FINAL
REMEDIAL INVESTIGATION WORK PLAN – ADDENDUM 4
NEWMAN'S CHEVRON
2021 6th Street
Bremerton, Washington

August 9, 2022

Prepared for:
Washington State Department of Ecology – NW Region Office
15700 Dayton Ave. N.
Shoreline, Washington 98133

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On Behalf of:
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REMEDIAL INVESTIGATION WORK PLAN – ADDENDUM 4
NEWMAN'S CHEVRON

1 INTRODUCTION AND OBJECTIVES

Leidos, Inc. (Leidos), on behalf of Chevron Environmental Management Company (CEMC), Nordic Properties, Inc., and Victory Business Park L.L.C. (herein collectively referred to as the PLPs), has prepared this addendum (Addendum 4) to the *Final Remedial Investigation Work Plan* (RIWP), dated July 3, 2018, for the Newman's Chevron Site (the Site), located at 2021 6th Street in Bremerton, Washington (Figure 1).

Addendum 4 has been prepared to define the scope of work and methods proposed to be used to further assess the potential for naphthalene vapor intrusion (VI) to buildings on and in the vicinity of the former Newman's Chevron service station property (former service station property).

RI activities at this Site are being performed pursuant to the requirements of Agreed Order No. DE 14246, which was executed by the Washington State Department of Ecology (Ecology) and the PLPs on February 6, 2018. Upon Ecology approval of this document, Addendum 4 will become a component of the RIWP and shall be used in conjunction with the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) established by the RIWP.

2 BACKGROUND

2.1 SUMMARY OF PREVIOUS VI ASSESSMENT ACTIVITIES

To date, the following six sampling events have been conducted at the Site to evaluate the potential for VI from petroleum compounds to buildings on and in the vicinity of the Site.

1. **September 27, 2018** – The first round of VI assessment sampling was conducted per the RIWP at soil vapor sampling probes SVP-1, SVP-2, and SVP-3 on the service station property. Samples were analyzed by ALS Laboratory of Simi Valley, California by EPA Method TO-15 and ASTM D-1946. Sampling results did not exceed Model Toxics Control Act (MTCA) Method B sub-slab soil gas screening levels for any of the target analytes (benzene, toluene, ethylbenzene, xylenes [BTEX], methyl tertiary butyl ether [MTBE], and naphthalene).
2. **March 25, 2020** – Based on the results of soil sampling completed in July 2019 that confirmed the presence of petroleum impacts in soil to the south and east of the former service station property, three new soil vapor sampling probes (SVP-4, SVP-5, and SVP-6) were installed in February 2020 to assess offsite shallow soil vapor conditions. Samples were analyzed by H&P Mobile Geochemistry, Inc of Carlsbad, California by EPA Method TO-15 and ASTM D-1946. Sampling results from this event did not exceed Method B sub-slab soil gas screening levels for BTEX, MTBE, or naphthalene; however, the quantification of naphthalene was affected by detection of naphthalene in the blank sample.
3. **August 19, 2020** – In June 2020, Ecology requested that another round of sampling be conducted at soil vapor sampling probes SVP-4 through SVP-6, including laboratory analysis for petroleum carbon fractions using the Massachusetts Department of

Environmental Protection Air-Phase Petroleum Hydrocarbons (MADEP APH) method, and modified sample collection methods to achieve a lower reporting limit for quantification of naphthalene by EPA Method TO-15. Samples were analyzed by Eurofins Air Toxics laboratory of Folsom, California (Eurofins). Results of this sampling event indicated that naphthalene was present in SVP-5 and SVP-6 at concentrations exceeding the MTCA Method B sub-slab soil gas screening level.

4. **December 4, 2020** – Based on the results of the August 2020 sampling event, a follow-up sampling event was performed that included all of the existing soil vapor sampling probes (SVP-1 through SVP-6). These samples were analyzed by EPA Method TO-15, ASTM D-1946, and MADEP APH by Eurofins. Results of this sampling event indicated that naphthalene was present at all sampling locations at near or above the Method B sub-slab soil gas screening level.
5. **June 22, 2021** – Based on the results of the previous four sampling events, an additional sampling event was conducted to focus specifically on naphthalene concentrations in each of the six existing shallow soil vapor sampling probes (SVP-1 through SVP-6). Samples were analyzed by Eurofins for naphthalene only by EPA Method TO-17, which is better suited than EPA Method TO-15 to accurately quantify low levels of naphthalene. Results of this sampling event indicated that naphthalene was detected at all six sampling locations at concentrations exceeding the Method B sub-slab soil gas screening level.
6. **February 18, 2022** – Based on the results of the June 2021 sampling event, one new shallow soil vapor sampling probe (SVP-7) was installed on the property at 1932 5th Street in November 2021 and sampled in February 2022. The sample was analyzed by Eurofins for naphthalene only by EPA Method TO-17, which was not detected.

Based on the results of these sampling efforts, BTEX and MTBE are no longer considered to be contaminants of concern in soil vapor at the Site. However, naphthalene has been detected in shallow soil vapor, both on and in the vicinity of the former service station property, at concentrations exceeding the Method B sub-slab soil gas screening level. Based on these data, Leidos has recommended additional assessment at the Site to further evaluate the potential for naphthalene VI to indoor air on the former service station property, as well as on the adjacent residential properties at 1936 5th Street and 2005/2007 6th Street.

2.2 POTENTIAL HOUSEHOLD SOURCES OF NAPHTHALENE IN INDOOR AIR

The assessment of VI to indoor air is inherently difficult because the presence of volatile and semi-volatile organic chemicals (VOCs and SVOCs) such as naphthalene is generally ubiquitous in residential homes and other buildings. For example, common sources of naphthalene in indoor air include consumer and building products including air fresheners, paints, stains, flooring and carpeting, and pest control products such as mothballs. Naphthalene can also be released to indoor air from sources such as woodstoves and fireplaces, cooking, cigarette smoke, and exhaust from vehicles and gas-powered equipment (Health Canada, 2013).

In fact, several studies of indoor air quality have reported average naphthalene concentrations in residential indoor air that would exceed the MTCA Method B cleanup level for naphthalene in indoor air (0.0735 micrograms per cubic meter [µg/m3]). A study completed by the Montana Department of Environmental Quality (MDEQ) found that the average indoor air concentration for naphthalene in non-smoking Montana residences not impacted by VI was 0.36 µg/m3. The MDEQ study concluded that naphthalene, along with five other volatile organic compounds

(VOCs), "… may be expected to normally be found above their generic screening levels in the indoor air of residential homes" (MDEQ, 2012). Similarly, a 2013 fact sheet distributed by Health Canada reported that the average concentration of naphthalene in Canadian homes ranged from 0.3 to 6.3 µg/m3 (Health Canada, 2013).

3 PRE-SAMPLING PROPERTY INSPECTIONS

To develop the sampling strategy and scope of work proposed by Addendum 4, Leidos conducted pre-sampling inspections on April 7, 2022 of the properties at 1936 5th Street and 2005/2007 6th Street, in order to understand the layout, use, and construction of the existing residential structures present. The findings of these inspections are summarized in the following subsections.

3.1 1936 5TH STREET

This property is located immediately south of the alley to the south of the former service station property (Figure 1). Two existing residential structures are present on the property. In the southeast portion of the property is a single-family home that has been divided into two separate apartment units. The upper portion of this unit is identified as 1936 5th Street and the basement floor apartment is identified as 1936A 5th Street. Another residential structure is located in the northwest portion of the property, adjacent to the alley to the north. This unit is identified as 1936-½ 5th Street.

The property is identified by Kitsap County as Parcel No. 3717-002-025-0005. Kitsap County Assessor's records indicate that the property is approximately 6,100 square feet.

Because potential VI would in general predominantly impact the lower floor of a structure, Leidos' inspection at the 1936 5th Street property included only the 1936A and 1936-½ units.

3.1.1 1936A 5th Street Residence

This unit is a residential apartment constructed in the walkout basement (partially below ground) portion of the structure. The apartment consists of two bedrooms, one bathroom, kitchen, and living area. All floors are finished with carpeting and linoleum, or similar, floor coverings, except for limited areas in one or more of the closed spaces. Kitsap County Assessor's records indicate that the area is approximately 950 square feet and that the structure was originally constructed in 1917.

Heating for the unit is provided by wall mounted electric heaters; however, a gas furnace is reportedly located in a closet, which provides heat for the upstairs apartment unit. Windows are present on the north, east, and west sides of the unit.

At the time of Leidos' inspection, no visible household chemicals were identified that may be sources for VOCs in indoor air; however, Leidos did not conduct a thorough inspection of storage spaces in the unit. Cigarette smoke odor was noted at the time of the inspection.

3.1.2 1936-½ 5th Street Residence

This unit is a stand-alone residential structure located in the northwest portion of the property. The structure is a one-floor residential unit, consisting of one bedroom, one bathroom, kitchen, living room, and a laundry/storage room. Kitsap County Assessor's records indicate that the

structure is approximately 512 square feet and was originally built in 1917. Heat for the unit is provided by wall mounted electric heaters.

The foundation structure for this unit appears to be post and beam construction, with an earthen crawlspace present beneath the floor. Several openings are present along the sides of the crawlspace, which provide ventilation of the crawlspace to ambient outdoor air.

At the time of Leidos' inspection, no household chemicals were identified that may be sources for VOCs in indoor air; however, Leidos did not conduct a thorough inspection of storage spaces in the unit.

3.2 2005/2007 6TH STREET

This property is located immediately east of the former service station property (Figure 1). Two residential structures are located on the property. A traditional single-family house, which is identified as 2005 6th Street, is located in the northeast portion of the property. A smaller structured, identified as 2007 6th Street, is located in the southwest portion of the property, adjacent to the alley to the south.

The property is identified as Kitsap County Parcel No. 3717-002-013-0009. Kitsap County Assessor's records indicate that the property is approximately 6,100 square feet.

3.2.1 2005 6th Street Residence

Kitsap County Assessors records indicate that this residence is a 1.5-story structure with three bedrooms and one bathroom that was built in 1918. The area of the structure is reported as 1,904 square feet, which includes an unfinished ground floor of approximately 770 square feet. Because potential VI would in general predominantly impact the lower floor of a structure, Leidos' inspection of this unit consisted only of the ground floor.

The ground floor portion of the structure is a walkout basement/garage that is partially below grade, with ground level access from the west through a single door, and from the south through an overhead garage door. Multiple single-pane windows are present along both the western and eastern sides of the space.

The basement/garage is constructed as a single continuous space with no permanent portioning walls. Use of the space at the time of Leidos' inspection appeared to be primarily as a garage in the western half, including storage of a vintage gasoline-powered automobile, gasoline-powered lawn mower, and various household tools and maintenance products, including paints and cleaning solvents. The eastern half of the space contained a natural gas furnace, laundry area, and storage for other various household items. A small storage area immediately adjacent to the southern wall of the space also contained various household maintenance items, including several fuel storage cans.

The basement floor is concrete and appeared to be in good condition, with no significant cracks observed.

3.2.2 2007 6th Street Residence

Information obtained online from the Kitsap County Assessor's website indicate that this residence is a one-story structure, with one bedroom and one bathroom, that was built in 1936. The area of the structure is reported as 331 square feet.

At the time of Leidos' inspection of the property, the main floor of the structure was found to consist of a single bedroom, kitchen, and bathroom. This portion of the structure appeared to be heated with wall mounted electric heaters. Windows were present in each room of the main floor and ceiling fans were present in the bedroom and kitchen.

The foundation of the structure appears to be post and beam construction. However, a small earthen floor basement and crawlspace is present beneath the structure, which can be accessed by an exterior stairwell and access door on the east side. Masonry walls are present around the perimeter of the basement portion of this area, but they do not extend up to the floor joists and do not appear to connect or otherwise provide structural support for the building. The ceiling height of the basement portion of this area is approximately 6.5 feet; however, only approximately 4 feet of this depth is below the surrounding ground surface. Therefore, the upper portion of the basement/crawlspace is above the surrounding ground surface and there appears to be openings for air exchange between the basement/crawlspace and outdoor ambient air. A hot water heater, sump pump, and sewer drain piping are also present in this area. The space also appears to be used for storage of various household items.

At the time of Leidos' inspection of this structure, no household items were identified in the basement/crawlspace or living area of the structure that could serve as potential sources of VOCs in indoor air. However, Leidos did not conduct a thorough inspection of the living portion of the unit.

4 PROPOSED ASSESSMENT STRATEGY

Due to the differences in construction and use of the structures to be assessed, a one-size-fits-all sampling approach cannot be utilized to further evaluate naphthalene VI potential for the Site. Based on the results of the pre-sampling inspections discussed in Section 3, as well as information obtained from previous work in the former service station building, Leidos has developed the following sampling strategy, which has been tailored for each of the structures to be assessed.

4.1 1936A 5TH STREET - SHALLOW SOIL VAPOR SAMPLING

Leidos proposes to assess naphthalene VI potential to the 1936A 5th Street structure by evaluating shallow soil vapor conditions from one sampling location (SVP-8) to be installed adjacent to the structure, to the north (Figure 1). This assessment strategy was selected for this location based on the following considerations:

- The location of the structure, which is set back south of the alley approximately 40 feet, allows installation of a sampling probe to assess shallow soil vapor conditions on the side of the structure facing the former service station property.
- This sampling strategy is less disruptive to residents because the work can be conducted without entry to the residence.
- This sampling strategy reduces concerns related to the detection of naphthalene from potential indoor household sources, such as residue from cigarette smoke.
- Installation of a sampling point to collect sub-slab soil vapor samples at this location would be problematic due to the presence of finished floors throughout the space.

Shallow soil vapor probe installation and sampling at this location will be conducted consistent with methods used previously at the Site, and which are further discussed in Section 7, Field Procedures. Sampling results from this location will be compared against the MTCA Method B sub-slab soil gas screening level for naphthalene, which is 2.5 µg/m3.[1]

4.2 1936-½ 5TH STREET AND 2007 6TH STREET – CRAWLSPACE AIR SAMPLING

The residential structures at 1936-½ 5th Street and 2007 6th Street are constructed with crawlspaces below the normally occupied living spaces. Therefore, Leidos proposes to collect air samples from the underlying crawlspace areas. This assessment strategy was selected for these locations based on the following considerations:

- Crawlspace air sampling will be less disruptive to residents because the work can be conducted without entry to the residences.
- This sampling strategy reduces concerns related to the detection of naphthalene from potential indoor household sources (although crawlspace air quality may also be influenced by indoor air).
- Any potential VOCs migrating from subsurface should be first going through the crawlspace area before entering the living space above.

At each of these locations, crawlspace air samples will be collected over an 8-hour period by the methods specified in Section 7. Results of the crawlspace air sampling will be compared against the MTCA Method B indoor air cleanup levels for naphthalene (0.0735 µg/m3) and ambient (outdoor) air samples that will be collected concurrently with these samples.[2]

4.3 2005 6TH STREET AND 2021 6TH STREET – SUB-SLAB AND INDOOR AIR SAMPLING

In order to assess VI potential to the 2005 6th Street residence and to the former service station building at 2021 6th Street, Leidos proposes to conduct both sub-slab and indoor air sampling at these locations. This assessment strategy was selected for these locations based on the following considerations:

- Previous sampling results indicate that naphthalene is present in shallow soil vapor beneath the former service station building and immediately adjacent to the 2005 6th Street residence at concentrations that exceed the MTCA Method B sub-slab soil gas screening level. Based on these results, and the lack of a subfloor crawlspace in these structures, assessment of indoor air conditions is warranted.
- Both structures are constructed with unfinished concrete floor slabs that allow installation and sampling of sub-slab soil vapor sampling points. Results of the sub-slab soil vapor

[1] If the results of one or more shallow soil vapor sampling events at this location indicate that naphthalene is present in soil vapor at concentrations exceeding the sub-slab soil gas screening level, then assessment of indoor air conditions at this location may be necessary.

[2] If the results of one or more crawlspace air sampling events at these locations indicate that naphthalene is present in crawlspace air at concentrations exceeding the indoor air cleanup level, and much higher than outdoor air concentrations, then assessment of indoor air conditions at that location may be necessary.

sampling will be used to evaluate the potential for indoor air sampling results to be impacted by background sources of naphthalene.

In the former service station building, two sub-slab vapor points will be installed, with one installed in the western portion of the building, in the vicinity of existing shallow soil vapor sampling probe SVP-1. The second sub-slab vapor point will be installed in the eastern portion of the building, near existing shallow soil vapor sampling probe SVP-2.

In the 2005 6th Street residence, one sub-slab vapor point will be installed in the approximate center portion of the ground floor/basement space. Final locations for the sub-slab vapor point locations will be determined based on results of a utility location survey and approval by the property owner.

Sampling at these locations will consist of collection of indoor air samples over an 8-hour period, which will be collected according to the procedures outlined in Section 7.6. Sub-slab soil vapor samples will be collected the following day to evaluate soil vapor conditions immediately below the floor slab at each sampling location.

Indoor air sampling results will be compared against the MTCA Method B indoor air cleanup levels for naphthalene, as well as outdoor air samples that will be collected concurrently with these samples. Indoor air sampling results will also be compared with the sub-slab sampling results in order to assess the potential for background sources of naphthalene in indoor air.

5 SCOPE AND SEQUENCE OF WORK

5.1 SCOPE OF WORK

Based on the assessment strategy outlined in Section 4, Leidos has developed the following scope of work. Investigation locations are shown on Figure 1.

- A public and private utility survey will be performed prior to any intrusive subsurface work.
- One (1) shallow vapor sampling probe (SVP-8) will be installed on the 1936 5th Street property.
- Three (3) sub-slab vapor points will be installed.
    - Sub-slab vapor points SSVP-1 and SSVP-2 will be installed in the building on the former service station property.
    - Sub-slab vapor point SSVP-3 will be installed in the basement/garage space of the residence at 2005 6th Street.
- One sampling event will be conducted, which will consist of the following:
    - 8-hour indoor air sampling at three locations
        - Two sampling locations in the former service station building
        - One sampling location in the 2005 6th Street residence
    - 8-hour crawlspace air sampling at two locations
        - 1936-½ 5th Street residence
        - 2007 6th Street residence
    - 8-hour outdoor air sample collection at three locations
        - 1936 5th Street property
        - 2005/2007 6th Street property

    - 2021 6th Street property
  - Sub-slab soil vapor sampling at three locations
    - Two sampling locations in the former service station building
    - One sampling location in the 2005 6th Street residence
  - Shallow soil vapor sample collection at one location
    - 1936A 5th Street

5.2 SEQUENCE OF WORK TO BE PERFORMED

The scope of work outlined above is expected to be conducted per the following sequence of work phases:

- **Phase One** (expected duration is 1 field day)
  - A public and private utility locate will be completed.
- **Phase Two** (expected duration is 2 field days, following property owner approval of proposed sampling locations)
  - One shallow soil vapor sampling probe (SVP-8) will be installed on the 1936 5th Street property.
  - Sub-slab soil vapor sampling points will be installed in the structures at 2005 6th Street and 2021 6th Street.
  - Leidos personnel will finalize access and equipment setup details for crawlspace sampling.
- **Phase Three – Sampling Event** (expected duration is 2 field days)
  - Day 1 – Collection of 8-hour indoor air, crawlspace, and outdoor air samples.
  - Day 2 – Collection of sub-slab and shallow soil vapor samples.

6 LABORATORY ANALYTICAL SERVICES

Sampling media and analytical services will be provided by Eurofins.

Sampling media will include:

- TO-17 sorbent tubes
  - (1) per each of sampling location (12 total)
  - (2) field blanks
  - (1) for sample pump calibration
  - spare tubes (25% of above)
- TO-17 sorbent tube stands
  - (1) per each indoor air, outdoor air, and crawlspace air sampling location (8 total)
- 50-milliliter (mL) purging/sampling syringe assemblies
  - (1) for soil vapor sampling probe purging
  - (1) for soil vapor sample collection
  - (1) spare
- Fittings/ferrules
- Laboratory-grade Teflon tubing

All samples will be analyzed by Modified EPA TO-17 for naphthalene only.

For indoor, outdoor, and crawlspace air samples that will be compared to the Method B indoor air cleanup level for naphthalene (0.0735 µg/m3), Eurofins has recommended a sample volume of approximately 14,000 mL, which will provide a reporting limit of 0.071µg/m3.

For soil vapor samples that will be compared to the Method B sub-slab soil gas screening level for naphthalene (2.5 µg/m3), Eurofins has recommended a sample volume of approximately 800 mL, which will provide a reporting limit of 1.25 µg/m3.

Two field blank samples will be collected for sample QA/QC.

7 FIELD PROCEDURES

The following are existing or new field procedures that will be incorporated into the Sampling and Analysis Plan (SAP) for the project to complete the proposed scope of work.

7.1 UTILITY LOCATE AND PROPERTY OWNER APPROVAL OF SAMPLING LOCATIONS

As specified in Section 3.1 of the SAP (Bore Hole Clearance), Leidos will contact the Utilities Underground Location Center and conduct a private utility location survey prior to beginning any ground disturbance activities.

Following identification of any subsurface utilities near the proposed investigation locations, Leidos will make adjustments as necessary, and confirm property owner approval of any changes prior to conducting any intrusive subsurface work.

7.2 SOIL VAPOR SAMPLING LOCATION INSTALLATION PROCEDURES

7.2.1 Shallow Soil Vapor Sampling Probe Installation Procedures

Installation of shallow soil vapor sampling probe SVP-8, to be installed on the property at 1936 5th Street, will be performed according to the procedures specified in Section 6 of the SAP. This work will be performed under the supervision of a Washington State licensed Professional Engineer.

7.2.2 Sub-Slab Soil Vapor Sampling Point Installation Procedures

The following procedure will be utilized to install sub-slab soil vapor sampling points in the buildings at 2021 6th Street and 2005 6th Street.

1) A rotary hammer-drill will be used to bore a 1-inch diameter hole approximately 1 to 1.5 inches deep in the concrete floor slab. A 5/16-inch diameter hole will then be bored at the center of the initial boring, to a depth of approximately 3 inches below the bottom of the concrete slab. Advancing the smaller diameter hole into the sub-slab material will create an open cavity to reduce the potential for the vapor point to become obstructed by small fragments of sub-grade material. A shop-vac will be used to remove any hammer-drill cuttings from the boring.
2) The body of the sampling point will consist of a stainless-steel Swagelok fitting (¼-inch Swagelok tube fitting by ¼-inch female American National Standard Pipe Thread (NPT), which will be fitted with a short length of ¼-inch outside diameter (O.D.) stainless steel for Teflon tubing. The female pipe thread side of the fitting will be capped with a threaded stainless-steel cap or pipe plug, wrapped in Teflon thread sealing tape. The sampling point body will be placed into the boring and cemented in place using quick-drying Portland

cement that will be hydrated with deionized water. The cement seal will be allowed to cure for a minimum of 24 hours prior to sampling.

7.3 SAMPLING EVENT SCHEDULING

Scheduling of VI assessment sampling events will be consistent with the guidelines presented in Section 7.1 of the Ecology approved SAP for the project (Leidos, 2018). Shallow 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 shallow unsaturated zone. Shallow soil vapor and/or air sampling events 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.

7.4 PRE-FIELD SAMPLING PREPARATION

Prior to mobilizing to the Site for VI assessment sampling, Leidos personnel will conduct a thorough check of all sampling supplies provided by the laboratory. **Upon receipt from the laboratory, TO-17 sorbent sampling tubes will be refrigerated or stored on ice to maintain their temperature at 4 degrees Celsius (+/- 2 degrees).**

All sampling pumps and other equipment will be checked to confirm proper function and equipment with rechargeable batteries will be fully charged prior to mobilization to the field.

7.5 VAPOR SAMPLE COLLECTION USING SAMPLING SYRINGES

This section outlines procedures that will be used to collect soil vapor samples from shallow soil vapor probes and sub-slab vapor points. Due to the smaller sample volume required, these samples will be collected using laboratory supplied sampling syringes.

7.5.1 Sub-Slab Vapor Point Sampling Preparation – Shutoff Valve Installation

Due to the construction of sub-slab vapor points, which are installed to be approximately flush with the upper surface of a concrete floor slab, they cannot be constructed with permanently installed valves for on/off flow control. Therefore, the first step for sample collection at sub-slab vapor points will be to install a temporary shutoff valve to provide vapor flow control.

1) Valves will be a stainless-steel Swagelok ball-valves (¼-inch Swagelok tube fitting by ¼-inch male NPT).
2) Prior to removal of the threaded cap on the sub-slab vapor point, the shutoff valve will be prepared for installation by wrapping the threaded inlet side with Teflon thread sealing tape.
3) The threaded cap of the sub-slab vapor point will then be removed, and the shutoff valve will **quickly** be threaded in place with the valve in the CLOSED position. This step should be performed quickly to minimize potential air exchange across the building floor slab.

7.5.2 Sub-Slab Vapor Point and Shallow Soil Vapor Sampling Probe Purging

Prior to sample collection, sub-slab vapor points and shallow soil vapor sampling probes must be purged to remove stagnant air in the tubing, which may not be representative of soil vapor conditions at the sampling location. The following procedure will be utilized:

1) The target purge volume for the sampling location will be calculated as follows:

a) The approximate length of tubing installed below the ground surface will be determined by reviewing the construction details of the sampling location.
b) The length of tubing above the ground surface, if any, will be approximately measured to the nearest foot in the field using a standard tape measure.
c) The target purge volume will be approximately equivalent to three times the volume of dead-air space in the tubing in-place below the shutoff valve. For Teflon tubing with a ¼-inch outside diameter, the target purge volume is approximately 20 mL per foot of tubing. Therefore, for a soil vapor sampling probe constructed with 10 feet of ¼-inch Teflon tubing (total length, both above and below grade), the target purge volume would be 200 mL.

2) The shutoff valve on the sampling point/probe will be confirmed to be in the CLOSED position.
3) The Swagelok endcap will be removed from the shutoff valve and a 50-mL purging syringe assembly will be connected to the shutoff valve using a ¼-inch Swagelok tube fitting with a new rubber ferule, and a short length of ¼-inch Teflon tubing. The plunger of the syringe will be confirmed to be fully seated and the three-way valve on the syringe assembly will turned so the OFF position is toward the valve vent.
4) The shutoff valve on the sampling point/probe will be OPENED.
5) The plunger of the syringe will be pulled back to withdraw a specific measured volume of air from the sampling point/probe. The three-way valve will be turned so the OFF position is toward the sampling point/probe and the plunger will be pushed back to the fully seated starting position, which will vent the collected air volume to the atmosphere through the valve vent.
6) The three-way valve will be turned so the OFF position is toward the valve vent and Step 5 above will be repeated until the target purge volume for the sampling point/probe has been achieved.
7) Upon reaching the target purge volume, the shutoff valve will be turned to the OFF position and the purging apparatus will be removed from the shutoff valve.

Additional guidance from Eurofins regarding the use of disposable syringes for TO-17 sample collection is provided in Appendix A.

7.5.3 Initial Leak Check Procedure for Sample Collection by Syringes

The initial leak check will be performed to identify potential air leaks that would allow ambient atmospheric air to be drawn into the sampling system, which could result in collection of a sample which may not be representative of shallow soil vapor conditions at the sampling location.

1) A new TO-17 sorbent sampling tube will be removed from its shipping packaging and the direction of sampling flow will be determined by checking the markings on the tube. The laboratory assigned identification number for the sorbent sampling tube will be recorded on the field data sheet for the sampling location. The Swagelok nut, cap, and ferrule will be removed from the outlet side of the sorbent sampling tube and this end of the tube will be fitted into the tube holder of the sampling syringe assembly.
2) The Swagelok nut and cap on the inlet side of the sorbent tube will be left in place and confirmed to be tight. The three-way valve on the sampling syringe will be turned to the OFF position, toward the valve vent connection.

3) The plunger of the sampling syringe will be pulled. If the plunger does not move or it immediately returns to the starting position, then the equipment will be considered acceptable for further leak testing. Otherwise, further evaluation of the sorbent tube and/or sampling syringe assembly will be conducted to determine the cause of the leak(s).

7.5.4 Secondary Leak Check Procedure for Sample Collection by Syringes

The secondary leak check will be performed to identify potential air leaks between the sorbent tube and soil vapor sampling probe shutoff valve that would allow ambient atmospheric air to be drawn into the sampling system.

1) Using the connected sorbent tube and sampling syringe assembly from the initial leak check, the Swagelok nut, cap, and ferrule will be removed from the inlet side of the sorbent sampling tube and this end of the sorbent tube will be connected to the shutoff valve of the soil vapor sampling probe with a Swagelok® tube fitting and new rubber ferrule.
2) The shutoff valve of the soil vapor sampling probe will be confirmed to be in the CLOSED position.
3) The three-way valve on the sampling syringe apparatus will be turned to the OFF position, toward the valve vent connection.
4) The plunger of the syringe will be pulled. If the plunger does not move or it immediately returns to the starting position, then the system is leak-tight and ready for sampling. Otherwise, further evaluation of the system will be conducted to determine the cause of the leak(s).

7.5.5 Sample Collection by Syringes

Soil vapor sample collection at each sampling location will be performed immediately following satisfaction of the secondary leak check.

1) The shutoff valve at the sampling location will be turned to the OPEN position.
2) With the three-way valve placed in the OFF position toward the valve vent connection, the plunger of the sampling syringe will be pulled back to withdraw a specific measured volume of air from the sampling location. The three-way valve will then be turned to the OFF position toward the sorbent sampling tube (opening the valve vent to the atmosphere) and the plunger will be pushed back to the fully seated starting position, which will vent the collected air volume to the atmosphere.
3) The three-way valve will be turned to the OFF position toward the valve vent and Step 2 above will be repeated until the target sampling volume of 800 mL has been achieved.
4) The three-way valve connection will be turned to the OFF position toward the valve vent and the shutoff valve at the sampling location will be turned to the CLOSED position. The sample collection time will be recorded on the field data sheet.
5) The sorbent sampling tube will be disconnected from the shutoff valve and sampling syringe assembly, and the Swagelok® endcaps will be reinstalled. See Appendix B for additional instructions for proper capping of a TO-17 sampling tube.

7.6 VAPOR SAMPLE COLLECTION USING AIR SAMPLING PUMPS

This section outlines the procedures for use of air sampling pumps for collection of vapor and/or air samples for TO-17 analysis.

Sampling pumps will generally be used instead of syringes for larger sample volumes (greater than 1 liter) or when a longer sample collection is desired (e.g., collection of indoor or outdoor air samples over an 8-hour period). The required sample volume will be specified by the laboratory to achieve the target reporting limits necessary for the project.

Sampling pumps will be provided by SKC – West, Inc., or an equivalent supplier that specializes in the supply of air sampling equipment. Air sampling pumps will be capable of providing flowrates as low as 20 milliliters per minute and will be equipped with self-adjustment capability to accommodate changes in temperature and barometric pressure during the sample collection period.

7.6.1 Air Sampling Pump Selection and Pre-Sampling Calibration

1) The target flowrate for collection of the sample shall be determined based on the required sample volume and the desired duration of the sample collection period. For example, a 14-liter sample to be collected over an 8-hour period will require a sampling pump flowrate of approximately 30 milliliters per minute (ml/min).
2) An air sampling pump and sampling pump calibration unit capable of providing the target flowrate will be acquired. If necessary, a low-flow adapter will be connected to the inlet of the air sampling pump to provide additional fine-tuning of the sampling pump flowrate.
3) One TO-17 sorbent tube will be selected from the laboratory supplied sampling equipment to support pre-sampling calibration of each of the air sampling pumps. The TO-17 sorbent tube will be connected to the inlet side of the air sampling pump and/or low-flow adapter. The pump calibration unit will then be connected to the inlet side of the TO-17 sorbent tube. The air sampling pump will then be turned on and the pump flowrate will be adjusted until the target flowrate for sample collection is achieved. The pre-sampling flowrate, serial number of the air sampling pump, and serial number for the calibration unit will be recorded on the field data form for the applicable sampling location.

7.6.2 Air Sampling Pump Sample Collection Procedure

1) Following completion of the pre-sampling calibration procedure, the calibration unit and the TO-17 sorbent tube being used for calibration will be removed from the inlet side of the air sampling pump.
2) A new TO-17 sorbent sampling tube will be removed from its shipping packaging and the direction of sampling flow will be determined by checking the markings on the tube. The laboratory assigned identification number for the sorbent sampling tube will be recorded on the field data sheet for the sampling location.
3) At the inlet side of the TO-17 sorbent tube, a sufficient length of Teflon tubing will be connected using a Swagelok to achieve the desired sample collection point. Expected sample collection points will be as follows:
   a) For indoor and outdoor air samples, the inlet of the sample collection tubing will be placed within the approximate breathing zone height of an adult person (4 to 6 feet above the surrounding floor or ground surface level).
   b) For crawlspace samples, the inlet of the sampling collection tubing will be placed within the approximate central portion of the crawlspace.
4) The air sampling pump will be turned on to initiate sample collection. The start time for the sample collection will be noted on the field data form.

5) Throughout the sampling period, the air sampling pump function will be remotely monitored by Bluetooth® wireless connection to a smart phone.
6) At the end of the sampling period, the air sampling pump will be turned off and the sample end time will be recorded. The sorbent sampling tube will be removed from the sampling train and recapped according to the procedure specified in Section 7.8.
7) Following completion of sample collection, the calibrator unit will be used to recheck the air sampling pump flowrate and record this value on the field data form. The flowrate measured at the end of sample collection should agree within 10% of the initial flow reading.

7.7 FIELD BLANK COLLECTION FOR TO-17 SAMPLING

Two field blank samples will be collected by removing the Swagelok® endcaps of a TO-17 sorbent sampling tube in the field at the Site and then immediately resealing the endcaps with no air pumped through them.

7.8 SAMPLE HANDLING AND CUSTODY PROCEDURES

1) Following sample collection and recapping of the TO-17 sorbent tube, the tubes will be repackaged in their shipping internal shipping containers (if applicable) and placed in a pre-chilled cooler on ice for sample preservation. Samples will be stored on ice, or refrigerated, to maintain their temperature at 4 degrees Celsius (+/- 2 degrees).
2) Samples will be shipped to Eurofins via overnight delivery on the day of sampling or the next business day, following industry standard Chain of Custody protocols. Samples will be shipped in coolers containing sufficient ice to maintain the samples at 4 degrees Celsius (+/- 2 degrees).

8 REFERENCES

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LIMITATIONS

This technical document was prepared on behalf of the PLPs and is intended for their sole use and for use by the local, state, or federal regulatory agency that the technical document was sent to by Leidos. Any other person or entity obtaining, using, or relying on this technical document hereby acknowledges that they do so at their own risk, and Leidos shall have no responsibility or liability for the consequences thereof.

Site history and background information provided in this technical document are based on sources that may include interviews with environmental regulatory agencies and property management personnel and a review of acquired environmental regulatory agency documents and property information obtained from the PLPs and others. Leidos has not made, nor has it been asked to make, any independent investigation concerning the accuracy, reliability, or completeness of such information beyond that described in this technical document.

Recognizing reasonable limits of time and cost, this technical document cannot wholly eliminate uncertainty regarding the vertical and lateral extent of impacted environmental media.

Opinions and recommendations presented in this technical document apply only to site conditions and features as they existed at the time of Leidos site visits or site work and cannot be applied to conditions and features of which Leidos is unaware and has not had the opportunity to evaluate.

All sources of information on which Leidos has relied in making its conclusions (including direct field observations) are identified by reference in this technical document or in appendices attached to this technical document. Any information not listed by reference or in appendices has not been evaluated or relied on by Leidos in the context of this technical document. The conclusions, therefore, represent our professional opinion based on the identified sources of information.

Figures

LEGEND:

SVP-1 — Existing Soil Vapor Sampling Probe Location

SVP-8 — Proposed Soil Vapor Sampling Probe Location

SSVP-1 — Proposed Sub-Slab Vapor Point Location

IA-1 — Proposed Indoor Air Sampling Location

OA-1 — Proposed Outdoor Air Sampling Location

CSA-1 — Proposed Crawlspace Air Sampling Location

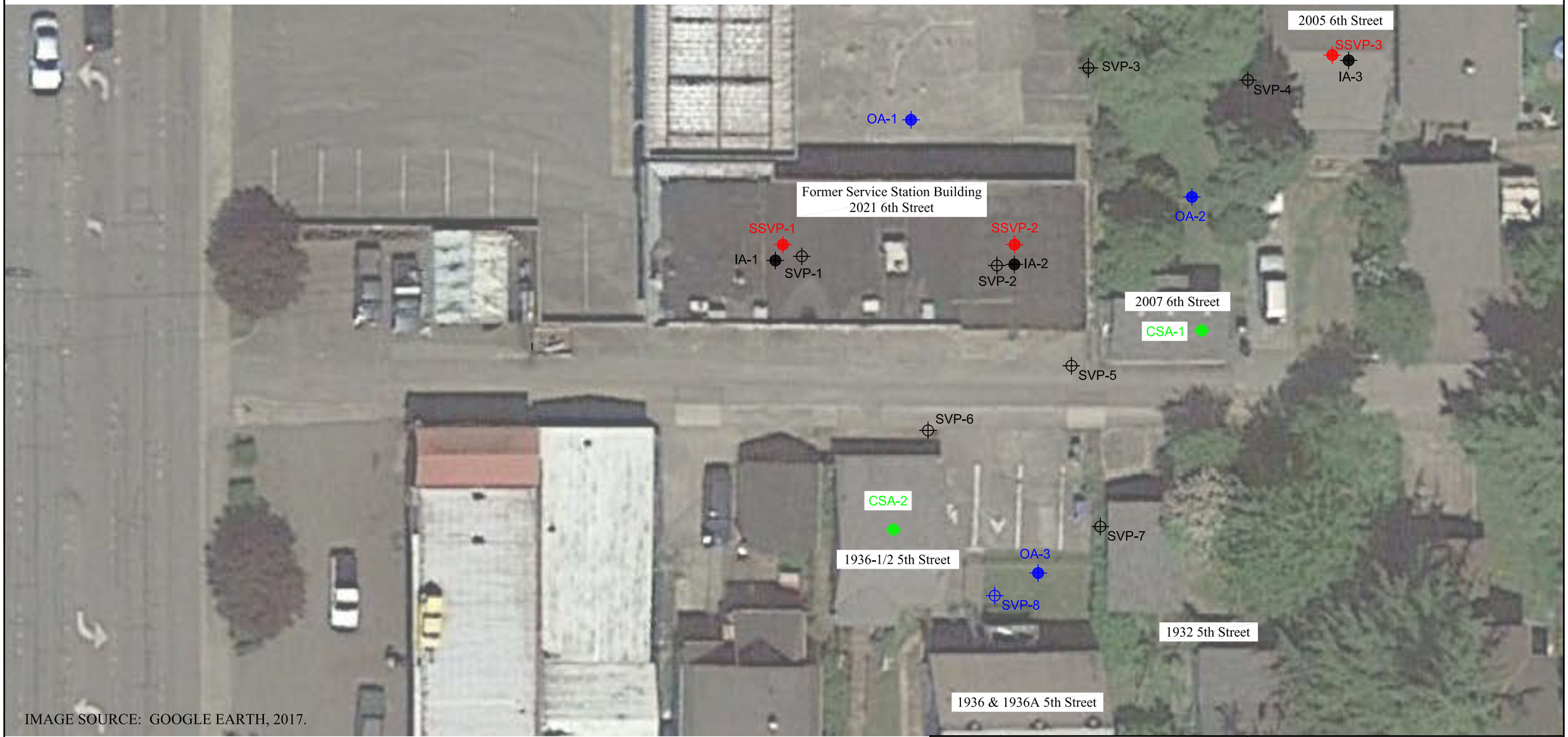


IMAGE SOURCE: GOOGLE EARTH, 2017.

leidos

SCALE

0 20 40 60ft

N

Newman's Chevron
2021 6th Street
Bremerton, Washington

FIGURE 1
Existing and Proposed VI
Assessment Sampling Locations

DATE: 6/29/2022 | DRAWING: 204177 RIWP Add 4.dwg

Appendix A:
Using Disposable Syringes for TO-17 Sample Collection

Using Disposable Syringes for TO-17 Sample Collection

Supplies:

- **TO-17 Sorbent Tubes** – Tubes are capped on each end with a Swagelok nut, pink ferrule and cap. Each tube is wrapped in uncoated aluminum foil and shipped in a tin box with activated charcoal granules.
- **Syringe assembly** – A 60 cc or 10 cc syringe is equipped with a 3-way valve and a tube holder.
- **Optional: Swagelok union and fitting** to connect sorbent tube sample inlet to 1/4" tubing.

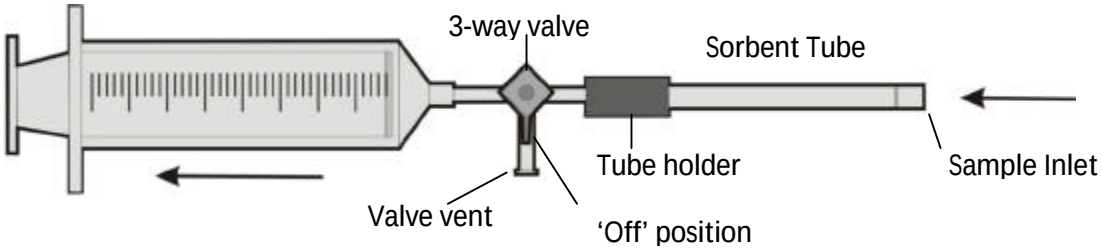
Leak Check Procedure:

1) Remove the Swagelok nut, cap, and ferrule from the outlet side of the sorbent tube.
2) Insert the sorbent tube into the tube holder on the syringe assembly.
3) Turn the valve so the 'Off' position is toward the valve vent, and make sure the Swagelok nut and cap on the tube inlet is tight.
4) Pull the plunger of the syringe.
5) If the plunger does not move or immediately returns to the starting position, then the system is leak-tight and ready for sampling.
6) Turn the 'Off' position toward the sorbent tube.

Sample Collection (See Figure 1 on page 2):

1) With the tube still in the tube holder, remove the cap from the inlet of the sorbent tube.
2) If collecting soil gas vapors from a ¼" tube, connect the Swagelok nut from the tube inlet to a union. Connect the ¼" probe tubing to the union using a Swagelok nut and ferrule. Check that this connection is secure by pulling on the sorbent tube and tubing. The sorbent tube and tubing should not move.
3) Turn the valve so the 'Off' position is toward the valve vent and pull the plunger to the desired volume.
4) If multiple aliquots are required, turn the valve so the 'Off' position is toward the sorbent tube and push the plunger back to the starting position, emptying the contents through the vent valve. ***Do not push the contents of the syringe through the sorbent tube.*** Repeat steps 3 and 4 as necessary.
5) When desired volume has been collected, remove sorbent tube from the tube holder and re-cap both ends using the original Swagelok nut, ferrule, and cap.
6) DO NOT OVERTIGHTEN THE SWAGELOK NUT. OVERTIGHTENING CAN CRIMP THE TUBE AND PREVENT ANALYSIS.
7) Record the sample volume on the COC.
8) Re-wrap tubes in aluminum foil and ship back in the tins under ice.
9) Return the syringe assembly with the tubes.

Sample collection: Turn valve so the 'Off' position is toward the valve vent; Pull plunger to desired volume.



Empty Syringe: Turn valve so the 'Off' position is toward the sorbent tube; Push plunger back to starting position.

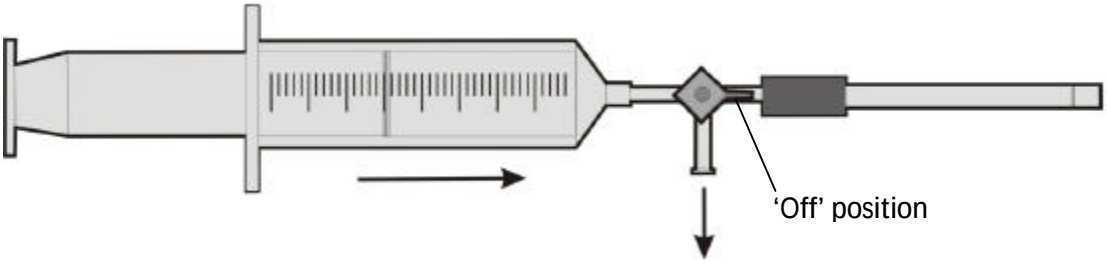


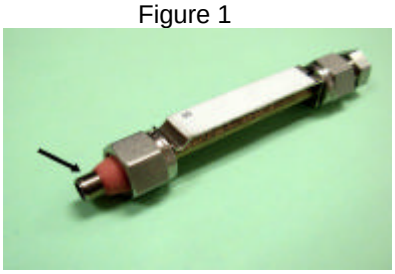
Figure 1. Schematic for sample collection using disposable syringes.

Note: In general, syringe assemblies may be reused for multiple samples. If extremely high concentrations are expected at a sampling location, a clean syringe assembly may be desirable for clean sites.

Appendix B:
Instructions for Proper Capping of a TO-17 Tube

Instructions for proper capping of a TO-17 tube

Figure 1

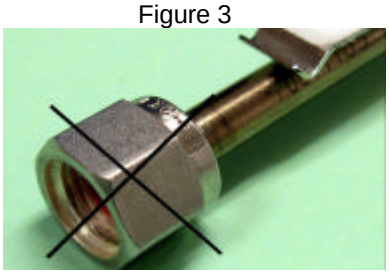


The bottom point of the ferrule should be 3/16” from edge of the tube.

Figure2

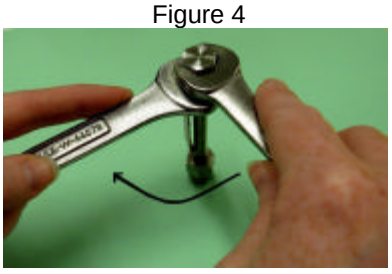
Slide the 1/4 nut against the ferrule.

Figure 3



It should **NOT LOOK** like this.

Figure 4

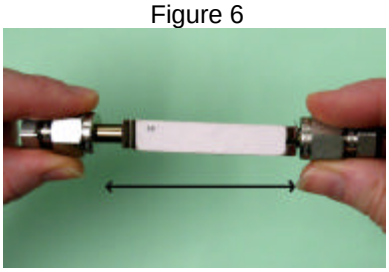


Attach Stainless Steel cap and turn clock wise **1/4" turn**.

Figure 5

Overtightning of Stainless cap will crimp the sample or the use of metal ferrules will permanently damage the sample tube. Damages may prevent sample analysis of the tube.

Figure 6



Gently pull Stainless steel caps apart to ensure proper tightness. Properly assembled tubes should be **no more 4 1/4" inches** in length from end to end.

Note: Please refreeze ice before shipping.