APPENDIX A
AGENCY REVIEW DRAFT REMEDIAL INVESTIGATION SAMPLING AND ANALYSIS PLAN

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1 INTRODUCTION AND OBJECTIVES

This Sampling and Analysis Plan (SAP) has been prepared by Leidos for anticipated Remedial Investigation (RI) field activities to be conducted at the Newman's Chevron site (the Site), located at 2021 6^{th} Street in Bremerton, Washington. This SAP is not intended to be a stand-alone document. Instead, the SAP has been prepared as an appendix to the RI Work Plan for the Site, and is designed to be used in conjunction with both the RI Work Plan and the Quality Assurance Project Plan (QAPP) for the project.

The objective of the SAP is to establish the procedures necessary to complete the scope of work presented in the RI Work Plan. Based on the currently anticipated scope of work for the RI field activities, the following procedures are included in this version of the SAP:

1) General Sampling Procedures;
2) Soil Boring and Soil Sampling Procedures;
3) Groundwater Monitoring Well Installation Procedures;
4) Groundwater Monitoring and Sampling Procedures;
5) Soil Vapor Sampling Probe Installation Procedures;
6) Soil Vapor Sampling Procedures;
7) Field Equipment Decontamination Procedures; and
8) Investigation-Derived Waste Management Procedures.

If, based on the results of the initial RI field activities, additional investigation tasks are added or modified beyond the scope of this SAP, the SAP will be amended to include procedures for those additional or revised tasks.

2 GENERAL SAMPLING PROCEDURES

Sampling personnel will be equipped with a bound field notebook during performance of RI field activities. All data regarding sample collection will be recorded in this field notebook.

The chain of custody (COC) program will be adequate to allow for the tracing, possession and handling of individual samples from the time of field collection through laboratory analysis. The COC form will be used by personnel responsible for ensuring the integrity of the samples and will be maintained in the project files as documentation of sample handling procedures.

2.1 SAMPLE CONTAINER PREPARATION

All containers used in the sampling of soils, groundwater, and/or soil vapor will be laboratory cleaned as specified in the Quality Assurance Project Plan (QAPP) provided in Appendix B. The container type and preservative requirements will follow the specifications of the QAPP.

2.2 PROCEDURES TO PREVENT CROSS-CONTAMINATION

Personnel collecting soil, groundwater, and/or soil vapor samples will take the following precautions to minimize sample contamination or cross-contamination between samples:

- New nitrile gloves will be used while taking all samples and disposed of after equipment has been decontaminated.
- Sampling personnel will not touch the inside of the sampling container.
- Only equipment that has been properly decontaminated according to the procedures specified by the SAP will be used for environmental sample collection.

Immediately following the collection of the sample, the container will be sealed and the sample will be labeled and entered in the field notebook. At this time, the COC form will be completed to note the acquisition of the sample.

The sample will then be placed in a pre-cooled ice chest container and preserved (if required) according to the directions of the QAPP.

2.3 SAMPLE IDENTIFICATION AND LABELING

The sample designation protocols will be adhered to during the sample collection procedures to maintain sample data integrity. Each sample will be identified in the logbook and on the sample container label. The label will be filled out as follows:

- Sampler's initials;
- Sample location number;
- Site identifier;
- Date – date of sample collection;
- Time – time of sample collection; and
- Source – sample number and matrix (i.e., soil, water).

2.3.1 Soil Sample Designation

Subsurface soil boring samples will be designated with the number corresponding to the boring and the depth at which the sample was collected. Sample names will be created using the following format:

- SB-1-10.0-S-MMDDYY

QA/QC samples such as method blanks, trip blanks, field blanks, and duplicate samples collected during the RI will be labeled with unique sample identifiers and the date at which the sample was collected. A record of the QA/QC samples collected will be kept in the field notebook along with the COC. The following format will be used for QA/QC samples:

Equipment Rinsate Blanks

- ER-1-MMDDYY

Trip Blanks

- TB-1-MMDDYY

Duplicate Samples

- DUP-1-MMDDYY

2.3.2 Groundwater Sample Designation

Groundwater samples collected from proposed monitoring wells (if monitoring wells are installed at the Site) will be labeled according to the monitoring well ID and the date of collection. The date and time of collection will be recorded in the field logbook and on the COC.

- MW-14-W-MMDDYY.

QA/QC samples collected during groundwater sampling will be labeled in the same manner as QA/QC samples for soil.

2.3.3 Soil Vapor Sample Designation

Soil vapor samples will be labeled according to the soil vapor probe ID and the date of collection. The date and time of collection will be recorded in the field logbook and on the COC.

- SVP-1-MMDDYY.

QA/QC samples such as equipment blanks, and duplicate samples collected during the RI will be labeled with unique sample identifiers and the date at which the sample was collected. A record of the QA/QC samples collected will be kept in the field notebook along with the COC. The following format will be used for QA/QC samples:

Equipment Blanks

- EB-1-MMDDYY

Duplicate Samples

- DUP-1-MMDDYY

2.4 FIELD DOCUMENTATION

Field personnel will maintain detailed records of drilling and installation activities as well as development activities. These records will consist of soil boring and well installation and development logs, information recorded in field notebooks, and driller's daily field reports.

A bound field notebook will be maintained by the sampler to provide a daily record of events. At the beginning of each entry, the following will be recorded:

- Date;
- Time;
- Meteorological conditions;
- Field personnel present;
- List of on-site visitors and equipment; and
- Initials of the person making the entry.

Field notebook entries will be in as much detail as necessary so that essential information is properly documented. All documentation in field notebooks will be in ink. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or rendered unreadable.

If sample locations cannot be indicated on field maps, a sample drawing of the location (not to scale) will be included in the notebook to provide an illustration of all sampling points.

The cover of each notebook used will contain:

- Project ID and book number;
- Start date;
- End date; and
- A list of personnel that are authorized to record entries into the notebook.

Entries in the notebook will include the following information for each sample date:

- Site identification;
- Location of sampling points;
- Description of sampling points;
- References to photographs (if applicable) and brief sketch of sampling points;
- Sample identification number;
- Number of samples collected;
- Time of sample collection;
- Reference to sample location map;
- Number of QA/QC samples collected and their labeled identifier;
- Sampler's name;
- Field observations;
- Sample distribution (i.e., split samples, analytical lab); and
- All field measurements made (e.g., PID readings, etc.).

Daily activities will be summarized in the field notebook.

3 SOIL BORING AND SAMPLING PROCEDURES

Soil boring advancement and soil sampling proposed in the RI Work Plan will be conducted according to the following procedures.

3.1 BORE HOLE CLEARANCE

Prior to beginning of ground disturbance activities, Leidos will contact the Utilities Underground Location Center to request location of all public utilities in the vicinity of the proposed locations. In addition, Leidos will subcontract a private utility locating contractor to locate on-site infrastructure or other buried objects that would not typically be identified through the public utility locating process. The private utility survey will use a combination of ground-penetrating radar (GPR) and electromagnetic (EM) locating techniques.

Soil borings will not be advanced within 3 feet of known underground utilities and 10 feet from any overhead utilities without first evaluating alternative boring locations, and without written approval to proceed by CEMC, Nordic, and Victory.

If present, asphalt/concrete will be removed from each of the boring locations using appropriate equipment (e.g. jackhammer, concrete cutter).

In order to comply with current CEMC requirements for subsurface asset avoidance, each boring will initially be cleared to a depth of at least 8 feet below ground surface (bgs) using an air-vacuum excavation system or similar "soft-dig" method to avoid damage to buried utilities or other subsurface infrastructure. Within this interval, the diameter of the boring is required to be at least 3 inches larger than the largest diameter of tooling to be advanced into the boring.

When soil sample collection is required between the ground surface and 8 feet bgs, air-vacuum excavation will be stopped at least 6 inches above the top of the desired sampling interval and a hand-auger will be used to clear the boring to the desired sampling depth and collect the soil sample.

3.2 SOIL SAMPLE COLLECTION METHODS

The soil sampling scope of work proposed in the RI Work Plan includes soil sampling by one or more of the following methods:

- Hand auger;
- Direct-push; or
- Split-spoon sampling conducted during hollow-stem-auger drilling operations.

Appropriate soil sampling procedures will be followed at all times to ensure that representative soil samples are provided for analysis and that the act of sampling does not contribute to further contamination by cross-contamination. Care will be taken to quickly collect and preserve soil samples in order to minimize the potential loss of volatile organic compounds (VOCs). All techniques will be thoroughly documented to ensure future re-creation. The location of each sample will be mapped using a measuring tape or wheel and referenced to a local permanent feature where possible.

For soil samples collected between the ground surface and 8 feet bgs (i.e. the boring clearance interval), soil samples will be collected using a stainless steel hand-auger. Samples within this interval will generally be collected at approximate 2-foot intervals, unless otherwise specified in the RI Work Plan.

For soil sampling at depths below 8 feet bgs, samples will be collected using direct-push tooling or a split-spoon sampler advanced using a hollow-stem auger rig. Within this interval, soil sample collection at each location will be as specified in Section 4 of the RI Work Plan.

3.3 LOGGING AND FIELD SCREENING OF SOIL SAMPLES

Soil samples will be logged in the field in accordance with the Unified Soil Classification System (USCS). In addition, each sample will be field screened for the presence of petroleum hydrocarbons by headspace vapor measurements using a photo-ionization detector (PID) and sheen testing.

The samples will be examined and the following items will be noted in the field logbook or boring log:

- Color;
- Moisture content (dry, damp, moist, or wet);
- Lithology (using USCS);
- Geological interpretation, if possible (e.g., fill, topsoil, alluvium, till, etc.);
- Presence of sheen or light non-aqueous phase liquid (LNAPL);
- Other indications of contamination (e.g., discoloration); and
- Field screening results (see below).

Each sample will be field screened to obtain a relative estimate of its VOC concentration. This field screening will be performed by measuring the concentration of VOCs in the headspace above the sample in a closed container using a PID. Headspace vapor measurements will be performed by placing the soil into a sealed plastic bag (e.g. Ziploc), disaggregating the soil by hand, allowing the sample to equilibrate for at least five minutes, and then opening the bag slightly, inserting the instrument probe, and measuring the VOC concentration in the headspace.

Sheen testing will be conducted by placing soil in a pan of water and observing the water surface for signs of sheen. Sheens are classified as follows:

- ***Slight Sheen***: Light, colorless, dull sheen. The spread is irregular and dissipates rapidly.
- ***Moderate Sheen***: Light to heavy sheen, may show color/iridescence. The spread is irregular to flowing. Few remaining areas of no sheen are evident on the water surface.
- ***Heavy Sheen***: Heavy sheen with color/iridescence. The spread is rapid and the entire water surface may be covered with sheen.

3.4 SOIL SAMPLES ANALYSIS

At a minimum, two soil samples from each boring will be submitted for laboratory analysis. It is expected that one sample will be submitted from the bottom-most sample interval attained in the boring. The bottom-most sample will be used to demonstrate that the sampling effort has advanced to a sufficient depth to define the vertical extent of petroleum-hydrocarbon impacts. Additional soil samples may also be submitted based on field-screening observations. For example, the sample producing the highest PID readings, strongest sheen, or otherwise having the greatest visual or olfactory indication of hydrocarbon impacts may also be submitted for laboratory analysis.

Selected soil samples will be submitted to Eurofins Lancaster Laboratories Environmental, of Lancaster, Pennsylvania for the following analyses:

- Gasoline-range hydrocarbons (GRO) by Ecology method 97-602 NWTPH-Gx;

- Diesel-range hydrocarbons (DRO) and oil-range organics (ORO) by Ecology method 97-602 NWTPH-Dx,;
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency (USEPA) method 8260B;
- Naphthalenes by USEPA method 8270; and
- Total lead by USEPA method 6010B.

Select soil samples (those displaying strong indications of petroleum hydrocarbon impact based on field screening results) will be submitted for the following additional analyses:

- Methyl tertiary butyl ether (MTBE), ethylene dibromide (EDB), ethylene dichloride (EDC), and n-hexane by USEPA method 8260B;
- Extractable petroleum hydrocarbons (EPH) by Ecology method 97-602 WA EPH;
- Volatile petroleum hydrocarbons (VPH) by Ecology method 97-602 WA VPH; and
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by USEPA method 8270 SIM.

Soil samples collected from boring SVP-2, which will be advanced inside an area of the building that is believed to have been formerly used as service bays, will also be analyzed for the following analyses:

- Polychlorinated biphenyls (PCBs) by USEPA method 8082;
- Halogenated volatile organic compounds (HVOCs) by USEPA 8260B;
- Extractable petroleum hydrocarbons (EPH) by Ecology method 97-602 WA EPH; and
- Volatile petroleum hydrocarbons (VPH) by Ecology method 97-602 WA VPH.

Duplicate soil samples will be collected at a rate of one per each 20 soil samples and submitted for the above-referenced analyses to ensure QA/QC. Additional QA/QC samples will include one trip blank to accompany each sample cooler, and equipment rinse samples to verify equipment decontamination procedures. Equipment rinse sampling will be performed by collecting laboratory-supplied distilled water that has been used as the final rinse following equipment decontamination procedures. Equipment rinse samples will be collected at a rate of one per sample collection method. Trip blank and equipment rinse QA/QC samples will be submitted for the following analysis:

- GRO by Ecology method 97-602 NWTPH-Gx; and
- BTEX by USEPA method 8260B.

3.5 SOIL BORING ABANDONMENT

Following soil sample collection, soil boring will be decommissioned with hydrated bentonite by a Washington State Licensed Driller, in accordance with requirements of WAC 173-160. The ground surface will be restored with an asphalt, concrete, or natural cover to resemble the surrounding area.

4 GROUNDWATER MONITORING WELL INSTALLATION PROCEDURES

Groundwater monitoring well installation and development proposed in the RI Work Plan will be conducted according to the following procedures.

4.1 MONITORING WELL CONSTRUCTION

Monitoring wells will be completed in accordance with the WAC Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC). The drilling subcontractor will be responsible for obtaining and submitting all well drilling permits, logs, and well identification (ID) tags as required by the State of Washington.

Wells will be constructed using a 2-inch-diameter PVC casing with 0.010-inch, factory-slotted screen. The screen-interval depths for the wells will depend on the water table at each location. Each well screen will be positioned to straddle the water table during anticipated seasonal fluctuations. The screen interval filter pack will consist of 2/12 Monterey or 10/20 Colorado sand to a depth of two feet above the top-of-screen elevation. Above the filter pack, the remaining borehole annulus will be filled with bentonite chips to approximately 1.5 feet bgs. The remaining annular space will be filled with cement and completed with a flush-mount, traffic-rated well box.

The purpose of the development activities is to set the sand pack and to remove fine-grained material from the sand pack and casing. This is done to enable the collection of groundwater samples with a low turbidity**.** Wells will not be developed until at least 24 hours after being installed in order to allow the surface seal to adequately cure. If light non-aqueous phase liquid (LNAPL) is observed in any new wells, the LNAPL will be removed prior to development. The well will be allowed to stabilize after development for at least 24 hours before being sampled.

Monitoring well development procedures are as follow:

- Date and time of arrival, general site conditions and other applicable field observations related to the Site will be recorded.
- Locations and conditions of the wells will be verified. The least contaminated wells (if known) and background wells will be developed first to minimize the potential for cross contamination.
- Monitoring instruments will be checked by performing one calibration check. Results will be recorded in the field logbook.
- Wells will be inspected to determine the condition of the surface casings, surface seal and well identification.
- A water level indicator (electronic) will be used to measure depth to water in the well. The total depth of each well will be measured. The measurement will be used to calculate the thickness of the water column (height of standing water in the well). Well depths will be compared to completion data and any significant differences that may indicate silt buildup in the well will be reported.
- Well development will consist of surging for 10 minutes and pumping at least 10 well-casing volumes of groundwater from the well using an electric submersible pump until water produced from the well is clear and free of sediment. However, if LNAPL is present, development will be performed by manual bailing, instead of using an electric submersible pump.

4.3 MONITORING WELL LOCATION AND ELEVATION SURVEY

Following installation of the new wells, Leidos will subcontract a Washington State licensed land-surveying firm to perform a location and elevation survey of the new monitoring wells. Monitoring well elevation measurements will be made to the nearest 0.01 foot at the ground surface (i.e., top of well-box lid) and at the top of the well casing, relative to the North American Vertical Datum (NAVD) of 1988. Monitoring well location measurements will be made relative to the NAD 1983 High Accuracy Reference Network [NAD83 (HARN)].

5 GROUNDWATER MONITORING AND SAMPLING PROCEDURES

Groundwater monitoring and sampling proposed in the RI Work Plan will be conducted according to the following procedures.

5.1 GROUNDWATER ELEVATION AND LNAPL THICKNESS MEASUREMENTS

The depth-to-groundwater and depth to the bottom of the monitoring well will be measured to the nearest 0.01 foot using an electronic water level meter. The water level indicator will be decontaminated between wells

The presence of LNAPL will be evaluated in all wells using an electronic oil/water interface probe. If present, the LNAPL thickness will be measured to the nearest 0.01 foot. The oil/water interface probe will be decontaminated between wells.

5.2 GROUNDWATER SAMPLE COLLECTION

Proper sampling protocol will be followed to ensure that representative samples of groundwater are provided for analysis and that the act of sampling does not contribute to further impact at the site or cross-contamination of samples. Techniques employed will be thoroughly documented.

The pump (or intake hose) will be placed near the middle or slightly above the middle of the screened interval. The well will be purged at a rate of 100 to 500 ml/min; the goal is to minimize drawdown in the well (ideally less than 10 cm drawdown).

Purge-water temperature, pH, specific conductance, dissolved oxygen, oxidation-reduction (redox) potential, and turbidity will be monitored using an in-line flow cell. Readings will be taken every 3 to 5 minutes.

Purging will cease when the following parameters have stabilized as defined below for three successive readings or when at least one well casing volume has been purged:

- Temperature: ± 1 ºC;
- pH: ± 0.1 units;
- Specific conductance: ± 10 percent; and
- Dissolved oxygen or turbidity: ± 10 percent.

To minimize delays in field parameter stabilization and potential bias in analytical testing results, any vents or other potential sources of air bubbles in the pump discharge tubing or in-line flow cell will be identified and sealed off (or otherwise isolated) prior to purging or as soon as possible after purging begins.

If well yield is so low that continuous flow is lost during well purging event at the minimum sustainable purge rate, the pump will be turned off to allow the well to recover as much as possible (but not longer than 24 hours). After the water level in the well has recovered, the required samples will be collected with the pump placed near the middle of the screened interval.

5.3 GROUNDWATER SAMPLE ANALYSIS

One groundwater sample will be collected from each of the monitoring wells and will be submitted to Lancaster for the following analyses:

- GRO by Ecology method 97-602 NWTPH-Gx;
- DRO and ORO by Ecology method 97-602 NWTPH-Dx, without silica gel cleanup;
- DRO and ORO by Ecology method 97-602 NWTPH-Dx, with silica gel cleanup;
- BTEX, MTBE, and EDC by USEPA method 8260B;
- EDB by USEPA method 8011;
- Naphthalene by USEPA method 8270;
- cPAHs by USEPA method 8270 SIM; and
- Total lead by USEPA method 6010B.

6 SHALLOW SOIL VAPOR SAMPLING PROBE INSTALLATION PROCEDURES

Shallow soil vapor sampling probe installation proposed in the RI Work Plan will be conducted according to the following procedures.

6.1 BORINGS FOR SHALLOW SOIL VAPOR PROBE INSTALLATION

Based on the planned construction of the shallow soil vapor sampling probes, which is described in further detail in Section 6.2, soil borings for installation of shallow soil vapor sampling probes will generally be advanced to a depth of approximately 6 feet bgs. Where borings are advanced to greater depths for additional soil sampling, or other purposes, the borings will be backfilled with pre-hydrated granular bentonite to 6 feet bgs.

Borings for installation of shallow soil vapor sampling probes will be advanced with a stainless-steel hand auger only. Air-vacuum or pressure excavation equipment will not be used for shallow soil vapor probe installation due to the potential to significantly disturb equilibrium soil vapor conditions near the sampling probe. Soil sampling during the shallow soil vapor probe installation process will be performed as stated in the RI Work Plan.

6.2 SHALLOW SOIL VAPOR SAMPLING PROBE CONSTRUCTION

Construction of shallow soil vapor sampling probes will be performed under the supervision of a Washington State licensed driller. Upon completion of the sampling probe boring to 6 feet bgs, the borehole will be prepared by placing a 6-inch lift of 2/12 Monterey or 10/20 Colorado sand into the bottom of borehole. The vapor sampling probe hardware, which will consist of a 6-inch long, 0.75-inch diameter stainless steel screen (0.0057-inch screen pore size) connected to a length of ¼-inch outside diameter (O.D.) Teflon® tubing via a Swagelok® fitting with a rubber compression ferule, will then be placed in the approximate center of the boring, and additional sand will be added until the sand pack extends to a depth approximately 6 inches above the top of the probe screen. Approximately 12 inches of dry, granular bentonite will then be placed above the sand pack. The boring will then be sealed with approximately 24 inches of pre-hydrated granular bentonite and the upper portion of the boring will be completed with an 18-inch thick cement cap. An 8-inch flush-mounted well box will be installed to protect the tubing line that is set in the cement cap. The above-grade end of the soil vapor sampling probe tubing will be fitted with a Swagelok® stainless steel on/off control valve. An illustration showing the typical construction of a soil vapor sampling probe is included as Figure A-1.

7 SHALLOW SOIL VAPOR SAMPLING PROCEDURES

Shallow soil vapor sampling proposed in the RI Work Plan will be conducted according to the following procedures.

7.1 SHALLOW SOIL VAPOR SAMPLING EVENT SCHEDULING

Sampling of shallow soil vapor sampling probes will not be performed within the first 48 hours after installation of the probes, in order to ensure that the surface seal of the probes is sufficiently cured. In addition, soil vapor sampling will not be performed during or within 48 hours after a significant rain event (greater than 1 inch of precipitation), due to the potential reduction of the effective diffusion coefficient and decrease in relative vapor saturation in the unsaturated zone. Soil vapor sampling will also not be performed during periods of high winds, or during other major storm events with the potential to cause significant and rapid changes in barometric pressure trends.

7.2 SHALLOW SOIL VAPOR SAMPLING EQUIPMENT

Soil vapor samples will be collected in stainless steel Summa air-sampling canisters (Summa canisters), which will be provided by the subcontracted laboratory for the vapor sampling portion of the project. Each Summa canister used for sample collection will be individually certified (100-percent certified) to contain less than the reporting limit for each of the target analytes listed in Section 7.8. Soil vapor sampling manifolds, duplicate sampling tees, purge canisters, and tubing will also be supplied by the subcontracted laboratory.

7.3 PRE-SAMPLING EQUIPMENT SETUP AND LEAK TESTING

7.3.1 Initial Canister Vacuum Check

To begin setup for the vapor sample collection process, the sampling canister (or canisters if a duplicate sample is being collected) will be checked to determine their initial vacuum level, in order to verify that the canisters have not been inadvertently opened or have otherwise leaked prior to the sampling event. The initial vacuum, which should be approximately 29 inches of mercury vacuum, will be recorded on the canister's identification tag and in the field log book and/or field data form. Sampling canisters with initial vacuum readings of less than 27 inches of mercury vacuum will not be used for soil vapor sample collection.

7.3.2 Sampling Canister and Manifold Assembly and Shut-In Test

Following the initial canister vacuum check, the sampling canister (or canisters if a duplicate sample is being collected) will be fitting with a sampling manifold. The sampling manifold will be equipped with an on/off valve and a flow controller that will be calibrated to provide a sample collection flow rate of less than 200 milliliters per minute (mL/min). Vacuum gauges will be provided on both in the inlet and outlet side of the flow controller. The manifold will also allow the sampling canister to be connected to another Summa canister that will be used to purge the soil vapor sampling probe and sampling equipment train. Where duplicate samples are to be collected, the sampling manifold will also allow connection of another Summa canister for simultaneous collection of a duplicate sample.

After connecting the sampling manifold to the sampling canister(s) and purge canister, a "shut-in" test will be performed as a preliminary check of the manifold connections. With the inlet to the manifold tightly capped, the purge canister will be opened momentarily and then shut, thereby applying a vacuum to the sampling manifold. Initial vacuum readings will then be recorded in the field log book and/or field data form from both of the two vacuum gauges on the sampling manifold. After a period of at least 5 minutes, the vacuum readings of each gauge will be checked again to verify that the initial vacuum levels have been maintained. If the vacuum readings between the initial and final readings are the same, the results of the shut-in test will be recorded and the sampling canister and manifold assembly will be used for vapor sample collection. However, if the vacuum readings between the initial and final readings are different, it is an indication that one or more of the manifold connections is leaking. In that event, an attempt will be made to tighten the manifold connections, or otherwise remedy the manifold leak(s), and the shut-in test will be repeated. If after three attempts, shut-in test results still indicate that the sampling canister and manifold assembly is not leak-free, the sampling manifold will be removed from service and not used for vapor sample collection.

7.4 CONNECTION TO SAMPLING PROBE AND PRE-SAMPLE COLLECTION PURGING

After satisfactory completion of the shut-in test, the sampling canister and manifold assembly will be connected to the soil vapor sampling probe. Teflon® tubing (¼–inch outside diameter) will be used to connect the soil vapor sampling probe control valve to the inlet of the sampling manifold. Swagelok® fittings with rubber compression ferrules will be used to make connections from the Teflon® tubing to the control valve and sampling manifold inlet. During this process, the soil vapor sampling probe control valve will be maintained in the closed position.

Prior to collecting a soil vapor sample, each soil vapor sampling probe will be purged to remove the air volume present in the sample collection train, which would not be representative of subsurface soil vapor conditions. Purge volume will be based on the volume of air contained within the inner diameter of the soil-vapor sampling probe and all tubing connected to the inlet of the sampling canister. The sand pack volume of the soil-vapor sampling probe will not be included in the purge volume calculation, as it is assumed that the soil-vapor concentration in the sand pack will be in equilibrium with the surrounding soil. Three purge volumes will be removed from each soil-vapor sampling probe prior to sample collection. The purge cycle will be completed by applying vacuum to the manifold, using the purge container, for the duration of the calculated purge time. Upon completion of the purge cycle, the purge canister valve will be closed to reseal the sampling manifold.

Assuming use of ¼-inch O.D. tubing and an approximate combined sampling probe and tubing length of 10 feet, it is estimated that the total purge volume would be equal to approximately 300 milliliters, which would equate to a purge time of approximately 1.5 minutes at a purge rate of approximately 200 mL/min.

7.5 SECONDARY LEAK TESTING AND SAMPLE COLLECTION

In order to verify the integrity of the vapor sample collection system during the sampling process, helium gas will be used as a tracer to check for leaks or short-circuiting of ambient air into the sampling system. To accomplish this, the entire soil-vapor sampling train (soil-vapor sampling probe, sampling manifold, sampling canister, and purge canister) will be contained in a shroud in which a helium-rich environment will be maintained throughout the duration of the sample collection. Laboratory-grade helium will be used as the tracer gas. During the duration of the sampling, the concentration of helium inside the shroud will be monitored using a Mark 9822, or equivalent, helium detector. During sample collection, the sampling technicians will attempt to maintain a concentration of helium of approximately 10 percent by volume in the sampling shroud. An illustration showing the typical equipment setup for soil vapor sample collection is included as Figure A-1.

After reaching a helium concentration in the sampling shroud of at least 10 percent by volume, the valve on the sampling canister(s) will be opened to begin sample collection. The start time and initial canister vacuum(s) will be recorded in the project log book. During collection of each sample, the sampling technician will periodically check the canister vacuum(s) readings to verify that the canister is filling at the expected rate. The sampling technician will also monitor and maintain the concentration of helium leak-detection gas within the sampling shroud. Sample collection will be stopped when the vacuum gauge on the sampling canister indicates that between approximately1 to 3 inches of mercury vacuum is remaining in the sampling canister. Once sample collection is done, the final canister vacuum will be recorded on the canister ID tag and also in the project log book.

7.6 QA/QC SAMPLE COLLECTION

In order to verify sample collection, and laboratory QA/QC, one equipment blank and one duplicate soil vapor sample will be collected. The QA/QC equipment blank will be collected by passing laboratory-certified nitrogen through a representative length of Teflon® tubing, and the sampling manifold, into a Summa canister. The QA/QC duplicate sample will be collected using a duplicate-sampling manifold, which will allow two sample collection canisters to be filled simultaneously in a parallel configuration.

7.7 WEATHER MONITORING AND OBSERVATIONS

During the soil vapor sampling event, the following weather data and observations will be recorded at the start of the work day, at the approximate time of each sample collected, and at the end of the work day:

- General weather conditions;
- Barometric pressure; and
- Wind speed and direction.

General weather conditions will be recorded based on observations in the field by Leidos personnel. Weather data will recorded from National Weather Service or equivalent web-based resources available for the Bremerton area.

7.8 SOIL VAPOR SAMPLE ANALYSIS

Soil vapor samples will be submitted to ALS Environmental in Simi Valley, California for the following analyses:

- BTEX, MTBE; and naphthalene by USEPA method TO-15 modified; and
- Oxygen, carbon dioxide, methane, nitrogen, and helium by American Society for Testing and Materials (ASTM) D1946.

8 FIELD EQUIPMENT DECONTAMINATION PROCEDURES

Field equipment used during drilling soil borings and sampling will be decontaminated prior to use and between sample collection events to reduce the potential for the introduction of contamination and cross-contamination in accordance with the guidelines and procedures set forth in this document. These procedures are necessary to ensure quality control in decontamination of field equipment and to serve as a means to identify and correct potential errors in sample collection and sample handling procedures.

The decontamination fluids generated during decontamination procedures will be treated as though they are contaminated and will be contained in 55-gallon drums, marked and secured until a proper disposal method is developed and implemented based on analytical test results.

Decontamination of all non-disposable field sampling equipment, field instruments and sample containers will be conducted in a thorough and step-wise manner as described below. New, disposable nitrile gloves will be worn when handling clean sampling equipment and monitoring well construction materials to ensure that the equipment is not cross-contaminated. Decontamination procedures will be documented in the field notebook.

8.1 EXPLORATION AND CONTRUCTION EQUIPMENT

Prior to use, between locations, and before leaving the Site; augers, direct-push rods, well screens, casings and other non-sampling equipment shall be certified clean or decontaminated in accordance with the following procedures:

- Move equipment to designated decontamination area;
- Clean thoroughly (inside and outside) with a high-pressure steam cleaning unit (water at 1,500 psi);
- Allow to air dry; and
- Store in a clean area on plastic sheeting.

8.2 SAMPLING EQUIPMENT

All non-disposable sampling equipment used for soil and water sampling will be decontaminated between each sample. The decontamination procedure is provided as follows:

- Scrub with Liquinox and water to remove any visible dirt;
- Rinse thoroughly with potable water;
- Rinse with distilled water; and
- Store in a clean area on plastic sheeting.

8.3 SAMPLE CONTAINERS

Reusable sample containers (such as Summa canisters for vapor sample collection) will be cleaned and certified prior to use, by the analytical laboratory performing the analyses.

9 INVESTIGATION DERIVED WASTE MANAGEMENT PROCEDURES

9.1 IDW STORAGE

Residual soil from this investigation will be contained in 55-gallon Department of Transportation (DOT) approved drums, which will remain on-site for temporary storage while awaiting laboratory results. All decontamination and purge water will be stored in 55-gallon DOT approved waste drums.

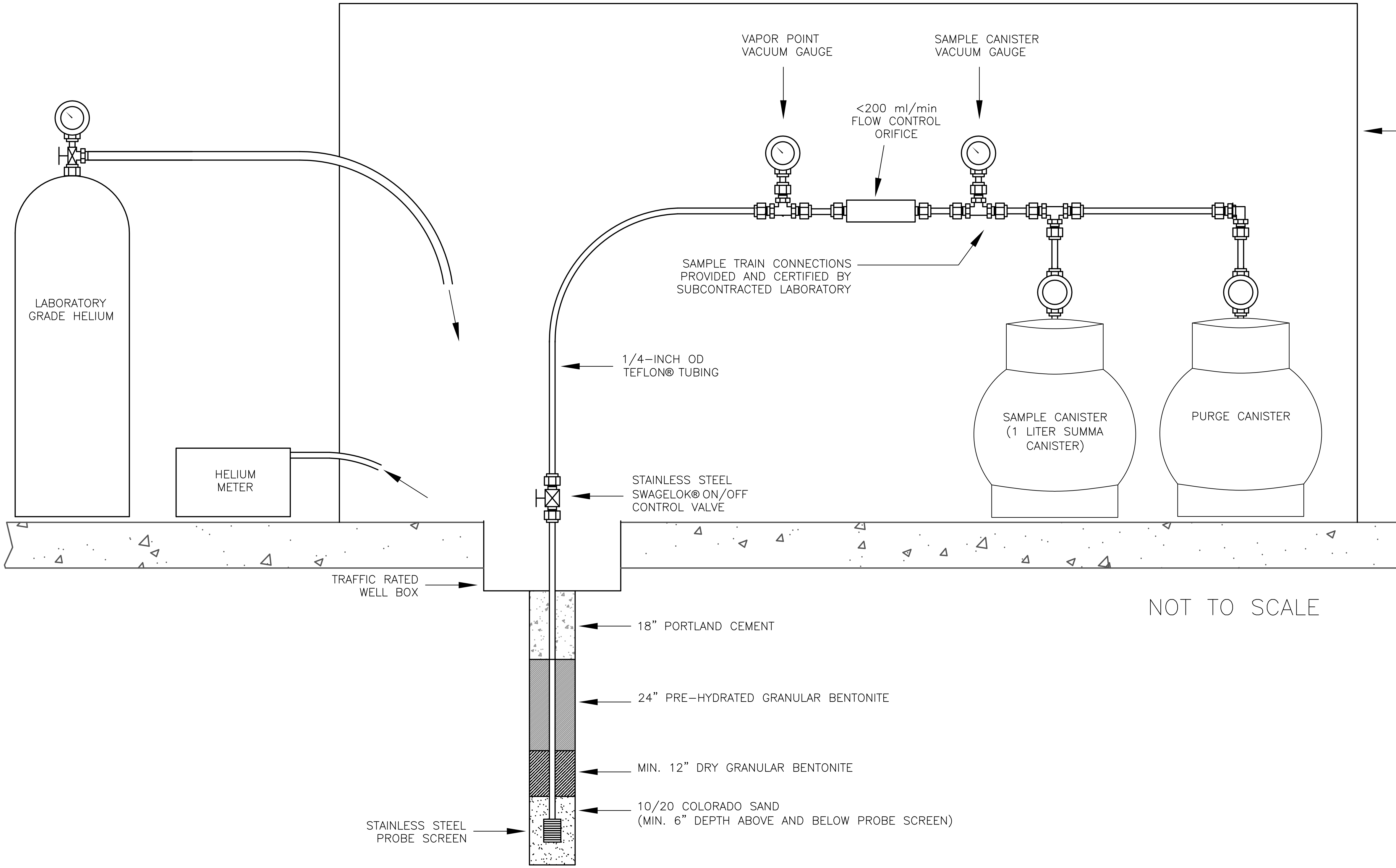
Each drum will be labeled immediately before waste is placed into the container using a non-hazardous waste or pending analysis label. The following information, at a minimum, will be written in indelible, waterproof ink on each label: container number, date of generation, facility address, contact information for the CEMC Waste Management Center, and a brief description of the contents of the container. Each drum will be secured after every addition of waste and prior to departing the site on each work day.

9.2 IDW SAMPLING

For waste profiling purposes, waste samples will be collected and submitted under a separate COC. For soil waste, a 4-point composite sample will be collected and composited by the laboratory. For liquid waste, one sample will be collected from the container where the liquid is stored. The waste samples will be submitted to Lancaster for analysis specified by CEMC in the site-specific waste sampling plan.

9.3 IDW DISPOSAL

Following receipt of laboratory analytical data, the waste soil and water will be transported for disposal at a permitted facility by an approved disposal subcontractor.



leidos

Newman's Chevron
2021 6th Street
Bremerton, Washington

FIGURE A-1

TYPICAL SOIL VAPOR SAMPLING PROBE CONSTRUCTION AND EQUIPMENT LAYOUT

FILE NAME:	DATE:
204117_SVSP.dwg	05/07/2018