Remedial Investigation Work Plan 35th Street Landfill Tacoma, Washington

May 2, 2008

Prepared for

City of Tacoma

LANDAU ASSOCIATES
950 Pacific Avenue, Suite 515
Tacoma, WA 98402
(253) 926-2493

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INTRODUCTION

This document presents the work plan for the 35th Street Landfill project. The subject of this investigation is a documented construction landfill along Pacific Avenue in Tacoma, Washington. The property is currently owned by the City of Tacoma. The purpose of this investigation is to collect soil, soil gas, surface water and groundwater (if encountered) data from exploratory borings and test pits to define the extent of contamination from the landfill. The general location of the landfill is shown on Figure 1.

In 1991, the City of Tacoma (City) excavated test pits in the landfill area to investigate the conditions of the property. Field indicators of petroleum hydrocarbon (diesel) odors were observed, specifically in test pits TP-1 and TP-3. Concrete, asphalt, yard waste, and street sweepings were also found during their explorations. Historical test pit locations are shown on Figure 2. Methane was also detected in bar hole samples collected by the City and the Tacoma-Pierce County Health Department (TPCHD).

The planned site investigation will include additional test pits, a single hollow stem auger boring, surface water sampling, and direct push borings. Soil and water will be tested for metals, NWTHP-Dx, BTEX and if TPH is detected, cPAHs. Additionally, methane monitoring wells will be installed in the direct push borings to test for methane gas.

FIELD INVESTIGATION

This section describes the field investigative approach using a combination of test pits, direct push borings, a single hollow stem auger boring, and surface water sampling. Landau Associates has contracted MRC Construction to conduct test pits using a rubber-tired backhoe, ESN Northwest to conduct direct push probes, and Holocene Drilling to conduct the hollow stem auger boring. Water sampling will be conducted by Landau Associates field personnel at specific surface water sites identified on the property. Planned test pit, probe, and drilling locations are shown on Figure 2. Landau Associates field personnel will be present to log soil and waste conditions, to collect and evaluate soil samples for potential contamination, and to direct the installation of the gas monitoring probes. Health and safety procedures and monitoring are summarized in the project Health and Safety Plan (Appendix A).

TEST PITS

Ten test pits will be excavated to observe shallow soil conditions and to collect soil samples. Test pits will be excavated using a rubber tired backhoe provided by MRC Construction and will be between depths of 12 to 15 ft or refusal, which every is less. Two soil samples will be collected using stainless

steel spoons and 4 oz collection jars from the backhoe bucket from each test pit. The location of each sample will be chosen based on visual and field meter evidence of potential contamination. Each sample will be tested for metals and NWTPH-Dx. Based on field observations six samples will be selected that are most likely to contain TPH contamination. Each of these samples will be analyzed for BTEX, EPH and cPAHs. Landau Associates will conduct explosive gas and volatile gas measurements using field meters.

The depth and soil description will be noted in field logs and classified in general accordance to *ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. The location of each test pit will be surveyed using a mapping grade global positioning system (GPS). Once sampling has been completed, the soil will remain on site and smoothed out to its original profile.

HOLLOW STEM AUGER BORING

One hollow-stem auger boring will be conducted in the center of the landfill site to a depth of 80 ft or refusal, whichever is less, with a truck-mounted hollow-stem auger drill rig. Split spoon samples are to be driven 18 inches with a 140-lb automatic hammer with a 30-inch fall. In general, samples will be collected at 5 ft intervals but final sample intervals will be at the discretion of the field scientist or engineer. Three soil samples will be collected at varying depths using stainless steel spoons and 4 oz collection jars. One sample will be collected between 10 and 15 ft, a second sample from 15 and 30 ft, and a final sample between 30 and 80 ft. Soil selected to be sampled will be dependent on the amount of recovery and visual evidence of potential contamination. Landau Associates will conduct explosive gas and volatile gas measurements using field meters as part of the Health and Safety Plan. If any is detected, the samples will be collected directly from the recovered soil. Each sample will be tested for metals and NWTPH-Dx. One sample will be sampled for cPAHs and BTEX if there is a strong field indication of TPH contamination. Figure 2 shows the proposed hollow-stem auger boring location.

The depth and soil description will be noted in field logs and classified in general accordance to *ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. The location of each test pit will be surveyed using a mapping grade global positioning system (GPS). Once the drilling is completed, the boring shall be backfilled in accordance with applicable water well regulations (WAC 173-160) and capped with quick-setting concrete. Soil and decon water from drilling activities will be spread out on site adjacent to boring location.

DIRECT PUSH BORINGS

Six direct push borings will be conducted using a direct push probe rig provided by ESN Northwest. Borings will be advanced to 30 ft or refusal, whichever is less. Once the borings are completed, gas monitoring wells will be installed in all borings at the site. Figure 2 shows the proposed geoprobe locations. Installation of gas monitoring wells and collection of groundwater samples is discussed further in the sections below.

The direct push probe is expected to collect a continuous sample in 4-ft increments. As is often the case with direct push borings, sample recovery may be less than 4 ft from each increment. In this case field staff will estimate the depth of each layer when logging the soil. Up to three samples will be collected for soil sample analysis from each boring. Samples will be selected for analysis based on visual and field meter evidence of contamination. Landau Associates will conduct explosive gas and volatile gas measurements using field meters. Samples will be collected using stainless steel spoons and 4 oz collection jars. Each sample will be tested for metals and NWTPH-Dx. Based on field observations, four samples will be analyzed for cPAHs and BTEX.

The depth and soil description will be noted in field logs and classified in general accordance to *ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. The location of each test pit will be surveyed using a mapping grade global positioning system (GPS). Soil from boring activities will be spread out on site adjacent to boring location.

INSTALLATION OF GAS PROBE WELLS

We expect to install the vapor extraction wells at all six of the probe locations. Wells will be constructed and sealed with bentonite material in accordance with Washington well construction standards for resource protection wells (WAC 173-160) or a variance will be obtained. Based on review of existing data it is possible that the vapor extraction wells may be screened in fill soil that includes landfill debris. Accordingly, wells will use 1-inch diameter ID schedule 40 PVC pipe and a 0.020 inch slot size screen and backfill with 10 to 20-filter sand pack. The target dept for screens is 10 to 30 ft below ground surface. A surface seal will be installed and consist of 2 ft of bentonite below 1 ft of concrete. Wells will be protected at the surface with a monument.

SURFACE WATER SAMPLING

Two surface water samples will be collected from the area. The first will be from a spring on the north side of the South 34th Street Bridge where a concrete pipe discharges water from the base of the fill. The second will be from a small wetland area in the northern portion of the site. Surface water sampling

is performed using a peristaltic pump and 1/4-inch tubing with a filtered end, placed inside the center of the water body. Each water sample will be analyzed for dissolved metals, NWTPH-Dx, and BETX. If TPH is detected, the samples will also be analyzed for PAHs (analysis should include cPAHs and naphthalenes). Additionally, water will be pumped into a flow cell where it will be measured for temperature, conductivity, and pH using a YSI meter.

GROUNDWATER SAMPLING

If groundwater is encountered, an attempt will be made to collect a sample with a peristaltic pump or bailer. Samples will be analyzed for dissolved metals, NWTPH-Dx and BTEX. The first groundwater sample collected will also be analyzed for PAHs.

GENERAL NOTE ON SAMPLING

All soil samples analyzed for TPH should undergo a silica gel cleanup procedure prior to analysis to remove non-petroleum based hydrocarbons. All water samples for metals will be field filtered. All water samples for PAHs should be settled to minimized turbidity in the water prior to analysis.

REPORTING

Upon completion of field work, a generalized soil log will be prepared from the explorations conducted at the site. Data will be compiled and mapped to determine the extent of any identified contamination. A report detailing the field work and findings will be produced and submitted for review.

UTILITY LOCATE

A utility locate will be conducted for the 35th Street Landfill site. Prior to the start of the field investigation, the "Call Before You Dig" public utility locate service will be notified to locate public utilities at the VIP Landfill site. Prior to advancing any boring or test pit, a visual survey of the surrounding utilities will be conducted; borings and test pits will be located a minimum of 4 ft from any marked utility.

HEALTH AND SAFETY

A project Health and Safety Plan for implementation of field activities described in this work plan is provided in Appendix A. All Landau Associates employees will follow the procedures described in

this plan. Landau Associates subcontractors will either adopt this plan or prepare their own plan that is at least as protective as this plan.

SCHEDULE

Work is scheduled for the week of May 5 through 9. Test pit excavations are expected to take one to two days, direct push boring investigations are expected to take two days, the hollow auger drilling is expected to take one day, and the surface water sampling is expected to take half a day.

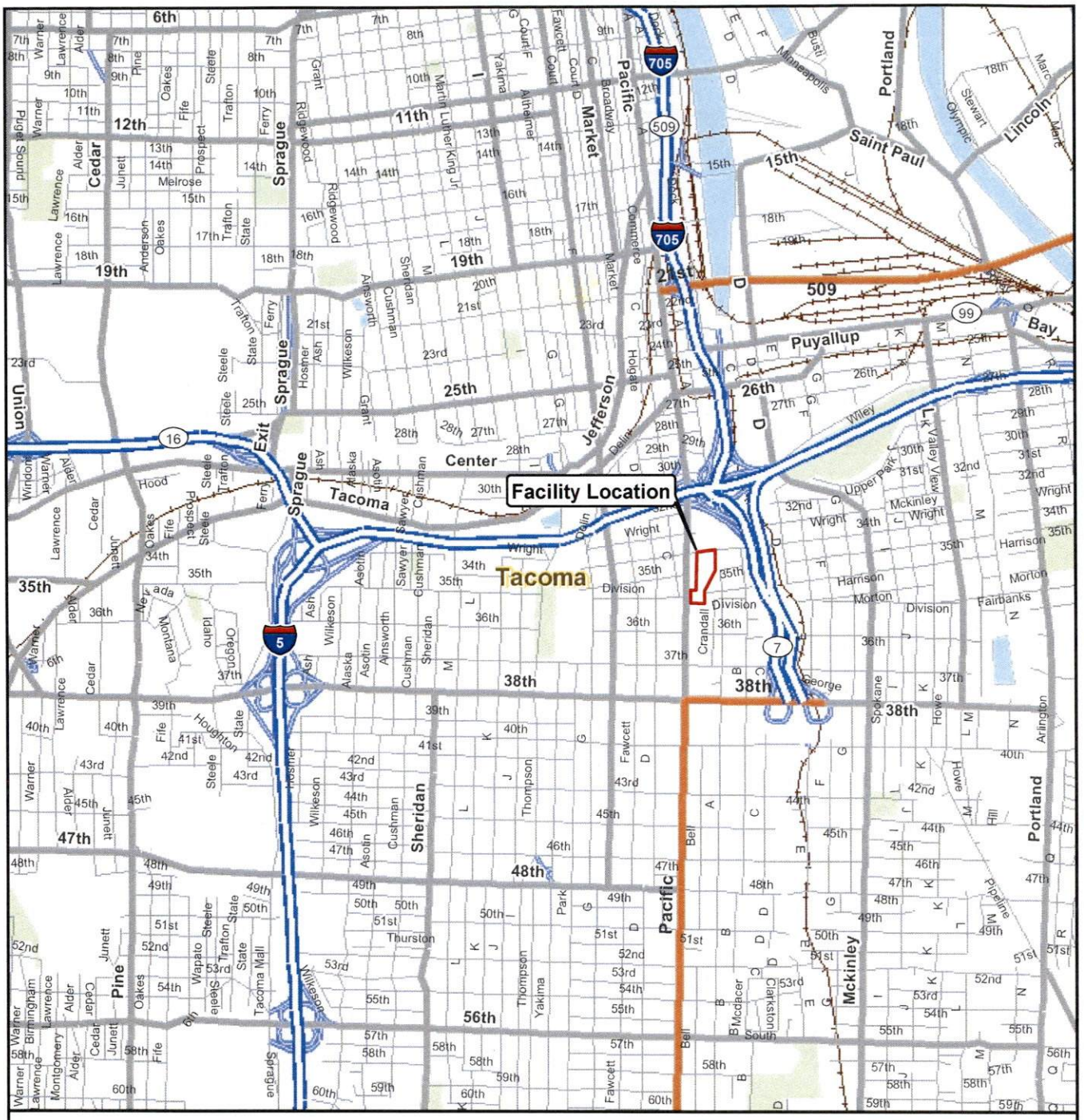
This document has been prepared under the supervision and direction of the following key staff.

LANDAU ASSOCIATES, INC.

Jessica C. Stone
Staff Scientist

Eric F. Weber, L.G.
Principal

JCS/EFW/jas



Data Source: ESRI 2006

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35th Street Landfill Tacoma, Washington	**Vicinity Map**	Figure 1

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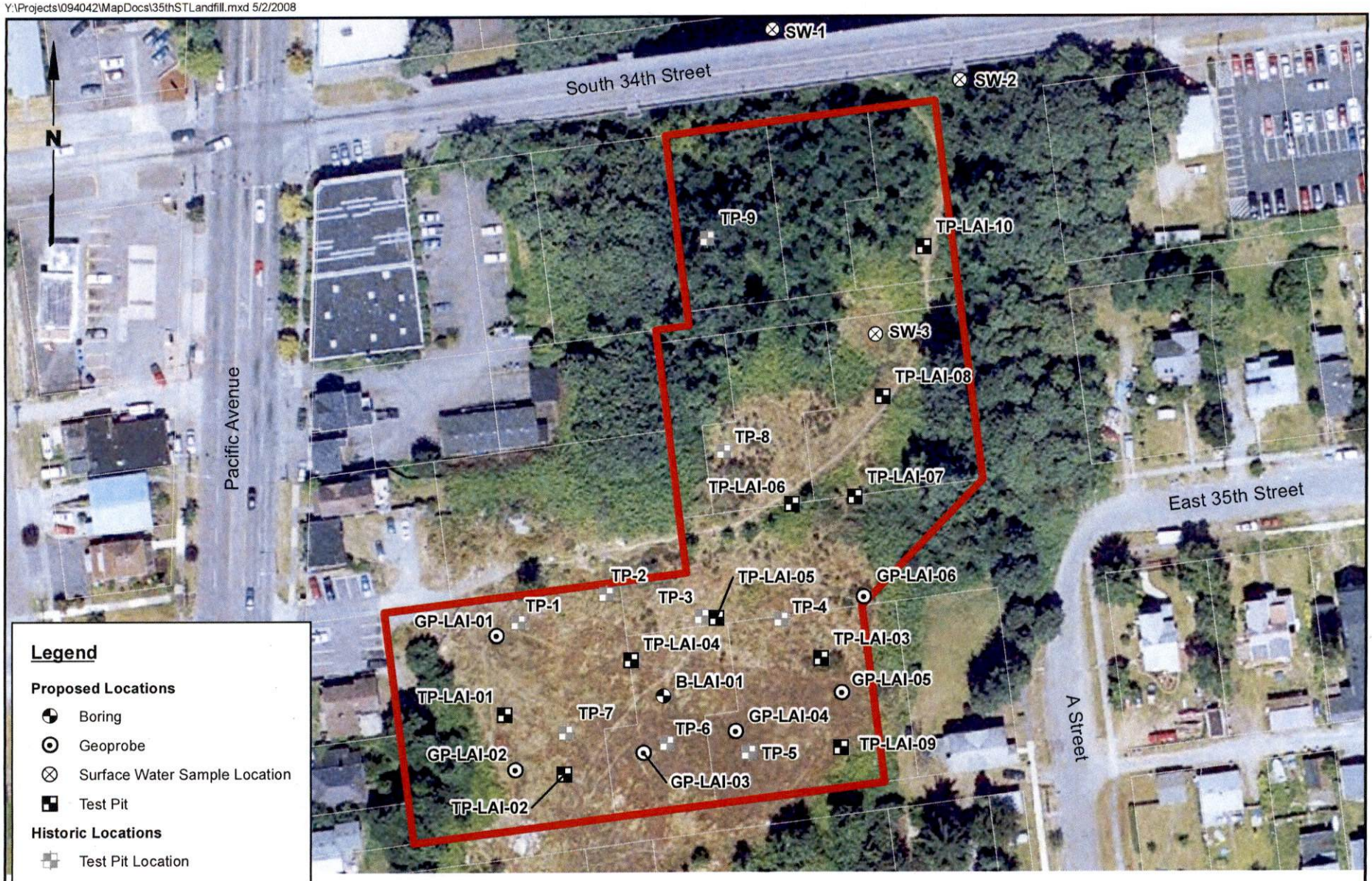

Data Source: Google Earth

0 100 200

Scale in Feet

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35th Street Landfill Site
Tacoma, Washington

Historic and Proposed Sampling Locations

Figure
2

APPENDIX A

Health and Safety Plan

LANDAU ASSOCIATES
ENVIRONMENTAL | GEOTECHNICAL | NATURAL RESOURCES

WORK LOCATION PERSONNEL PROTECTION AND SAFETY EVALUATION FORM

Attach Pertinent Documents/Data
Fill in Blanks As Appropriate

Job No.:	0774004.010		
Prepared by:	Jacob Stokes	Reviewed by:	JCS
Date:	May 2, 2008	Date:	4/7/08

A. WORK LOCATION DESCRIPTION

1. **Project Name:** 35th Street Landfill
2. **Location:** Vacant lot east of the Pacific Avenue and 34th street intersection.
3. **Anticipated Activities:** Soil boring, geoprobes, test pits, and surface water sampling.
4. **Size:** 250 ft by 300 ft
5. **Surrounding Population:** Surrounded by urban development with some vegetation.
6. **Buildings/Homes/Industry:** The site is currently undeveloped and was used as a landfill for road construction. The site has dumping and unconsolidated material around the perimeter. A small gravel road passes through the middle of the property. The northern portion of the property contains a small wetland area, two springs, and dense vegetation.
7. **Topography:** The southern end of the property is flat and steeply slopes downward towards the north into a ravine.
8. **Anticipated Weather:** Mid 50s with chance of rain and light wind.
9. **Unusual Features:** Construction fill has altered the ravine, creating steep slopes. This area has also been used as a local dumping ground and may contain transient encampments.
10. **Site History:** Has been used for roadside construction fill.

B. HAZARD DESCRIPTION

1. **Background Review:** ☒ Complete ☐ Partial

   If partial, why?

2. **Hazardous Level:** ☐ B ☐ C ☒ D ☐ Unknown

   Justification: Potential soil contamination from petroleum products as indicated from previous investigation in 1991.

3. **Types of Hazards:**

A. ☒ Chemical ☒ Inhalation ☒ Explosive
☐ Biological ☒ Ingestion ☐ O2 Def. ☒ Skin Contact

Describe: Exposure to cPAH products, possible heavy metals, and methane. Nitrile gloves will be worn. Incidental ingestion and/or inhalation possible from sampling process.

B. ☒ Physical ☐ Cold Stress ☒ Noise ☐ Heat Stress ☒ Other

Describe: Physical hazards from equipment and the steep slope may be encountered during geoprobe and test pit sampling. Noise hazards associated with exploration equipment. Ear protection will be used. Steel-toe boots will be worn at all times due to heavy object hazards. Potential trip and fall hazards associated with drilling equipment and the site will be minimized where possible. Hard hats, orange reflective vests, and steel-toe boats will be worn at all times.

C. ☐ Radiation

Describe:

4. Nature of Hazards:

☒ Air	Describe: Potential for volatile organics to be released from soil, potential explosion hazard related to methane release.
☒ Soil	Describe: Potential ingestion, inhalation, or skin exposure to Arsenic and/or cPAH constituents.
☒ Surface Water	Describe: Potential ingestion, inhalation or skin exposure to Arsenic and/or cPAH constituents.
☒ Groundwater	Describe: Potential ingestion, inhalation, or skin exposure to Arsenic and/or cPAH constituents.
☒ Other	Describe: Road and vehicle hazards while sampling on the steep slope.

5. Chemical Contaminants of Concern ☐ N/A

Contaminant	PEL (ppm)	I.D.L.H. (ppm)	Source/Quantity Characteristics	Route of Exposure	Symptoms of Acute Exposure	Instruments Used to Monitor Contaminant
As (Arsenic)	0.050 mg/m^3 *source: NIOSH*	5 mg/m^3 (as As) *source: NIOSH*	Soil concentrations up to .5 mg/m^3 and groundwater at unknown concentrations.	Inhalation, ingestion, dermal contact, eye contact	Ulceration of nasal septum, dermis, Gastro-intestinal disturbances, Peripheral neuropathay respiratory irritation, hyper-pigmentation of skin.	Visula Dust or HAM meter Wet down area if dust is apparent
cPAH (polycyclic aromatic hydrocarbons) (Coal tar pitch volatiles)	Ca, TWA 0.1 mg/m^3 *source: NIOSH*	0.2 mg/m^3 *source: NIOSH*	Soil concentrations up to 144 µ/kg and groundwater at unknown concentrations	Skin absorption or contact, inhalation	Dermatitis, bronchitis, affects respiration system, skin, bladder and kidneys	Visual Dust or HAM meter Wet down area if dust is apparent
Methane	10% LEL	N/A	>10% of LEL (stop work and reassess work plan)	In halation	Asphyxiant	Methane gas meter

Notes:

6. Physical Hazards of Concern ☐ N/A

Hazard	Description	Location	Procedures Used to Monitor Hazard
Slip/trip	Wet or uneven ground	Throughout area	Visual and area awareness, keep work area clear
Heavy lifting	Moving or lifting heavy objects	Throughout area	Visual area awareness, keep work area clear
Pinch points	Contact with equipment and heavy objects	Throughout area	Visual and area awareness, keep work area clear
Backhoe Trenches	Falls and burial	Near excavator trenches	Do not enter trenches more than three feet deep. Be aware of the depth of the back of trench along slope.

7. Work Location Instrument Readings ☒ N/A

Location: _____

Percent O_2: _____ Percent LEL: _____

Radioactivity: _____ PID: _____

FID: _____ Other: _____

Other: _____ Other: _____

Other: _____ Other: _____

Location: _____

Percent O_2: _____ Percent LEL: _____

Radioactivity: _____ PID: _____

FID: _____ Other: _____

Other: _____ Other: _____

Other: _____ Other: _____

Location: _____

Percent O_2: _____ Percent LEL: _____

Radioactivity: _____ PID: _____

FID: _____ Other: _____

Other: _____ Other: _____

Other: _____ Other: _____

Location: _____

Percent O_2: _____ Percent LEL: _____

Radioactivity: _____ PID: _____

FID: _____ Other: _____

Other: _____ Other: _____

Other: _____ Other: _____

8. Hazards Expected In Preparation for Work Assignment ☒ N/A

Describe:

C. PERSONAL PROTECTIVE EQUIPMENT

1. Level of Protection

☐ A ☐ B ☐ C ☒ D

Location/Activity: Drilling of borings, test pits, surface water sampling

☐ A ☐ B ☐ C ☐ D

Location/Activity:

2. Protective Equipment (specify probable quantity required)

Respirator ☐ N/A

- ☐ SCBA, Airline
- ☐ Full-Face Respirator
- ☒ Half-Face Respirator (Cart. organic vapor) (Only if upgrade to Level C)
- ☐ Escape mask
- ☐ None
- ☐ Other:
- ☐ Other:

Clothing ☒ N/A

- ☐ Fully Encapsulating Suit
- ☐ Chemically Resistant Splash Suit
- ☐ Apron, Specify:
- ☐ Tyvek Coverall
- ☐ Saranex Coverall
- ☐ Coverall, Specify
- ☐ Other:

Head & Eye ☐ N/A

- ☒ Hard Hat
- ☐ Goggles
- ☐ Face Shield
- ☐ Safety Eyeglasses
- ☒ Other: Hearing Protection

Hand Protection ☐ N/A

- ☐ Undergloves; Type:
- ☒ Gloves; Type: Nitrile
- ☐ Overgloves; Type:
- ☐ None
- ☐ Other:

Foot Protection ☐ N/A

- ☐ Neoprene Safety Boots with Steel Toe/Shank
- ☐ Disposable Overboots
- ☒ Other: Steel Toe Boots

3. **Monitoring Equipment** ☐ N/A

☐ CGI	☒ PID
☐ O^2 Meter	☐ FID
☐ Rad Survey	☐ Other
☐ Detector Tubes (optional)	

Type:

D. DECONTAMINATION

PERSONAL DECONTAMINATION

☒ Required ☐ Not Required

If required, describe:
Wash face/hands before breaks and lunch. Shower and wash clothing separately.

EQUIPMENT DECONTAMINATION (ATTACH DIAGRAM)

☒ Required ☐ Not Required

If required, describe and list equipment:
All non-dedicated equipment needs to be decontaminated. Prior to and before drilling each borehole, all downhole equipment will be cleansed by a high pressure. Potable tap water will be used as the cleansing agent. Non-dedicated sampling equipment will be decontaminated using an Alconox wash and a deionized water rinse.

E. PERSONNEL

	Name	Work Location Title/Task	Medical Current	Fit Test Current
1.	**Jessica Stone**	**Staff Scientist**	☒	☒
2.	**Jacob Stokes**	**Tech Staff**	☒	☒
3.	**Brian Christianson**	**Senior Project Geologist**	☒	☒
4.			☐	☐
5.			☐	☐
6.			☐	☐
7.			☐	☐
8.			☐	☐
9.			☐	☐
10.			☐	☐

Site Safety Coordinator: _____

F. ACTIVITIES COVERED UNDER THIS PLAN

Task No.	Description	Preliminary Schedule
1	Test pit excavation, direct push probe, hollow stem auger drilling, surface water sampling, methane sampling.	May 2008

G. SUBCONTRACTOR'S HEALTH AND SAFETY PROGRAM EVALUATION ☐ N/A

Name and Address of Subcontractor: To Be Determined

EVALUATION CRITERIA

Item	Adequate	Inadequate	Comments
Medical Surveillance Program	☐	☐	
Personal Protective Equipment Availability	☐	☐	
Onsite Monitoring Equipment Availability	☐	☐	
Safe Working Procedures Specification	☐	☐	
Training Protocols	☐	☐	
Ancillary Support Procedures (if any)	☐	☐	
Emergency Procedures	☐	☐	
Evacuation Procedures Contingency Plan	☐	☐	
Decontamination Procedures Equipment	☐	☐	
Decontamination Procedures Personnel	☐	☐	

GENERAL HEALTH AND SAFETY PROGRAM EVALUATION: ☐ Adequate ☐ Inadequate

Additional Comments:

Evaluation Conducted By: _____ Date: _____

EMERGENCY FACILITIES AND NUMBERS

Hospital: St. Joseph's Medical Center
1717 S J St
Tacoma, WA 98405
(253) 426-4101

Directions: 1.8 mi – about 7 mins

Head **north** on **Pacific Ave** toward **S 34th St** 0.7 mi
Turn **left** at **S 25th St** 0.4 mi
Turn **left** at **S Yakima Ave** 0.4 mi
Turn **left** at **S 19th St** 0.1 mi
Turn **right** at **S J st** 0.1 mi

Telephone: 360-754-5858

Emergency Transportation Systems (Fire, Police, Ambulance) – 911

Emergency Routes – Map (Attachment A)

Emergency Contacts:

	Offsite	Onsite
Eric Weber	253.926.2493	206.940.2406
Chris Kimmel	425.778.0907	206.786.3801

In the event of an emergency, do the following:

1. Call for help as soon as possible. Call 911. Give the following information:
   - WHERE the emergency is – use cross streets or landmarks
   - PHONE NUMBER you are calling from
   - WHAT HAPPENED – type of injury
   - WHAT is being done for the victim(s)
   - YOU HANG UP LAST – let the person you called hang up first.

2. If the victim can be moved, paramedics will transport to the hospital. If the injury or exposure is not life-threatening, decontaminate the individual first. If decontamination is not feasible, wrap the individual in a blanket or sheet of plastic prior to transport.

HEALTH AND SAFETY PLAN
APPROVAL/SIGN OFF FORMAT

I have read, understood, and agreed with the information set forth in this Health and Safety Plan (and attachments) and discussed in the Personnel Health and Safety briefing.

Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Jessica Stone Site Safety Coordinator	Signature	Date
Chris Kimmel Landau Health and Safety Manager	Signature	Date
Eric Weber Project Manager	Signature	Date

Personnel Health and Safety Briefing Conducted By:

Name	Signature	Date

ATTACHMENT A

35th Street Landfill to St. Joseph's Medical Center