	380U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
n-Propylbenzene	ug/L	NA		**1.5**	0.2U	**0.5**	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	16000	MTCA-B non-car	**44**	**0.3**	**1.8**	**290**	**2000**	0.2U	**0.2**	0.2U	**0.9**	**0.4**	0.2U
sec-Butylbenzene	ug/L	NA		0.2U	0.2U	**0.4**	20U	150U	0.2U	0.2U	0.2U	0.2U	**0.2**	0.2U
Styrene	ug/L	1.5	MTCA-B car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
tert-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	0.081	MTCA-B car	**0.63**	**1.9**	**0.33**	**0.55**	**21**	**0.56**	**0.6**	**0.032**	0.02U	**3.6**	**0.11**
Toluene	ug/L	640	MTCA-B non-car	**95**	**3**	**10**	**2200**	**18000**	0.2U	**0.4**	**1.4**	**11**	0.2U	0.2U
trans-1,2-Dichloroethene	ug/L	100	FED MCL	**0.078**	**0.02**	**1.3**	**3.2**	**9.1**	**0.027**	**0.4**	0.02U	0.02U	**1**	0.02U
trans-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	NA		1U	1U	1U	100U	750U	1U	1U	1U	1U	1U	1U
Trichloroethene (TCE)	ug/L	0.49	MTCA-B car	**0.72**	**2.2**	**1.6**	**0.83**	**19**	**0.42**	**1.8**	**0.066**	**0.079**	**1.8**	0.02U
Trichlorofluoromethane	ug/l	2400	MTCA-B non-car	0.2U	0.2U	0.2U	20U	150U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Vinyl Acetate	ug/L	8000	MTCA-B non-car	1U	1U	1U	100U	750U	1U	1U	1U	1U	1U	1U
Vinyl Chloride	ug/L	0.029	MTCA-B car	**9.8**	**0.58**	**4.7**	**22**	**1000**	**0.038**	**23**	**0.043**	**5.1**	**8.7**	0.02U
Xylene Isomers, M+P	ug/L	1600	MTCA-B non-car	**70**	**0.7**	**10**	**600**	**4000**	0.4U	0.4U	0.4U	**2**	0.4U	0.4U

	Units	Screening Level	Source	FORMER DRUM AREA										East of Landfill
				MW-32a	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-43p2	MW-29b	MW-30b	MW-31b	MW-42b	MW-26a
Other Organic Parameters														
Ethane	ug/L	NA							1.2U					
Ethene	ug/L	NA							1.1U					
Methane	ug/L	NA							8.5					
Total Organic Carbon	mg/L	NA		114	7.89	103	80.6	35.1		22.2	2.17	1.63	35	16.5

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

##E = Result estimated concentration for analyte above valid instrument calibration range (dilution value not reported because undetected)

##Q = VOC detection in sample; continuing lab calibration low for this compound; method allows up to 20% of compounds to be out of control

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table J1b. Groundwater (Round 6) - Analytical Results for Former Drum Area and East of Landfill Area (MW-26a)

	Units	Screening Level	Source	FORMER DRUM AREA										East of Landfill
				MW-32a	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-43p2	MW-29b	MW-30b	MW-31b	MW-42b	MW-26a
Inorganic Parameters														
Alkalinity (as CaCO3)	mg/L	NA		1160	451	1020	768	524		267	154	119	639	232
Arsenic, Dissolved[1]	ug/L	0.058	MTCA-B car	16.4	2.9	2	3	2.8	1.1	1U	1.5	0.5U	1.4	2.4
Bicarbonate As CaCO3	mg/L	NA		1160	451	1020	768	524		267	154	119	639	232
Calcium, Total	mg/L	NA		263						183	68.2	31.9	325	63.6
Carbon dioxide	mg/L	NA			120				4					
Carbonate as CaCO3	mg/L	NA		1U	1U	1U	1U	1U		1U	1U	1U	1U	1U
Carbonate as CO3	mg/L	NA												
Chloride	mg/L	250	GWCL	80.3	92.9	1370			89.5	466	8.9		348	26.7
Hydroxide (as CaCO3)	mg/L	NA		1U	1U	1U	1U	1U		1U	1U	1U	1U	1U
Iron, Dissolved	ug/L	300	GWCL	15300	50U	90	90	270	50U	320	10200	270	120	50U
Magnesium, Total	mg/L	NA		104						77.6	40.6	15.6	107	25
Manganese, Dissolved	ug/L	2200	MTCA-B non-car	9370	199	13400	8730	4020	138	882	302	84	1650	1U
Nitrate as Nitrogen	mg/L as N	10	FED MCL	0.1U	5.59	0.01U	0.01U	0.03	0.253	0.128	0.02U	0.01U	0.01U	4.49
Nitrate+Nitrite as Nitrogen	mg/L as N	10	FED MCL	0.1U	6.68	0.048	0.037	0.08	0.253	0.128	0.072	0.01U	0.01U	4.49
Nitrite as Nitrogen	mg/L as N	1	FED MCL	0.1U	1.09	0.043	0.028	0.05	0.01U	0.01U	0.071	0.01U	0.01U	0.01U
Potassium, Total	mg/L	NA		29.4						14.1	11	6.46	10.4	7.91
Sodium, Total	mg/L	NA		91						47.8	27.9	18.3	43.9	34
Sulfate	mg/L	250	GWCL	82.9	368	46.8	2U	67.3	52.6	84.3	37.6	45.6	264	53.3
Total Dissolved Solids	mg/L	500	GWCL	1510	1150	2980	2040	860	438	1070	245	248	1520	423
Total Kjeldahl Nitrogen	mg/L as N	NA		4.78	0.92	6.54	2.71	0.87		1.06	0.3U	0.3U	1.63	

	Units	Screening Level	Source	FORMER DRUM AREA										East of Landfill
				MW-32a	MW-37p1	MW-33p2	MW-35p2	MW-38p2	MW-43p2	MW-29b	MW-30b	MW-31b	MW-42b	MW-26a
Field Parameters														
Depth to Water	feet	NA		22.25	20.73		50.26	43.19	48.43	52.83	56.41	40.5	47.75	22.55
Dissolved Oxygen	mg/L	NA		0.4		0.9		2	5		5	0.6	0.5	
Oxidation Reduction Potential	mV	NA		-134	196	-36	-67	-2	321	-133	5	67	57	314
pH	std. units	NA		6.3	6.27	6.2	6.25	6.59	6.51	6.95	7.07	7.43	6.97	6.75
Specific Conductance @ 25C	umhos/cm	NA			1730	6220	4340	1920	900	2370	446	425	2810	748
Temperature, 0 F	0 F	NA		67.5	62.1	61	60.4	52.9	53.2	66.2	65.5	48.4	60.3	57.9

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC); MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

1. Site background concentration for dissolved arsenic is 3.4 ug/L (see text for details)

Table K1. Groundwater (Round 7) - Analytical Resultsfor Locations F-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION F			LOC. G	LOC. H
				MW-50c	MW-51b	MW-52p2	MW-54c	MW-53a
Volatile Organic Compounds (VOCs)								
1,1,1,2-Tetrachloroethane	ug/L	1.7	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	200	FED MCL	0.2U	0.2U	0.2U	0.2U	**0.4**
1,1,2,2-Tetrachloroethane	ug/L	0.22	MTCA-B car	0.02U	0.02U	0.02U	0.02U	0.02U
1,1,2-Trichloroethane	ug/L	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	1600	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	**1.3**
1,1-Dichloroethene	ug/L	7	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U
1,1-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L	NA		0.5U	0.5U	0.5U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L	0.0063	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	70	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.031	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	0.48	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloropropane	ug/L	0.64	MTCA-B car	0.2U	0.2U	0.2U	0.2U	**0.4**
1,3,5-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table K1. Groundwater (Round 7) - Analytical Resultsfor Locations F-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION F			LOC. G	LOC. H
				MW-50c	MW-51b	MW-52p2	MW-54c	MW-53a
Volatile Organic Compounds (VOCs) continued								
1,3-Dichlorobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
2,2-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
2-butanone	ug/L	4800	MTCA-B non-car	5U	5U	5U	5U	5U
2-Chloroethylvinylether	ug/L	NA		1U	1U	1U	1U	1U
2-Chlorotoluene	ug/L	160	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U
2-Hexanone	ug/L	NA		5U	5U	5U	5U	5U
4-Chlorotoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
4-Methyl-2-pentanone (MIBK)	ug/L	640	MTCA-B non-car	5U	5U	5U	5U	5U
Acetone	ug/L	800	MTCA-B non-car	5U	5U	5U	5U	5U
Acrolein	ug/L	160	MTCA-B non-car	5U	5U	5U	5U	5U
Acrylonitrile	ug/L	0.081	MTCA-B car	1U	1U	1U	1U	1U
Benzene	ug/L	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
Bromochloromethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
Bromodichloromethane	ug/L	0.71	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
Bromoform	ug/L	5.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
Bromomethane	ug/L	11	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table K1. Groundwater (Round 7) - Analytical Resultsfor Locations F-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION F			LOC. G	LOC. H
				MW-50c	MW-51b	MW-52p2	MW-54c	MW-53a
Volatile Organic Compounds (VOCs) continued								
Carbon Disulfide	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Tetrachloride	ug/L	0.34	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
Chloromethane	ug/L	3.4	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U
cis-1,2-Dichloroethene	ug/L	70	FED MCL	0.02U	0.02U	0.02U	0.02U	**0.053**
cis-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
Dibromochloromethane	ug/L	0.52	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromomethane	ug/L	80	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylene Dibromide (EDB)	ug/L	0.00051	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
Hexachlorobutadiene	ug/L	0.56	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U
Isopropylbenzene (Cumene)	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl iodide	ug/L	NA		1U	1U	1U	1U	1U
Methylene Chloride	ug/l	5	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U
Naphthalene	ug/L	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U
n-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
n-Propylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table K1. Groundwater (Round 7) - Analytical Resultsfor Locations F-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION F			LOC. G	LOC. H
				MW-50c	MW-51b	MW-52p2	MW-54c	MW-53a
Volatile Organic Compounds (VOCs) continued								
sec-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
Styrene	ug/L	1.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U
tert-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	0.081	MTCA-B car	0.02U	0.02U	0.02U	0.02U	**0.15**
Toluene	ug/L	640	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,2-Dichloroethene	ug/L	100	FED MCL	0.02U	0.02U	0.02U	0.02U	0.02U
trans-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	NA		1U	1U	1U	1U	1U
Trichloroethene (TCE)	ug/L	0.49	MTCA-B car	0.02U	0.02U	0.02U	**0.027**	**0.083**
Trichlorofluoromethane	ug/l	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U
Vinyl Acetate	ug/L	8000	MTCA-B non-car	1U	1U	1U	1U	1U
Vinyl Chloride	ug/L	0.029	MTCA-B car	0.02U	0.02U	0.02U	0.02U	0.02U
Xylene Isomers, M+P	ug/L	1600	MTCA-B non-car	0.4U	0.4U	0.4U	0.4U	0.4U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table K1. Groundwater (Round 7) - Analytical Resultsfor Locations F-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION F			LOC. G	LOC. H
				MW-50c	MW-51b	MW-52p2	MW-54c	MW-53a
Inorganic Parameters								
Alkalinity (as CaCO3)	mg/L	NA		126	151	125	119	192
Arsenic, Dissolved[1]	ug/L	0.058	MTCA-B car	1U	2	1U	1	9
Bicarbonate As CaCO3	mg/L	NA		126	151	125	115	192
Calcium, Total	mg/L	NA		19.5	33.3	31.1	15.7	50.5
Carbonate as CaCO3	mg/L	NA		1U	1U	1U	4	1U
Chloride	mg/L	250	GWCL	5.8	5.9	3.9	6.2	16.7
Hydroxide (as CaCO3)	mg/L	NA		1U	1U	1U	1U	1U
Iron, Dissolved	ug/L	300	GWCL	50U	50U	50U	50U	50U
Magnesium, Total	mg/L	NA		16	15.8	14.4	9.16	15.1
Manganese, Dissolved	ug/L	2200	MTCA-B non-car	44	11	42	52	7
Nitrate as Nitrogen	mg/L as N	10	FED MCL	0.01U	0.445	0.021	0.01U	3.3
Nitrate+Nitrite as Nitrogen	mg/L as N	10	FED MCL	0.01U	0.445	0.021	0.016	3.3

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

1. Site background concentration for dissolved arsenic is 3.4 ug/L (see text for details)

Table K1. Groundwater (Round 7) - Analytical Resultsfor Locations F-H (see Figure 1 of main report)

	Units	Screening Level	Source	LOCATION F			LOC. G	LOC. H
				MW-50c	MW-51b	MW-52p2	MW-54c	MW-53a
Inorganic Parameters continued								
Nitrite as Nitrogen	mg/L as N	1	FED MCL	0.01U	0.01U	0.01U	0.018	0.01U
Potassium, Total	mg/L	NA		8.6	6.4	7.9	18.2	3.1
Sodium, Total	mg/L	NA		25	17.3	17.7	35.8	49.1
Sulfate	mg/L	250	GWCL	40.9	39.1	24.4	39.6	68.5
Total Dissolved Solids	mg/L	500	GWCL	212	240	189	216	358

	Units	Screening Level	Source	LOCATION F			LOC. G	LOC. H
				MW-50c	MW-51b	MW-52p2	MW-54c	MW-53a
Field Parameters								
Depth to Water	feet	NA		82.1	42.45	36.53	98.92	11.18
pH	std. units	NA		7.74	7.65	8	8.67	7.06
Specific Conductance @ 25C	umhos/cm	NA		305	308	251	350	487
Temperature, 0 F	0 F	NA		59.2	54.9	53.8	48.6	51.8

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Shaded = concentration above RI screening levels

Blank = not measured

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table L1. Groundwater (Phase 2 Drilling) - Analytical Results

		Location:	P1 LOC. A	P1 at LOC. E	P1 at LOC. B	P2 LOC. D	P2 LOC. A
		Borings:	B-29-P1	B-32-30	B-36-15	MW-39p2	MW-40p2
		Final Well Completion at Boring:	(MW-40p2)	(MW-43p2)	(MW-47C)	(MW-39p2)	(MW-40p2)
Volatile Organic Compounds (VOCs)	Units						
1,1,1,2-Tetrachloroethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2,2-Tetrachloroethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L		0.2U	0.2U	0.2U	**0.4**	0.2U
1,1-Dichloroethene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloropropene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L		0.5U	0.5U	0.5U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L		0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L		0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dibromo-3-chloropropane	ug/L		0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloropropane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichloropropane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L		0.2U	0.2U	0.2U	**0.3**	0.2U
2,2-Dichloropropane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
2-butanone	ug/L		5U	5U	5U	5U	5U
2-Chloroethylvinylether	ug/L		1U	1U	1U	1U	1U
2-Chlorotoluene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
2-Hexanone	ug/L		5U	5U	5U	5U	5U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Blank = not measured

Table L1. Groundwater (Phase 2 Drilling) - Analytical Results

		Location:	P1 LOC. A	P1 at LOC. E	P1 at LOC. B	P2 LOC. D	P2 LOC. A
		Borings:	B-29-P1	B-32-30	B-36-15	MW-39p2	MW-40p2
		Final Well Completion at Boring:	(MW-40p2)	(MW-43p2)	(MW-47C)	(MW-39p2)	(MW-40p2)
Volatile Organic Compounds (VOCs) cont.	Units						
4-Chlorotoluene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L		0.2U	0.2U	0.2U	0.2U	**0.8**
4-Methyl-2-pentanone (MIBK)	ug/L		5U	5U	5U	5U	5U
Acetone	ug/L		**17**	5U	5U	**7.7**	5U
Acrolein	ug/L		5U	5U	5U	5U	5U
Acrylonitrile	ug/L		1U	1U	1U	1U	1U
Benzene	ug/L		**0.5**	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Bromochloromethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Bromodichloromethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Bromoethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Bromoform	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Bromomethane	ug/L		0.5U	0.5U	0.5U	0.5U	0.5U
Carbon Disulfide	ug/L		**0.3**	0.2U	0.2U	0.2U	0.2U
Carbon Tetrachloride	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Chloromethane	ug/L		0.5U	0.5U	0.5U	0.5U	0.5U
cis-1,2-Dichloroethene	ug/L		0.2U	0.2U	0.2U	**1.3**	0.2U
cis-1,3-Dichloropropene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Dibromochloromethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Dibromomethane	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Ethylene Dibromide (EDB)	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Blank = not measured

Table L1. Groundwater (Phase 2 Drilling) - Analytical Results

		Location:	P1 LOC. A	P1 at LOC. E	P1 at LOC. B	P2 LOC. D	P2 LOC. A
		Borings:	B-29-P1	B-32-30	B-36-15	MW-39p2	MW-40p2
		Final Well Completion at Boring:	(MW-40p2)	(MW-43p2)	(MW-47C)	(MW-39p2)	(MW-40p2)
Volatile Organic Compounds (VOCs) cont.	Units						
Hexachlorobutadiene	ug/L		0.5U	0.5U	0.5U	0.5U	0.5U
Hexane	ug/L			0.5U	0.5U	0.5U	0.5U
Isopropylbenzene (Cumene)	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Methyl iodide	ug/L		1U	1U	1U	1U	1U
Methyl tert-Butyl Ether	ug/L			0.5U	0.5U	0.5U	0.5U
Methylene Chloride	ug/l		0.5U	0.5U	0.5U	0.5U	0.5U
Naphthalene	ug/L		0.5U	0.5U	0.5U	0.5U	0.5U
n-Butylbenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
n-Propylbenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Styrene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
tert-Butylbenzene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L		**1**	0.2U	0.2U	**0.8**	0.2U
Toluene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,2-Dichloroethene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,3-Dichloropropene	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L		1U	1U	1U	1U	1U
Trichloroethene (TCE)	ug/L		0.2U	0.2U	0.2U	**0.3**	0.2U
Trichlorofluoromethane	ug/l		0.2U	0.2U	0.2U	0.2U	0.2U
Vinyl Acetate	ug/L		1U	1U	1U	1U	1U
Vinyl Chloride	ug/L		0.2U	0.2U	0.2U	0.2U	0.2U
Xylene Isomers, M+P	ug/L		0.4U	0.4U	0.4U	0.4U	0.4U

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Blank = not measured

Table L1. Groundwater (Phase 2 Drilling) - Analytical Results

		Location:	P1 LOC. A	P1 at LOC. E	P1 at LOC. B	P2 LOC. D	P2 LOC. A
		Borings:	B-29-P1	B-32-30	B-36-15	MW-39p2	MW-40p2
		Final Well Completion at Boring:	(MW-40p2)	(MW-43p2)	(MW-47C)	(MW-39p2)	(MW-40p2)
Inorganic Parameters	Units						
Alkalinity (as CaCO3)	mg/L			130			
Ammonia as Nitrogen, Total	mg/L as N				0.03		
Arsenic, Dissolved	ug/L		2.3	0.7		2.5	1.4
Bicarbonate as HCO3	mg/L			127			
Calcium, Total	mg/L			129			
Carbonate as CO3	mg/L			3			
Chloride	mg/L		233	47.7	6.1	327	43.5
Hydroxide (as CaCO3)	mg/L			1U			
Iron, Dissolved	ug/L		2460	50U		50U	50U
Magnesium, Total	mg/L			58.6			
Manganese, Dissolved	ug/L		7160	62		147	50
Nitrate as Nitrogen	mg/L as N		12.9	36.5	12.7	17.8	4.48
Nitrate+Nitrite as Nitrogen	mg/L as N		14	36.6	12.8	17.9	4.65
Nitrite as Nitrogen	mg/L as N		1.11	0.07	0.076	0.084	0.172
Potassium, Total	mg/L			11			
Sodium, Total	mg/L			32.6			
Sulfate	mg/L		1860	96.5	38.2	93.5	112
Total Dissolved Solids	mg/L		3320	549		1270	463
Field Parameters	Units						
pH	std. units		7.59	8.32	7.21		9
Specific Conductance @ 25C	umhos/cm		3880	1077	384		348
Temperature, 0 F	0 F		66	61.52	66.92		62
Water Level Elevation	feet			1252.91	1259.52		

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

Bold results = VOC detection

Blank = not measured

Table M1. Groundwater (Private Wells) - Analytical Results

VOLATILE ORGANIC COMPOUNDS (VOCs)	Units	Screening Level	Source	Abrams Initial	Abrams Confirm	Atkins New (aka Murphy)	Bolyard Deep	Bolyard Shallow	Gutierrez (Castillo)	Country Boys	Gutierrez (Field)	Gutierrez (House)	Moore	Olivares	Pashkovsky Leonid	Pashkovsky Vladimir	Perez	Roland	Whitson Initial	Whitson Confirm	City Irrigation	City MW#2	City MW#3
1,1,1,2-Tetrachloroethane	ug/L	1.7	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.22	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichloroethane	ug/L	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	1600	MTCA-B non-car	**0.7**	**0.4**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.3**	**1.2**	**2.1**	0.2U	**5.8**	**6.2**	0.2U	0.2U	0.2U
1,1-Dichloroethene	ug/L	7	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.2**	**0.2**	0.2U	0.2U	0.2U
1,1-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L	NA		0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L	0.0063	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	70	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.031	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.2**	**0.3**	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	0.48	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.2M**	0.2U	**0.6**	**0.5**	0.2U	0.2U	0.2U
1,2-Dichloropropane	ug/L	0.64	MTCA-B car	**0.7**	**0.4**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	**1.7**	**2.9**	0.2U	**4.7**	**4.6**	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2,2-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-butanone	ug/L	4800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
2-Chloroethylvinylether	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
2-Chlorotoluene	ug/L	160	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-Hexanone	ug/L	NA		5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
4-Chlorotoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Methyl-2-pentanone (MIBK)	ug/L	640	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U

Shaded cells for visual aid, no significance in terms of analytical results

Bold results = VOC detection

Outlined results = concentration above RI screening levels

Blank results = not measured

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#K = a flagged detection indicating constituent was detected in the Trip Blank near reporting limit; associated number is the concentration measured in the sample

#M = a flagged detection with an estimated value due to a low spectral match; associated number is the concentration measured in the sample

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table M1. Groundwater (Private Wells) - Analytical Results

VOLATILE ORGANIC COMPOUNDS (VOCs) cont.	Units	Screening Level	Source	Abrams Initial	Abrams Confirm	Atkins New (aka Murphy)	Bolyard Deep	Bolyard Shallow	Gutierrez (Castillo)	Country Boys	Gutierrez (Field)	Gutierrez (House)	Moore	Olivares	Pashkovsky Leonid	Pashkovsky Vladimir	Perez	Roland	Whitson Initial	Whitson Confirm	City Irrigation	City MW#2	City MW#3
Acetone	ug/L	800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acrolein	ug/L	160	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acrylonitrile	ug/L	0.081	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Benzene	ug/L	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.7**	**0.7**	0.2U	0.2U	0.2U
Bromobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromochloromethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromodichloromethane	ug/L	0.71	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoform	ug/L	5.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromomethane	ug/L	11	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Carbon Disulfide	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.3**	0.2U
Carbon Tetrachloride	ug/L	0.34	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**2.1**	**2.4**	0.2U	0.2U	0.2U
Chloroform	ug/L	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloromethane	ug/L	3.4	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
cis-1,2-Dichloroethene	ug/L	70	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	**0.8**	0.2U	**2.3**	**2.5**	0.2U	0.2U	0.2U
cis-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromochloromethane	ug/L	0.52	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromomethane	ug/L	80	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylene Dibromide (EDB)	ug/L	0.00051	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Hexachlorobutadiene	ug/L	0.56	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Hexane	ug/L	NA		0.5U	0.5U		0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	0.5U	0.5U		0.5U	0.5U				
Isopropylbenzene (Cumene)	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl iodide	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Methyl tert-Butyl Ether	ug/L	24	MTCA-B car	0.5U	0.5U		0.5U	0.5U	0.5U	0.5U	0.5U	0.5U		0.5U	0.5U	0.5U		0.5U	0.5U				
Methylene Chloride	ug/l	5	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	**0.6**	**0.5K**	**0.9**	**0.7**	0.5U

Shaded cells for visual aid, no significance in terms of analytical results

Bold results = VOC detection

Outlined results = concentration above RI screening levels

Blank results = not measured

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#K = a flagged detection indicating constituent was detected in the Trip Blank near reporting limit; associated number is the concentration measured in the sample

#M = a flagged detection with an estimated value due to a low spectral match; associated number is the concentration measured in the sample

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table M1. Groundwater (Private Wells) - Analytical Results

VOLATILE ORGANIC COMPOUNDS (VOCs) cont.	Units	Screening Level	Source	Abrams Initial	Abrams Confirm	Atkins New (aka Murphy)	Bolyard Deep	Bolyard Shallow	Gutierrez (Castillo)	Country Boys	Gutierrez (Field)	Gutierrez (House)	Moore	Olivares	Pashkovsky Leonid	Pashkovsky Vladimir	Perez	Roland	Whitson Initial	Whitson Confirm	City Irrigation	City MW#2	City MW#3
Naphthalene	ug/L	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
n-Propylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Styrene	ug/L	1.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
tert-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	0.081	MTCA-B car	0.2U	0.2U	0.2U	0.2U	**0.6**	**0.2**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.2**	**0.4**	**0.4**	0.2U	0.2U	0.2U
Toluene	ug/L	640	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,2-Dichloroethene	ug/L	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Trichloroethene (TCE)	ug/L	0.49	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.3**	0.3	0.2U	0.2U	0.2U
Trichlorofluoromethane	ug/l	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Vinyl Acetate	ug/L	8000	MTCA-B non-car	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Vinyl Chloride	ug/L	0.029	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**4.1**	**4.5**	0.2U	0.2U	0.2U
Xylene Isomers, M+P	ug/L	1600	MTCA-B non-car	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U

INORGANIC PARAMETERS	Units	Screening Level	Source	Abrams Initial	Abrams Confirm	Atkins New (aka Murphy)	Bolyard Deep	Bolyard Shallow	Gutierrez (Castillo)	Country Boys	Gutierrez (Field)	Gutierrez (House)	Moore	Olivares	Pashkovsky Leonid	Pashkovsky Vladimir	Perez	Roland	Whitson Initial	Whitson Confirm	City Irrigation	City MW#2	City MW#3
Alkalinity (as CaCO3)	mg/L	NA		172		181	136	213	214	137	216	172	215	127	184	153	160		129				
Arsenic, Dissolved[1]	ug/L	0.058	MTCA-B car	1.9		3.4	0.2U	10	3.5	2.2	3.1	2.4	4.3	1	2.6	2.9	2		0.8				
Arsenic, Total	ug/L	0.058	MTCA-B car															2.5					
Bicarbonate As CaCO3	mg/L	NA		172		181	136	213	214	137	216	172	215	127	184	153	160		129				

Shaded cells for visual aid, no significance in terms of analytical results

Bold results = VOC detection

Outlined results = concentration above RI screening levels

Blank results = not measured

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

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FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

GWCL = State Groundwater Contaminant Level (Chapter 173-200 WAC)

MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

1. Site background concentration for dissolved arsenic is 3.4 ug/L (see text for details)

Table M1. Groundwater (Private Wells) - Analytical Results

INORGANIC PARAMETERS continued	Units	Screening Level	Source	Abrams Initial	Abrams Confirm	Atkins New (aka Murphy)	Bolyard Deep	Bolyard Shallow	Gutierrez (Castillo)	Country Boys	Gutierrez (Field)	Gutierrez (House)	Moore	Olivares	Pashkovsky Leonid	Pashkovsky Vladimir	Perez	Roland	Whitson Initial	Whitson Confirm	City Irrigation	City MW#2	City MW#3
Bicarbonate as HCO3	mg/L	NA																					
Calcium, Total	mg/L	NA		56.9		42.1	25.5	50.9	47.7	38.7	49	46.6	55.6	26.7	63.8	52.7	67.5	59.4	39.4				
Carbonate as CO3	mg/L	NA		1U		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U				
Chloride	mg/L	250	GWCL	27.7		4.4	3.9	41.9	22.4	9	11.8	17.9	13.2	15.3	31.4	22	44.4		74.1				
Hydroxide (as CaCO3)	mg/L	NA		1U		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U				
Iron, Dissolved	ug/L	300	GWCL	50U		50U	50	50U	50U	50U	50U	50U	50U	50U	50U	50U	50U		50U				
Iron, Total	ug/L	300	GWCL															50U					
Magnesium, Total	mg/L	NA		20.3		14.9	10.3	18.2	19.1	12.8	18.3	19.5	18.1	14.2	23.7	18.3	24.6	23.3	25.9				
Manganese, Dissolved	ug/L	2200	MTCA-B non-car	1U		1U	35	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U		1U				
Manganese, Total	ug/L	50	GWCL															2					
Nitrate as Nitrogen	mg/L as N	10	FED MCL	6.67		0.717	0.01U	3.75	4.8	4	3.84	4.29	3.15	1.18	7.47	4.93	9.96		3.37				
Nitrate+Nitrite as Nitrogen	mg/L as N	10	FED MCL	6.7		0.717	0.01U	3.78	4.83	4.02	3.86	4.31	3.15	1.18	7.51	4.96	10		3.39				
Nitrite as Nitrogen	mg/L as N	1	FED MCL	0.031		0.01U	0.01U	0.029	0.025	0.019	0.02	0.022	0.01U	0.01U	0.036	0.026	0.039		0.018				
Potassium, Total	mg/L	NA		3.48		3.02	4.53	8.7	6.78	2.92	7.04	5.11	5.9	5.6	5.3	4.5	5.35	5.67	10.3				
Sodium, Total	mg/L	NA		22.1		18.4	17.5	57.5	41.6	12.4	33	19.9	24.2	19.1	25.3	19.7	20.8	32.7	20.8				
Sulfate	mg/L	250	GWCL	66.4		22.8	9.2	55.1	47	24.8	45.7	46.3	35.9	31.7	66.7	41.2	72.8		32.3				
Total Dissolved Solids	mg/L	500	GWCL	398		241	208	440	404	248	358	342	322	219	388	315	414		350				

FIELD PARAMETERS	Units	Screening Level	Source	Abrams Initial	Abrams Confirm	Atkins New (aka Murphy)	Bolyard Deep	Bolyard Shallow	Gutierrez (Castillo)	Country Boys	Gutierrez (Field)	Gutierrez (House)	Moore	Olivares	Pashkovsky Leonid	Pashkovsky Vladimir	Perez	Roland	Whitson Initial	Whitson Confirm	City Irrigation	City MW#2	City MW#3
pH	std. units	NA		8.03		7.77	8.02	7.5	7.32	7.58	7.54	7.71	7.31	7.86	7.59	7.58	7.04	7.31	8	8.07			
Specific Conductance @ 25C	umhos/cm	NA		541		458	291	693	571	443	520	479	626	428	751	600	625	628	604	547			
Temperature, 0 F	0 F	NA		60.08		57.56	64.4	60.08	58.64	61.88	58.46	59	60.08	66.56	59.36	59.54	54.86	58.46	61.34	61.52			

Shaded cells for visual aid, no significance in terms of analytical results

Bold results = VOC detection

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Blank results = not measured

#U = Undetected; associated number is lab reporting limit (e.g. 0.2U)

#K = a flagged detection indicating constituent was detected in the Trip Blank near reporting limit; associated number is the concentration measured in the sample

#M = a flagged detection with an estimated value due to a low spectral match; associated number is the concentration measured in the sample

FED MCL= Federal Maximum Contaminant Level (40 CFR 141.61)

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MTCA-B car = MTCA Method-B carcinogenic (Chapter 173-340 WAC)

MTCA-B non-car = MTCA Method-B non-carcinogenic (Chapter 173-340 WAC)

NA = no established screening level

Table M2. Groundwater (Additional Private Wells) and Neva Lake - Analytical ResultsResults

VOLATILE ORGANIC COMPOUNDS (VOCs)	Units	Screening Level	Source	Bohr	Manship	Manship Confirm	Spencer	Sanchez	Sanchez Confirm	Massey	Massey Confirm	Neva Lake	Neva Lake Confirm
1,1,1,2-Tetrachloroethane	ug/L	1.7	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,1-Trichloroethane	ug/l	200	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2,2-Tetrachloroethane	ug/L	0.22	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.02U
1,1,2-Trichloroethane	ug/L	0.77	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1,2-Trichlorotrifluoroethane	ug/L	240000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethane	ug/L	1600	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,1-Dichloroethene	ug/L	7	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.02U
1,1-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2,3-Trichlorobenzene	ug/L	NA		0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,3-Trichloropropane	ug/L	0.0063	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trichlorobenzene	ug/L	70	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dibromo-3-chloropropane	ug/L	0.031	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichlorobenzene	ug/L	600	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloroethane (EDC)	ug/L	0.48	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,2-Dichloropropane	ug/L	0.64	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3,5-Trimethylbenzene	ug/L	400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichlorobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,3-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
1,4-Dichlorobenzene	ug/L	1.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2,2-Dichloropropane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
2-butanone	ug/L	4800	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
2-Chloroethylvinylether	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
2-Chlorotoluene	ug/L	160	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

Shaded cells for visual aid, no significance in terms of analytical results

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High concentration of dissolved iron (1910 ug/L) in first Massey sample likely a field collection error. Confirmation sample was below 50 ug/L

Table M2. Groundwater (Additional Private Wells) and Neva Lake - Analytical ResultsResults

VOLATILE ORGANIC COMPOUNDS (VOCs) continued	Units	Screening Level	Source	Bohr	Manship	Manship Confirm	Spencer	Sanchez	Sanchez Confirm	Massey	Massey Confirm	Neva Lake	Neva Lake Confirm
2-Hexanone	ug/L	NA		5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
4-Chlorotoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Isopropyltoluene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
4-Methyl-2-pentanone (MIBK)	ug/L	640	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acetone	ug/L	800	MTCA-B non-car	5U	**6.9Q**	5U	5U	**6Q**	5U	5U	5U	5U	5U
Acrolein	ug/L	160	MTCA-B non-car	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U
Acrylonitrile	ug/L	0.081	MTCA-B car	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Benzene	ug/L	0.8	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromobenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromochloromethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromodichloromethane	ug/L	0.71	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoethane	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromoform	ug/L	5.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Bromomethane	ug/L	11	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Carbon Disulfide	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Carbon Tetrachloride	ug/L	0.34	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chlorobenzene	ug/L	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroethane	ug/L	15	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloroform	ug/L	7.2	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Chloromethane	ug/L	3.4	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
cis-1,2-Dichloroethene	ug/L	70	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.02U
cis-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Dibromochloromethane	ug/L	0.52	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

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High concentration of dissolved iron (1910 ug/L) in first Massey sample likely a field collection error. Confirmation sample was below 50 ug/L

Table M2. Groundwater (Additional Private Wells) and Neva Lake - Analytical ResultsResults

VOLATILE ORGANIC COMPOUNDS (VOCs) continued	Units	Screening Level	Source	Bohr	Manship	Manship Confirm	Spencer	Sanchez	Sanchez Confirm	Massey	Massey Confirm	Neva Lake	Neva Lake Confirm
Dibromomethane	ug/L	80	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylbenzene	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Ethylene Dibromide (EDB)	ug/L	0.00051	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Hexachlorobutadiene	ug/L	0.56	MTCA-B car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Isopropylbenzene (Cumene)	ug/L	800	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Methyl iodide	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Methylene Chloride	ug/l	5	FED MCL	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Naphthalene	ug/L	160	MTCA-B non-car	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
n-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
n-Propylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
o-Xylene	ug/L	16000	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
sec-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Styrene	ug/L	1.5	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
tert-Butylbenzene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Tetrachloroethene (PCE)	ug/L	0.081	MTCA-B car	0.2U	**0.8**	**0.8**	**1.8**	**0.5**	**0.5**	**3.7**	**3.9**	0.2U	0.02U
Toluene	ug/L	640	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,2-Dichloroethene	ug/L	100	FED MCL	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.02U
trans-1,3-Dichloropropene	ug/L	NA		0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
trans-1,4-Dichloro-2-butene	ug/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Trichloroethene (TCE)	ug/L	0.49	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	**0.4**	**0.3**	0.2U	0.02U
Trichlorofluoromethane	ug/l	2400	MTCA-B non-car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Vinyl Acetate	ug/L	8000	MTCA-B non-car	1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Vinyl Chloride	ug/L	0.029	MTCA-B car	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.02U
Xylene Isomers, M+P	ug/L	1600	MTCA-B non-car	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U

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High concentration of dissolved iron (1910 ug/L) in first Massey sample likely a field collection error. Confirmation sample was below 50 ug/L

Table M2. Groundwater (Additional Private Wells) and Neva Lake - Analytical ResultsResults

INORGANIC PARAMETERS	Units	Screening Level	Source	Bohr	Manship	Manship Confirm	Spencer	Sanchez	Sanchez Confirm	Massey	Massey Confirm	Neva Lake	Neva Lake Confirm
Alkalinity (as CaCO3)	mg/L	NA		219	149	152	207	148	152	155	156	410	415
Arsenic, Dissolved[1]	ug/L	0.058	MTCA-B car	2.5	1.8	2	1.2	0.8	1U	3	2.2	7.8	3
Bicarbonate As CaCO3	mg/L	NA		219	149	152	207	148	152	155	156	0	415
Calcium, Total	mg/L	NA		58	40.3	43.8	63.9	37.9	44.9	48.8	48	26.3	45.2
Carbonate as CO3	mg/L	NA		1U	1U	NM	1U	1U	NM	NM	NM	52.6	NM
Chloride	mg/L	250	GWCL	18	23.5	23	40.6	31.8	31.1	41.7	44	78.4	60.6
Hydroxide (as CaCO3)	mg/L	NA		1U	1U	1U	1U	1U	1U	1U	1U	1U	1U
Iron, Dissolved[2]	ug/L	300	GWCL	50U	50U	50U	50U	50U	50U	1910	50U	50U	120
Magnesium, Total	mg/L	2200	MTCABnon-carcin	22.3	18.3	18.6	29.4	17.8	20.1	20.4	20.8	41	42.1
Manganese, Dissolved	ug/L	2200	MTCABnon-carcin	1U	1U	1U	1U	1	2	9	1U	11	224
Nitrate as Nitrogen	mg/L as N	10	FED MCL	5.33	5.6	5.85	10.6	6.74	7.39	4.16	4.18	0.026	0.01U
Nitrate+Nitrite as Nitrogen	mg/L as N	10	FED MCL	5.36	5.63	5.85	10.6	6.77	7.39	4.16	4.18	0.037	0.01U
Nitrite as Nitrogen	mg/L as N	1	FED MCL	0.031	0.035	0.01U	0.044	0.034	0.01U	0.01U	0.01U	0.011	0.01U
Potassium, Total	mg/L	NA		5.13	5.86	5.7	7.7	6.6	6.5	5.8	5.83	50.9	46.3
Sodium, Total	mg/L	NA		25.4	17.7	18.2	26.1	17.1	19	26	24.1	120	104
Sulfate	mg/L	250	GWCL	56.5	29.6	27.4	40.6	26.5	25.1	42	42.3	51.6	46.2
Total Dissolved Solids	mg/L	500	GWCL			298			309	335	316	623	576

FIELD PARAMETERS	Units	Screening Level	Source	Bohr	Manship	Manship Confirm	Spencer	Sanchez	Sanchez Confirm	Massey	Massey Confirm	Neva Lake	Neva Lake Confirm
pH	std. units	NA		7.37	8.5	8.11	7.42	8.08	7.97	7.4	7.52	8.92	7.96
Specific Conductance @ 25C	umhos/cm	NA		651	433	424	728	448	466	466	520	1019	1001
Temperature, 0 F	0 F	NA		55.6	58.6	58.3	58.3	56.8	57.9	56.84	59.2	73.94	38.1

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1. Site background concentration for dissolved arsenic is 3.4 ug/L (see text for details)

2. High concentration of dissolved iron (1910 ug/L) in first Massey sample likely a field collection error. Confirmation sample was below 50 ug/L

Appendix N1: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Round 4 RI Groundwater Samples

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. The analytical analyses were performed by Analytical Resources, Inc. (ARI) in Tukwila.

Round 4 RI groundwater samples were collected from thirty-three monitoring wells on March 23-26, 2009. **Table N1** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the Round 4 RI dataset.

1. RI Round 4 Sampling Event

Thirty-three water samples, one matrix spike sample, one matrix spike duplicate sample, one field duplicate, two VOC trips blank samples, and one SIM-VOC trip blank sample were submitted to ARI laboratory (ARI job IDs OS05, OS26, OS46). Analyses performed by the lab include VOCs 8260B method, VOC selective ion monitoring (SIM) method, dissolved and total metals, and inorganic compounds (conventionals). Samples were collected from solid waste monitoring wells, corrective action monitoring wells, and remedial investigation monitoring wells:

- Solid waste monitoring wells (MW-1a, MW-2c, MW-3b, MW-4c, MW-5c, MW-6a, MW-6c MW-7b, MW-9b, MW-10a, MW-11a, MW-14a, MW-16d, MW-19b, MW-20c, MW-22c, and MW-23a).
- Corrective action wells (MW-17a and MW-18a).
- Remedial investigation wells (MW-24a, MW-25a, MW-26a, MW-28d, MW-29b, MW-30b, MW-31b, MW-32a, MW-33p2, MW-34p1, MW-35p2, MW-37p1, and MW-38p2

The solid waste monitoring wells are associated with the regular quarterly monitoring for the landfill under WAC 173-351. Analytical results for these wells were also reported in the first quarter 2009 quarterly report required under WAC 173-351.

The laboratory performed standard QA/QC analyses on the water samples and they were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Table N1**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results.

b. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Exception: d8-toluene SIM-VOC surrogate recovered low by 4% in sample MW-9b from ARI job ID OS05.

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene.

The following two surrogates were added to all samples for SIM-VOC analyses: d4-12-dichloroethane and d8-toluene.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC and semi-volatile analyses as 3 to 4 standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the laboratory limits for all samples associated with the sampling event except the following.

The surrogate d8-toluene for the SIM-VOC analysis recovered low by 4% in sample MW-9b. Since the SIM-VOC sample results matched the VOC results, no corrective action was taken.

Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: A few VOCs and chloride recovered high in the MS/MSD analyses associated with sample MW-14a in ARI job ID OS05.

Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

ARI job ID OS05 included an MS and MSD analysis for VOCs and SIM VOCs on sample MW-14a. An MS analysis was also run for total metals, dissolved metals, and conventionals on sample MW-14a.

ARI job ID OS26 included an MS analysis for total metals, dissolved metals, and conventionals on sample MW-21c.

ARI job ID OS46 included an MS analysis for conventionals on sample MW-32a.

The MS/MSD indicated acceptable percent recovery of all analytes except the following.

For ARI job ID OS05, a few VOCs and SIM VOCs were out of control high in the MS and or MSD. Since the analyte was not detected in the sample and MS values are only advisory, no corrective action was taken. For ARI job ID OS05, chloride was recovered high by 12% possibly due to over-spike. Since all other QC measures were in control, no corrective action was taken.

The relative percent differences (RPD) between MS and MSD results were all less than 20%.

d. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20.

All blanks resulted in non- detects.

e. Field Trip Blanks: ACCEPTABLE

Exception: Acetone detected slightly above the detection limit in ARI job ID OS05 and methylene chloride detected slightly above the detection limit in ARI job ID OS26.

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks for VOCs and SIM-VOCs were analyzed for ARI job ID OS05 and a trip blank for VOCs was analyzed for ARI job ID OS26. No analytes were detected except for low levels of acetone (2.6 ug/L) slightly

above the detection limit for ARI job ID OS05 and low levels of methylene chloride (0.6 ug/L) slightly above the detection limit for ARI job ID OS26. Acetone and methylene chloride are common laboratory contaminants. In accordance with the CLP guidelines, since a few samples had detections of acetone and methylene chloride less than 10 times the amount in the trip blank, these results have been flagged in the dataset as having a potential bias.

Reported Detection Limits: ACCEPTABLE

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses except for VOC analyses from ARI job ID OS46. For this batch a number of samples required high dilutions, which raised the RDL by one to several orders of magnitude, resulting in some of the detection limits being above the MTCA cleanup levels. See results table.

a. Field Duplicate

One field duplicate was collected from MW-3b (labeled MW-50 on COC).

Relative percent differences (RPDs) were all acceptable (less than 20%).

f. Lab Duplicates: ACCEPTABLE

Exception: Total manganese RPD was out of control at 40% for ARI job ID OS05.

Laboratory duplicates or replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

For ARI job ID OS05 LR analyses were performed on dissolved metals and total metals, and conventionals for sample MW-14a and carbonate species on MW-9b.

For ARI job ID OS26 LR analyses were performed on dissolved and total metals for sample MW-21c.

For ARI job ID OS46 an LR analysis was performed on conventionals for sample MW-32a.

The relative percent difference between the original results and the LR results were all within control limits established by ARI except for total manganese with RPD out of control at 40%. Since the sample had very low concentrations and all other QC measures where in control, no corrective action was taken.

g. Lab Control Sample: ACCEPTABLE

Exception: Acrolein and 1,2,3-trichlorobenzene recovered high in the LCS and LCSD for the VOC analysis in ARI job ID OS05. 1,1,2,2-tetrachloroethane recovered high in the LCS and LCSD for the VOC-SIM analysis in ARI job ID OS05 and ARI job ID OS26. Several RPDs between the LCS and LCSD were greater than 20% for the VOC analysis in ARI job ID OS46.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

LCS and LCSD (duplicate) water samples were run for all VOC, SIM-VOC, total metals, dissolved metals, and TDS. All the LCS and LCSD analyte recoveries were

within the laboratory quality control limits except the following.

Acrolein and 1,2,3-trichlorobenzene recoveries were biased high in the LCS and LCSD VOC analysis associated with ARI job ID OS05. Since the samples had no detections of these compounds, no corrective action was taken.

1,1,2,2-tetrachloroethane recoveries were biased high in the LCS and LCSD VOC-SIM analysis associated with ARI job ID OS05 and OS26. Since the samples had no detections of this compound, no corrective action was taken.

The relative percent differences (RPD) between LCS and LCSD analyses were all below 20% except for a number of VOCs associated with ARI job ID OS46 (**Table N1**). RPDs greater than 20% ranged from 21.8% to 30.5%.

h. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

i. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

j. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarize above include the following.

Acetone drifted high outside the QC limit in the closing calibrations on 3/26/09 in ARI job ID OS05. The outlier is acceptable per the lab.

Bromomethane was low outside the QC limit in the closing calibration on 4/6/09 in ARI job ID OS46. The outlier is acceptable per the lab.

2-butanone, 2-hexanone, and MIBK were high outside the QC limit in the LCS 4/7/09 run, but within the lab's marginal exceedance range.

Table N1. Quality Assurance Quality Control Summary for Groundwater (Round 4) - Lab Reports ARI OS05 and ARI OS26

Job Number: JE0714a
Data Set: Groundwater Sampling (RI Round 2) July 2008

Lab Data Batch -------->	ARI OS05 (Q12009)	ARI OS26 (Q12009)	ARI OS46 (RI Wells)
METHODOLOGY			
Method	Good	Good	Good
Date Sampled	ok	ok	ok
Date Analyzed	ok	ok	ok
Holding Time	ok	ok	ok
Preservative	ok	ok	ok
Acceptability	YES	YES	YES
SURROGATE SPIKES			
Surrogate Used	Yes (4 for VOC; 2 for SIM-VOC)[1]	Yes (4 for VOC; 2 for SIM-VOC)[1]	Yes (4 for VOC; 2 for SIM-VOC)[1]
Sample Spike Recovery	d8-toluene SIM-VOC surrogate recovered low by 4% in sample MW-9b - SIM-VOC results match the VOC results well, no corrective action.	fine	fine
Control Spike Recovery	fine	fine	fine
Acceptability	YES	YES	YES
MS/MSD	Yes (MS and MSD for VOCs and SIM-VOC; MS for Dissolved Metals, Total Metals, and Conventionals - sample MW-14a)	Yes (MS for Dissolved Metals, Total Metals and Conventionals - sample MW-21c)	Yes (MS for Conventionals - sample MW-32a)
MS Recovery	Acrolein and 1,2,3-Trichlorobenzene recovered high (VOC) - not detected in sample, MS values only advisory, no corrective action.	fine	fine
	1,1,2,2-tetrachloroethane recovered high (SIM-VOC) - not detected in sample, MS values only advisory, no corrective action.		
	Chloride recoverd out of control high by 12% - possibly due to overspike, all other QC in control, no corrective action.		
MSD Recovery	Acrolein and 1,2,3-Trichlorobenzene recovered high (VOC) - not detected in sample, MS values only advisory, no corrective action.	NA	NA
	1,1,2,2-tetrachloroethane recovered high (SIM-VOC) - not detected in sample, MS values only advisory, no corrective action.		
RPD	All less than 20%	NA	NA
Acceptability	YES	YES	YES
METHOD BLANK	Yes (1 Batch for: VOCs, SIM-VOCs, Dissolved Metals, Total Metals, and Conventionals)	Yes (VOCs - 2 batches, SIM-VOCs - 2 batches, Dissolved Metals - 1 batch, Total Metals - 1 batch, and Conventionals - 1 batch)	Yes (VOCs - 2 batches, SIM-VOCs - 1 batch, Dissolved Metals - 1 batch, and Conventionals - 1 batch)
Detections	none	none	none
Surrogate Recovery	fine	fine	fine
Acceptability	YES	YES	YES

Table N1. Quality Assurance Quality Control Summary for Groundwater (Round 4) - Lab Reports ARI OS05 and ARI OS26

Job Number: JE0714a
Data Set: Groundwater Sampling (RI Round 2) July 2008

Lab Data Batch -------->	**ARI OS05 (Q12009)**	**ARI OS26 (Q12009)**	**ARI OS46 (RI Wells)**
TRIP BLANK	Yes (VOC and SIM-VOC)	Yes (one for VOC)	none
Detections	Acetone detected slightly above the detection limit (VOC) - sample results are flagged	Methylene Chloride detected slightly above detection limit (VOC) - sample results are flagged	NA
Acceptability	YES	YES	NA
RDL	Okay	Okay (elevated where sample needed to be diluted)	Okay (elevated where sample needed to be diluted)
Regulation/Method	ok	ok	ok
Lab	ok	ok	ok
Acceptability	YES	YES	YES
FIELD DUPLICATES	none	yes	none
Sample:	NA	MW-3b	NA
RPD	NA	< 20%	NA
Acceptability	NA	YES	NA
LAB DUPLICATES	Yes (dissolved metals, total metals, conventionals)	Yes (dissolved and total metals)	Yes (Conventionals)
Sample	MW-14a for all and MW-9b for Alkalinity, Carbonate, Hydroxide, and Bicabonate	MW-21c	MW-32a
RPD	40% for Total manganese - very low concentrations in sample, all other QC in control, no corrective action.	fine	fine
Acceptability	YES	YES	YES

Table N1. Quality Assurance Quality Control Summary for Groundwater (Round 4) - Lab Reports ARI OS05 and ARI OS26

Job Number: JE0714a
Data Set: Groundwater Sampling (RI Round 2) July 2008

Lab Data Batch -------->	ARI OS05 (Q12009)	ARI OS26 (Q12009)	ARI OS46 (RI Wells)
LAB CONTROL	Yes (LCS and LCSD for VOCs and SIM-VOC; and LCS for Dissolved Metals, Total Metals and TDS)	Yes (LCS and LCSD for VOCs - 2 batches; LCS and LCSD for SIM-VOC - 2 batches; and LCS for Dissolved Metals, Total Metals and TDS)	Yes (LCS and LCSD for VOCs and LCS for Total Metals and (TDS)
Spike Recovery	Acrolein and 1,2,3-trichlorobenzene recovered high for VOC - not detected in sample, no corrective action 1,1,2,2-tetrachloroethane recovered high for SIM-VOCs - not detected in sample, no corrective action	1,1,2,2-tetrachloroethane recovered high for 3/26/09 SIM-VOCs - not detected in sample, no corrective action.	fine
Surrogate Recovery	fine	fine	fine
Spike Dupl. Recovery	Acrolein and 1,2,3-trichlorobenzene recovered high for VOC - not detected in sample, no corrective action 1,1,2,2-tetrachloroethane recovered high for SIM-VOCs - not detected in sample, no corrective action	1,1,2,2-tetrachloroethane recovered high for 3/26/09 SIM-VOCS - not detected in sample, no corrective action.	fine
RPD	fine	fine	>20% for Bromomethane run 3/31/09 (23%) >20% for Chloromethane run 4/6/09 (22.2%) > 20% Bromomethane run 3/31/09 (30.5%) > 20% for Vinyl Chloride run 3/31/09 (27.4%) > 20% for Chloroethane run 3/31/09 (22%) >20% for Carbon Disulfide run 3/31/09 (24.1%) >20% for 1,1-Dichloroethene run 3/31/09 (26.5%) >20% for 1,1,1-Trichloroethane run 3/31/09 (21.8%) >20% for Carbon Tetrachloride run 3/31/09 (24.5%) >20% for Tetrachloroethene run 3/31/09 (21.8%) >20% for Acrolonitrile run 3/31/09 (25.1%) >20% for 2,2-Dichloropropane run 3/31/09 (25.3%)
Acceptability	YES	YES	YES
STANDARD REFERENCE	Conventionals	Conventionals	Conventionals
Recovery	good	good	good
COC	yes	yes	yes
Acceptability	YES	YES	YES
LAB REPORT	Cover Report	Cover Report	Cover Report
Additional Information	Acetone drifted high outside the QC limit in the closing calibration on 3/26/09 (acceptable outlier per lab)	None	Bromomethane was low ouside the QC limit in the closing calibration on 4/6/09 (acceptable outlier per lab) 2-Butanone, MIBK, and 2-Hexanone outside QC limit at high bias in LCS 4/7/09 run, but within lab's Marginal Exceedence range (acceptable)
Acceptability	YES	YES	YES

1 VOA Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-dichloroethane; d8-toluene

Appendix N2: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Round 5 RI Groundwater Samples

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. The analytical analyses were performed by Analytical Resources, Inc. (ARI) in Tukwila.

A total of twelve Round 5 RI groundwater samples were collected from 11 monitoring wells and 1 private well on September 23-24, 2009. **Table N2** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the Round 5 RI dataset.

1. RI Round 5 Sampling Event

Twelve water samples and one trip blank were submitted to ARI laboratory (ARI job ID PQ06). Analyses performed by the lab include VOCs 8260C method, dissolved methan/ethane/ethene, dissolved and total metals, and inorganic compounds (conventionals). Samples were collected from remedial investigation monitoring wells and a private well:

- Remedial investigation wells (MW-39p2, MW-40p2, MW-41a, MW-42b, MW-43p2, MW-44b, MW45c, MW-46p2, MW-47c, MW-48b, and MW-49p2.
- Private well (Roland).

The laboratory performed standard QA/QC analyses on the water samples and they were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Table N2**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results. Some samples were not analyzed per the request listed on the COC due to incorrect bottle/preservative for the method requested: Methane/Ethane/Ethene analyses were not performed for MW-40p2, MW-43p2, MW-44b, MW-48b; Dissolved CO2 anaylses were not performed for MW-39p2, MW-40p2, MW-41a, MW-43p2, MW-44b, MW-48b, MW-49p2. Additionally, appropriate containers were not submitted to ARI, but the lab split and preserved volume for the analysis.

b. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Exception: None

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene. One surrogate, propane, was added to all samples for Methane/Ethane/Ethene analyses.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC and semi-volatile analyses as 3 to 4

standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the laboratory limits for all samples associated with the sampling event except the following.

Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: None.

Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

ARI job ID PQ06 included an MS analysis for nitrate+nitrite, chloride, sulfate, and TOC on sample MW-39p2.

The relative percent differences (RPD) were not quantified for sample MW-39p2.

d. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20.

All blanks resulted in non- detects.

e. Field Trip Blanks: ACCEPTABLE

Exception: None

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks for VOCs were analyzed for ARI job ID PQ06. No analytes were detected.

Reported Detection Limits: ACCEPTABLE

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses except for n-nitrate calculation for sample MW-46p2 and VOC analyses from ARI job ID PQ06 samples MW-42b, MW-43p2, MW-44b. These samples required dilutions in order to quantify results for all analytes. For the VOCs, both runs are reported.

a. Field Duplicate

None.

f. Lab Duplicates: ACCEPTABLE

Exception: None.

Laboratory duplicates or replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

For ARI job ID PQ06 LR analyses were performed on dissolved metals and total metals, and conventionals for sample MW-39p2.

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

Lab Control Sample: ACCEPTABLE

Exception: None.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

LCS and LCSD (duplicate) water samples were run for all VOC, MEE and dissolved CO2, with LCS for total metals, dissolved metals, and TDS. All the LCS and LCSD analyte recoveries were within the laboratory quality control limits.

Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

g. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

h. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarized above includes the following:

Dilutions performed according to necessity of qualifying E and/or S flags. In such cases, both runs have been reported and included.

Table N2. Quality Assurance Quality Control Summary for Groundwater (Round 5 and Roland Private Well)
Lab Report ARI PQ06

Job Number: JE0714a
Data Set: Groundwater Sampling (RI Round 5) September 2009

Lab Data Batch -------->	**ARI PQ06 (Test America Los Angeles LSI0205 Dissolved CO2)**
METHODOLOGY	
Method	Good
Date Sampled	ok
Date Analyzed	ok
Holding Time	ok
Preservative	Incorrect for Methane/Ethane/Ethene (MW-40p2, MW-43p2, MW-44b, MW-48b) - Analysis not performed Incorrect for Dissolved CO2 (MW-39p2, MW-40p2, MW-41a, MW-43p2, MW-44b, MW-48b, and MW-49p2) - Incorrect for TOC. Lab split and preserved volume for the analysis at the time of receipt.
Acceptability	YES
SURROGATE SPIKES	
Surrogate Used	Yes (4 for VOC, 1 for MEE)[1]
Sample Spike Recovery	fine
Control Spike Recovery	fine
Acceptability	YES
MS/MSD	Yes (MS for nitrate+nitrite, nitrite, chloride, sulfate, TOC - sample MW-39p2)
MS Recovery	fine
MSD Recovery	NA
RPD	NA
Acceptability	YES

Table N2. Quality Assurance Quality Control Summary for Groundwater (Round 5 and Roland Private Well)
Lab Report ARI PQ06

Job Number: JE0714a
Data Set: Groundwater Sampling (RI Round 5) September 2009

Lab Data Batch -------->	**ARI PQ06 (Test America Los Angeles LSI0205 Dissolved CO2)**
METHOD BLANK	Yes (2 runs for: VOCs and Dissolved Metals, and 1 run for: MEE, Dissolved CO2, Dissolved Metals, Total Metals, TOC, nitrate+nitrite, N-nitrite, chloride, sulfate, and TOC.)
Detections	none
Surrogate Recovery	fine
Acceptability	YES
TRIP BLANK	Yes (VOC)
Detections	none
Acceptability	YES
RDL	Okay
Regulation/Method	ok
Lab	ok
Acceptability	YES
FIELD DUPLICATES	none
Sample:	NA
RPD	NA
Acceptability	NA
LAB DUPLICATES	Yes (dissolved metals, total metals, conventionals,and TOC)
Sample	MW-39p2
RPD	fine
Acceptability	YES
LAB CONTROL	Yes (LCS and LCSD for VOCs, MEE, and Dissolved CO2; and LCS for Dissolved Metals, Total Metals and TDS)
Spike Recovery	fine
Surrogate Recovery	fine

Table N2. Quality Assurance Quality Control Summary for Groundwater (Round 5 and Roland Private Well)
Lab Report ARI PQ06

Job Number: JE0714a
Data Set: Groundwater Sampling (RI Round 5) September 2009

Lab Data Batch -------->	**ARI PQ06 (Test America Los Angeles LSI0205 Dissolved CO2)**
Spike Dupl. Recovery	fine
RPD	fine
Acceptability	YES
STANDARD REFERENCE	Conventionals
Recovery	good
COC	yes
Acceptability	YES
LAB REPORT	Cover Report
Additional Information	Dilutions performed according to necessity of qualifying E and/or S flags. Both runs reported
Acceptability	YES

1 VOA Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
Methane/Ethane/Ethene Surrogate: propane

Appendix N3a: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Round 6 RI Groundwater Samples (1 of 3)

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. The analytical analyses were performed by Analytical Resources, Inc. (ARI) in Tukwila.

Round 6 RI groundwater samples were collected from six monitoring wells on December 29 and 31, 2009. **Table N3a** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the Round 6 RI dataset part 1 of 3.

1. RI Round 6 Sampling Event

Six water samples, two VOC trips blank samples were submitted to ARI laboratory (ARI job IDs QD26 and QD61). Analyses performed by the lab include VOCs 8260C method, VOC selective ion monitoring (SIM) method, methane/ethane/ethene (MEE), dissolved CO2, dissolved and total metals, and inorganic compounds (conventionals). Samples were collected from remedial investigation monitoring wells:

- Remedial investigation wells (MW-50c, MW-51c, MW-52p2, MW-53a, MW-54c, and MW-45c)

The laboratory performed standard QA/QC analyses on the water samples and they were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Table N3a**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results.

b. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Exception: None

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene. The following two surrogates were added to all samples for SIM-VOC analyses: d4-12-dichloroethane and d8-toluene.

Also, one surrogate was added to all samples for MEE analysis: propane.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC and semi-volatile analyses as 3 to 4 standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the laboratory limits for all samples associated with the sampling event.

Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: None.

Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

ARI job ID QD26 included an MS analysis for nitrate-nitrite, n-nitrite, TOC, and TKN on sample MW-50c; and chloride and sulfate on sample MW-53a.

ARI job ID QD61 included an MS analysis for nitrate-nitrite, n-nitrite, TOC, and chloride on sample MW-45c.

The MS indicated acceptable percent recovery of all analytes.

The relative percent differences (RPD) were not calculated for since no MSD results were reported.

d. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20.

All blanks resulted in non- detects.

e. Field Trip Blanks: ACCEPTABLE

Exception: None.

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks for VOCs were analyzed for ARI job ID QD26 and QD61.

Reported Detection Limits: ACCEPTABLE

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses.

a. Field Duplicate

None.

f. Lab Duplicates: ACCEPTABLE

Exception: None.

Laboratory duplicates or replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

For ARI job ID QD26 LR analyses were performed on alkalinity, carbonate, bicarbonate, hydroxide, TDS, nitrite, nitrate+nitrite, TOC, Total Kjeldahl (MW-50c), and chloride, sulfate (MW-53a).

For ARI job ID QD61 LR analyses were performed on nitrate+nitrite, nitrite, TOC, chloride, sulfate, TDS (MW-45c).

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

g. Lab Control Sample: ACCEPTABLE

Exception: Acetone was slightly below the control limit in the LCS, but was within the lab's marginal exceedence range for ARI job ID QD26.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

LCS and LCSD (duplicate) water samples were run for all VOC, SIM-VOC, MEE, dissolved CO2, and LCS for total metals, dissolved metals, TDS and TKN. All the LCS and LCSD analyte recoveries were within the laboratory quality control limits.

h. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

i. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

j. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarized above include the following.

On 3/23/10 an unusual pattern was noticed in control charts for recovery of Ethane and Ethene in RSK-175 (headspace analysis) LCS samples.

Investigation revealed that the assignment of chromatographic peaks for the two compounds were reversed when evaluating an initial calibration on 11/16/09. From that date until corrections were made on 2/17/10 detectable Ethane was reported as Ethene with a concentration about 12% high. Ethene was reported as Ethane with concentration about 9% low. The identification and concentration of Ethane and Ethene in all of the associated samples and QG were corrected and the revised data has been included in this data package.

Bromomethane, acetone, 2-butanone, and 12-dibromo-3-chloropropane were recovered low bias in the continuing calibration for the VOC analysis in ARI job ID QD26. Q flags were applied to LCS/LCSD Form III, and Form I if the compound was detected.

Table N3a. Quality Assurance Quality Control Summary for Groundwater (Phase 2 / RI Round 6 Event/ December 29 and 31, 2009)

Data Set:	Groundwater Sampling (RI Round 6) December 29, 2009 RI Wells (MW-50c, MW-51c, MW-52p2, MW-53a, MW-54c)	Groundwater Sampling (RI Round 6) December 31, 2009 RI Wells (MW-45c)
Lab Data Batch -------->	**ARI QD26 (TA Los Angeles LSL0223 Dissolved CO2)**	**ARI QD61**
METHODOLOGY		
Method	Good	Good
Date Sampled	ok	ok
Date Analyzed	ok	ok
Holding Time	ok	ok
Preservative	ok	ok
Acceptability	YES	YES
SURROGATE SPIKES		
Surrogate Used	Yes (4 for VOCs, 2 for SIM-VOCs, 1 for MEE)[1]	Yes (4 for VOCs, 2 for SIM-VOCs,)[1]
Sample Spike Recovery	fine	fine
Control Spike Recovery	fine	fine
Acceptability	YES	YES
MS/MSD	Yes (MS for nitrate+nitrite, nitrite, TOC, total Kjeldahl nitrogen - MW-50c /MS for chloride, sulfate - MW-53a)	Yes (MS for nitrate+nitrite, nitrite, TOC, and chloride - MW-45c)
MS Recovery	fine	fine
MSD Recovery	NA	NA
RPD	NA	NA
Acceptability	YES	YES
METHOD BLANK	Yes (VOCs, SIM-VOCs, MEE, Dissolved CO2, Total Metals, Dissolved Metals, TOC, nitrate+nitrite, N-nitrite, total Kjeldahl nitrogen, chloride, sulfate, and TDS.)	Yes (VOCs, SIM-VOCs, Total Metals, Dissolved Metals, TOC, nitrate+nitrite, N-nitrite, total Kjeldahl nitrogen, chloride, sulfate, and TDS.)
Detections	none	none
Surrogate Recovery	fine	fine
Acceptability	YES	YES
TRIP BLANK	Yes (VOC)	Yes (VOC)
Detections	none	none
Acceptability	YES	YES

[1]Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene
Methane/Ethane/Ethene Surrogate: propane

Table N3a. Quality Assurance Quality Control Summary for Groundwater (Phase 2 / RI Round 6 Event/ December 29 and 31, 2009)

Data Set:	Groundwater Sampling (RI Round 6) December 29, 2009 RI Wells (MW-50c, MW-51c, MW-52p2, MW-53a, MW-54c)	Groundwater Sampling (RI Round 6) December 31, 2009 RI Wells (MW-45c)
RDL	Okay	Okay
Regulation/Method	ok	ok
Lab	ok	ok
Acceptability	YES	YES
FIELD DUPLICATES	none	none
Sample:	NA	NA
RPD	NA	NA
Acceptability	NA	NA
LAB DUPLICATES	Yes (conventionals)	Yes (conventionals)
Sample	alkalinity, carbonate, bicarbonate, hydroxide, TDS, nitrite, nitrate+nitrite, TOC, Total Kjeldahl (MW-50c) and chloride, sulfate (MW-53a)	nitrate+nitrite, nitrite, TOC, chloride, sulfate, TDS (MW-45c)
RPD	fine	fine
Acceptability	YES	YES
LAB CONTROL	Yes (LCS and LCSD for VOCs, SIM-VOC, MEE, and Dissolved CO2; and LCS for Dissolved Metals, Total Metals, TDS, and Total Kjeldahl Nitrogen)	Yes (LCS and LCSD for VOCs, and SIM-VOC; and LCS for Dissolved Metals, Total Metals, TDS, and Total Kjeldahl Nitrogen)
Spike Recovery	fine	fine
Surrogate Recovery	fine	fine
Spike Dupl. Recovery	fine	fine
RPD	fine	fine
Acceptability	YES	YES
STANDARD REFERENCE	Conventionals	Conventionals
Recovery	good	good
COC	yes	yes
Acceptability	YES	YES

[1]Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene
Methane/Ethane/Ethene Surrogate: propane

Table N3a. Quality Assurance Quality Control Summary for Groundwater (Phase 2 / RI Round 6 Event/ December 29 and 31, 2009)

Data Set:	Groundwater Sampling (RI Round 6) December 29, 2009 RI Wells (MW-50c, MW-51c, MW-52p2, MW-53a, MW-54c)	Groundwater Sampling (RI Round 6) December 31, 2009 RI Wells (MW-45c)
LAB REPORT	Cover Report	Cover Report
Additional Information	1. Recovery out of control low in continuing calibration: bromomethane, acetone, 2-12-dibromo-3-chloropropane Method allows up to 20% compounds to be out of control. Q-flags applied to Form Form I if compound detected.	No Additional Info
	2. Acetone was slightly below control limit in the LCS but within lab's marginal exceedance range. Data accepted.	
	3. Updated Report (April 26, 2010) - chromatograph peaks for ethane and ethen were reversed in initial calibration. Correction made on 2/17/10 and results resubmitted. All QC corrected and revised. Corrected recoveris for LCS and MS samples all within established limits.	
Acceptability	YES	YES

[1]Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene
Methane/Ethane/Ethene Surrogate: propane

Appendix N3b: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Round 6 RI Groundwater Samples (2 of 3)

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. The analytical analyses were performed by Analytical Resources, Inc. (ARI) in Tukwila.

Eight groundwater samples for Round 6 RI (part 2 of 3) were collected from seven monitoring wells on January 12 and 13, 2010. **Table N3b** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the Round 6 RI dataset (part 2 of 3).

1. RI Round 6 Sampling Event (2 of 3)

Seven water samples, one field duplicate, and one VOC trip blank sample were submitted to ARI laboratory (ARI job IDs QF29 and QF48). Analyses performed by the lab include VOCs 8260C method, VOC selective ion monitoring (SIM) method, dissolved and total metals, dissolved CO2, methane/ethane/ethene (MEE), and inorganic compounds (conventionals). Samples were collected from remedial investigation monitoring wells:

- Remedial investigation wells (MW-47c, MW-48b, MW-26a, MW-49p2, MW-46p2, and MW-42b)

The laboratory performed standard QA/QC analyses on the water samples and they were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Table N3b**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results. Note: sample MW-49p2 was preserved and filtered in the laboratory not in the field for dissolved metals analysis. Also, an unpreserved voa vial, usually for MEE analysis, was run for sample MW-48 for VOC analysis within the 7 day hold time.

b. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Exception: None.

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene. The following two surrogates were added to all samples for SIM-VOC analyses: d4-12-dichloroethane and d8-toluene. A propane surrogate was added to all samples for MEE analyses.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC and semi-volatile analyses as 3 to 4 standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the laboratory limits for all samples associated with the sampling event except the following.

Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: None.

Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

ARI job ID QF29 included an MS analysis for nitrate-nitrite, n-nitrite, TOC, and chloride on sample MW-47c.

ARI job ID QF48 included an MS analysis for nitrate-nitrite, n-nitrite, chloride, and sulfate on sample MW-26a.

The MS/MSD indicated acceptable percent recovery of all analytes.

Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20.

All blanks resulted in non- detects.

d. Field Trip Blanks: ACCEPTABLE

Exception: Very low level methylene chloride and styrene detected near RL for ARI job ID QF48.

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks for VOCs were analyzed for ARI job ID QF48. Very low level methylene chloride and styrene detected near the reporting limit. Methylene chloride is a common laboratory contaminants. Samples with methylene chloride detections were at concentrations an order of magnitude higher than concentrations measured in the trip blank. No corrective action was taken.

Reported Detection Limits: ACCEPTABLE

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses except for VOC analyses from ARI job ID QF48. For this batch a couple of samples required dilutions on the second run to quantify chloroethane in MW-44b, MW-44b field duplicate MW-1000, and MW-42b, which raised the RDL. Consequently, samples MW-44b, MW-44b field duplicate MW-1000, and MW-42b were E flagged for VOC-SIM analyses for cis-1,2,DCE, and MW-42b for Vinyl Chloride, 1,1-DCE, and PCE, all of which was adequately quantified during standard VOC analyses by Method 8260C.

Field Duplicate

One field duplicate was collected from MW-44b (labeled MW-1000 on COC).

Relative percent differences (RPDs) were all acceptable (less than 20%).

e. Lab Duplicates: ACCEPTABLE

Exception: None.

Laboratory duplicates or replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

For ARI job ID QF29 LR analyses were performed on nitrate-nitrite, n-nitrite, TOC, and chloride for sample MW-47c.

For ARI job ID QF48 LR analyses were performed on nitrate-nitrite, n-nitrite, sulfate, and chloride for sample MW-26a.

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

f. Lab Control Sample: ACCEPTABLE

Exception: None.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

LCS and LCSD (duplicate) water samples were run for all VOCs, SIM-VOC, MEE, and Dissolved CO2; and LCS for Dissolved Metals, Total Metals, TDS, and Total Kjeldahl Nitrogen. All the LCS and LCSD analyte recoveries were within the laboratory quality control limits except the following.

g. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

h. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

i. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarize above include the following.

On 3/23/10 an unusual pattern was noticed in control charts for recovery of Ethane and Ethene in RSK-175 (headspace analysis) LCS samples.

Investigation revealed that the assignment of chromatographic peaks for the two compounds were reversed when evaluating an initial calibration on 11/16/09. From that date until corrections were made on 2/17/10 detectable Ethane was reported as Ethene with a concentration about 12% high. Ethene was reported as Ethane with concentration about 9% low. The identification and concentration of Ethane and Ethene in all of the associated samples and QG were corrected and the revised data has been included in this data package.

Table N3b. Quality Assurance Quality Control Summary for Groundwater (Phase 2 / RI Round 6 Event/ January 12 and 13, 2010)

Data Set:	Groundwater Sampling (RI Round 6) January 12, 2010 RI Wells (MW-47c and MW-48b)	Groundwater Sampling (RI Round 6) January 13, 2010 RI Wells (MW-26a, MW-49p2, MW-44b, MW-46p2, MW-42b)
Lab Data Batch -------->	**ARI QF29 (TA Los Angeles LTA0082 Dissolved CO2)**	**ARI QF48 (TA Los Angeles LTA0097 Dissolved CO2)**
METHODOLOGY		
Method	Good	Good
Date Sampled	ok	ok
Date Analyzed	ok	ok
Holding Time	ok	ok
Preservative	ok	Dissolved Metals for MW-49p2 not preserved or filtered in field - - performed in lab.
Acceptability	YES	YES
SURROGATE SPIKES		
Surrogate Used	Yes (4 for VOCs, 2 for SIM-VOCs, 1 for MEE)[1]	Yes (4 for VOCs, 2 for SIM-VOCs, 1 for MEE)[1]
Sample Spike Recovery	fine	fine
Control Spike Recovery	fine	fine
Acceptability	YES	YES
MS/MSD	Yes (MS for nitrate+nitrite, nitrite, TOC, and chloride - MW-47c)	Yes (MS for conventionals)
MS Recovery	fine	fine
MSD Recovery	NA	NA
RPD	NA	NA
Acceptability	YES	YES
METHOD BLANK	Yes (VOCs, SIM-VOCs, MEE, Dissolved CO2, Total Metals, Dissolved Metals, TOC, nitrate+nitrite, N-nitrite, total Kjeldahl nitrogen, chloride, sulfate, and TDS.)	Yes (VOCs, SIM-VOCs, MEE, Total Metals, Dissolved Metals, Conventionals, Dissolved CO2,
Detections	TDS detected slightly above reporting limit. Samples significantly higher - data accepted	TDS detected slightly above reporting limit. Samples significantly higher - data accepted
Surrogate Recovery	fine	fine
Acceptability	YES	YES
TRIP BLANK	None	Yes (VOC)
Detections	NA	Very low level methylene chloride and styrene (near RL). Methylene chloride detected in some samples at concentrations an order of magnitude higher - No Action
Acceptability	YES	YES

[1]Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene
Methane/Ethane/Ethene Surrogate: propane

Table N3b. Quality Assurance Quality Control Summary for Groundwater (Phase 2 / RI Round 6 Event/ January 12 and 13, 2010)

Data Set:	Groundwater Sampling (RI Round 6) January 12, 2010 RI Wells (MW-47c and MW-48b)	Groundwater Sampling (RI Round 6) January 13, 2010 RI Wells (MW-26a, MW-49p2, MW-44b, MW-46p2, MW-42b)
Lab Data Batch -------->	**ARI QF29 (TA Los Angeles LTA0082 Dissolved CO2)**	**ARI QF48 (TA Los Angeles LTA0097 Dissolved CO2)**
RDL	Okay	Okay
Regulation/Method	ok	ok
Lab	ok	VOC dilutions required for MW-44b (1:10), Duplicate MW-1000 (1:10), and MW-42b (1:10) - higher RDL
		E-flagged SIM-VOC values are quanitified within reportable range in standard level 8260 method.
Acceptability	YES	YES
FIELD DUPLICATES	none	Yes
Sample:	NA	MW-44b
RPD	NA	fine
Acceptability	NA	YES
LAB DUPLICATES	Yes (conventionals)	Yes (conventionals)
Sample	nitrate+nitrite, nitrite, TOC, and chloride (MW-47c)	MW-26a
RPD	fine	fine
Acceptability	YES	YES
LAB CONTROL	Yes (LCS and LCSD for VOCs, SIM-VOC, MEE, and Dissolved CO2; and LCS for Dissolved Metals, Total Metals, TDS, and Total Kjeldahl Nitrogen)	Yes (LCS and LCSD for VOCs, SIM-VOC, MEE, and Dissolved CO2; and LCS for Total Metals, Dissolved Metals, TDS, and Total Kjeldahl Nitrogen)
Spike Recovery	fine	fine
Surrogate Recovery	fine	fine
Spike Dupl. Recovery	fine	fine
RPD	fine	fine
Acceptability	YES	YES
STANDARD REFERENCE	Conventionals	Conventionals
Recovery	good	good
COC	yes	yes
Acceptability	YES	YES

[1]Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene
Methane/Ethane/Ethene Surrogate: propane

Table N3b. Quality Assurance Quality Control Summary for Groundwater (Phase 2 / RI Round 6 Event/ January 12 and 13, 2010)

Data Set:	Groundwater Sampling (RI Round 6) January 12, 2010 RI Wells (MW-47c and MW-48b)	Groundwater Sampling (RI Round 6) January 13, 2010 RI Wells (MW-26a, MW-49p2, MW-44b, MW-46p2, MW-42b)
Lab Data Batch -------->	**ARI QF29 (TA Los Angeles LTA0082 Dissolved CO2)**	**ARI QF48 (TA Los Angeles LTA0097 Dissolved CO2)**
LAB REPORT	Cover Report	Cover Report
Additional Information	1. An unpreserved vial was used for the VOC analysis. Analysis performed within the 1 week holdin gtime for unpreserved samples - Data accepted.	1. Updated Report (April 26, 2010) - Chromatograph peaks for Ehtane and Ethene were reversed in initial calibration. Corrections made on 2/17/10 and results resubmitted. All QC corrected and revised. Corrected recoveres for LCS and MS samples all within established limits.
	2. Updated Report (April 26, 2010) - Chromatograph peaks for Ehtane and Ethene were reversed in initial calibration. Corrections made on 2/17/10 and results resubmitted. All QC corrected and revised. Corrected recoveres for LCS and MS samples all within established limits.	
Acceptability	YES	YES

[1]Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene
Methane/Ethane/Ethene Surrogate: propane

Appendix N3c: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Round 6 RI Groundwater Samples (3 of 3)

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. The analytical analyses were performed by Analytical Resources, Inc. (ARI) in Tukwila.

Twelve groundwater samples for Round 6 RI (part 3 of 3) were collected from twelve monitoring wells on January 13 to 15, 2010. **Table N3c** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the Round 6 RI dataset (part 3 of 3).

1. RI Round 6 Sampling Event (3 of 3)

Twelve water samples, one MS sample, one MSD sample, and two VOC trips blank samples were submitted to ARI laboratory (ARI job IDs QF69 and QF85). Analyses performed by the lab include VOCs 8260C method, VOC selective ion monitoring (SIM) method, dissolved and total metals, dissolved CO2, and inorganic compounds (conventionals). Samples were collected from remedial investigation monitoring wells:

- Remedial investigation wells (MW-31b, MW-35p2, MW-38p2, MW-39p2, MW-40p2, MW-41a, MW-32a, MW-29b, MW-33p2, MW-30b, MW-43p2, MW-37p1)

The solid waste monitoring wells are associated with the regular quarterly monitoring for the landfill under WAC 173-351. Analytical results for these wells were also reported in the first quarter 2009 quarterly report required under WAC 173-351.

The laboratory performed standard QA/QC analyses on the water samples and they were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Table N3c**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results. Samples MW-38p2, MW-35p2, MW-33p2, MW-43p2, and MW-37p1 for dissolved metals analysis were preserved and filtered in the laboratory rather than the field.

b. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Exception: d4-1,2-DCA SIM-VOC surrogate recovered slighly low for orginal and reanalysis run of MW-38p2 as well as for the original and reanalysis run of MW-32a.

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene. The following two surrogates were added to all samples for SIM-VOC analyses: d4-12-dichloroethane and d8-toluene. One surrogate, propane, was added to all samples for MEE analyses.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC and semi-volatile analyses as 3 to 4 standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the laboratory limits for all samples associated with the sampling event except the following.

d4-1,2-DCA SIM-VOC surrogate recovered slightly low for original and reanalysis run of MW-38p2 for ARI job ID QF69 as well as for the original and reanalysis run of MW-32a ARI job ID QF85. This is likely due to matrix interference, no corrective action was required.

Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: Sodium, magnesium, and calcium concentration too high in total metals analyses in sample MW-41a to quantify matrix spike recovery in ARI job ID QF69. For VOC analyses of sample MW-41a, the MS for 1,1-DCE; cis-1,2-DCE; 1,2-DCP; 1,1,1-TCA, chloroform, 2-hexanone, 1,1,2-trichloro-1,2,2,-trifluoroethane, trichlorofluoromethane, 4-chlorotolune, methylene chloride and acrylonitrile had low recovery. For VOC analyses of sample MW-41a, the MS/MSD RPD was >20% for acrolein (23.4%) and bromoethane (20.6%).

Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

ARI job ID QF69 included an MS and MSD analysis for VOCs and SIM VOCs on sample MW-41a. An MS analysis was also run for total metals, dissolved metals, and conventionals on sample MW-41a.

ARI job ID QF85 included an MS analysis for select conventionals on sample MW-32a.

The MS/MSD indicated acceptable percent recovery of all analytes except the following.

For VOC analyses of sample MW-41a, the MS for 1,1-DCE; cis-1,2-DCE; 1,2-DCP; 1,1,1-TCA, chloroform, 2-hexanone, 1,1,2-trichloro-1,2,2,-trifluoroethane, trichlorofluoromethane, 4-chlorotolune, methylene chloride and acrylonitrile had low recovery. The recoveries of these compounds were below the advisory Control Limit in the MS/MSD by less than 5%. All of these compounds were within control in the MSD. The data were accepted.

The relative percent differences (RPD) between MS and MSD results were all less than 20% with the following exception: For VOC analyses of sample MW-41a, the MS/MSD RPD was >20% for acrolein (23.4%) and bromoethane (20.6%). The data were accepted.

d. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20.

TDS was detected in the method blank for ARI job ID QF69. Samples analyzed had significantly higher TDS detections; the data were accepted. All other blanks resulted in non- detects for ARI job IDs QF69 and QF85.

e. Field Trip Blanks: ACCEPTABLE

Exception: Methylene chloride and styrene were detected slightly above the detection limit in trip blanks for VOC analysis for ARI job IDs QF69 and QF85.

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks for VOCs were analyzed for ARI job IDs QF69 and QF85. No analytes were detected except for low levels of methylene chloride and styrene detected near the reporting limit. Methylene chloride is a common laboratory contaminant. Additionally, the trip blank for ARI job ID QF85 for VOC analysis is reported to have headspace. No corrective action taken and data were accepted.

Reported Detection Limits: ACCEPTABLE

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses except for VOC and SIM-VOC analyses from ARI job ID QF69. For this batch MW-35p2 and MW-38p2 required dilutions for VOC analyses and MW-38p2 required dilutions for SIM-VOC analysis. The high dilutions for samples VOC analyses raised the RDL by one to several orders of magnitude, resulting in some of the detection limits being above the MTCA cleanup levels. See results table.

VOC-SIM parameters cis-12-DCE and vinyl chloride for MW-38p2 and MW-35p2, and vinyl chloride for MW-31b, are estimated concentrations above the calibration range and are flagged "E" for ARI job ID QF69. All parameters were detected in the VOC analysis by Method 8260C for these wells except cis-12-DCE in MW-35p2.

For ARI job ID QF85 some SIM-VOC results were flagged “E”. All flagged parameters were adequately quantified in standard VOC analyses.

a. Field Duplicate

None.

f. Lab Duplicates: ACCEPTABLE

Exception: None.

Laboratory duplicates or replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

For ARI job ID QF69 LR analyses were performed on dissolved metals and total metals, dissolved CO2 and conventionals for sample MW-41a.

For ARI job ID QF85 LR analyses were performed on TDS, chloride, N-nitrite, and nitrate+nitrite (MW-32a) and alakalinity, CO3, HCO3, and Hydroxide (MW-37p1).

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

g. Lab Control Sample: ACCEPTABLE

Exception: 2-hexanone was recovered low in the 1/19/2010 LCS and chloromethane was recovered high in the 1/25/10 run for VOC analysis, but both were within range in the LCSD and within the lab’s marginal exceedence criteria.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of

interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

LCS and LCSD were analyzed for VOCs, SIM-VOC, MEE, and Dissolved CO2; and LCS for Total Metals, Dissolved Metals, TDS, and Total Kjeldahl Nitrogen. All the LCS and LCSD analyte recoveries were within the laboratory quality control limits except the following.

2-hexanone was recovered low in the 1/19/2010 LCS and chloromethane was recovered high in the 1/25/10 run for VOC analysis, but both were within range in the LCSD and within the lab's marginal exceedence criteria. No corrective action was taken.

The relative percent differences (RPD) between LCS and LCSD analyses were all below 20% with the following exception: The RPD for acrolein was 38.5% for the 1/25/10 run, all other parameters were less than 20%.

h. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

i. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

j. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarize above include the following.

On 3/23/10 an unusual pattern was noticed in control charts for recovery of Ethane and Ethene in RSK-175 (headspace analysis) LCS samples.

Investigation revealed that the assignment of chromatographic peaks for the two compounds were reversed when evaluating an initial calibration on 11/16/09. From that date until corrections were made on 2/17/10 detectable Ethane was reported as Ethene with a concentration about 12% high. Ethene was reported as Ethane with concentration about 9% low. The identification and concentration of Ethane and Ethene in all of the associated samples and QG were corrected and the revised data has been included in this data package.

The following compounds were below the Control Limit in the Continuing Calibration performed 1/19/2010: Choroethane, Iodomethane, 2-Hexanone, trans-1 .4-Dichloro-2-butene, 1,2-Dibromo-3-chloropropane, and Naphthalene. Additionally, Acrolein was above the Control Limit. Q flags have been applied to the LCS/LCSD Form III's to indicate such.

The following compounds were below the Control Limit in the Continuing Calibration performed 1/18/2010: Bromomethane, Choroethane, Iodomethane, and trans-1 .4-Dichloro-2-butene. Additionally, Acrolein was above the Control Limit. Q flags have been applied to the LCS/LCSD Form III's to indicate such.

Table N3c. Quality Assurance Quality Control Summary for Groundwater (Phase 2 Wells / Round 6 RI Wells / January 13 - 15 ,2010)

Data Set:	Groundwater Sampling (RI Round 6) January 13-14, 2010 RI Wells (MW-31b, MW-35p2, MW-38p2, MW-39p2, MW-40p2, MW-41a)	Groundwater Sampling (RI Round 6) January 15, 2010 RI Wells (MW-32a, MW-29b, MW-33p2, MW-30b, MW-43p2, MW-37p1)
Lab Data Batch -------->	**ARI QF69 (Test America Los Angeles LTA0109 Dissolved CO2)**	**ARI QF85 (Test America Los Angeles LTA0108 Dissolved CO2)**
METHODOLOGY		
Method	Good	Good
Date Sampled	ok	ok
Date Analyzed	ok	ok
Holding Time	ok	ok
Preservative	Dissolved Metals for MW-38p2 and MW-35p2 not preserved or filtered in field -	Dissolved Metals for MW-33p2, MW-43p2, and MW-37p1 not preserved or filtered in
Acceptability	YES	YES
SURROGATE SPIKES		
Surrogate Used	Yes (4 for VOCs, 2 for SIM-VOCs, 1 for MEE)[1]	Yes (4 for VOCs, 2 for SIM-VOCs, 1 for MEE)[1]
Sample Spike Recovery	SIM-VOC surrogate d4-1,2-DCA slighly below limit for orginal and reanlysis run of MW- Likely related to sample matrix interference - no action.	SIM-VOC surrogate d4-1,2-DCA slighly below limit for orginal and reanlysis run of MW- Likely related to sample matrix interference - no action.
Control Spike Recovery	fine	fine
Acceptability	YES	YES
MS/MSD	Yes (MS and MSD for VOC and VOC-SIM, MSD for diss. metals, tot. metals,	Yes (MS for chloride, nitrite-nitrate as N, and nitrite as N)
MS Recovery	Sodium, magnesium, and calcium concentration too high in sample to assess MS	fine
	Low recovery for: 1,1-DCE; cis-1,2-DCE; 1,2-DCP; 1,1,1-TCA, chloroform, 2-hexanone, 1,1,2-trichloro-1,2,2,-trifluoroethane, trichlorofluoromethane, 4-chlorotolune, methylene chloride and acrylonitrile. Compounds only out of control by less than 5%. All compounds within control in MSD. MS and MSD only advisory. No action	
MSD Recovery	fine	NA
RPD	>20% for: acrolein (23.4%), bromoethane (20.6%)	NA
Acceptability	YES	YES
METHOD BLANK	Yes (VOCs, SIM-VOCs, MEE, Dissolved CO2, Dissolved Metals, Total Metals, TOC, nitrate+nitrite, N-nitrite, total Kjeldahl nitrogen, sulfate, and TDS.)	Yes (VOCs, SIM-VOCs, MEE, Dissolved CO2, Dissolved Metals, Total Metals, TOC, nitrate+nitrite, N-nitrite, total Kjeldahl nitrogen, sulfate, chloride and TDS.)
Detections	TDS detected slightly above reporting limit. Samples all significantly higher - data accept	none
Surrogate Recovery	fine	fine
Acceptability	YES	YES

1Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene
Methane/Ethane/Ethene Surrogate: propane

Table N3c. Quality Assurance Quality Control Summary for Groundwater (Phase 2 Wells / Round 6 RI Wells / January 13 - 15 ,2010)

Data Set:	Groundwater Sampling (RI Round 6) January 13-14, 2010 RI Wells (MW-31b, MW-35p2, MW-38p2, MW-39p2, MW-40p2, MW-41a)	Groundwater Sampling (RI Round 6) January 15, 2010 RI Wells (MW-32a, MW-29b, MW-33p2, MW-30b, MW-43p2, MW-37p1)
TRIP BLANK	Yes (VOC)	Yes (VOC)
Detections	Very low level methylene chloride and styrene detected (near RL), but no detections in samples - No Action	Very low level methylene chloride and styrene detected (near RL), but no detections in samples - No Action
		Only one vial for TB and reported ot have headspace - an amount that can impact results - No Action
Acceptability	YES	YES
RDL	Okay	Okay
Regulation/Method	ok	ok
Lab	VOC dilutions required for MW-35p2 (1:100) and MW-38p2 (1:1000) resulting in higher	ok
	SIM-VOC dilution required for MW-38p2 (1:100) resulting in higher RDL.	E-flagged values are quanitified within reportable range in standard level 8260 method.
	VOC-SIM parameters cis-12-DCE and vinyl chloride for MW-38p2 and MW-35p2, and vinyl chloride for MW-31b, are estimated concentration above the calibration range and flagged "E". All parameters were detected in the VOC analysis for these wells except cis-	
Acceptability	YES	YES
FIELD DUPLICATES	none	none
Sample:	NA	NA
RPD	NA	NA
Acceptability	NA	NA
LAB DUPLICATES	Yes (dissolved metals, total metals, conventionals and dissolved CO2)	Yes (conventionals)
Sample	metals and conventionals (MW-41a) and dissolved CO2 (water)	TDS, chloride, N-nitrite, and nitrate+nitrite (MW-32a) and Alakalinity, CO3, HCO3, and
RPD	fine	fine
Acceptability	YES	YES
LAB CONTROL	Yes (LCS and LCSD for VOCs, SIM-VOC, MEE, and Dissolved CO2; and LCS for Total Metals, Dissolved Metals, TDS, and Total Kjeldahl Nitrogen)	Yes (LCS and LCSD for VOCs, SIM-VOC, MEE, and Dissolved CO2; and LCS for Total Metals, Dissolved Metals, TDS, and Total Kjeldahl Nitrogen)
Spike Recovery	2-hexanone below limit (1/19/10) and chloromethane above limit (1/25/10) in the LCS run, but both within lab's Marginal Exceedance - No Action	2-hexanone below limit (1/19/10), but both within lab's Marginal Exceedance - No Action
Surrogate Recovery	fine	fine
Spike Dupl. Recovery	fine	fine
RPD	38.5% for acrolein on 1/25/10 - all others less than 20%	fine
Acceptability	YES	YES

1Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene
Methane/Ethane/Ethene Surrogate: propane

Table N3c. Quality Assurance Quality Control Summary for Groundwater (Phase 2 Wells / Round 6 RI Wells / January 13 - 15 ,2010)

Data Set:	Groundwater Sampling (RI Round 6) January 13-14, 2010 RI Wells (MW-31b, MW-35p2, MW-38p2, MW-39p2, MW-40p2, MW-41a)	Groundwater Sampling (RI Round 6) January 15, 2010 RI Wells (MW-32a, MW-29b, MW-33p2, MW-30b, MW-43p2, MW-37p1)
STANDARD REFERENCE	Conventionals	Conventionals
Recovery	good	good
COC	yes	yes
Acceptability	YES	YES
LAB REPORT	Cover Report	Cover Report
Additional Information	1. Following compounds below limit in continuing calibration for 1/19/10 run: chloroethane, iodomethane, 2-hexanone, trans-1,4-dichloro-2-butene, 1,2-dibromo-3-chloropropane, and naphthalnene. Q-flags applied. Method allows up to 20% failure - No Action	1. Following compounds below limit in continuing calibration for 1/18/10 run: bromomethane, chloroethane, iodomethane, trans-1,3-dichloro-2-butene. Q-flags applied. Method allows up to 20% failure - No Action
	2. Acrolein above limit in continuing calibration for 1/19/10 run. Q-flags applied. Method allows up to 20% failter - No Action.	2. Acrolein above limit in continuing calibration for 1/18/10 run. Q-flags applied. Method allows up to 20% failter - No Action.
	3. Hexachlorobutadiene below limit in continuing calibration for 1/25/10 run. Q-flags applied. Method allows up to 20% failure - No Action	3. Following compounds below limit in continuing calibration for 1/19/10 run: chloroethane, iodomethane, 2-hexanone, trans-1,4-dichloro-2-butene, 1,2-dibromo-3-chloropropane, and naphthalnene. Q-flags applied. Method allows up to 20% failure - No Action
	4. Updated Report (April 26, 2010) - Chromatograph peaks for Ehtane and Ethene were reversed in initial calibration. Corrections made on 2/17/10 and results resubmitted. All QC corrected and revised. Corrected recoveres for LCS and MS samples all within established limits.	4. Acrolein above limit in continuing calibration for 1/19/10 run. Q-flags applied. Method allows up to 20% failter - No Action.
		5. Updated Report (April 26, 2010) - Chromatograph peaks for Ehtane and Ethene were reversed in initial calibration. Corrections made on 2/17/10 and results resubmitted. All QC corrected and revised. Corrected recoveres for LCS and MS samples all within established limits.
Acceptability	YES	YES

1Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene
Methane/Ethane/Ethene Surrogate: propane

Appendix N4: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Round 7 RI Groundwater Samples

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. The analytical analyses were performed by Analytical Resources, Inc. (ARI) in Tukwila.

Nine Round 7 RI groundwater samples were collected from nine locations on February 16 and 17, 2009. **Table N4** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the Round 7 RI dataset.

1. RI Round 7 Sampling Event

Nine water samples, and one VOC trip blank samples were submitted to ARI laboratory (ARI job ID QK55). Analyses performed by the lab include VOCs 8260C method, VOC selective ion monitoring (SIM) method, dissolved and total metals, and inorganic compounds (conventionals). Samples were collected remedial investigation monitoring wells, private wells, and surface water body:

- Remedial investigation wells (MW-51b, MW-50c, MW-52p2, MW-53a)
- Private wells (Massey, Manship)
- Water Body (Neva Lake)

The laboratory performed standard QA/QC analyses on the water samples and they were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Table N4**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results. Dissolved metals samples for Neva Lake, Massey, and Manship arrived at the lab unpreserved and unfiltered for lab filtration.

b. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Exception: None.

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene. The following two surrogates were added to all samples for SIM-VOC analyses: d4-12-dichloroethane and d8-toluene.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC and semi-volatile analyses as 3 to 4 standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the laboratory limits for all samples associated with the sampling event.

Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: None.

Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

ARI job ID QK55 included an MS chloride, N-nitrite, nitrate+nitrite, and sulfate on sample MW-51b.

The MS/MSD indicated acceptable percent recovery of all analytes.

Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20.

All blanks resulted in non- detects.

d. Field Trip Blanks: ACCEPTABLE

Exception: None.

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Reported Detection Limits: ACCEPTABLE

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses except for Arsenic analyses from ARI job ID QK55. For this batch the laboratory had a temporary equipment failure for Method 200.8, so the samples were analyzed by Method 7060A, which has slightly higher reporting limits.

Field Duplicate

None.

e. Lab Duplicates: ACCEPTABLE

Exception: None

Laboratory duplicates or replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

For ARI job ID QK55 LR analyses were performed on conventionals for sample MW-51b and MW-53a.

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

f. Lab Control Sample: ACCEPTABLE

Exception: Acrolein was recovered high in the LCS and LCSD for the VOC analysis in ARI job ID QK55.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

LCS and LCSD (duplicate) water samples were run for all VOC, SIM-VOC, total metals, dissolved metals, and TDS. All the LCS and LCSD analyte recoveries were

within the laboratory quality control limits except the following.

Acrolein was recovered high in the LCS and LCSD for the VOC analysis in ARI job ID QK55. Both recoveries were within the lab's allowable Marginal Exceedence range, and the analyte was not detected in any samples.

Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

g. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

h. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarize above include the following.

2-Chloroethylvinylether was below the Control Limit in the Continuing Calibration. Additionally, Acrolein was above the Control Limit. Q flags have been applied to the Form Ill's to indicate such.

Table N4. Quality Assurance Quality Control Summary for Groundwater (Phase 2 Wells / Round 7 RI Wells)

Data Set:	Groundwater Sampling (RI Round 7) February 16 and 17, 2010 Massey, Sanchez, Manship, Neva Lake, MW-50c, MW-51b, MW-52p2, MW-53a, and MW-54c
Lab Data Batch -------->	**ARI QK55**
METHODOLOGY	
Method	Good (Dissolved arsenic used method SW7060A versus EPA 200.8)
Date Sampled	ok
Date Analyzed	ok
Holding Time	ok
Preservative	Dissolved metals for private wells and Neva Lake not field filtered (unpreserved). Filtered in Lab.
Acceptability	YES (Massey sample had elevated iron - possibly preserved in field - resampling)
SURROGATE SPIKES	
Surrogate Used	Yes (4 for VOC; 2 for SIM-VOC)[1]
Sample Spike Recovery	fine
Control Spike Recovery	fine
Acceptability	YES
MS/MSD	MS for chloride, N-nitrtie, nitrate+nitrite, and sulfate (MW-51b)
MS Recovery	fine
MSD Recovery	NA
RPD	NA
Acceptability	YES
METHOD BLANK	Yes (1 Batch for: VOCs, SIM-VOCs, Dissolved Metals, Total Metals, and Conventionals)
Detections	none
Surrogate Recovery	fine
Acceptability	YES

[1]Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene

Table N4. Quality Assurance Quality Control Summary for Groundwater (Phase 2 Wells / Round 7 RI Wells)

Data Set:	Groundwater Sampling (RI Round 7) February 16 and 17, 2010 Massey, Sanchez, Manship, Neva Lake, MW-50c, MW-51b, MW-52p2, MW-53a, and MW-54c
TRIP BLANK	Yes (VOC and SIM-VOC)
Detections	None
Acceptability	YES
RDL	Okay
Regulation/Method	ok
Lab	ok
Acceptability	YES
FIELD DUPLICATES	none
Sample:	NA
RPD	NA
Acceptability	NA
LAB DUPLICATES	Yes (conventionals)
Sample	MW-51b and MW-53a
RPD	fine
Acceptability	YES
LAB CONTROL	Yes (LCS and LCSD for VOCs and SIM-VOCs and LCS for Dissolved Metals, Total Metals and TDS)
Spike Recovery	Acrolein above control limit for LCS and LCSD, but within ME limits (no corrective action)
Surrogate Recovery	fine
Spike Dupl. Recovery	fine
RPD	fine
Acceptability	YES

[1]Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene

Table N4. Quality Assurance Quality Control Summary for Groundwater (Phase 2 Wells / Round 7 RI Wells)

Data Set:	Groundwater Sampling (RI Round 7) February 16 and 17, 2010 Massey, Sanchez, Manship, Neva Lake, MW-50c, MW-51b, MW-52p2, MW-53a, and MW-54c
STANDARD REFERENCE	Conventionals
Recovery	good
COC	yes
Acceptability	YES
LAB REPORT	Cover Report
Additional Information	2-chloroethylvinylether below control limit in continuing calibration and Acrolein above the control limit. Q-flags applied to Form III (Method allows up to 20% compounds to fail criteria)
	Arsenic typically analysed by Method 200.8. Due to temp equipment failure, request changed to Method 7060A (slightly higher reporting limits).
	Nitrite detection in MW-54c slightly higher than detection of nitrate+nitrite. Difference between the two numbers (0.002 mg-N/L) reltively insignificant (no action)
Acceptability	YES

[1]Note:
VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene
SIM VOC Surrogates: d4-1,2-dichloroethane; d8-Toluene

Appendix N5: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Phase 2 Drilling, Abrams, Whitson Confirmation, and EW-1 groundwater samples

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. The analytical analyses were performed by Analytical Resources, Inc. (ARI) in Tukwila.

Phase 2 Drilling groundwater samples were collected from 8 locations on August 4 to September 10, 2009. Single event samples were also collected from private off-Site Abrams well and groundwater from the Hole (EW-1). **Tables N5a and 5b** summarizes QA/QC for these sampling event.

The following QA/QC narratives are for the Phase 2 Drilling dataset.

1. Phase 2 Drilling Sampling

8 water samples and four VOC trip blank samples, were submitted to ARI laboratory (ARI job IDs PJ16, PJ20, PJ36, PN37, PJ74, PN07, PN08, and PN82). Analyses performed by the lab include VOCs 8260C method, dissolved and total metals, and inorganic compounds (conventionals). Samples were collected during Phase 2 drilling from the following locations:

- MW-39p2, Whitson, B-29-P1, MW-40p2, EW-1, Abrams, B-32-30, B-16-15

The laboratory performed standard QA/QC analyses on the water samples and they were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Tables B5a and 5b**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results.

b. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Exception: None

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC 3 to 4 standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the laboratory limits for all samples associated with the analyses.

Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: Chloride was recovered low in ARI Job ID PN08.

Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

ARI job ID PS37 included an MS analysis for select conventionals on sample B-29-p1.

ARI job ID PJ74 included an MS analysis for select conventionals on sample EW-1.

ARI job ID PN08 included an MS analysis for conventionals on sample B32-30.

ARI job ID PN82 included an MS analysis for conventionals on sample B36-15.

The MS/MSD indicated acceptable percent recovery of all analytes except the following.

For ARI job ID PN08, chloride was recovered low by 8.7% possibly due to under-spike. Since all other QC measures were in control, no corrective action was taken.

The relative percent differences (RPD) between MS and MSD results were all less than 20%.

d. Method Blanks: ACCEPTABLE

Exception: TDS was detected above the reporting limit in method blanks for ARI job IDs PJ20, PJ37, PJ74, and methylene chloride in ARI job ID PN82.

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20.

The method blank detections are insignificant for TDS because the relatively high TDS detections in the samples. The method blank detection of methylene chloride is irrelevant because methylene chloride was not detected in the sample analyzed for ARI job ID PN82.

e. Field Trip Blanks: ACCEPTABLE

Exception: Styrene and methylene chloride detected at or above the detection limit in ARI job ID PJ36 and methylene chloride detected slightly above the detection limit in ARI job IDs PJ74, PN07.

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks for VOCs were analyzed for ARI job IDs PJ36, PJ74, PN07. Trip Blanks were submitted, but not analyzed for ARI job ID PJ73.

Methylene chloride is a common laboratory contaminant and is insignificant for samples analyzed for ARI job IDs PJ74 and PN07, and styrene in ARI job ID PJ36.

Methylene chloride in the Whitson sample for ARI job ID PJ36 was detected at the reporting limit. The level of methylene chloride in this sample may have been elevated to the point of detection due to the same source of contamination that caused the detection in the Trip Blank. Detections for this compound can often be linked to reactions naturally occurring over time in an HCl preserved vial.

Reported Detection Limits: ACCEPTABLE

Exception: Reporting limits were elevated for sample EW-1 due to a dilution on the 2nd sample run, and for sample EW-1 for nitrate for ARI job ID PJ74.

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses except for VOC analyses from and conventional analysis from ARI job ID PJ74 for sample EW-1. For this batch a one sample required high dilutions, which raised the RDL. The data are acceptable for the VOC analysis because the reporting limit was raised for the second run in order to accurately quantify vinyl chloride. However, acetone results in the dilution run were higher than those in the original run; acetone is a common laboratory contaminant. The reporting limits were raised for EW-1 conventional analytes. The data are acceptable for conventional as all analytes were detected above the reporting limit.

f. Field Duplicate

None

g. Lab Duplicates: ACCEPTABLE

Exception: Carbonate RPD was 40% for sample B-32-30 for ARI job ID PN08.

Laboratory duplicates or replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

For ARI job ID PN08 LR analyses were performed on conventionals for sample B-32-30. Carbonate RPD was 40% for sample B-32-30, but the carbonate fraction of alkalinity was much smaller than the bicarbonate fraction. So, the carbonate RPD is insignificant and data are accepted.

For ARI job ID PJ20 LR analyses were performed on TDS for sample MW-39p2.

For ARI job ID PJ37 LR analyses were performed on chloride, nitrate-nitrite, and n-nitrite for sample B-29-p1.

For ARI job ID PJ74 an LR analysis were performed on nitrate-nitrite, n-nitrite, and sulfate for sample EW-1.

For ARI job ID PJ37 LR analyses were performed on conventionals for sample B-36-15.

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

h. Lab Control Sample: ACCEPTABLE

Exception: The RPD for chloromethane was 23%, greater than 20% for the VOC analysis for ARI job ID PJ73. All other QC are in compliance and data is accepted.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

LCS and LCSD (duplicate) water samples were run for all VOC analyses, and LCS for TDS. All the LCS and LCSD analyte recoveries were within the laboratory quality control limits except the following.

The RPD for chloromethane was 23%, greater than 20% for the VOC analysis for ARI job ID PJ73. All other QC are in compliance and data is accepted.

i. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional

analytes. The percent recoveries were found to be within the control limits established by ARI.

j. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

k. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarize above include the following.

The Trip Blank had detections at or just slightly above the Reporting Limit for methylene chloride. Sample Whitson had a detection at exactly the Reporting Limit for methylene chloride. The level of methylene chloride in this sample may have been elevated to the point of detection due to the same source of contamination that caused the detection in the Trip Blank. Detections for this compound can often be linked to reactions naturally occurring over time in an HCl preserved vial.

Bromomethane, Iodomethane, and 1,2-Dibromo-3-chloropropane were out of control low bias in the continuing calibration for ARI job ID PJ16. Q flags were added to Form III LCS/LCSD results.

Chloromethane was out of control high bias in continuing calibration for 8/06/09 samples B-29-p1 and trip blank for ARI job ID PJ36. The LCS/LCSD Form III for 8/16/09 is Q flagged for chloromethane. As a high recovery in a QC measure can only serve to indicate results biased high, and the samples had no detections for this compound, the outage is considered irrelevant to the sample data. Data meet compliance criteria and are accepted.

Acrolein was recovered high in the continuing calibration for the VOC analysis in ARI job ID PJ74 for run on 8/11/09. Acrolein is a known poor performer and Q flags have been added to LCS/LCSD form III.

Acetone, 2-Butanone, 4-Methyle-2-Pentanone, and 2-Hexanone were recovered out of control low bias in the continuing calibration for ARI job ID PN82. Q flags were added to LCS/LCSD Form III; Q flags are only applied to Form I results when there is a detection for the analyte.

Table N5a. Quality Assurance Quality Control Summary for Groundwater Samples (Phase 2 Drilling, Abrams, Whitson-Confirmation, and EW-1)

ARI Lab Reports: PJ16, PJ20, PJ36, PJ37, and PJ73

Job Number: JE0714a

Lab Data Batch -------->	PJ16	PJ20	PJ36	PJ37	PJ73
METHODOLOGY					
Method	Good	Good	Good	Good	Good
Date Sampled	8/4/2009	8/4/2009	8/4-5/2009	8/4-5/2009	8/6/2009
Date Analyzed	8/5/2009	8/7 to 13/2009	8/7/2009	8/6 to 13/2009	8/7/2009
Holding Time	ok	ok	ok	ok	ok
Preservative	fine	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES	YES
SURROGATE SPIKES					
Surrogate Used	Yes (4 for VOC)[1]	None	Yes (4 for VOC)[1]	None	Yes (4 for VOC)[1]
Sample Spike Recovery	fine	NA	fine	NA	fine
Control Spike Recovery	fine	NA	fine	NA	fine
Acceptability	YES	NA	YES	NA	YES
MS/MSD	none	none	none	YES	none
MS Recovery	NA	NA	NA	Good	NA
MSD Recovery	NA	NA	NA	NA	NA
RPD	NA	NA	NA	NA	NA
Acceptability	NA	NA	NA	Good	NA

Table N5a. Quality Assurance Quality Control Summary for Groundwater Samples (Phase 2 Drilling, Abrams, Whitson-Confirmation, and EW-1)

ARI Lab Reports: PJ16, PJ20, PJ36, PJ37, and PJ73

Job Number: JE0714a

Lab Data Batch -------->	**PJ16**	**PJ20**	**PJ36**	**PJ37**	**PJ73**
METHOD BLANK	Yes (1 Batch for: VOCs)	Yes (1 Batch for: Dissolved Metals and Conventionals)	Yes (1 Batch for: VOCs)	Yes (1 Batch for: Dissolved Metals and Conventionals)	Yes (1 Batch for: VOCs)
Detections	none	TDS	none	TDS	none
Surrogate Recovery	fine	NA	fine	NA	fine
Acceptability	YES	YES	YES	YES	YES
TRIP BLANK	none	none	YES	none	YES- not analyzed
Detections	NA	NA	Styrene and Methylene Chloride near reporting limit. Except for Whitson, no detection in samples - No Action	NA	NA
Acceptability	NA	NA	YES-see note below	NA	NA
RDL	Okay	Okay	Okay	Okay	Okay
Regulation/Method	ok	ok	ok	ok	ok
Lab	ok	ok	ok	ok	ok
Acceptability	YES	YES	YES	YES	YES
FIELD DUPLICATES	none	none	none	none	none
Sample:	NA	NA	NA	NA	NA
RPD	NA	NA	NA	NA	NA
Acceptability	NA	NA	NA	NA	NA

Table N5a. Quality Assurance Quality Control Summary for Groundwater Samples (Phase 2 Drilling, Abrams, Whitson-Confirmation, and EW-1)

ARI Lab Reports: PJ16, PJ20, PJ36, PJ37, and PJ73

Job Number: JE0714a

Lab Data Batch -------->	**PJ16**	**PJ20**	**PJ36**	**PJ37**	**PJ73**
LAB DUPLICATES	none	TDS	none	YES	none
Sample	NA	MW-39p2	NA	B-29-p1	NA
RPD	NA	2.30%	NA	Good	NA
Acceptability	NA	YES	NA	YES	NA
LAB CONTROL	Yes (LCS and LCSD for VOCs)	Yes (LCS for Dissolved Metals and TDS)	Yes (LCS and LCSD for VOCs)	Yes (LCS for TDS)	Yes (LCS and LCSD for VOCs)
Spike Recovery	fine	fine	fine	fine	fine
Spike Dupl. Recovery	fine	NA	fine	NA	fine
Surrogate Recovery	fine	NA	fine	NA	fine
RPD	fine	NA	fine	NA	chloromethane 23%
Acceptability	YES	YES	YES	YES	YES
STANDARD REFERENCE	NA	Conventionals	NA	Conventionals	NA
Recovery	NA	good	NA	good	NA

Table N5a. Quality Assurance Quality Control Summary for Groundwater Samples (Phase 2 Drilling, Abrams, Whitson-Confirmation, and EW-1)

ARI Lab Reports: PJ16, PJ20, PJ36, PJ37, and PJ73

Job Number: JE0714a

Lab Data Batch -------->	PJ16	PJ20	PJ36	PJ37	PJ73
COC	YES	YES	YES	YES	YES
Acceptability	YES	YES	YES	YES	YES
LAB REPORT	Cover Report	Cover Report	Cover Report	Cover Report	Cover Report
Additional Information	Bromoethane, Iodomethane, and 1,2-Dibromo-3-chloropropane out of control low bias in continuing calibration - Q flags added to Form III, but meet compliance criteria of <20% failure for Method 8260C	TDS above detection limit in MB. Detection was insignificant when compared to sample. Data accepted	Chloromethane was out of control high in continuing calibration for 8/06/09 samples B-29-p1 and Trip Blank. Results are Q flagged LCS/LCSD from III. Data Accepted	TDS above detection limit in MB. Detection was insignificant when compared to sample. Data accepted	LCS/LCSD Chloromethane RPD = 23%. All other QC in compliance. Analyte not detected in sample. Data accepted.
Acceptability	YES	YES	YES	YES	YES

1 VOA Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene

Table N5b. Quality Assurance Quality Control Summary for Groundwater Samples (Phase 2 Drilling, Abrams, Whitson-Confirmation, and EW-1)

ARI Lab Reports: PJ74, PN07, PN08, PN82

Job Number: JE0714a

Lab Data Batch -------->	**PJ74**	**PN07**	**PN08**	**PN82**
METHODOLOGY				
Method	Good	Good	Good	Good
Date Sampled	8/6/2009	9/3/2009	9/3/2009	9/10/2009
Date Analyzed	8/7 to 13/2009	9/4/2009	9/4 to 15/09	9/11 to 14/ 2010
Holding Time	ok	ok	ok	ok
Preservative	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES
SURROGATE SPIKES				
Surrogate Used	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]	None	Yes (4 for VOC)[1]
Sample Spike Recovery	fine	fine	NA	fine
Control Spike Recovery	fine	fine	NA	fine
Acceptability	YES	YES	NA	YES
MS/MSD	Yes	none	Yes	Yes
MS Recovery	Good	NA	Chloride recovered low. All other QC within control. Data accepted.	Good
MSD Recovery	NA	NA	NA	NA
RPD	NA	NA	NA	NA
Acceptability	Good	NA	Good	Good

Table N5b. Quality Assurance Quality Control Summary for Groundwater Samples (Phase 2 Drilling, Abrams, Whitson-Confirmation, and EW-1)

ARI Lab Reports: PJ74, PN07, PN08, PN82

Job Number: JE0714a

Lab Data Batch -------->	**PJ74**	**PN07**	**PN08**	**PN82**
METHOD BLANK	Yes (1 Batch for: VOCs, Dissolved Metals, and Conventionals)	Yes (1 Batch for: VOCs)	Yes (1 Batch for: Dissolved and Total Metals, and Conventionals)	Yes (1 Batch for: VOCs and Conventionals)
Detections	TDS	none	none	Methylene Chloride
Surrogate Recovery	fine	fine	NA	fine
Acceptability	YES	YES	YES	YES
TRIP BLANK	Yes	Yes	No	No
Detections	Methylene Chloride	Methylene Chloride	NA	NA
Acceptability	YES	YES	NA	NA
RDL	Okay	Okay	Okay	Okay
Regulation/Method	ok	ok	ok	ok
Lab	ok	ok	ok	ok
Acceptability	YES	YES	YES	YES
FIELD DUPLICATES	none	none	none	none
Sample:	NA	NA	NA	NA
RPD	NA	NA	NA	NA
Acceptability	NA	NA	NA	NA

Table N5b. Quality Assurance Quality Control Summary for Groundwater Samples (Phase 2 Drilling, Abrams, Whitson-Confirmation, and EW-1)

ARI Lab Reports: PJ74, PN07, PN08, PN82

Job Number: JE0714a

Lab Data Batch -------->	**PJ74**	**PN07**	**PN08**	**PN82**
LAB DUPLICATES	N-nitrite, Nitrate+nitrite, Sulfate	none	Conventionals	Conventionals
Sample	EW-1	NA	B-32-30	B-36-15
RPD	good	NA	good	good
Acceptability	YES	NA	YES	YES
LAB CONTROL	Yes (LCS and LCSD for VOCs and TDS)	Yes (LCS and LCSD for VOCs)	Yes (LCS for TDS)	Yes (LCS and LCSD for VOCs and TDS)
Spike Recovery	fine	fine	fine	fine
Spike Dupl. Recovery	fine	fine	NA	fine
Surrogate Recovery	fine	fine	NA	fine
RPD	fine	fine	NA	fine
Acceptability	YES	YES	YES	YES
STANDARD REFERENCE	Conventionals	NA	Conventionals	Conventionals
Recovery	good	NA	good	good
COC	YES	YES	YES	YES
Acceptability	YES	YES	YES	YES

Table N5b. Quality Assurance Quality Control Summary for Groundwater Samples (Phase 2 Drilling, Abrams, Whitson-Confirmation, and EW-1)

ARI Lab Reports: PJ74, PN07, PN08, PN82

Job Number: JE0714a

Lab Data Batch -------->	PJ74	PN07	PN08	PN82
LAB REPORT	Cover Report	Cover Report	Cover Report	Cover Report
Additional Information	TDS above detection limit in MB. Detectio nwas insignificant when compared to sample. Data accepted	Methylene Chloride detected at RL in TB. No detection in sample.	Carbonate RPD = 40%. The carbonate fraction of alkalinity is much smaller than that of biocarbonate. Data Accepted.	Acetone, 2-butanone, 4-methyl-2-pentanone, and 2-hexanone out of control low in LCS/LCSD. Q-flags added to Form III LCS/LCSD. Failure meets < 20% criteria. Data accepted.
	Methylene Chloride detected at RL in TB			
	Acrolein out of control (low) in continuing calibration. A-flags applied to LCS/LCSD Form III			
Acceptability	YES	YES	YES	YES

1 VOA Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene

Appendix N6: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Private Well Groundwater Samples (Round 1)

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. The analytical analyses were performed by Analytical Resources, Inc. (ARI) in Tukwila.

A total of ten (10) Private Well groundwater samples were collected from between June 16, 2009 and July 14, 2009. **Table N6** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the Private Well dataset.

1. Private Well Sampling Events

Ten water samples, one matrix spike samples, zero field duplicates, four VOC trips blank samples were submitted to ARI laboratory (ARI job IDs PD02, PD16, PG53, PG87). Note that additional Q2 2009 analyses were reported under job IDs PD02 and PD16, but are not included in this description. Analyses performed by the lab include VOCs 8260C method, dissolved and total metals, and inorganic compounds (conventionals).

Samples were collected from private wells:

- Moore, Murphy (Atkins New), Bolyard-Deep, Bolyard-Shallow, Whitson, Country Boys, Gutierrez-Castillo, Gutierrez-Home, Gutierrez-Field..

The laboratory performed standard QA/QC analyses on the water samples and they were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Table N6**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results.

b. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Exception: None

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC and semi-volatile analyses as 3 to 4 standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the laboratory limits for all samples associated with the sampling event.

Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: 2-chloroethylbinylether no recovered in MS or MSD in ARI job PD16. The compound is a poor performer according to method 8260C. No Action taken.

Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

ARI job ID PD02 included a MS analysis for conventionals on sample MW-1a (2009Q2).

ARI job ID PD16 included an MS analysis for VOC, dissolved metals, total metals, and conventionals on sample MW-14a. An MSD analysis was also performed for VOCs on sample MW-14a.

ARI job ID PG53 included an MS analysis for conventionals on the Whitson sample.

ARI job ID OG87 included an MS analysis for conventionals and nitrate on sample Gutierrez-Castillo.

The MS/MSD indicated acceptable percent recovery of all analytes except the following.

For ARI Job ID PD16 2-chloroethylbinylether was not recovered in the MS and MSD. The compound is a known poor performer in method 8260C and no action was taken.

The relative percent differences (RPD) between MS and MSD results were all less than 20%.

d. Method Blanks: ACCEPTABLE

Exception: Slight detection of nitrate (0.012 mg/L).

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20.

All blanks resulted in non- detects except for a slight detection of nitrate at 0.012 mg/L. The detection was ten times lower than the sample result. No action was taken.

e. Field Trip Blanks: ACCEPTABLE

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks for VOCs for ARI job ID PD02, PD16, PG53, and PG87.

All trip blanks resulted in non-detects.

Reported Detection Limits: ACCEPTABLE

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses.

f. Field Duplicate: NA

No field duplicates were collected.

g. Lab Duplicates: ACCEPTABLE

Exception: None

Laboratory duplicates or replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

For ARI job ID PD02 LR analyses were performed on conventionals for MW-1a.

For ARI job PD16 LR analyses were performed on dissolved metals and total metals for sample MW-14a (2009Q2) and conventionals for sample MW-9b (2009Q2).

For ARI job ID PG53 LR analysis was performed on conventionals for sample Whitson.

For ARI job ID PG87 LR analysis was performed on conventionals for sample Gutierrez-Castillo.

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

h. Lab Control Sample: ACCEPTABLE

Exceptions:

1. Choromethane recovered low in the LCS but within the lab's acceptable outliers for ARI job PG53 (no action taken).

2. m,p-xylene recovered high in the LCS and LCSD for ARI job PG53. There was no detection of this compound in the sample (no action taken).

3. 1,1,2-Trichloro-1,2,2-trichlouroethane recovered slightly low in the LCSD but within the lab's marginal exceedance range for ARI jobs PD02 and PD16 (no action taken).

4. Isopropylbenzene was above the control limit but within the lab's marginal exceedance in the LCSD for ARI job PD16 (no action taken).

5. Chloromethane recovered low but within lab's acceptable outliers in ARI job PG53 (no action taken).

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

LCS and LCSD (duplicate) water samples were run for all VOCs. All the LCS and LCSD analyte recovered were within laboratory quality control except those mentioned above.

i. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

j. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

k. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarized above:

The dissolved metals container for the Moore sample was collected in a preserved bottle but not field-filtered. As such, remaining unpreserved volume for conventional analysis was filtered at the lab and used for the analysis.

Table N6. Quality Assurance Quality Control Summary for Groundwater (Private Well Round 1)

Job Number: JE0714a
Data Set:

Lab Data Batch -------->	ARI PD02 (Q22009 and MOORE)	ARI PD16 (Q22009 and MURPHY)	ARI PG53 (Bolyard-D, Bolyard-S, Whitson, Country Boys)	ARI PG87 (Gutierrez-Castillo, Gutierez-Home, Gutierez-Field, Abrams)
METHODOLOGY				
Method	Good	Good	Good	Good
Date Sampled	ok	ok	ok	ok
Date Analyzed	ok	ok	ok	ok
Holding Time	ok	ok	ok	ok
Preservative	ok	ok	ok	ok
Acceptability	YES	YES	YES	YES
SURROGATE SPIKES				
Surrogate Used	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]
Sample Spike Recovery	fine	fine	fine	fine
Control Spike Recovery	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES
MS/MSD	Yes (MS or Conventionals - sample MW-1a)	Yes (MS/MSD for VOCs, MS for Dissolved Metals, Total Metals and Conventionals - sample MW-14a)	Yes (MS for Conventionals - sample Whitson)	Yes (MS for Conventionals (Nitrate) - sample Gutierrez-Castillo)
MS Recovery	fine	2-chloroethylvinylether not recovered - compound is poor performer according to method 8260C, no action taken.	fine (all less than 20%)	fine (all less than 20%)
MSD Recovery	NA	2-chloroethylvinylether not recovered - compound is poor performer according to method 8260C, no action taken.	NA	NA
RPD	NA	fine (all less than 20%)	NA	NA
Acceptability	YES	YES	YES	YES
METHOD BLANK	Yes (1 Batch for: VOCs, Dissolved Metals, Total Metals, and Conventionals)	Yes (VOCs - 2 batches, Dissolved Metals - 1 batch, Total Metals - 1 batch, and Conventionals - 1 batch)	Yes (VOCs - 1 batch, Dissolved Metals - 1 batch, Total Metals - 1 batch, and Conventionals - 1 batch)	Yes (VOCs - 1 batch, Dissolved Metals - 1 batch, Total Metals - 1 batch, and Conventionals - 1 batch)

Table N6. Quality Assurance Quality Control Summary for Groundwater (Private Well Round 1)

Job Number: JE0714a
Data Set:

Lab Data Batch -------->	**ARI PD02 (Q22009 and MOORE)**	**ARI PD16 (Q22009 and MURPHY)**	**ARI PG53 (Bolyard-D, Bolyard-S, Whitson, Country Boys)**	**ARI PG87 (Gutierrez-Castillo, Gutierez-Home, Gutierez-Field, Abrams)**
Detections	none	none	none	slight detection of nitrate at 0.012 mg/L (10x lower than sample results) - no action taken
Surrogate Recovery	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES
TRIP BLANK	Yes (VOC)	Yes (one for VOC)	Yes (one for VOC)	Yes (one for VOC)
Detections	none	none	none	none
Acceptability	YES	YES	YES	YES
RDL	Okay	okay	okay	okay
Regulation/Method	ok	ok	ok	ok
Lab	ok	ok	ok	ok
Acceptability	YES	YES	YES	YES
FIELD DUPLICATES	none	none	none	none
Sample:	NA	NA	NA	NA
RPD	NA	NA	NA	NA
Acceptability	NA	NA	NA	NA

Table N6. Quality Assurance Quality Control Summary for Groundwater (Private Well Round 1)

Job Number: JE0714a
Data Set:

Lab Data Batch -------->	**ARI PD02 (Q22009 and MOORE)**	**ARI PD16 (Q22009 and MURPHY)**	**ARI PG53 (Bolyard-D, Bolyard-S, Whitson, Country Boys)**	**ARI PG87 (Gutierrez-Castillo, Gutierez-Home, Gutierez-Field, Abrams)**
LAB DUPLICATES	Yes (conventionals)	Yes (dissolved and total metals and conventionals)	Yes (conventionals)	Yes (conventionals)
Sample	MW-1a	MW-14a (total metals, dissolved metals, conventionals) and MW-9b (conventionals)	Whitson	Gutierrez-Castillo
RPD	fine	RPD not applicable for some dissolved metals and conventionals below the detection limit - fine	fine	fine
Acceptability	YES	YES	YES	YES
LAB CONTROL	Yes (LCS and LCSD for VOCs and LCS for Dissolved Metals, Total Metals and TDS)	Yes (LCS and LCSD for VOCs - 3 batches; LCS for Dissolved Metals, Total Metals and TDS)	Yes (LCS and LCSD for VOCs; LCS for Dissolved Metals, Total Metals and TDS)	Yes (LCS and LCSD for VOCs; LCS for Dissolved Metals, Total Metals and TDS)
Spike Recovery	fine	fine	Chloromethane recovered low but within the lab's acceptable outliers (no action taken). m,p-xylene recovered high. There were no detections of compound in sample (no action taken)	fine
Surrogate Recovery	fine	fine	fine	fine
Spike Dupl. Recovery	1,1,2-Trichloro-1,2,2-triclouroethane recovered slightly low but within Lab's marginal exceedance range	1,1,2-trichloro-1,2,2-triflouroethane slightly below LCSD control limit but within lab's marginal exceedance (6/17/09 run) Isopropyl benzene above the control limit but within lab's marginal exceedance (6/19/09 run)	Chloromethane recovered low but within the lab's acceptable outliers (no action taken). m,p-xylene recovered high. There were no detections of compound in sample (no action taken)	fine
RPD	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES

Table N6. Quality Assurance Quality Control Summary for Groundwater (Private Well Round 1)

Job Number: JE0714a
Data Set:

Lab Data Batch -------->	**ARI PD02 (Q22009 and MOORE)**	**ARI PD16 (Q22009 and MURPHY)**	**ARI PG53 (Bolyard-D, Bolyard-S, Whitson, Country Boys)**	**ARI PG87 (Gutierrez-Castillo, Gutierez-Home, Gutierez-Field, Abrams)**
STANDARD REFERENCE	Conventionals	Conventionals	Conventionals	Conventionals
Recovery	good	good	good	good
COC	yes	yes	yes	yes
Acceptability	YES	YES	YES	YES
LAB REPORT	Cover Report	Cover Report	Cover Report	Cover Report
Additional Information	The Dissolved Metals container for Moore was collected in preserved bottle but not field-filtered As such, remaining unpreserved volume for conventional analysis was filtered at lab and used for the analysis.	None	None	None
Acceptability	YES	YES	YES	YES

1 VOA Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene

Appendix N7: Quality Assurance /Quality Control for Field Collection and Laboratory Analyses of Private Well Groundwater Samples (Round 2 and Contingency)

Quality Assurance and Quality Control (QA/QC) data were reviewed for this report to assess the validity of the analytical results. Both field and laboratory QA/QC procedures are reviewed. The analytical analyses were performed by Analytical Resources, Inc. (ARI) in Tukwila.

A total of fifteen (15) Private Well groundwater samples were collected from between September 1, 2009 and March 24, 2010. **Table N7** summarizes QA/QC for this sampling event.

The following QA/QC narratives are for the Private Well dataset.

1. Private Well Sampling Events

Fifteen water samples, five matrix spike samples, zero field duplicates, five VOC trips blank samples were submitted to ARI laboratory (ARI job IDs PM83, PS71, PS92, QA65, PZ38, PZ88, PS91, QP76). Note that additional Q3 2009 analyses were reported under job IDs PS71 and PS92, but are not included in this description. Analyses performed by the lab include VOCs 8260C method, dissolved and total metals, and inorganic compounds (conventionals).

Samples were collected from private wells:

- Pashovksky-L., Pashkovsky-V., Olivarez, Perez, Whitson Pre-treatment, Whitson Post-treatment, City Irrigation Well (Jesse Kriete), City Reclamation wells MW#2 and MW#3, Whitson Post-Treatment 2nd, Bohr, Manship, Sanchez, Spencer, and Massey 2nd.

The laboratory performed standard QA/QC analyses on the water samples and they were found to be generally acceptable with respect to the QA/QC program.

These results were also generally found to meet Contract Laboratory Program (i.e. CLP; Environmental Protection Agency, 1999 and 2004) limits or guidelines.

The following summarizes the findings of the QA/QC review of the laboratory analyses as summarized in **Table N7**:

a. Methodology: ACCEPTABLE

Samples were analyzed using acceptable EPA and standard methods as listed on each page of the analytical results.

b. Holding Times: ACCEPTABLE

The holding times were met for all analyses.

c. Surrogate Spikes: ACCEPTABLE

Exception: None

Surrogate spikes are known concentrations of compounds not normally found in samples. They are added to check for analytical interferences in every sample.

The following four surrogates were added to all samples for VOC analyses: d4-12-dichloroethane, d8-tolune, bromo-fluorobenzene, and d4-12-dichlorobenzene.

Acceptable percent recoveries are based on the laboratory derived control limits (CL) and marginal exceedance (ME) limits. Marginal exceedance limits are calculated for VOC and semi-volatile analyses as 3 to 4 standard deviations around the mean. Acceptable recoveries for VOC and semi-volatile analyses allow for up to four marginal exceedances before corrective action is taken. Acceptable recoveries for other analyses are based on the control limit.

The surrogate percent recovery ranges were within the acceptable ranges of the

laboratory limits for all samples associated with the sampling event.

Matrix Spikes/Matrix Spike Duplicate (MS/MSD): ACCEPTABLE

Exception: Nitrate was recovered below control limit, lab duplicate had the same result; all other QC were within control, so sample results were not flagged in ARI job ID PS92.

Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are known concentrations of analytes added to one sample in 20 to check for matrix interferences in recovering the analyte from the sample matrix; the duplicate is then run to check analytical duplication.

ARI job ID PM83 included an MS analysis for nitrate and chloride on sample Olivarez.

ARI job ID PS71 included an MS analysis for nitrate+nitrite, n-nitrite, sulfate, and chloride on sample Perez.

ARI job ID PS92 included an MS analysis for nitrate+nitrite, n-nitrite, sulfate, and chloride on sample Whitson Pre-Treament.

ARI job ID PS38 included an MS analysis for nitrate+nitrite, n-nitrite, sulfate, and chloride on sample Manship.

ARI job ID PS88 included an MS analysis for nitrate+nitrite and n-nitrite on sample Spencer.

The MS/MSD indicated acceptable percent recovery of all analytes except the following.

For ARI Job ID PS92, nitrate was recovered below control limit, and the lab duplicate had the same result; all other QC were within control, no corrective action was taken.

The relative percent differences (RPD) between MS and MSD results were all less than 20%.

d. Method Blanks: ACCEPTABLE

Method Blanks were run by the laboratory to check for possible laboratory contamination. Blanks were analyzed for all analytes in all analytical batches at a rate of at least one in 20.

All blanks resulted in non- detects.

e. Field Trip Blanks: ACCEPTABLE

Exception: Acetone detected at 6.8 ug/L, above the detection limit of 5 ug/L for ARI job ID PZ38. Methylene chloride detected near the reporting limit in ARI job ID PM83.

A field trip blank is used to determine the existence and magnitude of contamination resulting from field activities.

Trip blanks for VOCs for ARI job ID PM83, PS71, PS92, QA65, and PZ38.

Acetone (6.8 ug/L) was detected above the reporting limit for ARI job ID PZ38. Acetone was out of control low bias in continuing calibration. Results are flagged accordingly for ARI job ID PZ38.

Low levels of methylene chloride were detected near the detection limit for ARI job ID PM83. Methylene chloride was not detected in samples; no corrective action is required.

Acetone and methylene chloride are common laboratory contaminants. In accordance with the CLP guidelines, since a few samples had detections of acetone less than 10 times the amount in the trip blank, these results have been flagged in the dataset as having a potential bias.

Reported Detection Limits: ACCEPTABLE

Reporting detection limits (RDL), which reflect the labs instrument capability, are generally somewhat higher than the statistically calculated Method Detection Limits (MDLs).

MDLs are not generally achievable. Because the RDLs are within lab internal controls, they are considered acceptable.

The RDLs for the sampling event were found to be equivalent to levels previously negotiated with the lab for all analyses.

f. Field Duplicate: NA

No field duplicates were collected.

g. Lab Duplicates: ACCEPTABLE

Exception: None

Laboratory duplicates or replicates (LR) are run in the lab to demonstrate acceptable method precision by the laboratory at the time of analysis.

For ARI job ID PM83 LR analyses were performed on nitrate+nitrite, n-nitrite, sulfate, and chloride for sample Olivarez.

For ARI job ID PS71 LR analyses were performed on conventionals for sample Perez.

For ARI job ID PS92 an LR analysis was performed on nitrate+nitrite, n-nitrite, sulfate, and chloride for sample Whitson Pre-Treatment.

The relative percent difference between the original results and the LR results were all within control limits established by ARI.

h. Lab Control Sample: ACCEPTABLE

Exception: Hexachlorobutadiene RPD was 23%, greater than the 20% standard for VOC analysis for ARI job PM83. Carbon tetrachloride in the LCSD was just above the CL, but within the ME for ARI job ID PS71.

Laboratory control samples (LCS) are known concentrations of analytes added to a matrix free of interferences in order to demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences (e.g. clean sand or DI water). The LCS results are used in conjunction with MS/MSD results to separate issues of laboratory performance and matrix effects.

i. Standard Reference: ACCEPTABLE

Analyses of standard reference materials were performed for the ARI conventional analytes. The percent recoveries were found to be within the control limits established by ARI.

j. Chain-of-Custody: ACCEPTABLE

Chain-of-Custody procedures were followed for all samples and are considered acceptable.

k. Lab Narrative: ACCEPTABLE

Additional information provided on the lab narrative not summarized above:

Dichlorodifluoromethane, Iodomethane, Carbon Tetrachloride, Trans-14-dichloro 2-butene, and Hexachlorobudatiene were recovered low bias in the continuing calibration for ARI job PS71. Q flags were applied to LCS/LCSD Form III. The flagged analytes were not detected in samples.

Acrolein was low and Carbon Tetrachloride high in the continuing claibration for the VOC analyses in ARI job ID PS91. Q flags were applied to LCS/LCSD Form III. There were no detections of these analytes in samples.

Bromomethane, acetone, idomethane, 2-butanone, and dibrmomethane were recovered low in the continuing calibration for the VOC analysis in ARI job ID QA65. Q flags were applied to LCS/LCSD Form III.

Bromomethane, acrolein, acetone, vinyl acetate, 2-butanone, 1,2-dibromo-3-chloropropane were recovered low bias in the continuing calibration for the VOC analysis in ARI job ID PZ38. Q flags were applied to LCS/LCSD Form III.

Acrolein was recovered low bias in the continuing calibration for the VOC analysis in ARI job ID PZ88. Q flags were applied to LCS/LCSD Form III.

Carbon tetrachloride and acrolein were recovered high and low, respectively in the continuing calibration for the VOC analysis in ARI job ID PS91. Q flags were applied to LCS/LCSD Form III.

Bromomethane and acrolein were recovered low in the LCS continuing calibration for the VOC analysis in ARI job ID QP76. Q flags were applied to LCS/LCSD Form III.

Table N7. Quality Assurance Quality Control Summary for Groundwater (Private Wells Round 2 and Contingency)

Job Number: JE0714a

Lab Data Batch -------->	ARI PM83 (Pashkovsky L, Pashkovsky V, and Olivarez)	ARI PS71 (Perez, and Q32009)	ARI PS92 (Whitson Pre-and-Post Treatment and City Irrigation- Jess Kriete and Q32009)	ARI QA65 Whitson Post Treatment 2nd	ARI PZ38 Bohr, Manship, Sanchez	ARI PZ88 Spencer	ARI PS91 (City Wells and Jess Kriete- rush VOC data)	ARI QP76 Massey 2nd
METHODOLOGY								
Method	Good	Good	Good	Good	Good	Good	Good	Good
Date Sampled	ok	ok	ok	ok	ok	ok	ok	ok
Date Analyzed	ok	ok	ok	ok	ok	ok	ok	ok
Holding Time	ok	ok	ok	ok	ok	ok	ok	ok
Preservative	Dissolved metals not	fine	fine	fine	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES
SURROGATE SPIKES								
Surrogate Used	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]	Yes (4 for VOC)[1]
Sample Spike Recovery	fine	fine	fine	fine	fine	fine	fine	fine
Control Spike Recovery	fine	fine	fine	fine	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES
MS/MSD	Yes (MS on nitrate and chloride - Olivarez sample)	Yes (MS on nitrate+nitrite, n-nitrite, sulfate, chloride - Perez)	Yes (MS on nitrate+nitrite, n-nitrite, sulfate, chloride - Whitson Pre-treatment)	No	Yes (MS on chloride, n-nitrate, nitrate+nitrite, sulfate - Manship)	Yes (MS on n-nitrite, nitrate+nitrite, Spencer)	none	none
MS Recovery	fine	fine	Nitrate recovered	NA	fine	fine	NA	NA
MSD Recovery	NA	NA	NA	NA	NA	NA	NA	NA
RPD	NA	NA	NA	NA	NA	NA	NA	NA
Acceptability	YES	YES	YES	NA	YES	YES	NA	NA
METHOD BLANK	Yes (1 Batch for: VOCs, Dissolved Metals, Total	Yes (1 Batch for: VOCs, Dissolved Metals, Total	Yes (1 Batch for: VOCs, Dissolved Metals, Total	Yes (1 Batch for: VOCs, Dissolved Metals, Total	Yes (1 Batch for: VOCs, Dissolved Metals, Total	Yes (1 Batch for: VOCs, Dissolved Metals, Total	Yes (1 Batch for VOCs)	Yes (1 Batch for: VOCs, Dissolved Metals, Total
Detections	none	none	none	none	none	none	none	none
Surrogate Recovery	fine	fine	fine	fine	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES

Table N7. Quality Assurance Quality Control Summary for Groundwater (Private Wells Round 2 and Contingency)

Job Number: JE0714a

Lab Data Batch -------->	ARI PM83 (Pashkovsky L, Pashkovsky V, and Olivarez)	ARI PS71 (Perez, and Q32009)	ARI PS92 (Whitson Pre-and-Post Treatment and City Irrigation- Jess Kriete and Q32009)	ARI QA65 Whitson Post Treatment 2nd	ARI PZ38 Bohr, Manship, Sanchez	ARI PZ88 Spencer	ARI PS91 (City Wells and Jess Kriete- rush VOC data)	ARI QP76 Massey 2nd
TRIP BLANK	Yes	Yes	Not Analyzed in this Lab Batch (Analyzed with Q32009 samples ARI PS90)	Yes	yes	no	no	no
Detections	Methylene chloride detected near reporting limit - common lab contaminant - no detection in sample	none	none	none	Acetpme detected at 6.8 ug/L (slightly above the 5 ug/L RL)	NA	NA	NA
Acceptability	YES	YES	YES	YES	Yes - acetone out of control low bias in continuing calibration. Results are Q flagged	NA	NA	NA
RDL	Okay	Okay	Okay	Okay	Okay	Okay	Okay	Okay
Regulation/Method	ok	ok	ok	ok	ok	ok	ok	ok
Lab	ok	ok	ok	ok	ok	ok	ok	ok
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES
FIELD DUPLICATES	none	none	none	none	none	none	none	none
Sample:	NA	NA	NA	NA	NA	NA	NA	NA
RPD	NA	NA	NA	NA	NA	NA	NA	NA
Acceptability	NA	NA	NA	NA	NA	NA	NA	NA
LAB DUPLICATES	Yes (nitrate+nitrite, nitrite, chloride, sulfate)	Yes (conventionals)	Yes (nitrate+nitrite, nitrite, chloride, sulfate)	Yes (alkalinity, carbonate, bicarbonate, hydroxide)	Yes (chloride, nitrate-n, nitrate+nitrite, sulfate)	Yes (n-nitrite, nitrate+nitrite)	none	none
Sample	Olivarez	Perez	Whitson Pre-Treatment	Whitson Post-Treatment	Manship	Spencer	NA	NA
RPD	fine	fine	fine	fine	fine	fine	NA	NA
Acceptability	YES	YES	YES	YES	YES	YES	NA	NA

Table N7. Quality Assurance Quality Control Summary for Groundwater (Private Wells Round 2 and Contingency)

Job Number: JE0714a

Lab Data Batch -------->	ARI PM83 (Pashkovsky L, Pashkovsky V, and Olivarez)	ARI PS71 (Perez, and Q32009)	ARI PS92 (Whitson Pre-and-Post Treatment and City Irrigation- Jess Kriete and Q32009)	ARI QA65 Whitson Post Treatment 2nd	ARI PZ38 Bohr, Manship, Sanchez	ARI PZ88 Spencer	ARI PS91 (City Wells and Jess Kriete- rush VOC data)	ARI QP76 Massey 2nd
LAB CONTROL	Yes (LCS and LCSD for VOCs and LCS for Dissolved Metals, Total Metals and TDS)	Yes (LCS and LCSD for VOCs and LCS for Dissolved Metals, Total Metals and TDS)	Yes (LCS and LCSD for VOCs and LCS for Dissolved Metals, Total Metals and TDS)	Yes (LCS and LCSD for VOCs and LCS for Dissolved Metals and Total Metals)	Yes (LCS and LCSD for VOCs and LCS for Dissolved Metals and Total Metals)	Yes (LCS and LCSD for VOCs and LCS for Dissolved Metals and Total Metals)	Yes (LCS and LCSD for VOCs)	Yes (LCS and LCSD for VOCs and LCS for Dissolved Metals, Total Metals, and TDS)
Spike Recovery	fine	fine	fine	fine	fine	fine	fine	fine
Surrogate Recovery	fine	fine	fine	fine	fine	fine	fine	fine
Spike Dupl. Recovery	fine	Carbon tetrachloride	fine	fine	fine	fine	fine	fine
RPD	>20%	fine	fine	fine	fine	fine	fine	fine
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES
STANDARD REFERENCE	Conventionals	Conventionals	Conventionals	Conventionals	Conventionals	Conventionals	Conventionals	Conventionals
Recovery	good	good	good	good	good	good	good	good
COC	yes	yes	yes	yes	yes	yes	yes	yes
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES
LAB REPORT	Cover Report	Cover Report	Cover Report	Cover Report	Cover Report	Cover Report	Cover Report	Cover Report
Additional Information	No other information	continuing calibration - Q flags applied to form III - method allows up to 20% compounds to fail. Dichlorodifluoromethane, Iodomethane, Carbon Tetrachloride, Trans-14-dichloro 2-butene, and Hexachloro 13-budatiene above CL in continuing calibration - Q flags applied to form III - no detections in	slightly above the CL in continuing calibration. No detections in sample. No corrective action. 2. Acrolein below CL in continuing calibration. Q flags applied to Form III. Method allows up to 20% compounds to fail. Q flags applied to Form III.	in continuing calibration for the following: bromomethane, acetone, idomethane,	in continuing calbibration for the following: bromomethane, acrolein, acetone, vinyl	in continuing calibration for the following: acrolein (parameter is a poor performer). Q flags	C-Cal for Carbon Tetrachloride, considered irrelevant, and low bias in continuing calibration	in continuing calibration for following: Bromomethane and Acrolein (parameter is
Acceptability	YES	YES	YES	YES	YES	YES	YES	YES

1 VOA Surrogates: d4-1,2-dichloroethane; d8-Toluene; Bromofluorobenzene; and d4-1,2-dichlorobenzene