Stantec

Stantec Consulting Services Inc.
1687 114th Avenue Southeast, Suite 100
Bellevue, WA 98004

November 22, 2024
File: 203723678.W01

Kristin Beck
Washington State Department of Ecology
Eastern Regional Office
4601 North Monroe Street
Spokane, Washington 99205-1295
kbec461@ecy.wa.gov

Reference: Final Remedial Investigation/Feasibility Study Work Plan
Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Ecology Facility Site ID: 612

Kristin Beck:

At the request of the Port of Moses Lake (Port), Stantec Consulting Services Inc. (Stantec) conducts environmental activities at the Port of Moses Lake Pumphouse 1 (site). Stantec prepared the enclosed *Final Remedial Investigation/Feasibility Study Work Plan* (RI/FS Work Plan), dated November 22, 2024, at the request of the Washington State Department of Ecology (Ecology). The RI/FS Work Plan was prepared in accordance with Washington Administrative Code (WAC) 173-340-350 and -351.[1]

The purpose of the RI/FS Work Plan is to outline a soil and groundwater investigation for the purpose of collecting more information required to characterize the scope and scale of contamination, aid in determining strategies for future environmental remediation, and address any existing data deficiencies essential for finalizing the feasibility study.

Site Identification

Agreed Order No. DE 22056
Facility Site ID No. 612
Cleanup Site ID No. 7021

Site Location

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

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[1] Washington Administrative Code (WAC). Updated August 23, 2023. Washington Administration Code – Model Toxics Control Act Cleanup Regulations. https://app.leg.wa.gov/wac/default.aspx?cite=173-340.

Port of Moses Lake Contact

Port of Moses Lake
7810 Andrews Street Northeast
Moses Lake, Washington

Milton Miller
Director of Port Facilities
Phone: (509) 762-5363
Email: mmiller@portofmoseslake.com

Stantec Contact

Stantec Consulting Services Inc.
1687 114th Avenue Southeast
Suite 100
Bellevue, Washington 98004

Bobby Thompson
Project Manager
Phone: (206) 510-5855
Email: robert.thompson@stantec.com

Ecology Contact

State of Washington Department of Ecology
Eastern Regional Office
4601 North Monroe Street
Spokane, Washington 99205-1295

Kristin Beck
Site Manager
Phone: (509) 514-6806
Email: kbec461@ecy.wa.gov

Please contact Bobby Thompson, Stantec Project Manager for this site at (206) 510-5855, or Milton Miller, Port Project Manager for this site at (509) 762-5363, with questions.

Regards,

Stantec

LAINAECOLE

Laina Cole
Environmental Scientist
Mobile: (253) 247-1466
laina.cole@stantec.com

Bobby Thompson
Senior Project Manager
Mobile: (206) 510-5855
robert.thompson@stantec.com

Attachment: Stantec's *Final Remedial Investigation/Feasibility Study Work Plan*, dated November 22, 2024

c. Milton Miller, Port of Moses Lake *(Email)*
Rich Mueller, Port of Moses Lake *(Email)*
Jeff Johnson, ExxonMobil Environmental and Property Solutions Company (*Email*)

Final Remedial Investigation/Feasibility Study Work Plan

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Ecology Facility Site ID: 612

November 22, 2024

Prepared for:

Port of Moses Lake

Prepared by:

Stantec Consulting Services Inc
1687 114th Avenue Southeast, Suite 100
Bellevue, Washington 98004
USA
www.stantec.com

File: 203723678.W01

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Laina Cole
Environmental Scientist

LAINA E COLE
(signature)

Keri L. Chappell
LG 2719

Keri Chappell
(signature)

State of Washington
2719
Licensed Geologist
Keri Lynn Chappell

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Acronyms and Abbreviations

µg/L	Micrograms per liter
Airport	Grant County International Airport
AO	Agreed Order No. DE 22056
ARAR	Applicable, Relevant, and Appropriate Requirement
AST	Aboveground Storage Tank
ASTM	American Society of Testing and Materials
Behrens	K.L. Behrens & Associates
bgs	Below ground surface
Boeing	Boeing Aircraft Company
BRA	Blue Ridge Associates, Inc.
BTEX	Benzene, toluene, ethylbenzene, and xylenes
c	Cancer
CLARC	Cleanup Levels and Risk Calculation
COPC	Contaminant of potential concern
cPAH	Carcinogenic polycyclic aromatic hydrocarbon
DOH	Washington State Department of Human Health, Division of Environmental Health, Office of Drinking Water
Ecology	State of Washington Department of Ecology
EDB	1,2-Dibromoethane
EDC	1,2-Dichloroethane
EPA	Environmental Protection Agency
ERI	Environmental Resolutions, Inc.
ETBE	Ethyl tertiary butyl ether
ExxonMobil	Exxon Mobil Corporation
FAA	Federal Aviation Administration
FS	Feasibility study
Hydrometrics	Hydrometrics, Inc.
LNAPL	Light Non-aqueous Phase Liquid
MCL	Maximum Contaminant Level
mg/kg	Milligrams per kilogram
MNA	Monitored natural attenuation
msl	Mean sea level
MTBE	Methyl tert-butyl ether
MTCA	Model Toxics Control Act
nc	Noncancer
NE	Not established
ORC	Oxygen Release Compound
PCB	Polychlorinated biphenyl
PFAS	Per- and polyfluoroalkyl substances

PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PLP	Potentially liable person
Port	Port of Moses Lake
QA/QC	Quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
RI/FS Work Plan	*Final Remedial Investigation/Feasibility Study Work Plan*
SEACOR	SEACOR Science & Engineering Analysis Corporation
SECOR	SECOR International, Inc.
Site	Port of Moses Lake Pumphouse 1
Stantec	Stantec Consulting Services Inc.
SVOC	Semi volatile organic compound
TAME	Tertiary-amyl methyl ether
TBA	Tertiary-butyl alcohol
TCE	Trichloroethylene
TEE	Terrestrial ecological evaluation
TPH	Total petroleum hydrocarbons
TPHd	Total petroleum hydrocarbons as diesel
TPHg	Total petroleum hydrocarbons as gasoline
TPHo	Total petroleum hydrocarbons as oil
USACE	United States Army Corps of Engineers
USAF	United States Air Force
UST	Underground storage tank
VOC	Volatile organic compound
WAC	Washington Administrative Code

1.0 INTRODUCTION

At the request of the Port of Moses Lake (Port), Stantec Consulting Services Inc. (Stantec) prepared this *Final Remedial Investigation/Feasibility Study Work Plan* (RI/FS Work Plan), dated November 22, 2024, for the Port of Moses Lake Pumphouse 1 (site) located in Moses Lake, Washington (Plate 1).

The State of Washington Department of Ecology (Ecology) issued Agreed Order No. DE 22056 (AO) on December 26, 2023, directing preparation of this Final RI/FS Work Plan for the site (Ecology, 2023). The potentially liable persons (PLPs) identified in the AO and described in Section 2.6 of this document will conduct a remedial investigation (RI) to determine the nature, extent, and magnitude of petroleum hydrocarbons at the site. When this is complete, they will use the information to develop a feasibility study (FS) and identify remedial alternatives for implementation at the site. The preparation of this RI/FS Work Plan, completion of fieldwork, and preparation of reporting comprises Tasks I, II, and III as set forth in Exhibit B of the AO.

1.1 SITE INFORMATION

Site Name:	Port of Moses Lake Pumphouse 1
Property Address:	7810 Andrews Street Northeast Moses Lake, Washington 98837
Property Coordinates:	47°11'35.64"N, 119°18'57.53"
Section / Township / Range / Quarter-Quarter:	S28 / T20N / R28E / SW-SW
Tax Parcel:	171020000
Current Property Owner:	Port of Moses Lake (Port District #10)
Cleanup Site ID:	7021
Facility Site ID:	612
Agreed Order No.:	DE 22056
Potential Liable Parties:	**Property Owner:** Port of Moses Lake **Former Leaseholder and Operator:** Exxon Mobil Corporation (a successor through merger to Exxon Company U.S.A.)
Ecology Contact:	Kristin Beck Washington State Department of Ecology Eastern Regional Office 4601 North Monroe Street Spokane, Washington 99205-1295 Phone: (509) 514-6806 Email: kbec461@ecy.wa.gov
Current Property Owner:	Port District #10
Current Property Use:	Grant County International Airport

1.2 OBJECTIVE – TASK I

Task I, as identified in the AO, is to prepare a work plan outlining procedures for the RI (Task II). The objective of this Final RI/FS Work Plan is to outline a soil and groundwater investigation for the purpose of gathering additional information required to characterize the scope and scale of petroleum hydrocarbons contamination, aid in determining strategies for future environmental remediation, and address any existing data deficiencies essential for finalizing the FS.

The Final RI/FS Work Plan for Task I includes the following information:

- General facility information such as past and present ownership, adjacent property usage, and zoning designations.
- Site conditions maps illustrating current site features, groundwater monitoring wells, and subsurface structures.
- General geology and hydrogeology of the site vicinity including an inventory of wells within a 1-mile radius of the site.
- Summary of previous investigations and interim remedial actions at the site.
- Preliminary conceptual site model.
- Planning and description of Tasks II and III.
- Project management team and distribution of responsibilities.
- Schedule for RI/FS fieldwork, analysis, and report preparation.
- Sampling and Analysis Plan comprising a description of all proposed fieldwork including the locations for borings/wells, the number and types of samples to be collected, and laboratory analytical methods.
- Quality Assurance Project Plan comprising field and laboratory quality assurance/quality control (QA/QC) procedures and expectations, decontamination procedures, data management, and data validation.
- Site-Specific Health and Safety Plan conforming with Washington Administrative Code (WAC) 173-340-810 (WAC, 2023) and including chemical protection levels, hazard evaluation, emergency procedures, and other special considerations.
- Inadvertent Discovery Plan conforming with WAC 173-340-815 (WAC, 2023) comprising procedures to be followed upon discovery of any Native American or Euromerican artifacts or human remains and contact information for all applicable parties subject to notification.

1.3 WORK PLAN ORGANIZATION

This RI/FS Work Plan was prepared in accordance with WAC 173-340-350 and -351 and fulfills Task I as defined in Exhibit B of the AO. The organization of this RI/FS Work Plan is presented below:

- **Section 2.0 Site Background:** This section provides background information on the site, including its location, historical ownership, adjacent properties, regulatory oversight, geological and hydrogeological characteristics, climate, and past site assessment and interim actions.
- **Section 3.0 Examination of Historical Soil and Groundwater Contamination:** This section provides an examination of historical soil and groundwater analyses of petroleum hydrocarbons and their associated compounds released from underground storage tanks (USTs) and associated piping at Pumphouse 1 and a summary of all constituents present at concentrations exceeding preliminary screening levels.

- **Section 4.0 Preliminary Conceptual Site Model:** This section outlines the preliminary conceptual site model discussing sources, transport mechanisms, exposure pathways, and receptors of contaminants, while highlighting ongoing model refinement during the RI/FS process with a focus on USTs, product piping, soil, groundwater, light non-aqueous phase liquid (LNAPL), and potential receptors including workers and terrestrial organisms while also addressing future exposure pathways related to planned demolition activities.
- **Section 5.0 Preliminary Cleanup Standards:** This section establishes preliminary cleanup standards for the preliminary contaminants of potential concern (COPCs), preliminary points of compliance, and preliminary applicable or relevant and appropriate requirements (ARARs) for petroleum hydrocarbons and their associated compounds released from USTs and associated piping at Pumphouse 1, following the Model Toxics Control Act (MTCA) rules and considering site-specific conditions and exposure pathways identified in the preliminary conceptual site model. Final cleanup standards will be determined by Ecology in the Cleanup Action Plan.
- **Section 6.0 Proposed Site Characterization:** The proposed site characterization involves utility locating, advancing 5 shallow borings, installing at least 12 and up to 19 groundwater monitoring wells, collecting soil samples, and collecting four quarters of depth to water (and LNAPL if present) and groundwater samples from all groundwater monitoring wells associated with the site. Specific details outlined in the Sampling and Analysis Plan, Quality Assurance Project Plan, and Site-Specific Health and Safety Plan are provided in the appendices.
- **Section 7.0 Preliminary Cleanup Action Alternatives:** This section comprises a list of preliminary cleanup action alternatives that may be considered as part of the FS to address petroleum hydrocarbons and their associated compounds released from USTs and associated piping at Pumphouse 1 along with associated data or studies that may be required for their applicability evaluation.
- **Section 8.0 Groundwater Monitoring and Sampling:** This section summarizes the groundwater monitoring and sampling frequency expected throughout the duration of the AO.
- **Section 9.0 Planning and Descriptions of Tasks II and III:** This section summarizes Tasks II and III as outlined in the AO.
- **Section 10.0 Project Management:** This section identifies key personnel associated with this site and provides their contact information.
- **Section 11.0 Schedule for Implementation:** The section provides an implementation schedule for fieldwork and report writing following Ecology's approval and finalization of this RI/FS Work Plan.

2.0 SITE BACKGROUND

2.1 PROPERTY DESCRIPTION

The site is located on the grounds of Grant County International Airport (Airport) in Moses Lake, central Washington state, east of the Willamette Meridian (Plate 1). The Airport, owned and operated by the Port, is located approximately 5 miles northwest of the City of Moses Lake and is bordered to the east by Crab Creek and to the southwest by Moses Lake. The topography is relatively flat at an elevation of approximately 1,170 feet above mean sea level (msl).

Property uses include flight testing of new aircraft, pilot training, and operation of a Federal Aviation Administration (FAA) Part 139 certified airport (Coffman, 2014). Access to the site is restricted to permitted (badged) personnel and controlled by security fencing around the Airport and the site.

2.1.1 Legal Description

The Airport property is a 3,242.64-acre international airport, identified as Grant County tax parcel number 171020000 and owned by Port District #10 (Grant County, 2024). The legal description and select Grant County assessor information is summarized in Appendix A.

2.2 SITE DESCRIPTION

The site is a rectangular compound defined by a chain-link fence measuring approximately 200 feet by 180 feet, situated between two runways and northeast of the Main Terminal Building (Plate 2). Located in the center of the fenced compound is the Pumphouse 1 building. Four 50,000-gallon, one 25,000-gallon, and one 2,000-gallon decommissioned-in-place USTs are located to the east and northeast of the pumphouse building (Plate 3). The surface is covered with gravel and natural soils.

2.3 CURRENT PROPERTY OWNERS/OPERATORS

The Port was established on November 15, 1965, to manage the Airport after the closure of Larson Air Force Base. The Port is a standalone public entity, owned by Port District #10, and governed by a three-member Port Commission and administered by an Executive Director (Coffman, 2014). The current Port Commission President is District One Commissioner Darrin Jackson, the District Two Commissioner is Stroud W. Kunkle, and the District Three Commissioner is Kent Jones (Port, 2024).

2.4 PAST PROPERTY OWNERS/OPERATORS

2.4.1 Airport Facility At-Large

The Airport originated as Moses Lake Army Air Base on November 24, 1942, serving as a training base for P-38 and B-17 pilots (Coffman, 2014). In 1945, the base was placed on standby status for three years. During this time, Boeing Aircraft Company (Boeing) began using the base to test aircraft such as the B-29, B-47, B-50, and B-52 aircraft (Coffman, 2014; Denfeld, 2012). On November 26, 1948, the base was reopened as a United States Air Force (USAF) Air Defense Command Base and stationed fighter aircraft groups to protect the Hanford Nuclear Reservation, the Grand Coulee Dam, and other military and industrial developments in the Pacific Northwest (Denfeld, 2012). The base was renamed Larson Air Force Base in May 1950 and was transferred to the USAF Tactical Air Command on April 1, 1952 (Denfeld, 2012). Between 1957 and 1960, the base carried out military transport operations (Denfeld, 2012). In 1960, the base became a Strategic Air Command base and acquired three Titan missile-launching facilities (Coffman, 2014). According to the 1960 census, Larson Air Force Base employed 4,000 workers and housed 8,000 people (Coffman, 2014). In 1964, the planned closure of the base was announced and slated for completion by June 1966 (Denfeld, 2012; Coffman, 2014).

Aboveground storage tanks (ASTs) located south of the Airport (Plates 1 and 2) were installed by the USAF in the 1950s. The USAF originally used Tank 24 to store aviation gasoline. Tank 24 was converted to Jet A fuel storage in 1964 when ownership transferred from the USAF to the Port. Tank 38 has been used for Jet A fuel storage throughout its existence (EA, 1992).

2.4.2 Pumphouse 1 Fueling Infrastructure

The USTs at Pumphouse 1 were installed by the USAF in approximately 1952 under the direction of the United States Army Corps of Engineers (USACE) (SECOR, 1992; 1995). The pumphouse is constructed of concrete and was intended to survive a bomb attack (SECOR, 1992; 1995). The main fuel supply lines (8- and 10-inch diameter) to the pumphouse USTs are reportedly buried approximately 3 to 5 feet below ground surface (bgs) in the vicinity of the pumphouse (EA, 1992; Exxon, 1993) and surface into a vault on the south end of the pumphouse (BRA, 1994). There are four 50,000-gallon USTs (Tanks 24, 25, 28, and 29), one 25,000-gallon UST (Tank 15), and one 2,000-gallon UST (Tank 10) (SECOR, 1992; Exxon, 1993; Behrens, 1996). The bottoms of the USTs are at approximately 12 feet bgs (SECOR, 1992).

The USTs are owned by the Port and were leased to Exxon Company U.S.A. at the time of petroleum hydrocarbon contamination discovery in October 1992 (Exxon, 1992; EA, 1992). Exxon Company U.S.A. subleased a variety of fuel infrastructure facilities across the Airport, including those at Pumphouse 1, to multiple companies during the tenure of its leases from the Port (EA, 1992). A lease agreement between the Port and ExxonMobil, signed on January 24, 2005, indicates that ExxonMobil’s lease of fuel infrastructure facilities at the Airport began in 1966 (Port, 2005).

In September 1992, the six USTs associated with Pumphouse 1 were temporarily closed in-place. The remaining fuel was removed and the USTs were rinsed (SECOR, 1992, 1995). In March 1996, the four 50,000-gallon, one 25,000-gallon, and one 2,000-gallon USTs were decommissioned in-place by filling with a sand slurry mix injected into the maintenance holes at both east and west ends of the USTs and stabilized with the assistance of concrete vibrators. All air vents and fill pipes were cut off below ground surface and filled with the sand slurry mix (Behrens, 1996).

There are no site records indicating that any of the subsurface piping or other subsurface infrastructure associated with operations at Pumphouse 1 were decommissioned.

Electrical service is supplied by overhead lines to the Pumphouse 1 building. Other than the 8- and 10-inch pipelines, there are no known subsurface utility corridors at the site.

2.5 ADJACENT PROPERTIES

A majority of Airport operational and industrial buildings are located south of Pumphouse 1. East of the site is a Boeing facility and a United States Department of Agriculture Forest Service Air Tanker Base. East and north of the site (beyond the Airport boundary) are industrial manufacturing facilities. Approximately 1 mile south and southwest of the Airport are residential homes and small businesses. Recreational and agricultural areas are located west of the Airport.

2.5.1 Moses Lake Wellfield Contamination Superfund Site

Trichloroethylene (TCE) was identified during routine sampling of city of Moses Lake municipal drinking water wells by the Washington State Department of Health in early 1988 (EPA, 1993). Following confirmation sampling by the United States Environmental Protection Agency (EPA) and Ecology and potential source identification, EPA recommended the Moses Lake Wellfield for the National Priorities List in July 1991. The site was listed in October 1992 (EPA, 1993). Preliminary investigations identified TCE in groundwater beneath the Airport as well as in City of Moses Lake municipal wells and private water supply wells, with an estimated plume extending approximately 1 mile wide, 3 miles long, and 100 to 300 feet deep at the time of discovery (EA, 1992; EPA, 1993). The current EPA information page defines the Moses Lake Wellfield Superfund Site as approximately 15 square miles in extent including the Airport, Port of Moses Lake, commercial facilities, and residences (EPA, 2024).

A RI and baseline risk assessment completed in 2003 confirmed TCE as the only COC in groundwater and identified additional COCs exceeding human health-based standards in soil including polychlorinated biphenyls (PCBs), petroleum hydrocarbons, arsenic, lead, and mercury (EPA, 2022). Based on this information, EPA signed the Interim Record of Decision in 2008 identifying multiple interim remedial action objectives pending additional characterization (EPA, 2022).

The EPA's *Second Five-Year Review Report* (EPA, 2022) for the Moses Lake Wellfield Superfund Site acknowledges that emerging contaminants, per- and polyfluoroalkyl substances (PFAS), were not investigated at the Superfund Site prior to the 2008 Interim Record of Decision. In 2016, three monitoring wells near Fire Training Pit A (identified as "Site 10" by USACE) were sampled for PFAS and contained concentrations of combined perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) greater than EPA's health advisory level (EPA, 2022). As a result, EPA indicated they will conduct further review of historical files to identify additional locations across the Moses Lake Wellfield Superfund Site where PFAS compounds may have been used and warrant additional investigation (EPA, 2022).

For reference, Site 10 is located approximately 5,000 feet (nearly 1 mile) directly west of the Pumphouse 1 building.

2.6 SITE DISCOVERY AND REGULATORY BACKGROUND

This section summarizes the regulatory background of the site including the AO.

The cleanup of the site is regulated under WAC Chapter 173-340 – MTCA Cleanup Regulations (WAC, 2023). Environmental investigation and interim actions have been conducted at the site since 1991 (SECOR, 1992).

In 1991, the USACE, as part of a RI associated with the Moses Lake Wellfield Superfund Site, installed four groundwater monitoring wells (91-AW4 through 91-AW6 and 91-BW2) in the vicinity of Pumphouse 1 (referred to as "Site 2" by USACE) (SECOR, 1992). In April 1992, concentrations of total petroleum hydrocarbons (TPH) were observed in the sample collected from well 91-AW6, prompting USACE to propose fingerprinting of the petroleum product during the next scheduled sampling event in October 1992 (USACE, 1992). When the dedicated pump was pulled from the well in October 1992, approximately 18 inches of LNAPL were reported in the well (USACE, 1993).

In September 1992, SECOR International, Inc. (SECOR) conducted a site assessment at Pumphouse 1 to meet Washington State requirements for the permanent closure of UST facilities (SECOR, 1992). On September 26, 1992, petroleum-impacted soil was observed in soil borings around the USTs. The discovery of a release to soil was reported to Ecology by Exxon Company U.S.A. on September 28, 1992, as joint PLPs between the Port (owner of USTs) and Exxon Company U.S.A. (leaseholder and operator of USTs) (Exxon, 1992). Ecology visited the site on October 1, 1992, but was unable to make a visual inspection of the site due to its restricted location within the Airport. Ecology noted that no excavation had been started (Ecology, 1992).

In January 2019, Ecology issued Preliminary Determination of Liability letters to the Port and Exxon Mobil Corporation (ExxonMobil), a successor through merger to Exxon Company U.S.A. (Ecology, 2019a; 2019b). The letters identified the Port and ExxonMobil as PLPs; the Port was identified as the owner and ExxonMobil was identified as the operator. The Preliminary Determination of Liability letters identified the “Contaminated Site” as “Moses Lake Port Pumphouse 1” and the “release of hazardous substances” as “Total Petroleum Hydrocarbon concentrations (as Jet A fuel)” in soil and “free product (Jet A fuel)” in groundwater (Ecology, 2019a; 2019b).

In March 2019, Ecology issued Final Determination of Liability letters to the Port and ExxonMobil indicating they were each determined to be PLPs based on credible evidence that a release of hazardous substances had occurred at the site; the site was identified as the “Moses Lake Port Pumphouse 1” (Ecology, 2019c; 2019d).

Ecology invited the PLPs to negotiate an agreed order on November 17, 2022, for completion of remedial actions for contaminant releases at the site, identified as the “Moses Lake Port Pumphouse 1” (Ecology, 2022).

The AO was issued on December 26, 2023, directing preparation of this Final RI/FS Work Plan for the site (Ecology, 2023). The PLPs will conduct an RI to determine the nature, extent, and magnitude of petroleum contamination at the site. When this is complete, they will use the information to develop an FS.

2.7 GEOLOGY AND HYDROGEOLOGY

2.7.1 Regional Geology

The Moses Lake region is underlain by the Columbia River Basalt Group. The Columbia River Basalt Group comprises over 300 layers of extensive basalt flows covering an area of more than 81,000 square miles. Most layers were deposited as pāhoehoe sheet flows, ranging from 30 to greater than 150 feet thick. Eruptions lasted for more than 11 million years between 16.7 and 5.5 million years ago; the main eruptive phase lasted approximately 1.1 million years from 16.7 to 15.6 million years ago. The Miocene-age rock, generated in a back-arc region between the Cascade Range and Rocky Mountains, comprises the youngest continental flood basalt province on Earth (Camp et al., 2017). Moses Lake is underlain by the Wanapum Basalt, a member of the Yakima Basalt, a subgroup of the Columbia River Basalt (Camp et al., 2017; Gulick, 1990). Both the Priest Rapids Member and Roza Member of the Wanapum Basalt are mapped in the vicinity of Moses Lake (Gulick, 1990).

The regional basalt is overlain by the Ringold Formation comprising primarily lacustrine sediments composed of tuffaceous and quartzose sand, silt, and clay with minor basaltic gravel (Frans et al., 2018; Grolier and Foxworthy, 1961). The Ringold Formation is typically 100 to 300 feet thick across the region (Frans et al., 2018); this layer was observed to be approximately 50 to 135 feet thick in well logs in the vicinity of the site (Grolier and Foxworthy, 1961).

Surficial sediments in the Moses Lake area are mapped as basaltic gravel and gravel outburst flood deposits (Grolier and Foxworthy, 1961; Gulick, 1990; Schuster et al., 1997). These gravels are glaciofluvial in origin, composed primarily of unconsolidated basaltic sand and gravel (up to boulders), deposited by outburst floods from glacial Lake Missoula as fluvial terraces and gravel bars representing repeating periods of deposition and erosion (Grolier and Foxworthy, 1961; Gulick, 1990; Schuster et al., 1997). The gravel layer has been observed to be approximately 65 to 100 feet thick in well logs in the vicinity of the site (Grolier and Foxworthy, 1961). This unit is referred to as the Hanford Formation in geologic descriptions associated with the EPA's Moses Lake Wellfield Superfund Site (EPA, 2008).

The major physiographic feature of the greater regional area is the Columbia Basin, a broad structural basin situated between the Cascade Range and the Idaho batholith (Camp et al., 2017). Moses Lake is located in the eastern part of the Quincy Basin, a structural depression separated from the Pasco Basin by anticlinal ridges (Frans et al., 2018; Grolier and Foxworthy, 1961), in the Central Plains section of the Columbia Basin (Camp et al., 2017). There have been no significant changes to the regional topography since the Pleistocene (Grolier and Foxworthy, 1961).

2.7.2 Regional Hydrogeology

Groundwater occurs in the flood deposit gravels (sometimes called the Hanford Formation), lacustrine sediments of the Ringold Formation, as well as the Wanapum Basalt members (EPA, 2008; Frans et al., 2018). In the basalt, groundwater-bearing zones occur at or near the contacts of individual flows (Grolier and Foxworthy, 1961). Groundwater flows north to south across the greater Quincy Basin and northeast to southwest across the Moses Lake area (Frans et al., 2018; Grolier and Foxworthy, 1961). Groundwater recharge to the Quincy Basin occurs via infiltration of precipitation as well as irrigation return flows (Frans et al., 2018).

Hydraulic conductivities for the three primary groundwater-bearing units in the region, estimated using drawdown and pump testing data provided on well drillers' logs, were compiled by Frans et al. (2018). For the flood deposit gravels, evaluated using data from only a single well, hydraulic conductivity was estimated to be 250 feet per day. For the lacustrine sediments of the Ringold Formation, evaluation of data from 10 wells yielded a range of hydraulic conductivity from 20 to 290 feet per day with a median value of 48 feet per day. Hydraulic conductivity in the basalt (generally referred to as Columbia River Basalt by the authors) was estimated using data from 81 well logs and yielded a range of hydraulic conductivity from 0.3 to 770 feet per day with a median value of 24 feet per day (Frans et al., 2018).

The Quincy Basin is drained by Crab Creek, Rocky Ford Creek, and Lower Crab Creek (Frans et al., 2018). The Moses Lake itself occupies an abandoned channel of the Columbia River, dammed by sand dunes in the south (now artificially regulated by a dam near the natural outlet) and fed by Crab Creek and Rocky Ford Creek along with springs and groundwater sources along its length (Grolier and Foxworthy, 1961).

2.7.3 Site Geology

Boring logs at the site indicate sand and gravel mixtures, with gravel sizes extending to cobble and boulder, extending from ground surface to depths ranging from 27 to 75 feet bgs; this is interpreted to be the flood deposit gravels (sometimes called the Hanford Formation) identified in the region. Increasing fine-grained sediments interspersed with sand and gravel were observed between 75 and 107 feet bgs, including silty sand, sandy silt, and clayey silt; this is interpreted to be the lacustrine Ringold Formation. Weathered basalt has been encountered between approximately 99.5 and 107 feet bgs and is up to 40 feet thick. Competent basalt was observed from 147 to 180 feet bgs, the maximum depth investigated at the site. The weathered basalt is interpreted to be the Priest Rapids Member and the competent basalt is interpreted to be the Roza Member (EPA, 2008). Mechanical grain size analysis of two soil samples collected from the boring for well PH1-9601 at 82 and 85 feet bgs were classified using American Society of Testing and Materials (ASTM) Method D2488 to be ML, Sandy Silt (Table 1). Boring logs for the site are presented in Appendix B.

2.7.4 Site Hydrogeology

Groundwater is typically encountered at approximately 90 feet bgs. First-encountered groundwater occurs within the fine sands and gravel lenses within the lacustrine (Ringold Formation) deposits, and the overlying flood deposit gravels. Groundwater monitoring wells at the site are installed within the flood deposit gravel and lacustrine deposits. One monitoring well at the site (91-BW2) is installed within the fractured basalt. Groundwater generally flows from the northeast to the southwest across the site (Cardno ERI, 2012). Moses Lake, located approximately 1.25 miles southwest of the site, is the nearest surface water body (Plate 1).

2.8 CLIMATE

The climate of the Moses Lake area is classified as a desert with an average rainfall of 8 inches per year. Snowfall during the winter can be significant with annual averages at approximately 30 inches (Coffman, 2014).

2.9 GROUNDWATER USE EVALUATION

Stantec reviewed available records within an approximate 1-mile radius of the site. Well log records from Ecology’s Well Construction Map Search (Ecology, 2024a) and water system data from the State of Washington Department of Health, Division of Environmental Health, Office of Drinking Water Sentry Internet Water System Database (DOH, 2024) were reviewed to identify the locations and logs of all available monitoring wells and groundwater supply well records.

Four municipal wells owned by the City of Moses Lake (City Well No. 21, 22, 23, and 29) are uncased in basalt. One well owned by the City of Moses Lake (Ecology Well Tag No. BIB315) is screened much shallower in a sand and gravel unit immediately overlying a basalt unit. Two irrigation wells owned by the Bureau of Reclamation – Columbia Basin are uncased in basalt. Two domestic wells with private owners were identified. One has no screen details, but total depth only reached 72 feet suggesting it is sourcing water from sand and gravel rather than basalt units; the second is uncased in basalt. Records for 45 groundwater monitoring wells, 2 geotechnical soil borings, 3 well reconditioning events, and 2 well decommissioning events were also reported.

The review of well logs indicates that both the sand and gravel units and the regional basalt are utilized as groundwater sources for municipal, irrigation, and domestic wells. A summary of well construction details, including top of casing elevations and well screen elevations, are presented in Appendix C.

2.10 SITE ASSESSMENT ACTIVITIES

Previous environmental investigation and remediation activities have been conducted at the site by various consultants since 1991 (SECOR, 1992). Cumulative soil results are presented on Plates 4 through 6 and in Table 2. Well details are summarized on Table 3. Cumulative groundwater results are presented on Plates 7 and 8 and in Tables 4 through 10. Cumulative LNAPL characterization results are presented in Table 11.

In 1991, USACE, as part of an RI associated with what would later become the Moses Lake Wellfield Superfund Site, installed four groundwater monitoring wells (91-AW4 through 91-AW6 and 91-BW2) in the vicinity of Pumphouse 1 (SECOR, 1992). In April 1992, concentrations of TPH were observed in the sample collected from well 91-AW6, prompting USACE to propose fingerprinting of the petroleum product during the next scheduled sampling event in October 1992 (USACE, 1992). When the dedicated pump was pulled from the well in October 1992, approximately 18 inches of LNAPL were reported in the well (USACE, 1993). Approximately 1.77 feet of LNAPL were measured in well 91-AW6 in January 1993 (SEACOR, 1993).

On an unknown date between 1991 and 1993, the USACE advanced four test pits around a metallic geophysical anomaly east of the fencing surrounding Pumphouse 1 (USACE, 1993). The USACE also noted the presence of a concrete magnetic geophysical anomaly southeast of the metallic anomaly.

In September 1992, SECOR conducted a site assessment at Pumphouse 1 to meet Ecology requirements for the permanent closure of UST facilities (SECOR, 1992). Fourteen soil borings up to 30 feet bgs and one pit were advanced. A total of 21 soil samples were submitted for laboratory analysis. A maximum TPH concentration of 8,600 milligrams per kilogram (mg/kg) as Jet A fuel was observed between 13.5 to 15 feet bgs in soil boring PH1-B14. A sample of Jet A fuel was collected from a tanker truck at the Airport to establish a standard for laboratory comparison to soil sample results.

Between 1993 and 1994, Blue Ridge Associates, Inc. (BRA) oversaw the installation of six groundwater monitoring wells (PH1-9301 through PH1-9304, PH1-9401, and PH1-9402) (BRA, 1994; Port, 1994). The steel conductor casing used during construction of well PH1-9302 was not fully recovered and was suspected to be overlapped with the screened interval of the well (Port, 1994). This well was later abandoned in accordance with Ecology standards by pumping bentonite grout via tremie pipe into the well (BRA, 1994). Well PH1-9401 was intended as a replacement to well PH1-9302 (BRA, 1994). During the installation of monitoring wells PH1-9401 and PH1-9402, TPH as Jet A concentrations were less than the MTCA Method A Cleanup Levels from samples collected between 86 and 95 feet bgs (Anatek, 1994a; 1994b).

In October 1995, SECOR prepared a risk assessment evaluation to human and environmental receptors for the proposed closing in-place of the USTs at Pumphouse 1 (SECOR, 1995). SECOR concluded that permanent in-place closure would not increase risk to human nor environmental receptors and would serve to eliminate some physical surface hazards associated with the UST infrastructure. Additional recommendations included continued monitoring of LNAPL, delineation of petroleum hydrocarbons in groundwater, and evaluation of vapor extraction and intrinsic bioremediation (natural attenuation) for remediation of petroleum hydrocarbons in soil and groundwater.

In August 1996, SECOR installed three groundwater monitoring wells (PH1-9601 through PH1-9603) to delineate dissolved phase hydrocarbons in groundwater (SECOR, 1997).

In September 1996, SECOR collected vapor samples from the unsaturated well casings in five groundwater monitoring wells around the site and analyzed them for fixed gases (SECOR, 1997). Additionally, groundwater samples were analyzed for geochemical parameters and soil microbial enumerations were performed on soil samples collected from the borings for groundwater monitoring wells PH1-9601 through PH1-9603 to facilitate the FS for intrinsic bioremediation (natural attenuation). Based on the evaluation of the collected data, SECOR concluded that intrinsic bioremediation is occurring at the site.

In September 1996, SECOR performed aquifer (slug) testing to evaluate hydraulic conductivity to facilitate fate and transport modeling (SECOR, 1997). The hydraulic conductivity estimated via slug testing was 1.81 feet per day at well PH1-9601, 5.42 feet per day at well 91-AW6, and 22.3 feet per day at well PH1-9402. Hydraulic conductivity was also estimated using grain size analysis on soil samples collected from 82 to 87 feet in wells PH1-9601 through PH1-9603; hydraulic conductivity values ranged from 0.0198 to 1.98 feet per day using the grain size analysis. SECOR used the BIOSCREEN model to predict the migration distance of dissolved phase hydrocarbons in groundwater and the time required to reach cleanup goals using only intrinsic bioremediation (natural attenuation). The model predicted that the plume would be limited to the area “immediately southwest of Pumphouse 1” and that only 40 percent of the dissolved hydrocarbon mass would be removed by intrinsic bioremediation over a period of 25 years.

In April 2004, LNAPL thicknesses in wells 91-AW6 and PH1-9301 increased from the sheen that had been present intermittently since May 1995 (BRA, 1995; Behrens, 2004; Hydrometrics, 2004). An LNAPL sample collected from well PH1-9301 was characterized as similar to Jet A and did not show significant signs of degradation (Hydrometrics, 2004).

In April and May 2008, Environmental Resolutions, Inc. (ERI) installed five groundwater monitoring wells (MW13 through MW18) to assess various former ExxonMobil-leased facilities associated with operations at the Airport (ERI, 2008). Wells MW13 and MW14 were installed to assess subsurface conditions in the vicinity of the former ExxonMobil-leased ASTs (Tanks 24 and 38) located south of the Airport, well MW15 was installed next to the Pumphouse 1 building, and wells MW16 through MW18 were installed to assess subsurface conditions in the vicinity of the former ExxonMobil-leased fueling hydrants located on the fueling apron. A single soil sample collected from the boring for groundwater monitoring well MW15 contained a concentration of TPH as gasoline (TPHg) exceeding the MTCA Method A Cleanup Level.

In April 2011, Cardno ERI decommissioned groundwater monitoring wells MW13 and MW16 through MW18 via pressure-grouting with a bentonite slurry; well MW14 was decommissioned by over-drilling and backfilling with bentonite (Cardno ERI, 2011b). Cardno ERI also installed groundwater monitoring wells MW19 through MW22 and steam injection/air sparge well SP1 to further delineate LNAPL and for potential use for future feasibility studies. Soil collected during groundwater monitoring well installation activities indicated TPHg was present at up to 523 mg/kg at the capillary fringe between 85 and 90 feet bgs.

In May 2012, Cardno ERI installed groundwater monitoring wells MW23 through MW26 for delineation of residual hydrocarbons, use in proposed remedial feasibility studies, and LNAPL recovery operations (Cardno ERI, 2012). Soil collected during groundwater monitoring well installation activities indicated TPHg was present at up to 664 mg/kg at the capillary fringe between 80 and 90 feet bgs.

2.11 INTERIM ACTIONS

2.11.1 UST Closure In-Place

In September 1992, the six USTs associated with Pumphouse 1 were temporarily closed in-place. The remaining fuel was removed, the USTs were rinsed, and the inside of each UST was verified to have zero percent lower explosive limit and greater than 19.5 percent oxygen (SECOR, 1995).

In March 1996, the six USTs associated with Pumphouse 1 were decommissioned in-place, as approved by Ecology in a letter dated November 13, 1995 (Ecology, 1995). The clean tanks were decommissioned by filling with a sand slurry mix injected into the maintenance holes at both east and west ends of the USTs and stabilized with the assistance of concrete vibrators. All air vents and fill pipes were cut off below ground surface and filled with a sand slurry mix (Behrens, 1996).

2.11.2 LNAPL Characterization and Removal

2.11.2.1 LNAPL Characterization

Multiple LNAPL samples have been collected from wells on site and submitted for hydrocarbon identification analysis (Table 11).

Following the USACE's observation of LNAPL in well 91-AW6 in October 1992, SECOR submitted a sample of the LNAPL for laboratory analysis. The LNAPL was identified as matching a jet fuel standard (SECOR, 1993).

In March 1993, SECOR performed three LNAPL recharge tests at well 91-AW6 to estimate LNAPL recovery rate and "true" LNAPL thickness in the surrounding glaciofluvial gravel. LNAPL thickness was estimated to between 0.12 and 0.23 foot and the LNAPL recovery rate was estimated to be 2.8 to 8.8 gallons per day. Approximately 1.08 gallons of LNAPL were removed from well 91-AW6 over 9 hours of recharge testing equating to approximately 2.9 gallons per day LNAPL recovery rate (SECOR, 1995).

BRA noted a difference in the visual appearance between the LNAPL observed in well 91-AW6 and that in PH1-9301. BRA described the LNAPL in well PH1-9301 as "translucent to clear with a sharp odor" and the LNAPL in well 91-AW6 as "translucent with a dull odor" with the groundwater commonly appearing "murky with emulsified product" in well 91-AW6 (BRA, 1994).

In April 2004, LNAPL thicknesses in wells 91-AW6 and PH1-9301 increased from the sheen that had been present intermittently since May 1995 (BRA, 1995; Behrens, 2004; Hydrometrics, 2004). An LNAPL sample collected from well PH1-9301 was characterized as similar to Jet A and did not show significant signs of degradation (Hydrometrics, 2004).

In November 2010, Cardno ERI performed a baildown test using wells 91-AW6 and MW15 to evaluate the mobility of LNAPL in the subsurface and assess the potential recoverability of LNAPL for conceptual recovery system design (Cardno ERI, 2011a). Based on LNAPL recovery during the baildown test, and the theoretical recoverability evaluation, it was determined that LNAPL mobility in the aquifer was below the threshold that would make recovery via conventional technologies practicable.

2.11.2.2 Passive LNAPL Recovery

In December 1993, BRA began removing LNAPL from well 91-AW6 first via passive absorbent swabs, changed periodically upon saturation; in January 1994, the swab was replaced by a passive bailer recovery system (BRA, 1994; SECOR, 1995). Between January 12 and January 31, 1994, BRA estimated that the passive bailer recovery system was recovering approximately 2 liters of LNAPL every week (BRA, 1994).

By May 1994, LNAPL thicknesses in well PH1-9301 had reduced to levels that rendered the pump ineffective; the LNAPL removal technology was switched over to passive absorbent swabs, changed periodically upon saturation (BRA, 1994). Swabbing was used to address LNAPL observed in well PH1-9301 up to at least July 2001 (Behrens, 2001). The volume of LNAPL removed during swabbing activities is not available in site records.

In April 2002, absorbent petroleum swabs were installed in wells 91-AW6 and PH1-9301 following an increase in dissolved phase concentrations over the course of 2001 (Behrens, 2002).

Passive skimmers were installed in summer 2004 in wells 91-AW6 and PH1-9303 and maintained through second quarter 2006 (Hydrometrics, 2006a; 2006c). Passive skimmers were installed in November 2005 in wells PH1-9301 and PH1-9402 and maintained through second quarter 2006 (Hydrometrics, 2006c).

2.11.2.3 Active LNAPL Recovery

Between October and December 1993, BRA operated a pneumatic pump in well 91-AW6 to remove LNAPL. The LNAPL thickness was reportedly reduced to sheen (Port, 1994; SECOR, 1995). BRA pumped approximately 200 gallons of LNAPL and groundwater from well 91-AW6 between October and December 1993 (Port, 1994).

In October 1993, within a week of installation, LNAPL in well PH1-9301 was measured to be 0.52 foot (Port, 1994). In December 1993, BRA moved the pump from well 91-AW6 to well PH1-9301 for the purpose of collecting accumulated LNAPL (Port, 1994). BRA operated the pump in well PH1-9301 between December 1993 and May 1994 (BRA, 1994).

An LNAPL recovery pumping system was installed in July 2004 in wells PH1-9301 and PH1-9402 and in August 2004 in well 91-AW6; the system operated through November 2004 (Hydrometrics, 2006a). The pumps were removed on November 12, 2005, and replaced with passive skimmers to accommodate winter freezing conditions (Hydrometrics, 2006b). The pumps were reinstalled in wells PH1-9301 and PH1-9402 in March 2005 (Hydrometrics, 2006c). LNAPL recovery between July and September 2005 was reported as approximately 20 gallons (Hydrometrics, 2005). Cumulative LNAPL recovery (from both the recovery pumping systems and passive skimmers) from installation in summer 2004 through June 1, 2006, was approximately 140 gallons (Hydrometrics, 2006c).

In September 2015, Cardno installed a Xitech LNAPL recovery system. The system is comprised of a controller box that houses an air compressor and logic controller. Adjacent to the controller box is a 250-gallon steel holding tank located within a secondary containment vessel. Shallow trenches were excavated from Pumphouse 1 to groundwater monitoring wells MW15, MW21, MW22, MW25, and MW26. Remediation system piping is shown on Plate 9. A secondary containment line was installed in the trench to convey the high-pressure airline and LNAPL recovery line. Hydrophobic skimmer pumps were installed in each of the wells. During system operation, the pumps are lowered to the groundwater/LNAPL interface and designed for the pumping and conveyance of LNAPL only. The pumps are powered by compressed air that is generated by the air compressor located within the controller box. The pumps operate at pre-set intervals as programmed into the logic controller housed within the controller box. Pumping on each well would typically occur for approximately five minutes per day with a goal to never deplete the LNAPL lens as recovery thereafter is difficult to obtain. System operation commenced on October 9, 2015 (Cardno, 2015).

Beginning in October 2015, Cardno (and later Stantec) performed routine operation and maintenance visits where the LNAPL skimmer pumps were removed from the well and the LNAPL thickness was measured in each respective well. Pumps were reinstalled in the well at the location of the LNAPL lens and the pumping frequency/duration was adjusted via the logic controller. LNAPL continues to be observed in at least eight monitoring wells on site; however, the thickness does not always allow for effective removal via the LNAPL recovery system.

On April 28, 2016, approximately 165 gallons of LNAPL were transferred from the holding tank to three 55-gallon drums for removal from the site to be recycled (Appendix D). Between April 2016 and December 2023, approximately 60 gallons of LNAPL were generated and currently reside in the holding tank awaiting final profiling and disposal.

3.0 EXAMINATION OF HISTORICAL SOIL AND GROUNDWATER CONTAMINATION

During historical site assessment activities, petroleum hydrocarbons were identified in soil and groundwater samples. The record of historical analyses was examined for the purpose of developing the preliminary COPC list for the site as it pertains to releases of Jet A jet fuel from the USTs and/or product piping associated with operations at Pumphouse 1.

Historical soil samples were observed to have reportable concentrations of TPH as Jet A, TPHg, TPH as diesel (TPHd), TPH as oil (TPHo), and total lead. Historical soil samples were also analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX); these constituents were not present above reporting limits.

Historical groundwater samples were observed to have reportable concentrations of TPH as Jet A, TPHg, TPHd, TPHo, BTEX, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), naphthalenes, and total and dissolved metals including arsenic, barium, and chromium. Historical groundwater samples were also analyzed for pesticides, TCEs, additional metals, semi volatile organic compounds (SVOCs), and volatile organic compounds (VOCs) including TCE; these constituents were not present above reporting limits.

A single historical groundwater sample was analyzed for 1,2-dibromoethane (EDB), 1,2-dichloroethane (EDC), n-hexane, and methyl tert butyl ether (MTBE); these constituents were not present above reporting limits.

4.0 PRELIMINARY CONCEPTUAL SITE MODEL

MTCA Section 173-340-200 defines the conceptual site model as a conceptual understanding of a site that identifies potential or suspected sources of hazardous substances, types, and concentrations of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors (WAC, 2023). A preliminary conceptual site model was developed for this RI/FS Work Plan based on the geology and hydrogeology, site history and use, and nature and extent of preliminary COPCs in soil and groundwater. The conceptual site model will continue to be refined during the RI/FS process as data gaps are closed and the site is fully characterized. A preliminary conceptual site model is shown on Plate 10.

4.1 SOURCE OF PRELIMINARY CONTAMINANTS OF POTENTIAL CONCERN

The primary sources of preliminary COPCs at the site are the USTs and product piping associated with historical operations at Pumphouse 1. Secondary sources of preliminary COPCs at the site include soil, groundwater, and LNAPL in the subsurface. These secondary sources are also referred to as contaminated media. The secondary sources (contaminated media) are not fully characterized nor delineated.

4.2 FATE AND TRANSPORT

Petroleum hydrocarbons as Jet A jet fuel were released to the soil from the USTs and/or product piping associated with historical operations at Pumphouse 1. Once released, the LNAPL began to enter the pore spaces in the soil. Once enough LNAPL was released to the soil to overcome the capillary forces, it began to migrate downward though the soil via gravity. In addition to the vertical migration, horizontal spreading also occurs due to capillary forces, varying hydraulic conductivities, and geologic features such as bedding planes or fractures. Residual concentrations were left in the pore spaces as the LNAPL migrated vertically away from the source zone though the soil. This residual LNAPL is immobile but may be a source of dissolved-phase concentrations by interacting with pore water or vapor-phase concentrations through volatilization.

Eventually, a sufficient volume of LNAPL was released to migrate vertically through the vadose zone and capillary fringe to reach the water table. Once reaching the water table (approximately 90 feet bgs), the available pore space was saturated with groundwater resulting in the lateral migration of LNAPL, primarily in the downgradient (southeast) direction based on the head pressure. As the groundwater levels fluctuated, a smear zone was created leaving an area of residual LNAPL in pore spaces near the fluctuating groundwater surface and capillary fringe. The LNAPL in the smear zone may be a source of dissolved-phase concentrations by interacting with pore water and/or groundwater or vapor-phase concentrations through volatilization. LNAPL migrated laterally until the LNAPL head pressure was no longer sufficient to saturate the available pore spaces.

Once the LNAPL was in contact with groundwater, individual constituents partitioned into the dissolved-phase based on their respective solubilities. The dissolved-phase constituents migrated along with groundwater in the downgradient direction controlled by the hydraulic conductivity and groundwater gradient. Additionally, to a lesser extent, dissolved-phase constituents traveled both laterally and vertically due to dispersion. As the dissolved-phase constituents traveled through the soil, compounds sorbed to the soil reducing the concentrations and slowing the rate of migration. In addition, biodegradation occurred during the migration resulting in reduced concentrations.

Volatilization of compounds from the dissolved-phase to the vapor-phase occurred during the downgradient migration. Vapor-phase constituents migrated through diffusion and advection and were reduced by biodegradation.

4.3 POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS

The site is located within a secure airport facility with industrial and commercial developments across the property. Within the fenced Pumphouse 1 area, the ground surface is capped with gravel and interspersed high-desert vegetation. The surrounding pathways used by Airport personnel for movement of aircraft and motor vehicles are covered with asphalt or concrete. There is little to no natural undisturbed habitat in the immediate vicinity of Pumphouse 1.

The Pumphouse 1 building has no current occupants, no plans for future occupancy, and is thoroughly ventilated to outdoor ambient air via the absence of glass in the window openings. Therefore, any exposure pathways leading to indoor air receptors have been eliminated from consideration in the preliminary conceptual site model.

4.3.1 Soil

The potentially complete exposure pathways and potential receptors of preliminary COPCs in soil at the site include the following:

- **Dermal contact or ingestion of soil**: Commercial/Industrial Workers, Construction Workers, Terrestrial Receptors.
- **Inhalation of air from volatilization/atmospheric dispersion of soil:** Commercial/Industrial Workers, Construction Workers, Terrestrial Receptors.

4.3.2 Groundwater

Potentially complete exposure pathways and potential receptors of preliminary COPCs in groundwater at the site include the following:

- **Dermal contact or ingestion of groundwater:** Commercial/Industrial Workers, Construction Workers.
- **Potable water ingestion:** Water Beneficial Use Receptors.

- **Inhalation of air from volatilization/atmospheric dispersion of groundwater:** Commercial/Industrial Workers, Construction Workers, Terrestrial Receptors.

4.3.3 LNAPL

Potentially complete exposure pathways and potential receptors of LNAPL at the site include the following:

- **Dermal contact of LNAPL:** Commercial/Industrial Workers, Construction Workers, Terrestrial Receptors.
- **Inhalation of air from volatilization/atmospheric dispersion of LNAPL:** Commercial/Industrial Workers, Construction Workers, Terrestrial Receptors.

4.4 POTENTIAL FUTURE EXPOSURE PATHWAYS AND RECEPTORS

The site is located within a secure airport facility with industrial and commercial developments across the property. The Port plans to demolish the Pumphouse 1 building in the future and has no plans to redevelop the site with other structures. Demolition of the Pumphouse 1 building would permanently eliminate the vapor intrusion into indoor air exposure pathway.

5.0 PRELIMINARY CLEANUP STANDARDS

Cleanup standards must be established for affected media and must be considered appropriate for projected land uses, groundwater uses, and relevant potential exposure pathways identified in the conceptual site model (Plate 10). Cleanup standards will be proposed at the completion of the RI to facilitate the FS development and determined by Ecology in the Cleanup Action Plan.

5.1 PRELIMINARY CONTAMINANTS OF POTENTIAL CONCERN

The preliminary COPCs for the site are petroleum hydrocarbons and their associated compounds originating from Jet A jet fuel released from the USTs and/or product piping associated with operations at Pumphouse 1. Additionally, per- and polyfluoroalkyl substances (PFAS) will be evaluated based on historical and current property use as an airport. The list of preliminary COPCs comprises the current understanding of the site based on historical soil and groundwater sample analyses, consultation with the guidance provided in WAC 173-340-900 Table 830-1: Required Testing for Petroleum Releases (WAC, 2023), and specific requests from Ecology. This list, summarized in Figure 1, will be revised based on results of RI fieldwork.

Figure 1 Preliminary COPCs in Soil and Groundwater

Chemical Group	COPC
TPH	TPH as Jet A TPHg TPHd TPHo
VOCs	Full 8260 List Fuel Additives and Blending Compounds per Table 830-1
SVOCs	Full 8270 List
Metals	Resource Conservation and Recovery Act (RCRA) 8 Metals
PFAS*	EPA Method 1633 List

EXPLANATION:
* = PFAS are a group of nearly 15,000 synthetic chemicals, according to a chemicals database (CompTox) maintained by the EPA (NIH, 2024). 40 of these compounds are reported by EPA Method 1633, including the 8

compounds for which Ecology has developed cleanup levels and the 6 compounds for which the EPA has developed Maximum Contaminant Levels.

5.2 PRELIMINARY POINTS OF COMPLIANCE

The point of compliance is defined as the point or points where the cleanup standards established by Ecology in the Cleanup Action Plan shall be attained. Preliminary points of compliance for soil and groundwater at the site are considered to be the standard or conditional points of compliance, as specified in WAC 173-340-720 and 173-340-740 (WAC, 2023).

- For soil cleanup levels based on direct contact, the point of compliance is defined as throughout the site from the ground surface to 15 feet below the ground surface.
- For soil cleanup levels based on the protection of groundwater, the point of compliance shall be established in the soils throughout the site.
- For groundwater cleanup levels, the point of compliance shall be established throughout the site from the uppermost level of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the site.
- Where it can be demonstrated under WAC 173-340-350 through 173-340-390 that it is not practicable to meet the groundwater cleanup level throughout the site within a reasonable restoration time frame, Ecology may approve a conditional point of compliance for groundwater that shall be as close as practicable to the source of hazardous substances, and except as provided 173-340-720(8)(d), not to exceed the property boundary.

5.3 PRELIMINARY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Preliminary ARARs include the following:

- MTCA Requirements.
- State Environmental Policy Act.
- Public Works Permits.
- Washington State and Federal Worker Safety.
- Air Quality.
- National Recommended Water Quality Criteria.
- Native American Graves Protection and Repatriation Act.
- Archaeological Resources Protection Act.
- Washington Dangerous Waste Regulations.
- Washington Solid Waste Handling Standards.
- Federal Waste Transportation Standards.
- 14 Code of Federal Regulations (CFR) Chapter I – Federal Aviation Administration, Department of Transportation.

5.4 PRELIMINARY SCREENING LEVELS

The MTCA rules provide three methods for establishing cleanup levels: Method A, Method B, and Method C. The MTCA Method A Cleanup Levels may be used for sites undergoing a routine cleanup action as defined in WAC 173-340-200. The MTCA Method B Cleanup Levels may be used for any site to develop site-specific cleanup levels. The MTCA Method C Cleanup Levels are applicable in limited scenarios such as soil cleanup at industrial facilities.

It has not yet been determined if the site meets the criteria for undergoing a routine cleanup action as defined under WAC 173-340-200; if defined as such, the MTCA Method A Cleanup Levels could be applied as screening levels. Additionally, the site exists within the property boundary of the Airport, an industrial facility. Therefore, for the purposes of preliminary screening and delineation of preliminary COPCs during the RI, analytical results will be compared against the MTCA Method A, Method B, and/or Method C Cleanup Levels for soil and groundwater.

For compounds with an established Maximum Contaminant Level (MCL), the preliminary screening level will be the MCL or the MTCA values, whichever is the lowest concentration. Preliminary screening levels are available in the Ecology Cleanup Levels and Risk Calculation (CLARC) tables (Ecology, 2024b).

Preliminary screening levels for individual VOC, SVOC, and PFAS compounds identified as preliminary COPCs for the site are provided in Tables 1A through 1D of the Quality Assurance Project Plan (QAPP) included in Appendix F.

6.0 PROPOSED SITE CHARACTERIZATION

Proposed site characterization includes the following work:

- Collection of soil samples for surface soil assessment (6 inches bgs).
- Advancement of soil borings for shallow soil assessment (surface to 50 feet bgs).
- Installation of groundwater monitoring wells for shallow and/or deep soil assessment (depending on their location).
- Four quarters of monitoring and sampling of all groundwater monitoring wells associated with the site for current groundwater conditions evaluation of preliminary COPCs and monitored natural attenuation (MNA) parameters.

6.1 SAMPLING AND ANALYSIS PLAN

All fieldwork and laboratory analyses will be performed in accordance with the Sampling and Analysis Plan included in Appendix E. Proposed boring and groundwater monitoring well locations are illustrated on Plate 11.

6.2 QUALITY ASSURANCE PROJECT PLAN

All fieldwork and laboratory analyses will be performed in accordance with the Quality Assurance Project Plan included in Appendix F.

6.3 SITE-SPECIFIC HEALTH AND SAFETY PLAN

All fieldwork will be performed in accordance with the Site-Specific Health and Safety Plan included in Appendix G.

6.4 INADVERTENT DISCOVERY PLAN

All fieldwork will be performed in accordance with the Monitoring and Inadvertent Discovery Plan included in Appendix H.

6.5 TERRESTRIAL ECOLOGICAL EVALUATION

A terrestrial ecological evaluation (TEE) will be conducted to determine whether a release of hazardous substances may pose a threat to the terrestrial environment in accordance with WAC 173-340-7490 for TEE procedures (WAC, 2023).

7.0 PRELIMINARY CLEANUP ACTION ALTERNATIVES

In accordance with WAC 173-340-350, a summary of preliminary cleanup action alternatives likely to be considered in the FS, based on current site information, and a preliminary summary of studies needed to develop or evaluate cleanup action alternatives in the FS has been compiled (Figure 2). Cleanup action alternatives will be thoroughly evaluated for site applicability and discussed in detail in the FS at the completion of the RI. Data collected during the RI will be used to establish site-specific residual saturation remediation levels.

Figure 2 Preliminary Cleanup Action Alternatives

Preliminary Cleanup Action Alternative	Associated Studies or Other Potential Requirements
Excavation	Develop an engineering design report including methodologies on building demolition, UST removal, subsurface piping removal, sidewall stability/support, excavation, backfill, and resurfacing. Evaluation on emplacement of Oxygen Release Compound (ORC) or similar media.
Soil Vapor Extraction	Pilot testing to determine radius of influence, system specifications, air discharge permitting, establish operations and maintenance plan, and establish remediation lifecycle estimate including rebound analysis.
Dual Phase Extraction	Pilot testing to determine radius of influence, system specifications, air discharge permitting, water discharge treatment and permitting, establish operations and maintenance plan, and establish remediation lifecycle estimate including rebound analysis.
LNAPL Extraction	Pilot testing to determine radius of influence, system specifications, establish operations and maintenance plan, and establish remediation lifecycle estimate including rebound analysis.
Groundwater Extraction	Pilot testing to determine radius of influence, system specifications, water discharge, establish operations and maintenance plan, and establish remediation lifecycle estimate including rebound analysis.
Air Sparge/Soil Vapor Extraction	Pilot testing to determine radius of influence, system specifications, air discharge permitting, establish operations and maintenance plan, and establish remediation lifecycle estimate including rebound analysis.

Preliminary Cleanup Action Alternative	Associated Studies or Other Potential Requirements
Air Sparge/Dual Phase Extraction	Pilot testing to determine radius of influence, system specifications, air discharge permitting, water discharge treatment and permitting, establish operations and maintenance plan, and establish remediation lifecycle estimate including rebound analysis.
Subsurface Barrier Wall	Engineering design review including barrier type and extensive groundwater flow study.
Permeable Reactive Barrier Wall	Engineering design review including barrier type and extensive groundwater flow study. LNAPL, soil, and groundwater analysis of natural attenuation parameters. Literature review of media alternatives to trap contamination.
In-Situ Chemical Oxidation	LNAPL, soil, and groundwater analysis of natural attenuation parameters. Literature review of media alternatives to target contamination.
In-Situ Soil Stabilization	LNAPL, soil, and groundwater analysis of natural attenuation parameters. Literature review of media alternatives to immobilize contamination.
Enhanced Natural Attenuation/Biosparging	LNAPL, soil, and groundwater analysis of natural attenuation parameters. Literature review of biological alternatives to target contamination.
Monitored Natural Attenuation	LNAPL, soil, and groundwater analysis of natural attenuation parameters. Establish long term soil and groundwater monitoring plan with degradation analysis.
Institutional Controls	Evaluation of cleanup levels in association with administrative investigation of zoning and redevelopment restrictions. Consider impacts to Port of Moses Lake Master Development Plan.

8.0 GROUNDWATER MONITORING AND SAMPLING

Groundwater monitoring and sampling will be conducted on a quarterly basis for all preliminary COPCs following the completion of Task II until such time as a less frequent, less comprehensive sampling scope is approved by Ecology.

9.0 PLANNING AND DESCRIPTION OF TASKS II AND III

9.1 TASK II

The PLPs will begin implementation of the work (Task II) defined in Task I of the AO within 30 days of receiving Ecology's formal written approval of this document. Upon approval, PLPs will initiate Task II coordination efforts including consultant bid solicitation and contracting, access coordination, laboratory coordination, development of utility protection plans, and execution of the assessment drilling work defined within the final RI/FS Work Plan (Task I). It is anticipated that consultant bid solicitation will require at least three months.

Task II will include the following site characterization elements:

- Installation of new groundwater monitoring wells and soil borings in compliance with WAC 173-160 as needed for characterization and delineation of contaminants.
- Collection of soil samples for characterization of site stratigraphy and lithology, subsurface conditions, and contaminant concentrations.
- Generation of boring/well logs for the purpose of characterizing regional stratigraphy.
- Estimation of hydrogeologic parameters such as hydraulic conductivity and porosity.
- Measurement of groundwater elevation.
- Quarterly groundwater sampling for a period of one year to capture seasonal fluctuations.
- Analysis of soil and groundwater samples for TPHg, TPHd, TPHo, VOCs, SVOCs, metals, and PFAS.
- Collection of data to support estimation of contaminant mass degradation rates in vadose soil and saturated zones.
- Generation of maps showing groundwater elevation and regional/site hydrogeology.

Task II will include collection of data in support of an evaluation of potential human and ecological receptors:

- Potential use of the site and presence or absence of site controls to limit public access.
- Potential use of groundwater underlying the site for consumption or exposure of the public to surface water in the vicinity of the site.
- Identification of endangered or threatened species, potential habitats, and ecological environments.

9.2 TASK III

Following completion of the work outlined in Task II, PLPs will prepare the Final RI/FS Report (Task III). As noted in Section 9.0, Stantec estimates that Task III will be completed approximately two years (24 months) after Ecology provides formal written approval of this RI/FS Work Plan.

Task III will include a report documenting all fieldwork and laboratory analyses completed as part of Task II and will include but not be limited to the following elements:

- A RI in accordance with WAC 173-340-350 comprising:
  - Site and facility operational history, site use, physical setting, and previous investigations.
  - Nature and extent of contamination including maps and tables, laboratory reports, and boring/well logs.
  - ARARs analysis identifying applicable state and federal laws for cleanup of the site in accordance with WAC 173-340-710.
  - Cleanup levels analysis and baseline risk assessment characterizing current and potential threats to public health and the environment integrating cleanup standards and risk assessment in accordance with WAC 173-340-357 and WAC 173-340-708.
  - Discussion of data and recommendations, including an update to the conceptual site model, summary of all possible and suspected source areas, known or potential risks to public health and the environment, and identification of any remaining data gaps or additional data requirements for site characterization and decision-making.
- A FS in accordance with WAC 173-340-351 comprising:
  - Identification of contamination requiring remediation.
  - Initial screening of potential remedial actions.
  - Proposed remedial alternative and evaluation with respect to the MTCA criteria.

- Selected remedial alternative recommended for implementation.

10.0 PROJECT MANAGEMENT

Per the AO, Project Coordinators are listed in Figure 3.

Figure 3 Project Coordinator Contact Information

Project Coordinator	Organization	Address	Contact
Kristin Beck	State of Washington Department of Ecology	Eastern Regional Office 4601 North Monroe Street Spokane, WA 99205-1295	Phone: (509) 514-6806 Email: kbec461@ecy.wa.gov
Jeff Johnson	ExxonMobil Environmental and Property Solutions Company	25915 South Frontage Road Channahon, IL 60410	Phone: (815) 860-7290 Email: jeff.a-sh-e.johnson@exxonmobil.com
Rich Mueller	Port of Moses Lake	7810 Andrews Street Northeast Suite 200 Moses Lake, WA 98837	Phone: (509) 762-5363 Email: rjmueller@portofmoseslake.com

Each Project Coordinator is responsible for implementing the work defined in this document. Ecology's designated representative for the site is Kristin Beck. To the maximum extent possible, communication between Ecology and PLPs shall be directed through the Project Coordinators. The Project Coordinators may designate, in writing, working level staff contacts for all or portions of the work, including designation of environmental consultants to support the project work.

Per the AO, any party may change its respective Project Coordinator by way of written notification given to the other parties at least ten calendar days prior to the change.

10.1 TASK I

Bobby Thompson, the Stantec Project Manager, will be the primary point of contact for Stantec. Milton Miller has been designated as the Port Project Manager to facilitate the completion of Task I. Contact information for Stantec and Port Project Managers are presented in Figure 4.

Figure 4 Project Manager Contact Information

Project Manager	Organization	Address	Contact
Bobby Thompson	Stantec Consulting Services Inc.	1687 114th Avenue Southeast Suite 100 Bellevue, WA 98004	Phone: (206) 510-5855 Email: robert.thompson@stantec.com
Milton Miller	Port of Moses Lake	7810 Andrews Street Northeast Suite 200 Moses Lake, WA 98837	Phone: (407) 986-4240 Email: mmiller@portofmoseslake.com

10.2 TASKS II AND III

The Port's selected environmental consultant will facilitate the completion of the scope presented in the RI/FS Work Plan in collaboration with the designated Project Coordinators. The consultant Project Manager will coordinate and execute work with the project team comprised of geologists, staff scientists, editors, accountants, and other resources supporting the project.

Per the AO, any party may change its respective Project Coordinator by way of written notification given to the other parties at least ten (10) calendar days prior to the change.

11.0 SCHEDULE FOR IMPLEMENTATION

In accordance with the AO, and as defined in the table below, PLPs will execute Task II (Implementation of RI) and Task III (RI/FS Report):

Activity	Schedule
PLPs Receive Ecology's Approval of the Final RI/FS Work Plan (Task I)	Day 0
PLPs Begin Implementation of the RI/FS Work Plan (Task II)	Day 0 – Month 1
Task II Consultant Bid Solicitation and Contracting	Month 1 – Month 3
Task II Field Coordination Activities	Month 3 – Month 6
Task II Field Work Execution – Drilling	Month 6 – Month 9
Task II Field Work Execution – Groundwater Sampling (Four Quarters)	Month 9 – Month 21
Develop and Submit Task III Draft RI/FS Report	Month 21 – Month 24

For the duration of the AO, quarterly progress reports will be prepared and submitted to the Ecology Project Manager. These reports will serve to inform Ecology of the project progress and any significant interim findings that have been identified, including those related to QA. This will streamline the process of addressing issues as they arise and adjusting the program to better achieve project objectives. The progress reports shall include the following:

- A list of on-site activities that have taken place during the quarter.
- Detailed description of any deviations from required tasks not otherwise documented in project plans or amendment requests.
- Description of all deviations from the AO scope of work and schedule (Exhibits B and C of the AO) during the current quarter and any planned deviations in the upcoming quarter.
- For any deviations in schedule, a plan for recovering lost time and maintaining compliance with the schedule.
- All raw data (including laboratory analyses) received during the previous quarter (if not previously submitted to Ecology), together with a detailed description of the underlying samples collected.
- A list of deliverables for the upcoming quarter if different from the schedule.

Progress reports shall be submitted by the 10th day of the month in which they are due after the effective date of the AO.

12.0 REFERENCES

Anatek Labs (Anatek). April 24, 1994a. Results of Analysis for Samples Received April 15, 1994, Sample Log-in Number: 1731, Project: Port of Moses Lake – Pumphouse #1 Drilling.

Anatek Labs (Anatek). April 25, 1994b. Results of Analysis for Samples Received April 19, 1994, Sample Log-in Number: 1743, Project: Port of Moses Lake.

Blue Ridge Associates, Inc. (BRA). August 15, 1994. *Port of Moses Lake, Progress Report for: Pump House #1 Closure.*

Blue Ridge Associates, Inc. (BRA). May 1995. *Port of Moses Lake Project, May 1995, Progress Report.*

Camp, Victor E., Reidel, Stephen P., Ross, Martin E., Brown, Richard J., and Self, Stephen. 2017 (Camp et al.). *Field-Trip Guide to the Vents, Dikes, Stratigraphy, and Structure of the Columbia River Basalt Group, Eastern Oregon and Southeastern Washington*. Department of the Interior, United States Geological Survey, Scientific Investigations Report 2017-5022-N.

Cardno. November 20, 2015. *System Installation Report*, *Grant County Airport, Former Fueling Facilities*, 7810 Andrews Street Northeast, Moses Lake, Washington.

Cardno ERI. January 6, 2011a. *Baildown Test Report, Grant County Airport, Former Fueling Facilities*, 7810 Andrews Street Northeast, Moses Lake, Washington.

Cardno ERI. July 13, 2011b. *Well Installation, Destruction, and Groundwater Monitoring Report*, *Grant County Airport – Former Fueling Facilities*, 7810 Andrews Street Northeast, Moses Lake, Washington.

Cardno ERI. August 21, 2012. *Well Install Report, Grant County Airport, Former Fueling Facilities*, 7810 Andrews Street Northeast, Moses Lake, Washington.

Coffman Associates, Inc. (Coffman). August 2014. *Airport Master Plan for Grant County International Airport, Moses Lake, Washington.*

Denfeld, Duane Colt. August 27, 2012. “Larson Air Force Base – Grant County International Airport.” URL: Larson Air Force Base -- Grant County International Airport - HistoryLink.org.

EA Engineering, Science, and Technology (EA). June 30, 1992. *Results of EA’s Sensitive Receptor Survey – Jett-Aero facility, Grant County Municipal Airport, Moses Lake, Washington, Exxon Environmental Work Release Number 92036478.*

Environmental Resolutions Inc. (ERI). July 3, 2008. *Monitoring Well Installation and Groundwater Sampling Report, Grant County Airport, ExxonMobil-Leased Facilities, 7810 Andrews Street Northeast, Moses Lake, Washington.*

Exxon Company, U.S.A. (Exxon). September 29, 1992. Letter from Gary Gibson to File. “Moses Lake Aviation Terminal #7372.”

Exxon Company, U.S.A. (Exxon). March 3, 1993. Letter from Gary Gibson to David Bailey. “Exxon/Jett Aero Facility, Port of Moses Lake, Washington.”

Frans, Lonna M., Kahle, Sue C., Tecca, Alison E., and Olsen, Theresa D (Frans et al.). 2018. *Simulation of Groundwater Storage Changes in the Quincy Basin, Washington*. United States Geological Survey Scientific Investigations Report 2018–5162.

Grant County Assessor (Grant County). February 23, 2024. "Mapsifter." Search: 171020000. URL: https://grantwa-mapsifter.publicaccessnow.com/defaultHTML5.aspx.

Grolier, Maurice J., and Foxworthy, Bruce L. 1961. *Geology of the Moses Lake North Quadrangle, Washington.* Department of the Interior, United States Geological Survey, Miscellaneous Geologic Investigations, Map I-330.

Gulick, Charles W. January 1990. *Geologic Map of the Moses Lake 1:100,000 Quadrangle, Washington.* Washington Division of Geology and Earth Resources, Open File Report 90-1.

Hydrometrics, Inc. (Hydrometrics). June 3, 2004. *Moses Lake Groundwater Sampling.*

Hydrometrics, Inc. (Hydrometrics). November 2005. *ExxonMobil, Grant County Airport, Moses Lake, Washington, Pumphouse #1, Third Quarter 2005 Groundwater Monitoring Report.*

Hydrometrics, Inc. (Hydrometrics). January 2006a. *ExxonMobil, Grant County Airport, Moses Lake, Washington, Pumphouse #1, Fourth Quarter 2005 Groundwater Monitoring Report.*

Hydrometrics, Inc. (Hydrometrics). April 2006b. *ExxonMobil, Grant County Airport, Moses Lake, Washington, Pumphouse #1, First Quarter 2006 Groundwater Monitoring Report.*

Hydrometrics, Inc. (Hydrometrics). August 2006c. *ExxonMobil, Grant County Airport, Moses Lake, Washington, Pumphouse #1, Second Quarter 2006 Groundwater Monitoring Report.*

K.L. Behrens & Associates (Behrens). March 4, 1996. *UST Closure Pump House Number 1, WDOE Site Number 004947.*

K.L. Behrens & Associates (Behrens). August 20, 2001. *Pump House #1, Port of Moses Lake, Washington.* Progress report from June 1, 2001, to July 31, 2001.

K.L. Behrens & Associates (Behrens). April 8, 2002. *Pump House #1, Port of Moses Lake, Washington.* Progress report from December 16, 2001, through April 8, 2002.

K.L. Behrens & Associates (Behrens). April 26, 2004. *Pump House #1, Port of Moses Lake, Washington.* Progress report from October 29, 2003, to April 23, 2004.

National Institute of Environmental Health Sciences (NIH). September 3, 2024. *Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)*. https://www.niehs.nih.gov/health/topics/agents/pfc.

Port of Moses Lake (Port). January 3, 1994. *Summary of BlueRidge Associates, Inc.'s work to date at the Port of Moses Lake, Moses Lake, Washington.*

Port of Moses Lake (Port). January 24, 2005. *Agreement and Lease, Fixed Base Operations at the Grant County International Airport*. Lease agreement between Port of Moses Lake (Lessor) and ExxonMobil Oil Corporation (Lessee).

Port of Moses Lake (Port). “Meet the PORT.” URL: Meet the PORT (portofmoseslake.com). Accessed February 21, 2024.

Schuster, J. Eric, Gulick, Charles W., Reidel, Stephen P., Fecht, Karl R., and Zurenko, Stephanie (Schuster et al.). 1997. *Geologic Map of Washington – Southeast Quadrant*. Washington Division of Geology and Earth Resources, Geologic Map GM-45.

SEACOR Science & Engineering Analysis Corporation. (SEACOR). February 25, 1993. *Groundwater Monitoring and Sampling, Pump House #1 Area, Grant County Airport, Moses Lake, Washington.*

SECOR International Inc. (SECOR). November 12, 1992. *Site Assessment Report for 23 Underground Storage Tanks at Grant County Municipal Airport, Grant County, Washington.*

SECOR International Inc. (SECOR). October 30, 1995. *Risk Evaluation for Pump House 1 at the Grant County Municipal Airport, Moses Lake, Washington.*

SECOR International Inc. (SECOR). August 18, 1997. *Site Assessment, Focused Feasibility Study, and Fate Transport Modeling Report, Pumphouse 1, Grant County Airport, Moses Lake, Washington*.

State of Washington Department of Ecology (Ecology). October 30, 1992. Letter to David M. Bailey of Port of Moses Lake. “RE: Early Notice Letter Regarding the Pumphouse #1 Area at the Grant County Airport Facility/PR.”

United States Department of Defense Department of the Army, Seattle District, Corps of Engineers (USACE). September 8, 1992. Letter to David Bailey of Port of Moses Lake from John R. Vogel of USACE Hazardous Waste Management Section.

United States Department of Defense Department of the Army, Seattle District, Corps of Engineers (USACE). January 7, 1993. Assemblage of tables, plates, and written note delivered to Paul Turner at Washington Department of Ecology – Eastern Region from John Vogel of USACE.

United States Environmental Protection Agency (EPA). March 23, 1993. *Request for Information Pursuant to Section 104 of CERCLA (and Section 3007 of RCRA,) for the Moses Lake Wellfield Contamination Superfund Site in Moses Lake, Washington.*

United States Environmental Protection Agency (EPA). September 30, 2008. *Interim Record of Decision, Moses Lake Wellfield Superfund Site, Moses Lake, Washington.*

United States Environmental Protection Agency (EPA). March 22, 2022. *Second Five-Year Review Report for Moses Lake Wellfield Contamination Superfund Site, Grant County, Washington.*

United States Environmental Protection Agency (EPA). “Moses Lake Wellfield Contamination, Moses Lake, WA, Cleanup Activities.” URL: https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.Cleanup&id=1001249#bkground. Accessed March 25, 2024.

Washington Administrative Code (WAC). August 23, 2023. Chapter 173-340 Model Toxics Control Act – Cleanup. URL: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-340.

Washington State Department of Ecology (Ecology). November 13, 1995. Letter to David Bailey of Port of Moses Lake. “Re: Port of Moses Lake, Grant County Airport, Pump House #1 (Site #004947).”

Washington State Department of Ecology (Ecology). January 24, 2019a. Letter to Rich Mueller of Port of Moses Lake. “Re: Preliminary Determination of Liability for Release of Hazardous Substances at the following Contaminated Site: Site Name: Moses Lake Port Pumphouse 1, Site Address: 7810 Andrews N.E., Moses Lake, WA 98837, Cleanup Site ID: 7021, Facility/Site ID: 612, County Assessor's Parcel Number(s): 171020000.”

Washington State Department of Ecology (Ecology). January 24, 2019b. Letter to Jennifer Sedlachek of ExxonMobil Environmental Services Company. “Re: Preliminary Determination of Liability for Release of Hazardous Substances at the following Contaminated Site: Site Name: Moses Lake Port Pumphouse 1, Site Address: 7810 Andrews N.E., Moses Lake, WA 98837, Cleanup Site ID: 7021, Facility/Site ID: 612, County Assessor's Parcel Number(s): 171020000.”

Washington State Department of Ecology (Ecology). March 6, 2019c. Letter to Rich Mueller of Port of Moses Lake. “Re: Final Determination of Liability for Release of Hazardous Substances at the following Contaminated Site: Site Name: Moses Lake Port Pumphouse 1, Site Address: 7810 Andrews N.E., Moses Lake, WA 98837, Cleanup Site ID: 7021, Facility/Site ID: 612, County Assessor's Parcel Number(s): 171020000.”

Washington State Department of Ecology (Ecology). March 6, 2019d. Letter to Jennifer Sedlachek of ExxonMobil Environmental Services Company. “Re: Final Determination of Liability for Release of Hazardous Substances at the following Contaminated Site: Site Name: Moses Lake Port Pumphouse 1, Site Address: 7810 Andrews N.E., Moses Lake, WA 98837, Cleanup Site ID: 7021, Facility/Site ID: 612, County Assessor's Parcel Number(s): 171020000.”

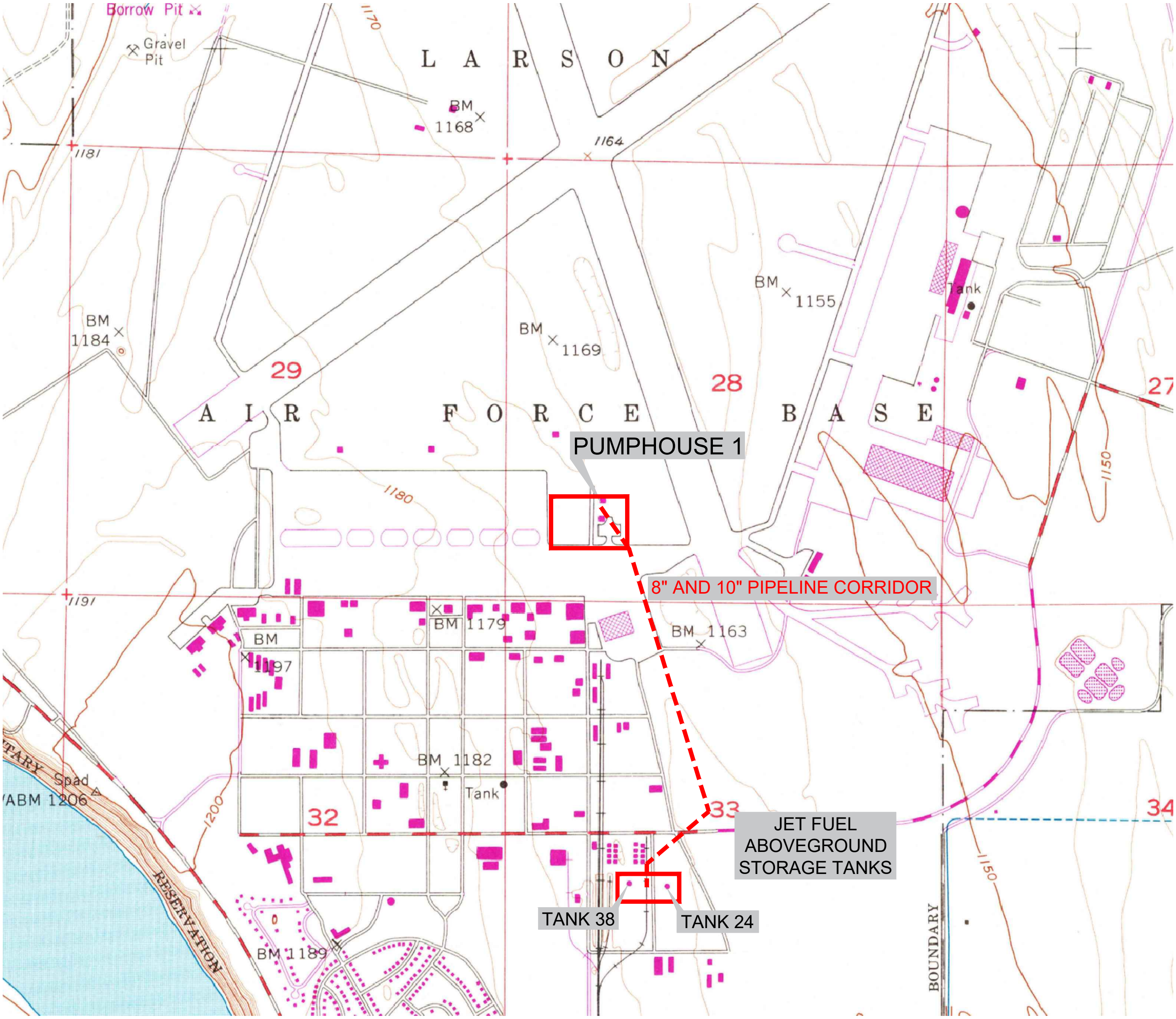
Washington State Department of Ecology (Ecology). November 17, 2022. Letter to Rich Mueller of Port of Moses Lake. “Re: Invitation to Initiate Agreed Order Negotiations at the Moses Lake Port Pumphouse 1 Site.”

Washington State Department of Ecology (Ecology). December 26, 2023. Agreed Order No. DE 22056.

Washington State Department of Ecology (Ecology). “Well Construction Map Search.” URL: https://appswr.ecology.wa.gov/WellConstruction/Map/WCLSWebMap/WellConstructionMapSearch.aspx. Accessed February 21, 2024.

Washington State Department of Ecology (Ecology). July 2024b. Cleanup Levels and Risk Calculation (CLARC) Master Table. https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables.

Washington State Department of Human Health, Division of Environmental Health, Office of Drinking Water (DOH). “Sentry Internet Water System Database.”
URL: https://fortress.wa.gov/doh/eh/portal/odw/si/findwatersystem.aspx. Accessed February 21, 2024.



FN 2037236780001

EXPLANATION

SOURCE:
Modified from a map
provided by
DeLorme 3-D TopoQuads

APPROXIMATE SCALE

Stantec

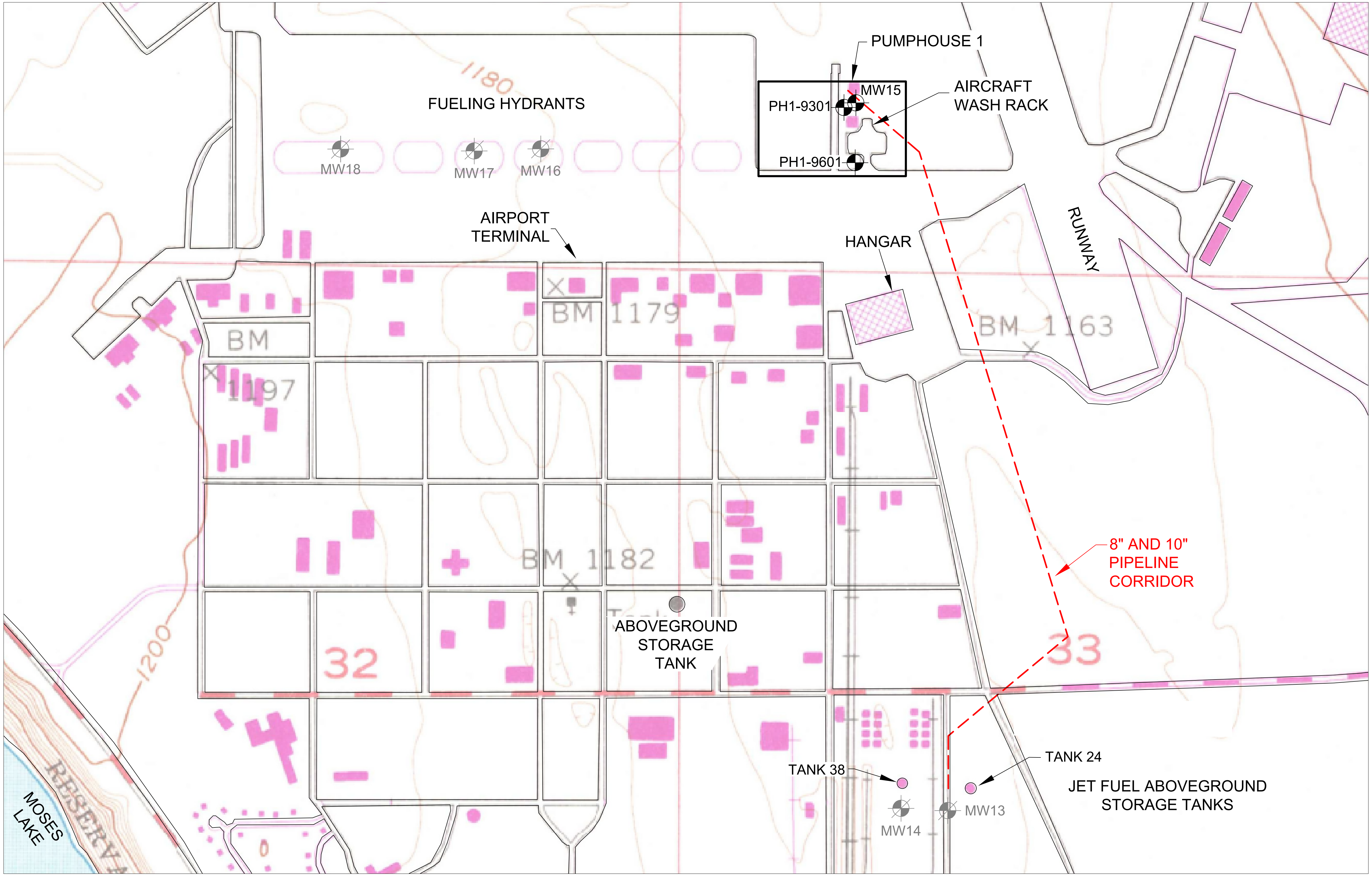
SITE LOCATION MAP

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

PROJECT NO.
203723678

PLATE
1

LEC: 03/21/24



FN 2037236780002

N

EXPLANATION

MW15
⊕ Groundwater Monitoring Well

MW18
⊕ Destroyed Groundwater Monitoring Well

NOTE: Select Pumphouse 1 features and monitoring wells omitted for clarity. Refer to the Generalized Site Plan for Pumphouse 1 (Plate 3) for details.

SOURCE: Modified from a map provided by DeLorme 3-D TopoQuads

APPROXIMATE SCALE

0 650 1,300
Feet

Stantec

GENERALIZED SITE PLAN (EXPANDED AREA)

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

PROJECT NO.

203723678

PLATE

2

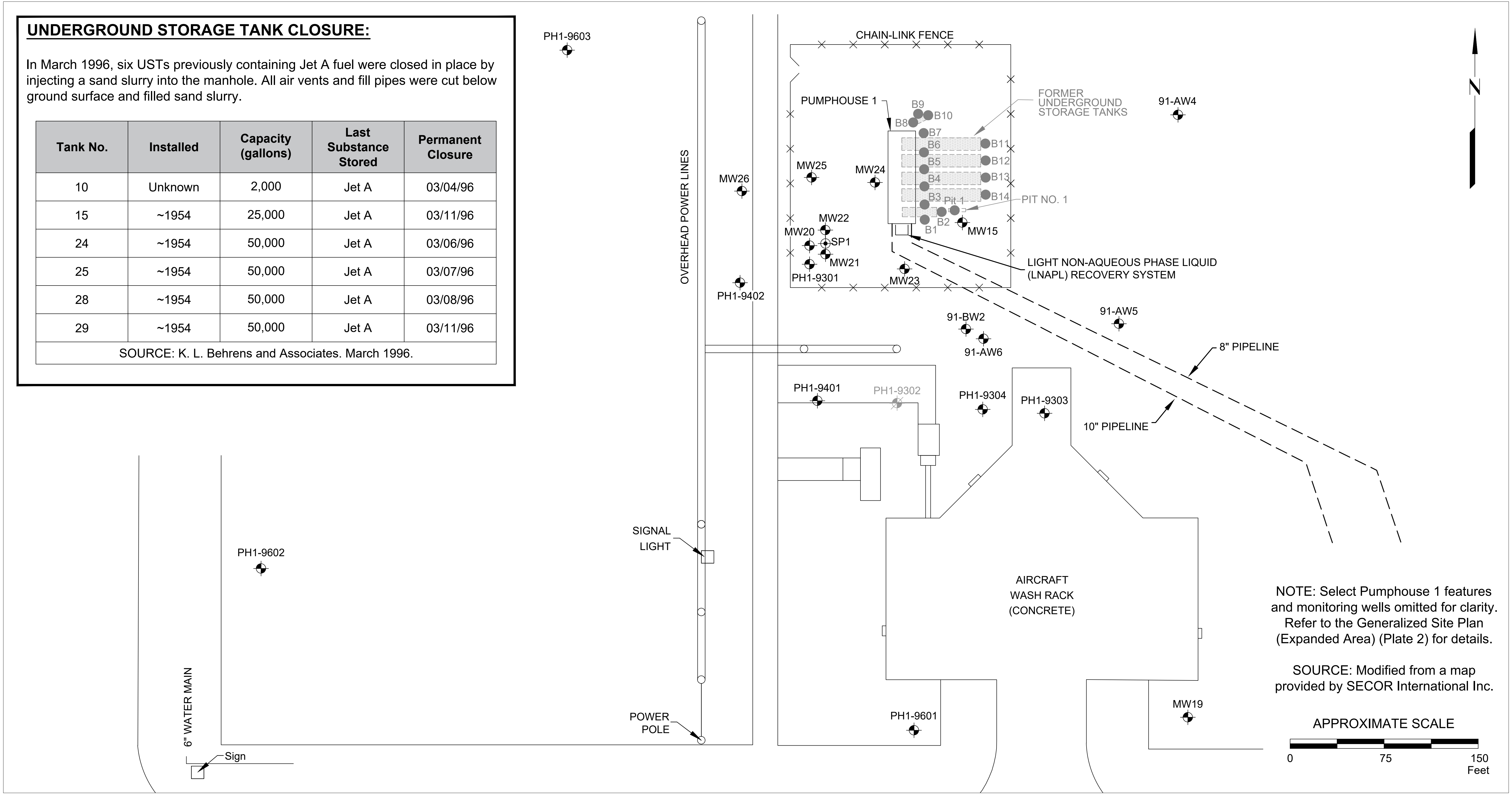
LEC: 05/14/24

UNDERGROUND STORAGE TANK CLOSURE:

In March 1996, six USTs previously containing Jet A fuel were closed in place by injecting a sand slurry into the manhole. All air vents and fill pipes were cut below ground surface and filled sand slurry.

Tank No.	Installed	Capacity (gallons)	Last Substance Stored	Permanent Closure
10	Unknown	2,000	Jet A	03/04/96
15	~1954	25,000	Jet A	03/11/96
24	~1954	50,000	Jet A	03/06/96
25	~1954	50,000	Jet A	03/07/96
28	~1954	50,000	Jet A	03/08/96
29	~1954	50,000	Jet A	03/11/96

SOURCE: K. L. Behrens and Associates. March 1996.



NOTE: Select Pumphouse 1 features and monitoring wells omitted for clarity. Refer to the Generalized Site Plan (Expanded Area) (Plate 2) for details.

SOURCE: Modified from a map provided by SECOR International Inc.

APPROXIMATE SCALE

0 75 150
Feet

FN 2037236780002

Stantec

GENERALIZED SITE PLAN (PUMPHOUSE 1)

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

EXPLANATION

MW26 ⊕ Groundwater Monitoring Well

SP1 ⊕ Steam Injection Well

PH1-9403 ⊕ Destroyed Groundwater Monitoring Well

B14 ● Historical Soil Boring

PROJECT NO.

203723678

PLATE

3

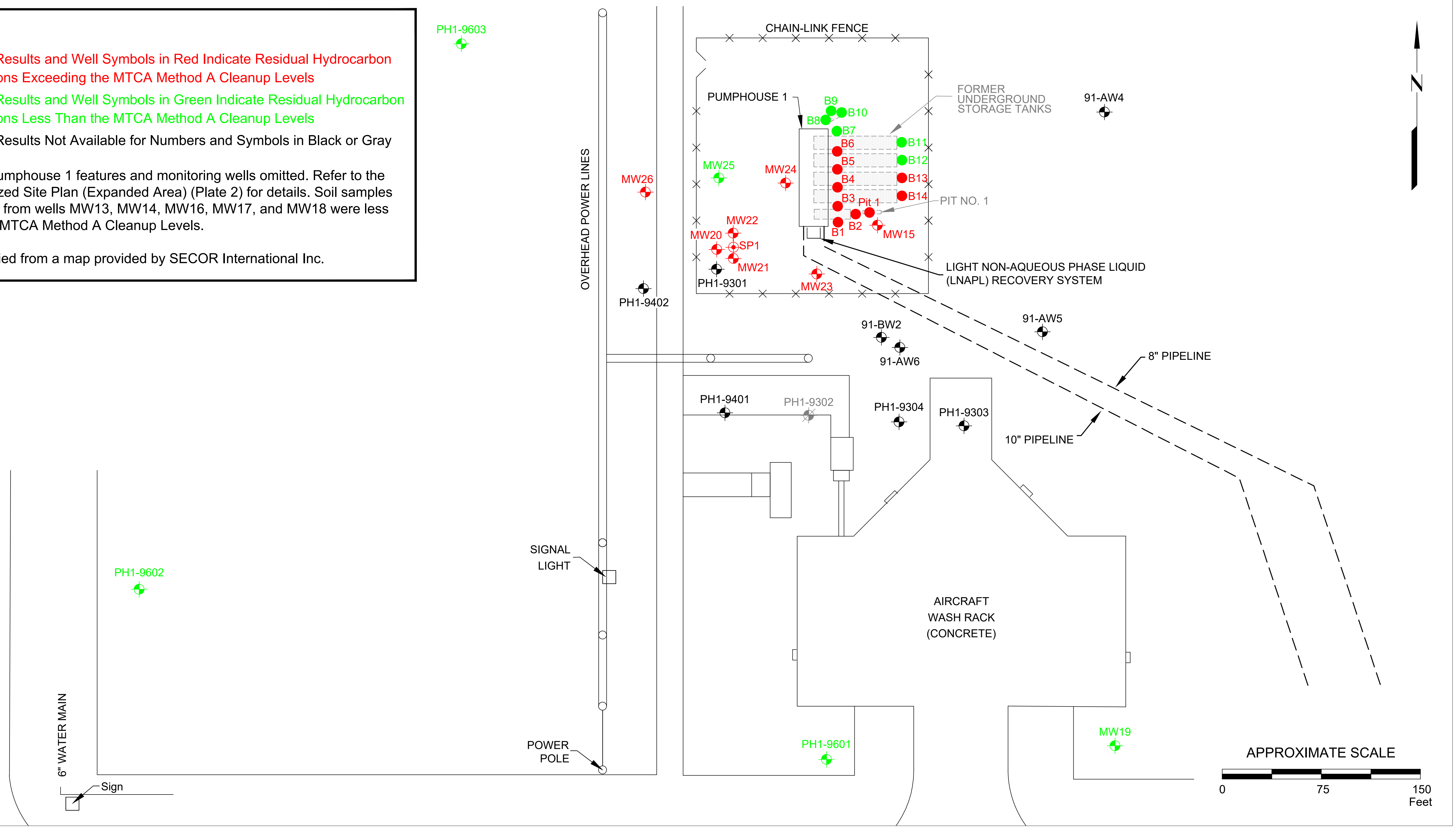
LEC: 05/14/23

LEGEND:

- 🟥 Laboratory Results and Well Symbols in Red Indicate Residual Hydrocarbon Concentrations Exceeding the MTCA Method A Cleanup Levels
- 🟩 Laboratory Results and Well Symbols in Green Indicate Residual Hydrocarbon Concentrations Less Than the MTCA Method A Cleanup Levels
- ● Laboratory Results Not Available for Numbers and Symbols in Black or Gray

NOTE: Select Pumphouse 1 features and monitoring wells omitted. Refer to the Generalized Site Plan (Expanded Area) (Plate 2) for details. Soil samples collected from wells MW13, MW14, MW16, MW17, and MW18 were less than the MTCA Method A Cleanup Levels.

SOURCE: Modified from a map provided by SECOR International Inc.



FN 2037236780002

Stantec

JET FUEL DISTRIBUTION MAP - CUMULATIVE SOIL

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

EXPLANATION

MW26 ⊕	Groundwater Monitoring Well
SP1 ⊕	Steam Injection Well
PH1-9403 ⊕	Destroyed Groundwater Monitoring Well
B14 ●	Historical Soil Boring

PROJECT NO.

203723678

PLATE

4

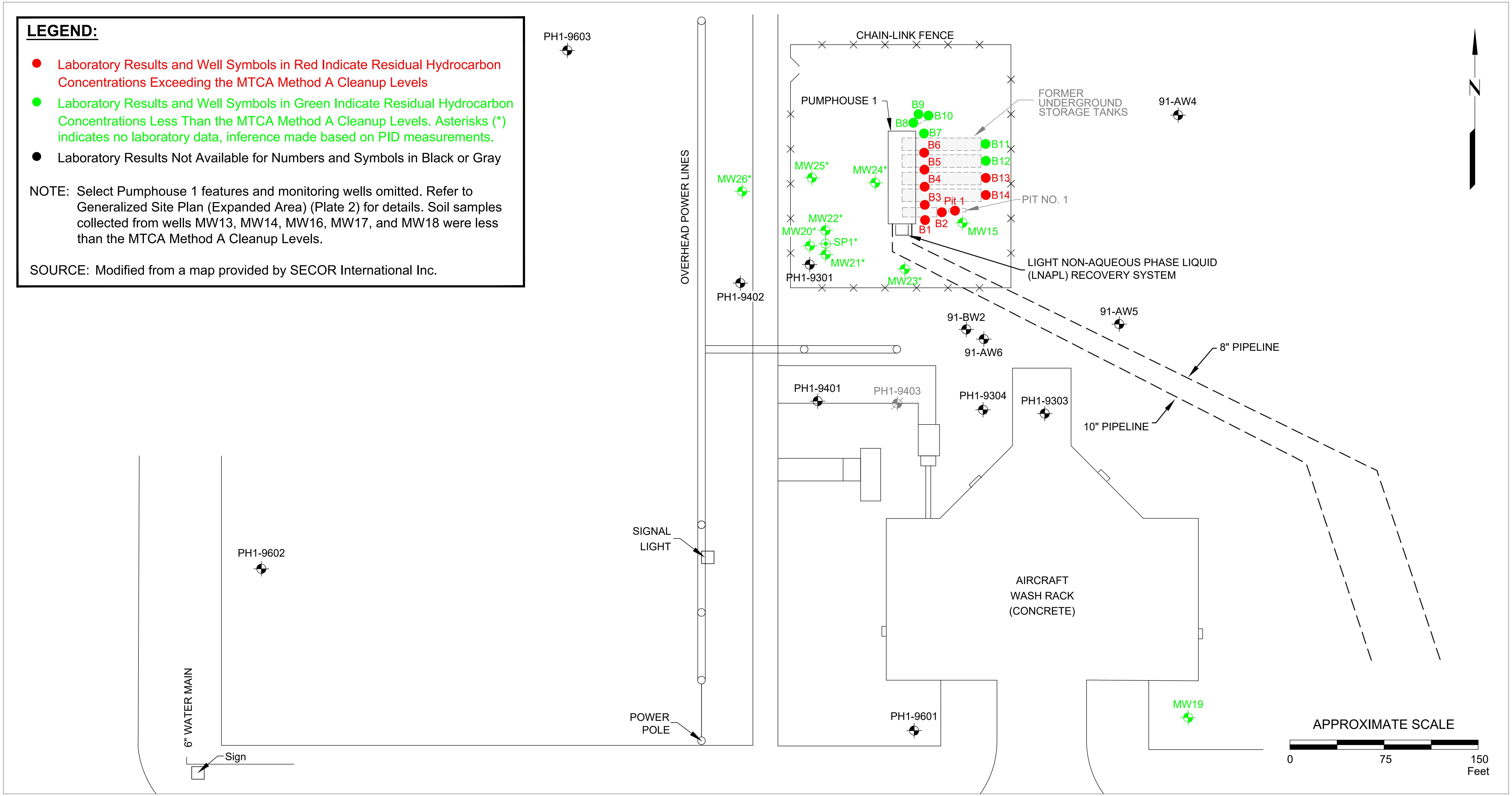
LEC: 05/14/24

LEGEND:

- 🟥 Laboratory Results and Well Symbols in Red Indicate Residual Hydrocarbon Concentrations Exceeding the MTCA Method A Cleanup Levels
- 🟩 Laboratory Results and Well Symbols in Green Indicate Residual Hydrocarbon Concentrations Less Than the MTCA Method A Cleanup Levels. Asterisks (*) indicates no laboratory data, inference made based on PID measurements.
- ● Laboratory Results Not Available for Numbers and Symbols in Black or Gray

NOTE: Select Pumphouse 1 features and monitoring wells omitted. Refer to Generalized Site Plan (Expanded Area) (Plate 2) for details. Soil samples collected from wells MW13, MW14, MW16, MW17, and MW18 were less than the MTCA Method A Cleanup Levels.

SOURCE: Modified from a map provided by SECOR International Inc.



FN 2037236780002

Stantec

JET FUEL DISTRIBUTION MAP - SOIL <50 FEET BGS

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

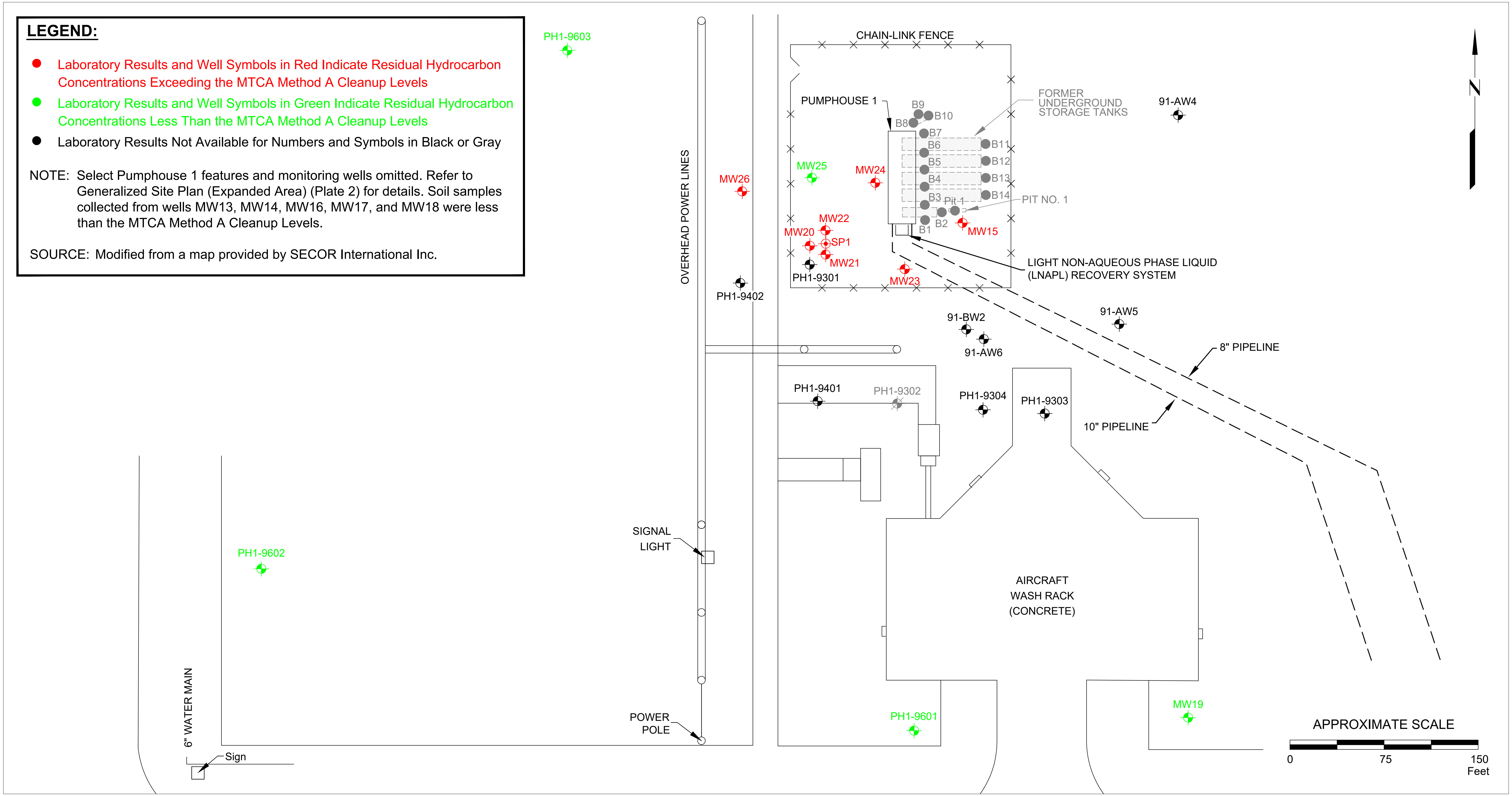
EXPLANATION

MW26	Groundwater Monitoring Well
SP1	Steam Injection Well
PH1-9403	Destroyed Groundwater Monitoring Well
B14	Historical Soil Boring

PROJECT NO.
203723678

PLATE
5

LEC: 05/14/24



LEGEND:

- 🟥 Laboratory Results and Well Symbols in Red Indicate Residual Hydrocarbon Concentrations Exceeding the MTCA Method A Cleanup Levels
- 🟩 Laboratory Results and Well Symbols in Green Indicate Residual Hydrocarbon Concentrations Less Than the MTCA Method A Cleanup Levels
- ● Laboratory Results Not Available for Numbers and Symbols in Black or Gray

NOTE: Select Pumphouse 1 features and monitoring wells omitted. Refer to Generalized Site Plan (Expanded Area) (Plate 2) for details. Soil samples collected from wells MW13, MW14, MW16, MW17, and MW18 were less than the MTCA Method A Cleanup Levels.

SOURCE: Modified from a map provided by SECOR International Inc.

FN 2037236780002

Stantec

JET FUEL DISTRIBUTION MAP - SOIL $\geq$50 FEET BGS

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

EXPLANATION

MW26 ⊕ Groundwater Monitoring Well
SP1 ⊕ Steam Injection Well
PH1-9403 ⊕ Destroyed Groundwater Monitoring Well
B14 ● Historical Soil Boring

PROJECT NO.
203723678

PLATE
6

LEC: 05/14/24

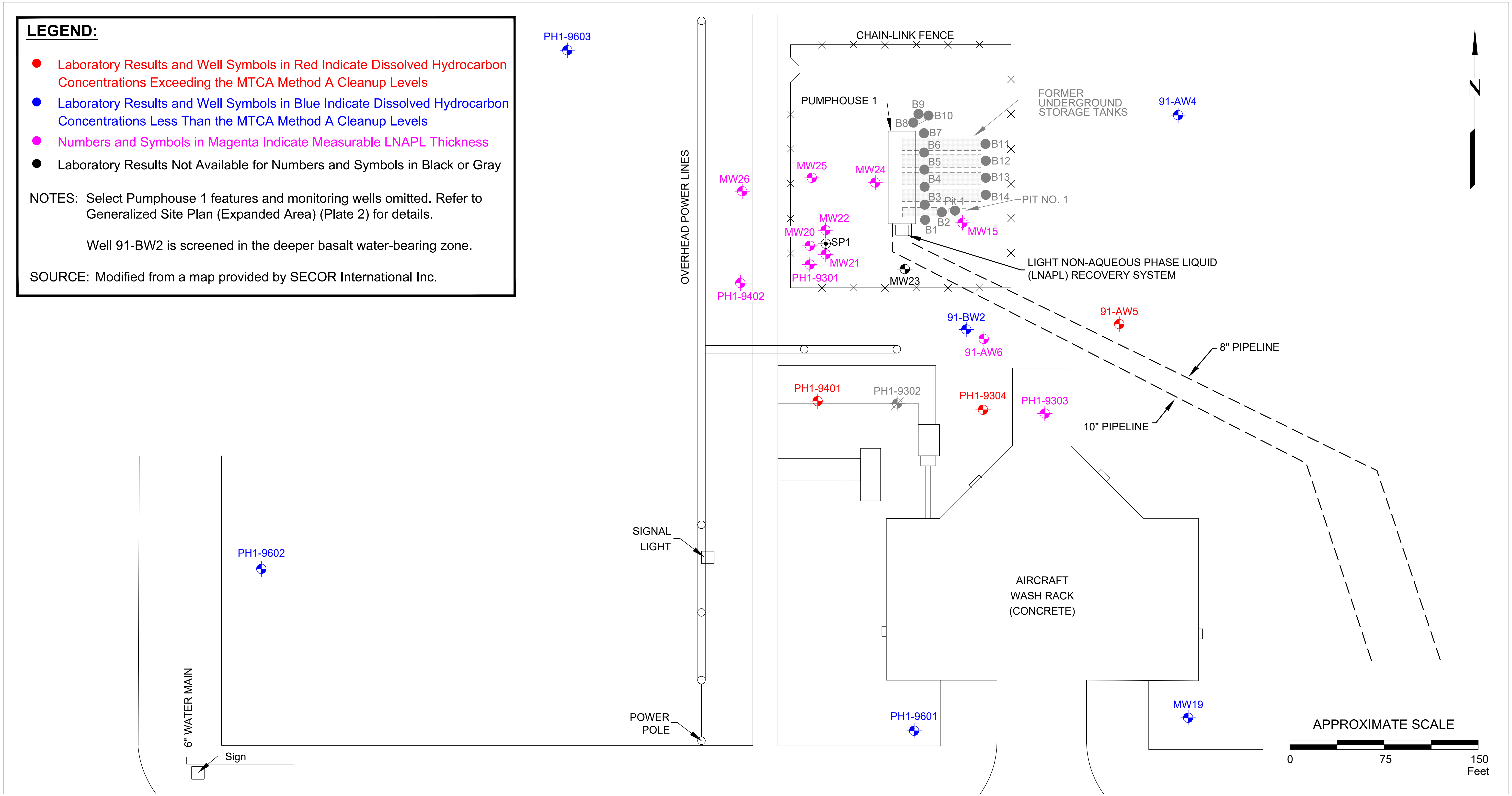
LEGEND:

- ● Laboratory Results and Well Symbols in Red Indicate Dissolved Hydrocarbon Concentrations Exceeding the MTCA Method A Cleanup Levels
- ● Laboratory Results and Well Symbols in Blue Indicate Dissolved Hydrocarbon Concentrations Less Than the MTCA Method A Cleanup Levels
- ● Numbers and Symbols in Magenta Indicate Measurable LNAPL Thickness
- ● Laboratory Results Not Available for Numbers and Symbols in Black or Gray

NOTES: Select Pumphouse 1 features and monitoring wells omitted. Refer to Generalized Site Plan (Expanded Area) (Plate 2) for details.

Well 91-BW2 is screened in the deeper basalt water-bearing zone.

SOURCE: Modified from a map provided by SECOR International Inc.



FN 2037236780002

Stantec

JET FUEL DISTRIBUTION MAP - GROUNDWATER

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

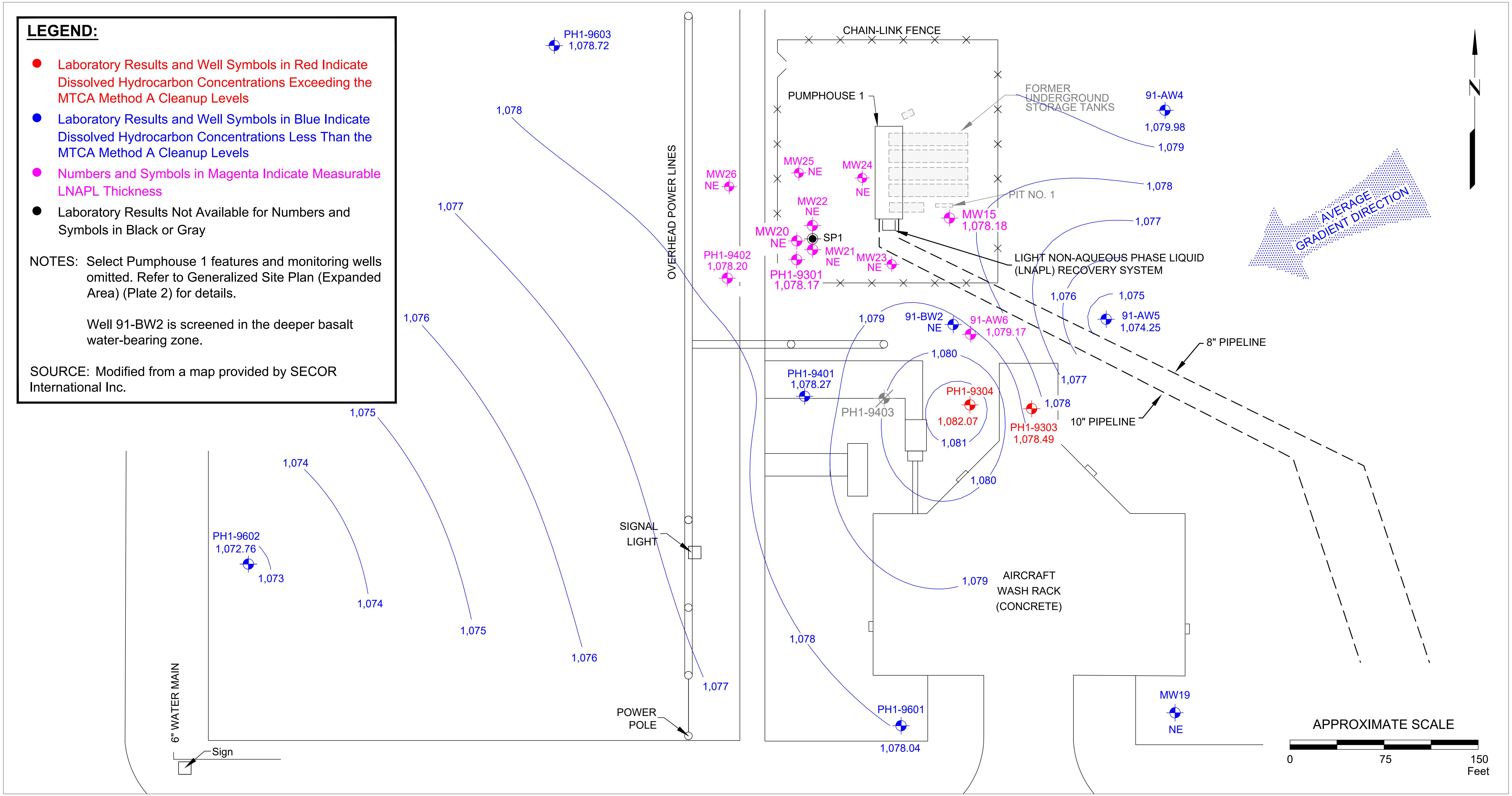
EXPLANATION

MW26 Groundwater Monitoring Well
SP1 Steam Injection Well
MW18 Destroyed Groundwater Monitoring Well
B14 ● Historical Soil Boring

PROJECT NO.
203723678

PLATE
7

LEC: 05/14/24



LEGEND:

- ● Laboratory Results and Well Symbols in Red Indicate Dissolved Hydrocarbon Concentrations Exceeding the MTCA Method A Cleanup Levels
- ● Laboratory Results and Well Symbols in Blue Indicate Dissolved Hydrocarbon Concentrations Less Than the MTCA Method A Cleanup Levels
- ● Numbers and Symbols in Magenta Indicate Measurable LNAPL Thickness
- ● Laboratory Results Not Available for Numbers and Symbols in Black or Gray

NOTES: Select Pumphouse 1 features and monitoring wells omitted. Refer to Generalized Site Plan (Expanded Area) (Plate 2) for details.

Well 91-BW2 is screened in the deeper basalt water-bearing zone.

SOURCE: Modified from a map provided by SECOR International Inc.

FN 2037236780002

Stantec

GROUNDWATER ELEVATION CONTOUR MAP - 10/15/19

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

EXPLANATION

MW26 ⊕	Groundwater Monitoring Well
1,078.72	Groundwater Elevation
NE	Not Established
SP1 ⊕	Steam Injection Well
MW18 ⊕	Destroyed Groundwater Monitoring Well
——	Groundwater Elevation Contour Line

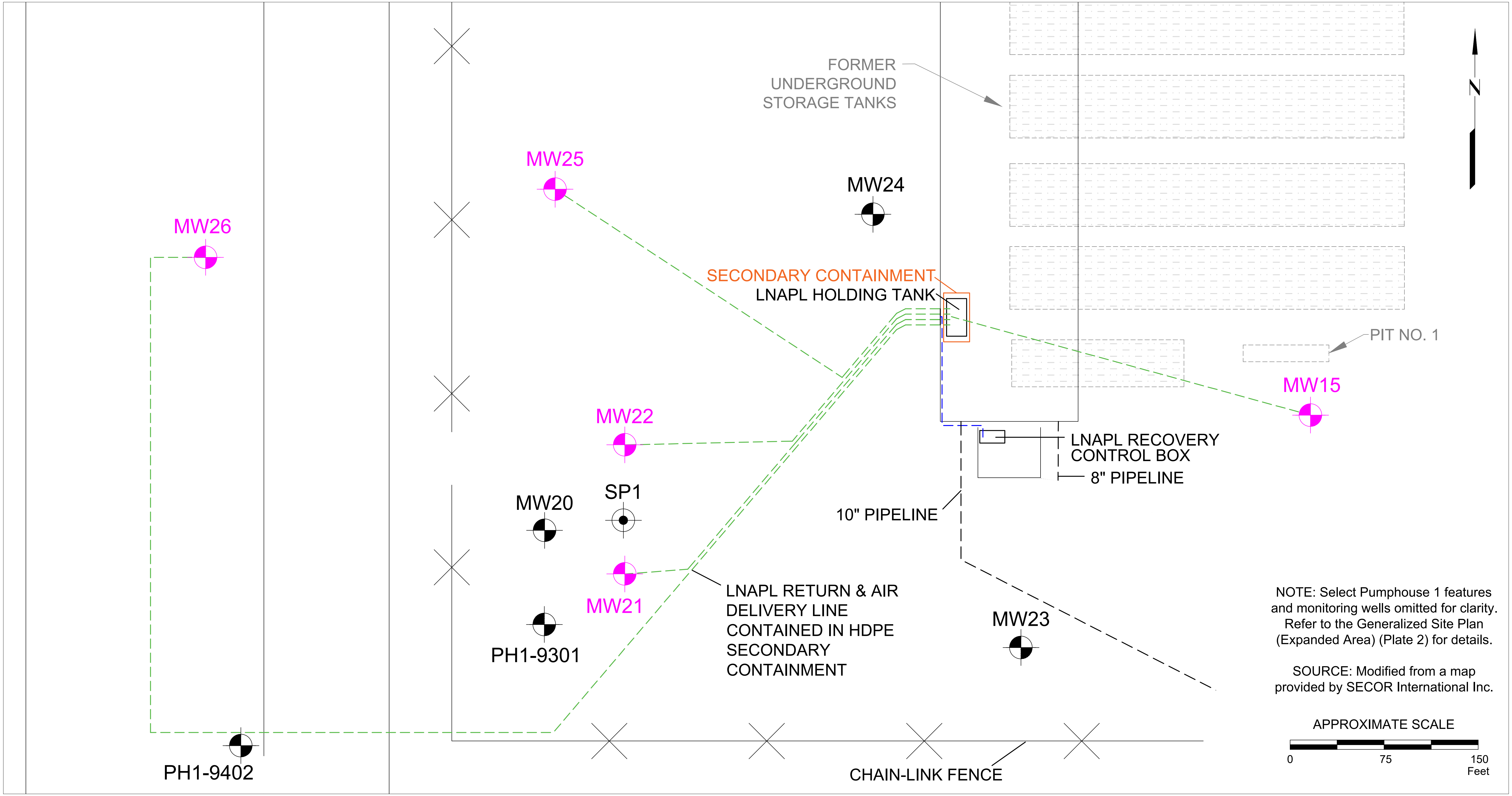
PROJECT NO.

203723678

PLATE

8

LEC: 05/14/24



NOTE: Select Pumphouse 1 features and monitoring wells omitted for clarity. Refer to the Generalized Site Plan (Expanded Area) (Plate 2) for details.

SOURCE: Modified from a map provided by SECOR International Inc.

FN 2037236780002

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REMEDIATION SYSTEM PIPING MAP

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

EXPLANATION

MW24 ⊕	Groundwater Monitoring Well
MW26 ⊕	Groundwater Monitoring Well Connected to Remediation System
SP1 ⊙	Steam Injection Well
LNAPL	Light Non-Aqueous Phase Liquid
- - - -	Remediation System Air Supply
- - - -	Remediation System Air Supply and LNAPL Return Piping

PROJECT NO.
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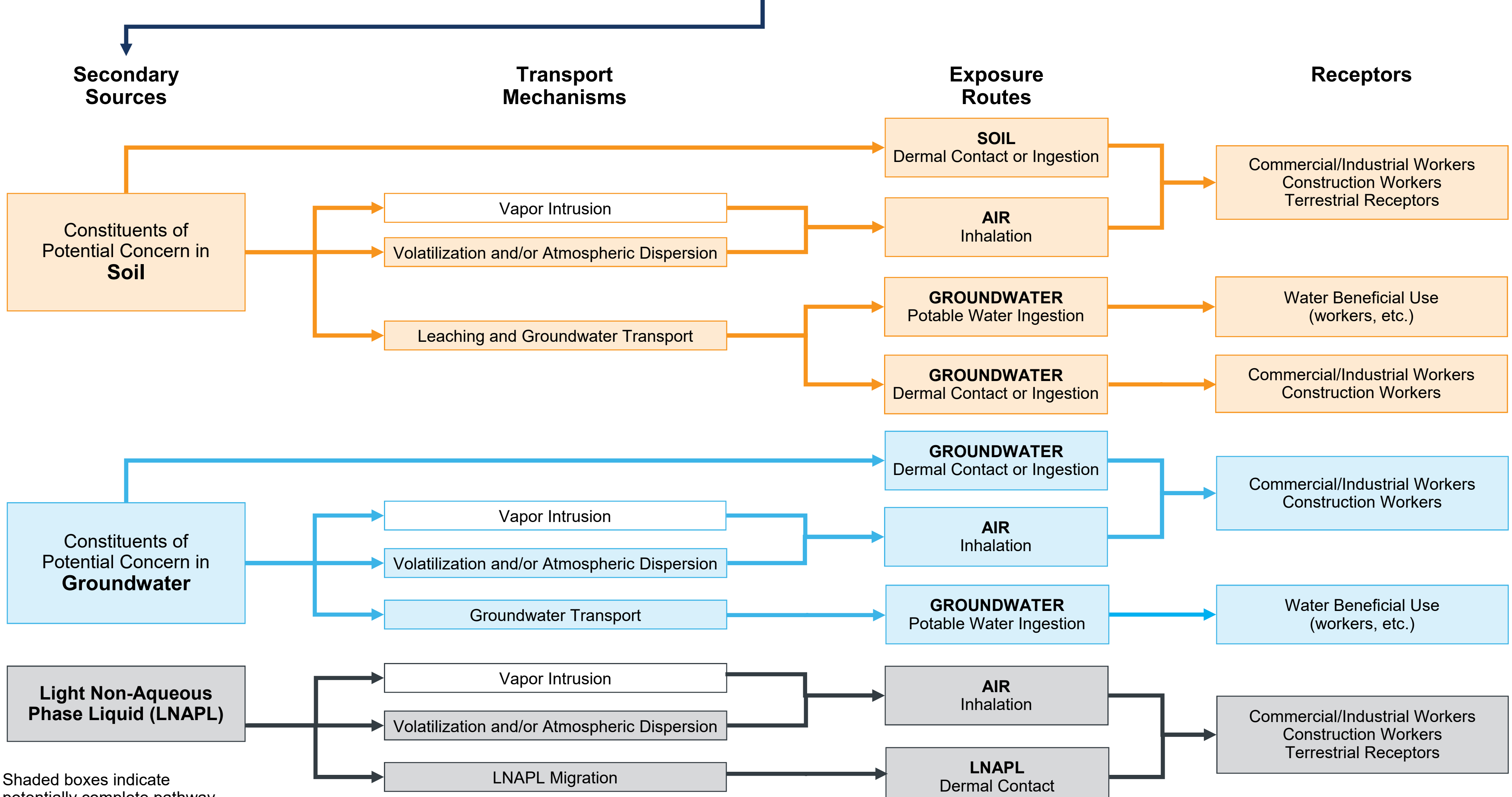
PLATE
9

LEC: 05/14/24

Primary Sources
Fuel Pumphouse Operations
Underground Storage Tanks
Product Piping

Primary Mechanism
Spills and Releases



Secondary Sources

Transport Mechanisms

Exposure Routes

Receptors

Constituents of Potential Concern in **Soil**

Vapor Intrusion
Volatilization and/or Atmospheric Dispersion
Leaching and Groundwater Transport

SOIL Dermal Contact or Ingestion
AIR Inhalation
GROUNDWATER Potable Water Ingestion
GROUNDWATER Dermal Contact or Ingestion

Commercial/Industrial Workers
Construction Workers
Terrestrial Receptors

Water Beneficial Use (workers, etc.)

Commercial/Industrial Workers
Construction Workers

Constituents of Potential Concern in **Groundwater**

Vapor Intrusion
Volatilization and/or Atmospheric Dispersion
Groundwater Transport

GROUNDWATER Dermal Contact or Ingestion
AIR Inhalation
GROUNDWATER Potable Water Ingestion

Commercial/Industrial Workers
Construction Workers

Water Beneficial Use (workers, etc.)

Light Non-Aqueous Phase Liquid (LNAPL)

Vapor Intrusion
Volatilization and/or Atmospheric Dispersion
LNAPL Migration

AIR Inhalation
LNAPL Dermal Contact

Commercial/Industrial Workers
Construction Workers
Terrestrial Receptors

Shaded boxes indicate
potentially complete pathway

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CONCEPTUAL SITE MODEL

MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

PROJECT NO.
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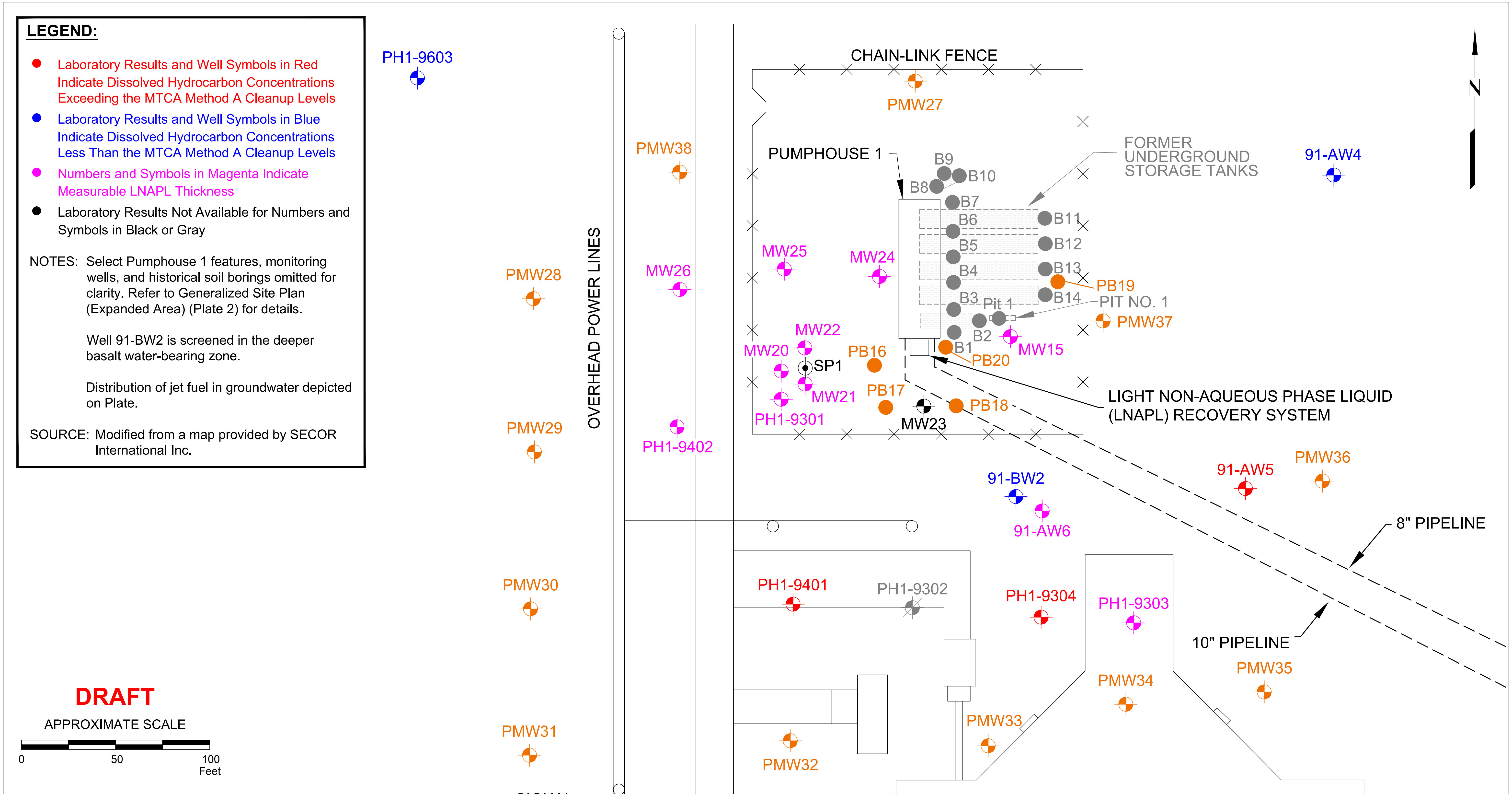
PLATE
10



LEGEND:

- ● Laboratory Results and Well Symbols in Red Indicate Dissolved Hydrocarbon Concentrations Exceeding the MTCA Method A Cleanup Levels
- ● Laboratory Results and Well Symbols in Blue Indicate Dissolved Hydrocarbon Concentrations Less Than the MTCA Method A Cleanup Levels
- ● Numbers and Symbols in Magenta Indicate Measurable LNAPL Thickness
- ● Laboratory Results Not Available for Numbers and Symbols in Black or Gray

NOTES: Select Pumphouse 1 features, monitoring wells, and historical soil borings omitted for clarity. Refer to Generalized Site Plan (Expanded Area) (Plate 2) for details.

Well 91-BW2 is screened in the deeper basalt water-bearing zone.

Distribution of jet fuel in groundwater depicted on Plate.

SOURCE: Modified from a map provided by SECOR International Inc.

FN 2037236780002

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PROPOSED SITE CHARACTERIZATION MAP

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

EXPLANATION

MW26	Groundwater Monitoring Well	PMW38	Proposed Groundwater Monitoring Well
SP1	Steam Injection Well	PB20	Proposed Soil Boring
PH1-9403	Destroyed Groundwater Monitoring Well		
B14	Historical Soil Boring		

PROJECT NO.

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PLATE

11

LEC: 05/14/24

TABLE 1
GRAIN SIZE ANALYSIS SUMMARY
Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 1

Sample Name	Sample Date	Depth (feet bgs)	Grain Size Distribution				USCS Classification	
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Group Symbol	Group Name
PH1-9601-82'	08/08/96	82	2.9	41.8	32.3	23.1	ML	Sandy SILT
PH1-9602-85'	08/08/96	85	0.0	31.3	54.4	14.4	ML	Sandy SILT

Notes:

feet bgs	=	Feet below ground surface
%	=	Percent
PH1-9601-82'	=	Well PH1-9601, sample collected at 82 feet below ground surface
Grain Size Distribution	=	Grain size distribution analyzed using ASTM Method D422
Gravel	=	Percent gravel in mechanical analysis sieves: #4
Sand	=	Percent sand in mechanical analysis sieves: #10, #20, #40, #60, #140
Silt	=	Percent silt in mechanical analysis sieve #200, #230, and in hydrometer analysis: phi 4 and phi 5 (0.0625-0.0156 mm)
Clay	=	Percent clay in hydrometer analysis: phi 6 through phi 10 (0.0156-0.0009 mm)
ASTM Classification	=	American Society for Testing and Materials classification using ASTM Method D2488
USCS	=	Unified Soil Classification System

TABLE 2
CUMULATIVE SOIL ANALYTICAL RESULTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 5

Sample ID	Well ID	Sample Date	Sample Depth (ft bgs)	TPH as Jet A (mg/kg)	TPHg (mg/kg)	TPHd (mg/kg)	TPHo (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	Total Lead (mg/kg)
Science & Engineering Analysis Corporation (SEACOR) - Site Assessment Report for 23 Underground Storage Tanks at Grant County Municipal Airport - November 12, 1992:												
Pit 1 13'	NA	09/26/92	13	**2,000 (d)**	--	--	--	--	--	--	--	--
PH1-B1-3	NA	09/26/92	13.5 - 15	**4,600**	--	--	--	--	--	--	--	--
PH1-B1-6	NA	09/26/92	28.5 - 30	**1,600**	--	--	--	--	--	--	--	--
PH1-B2-4	NA	09/26/92	18.5 - 20	**5,800**	--	--	--	--	--	--	--	--
PH1-B2-5	NA	09/26/92	23.5 - 25	**4,700**	--	--	--	--	--	--	--	--
PH1-B3-3	NA	09/26/92	12 - 13.5	**4,800**	--	--	--	--	--	--	--	--
PH1-B4-2	NA	09/27/92	8.5 - 10	**6,900**	--	--	--	--	--	--	--	--
PH1-B4-3	NA	09/27/92	11 - 12	<5.0	--	--	--	--	--	--	--	--
PH1-B5-2	NA	09/27/92	8.5 - 10	**4,100**	--	--	--	--	--	--	--	--
PH1-B5-3	NA	09/27/92	11 - 12	**1,100**	--	--	--	--	--	--	--	--
PH1-B6-2	NA	09/27/92	8.5 - 10	**3,900**	--	--	--	--	--	--	--	--
PH1-B6-3	NA	09/27/92	11 - 12	**3,400**	--	--	--	--	--	--	--	--
PH1-B7-3	NA	09/27/92	13.5 - 15	41	--	--	--	--	--	--	--	--
PH1-B8-2	NA	09/27/92	9.5 - 11	<5.0	--	--	--	--	--	--	--	--
PH1-B9-2	NA	09/27/92	9.5 - 11	<5.0	--	--	--	--	--	--	--	--
PH1-B10-2	NA	09/27/92	9.5 - 11	<5.0	--	--	--	--	--	--	--	--
PH1-B11-3	NA	09/27/92	13.5 - 15	<5.0	--	--	--	--	--	--	--	--
PH1-B12-3	NA	09/27/92	13.5 - 15	<42	--	--	--	--	--	--	--	--
PH1-B13-4	NA	09/27/92	18.5 - 20	**4,200**	--	--	--	--	--	--	--	--
PH1-B13-5	NA	09/27/92	23.5 - 25	**8,100**	--	--	--	--	--	--	--	--
PH1-B14-3	NA	09/27/92	13.5 - 15	**8,600**	--	--	--	--	--	--	--	--
PH1-B14-4	NA	09/27/92	18.5 - 20	**7,500**	--	--	--	--	--	--	--	--
Anatek Labs (Anatek) - Results of Analysis for Samples Received April 15, 1994 | Sample Log-in Number: 1731 - April 24,1994:												
PH1-9302B-86BGS	PH1-9401	04/13/94	86	<25	--	--	--	--	--	--	--	--
PH1-9302B-95BGS	PH1-9401	04/13/94	95	<25	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels - Unrestricted				2,000 (a)	30/100 (b)	2,000	2,000	0.03	7	6	9	250
MTCA Method A Cleanup Levels - Industrial				2,000 (a)	30/100 (b)	2,000	2,000	0.03	7	6	9	1,000
MTCA Method B Cleanup Levels - Noncancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	320	6,400	8,000	16,000	NE
MTCA Method B Cleanup Levels - Cancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	18	NE	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	14,000	280,000	350,000	700,000	NE
MTCA Method C Cleanup Levels - Cancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	2,400	NE	NE	NE	NE

TABLE 2
CUMULATIVE SOIL ANALYTICAL RESULTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 2 of 5

Sample ID	Well ID	Sample Date	Sample Depth (ft bgs)	TPH as Jet A (mg/kg)	TPHg (mg/kg)	TPHd (mg/kg)	TPHo (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	Total Lead (mg/kg)
Anatek Labs (Anatek) - Results of Analysis for Samples Received April 19, 1994 | Sample Log-in Number: 1743 - April 25,1994:												
PH1-9402-90BGS	PH1-9402	04/16/94	90	497	--	--	--	--	--	--	--	--
PH1-9402-95BGS	PH1-9402	04/16/94	95	<25	--	--	--	--	--	--	--	--
SECOR International, Inc. (SECOR) - Site Assessment Focused Feasibility Study and Fate and Transport Modeling Report - August 18, 1997:												
PH1-9601-82'	PH1-9601	08/08/96	82	<10.0	--	--	--	--	--	--	--	--
PH1-9602-85'	PH1-9602	08/07/96	85	<10.0	--	--	--	--	--	--	--	--
PH1-9603-87'	PH1-9603	08/06/96	87	<10.0	--	--	--	--	--	--	--	--
Environmental Resolutions, Inc. (ERI) - Monitoring Well Installation and Groundwater Monitoring Report - July 3, 2008:												
S-6-B1	MW13	04/28/08	6	--	<5.92	<3.94	18.0 (A-01a)	<0.0296	<0.0592	<0.0592	<0.178	3.21
S-94-B1	MW13	04/29/08	94	--	<6.61	<4.09	15.5 (A-01a)	<0.0330	<0.0661	<0.0661	<0.198	--
S-101-B1	MW13	04/29/08	101	--	<5.67	<4.07	10.4 (A-01a)	<0.0284	<0.0567	<0.0567	<0.170	--
S-110-B1	MW13	04/29/08	110	--	<4.77	<4.38	<4.38	<0.0239	<0.0477	<0.0477	<0.143	--
S-10-B2	MW14	05/01/08	10	--	<5.39	<3.99	<3.99	<0.0269	<0.0539	<0.0539	<0.162	2.54
S-100-B2	MW14	05/01/08	100	--	<6.81	4.84 (A-01a)	5.60 (A-01a)	<0.0340	<0.0681	<0.0681	<0.204	--
S-108-B2	MW14	05/01/08	108	--	<4.06	<4.41	<4.41	<0.0203	<0.0406	<0.0406	<0.122	--
S-10-B3	MW15	05/02/08	10	--	<5.04	34.1 (A-01)	35.5 (A-01)	<0.0252	<0.0504	<0.0504	<0.151	4.57
S-20-B3 (e)	MW15	05/02/08	20	--	<5.64	--	--	<0.0282	<0.0564	<0.0564	<0.169	--
S-30-B3	MW15	05/02/08	30	--	<5.28	<3.95	6.25 (A-01a)	<0.0264	<0.0528	<0.0528	<0.158	--
S-40-B3	MW15	05/02/08	40	--	<7.27	<5.30	11.7 (A-01a)	<0.0363	<0.0727	<0.0727	<0.218	--
S-55-B3	MW15	05/02/08	55	--	<6.54	<4.33	7.39 (A-01a)	<0.0327	<0.0654	<0.0654	<0.196	--
S-70-B3	MW15	05/02/08	70	--	<5.13	<4.05	5.25 (A-01a)	<0.0256	<0.0513	<0.0513	<0.154	--
S-81-B3	MW15	05/02/08	81	--	**132**	34.4 (A-01b)	<4.06	<0.0325	<0.0651	<0.0651	<0.195	1.88
S-96-B3	MW15	05/02/08	96	--	<5.93	6.96 (A-01b)	6.75 (A-01a)	<0.0297	<0.0593	<0.0593	<0.178	--
S-106-B3	MW15	05/02/08	106	--	<5.61	<4.27	9.60 (A-01a)	<0.0281	<0.0561	<0.0561	<0.168	--
S-6-B4	MW16	05/06/08	6	--	<4.83	5.43 (A-01)	17.5 (A-01b)	<0.0241	<0.0483	<0.0483	<0.145	3.20
MTCA Method A Cleanup Levels - Unrestricted				2,000 (a)	30/100 (b)	2,000	2,000	0.03	7	6	9	250
MTCA Method A Cleanup Levels - Industrial				2,000 (a)	30/100 (b)	2,000	2,000	0.03	7	6	9	1,000
MTCA Method B Cleanup Levels - Noncancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	320	6,400	8,000	16,000	NE
MTCA Method B Cleanup Levels - Cancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	18	NE	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	14,000	280,000	350,000	700,000	NE
MTCA Method C Cleanup Levels - Cancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	2,400	NE	NE	NE	NE

TABLE 2
CUMULATIVE SOIL ANALYTICAL RESULTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 3 of 5

Sample ID	Well ID	Sample Date	Sample Depth (ft bgs)	TPH as Jet A (mg/kg)	TPHg (mg/kg)	TPHd (mg/kg)	TPHo (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	Total Lead (mg/kg)
Environmental Resolutions, Inc. (ERI) - Monitoring Well Installation and Groundwater Monitoring Report - July 3, 2008 (continued):												
S-131-B4	MW16	05/06/08	131	--	<5.22	<4.91	12.3 (A-01b)	<0.0261	<0.0522	<0.0522	<0.157	--
S-7-B5	MW17	05/07/08	7	--	<4.71	7.51 (A-01a)	20.6 (A-01b)	<0.0235	<0.0471	<0.0471	<0.141	3.02
S-116-B5	MW17	05/07/08	116	--	<6.87	<4.82	11.5 (A-01b)	<0.0344	<0.0687	<0.0687	<0.206	--
S-130-B5	MW17	05/07/08	130	--	<7.00	<5.82	13.4 (A-01b)	<0.0350	<0.0700	<0.0700	<0.210	--
S-6-B6	MW18	05/08/08	6	--	<4.53	74.2 (A-01)	429 (A-01b)	<0.0226	<0.0453	<0.0453	<0.136	3.88
S-125-B6	MW18	05/09/08	125	--	<5.80	5.63 (A-01a)	22.7 (A-01b)	<0.0290	<0.0580	<0.0580	<0.174	--
S-142-B6	MW18	05/09/08	142	--	<5.45	11.4 (A-01a)	28.5 (A-01b)	<0.0272	<0.0545	<0.0545	<0.163	--
Cardno ERI - Well Installation, Destruction, and Groundwater Monitoring Report - July 13, 2011:												
S-80-B7	SP1	04/28/11	80	--	<7.07	7.11 (QP5)	16.1 (QP6)	<0.0316	<0.126	<0.126	<0.316	--
B-90-B7	SP1	04/28/11	90	--	**184**	437 (QP7)	19.4 (QP6)	<0.0246	<0.0983	<0.0983	<0.246	--
S-110-B7	SP1	04/28/11	110	--	10.4	17.1 (QP7)	7.44 (QP5)	<0.0197	<0.0788	<0.0788	<0.197	--
S-7.5-B8	MW19	04/19/11	7.5	--	<4.52	19.9 (QP) (QP6)	68.8 (QP) (QP7a)	<0.00203	<0.00203	<0.00203	<0.00508	4.18
S-40-B8	MW19	04/19/11	40	--	<7.34	<4.01	<4.01	<0.00173	<0.00173	<0.00173	<0.00433	--
S-75-B8	MW19	04/19/11	75	--	<6.02	6.46 (QP)	9.31 (QP5)	<0.00273	<0.00273	<0.00273	<0.00682	--
S-85-B8	MW19	04/19/11	85	--	<6.41	<4.95	5.86 (QP5)	<0.00227	<0.00227	<0.00227	<0.00568	--
S-90-B8	MW19	04/19/11	90	--	<5.87	<5.01	5.62 (QP5)	<0.00255	<0.00255	<0.00255	<0.00639	--
S-120-B8	MW19	04/19/11	120	--	<5.29	<4.31	7.30 (QP5)	<0.00198	<0.00198	<0.00198	<0.00496	--
S-85-B9	MW20	04/26/11	85	--	**296**	638 (QP7)	6.69 (QP5)	<0.0403	<0.161	<0.161	<0.403	--
S-90-B9	MW20	04/26/11	90	--	**523**	196 (QP7)	<5.07	<0.0412	<0.165	<0.165	<0.412	--
S-95-B9	MW20	04/26/11	95	--	37.6	74.8 (QP7)	18.4 (QP6)	<0.0229	<0.0918	<0.0918	<0.229	--
S-50-B10	MW21	04/22/11	50	--	<6.20	7.2 (QP5)	12.5 (QP)	<0.00258	<0.00258	<0.00258	<0.00645	--
S-85-B10	MW21	04/22/11	85	--	37.5	56.1 (QP7)	15.3 (QP5)	<0.00277	<0.00277	<0.00277	0.00697	--
S-90-B10	MW21	04/22/11	90	--	**114**	376 (QP7)	4.74 (QP5)	<0.00238	<0.00238	<0.00238	<0.00594	--
S-95-B10	MW21	04/22/11	95	--	**105**	384 (QP7)	14.5 (QP6)	<0.00236	<0.00236	<0.00236	<0.00590	--
S-100-B10	MW21	04/22/11	100	--	53.2	138 (QP7)	16.3 (QP6)	<0.00215	<0.00215	<0.00215	<0.00537	--
MTCA Method A Cleanup Levels - Unrestricted				2,000 (a)	30/100 (b)	2,000	2,000	0.03	7	6	9	250
MTCA Method A Cleanup Levels - Industrial				2,000 (a)	30/100 (b)	2,000	2,000	0.03	7	6	9	1,000
MTCA Method B Cleanup Levels - Noncancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	320	6,400	8,000	16,000	NE
MTCA Method B Cleanup Levels - Cancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	18	NE	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	14,000	280,000	350,000	700,000	NE
MTCA Method C Cleanup Levels - Cancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	2,400	NE	NE	NE	NE

TABLE 2
CUMULATIVE SOIL ANALYTICAL RESULTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 4 of 5

Sample ID	Well ID	Sample Date	Sample Depth (ft bgs)	TPH as Jet A (mg/kg)	TPHg (mg/kg)	TPHd (mg/kg)	TPHo (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	Total Lead (mg/kg)
Cardno ERI - Well Installation, Destruction, and Groundwater Monitoring Report - July 13, 2011:												
S-105-B10	MW21	04/22/11	105	--	22.3	76.4 (QP7)	20.9 (QP6)	<0.00191	<0.00191	<0.00191	<0.00477	--
S-85-B11	MW22	04/29/11	85	--	**121**	270 (QP7)	10.3 (QP)	<0.0359	<0.144	<0.144	<0.359	--
S-90-B11	MW22	04/29/11	90	--	**500**	850 (QP7)	5.75 (QP5)	<0.0320	<0.128	<0.128	<0.320	--
S-110-B11	MW22	04/29/11	110	--	14.1	38.6 (QP7)	13.6 (QP6)	<0.0359	<0.143	<0.143	<0.359	--
Cardno ERI - Well Install Report - August 21, 2012:												
S-80-B12	MW23	05/03/12	80	--	**192**	58.1 (QP7)	<4.06	<0.0191	<0.0382	<0.0382	<0.115	--
S-90-B12	MW23	05/03/12	90	--	2.91	9.00 (QP7)	<5.00	0.000536	<0.000912	<0.000912	<0.00274	--
S-100-B12	MW23	05/03/12	100	--	**219**	47.2 (QP7)	<5.69	<0.0299	<0.0597	<0.0597	<0.179	--
S-77-B13	MW24	05/07/12	77	--	**189**	905	7.01 (QP5)	<0.0338	<0.0676	<0.0676	<0.203	--
S-90-B13	MW24	05/07/12	90	--	**412**	805 (QP7)	<5.25	<0.0276	<0.0552	0.179	0.416	--
S-100-B13	MW24	05/07/12	100	--	15.0	154 (QP7)	68.3 (QP6)	<0.0217	<0.0435	<0.0435	<0.130	--
S-80-B14	MW25	05/08/12	80	--	<4.63	<4.11	<4.11	<0.0231	<0.0463	<0.0463	<0.139	--
S-90-B14	MW25	05/08/12	90	--	87.8	528 (QP7)	7.70 (QP5)	<0.0235	<0.0470	<0.0470	<0.141	--
S-100-B14	MW25	05/08/12	100	--	10.8	7.98	<4.73	<0.0253	<0.0505	<0.0505	<0.152	--
S-80-B15	MW26	05/11/12	80	--	<6.47	<4.71	<4.71	<0.0323	<0.0647	<0.0647	<0.194	--
S-90-B15	MW26	05/11/12	90	--	**664**	1,060 (QP7)	51.8 (QP7a)	<0.0288	<0.0576	0.123	0.549	--
S-100-B15	MW26	05/11/12	100	--	29.7	55.8 (QP7)	19.9 (QP6)	<0.0228	<0.0457	<0.0457	<0.137	--
MTCA Method A Cleanup Levels - Unrestricted				2,000 (a)	30/100 (b)	2,000	2,000	0.03	7	6	9	250
MTCA Method A Cleanup Levels - Industrial				2,000 (a)	30/100 (b)	2,000	2,000	0.03	7	6	9	1,000
MTCA Method B Cleanup Levels - Noncancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	320	6,400	8,000	16,000	NE
MTCA Method B Cleanup Levels - Cancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	18	NE	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	14,000	280,000	350,000	700,000	NE
MTCA Method C Cleanup Levels - Cancer				2,000 (a)	1,500 (c)	2,000 (c)	2,000 (c)	2,400	NE	NE	NE	NE

TABLE 2
CUMULATIVE SOIL ANALYTICAL RESULTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 5 of 5

<u>EXPLANATION</u>:

mg/kg = milligram per kilogram

ft bgs = feet below ground surface

TPH as Jet A = Total Petroleum Hydrocarbons in the Jet A Fuel Range (C9-C15) in accordance with EPA Method 8015

TPHg = Total Petroleum Hydrocarbons as Gasoline in accordance with Ecology Method NWTPH-Gx

TPHd, TPHo = Total Petroleum Hydrocarbons as Diesel and as Oil, respectively, in accordance with Ecology Method NWTPH-Dx

B = Benzene; T = Toluene; E = Ethylbenzene; X = Total Xylenes

BTEX = Aromatic compounds in accordance with EPA Method 8260B

Total Lead in accordance with EPA Method 6010B

Shaded values equal or exceed MTCA Method A Cleanup Levels

NA = Not applicable

NE = Not established

-- = Not analyzed

< = Less than the stated laboratory reporting limit

<u>FOOTNOTES</u>:

(a) = No established MTCA Method A Cleanup Level for TPH as Jet A. The MTCA Method A Cleanup Level was selected for screening per Ecology's *Guidance for Remediation Petroleum Contaminated Sites* , revised June 2016

(b) = TPHg soil cleanup level is 30 mg/kg, unless benzene is not detected in the sample, or if toluene, ethylbenzene, and total xylenes constitute less than 1% of the TPHg present in the sample. If these conditions are met, the cleanup level for TPHg may be elevated to 100 mg/kg.

(c) = The generic TPH cleanup level of 1,500 mg/kg was selected due to the presence of TPHg. Based on guidance from Ecology's *Model Remedies for Sites with Petroleum Impacts to Groundwater* , revised December 2017, the MTCA Method A Cleanup Level of 2,000 mg/kg for diesel range organics/heavy oils is still applicable.

(d) = Sample Pit 1 13' documented as not preserved with ice for 48 hours on the chain of custody

(e) = Sample S-20-B3 results are reported on a wet weight basis

(QP) = Hydrocarbon result partly due to individual peak(s) in quantitation range

(QP5) = There was insufficient contamination present to perform a pattern match

(QP6) = The contamination did not match any standards in our library

(QP7) = The hydrocarbon pattern most closely resembles a light petroleum product

(QP7a) = The hydrocarbon pattern most closely resembles a motor oil product

(A-01) = Contamination elutes between C10 and C18 and does not match any standards in our reference library

(A-01a) = Contamination elutes between C10 and C18. There is insufficient contamination present to perform a pattern match.

(A-01b) = Contamination elutes between C18 and C40 and does not match any standards in our reference library

TABLE 3
WELL CONSTRUCTION DETAILS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 2

Well ID	Date of Installation	Date of Destruction	Wellhead Elevation (feet)	Screened Interval (feet bgs)	Filter Pack	Total Well Depth	Casing/Borehole Diameter (inches)	Slot Size (inches)
91-AW4	September 9, 1991	N/A	1,169.47	79-99	20/40 Colorado Silica Sand	99	2/9	0.015
91-AW5	September 10, 1991	N/A	1,170.25	79-99	20/40 Colorado Silica Sand	99	2/9	0.015
91-AW6	September 10, 1991	N/A	1,170.38	78-98	20/40 Silica Sand	98	2/9	0.015
91-BW2	August 26, 1991	N/A	NE	137-147	10/20 Colorado Silica Sand	147	2/9	0.020
PH1-9301	October 25, 1993	N/A	1,167.07	79.5-99.5	10/20 Silica Sand	99.5	2/6	0.020
PH1-9302	--	April 22, 1994	1,163.16	--	--	--	--/--	--
PH1-9303	--	N/A	1,163.62	--	--	99	--/--	0.020
PH1-9304	--	N/A	1,166.44	--	--	99	--/--	0.020
PH1-9401	--	N/A	1,163.77	--	--	95	--/--	0.020
PH1-9402	April 16, 1994	N/A	1,167.09	75.5-95.5	8/12 Colorado Silica Sand	95.5	2/6	0.020
PH1-9601	August 8, 1996	N/A	1,165.44	75-95	8/12 Colorado Silica Sand	95	2/6	0.020
PH1-9602	August 7, 1996	N/A	1,167.66	77-97	8/12 Colorado Silica Sand	97	2/6	0.020
PH1-9603	August 6, 1996	N/A	1,170.29	80-100	8/12 Colorado Silica Sand	100	2/6	0.020
MW13	April 30, 2008	May 4, 2011	1,160.84	87.5-107.5	2/12 Silica Sand	110	2/6.25	0.010
MW14	May 1, 2008	May 4, 2011	NE	90-110	2/12 Silica Sand	110	2/6.25	0.010
MW15	May 2, 2008	N/A	1,164.08	88.5-108.5	2/12 Silica Sand	111	2/6.25	0.010
MW16	May 6, 2008	April 21, 2011	1,174.95	90-130	2/12 Silica Sand	131	2/6.25	0.010
MW17	May 7, 2008	April 21, 2011	1,181.31	100-130	2/12 Silica Sand	130	2/6.25	0.010
MW18	May 9, 2008	April 25, 2011	1,186.10	110-150	2/12 Silica Sand	151	2/6.25	0.010
MW19	April 20, 2011	N/A	NE	70-100	2/12 Silica Sand	100	4/10	0.020
MW20	April 26, 2011	N/A	NE	80-100	2/12 Silica Sand	100	4/10	0.020

TABLE 3

WELL CONSTRUCTION DETAILS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 2 of 2

Well ID	Date of Installation	Date of Destruction	Wellhead Elevation (feet)	Screened Interval (feet bgs)	Filter Pack	Total Well Depth	Casing/Borehole Diameter (inches)	Slot Size (inches)
MW21	April 27, 2011	N/A	NE	80-100	2/12 Silica Sand	100	4/10	0.020
MW22	April 29, 2011	N/A	NE	80-100	2/12 Silica Sand	105	4/10	0.020
MW23	May 3, 2012	N/A	NE	70-100	2/12 Silica Sand	101	4/10	0.010
MW24	May 7, 2012	N/A	NE	80-100	2/12 Silica Sand	102.5	4/10	0.020
MW25	May 9, 2012	N/A	NE	80-100	2/12 Silica Sand	101	4/10	0.020
MW26	May 11, 2012	N/A	NE	80-100	2/12 Silica Sand	101	4/10	0.020
SP1	April 28, 2011	N/A	NE	90-95/105-108 (a)	20/40 Silica Sand	108	2/7	0.030/0.020 (a)

EXPLANATION:

feet bgs = Feet below ground surface
-- = Not available
N/A = Not applicable
NE = Not established
(a) = SP1 is screened from 90 to 95 feet with 0.030-inch slot size, and from 105 to 108 feet with a 0.020-inch slot size sparge point

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 31

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
	Screen Interval 79-99 feet bgs / Total Well Depth 99 feet bgs												
91-AW4	01/13/92 g	1,168.61	91.66	0.00	1,076.95	--	--	ND	--	--	--	--	--
91-AW4	07/13/92	1,168.61	91.46	0.00	1,077.15	--	--	--	--	--	--	--	--
91-AW4	07/14/92	1,168.61	91.53	0.00	1,077.08	--	--	ND	--	ND	ND	ND	ND
91-AW4	01/28/93	1,168.61	91.70	0.00	1,076.91	--	<50	--	--	--	--	--	--
91-AW4	12/02/93	1,167.47	91.82	0.00	1,075.65	--	--	--	--	--	--	--	--
91-AW4	01/09/94	1,167.47	91.76	0.00	1,075.71	--	--	--	--	--	--	--	--
91-AW4	02/25/94	1,167.47	91.77	0.00	1,075.70	--	--	--	--	--	--	--	--
91-AW4	03/21/94	1,167.47	91.65	0.00	1,075.82	--	--	--	--	--	--	--	--
91-AW4	04/01/94	1,167.47	91.71	0.00	1,075.76	--	--	--	--	--	--	--	--
91-AW4	04/22/94	1,167.47	91.62	0.00	1,075.85	--	--	--	--	--	--	--	--
91-AW4	04/29/94	1,167.47	91.62	0.00	1,075.85	--	--	--	--	--	--	--	--
91-AW4	05/04/94	1,167.47	91.71	0.00	1,075.76	--	--	--	--	--	--	--	--
91-AW4	06/27/94	1,167.47	89.62	0.00	1,077.85	--	--	--	--	--	--	--	--
91-AW4	07/05/94	1,167.47	89.71	0.00	1,077.76	--	--	--	--	--	--	--	--
91-AW4	08/15/96	1,168.59	88.15	0.00	1,080.44	--	--	--	<250	<0.500	<0.500	<0.500	<1.00
91-AW4	11/22/96	1,168.59	88.29	0.00	1,080.30	--	--	--	--	--	--	--	--
91-AW4	05/25/04	1,169.47	91.69	0.00	1,077.78	--	--	--	--	--	--	--	--
91-AW4	09/09/04	1,169.47	91.80	0.00	1,077.67	--	150	--	--	--	--	--	--
91-AW4	11/11/04	1,169.47	91.91	0.00	1,077.56	--	<100/<100 (b)	--	--	--	--	--	--
91-AW4	03/22/05	1,169.47	91.88	0.00	1,077.59	--	ND	--	--	--	--	--	--
91-AW4	06/02/05	1,169.47	91.99	0.00	1,077.48	--	ND	--	--	--	--	--	--
91-AW4	09/27/05	1,169.47	92.11	0.00	1,077.36	--	132	<100	--	--	--	--	--
91-AW4	12/02/05	1,169.47	91.94	0.00	1,077.53	--	<100	<100	--	--	--	--	--
91-AW4	03/28/06	1,169.47	90.81	0.00	1,078.66	--	<100 (QSG)	--	--	--	--	--	--
91-AW4	06/06/06	1,169.47	90.49	0.00	1,078.98	--	<93.9 (QSG)	<93.9 (QSG)	--	--	--	--	--
91-AW4	10/19/07	1,169.47	90.34	0.00	1,079.13	<250	136	<118	--	<1.00	<1.00	<1.00	<3.00
91-AW4	05/12/08	1,169.47	90.70	0.00	1,078.77	--	--	--	--	--	--	--	--
91-AW4	05/14/08	1,169.47	90.66	0.00	1,078.81	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
91-AW4	12/30/08	1,169.47	91.76	0.00	1,077.71	--	--	--	--	--	--	--	--
91-AW4	12/31/08	1,169.47	91.74	0.00	1,077.73	<100	<100	<100	--	<1.00	<1.00	<1.00	<3.00
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
91-AW4	06/22/09	1,169.47	90.94	0.00	1,078.53	--	--	--	--	--	--	--	--
91-AW4	06/23/09	1,169.47	91.03	0.00	1,078.44	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
91-AW4	11/04/09	1,169.47	90.56	0.00	1,078.91	--	--	--	--	--	--	--	--
91-AW4	11/05/09	1,169.47	90.67	0.00	1,078.80	<100	<99.0	<99.0	--	<1.00	<1.00	<1.00	<3.00
91-AW4	05/19/10	1,169.47	91.79	0.00	1,077.68	--	--	--	--	--	--	--	--
91-AW4	05/20/10	1,169.47	92.83	0.00	1,076.64	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
91-AW4	11/08/10	1,169.47	90.27	0.00	1,079.20	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
91-AW4	05/17/11	1,169.47	90.76	0.00	1,078.71	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
91-AW4	12/14/11	1,169.47	90.63	0.00	1,078.84	--	--	--	--	--	--	--	--
91-AW4	12/15/11	1,169.47	90.79	0.00	1,078.68	<100	<99.0	<248	--	<1.00	<1.00	<1.00	<3.00
91-AW4	10/15/19	1,169.47	89.49	0.00	1,079.98	--	--	--	--	--	--	--	--
	Screen Interval 79-99 feet bgs / Total Well Depth 99 feet bgs												
91-AW5	01/13/92 g	1,169.31	92.75	0.00	1,076.56	--	--	ND	--	--	--	--	--
91-AW5	07/13/92	1,169.31	92.55	0.00	1,076.76	--	--	--	--	--	--	--	--
91-AW5	07/14/92	1,169.31	92.61	0.00	1,076.70	--	--	ND	--	ND	ND	ND	ND
91-AW5	01/28/93	1,169.31	92.76	0.00	1,076.55	--	<50	--	--	--	--	--	--
91-AW5	12/02/93	1,170.25	92.94	0.00	1,077.31	--	--	--	--	--	--	--	--
91-AW5	01/09/94	1,170.25	92.88	0.00	1,077.37	--	--	--	--	--	--	--	--
91-AW5	02/25/94	1,170.25	92.89	0.00	1,077.36	--	--	--	--	--	--	--	--
91-AW5	03/21/94	1,170.25	92.74	0.00	1,077.51	--	--	--	--	--	--	--	--
91-AW5	04/01/94	1,170.25	92.88	0.00	1,077.37	--	--	--	--	--	--	--	--
91-AW5	04/22/94	1,170.25	92.79	0.00	1,077.46	--	--	--	--	--	--	--	--
91-AW5	04/29/94	1,170.25	92.76	0.00	1,077.49	--	--	--	--	--	--	--	--
91-AW5	05/04/94	1,170.25	92.78	0.00	1,077.47	--	--	--	--	--	--	--	--
91-AW5	06/27/94	1,170.25	92.79	0.00	1,077.46	--	--	--	--	--	--	--	--
91-AW5	07/05/94	1,170.25	92.72	0.00	1,077.53	--	--	--	--	--	--	--	--
91-AW5	08/15/96	1,169.33	89.14	0.00	1,080.19	--	--	--	<250	<0.500	<0.500	<0.500	<1.00
91-AW5	11/22/96	1,169.33	88.83	0.00	1,080.50	--	--	--	--	--	--	--	--
91-AW5	05/12/08	1,170.25	91.85	0.00	1,078.40	--	--	--	--	--	--	--	--
91-AW5	05/14/08	1,170.25	91.81	0.00	1,078.44	<100	<94.3	106	--	<1.00	<1.00	<1.00	<3.00
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
91-AW5	12/30/08	1,170.25	92.84	0.00	1,077.41	--	--	--	--	--	--	--	--
91-AW5	12/31/08	1,170.25	92.83	0.00	1,077.42	<100	<94.3	95.0	--	<1.00	<1.00	<1.00	<3.00
91-AW5	06/22/09	1,170.25	92.92	0.00	1,077.33	--	--	--	--	--	--	--	--
91-AW5	06/23/09	1,170.25	92.99	0.00	1,077.26	<100	<125	<125	--	<1.00	<1.00	<1.00	<3.00
91-AW5	11/04/09	1,170.25	92.23	0.00	1,078.02	--	--	--	--	--	--	--	--
91-AW5	11/05/09	1,170.25	92.39	0.00	1,077.86	<100	<98.0	<98.0	--	<1.00	<1.00	<1.00	<3.00
91-AW5	05/19/10	1,170.25	92.82	0.00	1,077.43	--	--	--	--	--	--	--	--
91-AW5	05/20/10	1,170.25	93.13	0.00	1,077.12	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
91-AW5	11/08/10	1,170.25	91.38	0.00	1,078.87	<100	<105	<105	--	<1.00	<1.00	<1.00	<3.00
91-AW5	05/17/11	1,170.25	91.84	0.00	1,078.41	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
91-AW5	12/14/11	1,170.25	91.55	0.00	1,078.70	--	--	--	--	--	--	--	--
91-AW5	12/15/11	1,170.25	91.86	0.00	1,078.39	<100	**995**	244	--	<1.00	<1.00	<1.00	<3.00
91-AW5	10/15/19	1,170.25	96.00	0.00	1,074.25	--	--	--	--	--	--	--	--
	Screen Interval 78-98 feet bgs / Total Well Depth 98 feet bgs												
91-AW6	01/13/92 g	1,169.53	93.60	0.00	1,075.93	--	--	ND	--	--	--	--	--
91-AW6	07/13/92	1,169.53	92.55	0.00	1,076.98	--	--	--	--	--	--	--	--
91-AW6	07/14/92	1,169.53	92.60	0.00	1,076.93	--	--	**74,000**	--	<20	ND	42	760
91-AW6	07/14/92 Dup	1,169.53	92.60	0.00	1,076.93	--	--	**51,000**	--	<20	ND	32	550
91-AW6	01/28/93	1,169.53	94.63	**1.77**	1,074.90	**LNAPL Present**							
91-AW6	04/07/93	1,169.53	NM	--	--	**LNAPL Present**							
91-AW6	10/21/93	1,170.38	NM	**0.80**	--	**LNAPL Present**			**1,300,000**				
91-AW6	11/03/93	1,170.38	NM	--	--	**LNAPL Present**	**4,400,000 (d)**						
91-AW6	12/02/93	1,170.38	NM	**0.02**	--	**13,100**	--	--	**9,400,000**	<5	<5	7	360
91-AW6	01/01/94	1,170.38	NM	--	--	--	**18,500**	--	--	--	--	--	--
91-AW6	01/09/94	1,170.38	93.20	0.00	1,077.18	--	--	--	--	--	--	--	--
91-AW6	02/25/94	1,170.38	93.25	0.00	1,077.13	--	--	--	--	--	--	--	--
91-AW6	03/21/94	1,170.38	93.10	0.00	1,077.28	--	--	--	--	--	--	--	--
91-AW6	04/01/94	1,170.38	93.16	0.00	1,077.22	--	--	--	--	--	--	--	--
91-AW6	04/22/94	1,170.38	93.11	0.00	1,077.27	--	--	--	--	--	--	--	--
91-AW6	04/29/94	1,170.38	91.65	0.00	1,078.73	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
91-AW6	05/04/94	1,170.38	93.13	0.00	1,077.25	--	--	--	--	--	--	--	--
91-AW6	06/27/94	1,170.38	93.11	0.00	1,077.27	--	--	--	--	--	--	--	--
91-AW6	07/05/94	1,170.38	91.54	0.00	1,078.84	--	--	--	**28,000**	--	--	--	--
91-AW6	10/06/94	1,170.38	NM	--	--	--	**18,000**	--	--	--	--	--	--
91-AW6	01/17/95	1,170.38	NM	--	--	--	**450,000**	--	--	--	--	--	--
91-AW6	04/25/95	1,170.38	NM	--	--	--	**27,700**	--	--	--	--	--	--
91-AW6	07/25/95	1,170.38	NM	--	--	--	**155,000**	--	--	--	--	--	--
91-AW6	10/25/95	1,170.38	NM	--	--	--	**98,800 (d)**	--	--	--	--	--	--
91-AW6	02/14/96	1,170.38	NM	--	--	--	**39,000 (c)**	--	--	--	--	--	--
91-AW6	04/08/96	1,170.38	NM	--	--	--	**16,600**	--	--	--	--	--	--
91-AW6	07/08/96	1,170.38	NM	--	--	--	**19,900**	--	--	--	--	--	--
91-AW6	08/14/96	1,169.48	89.30	0.00	1,080.18	--	--	--	**28,700**	<0.500	<0.500	4.54	27.1
91-AW6	09/19/96	1,169.48	89.47	0.00	1,080.01	--	--	--	--	--	--	--	--
91-AW6	10/15/96	1,169.48	NM	--	--	--	**9,800**	--	--	--	--	--	--
91-AW6	11/22/96	1,170.38	89.71	0.00	1,080.67	--	--	--	--	--	--	--	--
91-AW6	02/21/97	1,170.38	NM	--	--	--	**12,200**	--	--	--	--	--	--
91-AW6	04/14/97	1,170.38	NM	--	--	--	**8,000**	--	--	--	--	--	--
91-AW6	07/22/97	1,170.38	NM	--	--	--	**3,220**	<1,000	--	--	--	--	--
91-AW6	10/15/97	1,170.38	NM	--	--	--	**8,400**	--	--	--	--	--	--
91-AW6	01/26/98	1,170.38	NM	--	--	--	**6,200**	--	--	--	--	--	--
91-AW6	04/08/98	1,170.38	NM	--	--	--	**5,500**	--	--	--	--	--	--
91-AW6	07/13/98	1,170.38	NM	--	--	--	**14,400**	--	--	--	--	--	--
91-AW6	10/08/98	1,170.38	NM	--	--	--	**2,810**	--	--	--	--	--	--
91-AW6	01/19/99	1,170.38	NM	--	--	--	**6,410**	--	--	--	--	--	--
91-AW6	04/06/99	1,170.38	NM	--	--	--	**13,900**	--	--	--	--	--	--
91-AW6	07/21/99	1,170.38	NM	--	--	--	**3,620**	--	--	--	--	--	--
91-AW6	10/04/99	1,170.38	NM	--	--	--	**2,000**	--	--	--	--	--	--
91-AW6	01/18/00	1,170.38	NM	--	--	--	**1,180 (e)**	--	--	--	--	--	--
91-AW6	04/04/00	1,170.38	NM	--	--	--	**4,500 (e)**	--	--	--	--	--	--
91-AW6	07/10/00	1,170.38	NM	--	--	--	**3,390**	--	--	--	--	--	--
91-AW6	10/09/00	1,170.38	NM	--	--	--	**12,200 (e)**	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
91-AW6	05/09/01	1,170.38	NM	--	--	--	**3,700**	--	--	--	--	--	--
91-AW6	07/12/01	1,170.38	NM	--	--	--	**4,800**	--	--	--	--	--	--
91-AW6	11/12/01	1,170.38	NM	--	--	--	**36,800 (e)**	--	--	--	--	--	--
91-AW6	03/14/02	1,170.38	NM	--	--	--	**88,900 (f)**	--	--	--	--	--	--
91-AW6	09/30/02	1,170.38	NM	--	--	--	**36,100**	--	--	--	--	--	--
91-AW6	08/27/03	1,170.38	NM	--	--	--	**52,600**	--	--	--	--	--	--
91-AW6	03/25/04	1,170.38	NM	**0.13**	--	**LNAPL Present**							
91-AW6	03/29/04	1,170.38	NM	**0.25**	--	**LNAPL Present**							
91-AW6	04/05/04	1,170.38	NM	**0.15**	--	**LNAPL Present**							
91-AW6	04/07/04	1,170.38	94.56	**0.33**	1,075.82	**LNAPL Present**							
91-AW6	04/15/04	1,170.38	NM	**0.33**	--	**LNAPL Present**							
91-AW6	04/23/04	1,170.38	NM	**0.42**	--	**LNAPL Present**							
91-AW6	05/25/04	1,170.38	94.25	**1.30**	1,076.13	**LNAPL Present**							
91-AW6	09/09/04	1,170.38	95.40	**2.49**	1,074.98	**LNAPL Present**							
91-AW6	11/11/04	1,170.38	93.82	**0.43**	1,076.56	**LNAPL Present**							
91-AW6	03/22/05	1,170.38	93.78	**0.41**	1,076.60	**LNAPL Present**							
91-AW6	06/02/05	1,170.38	93.94	**0.43**	1,076.44	**LNAPL Present**							
91-AW6	09/27/05	1,170.38	93.98	**0.36**	1,076.40	**LNAPL Present**							
91-AW6	12/02/05	1,170.38	93.80	**0.36**	1,076.58	**LNAPL Present**							
91-AW6	03/28/06	1,170.38	92.33	0.00	1,078.05	--	--	--	--	--	--	--	--
91-AW6	06/06/06	1,170.38	92.05	0.00	1,078.33	--	--	--	--	--	--	--	--
91-AW6	10/19/07	1,170.38	91.99	0.00	1,078.39	**3,820**	**738,000**	<19,600	--	<1.00	<1.00	6.13	27.4
91-AW6	05/12/08	1,170.38	92.36	0.00	1,078.02	--	--	--	--	--	--	--	--
91-AW6	05/14/08	1,170.38	92.35	0.00	1,078.03	**15,300**	**387,000**	<48,500	--	<1.00	<1.00	10.0	52.0
91-AW6	12/30/08	1,170.38	Inaccessible	--	--	--	--	--	--	--	--	--	--
91-AW6	12/31/08	1,170.38	Inaccessible	--	--	--	--	--	--	--	--	--	--
91-AW6	06/22/09	1,170.38	Inaccessible	--	--	--	--	--	--	--	--	--	--
91-AW6	06/23/09	1,170.38	Inaccessible	--	--	--	--	--	--	--	--	--	--
91-AW6	05/19/10	1,170.38	95.03	**2.56**	1,075.35	**LNAPL Present**							
91-AW6	11/08/10	1,170.38	94.64	**1.62**	1,075.74	**LNAPL Present**							
91-AW6	05/17/11	1,170.38	92.58	**0.24**	1,077.80	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
91-AW6	12/14/11	1,170.38	92.54	**0.16**	1,077.84	**LNAPL Present**							
91-AW6	04/06/17	1,170.38	89.78	0.00	1,080.60	--	--	--	--	--	--	--	--
91-AW6	06/16/17	1,170.38	79.35	0.00	1,091.03	--	--	--	--	--	--	--	--
91-AW6	01/30/19	1,170.38	90.37	**0.02**	1,080.01	**LNAPL Present**							
91-AW6	10/15/19	1,170.38	91.21	**0.11**	1,079.17	**LNAPL Present**							
	Screen Interval 137-147 feet bgs / Total Well Depth 147 feet bgs												
91-BW2	01/13/92 g	1,169.16	92.96	0.00	1,076.20	--	--	ND	--	--	--	--	--
91-BW2	07/13/92	1,169.16	92.70	0.00	1,076.46	--	--	--	--	--	--	--	--
91-BW2	07/14/92	1,169.16	92.81	0.00	1,076.35	--	--	--	--	--	--	--	--
91-BW2	01/28/93	1,169.16	93.17	0.00	1,075.99	--	<50	--	--	--	--	--	--
91-BW2	10/19/07	NE	95.08	0.00	--	<250	**701**	<96.2	--	<1.00	<1.00	<1.00	<3.00
91-BW2	05/12/08	NE	92.33	0.00	--	--	--	--	--	--	--	--	--
91-BW2	05/14/08	NE	94.64	0.00	--	<100	**607**	**908**	--	<1.00	<1.00	<1.00	<3.00
91-BW2	12/30/08	NE	96.34	0.00	--	--	--	--	--	--	--	--	--
91-BW2	12/31/08	NE	93.27	0.00	--	<100	165	<95.2	--	<1.00	<1.00	<1.00	<3.00
91-BW2	06/22/09	NE	93.95	0.00	--	--	--	--	--	--	--	--	--
91-BW2	06/23/09	NE	93.39	0.00	--	<100	<100	<100	--	<1.00	<1.00	<1.00	<3.00
91-BW2	11/04/09	NE	93.41	0.00	--	--	--	--	--	--	--	--	--
91-BW2	11/05/09	NE	93.61	0.00	--	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
91-BW2	05/19/10	NE	95.95	0.00	--	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
91-BW2	11/08/10	NE	93.05	0.00	--	<100	<100	<100	--	<1.00	<1.00	<1.00	<3.00
91-BW2	05/17/11	NE	92.04	0.00	--	--	--	--	--	--	--	--	--
91-BW2	05/18/11	NE	92.33	0.00	--	<100	220 (QP6)	<105	--	<1.00	<1.00	<1.00	<3.00
91-BW2	12/14/11	NE	92.91	0.00	--	--	--	--	--	--	--	--	--
91-BW2	12/15/11	NE	93.11	0.00	--	<100	370 (QP)	<240	--	<1.00	<1.00	<1.00	<3.00
91-BW2	04/06/17	NE	89.34	0.00	--	--	--	--	--	--	--	--	--
91-BW2	06/16/17	NE	89.00	0.00	--	--	--	--	--	--	--	--	--
91-BW2	09/07/17	NE	88.80	0.00	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
	Screen Interval 79.5-99.5 feet bgs / Total Well Depth 99.5 feet bgs												
PH1-9301	10/22/93	1,166.95	90.17	0.00	1,076.78	--	--	--	--	--	--	--	--
PH1-9301	11/03/93	1,166.95	NM	--	--	--	**12,500 (d)**	--	--	--	--	--	--
PH1-9301	12/02/93	1,167.07	90.17	**0.20**	1,076.90	**LNAPL Present**			**98,000,000**				
PH1-9301	01/09/94	1,167.07	89.85	0.00	1,077.22	--	--	--	--	--	--	--	--
PH1-9301	02/25/94	1,167.07	89.90	0.00	1,077.17	--	--	--	--	--	--	--	--
PH1-9301	03/21/94	1,167.07	89.70	0.00	1,077.37	--	--	--	--	--	--	--	--
PH1-9301	03/22/94	1,167.07	NM	--	--	--	--	--	**204,000**	--	--	--	--
PH1-9301	04/01/94	1,167.07	89.82	0.00	1,077.25	--	--	--	--	--	--	--	--
PH1-9301	04/18/94	1,167.07	89.73	0.00	1,077.34	--	--	--	--	--	--	--	--
PH1-9301	04/22/94	1,167.07	89.73	0.00	1,077.34	--	--	--	--	--	--	--	--
PH1-9301	04/29/94	1,167.07	89.89	0.00	1,077.18	--	--	--	--	--	--	--	--
PH1-9301	05/04/94	1,167.07	89.79	0.00	1,077.28	--	--	--	--	--	--	--	--
PH1-9301	06/27/94	1,167.07	89.73	0.00	1,077.34	--	--	--	--	--	--	--	--
PH1-9301	07/05/94	1,167.07	89.65	0.00	1,077.42	--	--	--	**23,000**	--	--	--	--
PH1-9301	10/06/94	1,167.07	NM	--	--	--	**73,000**	--	--	--	--	--	--
PH1-9301	01/17/95	1,167.07	NM	--	--	--	**140,000**	--	--	--	--	--	--
PH1-9301	04/25/95	1,167.07	NM	--	--	--	**36,300**	--	--	--	--	--	--
PH1-9301	07/25/95	1,167.07	NM	--	--	--	**16,300**	--	--	--	--	--	--
PH1-9301	10/25/95	1,167.07	NM	--	--	--	**134,000 (d)**	--	--	--	--	--	--
PH1-9301	02/14/96	1,167.07	NM	--	--	--	**48,000 (c)**	--	--	--	--	--	--
PH1-9301	04/08/96	1,167.07	NM	--	--	--	**24,500**	--	--	--	--	--	--
PH1-9301	07/08/96	1,167.07	NM	--	--	--	**7,500**	--	--	--	--	--	--
PH1-9301	08/14/96	1,167.10	86.90	0.00	1,080.20	--	--	--	**6,780**	**2.17**	<0.500	1.16	1.52
PH1-9301	09/19/96	1,167.10	87.07	0.00	1,080.03	--	--	--	--	--	--	--	--
PH1-9301	10/15/96	1,167.10	NM	--	--	--	**11,200**	--	--	--	--	--	--
PH1-9301	11/22/96	1,167.07	87.31	0.00	1,079.76	--	--	--	--	--	--	--	--
PH1-9301	02/21/97	1,167.07	NM	--	--	--	**6,800**	--	--	--	--	--	--
PH1-9301	04/14/97	1,167.07	NM	--	--	--	**7,200**	--	--	--	--	--	--
PH1-9301	07/22/97	1,167.07	NM	--	--	--	**1,660**	<1,000	--	--	--	--	--
PH1-9301	10/15/97	1,167.07	NM	--	--	--	**3,600**	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 8 of 31

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9301	01/26/98	1,167.07	NM	--	--	--	**6,000**	--	--	--	--	--	--
PH1-9301	04/08/98	1,167.07	NM	--	--	--	**6,400**	--	--	--	--	--	--
PH1-9301	07/13/98	1,167.07	NM	--	--	--	**6,700**	--	--	--	--	--	--
PH1-9301	10/08/98	1,167.07	NM	--	--	--	**2,980**	--	--	--	--	--	--
PH1-9301	01/19/99	1,167.07	NM	--	--	--	**5,720**	--	--	--	--	--	--
PH1-9301	04/06/99	1,167.07	NM	--	--	--	**500**	--	--	--	--	--	--
PH1-9301	07/21/99	1,167.07	NM	--	--	--	**2,930**	--	--	--	--	--	--
PH1-9301	10/04/99	1,167.07	NM	--	--	--	**1,500**	--	--	--	--	--	--
PH1-9301	01/18/00	1,167.07	NM	--	--	--	**5,440 (e)**	--	--	--	--	--	--
PH1-9301	04/04/00	1,167.07	NM	--	--	--	**24,900 (e)**	--	--	--	--	--	--
PH1-9301	07/10/00	1,167.07	NM	--	--	--	**1,860**	--	--	--	--	--	--
PH1-9301	10/09/00	1,167.07	NM	--	--	--	**2,730 (e)**	--	--	--	--	--	--
PH1-9301	05/09/01	1,167.07	NM	--	--	--	**7,900**	--	--	--	--	--	--
PH1-9301	07/12/01	1,167.07	NM	--	--	--	**18,000**	--	--	--	--	--	--
PH1-9301	11/12/01	1,167.07	NM	--	--	--	**5,000 (e)**	--	--	--	--	--	--
PH1-9301	03/14/02	1,167.07	NM	--	--	--	**6,100 (f)**	--	--	--	--	--	--
PH1-9301	09/30/02	1,167.07	NM	--	--	--	**5,800**	--	--	--	--	--	--
PH1-9301	08/27/03	1,167.07	NM	--	--	--	**32,100**	--	--	--	--	--	--
PH1-9301	03/25/04	1,167.07	NM	**0.04**	--	**LNAPL Present**							
PH1-9301	03/29/04	1,167.07	NM	**0.08**	--	**LNAPL Present**							
PH1-9301	04/05/04	1,167.07	NM	**0.08**	--	**LNAPL Present**							
PH1-9301	04/07/04	1,167.07	90.95	**0.06**	1,076.12	**LNAPL Present**							
PH1-9301	04/15/04	1,167.07	NM	**0.10**	--	**LNAPL Present**							
PH1-9301	04/23/04	1,167.07	NM	**0.10**	--	**LNAPL Present**							
PH1-9301	05/25/04	1,167.07	91.15	**0.79**	1,075.92	**LNAPL Present**	ND						
PH1-9301	09/09/04	1,167.07	91.35	**0.70**	1,075.72	**LNAPL Present**							
PH1-9301	11/11/04	1,167.07	91.97	**1.30**	1,075.10	**LNAPL Present**							
PH1-9301	03/22/05	1,167.07	92.00	**1.35**	1,075.07	**LNAPL Present**							
PH1-9301	06/02/05	1,167.07	92.57	**1.92**	1,074.50	**LNAPL Present**							
PH1-9301	09/27/05	1,167.07	92.57	**1.84**	1,074.50	**LNAPL Present**							
PH1-9301	12/02/05	1,167.07	92.18	**1.46**	1,074.89	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9301	03/28/06	1,167.07	89.87	**0.05**	1,077.20	**LNAPL Present**							
PH1-9301	06/06/06	1,167.07	89.50	0.00	1,077.57	--	--	--	--	--	--	--	--
PH1-9301	10/19/07	1,167.07	89.51	**0.10**	1,077.56	**LNAPL Present**							
PH1-9301	05/12/08	1,167.07	89.84	**0.13**	1,077.23	**LNAPL Present**							
PH1-9301	12/30/08	1,167.07	91.65	**0.98**	1,075.42	**LNAPL Present**							
PH1-9301	06/22/09	1,167.07	90.24	**0.22**	1,076.83	**LNAPL Present**							
PH1-9301	11/04/09	1,167.07	90.11	**0.44**	1,076.96	**LNAPL Present**							
PH1-9301	05/19/10	1,167.07	93.04	**2.53**	1,074.03	**LNAPL Present**							
PH1-9301	11/08/10	1,167.07	92.06	**1.85**	1,075.01	**LNAPL Present**							
PH1-9301	05/17/11	1,167.07	89.99	**0.32**	1,077.08	**LNAPL Present**							
PH1-9301	12/14/11	1,167.07	90.10	**0.38**	1,076.97	**LNAPL Present**							
PH1-9301	04/06/17	1,167.07	88.18	**1.24**	1,078.89	**LNAPL Present**							
PH1-9301	06/16/17	1,167.07	88.59	**2.05**	1,078.48	**LNAPL Present**							
PH1-9301	09/07/17	1,167.07	86.52	0.00	1,080.55	--	--	--	--	--	--	--	--
PH1-9301	01/09/18	1,167.07	87.40	**1.35**	1,079.67	**LNAPL Present**							
PH1-9301	01/30/19	1,167.07	87.98	**0.29**	1,079.09	**LNAPL Present**							
PH1-9301	04/30/19	1,167.07	88.57	**0.68**	1,078.50	**LNAPL Present**							
PH1-9301	06/11/19	1,167.07	88.36	**0.22**	1,078.71	**LNAPL Present**							
PH1-9301	07/18/19	1,167.07	88.56	**0.30**	1,078.51	**LNAPL Present**							
PH1-9301	08/07/19	1,167.07	88.62	**0.32**	1,078.45	**LNAPL Present**							
PH1-9301	10/15/19	1,167.07	88.90	**0.40**	1,078.17	**LNAPL Present**							
PH1-9301	12/23/19	1,167.07	89.02	**0.42**	1,078.05	**LNAPL Present**							
PH1-9301	01/29/20	1,167.07	88.97	**0.17**	1,078.10	**LNAPL Present**							
PH1-9301	02/14/20	1,167.07	89.17	**0.27**	1,077.90	**LNAPL Present**							
PH1-9301	05/07/20	1,167.07	89.19	**0.15**	1,077.88	**LNAPL Present**							
PH1-9301	06/01/20	1,167.07	89.16	**0.01**	1,077.91	**LNAPL Present**							
PH1-9301	06/22/20	1,167.07	89.24	**0.03**	1,077.83	**LNAPL Present**							
PH1-9301	08/10/20	1,167.07	89.31	**0.06**	1,077.76	**LNAPL Present**							
PH1-9301	12/09/20	1,167.07	89.64	**0.10**	1,077.43	**LNAPL Present**							
PH1-9301	01/14/21	1,167.07	89.75	**0.10**	1,077.32	**LNAPL Present**							
PH1-9301	04/05/21	1,167.07	89.72	**0.10**	1,077.35	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9301	05/12/21	1,167.07	89.89	**0.14**	1,077.18	**LNAPL Present**							
PH1-9301	07/13/21	1,167.07	90.12	**0.13**	1,076.95	**LNAPL Present**							
PH1-9301	09/29/21	1,167.07	90.45	**0.05**	1,076.62	**LNAPL Present**							
PH1-9301	11/15/21	1,167.07	90.40	0.00	1,076.67	--	--	--	--	--	--	--	--
PH1-9301	02/23/22	1,167.07	90.83	**0.20**	1,076.24	**LNAPL Present**							
PH1-9301	04/12/22	1,167.07	91.12	**0.46**	1,075.95	**LNAPL Present**							
PH1-9301	07/25/22	1,167.07	91.74	**1.00**	1,075.33	**LNAPL Present**							
	Screen Interval Unknown feet bgs / Total Well Depth Unknown feet bgs												
PH1-9302	10/22/93	1,163.16	86.06	0.00	1,077.10	--	--	--	--	--	--	--	--
PH1-9302	11/03/93	1,163.16	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9302	12/02/93	1,163.16	86.08	0.00	1,077.08	--	<500	--	--	--	--	--	--
PH1-9302	01/09/94	1,163.16	89.01	0.00	1,074.15	--	--	--	--	--	--	--	--
PH1-9302	02/25/94	1,163.16	86.07	0.00	1,077.09	--	--	--	--	--	--	--	--
PH1-9302	03/21/94	1,163.16	86.01	0.00	1,077.15	--	--	--	--	--	--	--	--
PH1-9302	04/01/94	1,163.16	86.08	0.00	1,077.08	--	--	--	--	--	--	--	--
PH1-9302	10/06/94	1,163.16	NM	--	--	--	<1,000	--	--	--	--	--	--
		Destroyed											
	Screen Interval Unknown feet bgs / Total Well Depth 99 feet bgs												
PH1-9303	10/22/93	1,163.69	86.38	0.00	1,077.31	--	--	--	--	--	--	--	--
PH1-9303	11/11/93	1,163.69	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9303	12/02/93	1,163.62	86.38	0.00	1,077.24	--	<500	--	--	--	--	--	--
PH1-9303	01/09/94	1,163.62	86.52	0.00	1,077.10	--	--	--	--	--	--	--	--
PH1-9303	02/25/94	1,163.62	86.36	0.00	1,077.26	--	--	--	--	--	--	--	--
PH1-9303	03/21/94	1,163.62	86.27	0.00	1,077.35	--	--	--	--	--	--	--	--
PH1-9303	04/01/94	1,163.62	86.33	0.00	1,077.29	--	--	--	--	--	--	--	--
PH1-9303	04/22/94	1,163.62	86.29	0.00	1,077.33	--	--	--	--	--	--	--	--
PH1-9303	04/29/94	1,163.62	86.23	0.00	1,077.39	--	--	--	--	--	--	--	--
PH1-9303	05/04/94	1,163.62	86.32	0.00	1,077.30	--	--	--	--	--	--	--	--
PH1-9303	06/27/94	1,163.62	86.29	0.00	1,077.33	--	--	--	--	--	--	--	--
PH1-9303	07/05/94	1,163.62	86.13	0.00	1,077.49	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9303	08/14/96	1,163.68	83.56	0.00	1,080.12	--	--	--	<250	<0.500	<0.500	<0.500	<1.00
PH1-9303	09/19/96	1,163.68	83.55	0.00	1,080.13	--	--	--	--	--	--	--	--
PH1-9303	11/22/96	1,163.68	83.83	0.00	1,079.85	--	--	--	--	--	--	--	--
PH1-9303	07/22/97	1,163.62	NM	--	--	--	<1,000	<1,000	--	--	--	--	--
PH1-9303	05/25/04	1,163.62	87.14	0.00	1,076.48	--	ND	--	--	--	--	--	--
PH1-9303	09/09/04	1,163.62	87.38	**0.01**	1,076.24	**LNAPL Present**	**8,180**						
PH1-9303	11/11/04	1,163.62	87.58	**0.19**	1,076.04	**LNAPL Present**							
PH1-9303	03/22/05	1,163.62	87.66	**0.26**	1,075.96	**LNAPL Present**							
PH1-9303	06/02/05	1,163.62	87.85	**0.35**	1,075.77	**LNAPL Present**							
PH1-9303	09/27/05	1,163.62	87.85	**0.51**	1,075.77	**LNAPL Present**							
PH1-9303	12/02/05	1,163.62	87.52	**0.09**	1,076.10	**LNAPL Present**							
PH1-9303	03/28/06	1,163.62	86.28	0.00	1,077.34	--	**103,000 (QSG)**	--	--	--	--	--	--
PH1-9303	06/06/06	1,163.62	86.04	0.00	1,077.58	--	<939 (QSG)	**3,340 (QSG)**	--	--	--	--	--
PH1-9303	10/19/07	1,163.62	85.99	**0.01**	1,077.63	**LNAPL Present**							
PH1-9303	05/12/08	1,163.62	86.36	0.00	1,077.26	--	--	--	--	--	--	--	--
PH1-9303	05/14/08	1,163.62	86.34	0.00	1,077.28	**1,640**	**638,000**	<47,200	--	<1.00	<1.00	<1.00	3.80
PH1-9303	12/30/08	1,163.62	Inaccessible	--	--	--	--	--	--	--	--	--	--
PH1-9303	06/22/09	1,163.62	88.19	**Sheen**	1,075.43	**LNAPL Present**							
PH1-9303	11/04/09	1,163.62	88.30	**0.68**	1,075.32	**LNAPL Present**							
PH1-9303	05/19/10	1,163.62	87.61	**0.35**	1,076.01	**LNAPL Present**							
PH1-9303	11/08/10	1,163.62	87.43	**0.18**	1,076.19	**LNAPL Present**							
PH1-9303	05/17/11	1,163.62	86.34	0.00	1,077.28	--	--	--	--	--	--	--	--
PH1-9303	05/18/11	1,163.62	86.47	0.00	1,077.15	**1,900**	**1,570,000 (QP7)**	<4,850	--	<1.00	<1.00	<1.00	6.78
PH1-9303	12/14/11	1,163.62	86.41	0.00	1,077.21	--	--	--	--	--	--	--	--
PH1-9303	12/15/11	1,163.62	86.57	0.00	1,077.05	267	**89,800 (QP7)**	**874 (QP6)**	--	<1.00	<1.00	<1.00	<3.00
PH1-9303	04/06/17	1,163.62	83.76	0.00	1,079.86	--	--	--	--	--	--	--	--
PH1-9303	06/16/17	1,163.62	83.38	0.00	1,080.24	--	--	--	--	--	--	--	--
PH1-9303	09/07/17	1,163.62	83.18	0.00	1,080.44	--	--	--	--	--	--	--	--
PH1-9303	01/30/19	1,163.62	84.37	0.00	1,079.25	--	--	--	--	--	--	--	--
PH1-9303	10/15/19	1,163.62	85.13	0.00	1,078.49	--	--	--	--	--	--	--	--

MTCA Method A Cleanup Levels	800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer	NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer	NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer	NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer	NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
Screen Interval Unknown feet bgs / Total Well Depth 99 feet bgs													
PH1-9304	10/22/93	1,166.46	89.30	0.00	1,077.16	--	--	--	--	--	--	--	--
PH1-9304	11/11/93	1,166.46	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9304	12/02/93	1,166.44	89.30	0.00	1,077.14	--	<500	--	--	--	--	--	--
PH1-9304	01/09/94	1,166.44	89.24	0.00	1,077.20	--	--	--	--	--	--	--	--
PH1-9304	02/25/94	1,166.44	89.28	0.00	1,077.16	--	--	--	--	--	--	--	--
PH1-9304	03/21/94	1,166.44	89.22	0.00	1,077.22	--	--	--	--	--	--	--	--
PH1-9304	04/01/94	1,166.44	89.29	0.00	1,077.15	--	--	--	--	--	--	--	--
PH1-9304	04/22/94	1,166.44	89.21	0.00	1,077.23	--	--	--	--	--	--	--	--
PH1-9304	04/29/94	1,166.44	89.19	0.00	1,077.25	--	--	--	--	--	--	--	--
PH1-9304	05/04/94	1,166.44	89.26	0.00	1,077.18	--	--	--	--	--	--	--	--
PH1-9304	06/27/94	1,166.44	89.21	0.00	1,077.23	--	--	--	--	--	--	--	--
PH1-9304	07/05/94	1,166.44	89.06	0.00	1,077.38	--	--	--	--	--	--	--	--
PH1-9304	10/06/94	1,166.44	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9304	01/17/95	1,166.44	NM	--	--	--	<500	--	<250	--	--	--	--
PH1-9304	07/25/95	1,166.44	NM	--	--	--	**687**	--	--	--	--	--	--
PH1-9304	10/25/95	1,166.44	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9304	02/14/96	1,166.44	NM	--	--	--	<25,000	--	--	--	--	--	--
PH1-9304	04/08/96	1,166.44	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9304	07/08/96	1,166.44	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9304	08/14/96	1,166.50	86.47	0.00	1,080.03	--	--	--	<250	<0.500	<0.500	<0.500	<1.00
PH1-9304	09/19/96	1,166.50	86.47	0.00	1,080.03	--	--	--	--	--	--	--	--
PH1-9304	10/15/96	1,166.50	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9304	11/22/96	1,166.44	86.81	0.00	1,079.63	--	--	--	--	--	--	--	--
PH1-9304	02/21/97	1,166.44	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9304	04/14/97	1,166.44	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9304	07/22/97	1,166.44	NM	--	--	--	<1,000	<1,000	--	--	--	--	--
PH1-9304	10/15/97	1,166.44	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9304	01/26/98	1,166.44	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9304	04/08/98	1,166.44	NM	--	--	--	<100	--	--	--	--	--	--
PH1-9304	07/13/98	1,166.44	NM	--	--	--	<500	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9304	10/08/98	1,166.44	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9304	01/19/99	1,166.44	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9304	04/06/99	1,166.44	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9304	07/21/99	1,166.44	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9304	10/04/99	1,166.44	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9304	01/18/00	1,166.44	NM	--	--	--	<100	--	--	--	--	--	--
PH1-9304	04/04/00	1,166.44	NM	--	--	--	<100	--	--	--	--	--	--
PH1-9304	07/10/00	1,166.44	NM	--	--	--	ND	--	--	--	--	--	--
PH1-9304	10/09/00	1,166.44	NM	--	--	--	<250	--	--	--	--	--	--
PH1-9304	05/25/04	1,166.44	90.07	0.00	1,076.37	--	ND/ND (b)	--	--	--	--	--	--
PH1-9304	09/09/04	1,166.44	90.30	0.00	1,076.14	--	ND	--	--	--	--	--	--
PH1-9304	11/11/04	1,166.44	90.37	0.00	1,076.07	--	<100	--	--	--	--	--	--
PH1-9304	03/22/05	1,166.44	90.39	0.00	1,076.05	--	ND/ND (b)	--	--	--	--	--	--
PH1-9304	06/02/05	1,166.44	90.47	0.00	1,075.97	--	ND	--	--	--	--	--	--
PH1-9304	09/27/05	1,166.44	90.58	0.00	1,075.86	--	<100	<100	--	--	--	--	--
PH1-9304	12/02/05	1,166.44	90.38	0.00	1,076.06	--	<100	<100	--	--	--	--	--
PH1-9304	03/28/06	1,166.44	89.24	0.00	1,077.20	--	154 (QSG)	--	--	--	--	--	--
PH1-9304	06/06/06	1,166.44	88.96	0.00	1,077.48	--	<93.9 (QSG)	<93.9 (QSG)	--	--	--	--	--
PH1-9304	10/19/07	1,166.44	88.91	0.00	1,077.53	<250	<96.2	<96.2	--	<1.00	<1.00	<1.00	<3.00
PH1-9304	05/12/08	1,166.44	89.28	0.00	1,077.16	--	--	--	--	--	--	--	--
PH1-9304	05/14/08	1,166.44	89.26	0.00	1,077.18	<100	102	<95.2	--	<1.00	<1.00	<1.00	<3.00
PH1-9304	12/30/08	1,166.44	90.29	0.00	1,076.15	--	--	--	--	--	--	--	--
PH1-9304	12/31/08	1,166.44	90.29	0.00	1,076.15	<100	<94.3	<94.3	--	<1.00	<1.00	<1.00	<3.00
PH1-9304	06/22/09	1,166.44	89.74	0.00	1,076.70	--	--	--	--	--	--	--	--
PH1-9304	06/23/09	1,166.44	89.79	0.00	1,076.65	<100	<100	<100	--	<1.00	<1.00	<1.00	<3.00
PH1-9304	11/04/09	1,166.44	89.56	0.00	1,076.88	--	--	--	--	--	--	--	--
PH1-9304	11/05/09	1,166.44	89.52	0.00	1,076.92	<100	<100	<100	--	<1.00	<1.00	<1.00	<3.00
PH1-9304	05/19/10	1,166.44	90.23	0.00	1,076.21	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
PH1-9304	11/08/10	1,166.44	90.17	0.00	1,076.27	<100	<105	<105	--	<1.00	<1.00	<1.00	<3.00
PH1-9304	05/17/11	1,166.44	89.72	0.00	1,076.72	--	--	--	--	--	--	--	--
PH1-9304	05/18/11	1,166.44	89.48	0.00	1,076.96	<100	**95,600 (QP7)**	<98.0	--	<1.00	<1.00	<1.00	<3.00

MTCA Method A Cleanup Levels	800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer	NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer	NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer	NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer	NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9304	12/14/11	1,166.44	89.54	0.00	1,076.90	--	--	--	--	--	--	--	--
PH1-9304	12/15/11	1,166.44	89.31	0.00	1,077.13	<100	**697 (QP6)**	<236	--	<1.00	<1.00	<1.00	<3.00
PH1-9304	10/15/19	1,166.44	84.37	0.00	1,082.07	--	--	--	--	--	--	--	--
	Screen Interval Unknown feet bgs / Total Well Depth 95 feet bgs												
PH1-9401	04/22/94	1,163.77	86.67	0.00	1,077.10	--	--	--	--	--	--	--	--
PH1-9401	04/29/94	1,163.77	86.61	0.00	1,077.16	--	--	--	<1,000	--	--	--	--
PH1-9401	05/04/94	1,163.77	86.70	0.00	1,077.07	--	--	--	--	--	--	--	--
PH1-9401	06/27/94	1,163.77	86.67	0.00	1,077.10	--	--	--	--	--	--	--	--
PH1-9401	07/05/94	1,163.77	86.41	0.00	1,077.36	--	--	--	--	--	--	--	--
PH1-9401	10/06/94	1,163.77	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9401	01/17/95	1,163.77	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9401	07/25/95	1,163.77	NM	--	--	--	**924**	--	--	--	--	--	--
PH1-9401	10/25/95	1,163.77	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9401	04/08/96	1,163.77	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9401	07/08/96	1,163.77	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9401	08/14/96	1,163.79	83.85	0.00	1,079.94	--	--	--	<250	<0.500	<0.500	<0.500	<1.00
PH1-9401	09/19/96	1,163.79	83.84	0.00	1,079.95	--	--	--	--	--	--	--	--
PH1-9401	10/15/96	1,163.79	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9401	11/22/96	1,163.77	84.17	0.00	1,079.60	--	--	--	--	--	--	--	--
PH1-9401	07/22/97	1,163.77	NM	--	--	--	<1,000	<1,000	--	--	--	--	--
PH1-9401	10/15/97	1,163.77	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9401	01/26/98	1,163.77	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9401	04/08/98	1,163.77	NM	--	--	--	<100	--	--	--	--	--	--
PH1-9401	07/13/98	1,163.77	NM	--	--	--	**900**	--	--	--	--	--	--
PH1-9401	10/08/98	1,163.77	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9401	01/19/99	1,163.77	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9401	04/06/99	1,163.77	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9401	07/21/99	1,163.77	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9401	10/04/99	1,163.77	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9401	01/18/00	1,163.77	NM	--	--	--	130 (e)	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9401	04/04/00	1,163.77	NM	--	--	--	<100	--	--	--	--	--	--
PH1-9401	07/10/00	1,163.77	NM	--	--	--	ND	--	--	--	--	--	--
PH1-9401	10/09/00	1,163.77	NM	--	--	--	<250	--	--	--	--	--	--
PH1-9401	05/25/04	1,163.77	87.54	0.00	1,076.23	--	ND	--	--	--	--	--	--
PH1-9401	09/09/04	1,163.77	87.70	0.00	1,076.07	--	ND	--	--	--	--	--	--
PH1-9401	11/11/04	1,163.77	87.81	0.00	1,075.96	--	<100	--	--	--	--	--	--
PH1-9401	03/22/05	1,163.77	87.77	0.00	1,076.00	--	ND	--	--	--	--	--	--
PH1-9401	06/02/05	1,163.77	87.92	0.00	1,075.85	--	ND	--	--	--	--	--	--
PH1-9401	09/27/05	1,163.77	88.00	0.00	1,075.77	--	<100	<100	--	--	--	--	--
PH1-9401	12/02/05	1,163.77	87.87	0.00	1,075.90	--	<100	<100	--	--	--	--	--
PH1-9401	03/28/06	1,163.77	86.69	0.00	1,077.08	--	<100 (QSG)	--	--	--	--	--	--
PH1-9401	06/06/06	1,163.77	86.39	0.00	1,077.38	--	<93.9 (QSG)	<93.9 (QSG)	--	--	--	--	--
PH1-9401	10/19/07	1,163.77	86.36	0.00	1,077.41	<250	<96.2	<96.2	--	<1.00	<1.00	<1.00	<3.00
PH1-9401	05/14/08	1,163.77	86.70	0.00	1,077.07	<100	**3,510**	**4,560**	--	<1.00	<1.00	<1.00	<3.00
PH1-9401	06/22/09	1,163.77	87.89	0.00	1,075.88	--	--	--	--	--	--	--	--
PH1-9401	06/23/09	1,163.77	87.91	0.00	1,075.86	<100	<105	<105	--	<1.00	<1.00	<1.00	<3.00
PH1-9401	11/04/09	1,163.77	87.62	0.00	1,076.15	--	--	--	--	--	--	--	--
PH1-9401	11/05/09	1,163.77	87.71	0.00	1,076.06	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
PH1-9401	05/19/10	1,163.77	87.61	0.00	1,076.16	<100	<111	<111	--	<1.00	<1.00	<1.00	<3.00
PH1-9401	11/08/10	1,163.77	87.64	0.00	1,076.13	--	--	--	--	--	--	--	--
PH1-9401	11/09/10	1,163.77	87.46	0.00	1,076.31	<100	<99.0	<99.0	--	<1.00	<1.00	<1.00	<3.00
PH1-9401	05/17/11	1,163.77	86.67	0.00	1,077.10	--	--	--	--	--	--	--	--
PH1-9401	05/18/11	1,163.77	86.42	0.00	1,077.35	<100	**538 (QP7)**	<99.0	--	<1.00	<1.00	<1.00	<3.00
PH1-9401	12/14/11	1,163.77	86.69	0.00	1,077.08	<100	<94.3	<236	--	<1.00	<1.00	<1.00	<3.00
PH1-9401	10/15/19	1,163.77	85.50	0.00	1,078.27	--	--	--	--	--	--	--	--
	Screen Interval 75.5-95.5 feet bgs / Total Well Depth 95.5 feet bgs												
PH1-9402	04/22/94	1,167.09	89.81	0.00	1,077.28	--	--	--	--	--	--	--	--
PH1-9402	04/29/94	1,167.09	89.76	0.00	1,077.33	--	--	--	<1,000	--	--	--	--
PH1-9402	05/04/94	1,167.09	89.81	0.00	1,077.28	--	--	--	--	--	--	--	--
PH1-9402	05/24/94	1,167.09	NM	--	--	--	--	--	<500	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 16 of 31

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9402	06/27/94	1,167.09	89.72	0.00	1,077.37	--	--	--	--	--	--	--	--
PH1-9402	07/05/94	1,167.09	89.81	0.00	1,077.28	--	--	--	<500	--	--	--	--
PH1-9402	04/25/95	1,167.09	NM	--	--	--	**7,700**	--	--	--	--	--	--
PH1-9402	07/25/95	1,167.09	NM	--	--	--	**8,250**	--	--	--	--	--	--
PH1-9402	10/25/95	1,167.09	NM	--	--	--	**53,900 (d)**	--	--	--	--	--	--
PH1-9402	02/14/96	1,167.09	NM	--	--	--	**44,000 (c)**	--	--	--	--	--	--
PH1-9402	04/08/96	1,167.09	NM	--	--	--	**17,400**	--	--	--	--	--	--
PH1-9402	07/08/96	1,167.09	NM	--	--	--	**12,000**	--	--	--	--	--	--
PH1-9402	08/14/96	1,167.13	87.12	0.00	1,080.01	--	--	--	<250	<0.500	<0.500	<0.500	<1.00
PH1-9402	09/19/96	1,167.13	87.11	0.00	1,080.02	--	--	--	--	--	--	--	--
PH1-9402	10/15/96	1,167.13	NM	--	--	--	**5,900**	--	--	--	--	--	--
PH1-9402	11/22/96	1,167.09	87.34	0.00	1,079.75	--	--	--	--	--	--	--	--
PH1-9402	02/21/97	1,167.09	NM	--	--	--	**2,800**	--	--	--	--	--	--
PH1-9402	04/14/97	1,167.09	NM	--	--	--	**3,000**	--	--	--	--	--	--
PH1-9402	07/22/97	1,167.09	NM	--	--	--	<1,000	<1,000	--	--	--	--	--
PH1-9402	10/15/97	1,167.09	NM	--	--	--	**1,200**	--	--	--	--	--	--
PH1-9402	01/26/98	1,167.09	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9402	04/08/98	1,167.09	NM	--	--	--	<100	--	--	--	--	--	--
PH1-9402	07/13/98	1,167.09	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9402	10/08/98	1,167.09	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9402	01/19/99	1,167.09	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9402	04/06/99	1,167.09	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9402	07/21/99	1,167.09	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9402	10/04/99	1,167.09	NM	--	--	--	<500	--	--	--	--	--	--
PH1-9402	01/18/00	1,167.09	NM	--	--	--	340 (e)	--	--	--	--	--	--
PH1-9402	04/04/00	1,167.09	NM	--	--	--	<100	--	--	--	--	--	--
PH1-9402	07/10/00	1,167.09	NM	--	--	--	ND	--	--	--	--	--	--
PH1-9402	10/09/00	1,167.09	NM	--	--	--	<250	--	--	--	--	--	--
PH1-9402	05/25/04	1,167.09	91.90	**1.62**	1,075.19	**LNAPL Present**	ND						
PH1-9402	09/09/04	1,167.09	92.00	**1.44**	1,075.09	**LNAPL Present**							
PH1-9402	11/11/04	1,167.09	92.38	**1.76**	1,074.71	**LNAPL Present**							

	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
MTCA Method A Cleanup Levels	800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer	NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer	NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer	NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer	NE	NE	NE	NE	8	NE	NE	NE

TABLE 4

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9402	03/22/05	1,167.09	92.28	**1.62**	1,074.81	**LNAPL Present**							
PH1-9402	06/02/05	1,167.09	92.14	**1.34**	1,074.95	**LNAPL Present**							
PH1-9402	09/27/05	1,167.09	92.14	**1.38**	1,074.95	**LNAPL Present**							
PH1-9402	12/02/05	1,167.09	91.75	**0.93**	1,075.34	**LNAPL Present**							
PH1-9402	03/28/06	1,167.09	90.20	**0.30**	1,076.89	**LNAPL Present**							
PH1-9402	06/06/06	1,167.09	90.71	**0.21**	1,076.38	**LNAPL Present**							
PH1-9402	10/19/07	1,167.09	89.95	**0.57**	1,077.14	**LNAPL Present**							
PH1-9402	05/12/08	1,167.09	90.35	**0.68**	1,076.74	**LNAPL Present**							
PH1-9402	12/30/08	1,167.09	91.65	**0.96**	1,075.44	**LNAPL Present**							
PH1-9402	06/22/09	1,167.09	90.57	**0.69**	1,076.52	**LNAPL Present**							
PH1-9402	11/04/09	1,167.09	90.23	**0.49**	1,076.86	**LNAPL Present**							
PH1-9402	05/19/10	1,167.09	91.04	**0.42**	1,076.05	**LNAPL Present**							
PH1-9402	11/08/10	1,167.09	89.64	**0.32**	1,077.45	**LNAPL Present**							
PH1-9402	05/17/11	1,167.09	89.84	**0.11**	1,077.25	**LNAPL Present**							
PH1-9402	12/14/11	1,167.09	89.98	**0.21**	1,077.11	**LNAPL Present**							
PH1-9402	04/06/17	1,167.09	88.55	**1.64**	1,078.54	**LNAPL Present**							
PH1-9402	06/16/17	1,167.09	88.55	**2.19**	1,078.54	**LNAPL Present**							
PH1-9402	09/07/17	1,167.09	87.90	**1.65**	1,079.19	**LNAPL Present**							
PH1-9402	01/09/18	1,167.09	88.28	**1.75**	1,078.81	**LNAPL Present**							
PH1-9402	01/30/19	1,167.09	89.12	**1.64**	1,077.97	**LNAPL Present**							
PH1-9402	03/28/19	1,167.09	89.35	**1.57**	1,077.74	**LNAPL Present**							
PH1-9402	04/30/19	1,167.09	88.19	**0.17**	1,078.90	**LNAPL Present**							
PH1-9402	06/11/19	1,167.09	88.58	**0.51**	1,078.51	**LNAPL Present**							
PH1-9402	07/18/19	1,167.09	88.46	**0.36**	1,078.63	**LNAPL Present**							
PH1-9402	08/07/19	1,167.09	88.60	**0.34**	1,078.49	**LNAPL Present**							
PH1-9402	10/15/19	1,167.09	88.89	**0.38**	1,078.20	**LNAPL Present**							
PH1-9402	12/23/19	1,167.09	88.76	**0.12**	1,078.33	**LNAPL Present**							
PH1-9402	01/29/20	1,167.09	89.30	**0.61**	1,077.79	**LNAPL Present**							
PH1-9402	02/14/20	1,167.09	89.31	**0.49**	1,077.78	**LNAPL Present**							
PH1-9402	05/07/20	1,167.09	89.29	**0.25**	1,077.80	**LNAPL Present**							
PH1-9402	06/01/20	1,167.09	89.34	**0.22**	1,077.75	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9402	06/22/20	1,167.09	89.37	**0.15**	1,077.72	**LNAPL Present**							
PH1-9402	08/10/20	1,167.09	89.35	**0.08**	1,077.74	**LNAPL Present**							
PH1-9402	12/09/20	1,167.09	89.66	**0.15**	1,077.43	**LNAPL Present**							
PH1-9402	01/14/21	1,167.09	89.78	**0.10**	1,077.31	**LNAPL Present**							
PH1-9402	04/05/21	1,167.09	89.67	0.00	1,077.42	--	--	--	--	--	--	--	--
PH1-9402	05/12/21	1,167.09	89.82	0.00	1,077.27	--	--	--	--	--	--	--	--
PH1-9402	07/13/21	1,167.09	90.22	**0.22**	1,076.87	**LNAPL Present**							
PH1-9402	09/29/21	1,167.09	90.55	**0.16**	1,076.54	**LNAPL Present**							
PH1-9402	11/15/21	1,167.09	90.45	**0.05**	1,076.64	**LNAPL Present**							
PH1-9402	02/23/22	1,167.09	90.74	**0.04**	1,076.35	**LNAPL Present**							
PH1-9402	04/12/22	1,167.09	90.89	**0.16**	1,076.20	**LNAPL Present**							
PH1-9402	07/25/22	1,167.09	91.59	**0.81**	1,075.50	**LNAPL Present**							
	Screen Interval 75-95 feet bgs / Total Well Depth 95 feet bgs												
PH1-9601	08/14/96	1,165.44	85.58	0.00	1,079.86	--	--	--	<250	<0.500	0.566	<0.500	<1.00
PH1-9601	09/19/96	1,165.44	85.62	0.00	1,079.82	--	--	--	--	--	--	--	--
PH1-9601	11/22/96	1,165.44	86.07	0.00	1,079.37	--	--	--	--	--	--	--	--
PH1-9601	07/24/97	1,165.44	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9601	05/25/04	1,165.44	89.39	0.00	1,076.05	--	ND	--	--	--	--	--	--
PH1-9601	09/09/04	1,165.44	89.56	0.00	1,075.88	--	ND	--	--	--	--	--	--
PH1-9601	11/11/04	1,165.44	89.61	0.00	1,075.83	--	<100	--	--	--	--	--	--
PH1-9601	03/22/05	1,165.44	89.62	0.00	1,075.82	--	ND	--	--	--	--	--	--
PH1-9601	06/02/05	1,165.44	89.73	0.00	1,075.71	--	ND	--	--	--	--	--	--
PH1-9601	09/27/05	1,165.44	89.79	0.00	1,075.65	--	<100	<100	--	--	--	--	--
PH1-9601	12/02/05	1,165.44	89.59	0.00	1,075.85	--	<100	<100	--	--	--	--	--
PH1-9601	03/28/06	1,165.44	88.39	0.00	1,077.05	--	<100 (QSG)	--	--	--	--	--	--
PH1-9601	06/06/06	1,165.44	88.17	0.00	1,077.27	--	<93.9 (QSG)	<93.9 (QSG)	--	--	--	--	--
PH1-9601	10/19/07	1,165.44	88.19	0.00	1,077.25	<250	<100	<100	--	<1.00	<1.00	<1.00	<3.00
PH1-9601	05/12/08	1,165.44	88.55	0.00	1,076.89	--	--	--	--	--	--	--	--
PH1-9601	05/14/08	1,165.44	88.58	0.00	1,076.86	<100	<95.2	100	--	<1.00	<1.00	<1.00	<3.00
PH1-9601	12/30/08	1,165.44	89.60	0.00	1,075.84	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9601	12/31/08	1,165.44	89.59	0.00	1,075.85	190	253	<99.0	--	<1.00	<1.00	<1.00	<3.00
PH1-9601	06/22/09	1,165.44	88.57	0.00	1,076.87	--	--	--	--	--	--	--	--
PH1-9601	06/23/09	1,165.44	88.63	0.00	1,076.81	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
PH1-9601	11/04/09	1,165.44	88.62	0.00	1,076.82	--	--	--	--	--	--	--	--
PH1-9601	11/05/09	1,165.44	88.82	0.00	1,076.62	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
PH1-9601	05/19/10	1,165.44	88.84	0.00	1,076.60	--	--	--	--	--	--	--	--
PH1-9601	05/20/10	1,165.44	89.32	0.00	1,076.12	<100	<96.2	<96.2	--	<1.00	<1.00	<1.00	<3.00
PH1-9601	11/08/10	1,165.44	88.33	0.00	1,077.11	<100	<111	<111	--	<1.00	<1.00	<1.00	<3.00
PH1-9601	05/17/11	1,165.44	88.54	0.00	1,076.90	<100	<99.0	<99.0	--	<1.00	<1.00	<1.00	<3.00
PH1-9601	12/14/11	1,165.44	88.57	0.00	1,076.87	<100	<97.1	<243	--	<1.00	<1.00	<1.00	<3.00
PH1-9601	10/15/19	1,165.44	87.40	0.00	1,078.04	--	--	--	--	--	--	--	--
	Screen Interval 77-97 feet bgs / Total Well Depth 97 feet bgs												
PH1-9602	08/14/96	1,167.66	89.12	0.00	1,078.54	--	--	--	<250	<0.500	<0.500	<0.500	<1.00
PH1-9602	09/19/96	1,167.66	89.14	0.00	1,078.52	--	--	--	--	--	--	--	--
PH1-9602	11/22/96	1,167.66	89.34	0.00	1,078.32	--	--	--	--	--	--	--	--
PH1-9602	07/24/97	1,167.66	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9602	05/25/04	1,167.66	92.51	0.00	1,075.15	--	ND	--	--	--	--	--	--
PH1-9602	09/09/04	1,167.66	92.63	0.00	1,075.03	--	ND	--	--	--	--	--	--
PH1-9602	11/11/04	1,167.66	92.73	0.00	1,074.93	--	<100	--	--	--	--	--	--
PH1-9602	03/22/05	1,167.66	92.71	0.00	1,074.95	--	ND	--	--	--	--	--	--
PH1-9602	06/02/05	1,167.66	92.74	0.00	1,074.92	--	ND	--	--	--	--	--	--
PH1-9602	09/27/05	1,167.66	92.84	0.00	1,074.82	--	<100	<100	--	--	--	--	--
PH1-9602	12/02/05	1,167.66	92.71	0.00	1,074.95	--	<100	<100	--	--	--	--	--
PH1-9602	03/28/06	1,167.66	91.58	0.00	1,076.08	--	<100 (QSG)	<100	--	--	--	--	--
PH1-9602	06/06/06	1,167.66	91.21	0.00	1,076.45	--	<93.9 (QSG)	<93.9 (QSG)	--	--	--	--	--
PH1-9602	10/19/07	1,167.66	91.45	0.00	1,076.21	<250	<98.0	<98.0	--	<1.00	<1.00	<1.00	<3.00
PH1-9602	05/12/08	1,167.66	91.52	0.00	1,076.14	--	--	--	--	--	--	--	--
PH1-9602	05/13/08	1,167.66	91.51	0.00	1,076.15	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
PH1-9602	12/30/08	1,167.66	92.72	0.00	1,074.94	--	--	--	--	--	--	--	--
PH1-9602	12/31/08	1,167.66	92.69	0.00	1,074.97	<100	<105	<105	--	<1.00	<1.00	<1.00	<3.00
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9602	06/22/09	1,167.66	92.47	0.00	1,075.19	--	--	--	--	--	--	--	--
PH1-9602	06/23/09	1,167.66	92.55	0.00	1,075.11	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
PH1-9602	11/04/09	1,167.66	92.55	0.00	1,075.11	--	--	--	--	--	--	--	--
PH1-9602	11/05/09	1,167.66	92.59	0.00	1,075.07	<100	<99.0	<99.0	--	<1.00	<1.00	<1.00	<3.00
PH1-9602	05/19/10	1,167.66	93.07	0.00	1,074.59	--	--	--	--	--	--	--	--
PH1-9602	05/20/10	1,167.66	93.14	0.00	1,074.52	<100	<111	<111	--	<1.00	<1.00	<1.00	<3.00
PH1-9602	11/08/10	1,167.66	92.69	0.00	1,074.97	--	--	--	--	--	--	--	--
PH1-9602	11/09/10	1,167.66	92.62	0.00	1,075.04	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
PH1-9602	05/17/11	1,167.66	91.67	0.00	1,075.99	<100	<94.3	<94.3	--	<1.00	<1.00	<1.00	<3.00
PH1-9602	12/14/11	1,167.66	91.53	0.00	1,076.13	--	--	--	--	--	--	--	--
PH1-9602	12/15/11	1,167.66	91.77	0.00	1,075.89	<100	<94.3	<236	--	<1.00	<1.00	<1.00	<3.00
PH1-9602	10/15/19	1,167.66	94.90	0.00	1,072.76	--	--	--	--	--	--	--	--
	Screen Interval 80-100 feet bgs / Total Well Depth 100 feet bgs												
PH1-9603	08/14/96	1,170.29	90.29	0.00	1,080.00	--	--	--	<250	<0.500	<0.500	<0.500	<1.00
PH1-9603	09/19/96	1,170.29	90.32	0.00	1,079.97	--	--	--	--	--	--	--	--
PH1-9603	11/22/96	1,170.29	90.47	0.00	1,079.82	--	--	--	--	--	--	--	--
PH1-9603	07/24/97	1,170.29	NM	--	--	--	<1,000	--	--	--	--	--	--
PH1-9603	05/25/04	1,170.29	93.54	0.00	1,076.75	--	ND	--	--	--	--	--	--
PH1-9603	09/09/04	1,170.29	93.91	0.00	1,076.38	--	ND/ND (b)	--	--	--	--	--	--
PH1-9603	11/11/04	1,170.29	94.03	0.00	1,076.26	--	<100	--	--	--	--	--	--
PH1-9603	03/22/05	1,170.29	94.03	0.00	1,076.26	--	ND	--	--	--	--	--	--
PH1-9603	06/02/05	1,170.29	94.09	0.00	1,076.20	--	ND	--	--	--	--	--	--
PH1-9603	09/27/05	1,170.29	94.21	0.00	1,076.08	--	201	267	--	--	--	--	--
PH1-9603	12/02/05	1,170.29	94.09	0.00	1,076.20	--	<100	<100	--	--	--	--	--
PH1-9603	03/28/06	1,170.29	93.03	0.00	1,077.26	--	<100 (QSG)	--	--	--	--	--	--
PH1-9603	06/06/06	1,170.29	92.62	0.00	1,077.67	--	<93.9 (QSG)	<93.9 (QSG)	--	--	--	--	--
PH1-9603	10/19/07	1,170.29	92.54	0.00	1,077.75	<250	113	<95.2	--	<1.00	<1.00	<1.00	<3.00
PH1-9603	05/12/08	1,170.29	92.73	0.00	1,077.56	--	--	--	--	--	--	--	--
PH1-9603	05/13/08	1,170.29	92.72	0.00	1,077.57	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
PH1-9603	12/30/08	1,170.29	93.93	0.00	1,076.36	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
PH1-9603	12/31/08	1,170.29	93.91	0.00	1,076.38	<100	<105	<105	--	<1.00	<1.00	<1.00	<3.00
PH1-9603	06/22/09	1,170.29	93.18	0.00	1,077.11	--	--	--	--	--	--	--	--
PH1-9603	06/23/09	1,170.29	93.22	0.00	1,077.07	<100	<100	<100	--	<1.00	<1.00	<1.00	<3.00
PH1-9603	11/04/09	1,170.29	92.11	0.00	1,078.18	--	--	--	--	--	--	--	--
PH1-9603	11/05/09	1,170.29	92.24	0.00	1,078.05	<100	<99.0	<99.0	--	<1.00	<1.00	<1.00	<3.00
PH1-9603	05/19/10	1,170.29	92.56	0.00	1,077.73	--	--	--	--	--	--	--	--
PH1-9603	05/20/10	1,170.29	92.83	0.00	1,077.46	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
PH1-9603	11/08/10	1,170.29	92.21	0.00	1,078.08	--	--	--	--	--	--	--	--
PH1-9603	11/09/10	1,170.29	92.29	0.00	1,078.00	<100	<99.0	<99.0	--	<1.00	<1.00	<1.00	<3.00
PH1-9603	05/17/11	1,170.29	92.61	0.00	1,077.68	<100	<100	<100	--	<1.00	<1.00	<1.00	<3.00
PH1-9603	12/14/11	1,170.29	92.76	0.00	1,077.53	--	--	--	--	--	--	--	--
PH1-9603	12/15/11	1,170.29	92.84	0.00	1,077.45	<100	<95.2	<238	--	<1.00	<1.00	<1.00	<3.00
PH1-9603	10/15/19	1,170.29	91.57	0.00	1,078.72	--	--	--	--	--	--	--	--
	Screen Interval 87.5-107.5 feet bgs / Total Well Depth 110 feet bgs												
MW13	05/12/08	1,160.84	90.12	0.00	1,070.72	<100	<97.1	118	--	<1.00	<1.00	<1.00	<3.00
MW13	12/30/08	1,160.84	88.41	0.00	1,072.43	<100	<99.0	<99.0	--	<1.00	<1.00	<1.00	<3.00
MW13	06/22/09	1,160.84	91.14	0.00	1,069.70	<100	<100	<100	--	<1.00	<1.00	<1.00	<3.00
MW13	11/04/09	1,160.84	90.74	0.00	1,070.10	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
MW13	05/19/10	1,160.84	91.29	0.00	1,069.55	--	--	--	--	--	--	--	--
MW13	05/20/10	1,160.84	91.36	0.00	1,069.48	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
MW13	11/08/10	1,160.84	91.04	0.00	1,069.80	--	--	--	--	--	--	--	--
		Destroyed											
	Screen Interval 90-110 feet bgs / Total Well Depth 110 feet bgs												
MW14	05/12/08	1,164.23	93.53	0.00	1,070.70	<100	126	286	--	<1.00	<1.00	<1.00	<3.00
MW14	12/30/08	1,164.23	91.85	0.00	1,072.38	--	--	--	--	--	--	--	--
MW14	12/31/08	1,164.23	91.83	0.00	1,072.40	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
MW14	06/22/09	1,164.23	93.36	0.00	1,070.87	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
MW14	11/04/09	1,164.23	92.05	0.00	1,072.18	<100	<99.0	<99.0	--	<1.00	<1.00	<1.00	<3.00
MW14	05/19/10	1,164.23	93.67	0.00	1,070.56	--	--	--	--	--	--	--	--
MW14	05/20/10	1,164.23	94.39	0.00	1,069.84	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
MW14	11/08/10	1,164.23 Destroyed	Inaccessible	--	--	--	--	--	--	--	--	--	--
	Screen Interval 88.5-108.5 feet bgs / Total Well Depth 111 feet bgs												
MW15	05/12/08	1,164.08	86.67	0.00	1,077.41	--	--	--	--	--	--	--	--
MW15	05/14/08	1,164.08	86.71	0.00	1,077.37	794	**14,100**	<952	--	<1.00	<1.00	<1.00	<3.00
MW15	06/22/09	1,164.08	88.43	0.00	1,075.65	--	--	--	--	--	--	--	--
MW15	06/23/09	1,164.08	88.46	0.00	1,075.62	<100	<96.2	<96.2	--	<1.00	<1.00	<1.00	<3.00
MW15	11/04/09	1,164.08	88.26	0.00	1,075.82	--	--	--	--	--	--	--	--
MW15	11/05/09	1,164.08	88.39	0.00	1,075.69	<100	<99.0	<99.0	--	<1.00	<1.00	<1.00	<3.00
MW15	05/19/10	1,164.08	88.24	**0.73**	1,075.84	**LNAPL Present**							
MW15	11/08/10	1,164.08	88.37	**0.91**	1,075.71	**LNAPL Present**							
MW15	05/17/11	1,164.08	86.74	**0.18**	1,077.34	**LNAPL Present**							
MW15	12/14/11	1,164.08	86.86	**0.19**	1,077.22	**LNAPL Present**							
MW15	12/02/15	1,164.08	88.73	**0.83**	1,075.35	**LNAPL Present**							
MW15	03/01/16	1,164.08	87.22	**0.03**	1,076.86	**LNAPL Present**							
MW15	07/27/16	1,164.08	85.81	**0.04**	1,078.27	**LNAPL Present**							
MW15	04/06/17	1,164.08	84.09	**0.07**	1,079.99	**LNAPL Present**							
MW15	06/16/17	1,164.08	83.64	**0.02**	1,080.44	**LNAPL Present**							
MW15	09/07/17	1,164.08	83.44	**0.01**	1,080.64	**LNAPL Present**							
MW15	01/09/18	1,164.08	89.11	0.00	1,074.97	--	--	--	--	--	--	--	--
MW15	01/30/19	1,164.08	84.65	0.00	1,079.43	--	--	--	--	--	--	--	--
MW15	10/15/19	1,164.08	85.90	**0.5**	1,078.18	**LNAPL Present**							
MW15	12/23/19	1,164.08	85.68	**0.16**	1,078.40	**LNAPL Present**							
MW15	01/29/20	1,164.08	85.80	**0.17**	1,078.28	**LNAPL Present**							
MW15	02/14/20	1,164.08	85.92	**0.17**	1,078.16	**LNAPL Present**							
MW15	05/07/20	1,164.08	86.11	**0.13**	1,077.97	**LNAPL Present**							
MW15	06/01/20	1,164.08	86.01	0.00	1,078.07	--	--	--	--	--	--	--	--
MW15	06/22/20	1,164.08	86.11	0.00	1,077.97	--	--	--	--	--	--	--	--
MW15	08/10/20	1,164.08	86.18	**0.01**	1,077.90	**LNAPL Present**							
MW15	12/09/20	1,164.08	86.49	**0.06**	1,077.59	**LNAPL Present**							
MW15	01/14/21	1,164.08	86.55	**0.05**	1,077.53	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
MW15	04/05/21	1,164.08	86.56	**0.01**	1,077.52	**LNAPL Present**							
MW15	05/12/21	1,164.08	86.76	**0.01**	1,077.32	**LNAPL Present**							
MW15	07/13/21	1,164.08	86.94	**0.03**	1,077.14	**LNAPL Present**							
MW15	09/29/21	1,164.08	87.36	**0.03**	1,076.72	**LNAPL Present**							
MW15	11/15/21	1,164.08	87.31	**0.01**	1,076.77	**LNAPL Present**							
MW15	02/23/22	1,164.08	87.56	**0.02**	1,076.52	**LNAPL Present**							
MW15	04/12/22	1,164.08	87.67	**0.06**	1,076.41	**LNAPL Present**							
MW15	07/25/22	1,164.08	87.81	**0.01**	1,076.27	**LNAPL Present**							
	Screen Interval 90-130 feet bgs / Total Well Depth 131 feet bgs												
MW16	05/12/08	1,174.95	107.38	0.00	1,067.57	--	--	--	--	--	--	--	--
MW16	05/13/08	1,174.95	107.39	0.00	1,067.56	<100	411	<100	--	<1.00	<1.00	<1.00	<3.00
MW16	12/30/08	1,174.95	109.47	0.00	1,065.48	<100	<104	<104	--	<1.00	<1.00	<1.00	<3.00
MW16	06/22/09	1,174.95	106.99	0.00	1,067.96	--	--	--	--	--	--	--	--
MW16	06/23/09	1,174.95	106.92	0.00	1,068.03	<100	<98.0	<98.0	--	<1.00	<1.00	<1.00	<3.00
MW16	11/04/09	1,174.95	105.42	0.00	1,069.53	--	--	--	--	--	--	--	--
MW16	11/05/09	1,174.95	105.51	0.00	1,069.44	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
MW16	05/19/10	1,174.95	104.63	0.00	1,070.32	--	--	--	--	--	--	--	--
MW16	05/20/10	1,174.95	104.85	0.00	1,070.10	<100	<105	<105	--	<1.00	<1.00	<1.00	<3.00
MW16	11/08/10	1,174.95	103.27	0.00	1,071.68	--	--	--	--	--	--	--	--
		Destroyed											
	Screen Interval 100-130 feet bgs / Total Well Depth 130 feet bgs												
MW17	05/12/08	1,181.31	116.67	0.00	1,064.64	--	--	--	--	--	--	--	--
MW17	05/13/08	1,181.31	116.68	0.00	1,064.63	<100	<97.1	<97.1	--	<1.00	<1.00	<1.00	<3.00
MW17	06/22/09	1,181.31	116.69	0.00	1,064.62	--	--	--	--	--	--	--	--
MW17	06/23/09	1,181.31	116.70	0.00	1,064.61	<100	<98.0	<98.0	--	<1.00	<1.00	<1.00	<3.00
MW17	11/04/09	1,181.31	116.23	0.00	1,065.08	--	--	--	--	--	--	--	--
MW17	11/05/09	1,181.31	116.31	0.00	1,065.00	<100	<98.0	<98.0	--	<1.00	<1.00	<1.00	<3.00
MW17	05/19/10	1,181.31	115.39	0.00	1,065.92	--	--	--	--	--	--	--	--
MW17	05/20/10	1,181.31	116.02	0.00	1,065.29	<100	<95.2	<95.2	--	<1.00	<1.00	<1.00	<3.00
MW17	11/08/10	1,181.31	114.33	0.00	1,066.98	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
		Destroyed											
	Screen Interval 110-150 feet bgs / Total Well Depth 151 feet bgs												
MW18	05/12/08	1,186.10	124.39	0.00	1,061.71	--	--	--	--	--	--	--	--
MW18	05/13/08	1,186.10	124.34	0.00	1,061.76	150	320 (A-01)	**662 (A-01)**	--	<1.00	<1.00	<1.00	<3.00
MW18	12/30/08	1,186.10	126.80	0.00	1,059.30	<100	<104	400	--	<1.00	<1.00	<1.00	<3.00
MW18	06/22/09	1,186.10	127.55	0.00	1,058.55	<100	<111	<111	--	<1.00	<1.00	<1.00	<3.00
MW18	11/04/09	1,186.10	128.41	0.00	1,057.69	--	--	--	--	--	--	--	--
MW18	11/05/09	1,186.10	128.46	0.00	1,057.64	<100	<98.0	<98.0	--	<1.00	<1.00	<1.00	<3.00
MW18	05/19/10	1,186.10	126.75	0.00	1,059.35	<100	289	**619**	--	<1.00	<1.00	<1.00	<3.00
MW18	11/08/10	1,186.10	125.88	0.00	1,060.22	--	--	--	--	--	--	--	--
		Destroyed											
	Screen Interval 70-100 feet bgs / Total Well Depth 100 feet bgs												
MW19	05/17/11	NE	88.71	0.00	--	--	--	--	--	--	--	--	--
MW19	05/18/11	NE	88.36	0.00	--	<100	<96.2	<96.2	--	<1.00	<1.00	<1.00	<3.00
MW19	12/14/11	NE	88.83	0.00	--	--	--	--	--	--	--	--	--
MW19	12/15/11	NE	88.68	0.00	--	<100	<111	<278	--	<1.00	<1.00	<1.00	<3.00
MW19	10/15/19	NE	87.56	0.00	--	--	--	--	--	--	--	--	--
	Screen Interval 80-100 feet bgs / Total Well Depth 100 feet bgs												
MW20	05/17/11	NE	90.41	0.00	--	255	**1,410 (QP7)**	180 (QP5)	--	<1.00	<1.00	<1.00	<3.00
MW20	12/14/11	NE	90.42	0.00	--	--	--	--	--	--	--	--	--
MW20	12/15/11	NE	90.76	0.00	--	139	**2,850 (QP7)**	<312	--	<1.00	<1.00	<1.00	<3.00
MW20	04/06/17	NE	87.91	**0.11**	--	**LNAPL Present**							
MW20	06/16/17	NE	87.44	**0.06**	--	**LNAPL Present**							
MW20	09/07/17	NE	87.29	**0.07**	--	**LNAPL Present**							
MW20	01/30/19	NE	88.53	**0.13**	--	**LNAPL Present**							
MW20	04/30/19	NE	88.83	**0.16**	--	**LNAPL Present**							
MW20	07/18/19	NE	89.15	**0.24**	--	**LNAPL Present**							
MW20	08/07/19	NE	89.19	**0.24**	--	**LNAPL Present**							
MW20	10/15/19	NE	89.45	**0.23**	--	**LNAPL Present**							
MW20	12/23/19	NE	89.54	**0.21**	--	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
MW20	01/29/20	NE	89.65	**0.23**	--	**LNAPL Present**							
MW20	02/14/20	NE	89.82	**0.28**	--	**LNAPL Present**							
MW20	05/07/20	NE	90.00	**0.25**	--	**LNAPL Present**							
MW20	06/01/20	NE	90.03	**0.27**	--	**LNAPL Present**							
MW20	06/22/20	NE	89.91	0.00	--	--	--	--	--	--	--	--	--
MW20	08/10/20	NE	89.97	**0.02**	--	**LNAPL Present**							
MW20	12/09/20	NE	90.27	**0.02**	--	**LNAPL Present**							
MW20	01/14/21	NE	90.40	**0.05**	--	**LNAPL Present**							
MW20	04/05/21	NE	90.36	**0.02**	--	**LNAPL Present**							
MW20	05/12/21	NE	90.47	**0.02**	--	**LNAPL Present**							
MW20	07/13/21	NE	90.73	**0.03**	--	**LNAPL Present**							
MW20	09/29/21	NE	91.20	**0.12**	--	**LNAPL Present**							
MW20	11/15/21	NE	91.12	**0.04**	--	**LNAPL Present**							
MW20	02/23/22	NE	91.46	**0.11**	--	**LNAPL Present**							
MW20	04/12/22	NE	91.53	**0.11**	--	**LNAPL Present**							
MW20	07/25/22	NE	91.70	**0.13**	--	**LNAPL Present**							
	Screen Interval 80-100 feet bgs / Total Well Depth 100 feet bgs												
MW21	05/17/11	NE	92.35	**2.69**	--	**LNAPL Present**							
MW21	12/14/11	NE	92.09	**2.27**	--	**LNAPL Present**							
MW21	12/02/15	NE	93.31	**2.15**	--	**LNAPL Present**							
MW21	03/01/16	NE	92.30	**1.91**	--	**LNAPL Present**							
MW21	07/27/16	NE	90.08	**0.88**	--	**LNAPL Present**							
MW21	04/06/17	NE	87.99	**0.51**	--	**LNAPL Present**							
MW21	06/16/17	NE	87.59	**0.54**	--	**LNAPL Present**							
MW21	09/07/17	NE	87.42	**0.57**	--	**LNAPL Present**							
MW21	01/30/19	NE	88.56	**0.49**	--	**LNAPL Present**							
MW21	03/28/19	NE	88.91	**0.54**	--	**LNAPL Present**							
MW21	04/30/19	NE	88.86	**0.50**	--	**LNAPL Present**							
MW21	06/11/19	NE	88.95	**0.46**	--	**LNAPL Present**							
MW21	07/18/19	NE	89.09	**0.49**	--	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
MW21	08/07/19	NE	89.10	**0.45**	--	**LNAPL Present**							
MW21	10/15/19	NE	89.36	**0.46**	--	**LNAPL Present**							
MW21	12/23/19	NE	89.30	**0.24**	--	**LNAPL Present**							
MW21	01/29/20	NE	89.29	**0.11**	--	**LNAPL Present**							
MW21	02/14/20	NE	89.49	**0.21**	--	**LNAPL Present**							
MW21	05/07/20	NE	89.62	**0.17**	--	**LNAPL Present**							
MW21	06/01/20	NE	89.73	**0.21**	--	**LNAPL Present**							
MW21	06/22/20	NE	89.81	**0.19**	--	**LNAPL Present**							
MW21	08/10/20	NE	89.79	**0.12**	--	**LNAPL Present**							
MW21	12/09/20	NE	90.32	**0.41**	--	**LNAPL Present**							
MW21	01/14/21	NE	90.56	**0.58**	--	**LNAPL Present**							
MW21	04/05/21	NE	90.62	**0.67**	--	**LNAPL Present**							
MW21	05/12/21	NE	91.02	**1.00**	--	**LNAPL Present**							
MW21	07/13/21	NE	91.68	**1.52**	--	**LNAPL Present**							
MW21	09/29/21	NE	92.25	**1.73**	--	**LNAPL Present**							
MW21	11/15/21	NE	92.29	**1.81**	--	**LNAPL Present**							
MW21	02/23/22	NE	92.63	**1.85**	--	**LNAPL Present**							
MW21	04/12/22	NE	92.63	**1.80**	--	**LNAPL Present**							
MW21	07/25/22	NE	92.89	**1.88**	--	**LNAPL Present**							
	Screen Interval 80-100 feet bgs / Total Well Depth 105 feet bgs												
MW22	05/17/11	NE	91.21	**1.22**	--	**LNAPL Present**							
MW22	12/14/11	NE	91.79	**1.85**	--	**LNAPL Present**							
MW22	12/02/15	NE	93.35	**2.07**	--	**LNAPL Present**							
MW22	03/01/16	NE	92.17	**1.60**	--	**LNAPL Present**							
MW22	07/27/16	NE	89.58	**0.14**	--	**LNAPL Present**							
MW22	04/06/17	NE	87.79	**0.10**	--	**LNAPL Present**							
MW22	06/16/17	NE	87.41	**0.20**	--	**LNAPL Present**							
MW22	09/07/17	NE	87.33	**0.33**	--	**LNAPL Present**							
MW22	01/09/18	NE	87.90	**0.62**	--	**LNAPL Present**							
MW22	01/30/19	NE	88.45	**0.21**	--	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 27 of 31

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
MW22	03/28/19	NE	88.82	**0.29**	--	**LNAPL Present**							
MW22	04/30/19	NE	88.81	**0.28**	--	**LNAPL Present**							
MW22	06/11/19	NE	88.90	**0.25**	--	**LNAPL Present**							
MW22	07/18/19	NE	88.81	0.00	--	--	--	--	--	--	--	--	--
MW22	08/07/19	NE	88.86	**0.01**	--	**LNAPL Present**							
MW22	10/15/19	NE	89.14	**0.03**	--	**LNAPL Present**							
MW22	12/23/19	NE	89.26	**0.01**	--	**LNAPL Present**							
MW22	01/29/20	NE	89.35	**0.03**	--	**LNAPL Present**							
MW22	02/14/20	NE	89.49	**0.07**	--	**LNAPL Present**							
MW22	05/07/20	NE	89.67	**0.02**	--	**LNAPL Present**							
MW22	06/01/20	NE	89.70	**0.03**	--	**LNAPL Present**							
MW22	06/22/20	NE	89.82	**0.07**	--	**LNAPL Present**							
MW22	08/10/20	NE	89.88	**0.08**	--	**LNAPL Present**							
MW22	12/09/20	NE	90.18	**0.08**	--	**LNAPL Present**							
MW22	01/14/21	NE	90.40	**0.21**	--	**LNAPL Present**							
MW22	04/05/21	NE	90.45	**0.29**	--	**LNAPL Present**							
MW22	05/12/21	NE	90.84	**0.62**	--	**LNAPL Present**							
MW22	07/13/21	NE	91.68	**1.37**	--	**LNAPL Present**							
MW22	09/29/21	NE	92.37	**1.72**	--	**LNAPL Present**							
MW22	11/15/21	NE	92.41	**1.81**	--	**LNAPL Present**							
MW22	02/23/22	NE	92.75	**1.83**	--	**LNAPL Present**							
MW22	04/12/22	NE	92.84	**1.88**	--	**LNAPL Present**							
MW22	07/25/22	NE	93.04	**1.94**	--	**LNAPL Present**							
	Screen Interval 70-100 feet bgs / Total Well Depth 101 feet bgs												
MW23	04/06/17	NE	87.11	0.00	--	--	--	--	--	--	--	--	--
MW23	06/16/17	NE	86.70	0.00	--	--	--	--	--	--	--	--	--
MW23	09/07/17	NE	86.51	0.00	--	--	--	--	--	--	--	--	--
MW23	01/30/19	NE	87.71	0.00	--	--	--	--	--	--	--	--	--
MW23	04/30/19	NE	88.00	**Sheen**	--	**LNAPL Present**							
MW23	07/18/19	NE	88.24	0.00	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
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Moses Lake, Washington
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
MW23	10/15/19	NE	88.52	0.00	--	--	--	--	--	--	--	--	--
MW23	06/22/20	NE	89.19	0.00	--	--	--	--	--	--	--	--	--
MW23	08/10/20	NE	89.21	0.00	--	--	--	--	--	--	--	--	--
MW23	12/09/20	NE	89.49	0.00	--	--	--	--	--	--	--	--	--
MW23	01/14/21	NE	89.59	0.00	--	--	--	--	--	--	--	--	--
MW23	04/05/21	NE	89.59	0.00	--	--	--	--	--	--	--	--	--
MW23	05/12/21	NE	89.72	0.00	--	--	--	--	--	--	--	--	--
MW23	07/13/21	NE	89.94	0.00	--	--	--	--	--	--	--	--	--
MW23	09/29/21	NE	90.35	0.00	--	--	--	--	--	--	--	--	--
MW23	11/15/21	NE	90.32	0.00	--	--	--	--	--	--	--	--	--
MW23	02/23/22	NE	90.60	0.00	--	--	--	--	--	--	--	--	--
MW23	04/12/22	NE	90.67	0.00	--	--	--	--	--	--	--	--	--
MW23	07/25/22	NE	90.82	0.00	--	--	--	--	--	--	--	--	--
	Screen Interval 80-100 feet bgs / Total Well Depth 102.5 feet bgs												
MW24	04/06/17	NE	88.04	**0.67**	--	**LNAPL Present**							
MW24	06/16/17	NE	87.57	**0.62**	--	**LNAPL Present**							
MW24	09/07/17	NE	87.38	**0.62**	--	**LNAPL Present**							
MW24	01/30/19	NE	88.73	**0.79**	--	**LNAPL Present**							
MW24	03/28/19	NE	89.09	**0.84**	--	**LNAPL Present**							
MW24	04/30/19	NE	88.43	**0.04**	--	**LNAPL Present**							
MW24	06/11/19	NE	88.61	**0.13**	--	**LNAPL Present**							
MW24	07/18/19	NE	88.75	**0.15**	--	**LNAPL Present**							
MW24	10/15/19	NE	89.02	**0.12**	--	**LNAPL Present**							
MW24	06/22/20	NE	89.82	**0.30**	--	**LNAPL Present**							
MW24	08/10/20	NE	89.79	**0.20**	--	**LNAPL Present**							
MW24	12/09/20	NE	90.04	**0.14**	--	**LNAPL Present**							
MW24	01/14/21	NE	90.24	**0.26**	--	**LNAPL Present**							
MW24	04/05/21	NE	90.19	**0.21**	--	**LNAPL Present**							
MW24	05/12/21	NE	90.31	**0.21**	--	**LNAPL Present**							
MW24	07/13/21	NE	90.52	**0.20**	--	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
MW24	09/29/21	NE	90.98	**0.26**	--	**LNAPL Present**							
MW24	11/15/21	NE	90.87	**0.08**	--	**LNAPL Present**							
MW24	02/23/22	NE	91.31	**0.29**	--	**LNAPL Present**							
MW24	04/12/22	NE	91.34	**0.30**	--	**LNAPL Present**							
MW24	07/25/22	NE	91.66	**0.46**	--	**LNAPL Present**							
	Screen Interval 80-100 feet bgs / Total Well Depth 101 feet bgs												
MW25	12/02/15	NE	92.92	**1.68**	--	**LNAPL Present**							
MW25	03/01/16	NE	91.47	**0.85**	--	**LNAPL Present**							
MW25	07/27/16	NE	89.40	0.00	--	--	--	--	--	--	--	--	--
MW25	04/06/17	NE	87.57	0.00	--	--	--	--	--	--	--	--	--
MW25	06/16/17	NE	87.15	0.00	--	--	--	--	--	--	--	--	--
MW25	09/07/17	NE	86.95	0.00	--	--	--	--	--	--	--	--	--
MW25	01/09/18	NE	87.23	0.00	--	--	--	--	--	--	--	--	--
MW25	01/30/19	NE	88.20	0.00	--	--	--	--	--	--	--	--	--
MW25	04/30/19	NE	88.45	**Sheen**	--	**LNAPL Present**							
MW25	07/18/19	NE	88.70	0.00	--	--	--	--	--	--	--	--	--
MW25	10/15/19	NE	89.01	0.00	--	--	--	--	--	--	--	--	--
MW25	06/22/20	NE	89.66	0.00	--	--	--	--	--	--	--	--	--
MW25	08/10/20	NE	89.71	0.00	--	--	--	--	--	--	--	--	--
MW25	12/09/20	NE	90.02	**0.01**	--	**LNAPL Present**							
MW25	01/14/21	NE	90.15	**0.01**	--	**LNAPL Present**							
MW25	04/05/21	NE	90.15	**0.03**	--	**LNAPL Present**							
MW25	05/12/21	NE	90.3	**0.08**	--	**LNAPL Present**							
MW25	07/13/21	NE	90.53	**0.10**	--	**LNAPL Present**							
MW25	09/29/21	NE	90.97	**0.14**	--	**LNAPL Present**							
MW25	11/15/21	NE	90.92	**0.08**	--	**LNAPL Present**							
MW25	02/23/22	NE	91.40	**0.29**	--	**LNAPL Present**							
MW25	04/12/22	NE	91.97	**0.93**	--	**LNAPL Present**							
MW25	07/25/22	NE	92.57	**1.48**	--	**LNAPL Present**							
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

TABLE 4
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TPH AND BTEX

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	LNAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHo (µg/L)	TPH Jet Fuel A (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
	Screen Interval 80-100 feet bgs / Total Well Depth 101 feet bgs												
MW26	12/02/15	NE	92.02	**1.23**	--	**LNAPL Present**							
MW26	03/01/16	NE	91.20	**0.99**	--	**LNAPL Present**							
MW26	07/27/16	NE	89.08	**0.09**	--	**LNAPL Present**							
MW26	04/06/17	NE	87.20	**0.02**	--	**LNAPL Present**							
MW26	06/16/17	NE	86.73	0.00	--	--	--	--	--	--	--	--	--
MW26	09/07/17	NE	86.55	0.00	--	--	--	--	--	--	--	--	--
MW26	01/30/19	NE	87.78	**0.01**	--	**LNAPL Present**							
MW26	10/15/19	NE	88.58	**0.01**	--	**LNAPL Present**							
MW26	06/22/20	NE	89.41	**0.20**	--	**LNAPL Present**							
MW26	08/10/20	NE	89.41	**0.15**	--	**LNAPL Present**							
MW26	12/09/20	NE	89.74	**0.15**	--	**LNAPL Present**							
MW26	01/14/21	NE	89.90	**0.21**	--	**LNAPL Present**							
MW26	04/05/21	NE	89.85	**0.16**	--	**LNAPL Present**							
MW26	05/12/21	NE	90.04	**0.24**	--	**LNAPL Present**							
MW26	07/13/21	NE	90.31	**0.32**	--	**LNAPL Present**							
MW26	09/29/21	NE	90.89	**0.53**	--	**LNAPL Present**							
MW26	11/15/21	NE	90.84	**0.48**	--	**LNAPL Present**							
MW26	02/23/22	NE	91.45	**0.85**	--	**LNAPL Present**							
MW26	04/12/22	NE	91.61	**0.99**	--	**LNAPL Present**							
MW26	07/25/22	NE	92.29	**1.64**	--	**LNAPL Present**							
	Screen Interval 90-95/105-108 feet bgs / Total Well Depth 108 feet bgs												
SP1	05/17/11	NE	86.41	0.00	--	--	--	--	--	--	--	--	--
SP1	12/14/11	NE	86.91	0.00	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000(a)	500	500	500	5	1,000	700	1,000
MTCA Method B Cleanup Levels - Noncancer						NE	NE	NE	NE	32	640	800	1,600
MTCA Method B Cleanup Levels - Cancer						NE	NE	NE	NE	0.8	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer						NE	NE	NE	NE	70	1,400	1,800	3,500
MTCA Method C Cleanup Levels - Cancer						NE	NE	NE	NE	8	NE	NE	NE

EXPLANATION:

Wellhead elevations were taken from prior consultant reports
Data collected before 10/19/07 were taken from prior consultants
Shaded values equal or exceed MTCA Method A Cleanup Levels
feet bgs = Feet below ground surface
µg/L = Micrograms per liter
DTW = Depth to water in feet below top of casing
GW elevation has been corrected for NAPL using the formula: (Reference Elevation - DTW + (NAPL*0.8))
TPHg = Total petroleum hydrocarbons as gasoline in accordance with Ecology Method NWTPH-Gx
TPHd and TPHo = Total Petroleum Hydrocarbons as Diesel and Oil, respectively, in accordance with Ecology Method NWTPH-Dx; TPHmo in accordance with EPA 418.1 in 1992
B = Benzene; T = Toluene; E = Ethylbenzene; X = Total xylenes
BTEX = Aromatic compounds in accordance with EPA Method 8021B or 8260B - refer to laboratory reports
LNAPL = Light non-aqueous phase liquid thickness in feet
ND = Not detected
NE = Not established
NM = Not measured
< = Less than the stated laboratory reporting limit
-- = Not analyzed
(a) = TPHg cleanup level for groundwater is 800 µg/L if benzene is present, or 1,000 µg/L if benzene is not present
(b) = Duplicate sample collected, laboratory results indicate sample and field duplicate contained the listed concentration
(c) = Diesel range organics appear to be kerosene
(d) = Diesel range organics appear to be kerosene / jet A fuel
(e) = Diesel range organics appear to be jet A fuel
(f) = In addition to diesel, sample contains diesel range hydrocarbons that do not appear to be diesel
(g) = 1992 reports list date ranges (01/13-16/92, 04/21-23/92, 07/14-16/92) only; first date of date range listed on table
(QP) = Hydrocarbon result partly due to individual peak(s) in quantitation range
(QP5) = There was insufficient contamination present to perform a pattern match
(QP6) = The contamination did not match any standards in our library
(QP7) = The hydrocarbon pattern most closely resembles a light petroleum product
(QSG) = Silica gel cleanup performed on extracts
(A-01) = Contamination elutes between C10 and C18 and does not match any standards in the laboratory reference library

TABLE 5

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - PURGEABLE PETROLEUM HYDROCARBONS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date	Aliphatics				Aromatics		
		C5-C6 (µg/L)	C6-C8 (µg/L)	C8-C10 (µg/L)	C10-C12 (µg/L)	C8-C10 (µg/L)	C10-C12 (µg/L)	C12-C13 (µg/L)
MW18	05/19/10	<50.0	<50.0	<50.0	1.55J	<50.0	<50.0	0.487J

EXPLANATION:

µg/L = Micrograms per liter
Purgeable Petroleum Hydrocarbons analyzed in accordance with Ecology Method NWTPH-VPH
< = Less than the stated laboratory reporting limit
J = Denotes a result that is an estimated value between the laboratory method detection limit and the method reporting limit

TABLE 6

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - EXTRACTABLE PETROLEUM HYDROCARBONS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date		EPH Screen (µg/L)	Aliphatics					Aromatics				
				C8-C10 (µg/L)	**C10-C12 (µg/L)**	**C12-C16 (µg/L)**	**C16-C21 (µg/L)**	**C21-C34 (µg/L)**	**C8-C10 (µg/L)**	**C10-C12 (µg/L)**	**C12-C16 (µg/L)**	**C16-C21 (µg/L)**	**C21-C34 (µg/L)**
91-AW4	03/22/05		<500	--	--	--	--	--	--	--	--	--	--
PH1-9304	03/22/05		<500	--	--	--	--	--	--	--	--	--	--
PH1-9304	03/22/05	Duplicate	<500	--	--	--	--	--	--	--	--	--	--
PH1-9401	03/22/05		<500	--	--	--	--	--	--	--	--	--	--
MW18	05/19/10		--	<20.0	<10.0	<30.0	<50.0	<50.0	<50.0	<10.0	<40.0	<30.0	<50.0

EXPLANATION:

µg/L = Micrograms per liter
Extractable Petroleum Hydrocarbons (EPH) analyzed in accordance with Ecology Method NWTPH-EPH
< = Less than the stated laboratory reporting limit

TABLE 7
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - ADDITIONAL VOCs

Port of Moses Lake Pumphouse 1
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Moses Lake, Washington
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Sample Name	Sampling Date		Carbon Tetrachloride (µg/L)	Chlorobenzene (µg/L)	EDB (µg/L)	EDC (µg/L)	n-Hexane (µg/L)	Naphthalene (µg/L)	MTBE (µg/L)	TCE (µg/L)	VOCs (µg/L)
91-AW4	01/13/92		--	--	--	--	--	--	--	--	ND
91-AW4	07/14/92		--	--	--	--	--	--	--	--	ND
91-AW5	01/13/92		--	--	--	--	--	--	--	--	ND
91-AW5	07/14/92		--	--	--	--	--	--	--	--	ND
91-AW6	01/13/92		<1	<1	--	--	--	--	--	<1	ND
91-AW6	01/13/92	Duplicate	<1	<1	--	--	--	--	--	<1	ND
91-AW6	01/13/92	Triplicate	<1	<1	--	--	--	--	--	<1	ND
91-AW6	04/21/92		<50	<50	--	--	--	--	--	<50	ND
91-AW6	04/21/92	Duplicate	<10 (J)	<10 (J)	--	--	--	--	--	<10.0 (J)	ND
91-AW6	04/21/92	Triplicate	<50	<50	--	--	--	--	--	<50	ND
91-AW6	07/14/92		<20	<20	--	--	--	--	--	<20	ND
91-AW6	07/14/92	Duplicate	<5	<5	--	--	--	--	--	<5	ND
91-AW6	07/14/92	Triplicate	<20	<20	--	--	--	--	--	<20	ND
91-BW2	01/13/92		--	--	--	--	--	--	--	--	ND
91-BW2	07/14/92		--	--	--	--	--	--	--	--	ND
MW18	05/19/10		--	--	<1.00	<1.00	<2.00	<5.00	<1.00	--	--
MTCA Method A Cleanup Levels			NE	NE	0.01	5	NE	160	20	5	NE
MTCA Method B Cleanup Levels - Noncancer			32	160	72	48	480	160	NE	4	NE
MTCA Method B Cleanup Levels - Cancer			0.63	NE	0.022	0.48	NE	NE	24	0.54	NE
MTCA Method C Cleanup Levels - Noncancer			70	350	160	110	1,100	350	NE	8.8	NE
MTCA Method C Cleanup Levels - Cancer			6.3	NE	0.22	4.8	NE	NE	240	9.5	NE

TABLE 7

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - ADDITIONAL VOCs

Port of Moses Lake Pumphouse 1
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EXPLANATION:

1992 reports list date ranges (01/13-16/92, 04/21-23/92, 07/14-16/92) only; first date of date range listed on table
Shaded and bold values equal or exceed the MTCA Method Cleanup Levels
µg/L = Micrograms per Liter
EDB = 1,2-Dibromoethane
EDC = 1,2-Dichloroethane
MTBE = Methyl tertiary butyl ether
ND = Not detected
NE = Not extablished
TCE = Trichloroethene
VOCs = Volatile Organic Compounds in accordance with EPA Method 8240 or 8260B - refer to laboratory report
-- = Not analyzed
< = Less than laboratory reporting limit
(J) = The sample quantification limit is an estimated quantity

TABLE 8
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - PAHs, SVOCs, PESTICIDES, AND PCBs

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Sample Name	Sampling Date		Carcinogenic PAHs							Non-carcinogenic PAHs						Base Neutral Acids					
			Benzo(a)anthracene (µg/L)	Benzo(b)fluoranthene (µg/L)	Benzo(k)fluoranthene (µg/L)	Benzo(a)pyrene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h) anthracene (µg/L)	Indeno(1,2,3-cd) pyrene (µg/L)	2-Methylnaphthalene (µg/L)	Fluoranthene (µg/L)	Fluorene (µg/L)	Naphthalene (µg/L)	Phenanthrene (µg/L)	Pyrene (µg/L)	Bis(2-ethylhexyl) phthalate (µg/L)	Di-n-butylphthalate (µg/L)	Dibenzofuran (µg/L)	Phenol (µg/L)	Other SVOCs (µg/L)	Pesticides/PCBs (µg/L)
91-AW4	01/13/92		(b)	(b)	(b)	(b)	(b)	--	--	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	ND	ND
91-AW4	07/14/92		(b)	(b)	(b)	(b)	(b)	--	--	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	ND	ND
91-AW4	10/19/07		<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	--	--	--	--	--	--
91-AW5	01/13/92		(b)	(b)	(b)	(b)	(b)	--	--	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	ND	ND
91-AW5	07/14/92		(b)	(b)	(b)	(b)	(b)	--	--	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	ND	ND
91-AW6	01/13/92		<1	<1	<1	<1	<1	--	--	1.4	<1	<1	<1	<1	<1	<1	<1	<1	<2	ND	ND
91-AW6	01/13/92	Duplicate	<10 (J)	<10 (J)	<10 (J)	<10 (J)	<10 (J)	--	--	<10 (J)	<10 (J)	<10 (J)	<10 (J)	<10 (J)	<10 (J)	<10 (J)	<10 (J)	<10 (J)	<10	ND	ND
91-AW6	01/13/92	Triplicate	<1	<1	<1	<1	<1	--	--	1.9	<1	<1	0.4 (J)	<1	<1	<1	<1	<1	<2	ND	ND
91-AW6	04/21/92		5.8 (J)	<10	<10	<10	5.1 (J)	--	--	**1,500 (J)**	16	24	**420**	8.8 (J)	14	<10	<10	<10	<20	ND	ND
91-AW6	04/21/92	Duplicate	<25.0	<25.0	<25.0	<25.0	<25.0	--	--	**130**	<25	<25	55	<25	<25	<25	<25	<25	<25	ND	ND
91-AW6	04/21/92	Triplicate	<1	<1	<1	<1	<1	--	--	**94 (J)**	0.6 (J)	1.3	37	<1	0.7 (J)	<1.0	<1.0	1.4	<2	ND	ND
91-AW6	07/14/92		<5,600 (J)	2,600 (J)	1,900 (J)	**2,400 (J)**	<5,600 (J)	--	--	**83,000 (J)(a)**	<5,600 (J)	<5,600 (J)	**24,000 (J)**	<5,600 (J)	<5,600 (J)	<5,600 (J)	<5,600 (J)	<5,600 (J)	<11,000 (J)	(c)	ND
91-AW6	07/14/92	Duplicate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND
91-AW6	07/14/92	Triplicate	<4,800 (J)	1,300 (J)(N)	1,000 (J)	**1,300 (J)(N)**	<4,800 (J)	--	--	**72,000 (J)**	<4,800 (J)	<4,800 (J)	**21,000 (J)**	<4,800 (J)	<4,800 (J)	<4,800 (J)	<4,800 (J)	<4,800 (J)	<9,600 (J)	(c)	ND
91-AW6	10/19/07		<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	**84.8**	<2.05	<2.05	<2.05	<2.05	<2.05	--	--	--	--	--	--
91-BW2	01/13/92		(b)	(b)	(b)	(b)	(b)	--	--	(b)	(b)	(b)	(b)	(b)	(b)	0.4J	(b)	(b)	(b)	ND	ND
91-BW2	07/14/92		(b)	(b)	(b)	(b)	(b)	--	--	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	ND	ND
91-BW2	10/19/07		<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	--	--	--	--	--	--
PH1-9401	10/19/07		<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	--	--	--	--	--	--
PH1-9601	10/19/07		<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	--	--	--	--	--	--
PH1-9602	10/19/07		<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	--	--	--	--	--	--
PH1-9603	10/19/07		<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	--	--	--	--	--	--
MW18	05/19/10		<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	--	--	--	--	--	--
MTCA Method A Cleanup Levels			NE	NE	NE	0.1	NE	NE	NE	NE	NE	NE	160	NE	NE	NE	NE	NE	NE	NE	NE
MTCA Method B Cleanup Levels - Noncancer			NE	NE	NE	4.8	NE	NE	NE	32	640	320	160	NE	240	320	1,600	8	4,800	NE	NE
MTCA Method B Cleanup Levels - Cancer			NE	NE	NE	0.023	NE	NE	NE	NE	NE	NE	NE	NE	NE	6.3	NE	NE	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer			NE	NE	NE	11	NE	NE	NE	70	1,400	70	350	NE	530	700	3,500	18	11,000	NE	NE
MTCA Method C Cleanup Levels - Cancer			NE	NE	NE	0.88	NE	NE	NE	NE	NE	NE	NE	NE	NE	63	NE	NE	NE	NE	NE

TABLE 8

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - PAHs, SVOCs, PESTICIDES, AND PCBs

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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EXPLANATION:

1992 reports list date ranges (01/13-16/92, 04/21-23/92, 07/14-16/92) only; first date of date range listed on table
Shaded and bold values equal or exceed the MTCA Method Cleanup Levels
µg/L = Micrograms per liter
PAHs = Polycyclic aromatic hydrocarbons analyzed in accordance with EPA Method 8270 or 8270C - refer to laboratory report
Pesticides/PCBs = Pesticides and polychlorinated biphenyls in accordance with EPA Method 8082
SVOCs = Semi-volatile organic compounds analyzed in accordance with EPA Method 8270 or 8270C - refer to laboratory report
< = Less than stated laboratory reporting limit
-- = Not analyzed
ND = Not detected above laboratory reporting limits
NE = Not established
(a) = An oily immersible hydrocarbon product was observed. Re-extractions of sample 91-AW6 and in samples collected from well 91-AW6 in July 1992. This floating product caused difficulties in collection of representative samples and analytical difficulties, particularly in the base neutral acid analyses. Re-extraction of samples 91-AW6 and 91-AW6B were performed, resulting in compound concentrations 10- to 100-fold lower than the concentrations reported here.
(b) = PAHs not listed in report text or tables; laboratory report unavailable
(c) = Report table notes that various SVOCs were detected; laboratory report unavailable
(J) = The sample quantification limit is an estimated quantity
(N) = The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification

TABLE 9
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TEF-ADJUSTED CARCINOGENIC PAHs

Port of Moses Lake Pumphouse 1
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Moses Lake, Washington
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Sample Name	Sampling Date			Benzo(a) anthracene (µg/L)	Benzo(a) pyrene (µg/L)	Benzo(b) fluoranthene (µg/L)	Benzo(k) fluoranthene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h) anthracene (µg/L)	Indeno(1,2,3-cd) pyrene (µg/L)	Total cPAHs (a) (µg/L)
Toxicity Equivalency Factor				0.1	1	0.1	0.1	0.01	0.1	0.1	--
MTCA Method A Cleanup Level				--	0.1	--	--	--	--	--	0.1
91-AW4	01/13/92		Result	(b)	(b)	(b)	(b)	(b)	--	--	--
			1/2 RL	--	--	--	--	--	--	--	--
			TEQ*value	--	--	--	--	--	--	--	--
91-AW4	07/14/92		Result	(b)	(b)	(b)	(b)	(b)	--	--	--
			1/2 RL	--	--	--	--	--	--	--	--
			TEQ*value	--	--	--	--	--	--	--	--
91-AW4	10/19/07		Result	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	--
			1/2 RL	<1.025	<1.025	<1.025	<1.025	<1.025	<1.025	<1.025	--
			TEQ*value	0.10	1.03	0.10	0.10	0.01	0.10	0.10	**1.55**
91-AW5	01/13/92		Result	(b)	(b)	(b)	(b)	(b)	--	--	--
			1/2 RL	--	--	--	--	--	--	--	--
			TEQ*value	--	--	--	--	--	--	--	--
91-AW5	07/14/92		Result	(b)	(b)	(b)	(b)	(b)	--	--	--
			1/2 RL	--	--	--	--	--	--	--	--
			TEQ*value	--	--	--	--	--	--	--	--
91-AW6	01/13/92		Result	<1	<1	<1	<1	<1	--	--	--
			1/2 RL	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
			TEQ*value	0.05	0.50	0.05	0.05	0.01	--	--	**0.66**
91-AW6	01/13/92	Duplicate	Result	<10 (J)	<10 (J)	<10 (J)	<10 (J)	<10 (J)	--	--	--
			1/2 RL	<5	<5	<5	<5	<5	--	--	--
			TEQ*value	0.50	5.00	0.50	0.50	0.05	--	--	**6.55**
91-AW6	01/13/92	Triplicate	Result	<1	<1	<1	<1	<1	--	--	--
			1/2 RL	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
			TEQ*value	0.05	0.50	0.05	0.05	0.01	--	--	**0.66**

TABLE 9

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TEF-ADJUSTED CARCINOGENIC PAHs

Port of Moses Lake Pumphouse 1
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Moses Lake, Washington
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Sample Name	Sampling Date			Benzo(a) anthracene (µg/L)	Benzo(a) pyrene (µg/L)	Benzo(b) fluoranthene (µg/L)	Benzo(k) fluoranthene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h) anthracene (µg/L)	Indeno(1,2,3-cd) pyrene (µg/L)	Total cPAHs (a) (µg/L)
Toxicity Equivalency Factor				0.1	1	0.1	0.1	0.01	0.1	0.1	--
MTCA Method A Cleanup Level				--	0.1	--	--	--	--	--	0.1
91-AW6	04/21/92		Result	5.8 (J)	<10	<10	<10	5.1 (J)	--	--	--
			1/2 RL	--	<5	<5	<5	--	--	--	--
			TEQ*value	0.58	5.00	0.50	0.50	0.05	--	--	**6.63**
91-AW6	04/21/92	Duplicate	Result	<25.0	<25.0	<25.0	<25.0	<25.0	--	--	--
			1/2 RL	<12.5	<12.5	<12.5	<12.5	<12.5	--	--	--
			TEQ*value	1.25	12.50	1.25	1.25	0.13	--	--	**16.38**
91-AW6	04/21/92	Triplicate	Result	<1	<1	<1	<1	<1	--	--	--
			1/2 RL	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
			TEQ*value	0.05	0.50	0.05	0.05	0.01	--	--	**0.66**
91-AW6	07/14/92		Result	<5,600 (J)	2,400 (J)	2,600 (J)	1,900 (J)	<5,600 (J)	--	--	--
			1/2 RL	<2800	--	--	--	<2800	--	--	--
			TEQ*value	280.00	2,400.00	260.00	190.00	28.00	--	--	**3,158.00**
91-AW6	07/14/92	Duplicate	Result	--	--	--	--	--	--	--	--
			1/2 RL	--	--	--	--	--	--	--	--
			TEQ*value	--	--	--	--	--	--	--	--
91-AW6	07/14/92	Triplicate	Result	<4,800 (J)	1,300 (J)(N)	1,300 (J)(N)	1,000 (J)	<4,800 (J)	--	--	--
			1/2 RL	<2400	--	--	--	<2400	--	--	--
			TEQ*value	240.00	1,300.00	130.00	100.00	24.00	--	--	**1,794.00**
91-AW6	10/19/07		Result	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	--
			1/2 RL	<1.025	<1.025	<1.025	<1.025	<1.025	<1.025	<1.025	--
			TEQ*value	0.10	1.03	0.10	0.10	0.01	0.10	0.10	**1.55**
91-BW2	01/13/92		Result	(b)	(b)	(b)	(b)	(b)	--	--	--
			1/2 RL	--	--	--	--	--	--	--	--
			TEQ*value	--	--	--	--	--	--	--	--

TABLE 9

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TEF-ADJUSTED CARCINOGENIC PAHs

Port of Moses Lake Pumphouse 1
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Sample Name	Sampling Date		Benzo(a) anthracene (µg/L)	Benzo(a) pyrene (µg/L)	Benzo(b) fluoranthene (µg/L)	Benzo(k) fluoranthene (µg/L)	Chrysene (µg/L)	Dibenzo(a,h) anthracene (µg/L)	Indeno(1,2,3-cd) pyrene (µg/L)	Total cPAHs (a) (µg/L)
Toxicity Equivalency Factor			0.1	1	0.1	0.1	0.01	0.1	0.1	--
MTCA Method A Cleanup Level			--	0.1	--	--	--	--	--	0.1
91-BW2	07/14/92	Result	(b)	(b)	(b)	(b)	(b)	--	--	--
		1/2 RL	--	--	--	--	--	--	--	--
		TEQ*value	--	--	--	--	--	--	--	--
91-BW2	10/19/07	Result	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	--
		1/2 RL	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	--
		TEQ*value	0.13	1.25	0.13	0.13	0.01	0.13	0.13	**1.89**
PH1-9401	10/19/07	Result	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	--
		1/2 RL	<1.11	<1.11	<1.11	<1.11	<1.11	<1.11	<1.11	--
		TEQ*value	0.11	1.11	0.11	0.11	0.01	0.11	0.11	**1.68**
PH1-9601	10/19/07	Result	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	--
		1/2 RL	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	--
		TEQ*value	0.13	1.25	0.13	0.13	0.01	0.13	0.13	**1.89**
PH1-9602	10/19/07	Result	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	<2.05	--
		1/2 RL	<1.025	<1.025	<1.025	<1.025	<1.025	<1.025	<1.025	--
		TEQ*value	0.10	1.03	0.10	0.10	0.01	0.10	0.10	**1.55**
PH1-9603	10/19/07	Result	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	<2.22	--
		1/2 RL	<1.11	<1.11	<1.11	<1.11	<1.11	<1.11	<1.11	--
		TEQ*value	0.11	1.11	0.11	0.11	0.01	0.11	0.11	**1.68**
MW18	05/19/10	Result	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	<0.0952	--
		1/2 RL	<0.0476	<0.0476	<0.0476	<0.0476	<0.0476	<0.0476	<0.0476	--
		TEQ*value	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.07

TABLE 9

CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - TEF-ADJUSTED CARCINOGENIC PAHs

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

EXPLANATION:

1992 reports list date ranges (01/13-16/92, 04/21-23/92, 07/14-16/92) only; first date of date range listed on table
Bolded values equal or exceed MTCA Method A Cleanup Level
µg/L = Micrograms per liter
cPAH = Carcinogenic polycyclic aromatic hydrocarbons analyzed in accordance with EPA Method 8270 or 8270C - refer to laboratory report
RL = Laboratory reporting limit
TEQ = Toxic Equivalent Concentration (TEF x 1/2 reporting limit)
-- = Not applicable
< = Less than the stated laboratory reporting limit
(a) = Total cPAHs were adjusted using TEFs in accordance with WAC 173-340-708(8) (https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-708)
(b) = PAHs not listed in report text or tables; laboratory report unavailable
(J) = The sample quantification limit is an estimated quantity
(N) = The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification

TABLE 10
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - METALS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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			Dissolved Metals						Total Metals					
Well ID		Sampling Date	Arsenic (µg/L)	Barium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Lead (µg/L)	Selenium (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Lead (µg/L)	Selenium (µg/L)
91-AW4	a	01/13/92	**4**	79	ND	ND	ND	ND	**3**	81	ND	**17**	ND	ND
91-AW4	a	04/21/92	**4**	80	ND	ND	ND	ND	**5**	84	ND	**22**	ND	ND
91-AW4	a	07/14/92	**4**	78	ND	ND	ND	ND	**3**	100	ND	**158**	ND	ND
91-AW5	a	01/13/92	**4**	75	ND	ND	ND	ND	**3**	82	ND	**15**	ND	ND
91-AW5	a	04/21/92	**5**	78	ND	ND	ND	ND	**5**	83	ND	**13**	ND	ND
91-AW5	a	07/14/92	**3**	79	ND	ND	1	ND	**3**	117	ND	**33**	ND	2
91-AW6	a	01/13/92	**3**	86	ND	<5	<1	<1 (J)	**3**	87	<0.2	**7**	<1	<1 (J)
91-AW6	a	01/13/92 Duplicate	**5.6**	77	ND	29	<10	<4.5	**5**	76	4	<7	<10	<4.5
91-AW6	a	01/13/92 Triplicate	**3**	72	ND	<5	<1	<1 (J)	**3**	87	<0.2	**5**	<2	<1 (J)
91-AW6	a	04/21/92	**3**	86	ND	<5	<1	<1	**4**	91	<0.2	**5**	<1	<1
91-AW6	a	04/21/92 Duplicate	**5**	81	ND	<10	<2	<5	**5**	82	<3	<10	<2	<5
91-AW6	a	04/21/92 Triplicate	**4**	86	ND	<5	<1	<1	**5**	91	<0.2	**8**	<1	<1
91-AW6	a	07/14/92	**4**	83	ND	<5	<1	<1	**3**	93	<0.2	**6**	<1	<1
91-AW6	a	07/14/92 Duplicate	**6.8**	120	ND	<5	<5	<5	**7.7**	140	<0.5	**8.2**	<5	<5
91-AW6	a	07/14/92 Triplicate	**3**	84	ND	<5	<1	<1	**4**	109	<0.2	**8**	<1	<1
91-BW2	a	01/13/92	**3**	37	ND	5	ND	1	**4**	44	ND	**45**	ND	ND
91-BW2	a	04/21/92	**4**	43	ND	ND	ND	ND	**4**	64	ND	**64**	3	ND
91-BW2	a	07/14/92	**5**	36	ND	ND	ND	ND	**3**	51	ND	**50**	ND	ND
MTCA Method A Cleanup Levels			5	NE	5	NE	15	NE	5	NE	5	5	15	NE
MTCA Method B Cleanup Levels - Noncancer			4.8	3,200	8	24,000	NE	80	4.8	3,200	8	NE	NE	80
MTCA Method B Cleanup Levels - Cancer			0.058	NE	NE	NE	NE	NE	0.058	NE	NE	NE	NE	NE
MTCA Method C Cleanup Levels - Noncancer			11	7,000	18	53,000	NE	180	11	7,000	18	NE	NE	180
MTCA Method C Cleanup Levels - Cancer			0.58	NE	NE	NE	NE	NE	0.58	NE	NE	NE	NE	NE

TABLE 10
CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - METALS
Port of Moses Lake Pumphouse 1
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Moses Lake, Washington
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EXPLANATION:

1992 reports list date ranges (01/13-16/92, 04/21-23/92, 07/14-16/92) only; first date of date range listed on table
Shaded and bold values equal or exceed the MTCA Method Cleanup Levels
Metals analyzed in accordance with EPA Method 6010/7000 series
µg/L = Micrograms per liter
ND = Not detected
NE = Not established
< = Less than the stated laboratory reporting limit
(a) = Dissolved and total mercury and silver non-detect
(J) = The sample quantification limit is an estimated quantity

TABLE 11
CUMULATIVE LNAPL ANALYTICAL RESULTS
Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Well ID	Sampling Date	Units	C9-C16	Gasoline	Mineral Spirits	Jet Fuel	Kersosene	Diesel	Other (a)	Benzene	Toluene	Ethylbenzene	Xylenes
91-AW6	01/28/93	mg/kg	--	--	--	980,000(b)	--	--	--	--	--	--	--
91-AW6	04/06/93	mg/kg	--	<25,000	<25,000	1,000,000	<25,000	<25,000	<50,000	--	--	--	--
91-AW6	04/06/93 Duplicate	mg/kg	--	<25,000	<25,000	1,000,000	<25,000	<25,000	<50,000	--	--	--	--
91-AW6	12/02/93	mg/L	--	400,000	--	--	--	--	--	<100	<100	206	10,800
91-AW6	05/10/24	%	98.33(c)	--	--	--	--	--	--	--	--	--	--

EXPLANATION:

January and April 1993 results analyzed by EPA Methods 3580/Modified 8015
December 1993 results analyzed by WTPH-G (gasoline) and EPA Method 8020 (benzene, toluene, ethylbenzene, and xylenes)
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
LNAPL = Light non-aqueous phase liquid thickness in feet
< = Less than the stated laboratory reporting limit
-- = Not analyzed
(a) = Quantified using 30-weight motor oil as a standard
(b) = The hydrocarbon pattern of the sample matched the pattern of the jet fuel standard provided by Seacor. Hydrocarbons present fell within the range of C9-C16.
Semi-quantitation of the sample is based on a dilution of 0.5013 gram of pure product into 100 milliliters of methylene chloride.
(c) = The hydrocarbons resemble relatively fresh JP-5 Jet Fuel. There was very little evidence of significant breakdown of the straight chain aliphatic hydrocarbons or evaporation of the lighter hydrocarbons, which are both indicators of weathering.

APPENDIX A

Legal Description and Tax Parcel Information

GRANT COUNTY
WASHINGTON

TAXSIFTER

SIMPLE SEARCH SALES SEARCH REETSIFTER COUNTY HOME PAGE CONTACT DISCLAIMER PAYMENT CART(0)

Melissa McKnight
Grant County Assessor P. O. Box 37 Ephrata, WA 98823

Assessor Treasurer Appraisal MapSifter

Parcel

Parcel#:	171020000	**Owner Name:**	Port District #10
DOR Code:	43 - Transportation - Aircraft	**Address1:**	7810 Andrews St NE, Ste 200
Situs:	7988 NE ANDREWS ST, MOSES LAKE RURAL 98837	**Address2:**	
Map Number:		**City, State:**	Moses Lake WA
Status:	EXEMPT FULL YEAR	**Zip:**	98837

Description:

(PORT DISTRICT NO 10 BLA) That part of Larson Air Force Base located in Township 20 North, Range 28 East, W. M. described as follows: Beginning at a point on the E line of Section 33, said Township 20 N, Range 28 E, N.0'53'26"W. 816.70' from the Southeast corner of said Section 33, said Township 20 N, Range 28 E, W. M., (whose Washington State Grid South zone coordinates are Y674047.08 - X2298909.20 and are referred to U.S.C. & G.S. Station "SPAD" whose Washington State Grid South zone coordinates are Y676911.66 - X2288625.74); thence continuing along the East line of Section 33, N. 0'53'26" W. 800.00' ; thence N. 23'13'02"W. 3965.95' ; thence N. 26'09'20" E. 1097.79' ; thence N. 72'42'20" W. 750.66' ; thence N. 17'18'07" E. 6650.35' ; thence N. 53'19'27" E. 1000.23' ; thence N. 57'33'24" E. 1354.14' to the centerline of a county road known as Randolph Road; thence N. 61'31'45" E. 353.51' ; thence N. 36'40'11" W. 2300.04' ; thence S. 48'16'34" W. 350.60' to the centerline of said Randolph Road; thence S. 48'16'34" W. 1355.75' ; thence S. 53' 19'07" W. 936.18' ; thence N. 72'41'18" W. 4179.79' ; thence N. 18'40'52" W. 5131.26' ; thence S. 59'23'01" W. 67.46' t; thence N. 14'07'47" W. 837.66' to the N. line of Section 17, said Township 20 N., Range 28 E., W. M.; thence N. 89'48'03" W. along the N. line of said Section 17, 2540.59' ; thence S. 24°05'49" E. 2118.42' ; thence S. 59'23'01" W. 226.22' ; thence S. 17'53'16" E. 663.84' ; thence S. 21'50'50"E. 871.28' ; thence S. 18'44'22" E. 3378.60' ; thence S. 17'17'52"W. 6525.46' ; thence S. 53'19'26" W. 971.96' ; thence S. 58'21'59" W. 967.56' to the West line of Section 29, said Township 20 N., Range 28 E., W. M.; thence S. 0'20'54" E. along the W. line of said Section 29, 2,098.89' to the SW corner of said Section 29; thence S. 0'21'59" E. 568.87' ; thence N. 89'42'14" E. 1058.89' ; thence N. 46'14'50" E. 994.25' ; thence N. 89'01'05" E. 481.27' ; thence S. 1'00'40" E. 174.87' , thence N. 89°02'50" E. 553.13' ; thenceS. 0'56'55" E. 593.55' to the centerline of a private road known as Andrews St.; thence N. 89'07'35" E. along the centerline of Andrews St. 1922.00' to the Westerly right-of-way of a county road known as 5th Ave. said point also being the beginning of a county road known as Andrews St.; thence N. 0'52'25" W. 30.00' to the Northerly right-of-way of said Andrews St.; thence N. 89'07'35" E. along the N. right-of-way of Andrews St. 790.00' to the centerline of a private road known as 4th Ave.; thence S. 0'52'25" E. along the centerline of 4th Ave. 580.00' ;·thence N. 89'07'35" E. 730.00' to the Westerly right-of-way of a county road known as 3rd Ave.; thence N. 0'52'25" W. along the West right-of-way of said 3rd Ave. 550.00' to the centerline of said Andrews St.; thence S. 0'52'25" E. along the West right-of-way of 3rd Ave. 16.94' ; thence N.89'07'35" E. 161.11' ; thence S. 22'16'16" E. 84.63' ; thence S. 49'33'58" E. 337.81' ; thence N. 89'53'05" E. 228.20' to the centerline of a private road known as 1st Ave.; thence S. 12'20'10" E. along the centerline of said 1st Ave. 1232.85 feet to the centerline of a private road known as Chanute St.; thence S. 89'07'35" W. along the centerline of Chanute St. 606.53' to the centerline of a private road known as 2nd Ave.; thence S. 0'52'25" E. along the centerline of said 2nd Ave. 740.00' to the Southerly right-of-way of a county road known as Dover St.; thence S. 89'07'35" W. along the South right-of-way of Dover St. 282.35' to the centerline of said county road being 3rd Ave.; thence continuing along the South right-of-way of said Dover St. S. 89'07'35" W. 569.51' ; thence S. 0'56'55" E. 463.22' ; thence N. 89'07'35" E. 599.51' to the Easterly right-of-way of said 3rd Ave.; thence S. 0'56'55" E. along the East right-of-way of 3rd Ave. 954.65' to the centerline of a private road known as Forbes St.; thence N. 89'09'50" E. along the centerline of Forbes St. 1639.88' ; thence S. 19'26'35" E. 1027.70' ; thence N. 71'16'25 E. 2415.68' to the Point of Beginning.TOGETHER WITH That part of Larson Air Force Base located in Sections 17, 20, and 29, T 20 N, R 28 E, W.M. described as follows: SEE COMPLETE LEGAL AT AFN 1479898

Comment:

All Situses	
7988 NE ANDREWS ST, MOSES LAKE RURAL 98837	7012 NE PATTON BLVD, MOSES LAKE RURAL
6957 NE PATTON BLVD, MOSES LAKE RURAL	8005 NE RD G, MOSES LAKE RURAL
7942 NE ANDREWS ST, MOSES LAKE RURAL 98837	

2024 Market Value

Land:	$16,305,850
Improvements:	$64,156,415
Permanent Crop:	$0
Total	$80,462,265

2024 Taxable Value

Land:	$0
Improvements:	$0
Permanent Crop:	$0
Total	$0

2024 Assessment Data

District:	0090 - 0090
Current Use/DFL:	No
Senior/Disability Exemption:	No
Total Acres:	3242.64000

Ownership

Owner's Name	Ownership %	Owner Type
Port District #10	100%	Title Owner
Port District #10	0%	* TR Selected Tax Payer

Sales History

Sale Date	Sales Document	# Parcels	Excise #	Grantor	Grantee	Price
11/03/22	1479898	2	256046	Port District #10	Port District #10	$0
10/10/22	1478813	2			Port District #10	$0
12/09/20	1439388	1			Port District #10	$0
06/01/20	1428715	1			Port District #10	$0
10/01/19	1452275	1			Port District #10	$0
10/01/19	1421062	1			Port District #10	$0
05/01/18	1395660	2			Port District #10	$0
11/12/15	1355333	2	224065	Port District No. 10	Port District #10	$0
04/01/15	1352266	3			Port District #10	$0
03/20/02	1099747	52		Fire District #5		$0
02/27/01	1080170	3		U.S.D.A. Forest Service		$0

Building Permits

Permit No.	Date	Description	Amount
23-0392	9/8/2023	Proposed rocket engine test stand	$581,310.76
23-0244	8/17/2023	Grading for proposed rocket engine test stand	
23-0325	6/26/2023	Commercial Roof Repair 2023 for 2024 NC---Entered after deadline	$113,660.00
22-0582	10/25/2022	Demolition of 140' x 200' x 60' peak hanger (Bldg 408) 2023 for 2024 NC---TTCarol at port office, building is gone	
22-0580	9/28/2022	No information on permit 2023 for 2024 NC---Permit closed, everything appears to be accounted for on the other permits	
22-0628	9/29/2022	Mechanical system for testing facility (BF 22-0307) 2023 for 2024 NC---Part of base cost of building on 40-1020-020	
22-0629	9/29/2022	Plumbing system for testing facility (BF 22-0307) 2023 for 2024 NC---Part of base cost of building on 40-1020-020	
22-0307	8/19/2022	New 7,320 Square Feet Testing Facility (B and S-1) Type IIB Sprinklered 2023 for 2024 NC---TTO, 100% complete. Built on 40-1020-020 due to being improvement on exempt land	$610,160.00
22-0279	5/13/2022	Sign Replacement/ Wall Sign/ 26 sf 2022 for 2023 NC---No value	
22-0042	1/26/2022	Fire Alarm Install 2022 for 2023 NC---No value	
21-0886	1/3/2022	Platform/Rocket Engine Test Stand/ Structural Steel/ Concrete & CMU Blast Walls 2022 for 2023 NC---Just getting started, check next year 2023 for 2024 NC---Equipment that is part of testing facility, no value	$18,570.00
20-0064	12/1/2021	Training Ctr/ Mess Hall/ Offices/ Conf Rm/ Restrooms/ Brkrm/Sprinkled/Wood Stick Frame 2022 for 2023 NC---Just getting started, check next year 2023 for 2024 NC---TTCarol at port office, this hasnt been started yet, check next year	$502,000.00
21-0747	10/13/2021	Fencing/ Chainlink/ 9 feet high/ 237 feet in length 2022 for 2023 NC---No value	
21-0589	9/13/2021	Shipping Container #1/ Storage/ Pallets, Bags, Beans, Equipment/ 1 of 4 2022 for 2023 NC---No value	
21-0590	9/13/2021	Shipping Container #2/ Storage/ Pallets, Bags, beans, Equipment / 2 of 4 2022 for 2023 NC---No value	
21-0591	9/13/2021	Shipping Container #3/ Storage/ Pallets, Bags, Beans, Equipment/ 3 of 4 2022 for 2023 NC---No value	
21-0593	9/13/2021	Shipping Container #4/ Storage/ Pallets, Bags, Beans, Equipment/ 4 of 4 2022 for 2023 NC---No value	
21-0489	6/28/2021	Shipping Container #1/ Storage/ Research testing/ See MSDS 2022 for 2023 NC---No value	
21-0490	6/28/2021	Shipping Container #2/ Storage/ Research testing/ See MSDS 2022 for 2023 NC---No value	
21-0491	6/28/2021	Shipping Container #3/ Storage/ Research testing/ See MSDS 2022 for 2023 NC---No value	
21-0492	6/28/2021	Shipping Container #4/ Storage/ Research testing/ See MSDS 2022 for 2023 NC---No value	

21-0375	4/26/2021	18000 Gallon Hydrogen tank / Vaporizer 2021 for 2022 New Construction---Doesnt appear to be started, check next year 2023 for 2024 NC---Built on 40-1020-020	
21-0120	3/11/2021	Replace HVAC (like and kind) Fan Coil, 4 kw Heater and Cooling Coil 2021 for 2022 New Construction---No change to value	
20-0719	12/3/2020	HVAC Replacement, like and kind, 5ton heat pump, 5ton air handler, 23 KW 2021 for 2022 New Construction---No change to value	
20-0755	11/6/2020	Install a fire alarm and fire suppression system monitoring system in a new aircraft hanger 2021 for 2022 New Construction---No change to value	
20-0480	9/28/2020	Replace Glycol Chiller/ New/ Like and Kind/ Commercial 2021 for 2022 New Construction---No change to value	
20-0381	9/17/2020	Extend the 20' fire line from the new wide body AeroTec Hanger to a point west of the hanger for future use by the Port for a new hanger construction 2021 for 2022 New Construction---No change to value, permit closed	
20-0299	8/13/2020	Install an overhead fire suppression system to include a high expansion foam system in a newly constructed group I aircraft hanger 2021 for 2022 New Construction---No change to value, permit closed	
20-0239	6/22/2020	Replace/ 2-3 ton heat pumps & air handlers/ 1-5 heat pump and air handler 2021 for 2022 New Construction---No change to value, permit closed	
20-0289	6/11/2020	Fuel Containment/ Concrete/ Sump Pits 2020 NC---No value, permit closed	$17,824.00
20-0125	5/29/2020	Aircraft hangar/ Office space/ Restrooms/ Breakrooms/ Storage mezzanine/ Mechanical Rms 2020 NC---Entered after deadline, check next year 2021 for 2022 New Construction---TTM, 100% complete, built on 40-1020-000	$5,252,528.00
19-0832	5/19/2020	Grading/ Roadway/ App 9 of 9 2020 NC---Updated depreciation on runway asphalt	
20-0120	2/25/2020	Demolition 60'X80' Metal Storage Bldg #2107 2020 NC---Building appears to be gone, removed from rolls and permit closed	
19-0193	8/29/2019	Grading/ Demolition and Reconstruction of Airport Runway/ Lights and Signs 2020 NC---Updated depreciation on runway asphalt	
19-0281	5/9/2019	FYI; Paint Booth Fire Suppression System	
170312	6/2/2017	Manufactured Home 30'4" X 76'	$92,480.00
19-0049	4/1/2019	Storage/ Warehouse/ Steel Bldg/ Shipping-Receiving/ Non-Conditioned/ No Plumbing 2019 NC---TTE, building is complete, added as storage warehouse	$358,400.00
19-0094	3/6/2019	Roof Framing and exhaust only	$275.00
18-0693	9/17/2018	Commerical Reroof/ Two-Ply Insulation/ Two-Ply Membrane/ Non-Structural	$59,864.00
18-0546	7/25/2018	FYI; Install a new Fire Alarm System	
18-0021	1/22/2018	Install 2 new additional pull stations at the hose/ foam reels 2018---No value added	
17-0637	10/17/2017	FYI; Install Overhead Fire Suppression/ High Expansion Foam System in a New Aircraft Hanger	
17-0582	9/15/2017	New Fire Alarm System/ Foam Activation System in New Aircraft Hanger at the Port of Moses Lake 2018---No value added	
17-0185	6/19/2017	Aircraft Hanger/ 1-Story/ Steel Bldg/ Restrooms/ Break Area	
17-0374	6/15/2017	FYI; Continue 20" to 12" underground Fire line to new Aerotec Hanger	
17-0221	4/28/2017	Install New Clean Agent fire suppression system in data room of Hanger 1 2018---No value added	
17-0052	4/26/2017	Covered Walkway 2018---No value added	$9,600.00
16-0763	4/10/2017	Add- Alt Wire Shop/ Storage/ S-1/ Mezzanine Storage 2018---No value added	$119,168.00
BF 16-0333	10/21/2016	Grading/trenching for main water line for fire suppression.	
BF 16-0522	10/18/2016	Install new 24" main fire water main	
16-0379	6/29/2016	INTERIOR REMODEL/CONSTRUC WALL IN FABRICATION AREA. 7988 NE Andrews St	
16-0425	6/24/2016	Type 1 Hood replacing Type 11 hood. FYI only. Which building was not noted	
16-0216	5/6/2016	FIRE ALARM MONITORING SYSTEM. FYI ONLY Which building was not noted	
2013 / 85	3/8/2013	RECONSTRUCTION OF TERMINAL APRON - 5/15 LB 100%	
165	5/7/2012	GRADING / ASPHALT RECONSTRUCTION	$0.00
719	9/7/2007	FIRE ALARM SYSTEM IN ELECTRICAL BLDG FOR RUNWAY	$0.00
719	9/7/2007	FIRE ALARM SYSTEM IN ELECTRICAL BLDG FOR RUNWAY	$0.00

Historical Valuation Info

Year	Billed Owner	Land	Impr.	PermCrop Value	Total	Exempt	Taxable
2024	Port District #10	$16,305,850	$64,156,415	$0	$80,462,265	$80,462,265	$0

2023	Port District #10	$15,350,200	$49,245,185	$0	$64,595,385	$64,595,385	$0
2022	Port District #10	$15,350,200	$42,821,900	$0	$58,172,100	$58,172,100	$0
2021	Port District #10	$15,350,200	$40,472,760	$0	$55,822,960	$55,822,960	$0
2020	Port District #10	$15,350,200	$33,955,230	$0	$49,305,430	$49,305,430	$0

View Taxes

Parcel Comments

No Comments Available

Property Images

No images found.

1.0.8368.16162 Data current as of: 2/23/2024 3:54 PM TX_RollYear_Search: 2024

APPENDIX B
Boring Logs

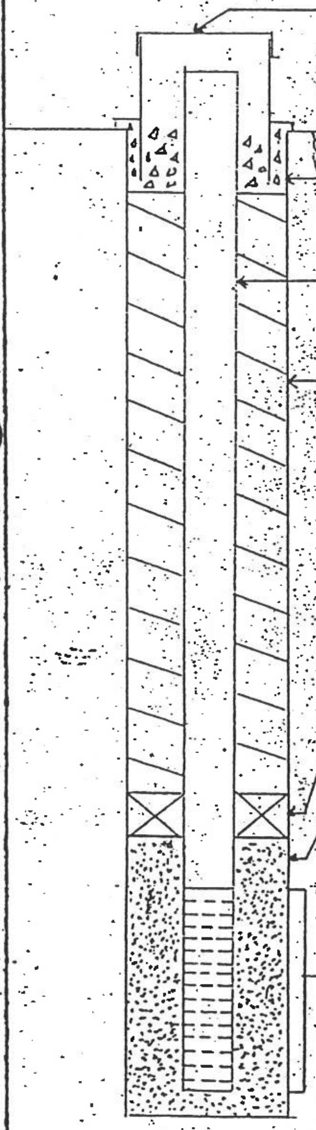
RESOURCE PROTECTION WELL REPORT

START CARD NO: 044805

PROJECT NAME: Larson AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW4 (Site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: Grant
LOCATION: NE 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 90.5
GROUND SURFACE ELEVATION:
INSTALLED: 9-9-91
DEVELOPED: 10-1-91

AS-BUILT



TOTAL DEPTH 102 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 72 FT.

Enviroplug Grout

SEAL 72 TO 74 FT.

1/4 Bentonite pellets

FILTER PACK 74 TO 99 FT.

20-40 Colorado Silica

SCREEN INTERVAL 79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER:
0 TO 102 9. IN.
TO 6 IN.

Plug back hole 99-102 w/ Bentonite pellets

FORMATION DESCRIPTION

0-4 brown silty, sandy GRAVEL w/cobbles, dry

4-11 brown to black gravelly SAND, dry

11-82 brown silty, sandy GRAVEL w/cobbles + occasional boulders, dry to moist, loose

82-88 brown to reddish brown slightly sandy SILT, damp, hard to cemented

88-99 reddish brown fine SAND w/trace silt + occasional gravels, damp to saturated

99-100 yellowish brown clayey SILT w/trace sand, damp

100-102 weathered basalt

RESOURCE PROTECTION WELL REPORT

START CARD NO. 044805

PROJECT NAME: LARSON AFB Moses LAKE
WELL IDENTIFICATION NO. 91-AW5 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County AIRPORT
WATER LEVEL ELEVATION: 90.5' 9-23-91
GROUND SURFACE ELEVATION:
INSTALLED: 9-10-91
DEVELOPED: 9-23-91

AS-BUILT

TOTAL DEPTH 99 FT.

WELL DATA

STEEL SURFACE MONUMENT
W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL
+.5 TO 2 FT.

WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT
2 TO 72 FT.

Enviroplug grout

SEAL 72 TO 74 FT.

1/4 Bentonite pellets

FILTER PACK
74 TO 99 FT.

20-40 Colorado Silica

SCREEN INTERVAL
79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 99 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-4 brown silty sandy GRAVEL w/cobbles, dry, loose

4-11 brown slightly silty SAND w/ occasional gravels + cobbles dry, loose

11-55 brown silty sandy GRAVEL w/ cobbles + occasional boulders dry to moist

55-80 brown silty gravelly SAND w/occasional cobbles, moist

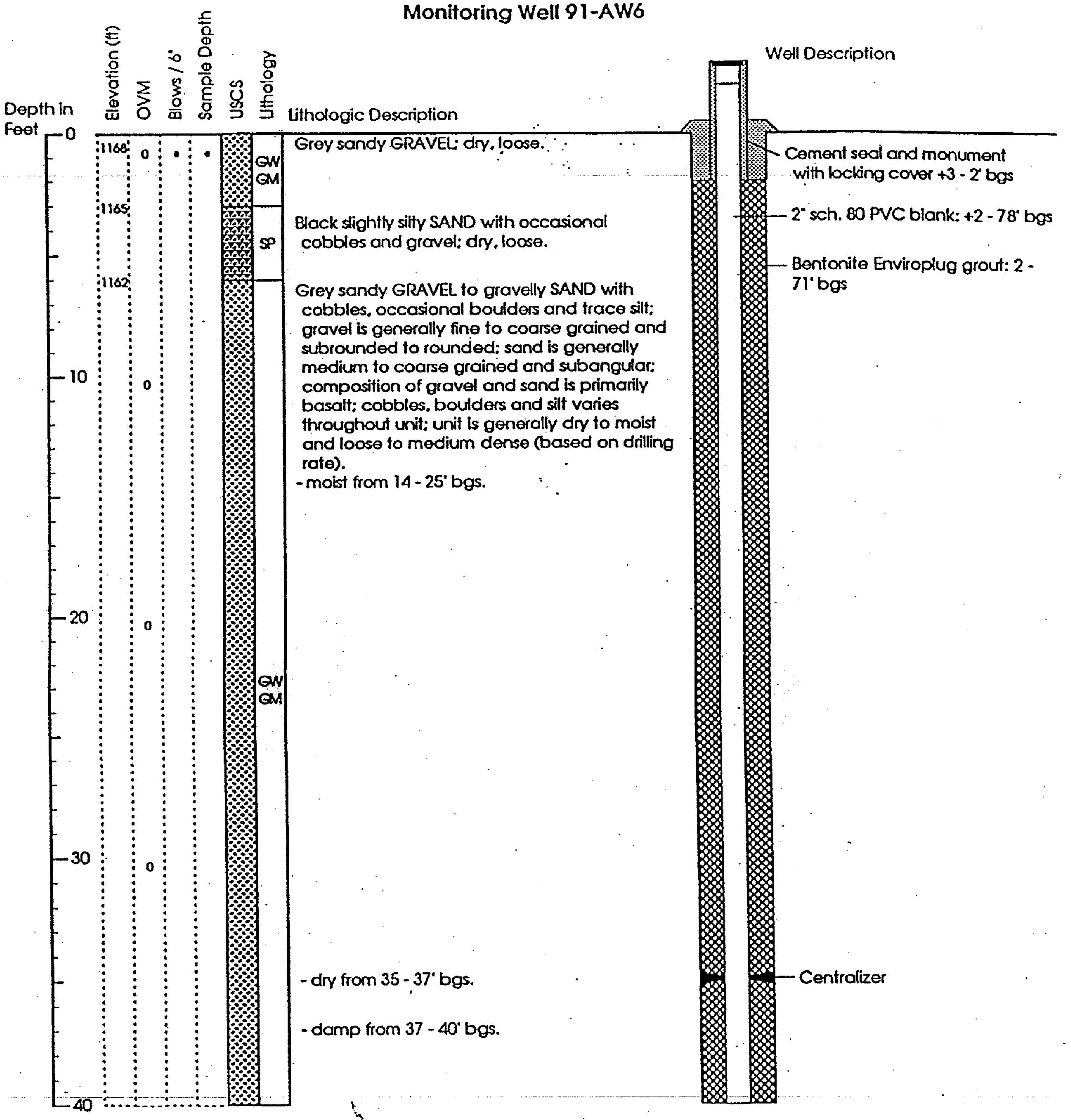
80-88 light brown to reddish brown sandy SILT w/occasional gravels, damp, loose

88-100 light brown to reddish brown silty fine SAND w/ occasional gravel, saturated

Environmental

Geological Boring Log and Well Construction Diagram

Monitoring Well 91-AW6



Grey sandy GRAVEL; dry, loose.

Black slightly silty SAND with occasional cobbles and gravel; dry, loose.

Grey sandy GRAVEL to gravelly SAND with cobbles, occasional boulders and trace silt; gravel is generally fine to coarse grained and subrounded to rounded; sand is generally medium to coarse grained and subangular; composition of gravel and sand is primarily basalt; cobbles, boulders and silt varies throughout unit; unit is generally dry to moist and loose to medium dense (based on drilling rate).
- moist from 14 - 25' bgs.
- dry from 35 - 37' bgs.
- damp from 37 - 40' bgs.

Cement seal and monument with locking cover +3 - 2' bgs

2" sch. 80 PVC blank: +2 - 78' bgs

Bentonite Enviroplug grout: 2 - 71' bgs

Centralizer

Client Name: U.S. Army Corps of Engineers
Job No: 00682-033-005
Location: Former Larson Air Force Base
Moses Lake, WA
Geologist: JKM

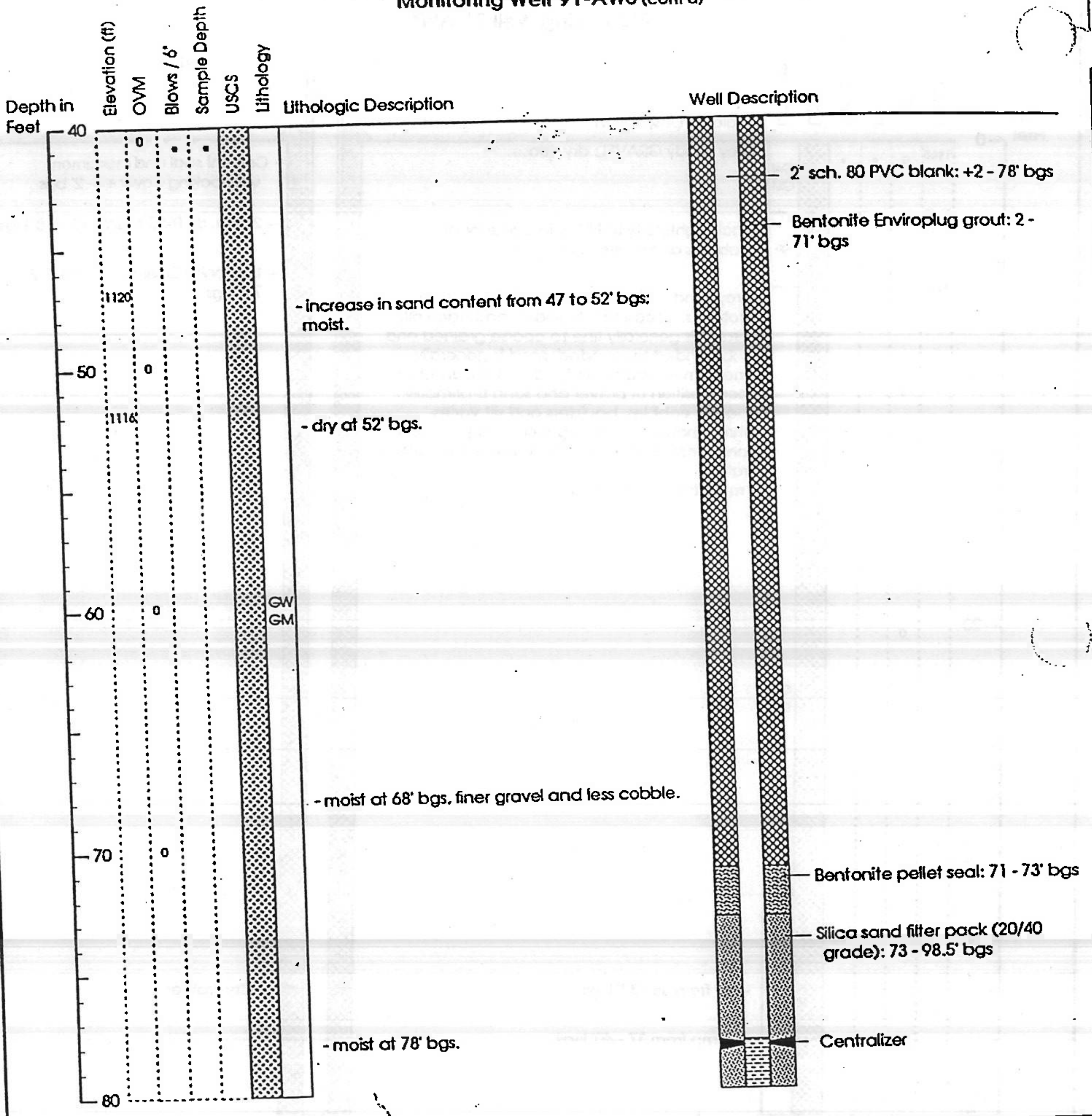
Drilling Method: Becker percussion hammer with 9" x 6" dual wall casing
Sample Method: D&M U-type sampler
Drilling Contractor: Layne Environmental Services, Inc.
Drilling Date: 9/10/91
Well Installation Date: 9/10/91

Elevation: (USC&GC 1947 adjusted elevations)
@ brass cap in well footing: 1168.13'
@ reference elevation: 1169.53'

• - Undistrubed soil samples for geologic logging and/or geotechnical testing were not collected in borehole 91-AW06, because it was drilled within 15 feet of 91-BW2 where soil samples were obtained.

Geological Boring Log and Well Construction Diagram

Monitoring Well 91-AW6 (cont'd)



Client Name:	U.S. Army Corps of Engineers	Drilling Method:	Becker percussion hammer with 9" x 6" dual wall casing
Job No:	00682-033-005	Sample Method:	D&M U-type sampler
Location:	Former Larson Air Force Base Moses Lake, WA	Drilling Contractor:	Layne Environmental Services, Inc.
		Drilling Date:	9/10/91
Geologist:	JKM	Well Installation Date:	9/10/91

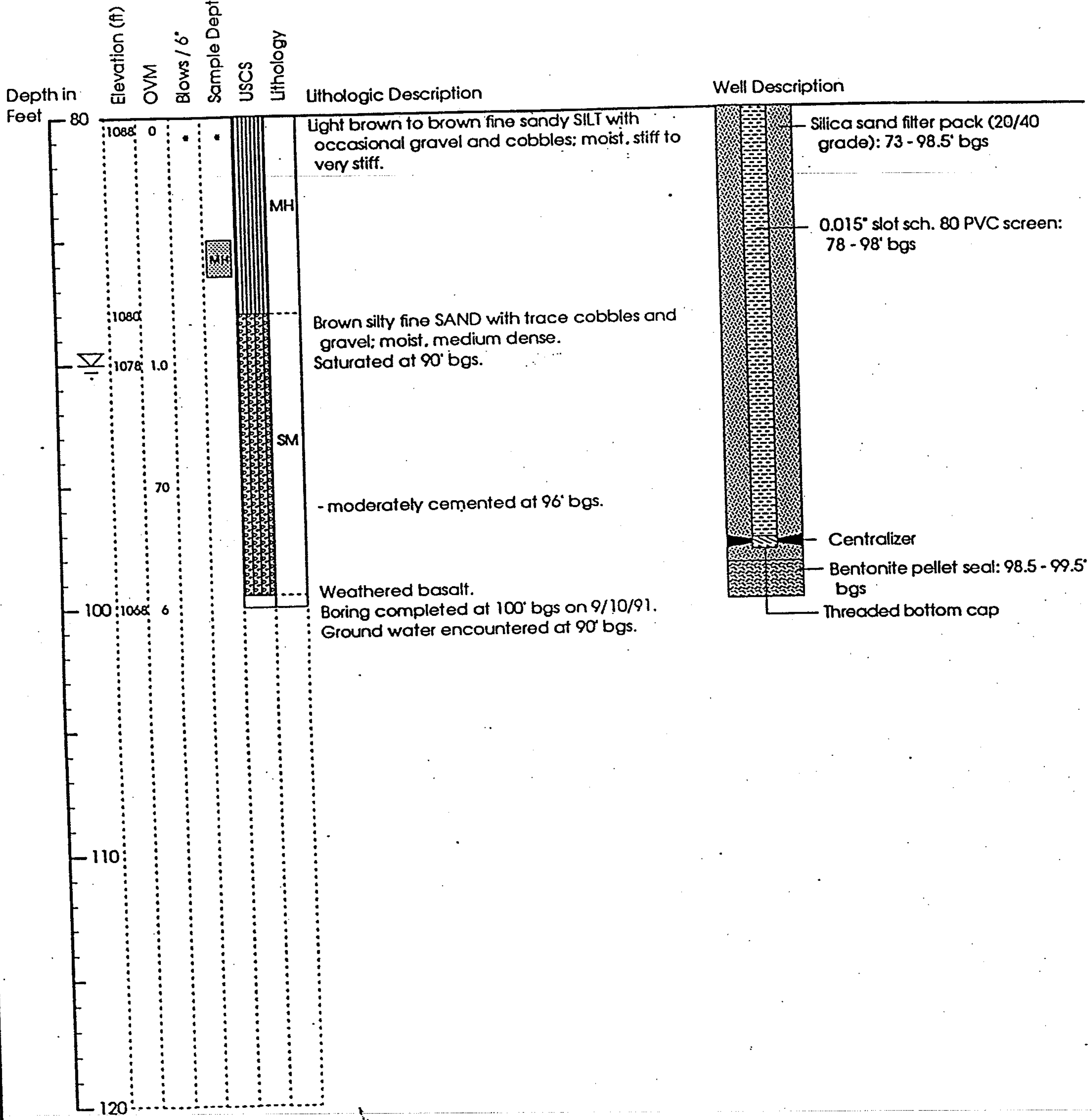
Elevation: (USC&GC 1947 adjusted elevations)

@ brass cap in well footing:	1168.13'
@ reference elevation:	1169.53'

* - Undistrubed soil samples for geologic logging and/or geotechnical testing were not collected in borehole 91-AW06, because it was drilled within 15 feet of 91-BW2 where soil samples were obtained.

Geological Boring Log and Well Construction Diagram

Monitoring Well 91-AW6 (cont'd)



Light brown to brown fine sandy SILT with occasional gravel and cobbles; moist, stiff to very stiff.

Brown silty fine SAND with trace cobbles and gravel; moist, medium dense.
Saturated at 90' bgs.

- moderately cemented at 96' bgs.

Weathered basalt.
Boring completed at 100' bgs on 9/10/91.
Ground water encountered at 90' bgs.

Silica sand filter pack (20/40 grade): 73 - 98.5' bgs

0.015" slot sch. 80 PVC screen: 78 - 98' bgs

Centralizer

Bentonite pellet seal: 98.5 - 99.5' bgs

Threaded bottom cap

Client Name:	U.S. Army Corps of Engineers	Drilling Method:	Becker percussion hammer with 9" x 6" dual wall casing
Job No:	00682-033-005	Sample Method:	D&M U-type sampler
Location:	Former Larson Air Force Base Moses Lake, WA	Drilling Contractor:	Layne Environmental Services, Inc.
		Drilling Date:	9/10/91
Geologist:	JKM	Well Installation Date:	9/10/91

Elevation: (USC&GC 1947 adjusted elevations)

@ brass cap in well footing:	1168.13'
@ reference elevation:	1169.53'

* - Undistrubed soil samples for geologic logging and/or geotechnical testing were not collected in borehole 91-AW06, because it was drilled within 15 feet of 91-BW2 where soil samples were obtained.

RESOURCE PROTECTION WELL REPORT

START CARD NO: 044805

PROJECT NAME: LARSON AFB Moses LAKE

WELL IDENTIFICATION NO. 91-AW6 (site 2)

DRILLING METHOD: Dual wall percussion hammer

DRILLER: Richard Jimenez

FIRM: Layne Environmental Services, Inc.

SIGNATURE:

CONSULTING FIRM: DAMES & MOORE

REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT

LOCATION: NE¼ SW ¼ Sec 28 Twn 20N R 28E

STREET ADDRESS OF WELL: Grant's County Airport

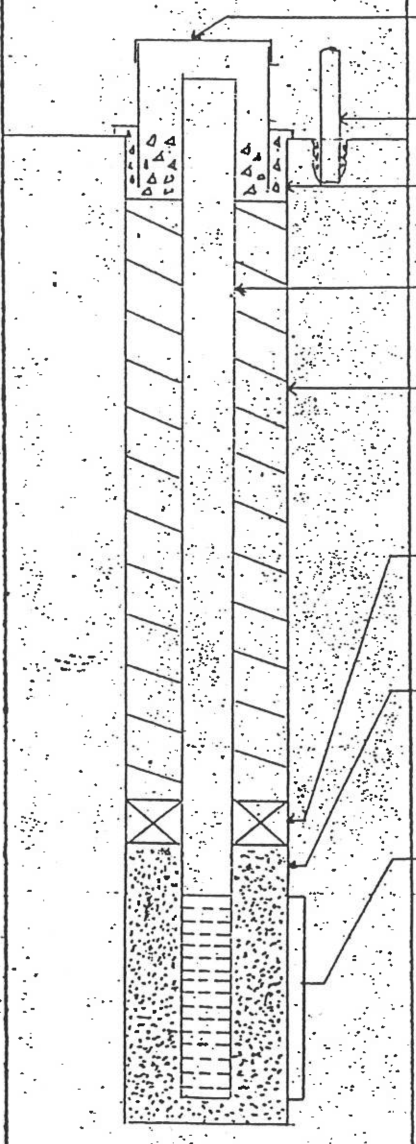
WATER LEVEL ELEVATION: 91 9-23-91

GROUND SURFACE ELEVATION:

INSTALLED: 9-10-91

DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 100 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 78 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 71 FT.
ENVIROPLUG GROUT

SEAL 71 TO 73 FT.
1/4 Bentonite Pellets

FILTER PACK 73 TO 98 FT.
20-40 Colorado Silica

SCREEN INTERVAL 78 TO 98 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 100 9. IN.
TO 6 IN.

Plug back 98' to 100' w/ 1/4" Bentonite pellets

FORMATION DESCRIPTION

0-6 brown sandy SILT w/ occasional gravel + cobbles dry, loose

6-48 brown silty sandy GRAVEL w/occasional cobbles, loose dry to moist

48-52 brown silty gravelly SAND w/ occasional cobbles moist

52-80 brown silty sandy GRAVEL w/ cobbles + occasional boulders moist to wet

80-88 reddish brown silty fine SAND w/ occasional gravel + cobbles, moist

88-99.5 reddish brown, fine SAND, trace silt w/ occasional cobbles + gravels wet.

99.5-100 weathered BASALT

Environmental

START CARD NO: 044816

PROJECT NAME: Larson AFB Moses Lake

WELL IDENTIFICATION NO. 91-BW2 (site 2)

DRILLING METHOD: Dual wall percussion hammer

DRILLER: Richard Jimenez

FIRM: Layne Environmental Services, Inc.

SIGNATURE:

CONSULTING FIRM: Dames + Moore

REPRESENTATIVE: Julie MacDonald

COUNTY: Grant

LOCATION: NE ¼ SW ¼ Sec 28 Twn 20N R 28E

STREET ADDRESS OF WELL: Grant's County Airport

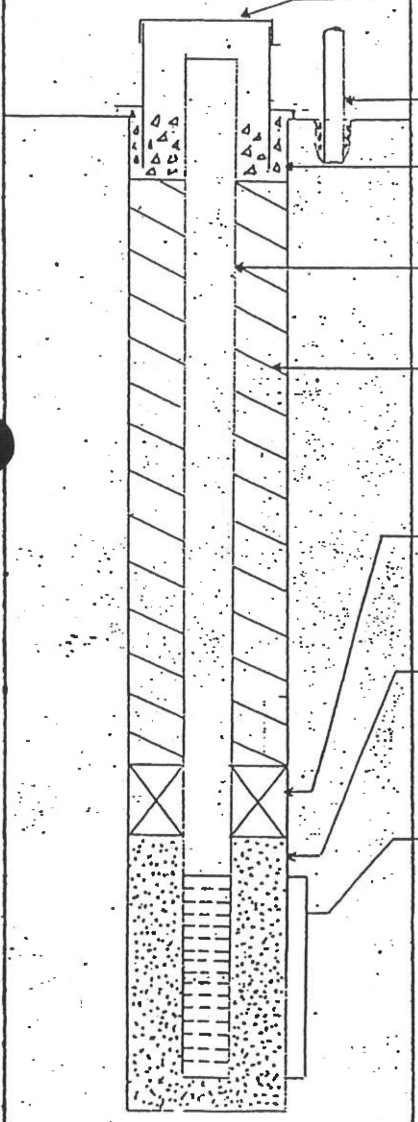
WATER LEVEL ELEVATION: 91'

GROUND SURFACE ELEVATION:

INSTALLED: 8-26-91

DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 180 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 4

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 137 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 122 FT.
Enviroplug Grout

SEAL 122 TO 130 FT.
¼ Bentonite pellets

FILTER PACK 130 TO 144 FT.
10-20 Colorado Silica

SCREEN INTERVAL 137 TO 147 FT.
2" SCH 80 TFJ PVC
".020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 110 9 IN.
110 TO 180 6 IN.

Drill 9" dual wall to 110
Drill 6" rotary hole to 180' plug back w/cement to 149'

FORMATION DESCRIPTION

0-2 Tan silt w/cobbles

2-18 Brown, silty sandy GRAVEL w/cobbles, damp

18-40 Black basaltic, silty SAND w/gravel, cobbles and occasional boulders, damp

40-44 Black basaltic boulders w/gravel

44-75 Black silty, gravelly, fine to coarse SAND, w/cobbles damp to moist

75-82 Dark brown, slightly clayey, silty, gravelly SAND w/cobbles, moist

82-107 Yellowish brown, clayey sandy, SILT w/cobbles and broken basalt, wet

107-147 Basalt, weathered, fractured, iron stained, wet

147-180 BASALT, hard, competent, black.

SEACOR

BORING LOG

BORING: PH1-B1
PAGE 1 of 2

PROJECT 00091-049-01
LOCATION SOUTH OF 1T1
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/26/92 1340
FINISH 1440
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose, Black, Moist, Coarse SAND, Trace Fine to Medium-Grained Sand, Trace Small Gravels (Oily Matrix)	SP	
5/4/7 PH1-B1-1 1350	▨	40	5			Slight Odor
5/5/4 PH1-B1-2 1355	▨	100	10			Strong Odor
9/9/8 PH1-B1-3 1400	▨	170	15			Strong Odor
				Grading more Cobble		
3/5/8 PH1-B1-4 1405		0	20			No Recovery
				Grading Moist		
				Grading Very Dense-more Cobble		
9/22/29 PH1-B1-5 1420	▨	No PID	25			Not Enough Recovery for Baggie, Strong Odor

SEACOR

BORING LOG

BORING: PH1-B1
PAGE 2 of 2

PROJECT 00091-049-01 LOCATION SOUTH OF 1T1

Penetration Results Blows 6"-6"-6"	Sample Depth Interval,feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			25	Very Dense, Black, Very Moist, Fine to Medium SAND and Cobbles	GP	
44/46/47 PH1-B1-6 1445	Refusal 30'	7	30	Bottom of Hole 30'		Slight Odor
			35			
			40			
			45			
			50			
			55			

SEACOR

BORING LOG

BORING: PH1-B2
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION EAST 1.5' OF 1T1
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/26/92 1530
FINISH 1610
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS COBBLES VERY SIGNIFICANT @23'-26'-TERMINATED BORING @26'
BROKE A TOOTH OFF OF LEAD AUGER FLIGHT

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose, Brown, Damp, Coarse SAND, Trace of Fines and Small Cobbles	SP	
1/2/1 PH1-B2-1 1530	▨	<1	5			
1/2/2 PH1-B2-2 1535	▨	0	10			Slight Odor Not Enough Recovery for PID Baggie
				Grading Darker Brown		
6/6/5 PH1-B2-3 1540	▨	125	15	Medium, Black, Moist, Coarse SAND Trace Fines and Small Gravels	SP	Strong Odor
6/6/9 PH1-B2-4 1545	▨	135	20	Grading more Cobbles- Drilling Very Dense, Black, Very Moist Sand		Very Strong Odor
				Very Dense, Black, Very Moist, Coarse SAND and Cobbles		
24/38/31 PH1-B2-5 1550	▨	25	25			Strong Odor

SEACOR

BORING LOG

BORING: PH1-B2
PAGE 2 of 2

PROJECT 00091-049-01 LOCATION EAST 1.5' OF 1T1

Penetration Results Blows 6"-6"-6"	Sample Depth Interval,feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			25			
				Refusal Due to Cobble at 26'		
			30			
			35			
			40			
			45			
			50			
			55			

SEACOR

BORING LOG

BORING: PH1-B3
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION BETWEEN 1T1 & 1T2
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/26/92 1630
FINISH 1640
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS CONCRETE SADDLE @13'7"

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose, Brown, Damp, Coarse SAND, Trace of Fines and Small Cobbles	SP	
1/2/3 PH1-B3-1 1635	▨	<1	5			Slight Odor
				Grading Moist, Black, Odorous Coarse SAND		
				Medium, Black, Wet, Coarse SAND, Trace Cobbles	SP	
7/6/5 PH1-B3-2 1640	▨	105	10			Strong Odor
				Wet with Product		
PH1-B3-3 1645	▨	*				Very Strong Odor Not Enough Sample for Baggie
				Refusal @13'7" Concrete Saddle Encountered @ 13'7"		
			15			
			20			
			25			

SEACOR

BORING LOG

BORING: PH1-B4
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION BETWEEN 1T2 & 1T3
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 0845
FINISH 0900
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose, Black, Damp, Coarse SAND, Trace Small Gravels		
2/3/2 PH1-B4-1 0850	▨	20	5			Slight Odor
				Grading Moist		
2/2/3 PH1-B4-2 0855	▨	50	10			Slight Odor
4/7 Refusal PH1-B4-3 0900	▨	10				Slight Odor
				Refusal @12'5" Concrete Saddle Encountered @ 12'5"		
			15			
			20			
			25			

SEACOR

BORING LOG

BORING: PH1-B5
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION BETWEEN 1T3 & 1T4
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 0915
FINISH 0925
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose, Black, Damp, Coarse SAND	SW	
3/3/4 PH1-B5-1 0915	▨	20	5			Slight Odor
				Saturated with Product		
1/2/1 PH1-B5-2 0920	▨	50	10			Very Strong Odor
4/5/0/6" PH1-B5-3 0925	▨	365				Very Strong Odor
				Refusal @12'2" Concrete Saddle Encountered @ 12'2"		
			15			
			20			
			25			

SEACOR

BORING LOG

BORING: PH1-B6
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION BETWEEN 1T4 & 1T5
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 0945
FINISH 1000
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose, Brown, Damp, Coarse SAND	SW	
				Loose, Black, Moist, Coarse SAND	SW	
2/2/2 PH1-B6-1 0950	▨	15	5			Slight Odor
3/2/1 PH1-B6-2 0955	▨	@50	10			Strong Odor
4/8/17 PH1-B6-3 1000	▨	40				Slight Odor
				Refusal @12'5"		
			15			
			20			
			25			

SEACOR

BORING LOG

BORING: PH1-B7
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION NORTH OF 1T5(1.5')
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 1025
FINISH 1040
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	Loose, Brown, Dry, Fine to Coarse SAND Trace Cobbles TANK BACKFILL	SP	
1/2/3 PH1-B7-1 1025	▨	5	5	Loose, Black, Damp to Moist, Coarse SAND	SW	Slight Odor
3/3/4 PH1-B7-2 1030	▨	20	10			Strong Odor
4/6/8 PH1-B7-3 1035	▨	40	15	Loose, Black, Damp to Moist, Coarse SAND		Strong Odor
				Bottom of Hole @15'		
			20			
			25			

SEACOR

BORING LOG

BORING: PH1-B8
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION SW/1' FROM 1T6(END)
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 1115
FINISH 1130
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose, Brown, Dry to Damp, Fine to Coarse SAND, Cobble	SP	1T6 Buried @4.5' BGS Tank =4' Diameter
3/4/3 PH1-B8-1 1120	▨	20	5	Grading Black, Coarse SAND-Odor		Slight Odor
13/17/19 PH1-B8-2 1125	▨	26	10			Slight Odor
				Bottom of Hole @11'		
			15			
			20			
			25			

SEACOR

BORING LOG

BORING: PH1-B9
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION NORTH 1.5' OF CENTER 1T6
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 1135
FINISH 1140
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose, Brown to Black, Coarse SAND Trace Fines	SP	
3/3/2 PH1-B9-1 1135	▨	40	5			Odor
4/6/7 PH1-B9-2 1140	▨	15	10	Loose, Brown to Black, Coarse SAND Trace Fines		Slight Odor
				Bottom of Hole @11'		
			15			
			20			
			25			

SEACOR

BORING LOG

BORING: PH1-B10
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION EAST/NE 1' FROM 1T6(END)
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 1230
FINISH 1255
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose, Brown to Black, Coarse SAND, Trace Fines	SP	
4/3/3 PH1-B10-1 1240	▨	<1	5			No Odor
				Dense, Brown and Black, Damp, Gravel Trace to some Fine to Coarse Sand		
22/19/21 PH1-B10-2 1245	▨	<1	10			No Odor
				Bottom of Hole @11'		
			15			
			20			
			25			

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BORING LOG

BORING: PH1-B11
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION EAST 1T5(1')
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 1315
FINISH 1330
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	Medium, Brown, Dry to Damp, Coarse SAND	SW	
				TANK BACKFILL		
8/7/6 PH1-B11-1 1305	▨	<1	5	Loose, Black/Dark Brown, Damp, Coarse SAND	SW	No Odor
3/3/3 PH1-B11-2 1310	▨	<1	10			No Odor
				Grading more Cobbles and Dense	SP	
7/12/13 PH1-B11-3 1315	▨	<1	15			
				Bottom of Hole @15'		
			20			
			25			

SEACOR

BORING LOG

BORING: PH1-B12
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION EAST OF 1T4(1')
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 1340
FINISH 1345
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	Loose, Brown, Damp, Fine to Coarse SAND, Trace to some Silt	SP	
4/5/6 PH1-B12-1 1335	▨	<1	5	TANK BACKFILL		No Odor
				Loose, Black to Dark Brown, Dry, Coarse SAND	SP	
2/1/1 PH1-B12-2 1340	▨	<1	10			No Odor
				Grading more Cobbles/Gravels		
8/6/7 PH1-B12-3 1345	▨	<1	15			No Odor
				Bottom of Hole @15'		
			20			
			25			

SEACOR

BORING LOG

BORING: PH1-B13
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION EAST OF 1T3(1')
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 1405
FINISH 1925
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Loose to Medium, Black to Dark Brown, Dry, Coarse SAND	SP	
7/5/5 PH1-B13-1 1410	▨	<1	5			No Odor
3/4/5 PH1-B13-2 1415	▨	<1	10			No Odor
				Very Dense, Black, Moist, Coarse SAND with Small Cobbles and Gravels	SW	
12/50/5" PH1-B13-3 1420	▨	12	15			Odor
				Grading Very Dense/Gravels		
				Very Dense, Black, Wet/Saturated, Gravels Trace Sand		
32/33/44 PH1-B13-4 1425	▨	Too Wet	20			Strong Odor(Photos Taken)
29/32/41 PH1-B13-5 1430	▨	+10	25	Very Dense, Black, Wet/Saturated, Gravels Trace Sand, Very Moist		Odor
				Bottom of Hole 25'		

SEACOR

BORING LOG

BORING: PH1-B14
PAGE 1 of 1

PROJECT 00091-049-01
LOCATION EAST OF 1T2(1')
SURFACE ELEVATION
CASING TOP ELEVATION
START 9/27/92 1535
FINISH 1550
SAMPLER 2.5" I.D. D&M
MONITORING DEVICE HNU
SUBCONTRACTOR AND EQUIPMENT HOLT DRILLING MOBILE B-61
COMMENTS

Penetration Results Blows 6"-6"-6"	Sample Depth Interval, feet	PID Reading (ppm)	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Boring Abandonment/ Well Construction Details
			0	TANK BACKFILL		
				Medium, Black, Moist, Coarse SAND Trace Cobbles		
4/4/5 PH1-B14-1 1535	▨	10	5			Slight Odor
6/7/9 PH1-B14-2 1540	▨	50	10			Strong Odor
				Dense, Black, Saturated, Coarse SAND and Cobbles/Gravels	GP	
4/7/13 PH1-B14-3 1545	▨	150	15			Very Strong Odor
27/42/43 PH1-B14-4 1550	▨	46	20			Strong Odor
				Very Dense, Black, GRAVELS	GW	
				Refusal @21.5'		
			25			

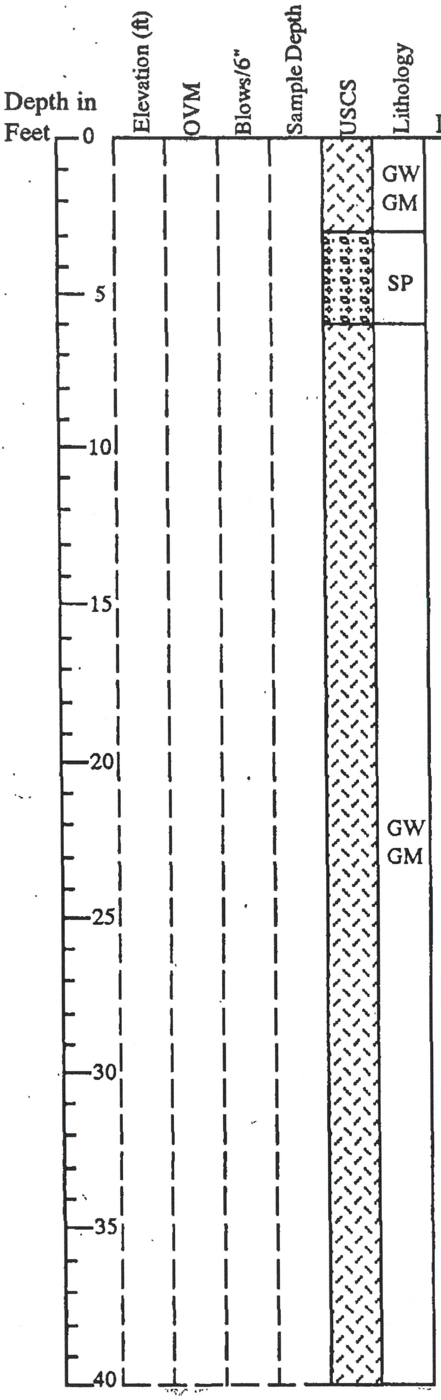
340693

RECEIVED
FEB 17 1994

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9301

(AAV-526)

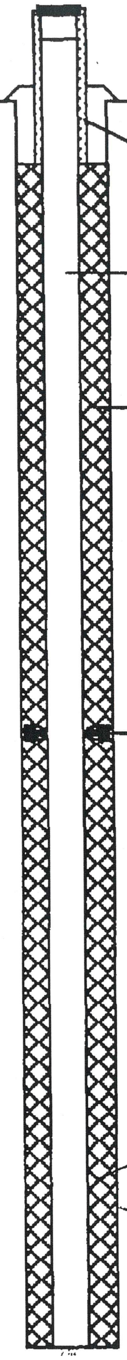


Lithologic Description

Gray sandy GRAVEL; dry, loose

Black slightly silty SAND with occasional cobbles and gravel; dry, loose

Gray sandy GRAVEL to gravelly SAND with cobbles, occasional boulders and trace silt; gravel is generally fine to coarse grained and subrounded to rounded; sand is generally medium to coarse grained and subangular; composition of gravel and sand is primarily basalt with other minor consituents; cobbles, boulders and silt varies throughout unit.



Well Description

Cement seal and monument with locking cover +3 - 2' bgs

2" sch. 40 PVC blank: +2.5 - 79' bgs

3/8" pellet bentonite: 2 - 77' bgs

Centralizer

RE: START CARD #Q20876

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

Bryan Rocque
Lic. #2141

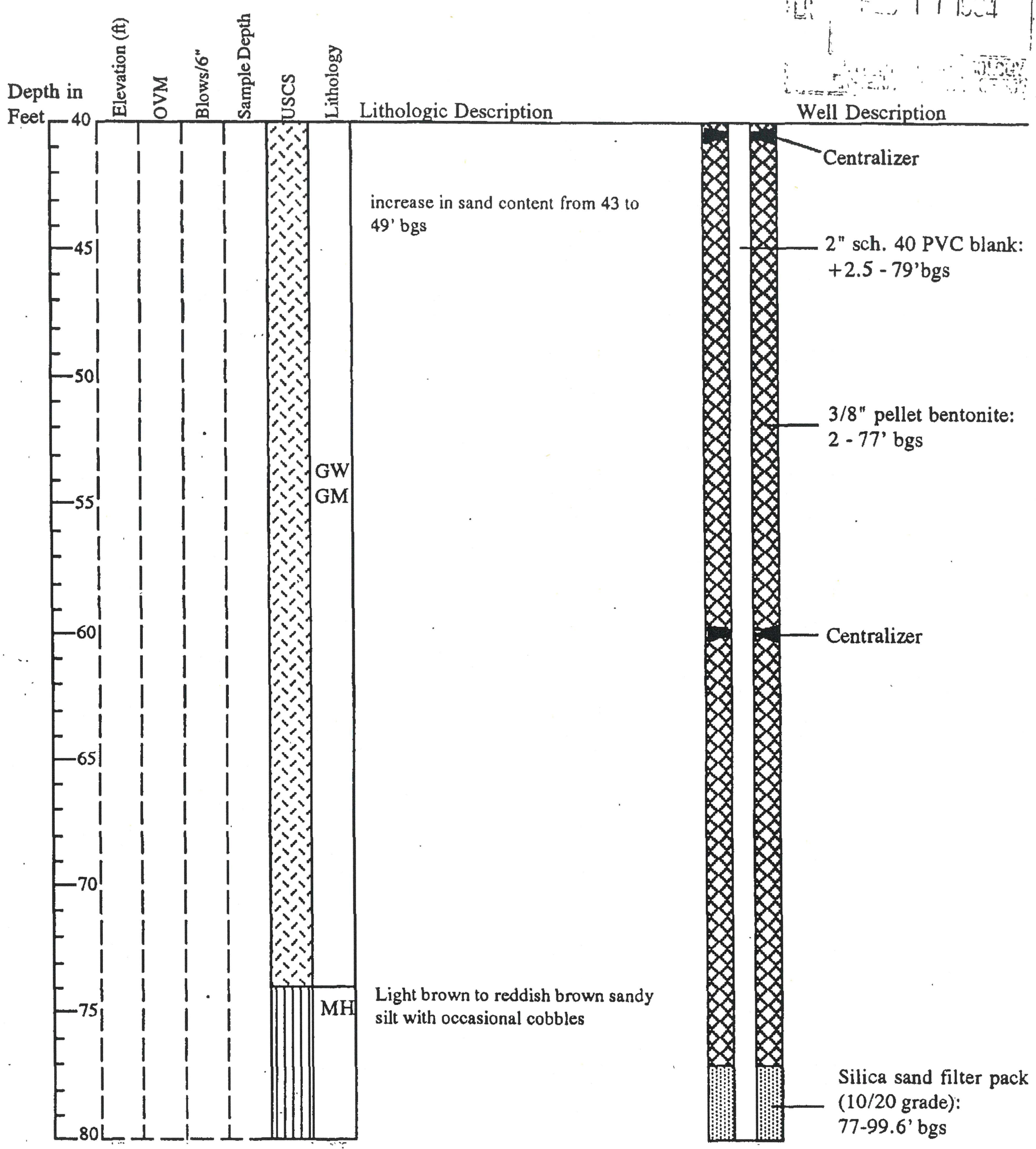
Client Name: Port of Moses Lake/Exxon
Job No.: 931001
Location: Grant County Airport Pumphouse # 1
Hydrogeologist: IAO

Drilling Method: Air Rotary - Tri-cone with 6" casing
Sample Method: Grab samples
Drilling Contractor: Ruen Drilling, Inc.
Drilling Date: 10/23/93
Well Installation Date: 10/25/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9301 (cont'd)

(AAV-526)



increase in sand content from 43 to 49' bgs

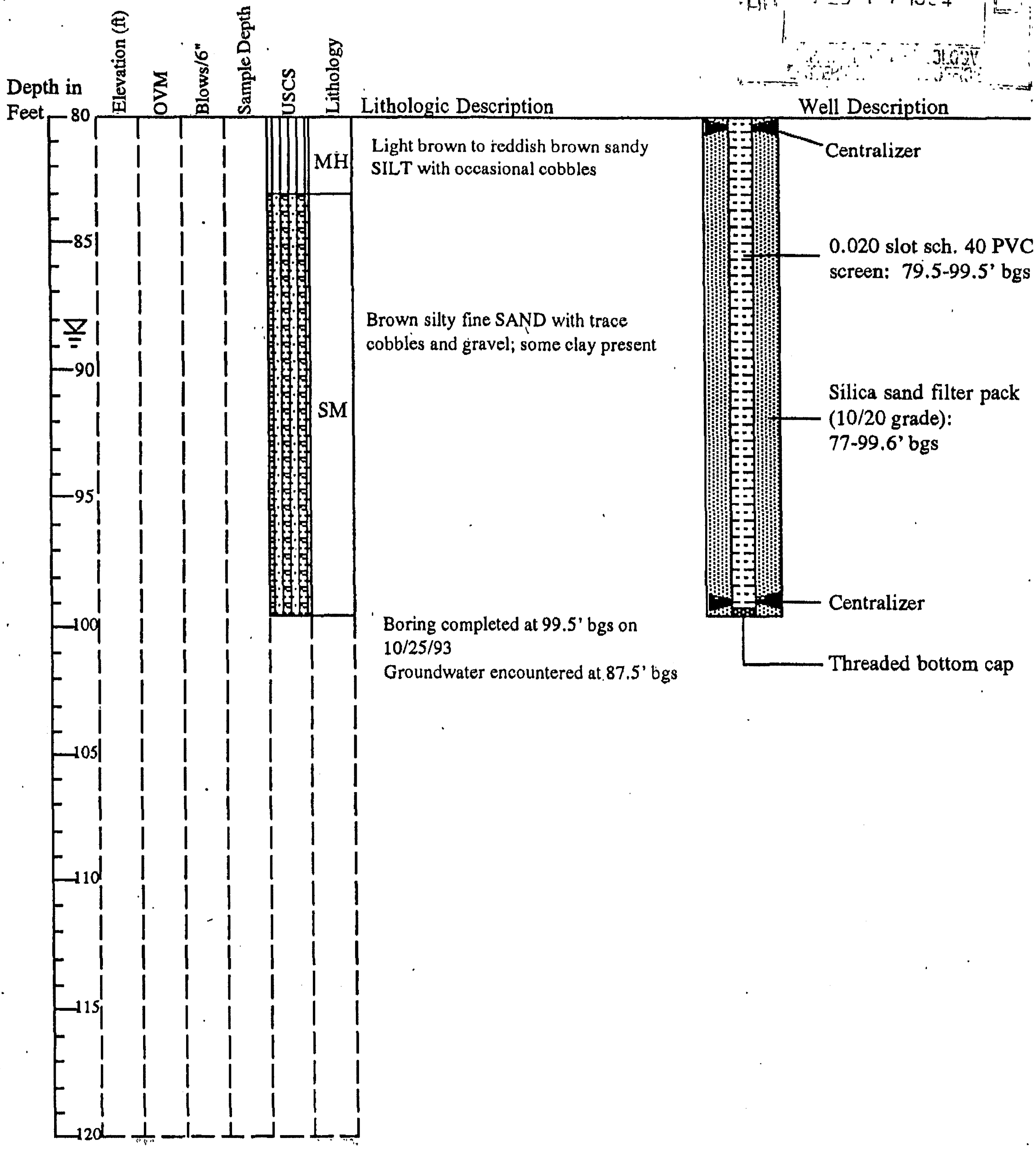
Light brown to reddish brown sandy silt with occasional cobbles

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/23/93
Hydrogeologist:	IAO	Well Installation Date:	10/25/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9301 (cont'd)

(AAV-526)



Light brown to reddish brown sandy SILT with occasional cobbles

Brown silty fine SAND with trace cobbles and gravel; some clay present

Boring completed at 99.5' bgs on 10/25/93
Groundwater encountered at 87.5' bgs

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/23/93
Hydrogeologist:	IAO	Well Installation Date:	10/25/93

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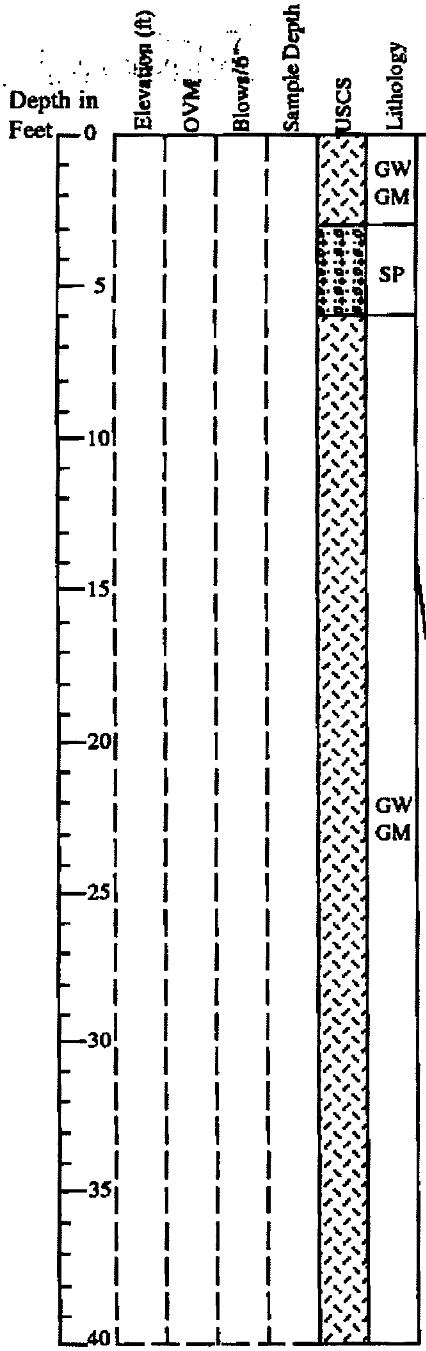
Geological Boring Log and Well Construction Diagram
Monitoring Well PH1-9402
(AAV-544)

LEGAL; NE¼ SW¼ SEC 28
T20N R28E
START CARD #ℓ21132
GRANT CO.



Lithologic Description

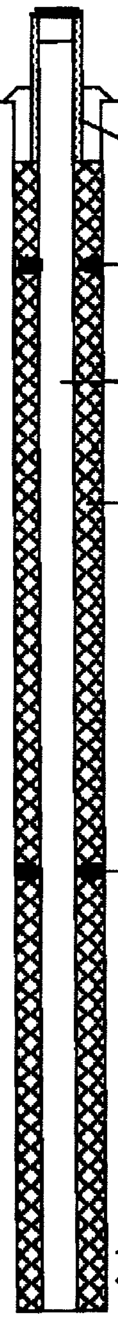
Gray sandy GRAVEL; dry, loose

Black slightly silty SAND with occasional cobbles and gravel; dry, loose

Gray sandy GRAVEL to gravelly SAND with cobbles, occasional boulders and trace silt; gravel is generally fine to coarse grained and subrounded to rounded; sand is generally medium to coarse grained and subangular; composition of gravel and sand is primarily basalt with other minor consituents; cobbles, boulders and silt varies throughout unit.

Increase in fines at 14' bgs

Decrease in fines



Well Description

Cement seal and monument with locking cover +3 - 2' bgs

Centralizer

2" sch. 40 PVC blank: +2.5 - 75.5' bgs

3/8" pellet bentonite: 2 - 70' bgs

Centralizer

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

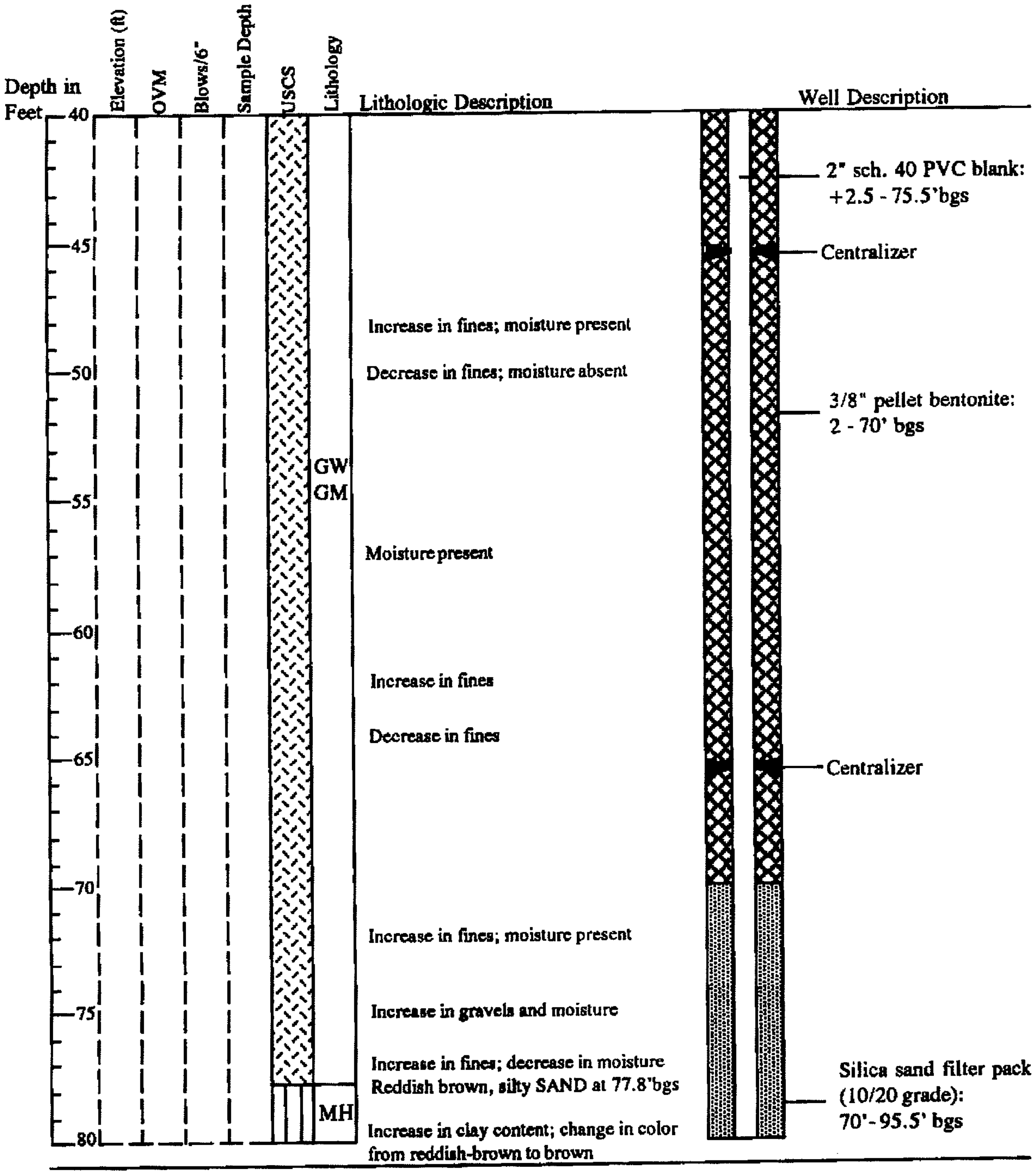
Bryan Rocque
BRYAN ROCQUE #2141

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Odex with 6" casing
Job No.:	940204	Sample Method:	Grab samples
Location:	Grant County Airport	Drilling Contractor:	Ruen Drilling, Inc.
	Pumphouse # 1	Drilling Date:	4/14/94
Hydrogeologist:	IAO	Well Installation Date:	4/16/94

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9402 (cont'd)

(AAV-544)

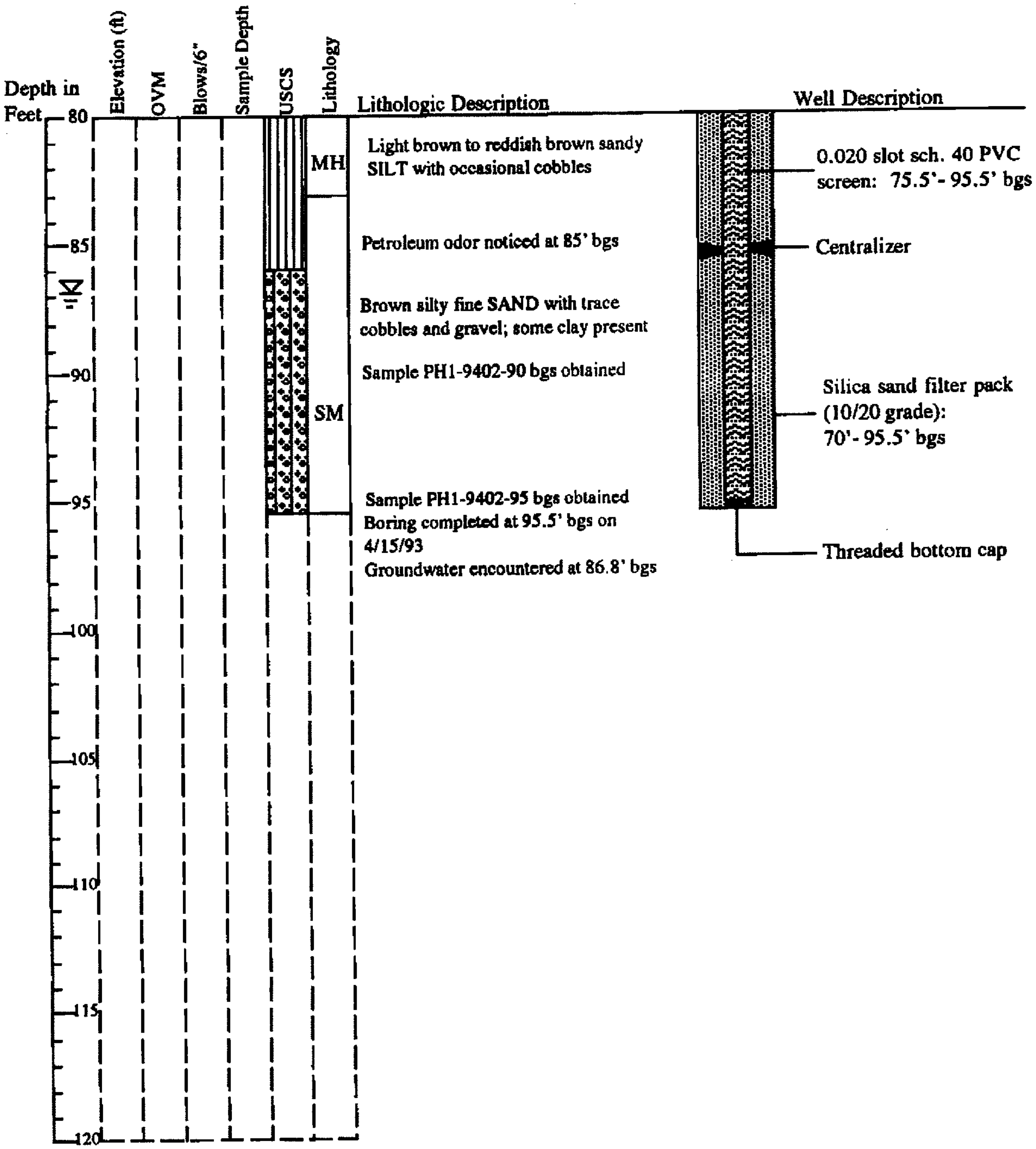


Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Odex with 6" casing
Job No.:	940204	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	4/14/94
Hydrogeologist:	IAO	Well Installation Date:	4/16/94

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9402 (cont'd)

(AAV-544)



Light brown to reddish brown sandy SILT with occasional cobbles

Petroleum odor noticed at 85' bgs

Brown silty fine SAND with trace cobbles and gravel; some clay present

Sample PH1-9402-90 bgs obtained

Sample PH1-9402-95 bgs obtained
Boring completed at 95.5' bgs on 4/15/93
Groundwater encountered at 86.8' bgs

0.020 slot sch. 40 PVC screen: 75.5'- 95.5' bgs

Centralizer

Silica sand filter pack (10/20 grade): 70'- 95.5' bgs

Threaded bottom cap

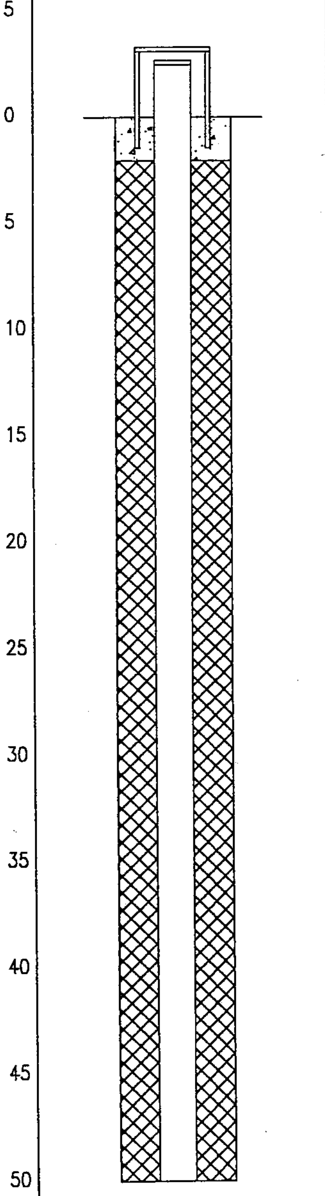
Client Name: Port of Moses Lake/Exxon
Job No.: 940204
Location: Grant County Airport
Pumphouse # 1
Hydrogeologist: IAO

Drilling Method: Air Rotary - Tri-cone with 6" casing
Sample Method: Grab samples
Drilling Contractor: Ruen Drilling, Inc.
Drilling Date: 4/14/94
Well Installation Date: 4/16/94

FACILITY **GRANT COUNTY AIRPORT, PUMPHOUSE #1** JOB # **00091-346-01** BORING/WELL **PH1-9601**
LOCATION **7810 ANDREWS ST., MOSES LAKE, WASHINGTON** SURFACE ELEVATION **-**
START **8/7/96 1640** FINISH **8/8/96 1215** CASING TOP ELEVATION **1165.44'**
LOGGED BY **T. REE** MONITORING DEVICE **OVM 580 B**
SUBCONTRACTOR AND EQUIPMENT **ENVIRONMENTAL WEST EXPLORATIONS, INC., MOBILE AIR ROTARY DRILL**
COMMENTS **SAMPLED USING A 2" I.D. X 1.5' LONG SPLIT SPOON SAMPLER LINED WITH BRASS SLEEVES USING A 140 POUND HAMMER WITH A 30" STROKE. WASHINGTON ECOLOGY WELL #ABT 580**

PENETRATION RESULTS BLOWS 6"/6"/6"	PID Reading	Sheen	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification
			5		
			0	Grass / Clay, white	
50–2"	NT	NT	5		
			10		
40/50–2"	1	NS	15	Gravel with sand and cobbles, trace fines, grayish–brown and black, subrounded to subangular, well graded, primarily basalt. Gravel is fine to coarse grained. Cobbles are fine to medium grained. Sand is fine to coarse grained, dry	
			20		
			25		GW
50–6"	NT	NT	30		
			35		
			40		
40/45/45	8	NS	45	Gravel with sand and cobbles, grayish–brown and black, subrounded to subangular, well graded, primarily basalt, damp	
			50		

Well Construction Schematic



▨ Field Screen/Lithologic Description Sample
☒ Preserved Sample
☐ No Recovery
* Sample Submitted for Laboratory Analysis

▽ Groundwater Level at Time of Drilling
▼ Static Groundwater Level
SD Sheen Detected
NS No Sheen Detected
NT Not Tested
(2.5Y 4/2) Munsell (1990) Soil Color Charts

Gradational Contact
Contact Located Approximately
Contact

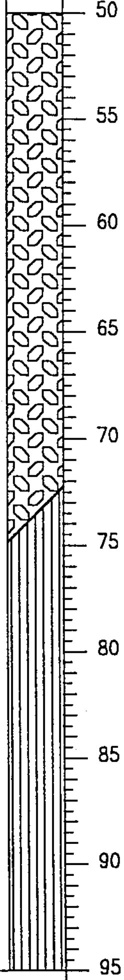
Concrete
Bentonite
8/12 Colorado Silica Sand
2" PVC Blank Casing
2" PVC Screen Casing (0.020 slots)
End Cap

DWG: EX34601L

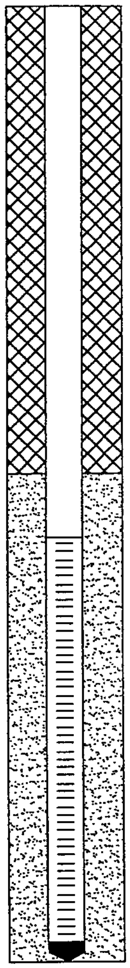
SECOR
International Incorporated

FACILITY **GRANT COUNTY AIRPORT, PUMPHOUSE #1** JOB # **00091-346-01** BORING/WELL **PH1-9601**
LOCATION **7810 ANDREWS ST., MOSES LAKE, WASHINGTON** SURFACE ELEVATION **-**
START **8/7/96 1640** FINISH **8/8/96 1215** CASING TOP ELEVATION **1165.44'**
LOGGED BY **T. REE** MONITORING DEVICE **OVM 580 B**
SUBCONTRACTOR AND EQUIPMENT **ENVIRONMENTAL WEST EXPLORATIONS, INC., MOBILE AIR ROTARY DRILL**
COMMENTS **SAMPLED USING A 2" I.D. X 1.5' LONG SPLIT SPOON SAMPLER LINED WITH BRASS SLEEVES USING A 140 POUND HAMMER WITH A 30" STROKE.** **WASHINGTON ECOLOGY WELL #ABT 580**

PENETRATION RESULTS BLOWS 6"/6"/6"	Sample Depth Interval, feet	PID Reading	Sheen	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification
				50		
				55		GW
50-6"	▭	NT	NT	60		
				65		
50-2"	▭	NT	NT	70		
50-5"	⊠	1	NS		Silt with few fine sands, brown, dry, hard	
40/35/45	▨⊠	0	NS	75	Silt with few fine sands, brown, dry, hard	
20/50-3"	▨⊠	3	NS	80		
35/50-5"	▨⊠	1	NS	▼	Sandy Silt with Clay, brown, well graded sands, brown, damp, hard	ML
20/33/40	▨⊠	1	NS	85 ▽	Silt with Clay, few fine sands, brown, saturated, hard	
				90		
				95	Boring terminated at 95 feet. Groundwater encountered at approximately 85 feet during drilling. Boring converted to a groundwater monitoring well on 8/8/96	
				100		
				105		



Well Construction Schematic



▨ Field Screen/Lithologic Description Sample
⊠ Preserved Sample
▭ No Recovery
* Sample Submitted for Laboratory Analysis
▽ Groundwater Level at Time of Drilling
▼ Static Groundwater Level
SD Sheen Detected
NS No Sheen Detected
NT Not Tested
(2.5Y 4/2) Munsell (1990) Soil Color Charts
╱ Gradational Contact
╱ Contact Located Approximately
— Contact
▭ Concrete
⊠ Bentonite
▒ 8/12 Colorado Silica Sand
▭ 2" PVC Blank Casing
☰ 2" PVC Screen Casing (0.020 slots)
▼ End Cap

DWG: EX34601L

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AUG 13 1996
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

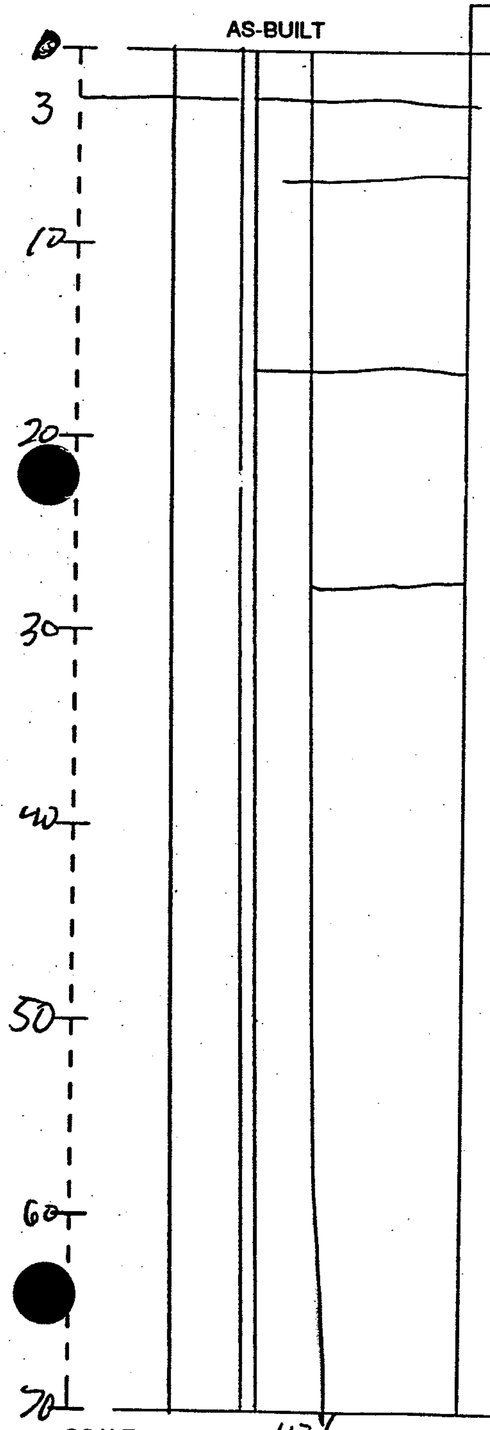
RESOURCE PROTECTION WELL REPORT

START CARD NO. 17813

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. PH-1-9601/ ABT-580
DRILLING METHOD: Tubex XL
DRILLER: Robert A. Sheldon
FIRM: Environmental West Explor.
SIGNATURE:
CONSULTING FIRM: SECOR
REPRESENTATIVE: Gant Goddard

COUNTY: Grant
LOCATION SW 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 7810 Andrews St.
Moses Lake WA.
WATER LEVEL ELEVATION: 82.7 b.G.L.
GROUND SURFACE ELEVATION: N.A.
INSTALLED: 8-8-96
DEVELOPED: 8-8-96

AS-BUILT



WELL DATA

Above monument + concrete

3/8" hole plug seal

2" P.V.C. Blank

6" Bore hole

FORMATION DESCRIPTION

0

gravel + cobbles

↓

10
20
30
40
50
60
70

SCALE: 1" = 10'

PAGE 1 OF ~~1~~ 2

ECY 050-12 (Rev. 11/89)

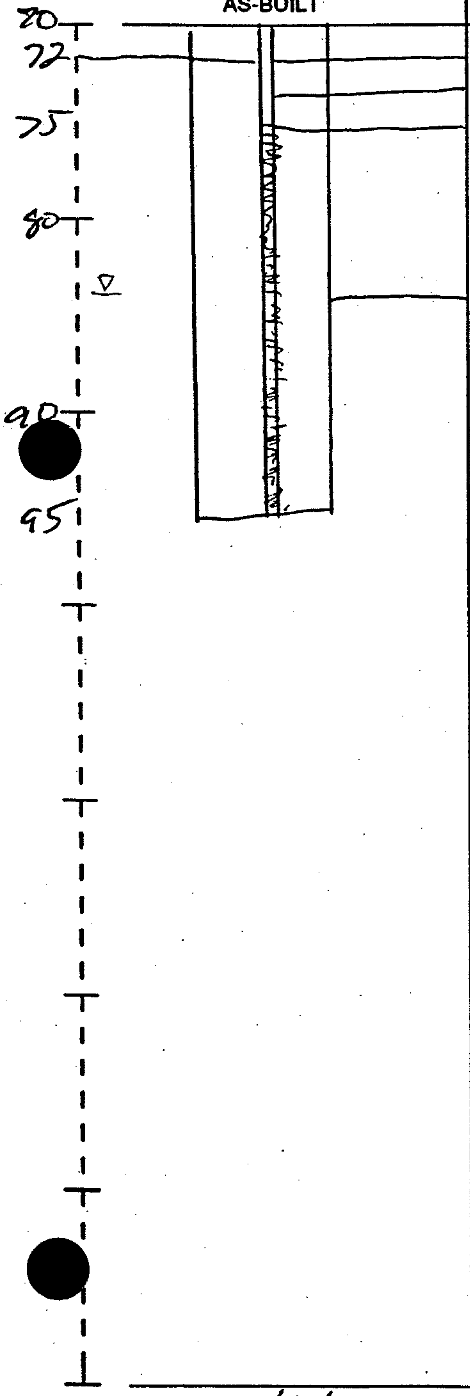
RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. PH-1-9601/ABT-580
DRILLING METHOD: Tubex XL
DRILLER: Robert A. Sheldon
FIRM: Environmental West Explor.
SIGNATURE: Robert A. Sheldon
CONSULTING FIRM: SECOR
REPRESENTATIVE: Curt Goddard

COUNTY: Grant
LOCATION: SW 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 7810 Andrews St.
Moses Lake WA.
WATER LEVEL ELEVATION: 82.7 B.G.L.
GROUND SURFACE ELEVATION: NA.
INSTALLED: 8-8-96
DEVELOPED: 8-8-94

AS-BUILT



WELL DATA

TOP OF 8/12 silica sand
2" P.V.C. Blank
TOP OF ~~8/12 silica sand~~ .020 slot 2" P.V.C. Screen
6" Borehole

FORMATION DESCRIPTION

70
gravel + cobbles
73
Brown silt
80
90
95

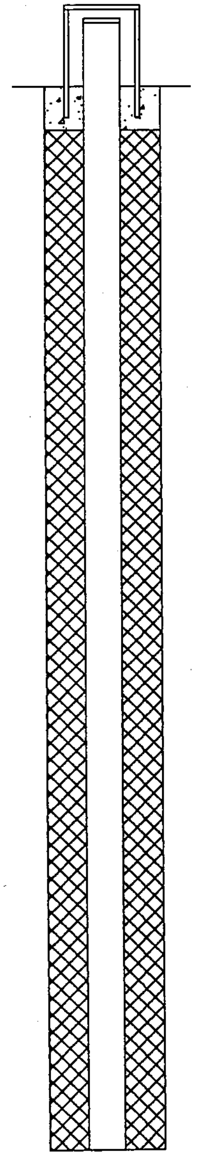
SCALE: 1" = 10'

PAGE 2 OF 2 ①

FACILITY **GRANT COUNTY AIRPORT, PUMPHOUSE #1** JOB # **00091-346-01** BORING/WELL **PH1-9602**
LOCATION **7810 ANDREWS ST., MOSES LAKE, WASHINGTON** SURFACE ELEVATION **NA**
START **8/7/96 0800** FINISH **8/7/96 1440** CASING TOP ELEVATION **1167.66'**
LOGGED BY **T. REE** MONITORING DEVICE **OVM 580 B**
SUBCONTRACTOR AND EQUIPMENT **ENVIRONMENTAL WEST EXPLORATIONS, INC., MOBILE AIR ROTARY DRILL**
COMMENTS **SAMPLED USING A 2" I.D. X 1.5' LONG SPLIT SPOON SAMPLER LINED WITH BRASS SLEEVES USING A 140 POUND HAMMER WITH A 30" STROKE. WASHINGTON ECOLOGY WELL #ABT 579**

PENETRATION RESULTS BLOWS 6"/6"/6"	Sample Depth Interval, feet	PID Reading	Sheen	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification	Depth Below Surface, feet
				5			5
				0	Grass / Clay, white		0
50–5"	▨	0	NS	5	Coarse Gravel with fine Cobbles, black, dry, basalt, subrounded		5
				10			10
30/40/40	▨ ☒	0	NS	15	Gravel with Sand and Cobbles, few fines, grayish-brown and black, subrounded to subangular, well graded, basalt. Gravel is fine to coarse grained. Cobbles are fine to medium grained. Sand is fine to coarse grained, damp		15
				20			20
				25		GW	25
30/50–3"	□	NT	NT	30			30
				35			35
				40			40
50–5"	☒	2	NS	45	Gravel with Sand and Cobbles, few fines, grayish-brown and black, subrounded to subangular, well graded, basalt, dry		45
				50			50

Well Construction Schematic



▨ Field Screen/Lithologic Description Sample
☒ Preserved Sample
□ No Recovery
* Sample Submitted for Laboratory Analysis

▽ Groundwater Level at Time of Drilling
▼ Static Groundwater Level
SD Sheen Detected
NS No Sheen Detected
NT Not Tested
(2.5Y 4/2) Munsell (1990) Soil Color Charts

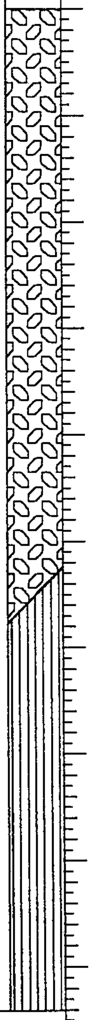
- - - Gradational Contact
/ Contact Located Approximately
—— Contact

Concrete
Bentonite
8/12 Colorado Silica Sand
2" PVC Blank Casing
2" PVC Screen Casing (0.020 slots)
End Cap

DWG: EX34602L

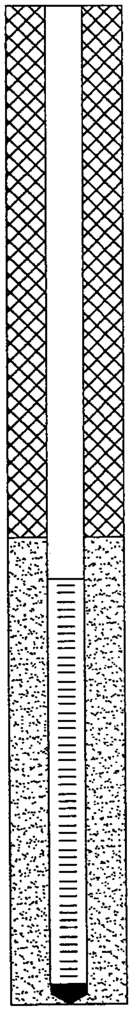
FACILITY **GRANT COUNTY AIRPORT, PUMPHOUSE #1** JOB # **00091-346-01** BORING/WELL **PH1-9602**
LOCATION **7810 ANDREWS ST., MOSES LAKE, WASHINGTON** SURFACE ELEVATION **NA**
START **8/7/96 0800** FINISH **8/7/96 1440** CASING TOP ELEVATION **1167.66'**
LOGGED BY **T. REE** MONITORING DEVICE **OVM 580 B**
SUBCONTRACTOR AND EQUIPMENT **ENVIRONMENTAL WEST EXPLORATIONS, INC., MOBILE AIR ROTARY DRILL**
COMMENTS **SAMPLED USING A 2" I.D. X 1.5' LONG SPLIT SPOON SAMPLER LINED WITH BRASS SLEEVES USING A 140 POUND HAMMER WITH A 30" STROKE. WASHINGTON ECOLOGY WELL #ABT 579**

PENETRATION RESULTS BLOWS 6"/6"/6"	Sample Depth Interval, feet	PID Reading	Sheen	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification
				50		
				55		
50-2"	☐	NT	NT	60		GW
				65		
16/50/50-3"	▨ ⊠	2	NS	70	Gravel with Sand and Cobbles, few fines, grayish-brown and black, well graded, basalt, subrounded to subangular, dry	
50-6"	⊠	NT	NT			
				75		
50-3"	☐	NT	NT			
30/50-1"	▨	0	NS	80	Silt with few fine sands, brown, hard, dry	
25/30/35	▨ ▨	1	NS		Silt, brown, damp,very stiff, damp	
16/30/50-1"	▨ ▨	2	NS	85 ∇ ▼	Sandy Silt with trace Clay, brown, very stiff to hard, poorly graded. Sand is fine grained	ML
25/30/50-5"	▨ ▨	2	NS		Saturated	
				90		
				95		
				100		
				105		



Boring terminated at 97 feet.
Groundwater encountered at approximately 87 feet during drilling.
Boring converted to a groundwater monitoring well on 8/7/96

Well Construction Schematic



▨ Field Screen/Lithologic Description Sample	∇ Groundwater Level at Time of Drilling	⁄ Gradational Contact	Concrete
⊠ Preserved Sample	▼ Static Groundwater Level	⁄ Contact Located Approximately	▩ Bentonite
☐ No Recovery	SD Sheen Detected	—— Contact	8/12 Colorado Silica Sand
* Sample Submitted for Laboratory Analysis	NS No Sheen Detected		2" PVC Blank Casing
	NT Not Tested		2" PVC Screen Casing (0.020 slots)
	(2.5Y 4/2) Munsell (1990) Soil Color Charts		End Cap

DWG: EX34602L

RECEIVED
AUG 13 1996
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

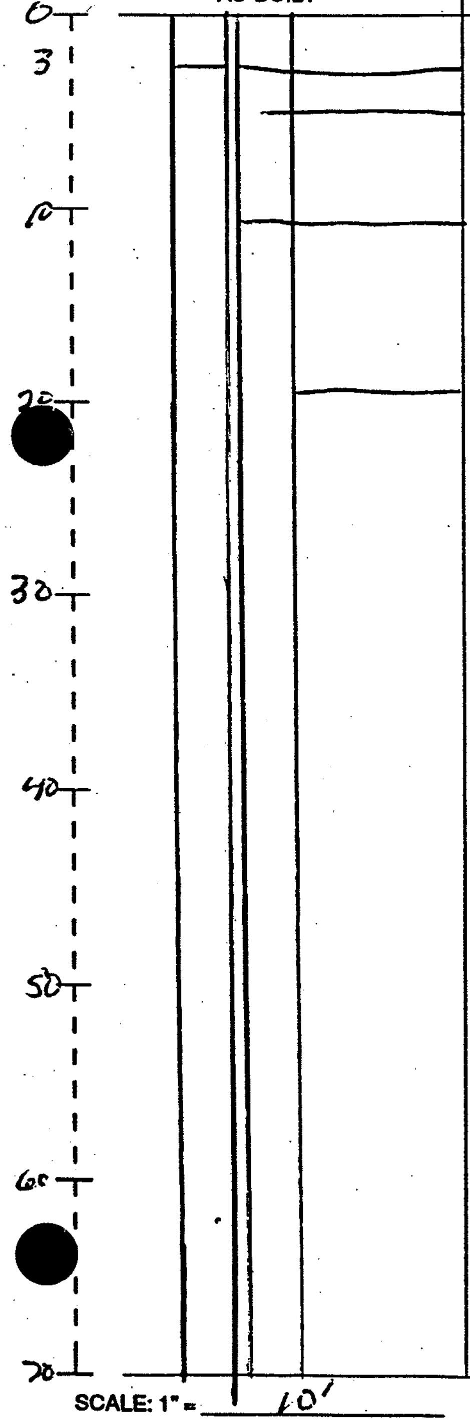
RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. PH-1-9602/ART-579
DRILLING METHOD: Tubex XL
DRILLER: Robert A. Sheldon
FIRM: Environmental West Explorn
SIGNATURE: Robert A. Sheldon
CONSULTING FIRM: ~~Secor~~ Secor
REPRESENTATIVE: Curt Goddard

COUNTY: Grant
LOCATION: SW 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 2810 Andrews St
Moses Lake WA.
WATER LEVEL ELEVATION: 86.5 B.G.L.
GROUND SURFACE ELEVATION: N.A.
INSTALLED: 8-7-96
DEVELOPED: 8-8-96

AS-BUILT



WELL DATA

Above monument + concrete

3/8" Hole plug seal

2" P.V.C. Blank

6" Borehole

FORMATION DESCRIPTION

gravel + cobbles

0 10 20 30 40 50 60 70

SCALE: 1" = 10'

PAGE 1 OF ~~1~~ 2

ECY 050-12 (Rev. 11/89)

RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: Grant County Airport

WELL IDENTIFICATION NO. PH-1-9602/ABJ-579

DRILLING METHOD: tubex XL

DRILLER: Robert A. Sheldon

FIRM: Environmental West Explor

SIGNATURE: Robt A. Sheldon

CONSULTING FIRM: SCEOR

REPRESENTATIVE: Curt Goddard

COUNTY: Grant

LOCATION: SW¼ SW ¼ Sec 28 Twn 20N R 28E

STREET ADDRESS OF WELL: 7810 Andrews St
Moses Lake WA.

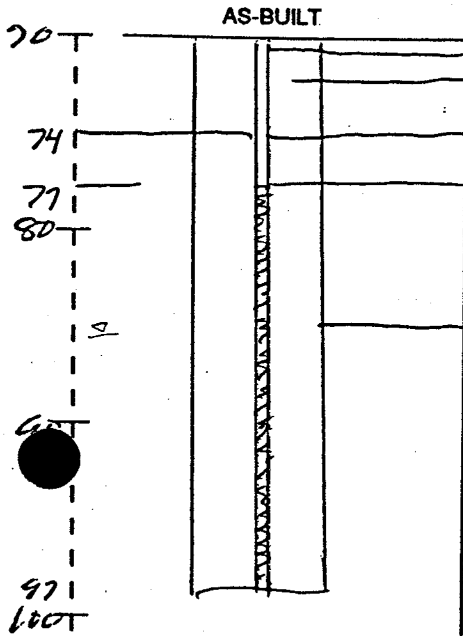
WATER LEVEL ELEVATION: 86.5 B.G.L.

GROUND SURFACE ELEVATION: NA.

INSTALLED: 8-7-96

DEVELOPED: 8-8-96

AS-BUILT



WELL DATA

2" P.V.C. Blank
3/8" hole Plug Seal
TOP OF 8/12 Silica Sand
TOP OF .020 Slot P.V.C. 2" screen
6" Bore hole

FORMATION DESCRIPTION

20 – 77.5: gravel + cobbles
77.5 – 87: Brown silt
87 – 97: Brown sandy silt

80
90
100

SCALE: 1" = 10'

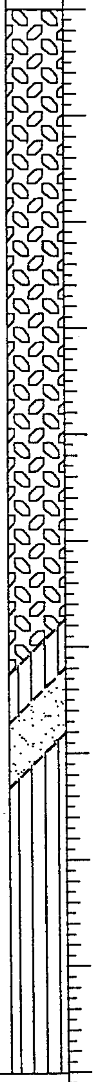
PAGE 2 OF 2

ECY 050-12 (Rev. 11/89)

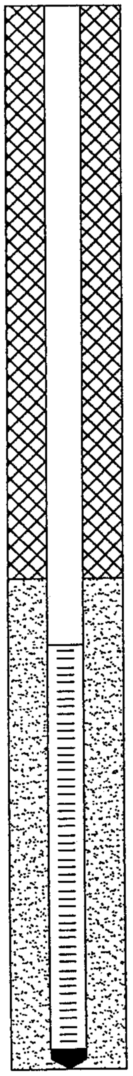
SECOR
International Incorporated

FACILITY **PUMPHOUSE NO. 1 - GRANT COUNTY AIRPORT** JOB # **00091-346-01** BORING/WELL **PH1-9603**
LOCATION **7810 ANDREWS ST., MOSES LAKE, WASHINGTON** SURFACE ELEVATION **NA**
START **8/6/96 0845** FINISH **8/6/96 1500** CASING TOP ELEVATION **1170.29'**
LOGGED BY **T. REE** MONITORING DEVICE **OVM 580 B**
SUBCONTRACTOR AND EQUIPMENT **ENVIRONMENTAL WEST EXPLORATIONS, INC., MOBILE AIR ROTARY DRILL**
COMMENTS **SAMPLED USING A 2" I.D. X 1.5' LONG SPLIT SPOON SAMPLER LINED WITH BRASS SLEEVES USING A 140 POUND HAMMER WITH A 30" STROKE. WASHINGTON ECOLOGY WELL #ABT 578**

PENETRATION RESULTS BLOWS 6"/6"/6"	Sample Depth Interval, feet	PID Reading	Sheen	Depth Below Surface, feet	Lithologic Description	Unified Soil Classification
				50		
				55		
29/50-3"	▨ ☒	1	NS	60	Sandy Gravel with occasional Cobbles, gray to dark brown. Sand is fine to medium grained. Gravel is fine to coarse grained, subrounded to rounded, dense to very dense. Gravel is primarily basalt, dry	GW
				65		
				70		
50-5"	☐	NT	NT	75		
50-2'	☒	1	NS			
				80	Silt with Sand, brown, hard. Sand is fine grained, dry	
50-5'	☒	1	NS			ML
20/50-5'	▨ ☒	1	NS	85	Silty SAND, brown, coarse to fine grained, well graded, damp	
						SM
40/23/35	▨ ☒	1	NS	▼ ▽	Silt with Sand, brown, hard, coarse to fine grained sand, well graded, moist	
40/23/35	▨ ☒	1	NS	90	Saturated	ML
				95		
				100	Boring terminated at 100 feet. Groundwater encountered at approximately 89 feet during drilling. Boring converted to a groundwater monitoring well on 8/6/96	
				105		



Well Construction Schematic



▨ Field Screen/Lithologic Description Sample
☒ Preserved Sample
☐ No Recovery
* Sample Submitted for Laboratory Analysis

▽ Groundwater Level at Time of Drilling
▼ Static Groundwater Level
SD Sheen Detected
NS No Sheen Detected
NT Not Tested
(2.5Y 4/2) Munsell (1990) Soil Color Charts

- - - Gradational Contact
/ Contact Located Approximately
—— Contact

Concrete
Bentonite
8/12 Colorado Silica Sand
2" PVC Blank Casing
2" PVC Screen Casing (0.020 slots)
End Cap

DWG: EX34603L

RECEIVED
AUG 13 1996
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

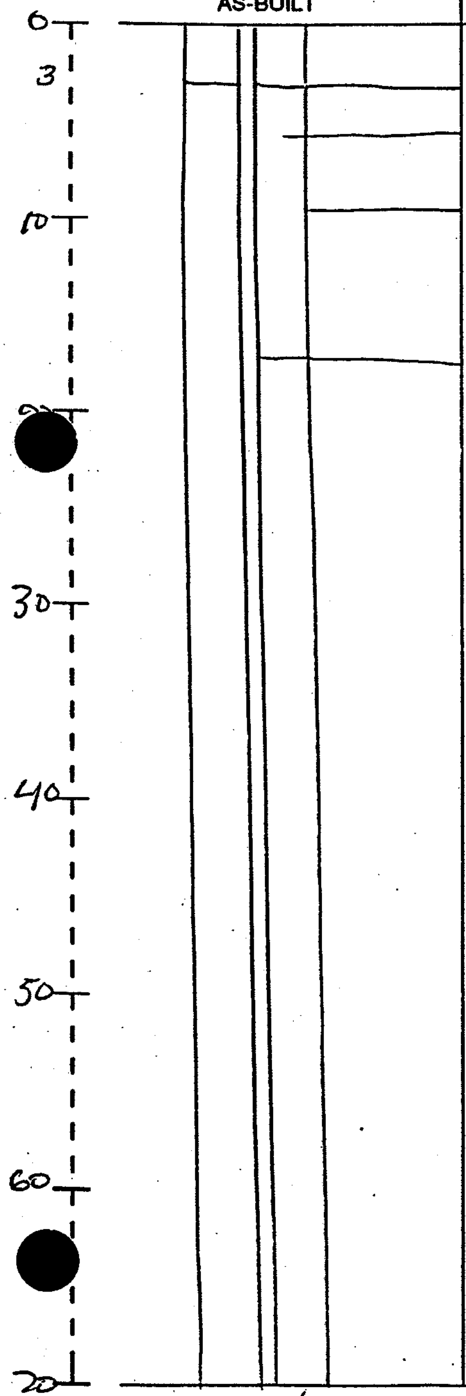
RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. PH-1-9603/ABT-578
DRILLING METHOD: Tubex XL
DRILLER: Robert A. Sheldon
FIRM: Environmental West Explor.
SIGNATURE: Robert A. Sheldon
CONSULTING FIRM: SECOR
REPRESENTATIVE: Cart Goddard

COUNTY: Grant
LOCATION: SW 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 2810 Andrews St. Moses Lake WA.
WATER LEVEL ELEVATION: 88 B.G.L.
GROUND SURFACE ELEVATION: N.A.
INSTALLED: 8-6-96
DEVELOPED: 8-8-96

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
0	Above monument & concrete	
3	3/8" Hole plug seal	Gravel & cobbles
10	6" Bore hole	
20	2" P.V.C. BLANK	
30		
31.5		Basalt Boulder
34		
40		Gravel & cobbles
50		
60		
70		



SCALE: 1" = 10'

PAGE 1 OF 2

ECY 050-12 (Rev. 11/89)

F pg

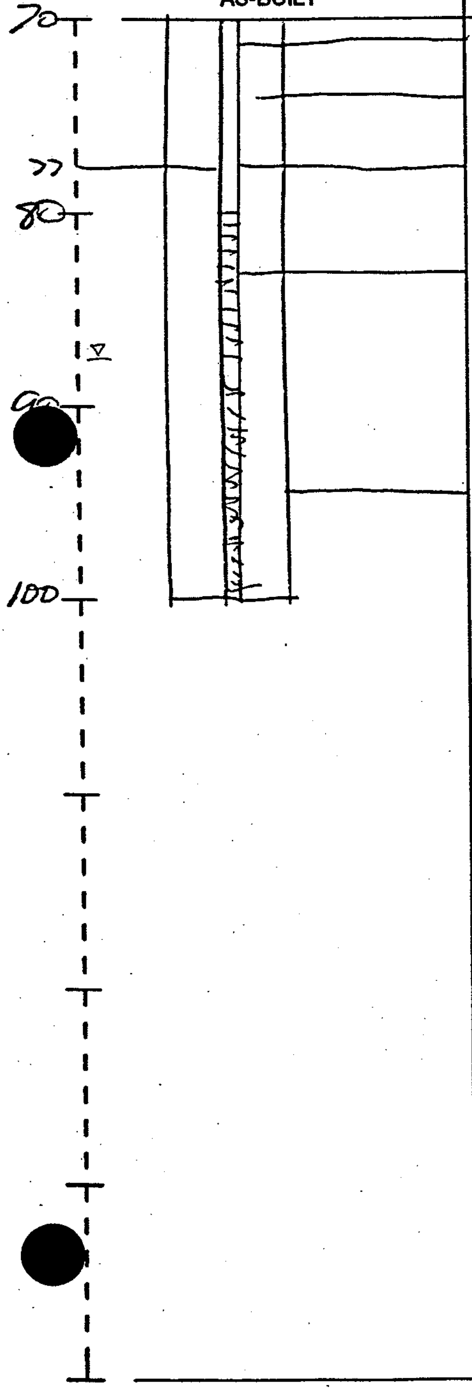
RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. PH-1-9603/ABT-578
DRILLING METHOD: Tubex XL
DRILLER: Robert A. Sheldon
FIRM: Environmental West Explor.
SIGNATURE:
CONSULTING FIRM: SECOR
REPRESENTATIVE: Curt Goddard

COUNTY: Grant
LOCATION: SW 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 2810 Andrews St. Moses Lake WA.
WATER LEVEL ELEVATION: 88 B.G.L.
GROUND SURFACE ELEVATION: NA.
INSTALLED: 8-6-96
DEVELOPED: 8-8-96

AS-BUILT



WELL DATA

2" P.V.C. Blank

3/8" Holeplug seal

TOP OF 8/12 Silica sand Filter pack

.020 slot 2" P.V.C. screen

Static water level 88. B.G.L.

6" Bore hole

FORMATION DESCRIPTION

70

Gravel & cobbles

80 / 80.5

Brown silt

90

100

SCALE: 1" = 10'

PAGE ~~1~~ 2 OF ~~1~~ 2

ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B1 / MW13

(Page 1 of 2)

Date Drilled:	: 04/28/08 - 04/30/08
Drilling Co.:	: Cascade Drilling, Inc.
Drilling Method:	: Air Rotary
Sampling Method:	: Grab Sample from Cyclone
Borehole Diameter:	: 6.25" / 4"
Casing Diameter:	: 2"
Location N-S	:
Location E-W	:
Total Depth:	: 110'
First GW Depth:	: 99'

Project No.:	: 31227
Site:	: ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By:	: Benjamin Kortlever
Reviewed By:	: Keith Romstad, L.G. 386
Signature:	:

Sample Condition

- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels

- ▼ After Completion (05/12/08)
- ▽ During Drilling

Well: B1 / MW13
Elev.: 1160.84

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						
5	N/A	0.0	▩			Sandy GRAVEL, with cobbles, with silt: fine- to coarse-grained gravel, medium- to coarse-grained sand, light to medium brown, dry, well graded.
10						
15						
20						
25						
30					GW	
35						
40						
45						
50						GRAVEL, with cobbles: gray, dry, well graded.
55						
60						

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ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B1 / MW13

(Page 2 of 2)

Date Drilled:	: 04/28/08 - 04/30/08
Drilling Co.:	: Cascade Drilling, Inc.
Drilling Method:	: Air Rotary
Sampling Method:	: Grab Sample from Cyclone
Borehole Diameter:	: 6.25" / 4"
Casing Diameter:	: 2"
Location N-S	:
Location E-W	:
Total Depth:	: 110'
First GW Depth:	: 99'

Project No.:	: 31227
Site:	: ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By:	: Benjamin Kortlever
Reviewed By:	: Keith Romstad, L.G. 386
Signature:	:

Sample Condition

- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

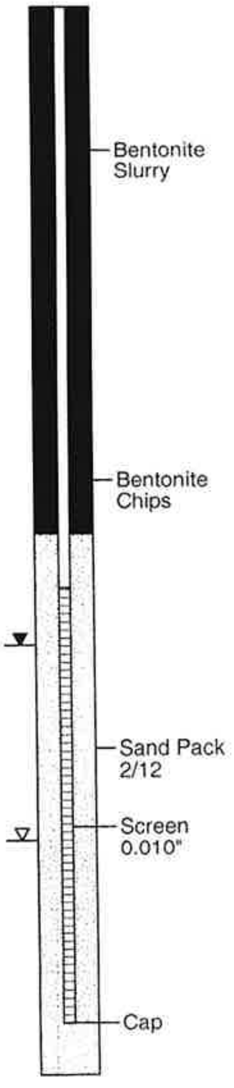
Water Levels

- ▼ After Completion (05/12/08)
- ▽ During Drilling

Well: B1 / MW13
Elev.: 1160.84

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	USCS	DESCRIPTION
60–93				GW	
93	N/A	0.0	▨	SP	SAND, with gravel, with cobbles: medium- to coarse-grained, dark gray to grayish black, damp, poorly graded.
100	N/A	0.0	▨	GW	GRAVEL, with cobbles, trace sand: fine- to coarse-grained, gray to black, wet, well graded, angular.
108				SP	Gravelly SAND, with cobbles: coarse- to very coarse-grained, grayish black to black, wet, poorly graded.
110	N/A	0.0	▨		

Bottom of Borehole @ 110'; 12:25; 04/29/08.
Air Knife/Vacuum: 0' to 5'; 04/28/08.
Hollow-Stem Auger: 5' to 110'.



ERI **ENVIRONMENTAL RESOLUTIONS, INC.**

BORING LOG B2 / MW14

(Page 1 of 2)

Date Drilled:	: 04/30/08 - 05/01/08
Drilling Co.:	: Cascade Drilling, Inc.
Drilling Method:	: Air Rotary
Sampling Method:	: Grab Sample from Cyclone
Borehole Diameter:	: 6.25" / 4"
Casing Diameter:	: 2"
Location N-S	:
Location E-W	:
Total Depth:	: 110'
First GW Depth:	: 99'

Project No.:	: 31227
Site:	: ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By:	: Benjamin Kortlever
Reviewed By:	: Keith Romstad, L.G. 386
Signature:	:

Sample Condition

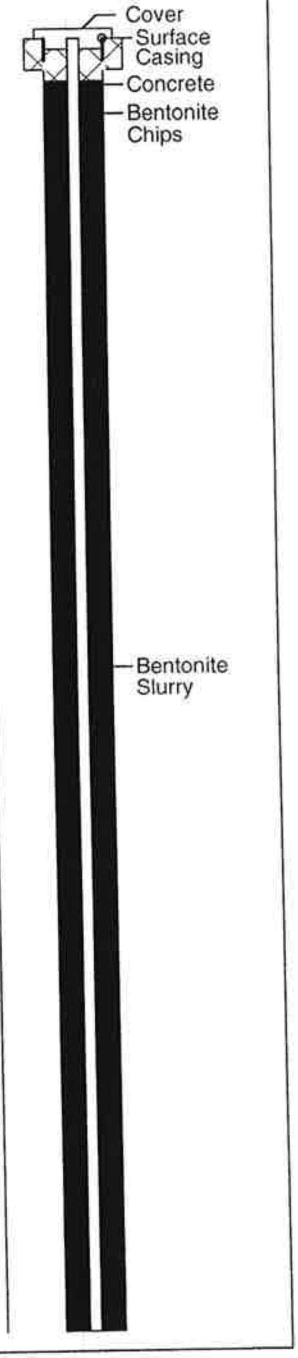
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels

- ▼ After Completion (05/12/08)
- ▽ During Drilling

Well: B2 / MW14
Elev.: 1164.23

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
10	N/A	0.0	▨		SW	Gravelly SAND, with cobbles, with silt: fine- to very coarse-grained, brown, dry, well graded, gravel is subrounded.
25					GW	GRAVEL, with cobbles, with sand: fine- to coarse-grained, gray, dry, well graded.



ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B2 / MW14

(Page 2 of 2)

Date Drilled: : 04/30/08 - 05/01/08
Drilling Co.: : Cascade Drilling, Inc.
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 6.25" / 4"
Casing Diameter: : 2"
Location N-S :
Location E-W :
Total Depth: : 110'
First GW Depth: : 99'

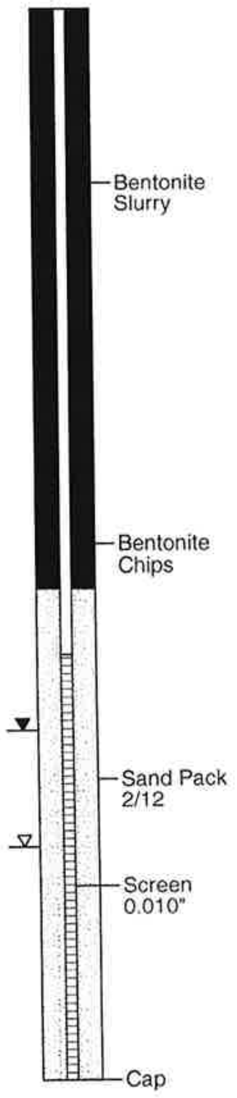
Project No.: : 31227
Site: : ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By: : Benjamin Kortlever
Reviewed By: : Keith Romstad, L.G. 386
Signature: :

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion (05/12/08)
- ▽ During Drilling

Well: B2 / MW14
Elev.: 1164.23

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
60–95					GW	
95–99					SP	Gravelly SAND, with cobbles: medium-grained, dark brown to gray, damp, poorly graded.
99–107					GW	Sandy GRAVEL, with cobbles: fine- to coarse-grained, grayish black to black, wet, well graded, angular to subangular.
100	N/A	0.0	▩			
107	N/A	0.0	▩			Sandy GRAVEL, with cobbles, with silt: fine- to coarse-grained, dark brown, saturated, well graded, angular.
110						Bottom of Borehole @ 110'; 11:20; 05/01/08. Air Knife/Vacuum: 0' to 5'; 04/28/08. Hollow-Stem Auger: 5' to 110'.



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ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B3 / MW15

(Page 1 of 2)

Date Drilled: : 05/02/08
Drilling Co.: : Cascade Drilling, Inc.
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 6.25" / 4"
Casing Diameter: : 2"
Location N-S :
Location E-W :
Total Depth: : 111'
First GW Depth: : 100'

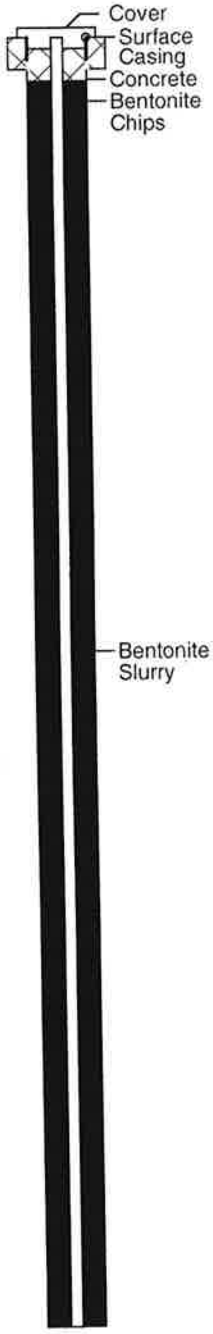
Project No.: : 31227
Site: : ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By: : Benjamin Kortlever
Reviewed By: : Keith Romstad, L.G. 386
Signature: :

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▨ Preserved Sample

Water Levels
▼ After Completion (05/12/08)
▽ During Drilling

Well: B3 / MW15
Elev.: 1164.08

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
10	N/A	0.0	▨		SP	SAND, with gravel, with silt: coarse- to very coarse-grained, medium to dark brown, dry, poorly graded (fill).
20	N/A	0.0	▨			SAND, with gravel, with cobbles, with silt: medium- to coarse-grained, dark brownish gray to gray, dry, poorly graded.
30	N/A	0.0	▨			SAND, with gravel, with cobbles, trace silt: medium- to coarse-grained, gray, dry, poorly graded.
40	N/A	0.0	▨		GW	Sandy GRAVEL, with cobbles, trace silt: fine- to coarse-grained, gray, dry, well graded.
55	N/A	0.0	▨			Sandy GRAVEL, with cobbles, trace silt: fine- to coarse-grained, gray, dry, well graded.



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ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B3 / MW15

(Page 2 of 2)

Date Drilled: : 05/02/08
Drilling Co.: : Cascade Drilling, Inc.
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 6.25" / 4"
Casing Diameter: : 2"
Location N-S :
Location E-W :
Total Depth: : 111'
First GW Depth: : 100'

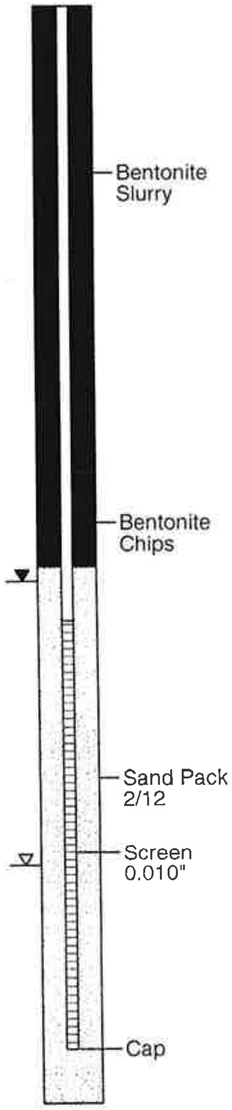
Project No.: : 31227
Site: : ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By: : Benjamin Kortlever
Reviewed By: : Keith Romstad, L.G. 386
Signature: :

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▩ Preserved Sample

Water Levels
▼ After Completion (05/12/08)
▽ During Drilling

Well: B3 / MW15
Elev.: 1164.08

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	USCS	DESCRIPTION
60 65				GW	
70 75	N/A	0.0	▩	SW	Gravelly SAND, with cobbles, trace silt: fine- to very coarse-grained, gray, dry, well graded.
80 85	N/A	48.9	▩	GW	GRAVEL, with sand, with cobbles: fine- to coarse-grained, gray, dry, well graded.
90				CL	CLAY, with silt, trace sand: medium brown, dry to damp, low to medium plasticity.
				ML	SILT, trace fine-grained sand: medium brown, dry to damp, low plasticity.
95 100	N/A	0.4	▩	CL	Sandy CLAY, with gravel, with silt: medium brown, moist to wet, low to medium plasticity, clay is balled up.
105 110	N/A	0.0	▩	SP	SAND, with silt, with gravel: very fine- to fine-grained, medium brown, dry to damp, poorly graded.
115 120					Bottom of Borehole @ 111'; 14:40; 05/02/08. Air Knife/Vacuum: 0' to 7'; 04/29/08. Hollow-Stem Auger: 7' to 111'.



ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B4 / MW16

(Page 1 of 2)

Date Drilled:	: 05/06/08
Drilling Co.:	: Cascade Drilling, Inc.
Drilling Method:	: Air Rotary
Sampling Method:	: Grab Sample from Cyclone
Borehole Diameter:	: 6.25" / 4"
Casing Diameter:	: 2"
Location N-S	:
Location E-W	:
Total Depth:	: 131'
First GW Depth:	: 120'

Project No.:	: 31227
Site:	: ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By:	: Benjamin Kortlever
Reviewed By:	: Keith Romstad, L.G. 386
Signature:	:

Sample Condition

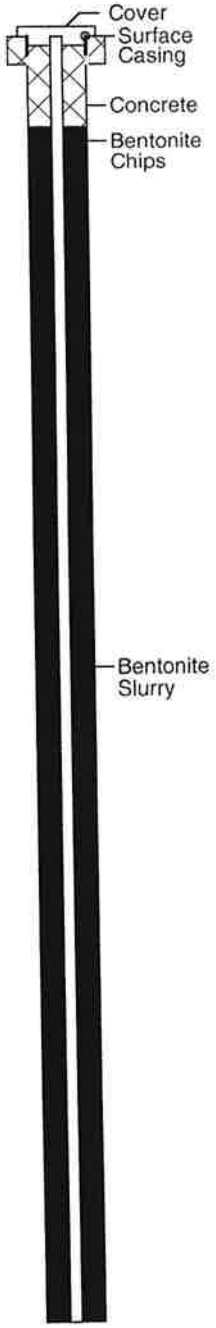
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels

- ▼ After Completion (05/12/08)
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						Approximately 4" of asphalt.
5	N/A	0.0	▩		GW	GRAVEL, with cobbles, with sand, trace silt: fine- to coarse-grained, dark brown, dry, well graded, subangular to subrounded.
10					GM	Silty GRAVEL, with cobbles, with sand: fine- to coarse-grained, gray, dry, well graded.
35					GW	GRAVEL, with silt, with cobbles, trace sand: fine- to coarse-grained, gray, dry, well graded.
70						

Well: B4 / MW16
Elev.: 1174.95



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ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B4 / MW16

(Page 2 of 2)

Date Drilled: : 05/06/08
Drilling Co.: : Cascade Drilling, Inc.
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 6.25" / 4"
Casing Diameter: : 2"
Location N-S :
Location E-W :
Total Depth: : 131'
First GW Depth: : 120'

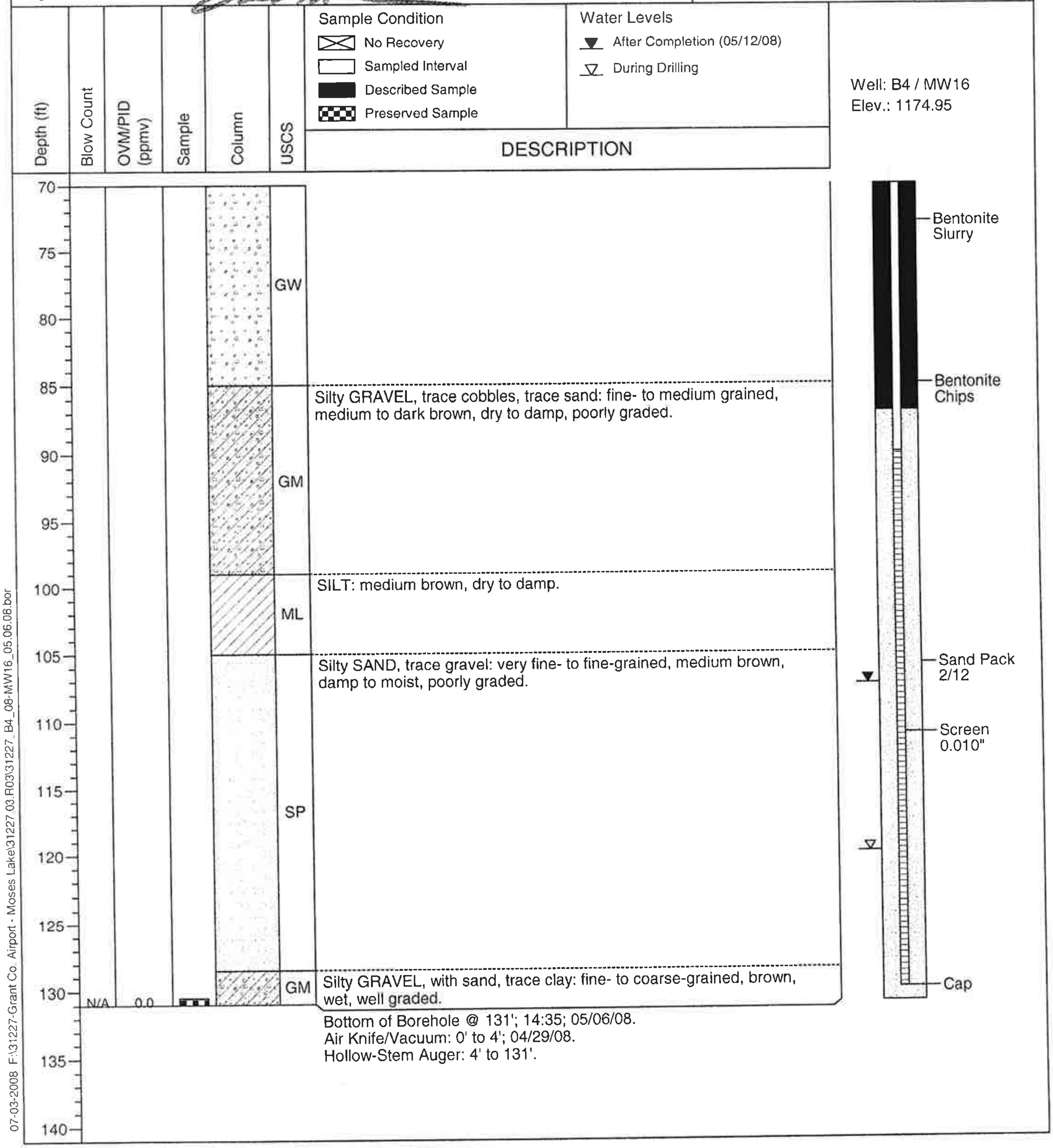
Project No.: : 31227
Site: : ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By: : Benjamin Kortlever
Reviewed By: : Keith Romstad, L.G. 386
Signature: :

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▦ Preserved Sample

Water Levels
▼ After Completion (05/12/08)
▽ During Drilling

Well: B4 / MW16
Elev.: 1174.95

Depth (ft) | Blow Count | OVM/PID (ppmv) | Sample | Column | USCS | DESCRIPTION



Silty GRAVEL, trace cobbles, trace sand: fine- to medium grained, medium to dark brown, dry to damp, poorly graded.

SILT: medium brown, dry to damp.

Silty SAND, trace gravel: very fine- to fine-grained, medium brown, damp to moist, poorly graded.

Silty GRAVEL, with sand, trace clay: fine- to coarse-grained, brown, wet, well graded.

Bottom of Borehole @ 131'; 14:35; 05/06/08.
Air Knife/Vacuum: 0' to 4'; 04/29/08.
Hollow-Stem Auger: 4' to 131'.

ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B5 / MW17

(Page 1 of 2)

Date Drilled: : 05/07/08
Drilling Co.: : Cascade Drilling, Inc.
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 6.25" / 4"
Casing Diameter: : 2"
Location N-S :
Location E-W :
Total Depth: : 130'
First GW Depth: : 125'

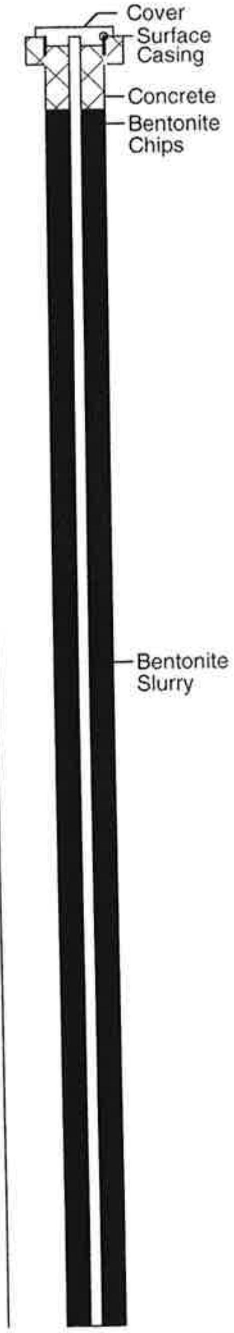
Project No.: : 31227
Site: : ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By: : Benjamin Kortlever
Reviewed By: : Keith Romstad, L.G. 386
Signature: :

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion (05/12/08)
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0 5						Approximately 4" of asphalt.
10	N/A	0.0	▩		SM	Silty SAND, with gravel, with cobbles: coarse- to very coarse-grained, medium brown, dry, poorly graded.
15 20 25 30					GM	Silty GRAVEL, with cobbles, with sand: fine- to coarse-grained, gray, dry, well graded.
35 40 45 50 55 60 65 70					GW	GRAVEL, with sand, with cobbles: fine- to coarse-grained, gray, dry, well graded.

Well: B5 / MW17
Elev.: 1181.31



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ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B5 / MW17

(Page 2 of 2)

Date Drilled: : 05/07/08
Drilling Co.: : Cascade Drilling, Inc.
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 6.25" / 4"
Casing Diameter: : 2"
Location N-S :
Location E-W :
Total Depth: : 130'
First GW Depth: : 125'

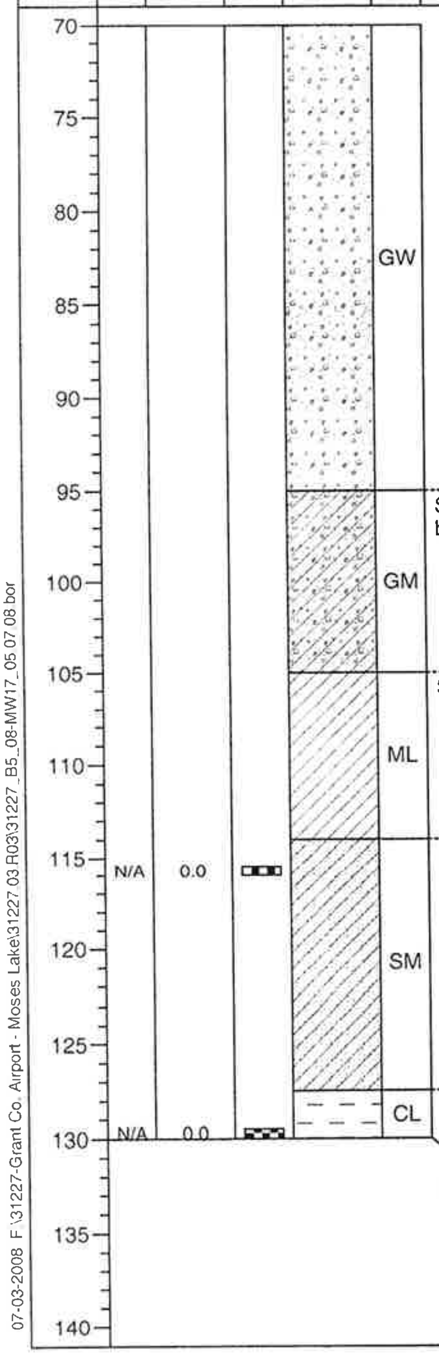
Project No.: : 31227
Site: : ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By: : Benjamin Kortlever
Reviewed By: : Keith Romstad, L.G. 386
Signature: :

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion (05/12/08)
- ▽ During Drilling

Well: B5 / MW17
Elev.: 1181.31

Depth (ft) | Blow Count | OVM/PID (ppmv) | Sample | Column | USCS | DESCRIPTION



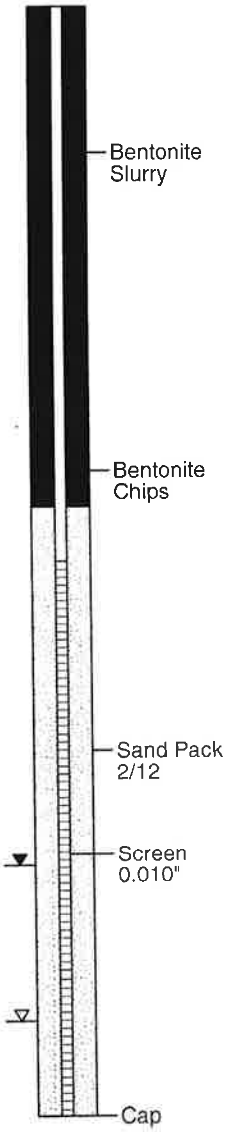
Silty GRAVEL, trace cobbles, trace sand: fine- to coarse-grained, dark brown, dry to damp, well graded.

SILT: medium brown, dry to damp.

Silty SAND, trace gravel, trace cobbles: very fine- to fine-grained, medium brown, dry to damp, poorly graded.

Silty CLAY, with sand, trace gravel, trace cobbles: medium brown, wet to saturated, medium plasticity.

Bottom of Borehole @ 130'; 16:00; 05/07/08.
Air Knife/Vacuum: 0' to 4'; 04/29/08.
Hollow-Stem Auger: 4' to 130'.



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ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B6 / MW18

(Page 1 of 2)

Date Drilled:	05/08/08 - 05/09/08
Drilling Co.:	Cascade Drilling, Inc.
Drilling Method:	Air Rotary
Sampling Method:	Grab Sample from Cyclone
Borehole Diameter:	6.25" / 4"
Casing Diameter:	2"
Location N-S	
Location E-W	
Total Depth:	151'
First GW Depth:	140'

Project No.:	31227
Site:	ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By:	Benjamin Kortlever
Reviewed By:	Keith Romstad, L.G. 386
Signature:	

Sample Condition

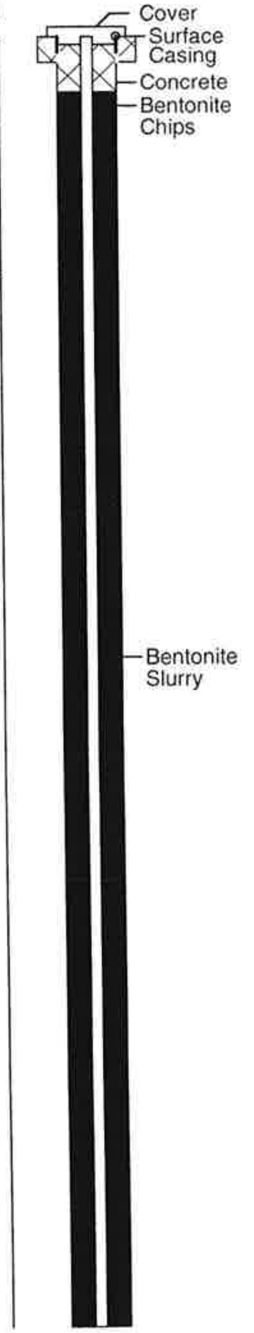
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels

- ▼ After Completion (05/12/08)
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						Approximately 4" of asphalt.
5	N/A	0.0	▩		GM	Silty GRAVEL, with sand, with cobbles, trace clay: fine- to very coarse-grained, medium brown, dry, well graded.
15					GW	GRAVEL, with sand, with cobbles: fine- to coarse-grained, gray, dry, well graded.
64						GRAVEL, with cobbles, trace sand: fine- to coarse-grained, medium brown to gray, dry, well graded.

Well: B6 / MW18
Elev.: 1186.10



ERI ENVIRONMENTAL RESOLUTIONS, INC.

BORING LOG B6 / MW18

(Page 2 of 2)

Date Drilled: : 05/08/08 - 05/09/08
Drilling Co.: : Cascade Drilling, Inc.
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 6.25" / 4"
Casing Diameter: : 2"
Location N-S :
Location E-W :
Total Depth: : 151'
First GW Depth: : 140'

Project No.: : 31227
Site: : ExxonMobil-Leased Facilities, Moses Lake, WA
Logged By: : Benjamin Kortlever
Reviewed By: : Keith Romstad, L.G. 386
Signature: :

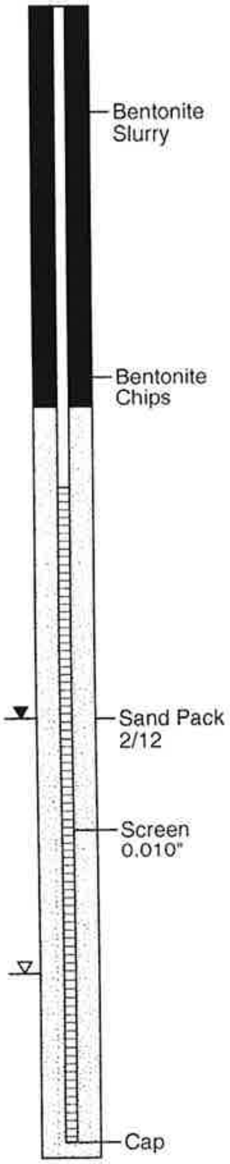
Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▩ Preserved Sample

Water Levels
▼ After Completion (05/12/08)
▽ During Drilling

Well: B6 / MW18
Elev.: 1186.10

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	USCS	DESCRIPTION
80–115				GW	
115				ML	SILT: medium brown, dry to damp.
125	N/A	0.0	▩	ML	Clayey SILT, with sand, trace gravel: medium brown, dry to damp, clay is balled up with medium plasticity.
140				CL	CLAY, with silt, trace gravel, trace sand: medium brown, wet, clay is balled up with medium plasticity.
142	N/A	0.0	▩	CL	

Bottom of Borehole @ 151'; 13:10; 05/09/08.
Air Knife/Vacuum: 0' to 4'; 04/30/08.
Hollow-Stem Auger: 4' to 151'.



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Cardno ERI
Shaping the Future

BORING LOG B8 / MW19

(Page 1 of 3)

Date Drilled: : 04/18 - 04/20/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 120'

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Rory Henneck
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▣ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B8 / MW19
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0					SW	SAND WITH SILT AND GRAVEL: very fine- to coarse-grained, brown, damp, trace rounded gravel (<2" diameter) (0/15/80/5).
5					GW	GRAVEL WITH SAND: fine- to coarse-grained, brown, damp, very fine- to coarse-grained sand, trace cobbles up to 6" diameter.
		0.0	▣		SW	SAND WITH GRAVEL AND SILT: very fine- to coarse-grained (mostly coarse-grained), brown, damp, angular to rounded gravel <1" diameter, trace organics (0/10/65/25).
10		0.0	■		GW	GRAVEL WITH SAND AND SILT: fine- to coarse-grained, damp, angular to rounded, <1" diameter, very fine- to coarse-grained sand (0/10/20/70).
15		1.0	■			@ 15': gray to dark gray sand and gravel, brown silt, subangular to subrounded gravel (0/5/20/75).
20		0.0	■		SW	SAND WITH SILT AND GRAVEL: very fine- to coarse-grained, gray to brown, damp, subangular to subrounded gravel (0/15/75/10).
25		0.0	■		SM	SILTY SAND WITH GRAVEL: very fine- to coarse-grained, gray to brown, damp, subangular to subrounded gravel (0/20/70/10).
30		0.0	■			@ 30': very fine- to medium-grained, light brown to gray, dry to damp, <1/2" diameter gravel (0/20/55/25).
35		1.0	■		SW	SAND WITH SILT AND GRAVEL: very fine- to medium-grained, gray, damp, subangular to subrounded gravel <1/2" diameter (0/15/60/25).
40		0.0	▣			@ 40': very fine- to coarse-grained, dry to damp, decreasing gravel (0/15/70/15).
45		0.0	■		SM	SILTY SAND WITH GRAVEL: very fine- to coarse-grained, dark gray, dry to damp, subangular to rounded gravel (0/30/55/15).
50						

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BORING LOG B8 / MW19

(Page 2 of 3)

Date Drilled:	: 04/18 - 04/20/11
Drilling Co.:	: Cascade Drilling, LP
Clearing Method:	: Vac/Air Knife
Drilling Method:	: Air Rotary
Sampling Method:	: Grab Sample from Cyclone
Borehole Diameter:	: 10"
Casing Diameter:	: 4"
Total Depth:	: 120'

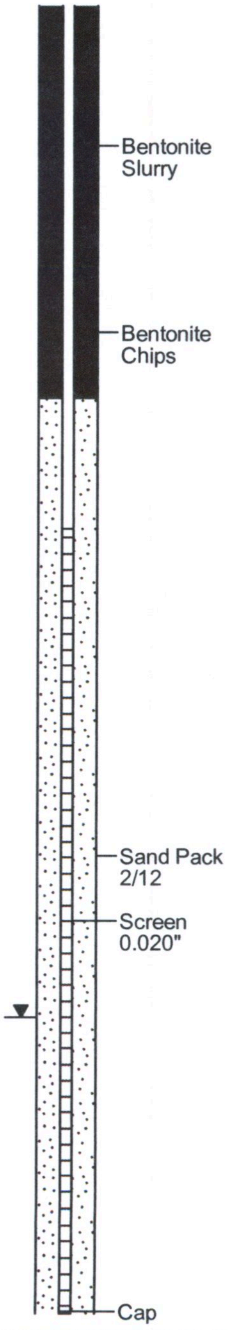
Project No.:	: 31227
Site:	: Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By:	: Rory Henneck
Reviewed By:	: Justin Foslien, L.G. 2540
Signature:	:

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ◧ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B8 / MW19
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
50		0.0	■		SM	SILTY SAND WITH GRAVEL: very fine- to coarse-grained, dark gray, dry to damp, subangular to subrounded gravel <1/2" diameter (0/25/60/15).
55		1.0	■		GW	GRAVEL WITH SAND AND SILT: fine- to coarse-grained, dark gray, dry to damp, subangular to subrounded <1" diameter, fine- to coarse-grained sand (0/10/30/60).
60		1.0	■		SW	SAND: fine- to coarse-grained, dark greenish gray, dry to damp, trace subangular gravel <1/4" diameter, trace silt (0/5/92/5).
65		1.0	■			@ 65': gravel <1/2" diameter.
70		0.0	■		SP	SAND: medium- to coarse-grained, dark greenish gray, dry to damp, trace silt, trace subangular gravel <1/4" diameter (0/5/90/5).
75		0.0	◧			@ 75': very fine- to fine-grained, brown (0/5/90/5).
80		0.0	■			@ 80': no gravel (0/5/95/0).
85		0.0	◧		SW	SAND: very fine- to medium-grained, dark yellowish brown, damp, trace subrounded gravel (0/0/98/2).
90		0.0	◧			@ 90': with silt, no gravel (0/10/90/0).
95						
100						



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BORING LOG B8 / MW19

(Page 3 of 3)

Date Drilled: : 04/18 - 04/20/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 120'

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Rory Henneck
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

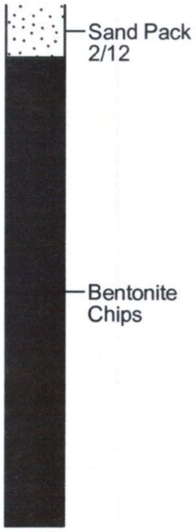
Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ◧ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B8 / MW19
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
100						
105						
110		0.0	■		SW	SAND WITH SILT: very fine- to medium-grained, brown, damp, silt is gray (0/10/90/0).
115		0.0	■			@ 115': very fine- to coarse-grained, trace silt (0/5/95/0).
120		0.0	◧		GW	GRAVEL WITH SAND: fine- to coarse-grained, dark brown, damp, subangular to rounded, very fine- to coarse-grained sand, trace silt (0/5/25/70).
125						
130						
135						
140						
145						
150						

Air Knife/Vacuum: 0' to 5'; 04/18/11.
Air Rotary: 5' to 120'; 04/19/11.
Bottom of Borehole @ 120'; 17:10; 04/19/11.
4" Monitoring Well Installed on 04/20/11.
(%Clay / %Silt / %Sand / %Gravel).



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BORING LOG B9 / MW20

(Page 1 of 3)

Date Drilled:	: 04/21/11; 04/26/11
Drilling Co.:	: Cascade Drilling, LP
Clearing Method:	: Vac/Air Knife
Drilling Method:	: Air Rotary
Sampling Method:	: Grab Sample from Cyclone
Borehole Diameter:	: 10"
Casing Diameter:	: 4"
Total Depth:	: 105'
First GW Depth:	: 95'

Project No.:	: 31227
Site:	: Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By:	: Benjamin Kortlever
Reviewed By:	: Justin Foslien, L.G. 2540
Signature:	:

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ◧ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B9 / MW20
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						
5					GW	GRAVEL: fine- to coarse-grained, trace subangular coarse-grained sand, cobbles up to 8" diameter (0/0/5/95).
10		0.0	■		GW	GRAVEL WITH COBBLES: fine- to coarse-grained, dark brown, dry, subangular to subrounded, trace silt (0/3/0/97).
15		0.0	■			@ 15': gray-brown to olive-brown, gravel up to 1" diameter, trace coarse-grained sand, no fines (0/0/4/96).
20		0.0	■		SW	SAND WITH GRAVEL AND COBBLES: very fine- to coarse-grained, light brown to gray-brown, dry, fine- to coarse-grained subangular gravel, trace silt (0/4/86/10).
25		0.0	■		GW	GRAVEL WITH SAND AND COBBLES: fine- to coarse-grained, light brown, dry, angular to subangular, very fine- to coarse-grained sand (0/0/40/60).
30		0.0	■		SW	SAND WITH GRAVEL, COBBLES, AND SILT: very fine- to coarse-grained, gray-brown, dry, fine- to coarse-grained subangular gravel (0/12/68/20).
35		1.0	■		GW	GRAVEL WITH SAND: fine- to coarse-grained, olive-gray, dry, coarse- to very coarse-grained sand - sample is primarily broken rock pieces and rock flour (0/0/10/90).
40		1.0	■			@ 40': gray-brown, subangular, medium- to coarse-grained sand (0/0/25/75).
45		0.0	■		SW	SAND WITH GRAVEL AND COBBLES: medium- to very coarse-grained, light brown, dry, angular to subangular fine- to coarse-grained gravel (0/0/75/25).
50						

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BORING LOG B9 / MW20

(Page 2 of 3)

Date Drilled: : 04/21/11; 04/26/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 105'
First GW Depth: : 95'

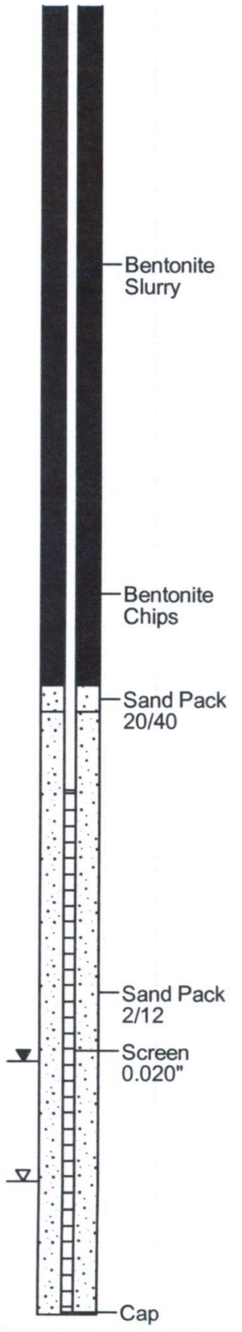
Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Benjamin Kortlever
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▣ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B9 / MW20
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
50		1.0	■		GW	GRAVEL WITH COBBLES AND SAND: fine- to coarse-grained, gray-brown, dry, angular to subangular, coarse- to very coarse-grained sand (0/0/15/85).
55		0.0	■			@ 55': increasing sand (0/0/25/75).
60		1.0	■			@ 60': decreasing sand, trace silt (0/4/20/76).
65		0.0	■		GW	GRAVEL: fine- to coarse-grained, gray-brown, dry, subangular to subrounded, trace coarse-grained sand, trace silt (0/3/4/93).
70		0.0	■			@ 70': gray to black, angular to subangular, with coarse- to very coarse-grained sand (0/0/10/90).
75		0.0	■			@ 75': gray-brown to olive-gray (0/0/15/85).
					SW	@ 77': cuttings: SAND WITH GRAVEL AND SILT: very fine- to coarse-grained, yellow brown, damp (0/10/60/30).
80		0.0	■		SM	SILTY SAND: very fine- to medium-grained, brown to red-brown, damp to moist, trace subangular to subrounded gravel, trace clay (3/20/73/4).
85		33.0	▣		SW	SAND: fine- to coarse-grained, brown to red-brown, damp to moist, trace silt, trace gravel (0/3/95/2).
90		38.0	▣			@ 90': with gravel, with silt, brown, moist, fine- to coarse-grained gravel (0/6/70/24).
95		17.0	▣		CL	GRAVELLY CLAY WITH SAND: brown, moist to wet, low to medium plasticity, fine- to coarse-grained subangular to subrounded gravel, fine- to coarse-grained sand, trace silt (57/3/10/30).
100						



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BORING LOG B9 / MW20

(Page 3 of 3)

Date Drilled: : 04/21/11; 04/26/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 105'
First GW Depth: : 95'

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Benjamin Kortlever
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

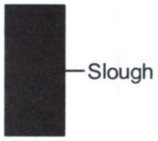
Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ◧ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B9 / MW20
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
100			☒		GW	@ 100': no recovery. GRAVEL: fine- to coarse-grained, brown, wet, subangular to subrounded, trace very coarse-grained sand (0/0/3/97).
105		6.0	■			
110						
115						
120						
125						
130						
135						
140						
145						
150						

Air Knife/Vacuum: 0' to 5'; 04/21/11.
Air Rotary: 5' to 105'; 04/26/11.
Bottom of Borehole @ 105'; 15:25; 04/26/11.
(%Clay / %Silt / %Sand / %Gravel).



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BORING LOG B10 / MW21

(Page 1 of 3)

Date Drilled: : 04/20/11; 04/22/11; 04/27/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 7"
Casing Diameter: : 2"
Total Depth: : 108'

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Rory Henneck / Kristine Martinez
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▨ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Well: B10 / MW21
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						
5					GW	GRAVEL WITH COBBLES: fine- to coarse-grained, trace subangular coarse-grained sand, cobbles up to 7" diameter (0/0/5/95).
10		0.0	■		SW	SAND WITH GRAVEL AND COBBLES: fine- to coarse-grained, dark gray, dry, fine- to coarse-grained subangular gravel up to 1/2" diameter (0/0/60/40).
15		0.0	■			GRAVEL WITH SAND AND COBBLES: fine- to coarse-grained, dark gray, dry, angular to subangular (large gravel), subangular to subrounded (finer grained gravel), up to 1" diameter (0/0/25/75).
20		0.0	■		GW	@ 20': dark brown, angular to subangular gravel up to 3/4" diameter, fine- to coarse-grained subangular sand (0/0/30/70).
25		0.0	■			@ 25': as above.
30		1.0	■			SAND WITH GRAVEL AND COBBLES: fine- to coarse-grained, very dark brown, moist, subrounded, fine- to coarse-grained angular to subangular gravel up to 1" diameter, trace silt (0/5/70/25).
35		1.0	■			@ 35': as above.
40		0.0	■		SW	@ 40': dark gray, subangular gravel up to 3/4" diameter (0/5/75/20).
45		0.0	■			@ 45': gravel up to 1" diameter.
50						

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BORING LOG B10 / MW21

(Page 2 of 3)

Date Drilled: : 04/20/11; 04/22/11; 04/27/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 7"
Casing Diameter: : 2"
Total Depth: : 108'

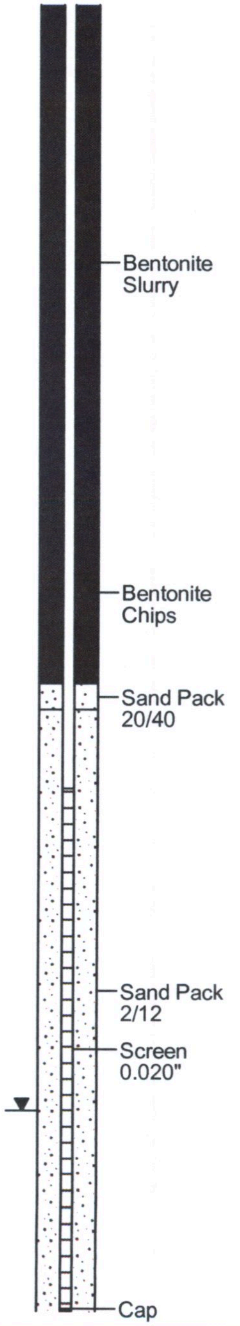
Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Rory Henneck / Kristine Martinez
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ◧ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B10 / MW21
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
50		1.0	◧		GW	SAND WITH GRAVEL: fine- to coarse-grained, gray, dry, rounded, angular to subangular gravel up to 1/2" diameter, trace silt (0/5/75/20).
55		2.0	■		SM	SILTY SAND: fine- to coarse-grained, dark gray, dry, subangular, trace angular gravel up to 1/4" diameter (0/20/75/5).
60		2.0	■		SW	SAND WITH GRAVEL: fine- to coarse-grained, gray, dry, well graded, subangular, subangular gravel up to 1/2" diameter, trace silt (0/5/65/30).
65		3.0	■			@ 65': angular to subangular gravel up to 3/4" diameter.
70		1.0	■			@ 70': dark gray, trace angular gravel up to 3/8" diameter (0/5/90/5).
75		1.0	■			@ 75': dark grayish brown, subangular gravel up to 1/2" diameter (0/0/70/30).
		0.0	■		SP	SAND: fine- to medium-grained, brown, moist, trace subangular gravel up to 1" diameter (0/0/95/5).
80		1.0	■			@ 80': as above.
		10.0	■			@ 82.5': as above.
85		32.0	◧			@ 85': as above.
90		90.0	◧			@ 90': medium-grained, dark brown, no gravel (0/0/100/0).
95		28.0	◧			@ 95': as above.
100						



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BORING LOG B10 / MW21

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Date Drilled: : 04/20/11; 04/22/11; 04/27/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 7"
Casing Diameter: : 2"
Total Depth: : 108'

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Rory Henneck / Kristine Martinez
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

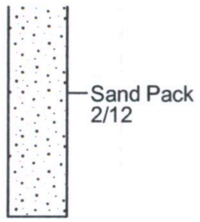
Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▨ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B10 / MW21
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
100		22.0	▨		SW	SAND: fine- to coarse-grained, dark brown, moist, trace subrounded gravel up to 3/8" diameter (0/0/95/5).
105		17.0	▨			@ 105': as above.

Air Knife/Vacuum: 0' to 5'; 04/20/11.
Air Rotary: 5' to 108'; 04/22/11.
Bottom of Borehole @ 108'; 04/22/11.
2" Monitoring Well Installed @ 09:50 on 04/27/11.
(%Clay / %Silt / %Sand / %Gravel).



110
115
120
125
130
135
140
145
150

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BORING LOG B11 / MW22

(Page 1 of 3)

Date Drilled:	: 04/20/11; 04/28 - 04/29/11
Drilling Co.:	: Cascade Drilling, LP
Clearing Method:	: Vac/Air Knife
Drilling Method:	: Air Rotary
Sampling Method:	: Grab Sample from Cyclone
Borehole Diameter:	: 10"
Casing Diameter:	: 4"
Total Depth:	: 110'
First GW Depth:	: 91'

Project No.:	: 31227
Site:	: Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By:	: Benjamin Kortlever
Reviewed By:	: Justin Foslien, L.G. 2540
Signature:	:

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ◧ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B11 / MW22
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						
5		0.0	■		GW	GRAVEL WITH COBBLES AND SAND: fine- to coarse-grained, subangular coarse-grained sand, cobbles up to 8" diameter (0/0/15/85).
10		0.0	■			@ 10': light brown to gray-brown, dry, fine- to coarse-grained sand, trace silt (0/3/30/67).
15		0.0	■			@ 15': gray-brown, angular, trace coarse-grained sand (0/0/4/96).
20		0.0	■			@ 20': gray-brown to olive-gray, angular to subangular, with coarse-grained sand (0/0/20/80).
25		0.0	■			@ 25': angular to subrounded gravel, increasing medium- to coarse-grained sand (0/0/35/65).
30		1.0	■			@ 30': gray-brown, angular, medium- to very coarse-grained sand (0/0/40/60).
35		1.0	■			@ 35': angular to subangular gravel, decreasing sand (0/0/10/90).
40		0.0	■			@ 40': increasing fine- to coarse-grained sand, trace silt (0/4/35/61).
45		1.0	■			@ 45': light brown to gray-brown, fine- to very coarse-grained sand (0/0/35/65).
50						

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BORING LOG B11 / MW22

(Page 2 of 3)

Date Drilled: : 04/20/11; 04/28 - 04/29/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 110'
First GW Depth: : 91'

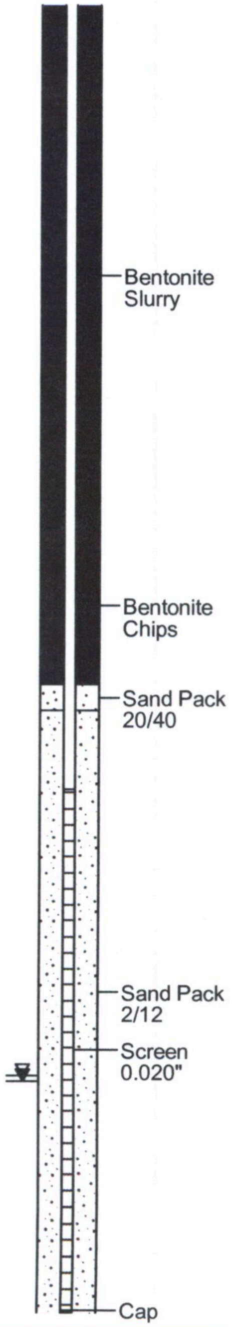
Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Benjamin Kortlever
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ◧ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B11 / MW22
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	USCS	DESCRIPTION
50		0.0	■	GW	GRAVEL WITH SAND AND COBBLES: fine- to coarse-grained, olive-gray to gray-brown, dry, angular, coarse- to very coarse-grained sand (0/0/15/85).
55		0.0	■		@ 55': angular to subrounded, increasing coarse- to very coarse-grained sand (0/0/40/60).
60		0.0	■	SW	SAND WITH GRAVEL WITH COBBLES: fine- to coarse-grained, olive-brown, dry, fine- to coarse-grained angular to subrounded gravel, trace silt (0/4/66/30).
65		0.0	■		@ 65': gray-brown, with silt (0/10/60/30).
70		0.0	■		@ 70': olive-gray to olive-brown, fine- to medium-grained gravel, trace silt (0/2/78/20).
75		0.0	■	GW	GRAVEL WITH COBBLES AND SAND: fine- to coarse-grained, olive-gray, dry, angular to subangular, medium- to very coarse-grained sand, trace silt (0/4/35/61).
80		20.0	■	SM	SILTY SAND WITH GRAVEL: very fine- to coarse-grained, brown, damp, fine- to coarse-grained gravel, trace clay (2/20/53/25).
85		168.0	◧		@ 85': decreasing gravel, no clay (0/25/60/15).
90		59.0	◧	GW	GRAVEL WITH SAND AND CLAY: fine- to coarse-grained, brown to dark brown, moist to wet, subangular to subrounded, medium- to very coarse-grained sand, trace silt (10/3/20/67).
95		1.0	■		@ 95': brown, moist, angular to subrounded, coarse- to very coarse-grained sand, no clay (0/4/15/81).
100					



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BORING LOG B11 / MW22

(Page 3 of 3)

Date Drilled: : 04/20/11; 04/28 - 04/29/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 110'
First GW Depth: : 91'

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Benjamin Kortlever
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

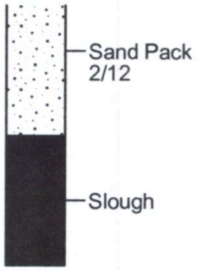
Sample Condition
☒ No Recovery
☐ Sampled Interval
■ Described Sample
▚ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Well: B11 / MW22
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
100		8.0	■		GW	GRAVEL WITH SAND AND SILT: fine- to coarse-grained sand, brown, moist, angular to subrounded, medium- to very coarse-grained sand (0/10/30/60).
105		2.0	■			@ 105': damp, angular to subangular gravel, trace coarse- to very coarse-grained sand (0/10/4/86).
110		3.0	▚			@ 110': brown to olive-gray, with sand, trace silt (0/4/15/81).
115						
120						
125						
130						
135						
140						
145						
150						

Air Knife/Vacuum: 0' to 5'; 04/20/11.
Air Rotary: 5' to 55'; 04/28/11.
Air Rotary: 55' to 110'; 04/29/11.
Bottom of Borehole @ 110'; 10:00; 04/29/11.
(%Clay / %Silt / %Sand / %Gravel).



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BORING LOG B12/MW23

(Page 1 of 3)

Date Drilled: : 05/01/12 - 05/03/12
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 103'
First GW Depth: : 87.7'
Well ID: : BHL 174

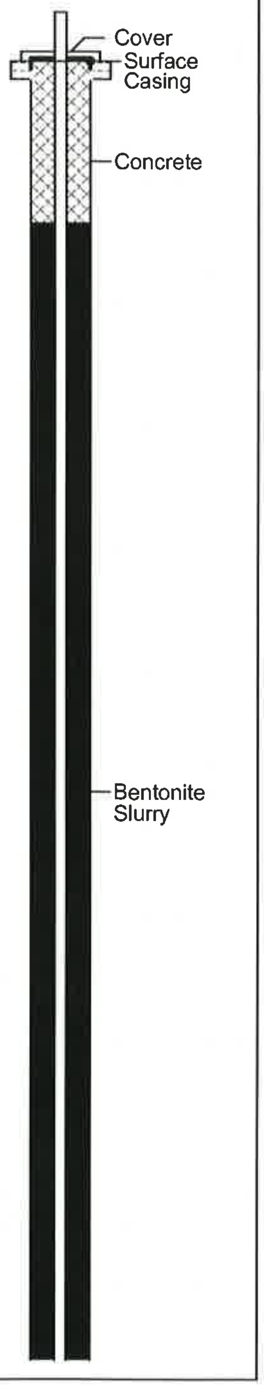
Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Shingo Yamazaki
Reviewed By: : Benjamin T. Kortlever, L.G. 2937
Signature:

Sample Condition
- ☒ No Recovery
- ▨ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						SAND WITH GRAVEL AND COBBLES: fine- to coarse-grained, dark gray, dry, subangular gravel, <3/4" diameter (0/0/60/40).
5	NA	0	■		SW	
10	NA	0	■			SAND WITH GRAVEL AND SILT: fine- to coarse grained, gray, dry, subrounded to angular gravel, trace clay (2/10/65/23).
15	NA	0	■		SW	@ 15': as above.
20	NA	0	■			SILTY SAND WITH GRAVEL: fine- to coarse- grained, gray, dry, decreasing gravel (2/15/65/18).
25	NA	0	■			@ 25': as above.
30	NA	0	■		SM	@ 30': increasing silt (2/20/60/18).
35	NA	0	■			@35': as above.
40	NA	0	■			@ 40': as above.

Well: B12 / MW23
Elevation: NE



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BORING LOG B12/MW23

(Page 2 of 3)

Date Drilled: : 05/01/12 - 05/03/12
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 103'
First GW Depth: : 87.7'
Well ID: : BHL 174

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Shingo Yamazaki
Reviewed By: : Benjamin T. Kortlever, L.G. 2937
Signature: :

Sample Condition
- ☒ No Recovery
- ▨ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B12 / MW23
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
40					SM	
45	NA	0	■			@ 45': as above.
50	NA	0	■			@ 50': as above.
55	NA	0	■			@ 55': as above.
60	NA	0	■			@ 60': increasing silt (2/28/60/10).
65	NA	0	■			@ 65': increasing gravel (2/20/60/18).
70	NA	0	■			@ 70': (2/15/75/8).
75	NA	0	■		GW	GRAVEL WITH SAND: angular, <3/4" diameter, gray, coarse-grained sand (0/5/30/65).
80	NA	97	▩			@ 80': angular to rounded, fine- to coarse-grained sand, odor (0/5/30/65).

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BORING LOG B12/MW23

(Page 3 of 3)

Date Drilled: : 05/01/12 - 05/03/12
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 103'
First GW Depth: : 87.7'
Well ID: : BHL 174

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Shingo Yamazaki
Reviewed By: : Benjamin T. Kortleyer, L.G. 2937
Signature: :

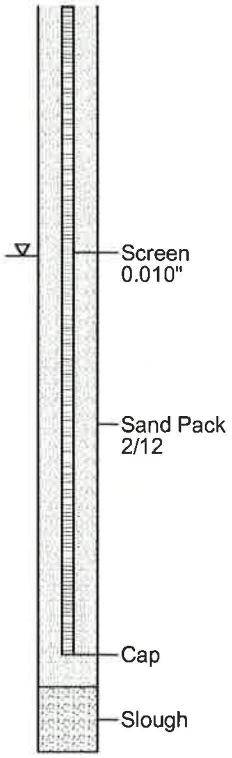
Sample Condition
- ☒ No Recovery
- ▨ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B12 / MW23
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
80					GW	
85	NA	31	■		SW	SAND WITH GRAVEL AND SILT: fine- to coarse-grained, brown, subangular to angular gravel, odor (0/5/70/25).
90	NA	38	▩		SM	SILTY SAND WITH GRAVEL: coarse- to very coarse-grained, brown, subangular gravel, odor (0/35/40/15).
95	NA	2	■			@ 95': as above.
100	NA	5	▩			@ 100': little to no odor.
105						
110						
115						
120						

Air Knife/Vacuum: 0' to 6.5'; 05/01/12.
Air Rotary: 6.5' to 103'; 05/02/12, 05/03/12.
Bottom of Borehole @ 103'; 05/03/12.
(%Clay / %Silt / %Sand / %Gravel).



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Shaping the Future

BORING LOG B13/MW24

(Page 1 of 3)

Date Drilled: : 04/30/12; 05/04/12; 05/07/12
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 102.5'
First GW Depth: : 87.9'
Well ID: : BHL 175

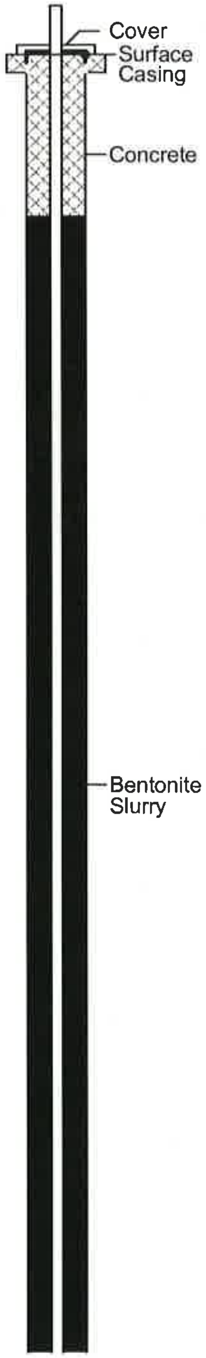
Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Shingo Yamazaki
Reviewed By: : Benjamin T. Kortlever, L.G. 2937
Signature: :

Sample Condition
- ☒ No Recovery
- ▨ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B13 / MW24
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						3" asphalt.
5	NA	0	■		SW	SAND WITH GRAVEL AND COBBLES: fine- to coarse-grained, dark gray, dry, subangular gravel, <3/4" diameter (0/0/60/40).
10	NA	0	■			@ 10': fine- to very coarse-grained, subrounded to angular gravel, trace silt (0/4/85/11).
15	NA	0	■		GW	GRAVEL WITH SAND AND COBBLES: 3/4" to 1" diameter, subrounded to angular, gray, fine- to coarse-grained sand, trace silt (0/4/11/85).
20	NA	0	■		SW	SAND WITH GRAVEL AND COBBLES: fine- to very coarse-grained, dark gray, dry, subrounded to angular gravel, trace silt (0/4/85/11).
25	NA	0	■			@ 25': as above.
30	NA	0	■			@ 30': as above.
35	NA	0	■			@35': increasing very coarse-grained sand (0/4/85/11).
40	NA	0	■			



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BORING LOG B13/MW24

(Page 2 of 3)

Date Drilled: : 04/30/12; 05/04/12; 05/07/12
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 102.5'
First GW Depth: : 87.9'
Well ID: : BHL 175

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Shingo Yamazaki
Reviewed By: : Benjamin T. Kortlever, L.G. 2937
Signature: : for

Sample Condition
☒ No Recovery
▨ Sampled Interval
■ Described Sample
▩ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
40					SM	SILTY SAND WITH GRAVEL: fine- to very coarse-grained, gray, dry, trace subangular gravel (0/25/70/5).
45	NA	0	■		GW	GRAVEL WITH SAND: subrounded to angular, dark gray, dry, fine- to very coarse-grained, trace silt (0/4/11/85).
50	NA	0	■		SW	SAND WITH GRAVEL: fine- to very coarse-grained, gray, dry, subrounded to angular gravel, trace silt (0/4/90/6).
55	NA	0	■			@ 55': dark gray (0/4/85/11).
60	NA	0	■			@ 60': as above.
65	NA	0	■			@ 65': as above.
70	NA	0	■			@ 70': as above.
75	NA	0	■		SW	SAND WITH GRAVEL: fine- to very coarse-grained, dark gray, dry, subrounded to angular gravel (0/0/90/10).
	NA	44	▩		SM	SILTY SAND WITH CLAY: very fine- to fine-grained, brown, dry to damp (5/25/70/0).
80						

Well: B13 / MW24
Elevation: NE

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BORING LOG B13/MW24

(Page 3 of 3)

Date Drilled: : 04/30/12; 05/04/12; 05/07/12
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 102.5'
First GW Depth: : 87.9'
Well ID: : BHL 175

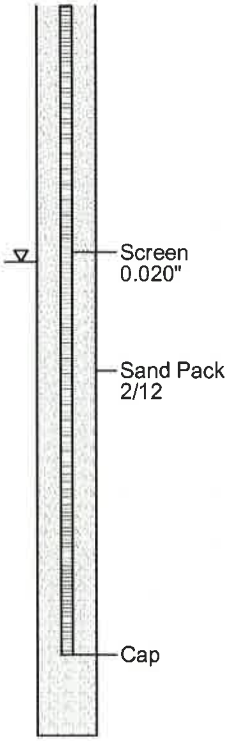
Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Shingo Yamazaki
Reviewed By: : Benjamin T. Kortlever, L.G. 2937
Signature: :

Sample Condition
☒ No Recovery
▨ Sampled Interval
■ Described Sample
▩ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Well: B13 / MW24
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
85	NA	163	■		SM	@ 85': damp to moist, subrounded gravel (6/20/70/4).
90	NA	100	▩			@ 90': damp to wet (6/20/70/4).
95	NA	22	■			@ 95': as above.
100	NA	3	▩			@ 100': no gravel (5/20/75/0).



Air Knife/Vacuum: 0' to 8'; 04/30/12.
Air Rotary: 8' to 102.5'; 05/04/12, 05/07/12.
Bottom of Borehole @ 102.5'; 05/07/12.
(%Clay / %Silt / %Sand / %Gravel).

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BORING LOG B14/MW25

(Page 1 of 3)

Date Drilled: : 05/01/12; 05/07/12 - 05/09/12
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 101'
First GW Depth: : 88.2'
Well ID: : BHL 176

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Shingo Yamazaki
Reviewed By: : Benjamin T. Kortlever, L.G. 2937
Signature: :

Sample Condition
- ☒ No Recovery
- ▨ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B14 / MW25
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						3" asphalt.
5	NA	0	■			SAND WITH GRAVEL AND COBBLES: fine- to very coarse-grained, dark gray, dry, subangular gravel, <3/4" diameter (0/0/60/40).
10	NA	0	■			@ 10': medium- to very coarse-grained, dry to damp, subrounded to angular gravel, trace silt (0/4/86/10).
15	NA	0	■			@ 15': fine- to very coarse-grained (0/4/80/16).
20	NA	0	■		SW	@ 20': (0/4/86/10).
25	NA	0	■			@ 25': as above.
30	NA	0	■			@ 30': no silt (0/0/90/10).
35	NA	0	■			@35': (0/4/86/10).
40	NA	0	■			@ 40': light gray (0/4/86/10).

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BORING LOG B14/MW25

(Page 2 of 3)

Date Drilled:	: 05/01/12; 05/07/12 - 05/09/12
Drilling Co.:	: Cascade Drilling, LP
Clearing Method:	: Vac/Air Knife
Drilling Method:	: Air Rotary
Sampling Method:	: Grab Sample from Cyclone
Borehole Diameter:	: 10"
Casing Diameter:	: 4"
Total Depth:	: 101'
First GW Depth:	: 88.2'
Well ID:	: BHL 176

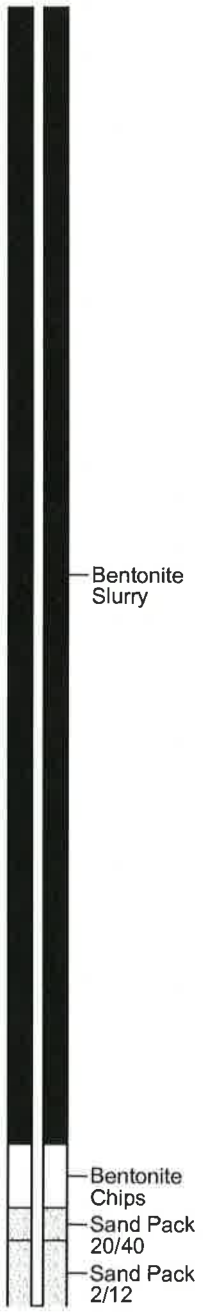
Project No.:	: 31227
Site:	: Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By:	: Shingo Yamazaki
Reviewed By:	: Benjamin T. Kortlever, L.G. 2937
Signature:	:

Sample Condition
- ☒ No Recovery
- ▨ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B14 / MW25
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
40						
45	NA	0	■			@ 45': as above.
50	NA	0	■			@ 50': as above.
55	NA	0	■			@ 55': as above.
60	NA	0	■		SW	@ 60': as above.
65	NA	0	■			@ 65': as above.
70	NA	0	■			@ 70': as above.
75	NA	0	■			@ 75': as above.
80	NA	0	▩			@ 80': as above.



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BORING LOG B14/MW25

(Page 3 of 3)

Date Drilled: : 05/01/12; 05/07/12 - 05/09/12
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 101'
First GW Depth: : 88.2'
Well ID: : BHL 176

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Shingo Yamazaki
Reviewed By: : Benjamin T. Kortlever, L.G. 2937
Signature: :

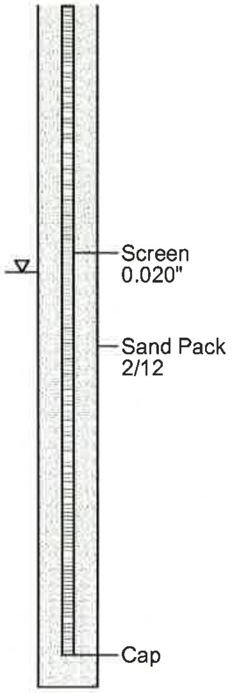
Sample Condition
☒ No Recovery
▨ Sampled Interval
■ Described Sample
▩ Preserved Sample

Water Levels
▼ After Completion
▽ During Drilling

Well: B14 / MW25
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
80					SW	
85	NA	15	■		SM	SILTY SAND WITH GRAVEL: very fine- to fine-grained, brown, silt, subrounded gravel, trace clay, odor (5/20/65/5).
90	NA	30	▩			@ 90': damp to wet.
95	NA	15	■			@ 95': less odor.
100	NA	1	▩			@ 100': as above.
105						
110						
115						
120						

Air Knife/Vacuum: 0' to 5'; 05/01/12.
Air Rotary: 5' to 101'; 05/07/12 - 05/09/12.
Bottom of Borehole @ 101'; 05/09/12.
(%Clay / %Silt / %Sand / %Gravel).



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BORING LOG B15/MW26

(Page 1 of 3)

Date Drilled:	05/01/12; 05/10/12; 05/11/12
Drilling Co.:	Cascade Drilling, LP
Clearing Method:	Vac/Air Knife
Drilling Method:	Air Rotary
Sampling Method:	Grab Sample from Cyclone
Borehole Diameter:	10"
Casing Diameter:	4"
Total Depth:	101'
First GW Depth:	87.2'
Well ID:	BHL 177

Project No.:	31227
Site:	Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By:	Shingo Yamazaki
Reviewed By:	Benjamin T. Kortlever, L.G. 2937
Signature:	for

Sample Condition
- ☒ No Recovery
- ▨ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0					SW	
5	NA	0	■			SAND WITH GRAVEL AND COBBLES: fine- to coarse-grained, dark gray, dry, subangular gravel, <3/4" diameter (0/0/60/40).
10	NA	0	■			@ 10': with silt, fine- to very coarse-grained, subrounded to angular gravel (0/10/80/10).
15	NA	0	■			@ 15': as above.
20	NA	0	■			@ 20': as above.
25	NA	0	■			@ 25': as above.
30	NA	0	■			@ 30': as above.
35	NA	0	■		SM	SILTY SAND WITH GRAVEL: fine- to coarse-grained, dark gray, dry, subrounded to angular gravel,(0/20/70/10).
40						

Well: B15 / MW26
Elevation: NE

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BORING LOG B15/MW26

(Page 2 of 3)

Project No.: 31227
Site: Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: Shingo Yamazaki
Reviewed By: Benjamin T. Kortlever, L.G. 2937
Signature:

Date Drilled: 05/01/12; 05/10/12; 05/11/12
Drilling Co.: Cascade Drilling, LP
Clearing Method: Vac/Air Knife
Drilling Method: Air Rotary
Sampling Method: Grab Sample from Cyclone
Borehole Diameter: 10"
Casing Diameter: 4"
Total Depth: 101'
First GW Depth: 87.2'
Well ID: BHL 177

Sample Condition
- ☒ No Recovery
- ▨ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B15 / MW26
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
40	NA	0	■			@ 40': as above.
45	NA	0	■			@ 45': as above.
50	NA	0	■		SM	@ 50': (0/20/75/5).
55	NA	0	■			@ 55': (0/15/80/5).
60	NA	0	■			@ 60': dark gray (0/20/75/5).
65	NA	0	■		SW	SAND WITH GRAVEL AND SILT: fine- to coarse-grained, dark gray, dry, subrounded to angular gravel (0/10/80/10).
70	NA	0	■		SM	SILTY SAND WITH GRAVEL: fine- to coarse-grained, dark gray, dry, subrounded to angular gravel, increasing silt (0/20/75/5).
75	NA	0	■			@ 75': (0/15/80/5).
					SM	SILTY SAND WITH GRAVEL AND CLAY: very fine- to fine-grained, brown, silt, subrounded gravel, trace clay (5/20/65/5).
80	NA	0	▩			

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Cardno ERI
Shaping the Future

BORING LOG B15/MW26

(Page 3 of 3)

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Shingo Yamazaki
Reviewed By: : Benjamin T. Kortlever, L.G. 2937
Signature: :

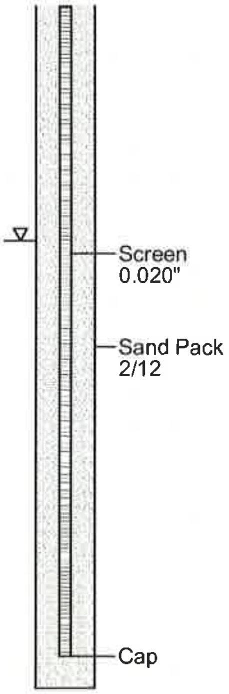
Date Drilled: : 05/01/12; 05/10/12; 05/11/12
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 10"
Casing Diameter: : 4"
Total Depth: : 101'
First GW Depth: : 87.2'
Well ID: : BHL 177

Sample Condition
- ☒ No Recovery
- ▨ Sampled Interval
- ■ Described Sample
- ▩ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B15 / MW26
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
80						@ 80': as above.
85	NA	95	■			@ 85': wet, odor.
90	NA	98	▩		SM	@ 90': as above.
95	NA	56	■			@ 95': as above.
						@ 98': hard drilling.
100	NA	2	▩			@ 100': less odor.
						Air Knife/Vacuum: 0' to 5'; 05/01/12. Air Rotary: 5' to 101'; 05/10/12, 05/11/12. Bottom of Borehole @ 101'; 05/11/12. (%Clay / %Silt / %Sand / %Gravel).
105						
110						
115						
120						



07-27-2012 M:\EXXONMOBIL\EXXONMOBIL PROJECTS\031227 (Grant County Airport) Moses Lake\BORING LOGS\31227_B15_051112.bor

Cardno ERI
Shaping the Future

BORING LOG B7 / SP1

(Page 1 of 3)

Date Drilled: : 04/19/11, 04/27 - 04/28/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 7"
Casing Diameter: : 2"
Total Depth: : 110'
First GW Depth: : 95'

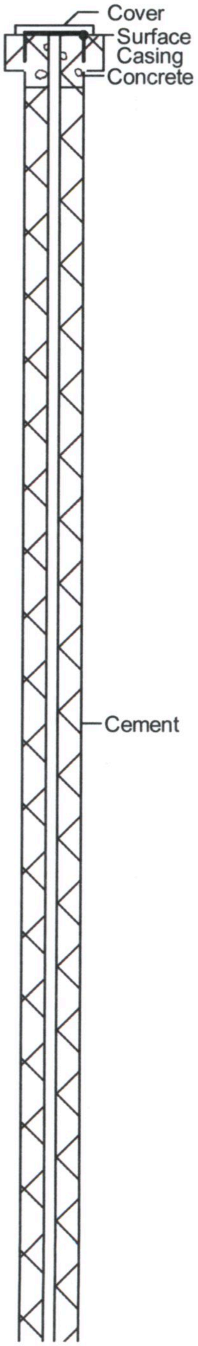
Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Benjamin Kortlever
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ◧ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B7 / SP1
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
0						
5					SW	SAND WITH COBBLES: coarse-grained, subangular, cobbles up to 6" diameter.
10		0.0	■			GRAVEL WITH SAND AND COBBLES: fine- to coarse-grained, olive-brown, damp, angular, coarse-grained sand, trace silt (0/2/10/88).
15		0.0	■			@ 15': olive-gray, increasing sand (0/2/20/78).
20		0.0	■			@ 20': olive-gray to black (0/2/20/78).
25		0.0	■			GRAVEL WITH SAND AND COBBLES: fine- to coarse-grained, olive-gray to gray-brown, dry, angular to subangular (0/0/15/85).
30		0.0	■		GW	@ 30': increasing sand (0/0/25/75).
35		0.0	■			@ 35': olive-gray, angular, trace coarse-grained sand (0/0/4/96).
40		0.0	■			@ 40': olive-gray to olive-brown, with coarse-grained sand (0/0/15/85).
45		0.0	■			@ 45': angular to subrounded gravel, decreasing sand (0/0/10/90).
50		0.0	■			



Cardno ERI
Shaping the Future

BORING LOG B7 / SP1

(Page 2 of 3)

Date Drilled: : 04/19/11, 04/27 - 04/28/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 7"
Casing Diameter: : 2"
Total Depth: : 110'
First GW Depth: : 95'

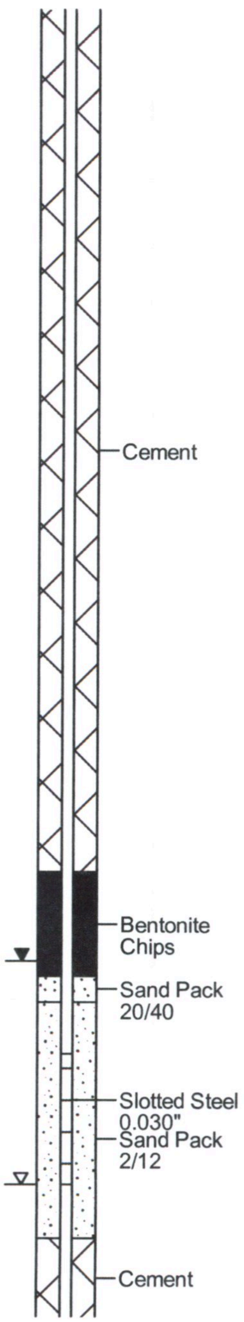
Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Benjamin Kortlever
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ◪ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B7 / SP1
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	USCS	DESCRIPTION
50				SW	SAND WITH GRAVEL AND COBBLES: fine- to coarse-grained, olive-gray to olive-brown, dry, fine- to coarse-grained angular to subangular gravel (0/0/90/10).
55		0.0	■	GW	GRAVEL WITH COBBLES AND SAND: fine- to coarse-grained, gray-brown, dry, subangular to subrounded, medium- to coarse-grained sand (0/0/15/85).
60		0.0	■		@ 60': increasing coarse-grained sand (0/0/30/70).
65		0.0	■		@ 65': olive-gray, less sand (0/0/25/75).
70		0.0	■		@ 70': gray-brown, angular to subrounded gravel, increasing sand (0/0/35/65).
75		0.0	■		@ 75': olive-gray to olive-brown, less sand (0/0/15/85).
80		1.0	◪	SM	SILTY SAND: very fine- to fine-grained, brown, damp, trace gravel (0/20/77/3).
85		8.0	■	GW	GRAVEL WITH SAND AND SILT: fine- to coarse-grained, brown, damp, angular to subangular, coarse-grained sand (0/10/25/65).
90		13.0	◪	GP	GRAVEL WITH SAND AND SILT: fine- to medium-grained, brown, damp to moist, subangular to subrounded, coarse- to very coarse-grained sand, trace clay (2/8/15/75).
95		12.0	■	GM	SILTY GRAVEL WITH SAND: fine- to coarse-grained, brown, moist to wet, medium- to coarse-grained sand, trace clay (4/30/10/56).
100		10.0	■		



Cardno ERI
Shaping the Future

BORING LOG B7 / SP1

(Page 3 of 3)

Date Drilled: : 04/19/11, 04/27 - 04/28/11
Drilling Co.: : Cascade Drilling, LP
Clearing Method: : Vac/Air Knife
Drilling Method: : Air Rotary
Sampling Method: : Grab Sample from Cyclone
Borehole Diameter: : 7"
Casing Diameter: : 2"
Total Depth: : 110'
First GW Depth: : 95'

Project No.: : 31227
Site: : Grant County Airport - Former Fueling Facilities, Moses Lake
Logged By: : Benjamin Kortlever
Reviewed By: : Justin Foslien, L.G. 2540
Signature: :

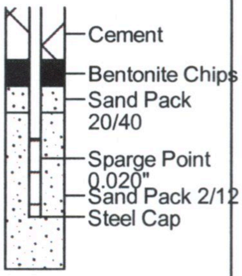
Sample Condition
- ☒ No Recovery
- ☐ Sampled Interval
- ■ Described Sample
- ▣ Preserved Sample

Water Levels
- ▼ After Completion
- ▽ During Drilling

Well: B7 / SP1
Elevation: NE

Depth (ft)	Blow Count	OVM/PID (ppmv)	Sample	Column	USCS	DESCRIPTION
100					SM	SILTY SAND WITH GRAVEL: medium- to coarse-grained, brown, moist, fine- to coarse-grained gravel (0/30/60/10).
105		7.0	■		GW	GRAVEL WITH SAND: fine- to coarse-grained, brown, damp, subangular to subrounded, coarse-grained sand, trace silt (0/3/10/87).
110		8.0	▣		GP	GRAVEL: fine- to medium-grained, brown, dry to damp, angular to subrounded, trace coarse- to very coarse-grained (0/0/3/97).

Air Knife/Vacuum: 0' to 5'; 04/19/11.
Air Rotary: 5' to 67'; 04/27/11.
Air Rotary: 67' to 110'; 04/28/11.
Bottom of Borehole @ 110'; 08:30; 04/28/11.
(%Clay / %Silt / %Sand / %Gravel).



APPENDIX C

Groundwater Use Evaluation

RESULTS OF GROUNDWATER USE EVALUATION
Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 2

Ecology Well Report ID	Ecology Well Tag Number	Project Well Number	Well Type	Owner Name	Well Completion Date	Screened or Uncased Interval (ft)	Total Well Depth (ft)	Sceen Slot Size (in)
177871	--	--	Irrigation	BUREAU OF RECLAMATION - COLUMBIA BASIN JCCC	6/2/1986	134 - 475	475	--
177872	--	--	Irrigation	BUREAU OF RECLAMATION - COLUMBIA BASIN CCC	6/2/1986	--	336	--
178300	--	Well #21	Municipal, Reconditioning	CITY OF MOSES LAKE	7/21/1993	420 - 730	730	--
178301	--	Well #22	Municipal	CITY OF MOSES LAKE	6/4/1943	208 - 725	725	--
178302	ABR745	Well #21	Municipal	CITY OF MOSES LAKE	1/1/1943	214 - 712	712	--
178303	--	Well #23	Industrial	CITY OF MOSES LAKE	3/5/1953	407.9 - 546.9 (Perforated Casing) 546.9 - 791 (Uncased Hole)	791	Perforations 0.25"x4" 8.5"-17" cc horiz 10" cc vert
178312	ABS797	Well #29	Municipal	CITY OF MOSES LAKE	2/21/1955	77 - 84 (Perforated Casing) 84 - 134 (Uncased Hole)	134	Perforation size/spacing not noted on log
178313	--	Well #22	Municipal, Reconditioning	CITY OF MOSES LAKE	8/17/1989	273 - 718	718	--
180939, 576325	--	92 BW-2	Groundwater Monitoring Well	GRANT COUNTY AIRPORT	2/15/1993	147 - 157	160	--
182774, 576305	--	91-AW14	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/24/1991	116 - 136	140	0.015
182775, 576309	--	91-AW16	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/11/1991	69 - 89	90.5	0.015
182776, 576307	--	91-AW15	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/8/1991	89 - 109	110	0.020
182777, 576313	--	91-AW18	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/11/1991	139 - 159	159	0.015
182778, 576315	--	91-AW17	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/19/1991	108 - 128	129	0.015
188714	ACK712	Well #1	Domestic	PATRIC J. HICKMAN	7/11/1996	--	72	--
209086	--	BML-1	Groundwater Monitoring Well	BOEING - MOSES LAKE	2/20/1998	64 - 74	75	0.020
209087	--	BML-5	Groundwater Monitoring Well	BOEING - MOSES LAKE	2/21/1998	62 - 72	72	0.020
209088	--	BML-4	Groundwater Monitoring Well	BOEING - MOSES LAKE	2/19/1998	60.5 - 70.5	75	0.020
209089	--	BML-3	Groundwater Monitoring Well	BOEING - MOSES LAKE	2/17/1998	60 - 75	75	0.020
209090	--	BML-2	Groundwater Monitoring Well	BOEING - MOSES LAKE	2/19/1998	60 - 70	75	0.020
209381, 576323	--	92 BW-3	Groundwater Monitoring Well	GRANT COUNTY AIRPORT	2/15/1993	140 - 150	180	--
209562, 209565, 576289, 576295	--	91-AW6 (Site 2)	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/10/1991	78 - 98	100	0.015
209563, 209566, 576291, 576297	--	91-AW5 (Site 2)	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/10/1991	79 - 99	99	0.015
209564, 209567, 576293, 576299	--	91-AW4 (Site 2)	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/9/1991	79 - 99	102	0.015
209568, 576301	--	91-BW2 (Site 2)	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	8/26/1991	137 - 147	180	0.020
209569, 576311	--	91-BW3 (Site 3)	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/5/1991	170 - 180	185	0.020
209570, 576317	--	91-AW9 (Site 3)	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/6/1991	81 - 101	102	0.020
209571, 576319	--	91-AW8 (Site 3)	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/5/1991	80 - 100	103	0.020
209572, 576321	--	91-AW7 (Site 3)	Groundwater Monitoring Well	LARSON AFB MOSES LAKE	9/6/1991	81 - 101	102	0.020
210355	AAV544	PH1-9402	Groundwater Monitoring Well	PORT OF MOSES LAKE / EXXON	4/16/1994	75.5 - 95.5	95.5	0.020
210388	ABT578	PH1-9603	Groundwater Monitoring Well	GRANT COUNTY AIRPORT	8/6/1996	80 - 100	100	0.020
210389	ABT579	PH1-9602	Groundwater Monitoring Well	GRANT COUNTY AIRPORT	8/7/1996	77 - 97	97	0.020
210390	ABT580	PH1-9601	Groundwater Monitoring Well	GRANT COUNTY AIRPORT	8/8/1996	75 - 95	95	0.020
386047	--	--	Geotech Soil Boring	US AIR FORCE / PORT OF MOSES LAKE	8/18/2004	--	172	--
461190	--	--	Geotech Soil Boring	US AIR FORCE / PORT OF MOSES LAKE	8/6/2004	--	47	--
484580	--	Well #22	Abandoned	CITY OF MOSES LAKE	6/16/1998	--	700	--
484581, 523630	--	92 BW-3	Abandoned	GRANT COUNTY AIRPORT	8/29/1995	--	100	--
516042	--	Well #23	Municipal, Reconditioning	CITY OF MOSES LAKE	11/12/1998	415 - 535 (Perforated Casing) 535 - 791 (Uncased Hole)	535	Perforations 0.5"x3" 4 per 12" vert
552688	BAS228	--	Domestic	JOHN GAMBLE	7/3/2008	35 - 330 (Uncased Hole)	330	--
577451	AMP901	--	Groundwater Monitoring Well	KON H. CHO	8/5/2005	65 - 75	76	0.020
577452	AMP902	--	Groundwater Monitoring Well	KON H. CHO	8/3/2005	65 - 75	76	0.020

RESULTS OF GROUNDWATER USE EVALUATION

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 2 of 2

Ecology Well Report ID	Ecology Well Tag Number	Project Well Number	Well Type	Owner Name	Well Completion Date	Screened or Uncased Interval (ft)	Total Well Depth (ft)	Sceen Slot Size (in)
577453	AMP903	--	Groundwater Monitoring Well	KON H. CHO	8/5/2005	65 -75	76	0.020
577994	BAR563	MW13	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	4/30/2008	87.5 - 107.5	107.5	0.010
577995	BAR564	MW14	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	5/1/2008	90 - 110	112	0.010
577996	BAR565	MW15	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	5/5/2008	88.5 - 108.5	111	0.010
577997	BAR567	MW17	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	5/8/2008	100 - 130	130	0.010
577998	BAR566	MW16	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	5/6/2008	90 - 130	131	0.010
577999	BAR568	MW18	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	5/13/2008	110 - 150	151	0.010
585952	AEN484	99-AW-01	Groundwater Monitoring Well	US ARMY CORPS OF ENGINEERS	7/26/1999	100 - 110	110	0.020
586013	AAV-527	PH1-9302	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	10/31/1993	79.5 - 99.5	99.5	0.020
586014	AAV-528	PH1-9303	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	11/10/1993	79.5 - 100	100	0.020
586015	AAV-526	PH1-9301	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	10/25/1993	79.5 - 99.5	99.5	0.020
586016	AAV-529	PH1-9304	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	11/11/1993	79.5 - 99.3	99.3	0.020
832883	BHL174	MW23	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	5/3/2012	70 - 100	103	0.010
832885	BHL175	MW24	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	5/7/2012	80 - 100	102.5	0.020
832887	BHL176	MW25	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	5/9/2012	80 - 100	101	0.020
832889	BHL177	MW26	Groundwater Monitoring Well	EXXONMOBIL, PORT OF MOSES LAKE	5/11/2012	80 - 100	101	0.020
1566265	BIB315	--	Municipal	CITY OF MOSES LAKE	4/7/2016	39.2 - 60.4	70.5	0.100
2063314, 2085670	BWU808	MW-1	Groundwater Monitoring Well	PORT OF MOSES LAKE	3/9/2021	40 - 50	70	0.020
2207516	BPA280	22-BW-01	Groundwater Monitoring Well	CITY OF MOSES LAKE	7/22/2022	97 - 107	120	0.001
2207555	BPA270	22-BW-02	Groundwater Monitoring Well	CITY OF MOSES LAKE	7/24/2022	105 - 115	125	0.001

EXPLANATION:

-- = Not available

Search radius of approximately 1 mile surrounding Port of Moses Lake Pumphouse 1

Division of Environmental Health, Office of Drinking Water (DOH) Sentry Internet Water System Database (https://fortress.wa.gov/doh/eh/portal/odw/si/findwatersystem.aspx)

Source: Washington State Department of Ecology’s Well Construction Map Search (https://appswr.ecology.wa.gov/WellConstruction/Map/WCLSWebMap/WellConstructionMapSearch.aspx) and the Washington State Department of Health Division of Environmental Health, Office of Drinking Water (DOH) Sentry Internet Water System Database (https://fortress.wa.gov/doh/eh/portal/odw/si/findwatersystem.aspx)

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. G3-28098
Permit No. QB-1100

(1) OWNER: Name Bur. of Rec., Columbia Basin JCOC Address 2492 24th St., Moses Lake, WA 98837

(2) LOCATION OF WELL: County Grant — SE ¼ NE ¼ Sec 32 T20 N., R 28 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 12 inches.
Drilled .... ft. Depth of completed well .... ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 12" Diam. from 0' ft. to 134 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☒ 12" 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 1180 ft.
Static level 122 ft. below top of well Date 7/17/86 DW
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? B-J
Yield: 65 gal./min. with ft. drawdown after 8 hrs.
" Air " Test " 65 G.P.M. "
" 250 " 118 " 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
0	124	5	116		

Date of test 7-10-86
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
Soil	0	2
Boulders	2	21
Gravel	21	44
Sand and Gravel	44	56
Gravel	56	80
Boulders	80	88
Sand	88	120
Gravel	120	131
Broken Basalt	131	156
Black Basalt	156	162
Broken Basalt	162	185
Med Basalt	185	221
Broken Basalt	221	223
Hard Basalt	223	267
Broken Basalt Clay slag	267	276
Med Basalt	276	329
Broken Basalt	329	334
Hard Basalt	334	336
Hard Basalt	336	431
Broken Basalt	431	433
Hard Basalt	433	457
Broken Basalt H20	457	467
Hard Basalt	467	475

RECEIVED
JUL 18 1986
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started May 12, 1986. Completed June 2, 1986

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 B-J Exploration Co, Inc. (Person, firm, or corporation) (Type or print)

Address 1547 Ridgeview, Richland, WA 99352

[Signed] Tony (Well Driller)

License No. 0337 Date June 2, 1986

7/18/86

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

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. G3-28098
Permit No. QB-1100

(1) OWNER: Name Bur. of Rec., Columbia Basin CCC Address 2492 24th St, Moses Lake, Wa. 98837

(2) LOCATION OF WELL: County Grant SE ¼ NE ¼ Sec 32 T 20 N., R 28 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 12 inches.
Drilled ft. Depth of completed well ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 12" Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ 12" 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.... ft.
Static level 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? B-J
Yield: 65 gal./min. with XX ft. drawdown after 8 hrs.
" Air " Test " 65 G.P.M. "
" " " "

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 ☐

6/14/86

(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	2
Boulders	2	21
Gravel	21	44
Sand & Gravel	44	56
Gravel	56	80
Boulders	80	88
Sand	88	120
Gravel	120	131
Broken Basalt	131	156
Black Basalt	156	162
Broken Basalt	162	185
Med Basalt	185	221
Broken Basalt	221	223
Hard Basalt	223	267
Broken Basalt Clay Slag	267	276
Med Basalt	276	329
Broken Basalt	329	334
Hard Basalt	334	336

Work started May 12, 1986 Completed June 2, 1986

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 B-J Exploration Co., Inc. (Person, firm, or corporation) (Type or print)

Address 1547 Ridgeview, Richland, Wa.

[Signed] (Well Driller)

License No. 0337 Date June 2, 1986

(USE ADDITIONAL SHEETS IF NECESSARY)

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: 0

Water Right Permit No.

(1) **OWNER:** Name CITY OF MOSES LAKE Address 321 S BALSAM MOSES LAKE, WA

(2) **LOCATION OF WELL:** County GRANT - ¼ B ¼ Sec 32 T. 20 N., R 28 W.M.

(2a) **STREET ADDDRESS 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) WELL #21

Abandoned ☐ New well ☐ Deepened ☐ Reconditioned ☒ Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well inches.

Drilled feet. Depth of completed well ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 18" Diam. from 0 ft. to 116 ft.

Welded ☒ 16" Diam. from 0 ft. to 209 ft.

Liner installed ☐

Threaded ☐ 12" Diam. from 0 ft. to 420 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? ft.

Material used in seal

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 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.

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
PERFORATE 16" CASING		
INSTALL 12" LINER		
GROUT		
CLEAN HOLE TO 730'		

RECEIVED
FEB 17 1994
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work started 6-18-93, 19. Completed 7-21, 1993

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 IRRIGATORS INC (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address P.O. BOX 449 MOSES LAKE, WA 98837

(Signed) H Tom Pryor License No. 2112 (WELL DRILLER)

Contractor's Registration No. IRRIGI*1160J Date 2-15, 1994

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329- 3

ile Original and First Copy with
epartment of Ecology
econd Copy — Owner's Copy
hird Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. 11692
Permit No. G3 006 37P

1) OWNER: Name City of Moses Lake Address P. O. Box 940 Moses Lake, WA 98837

2) LOCATION OF WELL: County Grant — E½ ~~xx~~ NW¼ Sec. 32 T. 20 N., R. 28 W.M.

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) 22
Existing well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

5) DIMENSIONS: Diameter of well 20 & 18 inches.
Drilled 725 ft. Depth of completed well 725 ft.

6) CONSTRUCTION DETAILS:
Casing installed: 20" Diam. from 0 ft. to 132 ft.
Threaded ☐ 18" Diam. from 120 ft. to 208 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? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

7) PUMP: Manufacturer's Name U.S. Electric
Type: CFU H.P. 125

8) WATER LEVELS: Land-surface elevation above mean sea level 1195 ft.
Static level 146 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.
1100	30 to 40	"
"	"	"

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
Sand Gravel & Boulders	0'	120'
Clay and Gravel	120'	170'
Basalt	170'	185'
Clay	185'	190'
Clay and Gravel	190'	200'
Basalt	200'	225'
Fractured	225'	240'
Very Hard Basalt	240'	300'
Soft Basalt	300'	340'
Hard Basalt	340'	580'
Hard Black Basalt	580'	610'
Porous Basalt, Some Water	610'	615'
Hard, Black Basalt	615'	660'
Porous Basalt	660'	670'
Water Bearing Basalt	670'	719'
Hard Basalt	719'	-

WELL No. 22

6000
1200

RECEIVED
AUG 22 1973
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Moses Lake

Work started Jan. 29 19 43 Completed June 4, 19 43

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 (Person, firm, or corporation) (Type or print)
Address
[Signed] (Well Driller)
License No. Date 19

OK
8-28-73

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

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 11692
Permit No. G3-00627P

(1) **OWNER:** Name City of Moses Lake Address 321 South Balsam

(2) **LOCATION OF WELL:** County Grant NE ¼ SE ¼ Sec. 32 T. 20 N., R. 28 W.M.
Bearing and distance from section or subdivision corner 3875' South 18° from NW Corner of Section 32

(3) **PROPOSED USE:** Domestic ☐ Industrial ☐ Municipal ☒ Irrigation ☐ Test Well ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) 21
Existxxx well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 18, 16, 14 inches.
Drilled 712 ft. Depth of completed well 712 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 18" Diam. from 0 ft. to 116 ft.
Threaded ☐ 16" Diam. from 116 ft. to 214 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? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name Byron Jackson
Type: Submersible H.P. 125

(8) **WATER LEVELS:** Land-surface elevation above mean sea level 1187 ft.
Static level 136 ft. below top of well Date 2/5/59
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? City

Yield: gal./min.	with ft. drawdown	after hrs.
1300	45-60	

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
Alt. Layers Sand, Clay & Gravel	0	91
Alt. Layers clay, sand & shale	91	178
Broken Basalt, Water Bearing	178	202
Porous Basalt	202	216
Blue Clay	216	226
Med. & Hard Basalt	226	228
Broken Basalt w/ Blue Clay	228	288
Med. to Hard Basalt	288	376
Porous Basalt	376	473
Hard Basalt	473	487
Obsidian	487	496
Broken Basalt, Water Bearing	496	532
Hard & Broken Basalt	532	560
Broken Basalt, Water Bearing	560	600
Hard Solid Basalt	600	-

WELL No. 21

Work started 19 Completed 1/1/43 19

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 (Person, firm, or corporation) (Type or print)
Address
[Signed] (Well Driller)
License No. Date 19

OK

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

m

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Well Tagging Form

Unique Well Tag No: ADR 745

56300X SrcNum 12 (well21)

RECORD VERIFICATION (check✓one)

☐ Well Report available *(please attach this form to the well report and submit it to the Ecology Regional Office near you)*

☐ Verification inconclusive

☑ Well Report not available

WELL OWNERSHIP, IF DIFFERENT FROM WELL REPORT

First Name: Moses Lake Last Name:

Street Address:

City: Moses Lake State:

LOCATION OF WELL, IF DIFFERENT FROM WELL REPORT

Well Address: 7751 Nowell Street NE

City: County:

T. 20 N. R. 28 E W.M. Sec. 32 NE 1/4 of the SE 1/4

FOR AGENCY USE ONLY

Latitude 47 10 ' 47 . 30320N "

Longitude 119 19 ' 31 . 95352W "

☒ GPS
☐ Topographic Map
☐ Survey
☐ Computer generated

Elevation at land surface 385 feet/meters *(circle one)*

☐ Digital Altimeter
☐ Topographic Map
☒ Other GPS

Additional information, if available:

☐ Location marked on topographic map *(please attach)*

☐ Location marked on air photo *(please attach)*

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

FOR AGENCY USE ONLY

WELL CHARACTERISTICS

Physical Description of well (size of casing, type of well, housing, etc.)

Location of Well identification Tag: Wellhead / Base in pumphouse

Was supplemental tag needed for ease of identifying well? ☐ Yes ☒ No

If yes, where was tag placed?

D	C	B	A
E	F	G	H
M	L	K	[✓ J]
N	P	Q	R

Scale 1:24,000 (1"=2,000')

Indicate the location of the well within the Section by drawing a dot at that point.

SECTION 32

COMMENTS:

FOR ECOLOGY WATER RESOURCES PROGRAM ONLY

Water Right #

Date Issued

Circle One: Application Permit Certificate Claim Exempt

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

WELL LOG

No. Appl./ #2855
Cert. #2091-A

Date 3-5, 1954

Record by Paul A. Durand

Source Well driller's record

Location: State of WASHINGTON

County Grant

Area

Map Within boundary of Larson Air Force Base

¼ ¼ sec. 33 T. 20 N., R. 28 E. ~~W.~~

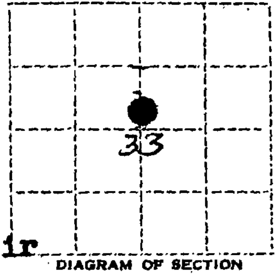


DIAGRAM OF SECTION

Drilling Co. A. A. Durand

Address Walla Walla, Washington

Method of Drilling Drilled Date 12-15 1953

Owner U.S.Corps of Engineers

Address Walla Walla, Washington

Land surface, datum 1160 ft. above below

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Well No. 3		
	Gravel & boulders	85	85
	Gravel & clay (water)	57	142
	Broken basalt "	23	165
	Dark basalts	251	419
	Red soft basalt (water)	6	425
	Broken soft basalt (water)	26	451
	Hard basalt	62	513
	Broken basalt (water)	2	515
	Hard basalts	192	707
	Blue-green clay	16	723
	Broken basalt (water)	73	791
	Note: "0" of well log approx., 2' above natural ground.		
	(over)		

Turn up

Sheet ____ of ____ sheets

WELL LOG.—Continued No.____/____-____

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Depth forward	——	
Pump Test:			
	Dim: 789.6' x 16"		
	SWL: 98'		
	Dd: 19'		
	Yield: 1122 g.p.m.		
	Casing: 24OD" dia. 0.375" wall from		
	0 to 167.6		
	20 OD" dia. 0.375" wall from		
	0 to 222.4'		
	Perforations: 16" casing 0.375"		
	¼x4" slots, 8½" cc horiz, 10" cc ve		
	from 408'to 426', 448'to 461', and		
	510' to 519'.		
	¼"x4" slots 17"cc horiz 10"cc vert.		
	426' to 448', 461 to 510', and		
	519' to 548'.		
	Pump: Peerless Gear Pump, 1250 GPM at		
	1750 RPM. Climax 100 HP Gas		
	Engine.		

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Third Copy — Driller's Copy

WATER WELL REPORT

TATE OF WASHINGTON

Application No. **11692**

Permit No 63-006-57P

(1) OWNER: Name **City of Moses Lake** Address **P.O. Drawer 940**

OCATION OF WELL: County **Grant** **SW** ¼ **NW** ¼ Sec. **33** T. **20** N., R. **28** W.M.

and distance from section or subdivision corner **2470' South 16° W from NW corner of Section 33**

(3) PROPOSED USE: Domestic ☐ Industrial ☒ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) **23**

Exist XXX well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well **24,20,16** inches.
Drilled **791** ft. Depth of completed well **791** ft.

(6) CONSTRUCTION DETAILS:

Casing installed: **24** " Diam. from **0** ft. to **167.4** ft.
Threaded ☐ **20** " Diam. from **0** ft. to **218.9** ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used **16" Perforated Liner**
SIZE of perforations in. by in.
perforations from **407.9** ft. to **546.9** 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? ✓
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name **Jacuzzi**
Type: **Centrifugal** H.P. **100**

(8) WATER LEVELS: Land-surface elevation above mean sea level **1169** ft.
Static level **102** ft. below top of well Date **8/6/54**
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? **City**
Yield: gal./min. with ft. drawdown after hrs.
" **1000** " **25-30** " "
" " " "

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 ☐

OK [illegible] 23

(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
Gravel & Boulders	0	85
Clay & Gravel	85	142
Alt. Layers Broken Basalt	142	165
Hard Basalt	165	169
Broken Basalt	169	180
Alt. Layers Med.&Hard Basalt	180	421
Broken Basalt	421	451
Alt. Layers Med,Hard,VeryHard	451	513
Broken Basalt	513	515
Alt. Layers Med. to HardBasalt	515	710
Clay, Bluegreen, Sticky	710	723
Broken Basalt mix w/green shale	723	791

WELL No. 23

600 gpm

1200 gpm

Moses Lake [illegible]

Work started 19 Completed 19

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 (Person, firm, or corporation) (Type or print)

Address

[Signed] (Well Driller)

License No. Date 19

ile Original and First Copy with
epartment of Ecology
econd Copy — Owner's Copy
hird Copy — Driller's Copy

ATER WELL REPORT
STATE OF WASHINGTON

Application No. 11692
Permit No. 63 006 57P

(1) OWNER: Name City of Moses Lake Address P.O. Box Drawer 940 98837

(2) OCATION OF WELL: County Grant — SW¼ NW¼ Sec. 27 T. 20 N., R. 28 W.M.
and distance from section or subdivision corner 1725' South 7° East of NW Corner of Section 27

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 29
Exist ~~New~~ well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 24 & 18 inches.
Drilled 134 ft. Depth of completed well 135 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 24" Diam. from 0 ft. to 73 ft.
Threaded ☐ 18" Diam. from 77 ft. to 84 ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used 18" casing
SIZE of perforations in. by in.
perforations from 77 ft. to 84 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? ft.
Material used in seal
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 1150 ft.
atic level 68' ft. below top of well Date 6/14/62
rtesian 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
as a pump test made? Yes ☐ No ☒ If yes, by whom?
eld: 750 gal./min. with ft. drawdown after hrs.
" " " "
" " " "

ecovery 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

ate of test
ailer test gal./min. with ft. drawdown after hrs.
rtesian flow g.p.m. Date
emperature 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
Gravel and Boulders	0	28
Gravel & Silt	28	29
Boulders & Sand	29	33
Gravel & Course Sand	33	47
Boulders, Sand & Gravel	47	59
Gravel & Clay	59	73
Gravel, Clay & Boulders	73	76
Loose Gravel, Sand w/ water	76	83
Boulders, gravel & clay	83	105
Hard Gray Basalt	105	-

WELL No. 29

600

1200

RECEIVED
AUG 22 1973
[illegible] ECOLOGY

Work started , 19 Completed 2/21/ 1955

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 (Person, firm, or corporation) (Type or print)

Address

[Signed] (Well Driller)

License No. Date , 19

OK
TMO
8-28-73

F. No. 7356—OS—(Rev. 4-71). (USE ADDITIONAL SHEETS IF NECESSARY)

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Well Tagging Form

Unique Well Tag No: ABS797 ✓

56300X Src Num 16 (Well 29)

RECORD VERIFICATION (check✓ one)

☐ Well Report available *(please attach this form to the well report and submit it to the Ecology Regional Office near you)*
☐ Verification inconclusive
☒ Well Report not available

WELL OWNERSHIP, IF DIFFERENT FROM WELL REPORT

First Name: Moses Lake
Last Name:
Street Address:
City: Moses Lake
State: WA

LOCATION OF WELL, IF DIFFERENT FROM WELL REPORT

Well Address: 9004 Tyndall Road NE
City:
County:
T. 20 N. R. 28 E W.M. Sec. 27 Sw 1/4 of the NW ✓

FOR AGENCY USE ONLY

Latitude 47 11 ' 59 . 16934 N "
Longitude 119 17 ' 53 . 30610 W "

☒ GPS
☐ Topographic Map
☐ Survey
☐ Computer generated

Elevation at land surface 371 feet/[✓ meters] *(circle one)*

☐ Digital Altimeter
☐ Topographic Map
☒ Other GPS

Additional information, if available:

☐ Location marked on topographic map *(please attach)*
☐ Location marked on air photo *(please attach)*

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. —

Water Right Permit No.

(1) **OWNER:** Name City of Moses Lake Address

(2) **LOCATION OF WELL:** County Grant NW ¼ NE ¼ Sec 32 T 20 N., R 28 W.M.

(2a) **STREET ADDDRESS OF WELL** (or nearest address) Dover & 29th Street

(3) **PROPOSED USE:** ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☒ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) #22

Abandoned ☐ New well ☐ Deepened ☐ Reconditioned ☒

Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well ______ inches.

Drilled ______ feet. Depth of completed well 718 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 14 " Diam. from 0 ft. to 273 ft.

Welded ☒ ______ " Diam. from ______ ft. to ______ ft.

Liner installed ☒

Threaded ☐ ______ " 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? 273 ft.

Material used in seal Cement Grout

Did any strata contain unusable water? Yes ☒ No ☐

Type of water? 12 PPm TCE Depth of strata 208'

Method of sealing strata off Cement Grout

(7) **PUMP:** Manufacturer's Name

Type: ______ H.P. ______

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ______ ft.

Static level 212' ft. below top of well Date 8-17-89

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 ______ 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

RECEIVED
OCT 10 1989
DEPARTMENT OF ECOLOGY
[illegible]

Work started 4-17, 19. Completed 8-17, 1989

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 Lad Irrigation Co Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address PO Box 880 Moses Lake Wa. 98837

(Signed) Del Telow (WELL DRILLER) License No. 1622

Contractor's Registration No. LADIRCI194RC Date 10-2-, 1989

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329- 3

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

REC

MAY 14 19

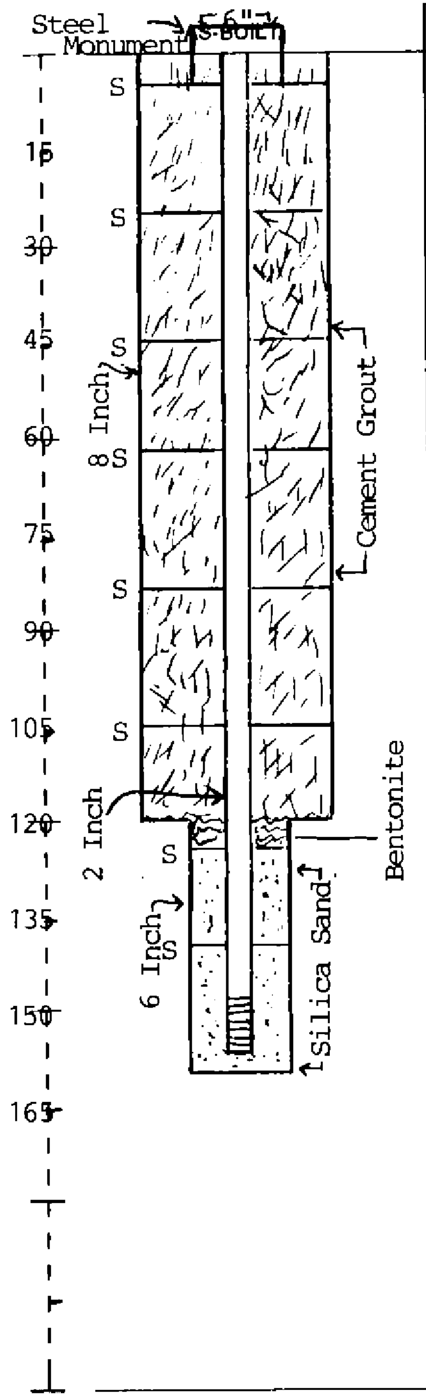
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

RESOURCE PROTECTION WELL REPORT

START CARD NO. 204810

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. 92 BW-2
DRILLING METHOD: Rotary
DRILLER: Craig S. DeYoung
FIRM: Andrew Well Drilling Services
SIGNATURE:
CONSULTING FIRM: Blue Ridge Associates
REPRESENTATIVE: Iain Olness

COUNTY: Grant
LOCATION: NW ¼ SE ¼ Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant County Airport
WATER LEVEL ELEVATION: 81.25 ft BGS
GROUND SURFACE ELEVATION: Not Available
INSTALLED: Feb 15/93
DEVELOPED: Feb 15/93



WELL DATA

Hole Data:
Size: 8" to 119 ft
6" to 160 ft

Casing:
Steel .280 6"
From +2.5 to -3.5 ft

PVC Sch 80 2"
From +2 to 147 ft

Screen: 2" PVC Monoflex
From 147 to 157 ft

Filter:
Colorado Silica Sand
Size: 10-20
Inst. Method:
Tremmie Pipe
Depth: 123 to 160 ft

Grout:
Cement w/Bentonite (5%)
Depth: 0 to 119 feet

(S= Stabilizer)

FORMATION DESCRIPTION

Gravel	(0-85)	45
Silt and Clay	(85 - 100)	75
Weathered Basalt	(100-157)	135
Competent Basalt	(157-160)	150

SCALE: 1" = 30 Feet

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

RESOURCE PROTECTION WELL REPORT

START CARD NO. 044809

PROJECT NAME: LARSON AFB Moses LAKE

WELL IDENTIFICATION NO. 91-AW14

DRILLING METHOD: Dual wall percussion hammer

DRILLER: Richard Jimenez

FIRM: Layne Environmental Services, Inc.

SIGNATURE:

CONSULTING FIRM: Dames + Moore

REPRESENTATIVE: Joe Turner

COUNTY: GRANT

LOCATION: NW 1/4 NE 1/4 Sec 32 Twn 20N R 28E

STREET ADDRESS OF WELL: GRANT'S County Airport

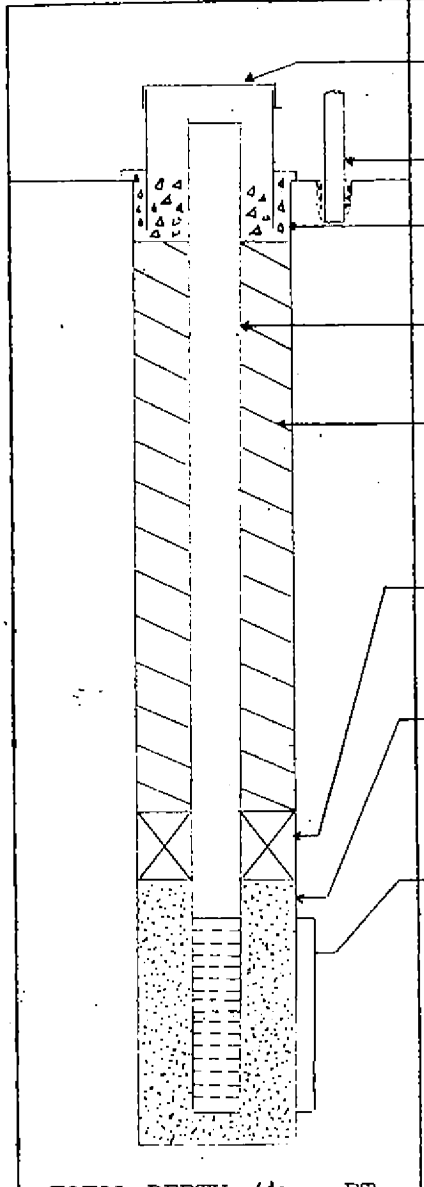
WATER LEVEL ELEVATION: 125.4'

GROUND SURFACE ELEVATION:

INSTALLED: 9-24-91

DEVELOPED: 10-8-91

AS-BUILT



TOTAL DEPTH 140 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG 2 TO 116 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT ____ TO ____ FT.

SEAL 108 TO 110 FT.
1/4 Bentonite pellets

FILTER PACK 110 TO 138 FT.
20-40 Colorado Silica Sand

SCREEN INTERVAL 116 TO 136 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 140 9 IN.
____ TO ____ 6 IN.

Plug back w/bentonite pellets 138-140'

FORMATION DESCRIPTION

0-5 Brown silty SAND w/ occasional gravel, damp

5-108 Brown coarse GRAVEL w/ cobbles + occasional boulders dry to moist

108-140 Brown gravelly, silty SAND w/ some clay, moist to wet

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

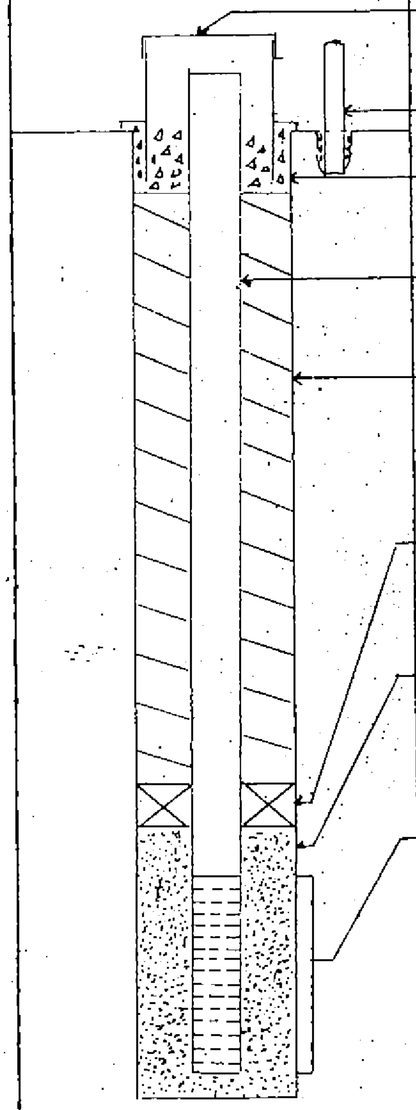
RESOURCE PROTECTION WELL REPORT

START CARD NO: 44811

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW16
DRILLING METHOD: Dual Wall Percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: ~~Dames~~ + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NW¼ SE ¼ Sec 32 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 84'
GROUND SURFACE ELEVATION:
INSTALLED: 9-11-91
DEVELOPED: 10-5-91

AS-BUILT



TOTAL DEPTH 90.5 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 69 FT. 2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 62 FT.

Enviroplug grout

SEAL 62 TO 64 FT.

1/4 Bentonite pellets

FILTER PACK 64 TO 89 FT.

20-40 Colorado Silica Sand

SCREEN INTERVAL 69 TO 89 FT.
2" SCH 40 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 90.5 9 IN.
TO 6 IN.

Bentonite pellet seal 89 to 90.5

FORMATION DESCRIPTION

0-53 grey/black silty sandy GRAVEL w/cobbles + occasional boulders, dry to moist

53-77 grey/black sandy GRAVEL w/ occasional cobbles, moist

77-88 reddish brown slightly sandy SILT, damp, loose moist to saturated

88-90 yellowish clay w/ iron staining + basalt nodules

90-90.5 weathered basalt

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

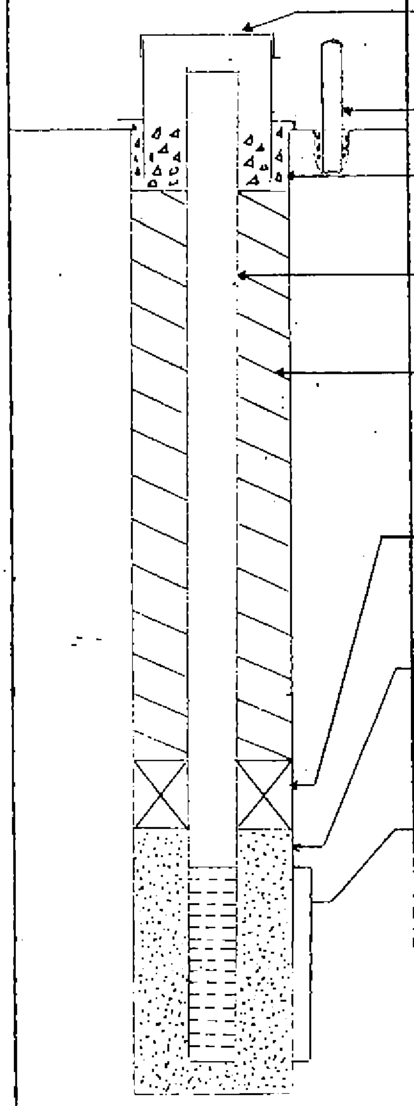
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044810

PROJECT NAME: Larson AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW15
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: Grant
LOCATION: NE 1/4 SW 1/4 Sec 32 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 97'
GROUND SURFACE ELEVATION:
INSTALLED: 9-8-91
DEVELOPED: 10-8-91

AS-BUILT



TOTAL DEPTH 110 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +1.5 TO 2 FT.

WELL CSG +2 TO 89 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 82 FT.
Enviroplug Grout

SEAL 82 TO 84 FT.
1/4 Bentonite pellets

FILTER PACK 84 TO 110 FT.
10-20 Colorado Silica

SCREEN INTERVAL 89 TO 109 FT.
2" SCH 80 TFJ PVC
.020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 110 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-17 Dark brown slightly clayey silty sandy GRAVEL w/cobbles & occasional boulders damp

17-25 Brown silty, gravelly SAND, moist

25-72 Brown silty sandy GRAVEL w/ cobbles, dry to moist

72-74 Yellowish brown silty fine SAND; damp

74-93 Yellowish brown to light brown sandy SILT, damp

93-98 Reddish brown fine SAND w/trace silt, moist

98-110 Dark brown to black silty sandy GRAVEL, saturated

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

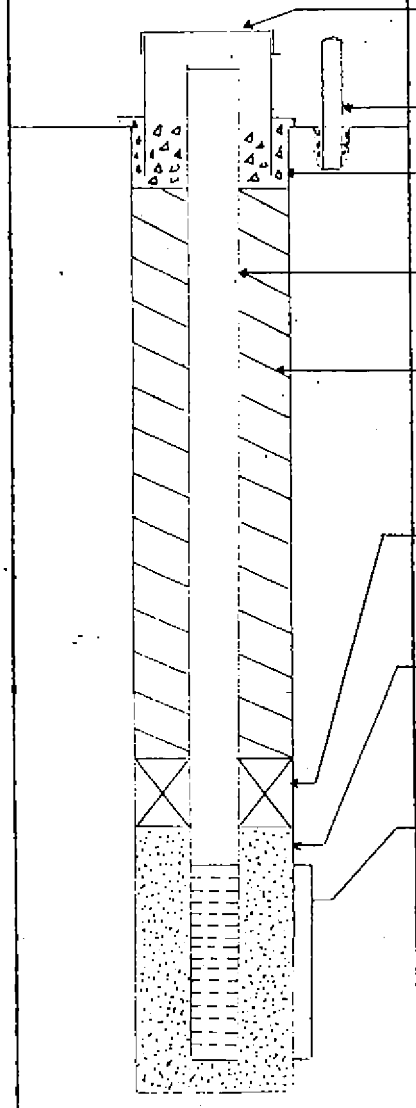
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044813

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW18
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE ¼ NE ¼ Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 142
GROUND SURFACE ELEVATION:
INSTALLED: 9-11-91
DEVELOPED: 10-4-91

AS-BUILT



TOTAL DEPTH 159 FT.

WELL DATA

STEEL SURFACE MONUMENT
W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL
+.5 TO 2 FT.

WELL CSG +2 TO 139 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT
2 TO 130 FT.

Enviroplug grout

SEAL 130 TO 132 FT.

1/4 Bentonite pellets

FILTER PACK
132 TO 159 FT.

20-40 Colorado Silica

SCREEN INTERVAL
139 TO 159 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 159 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-8 Brown silty SAND w/ gravel + cobbles, dry

8-36 Brown to gray silty, sandy GRAVEL w/cobbles, dry

36-58 Brown silty, gravelly SAND w/cobbles and occassional boulders, dry to moist

58-125 Brown silty, sandy GRAVEL w/cobbles and occassional boulders, damp to moist

125-159 Reddish yellow to dark brown slightly clayey SILT w/fine sand and occassional gravels, moist to wet

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

RESOURCE PROTECTION WELL REPORT

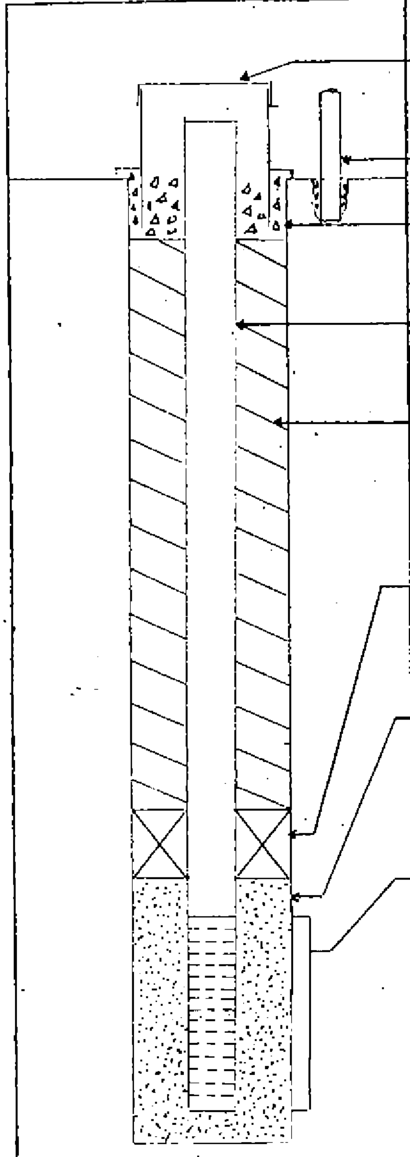
START CARD NO. 044812

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW17
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Joe Turner

COUNTY: GRANT
LOCATION: NW 1/4 NW 1/4 Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County Airport

WATER LEVEL ELEVATION: 119'
GROUND SURFACE ELEVATION:
INSTALLED: 9-19-91
DEVELOPED: 9-24-91

AS-BUILT



TOTAL DEPTH 129 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 108 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 100 FT.
ENVIROPLUG GROUT

SEAL 100 TO 102 FT.
1/4" Bentonite pellets

FILTER PACK 102 TO 129 FT.
20-40 Colorado Silica Sand

SCREEN INTERVAL 108 TO 128 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 129 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-7 Brown GRAVEL w/coarse sand + silt, dry

7-68 Brown sandy GRAVEL w/occassional boulders moist

68-78 Brown gravelly coarse SAND, little fines, wet

78-107 Brown GRAVEL w/ coarse sand and occassional boulders, moist

107-129 Brown gravelly silty SAND, moist to saturated

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

55716

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. W080465.
UNIQUE WELL I.D. # ACK 712
Water Right Permit No.

[illegible] OWNER: Name Patric J. Hickman Address 2014 Lakeside Dr M.L.

(2) LOCATION OF WELL: County Grant - SE 1/4 NW 1/4 Sec 34 T. 20 N., R 28E 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) 1
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ 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 72 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 55 ft. below top of well Date 7-11-96
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: 40 gal./min. with air Lift ft. drawdown after 2 hrs.
" Pump " 12½ GPM " 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 59.2 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 & Rock.	0	3
Sand Black	3	7
Gravel & Boulders w sand.	7	72
Clay yellow	72	74

RECEIVED
JUL 18 1996
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 7-11 96 19. Completed 7-11-96. 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) Tim (WELL DRILLER) License No. 0469
Contractor's Registration No. JOYDRC1370L Date 7-11 96, 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

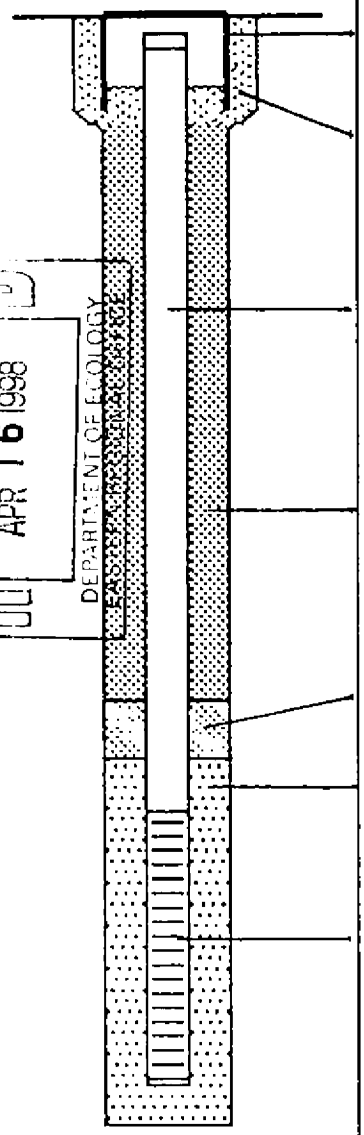
RESOURCE PROTECTION WELL REPORT

START CARD NO. 05021

PROJECT NAME: Boeing - Moses Lake WA
WELL IDENTIFICATION NO. BML - 1
DRILLING METHOD: Dual-wall Percussion hammer
DRILLER: Charles Storey # 2072
FIRM: Layne Christensen Co.
SIGNATURE: Paul E. Sly
CONSULTING FIRM: Woodward Clyde.
REPRESENTATIVE: Tom Middleton

COUNTY: Grant
LOCATION: SW ¼ NW ¼ SEC 27 TWN 20N R 28E E.WM
STREET ADDRESS OF WELL: Grant Co. Airport - Moses Lake WA
WATER LEVEL BELOW GROUND SURFACE: 63'
GROUND SURFACE ELEVATION: NA
DATE(S) INSTALLED: 2-20-98
DATE(S) DEVELOPED: NA

AS-BUILT



TOTAL DEPTH OF BORING 75' FT.

WELL DATA

FLUSH MOUNT WELL COVER:
DIAMETER 8" DEPTH 12"

CONCRETE SURFACE SEAL 2' TO 0 FT.

WELL CASING 64 TO 6" Below grade
SCHEDULE 40 PVC DIA. 2"

ANNULAR SEALANT 60' TO 2' FT.
MATERIAL: Bentonite grout

SEAL 62' TO 60' FT.

FILTER PACK 24' TO 62' FT.
MATERIAL: Silica 10-20

SCREEN INTERVAL 24' TO 64' FT.
SCHEDULE 40 PVC DIA. 2"
020 FACTORY SLOTTED

HOLE DIAMETER
9 IN. 0 TO 75' FT.
/ IN. / TO / FT.

FORMATION DESCRIPTION

0'-10' silted sand w/ med, large Cobbles mixed, lite brown in color.

10'-20' same as 0'-10

20'-30' same

30-40 same

40-50 silted sand turning lite gray in color.

50'-60' same (damp)

60-70' very silted, fine sand w/ small and med Cobbles

70'-75' same

APR 16 1998
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

RECEIVED
APR 10 1998
Water Resources Program
Department of Ecology

Layne Christensen Company
1401 E. 26th Street - Tacoma, WA 98421 - (206) 572-3727 Fax (206) 572-3730

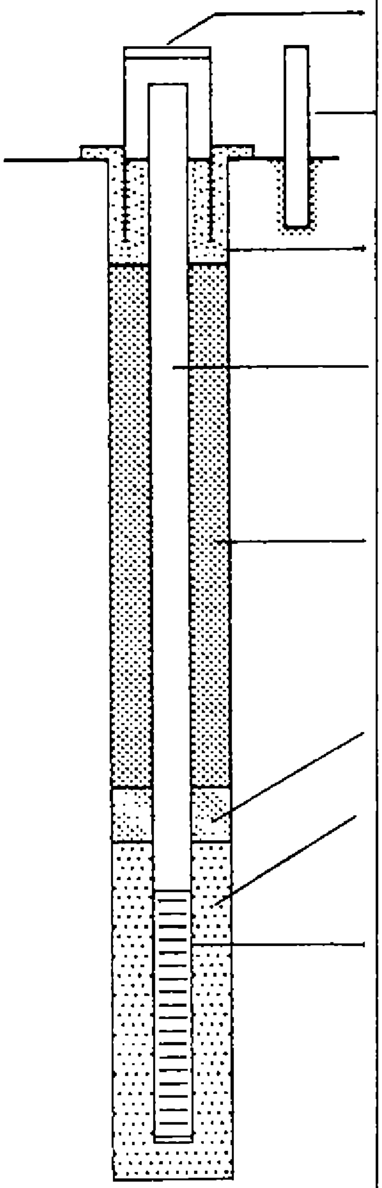
RESOURCE PROTECTION WELL REPORT

START CARD NO. 05021

PROJECT NAME: Boeing Moses Lake WA
WELL IDENTIFICATION NO. BML-5
DRILLING METHOD: Dual-wall Percussion hammer
DRILLER: Charles Shorey #2072
FIRM: Layne Christensen Co.
SIGNATURE:
CONSULTING FIRM: Woodward Clyde
REPRESENTATIVE: Tom Middleton

COUNTY: Grant
LOCATION: SW ¼ NW ¼ SEC 27 TWN 20N R 28E E.WM
STREET ADDRESS OF WELL: Grant Co. Airport - Moses Lake WA
WATER LEVEL BELOW GROUND SURFACE: 63'
GROUND SURFACE ELEVATION: NA
DATE(S) INSTALLED: 2-21-98
DATE(S) DEVELOPED: NA

AS-BUILT



TOTAL DEPTH OF BORING 72 FT.

WELL DATA

STEEL SURFACE MONUMENT
W/LOCK 3 FT. ABOVE G.L.
PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL 2' TO 6" Above grade

WELL CASING 62' TO 3' AGL FT.
SCHEDULE 40 PVC DIA. 2"

ANNULAR SEALANT 58' TO 2' FT.
MATERIAL Bentonite grout

SEAL 60' TO 58' FT.

FILTER PACK 72' TO 60' FT.
MATERIAL: Silica 10-20

SCREEN INTERVAL 72' TO 62' FT.
SCHEDULE 40 PVC DIA. 2"
020 FACTORY SLOTTED

HOLE DIAMETER
9 IN. 0 TO 72' FT.
/ IN. / TO / FT.

FORMATION DESCRIPTION

0'-10' brown silted sand w/ large Cobbles

10'-50' same

50'-60 silted gray sand (damp)

60-70' very fine gray silted sand w/ small med Cobbles

70'-75 same

RECEIVED
APR 16

RECEIVED
APR 10 1998
Resources Program
Department of Ecology

Layne
Layne Christensen Company
1401 E. 26th Street - Tacoma, WA 98421 - (206) 572-3727 Fax (206) 572-3730

RESOURCE PROTECTION WELL REPORT

START CARD NO. 05021

PROJECT NAME: Boeing - Moses Lake WA

WELL IDENTIFICATION NO. BML - 4

DRILLING METHOD: Dual-wall Percussion hammer

DRILLER: Charles Shorey #2072

FIRM: Layne Christensen Co.

SIGNATURE:

CONSULTING FIRM: Woodward Clyde

REPRESENTATIVE: Tom Middleton

COUNTY: Grant

LOCATION: SW ¼ NW ¼ SEC 27 TWN 20N R 28 E E·WM

STREET ADDRESS OF WELL: Grant Co. Airport - Moses Lake WA

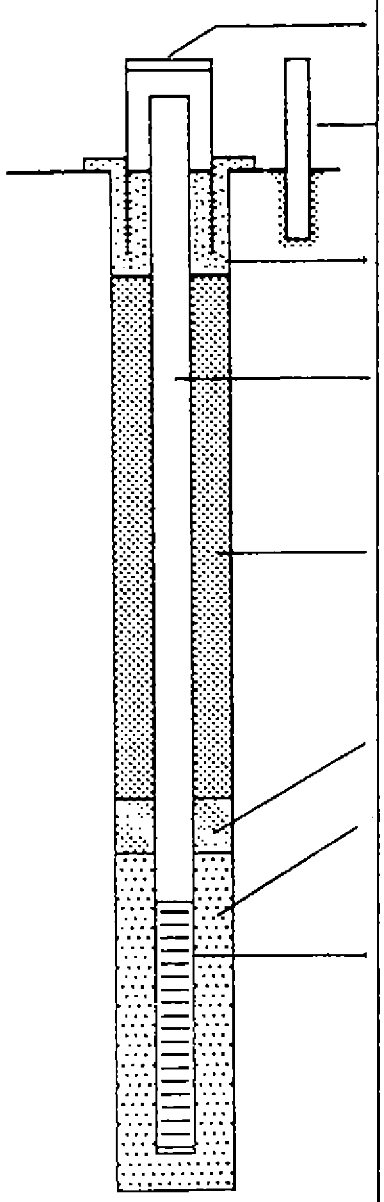
WATER LEVEL BELOW GROUND SURFACE: 63'

GROUND SURFACE ELEVATION: NA

DATE(S) INSTALLED: 2-19-98

DATE(S) DEVELOPED: NA

AS-BUILT



TOTAL DEPTH OF BORING 75' FT.

WELL DATA

STEEL SURFACE MONUMENT

W / LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL 2" TO 6" AGL

WELL CASING 60.5 TO 3 AGL FT.

SCHEDULE 40 PVC DIA. 2"

ANNULAR SEALANT 56' TO 2' FT.

MATERIAL Bentonite grout

SEAL 58' TO 56' FT.

FILTER PACK 70.5' TO 58' FT.

MATERIAL: Silica 10-20

SCREEN INTERVAL 70.5' TO 60.5' FT.

SCHEDULE 40 PVC DIA. 2"

.020 FACTORY SLOTTED

HOLE DIAMETER

9 IN. 0 TO 75' FT.

IN. TO FT.

FORMATION DESCRIPTION

0'-10' silted brown fine sand w/ large cobbles

10'-50' same

50' 60' silted sand turning gray in color (damp)

60-70' very silted sand gray in color.

70-75 same

DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

RECEIVED

APR 10 1998

Water Resources Program Department of Ecology

Layne

Layne Christensen Company
1401 E. 26th Street - Tacoma, WA 98421 - (206) 572-3727 Fax (206) 572-3730

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

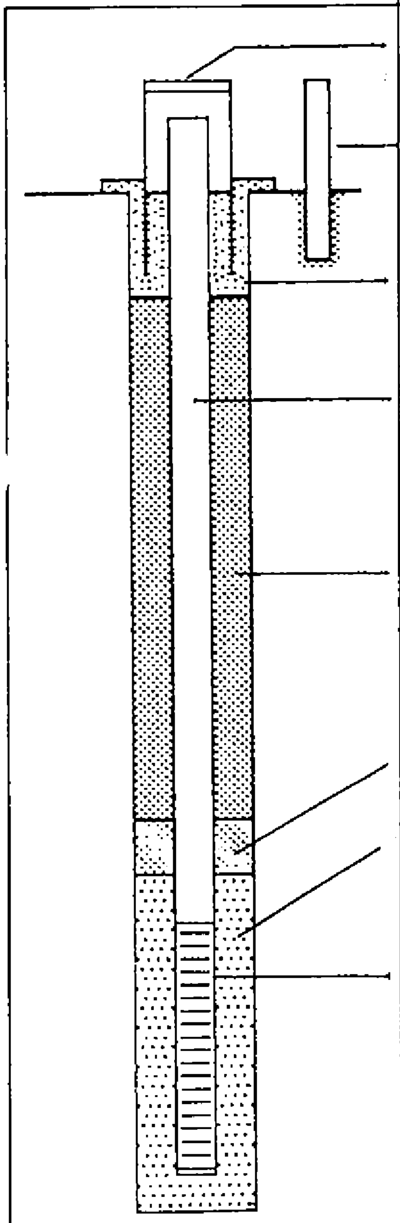
RESOURCE PROTECTION WELL REPORT

START CARD NO. 05021

PROJECT NAME: Boeing - Moses Lake WA
WELL IDENTIFICATION NO. BML-3
DRILLING METHOD: Dual-wall Percussion hammer
DRILLER: Charles Shorey # 2072
FIRM: Layne Christensen Co.
SIGNATURE: Charles E Shorey
CONSULTING FIRM: Woodward Clyde.
REPRESENTATIVE: Tom Middleton.

COUNTY: Grant
LOCATION: SW ¼ NW ¼ SEC 27 TWN 20N R 28E E.W.M
STREET ADDRESS OF WELL: Grant Co. Airport - Moses Lake WA
WATER LEVEL BELOW GROUND SURFACE: 63'
GROUND SURFACE ELEVATION: N/A
DATE(S) INSTALLED: 2-17-98
DATE(S) DEVELOPED: N/A

AS-BUILT



TOTAL DEPTH OF BORING 75' FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.
PROTECTIVE POSTS 3
CONCRETE SURFACE SEAL 2' TO 6" AGL
WELL CASING 65 TO 3 AGL FT.
SCHEDULE 40 PVC DIA. 2"
ANNULAR SEALANT 61' TO 2' FT.
MATERIAL Bentonite grout.
SEAL 63' TO 61' FT.
FILTER PACK 75' TO 63' FT.
MATERIAL: 10-20 silica.
SCREEN INTERVAL 75' TO 65' FT.
SCHEDULE 40 PVC DIA. 2"
020 FACTORY SLOTTED
HOLE DIAMETER
9 IN. 0 TO 75 FT.
/ IN. / TO / FT.

FORMATION DESCRIPTION

0'-10' silted sands w/ med Cobble, brown in Color

10'-50' Same.

50-60' silted sand very fine gray in Color (damp)

60-70' gray silted sand w/ large and med Cobble

70-75 Same.

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EASTERN REGIONAL OFFICE

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APR 10 1998
Water Resources Program
Department of Ecology

Layne Layne Christensen Company
1401 E. 26th Street - Tacoma, WA 98421 - (206) 572-3727 Fax (206) 572-3730

RESOURCE PROTECTION WELL REPORT

START CARD NO. 05021

PROJECT NAME: Boeing Moses Lake WA

WELL IDENTIFICATION NO. BML-2

DRILLING METHOD: Dual-wall Percussion hammer

DRILLER: Charles Shorey # 2072

FIRM: Layne Christensen Co.

SIGNATURE: Charl C Shy

CONSULTING FIRM: Woodward Clyde

REPRESENTATIVE: Tom Middleton

COUNTY: Grant

LOCATION: SW ¼ NW ¼ SEC 27 TWN 20N R 28E E.WM

STREET ADDRESS OF WELL: Grant Co. Airport - Moses Lake WA

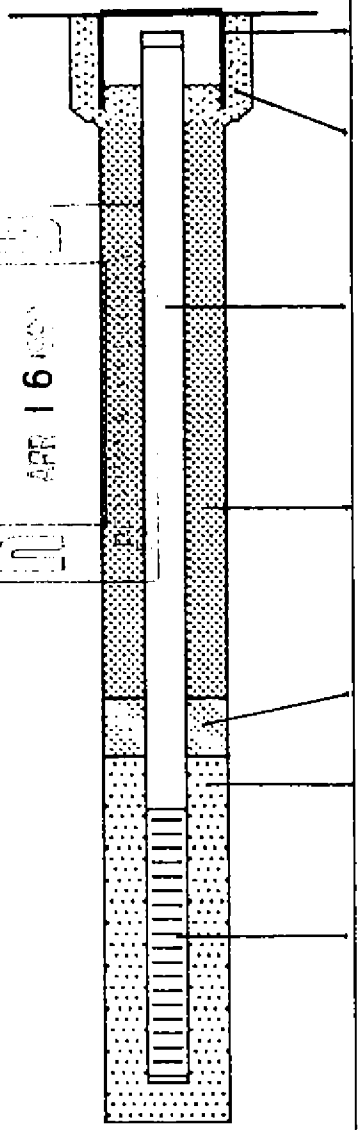
WATER LEVEL BELOW GROUND SURFACE: 63'

GROUND SURFACE ELEVATION: N/A

DATE(S) INSTALLED: 2-18-98

DATE(S) DEVELOPED: N/A.

AS-BUILT



TOTAL DEPTH OF BORING 75' FT.

WELL DATA

FLUSH MOUNT WELL COVER:

DIAMETER 8" DEPTH 12"

CONCRETE SURFACE SEAL 2' TO 0 FT.

WELL CASING 60 TO 6" Below grade

SCHEDULE 40 PVC DIA. 2"

ANNULAR SEALANT 56' TO 2' FT.

MATERIAL: Bentonite grout

SEAL 58' TO 56' FT.

FILTER PACK 70' TO 58' FT.

MATERIAL: 10-20 silica.

SCREEN INTERVAL 70' TO 60' FT.

SCHEDULE 40 PVC DIA. 2"

020 FACTORY SLOTTED

HOLE DIAMETER

9 IN. 0 TO 75' FT.

— IN. — TO — FT.

FORMATION DESCRIPTION

0'-10' silted sand w/ med and large Cobbles lite brown in color

10'-40' same

40'-50' silted sand turning lite gray in color

50'-60 same (damp)

60-70' silted fine sand w/ small and med Cobbles

70'-75' same

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Water Resources Program
Department of Ecology

Layne Christensen Company
1401 E. 26th Street - Tacoma, WA 98421 - (206) 572-3727 Fax (206) 572-3730

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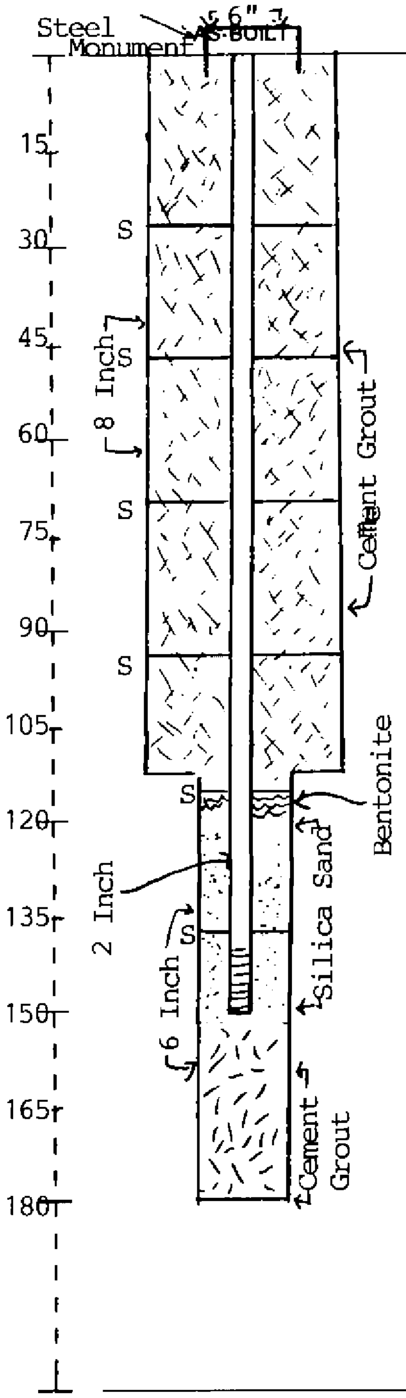
RESOURCE PROTECTION WELL REPORT

START CARD NO. 20809

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. 92 BW-3
DRILLING METHOD: Rotary
DRILLER: Craig S. DeYoung
FIRM: Andrew Well Drilling Services
SIGNATURE:
CONSULTING FIRM: Blue Ridge Assoc.
REPRESENTATIVE: Iain Olness

COUNTY: Grant
LOCATION: NE¼ SE ¼ Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant County Airport
WATER LEVEL ELEVATION: 80.5 ft
GROUND SURFACE ELEVATION: Not Available
INSTALLED: Feb 15/93
DEVELOPED: Feb 15/93



WELL DATA

Hole Data:
Size: 8" to 110 feet
6" to 180 feet

Casing:
Steel .280 6"
From +2.5 to -3.5 ft

PVC Sch80 2"
From +2 to 140 feet

Screen: 2" PVC Monoflex
From 140 to 150 feet

Filter:
Colorado Silica Sand
Size: 10-20
Inst. Method:
Tremmie Pipe
Depth: 120 to 152 ft

Grout:
Cement w/Bentonite (5%)
Depth: 152 to 180 ft
0 to 117 ft

(S=Stabilizer)

FORMATION DESCRIPTION

Silt	(0 - 3)
Gravel	(3 - 83)
Silt and Clay	(83 - 100)
Weathered Basalt	(100-148)
Competent Basalt	(148-180)

SCALE: 1" = 30 feet

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

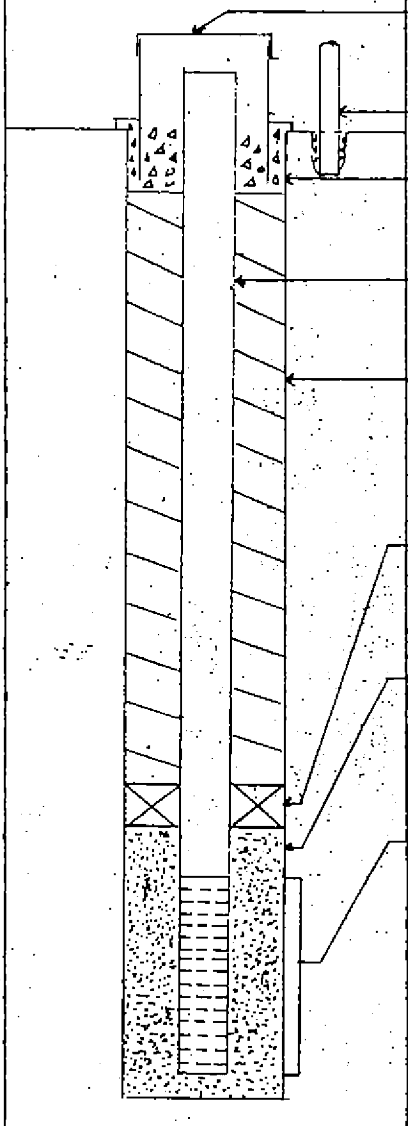
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044805

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW6 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE¼ SW¼ Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 91 9-23-91
GROUND SURFACE ELEVATION:
INSTALLED: 9-10-91
DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 100 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 78 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 71 FT.
ENVIROPLUG GROUT

SEAL 71 TO 73 FT.
1/4 Bentonite Pellets

FILTER PACK 73 TO 98 FT.
20-40 Colorado Silica

SCREEN INTERVAL 78 TO 98 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 100 9 IN.
TO 6 IN.

Plug back 98' to 100' w/ 1/4" Bentonite pellets

FORMATION DESCRIPTION

0-6 brown sandy SILT w/ occasional gravel + cobbles dry, loose

6-48 brown silty sandy GRAVEL w/occasional cobbles, loose dry to moist

48-52 brown silty gravelly SAND w/ occasional cobbles moist

52-80 brown silty sandy GRAVEL w/cobbles + occasional boulders moist to wet

80-88 reddish brown silty fine SAND w/occasional gravel + cobbles, moist

88-99.5 reddish brown, fine SAND, trace silt w/ occasional cobbles + gravels wet.

99.5-100 weathered BASALT

Layne Environmental Services, Inc.

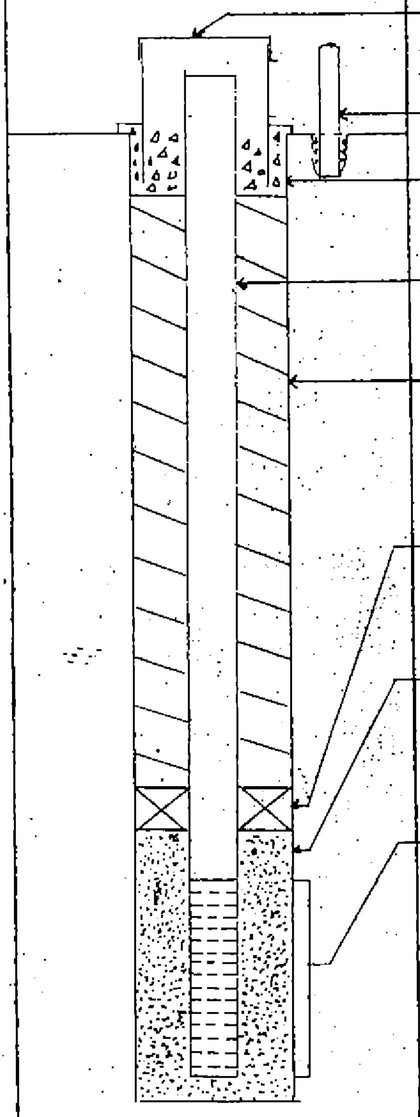
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044805

PROJECT NAME: LARSON AFB Moses LAKE
WELL IDENTIFICATION NO. 91-AW5 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE ¼ SW ¼ Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County AIRPORT
WATER LEVEL ELEVATION: 90.5' 9-23-91
GROUND SURFACE ELEVATION:
INSTALLED: 9-10-91
DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 99 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 72 FT.
Enviroplug grout

SEAL 72 TO 74 FT.
1/4 Bentonite pellets

FILTER PACK 74 TO 99 FT.
20-40 Colorado Silica

SCREEN INTERVAL 79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 99 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-4 brown silty sandy GRAVEL w/cobbles, dry, loose

4-11 brown slightly silty SAND w/occasional gravels + cobbles dry, loose

11-55 brown silty sandy GRAVEL w/cobbles & occasional boulders dry to moist

55-80 brown silty gravelly SAND w/occasional cobbles, moist

80-88 light brown to reddish brown sandy SILT w/occasional gravels, damp, loose

88-100 light brown to reddish brown silty fine SAND w/ occasional gravel, saturated

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Indus

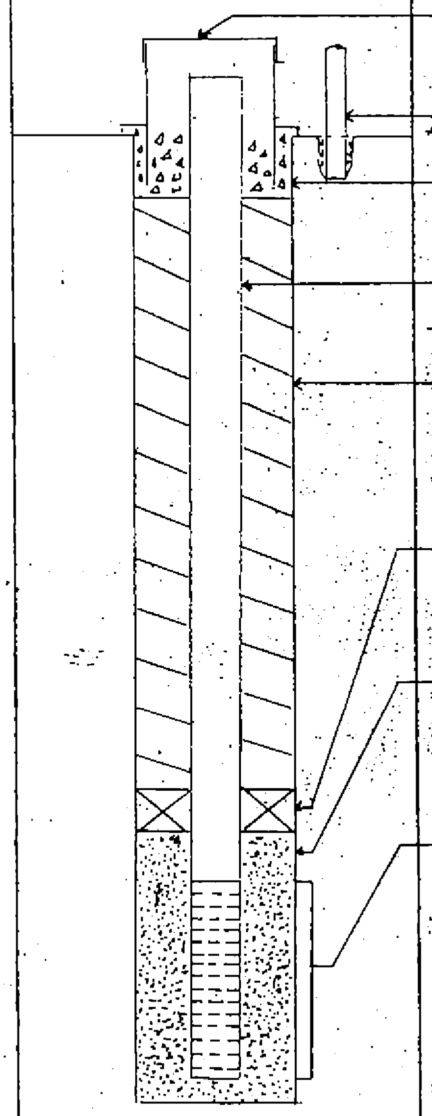
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044805

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW4 (Site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: JAMES + MOORE
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE ¼ SW ¼ Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT'S County Airport
WATER LEVEL ELEVATION: 70.5
GROUND SURFACE ELEVATION:
INSTALLED: 9-9-91
DEVELOPED: 10-1-91

AS-BUILT



TOTAL DEPTH 102 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 72 FT.

ENVIROPLUG GROUT

SEAL 72 TO 74 FT.

1/4 Bentonite pellets

FILTER PACK 74 TO 99 FT.

20-40 Colorado Silica

SCREEN INTERVAL 79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 102 9. IN.
TO 6 IN.

Plug back hole 99-102 w/ Bentonite pellets

FORMATION DESCRIPTION

0-4 brown silty, sandy GRAVEL w/cobbles, dry

4-11 brown to black gravelly SAND, dry

11-82 brown silty, sandy GRAVEL w/cobbles & occasional boulders, dry to moist, loose

82-88 brown to reddish brown slightly sandy SILT, damp, hard to cemented

88-99 reddish brown fine SAND w/trace silt & occasional gravels, damp to saturated

99-100 yellowish brown clayey SILT w/trace sand, damp

100-102 weathered basalt

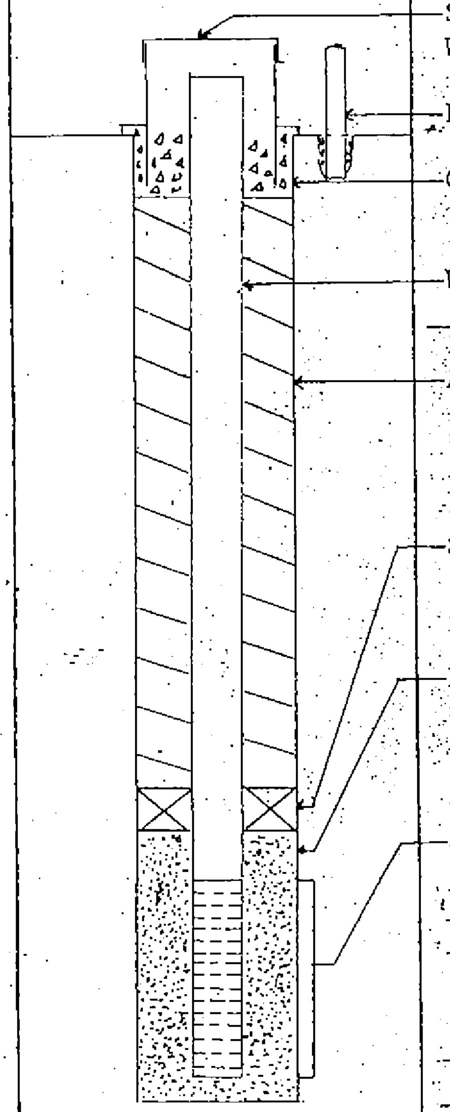
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044805

PROJECT NAME: LARSON AFB Moses LAKE
WELL IDENTIFICATION NO. 91-AW6 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 91 9-23-91
GROUND SURFACE ELEVATION:
INSTALLED: 9-10-91
DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 100 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 78 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 71 FT.
ENVIROPLUG GROUT

SEAL 71 TO 73 FT.
1/4 Bentonite Pellets

FILTER PACK 73 TO 98 FT.
20-40 Colorado Silica

SCREEN INTERVAL 78 TO 98 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 100 9 IN.
TO 6 IN.

Plug back 98' to 100' w/ 1/4" Bentonite pellets

FORMATION DESCRIPTION

0-6 brown sandy SILT w/ occasional gravel + cobbles dry, loose

6-48 brown silty sandy GRAVEL w/occasional cobbles, loose dry to moist

48-52 brown silty gravelly SAND w/ occasional cobbles moist

52-80 brown silty sandy GRAVEL w/ cobbles + occasional boulders moist to wet

80-88 reddish brown silty fine SAND w/ occasional gravel + cobbles, moist

88-99.5 reddish brown, fine SAND, trace silt w/ occasional cobbles + gravels wet.

99.5-100 weathered BASALT

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

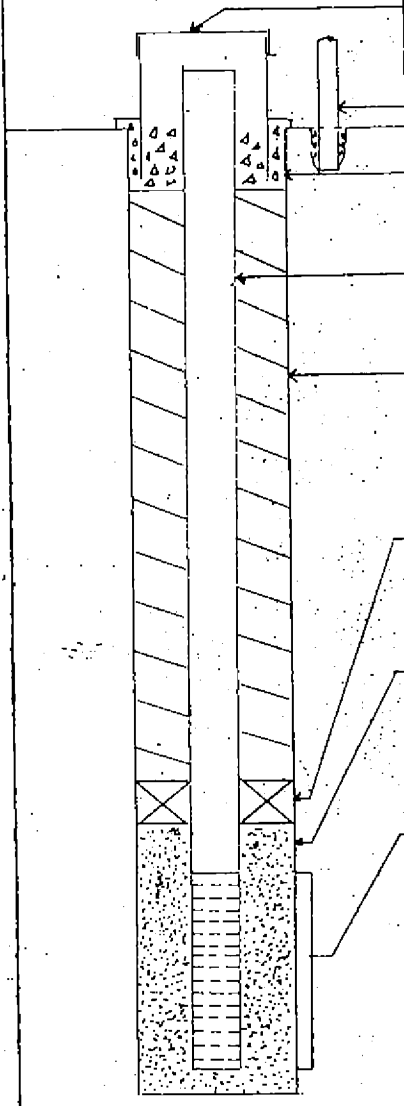
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044805

PROJECT NAME: LARSON AFB Moses LAKE
WELL IDENTIFICATION NO. 91-AW5 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE ¼ SW ¼ Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County AIRPORT
WATER LEVEL ELEVATION: 90.5' 9-23-91
GROUND SURFACE ELEVATION:
INSTALLED: 9-10-91
DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 99 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 72 FT.
Enviroplug grout

SEAL 72 TO 74 FT.
¼ Bentonite pellets

FILTER PACK 74 TO 99 FT.
20-40 Colorado Silica

SCREEN INTERVAL 79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER:
0 TO 99 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-4 brown silty sandy GRAVEL w/cobbles, dry, loose

4-11 brown slightly silty SAND w/ occasional gravels + cobbles dry, loose

11-55 brown silty sandy GRAVEL w/cobbles & occasional boulders dry to moist

55-60 brown silty gravelly SAND w/occasional cobbles, moist

80-88 light brown to reddish brown sandy SILT w/occasional gravels, damp, loose

88-100 light brown to reddish brown silty fine SAND w/ occasional gravel, saturated

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

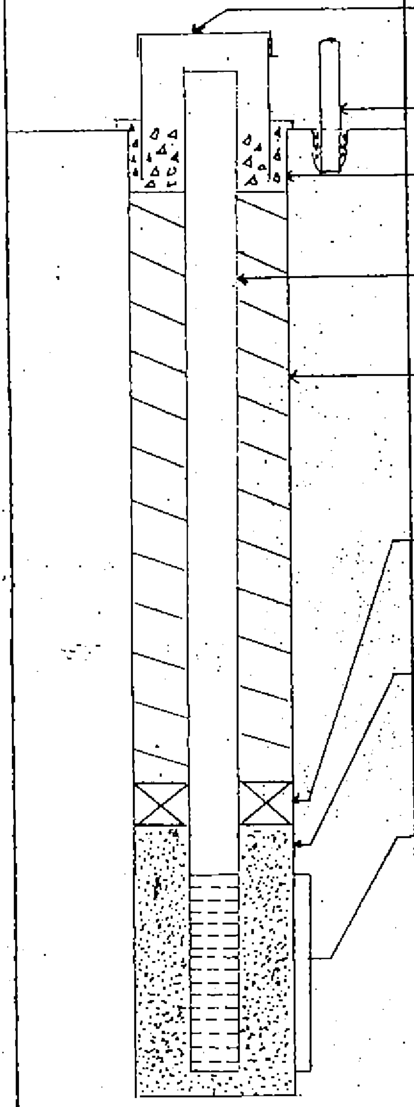
RESOURCE PROTECTION WELL REPORT

START CARD NO. C44805

PROJECT NAME: Larson AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW4 (Site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: Grant
LOCATION: NE 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 70.5
GROUND SURFACE ELEVATION:
INSTALLED: 9-9-91
DEVELOPED: 10-1-91

AS-BUILT



TOTAL DEPTH 102 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 72 FT.

Enviroplug Grout

SEAL 72 TO 74 FT.

1/4 Bentonite pellets

FILTER PACK 74 TO 99 FT.

20-40 Colorado Silica

SCREEN INTERVAL 79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 102 9 IN.
TO 6 IN.

Plug back hole 99-102 w/ Bentonite pellets

FORMATION DESCRIPTION

0-4 brown silty, sandy GRAVEL w/cobbles, dry

4-11 brown to black gravelly SAND, dry

11-82 brown silty, sandy GRAVEL w/cobbles & occasional boulders, dry to moist, loose

82-88 brown to reddish brown slightly sandy SILT, damp, hard to cemented

88-99 reddish brown fine SAND w/trace silt & occasional gravels, damp to saturated

99-100 yellowish brown, clayey SILT w/trace sand, damp

100-102 weathered basalt

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

RESOURCE PROTECTION WELL REPORT

START CARD NO. 044816

PROJECT NAME: Larson AFB Moses Lake

WELL IDENTIFICATION NO. 91-BW2 (site 2)

DRILLING METHOD: Dual wall percussion hammer

DRILLER: Richard Jimenez

FIRM: Layne Environmental Services, Inc.

SIGNATURE:

CONSULTING FIRM: Dames + Moore

REPRESENTATIVE: Julie MacDonald.

COUNTY: Grant

LOCATION: NE ¼ SW ¼ Sec 28 Twn 20N R 28E

STREET ADDRESS OF WELL: Grant's County Airport

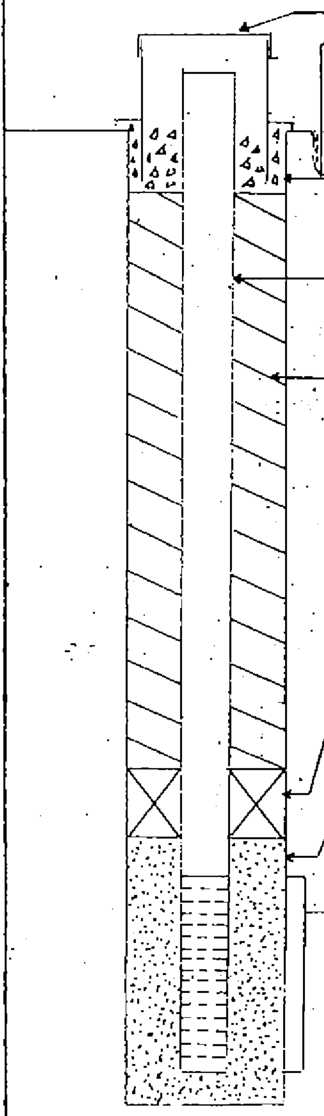
WATER LEVEL ELEVATION: 91'

GROUND SURFACE ELEVATION:

INSTALLED: 8-26-91

DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 180 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 4

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 137 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 122 FT.

Enviroplug Grout

SEAL 122 TO 130 FT.

¼ Bentonite pellets

FILTER PACK 130 TO 149 FT.

10-20 Colorado Silica

SCREEN INTERVAL 137 TO 147 FT.
2" SCH 80 TFJ PVC
".020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 110 9. IN.
110 TO 180 6 IN.

Drill 9" dual wall to 110
Drill 6" rotary hole to 180' plug back w/cement to 149'

FORMATION DESCRIPTION

0-2 Tan silt w/cobbles

2-18 Brown, silty sandy GRAVEL w/cobbles, damp

18-40 Black basaltic, silty SAND w/gravel, cobbles and occasional boulders, damp

40-44 Black basaltic boulders w/gravel

44-75 Black silty, gravelly, fine to coarse SAND, w/cobbles damp to moist

75-82 Dark brown, slightly clayey, silty, gravelly SAND w/cobbles, moist

82-107 Yellowish brown, clayey sandy SILT w/cobbles and broken basalt, wet

107-147 Basalt, weathered, fractured, iron stained, wet

147-180 BASALT, hard, competent, black

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

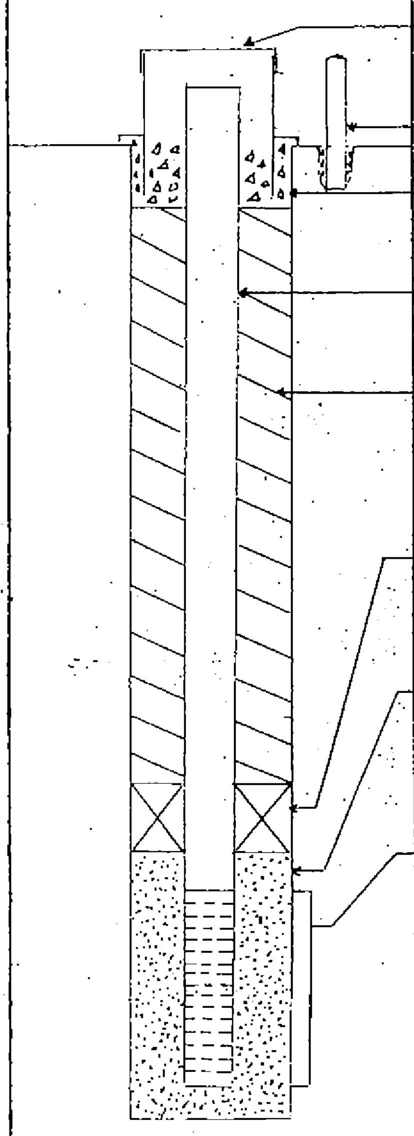
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044817

PROJECT NAME: Larson AFB Moses Lake
WELL IDENTIFICATION NO. 91-BW3 (Site 3)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County Airport
WATER LEVEL ELEVATION: 90
GROUND SURFACE ELEVATION:
INSTALLED: 9-5-91
DEVELOPED:

AS-BUILT



TOTAL DEPTH 185 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 170 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 160 FT.
ENVIROPLUG GROUT

SEAL 160 TO 163 FT.
1/4 Bentonite pellets

FILTER PACK 163 TO 185 FT.
10-20 Colorado Silica

SCREEN INTERVAL 170 TO 180 FT.
2" SCH 80 TFJ PVC
.020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 145 9 IN.
145 TO 185 6 IN.

Drill 9" dual wall to 145'
Drill 6" rotary hole to 185'

FORMATION DESCRIPTION

0-2 Brown sandy SILT w/ cobbles, dry

2-5 Brown silty, cobbley, fine to coarse SAND, dry

5-35 Brown silty, sandy, GRAVEL w/ cobbles, dry

35-60 Brown, silty, gravelly SAND w/ occasional cobbles, damp

60-117 Brown, silty, sandy GRAVEL w/ cobbles and occasional boulders, damp

117-125 Reddish brown, sandy clayey SILT, damp

125-135 Greyish brown, silty CLAY, dry

135-165 BASALT, weathered, fractured, vesicular, moist

165-180 BASALT, baked (red), very vesicular w/ white precipitate in vesicles on fractures, wet

160-185 BASALT, black, competent

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

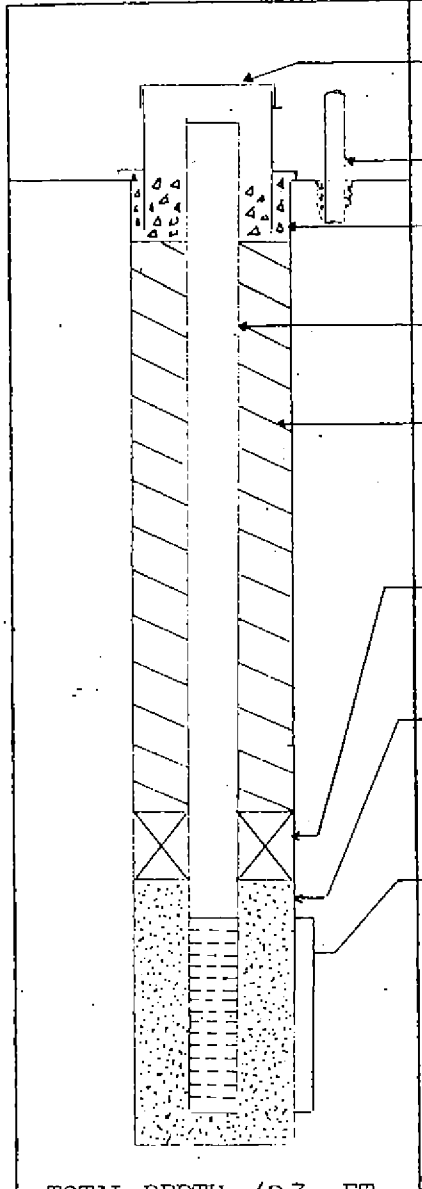
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044806

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91- AW9 (Site 3)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: DAMES + MOORE
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County Airport
WATER LEVEL ELEVATION: 88.5
GROUND SURFACE ELEVATION:
INSTALLED: 9-6-91
DEVELOPED: 9-24-91

AS-BUILT



TOTAL DEPTH 102 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 81 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 73 FT.
ENVIROPLUG GROUT

SEAL 73 TO 75 FT.
1/4 Bentonite pellets

FILTER PACK 75 TO 102 FT.
10-20 Colorado Silica SAND

SCREEN INTERVAL 81 TO 101 FT.
2" SCH 80 TFJ PVC
.020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 102 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-2 Brown sandy SILT, dry

2-30 Brown to grey silty, sandy, GRAVEL w/occasional cobbles and boulders, dry

30-45 Grey gravelly SAND w/ occasional cobbles, damp to moist

45-102 Grey silty, sandy GRAVEL w/cobbles, damp to saturated

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

RESOURCE PROTECTION WELL REPORT

START CARD NO. 044806

PROJECT NAME: Larson AFB Moses Lake

WELL IDENTIFICATION NO. 91-AW8 (Site 3)

DRILLING METHOD: Dual wall percussion hammer

DRILLER: Richard Jimenez

FIRM: Layne Environmental Services, Inc.

SIGNATURE:

CONSULTING FIRM: Dames + Moore

REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT

LOCATION: NE¼ SW¼ Sec 33 Twn 20N R 28E

STREET ADDRESS OF WELL: Grants County Airport

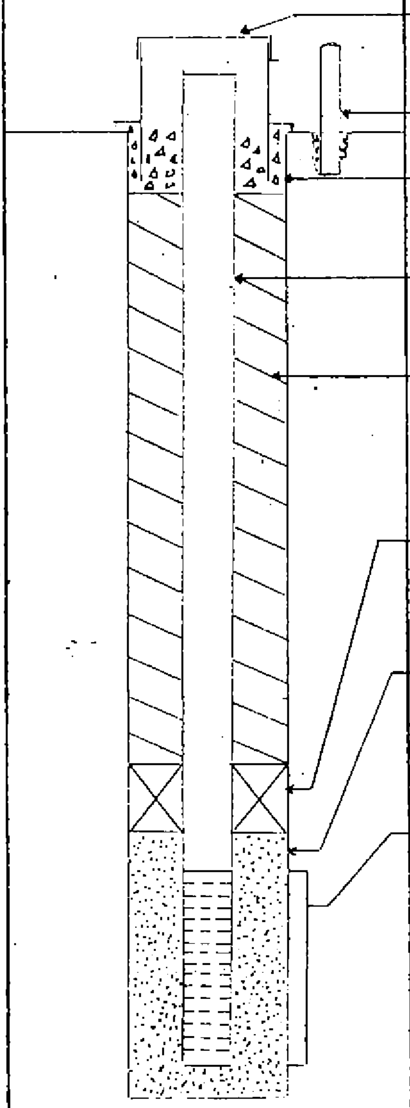
WATER LEVEL ELEVATION: 89.5

GROUND SURFACE ELEVATION:

INSTALLED: 9-5-91

DEVELOPED: 10-9-91

AS-BUILT



TOTAL DEPTH 103 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 80 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 73 FT.
Enviroplug Grout

SEAL 73 TO 75 FT.
¼ Bentonite pellets

FILTER PACK 75 TO 103 FT.
10-20 Colorado Silica

SCREEN INTERVAL 80 TO 100 FT.
2" SCH 80 TFJ PVC
.020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 103 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-2 Brown sandy SILT, dry, loose

2-35 Grey silty sandy GRAVEL w/occasional cobbles, damp

35-60 Grey silty, gravelly SAND w/occasional cobbles, boulders damp

60-103 Grey silty, sandy GRAVEL w/cobbles + occasional boulders, damp to saturated

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

RESOURCE PROTECTION WELL REPORT

START CARD NO. 044806

PROJECT NAME: LARSON AFB Moses Lake

WELL IDENTIFICATION NO. 91- AW7 (site 3)

DRILLING METHOD: Dual wall percussion hammer

DRILLER: Richard Jimenez

FIRM: Layne Environmental Services, Inc.

SIGNATURE:

CONSULTING FIRM: DAMES + MOORE

REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT

LOCATION: NE ¼ SW ¼ Sec 33 Twn 20N R 28E

STREET ADDRESS OF WELL: GRANT's County Airport

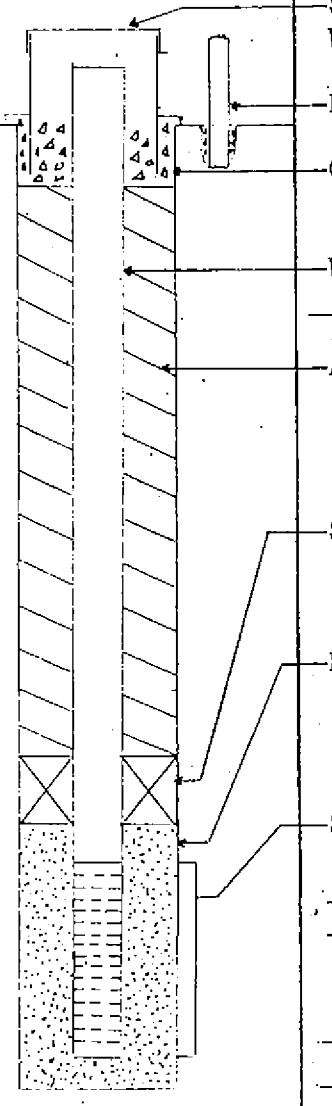
WATER LEVEL ELEVATION: 89'

GROUND SURFACE ELEVATION:

INSTALLED: 9-6-91

DEVELOPED: 9-19-91

AS-BUILT



TOTAL DEPTH 102 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 81 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 73 FT.
ENVIROPLUG GROUT

SEAL 73 TO 75 FT.
¼" Bentonite pellets

FILTER PACK 75 TO 102 FT.
10-20 Colorado Silica

SCREEN INTERVAL 81 TO 101 FT.
2" SCH 80 TFJ PVC
.020 FACTORY SLOTTED

HOLE DIAMETER 0 TO 102 9 IN.

TO 6 IN.

FORMATION DESCRIPTION

0-2 Brown sandy SILT, dry

2-12 Brown silty gravelly SAND w/occasional cobbles, dry

12-102 Brown to black, silty, sandy GRAVEL w/occ. cobbles & boulders

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

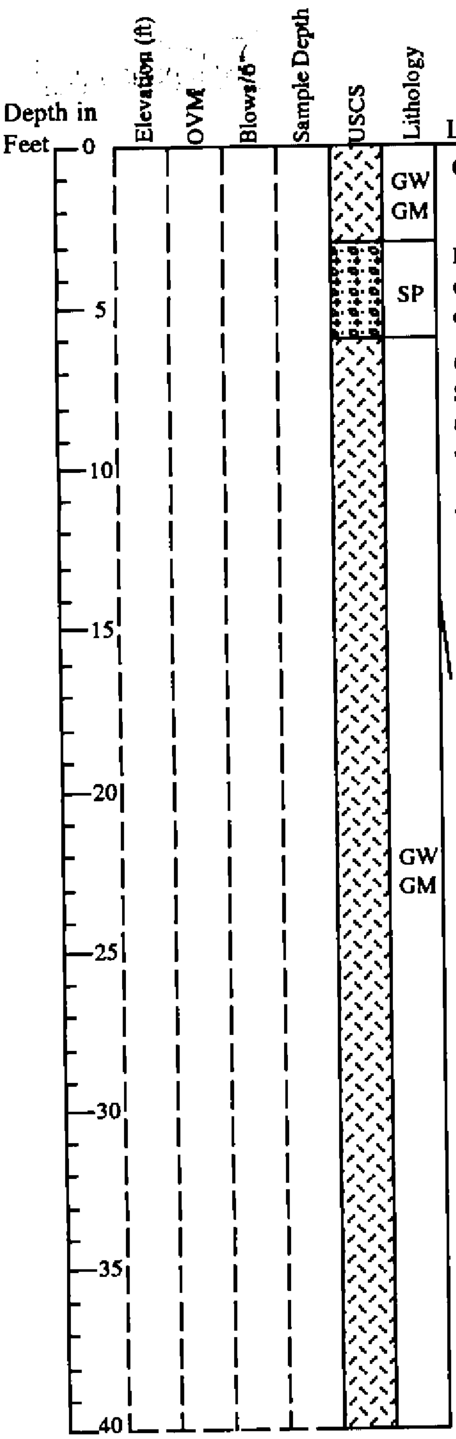
Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9402

(AAV-544)

LEGAL; NE¼ SW¼ SEC 28
T20N R28E
START CARD #R21132
GRANT CO.

18



Lithologic Description

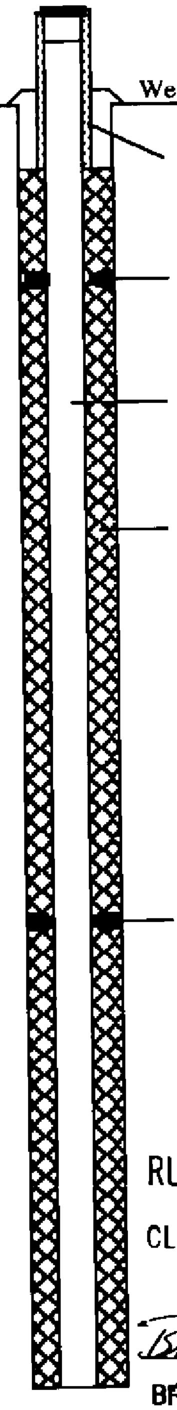
Gray sandy GRAVEL; dry, loose

Black slightly silty SAND with occasional cobbles and gravel; dry, loose

Gray sandy GRAVEL to gravelly SAND with cobbles, occasional boulders and trace silt; gravel is generally fine to coarse grained and subrounded to rounded; sand is generally medium to coarse grained and subangular; composition of gravel and sand is primarily basalt with other minor consituents; cobbles, boulders and silt varies throughout unit.

Increase in fines at 14' bgs

Decrease in fines



Well Description

Cement seal and monument with locking cover +3 - 2' bgs

Centralizer

2" sch. 40 PVC blank: +2.5 - 75.5' bgs

3/8" pellet bentonite: 2 - 70' bgs

Centralizer

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

Bryan Rocque
BRYAN ROCQUE #2141

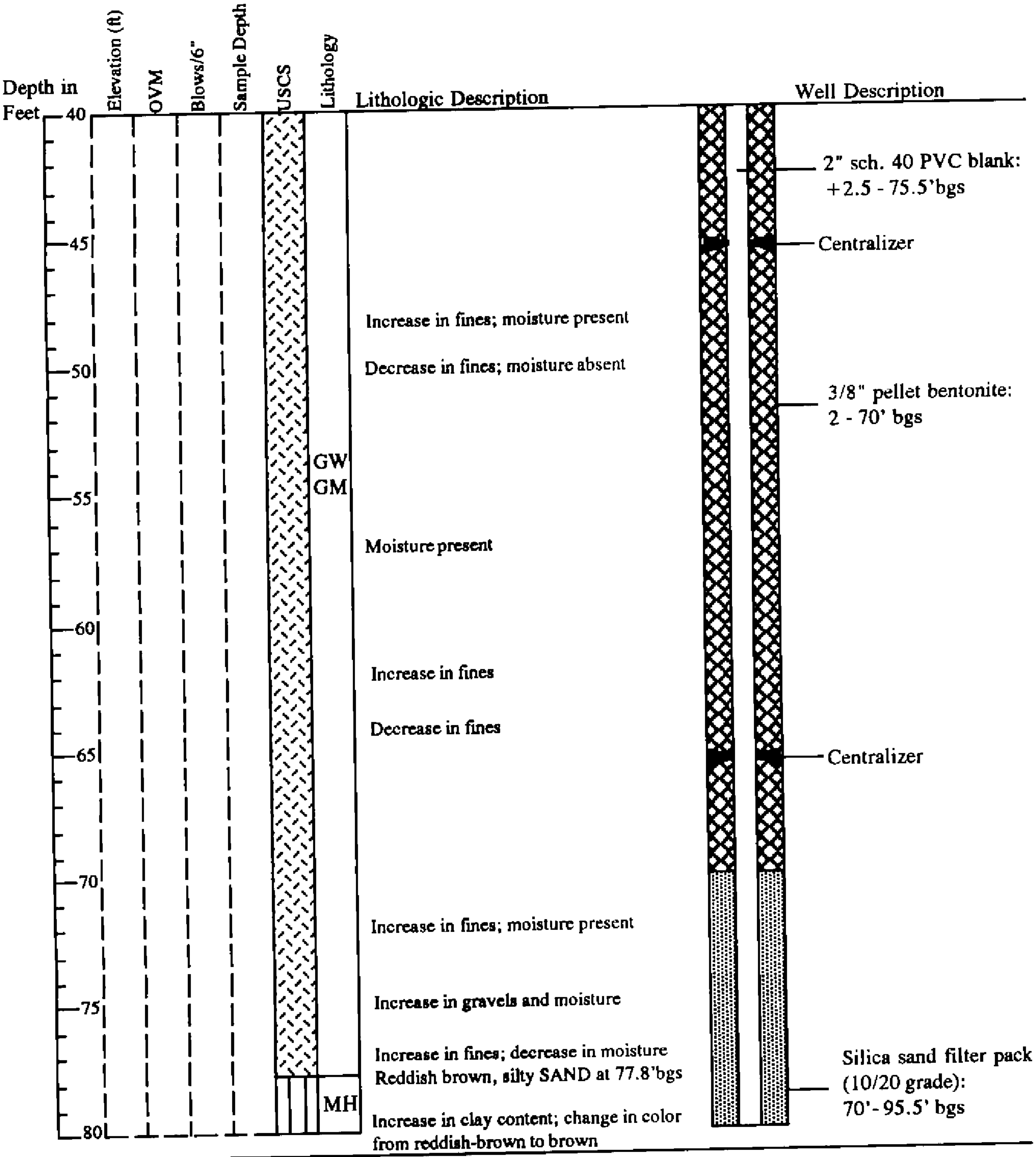
Client Name: Port of Moses Lake/Exxon
Job No.: 940204
Location: Grant County Airport Pumphouse # 1
Hydrogeologist: IAO

Drilling Method: Air Rotary - Odex with 6" casing
Sample Method: Grab samples
Drilling Contractor: Ruen Drilling, Inc.
Drilling Date: 4/14/94
Well Installation Date: 4/16/94

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9402 (cont'd)

(AAV-544)



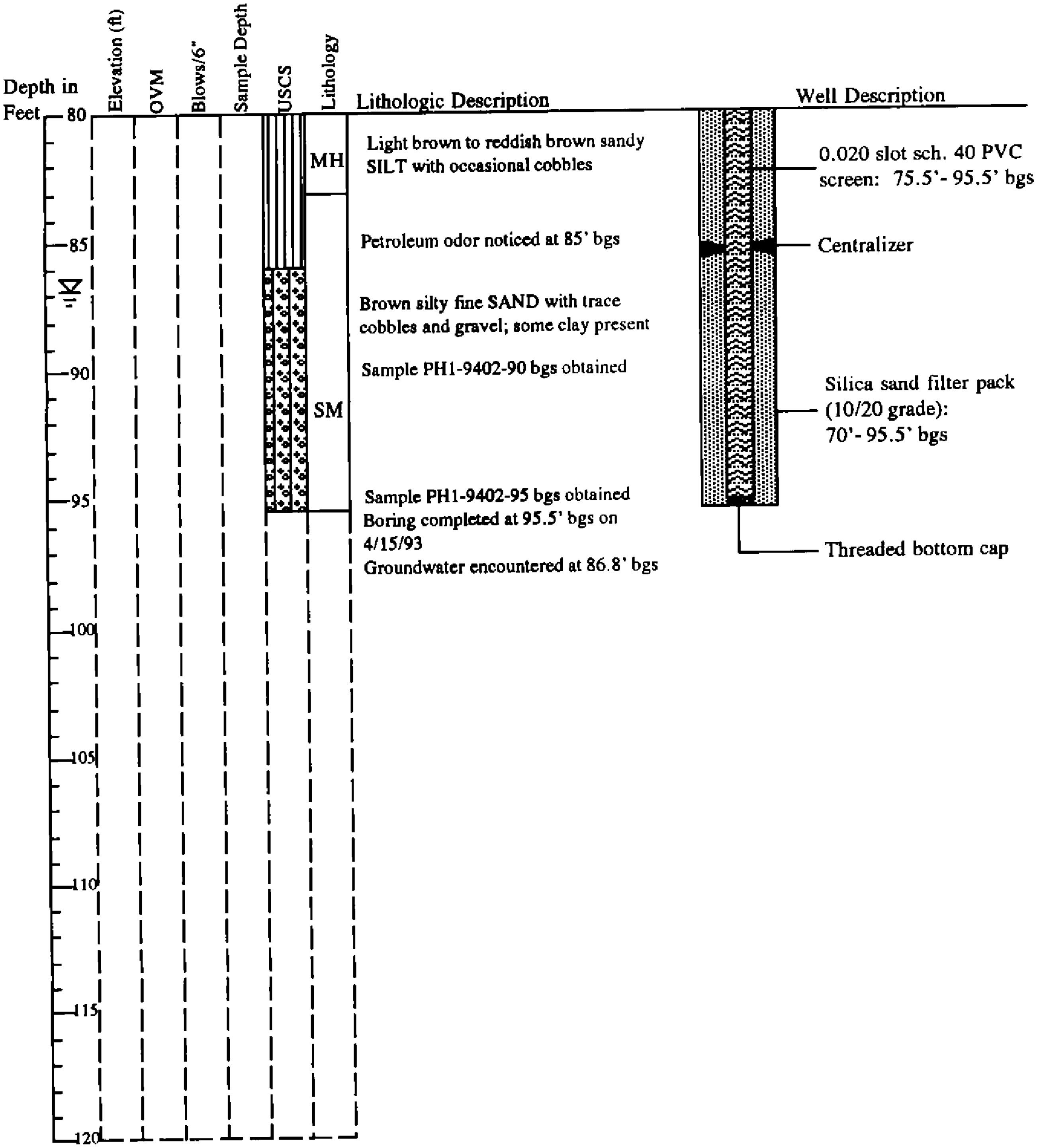
Client Name: Port of Moses Lake/Exxon
Job No.: 940204
Location: Grant County Airport
Pumphouse # 1
Hydrogeologist: IAO

Drilling Method: Air Rotary - Odex with 6" casing
Sample Method: Grab samples
Drilling Contractor: Ruen Drilling, Inc.
Drilling Date: 4/14/94
Well Installation Date: 4/16/94

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9402 (cont'd)

(AAV-544)



Light brown to reddish brown sandy SILT with occasional cobbles

Petroleum odor noticed at 85' bgs

Brown silty fine SAND with trace cobbles and gravel; some clay present

Sample PH1-9402-90 bgs obtained

Sample PH1-9402-95 bgs obtained
Boring completed at 95.5' bgs on 4/15/93
Groundwater encountered at 86.8' bgs

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	940204	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	4/14/94
Hydrogeologist:	IAO	Well Installation Date:	4/16/94

AUG 13 1996
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

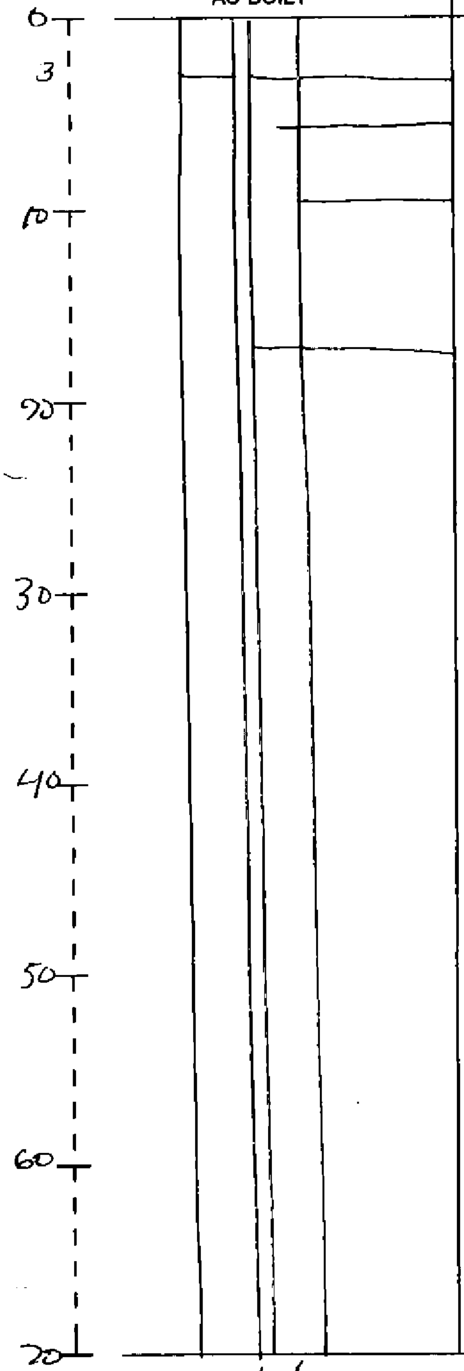
RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: [illegible] County Airport
WELL IDENTIFICATION NO. PH-1-9603/ABT-578
DRILLING METHOD: Tubex XL
DRILLER: Robert A. Sneldon
FIRM: Environmental west Explor.
SIGNATURE: Robert A. Sheldon
CONSULTING FIRM: SECOR
REPRESENTATIVE: Curt Goddard

COUNTY: Grant
LOCATION: SW 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 2810 Andrews St. Moses Lake WA.
WATER LEVEL ELEVATION: 88 B.G.L.
GROUND SURFACE ELEVATION: NA.
INSTALLED: 8-6-96
DEVELOPED: 8-8-96

AS-BUILT



WELL DATA

Above monument & concrete
3/8" Hole plug seal
6" Bore hole
2" P.V.C. BLANK

FORMATION DESCRIPTION

0
Gravel & cobbles
10
20
30
31.5
Basalt Boulder
34
40
Gravel & cobbles
50
60
70

SCALE: 1" = 10'

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

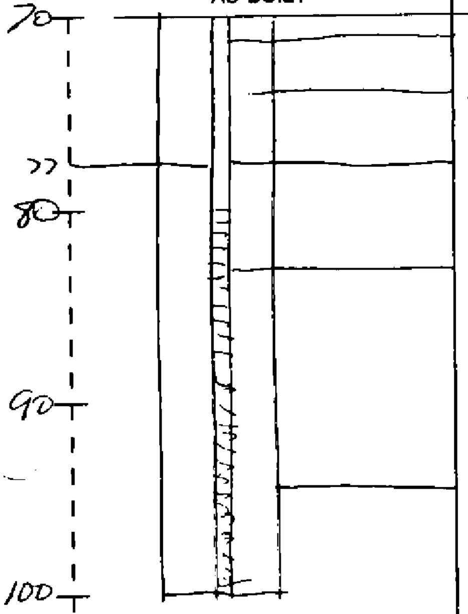
RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: Grant County Air Port
WELL IDENTIFICATION NO. PH-1-9603/ABT-578
DRILLING METHOD: Tubex XL
DRILLER: Robert A. Sheldon
FIRM: ENVIRONmental West Explor.
SIGNATURE:
CONSULTING FIRM: SECOR
REPRESENTATIVE: Curt Goddard

COUNTY: Grant
LOCATION: SW 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 2810 Andrews St.
Moses Lake WA.
WATER LEVEL ELEVATION: 88 B.G.L.
GROUND SURFACE ELEVATION: NA.
INSTALLED: 8-6-96
DEVELOPED: 8-8-96

AS-BUILT



WELL DATA

2" P.V.C. Blank

3/8" Holeplug seal

TOP OF 8/12 Silica sand Filter pack

.020 slot 2" P.V.C. screen

Static water level 88. B.G.L.

6" Bore hole

FORMATION DESCRIPTION

70

Gravel & cobbles

80
80.5

Brown silt

90

100

SCALE: 1" = 10'

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

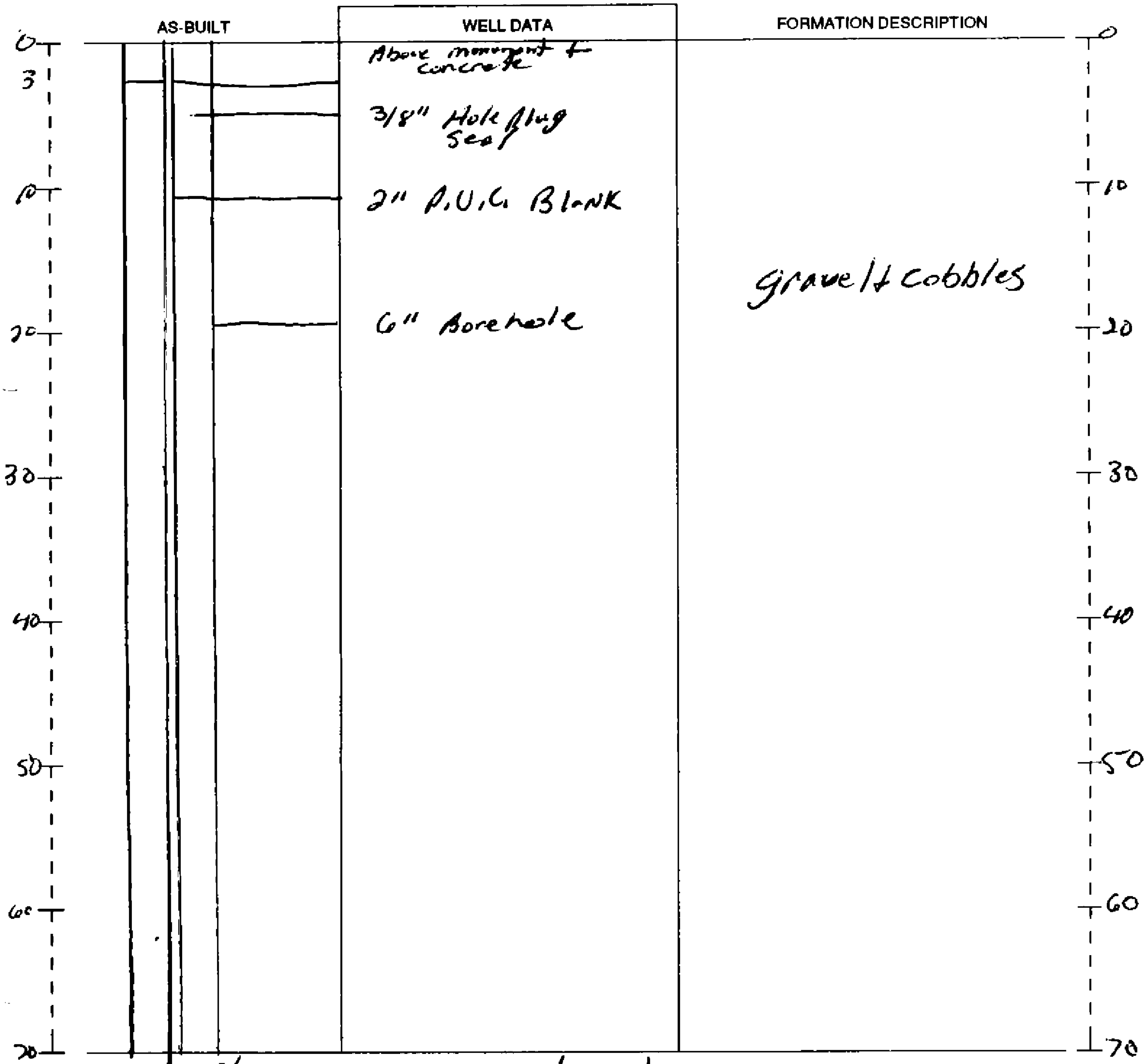
AUG 13 1996
DEPARTMENT OF ECOLOGY
REGIONAL OFFICE

RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: [illegible] County Airport
WELL IDENTIFICATION NO. PH-1-9602/ART-579
DRILLING METHOD: T4bax XL
DRILLER: Robert A. Sheldon
FIRM: Environmental West Explora
SIGNATURE: Robert A. Sheldon
CONSULTING FIRM: Secor
REPRESENTATIVE: Curt Goddard

COUNTY: Grant
LOCATION: SW ¼ SW ¼ Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 2810 Andrews St
Moses Lake WA.
WATER LEVEL ELEVATION: 86.5 B.G.L.
GROUND SURFACE ELEVATION: N.A.
INSTALLED: 8-7-96
DEVELOPED: 8-8-96



AS-BUILT

WELL DATA
Above monument + concrete
3/8" Hole plug seal
2" P.V.C. Blank
6" Borehole

FORMATION DESCRIPTION
gravel + cobbles

SCALE: 1" = 10'

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

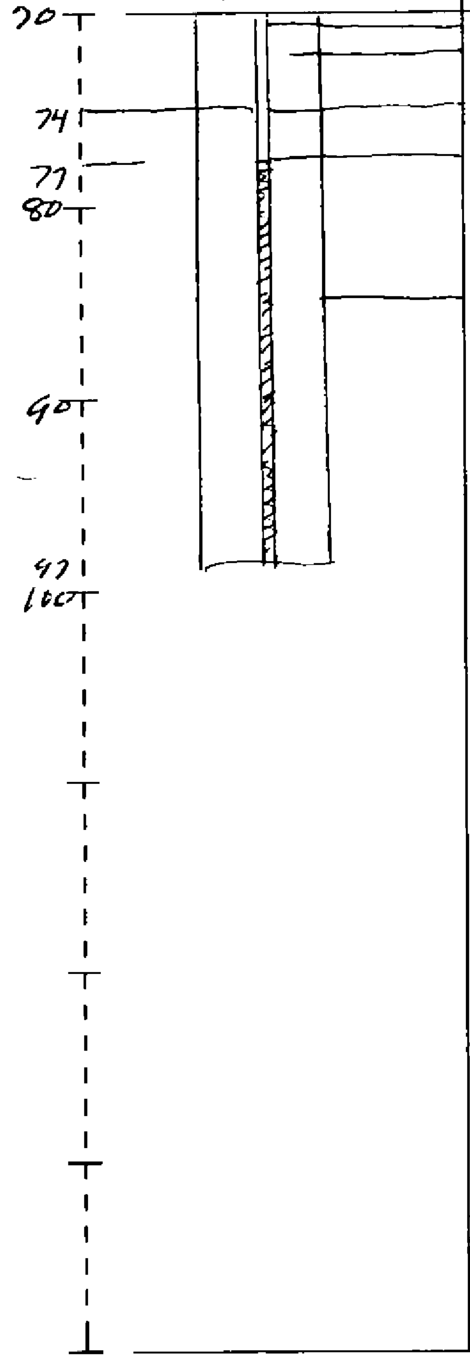
RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. PH-1-9602/ABT-579
DRILLING METHOD: tubex XL
DRILLER: Robert A. Sheldon
FIRM: Environmental West Explor
SIGNATURE:
CONSULTING FIRM: SECOR
REPRESENTATIVE: Curt Goddard

COUNTY: Grant
LOCATION: SW 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 7810 Andrews St
Moses Lake WA.
WATER LEVEL ELEVATION: 86.5 B.G.L.
GROUND SURFACE ELEVATION: NA.
INSTALLED: 5-7-96
DEVELOPED: 8-8-96

AS-BUILT



WELL DATA

2" P.V.C. Blank
3/8" hole Plug Seal
TOP OF 8/12 Silica Sand
TOP OF .020 Slot P.V.C. 2" screen
6" Bore hole

FORMATION DESCRIPTION

70
gravel + cobbles
77.5
80
Brown silt
87
90
Brown sandy silt
97
100

SCALE: 1" = 10'

PAGE 2 OF 2

ECY 050-12 (Rev. 11/89)

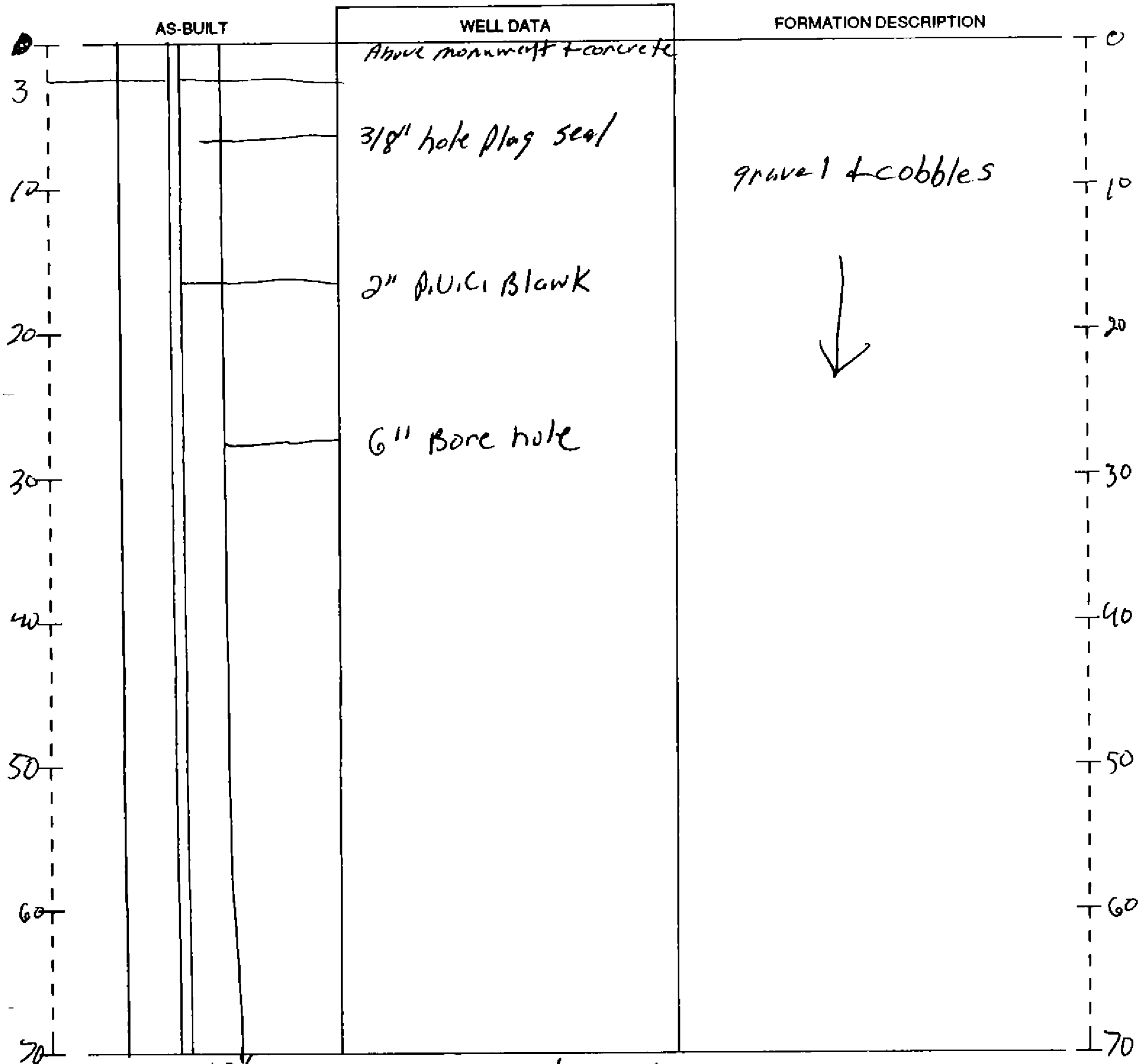
RECEIVED
AUG 13 1996
DEPARTMENT OF ECOLOGY

RESOURCE PROTECTION WELL REPORT

START CARD NO. 12813

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. AH-1-9601/ ABT-580
DRILLING METHOD: Tubex XL
DRILLER: Robert A. Sheldon
FIRM: Environmental West Explor.
SIGNATURE: Robert A. Sheldon
CONSULTING FIRM: SECOR
REPRESENTATIVE: Curt Goddard

COUNTY: Grant
LOCATION SW 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 2810 Andrews St.
Moses Lake WA.
WATER LEVEL ELEVATION: 82.7 b.G.L.
GROUND SURFACE ELEVATION: NA.
INSTALLED: 8-8-96
DEVELOPED: 8-8-96



Above monument + concrete

3/8" hole plug seal

2" P.V.C. Blank

6" Bore hole

gravel + cobbles

SCALE: 1" = 10'

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

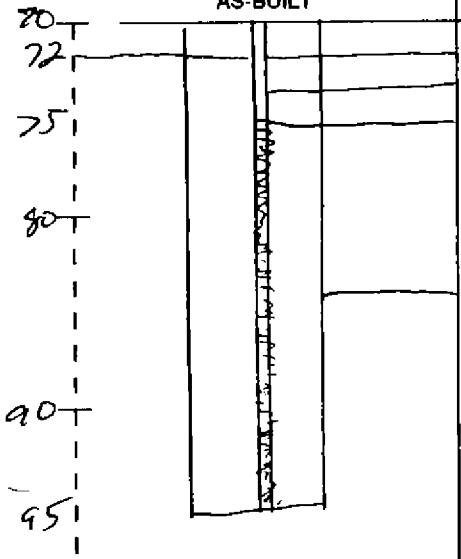
RESOURCE PROTECTION WELL REPORT

START CARD NO. 17843

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. PH-1-9601/ABT-580
DRILLING METHOD: Tubex XL
DRILLER: Robert A. Sheldon
FIRM: ENVIRONmental West Explora
SIGNATURE:
CONSULTING FIRM: SECOR
REPRESENTATIVE: Curt Goddard

COUNTY: Grant
LOCATION: SW ¼ SW ¼ Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: 7810 Andrews St.
Moses Lake WA.
WATER LEVEL ELEVATION: 82.7 B.G.L.
GROUND SURFACE ELEVATION: NA.
INSTALLED: 8-8-96
DEVELOPED: 8-8-94

AS-BUILT



WELL DATA

TOP OF 8/12 silica sand
2" P.V.C. Blank
TOP OF ~~8/12 silica sand~~ .020 slot 2" P.V.C. Screen
6" Borehole

FORMATION DESCRIPTION

70
gravel + cobbles
73
Brown silt
80
90
95

SCALE: 1" = 10'

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. S04329

154235

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
☑ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well *(select one)*
☐ Resource Protection
☑ Geotech Soil Boring

Consulting Firm Applied Research Associates

Unique Ecology Well ID
Tag No. ______

Property Owner US Air Force / Port of Moses Lake
Site Address 7810 Andrews St NE
City Moses Lake County Grant
Location SW 1/4-1/4 NE 1/4 Sec 32 Twn 20 R 28 Select One ☒ EWM ☐ WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ______ Lat Min/Sec ______
Long Deg ______ Long Min/Sec ______
Tax Parcel No. ______
Cased or Uncased Diameter 3" Static Level ______
Work/Decommission Start Date 8/7/04
Work/Decommission Completed Date 8/18/04

WELL CONSTRUCTION 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.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Ethan E Hageman
Driller/Engineer /Trainee Signature
Driller or Trainee License No. 2734

If trainee, licensed driller's Signature and License No. 2734

Construction/Design	Well Data	Formation Description
	Boring abandoned / backfilled with bentonite/cement grout	Gravel & Cobbles with Sand & Boulders
		50
		100
		Silt
		150
		Boring Terminated @ 172' Basalt

RECEIVED
AUG 2 3 2004
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

RECEIVED
AUG 26 2004
DEPARTMENT OF ECOLOGY
[illegible]TERN REGIONAL OFFICE

SCALE: 1"= ______ PAGE 1 OF 1

ECY 050-12 (Rev. 2/03)

154236

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. S04328

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
☑ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well *(select one)*
☐ Resource Protection
☑ Geotech Soil Boring

Consulting Firm Applied Research Associates

Unique Ecology Well ID Tag No. ______

Property Owner US Air Force / Port of Moses Lake

Site Address 7810 Andrews St NE

City Moses Lake County Grant

Location SW 1/4-1/4 NW 1/4 Sec 27 Twn 20 R 28 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION 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.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Ethan E Hageman

Driller/Engineer /Trainee Signature

Driller or Trainee License No. 2734

If trainee, licensed driller's Signature and License No. 2734

Lat/Long (s, t, r still REQUIRED) Lat Deg ______ Lat Min/Sec ______
Long Deg ______ Long Min/Sec ______

Tax Parcel No. ______

Cased or Uncased Diameter 2" Static Level ______

Work/Decommission Start Date 8/5/04

Work/Decommission Completed Date 8/6/04

Construction/Design	Well Data	Formation Description	
	Boring abandoned / backfilled with bentonite	Gravel & Cobbles with Sand & Boulders	
			20
			40
		Boring Terminated @ 47'	
			60

RECEIVED
AUG 23 2004
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

RECEIVED
AUG 26 2004
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

SCALE: 1"= ______

PAGE 1 OF 1

ECY 050-12 (Rev. 2/03)

2860

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. A020119
UNIQUE WELL I.D. # ______
Water Right Permit No. ______

) **OWNER:** Name City Of Moses Lake Address S. 321 Balsam St, Moses Lake Wa 98837

(2) **LOCATION OF WELL:** County Grant well #22 NE 1/4 NW 1/4 Sec 32 T. 20N N., R 28E W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address) Across Street of Big Bend baseball field at 6838 30 Ave NE.

(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 ______ inches.
Drilled ______ feet. Depth of completed well ______ ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 14" Diam. from 0 ft. to 273 ft.
Welded ☐ ____" Diam. from ____ ft. to ____ ft.
Liner installed ☐ ____" Diam. from ____ ft. to ____ ft.
Threaded ☐ ____" 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? ____ ft.
Material used in seal ______
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 ______ 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.
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
Run 700' of 2" pvc		
power grout well.		
35 C.Y. of 7 bag mix		
with Sand filler.		

RECEIVED
AUG 19 1998
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 6-16-98 19. Completed 6-16-98, 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 H+N Electric-Spokane (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address E5603 Broadway Spokane WA
(Signed) Roger Kelly (WELL DRILLER) License No. 2004
Contractor's Registration No. HNELESI039D6 Date 8/18, 1998

(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

2843

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. A19997
UNIQUE WELL I.D. # 92-BW-3
Water Right Permit No. ______

(1) **OWNER:** Name Grant County Airport Address Moses Lake, WA

(2) **LOCATION OF WELL:** County Grant - NE 1/4 SE 1/4 Sec 33 T. 20N N., R 28E W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address) Airport Ramp

(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 8 inches.
Drilled 100 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? ______ ft.
Material used in seal ______
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 ______ 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.
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
Well Decommission:		
1, Perforated 100' of 8" casing		
2. Tremmied grouted well with neat cement		
3. Cut casing off 4' below grade		

COPY
ORIGINAL NOT FOUND

OCT 13 1997

Work Started 28 Aug, 19 95 Completed 29 Aug, 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 PONDEROSA DRILLING & DEVELOPMENT INC (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 6010 E. Broadway, Spokane WA 99212
(Signed) ______ (WELL DRILLER) License No. 0996
Contractor's Registration No. PONDEI*248JE Date 3 Sept, 1995

(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.

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

~~100406~~ 287821

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 102156
UNIQUE WELL I.D. # 2901
Water Right Permit No.

(1) OWNER: Name CITY OF MOSES LK WELL #23 Address PO BOX 1579 MOSES LK WA 98837

(2) LOCATION OF WELL: County GRANT COUNTY 1/4 NW 1/4 Sec 33 T. 20N N., R 28E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) 8053 CHANUTE STREET NE MOSES LK WA 98837

(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 24" 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 ☐
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used KNIFE
SIZE of perforations 1/2" in. by 3" in.
480 perforations from 415 ft. to 535 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? ft.
Material used in seal
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 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.
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
PER CONTRACT INSTRUCTIONS:		
PERFORATE 16" LINER WITH 4 PERFORATIONS		
PER FOOT, FROM 415' to 535'		
BELOW GROUND SURFACE		

RECEIVED
JUL 26 1999
JULY 26 1999
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 11/10, 19. Completed 11/12, 1998

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 IRRIGATORS, INC (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address PO BOX 449 MOSES LK WA 98837
(Signed) John Roberts (WELL DRILLER) License No. 2083
Contractor's Registration No. IRRIGI*1169J Date JULY 22, 1999

(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.

295669

SEP 26

RESOURCE PROTECTION WELL REPORT

A

START CARD NO 12218

PROJECT NAME: DECOMMISSION WELL AT GRANT County AIRPORT

WELL IDENTIFICATION NO. 92 BW 3

DRILLING METHOD: AIR ROTARY

DRILLER: Rodney A Gilsoth

FIRM: R & R Drilling Inc

SIGNATURE: Rodney A Gilsoth

CONSULTING FIRM: US Army Corps of ENG

REPRESENTATIVE: ANNA CAMPBELL

COUNTY: GRANT

LOCATION: NE¼ SE¼ Sec 33 Twn 20N R 28 E

STREET ADDRESS OF WELL: GRANT County AIRPORT

WATER LEVEL ELEVATION: 140'

GROUND SURFACE ELEVATION: 350'

INSTALLED: 0

DEVELOPED: 0

AS-BUILT

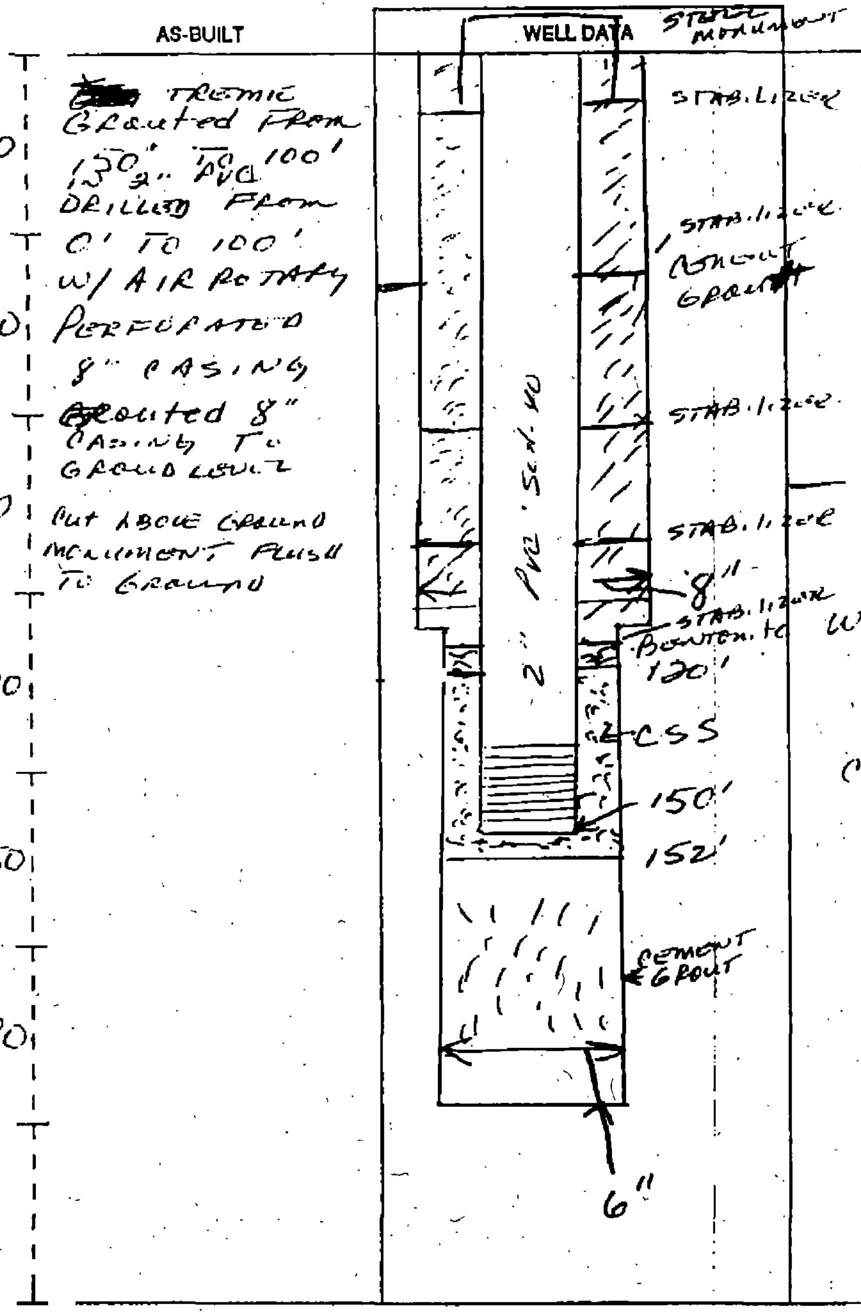
TREMIE GROUTED FROM 130' 2" PVC TO 100'

DRILLED FROM 0' TO 100' W/ AIR ROTARY

PERFORATED 8" CASING

GROUTED 8" CASING TO GROUND LEVEL

PUT ABOVE GROUND MONUMENT FLUSH TO GROUND



FORMATION DESCRIPTION

SILT & CLAY

WEATHERED BASALT

COMPETENT BASALT

SEP 6 1995

SCALE: 1" = ____ PAGE ____ OF ____

ECY 050-12 (Rev. 11/89)

Please print, sign and return to the Department of Ecology

Water Well Report

Original – Ecology, 1st copy – owner, 2nd copy – driller

Construction/Decommission 316501

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ______

TYPE OF WORK: Owner's number of well (if more than one) ______

☒ New well ☐ Reconditioned *Method :* ☐ Dug ☐ Bored ☐ Driven

☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 330 ft.

Depth of completed well 330 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 6" Diam. from +1 ft. to 39 ft.

☐ Liner installed ______" Diam. from ______ ft. to ______ ft.

☐ Threaded ______" Diam. from ______ ft. to ______ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used ______

SIZE of perfs ______ in. by ______ in. and no. of perfs ______ from ______ ft. to ______ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ______

Manufacturer's Name ______

Type ______ Model No. ______

Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand ______

Materials placed from ______ ft. to ______ ft.

Surface Seal: : ☒ Yes ☐ No To what depth? 38 ft.

Material used in seal ______

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ______ Depth of strata ______

Method of sealing strata off ______

PUMP: Manufacturer's Name ______

Type: ______ H.P. ______

WATER LEVELS: Land-surface elevation above mean sea level ______ ft.

Static level 70 ft. below top of well Date 3-27-08

Artesian pressure ______ lbs. per square inch Date ______

Artesian water is controlled by ______ (cap, valve, etc.)

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.

Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.

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 30+ gal./min. with stem set at 300 ft. for 4 hrs.

Artesian flow ______ g.p.m. Date ______

Temperature of water ______ Was a chemical analysis made? ☐ Yes ☐ No

Current Notice of Intent No. W214813

Unique Ecology Well ID Tag No. BaS 228

Water Right Permit No. NA

Property Owner Name Jon Gamble

Well Street Address ______

City Moses Lake County Grant

Location SE 1/4-1/4 NE 1/4 Sec 32 Twn 20 R 28 [✓ EWM] or WWM ☐ ☐ circle one

Lat/Long (s, t, r still REQUIRED) Lat Deg ______ Lat Min/Sec ______

Long Deg ______ Long Min/Sec ______

Tax Parcel No. ______

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Blow Sand	0	32
Brown basalt	32	40
Black basalt	40	120
Brown basalt	120	130
Black basalt	130	250
Blown basalt	250	260
Black basalt	260	305
Brown basalt (H2O)	305	330

RECEIVED
JUL - 3 2008
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Start Date ______ Completed Date ______

WELL CONSTRUCTION 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.

Driller/Engineer/Trainee Name (Print) Gary Eisenman

Driller/Engineer/Trainee Signature ______

Driller or trainee License No. 0116

If TRAINEE.
Driller's Licensed No. ______
Driller's Signature ______

Drilling Company D&F Drilling

Address 3608 Rd E NE

City, State, Zip Moses Lake WA 98837

Contractor's Registration No. DFDRI022PF Date ______

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 2/03)

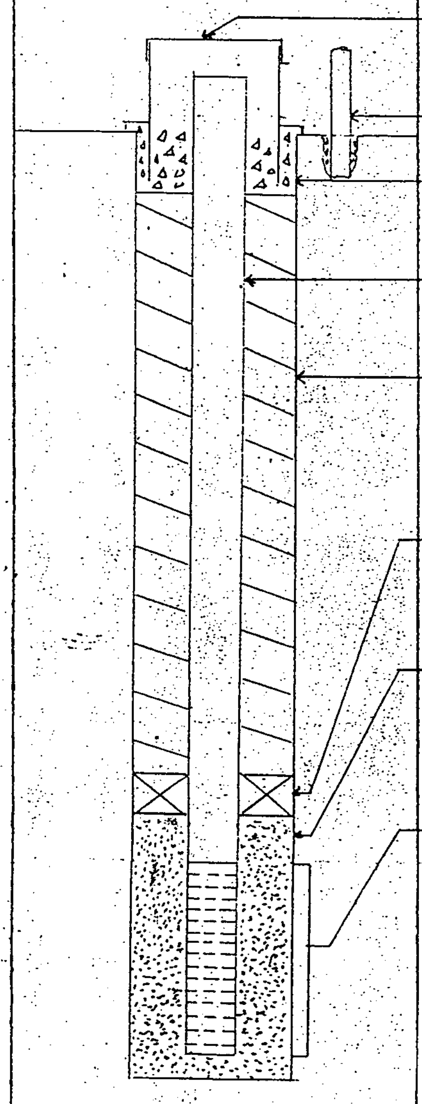
RESOURCE PROTECTION WELL REPORT

START CARD NO: 044805

PROJECT NAME: LARSON AFB Moses LAKE
WELL IDENTIFICATION NO. 91-AW6 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & MooRE
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE¼ SW¼ Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 91 9-23-91
GROUND SURFACE ELEVATION:
INSTALLED: 9-10-91
DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 100 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.
PROTECTIVE POSTS 3
CONCRETE SURFACE SEAL +.5 TO 2 FT.
WELL CSG +2 TO 78 FT.
2" SCH 80 TFJ PVC
ANNULAR SEALANT 2 TO 71 FT.
ENVIROPLUG GROUT
SEAL 71 TO 73 FT.
1/4 Bentonite Pellets
FILTER PACK 73 TO 98 FT.
20-40 Colorado Silica
SCREEN INTERVAL 78 TO 98 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED
HOLE DIAMETER 0 TO 100 9 IN.
TO 6 IN.

Plug back 98' to 100' w/ 1/4" Bentonite pellets

FORMATION DESCRIPTION

0-6 brown sandy SILT w/ occasional gravel + cobbles dry, loose

6-48 brown silty sandy GRAVEL w/occasional cobbles, loose dry to moist

48-52 brown silty gravelly SAND w/ occasional cobbles moist

52-80 brown silty sandy GRAVEL w/ cobbles + occasional boulders moist to wet

80-88 reddish brown silty fine SAND w/ occasional gravel + cobbles, moist

88-99.5 reddish brown, fine SAND, trace silt w/ occasional cobbles + gravels wet.

99.5-100 weathered BASALT

Layne Environmental Services, Inc.

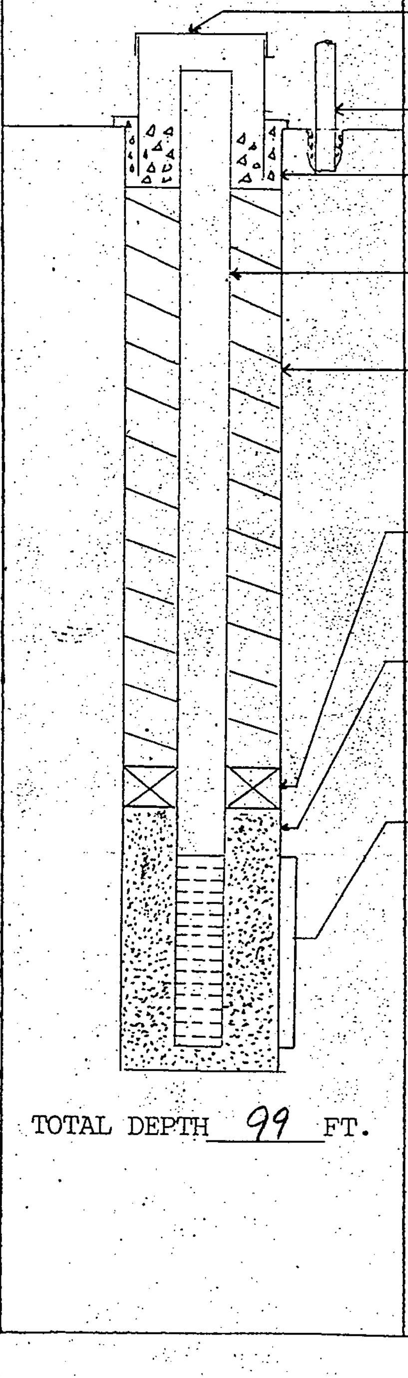
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044805

PROJECT NAME: LARSON AFB Moses LAKE
WELL IDENTIFICATION NO. 91-AW5 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County AIRPORT
WATER LEVEL ELEVATION: 90.5' 9-23-91
GROUND SURFACE ELEVATION:
INSTALLED: 9-10-91
DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 99 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 72 FT.
Enviroplug grout

SEAL 72 TO 74 FT.
1/4 Bentonite pellets

FILTER PACK 74 TO 99 FT.
20-40 Colorado Silica

SCREEN INTERVAL 79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 99 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-4 brown silty sandy GRAVEL w/cobbles, dry, loose

4-11 brown slightly silty SAND w/occasional gravels + cobbles dry, loose

11-55 brown silty sandy GRAVEL w/cobbles + occasional boulders dry to moist

55-80 brown silty gravelly SAND w/occasional cobbles, moist

80-88 light brown to reddish brown sandy SILT w/occasional gravels, damp, loose

88-100 light brown to reddish brown silty fine SAND w/ occasional gravel, saturated

DEPARTMENT OF ECOLO

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

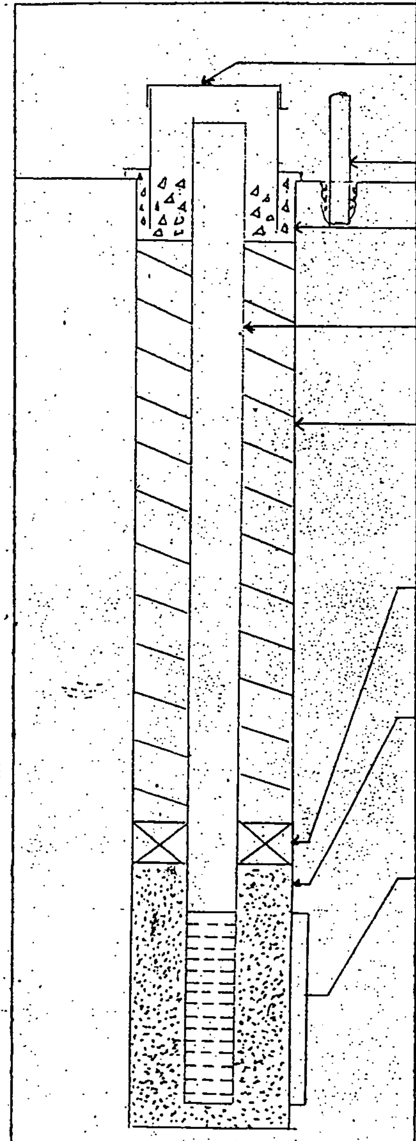
RESOURCE PROTECTION WELL REPORT

START CARD NO: 044805

PROJECT NAME: Larson AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW4 (Site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: Grant
LOCATION: NE 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 90.5
GROUND SURFACE ELEVATION:
INSTALLED: 9-9-91
DEVELOPED: 10-1-91

AS-BUILT



TOTAL DEPTH 102 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 72 FT.
Enviroplug Grout

SEAL 72 TO 74 FT.
1/4 Bentonite pellets

FILTER PACK 74 TO 99 FT.
20-40 Colorado Silica

SCREEN INTERVAL 79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 102 9 IN.
TO 6 IN.

Plug back hole 99-102 w/ Bentonite pellets

FORMATION DESCRIPTION

0-4 brown silty, sandy GRAVEL w/cobbles, dry

4-11 brown to black gravelly SAND, dry

11-82 brown silty, sandy GRAVEL w/cobbles + occasional boulders, dry to moist, loose

82-88 brown to reddish brown slightly sandy SILT, damp, hard to cemented

88-99 reddish brown fine SAND w/trace silt + occasional gravels, damp to saturated

99-100 yellowish brown, clayey SILT w/trace sand, damp

100-102 weathered basalt

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

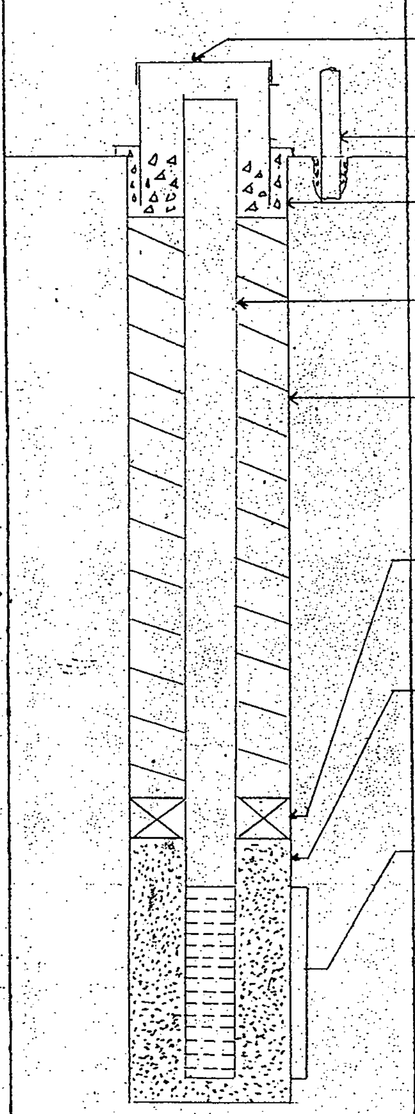
RESOURCE PROTECTION WELL REPORT

START CARD NO: 044805

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW6 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE: Rich Jimen
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE¼ SW ¼ Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 91 9-23-91
GROUND SURFACE ELEVATION:
INSTALLED: 9-10-91
DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 100 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 78 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 71 FT.
ENVIROPLUG GROUT

SEAL 71 TO 73 FT.
1/4 Bentonite Pellets

FILTER PACK 73 TO 98 FT.
20-40 Colorado Silica

SCREEN INTERVAL 78 TO 98 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 100 9 IN.
TO 6 IN.

Plug back 98' to 100' w/ 1/4" Bentonite pellets

FORMATION DESCRIPTION

0-6 brown sandy SILT w/ occasional gravel + cobbles dry, loose

6-48 brown silty sandy GRAVEL w/occasional cobbles, loose dry to moist

48-52 brown silty gravelly SAND w/ occasional cobbles moist

52-80 brown silty sandy GRAVEL w/cobbles + occasional boulders moist to wet

80-88 reddish brown silty fine SAND w/occasional gravel + cobbles, moist

88-99.5 reddish brown, fine SAND, trace silt w/ occasional cobbles + gravels wet.

99.5-100 weathered BASALT

NOV 1

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

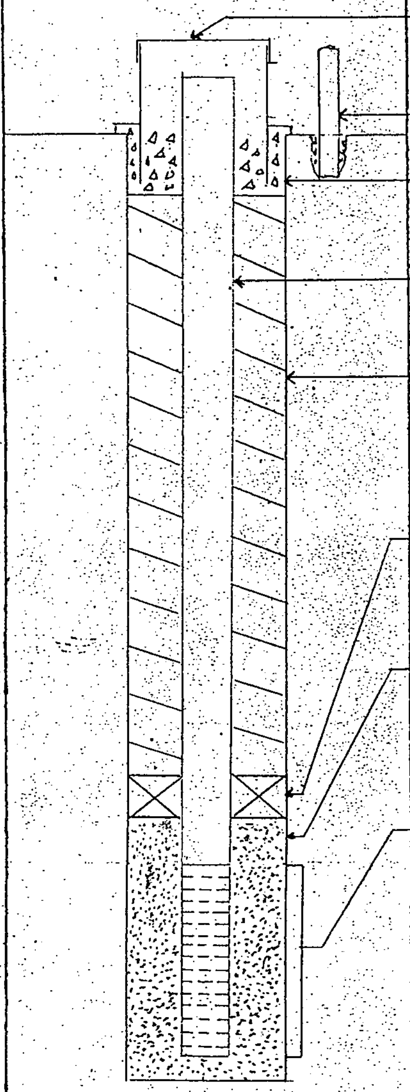
RESOURCE PROTECTION WELL REPORT

START CARD NO. 044805

PROJECT NAME: LARSON AFB Moses LAKE
WELL IDENTIFICATION NO. 91-AW5 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames & Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County AIRPORT
WATER LEVEL ELEVATION: 90.5' 9-23-91
GROUND SURFACE ELEVATION:
INSTALLED: 9-10-91
DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 99 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.
PROTECTIVE POSTS 3
CONCRETE SURFACE SEAL +.5 TO 2 FT.
WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC
ANNULAR SEALANT 2 TO 72 FT.
Enviroplug grout
SEAL 72 TO 74 FT.
1/4 Bentonite pellets
FILTER PACK 74 TO 99 FT.
20-40 Colorado Silica
SCREEN INTERVAL 79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED
HOLE DIAMETER
0 TO 99 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-4 brown silty sandy GRAVEL w/cobbles, dry, loose
4-11 brown slightly silty SAND w/occasional gravels + cobbles dry, loose
11-55 brown silty sandy GRAVEL w/cobbles + occasional boulders dry to moist
55-80 brown silty gravelly SAND w/occasional cobbles, moist
80-88 light brown to reddish brown sandy SILT w/occasional gravels, damp, loose
88-100 light brown to reddish brown silty fine SAND w/ occasional gravel, saturated

NOV 12

Layne Environmental Services, Inc.
Specialized Drilling for the Environmental Industry

RESOURCE PROTECTION WELL REPORT

START CARD NO: 044805

PROJECT NAME: LARSON AFB Moses Lake

WELL IDENTIFICATION NO. 91-AW4 (Site 2)

DRILLING METHOD: Dual wall percussion hammer

DRILLER: Richard Jimenez

FIRM: Layne Environmental Services, Inc.

SIGNATURE:

CONSULTING FIRM: DAMES & MOORE

REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT

LOCATION: NE 1/4 SW 1/4 Sec 28 Twn 20N R 28E

STREET ADDRESS OF WELL: GRANT'S County Airport

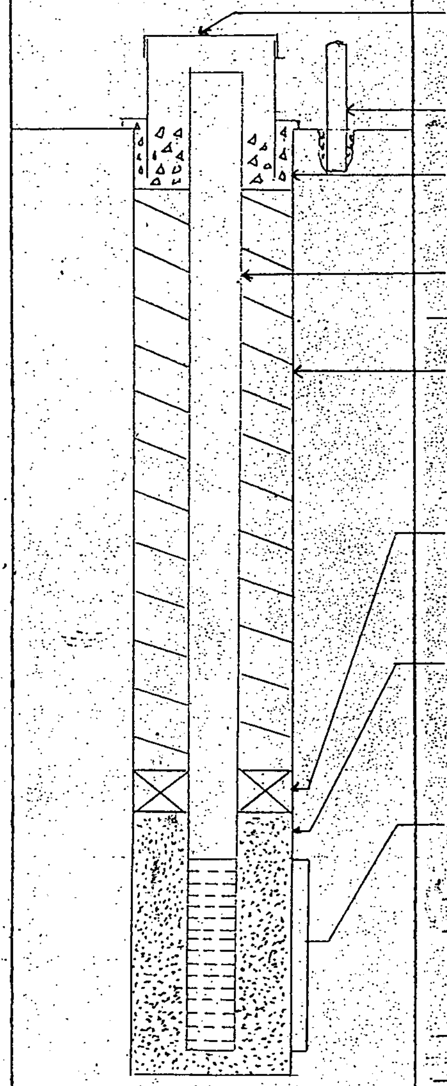
WATER LEVEL ELEVATION: 90.5

GROUND SURFACE ELEVATION:

INSTALLED: 9-9-91

DEVELOPED: 10-1-91

AS-BUILT



TOTAL DEPTH 102 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 79 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 72 FT.

ENVIROPLUG GROUT

SEAL 72 TO 74 FT.

1/4 Bentonite pellets

FILTER PACK 74 TO 99 FT.

20-40 Colorado Silica

SCREEN INTERVAL 79 TO 99 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 102 9 IN.
TO 6 IN.

Plug back hole 99-102 w/ Bentonite pellets

FORMATION DESCRIPTION

0-4 brown silty, sandy GRAVEL w/cobbles, dry

4-11 brown to black gravelly SAND, dry

11-82 brown silty, sandy GRAVEL w/cobbles & occasional boulders, dry to moist, loose

82-88 brown to reddish brown slightly sandy SILT, damp, hard to cemented

88-99 reddish brown fine SAND w/trace silt & occasional gravels, damp to saturated

99-100 yellowish brown clayey SILT w/trace sand, damp

100-102 weathered basalt

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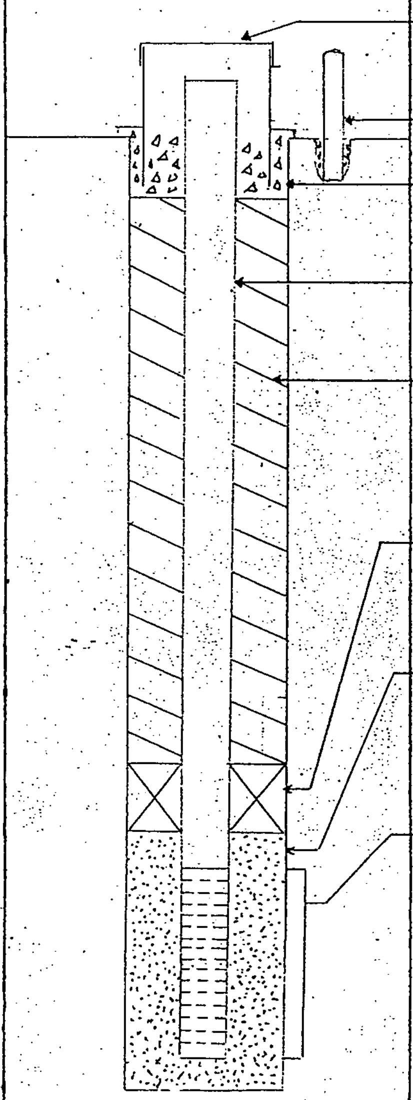
RESOURCE PROTECTION WELL REPORT

START CARD NO.: 044816

PROJECT NAME: LARSON AFB Moses LAKE
WELL IDENTIFICATION NO. 91- BW2 (site 2)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: DAMES + MOORE
REPRESENTATIVE: Julie MacDonald.

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 28 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT'S County Airport
WATER LEVEL ELEVATION: 91'
GROUND SURFACE ELEVATION:
INSTALLED: 8-26-91
DEVELOPED: 9-23-91

AS-BUILT



TOTAL DEPTH 180 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 4

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 137 FT.
2' SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 122 FT.
ENVIROPLUG GROUT

SEAL 122 TO 130 FT.
1/4 Bentonite pellets

FILTER PACK 130 TO 149 FT.
10-20 Colorado Silica

SCREEN INTERVAL 137 TO 147 FT.
2" SCH 80 TFJ PVC
".020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 110 9 IN.
110 TO 180 6 IN.

Drill 9" dual wall to 110
Drill 6" rotary hole to 180' plug back w/cement to 149'

FORMATION DESCRIPTION

0-2 TAN silt w/cobbles
2-18 Brown, silty sandy GRAVEL w/cobbles, damp
18-40 Black basaltic, silty SAND w/gravel, cobbles and occasional boulders, damp
40-44 Black basaltic boulders w/gravel
44-75 Black silty, gravelly, fine to coarse SAND, w/cobbles damp to moist
75-82 Dark brown, slightly clayey, silty, gravelly SAND w/cobbles, moist
82-107 Yellowish brown, clayey sandy SILT w/cobbles and broken basalt, wet
107-147 Basalt, weathered, fractured, iron stained, wet
147-180 BASALT, hard, competent, black.

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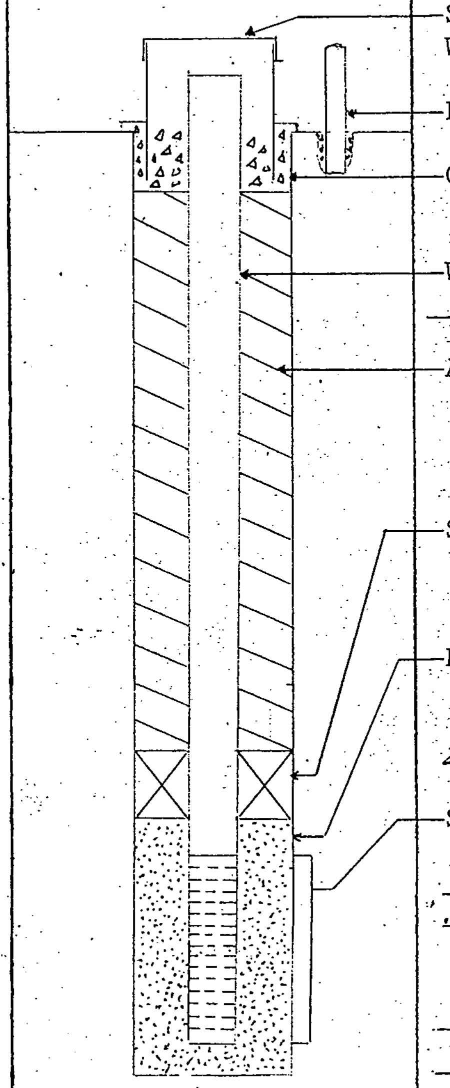
RESOURCE PROTECTION WELL REPORT

START CARD NO: 044 809

PROJECT NAME: LARSON AFB Moses LAKE
WELL IDENTIFICATION NO. 91-AW14
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: DAMES + MOORE
REPRESENTATIVE: Joe Turner

COUNTY: GRANT
LOCATION: NW 1/4 NE 1/4 Sec 32 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT'S County Airport
WATER LEVEL ELEVATION: 125.4'
GROUND SURFACE ELEVATION:
INSTALLED: 9-24-91
DEVELOPED: 10-8-91

AS-BUILT



TOTAL DEPTH 140 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.
PROTECTIVE POSTS 3
CONCRETE SURFACE SEAL +.5 TO 2 FT.
WELL CSG 2 TO 116 FT.
2" SCH 80 TFJ PVC
ANNULAR SEALANT TO FT.
SEAL 108 TO 110 FT.
1/4 Bentonite pellets
FILTER PACK 110 TO 138 FT.
20-40 Colorado Silica Sand
SCREEN INTERVAL 116 TO 136 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED
HOLE DIAMETER
0 TO 140 9 IN.
TO 6 IN.
Plug back w/bentonite pellets 138-140'

FORMATION DESCRIPTION

0-5 Brown silty SAND w/ occasional gravel, damp

5-108 Brown coarse GRAVEL w/ cobbles + occasional boulders dry to moist

108-140 Brown gravelly, silty SAND w/some clay, moist to wet

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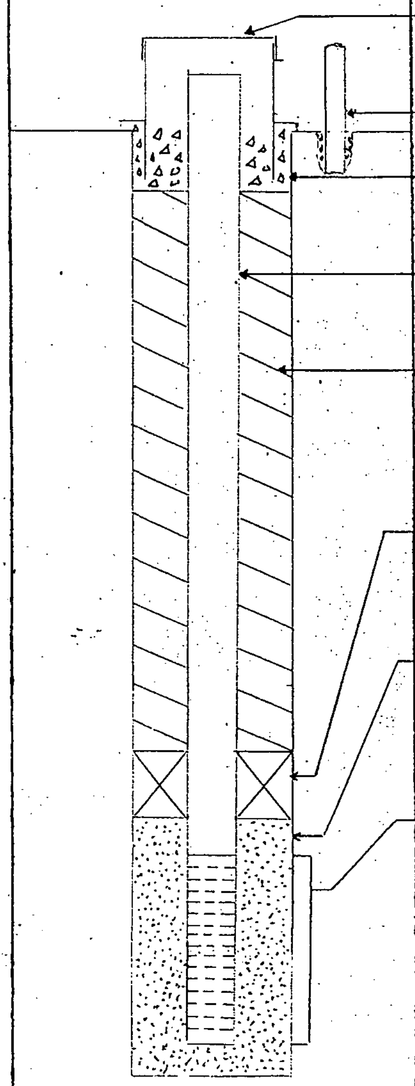
RESOURCE PROTECTION WELL REPORT

START CARD NO: 049810

PROJECT NAME: Larson AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW15
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: Grant
LOCATION: NE 1/4 SW 1/4 Sec 32 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 97'
GROUND SURFACE ELEVATION:
INSTALLED: 9-8-91
DEVELOPED: 10-8-91

AS-BUILT



TOTAL DEPTH 110 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.
PROTECTIVE POSTS 3
CONCRETE SURFACE SEAL 1.5 TO 2 FT.
WELL CSG +2 TO 89 FT.
2" SCH 80 TFJ PVC
ANNULAR SEALANT 2 TO 82 FT.
Enviroplug Grout
SEAL 82 TO 84 FT.
1/4 Bentonite pellets
FILTER PACK 84 TO 110 FT.
10-20 Colorado Silica
SCREEN INTERVAL 89 TO 109 FT.
2" SCH 80 TFJ PVC
.020 FACTORY SLOTTED
HOLE DIAMETER
0 TO 110 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-17 Dark brown slightly clayey silty sandy GRAVEL w/cobbles & occasional boulders damp

17-25 Brown silty, gravelly SAND, moist

25-72 Brown silty sandy GRAVEL w/ cobbles, dry to moist

72-74 Yellowish brown silty fine SAND; damp

74-93 Yellowish brown to light brown sandy SILT, damp

93-98 Reddish brown fine SAND w/trace silt, moist

98-110 Dark brown to black silty sandy GRAVEL, saturated

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Specialized Drilling for the Environmental Industry

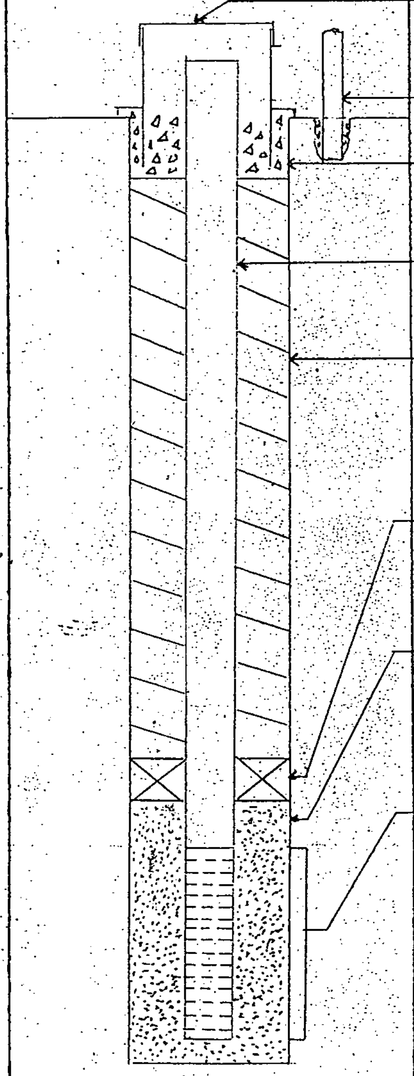
RESOURCE PROTECTION WELL REPORT

START CARD NO: 44811

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW16
DRILLING METHOD: Dual Wall Percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NW 1/4 SE 1/4 Sec 32 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 84'
GROUND SURFACE ELEVATION:
INSTALLED: 9-11-91
DEVELOPED: 10-5-91

AS-BUILT



TOTAL DEPTH 90.5 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 69 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 62 FT.
Enviroplug grout

SEAL 62 TO 64 FT.
1/4 Bentonite pellets

FILTER PACK 64 TO 89 FT.
20-40 Colorado Silica Sand

SCREEN INTERVAL 69 TO 89 FT.
2" SCH 40 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 90.5 9 IN.
TO 6 IN.

Bentonite pellet seal
89 to 90.5

FORMATION DESCRIPTION

0-53 grey/black silty sandy GRAVEL w/cobbles + occasional boulders, dry to moist

53-77 grey/black sandy GRAVEL w/occasional cobbles, moist

77-88 reddish brown slightly sandy SILT, damp, loose moist to saturated

88-90 yellowish clay w/iron staining + basalt nodules

90-90.5 weathered basalt

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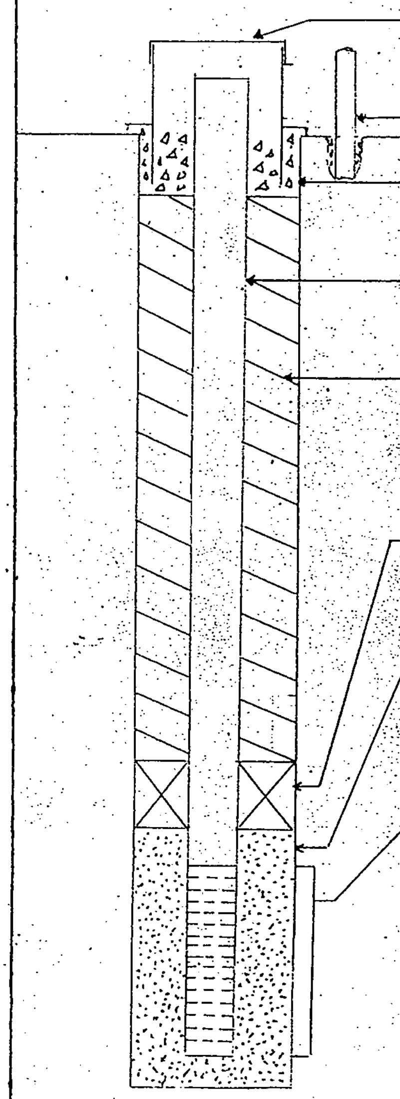
RESOURCE PROTECTION WELL REPORT

START CARD NO: 044817

PROJECT NAME: Larson AFB Moses Lake
WELL IDENTIFICATION NO. 91-BW3 (Site 3)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE ¼ SW ¼ Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County Airport
WATER LEVEL ELEVATION: 90
GROUND SURFACE ELEVATION:
INSTALLED: 9-5-91
DEVELOPED:

AS-BUILT



TOTAL DEPTH 185 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 170 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 160 FT.
ENVIROPLUG GROUT

SEAL 160 TO 163 FT.
1/4 Bentonite pellets

FILTER PACK 163 TO 185 FT.
10-20 Colorado Silica

SCREEN INTERVAL 170 TO 180 FT.
2" SCH 80 TFJ PVC
.020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 145 9 IN.
145 TO 185 6 IN.

Drill 9" dual wall to 145'
Drill 6" rotary hole to 185'

FORMATION DESCRIPTION

0-2 Brown sandy SILT w/ cobbles, dry
2-5 Brown silty, cobbley, fine to coarse SAND, dry
5-35 Brown silty, sandy, GRAVEL w/ cobbles, dry
35-60 Brown, silty, gravelly SAND w/ occasional cobbles, damp
60-117 Brown, silty, sandy GRAVEL w/ cobbles and occasional boulders, damp
117-125 Reddish brown, sandy clayey SILT, damp, hard
125-135 Greyish brown, silty CLAY, dry
135-165 BASALT, weathered, fractured, vesicular, moist
165-180 BASALT, baked (red), very vesicular w/ white precipitate in vesicles on fractures, wet
180-185 BASALT, black, competent

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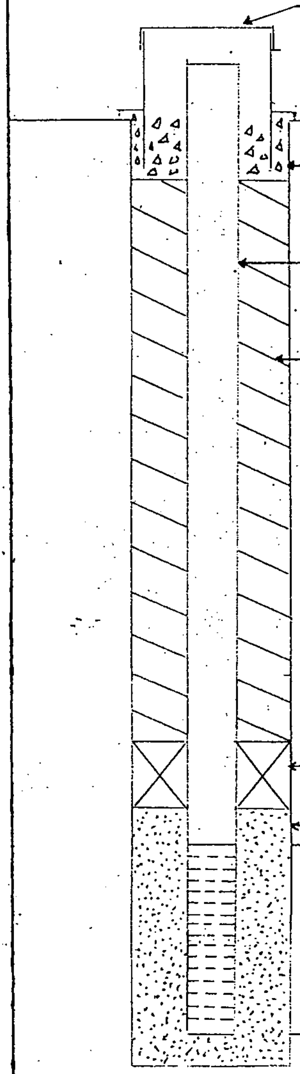
RESOURCE PROTECTION WELL REPORT

STA CARD NO. 044813

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW18
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: DAMES + MOORE
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE ¼ NE ¼ Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANTS County Airport
WATER LEVEL ELEVATION: 142
GROUND SURFACE ELEVATION:
INSTALLED: 9-11-91
DEVELOPED: 10-4-91

AS-BUILT



TOTAL DEPTH 159 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.
PROTECTIVE POSTS 3
CONCRETE SURFACE SEAL +.5 TO 2 FT.
WELL CSG +2 TO 139 FT. 2" SCH 80 TFJ PVC
ANNULAR SEALANT 2 TO 130 FT.
Enviroplug grout
SEAL 130 TO 132 FT.
1/4 Bentonite pellets
FILTER PACK 132 TO 159 FT.
20-40 Colorado Silica
SCREEN INTERVAL 139 TO 159 FT. 2" SCH 80 TFJ PVC .015 FACTORY SLOTTED
HOLE DIAMETER 0 TO 159 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-8 Brown silty SAND w/ gravel + cobbles, dry

8-36 Brown to gray silty, sandy, GRAVEL w/cobbles, dry

36-58 Brown silty, gravelly SAND w/cobbles and occassional boulders, dry to moist

58-125 Brown silty, sandy GRAVEL w/cobbles and occassional boulders, damp to moist

125-159 Reddish yellow to dark brown slightly clayey SILT w/fine sand and occassional gravels, moist to wet

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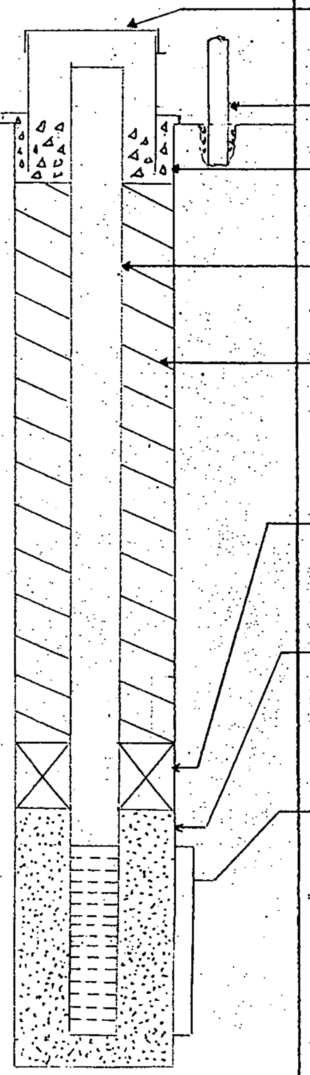
RESOURCE PROTECTION WELL REPORT

STAR CARD NO: 044812

PROJECT NAME: Larson AFB Moses Lake
WELL IDENTIFICATION NO. 91- AW17
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Joe Turner

COUNTY: Grant
LOCATION: NW 1/4 NW 1/4 Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant's County Airport
WATER LEVEL ELEVATION: 119'
GROUND SURFACE ELEVATION:
INSTALLED: 9-19-91
DEVELOPED: 9-24-91

AS-BUILT



TOTAL DEPTH 129 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 108 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 100 FT.
Enviroplug Grout

SEAL 100 TO 102 FT.
1/4" Bentonite pellets

FILTER PACK 102 TO 129 FT.
20-40 Colorado Silica Sand

SCREEN INTERVAL 108 TO 128 FT.
2" SCH 80 TFJ PVC
.015 FACTORY SLOTTED

HOLE DIAMETER
0 TO 129 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-7 Brown GRAVEL w/coarse sand + silt, dry

7-68 Brown sandy GRAVEL w/occassional boulders moist

68-78 Brown gravelly coarse SAND, little fines, wet

78-107 Brown GRAVEL w/ coarse sand and occassional boulders, moist

107-129 Brown gravelly, silty SAND, moist to saturated

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Specialized Drilling for the Environmental Industry

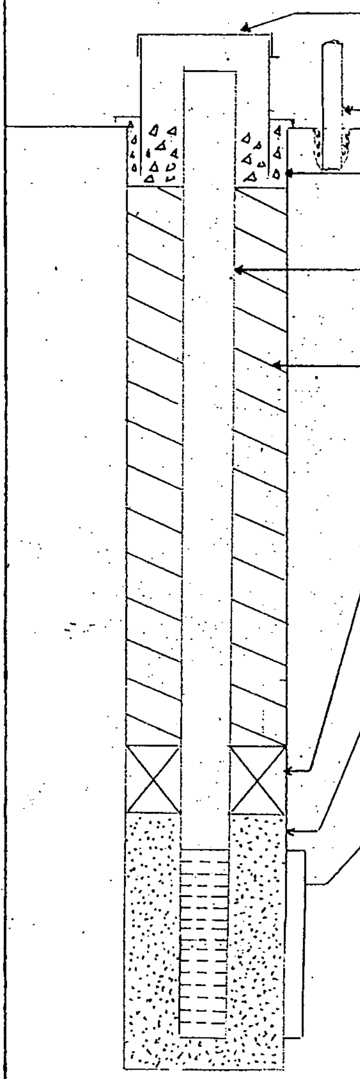
RESOURCE PROTECTION WELL REPORT

START CARD NO: 044806

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91- AW9 (Site 3)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: DAMES + MOORE
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County Airport
WATER LEVEL ELEVATION: 88.5
GROUND SURFACE ELEVATION:
INSTALLED: 9-6-91
DEVELOPED: 9-24-91

AS-BUILT



TOTAL DEPTH 102 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 81 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 73 FT.
ENVIROPLUG GROUT

SEAL 73 TO 75 FT.
1/4 Bentonite pellets

FILTER PACK 75 TO 102 FT.
10-20 Colorado Silica Sand

SCREEN INTERVAL 81 TO 101 FT.
2" SCH 80 TFJ PVC
.020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 102 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-2 Brown sandy SILT, dry

2-30 Brown to grey silty, sandy, GRAVEL w/occasional cobbles and boulders, dry

30-45 Grey gravelly SAND w/ occasional cobbles, damp to moist

45-102 Grey silty, sandy, GRAVEL w/cobbles, damp to saturated

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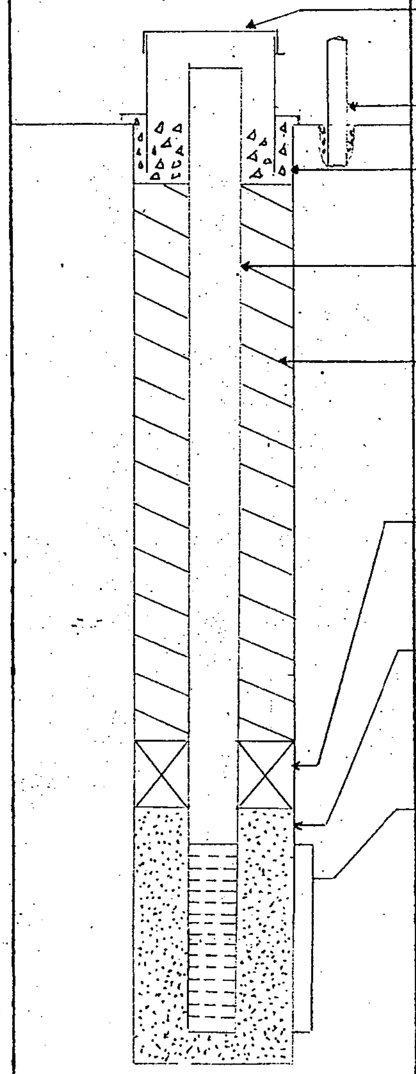
RESOURCE PROTECTION WELL REPORT

START CARD NO: 044806

PROJECT NAME: Larson AFB Moses Lake
WELL IDENTIFICATION NO. 91-AW8 (Site 3)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: Grants County Airport
WATER LEVEL ELEVATION: 89.5
GROUND SURFACE ELEVATION:
INSTALLED: 9-5-91
DEVELOPED: 10-9-91

AS-BUILT



TOTAL DEPTH 103 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 80 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 73 FT.
ENVIROPLUG GROUT

SEAL 73 TO 75 FT.
1/4 Bentonite pellets

FILTER PACK 75 TO 103 FT.
10-20 Colorado Silica

SCREEN INTERVAL 80 TO 100 FT.
2" SCH 80 TFJ PVC
020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 103 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-2 Brown sandy SILT, dry, loose

2-35 Grey silty sandy GRAVEL w/occasional cobbles, damp

35-60 Grey silty, gravelly SAND w/occasional cobbles, boulders damp

60-103 Grey silty, sandy GRAVEL w/cobbles & occasional boulders, damp to saturated

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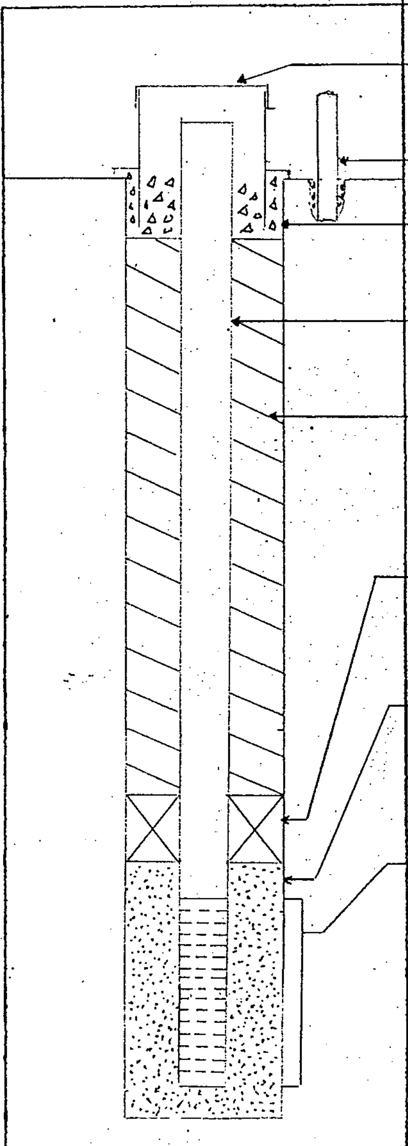
RESOURCE PROTECTION WELL REPORT

START CARD NO: 044806

PROJECT NAME: LARSON AFB Moses Lake
WELL IDENTIFICATION NO. 91- AW7 (site 3)
DRILLING METHOD: Dual wall percussion hammer
DRILLER: Richard Jimenez
FIRM: Layne Environmental Services, Inc.
SIGNATURE:
CONSULTING FIRM: Dames + Moore
REPRESENTATIVE: Julie MacDonald

COUNTY: GRANT
LOCATION: NE 1/4 SW 1/4 Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: GRANT's County Airport
WATER LEVEL ELEVATION: 89'
GROUND SURFACE ELEVATION:
INSTALLED: 9-6-91
DEVELOPED: 9-19-91

AS-BUILT



TOTAL DEPTH 102 FT.

WELL DATA

STEEL SURFACE MONUMENT W/LOCK 3 FT. ABOVE G.L.

PROTECTIVE POSTS 3

CONCRETE SURFACE SEAL +.5 TO 2 FT.

WELL CSG +2 TO 81 FT.
2" SCH 80 TFJ PVC

ANNULAR SEALANT 2 TO 73 FT.
ENVIROPLUG GROUT

SEAL 73 TO 75 FT.
1/4" Bentonite pellets

FILTER PACK 75 TO 102 FT.
10-20 Colorado Silica

SCREEN INTERVAL 81 TO 101 FT.
2" SCH 80 TFJ PVC
.020 FACTORY SLOTTED

HOLE DIAMETER
0 TO 102 9 IN.
TO 6 IN.

FORMATION DESCRIPTION

0-2 Brown sandy SILT, dry

2-12 Brown silty gravelly SAND w/occasional cobbles, dry

12-102 Brown to black, silty, sandy GRAVEL w/ occ. cobbles & boulders

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The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

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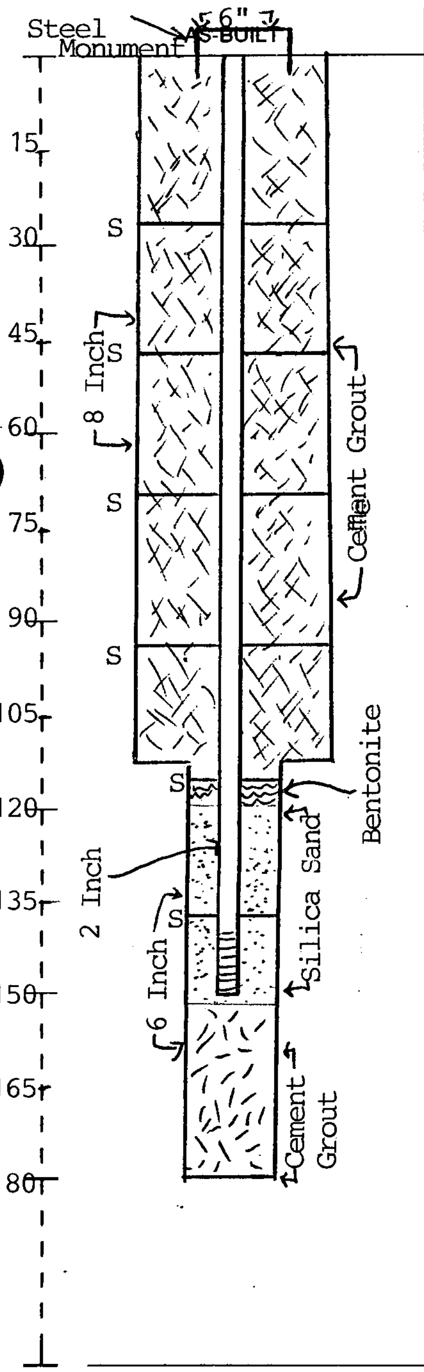
RESOURCE PROTECTION WELL REPORT

START CARD NO. 20809

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. 92 BW-3
DRILLING METHOD: Rotary
DRILLER: Craig S. DeYoung
FIRM: Andrew Well Drilling Services
SIGNATURE:
CONSULTING FIRM: Blue Ridge Assoc.
REPRESENTATIVE: Iain Olness

COUNTY: Grant
LOCATION: NE 1/4 SE 1/4 Sec 33 Twn 20NR 28E
STREET ADDRESS OF WELL: Grant County Airport
WATER LEVEL ELEVATION: 80.5 ft
GROUND SURFACE ELEVATION: Not Available
INSTALLED: Feb 15/93
DEVELOPED: Feb 15/93

AS-BUILT



WELL DATA

Hole Data:
Size: 8" to 110 feet
6" to 180 feet

Casing:
Steel .280 6"
From +2.5 to -3.5 ft

PVC Sch80 2"
From +2 to 140 feet

Screen: 2" PVC Monoflex
From 140 to 150 feet

Filter:
Colorado Silica Sand
Size: 10-20
Inst. Method:
Tremmie Pipe
Depth: 120 to 152 ft

Grout:
Cement w/Bentonite (5%)
Depth: 152 to 180 ft
0 to 117 ft

(S=Stabilizer)

FORMATION DESCRIPTION

Silt	(0 - 3)
Gravel	(3 - 83)
Silt and Clay	(83 - 100)
Weathered Basalt	(100-148)
Competent Basalt	(148-180)

SCALE: 1" = 30 feet

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

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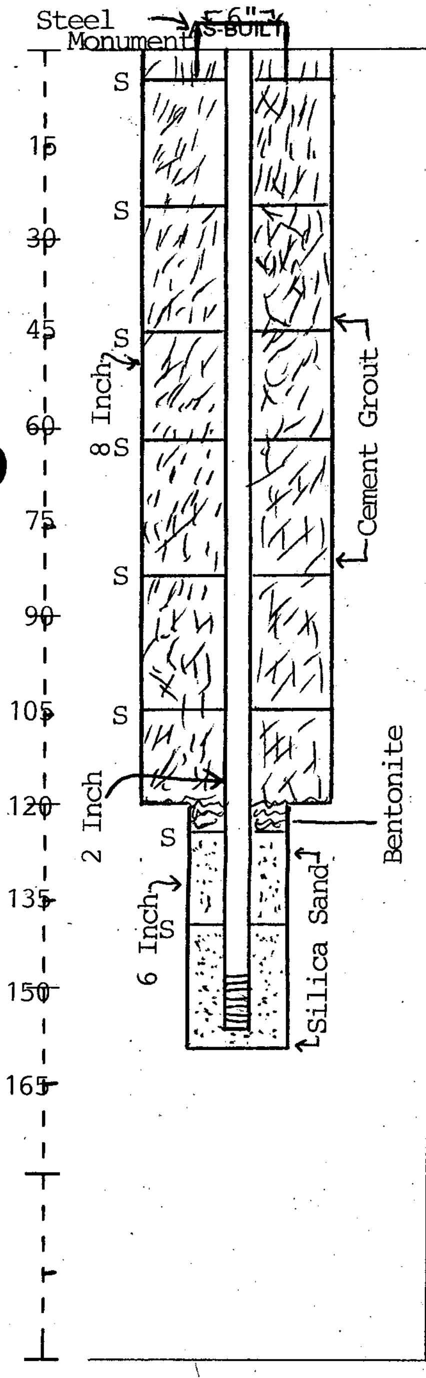
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

RESOURCE PROTECTION WELL REPORT

START CARD NO. 204810

PROJECT NAME: Grant County Airport
WELL IDENTIFICATION NO. 92 BW-2
DRILLING METHOD: Rotary
DRILLER: Craig S. DeYoung
FIRM: Andrew Well Drilling Services
SIGNATURE:
CONSULTING FIRM: Blue Ridge Associates
REPRESENTATIVE: Iain Olness

COUNTY: Grant
LOCATION: NW 1/4 SE 1/4 Sec 33 Twn 20N R 28E
STREET ADDRESS OF WELL: Grant County Airport
WATER LEVEL ELEVATION: 81.25 ft BGS
GROUND SURFACE ELEVATION: Not Available
INSTALLED: Feb 15/93
DEVELOPED: Feb 15/93



WELL DATA

Hole Data:
Size: 8" to 119 ft
6" to 160 ft

Casing:
Steel .280 6"
From +2.5 to -3.5 ft

PVC Sch 80 2"
From +2 to 147 ft

Screen: 2" PVC Monoflex
From 147 to 157 ft

Filter:
Colorado Silica Sand
Size: 10-20
Inst. Method:
Tremmie Pipe
Depth: 123 to 160 ft

Grout:
Cement w/Bentonite (5%)
Depth: 0 to 119 feet

(S= Stabilizer)

FORMATION DESCRIPTION

Gravel	(0-85)
Silt and Clay	(85 - 100)
Weathered Basalt	(100-157)
Competent Basalt	(157-160)

15
30
45
60
75
90
105
120
135
150
165

SCALE: 1" = 30 Feet
PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

204210 334170

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. RE01237

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
☑ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ____

Type of Well *(select one)*
☑ Resource Protection
☐ Geotech Soil Boring

Consulting Firm Geo Matrix
Unique Ecology Well ID Tag No. AMP 901

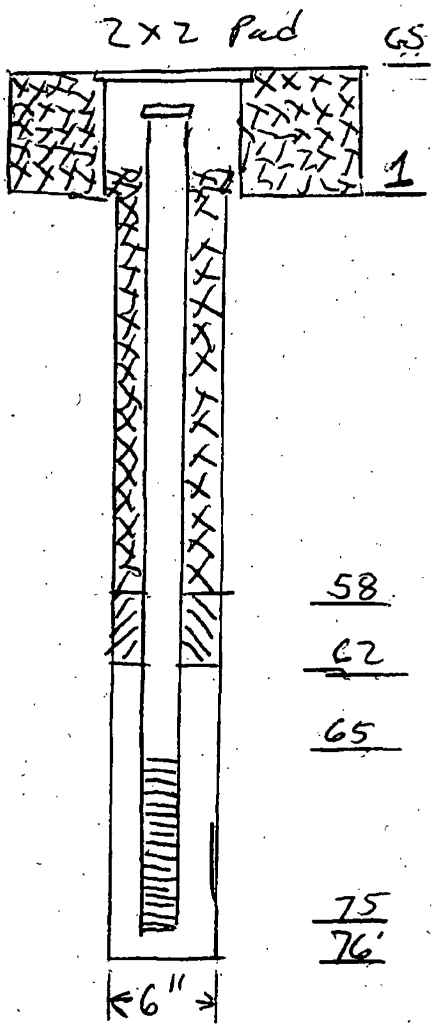
Property Owner Kon H. CHO
Site Address Tyndell Rd
City Moses Lake County Grant
Location SW1/4-1/4 NW1/4 Sec 27 Twn 20 R 28 Select One ☑ EWM ☐ WWM

WELL CONSTRUCTION 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.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Steve Zimmerman
Driller/Engineer /Trainee Signature
Driller or Trainee License No. 2772

If trainee, licensed driller's Signature and License No. ____

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____
Long Deg ____ Long Min/Sec ____
Tax Parcel No. ____
Cased or Uncased Diameter 2"/6" Static Level 61
Work/Decommission Start Date 8/4/05
Work/Decommission Completed Date 8/5/05

Construction/Design	Well Data	Formation Description
	8" Flush mount Concret mix 2" Cap Locking Cement Grout 2" Sch 40 PVC Riser Top of Bentonite Chips top of 10/20 Sand Pack To of Screen 2" Sch 40 .020 Slot PVC Bottom of Screen Bottom of Hole	0 Sand Gravels Cobles 76

SCALE: 1"=__ Page__of__

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

2041121 334171

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RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. RE01237

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
☑ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ____

Type of Well *(select one)*
☑ Resource Protection
☐ Geotech Soil Boring

Consulting Firm GeoMatrix

Unique Ecology Well ID Tag No. AMP 902

Property Owner Kon H Cho

Site Address Tyndell Road

City Moses Lake County Grant

Location SW 1/4-1/4 NW 1/4 Sec 27 Twn 20 R 28 Select One ☑ EWM ☐ WWM

WELL CONSTRUCTION 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.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Steve Zimmerman

Driller/Engineer /Trainee Signature

Driller or Trainee License No. 2772

If trainee, licensed driller's Signature and License No. ____

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____

Long Deg ____ Long Min/Sec ____

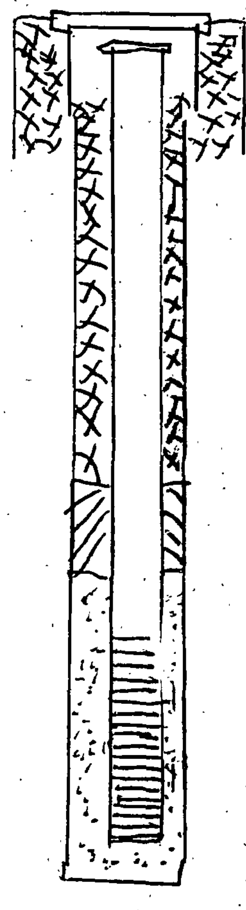
Tax Parcel No. ____

Cased or Uncased Diameter 2/6" Static Level 61

Work/Decommission Start Date 8/2/05

Work/Decommission Completed Date 8/3/05

2'x 2' Pad



Construction/Design	Well Data	Formation Description
0	8" Flush mount concret mix	0 ft Sand Gravel cobles
1'	2" Locking cap	
	Cement Grout	
	2" pvc Sch 40 Riser	
58	top of chip Bentonite	
62	top of Sand pack 10/20	
65	Top of Screen PVC Sch 40 2" ,020 slot	
75	Bottom of Screen	↓ 76
76'	Bottom of Hole	

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

204122 334172

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. RE01237

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
☑ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ____________

Consulting Firm GeoMatrix

Unique Ecology Well ID Tag No. AMP903

Type of Well *(select one)*
☑ Resource Protection
☐ Geotech Soil Boring

Property Owner Kon H. Cho

Site Address Tyndell Rd

City Moses Lake County Grant

Location SW 1/4-1/4 NW 1/4 Sec 27 Twn 20 R 28 Select One ☑ EWM ☐ WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ________ Lat Min/Sec ________ Long Deg ________ Long Min/Sec ________

Tax Parcel No. ____________

Cased or Uncased Diameter ________ Static Level 61

Work/Decommission Start Date 8/4/05

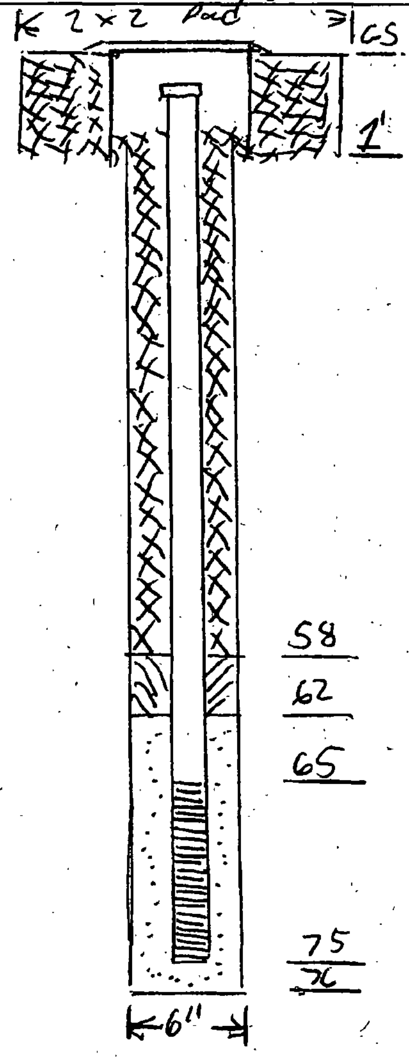
Work/Decommission Completed Date 8/5/05

WELL CONSTRUCTION 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.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Steve Zimmerman
Driller/Engineer /Trainee Signature Steve Zimmerman
Driller or Trainee License No. 2772

If trainee, licensed driller's Signature and License No. ____________

Construction/Design



Well Data

8" flush mount
2" Locking Cap

2" Sch 40
PVC Riser

Cement Grout

top of Bentonite Chips

top of 10/20 Sand Pack

top of Screen
Sch 40 PVC .020 slot

Bottom of Screen
Bottom of Hole

Formation Description

0

Sand Gravels
Cobbles

76

5914

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334852

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. R73590

313970

Construction/Decommission

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number*

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner: **Port of Moses Lake**

Site Address: **7810 Andrews St. NE**

Consulting Firm: **ERI (Environmental Resolutions, Inc.)**

City: **Moses Lake** County: **Grant**

Unique Ecology Well ID Tag No. BAR 563

Location 1/4 **NE** 1/4 **NE** Sec **32** TWN **20N** Range **28E** [✓ EWM] or WWM

WELL CONSTRUCTION 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

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x

Long Deg x Long Min/Sec x

Tax Parcel No. N/A

☒ Driller ☐ Trainee Name (Print) **Ed Kostelecky**

Driller/Trainee Signature Ed Kostelecky

Driller/Trainee License No. **2490**

[✓ Cased] or Uncased Diameter 2"

Static Level 90.03

Work/Decommision Start Date **4/28/2008**

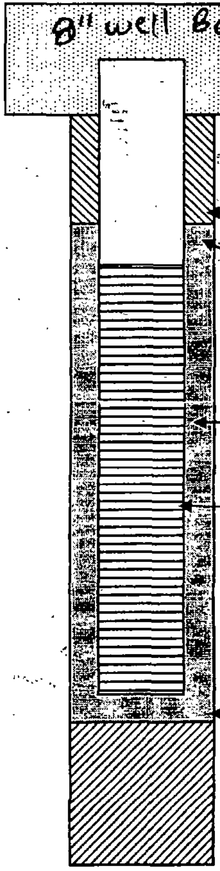
If trainee, licensed driller's Signature and License No.

Work/Decommision End Date ~~4/28/2008~~ 4-30-2008

#1 Construction/Design

Well Data W08-285A

Formation Description



Concrete Surface Seal Depth 3 FT

Blank Casing (dia x dep) 2" x 87.5'

Material SCH 40 P.V.C.

Backfill 79-3' FT

Type Bent Grout/Chips

Seal 79-85'

Material Bent CHIPS

Gravel Pack 85-107.5' 22.5' FT

Material 2-12 SAND

Screen (dia x dep) 2" x 20'

Slot Size .010

Material SCH. 40 P.V.C.

Well Depth 107.5 FT

Backfill —

Material —

Total Hole Depth 107.5 FT

0 - 22 FT

Boulders, Cobbles, Gravels.

22 - 89' FT

Brn silty gravel

89 - 107.5 FT

BRN GRAVELS W SILT

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334853

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

313971

CURRENT

Notice of Intent No. R73590

Construction/Decommission

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number*

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner **Port of Moses Lake**

Site Address **7810 Andrews St. NE**

City **Moses Lake** County **Grant**

Consulting Firm **ERI (Environmental Resolutions, Inc.)**

Unique Ecology Well ID Tag No. BAN 564

Location 1/4 **NE** 1/4 **NE** Sec **32** TWN **20N** Range **28E** or EWM ☐ WWM

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x

Long Deg x Long Min/Sec x

WELL CONSTRUCTION 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.

☒ Driller ☐ Trainee Name (Print) **Ed Kostelecky**

Driller/Trainee Signature Ed Kostelecky

Driller/Trainee License No. **2490**

If trainee, licensed driller's Signature and License No.

Tax Parcel No. N/A

Cased or Uncased Diameter

Static Level 93.44'

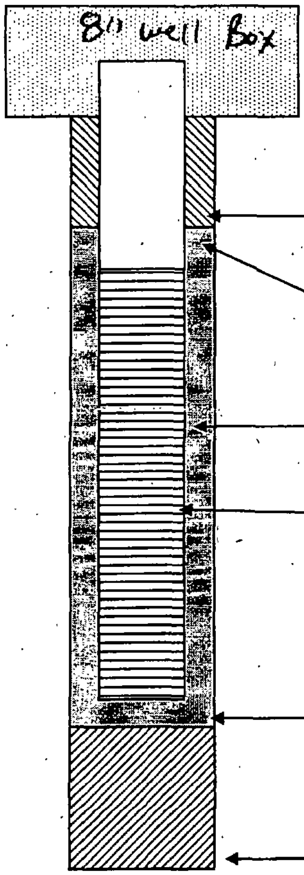
Work/Decommision Start Date ~~4/28/2008~~ 4-30-2008

Work/Decommision End Date ~~4/28/2008~~ 5-1-2008

#2 Construction/Design

Well Data W08-285A

Formation Description



Concrete Surface Seal Depth 3' FT

Blank Casing (dia x dep) 2" x 90'

Material SCH 40 PVC

Backfill SAnd FT

Type

Seal 3'-87'

Material Bent Grout + CHIPS

Gravel Pack 87-112' 25' FT

Material 2-12 SAND

Screen (dia x dep) 2" x 20'

Slot Size .010

Material SCH 40 PVC

Well Depth 110 FT

Backfill NATIVE

Material 2/12 SAND

Total Hole Depth 112 FT

0 - 23 FT

Boulders, COBBLES, GRAvels.

~~0~~ 23 - 90 FT

Brn silty grael w SAND lenses

~~0~~ 90 - 112 FT

BRN GRAvels w Silt

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334854

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. R73590

Construction/Decommission

313972

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number*

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner: **Port of Moses Lake**

Site Address: **7810 Andrews St. NE**

Consulting Firm: **ERI (Environmental Resolutions, Inc.)**

City: **Moses Lake** County: **Grant**

Unique Ecology Well ID Tag No. BAN 565

Location 1/4 **NE** 1/4 **NE** Sec **32** TWN **20N** Range **28E** ☐ EWM or WWM

WELL CONSTRUCTION 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

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x

Long Deg x Long Min/Sec x

Tax Parcel No. N/A

☒ Driller ☐ Trainee Name (Print) **Ed Kostelecky**

Driller/Trainee Signature Ed Kostelecky

Driller/Trainee License No. **2490**

[✓ Cased] or Uncased Diameter 2"

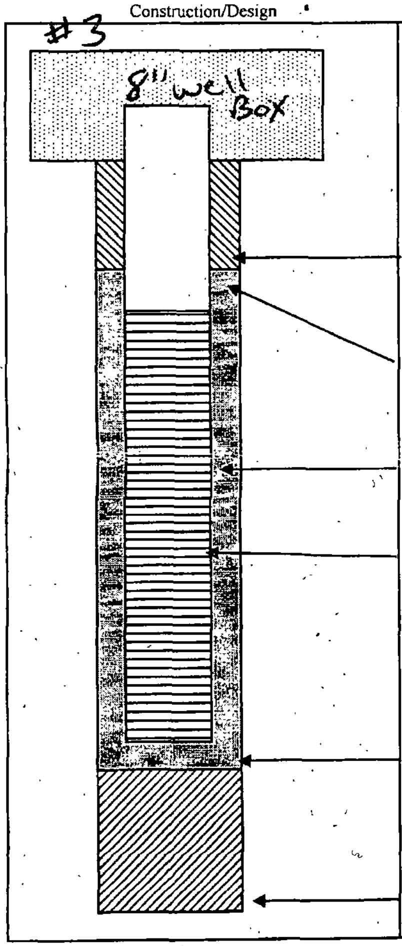
Static Level 87.64

Work/Decommision Start Date 5-1-2008 ~~4/28/2008~~

Work/Decommision End Date 5-5-2008 ~~4/28/2008~~

If trainee, licensed driller's Signature and License No.

Construction/Design



Well Data W08-285A

Concrete Surface Seal Depth 3' FT

Blank Casing (dia x dep) 2" x 88.5'

Material SCH 40 PVC

Backfill 3'-81 FT

Type Bent Grout + CHIPS

81-86'

Seal

Material Bent CHIPS

86-111

Gravel Pack 25' FT

Material 2-12 SAND

Screen (dia x dep) 2" x 20'

Slot Size .010

Material SCH 40 PVC

Well Depth 108.5 FT

Backfill NATIVE +

Material 2-12 SAND

Total Hole Depth 111 FT

Formation Description

0 - 8 FT

SILTY Gravel

8 12
8 - FT

Boulders, COBBLES, Gravels

12-36 GRAY SILTY Gravel

36-86 - HARD GRAY Gravel

86-100 BRN. Gravelly silt

1000 - 105 FT Brn silt

105-113 - Brn. FINE, SILTY SAND

113-131 - Brn Silt

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334855

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

313974

CURRENT
Notice of Intent No. R73590

Construction/Decommission

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner: Port of Moses Lake

Site Address: 7810 Andrews St. NE

City: Moses Lake County: Grant

Consulting Firm: ERI (Environmental Resolutions, Inc.)

Unique Ecology Well ID Tag No. BAN 567

Location 1/4 NE 1/4 NE Sec 32 TWN 20N Range 28E EWM or WWM

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x

Long Deg x Long Min/Sec x

WELL CONSTRUCTION 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

☒ Driller ☐ Trainee Name (Print) Ed Kostelecky

Driller/Trainee Signature Ed Kostelecky

Driller/Trainee License No. 2490

If trainee, licensed driller's Signature and License No. ______

Tax Parcel No. N/A

[✓ Cased] or Uncased Diameter 2"

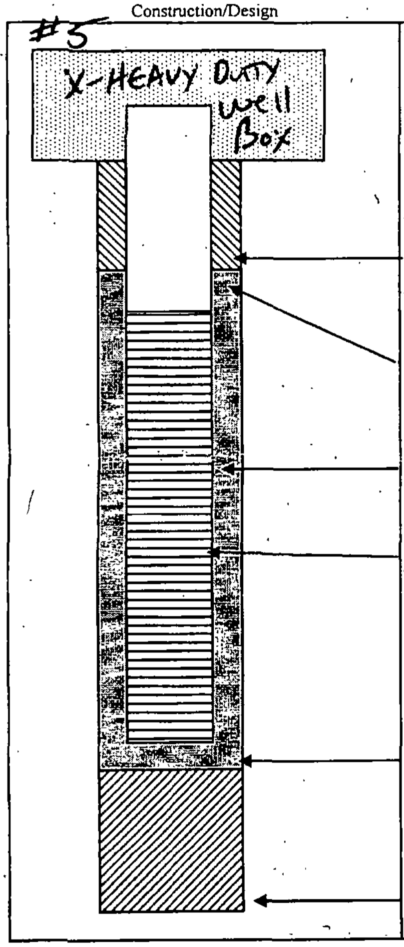
Static Level 116.67'

Work/Decommision Start Date 5-7-08 ~~4/28/2008~~

Work/Decommision End Date 5-8-08 4/28/2008

Construction/Design

#5



Well Data W08-285A

Concrete Surface Seal Depth 4 FT

Blank Casing (dia x dep) 2" x 100'

Material SCH 40 PVC

Backfill 4' x 92' FT

Type Bent Grout + CHIPS

92-97'

Seal

Material BENT. CHIPS

97 x 130'

Gravel Pack FT

Material 2-12 SAND

Screen (dia x dep) 2" x 30'

Slot Size .010

Material SCH 40 P.V.C.

Well Depth 130' FT

Backfill /

Material /

Total Hole Depth 130 FT

Formation Description

0 - 1 FT

Asphalt

1-11 FT.

Boulders, cobbles, gravel

11-36 FT. GRAY SILTY GRAVEL

0 - FT

36-86' - HARD, GRAY GRAVEL

86-100' BRN Gravelly silt

100-105' BRN SILT

105-113' FINE SILTY SAND

0 - FT

113-130'

BRN Silt w SAND

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ECY 050-12 (Rev 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

3348576

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

313973

CURRENT

Notice of Intent No. R73590

Construction/Decommission

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner **Port of Moses Lake**

Site Address **7810 Andrews St. NE**

City **Moses Lake** County **Grant**

Consulting Firm **ERI (Environmental Resolutions, Inc.)**

Unique Ecology Well ID Tag No. BAR-566

Location 1/4 **NE** 1/4 **NE** Sec **32** TWN **20N** Range **28E** [✓ EWM] or WWM

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x

Long Deg x Long Min/Sec x

Tax Parcel No. N/A

WELL CONSTRUCTION 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

☒ Driller ☐ Trainee Name (Print) Ed Kastelecky

Driller/Trainee Signature Ed Kastelecky

Driller/Trainee License No. **2490**

If trainee, licensed driller's Signature and License No. ______

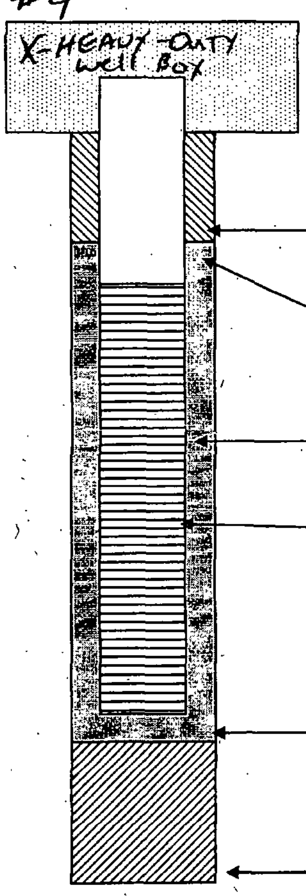
[✓ Cased] or Uncased Diameter 2" Static Level 107.6

Work/Decommision Start Date 5-6-2008 ~~4/28/2008~~

Work/Decommision End Date 5-6-2008 4/28/2008

Construction/Design

#4



Well Data W08-285A

Concrete Surface Seal Depth 4' FT

Blank Casing (dia x dep) 2" x 90

Material SCH 40 PVC.

Backfill Bent Grout FT

Type +CHIPS 4'-82'

82-87

Seal

Material Bent. CHIPS

87-131

Gravel Pack 44' FT

Material 2-12 SAND

Screen (dia x dep) 2" x 40'

Slot Size .010

Material SCH 40 PVC.

Well Depth 130 FT

Backfill NATIVE/2-12

Material SAND

Total Hole Depth 131 FT

Formation Description

0 - 1 FT

Asphalt /CONCRETE

1-11 FT.

Boulders, cobbles, gravel

11-36' GRAY SILTY Gravel

0 - FT

36-86' HARD, GRAY GRAVEL

86-100' BRN. gravelly silt

100-105 BRN SILT

0 - FT

105-113' FINE silty SAND

113-131'

BRN silt w SAND

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ECY 050-12 (Rev 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

334857

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. R73590

313975

Construction/Decommission

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ____

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner **Port of Moses Lake**

Site Address **7810 Andrews St. NE**

City **Moses Lake** County **Grant**

Consulting Firm **ERI (Environmental Resolutions, Inc.)**

Unique Ecology Well ID Tag No. BAR 568

Location 1/4 **NE** 1/4 **NE** Sec **32** TWN **20N** Range **28E** ☒ EWM or WWM

Lat/Long (s,t,r still Required) Lat Deg x Lat Min/Sec x

Long Deg x Long Min/Sec x

WELL CONSTRUCTION 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.

Tax Parcel No. N/A

☒ Driller ☐ Trainee Name (Print) **Ed Kostelecky**

Driller/Trainee Signature Ed Kostelecky

Driller/Trainee License No. **2490**

[✓ Cased] or Uncased Diameter 2" Static Level 124.4'

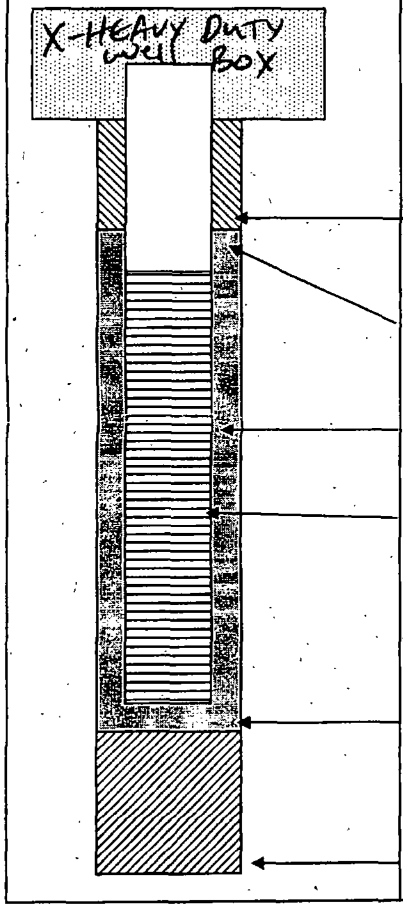
Work/Decommision Start Date 5-9-08 ~~4/28/2008~~

If trainee, licensed driller's Signature and License No. ____

Work/Decommision End Date 5-13-08 ~~4/28/2008~~

#6

Construction/Design



Well Data W08-285A

Concrete Surface Seal Depth	4 FT
Blank Casing (dia x dep)	2" x 110'
Material	SCH 40 PVC
Backfill	4-100' FT
Type	Bent Grout & CHIPS
Seal	100-105'
Material	Bent CHIPS
Gravel Pack	105-151 46' FT
Material	2-12 SAND
Screen (dia x dep)	2" x 40'
Slot Size	.010
Material	SCH 40 P.V.C.
Well Depth	150 FT
Backfill	2-12 SAND
Material	
Total Hole Depth	151 FT

Formation Description

0 - 1 FT

Asphalt

1-11 FT

Boulders, cobbles, gravel

11-36 FT. HARD, Gray Gravel

0 - FT

86-100' BRN Gravelly Silt

100-105' BRN SILT

105-113 FINE, SILTY SAND

113-151'

0 - FT

Brn Silt w SAND

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Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

~~340616~~
340617

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent R 43151
UNIQUE WELL I.D. # AEN 484
Water Right Permit No. ______

(1) **OWNER:** Name USACE Address PO Box 3755, Seattle, wa 98124

(2) **LOCATION OF WELL:** County Grant SW 1/4 NE 1/4 Sec 33 T 20 N.R. 28 WM
(2a) **STREET ADDRESS OF WELL:** (or nearest address) Larson AFB, moses lake, wa.
TAX PARCEL NO.: ______

(3) **PROPOSED USE:** ☐ Domestic ☐ Irrigation ☐ DeWater ☐ Industrial ☒ Test Well ☐ Municipal ☐ Other

(4) **TYPE OF WORK:** Owner's number of well (if more than one) 99-AW-01
☒ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission
Method: ☐ Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted

(5) **DIMENSIONS:** Diameter of well 8 inches
Drilled 110 feet. Depth of completed well 110 ft.

(6) **CONSTRUCTION DETAILS**
Casing Installed:
☐ Welded 4 " Diam. from +3 ft. to 100 ft.
☐ Liner installed ______ " Diam. from ______ ft. to ______ ft.
☒ Threaded ______ " Diam. from ______ ft. to ______ ft.

Perforations: ☐ Yes ☒ No
Type of perforator used ______
SIZE of perforations ______ in. by ______ in.
______ perforations from ______ ft. to ______ ft.

Screens: ☒ Yes ☐ No ☐ K-Pac Location ______
Manufacturer's Name Johnson
Type PVC Sch 40 Model No. ______
Diam. 4" Slot Size 020 from 100 ft. to 110 ft.
Diam. ______ Slot Size ______ from ______ ft. to ______ ft.

Gravel/Filter packed: ☒ Yes ☐ No ☐ Size of gravel/sand 10/20 sand
Material placed from 85 ft. to 110 ft.

Surface seal: ☒ Yes ☐ No To what depth? 85 ft.
Material used in seal Bentonite grout
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? ______ Depth of strata ______
Method of sealing strata off ______

(7) **PUMP:** Manufacturer's Name N/A
Type: ______ H.P. ______

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ______ ft.
Static level 86 ft. below top of well Date 7-20-99
Artesian pressure -0- 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.
Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.
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 ______ gal./min. with ______ ft. drawdown after ______ hrs.
Artesian flow ______ g.p.m. Date ______
Temperature of water 56° Was a chemical analysis made? ☐ Yes ☒ No

(10) **WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION**
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
gray, sandy gravel + large cobbles	0	110

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OCT 22 1999
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 7-20, 99. Completed 7-26-99

WELL CONSTRUCTION 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.

Type or Print Name Dan Claassen License No. 1827
(Licensed Driller/Engineer)

Trainee Name ______ License No. ______
Drilling Company ENV. WEST EXPLORATION INC
(Signed) ______ License No. ______
(Licensed Driller/Engineer)
Address PO BOX 11095 Spokane WA 99211
Contractor's Registration No. ENVIRWE101PP Date 10/21, 99

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

340691

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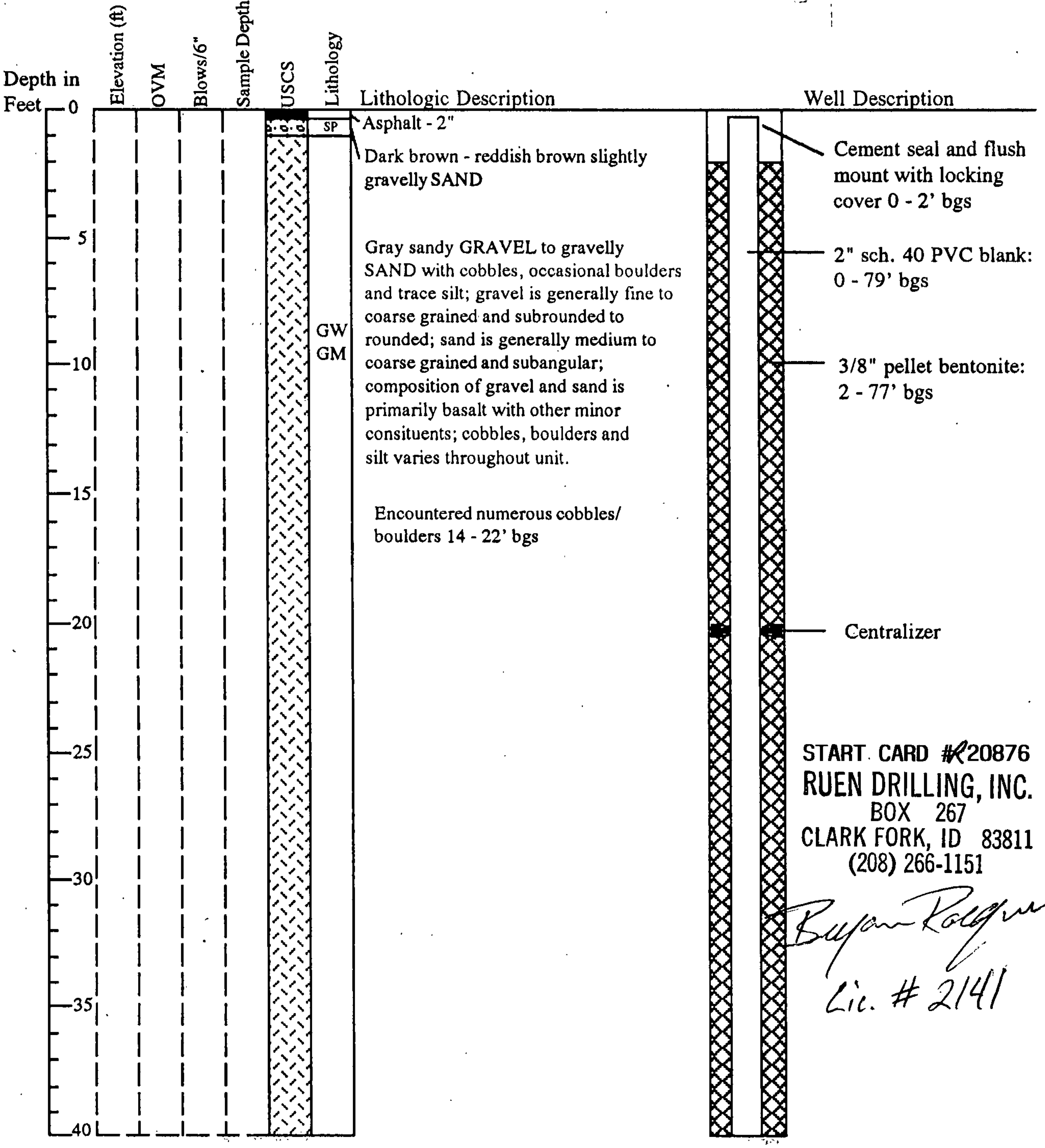
FEB 17 1994

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9302

(AAV-527)



Asphalt - 2"

Dark brown - reddish brown slightly gravelly SAND

Gray sandy GRAVEL to gravelly SAND with cobbles, occasional boulders and trace silt; gravel is generally fine to coarse grained and subrounded to rounded; sand is generally medium to coarse grained and subangular; composition of gravel and sand is primarily basalt with other minor consituents; cobbles, boulders and silt varies throughout unit.

Encountered numerous cobbles/ boulders 14 - 22' bgs

Cement seal and flush mount with locking cover 0 - 2' bgs

2" sch. 40 PVC blank: 0 - 79' bgs

3/8" pellet bentonite: 2 - 77' bgs

Centralizer

START CARD #R20876
RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

Bryan Rolque

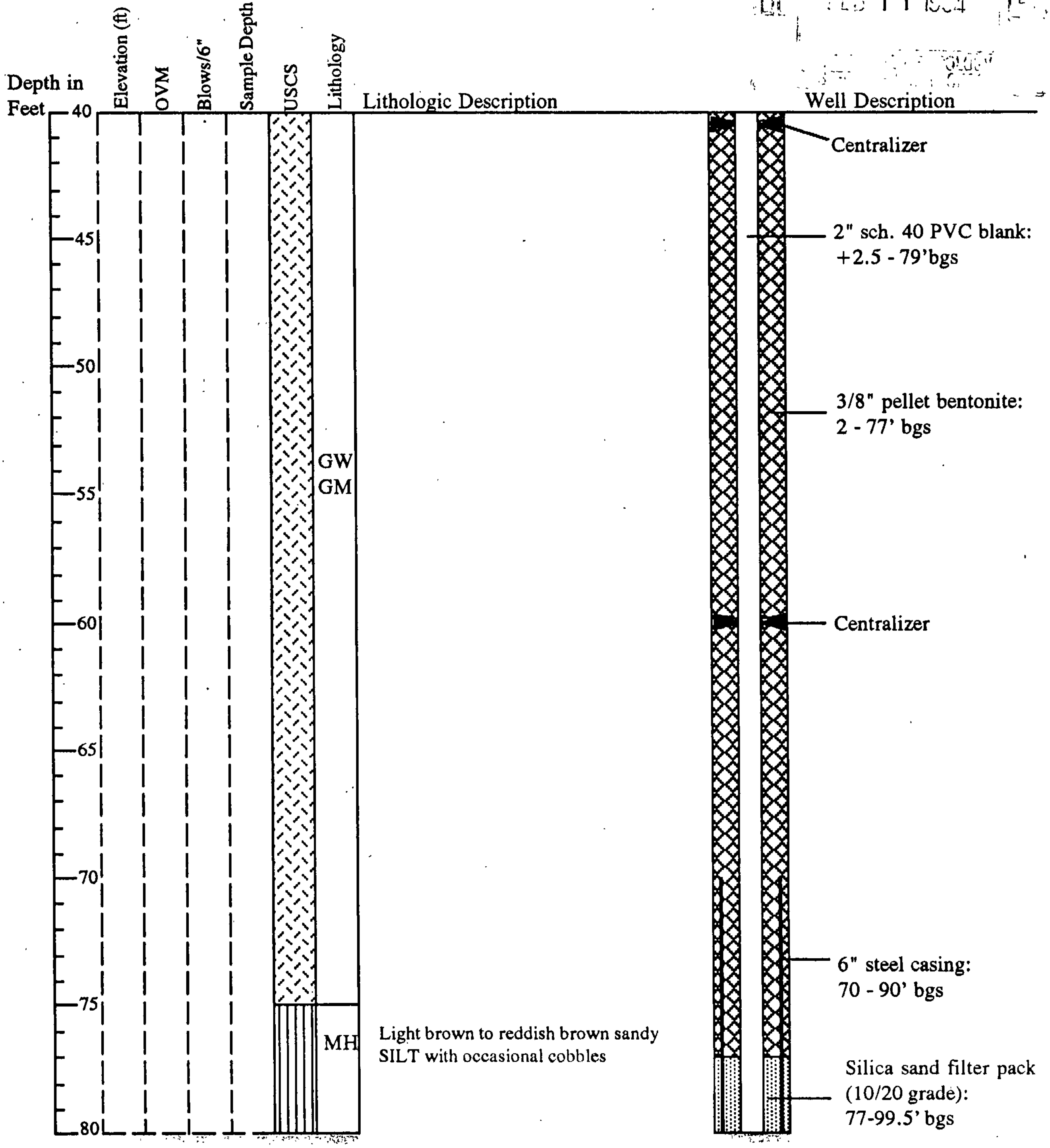
Lic. # 2141

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/27/93
Hydrogeologist:	IAO	Well Installation Date:	10/31/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9302 (cont'd)

(AAV-527)

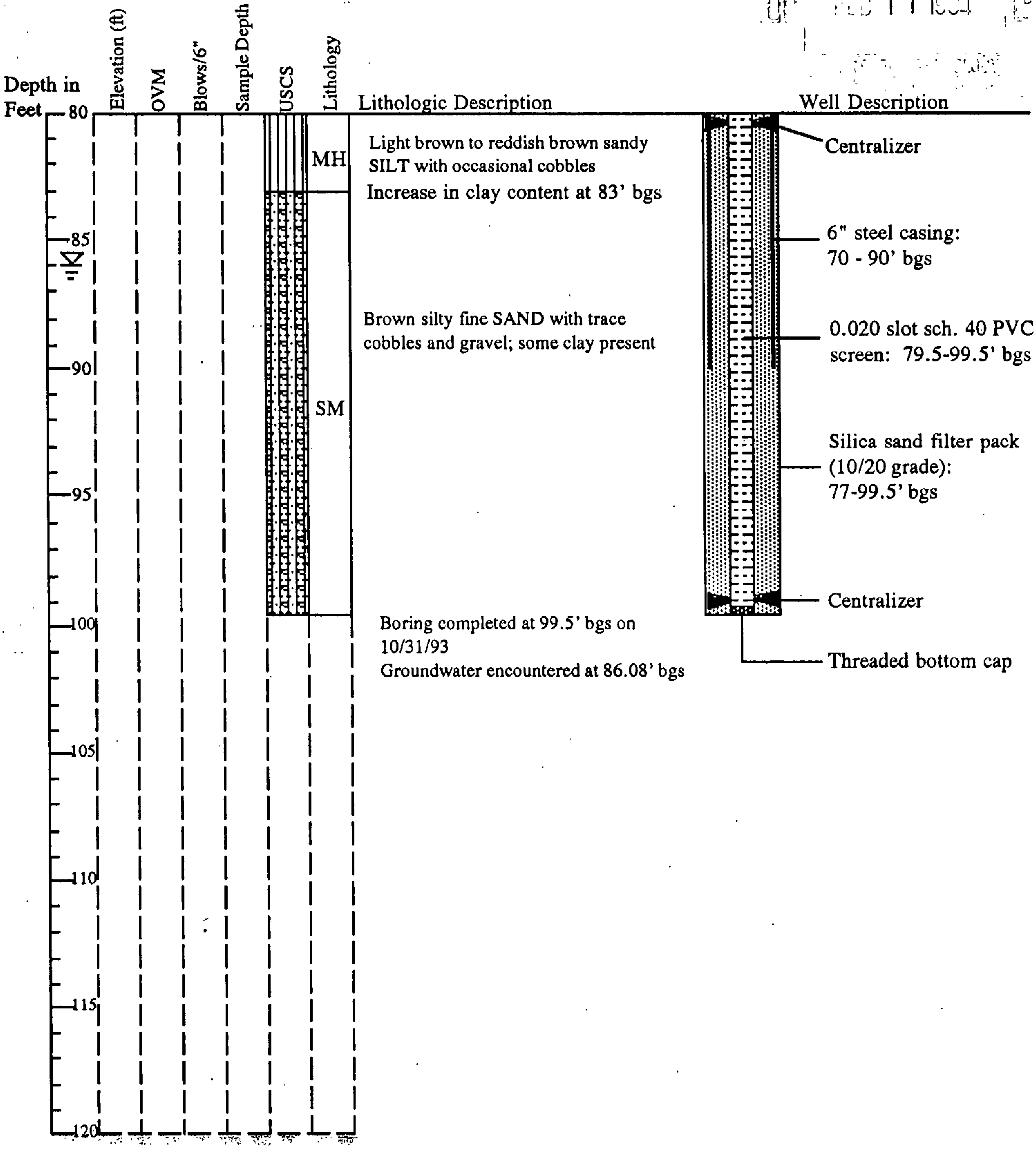


Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/27/93
Hydrogeologist:	IAO	Well Installation Date:	10/31/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9302 (cont'd)

(AAV-527)



Light brown to reddish brown sandy SILT with occasional cobbles

Increase in clay content at 83' bgs

Brown silty fine SAND with trace cobbles and gravel; some clay present

Boring completed at 99.5' bgs on 10/31/93

Groundwater encountered at 86.08' bgs

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/27/93
Hydrogeologist:	IAO	Well Installation Date:	10/31/93

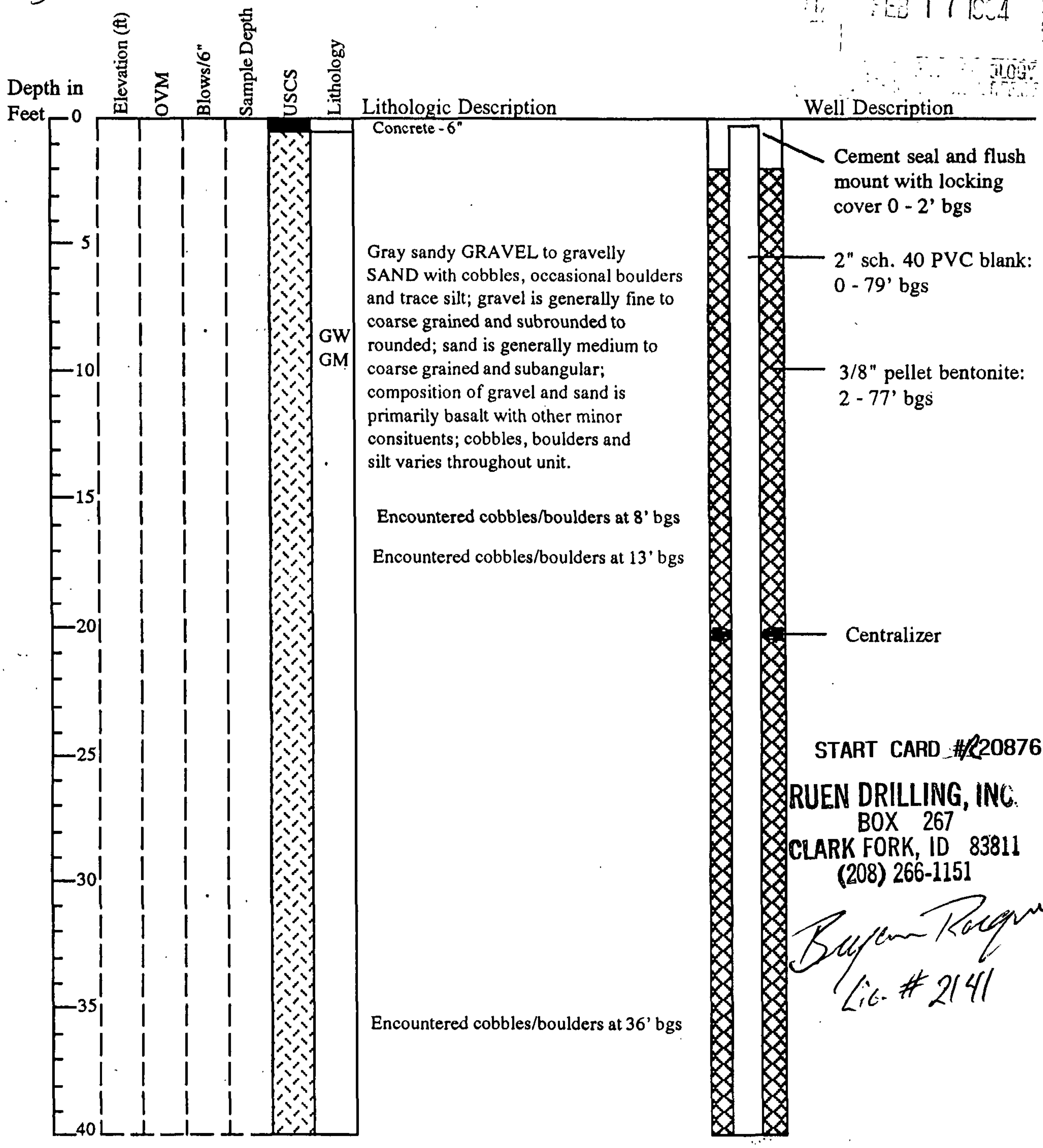
340692

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9303

(AAV-528)

FEB 17 1994



Concrete - 6"

Gray sandy GRAVEL to gravelly SAND with cobbles, occasional boulders and trace silt; gravel is generally fine to coarse grained and subrounded to rounded; sand is generally medium to coarse grained and subangular; composition of gravel and sand is primarily basalt with other minor consituents; cobbles, boulders and silt varies throughout unit.

Encountered cobbles/boulders at 8' bgs

Encountered cobbles/boulders at 13' bgs

Encountered cobbles/boulders at 36' bgs

START CARD #R20876

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

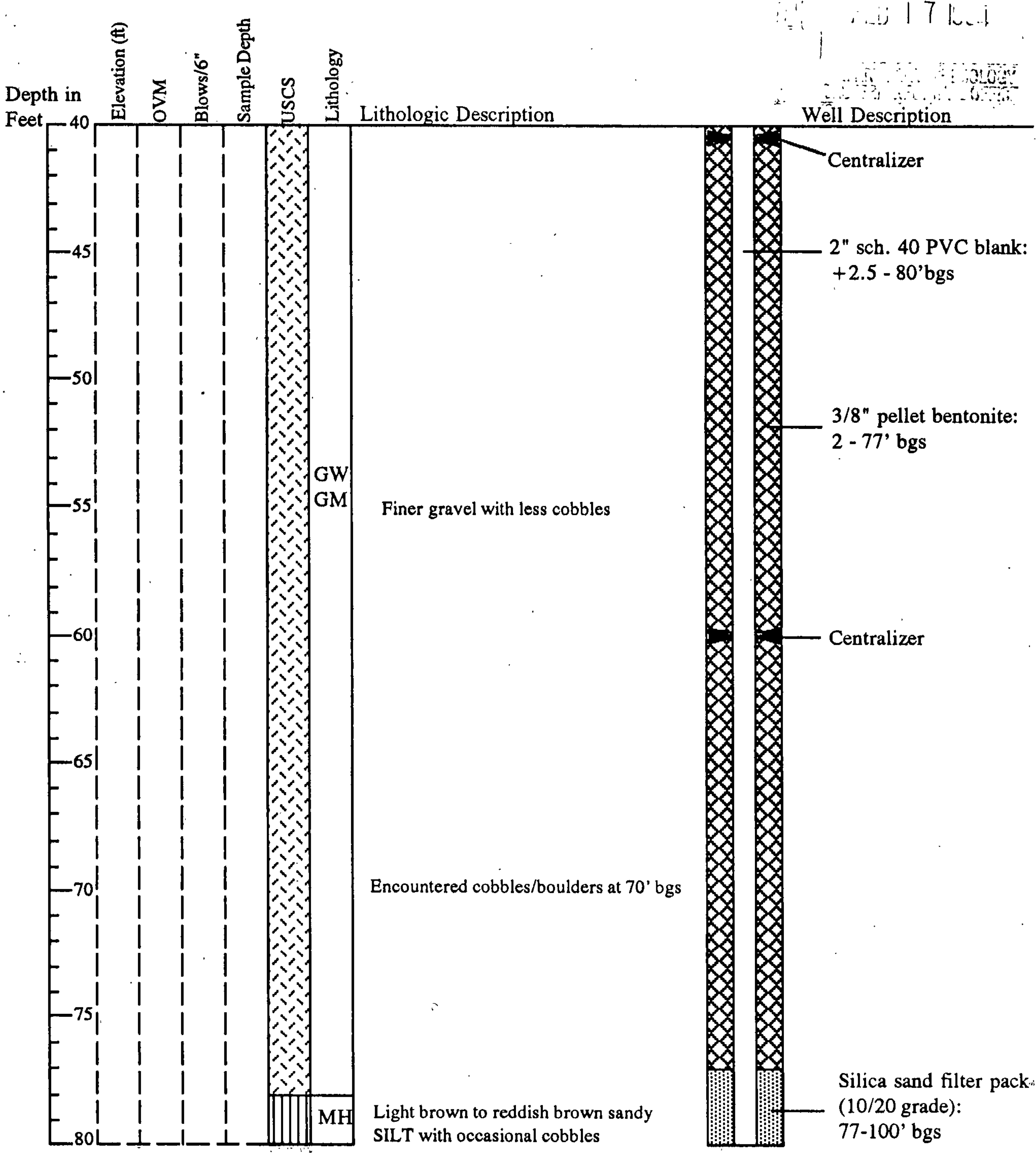
Lic. #2141

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/31/93
Hydrogeologist:	IAO	Well Installation Date:	11/10/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9303 (cont'd)

(AAV-528)

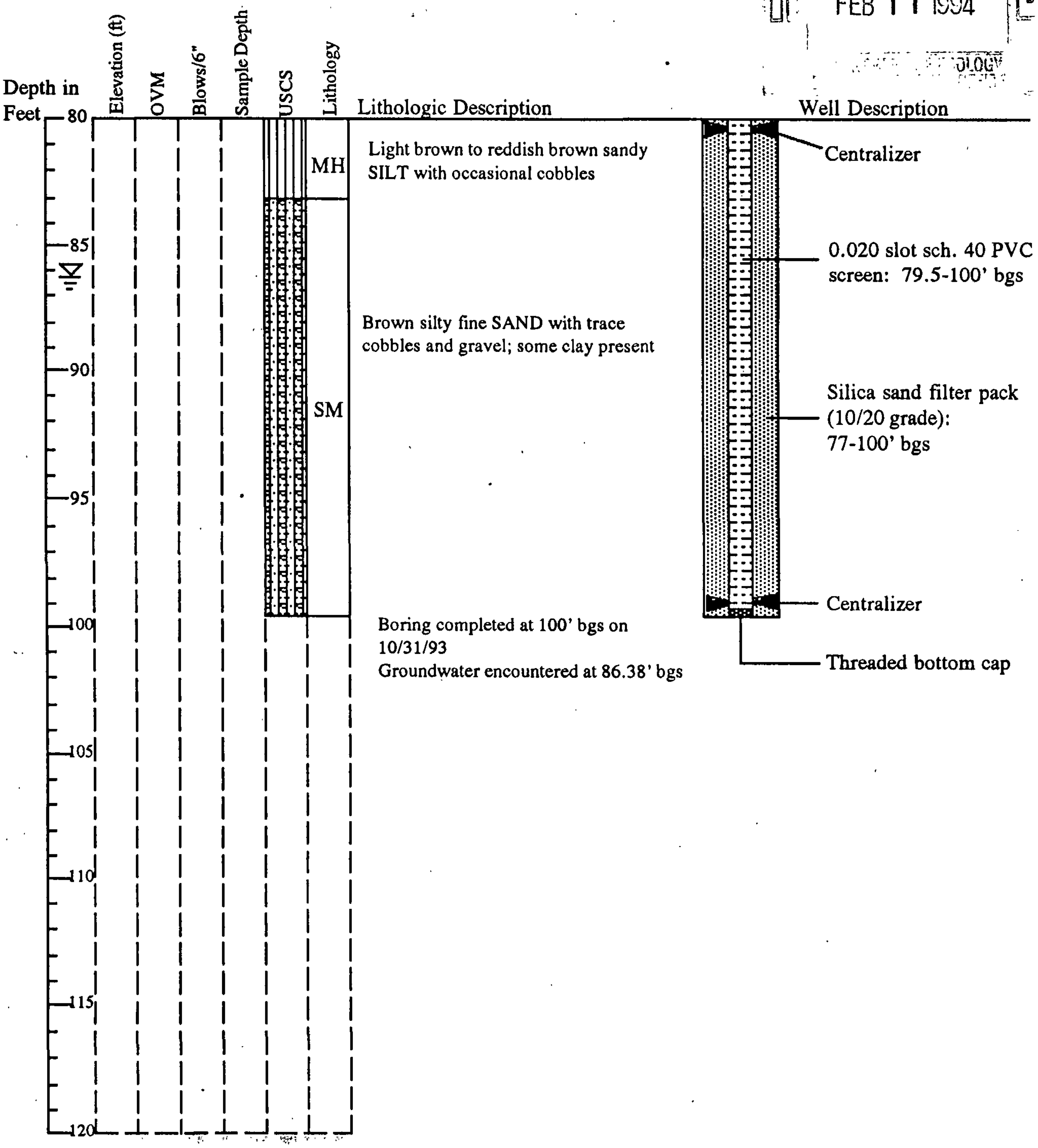


Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/31/93
Hydrogeologist:	IAO	Well Installation Date:	11/10/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9303 (cont'd)

(AAV-528)



Light brown to reddish brown sandy SILT with occasional cobbles

Brown silty fine SAND with trace cobbles and gravel; some clay present

Boring completed at 100' bgs on 10/31/93
Groundwater encountered at 86.38' bgs

0.020 slot sch. 40 PVC screen: 79.5-100' bgs

Silica sand filter pack (10/20 grade): 77-100' bgs

Client Name: Port of Moses Lake/Exxon
Job No.: 931001
Location: Grant County Airport Pumphouse # 1
Hydrogeologist: IAO

Drilling Method: Air Rotary - Tri-cone with 6" casing
Sample Method: Grab samples
Drilling Contractor: Ruen Drilling, Inc.
Drilling Date: 10/31/93
Well Installation Date: 11/10/93

340693

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9301

(AAV-526)

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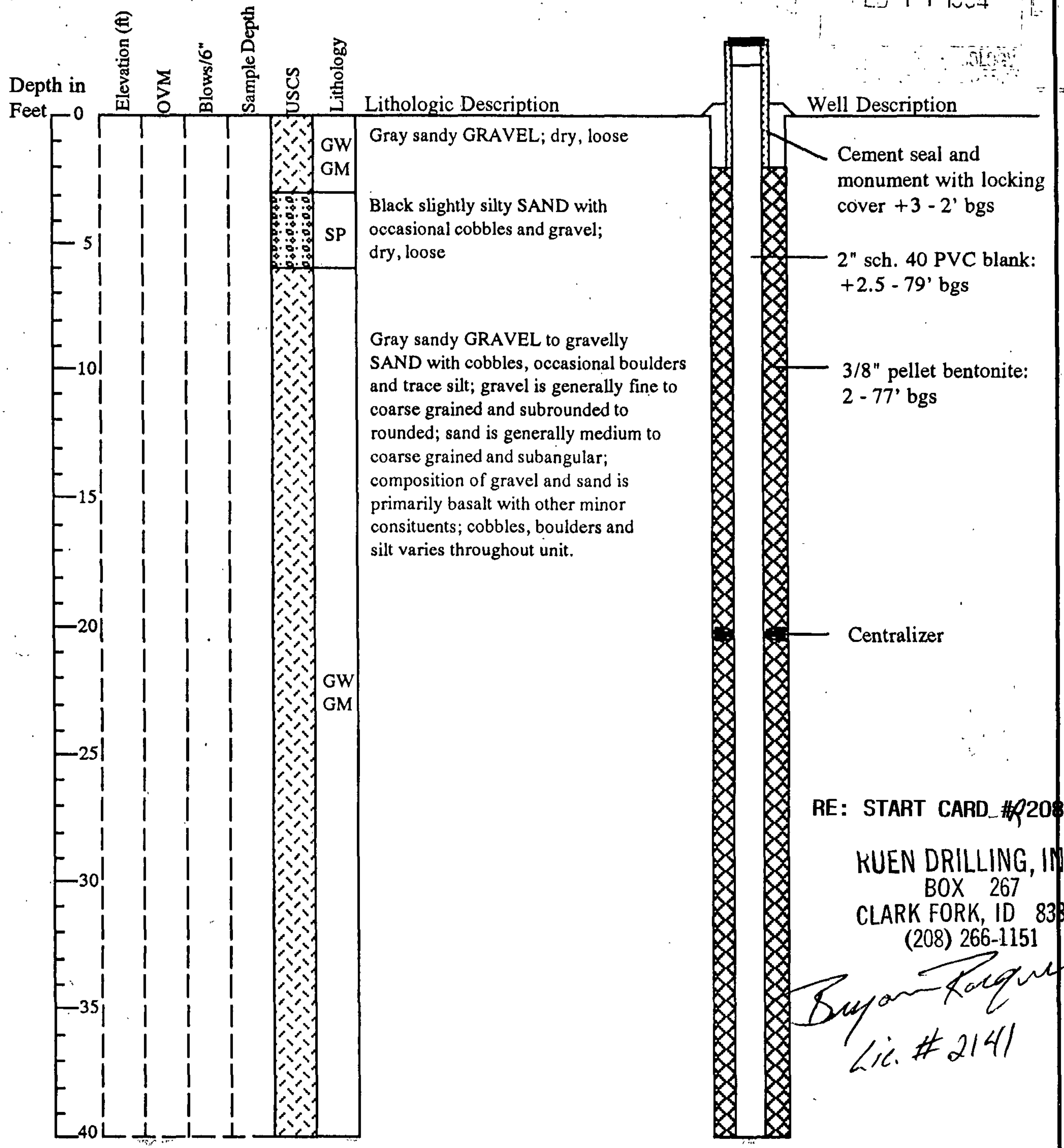
FEB 17 1994



Gray sandy GRAVEL; dry, loose

Black slightly silty SAND with occasional cobbles and gravel; dry, loose

Gray sandy GRAVEL to gravelly SAND with cobbles, occasional boulders and trace silt; gravel is generally fine to coarse grained and subrounded to rounded; sand is generally medium to coarse grained and subangular; composition of gravel and sand is primarily basalt with other minor consituents; cobbles, boulders and silt varies throughout unit.

Cement seal and monument with locking cover +3 - 2' bgs

2" sch. 40 PVC blank: +2.5 - 79' bgs

3/8" pellet bentonite: 2 - 77' bgs

Centralizer

RE: START CARD #R20876

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

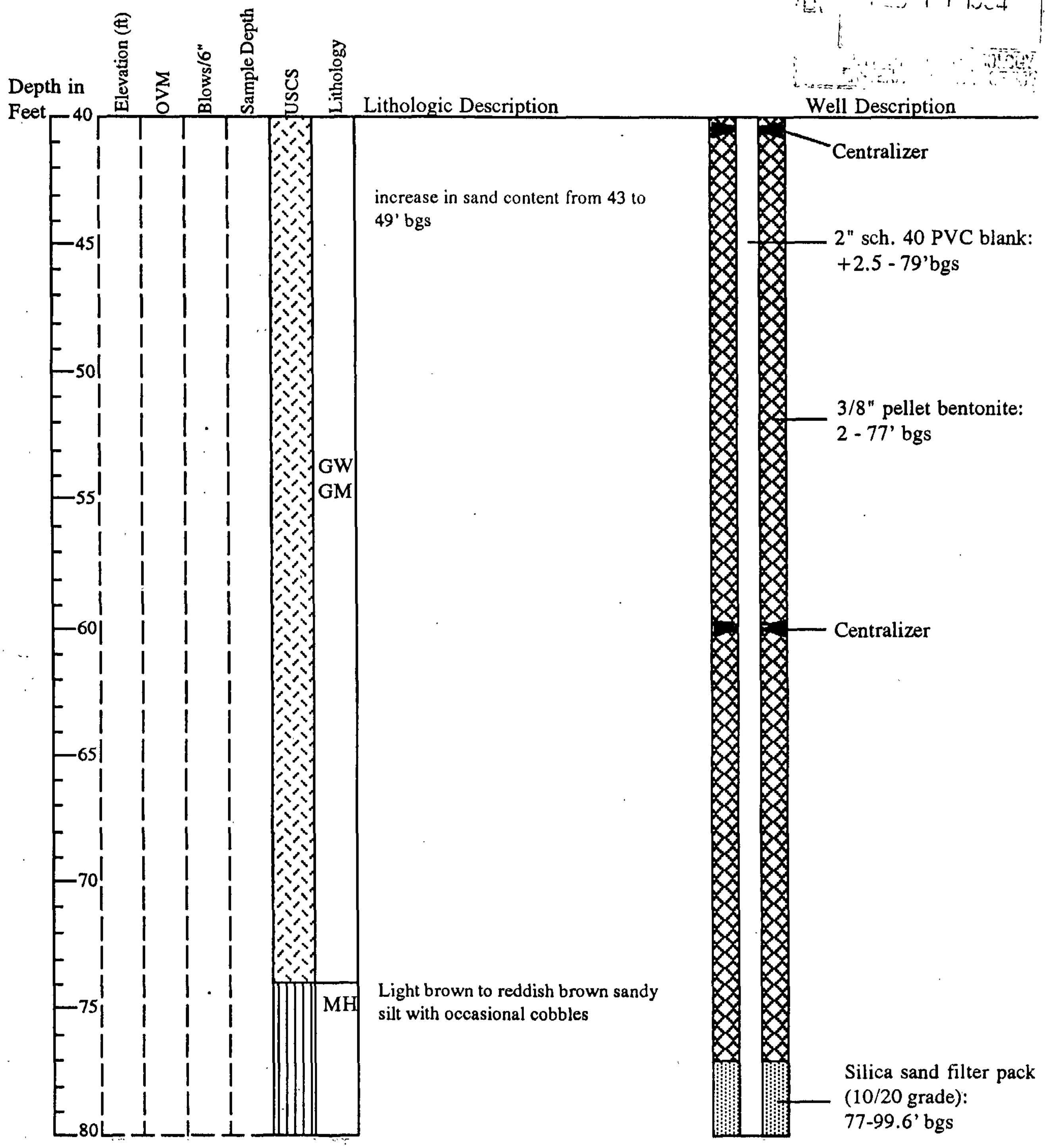
Bryan Rocque
Lic. #2141

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/23/93
Hydrogeologist:	IAO	Well Installation Date:	10/25/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9301 (cont'd)

(AAV-526)

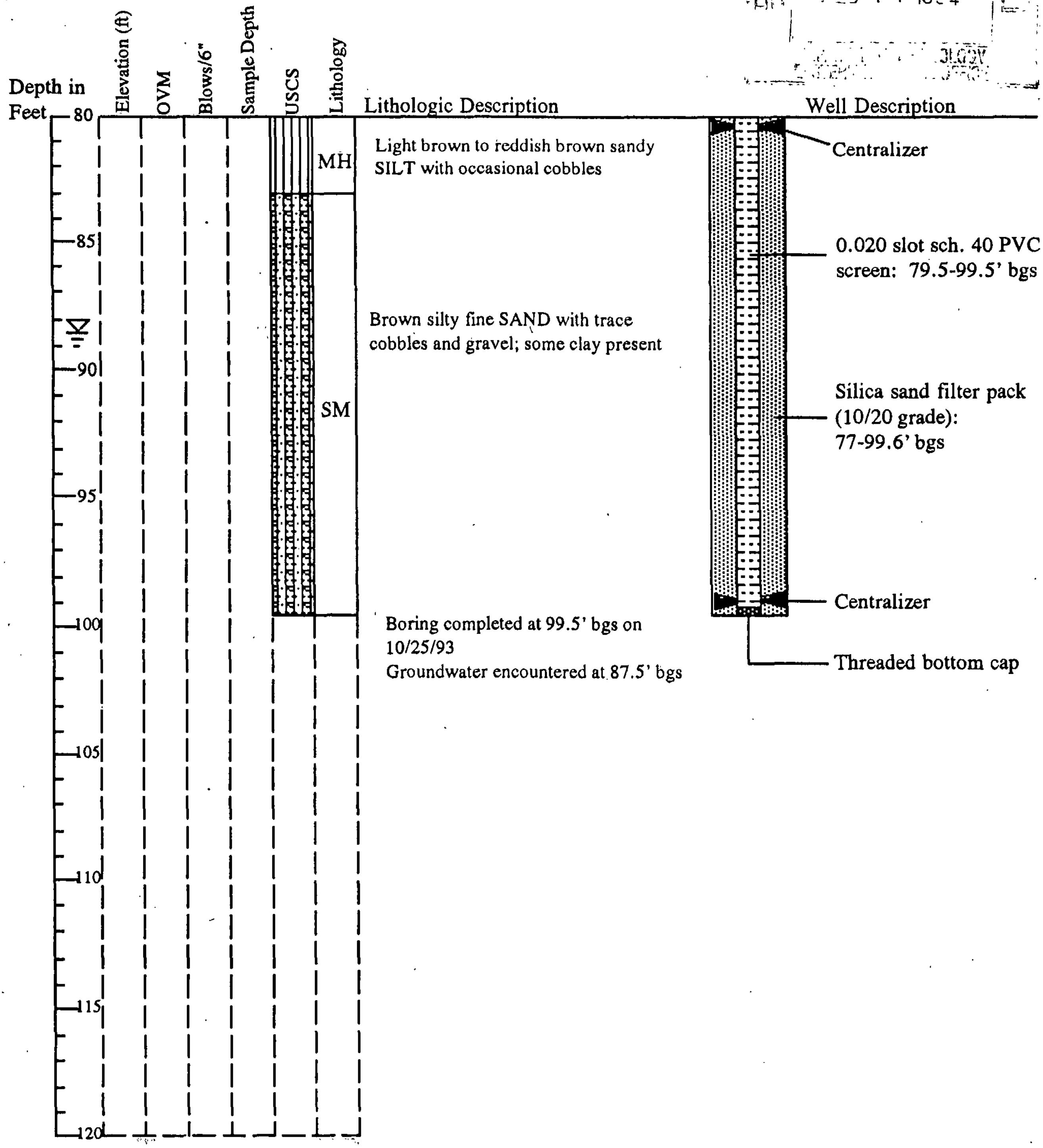


Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/23/93
Hydrogeologist:	IAO	Well Installation Date:	10/25/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9301 (cont'd)

(AAV-526)



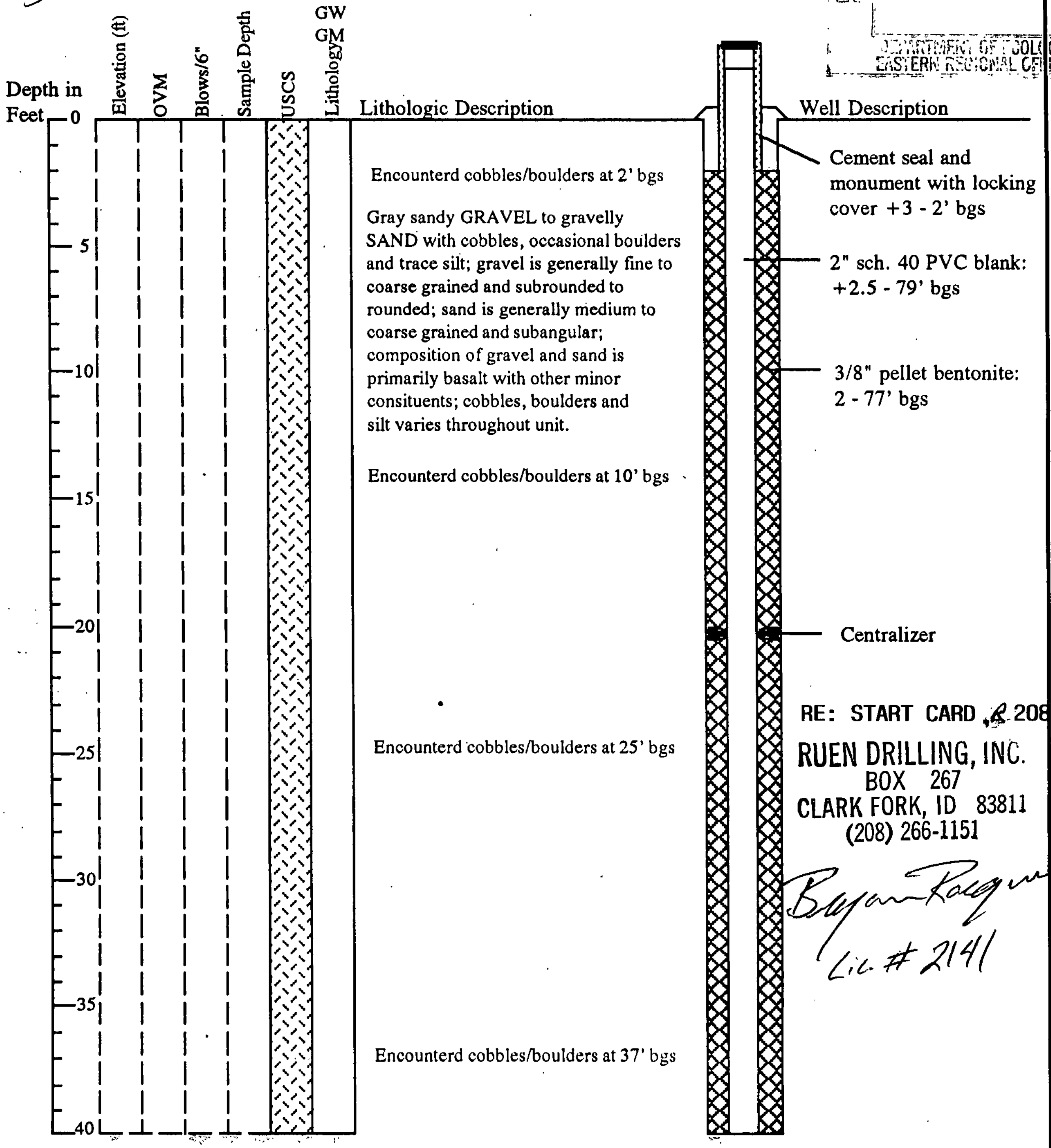
Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	10/23/93
Hydrogeologist:	IAO	Well Installation Date:	10/25/93

340694

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9304

(AAV-529)



Encounterd cobbles/boulders at 2' bgs

Gray sandy GRAVEL to gravelly SAND with cobbles, occasional boulders and trace silt; gravel is generally fine to coarse grained and subrounded to rounded; sand is generally medium to coarse grained and subangular; composition of gravel and sand is primarily basalt with other minor consituents; cobbles, boulders and silt varies throughout unit.

Encounterd cobbles/boulders at 10' bgs

Encounterd cobbles/boulders at 25' bgs

Encounterd cobbles/boulders at 37' bgs

RE: START CARD R 20876
RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

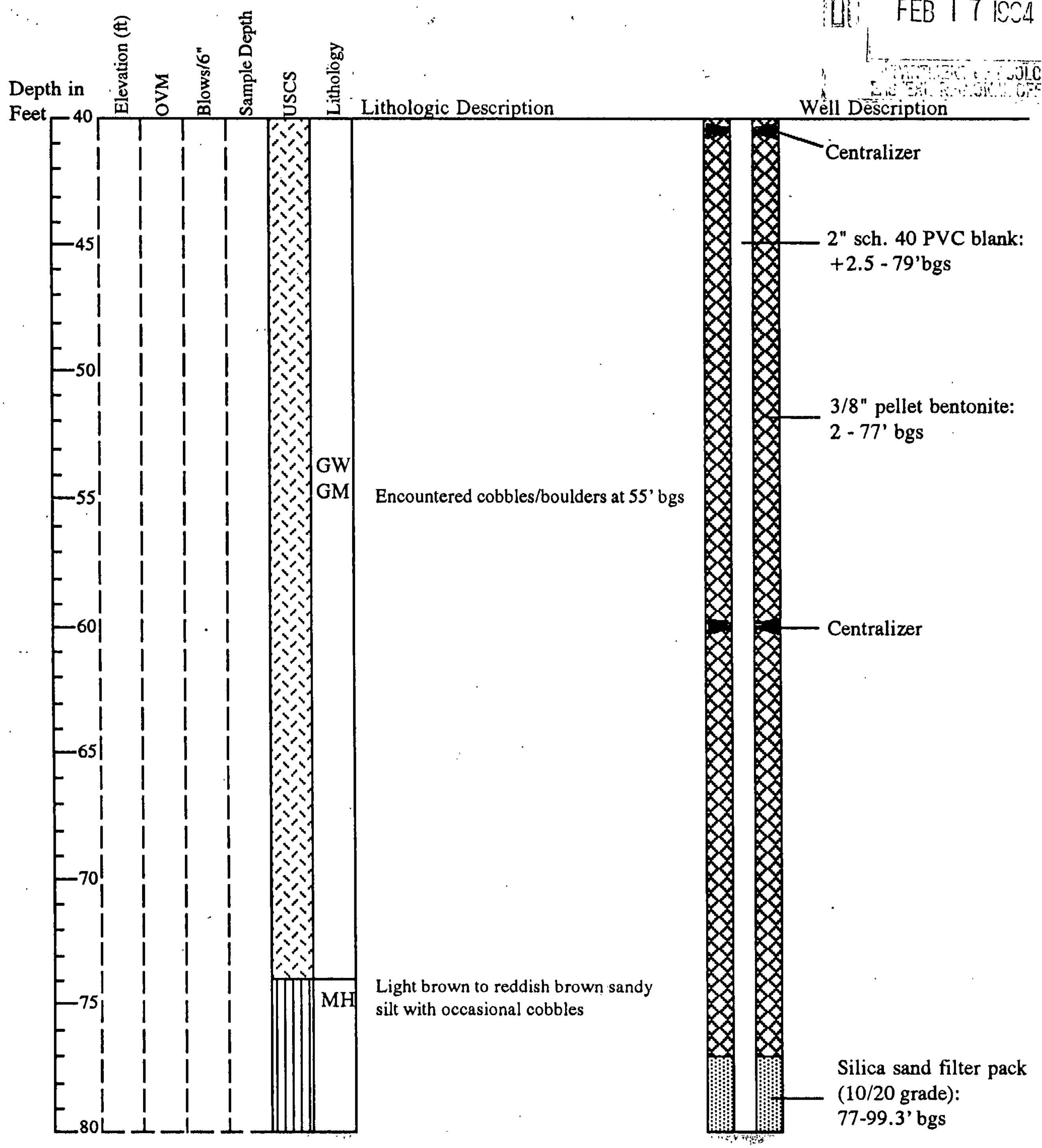
Bryan Racque
Lic. # 2141

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	11/1/93
Hydrogeologist:	IAO	Well Installation Date:	11/11/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9304 (cont'd)

(AAV-529)

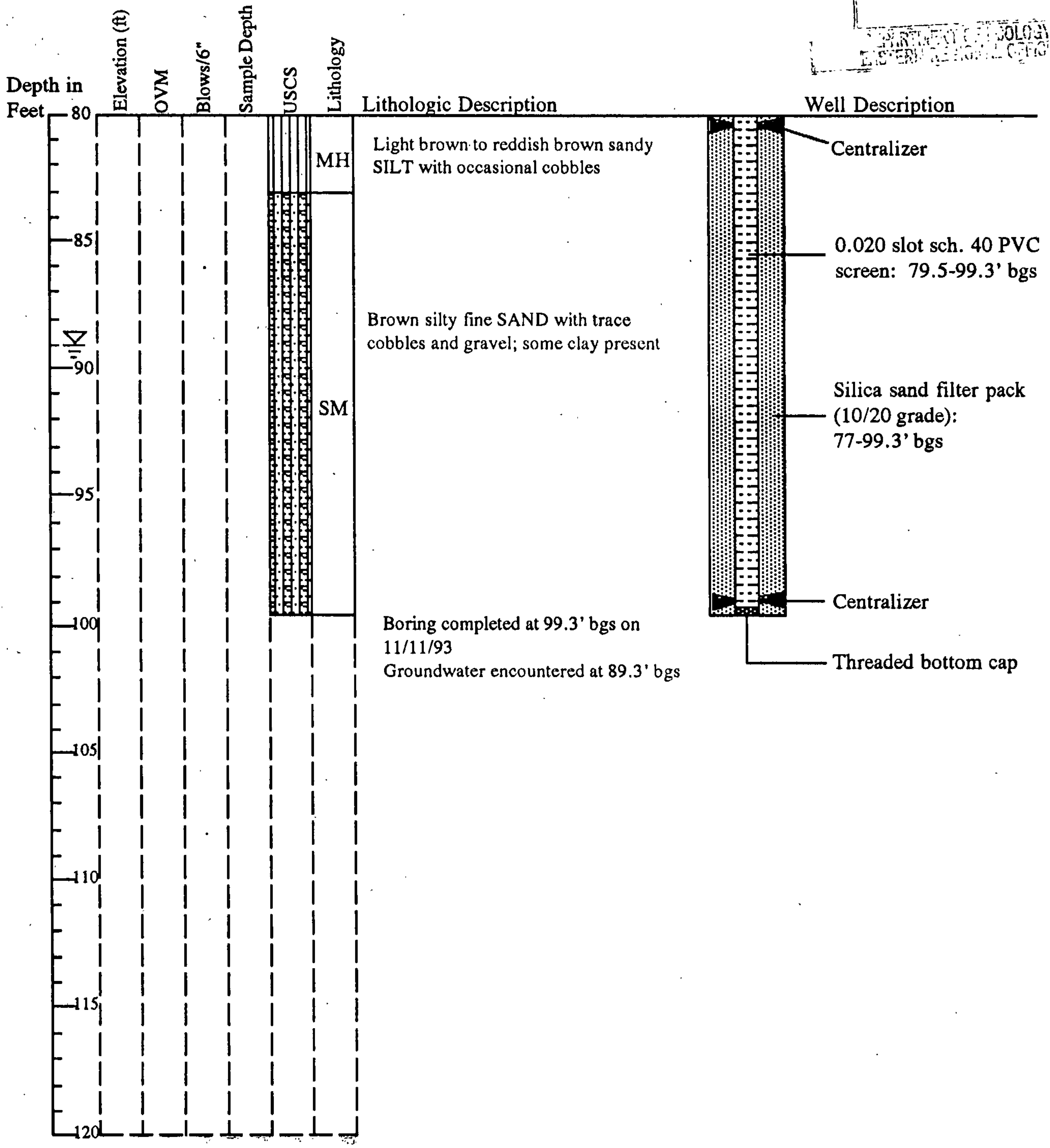


Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	11/1/93
Hydrogeologist:	IAO	Well Installation Date:	11/11/93

Geological Boring Log and Well Construction Diagram

Monitoring Well PH1-9304 (cont'd)

(AAV-529)



Light brown to reddish brown sandy SILT with occasional cobbles

Brown silty fine SAND with trace cobbles and gravel; some clay present

Boring completed at 99.3' bgs on 11/11/93
Groundwater encountered at 89.3' bgs

Centralizer

0.020 slot sch. 40 PVC screen: 79.5-99.3' bgs

Silica sand filter pack (10/20 grade): 77-99.3' bgs

Centralizer

Threaded bottom cap

Client Name:	Port of Moses Lake/Exxon	Drilling Method:	Air Rotary - Tri-cone with 6" casing
Job No.:	931001	Sample Method:	Grab samples
Location:	Grant County Airport Pumphouse # 1	Drilling Contractor:	Ruen Drilling, Inc.
		Drilling Date:	11/1/93
Hydrogeologist:	IAO	Well Installation Date:	11/11/93

BHL 469816

RESOURCE PROTECTION WELL REPORT

CURRENT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

RECEIVED
JUL 16 2012
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Notice of Intent No. RE07013

Construction/Decommission

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner: Port of Moses Lake

Site Address: 7810 Andrews St NE

City: Moses Lake County: 13-Grant

Consulting Firm: Cardno ERI

Location 1/4 NE 1/4 NE Sec 32 Twn 20N R 28E EWM or WWM

Unique Ecology Well ID Tag No. BHL174

Lat/Long (s,t,r still Required) Lat Deg 47 Lat Min/Sec 11/34.76 N

Long Deg -119 Long Min/Sec 18/57.66 W

WELL CONSTRUCTION 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

Tax Parcel No. ______

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Chris Baker

Driller/Trainee Signature Chris Baker

Driller/Trainee License No. 3080

Cased or [✓ Uncased] Diameter 9.625" Static Level 87.7'

If trainee, licensed driller's Signature and License No. ______

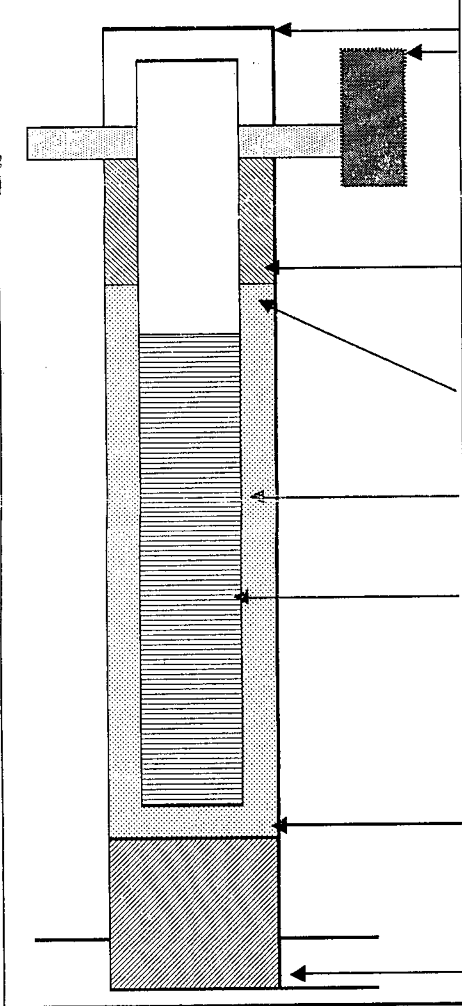
Work/Decommission Start Date 4/30/2012

Work/Decommission End Date 5/9/2012

Construction/Design

Well Data W12-251B

Formation Description



Locking Cap	
Protective Post	
Concrete Surface Seal Depth	0' to 5 FT
Blank Casing (dia x dep)	4" x 70' (+30" riser)
Material	PVC sch. 40
Backfill	5' to 64 FT
Type	Bentonite grout + 20% solids
Seal	3/4" bentonite chips
Material	64' to 67'
Gravel Pack	68' to 101 FT
Material	2/12 silica sand
Screen (dia x dep)	4" x 30'
Slot Size	.010"
Material	PVC
Well Depth	101 FT
Backfill	slough
Material	sand/siltstone
Total Hole Depth	103 FT

0 - 10 FT
sand with gravel and cobbles dark gray, dry,

10 - 30 FT
gray, subrounded to angular gravel, increasing silt

30 - 80 FT
same as above increasing silt

@ 80' angular to rounded, fine to coarse grained sand. Oder,

(@ 100': little or no odor)

80 - 103 FT
sand with gravel + silt, fine to coarse-grained, brown, subangular gravel. Moist and dense silt

Scale 1" = 25'

Page 1 of 4

ECY 050-12 (Rec=v 2/01)

469817

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

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JUL 16 2012
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

CURRENT
Notice of Intent No. RE07013

Construction/Decommission

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number*

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner Port of Moses Lake

Site Address 7810 Andrews St NE

City Moses Lake County 13-Grant

Consulting Firm Cardno ERI

Unique Ecology Well ID Tag No. BHL175

Location 1/4 NE 1/4 NE Sec 32 Twn 20N R 28E EWM or WWM

Lat/Long (s,t,r still Required) Lat Deg 47 Lat Min/Sec 11/35.60 N

Long Deg -119 Long Min/Sec 18/58.00 W

WELL CONSTRUCTION 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.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Chris Baker

Driller/Trainee Signature Chris Baker

Driller/Trainee License No. 3080

If trainee, licensed driller's Signature and License No.

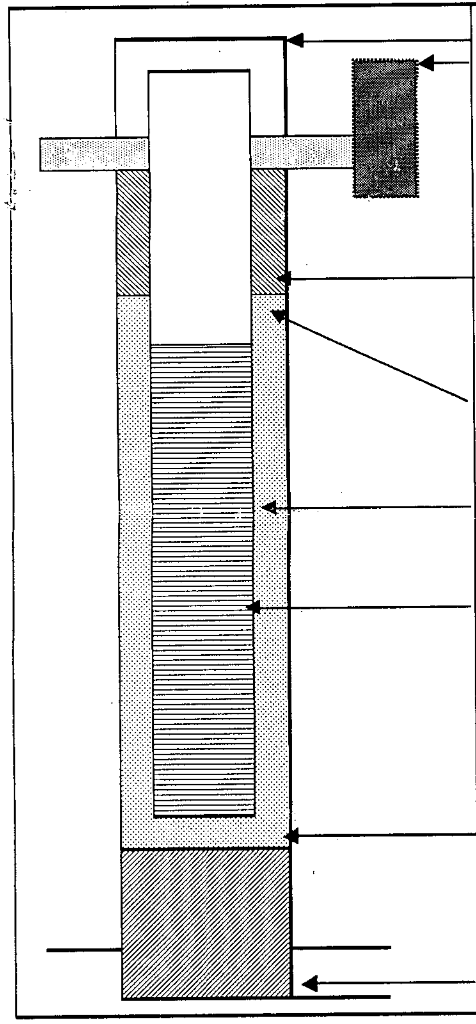
Tax Parcel No.

Cased or Uncased Diameter 9.625" Static Level 87.9'

Work/Decommission Start Date 4/30/2012

Work/Decommission End Date 5/9/2012

Construction/Design



Well Data W12-251B

Locking Cap
Protective Post
Concrete Surface Seal
Depth 0' to 5 FT
Blank Casing (dia x dep) 4" x 80' (+30" riser)
Material PVC sch.40
Backfill 5' to 74 FT
Type bentonite grout
Seal 74' to 77' FT
Material 3/8" bentonite chips
Gravel Pack 77' to 101 FT
Material 2/12 silica sand
Screen (dia x dep) 4" x 20'
Slot Size .020"
Material PVC sch. 40
Well Depth 101 FT
Backfill slough
Material sand and silt
Total Hole Depth 102.5 FT

Formation Description

0 - 30 FT
sand with gravel and cobbles: fine to coarse grained, dark gray, dry, subangular gravel, trace silt

30 - 75 FT
same as above, increasing coarse grained sand, gray silt,

75 - 102.5 FT
silty sand: very fine to fine-grained, brown, damp, silt, clay.

@90' damp to wet.

@100' no gravel.

Scale 1" = 25'

Page 2 of 4

ECY 050-12 (Rev 2/01)

469818

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

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DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

CURRENT
Notice of Intent No. RE07013

Construction/Decommission

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Property Owner Port of Moses Lake

Site Address 7810 Andrews St NE

City Moses Lake County 13-Grant

Location 1/4 NE 1/4 NE Sec 32 Twn 20N R 28E [✓ EWM] or WWM

Lat/Long (s,t,r still Required) Lat Deg 47 Lat Min/Sec 11/35.53N

Long Deg -119 Long Min/Sec 18/58.58 W

Tax Parcel No. ______

Consulting Firm Cardno ERI

Unique Ecology Well ID Tag No. BHL 176

WELL CONSTRUCTION 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

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Chris Baker

Driller/Trainee Signature Chris Baker

Driller/Trainee License No. 3080

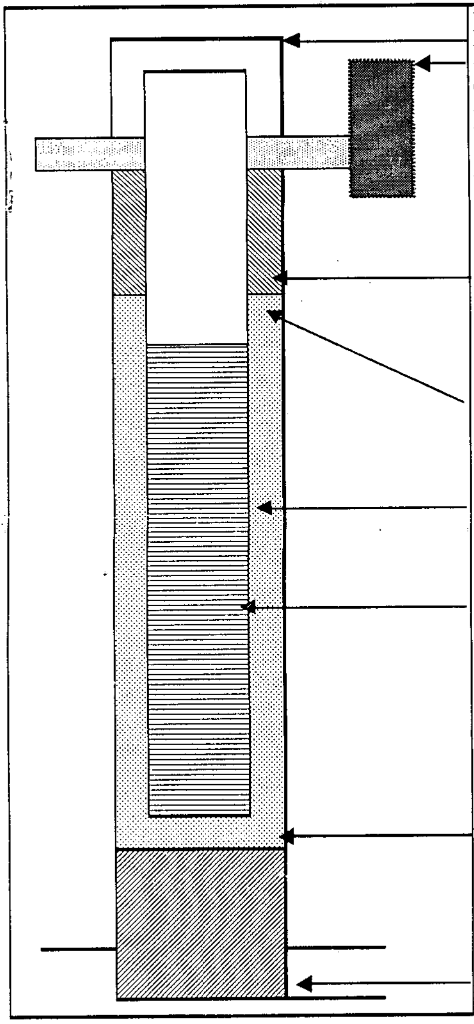
If trainee, licensed driller's Signature and License No. ______

Cased or [✓ Uncased] Diameter 9.625" Static Level 88.2'

Work/Decommission Start Date 4/30/2012

Work/Decommission End Date 5/9/2012

Construction/Design



Well Data W12-251B

Locking Cap

Protective Post

Concrete Surface Seal

Depth 0' to 5 FT

Blank Casing (dia x dep) 4"x 80' (+30" riser)

Material PVC sch.40

Backfill 5' to 74 FT

Type bentonite grout

Seal 3/8" bent chips

Material 74' to 77'

Gravel Pack 77' to 101 FT

Material 2/12 silica sand

Screen (dia x dep) 4"x 20'

Slot Size .020"

Material PVC sch.40

Well Depth 101 FT

Backfill none

Material none

Total Hole Depth 101' FT

Formation Description

0 - 30 FT
sand with gravel and cobbles: fine to very course grained, dark gray, dry, subangular gravels trace silts

30 - 85 FT
same as above, light gray, dry,

85 - 101 FT
silty sand with little gravel: very fine to fine grained, brown, silt, subrounded gravel, trace clay, odo

Scale 1" = 25'

Page 3 of 4

ECY 050-12 (Rec=v 2/01)

469819

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

RECEIVED
JUL 16 2012
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

CURRENT
Notice of Intent No. RE07013

Construction/Decommission
☒ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number*

Type of Well
☒ Resource Protection
☐ Geotechnical Soil Boring

Property Owner Port of Moses Lake
Site Address 7810 Andrews St NE
City Moses Lake County 13-Grant
Location 1/4 NE 1/4 NE Sec 32 Twn 20N R 28E EWM or WWM
Lat/Long (s,t,r still Required) Lat Deg 47 Lat Min/Sec 11/35.53 N
Long Deg -119 Long Min/Sec 18/59.40 W
Tax Parcel No.
Cased or [✓ Uncased] Diameter 9.625" Static Level 87.2'
Work/Decommission Start Date 4/30/2012
Work/Decommission End Date 5/9/2012

Consulting Firm Cardno ERI

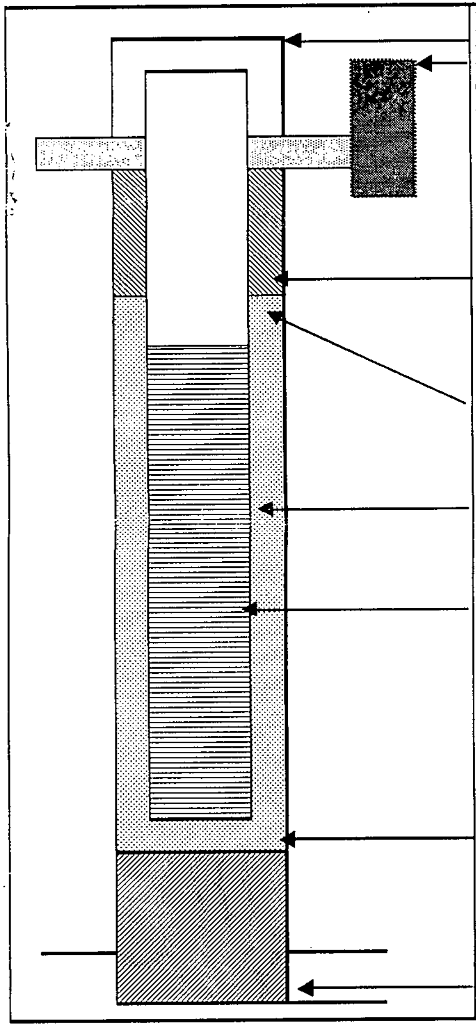
Unique Ecology Well ID Tag No. BHL177

WELL CONSTRUCTION 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

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Chris Baker
Driller/Trainee Signature Chris Baker
Driller/Trainee License No. 3080

If trainee, licensed driller's Signature and License No.

Construction/Design



Well Data W12-251B

Locking Cap
Protective Post
Concrete Surface Seal
Depth 0' to 5 FT
Blank Casing (dia x dep) 4" x 80'
Material PVC sch. 40
Backfill 5' to 74 FT
Type bentonite grout
Seal 71' to 74'
Material 3/8" bentonite chips
Gravel Pack 77' to 101 FT
Material 2/12 silica sand
Screen (dia x dep) 4" x 20'
Slot Size .020"
Material PVC sch. 40
Well Depth 101 FT
Backfill n/a
Material n/a
Total Hole Depth 101 FT

Formation Description

0 - 30 FT
sand with gravel and cobbles; fine to coarse grained, dark gray, dry, subangular gravel.

30 - 77 FT
same as above, increasing silt, dark gray, and dry.

77 - 101 FT
silty sand with gravel: very fine to fine grained, brown, silt, subrounded gravel, trace clay, odor. (5% clay, 20% silt, 65% sand, 5% gravel)

@ 85' wet, odor.

@ 98': Hard to penetrate by drilling

@ 100' less odor.

Scale 1" = 05'

Page 4 of 4

ECY 050-12 (Rec=v 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

DEPARTMENT OF ECOLOGY
State of Washington

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number ____________

CURRENT

Notice of Intent No. WE23419

Unique Ecology Well ID Tag No. **BIB 315**

Water Right Permit No. ____________

Property Owner Name **City Of Moses Lake**

Well Street Address **8213 Randolph Rd NE**

City Moses Lake County Grant

Location NW1/4-1/4 **SW**1/4 Sec **27** Twn **20n** R **28** EWM ☒ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long

Lat Deg _____ Lat Min/Sec _____

Long Deg _____ Long Min/Sec _____

Tax parcel No. (Required) **12-0682-301**

PROPOSED USE: ☐ Domestic ☐ Industrial ☒ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ____________

TYPE OF WORK: Owner's number of well (if more than one) _____

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven

☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well **20** inches, drilled **70.5** ft.

Depth of completed well **72** ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded **20**" Diam. from **+1.5** ft. to **37.5** ft.

☐ Liner installed _____" Diam. from _____ ft. to _____ ft.

☐ Threaded _____" Diam. From _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used ____________

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☒ Yes ☐ No ☐ K-Pac Location ____________

Manufacturer's Name **Alloy Machine Works**

Type **S.S** Model No. **Pipe Size**

Diam. **18"** Slot size **.100** from **39.2** ft. to **60.4** ft.

Diam. **18"** Slot size **sump** from **60.4** ft. to **70.5** ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? **18** ft.

Material used in seal **Bentonite Chips**

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ____________ Depth of strata ____________

Method of sealing strata off ____________

PUMP: Manufacturer's Name ____________

Type: ____________ H.P. ____________

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level **35.9** ft. below top of well Date **3-31-16**

Artesian pressure _____ lbs. per square inch Date ____________

Artesian water is controlled by ____________ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom? **TP@D**

Yield: **1020** gal./min. with **.42** ft. drawdown after **2.5** hrs.

Yield: **1515** gal./min. with **1.35** ft. drawdown after **3** hrs.

Yield: **1930** gal./min. with **2** 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
1min	**38.53**				

Date of test **6-9-16**

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 **58** Was a chemical analysis made? ☒ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Fine silty topsoil.	**0**	**1**
Course gravels and cobbles.	**1**	**8**
Grey brown clayey course gravel, cobbles.	**8**	**21**
Boulder	**21**	**24**
Medium to course gravel, cobbles.	**24**	**41**
Looser medium to course sand and gravels,	**41**	**50**
some visicular basalt gravel with light brown		
silt.		
Wet medium to course gravel, cobbles.	**50**	**57**
Grey brown weathered basalt.	**57**	**63**
Fractured grey basalt, oxidized	**63**	**70.5**

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JUN 20 2016
Department of Ecology
Eastern Washington Office

Start Date **3-22-16** Completed Date **4-7-16**

WELL CONSTRUCTION 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.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) **MattCall**

Driller/Engineer/Trainee Signature

Driller or trainee License No. **2467**

IF TRAINEE: Driller's License No:

Driller's Signature: Matt Call

Drilling Company **Tacoma Pump @ Drilling**

Address **30316 Mountain Hwy**

City, State, Zip **Graham** , **Wa, 98338**

Contractor's Registration No. **TACOMPD203PF** Date **6-16-16**

ECY 050-1-20 (Rev 02-2010) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

DEPARTMENT OF
ECOLOGY
State of Washington

Resource Protection Well Report

Submit one well report per well installed. See page two for instructions.

Type of Work:
☒ Construction
☐ Decommission ⇨ Original NOI No. ________
Ecology Well ID Tag No. BWU-808
Site Well Name MW-1
Consulting Firm ________
Was a variance approved for this well/boring? ☐ Yes ☒ No
If yes, what was the variance for? ________

RECEIVED
JUN 07 2021
Department of Ecology
Eastern Washington Office

Notice of Intent No. RE20652
Type of Well:
☒ Resource Protection Well ☐ Injection Point
☐ Remediation Well ☐ Grounding Well
☐ Geotechnical Soil Boring ☐ Ground Source Heat Pump
☐ Environmental Boring ☐ Other ________
↳ ☐ Soil- ☐ Vapor- ☐ Water-sampling
Property Owner Port of Moses Lake
Well Street Address Grant County airport
City Moses Lake County Grant
Tax Parcel No. ________
Location (see instructions): WWM ☐ or EWM ☒
SE ¼-¼ NE ¼, Section 21 Town 20N. Range 28
Latitude (Example: 47.12345) ________
Longitude (Example: -120.12345) ________
(WGS 84 Coordinate System)
Borehole diameter 8 inches Casing diameter 2'' inches
Static water level ____ ft below top of casing Date ____
☐ Above-ground completion with bollards ☐ Flush monument
↳ Stick-up of top of well casing ____ ft above ground surface
Start Date 3/8/21 Completed Date 3/9/21.

WELL CONSTRUCTION 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 are true to my best knowledge and belief.

☒ Driller ☐ Trainee ☐ Engineer
Name (Print Last, First Name) Gregory Lawrence
Driller/Engineer/Trainee Signature Lawrence Gregory
License No. 1973
Company Name Gregory Drilling
If trainee box is checked, sponsor's license number: ________
Sponsor's signature ________

Construction Design	Well Data	Driller's Log
Surface Completion: 8' monument (TYPE / SIZE) Well Diameter / Type: 2" pvc, Sch40 Riser 40-+2 ____ Top of Transition Seal 20 Top of Sand 40' Top Of Screen Screen 50-40 020 Screen Slot Size 50' Bottom of Screen	Surface Completion: Concrete, 0' to 3' Surface Seal: 3/4 Bentonite Chip, 3 to 20 Transition Seal: N/A, ____ to ____ Filter Pack: 12-20, 20 to 50	0' to 40' Brown sandy silt with cobbles. 40' to 60' Gravels with cobbles. 60' to 70' silty clay with cobbles.

ECY050-12 (07/2018) *To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.*

DEPARTMENT OF
ECOLOGY
State of Washington

Resource Protection Well Report

Submit one well report per well installed. See page two for instructions.

Type of Work:
☒ Construction
☐ Decommission ⇨ Original NOI No. ______
Ecology Well ID Tag No. BWU-[illegible]C08
Site Well Name MW-1
Consulting Firm ______
Was a variance approved for this well/boring? ☐ Yes ☒ No
If yes, what was the variance for? ______

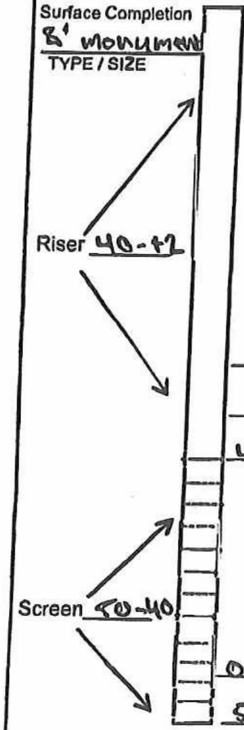
Notice of Intent No. RE20652
Type of Well:
☒ Resource Protection Well ☐ Injection Point
☐ Remediation Well ☐ Grounding Well
☐ Geotechnical Soil Boring ☐ Ground Source Heat Pump
☐ Environmental Boring ☐ Other ______
↳ ☐ Soil- ☐ Vapor- ☐ Water-sampling
Property Owner Port of Moses Lake
Well Street Address Grant County Airport
City Moses Lake County Grant
Tax Parcel No. N/A
Location (see instructions): WWM ☐ or EWM ☒
NE ¼-¼ SE ¼, Section 21 Town 20 Range 28
Latitude (Example: 47.12345) ______
Longitude (Example: -120.12345) ______
(WGS 84 Coordinate System)
Borehole diameter 8 inches Casing diameter 2'' inches
Static water level N/A ft below top of casing Date ______
☐ Above-ground completion with bollards ☐ Flush monument
↳ Stick-up of top of well casing ______ ft above ground surface
Start Date 3/9/21 Completed Date 3/9/21

WELL CONSTRUCTION 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 are true to my best knowledge and belief.

☒ Driller ☐ Trainee ☐ Engineer
Name (Print Last, First Name) Chad N Gregory
Driller/Engineer/Trainee Signature Chad N Gregory
License No. 2369
Company Name Gregory Drilling Inc

If trainee box is checked, sponsor's license number: ______
Sponsor's signature ______

Construction Design	Well Data	Driller's Log
Surface Completion 8' monument TYPE / SIZE Well Diameter / Type 2" pvc, Sch 40 Riser 40-+2 ______ Top of Transition Seal 20 Top of Sand 40' Top Of Screen Screen 50-40 .020 Screen Slot Size 50' Bottom of Screen	Surface Completion Con. crete 0' to 3' Surface Seal 3/4 Bentonite chip 3 to 20 Transition Seal n/a ______ to ______ Filter Pack 12-20 20 to 50	0' to 40' Brown sandy silts with cobbles. 40' to 60' Gravels with cobbles. 60' to 70' silty clay with cobbles.



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RECEIVED
OCT 28 2021
Dept of Ecology
Central Regional Office

DEPARTMENT OF ECOLOGY
State of Washington

Resource Protection Well Report

Submit one well report per well installed. See page two for instructions.

Type of Work:

☒ Construction
☐ Decommission ⇨ Original NOI No. ______

Ecology Well ID Tag No. BPA-280

Site Well Name 22-BW-01

Consulting Firm Jacobs

Was a variance approved for this well/boring? ☐ Yes ☐ No

If yes, what was the variance for? ______

WELL CONSTRUCTION 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 are true to my best knowledge and belief.

☒ Driller ☐ Trainee ☐ Engineer

Name (Print Last, First Name) Rider, Dan

Driller/Engineer/Trainee Signature Dan Rider

License No. 3223

Company Name Anderson Environmental Contracting LLC

If trainee box is checked, sponsor's license number: ______

Sponsor's signature ______

Notice of Intent No. RE23232

Type of Well:

☒ Resource Protection Well ☐ Injection Point
☐ Remediation Well ☐ Grounding Well
☐ Geotechnical Soil Boring ☐ Ground Source Heat Pump
☐ Environmental Boring ☐ Other ______
↳ ☐ Soil- ☐ Vapor- ☐ Water-sampling

Property Owner City of Moses Lake

Well Street Address 66691 Randolph Rd NE

City Moses Lake County Grant

Tax Parcel No. ______

Location (see instructions): WWM ☐ or EWM ☒

NW ¼-¼ NW ¼, Section 34 Town 20N Range 28E

Latitude (Example: 47.12345) ______

Longitude (Example: -120.12345) ______

(WGS 84 Coordinate System)

Borehole diameter 8 inches Casing diameter 4 inches

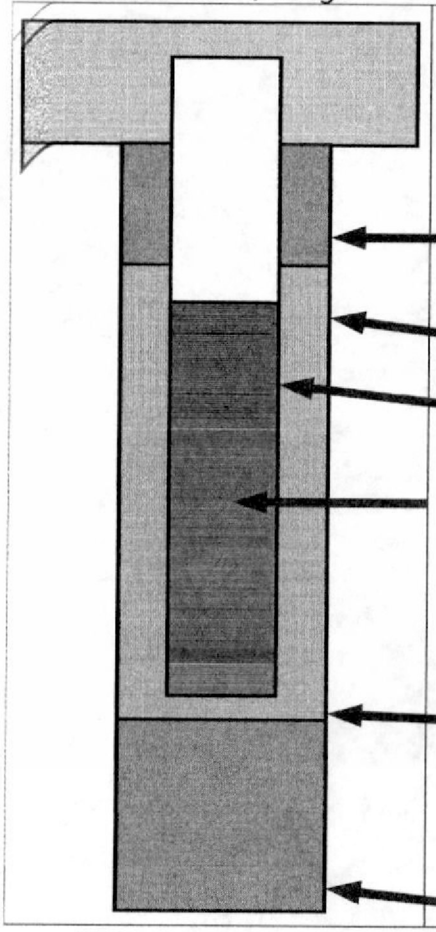
Static water level 60 ft below top of casing Date 7-21-2022

☒ Above-ground completion with bollards ☐ Flush monument

↳ Stick-up of top of well casing 3 ft above ground surface

Start Date 7-21-2022 Completed Date 7-22-2022

Construction/Design



Well Data

Concrete Surface Seal Depth	3	FT
Blank Casing (dia x dep)	4" x 97"	
Material	PVC	
Backfill		FT
Type	Chips	
Seal	88	FT
Gravel Pack	19.5	FT
Material	Sand	
Screen (dia x dep)	4" x 10"	
Slot Size	.001	
Material	PVC	
Well Depth	107	FT
Backfill	13	
Material	Chips	
Total Hole Depth	120	FT

Formation Description

0-60 FT

Dry, Sand, Gravel and cobbles

60-120 FT

weathered Basalt

RECEIVED
JAN 27 2023
Department of Ecology
Eastern Washington Office

Space Reserved for Ecology Stamp of Receipt

ECY050-12 (07/2018) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

The Department of Ecology does NOT warranty the Data and/or information on this well report.

DEPARTMENT OF
ECOLOGY
State of Washington

Resource Protection Well Report

Submit one well report per well installed. See page two for instructions.

Type of Work:

☒ Construction
☐ Decommission ⇨ Original NOI No. ____

Ecology Well ID Tag No. BPA-270

Site Well Name 22-BW-02

Consulting Firm Jacobs

Was a variance approved for this well/boring? ☐ Yes ☐ No

If yes, what was the variance for? ____

WELL CONSTRUCTION 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 are true to my best knowledge and belief.

☒ Driller ☐ Trainee ☐ Engineer

Name (Print Last, First Name) Rider, Dan

Driller/Engineer/Trainee Signature Dan Rider

License No. 3223

Company Name Anderson Environmental Contracting LLC

If trainee box is checked, sponsor's license number: ____

Sponsor's signature ____

Notice of Intent No. RE23232

Type of Well:

☒ Resource Protection Well ☐ Injection Point
☐ Remediation Well ☐ Grounding Well
☐ Geotechnical Soil Boring ☐ Ground Source Heat Pump
☐ Environmental Boring ☐ Other ____
↳ ☐ Soil- ☐ Vapor- ☐ Water-sampling

Property Owner City of Moses Lake

Well Street Address 66691 Randolph Rd NE

City Moses Lake County Grant

Tax Parcel No. ____

Location (see instructions): WWM ☐ or EWM ☒

NW ¼-¼ NW ¼, Section 34 Town 20N Range 28E

Latitude (Example: 47.12345) ____

Longitude (Example: -120.12345) ____

(WGS 84 Coordinate System)

Borehole diameter 8 inches Casing diameter 4 inches

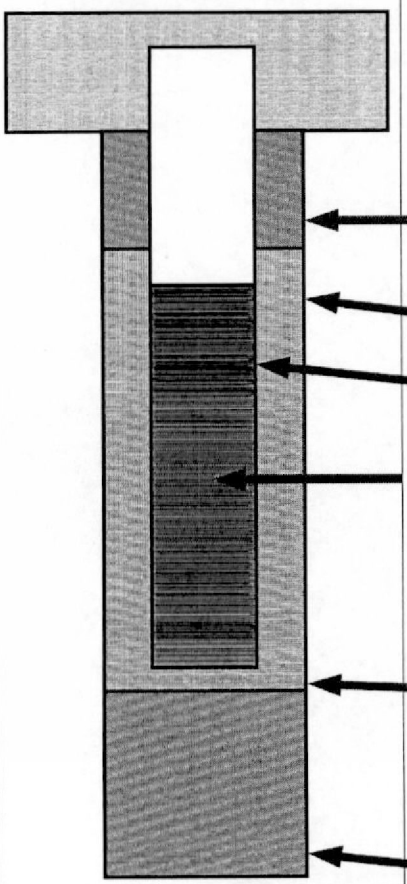
Static water level 65 ft below top of casing Date 7-22-2022

☐ Above-ground completion with bollards ☒ Flush monument

↳ Stick-up of top of well casing 3 ft above ground surface

Start Date 7-22-2022 Completed Date 7-24-2022

Construction/Design



Well Data

Concrete Surface Seal Depth 3 FT

Blank Casing (dia x dep) 4" x 105"

Material PVC

Backfill ____ FT

Type Chips

Seal 97 FT

Gravel Pack 20.5 FT

Material Sand

Screen (dia x dep) 4" x 10"

Slot Size .001

Material PVC

Well Depth 115 FT

Backfill 10

Material Chips

Total Hole Depth 125 FT

Formation Description

0-60 FT

Dry, Sand, Gravel and cobbles

60-125 FT

weathered Basalt

RECEIVED

____ FT

JAN 27 2023

Department of Ecology
Eastern Washington Office

Space Reserved for Ecology Stamp of Receipt

ECY050-12 (07/2018) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

APPENDIX D

Waste Documentation

CASE OF EMERGENCY CALL 1-800-424-9300 Contract# 7619 ***

NON-HAZARDOUS WASTE MANIFEST

print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. W A D 9 8 8 4 9 6 1 5 4

Manifest Document No. 3 7 3 9 1

2. Page 1 1

BOBBY THOMPSON

Site Address
PORT OF MOSES LAKE
7810 ANDREWS ST NE
MOSES LAKE, WA 98837
156704

3. Generator's Name and Mailing Address
CARDNO ERI
801 2ND AVE, STE 700
SEATTLE, WA 98104
(206) 510-5855

4. Generator's Phone ( )

5. Transporter 1 Company Name EMERALD SERVICES, INC.

6. US EPA ID Number W A D 0 5 8 3 6 4 6 4 7

A. State Transporter's ID (206) 832-3000

B. Transporter 1 Phone

7. Transporter 2 Company Name

8. US EPA ID Number

C. State Transporter's ID

D. Transporter 2 Phone

9. Designated Facility Name and Site Address
EMERALD SERVICES INC - AIRPORT WAY
1500 AIRPORT WAY S.
SEATTLE, WA 98134

US EPA ID Number W A D 0 5 8 3 6 7 1 5 2

E. State Facility's ID

F. Facility's Phone (206) 832-3090

11. WASTE DESCRIPTION	12. Containers No.	Type	13. Total Quantity	14. Unit Wt./Vol.
a. UN1993, Flammable liquids, n.o.s. (weathered, leaded gasoline and water), 3, PGII, ERG#128	3	DM	165	G
b.				
c.				
d.				

G. Additional Descriptions for Materials Listed Above
1)G02903 Fuel for Re-Use (Leaded Gasoline and Water)- Flashpoin

H. Handling Codes for Wastes Listed Above
1)NA

15. Special Handling Instructions and Additional Information
I certify that this material is not regulated nor mixed with waste regulated as a Dangerous waste under WAC173-303,40CFR261or40CFR761. All used oil meets the definition under WAC173-303-515&40CFR279. Generator agrees to indemnify and hold harmless Emerald Services or its subsidiary for any damages, costs, attorneys and expert fees arising from or related to the above certification.

GENERATOR

16. **GENERATOR'S CERTIFICATION:** I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

Printed/Typed Name Robert Thompson for EMES
Signature
Date Month 4 Day 28 Year 16

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name LEE HOFF
Signature Lee Hoff
Date Month 4 Day 28 Year 16

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name
Signature
Date Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in item 19.

Printed/Typed Name [illegible] Pedroza
Signature
Date Month 4 Day 28 Year 16

NON-HAZARDOUS WASTE

APPENDIX E

Stantec's *Sampling and Analysis Plan*

Stantec

Stantec Consulting Services Inc.
1687 114th Avenue Southeast, Suite 100
Bellevue, WA 98004

November 22, 2024
File:	203723678.SAP24

Kristin Beck
Washington State Department of Ecology
Eastern Regional Office
4601 North Monroe Street
Spokane, Washington 99205-1295
kbec461@ecy.wa.gov

Reference: Sampling and Analysis Plan
Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Ecology Facility Site ID: 612

Kristin Beck:

At the request of the Port of Moses Lake (Port), Stantec Consulting Services Inc. (Stantec), is submitting the attached *Sampling and Analysis Plan*, dated November 22, 2024.

Please contact Mr. Bobby Thompson, Stantec Project Manager for this site, at (206) 510-5855 or Mr. Milton Miller, Port Project Manager for this site, at (509) 762-5363, with questions.

Regards,

Stantec

Bobby Thompson
Senior Project Manager
Mobile: (206) 510-5855
robert.thompson@stantec.com

Attachment: Stantec's *Sampling and Analysis Plan*, dated November 22, 2024

c.	Mr. Milton Miller, Port of Moses Lake (*Email*)
Mr. Rich Mueller, Port of Moses Lake *(Email)*
Mr. Jeff Johnson, ExxonMobil Environmental and Property Solutions Company (*Project file*)

Sampling and Analysis Plan

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Ecology Facility Site ID: 612

November 22, 2024

Prepared for:

Port of Moses Lake

Prepared by:

Stantec Consulting Services Inc
1687 114th Avenue Southeast, Suite 100
Bellevue, Washington 98004
USA
www.stantec.com

File: 203723678.SAP24

This document entitled *Sampling and Analysis Plan* was prepared by Stantec Consulting Services Inc. (Stantec) for the account of the Port of Moses Lake (Client). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Laina Cole
Environmental Scientist

LAINAECOLE
(signature)

Keri L. Chappell
LG 2719

Keri Chappell
(signature)

State of Washington
2719
Licensed Geologist
Keri Lynn Chappell

Table of Contents

PLATES

TABLES

APPENDICES

Acronyms and Abbreviations

AO	Agreed Order No. DE 22056
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, total xylenes
COC	Chain of custody
DO	Dissolved oxygen
DOT	Department of Transportation
DTW	Depth to water
Ecology	Washington State Department of Ecology
EDB	1,2-Dibromoethane
EDC	1,2-Dichloroethane
EPA	United States Environmental Protection Agency
EPH	Extractable petroleum hydrocarbon
ETBE	Ethyl tertiary butyl ether
FS	Feasibility study
L/min	Liters per minute
LNAPL	Light non-aqueous phase liquid
mg/L	Milligrams per liter
MS/MSD	Matrix spike/matrix spike duplicate
MTBE	Methyl tert-butyl ether
NTU	Nephelometric turbidity units
NWEPH	Method for the Determination of Extractable Petroleum Hydrocarbons Fractions
NWTPH	Northwest Total Petroleum Hydrocarbons
NWTPH-Dx	Northwest Total Petroleum Hydrocarbons for Diesel/Oil Range Organics
NWTPH-Gx	Northwest Total Petroleum Hydrocarbons for Gasoline Range Organics
NWVPH	Method for the Determination of Volatile Petroleum Hydrocarbons Fractions
ORP	Oxidation reduction potential
PAH	Polycyclic aromatic hydrocarbon
PFAS	Per- and polyfluoroalkyl substances
PID	Photoionization detector
PLP	Potentially liable person
Port	Port of Moses Lake
PVC	Polyvinyl chloride
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan
RI	Remedial investigation
SAP	Sampling and Analysis Plan
SIM	Select Ion Monitoring
Site	Port of Moses Lake Pumphouse 1
Stantec	Stantec Consulting Services Inc.

TAME	Tertiary-amyl methyl ether
TBA	Tertiary-butyl alcohol
TPH	Total petroleum hydrocarbon
TPHd	Total petroleum hydrocarbons as diesel
TPHg	Total petroleum hydrocarbons as gasoline
TPHo	Total petroleum hydrocarbons as oil
USCS	Unified Soil Classification System
UST	Underground storage tank
VOA	Volatile organic analysis
VOC	Volatile organic compound
VPH	Volatile petroleum hydrocarbon
WAC	Washington Administrative Code

1.0 INTRODUCTION

At the request of the Port of Moses Lake (Port), Stantec Consulting Services Inc. (Stantec) prepared this Sampling and Analysis Plan (SAP) to describe the procedures and methods for collection and analysis of environmental data associated with the remedial investigation (RI)/feasibility study (FS) for the Port of Moses Lake Pumphouse 1 (site), located at 7810 Andrews Street Northeast in Moses Lake, Washington. Environmental samples are being collected in support of an RI to identify and address data gaps by conducting field investigations to guide development of the FS.

All fieldwork will be conducted in accordance with Agreed Order No. DE 22056 (AO) (Ecology, 2023), field protocols, the Project Quality Assurance Project Plan (QAPP), and applicable Washington Administrative Code (WAC) Chapters. Example field protocols applicable to the work in this SAP are included as Appendix A. Example field forms are included as Appendix B.

2.0 PROPOSED DATA GAP INVESTIGATION

2.1 SOIL CONDITIONS

2.1.1 Surface Soil Evaluation

Two soil borings (B16 and B19) and four groundwater monitoring well locations (PMW27, PMW32, PMW36, and PMW38) are proposed for surface soil evaluation. The surface soil samples will be collected 6 inches below ground surface (bgs). The purpose of the surface soil evaluation is to identify the presence or absence of per- and polyfluoroalkyl substances (PFAS) in the vicinity of the Pumphouse 1 building.

Proposed surface soil sample locations are illustrated on Plate 1. Anticipated sample collection depths and locations are summarized on Table 1.

2.1.2 Shallow Soil Evaluation

Five soil borings (PB16 through PB20) and one groundwater monitoring well location (PMW37) are proposed for shallow soil (less than 50 feet bgs) petroleum evaluation around the Pumphouse 1 building.

The shallow soil evaluation locations are located on the southern and eastern sides of the Pumphouse 1 building. The purpose of the shallow soil evaluation is to delineate petroleum hydrocarbons near the closed-in-place underground storage tanks (USTs) at historical sample locations Pit 1, PH1-B1 through PH1-B6, PH1-B13, and PH1-B14.

The shallow soil samples collected around Pumphouse 1 from the soil borings will also be used to evaluate potential exclusions from the Washington State Department of Ecology's (Ecology) terrestrial ecological evaluation.

Proposed soil boring locations are illustrated on Plate 1. Anticipated sample collection depths are summarized on Table 1.

2.1.3 Deep Soil Evaluation

One soil boring, which will be constructed as a groundwater monitoring well at the completion of drilling, is proposed for deep soil (greater than 50 feet bgs) petroleum evaluation east of the Pumphouse 1 building. This same boring will also be subject to the shallow soil petroleum evaluation. The purpose of this deep boring is to delineate petroleum contamination reported in soil at 81 feet bgs in the historical boring for well MW15 (S-81-B3). The location is noted as proposed groundwater monitoring well PMW37 on Plate 1.

Eleven additional soil borings, which will be constructed as groundwater monitoring wells at the completion of drilling, are proposed for deep soil (greater than 50 feet bgs) petroleum evaluation around the perimeter of the site on the north, east, south, and west sides of the site, beyond the known extent of LNAPL. A selection of these borings (PMW27, PMW32, PMW36, and PMW38) will also be evaluated for the presence or absence of PFAS in soil near the smear zone or capillary fringe. The locations are depicted as proposed groundwater monitoring wells PMW27 through PMW36 and PMW38 on Plate 1.

To adhere to the groundwater monitoring well naming convention employed during previous investigations at the site, the completed groundwater monitoring wells will be named MW27 through MW38. The borings will not be identified as a separate boring name or number.

The borings for deep soil evaluation will be advanced to first-encountered groundwater or bedrock, whichever is shallower. First-encountered groundwater has been observed at approximately 90 feet bgs. Bedrock in the site vicinity is weathered basalt and has been encountered between 100 and 170 feet bgs.

The proposed groundwater monitoring well locations are illustrated on Plate 1. Anticipated sample collection depths are summarized on Table 1.

2.2 GROUNDWATER CONDITIONS

Twelve groundwater monitoring wells are proposed for construction in first-encountered groundwater (approximately 90 feet bgs) around the perimeter of the site on the north, east, south, and west sides of the site. The purpose of the groundwater monitoring wells is to provide delineation of the light non-aqueous phase liquid (LNAPL) area and dissolved-phase hydrocarbons in groundwater. Additionally, groundwater will be evaluated for the presence or absence of PFAS. To adhere to the groundwater monitoring well naming strategy employed during previous investigations at the site, the wells will be named MW27 through MW38 (depicted as PMW27 through PMW38) on Plate 1.

Groundwater samples will be collected from the proposed groundwater monitoring wells following their development, unless measurable LNAPL is present. If measurable LNAPL is present, the LNAPL thickness will be recorded and a groundwater sample will not be collected. The proposed groundwater monitoring wells will be added to the groundwater monitoring and sampling schedule for the site. The proposed groundwater monitoring well locations are illustrated on Plate 1.

3.0 PRE-FIELDWORK PROCEDURES

3.1 NOTIFICATIONS

The Ecology Project Manager will be notified at least seven days in advance of any sample collection or work activity at the site, in accordance with the AO. The Port Project Manager and other applicable Port personnel will be notified in accordance with the agreements established during the consultant contracting process.

3.2 SITE ACCESS

The site is within the boundary of the Grant County International Airport, a secure facility, managed by the Port. The Port facilitates an access badge program comprising of an application, identification verification, and in-person training session, to those that require access to the facility independently without an escort. The Ramp (non-movement) badge is required for access to the site.

At least two consultant badge-holders will be present on site for all fieldwork. Badged personnel are authorized to escort non-badged site visitors. All subcontractors, clients, and Ecology personnel must either be current badge-holders or must be escorted at all times on site by badged personnel. No Ecology personnel will be denied access to the site provided they are badged or escorted. Consultants and subcontractors have routinely accessed the site since 1991; access complications are not anticipated.

Additional details regarding site access are provided in the QAPP.

3.3 START CARDS

Prior to conducting field activities, the drilling subcontractor will obtain Washington start cards from Ecology in accordance with WAC 173-160-151 (WAC, 2008). No other permits are anticipated for completion of the RI/FS Work Plan fieldwork.

3.4 UTILITY CLEARANCE

Consultant personnel will visit the site to check for obstructions and mark the proposed boring and groundwater monitoring well locations. Underground Service Alert will be notified at least 48 hours prior to the onset of field activities. A private utility locating service will be contracted to locate utilities or other subsurface structures at the site. If subsurface utilities or structures are detected during the locate, the locations of the proposed borings and groundwater monitoring wells may be revised based on the information collected in the field.

4.0 SOIL SAMPLE COLLECTION

Soil samples will be collected for laboratory analysis at depths where confirmation or delineation is necessary, where field observations indicate the presence of hydrocarbons, and for geologic logging purposes. Additional soil samples may be collected from each location depending on soil conditions observed during drilling activities.

4.1 SUBSURFACE CLEARANCE

The proposed soil borings and groundwater monitoring wells will be cleared using a combination of hand tools and soft digging methods to depths of approximately 5 to 8 feet bgs (or to the bottom of any subsurface structure, whichever deeper) to avoid damage to subsurface utilities. Soft digging methods may include the use of an air knife or water knife in coordination with vacuum extraction or advancement of a hand auger.

For locations where surface soil samples are proposed, a hand auger will be advanced to the sample depth prior to using any subsurface clearance equipment. Soil samples collected during air or water knife clearance will be advanced by a hand auger from 18 inches above the desired sample depth to preserve the sample integrity. After retrieving the hand auger from the desired sample depth, the contents of the hand auger will be transferred directly into a sample container or into a zip top bag and sealed. This bag will be taken to the sampling table where field personnel will use the contents to fill the required sample containers (Section 4.5).

An aliquot of soil will be transferred directly into a second zip top bag, sealed, and labeled with the location number, sample depth, date, and time; this soil will be set aside for field screening using a photoionization detector (PID) or similar field instrument for evaluation of the presence of VOCs.

4.2 SONIC DRILLING

The proposed soil borings and groundwater monitoring wells will be advanced from their cleared depth of 5 to 8 feet bgs to their total depths using sonic drilling methods. Sonic drilling employs high-frequency resonant energy generated inside the sonic head via two counterrotating weights. A pneumatic isolation system directs the energy down the drill string to advance the core barrel and casing into the subsurface.

Sonic drilling can produce relatively undisturbed samples from the subsurface in a variety of soil conditions. First, the core barrel is advanced, often in 10- or 20-foot intervals. Next, the casing is advanced outside of the core barrel to protect the borehole integrity. After the casing is in place, the core barrel is retrieved from the borehole. A length of plastic bagging is placed over the exposed end of the core barrel. The core barrel is vibrated to release a segment of the sample, filling the plastic bagging. The bagging process is repeated until the core barrel is empty, often in 5-foot intervals. Each bag is labeled by the driller with the top and bottom depth of the sample contained therein and placed in a designated area, lined with visqueen, in depth order.

Field personnel will use an approved cutting tool with a recessed blade to open the plastic bags one at a time. A soil sample from the desired depth, as estimated along the length of the labeled bag, will be collected by hand using a disposable tool directly into a sample container or into a zip top bag and sealed. This bag will be taken to the sampling table where field personnel will use the contents to fill the required sample containers (Section 4.5).

An aliquot of soil will be transferred directly into a second zip top bag, sealed, and labeled with the location number, sample depth, date, and time; this soil will be set aside for field screening.

4.3 FIELD SCREENING

The zip top bag designated for field screening will be placed away from direct sunlight for a period of time that allows volatilization of chemical constituents, after which the tip of a PID or similar device will be inserted through the plastic bag to measure organic vapor concentrations in the headspace. The PID measurement is recorded on the boring log. Instruments such as the PID, equipped with a 10.6 electron volt lamp, are useful for evaluating relative concentrations of volatilized hydrocarbons, but they do not measure the concentration of volatilized hydrocarbons in the soil matrix with the same precision as laboratory analysis. Samples will also be visually inspected for the presence of LNAPL or sheen. Following completion of PID measurements, water will be introduced into the zip top bag in sufficient quantity to submerge the soil sample. The soil will be broken apart and allowed to rest for a period of 10 minutes. After 10 minutes, the sample will be examined for sheen or presence of LNAPL. Results of the sheen test will be recorded on the boring log.

4.4 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

At the sample table, field personnel will prepare the required laboratory-supplied sample containers by inspecting them for the correct preservative, completing the labels, securing them in an upright position, and removing the caps. A single use, disposable Terra Core (or similar) sample plunger will be used to transfer a 5-gram portion of sample soil from the zip top bag to each volatile organic analysis (VOA) sample container. The transfer will be repeated using the same plunger until all sample containers are filled as required for a given sample. A disposable tool (spoon or similar) will be used to fill laboratory-supplied sample containers for non-VOC analyses. After transfer is completed for a given sample, the plunger and disposable tool will be disposed.

A summary of sample containers, preservatives, and hold times is provided in Table 2 and in the QAPP.

Field personnel will initiate chain of custody (COC) procedures in accordance with the QAPP. Samples will be promptly transported in iced storage in a thermally insulated cooler, accompanied by the COC(s), to the analytical laboratory. An example COC is provided in Appendix B.

4.5 QA/QC SAMPLES

The following quality assurance/quality control (QA/QC) samples will be collected during soil sampling activities:

- One equipment blank per day per type of sampling equipment.
- One field duplicate per 20 field samples.
- One sample collected for the purpose of matrix spike/matrix spike duplicate (MS/MSD) at the laboratory per 20 field samples.
- One trip blank will accompany all samples selected for VOC analysis.

4.6 PFAS SPECIFIC REQUIREMENTS

Field quality control for PFAS soil sample collection requires additional care and attention to detail. Requirements included in this section are intended to supplement those discussed in previous sections.

All previous field quality control procedures are applicable unless explicitly superseded by procedures described in this section or in the field protocols provided in Appendix A.

Sample containers for PFAS analysis of soil samples should be filled after sample containers for VOC analysis in order to limit potential volatilization. Sample containers for PFAS analysis should be filled directly, when possible; soil samples for PFAS analysis may not be collected from the aliquot of soil in the zip-top bag. Sample containers and lids should never be set down on the ground, table, chair, cooler, or other surface during sample collection. Handle sample lids from the sides only; do not touch the inside of the lid. After collection, PFAS sample containers must be protected from light.

QA/QC equipment blank samples collected during PFAS soil sample collection will be generated using laboratory-supplied PFAS-free water.

Supplies and consumables required for PFAS sample collection will be obtained from vendors who verify that their products are PFAS-free. This includes but is not limited to sampling equipment, cleaning supplies, and personal protective equipment.

Additional details are included in the field protocols in Appendix A and in the QAPP.

5.0 LITHOLOGIC LOGGING

A trained geologist, under the supervision of a State of Washington Licensed Geologist, will generate a lithologic log at each boring and groundwater monitoring well location. At a minimum, the geologist will describe the grain size, color, moisture, and estimated percentages of clay, silt, sand, and gravel in each soil sample examined. Additional characteristics that may be included in the lithologic description are angularity, grading, stratification, plasticity, and cementation. The geologist will note the depths and thicknesses of distinct soil layers and the depth at which groundwater is encountered. Soil layers will be named in general accordance with the Unified Soil Classification System (USCS).

The geologist will examine the soil contained within the zip top bag set aside for field screening (after field screening has been completed) for samples collected between surface and 5 or 8 feet bgs. The geologist will examine the full subsurface sample between 5 or 8 feet bgs and total depth retrieved by the sonic core barrel.

The finished boring log will also include backfill materials used in borings and well construction materials (annular backfill, casing, surface vault) used to construct groundwater monitoring wells. An example boring log is included in Appendix B.

6.0 WELL CONSTRUCTION

6.1 GROUNDWATER MONITORING WELLS

6.1.1 Construction Materials

Groundwater monitoring wells will be constructed with 2-inch diameter, Schedule 40 polyvinyl chloride (PVC) casing. Slotted casing will be installed across the desired groundwater sampling depth; blank casing will be extended from the top of the slotted interval to approximately 2 to 3 feet above surface grade. Factory-sealed PVC casing will be used to reduce the probability of cross contamination and all casing joints will be flush threaded. The annulus of the well will be backfilled with an appropriately sized silica sand filter pack from the total depth of the slotted casing to approximately 2 feet above the top of the slotted casing. A bentonite seal will be placed on top of the sand filter pack. Grout may be placed on top of the bentonite seal to within 6 inches of surface grade. Materials in the annulus will be installed using a tremie pipe to avoid bridging conditions. Surface completion will consist of a 6-inch nominal diameter steel protective casing (stovepipe) surrounding the well casing extending above the ground surface or a traffic-rated flush mount well vault. A concrete well pad will be installed around the stovepipe or flush mount well vault. If a well is completed with a stovepipe, it will be surrounded by three metal bollards in a triangular array in accordance with WAC 173-160-420 (WAC, 2008). A locking lid on the stovepipe and a locking cap for the well casing will be installed to protect against surface water infiltration and unauthorized entry. No glues, chemical cements, or solvents will be used in well construction. All construction materials including casing, sand pack, bentonite, grout, and source water for grout mixing will be verified as PFAS-free prior to use. A well identification tag with a unique identification number, supplied by Ecology, will be installed at the top of the well casing. All well installations will be completed in accordance with WAC Chapter 173-160 (WAC, 2008).

6.1.2 Screened Intervals

Groundwater monitoring wells will be screened in the first groundwater-bearing zone. Groundwater is expected to be encountered at approximately 90 feet bgs and wells are expected to be screened from approximately 80 to 100 feet bgs. The screened intervals may be modified depending on soil and groundwater conditions observed during drilling activities. The 20-foot screen length in existing groundwater monitoring wells at the site has successfully accommodated seasonal fluctuations in groundwater elevation and accumulation of LNAPL without submersion, and enabled purging prior to sample collection to proceed without dewatering. Based on other groundwater monitoring wells at the site and expected lithologic conditions, a screened casing with 0.020-inch slots is proposed for installation.

6.1.3 Development

Prior to development, the static water level (depth to water [DTW]) will be measured with an interface probe to the nearest 0.01 foot. If LNAPL is present, the depth to LNAPL will be measured with an interface probe to the nearest 0.01 foot and the LNAPL thickness will be calculated. Well development will not occur in groundwater monitoring wells containing measurable LNAPL.

Development of a groundwater monitoring well can take place either before the seal is placed, or after the grout has been allowed to cure a minimum of 48 hours. Field personnel or a contracted driller will use a surge block and submersible pump to develop the newly-installed well. The well will be developed until turbidity is stabilized (±10 percent on three successive readings), turbidity is measured to be 10 nephelometric turbidity units (NTU) or less, or 10 casing volumes have been removed. The volume of groundwater extracted will be recorded on a log (example provided in Appendix B). Groundwater sampling will not commence until a minimum of 72 hours after development is completed.

7.0 CONTINGENCY PLANNING

In order to ensure that the full extent of LNAPL and COPCs in soil and groundwater at the site are delineated and to ensure that field personnel have the flexibility to make real time adjustments to the scope of work during drilling, a contingency plan has been developed to accommodate additional soil borings or groundwater monitoring well installation.

Following receipt of analytical results at the proposed soil and groundwater sampling locations as depicted on Plate 11, or observance of LNAPL during any segment of the fieldwork (drilling, well development, groundwater sampling, etc.), the consultant will activate a step-out process to fully delineate LNAPL and COPCs in soil and groundwater at the site. This includes but is not limited to additional shallow or deep soil sampling and additional groundwater monitoring well installation and sampling. All step-out locations will be positioned in consultation with and approved by Ecology. This step-out process will be repeated, as needed, to characterize the site and source, types, and extent of contamination present to sufficiently complete the feasibility study and select the appropriate remedial action.

The contingency soil borings or groundwater monitoring wells installed during the step-out process will be subject to the same pre-field, drilling, sampling, and well construction procedures outlined in this SAP.

8.0 SURVEY

The horizontal coordinates of borings B16 through B20 and all previously existing and newly-installed groundwater monitoring wells at the site will be surveyed by a licensed land surveyor relative to a known datum, identified in their report. The survey subcontractor will provide the northing, easting, latitude, and longitude of all surveyed locations.

The ground surface elevation of borings B16 through B20 and the top of well casing elevation of all previously existing and newly-installed groundwater monitoring wells will be surveyed by a licensed land surveyor relative to a known datum, identified in their report. The survey contractor will provide the elevation of all surveyed locations relative to mean sea level to an accuracy of at least +/- 0.01 foot. The groundwater monitoring well casings will be notched or marked on one side to identify a consistent surveying and measuring point.

9.0 DEPTH TO WATER AND LNAPL THICKNESS MEASUREMENTS

The static water level (depth to water [DTW]) will be measured with an interface probe to the nearest 0.01 foot. If LNAPL is present, the depth to LNAPL will be measured with an interface probe to the nearest 0.01 foot and the LNAPL thickness will be calculated. Measurements will be taken from the notched or marked location on the well casing. DTW measurements will be collected prior to purging and/or groundwater sample collection. DTW measurements will be used with surveyed top of well casing elevation data to determine groundwater elevations relative to mean sea level. The DTW and LNAPL thickness measurements will be recorded on the appropriate field form (example provided in Appendix B).

Groundwater samples will not be collected from groundwater monitoring wells containing measurable LNAPL.

10.0 GROUNDWATER SAMPLE COLLECTION

10.1 PURGING

Before groundwater samples are collected from the groundwater monitoring wells, the wells will be purged using a non-dedicated bladder pump at rates not exceeding 1 liter per minute (L/min) until stabilization of groundwater quality parameters are obtained. The pump will be lowered into the water column to approximately the midpoint of the wetted screen or 5 feet below the static water level, whichever is closer to the static water level.

Readings of the groundwater quality parameters will be recorded every three minutes while the water is purged to determine stabilization. DTW readings will be collected every three minutes to ensure drawdown in the well is less than 0.33 foot from the initial DTW measurement. If drawdown exceeds 0.33 foot, the pumping rate will be reduced.

The following groundwater quality parameters will be monitored for these stabilization criteria:

- Dissolved oxygen (DO) has a change of less than 10 percent for values greater than 0.5 milligram per liter (mg/L); if three DO values are less than 0.5 mg/L, the values are considered stabilized.
- Conductivity has a change of less than 3 percent.
- Temperature has a change of less than 3 percent.
- pH has a change of less than 0.1 unit.
- Oxidation reduction potential (ORP) has a change of less than 10 millivolts.

Purging will continue until three consecutive readings meet the stabilization criteria or three well casing volumes have been purged from the groundwater monitoring well. The groundwater quality parameters will be recorded on the appropriate field form (example provided in Appendix B).

10.2 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

Once groundwater quality parameters have reached stabilization, the tubing is directed away from the water quality meter to the sample containers. Groundwater samples for volatile contaminants of concern will be collected in laboratory-supplied 40-milliliter glass vials preserved with hydrochloric acid. The vials will be filled to produce a positive meniscus. After filling, each vial will be sealed with a cap containing a Teflon septum, and subsequently examined for air bubbles to avoid headspace that would allow volatilization to occur. Additional samples for other contaminants of concern will be collected in the appropriate laboratory-supplied sample containers. A summary of sample containers, preservatives, and hold times is provided in Table 2 and in the QAPP. The samples will be promptly transported in iced storage in a thermally-insulated cooler, accompanied by COC documentation, to the analytical laboratory.

10.3 QA/QC SAMPLES

The following QA/QC samples will be collected during groundwater sampling activities:

- One equipment blank per day per type of sampling equipment.
- One field duplicate per 20 field samples.
- One sample collected for the purpose of MS/MSD at the laboratory per 20 field samples.
- One trip blank will accompany all samples selected for VOC analysis.

10.4 PFAS SPECIFIC REQUIREMENTS

Field quality control for PFAS groundwater sample collection requires additional care and attention to detail. Requirements included in this section are intended to supplement those discussed in previous sections. All previous field quality control procedures are applicable unless explicitly superseded by procedures described in this section or in the field protocols provided in Appendix A.

Sample containers for PFAS analysis must be filled first at each groundwater sampling location. Sample containers for PFAS should be filled directly, when possible. Sample containers and lids should never be set down on the ground, table, chair, cooler, or other surface during sample collection. Handle sample lids from the sides only; do not touch the inside of the lid. Sample containers for PFAS must be filled to allow head space, preferably filled only to the shoulder of the bottle. After collection, PFAS sample containers must be protected from light.

QA/QC equipment blank samples collected during PFAS groundwater sample collection will be generated using laboratory-supplied PFAS-free water.

Supplies and consumables required for PFAS sample collection will be obtained from vendors who verify that their products are PFAS-free. This includes but is not limited to sampling equipment, cleaning supplies, and personal protective equipment.

Additional details are included in the field protocols in Appendix A and in the QAPP.

11.0 SAMPLE ANALYSES

Environmental samples collected at the site in support of RI/FS work will be analyzed for petroleum hydrocarbons and metals suspected of originating from Jet A jet fuel released to the subsurface from the USTs and/or associated piping and infrastructure at Pumphouse 1, along with VOCs, SVOCs, PFAS, and other geochemical parameters at the request of Ecology.

11.1 SOIL SAMPLES

Soil samples collected from soil borings will be analyzed for a selection of the following constituents:

- Total petroleum hydrocarbons (TPH) as gasoline (TPHg) by Northwest TPH (NWTPH) for Gasoline Range Organics (NWTPH-Gx).
- TPH as diesel (TPHd) and TPH as oil (TPHo) by NWTPH for Diesel/Oil Range Organics (NWTPH-Dx).
- Volatile petroleum hydrocarbons (VPH) by the Determination of VPH Fractions (NWVPH) Method.
- Extractable petroleum hydrocarbons (EPH) by the Determination of EPH Fractions (NWEPH) Method.
- VOCs United States Environmental Protection Agency (EPA) Method 8260 or 8260 with Select Ion Monitoring (SIM).

- Methanol by EPA Method 8015.
- Semi volatile organic compounds (SVOCs) by EPA Method 8270 or 8270SIM.
- Total arsenic, barium, cadmium, chromium, lead, silver, selenium, and mercury by EPA Method 6010, 6020, or 7471, as applicable.
- PFAS by EPA Method 1633.

All TPH results will be subject to comparison with standard chromatograms for Jet A jet fuel. Jet A primarily overlaps with the carbon range reported as TPHd.

11.2 GROUNDWATER SAMPLES

Groundwater samples collected from groundwater monitoring wells will be analyzed for a selection of the following constituents:

- TPHg by NWTPH-Gx.
- TPHd and TPHo by NWTPH-Dx.
- VPH by NWVPH Method.
- EPH by NWEPH Method.
- VOCs by EPA Method 8260 or 8260 SIM.
- Methanol by EPA Method 8015.
- SVOCs by EPA Method 8270 or 8270SIM.
- Total and dissolved arsenic, barium, cadmium, chromium, iron, lead, manganese, silver, selenium, and mercury by EPA Method 200.8, 6010, 6020 or 7470, as applicable.
- PFAS by EPA Method 1633.
- Ferrous iron by Standard Method 3500-FeB.
- Nitrate and sulfate by EPA Method 300.0.
- Alkalinity by Standard Method 2320B.
- Carbon dioxide by Standard Method 4500-CO2D.
- Methane by RSK SOP-175.

All TPH results will be subject to comparison with standard chromatograms for Jet A jet fuel. Jet A primarily overlaps with the carbon range reported as TPHd.

12.0 DECONTAMINATION PROCEDURES

Field personnel will decontaminate non-dedicated soil or groundwater sampling equipment between each sample location with a non-phosphate solution (such as Liquinox), followed by a minimum of two tap water rinses. Distilled water may be used for the final rinse. Downhole drilling equipment is steam-cleaned prior to drilling the borehole and at completion of the borehole.

Between sample intervals when soil sampling, the soil sampling table is cleaned by spraying it with a non-phosphate solution and wiping with disposable paper towels.

Prior to well development, the submersible pump is decontaminated by allowing it to run and recirculate while immersed in a non-phosphate solution followed by successive immersions in potable water and distilled water baths.

Before starting groundwater monitoring and sampling activities, and between each well, the DTW probe and multi-parameter probe are decontaminated by rinsing twice with a non-phosphate solution. The probes are then rinsed with tap water followed by a rinse with distilled water. The sample table/workstation, exterior of pump housing, and scissors (used for cutting disposable tubing) are cleaned with commercially-available disinfectant wipes before starting groundwater sampling activities and between each well.

Additional details regarding decontamination procedures are included in the QAPP and in the field protocols (Appendix A).

12.1 PFAS SPECIFIC REQUIREMENTS

Field quality control for PFAS sampling requires additional care and attention to detail. Decontamination requirements included in this section are intended to supplement those discussed in previous sections. All previous decontamination procedures are applicable unless explicitly superseded by procedures described in this section.

12.1.1 Decontamination Water Source Testing

The onsite water source proposed for use in decontamination (i.e. steam cleaning drilling equipment and non-final rinses of non-dedicated equipment) will be verified as PFAS-free prior to use. Verification will be achieved through sample collection at the tap and analysis at the contracted laboratory in accordance with sample collection and analytical procedures as described in the QAPP and in the field protocols included as Appendix A.

If the onsite water source is not verified to be PFAS-free, an alternative PFAS-free water source will be imported to the site for use during decontamination activities.

12.1.2 PFAS Field Instrument/Equipment Decontamination

Decontamination of field instruments and equipment used during PFAS sample collection must use laboratory-supplied PFAS-free water as the final rinse. This includes but is not limited to all drilling equipment and non-dedicated sample collection equipment such as hand augers, trowels, bowls, probes, and submersible pumps.

13.0 EQUIPMENT CALIBRATION

Field equipment will be calibrated in accordance with manufacturer’s specifications and noted on a calibration log (example provided in Appendix B). Field equipment calibration procedures are included in the QAPP.

14.0 WASTE MANAGEMENT

14.1 TEMPORARY STORAGE PENDING PROFILING

Soil cuttings generated from the drilling or sampling will be stored on site in labeled, Department of Transportation (DOT)-approved 55-gallon drums or other appropriate storage container. Decontamination fluids and purge water from well development and groundwater sampling activities will be stored on site in labeled, DOT-approved 55-gallon drums.

14.2 WASTE CHARACTERIZATION AND PROFILING

Waste profiling will be completed following analysis of waste characterization samples. Samples of soil and water will be collected from waste containers and analyzed for a selection of the following constituents:

- TPHg by NWTPH-Gx.
- TPHd and TPHo by NWTPH-Dx.
- VOCs by EPA Method 8260.
- Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver by EPA Method 200.8, 6020, 245.1, or 7471, as applicable.
- PFAS by EPA Method 1633.

14.3 TRANSPORTATION AND DISPOSAL

The soil will be removed from the site and transported under manifest to a client- and regulatory-approved facility for recycling or disposal. Water will be subsequently transported under manifest to a client- and regulatory-approved facility for disposal.

15.0 SCHEDULE

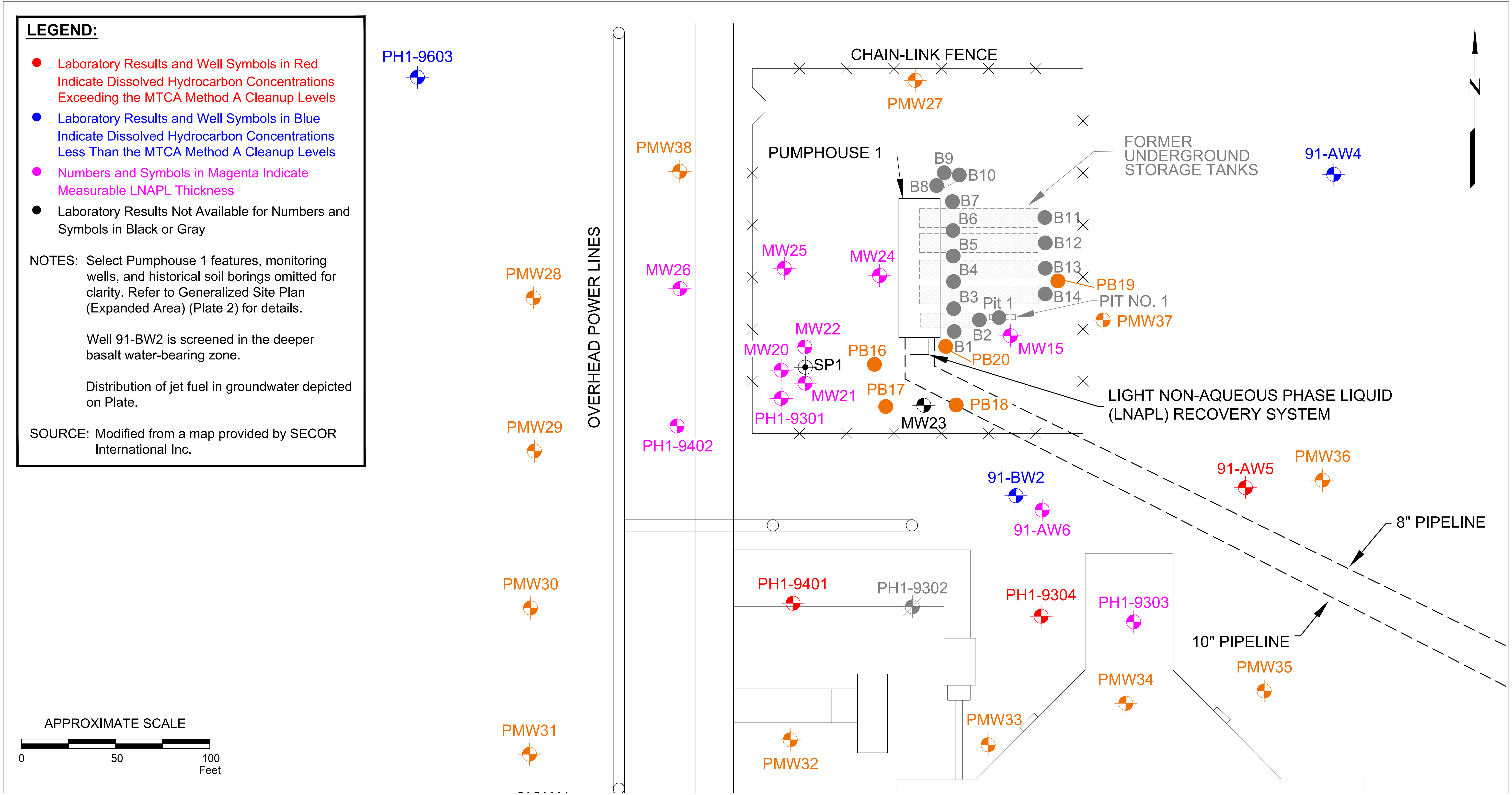
The potentially liable persons (PLPs) will execute Task II (Implementation of the RI) and Task III (Draft RI/FS Report) in accordance with the AO, and as defined in the following table:

Activity	**Schedule**
PLPs Receive Ecology's Approval of the Final RI/FS Work Plan (Task I)	Day 0
PLPs Begin Implementation of the RI/FS Work Plan (Task II)	Day 0 – Month 1
Task II Consultant Bid Solicitation and Contracting	Month 1 – Month 3
Task II Field Coordination Activities	Month 3 – Month 6
Task II Field Work Execution – Drilling	Month 6 – Month 9
Task II Field Work Execution – Groundwater Sampling (Four Quarters)	Month 9 – Month 21
Develop and Submit Task III Draft RI/FS Report	Month 21 – Month 24

16.0 REFERENCES

Washington Administrative Code (WAC). December 19, 2008. Chapter 173-160 Minimum Standards for Construction and Maintenance of Wells. URL: https://app.leg.wa.gov/wac/default.aspx?cite=173-160.

Washington State Department of Ecology (Ecology). December 26, 2023. Agreed Order No. DE 22056.



LEGEND:

- ● Laboratory Results and Well Symbols in Red Indicate Dissolved Hydrocarbon Concentrations Exceeding the MTCA Method A Cleanup Levels
- ● Laboratory Results and Well Symbols in Blue Indicate Dissolved Hydrocarbon Concentrations Less Than the MTCA Method A Cleanup Levels
- ● Numbers and Symbols in Magenta Indicate Measurable LNAPL Thickness
- ● Laboratory Results Not Available for Numbers and Symbols in Black or Gray

NOTES: Select Pumphouse 1 features, monitoring wells, and historical soil borings omitted for clarity. Refer to Generalized Site Plan (Expanded Area) (Plate 2) for details.

Well 91-BW2 is screened in the deeper basalt water-bearing zone.

Distribution of jet fuel in groundwater depicted on Plate.

SOURCE: Modified from a map provided by SECOR International Inc.

FN 2037236780002

Stantec

PROPOSED SITE CHARACTERIZATION MAP

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

EXPLANATION

MW26	Groundwater Monitoring Well	PMW38	Proposed Groundwater Monitoring Well
SP1	Steam Injection Well	PB20 ●	Proposed Soil Boring
PH1-9403	Destroyed Groundwater Monitoring Well		
B14 ●	Historical Soil Boring		

PROJECT NO.
203723678

PLATE
1

LEC: 05/14/24

TABLE 1
PROPOSED SAMPLE COLLECTION DETAILS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 2

Sample Location ID	Sample Matrix	Sample Depth (feet bgs)	Number of Samples per Sampling Event	Number of Sampling Events	Estimated Total Number of Samples
Surface Soil Evaluation					
B16	Soil	0.5	1	1	1
B19	Soil	0.5	1	1	1
MW27	Soil	0.5	1	1	1
MW32	Soil	0.5	1	1	1
MW36	Soil	0.5	1	1	1
MW38	Soil	0.5	1	1	1
			Shallow Soil Samples		**6**
Shallow Soil Evaluation					
B16	Soil	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	10	1	10
B17	Soil	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	10	1	10
B18	Soil	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	10	1	10
B19	Soil	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	10	1	10
B20	Soil	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	10	1	10
MW37	Soil	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	10	1	10
			Shallow Soil Samples		**60**
Deep Soil Evaluation					
MW27	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW28	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW29	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW30	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW31	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW32	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW33	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW34	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW35	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW36	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW37	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
MW38	Soil	55, 60, 65, 70, 75, 80, 85, 90, 95, 100	10	1	10
			Deep Soil Samples		**120**
Groundwater Evaluation					
91-BW2	Water	90 (a)	1	4	4
91-AW4	Water	90	1	4	4
91-AW5	Water	90	1	4	4
91-AW6	Water	90	1	4	4
PH1-9301	Water	90	1	4	4
PH1-9303	Water	90	1	4	4
PH1-9304	Water	90	1	4	4
PH1-9401	Water	90	1	4	4
PH1-9402	Water	90	1	4	4
PH1-9601	Water	90	1	4	4
PH1-9602	Water	90	1	4	4
PH1-9603	Water	90	1	4	4
MW15	Water	90	1	4	4
MW19	Water	90	1	4	4

TABLE 1
PROPOSED SAMPLE COLLECTION DETAILS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 2 of 2

Sample Location ID	Sample Matrix	Sample Depth (feet bgs)	Number of Samples per Sampling Event	Number of Sampling Events	Estimated Total Number of Samples
Groundwater Evaluation (continued)					
MW20	Water	90	1	4	4
MW21	Water	90	1	4	4
MW22	Water	90	1	4	4
MW23	Water	90	1	4	4
MW24	Water	90	1	4	4
MW25	Water	90	1	4	4
MW26	Water	90	1	4	4
MW27	Water	90	1	4	4
MW28	Water	90	1	4	4
MW29	Water	90	1	4	4
MW30	Water	90	1	4	4
MW31	Water	90	1	4	4
MW32	Water	90	1	4	4
MW33	Water	90	1	4	4
MW34	Water	90	1	4	4
MW35	Water	90	1	4	4
MW36	Water	90	1	4	4
MW37	Water	90	1	4	4
MW38	Water	90	1	4	4
			Groundwater Samples		**132**

EXPLANATION:

feet bgs = Feet below ground surface

(a) = Well 91-BW2 is screened in a deeper water-bearing zone from 137 to 147 feet bgs; however, the screen has historically been drowned with a depth to water of 90 feet bgs

TABLE 2
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 3

Matrix	Analysis	Analytical Method	Container	Preservation	Holding Time
Soil	TPHg	NWTPH-Gx	(1) 4 oz glass jar; (2) 40 mL glass VOA vial w/MeOH; (1) Field Preservation Kit	MeOH Cool to 4°C	14 days
	TPHd, TPHo	NWTPH-Dx	(1) 4 oz glass jar	Cool to 4°C	14 days for extraction; 40 days for analysis
	VPH	NWTPH-VPH	(1) 4 oz glass jar; (2) 40 mL glass VOA vial w/MeOH; (1) Field Preservation Kit	MeOH Cool to 4°C	14 days
	EPH	NWTPH-EPH	(1) 4 oz glass jar	Cool to 4°C	14 days for extraction; 40 days for analysis
	VOCs	EPA 8260 EPA 8260SIM	(1) 4 oz glass jar; (2) 40 mL glass VOA vial w/MeOH; (1) Field Preservation Kit	MeOH Cool to 4°C	14 days
		EPA 8015	(1) 4 oz glass jar	Cool to 4°C	
	SVOCs	EPA 8270 EPA 8270 SIM	(1) 4 oz glass jar	Cool to 4°C	14 days for extraction; 40 days for analysis
	Total Metals	EPA 6020/7471	(1) 4 oz glass jar	Cool to 4°C	6 months
	PFAS	EPA 1633	(1) 4 oz polypropylene container w/ polyethylene screw cap	Cool to 0-6°C; protect from light	90 days

TABLE 2
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 2 of 3

Matrix	Analysis	Analytical Method	Container	Preservation	Holding Time
Groundwater	TPHg	NWTPH-Gx	(3) 40 mL glass VOA vial w/HCl	HCl Cool to 4°C	14 days
	TPHd, TPHo	NWTPH-Dx	(1) 500 mL amber glass w/HCl	HCl Cool to 4°C	14 days for extraction; 40 days for analysis
	VPH	NWVPH	(3) 40 mL glass VOA vial w/HCl	HCl Cool to 4°C	14 days
	EPH	NWEPH	(1) 1 L amber glass w/HCl	HCl Cool to 4°C	14 days for extraction; 40 days for analysis
	VOCs	EPA 8260 EPA 8260SIM	(4) 40 mL glass VOA vial w/HCl	HCl Cool to 4°C	14 days
		EPA 8015	(2) 40 mL glass VOA vial w/HCl		
	SVOCs	EPA 8270 EPA 8270 SIM	(1) 500 mL amber glass	Cool to 4°C	7 days for extraction; 40 days for analysis
	Total and Dissolved Metals	EPA 6020	(1) 250 mL polyethylene w/HNO_3 (Field Filter) -or- (1) 250 mL polyethylene, unpreserved (Request Lab Filtration)	HNO_3 Cool to 4°C	6 months for preserved analysis -or- Filter and preserve within 14 days
	Ferrous Iron	SM 3500-FeB	(1) 250 mL amber w/HCl	Cool to 4°C	24 hours
	Nitrate and Sulfate	EPA 300	(1) 250 mL poly	Cool to 4°C	48 hours
	Alkalinity	EPA 2320B	(1) 250 mL poly	Cool to 4°C	14 days
	Methane	RSK-175	(2) 40 mL VOA vial w/HCl	HCl Cool to 4°C	14 days
	Carbon dioxide	SM 4500-CO2_D	(1) 250 mL poly	Cool to 4°C	14 days
	PFAS	EPA 1633	(2) 125 mL HDPE containers	Cool to 0-6°C; protect from light	28 days

TABLE 2
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 3 of 3

Notes:

The Field Preservation Kit for soil consists of (2) x 40-mL VOA vials preserved with MeOH and 5 grams of sample volume.

°C = Degrees Celsius
EPA = United States Environmental Protection Agency
EPH = Extractable petroleum hydrocarbons
HCl = Hydrochloric acid
HDPE = High density polyethylene
HNO_3 = Nitric acid
L = Liter
MeOH = Methanol
mL = Milliliter
NWEPH = Northwest Total Petroleum Hydrocarbons for the Determination of Extractable Petroleum Hydrocarbons Fractions
NWTPH-Dx = Northwest Total Petroleum Hydrocarbons for Diesel/Oil Range Organics
NWTPH-Gx = Northwest Total Petroleum Hydrocarbons for Gasoline Range Organics
NWVPH = Northwest Total Petroleum Hydrocarbons for the Determination of Volatile Petroleum Hydrocarbons Fractions
oz = Ounce
PFAS = Per- and polyfluoroalkyl substances
SIM = Selective ion monitoring
SVOCs = Semi volatile organic compounds
TPH = Total petroleum hydrocarbons
TPHd = Total petroleum hydrocarbons as diesel
TPHg = Total petroleum hydrocarbons as gasoline
TPHo = Total petroleum hydrocarbons as oil
VOA = Volatile organic analysis
VOCs = Volatile organic compounds
VPH = Volatile petroleum hydrocarbons
w/ = With

APPENDIX A

Example Field Protocols

Soil Boring and Well Installation Field Protocol

Preliminary Activities

Prior to the onset of field activities at the site, Stantec obtains the appropriate permit(s) from the governing agency(s). Advance notification is made as required by the agency(s) prior to the start of work. Stantec marks the borehole locations and contacts the local one call utility locating service at least 48 hours prior to the start of work to mark buried utilities. Borehole locations may also be checked for buried utilities by a private geophysical surveyor. Prior to drilling, the borehole location is cleared in accordance with the client's procedures. Fieldwork is conducted under the advisement of a registered professional geologist and in accordance with an updated site-specific safety plan prepared for the project, which is available at the job site during field activities.

Drilling and Soil Sampling Procedures

Stantec contracts a licensed driller to advance the boring and collect soil samples. The specific drilling method (e.g., hollow-stem auger, direct push method, or sonic drilling), sampling method [e.g., core barrel or California-modified split spoon sampler (CMSSS)] and sampling depths are documented on the boring log and may be specified in a work plan. Soil samples are typically collected at the capillary fringe and at 5-foot intervals to the total depth of the boring. To determine the depth of the capillary fringe prior to drilling, the static groundwater level is measured with a water level indicator in the closest monitoring well to the boring location, if available.

The borehole is advanced to just above the desired sampling depth. For CMSSSs, the sampler is placed inside the auger and driven to a depth of 18 inches past the bit of the auger. The sampler is driven into the soil with a standard 140 pound hammer repeatedly dropped from a height of 30 inches onto the sampler. The number of blows required to drive the sampler each 6-inch increment is recorded on the boring log. For core samplers (e.g., direct push), the core is driven 18 inches using the rig apparatus.

Soil samples are preserved in the metal or plastic sleeve used with the CMSSS or core sampler, in glass jars or other manner required by the local regulatory agency (e.g., Environmental Protection Agency Method 5035). Sleeves are removed from the sample barrel, and the lowermost sample sleeve is immediately sealed with Teflon™ tape, capped and labeled. Samples are placed in a cooler chilled to 4º Celsius and transported to a state-certified laboratory. The samples are transferred under chain-of-custody (COC) protocol.

Field Screening Procedures

Stantec places the soil from the middle of the sampling interval into a plastic re-sealable bag. The bag is placed away from direct sunlight for approximately 20 minutes, after which the tip of a photo-ionization detector (PID) or similar device is inserted through the plastic bag to measure organic vapor concentrations in the headspace. The PID measurement is recorded on the boring log. At a minimum, the PID or other device is calibrated on a daily basis in accordance with manufacturer's specifications using a hexane or isobutylene standard. The calibration gas and concentration are recorded on a calibration log. Instruments such as the PID are useful for evaluating relative concentrations of volatilized hydrocarbons, but they do not measure the concentration of petroleum hydrocarbons in the soil matrix with the same precision as laboratory analysis. Stantec trained personnel describe the soil in the bag according to the Unified Soil Classification System and record the description on the boring log, which is included in the final report.

Air Monitoring Procedures

Stantec performs a field evaluation for volatile hydrocarbon concentrations in the breathing zone using a calibrated photo-ionization detector or lower explosive level meter.

Groundwater Sampling

A groundwater sample, if desired, is collected from the boring by using Hydropunch^{TM} sampling technology or installing a well in the borehole. In the case of using Hydropunch^{TM} technology, after collecting the capillary fringe soil sample, the boring is advanced to the top of the soil/groundwater interface and a sampling probe is pushed to approximately 2 feet below the top of the static water level. The probe is opened by partially withdrawing it and thereby exposing the screen. A new or decontaminated bailer is used to collect a water sample from the probe. The water sample is then emptied into laboratory-supplied containers constructed of the correct material and with the correct volume and preservative to comply with the proposed laboratory test. The container is slowly filled with the retrieved water sample until no headspace remains and then promptly sealed with a Teflon-lined cap, checked for the presence of bubbles, labeled, entered onto a COC record and placed in chilled storage at 4° Celsius. Laboratory-supplied trip blanks accompany the water samples as a quality assurance/quality control procedure. Equipment blanks may be collected as required. The samples are kept in chilled storage and transported under COC protocol to a client-approved, state-certified laboratory for analysis.

Backfilling of Soil Boring

If a well is not installed, the boring is backfilled from total depth to approximately 5 feet below ground surface (bgs) with either neat cement or bentonite grout using a tremie pipe and either the boring is backfilled from 5 feet bgs to approximately 1 foot bgs with hydrated bentonite chips or backfill is continued to just below grade with neat cement grout. The borehole is completed to surface grade with material that best matches existing surface conditions and meets local agency requirements. Site-specific backfilling details are shown on the respective boring log.

Well Construction

A well (if constructed) is completed using materials documented on the boring log or specified in a work plan. The well is constructed with slotted casing across the desired groundwater sampling depth(s) and completed with blank casing to within 6 inches of surface grade. No further construction is conducted on temporary wells. For permanent wells, the annular space of the well is backfilled with Monterey sand from the total depth to approximately 2 feet above the top of the screened casing. A hydrated granular bentonite seal is placed on top of the sand filter pack. Grout may be placed on top of the bentonite seal to the desired depth using a tremie pipe. The well may be completed to surface grade with a 1-foot thick concrete pad. A traffic-rated well vault and locking cap for the well casing may be installed to protect against surface-water infiltration and unauthorized entry. Site-specific well construction details including type of well, well depth, casing diameter, slot size, length of screen interval and sand size are documented on the boring log or specified in the work plan.

Well Development and Sampling

If a permanent groundwater monitoring well is installed, the grout is allowed to cure a minimum of 48 hours before development. Stantec personnel or a contracted driller use a submersible pump or surge block to develop the newly installed well. Prior to development, the pump is decontaminated by allowing it to run and re-circulate while immersed in a non-phosphate solution followed by successive immersions in potable water and de-ionized water baths. The well is developed until sufficient well casing volumes are removed so that turbidity is within allowable limits and pH, conductivity and temperature levels stabilize in the purge water. The volume of groundwater extracted is recorded on a log.

Following development, groundwater within the well is allowed to recharge until at least 80% of the drawdown is recovered. A new or decontaminated bailer is slowly lowered past the air/water interface in the well, and a water sample is collected and checked for the presence of non-aqueous phase liquid, sheen, or emulsions. The water sample is then emptied into laboratory-supplied containers as discussed above.

Surveying

If required, wells are surveyed by a licensed land surveyor relative to an established benchmark of known elevation above mean sea level to an accuracy of +/- 0.01 foot. The casing is notched or marked on one side to identify a consistent surveying and measuring point.

Decontamination Procedures

Stantec or the contracted driller decontaminates soil and water sampling equipment between each sampling event with a non-phosphate solution, followed by a minimum of two tap water rinses. De-ionized water may be used for the final rinse. Downhole drilling equipment is steam-cleaned prior to drilling the borehole and at completion of the borehole.

Waste Treatment and Soil Disposal

Soil cuttings generated from the drilling or sampling are stored on site in labeled, Department of Transportation-approved, 55-gallon drums or other appropriate storage container. The soil is removed from the site and transported under manifest to a client- and regulatory-approved facility for recycling or disposal. Decontamination fluids and purge water from well development and sampling activities, if conducted, are stored on site in labeled, regulatory-approved storage containers. Fluids are subsequently transported under manifest to a client- and regulatory-approved facility for disposal or treated with a permitted mobile or fixed-base carbon treatment system.

Low-Flow Sampling Field Protocol

The static water level and non-aqueous phase liquid (NAPL) level, if present, in each groundwater monitoring well that contain water and/or NAPL are measured with an interface probe to the nearest 0.01 foot. To calculate groundwater elevations and evaluate groundwater gradient, depth to water (DTW) levels are subtracted from wellhead elevations.

Before water samples are collected from the groundwater monitoring wells, the wells are purged using a peristaltic or a submersible pump at rates not exceeding 1 liter per minute (L/min) until stabilization of the following groundwater quality parameters are obtained: dissolved oxygen (DO), specific conductance (conductivity), temperature, pH, and oxidation/reduction potential (ORP). Readings of these parameters are recorded every three minutes while the water is purged, and DTW readings are collected every three minutes to ensure drawdown in the well is less than 0.33 feet. If drawdown occurs too quickly, the pumping rate will be reduced.

Purging will continue until three consecutive readings meet the following stabilization criteria:

- DO has a change of less than ±10% for values greater than 0.5 milligram per liter (mg/L), if three DO values are less than 0.5 mg/L, the values are considered stabilized
- Conductivity has a change of less than 3%
- Temperature has a change of less than 3%
- pH has a change of less than ±0.1 unit
- ORP has a change of less than ±10 millivolts

Purging will continue until these stabilization criteria have been met, or three well casing volumes have been purged from the groundwater monitoring well. The groundwater quality parameters will be recorded on the appropriate field log form.

Once groundwater conditions have stabilized, groundwater samples for volatile contaminants of concern are collected in 40-milliliter glass vials, which are filled to produce a positive meniscus. Each vial is preserved with hydrochloric acid, sealed with a cap containing a Teflon® septum, and subsequently examined for air bubbles to avoid headspace, which would allow volatilization to occur. Additional samples for other contaminants of concern will be collected in the appropriate laboratory-supplied sampling containers. The samples are promptly transported in iced storage in a thermally insulated cooler, accompanied by chain-of-custody documentation, to a state-certified laboratory.

Per- and Polyfluoroalkyl Substances (PFAS) Fieldwork Considerations

Field quality control for per- and polyfluoroalkyl substances (PFAS) soil and groundwater sample collection requires additional care and attention to detail. Requirements included in this document are intended to supplement the standard field protocols for drilling, well construction, soil sample collection, groundwater sample collection, and decontamination activities. All standard field quality control procedures are applicable unless explicitly superseded by procedures described in this document.

Sample Container Handling

Sample containers should remain sealed until use. Sample containers and lids should never be set down on the ground, table, chair, cooler, or other surface during sample collection. Handle sample lids from the sides only; do not touch the inside of the lid. After collection, PFAS sample containers must be protected from light.

Soil Samples

Sample containers for PFAS analysis of soil samples should be filled after sample containers for VOC analysis in order to limit potential volatilization. Sample containers for PFAS analysis should be filled directly, when possible; soil samples for PFAS analysis may not be collected from the aliquot of soil in the zip-top bag.

Groundwater Samples

Sample containers for PFAS analysis must be filled first at each groundwater sampling location. Sample containers for PFAS should be filled directly, when possible. Sample containers for PFAS must be filled to allow head space, preferably filled only to the shoulder of the bottle.

Equipment/Field Blank Samples

Equipment/field blank samples collected during PFAS sample collection will be generated using laboratory-supplied PFAS-free water.

Decontamination Water Source Testing

The onsite water source proposed for use in decontamination (i.e. steam cleaning drilling equipment and non-final rinses of non-dedicated equipment) will be verified as PFAS-free prior to use. Verification will be achieved through sample collection at the tap and analysis at the contracted laboratory in accordance with PFAS sample collection and analytical procedures. If the onsite water source is not verified to be PFAS-free, an alternative PFAS-free water source will be imported to the site for use during decontamination activities.

Field Instrument/Equipment Decontamination

Decontamination of field instruments and equipment used during PFAS sample collection must use laboratory-supplied PFAS-free water as the final rinse. This includes but is not limited to all drilling equipment and non-dedicated sample collection equipment such as hand augers, trowels, bowls, probes, and submersible pumps.

Supplies and Consumables

Supplies and consumables required for PFAS sample collection will be obtained from vendors who verify that their products are PFAS-free. This includes but is not limited to well construction supplies (casing, sand pack, bentonite, grout), sampling equipment, cleaning supplies, personal protective equipment (PPE), and general field supplies.

According to the Interstate Technology & Regulatory Council (ITRC) in their September 2023 *Per- and Polyfluoroalkyl Substances (PFAS)* guidance, supplies and consumables can be regarded in a tiered approach:

> “A tiered approach should be implemented for materials restrictions, where the first tier would include restrictions on the sampling materials that will come in direct contact with the sample media, and the second tier would include restrictions on what materials are allowed on sampling personnel or within the staging area. The focus on restrictions within the second tier should consider how reasonable the potential for contact with the sample media is when good sampling practices are employed, the practicality of the restriction (for example, does it compromise employee safety or increase an exposure risk), and the documentability of the requirement (can the restriction or measure be properly documented).”

The following is a list of prohibited and allowed materials adapted from PFAS sampling guidance published by the following:

- Interstate Technology & Regulatory Council (ITRC). September 2023. *Per- and Polyfluoroalkyl Substances (PFAS).*
- Michigan Department of Environment, Great Lakes, and Energy (EGLE). January 2024. *General PFAS Sampling Guidance.*
- Washington State Department of Ecology (Ecology). June 2023. *Guidance for Investigating and Remediating PFAS Contamination in Washington State. Publication No. 22-09-058.*

The list is not considered exhaustive, and should be revised, as needed, to meet regulatory requirements for your specific sampling event.

Category	**Prohibited Items**	**Allowable Items**
Pumps and Tubing	Teflon® and other fluoropolymer-containing materials, low density polyethylene (LDPE)	High-density polyethylene (HDPE), silicon tubing, peristaltic pump or stainless-steel submersible pump
Core liners	Teflon® and other fluoropolymer-containing materials, LDPE	Acetate liners, HDPE, and stainless-steel samplers
Decontamination	Decon 90®	Alconox® or Liquinox® or Citranox®, PFAS-free potable water followed by deionized rinse using laboratory supplied PFAS-free water, polyvinyl chloride (PVC) brushes/bowls/buckets
Sample Storage and Preservation	LDPE or glass bottles, PTFE-or Teflon®-lined caps, chemical ice packs	Laboratory-provided sample containers preferred, linerless HDPE or polypropylene bottles and caps, regular ice
Clothing	Clothing or boots waterproofed or treated for stain-resistance with fluoropolymer-containing materials (e.g., Gore-Tex™, Tyvek®, etc.), clothing chemically treated for insect resistance or ultraviolet protection	Synthetic and natural fibers (preferably cotton), previously laundered clothing (preferably washed more than 6 times without the use of fabric softeners), PVC or wax-coated fabrics, neoprene, powderless nitrile gloves
Field Documentation	Waterproof/treated paper or field books (e.g. Rite in the Rain®), plastic clipboards, Sharpie® markers (Note: Ultra-Fine/Fine Sharpie® markers allowed for use in staging area, prior to sampling), waterproof/write-anywhere pens, Post-It® and other adhesive paper products	Plain non-recycled paper, metal clipboard, ballpoint pens, pencils
Food and Beverage	Pre-packaged food, fast food wrappers or containers. Consumption of food or beverages should not occur at any time in the sampling area, even if the products appear in the “allowable items” column	Bottled water or hydration drinks

Category	Prohibited Items	Allowable Items
Personal Care Products* (for day of sample collection)	Cosmetics, moisturizers, hand cream, and other related products are not be used at any time in the sampling area, even if they appear in the “allowable items” column. Use of personal care products should be minimized, when possible, on the day of sample collection.	Sunscreens: • Banana Boat® for Men Triple Defense Continuous Spray Sunscreen SPF 30 • Banana Boat® Sport Performance Coolzone Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Lotion Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Stick SPF 50 • Coppertone® Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50 • Coppertone® Sport High Performance AccuSpray Sunscreen SPF 30 • Coppertone® Sunscreen Stick Kids SPF 55 • L’Oréal® Silky Sheer Face Lotion 50 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 50 • Meijer® Sunscreen Continuous Spray Broad Spectrum SPF 30 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50 • Meijer® Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Lotion SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Spray Broad Spectrum SPF 30 • Neutrogena® Pure & Free Baby Sunscreen Broad Spectrum SPF 60+ • Neutrogena® UltraSheer Dry-Touch Sunscreen Broad Spectrum SPF 30 Insect Repellants: • OFF® Deep Woods • Sawyer® Permethrin

References

Interstate Technology & Regulatory Council (ITRC). September 2023. *Per- and Polyfluoroalkyl Substances (PFAS).*

Michigan Department of Environment, Great Lakes, and Energy (EGLE). January 2024. *General PFAS Sampling Guidance*.

United States Environmental Protection Agency (EPA). January 2024. *Method 1633: Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LCS-MS/MS.*

Washington State Department of Ecology (Ecology). June 2023. *Guidance for Investigating and Remediating PFAS Contamination in Washington State. Publication No. 22-09-058.*

APPENDIX B

Example Field Forms

Daily Field Report

Stantec

Project #: **Stantec #:**

Activity: **Date:**

Equipment Used: **Sheet:** **of**

Name(s):

Arrived On Site: **Departed Site:** **Total Travel:**

Project #: **Sheet:** **of**

CALIBRATION LOG

Stantec

Equipment: ______________________________

Date	Time	Calibrated By	Standard	Standard Concentration	Comments

Stantec

SITE ID: ________________ **BORING:** ________ **PLATE:** ________

STANTEC #: ________________ **DATE:** ________________

DRILL CONTRACTOR: ________________

SAMPLE METHOD: ________________ **GEOLOGIST:** ________________

DRILL RIG: ________________ **SIGNATURE:** ________________

BOREHOLE DIAMETER: ________________ **WELL TAG #:** ________________

LOCATION: ________________ **LOGGED BY:** ________________

DEPTH (ft)	BLOW COUNTS	PID/OVM (ppm)	SAMPLE	COLUMN	USCS	GEOLOGIC DESCRIPTION	WELL DESIGN

GROUT: ________________

SAND SIZE: ________________

SLOT SIZE: ________________

CASING DIAMETER: ________________

FIELD LOG
WELL DEVELOPMENT FIELD PARAMETERS

SITE: **STANTEC# :**
LOCATION:
FIELD CREW: **DATE:**

WELL ID:

PURGE START hr:min	**PURGE STOP** hr:min	**INITIAL DTW** ft bgs	**FINAL DTW** ft bgs	**PUMP RATE** gal/min	**PURGE VOLUME** gal	**TIME** hr:min	**TURBIDITY** NTU

TOTAL PURGE VOLUME: 0.0 gal

COMMENTS:

WELL CONSTRUCTION:	Flush	**WELL DIAMETER:**	2-inch	**TOTAL DEPTH (ft bgs):**	15	**SCREEN INTERVAL (ft bgs):**	5-15

EXPLANATION:
-- = Not measured
DTW = Depth to water in feet below top of casing
ft bgs = Feet below ground surface
gal = Gallon
gal/min = Gallon per minute
hr:min = Hour:Minute time format
NTU = Nephelometric turbidity unit

FIELD LOG
DEPTH TO WATER RECORD

CLIENT NAME: **STANTEC#**:
SITE LOCATION:
FIELD CREW: **DATE**:

Well #	Time	DTNAPL (ft)	DTW (ft)	NAPL Thickness	Comments/Repairs

Comments:

FIELD LOG
PURGING & SAMPLING RECORD AND WELL EQUIPMENT STATUS

SITE: **STANTEC#**:

LOCATION:

FIELD CREW: **DATE**: Low-Flow Sampling

WELL #

TIME	DTW	PURGE VOLUME	PUMP RATE (Q)	TEMP	COND	pH	ORP	DO
hr:min	ft	mL	mL/min	deg C	mS/cm	unit	mV vs NHE	mg/L
				±3%	±3%	±0.1	±10	±10% / 0.5*
Comments:								
SW		1 gal = 3.79 L						
Total Purge Volume		0 mL		0.00 gal				

WELL #

TIME	DTW	PURGE VOLUME	PUMP RATE (Q)	TEMP	COND	pH	ORP	DO
hr:min	ft	mL	mL/min	deg C	mS/cm	unit	mV vs NHE	mg/L
				±3%	±3%	±0.1	±10mV	±10% / 0.5*
Comments:								
SW		1 gal = 3.79 L						
Total Purge Volume		0 mL		0.00 gal				

*10% for values >0.5 mg/L, if three DO values are <0.5 mg/L, values are considered stabilized.

Fremont
Analytical
An Alliance Technical Group Company

3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Chain of Custody Record & Laboratory Services Agreement

Date: **Page:** **of:**

Laboratory Project No (internal):

Project Name:

Special Remarks:

Client:

Project No:

Address:

Collected by:

City, State, Zip:

Location:

Telephone:

Report To (PM):

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

Email(s):

Sample Name	**Sample Date**	**Sample Time**	**Sample Type (Matrix)***	**# of Cont.**	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)					Comments
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

***Matrix:** A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

****Metals (Circle):** MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

*****Anions (Circle):** Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☐ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day ________ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

SAMPLE RECEIVING. The laboratory hours are from 8:00am to 6:30pm – Monday through Friday. Sample receiving hours are between 8:00am and 4:00pm – Monday through Friday. Turnaround times for samples received after 4:00pm will begin on the following business day.

TURNAROUND TIMES. Standard turnaround is 5 business days from the date of sample receipt for most sample analyses. For many analyses we can offer expedited turnaround, including:

- 3 Day (50% surcharge)
- 2 Day (75% surcharge)
- Next Day (100% Surcharge)
- Same Day Service – Call for Quote.

Expedited turnaround and/or specific data delivery requirements should be coordinated with the lab in advance. Samples received by Fremont Analytical (FAI) near the end of a holding time period may incur an expedited analysis surcharge.

SAMPLE DISPOSAL. Fremont Analytical, Inc. will archive samples for 30 days. Afterwards FAI will dispose of the samples appropriately. Clients should contact FAI to retrieve their samples before disposal and/or arrange for storage beyond the standard 30 days. A $5.00 monthly fee, per sample, will be applied for storage beyond 30 days.

Certain hazardous samples, and/ or samples placed on hold, may be returned to the client upon completion of the project. FAI reserves the right to charge a disposal fee (not to exceed $25.00/sample) for samples requiring special packaging and labeling as Hazardous Materials. "Hazardous Materials" include, but are not limited to, substances of any kind which are potentially poisonous, toxic, radioactive, explosive, flammable, contain biohazards, high levels of trace metals, or pose any risk to persons or the environment, through handling or disposal.

PAYMENT. All invoices are sent directly to the client. For clients with approved credit, payment terms are net 30 days from the date of the invoice. All overdue payments are subject to 1.5% interest and service charge per month from the due date of the invoice. Billing of a third party will not be accepted without a signed statement which acknowledges and accepts payment responsibility. In the event that payment is not received within 60 days following the invoice date, FAI may, at its option, terminate all duties without liability to the Client or others. All data produced by FAI is the property of FAI until all fees are paid.

Clients choosing to suspend or terminate a project should contact FAI. Those clients suspending or terminating a project will be charged for services already rendered and all samples associated with that project number will be held for the standard 30 days unless otherwise directed (please see "Sample Disposal" above for the guidelines and fees associated with longer storage). FAI is not liable for the storage of samples past 30 days if the client does not contact the laboratory to make arrangements. Clients should contact the laboratory to resume suspended or terminated projects.

CONFIDENTIALITY. Fremont Analytical maintains the confidentiality of all analytical data. No information regarding projects of analytical data will be released without direct authorization from our clients. All data and results provided to the client by FAI are specifically for the use of the client. FAI is not responsible for the use of data and results by the client or third parties. Results are intended to be considered in their entirety and FAI is not responsible for the misuse of any portion of the results.

COMPLETE AGREEMENT, MODIFICATION, WAIVER, ENFORCEABILITY. This Agreement, including the parts incorporated herein by reference, is the complete agreement of the parties with regard to services of FAI. No modification or amendment to this Agreement shall be valid unless in writing and signed by an authorized representative of each party. This Agreement is binding on each party's heirs, successors, and assigns. If any provision of this Agreement is held invalid, illegal, or unenforceable, then the remaining provisions shall remain in effect and may be reformed and enforced by the court. Failure to require performance of any term of this Agreement shall not be deemed a waiver of the right to enforce any term of this Agreement.

JURISDICTION AND VENUE. This Agreement shall be interpreted according to the laws of the State of Washington. FAI and Client agree to submit to the jurisdiction and venue of state and federal courts in Seattle, Washington.

LIMITED WARRANTY. FAI warrants only that it will perform services using analytical methodologies with published test methods according to industry standards. If circumstances require analytic practices for which standards do not exist, FAI warrants only that its services will be in accordance with standard scientific procedures and good laboratory practices. **FAI MAKES NO OTHER WARRANTIES AND DISCLAIMS ALL OTHER EXPRESS OR IMPLIED WARRANTIES. FAI MAKES NO REPRESENTATIONS OR WARRANTIES REGARDING THE FITNESS OF THE DATE IN ITS LAB REPORTS FOR ANY PARTICULAR USE OR PURPOSE.**

LIMITATIONS ON FAI'S LIABILITY. FAI shall not be liable to Client for any of the following types of damages or losses arising out of this agreement: incidental damages, indirect damages, consequential damages, lost profits, or tort damages. **CLIENT'S SOLE REMEDY SHALL BE A REFUND OF THE APPLICABLE PAYMENT TO FAI. FAI SHALL HAVE NO LIABILITY OR OBLIGATIONS EXCEPT AS STATED HEREIN.**

TIME LIMITATIONS ON ACTIONS AGAINST FAI. No legal action arising out of any service provided by FAI under this Agreement may be brought against FAI more than one year after FAI has completed the service that is the subject of the legal action, regardless of whether the parties have agreed to arbitration.

NOTICES. Client(s) shall inspect completed data packages and notify Fremont Analytical, Inc. of any defects or nonconformity within thirty (30) days of receipt. Failure to provide timely notification or provide payment for services shall be considered acceptance of such services, except as to latent defects which reasonable and timely examination would not have revealed.

APPENDIX F

Stantec's *Quality Assurance Project Plan*

Stantec

Stantec Consulting Services Inc.
1687 114th Avenue Southeast, Suite 100
Bellevue WA 98004

November 22, 2024
File: 203723678.QAPP24

Kristin Beck
Washington State Department of Ecology
Eastern Regional Office
4601 North Monroe Street
Spokane, Washington 99205-1295
kbec461@ecy.wa.gov

Reference: Quality Assurance Project Plan
Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Ecology Facility Site ID: 612

Kristin Beck:

At the request of the Port of Moses Lake (Port), Stantec Consulting Services Inc. (Stantec) is submitting the enclosed *Quality Assurance Project Plan*, dated November 22, 2024.

Please contact Mr. Bobby Thompson, Stantec Project Manager for this site, at (206) 510-5855 or Mr. Milton Miller, Port Project Manager for this site, at (509) 762-5363, with questions.

Regards,

Stantec

Bobby Thompson
Senior Project Manager
Mobile: (206) 510-5855
robert.thompson@stantec.com

Attachment: Stantec's *Quality Assurance Project Plan*, dated November 22, 2024

c. Mr. Milton Miller, Port of Moses Lake (*Email*)
Mr. Rich Mueller, Port of Moses Lake *(Email)*
Mr. Jeff Johnson, ExxonMobil Environmental and Property Solutions Company (*Project file*)

Quality Assurance Project Plan

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

November 22, 2024

Prepared for:

Port of Moses Lake

Prepared by:

Stantec Consulting Services Inc
1687 114th Avenue Southeast, Suite 100
Bellevue, Washington 98004
USA
www.stantec.com

File: 203723678.QAPP24

This document entitled *Quality Assurance Project Plan* was prepared by Stantec Consulting Services Inc. (Stantec) for the account of Port of Moses Lake (Client). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Laina Cole
Environmental Scientist

LAINAECOLE
(signature)

Keri L. Chappell
LG 2719

Keri Chappell
(signature)

State of Washington
2719
Licensed Geologist
Keri Lynn Chappell

Table of Contents

PLATES

TABLES

APPENDICES

Acronyms and Abbreviations

AO	Agreed Order No. DE 22056
bgs	Below ground surface
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain of custody
CPR	Cardiopulmonary resuscitation
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPA	United States Environmental Protection Agency
EPH	Extractable petroleum hydrocarbons
Eurofins	Eurofins Lancaster Laboratories Environment Testing
ExxonMobil	Exxon Mobil Corporation
Fremont	Fremont Analytical Laboratory
FS	Feasibility study
HASP	Site-Specific Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
MDL	Method detection limit
MS	Matrix spike
MSD	Matrix spike duplicate
MTCA	Model Toxics Control Act
NELAP	National Environmental Laboratory Accreditation Program
NFG	National Functional Guidelines
NWEPH	Method for the Determination of Extractable Petroleum Hydrocarbons Fractions
NWTPH	Northwest Total Petroleum Hydrocarbons
NWTPH-Dx	Northwest Total Petroleum Hydrocarbons for Diesel/Oil Range Organics
NWTPH-Gx	Northwest Total Petroleum Hydrocarbons for Gasoline Range Organics
NWVPH	Method for the Determination of Volatile Petroleum Hydrocarbons Fractions
OSHA	Occupational Safety and Health Administration
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity
PDF	Portable Document Format
PFAS	Per- and polyfluoroalkyl substances
PLP	Potentially liable person
Port	Port of Moses Lake
QA/QC	Quality assurance/quality control
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
RI	Remedial investigation

RI/FS Work Plan	Remedial Investigation/Feasibility Study Work Plan
RL	Reporting limit
RPD	Relative percent difference
SAP	Sampling and Analysis Plan
SIM	Selective Ion Monitoring
Site	Port of Moses Lake Pumphouse 1
SOP	Standard operating procedure
Stantec	Stantec Consulting Services Inc.
SVOC	Semi volatile organic compound
TPH	Total petroleum hydrocarbons
TPHd	Total petroleum hydrocarbons as diesel
TPHg	Total petroleum hydrocarbons as gasoline
TPHo	Total petroleum hydrocarbons as oil
USDOT	United States Department of Transportation
VOC	Volatile organic compound
VPH	Volatile petroleum hydrocarbons
WAC	Washington Administrative Code

1.0 INTRODUCTION

At the request of the Port of Moses Lake (Port), Stantec Consulting Services Inc. (Stantec) prepared this Quality Assurance Project Plan (QAPP) to describe the personnel, procedures, and methods for ensuring the quality, accuracy, and precision of environmental data associated with the remedial investigation (RI)/feasibility study (FS) for the Port of Moses Lake Pumphouse 1 (site), located at 7810 Andrews Street Northeast in Moses Lake, Washington (Plate 1). Environmental samples are being collected in support of an RI to identify and address data gaps by conducting field investigations to guide development of the FS.

The purpose of this document is to describe the personnel, procedures, and methods for ensuring the quality, accuracy, precision, and usability of data associated with the RI for the site. This QAPP addresses quality assurance/quality control (QA/QC) associated with the field collection and laboratory analysis of environmental samples during the RI. Following the procedures outlined in this QAPP will ensure that the data collected and evaluated meet the project objectives.

This QAPP provides field and laboratory personnel with instructions regarding activities to be performed before, during, and after field investigations. These instructions will ensure data collected for use in project decisions will be of the type and quality required to meet the data use objectives for the project.

1.1 OBJECTIVES

The primary objective of this QAPP is to provide the guidance to be followed for collection and chemical analysis of soil, groundwater, and QA/QC samples so that the data are of sufficient quality to support the project data objectives and the data end uses. This QAPP also presents the overall project team organization and QA/QC procedures to be followed.

Consultant staff participating in the data collection work effort are required to be familiar with the requirements of the QAPP. The QAPP should be in the possession of the field team during sample collection and in possession of the analytical laboratory providing analytical services. The consultant and analytical laboratory personnel working on this project will be required to comply with the procedures documented in this QAPP to maintain comparability and representativeness of the resulting data.

2.0 PROJECT MANAGEMENT

2.1 PROJECT ORGANIZATION AND RESPONSIBILITIES

Responsibilities of key project personnel are outlined in this section. The lines of communication, management activities, and technical direction within this project team will follow this organizational arrangement. Any directions or communications from the Washington State Department of Ecology (Ecology) will be given to the Project Coordinator and Project Manager. The Project Manager and staff will communicate with the analytical laboratory and other subcontractors, as appropriate.

2.2 REGULATORY AGENCY

Ecology is the lead agency and will oversee activities associated with the RI/FS for the site. Kristin Beck with Ecology will provide regulatory leadership and be responsible for the review and approval of reports.

2.3 POTENTIALLY LIABLE PERSONS

The Port and Exxon Mobil Corporation (ExxonMobil) have been identified as potentially liable persons (PLPs) under Ecology Agreed Order DE 22056 (AO; Ecology, 2023). To effectuate work performed under the AO in the most efficient manner, the Port has elected to take the lead as Project Coordinator for the PLPs.

2.4 CONSULTANT

Together, the consultant management team will be responsible for the technical planning and implementation of the work. The QA/QC staff has responsibility for effective planning, verifying, and managing QA/QC activities associated with the assigned project. Below are descriptions of project responsibilities.

2.4.1 Project Manager

The Project Manager is responsible for the implementation of the field program and will provide management and tracking of the project schedule and budget. Other responsibilities include coordination and preparation of the required reports and assignment of technical responsibilities to appropriate personnel or subcontractors. The Project Manager will be responsible for coordinating all communications between the consultant, Ecology, and the Port.

2.4.2 Field QA Manager

The Field QA Manager will be responsible for the overall quality of field data and deliverables generated during the project. It is the responsibility of the Field QA Manager to ensure that required QA/QC protocols are met in the field.

2.4.3 Project Database Manager

The Project Database Manager will be responsible for management and maintenance of the project database and analytical data collected during field activities. The Project Database Manager oversees all database efforts that support the project, including screening sample analytical results against applicable screening levels.

2.4.4 Project Chemist

The Project Chemist will be responsible for the overall quality and consistency with respect to chemistry procedures and products. In addition, the Project Chemist will provide guidance on QA/QC operations for field and laboratory activities related to sampling and analysis. The Project Chemist will coordinate with the analytical laboratory to ensure readiness to implement project-specific requirements. The Project Chemist will also support data validation and be the primary author of the Data Validation/Data Usability Report.

2.4.5 QA Manager

The QA Manager will be responsible for reviewing the project QA program as it relates to the collection, completeness, and quality of data and deliverables generated during the project. The QA Manager is independent of the Project Manager and any data generation activities.

2.5 ANALYTICAL LABORATORY

A state-certified laboratory will be contracted for laboratory analysis of environmental samples. For the purposes of this QAPP, Stantec solicited example documentation and materials from Fremont Analytical Laboratory (Fremont) in Seattle, Washington, and Eurofins Lancaster Laboratories Environment Testing (Eurofins) in Lancaster, Pennsylvania.

2.5.1 Laboratory Project Managers

The contract laboratory will provide laboratory analytical services in accordance with their laboratory Quality Assurance Manuals (QAMs), this QAPP, and other project-related communication. The Laboratory Project Manager will report to the Project Chemist on aspects of the sample analysis and reporting. In addition, the Project Manager will be advised of any matters related to data quality.

2.5.2 Laboratory QA Managers

The Laboratory QA Managers are responsible for overseeing and implementing QA activities in the laboratory and ensuring the quality of the data for the project. The Laboratory QA Manager will coordinate with the Laboratory Project Manager on responses to any QC issues that affect the project.

3.0 DATA QUALITY OBJECTIVES

3.1 PARCCS OVERVIEW

Criteria for measurements made during this project will be addressed in terms of Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity (PARCCS). The measurement criteria and numerical PARCCS parameters described in the following sections will require that the sampling be performed using standard methods with properly operated and calibrated equipment and conducted by trained personnel.

3.1.1 Precision

Precision is the degree of agreement among repeated measurements of the same parameter under the same or similar conditions. Precision is reported as either relative percent difference (RPD) or relative standard deviation, depending on the end use of the data.

3.1.1.1 Field Precision Objectives

Field precision will be assessed through the collection and analysis of field duplicate samples.

RPDs will be calculated for the detected analytes from investigative and field duplicate samples using the following equation:

$$\mathrm{RPD} = \frac{|c_1 - c_2|}{\left(\frac{c_1 + c_2}{2}\right)} \times 100\, percent$$

Where:

- C_1 = Concentration of the compound or element in the sample.
- C_2 = Concentration of the compound or element in the duplicate/replicate.

Field duplicate samples will be collected for soil and groundwater samples. Duplicate RPDs of ±50 percent will be used as advisory limits for analytes detected in both investigative and field duplicate samples at concentrations greater than or equal to five times its reporting limit (RL). RPDs for samples with reported results that are less than five times its RL, non-detect, or estimated or rejected based on blank contamination, are considered non-representative and will not be calculated. The number of field duplicate samples recommended for each round of sampling is one for every 20 samples, per matrix.

3.1.1.2 Laboratory Precision Objectives

For the analytical laboratory to be used for this project, precision of laboratory analyses will be based upon laboratory matrix spike (MS), laboratory control sample (LCS), and laboratory duplicate analyses. Duplicate precision is reported as RPD, the equation to be used to determine precision is presented in Section 3.1.1.1. The LCS, MS, and laboratory duplicate analyses will be performed either at a rate of one per 20 samples per matrix received by the laboratory or in accordance with laboratory procedures.

3.1.2 Accuracy and Bias

Accuracy is the extent of agreement between an observed or measured value and the accepted reference, or true, value of the parameter being measured.

3.1.2.1 Field Accuracy Objectives

The objective for accuracy of the field sample collection procedures will be to ensure that samples are not affected by sources external to the sample, such as sample contamination by ambient conditions or inadequate equipment decontamination procedures. Sampling accuracy will be assessed by evaluating the results of equipment and trip blank samples for contamination.

Equipment blanks will be collected only from decontaminated, reusable field equipment, such as split spoon samplers or hand augers. Equipment blanks will be collected by pouring laboratory-prepared water or distilled water over or through reusable field sampling equipment and collecting the rinsate in the laboratory-supplied analytical containers. Equipment blanks should be collected following decontamination procedures and will not be collected for dedicated or disposable field equipment. Equipment blanks will be submitted to the laboratory with the associated investigative samples and will be analyzed for the same parameters as the investigative samples. The minimum required frequency is one equipment blank per day per type of sampling equipment. Where possible, the use of disposable, one-time use field equipment will be emphasized.

Trip blanks will be used when samples are collected for volatile organic compound (VOC) analysis. The laboratory-prepared organic-free sample taken from the laboratory to the sampling site and transported back to the laboratory without having been exposed to sampling procedures will be used to assess contamination during shipping and field handling procedures. One trip blank per cooler containing samples for VOC analysis will be used.

3.1.2.2 Laboratory Accuracy Objectives

Laboratory accuracy will be assessed by determining percent recoveries from the analysis of LCS and LCS duplicate (LCSD), MS and MS duplicate (MSD), or standard reference material samples. MS/MSD samples should be collected for organic and inorganic analyses at a minimum frequency of one per 20 or fewer samples for soil and groundwater.

The equation used to determine the analytical accuracy for this project is:

$$Accuracy = Percent\ Recovery = \frac{A_r - A_0}{A_f} \times 100\ percent$$

Where:

- A_r = Total amount detected in spiked sample.
- A_o = Amount detected in unspiked sample.
- A_f = Amount added to sample.

The accuracy of organics analyses will also be monitored through analysis of surrogate compounds. Surrogate compounds are added to each sample, standard, blank, and QC sample prior to sample preparation and analysis. Surrogate compounds are not expected to be found occurring naturally in the samples but behave analytically similar to the compounds of interest. Consequently, surrogate compound percent recoveries will provide information on the effect that the sample matrix exhibits on the accuracy of the analyses.

In addition, example laboratory QA objectives can be referenced in the QAM presented in Appendix A.

3.1.3 Representativeness

Representativeness is a qualitative term that describes the extent to which a sampling design adequately reflects the environmental conditions of the site. It also reflects the ability of the sample team to collect samples and laboratory personnel to analyze those samples in such manners that the data accurately and precisely reflect the conditions at the site.

3.1.3.1 Measures to Ensure Representativeness of Field Data

Representativeness will be achieved by establishing the level of allowable uncertainty in the data and then statistically determining the number of samples needed to characterize the site. It will also be achieved by ensuring that sampling locations are properly selected. Representativeness is dependent upon the proper design of the sampling program and will be accomplished by ensuring that this QAPP, the project-specific Sampling and Analysis Plan (SAP), and standard procedures are followed. The QA goal will be to have all samples and measurements representative of the media sampled.

3.1.3.2 Measures to Ensure Representativeness of Laboratory Data

Representativeness of laboratory data cannot be quantified; however, adherence to the prescribed analytical methods and procedures, including holding times, blanks, and duplicates, will ensure that the laboratory data are representative.

3.1.4 Completeness

Completeness is defined as the measure of the quantity of valid data obtained from a measurement system compared to the quantity that was expected under normal conditions. The equation used to determine completeness for this project is:

$$\%\ Completeness = \frac{Number\ of\ Valid\ (usable\ measurements)}{Number\ of\ Measurements\ Planned} \times 100$$

While a completeness goal of 100 percent is desirable, an overall completeness goal of 90 percent may be realistically achieved under normal field sampling and laboratory analysis conditions.

3.1.4.1 Field Completeness Objectives

The field sampling team will take measures to generate valid data in the field; however, some samples or sample containers may be lost or broken during handling and transit. Therefore, the field completeness goal for this project will be to have 90 percent of all samples be valid data. The equation for calculating completeness is presented in Section 3.1.4.

3.1.4.2 Laboratory Completeness Objectives

Laboratory completeness will be a measure of the quantity of valid data measurements and analyses obtained from all the measurements and analyses completed for the project. The laboratory completeness goal is for 90 percent of the samples analyzed to be valid data. The procedure for determining laboratory data validity is provided in Section 11.2. The equation for calculating completeness is presented in Section 3.1.4.

3.1.5 Comparability

The confidence with which one data set can be compared to another is a measure of comparability. The ability to compare data sets is particularly critical when a set of data for a specific parameter is compared to historical data for determining trends.

3.1.5.1 Measures to Ensure Comparability of Field Data

Ensuring that this QAPP and the SAP are adhered to and that samples are properly handled and analyzed will satisfy the comparability of field data. Additionally, efforts will be made to have sampling completed in a consistent manner by the same sampling team using the same methodologies.

3.1.5.2 Measures to Ensure Comparability of Laboratory Data

Analytical data are comparable when the data are collected and preserved in the same manner followed by analysis with the same standard method and RLs. Data comparability is limited to data from the same environmental media. Analytical method quality specifications have been established to help ensure that the data will produce comparable results. Tables 1A through 1D summarize example laboratory RLs.

3.1.6 Sensitivity

Sensitivity is the ability of a method or instrument to detect a parameter to be measured at a level of interest. Analytical sensitivity is a measure of both the ability of the analytical method to detect the analyte and the concentration that can be reliably quantified. The minimum concentration of the analyte that can be detected is the method detection limit (MDL). The minimum concentration that can be reliably quantified is the RL. Laboratories use both MDLs and RLs for reporting analyte concentrations, and both values will be used as measures of sensitivity for each analysis.

The sensitivity requirements for laboratory analyses are to meet the screening levels established for the project and the Model Toxics Control Act (MTCA) standards, if applicable. Analytical results will be reported to the laboratory RL except for when the RL value exceeds applicable screening levels. For these cases, analytical results will be reported to the MDL.

Tables 1A through 1D summarize example laboratory RLs.

4.0 SPECIALIZED TRAINING AND CERTIFICATIONS

4.1 PERSONNEL TRAINING

Field technical staff working at locations where hazardous materials and/or other contaminants may be encountered will be trained as mandated by Occupational Safety and Health Administration (OSHA) regulations (29 Code of Federal Regulations [CFR] 1910.120) and Washington Administration Code (WAC) 296-843 (WAC, 2018). The consultant will also ensure that site personnel complete either their initial Hazardous Waste Operations and Emergency Response (HAZWOPER) training or their annual 8-Hour HAZWOPER refresher training and maintain personnel training records. At least one field member at each field sampling station will have cardiopulmonary resuscitation (CPR) and first aid training. Additionally, field personnel will be properly trained in procedures for using field equipment or monitoring devices as well as in procedures for collecting, labeling, packaging, and shipping environmental samples.

Personnel engaged in field activities will have completed health and safety training that meets the requirements of the site-specific Health and Safety Plan (HASP) in accordance with WAC 173-340-810 (WAC, 2024). Documentation will be maintained to demonstrate that requirements of the HASP are followed. The Project Manager will be responsible for ensuring requirements for safety training set forth in the HASP are satisfied. Each day, prior to work commencing, the consultant field personnel will conduct a tailgate health and safety meeting with participation by the full contractor field team.

Subcontractors will be prequalified by the consultant to determine that their training and certification meet industry standards and are contractually aligned. The consultant will verify that all subcontractors are qualified to work on the project by conducting a thorough review of their safety programs, safety records, insurance requirements, licenses, and training and certifications specific to their task. Additional details pertaining to special training and required certification are described in detail in the HASP.

Personnel and subcontractors who work on the per- and polyfluoroalkyl substances (PFAS) sampling portion of the work will be required to adhere to additional specific requirements and/or training regarding materials, equipment, and procedures to prevent cross-contamination or introduction of PFAS into the sampling environment. Additional details are included in the Field Quality Control section of this QAPP and in the field protocols included as an appendix to the project-specific SAP.

4.2 SITE ACCESS

The site is within the boundary of the Grant County International Airport, a secure facility, managed by the Port. The Port facilitates an access badge program comprising of an application, identification verification, and in-person training session, to those that require access to the facility independently without an escort. The Ramp (non-movement) badge is required for access to the site.

At least two consultant badge-holders will be present on site for all fieldwork. Badged personnel are authorized to escort non-badged site visitors. All subcontractors, clients, and Ecology personnel must either be current badge-holders or must be escorted at all times on site by badged personnel. No Ecology personnel will be denied access to the site provided they are badged or escorted. Consultants and subcontractors have routinely accessed the site since 1991; access complications are not anticipated.

Additional details regarding site access are provided on Plate 2.

4.3 LABORATORY ACCREDITATION

The laboratory performing sample analyses will be accredited by Ecology in accordance with WAC 173-50 Accreditation of Environmental Laboratories (WAC, 2023) or the National Environmental Laboratory Accreditation Program (NELAP). The laboratory must be approved under Ecology for each analytical method or approved for each parameter of analysis under NELAP. Example laboratory certifications are provided in Appendix B.

5.0 DOCUMENTATION AND RECORDS

Records to be used for project documentation include field forms and chain of custody (COC) forms. Example forms are included in the SAP. Final copies of reports and spreadsheets will be saved in Portable Document Format (PDF). The consultant will retain these files for a period of at least 10 years following the completion of work performed pursuant to the AO.

Each product completed as part of the RI/FS will undergo a quality review by an experienced staff member and a final review by a senior reviewer prior to submittal to Ecology or discussion with outside parties. Corrective action will be implemented in response to deficiencies that are encountered during product or deliverable assessments. Any reviewer who detects a deficiency or non-conforming situation will be responsible for reporting the deficiency to the author/reviewer. A closed-loop corrective action system will be used to address these types of needed corrections.

6.0 DATA GENERATION AND ACQUISITION

This section addresses data generation and acquisition to ensure that appropriate methods for sampling measurement and analysis, data collection or generation, data handling, and QC activities are employed and documented.

6.1 SAMPLE DESIGN

The RI/FS Work Plan and SAP describe field activities, including the following elements:

- Project background.
- Sample matrices, numbers, locations, and depths.
- Sampling procedures.
- Number and type of QC samples to be collected and submitted for analysis.
- Field documentation and procedures.
- Requested analytical methods.
- Additional sampling, analytical, or QA/QC requirements that deviate from those established in this QAPP.

Sample containers, preservation, and holding times are summarized in Table 2. QA/QC samples will be collected in accordance with the QAPP protocols. Requirements for QA/QC samples are presented in Table 3.

6.2 SAMPLE METHODS

6.2.1 Sample Nomenclature Scheme

Each sample collected during site activities will be given a unique identification code. Each unique sample identification will consist of the following:

- *Sample Type.* Each sample will be identified by a sample type code as follows:

  S – soil sample.
  W – groundwater sample.

- *Depth interval.* Following the sample type, the depth, or depth interval, from which the sample was collected will be identified. For example:

  5 – sample collected at 5 feet below ground surface (bgs).

- *Station Number*. Following the sample type each sample will be identified by a station number as follows:
  B## – boring sample location.
  MW## – monitoring well sample location.

- *QA Sample IDs.* Field, equipment, and duplicate samples will be identified using the project area code and the codes noted below. These codes will be followed by 01, 02, 03, etc. if more than one of the sample types are collected.

TB – trip blank sample.
EQB – equipment blank sample.
DUP – field duplicate sample.

Examples:

S-50-B1 = Soil sample collected at 50 feet bgs from boring B1.
W-90-MW1 = Groundwater sample collected at 90 feet bgs from groundwater monitoring well MW1.
EQB01 = First equipment blank collected.
S-50-B1-DUP = Field duplicate soil sample collected at 50 feet bgs from boring B1.

Sample bottle labels appropriate for the size and type of sample containers shall be provided by each laboratory. Each label will be completed in waterproof ink and indicate at a minimum:

- Site name.
- Sample identification code.
- Date and time of sample collection.
- Sampler's initials.
- Requested analyses.
- Type of preservative.

6.2.2 Sample Collection

Table 2 lists the required sample containers, preservatives, and recommended maximum holding times for samples. Samples will be collected into containers provided by the laboratory. To maintain sample integrity and prevent cross contamination, samplers will follow field protocols (example field protocols are included in the SAP).

6.3 SAMPLE HANDLING

6.3.1 Sample Custody

The possession and handling of samples will be documented from the time of collection until delivery to the laboratory. Field personnel are responsible for ensuring that COC procedures are followed. Field personnel will maintain custody of all samples until they are relinquished to another custodian, the laboratory, or the freight shipper.

A sample is considered "in custody" if it is:

- In a person's possession.
- In view of the person after being in their possession.
- Sealed in such a manner that it cannot be tampered with after having been in physical possession.
- In a secure area restricted to authorized personnel.

All samples must be catalogued on a COC form using sample identification codes. The date and time of collection will be recorded on the form, as well as the number of each type of bottle, the method of preservation, and the type of analysis.

6.3.2 Sample Packing and Shipping

Samplers will transport environmental samples directly to the laboratory or use an overnight delivery service. The laboratory will be contacted in advance to expect shipment so that sample holding times will be met. The COC forms will be sealed in a plastic bag and placed inside the sample cooler. Samples will be packed in the cooler using bubble-wrap packing materials and ice. Appropriate United States Department of Transportation (USDOT) regulations for packaging, marking/labeling, and shipping of hazardous materials and wastes will be followed.

If using an overnight delivery service, the sample cooler will be taped closed and custody seals provided by the laboratory will be affixed to prevent tampering during transport, and to facilitate the detection of possible tampering (if the seals are broken). Upon relinquishing the sample cooler to the contract laboratory or shipper, field personnel will assign custody of the samples to the laboratory or shipper by signing and dating the bottom of the COC form. One copy of the COC documentation will be retained by the Project Chemist and a second copy will be retained by the laboratory or shipper. The integrity of the custody seals shall be noted by the laboratory on the COC form upon arrival.

The project laboratory will perform laboratory custody procedures for sample receiving and log-in, sample storage, tracking during sample preparation and analysis, and storage of data in accordance with their standard operating procedures (SOPs). The Laboratory Project Manager will be responsible for ensuring that laboratory custody protocol is maintained. The laboratory procedures related to sample custody are discussed in the laboratory's QAM (example QAM provided in Appendix A).

The consultant will be responsible for the custody of evidence files and will maintain and update contents of the files during the project term. The evidence files will include all records relevant to sampling and analysis activities such as field logbooks, photographs, subcontractor reports, laboratory data deliverables, COC forms, and data reviews. The consultant will retain this file for a period of at least 10 years following the completion of work performed pursuant to the AO.

6.4 LABORATORY PROCEDURES

6.4.1 Intra-Laboratory and Subcontracted Laboratory Sample Transfer

Transfer of samples, subsamples, digestates, or extracts to another party are subject to all of the requirements for legal COC for all samples associated with legal COC.

6.5 ANALYTICAL METHODS

Analytical methods will be selected that will achieve project objectives. Samples will be prepared and analyzed in accordance with the analytical methods outlined in the laboratory's QAM (example QAM provided in Appendix A).

Samples will be submitted for analysis using one or more of the following methods:

- Total petroleum hydrocarbons (TPH) as gasoline (TPHg) by Ecology Method Northwest TPH (NWTPH) for Gasoline Range Organics (NWTPH-Gx).
- TPH as diesel (TPHd) and oil (TPHo) by Ecology Method NWTPH for Diesel/Oil Range Organics (NWTPH-Dx).

- Volatile petroleum hydrocarbons (VPH) by Ecology Method for the Determination of VPH Fractions (NWVPH) Method. NWTPH-VPH
- Extractable petroleum hydrocarbons (EPH) by Ecology Method for the Determination of EPH Fractions (NWEPH) Method.
- VOCs by United States Environmental Protection Agency (EPA) Method 8260 or 8260 with Selective Ion Monitoring (SIM).
- Methanol by EPA Method 8015.
- Semi volatile organic compounds (SVOCs) by EPA Method 8270 or 8270SIM.
- Total arsenic, barium, cadmium, chromium, lead, silver, selenium, and mercury by EPA Method 6010, 6020, or 7471, as applicable.
- Dissolved arsenic, barium, cadmium, chromium, iron, lead, manganese, silver, selenium, and mercury by EPA Method 200.8, 6010, 6020 or 7470, as applicable.
- PFAS compounds by EPA Method 1633.
- Ferrous iron by Standard Method 3500-FeB.
- Nitrate and sulfate by EPA Method 300.0.
- Alkalinity by Standard Method 2320B.
- Carbon dioxide by Standard Method 4500-CO2D.
- Methane by RSK SOP-175.

All TPH results will be subject to comparison with standard chromatograms for Jet A jet fuel. Jet A fuel primarily overlaps with the carbon range reported as TPHd. Analytical methods and example RLs are presented in Tables 1A through 1D.

After submittal of the samples to the laboratory for analysis, the analytical results are anticipated to be received on different turnaround times based on complexity of the analysis, method extraction, hold times, laboratory QA/QC validation times, and overall laboratory logistical and volume capabilities. It is anticipated that results will report on a two-week turnaround time.

7.0 QUALITY CONTROL

QC requirements ensure that the environmental data collected are of the highest standard feasible, as appropriate for the intended application.

7.1 FIELD QUALITY CONTROL

Where applicable, field QC checks will be conducted through replicate measurements, equipment calibration checks, and data verification by field personnel. Field-sampling precision and data quality will be evaluated through use of sample duplicates, equipment blanks, and trip blanks. If there is any discrepancy in the sample data, field personnel will notify the Project Manager and discuss methods for resampling or otherwise addressing the discrepancy.

7.1.1 Field QA/QC Samples

The minimum required frequency for equipment blanks is one equipment blank per day per type of sampling equipment. The number of field duplicate samples recommended for each round of sampling is one for every 20 samples, per matrix. One sample collected for the purpose of MS/MSD at the laboratory will be collected for every 20 samples for soil and groundwater. One trip blank per cooler containing samples for VOC analysis will be used. Ecology shall be permitted to take split or duplicate samples of any environmental samples collected at the site in accordance with the AO.

7.1.2 Field Instrument Calibration

Measuring and test equipment used in the field and laboratory will be subject to a formal calibration program. The program will require equipment of proper type, range, accuracy, and precision to provide data compatible with the specified requirements and the desired results. Calibration of measuring and test equipment may be performed internally using in-house reference standards, or externally by agencies or manufacturers. Field personnel are responsible for calibration of consultant field equipment and field equipment provided by vendors.

Calibrated equipment will be uniquely identified by the manufacturer’s serial number, a consultant equipment identification number, or by other means. These identification numbers will be attached to the equipment, along with a label indicating when the next calibration is due (only for equipment which does not require daily calibration). If this is not possible, records traceable to the equipment will be readily available for reference. It will be the responsibility of all equipment operators to check the calibration status per the due date labels or records prior to using the equipment.

Measuring and testing equipment will be calibrated at prescribed intervals and/or as part of operational use. Frequency will be based on the type of equipment, inherent stability, manufacturer’s recommendations, values given in national standards, intended use, and experience. Whenever possible, equipment will be calibrated using reference standards associated with nationally recognized standards or accepted values of physical constants. If national standards do not exist, the basis for calibration will be documented.

Physical and chemical reference standards will be used only for calibration. Equipment that fails calibration or becomes inoperable during use will be removed from service, segregated to prevent inadvertent use, and tagged to indicate the fault. Such equipment will be recalibrated and repaired to the satisfaction of the Project Chemist or field personnel, as applicable. Equipment that cannot be repaired will be replaced.

Records will be prepared and maintained for each piece of calibrated measuring and test equipment to document that established calibration procedures have been followed. Records for consultant equipment, used only for this project, will be kept in the project files.

7.1.3 Field Instrument/Equipment Decontamination

Field personnel or the contracted driller will decontaminate non-dedicated sampling equipment between each sample location with a non-phosphate solution (such as Liquinox), followed by a minimum of two tap water rinses. Distilled water may be used for the final rinse. Downhole drilling equipment is steam-cleaned prior to drilling the borehole and at completion of the borehole.

Between sample intervals, the soil sampling table is cleaned by spraying it with a non-phosphate solution and wiping with disposable paper towels.

Prior to well development, the submersible pump is decontaminated by allowing it to run and recirculate while immersed in a non-phosphate solution followed by successive immersions in potable water and distilled water baths.

Before starting groundwater monitoring and sampling activities, and between each well, the depth to water probe and multi-parameter probe are decontaminated by rinsing twice with a non-phosphate solution. The probes are then rinsed with tap water followed by a rinse with distilled water. The sample table/workstation, exterior of pump housing, and scissors (used for cutting disposable tubing) are cleaned with commercially-available disinfectant wipes before starting groundwater sampling activities, and between each well.

7.1.4 Field Supplies and Consumables

Supplies and consumables including standard reference materials for field meter calibration, sampling equipment, cleaning supplies, distilled water for equipment decontamination, and personal protective equipment will be obtained from vendors to meet manufacturer operation/maintenance specifications and minimum safety requirements.

7.1.5 PFAS Specific Requirements

Field quality control for PFAS sampling requires additional care and attention to detail. Requirements included in this section are intended to supplement those discussed in previous sections. All previous field quality control procedures are applicable unless explicitly superseded by procedures described in this section.

7.1.5.1 Decontamination Water Source Testing

The onsite water source proposed for use in decontamination (i.e. steam cleaning drilling equipment and non-final rinses of non-dedicated equipment) will be verified as PFAS-free prior to use. Verification will be achieved through sample collection at the tap and analysis at the contracted laboratory in accordance with sample collection and analytical procedures as described in this QAPP and in the field protocols included as an appendix to the project-specific SAP.

If the onsite water source is not verified to be PFAS-free, an alternative PFAS-free water source will be imported to the site for use during decontamination activities.

7.1.5.2 PFAS Field Instrument/Equipment Decontamination

Decontamination of field instruments and equipment used during PFAS sample collection must use laboratory-supplied PFAS-free water as the final rinse. This includes but is not limited to all drilling equipment and non-dedicated sample collection equipment such as hand augers, trowels, bowls, probes, and submersible pumps.

7.1.5.3 PFAS Field Supplies and Consumables

Supplies and consumables required for PFAS sample collection will be obtained from vendors who verify that their products are PFAS-free. This includes but is not limited to sampling equipment, cleaning supplies, and personal protective equipment.

7.2 LABORATORY QUALITY CONTROL

The Laboratory QA Manager will be responsible for ensuring that each laboratory's data precision and accuracy are maintained in accordance with the laboratory QAM and this QAPP. Laboratory QA/QC (initial and continuing calibration, frequency of blank analysis, etc.) will be determined in accordance with the analytical method requirements and internal laboratory SOPs.

The laboratory will qualify all results that are affected by QC exceptions or other events that affect the interpretation of the analytical results with a flag that is defined unambiguously in the analytical report.

7.2.1 Laboratory Instrument Calibration

The proper calibration of laboratory equipment is a key element to the quality of laboratory analysis. Each type of instrumentation and each Ecology- or EPA-approved method have specific calibration procedure requirements, depending on the analytes of interest and the sample medium.

Calibration procedures and frequencies of equipment used to perform analyses will be in accordance with requirements established by Ecology or EPA. The Laboratory QA Manager will be responsible for ensuring that laboratory instrumentation is maintained in accordance with specifications. Individual laboratory SOPs will be followed for corrective actions and preventative maintenance frequencies.

The laboratory will be responsible for the calibration of laboratory equipment and will maintain individual laboratory calibration records.

7.2.2 Laboratory Supplies and Consumables

The Laboratory QA Manager or designee will be responsible for ensuring the acceptability of supplies and consumables used in the collection, preservation, preparation, and analysis of samples.

8.0 NON-DIRECT MEASUREMENTS

Any non-direct measurements or data will be taken from industry recognized standard sources. These sources include the United States Geological Survey, as well as standard engineering, chemistry, and geological reference standards.

Available historical site data from previous investigations are discussed in detail in the RI/FS Work Plan. The historical data that met acceptance criteria were considered and used extensively to plan the investigation scope described in the RI/FS Work Plan and SAP.

9.0 DATA MANAGEMENT

Field and electronic data will be managed to provide consistent, accurate, documentable, and defensible data quality. Field personnel will manage data during field activities. Field data such as sample location latitudes and longitudes collected in the field using a global positioning system unit, geologic profiles, and field measurements, will be recorded on the appropriate field forms or in field logbooks. Example field data sheets are provided for reference in the SAP. The Project Database Manager will collect data gathered during assessment activities and save the data in the project file. Any errors or exceptions in field QA/QC observed by field staff will be brought to the attention of the Field QA Manager.

The Laboratory Project Manager will be responsible for laboratory data management. Procedures for data review and data reporting are discussed in the laboratory QAM and SOPs. Laboratory-generated analytical data reports will present all sample results, including all QA/QC samples.

The Project Database Manager will incorporate electronic data into Ecology's Environmental Information Management (EIM) database in accordance with Ecology's *Toxics Cleanup Program Policy 840: Data Submittal Requirements* (Ecology, 2005).

9.1 STANDARD OPERATING PROCEDURES

Whenever field protocols are applicable and available, they will be incorporated into data collection activities. To ensure environmental sample collection efforts are comparable, procedures found in sampling field protocols will be followed. Example sampling field protocols are provided in the SAP.

Data to be managed for this project includes sample documentation, field forms and logbooks, field protocols, and analytical data deliverables.

9.2 FIELD NOTES

Field notes detailing site activities and observations will be kept (electronically or in a field logbook) so that an accurate and factual account of field procedures may be reconstructed. All field logbook entries will be signed by the individuals who are making them. Field notes should document the following:

- Site name and project number.
- Consultant name and address.
- Names of personnel on site.
- Dates and times of all entries.
- Descriptions of all site activities, including site entry and exit times.
- Noteworthy events and discussions.
- Weather conditions.
- Site observations.
- Identification and description of samples and locations.
- Subcontractor information and names of on-site personnel.
- Dates and times of sample collections and COC information.
- Photographs taken.
- Site sketches.
- Relevant and appropriate information delineated in field data sheets and sample labels.

Real-time measurements and observations will be recorded in a logbook or field form. Field data records will be organized into standard formats whenever possible. Hard copies of field notes and laboratory data reports will be kept at least until data review, verification, validation, reconciliation with user requirements, and reporting is complete. Electronic copies of field notes and laboratory reports will be kept in the electronic project file.

9.3 ANALYTICAL DATA DELIVERABLE REQUIREMENTS

Analytical data will contain the necessary sample results and QC data to evaluate the data use objectives defined for the project.

The laboratory will provide Level II data deliverables. Data shall be presented on numbered pages with an index or table of contents describing the contents. Analytical results should be reported as detected concentrations, estimated concentrations below the RL, or less than the quantitation limit. All quality control samples shall be clearly linked to the associated samples and the results summarized on EPA Contract Laboratory Program (CLP) or CLP-like forms. The following information shall be included in the data package:

- A case narrative shall be included in each data package. The case narrative shall identify all samples not meeting QC criteria and any other out-of-control condition. The narrative shall describe the corrective action taken. If matrix effects are invoked as a case for out-of-control recoveries, a subsection of the narrative shall present a detailed justification for this assertion and include a summary of all relevant quality control data.
- A copy of the original COC and a copy of the cooler receipt form.
- Sample collection, extraction, preparation, and analysis dates.
- Method of analysis (name and method number).
- QC sample identification (for project-specific QC samples).
- Dilution factors for all applicable samples.
- Detection limits (RLs and MDLs) and units of measure for all analyses.
- Field sample and laboratory sample identifications cross-reference.
- QC batch identifications.
- Laboratory data qualifiers.
- Surrogate recovery results with associated control limits (all organic analyses).
- LCS precision results with associated control limits. All samples must be clearly associated with each LCS/LCD sample pair analyses (where applicable).
- MS/MSD (as applicable) precision and accuracy results with associated control limits. All samples must be clearly associated with each MS/MSD sample pair analyses.
- Laboratory duplicate (as applicable) precision and accuracy results with associated control limits. All samples must be clearly associated with each laboratory duplicate sample pair analyses.
- Method blank analytical results will be reported for all target analytes for all required analyses. All samples must be clearly associated with each method blank sample analyses.
- Post digestion spike recovery values for metals analyses where MS/MSD or LCS samples were outside of acceptable ranges.

9.4 ELECTRONIC DATA DELIVERABLE

An Ecology EIM database formatted electronic data deliverable will be provided by the laboratory for loading the analytical results into the project database.

10.0 DATA QUALITY ASSESSMENT

10.1 ASSESSMENTS AND RESPONSE ACTIONS

10.1.1 Performance and System Audits

Performance and system audits may be completed to ensure that field sampling activities and laboratory analyses are performed in accordance with procedures established in this QAPP, including the SAP and field protocols.

Generally, system audits are a qualitative measure of adherence to overall sampling QA measures, including sample collection and handling, decontamination procedures, COC use and completion, and recording requirements in the field, as well as sample receiving, log-in, and instrument operating records in the laboratory.

10.1.2 Field System Audits

Early in the project, the Field QA Manager may conduct a field audit to assess whether field activities are being conducted in accordance with this QAPP and the SAP. If deviations are noted during the audit, the auditor will take immediate action to bring practices in line with this QAPP. The auditor will document any deficiencies encountered and corrections made. Results of the audit will be maintained in the project file.

The field audit will include the following:

- Review of field sampling records.
- Review of field measurement procedures.
- Comparison of sample identifications to the QAPP sample identification protocol.
- Review of field instrument calibration records and procedures.
- Recalibration of field instruments to verify calibration to the manufacturer’s specifications.
- Review of sample handling and packaging procedures.
- Review of COC procedures.

If deficiencies are observed during the audit, each deficiency shall be noted in writing and a follow-up audit may be completed if deemed necessary by the Field QA Manager. Corrective action procedures may need to be implemented due to the findings from the audit, following the procedures outlined in Section 10.2.2.

Upon completion of any audit, the auditor will submit to the Project Manager a report or memorandum describing any problems or deficiencies identified during the audit. It is the responsibility of the Project Manager to determine if the deviations will result in any adverse effect on the project conclusions. If it is determined that corrective action is necessary, procedures outlined in Section 10.2.2 will be followed.

10.1.3 Laboratory Audits

The laboratory will be responsible for ensuring that laboratory data precision and accuracy are maintained in accordance with specifications and laboratory SOPs.

10.1.4 Report Preparation QA/QC

All reports will undergo a quality review by an experienced staff member and a final review by a senior reviewer prior to submittal to Ecology. The report will be signed by a State of Washington professional geologist, hydrogeologist, or engineer in accordance with WAC 196-23 (WAC, 2022). Corrective action will be implemented in response to deficiencies that are encountered during product or deliverable assessments. Any reviewer who detects a deficiency or non-conforming situation will be responsible for reporting the deficiency to the author/reviewer and the Project Manager. A closed-loop corrective action system will be used to address these types of needed corrections.

10.2 QUALITY ASSURANCE REPORTING PROCEDURES

10.2.1 Progress Reports

For the duration of the project, quarterly progress reports will be prepared and submitted to the Ecology Project Manager in accordance with the AO. These reports will serve to inform Ecology of the project progress and any significant interim findings that have been identified, including those related to QA. This will streamline the process of addressing issues as they arise and adjusting the program to better achieve project objectives.

The progress reports shall include the following:

- A list of on-site activities that have taken place during the quarter.
- Detailed description of any deviations from required tasks not otherwise documented in project plans or amendment requests.
- Description of all deviations from the AO scope of work and schedule (Exhibits B and C of the AO) during the current quarter and any planned deviations in the upcoming quarter.
- For any deviations in schedule, a plan for recovering lost time and maintaining compliance with the schedule.
- All raw data (including laboratory analyses) received during the previous quarter (if not previously submitted to Ecology), together with a detailed description of the underlying samples collected.
- A list of deliverables for the upcoming quarter if different from the schedule.

Progress reports shall be submitted by the 10th day of the month in which they are due after the effective date of the AO.

10.2.2 Corrective Action

Corrective actions will be initiated whenever data quality indicators suggest that data usability objectives and/or measurement criteria have not been met. Corrective actions will begin with identifying the source of the problem. Potential problem sources include failure to adhere to method procedures, improper data reduction, equipment malfunctions, or systemic contamination. The first level of responsibility for identifying the problems and initiating corrective action lies with the analyst/field personnel. The second level of responsibility lies with any person reviewing the data. Corrective actions may include more intensive staff training, equipment repair followed by a more intensive preventive maintenance program, or removal of the source of systemic contamination. If data usability objectives are not met, the samples in question may require recollection and/or reanalysis using a properly functioning system.

The Project Manager is responsible for verifying and documenting completion of corrective actions.

11.0 DATA REVIEW, VERIFICATION, AND VALIDATION

This section describes the QA activities that will be performed to verify that data collected and generated during the project are scientifically defensible, properly documented, of known quality, and meet project objectives. Data verification, validation, and usability assessment will be conducted to ensure that project data quality needs are met.

To perform the data evaluation steps in this section, reported data will be supported by complete data packages that include sample receipt and tracking information, COC records, tabulated data summary forms, QC checks, QC sample results, and other project-specific documents generated.

11.1 DATA VERIFICATION CRITERIA AND METHODS

Data verification is a process of evaluating the completeness, correctness, and contractual compliance of a data set against the analytical method procedure, field protocols, or contract requirements. The goal of data verification is to assess whether the types and quantities of data specified in the QAPP and SAP were collected.

Field and laboratory data will be verified by:

1. Identifying project requirements/specifications as documented in the laboratory QAM, QAPP, SAP, field protocols, and analytical method procedures.
2. Reviewing project records such as field logbooks, COCs, sample receipts, laboratory preparation and analysis records to verify that collected data complies with procedures outlined in this QAPP.

The Project Chemist will verify field data by periodically comparing field documentation including COCs, logbooks, and field forms to specifications in the QAPP and SAP. Data to be verified will include sample collection and handling procedures, sample identification system, number and type (media) of samples collected, sample location and depth, field equipment calibration and use, units of measure, and analytical services requested on COCs.

The laboratory will verify analytical data by comparing procedures and requirements in the laboratory QAM, analytical method procedures, SOPs, and QAPP to records such as COCs, sample receipt forms, and sample preparation, handling, and analysis records. The Project Chemist will review laboratory electronic data deliverables for compliance with contract and work order specifications.

If a significant problem that affects data usability is discovered, the Project Chemist will contact the laboratory to initiate corrective action. If necessary, review of raw data associated with the identified problem will be performed. This further review will focus only on the identified problem and will not include analyses that did not exhibit serious data quality deficiencies for important target analytes.

11.2 DATA VALIDATION CRITERIA AND METHODS

Data validation is an analyte- and sample-specific process that extends the qualification of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of specific data sets. Data validation results are accepted, qualified, or rejected data.

All analytical data received from the project laboratory will be validated based on the evaluation criteria outlined in the EPA National Functional Guidelines (NFGs) inorganic (EPA, 2020a) and organic data review (EPA, 2020b). The NFG provide specific data validation criteria that can be applied to data generated from this site. Professional judgment will be applied by the data validator or Project Chemist based on the NFGs.

Level II data validation procedures will be used for this program to obtain an adequate level of confidence in the data presented. Data validation will be performed by, or under the supervision of, the Project Chemist and will include an evaluation of the following:

- Sample management (collection techniques, sample containers, preservation, handling, transport, COC, and holding times).
- Blanks sample results (method, equipment, and trip blanks).
- LCS/LCSD recoveries and/or precision.
- Surrogate recoveries (if applicable).
- MS/MSD recoveries and precision.
- Field duplicate comparison.
- Compound identification and quantification limits.

The consultant will document data validation results in a Data Validation/Data Usability Report that will be included as an appendix to each RI/FS-related report where laboratory analysis of samples is conducted.

If data are determined to be unusable, corrective action may be taken. Potential corrective actions may include resampling by the field team or laboratory reanalysis of the samples. Corrective actions will depend on ability to mobilize the field team and whether data are critical to project data quality objectives. Should the QA Manager or Project Chemist identify a situation warranting corrective action, the Project Manager will be responsible for approving implementation of the corrective action.

11.3 DATA LIMITATIONS AND ACTIONS

Sources of sampling and analytical error will be identified and corrected as early as possible. An ongoing data assessment process will be incorporated throughout the project, rather than as a final step, to facilitate early detection and correction of problems, ensuring that project quality objectives are met.

Data that do not meet the measurement performance criteria specified in this QAPP will be identified, and impact on project quality objectives will be assessed and discussed within the final report. Specific actions for data that do not meet measurement performance criteria will depend on the use of data and may require that additional samples be collected or use of the data be restricted.

12.0 LIMITATIONS

Select documents and materials provided in this QAPP such as the example RLs, precision, and accuracy values provided in Tables 1A through 1D; the example laboratory QAM provided in Appendix A; and the example laboratory certification provided in Appendix B may not be applicable to the consultant and analytical laboratory contracted for the work outlined in Task II of the AO. An addendum to this QAPP may be necessary to provide updated documents and materials if they vary significantly from the examples provided herein.

13.0 REFERENCES

United States Environmental Protection Agency (EPA). November 2020a. *National Functional Guidelines for Inorganic Superfund Methods Data Review*.

United States Environmental Protection Agency (EPA). November 2020b. *National Functional Guidelines for Organic Superfund Methods Data Review*.

Washington Administrative Code (WAC). October 12, 2007. Chapter 173-340 Model Toxics Control Act – Cleanup. URL: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-340.

Washington Administrative Code (WAC). November 6, 2018. Chapter 296-843 Hazardous Waste Operations. URL: https://app.leg.wa.gov/wac/default.aspx?cite=296-843.

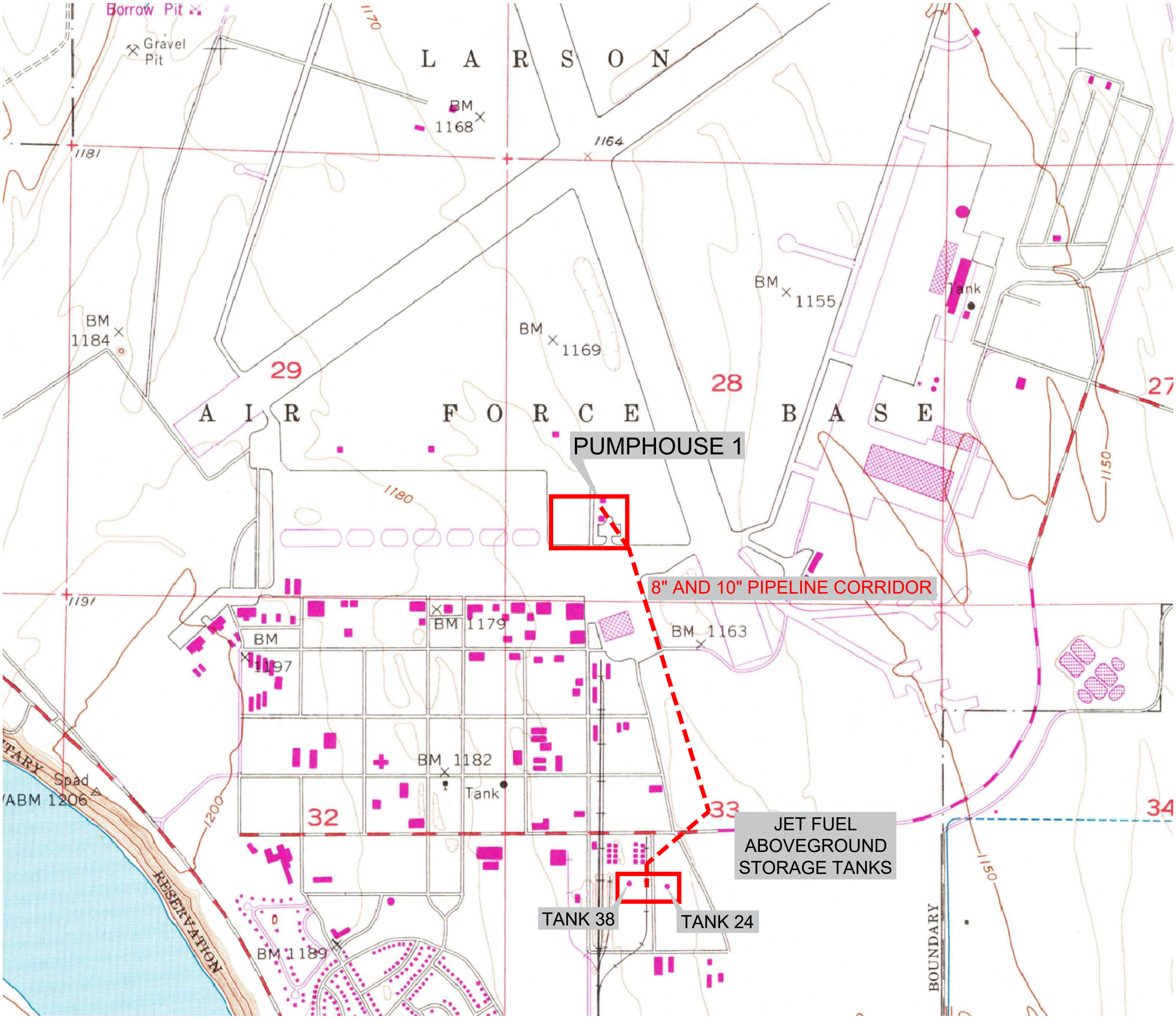
Washington Administrative Code (WAC). April 27, 2022. Chapter 196-23 Stamping and Seals. URL: https://app.leg.wa.gov/wac/default.aspx?dispo=true&cite=196-23.

Washington Administrative Code (WAC). September 1, 2023. Chapter 173-50 Accreditation of Environmental Laboratories. URL: https://app.leg.wa.gov/wac/default.aspx?cite=173-50.

Washington Administrative Code (WAC). January 1, 2024. Chapter 173-340-810 Worker Health and Safety. URL: https://app.leg.wa.gov/wac/default.aspx?cite=173-340-810.

Washington State Department of Ecology (Ecology). August 1, 2005. *Toxics Cleanup Program Policy 840: Data Submittal Requirements.* https://apps.ecology.wa.gov/publications/documents/1609050.pdf.

Washington State Department of Ecology (Ecology). December 26, 2023. Agreed Order No. DE 22056.



FN 2037236780001

EXPLANATION

SOURCE:
Modified from a map
provided by
DeLorme 3-D TopoQuads

APPROXIMATE SCALE

Stantec

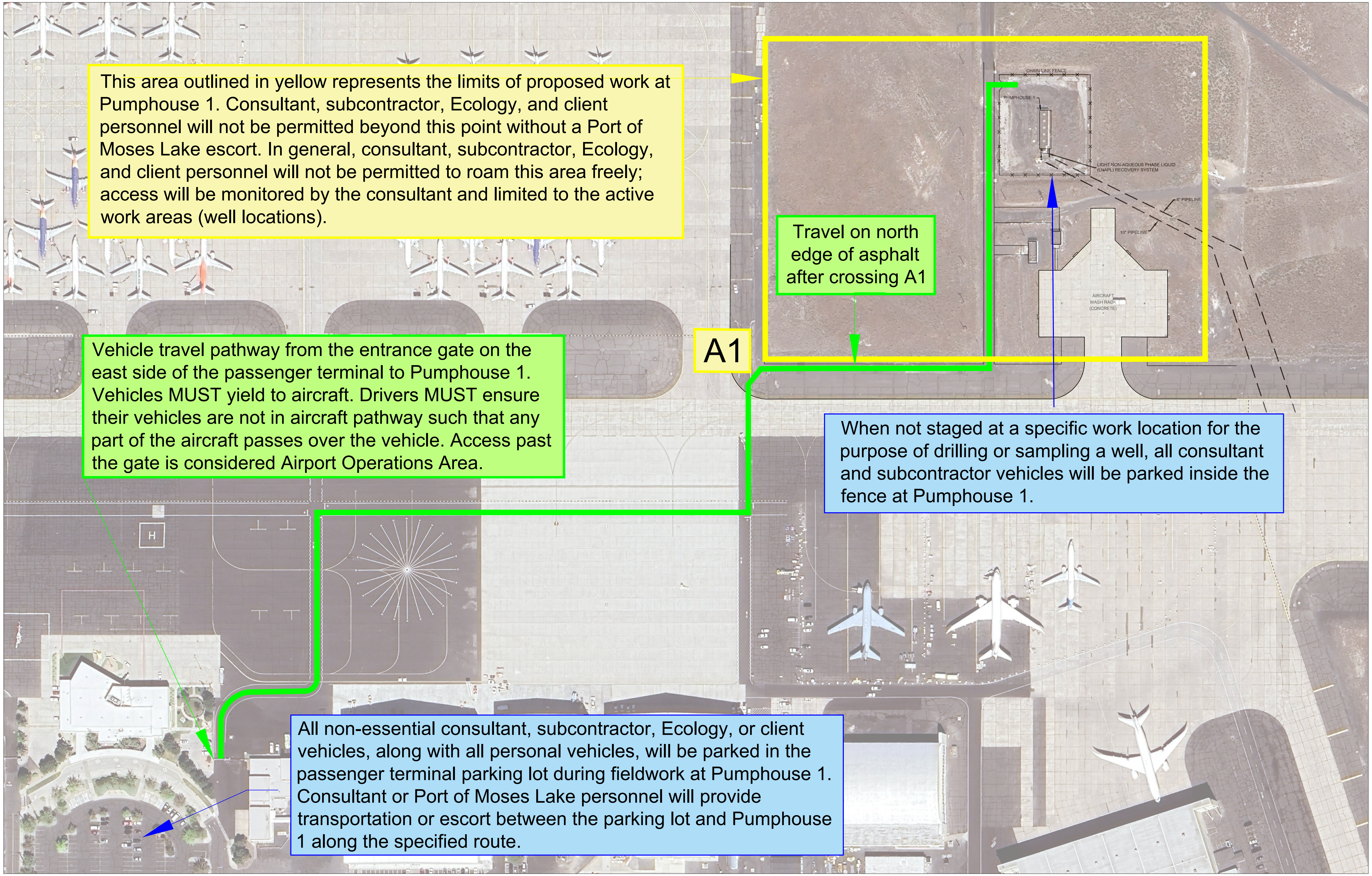
SITE LOCATION MAP

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

PROJECT NO.
203723678

PLATE
1

LEC: 03/21/24



This area outlined in yellow represents the limits of proposed work at Pumphouse 1. Consultant, subcontractor, Ecology, and client personnel will not be permitted beyond this point without a Port of Moses Lake escort. In general, consultant, subcontractor, Ecology, and client personnel will not be permitted to roam this area freely; access will be monitored by the consultant and limited to the active work areas (well locations).

Travel on north edge of asphalt after crossing A1

Vehicle travel pathway from the entrance gate on the east side of the passenger terminal to Pumphouse 1. Vehicles MUST yield to aircraft. Drivers MUST ensure their vehicles are not in aircraft pathway such that any part of the aircraft passes over the vehicle. Access past the gate is considered Airport Operations Area.

When not staged at a specific work location for the purpose of drilling or sampling a well, all consultant and subcontractor vehicles will be parked inside the fence at Pumphouse 1.

All non-essential consultant, subcontractor, Ecology, or client vehicles, along with all personal vehicles, will be parked in the passenger terminal parking lot during fieldwork at Pumphouse 1. Consultant or Port of Moses Lake personnel will provide transportation or escort between the parking lot and Pumphouse 1 along the specified route.

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N

NOTES:

All consultant personnel will be badged. All subcontractor, Ecology, or client personnel who are not badged will be escorted by consultant or Port of Moses Lake personnel at all times.

SOURCE: Modified from a map modified from Google Earth

APPROXIMATE SCALE

0 250 500
Feet

Stantec

VEHICLE ACCESS ROUTE AND WORK AREA LIMITS MAP

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

PROJECT NO.

203723678

PLATE

2

LEC: 05/15/24

TABLE 1A
ANALYTICAL PARAMETERS, REPORTING LIMITS, PRECISION, AND ACCURACY
FREMONT ANALYTICAL LABORATORY - SOLID SAMPLES

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 4

Analyte Group	Analyte	CAS No.	Analytical Method	MDL	MRL	Lowest Preliminary Soil Screening Levels	Units	LCS Criteria (% R)	MS Criteria (% R)	Duplicate RPDL (%)
TPH	TPHg	---	NWTPH-Gx	1.73	5	30	mg/kg	70-130	70-130	25
	TPHd	---	NWTPH-Dx	13.1	50	2,000	mg/kg	70-130	70-130	25
	TPHo	---	NWTPH-Dx	18.2	100	2,000	mg/kg	70-130	70-130	25
VPH	C5-C6 Aliphatics	---	NWVPH	0.329	2.5	---	mg/kg	70-130	70-130	25
	>C6-C8 Aliphatics	---	NWVPH	0.538	2.5	---	mg/kg	70-130	70-130	25
	>C8-C10 Aliphatics	---	NWVPH	1.44	2.5	---	mg/kg	70-130	70-130	25
	>C10-C12 Aliphatics	---	NWVPH	0.380	2.5	---	mg/kg	70-130	70-130	25
	>C8-C10 Aromatics	---	NWVPH	0.220	2.5	---	mg/kg	70-130	70-130	25
	>C10-C12 Aromatics	---	NWVPH	0.432	2.5	---	mg/kg	70-130	70-130	25
	>C12-C13 Aromatics	---	NWVPH	0.718	2.5	---	mg/kg	70-130	70-130	25
EPH	C8-C10 Aliphatics	---	NWEPH	10	20	---	mg/kg	70-130	70-130	25
	>C10-C12 Aliphatics	---	NWEPH	4.55	10	---	mg/kg	70-130	70-130	25
	>C12-C16 Aliphatics	---	NWEPH	1.94	10	---	mg/kg	70-130	70-130	25
	>C16-C21 Aliphatics	---	NWEPH	3.87	10	---	mg/kg	70-130	70-130	25
	>C21-C34 Aliphatics	---	NWEPH	6.22	10	---	mg/kg	70-130	70-130	25
	C8-C10 Aromatics	---	NWEPH	6.90	20	---	mg/kg	70-130	70-130	25
	>C10-C12 Aromatics	---	NWEPH	3.23	10	---	mg/kg	70-130	70-130	25
	>C12-C16 Aromatics	---	NWEPH	2.22	10	---	mg/kg	70-130	70-130	25
	>C16-C21 Aromatics	---	NWEPH	5.14	10	---	mg/kg	70-130	70-130	25
	>C21-C34 Aromatics	---	NWEPH	7.59	10	---	mg/kg	70-130	70-130	25
VOCs	1,1,1,2-Tetrachloroethane	630-20-6	SW8260	0.0147	0.05	38	mg/kg	80-120	66-122	20
	1,1,1-Trichloroethane	71-55-6	SW8260	0.0048	0.025	2	mg/kg	80-120	60-148	20
	1,1,2,2-Tetrachloroethane	79-34-5	SW8260	0.0062	0.025	5	mg/kg	80-120	49-144	20
	1,1,2-Trichloroethane	79-00-5	SW8260	0.0039	0.025	18	mg/kg	80-120	64-136	20
	1,1-Dichloroethane	75-34-3	SW8260	0.0051	0.025	180	mg/kg	80-120	63-134	20
	1,1-Dichloroethene	75-35-4	SW8260	0.0032	0.025	4,000	mg/kg	80-120	59-160	20
	1,1-Dichloropropene	563-58-6	SW8260	0.0055	0.025	---	mg/kg	80-120	63-144	20
	1,2,3-Trichlorobenzene	87-61-6	SW8260	0.0185	0.05	64	mg/kg	80-120	58-134	20
	1,2,3-Trichloropropane	96-18-4	SW8260	0.0057	0.025	0.0063	mg/kg	80-120	59-133	20
	1,2,4-Trichlorobenzene	120-82-1	SW8260	0.0193	0.05	34	mg/kg	80-120	59-131	20
	1,2,4-Trimethylbenzene	95-63-6	SW8260	0.0054	0.025	800	mg/kg	80-120	63-121	20
	1,2-Dibromo-3-chloropropane	96-12-8	SW8260	0.0227	0.1	0.23	mg/kg	80-120	41-150	20
	1,2-Dibromoethane	106-93-4	SW8260SIM	0.0021	0.007	0.005	mg/kg	80-120	67-137	20
	1,2-Dichlorobenzene	95-50-1	SW8260	0.0063	0.025	7,200	mg/kg	80-120	71-117	20
	1,2-Dichloroethane	107-06-2	SW8260	0.0053	0.025	11	mg/kg	80-120	62-125	20
	1,2-Dichloropropane	78-87-5	SW8260	0.0038	0.025	27	mg/kg	80-120	63-137	20
	1,3,5-Trimethylbenzene	108-67-8	SW8260	0.0047	0.025	800	mg/kg	80-120	67-123	20
	1,3-Dichlorobenzene	541-73-1	SW8260	0.0137	0.05	---	mg/kg	80-120	73-113	20
	1,3-Dichloropropane	142-28-9	SW8260	0.0029	0.025	1,600	mg/kg	80-120	66-133	20
	1,4-Dichlorobenzene	106-46-7	SW8260	0.0043	0.025	190	mg/kg	80-120	71-111	20
	2-Butanone	78-93-3	SW8260	0.0906	0.25	48,000	mg/kg	80-120	40-159	20
	2-Chlorotoluene	95-49-8	SW8260	0.0039	0.025	1,600	mg/kg	80-120	69-117	20
	2-Hexanone	591-78-6	SW8260	0.0232	0.1	400	mg/kg	80-120	58-160	20
	4-Chlorotoluene	106-43-4	SW8260	0.0038	0.025	1,600	mg/kg	80-120	68-117	20
	4-Isopropyltoluene	99-87-6	SW8260	0.0061	0.025	---	mg/kg	80-120	60-133	20
	4-Methyl-2-pentanone	108-10-1	SW8260	0.0192	0.1	6,400	mg/kg	80-120	56-153	20
	Acetone	67-64-1	SW8260	0.0687	0.2	72,000	mg/kg	80-120	43-160	20
	Benzene	71-43-2	SW8260	0.0039	0.012	0.03	mg/kg	80-120	59-137	20
	Bromobenzene	108-86-1	SW8260	0.0035	0.025	640	mg/kg	80-120	72-114	20
	Bromodichloromethane	75-27-4	SW8260	0.0313	0.1	16	mg/kg	80-120	60-140	20
	Bromoform	75-25-2	SW8260	0.0047	0.025	130	mg/kg	80-120	60-127	20
	Bromomethane	74-83-9	SW8260	0.0291	0.1	110	mg/kg	80-120	42-154	20
	Carbon Tetrachloride	56-23-5	SW8260	0.0328	0.1	14	mg/kg	80-120	48-154	20
	Chlorobenzene	108-90-7	SW8260	0.0026	0.025	1,600	mg/kg	80-120	71-114	20
	Chloroethane	75-00-3	SW8260	0.0264	0.1	---	mg/kg	80-120	27-154	20

TABLE 1A
ANALYTICAL PARAMETERS, REPORTING LIMITS, PRECISION, AND ACCURACY
FREMONT ANALYTICAL LABORATORY - SOLID SAMPLES

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 2 of 4

Analyte Group	Analyte	CAS No.	Analytical Method	MDL	MRL	Lowest Preliminary Soil Screening Levels	Units	LCS Criteria (% R)	MS Criteria (% R)	Duplicate RPDL (%)
VOCs (cont'd)	Chloroform	67-66-3	SW8260	0.0055	0.025	32	mg/kg	80-120	63-132	20
	Chloromethane	74-87-3	SW8260	0.0334	0.1	---	mg/kg	80-120	33-155	20
	cis-1,2-Dichloroethene	156-59-2	SW8260	0.0053	0.025	---	mg/kg	80-120	63-134	20
	cis-1,3-Dichloropropene	542-75-6	SW8260	0.0153	0.05	10[a]	mg/kg	80-120	61-137	20
	Chlorodibromomethane	124-48-1	SW8260	0.0250	0.1	12	mg/kg	80-120	59-136	20
	Cumene	98-82-8	SW8260	0.0054	0.025	8,000	mg/kg	80-120	65-133	20
	Dibromomethane	74-95-3	SW8260	0.0040	0.025	800	mg/kg	80-120	66-139	20
	Dichlorodifluoromethane	75-71-8	SW8260	0.0053	0.025	16,000	mg/kg	80-120	36-160	20
	Ethanol	64-17-5	SW8260	0.2800	0.75	---	mg/kg	80-120	70-130	20
	Ethylbenzene	100-41-4	SW8260	0.0053	0.025	6	mg/kg	80-120	70-121	20
	Ethyl tertiary butyl ether	637-92-3	SW8260	0.0068	0.025	80,000	mg/kg	80-120	70-130	20
	Hexachlorobutadiene	87-68-3	SW8260	0.0124	0.05	13	mg/kg	80-120	64-147	20
	Methanol	67-56-1	SW8015	0.2000	1.0	160,000	mg/kg	71-136	71-136	20
	Methyl tert-butyl ether	1634-04-4	SW8260	0.0045	0.025	0.1	mg/kg	80-120	57-140	20
	Methylene Chloride	75-09-2	SW8260	0.0026	0.01	0.02	mg/kg	80-120	52-139	20
	n-Butylbenzene	104-51-8	SW8260	0.0063	0.025	4,000	mg/kg	80-120	58-142	20
	n-Hexane	110-54-3	SW8260	0.0276	0.1	4,800	mg/kg	80-120	70-130	20
	n-Propylbenzene	103-65-1	SW8260	0.0046	0.025	8,000	mg/kg	80-120	64-130	20
	Naphthalene	91-20-3	SW8260	0.0385	0.1	5	mg/kg	80-120	61-135	20
	sec-Butylbenzene	135-98-8	SW8260	0.0054	0.025	8,000	mg/kg	80-120	63-140	20
	Styrene	100-42-5	SW8260	0.0030	0.025	16,000	mg/kg	80-120	75-115	20
	tert-Butylbenzene	98-06-6	SW8260	0.0047	0.025	8,000	mg/kg	80-120	65-133	20
	Tertiary-butyl alcohol	75-65-0	SW8260	0.2416	0.5	2,000	mg/kg	80-120	70-130	20
	Tertiary-amyl methyl ether	994-05-8	SW8260	0.0059	0.05	---	mg/kg	80-120	70-130	20
	Tetrachloroethene	127-18-4	SW8260	0.0044	0.025	0.05	mg/kg	80-120	65-138	20
	Toluene	108-88-3	SW8260	0.0092	0.025	7	mg/kg	80-120	63-130	20
	trans-1,2-Dichloroethene	156-60-5	SW8260	0.0034	0.025	1,600	mg/kg	80-120	61-143	20
	trans-1,3-Dichloropropene	542-75-6	SW8260	0.0128	0.05	10[a]	mg/kg	80-120	58-140	20
	Trichloroethene	79-01-6	SW8260	0.0038	0.025	0.03	mg/kg	80-120	61-147	20
	Trichlorofluoromethane	75-69-4	SW8260	0.0348	0.1	24,000	mg/kg	80-120	44-156	20
	Vinyl Chloride	75-01-4	SW8260	0.0081	0.025	0.67	mg/kg	80-120	44-158	20
	m,p-Xylene	179601-23-1	SW8260	0.0092	0.05	16,000	mg/kg	80-120	67-123	20
	o-Xylene	95-47-6	SW8260	0.0051	0.025	16,000	mg/kg	80-120	72-113	20
	Total Xylenes	1330-20-7	SW8260	---	0.05	9	mg/kg	80-120	70-130	20
SVOCs	1,2,4-Trichlorobenzene	120-82-1	SW8270	0.0097	0.04	34	mg/kg	58-121	33-117	30
	1,2-Dichlorobenzene	95-50-1	SW8270	0.0132	0.04	7,200	mg/kg	58-118	30-116	30
	1,3-Dichlorobenzene	541-73-1	SW8270	0.0119	0.04	---	mg/kg	59-117	28-116	30
	1,4-Dichlorobenzene	106-46-7	SW8270	0.0125	0.04	190	mg/kg	59-120	18-119	30
	1-Methylnaphthalene	90-12-0	SW8270	0.0051	0.04	20	mg/kg	60-123	34-121	30
	2,4,5-Trichlorophenol	95-95-4	SW8270	0.0294	0.1	8,000	mg/kg	55-128	24-127	30
	2,4,6-Trichlorophenol	88-06-2	SW8270	0.0314	0.1	80	mg/kg	55-128	29-124	30
	2,4-Dichlorophenol	120-83-2	SW8270	0.0140	0.04	240	mg/kg	53-125	25-121	30
	2,4-Dimethylphenol	105-67-9	SW8270	0.0059	0.03	1,600	mg/kg	21-147	5-126	30
	2,4-Dinitrophenol	51-28-5	SW8270	0.7684	2	160	mg/kg	6-108	5-112	30
	2,4-Dinitrotoluene	121-14-2	SW8270	0.0242	0.1	3.2	mg/kg	63-121	26-126	30
	2,6-Dinitrotoluene	606-20-2	SW8270	0.0422	0.2	0.67	mg/kg	63-126	28-130	30
	2-Chloronaphthalene	91-58-7	SW8270	0.0063	0.04	6,400	mg/kg	58-127	31-125	30
	2-Chlorophenol	95-57-8	SW8270	0.0101	0.04	400	mg/kg	58-122	34-113	30
	2-Methylnaphthalene	91-57-6	SW8270	0.0073	0.04	320	mg/kg	58-124	34-119	30
	2-Methylphenol	95-48-7	SW8270	0.0156	0.04	4,000	mg/kg	48-128	29-115	30
	2-Nitroaniline	88-74-4	SW8270	0.0562	0.2	800	mg/kg	56-131	25-129	30
	2-Nitrophenol	88-75-5	SW8270	0.0564	0.2	---	mg/kg	56-123	30-120	30
	3-methylphenol + 4-methylphenol	108-39-4 106-44-5	SW8270	0.0070	0.04	4,000 8,000	mg/kg	49-127	24-119	30
	4,6-Dinitro-2-methylphenol	534-52-1	SW8270	0.1097	0.5	6.4	mg/kg	16-132	6-126	30

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Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
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Page 3 of 4

Analyte Group	Analyte	CAS No.	Analytical Method	MDL	MRL	Lowest Preliminary Soil Screening Levels	Units	LCS Criteria (% R)	MS Criteria (% R)	Duplicate RPDL (%)
SVOCs (cont'd)	4-Bromophenyl phenyl ether	101-55-3	SW8270	0.0251	0.1	---	mg/kg	57-125	33-124	30
	4-Chloro-3-methylphenol	59-50-7	SW8270	0.0438	0.1	8,000	mg/kg	49-132	28-128	30
	4-Chloroaniline	106-47-8	SW8270	0.0244	0.1	5	mg/kg	34-133	8-104	30
	4-Chlorophenyl phenyl ether	7005-72-3	SW8270	0.0214	0.04	---	mg/kg	60-120	31-123	30
	4-Nitrophenol	100-02-7	SW8270	0.2796	0.75	---	mg/kg	22-143	5-123	30
	Acenaphthene	83-32-9	SW8270	0.0070	0.04	4,800	mg/kg	59-125	34-120	30
	Acenaphthylene	208-96-8	SW8270	0.0063	0.04	---	mg/kg	59-129	30-126	30
	Anthracene	120-12-7	SW8270	0.0119	0.04	24,000	mg/kg	55-123	31-118	30
	Benz(a)anthracene	56-55-3	SW8270	0.0081	0.04	---	mg/kg	57-129	21-135	30
	Benzo(a)pyrene	50-32-8	SW8270	0.0145	0.05	0.1	mg/kg	56-128	12-141	30
	Benzo(b)fluoranthene	205-99-2	SW8270	0.0106	0.04	---	mg/kg	55-128	16-136	30
	Benzo(k)fluoranthene	207-08-9	SW8270	0.0100	0.04	---	mg/kg	57-126	16-134	30
	Benzo(g,h,i)perylene	191-24-2	SW8270	0.0289	0.1	---	mg/kg	49-132	12-132	30
	Benzyl alcohol	100-51-6	SW8270	0.0575	0.15	8,000	mg/kg	19-148	5-109	30
	Bis(2-chloroethoxy)methane	111-91-1	SW8270	0.0057	0.1	240	mg/kg	52-123	29-115	30
	Bis(2-chloroethyl) ether	111-44-4	SW8270	0.0089	0.04	0.91	mg/kg	51-12	25-123	30
	Bis(2-ethylhexyl) phthalate	117-81-7	SW8270	0.0102	0.04	71	mg/kg	55-125	32-129	30
	bis(2-Ethylhexyl)adipate	103-23-1	SW8270	0.0736	0.2	830	mg/kg	53-130	31-132	30
	Butyl benzyl phthalate	85-68-7	SW8270	0.0147	0.04	530	mg/kg	56-129	34-131	30
	Carbazole	86-74-8	SW8270	0.0065	0.04	---	mg/kg	56-125	27-122	30
	Chrysene	218-01-9	SW8270	0.0115	0.04	---	mg/kg	57-122	25-124	30
	Di-n-butyl phthalate	84-74-2	SW8270	0.0108	0.04	8,000	mg/kg	56-127	35-123	30
	Di-n-octyl phthalate	117-84-0	SW8270	0.0411	0.5	800	mg/kg	54-129	28-139	30
	Dibenz(a,h)anthracene	53-70-3	SW8270	0.0149	0.04	---	mg/kg	48-138	5-146	30
	Dibenzofuran	132-64-9	SW8270	0.0060	0.04	80	mg/kg	59-119	31-117	30
	Diethyl phthalate	84-66-2	SW8270	0.0138	0.04	64,000	mg/kg	59-122	33-120	30
	Dimethyl phthalate	131-11-3	SW8270	0.0086	0.04	---	mg/kg	62-129	32-131	30
	Fluoranthene	206-44-0	SW8270	0.0088	0.04	3,200	mg/kg	57-125	30-126	30
	Fluorene	86-73-7	SW8270	0.0127	0.04	3,200	mg/kg	59-119	30-119	30
	Hexachlorobenzene	118-74-1	SW8270	0.0216	0.1	0.63	mg/kg	55-127	25-132	30
	Hexachlorobutadiene	87-68-3	SW8270	0.0087	0.04	13	mg/kg	60-127	27-134	30
	Hexachlorocyclopentadiene	77-47-4	SW8270	0.0985	0.2	480	mg/kg	7-154	7-109	30
	Hexachloroethane	67-72-1	SW8270	0.0118	0.04	25	mg/kg	57-118	15-130	30
	Indeno(1,2,3-cd)pyrene	193-39-5	SW8270	0.0176	0.1	---	mg/kg	54-133	7-144	30
	Isophorone	78-59-1	SW8270	0.0400	0.5	1,100	mg/kg	54-125	24-132	30
	N-nitrosodipropylamine	621-64-7	SW8270	0.0275	0.5	0.14	mg/kg	51-125	35-109	30
	Naphthalene	91-20-3	SW8270	0.0064	0.04	5	mg/kg	59-127	30-123	30
	Nitrobenzene	98-95-3	SW8270	0.0121	0.04	160	mg/kg	54-125	32-114	30
	Pentachlorophenol	87-86-5	SW8270	0.0717	0.2	2.5	mg/kg	6-125	12-132	30
	Phenanthrene	85-01-8	SW8270	0.0079	0.04	---	mg/kg	56-121	25-123	30
	Phenol	108-95-2	SW8270	0.0079	0.04	24,000	mg/kg	49-127	30-115	30
	Pyrene	129-00-0	SW8270	0.0119	0.04	2,400	mg/kg	57-126	29-127	30
	Pyridine	110-86-1	SW8270	0.0426	0.15	80	mg/kg	51-128	8-103	30
	cPAHs (BaP eq)	---	SW8270	---	---	0.1	---	---	---	---
Metals	Arsenic	7440-38-2	SW6020	0.0481	0.2	0.67	mg/kg	80-120	75-125	20
	Barium	7440-39-3	SW6020	0.3753	1	16,000	mg/kg	80-120	75-125	20
	Cadmium	7440-43-9	SW6020	0.0058	0.02	2	mg/kg	80-120	75-125	20
	Chromium	7440-47-3	SW6020	0.1397	0.5	2,000[b]	mg/kg	80-120	75-125	20
	Lead	7439-92-1	SW6020	0.0352	1.0	250	mg/kg	80-120	75-125	20
	Selenium	7440-22-4	SW6020	0.0423	0.2	400	mg/kg	80-120	75-125	20
	Silver	7782-49-2	SW6020	0.0978	0.3	400	mg/kg	80-120	75-125	20
	Mercury	7439-97-6	SW7471B	0.0046	0.2	2	mg/kg	80-120	70-130	20

TABLE 1A
ANALYTICAL PARAMETERS, REPORTING LIMITS, PRECISION, AND ACCURACY
FREMONT ANALYTICAL LABORATORY - SOLID SAMPLES

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
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Notes:

Modifications may be made to laboratory analytical methods, as necessary and technically feasible, to improve MRLs to meet Preliminary Screening Levels

--- = Not applicable or not available
% = Percent
% R = Percent recovery
BaP eq = Benzo(a)pyrene equivalent
CAS = Chemical Abstracts Service
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
EPH = Extractable petroleum hydrocarbons
LCS = Laboratory control sample
MDL = Method detection limit
mg/kg = Milligrams per kilogram
MRL = Method reporting limit
MS = Matrix spike
SVOCs = Semi volatile organic compounds
RPDL = Relative percent difference limit
TPH = Total petroleum hydrocarbons
TPHd = Total petroleum hydrocarbons as diesel
TPHg = Total petroleum hydrocarbons as gasoline
TPHo = Total petroleum hydrocarbons as oil
VOCs = Volatile organic compounds
VPH = Volatile petroleum hydrocarbons
a = Screening level for 1,3-dichloropropene with no differentiation between cis- or trans-
b = Screening level for chromium III

TABLE 1B
ANALYTICAL PARAMETERS, REPORTING LIMITS, PRECISION, AND ACCURACY
FREMONT ANALYTICAL LABORATORY - AQUEOUS SAMPLES

Port of Moses Lake Pumphouse 1
7810 Andrews Street NE
Moses Lake, Washington
Page 1 of 4

Analyte Group	Analyte	CAS No.	Analytical Method	MDL	MRL	Lowest Preliminary Groundwater Screening Levels	Units	LCS Criteria (% R)	MS Criteria (% R)	Duplicate RPDL (%)
TPH	TPHg	---	NWTPH-Gx	37.4	250	800	µg/L	70-130	70-130	25
	TPHd	---	NWTPH-Dx	37.4	250	500	µg/L	70-130	70-130	25
	TPHo	---	NWTPH-Dx	28.5	500	500	µg/L	70-130	70-130	25
VPH	C5-C6 Aliphatics	---	NWVPH	6.20	40	---	µg/L	70-130	70-130	25
	>C6-C8 Aliphatics	---	NWVPH	13.1	40	---	µg/L	70-130	70-130	25
	>C8-C10 Aliphatics	---	NWVPH	14.2	40	---	µg/L	70-130	70-130	25
	>C10-C12 Aliphatics	---	NWVPH	5.08	40	---	µg/L	70-130	70-130	25
	>C8-C10 Aromatics	---	NWVPH	7.40	40	---	µg/L	70-130	70-130	25
	>C10-C12 Aromatics	---	NWVPH	8.46	40	---	µg/L	70-130	70-130	25
	>C12-C13 Aromatics	---	NWVPH	13.3	40	---	µg/L	70-130	70-130	25
EPH	C8-C10 Aliphatics	---	NWEPH	39.6	80.0	---	µg/L	70-130	70-130	25
	>C10-C12 Aliphatics	---	NWEPH	20.7	40.0	---	µg/L	70-130	70-130	25
	>C12-C16 Aliphatics	---	NWEPH	9.85	40.0	---	µg/L	70-130	70-130	25
	>C16-C21 Aliphatics	---	NWEPH	14.3	40.0	---	µg/L	70-130	70-130	25
	>C21-C34 Aliphatics	---	NWEPH	22.6	40.0	---	µg/L	70-130	70-130	25
	C8-C10 Aromatics	---	NWEPH	26.1	80.0	---	µg/L	70-130	70-130	25
	>C10-C12 Aromatics	---	NWEPH	8.91	40.0	---	µg/L	70-130	70-130	25
	>C12-C16 Aromatics	---	NWEPH	6.99	40.0	---	µg/L	70-130	70-130	25
	>C16-C21 Aromatics	---	NWEPH	12.8	40.0	---	µg/L	70-130	70-130	25
	>C21-C34 Aromatics	---	NWEPH	26.6	40.0	---	µg/L	70-130	70-130	25
VOCs	1,1,1,2-Tetrachloroethane	630-20-6	SW8260	0.117	0.5	1.7	µg/L	80-120	71-140	20
	1,1,1-Trichloroethane	71-55-6	SW8260	0.103	0.5	200	µg/L	80-120	74-159	20
	1,1,2,2-Tetrachloroethane	79-34-5	SW8260	0.070	0.2	0.22	µg/L	80-120	55-159	20
	1,1,2-Trichloroethane	79-00-5	SW8260	0.081	0.5	0.77	µg/L	80-120	66-149	20
	1,1-Dichloroethane	75-34-3	SW8260	0.141	0.5	7.7	µg/L	80-120	60-157	20
	1,1-Dichloroethene	75-35-4	SW8260	0.122	0.5	7	µg/L	80-120	70-160	20
	1,1-Dichloropropene	563-58-6	SW8260	0.143	0.5	---	µg/L	80-120	77-159	20
	1,2,3-Trichlorobenzene	87-61-6	SW8260	0.295	1	6.4	µg/L	80-120	56-147	20
	1,2,3-Trichloropropane	96-18-4	SW8260	0.098	0.5	0.00038	µg/L	80-120	62-141	20
	1,2,4-Trichlorobenzene	120-82-1	SW8260	0.234	0.75	1.5	µg/L	80-120	61-141	20
	1,2,4-Trimethylbenzene	95-63-6	SW8260	0.138	0.5	80	µg/L	80-120	69-141	20
	1,2-Dibromo-3-chloropropane	96-12-8	SW8260SIM	0.00997	0.2	0.014	µg/L	80-120	47-159	20
	1,2-Dibromoethane	106-93-4	SW8260SIM	0.00319	0.1	0.022	µg/L	80-120	63-152	20
	1,2-Dichlorobenzene	95-50-1	SW8260	0.118	0.5	600	µg/L	80-120	68-133	20
	1,2-Dichloroethane	107-06-2	SW8260	0.048	0.2	0.48	µg/L	80-120	55-151	20
	1,2-Dichloropropane	78-87-5	SW8260	0.050	0.2	1.2	µg/L	80-120	66-154	20
	1,3,5-Trimethylbenzene	108-67-8	SW8260	0.102	0.5	80	µg/L	80-120	70-146	20
	1,3-Dichlorobenzene	541-73-1	SW8260	0.099	0.5	---	µg/L	80-120	67-133	20
	1,3-Dichloropropane	142-28-9	SW8260	0.0827	0.5	160	µg/L	80-120	64-152	20
	1,4-Dichlorobenzene	106-46-7	SW8260	0.119	0.5	8.1	µg/L	80-120	65-133	20
	2-Butanone	78-93-3	SW8260	1.978	5	4,800	µg/L	80-120	25-138	20
	2-Chlorotoluene	95-49-8	SW8260	0.072	0.5	160	µg/L	80-120	66-144	20
	2-Hexanone	591-78-6	SW8260	0.364	1.25	40	µg/L	80-120	25-147	20
	4-Chlorotoluene	106-43-4	SW8260	0.088	0.5	160	µg/L	80-120	69-136	20
	4-Isopropyltoluene	99-87-6	SW8260	0.106	0.5	---	µg/L	80-120	70-152	20
	4-Methyl-2-pentanone	108-10-1	SW8260	0.354	2.5	640	µg/L	80-120	48-159	20
	Acetone	67-64-1	SW8260	2.55	5	7,200	µg/L	80-120	8-157	20
	Benzene	71-43-2	SW8260	0.054	0.2	0.8	µg/L	80-120	69-153	20
	Bromobenzene	108-86-1	SW8260	0.068	0.2	64	µg/L	80-120	70-134	20
	Bromodichloromethane	75-27-4	SW8260	0.0489	0.2	0.71	µg/L	80-120	67-149	20
	Bromoform	75-25-2	SW8260	0.0986	0.5	5.5	µg/L	80-120	63-144	20
	Bromomethane	74-83-9	SW8260	0.39	2	11	µg/L	80-120	46-159	20
	Carbon Tetrachloride	56-23-5	SW8260	0.0798	0.5	0.63	µg/L	80-120	80-160	20
	Chlorobenzene	108-90-7	SW8260	0.093	0.5	100	µg/L	80-120	73-135	20
	Chloroethane	75-00-3	SW8260	0.334	1.0	---	µg/L	80-120	62-157	20
	Chloroform	67-66-3	SW8260	0.087	0.5	1.4	µg/L	80-120	61-158	20
	Chloromethane	74-87-3	SW8260	0.218	1	---	µg/L	80-120	61-153	20
	cis-1,2-Dichloroethene	156-59-2	SW8260	0.164	0.5	16	µg/L	80-120	47-158	20
	cis-1,3-Dichloropropene	542-75-6	SW8260	0.109	0.5	0.44[a]	µg/L	80-120	66-145	20
	Chlorodibromomethane	124-48-1	SW8260	0.101	0.5	0.52	µg/L	80-120	69-147	20

TABLE 1B
ANALYTICAL PARAMETERS, REPORTING LIMITS, PRECISION, AND ACCURACY
FREMONT ANALYTICAL LABORATORY - AQUEOUS SAMPLES

Port of Moses Lake Pumphouse 1
7810 Andrews Street NE
Moses Lake, Washington
Page 2 of 4

Analyte Group	Analyte	CAS No.	Analytical Method	MDL	MRL	Lowest Preliminary Groundwater Screening Levels	Units	LCS Criteria (% R)	MS Criteria (% R)	Duplicate RPDL (%)
VOCs (cont'd)	Cumene	98-82-8	SW8260	0.122	0.5	800	µg/L	80-120	69-156	20
	Dibromomethane	74-95-3	SW8260	0.081	0.5	80	µg/L	80-120	65-153	20
	Dichlorodifluoromethane	75-71-8	SW8260	0.177	1	1,600	µg/L	80-120	64-156	20
	Ethanol	64-17-5	SW8260	280	750	---	µg/L	80-120	70-130	20
	Ethylbenzene	100-41-4	SW8260	0.125	0.5	700	µg/L	80-120	70-144	20
	Ethyl tertiary butyl ether	637-92-3	SW8260	0.129	0.2	8,000	µg/L	80-120	70-130	20
	Hexachlorobutadiene	87-68-3	SW8260SIM	0.051	0.2	0.56	µg/L	80-120	62-157	20
	Methanol	67-56-1	SW8015	460	1,000	16,000	µg/L	74-134	74-134	30
	Methyl tert-butyl ether	1634-04-4	SW8260	0.121	0.5	20	µg/L	80-120	54-156	20
	Methylene Chloride	75-09-2	SW8260	0.649	2	5	µg/L	80-120	57-154	20
	n-Butylbenzene	104-51-8	SW8260	0.165	0.5	400	µg/L	80-120	67-159	20
	n-Hexane	110-54-3	SW8260	0.790	1	480	µg/L	80-120	70-130	20
	n-Propylbenzene	103-65-1	SW8260	0.124	0.5	800	µg/L	80-120	66-154	20
	Naphthalene	91-20-3	SW8260	0.405	1.25	160	µg/L	80-120	55-154	20
	sec-Butylbenzene	135-98-8	SW8260	0.112	0.5	800	µg/L	80-120	72-158	20
	Styrene	100-42-5	SW8260	0.115	0.5	100	µg/L	80-120	69-137	20
	tert-Butylbenzene	98-06-6	SW8260	0.082	0.5	800	µg/L	80-120	73-151	20
	Tertiary-butyl alcohol	75-65-0	SW8260	1.058	5	88	µg/L	80-120	70-130	20
	Tertiary-amyl methyl ether	994-05-8	SW8260	0.143	0.2	---	µg/L	80-120	70-130	20
	Tetrachloroethene	127-18-4	SW8260	0.102	0.5	5	µg/L	80-120	68-160	20
	Toluene	108-88-3	SW8260	0.129	0.5	640	µg/L	80-120	66-154	20
	trans-1,2-Dichloroethene	156-60-5	SW8260	0.115	0.5	100	µg/L	80-120	60-171	20
	trans-1,3-Dichloropropene	542-75-6	SW8260	0.099	0.5	0.44[a]	µg/L	80-120	63-147	20
	Trichloroethene	79-01-6	SW8260	0.135	0.5	0.54	µg/L	80-120	61-157	20
	Trichlorofluoromethane	75-69-4	SW8260	0.062	0.5	2,400	µg/L	80-120	73-159	20
	Vinyl Chloride	75-01-4	SW8260SIM	0.007	0.02	0.029	µg/L	80-120	64-160	20
	m,p-Xylene	179601-23-1	SW8260	0.289	1.0	1,600	µg/L	80-120	67-142	20
	o-Xylene	95-47-6	SW8260	0.144	0.5	1,600	µg/L	80-120	68-139	20
	Total Xylenes	1330-20-7	SW8260	---	1.0	1,000	µg/L	80-120	70-130	20
SVOCs	1,2,4-Trichlorobenzene	120-82-1	SW8270	0.034	0.2	1.5	µg/L	15-107	48-94	30
	1,2-Dichlorobenzene	95-50-1	SW8270	0.026	0.08	600	µg/L	24-111	40-94	30
	1,3-Dichlorobenzene	541-73-1	SW8270	0.022	0.08	---	µg/L	13-104	41-89	30
	1,4-Dichlorobenzene	106-46-7	SW8270	0.023	0.08	8.1	µg/L	15-104	39-93	30
	1-Methylnaphthalene	90-12-0	SW8270	0.013	0.08	0.86	µg/L	16-118	16-134	30
	2,4,5-Trichlorophenol	95-95-4	SW8270	0.125	0.4	1,600	µg/L	11-127	39-138	30
	2,4,6-Trichlorophenol	88-06-2	SW8270	0.047	0.2	8	µg/L	7-131	30-140	30
	2,4-Dichlorophenol	120-83-2	SW8270	0.034	0.2	48	µg/L	10-113	39-124	30
	2,4-Dimethylphenol	105-67-9	SW8270	0.127	0.4	320	µg/L	5-102	21-152	30
	2,4-Dinitrophenol	51-28-5	SW8270	1.404	4	32	µg/L	5-103	25-125	30
	2,4-Dinitrotoluene	121-14-2	SW8270	0.033	0.08	0.28	µg/L	18-131	56-135	30
	2,6-Dinitrotoluene	606-20-2	SW8270	0.153	0.05	0.058	µg/L	16-140	47-151	30
	2-Chloronaphthalene	91-58-7	SW8270	0.025	0.08	640	µg/L	17-121	63-103	30
	2-Chlorophenol	95-57-8	SW8270	0.027	0.08	40	µg/L	3-97	36-88	30
	2-Methylnaphthalene	91-57-6	SW8270	0.021	0.08	32	µg/L	16-117	36-112	30
	2-Methylphenol	95-48-7	SW8270	0.117	0.4	800	µg/L	5-92	29-88	30
	2-Nitroaniline	88-74-4	SW8270	0.108	0.4	160	µg/L	13-134	42-140	30
	2-Nitrophenol	88-75-5	SW8270	0.051	0.2	---	µg/L	6-118	41-120	30
	3-methylphenol + 4-methylphenol	108-39-4 106-44-5	SW8270	0.087	2	800 1,600	µg/L	5-85	37-77	30
	4,6-Dinitro-2-methylphenol	534-52-1	SW8270	0.633	2	1.3	µg/L	11-129	8-145	30
	4-Bromophenyl phenyl ether	101-55-3	SW8270	0.039	0.2	---	µg/L	17-129	54-112	30
	4-Chloro-3-methylphenol	59-50-7	SW8270	0.191	1	1,600	µg/L	7-120	21-159	30
	4-Chloroaniline	106-47-8	SW8270	0.029	0.08	0.44	µg/L	5-133	7-80	30
	4-Chlorophenyl phenyl ether	7005-72-3	SW8270	0.025	0.08	---	µg/L	19-123	54-106	30
	4-Nitrophenol	100-02-7	SW8270	0.219	1	---	µg/L	5-95	7-97	30
	Acenaphthene	83-32-9	SW8270	0.024	0.08	480	µg/L	13-125	56-116	30
	Acenaphthylene	208-96-8	SW8270	0.026	0.08	---	µg/L	14-126	53-109	30
	Anthracene	120-12-7	SW8270	0.020	0.08	2,400	µg/L	7-118	60-16	30
	Benzo(a)anthracene	56-55-3	SW8270	0.042	0.2	---	µg/L	12-131	43-114	30
	Benzo(a)pyrene	50-32-8	SW8270SIM	0.01999	0.1	0.023	µg/L	10-119	39-102	30

TABLE 1B
ANALYTICAL PARAMETERS, REPORTING LIMITS, PRECISION, AND ACCURACY
FREMONT ANALYTICAL LABORATORY - AQUEOUS SAMPLES

Port of Moses Lake Pumphouse 1
7810 Andrews Street NE
Moses Lake, Washington
Page 3 of 4

Analyte Group	Analyte	CAS No.	Analytical Method	MDL	MRL	Lowest Preliminary Groundwater Screening Levels	Units	LCS Criteria (% R)	MS Criteria (% R)	Duplicate RPDL (%)
SVOCs (cont'd)	Benzo(b)fluoranthene	205-99-2	SW8270	0.045	0.2	---	µg/L	17-129	36-107	30
	Benzo(k)fluoranthene	207-08-9	SW8270	0.030	0.08	---	µg/L	14-126	38-99	30
	Benzo(g,h,i)perylene	191-24-2	SW8270	0.085	0.4	---	µg/L	5-129	8-137	30
	Benzyl alcohol	100-51-6	SW8270	0.497	1.5	1,600	µg/L	5-109	5-113	30
	Bis(2-chloroethoxy)methane	111-91-1	SW8270	0.028	0.08	48	µg/L	13-116	31-119	30
	Bis(2-chloroethyl) ether	111-44-4	SW8270	0.030	0.2	0.04	µg/L	10-112	33-105	30
	Bis(2-ethylhexyl) phthalate	117-81-7	SW8270	0.141	1	6	µg/L	5-142	29-105	30
	bis(2-Ethylhexyl)adipate	103-23-1	SW8270	0.201	1	73	µg/L	5-141	32-104	30
	Butyl benzyl phthalate	85-68-7	SW8270	0.045	0.2	46	µg/L	10-146	53-133	30
	Carbazole	86-74-8	SW8270	0.032	0.2	---	µg/L	9-139	59-121	30
	Chrysene	218-01-9	SW8270	0.033	0.2	---	µg/L	18-126	44-103	30
	Di-n-butyl phthalate	84-74-2	SW8270	0.257	1	1,600	µg/L	13-144	65-129	30
	Di-n-octyl phthalate	117-84-0	SW8270	0.067	0.2	160	µg/L	5-146	25-112	30
	Dibenz(a,h)anthracene	53-70-3	SW8270	0.054	0.2	---	µg/L	5-141	10-147	30
	Dibenzofuran	132-64-9	SW8270	0.018	0.08	8	µg/L	19-119	40-137	30
	Diethyl phthalate	84-66-2	SW8270	0.047	0.2	13,000	µg/L	17-138	63-118	30
	Dimethyl phthalate	131-11-3	SW8270	0.032	0.2	---	µg/L	15-141	67-124	30
	Fluoranthene	206-44-0	SW8270	0.029	0.08	640	µg/L	19-129	54-117	30
	Fluorene	86-73-7	SW8270	0.029	0.08	320	µg/L	19-123	48-110	30
	Hexachlorobenzene	118-74-1	SW8270	0.033	0.2	0.027	µg/L	16-127	48-110	30
	Hexachlorobutadiene	87-68-3	SW8270	0.027	0.08	0.56	µg/L	8-113	47-95	30
	Hexachlorocyclopentadiene	77-47-4	SW8270	0.135	0.4	48	µg/L	5-119	5-126	30
	Hexachloroethane	67-72-1	SW8270	0.031	0.2	1.1	µg/L	9-104	5-160	30
	Indeno(1,2,3-cd)pyrene	193-39-5	SW8270	0.048	0.2	---	µg/L	6-128	14-145	30
	Isophorone	78-59-1	SW8270	0.063	0.2	92	µg/L	13-126	59-99	30
	N-nitrosodipropylamine	621-64-7	SW8270	0.064	0.2	0.013	µg/L	10-124	46-113	30
	Naphthalene	91-20-3	SW8270	0.131	0.4	160	µg/L	16-114	19-131	30
	Nitrobenzene	98-95-3	SW8270	0.036	0.2	16	µg/L	13-118	48-104	30
	Pentachlorophenol	87-86-5	SW8270SIM	0.025	0.1	0.22	µg/L	6-121	23-147	30
	Phenanthrene	85-01-8	SW8270	0.033	0.2	---	µg/L	16-127	46-123	30
	Phenol	108-95-2	SW8270	0.045	0.3	4,800	µg/L	5-46	12-52	30
	Pyrene	129-00-0	SW8270	0.032	0.2	240	µg/L	14-132	53-117	30
	Pyridine	110-86-1	SW8270	0.104	2	8	µg/L	5-78	5-50	30
	cPAHs (BaP eq)	---	SW8270	---	---	0.023	µg/L	---	---	---
Metals	Arsenic, total	7440-38-2	SW6020	0.0884	0.5	0.058	µg/L	80-120	75-125	20
	Arsenic, dissolved	7440-38-2	SW6020	0.0884	0.5	0.058	µg/L	80-120	75-125	20
	Barium, total	7440-39-3	SW6020	0.3779	1	2,000	µg/L	80-120	75-125	20
	Barium, dissolved	7440-39-3	SW6020	0.3779	1	2,000	µg/L	80-120	75-125	20
	Cadmium, total	7440-43-9	SW6020	0.0301	0.05	5	µg/L	80-120	75-125	20
	Cadmium, dissolved	7440-43-9	SW6020	0.0301	0.05	5	µg/L	80-120	75-125	20
	Chromium, dissolved	7440-47-3	SW6020	0.1082	0.55	50[b]	µg/L	80-120	75-125	20
	Chromium, total	7440-47-3	SW6020	0.1082	0.55	50[b]	µg/L	80-120	75-125	20
	Iron, total	7439-89-6	SW6020	10	30	11,000	µg/L	85-115	70-130	20
	Iron, dissolved	7439-89-6	SW6020	10	30	11,000	µg/L	85-115	70-130	20
	Ferrous Iron	15438-31-0	3500-FeB	0.0476	0.15	---	µg/L	85-115	70-130	20
	Lead, dissolved	7439-92-1	SW6020	0.0796	0.3	15	µg/L	80-120	75-125	20
	Lead, total	7439-92-1	SW6020	0.0796	0.3	15	µg/L	80-120	75-125	20
	Manganese, total	7439-96-5	SW6020	0.2083	0.5	750	µg/L	85-115	70-130	20
	Manganese, dissolved	7439-96-5	SW6020	0.2083	0.5	750	µg/L	85-115	70-130	20
	Selenium, total	7440-22-4	SW6020	0.0801	0.5	50	µg/L	80-120	75-125	20
	Selenium, dissolved	7440-22-4	SW6020	0.0801	0.5	50	µg/L	80-120	75-125	20
	Silver, total	7782-49-2	SW6020	0.0060	0.2	80	µg/L	80-120	75-125	20
	Silver, dissolved	7782-49-2	SW6020	0.0060	0.2	80	µg/L	80-120	75-125	20
	Mercury, total	7439-97-6	SW7470	0.0123	0.1	2	µg/L	80-120	75-125	20
	Mercury, dissolved	7439-97-6	SW7470	0.0123	0.1	2	µg/L	80-120	75-125	20
Geochemical Parameters	Nitrate	14797-55-8	SW300.0	0.0529	0.2	10,000	mg/L	90-110	80-120	20
	Sulfate	14808-79-8	SW300.0	0.3618	1.0	---	mg/L	90-110	80-120	20
	Alkalinity	---	2320B	0.7878	2.5	---	mg/L	85-124	---	20
	Carbon dioxide	124-38-9	4500-CO2D	1.25	2.5	---	mg/L	94-116	---	20
	Methane	74-82-8	RSK SOP-175	0.0045	0.005	---	mg/L	73-124	---	20

TABLE 1B
ANALYTICAL PARAMETERS, REPORTING LIMITS, PRECISION, AND ACCURACY
FREMONT ANALYTICAL LABORATORY - AQUEOUS SAMPLES

Port of Moses Lake Pumphouse 1
7810 Andrews Street NE
Moses Lake, Washington
Page 4 of 4

Notes:

Modifications may be made to laboratory analytical methods, as necessary and technically feasible, to improve MRLs to meet Preliminary Screening Levels

--- = Not applicable or not available
% = Percent
% R = Percent recovery
μg/L = Micrograms per liter
BaP eq = Benzo(a)pyrene equivalent
CAS = Chemical Abstracts Service
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
EPH = Extractable petroleum hydrocarbons
LCS = Laboratory control sample
MDL = Method detection limit
MRL = Method reporting limit
MS = Matrix spike
PAHs = Polycyclic aromatic hydrocarbons
RPDL = Relative percent difference limit
SIM = Select Ion Monitoring
TPH = Total petroleum hydrocarbons
TPHd = Total petroleum hydrocarbons as diesel
TPHg = Total petroleum hydrocarbons as gasoline
TPHo = Total petroleum hydrocarbons as oil
VOCs = Volatile organic compounds
VPH = Volatile petroleum hydrocarbons
a = Screening level for 1,3-dichloropropene with no differentiation between cis- or trans-
b = Screening level for chromium total

TABLE 1C
ANALYTICAL PARAMETERS, REPORTING LIMITS, PRECISION, AND ACCURACY
EUROFINS LANCASTER LABORATORY - SOLID SAMPLES

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 1

Analyte Group	Analyte	Abbreviation	CAS No.	Analytical Method	MDL	MRL	Lowest Preliminary Soil Screening Levels	Units	LCS Criteria (% R)	MS Criteria (% R)	Duplicate RPDL (%)
PFAS	Perfluorobutanoic acid	PFBA	375-22-4	EPA 1633	0.100	0.800	80,000	ng/g	40-150	40-150	30
	Perfluoropentanoic acid	PFPeA	2706-90-3	EPA 1633	0.100	0.400	---	ng/g	40-150	40-150	30
	Perfluorohexanoic acid	PFHxA	307-24-4	EPA 1633	0.0900	0.200	40,000	ng/g	40-150	40-150	30
	Perfluoroheptanoic acid	PFHpA	375-85-9	EPA 1633	0.0900	0.200	---	ng/g	40-150	40-150	30
	Perfluorooctanoic acid	PFOA	335-67-1	EPA 1633	0.0510	0.200	0.034	ng/g	40-150	40-150	30
	Perfluorononanoic acid	PFNA	375-95-1	EPA 1633	0.0500	0.200	200	ng/g	40-150	40-150	30
	Perfluorodecanoic acid	PFDA	335-76-2	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluoroundecanoic acid	PFUnA	2058-94-8	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluorododecanoic acid	PFDoA	307-55-1	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluorotridecanoic acid	PFTriA	72629-94-8	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluorotetradecanoic acid	PFTeA	376-06-7	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluorobutanesulfonic acid	PFBS	375-73-5	EPA 1633	0.0500	0.200	24,000	ng/g	40-150	40-150	30
	Perfluoropentanesulfonic acid	PFPeS	2706-91-4	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluorohexanesulfonic acid	PFHxS	355-46-4	EPA 1633	0.0500	0.200	780	ng/g	40-150	40-150	30
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluorooctanesulfonic acid	PFOS	1763-23-1	EPA 1633	0.210	0.500	8	ng/g	40-150	40-150	30
	Perfluorononanesulfonic acid	PFNS	68259-12-1	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluorodecanesulfonic acid	PFDS	335-77-3	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluorododecanesulfonic acid	PFDoS	79780-39-5	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	Perfluorooctanesulfonamide	FOSA	754-91-6	EPA 1633	0.0900	0.200	---	ng/g	40-150	40-150	30
	N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2 FTS	757124-72-4	EPA 1633	0.200	0.800	---	ng/g	40-150	40-150	30
	1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2 FTS	27619-97-2	EPA 1633	0.350	1.00	---	ng/g	40-150	40-150	30
	1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2 FTS	39108-34-4	EPA 1633	0.350	1.00	---	ng/g	40-150	40-150	30
	N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8	EPA 1633	0.0500	0.200	---	ng/g	40-150	40-150	30
	N-methyl perfluorooctanesulfonamido ethanol	NMeFOSE	24448-09-7	EPA 1633	0.500	2.00	---	ng/g	40-150	40-150	30
	N-ethyl perfluorooctanesulfonamido ethanol	NEtFOSE	1691-99-2	EPA 1633	0.500	2.00	---	ng/g	40-150	40-150	30
	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1	EPA 1633	0.200	0.800	---	ng/g	40-150	40-150	30
	Hexafluoropropylene oxide dimer acid	HFPO-DA (GenX)	13252-13-6	EPA 1633	0.500	1.00	240	ng/g	40-150	40-150	30
	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9	EPA 1633	0.200	0.800	---	ng/g	40-150	40-150	30
	4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4	EPA 1633	0.200	0.800	---	ng/g	40-150	40-150	30
	3-Perfluoropropyl propanoic acid	3:3 FTCA	356-02-5	EPA 1633	0.250	1.00	---	ng/g	40-150	40-150	30
	2H,2H,3H,3H-Perfluorooctanoic acid	5:3 FTCA	914637-49-3	EPA 1633	1.00	5.00	---	ng/g	40-150	40-150	30
	3-Perfluoroheptyl propanoic acid	7:3 FTCA	812-70-4	EPA 1633	1.00	5.00	---	ng/g	40-150	40-150	30
	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6	EPA 1633	0.104	0.400	---	ng/g	40-150	40-150	30
	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5	EPA 1633	0.100	0.400	---	ng/g	40-150	40-150	30
	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	EPA 1633	0.100	0.400	---	ng/g	40-150	40-150	30
	Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7	EPA 1633	0.100	0.400	---	ng/g	40-150	40-150	30

Notes:

Modifications may be made to laboratory analytical methods, as necessary and technically feasible, to improve MRLs to meet Preliminary Screening Levels

--- = Not applicable or not available
% = Percent
% R = Percent recovery
ng/g = Nanograms per gram
CAS = Chemical Abstracts Service
LCS = Laboratory control sample
MDL = Method detection limit
MRL = Method reporting limit
MS = Matrix spike
PFAS = Per- and polyfluoroalkyl substances
RPDL = Relative percent difference limit

TABLE 1D
ANALYTICAL PARAMETERS, REPORTING LIMITS, PRECISION, AND ACCURACY
EUROFINS LANCASTER LABORATORY - AQUEOUS SAMPLES

Port of Moses Lake Pumphouse 1
7810 Andrews Street NE
Moses Lake, Washington
Page 1 of 1

Analyte Group	Analyte	Abbreviation	CAS No.	Analytical Method	MDL	MRL	Lowest Preliminary Groundwater Screening Levels	Units	LCS Criteria (% R)	MS Criteria (% R)	Duplicate RPDL (%)
PFAS	Perfluorobutanoic acid	PFBA	375-22-4	EPA 1633	1.10	4.00	8,000	ng/L	70-140	70-140	30
	Perfluoropentanoic acid	PFPeA	2706-90-3	EPA 1633	0.600	2.00	---	ng/L	65-135	65-135	30
	Perfluorohexanoic acid	PFHxA	307-24-4	EPA 1633	0.500	2.00	8,000	ng/L	70-145	70-145	30
	Perfluoroheptanoic acid	PFHpA	375-85-9	EPA 1633	0.800	2.00	---	ng/L	70-150	70-150	30
	Perfluorooctanoic acid	PFOA	335-67-1	EPA 1633	0.900	2.00	0.003	ng/L	70-150	70-150	30
	Perfluorononanoic acid	PFNA	375-95-1	EPA 1633	0.500	2.00	10	ng/L	70-150	70-150	30
	Perfluorodecanoic acid	PFDA	335-76-2	EPA 1633	0.500	2.00	---	ng/L	70-140	70-140	30
	Perfluoroundecanoic acid	PFUnA	2058-94-8	EPA 1633	0.500	2.00	---	ng/L	70-145	70-145	30
	Perfluorododecanoic acid	PFDoA	307-55-1	EPA 1633	0.500	2.00	---	ng/L	70-140	70-140	30
	Perfluorotridecanoic acid	PFTriA	72629-94-8	EPA 1633	0.500	2.00	---	ng/L	65-140	65-140	30
	Perfluorotetradecanoic acid	PFTeA	376-06-7	EPA 1633	0.500	2.00	---	ng/L	60-140	60-140	30
	Perfluorobutanesulfonic acid	PFBS	375-73-5	EPA 1633	0.500	2.00	4,800	ng/L	60-145	60-145	30
	Perfluoropentanesulfonic acid	PFPeS	2706-91-4	EPA 1633	0.500	2.00	---	ng/L	65-140	65-140	30
	Perfluorohexanesulfonic acid	PFHxS	355-46-4	EPA 1633	0.800	2.00	10	ng/L	65-145	65-145	30
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8	EPA 1633	0.500	2.00	---	ng/L	70-150	70-150	30
	Perfluorooctanesulfonic acid	PFOS	1763-23-1	EPA 1633	0.500	2.00	1.6	ng/L	55-150	55-150	30
	Perfluorononanesulfonic acid	PFNS	68259-12-1	EPA 1633	0.500	2.00	---	ng/L	65-145	65-145	30
	Perfluorodecanesulfonic acid	PFDS	335-77-3	EPA 1633	0.500	2.00	---	ng/L	60-145	60-145	30
	Perfluorododecanesulfonic acid	PFDoS	79780-39-5	EPA 1633	0.600	2.00	---	ng/L	50-145	50-145	30
	1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2 FTS	757124-72-4	EPA 1633	1.00	4.00	---	ng/L	70-145	70-145	30
	1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2 FTS	27619-97-2	EPA 1633	1.00	4.00	---	ng/L	65-155	65-155	30
	1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2 FTS	39108-34-4	EPA 1633	1.00	4.00	---	ng/L	60-150	60-150	30
	Perfluorooctanesulfonamide	PFOSA	754-91-6	EPA 1633	0.500	2.00	---	ng/L	70-145	70-145	30
	N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8	EPA 1633	0.500	2.00	---	ng/L	60-150	60-150	30
	N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2	EPA 1633	0.500	2.00	---	ng/L	65-145	65-145	30
	N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	EPA 1633	0.500	2.00	---	ng/L	50-140	50-140	30
	N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	EPA 1633	0.500	2.00	---	ng/L	70-145	70-145	30
	N-methyl perfluorooctanesulfonamido ethanol	NMeFOSE	24448-09-7	EPA 1633	2.50	10.0	---	ng/L	70-145	70-145	30
	N-ethyl perfluorooctanesulfonamido ethanol	NEtFOSE	1691-99-2	EPA 1633	2.50	10.0	---	ng/L	70-135	70-135	30
	Hexafluoropropylene oxide dimer acid	HFPO-DA (GenX)	13252-13-6	EPA 1633	1.20	3.00	10	ng/L	70-140	70-140	30
	4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4	EPA 1633	0.500	2.00	---	ng/L	65-145	65-145	30
	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	EPA 1633	0.500	2.00	---	ng/L	55-140	55-140	30
	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5	EPA 1633	0.500	2.00	---	ng/L	60-150	60-150	30
	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6	EPA 1633	0.500	2.00	---	ng/L	50-150	50-150	30
	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1	EPA 1633	0.500	2.00	---	ng/L	70-155	70-155	30
	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9	EPA 1633	0.500	2.00	---	ng/L	55-160	55-160	30
	Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7	EPA 1633	0.500	2.00	---	ng/L	70-140	70-140	30
	3-Perfluoropropyl propanoic acid	3:3 FTCA	356-02-5	EPA 1633	1.00	4.00	---	ng/L	65-130	65-130	30
	2H,2H,3H,3H-Perfluorooctanoic acid	5:3 FTCA	914637-49-3	EPA 1633	2.80	10.0	---	ng/L	70-135	70-135	30
	3-Perfluoroheptyl propanoic acid	7:3 FTCA	812-70-4	EPA 1633	2.50	10.0	---	ng/L	50-145	50-145	30

Notes:

Modifications may be made to laboratory analytical methods, as necessary and technically feasible, to improve MRLs to meet Preliminary Screening Levels

--- = Not applicable or not available
% = Percent
% R = Percent recovery
ng/L = Nanograms per liter
CAS = Chemical Abstracts Service
LCS = Laboratory control sample
MDL = Method detection limit
MRL = Method reporting limit
MS = Matrix spike
PFAS = Per- and polyfluoroalkyl substances
RPDL = Relative percent difference limit

TABLE 2
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 3

Matrix	Analysis	Analytical Method	Container	Preservation	Holding Time
Soil	TPHg	NWTPH-Gx	(1) 4 oz glass jar; (2) 40 mL glass VOA vial w/MeOH; (1) Field Preservation Kit	MeOH Cool to 4°C	14 days
	TPHd, TPHo	NWTPH-Dx	(1) 4 oz glass jar	Cool to 4°C	14 days for extraction; 40 days for analysis
	VPH	NWTPH-VPH	(1) 4 oz glass jar; (2) 40 mL glass VOA vial w/MeOH; (1) Field Preservation Kit	MeOH Cool to 4°C	14 days
	EPH	NWTPH-EPH	(1) 4 oz glass jar	Cool to 4°C	14 days for extraction; 40 days for analysis
	VOCs	EPA 8260 EPA 8260SIM	(1) 4 oz glass jar; (2) 40 mL glass VOA vial w/MeOH; (1) Field Preservation Kit	MeOH Cool to 4°C	14 days
		EPA 8015	(1) 4 oz glass jar	Cool to 4°C	
	SVOCs	EPA 8270 EPA 8270 SIM	(1) 4 oz glass jar	Cool to 4°C	14 days for extraction; 40 days for analysis
	Total Metals	EPA 6020/7471	(1) 4 oz glass jar	Cool to 4°C	6 months
	PFAS	EPA 1633	(1) 4 oz polypropylene container w/ polyethylene screw cap	Cool to 0-6°C; protect from light	90 days

TABLE 2
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 2 of 3

Matrix	Analysis	Analytical Method	Container	Preservation	Holding Time
Groundwater	TPHg	NWTPH-Gx	(3) 40 mL glass VOA vial w/HCl	HCl Cool to 4°C	14 days
	TPHd, TPHo	NWTPH-Dx	(1) 500 mL amber glass w/HCl	HCl Cool to 4°C	14 days for extraction; 40 days for analysis
	VPH	NWVPH	(3) 40 mL glass VOA vial w/HCl	HCl Cool to 4°C	14 days
	EPH	NWEPH	(1) 1 L amber glass w/HCl	HCl Cool to 4°C	14 days for extraction; 40 days for analysis
	VOCs	EPA 8260 EPA 8260SIM	(4) 40 mL glass VOA vial w/HCl	HCl Cool to 4°C	14 days
		EPA 8015	(2) 40 mL glass VOA vial w/HCl		
	SVOCs	EPA 8270 EPA 8270 SIM	(1) 500 mL amber glass	Cool to 4°C	7 days for extraction; 40 days for analysis
	Total and Dissolved Metals	EPA 6020	(1) 250 mL polyethylene w/HNO_3 (Field Filter) -or- (1) 250 mL polyethylene, unpreserved (Request Lab Filtration)	HNO_3 Cool to 4°C	6 months for preserved analysis -or- Filter and preserve within 14 days
	Ferrous Iron	SM 3500-FeB	(1) 250 mL amber w/HCl	Cool to 4°C	24 hours
	Nitrate and Sulfate	EPA 300	(1) 250 mL poly	Cool to 4°C	48 hours
	Alkalinity	EPA 2320B	(1) 250 mL poly	Cool to 4°C	14 days
	Methane	RSK-175	(2) 40 mL VOA vial w/HCl	HCl Cool to 4°C	14 days
	Carbon dioxide	SM 4500-CO2_D	(1) 250 mL poly	Cool to 4°C	14 days
	PFAS	EPA 1633	(2) 125 mL HDPE containers	Cool to 0-6°C; protect from light	28 days

TABLE 2
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 3 of 3

Notes:

The Field Preservation Kit for soil consists of (2) x 40-mL VOA vials preserved with MeOH and 5 grams of sample volume.

°C = Degrees Celsius
EPA = United States Environmental Protection Agency
EPH = Extractable petroleum hydrocarbons
HCl = Hydrochloric acid
HDPE = High density polyethylene
HNO_3 = Nitric acid
L = Liter
MeOH = Methanol
mL = Milliliter
NWEPH = Northwest Total Petroleum Hydrocarbons for the Determination of Extractable Petroleum Hydrocarbons Fractions
NWTPH-Dx = Northwest Total Petroleum Hydrocarbons for Diesel/Oil Range Organics
NWTPH-Gx = Northwest Total Petroleum Hydrocarbons for Gasoline Range Organics
NWVPH = Northwest Total Petroleum Hydrocarbons for the Determination of Volatile Petroleum Hydrocarbons Fractions
oz = Ounce
PFAS = Per- and polyfluoroalkyl substances
SIM = Selective ion monitoring
SVOCs = Semi volatile organic compounds
TPH = Total petroleum hydrocarbons
TPHd = Total petroleum hydrocarbons as diesel
TPHg = Total petroleum hydrocarbons as gasoline
TPHo = Total petroleum hydrocarbons as oil
VOA = Volatile organic analysis
VOCs = Volatile organic compounds
VPH = Volatile petroleum hydrocarbons
w/ = With

TABLE 3
FIELD AND LABORATORY QUALITY ASSURANCE/QUALITY CONTROL SAMPLE REQUIREMENTS

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington
Page 1 of 1

	QC Sample Type	Frequency of Sample/Analysis	Details
Field Samples	Duplicate Samples	1 duplicate per 20 samples per matrix	Duplicate sample to be collected using the same methods and at the same time (within reason) as the parent sample; used to verify sample and analytical reproducibility
	Matrix Spike/ Matrix Spike Duplicate	1 MS/MSD per 20 samples per matrix	Samples spiked by the laboratory with a known concentration of analytes of interest prior to sample preparation and analysis; used to assess the accuracy and precision of the method for that sample
	Equipment Blanks	1 equipment blank per day per sample matrix when non-dedicated/reusable sampling equipment is used	Distilled water poured over decontaminated field sampling equipment into laboratory containers (rinsate/equipment blanks); used to assess quality of data from field sampling and decontamination procedures
	Trip Blanks	1 trip blank per cooler containing samples for VOC analysis	Laboratory-prepared organic-free sample taken from the laboratory to the sampling site and transported back to the laboratory without having been exposed to sampling procedures; used to assess contamination during shipping and field handling procedures
Laboratory Samples	Method Blanks	1 method blank per batch of samples in accordance with laboratory SOP	A blank prepared to represent the matrix as closely as possible; used to assess contamination introduced during sample preparation by the laboratory
	Instrument Blanks	Defined by the analytical method or at the analyst's discretion	A blank analyzed with field samples; used to assess the presence or absence of instrument contamination
	Laboratory Control Samples and Sample Duplicates	Analyzed as per method requirements and laboratory SOPs	Samples prepared that contain analytes that are representative of the analytes of interest at known concentrations in distilled water or sand and process in the same manner as the field samples; used to demonstrate the laboratory has control over sample preparation and analysis of specific tests and to demonstrate reproducibility

Notes:
MS/MSD = Matrix spike/matrix spike duplicate
QC = Quality control
SOP = Standard operating procedure
VOC = Volatile organic compound

APPENDIX A
Laboratory Quality Assurance Manual

SOP Proprietary Information

FREMONT ANALYTICAL, INC.

STANDARD OPERATING PROCEDURE

This document has been prepared by and remains the sole property of Fremont Analytical, Inc. It is submitted to a client or government agency solely for its use in evaluating Fremont Analytical, Inc.'s qualifications in connection with the particular project, Certification, or approval for which it was prepared and is to be held proprietary to Fremont Analytical, Inc.

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Quality Assurance

Quality Assurance and Quality Control Programs
Fremont Analytical, Inc.
3600 Fremont Ave N.
Seattle, WA 98103
206-352-3790

Date 4/18/2023

Matt Langston
Laboratory Director

Date 4/18/23

Sean Galloway
Technical Director

Date 4/18/23

Alex Kegley
Quality Assurance Manager

Revisions

Date	Revision #	Notation
7.18.07	1.1	Changed section 3.2 from FA-yymmdd to CHM-yymmdd
8.3.07	1.2	USDA APHIS PPQ regulations
8.3.08	1.3	General Edits and Revisions
10.20.08	1.4	General Edits and Revisions
02.15.09	1.5	Edits and Revisions (logo, syntax)
12.17.09	1.6	Updated Storage procedure re: Foreign Soil
12.22.09	1.7	Add Appendix (addendum): Foreign Soil
12.20.10	1.8	General Review
1.11.12	1.9	Edits and Revisions
3.21.12	2.0	Final
5.29.12	2.1	NELAC Edits
2.14.13	2.2	DoD Edits
6.25.13	2.3	DoD Edits – Final Review (MCR)
1.14.14	2.3.1	General Edits and Revisions (C.Ward)
6.03.14	2.4	DoD Edits (Kari Scott, Erica Silva, M. Ridgeway)

4.16.15	2.5	Edits and Revisions (N. Masters)
2.18.16	2.6	Edits and Revisions (N. Masters)
2.23.16	2.7	Edits and Revisions (M. Dee)
3.1.16	2.8	Edits and Revisions (M. Ridgeway)
3.4.16	2.9	Edits and Revisions (N. Masters)
3.23.17	3.0	Edits and Revisions (N. Masters)
10.30.17	3.1	Edits and Revisions (E. Mar)
4.12.18	3.2	Edits, Revisions, and Review (E. Mar)
6.25.18-5.6.2019	3.3	Edits, Revisions, and Review (E. Mar, M. Ridgeway, S. Galloway)
4.13.20-5.3.20	3.4	Edits, Revisions, and Review (E.Mar, A. Kegley, M. Langston, S. Galloway)
8.3.20-8.14.20	3.5	Post-DOD Audit Edits (A. Kegley)
5.12.22	3.6	Edits and Review (A. Kegley)
4.18.23	3.7	Edits and Review (A. Kegley)

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List of Tables

1. INTRODUCTION AND SCOPE (TNI V1:M2 – SECTION 1, 2, 3)

1.1. The purpose of the Quality Assurance and Quality Manual is to outline the management systems for Fremont Analytical, Inc. The Quality Manual identifies the policies, procedures, and documentation that assure analytical services continually meet defined standards of quality, designed to provide clients with data of known and documented quality and, where applicable, demonstrate regulatory compliance.

1.2. The Quality Manual sets the standard under which all laboratory operations are performed, including the laboratory's organization, objectives, and operating philosophy. The Quality Manual has been prepared to assure compliance with the 2016 TNI Environmental Laboratory Sector Standard – Volume 1 – Management and Technical Requirements for Laboratories Performing Environmental Analysis (EL-V1-M1 through M7-ISO-2016) and the DoD Quality Systems Manual version 5.4. These Standards are consistent with ISO/IEC 17025:2017 requirements that are relevant to the scope of environmental testing services and thus, the laboratory operates a quality system in conformance with ISO/IEC 17025:2017. In addition, the policies and procedures outlined are compliant with the following accreditation and certification programs: Washington Department of Ecology, ORELAP (recognized by NELAP), and the Department of Defense.

1.3. The Quality Assurance and Quality Control (QAQC) Program is organized so that data produced from Fremont Analytical, Inc. is traceable, reviewed multiple times and is of the utmost quality. The QAQC Program functions at the management level working through written standard operating procedures and overall laboratory quality control.

1.4. The QAQC Program provides a means by which the integrity of data can be verified. Because industrial, engineering, and environmental decisions are based on the data produced, it is essential that clear and extensive verification procedures exist and are followed. The precision, accuracy, comparability, and completeness criteria are all aspects of a data package that verify the integrity of the analysis.

1.5. Fremont Analytical, Inc. follows approved methods (EPA, Standard Methods, ASTM, State specific methods) and has developed and implemented a quality assurance plan for a variety of laboratory analyses. The quality control program is blended with QC requirements to provide effective and efficient laboratory protocol. When it is necessary to deviate from standard methods, documentation is developed describing the properties of the method used.

1.6. The general quality assurance program utilized in each laboratory program includes considerations of the following areas:

- Personnel training
- Sample handling and control
- Equipment and supplies
- Equipment calibration and standards
- Quality control test samples
- Data handling and documentation

1.7. Laboratory training includes:

- Observing experienced operators/Chemists
- Studying applicable SOPs
- Performing analysis under direct supervision of experienced personnel
- Performing an Initial Demonstration of Capability
- Analyzing blind QC samples (if applicable)

1.8. The Quality Assurance Manager coordinates quality assurance training. The training may consist of seminars addressing QC problems of general laboratory interest, and distribution of reports and manuals addressing QC issues.

2. SCOPE OF TESTING

2.1. Fremont Analytical, Inc. analyzes water, drinking water, soil, sediment, oil, air, solid and wipe samples. The parameters/analytes measured, Method used and the laboratory SOPs can be found in Appendix C.

3. APPENDICES

*Note: Appendices may be updated independently of the QA Manual and will have individual revision numbers and dates.

3.1. Appendix A: Laboratory Organization Chart

3.2. Appendix B: Laboratory Floor Plan

3.3. Appendix C: Methods, SOP, and Analytes

3.4. Appendix D: Data Qualifiers

3.5. Appendix E: Chemistry

3.6. Appendix F: Instrumentation Listing/Support Equipment

3.7. Appendix G: Common Calculations

4. REFERENCES

4.1. 2016 NELAC Standards, 2016.

4.2. DoD Quality Systems Manual, Version 5.4 Final October 2021 (based on the NELAC Institute (TNI) Standards, Volume 1, September 2009, ISO/IEC 17025:2017 and ISO/IEC 17025:2005).

4.3. 2009 NELAC Standards, September 2009.

4.4. 40CFR part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants.

4.5. 40CFR part 141, National Primary Drinking Water Regulations.

4.6. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80, December 29, 1980, Office of Monitoring Systems and Quality Assurance, ORD, U.S. EPA, Washington, DC 20460.

4.7. RCRA QAPP Instructions, U. S. EPA Region 5, Revision: April 1998

4.8. ASTM D-5283-92. Generation of Environmental Data Related to Waste Management Activities: Quality assurance and Quality Control Planning and Implementation

4.9. “American National Standards Specification and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4)”, 1994

4.10. EPA 2185 - Good Automated Laboratory Practices, 1995

4.11. ISO/IEC Guide 25: 1990. General requirements for the competence of calibration and testing laboratories

4.12. QA/R-2: EPA Requirements for Quality Management Plans, August, 1994

4.13. QA/G-4: Guidance for the Data Quality Objectives Process EPA/600/R-96/055, September, 1994

4.14. QA/R-5: EPA Requirements for Quality Assurance Project Plans, Draft Final – October, 1998

4.15. QA/G-5: Guidance on Quality Assurance Project Plans, EPA/600/R-98/018, February, 1998

4.16. QA/G-6: Guidance for the Preparation of Standard Operating Procedures for Quality-Related Operations EPA/600/R-96/027, November, 1995

4.17. QA/G-9: Guidance for the Data Quality Assessment: Practical Methods for Data Analysis EPA/600/R-96/084, January, 1998

4.18. Manual for the Certification of Laboratories Analyzing Drinking Water EPA 815-r-05-004, January 2005, Fifth Edition.

4.19. Estimation of Analytical Measurement Uncertainty – Laboratory Quality and Accreditation Office Uncertainty Calculation SOP, https://www.denix.osd.mil/edqw/documents/reports/uncertainty-standard-operating-procedure/, Downloaded 2018.

4.20. Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples, EPA/600/R-03/027, December 2003.

5. GLOSSARY AND ABBREVIATIONS USED

5.1. Glossary

5.1.1. **Accuracy**. The degree of agreement between an observed value and an accepted reference or true value. Laboratory accuracy is assessed through the analysis of MS/MSD, quality control check samples, laboratory control samples (LCS), and surrogate compound spikes for organic analyses as methods require. The accuracy of a result is affected by both systematic and random errors. Accuracy does not denote only systematic error. (See "bias".)

5.1.2. **Analyte**. Denotes 'that which is to be analyzed for' in chemical, but not physical or biological determinations.

5.1.3. **Analytical Method**. Denotes a set of written instructions specifying an analytical procedure followed by a Chemist to obtain a numerical estimate of the concentration of a determinant (analyte) in each of one or more samples.

5.1.4. **Analytical Response**. A numerical observation which is obtained when a portion of a sample is presented to a measurement sub-system (e.g., spectrophotometric measurement of the absorbency of a solution). The magnitude is related to the amount or concentration of the determinant (analyte) in that portion.

5.1.5. **Analytical Result**. Denotes a numerical estimate of the concentration of a determinant (analyte) in a sample, and is obtained by carrying out once the procedure specific in an analytical method. Note that a method may specify analysis of more than one portion of a sample to produce one analytical result. The result can also be thought of as the final value reported to the user.

5.1.6. **Analytical System**. Denotes a combination of Chemist, analytical method, equipment, reagents, standards, laboratory facilities, any other components involved in carrying out an analytical procedure.

5.1.7. **Bias**. The inaccuracy of an analytical result caused by systematic error. Bias is indicated by the mean value generated from a data set. For example, the mean value of recovery for a set of laboratory control samples will indicate the bias of the method results above or below the true sample value.

5.1.8. **Calibration Standards**. Standards(s) of known concentration used in the calibration (standardization) procedure to determine the relationship between instrument response and concentration.

5.1.9. **Check Standard**. A solution of known concentration used to check the precision of analyses (and bias due to calibration). Used in conjunction with a control chart it becomes a control standard.

5.1.10. **Comparability.** An expression of the confidence with which one data set can be compared to another. Comparability is achieved by the use of routine analytical methods, achieving holding times, reporting results in common units, use of consistent detection levels, and consistent rules for reporting data.

5.1.11. **Duplicate (DUP)**. An intra-laboratory split sample documenting the precision of a method in a given sample matrix.

5.1.12. **External Standards**. Independently prepared standards used to determine the relationship between response and concentration. They are run separately from the samples.

5.1.13. **Initial Calibration**. A procedure, using a series of standards of different concentration to define the usable quantitation range of instrument. The initial calibration contains a minimum of three to five standards spanning from ten times the intended detection limit to the upper quantitation limit.

5.1.14. **Instrument Detection Limit (IDL)**. The Instrument Detection Limit (IDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

5.1.15. **Interference**. A systematic error (bias) in the analytical result caused by the presence of a substance in the sample (or added to the sample during analysis).

5.1.16. **Internal Standard Standardization**. A calibration procedure in which the responses of analytes are determined relative to internal standards added to every sample. Used to reduce bias in calibration.

5.1.17. **Laboratory Control Sample (LCS)**. A method blank spiked with the analytes of interest at a concentration generally near the middle of the instrument calibration range. The recovery percent from this analysis is plotted to indicate the bias of the analytical method.

5.1.18. **Laboratory Information Management (LIM) System**. Sample and data management software. Fremont Analytical uses Omega™ by Khemia Software, Inc.

5.1.19. **Limit of Detection (LOD).** The minimum concentration of a substance that can be detected at 3x the instrument signal to noise or greater.

5.1.20. **Limit of Quantitation (LOQ)**. The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The LOQ is generally 2 to 10 times the LOD.

5.1.21. **Matrix Spike (MS)**. An aliquot of sample spiked with known concentrations of target analyte(s). Spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

5.1.22. **Matrix Spike Duplicate (MSD)**. Intra-laboratory samples spiked with identical concentrations of target analyte(s). The spiking occurs prior to sample preparation and analysis. MSDs are used to document the precision and bias of a method in a given sample matrix.

5.1.23. **Method Blank (MB)**. A determination intended to estimate the analytical response attributable to all factors other than the determinant (analyte) in the sample. Blanks are analyzed identically to samples, but do not contain the determinant (analyte) (e.g., in water analyses, pure water is analyzed to determine the blank). Some use the term analytical blank with the same meaning given here for method blank. Not to be confused with the reagent blank.

5.1.24. **Method Detection Limit**. The Method Detection Limit (MDL) is defined as the minimum concentration of a substance that has gone through the preparation process, which can be measured and reported with 99% confidence that the analyte concentration is greater than zero. This limit is equal to or above the Instrument Detection Limit.

5.1.25. **Omega**. Omega is a laboratory information system (LIMS) specifically designed for environmental laboratories. Omega is capable of exporting (and importing) data directly to most PC based database formats or to fixed-field or delimited ASCII formats that are universally applicable across system platforms.

5.1.26. **Percent Recovery (%REC)**. That percent of a known amount of material spiked or added to a sample being analyzed which is recovered at the end of analysis.

5.1.27. **Percent Relative Standard Deviation (%RSD)**. The standard deviation relative to the mean. Also called 'coefficient of variation'.

5.1.28. **Practical Quantitation Limit (PQL)**. Limit to which analytical data is reported. The PQL is typically 3 times the MDL.

5.1.29. **Precision**. A measure of the degree to which two or more measurements are in agreement. Precision is assessed through the calculation of relative percent difference (RPD) and relative standard deviation (RSD) for replicate samples. Precision is assessed through the analysis of a sample/sample duplicate pair and/or Matrix Spike/Matrix Spike Duplicate (MS/MSD) pairs.

5.1.30. **Quality Assurance (QA).** The total integrated program for assuring the reliability of monitoring and measurement data.

5.1.31. **Quality Control (QC)**. The routine application of statistically based procedures to evaluate and control the accuracy of results from analytical measurements.

5.1.32. **Random Errors**. Errors occurring when repeated analyses of identical portions of a homogeneous sample do not give a series of identical results. The results differ among themselves and are more or less scattered about some value. They are termed random because the sign and magnitude of the error of any particular result vary at random, and cannot be predicted exactly.

5.1.33. **Reagent Blank**. Reagents used in the analyses that have not been subjected to the sample preparation (extraction) procedure. The reagent blank will generally be prepared in the same manner as the standards used in calibration. A reagent blank is used in Infrared and Atomic Absorption spectrometry to zero instrument readings before calibration or analysis. Also referred to as a zero blank.

5.1.34. **Recovery**. An estimate, usually expressed in percent, of an analytical result in comparison with a true or reference value for the analyte (e.g., an analytical recovery of 95% for compound 'X' means that the result was 95 % of the true or reference value for 'X' in the sample). It is a direct indication of analytical performance.

5.1.35. **Reference Material**. A material or substance one or more properties of which are sufficiently well established are used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

5.1.36. **Relative Percent Difference (RPD)**. The difference between two values determined by dividing the absolute of the difference between the first and second value by the average of the values.

5.1.37. **Representativeness.** An expression of the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. Representativeness is ensured by using the proper analytical procedures, appropriate methods, and meeting sample-holding times.

5.1.38. **Spike**. The addition of known amount of analyte to a sample for the purpose of judging, from the analytical percent recovery, whether there is bias due to interference present in the sample. Also referred to as fortification of the sample.

5.1.39. **Standard**. A solution of known concentration. There are two types of standards: check (or control) and calibration.

5.1.40. **Standard Operating Procedure (SOP)**. A detailed, written description of a procedure designed to systematize the performance of the procedure.

5.1.41. **Surrogate Standard**. A type of check standard. It is added to every sample in a known amount at the start of processing. The surrogate is not one of the target compounds for the analysis, but should have analytical properties similar to those compounds. The surrogate compounds are not expected to be present in environmental samples.

5.1.42. **Systematic Errors**. Errors which are indicated by a tendency of results to be greater or smaller than the true value. Usually bias can be considered to be equivalent to systematic error.

5.1.43. **Target Compound**. A compound expected in an environmental sample or for which the analysis is being conducted.

Table 1: Abbreviations

Abbreviation	Definition
AB	Accrediting Body
ANSI	American National Standards Institute
ASQC	American Society for Quality Control
ASTM	American Society for Testing and Materials
BLK	Blank
°C	Degrees Celsius
CAL	Calibration
CAS	Chemical Abstract Service
CCV	Continuing Calibration Verification
COC	Chain of Custody
CVAA	Cold Vapor Atomic Absorbance
CVAF	Cold Vapor Atomic Fluorescence
DO	Dissolved Oxygen
DOC	Demonstration of Capability
DoD	Department of Defense

Table 1: Abbreviations	
Abbreviation	**Definition**
DUP	Duplicate
EPA	Environmental Protection Agency
FAI	Fremont Analytical, Inc
FoPT	Field of Proficiency Testing
g/L	Grams per liter
GC-ECD	Gas Chromatography-Electron Capture Detector
GC-FID	Gas Chromatography –Flame Ionization Detector
GC-FID/PID	Gas Chromatography-Flame Ionization Detector/Photo Ionization Detector
GC-MS	Gas Chromatography-Mass Spectrometry
GC-TCD	Gas Chromatography-Thermal Conductivity Detector
IC	Ion Chromatography
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit

Table 1: Abbreviations

Abbreviation	Definition
ISO/IEC	International Organization for Standardization/International Electrochemical Commission
LCS	Laboratory Control Sample
LFB	Laboratory Fortified Blank
LOD	Limit of Detection
LOQ	Limit of Quantitation
MB	Method Blank
MDL	Method Detection Limit
mg/Kg	Milligrams per kilogram
mg/L	Milligrams per liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NELAP	National Environmental Laboratory Accreditation Program
NIST	National Institute of Standards and Technology
PAH	Polycyclic Aromatic Hydrocarbon

Table 1: Abbreviations

Abbreviation	Definition
PCB	Polychlorinated Biphenyl
PQL	Practical Quantitation Limit
PT	Proficiency Test(ing)
PTP	Proficiency Testing Provider
QA	Quality Assurance
QC	Quality Control
QAM	Quality Assurance Manager
QM	Quality Manual
RL	Reporting Level
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SOPs	Standard Operating Procedures
SPK	Spike
STD	Standard
SVOC	Semi-Volatile Organic Compounds

Table 1: Abbreviations	
Abbreviation	**Definition**
TNI	The NELAC Institute
TOC	Total Organic Carbon
µg/L	Micrograms per liter
µg/m^3	Micrograms per cubic meter
UV	Ultraviolet
VOC	Volatile Organic Compound

6. ORGANIZATION (TNI V1:M2 – SECTION 4.1)

6.1. The laboratory is a legally identifiable organization. The Tax ID number is available upon request. The laboratory operates at 3600 Fremont Ave. N. Seattle, Washington, 98103.

6.2. The laboratory is responsible for carrying out testing activities that meet the requirements of the TNI Standard, DoD QSM, State Accreditation authorities, and that meet the needs of the client. Through application of the policies and procedures outlined in this section and throughout the Quality Manual, Fremont Analytical, Inc. is structured to ensure that the final data package produced for the client meets or exceeds regulatory standards.

6.3. An organization chart for Fremont Analytical is shown in Appendix A. Additional information regarding responsibilities, authority and interrelationship of personnel who manage, perform or verify testing is included in Section 7 –“Management” and Section 21 – “Personnel”. These Sections also include information on supervision, training, technical management, job descriptions, quality personnel, and appointment of deputies for key managerial personnel.

6.4. The laboratory has the resources and authority to operate a management system that is capable of identifying departures from that system and from procedures during testing, and initiates actions to minimize or prevent departures.

6.5. Management and technical personnel have the authority and resources to carry out their duties and have procedures to identify and correct departures from the laboratory’s management system.

6.6. Personnel understand the relevance and importance of their duties as related to the maintenance of the laboratory’s management system.

6.7. Ethics and data integrity procedures (see SOP85, Section 7 – “Management” and Section 20 – “Data Integrity Investigations”) ensure personnel do not engage in activities that diminish confidence in the laboratory’s capabilities.

6.8. Confidentiality is maintained.

6.9. Conflict of Interest and Undue Pressure

6.9.1. The organizational structure indicated above minimizes the potential for conflicting or undue interests that might influence the technical judgment of analytical personnel. In addition, procedures are in place to prevent outside pressures or involvement in activities that may affect competence, impartiality, judgment, operational integrity, or the quality of the work performed at the laboratory.

6.9.2. All parties are required to act with complete integrity. If a conflict of interest issue arises, it is the responsibility of the Laboratory Director to resolve the conflict.

6.9.3. Arrangements, such as policies and procedures to prevent commercial, financial or other influences that may negatively affect the quality of the work or negatively reflect on the competence, impartiality, judgment or operational integrity are described in the Ethics and Data Integrity procedures.

6.9.4. Fremont Analytical must remain vigilant for conflicts of interest that may arise between the laboratory and clients, vendors, accrediting bodies or its own employees. If conflicts of interest are observed, they must be disclosed to upper management to allow for assessment of bias and potential impact on the laboratory. If a risk is identified, and management deems it a threat to ongoing data integrity, or other areas of concern, the risk will be minimized or eliminated. Each instance will require a case by case review of the details and a plan will be agreed upon by management.

6.9.4.1. Examples of actions that could be taken by the laboratory to eliminate or minimize risk include: changing the role of an employee to avoid ability to act on bias, enacting routine review of affected area by an unbiased party, or termination of relationship between the connected parties to eliminate impartiality.

7. MANAGEMENT (TNI V1:M2 – SECTION 4.2)

7.1. The laboratory maintains a management system that is appropriate to the scope of its activities.

7.2. Management Requirements

7.2.1. Senior management includes the President (principal), Laboratory Director, Technical Director, and the Quality Assurance Manager (QAM). Management's commitment to good professional practices and to the quality of its products is defined in the Quality Policy in Section 7.4.

7.2.2. Management has overall responsibility for laboratory operations and the authority needed to generate the required quality of laboratory operations.

7.2.3. Management ensures communication within the organization to maintain an effective management system and to communicate the importance of meeting customer, statutory, and regulatory requirements.

7.2.4. Management ensures that the system of documentation is known and available so that appropriate personnel can implement their part. When changes to the management system occur or are planned, managers ensure that the integrity of the system is maintained.

7.2.5. Management is responsible for carrying out testing activities that meet the requirements of the TNI Standard, the ISO/IEC 17025 Standard, State Accreditation authorities, and that meet the needs of the client.

7.2.6. Managers implement, maintain, and improve the management system, and identify noncompliance with the management system of procedures.

7.2.7. Managers initiate actions to prevent or minimize noncompliance.

7.2.8. Management ensures technical competence of personnel when operating equipment, performing tests, evaluating results, or signing reports and limits authority to perform laboratory functions to those appropriately trained and/or supervised. Hiring is based on education and/or years of work experience.

7.2.9. Management is responsible for defining the minimal level of education, qualifications, experience, and skills necessary for all positions in the laboratory and assuring that technical staff have demonstrated capabilities in their tasks.

7.2.10. Training is kept up to date as described in Section 21 – "Personnel" by periodic review of training records and through employee performance review.

7.2.11. Management bears specific responsibility for maintenance of the management system. This includes defining roles and responsibilities to personnel, approving documents, providing required training, providing a procedure for confidential reporting of data integrity issues, and periodically reviewing data, procedures, and documentation. The assignment of responsibilities, authorities, and interrelationships of the personnel who manage, perform, or verify work affecting the quality of environmental tests is documented in their job descriptions. Management ensures that audit findings and corrective actions are completed within required time frames.

7.2.12. Designated deputies are appointed by management during the absence of the Laboratory Director, Technical Director or the QAM. This is a requirement if the absence is more than 15 days.

7.2.13. If a member of the Senior Management team is absent for more than 35 days, the accrediting bodies will be notified in writing.

7.3. Management Roles and Responsibilities

7.3.1. Laboratory Director

The Laboratory Director is responsible for the overall quality, safety, financial, technical, human resource, and service performance of the laboratory. The Laboratory Director provides the resources necessary to implement and maintain an effective quality and data integrity program. The Laboratory Director is responsible for:

- Defining the minimal level of experience and skills necessary for all positions in the laboratory;
- Ensuring that the training of its personnel is up-to-date;
- Documenting all analytical and operational activities;
- Overseeing preparation of analytical reports;
- Acts as an approved signatory;
- Supervising all personnel;
- Ensuring that all sample acceptance criteria is verified, and that samples are labeled, stored, and properly logged into the sample tracking system;
- Reviewing an annual Management System Review from the QAM;
- Documenting the quality of data reported by the laboratory;
- Ensuring that the laboratory has the appropriate resources and facilities to perform requested work;

- Ensuring that personnel are free from any commercial, financial and other undue pressures that might adversely affect the quality of their work. Procedures that do not meet the standards set forth in the Quality Manual, laboratory SOPs or laboratory policies may be temporarily suspended by the Laboratory Director.
- Ensuring that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented.
- Ensuring that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits.
- Works with the Technical Director and QAM in the review and approval of SOPs and policies prior to their implementation and ensures all approved SOPs and policies are provided to laboratory personnel and are adhered to.
- Nominating deputies when the Technical Director or QAM is absent.
- Coordinating laboratory certifications with the QAM.
- In the event the Laboratory Director is absent from the facility, the Technical Director and/or the QAM or other designee will assume those duties.

7.3.2. Technical Director

The Technical Director supervises laboratory operations. The Technical Director’s proof of experience in the fields of accreditation may be found in the employees’ file. The Technical Director is responsible for:

- Staff Supervision (Laboratory Managers);
- Coordinating laboratory analyses;
- Overseeing data review;
- Acts as an approved signatory;
- Technical training and aptitude of the laboratory personnel, ensuring that all technical laboratory staff have demonstrated initial and ongoing proficiency in the activities for which they are responsible;
- Maintenance of Analytical Systems and other technologies utilized by the laboratory;
- Review of all testing procedures for improved performance and reduced cost;
- New Method Development and all R&D efforts;
- General Technical Assistance and troubleshooting of laboratory instrumentation;
- Reviews and approves SOPs and policies prior to their implementation and ensures all approved SOPs and policies are provided to laboratory personnel and are adhered to;
- Ensuring all analytical and operational activities are documented;
- Ensuring that the laboratory has the appropriate resources and facilities to perform requested work;
- Equipment purchases
- Certifying that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited;
- The Technical Director(s) meet the requirements specified in the Personnel Qualifications, NELAC, Accreditation Process, in Sections 4.1.7.2 and 5.2.6.1 of the TNI Standard - EL-V1M2-2016;
- When the Technical Director is absent from the facility, the QAM and/or the Laboratory Director will assume the duties of the Technical Director.

7.3.3. Quality Assurance Manager

The QAM is responsible for the oversight and review of quality control data. As shown in Appendix A, the QAM has direct access to the Laboratory Director, to resolve any dispute involving data quality. The QAM's training and proof of experience in QA/QC procedures, knowledge of analytical methods, and the laboratory's management system are available in the employees' file. The QAM is responsible for auditing the implementation of the Quality System. The QAM has sufficient authority to stop work as deemed necessary in the event of serious QA/QC issues. Specific functions and duties include:

- Providing QA technical assistance to project staff;
- Reporting on the adequacy, status, and effectiveness of the Quality System regularly to the Laboratory Director;
- Overseeing laboratory QA;
- Overseeing QA/QC documentation;
- Acts as an approved signatory;
- Implementing and reviewing laboratory corrective actions, if necessary;
- Defining appropriate laboratory QA procedures;
- Reviewing and approving QA plans and procedures;
- Maintain documentation control;
- Maintaining a current QA Manual;
- Approving the title page of the QA Manual;
- Serving as the focal point for QA/QC and being responsible for the oversight and/or Review of quality control data;
- Ensuring that corrective actions relating to findings from the audits (internal/external) are completed;
- Having documented training and/or experience in QA/QC procedures and being knowledgeable in the quality system as defined under NELAC; having a general knowledge of the analytical test methods for which data review is performed;
- Conducting internal audits without outside (e.g., managerial) influence; on the entire technical operation at a minimum annually (this may include a system audit);
- Notifying laboratory management of deficiencies in the quality system and monitoring corrective action;
- Monitoring and maintaining laboratory certifications.
- Documenting all analytical and operational activities;
- Reviews and approves SOPs and policies prior to their implementation and ensures all approved SOPs and policies are provided to laboratory personnel and are adhered to.

7.3.4. Laboratory Manager

The Laboratory Manager is expected to perform the same responsibilities as the Laboratory Analysts (see 21.2). However, the Laboratory Manager is designated to individuals who have obtained and demonstrated thorough knowledge of procedures and are capable of performing managerial duties. The responsibilities of the Laboratory Managers are:

- Oversee and manage the department to which they are assigned
- Ensure QA and QC measures are being followed by the assigned department
- Assist with technical operations
- Work with Technical Director and QAM to develop modified or new analytical methods

- Approve requests of necessary supplies for the department
- Propose equipment purchases
- Preserve and prepare samples
- Perform analyses
- Report results
- Ensure routine maintenance of equipment is performed
- Ensure laboratory data is delivered on time
- Ensure data backups are occurring on laboratory workstations
- Review analytical data
- Ensure that laboratory spaces are clean and safe
- Laboratory Managers may meet the requirements specified in the Personnel Qualifications, NELAC, Accreditation Process, in Sections 4.1.7.2 and 5.2.6.1 of the TNI Standard - EL-V1M2-2016.

7.3.5. Technical Project Manager

Project Managers are responsible for sending out project reports. They are able to perform the same responsibilities as Project Coordinators. The responsibilities of Project Managers are as follows:

- Acts as an approved signatory for project reports;
- Sends project reports;
- Generate electronic data deliverables (EDDs)
- Able to interpret results to clients;
- Interfacing with clients in a professional and friendly manner to serve as a liaison between them and the laboratory
- Maintaining records and contracts
- Managing client expectations
- Reviewing and interpreting client Sample Analysis Plans (SAP), permits, Quality Assurance Project Plans (QAPP), insurance requirements, and general project needs to ensure that we are able to successfully fulfill their requests
- Assist with company marketing
- Creating project quotes, invoices, and statements
- Accounts receivable
- Sample log in
- Creating bottle orders.

7.3.6. Client Services Manager

The Client Services Manager is expected to perform the same responsibilities as the Project Coordinator while overseeing the department. The responsibilities of the Client Services Manager are as follows:

- Interfacing with clients in a professional and friendly manner to serve as a liaison between them and the laboratory
- Maintaining records and contracts
- Managing client expectations
- Reviewing and interpreting client Sample Analysis Plans (SAP), Quality Assurance Project Plans (QAPP), permits, insurance requirements, and general project needs to ensure that we are able to and successfully fulfill their requests
- Assist with company marketing

- Creating project quotes, invoices, and statements
- Accounts receivable
- Sample log in
- Creating bottle orders.

7.3.7. Human Resources Manager

The Human Resources Manager maintains and enhances the organization's human resources by planning, implementing, and evaluating employee relations and human resources policies, programs, and practices. The responsibilities of the Human Resources Manager are as follows:

- Maintains the work structure by updating job requirements and job descriptions for all positions;
- Maintains organization of staff by establishing a recruiting, testing, and interview program;
- Prepares employees for assignments by coordinating orientation and training programs;
- Maintains a pay plan and payroll services;
- Hears and resolves employee grievances and counsels employees and supervisors;
- Maintains employee benefits program
- Ensures legal compliance by monitoring and implementing applicable human resource federal and state requirements;
- Maintains historical human resource records by designing a filing and retrieval system, keeping past and current records

7.3.8. Purchasing Manager

The Purchasing Manager obtains requirements by verifying, preparing, and forwarding purchase orders, verifying receipt of items, and authorizing payment. The responsibilities of the Purchasing Manager are as follows:

- Negotiates with vendors for goods and services;
- Establishes purchasing policies and ensures compliance;
- Verifies purchase requisitions by comparing items requested to a master list;
- Prepares purchase orders by verifying specifications and price;
- Verifies receipt of items by comparing items received to items ordered;
- Keeps information accessible by sorting and filing documents;
- Provides purchasing planning and controls information by collecting, analyzing, and summarizing data and trends

7.3.9. The following table defines who assumes the responsibilities of key personnel in their absence:

Table 2: Key Personnel Deputies	
Key Personnel	Deputy
Laboratory Director	QA Manager, Technical Director, or Principal
QA Manager	Technical Director
Technical Director	QA Manager, Laboratory Director, or Principal
Laboratory Manager	Laboratory Manager, Analyst, or Technical Director

7.4. Management Systems Quality Policy

7.4.1. The overall QA objectives for Fremont Analytical, Inc. are to develop and implement procedures for laboratory analysis, sample management, and data reporting, that will provide results of known and documented quality. The quality of data is assessed for precision, accuracy, representativeness, comparability, completeness, and detection limits based upon data quality objectives detailed in this QA/QC Program. Data quality is assessed by various means, including traceability of standards, instrument performance, spike and duplicate sample analyses, and internal and external performance audits.

7.4.2. Management's commitment to quality and to the management system is stated in the Quality Policy above, which is upheld through the application of related policies and procedures described in the laboratory's Quality Manual, SOPs and policies. The objectives of the management system and the commitment of management are to consistently provide our customers with data of known and documented quality that meets their requirements. Our policy is to use good professional practices, maintain quality, uphold the highest quality of service, and comply with the TNI Standard, DoD/ELAP and State accreditation authorities. The laboratory ensures that personnel are free from any commercial, financial, and other undue pressures, which might adversely affect the quality of work. This policy is implemented and enforced through the unequivocal commitment of management, at all levels, to the Quality Assurance principles and practices outlined in this manual. However, the primary responsibility for quality rests with each individual within the laboratory organization. Every laboratory employee must ensure that the generation and reporting of quality analytical data is a fundamental priority. Every laboratory employee is required to familiarize themselves with the quality documentation and to implement the policies and procedures in their work. All employees are trained annually on ethical principles and procedures surrounding the data that is generated. The laboratory maintains a strict policy of client confidentiality.

7.5. Ethics and Data Integrity System

The laboratory has an Ethics and Data Integrity policy that is included in SOP85. The laboratory's Ethics and Data Integrity program, training and investigations are discussed in Section 20 – "Data Integrity Investigations".

The management system is defined through the policies and procedures provided in this Quality Manual, written laboratory Standard Operating Procedures (SOPs), and policies.

7.5.1. Quality Manual

The Quality Manual contains or references required elements as defined in the TNI Standard – V1:M2, section 4.2.8.4, as well as the following required items:

- Document title;
- Laboratory's full name and address;
- Name, address (if different from above), and telephone number of individual(s) responsible for the laboratory;
- Identification of all major organizational units which are to be covered by this quality manual and the effective date of the version;
- Identification of the laboratory's approved signatories;
- The signed and dated concurrence (with appropriate names and titles), of all responsible parties including the Quality Assurance Manager, Technical Director, and the agent who is in charge of all laboratory activities, such as the Laboratory Director or Laboratory Manager;
- The objectives of the management system and contain or reference the laboratory's Policies and procedures;
- The laboratory's official quality policy statement, which shall include management system objectives and management's commitment to ethical laboratory practices and to upholding the requirements of this Standard; and
- A table of contents, and applicable lists of references, glossaries and appendices.

7.5.2. Standard Operating Procedures (SOPs)

Standard operating procedures (SOPs) represent all phases of current laboratory operations. They include an effective date, revision number, and signature of the approving authorities and are available to all personnel. They contain sufficient detail such that someone with similar qualifications could perform the procedures. There are two types of SOPs used in the laboratory: 1) test method SOPs, which have specific requirements as outlined below, and 2) general use SOPs which document general procedures. Details for writing and who approves SOP can be found in SOP56.

Each accredited analyte or method has an SOP. Sometimes an SOP is a copy of a method, and any additions are clearly described. The laboratory's test method SOPs include the following topics, where applicable.

- Identification of the method;
- Applicable matrix or matrices;
- Limits of detection and quantitation;
- Scope and application, including parameters to be analyzed;
- Summary of the method;
- Definitions;
- Interferences;
- Safety;
- Equipment and supplies;

- Reagents and standards;
- Sample collection, preservation, shipment and storage;
- Quality control;
- Calibration and standardization;
- Procedure;
- Data analysis and calculations;
- Method performance;
- Pollution prevention;
- Data assessment and acceptance criteria for quality control measures;
- Corrective actions for out-of-control data;
- Contingencies for handling out-of-control or unacceptable data;
- Waste management;
- References; and
- Any tables, diagrams, flowcharts and validation data.

7.5.3. Order of Precedence

In the event of a conflict or discrepancy between policies, the order of precedence is as follows unless otherwise noted:

1. Quality Manual
2. SOPs and Policies
3. Other (Work Instructions, memos, flow charts, etc.)

8. DOCUMENT CONTROL (TNI V1:M2 – SECTION 4.3)

8.1. This section describes how the laboratory establishes and maintains a process for document management. The purpose of document management is to preclude the use of invalid and/or obsolete documents. Procedures for document management include controlling, distributing, reviewing, and accepting modifications. A document control system is used to ensure that all staff has access to current policies and procedures at all times.

8.2. Documents can be SOPs, policy statements, specifications, calibration tables, charts, textbooks, posters, notices, memoranda, software, drawings, plans, etc. These may be on various media, whether hard copy or electronic, and they may be digital, analog, photographic or written.

8.3. The system consists of a document review, revision, approval system, document control and distribution. The laboratory manages three types of documents: 1) controlled, 2) approved, and 3) obsolete.

8.4. A controlled document is one that is uniquely identified, issued, tracked, and kept current as part of the management system. Controlled documents may be internal documents or external documents.

8.5. An approved document means it has been reviewed, and either signed and dated, or acknowledged in writing or by secure electronic means by the issuing authority(ies).

8.6. Obsolete documents are documents that have been superseded by more recent versions or are no longer needed.

8.7. Controlled Documents

8.7.1. The QAM controls all laboratory SOPs and the Quality Manual. Documents will be reviewed, revised (as appropriate), and approved by the Laboratory Director and/or Technical Director (or designee) and the QAM (or designee). Documents are reviewed annually (or as needed) to ensure their contents are suitable and in compliance with the current management systems requirements, and accurately describe current operations. The QAM, Technical Director or Laboratory Director may approve SOPs. The QAM has the authority to modify or update the Quality Assurance Manual. The Laboratory Director is responsible for final approval of all changes made to the Quality Assurance Manual. The revised document takes effect when signed and dated by the Laboratory Director.

8.7.2. Approved copies of documents are available to staff at all locations where operations are essential to the effective functions of the laboratory. SOPs are attached to the Documents and SOPs section of the Omega LIM System and are available to all employees. Only the current, un-editable SOP is available for use. All archived and editable versions of SOPs are stored within the SOPs folder on the shared drive. Access to this folder is limited to those parties that have administrative privileges. The documents are approved by the Laboratory Director or QAM, and then loaded into Omega.

8.7.3. If printed, the SOP is considered “uncontrolled.” Uncontrolled documents are not permitted for use. Controlled hard copies may be provided to individuals in the laboratory at the discretion of the QAM. The QAM maintains a distribution list for numbered and dated controlled hard copies and ensures that revisions are distributed appropriately. Outdated revisions issued to the staff are retrieved and destroyed.

8.7.4. All SOPs and the Quality Assurance Manual have electronic signatures showing the approving party. The electronic signatures are added to the document by the approving manager (QAM, Technical Director or Laboratory Director). These individuals have access to their electronic signatures and the Laboratory Director has access to all electronic signatures. The signatures may be stored in the Omega LIM system and are accessible by those parties that have administrative privileges. Secondary copies of electronic signatures are stored in a SQL Database file and can only be accessed by the President and/or Laboratory Director.

8.7.5. When an SOP is no longer valid, the SOP is marked as void or deleted in Omega. The updated SOP is then loaded into Omega. The QAM keeps a list of all SOPs and the date of revision.

8.7.6. Controlled internal documents are uniquely identified with 1) a unique name or number identification n 2) revision identification, 3) page number, 4) the total number of pages (or a mark to indicate the end of the document), and 5) the signatures of the issuing authority when applicable (i.e. management), see SOP56.

8.7.7. A master list of controlled internal documents is maintained that includes location and revision dates. The controlled document list is maintained by QAM and is updated biannually or as needed.

8.7.8. Controlled copies of the Quality Manual and other SOPs may be issued to clients upon request. Additional issuance of subsequent versions is also by request only. The QAM will maintain a list of documents that go out to clients. Each document issued to clients must have a confidentiality statement disclosing who is authorized to view it.

8.8. Document Changes to Controlled Documents

8.8.1. Document changes are approved by the original approving authority.

8.8.2. All document modifications must be approved; changes that are not process modifications but clarifications may be performed without revision, however approval is required. The modified document is then copied and distributed, and obsolete documents are removed according to the master list of controlled documents.

8.8.3. Amendments/modifications to documents are incorporated into a new revision and reissued when the document is reviewed and updated.

8.8.4. A reason for the modification or change can be provided as historical information in the revised document. See SOP53.

8.9. Obsolete Documents

8.9.1. All invalid or obsolete documents are removed from general distribution, or otherwise prevented from unintended use.

8.9.2. Obsolete documents retained for legal use or historical knowledge preservation are appropriately marked and retained. An electronic copy is stored for a minimum of 5 years.

8.9.3. Obsolete documents are identified as being obsolete by management. All copies of the obsolete document are collected from employees. Electronic copies of obsolete documents are moved to an “Archive” folder within its originating folder. All printed copies are destroyed (unless they contain records in which case, they are filed appropriately). Copies in Omega are marked void or deleted and replaced with the new document.

9. REVIEW OF REQUESTS, TENDERS, AND CONTRACTS (TNI V1:M2 – SECTION 4.4)

9.1. The review of all new work assures that oversight is provided so that requirements are clearly defined, the laboratory has adequate resources and capability, and the test method is applicable to the customer's needs. This process assures that all work will be given adequate attention without shortcuts that may compromise data quality.

9.1.1. A more detailed procedure is outlined in SOP 7.

9.2. Contracts for new work may be formal bids, signed documents, verbal, or electronic. The client’s requirements, including the methods to be used, must be clearly defined, documented and understood. Requirements might include target analyte lists, project specific reporting limits (if any), project specific quality control requirements (if any), turnaround time, and requirements for data deliverables. The review must also cover any work that will be subcontracted to another laboratory.

9.3. Procedure for the Review of Work Requests

9.3.1. The Laboratory Director, Technical Director, or designee, determine if the laboratory has the necessary accreditations, resources, including schedule, equipment, deliverables, and personnel to meet the work request.

9.3.2. Project Manager, Client Services Representation and/or the Laboratory Director obtains the client requirements which may include the following:

- Sample matrices
- Sample volume requirements
- Analytical methods
- Analyte lists
- Reporting limits
- Minimum Detection limits

- Quality Control limits
- Certification/Accreditation
- Turn-around times
- QA/QC data packages
- Final report formatting and electronic deliverable documents
- Payment terms
- Sample storage
- Sample disposal

9.3.3. This information is kept in the Omega LIM system, the FAI online server, and accounting system.

9.3.4. If there are questions or concerns about meeting the project objectives, the Project Manager and/or Laboratory Director will hold a review meeting to discuss the criteria.

9.3.5. The Laboratory Director, Laboratory Manager and/or Project Manager informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to the complete the work satisfactorily.

9.3.6. The client is informed of any deviation from the contract including the test method or sample handling processes. All differences between the request and the final contract are resolved and recorded before any work begins. It is necessary that the agreement be acceptable to both the laboratory and the client. Any modifications are recorded within Fremont Analytical, Inc.'s LIM and accounting system and distributed in the form of a quote to the client.

9.3.7. The review process is repeated when there are amendments to the original scope of work by the client. Participating personnel are given copies of the amendments. The amendments are maintained within the client's folder on the FASVR Shared drive and accounting system.

9.3.8. For routine projects and other simple tasks, a review by the Project Manager is considered adequate. The Project Manager confirms that the laboratory has any required certifications, that it can meet the client's data quality and reporting requirements, and that the lab has the capacity to meet the clients turnaround needs.

9.3.9. The Project Manager submits the bid and formal quote to the client and maintains copies of any signed agreements or contracts.

9.4. Documentation of Review

9.4.1. Records are maintained for every contract or work request, when appropriate. This includes pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract. This information is maintained in the client's folder on the FASVR Shared drive.

9.4.2. Records of all project-related communication with the client (including e-mails, faxes, telephone conversations, etc.) are maintained in the project work order, project folder in the Project Manager's email.

9.4.3. All changes to work orders are maintained in the Omega LIM system.

10. SUBCONTRACTING OF ENVIRONMENTAL TESTS (TNI V1:M2 – SECTION 4.5)

10.1. A subcontract laboratory is defined as a laboratory external to this laboratory, or at a different location than the address indicated on the front cover of this manual, that performs analyses for this laboratory.

10.2. When subcontracting analytical services, the laboratory assures the work requiring accreditation is placed with an appropriately accredited laboratory or one that meets applicable statutory and regulatory requirements for performing the tests.

10.3. The laboratory will ensure that the subcontract laboratory understands the requirements and will meet the same commitments made to the client by the primary laboratory.

10.4. Procedure

10.4.1. The Client Services Manager maintains a database of subcontractors and reference file of their accreditations. The subcontracting laboratory's certificate and analyte list are reviewed by the QAM to ensure it has the appropriate accreditation.

10.4.2. Client Services notifies the client of the intent to subcontract the work in writing and requests written approval.

10.4.3. The laboratory performing the subcontracted work is identified in the final report.

10.4.4. The laboratory assumes responsibility for all subcontracting laboratories' work, except in the case where the client or a regulating authority requested or required a specific subcontracting lab be used.

10.5. Further information regarding subcontracting of environmental tests is found in SOP 66.

11. PURCHASING SERVICES AND SUPPLIES (TNI V1:M2 – SECTION 4.6)

11.1. The laboratory ensures that purchased supplies and services that affect the quality of environmental tests are of the required or specified quality, by using approved suppliers and products. The laboratory has procedures for purchasing, receiving, and storage of supplies that affect the quality of environmental tests.

11.2. Approval of Suppliers

11.2.1. Management maintains a list of approved suppliers. Evaluation and selection of suppliers and vendors is performed, in part, on the basis of the quality of their products, their ability to meet the demand for their products, the overall quality of their services, their past history, and competitive pricing. This is achieved through the evaluation of objective evidence of quality, furnished by the supplier, which may include certificates of analysis, recommendations, and proof of historical compliance with similar programs to other clients. To ensure that quality critical consumables and equipment conform to specified requirements, all purchases from specific vendors are approved by the Technical Director.

11.2.2. Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered and that the material is of the appropriate quality. This is documented by signing off on the packing slips or other supply receipt documents. The purchasing documents contain data that adequately describes the services and supplies ordered.

11.3. Procedure

11.3.1. The Technical Director, Laboratory Director, or designee reviews and approves the supplier of services and supplies and approves technical content of purchasing documents to the Purchasing Manager prior to ordering.

11.3.2. The supplies received are inspected for breakage, leaks or any other damage. The supplies and chemicals are checked for date of manufacture, expiration date, concentration, grade, storage conditions, etc. (where applicable). Chemicals are then checked into Omega LIM System and labeled with an Omega number. The supplies received are stored according to manufacturer's recommendations, laboratory SOPs, or test method specifications.

11.3.3. Any documents received with the laboratory supplies (such as bottle ware) including specifications, certificates of analysis, warranties, maintenance records, calibration records, etc., are kept on file by the supplier. For items such as chemicals, standards, instrumentation etc. any certificates received are scanned and attached into the Omega record.

11.3.4. Purchased supplies and reagents that affect the quality of the tests are not used until they are inspected or otherwise verified as complying with requirements defined in the test method.

11.4. Purchase of New Equipment

11.4.1. The purchase of new equipment is reviewed by the Laboratory Director and the Technical Director. During this review the need for the equipment is discussed as well as budget, technical criteria and cost effectiveness is considered. Once the new equipment is approved, quotes are requested from the suppliers.

11.5. SOP 5 and SOP 6 contain further information regarding FAI's procedure for purchasing and order receipt.

12. SERVICE TO THE CLIENT (TNI V1:M2 – SECTION 4.7, 4.8)

12.1. The laboratory collaborates with clients and/or their representatives in clarifying their requests and in monitoring laboratory performance related to their work. Each request is reviewed to determine the nature of the requirements and the laboratory's ability to comply within the confines of prevailing statutes and/or regulations without risk to the confidentiality of other clients.

12.2. Client Confidentiality

12.2.1. The laboratory's confidentiality policy is not to divulge or release any information to a third party without proper authorization. Third party requests for data and information are referred to the client. Data and records identified as proprietary, privileged, or confidential are exempt from disclosure.

12.2.2. All electronic data (storage or transmissions) are kept confidential, based on technology and laboratory limitations, as required by the client or regulations.

12.2.3. Laboratory results and associated raw data are kept in confidence. Only the client may have access to the files. Access to laboratory records and LIMS data is limited to laboratory personnel except with the permission of the QAM, Technical Director, or the Laboratory Director. Records are made available to authorized accrediting authority personnel during on and off-site audits.

12.2.4. Where clients require transmission of test results by telephone, facsimile, or other electronic means, staff will ensure confidentiality is preserved.

12.3. Client Support

12.3.1. Communication with the client or their representative is maintained to provide proper instruction and modification for testing. Technical staff is available to discuss any technical questions or concerns the client may have.

12.3.2. The client or representative may be provided reasonable access to laboratory areas for witnessing testing, as long as the Laboratory Director and Laboratory Manager has been informed and has approved the request.

12.3.3. Delays or major deviations to the testing are communicated to the client immediately. The client is contacted by the Project Manager (or designee) by phone or email.

12.3.4. The laboratory will provide the client with all requested information pertaining to the analysis of their samples. An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

12.4. Client Feedback

12.4.1. The laboratory seeks both negative and positive feedback following the completion of projects and periodically for ongoing projects. Feedback provides acknowledgement, and corrective actions when necessary.

12.4.2. Clients may supply feedback via the Fremont Analytical portal (Called "Flashpoint"). Within the portal the client may select to provide feedback for one of the following sections:

- Technical
- Online Account
- Billing
- Other

12.4.3. The feedback form will automatically send an email to service@fremontanalytical.com and send an automated courtesy response to the client. This email is then distributed to the Laboratory Directory, QAM, Project Manager and Client Services Manager. For an active project, the Project Manager or Laboratory Director will coordinate the appropriate responses. For all other inquiries, the Laboratory Director (or designee) will coordinate the responses.

12.4.4. Clients may also supply feedback by sending an email directly to service@fremontanaytical.com, info@fremontanalytical.com, or to any laboratory staff.

12.5. Complaints

12.5.1. The purpose of this section is to assure that customer complaints are addressed, monitored and corrected. This includes requests to verify results or analytical data. Complaints provide the laboratory an opportunity to improve laboratory operation and client satisfaction.

12.5.2. Complaints by customers or other parties are reviewed by management so that appropriate action will be determined. All customer complaints are documented by the person receiving the complaint and addressed to the responsible manager. Negative customer feedback is documented as a customer complaint.

12.5.3. If it is determined that the complaint has merit, the procedures outlined in Section 15 – Corrective Action are utilized. If it is determined that a complaint is without merit, it is documented, and the client is contacted by the Laboratory Director. The details for handling customer complaints and feedback are in SOP63. In either case, the outcome of the complaint resolution process must be reviewed by an individual not involved in the original activities in question, and the client shall be notified of the end of the review process. Further details for handling customer complaints and feedback are in SOP63.

12.5.4. A complaint such as a concern that data is repeatedly late should be reviewed for preventive action (see Section 17 – "Preventive Action") to minimize a future occurrence.

13. CONTROL OF NON-CONFORMING ENVIRONMENTAL TESTING WORK (TNI V1:M2 – SECTION 4.9)

13.1. Non-conforming work is work that does not meet acceptance criteria or requirements. Nonconformances can include departures from standard operating procedures or test methods, or unacceptable quality control results (see Section 28 – "Quality Assurance for Environmental Testing"). Identification of non-conforming work can come through customer complaints, quality control, instrument calibration, evaluating consumable materials, staff observation, final report review, management reviews, and internal and external audits.

13.2. Exceptionally Permitting Departures from Documented Policies and Procedures

13.2.1. Requests for departures from laboratory procedures are approved by the Laboratory Director and documented. Planned departures from procedures or policies do not require audits or investigations.

13.2.2. If a client requests a departure from laboratory procedures, the laboratory does not have to consider that departure as a nonconformance that requires corrective action. However, that nonconformance must be documented as a nonconformance that was approved by management. Departures are noted on the sample check-in form or in the case narrative in Omega.

13.2.3. Below are examples of departures:

- Insufficient sample volume for a rerun;
- Holding time has already been exceeded
- Sample data is not affected by the nonconformance

13.3. Non-Conforming Work

13.3.1. Laboratory policy for control of non-conforming work is to identify the nonconformance, determine if it will be permitted, and take appropriate action. All employees are encouraged to report "stop-work" issues to any member of management when any aspect of the process does not conform to laboratory requirements, and have a member of management review the nonconformance.

13.3.2. The procedure for investigating and taking appropriate corrective actions of non-conforming work are described in Section 15 – "Corrective Actions". Section 15.7 describes procedures for Technical Corrective Actions. Formal corrective action procedures must be followed for non-conforming work that could reoccur (beyond expected random QC failures), or where there is doubt about the laboratory's compliance to its own policies and procedures.

13.3.3. The investigation and associated corrective actions of non-conforming work involving alleged violations of the company's Ethics and Data Integrity policies must follow the procedures outlined in Section 20 – "Data Integrity Investigations".

13.3.4. The laboratory evaluates the significance of the non-conforming work and takes corrective action immediately. The customer is notified if their data has been impacted. The laboratory allows the release of non-conforming data only with approval of the Laboratory Director, the QAM or their designee(s) on a case-by-case basis. Non-conforming data is clearly identified in the final report (see Section 29 – "Reporting the Results").

13.3.5. The discovery of a nonconformance for results that have already been reported to the client must be immediately evaluated for significance of the nonconformance, its acceptability to the client, and determination of the appropriate corrective action. Reports must be re-issued within 30 days of discovery.

13.3.6. Corrective action for routine, non-recurring exceedances can be documented on raw data worksheets, logbooks, e-mail, a database or other documents. More serious corrective actions (non-conforming work that could reoccur or where there is doubt that the laboratory is in compliance with its own policies and procedures) will require a more formal corrective action process that usually includes the use of a corrective action report within the Omega LIM system.

13.4. Stop Work Procedures

13.4.1. Laboratory personnel shall notify any member of Management regarding any nonconformance. Management reviews the significance of the nonconformance and immediately develops a course of action. Any member of the management team can issue a “stop work” order as long as the Laboratory Director has been notified. If data is questionable, the Laboratory Director may be involved in the review. The Laboratory Director (or designee) will also coordinate any and all communications with the client.

13.4.2. When an investigation of nonconformance indicates that the cause of the nonconformance requires that a method be restricted or not used until modifications are implemented, the Laboratory Director and/or Technical Director will immediately notify all personnel of the suspension/restriction. The lab will hold all relevant reports to clients pending review. All members of management must be involved in the resolution of the issue and must verify that the issue is resolved before work may resume. Personnel are notified by the Laboratory Director or Technical Director when resumption of work is authorized. The Laboratory Manager and QAM will document the issue, root cause, and resolution, using the corrective action procedures described in Section 15 – “Corrective Action”.

13.4.3. The reporting of non-conforming work involving alleged violations of the company’s ethics and data integrity policies must be reported to the Laboratory Director, Human Resources Manager, or designee. Procedures described in Section 20 – “Data Integrity Investigations. Resumption of work after work has been stopped for ethics and data integrity is authorized by the Laboratory Director.

14. IMPROVEMENT (TNI V1:M2 – SECTION 4.10)

14.1. Improvement in the overall effectiveness of the laboratory Management System is a result of the implementation of various aspects of the laboratory’s management system: quality policy and objectives (Section 7 – “Management”); internal auditing practices (Section 18 – “Audits”); the review and analysis of data (Section 28 – “Quality Assurance for Environmental Testing”); the corrective action, (Section 15 – “Corrective Action”) preventive action (Section 16 – “Preventive Action”) process; and the annual management review of the quality management system (Section 19 – “Management Reviews”) where the various aspects of the management/quality system are summarized, and evaluated and plans for improvement are developed.

14.2. At Fremont Analytical, Inc., additional areas are also monitored, such as on time delivery, PT performance, re-issuing reports, numbers and types of corrective actions, audit performance, complaints, control charting, and customer feedback. The monitoring of all the above parameters allows management to provide feedback to analysts in order to provide the client with the best possible data.

15. CORRECTIVE ACTION (TNI V1:M2 – SECTION 4.11)

15.1. Corrective actions are the actions taken to address occurrences of non-conformity, as well as to eliminate the causes of non-conformity in order to prevent recurrence.

15.2. Occurrences cited in external assessments, internal quality audits, data reviews, customer feedback/complaints, control of non-conforming work, or managerial reviews require corrective action.

15.3. Occurrences of nonconformance and the associated corrective actions may be documented on a Corrective Action Report form in the LIM system. Corrective actions are minimized through the development and implementation of routine internal program controls.

15.4. Corrective actions may be necessary when:

- QC data is outside acceptable precision and accuracy;
- Blanks contain contaminants above acceptable levels;
- Undesirable trends are detected in spike recoveries or relative percent difference (RPD) between duplicates;
- There are unusual changes in detection limits;
- Deficiencies are detected during internal or external audits, or from the results of performance evaluation samples;
- Inquiries concerning data quality are received from clients.
- Findings from Internal Audits
- Findings from External Audits
- Proper procedures are not followed
- Incorrect data is distributed to clients

15.5. General Procedure

15.5.1. The laboratory uses Omega to document and track corrective actions. Detailed directions for initiating corrective actions, entering the relevant details into Omega, and completing the Corrective Action Report process are contained in SOP48.

15.5.2. All lab staff members are responsible for reporting occurrences of nonconformance and initiating a Corrective Action Report (CAR) if necessary. The department manager or QAM to whom the nonconformance is reported will initiate the CAR.

15.5.3. CARs include a complete description of the nonconformance, an analysis of why the nonconformance occurred (Root Cause Analysis), a detailed plan for addressing the nonconformance (Corrective Action Required), an outline of actions taken to prevent the nonconformance from occurring again (QA Action Required), and review notes added periodically documenting the implementation of the corrective actions taken.

15.5.3.1. Complete Description of Nonconformance

This section of the CAR includes the circumstances under which the nonconformance occurred and a detailed description of the nonconformance.

15.5.3.2. Root Cause Analysis

This section of the CAR outlines the systematic deficiency or deficiencies that led to the occurrence of nonconformance and includes the results of any investigation into the relevant systems.

If the nonconformance is determined to be an anomaly rather than the result of a systematic deficiency, an investigation into the relevant systems may not be necessary.

15.5.3.3. Corrective Action Required

Appropriate corrective actions can be determined by the lab staff member who caused or identified the nonconformance, the corresponding Laboratory Manager, the QAM, the Technical Director, or the Lab Director. Appropriate corrective actions will address the nonconformance on the proper scale and at the proper level of detail as determined by the initiator of the CAR and as approved by the QAM.

15.5.3.4. QA Action Required

Appropriate QA Actions in response to CARs will address the underlying cause of the nonconformance, whether the nonconformance was determined to have been caused by a systematic deficiency or an anomaly. For an anomalous occurrence of nonconformance, appropriate QA Action may be minimal. For occurrences of nonconformance cause by a systematic deficiency, appropriate QA Action may be extensive and include the revision of SOPs, re-training of lab staff members, or the development and implementation of new standard practices.

15.5.3.5. Monitoring of Corrective Action

It is the responsibility of each Laboratory Manager to monitor the implementation of corrective actions in their department, to schedule periodic reviews of that implementation, and to document all progress within the originating CAR. The schedule of review is based on guidelines developed by the QAM designed to ensure appropriate follow-up based on the nature and severity of each corrective action required.

The laboratory’s internal auditing processes may be used for follow-up monitoring of corrective actions and their effectiveness if a serious issue or risk was identified.

15.6. Additional Audits

15.6.1. Where the identification of occurrences of nonconformance’s or departures from normal lab procedures cast doubt on the laboratory's compliance with its own policies and procedures, or on its compliance with the TNI Standard, the laboratory ensures that the appropriate areas of activity are audited in accordance with Section 18.2 – “Internal Audits” as soon as possible.

15.7. Technical Corrective Action

15.7.1. Sample data associated with a failed quality control are evaluated for the need to be reanalyzed or qualified. Unacceptable quality control results are documented, and if the evaluation requires re-analysis, the cause and solution are recorded on the corrective action form in the Omega LIM system (also see Section 13 – “Control of Nonconforming Environmental Testing Work”).

15.7.2. Analysts routinely implement corrective actions for data with unacceptable QC measures. First level correction may include re-analysis without further assessment. If the test method SOP addresses the specific actions to take, they are followed. Otherwise, corrective actions start with assessment of the cause of the problem.

15.7.3. Corrective actions for non-systematic errors or expected random failures are documented in the Omega database. Corrective actions for occurrences of nonconformance beyond expected, random QC failures, or where there is concern that the laboratory is not in compliance with its own policies and procedures, require that a CAR be completed.

15.7.4. If the data reported is affected adversely by the nonconformance, it is the responsibility of any analyst working on the data to alert the Laboratory Director and the responsibility of the Laboratory Director to identify the compromised data in the report to the client.

16. PREVENTIVE ACTION (TNI V1:M2 – SECTION 4.12)

16.1. Preventive action is a proactive process to identify opportunities for improvement, rather than a reaction to the identification of problems or complaints. Preventive action may include, but is not limited to: review of QC data to identify quality trends, regularly scheduled staff quality meetings to ensure staff is knowledgeable in quality procedures, review of client feedback to look for improvement opportunities, review of proficiency testing data to look for analytes that were nearly missed, annual managerial reviews, and scheduled instrument maintenance.

16.2. When improvement opportunities are identified or if preventive action is required, action plans are developed, implemented and monitored to reduce the likelihood of the occurrence of nonconformities. Procedures for preventive actions include the initiation of such actions and subsequent monitoring to ensure that they are effective.

16.3. All personnel have the authority to offer suggestions for improvements and to recommend preventive actions; however, Management is responsible for implementing preventive action.

17. CONTROL OF RECORDS (TNI V1:M2 – SECTION 4.13)

17.1. Records are a subset of documents, usually data recordings that include annotations (such as daily refrigerator temperatures posted to a laboratory form), lists, spreadsheets, or analyst notes on a chromatogram. Records may be on any form of media, including electronic and hard copy. Records allow for the historical reconstruction of laboratory activities related to sample-handling and analysis.

17.2. The laboratory maintains a record system appropriate to its needs, records all laboratory activities, and complies with applicable standards or regulations as required. Records of original observations and derived data are retained to establish an audit trail. Records help establish factors affecting the uncertainty of the test and enable test repeatability under conditions as close as possible to the original. Records provide the direct evidence and support for the necessary technical interpretations, judgments, and discussions concerning laboratory results. The records, particularly those that are anticipated to be used as evidentiary data, provide the historical evidence needed for later reviews and analyses. Records should be legible, identifiable, and retrievable, and protected against damage, deterioration, or loss. All records referenced in this section are retained for a minimum of five years.

17.3. Records Maintained

17.3.1. Records of all procedures to which a sample is subjected while in the possession of the laboratory are kept. The laboratory retains all original observations, calculations and derived data (with sufficient information to produce an audit trail), calibration records, personnel records, and a copy of the test report for a minimum of five years from generation of the last entry in the records.

17.3.2. Scanned documents (worksheets, bench sheets, etc.) are considered original records at Fremont Analytical. Once the record is scanned and verified, hard copies may be destroyed. Additionally, carbon copies of COCs are not considered originals and may be destroyed unless original observations are written on them, in which case they will be kept for a minimum of five years.

17.3.3. At a minimum, the following records are maintained by the laboratory to provide the information needed for historical reconstruction:

- All raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' worksheets and data output records (chromatograms and other instrument response readout records);
- A written description or reference to the specific method(s) used, which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value (a copy of all pertinent Standard Operating Procedures);
- Laboratory sample ID code;
- Date of analysis;
- Time of analysis is required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., extractions and incubations);
- Instrumentation identification and instrument operating conditions/parameters (or reference to such data);
- All manual calculations (including manual integrations);
- Analyst's or operator's initials/signature or electronic identification;
- Sample preparation including cleanup, separation protocols, incubation periods or subculture, ID codes, volumes, weights, instrument printouts, meter readings, calculations, and, reagents;
- Test results (including a copy of the final report);
- Standard and reagent origin, receipt, preparation, and use;
- Calibration criteria, frequency and acceptance criteria;
- Data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;
- Quality control protocols and assessment;
- Electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries;
- Method performance criteria including expected quality control requirements;
- Proficiency test results;
- Records of demonstration of capability for each analyst;
- A record of names, initials, and signatures for all individuals who are responsible for signing or initialing any laboratory record;
- Correspondence relating to laboratory activities for a specific project;
- Corrective action reports;
- Preventive action records;
- Copies of internal and external audits including audit responses;
- Copies of all current and historical laboratory SOPs, policies and Quality Manuals;
- Sample receiving records (including information on any inter-laboratory transfers);
- Sample storage records;
- Data review and verification records;
- Personnel qualification, experience and training records;
- Archive records; and
- Management reviews.

17.3.4. Precautions are taken during the reduction and storage of data to prevent introducing errors and losing or misinterpreting data. GC/MS, GC, ICP, and most General Chemistry data are retained on hard copy and in electronic media. Laboratory notebooks, bench records, and standardized forms are also used to retain data. All hard-copy data and electronic media are retained on-site.

17.3.5. If corrections are made to records such as Chains of Custody, technical records, quality records, etc., the individual making the correction must strike through the error with a single line, initial, date, and if not self-explanatory, include a justification for the change.

17.3.6. Laboratory records include the following:

17.3.6.1. Standard Operating Procedures - Any revisions to laboratory procedures are written, dated, and distributed to all appropriate individuals to ensure implementation of changes.

17.3.6.2. Equipment Maintenance Documentation - Documents detailing the receipt and specification of analytical equipment is retained. A history of the maintenance record of each system serves as an indication of the adequacy of maintenance schedules and parts inventory. As appropriate, the maintenance guidelines of the equipment manufacturer are followed. When maintenance is necessary, it is documented on a standard form in LIMS.

17.3.6.3. Calibration Records & Traceability of Standards/Reagents -- The frequency, conditions, standards, and records reflecting the calibration history of a measurement system are recorded.

17.3.6.4. Sample Management -- A record of all procedures to which a sample is subjected while in the possession of the laboratory is maintained. These include records pertaining to:

- Sample preservation including appropriateness of sample container and compliance with holding time requirement;
- Sample identification, receipt, acceptance or rejection and log-in;
- Sample storage and tracking including shipping receipts, transmittal forms, and internal routing and assignment records; and
- Disposal of hazardous samples including the date of sample or sub-sample disposal and name of the responsible person.

17.3.6.5. Original Data -- The raw data and calculated results for all samples are maintained in laboratory notebooks, logs, bench-sheets, files, or other sample tracking or data entry forms. Instrumental output is stored in a computer file or a hard copy report. These records include:

- Laboratory sample ID code;
- Date of analysis;
- Instrumentation identification and instrument operating conditions/parameters;
- Analysis types and sample preparation information, including sample aliquots processed, cleanup, and separation protocols;
- All manual, automated, or statistical calculations;
- Confirmatory analysis data, when required to be performed;
- Review history of sample data; and
- Analyst's or operator's initials/signature.

17.3.6.6. QC Data -- The raw data and calculated results for all QC samples and standards are maintained in the manner described in the preceding paragraph. Documentation allows correlation of sample results with associated QC data. Documentation also includes the source and lot numbers of standards for traceability. QC samples include, but are not limited to control samples, Method Blanks, Matrix Spikes, and Matrix Spike Duplicates.

17.3.6.7. Correspondence -- Correspondence pertinent to a project is kept and placed in the project files.

17.3.6.8. Deviations -- All deviations from SOPs are reviewed and approved by the QA Manager or Technical Director.

17.3.6.9. Final Report -- A copy of any report issued and any supporting documentation is stored for a period of 5 years.

17.3.6.10. Administrative Records -- The following are maintained:

- Personnel qualifications, experience and training records;
- Initial and continuing demonstration of proficiency for each analyst; and
- A log of names, initials, and signatures for all individuals who are responsible for signing or initialing any laboratory records.

17.4. Records Management and Storage

17.4.1. The laboratory maintains a record management system for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage, and reporting. Fremont Analytical, Inc. uses a Laboratory Information Management System (LIMS) for record management. Hand written data is recorded immediately and legibly in permanent ink; data generated by automated data collections systems is recorded electronically. Corrections are initialed and dated with the reason noted for corrections other than transcription errors. A single line strikeout is used to make corrections so that the original record is not obliterated. Backups and data storage are covered in SOP1 and SOP3.

17.4.2. Records, including electronic records, are easy to retrieve, legible, and protected from deterioration or damage; held secure and in confidence; and are available to accrediting bodies for a minimum of five years or as required by regulation or contract. Records that are stored only on electronic media are supported by the hardware and software necessary for their retrieval. Access to protected records is limited to laboratory management or their designees to prevent unauthorized access or amendment.

17.4.2.1. To ensure that documents remain free from damage, FAI will scan most hard copy records and will consider those scans as original records.

17.4.3. Additional information regarding control of data is included in Section 23.5 – “Control of Data”.

17.4.4. Procedures for identification, collection, indexing, access, filing, storage, maintenance, and disposal of quality and technical records are found in SOP1. Quality records shall include reports from internal audits and management reviews as well as records of corrective and preventive actions. The final Omega report is the primary record for analytical results.

17.4.5. Archived information and access logs are protected against fire, theft, loss, environmental deterioration, vermin, and in the case of electronic records, electronic or magnetic sources. Archived records have limited access.

17.4.6. In the event of a change of ownership, mergers, or closures of the laboratory, in accordance with section 4.1.8 of the current NELAC Standards, and sections III-15 and IV-8.2 of the Manual for the Certification of Laboratories Analyzing Drinking Water, records shall be maintained and stored in good condition in an easily accessible location for a minimum of five years; a minimum of six years is required for records for on-site laboratory assessments and certification program reviews by the individual states. Clients will be given written notice to request that their records be transmitted to them. If a transfer of data to the client occurs, the client will need to assure the laboratory that regulatory agencies have access to the records for the remaining required period of time so that appropriate regulatory and state legal requirements concerning laboratory records are followed.

17.5. Legal Chain of Custody Records

17.5.1. Evidentiary sample data is used as legal evidence. Fremont does not handle evidentiary samples. For all other samples, the Chain of Custody is the documented history of any sample. It begins at the project site with the sampling personnel and continues on with the sample through transport to the laboratory where it is received, stored, analyzed, and archived under the custody of the laboratory. Chain of custody records, both hard copy and computer stored, are used to establish an intact, continuous record of the physical possession, storage and disposal of sample containers, collected samples, sample aliquots, and sample extracts or digestates. The COC records account for all time periods associated with the samples. The COC records identify individuals who physically handle the samples from the field to the laboratory. The COC forms remain with the samples during transport or shipment. When shipping containers and/or individual sample containers are submitted with or without sample custody seals, and any seals are not intact, it is recorded in the LIM system. The original COC is retained in the project file and in Omega. The scanned version of the COC is returned to the client with the final report. Fremont Analytical views all COCs as legal documents.

17.5.2. It is necessary to have an accurate written record to trace the possession and handling of samples from collection through reporting.

17.5.3. A sample is in someone's "custody" if:

- It is in one's actual physical possession;
- It is in view, after being in one's physical possession;
- It is in one's physical possession and then locked up so that no one can tamper with it; or
- It is kept in a secured area, restricted to authorized personnel only.

18. AUDITS (TNI V1:M2 – SECTION 4.14)

18.1. Audits measure laboratory performance and verify compliance with accreditation/certification and project requirements. Audits specifically provide management with an ongoing assessment of the management system. They are also instrumental in identifying areas where improvement in the management/quality system will increase the reliability of data. Audits are of four main types: internal, external, performance, and system. Section 18.6 discusses the handling of audit findings.

18.2. Internal Audits

18.2.1. At a minimum annually, the laboratory prepares a schedule of internal audits to be performed during the year. These audits verify compliance within the departments regarding the requirements of the management/quality system, including analytical methods, SOPs, the Quality Manual, ethics policies, data integrity, other laboratory policies, the TNI Standard, and the DoD QSM.

18.2.2. It is the responsibility of the QAM to plan and organize audits as required by the schedule and as requested by management. Deficiencies and the corrective action are documented. These audits are carried out by trained and qualified personnel who are, wherever resources permit, independent of the activity to be audited.

18.2.3. The auditor should not be the person responsible for the work being audited or be the supervisor of the person responsible for the work. The auditor should have the necessary qualifications to review the area being audited and use a checklist approved by the QAM. At minimum, auditors should have the same training as Project Managers (SOP59).

18.2.4. The following methods are employed routinely:

- Quality control charts are employed by all applicable analytical sections of the laboratory. QC charts are made for most quality control samples including LCS, surrogate spike recoveries, matrix spikes and matrix spike duplicates (including RPD), and sample/sample duplicate RPD. QC charts are used to monitor laboratory performance, analyze trends, detect out of control situations, explain anomalous results and prepare specialized QA/QC packages upon request by laboratory management or clients.
- Single and/or double blind performance evaluation samples are used to monitor analytical system performance with or without the knowledge of the analyst. The samples for these audits are either purchased from a commercial supplier or prepared in-house by the department manager or QA staff.
- Laboratory logbooks (i.e., instrument logs, maintenance logs, standards logs, etc.) are reviewed for completeness of entries, adherence to preventive maintenance schedules, proper standards preparation and record keeping, and adherence to established laboratory SOPs.
- All audit activity results, external and internal, are used to identify areas where additional training is needed, clarification of procedures is required, and to assess performance of the entire analytical system

18.2.5. The proposed internal audit schedule for Fremont will be:

- First Quarter: Management Systems, QA, Purchasing, Sample Receiving, Reporting and General Client Services, Equipment Calibration, PMoist
- Second Quarter: Wet Chemistry (Anions, TOC, Solids, CN Cr6, pH, Turbidity, Ferrous Iron, Residual Chlorine, Conductivity/Salinity, COD)
- Third Quarter: VOC, Gasoline, VPH, Air, Metals, Grainsize, Bio (BOD, Coliforms), Organic Matter, Bulk Density
- Fourth Quarter: Semi VOC, Diesel, Glycols, EPH, PCBs, Pesticides, 1664, Herbicides, Flashpoint

18.2.6. Analytical methods will also have their corresponding preparation methods audited.

18.2.7. In addition to the scheduled internal audits, it may sometimes be necessary to conduct special audits as a follow-up to corrective actions, PT results, complaints, regulatory audits or alleged data integrity issues. These audits address specific issues.

18.2.8. The area audited, the audit findings, and corrective actions are recorded. Audits are reviewed after completion to assure that corrective actions were implemented and effective.

18.2.9. The schedule proposed in Section 18.2.5 is created, based on guidelines developed by the QAM, for reviewing the implementation of corrective actions and documenting each periodic review. The relevant department manager may be responsible for creating and adhering to the schedule of review, as well as for documenting the progress/success of the corrective action.

18.2.9.1. For analyses which only have NELAP and WADOE accreditation, if the technology has been internally audited for an analysis in a given year, other tests utilizing that technology may not need to be internally audited that year.

18.2.9.1.1. The schedule determined by the QAM may reflect this in a rotation.

18.2.9.1.2. All DoD accredited analyses and procedures will be internally audited annually.

18.3. External Audits

18.3.1. It is the laboratory's policy to cooperate and assist with all external audits, whether performed by clients or an accrediting body. Management ensures that all areas of the laboratory are accessible to auditors as applicable and that appropriate personnel are available to assist in conducting the audit.

18.3.2. Confidential Business Information (CBI) Considerations

18.3.2.1. During on-site audits, auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as "a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment." When information is claimed as business confidential, the laboratory must place on (or attach to) the information at the time it is submitted to the auditor, a cover sheet, a stamped or typed legend, or other suitable form of notice, employing language such as "trade secret", "proprietary" or "company confidential". Confidential portions of documents otherwise non-confidential must be clearly identified. CBI may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. However, sample identifiers may not be obscured from the information.

18.4. Performance Audits

18.4.1. Performance audits may be Proficiency Test Samples, internal single-blind samples, double-blind samples through a provider of client, LOD/LOQ Verifications, or anything that tests the performance of the analyst and method.

18.4.2. Proficiency Test Samples are discussed in Section 28 – "Quality Assurance for Environmental Testing".

18.5. System Audits

18.5.1. The Laboratory's management system is audited though annual management reviews. Refer to Section 19 – "Management Reviews" for further discussion of management reviews.

18.6. Handling Audit Findings

18.6.1. Internal or external audit findings are responded to within the time frame agreed to at the time of the audit. The response may include action plans that could not be completed within the response time frame. A completion date is established by management for each action item and included in the response.

18.6.2. The responsibility for developing and implementing corrective actions to findings is the responsibility of the Laboratory Manager and QAM. Corrective actions are documented through the corrective action process described in Section 15 – "Corrective Actions".

18.6.3. Audit findings that cast doubt on the effectiveness of the laboratory operation to produce data of known and documented quality or that question the correctness or validity of sample results must be investigated. Corrective action procedures described in Section 15 – "Corrective Action" must be followed. Clients must be notified in writing if the investigation shows the laboratory results have been negatively affected and the clients' requirements have not been met. The client must be notified by the Laboratory Director (or designee) within 48 hours after a finding has been made. Laboratory management will ensure that this notification is done within the specified time frame.

18.6.4. All investigations that result in findings of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients. See Section 20 – "Data Integrity Investigation" for additional procedures for handling inappropriate activity.

19. MANAGEMENT REVIEWS (TNI V1:M2 – SECTION 4.15)

19.1. Top management reviews the management system on an annual basis and maintains records of review findings and actions.

19.2. Management Review Topics

19.2.1. At least once per year, typically during the first quarter of the year, laboratory management conducts a review of the quality system and environmental testing activities to ensure its continuing suitability and effectiveness, and to introduce any necessary changes or improvements. The review takes account of:

a) changes in internal and external issues that are relevant to the laboratory
b) fulfilment of objectives
c) suitability of policies and procedures
d) status of actions from previous management reviews
e) outcome of recent internal audits
f) corrective actions
g) assessments by external bodies
h) changes in the volume and type of the work or in the range of laboratory activities
i) customer and personnel feedback
j) complaints
k) effectiveness of any implemented improvements
l) adequacy of resources
m) results of risk identification
n) outcomes of the assurance of the validity of results
o) other relevant factors, such as monitoring activities and training

19.2.2. The outcome of the review is a written discussion of:

a) the effectiveness of the management system and its processes
b) improvement of the laboratory activities related to the fulfilment of the requirements of this
c) document
d) provision of required resources
e) any need for change

19.2.3. A meeting may be held to discuss the written reviews. Findings and follow-up actions from management reviews are recorded. Management will determine appropriate completion dates for action items and ensure they are completed within the agreed upon time frame.

19.2.4. This is a separate review from the internal audit discussed in section 18.1 and shall be completed by laboratory managerial personnel. However, internal audits and management reviews may be conducted in conjunction with each other.

19.2.5. Findings from management reviews and the actions that arise from them shall be recorded. The management shall ensure that those actions are carried out within an appropriate timescale.

20. DATA INTEGRITY INVESTIGATIONS (TNI V1:M2 – SECTION 4.16)

20.1. Fremont Analytical is committed to ensuring the integrity of its data and providing valid data of known and documented quality to its clients. The elements in Fremont Analytical Ethics and Data Integrity program include:

- Documented data integrity procedures signed and dated by top management.
- An Ethics and Data Integrity Policy signed by all management and staff annually – during the annual data integrity training, or at time of employment. (See SOP 85).
- Annual data integrity training.
- Procedures for confidential reporting of alleged data integrity issues.
- An audit program that monitors data integrity (see Section 18 – “Audits”) and procedures for handling data integrity investigations and client notifications.

20.2. The Fremont Analytical Code of Ethics is signed annually by the Laboratory Director, Technical Director, and Quality Assurance Manager. It states:

- Fremont Analytical, Inc. through its management identified below is committed to ensuring the integrity of its data and meeting the quality needs of its clients. Fremont Analytical, Inc. pledges to manage its business according to the following principles:
    - To produce results that are technically sound and legally defensible;
    - To present services in a confidential, honest, and forthright manner;
    - To have a clear understanding with the client as to the extent and kind of services to be rendered;
    - To provide employees with guidelines and an understanding of the ethical and quality standards required in this industry;
    - To operate facilities in a manner that protects the environment and the health and safety of employees and the public;
    - To obey all pertinent federal, state, and local laws and regulations;
    - To continually improve product and service quality;
    - To treat employees equitably, acknowledge their scientific contributions, and provide them with opportunities for professional growth and development; and
    - To deal openly, honestly, and fairly in all business and financial matters with employees, clients and the public.

20.3. Ethics and Data Integrity Procedures

20.3.1. The Ethics and Data Integrity Policy provides an overview of the program. Written procedures that are considered part of the Ethics and Data Integrity program include:

- Ethics and Data Integrity Policy (see SOP85)
- Manual integration procedures (SOP85 & SOP52)
- Corrective action procedures (SOP48)
- Procedures for Data Integrity Investigations (Section 20.5)
- Data recall procedures (SOP1)
- Data Integrity training procedures (SOP85)

20.3.2. Management reviews data integrity procedures annually and updates these procedures as needed. The Ethics and Data Integrity Policy Training is SOP85. It includes an example of the form for signatures of the lab personal.

20.3.3. Data integrity training is provided as a formal part of new employee orientation and a refresher is given annually for all employees.

20.3.4. Employees are required to understand that any infractions of the laboratory data integrity procedures shall result in a detailed investigation that could lead to very serious consequences including immediate termination, debarment or civil/criminal prosecution. This is discussed in the Ethics and Data Integrity Policy that every employee is required to sign annually. Attendance for required training is monitored through a signature attendance sheet.

20.3.5. Data integrity training emphasizes the importance of proper written narration on the part of the analyst with respect to those cases where analytical data may be useful, but are in one sense or another partially deficient. The following topics and activities are covered:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting;
- How and when to report data integrity issues;
- Record keeping;
- Training, including discussion regarding all data integrity procedures;
- Data integrity training documentation;
- In-depth data monitoring and data integrity procedure documentation; and
- Specific examples of breaches of ethical behavior such as improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards.

20.3.6. It is the responsibility of each department manager to ensure that each member of his/her staff is trained appropriately, and to document all training and maintain all training records. The training records are maintained by the QAM.

20.3.7. When contracted technical or support personnel are used, the Technical Director or Laboratory Director is responsible for ensuring that they are trained to the laboratory’s management system and data integrity procedures, competent to perform the assigned tasks, and appropriately supervised.

20.3.8. Topics covered are provided in writing to all trainees.

- The organizational mission and its relationship to the need for honesty and full disclosure in all analytical reporting;
- How and when to report data integrity issues;
- Recordkeeping;
- Discussion regarding all data integrity procedures;
- Data integrity training documentation;
- In-depth data monitoring;
- Data integrity procedure documentation;
- Improper data manipulations;
- Adjustments of instrument time clocks;
- Inappropriate changes in concentrations of standards;
- The importance of proper written narration on the part of the analyst with respect to those cases where analytical data may be useful, but are in one sense or another partially deficient;
- Written ethics agreements (not all labs can legally sign a written ethics agreement so the commitment is made by attendance at training sessions);
- Examples of improper practices;
- Examples of improper chromatographic manipulations;
- Requirements for external ethics program training;

- Any external resources available to employees; and
- Consequences for data integrity infractions.
- Computer awareness security training

20.4. Confidential Reporting of Ethics and Data Integrity Issues

20.4.1. The Laboratory Director or Human Resources Manager is the point of contact for assisting employees with questions on ethics related matters and for reporting observations of suspected unethical behavior or business conduct. All inquiries will be acted upon in a prompt manner.

20.4.2. Employees are responsible for reporting ethics violations to the Laboratory Director or Human Resources. Matters of ethical concern that are brought to attention will be kept confidential to the maximum extent possible. The Laboratory Director may consult with management concerning resolution of ethical concerns.

20.5. Investigations

20.5.1. All investigations resulting from data integrity issues are conducted confidentially. They are documented and notifications are made to clients who received any negatively affected data that did not meet the client's data quality requirements.

20.5.2. The laboratory, as part of the overall internal auditing program, ensures that a review is conducted with respect to any evidence of inappropriate actions or vulnerabilities related to data integrity. Discovery of potential issues are handled in a confidential manner until such time as a follow up evaluation, full investigation, or other appropriate actions have been completed and the issues clarified. All investigations that result in finding of inappropriate activity will be documented and will include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients. All documentation of these investigation and actions taken will be maintained for at least five years

21. PERSONNEL (TNI V1:M2 – SECTION 5.2)

Fremont Analytical employs competent personnel based on education, training, experience and demonstrated skills as required. The laboratory's organization chart can be found in Appendix A.

21.1. Overview

21.1.1. All personnel are responsible for complying with all quality and data integrity policies and procedures that are relevant to their area of responsibility.

21.1.2. All personnel who are involved in activities related to sample analysis, evaluation of results or who sign test reports, must demonstrate competence in their area of responsibility. Appropriate supervision is given to any personnel in training and the trainer is accountable for the quality of the trainees work. Personnel are qualified to perform the tasks they are responsible for based on education, training, experience and demonstrated skills as required for their area of responsibility.

21.1.3. The laboratory provides goals with respect to education, training and skills of laboratory staff. These goals are outlined in the job description. Training needs are identified at the time of employment and when personnel are moved to a new position or new responsibilities are added to their job responsibilities. Ongoing training, as needed, is also provided to personnel in their current jobs. The effectiveness of the training must be evaluated before the training is considered complete.

21.1.4. Contracted personnel, when used, must meet the same competency standards and follow the same policies and procedures that laboratory employees must meet.

21.2. Job Descriptions

21.2.1. Job descriptions are available for all positions that manage, perform, or verify work affecting data quality. Job descriptions are kept and managed by the Human Resources Manager.

21.2.2. Job descriptions include the specific tasks, minimum education and qualifications, skills, and experience required for each position. An overview of top management's responsibilities is included in Section 7 – "Management".

21.2.3. Laboratory Analyst

- Technical operations
- Developing modified or new analytical methods
- Order requests of supplies for the laboratory
- Proposing equipment purchases
- Sample preservation and preparation
- Performing the analyses
- Reporting the results
- Routine maintenance of equipment

21.2.4. Laboratory Technician II

- Sample preparation and extraction
- Technical operations
- Routine maintenance of equipment
- Assists Laboratory Technician I and Analysts

21.2.5. Laboratory Technician I

- Sample receipt
- Sample preservation and initial preparation
- Technical operations
- Routine maintenance and calibration of support equipment
- Assists Laboratory Technician II and Analysts

21.2.6. Project Coordinator

- Interfacing with clients in a professional and friendly manner to serve as a liaison between them and the laboratory
- Maintaining records and contracts
- Managing client expectations
- Working with Project Managers and Clients to communicate and understand special client requirements
- Creating project quotes, invoices, and statements
- Sample log in
- Creating bottle orders.
- Accounts Receivable

21.3. Training

21.3.1. All personnel are appropriately trained and competent in their assigned tasks before they contribute to functions that can affect data quality. It is management's responsibility to assure personnel are trained. Training records are used to document management's approval of personnel competency. The date on which authorization and/or competence is confirmed is included. Training records are maintained by the QAM and the Human Resources Manager and include records of both onsite and offsite training. See SOP59 for the forms and complete procedure.

21.3.2. Training for New Staff

21.3.2.1. All new staff members are given introductory training and orientation upon arrival. The training may be documented on a training sheet that outlines what will be covered during the training. The new employee receives Data Integrity training and must sign-off on the Ethics and Data Integrity Policy. The reading of QA manual, the Lab Safety handbook and the Fremont Analytical Employee Manual is required. After completion of the general training, the new staff member is required to follow the SOP59 for analyst training.

21.3.2.2. The normal training for sample preparation or analyses is comprised of three steps:

- First, the trainee is required to read and understand the method and its SOP, all applicable safety data sheets (SDS).
- Second, the trainee observes the method or procedure in use.
- Third, the trainee performs the method or procedure under close observation by a certified analyst.

21.3.2.3. Once these steps are complete, the trainee must then perform the steps outlined in SOP59.

21.3.2.4. After successful completion of this process, the trainee is certified to perform the method or procedure on client samples. This process may vary due to method or procedure requirements, but is followed as closely as possible by all laboratory departments.

21.3.3. Ongoing Training

21.3.3.1. Staff members are given the following ongoing training:

- The employee attests, through signature, that they have read, understood, and agree to perform the latest version of the Quality Manual and any SOPs or policies they are responsible for following.
- Annually, analysts, laboratory technicians, and technical managers show continued proficiency in each method they perform by completing Continued Demonstration of Capability (CDC) analyses (can be in the form of acceptable PT results).
- Attending training related to job function as applicable.

21.3.3.2. The QAM maintains training documentation in the employees training file.

22. ACCOMODATIONS AND ENVIRONMENTAL CONDITIONS (TNI V1:M2 – SECTION 5.3)

22.1. Environmental

22.1.1. The laboratory facility is designed and organized to facilitate testing of environmental samples. Environmental conditions are monitored to ensure that conditions do not invalidate results or adversely affect the required quality of any measurement. Such environmental conditions include a separate extraction room with a positive airflow and a separate room for metals analysis. For VOC analysis of a blank sample is continually checked for solvent contamination. Analyses could be stopped if the blank was found to be contaminated. Work would continue after the issues are resolved.

22.2. Work Areas

22.2.1. Testing occurs only within the laboratory. Laboratory space is maintained and monitored to the specifications required for laboratory space and the testing performed. Electronic balances are located away from drafts and doorways in areas where their use is not affected by vibrations. Biological work areas are sterilized between uses. Neighboring test areas of incompatible activities are effectively separated. Specific work areas are defined and access is controlled (only authorized laboratory personnel and escorted visitors may enter the work area). Good housekeeping measures are employed to avoid the possibility of contamination. Smoking, eating, and drinking is prohibited in lab space.

22.2.2. Access to, and use of, areas affecting the quality of the environmental tests is controlled by restriction of areas to authorized personnel only.

22.2.3. The laboratory work spaces are adequate for their use, and appropriately clean to support environmental testing and ensure an unencumbered work area. Work areas include:

- Entries to the laboratory
- Sample receipt area
- Sample storage area
- Sample preparation area
- Laboratory analysis area
- Chemical and waste storage area
- Data handling

22.2.4. The laboratory procedure for good housekeeping includes such measures as:

- Janitorial service either internal or contracted
- Periodic dedicated clean-up days
- Each employee is responsible for straightening up their work area at the end of the day

22.2.5. A floor plan can be found in Appendix B

22.3. Building Security

22.3.1. The laboratory is kept secure during off hours with an alarm. Visitors must be accompanied by laboratory personnel when in secure areas and must sign in before entering any functional area of the laboratory. Signs are used to designate secure areas.

23. ENVIRONMENTAL METHODS AND METHOD VALIDATION (TNI V1:M2 – SECTION 5.4 AND SECTIONS 1.4, 1.5 AND 1.6 OF TECHNICAL MODULES TNI V1:M 3-7)

23.1. Methods and/or procedures are available for all activities associated with the analysis of the sample including preparation and testing. For purposes of this Section, "method" refers to both the sample preparation and determinative methods. The methods used and their SOPs can be found in Appendix C.

23.2. Before being put into use, a test method is confirmed by a demonstration of capability or method validation process (Appendix E).

23.3. All methods are published or documented. Deviations from the methods are allowed only if the deviation is documented, technically justified, authorized by management and accepted by the client (when applicable).

23.4. Method Selection

23.4.1. A reference method is a method issued by an organization generally recognized as competent to do so (When ISO refers to a standard method, that term is equivalent to reference method). When a laboratory is required to analyze a parameter by a specified method due to a regulatory requirement, the parameter/method combination is recognized as a reference method.

23.4.2. The laboratory will use methods that meet the needs of the client. Such methods will be based on the latest edition of the method, unless it does not meet the needs of the client. When the regulatory authority mandates or promulgates methods for a specific purpose, only those methods will be used.

23.4.3. If a method proposed by a client is considered to be inappropriate or out-of-date, the client is informed and the issue resolved before proceeding with analysis of any samples (see Section 9 – Review of Requests, Tenders and Contracts).

23.4.4. If a method is not specified by the client, an appropriate method will be selected using the process outlined below. The client will be informed of the selected method and must approve its use before being used to report data.

- If the data are to be submitted to a regulatory authority, the method(s) specified by the regulatory authority will be used.
- For drinking water compliance a method will be selected from those specified in 40 CFR Part 141, or the applicable state regulations.
- For NPDES permits, the method will be selected from those specified in 40 CFR Part 136.

23.4.5. If the end use of the data is not regulatory or if the regulatory authority does not specify a method, the laboratory will determine the client needs in terms of reporting level (e.g., LOD, LOQ), bias (e.g., screening versus quantitative) and the laboratory capabilities and capacity. Based on these criteria, the laboratory will select an appropriate method based on the following hierarchy:

- Resources from published regional, national or international standards
- Methods published by technical organizations such as ASTM, Standard Methods or AOAC
- Methods developed by the instrument manufacturer

23.4.6. If the client has given the laboratory approval to analyze samples by an unaccredited method, the laboratory will document client approval on the final report.

23.5. Laboratory – Developed Methods

23.5.1. Fremont Analytical, Inc. will perform its services using analytical methodologies with published test methods which are standard of the industry. Should deviations be necessary, they will be from other recognized and appropriate methodologies unless circumstances require less traditional analytical practices. In such cases, these non-traditional methods will be complementary of standard scientific procedures and good laboratory practices.

23.6. Method Validation

23.6.1. Validation is the confirmation, by examination and objective evidence, that the particular requirements for a specific intended use are fulfilled.

23.6.2. At a minimum, reference methods are validated by performing an initial demonstration of capability. Additional requirements are discussed for each technology.

23.6.3. All methods that are not reference methods are validated before use. The validation is designed so that the laboratory can demonstrate that the method is appropriate for its intended use. All records (e.g., planning, method procedure, raw data and data analysis) shall be retained while the method is in use. Based on the validation process, the laboratory will make a statement in the SOP for the method of the intended use requirements and whether or not the validated method meets the use requirements.

23.6.4. Method Validation and Demonstration of Capability procedures can be found in:

- Appendix E – Chemistry

23.7. Control of Data

23.7.1. To ensure that data are protected from inadvertent changes or unintentional destruction, the laboratory uses procedures to check calculations and data transfers (both manual and automated).

23.7.2. Computer and Electronic Data Requirements

23.7.2.1. The laboratory assures that computers, user-developed computer software, automated equipment, or microprocessors used for the acquisition, processing, recording, reporting, storage, or retrieval of environmental test data are:

- Documented in sufficient detail and validated as being adequate for use;
- Protected for integrity and confidentiality of data entry or collection, data storage, data transmission and data processing;
- Maintained to ensure proper functioning and are provided with the environmental and operating conditions necessary to maintain the integrity of environmental test data;
- Held secure including the prevention of unauthorized access to, and the unauthorized amendment of, computer records. Data archive security is addressed in Section 17 – “Control of Records” and building security is addressed in Section 22 – “Accommodations and Environmental Conditions”.

23.7.2.2. The laboratory controls access to all programs that are used to acquire, process, record or report data. All computers are password-protected. Each employee is granted access only to those programs that he or she uses. The password is unique to the individual, and cannot be shared. Omega LIM system passwords are required to be updated at a minimum annually, or more frequently as needed.

23.7.2.2.1. Analytical lab computers will have a common user ID and password to prevent instrumentation errors. Lab computers will have limited access to shared folders on the network.

23.7.2.3. The laboratory utilizes the Omega LIM system to calculate final results from the raw data. Prior to implementing new calculations into Omega, the laboratory shall validate the underlying calculations by doing a hand calculation of the data.

23.7.2.4. The laboratory uses spreadsheets to reduce raw data to final results for many of the Wet Chemistry department tests. To ensure that the worksheet formulae are correct, the laboratory tests each set of cells used for input of the data as well all cells used for calculations by comparing the results of the spreadsheet with manually calculated data. All calculation cells are locked to prevent formulas from changing.

23.7.2.5. Periodically, but at least annually, at least 5% of the calculated results are verified by comparing the spreadsheet result with the manually calculated value.

23.7.2.6. If any changes are made to the spreadsheet program, the laboratory revalidates the calculations before reporting results.

23.7.2.7. In addition, the algorithms and all spreadsheet calculations or other programs that are used to reduce raw data to a reported value will be verified upon first use and annually thereafter to ensure that the process produces accurate results.

23.7.2.8. Data from all electronic media are backed up daily to ensure that data are not lost. The backed up copies are stored on the server.

23.7.2.9. Any change in software that occurs that affects electronic data must be documented. If the change affects client electronic data, clients must be notified by the change.

23.7.3. Data Reduction: Manual Calculations

23.7.3.1. As a part of the management system, the laboratory ensures that all manual calculations are checked by another individual. In addition, all data transfers (data entry, transcribing raw or calculated data, etc.) will be checked for accuracy.

23.7.3.2. The analyst calculates final results from raw data or appropriate computer programs provide the results in a reportable format. The test methods provide required concentration units, calculation formulas and any other information required to obtain final analytical results.

23.7.3.3. The laboratory has manual integration procedures that must be followed when integrating peaks during data reduction: SOP52.

23.7.3.4. The laboratory's procedures for use of significant figures may be found in SOP55.

23.7.3.5. All raw data must be retained in the work order folder and it is maintained as described in Section 17 – "Control of Records".

23.7.4. Data Review Procedures

23.7.4.1. Data review procedures are located in Section 28.13 – "Data Review".

24. CALIBRATION REQUIREMENTS (TNI V1:M2 – SECT 5.5 AND SECTION 1.7 OF TECHNICAL MODULES TNI V1:M 3-7)

24.1. General Equipment Requirements

24.1.1. The laboratory provides all the necessary equipment required for the correct performance of the scope of environmental testing performed by the laboratory.

24.1.2. All equipment and software used for testing and sampling are capable of achieving the accuracy required for complying with the specifications of the environmental test methods as specified in the laboratory SOPs.

24.1.3. Equipment is operated only by authorized and trained personnel (see Section 21 – "Personnel").

24.1.4. The laboratory has procedures for the use, maintenance, handling and storage of equipment. These procedures are readily available to laboratory personnel. Manuals provided by the manufacturer of the equipment provide information on use, maintenance, handling and storage of the equipment. The laboratory maintains an equipment table that includes additional information on storage location. This information is also kept in the Omega LIMS along with maintenance records and repairs.

24.1.5. All equipment is calibrated or verified before being placed in use to ensure that it meets laboratory specifications and relevant standard specifications. Calibration dates are kept in Omega.

24.1.6. Test equipment, including hardware and software, are safeguarded from adjustments that would invalidate the test result measurements by limiting access to the equipment and using password protection where possible (see Section 23.7 – "Control of Data").

24.1.7. Equipment that has been subject to overloading, mishandling, given suspect results, or shown to be defective or outside specifications is taken out of service. The equipment is isolated to prevent its use or clearly labeled as being out of service until it has been shown to function properly. If it is shown that previous tests are affected, then procedures for nonconforming work are followed and results are documented (see Section 13 – "Control of Nonconforming Environmental Testing Work" and Section 15 – "Corrective Action").

24.1.8. No equipment is used outside of the permanent control of the laboratory.

24.1.9. Each item of equipment and software used for testing and significant to the results is uniquely identified. Records of equipment and software are maintained. This information includes the following:

- Identity of the equipment and its software;
- Manufacturer's name, type identification, serial number or other unique identifier;
- Checks that equipment complies with specifications of applicable tests;
- Current location;
- Manufacturer's instructions, if available, or a reference to their location;
- Dates, results and copies of reports and certificates of all calibrations, adjustments, Acceptance criteria, and the due date of next calibration;

- Maintenance plan where appropriate, and maintenance carried out to date; documentation on all routine and non-routine maintenance activities and reference material verifications;
- Any damage, malfunction, modification or repair to the equipment;
- Date placed in service;
- Condition received (ex: new, used, reconditioned);
- Operations status; and
- Instrument configuration and settings
- Current column serial numbers upon installation

24.2. Support Equipment

24.2.1. Support equipment includes, but is not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, temperature measuring devices, volumetric dispensing devices, and thermal/pressure sample preparation devices. All support equipment is maintained in proper working order. Records are kept for all repair and maintenance activities (which may include service calls), in Omega.

24.2.2. All raw data records are retained to document equipment performance. These records include logbooks, data sheets, or equipment computer files.

24.2.3. If support equipment undergoes catastrophic failure in ways that can negatively impact client samples, the failing piece of support equipment will immediately be taken out of service. Clients will be notified if the lab does not have an immediate resolution.

24.2.4. Support Equipment Maintenance

24.2.4.1. Regular maintenance of support equipment, such as balances, thermometers, and fume hoods is conducted at least annually.

24.2.4.2. Maintenance on other support equipment, such as ovens, and refrigerators, is conducted on an as needed basis.

24.2.4.3. Records of maintenance to support equipment are documented in Instrument Maintenance Logs. The logs are located in the Omega LIMS.

24.2.4.4. The list of support equipment can be found in Appendix F.

24.2.5. Support Equipment Calibration

24.2.5.1. All applicable support equipment is calibrated or verified annually over the entire range of use using NIST traceable references where available. The results the calibration of support equipment must be within specifications and recorded. If calibrations generate correction factors, all locations where the piece of equipment is referenced must be updated to the new correction factor.

24.2.5.2. Support equipment such as balances, ovens, refrigerators, freezers, and water baths are verified with a NIST traceable reference if available, each day prior to use, to ensure operation is within the expected range for the application for which the equipment is to be used. Acceptance criteria for support equipment is listed in Table 4.

24.2.5.2.1. For sample refrigerators, minimum temperatures below 0°C will require a review of the condition of all water samples in the affected refrigerator. Maximum temperatures above 8°C will require notification of temperature exceedance to the Department Manager and the Stage 1 Manager.

24.2.5.2.2. Temperature exceedances over two consecutive days requires notification to the Department Manager and Quality Assurance Manager, a recording of all contents of the affected area and a corrective action report.

24.2.5.2.3. If it is determined that the cause of non-compliance is due to deterioration of the support equipment, the Technical Director will be notified and the piece of equipment will be taken out of service and repaired or replaced.

24.2.5.3. Class A glassware and glass microliter syringes will be replaced upon evidence of deterioration.

24.2.5.3.1. If glassware is being used to measure specific volumes, only Class A glassware will be used.

24.2.5.4. External calibration services will be used for annual balance and Eppendorf ® pipette calibrations. Calibration certificates will be stored on the FAI server as well as in LIMS.

24.2.5.4.1. When externally calibrated support equipment's "as found" parameters are documented as "out of tolerance" the lab will first compare the parameters that the external calibrator is following against the in-lab policy.

24.2.5.4.1.1. If the "as found" parameters are passing in accordance to the QA manual, the lab will document that on the calibration certificate and re-scan the document into LIMS.

24.2.5.4.1.2. If the "as found" parameters do not pass in accordance to the QA manual, corrective action will be taken. However, there should not be cases where this occurs because pipettes and balances are verified daily according to Table 3.

24.2.5.4.2. FAI will use an ISO 17025 accredited service for annual balance calibrations.

24.2.5.4.3. FAI is not required to use an ISO 17025 accredited service for annual Eppendorf® pipette calibrations.

24.2.5.5. Volumetric dispensing devices (except Class A glassware and Glass microliter syringes) will be verified according to Table 3.

Table 3: Calibration Acceptance Criteria for Support Equipment

Equipment	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Analytical Balance	Accuracy determined using accredited NIST weights. Inspected and calibrated by a 17025 accredited service annually. Weights used for daily balance verification should be calibrated at least every 5 years to obtain a new ISO17025 calibration certificate.	Daily Verification	Top Loading: ±2% or ±0.02g, whichever is greater. Analytical: ±0.1% or ±0.5mg, whichever is greater.	Clean, check level, ensure lack of drafts, ensure unit is warmed up. Recheck if balance fails verification.
Thermometer	Against NIST traceable thermometer	Annually at appropriate temperature range for intended use.	N/A	Apply correction factor determined by annual verification.
Infrared Temperature Guns	Against NIST traceable thermometer	Quarterly at appropriate temperature range for intended use.	N/A	Apply correction factor determined by quarterly verification. Replace upon expiration
Eppendorf® pipettes	Delivery by weight. Using DI water, dispense into tared vessel. Record weight with devices ID number. If a solvent other than DI is measured, the density of that solvent must be accounted for	Daily verification at the volumes used or at volumes that bracket the range of use.	Bias: ± 2% nominal volume. Precision: RSD ≤ 1% of nominal volume based on at least 3 replicates	Adjust/Replace

Table 3: Calibration Acceptance Criteria for Support Equipment

Equipment	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Volumetric Dispensing Devices (Automatic dilutor or dispensing devices.	One delivery by weight. Using DI water, dispense into tared vessel. Record weight with devices ID number. If a solvent other than DI is measured, the density of that solvent must be accounted for.	Quarterly in house, Inspected and calibrated by accredited person annually	± 2% Calculate accuracy by dividing weight by stated volume and multiply by 100 for a percentage value.	Adjust/Replace
Non-volumetric Lab ware (Autosampler vials, VOA vials, etc.)	Delivery by weight. Using DI water, dispense into tared vessel. Record weight with device ID number.	By lot before use.	± 3% of nominal value. RSD ≤ 3% of nominal volume based on 10 replicate measurements	Replace

Table 4: Acceptance Criteria for Support Equipment

Equipment Identification	Use	Acceptance Criteria
REFRIG 1	Samples. Standards are in the freezer	Refrigerator: <6° Freezer: < 0°C
REFRIG 2	Samples. Standards are in the freezer	Refrigerator: <6° Freezer: < 0°C
WALKIN	Sample Storage.	<6°
Ovens	Drying	± 5% set temperature

24.3. Analytical Equipment Maintenance

24.3.1. All equipment is properly maintained, inspected, and cleaned.

24.3.2. Maintenance of analytical instruments and other equipment may include regularly scheduled preventive maintenance or maintenance on an as-needed basis. Instrument malfunction may be documented in Omega maintenance log, which is part of the laboratory's permanent records. A description of what was done to repair the malfunction and proof of return to control are also documented in the log. Proof of return to control can be a statement that a QC sample was run and it passed criteria.

Table 5: Recommended Analytical Equipment Maintenance

Instrument	Procedure	Frequency
Cetac Mercury Analyzers	Check tubing for wear	Daily
	Fill rinse tank with 2% HNO3	Daily
	Clean liquid gas separator	As required
	Fill reductant bottle with 10% Stannous Chloride	Daily
ICP-MS	Check Pump Tubing	Daily
	Check liquid argon supply	Daily
	Check fluid level in waste container	Daily
	Check filters	Weekly
	Clean or replace filters	As required
	Check torch	Daily
	Check sample spray chamber for debris	Monthly
	Clean and align nebulizer	Monthly
	Replace pump tubing	Monthly
	Clean cones	As required
Spectrophotometer	Check/adjust cell alignment	Annually
Mass Spectrometer	Ion gauge tube degassing	As required
	Pump oil level check	Monthly
	Pump oil changing	Semi-annually
	Analyzer bake-out	As required
	Analyzer cleaning	As required
	Resolution adjustment	As required
Gas Chromatograph	Compare standard response to previous day or since last initial calibration	Daily via use of known compound retention
	Check carrier gas flow rate in column	Daily
	Check temp. of detector, inlet, column oven	As required
	Septum replacement	As required
	Glass wool replacement	As required
	Check system for gas leaks with SNOOP	As required
	Check for loose/fray wires and insulation	As required
	Bake injector/column	Monthly
	Change/remove sections of guard column	As required
	Replace connectors/liners	As required
	Change/replace column(s)	As required
Electron Capture Detector (ECD)	Detector wipe test (Ni 63)	Semi-annually
	Detector cleaning	As required
Flame Ionization Detector (FID)	Detector cleaning	As required
Photoionization Detector (PID)	Change O-rings	As required
	Clean lamp window	As required

Table 5: Recommended Analytical Equipment Maintenance		
Instrument	Procedure	Frequency
HPLC	Change guard columns Change lamps Change pump seals Replace tubing Change fuses in power supply Filter all samples and solvents Change autosampler rotor/stator	As required As required Semi-annually or as required As required As required Daily As required
Balances	Class "1" traceable weight check Clean pan and check if level Field service	Daily, when used Daily At least annually
Conductivity Meter	0.01 M KCl calibration	Daily, when used
Turbidimeter	Check light bulb	Daily, when used
Deionized/Distilled Water	Check conductivity Check deionizer light Monitor for VOCs System cleaning Replace cartridge & large mixed bed resins	Daily Daily Daily As required As required
Drying Ovens	Temperature monitoring Temperature adjustments	Daily As required
Refrigerators/ Freezers	Temperature monitoring Temperature adjustment Defrosting/cleaning	Daily As required As required
Vacuum Pumps/ Air Compressor	Belts/filters checked Lubricated	Monthly, as needed Semiannually, as needed
pH/Specific Ion Meter	Calibration/check slope Clean electrode	Daily As required
Incubator	Temperature monitoring Coil and incubator cleaning	Daily As required
Centrifuge	Check brushes and bearings	Every 6 months or as needed

24.4. Instrument Calibration

24.4.1. Information on instrument calibration can be found in each method’s SOP.

24.4.2. Initial instrument calibration and continuing instrument calibration verification are an important part of ensuring data of known and documented quality. If more stringent calibration requirements are included in a mandated method or by regulation, those calibration requirements override any requirements outlined here and will be documented in laboratory method SOPs.

24.4.3. Instrument calibration consists of two steps. The Initial Calibration is performed to document the instrument range of performance. A Calibration Standard analysis is performed before each day's analysis to reference daily operation to the initial calibration and calibrates the instrument for quantitation of the days' samples. Calibration Check analyses are performed at regular intervals during the analysis to track instrument performance during the analytical batch.

24.4.4. Initial Calibration (IC)

24.4.4.1. The analyst calibrates each system with external standards. First the performance of each instrument is documented with an initial calibration curve. This curve establishes the operation range for each analyte on each instrument.

24.4.4.2. Typically, a minimum of three to five concentrations of each analyte is prepared. The low calibration standard should be three to five times the method reporting limit. The other concentrations define the linear quantitation range for the analyte and instrument.

24.4.5. Least Squares Analysis

24.4.5.1. The straight line that best fits the data points generated in the IC is determined using a linear regression analysis. The formula for estimation is found in Appendix E.

24.4.5.2. A straight line approximates the relationship between the independent actual concentration (X) and dependent instrument response (Y).

24.4.5.3. The correlation coefficient (r^2) is a determination of how closely the data fit the line. The correlation coefficient ranges from 0 to +1. At r^2=1 the data falls directly on the straight line with a slope.

24.4.5.4. At r^2=0 the relationship cannot be estimated by a straight line. Unless otherwise noted in specific analytical SOPs, an acceptable IC, r^2 must be greater than or equal to 0.990.

24.4.5.5. The correlation coefficient is calculated using the equation found in Appendix E.

24.4.5.6. Many calculators, computer spreadsheet programs, and chromatographic data systems calculate and display the values for slope (A), intercept (B), and correlation (r^2).

24.4.5.7. In gas chromatographic analyses a reagent blank is not considered one of the calibration standards and is not used in the calculation of curve fit. In infrared and atomic absorption analyses the instrument readings are set to zero using a reagent blank prior to calibration.

24.4.6. Standard Deviation of Response

24.4.6.1. Three to five calibration standards are analyzed and the response factors are determined (Appendix E)

24.4.6.2. The standard deviation of the response factors is determined to calculated the percent relative standard deviation (%RSD).

24.4.6.3. If the %RSD is less than 20 percent over the working range, linearity through the origin can be assumed and the continuing calibration response factor is used in place of a calibration curve.

24.4.6.3.1. Please see specific methods for %RSD requirements.

24.4.6.4. The working range for the instrument is defined between the lowest standard and the highest standard in the IC.

24.4.6.5. A new initial calibration may be performed if the following conditions occur:

- Instrument has major repairs, alterations, or cleaning affecting analytical performance;
- Instrument is shut down for an extended period of time;
- Instrument fails Continuing Calibration Verification (CCV) control limits; or
- Instrument fails Laboratory Control Sample (LCS) control limits.

24.4.7. Continuing Calibration Verification (CCV)

24.4.7.1. The Continuing Calibration Verification (CCV) standard refers the instrument continuing performance after a calibration has been run. It is used to check system stability during sample analyses. For details and frequency of Initial and Continuing Calibration check please refer to the SOP for the method.

24.4.7.2. CCVs are typically a single mid-range standard at approximately 20 to 80 percent of the instrument's IC range. This range may vary depending on the analytical method.

24.4.7.3. The results are quantified using the IC. For specific limits please refer to the SOP for the method.

24.4.7.4. If a CCV does not meet the control limit the standard may be re-analyzed. If it still does not meet the control limit the source of the error is determined and corrected before analysis continues.

24.4.7.4.1. DoD requires the analysis of two consecutive passing CCVs following a failing CCV, to confirm batch validity. If both do not pass, the source of the error is determined and corrected before analysis continues.

25. MEASUREMENT TRACEABILITY (TNI V1:M2 – SECTION 5.6)

25.1. Measurement quality assurance comes in part from traceability of standards to certified materials. All equipment used affecting the quality of test results are calibrated prior to being put into service and on a continuing basis (see Section 24 – “Calibration Requirements”). These calibrations are traceable to national standards of measurement where available.

25.2. If traceability of measurements to SI units is not possible or not relevant, evidence for correlation of results through interlaboratory comparisons, proficiency testing, or independent analysis is provided.

25.3. Reference Standards

25.3.1. Reference standards are standards of the highest quality available at a given location, from which measurements are derived.

25.3.2. Reference Standards, such as ASTM Class 1 weights, are used for calibration only and for no other purpose.

25.3.3. Reference standards, such as ASTM Class 1 weights, are calibrated by an entity that can provide traceability to national or international standards.

25.4. Reference Materials

25.4.1. Reference materials are substances that have concentrations that are sufficiently well established to use for calibration or as a frame of reference.

25.4.1.1. Technical SOPs may also refer to reference materials as reference standards.

25.4.2. Reference materials, where commercially available, are traceable to national standards of measurement, or to Certified Reference Materials, usually by a Certificate of Analysis.

25.4.3. Purchased reference materials require a Certificate of Analysis where available. If a reference material cannot be purchased with a Certificate of Analysis, it is verified by analysis and comparison to a certified reference material and/or demonstration of capability for characterization.

25.4.4. Internal reference materials, such as working standards or intermediate stock solutions, are checked as far as is technically and economically practical. Working standards or intermediate stock solutions should be checked against a second source at first time of use. When a second source is not available, a vendor certified different lot is accepted as a second source. Working standards and intermediate stock solutions are given expiration dates when they are prepared based on method or regulatory requirements. These standards are used up or disposed of by the expiration date. Each method SOP has details on how often standards are made and how often the checks are required. Dates for standard makeup and expiration are in the Omega LIM system.

25.4.4.1. In the event a standard expires, the lab may choose to recertify the expired standard as described in Appendix E.

25.5. Transport and Storage of Reference Standards and Materials

25.5.1. The laboratory handles and transports reference standards and materials in a manner that protects the integrity of the materials. Reference standard and material integrity is protected by separation from incompatible materials and/or minimizing exposure to degrading environments or materials.

25.5.2. Reference standards and materials are stored according to manufacturer's recommendations, method SOP requirements and separately from samples. Storage locations are tracked in the Omega LIM system.

25.6. Labeling of Reference Standards, Reagents, and Reference Materials

25.6.1. The laboratory has procedures for purchase, receipt and storage of standards, reagents and reference materials. Purchase procedures are described in Section 11 – "Purchasing Services and Supplies" as well as SOPs 5 and 6.

25.6.2. Expiration dates can be extended if the reference standard or material's integrity is verified. The extended date may not be beyond the expiration date of the referenced standards used to re-verify. A standard expiration date can be extended if they can be verified against a separate source. The verification will be documented in Omega. If the material is not re-verified, the expired material will be marked as expired and will no longer be used for quantitative purposes. See SOP 57 for more information.

25.6.3. Reagent quality is verified during routine QC analyses.

25.7. Purchased Stock Standards, Reagents, Reference Materials and Media

25.7.1. Records for all standards, reagents, reference materials, and media include:

- The manufacturer/vendor name (or traceability to purchased stocks or neat compounds)
- The manufacturer's Certificate of Analysis or purity (if supplied)
- The date of receipt
- Recommended storage conditions
- Date of Expiration

25.7.2. This information is recorded in the Omega LIM system.

25.7.3. If the original container does not have an expiration date provided by the manufacturer or vendor it is assigned an arbitrary expiration date of one year from date of receipt, unless the Certificate of Analysis or similar documentation states “no expiration”. If an expiration date is provided, it must be labeled with the assigned expiration date.

25.7.4. In methods where the purity of reagents is not specified, analytical reagent grade is used. If the purity is specified, that is the minimum acceptable grade. Purity is verified and documented according to Section 11 – “Purchasing Services and Supplies”.

25.8. Prepared Standards, Reagents, Reference Materials and Media

25.8.1. Records for standards, reagents, reference materials, and media preparation include:

- Traceability to purchased stock or neat compounds
- Reference to the method of preparation
- Date of preparation
- An expiration date (that does not exceed the stock standards used) after which the material shall not be used (unless its reliability is verified by the laboratory)
- Preparer’s name (if prepared)

25.8.2. All containers of prepared standards, reagents, or materials are labeled with a unique ID and an expiration date. The unique ID is determined by Omega. The Omega label is then placed on all Standards, Reagents, and Reference Materials: See SOP57.

26. COLLECTION OF SAMPLES (TNI V1:M2 – SECTION 5.7)

26.1. Fremont Analytical does not provide sampling services. The laboratory’s responsibility in the sample collection process lies in supplying the sampler with the necessary coolers, reagent water, sample containers, preservatives, sample labels, custody seals, COC forms, ice, and packing materials required to properly preserve, pack, and ship samples to the laboratory.

26.2. Fremont Analytical is occasionally asked to advise field-sampling personnel on appropriate sampling methodology for a particular analysis. Fremont recommends that the procedures described in SW846, Update III, Chapter 3 for inorganic analytes and Chapter 4 for organic analytes, the Manual for the Certification of Laboratories Analyzing Drinking Water Section 6 and Table IV-6, or 40 CFR part 136 Table II be followed

26.3. Sampling Containers

26.3.1. The laboratory offers sampling containers for use by clients. Sample containers are obtained from an independent supplier. The independent supplier may certify that the sample containers are cleaned following EPA protocols, and that the preservatives added will not lead to contamination. Certificates of cleanliness may be provided with each case of containers, and can be forwarded upon request. In cases where we do not receive certificates from the supplier, FAI tests bottle lots for cleanliness as described in SOP45.

26.4. Preparing Container Orders

26.4.1. Containers (containing any required preservatives) are provided to the client upon request. Details for filling bottle orders can be found in SOP62.

26.5. Sampling Containers, Preservation Requirements, Holding Times

26.5.1. Sampling container, preservation and holding time requirements can be found in the following table.

Table 6: Sampling Containers, Preservation Requirements, Holding Times			
Parameter	Method	Container/Preservatives	Holding Time
SOIL			
Alkalinity	SM 2320B Modified	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 14 Days
Anions - Br, Cl, F, SO_4	EPA 300.0	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 28 Days
Anions - NO_2, NO_3, PO_4	EPA 300.0	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 48 Hours
BTEX / Gasoline Range Hydrocarbons	EPA 8260/NWTPH-Gx/EPA 8015	Field Preservation Kit / Cool 4ºC	Analyze within 14 Days if preserved. Must be preserved or analyzed within 48 hours.
Cyanide	SM 4500-CN C,E	2-4 oz Glass Jar / Cool 4°C	Extract within 28 Days, analyze within 14 days of extraction.
Diesel Range Organics	NWTPH-Dx/EPA 8015/AK102-103	4 to 8 oz Glass Jar / Cool 4°C	Extract within 14 Days / Analyze within 40 Days of Extraction
Extractable Petroleum Hydrocarbons (EPH)	NWTPH-EPH	4 to 8 oz Glass Jar / Cool 4°C	Extract within 14 Days / Analyze within 40 Days of Extraction
Gasoline Range Organics (GRO	AK 101	2 oz glass jar / BFB surrogated MeOH / Cool 4°C	Extract within 14 days
Herbicides	EPA 8151A	4 to 8 oz Glass Jar / Cool 4°C	Extract within 14 Days / Analyze within 40 Days of Extraction

Table 6: Sampling Containers, Preservation Requirements, Holding Times			
Parameter	Method	Container/Preservatives	Holding Time
Hexavalent Chromium	EPA 7196	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 28 Days
Ignitability / Flashpoint	ASTM D93/ EPA 1010	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 28 Days
Langelier Index / Corrosivity	SM 2330B	2-4 oz Glass Jar / Cool 4°C	Analyze immediately
Mercury (Hg)	EPA 7471	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 28 Days
Metals (Except Mercury)	EPA 6020	4 to 8 oz Glass Jar	Analyze within 6 Months
Pesticides	EPA 8081	4 to 8 oz Glass Jar / Cool 4°C	Extract within 14 Days / Analyze within 40 Days of Extraction
pH	EPA 9045D	2-4 oz Glass Jar / Cool 4°C	Analyze immediately
Phosphorus, Total	EPA 6020	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 28 Days
Polychlorinated Biphenyls (PCBs/Aroclor)	EPA 8082	4 to 8 oz Glass Jar / Cool 4°C	Extract within one year
Semi Volatile Organic Compounds (SVOC)	EPA 8270	4 to 8 oz Glass Jar / Cool 4°C	Extract within 14 Days / Analyze within 40 Days of Extraction
Salinity	SM 2520B	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 8 Days
TCLP/SPLP - Metals	1311/1312	4 to 8 oz Glass Jar / Cool 4º°C	Extract within 180 Days (Hg = 28 days)

Table 6: Sampling Containers, Preservation Requirements, Holding Times			
Parameter	Method	Container/Preservatives	Holding Time
TCLP/SPLP – Semi-Volatile Organics	1311/1312	4 to 8 oz Glass Jar / Cool 4º°C	Extract within 14 days
TCLP/SPLP - ZHE	1311/1312	4 to 8 oz Glass Jar / Cool 4°C	Extract within 14 Days
Total Organic Carbon	EPA 9060A,	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 28 Days
Volatile Organic Compounds (VOC)	EPA 8260	4 to 8 oz Glass Jar / Field Preservation Kit / Cool 4°C	Analyze within 14 Days if preserved. Must be preserved or analyzed within 48 hours.
Volatile Petroleum Hydrocarbons (VPH)	NWTPH-VPH	Field Preservation Kit / Cool 4°C	Analyze within 14 Days
WATER			
Parameter	Method	Container/Preservatives	Holding Time
Alkalinity	SM 2320B	250mL/1L Polyethylene / Cool 4°C	Analyze within 28 Days
Anions – Br, Cl, F, SO_4, Nitrate+Nitrite	EPA 300.0	250 mL Polyethylene / Cool 4°C	Analyze within 28 Days
Anions - NO_2, NO_3, PO_4	EPA 300.0	250 mL Polyethylene / Cool 4°C	Analyze within 48 Hours
Biological Oxygen Demand (BOD)	SM 5210B	500 L Polyethylene / Cool 4°C	Analyze within 48 Hours
BTEX / Gasoline Range Hydrocarbons	EPA 8260/NWTPH-Gx/EPA 8015	40 mL Glass VOA Vial / Cool 4°C, HCl	Analyze within 14 Days/Analyze within 7 days if unpreserved

Table 6: Sampling Containers, Preservation Requirements, Holding Times

Parameter	Method	Container/Preservatives	Holding Time
Chemical Oxygen Demand (COD)	SM 5220D	250 mL Polyethylene / Cool 4°C, H_2SO_4	Analyze within 28 Days
Coliform, Fecal & Total	Colilert	110 mL Sterile / Cool 4°C, $Na_2S_2O_3$	Analyze within 6 hrs
Cyanide, Total	SM 4500-CN C,E	250 mL Polyethylene / Cool 4°C, NaOH	Analyze within 14 Days
Diesel Range Organics	NWTPH-Dx/ AK102-103	500 mL Amber Glass / Cool 4°C/HCl	Extract within 14 Days / Analyze within 40 Days of Extraction Extract within 7 days if unpreserved
Dissolved Organic Carbon	SM 5310B/C	250/500 mL Amber Glass / Cool 4°C, H_2SO_4, Protect from Sunlight	Analyze within 28 Days
Dissolved Oxygen	ASTM D888	BOD Bottle / Cool 4°C	<15 min
Extractable Petroleum Hydrocarbons (EPH)	NWTPH-EPH	1 L Amber Glass / Cool 4°C/HCl	Extract within 14 Days / Analyze within 40 Days of Extraction Extract within 7 days if unpreserved
Herbicides	EPA 8151A	1 L Amber Glass / Cool 4°C	Extract within 7 Days / Analyze within 40 Days of Extraction
Hexavalent Chromium	EPA 7196/SM 3500 Cr6 B	250 to 500 mL Polyethylene / Cool 4°C	Analyze within 24 Hours

Table 6: Sampling Containers, Preservation Requirements, Holding Times

Parameter	Method	Container/Preservatives	Holding Time
Ignitability / Flashpoint	ASTM D93/EPA 1010A	250 mL Amber Glass / Cool 4°C	Analyze within 28 Days
Langelier Index / Corrosivity (Alk, Ca, pH, TDS)	SM 2330B	250 mL to 1 L Polyethylene / Cool 4°C	Analyze pH immediately
Mercury (Hg)	245.1/7470	250 to 500 mL Polyethylene / Cool 4°C, HNO_3	Analyze within 28 Days
Mercury, (Hg) (Low Level)	EPA 1631	250 to 500 mL Amber Glass / Cool 4°C BrCl	Preserve within 48 hours. Analyze within 90 days
Metals, Dissolved (Except Mercury)	EPA 6020/200.8	250 to 500 mL Polyethylene (Field Filter) / Cool 4°C, HNO_3	Analyze within 6 Months
Metals, Total (Except Mercury)	EPA 6020/200.8	250 to 500 mL Polyethylene / Cool 4°C, HNO_3	Analyze within 6 Months
Methane, Ethane, and Ethene	RSK-175	40 mL Glass VOA Vial / Cool 4°C, HCl	Analyze within 14 Days
Ammonia	SM 4500 NH_3 D	1L Polyethylene / Cool 4°C, H_2SO_4	Analyze within 28 Days
Kjeldahl	SM 4500N	500 mL to 1 L Polyethylene / Cool 4°C, H_2SO_4	Analyze within 28 Days
Oil & Grease	EPA 1664	1 L Amber Glass / Cool 4°C, HCl or H_2SO_4	Analyze within 28 Days

Table 6: Sampling Containers, Preservation Requirements, Holding Times

Parameter	Method	Container/Preservatives	Holding Time
Pesticides	EPA 8081	1 L Amber Glass / Cool 4°C	Extract within 7 Days / Analyze within 40 Days of Extraction
pH	SM 4500H+B	250 mL Polyethylene / Cool 4°°C	ASAP
Phosphorus, Total	EPA 365.3	4 to 8 oz Glass Jar / Cool 4°C	Analyze within 28 Days
Polychlorinated Biphenyls (PCBs/Aroclor)	EPA 8082	1 L Amber Glass / Cool 4°C	Extract within one year
Residual Chlorine	SM 4500Cl	250 mL Amber Glass / Cool 4°C	<15 min
Salinity	EPA 2520B	250 mL Polyethylene / Cool 4°C	Analyze within 8 Days
Semi Volatile Organic Compounds (BNA, PAH)	EPA 8270	1 L Amber Glass / Cool 4°C	Extract within 7 Days / Analyze within 40 Days of Extraction
Settleable Solids	SM 2540F	1 L Polyethylene / Cool 4°C	Analyze within 48 Hours
Total Solids (TS)	SM 2540B	250 mL Polyethylene / Cool 4°C	Analyze within 7 Days
Total Dissolved (TDS)	SM 2540C	250 mL Polyethylene / Cool 4°C	Analyze within 7 Days
Total Suspended (TSS)	SM 2540D	250 mL Polyethylene / Cool 4°C	Analyze within 7 Days
Total Volatile (TVS)	SM 2540E	250 mL Polyethylene / Cool 4°C	Analyze within 7 Days

Table 6: Sampling Containers, Preservation Requirements, Holding Times			
Parameter	Method	Container/Preservatives	Holding Time
Specific Conductance (Conductivity)	SM 2510B	250 mL Polyethylene / Cool 4°C	Analyze within 48 hrs
Sulfide	SM 4500-S^{2-}F	250 mL Polyethylene / Cool 4°C, Zn Acetate, H_2SO_4	Analyze within 7 days
Total Organic Carbons (TOC)	SM 5310B/C	250/500 mL Amber Glass / Cool 4°C, H_2SO_4, Protect from Sunlight	Analyze within 28 Days
Turbidity	EPA 180.1	250 mL Polyethylene / Cool 4°C	Analyze within 48 Hours

Table 6: Sampling Containers, Preservation Requirements, Holding Times			
Parameter	Method	Container/Preservatives	Holding Time
Volatile Organic Compounds (VOC)	EPA 8260	40 mL Glass VOA Vial / Cool 4°C, HCl	Analyze within 14 Days/Analyze within 7 days if unpreserved
Volatile Petroleum Hydrocarbons (VPH)	NWTPH-VPH	40 mL Glass VOA Vial / Cool 4°C, HCl	Analyze within 14 Days/Analyze within 7 days if unpreserved
1,2-Dibromoethane (EDB) / 1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	2-40 mL VOA Vials / Cool 4°C, 0.5 mL $Na_2S_2O_3$	Analyze within 14 Days/Analyze within 7 days if unpreserved
DRINKING WATER			
Parameter	Method	Container/Preservatives	Holding Time
11 Regulated Metals	EPA 200.8/245.1	250 mL Polyethylene / Cool 4°C	180 Days (28 Days for Mercury) after lab preservation
Coliform, Fecal	SM 9222D (MF)	110 mL Sterile / Cool 4°C, $Na_2S_2O_3$	6 Hours
Coliform, Total	EPA 1604	110 mL Sterile / Cool 4°C, $Na_2S_2O_3$	30 Hours
Dissolved Organic Carbon (DOC)	SM 5310C	250 mL Amber Glass / Cool 4°C	Analyze within 28 Days
Lead and Copper Rule	EPA 200.8	1 L Polyethylene / Cool 4ºC, HNO_3	180 days after lab preservation
Total Organic Carbon (TOC)	SM 5310C	500 mL Amber Glass / Cool 4^0C, H_2SO_4, Protect from Sunlight	Analyze within 28 Days

Table 6: Sampling Containers, Preservation Requirements, Holding Times			
Parameter	Method	Container/Preservatives	Holding Time
AIR			
Parameter	Method	Container/Preservatives	Holding Time
Volatile Organic Compounds	TO-15	Tedlar® Bag/Canister	Analyze within 72 hours/30 days
Sulfur Compounds	TO-15	Tedlar® Bag / Canister	Analyze within 24 hours
Siloxanes	TO-15	Tedlar® Bag/ Canister	Analyze within 72 hours/30 days
Major Gases	EPA Method 3C	Tedlar® Bag	Analyze within 72 hours
Formaldehyde	TO-11A	Sorbent Tube	Analyze within 14 days

26.5.2. If preservation or holding time requirements are not met, the procedures in Section 13 – “Control of Nonconforming Environmental Testing Work” are followed.

27. HANDLING SAMPLES AND TEST ITEMS (TNI V1:M2 – SECTION 5.8 AND SECTION 1.7 OF TECHNICAL MODULES TNI V1:M 3-7)

27.1. Sample Receipt

27.1.1. When samples are received at the laboratory, the chain-of-custody is reviewed and conditions are documented. The samples are then logged into the Laboratory Information System (LIM) for sample tracking and given unique identifiers.

27.2. Chain of Custody

27.2.1. As described in section 17.5, the Chain of Custody is the documented history of any sample.

27.2.2. At the project site each sample is labeled with:

- Date and time of sampling
- Name of the client
- Name of the sampler
- Sample identification number
- Other pertinent information

27.2.3. At the same time, the Chain of Custody form is filled out in ink with the same information as well as the type of sample, address and phone number of the client, the containers and preservatives used, the analyses requested, the project name and any special handling or analytical requirements.

27.2.4. When the samples are received at the laboratory, sample receiving checks to ensure that all samples listed on the Chain of Custody are, in fact, present and in satisfactory condition and are properly preserved.

27.3. Sample Acceptance

27.3.1. The condition of samples as the laboratory receives them directly affects the quality of the data that can be produced. Samples that are not properly preserved or handled during shipping will not reliably represent the conditions that exist at the sampling point. The laboratory must check and document the condition of the samples as submitted to verify proper handling of the samples. Any abnormalities or departures from standard conditions are recorded on the sample receipt form/original observation sheet and then input into the Omega LIM system (Sample Receipt form). The container the samples are received in are inspected at time of receipt for condition of the sample, sample label, temperature, preservatives, packaging materials, and sample seals. Information on the sample label is reconciled against information on the Chain of Custody and any discrepancies are noted. All samples are checked for proper chemical preservation, if required. Water samples for volatile organics analysis are not preserved after receipt but are checked for entrapped bubbles. The Laboratory Manager is notified if volatile samples are received without preservatives. The samples are given priority for prompt analysis.

27.3.2. All samples that require thermal preservation are considered acceptable if they are received on ice and sample arrival temperature is received at 4º C, ± 2°C. Samples that are hand delivered to the laboratory immediately after collection may not meet these criteria. In these cases, the samples will be considered acceptable if there is evidence that the chilling process has begun, such as arrival on ice. The temperature of the samples is taken using an infra-red thermometer and recorded.

27.3.3. If these conditions are not met, the client is contacted prior to any further processing. The following may occur:

- The sample is rejected as agreed with the client,
- The decision to proceed is documented and agreed upon with the client,
- The condition is noted on the Chain of Custody form and/or lab receipt documents, and
- The analytical report is noted with the conditions.

27.3.4. The client services representative logs all samples into the LIMS. The login procedure generates a work order and labels for each sample container. Sample containers are stored in a walk-in refrigerator or at the designated location for the analysis requested.

27.3.5. The laboratory has a sample acceptance policy that is made available to sample collection personnel.

27.3.6. Further information on sample acceptance is found in SOP 64.

27.4. Sample Identification

27.4.1. Each group of samples submitted is assigned a unique work order number indicating the current year followed by a two-digit code for the month. The work order numbers are assigned sequentially throughout each calendar year. Each sample submitted within a work order is numbered sequentially beginning with 001. The samples are labeled in the order listed on the COC. The sample number includes the work order number followed by the sequential number from the COC (e.g., 110101-001A). Each container for a specific sample is assigned a letter suffix. Thus, each sample container received at Fremont Analytical is assigned a unique identification number. The sample identification system includes identification for all samples, sub-samples and subsequent extracts and/or digestates. A unique identification (ID) code is placed on each sample container using a durable label.

27.4.2. The status of a work order while at Fremont Analytical is tracked through the Omega LIM system which also provides the daily work order schedule.

27.4.3. The client services representative logs all samples into Omega. The login procedure generates a work order and labels for each sample container. Sample containers are stored in a walk-in refrigerator. Samples for certain volatile analyses are stored in separate refrigerators to avoid possible cross contamination.

27.4.4. Sample information is recorded in Omega under the work orders tab upon receipt.

27.4.5. Information required for log-in includes:

- Date received
- Date and time of sampling linked to the date and time of laboratory receipt
- Client
- Work order number
- Project Name
- Project Manager
- Analysis
- Client Sample ID
- Containers
- Lab Sample ID number (generated by Omega)

27.4.6. Once the sample receipt form and login have been completed, the laboratory personnel will attach a label for Omega identification on the sample containers. Sample containers are not marked for identification on the container lid. Laboratory personnel will not place marks on the label that obscures other pertinent information on the label.

27.4.7. All documentation received regarding the sample, such as memos or chain of custody, are retained and scanned into Omega for the correct work order.

27.4.8. Upon login, each employee has the ability to view a backlog of work orders to schedule the daily workload and plan future workloads. It is the responsibility of each Lab Manager to schedule work, ensure that holding times are met and that all data is reported on time.

27.4.9. Further information regarding sample log-into Omega is found in SOP 65.

27.5. USDA, Animal and Plant Health Inspection Service

27.5.1. All samples which are considered foreign and/or regulated domestic soil will be treated in accordance with USDA, APHIS, USDA APHIS PPQ compliance (SOP50). All samples will be stored in a locked container at Fremont Analytical.

27.5.2. All samples will be heat treated according to SOP50 when preparing for disposal.

27.5.3. All disposed samples will be documented.

27.5.4. Shipping container will be decontaminated with approved disinfectants.

27.5.5. All hazardous waste (including foreign and domestic soil) will be disposed of in accordance with Washington State Model Toxics Control Act (MTCA) NOTE: All foreign and/or regulated domestic soil will be noted in Omega as Foreign soil.

27.6. Sample Aliquots / Sub-sampling

27.6.1. In order for analysis results to be representative of the sample collected in the field, soil samples are homogenized, and water samples are taken from the appropriate bottle for each test.

27.6.2. Laboratory employees should take note of any extraneous materials such as rocks and twigs.

27.6.3. Laboratory employees shall not manipulate the sample material in order to obtain their exact target weight because it may produce non-representative subsamples if the sample is highly heterogeneous.

27.7. Preservation Checks

27.7.1. The following preservation checks are performed and documented after samples have been logged in:

27.7.1.1. Chlorine checks:

27.7.1.1.1. Chlorine checks occur when required by the analytical method (such as BOD-5) and upon request.

27.7.1.2. pH checks:

27.7.1.2.1. The pH of samples requiring acid/base preservation is checked upon sample receipt or upon initiation of analysis. VOC waters must be verified after analysis to preserve the integrity of the sample.

27.8. Sample Storage

27.8.1. Samples are not stored with standard reference materials or extracts. Samples with obvious high contamination or product samples are segregated from other samples. To assure that the laboratory will satisfy Chain of Custody protocols, the following laboratory conditions are maintained:

- Samples that require thermal preservation are stored under refrigeration that is ±2° C of the specified preservation temperature. For samples with a specified storage temperature of 4° C storage at a temperature above the freezing point of water to 6° C is considered acceptable.
- Sample storage area, walk-ins, refrigerators and freezers are monitored for correct temperature 7 days a week. The min/max temperature is recorded for each area.
- Samples are stored away from all standards, reagents, food, and other potentially contaminating sources to prevent cross contamination.
- Samples will remain in limited access sample storage until removed for sample preparation or analysis;
- Samples with noxious odors or that require segregation from other samples are stored within coolers.

27.8.2. The sample storage refrigerators will have a thermometer to register storage temperature. The temperature for all refrigerators and freezers storing samples will be recorded daily.

27.8.2.1. Access to the refrigerators is restricted to designated Fremont Analytical Laboratory staff only.

27.9. Sample Disposal

27.9.1. Samples are retained a minimum of 30 days after the sample has been received unless other arrangements have been made with the client.

27.9.2. Samples in air canisters are retained for 7 days after the final report has been sent to the client.

27.9.3. Samples are disposed of according to Federal, State and local regulations. Procedures are described in SOP61 for the disposal of samples, digestates, leachates, and extracts.

27.10. Sample Transport

27.10.1. Samples that are transported under the responsibility of the laboratory, where necessary, are done so safely and according to storage conditions. This includes moving bottles within the laboratory. Specific safety operations are addressed outside of this document.

27.10.2. Sample shipping procedures are described in SOP62.

28. QUALITY ASSURANCE FOR ENVIRONMENTAL TESTING (TNI V1:M1, V1:M2 – SECTION 5.9 AND SECTION 1.7 OF TECHNICAL MODULES TNI V1:M 3-7)

28.1. Fremont Analytical has procedures for monitoring the validity of the testing it performs. The qualities of test results are recorded in such a way that trends are detectable, and where practicable, are statistically evaluated. To evaluate the quality of test results, the laboratory utilizes certified reference materials, control charting, proficiency testing samples, replicate or confirmation analyses comparison to historical data.

28.2. In addition to procedures for calibration, the laboratory monitors quality control measurements such as blanks, laboratory control samples (LCS), matrix spikes (MS), duplicates, surrogates and internal standards to assess precision and accuracy. Proficiency Testing samples are also analyzed to assess laboratory performance.

28.3. Quality control (QC) data are analyzed and, when found to be outside pre-defined criteria, action is taken to correct the problem and to prevent incorrect results from being reported. Data associated with quality control data outside of criteria and still deemed reportable will be qualified so the end user of the data may make a determination of the usability of the data - see Section 29 – "Reporting of Results".

28.4. Essential Quality Control Procedures

28.4.1. The quality control procedures specified in test methods are followed by laboratory personnel. The most stringent of control procedures is used in cases where multiple controls are offered. If it is not clear which is the most stringent, that mandated by test method or regulation is followed.

28.4.2. For test methods that do not provide acceptance criteria for an essential quality control element or where no regulatory criteria exist, acceptance criteria are developed. The limits are set at +/- 30 percent, until enough data points are available to do a control chart. All control charting is done inside of Omega (See SOP47).

28.4.3. Written procedures to monitor routine quality controls including acceptance criteria are located in the test method SOPs and include such procedures as:

- use of laboratory control samples and blanks to serve as positive and negative controls for chemistry methods;
- use of laboratory control samples to monitor test variability of laboratory results;
- use of calibrations, continuing calibrations, certified reference materials and/or PT samples to monitor accuracy of the test method;
- measures to monitor test method capability, such as limit of detection, limit of quantitation, and/or range of test applicability, such as linearity;
- use of regression analysis, internal/external standards, or statistical analysis to reduce raw data to final results;
- use of reagents and standards of appropriate quality and use of second source materials as appropriate;
- procedures to ensure the selectivity of the test method for its intended use;
- measures to assure constant and consistent test conditions, such as temperature, humidity, rotation speed, etc., when required by test method;
- use of sterility checks for equipment, media and dilution water for microbiology; and
- use of positive and negative culture controls for microbiology.

28.5. Internal Quality Control Practices

28.5.1. Analytical data generated with QC samples that fall within all prescribed acceptance limits indicate the test method is deemed to be in control.

28.5.2. QC samples that fall outside QC limits indicate the test method are deemed to be out of control (nonconforming) and that corrective action is required and/or that the data are qualified (see Section 13 – “Control of Nonconforming Environmental Testing Work” and Section 15 - “Corrective Actions”).

28.5.3. Detailed QC procedures and QC limits are included in test method SOPs, or where unspecified in the SOPs, are detailed by the use of control charts.

28.5.4. All QC measures are assessed and evaluated on an on-going basis, so that trends are detected.

28.6. General Controls

28.6.1. Positive and Negative Controls such as:

- Blanks (negative)
- Laboratory control sample (positive)
- Sterility checks and control cultures (positive and negative)

28.6.2. Selectivity is assured through:

- Absolute and relative retention times in chromatographic analyses;
- Two-column confirmation when using non-specific detectors;
- Use of acceptance criteria for mass-spectral tuning (found in test method SOPs);
- Use of the correct method according to its scope assessed during method validation; and
- Use of reference cultures (positive and negative) from a recognized manufacturer (where applicable).

28.6.3. Consistency, Variability, Repeatability, and Accuracy are assured through:

- Recommendations or according to the processes used during method validation;
- Monitoring and controlling environmental conditions (temperature, access, proximity to potential contaminants)
- Selection and use of reagents and standards of appropriate quality; and
- Cleaning glassware appropriate to the level required by the analysis as demonstrated with method blanks (SOP46)
- For microbiology, glassware care includes use of detergents designed for laboratory use and sterilization in the autoclave
- Following SOPs and documenting any deviation, assessing for impact, and treating data appropriately;
- Testing to define the variability and/or repeatability of the laboratory results, such as replicates;
- Use of measures to assure the accuracy of the test method, including calibration and/or continuing calibrations, use of certified reference materials, proficiency test samples, or other measures; and
- Use of duplicate plate counts on positive samples (microbiology only, where feasible)

28.6.4. Test Method Capability (also see Section 23 – “Environmental Methods and Method Validation”) is assured through:

- Establishment of the limit of detection activity if also performing where appropriate (SOP53);
- Establishment of the limit of quantitation or reporting level (SOP53); and/or
- Establishment of the range of applicability such as linearity.

28.6.5. Data reduction is assured to be accurate by:

- selection of appropriate formulae to reduce raw data to final results such as regression;
- following specific procedures for data reduction such as manual integration procedures;
- periodic review of data reduction processes to assure applicability;
- microbiological calculations, data reduction, and statistical interpretations specified by each test method; and

28.6.6. Sample Specific controls are used to evaluate the effect of sample matrix on the performance of the selected analytical method (not a measure of laboratory performance):

- Matrix Spike and Matrix Spike Duplicate (MS/MSD)
- Surrogate Spikes
- Sample Duplicates

28.7. Essential Quality Control Elements

28.7.1. Table 7 summarizes the key elements of a quality control system for a laboratory performing chemistry and microbiology testing.

Table 7: Essential Quality Control Elements for Chemistry

Item	Frequency	Acceptance Criteria	Corrective Action
Negative Control (Method Blank)	1/batch	Method specific or reporting limit	Qualify data and take corrective action
Positive Control (Laboratory Control Sample)	1/batch	Method specific or determined by laboratory	Reprocess, reanalyze, or qualify data.
Matrix Spike; Matrix Spike Duplicates Note: Samples are designed as data quality indicators for a specific sample using the designated method. These controls alone are not used to judge a laboratory's performance.	Per method requirement	Method specific or determined by laboratory	Corrective action or qualify data.
Surrogate spikes See note above.	Per method requirement	Method specific or determined by laboratory	Corrective action or qualify data
Batch Duplicates See note above	Per method requirement	Method specific or determined by laboratory	Corrective action or qualify data
Continuing Calibration Verification	Per method requirement	Method specific or determined by the laboratory	Reanalyze standard immediately; Corrective action
Initial calibration Verification	After initial calibration	Method specific or determined by laboratory	Reanalyze standard immediately; Corrective action

28.8. Method Blanks

28.8.1. Method blanks are processed along with and under the same conditions as the associated samples to include all steps in the method. A method blank must be analyzed at a minimum of one per preparation batch. When no separate preparation method is used the batch is defined as the environmental samples that are analyzed with the same method and personnel, using the same lots of reagents, not to exceed the analysis of twenty environmental samples, not including method blanks, LCS, matrix spikes and matrix duplicates. The matrix of the method blank must be similar to the associated samples and be free from any analytes of interest.

28.8.2. Method blanks are not required for some analyses such as, settleable solids, flash point, temperature, percent moisture.

28.8.3. Contaminated blanks are identified according to the acceptance limits in the test method SOPs or laboratory documentation.

28.8.4. The laboratory identifies a blank as contaminated when analyte results are greater than the reporting limit. For DoD projects, blanks must be less than ½ the LOQ. Omega flags all data with a B that has a hit above the reporting limit. When a blank is determined to be contaminated, the cause must be investigated and measures taken to minimize or eliminate the problem.

28.8.5. Data that are unaffected by the blank contamination (non-detects or other analytes) are reported unqualified. Detections in blanks may be deemed acceptable if detections in samples are greater than 10 times the detection in the method blank.

28.8.6. Sample data that are suspect due to the presence of a contaminated blank are reanalyzed, qualified, or voided.

28.9. Laboratory Control Samples

28.9.1. Laboratory Control Samples (LCS) are prepared from analyte free water or other clean matrix, and spiked with verified and known amounts of analytes for the purpose of establishing precision or bias measurements.

28.9.2. Laboratory control samples are analyzed at a frequency mandated by method, regulation, or client request, whichever is more stringent. The standard frequency of LCS preparation and analysis is one per analytical batch or as otherwise stated in a laboratory SOP. Exceptions would be for those analytes where no spiking solution is available, such as: Settleable Solids and Salinity. When no separate preparation method is used the batch is defined as the environmental samples that are analyzed with the same method and personnel, using the same lots of reagents, not to exceed the analysis of twenty environmental samples, not including method blanks, LCS, matrix spikes and matrix duplicates.

28.9.3. The analytes to be spiked in the LCS are specified in the test method SOP.

28.9.4. The results of laboratory control samples (LCS) are calculated in percent recovery (see Appendix G). This is done in Omega and can be tracked in the control chart function.

28.9.5. The individual LCS is compared to the acceptance criteria as published in the mandated test method, or where there are no established criteria, the laboratory may set the LCS limits to 70-130% until there is enough data to run control charts.

28.9.6. Analytes that fail the LCS are flagged in Omega with an “S.” Corresponding samples are flagged with a “*.”

28.9.6.1. If the majority of the analytes in an LCS fail, or if common target analytes fail, a re-extraction of the batch should be initiated.

28.9.6.2. If an analysis is consistently failing LCS recoveries, corrective action should be taken to address the root cause of the failures.

28.9.6.3. Analyte(s) that have high biased failures in the LCS do not need to be flagged if the analyte(s) in the corresponding samples are non-detect (ND).

28.10. Matrix Spikes and Matrix Spike Duplicates

28.10.1. Matrix Spikes and Matrix Spike Duplicates (MS/MSD) are environmental samples fortified with a known amount of analyte to help assess the effect of the matrix on method performance.

28.10.2. The laboratory procedure for MS/MSD includes spiking appropriate analytes at appropriate concentrations, calculating percent recoveries and relative percent difference (RPD), and evaluating and reporting the results. The procedure can be found in each method SOP. Calculations can be found in Appendix G.

28.10.3. Where there are no established criteria, the laboratory may set the percent recovery limits to 70-130% and the RPD limits to 30% until there is enough data to run control charts.

28.10.4. For MS/MSD results outside established criteria, corrective action may be documented or the data is reported with appropriate data qualifying codes. Only the data from the spiked sample is qualified with an "S."

28.10.4.1. If an analysis is consistently failing MS/MSD recoveries and it has been determined that sample matrix is not a factor, corrective action should be taken to address the root cause of the failures.

28.11. Batch Duplicates/Replicates

28.11.1. Duplicates and/or replicates (DUP/REP) are analyzed at a frequency mandated by analytical methods. They are prepared in the same way as their parent sample as a way to measure batch precision. Precision is measured as relative percent difference (RPD).

28.11.2. Where there are no established criteria, the laboratory may set the RPD limits to 30%. When there is enough data, the laboratory may choose to run control charts to set RPD limits.

28.11.3. For duplicate RPD results outside established criteria, corrective action may be documented or the data is reported with appropriate data qualifying codes. Only the DUP or REP will be qualified with an "R."

28.11.3.1. Low level detections of a target analyte may result in high RPD values. In these cases, qualified data may be deemed acceptable.'

28.11.3.2. If an analysis is consistently failing DUP RPDs, and it has been determined that the sample matrix is not a factor, corrective action should be taken to address the root causes of the failures.

28.12. Surrogate Spikes

28.12.1. Surrogate spikes are substances with chemical properties and behaviors similar to the analytes of interest used to assess method performance in individual samples. Surrogates are added to all samples (in test methods where surrogate use is appropriate) prior to sample preparation or extraction, with the exception of VOC and TO-15 analysis where surrogate is added automatically by the autosamplers and preconcentrators, respectively.

28.12.2. Surrogate recovery results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory uses 70-130% as surrogate recovery limits until there is enough data to run control charts. Omega flags surrogates with an "S" when they fall outside established acceptance criteria.

28.12.3. For surrogate results outside established criteria, data is evaluated to determine the impact. Corrective actions may include control charting, re-run, re-extraction, or qualifying the data as appropriate.

28.12.3.1. If an analysis is consistently failing surrogate recoveries and it has been determined that sample matrix is not a factor, corrective action should be taken to address the root cause of the failures.

28.13. Proficiency Test Samples

28.13.1. Compliance to Accreditation Requirements

28.13.1.1. The laboratory analyzes at least two TNI-compliant PT samples per calendar year for each analyte-matrix-method for which the laboratory is accredited.

28.13.1.1.1. For DoD accreditation, if a PT is not available for a specific analyte-matrix-method combination, FAI will employ an in-lab PT procedure that evaluates performance based on repeatability. The FAI PT procedure is outlined in SOP86.

28.13.1.2. The successive PTs are analyzed at least five months apart and no more than 7 months apart unless the PT is being used for corrective action to maintain or reinstate accreditation, in which case the dates of successive corrective action PT samples for the same accreditation is at least fifteen days apart.

28.13.1.3. For analyses that only have WADOE accreditation, only one PT is required to be run per accreditation year. Make-up PTs must be analyzed within 30 days of unacceptable results.

28.13.1.4. An exception is made for analytes where there is no PT available from any PTPA approved PT provider within the year. In these cases, the lab will run the PTs in the minimum time frame the PTs are available and not at all if they are not available (TNI and WADOE only).

28.13.2. PT Sample Handling, Analysis and Reporting

28.13.2.1. The laboratory does not share PT samples with other laboratories, does not communicate with other laboratories regarding current PT sample results, and does not attempt to obtain the assigned value of any PT sample from the PT provider.

28.13.2.2. Proficiency Testing (PT) samples are treated as typical samples in the normal production process where possible, including the same analysts, preparation, calibration, quality control and acceptance criteria, sequence of analytical steps, number of replicates, and sample log-in. PT samples are not analyzed multiple times unless routine environmental samples are analyzed multiple times. Where PT samples present special conditions in the analysis process, they will be treated as laboratory samples where clients have special requests.

28.13.2.3. If PT Samples cannot be included within an analytical batch containing client samples, then the PT sample can be used as quality assurance samples (sample duplicate) if sufficient volume is supplied. In cases where sufficient volume of the PT sample is not provided, then an LCS/LCS Duplicate may be substituted if approved by the Laboratory Director or QAM.

28.13.2.4. The type, composition, concentration and frequency of quality control samples analyzed with the PT samples are the same as with typical samples.

28.13.2.5. Prior to the closing date of a study, laboratory personnel do not:

- Subcontract analysis of a PT sample to another laboratory being run for accreditation purposes.
- Knowingly receive and analyze a PT for another laboratory being run for accreditation purposes.
- Communicate with an individual from another laboratory concerning the analysis of the PT sample.
- Attempt to find out the assigned value of a PT from the PT Provider.

28.13.2.6. PT results are imported into Omega and verified. The Omega report is then used to fill out the PT provider’s forms.

28.13.2.6.1. It is important that the correct method and analyte codes that correspond to each scope be reported. If they are not, Accrediting Bodies may consider the PT a deficiency. There may be occasions where PTs must be reported multiple times due to varying method/analyte codes between accreditation scopes.

28.13.2.6.2. PTs will be reported to the Proficiency Test Reporting Limit (PTRL) as given by PT providers. These PTRLs are taken from the Field of Proficiency Test (FoPT) tables developed by TNI. Results will be deemed unacceptable if the lab reports non-detects for PTs with detections below the lab RL but above the PTRL. Project logins for PT may be used in order to ensure the lab reports to the correct PTRL. If project logins are used, it is the QAM's responsibility to maintain the PTRLs listed in each test code.

28.13.2.7. The laboratory institutes corrective action procedures for failed PT samples following the guidelines in Section 15 – "Corrective Action".

28.13.2.8. Retention of PT records is similar to that maintained for regular environmental samples. In addition, the lab maintains a copy of the online data entry summary when the PT results are submitted online.

28.14. Data Review

28.14.1. The laboratory reviews all data generated in the laboratory for compliance with method, laboratory and, where appropriate, client requirements.

28.14.2. An electronic data file is generated by the instrument and saved on computer network. The data file is loaded into LIMS. During data processing the program checks quality control measurements for acceptability. Quality control analyses that do not meet the quality control criteria are flagged. This data is checked by the analyst to ensure that a narrative is provided and the appropriate flag is attached.

28.14.3. Any data that does not meet quality assurance criteria is either re-analyzed or flagged.

28.14.4. When the analyst has finished the primary analysis review they fill out a reporting checklist and turns it in to their laboratory manager who checks for the following items:

- All required information has been recorded on the bench sheet and reporting checklist.
- QC criteria have been met or exceptions are documented in the comments section of the reporting checklist.
- Manual calculations are checked for accuracy.

28.14.5. When these checks have been completed, the reviewer signs and dates the reporting checklist to document that the review has been performed.

28.14.6. Once all analyses for a project have been completed the folder with the raw data is turned into the Project Manager or Lab Director for the final report. Data is reviewed again for completeness and accuracy, then the final report is generated.

28.14.7. The QAM, or designee, reviews a minimum of 10% of all DoD data packages for completeness and accuracy either prior to, or after reporting. Findings from these reviews are recorded and brought to the attention of the management team so appropriate action can be taken.

29. REPORTING THE RESULTS (TNI V1:M2 – SECTION 5.10)

29.1. The result of each test performed is reported accurately, clearly, unambiguously, and objectively and complies with all specific instructions contained in the test method.

29.2. Laboratory results are reported in a test report that includes all the information requested by the client and necessary for the interpretation of the test results and all information required by the method used.

29.3. Data are reported without qualification if the results are within the working range of the instrument, and without compromised sample or method integrity.

29.4. Test Reports

29.4.1. The report format has been designed to accommodate each type of test performed and to minimize the potential for misunderstanding or misuse.

29.4.2. The laboratory does not issue multiple reports for the same samples where there is different information on each report unless required to meet regulatory needs and approved by the Lab Director.

29.4.3. Each test report generated contains the following information:

- A title, such as Analytical Report
- The name and address of the laboratory
- Unique identification of the test report, such as a Work Order
- A pagination system that ensures that each page is recognized as part of the test report and a clear identification of the end of the report, such as “3 of 10”
- The name and address of the client
- The identification of the method(s) used
- A description, the condition, and unambiguous identification of the sample(s) tested, including the client identification code
- The date of sample receipt when it is critical to the validity and application of the results
- The date and time of sample collection (if not provided, the lab assumes a sample collection time of midnight on the day of sampling)
- The date and time the tests were prepared/analyzed, at minimum for tests with a required holding time of less than 72 hours
- The time of sample preparation (DoD reports only)
- Reference to the sampling plan and procedures used by the laboratory where these are relevant to the validity or application of the results
- Case narrative
- The test results, units of measurement, an indication of when results are reported on any basis other than as received (e.g. dry weight), failures identified
- A list of laboratory qualifiers
- QC report (MB; LCS/MS/MSD/Surrogate %recovery, acceptance criteria, etc.)
- The name, function, and signature or an equivalent electronic identification of the person authorizing the test report, and the date of issue
- Where relevant, a statement to the effect that the results relate only to the samples
- Any non-accredited tests or parameters shall be clearly identified as such to the client when claims of accreditation to this Standard are made in the analytical report or in the supporting electronic or hardcopy deliverables
- The date of issuance
- Chain of Custody

29.5. Supplemental Test Report Information

29.5.1. When necessary for interpretation of the results or when requested by the client, test reports include the following additional information:

- Deviations from, additions to, or exclusions from the test method, information on specific test conditions, such as environmental conditions, and any non-standard conditions that may have affected the quality of the results, and any information on the use and definitions of data qualifiers
- A statement of compliance/non-compliance when requirements of the management system are not met, including identification of test results that did not meet the laboratory and regulatory sample acceptance requirements, such as holding time, preservation, etc.
- Where applicable and when requested by the client, a statement on the estimated uncertainty of the measurement

29.5.2. Where appropriate and needed, opinions and interpretations may be required. When opinions and interpretations are included, the basis upon which the opinions and interpretations are documented. Opinions and interpretations are clearly marked as such in the test report in the case narrative section

- Opinions and interpretations included in a test report may comprise, but not be limited to, the following:
  - ○ An opinion on the statement of compliance/noncompliance of the results with requirements
  - ○ Fulfillment of contractual requirements
  - ○ Guidance to be used for improvements
    - Additional information which may be required by specific methods or client
    - Qualification of results with values outside the calibration range as appropriate

29.5.3. In addition to the items above, for test reports that contain the results of sampling, the following is provided when necessary for the interpretation of the results:

- The date of sampling
- Unambiguous identification of the material sampled
- The locations of the sampling, including diagrams, sketches, or photographs
- A reference to the sampling plan and procedures used
- Details of any environmental conditions during sampling that may affect the interpretations of the test results
- Any standard or other specification for the sampling method or procedure, and deviations, additions to or exclusions from the specification concerned

29.6. Environmental Testing Obtained from Subcontractors

29.6.1. Test results obtained from tests performed by subcontractors are clearly identified on the test report by subcontractor name and/or accreditation number.

29.6.2. The subcontractors report their results in writing or electronically. A copy of the subcontractors report is made available to the client if requested.

29.6.3. The actual report received from the subcontractor on their letterhead with the test result is provided to the client.

29.7. Electronic Transmission of Results

29.7.1. All test results transmitted by telephone, fax, telex, e-mail, or other electronic means comply with the requirements of the TNI Standard and associated procedures to protect the confidentiality and proprietary rights of the client (see Section 23- “Environmental Methods and Method Validation”).

29.8. Electronic Data Deliverables (EDDs)

29.8.1. The Omega LIMS produces an electronic data file; this file may be produced at the same time as the final report.

29.9. Amendments to Test Reports

29.9.1. Material amendments to a test report after it has been issued are made only in the form of another document or data transfer. All supplemental reports meet all the requirements for the initial report and the requirements of this Quality Manual.

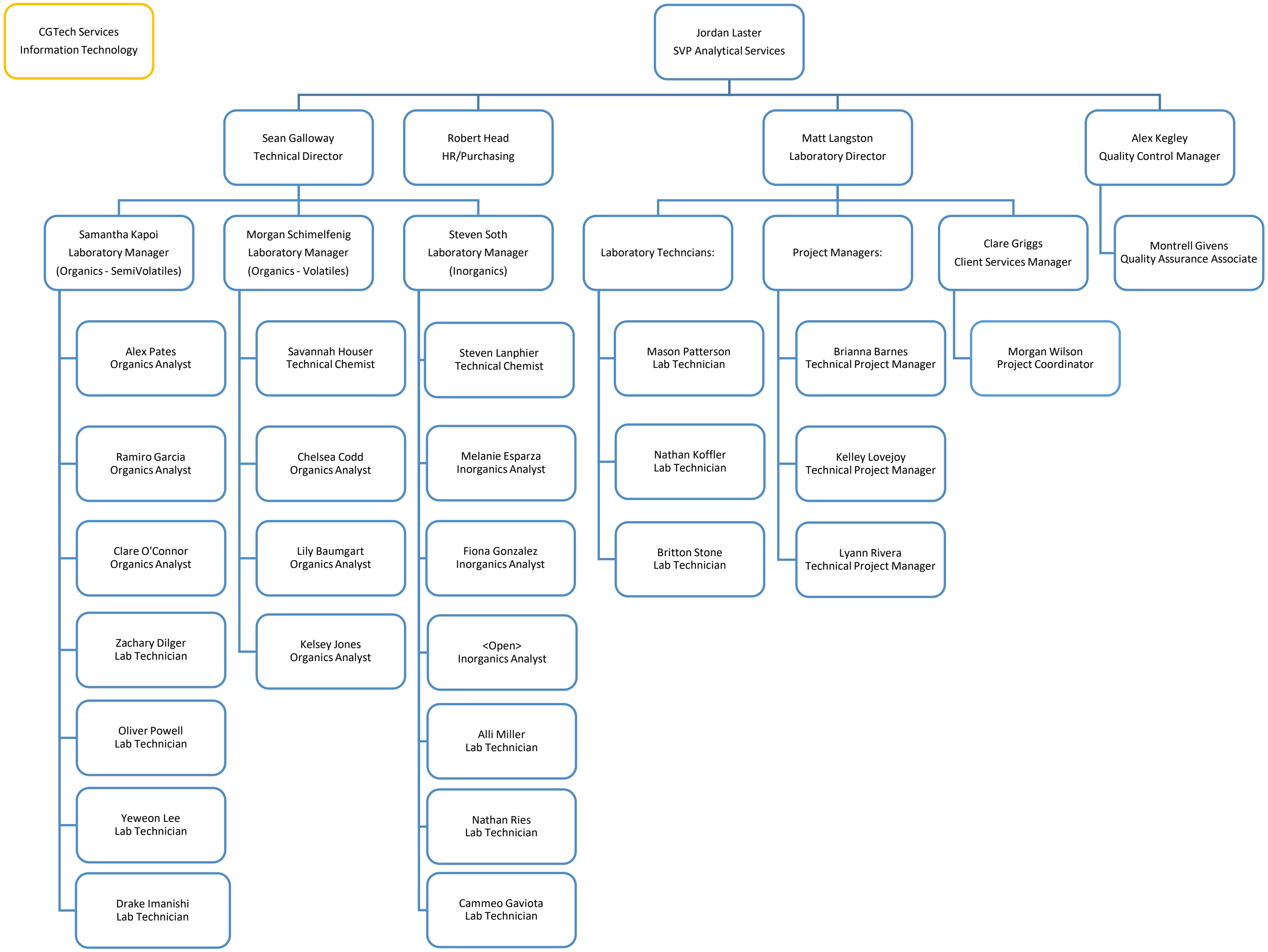
29.9.2. When it is necessary to re-issue a report, the new report is uniquely identified and contains a reference to the original that it replaces. All prior versions are considered “voided”.

29.9.3. A revision note must be included in the case narrative describing why the revision occurred.

30. CHANGES SINCE LAST REVISION

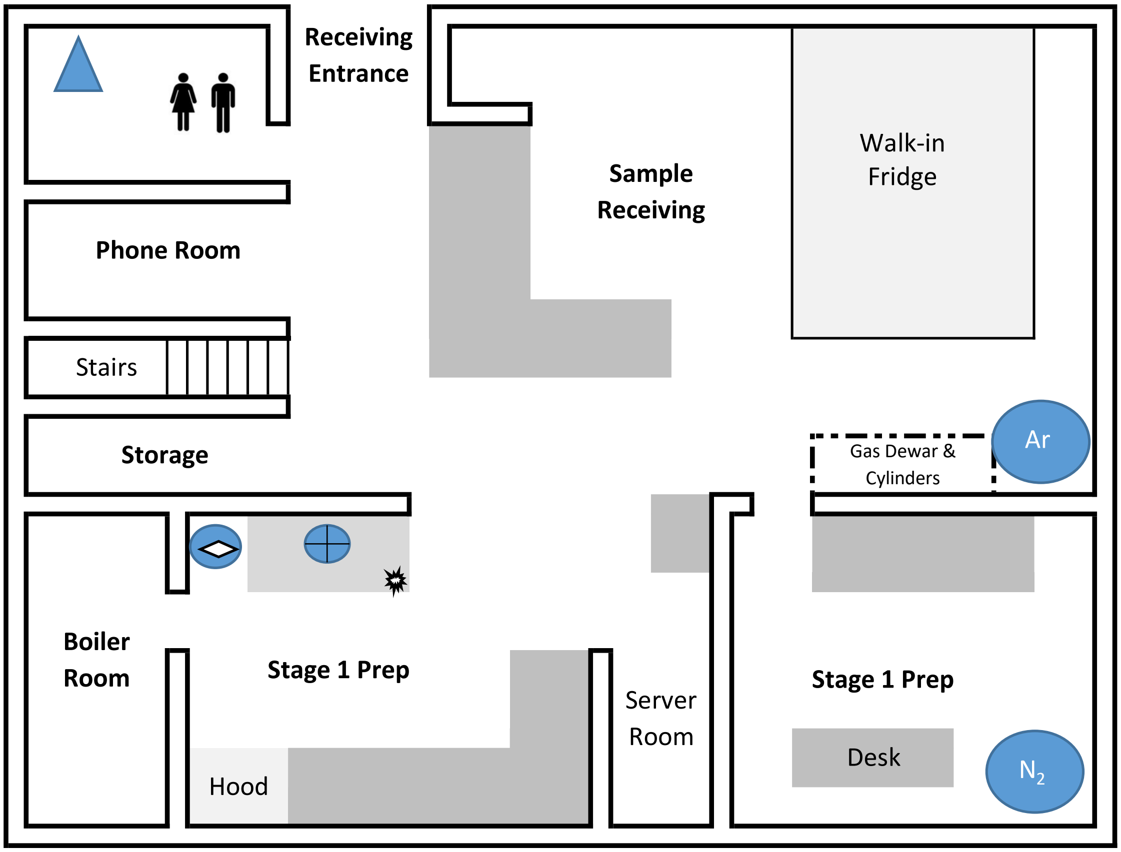
30.1.1. Updated containers in Table 6

Contractors



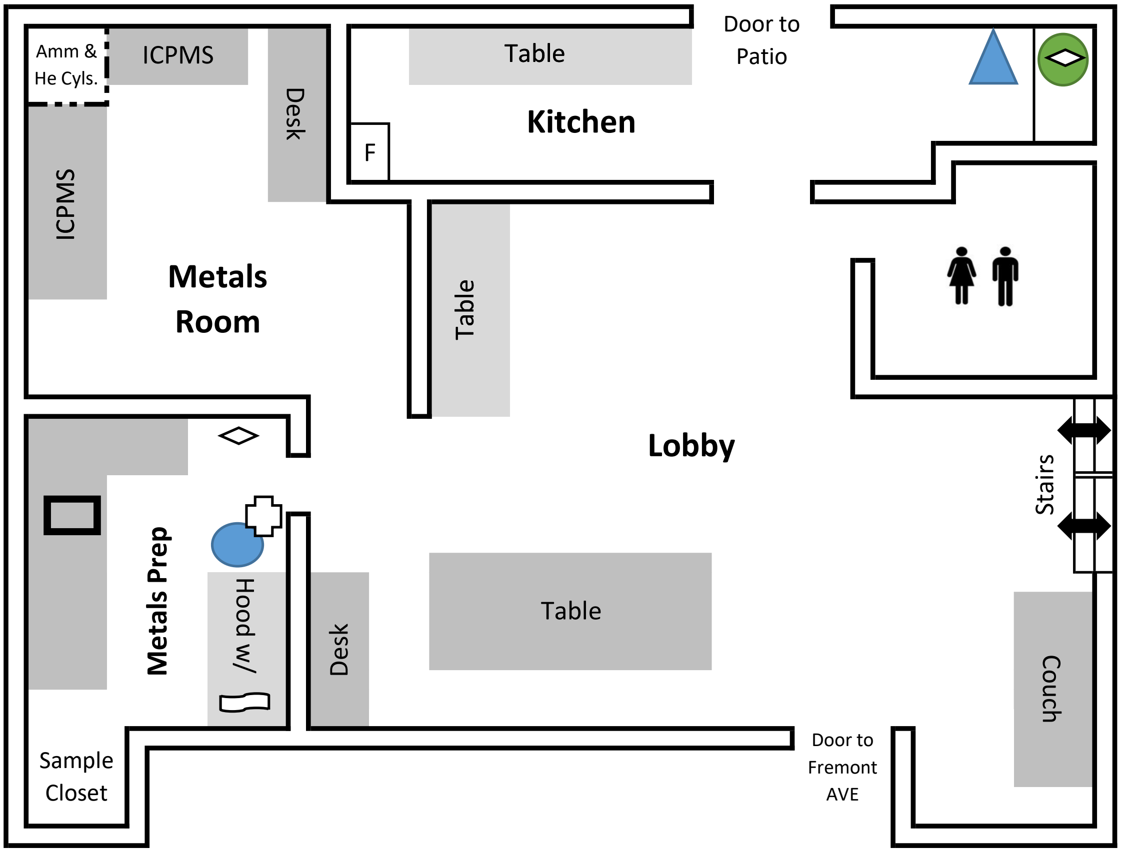
Signature:

3600 Fremont AVE N - Lower Level



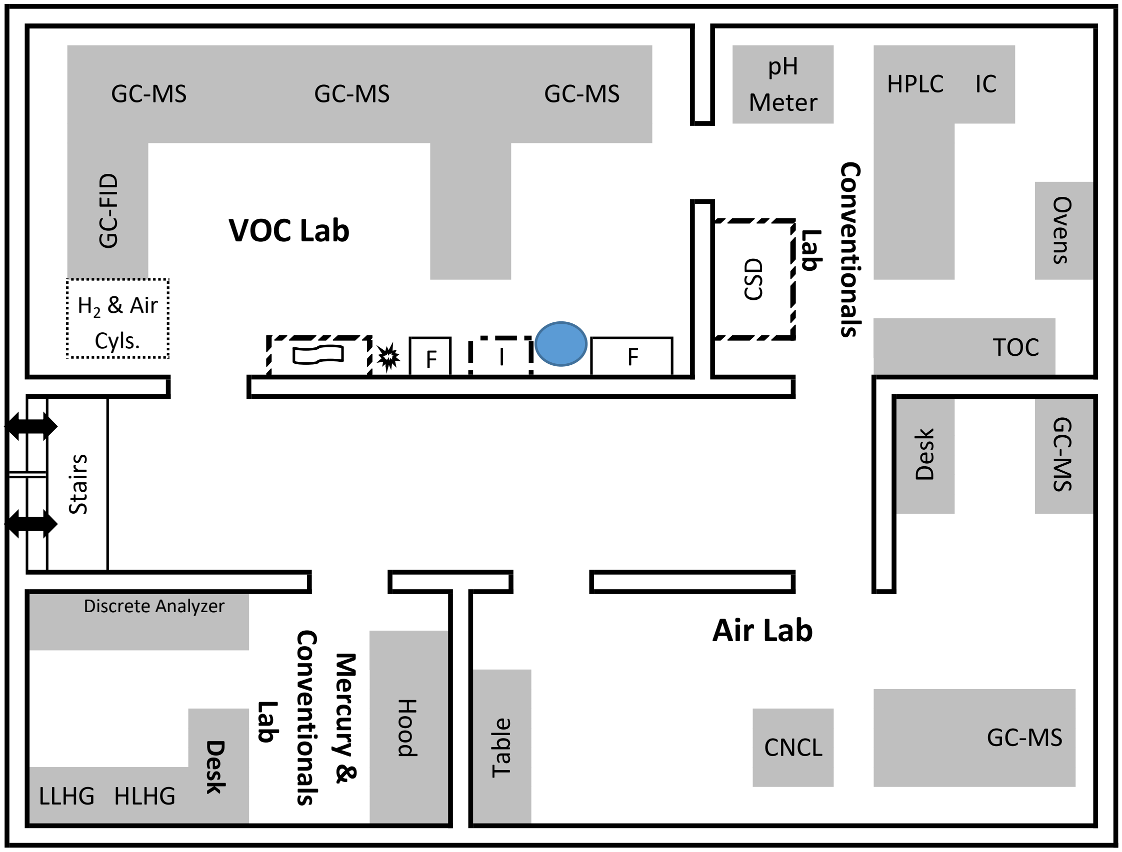
Symbol	Meaning	Symbol	Meaning
◇	DI Faucet with Eyewash	Ar	Argon Bulk Tank
⊕	DI Water System	N_2	Liquid Nitrogen Bulk Tank
▲	Shower	■	Bench/Counter Space
✸	Fire Extinguisher	🚻	Restroom

Mezzanine Floor Plan 3600 Fremont AVE N



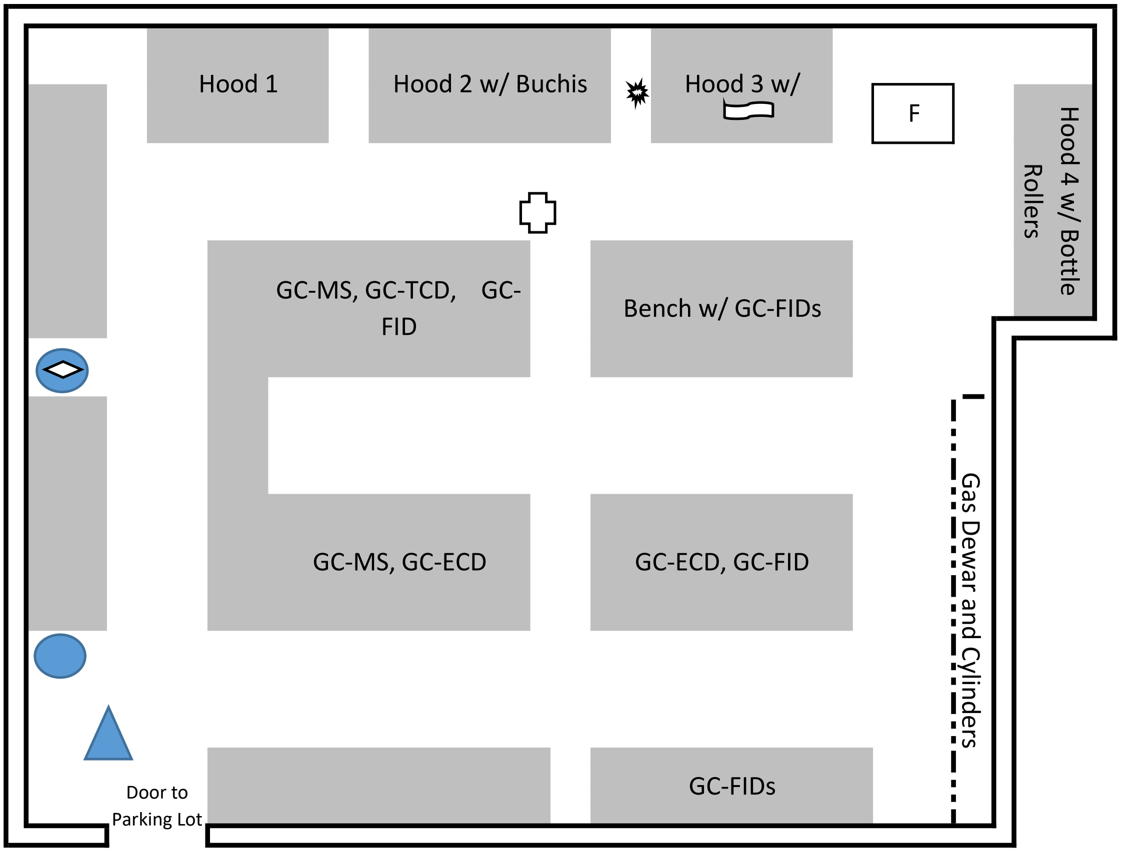
Symbol	Meaning	Symbol	Meaning
✚	Fire Blanket	▲	Safety Shower
◇	Eyewash Station	🚻	Restroom
●	DI Faucet	■	Bench Space
F	Fridge	▭	Autoclave (under bench)
▭	Flammable Cabinet (under hood)	●	Sink

3600 Fremont AVE N - Upper Level



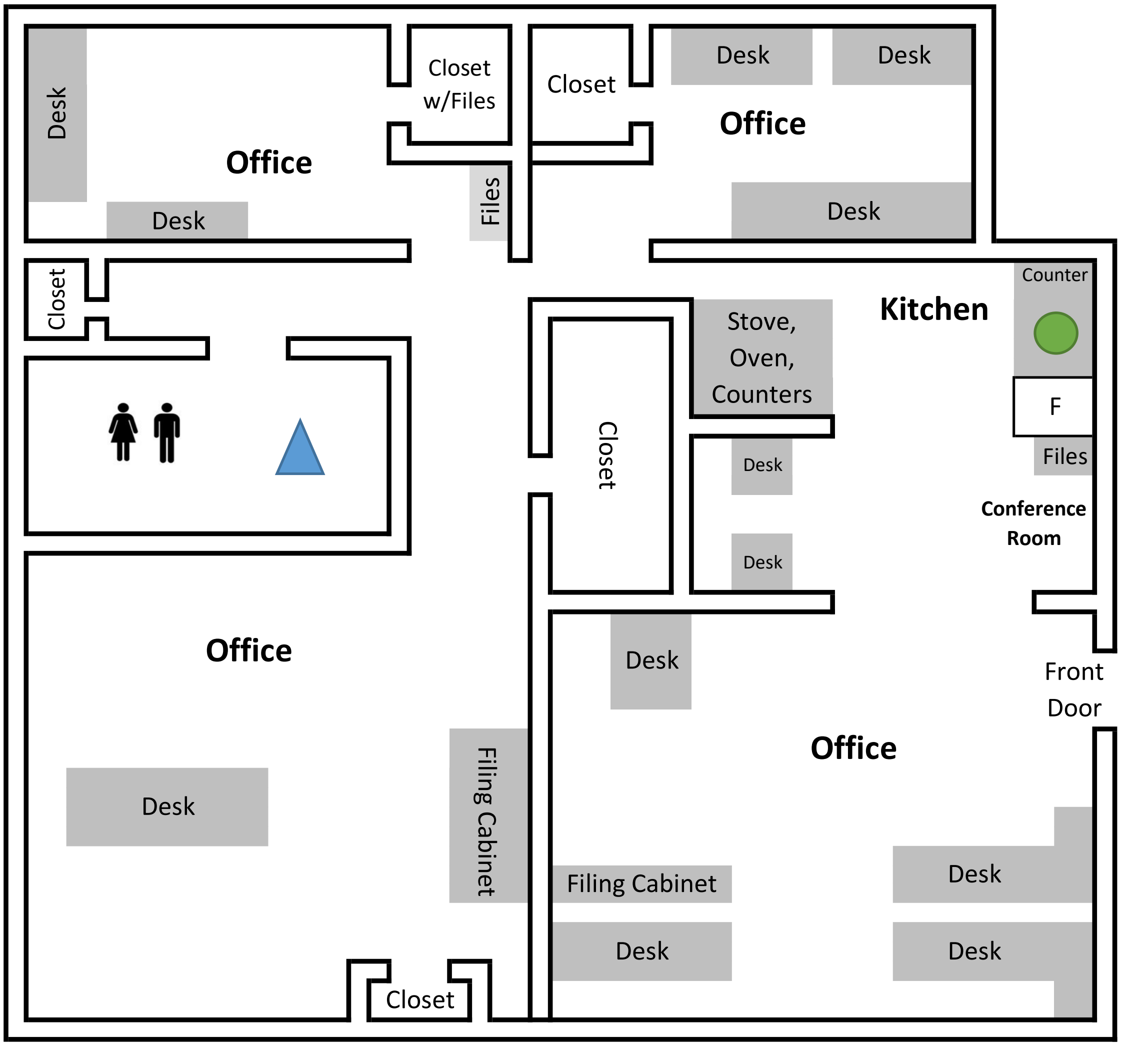
Symbol	Meaning	Symbol	Meaning
▭	Flammable Cabinet	●	DI Faucet
F	Fridge	CSD	Chemical Storage and Desiccators
I	Coliform Incubators	▨	Bench Space
✸	Fire Extinguisher		

3608 N. 36th St. - Organic Extractions and Analysis



Symbol	Meaning	Symbol	Meaning
●	DI Faucet	✚	Fire Blanket
◈	DI Faucet with Eyewash	▭	Flammable Cabinet (under hood)
F	Fridge	✹	Fire Extinguisher
▲	Safety Shower	■	Bench Space

3612 Fremont AVE N - Admin Offices



Symbol	Meaning
🚻	Restroom
▲	Shower
F	Fridge
●	Sink

Appendix C
Methods and SOPs

METALS ANALYTES		
Parameter/Analyte	**Methodology**	**SOP#**
Acid Digestion – Aqueous	EPA 3010A	SOP22
Acid Digestion – Solid	EPA 3050B	SOP23
Cold Vapor Mercury	EPA 245.1	SOP29
Cold Vapor Mercury – Aqueous	EPA 7470A	SOP29
Cold Vapor Mercury – Soil	EPA 7471A	SOP29
ICP/MS Metals	EPA 200.8	SOP28
ICP/MS Metals	EPA 6020B	SOP31
Atomic Fluorescence	EPA 1631E	SOP30

INORGANIC ANALYTES		
Parameter/Analyte	**Methodology**	**SOP#**
Alkalinity	SM 2320 B	SOP75
Ammonia ISE	SM 4500-NH_3 E	SOP79
Ammonia Phenate	SM 4500-NH_3 G	SOP80
Anions	EPA 300.0	SOP68
Bulk Density	ASTM D5057	SOP42
Biological Oxygen Demand (BOD)	SM 5210B	SOP9
Cation Exchange Capacity (CEC)	EPA 9081	SOP32
Chemical Oxygen Demand (COD)	SM 5220 D	SOP83
Cyanide, Total	SM 4500-CN C/E	SOP82
Dissolved Organic Carbon (DOC)	SM 5310 C	SOP74
Fecal Coliform	Colilert 18	SOP89
Ferrous Iron	SM 3500 Fe B	SOP78
Flashpoint/Ignitability	ASTM D93/EPA1010	SOP43
Grainsize/Particle Distribution	ASTM D422	SOP41
Hexavalent Chromium (Cr^{6+})	EPA 7196/SM3500 Cr B	SOP71
Microbiology QC	SM 9223B / Colilert 18	SOP 87
Oil & Grease, Hexane Extractable Material (HEM)	EPA 1664A	SOP70
Organic Matter	ASTM 2974	SOP40
pH – Soils/Wastes	EPA 9045D	SOP72
pH – Waters	SM 4500-H^+ B	SOP72
Phosphorus, Total	EPA 365.3	SOP69
Specific Conductance/Salinity	SM 2510 B/2520 B	SOP76
Sulfide, Total	SM 4500-S^{2-} F	SOP81
Total Dissolved Solids (TDS)	SM 2540 C	SOP77
Total Organic Carbon (TOC) – Water	SM 5310 B	SOP74

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Total Organic Carbon (TOC) – Soil	EPA 9060	SOP75
Total Settleable Solids	SM 2540 F	SOP77
Total Solids (TS)	SM 2540 B	SOP77
Total Suspended Solids (TSS)	SM 2540 D	SOP77
Turbidity	SM 2130 B	SOP67
Total Coliform	SM 9223B	SOP88
Volatile Solids/Fixed Solids	SM 2540E	SOP77

ORGANIC ANALYTES

Parameter/Analyte	**Methodology**	**SOP#**
Chlorinated Herbicides by GC/ECD	EPA 8151A	SOP24
Chlorinated Pesticides by GC/ECD	EPA 8081B/608.3	SOP14
Diesel and Heavy Oil	NWTPH-Dx / EPA 8015C / AK102 / AK103	SOP16
Gasoline Range Organics	NWTPH-Gx / EPA 8015C / AK101	SOP18
Methane, Ethane, Ethene, Acetylene in-Water by GC/FID	RSK-175	SOP20
PCBs by GC/ECD	EPA 8082A/608.3	SOP15
Semi-Volatile Organics (SVOC)	EPA 8270D/E/625.1	SOP26
Total Extractable Petroleum Hydrocarbons (EPH)	NWTPH-EPH	SOP17
Volatile Organics (VOC)	EPA 8260C/D/624.1	SOP25
Volatile Petroleum Hydrocarbons (VPH)	NWTPH-VPH	SOP19
Ethylene Dibromide and 1,2-Dibromo-3-Chloropropane	EPA 8011	SOP12

Organic Preparation

Parameter/Analyte	**Methodology**	**SOP #**
Aqueous Extractions by Separatory Funnel	EPA 3510C	SOP35
Bottle Roller Liquid-Liquid Extraction	EPA 3510C	SOP33
Solvent Concentration	EPA 3510C	SOP34
Soil Extractions by Sonication	EPA 3550C	SOP38
PCB Cleanup: Sulfuric Acid, Florisil®, TBA	EPA 3665A, 3620C, 3660B	SOP39
Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311	SOP84
Purge and Trap and Extraction for Soil VOC Samples	EPA 5035A	SOP37
Purge and Trap for Aqueous VOC Samples	EPA 5030B	SOP36

Air Analytes

Parameter/Analyte	**Methodology**	**SOP #**
TO-15	EPA TO-15	SOP27
Sulfur Analysis	ASTMD5504/ EPA TO-15	SOP27
Siloxanes Analysis	EPA TO-15	SOP27
Major Gases and Helium	EPA 3C/3C MOD	SOP11

Signature

Appendix D

Data Qualifiers

*****	Flagged value is not within established control limits.
A	Analysis or analyte is accredited by entity other than DoD/ELAP
B	Analyte detected in the associated Method Blank
BT	Breakthrough fraction
D	Dilution was required
E	Value above quanititation range
H	Holding times for preparation or analysis exceeded
I	Analyte with an internal standard that does not meet established acceptance criteria
J	Analyte detected below quantitation limits
MDL	Analyte reported to the Method Detection Limit (MDL)
N	Tentatively Identified Compounds
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD).
Q+	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD) – High bias.
Q-	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD) – Low bias.
S	Spike recovery outside accepted recovery limits
SGT	Silica gel treatment
R	RPD outside accepted recovery limits
ND	Not detected at the Reporting Limit
TNTC	Too numerous to count
U	Analyte detected below MDL

Signature:

APPENDIX E: CHEMISTRY – METHOD VALIDATION

Revision History

v1.0	April 8, 2013	Initial Document – M. Clements
v1.2	June 4, 2013	Edits and Revisions – M. Clements
v1.3	March 4, 2016	Edits and Revisions – N. Masters
v1.4	October 30, 2017	Edits and Revisions – E. Mar
v1.5	April 12, 2018	Edits and Revisions – E. Mar
v1.6	April 2, 2019	Edits and Revisions – E. Mar, S. Galloway
v1.7	April 27, 2020	Edits and Revisions – S. Galloway, M. Langston, E. Mar

Table of Contents

1. QUALIFICATION AND CALIBRATION OF INSTRUMENTATION

1.1. Section 24.4 of the QA Manual includes information on calibration of support equipment. This section covers calibration of analytical equipment.

1.2. Initial instrument calibration and continuing instrument calibration verification are an important part of ensuring data of known and documented quality. If more stringent calibration requirements are included in a mandated method or by regulation, those calibration requirements override any requirements outlined here or in laboratory SOPs. Generally, procedures and criteria regarding instrument calibrations are provided in each test SOP.

1.3. New Instrument Qualification

1.3.1. When qualifying a new instrument, it is important to verify that it produces data that meet the criteria of the method it is designed to test.

1.3.2. A plan is generated that addresses any benchmarks the instrument needs to meet both specific and general. Involve anyone who will work with the instrument in designing the plan. The plan is reviewed by the Technical Director before qualification testing begins.

1.3.2.1. The plan includes specific criteria and tests used to evaluate them.

1.3.2.2. Set a timeline for completion.

1.3.2.3. Assign a person to be the leader of the qualification process. They are responsible for ensuring continued forward progress, working through emergent issues, and keeping the plan on track. Usually this is the department manager.

1.3.2.4. When the instrument qualification plan is completed, it is reviewed by the Technical Director for completeness. Once approved, testing can begin. The data produced during testing is clearly documented and attached to the instrument in Omega for traceability.

1.3.3. Common areas to include in an instrument qualification plan

1.3.3.1. Interferences

1.3.3.1.1. Ensure that a blank (including all potential sources of contamination) produces a signal low enough as to not interfere with sample quantitation.

1.3.3.1.2. If interferences are seen, work to isolate the contributing factor and reduce or eliminate the issue.

1.3.3.2. Accuracy

1.3.3.2.1. Calibrate the instrument and show that the instrument can properly assess the concentration of a known standard by relating the response to that initial calibration.

1.3.3.2.2. The acceptance criteria to evaluate that recovery will vary depending on the method used. Refer to the appropriate SOP for more guidance.

1.3.3.3. Precision

1.3.3.3.1. Evaluate the instrument's ability to reproducibly generate a signal when given the same input multiple times.

1.3.3.3.2. Usually this is done by comparing the results of a mid-range calibration standard ran 4 times consecutively.

1.3.3.3.3. The acceptance criteria to evaluate that precision will vary depending on the method used. Refer to the appropriate SOP for more guidance.

1.3.3.4. Sensitivity

1.3.3.4.1. Instrument detection level is the concentration at which the instrument produces a signal 3X that of a blank matrix.

1.3.3.4.2. Ensure the settings used allow for an instrument detection limit that is low enough to produce usable data for client samples.

1.3.3.4.3. Refer to the appropriate SOP, client permits, and EPA regulations when evaluating the suitability of the instrument detection limit.

1.3.4. Once all necessary data has been collected, the results are summarized on the plan document, and submitted to the technical director for review. After approval, the plan will be attached to the instrument in Omega and the instrument may be used to analyze client samples.

1.4. Initial Instrument Calibration

1.4.1. Prior to bringing an instrument online, the instrument must be calibrated to demonstrate sensitivity and linearity. Sample analysis may not occur until the instrument is properly calibrated.

1.4.2. Records

1.4.2.1. Initial instrument calibration includes calculations, integrations, acceptance criteria, and associated statistics referenced in the test method SOP .

1.4.2.2. Sufficient raw data records are collected to allow reconstruction of the initial instrument calibration. These include, at a minimum, calibration date, test method, instrument, analysis date, analyte names, analysts signature or initials, concentration and response, calibration curve or response factor, or unique equation or coefficient used to reduce instrument responses to concentration.

1.4.3. Number of Standards and Concentrations

1.4.3.1. If the reference or mandated method does not specify the number of calibration standards to use, the minimum number is three, not including blanks or a zero standard.

1.4.3.2. For instrumentation where single point calibration is recommended by manufacturer's instructions, such as with some ICP and ICP/MS technologies (with a zero and single point calibration), the following apply:

- For single point plus zero blank calibrations, the zero point and the single point standard are analyzed prior to the analysis of samples, and the linear range of the instrument established by analyzing a series of standards, one of which is at the lowest quantitation level.
- Zero blank and single point calibration standards are analyzed with each analytical batch for methods where they are specified.
- A standard corresponding to the limit of quantitation is analyzed with each analytical batch and must meet established acceptance criteria when using single point plus zero blank calibrations.
- The linearity of single point plus zero blank calibrations is verified at a frequency established by the method or the manufacturer.

1.4.3.3. The lowest calibration standards is the lowest concentration for which quantitative results can be reported without qualification.

1.4.3.4. The highest calibration standard is the highest concentration for which quantitative results can be reported. Data reported exceeding the highest calibration standards without dilutions is considered to have increased uncertainty and are reported with a qualifier code or diluted and reanalyzed.

1.4.3.4.1. For ICP-MS, a Linear Dynamic Range (LDR) study may be done so that data may be reported up to the top of the LDR.

1.5. Continuing Instrument Calibration

1.5.1. Records

1.5.1.1. The calculations and associated statistics for continuing instrument calibration are included or referenced in the test method SOP.

1.5.1.2. Sufficient raw data records are retained to allow reconstruction of the continuing instrument calibration verification. Continuing instrument calibration verification records connect the continuing verification date to the initial instrument calibration.

1.5.2. Frequency

1.5.2.1. Calibrations are performed whenever it is expected that the analytical system may be out of calibration or might not meet continuing calibration verification (CCV) acceptance criteria.

1.5.2.2. Calibrations are verified for each compound, element, or other discrete chemical species by running a mid-point calibration standard prior to running an analytical batch. For multi-component analytes such as aroclors, chlordane, toxaphene, or total petroleum hydrocarbons, a representative chemically related substance or mixture is used.

1.5.2.3. Calibration verifications (CCVs) are performed:

- At the beginning and end of each analytical batch. Unless it is a DoD project, methods employing internal standards are only required to run one CCV at the beginning of an analytical batch. Some methods require more frequent CCVs. Many inorganic methods require a CCV to be analyzed after every 10 samples.
- When the time period for calibration or the most recent calibration verification has expired.

1.6. Evaluation, Verification, and Corrective Action

1.6.1. Criteria for the acceptance of an instrument calibration is established and defined in each method SOP. The criteria used are appropriate to the calibration technique.

1.6.1.1. Calibration points are not dropped from the middle of the curve unless the cause is determined and documented. If cause is determined and points in the middle are dropped, that same point must be dropped from all analytes. If the cause is not determined, the calibration curve is re-prepared.

1.6.1.2. If the low or high calibration point is dropped from the curve, the working curve is adjusted and sample results outside the curve are qualified as estimates.

1.6.2. Instrument calibrations are verified with a standard obtained from a second source standard. This may be from a different lot of the same standard used to calibrate, or from a standard from a completely different source. Acceptance criteria for initial calibration verifications (ICV) are listed in each method SOP as well as in LIMS.

1.6.3. Where appropriate, the laboratory has manual integration procedures (*SOP52*), which are adhered to when evaluating calibration data.

1.6.4. Any samples that are analyzed after an unacceptable initial calibration are re-analyzed. If data must go out to clients, the data will be qualified. (See Section 13 – Control of Nonconforming Environmental Testing”).

1.6.4.1. Corrective actions are performed when the initial calibration results are outside acceptance criteria.

1.6.5. Acceptance criteria for CCVs are listed in each method SOP as well as in LIMS.

1.6.6. When a CCV falls outside of acceptance criteria, two additional, consecutive CCVs may be analyzed immediately (within one hour) and prior to the analysis of any client samples. Both of these CCVs must meet acceptance criteria in order for the samples to be reported without re-analysis.

1.6.6.1. Corrective actions are initiated for CCV results that are outside of acceptance criteria (Ex. Performance maintenance, new calibration).

1.6.7. For any samples analyzed on a system with an unacceptable calibration or CCV, some results may be usable if they fall under the following conditions:

- If the acceptance criteria are exceeded high (high bias) and the associated samples are below detection, those sample results that are non-detects may be reported as un-qualified non-detects.
- If the acceptance criteria are exceeded low (low bias) and there are samples that exceed the maximum regulatory limit, those exceeding the regulatory limit may be reported with qualifiers.

2. NEW METHOD QUALIFICATION

2.1. If the lab wishes to update an existing method to a more current revision or run a new method, the following must take place:

2.1.1. The Lab Director, Technical Director, and Quality Assurance Manager must approve of the change.

2.1.2. SOPs must be updated, or if it is a new method, created.

2.1.3. In order to apply for accreditation for the new/updated method, the lab will also be required to analyze and pass two PT studies prior to application with accrediting bodies.

2.2. When changing existing, qualified parameters on an instrument, requalification could be necessary.

2.2.1. Review the proposed changes with the Technical Director. They will dictate the extent of the requalification process based on the changes. The requalification will follow the structure of the new instrument qualification process outlined above in section 1.3 with possible omissions of unaffected instrument qualities.

3. MDL, LOD, LOQ

3.1. Reference methods are further validated by determining the Method Detection Limit (MDL), Limit of Detection (LOD), and Limit of Quantitation (LOQ). These procedures are summarized below and described in *SOP53*.

3.1.1. MDL/LOD/LOQs are verified for each quality system matrix/technology/analyte combination.

3.1.2. In addition, the action level (compliance level, project decision level, etc) may be used to establish the LOD, LOQ, and Practical Quantitation Limit (PQL/RL).

3.1.3. For tests that do not have DoD accreditation, the LOD and LOQ verification/determination will be performed annually.

3.1.4. For tests that do have DoD accreditation, the LOD and LOQ verification will be performed quarterly.

3.1.5. For all tests, 2 MDL samples will be analyzed quarterly. The final MDL study will be compiled after 12 months. If there are no samples for a given test in a given quarter, the MDL samples may be put on hold until samples are received for that analysis.

3.1.6. It is the responsibility of the department managers to ensure that MDL/LOD/LOQs are analyzed in the required time frame.

3.2. MDL – Measures precision and bias

3.2.1. For any new method or new instrument, in initial MDL study must be performed as a part of the method validation procedure. If a current instrument has been altered in a way that affects sensitivity of an instrument, an initial MDL study must be performed. An initial MDL study may also be performed on methods that have been rarely used in the last 24 months.

3.2.2. A minimum of 7 spiked samples and 7 method blanks are prepared. These samples and method blanks must be prepared in at least 3 separate batches on 3 separate calendar days. Samples and method blanks must be prepared according to their SOPs.

3.3. LOD

3.3.1. LODs are the minimum concentration of a substance that can be detected.

3.3.2. LODs are determined in samples that represent the quality system matrices to be evaluated. All sample processing/preparation steps and all determinative steps are used to validate the method for all targeted analytes. Not all possible combination of preparation and clean-up techniques require LOD verification. In this situation, the verification occurs on the worst case basis. The representative quality system matrix will be free from the target analytes of interest or interfering analytes that impact the LOD.

3.3.3. LODs are spiked at 2-3x the established detection limit for single analyte tests, and at 1-4x the detection limit for multi-analyte tests. The apparent signal-to-noise ratio at the LOD must be at least 3x and meet all requirements for analyte identification. For analyses that do not provide a measure of noise, the signal at the LOD level must be at least three standard deviations greater than the mean of the method blank concentration. This is initially established using a minimum of four method blanks.

3.3.3.1. If the LOD verification does not meet these criteria, a higher concentration is established and must meet all criteria.

3.4. LOQ

3.4.1. The Limit of Quantitation (LOQ) is an estimate of the minimum amount of a substance that can be reported with a specified degree of confidence.

3.4.2. LOQs are not required for components or properties for which spiking solutions or QC samples are not available. These include temperature, pH, TDS, TS, TSS.

3.4.3. An LOQ study includes all sample processing and analysis steps in the analytical method. The study is performed in each quality system matrix for which the test will be performed and must meet criteria for precision and bias. The procedure is documented and all supporting data are retained. The resulting LOQ will be above the LOD.

3.4.4. The LOQ is established at or above the low calibration standard. If the low calibration level needs to be changed, the analyst must first verify with their manager that the new low level will meet method, client, and laboratory requirements.

3.4.4.1. If the LOQ verification does not meet these criteria, a higher concentration is established and must meet all criteria.

4. DEMONSTRATION OF CAPABILITY

4.1. Demonstration of Capability : A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision.

4.2. Before reporting any data with a given method, a satisfactory Initial Demonstration of Capability (IDC) is performed. Thereafter, each analyst demonstrates continuing proficiency through the procedures outlined below in Continuing Demonstrations of Capability (CDC) and *SOP59,* and cover all methods as outlined in Appendix D of the QA Manual.

4.3. TheIDCs and CDCs for each analyst are documented in their training files on the FASVR shared drive. The documents identify the analyst involved, matrix, analyte(s), the method(s) performed, the laboratory specific SOP used for analysis (including revision number), the date(s) of analysis, and a summary of the results used to calculate the mean recovery, standard deviations, and Percent Relative Percent Difference (%RPD).

4.4. An IDC is performed:

- Before using any method
- Each time there is a change in instrument type, personnel, or method
- If the laboratory or analysts have not performed the method in a twelve-month period.

4.4.1. All raw data, preparation records, and calculations for each IDC are retained in Omega and on FAI’s server, and are available for review.

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4.4.2. In cases where the laboratory analyzes samples using a method that has been in use by the laboratory for at least one year prior to applying for accreditation, and there have been no significant changes in instrument type, personnel, or method, the Continuing Demonstration of Capability is acceptable as an IDC. Records will be kept on file to demonstrate that an IDC is not required.

4.5. Continuing Demonstration of Capability (CDC)

4.5.1. After the demonstration of capability is completed, on-going proficiency is maintained and demonstrated at least annually. Each analyst is expected to consistently meet the QC requirements of the method, the laboratory SOP, client requirements and/or the TNI Standard. CDCs are documented in each analysts file, and all records related to the demonstration are retained.

4.5.2. The laboratory uses the procedure found in *SOP59* to demonstrate CDCs.

5. RECERTIFYING SPIKES, STANDARDS, REAGENTS, AND CHEMICALS

The objective of this supplemental appendix is to outline a procedure for recertifying spikes, standards, and reagents. It is important to note that not all spikes, standards, and reagents may be recertified by the lab. If analytical SOPs specify shelf life, that shelf life must be followed. There are spikes and standards whose shelf lives are intentionally set low. Those spikes and standards may not be recertified. In these cases, FAI will purchase new spikes, standards, or reagents.

It is important that this procedure occurs prior to approaching expiration dates to ensure that the spikes, standards, and reagents being used for the lab are always current.

5.1. Reagents and Chemicals

5.1.1. If the laboratory wishes to recertify a reagent or chemical that was purchased from an external source or made in-house, because it is approaching its expiration date, the following must occur.

5.1.2. The analyst will evaluate the last 4 batches in which the reagent in question was used.

5.1.2.1. If QC passed in all 4 batches, the reagent’s expiration date may be extended up to 6 month or less.

5.1.2.2. If the QC does not pass in all 4 batches, the reagent may not be recertified and a new reagent must be made or purchased prior to expiration.

5.1.3. Prior to use:

5.1.3.1. The analyst must create a new Omega ID and Container number under Operations → Reagents.

5.1.3.2. New labels will be printed and affixed to the reagent bottle.

5.1.3.3. The analyst will be required to fill out the Reagent Recertification form which will contain the following information:

- Reagent Name
- Date of Recertification
- Old Omega container number and if applicable, lot number
- Previous Expiration Date
- Omega runs evaluated
- New Omega ID
- New Expiration Date

5.1.4. The recertification form must be attached to the linked files section of the new Omega ID to document that proper procedures were followed.

5.2. Spikes and Standards

5.2.1. If a spike or standard that was purchased from an approved vendor is approaching expiration and qualifies to be recertified, the following must occur.

5.2.1.1. The soon to be expired standard must be run, preferably in succession, with two non-expired standards, all from separate lots.

5.2.1.1.1. This analysis will be imported into an Omega Analytical Run.

5.2.1.2. The two non-expired comparison standards must pass within ± 30% from the true value.

5.2.1.3. The soon to be expired standard may be deemed acceptable if the % RSD of the concentrations of all 3 standards are within 20%.

5.2.1.4. If all criteria is met, the expiration date may be extended to 1 year or less.

5.2.1.4.1. If the analyst suspects a quicker degradation, they should set the expiration date accordingly. It is important that analysts use good judgement in this procedure because if they do suspect quicker degradation, it may be a better option to purchase a new, certified standard.

5.2.1.5. If all criteria are not met, the standard may not be recertified and a new standards will be purchased from an approved vendor.

5.2.1.6. The analyst performing the re-certification will be required to fill out the Spike/Standard Recertification Form which will contain the following information:

- Name of Standard
- Date of Recertification
- Analytical Run in Omega

- Omega Container IDs of the three standards used for testing
- Lot numbers of the three standards used for testing
- Previous Expiration Date
- New Expiration Date
- New Omega Container ID
- A separate tab in the workbook showing %REC and %RSD calculations.

5.2.1.7. A new Omega Spike ID for the recertified standard will be created and the following information will be attached to the linked files section:

- Spike/Standard Recertification Form
- Raw data from the three standards
- Previous CoA
- CoAs from the standards that were used to recertify the standard

5.2.1.8. New container labels will be created and affixed to the standard containers.

5.3. Air Standards

5.3.1. Air standards may not be recertified in-house. The recommended protocol for expired standards are as follows:

5.3.1.1. Purchase a new certified standard from an approved vendor.

5.3.1.2. Get the air standard that is close to expiration recertified by an approved external source.

6. GUIDELINES GOVERNING THE REUSE OF METHYLENE CHLORIDE SOLVENT RECOVERED FROM BUCHI ANALYST

6.1. Objective

6.1.1. It is Fremont Analytical, Inc’s practice to reduce waste and exposure to hazardous chemicals wherever possible while producing data that is compliant with regulatory agency guidance and best practices.

6.1.2. Certain procedures use a surplus of a given reagent, which is subsequently recovered upon completion of the procedure. The appropriateness of the recovered reagent for further use may be quantitatively evaluated. These guidelines will describe the procedure for evaluating methylene chloride (DCM) recovered via vacuum distillation.

6.2. Procedure

6.2.1. Prior to Buchi Syncore Analyst operation, clean the recovery flask as follows:

6.2.1.1. Discard any collected volume from flask.

6.2.1.2. Rinse with approximately 15 mL of clean DCM and discard.

6.2.2. Operate Buchi Analyst per SOP 34. During normal operation, sample extracts are heated and subjected to vacuum distillation in order to evaporate DCM while analytes of interest are maintained in solution. DCM vapors in the condenser unit return to the liquid phase and are collected in the recovery flask.

6.2.3. Transfer recovered DCM to a clean 4-L amber glass vessel.

6.2.4. When 4-L amber glass vessel is full, proceed with certification.

6.3. Certification

6.3.1. Evaluation of reagents in general is described in SW-846 method 8000D, sections 7.1 and 9.2. FAI has adopted practices consistent with the approach described therein, namely via the use of method blanks. In addition, it is FAI's practice to evaluate suitability of recovered DCM via the use of reagent blanks as described below.

6.3.2. Each lot of recovered DCM is evaluated individually. A reagent lot is defined as one full 4-L bottle of DCM.

6.3.2.1. Using Omega, assign a unique identifier to the recovered DCM lot.

6.3.2.2. Prepare an aliquot of the DCM appropriate to the method.

6.3.2.2.1. Dx soils: transfer 10 mL of DCM into a 40-mL VOA. Add surrogate and sodium sulfate.

6.3.2.2.2. PAH soils: transfer 30 mL of DCM into a 40-mL VOA. Add surrogate and sodium sulfate. Reduce volume to 10 mL using the n-Evap hot water bath.

6.3.2.2.3. Other analyses: prepare a reagent blank in the same manner as a method blank described in the respective analytical SOP.

6.3.2.3. Analyze the reagent blank according to the appropriate analytical methodology.

6.3.2.4. Evaluate the results against acceptance criteria

6.3.2.4.1. FAI has adopted the following limits for evaluating compliance:

6.3.2.4.1.1. Reagent lots with calculated concentration of analytes in the reagent blank less than the MDL shall be immediately approved for analytical use.

6.3.2.4.1.2. Reagent lots with analytes detected at a level greater than the MDL but below ½ the PQL may be approved for use provided data quality objectives are met.

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6.3.2.4.1.3. Reagent lots with analytes detected at a level greater than ½ the PQL shall not be approved for analytical use.

6.3.2.5. Record the results of the reagent blank in Omega and link with the associated lot of DCM.

6.3.2.6. Any lot that fails the above requirements will be disposed of in solvent waste. Refer to SOP 61.

7. REFERENCES

7.1. SW-846 8000D, March 2018.

7.2. EPA TO-15A, September 2019.

7.3. Definition and Procedure for the Determination of the Method Detection Limit, Revision 2, EPA, December 2016.

7.4. TNI Standard, 2016.

7.5. DoD QSM 5.3, 2019.

8. CHANGES SINCE LAST REVISION

8.1. Added Revision History and Table of Contents

8.2. Added section describing how to qualify new instruments – Section 1.3

8.3. Added section “Recertifying Spikes, Standards, Reagents, and Chemicals.”

8.4. Added section “Guidelines Governing the Reuse of Methylene Chloride Solvent Recovered from Buchi Analyst.”

8.5. Added section “References.”

8.6. Added section “Changes Since Last Revision.:

Signature

Appendix F
Instrument List

Instrument ID #	Serial #:	Manufacturer	Model #	Technology
GC-2	2750A16652	Hewlett Packard	5890 Series II	GC-FID/PID
GC-3	US00062981	Hewlett Packard	5890 Series II	GC-FID
GC-9	CN12371132	Agilent	7890A	GC
GC-13	CN12371130	Agilent	7890A	GC
GC-14	CN11151019	Agilent	7890A	GC
GC 16	CN11151043	Agilent	7890A	GC-Electron Capture Detector (Micro)
GC-18	CN10191105	Agilent	7890A	GC
GC-19	CN14182004	Agilent	7820A	GC
GC-21	CN13393081	Agilent	7890B	GC
GC-24	CN17081222	Agilent	7890B	GC-FID (Dual)
GC-25	CN17093129	Agilent	7890B	GC-Electron Capture Detector (Micro)
GC-26	CN17363458	Agilent	7890B	GC
GC-27	US18183013	Agilent	7890B	GC
GC-28	US1939A006	Agilent	8890	GC-FID(Dual)
GC-29	US2245A035	Agilent	8890	GC-FID/PID
Autosampler 1	CENTS238071411	EST Analytical	Cent WS	Autosampler
Autosampler 5	US12272003	Teledyne Tekmar	Atomx	Autosampler/Purge & Trap
Autosampler 9	0173	Entech	7016CA	Autosampler
Autosampler 10	CN11100035	Agilent	7693	Autosampler
Autosampler 13	US14197002	Teledyne Tekmar	Atomx	Autosampler/Purge & Trap
Autosampler 20	CN10510031	Agilent	7693	Autosampler
Autosampler 24	1919002002640	Metrohm	919 Autosampler Plus	Autosampler

Signature

Instrument ID #	Serial #:	Manufacturer	Model #	Technology
Autosampler 25	CN17020078	Agilent	7693	Autosampler
Autosampler 26	CN17020044	Agilent	7693	Autosampler
Autosampler 27	0066	Entech	7650	Autosampler
Autosampler 28	0067	Entech	7650	Autosampler
Autosampler 29	E845788696	OI Analytical	1088AS	Autosampler
Autosampler 30	US18318079	Tekmar	Atomx XYZ	Autosampler/Purge &Trap
Autosampler 31	RO19270016	Agilent	G4514A	Autosampler
Autosampler 32	1786	Entech	7016D	Autosampler
Autosampler 33	CN91700241	Agilent	G4520, 7693	Autosampler
Autosampler 34	CN10440059	Agilent	G4514A	Autosampler
Autosampler 35	US22270008	Teledyne Tekmar	Atomx XYZ	Autosampler/Purge &Trap
Tower 1	CN13090174	Agilent	G4513A	Tower
Tower 2	CN11120112	Agilent	G4513A	Tower
Tower 3	CN11120133	Agilent	G4513A	Tower
Tower 12	CN16530056	Agilent	G4513A	Tower
Tower 13	CN16530057	Agilent	G4513A	Tower
Tower 14	CN16530050	Agilent	G4513A	Tower
Tower 15	CN19370108	Agilent	G4513A	Tower
Tower 16	CN19340050	Agilent	G4513A	Tower
Concentrator 1	EV306070510	EST Analytical	Encon Evolution	Purge & Trap
Concentrator 6	1543	ENTECH	7200	Preconcentrator
Concentrator 7	1586	ENTECH	7200CTS	Preconcentrator
Mass Spec 6	US12493A24	Agilent	5975C	Detector
Mass Spec 7	US11173714	Agilent	5975C	Detector
Mass Spec 10	US1416R202	Agilent	5977E	Detector

Signature

Instrument ID #	Serial #:	Manufacturer	Model #	Technology
Mass Spec 11	US12493A21	Agilent	5975C	Detector
Mass Spec 12	US1446L480	Agilent	5977A	Detector
Mass Spec 13	US1747M017	Agilent	5977B	Detector
Mass Spec 14	US1628N002	Agilent	5977B	Detector
Canister Cleaning System	0133/1851	Entech	3100D/ 3108	Cleaner/Oven
Dynamic Diluter	0217	Entech	4700	Regulator
Flow Professor	0381	Entech	Flow Professor	Regulator
TCLP Tumbler	GF18N060-BMYJ1C	Environmental Express	LE1002	Tumbler
YSI DO meter/Probe	304502\13C100582	YSI	ProODO/ProOBOD	Meter
Conductivity Probe	21032003	YSI	YSI 4310-3	Probe
Meter	20501269	YSI	MultilabIDS 4010-2W	Meter
pH METER 2	1230425626	Mettler Toledo	SevenMulti	Meter
Ammonia Ion Selective Electrode	SY1-18949	Thermo Scientific	9512HPBNWP	Probe
Turbidimeter 2	201511126	MicroTPW	20000	Meter
Turbidimeter 3	H0090811	Hannah Instruments	HI88703	Meter
C-Conductivity Meter-Extech	CE 134562	Extech Instruments	Extech Instruments	Meter
IC-2	1930200013155	Metrohm	930 Compact IC Flex	Ion Chromatography
Spectrometer	3OUJ161007	Thermo Electron Corp	Spectronic 20D+	Spectrometer
Hach DR/890 Colorimeter	071090C65914	Hach	DR/890	Colorimeter
TOC 2	P843732823	OI Analytical	Aurora 1030	Detector
TOC Soil Module	B846733063	OI Analytical	1030S	Sampler
Astoria-Pacific Discrete Analyzer	4620-1020	Astoria-Pacific	CHEMWELL-T 4600	Spectrometer
PerkinElmer Nexion	81DN10B1302	Perkin Elmer	NexION 300D	Inductively Coupled Plasma Mass Spectrometer

Instrument ID #	**Serial #:**	**Manufacturer**	**Model #**	**Technology**
ICP-MS 2 Agilent 7850	SG22151236	Agilent	7850	Inductively Coupled Plasma Mass Spectrometer
ICP-MS Autosampler	X2DX-140313	ESI	SC-2DXS	Autosampler
PrepFAST ICP-MS Autosampler - ESI	X4DXCi-220515	ESI	4DXCi	Autosampler
M-7600 MERCURY ANALYZER	071201Q76	Cetac Technologies	M-7600	Cold Vapor Atomic Absorption
M-7600 Autosampler	061280A520	Cetac Technologies	ASX-520	Autosampler
RA-4300FG+ Mercury Analyzer for 1631	18850038	Nippon	RA-4300FG+	Cold Vapor Atomic Fluorescence Spectroscopy
Flashpoint	R02291362	Koehler	K16200	Flashpoint
Grain Size Shaker	03104325	Humboldt	H4325	Shaker

Support Equipment					
Instrument ID #	**Serial Number**	**Manufacturer**	**Model #**	**Maintenance Activity & Frequency**	**Calibration Frequency**
Autoclave		Rodwell	Phoenix	Cleaning (Monthly or as needed), Refill water supply as needed	Quarterly sterility verification
Autoclave 3	2807319	Tuttnauer	EZ10 (2540EA)	Cleaning (Monthly or as needed), Refill water supply as needed	Quarterly sterility verification
BALANCE-1	1118323397	Mettler Toledo	AG204	Calibration Weights, Cleaning, Leveling (Daily)	Daily calibration verification; Yearly calibration
BALANCE-2	B238330459	Mettler Toledo	ML802E	Calibration Weights, Cleaning, Leveling (Daily)	Daily calibration verification; Yearly calibration
BALANCE-3	1123460917	Mettler Toledo	NewClassic ML	Calibration Weights, Cleaning, Leveling (Daily)	Daily calibration verification; Yearly calibration
Balance-4	B339833406	Mettler Toledo	ME2002E	Calibration Weights, Cleaning, Leveling (Daily)	Daily calibration verification; Yearly calibration
Balance-5	B420595182	Mettler Toledo	MS1003S/03	Calibration Weights, Cleaning, Leveling (Daily)	Daily calibration verification; Yearly calibration
Balance-6	B734558068	Mettler Toledo	XSE204	Calibration Weights, Cleaning, Leveling (Daily)	Daily calibration verification; Yearly calibration

Instrument ID #	Serial Number	Manufacturer	Model #	Maintenance Activity & Frequency	Calibration Frequency
OVEN-2	3N0116	Fisher Scientific	Iso -temp 500 Series	Cleaning (Weekly)	Temp Check (Daily) when in use
OVEN-3	300040806 ALT. NO. 3166764	Thermo Scientific	3511FSq	Cleaning (Weekly)	Temp Check (Daily) when in use
OVEN-4	300196029 ALT. NO. 3166764	Thermo Scientific	3511FSQ	Cleaning (Weekly)	Temp Check (Daily) when in use
OVEN-5	109N0208	Fisher Scientific	650G	Cleaning (Weekly)	Temp Check (Daily) when in use
Muffle Furnace 1	1126369001190318	Thermo Fisher	F47195	NA	NA
Incubator-2	03101086	Labnet	I5110	Cleaning (Monthly)	Temp Check (Daily) when in use
Incubator-4	11024462	Lab-Line Instruments, Inc	490	Cleaning (Monthly)	Temp Check (Daily) when in use
Incubator 5	20190000011479	Binder	BD023UL-120V	Cleaning (Monthly)	Temp Check (Daily) when in use
Incubator 6	11026321	Sheldon Manufacturing	SRI6P	Cleaning (as needed)	Temp Check (Daily) when in use
Water Bath 1	300412538	Thermo Fisher	TSCIR35	Cleaning (as needed)	NA
Q-Tray Sealer 1	QTP13201401028	IDEXX	Qantitray Sealer Plus	NA	NA
Buchi 1	1000112071	Buchi	Syncore	Clean seals (daily), change seals and o-rings, top off coolant (when needed)	N/A

Signature

Equipment ID #	Serial Number	Manufacturer	Model #	Maintenance Activity & Frequency	Calibration Frequency
Buchi 2	1000548205	Buchi	Syncore	Clean seals (daily), change seals and o-rings, top off coolant (when needed)	N/A
N-EVAP	53571	Organomation Associates, Inc.	N-Evap	Cleaning (Bi-weekly)	N/A
Sonicator	B29259	Bransonic	B-321	Cleaning (Bi-weekly)	N/A
Sonicator 2	BGI012157640 B	Branson	M3800	Cleaning Monthly	NA
CENTRIFUGE	89151	Hamilton Bell	Vanguard V6500	Cleaning (Bi-weekly)	N/A
CENTRIFUGE 2	8295	Vulron Technologies	CS6C	Cleaning (Bi-weekly)	N/A
Centrifuge 3	160160154AA7 33	QuEChERS/Restek	Q-sep 3000 Centrifuge	Cleaning (Bi-weekly)	N/A
Hot Block 2	8826DISW112 6	Environmental Express	SCC6002	Cleaning (Bi-weekly)	Temp Check when in use
Hot Block 4	20ZN0834	Fisher Scientific	Dry Bath Incubator	Cleaning (Bi-weekly)	Temp Check when in use
Hot Block 5	8885CECW381 6	Environmental Express	SC154	Cleaning (Bi-weekly)	Temp Check when in use
Hot Block 7	N/A	CPI International	Mod Block	Cleaning (Bi-weekly)	Temp Check when in use
Hot Block 9	2020CECW535 6	Environmental Express	SC154	Cleaning Monthly	Temp Check when in use
Hydrometer 4	230219	ICL Calibration Laboratories	40152H-C	NA	Annually (Swapped with Hydrometer 3 through ICL Program)

Appendix G: Common Calculations

1. Calibration

1.1. Least Squares Analysis

$$A = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum c)^2} \qquad B = \frac{\sum y \sum x^2 - \sum x \sum xy}{n\sum x^2 - (\sum x)^2}$$

Where:

A= The line slope
B = The line intercept
x = The standard concentration
y = The instrument response value
n = The number of different standards analyzed

1.2. Correlation Coefficient

$$r^2 = \frac{A\sum y_i + B\sum x_i y_i - \frac{1}{n}(\sum y_i)^2}{\sum(y_i)^2 - \frac{1}{n}((\sum y_i)^2}$$

Where

r^2 = Correlation coefficient
A = Slope of the line
B = y-intercept
n = The number of standards in the calibration
x_i = The concentration of an individual standard compound
y_i = The chromatographic area of an individual standard compound

1.3. Response Factor - Internal Standards

$$RF = \frac{A_S * C_{IS}}{A_{IS} * C_S}$$

Where:

RF = Response factor
A_s = Peak area (or height) of the analyte or surrogate
A_{IS} = Peak area (or height) of the internal standard
C_S = Concentration of the analyte or surrogate
C_{IS} = Concentration of the internal standard

1.4. Calibration Factor –External standards

$$CF = \frac{Peak\ area\ (or\ height) in\ the\ standard}{Concentration\ of\ the\ standard}$$

Signature

1.5. Standard Deviation of Response

$$S = \sqrt{\sum_{i=l}^{n} \frac{(X_i - X_{avg})^2}{n-1}}$$

Where

S = Standard deviation
n = Number of measurements
X_i = Response/calibration factor for each level
X_{avg} = Average of the response/calibration factors

1.6. Relative Percent Standard Deviation

$$\%RSD = \frac{S}{X_{avg}} * 100$$

Where

%RSD = Relative percent standard deviation
S = Standard deviation
X_{avg} = Average of the response/calibration factors

1.7. Percent Recovery – ICVs and CCVs

$$\%REC = \frac{C}{F} * 100$$

Where

%REC = Percentage that recovered when compared to the true value of the standard
C = Concentration measured in the ICV or CCV
F = Fortifying Concentration (True Value)

2. Batch Quality Control

2.1. Percent Recovery – LCS/LCSDs

$$\%REC = \frac{C}{F} * 100$$

Where

%REC = Percentage that recovered when compared to the true value of the standard
C = Concentration measured in the ICV or CCV
F = Fortifying Concentration (True Value)

2.2. Percent Recovery – MS/MSDs

$$\%REC = \frac{(C_f - C_b)}{F} * 100$$

Where

%REC = Percentage that recovered when compared to the true value of the standard
C_f = Concentration in the fortified sample
C_b = Concentration in the unfortified sample
F = Fortifying Concentration (True Value)

2.3. Relative Percent Difference – DUP/MSD/LCSD

$$\%RPD = \frac{|R_1 - R_2|}{(\frac{1}{2})(R_1 + R_2)} * 100$$

Where

%RPD = Relative percent difference between the duplicate sample and its parent sample
R_1 = Parent sample result
R_2 = Duplicate sample result

Signature

APPENDIX B

Laboratory Certifications

The State of Washington
Department of Ecology

1889

Fremont Analytical, Inc.
Seattle, WA

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective July 9, 2023 and shall expire July 8, 2024.

Witnessed under my hand on July 31, 2023

Rebecca Wood

Rebecca Wood
Lab Accreditation Unit Supervisor

Laboratory ID
C910

WASHINGTON STATE DEPARTMENT OF ECOLOGY

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

SCOPE OF ACCREDITATION

Fremont Analytical, Inc.

Seattle, WA

is accredited for the analytes listed below using the methods indicated. Full accreditation is granted unless stated otherwise in a note. EPA is the U.S. Environmental Protection Agency. SM is "Standard Methods for the Examination of Water and Wastewater." SM refers to EPA approved method versions. ASTM is the American Society for Testing and Materials. USGS is the U.S. Geological Survey. AOAC is the Association of Official Analytical Chemists. Other references are described in notes.

Matrix/Analyte	Method	Notes
Air		
Carbon dioxide	EPA 3C	
Carbon monoxide	EPA 3C	
Hydrogen	EPA 3C	
Methane	EPA 3C	
Nitrogen	EPA 3C	
Oxygen	EPA 3C	
Helium	FAL SOP 11	6
Carbon disulfide	ASTM D5504-08	
Carbonyl sulfide	ASTM D5504-08	
Dimethyl disulfide	ASTM D5504-08	
Dimethyl Sulfide	ASTM D5504-08	
Ethyl Mercaptan	ASTM D5504-08	
Hydrogen sulfide	ASTM D5504-08	
Isobutyl Mercaptan	ASTM D5504-08	
Isopropyl Mercaptan	ASTM D5504-08	
Methyl Mercaptan	ASTM D5504-08	
n-Butyl Mercaptan	ASTM D5504-08	
n-Propyl Mercaptan	ASTM D5504-08	
t-Butyl Mercaptan	ASTM D5504-08	
1,1,1-Trichloroethane	EPA TO-15 Rev. 2 (1999)	5
1,1,2,2-Tetrachloroethane	EPA TO-15 Rev. 2 (1999)	5
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA TO-15 Rev. 2 (1999)	5
1,1,2-Trichloroethane	EPA TO-15 Rev. 2 (1999)	5
1,1-Dichloroethane	EPA TO-15 Rev. 2 (1999)	5
1,1-Dichloroethylene	EPA TO-15 Rev. 2 (1999)	5
1,2,3-Trimethylbenzene	EPA TO-15 Rev. 2 (1999)	5

Matrix/Analyte	Method	Notes
Air		
1,2,4-Trichlorobenzene	EPA TO-15 Rev. 2 (1999)	5
1,2,4-Trimethylbenzene	EPA TO-15 Rev. 2 (1999)	5
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-15 Rev. 2 (1999)	5
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	EPA TO-15 Rev. 2 (1999)	5
1,2-Dichlorobenzene	EPA TO-15 Rev. 2 (1999)	5
1,2-Dichloroethane (Ethylene dichloride)	EPA TO-15 Rev. 2 (1999)	5
1,2-Dichloropropane	EPA TO-15 Rev. 2 (1999)	5
1,3,5-Trimethylbenzene	EPA TO-15 Rev. 2 (1999)	5
1,3-Butadiene	EPA TO-15 Rev. 2 (1999)	5
1,3-Dichlorobenzene	EPA TO-15 Rev. 2 (1999)	5
1,4-Dichlorobenzene	EPA TO-15 Rev. 2 (1999)	5
1,4-Dioxane (1,4- Diethyleneoxide)	EPA TO-15 Rev. 2 (1999)	5
1-Propene	EPA TO-15 Rev. 2 (1999)	5
2,5-Dimethylthiophene	EPA TO-15 Rev. 2 (1999)	
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-15 Rev. 2 (1999)	5
2-Ethylthiophene	EPA TO-15 Rev. 2 (1999)	
2-Hexanone	EPA TO-15 Rev. 2 (1999)	5
2-Methylbutane (Isopentane)	EPA TO-15 Rev. 2 (1999)	5
2-Propanol	EPA TO-15 Rev. 2 (1999)	5
3-Methylthiophene	EPA TO-15 Rev. 2 (1999)	
4-Ethyltoluene	EPA TO-15 Rev. 2 (1999)	5
4-Isopropyltoluene (p-Cymene)	EPA TO-15 Rev. 2 (1999)	5
4-Methyl-2-pentanone (MIBK)	EPA TO-15 Rev. 2 (1999)	5
Acetone	EPA TO-15 Rev. 2 (1999)	5
Acrolein (Propenal)	EPA TO-15 Rev. 2 (1999)	5
APH Aliphatics C5-C8	EPA TO-15 Rev. 2 (1999)	5
APH Aliphatics C9-C12	EPA TO-15 Rev. 2 (1999)	5
APH Aromatics C9-C10	EPA TO-15 Rev. 2 (1999)	5
Benzene	EPA TO-15 Rev. 2 (1999)	5
Benzyl chloride	EPA TO-15 Rev. 2 (1999)	5
Bromodichloromethane	EPA TO-15 Rev. 2 (1999)	5
Bromoform	EPA TO-15 Rev. 2 (1999)	5
Carbon disulfide	EPA TO-15 Rev. 2 (1999)	5
Carbon tetrachloride	EPA TO-15 Rev. 2 (1999)	5
Carbonyl sulfide	EPA TO-15 Rev. 2 (1999)	
Chlorobenzene	EPA TO-15 Rev. 2 (1999)	5
Chlorodibromomethane	EPA TO-15 Rev. 2 (1999)	5

Matrix/Analyte	Method	Notes
Air		
Chloroethane	EPA TO-15 Rev. 2 (1999)	5
Chloroform	EPA TO-15 Rev. 2 (1999)	5
cis-1,2-Dichloroethylene	EPA TO-15 Rev. 2 (1999)	5
cis-1,3-Dichloropropene	EPA TO-15 Rev. 2 (1999)	5
Cyclohexane	EPA TO-15 Rev. 2 (1999)	5
Decamethylcyclopentasiloxane (D6)	EPA TO-15 Rev. 2 (1999)	
Decamethyltetrasiloxane-L4 (MD2M)	EPA TO-15 Rev. 2 (1999)	
Dichlorodifluoromethane (Freon-12)	EPA TO-15 Rev. 2 (1999)	5
Diethyl disulfide	EPA TO-15 Rev. 2 (1999)	
Dimethyl disulfide	EPA TO-15 Rev. 2 (1999)	
Dimethyl Sulfide	EPA TO-15 Rev. 2 (1999)	
Dodecamethylpentasiloxane (L5)	EPA TO-15 Rev. 2 (1999)	
Ethanol	EPA TO-15 Rev. 2 (1999)	5
Ethyl acetate	EPA TO-15 Rev. 2 (1999)	5
Ethyl Mercaptan	EPA TO-15 Rev. 2 (1999)	
Ethylbenzene	EPA TO-15 Rev. 2 (1999)	5
Gasoline range organics (GRO)	EPA TO-15 Rev. 2 (1999)	5
Hexachlorobutadiene	EPA TO-15 Rev. 2 (1999)	5
Hexamethylcyclotrisiloxane (D3)	EPA TO-15 Rev. 2 (1999)	5
Hexamethyldisiloxane	EPA TO-15 Rev. 2 (1999)	5
Hexane	EPA TO-15 Rev. 2 (1999)	5
Hydrogen sulfide	EPA TO-15 Rev. 2 (1999)	
Isobutyl Mercaptan	EPA TO-15 Rev. 2 (1999)	
Isopropyl Mercaptan	EPA TO-15 Rev. 2 (1999)	
Isopropylbenzene	EPA TO-15 Rev. 2 (1999)	5
m+p-xylene	EPA TO-15 Rev. 2 (1999)	5
Methyl bromide (Bromomethane)	EPA TO-15 Rev. 2 (1999)	5
Methyl chloride (Chloromethane)	EPA TO-15 Rev. 2 (1999)	5
Methyl ethyl sulfide	EPA TO-15 Rev. 2 (1999)	
Methyl Mercaptan	EPA TO-15 Rev. 2 (1999)	
Methyl tert-butyl ether (MTBE)	EPA TO-15 Rev. 2 (1999)	5
Methylene chloride (Dichloromethane)	EPA TO-15 Rev. 2 (1999)	5
Naphthalene	EPA TO-15 Rev. 2 (1999)	5
n-Butane	EPA TO-15 Rev. 2 (1999)	5
n-Butyl Mercaptan	EPA TO-15 Rev. 2 (1999)	
n-Decane	EPA TO-15 Rev. 2 (1999)	5
n-Dodecane	EPA TO-15 Rev. 2 (1999)	5

Matrix/Analyte	Method	Notes
Air		
n-Heptane	EPA TO-15 Rev. 2 (1999)	5
n-Nonane	EPA TO-15 Rev. 2 (1999)	5
n-Octane	EPA TO-15 Rev. 2 (1999)	5
n-Propyl Mercaptan	EPA TO-15 Rev. 2 (1999)	
n-Undecane	EPA TO-15 Rev. 2 (1999)	5
Octamethylcyclotetrasiloxane (D4)	EPA TO-15 Rev. 2 (1999)	5
Octamethyltrisiloxane-L3 (MDM)	EPA TO-15 Rev. 2 (1999)	5
o-Xylene	EPA TO-15 Rev. 2 (1999)	5
Pentamethyldisiloxane	EPA TO-15 Rev. 2 (1999)	5
Styrene	EPA TO-15 Rev. 2 (1999)	5
t-Butyl Mercaptan	EPA TO-15 Rev. 2 (1999)	
Tetrachloroethylene (Perchloroethylene)	EPA TO-15 Rev. 2 (1999)	5
Tetrahydrofuran (THF)	EPA TO-15 Rev. 2 (1999)	5
Tetrahydrothiophene	EPA TO-15 Rev. 2 (1999)	
Thiophene	EPA TO-15 Rev. 2 (1999)	
Toluene	EPA TO-15 Rev. 2 (1999)	5
trans-1,2-Dichloroethylene	EPA TO-15 Rev. 2 (1999)	5
trans-1,3-Dichloropropylene	EPA TO-15 Rev. 2 (1999)	5
Trichloroethene (Trichloroethylene)	EPA TO-15 Rev. 2 (1999)	5
Trichlorofluoromethane (Freon 11)	EPA TO-15 Rev. 2 (1999)	5
Vinyl acetate	EPA TO-15 Rev. 2 (1999)	5
Vinyl chloride	EPA TO-15 Rev. 2 (1999)	5
Drinking Water		
Turbidity	EPA 180.1_2_1993	5
Chloride	EPA 300.0_2.1_1993	5
Nitrate + Nitrite as N	EPA 300.0_2.1_1993	5
Nitrate as N	EPA 300.0_2.1_1993	5
Nitrite as N	EPA 300.0_2.1_1993	5
Orthophosphate as P	EPA 300.0_2.1_1993	5
Sulfate	EPA 300.0_2.1_1993	5
Solids, Total Dissolved	SM 2540 C-2011	
Dissolved Organic Carbon	SM 5310 C-2011	
Total Organic Carbon	SM 5310 C-2011	
Aluminum	EPA 200.8_5.4_1994	5
Antimony	EPA 200.8_5.4_1994	5
Arsenic	EPA 200.8_5.4_1994	5
Barium	EPA 200.8_5.4_1994	5

Matrix/Analyte	Method	Notes
Drinking Water		
Beryllium	EPA 200.8_5.4_1994	5
Cadmium	EPA 200.8_5.4_1994	5
Copper	EPA 200.8_5.4_1994	5
Lead	EPA 200.8_5.4_1994	5
Manganese	EPA 200.8_5.4_1994	5
Selenium	EPA 200.8_5.4_1994	5
Silver	EPA 200.8_5.4_1994	5
Thallium	EPA 200.8_5.4_1994	5
Zinc	EPA 200.8_5.4_1994	5
Mercury	EPA 245.1_3_1994	
E.coli-count	SM 9223 B Colilert® 24 QTray®	9,10
Total coliforms-count	SM 9223 B Colilert® 24 QTray®	9,10
Non-Potable Water		
n-Hexane Extractable Material (O&G)	EPA 1664A_1_1999	5
Turbidity	EPA 180.1_2_1993	5
Bromide	EPA 300.0_2.1_1993	5
Chloride	EPA 300.0_2.1_1993	5
Fluoride	EPA 300.0_2.1_1993	5
Nitrate + Nitrite as N	EPA 300.0_2.1_1993	5
Nitrate as N	EPA 300.0_2.1_1993	5
Nitrite as N	EPA 300.0_2.1_1993	5
Orthophosphate as P	EPA 300.0_2.1_1993	1
Sulfate	EPA 300.0_2.1_1993	5
Phosphorus, total	EPA 365.3_1978	5
Alkalinity	SM 2320 B-2011	5
Hardness (calc.)	SM 2340 B-2011	5
Specific Conductance	SM 2510 B-2011	5
Salinity	SM 2520 B-2011	5
Solids, Total	SM 2540 B-2011	5
Solids, Total Dissolved	SM 2540 C-2011	5
Solids, Total Suspended	SM 2540 D-2011	5
Volatile suspended solids	SM 2540 E-2011	
Solids, Settleable	SM 2540 F-2011	5
Chromium, Hexavalent	SM 3500-Cr B-2011	
Cyanide, Total	SM 4500-CN^{-} E-2011	5
Ammonia as N	SM 4500-NH3 E-2011	5
Ammonia as N	SM 4500-NH3 G-2011	5

Matrix/Analyte	Method	Notes
Non-Potable Water		
Sulfide	SM 4500-S2¯ F-2011	5
Biochemical Oxygen Demand (BOD)	SM 5210 B-2011	4
Chemical Oxygen Demand (COD)	SM 5220 D-2011	5
Dissolved Organic Carbon	SM 5310 C-2011	5
Total Organic Carbon	SM 5310 C-2011	5
Mercury	EPA 1631 E-02	5
Aluminum	EPA 200.8_5.4_1994	5
Antimony	EPA 200.8_5.4_1994	5
Arsenic	EPA 200.8_5.4_1994	5
Barium	EPA 200.8_5.4_1994	5
Beryllium	EPA 200.8_5.4_1994	5
Boron	EPA 200.8_5.4_1994	
Cadmium	EPA 200.8_5.4_1994	5
Calcium	EPA 200.8_5.4_1994	5
Chromium	EPA 200.8_5.4_1994	5
Cobalt	EPA 200.8_5.4_1994	5
Copper	EPA 200.8_5.4_1994	5
Iron	EPA 200.8_5.4_1994	5
Lead	EPA 200.8_5.4_1994	5
Magnesium	EPA 200.8_5.4_1994	5
Manganese	EPA 200.8_5.4_1994	5
Molybdenum	EPA 200.8_5.4_1994	5
Nickel	EPA 200.8_5.4_1994	5
Potassium	EPA 200.8_5.4_1994	5
Selenium	EPA 200.8_5.4_1994	5
Silver	EPA 200.8_5.4_1994	5
Sodium	EPA 200.8_5.4_1994	5
Strontium	EPA 200.8_5.4_1994	5
Thallium	EPA 200.8_5.4_1994	5
Tin	EPA 200.8_5.4_1994	5
Titanium	EPA 200.8_5.4_1994	5
Vanadium	EPA 200.8_5.4_1994	5
Zinc	EPA 200.8_5.4_1994	5
Mercury	EPA 245.1_3_1994	5
Iron	SM 3500-Fe B-2011	5
4,4'-DDD	EPA 608.3	5
4,4'-DDE	EPA 608.3	5

Matrix/Analyte	Method	Notes
Non-Potable Water		
4,4'-DDT	EPA 608.3	5
Aldrin	EPA 608.3	5
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 608.3	5
alpha-Chlordane	EPA 608.3	5
Aroclor-1016 (PCB-1016)	EPA 608.3	5
Aroclor-1221 (PCB-1221)	EPA 608.3	5
Aroclor-1232 (PCB-1232)	EPA 608.3	5
Aroclor-1242 (PCB-1242)	EPA 608.3	5
Aroclor-1248 (PCB-1248)	EPA 608.3	5
Aroclor-1254 (PCB-1254)	EPA 608.3	5
Aroclor-1260 (PCB-1260)	EPA 608.3	5
Aroclor-1262 (PCB-1262)	EPA 608.3	5
Aroclor-1268 (PCB-1268)	EPA 608.3	5
beta-BHC (beta-Hexachlorocyclohexane)	EPA 608.3	5
Chlordane (tech.)	EPA 608.3	5
delta-BHC	EPA 608.3	5
Dieldrin	EPA 608.3	5
Endosulfan I	EPA 608.3	5
Endosulfan II	EPA 608.3	5
Endosulfan sulfate	EPA 608.3	5
Endrin	EPA 608.3	5
Endrin aldehyde	EPA 608.3	5
Endrin ketone	EPA 608.3	5
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 608.3	5
gamma-Chlordane	EPA 608.3	5
Heptachlor	EPA 608.3	5
Heptachlor epoxide	EPA 608.3	5
Methoxychlor	EPA 608.3	5
Toxaphene (Chlorinated camphene)	EPA 608.3	5
Ethane	EPA RSK-175	
Ethene	EPA RSK-175	
Methane	EPA RSK-175	
1,1,1,2-Tetrachloroethane	EPA 624.1	5
1,1,1-Trichloroethane	EPA 624.1	5
1,1,2,2-Tetrachloroethane	EPA 624.1	5
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 624.1	5
1,1,2-Trichloroethane	EPA 624.1	5

Matrix/Analyte	Method	Notes
Non-Potable Water		
1,1-Dichloroethane	EPA 624.1	5
1,1-Dichloroethylene	EPA 624.1	5
1,1-Dichloropropene	EPA 624.1	5
1,2,3-Trichlorobenzene	EPA 624.1	5
1,2,3-Trichloropropane	EPA 624.1	5
1,2,4-Trimethylbenzene	EPA 624.1	5
1,2-Dibromo-3-chloropropane (DBCP)	EPA 624.1	5
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 624.1	5
1,2-Dichlorobenzene	EPA 624.1	5
1,2-Dichloroethane (Ethylene dichloride)	EPA 624.1	5
1,2-Dichloropropane	EPA 624.1	5
1,3,5-Trimethylbenzene	EPA 624.1	5
1,3-Dichlorobenzene	EPA 624.1	5
1,3-Dichloropropane	EPA 624.1	5
1,4-Dichlorobenzene	EPA 624.1	5
2-Butanone (Methyl ethyl ketone, MEK)	EPA 624.1	5
2-Chloroethyl vinyl ether	EPA 624.1	5
2-Chlorotoluene	EPA 624.1	5
2-Hexanone	EPA 624.1	1
4-Chlorotoluene	EPA 624.1	5
4-Isopropyltoluene (p-Cymene)	EPA 624.1	5
4-Methyl-2-pentanone (MIBK)	EPA 624.1	5
Acetone	EPA 624.1	5
Acrolein (Propenal)	EPA 624.1	5
Acrylonitrile	EPA 624.1	5
Allyl chloride (3-Chloropropene)	EPA 624.1	5
Benzene	EPA 624.1	5
Bromobenzene	EPA 624.1	5
Bromochloromethane	EPA 624.1	5
Bromodichloromethane	EPA 624.1	5
Bromoform	EPA 624.1	5
Carbon disulfide	EPA 624.1	5
Carbon tetrachloride	EPA 624.1	5
Chlorobenzene	EPA 624.1	5
Chlorodibromomethane	EPA 624.1	5
Chloroethane (Ethyl chloride)	EPA 624.1	5
Chloroform	EPA 624.1	5

Matrix/Analyte	Method	Notes
Non-Potable Water		
cis-1,2-Dichloroethylene	EPA 624.1	5
cis-1,3-Dichloropropene	EPA 624.1	5
Dibromomethane (Methylene bromide)	EPA 624.1	5
Di-isopropylether (DIPE)	EPA 624.1	5
Ethyl acetate	EPA 624.1	5
Ethyl methacrylate	EPA 624.1	5
Ethylbenzene	EPA 624.1	5
Ethyl-t-butylether (ETBE)	EPA 624.1	5
Iodomethane (Methyl iodide)	EPA 624.1	5
Isopropylbenzene	EPA 624.1	5
m+p-xylene	EPA 624.1	5
Methacrylonitrile	EPA 624.1	5
Methyl acrylate	EPA 624.1	5
Methyl bromide (Bromomethane)	EPA 624.1	5
Methyl chloride (Chloromethane)	EPA 624.1	5
Methyl methacrylate	EPA 624.1	5
Methyl tert-butyl ether (MTBE)	EPA 624.1	5
Methylene chloride (Dichloromethane)	EPA 624.1	5
n-Butylbenzene	EPA 624.1	5
n-Hexane	EPA 624.1	5
n-Propylbenzene	EPA 624.1	5
o-Xylene	EPA 624.1	5
sec-Butylbenzene	EPA 624.1	5
Styrene	EPA 624.1	5
tert-amylmethylether (TAME)	EPA 624.1	5
tert-Butylbenzene	EPA 624.1	5
Tetrachloroethylene (Perchloroethylene)	EPA 624.1	5
Tetrahydrofuran (THF)	EPA 624.1	5
Toluene	EPA 624.1	5
trans-1,2-Dichloroethylene	EPA 624.1	5
trans-1,3-Dichloropropylene	EPA 624.1	5
trans-1,4-Dichloro-2-butene	EPA 624.1	5
Trichloroethene (Trichloroethylene)	EPA 624.1	5
Trichlorofluoromethane (Freon 11)	EPA 624.1	5
Vinyl acetate	EPA 624.1	5
Vinyl chloride	EPA 624.1	5
Xylene (total)	EPA 624.1	5

Matrix/Analyte	Method	Notes
Non-Potable Water		
1,2,4-Trichlorobenzene	EPA 625.1	5
1,2-Dinitrobenzene	EPA 625.1	5
1,3-Dinitrobenzene (1,3-DNB)	EPA 625.1	5
1,4-Dinitrobenzene	EPA 625.1	5
1-Methylnaphthalene	EPA 625.1	5
2,3,4,6-Tetrachlorophenol	EPA 625.1	5
2,3,5,6-Tetrachlorophenol	EPA 625.1	5
2,4,5-Trichlorophenol	EPA 625.1	5
2,4,6-Trichlorophenol	EPA 625.1	5
2,4-Dichlorophenol	EPA 625.1	5
2,4-Dimethylphenol	EPA 625.1	5
2,4-Dinitrophenol	EPA 625.1	5
2,4-Dinitrotoluene (2,4-DNT)	EPA 625.1	5
2,6-Dinitrotoluene (2,6-DNT)	EPA 625.1	5
2-Chloronaphthalene	EPA 625.1	5
2-Chlorophenol	EPA 625.1	5
2-Methylnaphthalene	EPA 625.1	5
2-Methylphenol (o-Cresol)	EPA 625.1	5
2-Nitroaniline	EPA 625.1	5
2-Nitrophenol	EPA 625.1	5
3,3'-Dichlorobenzidine	EPA 625.1	5
3-Nitroaniline	EPA 625.1	5
4,6-Dinitro-2-methylphenol	EPA 625.1	5
4-Bromophenyl phenyl ether (BDE-3)	EPA 625.1	5
4-Chloro-3-methylphenol	EPA 625.1	5
4-Chloroaniline	EPA 625.1	5
4-Chlorophenyl phenylether	EPA 625.1	5
4-Nitroaniline	EPA 625.1	5
4-Nitrophenol	EPA 625.1	5
Acenaphthene	EPA 625.1	5
Acenaphthylene	EPA 625.1	5
Aniline	EPA 625.1	5
Anthracene	EPA 625.1	5
Azobenzene	EPA 625.1	5
Benzidine	EPA 625.1	5
Benzo(a)anthracene	EPA 625.1	5
Benzo(a)pyrene	EPA 625.1	5

Matrix/Analyte	Method	Notes
Non-Potable Water		
Benzo(g,h,i)perylene	EPA 625.1	5
Benzo(k)fluoranthene	EPA 625.1	5
Benzo[b]fluoranthene	EPA 625.1	5
Benzoic acid	EPA 625.1	5
Benzyl alcohol	EPA 625.1	5
bis(2-Chloroethoxy)methane	EPA 625.1	5
bis(2-Chloroethyl) ether	EPA 625.1	5
Butyl benzyl phthalate	EPA 625.1	5
Carbazole	EPA 625.1	5
Chrysene	EPA 625.1	5
Di(2-ethylhexyl)adipate	EPA 625.1	5
Dibenz(a,h) anthracene	EPA 625.1	5
Dibenzofuran	EPA 625.1	5
Diethyl phthalate	EPA 625.1	5
Dimethyl phthalate	EPA 625.1	5
Di-n-butyl phthalate	EPA 625.1	5
Di-n-octyl phthalate	EPA 625.1	5
Diphenylamine	EPA 625.1	5
Fluoranthene	EPA 625.1	5
Fluorene	EPA 625.1	5
Hexachlorobenzene	EPA 625.1	5
Hexachlorobutadiene	EPA 625.1	5
Hexachlorocyclopentadiene	EPA 625.1	5
Hexachloroethane	EPA 625.1	5
Indeno(1,2,3-cd) pyrene	EPA 625.1	5
Isophorone	EPA 625.1	5
m+p Cresol	EPA 625.1	5
Naphthalene	EPA 625.1	5
Nitrobenzene	EPA 625.1	5
N-Nitrosodimethylamine	EPA 625.1	5
N-Nitroso-di-n-propylamine	EPA 625.1	5
N-Nitrosodiphenylamine	EPA 625.1	5
Pentachlorophenol	EPA 625.1	5
Phenanthrene	EPA 625.1	5
Phenol	EPA 625.1	5
Pyrene	EPA 625.1	5
Pyridine	EPA 625.1	5

Matrix/Analyte	Method	Notes
Non-Potable Water		
Fecal coliform-count	SM 9223 B Colilert 18® QTray®	9,10
E.coli-count	SM 9223 B Colilert® 24 QTray®	9,10
Total coliforms-count	SM 9223 B Colilert® 24 QTray®	9,10,11
Solid and Chemical Materials		
Total Organic Material	ASTM D2974-07A	5
Bromide	EPA 300.0_2.1_1993	1
Chloride	EPA 300.0_2.1_1993	1
Fluoride	EPA 300.0_2.1_1993	1,3
Nitrate + Nitrite as N	EPA 300.0_2.1_1993	1
Nitrate as N	EPA 300.0_2.1_1993	1
Nitrite as N	EPA 300.0_2.1_1993	1
Orthophosphate as P	EPA 300.0_2.1_1993	1
Sulfate	EPA 300.0_2.1_1993	1
Chromium, Hexavalent	EPA 7196A_1_1992	5
pH	EPA 9045 D_2004	
Total Organic Carbon	EPA 9060A_1_2004	5
Cation Exchange Capacity	EPA 9081	
Cyanide, Total	SM 4500-CN¯ E-2011	5
Ammonia as N	SM 4500-NH3 E-2011	5
Sulfide	SM 4500-S2¯ D-2011	2,9
Aluminum	EPA 6020B_(7/14)	5
Antimony	EPA 6020B_(7/14)	5
Arsenic	EPA 6020B_(7/14)	5
Barium	EPA 6020B_(7/14)	5
Beryllium	EPA 6020B_(7/14)	5
Boron	EPA 6020B_(7/14)	5
Cadmium	EPA 6020B_(7/14)	5
Calcium	EPA 6020B_(7/14)	5
Chromium	EPA 6020B_(7/14)	5
Cobalt	EPA 6020B_(7/14)	5
Copper	EPA 6020B_(7/14)	5
Iron	EPA 6020B_(7/14)	5
Lead	EPA 6020B_(7/14)	5
Magnesium	EPA 6020B_(7/14)	5
Manganese	EPA 6020B_(7/14)	5
Mercury	EPA 6020B_(7/14)	5
Molybdenum	EPA 6020B_(7/14)	5

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
Nickel	EPA 6020B_(7/14)	5
Phosphorus, Total	EPA 6020B_(7/14)	5
Potassium	EPA 6020B_(7/14)	5
Selenium	EPA 6020B_(7/14)	5
Silver	EPA 6020B_(7/14)	5
Strontium	EPA 6020B_(7/14)	5
Thallium	EPA 6020B_(7/14)	5
Tin	EPA 6020B_(7/14)	5
Titanium	EPA 6020B_(7/14)	5
Vanadium	EPA 6020B_(7/14)	5
Zinc	EPA 6020B_(7/14)	5
Mercury, Liquid Waste	EPA 7470A_1_1994	
Mercury, Solid Waste	EPA 7471B_(2/07)	
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011-92	2,5
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011-92	2,5
4,4'-DDD	EPA 8081B_(2/07)	5
4,4'-DDE	EPA 8081B_(2/07)	5
4,4'-DDT	EPA 8081B_(2/07)	5
Aldrin	EPA 8081B_(2/07)	5
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081B_(2/07)	5
alpha-Chlordane	EPA 8081B_(2/07)	5
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081B_(2/07)	5
Chlordane (tech.)	EPA 8081B_(2/07)	5
delta-BHC	EPA 8081B_(2/07)	5
Dieldrin	EPA 8081B_(2/07)	5
Endosulfan I	EPA 8081B_(2/07)	5
Endosulfan II	EPA 8081B_(2/07)	5
Endosulfan sulfate	EPA 8081B_(2/07)	5
Endrin	EPA 8081B_(2/07)	5
Endrin aldehyde	EPA 8081B_(2/07)	5
Endrin ketone	EPA 8081B_(2/07)	5
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081B_(2/07)	5
gamma-Chlordane	EPA 8081B_(2/07)	5
Heptachlor	EPA 8081B_(2/07)	5
Heptachlor epoxide	EPA 8081B_(2/07)	5
Methoxychlor	EPA 8081B_(2/07)	5
Toxaphene (Chlorinated camphene)	EPA 8081B_(2/07)	5

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
Aroclor-1016 (PCB-1016)	EPA 8082A_(2/07)	5
Aroclor-1221 (PCB-1221)	EPA 8082A_(2/07)	5
Aroclor-1232 (PCB-1232)	EPA 8082A_(2/07)	5
Aroclor-1242 (PCB-1242)	EPA 8082A_(2/07)	5
Aroclor-1248 (PCB-1248)	EPA 8082A_(2/07)	5
Aroclor-1254 (PCB-1254)	EPA 8082A_(2/07)	5
Aroclor-1260 (PCB-1260)	EPA 8082A_(2/07)	5
Aroclor-1262 (PCB-1262)	EPA 8082A_(2/07)	5
Aroclor-1268 (PCB-1268)	EPA 8082A_(2/07)	5
2,4,5-T	FAL SOP 24	7,8
2,4-D	FAL SOP 24	7,8
2,4-DB	FAL SOP 24	7,8
3,5-Dichlorobenzoic acid	FAL SOP 24	7,8
4-Nitrophenol	FAL SOP 24	7,8
Acifluorfen	FAL SOP 24	7,8
Bentazon	FAL SOP 24	7,8
Chloramben	FAL SOP 24	7,8
Dacthal (DCPA)	FAL SOP 24	7,8
Dalapon	FAL SOP 24	7,8
Dicamba	FAL SOP 24	7,8
Dichloroprop (Dichlorprop)	FAL SOP 24	7,8
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	FAL SOP 24	7,8
MCPA	FAL SOP 24	7,8
MCPP	FAL SOP 24	7,8
Pentachlorophenol	FAL SOP 24	7,8
Picloram	FAL SOP 24	7,8
Silvex (2,4,5-TP)	FAL SOP 24	7,8
>C10-C12 Aliphatic EPH	WDOE EPH_(1997)	3
>C10-C12 Aromatic EPH	WDOE EPH_(1997)	3
>C12-C16 Aliphatic EPH	WDOE EPH_(1997)	3
>C12-C16 Aromatic EPH	WDOE EPH_(1997)	3
>C16-C21 Aliphatic EPH	WDOE EPH_(1997)	3
>C16-C21 Aromatic EPH	WDOE EPH_(1997)	3
>C21-C34 Alpihatic EPH	WDOE EPH_(1997)	3
>C21-C34 Aromatic EPH	WDOE EPH_(1997)	3
C8-C10 Aliphatic EPH	WDOE EPH_(1997)	3
C8-C10 Aromatic EPH	WDOE EPH_(1997)	3

Matrix/Analyte	**Method**	**Notes**
Solid and Chemical Materials		
Diesel range organics (DRO)	WDOE NWTPH-Dx_(1997)	5
Motor Oil	WDOE NWTPH-Dx_(1997)	5
Gasoline range organics (GRO)	WDOE NWTPH-Gx_(1997)	3,5
>C10-C12 Aliphatic VPH	WDOE VPH_(1997)	
>C10-C12 Aromatic VPH	WDOE VPH_(1997)	
>C12-C13 Aromatic VPH	WDOE VPH_(1997)	
>C6-C8 Aliphatic VPH	WDOE VPH_(1997)	
>C8-C10 Aliphatic VPH	WDOE VPH_(1997)	
C5-C6 Aliphatic VPH	WDOE VPH_(1997)	
C8-C10 Aromatic VPH	WDOE VPH_(1997)	
1,1,1,2-Tetrachloroethane	EPA 8260D_4_(6/18)	5
1,1,1-Trichloroethane	EPA 8260D_4_(6/18)	5
1,1,2,2-Tetrachloroethane	EPA 8260D_4_(6/18)	5
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 8260D_4_(6/18)	5
1,1,2-Trichloroethane	EPA 8260D_4_(6/18)	5
1,1-Dichloroethane	EPA 8260D_4_(6/18)	5
1,1-Dichloroethylene	EPA 8260D_4_(6/18)	5
1,1-Dichloropropene	EPA 8260D_4_(6/18)	5
1,2,3-Trichlorobenzene	EPA 8260D_4_(6/18)	5
1,2,3-Trichloropropane	EPA 8260D_4_(6/18)	5
1,2,4-Trichlorobenzene	EPA 8260D_4_(6/18)	5
1,2,4-Trimethylbenzene	EPA 8260D_4_(6/18)	5
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260D_4_(6/18)	5
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260D_4_(6/18)	5
1,2-Dichlorobenzene	EPA 8260D_4_(6/18)	5
1,2-Dichloroethane (Ethylene dichloride)	EPA 8260D_4_(6/18)	5
1,2-Dichloropropane	EPA 8260D_4_(6/18)	5
1,3,5-Trimethylbenzene	EPA 8260D_4_(6/18)	5
1,3-Dichlorobenzene	EPA 8260D_4_(6/18)	5
1,3-Dichloropropane	EPA 8260D_4_(6/18)	5
1,4-Dichlorobenzene	EPA 8260D_4_(6/18)	5
1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260D_4_(6/18)	5
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260D_4_(6/18)	5
2-Chloroethyl vinyl ether	EPA 8260D_4_(6/18)	5
2-Chlorotoluene	EPA 8260D_4_(6/18)	5
2-Hexanone	EPA 8260D_4_(6/18)	5
4-Chlorotoluene	EPA 8260D_4_(6/18)	5

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
4-Isopropyltoluene (p-Cymene)	EPA 8260D_4_(6/18)	5
4-Methyl-2-pentanone (MIBK)	EPA 8260D_4_(6/18)	5
Acetone	EPA 8260D_4_(6/18)	5
Acrolein (Propenal)	EPA 8260D_4_(6/18)	5
Acrylonitrile	EPA 8260D_4_(6/18)	5
Allyl chloride (3-Chloropropene)	EPA 8260D_4_(6/18)	5
Benzene	EPA 8260D_4_(6/18)	5
Bromobenzene	EPA 8260D_4_(6/18)	5
Bromochloromethane	EPA 8260D_4_(6/18)	5
Bromodichloromethane	EPA 8260D_4_(6/18)	5
Bromoform	EPA 8260D_4_(6/18)	5
Carbon disulfide	EPA 8260D_4_(6/18)	5
Carbon tetrachloride	EPA 8260D_4_(6/18)	5
Chlorobenzene	EPA 8260D_4_(6/18)	5
Chlorodibromomethane	EPA 8260D_4_(6/18)	5
Chloroethane (Ethyl chloride)	EPA 8260D_4_(6/18)	5
Chloroform	EPA 8260D_4_(6/18)	5
cis-1,2-Dichloroethylene	EPA 8260D_4_(6/18)	5
cis-1,3-Dichloropropene	EPA 8260D_4_(6/18)	5
Dibromomethane	EPA 8260D_4_(6/18)	5
Dichlorodifluoromethane (Freon-12)	EPA 8260D_4_(6/18)	5
Di-isopropylether (DIPE)	EPA 8260D_4_(6/18)	5
Ethyl acetate	EPA 8260D_4_(6/18)	5
Ethyl methacrylate	EPA 8260D_4_(6/18)	5
Ethylbenzene	EPA 8260D_4_(6/18)	5
Ethyl-t-butylether (ETBE)	EPA 8260D_4_(6/18)	5
Hexachlorobutadiene	EPA 8260D_4_(6/18)	5
Iodomethane (Methyl iodide)	EPA 8260D_4_(6/18)	5
Isopropylbenzene	EPA 8260D_4_(6/18)	5
m+p-xylene	EPA 8260D_4_(6/18)	5
Methacrylonitrile	EPA 8260D_4_(6/18)	5
Methyl acrylate	EPA 8260D_4_(6/18)	5
Methyl bromide (Bromomethane)	EPA 8260D_4_(6/18)	5
Methyl chloride (Chloromethane)	EPA 8260D_4_(6/18)	5
Methyl methacrylate	EPA 8260D_4_(6/18)	5
Methyl tert-butyl ether (MTBE)	EPA 8260D_4_(6/18)	5
Methylene chloride (Dichloromethane)	EPA 8260D_4_(6/18)	5

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
Naphthalene	EPA 8260D_4_(6/18)	5
n-Butylbenzene	EPA 8260D_4_(6/18)	5
n-Hexane	EPA 8260D_4_(6/18)	5
n-Propylbenzene	EPA 8260D_4_(6/18)	5
o-Xylene	EPA 8260D_4_(6/18)	5
sec-Butylbenzene	EPA 8260D_4_(6/18)	5
Styrene	EPA 8260D_4_(6/18)	5
tert-amylmethylether (TAME)	EPA 8260D_4_(6/18)	5
tert-Butylbenzene	EPA 8260D_4_(6/18)	5
Tetrachloroethylene (Perchloroethylene)	EPA 8260D_4_(6/18)	5
Tetrahydrofuran (THF)	EPA 8260D_4_(6/18)	5
Toluene	EPA 8260D_4_(6/18)	5
trans-1,2-Dichloroethylene	EPA 8260D_4_(6/18)	5
trans-1,3-Dichloropropylene	EPA 8260D_4_(6/18)	5
trans-1,4-Dichloro-2-butene	EPA 8260D_4_(6/18)	5
Trichloroethene (Trichloroethylene)	EPA 8260D_4_(6/18)	5
Trichlorofluoromethane (Freon 11)	EPA 8260D_4_(6/18)	5
Vinyl acetate	EPA 8260D_4_(6/18)	5
Vinyl chloride	EPA 8260D_4_(6/18)	5
Xylene (total)	EPA 8260D_4_(6/18)	5
1,2,4-Trichlorobenzene	EPA 8270E_6_(6/18)	5
1,2-Dichlorobenzene	EPA 8270E_6_(6/18)	5
1,2-Dinitrobenzene	EPA 8270E_6_(6/18)	5
1,3-Dichlorobenzene	EPA 8270E_6_(6/18)	5
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270E_6_(6/18)	5
1,4-Dichlorobenzene	EPA 8270E_6_(6/18)	5
1,4-Dinitrobenzene	EPA 8270E_6_(6/18)	5
1-Methylnaphthalene	EPA 8270E_6_(6/18)	5
2,2'-Oxybis(1-chloropropane)	EPA 8270E_6_(6/18)	5
2,3,4,6-Tetrachlorophenol	EPA 8270E_6_(6/18)	5
2,3,5,6-Tetrachlorophenol	EPA 8270E_6_(6/18)	5
2,4,5-Trichlorophenol	EPA 8270E_6_(6/18)	5
2,4,6-Trichlorophenol	EPA 8270E_6_(6/18)	5
2,4-Dichlorophenol	EPA 8270E_6_(6/18)	5
2,4-Dimethylphenol	EPA 8270E_6_(6/18)	5
2,4-Dinitrophenol	EPA 8270E_6_(6/18)	5
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270E_6_(6/18)	5

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270E_6_(6/18)	5
2-Chloronaphthalene	EPA 8270E_6_(6/18)	5
2-Chlorophenol	EPA 8270E_6_(6/18)	5
2-Methylnaphthalene	EPA 8270E_6_(6/18)	5
2-Methylphenol (o-Cresol)	EPA 8270E_6_(6/18)	5
2-Nitroaniline	EPA 8270E_6_(6/18)	5
2-Nitrophenol	EPA 8270E_6_(6/18)	5
3,3'-Dichlorobenzidine	EPA 8270E_6_(6/18)	5
3-Nitroaniline	EPA 8270E_6_(6/18)	5
4,6-Dinitro-2-methylphenol	EPA 8270E_6_(6/18)	5
4-Bromophenyl phenyl ether (BDE-3)	EPA 8270E_6_(6/18)	5
4-Chloro-3-methylphenol	EPA 8270E_6_(6/18)	5
4-Chloroaniline	EPA 8270E_6_(6/18)	5
4-Chlorophenyl phenylether	EPA 8270E_6_(6/18)	5
4-Nitroaniline	EPA 8270E_6_(6/18)	5
4-Nitrophenol	EPA 8270E_6_(6/18)	5
Acenaphthene	EPA 8270E_6_(6/18)	5
Acenaphthylene	EPA 8270E_6_(6/18)	5
Aniline	EPA 8270E_6_(6/18)	5
Anthracene	EPA 8270E_6_(6/18)	5
Azobenzene	EPA 8270E_6_(6/18)	5
Benzidine	EPA 8270E_6_(6/18)	5
Benzo(a)anthracene	EPA 8270E_6_(6/18)	5
Benzo(a)pyrene	EPA 8270E_6_(6/18)	5
Benzo(g,h,i)perylene	EPA 8270E_6_(6/18)	5
Benzo(k)fluoranthene	EPA 8270E_6_(6/18)	5
Benzo[b]fluoranthene	EPA 8270E_6_(6/18)	5
Benzoic acid	EPA 8270E_6_(6/18)	5
Benzyl alcohol	EPA 8270E_6_(6/18)	5
bis(2-Chloroethoxy)methane	EPA 8270E_6_(6/18)	5
bis(2-Chloroethyl) ether	EPA 8270E_6_(6/18)	5
Butyl benzyl phthalate	EPA 8270E_6_(6/18)	5
Carbazole	EPA 8270E_6_(6/18)	5
Chrysene	EPA 8270E_6_(6/18)	5
Di(2-ethylhexyl)adipate	EPA 8270E_6_(6/18)	5
Di(2-ethylhexyl)phthalate	EPA 8270E_6_(6/18)	5
Dibenz(a,h) anthracene	EPA 8270E_6_(6/18)	5

Matrix/Analyte	Method	Notes
Solid and Chemical Materials		
Dibenzofuran	EPA 8270E_6_(6/18)	5
Diethyl phthalate	EPA 8270E_6_(6/18)	5
Dimethyl phthalate	EPA 8270E_6_(6/18)	5
Di-n-butyl phthalate	EPA 8270E_6_(6/18)	5
Di-n-octyl phthalate	EPA 8270E_6_(6/18)	5
Diphenylamine	EPA 8270E_6_(6/18)	5
Fluoranthene	EPA 8270E_6_(6/18)	5
Fluorene	EPA 8270E_6_(6/18)	5
Hexachlorobenzene	EPA 8270E_6_(6/18)	5
Hexachlorobutadiene	EPA 8270E_6_(6/18)	5
Hexachlorocyclopentadiene	EPA 8270E_6_(6/18)	5
Hexachloroethane	EPA 8270E_6_(6/18)	5
Indeno(1,2,3-cd) pyrene	EPA 8270E_6_(6/18)	5
Isophorone	EPA 8270E_6_(6/18)	5
m+p Cresol	EPA 8270E_6_(6/18)	5
Naphthalene	EPA 8270E_6_(6/18)	5
Nitrobenzene	EPA 8270E_6_(6/18)	5
n-Nitrosodimethylamine	EPA 8270E_6_(6/18)	5
N-Nitroso-di-n-propylamine	EPA 8270E_6_(6/18)	5
n-Nitrosodiphenylamine	EPA 8270E_6_(6/18)	5
Pentachlorophenol	EPA 8270E_6_(6/18)	5
Phenanthrene	EPA 8270E_6_(6/18)	5
Phenol	EPA 8270E_6_(6/18)	5
Pyrene	EPA 8270E_6_(6/18)	5
Pyridine	EPA 8270E_6_(6/18)	5
Particle Size Distribution	ASTM D422	1
Ignitability	ASTM D93-02	
Ignitability	EPA 1010A - 2002	

Accredited Parameter Note Detail

(1) Accreditation based in part on recognition of Laboratory Accreditation Bureau DoD accreditation.(2) Accreditation is limited to liquid matrix only.(3) Provisional accreditation pending submittal of acceptable corrective action report and Proficiency Testing (PT) results (WAC 173-50-110).(4) The Laboratory is permited to use BOD7 under 40cfr417 for use in monitoring the effluent discharges from soap and detergent manufacturing point sources. (5) Accreditation based in part on recognition of Oregon NELAP accreditation (6) Modified EPA 3C for helium analysis. (7) Provisional accreditation pending acceptable audit corrective actions. (8) Based on EPA 8151A modified for MS. (9) Interim accreditation pending the successful completion of an on-site audit to verify method capabilities (WAC 173-50-100). (10) Provisional accreditation pending submittal of acceptable QA/QC and SOP documents. (11) Not approved for total coliform regulatory samples under 40CFR136.(12) Provisional accreditation pending submittal of acceptable Proficiency Testing (PT) results (WAC 173-50-110).

08/18/2023

Authentication Signature
Rebecca Wood, Lab Accreditation Unit Supervisor

Date

APPENDIX G

Stantec's *Site-Specific Health and Safety Plan*

Site-Specific Health and Safety Plan

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

November 22, 2024

Prepared for:

Port of Moses Lake

Prepared by:
Stantec Consulting Services Inc.
1687 114th Avenue Southeast, Suite 100
Bellevue, Washington 98004
USA
www.stantec.com

Health and Safety Plan Modification Log				
Version	**Date**	**Sections**	**Description**	**Approver(s)**
1	June 7, 2024	All	New Issuance	Laina Cole Peter Petro
2	November 22, 2024		Addition of PFAS	Laina Cole Peter Petro

This HASP will be amended (with changes recorded on the Health and Safety Plan Modification Log above) if site conditions, scope of work, training, personnel, or other critical items change.

HASP Use Declaration

This Site-Specific Health and Safety Plan (HASP) was prepared by and for Stantec Consulting Services Inc. Any reliance on this document by a third party is strictly prohibited. Stantec subcontractors are responsible for assessing the hazards of their operations and preparing a project specific HASP as applicable to their scope of work and conditions. A copy of this HASP will be provided to Stantec subcontractors conducting field work related to site activities as a means of communicating recognized hazards at the site of which Stantec has knowledge.

For subcontractors, the methods to identify hazards, implement controls, enforce the precautions and requirements for ensuring the health and safety of its employees and property; remain the subcontractor's responsibility. The material in this HASP reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document as well as in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Leadership Preparation, Review and Approval

Client: Port of Moses Lake	**Site Name:** Pumphouse 1
Project Name: Port of Moses Lake Pumphouse 1	**Project Number:** 203723678
Start Date: May 2024	**End Date:** 12/31/2026
Plan Review Date: November 22, 2024	

Prepared by: Keri Chappell Primary Author	Signature:	Keri Chappell	Date: 11/22/24
Laina Cole Site Health and Safety Officer (SHSO)	Signature:	LAINAECOLE	Date: 11/22/24
Peter Petro HSSE Representative	Signature:	Peter A. Petro Digitally signed by Petro, Peter Date: 2024.11.20 16:05:57 -08'00'	Date: 11/22/24

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FIGURES

LIST OF APPENDICES

Acknowledgement and Agreement

This Site-Specific Health and Safety Plan (HASP) has been developed for the purpose of aiding Stantec employees in identifying, understanding, and mitigating the risks/hazards they are likely to encounter at the site. This HASP is a means of communicating recognized hazards at the site of which Stantec has knowledge and may also be used as a guidance document by properly trained and experienced Stantec subcontractors and clients to assist them in their hazard evaluation process. Stantec is available to assist subcontractors in identifying recognized hazards of which Stantec is knowledgeable. Subcontractors and other contractors at the site must develop and enforce their own HASP or other safety planning documents as appropriate for their work at the site to address the hazards faced by their own employees. The methods to identify hazards, implement controls, and enforce the precautions and requirements for ensuring the health and safety of its employees and property, remain the subcontractor’s responsibility.

All parties conducting site activities under the scope of this HASP are required to coordinate their activities and practices with the Stantec Project Manager or their designee, the Site Health and Safety Officer (SHSO). Stantec has provided a copy of this HASP to our subcontractors and other contractors to assist in identifying hazards of which Stantec is aware and to satisfy Stantec's responsibilities under the Occupational Safety and Health Administration (OSHA) Hazard Communication standard. Similarly, Stantec’s subcontractors and other contractors are required to inform Stantec of any recognized hazards or hazards created by their work on site that may affect Stantec employees including, but not limited to, the Safety Data Sheets for chemicals the contractor may bring on site.

Your signature below confirms the following: you have read and understand the hazards and associated mitigation measures discussed in this HASP; you have received training and medical surveillance according to this HASP and the OSHA Standard for Hazardous Waste Operations and Emergency Response (HAZWOPER) found in 29 Code of Federal Regulations (CFR) 1910.120/ 29 CFR 1926.65 or state equivalent; you understand that subcontractors and other contractors must develop their own HASP for their employees; and that you will complete your tasks in a manner conforming to this HASP and your employer specific Safe Work Practices, Safety Plans or guidance. Furthermore, you understand that you could be prohibited by the SHSO from working on this project due to failure to comply with any aspect of this HASP. Finally, you understand that you have the authority and responsibility to call for “Stop Work” when unsafe conditions are recognized until safe methods are developed and implemented.

Acknowledgement and Agreement

Name	Signature	Company	Date

Additional pages may be used.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated external defibrillator
ANSI	American National Standards Institute
AOA	Air Operations Area
APA	Alliance Partnership Agreement
ASAOC	Administrative Settlement Agreement and Order on Consent
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
City	City of Portland
CO	Carbon Monoxide
CPR	Cardiopulmonary resuscitation
CSO	Combined Sewer Overflow
dBA	decibels, A-weighted scale
DCR	Designated Company Representative
DEET	N,N-Diethyl-meta-toluamide
DOT	Department of Transportation
EFAP	Employee and Family Assistance Plan
EHS	Environmental, Health and Safety
ERP	Emergency Response Plan
eV	Electron volt
FOD	Foreign Object Debris
FSP	Field Sampling Plan
ft	Feet
GE	General Electric Company

HASP	Health and Safety Plan
HAZCOM	Hazard Communication Standard (29 CFR 1910.1200)
HAZMAT	Hazardous Materials Response
HAZWOPER	Hazardous Waste Operations and Emergency Response
HRAC	Hazard Recognition, Assessment, and Control
HSSE	Health, Safety, Security, and Environment
ICOC	In Case of Crisis Mobile Application
IDLH	Immediately dangerous to life or health
IDW	Investigative Derived Waste
JHA	Job Hazard Analysis
JSA	Job Safety Analysis
kV	Kilovolts
LMRA	Last-Minute Risk Assessment
L&I	Washington State Department of Labor and Industries
LOTO	Lock-Out/Tag-Out
LTT	Lock, Tag, Try
MOC	Management of Change
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NORM	Naturally Occurring Radioactive Material
NRR	Noise Reduction Rating
OEL	Occupational Exposure Limit
OSEC	Office Safety and Environmental Coordinator
OSHA	U.S. Occupational Safety and Health Administration
OVM	Organic Vapor Monitor
PCBs	Polychlorinated biphenyls
PDI	Pre-Design Investigation

PEL	Permissible Exposure Limit
PFAS	Per- and polyfluoroalkyl substances
PFD	Personal Flotation Device
PHSS	Portland Harbor Superfund Site
PID	Photoionization Detector
PJO	Planned Job Observation
Port	Port of Moses Lake
PPE	Personal Protective Equipment
ppb	Parts per billion
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act of 1976 as amended (42 U.S.C. 6901 et seq);
RD	Remedial Design
REL	Recommended Exposure Limit
River	Willamette River
RM	River Mile
RM10W	River Mile 10 West
RMS	Risk Management Strategy
ROD	Record of Decision
SCBA	Self-contained Breathing Apparatus
SDS	Safety Data Sheet
SHSO	Site Health and Safety Officer
SMA	Sediment Management Area
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC	Spill Prevention, Control, and Countermeasures
Stantec	Stantec Consulting Services Inc.
STEL	Short Term Exposure Limit

Sulzer	Sulzer Pumps US
SWP	Stantec Safe Work Practice
T2	Port of Portland Terminal 2
TLV	Threshold Limit Values established by the ACGIH
TPH	Total Petroleum Hydrocarbons
TSD	Treatment, storage, and disposal
TWA	Time Weighted Average
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WCCC	Workers Compensation Claims Coordinator

Glossary

Buddy System	A system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.
Clean-up operation	An operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared-up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment.
Competent Person	Person capable of identifying existing and predictable hazards and has the authority and responsibility to take prompt measures to eliminate or control the hazards.
Decontamination	The removal of hazardous substances from employees and their equipment (including their personal protective equipment [PPE]) to the extent necessary to preclude the occurrence of foreseeable adverse health effects.
Emergency response	A response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel are not considered to be emergency responses. Responses to releases of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses.
Hazard	A hazard is any condition, device, substance, or practice that has the potential to cause loss, such as injury to people or damage to equipment, materials, environment, or property.
Hazardous materials response (HAZMAT) team	An organized group of employees, designated by the employer, who are expected to perform work to handle and control actual or potential leaks or spills of hazardous substances requiring possible close approach to the substance. The team members perform responses to releases or potential releases of hazardous substances for the purpose of control or stabilization of the incident. A HAZMAT team is not a fire brigade nor is a typical fire brigade a HAZMAT team. A HAZMAT team, however, may be a separate component of a fire brigade or fire department
Hazardous substance	Any substance designated below, exposure to which results or may result in adverse effects on the health or safety of employees. Designated substances include: • Any substance defined under section 103(14) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (42 U.S.C. 9601). • Any biologic agent and other disease causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological

	malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring. • Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 Code of Federal Regulations (CFR) 172.101 and appendices. • Hazardous waste as defined by Resource Conservation and Recovery Act (RCRA) and in 40 CFR 261.3, or those substances defined as hazardous wastes in 49 CFR 171.8.
Hazardous waste	A waste or combination of wastes as defined in 40 CFR 261.3, or those substances defined as hazardous wastes in 49 CFR 171.8.
Health hazard	A chemical or a pathogen where acute or chronic health effects may occur in exposed employees. It also includes stress due to temperature extremes. The term health hazard includes chemicals that are classified in accordance with the Hazard Communication Standard, 29 CFR 1910.1200, as posing one of the following hazardous effects: Acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); aspiration toxicity or simple asphyxiant.
Immediately dangerous to life or health (IDLH)	An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would interfere with an individual's ability to escape from a dangerous atmosphere.
Near Miss	Potentially fatal events not resulting in injury, illnesses, or property damage; minor spills that are not reportable, are controlled, and immediately cleaned up; and any other event nearly resulting in injury, property damage, or loss not covered here.
Occupational Safety and Health Administration (OSHA)	United States federal agency responsible for overseeing and implementing safe and healthy working conditions for workers by setting and enforcing standards and by providing training, outreach, education, and assistance.
Oxygen deficiency	The concentration of oxygen by volume below which atmosphere-supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent.
Permissible exposure limit (PEL)	The maximum exposure concentration of a chemical (inhalation or dermal) identified by OSHA or state agency.
Post emergency response	That portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If post emergency response is performed by an employer's own employees who were part of the initial emergency response, it is considered to be part of the initial response and not post emergency response. However, if a group of an employer's own employees, separate from the group providing initial response, performs the clean-up operation, then the separate group of employees would be performing post-emergency response and subject to 29 CFR 1910.120(q)(11).
Published exposure level	Exposure limits published in "NIOSH Recommendations for Occupational Health Standards" dated 1986, which is incorporated by reference as specified in § 1910.6, or if none is specified, the exposure limits published in the standards specified by the American Conference of Governmental Industrial Hygienists in their publication "Threshold Limit Values and Biological Exposure Indices for 1987-

	88" dated 1987, which is incorporated by reference as specified in § 1910.6.
Qualified person	A person with specific training, knowledge, and experience in the area for which the person has the responsibility and the authority to control.
Risk	Risk is the likelihood of a potential loss occurring, and the severity of the loss if it does occur. When determining likelihood, consideration needs to be given to the frequency of exposure and the probability of loss occurring.
Site health and safety officer (SHSO)	The individual located on a hazardous waste site who is responsible to the employer and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements.
State Only Hazardous Waste	A waste or combination of wastes as defined by OAR 340-101-0033, which include pesticide residues and mixtures of wastes containing constituents of federal P (3 percent) and U (10 percent) listed wastes
Uncontrolled hazardous waste site	An area identified as an uncontrolled hazardous waste site by a governmental body, whether Federal, state, local or other where an accumulation of hazardous substances creates a threat to the health and safety of individuals or the environment or both. Some sites are found on public lands such as those created by former municipal, county or state landfills where illegal or poorly managed waste disposal has taken place. Other sites are found on private property, often belonging to generators or former generators of hazardous substance wastes. Examples of such sites include, but are not limited to, surface impoundments, landfills, dumps, and tank or drum farms. Normal operations at treatment, storage, and disposal (TSD) sites are not covered by this definition.

1.0 INTRODUCTION

This Site-Specific Health and Safety Plan (HASP) was prepared by Stantec Consulting Services Inc. (Stantec) on behalf the Port of Moses Lake (Client), for the Port of Moses Lake Pumphouse 1 (site).

Select documents and materials provided in this HASP are specific to Stantec and may not be applicable to the environmental consultant contracted for the work outlined in Task II of Agreed Order DE 22056 issued by the Washington State Department of Ecology. The contracted consultant will need to prepare a site-specific HASP prior to beginning fieldwork.

Pumphouse 1 is located at the Grant County International Airport. Stantec does not have responsibility for initiating, maintaining, monitoring, supervising, or determining the adequacy or implementation of the safety precautions, programs, or plans of any additional party outside of their direct control operating or working within the Pumphouse 1 site, but outside Stantec's site controls. The information in this HASP should not be used for advising, issuing direction, or assuming control over any safety precautions or programs of the Client or Subcontractors.

Where this HASP addresses safe practices for various specific work activities, this information is provided solely as directives or guidelines for protecting Stantec employees (including "employee like" subconsultant employees that are supervised by Stantec on a day-to-day basis) and establishing minimum requirements for Stantec subcontractors. Any implementation questions for this plan should be addressed to the Project Manager, designated project Site Health and Safety Officer (SHSO) or a Stantec Health, Safety, Security, and Environment (HSSE) team member.

Stantec subcontractors are contractually responsible for assuring the safety and health of their employees and shall effectively carry out all requirements referenced in the contract documents, and as required by State and/or Federal law. Any precautions, programs, or HASP by any Stantec subcontractor must, at a minimum, meet the requirements of this HASP. However, this HASP is not intended in any way to be a substitute for any subcontractor's own risk analysis, or to otherwise relieve any subcontractor of any applicable contractual and regulatory requirements for health and safety. Stantec subcontractor's will be provided a copy of this HASP and shall acknowledge that it is only intended as minimum HASP requirements, and shall provide and enforce their own HASP, including any changes or revisions specific to their activities and scope of work.

1.1 HEALTH AND SAFETY PLAN OBJECTIVE

This HASP is issued by Stantec to establish the work practices necessary for the protection of Stantec employees and site visitors during the performance of their work activities. The scope of services for Stantec work activities is summarized in **Section 2.1**. The detailed scope of work for individual activities conducted under this HASP are within the specific Field Sampling Plans (FSPs) established for the Project Work Plan prepared under separate cover.

The objective of this HASP is to address known and reasonably anticipated health and safety hazards to the Stantec employees providing services under Stantec's contract with the Client. This HASP provides information designed to prevent and minimize personal injuries, illnesses to Stantec employees and physical damage to equipment, supplies, and property.

1.1.1 Regulatory and Other Requirements

All project activities will be performed in accordance with applicable sections of the Code of Federal Regulations (CFRs), including the Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910.120 (General Industry) and 29 CFR 1926.65 (Construction). The HASP is intended to satisfy the requirements of the Port of Moses Lake Airport Operations Construction Safety Provision Requirements (Appendix A). The following table outlines federal Hazardous Waste Operations and Emergency Response (HAZWOPER) regulatory requirements cross referenced to the appropriate HASP section.

Requirement	Regulatory Reference	HASP Section
A safety and health risk or hazard analysis for each site task and operation found in the workplan.	1910.120(b)(4)(ii)(A)	Section 4.0, 5.0, 0, 7.0, 8.0, 9.0, 10.0 and **Appendix B, C, and D**.
Employee training assignments to assure compliance with 29 CFR 1910.120(e).	1910.120(b)(4)(ii)(B)	Section 1.9, 13.0, 18.7, 18.8
Personal protective equipment to be used by employees for each of the site tasks and operations being conducted as required by the personal protective equipment program requirements found in 29 CFR 1910.120(g)(5).	1910.120(b)(4)(ii)(C)	Section 15.0 and **Appendix B and D**.
Medical surveillance requirements in accordance with 29 CFR 1910.120(f).	1910.120(b)(4)(ii)(D)	Section 16.0
Site control measures in accordance with the site control program requirements found in 29 CFR 1910.120(d).	1910.120(b)(4)(ii)(F)	Section 11.0
Decontamination procedures in accordance with 29 CFR 1910.120(k).	1910.120(b)(4)(ii)(G)	Section 11.5
An emergency response plan meeting the requirements of 29 CFR 1910.120(l) for safe and effective responses to emergencies, including the necessary personal protective equipment (PPE) and other equipment.	1910.120(b)(4)(ii)(H)	Section 18.0
Confined space entry procedures.	1910.120(b)(4)(ii)(I)	Section 9.0
A spill containment program meeting the requirements of 29 CFR 1910.120(j).	1910.120(b)(4)(ii)(J)	Section 18.6
Policy statements of the line of authority and accountability for implementing the program, the objectives of the program and the role of the site safety and health supervisor or manager and staff;	29 CFR 1910.120/1926.65 Appendix C	Section 3.0
Mean or methods for the development of procedures for identifying and controlling workplace hazards at the site.	29 CFR 1910.120/1926.65 Appendix C	Section 4.0
Means or methods for the development and communication to employees of the various plans, work rules, standard operating procedures (SOP) and practices that pertain to individual employees and supervisors.	29 CFR 1910.120/1926.65 Appendix C	Section 3.2, 4.0

Requirement	Regulatory Reference	HASP Section
Means for the training of supervisors and employees to develop the needed skills and knowledge to perform their work in a safe and healthful manner.	29 CFR 1910.120/1926.65 Appendix C	Section 1.9, 13.0
Means to anticipate and prepare for emergency situations.	29 CFR 1910.120/1926.65 Appendix C	Section 18.0
Means for obtaining information feedback to aid in evaluating the program and for improving the effectiveness of the program.	29 CFR 1910.120/1926.65 Appendix C	Section 1.5 and 1.6

1.1.2 Client Requirements

Project activities will be performed in accordance with Client site safety requirements, and other policies and/or procedures incorporated into the contract for the contracted work activities. The Port's Construction Safety Contract Provision Requirements are included as Appendix A.

1.2 HSSE POLICY

Policy

Stantec is committed to providing and maintaining a healthy, safe, and secure workplace for our staff, clients, partners, and subcontractors and to responsibly managing the environmental aspects of its business.

Practice

Our core company values guide us in all that we do. The way we treat our people, our clients, and our neighbors reflects who we are, what we believe in, and how we do our work. At Stantec, we believe in doing what is right and being Safer Together, which includes zero harm to the environment and sending our people home injury-free, every day.

Stantec's HSSE Program is a cornerstone of the Occupational Health and Safety Management System and the Environmental Management System. In turn, these Management Systems are part of Stantec's overall Integrated Management System.

Stantec strives to:

- Visibly demonstrate a commitment to HSSE by providing responsible leadership, and clearly communicating expectations.
- Assist and support employees in developing an awareness and understanding of the health, safety, security, and environmental issues related to their work.
- Identify, assess, and manage the health, safety, security and environmental hazards and risks to which its employees are exposed.
- Minimize the environmental aspects and impacts associated with the services and products it provides.
- Comply with legislation, regulations, and appropriate industry standards.

- Monitor and enhance the health, safety, security and environmental practices through inspections, audits, reviews, investigations, corrective actions, shared learnings, review of best practices, and behavior-based processes.
- Share lessons learned and integrate best HSSE practices into our businesses.
- Provide a framework which supports the continual improvement of the system.
- Work collaboratively with employees to achieve health, safety, security, and environmental objectives, at work and at home.
- Foster a culture of being SaferTogether™, in which all employees, partners, and subcontractors share a commitment to health, safety, security, and the environment.

Everyone working for Stantec is responsible and accountable for Stantec's health, safety, security, and environmental performance. Management, supervisors, employees, and subcontractors are expected to understand their roles and responsibilities as outlined by the HSSE Program and to comply with the practices of the Occupational Health and Safety Management System, and the Environmental Management System.

1.3 EMPLOYEE EMPOWERMENT AND STOP WORK AUTHORITY

Employees are Stantec's most valuable asset; their safety is of vital concern. If at any time, a Stantec employee or contractor feels an unsafe condition exist, they have not only the authority, but ALSO the responsibility to call for "Stop Work" until safe methods are developed and implemented. It is the intent on this project for employees to accept responsibility and ownership of the HSSE Program. This HASP is a living document, and the goal of Stantec is that employees are involved in the development and evolution of the HASP.

1.4 RIGHT TO UNDERSTAND

All employees have the right to know what hazards are present on the job, understand how these hazards can affect them, and participate in the selection of controls used to mitigate these hazards. Employees will learn about the job-specific hazards during training and through on-the-job instruction. Employees will participate in the selection of safety mitigations during the Hazard Recognition, Assessment and Control (HRAC) process.

1.5 SAFETY MANAGEMENT AND PLAN FEED BACK

The objective of safety management is to integrate safety, health, and environmental protection into all work practices. Stantec will accomplish this objective by involving all employees in the work planning process through development of task level assessments or Job Safety Analysis (JSAs), and project safety plans up to and including development of the HSSE Program. Feedback on site hazards and controls should be provided to the SHSO and if not addressed, can be raised to the employee's supervisor or a member of the HSSE Team. Hazards and safety concerns may also be reported directly to regional HSSE Management using the RMS3 Event Reporting Form or through the In Case of Crisis (ICOC) Mobile App. As identified in **Section 1.3** all employees have Stop Work Authority.

1.6 CONTINUOUS IMPROVEMENT

This section describes the field inspection and observation process to maintain compliance with third party certifications. Formal activities include project audits, safety file reviews, management walk arounds, contractor conformance reviews, site inspections, and project job observations as summarized below:

Type	Purpose	Frequency	Documented (Yes/No)	Responsible Party(s)
Safety Compliance File Review	Formal review of contractual, Stantec, and regulatory safety requirements.	As needed	Yes, using RMS6 (Project File Safety Review)	Any project personnel or leadership team member
Jobsite Safety Inspections	Identify hazards and observe health and safety program implementation by employees.	As needed	Yes, using RMS5 (Worksite Inspection – Field) or approved equivalent	SHSO
SAFE Observations/ Planned Job Observation (PJO)	Identify hazards and reinforce safe work practices of peers.	As needed	Yes, using SAFE Observation Card or RMS10 (Planned Job Observation)	Any Site Personnel

1.7 MODIFYING THE HEALTH AND SAFETY PLAN

This HASP and associated task level hazard assessments (JSA) found in **Appendix D** or RMS 2 field level risk assessment (blank copies found in **Appendix B**) must be modified if; new hazards are identified, the scope of work is revised, or the provisions specified in the HASP are not adequate to protect the health and safety of all personnel. Modifications will be accomplished in consultation with associated project health and safety personnel, who in turn shall recommend appropriate modifications after approval by the Project Manager and Stantec's HSSE Manager or their designee. Significant changes to the HASP shall be documented with the appropriate revision number in the revision log found in the HASP preface. Minor changes which can be adequately controlled in the field can be documented on the task level hazard assessments (**Appendix D**) or RMS2 form as appropriate. The HSSE Manager or their designee and the Project Manager must approve the changes to this document. This process is to be documented in the HASP and the project files. The Project Manager will be responsible for informing staff and Stantec subcontractors of all changes.

1.8 MANAGEMENT OF CHANGE

The purpose of a Management of Change (MOC) procedure is to identify risks, both real and potential, associated with change and reduce them to acceptable levels. An MOC procedure provides a process by which the impact of changes to HSSE practices are recognized, controlled, reviewed, approved, communicated, and documented. This section is primarily applicable to situations where even small changes in processes could result in significant risks of injury or damage, such as equipment/valve lock-out procedures, implementing underwater inspection operations, etc., and when required by regulation, such as client processes involving Highly Hazardous Chemicals as identified by OSHA.

MOC applies to changes in operating parameters, equipment, maintenance practices, product compositions, chemicals used, procedures, equipment, and personnel. Examples of where a MOC process may become necessary are for confined space operations, when client requirements dictate changes to our internal processes, and utility clearance procedures. Regulatory changes must also be considered and may impact permit limits or other operating parameters. These changes could take the form of new or emerging regulations, or changes to existing regulations. Changes may be permanent, or temporary in nature.

1.8.1 Responsibility

The MOC owner is typically the project manager or other designated responsible person who is looking to implement the proposed change. The reviewers will likely be technical experts familiar with the impacts that could be caused by the proposed change. The approver is a sufficient level of management to authorize the change, given the potential impacts. Input from the appropriate HSSE resources should also be sought and is required whenever a change involves a change to a Stantec SWP or HSSE practice or procedure.

The Management of Change (MOC) Form (RMS 11) must clearly identify:

- Who is responsible for initiating the MOC (the MOC owner).
- Who needs to review and approve the MOC.
- Who manages the MOC process.
- How the MOC is communicated to affected personnel and what review/audit process is in place.

The completed MOC form shall be maintained in the Project File, with a copy sent to the appropriate Stantec Regional HSSE Representative.

1.8.2 Condition Limits

Temporary changes must be time limited. If the change must continue beyond the intended time limit, then an additional MOC is required. Additionally, if a change is approved within given physical parameters, and any of these parameters are to be exceeded, then another MOC review is required.

1.8.3 Emergency Changes

On rare occasions, a provision for emergency changes may be required. Using the MOC form and process provides a mechanism for authorizing an emergency change and a requirement to have the change formally reviewed in a prompt fashion.

1.9 H&S TRAINING FOR PROJECT WORK AND SITE ACCESS

Stantec will provide or validate their employees are provided with the proper training required for their work tasks. At a minimum, any Stantec employee or subcontractor performing work at the site will be briefed on Client safety requirements and the requirements of this HASP, including the incident reporting and emergency response protocol. Acknowledgement of this training will be documented by signature on the Acknowledgement Form found in the preface of this HASP. Stantec visitors will be briefed in accordance with **Section 3.3**. Hazard specific training requirements are found in **Section 13.0**.

Client Life Saving Principles and site safety training requirements are required for all project personnel prior to working on the site.

1.10 STANTEC SUBCONTRACTORS SITE HEALTH AND SAFETY PLAN

Stantec subcontractors are responsible for preparing a project specific HASP/Program as applicable to their scope of work. Their HASP shall provide for the means and methods to identify hazards, implement controls, and enforce the precautions and requirements for ensuring the health and safety of its employees and property. At a minimum, the Stantec subcontractor must meet or exceed the requirements of this HASP and those identified by OSHA 29 CFR 1910 and 1926.

A copy of this HASP will be provided to all Stantec subcontractors for their review and acknowledgement of understanding in advance of performing any activities on site. This HASP is intended to be a guidance document conveying site hazards of which Stantec has knowledge.

2.0 PROJECT DESCRIPTION

2.1 SITE DESCRIPTION

The site, also referred to as Pumphouse 1, is shown on **Plate 1**, and is a subset former refueling pumphouse and remediation compound located within the active Grant County International Airport in Moses Lake, Washington. Grant County International Airport offers a fully secured, 3,500-acre airfield. A background check and specific training is required before access credentials are issued. The airport has 24-hour support onsite. The airport is a secure facility and visitors are required to maintain access badges or be always escorted by a badged person. The airport is located approximately 6 miles northwest of the main town-center of Moses Lake, Washington, and all areas to the site are accessed by paved roads.

Additional site plan(s) will be added to this HASP as site conditions are refined during the project, such as after completion of utility locating events or adding/destroying well locations. The site plan(s) may be updated and annotated with work zones, site ingress/egress, staging areas, sample processing flow diagrams, temporary waste storage areas, etc., as needed.

2.2 SCOPE OF WORK

The primary objective of the project is to identify and address investigation data gaps by conducting field investigations for development of an effective remediation plan for the main constituents of concern (COC), Jet-B (later called JP-4, and Air Force fuel) and Jet-A. Stantec will mobilize staff from our offices within the region to conduct remediation-related activities. The scope of this project consists of, but is not limited to, the following:

- Groundwater Monitoring and Sampling (M&S)
- System Operations and Maintenance (O&M)
- Subsurface Clearance/Utility Locates
- Well Drilling and Installation/Destruction
- General Site Activities

Therefore, this HASP was prepared for use by Stantec personnel while performing the following major tasks:

- Drive to/from the site. Site access will conform to client security and on-site travel requirements.
- Supervision of subcontractors.
- Collection groundwater samples and data from monitoring wells.
- Logging and sampling of soils during drilling events.
- Installation of wells.
- Conducting site walks.
- Subsurface clearance related activities, including private utility locate.
- Supervision of the proper collection and storage of IDW pending profiling and removal for disposal.
- Supervision of a waste management transportation company for the collection and removal of IDW.
- Maintenance, expansion, and data collection of systems operations.

The detailed scope of work for individual activities conducted under this HASP are subject to change based on a developing scope of work and in the event of change, this HASP will be modified accordingly, or a concurrent work plan will be present onsite dictating scope of work in addition to this document. All questions about the proposed activities can be directed to the Stantec Project Manager and Project Technical Lead.

2.3 CURRENT OPERATIONS

The Pumphouse 1 site is located within the active airport facility. The site features include a pumphouse, two large ASTs, fuel hydrant dispensing equipment, and associated product piping. Tools, materials, and waste must be stored securely to prevent items from becoming foreign object debris (FOD) that present a hazard for nearby aircraft. Several on-site wells are above grade and located in low grasses and sagebrush which may conceal uneven surfaces, biological hazards, and debris that may present a hazard to vehicles. Dry grasses and shrubs may become combustible materials that must be cleared prior to performing hot work. Heavy snow may prevent site features and hazards from being visible. Perform a site walk prior to accessing these areas and carry a metal detector during inclement conditions to locate wells. The primary access method for the site is via gated driveways accessible by light truck. An operating passive NAPL recovery system is located in Pumphouse #1.

- All wells require personnel to cross an operating airport taxiway. Vehicles must have a flashing amber beacon operating while driving on the site. Drill rigs must have an orange checkered flag on the mast while drilling on airport property.
- Site access must be coordinated with the Port of Moses Lake (Port) and notification of Port personnel must occur a minimum of 24 hours in advance prior to site access for orientation and safety training.

2.4 SITE HISTORY

The site is a former jet fuel dispensing facility located at Grant County Airport in Moses Lake, Washington.

The airport was developed first as an Army base, then transitioned to an Air Force base, then transitioned to "local" ownership by the Port of Moses Lake to function as the Grant County International Airport. In 1982, Former ExxonMobil entered a lease agreement with the Port of Moses Lake for certain aircraft refueling facilities. Three pumphouses in total historically existed to move jet fuel, Jet-B (later called JP-4, and Air Force fuel), and Jet-A, through the pipelines to the dispensers for refueling. Each pumphouse contained a building with adjacent USTs, which were fed via piping coming in from off-site ASTs and pumped from the USTs out to the tarmac for plane re-fueling. Based on historical review of reports, periodic groundwater monitoring and sampling activities were initiated on January 28, 1993, after contamination was discovered in soil borings near Pumphouse 1 in 1992. In some wells, measurable levels of non-aqueous phase liquid (NAPL) were discovered, and removal of free product began. In 1992, the USTs (6) were temporarily abandoned, then permanently abandoned in place in 1996. Groundwater monitoring and assessment activities, as well as free product recovery, continues to present day. Pumphouse 1 was leased and operated by multiple parties, including Exxon Mobil Environmental and Property Solutions, before transitioning solely to the responsibility of the Port of Moses Lake.

2.5 SITE TOPOGRAPHY

The site lies at an elevation of approximately 1,170 feet above msl (**Plate 1**) and is generally flat.

3.0 PROJECT ROLES AND RESPONSIBILITIES

3.1 PROJECT ORGANIZATION

The following staff will comprise the project leadership team:

Role	Name – Phone
Client Contact/Project Coordinator:	Milton Miller, Port of Moses Lake – (509) 762-5363
Stantec Project Manager:	Bobby Thompson – (206) 510-5855
Task Manager and SHSO officer:	Laina Cole – (253) 247-1466
Stantec Director of Health, Safety, Security and Environment Operations – US:	Peter Petro – (707) 338-3386
HSSE Manager:	US West – Tony Wong (805) 234-6227
Stantec Business Line HSSE Manager:	Peter Petro – (707) 338-3386
Stantec Regional HSSE Advisor:	John Currie – (262) 643-9165
Stantec Office Safety and Environment Coordinator (OSEC):	Cassidy Correia – (425) 602-4008
Stantec Regional HR:	Cheri Stolz – (949) 923-6018
Public Relations:	US West – Ryan Lamont – (213) 955-9775
Stantec Designated Company Representative (DCR) (A&D Testing):	Lindsay Milne – (780) 917-6950
Stantec Workers Compensation Claims Coordinator:	Melissa Helton - (513) 720-3706
Medical Consultation Line:	WorkCare - (888) 449-7787

A table summarizing key responsibilities for project personnel is provided below.

Project Role	General Project Responsibilities
Client Contact: Milton Miller Port of Moses Lake	Port of Moses Lake Project Manager and main point of contact.
Agency Representative: Kristin Beck Washington Department of Ecology	Washington State Department of Ecology Agreed Order Project Manager. Regulatory oversight.

Project Role	General Project Responsibilities
Stantec Account Manager	• Take reasonable precaution to provide a safe work environment. • Demonstrate a commitment to safety. • Provide general direction to Project Managers, HSSE Team Members and employees about their responsibilities and roles in providing a safe and healthy workplace. • Notify Client of HSSE Incidents • Provide the support and training necessary for employees to carry out their HSSE responsibilities. • Encourage employees to express concerns and suggest improvements on HSSE issues. • Intervene when at-risk behavior is observed. • Support team members who use stop work authority. • Demonstrate accountability through performance reviews, counselling, and disciplinary action. • Participate in investigations into injuries, accidents, and high potential incidents, contributing to the reports and ensuring follow up of actions and provision of feedback. • Conducting management site visits and reporting findings
Stantec Project Manager	• Overall financial, safety, quality, and logistics responsibility for the project • Contact client and subcontractors to understand all hazards and discuss with SHSO to develop an effective HASP. • Follow-up all incidents upon notice. Contact Regional HSSE Manager and Stantec Account Manager when notified of an onsite incident. • Demonstrate a commitment to safety. • Implement and enforce necessary risk control and HSSE programs. • Verify that required HSSE policies are applied at the site and communicated to the project team. • Clearly communicate HSSE expectations to subcontractors • Assist in identifying and eliminating or controlling site hazards during project planning. • Participate in periodic jobsite HSSE audits. • Support team members who use stop work authority. • Remove team members and subcontractors from the site when their actions are considered dangerous or contrary to these HSSE requirements. • Provide access to and maintain protective equipment, devices, and clothing, and require that they be used in accordance with Safe Work Practices and other instructions. • Verify PPE is readily available onsite and that employees wear the prescribed level of PPE. • Be familiar with Stantec's HSSE Program and their role in its operation and implementation. • Communicate foreseeable hazards to employees, along with information and training on appropriate control measures. • Participate in investigations of unsafe acts and conditions, incidents, and near misses reported to them and facilitate prompt corrective action. • Manage project team resources to adequately implement HSSE policies, standards, and best practices
Stantec Site Health and Safety Officer (SHSO)	• Serve as the project lead for all issues related to health and safety. • Conduct work in accordance with JSA and this HASP. • Report all incidents and near misses immediately to Project Manager and Affected Employee's Supervisor. • Validate safe work practices are conducted per the project plan.

Project Role	General Project Responsibilities
	• Lead the daily Field Level Risk Assessment (RMS2) process and safety meeting. • Maintain all project and regulatory required health and safety documentation and records. • Verify PPE is readily available onsite and that employees wear the prescribed level of PPE. • Verify that the project bulletin board, where applicable, contains the necessary health and safety postings and that the information is current. • Update and maintain a current JSA that addresses potential hazards and associated controls. • Lead incident response operations until relieved by a qualified individual following the incident command system.
Stantec Human Resources	Assist with incident review, policy interpretation, recordkeeping, and discipline.
Stantec Director of Health, Safety and Environment	Respond with corporate resources to all incidents as appropriate. Assist in incident investigation.
Stantec HSSE Manager and HSSE Business Line Manager	Respond with corporate resources to all incidents as appropriate. Assist in incident investigation. Review and comment on HASP. Provide technical guidance on HSSE requirements.
HSSE Advisor	• Assist in incident investigation. • Review and comment on HASP when designated by HSSE Manager. • Provide technical guidance on HSSE requirements. • Audit project sites as needed and perform planned job observations. • Provide safety related trainings to project staff as needed.
Stantec US – Workers Compensation Claims Coordinator (WCCC)	Assist with incident review, medical case management, and recordkeeping.
Medical Consultation Line	Provide advice on work related-related injuries and medical symptoms. Administer medical surveillance program.
Stantec OSEC	Manage Health and Safety responsibilities for personnel in Office. Assist in HASP review. Assist employees with setting up training and attending/completing necessary courses.
Stantec Project Staff	• Perform work in accordance with HASP and Stantec Policies and Practices. • Participate in RMS2 development and daily tailgate meetings. • Assess the work area for hazards before starting a task. • Immediately report all injuries and hazards. • Use Stop Work Authority when a hazardous condition exists. • Only conduct work that the personnel are trained and authorized to complete. • Participate in incident investigations when applicable. • Always use the proper safety equipment/PPE.
Subcontractor Safety Lead	Subcontractor shall designate a competent person (capable of recognizing hazards, with the authority to immediately correct) in a supervisory position, to administer its HASP.
Subcontractor Project Manager	• Implement and enforce necessary risk control and HSSE programs. • Verify that required HSSE policies are communicated to the team. • Assist in identifying and eliminating or controlling site hazards during project planning. • Participate in periodic jobsite HSSE audits.

Project Role	General Project Responsibilities
	• Support team members who use stop work authority. • Remove team members from the site when their actions are considered dangerous or contrary to these HSSE requirements. • Provide access to and maintain protective equipment, devices, and clothing, and require that they be used in accordance with company policy and other instructions. • Communicate foreseeable hazards to Stantec and company employees. • Participate in investigations of unsafe acts and conditions, incidents, and near misses reported to them and facilitate prompt corrective action. • Manage project team resources to adequately implement HSSE policies, standards, and best practices

3.2 PROJECT COMMUNICATIONS

Two general types of communication systems will be available for workers assigned to field projects. One system will ensure adequate communication between site personnel, and the other will ensure the ability to contact personnel and emergency assistance off the site.

3.2.1 Onsite Communication

Internal communication is used to:

- Alert team members to emergencies.
- Pass along safety information, such as weather conditions that could affect heat stress, cold stress, or general safety, etc.
- Maintain site control.
- Facilitate site work by being able to call to the appropriate party for information, without having to decontaminate the work party and equipment and secure the site.

Verbal communication can be impeded by on-site background noise and the use of PPE. Thus, pre-arranged signals of communication will be established prior to the initiation of site activities, particularly when heavy equipment work is involved. Internal communication devices to be used onsite to facilitate communications over distance or in loud noise areas include:

- Cell Phones (where reliable).
- Vehicle horns.
- Air horns.
- Hand/arm signals as shown in SWP216 Working Near Mobile Equipment or as documented during the Tailgate Safety meeting.

3.2.2 Offsite Communication

External communication systems between on-site and off-site personnel are necessary to:

- Coordinate emergency response efforts.
- Report to leadership and the client about site activities.
- Maintain contact with essential off-site personnel.

- Maintain contact with emergency responders or regulatory agencies (where applicable).

When the job site is in a developed location, the primary means of external communication devices are cell phones and computer networks. These communication methods shall be verified prior to conducting field activities.

3.3 SITE VISITORS

All personnel visiting the site who are invitees (visitors), clients, employees, or subcontractors will be permitted to enter the project site only with prior approval by the Project Manager or their designee (Task Leader or SHSO). The SHSO must provide visitors with a project briefing that covers the current hazards and controls including required PPE.

All personnel will comply with site entry requirements (if any) for each facility listed in **Section 2.1**. Site visitors require a full-time escort by a Stantec employee and follow the procedures required by each facility. Visitors must have the necessary training and medical clearance for access to areas that are restricted due to specific training, medical surveillance, and PPE requirements.

3.4 INCIDENT INVESTIGATION AND REPORTS

Accidents and incidents, including near misses, involving Stantec and/or Stantec subcontractor employees shall be immediately reported to the SHSO and will be investigated. The SHSO will begin the Stantec incident reporting procedure by calling the Regional HSSE Manager and the Project Manager identified in **Section 3.1** (above). The incident will be documented either using a Stantec incident report form (RMS3), client form, or the Subcontractor's form as applicable. The original report form will be forwarded electronically to hsse@stantec.com. Refer to **Appendix E** for the Stantec incident reporting process and forms.

The Stantec HSSE Manager or their designee is responsible for leading incident investigations, documenting root cause and corrective actions, and sharing lessons learned with the project team, the Client, and affected employers as applicable. Subcontractors shall also follow their employer's incident reporting process but also alert the SHSO, for project related incidents.

The Project Manager shall alert the Client Account Manager (if applicable), the Client (if applicable), and the affected employee's supervisor or employer (in the case of a subcontractor). The Project Manager shall work with the HSSE Manager to determine root cause an implement any required corrective actions (if applicable).

Incident Type	Definition (Current Stantec Corporate Definitions)
Report Only	An employee needs to document a happening which may be relevant in the future. Examples include witnessing an accident or a non-work-related injury, an incident on a worksite not involving Stantec personnel, physical signs and symptoms related to workstation ergonomics and/or materials handling
Incident	Any unplanned event that adversely affects our employees, our business, its physical assets, the clients we serve, or the environment. Any injury (medical and first aid), illnesses, fatality, near misses, damage to property or product, documented industrial hygiene exposure events (e.g., permissible exposure limit exceeded, or employee

Incident Type	Definition (Current Stantec Corporate Definitions)
	entry into a mandated medical surveillance program due to an exposure), notices of violation for agencies having jurisdiction, spills, fires, and environmental releases.
Serious Incident	Any work-related incident where there is property damage greater than $5,000, employee hospitalization, fatality, facility/site shutdown, or involves a third party (public). A near miss with the potential for any of the above consequences would also be considered a serious incident.
Near-Miss	Any event that could adversely affect our employees, our business, its physical assets, the customers we serve, or the environment, given any change in circumstances
Hazard Identification	The identification of a condition or practice that has the potential for an incident or loss.
Property Damage (Vehicle)	Damage to any vehicle used for Stantec business, includes normal wear and tear (e.g., tire damage, minor scratches, stone chips to paint or windshield, mechanical wear), whether the vehicle is attended or not.
Property Damage (Other)	Damage to equipment, materials, etc., excluding vehicle damage.
Theft	Theft of any property under the care and control of Stantec.
Non-compliance	Where an employee or project is identified as operating outside the parameters of Stantec policy and/or legislative requirements.
***Near Miss – Injury**	An employee reports physical symptoms related to work activities which have not yet resulted in treatment of any type, nor have they impacted the employee's working ability.
First Aid	An injury or illness requires first aid treatment only
Medical Treatment	Medical treatment above and beyond first aid, without loss of work time beyond the day of injury or illness.
Restricted Work	Change in job duties and/or shortened workday resulting from a work-related injury or illness, affecting the employee’s ability to engage in one or more routine work activities (i.e., an activity carried out at least once per week).
Lost Time	Health care professional recommends one or more days away from work due to a work-related injury or illness.
Fatality	Work related fatality.
Motor Vehicle Incident	An incident involving a vehicle driven by an employee, whether on or off the road, which has resulted in damage to assets, the environment or Stantec’s reputation, irrespective of cost or responsibility for cause. This does not include damage as a result of normal wear and tear (see Property Damage – Vehicle).
Spill or Release	Discharge of material or substance which is reportable to a third party such as a regulatory agency or a client, or which may expose an employee to a health risk.
Contractor Recordable Injury	Definitions as above, including Medical Aid – No Lost Time, Restricted Work, Lost Time, or Fatality) but applied to a Stantec subcontractor.
Fire / Explosion / Flood	A natural or man-made hazard including fire, explosion or flood that causes damage or injury.
Violence or Harassment	Any act in which a person is abused, threatened, intimidated, or assaulted in the course of their employment.
3rd Party Incident	Incident involves someone who is not party to the work being completed but may be impacted. Example: Member of the public.

Incident Type	Definition (Current Stantec Corporate Definitions)
Utility Strike	Compromising or disrupting of service to buried and/or overhead utility service lines, municipal or third party owned utility services, underground storage tank (UST) system components and other subsurface property service lines or systems
Work Refusal	An employee has enacted their legislated Right to Refuse dangerous work.
Stop Work Authority	An employee has enacted Stantec's Stop Work Authority provisions upon observing the presence of unsafe conditions associated with Stantec work activities. All employees have the right to stop or refuse work when they perceive an immediate danger to their health and safety or that of their colleagues.
High Potential Incident	A Near Miss, First Aid injury, Medical Aid injury, Modified Work injury or Lost Time injury can often have the potential to be a fatality or a Significant Injury with disability if the circumstances would have been slightly different. For example, a Lost Time incident due to a back soft tissue injury would only be counted as a Lost Time with low potential for a serious injury, whereas a First Aid incident involving a remotely operated machine striking a worker and imparting a small cut would be counted as a First Aid incident with high potential for a Fatality or a Significant Injury. Any incident with energy exchange that had the potential to be a Fatality or a Significant Injury if the circumstances would have been slightly different should be counted as High Potential; all others should be counted as low potential and reported as normal incidents (see above). In terms of Risk Assessment language when the exposure, probability and consequence of the hazard(s) that created the injury calculate to a High or Extreme Risk Level, the incident should be counted as a High Potential; all others should be counted as low potential.

4.0 HAZARD RECOGNITION

4.1 CRITICAL RISK CONTROLS

Stantec has identified twelve critical risks based upon our evaluation of tasks with the greatest potential to cause serious injuries, incidents, and fatalities to Stantec employees. To reduce or eliminate the potential for serious incidents, we have established controls for employees to follow when engaged in critical risk work. These controls can be found in the Critical Risk Controls Information Sheets, and are incorporated into our SWPs and RMS forms. The following critical risks have been identified at the Site:

Driving ☒ Applicable	**Working at Heights** ☐ Applicable	**Traffic Control** ☒ Applicable	**Wildlife, Insects, and Vegetation** ☒ Applicable
Mobile and Heavy Equipment ☒ Applicable	**Environments with Water or Ice** ☒ Applicable	**Ground Disturbance** ☒ Applicable	**Ergonomic Hazards and Manual Handling** ☒ Applicable
Hazardous Materials and Environments ☒ Applicable	**Hazardous Energy** ☐ Applicable	**Hot Work** ☐ Applicable	**Confined Spaces** ☐ Applicable

4.2 ENERGY WHEEL HAZARD RECOGNITION

The Energy Wheel is a simple, yet effective, method to focus worker's attention on the various types of energy present in the workplace which if released in an uncontrolled manner could cause an injury. By identifying the energies, workers can also identify the hazards associated with the energy sources. Both task related and site/location related hazards including time of day, time of year and project stages must be considered. Foreseeable energy hazards are described in the sections that follow.

4.2.1 Chemical Hazard Recognition

The following chemical hazards have been identified at the site. Information on the specific controls for these hazards are found in **Section 5.0** of this HASP, the attached JSA (**Appendix D**), and the referenced Stantec Safe Work Practices accessible on The Lens and listed in **Appendix C**. Required Work Plans and/or supplemental safety forms such as pre-ground disturbance worksheets and checklists are found in **Appendix A**. Note that the control SWP listed below do not necessary relate specifically to the hazard identified in the left column but it does apply to one or several associated hazards.

Energy	**Hazard**		**Administrative Controls for Selected Energy Hazards**	
Chemical	☒	Hazardous Material(s)/Chemicals	☒	SWP 104 - Hazard Communication
	☐	Oxygen deficient atmosphere	☒	SWP 105 - Personal Protective Equipment (PPE)
	☐	Carbon Monoxide	☒	SWP 107 - First Aid
	☐	Oxygen enriched atmosphere	☒	SWP 108 - Bloodborne Pathogens
	☐	H_2S (Hydrogen sulfide)	☒	SWP 111 - Medical Surveillance
	☒	Asbestos	☒	SWP 304 - Asbestos Safety
	☒	Silica	☒	SWP 305 - Benzene Safety
	☒	Acids	☐	SWP 306 - Hydrogen Sulfide
	☐	Caustics	☒	SWP 309 - Silica Awareness
	☐	Oxidizer	☒	SWP 310 - Compressed Gas Cylinders
	☒	Petroleum hydrocarbons	☒	SWP 312 - Fueling Gasoline Engines
	☐	Solvents/Flammables	☒	SWP 314 - Working Around Hazardous Waste and Wastewater
	☒	Volatile organic compounds (VOCs)	☐	SWP 315 - Arsenic Safety
	☐	Heavy metals	☐	SWP 319 - Hydrogen Fluoride/Hydrofluoric Acid Safety
	☐	Benzene	☒	SWP 409 - Respiratory Protection
	☒	Lead	☐	SWP 411 - Confined Space Entry
	☐	Arsenic	☐	SWP 414 - Hot Work
	☒	Polycyclic Aromatic Hydrocarbons (PAH)	☒	JSA (**Appendix D**)
	☐	Polychlorinated biphenyls (PCBs)	☒	Field Level Risk Assessment (RMS2; **Appendix B**)
	☐	Dioxins/Furans		
	☐	Munitions of concern (MEC) and/or Unexploded Ordnance (UXO)		
	☐	Pesticides/Herbicides		

Energy	Hazard		Administrative Controls for Selected Energy Hazards	
	☐	Hydrogen fluoride / Hydrofluoric acid		
	☒	Hazardous Waste		
	☒	Other: Per- and polyfluoroalkyl substances (PFAS)		

4.2.2 Biological Hazard Recognition

The following biological hazards have been identified at the site. Information on the specific controls for these hazards are found in **Section 6.0** of this HASP, the attached Job Hazard Analysis (**Appendix D**), and the referenced Stantec Safe Work Practices accessible on The Lens and listed in **Appendix C**.

Energy	Hazard		Administrative Controls for Selected Energy Hazards	
Biological	☐	Wildlife	☒	HSSE-100 – Alcohol and Drug Practice
	☐	Domestic animals (dogs, cattle)	☒	SWP 102 - Workplace Violence Prevention Program
	☒	Bees / wasps / hornets	☒	SWP 104 - Hazard Communication
	☐	Ticks	☒	SWP 105 - Personal Protective Equipment (PPE)
	☐	Black flies	☒	SWP 107 - First Aid
	☒	Other stinging or biting insects	☒	SWP 108 - Bloodborne Pathogens
	☐	Pedestrians / onlookers	☒	SWP 111 - Medical Surveillance
	☐	Protesters	☐	SWP 118 - Working Alone in the Field
	☐	Poison ivy	☐	SWP 118a - Working Alone in the Field Checklist
	☐	Poison oak	☒	SWP 124 - Safe Driving
	☐	Giant hogweed	☒	SWP 124b - Journey Management Plan
	☐	Wild parsnip	☐	SWP 125 - Workstation Ergonomics
	☐	Brush clearance	☒	SWP 314 - Working Around Hazardous Waste and Wastewater
	☐	Thorns/ brambles	☒	SWP 407 - Traffic Control and Protection Planning
	☐	Sewage	☒	SWP 407a - Traffic Protection Plan or equivalent
	☐	Wastewater	☒	SWP 409 - Respiratory Protection
	☐	Domestic waste/refuse	☐	SWP 501 - Using the Spot Messenger System
	☐	Medical waste	☒	SWP 508 - Wildlife Encounter
	☐	Bloodborne pathogens	☐	SWP 511 - Ticks and Tickborne Diseases
	☒	Rodents/Droppings	☐	SWP 517 - Safe Machete Use
	☒	Birds/Droppings	☐	SWP 518 - Using a Chainsaw
	☐	Bacterial cultures or bioaugmentation	☐	SWP 519 - Post-Disaster Building Entry
	☐	Fungal affected soil/materials	☐	SWP 519b - Safety Precautions and Field Equipment Checklist
	☒	Fatigue	☒	JSA (**Appendix D**)

Energy	Hazard		Administrative Controls for Selected Energy Hazards	
	☒	Working under the influence	☒	Field Level Risk Assessment (RMS2; **Appendix B**)
	☐	Working alone	☐	
	☐	Other		

4.2.3 Physical Hazard Recognition

The following physical hazards have been identified at the site. Information on the specific controls for these hazards are found in **Section 7.0, 8.0, 9.0 and 10.0** of this HASP, the attached JSA (**Appendix D**), and the referenced Stantec Safe Work Practices accessible on The Lens and listed in **Appendix C**.

Energy	Hazard		Administrative Controls for Selected Energy Hazards	
Thermal	☒	Cold stress	☒	SWP 113 - Heat Stress
	☐	Cold surfaces	☐	SWP-113a - California Heat Illness Prevention Plan
	☐	Refrigerated or Cryogenic Equipment	☒	SWP 114 - Working in Cold Environments
	☒	Heat stress	☐	SWP 414 - Hot Work, SWP 414a - Hot Work Permit
	☐	Hot surfaces	☐	SWP 514 - Working on or Near Ice
	☐	Hot work	☒	JSA (**Appendix D**)
	☒	Weather conditions	☒	Field Level Risk Assessment (RMS2; **Appendix B**)
	☐	Vessel/container temperature change		
	☐	Other:		
Radiation	☒	Solar (UVA/UVB)	☒	SWP 104 - Hazard Communication
	☐	Non-ionizing	☐	SWP 414 - Hot Work, SWP 414a - Hot Work Permit
	☐	Welding	☐	SWP 516 - Radiation Safety (US)
	☐	Nuclear densometers	☒	JSA (**Appendix D**)
	☐	Naturally Occurring Radioactive Materials (NORMs)	☒	Field Level Risk Assessment (RMS; **Appendix B**)
	☐	Microwave		
	☐	X-ray		
	☐	Other Ionizing Radiation		
	☐	Other:		
Noise	☒	Mobile equipment	☒	SWP 105 - Personal Protective Equipment (PPE)
	☒	Stationary equipment	☒	SWP 106 - Hearing Conservation
	☒	Manual equipment	☒	SWP 206 - Hand and Portable Power Tools
	☒	Impact	☐	SWP 215 - Supervision of Hydro-Excavation Activities (Daylighting)

	☐	Vibration	☒	SWP 216 - Working Near Mobile Equipment
	☒	Impact on communications	☒	JSA (**Appendix D**)
	☒	Traffic	☒	Field Level Risk Assessment (RMS2; **Appendix B**)
	☐	Other:		
Gravity	☒	Slip / Trip / Fall	☒	SWP 105 - Personal Protective Equipment (PPE)
	☒	Manual lifting	☒	SWP 115 - Material Handling and Safe Lifting
	☐	Work from heights	☐	SWP 201 - Fall Protection/Working from Heights
	☒	Falling objects	☐	SWP 202 - Ladder Safety , SWP 202a - Ladder Inspection Checklist
	☐	Damaged walking surface	☐	SWP 203 - Aerial Work Platforms
	☐	Work on Ice	☐	SWP 205 - Scaffold Safety
	☐	Work on/over water	☐	SWP 208 - Hoisting and Lifting
	☐	Falling trees/branches	☐	SWP 214 - Entering Excavations and Trenches
	☐	Demolition of structure or component	☐	SWP 217 - Forklift Operations, SWP 217a - Forklift Pre-Operation Checklist
	☒	Jacking equipment, vehicle, or structure	☐	SWP 411 - Confined Space Entry
	☐	Unsecure load	☐	SWP 505 - Off-Road Vehicles
	☐	Work on slope (unstable ground/surface)		SWP 510 - Working in Abandoned Buildings
	☐	Work on slope (greater than 1:1 / 45°)	☐	SWP 513 - Boat and Water Safety
	☐	Unmaintained or damaged structure	☐	SWP 514 - Working on or Near Ice
	☒	Rigging/hoist/crane	☐	SWP 517 - Safe Machete Use
	☒	Loading trailer/flat bed/ truck	☐	SWP 518 - Using a Chainsaw
	☐	Engulfment	☐	SWP 519 - Post-Disaster Building Entry, SWP 519b - Safety Precautions and Field Equipment Checklist
	☐	Other:	☒	JSA (**Appendix D**)
			☒	Field Level Risk Assessment (RMS2; **Appendix B**)
Motion	☒	Working near traffic	☒	SWP 105 - Personal Protective Equipment (PPE)
	☒	Automobile/truck/trailer	☒	SWP 124 - Safe Driving,
	☒	Mobile equipment (construction, forklift)	☒	SWP 124a - Vehicle Pre-Use Checklist
	☐	Elevated work platform	☒	SWP 124b - Journey Management Plan
	☐	Pedestrians	☐	SWP 125 - Workstation Ergonomics
	☐	Cyclists	☐	SWP 201 - Fall Protection/Working from Heights
	☐	Rail	☐	SWP 202 - Ladder Safety , SWP 202a - Ladder Inspection Checklist
	☐	ATV	☐	SWP 203 - Aerial Work Platforms
	☐	ARGO	☐	SWP 205 - Scaffold Safety

	☐	Watercraft / water	☒	SWP 206 - Hand and Portable Power Tools
	☐	Snowmobile	☒	SWP 208 - Hoisting and Lifting
	☒	Aircraft (fixed wing or rotary)	☐	SWP 214 - Entering Excavations and Trenches
	☐	UAVs/Drones	☒	SWP 216 - Working Near Mobile Equipment
	☒	Walking/Hiking	☐	SWP 217 - Forklift Operations, SWP 217a - Forklift Pre-Operation Checklist
	☒	Lifting	☒	SWP 407 - Traffic Control and Protection Planning
	☒	Pushing/Pulling	☒	SWP 407a - Traffic Protection Plan
	☒	Bending	☐	SWP 407c - Traffic Protection Plan - Construction, Parking, and Forecourts
	☒	Posture/position	☐	SWP 408 - Lock, Tag & Try (LTT)
	☐	Climbing	☐	SWP 411 - Confined Space Entry
	☒	Twisting	☐	SWP 504 - Backpack and Boat Mounted Electrofishing
	☐	Limited Motion/Entrapment	☐	SWP 505 - Off-Road Vehicles
	☒	Cutting (Blade Use)	☐	SWP 506 - Rail Safety
	☐	Diving	☐	SWP 507 - Aircraft Safety
	☐	Repetitive Stress	☐	SWP 513 - Boat and Water Safety
	☐	Other:	☐	SWP 514 - Working on or Near Ice
			☐	SWP 517 - Safe Machete Use
			☒	JSA (**Appendix D**)
			☒	Field Level Risk Assessment (RMS2; **Appendix B**)
Mechanical	☒	Cutting edges	☒	SWP 105 - Personal Protective Equipment (PPE)
	☒	Blades	☒	SWP 115 - Material Handling and Safe Lifting
	☒	Rotating parts (e.g., drill/auger)	☐	SWP 203 - Aerial Work Platforms
	☐	Wrap points	☒	SWP 206 - Hand and Portable Power Tools
	☒	Shear points	☒	SWP 213 - Ground Disturbance and Overhead Utility
	☒	Pinch points	☒	SWP 213a - Pre-Ground Disturbance Worksheet and Approval Form
	☐	Freewheeling point	☒	SWP 213b - Aboveground/Underground Utilities Checklist
	☐	Chains	☐	SWP 217 - Forklift Operations, SWP 217a - Forklift Pre-Operation Checklist
	☒	Cables	☐	SWP 408 - Lock, Tag & Try (LTT)
	☒	Lift Gate	☐	SWP 411 - Confined Space Entry
	☐	Other:	☒	SWP 416 - Supervision of Contracted Drilling Activities
	☐	Other:	☐	SWP 517 - Safe Machete Use
	☐	Other:	☐	SWP 518 - Using a Chainsaw
	☐	Other:	☒	JSA (**Appendix D**)

	☐ Other:	☒ Field Level Risk Assessment (RMS2; **Appendix B**)
Pressure	☐ Spoil piles	☒ SWP 105 - Personal Protective Equipment (PPE)
	☒ Hydraulic systems	☒ SWP 113 - Heat Stress
	☒ Pneumatic systems/tools	☐ SWP-113a - California Heat Illness Prevention Plan
	☐ Pressure Testing	☐ SWP 203 - Aerial Work Platforms
	☐ Fire System Impact/Use	☒ SWP 206 - Hand and Portable Power Tools
	☒ Pressure Washing	☒ SWP 208 - Hoisting and Lifting
	☐ Pigging	☒ SWP 213 - Ground Disturbance and Overhead Utility
	☐ Steam	☒ SWP 213a - Pre-Ground Disturbance Worksheet and Approval Form
	☒ Vacuum	☒ SWP 213b - Aboveground/Underground Utilities Checklist
	☒ Cylinders	☐ SWP 214 - Entering Excavations and Trenches
	☐ Powder Actuated Tools	☐ SWP 215 - Supervision of Hydro-Excavation Activities (Daylighting)
	☐ In-situ Injection	☒ SWP 216 - Working Near Mobile Equipment
	☐ Other:	☐ SWP 217 - Forklift Operations, SWP 217a - Forklift Pre-Operation Checklist
		☒ SWP 310 - Compressed Gas Cylinders
		☐ SWP 408 - Lock, Tag & Try (LTT)
		☐ SWP 411 - Confined Space Entry
		☒ SWP 416 - Supervision of Contracted Drilling Activities
		☒ JSA (**Appendix D**)
		☒ Field Level Risk Assessment (RMS2; **Appendix B**)

4.2.4 Electrical Hazard Recognition

The following electrical hazards have been identified at the site. Information on the specific controls for these hazards are found in **Section 7.0 and 10.0** of this HASP, the attached JSA (**Appendix D**), and the referenced Stantec Safe Work Practices accessible on The Lens and listed in **Appendix B**.

Energy	Hazard	Administrative Controls for Selected Energy Hazards
Electrical	☒ Power and communication lines	☒ SWP 105 - Personal Protective Equipment (PPE)
	☐ Static charge	☒ SWP 213 - Ground Disturbance and Overhead Utility
	☐ Wiring	☒ SWP 213a - Pre-Ground Disturbance Worksheet and Approval Form
	☒ Batteries	☒ SWP 213b - Aboveground/Underground Utilities Checklist
	☒ Lighting levels	☐ SWP 312 - Fueling Gasoline Engines
	☒ Wet environment with power source	☒ SWP 406 - Electrical Safety Program
	☐ Non-GFCI cords/plugs	☒ SWP 406a - Electrical Job Briefing / Hazard Awareness

☐	Non-Double insulated tools	☐	SWP 408 - Lock, Tag & Try (LTT)
☐	Exposed circuit/ live part	☐	SWP 411 - Confined Space Entry
☒	Lightning	☐	SWP 414 - Hot Work, SWP 414a - Hot Work Permit
☐	Electrofishing	☐	SWP 504 - Backpack and Boat Mounted Electrofishing
☐	Damaged/down power lines	☐	SWP 506 - Rail Safety
☐	Transformer yard	☐	SWP 510 - Working in Abandoned Buildings
☐	Induced current	☐	SWP 513 - Boat and Water Safety
☐	Arc Welding	☐	SWP 518 - Using a Chainsaw
☐	Other:	☐	SWP 519 - Post-Disaster Building Entry, SWP 519b - Safety Precautions and Field Equipment Checklist
		☒	JSA (**Appendix D**)
		☒	Field Level Risk Assessment (RMS2; **Appendix B**)

4.3 ONSITE HRAC PROCESS

Since preparation of this HASP is a planning exercise, when crews report to the field, they must verify that all hazards and controls have been identified before executing work. A Field Level Risk Assessment will be used to identify any new or previously unidentified conditions, as well as to review hazards and controls outlined in the HASP, SWPs, client safety requirements, and/or task specific JSAs. As part of a pre-start tailgate meeting, the Field Level Risk Assessment is to be completed by appropriate on-site project personnel and shall identify the specific site controls to be implemented for the particular task. The Field Level Risk Assessment should consider impacts from subcontractor activities (e.g., traffic control, maintenance, drilling), as well as other operations not under Stantec control, which are occurring at the same site, and which can affect our personnel (i.e., simultaneous operations). If Stantec employees are participating in onsite risk reviews led by a client, general contractor or a prime contractor, this participation must also be documented at least daily.

An Energy Wheel RMS2 form or equivalent eFLRA will be used onsite as the Field Level Risk Assessment on this project. The form will be completed daily to reflect the potential for changing situations on the worksite. The “Seven Day Extension” form can be used for tasks/activities that extend beyond a single day and should reflect changes in on-site field personnel and weather conditions. Blank copies of the forms are available in **Appendix B**.

Before beginning or restarting work, supervisors and employees need to conduct a Last-Minute Risk Assessment (LMRA). This is not a form to be filled out, but a deliberate stop in the process to check for potential hazards and to determine whether appropriate controls are in place. Utilize the Energy Wheel described in **Section 4.2** to identify hazards from the 10 sources of energy that cause hazards: gravity, mechanical, motion, noise, pressure, radiation, thermal, biological, chemical and electrical during this LMRA process. Remember, all Stantec employees have the authority and responsibility to stop unsafe work.

5.0 CHEMICAL HAZARDS

Hazardous Materials and Environments

5.1 HAZARD COMMUNICATION

The SHSO is charged with the responsibility for maintaining a Hazard Communication Program as outlined in SWP 104 - Hazard Communication. This program is designed to effectively manage information related to hazardous materials on the Site and the training of our employees who are required to work with hazardous materials. All chemicals brought onto the Site by Stantec or a Stantec subcontractor shall have a Safety Data Sheet (SDS). The Stantec SHSO shall request SDS of chemicals used at the site to which our employees may be exposed in the course of our field activities. SDSs shall be maintained onsite are included as Appendix F.

5.2 CONSUMABLE CHEMICAL HANDLING AND STORAGE

No hazardous chemicals will be used onsite and used in support of field activities with exception of preservatives present in laboratory supplied containers that will be used for environmental sampling and petroleum-based fuels and oils for equipment and vehicles. Only mild cleaning products, cleaning wipes and calibration gas standards for the PID are anticipated to be used on this project by Stantec employees.

5.2.1 Sample Preservatives and Reagents

Corrosive (Acid/Base)		Flammable/Combustible		Specialized Reagents	
☒	Hydrochloric acid (HCl)	☒	Methanol (CH_3OH)	☐	Sodium thiosulfate ($Na_2O_3S_2$)
☒	Nitric acid (HNO_3)	☐	Other:	☐	HACH kit: ___________
☒	Sulfuric acid (H_2SO_4)			☐	Other:
☐	Zinc acetate ($C_4H_6O_4Zn$)				
☐	Sodium hydroxide (NaOH).				
☐	Acetic acid ($C_2H_4O_2$)				
☐	Ascorbic acid ($C_6H_8O_6$)				
☒	Sodium Bisulfate ($NaHSO_4$)				
☐	Other:				

5.2.2 Cleaners and Decontamination Supplies

General		Flammable/Combustible	
☐	Alconox	☐	Isopropyl alcohol (IPA)
☒	Liquinox	☐	Methanol
☒	Simple Green	☐	Hexane
☐	Nitric Acid (Note: **Corrosive**)	☐	Acetone
☐	Tecnu (Poison Ivy/Oak Cleanser)	☐	Other:
☐	Respirator Wipes - Benzalkonium Chloride and Alcohol		
☐	Trisodium phosphates (TSP)		
☒	Disposable decontamination wipes		
☐	Dish Soap		
☐	Other:		

5.2.3 Calibration Supplies and Probe Electrolyte

General		Compressed Gases	
☒	pH standards (4 - 7 - 10)	☒	Isobutylene
☒	Conductivity standard	☐	Methane
☒	ORP / Zobel solution	☐	Hydrogen
☐	Turbidity standard	☐	Propane
☐	Electrode storage solution	☐	Hydrogen sulfide
☐	Other:	☐	Carbon monoxide
		☐	Nitrogen
		☒	Mixture (Specify): O_2, CO, H_2S , LEL
		☐	Other:

5.2.4 Other Chemicals

General		Flammable / Combustible	
☒	Hand Soap	☒	Gasoline
☒	Eye wash buffer solution	☐	Diesel
☐	Leak detector (Soap)	☐	Motor oil
☐	Pipe joint compound	☐	Hydraulic oil
☐	Anti- seize compound	☐	Air compressor oil
☐	Other: Leak Detector - 1,1-Difluoroethane (DFA) **(Flammable)**	☒	Marking paint
☐	Other:	☒	Spray paint
		☐	WD-40
		☐	Plastic cement/ primer (e.g., PVC)
		☐	Propane
		☒	Hand Sanitizer
		☐	Other:

5.3 ANTICIPATED CHEMICALS OF CONCERN

5.3.1 Chemical Routes of Exposure

Occupational exposure to chemical hazards associated with the scope of work could potentially occur through the following pathways.

Inhalation

Inhalation of chemicals occurs by absorption of chemicals via the respiratory tract (lungs). Once chemicals have entered the respiratory tract, the chemicals can then be absorbed into the bloodstream for distribution throughout the body. Chemicals can be inhaled in the form of vapors, fumes, mists, aerosols, and fine dust.

As indicated in **Section 10.8**, any drills used for coring concrete must have a water mist or shroud attachment to control silica dust.

Eye and/or Skin Contact/Absorption

Some chemicals can be absorbed by the eyes and skin, resulting in a chemical exposure. Most situations of this type of exposure result from a chemical spill or splash to unprotected eyes or skin. Once absorbed by these organs, the chemical can quickly find its way into the bloodstream and cause further damage, in addition to the immediate effects that can occur to the eyes and the skin.

Ingestion

Chemical exposure through ingestion occurs by absorption of chemicals through the digestive tract. Ingestion of chemicals can occur directly and indirectly. Direct ingestion can occur by accidently eating or drinking a chemical; with proper housekeeping and labeling, this is less likely to occur. A higher probability of receiving a chemical exposure can occur by way of indirect ingestion. This can occur when food or drink is brought into a chemical laboratory.

Employees could be exposed to equipment, waste, and materials that have been exposed to residuals containing contaminants of concern by incidental ingestion. This exposure can occur if PPE is not used, or personal hygiene is not practiced. Proper decontamination procedures must be used. No eating or drinking is allowed in situations where employees could be exposed to environmental sampling media (see **Section 11.6**).

Injection

Chemical exposure via injection can occur when handling chemically contaminated items such as broken glass, plastic, pipettes, needles, razor blades, or other items capable of causing punctures, cuts, or abrasions to the skin. When this occurs, chemicals can be injected directly into the bloodstream and cause damage to tissue and organs.

5.3.2 Chemical Exposure Limits

The following table presents Occupational Health Exposure and Toxicological Properties for these chemicals of concern.

Occupational Health Exposure and Toxicological Properties for Chemicals of Concern									
Contaminant (CAS No.)	**OR OSHA PEL (FED OSHA PEL)**	**NIOSH REL**	**ACGIH TLV**	**ACGIH/ OSHA STEL**	**OSHA/ NIOSH IDLH**	**IP (eV)**	**Vapor Pressure (mmHg)**	**Route of Exposure**	**Symptoms of Exposure**
Total Xylenes (1330-20-7)	100 ppm 300 ppm – Ceiling (100 ppm)	100 ppm	100 ppm	150 ppm	900 ppm	8.44-8.56	9 mmHg for m and p-xylene, 7 mmHg for o-xylene	INH, ING, CON	Throat and skin irritant (dermatitis), headache, nausea, drowsiness, fatigue
Jet A-1 (64742-81-0)	200 mg/m^3	--	200 mg/m^3	--	--	--	1 mmHg	INH, ING, CON	Irritant: eyes, nose, throat, lungs, skin; may cause mild, short-lasting discomfort to the eyes; may cause drowsiness or dizziness; fatal if swallowed or inhaled
TCE (tetrachloroethylene) (79-01-6)	100 ppm 300 ppm – Ceiling (100 ppm)	10 ppm	10 ppm	25 ppm	1,000 ppm	9.45	58 mmHg	INH, ING, CON	irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
PCE (perchloroethylene) (127-18-4)	100 ppm 300 ppm – Ceiling (100 ppm)	25 ppm	25ppm	100 ppm	150 ppm	9.32	14 mmHg	INH, TNG, CON	Irritation and burns to eyes, skin, nose, throat, lungs; headache, dizziness, lightheadedness, passing out, coughing, shortness of breath, pulmonary edema; carcinogen (liver, esophagus, bladder)
Vinyl Chloride (75-01-4)	1 ppm 0.5 ppm Action level (5 ppm)	--	1 ppm	5 ppm	--	9.99	98.7 mmHg (3.3 atm)	INH, CON	lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]
Naphthalene (91-20-3)	0.1 ppm (10 ppm)	10 ppm	10 ppm	15 ppm (NIOSH)	250 ppm	8.12	0.08	INH, ING, CON	Irritant: inhalation, skin, eye, metabolic disorders, respiratory disorders, skin disorders, eye disorders, blood system disorders
2-methyl naphthalene (91-57-6)	0.5 ppm	--	0.5 ppm	--	--	NA	1 mmHg	INH, ING, CON	Respiratory tract irritation, Narcotic effects. irritation of the skin, eyes, mucous membranes, and upper respiratory tract. It may also cause headaches, nausea, vomiting, diarrhea, anemia, jaundice, euphoria, dermatitis, visual disturbances, convulsions and comatose. harmful by inhalation, ingestion, or skin absorption. It is an irritant of the skin, eyes, mucous membranes, and upper respiratory tract.
Lead (7439-92-1)	0.05 mg/m^3 (0.03 mg/m^3)	0.05 mg/m^3	0.05 mg/m^3	NA	100 mg/m^3	NA	0	INH, ING, CON	lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension

PFAS	NA	NA	NA	NA	NA	NA	NA	INH, ING, CON, ABS	NA

Key:
% – percent
A1 – ACGIH notation for a confirmed human carcinogen.
ABS – Absorption
ACGIH – American Conference of Governmental Industrial Hygienists
C – Ceiling REL
Ca – Carcinogen, minimize exposure to a level as low are reasonably achievable
CAS – Chemical abstract number
CAL – California OSHA
CNS – Central Nervous System
Con – Contact – Skin or Mucus Membrane
eV – Electron Volt
IDLH – Immediately Dangerous to Life and Health.
Ing – Ingestion
Inh – Inhalation
IP – Ionization Potential
LFT – Lowest Feasible Concentration
mg/m^3 – milligrams per cubic meter
NIOSH – National Institute for Occupational Safety and Health.
NA – Not Applicable
NL – Not Listed
OSHA – Occupational Safety and Health Administration.
PEL – Permissible Exposure Limit (8-hour TWA).
ppm – parts per million
REL – Recommended Exposure Limit.
ST- Designated STEL preceding the value
STEL- Short Term Exposure Limit (15-minute TWA).
TLV – Threshold Limit Value.
TWA – Time–Weighted Average

Table validated against current exposure levels on: 12/17/20

5.4 AIR MONITORING

Air monitoring during invasive soil work, hazard material management and sampling, or activities which affect the potential for airborne exposures shall be monitored to determine if engineering, administrative or personal protective equipment controls are required. The following sections describe monitoring requirements.

5.4.1 Air Monitoring Equipment

Photoionization Detector

A direct-reading photoionization detector (PID) with a 10.6 electron volt (eV) lamp and a sensitivity range of 0.1 parts per million (ppm) or better will be used on site to screen for volatile vapors during intrusive soil work, soil and sediment sampling and similar operations which could release VOCs. PID readings should be taken during sample collection when airborne exposures may occur. PID readings should also be measured during each main work phase (e.g., drilling, purging, and sampling). If detectable readings occur, measurements will also be collected from worker breathing zones throughout the shift.

The PID will be calibrated with 100 ppm isobutylene calibration gas before each shift. Calibrations will be performed at the beginning of each day of PID use and recorded on a calibration record or log. The PID will be operated in accordance with the manufacturer's instructions. During regular use, the PID will be kept on the most sensitive scale.

5.4.2 Air Monitoring Action Levels

Air Monitoring Action Levels					
Chemical (or Class)	**Monitoring Equipment**	**Task**	**Monitoring Frequency/ Location**	**Level for Respirator Use**	**Level for Work Stoppage**
VOCs and total petroleum hydrocarbons (TPH)	PID with 10.6 eV bulb calibrated with 100 ppm Isobutylene	While onsite during disruption of soil, hazardous material removal, excavation, or sampling where VOCs are likely to be present.	Air monitoring instrument should be either calibrated or "bump checked" with standard calibration gas prior to use. Monitoring will be continuous if any detectable concentrations of VOC are measured.	Any sustained concentration of detectable concentration of VOC greater than **1 ppm for 5 minutes** detected on the PID will require VOC investigation. Respirator to be used will be full-face piece respirator with organic vapor/P 100 combination cartridges over any sustained level of 1 ppm of unknown VOC.	At **5 ppm** in breathing zone, Stop Work immediately. Spills of unknown chemicals. Continuously attempt to determine cause of exposure and usage of engineering controls to attempt to never reach the stop work level.

Air Monitoring Action Levels					
Chemical (or Class)	**Monitoring Equipment**	**Task**	**Monitoring Frequency/ Location**	**Level for Respirator Use**	**Level for Work Stoppage**
Particulates (Jet A-1, Lead in mg/m^3)	TSI DustTrak II	While in areas where chemicals of concern that are particulate based may be disrupted	Calibration of meter prior to start of work/breaking ground. Monitoring will be continuous while ground disturbance takes place	Any sustained concentration at or above 1 mg/m^3 for sustained 5 minutes in the breathing zone, requires a respirator with dust filter.	At **0.05 mg/m^3** in breathing zone, Stop Work immediately. Spills of unknown chemicals. Continuously attempt to determine cause of exposure and usage of engineering controls to attempt to never reach the stop work level

6.0 BIOLOGICAL HAZARDS

Biological hazards may be present on Stantec project sites. These hazards may be naturally occurring (e.g., wildlife), or may be inherent due to the nature of work performed by the Client. The SWP hazard controls selected in **Section 4.2.2** are incorporated herein by reference. The subsections below briefly describes the hazards and control measures for each hazard identified in **Section 4.2.2** for which an existing SWP, policy, or practice does not apply. Detailed controls are also found in the attached JSAs (**Appendix D**).

Wildlife, Insects, and Vegetation

6.1 BEES AND YELLOW JACKETS

Most encounters with bees and yellow jackets occur when nests in low human traffic areas are disturbed. Before entering an area or opening an enclosure that is not frequently disturbed, take a few moments to observe whether insects are entering or exiting. If they are flying to or from the area or enclosure, avoid it if possible. Stinging insects fly around the top of their target, so if you get into trouble, cover your head if possible and run away. Insects often are less active during colder weather and early mornings, so observe where you place your hands before attempting to operate equipment during colder parts of the day or year.

If you get stung, remove yourself from the hazardous area then look for a stinger, and, if present, remove following first aid procedures. Contact WorkCare for information on treatment. If the sting is followed by severe symptoms, or if the sting occurs on the neck, the mouth, or near the eye, seek medical attention immediately because swelling could cause suffocation or limit your vision.

If you need to destroy a nest, consult with the SHSO first. Commercially available stinging insect control aerosols are very effective but could potentially contaminate the area. Once the nest is destroyed, fine mesh may be applied over the exit and entry points of an enclosure to prevent re-infestation.

Employees with a known bee sting allergy should carry an EpiPen® prescribed by their personnel physician. These employees should let the SHSO about this allergy and where the EpiPen® will be kept while that employee is onsite, however volunteering this information is a personal choice.

6.2 MOSQUITOS

Mosquitoes in the U.S. have been known to carry several diseases such as West Nile Virus, St. Louis encephalitis, and Dengue Fever. West Nile Virus is the greatest risk, symptoms of the disease include flu-like symptoms, including fever, headache, body weakness, nausea, or rash. Less than one percent of victims show serious neurological complications such as tremors, paralysis, or coma. To avoid mosquito bites:

- Apply insect repellent containing N,N-Diethyl-meta-toluamide (DEET) when you are outdoors. Be mindful that this may contaminate environmental samples however and should be applied prior to start of the field work, and only if allowed by the client. Always read and follow the product directions whenever you use insect repellent.
- Wearing long-sleeved clothes and long pants treated with repellent to further reduce your risk, as will staying indoors during peak mosquito feeding hours (dusk until dawn).

- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources from around the work area.

6.3 SPIDERS AND TICKS

Ticks are indigenous to most of North America. Ticks are mobile most of the year but proliferate more in spring through fall. If ticks are a concern, wear light colored clothing and work boots to aid in the detection of ticks. Tuck paints into socks and use a repellant prior to starting work. Consider wearing tick gaiters and clothing treated with permethrin. DEET application is good for mosquitos but limits protection to from ticks. Another best practice is treat a large towel and place it over the driver's seat.

Perform tick checks throughout the day and when returning to your home remove clothing, place clothes in the dryer and dry on high heat. Shower and perform a more thorough search for any stragglers. If a tick is found attached, use a tick removal tool to remove the tick as close to the skin as possible. Be sure that the head is removed. Disinfect the area and place surface antibiotic on the bite location. Follow incident reporting protocols and closely watch the area of the bite for additional symptoms.

As for spiders, the most dangerous spiders to humans in North America are Black Widows and Brown spiders (also known as Brown Recluse or Fiddleback spiders). Although Black Widows and Brown Recluse spiders are relatively rare, they tend to be found in isolated locations such as vaults. Similar to stinging insects, observe where you put your hands and body for signs of spiders prior to entering an area. Wear general duty gloves and long pants and shirts. A guide to identifying these spiders is presented below.

Black Widow Spider Identification

Abdomen usually shows hourglass marking; the female is 3-4 centimeters in diameter; have been found in well casings and flush-mount well covers; not aggressive, but more likely to bite if guarding eggs; symptoms include light, local swelling and reddening of the bite are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea.

If bitten, immediately seek medical help.

Brown Spiders (Recluse) Identification

Has a ¼- to ½-inch-long body, full grown are approximately the size of a silver dollar, legs included. It can vary from cream to dark brown depending on diet. It has a dark brown violin shape on the cephalothorax. The neck of the violin points toward the abdomen.

Prefers to hide in baseboards, ceiling cracks, and undisturbed piles of material.

At first the bite may either go unnoticed or be followed by a severe localized reaction, including scabbing, necrosis of affected tissue, and very slow healing. **If bitten, immediately seek medical help.**

6.4 POISONOUS PLANTS

No heavily vegetated areas with the potential for poisonous plants are anticipated to be present on the site.

6.5 RATS, SNAKES AND OTHER VERMIN

Certain animals, particularly those that feed on garbage and other wastes, can represent significant sources (vectors) of disease transmission. Therefore, precautions to avoid or minimize potential contact with (biting) animals (such as rats) or animal waste (such as pigeon droppings) should be considered prior to all field activities. Rats, snakes, and other wild animals can inflict painful bites. These bites can be poisonous (as in the case of some snakes) or disease causing (as in the case of rabid animals). Avoidance of these animals is the best protection. Observe areas with garbage or limited human interaction prior to entering abandoned or remote worksites or thick brush.

6.6 FATIGUE

While there are no specific limitations to work hours or consecutive days worked, worker fatigue is a concern and should be considered when developing the work schedule. In general, workers should not be working longer than 12-hour shifts for five consecutive days or more. A mandatory day of rest should be taken after six days of consecutive work. If work periods routinely exceed these guidelines, then shift rotations and/or additional personnel support should be implemented. If worker fatigue issues arise and if determined necessary by either the Project Manager or HSSE Management, a Fatigue Management Plan may be prepared. Workers experiencing fatigue on a regular basis and due to the hours worked should alert the Project Manager, SHSO, or HSSE Lead of their concerns.

Some general fit for duty guidelines are listed below.

- Obtain plenty of rest between shifts.
- Limit alcohol consumption.
- Give your body time to adapt to changing shifts or work hours (i.e., transitioning from night or evening shift to day shift).
- To the extent possible, eat meals at regular intervals and stay hydrated.
- Document worker fitness for duty on the RMS2 form.

6.7 HEAT AND COLD STRESS

Overexposure to temperature extremes can represent significant risks to personnel if simple precautions are not observed. All work occurring under this HASP is anticipated to occur over various seasons. Typical control measures designed to prevent heat/cold stress also include dressing properly and establishing an appropriate work/break regimen. SWP-113 and SWP-114 both provide guidance and requirements of all Stantec employees while working in extreme heat and cold. Review these practices if the hazards are anticipated to be relevant at the time of the work. The SHSO must assure that the following appropriate heat and cold stress control measures are implemented.

- Selection of appropriate PPE to reduce the risk of heat and/or cold related illnesses (Select PPE based on Site data and working conditions).

- Hydration (fluid replacement with cool water or electrolyte replacement).
- Cool rest areas (provide shaded rest areas).
- Engineering controls (if feasible provide air-conditioned or heated cabs in heavy equipment, cool water drenching during breaks during warm weather).
- Administrative controls (adjust work schedules by starting work earlier in the day, acclimate work force to working in heat/cold, and provide appropriate work/rest regimens).
- PPE (provide ice vests, heat packs, and vortex tubes where appropriate).
- Monitoring (body core temperature with thermometer, check pulse rate of workers).
- Identification of heat-related illness (Including heat cramps, heat exhaustion, and heat stroke).
- Employee training (train employees on health effects of heat and cold stress related illnesses).

6.8 HUMAN ENCOUNTERS AND DRUG PARAPHERNALIA

Ensure that all Stantec equipment, devices and personal items are properly secured/locked in a field vehicle or in the secure sample processing facility. Avoid eye-contact and communication with the public when possible. If the public request information related to the site or investigation, refer them to the Stantec Project Manager or the Stantec SHSO.

If an unsafe condition occurs, leave the site in the field vehicle and/or call 911. Additional workplace safety information can be found in SWP 102 – Workplace Violence Prevention.

If drug paraphernalia (i.e., used needles) is found at the site, field staff should notify their Stantec supervisor. Field staff should not touch or attempt to dispose of these items. Instead, a cone or other warning device should be placed near or on top of the items to warn others not to touch them.

7.0 WEATHER AND NATURAL DISASTERS

Hazards associated with weather and natural disasters may include, but are not limited to, effects of extreme heat (heat exhaustion, heat stroke), effects of cold (hypothermia, frostbite), winds, heavy rain, lightening, earthquakes, landslides, and flooding. Information on heat illness prevention can be found in **Section 6.7** and SWP-113. Information on inclement weather and earthquakes, the most likely weather and natural disaster hazards for this project are found below.

7.1 EARTHQUAKES

Earthquakes can last just a few seconds or as long as several minutes. Safety precautions include (as amended from http://safety.lovetoknow.com/Earthquake_Safety_Precautions):

Before an earthquake:

- Store heavy items or glassware on low shelves so they do not become dangerous projectiles. Secure large equipment with straps, bolts, or other stabilizing methods.
- Know the emergency meeting location at the site.
- Have a reunification plan with your family.

During an earthquake:

- If inside a building, immediately seek a safe location such as beneath a table or desk, or along an interior wall away from windows, the drill rig, or hazardous objects.
- Drop to your knees and cover the back of your head and your eyes to minimize injury from flying debris. Try to hold on and stay calm.
- Do not take elevators during an earthquake.

If outdoors, stay in open areas away from buildings, power lines, trees, and other potential hazards.

- Stay calm and brace yourself to keep your balance. Sit if possible.
- If driving, stop quickly but safely and stay in the vehicle. Do not stop near power lines, bridges, overpasses, or other potentially dangerous locations.

After an earthquake:

- Be prepared for aftershocks, which may be stronger than the initial jolt.
- Administer First Aid, if you are trained to do so, and summon emergency assistance if necessary.
- Wear PPE (boots, gloves) to avoid getting cut by broken glass.
- Turn off gas, electricity, and water if damage is suspected or if advised to do so by authorities.
- Be cautious opening cabinets, cupboards, and closets in case items are poised to fall.
- Keep phone lines clear for emergency use.
- Gather at the muster point for the Site and follow check-in procedures, do not enter any buildings unless a post-disaster building assessment has been completed by a qualified inspector.
- Depending on severity, suspend work and follow local office emergency procedures as applicable.
- Listen to the radio for emergency information and local road conditions.

7.2 SEVERE WEATHER

Personnel will consult publicly available weather forecast data provided on the NOAA website daily to understand expected weather conditions. If severe weather is expected, such as snow, flooding, or a severe storm the PM will consult with the SSHO, and subcontractors as applicable, by the SHSO each day to determine if field work should occur. In the event of thunderstorms or similar high wind and storm events, site personnel will:

- Immediately get into the nearest permanent building (preferred) or vehicle.
- Close windows and avoid touching metal or other surfaces that conduct electricity in and outside the vehicle.
- Do not go outside for at least 30 minutes after the last sign/sound of lightning and thunder.
- During heavy winds avoid parking or working under trees or unstable structures. Do not carry objects with a large surface area, such as plywood during storm events. Avoid roof work and drilling when storms are expected.

7.3 WILDFIRE SMOKE

In the event that wildfire smoke encroaches on the airport, the following air quality monitoring and PPE guidelines, provided by the Washington State Department of Labor & Industries (L&I), and safe work practices developed by Stantec will be followed. L&I issued wildfire smoke rules for general industry on January 15, 2024; guidance documents are available at www.lni.wa.gov. The following table is a composite scheme of L&I and Stantec requirements.

Air Quality Index (AQI) for $PM_{2.5}$	Required Protections
0 - 71	• Prepare a written wildfire smoke response plan. • Provide wildfire smoke training to employees. • Watch the $PM_{2.5}$ conditions and forecasts. • Prepare a two-way communication system. • Make provisions for prompt medical attention and permit that medical attention without retaliation.
72 - 100	All of the above and: • Notify employees of $PM_{2.5}$ conditions. • Ensure only trained employees work outdoors. • Consider implementing exposure controls. • Consider providing voluntary use respirators.
101 - 151	All of the above and: • Implement exposure controls. • Make N95 respirators available for voluntary use.

Air Quality Index (AQI) for $PM_{2.5}$	Required Protections
151 - 500	All of the above and: • Limit work to one hour or less when AQI for $PM_{2.5}$ is greater than 151. • Ensure workers experiencing symptoms requiring immediate medical attention be moved to a location that ensures sufficient clean air. • Directly distribute N95 respirators to employees for voluntary use.
500 or more	• Stop work and seek guidance from Regional HSSE Manager or Advisors.

7.4 DAILY CONTINGENCY PLANNING

To address potential hazards related to weather and/or natural disasters, the daily HRAC briefings (**Section 4.3**) completed during the tailgate safety meetings and documented on the RMS2 Field Level Risk Assessment form. Potential weather and natural disaster hazards include but are not limited:

- A summary of the daily weather forecast and any associated additional hazards (i.e., high winds, rain, below freezing temperatures, etc.).
- Primary emergency muster points (**Appendix G**).
- Any additional muster point location(s) to be determined based on daily work locations, weather conditions, simultaneous work operations, etc.

8.0 ELECTRICAL HAZARDS

SWP 406 – Electrical Safety Program is designed to increase worker safety by:

Hazardous Energy

- Raising awareness of electrical hazards.
- Providing instruction on electrical hazard recognition.
- Providing ways to eliminate and prevent electrical hazards in the workplace.
- Providing procedures, controls, and PPE to exposed employees.
- Emphasizing the importance of observing all electrical safety requirements and practices.

Although not anticipated in the scope of work, some components could require deenergizing power systems following SWP 408 - Lock, Tag & Try (LTT). Only trained and authorized personnel electrical workers are allowed to energize or de-energize electrical circuits, or perform work of an electrical nature, including validation testing of circuits. Subcontractors will be used to perform electrical work, including de-energization of treatment system components, however site personnel with potential exposure to unguarded live electrical parts should become familiar with the shock and arc flash protection boundaries and protective measures established in SWP 406 - Electrical Safety Program.

9.0 CONFINED SPACE ENTRY

SWP 411 – Confined Space Entry has been developed to provide guidance to Stantec employees with respect to confined space entry. Confined spaces that may be encountered at the site are utility holes, sumps, vaults, vessels, and tanks. Stantec personnel will not enter confined spaces under the scope of this project. Should Stantec personnel need to enter a confined space, contact your Regional HSSE Manager.

Confined Spaces

10.0 OTHER SPECIALIZED HAZARDS

10.1 TRAVEL TO SITE

The Site is approximately 185 miles (3-hour drive) from the Stantec warehouse in Seattle, Washington. Review and follow the Stantec Safe Driving Procedures provided in SWP-124. Utilize the SWP 124a - Vehicle Pre-Use Checklist at least once a day for each vehicle driven for Stantec business to identify potential vehicle issues/hazards. A Stantec Vehicle Collision Kit will be kept in every vehicle used for Stantec project work. The Stantec Vehicle Collision Kit should include a disposable camera, small pad of paper, a pen, proof of insurance, and an RMS3 Incident Report. A first aid kit and fire extinguisher shall be placed in each Stantec vehicle.

10.2 UNDERGROUND AND OVERHEAD UTILITIES

Ground Disturbance

Underground and overhead utilities may be affected by drilling for subsurface sampling. SWP 213 - Ground Disturbance and Overhead Utility must be followed prior to intrusive work or drilling into foundations. Foundations, site soils, and parking areas may contain subgrade conduits and piping which need to be adequately located prior to the start of work. Personnel shall also inspect work areas for indications of subsurface utilities such as penetrations, pavement cuts, and irrigation, fuel, or hydrant lines. See **Section 11.4** for details on utility locate requirements.

Overhead hazards can include low hanging structures that can cause injury due to bumping into them. Other overhead hazards include falling objects, suspended loads, swinging loads and rotating equipment. Hardhats must be worn by personnel in areas where these types of physical hazards may be encountered. Barriers or other methods must also be used to exclude personnel from these areas where appropriate. Electrical wires are another significant overhead hazard. SWP-406, Electrical Safety Program, provides more guidance on safety requirements when working near or on electrical equipment and overhead lines. According to OSHA (29 CFR 1926.550), the minimum clearance which must be maintained from overhead electrical wires is 10 feet from an electrical source rated less than 50 kilovolts (kV). Sources rated greater than 50 kV require a minimum clearance of 10 feet plus 0.4 inches per kV above 50 kV. Below is a chart referencing the minimum required distance for work near electrical wires/equipment.

Minimum Distances from Overhead Powerlines	
Power lines Nominal System kV	**Minimum Required Distance**
0 – 50	10 feet (3 meters)
51 – 100	12 feet (3.6 meters)
101 – 200	15 feet (4.6 meters)
201 – 300	20 feet (6.1 meters)
301 – 500	25 feet (7.6 meters)
501 – 750	35 feet (10.7 meters)
751 – 1000	45 feet (13.7 meters)

10.3 HEAVY EQUIPMENT OPERATION

SWP 216 - Working Near Mobile Equipment shall be followed when drilling equipment is being operated as part of sampling activities. Stantec should maintain a safety buffer of at least 30-feet from drilling equipment where possible. Where proximity to heavy equipment cannot be avoided, then a heightened level of awareness and visibility should be stressed with all personnel affected by such activities. Do not approach mobile equipment unless you have made eye contact with the operator, you receive a positive acknowledgment and equipment is either powered off or placed in a low energy state, and it is known that you plan to approach. Wear a Class 2 high visibility safety vest while on site and discuss segregation of personnel and equipment with operators at the start of each shift.

10.4 SLIP, TRIP, AND FALL HAZARDS

Slip, trip, and fall hazards may include uneven terrain, sharp debris, electrical fencing, holes, wet surfaces, etc. The most likely physical hazards at the site are uneven terrain (curbs and gutters), wet surfaces, and sharp debris. To protect yourself, look before you step, plan your path, do not walk while distracted, maintain good housekeeping practices on the site, and wear proper PPE for the task being performed such as a sturdy ankle supporting shoe.

When water is used for dust control, care must be taken to avoid creating muddy or slippery conditions. If slippery conditions are unavoidable, barriers and warning signs must be used to warn of these dangers.

10.5 HOT WORK

If Stantec personnel are exposed to welding and cutting activities outside of an approved fabrication zone for hot work activity, and where fire hazards cannot be removed, then guards, shields, and fire blankets shall be used to confine the heat, sparks, and slag and protect the immovable fire hazards. A ventilation system shall be implemented, as the situation warrants, to remove any welding gases or smoke from the work zone to protect employees and any sensitive electrical equipment which may be nearby.

Hot Work Permits shall be used as required by SWP 414 - Hot Work. Stantec personnel working in close proximity to the welding and cutting performed by a subcontractor should verify that a Hot Work Permit is in place, and that conditions are safe.

When Stantec personnel are directly exposed to torch cutting or welding activities, then long sleeve shirts, fire resistant clothing, leather gloves, and eye/face wear with appropriate shade lens and face protection must be worn. Additional precautions, such as weld jackets or leather chaps, should be used if the field level risk assessment or LMRA warrants.

10.6 HAND AND POWER TOOL USE

SWP 206 – Hand and Portable Power Tools has been developed to describe the safe work practices required by all Stantec employees who will utilize hand and power tools. All Stantec employees are required to read, be familiar with, and abide by all the requirements detailed in the SWP in additional to the manufacturer's recommendations. All tools will be properly maintained and inspected prior to each use. Drills used on concrete must have a water mist or shrouded attachment to control silica dust.

10.7 NOISE AND HEARING CONSERVATION

All Stantec employees exposed to an 8-hour TWA sound pressure level of 82 decibels, A-weighted scale (dBA) or greater are required to be included in our Hearing Conservation Program and be familiar with SWP 106 - Hearing Conservation, SWP 105 - Personal Protective Equipment (PPE) , and SWP 111 - Medical Surveillance address requirements for hearing protection and our hearing conservation program. A noise survey matrix is included in SWP 106a - Noise Level Assessment Tool. The survey should be completed at the beginning of each new task or if new equipment (i.e., a drill rig) is brought to the site.

Employees participating in field work are required to fill out a Medical Surveillance Assessment Form (RMS9). Elements of the Hearing Conservation Program include:

- Initial and annual audiometry
- Employee training in hearing conservation and the safe use of hearing protection
- Supervisory oversight in the correct application and use of hearing protection

In general, when you need to raise your voice to be heard, hearing protection is required. If planning to be near (within 10-feet) of heavy equipment, generators, air compressors, or similar load stationary equipment for more than four hours a day, hearing protection should be used to mitigate the effects of constant noise. Monitoring of noise levels can be coordinated by the SSHO, or a noise level check can be conducted using the National Institute for Occupational Safety and Health (NIOSH) noise level meter app on a company phone. Accommodations for adequate communication between team members, such as radios or hand signals shall be arranged during the daily tailgate safety meeting.

10.8 MANUAL MATERIAL HANDLING

SWP 115 - Material Handling and Safe Lifting has been developed to provide guidance to Stantec employees for protection of hazards associated with manual material handling. All employees should be familiar with the SWP and exercise the requirements. Information specific to drum handling is found in **Section 12.1**.

Ergonomic Hazards and Manual Handling

10.9 FIRE AND EXPLOSION

The possibility of flammable materials being encountered during field activities must be recognized and the appropriate steps necessary to minimize fire and explosion must be observed. This includes situations where excessive organic vapors or free product are encountered. When this occurs, monitoring with a combustible gas indicator (CGI) and PID is required.

In situations where flammable materials (gasoline, acetylene cylinders, hexane, methanol) are used onsite, the following precautions must be observed: keep flammable and combustible materials away from heat, sparks and open flames; do not smoke around flammable or combustible materials; keep all flammable and combustible liquids in approved and properly labeled safety containers and segregate all flammable materials from other incompatible materials such as oxidizers. Follow the HOT Work procedures described in **Section 10.7**.

Stantec personnel will use compressed gas (isobutylene) to calibrate air monitoring equipment for personal air quality monitoring. Stantec personnel will follow instructions provided when calibrating air monitoring equipment. Stantec personnel may use compressed gas (carbon dioxide) to pressurize the air compressor during groundwater sampling.

Key guidelines to remember during transportation and storage of compressed gas cylinders include:

- Cylinders should not be transported with the regulator attached to the cylinder.
- Cylinders should be stored in a well-ventilated area away from flames, sparks or any source of heat or ignition. Keep cylinders away from electrical circuits.
- Cylinders should not be exposed to an open flame or to any temperature above 125°F (52°C) including storing in enclosed vehicles.

Additional guidelines required by Stantec’s Safe Work Practice, SWP-310 Compressed Gas Cylinders, if gas cylinders are intended to be used at the site.

10.10 TRAFFIC SAFETY

Where exposed to vehicle traffic, it is necessary for employees on foot to remain aware of vehicle traffic and to wear a minimum of a Class 2 high-visibility safety vest. Personnel shall follow the requirements in SWP 407 - Traffic Control and Protection Planning.

No work is anticipated to occur in public roadways as part of this work. Site work will require compliance with airport security and traffic measures including the use of a flashing amber beacon while driving on the site and the use of orange checkered flags on drill rigs.


Traffic Control

10.11 HAZARDS IDENTIFIED DURING WORK

10.11.1 Hazards Created by or Identified During Work Controlled by Stantec or Stantec Subcontractors

When apparent non-compliance to the HASP, unsafe conditions or practices are observed, the Stantec Project Manager, and/or SHSO will be notified, and corrective actions implemented. For Stantec’s subcontractor, the subcontractor's SHSO or Project Manager will be notified, and corrective actions will be required. For work activities performed by the subcontractor, the subcontractor is responsible for determining and implementing necessary controls and corrective actions.

When Stantec employees or subcontractors may be exposed to an imminent danger, immediately stop work, and alert all affected individuals. Remove all affected Stantec and Stantec subcontractor employees from the danger and notify the Project Manager, and/or SHSO, and the subcontractor's SHSO or Project Manager where appropriate. Do not allow work to resume until adequate corrective measures are implemented and documented and accepted by the SHSO or his/her designee.

10.11.2 Hazards Identified with Client or other Contractor Work Activities

In carrying out Stantec’s responsibilities of assuring safety compliance for Stantec personnel, the following guidelines are implemented when employees identify hazardous conditions created by the Client or Contractors (third party) within or adjacent to their work area:

If a condition is identified as being immediately dangerous to life or health (IDLH):

- Take appropriate measures to ensure your own safety and all other Stantec and Stantec subcontractor employees by immediately removing yourself from the immediate danger of the hazard zone.
- Advise others in the area of your potential concern. This would include notifying the Client's representative and third-party management (if applicable). Do not advise how to correct the immediate hazard, only that one appears to exist.
- If the potential concern is not addressed, the Stantec employee should notify the Project Manager or his/her designee, who then may notify Client Management of the potential concern. It is the Client's responsibility to determine, and implement if appropriate, the issuance of a stop work order or to suspend the affected activity.

If a condition is identified that may not be an immediate danger, but could result in an accident involving less serious or minor injury, damage to equipment, or environmental release:

- Take appropriate measures to ensure your own safety and the safety of all other Stantec and/or Stantec subcontractor personnel by immediately removing yourself/them from the immediate hazard zone.
- Advise others in the area of your concern. This would include notifying the client representative. Do not advise how to correct the deficiency; only that it appears that one exists.
- Notify the Project Manager and/or SHSO. The situation will be evaluated, and protective actions taken to ensure the safety of Stantec and Stantec subcontractor personnel during the performance of their work activities.

10.12 FOREIGN OBJECT DEBRIS (FOD)

Tools, materials, and waste must be stored securely to prevent items from becoming foreign object debris (FOD) that present a hazard for nearby aircraft. A heavy trash receptacle with a cover will be provided at each work location; the cover will remain in place except when waste is being added to the container. Trash receptacles will be emptied at the conclusion of work each day. Care will be taken to prevent any materials from becoming airborne during use (e.g., paper, zip top bags, plastic liner from PVC pipes, etc.).

While still in the work area, and before moving onto paved surfaces, trucks will have any soil on exterior surfaces removed via shovel, broom, and other hand tools as necessary to prevent this material from becoming FOD.

11.0 SITE CONTROL AND SITE REQUIREMENTS

Procedures described in this section are intended to aid Stantec personnel in mitigating site risks/hazards.

11.1 PRE-ENTRY BRIEFING

All on-site workers and visitors will apply for and acquire a Port of Moses Lake Ramp Badge (non-movement area). Individuals that do not have a ramp badge must be escorted by a consultant employee or Port of Moses Lake representative. All personnel who will drive a vehicle within the Air Operations Area are required to have a ramp badge.

In addition to the facility orientation, Stantec personnel are expected to conduct a daily site safety meeting (RMS2) to discuss hazards in the daily scope of work and to effectively communicate expectations. The briefing will include reviewing contents of the HASP and signing the Acknowledgement and Agreement Form. The briefing for visitors may be abbreviated to be fit-for-purpose based on the intent of the visit.

11.2 SITE ACCESS AND LAYOUT

Before mobilizing to the site for an event, site access must be coordinated with the Port of Moses Lake (Port) and notification of Port personnel must occur prior to site access for orientation and safety training. The access route between the entrance gate at the east side of the passenger terminal and the Pumphouse 1 enclosure is a set route that must be followed by drivers who have a ramp badge (**Plate 4**). Various access routes from Pumphouse 1 to individual work areas are present depending on the specific part of the site under investigation at the time of work; no access is permitted beyond the limits specified on **Plate 4**. Site maps are provided as **Plate 2 and 3.** The exclusion zone(s) will be set around individual work locations using delineators and/or caution tape. Work performed on the airport property will require safety watch to maintain exclusion zone. Work is not permitted beyond the limits specified on **Plate 4**.

All work locations require personnel to cross an operating airport taxiway. Vehicles must operate within the lined pathways on paved surfaces prior to the crossing at A1 and on the northern edge of the paved surface after crossing at A1 (**Plate 4**). Aircraft always have the right-of-way and vehicles must always yield. Drivers must ensure that they do not pass under any part of an aircraft or put themselves in a compromising position where part of an aircraft passes over the top of their vehicle. Best practices include vehicles stopping whenever aircraft are moving within the same area.

Vehicles must have a flashing amber beacon operating while driving on the site. Drill rigs must have an orange checkered flag on the mast while drilling on airport property. Site-specific training is required as defined in **Section 11.1**.

Additional site plan(s) will be added to this HASP as site conditions are refined during the project, such as after completion of utility locating events or other surveys. The site plan(s) will be updated and annotated with work zones, site ingress/egress, staging areas, sample processing flow diagrams, etc.

11.3 SITE WORK ZONES

No eating, drinking, or smoking within the exclusion zone. These activities will be conducted only in designated areas of the site or within field vehicles. Use of PDAs, cell phones, pagers, or other electrical devices (with the exception of intrinsically safe devices) are prohibited in the exclusion zone.

Work zones will be designated daily during the tailgate meeting and documented on the RMS2 Field Level Risk Assessment form. Work zones are not to extend beyond the limits specified on **Plate 4**. Additional factors to consider when evaluating daily work zone(s) include weather and natural disasters (**Section 7**), other specialized hazards identified in **Section 10**, emergency muster point(s)/emergency route maps (**Appendix F**).

11.4 UTILITY CLEARANCE

The identification of USTs, pipes, utilities, and other underground hazards is critically important prior to drilling, excavating and other intrusive activities. In accordance with OSHA 29 CFR 1926.650, the estimated location of utility installations, such as gas, sewer, telephone, electric, water lines and other underground installations that may reasonably be expected to be encountered during intrusive activities.

All intrusive activities conducted by Stantec or Stantec subcontractors must be conducted in accordance with Stantec's SWP-213 - Ground Disturbance and Overhead Utility.

The Stantec PM has the following responsibilities for implementing intrusive work.

- Require that applicable equipment be maintained and used in accordance with this practice.
- Verify that a Utility Services Pre-Ground Disturbance Worksheet & Approval Form (SWP 213a) is completed for each project as required (according to scope of work) prior to work commencing and that it is available for reference on the worksite.
- Review the tasks and procedures prior to commencing work and sign off on SWP 213a.
- Use only employees who are trained on the hazards anticipated with the work and are aware of the required controls and precautions as outlined in this safe work practice and in the hazard assessment.
- Underground utilities will be marked in the field, where accessible. Submerged utilities will be located in the field by the utility owner and/or Stantec in accordance with SWP-213 (Ground Disturbance and Overhead Utility).

Onsite Stantec employees have the below listed responsibilities while conducting or overseeing intrusive earthwork.

- Applicable services are to be cleared prior to commencing intrusive activities using the Above Ground/Underground Utilities Checklist (SWP-213b) to document all locates, shut offs or any other activities to identify above ground and below ground hazards.
- At the completion of work, use the Backfill Observation Form (SWP-213c) to document that all work has been completed, and that all ground disturbances have been returned to their regular state to the satisfaction of the owner. Sediment borings collected from the river will not be backfilled.
- Report to the PM any concerns they may have with the location of the intrusive work and/or equipment being used to perform the intrusive work.

11.5 DECONTAMINATION

Personnel will properly decontaminate after leaving designated exclusion zones. Decontamination procedures may involve disposing of Tyvek® coveralls, boot covers, disposable gloves, etc. in a decontamination zone located at the edge of the exclusion zone. Disposable sampling equipment will also be bagged for disposal in this area. At a minimum, personnel will wash exposed skin before leaving a site using soap and water or pre-moistened cleansing towels. Sampling equipment will be decontaminated using the existing wash rack attached to the driller’s vehicle or in a wash rack constructed onsite. Disposable equipment will be containerized and disposed of in accordance with the waste management plan (**Section 12.0**).

11.6 PERSONAL HYGIENE AND SANITATION

Work breaks, eating, drinking, and conducting paperwork tasks will be performed in the field vehicle, office, or other suitable location outside the exclusion zone or off the site. Field personnel will wash their hands prior to eating or drinking.

Stantec does not have access to site buildings. During work a portable toilet will be installed. Separate sex toilet facilities will be required if there are more than 20 people at a project site. All rental toilets will be equipped with a door that is lockable from the inside. Rental toilets and hand wash stations will come equipped with a minimum of a bi-weekly cleaning service. A visual search for spiders (particularly black widow spiders) should be conducted prior to using any portable toilet.

11.7 SITE SECURITY

Grant County International Airport offers a fully secured, 3,500-acre airfield. A background check and specific training is required before access credentials are issued. Your access badge must always remain visible. If needed, the airport has 24-hour support onsite.

Managing equipment on site while working requires employees and subcontractors to keep tools and equipment secured when not being used. This includes locking vehicle and truck doors and truck utility beds. Pumps, tools, probes, surveying equipment, and traffic delineation will remain inside locked vehicles when unattended and will remain in the exclusion zone when attended but not in use. No equipment will be left overnight without the permission of the Project Manager and agreement of the site operator. Equipment left on site will be kept in a locked area such as a locked fenced garbage enclosure or remediation compound when possible.

Security of our staff, subcontractors, equipment, and the public is of paramount importance to Stantec. Employees are trained in hazard recognition and will follow standard policies and procedures to report and mitigate site security issues/hazards if identified. Note that security consideration is different than traffic guidance and control, which also impacts security to some extent. Security refers to personal safety and freedom from theft or violence. The following items will be evaluated when considering security measures at the site:

- Daytime activities at the site (e.g., gas station only, gas station with convenience store, etc.).
- Recent criminal activity at the site and nearby areas (ask site owner/operator and the police).
- Work hours (security concerns may be different depending on the time of day).

- Lighting at the site (thieves are generally dissuaded from stealing on well-lit sites).

Standard security measures will be implemented on site to minimize the potential for loss at the site. Standard security measures include properly maintained lighting, functioning locks for windows/doors/ equipment storage areas, and maintaining control of tools and equipment when not in use. Security may be implemented in a variety of ways:

- Orange construction fence (minimal security).
- Chain link fencing.
- Extra lighting.
- Specialized locks.
- Contract security.

11.8 PERMITS

This HASP will serve as the general permit to work for this site. Stantec SWPs will be followed in addition to RMS2. City or County specific permits will be acquired if necessary.

11.9 WORK HOURS

Work on this project will be generally conducted during daylight hours on weekdays and should never exceed 12 hours. Review by BC leadership is recommended whenever they exceed 12 hours. Regional Fatigue Management guidance is available from the HSSE Manager.

11.10 PUBLIC QUESTIONS AND PRESS

Questions about the site posed by neighbors, the press, or other interested parties will be directed to the Stantec Project Manager. They are to contact Regional Public Relations representatives for any official Stantec status before commenting on questions that could lead to a negative perception by a third party or the public.

12.0 WASTE MANAGEMENT

The following provides a general summary of the anticipated waste streams and their management.

A. Waste Generation (Type(s)/Quantities Expected):

Anticipated (**YES**/NO):

Types: Liquid _X_ Solid _X_ Sludge _X_ Other (describe) ________

Quantity (Expected Volume): **To be determined.**

Hazardous wastes may not stay onsite for more than 30-days.

B. Characteristics (Expected):

Corrosive _____ Flammable/Ignitable _____ Radioactive _____ Toxic ____

Reactive _____ Unknown _X_ Other (specify) ________

C. Packaging Requirements for Waste Material (Expected):

DOT-approved Drums _X_ Baker Tanks (possibly tankers if trucked off-site) _____

Lined Waste Bins _____ Temporary Stockpile _____

D. Disposal and/or Treatment Methods Proposed (Expected):

All wastes will be labeled, sampled, and analyzed for all applicable chemicals of potential concern and physical properties (e.g., pH, vapor pressure, etc.) to ensure proper waste characterization. Results of analysis will determine how and where impacted materials may be disposed. Client-approved vendors will be responsible for the categorization and transportation of waste generated on this Site. Materials will be disposed of or treated in accordance with federal, state, and local regulations as selected and arranged by Stantec on behalf of the Client using the Client Approved vendors. The Client will be responsible for signing the manifest unless a letter is written authorizing Stantec as agent to sign the manifest in their place.

12.1 DRUM AND CONTAINER HANDLING

Before you move a drum, put on a pair of thick gloves, and observe the area. Check to see how much room there is to move the drum and plan out your route. Check the route for anything that might cause you or your equipment to trip or slip. Then, check the drum to make sure it is not warped, leaking, or bulging. Check the bung and/or lid to make sure they are tight enough to prevent leaks.

If the drum is safe to use, use a drum dolly to move the drum to the new location. If a drum starts to fall, get away from it as quickly as possible. If the contents spill, follow the spill response procedure in **Section 18.2**.

If rolling a drum is the only option and the drum is not overweight, place your left hand high on the chime and your right hand low and use both hands to roll the drum on the bottom edge. As your right hand reaches the top, switch the left hand to the top position. Lift your hands and place them into position. Do not slide your hands because you may cut them. Keep your feet separated and do not slide them, use a sidestep. Turn your body slightly away from the drum and stay ahead of it.

13.0 HEALTH AND SAFETY TRAINING REQUIREMENTS

13.1 TRAINING REQUIREMENTS FOR SITE ACCESS

The SHSO will conduct a site orientation for all Stantec and Stantec subcontractor personnel to include sponsored visitors. The site orientation will include an overview of this HASP, emergency information, and other relevant information that would provide the worker with safety and health information prior to entering the project site (Field Level Risk Assessment).

All on-site workers and visitors will apply for and acquire a Port of Moses Lake Ramp Badge (non-movement area). Individuals that do not have a ramp badge must be escorted by someone that does.

13.2 ACTIVITY SPECIFIC HEALTH AND SAFETY TRAINING

Health and safety training are an integral part of the total project health and safety program. The objectives of such training are to educate workers about the potential health and safety hazards associated with working at the project site. The Project Manager is expected to instruct employees about the hazards of the project and site before allowing them to perform work on site. If at any time an employee feels that have not been adequately trained to safely perform the work, they have the authority and responsibility to “Stop Work” for that activity until properly trained.

The health and safety training that applies to work activities, as applicable and cited in the activities’ JSA may vary based on the scope of work to be performed and the anticipated hazards. The PM or SHSO will conduct a review of each individual’s planned job activities and evaluate whether the training and competencies have been completed and are recorded in the project record. Stantec training that applies to the scope of this project include:

- 40-hour HAZWOPER training.
- Annual 8-Hour Refresher.
- Supervisory 8-Hour Training for the SHSO.
- First Aid/Cardiopulmonary resuscitation (CPR)/Automated external defibrillator (AED).
- Stantec HSE 1201/1202: Safety Training for Supervisors and Project Managers.
- Stantec HSE 1220: Hazard Communication Standard (HAZCOM).
- Stantec HSE 1230: HSSE Orientation.
- Stantec HSE 1260: Safer Together.
- Stantec HSE 7003: Green Defensive Driver Training or equivalent.
- Airport Orientation and Site Safety Training.

Additional training may be required based upon site duties and anticipated hazards. These could include:

- SWP Trainings have been identified in Section 4.
- Stantec HSE 1270: Work zone Traffic Control.
- Stantec HSE 1271: Ground Disturbance.
- Stantec HSE 1282: Situational Awareness.

Site personnel responsible for hazardous waste transportation and/or hazardous waste management will also be trained and certified in the following:

- DOT Hazardous Materials Transportation (49 CFR 172.704[a][1][3]).
- DOT Security Awareness (49 CFR 172.704[a][4]).
- Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management (40 CFR 262.34 and 265.16).

Fit tests are required where respirator use may occur.

As work scope changes and new training requirements are identified, they will be incorporated into the program. Subcontractors are required to verify that their employees have received the necessary training for their work task and that documentation is available and supplied to the SHSO prior to work execution.

Prior to commencement of site activities, the SHSO will provide a copy of the HASP to site workers and conduct a project safety briefing. Employees and subcontractor's employees engaged in a work activity must be informed of the nature and degree of exposure to chemical, biological, and physical hazards that are likely to result from performance of work.

13.3 RECORDKEEPING

The Project shall establish reporting and recordkeeping requirements in accordance with Federal and/or State law and Stantec HSSE Procedures, Occupational Injury and Illness Reporting and recordkeeping, including reporting as required by OSHA. Examples of reports or records are:

- HSSE Event Report – RMS3.
- Daily Field Level Risk Assessment – RMS2/ eFLRA.
- Weekly Worksite Inspection: Field – RMS5.
- Project File Safety Review – RMS6.
- Quantified Hazard Assessment – RMS7 or JSA (**Appendices B and D**).
- Medical Surveillance Assessment – RMS9.
- Weekly Planned Job Observation – SAFE form or RMS10.
- Management of Change – RMS11.
- Subcontractor variances.
- Visitor sign in sheets.
- HASP and completed acknowledgement forms.
- Air monitoring forms.
- Employee medical clearance.
- Employee fit tests.
- Noise monitoring results.
- Safety training records.
- Vehicle Inspection forms.
- Utility Clearance forms.
- Operator certifications (driller, vessel captain, hoist operator, etc.).
- Permits (Hot work, Confined Space, etc.).

14.0 REQUIRED MEETINGS

Stantec and Stantec Subcontractor employees are to attend a project safety orientation, as well as periodic safety meetings.

Stantec meeting safety topics discussed are to be documented accompanied with an attendance signature sheet. The Stantec meetings to be conducted are as follows:

Meeting Type	Purpose	Length	Frequency
Project Orientation	To acquaint employees with the Stantec Project scope of work, field activities Stantec HASP requirements.	Approximately one hour.	At time of first assignment to the Project.
Daily "Tailgate" Safety Briefs	To ensure that hazards and controls associated with work to be performed are understood by all those involved. Discuss relevant JSAs, emphasis items, weather, any unusual or special conditions. Documented in project files.	As needed, typically 15 to 30 minutes.	At the start of every work shift when field work is performed. Additional briefs may be required for new tasks or scope change.
Facility Orientation	All on-site workers and visitors will apply for and acquire a Port of Moses Lake Ramp Badge (non-movement area). Individuals that do not have a ramp badge must be escorted by someone that does.	Prior to first visit/mobilization without a badged escort.	Prior to accessing site without a badged escort.

The Field Level Risk Assessment – (e.g., RMS2/eFLRA form) is used as a means of documenting these meetings.

14.1 DAILY HEALTH AND SAFETY BRIEFINGS

A safety meeting will be conducted prior to initiating site activity, and at other appropriate times (each morning and change or addition of work) at the site to discuss the health and safety issues for the activities to be conducted that day. The topics of the meeting will include, at a minimum, general health, and safety procedures, expected weather conditions, reviewing health and safety policies, and reviewing the job hazard analyses for the tasks to be conducted. Additional safety meetings may be conducted if the scope of work changes during the day, or if other health and safety issues are identified. The Field Level Risk Assessment form (RMS2/eFLRA) will be used to document daily health and safety briefings. Completed RMS2 forms should be routinely provided to the Stantec Project Manager and saved in the project files.

14.2 DAILY HEALTH AND SAFETY INSPECTIONS

A safety and health inspection will be completed daily with the minimum inspection requirements documented in the Daily Field Report. Findings and associated corrective actions will be documented in the Daily Field Report. An RMS5, worksite inspection form, with relevant HSSE hazards to be considered should be completed and updated upon identification of any deficiencies.

15.0 PERSONAL PROTECTIVE EQUIPMENT

15.1 MINIMUM PPE REQUIREMENTS (LEVEL D)

PPE is worn to reduce exposure to hazards to an acceptable level after all other reasonable control measures have been implemented. Using PPE is the last step in the hierarchy of controls discussed in the HRAC process. Information on selection and use of PPE, can be found in Stantec SWP 105 – Personal Protective Equipment.

Employees are expected to wear the PPE required by occupational health and safety legislation, Stantec SWPs, client directives, and as identified in task-specific JSAs.

During fieldwork, where PPE requirements are not identified by the Client, facility, jurisdictional regulation or hazard assessment, all employees, guests, and visitors will wear the following minimum protective equipment, special equipment may be required for a specific task as defined elsewhere in the HASP or in task specific JSAs:

Item	Specifications
Exterior garments	Long pants, shirt with long sleeves (no tank tops or shorts)
Foot protection	Safety toed footwear/boots with ankle support (per ASTM F2413).
Gloves	When required to handle hazardous or corrosive chemicals or environmental samples compatible, durable chemical rated nitrile gloves will be worn. General duty work gloves (e.g., cotton, leather, mechanics) may be used when handling material or performing work unrelated to chemical contamination.
Eye and face protection	Safety glasses with side shields. (per American National Standards Institute [ANSI] Z87.1). Additional face shield or goggles when there is a danger of chemical splashes or flying debris.
Head protection	Type I G or better Hard hats (per ANSI Z89.1). Hard hats shall be worn with the brim pointed forward.
Hearing protection	Earplugs or muffs with a noise reduction rating (NRR) of at least 22 dB, when working on or near operating equipment or machinery. Double hearing protection required at 100 dBA or greater.
Traffic vest	Workers will wear a high-visibility traffic safety vest per ANSI 107, class 2 or 3.

Personnel shall only use PPE for which they have been trained to use and medically capable of utilizing safely. Personnel who perform field tasks which significantly stress the body, have the potential to expose personnel above an occupational exposure limit (OEL), require the use of respirators or hearing protection, or work with certain toxic compounds or bloodborne pathogens, will be entered into Stantec's Medical Surveillance program. Project managers shall work with affected personnel to complete RMS9 (Medical Surveillance Assessment) forms for field staff to document medical surveillance requirements for personnel. These forms shall be managed by the local OSEC. See **Section 16.0** for more information on Stantec's Medical Surveillance program.

15.2 HAZARD SELECTION AND EQUIPMENT SELECTION

The Project Manager and SHSO shall, in consultation with field teams, identify actual or potential hazards and the need for PPE. If respiratory protection or chemically protective clothing/gloves are required, the appropriate PPE was selected with the assistance of an HSSE Team Member. Two conditions typically dictate the necessity for PPE: general hazards present in the work area and hazards created by the tasks being performed. Some work areas have actual or potential hazards that can be present at any time, thereby potentially exposing any personnel working or walking through the area. Such areas will be posted as PPE-required areas, or personnel will be informed of the requirements in an equivalent manner. In addition, the actual task being performed may create a hazard and require personnel who perform this task to wear appropriate PPE. The areas where these tasks are taking place may become PPE-required areas for the duration of that specific task. For this project, each JSA specifies the exact PPE required for each task. This is accomplished using established levels of PPE and then, if necessary, specifying the exact features of appropriate equipment items.

15.3 LEVELS OF PPE

This HASP uses the PPE levels of protection outlined in OSHA’s 29CFR1910.120. Activities on this site require at least Level D as described in **Section 15.1**. Certain tasks, such as intrusive work or spill response activities may require a higher level of protection as described below and in the air monitoring action level portion of this HASP (**Section 5.4.2**). Consult with task specific JSAs and Airborne Action Levels found in **Section 5.6.3** to understand the level of protection required during routine and potential emergency situations at this Site.

15.3.1 Respiratory Protection

In the event the elevated levels of volatiles are found, and respiratory protection will be necessary to continue work, all affected employees will be subject to a respiratory protection program in accordance with Stantec SWP 409: Respiratory Protection. All personnel required to respiratory protection will be medically cleared and have had a successful respirator fit test for the respirator they intend to use.

15.3.2 Level A

Level A is selected when the greatest level of chemical or biological skin, respiratory, and eye protection is required. **Level A is not anticipated to be used for this project.**

The following constitute Level A equipment.

- Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the NIOSH.
- Totally encapsulating chemical-protective suit.
- Coveralls (optional).
- Long underwear (optional).
- Gloves, outer, chemical-resistant.
- Gloves, inner, chemical-resistant.
- Boots, chemical-resistant, steel toe and shank.
- Hard hat (under suit) (optional, may be required for some activities).

To protect the critical components of the ensemble, disposable protective suit, gloves, and boots (depending on suit construction, may be worn over totally encapsulating suit).

15.3.3 Level B

Level B is selected when the highest level of respiratory protection is necessary, but a lesser level of skin protection is needed. **Level B is not anticipated to be used on this project except for emergency response operations by trained personnel.**

The following constitute Level B equipment.

- Positive pressure, full-facepiece SCBA, or positive pressure supplied air respirator with escape SCBA (NIOSH approved).
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
- Coveralls (optional).
- Gloves, outer, chemical-resistant.
- Gloves, inner, chemical-resistant.
- Boots, outer, chemical-resistant steel toe, and shank.
- Boot-covers, outer, chemical-resistant (disposable) (optional, depends on activity).
- Hard hat.
- Face shield (optional).
- Safety glasses (Required if not using a full-face tight-fitting respirator).

15.3.4 Level C

Level C is selected when the concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met. Level C will be used when action levels are exceeded as specified in **Section 5.4.2**.

The following constitute Level C equipment; it may be used when air monitoring indicates an exceedance of the Action Level but at a concentration that is below the Stop Work Level.

- Full-face or half-mask, air purifying respirator (NIOSH approved).
- Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls, disposable coveralls, optional depends on activity).
- Gloves, outer, chemical-resistant (optional depends on activity).
- Gloves, inner, general duty.
- Boots (outer), chemical-resistant steel toe and shank (optional, depends on activity).
- Boot-covers, outer, chemical-resistant (disposable) (optional, depends on activity).
- Hard hat.
- Boots/shoes, steel toe, and shank.
- Escape mask (optional, depending on hazards).
- Face shield (optional depending on activity).
- Safety Glasses (if not using full face respirator).

15.3.5 Level D/ Modified level D

Level D is a work uniform affording minimal protection: used for nuisance contamination only and to provide protection from impact, cuts, and flying debris. Level D is the standard level of PPE for field work.

Examples of Level D equipment are found below. Specific PPE requirements are found in the task specific JSAs. Minimum requirements to work on the site are found in **Section 15.1**.

- Chemical resistant coveralls (required in exclusion zone) or durable pants and long-sleeved shirt.
- Gloves (depends on activity).
- Boots/shoes, steel toe and shank.
- Boots, outer, chemical-resistant (disposable or rubber) (optional, depends on contaminant).
- Safety glasses.
- Chemical splash goggles (optional).
- Hard hat.
- Escape respirator (optional, depends on hazards and concentration).
- Face shield (optional, depends on activity).
- High visibility traffic vest.
- Hearing protection.
- Diving equipment.
- Personal flotation device.
- Dust mask or N95 respirator.

16.0 MEDICAL SURVEILLANCE

16.1 PERSONS COVERED

All employees engaged in or overseeing intrusive activities (e.g., sampling, drilling, or other investigation activities) will be enrolled in our medical surveillance program in addition to those that meet the following regulatory triggers.

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.
- All employees who wear a respirator for 30 days or more a year or as required by 1910.134.
- All employees who are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

16.2 FREQUENCY (SCHEDULE)

- Prior to assignment.
- At least once every twelve months for each employee covered; unless the attending physician believes a longer interval (not greater than biennially) is appropriate.
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months.
- As soon as possible upon notification by an employee that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limits or published exposure levels in an emergency situation.

16.3 PROGRAM REQUIREMENTS

The elements of the medical surveillance program are maintained in SWP 111 - Medical Surveillance, The program includes at least an annual review of an employee's exposures using a Medical Surveillance Assessment Form (RMS9) regardless of the triggers identified in **Section 16.1** above. HAZWOPER surveillance includes special emphasis on symptoms related to the handling of hazardous substances, health hazards affecting fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

16.4 EATING, DRINKING AND SMOKING RESTRICTIONS

Stantec desires to provide a tobacco-free environment and does not condone the use of tobacco products by its employees while serving clients or during the course of work. Further, all facilities, including vehicles owned or operated by Stantec are strictly tobacco-free. To prevent ingestion of toxins, eating, drinking, smoking, or applying cosmetics is not allowed while in an area of known contamination (Exclusion Zone/Hot Zone or Support Zone), when working with chemicals or contaminated items, or when wearing PPE that prevents chemical exposure (respirator, gloves, chemical apron, etc.). After exposure to any chemical or contaminants and prior to eating, drinking or smoking workers must thoroughly wash their hands and face.

16.5 DRUG AND ALCOHOL POSSESSION AND USE

Stantec's Alcohol and Drug Practice (HSSE-100) details requirements for Stantec employees on project sites. Key requirements include:

- Employees must arrive fit for duty and remain fit for duty during their period of work.
- Employees must understand the alcohol and drug practice, their role, and the resources available.
- Employees shall take responsibility to ensure their safety and the safety of others. This may include contacting a supervisor, HSSE, HR, the Employee and Family Assistance Plan (EFAP), or the Integrity Hotline for confidential advice on what action to take.
- Employees shall use medications responsibly, be aware of potential side effects and notify their supervisor of any potential unsafe side-effects where applicable.
- Employees shall not sell, distribute, possess, consume, or use alcohol, drugs (other than authorized medications), drug paraphernalia, or any device or product that could tamper with any sample for an alcohol or drug test.

Following an incident, Stantec will follow the incident reporting procedures. If appropriate, Stantec will include drug and alcohol testing, consistent with Stantec's Policies and Procedures, as well as the client's contractual requirements for testing.

17.0 WORKING ALONE AND USE OF THE BUDDY SYSTEM

Stantec has established a buddy system which is applicable to most situations governed by this HASP. SWP 118 - Working Alone in the Field requires the completion of a risk assessment to determine the appropriateness of lone work and development of methods to monitor the condition of all employees who are working alone. Stantec personnel will work with a subcontractor, client, or another Stantec employee when onsite.

18.0 EMERGENCY RESPONSE PLAN

The following sections outline the Emergency Response Plan (ERP) for the implementation of the Pumphouse 1 Work Plan. The ERP describes procedures to be used in the event of an accident or emergency at the Pumphouse 1 Project Area during the implementation of the Work Plan.

18.1 EMERGENCY INCIDENT CONTACT AND HOSPITAL ROUTE

The person responsible for responding in the event of an emergency at the Pumphouse 1 Project Area during execution of the work covered under this HASP is the SHSO:

Laina Cole
Direct: (253) 247-1466
laina.cole@stantec.com

Appendix F, *Emergency Response Procedures and Contacts*, provides emergency notification/contact information of local Emergency Medical Services and route information and maps to the nearest emergency medical facility.

18.2 SPILL PREVENTION, CONTROL, AND COUNTERMEASURES (SPCC) PLAN

No oil or materials in quantities that would trigger the 40 CFR Part 112, Oil Pollution Prevention regulation, are anticipated during implementation of the Work Plan, an SPCC plan will not be required. Operations of the facilities within the Pumphouse 1 Project Area are separate from and independent of any investigative-related activities described within the Work Plan. This document assumes those facilities have their own SPCC plans if needed.

Smaller quantities of fuels, oils, and greases will be used during assessment and sampling activities. Field work is expected to generate investigation derived waste potentially consisting of contaminated solids (i.e., soil) and liquids (i.e., groundwater and decontamination fluids).

Best management practices will be utilized during field activities to prevent the entrance of petroleum products or other hazardous materials into drainage features, underground water sources, or bodies of water. Stantec work crews and field inspectors will monitor the use of fuels, lubricating oils, hydraulic fluids, grease, and other products involved in sample collection operations, and promptly clean up and dispose of any releases of these products.

The location of underground lines (e.g., product, sewer, telephone, fiber optic) will be documented before starting site work. If a line or tank is drilled through, or another leak occurs, the event will be documented as soon as possible using an Event Report (RMS3) and the procedures in the following sections will be followed.

The following procedures will be used to prevent or contain spills:

- Hazardous materials will be stored in appropriate containers and labelled.
- Containers will be kept closed when not in use.

- Containers will be stored away from moving equipment. A designated container storage area will be established in the sample processing facility, at least 20 feet from any storm water inlet or surface water body.
- Drums/containers will be secured and handled in a manner that minimizes spillage.
- Equipment will be inspected daily for signs of leaks, wear, or strain on parts that, if ruptured or broken, would result in a spill.
- A container inventory will be updated daily and maintained by the SHSO.
- To the extent possible, refueling will occur in designated areas where incidental spills can be prevented from reaching permeable ground surfaces or surface water.
- To the extent possible, equipment will be placed over secondary containment and/or absorbent materials to prevent spills from reaching permeable ground surfaces.
- A spill response kit with materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e., speedy-dri, absorbent pads, etc.) and containers will be available at all times.

In the event of a release, reporting, if necessary, will follow the requirements in the following section.

18.3 RELEASE REPORTING

Release Reporting will be conducted in accordance with Section 103 of Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-Know Act, 42 U.S.C. § 11004, the Project Coordinator will immediately notify the following by phone:

- National Response Center (800-424-8802)
- Washington State Department of Ecology, Emergency Management Division (800-258-5990).

18.4 EMERGENCY RESPONSE PROCEDURES: EVACUATION

In the event of an on-site or off-site emergency requiring site evacuation (e.g., fire, release, explosion, etc.), the following procedures will be followed:

- Stop Work and notify the SHSO.
- Evacuate the site and go to the emergency meeting location if safe conditions exist. Unless otherwise noted, the emergency meeting location is the parking lot for the main airport building:

Due to the size of the site and varying work activities, the emergency meeting location will be confirmed and updated (if necessary) during the tailgate safety meeting on a daily basis, including identifying muster points as necessary. If safe conditions prevent evacuation to the designated location, move upwind, away from the source of the emergency. Maintain a safe distance from the source.

- Check in with the SHSO at the emergency meeting location. The SHSO will take attendance once all personnel have gathered.
- Dial the appropriate emergency response number(s). State the problem clearly and completely and remain on the line until dismissed by the operator.
- Only attempt extinguishing small fires with portable dry chemical equipment on-hand. When in doubt, emergency response personnel shall be notified.
- Do not reenter the emergency site without specific approval from emergency response personnel.

Randomly scheduled evacuation drills may be conducted at any time during field activities.

18.5 EMERGENCY RESPONSE PROCEDURES: INJURY OR ILLNESS

If an injury or illness occurs, take the following action:

1. Stop Work, stabilize the situation, and secure the site.
2. If it is safe to do so, administer First Aid for the person immediately using a first aid and blood-borne pathogens kit. Ensure Universal Precautions are taken (i.e., avoid contact with patient's bodily fluids by means of wearing nonporous articles such as gloves, goggles, and face shield).

3. Determine if emergency response (fire/ambulance) is necessary. WorkCare may be contacted if employees are unsure of the extent of injury. If emergency response is required, call appropriate emergency response numbers on closest available phone. Meet the emergency vehicle at the emergency muster point identified for that day during the tailgate safety meeting, then direct them to the incident area. Provide the location of the injured person and other details as requested. Advise personal of potential contamination or exposure concerns. Drive the individual to the hospital only if it makes sense and there are at least two staff available to go with the injured person, one first aid trained person to attend to the individual in the vehicle and one driver.
4. If emergency decontamination is required:
   - Immediately remove contaminated PPE or clothing.
   - If possible, wash contaminated area with mild soap and water.
   - Use eyewash station if necessary.
   - Personnel assisting the contaminated individual will don the proper PPE to avoid unnecessary exposures.
5. For all injuries or illness, even minor cuts, scratches, and bruises, notify the SHSO immediately. The SHSO is responsible for initiating incident reporting procedures immediately after the victim(s)/site have been stabilized. The SHSO will assume responsibility during a medical emergency until more qualified emergency response personnel arrive at the site as needed.
6. As promptly as possible following an injury or illness, ensure appropriate notification has been made to the family of the individual involved by contacting the Project Manager who will inform the HR Lead.
7. Please see **Section 3.4** for incident reporting procedures.

18.5.1 Injuries or Illnesses Requiring Hospital Service WITHOUT Ambulance Service

Injuries or illnesses requiring hospital service without ambulance services include minor lacerations, minor sprains, etc. The following procedures will be taken immediately.

1. The SHSO will ensure prompt transportation of the injured person to a physician or hospital.
2. A representative of Stantec will drive the injured employee to the medical facility and remain at the facility until the employee is ready to return. A second first aid trained person shall accompany the individual to allow for continuation of care on the ride to the medical facility.
3. If the driver of the vehicle is not familiar with directions to the hospital, an additional person shall accompany the driver and the injured employee and navigate the route to the hospital.
4. If it is necessary for the SHSO to accompany the injured employee, provisions will be made to have another qualified employee, properly trained and certified in First Aid, to act as the temporary SHSO.
5. If the injured employee is able to return to the job site the same day, he/she will bring with him/her a statement from the doctor containing such information as:
   - Date
   - Employee's name
   - Diagnosis
   - Date he/she is able to return to work, regular or light duty
   - Date he/she is to return to doctor for follow-up appointment, if necessary
   - Signature and address of doctor

6. As promptly as possible following an injury or illness, ensure appropriate notification has been made to the family of the individual involved by contacting the Project Manager who will inform the HR Lead.
7. Please see **Section 3.4** for incident reporting procedures.

If the injured employee is unable to return to the job site the same day, the employee who transported him will bring this information back to the job site and report it to the Project Manager, office OSEC, HSSE Manager, Stantec's Practice and Risk Management (PRM – via email to hsse@stantec.com), and their regional Human Resources Specialist.

18.5.2 Injuries or Illnesses Requiring Hospital Service WITH Ambulance Service

Injuries or illnesses requiring hospital service with ambulance services include severe head injuries, amputations, heart attacks, heat stroke, etc. The following procedures will be taken immediately:

1. Call for ambulance service and notify the SHSO.
2. Administer First Aid until ambulance service arrives.
3. While the injured employee is being transported, the SHSO will contact the medical facility to be utilized.
4. One designated representative will accompany the injured employee to the medical facility and remain at the facility until final diagnosis and other relevant information is obtained.
5. As promptly as possible following an injury or illness, ensure appropriate notification has been made to the family of the individual involved by contacting the Project Manager who will inform the regional Human Resources Specialist.
6. Please see **Section 3.4** for incident reporting procedures.

18.5.3 Death of an Individual or In-Patient Hospitalization of Employees

Title 29 CFR 1904.39 requires notification to OSHA for incidents that involve a fatality, hospitalization of an employee, amputation, or loss of eye. The emergency response procedures above will be followed. If the injured person dies or is admitted to the hospital for treatment (not observation), follow the incident reporting procedures. The HSSE Manager will notify the Human Resources Department, and institute Stantec's Crisis Communications Plan.

A designated company representative will notify the local OSHA office within 8 hours of the incident in the event of a fatality or the hospitalization of one or more employees. Notification of OSHA for admitted to the hospital must occur within 24 hours. Other injuries involving amputations or loss of eyesight must also be reported to OSHA in 24 hours.

18.6 EMERGENCY RESPONSE PROCEDURES: SPILLS OR CUT LINES

Emergency response and reporting will be conducted in accordance with **State of Washington.**

Stantec employees or subcontractors are not expected to take action or participate in rescues or response to chemical releases beyond the initial discovery and the immediate mitigation actions described herein. In the event of a spill/release, follow this plan:

1. Stop Work, stabilize the situation, and secure the site.

2. Call Fire Department immediately if the spill cannot be contained or in case of fire or another emergency.
3. Stay upwind of the spill/release.
4. Wear appropriate PPE.
5. Turn off equipment and other sources of ignition. Do not turn off electrical equipment or lights as a small arc may occur and ignite a flammable atmosphere (if applicable).
6. Turn off pumps and shut valves to stop the flow/leak.
7. Plug the leak or collect drippings, when possible.
8. Use sorbent pads to collect product and impede its flow, if possible.
9. Notify the SHSO to begin the incident reporting procedures. All spills/releases will be reported to the Client Project Manager within 24 hours.
10. Determine if the client wants Stantec to repair the damage or if the client will use an emergency repair contractor.
11. Based on agreements, contact emergency spill contractor for containment of free product. The contacts for this project will be the local fire department and/or 911.
12. Advise the client of spill discharge notification requirements and determine who will complete and submit forms. Document each interaction with the client and regulators and note, in writing; name, title, authorizations, refusals, decisions, and commitments to action.

Decontamination procedures will take place as described in **Section 11.5**. Any decontamination fluids will be decanted into the waste drum. Waste will be disposed of in accordance with federal, state, and local regulations. Do not transport or approve transportation of contaminated soils or product until proper manifests have been completed and approved. Be aware that soils / product may meet criteria for hazardous waste. Do not sign manifests as generator of wastes unless you have been given appropriate training and approval for signing on behalf of the generator; contact the Project Manager to discuss waste transportation.

Additional SPCC information is presented in **Section 18.2**.

18.7 FIRST AID/EMERGENCY TRAINING AND EQUIPMENT

First Aid training is required when working at sites where there is no infirmary, clinic, or hospital in near proximity to the workplace (3-4 minutes) and there is no client or contractor personnel onsite who is trained in first aid. When required, a minimum of two employees per shift shall have First Aid and CPR training consistent with the requirements of the American Red Cross or American Heart Association. This training shall also be provided for an adequate number of people to provide support during an emergency and to comply with OSHA regulations.

The first aid kits will contain SHSO-approved supplies in a weatherproof container with individual sealed packages for each type of item. It should also include rubber gloves to prevent the transfer of infectious diseases. Provisions should also be made to provide for quick drenching or flushing of the eyes should any person be working around corrosive materials. Eye flushing must be done with water containing no additives. The contents of the kit shall be checked before being sent out on each job and at least weekly to ensure the expended items are replaced.

18.8 LEVELS OF TRAINING

- **First-Aid and CPR** training will be from either the American Red Cross or the American Heart Association and will include a hands-on component. At least two individuals on every shift will have this training, which may include the SHSO.
- **Fire Protection** training will be limited to training employed alarm/warning systems, the proper use and limitations of handheld fire extinguishers, and notification of local emergency services. Every on-site employee will receive this training as part of orientation and at least annually thereafter.
- **Spill Containment** training will be provided to all personnel working with or near hazardous materials or waste which might suffer a spill. Training shall include spill response procedures (notification, personal protection, spill containment, clean-up, and reporting) and clearly convey the limits of spill response by on-site personnel. Only those trained in spill response/containment procedures are authorized to take such actions.

18.9 LIST OF ON-SITE EQUIPMENT AND SUPPLIES

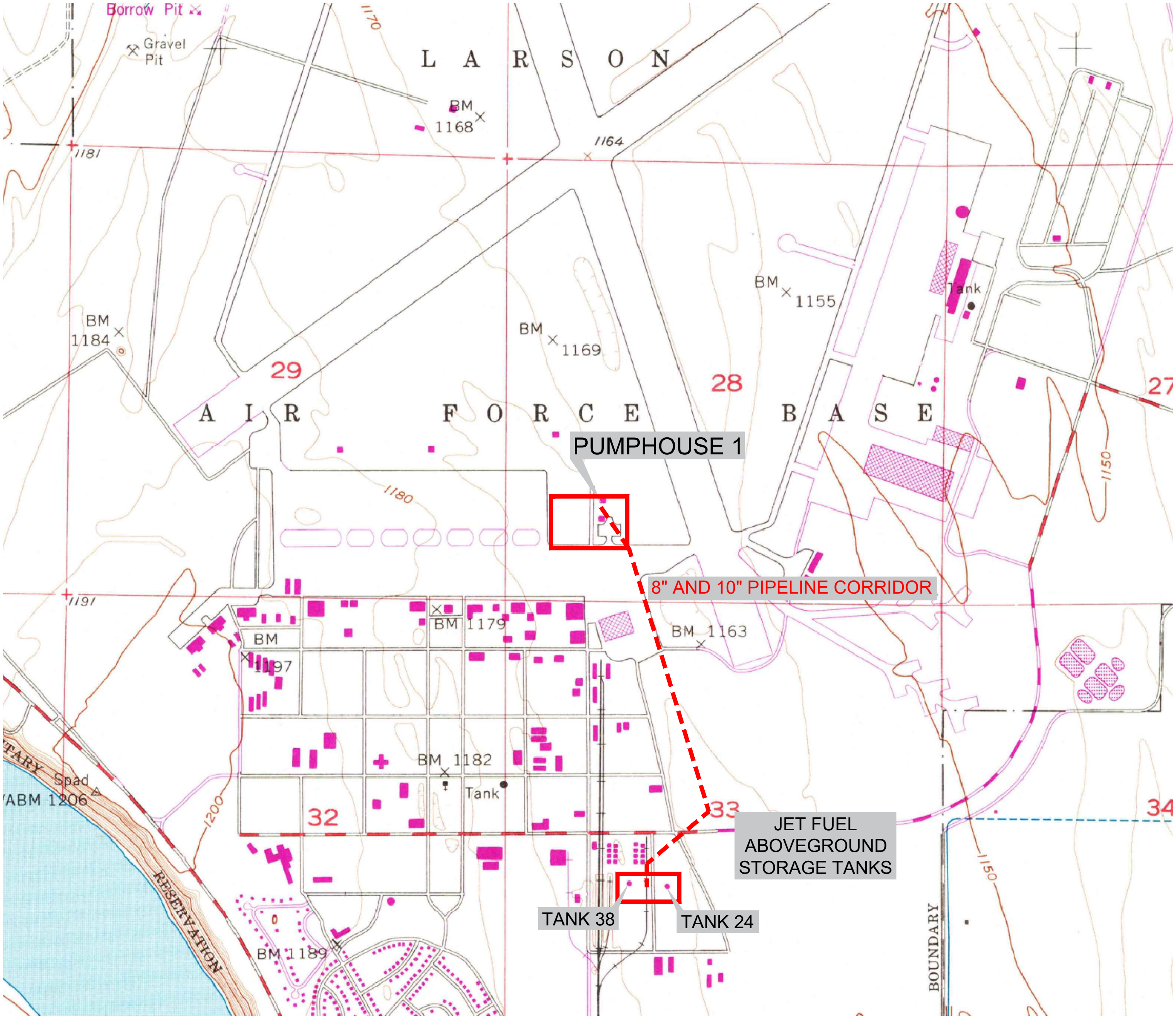
An itemized list and the location of on-site emergency response and first aid equipment is below.

Equipment	Location
First Aid Kit	In Stantec Field Vehicle
Emergency Eye Wash	Bottle in First Aid Kit
Fire Extinguisher	In Stantec Field Vehicle
Appropriately sized spill kits, as needed	• In Stantec Field Vehicle • In Sample Processing Facility • Other Locations as determined by the SHSO

18.10 PRE-EMERGENCY PLANNING

Emergency response procedures must address possible or anticipated situations and the appropriate actions to be taken. The Project Manager will ensure that the emergency response section of this health and safety plan is modified as needed to reflect project changes. During site-specific orientation and at the daily tailgate safety meetings, all employees will be trained in and reminded of the provisions of the emergency response plan, the communication systems, posted names and phone numbers, and evacuation routes. This plan will be reviewed and revised, if necessary, on a regular basis. This will ensure that the emergency plan is adequate and consistent with prevailing Site conditions. Periodic emergency drills may be conducted using the discretion of the SHSO.

A windsock, flag, or other device may be utilized to show the wind direction to Site workers.



FN 2037236780001

EXPLANATION

SOURCE:
Modified from a map
provided by
DeLorme 3-D TopoQuads

APPROXIMATE SCALE

Stantec

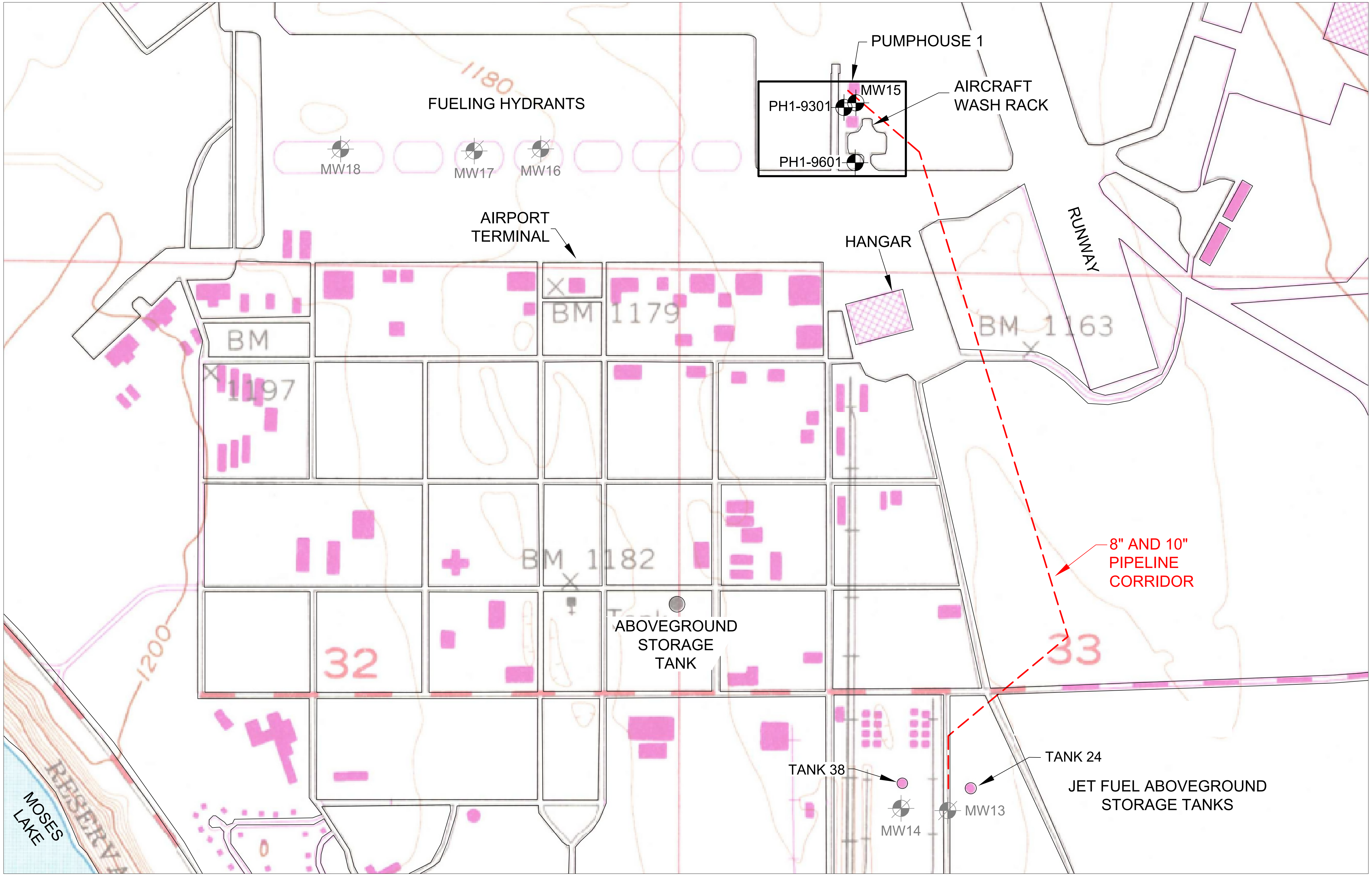
SITE LOCATION MAP

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

PROJECT NO.
203723678

PLATE
1

LEC: 03/21/24



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N

EXPLANATION

MW15

⊕ Groundwater Monitoring Well

MW18

⊕ Destroyed Groundwater Monitoring Well

NOTE: Select Pumphouse 1 features and monitoring wells omitted for clarity. Refer to the Generalized Site Plan for Pumphouse 1 (Plate 3) for details.

SOURCE: Modified from a map provided by DeLorme 3-D TopoQuads

APPROXIMATE SCALE

0 650 1,300 Feet

Stantec

GENERALIZED SITE PLAN (EXPANDED AREA)

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

PROJECT NO.

203723678

PLATE

2

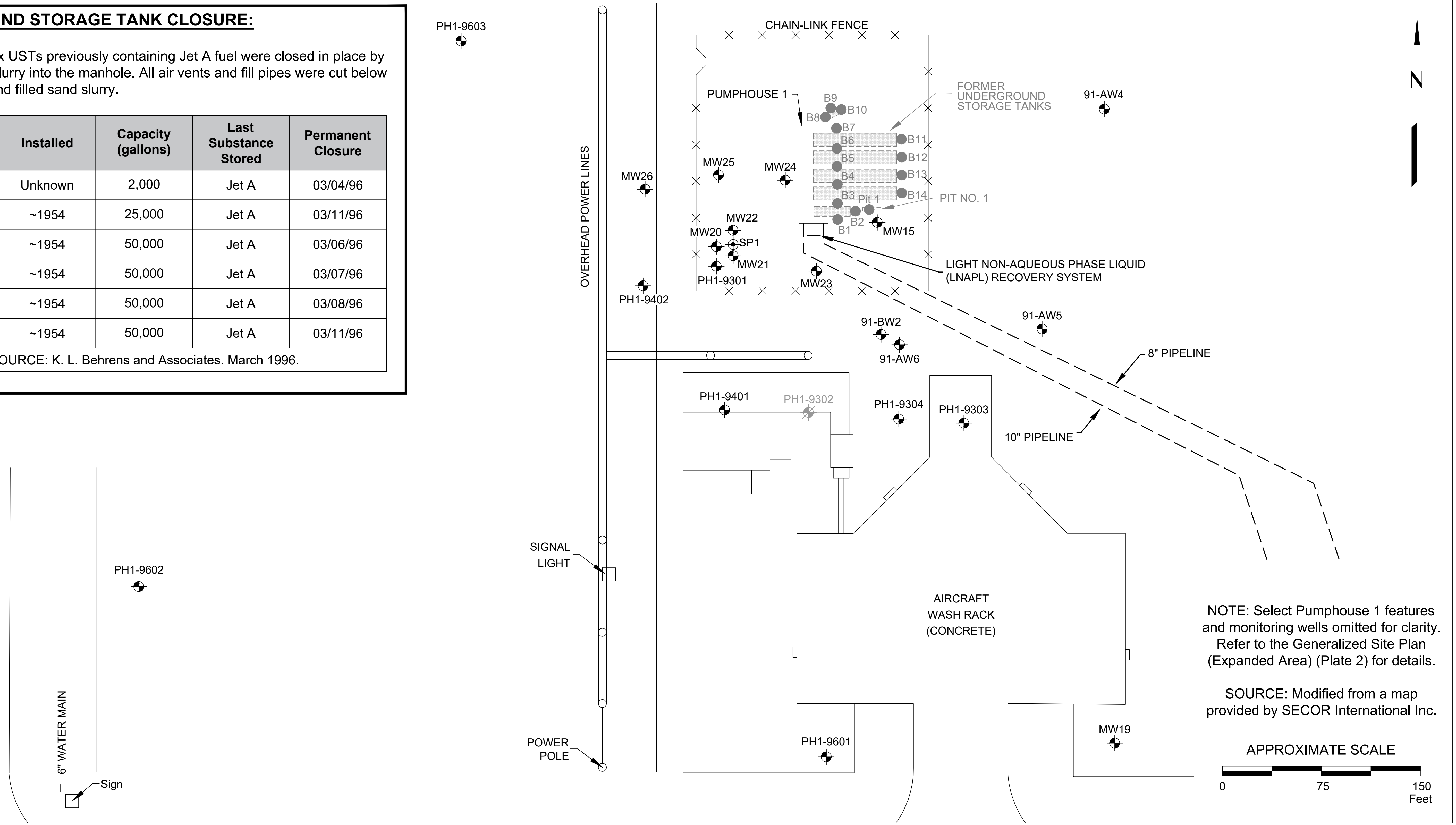
LEC: 05/14/24

UNDERGROUND STORAGE TANK CLOSURE:

In March 1996, six USTs previously containing Jet A fuel were closed in place by injecting a sand slurry into the manhole. All air vents and fill pipes were cut below ground surface and filled sand slurry.

Tank No.	Installed	Capacity (gallons)	Last Substance Stored	Permanent Closure
10	Unknown	2,000	Jet A	03/04/96
15	~1954	25,000	Jet A	03/11/96
24	~1954	50,000	Jet A	03/06/96
25	~1954	50,000	Jet A	03/07/96
28	~1954	50,000	Jet A	03/08/96
29	~1954	50,000	Jet A	03/11/96

SOURCE: K. L. Behrens and Associates. March 1996.



NOTE: Select Pumphouse 1 features and monitoring wells omitted for clarity. Refer to the Generalized Site Plan (Expanded Area) (Plate 2) for details.

SOURCE: Modified from a map provided by SECOR International Inc.

FN 2037236780002

Stantec

GENERALIZED SITE PLAN (PUMPHOUSE 1)

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

EXPLANATION

MW26 ⊕	Groundwater Monitoring Well
SP1 ⊕	Steam Injection Well
PH1-9403 ⊗	Destroyed Groundwater Monitoring Well
B14 ●	Historical Soil Boring

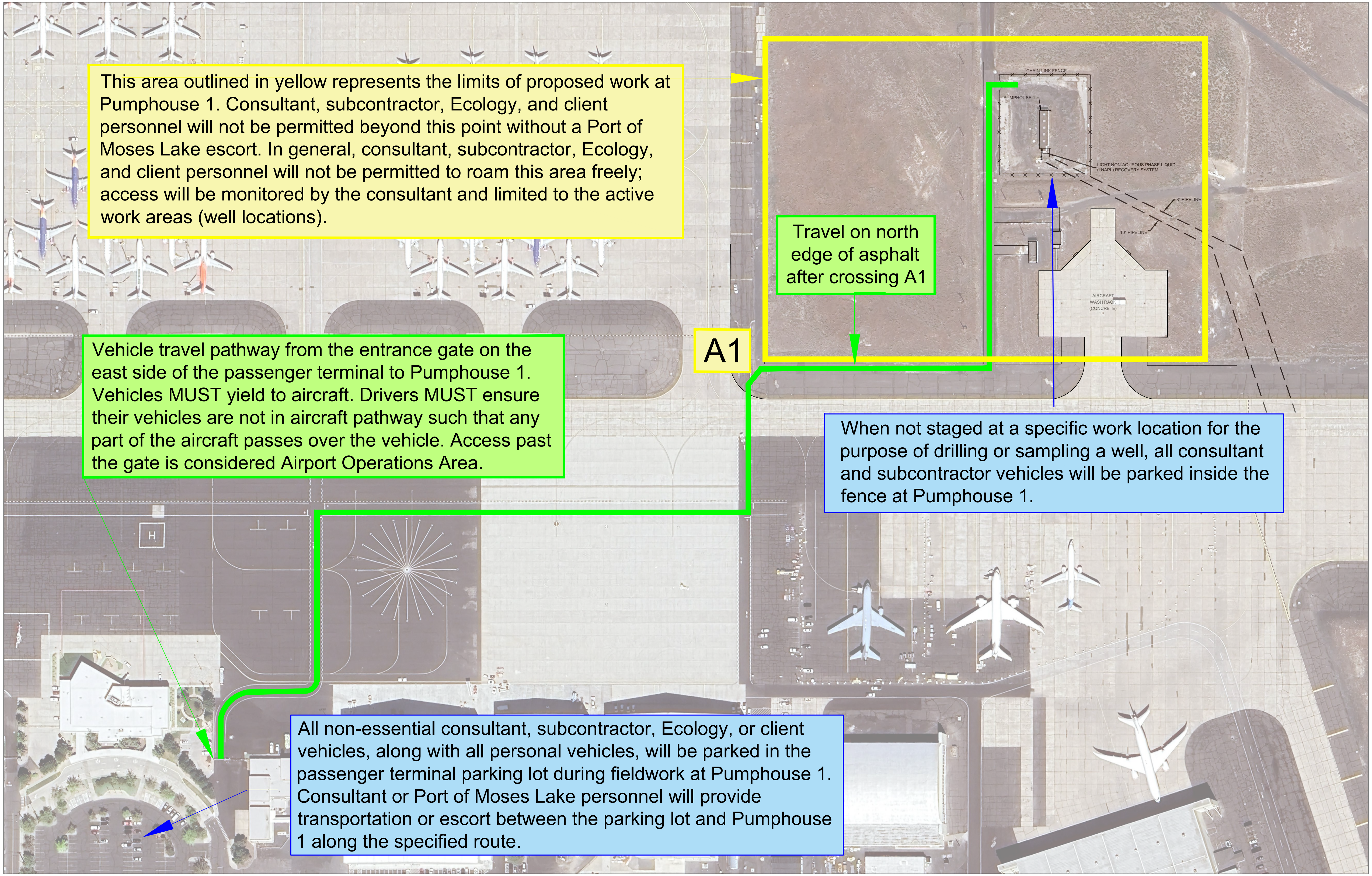
PROJECT NO.

203723678

PLATE

3

LEC: 05/14/23



This area outlined in yellow represents the limits of proposed work at Pumphouse 1. Consultant, subcontractor, Ecology, and client personnel will not be permitted beyond this point without a Port of Moses Lake escort. In general, consultant, subcontractor, Ecology, and client personnel will not be permitted to roam this area freely; access will be monitored by the consultant and limited to the active work areas (well locations).

Travel on north edge of asphalt after crossing A1

Vehicle travel pathway from the entrance gate on the east side of the passenger terminal to Pumphouse 1. Vehicles MUST yield to aircraft. Drivers MUST ensure their vehicles are not in aircraft pathway such that any part of the aircraft passes over the vehicle. Access past the gate is considered Airport Operations Area.

When not staged at a specific work location for the purpose of drilling or sampling a well, all consultant and subcontractor vehicles will be parked inside the fence at Pumphouse 1.

All non-essential consultant, subcontractor, Ecology, or client vehicles, along with all personal vehicles, will be parked in the passenger terminal parking lot during fieldwork at Pumphouse 1. Consultant or Port of Moses Lake personnel will provide transportation or escort between the parking lot and Pumphouse 1 along the specified route.

FN 2037236780002

N

NOTES:

All consultant personnel will be badged. All subcontractor, Ecology, or client personnel who are not badged will be escorted by consultant or Port of Moses Lake personnel at all times.

SOURCE: Modified from a map modified from Google Earth

APPROXIMATE SCALE

0 250 500
Feet

Stantec

VEHICLE ACCESS ROUTE AND WORK AREA LIMITS MAP

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

PROJECT NO.

203723678

PLATE

4

LEC: 05/15/24

Appendix A PORT OF MOSES LAKE CONSTRUCTION SAFETY CONTRACT PROVISION REQUIREMENTS

Port of Moses Lake

Airport Operations Area (AOA) Construction Safety Contract Provision Requirements; Appendix to Grant County International Airport "Rules and Regulations"

April 20, 2021

Appendix C – AOA Construction Safety Contract/Activity Provision Requirements

Section 1- General Description

Port Contracted Activities

All proposed construction, site development, and/or other site investigational activities, implemented through a contract between the Port of Moses Lake and a Contract provider (i.e. construction contractor, consultant, or any other entity contracted with the Port); that will include work to be within the AOA, controlled airspace, or having the potential to impact the AOA or controlled airspace; and/or as directed by the Port of Moses Lake; must include minimum contract provision language as stipulated within this appendix to the Grant County International Airport "Rules and Regulations."

The minimum contract provisions are supplementary to other contract provisions otherwise required by the FAA, or other jurisdictional requirements; and are not necessarily intended to replace or supersede other agency provisional requirements. Where provisional conflicts may arise, contract provisions shall specify the order of provisional hierarchy.

Non-Port Contracted Activities

Where proposed development construction, site development, and/or other site investigational work, or any other activities defined by the Port, are to be undertaken by an Airport tenant, non-Port entity, or a hired construction contractor, consultant, or other entity; and are within the AOA, or are adjacent and may impact the AOA or surrounding airspace; the non-Port entity must undertake a pre-activity safety meeting with the Port, to review and complete the AOA Construction Safety Contract/Activity Provision Checklist prior to undertaking said activities. Further operational safety planning, implementation, and submittal requirements will be identified through the completion of the pre-activity safety meeting and checklist. Written Port approval to the non-Port entity is required prior to undertaking activities within the AOA, or any activities in adjacent areas, having the potential to impact the AOA or controlled airspace.

Section 2- Intended Use and Format of Appendix Content

The provisional contract and/or operational requirements are organized and listed within the form titled, "AOA Construction Safety Contract/Activity Provision Checklist". This form provides a list of requirements, description of intent of requirements, implementation parameters and considerations, and checkboxes identifying applicability of provision to specific AOA proposed activities. The check boxes are listed as either "Yes" applicable, or "N/A" not applicable to the intended proposed activity. If any provision is deemed to be N/A, the form provides space and requires documentation of the rationale and justification of why the provision is not applicable. If any provision is deemed to be applicable, notes of implementation requirements to be implemented and/or included within a Port Contract shall be documented with the notes space of each applicable item.

The form serves as the itemized list of minimum provisional or operational requirements that must be considered by the contract preparer (or non-Port entity). If the activities are to be Port direct contracted work, the completed and signed form will serve as documentation of the required supplementary provisions to be included in the project specific contract (bid) documents. If the activities are to be implemented as non-Port contracted work, the completed and signed form will serve as documentation of the required operational provisions, required of the non-Port entity.

The form shall be signed by the Port project manager, consultant project manager (as applicable), non-Port entity (as applicable), and Airport Director. The completed and signed form shall be retained and filed with Port, consultant project records, or non-Port proponent (as applicable).

Section 3- Implementation Authority

Authority of applicability and inclusion of individual provisions resides with the Airport Director or other Port personnel as directed by the Port Commission. The authorized Port representative has the authority to include, waive, or modify provisions as deemed necessary and prudent, in order to implement contract provisions that encourage safe contract activities to the greatest extent possible.

Section 4- AOA Construction Safety Contract/Activity Provision Checklist

AOA Construction Safety Contract/Activity Provision Checklist form is attached below:

AOA Construction Safety Contract/Activity Provision Checklist

Project Name:	Date:
Project Sponsor/Proponent:	

Project Location, AOA Proximity, and Risk Potential:

Requirements below, deemed applicable and required to be implemented and/or set forth within the project requirements, shall be itemized within the project's contract provisions of the "Construction Safety and Phasing Plan (CSPP)"; and by provision required to be addressed and included in the Contractor's "Safety Plan Compliance Document (SPCD)", or other contract required safety management plan(s); or required to be addressed by a non-Port entity intending to undertake activities within the AOA.

Port Contract Activities

The following item descriptions and contract/operational implementation requirements, are intended as notes for consideration and not actual vetted contract language or final operational requirements for each subject item. The intent of the content is a checklist for the Port contract preparer to consider in establishing safety related provisions and/or plans. The actual provisional applicable language will be developed at the time of project specific contract development. The checklist includes both items for consideration in developing the construction contract safety and phasing plan requirements; and includes several other coordination items for the construction contract preparer and/or Port representative.

Non-Port Contracted Activities

The following item descriptions and contract/operational implementation requirements, are intended as notes for consideration and not actual vetted final operational requirements for each subject item. The non-Port entity must undertake a pre-activity safety meeting with the Port, to review and complete the AOA Construction Safety Contract Provision Checklist prior to undertaking said activities. Further operational safety planning, implementation, and submittal requirements will be identified through the completion of the pre-activity safety meeting and checklist review. Written Port approval to the non-Port entity is required prior to undertaking activities within the AOA, or activities having the potential to impact the AOA or controlled airspace.

Construction Contract Safety & Phasing Plan Development Considerations:

#	Item	Item Description & Intent	Implementation Considerations	Applicability
1	**Construction Safety & Phasing Plan (CSPP)**	Require preparation of Construction Safety & Phasing Plan (CSPP), and Safety Plan Compliance Document (SPCD), and to specify safety requirements established within the contract.	• Stipulate contract safety, phasing, and operational parameters specific to the project activities and/or contract. • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
2	**Dedicated Onsite Contractor Safety Manager**	Require dedicated Contractor provided safety manager that is onsite during construction. Intent is there sole responsibility is managing safety and operations to ensure implementation compliance with the CSPP, SPCD, and other safety requirements established within the contract. The intent for this individual is they are not responsible for other duties (i.e. management or implementation of contract activities).	• Determine and stipulate required onsite presence of Contractor Safety Manager. • Determine and stipulate minimum required responsibilities, authority, and documentation requirements of Contractor Safety Manager. • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
3	**Dedicated Contractor Flagger/Guard at each crossing or entrance**	Require dedicated flagger/guard at each key construction/AOA crossing location as determined in the CSPP, with the intent that they are solely responsible for the one assigned location, and are not responsible for other duties (i.e. sweeping, control of other locations, or other construction activities); and if the flagger/guard is not present at the location the crossing is closed to contractor utilization.	• Determine and stipulate number of construction crossings. • Determine and stipulate required flagger presence for each phase of work (days, durations, times, etc.). • Stipulate requirement of radio call sign assignments per (individual or location?) • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			

4	**Contractor personnel attendance of Formal Port operational and safety training** ***(Pre Project training prior to NTP)***	Require Contractor personnel to attend formal Port operational and safety training. Training is intended to include general airfield and project specific training. This training is intended for all personnel. Completion of this training will documented by issuance of a safety training completion badge that includes photo.	• Establish who is required to attend (i.e. all, or just key personnel?) • If not requiring all personnel to attend Port led training, establish content and documentation requirements of Contractor led training. • Establish amount of time anticipated for training session. • Establish documentation tracking mechanism to track contractor employee attendance. • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
5	**Contractor personnel attendance of Formal Port operational and safety training** ***(Ongoing re-occurring training during project)***	Require Contractor personnel to attend on-going Port operational and safety training. Training is intended to include general airfield and project specific training. This training is intended for all personnel. Completion of this training will be documented by issuance of a safety training completion badge that includes photo. Attendance of re-occurring training will be documented by Port tracking documentation.	• Establish pre-set intervals established during construction duration (i.e. phase operational area transitions, and/or general required # of required refresher training even if no phase or operational change?) • Establish re-training requirements for either Contractor or Port directed change to Phasing and/or safety operations plan, and/or CSPP/SPCD • Establish who is required to attend (i.e. all, or just key personnel?) • If not requiring all personnel to attend Port led training, establish content and documentation requirements of Contractor led training. • Establish amount of time anticipated for training session. • Establish documentation tracking mechanism to track contractor employee attendance. • Establish and specify how cost of multiple re-training is contractually covered. • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			

6	**Contractor personnel Safety Training Completion Badge requirements**	Provide system that all contractor personnel (and/or sub-contractors/suppliers/delivery personnel) on airfield have as minimum, attended a Port safety training completion meeting. A badge of completion with individual's photo will be issued. If they're on the airfield without, it even if escorted, they shall be removed from site.	• Establish if this will be requirement for being on project site. Photo could help to ensure personnel are not being swapped out later with non-trained personnel. Allows ability for anyone to check anyone on site for a safety training badge) • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
7	**Contractor personnel AOA-Movement Area Badge requirements**	Issue AOA-Movement area Badge to contractor personnel (and/or sub-contractors/suppliers/delivery personnel). Badge issuance requires attending badge class and passing exam.	• Establish if all contractor personnel, or just key personnel are required to have this. • Establish if intend to have Contractor provide escorts into AOA, or Port will provide all escorting during duration of project? • If Contractor to provide escorting, establish if all contractor personnel, or just key personnel are required to have this. • Specify within appropriate contract provision • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
8	**Daily/Weekly Contractor/Port Safety Coordination meeting requirements, and check off documentation requirements**	Establish minimum daily and/or weekly contractor safety coordination meeting content and implementation requirements; and meeting documentation requirements.	• Specify frequency requirements • Specify personnel attendance requirements • Specify minimum content requirements • Specify documentation requirements	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			

9	**Safety/Phasing changes, value engineering (field) requests, updating requirements of SPCD, and field change approval process**	Establish contract requirements for making changes to approved safety and phasing plans, CSPPs, SPCDs, or other safety protocols, operating procedures, of other operational requirements.	• Specify process/protocol for adjustments. • Specify resubmittal and approval/authorization requirements for changes to SPCD. • Specify processes for value engineering or field requests relative to safety operational changes.	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
10	**Contract Safety Violation/incident Protocol Requirements (for violation instigated *by Contractor* personnel or one of its contractual sub-contractor agents/supplier)**	Establish contract requirements and response protocols for contractor (or sub-contractor) safety violations and/or safety incidents.	• Determine the Stop work # of day(s) for full safety stand-down. • Specify no adjustments during stand-down, to contract time or completion date, unless # of conditions are met. Specify conditions. Specify Port has the authority to determine if conditions satisfied. • Determine mandatory re-training requirement (for all or select) personnel? • Specify liability for cost of training? • Require updating and resubmission of SPCD? • Specify how and what safety fines will be assessed and collected.	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
11	**Contract Safety Violation/incident Protocol Requirements (for violation instigated *by non-Contractor* personnel or one of its contractual sub-contractor agents/supplier; i.e. Port, ATCT, consultant…..)**	Establish contract requirements and response protocols with contractor (or sub-contractor) if safety violations and/or safety incidents impacts occur within the work zone by non-contractor personnel or activities.	• Specify requirements on Contractor if the violation was not by their personnel • Specify how contract time and impact costs to contractor are contractually covered.	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			

12	**Safety Violation Fines**	Establish safety violation fine schedule to be included within the contract requirements. Fine structure would be established and correlated to type and degree of infraction. Fines would not be labeled liquidate damages, which requires documented financial impacts.	• Specify chart list of infractions and associated fine structure. • Specify escalation clauses for repeat offenses • Specify if fines are tied to a general or project specific risk assessment matrix. • Define violations, fines, and run through legal review. • Assess whether requires higher level adoption in general at commission level.	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
13	**Project Risk Assessment Matrix**	Establish list and matrix of potential safety risks potentially possible specific to the proposed project or activity. Matrix intended to identify type of risks, and rating of likelihood and/or severity potential of risk. Matrix may be tied to and support fine structure in item 12.	• Assess and include as appropriate within contract document • Define risk matrix categorized by rating from high risk to low risk; and rating of high potential occurrence to low potential occurrence. • Assess with Port attorney as appropriate for legal liability. • Instigate in contract requirement Contractor to submit matrix assessment if proposing change to original CSPP.	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
14	**Requirements for Contractor to submit step-by-step AOA crossing protocols**	Establish contract requirements for contractor to submit step-by-step minimum requirements and protocols for personnel or equipment crossing or entering an AOA.	• Require in contract, requirement for Contractor to submit detailed step-by-step crossing protocols. • Require SPCD to include step-by-step crossing protocols. • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			

Non-Construction Contract Pre-Safety & Phasing Plan Development Coordination Considerations:

15	**Port, ATCT, and Consultant, Coordination *during design***	Engage stakeholders controlling airfield operations, during design or activity planning, to identify and establish appropriate safety measures and protocols for proposed construction or activity.	• Coordinate between appropriate authority levels of ATCT, Port, or other stakeholder entities. • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			
16	**Port, ATCT, and Consultant, Coordination *during construction***	Engage stakeholders controlling airfield operations, during construction or activity implementation, to identify ongoing appropriate safety measures and protocols for construction or activity.	• Coordinate between multiple shifts of ATCT, Port, or other stakeholder entities as construction (or activity) progresses. • Adjust protocols as warranted. • Other	☐ Yes ☐ N/A
	Implementation/Applicability Notes:			

Port Consultant Project Manager Signature:____ Date:___________

Tenant/Developer/Non-Port Entity Signature:_______________________________________ Date:___________

Port Project Manager Signature:____ Date:___________

Airport Director Signature:____ Date:___________

Appendix B FIELD LEVEL RISK ASSESSMENT

Stantec

Field Level Risk Assessment (RMS2)

Project Number: **Date:**

Project Name:

Project Location:

Description of Work:

HASP/RMS1 reviewed with staff on site	Yes	☐
Review of STOP Work Authority with staff and subs	Yes	☐
Emergency plan adequate and communicated	Yes	☐
Tools and appropriate PPE inspected before use	Yes	☐
Last Minute Risk Assessment process reviewed	Yes	☐

If the answer to any of the above questions is not "YES" stop work and contact your supervisor

Field crews have certifications on site	Yes	☐	N/A	☐
Utility locates on site and understood	Yes	☐	N/A	☐
Working alone plan in place	Yes	☐	N/A	☐
Work permits completed	Yes	☐	N/A	☐
Client site safety meeting conducted/attended	Yes	☐	N/A	☐

CRITICAL RISKS

Driving	Working at Heights	Traffic Control	Wildlife, Insects and Vegetation	Mobile and Heavy Equipment	Environments with water or ice
☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes
Ground Disturbance	Ergonomic Hazards and Manual Handling	Hazardous Materials and Environments	Control of Hazardous Energy	Hot Work	Confined Spaces
☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes	☐ Yes

ENERGY HAZARD

Thermal: Open flame, electric ignition sources (including phones and friction), hot or cold surfaces, liquids or gasses, weather conditions including humidity levels and snow/ice	**Gravity**: Falling objects, collapsing objects, slipping, tripping or falling
Chemical: Flammable vapors, reactive hazards, carcinogens or other toxic compounds, corrosives, pyrophorics, combustibles, oxygen deficient atmospheres, fumes, dusts, naturally occurring gases	**Motion**: Vehicles (car, truck, ATV, ARGO, boat, snowmobile, bicycles, transit, mobile equipment, trailer), workers and other people (lifting, pushing, pulling, carrying, use of hand and power tools, body position, walking), flowing water, sprung branches
Biological: Animals, bacteria, viruses, insects, blood borne pathogens (needles), poisonous and noxious plants, contaminated water, human behaviors (protesters, concerned citizens, onlookers)	**Mechanical**: Rotating equipment (augers, pulleys, drive shafts), compressed springs, drive belts, conveyors and motors
Radiation: Welding, NORMs (Naturally Occurring Radioactive Material), X rays, Nuclear Densometers, Lasers, Microwaves, Solar, Radioactive waste and sources	**Electrical**: Power and communication lines (overhead and buried), static charge, lightning, energized equipment, wiring, batteries, GFCI cords/plugs, lighting levels, double insulated tools, wet environment
Noise: Stationary or mobile equipment, impact noise, high pressure release, impact of noise on communication	**Pressure**: pressure piping, compressed cylinders (fire extinguisher, calibration gas, propane), control lines, vessels, tanks, hoses, pneumatic and hydraulic equipment

JOB SAFETY ANALYSIS (JSA)

	Basic Job Steps	Describe Energy Hazard	Controls	Person Responsible
1				
2				
3				
4				
5				
6				
7				
8				

Field Level Risk Assessment (RMS2)

Toolbox Meeting		
Pre-Start Time:	Date:	
Weather:	Toolbox Discussion Leader Name:	Toolbox Leader Signature:
Notes:		
Mid-Day Time:		
Weather:	Toolbox Discussion Leader Name:	Toolbox Leader Signature:
Notes:		
End of Day Time:		
Weather:	Toolbox Discussion Leader Name:	Toolbox Leader Signature:
Notes:		

Review / Sign-off

Print the company that you work for, your name and initial beside your fitness level under the corresponding time column:
Fit for Duty = F   Alternate Plan = AP

Company Name	Print your Name	Pre-Start	Mid-Day	End of Day
		F:	F:	F:
		AP:	AP:	AP:
		F:	F:	F:
		AP:	AP:	AP:
		F:	F:	F:
		AP:	AP:	AP:
		F:	F:	F:
		AP:	AP:	AP:
		F:	F:	F:
		AP:	AP:	AP:
		F:	F:	F:
		AP:	AP:	AP:
		F:	F:	F:
		AP:	AP:	AP:
		F:	F:	F:
		AP:	AP:	AP:
		F:	F:	F:
		AP:	AP:	AP:
		F:	F:	F:
		AP:	AP:	AP:

In North America, for work-related symptoms or injuries, and to speak to a medical professional for guidance and treatment options contact:

Work Care
1-888-449-7787

For questions regarding work-related symptoms or injuries, contact your Workers' Compensation Claims Coordinator
(Canada) Tel: 905-944-6854 / Cell: 416-951-5663
(US) Cell: 513-720-3706
(Global) local HR business partner

LAST-MINUTE RISK ASSESSMENT (LMRA)

Are you ready to work safely?
Always remember your
Stop Work Authority.

① STOP AND THINK

② LOOK AROUND
Is the work area safe?
Will my work endanger others?
Will other people/tasks create hazards?

③ ASSESS RISK
Do I clearly understand the task?
Will lifting or manual handling be required?
Potential for slips, trips, or falls?
Are there driving or vehicle concerns?
Have I considered all underground services?
Moving or pressurized equipment?
What could go wrong?

④ CONTROL RISK
What can I do to control hazards?
Do I have the right tools?
Is the SWP (Safe Work Practice) appropriate?
Do I have the appropriate PPE?
Are emergency plans in place?

⑤ BEGIN/RESUME WORK

If you're unsure, talk to your supervisor.
hsse@stantec.com

Appendix C APPLICABLE SAFE WORK PRACTICES

Stantec Safe Work Practices

HSSE/SWP No.	Title
HSSE 100	Alcohol and Drug Practice
SWP 102	Workplace Violence Prevention Program
SWP 104	Hazard Communication
SWP 105	Personal Protective Equipment (PPE)
SWP 106	Hearing Conservation
SWP 107	First Aid
SWP 108	Bloodborne Pathogens
SWP 111	Medical Surveillance
SWP 113	Heat Stress
SWP 114	Working in Cold Environments
SWP 115	Material Handling and Safe Lifting
SWP 124	Safe Driving
SWP 206	Hand and Portable Power Tools
SWP 208	Hoisting and Lifting
SWP 213	Ground Disturbance and Overhead Utility
SWP 216	Working Near Mobile Equipment
SWP 304	Asbestos Safety
SWP 305	Benzene Safety
SWP 309	Silica Awareness
SWP 310	Compressed Gas Cylinders
SWP 312	Fueling Gasoline Engines
SWP 314	Working Around Hazardous Waste and Wastewater
SWP 406	Electrical Safety Program
SWP 407	Traffic Control and Protection Planning
SWP 409	Respiratory Protection
SWP 416	Supervision of Contracted Drilling Activities
SWP 508	Wildlife Encounter

Appendix D JOB SAFETY ANALYSIS SHEETS

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 3

WORK ACTIVITY (Description):

COMPRESSED GAS CYLINDER TRANSPORT & HANDLING – GRADE D AIR ONLY

EQUIPMENT necessary to mitigate hazards associated with this work activity:

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Carl W. Miklich	Branch H&S Manager	Sean Guiltinan	SSH&E Program Manager
		Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses

☐ Goggles
☐ Face Shield
☐ Hearing Protection
☒ Safety Shoes—Type: Puncture Resistant, Electrical Hazard Resistant, Impact Resistant (75lbs)

☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: Fire Resistant Clothing (FRC)

☒ Gloves—Type: Level 3 Cut Resistant & Puncture Resistant
☐ Other—Specify:

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Inspection of Operator	• Unqualified Operator - causing damage, injury or death	• Employees must review Stantec's Compressed Gas Safety Program and receive training on compressed gases before working with them. No training equals STOP WORK.
2. Transportation of compressed gas cylinder	• Fine resulting from non-adherence with DOT regulations for safe movement of compressed gases	• Driver of vehicle must know compressed gas is in the vehicle.
		• Compressed gas limitations: 220 lbs. gross weight per Grade D Air Cylinder. Less than 440 pounds compressed gas and cylinder total per vehicle (MOT49CFR173.6)
		• Compressed Grade D Air Cylinders must have applicable DOT-approved hazardous material warning label(s) and/or placard(s). Do not remove or modify.
	• Damage to cylinder during transportation. High pressure impact hazard.	• Inspect cylinder before accepting from vendor. Refuse if damaged or deficient.
		• Grade D Air cylinder cap must be on cylinder for transportation, if designed for cap. Smaller cylinders are not manufactured with valve stem covers.
		• Cylinder must be stored closed, upright, and secured in vehicle. Grade D Air cylinders may be transported inside or outside of passenger space.
		• Use 2 straps to secure each cylinder. Inspect straps. Do not use if damaged.
		• Do not expose grade D cylinders to temperatures greater than 125 degrees F. Do not leave grade D cylinders in vehicle exposed to direct sunlight.
		• Valve stem protection required. Never move cylinder by valve stem or cap.
3. Onsite Grade D Air Use	• Heavy Objects – Gas Cylinder: pinch / crush hazards, cylinder damage if dropped	• Lift no more than 50 lbs per person, 100 lbs for 2 people without mechanical assistance. A full cylinder may weigh more than 130 pounds.
		• Lift with legs and arms. Do not bend back to lift heavy equipment.
		• Use cylinder cart to move cylinder. Secure cylinder onto cart.
		• Keep hands and feet 6 inches away from the bottom of the cylinder or cart when preparing to set down.
		• Wear level 3 cut resistant and puncture resistant gloves to protect hands from environment.
	• Trips, Slips, and Falls resulting in broken bones and tissue damage	• Walk path prior to moving cylinder. Make sure no serious obstructions will cause cart to tip and fall or you to fall. Remove hazard for safe pathway or choose alternate route.
		• Pull cart, rather than pushing across uneven ground
	• Uncontrolled release of gas - damage to equipment, pressure explosion, skin irritations	• Connections are not to be forced. Hand valves only require hand pressure and not the use of a wrench. Cylinders that require a wrench will be provided by the gas supplier. If you do not have the wrench available, contact the supplier and get one.
		• Ensure regulator attachments are free of oil and debris. Verify discharge pressure and secure end of hose attached to regulator prior to opening hand valve system.

3. Onsite Grade D Air Use (continued)	• Uncontrolled release of gas - damage to equipment, pressure explosion, skin irritations	• Crack valve stem to release compressed gas pressure. Do not rapidly open valve stem as it may damage regulator and increase likelihood of uncontrolled release.
		• Ensure hoses, hosing, and fittings are rated for operational pressures.
	• Projectile hazard from cylinder tipping and stem breaking	• Use 2 straps to secure each cylinder to remediation system.
		• Unused cylinders must have cap in place.
4. Disconnect used cylinder	• Injury from release of pressurized gas	• Close cylinder valve, release regulator pressure and replace gas cap if it will not be used in the near future.
5. Pack up equipment and materials	• Impact to third parties from slips, trips, and falls	• Double check work area to ensure no equipment has been left behind. Maintain housekeeping by keeping tools and equipment in a bucket or tool pouch throughout task to aid in locating equipment.
	• Heavy Objects – Gas Cylinder: pinch, crush hazards, cylinder damage if dropped.	• Lift with legs and arms. Do not bend back to lift heavy equipment. No more than 50 lbs per person, 100 lbs for two people without mechanical assistance. Use cylinder cart to move cylinder. Secure cylinder to cart.
	• Damage to cylinder during transportation. High Pressure impact hazard.	• Grade D Air cylinder cap must be on cylinder for transportation, if designed for cap. Smaller cylinders are not manufactured with valve stem covers.
		• Cylinder must be stored closed, upright, and secured in vehicle. Grade D Air cylinders may be transported inside or outside of passenger space.
		• Use 2 straps to secure each cylinder to vehicle. Inspect straps. Do not use if damaged.
		• Do not expose grade D cylinders to temperatures greater than 125 degrees F. Do not leave grade D cylinders in vehicle exposed to direct sunlight.
		• Valve stem protection required. Never move cylinder by valve stem or cap.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 4

WORK ACTIVITY (Description):

CONCRETE/ASPHALT CORING

This JSA addresses the hazards associated with using a concrete/asphalt core.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Concrete Core, Roto-hammer, Redhead bolts, Hammer

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Anthony Beltran	Field Technician	Sean Guiltinan	SSH&E Program Manager
Nicholas Kincaid	Senior Staff Scientist	Andrew Whitman	Senior Staff Scientist
		Haley Perry	Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☐ Goggles ☒ Face Shield ☒ Hearing Protection ☒ Safety Shoes—Puncture Resistant, Impact/Crush 75lbs, Electrical Hazard Resistant	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Long sleeve protection	☒ Gloves—Type: Level 3 Cut Resistant ☒ Other—Specify: Half-face P-100 respirator or N95 dust mask

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Unloading Core Drill	Back Strain	• Use lift gate to unload from vehicle, if available, and refer to Lift Gate • Lift no more than 50 lbs. without assistance. Two people lift no more than 100 lbs. • Lift with legs (not back), keep head up, tighten core (stomach) muscles, and keep load close to center of body while lifting. Face forward. Do not twist.
	Pinch Points	• Identify pinch points ahead of time and keep hands away from these areas (under core blade and gears). • Use handle and base to lift. • Transport by tilting on wheels. • Wear level 3 cut resistant gloves.
2. Set Up	Electric Shock	• Inspect all electrical cords and components for damage, cuts and frays. Cords must be able to carry the load amps of the drill. • Use ground fault circuit interrupter (GFIC). • No spliced or repaired cords allowed. • Keep all electric cords and components away from water. • Inspect water hose where water could leak onto electric cords. If found replace hose.
	Pinch Points / Cuts	• Identify pinch points ahead of time and keep hands away from these areas (under core blade and gears). • Identify and avoid sharp edges. Inspect Core blade for loose teeth and cracks. • Wear level 3 cut resistant gloves.
	Vehicle / pedestrian traffic	• Set up exclusion zone to keep people out of work area. Establish minimum 5-foot clearance zone to prevent third party damage.
	Core drill detaching from stand	• When using a drill with the detachable stand, ensure prior to use that the drill is properly latched into the stand. • Conduct a self-check at each new location: Pull up on the drill to ensure it is secure.
3. Redhead Anchoring	Injury: struck by hammer	• When setting the redhead using, keep your body out of the line of fire between the bolt head and the hammer. Do not use your hand to hold the redhead in place while hammering. Let the bolt sit in the pre-drilled hole without assistance.
4. Securing Core	Pinch Points	• While setting core base over redhead, keep fingers and toes clear of base and set down slowly.
5. Coring	Struck by spinning core base	• Set core base over redhead and check to make sure core footing is level. Put a washer and nut on the redhead and tighten to secure the core base from spinning in case the barrel locks up.
	Rotating concrete core blade	• Stay clear of core barrel while spinning. • Do not wear loose clothing.
	Diamond segments detaching from core barrel	• Use blast shields as barrier around work zone • Use water to keep core barrel cool

5. Coring (continued)	Flying debris – broken blades, asphalt, concrete	• Check core barrel and core teeth for wear/cracks. Replace if necessary. • Use water to keep core barrel cool • Establish minimum 5-foot clearance zone to prevent third party damage. • Safety glasses must be worn by operator.
	Hearing damage from working in areas of high noise - temporary or permanent hearing loss	• Hearing protection (plugs or muffs, NRR > 28) must be worn when working around concrete core. Use of hearing protection can limit one's ability to hear instructions, warnings or approaching traffic, etc. Post hearing protection signs for required single and/or double hearing protection.
	Slip/Trip/Fall	• Be aware of water use and slip hazards. Vacuum up cuttings as needed. • Keep hoses and electric cords out of work path. • Be aware of other workers work paths and keep hose and electric cords out of their path. • Leaking water may cause a slip hazard.
	Equipment damage	• Don't force the core down while coring. Allow gravity to force the core blade down.
	Hazardous cement dust inhalation resulting in lung damage or disease including silicosis, pulmonary fibrosis, lung cancer, or other organ acute/chronic health effects	• Use water while coring concrete. Ensure water supply is adequate and hose is not kinked. • Avoid breathing dust. Mandatory use of half-face P-100 respirator or N95 dust mask when working with dust. Ensure no facial hair compromises the seal of the mask.
	Hazardous cement dust resulting in eye damage, burning, irritation	• Don goggles or spoggles for eye protection if dust is present.
5. Removal of Core	Pinch Points	• Identify pinch points ahead of time and keep hands clear of these areas (under core blade and gears). • Use rotohammer to remove core by drilling multiple holes in plug until it breaks out. Refer to Jackhammer/ Rotohammer
	Back Strain	• Lift with legs (not back), keep head up, tighten core (stomach) muscles, and keep load close to center of body while lifting. Face forward. Do not twist. • Lift no more than 50 lbs. without assistance. Two people lift no more than 100 lbs.
6. Cleanup / Load Core Machine	Slip/Trip/Fall	• Clean up work area and cover hole or backfill, as necessary.
	Pinch Points / Cuts	• Identify pinch points ahead of time and keep hands clear of these areas. Under core blade and gears) • Avoid contact with sharp edges. • Wear level 3 cut resistant gloves
	Back Strain	• Use lift gate, if available, and refer to lift gate • Lift no more than 50 lbs. without assistance. Two people lift no more than 100 lbs. • Lift with legs (not back), keep head up, tighten core (stomach) muscles, and keep load close to center of body while lifting. Face forward. Do not twist.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 8

WORK ACTIVITY (Description):

GENERAL CONSTRUCTION – HAND & POWER TOOL OPERATION

Includes tasks and hazards for basic hand and power tool operations.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Hand and power tools various types

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Ryan Rooks	Construction Foreman	Sean Guiltinan	SSH&E Program Manager
		Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☐ Goggles ☐ Face Shield ☐ Hearing Protection ☒ Safety Shoes—Type: Puncture Resistant, Impact Resistant (75lb), Electrical Hazard Resistant	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Long Sleeve Protection Required	☒ Gloves—Type: Level 3 Cut Resistant & Puncture Resistant ☐ Other—Specify:_________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Pre-use tool inspection	•Injury, electrocution or property damage due to faulty or substandard tools	• Inspect all tools for any signs of defect, broken or missing parts. Do not use tools that are broken or compromised. Be sure that all protective guards are intact, properly located and in good shape. Inspect tools with wooden handles for cracks or splintering. Tools such as pliers, and pipe wrenches must be lubricated and inspected for loose or missing parts to ensure safe operation. • ONLY USE THE RIGHT TOOL FOR THE JOB. Do not use makeshift tools. • Inspect blades, bits or attachments and replace if worn, dull or damaged. Use the correct blade for the material being cut (e.g., wood, metal, plastic.) • Inspect extension cords for frayed or exposed wires (no electrical taped cords allowed). Inspect plugs and sockets for broken/damaged/missing prongs or grounds. • Wear cut and puncture resistant gloves during tool inspection process to prevent accidental contact with broken, pointed, or sharp edges.
2. Connecting power tools and cordless chargers to power source using extension cords	•Electrocution hazards, tool motor damage and breaker overload, fire	• Be sure tools are grounded at power source and a GFCI outlet is always used. Test GFCI outlets prior to use, do not use if it fails test. Use GFCI adapters (3-prong) for non-grounded tools (2-prong). • Extension cords will be rated for 15 amp draw capacity. Short distance up to 50' is a 14-gauge cord, up to 100' must be 12 gauge. If using a splitter to power more than one tool, total amps must not exceed 15. • Have an ABC rated fire extinguisher on standby in case of electrical fire.
3.General Hand and Power tool Operations	•Power Hand Tools - Lacerations and cuts from bits, blades and materials being cut. Eye injuries. Hearing Damage.	• Hold tools only by the handles while operating and handling to prevent cuts, pinches or strains. Tools MUST be unplugged prior to changing any blades or attachments. When cutting, cut away from body and keep hands and other body parts out of the line of fire. Use the tools for their intended purpose and do not improvise. Use tool tables and guides to help in cutting for example: use Sawzall table pressed firmly against material to be cut or set depth of circular saw table to proper depth of material to be cut. Always unplug or remove battery when adjusting tables or angles of tables. • Tools must be unplugged or batteries removed from cordless tools when handing to another worker or changing blades, bits etc. • Safety glasses shall be worn to protect against flying debris from using hand or power tool. Snug fit around eye less than 1/16" gap. • Wear cut and puncture resistant gloves during tool use to protect against accidental contact with sharp edges. • Wear hearing protection when using powered hammering tools and saws. Post hearing protection signs to warn public and workers.

3.General Hand and Power tool Operations (continued)	•Non-power hand tools - Pinches, strains, lacerations, crushing injuries. Slips, trips and falls on loose tools laying around	• Maintain eye contact with the tool and the materials. Keep hands and other body parts out of line of fire. Use holders to position nails when hammering. When tools are not being used, they must either be put away or placed out of any walking path. • To address crush/impact hazard wear gloves with impact protection in addition to cut and puncture. • When hammering a tool, such as a chisel, make sure a hand guard is in place, or use another tool such as a vise to move your hand out of the line of fire. Inspect striking head for mushrooming, if present tag out tool do not use.
	• Back / muscle strains due to operating power or hand tools.	• Keep aware of body positioning and lifting techniques. Bend at knees, keep a straight back, and keep balanced. Be sure the work surface is stable and secure. Use vise, pipe stand or other means to secure materials that are being cut or worked on. Secure and brace body before turning on tool. • When shoveling or sweeping, move in straight lines, do not twist back to empty shovel or move dirt, step in direction. Switch arms when shoveling to balance strain on back and arms.
	• Flying embers, sparks, or hot materials	• If sparks or other hot conditions are generated during cutting, grinding, etc., and work is being performed around dispenser pump islands, fueling operations, or around dry brush or other ignitable sources, a Hot Work Permit must be used with Fire Watch at all times. Two 20 lb. ABC extinguishers MUST be within 25 ft. of work area.
4. Working with tools and around others with tools.	• Striking others or being struck by others	Be aware of the tools swing radius. Keep at least 2-3 feet away from swing radius to prevent striking or being struck by tools. Stay out of the line of fire of other people's tools.
	• Being struck by falling objects while cutting	• Keep feet and other body parts out of line of fire for cut pieces as they fall. • Use vise, pipe stands and buddy system to secure and hold pipes from both ends. • Wear metatarsal guard protection when objects can fall onto feet.
5. Cutting and drilling metal pipes, rebar, and other metal objects	• Sharp edges at cuts especially metal pipe, rebar, and other metal objects	Do not run hands across cut edges. Do not hold or handle objects by the cut edges, hold in middle or away from cuts. Use file or wire brush to clean or de-burr cuts to metal.
	• Burns from metal shavings or metal that has become hot from friction	• Let metal cool down after drilling or cutting before handling. Use water to cool metal after cutting or drilling if needed.
6. Turning adjustable, pipe and open-ended wrenches or ratchet and sockets on bolts and fittings	• Knuckle busters and injury due to slipping tools	Gain a firm grip on wrench and ratchet handles. Be sure to have a firm grip on bolt or fitting with proper size wrench or socket. Be sure adjustable wrenches are tight with minimal play. Use two hands on tool, one to turn handle and one to keep socket or wrench end on bolt or fitting. Use proper sized tool for the task for example: a long-handled wrench or ratchet for leverage on large or frozen bolts and fittings. Do not use a cheater bar. Pull instead of pushing bolts or fittings to minimize slipping off, hand injuries or falling.
7. Operating loud tools	• Hearing loss or damage	Wear hearing protection if tool or tool use is greater than 90 decibels. Use double hearing protection if tool or tool use is greater than 110 decibels. Use earmuffs and ear plugs in combination for double protection. Post hearing protection signs to warn public and workers.
	• Impact on third parties	• Secure proper permits if necessary. Know and comply with local sound ordinances. Do not operate excessively loud tools early in the morning or at night unless time of operation complies with city/county noise ordinances. Inform station owners or other nearby businesses of loud noises from tool use.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 17

WORK ACTIVITY (Description):

CONSTRUCTION – JACKHAMMER / ROTOHAMMER

This JSA covers hazards associated with using a pneumatic or electric jack hammer or rotohammer.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Jack Hammer, Air Compressor & Line, Whip Checks & Pins, Wheel Chocks, Cords, Plywood Sheeting or Fabric Covered Fence Panels, Protective Screens, Pry Bar, Crowbar, Breaker Bar, Heavy Equipment (to remove large concrete pieces)

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Nicholas Gerkin	Staff Scientist	Sean Guiltinan	SSH&E Program Manager
Nicholas Kincaid	Environmental Professional	Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses

☒ Goggles
☒ Face Shield
☒ Hearing Protection
☒ Safety Shoes—Type: Puncture Resistant, Impact Resistant (75lb), Electrical Hazard Resistant

☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: Long Sleeve Protection Required

☒ Gloves—Type: Level 3 Cut and Puncture Resistant
☐ Other—Specify:__________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Jack Hammering Concrete & Removal of Concrete Debris	• Equipment Failure: crush or cut hazards	• Inspect jack hammer, ensure all safety locks/devices are in place and working before operation. Do not use if air hoses and connections are damaged, cut or excessively worn. Take out of service and find replacement.
	• Crush or laceration hazard to fingers from latch	• Do not place fingers/hand between latch and jackhammer when closing; use tool or foot to close, and tool to open the latch
	• Electrical hazards, shocked or electrocuted personnel	• Ensure electric jack hammer or rotohammer complies with assured grounding program as noted in SSP. Requires use of GFIC and equipment and cords to be inspected prior to each use.
	• Injury to person or property damage from runaway compressor	• Jackhammer compressor wheels must be chocked before operation.
	• Compressed air hazards - striking hazard, line failure causing impact injury to worker - crushed body parts from hose whip with metal ends	• Before turning on the air compressor, ensure that all connections are made from A/C to the jack hammer. All hose-to-hose and hose-to-equipment connections must have whip checks and pins in place. If quick connect fitting is used, ensure they have a locking ring. Ensure that valves on air compressor are closed before starting the unit. Once the unit is turned on, SLOWLY open the valve until fully open. Wait until line is fully pressurized to ensure there are no leaks in the line.
	• Hearing damage from working in areas of high noise - temporary or permanent hearing loss.	• Double Hearing protection (plugs and muffs, NRR > 28) must be worn by operator of jackhammer or rotohammer. Post hearing protection signs to warn public and workers.
	• Use of hearing protection can limit one's ability to hear instructions, warnings or approaching traffic, etc.	• Visually check work area routinely to evaluate changing site conditions (safety issues and threats).
	• Repetitive exposure to vibration may lead to Hand and Arm Vibration Syndrome (HAVS) or Raynaud's Syndrome, effects which can be chronic, progressive, and potentially irreversible	• Operator must wear anti-vibration gloves with impact, cut level 3, puncture resistance. • Stop work if you experience: ▪ strong feeling of tingling or numbness in the fingers ▪ cold or painful sensation in the fingers or fingertips ▪ loss of feeling in the fingers ▪ loss of strength in the hand(s) ▪ aching in the wrists and muscles of the forearm ▪ fingers turn pale or white (blanching) and then blue; as blood flow returns to affected areas, fingers turn red, throb, tingle, burn, or feel numb (this may only be in the fingertips at first)
	• Injury/strain from repetitive lifting of heavy jackhammer	• Jackhammer typically weighs 60 lbs. Use legs to lift hammer from place to place. Do not drive bit over 8" to prevent it from being stuck.
	• Burn skin from contact with hot bit	• Jackhammer bit gets hot after use. Let the bit and tool cool down before removing and/or wear heavy over-leather gloves when handling.

1. Jack Hammering Concrete & Removal of Concrete Debris (continued))	• Back strain from Butts Up or Elbows Out; Muscle strain in arm from Overreaching	• Bend at knees, not waist. • Keep jackhammer close to body while moving and keep elbows bent while lifting or operating. Keep elbows within 1 foot of body while operating.
	• Slipping / tripping hazards - resulting in broken bones, damaged/torn ligaments or tendons	• Jack hammered debris creates tripping and slipping hazard. Stop work and remove debris if workers are walking on it. Keep the air hose or electrical cord away from point of operation, to the side of the operator. Hose/cords can become entangled in the rubble and cause tripping hazard.
	• Potential fire, explosion from ignition of flammable vapors; Potential fire, explosion or electrocution if underground utilities are damaged.	• Jack hammering can generate sparks when contacting rebar or aggregate in concrete. It can damage/puncture underground utilities. Prior to beginning any ground penetration, confirm with PM: ▪ Do site conditions require a HOT WORK PERMIT? Is there a potential for combustible or flammable gases? If yes, complete and follow permit requirements. ▪ Have underground utilities been cleared from work area? Confirm USA markings are complete and not in conflict with the work area. Confirm subsurface clearance protocols have been met.
	• Crushed foot from contact by jackhammer	• Operator to wear metatarsal guards. • Keep feet at least 1 foot away from operating bit.
	• Flying debris and dust: property damage and eye and face injury	• Establish minimum 10 foot clearance zone to protect personnel and prevent third party damage.
		• If windows, structures, people, or 3rd party equipment are present, place protective screens around work area.
		• Face shield and safety glasses must be worn by operator.
		• Only the operator is permitted within the 10-foot clearance zone while the jackhammer is being used.
	• Crush or Cut Hazards to hands	• Do not place hands within 10 feet of jackhammer when jackhammer is operating.
		• Use a shovel to pick up debris as much as possible; if hands are necessary, operator must stop, take hand off trigger, and Show His Hands
		• Wear heavy duty leather over gloves and cut resistant gloves for removal of debris.
		• Scan concrete looking for metal mesh or rebar sharp edges. Grab concrete pieces carefully.
	• Muscle or back strain from Butts Up or Shoulders Too High/Too Low	• Use pry bar, crowbar or breaker bar to move large pieces.
		Get help with objects that are too heavy (>50 lbs.) or awkward for one person to lift. Use mechanical means such as pallet jack, wheelbarrow, dolly to transport heavy materials
		• Lift with legs, keep back straight, tighten core muscles (stomach) and kept head looking forward when removing debris.
		• When using pry bar, place hands body-width apart on bar. Do not raise hands above shoulders.
2. Shut Down Air Compressor	• Injury to eye from high pressure air; injury to body from whipping hose or being hit by jackhammer	• Lay down jack hammer ensuring that the air hose does not kink. Turn off air compressor. Keep the valve to the jack hammer open and slowly open the second valve to release the air pressure from the air hoses, jack hammer and the compressor.
		• Ensure pressure is released by activating lever before disconnecting hoses
	• Cut hazards to hands	• Wear cut resistant gloves when disconnecting the air hoses and jack hammer.
	• Muscle or back strain from Butts Up while loading the jackhammer	• Use legs, keep back straight, bend at knees not waist (avoid butts up), tighten core muscles when handling or moving the jack hammer. Get help lifting or moving the jack hammer.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 16

WORK ACTIVITY (Description):

CONSTRUCTION – SAW CUTTING

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Saw Cutter, Paint, Vacuum, Crowbar, Pry Bar, Roto-Hammer, Multi-Gas Meter

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Mark Lach	Project Manager	Sean Guiltinan	SSH&E Program Manager
Anthony Beltran	Field Technician	Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☐ Goggles ☒ Face Shield ☒ Hearing Protection ☒ Safety Shoes—Type: Puncture Resistant, Impact Resistant (75lb), Electrical Hazard Resistant	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Long Sleeve Protection Required	☒ Gloves—Type: Level 3 Cut and Puncture Resistant ☐ Other—Specify:__________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Preparing Work Area for Saw-Cutting Asphalt or Concrete	• Cuts made in wrong location - unnecessary damage to pavement	• Mark-out saw cutting lines with paint
2. Saw-Cutting Asphalt or Concrete, and vacuuming debris NOTE: THIS ACTIVITY MAY REQUIRE A HOT WORK PERMIT	• Slipping / tripping hazards resulting broken bones and damaged/torn tendons / ligaments	• Slurry generated by saw cutting must be vacuumed up as soon as possible to prevent slipping and run-off hazards.
	• Muscle strain due to “Elbows Out” or “Shoulders Too High / Too Low” while sawcutting (push saw or hand held)	• Keep elbows close to body, bend elbows down. • Do not tilt your body to one side while inspecting cutting line. Change to push saw if necessary to maintain straight body posture.
	• Electrical hazards, shocked or electrocuted personnel	• Ensure saw cutter is complying with assured grounding program as noted in SSP. Requires tested GFCI and equipment and cords to be inspected prior to each use. If GFCI will not reset, STOP WORK.
	• Hearing damage from working in areas of high noise, other damage and injury due to changing working conditions	• Hearing protection (plugs, muffs, caps NRR > 28) must be worn when working around saw cutting equipment. Use of hearing protection can limit one's ability to hear instructions, warnings or approaching traffic, etc. Post hearing protection signs to warn public and workers • Visual check working area while wearing hearing protection every ten minutes to stay aware of safety issues and threats.
	• Muscle strain from “Butts Up” and “Awkward Legs” from vacuuming debris	• Kneel on your knee(s) with knee pad(s) or squat by bending both knees. Do not bend at waist. • Keep your feet 1-2 feet apart and keep legs parallel to one another as best as possible.
	• Potential fire, explosion	• Saw cutting generates sparks when cutting through concrete or asphalt, must provide fire watch and complete hot work permit taking LEL (<10%) and O2 (19.5%< O2 <23%) readings every 15 minutes while saw cutting. • Work must stop if LEL or O2 readings exceed limits. Relocate to evacuation point, contact PM for hazard elimination
	• Potential fire, explosion, or electrocution if underground utilities are damaged during saw cutting activities	• The location of underground utilities, piping, and other services must be marked out (positively identified) prior to saw cutting • Follow ExxonMobil subsurface clearance protocol. • Ensure that Underground Service Alert is notified and that the work area is cleared prior to activity. Do not saw cut if utility mark out is not present. • Obtain the latest As-built drawing for the site and conduct a utility inspection. • Walk the trench lines, do mark outs make sense and align with as-built drawing.

2. Saw-Cutting Asphalt or Concrete, and vacuuming debris (continued)	• Flying debris. High speed metal blade parts impaling body other structures	• Saw cutting blade operates at several thousand revolutions per minute, if the blade shatters, sharp metals pieces will shoot out from front of equipment. Stay out of the line of fire by not positioning self in front of blade. Small rock and debris from saw cutting can impale face, wear face shield to prevent any harm • Operator to keep 3rd party individuals and property (such as vehicles) out of line of fire - in front of saw blade.
3. Removal of Section Blocks from Saw Cutting	• Pinch or Crushing Hazards	• Select location for block to be placed that is flat and level. • Wear heavy duty over-leather gloves with cut resistant glove for block removal. • Use crowbar or other tool to block crush hazard if prying block out. • If roto-hammer is used to lift block out, watch for early release (slipping of block off of bit) keeps hands and feet clear.
	• Muscle strain from “Shoulders Too High / Too Low”, “Butts Up” and “Awkward Legs” while lifting debris.	• Keep elbows close to body. Do not tilt your body to reach for debris. • Kneel on your knee(s) with knee pad(s) or squat by bending both knees. Do not bend at waist. • Keep your feet 1-2 feet apart and keep legs parallel to one another as best as possible.
	• Muscle or back strain	• Ensure proper lifting techniques when removing key block, saw cutter lifts with legs, back straight, tighten core muscles (stomach), head looking forward.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 13

WORK ACTIVITY (Description):

DRIVING

The Driving JSA covers the pre-drive hazards check, leaving and entering driveways, general driving, intersections, long-distance driving, stopping, and parking.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Fire Extinguisher, First Aid Kit, Triangles or Cones, Spare Tire, Jack, Wheel Chocks

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Alejandro Chairez	Environmental Technician	Sean Guiltinan	SSH&E Program Manager
Bridget Cook	Staff Scientist	Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☐ Reflective Vest
☐ Hard Hat
☐ Lifeline/Harness
☐ Safety Glasses
☐ Goggles
☐ Face Shield
☐ Hearing Protection
☐ Safety Shoes—Type:____________
☐ Air purifying respirator
☐ Supplied respirator
☐ PPE Clothing—Type:__________
☐ Gloves—Type: __________
☐ Other—Specify:__________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Engine Start & Initial Drive	• Mechanical Failure causing operator to lose control or cause an accident from no working horn, signal, poor visibility, etc.	Perform a complete vehicle inspection at the beginning of the drive: • Check the windows. Are they clean?
		• Ensure the wipers work.
		• Check the tires for proper inflation and tread.
		• Check the Registration/Insurance/Maintenance report. Are they all current?
		• Check the horn, lights, and back-up alarm (if equipped) for proper operation. Check for wheel chocks.
		• Check the gauges on the instrument panel. Are they working correctly and giving satisfactory readings?
		• Check for body damage. Are there any unsafe parts ready to fall off during the drive?
		• Check under the vehicle. Are there any leaks or obstructions?
		• Check and secure loose items in the cab, passenger area, trunk, and/or truck bed.
		• Adjust the belt/shoulder harness, seat, head rest and mirrors before driving.
		• Always wear the seat belt/shoulder harness when driving.
		• Before long trips and at every fuel tank fill, check the oil, coolant, transmission, and brake fluid levels. Also ensure the fire extinguisher, first aid kit, triangles or cones, spare tire and jack are present and in good condition.
	• Collision with pedestrians, vehicles, or property	• Always perform a "walk-around" before driving the vehicle, especially if you need to engage the reverse gear.
		• Look for small objects and pedestrians that you normally wouldn't see when looking from inside the vehicle.
		• Always use a spotter when available.
		• Review the use of hand signals with the spotter before maneuvering the vehicle.
		• Turn the headlights on while driving, even in the daytime, to make sure others see you.
2. Driving from the parking lot or driveway into a traffic lane	• Collision with pedestrians, cyclists, skateboarders, or other vehicles	• Always look over your shoulder when pulling out into traffic.
	• Mechanical Failure (Engine)	• Use slow, easy acceleration. Avoid "jack-rabbit" starts.
3. General Driving	• Mechanical Failure/Collision (Loss of Steering Control)	• Maintain the hand position at 9 and 3 to avoid loss of control of the steering wheel. Steering loss can happen at any time from potholes, debris, and distractions.
	• Collision with pedestrians, vehicles, or property	• Obey all traffic laws, signals and signs.
		• Always use turn signals when turning or changing lanes.
		• Use the "SMOG" technique (Signal, Mirror check, look Over Shoulder and Go) when making a lane change or entering traffic.
4. Approaching Intersections	• Collision with pedestrians, cyclists, skateboarders, or other vehicles	• 30-40 feet back from the limit line of the intersection is the Point of No Return (PONR).

4. Approaching Intersections (continued)	• Collision with pedestrians, cyclists, skateboarders, or other vehicles	• If the signal light is still green when passing the PONR, then look Left-Right-Left (L-R-L) and proceed through the intersection provided there are no red-light runners from cross traffic. This can be done even if the light turns yellow after passing the PONR.
		• If the signal light turns yellow before the PONR, then ease slowly to a stop, 15' before the limit line or the vehicle in front.
	• Chain reaction collision from "rear-enders"	•Always plan to have 15' of space cushion in front of the vehicle when stopping at intersections. This will break up a "chain reaction".
	• "Car Jacking" or vehicle theft while stopped	• Keep the 15' space cushion in front of the vehicle. Carjackers look for those potential victims who continually trap themselves.
	• Mechanical Failure (Brakes and Transmission)	• Use slow, gradual deceleration techniques. Avoid hard braking.
5. Normal Driving between intersections and on long stretches of highway	• Collision with pedestrians, cyclists, skateboarders, or other vehicles	• Maintain a 15 second Eye Lead Time.
		• Avoid the fixed stare by keeping your eyes moving (every 5 to 8 seconds).
		• Scan the mirrors every 5-8 seconds to maintain the circle of awareness.
		• Maintain a space cushion of "4 seconds" in front of the vehicle.
		• Avoid driving in other driver's blind spots. Maintain a space cushion to the sides of the vehicle.
	• Collision from "tail-gators"	• Increase the following distance to the front of the vehicle
		• Make a convenient lane change to the right and allow the "tailgater" to pass.
6. Stopping and Parking	• Collision with pedestrians, cyclists, skateboarders, or other vehicles, run away vehicle	• Always obey signs and use signals when in a parking lot.
		• Do not exceed 15 mph in a parking lot.
		• Plan ahead and try to "pull-through" to avoid backing at the end of the visit.
		• If unable to "pull-through" then back into a perimeter slot or pull into a slot well away from everyone else to maintain a space cushion when leaving.
		• Get Out and Look (GOAL) before backing into or from a parking slot.
		• Check parking area for obstructions/hazards when there is limited line of sight, blind spots from the vehicle or other site features or vehicles already parked on the site
		• Always put transmission into park and turn off ignition when parking.
		• Always set the parking brake and use wheel chocks when parked.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 17

WORK ACTIVITY (Description):

DRUM MANAGEMENT

This JSA covers the hazards associated with the inspection, labeling, opening, filling, closing, and moving of non-hazardous soil and water drums generated from site investigation activities. If loading drums on truck, use alternate JSA: Drum Management Using Lift Gate.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Non-Sparking Tools Drum/Speed Wrench, Non-Sparking Bung Wrench, Shovel, Broom, Drum Dolly, Wheel Chocks

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Laina Cole	Field Staff	Sean Guiltinan	SSH&E Program Manager
Andrew Yonkofski	Scientist II	Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☐ Goggles ☐ Face Shield ☐ Hearing Protection ☒ Safety Shoes—Type: Puncture Resistant, Electrical Hazard, Crush/Impact Resistant 75lbs.	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Long sleeve protection required.	☒ Gloves—Type: Nitrile and Class 3 Cut Resistant ☐ Other—Specify:__________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1.Labeling and Inspecting the Drum	• Incorrect identification of drum contents resulting in exposure to hazardous contents	• Do not approach or tamper with unknown drum that may have been dumped onsite. Contact PM for further instructions.
		• Identify the contents of the drum by reading the label.
		• Nitrile and cut resistant gloves and safety glasses should be worn when inspecting any drum.
	• Injury due to release of contents from pressurized drum	• Inspect the drum for signs of pressure (i.e., bulging). If bulging, do not handle. STOP WORK. Contact PM for further action.
2.Opening and Closing the Drum	• Exposure to drum contents - skin, eye damage due to contact	• Nitrile and cut resistant gloves and safety glasses are to be worn when opening/closing any drum.
	• Injury Due to Pressurized Drum • Potential Explosion (Visible Signs of Bulging or Swelling of Drum)	• Pressure from a pressurized drum should be bled off slowly from the vent bung. Only use non-sparking tools.
		• Drums known to contain liquid phase hydrocarbons that are pressurized ARE NOT TO BE HANDLED. POTENTIAL FOR EXPLOSION OR FIRE EXISTS. Stop work and contact PM.
	• Cuts and/or pinched fingers	• Identify sharp edges on the drum rim and ring prior to handling drum. Set line-of-fire to avoid sharp edges while opening or closing.
		• Keep hands clear of drum ring and drum to avoid pinching hands in the drum ring.
	• Fire caused by flammable vapors	• Use a drum/speed wrench and a non-sparking bung wrench.
		• Visibly inspect area where the drum is located and do not open if sources of ignition are present.
3. Adding Soil or Water to Drum	• Add contents to drum - back injury, sprains and strains from “Twist and Shout”	• Lift with legs, back straight, tighten core muscles (stomach), head looking forward.
		• Get assistance with objects that are too heavy (greater than 50 lbs) or awkward for one person to lift.
		• When shoveling or sweeping, move in straight lines. Do not twist back to empty shovel or move dirt. Step in direction. Switch arms (every ten to fifteen shovels) when shoveling to balance strain on back and arms.
		• If adding water by hand to drum, fill bucket to level comfortable for lifting. Full bucket weighs 50 lbs. Preference is to use hand or electric pump.
	• Slips, trips and falls - result in broken bones, torn tendons and ligaments	• Place the drum ring and lid where it is not a tripping hazard.
		• Keep work area free of spilled liquid and soils. Clean up spills immediately after occurrence to prevent slips, trips and falls.
	• Environmental Release - compromised integrity of drum or inadequately sealed drum	• Inspect drum for visual indication of damage (i.e. dents, pitting, bulging, rust) especially along seams.
		• Ensure that the drum is tightly sealed with intact gasket upon closing.

4. Picking up and moving a Drum	• Slips, trips and falls - result in broken bones, torn tendons and ligaments	• When moving an empty drum on its edge, keep both hands on the drum while it is in motion.
		• Walk on smooth, even ground. Keep work area clean.
		• Walk path drum will take. Remove pebbles from path as pebbles will stop a drum dolly wheel. Stay to smooth walking surfaces and reconsider path if slippery ground cannot be avoided.
	• Exposure to drum contents - skin, eye damage due to contact	• Ensure that the drum is tightly closed before moving it. For open top drums, ensure gasket is in good condition and set into lid ring.
	• Back injury, sprains and strains from "Twist and Shout"	• DO NOT MOVE A LOADED DRUM WITHOUT A DRUM DOLLY.
		• Do not lift anything over 50 lbs. without assistance.
		• Keep head up, tighten core muscles. Do not twist.
	• Back injury, sprains and strains	• Make sure top latch of drum dolly is SECURELY ATTACHED on drum.
		• Make sure bottom two forks of drum dolly are completely SECURED under drum.
		• Ensure dolly strap secures drum to dolly. Inspect strap for tears. If torn, do not use.
	• Hand or foot injury, or pinched fingers and cuts	• Safety shoes and level 3 cut resistant gloves should be worn when moving any drum, even an empty one. Consider leather over gloves for additional padding.
	• Striking or being struck by a moving vehicle	• When moving a drum through traffic flow, a reflective safety vest must be worn.
		• Plan a path clear of all obstructions, making note of traffic and pedestrian flow.
		• Use a spotter when moving a drum through traffic.
5. Drop off drum	• Being struck by drum dolly	• Pick a level spot to deposit the drum.
		• Keep both hands securely on the dolly handles.
		• Start with front foot on foot support. Slowly let the weight of the load pull forward using the leverage of the dolly for control.
		• Keep rear foot on ground and your body well balanced over it.
		• When driving, practice slow starts and stops to keep inertia low.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 9

WORK ACTIVITY (Description):

FORKLIFT OPERATIONS

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Forklift, Wheel Chocks

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Mike Thomas (Cascade)	CSP	Sean Guiltinan	SSH&E Program Manager
Shannon Magers (Cascade)	Operations Manager	Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses
☐ Goggles
☐ Face Shield
☐ Hearing Protection
☒ Safety Shoes—Type: Puncture Resistant, Electrical Hazard, Crush/Impact Resistant 75 lbs.
☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: Long sleeve protection required.
☒ Gloves—Type: Level 3 Cut Resistant
☒ Other—Specify: As specified in SSP

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Pre-construction Health and Safety Meeting; General Site Activities	• Inattention to safety procedures	• All employees assigned to this task will attend a pre-construction health and safety meeting, which will include the pertinent JSA, site safety procedures manual, types of potential hazards and actual hazards present, and controls for those hazards.
	• Unsupervised delivery of forklift: injury/property and/or equipment damage	• Ensure rental company is aware of requirement for consultant to be onsite to provide safety oversight and JSA review of unloading procedure.
2. Pre-trip Forklift	• If forklift is not mechanically sound, it could lead to an accident	• Thoroughly inspect the forklift for tire condition, all fluids, brakes, lights, seat belt, horn – If any are not satisfactory, shut down the job and get another forklift
	• Hydraulic pressure loss causing load/equipment loss, environmental release	• Inspect hydraulic hoses for damage and leaks. If damage or leaking hose identified, do not use. Request new forklift to be delivered.
	• Unfamiliar with this forklift (rental, etc.)	• Review operational controls and test without load prior to lifting.
3. Operating Forklift	• Striking vehicles or pedestrians with forklift	• Forklift driver must have current forklift certification (3 years) – Must be checked by site supervisor.
		• Driver must wear a seat belt.
		• Operator must use "Hands Program" in order for personnel to approach forklift. (Lower forks to ground, set brake, turn off lift, show hands to person who wants to approach).
		• Absolutely no riders or passengers allowed.
		• Gloves are restricted to clean leather or cotton gloves.
		• Be aware of your surroundings.
		• Check behind you and honk horn before backing.
		• Back-up slowly. Use spotter if view is obstructed and in tight locations. Review spotting signals before operating. Ensure spotter is equipped with air horn.
		• Drive no faster than 3 mph.
		• Drive with forks at least 10 inches off the ground or as high as ground surface dictates, but not higher than 25 inches.
		• Do not drive in a direction that you cannot see. If load obstructs view: use a spotter, drive in reverse, or stop the job and get a more suitable forklift. Ensure spotter is equipped with air horn.
		• Sound horn before going around blind corners.
		• Be careful of forklift rear end swing.
		• Watch for pedestrians.
		• DO NOT USE A CELL PHONE WHILE DRIVING!
4. Picking up a load or equipment	• Spilled or dropped load	• Review load capacity of forklift. Know weight of load being lifted. Do not exceed the load limit of the forklift.
		• Do not pick up an uneven load.
		• If necessary, adjust forks for the width of the load, leather gloves required (Watch the pinch points).
		• Seat the forks all the way into the load.

4. Picking up a load or equipment	• Spilled or dropped load	• Lift the load 3-4", then tilt back. If removing a load from the truck, back up slowly (just far enough to clear the forks from the edge of the truck) and then lower.
		• Adjust forks to at least 10" off the ground or as high as ground conditions dictate but not higher than 25 inches.
		• Secure drums, augers, rods, casing, and any other unstable load.
		• Adjust tilt of forks backward.
		• Drive no faster than 3 mph.
	• Forklift rollover	• Driver must wear seat belt.
		• Do not lift load higher than necessary for safe ground clearance until you reach the area you are going.
		• Do not lift or lower forks while driving forward, backwards or turning.
5. Moving a load or equipment	• Spilled or dropped load	• Drive no faster than 3 mph.
		• Transport with load no higher than ground clearance dictates.
		• Augers, conductor casing, and other round materials must be secured properly. Either tie down or install a blocking device on forks.
	• Forklift rollover	• Driver must wear seat belt.
		• Transport with load no higher than 8 inches off the ground.
		• Be aware of uneven surfaces and potholes.
	• Hitting overhead obstructions	• Be aware of canopy, overhead utilities, trees, etc. If forklift is too big or inadequate for the site, shut down and change out.
6. Delivering or setting down a load or equipment on elevated surfaces	• Spilled or dropped load	• Do not lift or lower forks while driving forward, backwards or turning.
		• Approach deliver point with forks lowered.
		• After coming to a complete stop, raise load 3-6 inches above elevated surface.
		• Drive forward until mast is 3-4 inches from deposit site, then level load.
		• Lower forks slightly and back up until forks are clear of load and deposit site.
		• Use chocks to secure casing, rods, and tooling with potential to roll.
		• Lower forks to no higher than ground clearance dictates.
	• Forklift rollover	• Driver must wear seat belt.
		• Pull forks straight out of load.
		• Do not turn the forklift while lowering the forks.
7. Parking Lift truck	• Unexpected movement of forklift	• Lower forks all the way down and level with the ground.
		• Apply parking brakes.
		• Chock tires.
		• Secure forklift key to prevent theft. Do not leave key onsite without personnel onsite. Employee to meet rental company for pickup.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

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Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 29

WORK ACTIVITY (Description):

GENERAL SITE ACTVITY

The purpose of this JSA is to focus employee attention on common hazards that occur in the work environment and keeping awareness high to mitigate these hazards. This JSA must be used in conjunction with a task and/or site-specific JSA. This JSA shall be reviewed anytime working conditions and or tasks change at the job site.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Traffic Control Devices, Hand Tools, Wheel Chocks, Signage (authorized personnel only, hard hat area, hearing protection must be worn)

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Cole Grover	Project Scientist	Sean Guiltinan	SSH&E Program Manager
Laina Cole	LPS Steward	Andrew Whitman	Senior Staff Scientist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses

☐ Goggles
☐ Face Shield
☒ Hearing Protection
☒ Safety Shoes—Type: Puncture Resistant, Impact Resistant (75lb), Electrical Hazard Resistant

☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: Long Sleeve Protection Required

☒ Gloves—Type: Nitrile and Level 3 Cut, Puncture, Impact Resistant
☐ Other—Specify:__________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. General Site Activities - preparing work area & traffic control (does not cover working in the street, review **Traffic Control JSA**)	Traffic Hazards, being struck by /striking third party, contractor vehicle, or client property	• Park field vehicles in safe/low traffic area where tailgate safety meeting/paperwork can be conducted safely. • All contractor/consultant parked onsite vehicles must be chocked. • Use crosswalk when crossing the street. • Notify attendant and/or owner/manager of work activities/location. • Verbally communicate with third party workers/co-workers the hazards and PPE requirements. • Ensure work area and equipment are within a defined exclusion zone using traffic barricades an-d/or delineators with caution tape. Use company vehicle to block access. • If vehicles do not pose contact hazard with personnel or equipment, leave opening for vehicle traffic to move across site. • Wear high visibility clothing such as a reflective vest or reflective suit (Class II Minimum) • Wear level 3 cut, puncture, impact resistant gloves for setup of traffic control equipment. • Continually watch out for vehicle traffic and plan a safe pathway to move clear of vehicles if they approach within 15 feet. • Where vehicles may pass work area, post traffic watch to warn employee of dangerous vehicle movement (vehicle backing up or driving towards work area). • Traffic watch to establish warning signal in case equipment operation generates noise levels preventing verbal warning (when operator cannot hear you >2 feet away using a conversational voice). • Apply 360 degree check and Smith driving techniques using a spotter prior to backing or moving vehicle around site. Ensure spotter is equipped with air horn. • Use vehicle 4-way flashers and beacon if available when moving vehicle around high vehicle and pedestrian traffic areas.
	Unauthorized Access, third party entering work area gets hurt or causes injury or accident	• Prevent unauthorized access by delineating the work area. Utilize physical barriers such as caution tape, fencing and barricades, vehicle to prevent inadvertent entry. • For construction work, post signage to indicate work area (hard hat area, authorized personnel only, hearing protection, double hearing protection, Prop 65).
	Potential for crime and aggressive individuals causing injury or worse	• Stay aware of surroundings; avoid confrontation. Do not leave doors of vehicle unlocked at any time. Have phone readily available to contact 911 in the event of emergency. Prepare to leave the area if personal safety appears at risk.
2. General Site Activities - employee dress, prepared for work	Loose Clothing & Jewelry, Long Hair, Keys Attached to Belt Clip Caught by Rotating Equipment or Other Obstructions - loss of or tear in appendage from being caught	• No loose sleeves, tails, ties, frills, lapels, cuffs, or other loose clothing shall be worn around machinery where it might entangle. • Where there is a risk of injury from long hair, jewelry, or keys attached to a belt clip entangling in moving parts of machinery or getting caught on ladders or other fixed structures, employees shall confine, secure or remove the item to eliminate the hazard.

3. General Site Activities - accesses, walking the site	Slips, Trips, Falls - strains, broken bones, twisted joints	• Rocks, dirt mounds and dead vegetation are significant trip hazards, know body position and avoid stepping on rocks or dragging your feet around soft dirt, remove long vegetation from work zone. • Keep work area dry and free of excess materials, debris. • Remove trip hazards; keep materials organized/out of walkways • Stay aware of footing and walk, do not run. • Do not step backwards without first looking at footing surface. • If freezing temperatures, watch for ice slip hazards.
4. General Site Activities - climbing ladders / equipment / buildings	Mounting - Dismounting Equipment - strains, broken bones, twisted joints, and falls	• Do not carry anything in hands while climbing/descending ladder. Carry keys in pocket (not attached to belt loop) and tools in tool belt. • Use 3 points of contact when climbing up/down ladders/equipment. • Always face equipment/ladders when mounting and dismounting. • Make sure ladders are secure before using. • Fall protection required when working at heights greater than 6 feet, includes ladders. • Identify stable surface before stepping down on it (never jump off).
5. General Site Activities - environmental working conditions	Heat/Cold Stress - serious injury to body, possible death	• In hot environment, drink small amounts of water often, about 8 oz every 15 minutes. Start drinking water 1-2 hours before work begins. • Take breaks based on heat index rule: For temperatures < 85 F, work continuously. For temps 85 F to 95 F, work 40 minutes followed by 20 minutes rest. For temps > 95 F, work for 20 min followed by 40 minutes rest. Additional cooling measures required (i.e., water dampened clothing, cool mist). • In hot environments wear light clothing, sunscreen for exposed skin • In hot environments take rest breaks in covered, shaded area. If no shade, idle vehicle with AC on. • Cold environment consume non-caffeine sweet liquids, heavy meals • Cold environment wear layered clothing to adjust. • Review HASP Attachment for **Heat and Cold Stress Protocols** • Adjust work schedule to avoid heat/cold stress.
6. General Site Activities - biological hazards	Biological Hazards: Insects, Snakes, Wildlife, Vegetation, Feces, Blood	• Inspect work areas upon arrival to site to identify hazards • Use insect repellant as necessary. Evaluate risk. If uncertain contract professional exterminator (i.e., beehive). • Open enclosures slowly to react against biological hazards. • Stay alert and out of contact distance from biological hazards. • Use universal precautions if encounter blood on site. If needles are observed, isolate the hazard using a cone or delineator and notify the property manager. Notify employees to avoid hazard. Do not touch. • In areas with large amounts of rodent or bird feces, do not work in or create dust. Requires professional abatement; call PM. • Identify poisonous plants - poison sumac, stinging nettles, poison ivy, or poison oak. • Wear snake chaps if in area known for snakes. Use walking stick to probe tall grass before entering.
7. General Site Activities - impact hazards	Body, arm, leg, hand, foot impact line of fire hazards	• Evaluate work area to ensure worker body is not in a line-of-fire hazard. STOP WORK and address with PM if risk is present to isolate or eliminate impact hazard.
	Hand hazards from being caught, crushed, cut, pinched, or damaged.	• Use Hands Program when more than one person working around the same equipment.
		• No fixed blades are to be used by staff or subcontractors. • Before you put your hands somewhere, ask yourself, "Can my hands be cut, crushed, torn or damaged by what I am about to do?" • Use Level 3 cut, puncture, impact resistant gloves for general work, and chemical resistant over glove for impacted soil, water and hazardous materials, heavy over-leather for hot/cold. Cut protection must be worn at all times while working. • Use tool to take the place of hand when cutting, impact or crushing hazards are present. Keep hands 6 inches clear of any pinch hazard

FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.

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Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED REV # 3

WORK ACTIVITY (Description):

OVERSIGHT OF GEOPHYSICAL INVESTIGATION / SUBSURFACE UTILITY DESIGNATING

This JSA covers the hazards associated with performing utility designating services at various sites.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Traffic Control Devices (as needed/job specific), Hand Tools, Wheel Chocks, Signage (authorized personnel only, hard hat area, no smoking), Spray Paint, Metal Detector, Ground Penetrating Radar (GPR)

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
James Foster	Utility Designation Technician	Sean Guiltinan	SSH&E Program Manager
		Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses

☐ Goggles
☐ Face Shield
☐ Hearing Protection (as needed)
☒ Safety Shoes— Type: Puncture Resistant, Impact Resistant (75lb), Electrical Hazard Resistant

☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: Long Sleeve Protection Required

☒ Gloves—Type: Level 3 Cut, Puncture, Impact Resistant
☐ Other—Specify:

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Loading and Unloading Equipment	• Ergonomics – back strains while lifting, bending, twisting, squatting causing chronic back pain	• Lift with knees, not your back. • Keep load close to body about waist height. • Keep back straight while lifting, moving, and placing. • Do not carry more than 50 LBs per person. • Ask for help to carry heavy items and or awkward items • Remove only one piece of equipment at a time. • Do not carry equipment when entering or exiting vehicles. • Plan your route.
	• Slips / Trips / Falls – strains, broken bones, twisted joints and falls	• Inspect work area for tripping and slipping hazards (water, mud, ropes, equipment, etc.) and remove obstacles or move away from work area. • Maintain 3-point contact when climbing onto or down from equipment, trailers and trucks.
2. Operating utility designating equipment	• Slips / Trips / Falls – strains, broken bones, twisted joints and falls	• Rocks, dirt mounds and dead but moist vegetation are significant trip hazards. Know body position and avoid stepping on rocks or dragging your feet around soft dirt. Remove long vegetation from work zone. Watch where walking. Stop to take reading. Do not multi-task. • Keep work area dry and free of excess materials, debris. • Remove all trip hazards by keeping materials/objects organized and out of walkways. • Stay aware of footing. Walk, do not run.
	• Struck by vehicles – serious injury or fatality	• Set up exclusion zone around work area being surveyed. • Face oncoming traffic at all times. • Watch traffic keeping eye contact with the drivers. Move away from exclusion zone edge if driver is not paying attention. • Request “second set of eyes” provided by Stantec Supervisor to act as safety alert. Agree on warning mechanism. Plan escape route.
3. Marking Utilities	• Being sprayed in the face with marking paint – damage to eyes • Chemical exposure to propellant acute headache or dizziness • Possible fire from propellant in spray can	• Keep cap on spray paint can while mixing. • Never point spray paint at someone or your own face. • Use in well vented area. • Never spray paint on open flame or electrical arch or ignition source, e.g. spent cigarettes.
4. Lifting manhole covers or grate inlets	• Ergonomics – back, neck, shoulder strains while lifting, bending, twisting, squatting	• Lift with knees, not your back. • Keep load close to body about waist height. • Keep back straight while lifting, moving, and placing. • Use a magnetic manhole cover lifting system or other lifting system to safely lift manhole covers and grate inlets.

4. Lifting manhole covers or grate inlets (continued)	• Impact – potential of crushing fingers and hands	• Before putting hands somewhere, ask yourself, "Can my hands be cut, crushed, torn or damaged by what I am about to do?" • Hand protection must be worn at all times while working. ○ Wear Level 3 cut, puncture, impact resistant gloves for general work. ○ Wear chemical resistant over glove for impacted soil, water and hazardous materials. ○ Wear heavy over-leather for hot/cold. • Never place fingers or hands beneath manhole/grate cover and rim of vault.
	• Biological – Insects, Snakes, Wildlife, Vegetation, Feces, Blood	• Watch for spiders and other insects before putting hands into well vaults. • Use tool (pry bar) and visual inspection to explore well vault before reaching in with gloved hand.
5. Designating electric facilities	• Possible shock, arc flash exposure, or electrocution	• Verify with utility locator electrical safety precautions for attaching to live electrical equipment. • Maintain 10-foot clearance from live electrical equipment (transformers, switches, sub-panels, motors, etc.). Only utility owner representatives are qualified to access this equipment. • Confirm utility locator is connecting a current only to ground potential or neutral conductor. Never apply current to live electrical equipment.
6. Perform Site Cleanup	• Ergonomics – back strains while lifting, bending, twisting, squatting	• Lift with knees, not your back. • Keep load close to body about waist height. • Keep back straight while lifting, moving, and placing. • Do not carry more than 50 LBs per person. • Ask for help to carry heavy items and or awkward items. • Remove only one piece of equipment at a time. • Do not carry equipment when entering or exiting vehicles
	• Slips / Trips / Falls – strains, broken bones, twisted joints and falls	• Inspect work area for tripping and slipping hazards (water, mud, ropes, equipment, etc.) and remove obstacles. • Maintain 3-point contact when climbing onto or down from equipment, trailers and trucks.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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¹ Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

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³ Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED REV # 4

WORK ACTIVITY (Description):

GEOPHYSICAL SURVEY

EQUIPMENT necessary to mitigate hazards associated with this work activity:

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Beckie Ullett	Project Geophysicist Spectrum Geophysics	Sean Guiltinan	SSH&E Program Manager
		Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☐ Goggles ☐ Face Shield ☐ Hearing Protection ☒ Safety Shoes—Puncture Resistant, Crush Resistant (75lbs), Electrical Hazard Resistant	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing —Type: Flame resistant clothing Nomex suits	☒ Gloves—Type: Level 3 Cut Resistant ☒ Other—Specify: Snake Chaps Required Refer to HASP for additional PPE requirements

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Field Prep/Vehicle Inspection	Vehicle accident/stall	• Check tires for low air pressure or obvious wear • Test headlamps and break/flashers to ensure proper function • Look for fluids that may have leaked from vehicle.
	Equipment falling out of truck bed causing property damage, vehicle accident, personal injury, fatality	• Verify all bins closed • Make sure equipment can't slide freely and is lying flat
2. Site arrival – parking vehicle	Vehicular accident, striking a pedestrian, damaging buildings or structures	• Follow posted speed limits. If none is posted, then drive at maximum 5 miles/hour. • Do not use cell phone while operating vehicle • Ensure vehicle is off, transmission is in PARK and emergency brake is applied before leaving vehicle. Chock vehicle wheels. • Use spotter if reverse driving is necessary. Ensure spotter is equipped with air horn. • Watch for pedestrian and other vehicular traffic.
	Back strain while installing wheel chocks	• Lift with your knees and within your green zone (between shoulders to knees and less than a foot away from your abdomen)
3. Conducting tailgate health and safety meeting	Getting struck by a moving vehicle	• All personnel should wear traffic vest and hard hat. • Choose a safe location away from traffic to conduct tailgate safety meeting.
	Biological hazards (bees, scorpions, snakes, etc.)	• Inspect your meeting location for insects, standing water and shrubs • Wear snake chaps, if a potential hazard at site • Inspect for bees/hornets and nests, and move away if identified • Wear insect repellent (e.g., DEET) • Do not walk in grass more than calf height • Verify location of first aid kit
4. Site walk through	Getting struck by a moving vehicle	• Use buddy system, watch for traffic patterns (if applicable)
5. Unloading equipment/equipment setup	Slips/trips/falls	• Be aware of your foot placement and walk forward at all times
	Back strain	• Lift with your knees and within your green zone (between shoulders to knees and less than a foot away from your abdomen) • Do not overreach for equipment in center of truck bed
	Hand injury	• Wear cut resistant gloves (level 3 or higher at specific sites) • Avoid line of fire
6. Perform Equipment Inspection	Dropped electronics	• Make sure all straps and handles are secure and that latches on cases are closed when lifting
	Fatality or injury from hitting non-identified line	• Verify batteries are good and that equipment passes self-calibration tests
7. Performing sub-surface investigation	Getting struck by a moving vehicle	• Watch for traffic patterns (if applicable). Use buddy system while kneeling down or bent over
	Slips/trips/falls (uneven terrain)	• Do not walk backward • All personnel will be aware of their surroundings and void walking on slopes, uneven terrain, and slip/trip hazards

7. Opening Vaults	Dropping vault onto foot or hand/back	• Utilize vault removal tool to remove vault lids • Avoid line of fire – do not place fingers under lid
	Slip/trip/fall	• Place tools in bucket or back on truck; do not place tools on the ground
	Hand injury	• Wear cut/puncture resistant gloves
8. Open vaults and pump covers	Vehicular traffic, getting struck by a moving vehicle	• Wear reflective traffic vest • Watch for vehicles • Set-up traffic control/cones where feasible • Use buddy system where possible to watch for traffic • Identify public access areas • Set up exclusion zone (caution tape, delineators, barricades, hazard lights) around work vehicle and other work areas
	Falling into vault	• Keep vault in sight and in front when directly adjacent • Never straddle vault
9. Packing equipment to truck	Back Strains	• Lift with your knees and within your green zone (between shoulders to knees and less than a foot away from your abdomen)
	Hand Injury	• Wear cut resistant gloves (level 3 or higher at ExxonMobil sites) • Avoid line of fire
10. Personal Health and Safety	Heat stress and heat stroke	• In hot environment, drink small amounts of water often, on average 1 cup (8 oz) every 15 minutes. Start drinking water 1-2 hours before hot work begins. Have plenty of fluids available. Water and sports drinks are recommended; coffee and soda may cause further dehydration. • Take breaks based on heat index rule: For temperatures < 85 F, work continuously. For temps 85 F to 95 F, work 40 minutes followed by 20 minutes rest. For temps > 95 F, work for 20 min followed by 40 minutes rest. Additional cooling measures required (i.e., water dampened clothing, cool mist). • In hot environments, take rest breaks in covered, shaded area. If no shade, idle vehicle with AC on. • Wear loose, non-restrictive clothing and hat/cap (refer to HASP) • Wear sunscreen on exposed skin to prevent sunburn; wear lip balm to prevent chapped lips. • Be aware of faintness, dizziness, unconsciousness, paleness, and profuse sweating in site personnel (contact PM or, if severe, contact emergency personnel). • Redness to face, high body temperature, and lack of sweating may indicate heat stroke (contact emergency personnel immediately) • Review HASP Attachment for **Heat and Cold Stress Protocols** (Appendix G & H) • Adjust work schedule to avoid heat stress.
	Biological hazards (dense plants, wild animals, etc.)	• Inspect area of investigation for signs of animals • Approach dense vegetation with caution
	Miscellaneous hazards (live lines, open vaults, etc.)	• Exercise absolute care and caution when working in the vicinity of electrical lines • Maintain minimum 3' distance from open vaults • Do not attach instruments to electrical wiring that shows signs of broken insulation, corrosion, wear, scorching, or arcing • Do not attach to exposed electrical wires without electronic/physical verification by a facilities manager or plant electrician that the lines are not energized.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 4

WORK ACTIVITY (Description):

GROUNDWATER GAUGING AND SAMPLING WITH A PUMP (HS)

This JSA addresses the hazards associated with routine sampling of groundwater wells both on site and off site using a battery operated pump.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Multi-Gas Meter (as needed)

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Azat Magdanov	QM Technician	Sean Guiltinan	SSH&E Program Manager
Mark Lach	Site Supervisor	Andrew Whitman	Senior Staff Scientist
Rebekah Westrup	Site Supervisor	Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☐ Goggles ☐ Face Shield ☐ Hearing Protection ☒ Safety Shoes—Type: Puncture Resistant, Electrical Hazard Resistant, Impact Resistant (75lb.)	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Fire Resistant Clothing (FRC)as needed	☒ Gloves—Type: Level 3 Cut/Puncture Resistant & Nitrile ☒ Other—Specify: Snake Chaps

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Maneuvering Vehicle On Site	Collision with person / vehicle / property - damage to property, person being hit and run over	• Visually assess pathway before relocating vehicle to ensure safe route before moving.
		• Clear communication between spotter and driver, including agreed position for spotter and hand signals for left, right, move and stop. Ensure spotter is equipped with air horn.
		• Wear traffic vest.
		• Driver must stop vehicle if spotter is not visible.
	Items falling from truck	• Drive with the tailgate closed at all times. Secure loose items.
		• Conduct a 360 walk around of the vehicle before moving to another location.
2. Handling Equipment/Removing Well Lids	Over Exertion- Lifting Heavy Equip	• Do not lift anything awkward or > 50 pounds without assistance.
	Muscle strain from Overreaching and Butts Up	• Keep aware of body positioning and use lifting techniques: Bend at knees, lift with legs, keep a straight back, tighten core (stomach) muscles, keep load within 6 inches of body.
	Coming into contact with sharp and/or heavy objects	• Wear Level 3 Cut Resistant gloves and safety shoes as noted above.
	Coming into Contact with objects Slips / Trips / Falls - cuts, broken bones, damage ligaments / tendons	• Keep tools clear of walkways to avoid tripping hazards.
		• Look down frequently to inspect walking pathway. Avoid uneven ground, holes, rocks, etc. Do not perform other tasks while walking - Walking is Working.
	Bite / allergic reaction from biological hazards	• Watch for spiders and other insects before putting hands into well vaults. Use tool (screwdriver) and visual inspection to explore well vault before reaching in with gloved hand.
		• Inspect area for ant nests. Do not stop and stand on top of or next to an ant nest.
	Laceration to hand from opening well lid	• Inspect edges of monument lid / box for burrs and sharp edges - remove with file if identified. Avoid touching the edges of metal box
		• Wear level 3 cut resistant and puncture resistant gloves.
	Stuck lids - crushed fingers	• Place hand on well lid on the side with lock when opening; keep fingers away from side with hinge. Keep fingers from between the lid and the monument
	Crushing hazard from vehicle doors and tailgate	• Keep cab doors closed • Use “Hands Free” program to ensure all personnel are out of the way prior to opening/closing tailgate.
3. Removing well caps	• Exposure to contaminants from splash, pressurized release of vapors, or hazardous contact from flying well cap	• Safety glasses with side shields, nitrile gloves and Level 3 Cut Resistant gloves must be worn at all times.
		• Loosen cap slowly, keeping control if pressure is released. Keep face out of the line-of-fire.
4. Gauging Wells	• Exposure to vapors and airborne particulates	• If you smell a strong petroleum odor upon opening cap, STOP WORK and check area with PID. If PID is => 100ppm STOP WORK and call PM. If concentrations are irritating but below 100ppm, wear respirator as part of our voluntary program. Keep face away from well opening as much as possible.

4. Gauging Wells	• Exposure to vapors and airborne particulates	• Check for the presence of NAPL. Call PM if NAPL is encountered for instructions on how to proceed.
	• Splash hazard when gauging wells	• Wear safety glasses with side shields, nitrile and Level 3 Cut Resistant gloves at all times while handling bailer.
		• Do not “free-fall” interface probe. Lower the interface probe with controlled slow movement (approximately 1 foot/second)
	• Muscle strain or pull from “elbows-out and overreaching	• Keep your elbows and interface probe close to your body while gauging the well. Do not overreach when opening or closing the well lid, or inserting the probe
	• Impact / Laceration to face from reeling in DTW tape	• Reel in DTW tape in a slow, controlled manner.
5. Installing/Removing Pump and hoses	Laceration to hand from cutting tools	• Use scissors or similar tool to cut string. No fixed or open bladed knifes may be used.
		• Avoid clamps and zip ties with sharp edges when handling tubing.
	Environmental Release	• Allow pump and hose to drain before removing
	Electrical shock	• Make sure that pump switch is in off position
		• Use the supplied connector to plug into the 12 Volt connection in the truck, do not use portable battery pack or loose car battery in truck bed.
	Slips/Trips/Falls – sprained ankle, and broken bones	• Good housekeeping – store tubing and cords away from work area either under vehicle or inside well box (if possible) and do not step over tubing or cords
	Back strain from Twist & Shout and Shoulders Too High/Too Low	• Keep arms close to the body and do not lift arms higher than your shoulders while lowering and raising the pump and tubing. Keep load close to body.
		• Face well while installing and removing pumps and tubing from well
6. Purging Wells	Splash hazard	• Safety glasses with side shields must be worn at all times.
		• Nitrile/Cut Resistant gloves must be worn while handling the tubing
	Exposure to Vapors	• Keep lids closed on poly tanks and drums as much as possible.
	Environmental Release	• Perform an inspection of tubing and connections to ensure competent and secure to pump.
		• Secure tubing to bucket to prevent falling out over the duration of purging and sampling. • Ensure bucket is located on stable surface.
7. Collecting Groundwater Samples	Contact with sharp objects (broken Sampling Bottles) - laceration	• Visually inspect each glass bottle for defects prior to use.
		• Place and fill VOA in holding device and then tighten on lid.
		• Do not over-tighten lid
	Sample bottle falling and breaking due to tipping or wind- exposure to acid preservative or impacted water	• Wear level 3 cut resistant and puncture resistant gloves under Nitrile gloves while handling glass sample bottles. • Verify gloves are intact without holes or tears
		• Sample containers must be placed on level surface and secured (e.g., holder) to prevent tipping when filling and closing container.
8. Placing Samples in Cooler	Back strain from overreaching	• Position cooler close to you prior to trying to open/close cooler.
9. Locking Well Lids	Exposure to biological hazards, cuts to hands	• Wear level 3 cut resistant and puncture resistant gloves.
		• The well cap must effectively seal well and be locked.
		• Watch for spiders and other insects before putting hands into well vaults. Use tool (screwdriver) and visual inspection to explore well vault before reaching in with gloved hand.
10. Cleaning Up and Departing the Site	Slips, trips and falls - results in broken bones and torn ligaments / tendons	• Check that well covers are secure upon departure. Remove all tools and bailing equipment from the site.
		• Walk around site and vehicle to perform a visual inspection before demobilization.
	Well / truck damage when departing the work area	• Pull forward whenever possible and ensure you can visually see the well location or have a spotter identify it before moving the truck. Ensure spotter is equipped with air horn.
		• Review Driving JSA
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 21

WORK ACTIVITY (Description):

GROUNDWATER SAMPLING

This JSA covers routine sampling of groundwater wells on property. Working in remote area around livestock requires the use of the **Monitoring and Gauging JSA**

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Impact Driver, Magnets rated for various lids, Manhole Dolly for 2x2 and larger lids, Screwdriver, Ratchet, Pry Bar, Groundwater Sampling Equipment and Sample Containers

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Gary DeCarlo	QM Manager	Sean Guiltinan	SSH&E Program Manager
David Daniels	Project Geologist	Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses

☐ Goggles
☐ Face Shield
☐ Hearing Protection
☒ Safety Shoes—Type: Puncture Resistant, Impact Resistant (75lb), Electrical Hazard Resistant

☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: Long sleeve protection required

☒ Gloves—Type: Level 5 Cut Resistant with listed puncture & impact resistance (general work) Level 3 cut & listed puncture resistance (sampling)
☐ Other—Specify: ________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Maneuvering Vehicle/Trailer On Site	• Collision with person/vehicle/property - damage to property, person being hit and run over	• Communicate with other onsite personnel where work is taking place and how long it will take.
		• Visually assess pathway before relocating vehicle to ensure safe route before moving.
		• Clear communication between spotter and driver, including agreed position for spotter and hand signals for left, right, move and stop. Ensure spotter is equipped with air horn.
		• Wear traffic vest.
		• Driver must stop vehicle if spotter is not visible.
	• Items falling from truck	• Drive with the tailgate closed whenever possible. If the tailgate must remain open, strap down any loose items.
		• Conduct a walk around of the vehicle before moving to another location. Secure loose items
2. Handling Equipment/Removing - Replacing Well Lids	• Over Exertion- Lifting Heavy Equipment with "Butts Up" (Legs straight and back bent)	• Get help with objects that are too heavy (>50 lbs.) or awkward for one person to lift. Use mechanical means such as pallet jack, wheelbarrow, dolly to transport heavy materials
		• Keep aware of body positioning and use lifting techniques: Bend at knees, lift with legs, keep a straight back, tighten core muscles, keep load within 6 inches of body.
	• Coming into contact with sharp and/or heavy objects	• Wear cut resistant level 3 gloves and safety shoes as defined by ANSI Z41.
	• Coming into Contact with objects Slips/Trips/Falls - cuts, broken bones, damage ligaments/tendons	• If lid is removable, store as close as possible. Clear of potential walkways to avoid tripping hazards. Consider placing lid underneath tailgate of truck if feasible. Replace well lid as soon as you complete task to eliminate a potential trip hazard.
	• Exposure to Contaminants, biological hazards	• Watch for spiders and other insects before putting hands into well vaults. Use tool (screw driver) and visual inspection to explore well vault before reaching in with gloved hand.
	• Heavy Well Lids/Covers - crushed or amputated fingers/toes; "Twist and Shout" leading to **Back Strain**	• Wear cut resistant under and Nitrile over gloves.
		• Keep hands/fingers away from raised covers.
		• Use hand tools to initially loosen and hold well vault lids; do not place fingers under lid
		• Use Heavyweight steel dolly to remove oversized well vaults to prevent injuries to fingers, toes and long term back injuries/soreness. Use weight-rated magnets to remove smaller well vault lids.
3. Purging Wells	• Splash hazard when gauging wells	• Safety glasses with side shields must be worn at all times.
		• Nitrile/cut resistant gloves must be worn while handling the bailer.
	• Exposure to Vapors and Airborne particulates	Check for the presence of NAPL. Call PM if NAPL is encountered for instructions on how to proceed.
		If NAPL is confirmed and the PM decides to proceed with work on the well, consult the NAPL bailing JSA.
		• Keep lids closed on poly tanks and drums as much as possible.

4. Collecting Groundwater Samples	• Contact with sharp objects (broken Sampling Bottles) - cuts	• Use clear glass VOAs.
		• Visually inspect each glass bottle for defects prior to use.
		• Place VOA in holding device and then tighten on lid
		• Wear cut-resistant gloves under Nitrile gloves while handling glass sample bottles.
	• Sample bottle falling and breaking - exposure to impacted water, cuts	• Large sample containers must be secured in event it tips. Place large sample container in plastic tote or box to secure while opening, filling and closing container.
		• Review Sample Packing SOP before packing and shipping samples.
5. Locking Well Caps	• Exposure to Contaminants, biological hazards, cuts to hands	• Wear cut resistant level 3 under and Nitrile over gloves.
		• The well cap must be effectively sealing well and be locked.
		• Watch for spiders and other insects before putting hands into well vaults. Use tool (screw driver) and visual inspection to explore well vault before reaching in with gloved hand.
6. Cleaning Up and Departing the Site	• Slips, trips and falls - results in broken bones and torn ligaments/tendons	• Check that well covers are secure upon departure, and that all tools and bailing equipment are removed from the site.
		• Walk around site and vehicle to perform a visual inspection before demobilization.
	• Demobilization	• Review **Driving JSA**
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED REV # 3

WORK ACTIVITY (Description):

GROUNDWATER WELL DEVELOPMENT WITH PRESSURIZED WATER

This JSA addresses the hazards associated with development of well using pressurized, hot water

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Multi-Gas Meter (as needed), Steam Cleaner

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Rebekah A Westrup	Geologist/Field Supervisor	Sean Guiltinan	SSH&E Program Manager
Mark Lach	Geologist/Field Supervisor	Andrew Whitman	Senior Staff Scientist
Don Clabaugh	Senior Engineer	Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses

☐ Goggles
☒ Face Shield
☐ Hearing Protection
☒ Safety Shoes—Puncture Resistant, Crush/Impact Resistant (75lbs), Electrical Hazard Resistant

☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: FRC Clothing

☒ Gloves—Type: Level 3 Cut, Puncture Resistant & Nitrile
☐ Other—Specify:

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

^{1} JOB STEPS	^{2} POTENTIAL HAZARDS	^{3} CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Handling Equipment / Opening Well	• Coming into contact with sharp and/or heavy objects	• Wear cut resistant level 3 gloves and safety shoes as defined by ANSI Z41.
	• Slips/Trips/Falls - Coming into contact with objects resulting in cuts, broken bones, damage to ligaments/tendons	• Keep tools off the ground. Place in bucket or back on truck, and out of walkways to avoid tripping hazards.
		• Look down frequently to inspect walking pathway. Where possible, even out uneven ground, fill holes, and remove rocks, etc. Do not perform other tasks while walking - Walking is Working.
	• Bite/allergic reaction from biological hazards	• Watch for spiders and other insects before opening or putting hands into well vaults. Use tool (screw driver) and visual inspection to explore well vault before reaching in with gloved hand.
		• If snakes are a potential hazard at the site, wear snake chaps at all times.
		• Inspect area for ant nests. Do not stop and stand on top of or next to a nest.
	• Laceration to hand from opening well lid	• Inspect edges of monument lid/box for burrs and sharp edges. Remove with file if identified. Avoid touching the metal box when lowering tubing.
	• Stuck lids - crushed fingers	• Place hand on well lid on side with lock when opening. Keep fingers away from side with hinge.
2. Monitor the amount of product and water in well and decontaminate probe	• Chemical exposure from NAPL	• Wear nitrile gloves over cut resistant gloves, and wear safety glasses.
		• Slowly wind and unwind the interface probe to prevent splashing.
3. Bail product	• Refer to Bailing JSA	• Refer to Bailing JSA
4. Installing/Connecting steam cleaner and hoses	• Slips, trips and falls from pump hose	• Park truck a minimum of 10' from well and place cones between well and truck where pump hose runs.
5. Introducing pressurized hot water into the well	• Splash hazard	• Faceshield must be worn at all times.
		• Use cone over well as shield from splashing
		• Nitrile/cut resistant gloves must be worn while handling the hoses.
	• Exposure to Vapors and Airborne particulates	• Monitor breathing space, stop work if 100 PPM (EMES PEL)
		• IF ANY VAPORS ARE NOTED AS ABOVE: Wear respirator if gasoline concentrations greater than 100 ppm or implement engineering controls to reduce concentrations. Employee can wear respirator at lower concentrations if no discomfort or irritation occurs.
	• Burn or skin laceration from hot surfaces or release of heated pressurized water	• Verify all connections are tight before starting equipment.
		• Weather leather or heat resistant gloves.
		• Identify hot surfaces on equipment and do not touch. Use guide rope to raise and lower hose while hot water is running through it.
6. Remove Pump and Disconnect Tubing	• Environmental release	•If NAPL is present in the well, use plastic under hosing while removing from the well.
	• Burn or skin laceration from release of heated pressurized water	• Verify steam cleaner is shutoff and water pressure released before disconnecting hoses.
7. Locking Well Lids	• Cuts to hands	• Wear cut resistant level 3/puncture resistant gloves.

8. Cleaning up and departing the Site	• Crushing Hazards to hands	• Make sure that coworkers "show their hand" prior to closing truck bed.
	• Equipment damage when departing the work area	• Walk around site and vehicle to perform a visual inspection. Ensure all equipment has been securely packed before demobilization.
	• Well/truck damage when departing the work area	• Pull forward whenever possible. Ensure you can visually see the well location or have a spotter identify it before moving the truck.
	• Review Driving JSA	• Review Driving JSA
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

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[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 16

WORK ACTIVITY (Description):

HAND AUGER EXCAVATION

Covers the hazards with completing excavation using a hand auger.

EQUIPMENT:

Hand Auger, Bristle Brush, Shovel, Bucket, Mallet, Wrenches, and PID

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Robert Serrato	Staff Hydrogeologist	Sean Guiltinan	SSH&E Program Manager
Mark Lach	Field Supervisor	Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☐ Goggles ☐ Face Shield ☐ Hearing Protection ☒ Safety Shoes—Type: Puncture Resistant, Electrical Hazard, Crush/Impact Resistant 75lbs.	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Long sleeved clothing	☒ Gloves—Type: Level 3 cut resistant and puncture resistant ☒ Other—Specify: Snake chaps

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Hand Auger Excavation Set Up	• Injury from / damage to underground utilities and/or structures - resulting in fire, explosion, release of water, electrocution	• Contact utility locator service (811) at least 48 hours before onset of fieldwork. Confirm markings are present and not in conflict with the work area.
		• Issue and comply with ExxonMobil Subsurface Clearance procedure and work permit.
		• Use of hand auger with rounded edges is required.
	• Back strain from poor body positioning during shoveling	• Refer to Shoveling JSA.
	• Laceration from struck by brush	• Ensure brush is removed from directly around work area.
	• Injury from tripping/slipping - resulting in broken bones, torn ligaments and tendons	• Use shovel to level ground to create flat working surface around the location.
		• Attempt to add dry dirt if ground is saturated or muddy.
		• **Walking is working.** Focus on path; look down frequently. Avoid uneven ground and slopes when walking. Plan path which provides least number of obstacles.
2. Hang Augering	• Potential fire, explosion from ignition of flammable vapors; Potential fire, explosion or electrocution if underground utilities are damaged.	• Hand augering can generate sparks when contacting materials in subsurface. It can damage/puncture underground utilities. Prior to beginning any ground penetration, confirm with PM: • Do site conditions require a HOT WORK PERMIT? Is there a potential for combustible or flammable gases? If yes, complete and follow permit requirements.
		• If utility is observed in hole, or fragments or non-native fill observed in bucket, STOP WORK and call PM to discuss.
		• Do not force hand auger. If refusal, call PM to discuss potential subsurface obstructions.
	• Cut injury to hands from handling tools or breaking tools	• Inspect for broken welds & metal spurs on connection. Do not use if damaged.
		• Wear Level III cut resistant gloves at all times when handling tools/equipment.
	• Muscle strain from Twist and Shout, Butts Up, Shoulders Too High/Too Low, and muscle overexertion	• Do not twist auger more than 1/2 turn.
		• Do not use excessive force (do not lock arms straight) or use cheater bar. Choose alternate tool to loosen soil or step out with PM approval.
		• Take breaks based on heat stress appendix in SSP (to include drinking fluids to stay hydrated). Refer to General Activities JSA.
		• Change extension lengths to keep hand auger handle between head and knee level – Prevents Butts Up Position and Overreaching.
		• Rotate personnel performing hand augering once per half hour.
		• Lift auger straight up from hole; keep back straight and lift with legs; keep rod close to body - Prevents Elbows Out or Shoulder Too High/Too Low. Get help from co-worker if auger is bound in soil.
		• Do not turn at waist. Turn with arms and shoulders. Keep feet square to hole - Prevents Twist and Shout.

2. Hand Augering (continued)	• Injury from tripping/slipping - resulting in broken bones, torn ligaments and tendons	• Keep tools in a bucket or in pocket. Do not place tools on the ground.
		• Do not set auger on the ground around your feet.
	• Injury to eyes from flying debris	• Rotate auger slowly when turning over. Ensure 2nd person is out of line of fire of debris from the bucket.
		• Wear safety glasses which seal to the face.
	• Hitting people or stationary objects with T handle / extension rods	• Create exclusion zone larger than the hand auger length at full extension • Notify co-workers before swinging auger.
		• Utilize two personnel to remove auger from hole when >10 feet in length.
		• Look up and watch the T handle while lowering auger into the hole to avoid hitting yourself with the T handle.
3. Emptying Soil from Hand Auger Bucket	• Crush to fingers from line of fire of striking with mallet	• Use mallet to remove soil from bucket. Keep grip hand on rod at least 6 inches below the bucket.
	• Cut to fingers/hand from losing control of tool	• When using tool (screwdriver) to remove high plasticity soil, always point and operate away from body and hand holding the auger rod.
	• Head Injury from losing control of auger	• Always keep one hand on rod.
		• Keep head / face clear of end of bucket.
	• Eye injury from flying debris	• Do not empty the auger with bucket above your head. Hold the rod out at a slight angle.
	• Injury from fall into excavation > 4 feet bgs	• Do not work within 6 feet from edge of unsloped excavation. • Ensure exclusion zone/fencing is present around open excavation if near work area.
4. Decontaminating hand auger equipment	• Cut to hand from contacting blades	• Use bristle brush to clean auger blades. Keep hands clear of auger blades.
5. Backfilling hand auger boring	• Back strain from lifting / pouring from Butts Up	• Do not lift greater than 50 lbs. without assistance. Empty bags into 5-gallon buckets if > 50 Lbs.
		• Do not bend at waist. Keep back straight.
	• Cut Injury to hands from handling tools or breaking tools	• Thoroughly inspect shovel. Do not use if damaged.
		• Wear cut resistant level 3 gloves at all times when handling tools/equipment.
6. Cleaning Up and Departing the Site	• Broken ankle from Slip/Trip/Fall	• Ensure that surface completion matches existing grade and is leveled. Do not leave open holes unattended. • Ensure all tools/equipment are removed.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED REV # 3

WORK ACTIVITY (Description):

HAND SHOVELING - This JSA covers the hazards associated with the use of a shovel for picking up, moving, and digging materials.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Hand Shovel

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Carl Miklich	Site Supervisor	Sean Guiltinan	SSH&E Program Manager
		Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses
☐ Goggles
☐ Face Shield
☐ Hearing Protection
☒ Safety Shoes—Puncture Resistant, Electrical Hazard resistant, Impact/Crush resistant (75lbs)
☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: Long Sleeve Shirt
☒ Gloves—Type: Cut III, Impact and PR resistant, Leather or synthetic palm
☐ Other—Specify:

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Select tool based on work to be performed	Ergonomic strain from selecting wrong shovel type – Twist & Shout, Butts Up, Over-reach	• For sand and dry earth, use triangular or round blades with long handles. Long handle length should be approximately to elbow height when arms are at your side. • For coarse-grained materials such as gravel, coal, or ore, use square blades with short handles. • For digging in hard earth, use a blade that has a wide, rolled step on top of blade to minimize pressure to sole of foot.
2. Inspecting Tool	Puncture or impalement hazard from shovel breaking during use	Inspect handle for cracks and splinters. Cracked and/or splintered shovels are to be removed from service and disposed of.
3. Shoveling Material	Back strain from "Twist & Shout", "Butts Up", "Over-reach"	1. Keep feet about shoulder distance apart with one foot ahead of the other, placing front foot close to shovel. 2. Put weight on front foot. Use back leg to push shovel into load. Bend at knees and not at the back. 3. Shift weight to rear foot. Keep load close to body. 4. Turn feet in direction of throw. Do not twist torso. Throw height should not exceed 4 feet. Optimal throw distance is slightly over 3 feet. Reduce load if task requires longer throw.
	Muscle strain due to fatigue or heavy lifting	For continuous shoveling tasks: • Do not to exceed 15 scoops per minute to prevent fatigue. • Shovel load (weight of shovel + load) should not exceed 10-15 lbs. • In extreme conditions (very hot and humid or very cold and windy), take a 15-minute break every 15 minutes of shoveling. In less extreme conditions, take 5-10 minute break every 15 minutes.
4. Digging Material	Back strain from "Twist & Shout", "Butts Up", "Over-reach"	1. Keep feet about shoulder distance apart with one foot ahead of the other, placing front foot close to shovel. 2. Apply foot pressure to spade using leg muscle to push blade into earth. Bend at knees and not at the back. 3. Slide load close to body. Ensure load is loose from ground before lifting. Lift with legs, not back. 4. Shift weight to rear foot. Keep load close to body. 5. Turn feet in direction of throw. Do not twist torso. Throw height should not exceed 4 feet. Optimal throw distance is slightly over 3 feet. Reduce load if task requires longer throw.
	Muscle strain due to fatigue or heavy lifting	For continuous digging tasks: • Do not to exceed 15 scoops per minute to prevent fatigue. • Shovel load (weight of shovel + load) should not exceed 10-15 lbs. • In extreme conditions (very hot and humid or very cold and windy), take a 15-minute break every 15 minutes of shoveling. In less extreme conditions, take 5-10 minute break every 15 minutes.
	Broken ankle from slip/trip/fall	Do not store the shovel on the ground. Place upright and secure from falling over.

Job Safety Analysis

FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 19

WORK ACTIVITY (Description):

MONITORING AND GAUGING

This JSA addresses the hazards associated with routine gauging and monitoring of groundwater in wells both on site and off site. Additionally, it covers working on well heads in a remote area around livestock.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Delineators, Caution Tape, Cones, Pry Bar, Impact Gun or Ratchet with Extension

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Azat Magdanov	QM Technician	Sean Guiltinan	SSH&E Program Manager
Scott Savko	Staff Geologist	Andrew Whitman	Senior Staff Scientist
Katherine Plank	Environmental Technician	Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses

☐ Goggles
☐ Face Shield
☐ Hearing Protection
☒ Safety Shoes—Type: Puncture Resistant, Electrical Hazard, Crush/Impact Resistant 75lbs.

☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: Long sleeve protection required.

☒ Gloves—Type: Level 5 Cut Resistant with listed puncture & impact resistance (general work) Level 3 cut & listed puncture resistance (sampling)
☐ Other—Specify:

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

^{1} JOB STEPS	^{2} POTENTIAL HAZARDS	^{3} CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Movement of equipment and vehicles on / off site	• Items falling from truck	• Drive with the tailgate closed whenever possible. If the tailgate must remain open, strap down any loose items.
2. Establishing Work Zones in the street	• Vehicle or pedestrian traffic entering the work zone; danger of being struck by a vehicle	• Review Traffic Control JSA for off-site street hazard mitigation.
3. Establishing Work Zones (non-street) on site propert(ies)	• Vehicle or pedestrian traffic entering the work zone; danger of being struck by a vehicle	• Use traffic watch in high-risk traffic areas and when a second person is on site.
		• For work in high pedestrian areas, use delineators with caution tape to establish exclusion zone.
4. Handling equipment / Opening / Removing well lids	•Overexertion from lifting heavy equipment	• Do not lift anything over 50 pounds without assistance. Bend knees and lift using legs / arms, not your back. Keep the load close to your body and tighten core (stomach) muscles.
	•Coming into contact with sharp objects	• Keep hands out of the line-of-fire when working near sharp objects. Place heavy objects on stable surface, which will not fall on toes. Wear Level 5 cut-resistant gloves and steel-toe boots.
	•Knuckle buster hazard from fingers/hand impacting well lid	• When opening well lids use an appropriate length socket for an impact gun or ratchet with extension.
	• Crush / pinch / chop hazard from heavy well lids could cause loss of fingertip or broken finger	•When opening / removing well lids use wrench handle or pry bar to place block between lid and ring in case the lid slips. Doing so blocks scissor and crush hazard from lid. The block needs to be thicker than a hand or finger.
		• Use pry bar to initially lift and hold heavy covers. Remove pry bar and other tools from work area after the well has been opened.
		• Keep fingers and toes 6 inches from edge of well vault. Do not allow fingers to cross into well vault while opening lid.
	• Biological hazards - insect bites and stings causing injury	• Watch for spiders and other insects before putting hands into well vaults. Use tool (pry bar) and visual inspection to explore well vault before reaching in with gloved hand.
	•Coming into contact with objects Slips/Trips/Falls	• If lid is removable, store as close as possible, but clear of potential walkways to avoid tripping hazards. Place cone on top of well lid to identify trip hazard. Consider storing lid under tailgate if feasible.
5. Removing well caps	• Exposure to contaminants from splash, pressurized release of vapors, or hazardous contact from flying well cap	• Wear Nitrile gloves and Level 3 Cut Resistant gloves.
		• Loosen cap slowly, keeping control if pressure is released. Keep face out of the line-of-fire.
6. Gauging wells	• Fire / explosion hazards from free product, new release, vapor build-up	• If you smell a strong petroleum odor upon opening cap, STOP WORK! Keep face away from opening, stay upwind, use bailer to check for the presence of product. If product present, STOP WORK on that well. Replace and tighten well cap, secure well lid. Call PM for further direction.
	• Splash hazard when gauging wells	• Lower and raise bailer with controlled movement. Keep face away from well opening and bailer. Stay upwind of well.
		• Wear safety glasses with side shields at all times. Nitrile and Level 3 Cut Resistant gloves must be worn while handling bailer.

6. Gauging wells (continued)	• Overexertion and awkward body positioning “Butts Up” (legs straight and bent back) when observing wells.	• Keep aware of body positioning and use lifting techniques: Bend at knees, lift with legs, keep a straight back, tighten core muscles, keep load within 6 inches of body.
	• Exposure to vapors and airborne particulates	• Stay upwind. If concentrations are irritating, wear respirator as part of our voluntary program. Keep face away from well opening as much as possible.
		• Keep lids closed on poly tanks and drums except when adding or removing liquids.
7. Cleaning Up and Departing the Site	• Impact to third parties from slips, trips, and falls	• Check that well covers are secure upon departure and that all tools and bailing equipment are removed from the site.
	• Vehicle accident when leaving the site.	• Review Driving JSA.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 19

WORK ACTIVITY (Description):

PORTABLE GAS OR DIESEL POWERED GENERATORS

This JSA covers the hazards associated with using portable gasoline- or diesel-powered generators to provide electrical power for electric tools, lights, pumps, etc.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Hand Cart, Wheelbarrow, Generator, Fuel Container, GFCI Tester

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
George Gonzalez	Field Specialist	Sean Guiltinan	SSH&E Program Manager
Andrew Yonkofski	Scientist II	Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest
☒ Hard Hat
☐ Lifeline/Harness
☒ Safety Glasses

☐ Goggles
☐ Face Shield
☒ Hearing Protection
☒ Safety Shoes—Type: Puncture Resistant, Electrical Hazard, Crush/Impact Resistant 75lbs.

☐ Air purifying respirator
☐ Supplied respirator
☒ PPE Clothing—Type: Long sleeve protection required.

☒ Gloves—Type: Level 3 Cut Resistant & Fuel-Resistant Over-gloves
☐ Other—Specify:__________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

^{1} JOB STEPS	^{2} POTENTIAL HAZARDS	^{3} CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Unloading/Loading Generator	• Back injury from “Elbows Out”, “Butt’s Up,” “Twist and Shout,” and/or “Overreaching”.	• Do not lift anything >50 lbs. or awkward shape without assistance. Bend and lift using legs/arms, not your back. Tighten your stomach muscles before the lift. Do not twist.
		• Lift and move generator using handle grips on generator.
		• Use lift gate, hand cart, or wheel barrel to lift and move generator, when available.
	• Injury from pinch points	• Position hands and feet out of pinch and crush points when moving generator. Wear level 3 cut resistant gloves. Impact resistant/cut resistant or leather over gloves recommended.
	• Burns from hot surfaces	• Allow generator to cool prior to moving it.
	• Unsecured equipment - spill of fuel, damage to generator/other equipment	• Ensure that generator is secured against movement or jostling prior to transport.
2. Fueling Generator	• Back strain from “Butts Up” or “Elbows Out”	• Position generator at waist height if possible. Bend using legs, not at the back. Keep back straight, core engaged and arms in front of body.
	• Eye or skin contact from fuel	• Wear safety glasses and fuel-resistant over-gloves.
		• Pour slowly.
		• Ensure the spout is tightened to the can.
	• Explosion and fire	• TURN OFF GENERATOR AND ALLOW TO COOL. Never fuel generator while it is operating or in an overheated condition.
	• Inhaling fumes from fuel	• Fuel generator in open air environment to avoid fumes.
	•Explosion and fire	• Ensure any spilled fuel has dried or is wiped off prior to starting generator.
		• Do not store fuel containers in the vicinity of the generator. Ensure that all materials are clear of the exhaust. Heat from the exhaust can get very hot and cause some materials to melt and/or burn.
		• Inspect fuel lines for leakage. Keep generator properly maintained.
		• Keep a 20 lb fire extinguisher next to the generator.
	• Electrical shock	• Ensure generator is properly grounded. Consult Owner's Manual prior to operation.
		• Dry your hands before touching generator.
		• If you must use a generator when it is wet outside, protect the generator from moisture. Do NOT operate generator indoors.
		• Ensure generator is equipped with a Ground Fault Circuit Interrupter (GFCI). Test GFCI to ensure electrical power is interrupted.
		• If GFCI is not built into the generator, plug a GFCI tester into the generator followed by the electrical cord & test operation.
		• Check that the entire length of each electrical cord is free of cuts or tears and that the plug is not altered prior to connecting to generator.
		• Protect electrical cords from getting pinched or crushed.
		• Make sure the wattage rating for each cord exceeds the total wattage of all appliances connected to it.

3. Starting Generator	• Back strain from “Twist and Shout”	• If generator is equipped with a pull cord to start, ensure adequate spacing between generator and body to pull cord directly towards body. Keep back straight and do not twist while pulling.
	• Inhaling fumes from exhaust	• Never operate generator indoors or in confined areas without proper ventilation.
	• Hearing damage: temporary or permanent hearing loss	• Wear hearing protection (plugs, caps, muff NRR > 28) to protect ears if operating generator exceeds 85 db. Post hearing protection signs to warn public and workers
		• Do not stand/work within 3 feet of operating generator except when starting/shutting down.
4. Operating Generator	• Burns from hot surfaces	• Wear level three cut resistant gloves AND heavy duty over gloves.
		• Avoid contact with generator while it is in operation.
	• Explosion and fire	• Do not store fuel containers in the vicinity of the generator.
		• Inspect fuel lines for leakage. Keep generator properly maintained.
		• Do not operate generator in the vicinity of combustible materials (paper, rags, clothing).
	• Electrical shock	• Dry hands before touching generator.
		• If you must use a generator when it is wet outside, protect the generator from moisture. Do NOT operate generator indoors.
		• NEVER plug generator into an electrical wall outlet (Back feeding).
		• Ensure generator is equipped with a Ground Fault Circuit Interrupter (GFCI). Test GFCI to ensure electrical power is interrupted.
		• If generator is not equipped with GFIC, plug a GFCI tester into the generator followed by the electrical cord & test operation.
		• Check that the entire length of each electrical cord is free of cuts or tears and that the plugs are not altered prior to connecting to generator.
		• Protect electrical cords from getting pinched or crushed.
		• Make sure the wattage rating for each cord exceeds the total wattage of all appliances connected to it.
	• Inhaling fumes from exhaust	• Never operate generator indoors or in confined areas without proper ventilation.
	• Hearing damage	• Wear ear plugs if noise from operating generator exceeds 85 db.
		• Do not stand/work within 3 feet of operating generator except when starting/shutting down. If noise exceeds 85 db, post hearing protection signs to warn public and workers
5. Cease Generator Operation	• Electrical shock	• Dry hands before touching generator.
	• Equipment damage	• Turn off all appliances powered by the generator and then turn off generator.
	• Fuel Spill	• Turn off fuel valve when generator is done operating prior to transporting.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 17

WORK ACTIVITY (Description):

SOIL SAMPLING

The JSA covers the hazards encountered when collecting soil samples during: hand auger, slide hammer soil sampler, split spoon sampler, and acetate sleeve.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Auger, Auger Extension, Hammer, Chisel, Soil Sampling Equipment, Brush (to clean auger), Pipe Tape, Pipe Vise, Pipe Wrench, Box Wrenches, Slide Hammer, Chain Pipe Vise

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Robert Thompson	Senior Staff Scientist	Sean Guiltinan	SSH&E Program Manager
		Andrew Whitman	Senior Staff Scientist
		Jens Walker	Senior Staff Geologist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest ☒ Hard Hat ☐ Lifeline/Harness ☐ Safety Glasses	☒ Goggles ☐ Face Shield ☒ Hearing Protection ☒ Safety Shoes—Type: Puncture Resistant, Electrical Hazard, Crush/Impact Resistant 75lbs.	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Long sleeve protection required.	☒ Gloves—Type: Nitrile & Level 3 Cut Resistant ☐ Other—Specify:__________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Hand Auger Soil Sampling - Turning Auger (GENERAL WORK PERMIT REQUIRED)	• Damage to underground utility: shock, explosion, chemical exposure	• Confirm subsurface protocol was completed and auger location cleared.
	• Over exertion, strain, muscle pull, struck-by	• Confirm subsurface protocol was completed and auger location cleared.
		• Do not use cheater bar to provide extra force on T-handle.
2. Hand Auger Soil Sampling - Sample Collection	• Pinch, cut, scrape, or puncture hazard from removing soil	• Tap auger using hammer to loosen soil out of sleeve into sample container.
		• Do not put any body component in line-of-fire (within 1 foot) if using decontaminated screwdriver or chisel to pry soil from sleeve.
		• Block auger tips so they will not slip and come in contact with any body part while removing soil.
		• If sample container has preservative, review MSDS to ensure use of correct protective gloves: HCL – Nitrile | Sodium Bisulfate – Nitrile | Methanol - Nitrile (splash) Neoprene or PVC (immersion)
		• Inspect glassware for cracks before using to hold soil sample. Open slowly, place on level surface to prevent spilling any preservative.
3. Hand Auger Soil Sampling - Decontamination	• Exposure to impacted water/soil, cut or pinch/impact hazard	• Make sure gloves are in good condition and not ripped before placing hands in decon water.
		• Use brush (not hand) to clean auger. Inspect for metal burrs on auger or auger extension before cleaning. File down if present.
		• Pinch or impact hazard from disconnecting auger extensions. If screw type connection, ensure threads coated with pipe tape to prevent locking. Use pipe vise if available to secure auger extensions. Use box wrenches (not adjustable wrenches or channel locks). If pin type, keep hands 6 inches from connection points to prevent pinch hazard when reassembling.
	• Muscle strain from rotating at the waist (twist and shout)	Always face the auger extensions.
4. Slide Hammer Soil Sampler - Sample Collection (GENERAL WORK PERMIT REQUIRED)	• Damage to underground utility: shock, explosion, chemical exposure	• Confirm subsurface protocol was completed and auger location cleared.
	• Cut hazard loading sleeve into barrel	• Inspect barrel to slide hammer to ensure no metal burrs are present. If metal burrs are present use a file to remove the burrs, Inspect metal sleeve insert as well. Remove or replace if burrs are present.
	• Impact, pinch, muscle pull hazards	• Place sampler head on surface for soil sample to check depth to avoid being too short and overextending arm or back when striking sampler.
5. Slide Hammer Soil Sampler - Sample Collection	• Impact, pinch, muscle pull hazards	• Check striking motion before applying heaving force to ensure arm and wrist movement are in straight lines and not at awkward angles.
		• Lift with legs (do not lift with back) to extract sampler head when sampler is full. May need to use upward strikes to free equipment – keep the upper body out of the line of fire when executing upward strikes.

Job Safety Analysis

6. Slide Hammer Soil Sampler - Sample Removal	• Exposure to impacted Soil, Cut or Impact Hazard	• If sampler head is stuck, use pipe wrenches to free inner sleeve. Use chain pipe vise to secure head of sampler. Clear hands motion to prevent contact with other objects if wrench slips.
		• Wear cut resistant and chemical protective gloves.
		• Inspect edges of sleeves from brass sample before capping to prevent cuts.
7. Slide Hammer Soil Sampler - Decontamination	• Exposure to impacted water/soil, cut or pinch/impact hazard	• Make sure gloves are in good condition and not ripped before placing hands in decon water.
		• Use brush (not hand) to clean sampler head. Be aware of metal burrs extensions or sampler head.
		• Pinch or impact hazard from disconnecting extensions. If screw type connection, ensure threads are coated with pipe tape to prevent locking. Use pipe vise (if available) to secure auger extensions and box wrenches (not adjustable wrenches or channel locks). If pin type connection, keep hands 6 inches away from connection points to prevent pinch hazard when reassembling.
8. Split Spoon Sampler - Sample Collection & Decontamination	• Line of Fire	• Review drilling company's JSA for sample handling.
		• Do not assist driller with handling of split spoon. Not trained on hazard recognition or protocol.
	• Burn or Cut or Scrape, or exposure to chemicals (rash or acute reaction)	• Geologic conditions during sample collection can make sample very hot. Test before grabbing and burning self.
		• Wear chemical and cut resistant gloves and goggles when handling soil if windy or there is a site-specific concern for flying debris.
		• Inspect edges of sleeves from brass sample before capping to prevent cuts.
		• If sample container has preservative, review MSDS. Ensure use of correct protective gloves: HCL – Nitrile | Sodium Bisulfate – Nitrile | Methanol - Nitrile (splash) Neoprene or PVC (immersion)
		• Inspect glassware for cracks before using to hold soil sample. Open slowly, place on level surface to prevent spilling any preservative.
9. Acetate Sleeve - Sample Collection & Decontamination	• Line of Fire	• Review drilling company's JSA for sample handling.
		• Do not assist driller with handling of acetate sleeve. Focus on your own task.
	• Cut or Scrape	• Ensure driller is using vise to hold sleeve down when cutting sleeve with hand saw or opening sleeve for inspection with geoprobe. Review cutting process identifying line-of-fire hazards.
		• Wear chemical and cut resistant gloves and goggles when handling acetate sleeve. Edges of sleeve are very sharp cutting hazard.
		• If sample container has preservative, review MSDS. Ensure use of correct protective gloves: HCL – Nitrile | Sodium Bisulfate – Nitrile | Methanol - Nitrile (splash) Neoprene or PVC (immersion)
		• Inspect glassware for cracks before using to hold soil sample. Open slowly, place on level surface to prevent spilling any preservative.
FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.		

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[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

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Job Safety Analysis

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	DATE	NEW/REVISED
Stantec	1/31/2023	☐ NEW ☒ REVISED Rev # 8

WORK ACTIVITY (Description):

SPOTTING / MOVING EQUIPMENT

This JSA addresses hazards associated with exclusion zones, clear traffic paths, and coordination during operation of mobile equipment and third-party vehicles. The standard Traffic Control JSA should also be used when working on public property.

EQUIPMENT necessary to mitigate hazards associated with this work activity:

Air horn

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Carl Miklich	Assistant Project Manager	Andy Nelson	Branch Manager / Senior Geologist
		Sean Guiltinan	SSH&E Program Manager
		Andrew Whitman	Senior Staff Scientist

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)

☒ Reflective Vest ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☐ Goggles ☐ Face Shield ☐ Hearing Protection ☒ Safety Shoes—Type: Puncture Resistant, Electrical Hazard, Crush/Impact Resistant 75lbs.	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Long sleeve protection required.	☒ Gloves—Type: Level 3 Cut Resistant and Puncture Resistant ☐ Other—Specify:__________

REMINDER: Complete an LPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.

¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Review of work area and exclusion zones	• Equipment damage and personal injury	• All parties must review the traffic control plan. • Review and have a clear understanding of work zones, areas of third-party traffic and safety zones for employees on foot.
2. Moving vehicle backwards	• Property damage or personal injury	• Always use a spotter when moving a vehicle backwards. Determine the route to take prior to moving the vehicle.
		• The spotter shall discuss signals with the driver ahead of time. • The spotter shall communicate by hand or radio signals with driver. • Ensure spotter is equipped with air horn
		• The driver shall obey signals from the spotter.
		• A separate spotter is required for each potential point of contact between the vehicle and another structure (e.g., if backing, a 2nd spotter is required if front of vehicle may contact a structure).
	• Property damage from vehicle hitting object due to blind spots	• If a blind spot exists, the driver must communicate this to the spotter and not move until the spotter determines that it is safe to proceed.
	• Property damage or personal injury due to third-party vehicles or pedestrians entering the path of the moving vehicle.	• Spotter and driver should assess for third-party traffic and pedestrians prior to moving vehicle. While spotting, both the driver and spotter should communicate with pedestrians to stay clear and stop if other vehicles approach. Ensure spotter is equipped with air horn.
	• Electrocution or damage from striking utility line	• A spotter must be used if vehicle is passing underneath overhead lines, unless it has been verified there is at least 3 feet (1.0 m) of clearance between the line and top of vehicle
		• The spotter shall not allow vehicle to pass underneath any utility line with 1 foot (0.3 m) or less clearance.
		• If clearance is 3 feet (1.0 m) or less, the driver is to restrict his speed to <5 miles per hour.
	• Fatality from being hit by vehicle	• Do not stand directly behind vehicle in the line of fire.
		• Spotter shall wear a traffic vest.
		• Do not spot for more than one vehicle at a time.
		• Driver shall stop if eye contact or visual contact with spotter is lost.
		• Maintain eye contact with driver when vehicle is moving. Do not glance away for more than 1 second.
3. Repositioning Spotter	• Broken ankle from tripping	• Never walk backwards while spotting.
		• Inspect ground before walking, and avoid slopes, trip hazards and uneven ground.
		• Spotter must not move while vehicle is being spotted. If spotter has to reposition, spotter shall direct vehicle to stop, turn and walk to new location, then re-establish eye contact with driver and resume spotting.

FIELD CHANGE SECTION: Document Job Steps, Potential Hazards, and Critical Actions to Mitigate Hazards seen during operations.

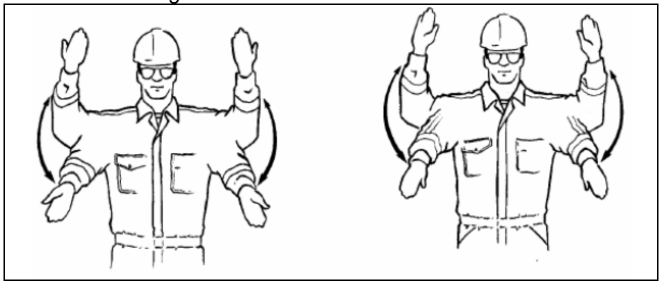
Job Safety Analysis

[1] Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed.

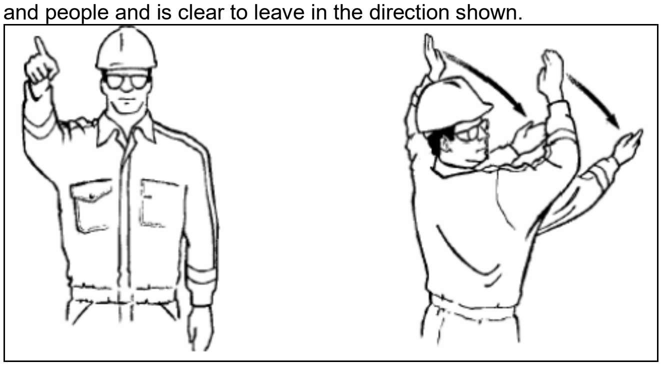
[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? **Contact**—struck by or strikes an object; **Caught**—caught on, in, or between objects; **Fall**—falls to ground or lower level (includes slips and trips); **Exertion**—excessive strain or stress/ergonomics/lifting techniques; **Exposure**—inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise, and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "Be careful" or "Use as appropriate."

BACK UP – Straight backward or forward



CLEAR TO LEAVE THE AREA
Show operator of equipment or vehicle it is clear of obstructions
and people and is clear to leave in the direction shown.

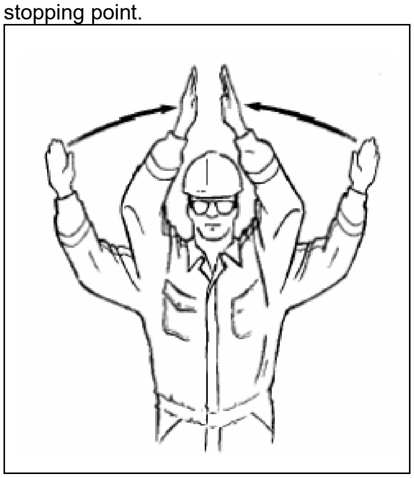


Turn vehicle **RIGHT**

Turn the vehicle **LEFT**

STOP all movement immediately.

Distance to **STOPPING POINT**
As hands get closer together, vehicle is closer to stopping point.



Appendix E STANTEC INCIDENT REPORTING PROCESS

Incident Reporting Protocol - US

Health, Safety, Security, & Environment

IMMEDIATE ACTIONS FOR ALL INJURIES/ILLNESS AND FOR SERIOUS* or SIGNIFICANT* INCIDENTS

1. **IMPLEMENT EMERGENCY RESPONSE PLAN.** At a minimum…
   a) **Stabilize the scene,**
   b) **Provide care for ill/injured people** (as needed),
      - for life-threatening injuries or serious injuries such as fractures or deep cuts, **call local emergency number** or transport injured employee to a medical facility and **inform the Worker's Compensation Claims Coordinator (WCCC)** listed below.
      - for non-life threatening/serious injuries, **call WorkCare at 1-888-449-7787**. If WorkCare recommends a clinic visit or the injured employee requests medical attention, **immediately inform the supervisor and the WCCC.** In most cases, WorkCare will provide guidance about which clinic is available and provide directions. Some job sites already have prescribed clinics. Use this *Clinic Search link* to access additional clinic locations.

2. **CALL YOUR SUPERVISOR** (within 1 hour). Leaving a voicemail does not count. If you cannot contact your supervisor or project manager, call the HSSE Contact listed below.

3. **SUPERVISOR RESPONSIBILITIES**
   a) **Immediately call your HSSE Contact** to discuss severity and required notifications (e.g., BCOL/PM/Account Manager).
   b) **Require that an 'Incident Report' be submitted in** Pro-Sapien (within 24 hrs.) and **complete the 'Initial Review'**.
   c) If the employee sought treatment at a medical facility, **obtain the medical note and call the WCCC**.

HSSE Contacts		**Cell**
Buildings	Kyle Ferguson	902-240-3847
Energy & Resources	Warren Bridgewater	403-689-6219
Environmental Services	Peter Petro	279-289-0708
Infrastructure / Community Development	Ruth O'Haire	780-231-5290
Infrastructure / Transportation	Yvonne Beattie	780-616-8909
Water	Randy Jones	907-707-9305
FST / Corporate / Regional G&A and Shared Services (see Region Map - North America)		
North Central	Wes Cline	916-281-7459
Northeast	Fred Miller	610-235-7315
South	David Williamson	407-768-7860
West	Tony Wong	805-234-6227
NA Export employees reporting to a US office	Kev Metcalfe	780-231-2185

Other HSSE Contacts		**Office**	**Cell**
WCCC	Melissa Helton	513-720-3706	513-720-3706
Director HSSE Operations – United States	Michael Doherty	503-220-5434	415-307-2920
HSSE Senior Vice President	Pat Poelzer	780-917-6964	587-930-8524
Your OSEC or HSSE Advisor	Office Safety Environment Coordinator (OSEC) Contacts		

* Significant and Serious incidents are levels 3 and 4 severity incidents: Examples include gas line strike, reportable spill/release, damages greater than $25k, involvement of a regulatory agency and negative media attention.

Please note: All incidents must be reported in Pro-Sapien, regardless of severity If you are not sure, call HSSE.

Appendix F SAFETY DATA SHEETS

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **EXXONMOBIL JET A-1**
Product Description: Hydrocarbons and Additives
Product Code: 708126-00
Intended Use: Aviation fuel

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX 77389 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	www.exxon.com, www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Flammable liquid: Category 3.
Skin irritation: Category 2. Specific target organ toxicant (central nervous system): Category 3. Aspiration toxicant: Category 1.

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:

H226: Flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H336: May cause drowsiness or dizziness.

Precautionary Statements:
P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P261: Avoid breathing mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves and eye / face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/ attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Contains: Kerosine (petroleum)

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS
Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

HEALTH HAZARDS
High-pressure injection under skin may cause serious damage. May be irritating to the eyes, nose, throat, and lungs. Breathing of high vapor concentrations may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness.

ENVIRONMENTAL HAZARDS
Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	2	Flammability:	2	Reactivity:	0
HMIS Hazard ID:	Health:	2	Flammability:	2	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#		GHS Hazard Codes

		Concentration*	
Kerosine (petroleum)	8008-20-6	> 99 %	H226, H304, H336, H315, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL BENZENE	100-41-4	0.1 - 1%	H225, H304, H332, H373, H401, H412
NAPHTHALENE	91-20-3	< 1%	H228(2), H302, H351, H400(M factor 1), H410(M factor 1)

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE

Contains hydrocarbon solvent/petroleum hydrocarbons; skin contact may aggravate an existing dermatitis.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Flammable. Hazardous material. Firefighters should consider protective equipment indicated in Section 8. Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.7 UEL: 5.0
Autoignition Temperature: 250°C (482°F) [ASTM E659]

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Do not siphon by mouth. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) during safety critical tasks, such as bulk fuel loading or unloading operations, or in storage areas where vapors may be present, unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
Kerosine (petroleum)	Stable Aerosol.	TWA	5 mg/m3		Skin	ExxonMobil
Kerosine (petroleum)	Vapor.	TWA	200 mg/m3		Skin	ExxonMobil
Kerosine (petroleum) [as total hydrocarbon vapor]	Non-Aerosol	TWA	200 mg/m3		Skin	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
ETHYL BENZENE	Creatinine in urine	End of shift	0.15 g/g	Sum of mandelic acid and phenylglyoxylic acid	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Pale Yellow
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.775 - 0.83
Density (at 15 °C): 750 kg/m³ (6.26 lbs/gal, 0.75 kg/dm³) - 860 kg/m³ (7.18 lbs/gal, 0.86 kg/dm³) [ASTM D4052]
Flammability (Solid, Gas): N/A
Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.7 UEL: 5.0
Autoignition Temperature: 250°C (482°F) [ASTM E659]
Boiling Point / Range: > 200°C (392°F) [EN ISO 3405]
Decomposition Temperature: N/D
Vapor Density (Air = 1): N/D
Vapor Pressure: < 0.133 kPa (1 mm Hg) at 20 °C [EN 13016-1]
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible

Viscosity: 1.1 cSt (1.1 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION
Freezing Point: -47°C (-53°F) - -40°C (-40°F)
Melting Point: N/A

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Alkalies, Halogens, Strong Acids, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 > 5000 mg/m3 (Vapor)	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 420
Skin	
Acute Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 402
Skin Corrosion/Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.

Germ Cell Mutagenicity: Data available.	Not expected to be a germ cell mutagen. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475 476 478 479
Carcinogenicity: Data available.	Not expected to cause cancer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 414 421
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	May cause drowsiness or dizziness.
Repeated Exposure: Data available.	Not expected to cause organ damage from prolonged or repeated exposure. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 412

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapor) (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Vapor/aerosol concentrations above recommended exposure levels are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness and other central nervous system effects including death.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Repeated co-exposure to monoaromatic hydrocarbons contained in this product in excess of recognized occupational exposure limits and noise levels in excess of 85 dB(A) may increase the risk of hearing impairment.

Jet fuel: Some jet fuels have potential in mice to suppress indicators of immune system functionality. The relevance of these effects to humans is uncertain.

Contains:

Kerosene: Carcinogenic in animal tests. Lifetime skin painting tests produced tumors, but the mechanism is due to repeated cycles of skin damage and restorative hyperplasia. This mechanism is considered unlikely in humans where such prolonged skin irritation would not be tolerated. Did not cause mutations In vitro. Inhalation of vapors did not result in reproductive or developmental effects in laboratory animals. Inhalation of high concentrations in animals resulted in respiratory tract irritation, lung changes and some reduction in lung function. Non-sensitizing in animal tests.

NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ETHYL BENZENE	100-41-4	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

Majority of components -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Majority of components -- Low potential to migrate through soil.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Material -- Expected to be inherently biodegradable

Atmospheric Oxidation:

Majority of components -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	48 hour(s)	Daphnia magna	EL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	96 hour(s)	Oncorhynchus mykiss	LL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	EL50 1 - 100 mg/l: data for similar materials

Aquatic - Chronic Toxicity	21 day(s)	Daphnia magna	NOELR 0.48 mg/l: data for similar materials
Aquatic - Chronic Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	NOELR 1 - 10 mg/l: data for similar materials

Persistence, Degradability and Bioaccumulation Potential

Media	Test Type	Duration	Test Results
Water	Ready Biodegradability	28 day(s)	Percent Degraded < 60 : similar material

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)

Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
Hazard Class & Division: 3
ID Number: 1863
Packing Group: III
Marine Pollutant: Yes
ERG Number: 128
Label(s): 3
Transport Document Name: UN1863, FUEL, AVIATION, TURBINE ENGINE, 3, PG III, MARINE POLLUTANT (Kerosene)

Footnote: The flash point of this material is greater than 100 F. Regulatory classification of this material varies. DOT: Flammable liquid or combustible liquid. OSHA: Combustible liquid. IATA/IMO: Flammable liquid.

LAND (TDG)

Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
Hazard Class & Division: 3
UN Number: 1863
Packing Group: III
Special Provisions: 17, 150

SEA (IMDG)

Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1863
Packing Group: III
Marine Pollutant: Yes
Label(s): 3
Transport Document Name: UN1863, FUEL, AVIATION, TURBINE ENGINE, 3, PG III, (38°C c.c.), MARINE POLLUTANT (Kerosene)

AIR (IATA)

Proper Shipping Name: FUEL, AVIATION, TURBINE ENGINE
Hazard Class & Division: 3
UN Number: 1863
Packing Group: III
Label(s) / Mark(s): 3
Transport Document Name: UN1863, FUEL, AVIATION, TURBINE ENGINE, 3, PG III

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, ENCS, IECSC, KECI, PICCS, TCSI, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE GHS HAZARD CLASSES: Aspiration Hazard, Flammable (gases, aerosols, liquids, or solids), Skin Corrosion or Irritation, Specific Target Organ toxicity (single or repeated exposure)

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value

ETHYL BENZENE	100-41-4	0.1 - 1%
NAPHTHALENE	91-20-3	< 1%

The following ingredients are cited on the lists below:

Chemical Name	**CAS Number**	**List Citations**
ETHYL BENZENE	100-41-4	1, 4, 10, 17, 19
Kerosine (petroleum)	8008-20-6	1, 18
NAPHTHALENE	91-20-3	1, 4, 10, 17, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL
2 = ACGIH A1
3 = ACGIH A2
4 = OSHA Z
5 = TSCA 4
6 = TSCA 5a2
7 = TSCA 5e
8 = TSCA 6
9 = TSCA 12b
10 = CA P65 CARC
11 = CA P65 REPRO
12 = CA RTK
13 = IL RTK
14 = LA RTK
15 = MI 293
16 = MN RTK
17 = NJ RTK
18 = PA RTK
19 = RI RTK

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights.

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
H228(2): Flammable solid; Flammable Solid, Cat 2
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H336: May cause drowsiness or dizziness; Target Organ Single, Narcotic
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Composition: Component Table information was modified.

Section 04: First Aid Inhalation information was modified.
Section 06: Accidental Release - Spill Management - Land information was modified.
Section 07: Handling and Storage - Handling information was modified.
Section 12: information was modified.
Section 14: Special Provisions information was modified.
Section 16: HCode Key information was modified.

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Internal Use Only
MHC: 1A, 0B, 0, 0, 4, 1 PPEC: C

DGN: 2000286XUS (1005331)

SAFETY DATA SHEET

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Revision Date 01/27/2015 Version 1.2

SECTION 1.Identification

Product identifier

Product number	HX0607
Product name	Hydrochloric Acid 34-37% OmniTrace®

Relevant identified uses of the substance or mixture and uses advised against

Identified uses	Reagent for research and development

Details of the supplier of the safety data sheet

Company	EMD Millipore Corporation | 290 Concord Road, Billerica, MA 01821, United States of America | General Inquiries: +1-978-715-4321 | Monday to Friday, 9:00 AM to 4:00 PM Eastern Time (GMT-5)

Emergency telephone	800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. Hazards identification

GHS Classification

Corrosive to Metals, Category 1, H290
Skin corrosion, Category 1B, H314
Serious eye damage, Category 1, H318
Specific target organ systemic toxicity - single exposure, Category 3, Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

GHS-Labeling

Hazard pictograms

Signal Word
Danger

Hazard Statements
H290 May be corrosive to metals.
H314 Causes severe skin burns and eye damage.
H335 May cause respiratory irritation.

Precautionary Statements

P234 Keep only in original container.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353 IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 Immediately call a POISON CENTER or doctor/ physician.
P321 Specific treatment (see supplemental first aid instructions on this label).
P363 Wash contaminated clothing before reuse.
P390 Absorb spillage to prevent material damage.
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.
P406 Store in corrosive resistant stainless steel container with a resistant inliner.
P501 Dispose of contents/ container to an approved waste disposal plant.

Other hazards

None known.

SECTION 3. Composition/information on ingredients

Chemical nature	Aqueous solution

Hazardous ingredients

Chemical Name (Concentration)
CAS-No.
hydrochloric acid (>= 30 % - < 50 %)
7647-01-0

Exact percentages are being wihtheld as a trade secret.

SECTION 4. First aid measures

Description of first-aid measures

General advice
First aider needs to protect himself.

Inhalation
After inhalation: fresh air. Call in physician.

Skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

Eye contact
After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist.

Ingestion
After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation!). Call a physician immediately. Do not attempt to neutralize.

Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed

Irritation and corrosion, Cough, Shortness of breath, cardiovascular disorders, Risk of blindness!

Indication of any immediate medical attention and special treatment needed

No information available.

SECTION 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

Special hazards arising from the substance or mixture

Not combustible.
Ambient fire may liberate hazardous vapors.
Fire may cause evolution of:
Hydrogen chloride gas

Advice for firefighters

Special protective equipment for fire-fighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

Advice for emergency responders: Protective equipment see section 8.

Environmental precautions

Do not empty into drains.

Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills.
Observe possible material restrictions (see sections 7 and 10).
Take up with liquid-absorbent and neutralizing material (e.g. Chemizorb® H^+, Art. No. 101595).
Dispose of properly. Clean up affected area.

SECTION 7. Handling and storage

Precautions for safe handling

Observe label precautions.

Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers

No metal containers.

Tightly closed.

Store at room temperature.

SECTION 8. Exposure controls/personal protection

Exposure limit(s)

Ingredients

Basis	Value	Threshold limits	Remarks
hydrochloric acid 7647-01-0			
ACGIH	Ceiling Limit Value:	2 ppm	
NIOSH/GUIDE	Ceiling Limit Value and Time Period (if specified):	5 ppm 7 mg/m³	
OSHA_TRANS	Ceiling Limit Value:	5 ppm 7 mg/m³	
Z1A	Ceiling Limit Value:	5 ppm 7 mg/m³	

Engineering measures

Technical measures and appropriate working operations should be given priority over the use of personal protective equipment.

Individual protection measures

Protective clothing should be selected specifically for the workplace, depending on concentration and quantity of the hazardous substances handled. The chemical resistance of the protective equipment should be inquired at the respective supplier.

Hygiene measures

Immediately change contaminated clothing. Apply skin- protective barrier cream. Wash hands and face after working with substance.

Eye/face protection

Tightly fitting safety goggles

Hand protection

Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Other protective equipment:

Acid-resistant protective clothing.

Respiratory protection
required when vapors/aerosols are generated.
Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

SECTION 9. Physical and chemical properties

Physical state	liquid
Color	colorless
Odor	stinging
Odor Threshold	0.8 - 5 ppm Gaseous hydrogen chloride (HCl).
pH	< 1 at 68 °F (20 °C)
Solidification point	-30 °C
Boiling point	No information available.
Flash point	Not applicable
Evaporation rate	No information available.
Flammability (solid, gas)	No information available.
Lower explosion limit	Not applicable
Upper explosion limit	Not applicable
Vapor pressure	190 hPa at 68 °F (20 °C)
Relative vapor density	No information available.
Density	ca.1.19 g/cm³ at 68 °F (20 °C)
Relative density	No information available.
Water solubility	at 68 °F (20 °C) soluble
Partition coefficient: n-octanol/water	Not applicable

Autoignition temperature	No information available.
Decomposition temperature	No information available.
Viscosity, dynamic	2.3 mPa.s at 59 °F (15 °C)
Explosive properties	Not classified as explosive.
Oxidizing properties	none
Ignition temperature	Not applicable
Corrosion	May be corrosive to metals.

SECTION 10. Stability and reactivity

Reactivity

Corrosive in contact with metals

Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

Possibility of hazardous reactions

Exothermic reaction with:

Amines, potassium permanganate, salts of oxyhalogenic acids, semimetallic oxides, semimetallic hydrogen compounds, Aldehydes, vinylmethyl ether

Risk of ignition or formation of inflammable gases or vapors with:

carbides, lithium silicide, Fluorine

Generates dangerous gases or fumes in contact with:

Aluminum, hydrides, formaldehyde, Metals, strong alkalis, Sulfides

Risk of explosion with:

Alkali metals, conc. sulfuric acid

Conditions to avoid

Heating.

Incompatible materials

Metals, metal alloys
Gives off hydrogen by reaction with metals.

Hazardous decomposition products

in the event of fire: See section 5.

SECTION 11. Toxicological information

Information on toxicological effects

Likely route of exposure
Inhalation, Eye contact, Skin contact

Target Organs
Eyes
Skin
Respiratory system
Cornea

Acute oral toxicity
Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Acute toxicity estimate: 1,892 mg/kg
Calculation method

Acute inhalation toxicity

Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

Acute toxicity estimate: 6.41 mg/l; 4 h
Calculation method

Skin irritation
Mixture causes burns.

Eye irritation
Mixture causes serious eye damage. Risk of blindness!

Specific target organ systemic toxicity - single exposure
Target Organs: Respiratory system
Mixture may cause respiratory irritation.

Specific target organ systemic toxicity - repeated exposure
The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard
Regarding the available data the classification criteria are not fulfilled.

Carcinogenicity

IARC	No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
OSHA	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
NTP	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
ACGIH	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

Further information

After uptake:
After a latency period:
cardiovascular disorders
Handle in accordance with good industrial hygiene and safety practice.

Ingredients

hydrochloric acid
No information available.

SECTION 12. Ecological information

Ecotoxicity

No information available.

Persistence and degradability

No information available.

Bioaccumulative potential

Partition coefficient: n-octanol/water
Not applicable

Mobility in soil

No information available.

Additional ecological information
Forms corrosive mixtures with water even if diluted. Harmful effect due to pH shift.
Discharge into the environment must be avoided.

Ingredients

hydrochloric acid

Substance does not meets the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII.

SECTION 13. Disposal considerations

The information presented only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. Disposal should be in accordance with applicable regional, national and local laws and regulations.

SECTION 14. Transport information

Land transport (DOT)

UN number	UN 1789
Proper shipping name	HYDROCHLORIC ACID
Class	8
Packing group	II
Environmentally hazardous	--

Air transport (IATA)

UN number	UN 1789
Proper shipping name	HYDROCHLORIC ACID
Class	8
Packing group	II
Environmentally hazardous	--
Special precautions for user	no

Sea transport (IMDG)

UN number	UN 1789
Proper shipping name	HYDROCHLORIC ACID
Class	8
Packing group	II
Environmentally hazardous	--
Special precautions for user	yes
EmS	F-A S-B

SECTION 15. Regulatory information

United States of America

SARA 313

The following components are subject to reporting levels established by SARA Title III, Section 313:

Ingredients		
hydrochloric acid	7647-01-0	*37 %*

SARA 302

The following components are subject to reporting levels established by SARA Title III, Section 302:

Ingredients	
hydrochloric acid	7647-01-0

Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

Ingredients
hydrochloric acid

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

Ingredients
hydrochloric acid

DEA List I

Not listed

DEA List II

Listed

Ingredients	
hydrochloric acid	7647-01-0

US State Regulations

Massachusetts Right To Know

Ingredients
hydrochloric acid

Pennsylvania Right To Know

Ingredients
hydrochloric acid

New Jersey Right To Know

Ingredients
hydrochloric acid

California Prop 65 Components

This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

Notification status

TSCA:	All components of the product are listed in the TSCA-inventory.
DSL:	All components of this product are on the Canadian DSL.
KOREA:	Not in compliance with the inventory

SECTION 16. Other information

Training advice

Provide adequate information, instruction and training for operators.

Labeling

Hazard pictograms

Signal Word
Danger

Hazard Statements
H290 May be corrosive to metals.
H314 Causes severe skin burns and eye damage.
H335 May cause respiratory irritation.

Precautionary Statements
Prevention
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P310 IF exposed or concerned: immediately call a POISON CENTER or doctor/ physician.

Full text of H-Statements referred to under sections 2 and 3.

H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.

Key or legend to abbreviations and acronyms used in the safety data sheet
Used abbreviations and acronyms can be looked up at www.wikipedia.org.

Revision Date01/27/2015

Safety Data Sheet

Effective date: 11 May 2020

Revision : 11 May 2020

Trade Name: Liquinox®

1 Identification of the substance/mixture and of the supplier

1.1 GHS Product identifier

Trade Name: Liquinox®
Product number: 1201, 1201-1, 1205, 1215, 1230, 1232, 1232-1, 1255

1.2 Application of the substance / the mixture: Cleaning material/Detergent

1.2.1 Recommended dilution ratio: 1 - 2% in water

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer:

Supplier:

Alconox Inc.
30 Glenn St
White Plains, NY 10603
(914) 948-4040

Emergency telephone number:
ChemTel Inc
North America: 1-888-255-3924
International: +1 813-248-0573

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272, 29CFR1910/1200 and GHS requirements.

Hazard-determining components of labeling:
Alcohol ethoxylate
Sodium alkylbenzene sulfonate
Sodium xylenesulphonate
Lauramine oxide

2.2 Label elements:

Eye damage, category 1.
Skin irritation, category 2.

Product at recommended dilution:

Eye irritation, category 2B

Hazard pictograms:

Signal word: Danger

Hazard statements:
H315 Causes skin irritation.
H318 Causes serious eye damage.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P501 Dispose of contents and container as instructed in Section 13.

Hazardous Elements at Use Dilution:

Hazard pictograms:

Signal word: Warning

Hazard statements:

H320 Causes eye irritation

Precautionary statements:

P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P501 Dispose of contents and container as instructed in Section 13

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): May cause surfaces to become slippery. Use caution in areas of foot traffic if on floors.

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272, 29CFR1910/1200 and GHS, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization: None

3.2 Description: None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Dam. 1; H318	10-25
CAS number: 1300-72-7	Sodium Xylenesulphonate	Eye Irrit. 2;H319	2.5-10
CAS number: 84133-50-6	Alcohol Ethoxylate	Skin Irrit. 2 ; H315 Eye Dam. 1; H318	2.5-10
CAS number: 1643-20-5	Lauramine oxide	Skin Irrit. 2 ; H315 Eye Dam. 1; H318	1-2

At use dilution:

CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Eye Irr. 2B; H319	0.1-0.25

3.4 Additional Information: None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:
Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:
Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:
Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:
Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

First aid measure at recommended dilution:

General information: None.

After inhalation:
Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:
Wash affected area with soap and water.

After eye contact:
Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.

After swallowing:
Rinse mouth thoroughly. Seek medical attention if irritation, discomfort, or vomiting develops.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents: None

5.2 Special hazards arising from the substance or mixture:

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information:

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions:

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up:

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections: None

7 Handling and storage

7.1 Precautions for safe handling:

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

8 Exposure controls/personal protection

8.1 Control parameters :

25322-68-3, Poly(ethylene oxide), AIHA TWA 10 mg/m3 (<0.15% present in concentrate)

8.2 Exposure controls

Appropriate engineering controls:
Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:
Not needed under normal conditions.

Protection of skin:
Select glove material impermeable and resistant to the substance.

Eye protection:
Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:
Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

Exposure Control and Personal Protective Equipment at recommended dilution:

Under normal use and operational conditions, no special personal protective equipment or engineering controls will be necessary. Handle with care.

9 Physical and chemical properties

Appearance (physical state, color):	Pale yellow liquid	**Explosion limit lower**: **Explosion limit upper**:	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or not available.
pH-value:	8.5 (as is)	**Relative density**:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or not available.
Flammability (solid, gaseous):	Not flammable	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	1.08 g/mL		

10 Stability and reactivity

10.1 Reactivity: Not determined or not available.
10.2 Chemical stability: Not determined or not available.
10.3 Possibility hazardous reactions: Not determined or not available.
10.4 Conditions to avoid: Not determined or not available.
10.5 Incompatible materials: Not determined or not available.
10.6 Hazardous decomposition products: Not determined or not available.

11 Toxicological information

11.1 Information on toxicological effects:

Acute Toxicity:

Oral:

: LD50 >5000 mg per kg (Rat, Oral) - product.

Chronic Toxicity: No additional information.

Skin corrosion/irritation (raw materials):

Alcohol Ethoxylate: May cause mild to moderate skin irritation.

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

Lauramine oxide: Causes skin irritation.

Serious eye damage/irritation (raw materials):

Sodium Alkylbenzene Sulfonate: Causes serious eye damage.

Alcohol Ethoxylate: Causes moderate to severe eye irritation and conjunctivitis.

Sodium xylenesulphonate: irritating to eyes.

Lauramine oxide: Causes serious eye damage.

Product information at recommended dilution:

Eye irritation may occur upon direct contact with eyes. No specific hazards for skin contact, inhalation, or chronic exposure are expected within normal use parameters.

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.9 mg/l, 48 hours. Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Lauramine oxide: Fish, LC50 24.3 mg/l, 96h [Killifish (Cyprinodontidae)]
Lauramine oxide: Aquatic invertebrates, (LC50): 3.6 mg/l 96 hours [Daphnia (Daphnia)].
Lauramine oxide: Aquatic plants, EC50 Algae 0.31 mg/l 72 hours [Algae]
Alcohol Ethoxylate: Aquatic invertebrates, (LC50): 4.01 mg/l 48 hours [Daphnia (daphnia)].

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: ADR, ADN, DOT, IMDG, IATA	None
14.2 UN Proper shipping name: ADR, ADN, DOT, IMDG, IATA	None
14.3 Transport hazard classes: ADR, ADN, DOT, IMDG, IATA	
Class:	None
Label:	None
LTD.QTY:	None
US DOT **Limited Quantity Exception:**	None

Bulk:	Non Bulk:
RQ (if applicable): None **Proper shipping Name:** None **Hazard Class:** None **Packing Group:** None **Marine Pollutant (if applicable):** No additional information. **Comments:** None	**RQ (if applicable):** None **Proper shipping Name:** None **Hazard Class:** None **Packing Group:** None **Marine Pollutant (if applicable):** No additional information. **Comments:** None

14.4 Packing group: None
ADR, ADN, DOT, IMDG, IATA

14.5 Environmental hazards: None

14.6 Special precautions for user: None

Danger code (Kemler):	None
EMS number:	None
Segregation groups:	None

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable.

14.8 Transport/Additional information:

Transport category:	None
Tunnel restriction code:	None
UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act)

Reportable Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed as active.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Germany MAK: Not classified.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H318 Causes serious eye damage.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

	At recommended dilution:
NFPA: 1-0-0 HMIS: 1-0-0	NFPA: 1-0-0 HMIS: 1-0-0

SAFETY DATA SHEET

1. Identification

Product identifier: NITRIC ACID

Other means of identification
Synonyms: Aqua Fortis, Azotic Acid
Product No.: 9604, V471, V231, V230, V077, 6623, 2712, 2707, 2706, 2704, H988, 5876, 5856, 5801, 5796, 1409, 9761, 9670, 9618, 9617, 9616, 9615, 9612, 9607, 9606, 9601, 9598, 9597, 5371, 20758, 20754, 20752, 20750

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer
Company Name: Avantor Performance Materials, Inc.
Address: 3477 Corporate Parkway, Suite 200
Center Valley, PA 18034
Telephone:
Customer Service: 855-282-6867
Fax:
Contact Person: Environmental Health & Safety
e-mail: info@avantormaterials.com

Emergency telephone number:
24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard classification

Physical hazards

Oxidizing liquids	Category 3
Corrosive to metals	Category 1

Health hazards

Skin corrosion/irritation	Category 1A

Unknown toxicity

Acute toxicity, oral	65 %
Acute toxicity, dermal	65 %
Acute toxicity, inhalation, vapor	100 %
Acute toxicity, inhalation, dust or mist	100 %

Unknown toxicity

Acute hazards to the aquatic environment	65 %
Chronic hazards to the aquatic environment	65 %

Label elements

Hazard symbol:

Signal word: Danger

Hazard statement: May intensify fire; oxidizer.
May be corrosive to metals.
Causes severe skin burns and eye damage.

Precautionary statement

Prevention: Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling. Keep only in original container. Keep away from heat. Keep/Store away from clothing/combustible materials. Take any precaution to avoid mixing with combustibles. Use only outdoors or in a well-ventilated area.

Response: In case of fire: Use water spray, foam, dry powder or carbon dioxide for extinction. Immediately call a POISON CENTER/doctor. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Absorb spillage to prevent material damage.

Storage: Store locked up. Store in corrosive resistant container with a resistant inner liner. Store in a well-ventilated place. Keep container tightly closed.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Mixtures

Chemical identity	Common name and synonyms	CAS number	Content in percent (%)*
NITRIC ACID		7697-37-2	65 - 70%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Do NOT induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Call a physician or poison control center immediately. If breathing stops, provide artificial respiration. If breathing is difficult, give oxygen.

Skin contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Symptoms: Corrosive to skin and eyes. Causes digestive tract burns. Spray mists may cause respiratory tract irritation.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General fire hazards: Strong oxidizer - contact with other material may cause fire.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Water spray, fog, CO2, dry chemical, or regular foam.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Oxidizing Contact with combustible material may cause fire. Fire may produce irritating, corrosive and/or toxic gases.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Keep unauthorized personnel away. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Use personal protective equipment. See Section 8 of the MSDS for Personal Protective Equipment. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Keep combustibles (wood, paper, oil, etc.) away from spilled material. Stop leak if possible without any risk. Do not absorb in sawdust or other combustible materials. Absorb spill with vermiculite or other inert material. Collect in a non-combustible container for prompt disposal. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.

Environmental precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling: Keep away from combustible material. Do not get in eyes, on skin, on clothing. Wash hands thoroughly after handling. Do not eat, drink or smoke when using the product. Do not taste or swallow. Never add water to acid! Never pour water into acid/base. Dilute by slowly pouring the product into water while stirring.

Conditions for safe storage, including any incompatibilities: Do not store in metal containers. Store away from heat and light. Keep away from combustible material. Keep containers closed when not in use. Store in a cool, dry place. Keep container in a well-ventilated place.

8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Chemical identity	Type	Exposure Limit values		Source
NITRIC ACID	TWA	2 ppm		US. ACGIH Threshold Limit Values (2011)
	STEL	4 ppm		US. ACGIH Threshold Limit Values (2011)
	STEL	4 ppm	10 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	REL	2 ppm	5 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	PEL	2 ppm	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	TWA	2 ppm	5 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	STEL	4 ppm	10 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)

Appropriate engineering controls No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin protection

Hand protection: Chemical resistant gloves

Other:	Wear suitable protective clothing.
Respiratory protection:	In case of inadequate ventilation use suitable respirator. Chemical respirator with acid gas cartridge.
Hygiene measures:	Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

9. Physical and chemical properties

Appearance	
Physical state:	Liquid
Form:	Liquid
Color:	Colorless to slightly yellow
Odor:	Pungent
Odor threshold:	No data available.
pH:	1 (0.1 molar aqueous solution)
Melting point/freezing point:	-42 °C
Initial boiling point and boiling range:	122 °C
Flash Point:	Not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	6.4 kPa
Vapor density:	2.5
Relative density:	1.41 (20 °C)
Solubility(ies)	
Solubility in water:	Soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	Reacts violently with strong alkaline substances.
Chemical stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur. Decomposes on heating.
Conditions to avoid:	Reacts violently with strong alkaline substances. Avoid contact with strong reducing agents. Excessive heat. Contact with incompatible materials.
Incompatible materials:	Alcohols. Reducing agents. Metals. Alkalies.
Hazardous decomposition products:	Nitrogen Oxides By heating and fire, corrosive vapors/gases may be formed.

11. Toxicological information

Information on likely routes of exposure

Ingestion:	May cause burns of the gastrointestinal tract if swallowed.
Inhalation:	May cause damage to mucous membranes in nose, throat, lungs and bronchial system.
Skin contact:	Causes severe skin burns.
Eye contact:	Causes serious eye damage.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product:	No data available.

Dermal

Product:	No data available.

Inhalation

Product:	No data available.
Specified substance(s):	
NITRIC ACID	LC 50 (Rat, 4 h): 65 mg/l

Repeated dose toxicity

Product:	No data available.

Skin corrosion/irritation

Product:	Causes severe skin burns.

Serious eye damage/eye irritation

Product:	Causes serious eye damage.

Respiratory or skin sensitization

Product:	Not a skin nor a respiratory sensitizer.

Carcinogenicity

Product:	This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ cell mutagenicity

In vitro

Product:	No mutagenic components identified

In vivo

Product:	No mutagenic components identified

Reproductive toxicity

Product:	No components toxic to reproduction

Specific target organ toxicity - single exposure

Product:	None known.

Specific target organ toxicity - repeated exposure

Product:	None known.

Aspiration hazard

Product:	Not classified

Other effects:	None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish

Product:	No data available.
Specified substance(s):	
NITRIC ACID	LC 50 (Fish, 48 h): 100 - 330 mg/l Mortality

Aquatic invertebrates

Product:	No data available.
Specified substance(s):	
NITRIC ACID	LC 50 (Cockle (Cerastoderma edule), 48 h): 330 - 1,000 mg/l Mortality LC 50 (Green or European shore crab (Carcinus maenas), 48 h): 180 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish

Product:	No data available.

Aquatic invertebrates

Product:	No data available.

Toxicity to Aquatic Plants

Product:	No data available.

Persistence and degradability

Biodegradation

Product:	Expected to be readily biodegradable.

BOD/COD ratio

Product:	No data available.

Bioaccumulative potential

Bioconcentration factor (BCF)

Product:	No data available on bioaccumulation.

Partition coefficient n-octanol / water (log Kow)

Product:	No data available.
Mobility in soil:	The product is water soluble and may spread in water systems.
Other adverse effects:	The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions:	Discharge, treatment, or disposal may be subject to national, state, or local laws.
Contaminated packaging:	Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number:	UN 2031
UN proper shipping name:	Nitric acid
Transport hazard class(es)	
Class(es):	8, 5.1
Label(s):	8, 5.1
Packing group:	II
Marine Pollutant:	No

IMDG

UN number:	UN 2031
UN proper shipping name:	NITRIC ACID
Transport hazard class(es)	
Class(es):	8, 5.1
Label(s):	8, 5.1
EmS No.:	F-A, S-Q
Packing group:	II
Marine Pollutant:	No

IATA

UN number:	UN 2031
Proper Shipping Name:	Nitric acid
Transport hazard class(es):	
Class(es):	8, 5.1
Label(s):	8, 5.1
Marine Pollutant:	No
Packing group:	II

15. Regulatory information

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

NITRIC ACID	Reportable quantity: 1000 lbs.

Superfund amendments and reauthorization act of 1986 (SARA)

Hazard categories

☒ Acute (Immediate) ☒ Chronic (Delayed) ☒ Fire ☐ Reactive ☐ Pressure Generating

SARA 302 Extremely hazardous substance

Chemical identity	RQ	Threshold Planning Quantity
NITRIC ACID	1000 lbs.	1000 lbs.

SARA 304 Emergency release notification

Chemical identity	RQ
NITRIC ACID	1000 lbs.

SARA 311/312 Hazardous chemical

Chemical identity	Threshold Planning Quantity
NITRIC ACID	500lbs

SARA 313 (TRI reporting)

Chemical identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
NITRIC ACID	10000 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

NITRIC ACID	Reportable quantity: 1000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

NITRIC ACID	Threshold quantity: 15000 lbs

US state regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

NITRIC ACID	Listed

US. Massachusetts RTK - Substance List

NITRIC ACID	Listed

US. Pennsylvania RTK - Hazardous Substances

NITRIC ACID	Listed

US. Rhode Island RTK

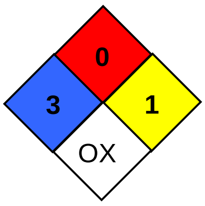
NITRIC ACID	Listed

Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EINECS, ELINCS or NLP:	On or in compliance with the inventory
Japan (ENCS) List:	On or in compliance with the inventory
China Inv. Existing Chemical Substances:	Not in compliance with the inventory.
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16.Other information, including date of preparation or last revision

NFPA Hazard ID



🟥 Flammability
🟦 Health
🟨 Reactivity
⬜ Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe
OXY: Oxidizer

Issue date:	06-04-2014
Revision date:	No data available.
Version #:	2.0
Further information:	No data available.

Disclaimer:

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Material Safety Data Sheet
Sodium bisulfate monohydrate

ACC# 20995

Section 1 - Chemical Product and Company Identification

MSDS Name: Sodium bisulfate monohydrate
Catalog Numbers: AC419430000, AC419430050, AC419435000, S240-3, S240-500, S2403LC
Synonyms: Sodium hydrogen sulfate monohydrate.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
10034-88-5	Sodium bisulfate monohydrate	97+	unlisted

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless crystals.
Danger! Causes eye and skin burns. Causes digestive and respiratory tract burns. Hygroscopic (absorbs moisture from the air). Corrosive to aluminum in aqueous solution.
Target Organs: Respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects

Eye: Causes eye burns.
Skin: Contact with skin causes irritation and possible burns, especially if the skin is wet or moist.
Ingestion: May cause burns to the digestive tract.
Inhalation: May cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed lung edema. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Substance is noncombustible. Reacts with most metals in the presence of moisture, liberating extremely flammable hydrogen gas. Oxides of sulfur may be produced in fire.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation. Remove ignition sources since flammable hydrogen gas may be generated by reaction of metal with aqueous solution of product.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Use with adequate ventilation. Discard contaminated shoes.
Storage: Store in a cool, dry place. Keep container closed when not in use. Aqueous solutions cannot be stored in aluminum, carbon steel, copper, copper alloys, zinc or nickel containers.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Sodium bisulfate monohydrate	none listed	none listed	none listed
Sodium bisulfate anhydrous	none listed	none listed	none listed

OSHA Vacated PELs: Sodium bisulfate monohydrate: No OSHA Vacated PELs are listed for this chemical. Sodium bisulfate anhydrous: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Crystals
Appearance: colorless
Odor: odorless
pH: ~1 (50 g/l H_2O @ 20°C)
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: Decomposes.
Freezing/Melting Point:183 deg C
Decomposition Temperature:430 deg C
Solubility: Soluble.
Specific Gravity/Density:2.12 g/cm3
Molecular Formula:$NaHSO_4.H_2O$
Molecular Weight:138.08

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures. Hygroscopic: absorbs moisture or water from the air.
Conditions to Avoid: Dust generation, excess heat, exposure to moist air or water, Corrosive to aluminum in aqueous solution..
Incompatibilities with Other Materials: Metals, strong bases, alcohols.
Hazardous Decomposition Products: Oxides of sulfur.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 10034-88-5: VZ1870000
CAS# 7681-38-1: VZ1860000
LD50/LC50:
Not available.
Not available.

Carcinogenicity:
CAS# 10034-88-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7681-38-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No data available.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	**Canada TDG**
Shipping Name:	CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.	Corrosive Solid, Acidic, Inorganic, N.O. (SODIUM BISULFATE MONOHYDRATE)
Hazard Class:	8	8
UN Number:	UN3260	UN3260
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 10034-88-5 is not on the TSCA Inventory because it is a hydrate. It is considered to be listed if the CAS number for the anhydrous form is on the inventory (40CFR720.3(u)(2)).
CAS# 7681-38-1 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 10034-88-5: immediate.
CAS # 7681-38-1: immediate.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 10034-88-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 7681-38-1 can be found on the following state right to know lists: New Jersey.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XI

Risk Phrases:

R 41 Risk of serious damage to eyes.

Safety Phrases:

S 24 Avoid contact with skin.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

WGK (Water Danger/Protection)

CAS# 10034-88-5: No information available.
CAS# 7681-38-1: 1

Canada - DSL/NDSL

CAS# 7681-38-1 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7681-38-1 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/30/1997
Revision #7 Date: 2/15/2008

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : **Methanol, Lab Grade, 4L**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25426A**

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:

Flammable
Flammable liquids, category 2

Toxic
Acute toxicity (oral, dermal, inhalation), category 3

Health hazard
Specific target organ toxicity following single exposure, category 1

AcTox Dermal. 3
Flammable liq. 2
AcTox Oral. 3
AcTox Inhaln. 3
Stot SE. 1

Signal word :Danger

Hazard statements:
Highly flammable liquid and vapour
Toxic if swallowed
Toxic in contact with skin
Toxic if inhaled
Causes damage to organs
Precautionary statements:
If medical advice is needed, have product container or label at hand
Keep out of reach of children
Read label before use

Wear protective gloves/protective clothing/eye protection/face protection
Wash skin thoroughly after handling
Do not eat, drink or smoke when using this product
Avoid breathing dust/fume/gas/mist/vapours/spray
Keep away from heat/sparks/open flames/hot surfaces. No smoking
Do not breathe dust/fume/gas/mist/vapours/spray
Specific treatment (see supplemental first aid instructions on this label)
IF ON SKIN: Wash with soap and water
Call a POISON CENTER or doctor/physician if you feel unwell
Specific measures (see supplemental first aid instructions on this label)
Take off contaminated clothing and wash before reuse
Wash contaminated clothing before reuse
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
IF exposed: Call a POISON CENTER or doctor/physician
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Store locked up
Store in a well ventilated place. Keep cool
Dispose of contents and container as instructed in Section 13

Other Non-GHS Classification:

WHMIS

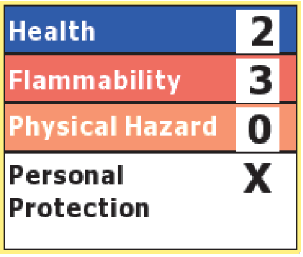
B2

D1B

D2B

NFPA/HMIS

NFPA SCALE (0-4)



Health	2
Flammability	3
Physical Hazard	0
Personal Protection	X

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:		
CAS 67-56-1	Methanol	>90 %

Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Move exposed individual to fresh air. Loosen clothing as necessary and position individual in a comfortable position.Get medical assistance.If breathing is difficult, give oxygen

After skin contact: Wash affected area with soap and water. Rinse/flush exposed skin gently using water for 15-20 minutes. Seek medical attention if irritation persists or if concerned.

After eye contact: Protect unexposed eye. Rinse or flush eye gently with water for at least 15-20 minutes, lifting upper and lower lids.Seek medical attention if irritation persists or if concerned

After swallowing: Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Dilute mouth with water or milk after rinsing.Get medical assistance.

Most important symptoms and effects, both acute and delayed:

Poison. Toxic by ingestion, absorption through skin and inhalation, potentially causing irreversible effects. Irritating to eyes, skin, and respiratory tract. Irritation- all routes of exposure.Shortness of breath.Nausea.Headache.May be fatal or cause blindness if swallowed. Cannot be made non-poisonous. May cause gastrointestinal irritation, vomiting, and diarrhea. Central nervous system disorders. Skin disorders, preexisting eye disorders, gastrointestinal tract;Toxic: danger of very serious irreversible effects by inhalation, ingestion or absorption through skin. Experiments have shown reproductive toxicity effects on laboratory animals. May cause adverse kidney and liver effects

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician.Physician should treat symptomatically.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: Dry chemical, foam, dry sand, or Carbon Dioxide.Water spray can keep containers cool.

For safety reasons unsuitable extinguishing agents: Water may be ineffective.

Special hazards arising from the substance or mixture:

Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated

Advice for firefighters:

Protective equipment: Wear protective eyeware, gloves, and clothing. Refer to Section 8.

Additional information (precautions): Remove all sources of ignition. Avoid contact with skin, eyes, and clothing.Ensure adequate ventilation.Take precautions against static discharge.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Use spark-proof tools and explosion-proof equipment.Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor and mists below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.Ensure adequate ventilation.

Environmental precautions:

Prevent from reaching drains, sewer or waterway. Should not be released into environment.

Methods and material for containment and cleaning up:

If necessary use trained response staff or contractor. Remove all sources of ignition. Contain spillage and then collect. Do not flush to sewer.Absorb with a noncombustible absorbent material such as sand or earth and containerize for disposal. Ventilate area of leak or spill.Use spark-proof tools and explosion-proof equipment.Follow proper disposal methods. Refer to Section 13.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Use in a chemical fume hood. Wash hands before breaks and immediately after handling the product.Avoid contact with skin, eyes, and clothing.Take precautions against static discharge.

Conditions for safe storage, including any incompatibilities:

Store in a cool location. Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Keep container tightly sealed.Store with like hazards. Protect from freezing and physical damage.

SECTION 8 : Exposure controls/personal protection

Control Parameters:	67-56-1, Methanol, ACGIH: 250 ppm STEL; 200 ppm TWA 67-56-1, Methanol, NIOSH: 250 ppm STEL; 325 mg/m3 STEL 67-56-1, Methanol, NIOSH: 200 ppm TWA; 260 mg/m3 TWA
Appropriate Engineering controls:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling. Ensure that dust-handling systems (exhaust ducts, dust collectors, vessels, and processing equipment) are designed to prevent the escape of dust into the work area.
Respiratory protection:	Use in a chemical fume hood. If exposure limit is exceeded, a full-face respirator with organic cartridge may be worn.
Protection of skin:	Select glove material impermeable and resistant to the substance.Select glove material based on rates of diffusion and degradation.
Eye protection:	Safety glasses with side shields or goggles.
General hygienic measures:	Wash hands before breaks and at the end of work. Avoid contact with the eyes and skin.Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.Perform routine housekeeping.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	Clear colorless liquid	**Explosion limit lower**: **Explosion limit upper**:	6 31
Odor:	Alcohol	**Vapor pressure**:	128 hPa @ 20°C
Odor threshold:	Not Available	**Vapor density**:	1.11
pH-value:	Not Available	**Relative density**:	0.79
Melting/Freezing point:	-98°C	**Solubilities**:	Miscible at 20 °C

Boiling point/Boiling range:	64.7°C @ 760mmHg	**Partition coefficient (n-octanol/water)**:	Not Available
Flash point (closed cup):	12°C	**Auto/Self-ignition temperature**:	455°C
Evaporation rate:	5.2	**Decomposition temperature**:	Not Available
Flammability (solid,gaseous):	Flammable	**Viscosity**:	a. Kinematic:Not Available b. Dynamic: Not Available
Density: Not Available			

SECTION 10 : Stability and reactivity

Reactivity: Vapours may form explosive mixture with air.
Chemical stability: Stable under normal conditions.
Possible hazardous reactions: None under normal processing.
Conditions to avoid: Excess heat, Incompatible Materials, flames, or sparks.
Incompatible materials: Oxidizing agents, reducing agents, alkali metals, acids, sodium, potassium, metals as powders, acid chlorides, acid anhydrides, powdered magnesium, and aluminum.
Hazardous decomposition products:carbon monoxide, formaldehyde.

SECTION 11 : Toxicological information

Acute Toxicity:		
Dermal:	(rabbit)	LD-50 15800 mg/kg
Oral:	(rat)	LD-50 5628 mg/kg
Inhalation:	(rat)	LC-50 130,7 mg/l
Chronic Toxicity: No additional information.		
Corrosion Irritation:		
Ocular:		Irritating to eyes
Dermal:		Irritating to skin
Sensitization:		No additional information.
Single Target Organ (STOT):		Classified as causing damage to organs:Eyes, skin, optic nerve, gastrointestinal tract, central nervous system, respiratory system, liver, spleen, kidney, blood
Numerical Measures:		No additional information.
Carcinogenicity:		Teratogenicity : has occurred in experimental animals.
Mutagenicity:		Mutagenetic effects have occurred in experimental animals.

Reproductive Toxicity:	Developmental Effects (Immediate/Delayed) have occurred in experimental animals

SECTION 12 : Ecological information

Ecotoxicity

Freshwater Fish: 96 Hr LC50 Pimephales promelas: 28200 mg/L

Freshwater Fish: 96 Hr LC50 Oncorhynchus mykiss: 19500 - 20700 mg/L

Freshwater Fish: 96 Hr LC50 Pimephales promelas: >100 mg/L

Freshwater Fish: 96 Hr LC50 Oncorhynchus mykiss: 18 - 20 mL/L

Freshwater Fish: 96 Hr LC50 Lepomis macrochirus: 13500 - 17600 mg/L

Persistence and degradability: Not persistant.
Bioaccumulative potential: Not Bioaccumulative.
Mobility in soil: Aqueous solution has high mobility in soil.
Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Methanol RCRA waste code U154. Do not allow product to reach sewage system or open water.It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Absorb with a noncombustible absorbent material such as sand or earth and containerize for disposal. Provide ventilation. Have fire extinguishing agent available in case of fire. Eliminate all sources of ignition.Use spark-proof tools and explosion-proof equipment.Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

SECTION 14 : Transport information

UN-Number

UN1230

UN proper shipping name

Methanol

Transport hazard class(es)

Class:
3 Flammable liquids

Class:
6.1 Toxic substances

Packing group:II
Environmental hazard:
Transport in bulk:
Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Acute, Chronic, Fire

SARA Section 313 (Specific toxic chemical listings):

67-56-1 Methanol

RCRA (hazardous waste code):

67-56-1 Methanol RCRA waste code U154

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

67-56-1 Methanol 5000 lbs

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

67-56-1 Methanol

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

67-56-1 Methanol

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.Note:. The responsibility to provide a safe workplace remains with the user.The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.The information contained herein is, to the best of our knowledge and belief, accurate.However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material.It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods
PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)
SARA: Superfund Amendments and Reauthorization Act (USA)
RCRA: Resource Conservation and Recovery Act (USA)
TSCA: Toxic Substances Control Act (USA)
NPRI: National Pollutant Release Inventory (Canada)
DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
DNEL: Derived No-Effect Level (REACH)

Effective date : 01.08.2015
Last updated : 03.27.2015

SAFETY DATA SHEET – NMS#330

Centurion^{TMC6} 3%
Aqueous Film Forming Foam Concentrate (AFFF)

1. IDENTIFICATION

Product Name	Centurion^{TMC6} 3% Aqueous Film Forming Foam Concentrate (AFFF)
Recommended use of the chemical and restrictions on use	
Identified uses	Firefighting Foam Concentrate
Restrictions on Use	See Section 15
Company Identification	National Foam 350 East Union Street West Chester, PA 19382
Customer Information Number	(610) 363-1400
Emergency Telephone Number	Infotrac at (800) 535-5053
Issue Date	May 18, 2021
Supersedes Date	November 30, 2020

Safety Data Sheet prepared in accordance with OSHA's Hazard Communication Standard (29 CFR 1910.1200, the Canadian Hazardous Products Regulations (HPR) and the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

2. HAZARD IDENTIFICATION

Hazard Classification
Eye Damage/Irritation – Category 2A

Label Elements
Hazard Symbols

Signal Word: Warning

Hazard Statements
Causes serious eye irritation.

Precautionary Statements

Prevention
Wash hands thoroughly after handling.
Wear eye protection and face protection.
Response
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists: Get medical advice/attention.
Storage
None
Disposal
None

Other Hazards
This product contains fluoroalkyl surfactants which are and include PFAS (per- or poly- fluoroalkyl substances) and is required to be disposed of by high temperature incineration. See Sections 13 and 15 for additional information.

2. HAZARD IDENTIFICATION

Specific Concentration Limits

The values listed below represent the percentages of ingredients of unknown toxicity.

Acute oral toxicity	<5%
Acute dermal toxicity	<5%
Acute inhalation toxicity	10 - 20%
Acute aquatic toxicity	<10%

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CAS Number	Concentration*
Dipropylene Glycol Monomethyl Ether	34590-94-8	1 - 5%
Sodium decyl sulfate	142-87-0	1 - 5%
Alkylpolyglycoside	132778-08-6	1 - 5%

*Exact concentration withheld as trade secret.

This product contains fluoroalkyl surfactants which are and include PFAS (per- or poly- fluoroalkyl substances). See Sections 13 and 15 for additional information.

4. FIRST- AID MEASURES

Description of necessary first-aid measures

Eyes

Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.

Skin

Wash skin thoroughly with soap and water. Obtain medical attention if irritation persists.

Ingestion

Dilute by drinking large quantities of water and obtain medical attention.

Inhalation

Move victim to fresh air. Obtain medical attention immediately for any breathing difficulty.

Most important symptoms/effects, acute and delayed

Aside from the information found under Description of necessary first aid measures (above) and Indication of immediate medical attention and special treatment needed, no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed

Notes to Physicians

Treat symptomatically.

5. FIRE - FIGHTING MEASURES

Suitable Extinguishing Media

This preparation is used as an extinguishing agent and therefore is not a problem when trying to control a fire. Use extinguishing agent appropriate to other materials involved.

5. FIRE - FIGHTING MEASURES

Specific hazards arising from the chemical
None known

Special Protective Actions for Fire-Fighters
Wear full protective clothing and self-contained breathing apparatus as appropriate for specific fire conditions.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures
Wear appropriate protective clothing. Prevent skin and eye contact.

Environmental Precautions
Environmental exposure controls: Observe local/national regulations on emissions. Ensure all local/national regulations are observed.
Prevent foam concentrate or foam solution from entering ground water, surface water, or storm drains. Discharge and disposal of concentrate or foam solution should be made in accordance with federal, state, and local regulations. See Section 13 for disposal requirements.

Methods and materials for containment and cleaning up
Contain and absorb using appropriate inert material and transfer into suitable containers for recovery or disposal. See Section 13 for disposal requirements.

7. HANDLING AND STORAGE

Precautions for safe handling
Wear appropriate protective clothing. Prevent skin and eye contact.

Conditions for safe storage
Store in original containers between 35°F and 120°F (2°C and 49°C). Storage area should be: - cool - dry - well ventilated - under cover - out of direct sunlight

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters
Exposure limits are listed below, if they exist.

Dipropylene Glycol Monomethyl Ether
ACGIH TLV: 100 ppm (606 mg/m^3) 8hr TWA; 15 min STEL 150 ppm (909 mg/m^3); Danger of cutaneous absorption.
OSHA PEL: 100 ppm (600 mg/m3) Danger of cutaneous absorption.
Sodium Decyl Sulfate
None established
Alkylpolyglycoside
None established

Appropriate engineering controls
Use with adequate ventilation. If this product is used in a pressurized system, there should be local procedures for the selection, training, inspection and maintenance of this equipment. When used in large volumes, use local exhaust ventilation.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Individual protection measures

Respiratory Protection

Wear respiratory protection if there is a risk of exposure to high vapor concentrations, aerosols or if applied to hot surfaces. A NIOSH approved full face respirator may be worn. The specific respirator selected must be based on the airborne concentration found in the workplace and must not exceed the working limits of the respirator.

Skin Protection

Gloves

Eye/Face Protection

Chemical goggles or safety glasses with side shields.

Body Protection

Normal work wear.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	
Physical State	Liquid
Color	Pale yellow
Odor	Mild, pleasant
Odor Threshold	No data available
pH	8.0
Specific Gravity	1.025
Boiling Range/Point (°C/F)	No data available
Melting Point (°C/F)	No data available
Flash Point (°C/F)	>200°F
Vapor Pressure	No data available
Evaporation Rate (BuAc=1)	No data available
Solubility in Water	Soluble
Vapor Density (Air = 1)	Not applicable
VOC (%)	No data available
Partition coefficient (n-octanol/water)	No data available
Viscosity	No data available
Auto-ignition Temperature	Not applicable
Decomposition Temperature	No data available
Upper explosive limit	Not applicable
Lower explosive limit	Not applicable
Flammability (solid, gas)	Not applicable

10. STABILITY AND REACTIVITY

Reactivity

No data available.

Chemical Stability

Stable under normal conditions.

Possibility of hazardous reactions

Hazardous polymerization will not occur.

10. STABILITY AND REACTIVITY

Conditions to Avoid
Contact with incompatible materials

Incompatible Materials
Water reactive materials – burning metals – electronically energized equipment

Hazardous Decomposition Products
Oxides of carbon – hydrogen fluoride – aldehydes – ketones – organic acids

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
Dipropylene Glycol Monomethyl Ether
Oral LD50 (rat) >5000 mg/kg
Dermal LD5 (rabbit) >9510 mg/kg
Inhalation LC50 (rat) > 3.35 mg/l,7h, vapour, no deaths occurred at this concentration

Specific Target Organ Toxicity (STOT) – single exposure
Available data indicates this product is not expected to cause target organ effects after a single exposure.

Specific Target Organ Toxicity (STOT) – repeat exposure
Available data indicates this component not expected to cause target organ effects after repeated exposure.

Serious Eye damage/Irritation
Product: Primary irritant (rabbit) (tested on a similar product)
Sodium decyl sulfate: Risk of serious eye damage (>=20%) Causes serious eye irritation (>=10 - <20%).
Alkylpolyglycoside: Severely irritating (rabbit) (50% solution)

Skin Corrosion/Irritation
Product: Not a primary irritant (rabbit) (tested on a similar product)

Respiratory or Skin Sensitization
Available data indicates this product is not expected to cause skin sensitization.

Carcinogenicity
Not considered carcinogenic by NTP, IARC, and OSHA.

Germ Cell Mutagenicity
Available data indicates this product is is not expected to be mutagenic.

Reproductive Toxicity
Available data indicates this product is not expected to cause reproductive toxicity or birth defects.

Aspiration Hazard
Not an aspiration hazard.

12. ECOLOGICAL INFORMATION

Ecotoxicity
No relevant studies identified.

12. ECOLOGICAL INFORMATION

Mobility in soil
No relevant studies identified.

Persistence/Degradability
No relevant studies identified.

Bioaccumulative Potential
No relevant studies identified.

Other adverse effects
No relevant studies identified.

13. DISPOSAL CONSIDERATIONS

Disposal Methods
This product contains PFAS (per- or poly- fluoroalkyl substances). Local requirements for waste disposal may be more restrictive or otherwise different from national regulations. Therefore, applicable local and state regulatory agencies should be contacted regarding disposal of waste foam concentrate or foam/foam solution.

Concentrate
Prevent foam concentrate from entering ground water, surface water or storm drains. Small quantities of foam concentrate may be collected on absorbents which can then be disposed of. Disposal should be made in accordance with local, state and federal regulations. High temperature incineration is required at a minimum of 1000°C with a minimum residence time of 2 seconds per the United States Environmental Protection Agency's Significant New Use Rule for a component of this product. See 40 CFR721.10700.

Foam/Foam Solution
Prevent foam/foam solution from entering ground water, surface water or storm drains. Small quantities of foam solution may be collected on absorbents which can then be disposed of. Disposal should be made in accordance with local, state and federal regulations. High temperature incineration is required at a minimum of 1000°C with a minimum residence time of 2 seconds per the United States Environmental Protection Agency's Significant New Use Rule for a component of this product. See 40 CFR721.10700.

NOTE: Please consult National Foam for additional information regarding the disposal of foam concentrates and foam solutions or visit http://nationalfoam.com/use-discharge-and-disposal-of-firefighting-foam-products/

14. TRANSPORT INFORMATION

Shipping Information

Shipping Description	Fire Extinguisher Charges or Compounds N.O.I., Class 70
National Motor Freight Code	69160 Sub 0

This information is not intended to convey all transportation classifications that may apply to this product. Classifications may vary by container volume and by regional regulations. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules when transporting this material.

15. REGULATORY INFORMATION

United States TSCA Inventory
This product contains ingredients that have restricted use under the EPA Toxic Substance Control Act and are subject to a Significant New Use Rule (40CFR721.10700, 40CFR721.10515 and 40CFR721.10727). This product may only be used as a fire fighting foam. Any other use of this product is strictly prohibited. Disposal of this product must be done by incineration at a minimum of 1000°C with a minimum residence time of 2 seconds.

Canada DSL Inventory
This product contains an ingredient that is not listed on the Domestic Substance List (DSL) or the Non-Domestic Substance List (NDSL).

SARA Title III Sect. 311/312 Categorization
Eye irritation

SARA Title III Sect. 313
This product does not contain any chemicals that are listed in Section 313 at or above de minimis concentrations.

California Proposition 65
⚠ **WARNING:** This product can expose you to chemicals including formaldehyde, which is known to the State of California to cause cancer, and perfluorooctanoic acid, 1,4 dioxane and methanol, which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov/

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
None

16. OTHER INFORMATION

NFPA Ratings
NFPA Code for Health - 0
NFPA Code for Flammability - 0
NFPA Code for Reactivity - 0
NFPA Code for Special Hazards - None

Legend
ACGIH: American Conference of Governmental Industrial Hygienists
CAS#: Chemical Abstracts Service Number
EC50: Effect Concentration 50%
IARC: International Agency for Research on Cancer
LC50: Lethal Concentration 50%
LD50: Lethal Dose 50%
N/A: Denotes no applicable information found or available
OSHA: Occupational Safety and Health Administration
PEL: Permissible Exposure Limit
RQ: Reportable Quantity
STEL: Short Term Exposure Limit
N/A: Denotes no applicable information found or available
OSHA: Occupational Safety and Health Administration
PEL: Permissible Exposure Limit
RQ: Reportable Quantity

16. OTHER INFORMATION

Legend, continued
STEL: Short Term Exposure Limit
TLV: Threshold Limit Value
TSCA: Toxic Substance Control Act

Revision Date: May 18, 2021
Replaces: November 30, 2020
Changes made: Updates to sections 2, 6 and 13 and 15.

Information Source and References
This SDS is prepared by Hazard Communication Specialists based on information provided by internal company references.

Prepared By: EnviroNet LLC.

Centurion is a trademark of Angus International.

The information and recommendations presented in this SDS are based on sources believed to be accurate. National Foam assumes no liability for the accuracy or completeness of this information. It is the user's responsibility to determine the suitability of the material for their particular purposes. In particular, we make NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, with respect to such information, and we assume no liability resulting from its use. Users should ensure that any use or disposal of the material is in accordance with applicable Federal, State, and local laws and regulations.

Appendix G EMERGENCY CONTACTS AND ROUTE MAPS

Muster Point: If there is an emergency where a fire, significant release, or safety hazard exists at the site, all personnel will assemble at the location identified during the safety and orientation meeting. Factors to consider are:

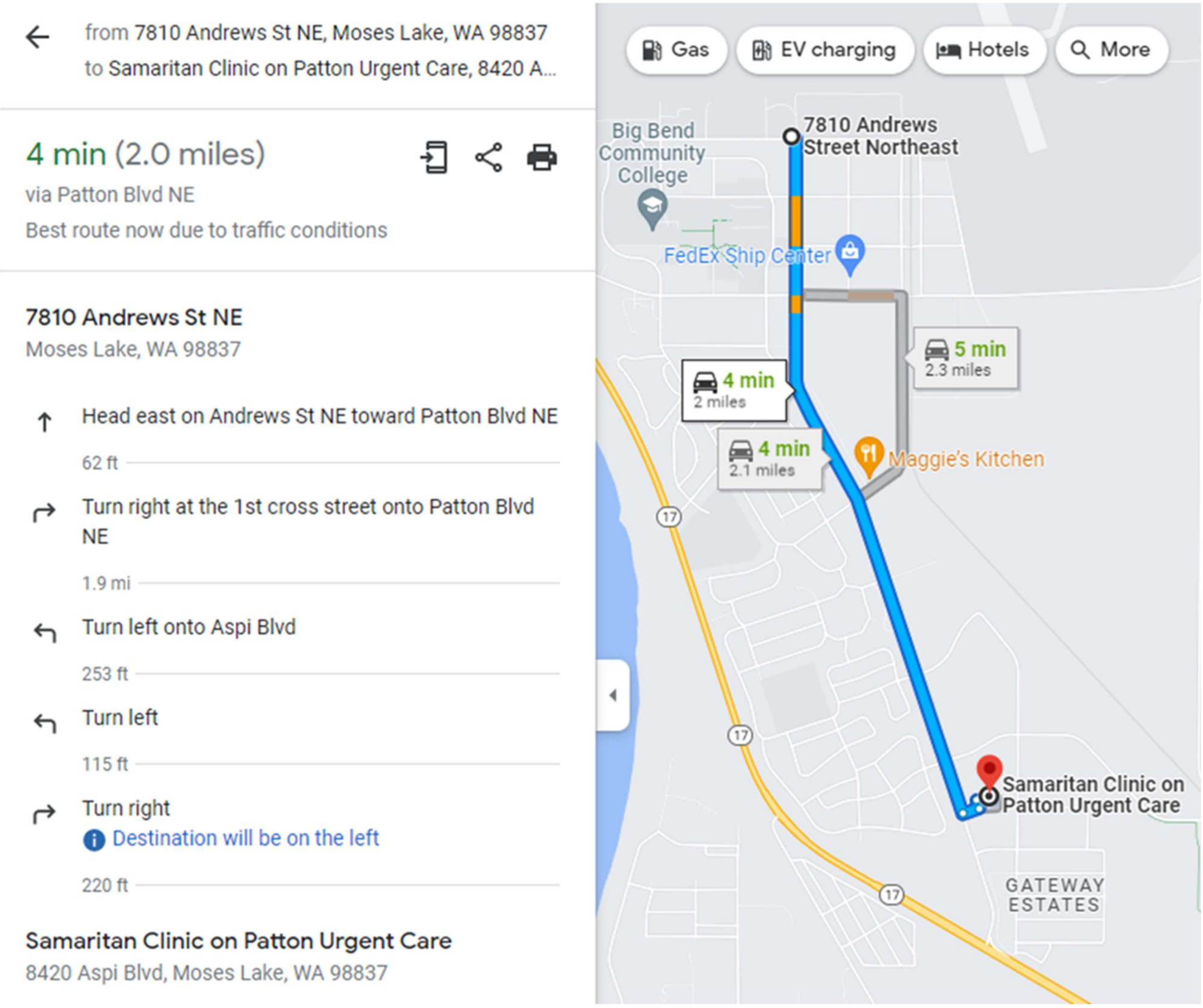
- Direction of wind (locate up wind)
- Proximity to traffic (should not be in the way of emergency vehicles or exposed to street vehicle hazards)
- Presence of overhead structures (avoid)
- Not downhill of a potential release where it could move toward you

Evacuate the site and go to the emergency meeting location if safe conditions exist. Unless otherwise noted, the emergency meeting location is the parking lot for the Port of Moses Lake Airport (7810 Andrews St NE, Moses Lake, WA 98837):

Emergency Contact List

Role	Name - Phone
Police/Fire/EMS	**911**
Local Police – Moses Lake Police Department	**(509) 764-3887**
Local Fire – Moses Lake Fire Department	**(509) 765-2204**
Poison Control	(800) 222-1222
One Call/Dig Alert	811
Chemical Transportation Emergency Center (CHEMTREC)	(800) 424-9300
Washington State Department of Ecology Environmental Report (ERTS) (Spill reporting)	(206) 594-0000
Samaritan Clinic on Patton Urgent Care (Clinic)	(509) 793-9782
Samaritan Healthcare: Emergency Room (Hospital)	(509) 765-5606
Client Contact/Project Coordinator:	Milton Miller, Port of Moses Lake – (509) 762-5363
Stantec Project Manager:	Bobby Thompson – (206) 510-5855
SHSO and Task Manager:	Laina Cole – (253) 247-1466
Stantec Director of Health, Safety, Security and Environment Operations – US:	Peter Petro – (707) 338-3386
HSSE Regional Manager:	US West – Tony Wong – (805) 234-6227
Public Relations:	US West – Ryan Lamont – (213) 955-9775
Stantec Workers Compensation Claims Coordinator:	Melissa Helton – (513) 720-3706
Medical Consultation Line	WorkCare (888) 449-7787

EMERGENCY ROUTE TO OCCUPATIONAL MEDICAL CLINIC



from 7810 Andrews St NE, Moses Lake, WA 98837
to Samaritan Clinic on Patton Urgent Care, 8420 A...

4 min (2.0 miles)
via Patton Blvd NE
Best route now due to traffic conditions

7810 Andrews St NE
Moses Lake, WA 98837

↑ Head east on Andrews St NE toward Patton Blvd NE
62 ft

↱ Turn right at the 1st cross street onto Patton Blvd NE
1.9 mi

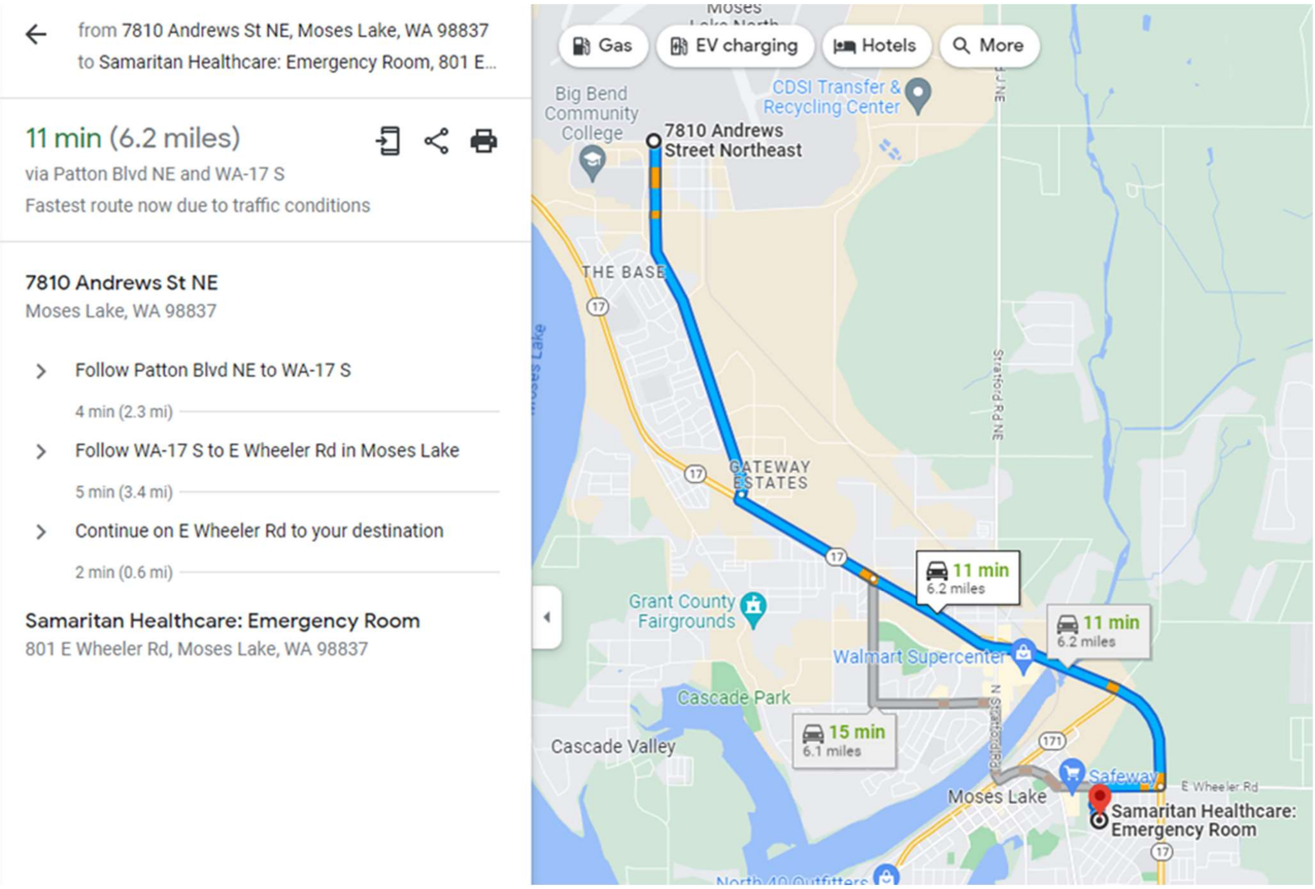
↰ Turn left onto Aspi Blvd
253 ft

↰ Turn left
115 ft

↱ Turn right
ⓘ Destination will be on the left
220 ft

Samaritan Clinic on Patton Urgent Care
8420 Aspi Blvd, Moses Lake, WA 98837

EMERGENCY ROUTE TO HOSPITAL



from 7810 Andrews St NE, Moses Lake, WA 98837
to Samaritan Healthcare: Emergency Room, 801 E...

11 min (6.2 miles)
via Patton Blvd NE and WA-17 S
Fastest route now due to traffic conditions

7810 Andrews St NE
Moses Lake, WA 98837

- Follow Patton Blvd NE to WA-17 S
  4 min (2.3 mi)
- Follow WA-17 S to E Wheeler Rd in Moses Lake
  5 min (3.4 mi)
- Continue on E Wheeler Rd to your destination
  2 min (0.6 mi)

Samaritan Healthcare: Emergency Room
801 E Wheeler Rd, Moses Lake, WA 98837

APPENDIX H

Stantec's *Monitoring and Inadvertent Discovery Plan*

Monitoring and Inadvertent Discovery Plan for the Remedial Investigation/Feasibility Study of the Port of Moses Lake Pumphouse 1 Project Area

Port of Moses Lake Pumphouse 1
7810 Andrews Street Northeast
Moses Lake, Washington

November 22, 2024

Prepared for:

Port of Moses Lake

Prepared by:

Stantec Consulting Services Inc
601 Southwest Second Avenue, Suite 1400
Portland, Oregon 97204-3128
USA
www.stantec.com

File: 203723678.IDP24

This document entitled *Monitoring and Inadvertent Discovery Plan for the Remedial Investigation/Feasibility Study of the Port of Moses Lake Pumphouse 1 Project Area* was prepared by Stantec Consulting Services Inc. (Stantec) for the account of Port of Moses Lake (Client). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by: Gilbert Browning III
Signature

Gilbert Browning, MA, RPA
Printed Name

Reviewed by: Mackenzie Hughes
Signature

Mackenzie Hughes, MS, RPA
Printed Name

Table of Contents

Acronyms and Abbreviations

AO	Agreed Order No. DE 22056
bgs	Below ground surface
CFR	Code of Federal Regulations
Ecology	Washington State Department of Ecology
FS	Feasibility study
IDP	Inadvertent Discovery Plan
NRHP	National Historic Preservation Act
PLP	Potential liable person
Port	Port of Moses Lake
RI	Remedial investigation
RI/FS Work Plan	Remedial Investigation/Feasibility Study Work Plan
SHPO	Washington State Historic Preservation Officer
Site	Port of Moses Lake Pumphouse 1
SOI	Secretary of the Interior
Stantec	Stantec Consulting Services Inc.
USC	United States Code
UST	Underground storage tank
WAC	Washington Administrative Code

1.0 INTRODUCTION

Based on Agreed Order No. DE 22056 (AO) issued to the Port of Moses Lake (Port) by the Washington State Department of Ecology (Ecology) on December 26, 2023 (Ecology, 2023), the Port retained Stantec Consulting Services Inc. (Stantec) to prepare a Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) for the Port of Moses Lake Pumphouse 1 (site). The potential liable persons (PLPs) identified by Ecology in the AO will conduct a remedial investigation (RI) to determine the nature, extent, and magnitude of petroleum hydrocarbons at the site. Following the RI, the PLPs will use the resulting information to develop a feasibility study (FS) and identify remedial alternatives for implementation at the site.

The site is located at 7810 Andrews Street Northeast, in Moses Lake, central Washington State (Plate 1), on the grounds of Grant County International Airport (Airport) in Moses Lake (Township 20N, Range 28E, SW of SW of Section 28). The Airport, owned and operated by the Port, is located approximately 5 miles northwest of the City of Moses Lake and is bordered to the east by Crab Creek and to the southwest by Moses Lake. The site is a rectangular compound defined by a chain-link fence measuring approximately 200 feet by 180 feet, situated between two runways and northeast of the Main Terminal Building. Located in the center of the fenced compound is the Pumphouse 1 building. Four 50,000-gallon, one 25,000-gallon, and one 2,000-gallon underground storage tanks (USTs) are located to the east and northeast of the pumphouse building. The surface is covered with gravel and natural soils.

Implementation of the RI will include ground disturbing activities, including advancement of 5 borings to approximately 50 feet below ground surface (bgs) and installation of at least 12 and up to a total of 19 groundwater monitoring wells to approximately 100 feet bgs (groundwater is typically encountered at 90 feet bgs) in the immediate vicinity (within 300 feet) of Pumphouse 1. Soil samples will be field-screened continuously via sonic core drilling and collected for laboratory analysis approximately every 5 to 10 feet, depending on field screening results.

Pursuant to and in accordance with Washington Administrative Code (WAC) 173-340-350(5)(b)(i)(F) (WAC, 2023), the RI/FS Work Plan is required to include an Inadvertent Discovery Plan (IDP). This IDP outlines procedures to perform in the event of a discovery of archaeological materials, human remains, and/or funerary objects, in accordance with Washington state and federal laws, including WAC 173-340-815 (Appendix A). The following sections describe the protocols to be followed if cultural resources or human remains are identified during implementation of the RI/FS Work Plan.

Select documents and materials provided in this IDP are specific to Stantec and may not be applicable to the environmental consultant contracted for the work outlined in Task II of the AO issued by Ecology (Ecology, 2023). The contracted consultant will need to prepare a site-specific IDP prior to beginning fieldwork.

Work under the terms of the IDP is to be carried out by or under the direct supervision of a person or persons meeting, at a minimum, the Secretary of the Interior (SOI) Professional Qualifications Standards for Archaeology (Title 48 Code of Federal Regulations [CFR] 44738-44739). All documentation, data recovery, evaluation, and reporting of cultural resource materials as described for these procedures will follow and meet the contemporary professional standards and the SOI's Standards and Guidelines for

Archaeology and Historic Preservation (48 CFR 44716). An IDP is not a substitute for a formal cultural resources review (Executive 21-02 or National Historic Preservation Act [NRHP] Section 106). For discoveries of cultural resources or human remains after the standard review process is completed, Title 54 of the United States Code (USC) Section 306108 (54 USC § 306108) and Title 36 CFR Section 800.13 (36 CFR 36 CFR § 800.13(b)(3)) post-review discoveries apply (USC, 2014; CFR, 2024).

Additional federal laws which may apply include but are not limited to 16 USC 470ee (Archeological Resources Protection Act or ARPA), which prohibits the unauthorized destruction or removal of archaeological materials, including human remains (i.e., more than 100 years old) on federal lands and federal trust lands (USC, 2018). Violations may be prosecuted as a misdemeanor or felony, as warranted by the severity of the violation.

This IDP describes all necessary protocols that will be followed if potentially significant cultural resources or human remains are identified during the project, as well as the steps necessary to minimize damage to these inadvertently discovered archaeological resources. Cultural resources include objects modified by humans and locations of human activity, occupation, or use, including locations (sites or places) of traditional, religious, and cultural importance to specified social and/or cultural groups. A cultural resource that could be an inadvertently discovered on this project could include a variety of precontact, historic, or burial related resources.

2.0 INADVERTENT DISCOVERY IDENTIFICATION

Subsurface sampling may uncover previously unidentified Native American or Euromerican artifacts. Work must stop when the following types of artifacts and/or features are encountered:

Native American artifacts may include (but are not limited to):

- Flaked stone tools (arrowheads, knives, scrapers, etc.).
- Waste flakes that result from the construction of flaked stone tools.
- Ground stone tools like mortars and pestles.
- Layers (strata) of discolored earth resulting from fire hearths. May be black, red, or mottled brown and often contain discolored cracked rocks or dark soil with broken shell (middens).
- Human remains.
- Structural remains (wooden beams, post holes, fish weirs, etc.).

Euromerican artifacts may include (but are not limited to):

- Glass (bottles, vessels, windows, etc.).
- Ceramic (dinnerware, vessels, etc.).
- Metal (nails, drink/food cans, tobacco tins, industrial parts, etc.).
- Building materials (bricks, shingles, etc.).
- Building remains (foundations, architectural components, wells, etc.).
- Old wooden posts, pilings, or planks (these may be encountered above or below water).
- Even what looks to be old garbage could very well be an important archaeological resource.
- Old farm equipment may indicate historic resources in the area.

Human remains and/or funerary objects may include (but are not limited to):

- Skeletal remains, complete or fragmentary
- Headstones or coffin wooden fragments
- Burial goods

When in doubt… STOP, PROTECT, NOTIFY.

3.0 INADVERTENT DISCOVERY STEPS

This section presents the protocols and procedures to follow in the event of an inadvertent discovery of archaeological resources and human remains during project implementation. See Section 2 for examples of potential inadvertent discoveries.

3.1 STEP 1: STOP WORK

All work must stop immediately in the vicinity of the discovery. Do not pick up, move, or touch any discovery. Leave the discovery where it was identified. Do not allow any activities to continue within the vicinity of the find, approximately 100 feet (30 meters) around the discovery.

3.2 STEP 2: PROTECT THE DISCOVERY

Leave the discovery untouched, and create a clear, identifiable, and wide boundary (100 feet) with temporary fencing, flagging, stakes, or other clear markings. Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Ensure that no personnel further disturb the resource and stop all activities in the vicinity. Do not allow any soil to be moved, including the spoils. Leave all artifacts and materials in place and secure the area to prevent further damage, theft, or removal. Do not allow work to resume within the boundary until the requirements of this IDP are met. Provide protection and ensure integrity of the discovery until cleared by the Washington State Historic Preservation Officer (SHPO).

- Leave the discovery and the surrounding area UNTOUCHED (do not pick up, move, or touch any discovery).
- Create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings.
- Provide protection and ensure integrity of the discovery. Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

3.3 STEP 3: NOTIFY LEAD ARCHAEOLOGISTS

In the event of a discovery, Notify Stantec archaeologists. Stantec archaeologists will notify the SHPO. If possible human remains are encountered, Stantec archaeologists will confirm with the State Physical Anthropologist (Guy Tasa) before contacting law enforcement, the Medical Examiner/Coroner, and Tribes.

Primary Contact
Name: Gilbert Browning
Organization: Stantec
Phone: (707) 779-2618
Email: gilbert.browning@stantec.com

Alternate Contact
Name: Mackenzie Hughes
Organization: Stantec
Phone: (509) 859-2031
Email: mackenzie.hughes@stantec.com

State Physical Anthropologist
Name: Guy Tasa, State Physical Anthropologist
Organization: Washington State Department of Archaeology and Historic Preservation
Phone: (360) 790-1633
Email: guy.tasa@dahp.wa.gov

Local Law Enforcement
Name: Dave Sands, Police Chief
Organization: Moses Lake Police Department
Phone: (509) 764-3887

Local Medical Examiner
Name: Craig Morrison
Organization: Grant County Coroner’s Office
Phone: (509) 765-7601
Emergency Phone: (509) 762-1160
Email: cmorrison@grantcountywa.gov

Local Non-Emergency
Organization: Non-Emergency Dispatch (Multi Agency Communications Center)
Phone: (509) 762-1160
Alternate: 911

- No work may resume until Stantec archaeologists are on-site and able to assess the situation.
- If human remains are encountered, do not disturb them in any way. Do not call 911. Do not speak with the media. Secure the location. Do not take photos.
- Stantec archaeologists will consult with SHPO and appropriate Tribal Governments and determine an appropriate course of action.
- Additional archaeological excavations may be required. This is handled on a case-by-case basis through consultation with SHPO and appropriate Tribes.

4.0 PROCEEDING WITH WORK

Work outside the discovery location may continue while documentation and assessment of the cultural resource proceeds; however, all ground-disturbing activity will need to be monitored by an archaeologist. Construction activities may continue at the discovery location only after the process outlined in this plan is followed and compliance with state laws is complete.

5.0 REFERENCES

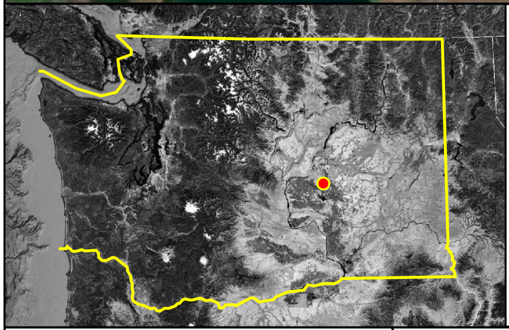
Code of Federal Regulations (CFR). Amended Ma 6, 2024. Title 36 – Parks, Forests, and Public Property. URL: https://www.ecfr.gov/current/title-36/chapter-VIII/part-800?toc=1.

United States Code (USC). December 19, 2014. Title 54 – National Park Service and Related Programs. URL: https://uscode.house.gov/view.xhtml?path=/prelim@title54&edition=prelim.

United States Code (USC). 2018 Edition. Title 16 – Conservation, Chapter 1B – Archaeological Resources Protections, Section 470ee – Prohibited Acts and Criminal Penalties. URL: https://www.govinfo.gov/app/details/USCODE-2022-title16/USCODE-2022-title16-chap1B-sec470ee.

Washington Administrative Code (WAC). August 23, 2023. Chapter 173-340 Model Toxics Control Act Cleanup Regulations. https://apps.leg.wa.gov/wac/default.aspx?cite=173-340.

Washington State Department of Ecology (Ecology). December 26, 2023. Agreed Order No. DE 22056.



SOURCE:
Modified from maps provided by
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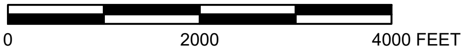
MAP SCALE 1 : 24000

APPROXIMATE SCALE



Stantec

PROJECT LOCATION MAP

PORT OF MOSES LAKE PUMPHOUSE 1
7810 Andrews Street Northeast
Moses Lake, Washington

PROJECT NO.
203723678

PLATE
1

APPENDIX A

Ecology Inadvertent Discovery Plan: Plan and Procedures for the Discovery of Cultural Resources and Human Skeletal Remains

INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): Port of Moses Lake Pumphouse 1 Location: 7810 Andrews Street NE, Moses Lake, WA 98837 (T20N, R28E, S28)

Project Lead/Organization: Port of Moses Lake County: Grant

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

Once completed, **the IDP should always be kept at the project site** during all project activities. All staff, contractors, and volunteers should be familiar with its contents and know where to find it.

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move.***
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact

Name: Rick Mueller
Organization: Airport Direction, POML
Phone: O: 509-964-1924
Email: rjmueller@portofmoseslake.com

Alternate Contact

Name: Milton Miller
Organization: Director of Port Facilities, P
Phone: O: 509-762-5363 C: 509-431-0884
Email: mmiller@portofmoseslake.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager

Name: Kristin Beck
Program: Toxics Cleanup Program
Phone: 509-514-6806
Email: kbec461@ecy.wa.gov

Alternate or Cultural Resource Contact

Name: Ali Furmall
Program: Toxics Cleanup Program
Phone: 509-655-0538
Email: afur461@ecy.wa.gov

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

<u>DAHP Contacts:</u>

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe: Confederated Tribes of the Colville Reservation
Name: Guy Moura
Title: THPO
Phone: 509-634-2695
Email: guy.moura@colvilletribes.com

Tribe: Confederated Tribes of the Colville Reservation
Name: Melissa Ayvaz
Title: N/A
Phone: N/A
Email: melissa.ayvaz.hsy@colvilletribes.com

Tribe: Confederated Tribes and Bands of the Yakama Nation
Name: The Honorable Gerald Lewis
Title: Chairman
Phone: N/A
Email: THPO@yakama.com

Tribe: Confederated Tribes and Bands of the Yakama Nation
Name: Rose Ferri
Title: Interim THPO
Phone: 509-307-2009
Email: Rose_Ferri@yakama.com

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:

Agency: N/A
Name:
Title:
Phone:
Email:

State Agency:

Agency: N/A
Name:
Title:
Phone:
Email:

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify.*** For specific instructions on how to handle a human remains discovery, see: *RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions*.

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov

(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):
   - Local Medical Examiner or Coroner name and phone: Craig Morrison / 509-765-7601
   - Local Law Enforcement main name and phone: Dave Sands (Police Chief) / 509-764-3887
   - Local Non-Emergency phone number (911 if without a non-emergency number): 509-762-1160
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.53 and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the sites and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

Informational Resources

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003)
(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

Potentially Interested Tribes

Interactive Map of Tribes by Area
(https://dahp.wa.gov/archaeology/tribal-consultation-information)

WSDOT Tribal Contact Website
(https://wsdot.wa.gov/tribal/TribalContacts.htm)

11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

Project Archaeology Contacts:
Primary: Gilbert Browning
Senior Archaeologist
Stantec
Phone: 707-779-2618
Email: gilbert.browning@stantec.com

Alternate: Mackenzie Hughes
Archaeologist
Stantec
Phone: 509-859-2031
Email: mackenzie.hughes@stantec.com

Tribal Contacts (continued):
Spokane Tribe
Randy Abrahamson
THPO
Phone: 509-258-4315
Email: randya@spokanetribe.com

Implement the IDP if you see…

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.

Stone artifacts from Oregon.

Stone artifacts from Washington.

Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see…

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.

Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.

Artifacts from unknown locations (left and right images).

Implement the IDP if you see…

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.

Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.*

Implement the IDP if you see…

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.

Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry*.

Implement the IDP if you see…

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- “Unusual” accumulations of rock (especially fire-cracked rock).
- “Unusual” shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a “layer cake” appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the “unusual” or out of place (for example, rock piles in areas with otherwise few rocks).

Shell Midden pocket in modern fill discovered in sewer trench.

Underground oven. Courtesy of DAHP.

Shell midden with fire cracked rock.

Hearth excavated near Hamilton, WA.

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.

Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.

Main Image: *Dishes, bottles, workboot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*

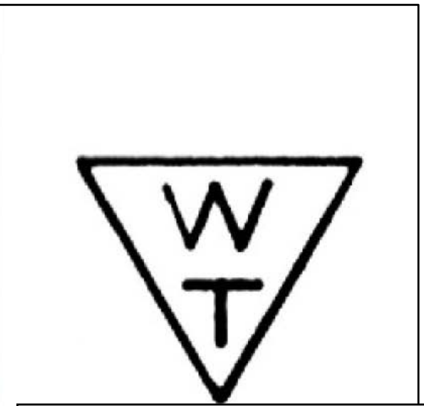
Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Implement the IDP if you see…

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.

Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!
Left: Maker's mark on bottom of old bottle.

Right: *Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.*



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).

Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see…

You see historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.

Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see...

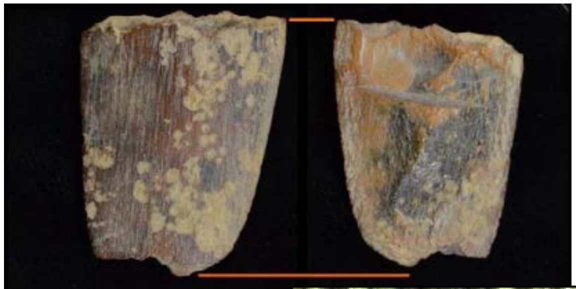
Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



Directly Above: This is a real discovery at an Ecology sewer project site.

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: *Read the plan!*