APPENDIX A
PHASE 2 REMEDIAL INVESTIGATION
UPLANDS SAMPLING AND ANALYSIS PLAN

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Ecology No. 2757

Prepared for

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ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
bgs	below ground surface
BNAs	semi-volatile organic compounds (sediment)
DQO	data quality objective
Ecology	Washington State Department of Ecology
GC/MS	gas chromatograph/mass spectrophotometer
GRO	gas range organics
HASP	health and safety plan
HCID	hydrocarbon identification
ICP	inductively coupled plasma-atomic emission spectroscopy
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MLLW	Mean lower low water (datum)
MRLs	method reporting limits
MTCA	Model Toxics Control Act
MW	Monitoring well
NAPL	nonaqueous phase liquid
NAVD	North American Vertical Datum
NGVD	National Geodetic Vertical Datum of 1929
PCB	polychlorinated biphenyl
PCP	Pentachlorophenol
PPMETS	Priority pollutant metals, antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, zinc
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
SAP	sampling and analysis plan
SVOC	Semi volatile organic compounds
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
TEF	toxicity equivalency factor

ACRONYMS AND ABBREVIATIONS (Continued)

TEQ	total toxicity equivalence
TOC	total organic carbon
TSS	total suspended solids
TPH	total petroleum hydrocarbons
TPH-Gx	total petroleum hydrocarbons as gasoline
TPH-Dx	total petroleum hydrocarbons as diesel
TSS	total suspended solids
TVS	total volatile solids
VOA	volatile organic analysis
WAC	Washington Administrative Code

1 INTRODUCTION

1.1 Purpose

This uplands Sampling and Analysis Plan (uplands SAP) is being prepared as part of the Phase 2 Remedial Investigation (Phase 2 RI) for the former Nord Door facility in Everett, Washington. This SAP is provided to identify the purpose and objectives of the uplands data collection in support of the work plan for remedial investigation/feasibility study (RI/FS) and Cleanup Action Plan (CAP) "Work Plan", specify field procedures, identify quality assurance (QA) procedures to be implemented during sampling activities and laboratory analyses, and to meet the requirements of WAC 173-340-820, Model Toxics Control Act (MTCA).

1.2 Sampling and Analysis Plan Organization

The Sampling and Analysis Plan is organized in three sections. A brief description of each section is presented below.

Section 1—Introduction. Section 1 contains an overview of the Uplands Sampling and Analysis Plan.

Section 2—Field Sampling Plan. Section 2 identifies the sampling locations and depths, and presents the procedures to be used in field sampling. Included are procedures for: soil sample, temporary well installation, groundwater sample collection, boring abandonment, water and product measurements, residuals management, sample splitting, sample labeling, shipping, and custody.

Section 3—Quality Assurance Project Plan. Section 3 identifies the project organization and includes QA procedures for field activities and laboratory analyses.

1.3 Project Organization and Responsibilities

Noted below are the responsibilities of key project personnel.

Dwayne Arino, Project Coordinator for JELD-WEN. Responsible for overseeing the implementation of the Agreed Order for JELD-WEN. Coordinates with the Department of Ecology (Ecology) and SLR International Corp (SLR). Provides oversight of program activities. Reviews project work scope, resource needs, and requests.

Isaac Standen, Site Manager for Ecology. Responsible for overseeing the implementation of the Agreed Order for Ecology. Coordinates with JELD-WEN, Ecology and SLR. Provides oversight of all program activities. Reviews project work scope. Defines and coordinated Ecology resources.

Scott Miller, Project Manager, SLR. Provides technical oversight of all SLR project activities at the Site and senior review of all project activities. Oversees project performance and provides technical expertise to accomplish project objectives. Ensures that project tasks are successfully completed within the project time periods. Coordinates with JELD-WEN.

SLR Field Personnel. Geologists, scientists, engineers, and technicians are responsible for implementing the SAP.

Laboratories. Provide analytical support. Perform all required quality control analyses including analytical duplicates, blanks, and matrix spikes. Initiate and document required corrective action. Perform preliminary review of data for completeness, transcription, or analytical errors. Follow U.S. Environmental Protection Agency (EPA) guidelines and good laboratory practices. The project laboratory for the uplands sampling is Environmental Science Corp. (ESC) located in Mt. Juliet, Tennessee. Some of the soil and groundwater samples will be subcontracted by ESC to Analytical Resource, Inc. (ARI). ARI is located in Tukwila, Washington. Dioxin/Furan samples will be analyzed by Analytical Perspectives, Inc (AP) in Wilmington, North Carolina. ESC (C1915), ARI (C1235) and AP (C901-10) are accredited by Ecology.

1.4 Remedial Investigation Schedule

The schedule for the uplands sampling that will be completed as part of the Phase 2 RI is presented in the Work Plan (Section 2). Any schedule modifications will be submitted for approval by SLR to the Ecology Site Manager.

2 FIELD SAMPLING PLAN

2.1 Sampling Needs and Objectives

The Phase 2 RI sampling activities to be performed at the Site are intended to provide additional information to support site characterization and cleanup decision making. Sampling will supplement the initial results and previous testing conducted on the Site. Specific sampling objectives are as follows:

- Perform additional sampling in the vicinity of former Woodlife storage, piping, and use area to provide further assessment dioxins and furans in soil and groundwater near sampling location GP-302.

- Perform soil sampling in the vicinity of the burner ash drum to evaluate whether soils in this area have been impacted by dioxins/furans found in boiler ash.

- Perform additional assessment for metals in groundwater near former boring GP-304.

- Collect groundwater samples from monitoring wells MW-1 and MW-6 to help establish the relationship between total and dissolved metals in groundwater.

- Sample existing groundwater monitoring wells MW-1 and MW-5 at high water and at low water to fully document that groundwater is not affected by TPH these locations.

- Perform additional groundwater characterization for VOCs in the vicinity of former thinner tank.

- Perform additional groundwater characterization to the east of the Site on the BNSF railroad property near Maulsby Marsh for TPH, PAHs, VOCs, and total and dissolved metals.

2.2 Sampling Locations, Types, Frequency, and Analyses

This section generally describes proposed sampling locations. Proposed sample locations are depicted in Figure 3 of the Phase 2 RI Work Plan. A summary of the proposed sampling areas, proposed sampling location labels, and the proposed analysis is summarized in Table 1 (attached). A description of the samples to be collected at each sampling location, the proposed frequency of sampling, and the analyses to be performed is also described in this section. Sampling methods and sampling procedures are described in Section 2.3. Examples of field boring logs and sample Chain of Custody are included as Appendix B.

Former Woodlife Storage and Use Area Dioxins and Furans. Three Geoprobe borings (locations 401P through 403P) will be completed in proximity to former boring location GP-302 to evaluate the extent of dioxin/furan impacts to soil and groundwater. One soil sample from each boring will be collected from a approximate depth of 3 feet below ground surface (bgs) and submitted for dioxin/furan analysis per EPA Method 1613. One groundwater sample from each boring will be collected and held by the laboratory pending receipt of the results of the soil samples from the three borings. The groundwater sample from the soil boring exhibiting the highest total toxicity equivalence (TEQ) concentration of dioxin/furan will be submitted for analysis of dioxins and furans by EPA Method 1613. The groundwater sample will be centrifuged by the laboratory prior to analysis to remove excess sediment and suspended silts from the sample.

One groundwater sample will be collected from monitoring well MW-6, located downgradient of the former Woodlife storage and use area, and submitted for dioxin/furan analysis.

Former Burner Area Dioxins and Furans. One Geoprobe boring (404P) will be completed in proximity to the ash storage area for the former burner. One soil sample will be collected from location 404P at a depth of 3 feet bgs and analyzed for dioxin and furans per EPA Method 1613. A groundwater sample from a temporary well point in the boring will be collected and archived by the laboratory pending receipt of the results of the soil sample. If the soil sample from location 404P identifies concentrations of dioxins/furans above the Work Plan PCLs, the groundwater sample from the probe boring will be submitted for dioxin/furan analysis per EPA Method 1613. The sample will be centrifuged prior to analysis to remove excess sediment and suspended silts from the sample.

Metals in Groundwater at Boring GP-304. One Geoprobe boring (GP-405P) will be completed proximate to former boring GP-304 for the collection of groundwater samples for total and dissolved metals analysis by EPA 6000/7000 series metals. The groundwater samples will be filtered in the field using a 0.45-μm in-line filter prior to submittal to the laboratory.

Metals in Groundwater Monitoring Wells. Groundwater samples will be collected from monitoring wells MW-1 and MW-6 for total and dissolved metals analysis by EPA

6000/7000 series metals. The groundwater samples will be filtered in the field using a 0.45-µm in-line filter prior to submittal to the laboratory.

TPH in Groundwater Monitoring Wells. Two additional rounds of groundwater samples will be collected from monitoring wells MW-1 and MW-5 for TPH-HCID analysis, with follow-up analysis for TPH-Dx and/or TPH-Gx. The two sampling events will be scheduled to coordinate with the predicted high tide and predicted low tide times for the Everett area of Possession Sound.

VOCs Near Former Thinner Tank. Groundwater samples collected from proposed borings 401P and 403P (former Woodlife storage and use area) will be submitted for VOC analysis by EPA Method 8260.

2.2.1 Field Quality Assurance Samples

Field QA will be maintained through compliance with the sampling plan, collection of field QA samples, and documentation of sampling plan alterations.

2.3 Sampling Methods and Procedures

This section generally describes the methods and procedures for fieldwork associated with the proposed soil and groundwater sampling.

2.3.1 Utility Location

All drilling and excavation locations will be checked for underground utilities prior to the start of field activities. Boring locations may be moved due to underground or aboveground utilities, structures, features or site operational constraints seen during site visits. The field geologist/engineer may approve relocations within 25 feet of the original site and will notify the SLR project manager. Relocations greater than 25 feet from the original boring location will require approval by both the SLR project manager and the JELD-WEN project manager before drilling commences.

2.3.2 Soil Sampling

Soil samples will be collected using the following general procedures:

A. All sampling equipment and reusable materials that will contact the sample will be decontaminated on site in accordance with procedures identified in Section 2.3.8. The field staff will use clean neoprene, nitrile, or vinyl gloves for handling each sample.

B. The sample container labels will be filled out and attached to the appropriate containers as described in Section 2.3.9.

C. Soil samples collected for chemical analysis will be transferred directly from the sampler into sample containers.

D. Laboratory provided glass jars will be filled for analyses at each sample interval, if sample volume permits. If the soil volume from a sampling interval does not adequately fill the soil jars, an additional sample will be collected from the depth interval immediately below it. Soil will be transferred directly from the stainless-steel bowl (composite samples), or from the sampling sleeve (Geoprobe samples) to the sample containers. Each container will be filled as full as possible to minimize headspace.

E. A PID will be used to monitor each sample for volatile constituents after the sampler is first opened. The PID reading will be recorded on a Field Sampling Data Form or on a Boring Log Form (Section 3.4).

F. After filling the sample jars, the remaining sample will be logged on a Boring Log Form or a Field Sampling Data Form as described in Section 3.4. If free product contamination is observed in any sample interval, that sample will also be transferred into sample containers. For the purposes of this investigation, free product contamination is defined as a nonaqueous phase liquid that is adsorbed to the soil and is in soil pore spaces, causing staining, iridescent sheens, and an odor characteristic of petroleum or polycyclic aromatic hydrocarbons.

After being filled, the sample container(s) will be placed on ice in a cooler and handled as described in Section 2.3.9. The sample coolers will be sent to the laboratory within 36 hours of sampling.

Soil samples will be identified by the Geoprobe or hand auger location which they are collected. The prefix "GP-" will precede all Geoprobe boring numbers. Geoprobe soil samples will be numbered according to the top of the depth range sampled. For example, GP-401-5 would denote a Geoprobe soil sample from soil boring location 401 collected from a depth of 5 feet bgs.

Geoprobe Soil Borings. The Geoprobe borings will be advanced using a truck-mounted, Geoprobe direct-push drilling rig. The Geoprobe rig will be equipped with nominal 2-foot-long or 4-foot-long, 2-inch-diameter probes fitted with acetate sampling sleeves. The Geoprobe borings will be advanced to approximately 15 feet bgs. As is discussed in Section 2.3.3 below, temporary well screens will be installed in each of the Geoprobe borings. Following sampling, the Geoprobe soil borings will be abandoned as described in Section 2.3.4.

Geoprobe borings will require coring of asphalt or concrete in paved areas. Subsurface soil samples in the Geoprobe borings will be collected continuously from the ground surface to the maximum explored depth of 15 feet bgs. Soil samples will be taken from the continuous core sample (contained within the plastic sample sleeve) by hand packing the soil into a clean glass jar supplied by the project laboratory. Lithologic descriptions of the sampled soil will be recorded on a Boring Log Form. Soil samples will be collected for chemical analyses.

Soil samples from each boring will be field screened for the presence of petroleum hydrocarbons and volatile organic compounds (VOCs) by using visual appearance, odors, and a photoionization detector (PID). The soil samples will be submitted for laboratory analysis based on the highest PID measurement or visual evidence of impacts. If there is no visual evidence of impact and the PID measurements are below detection limits, the sample will be collected from a depth just above the groundwater table as observed during the field work. Field equipment will be decontaminated according to the procedures outlined in Section 2.3.9 prior to moving to the next sampling location.

2.3.3 Groundwater Sampling Procedures

Groundwater samples from existing monitoring wells will be collected using the following general procedures:

A. Depth to water will be measured before sampling. The water level will be measured by using an electric well probe or oil-water interface probe to the nearest 0.01 foot from a surveyed notch in the well casing. Water depths will be recorded on a Field Sampling Data Form and will include date, time, and sampler's initials. If floating product is present, the thickness will be measured with an oil-water interface probe or a combination of water finding paste and product paste. Groundwater samples will not be collected from wells with floating product.

B. The monitoring wells will be purged using low-flow procedures. Groundwater samples will be collected using a peristaltic pump fitted with silicon tubing and either Tygon® or polyethylene tubing. Pump tubing will be lowered to a mid-screen depth for purging and sampling. Monitoring wells will be purged at a rate of 0.25 to 0.5 liters per minute.

C. Field parameters (temperature, pH, specific conductance, dissolved oxygen, and oxidation redox potential [ORP]) will be measured in purged groundwater as it is discharging through a flow-through cell. Groundwater will be passed through the cell and discharged into a temporary storage container. Field parameters will be periodically measured and recorded during well purging and upon stabilization. Field parameters will be measured using a multi-parameter meter that includes a thermometer, pH/conductivity meter, dissolved oxygen meter, and ORP meter. The multi-parameter meter will be calibrated before the start of field work. Field parameter measurements will be recorded as follows:

- Temperature to ±0.5°C
- pH to ±0.01 units
- Specific conductance to ±1 µS/cm (measured specific conductance ≤ 999 µS/cm), ±10 µS/cm (999 µS/cm < specific conductance <10,000 µS/cm), or ±100 µS/cm (measured specific conductance >10,000 µS/cm)
- Dissolved oxygen to 0.1 mg/L
- Turbidity to 0.1 NTU
- ORP to ± 15 mV

D. Groundwater samples will be collected after the field parameters have stabilized to within 10 percent of the previous reading. If the groundwater parameters do not stabilize, a maximum of three casing volumes will be purged prior to sampling. Residuals will be managed as described in Section 2.13.

E. Groundwater samples will be collected from discharge line of the peristaltic pump (prior to removal of the discharge line after purging the well). All samples will be transferred in the field from the sampling equipment into a container prepared for the given parameters by the analytical laboratory.

E. Groundwater samples collected from the temporary well points (Geoprobe or hand auger borings) and monitoring wells will not be filtered, with the exception of those samples collected for metals analysis. Groundwater samples collected for metals analysis will be filtered in the field using a 0.45-µm in-line filter prior to submittal to the laboratory.

F. Groundwater samples collected for dioxin/furan analysis will be centrifuged in the lab prior to analysis. In addition, groundwater samples collected from temporary well points in the hand auger borings on the BNSF property may also be centrifuged based on the appearance of the sample (i.e. suspended sediment/cloudy) and/or the sample collection methodology (slotted PVC pipe). Samples to be centrifuged prior to analysis will be identified on the chain of custody.

G. Samples will be labeled, handled, and shipped using the procedures described in Section 2.16. Sample custody will be maintained until delivery to the analytical laboratory. All sampling field activity and data will be recorded on a Field Sampling Data Form.

H. The sampler(s) will wear new neoprene or vinyl gloves at each sampling location. New Tygon or polyethylene tubing will be used at each sampling location.

I. All reusable sampling equipment will be decontaminated using the procedures described in Section 2.15.

Groundwater samples from existing monitoring wells will be labeled with the monitoring well designation (described above) and a date suffix. The date suffix will include the month and year. For example, MW-5-811 would represent the water sample collected from MW-5 in August 2011.

Geoprobe Borings. Groundwater samples will be collected from temporary well points installed in the Geoprobe borings. The temporary wells will be constructed of 1 inch diameter PVC blank well casing and machine-slotted well screen. Groundwater samples will be collected using dedicated polyethylene tubing and a peristaltic pump. Approximately three well casing volumes will be purged prior to sampling. Conductivity, pH, and temperature will be monitored during the purging of groundwater from the temporary wells, and the groundwater samples will be collected once these parameters have stabilized. The groundwater samples will be transferred directly from the polyethylene tubing into the laboratory-provided sampling containers, stored on ice, and delivered to project laboratory for analyses. Groundwater samples collected for analysis of organic parameters will not be filtered prior to analysis. Groundwater samples collected for metals analysis will be filtered in the field using a 0.45-μm in-line filter prior to submittal to the laboratory. Development details, including discharge volume, discharge rate, development parameters, and appearance will be recorded on a Field Sampling Data Form. Development water will be handled as described in Section 2.11.1. After collecting the groundwater samples, the temporary wells will be abandoned as described in Section 2.3.6.

Groundwater samples collected from Geoprobe or hand auger locations will be suffixed with "GW." For example, GP-401-GW would denote a groundwater sample from Geoprobe location 401.

2.3.4 Boring Abandonment

Boring abandonment will be conducted per the requirements of WAC 173-160-560. All soil borings and hand auger borings will be abandoned by simultaneously adding bentonite chips to the boring while the probe, auger, or casing is removed. Bentonite chips placed above the water table will be hydrated with water. The abandoned borings will be sealed at the surface with concrete or gravel, depending on the surrounding surface material.

2.3.5 Water and Product Measurements

Water levels and floating product levels, if present, will be measured before sampling in each well within the monitoring well network. Depth-to-water measurements will be obtained using an electric water level indicator or a combination of water finding paste and product paste. Depths will be measured to the nearest 0.01 foot relative to the top of the well casing rim (north side). Measurements will be recorded to the nearest 0.01 foot in the field logbook. Sampling records will note the measured depth to water, depth to product, measurement date, time, and sampler's initials.

2.3.6 Residuals Management - Handling Procedures

All residual soil, water, product, and used decontamination solutions will be handled appropriately. Residual soil and water will be managed in accordance with all applicable local, state, and federal requirements, and in a manner consistent with *Guidance for Remediation of Petroleum Contaminated Soils* (Ecology, 1995). There are no specific Snohomish Health District requirements for storage of residual soil or water. Used disposable clothing and equipment will be handled as solid waste. Appropriate personal protective clothing will be worn during residuals transfers because of potential skin contact and splash hazards. The following residuals management procedures will be used:

- All soil generated during drilling will be containerized or stockpiled on-site. If possible, soil will be segregated to separate potentially contaminated soil from potentially uncontaminated soil. Soil disposition will be determined by JELD-WEN.

- Water generated from drilling, sampling, and decontamination will be kept separate, to the extent possible, from residual soil. Water will be placed in 55-gallon drums or tanks.

- Drums and tanks will be labeled with a label stating the drum contains investigation derived waste – pending analysis. The label will provide the site name, address, accumulation date, and contents (including approximate quantity).

- Drums and tanks will be sealed and secured daily. An on-site staging area for the accumulation of drums and tanks will be identified by JELD-WEN. Drums and tanks containing water will be stored in the designated temporary holding area as necessary until shipped off site.

- A record of all generated residuals that have been drummed, stockpiled, or otherwise stored will be maintained to expedite characterization and disposal upon completion of field activities.

- Disposable clothing and equipment will be placed in plastic bags and disposed of as solid waste.

- JELD-WEN will be responsible for the proper disposal of all wastes. SLR will coordinate with JELD-WEN for appropriate disposal procedures.

2.3.7 Guidelines for Splitting Samples

If requested by Ecology, JELD-WEN's on-site representative will provide for the collection of split or replicate samples. The following sample splitting procedures will be followed:

- Samples will be collected as described above.

- If sufficient sample is available in the Geoprobe or auger barrel from which JELD-WEN's representative is collecting a sample, then either Ecology (or representative) or JELD-WEN's representative will collect a split sample concurrently.

- If insufficient sample is available in the Geoprobe or auger barrel from which JELD-WEN's representative is collecting a sample, then an additional split spoon drive or hand auger sample will be collected in the same sampling interval, if desired by Ecology, or immediately below the JELD-WEN sampling interval.

2.3.8 Decontamination Procedures

A decontamination area will be established for cleaning the drilling rig and well materials. All down-hole drilling equipment and the working area of the drill rig will be steam-cleaned or hot water pressure-washed prior to beginning drilling and between drilling each boring. Hand-auger equipment, split-spoon samplers, spoons, bowls, and other sampling equipment that will contact samples will be decontaminated prior to initial use, between sampling locations, and between different sampling depths at the same location. Soil, groundwater, and surface water sampling equipment will be decontaminated by following procedure:

- Tap water rinse
- Alcohol rinse (if equipment visibly stained with product)
- Tap water rinse
- Nonphosphatic detergent and tap water wash
- Tap water rinse
- Second alcohol rinse (if equipment visibly stained with product)
- Tap water rinse
- Distilled water rinse

The electric well probe and oil/water interface probe will be rinsed with alcohol and distilled water between uses in different monitoring wells. All labels and binding tape will be removed from well materials prior to steam cleaning or washing. New sampling tubing will be used at each well.

Decontamination of personnel involved in sampling activities will be accomplished as described in the site Health and Safety Plan.

2.3.9 Sample Labeling, Shipping, and Chain-of-Custody

Sample Labeling. Sample container labels will be completed immediately before or immediately after sample collection. Container labels will include the following information:

- Project name
- Sample number (including sample depth, if applicable)
- Name of collector
- Date and time of collection

Sample Shipping. Soil and water samples will be shipped to the selected analytical laboratory as follows:

- Sample containers will be transported in a sealed, iced cooler.
- In each shipping container, glass bottles will be separated by a shock-absorbing and absorbent material to prevent breakage and leakage.

- Ice or "blue ice," sealed in separate plastic bags, will be placed into each shipping container with the samples.

- All sample shipments will be accompanied by a Chain-of-Custody Form. The completed form will be sealed in a plastic bag and taped to the inside lid of the shipping container.

- Signed and dated chain-of-custody seals will be placed on all shipping containers, unless samples will be picked up at the site by the laboratory.

- The analytical laboratory's name and address and SLR's name and office (return) address will be placed on each shipping container prior to shipping.

Chain-of-Custody. Once a sample is collected, it will remain in the custody of the sampler or other SLR personnel until shipment to the laboratory. Upon transfer of sample containers to subsequent custodians, a Chain-of-Custody/Analysis Request Form will be signed by the persons transferring custody of the sample container. A signed and dated chain-of-custody seal will be placed on each shipping container prior to shipping.

Upon receipt of samples at the laboratory, the shipping container seal will be broken, and the condition of the samples will be recorded by the receiver. Chain-of-custody records will be included in the analytical report prepared by the laboratory.

3 QUALITY ASSURANCE PROJECT PLAN

3.1 Introduction

The purpose of this Quality Assurance Project Plan (QAPP) is to present the quality assurance and quality control activities developed for the SAP. This QAPP covers the soil and groundwater sampling work to be undertaken by SLR International Corp during this investigation.

3.1.1 Project Organization

Primary responsibility for project quality rests with SLR International Corp project manager (PM), Mr. Scott Miller. The PM will review all project deliverables before submittal to Ecology or other appropriate regulatory agency. Where quality assurance problems or deficiencies are observed, the PM will identify the appropriate corrective action to be initiated.

3.1.2 Data Quality Objectives

This section presents the data quality objectives (DQO's) for the Remedial Investigation. This environmental assessment is being conducted to help ensure that data of sufficient quality and quantity will be available to identify if hazardous compounds are present at the Site and to evaluate risks posed by the presence of hazardous compounds in the soil and groundwater at the Site. Information is needed to identify if hazardous compounds associated with historical industrial activities have entered the subsurface and if these compounds, and the previously identified compounds, may pose unacceptable risk to current and future human and ecological receptors via direct contact or migration.

The data collected during the environmental assessment and the previously completed site assessments will be used to assess whether Site related contaminants of interest (COIs) may result in unacceptable risk to human and/or ecological receptors (current or likely future).

The numbers of sampling locations, sampling depths, types of samples, and types of analysis have been selected to meet the DQOs. The sampling proposed in this work plan represents the minimum sampling required to meet the DQOs. If observations made during the field work indicate a release of chemicals in an assessment area, additional sampling may be completed in that area to help assess the extent of the chemical release in soil and groundwater. These DQOs will be applied to facilitate data adequacy reviews and identify data gaps. Additionally, the DQOs will be used to identify the analytical practical quantification limit (PQL) and to establish other quality assurance goals with the QAPP and the SAP. The PQL is defined as the lowest levels which can be routinely quantified and reported by a laboratory. Thresholds for PQLs from WAC 173-340-707 include that the PQL may be no greater than ten times the laboratory method detection limit (MDL); or that the PQL for a hazardous substance, medium and analytical procedure may be no greater than the PQL established by the US EPA and used in 40 CFR 136, 40 CFR 141 through 143, or 40 CFR through 270. An important DQO for this project is to obtain appropriate quantitation limits and to meet the requirements of WAC 173-340-820, MTCA. The PQLs for the proposed soil and groundwater sample analysis at the former Nord Door site are presented in Tables 2 through 7 (attached). The Preliminary Cleanup Levels (PCLs) for the Site have been calculated in accordance with MTCA Cleanup Regulation, Chapter 173-340 WAC, as is described in the Work Plan (Section 4.1). As is shown in the tables, the calculated PCLs for some analytes are lower than the PQLs which can be achieved by the laboratory. In these instances the PCL has defaulted to the laboratory PQL. When necessary to meet the PCL, PAHs will be analyzed by EPA Method 8270 SIM SS, which will provide lower PQL than Method 8270.

3.2 Data Quality Assurance Objectives

The applicable data quality assurance objectives are dictated by the intended use of the data and the nature of the analytical methods. The accuracy, precision, representativeness, completeness, and comparability data quality assurance objectives are explained below.

3.2.1 Accuracy

Accuracy is the agreement between the measured value and the true value. Accuracy can be expressed as the difference between two values or the difference as a percentage of the reference or true value (ratio). Accuracy depends on the magnitude of the systematic (bias) and random (precision) errors in the measurement. Bias due to sample matrix effects will be assessed by spiking samples with known standards and calculating the recovery of the standards.

3.2.2 Precision

Precision is a measurement of mutual agreement among individual measurements of the same property under prescribed similar conditions. It is expressed in terms of the standard deviation or relative percent difference (RPD). Precision is determined through laboratory quality control parameters such as surrogate recoveries, matrix spikes, or quality control check samples. Separate field control samples will not be collected for this scope of work. Quality control objectives for surrogate recovery, percent recovery, and RPD for matrix spikes will be those currently established by the testing laboratory.

3.2.3 Representativeness

Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of chemical compounds in the media sampled. Sampling plan design, sampling techniques, and sample handling protocols are included in the SAP to ensure that samples collected are representative of site conditions within the limitations of the collection technologies. Sampling locations were selected based on their representativeness in further assessing the extent of contamination is soil and groundwater at the site. This documentation establishes protocols for assurance of sample identification and integrity.

3.2.4 Completeness

Completeness is a measure of the amount of valid data obtained from the analytical system compared to the total data collected. The completeness of the data will be assessed during quality control reviews. Audits, internal control checks, and preventative maintenance will be implemented to help maintain the above quality assurance objectives.

3.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be ensured by monitoring the control of sample collection, analytical methods, and data recording. Comparability of laboratory and field data will be maintained by using EPA-defined procedures, where available. Data comparability will be maintained by use of consistent methods and units. The laboratory predicted method detection limits (MDL) and method reporting limits (MRL) for the proposed sampling protocol are included as Attachment 1 to this document. Actual detection limits will depend on the sample matrix and will be reported as defined for the specific samples.

3.3 Field Data Quality Assurance Objectives

This QAPP also presents the field data quality assurance objectives for the ESA at the former JELD-WEN Site. The field data quality assurance objectives include field measurements and observations, field equipment calibration, chain-of-custody procedures, and sample handling procedures.

3.3.1 Field Measurement and Observation

Field measurements and observations will be recorded in the project log notes. Sufficient information will be recorded so that all field activities can be reconstructed without reliance on personnel memory. Entries will be recorded directly in waterproof ink and legibly and will be signed and dated by the person conducting the work. If changes are made, the changes will not obscure the previous entry, and the changes will be initiated and dated. At a minimum, the following data will be recorded:

- Location of activity
- Description of sampling reference point(s)
- Date and time of any activity
- Sample number and volume or number of containers
- Field measurements made
- Calibration records for field instruments
- Relevant comments regarding field activities
- Initials of responsible personnel

3.3.2 Field Instrument Calibration

The field instruments to be used during field activities will be calibrated at the beginning and as required according to manufacturers' specifications. Calibration records will be recorded in the project log notes including date, project number, instrument make and model, and instrument response to calibration.

3.3.3 Chain-of-Custody Procedures

The management of samples collected in the field will follow specific procedures to ensure sample integrity. To ensure sample integrity, the samples will be handled by as few people as possible and the sample collector will be responsible for the care and custody of the samples. Sample possession will be tracked from collection to analysis. Each time the samples are transferred between parties, both the sender and receiver will sign and date the chain-of-custody form and specify what samples have been transferred. When a sample shipment is sent to the laboratory, the original form will be placed with the samples and transmitted to the laboratory. A copy of the form will be retained in the project files. A chain-of-custody record will be completed for each batch of samples hand delivered or shipped to the laboratory.

The following information will be included on the chain-of-custody form:

- Sample number

- Sampler signature
- Sample collection date and time
- Site Name
- Sample type
- Inclusive dates of possession
- Signature of sender and receiver

In addition to the chain-of-custody form, other components of sample tracking will include the sample labels and seals, field logs, sample shipment receipt, and laboratory log book. The sample labels and seals will include the following information:

- Project name and number
- Name of sampler
- Date and time of sample collection
- Sample location and number
- Preservation

3.3.4 Sample Handling Procedures

Sampling plan design, sampling techniques, sampling location, and sample handling protocols are included in the SAP to ensure that samples collected are representative of site conditions within the limitations of the collection technologies.

The following table summarizes the soil sample handling requirements:

Analysis	Sample Container	Container Size	Preservation and Handling	Holding Times
Dioxins & Furans	Glass Jar	8 oz	Fill jar leaving minimal air space; keep in dark; cool to 4°C	30 days

The following table summarizes the groundwater sample handling requirements:

Analysis	Sample Container	Container Size	Preservation and Handling	Holding Times
Total Petroleum Hydrocarbon - Diesel (TPH-Dx)	Amber Glass Bottle	1 Liter	Fill bottle leaving no air space; keep in dark; cool to 4°C; HCL to pH<2	7 days
Total Petroleum Hydrocarbon - Gasoline (TPH-Gx)	Voa Vial	3 Voa Vials	Fill bottle leaving no air space; keep in dark; cool to 4°C; HCL to pH<2	14 days

Analysis	Sample Container	Container Size	Preservation and Handling	Holding Times
Priority Pollutant Metals - Total	Plastic Bottle	500 mL	Fill bottle leaving no air space; keep in dark; cool to 4°C; HNO_3 to pH<2	6 Months
Priority Pollutant Metals-Dissolved	Plastic Bottle	500 mL	Fill bottle leaving no air space; keep in dark; cool to 4°C	6 Months
Volatile Organic Analysis (VOA)	Voa Vial	3 Voa Vials	Fill vial leaving no air space; keep in dark; cool to 4°C; HCL to pH<2	14 days
Semi-Volatile Organic Compounds (BNA)	Amber Glass Bottle	1 Liter	Fill bottle leaving no air space; keep in dark; cool to 4°C	7 days
Dioxins & Furans	Plastic Bottle	Two -1 Liter	Fill bottle leaving no air space; keep in dark; cool to 4°C Laboratory centrifuge sample to remove suspended sediment	30 days

3.4 Quality Control

Quality control checks consist of measurements and tests performed in the field and laboratory. The analytical methods that will be performed as a part of this project have routine quality control checks performed to evaluate the precision and accuracy, and to determine whether the data are within the quality control limits.

3.4.1 Laboratory Quality Control Methods

Specific procedures and frequencies for laboratory quality control are detailed by the analytical method in the laboratory's Quality Assurance Plan. A general description of the types of laboratory quality control samples is as follows:

- **Method Blanks –** A minimum of one laboratory method blank will be analyzed per twenty samples or one per batch (whichever is greater) to assess possible laboratory contamination. Method blanks will contain all reagents and undergo all procedural steps used for analysis.
- **Control Samples –** A minimum of one laboratory control sample per twenty samples or one per batch (whichever is greater) will be analyzed for inorganics to verify the precision of the laboratory equipment. The control sample will be at a concentration within the calibration range, but at a different concentration than the standards used to establish the calibration curve.
- **Matrix Spike -** A minimum of one laboratory matrix spike sample will be analyzed per twenty samples or one per batch (whichever is greater) to monitor recoveries and assure that extraction and concentration levels are acceptable for quality assurance and quality control review. The laboratory matrix spike will be analyzed on a separate groundwater sample collected from one of the wells.

3.5 Data Management

This section addresses issues related to data sources, data processing, and data evaluation. Raw data generated in the field or received from analytical laboratories will be validated, entered into a computerized database, and verified for consistency and correctness.

3.5.1 Field Data Management

Accurate documentation of field activities (e.g., field parameters measurements, field notes) will be maintained using field log-books and field data forms. Entries will be made in sufficient detail to provide an accurate record of field activities without reliance on memory.

Field log entries will be dated and include a chronological description of task activities, names of individuals present, names of visitors, weather conditions, etc. All entries will be legibly entered in ink and initialed. A record of drilling, including the boring name and location, sampling intervals, sample names, and lithologic and field screening observations, will be included on a boring log.

Copies of standard SLR field forms are included in Appendix B.

3.5.2 Analytical Data Management

Following validation, all analytical data will be entered into a computerized database. The data may require some manipulation, such as common unit conversions and extraction from support information. To accomplish these manipulations, data reduction and tabulation techniques will be applied to the data and documented.

Several different tabular reports will be generated from the database. All analytical, locational, and tracking data will be stored in the database. Data reports for each type of analysis will be generated to produce standard reports.

All data validation, document control, and locational and analytical information generated by this project will be entered, stored, and generated by PC-compatible machines. Standardized software products will be used.

The volume of digital data anticipated on this project may be accommodated on a single PC work station. Project data backups will be made on a weekly basis or whenever major additions or modifications have been made to the various data management systems. Access to the database will be limited to the data manager and the authorized project personnel.

3.5.3 Sample Management

The sample management system forms the foundation of all other analytical data collection, verification, and validation tasks. Analytical data cannot be considered valid unless all the proper steps have been carried out with respect to sample management. These include:

- Sample properly documented in daily field log
- Chain-of-custody requirements met
- All sample-related documents filed
- Use of unique sample identification numbers

Data that do not pass the validation process either will be assigned data qualifiers to restrict or modify usage, or will be rejected for use. Modifications to the use of data will be documented in data validation reports.

3.5.4 Data Reporting Requirements

Quality assured data will be submitted to Ecology electronically in Environmental Information Management System (EIM) format. The electronic data will be verified to be compatible with EIM prior to delivery to Ecology.

TABLES

APPENDIX A

STANDARD SLR FIELD FORMS