ADDENDUM NO. 5
SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN

South State Street Manufactured Gas Plant
Remedial Investigation/Feasibility Study

Prepared for

City of Bellingham
Parks and Recreation Department
3424 Meridian Street
Bellingham, Washington 98225

Puget Sound Energy
Environmental Services
10885 NE 4th Street PSE-11N
Bellevue, Washington 98004

Prepared by

Herrenkohl Consulting LLC
PO Box 1000
Lopez Island, Washington 98261

Landau Associates Inc.
130 2nd Avenue South
Edmonds, Washington 98020

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ACRONYMS AND ABBREVIATIONS

ARI	Analytical Resources, Inc.
City	City of Bellingham
Ecology	Washington State Department of Ecology
ft	foot or feet
DGPS	differential global positioning system
HASP	Health and Safety Plan
Herrenkohl	Herrenkohl Consulting LLC
Landau Associates	Landau Associates, Inc.
MDL	method detection limit
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mg/kg OC	milligrams per kilogram normalized to organic carbon
MGP	manufactured gas plant
MLLW	mean lower low water
MTCA	Model Toxics Control Act
PAHs	polycyclic aromatic hydrocarbons
PSE	Puget Sound Energy
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RI/FS	remedial investigation and feasibility study
SAP	sampling and analysis plan
SIM	Selective Ion Monitoring
SMS	Sediment Management Standards
SSSMGP	South State Street Manufactured Gas Plant
SOP	standard operating procedure
SVOCs	Semivolatile organic compounds
TOC	total organic carbon
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WP	well point
WSDOT	Washington State Department of Transportation

CERTIFICATION

I, Mark J. Herrenkohl, a licensed engineering geologist in the State of Washington, certify that I have reviewed the geosciences portions of this document.

Signature and Stamp of Geologist:

Name: Mark J. Herrenkohl Date: September 8, 2015

1 INTRODUCTION

This document is an addendum to the sampling and analysis plan (SAP) and quality assurance project plan (QAPP) for the South State Street Manufactured Gas Plant (SSSMGP) Site remedial investigation and feasibility study (RI/FS) in Bellingham, Washington. It outlines additional sampling and testing activities proposed for the SSSMGP Site, activities supplementary to work conducted under the August 6, 2010 Work Plans (Herrenkohl Consulting and Landau Associates 2010) based on recommendations in the *Remedial Investigation Interim Data Report* (Interim Data Report, Herrenkohl Consulting and Landau Associates 2011), and further discussions with the Washington State Department of Ecology (Ecology).

This addendum provides specific guidance for field methodology and quality assurance procedures that will be followed by Herrenkohl Consulting LLC (Herrenkohl Consulting), Landau Associates, Inc. (Landau Associates), and subcontractors. Herrenkohl Consulting and Landau Associates are conducting this work under contract with the City of Bellingham, Parks and Recreation Department (City), with direction from the Ecology Toxics Cleanup Program. The addendum to the SAP and QAPP was prepared in accordance with an Agreed Order and Scope of Work negotiated between the City, Puget Sound Energy (PSE), and Ecology and signed April 30, 2010 (Document No. 7655), and was developed to meet the requirements of an RI/FS as defined by the Washington State Model Toxics Control Act (MTCA) Cleanup Regulation [Washington Administrative Code (WAC) 173-340; Ecology 2007].

Several documents are cited repeatedly in this addendum. Altogether, these documents are referred to as the Work Plans for the SSSMGP Site RI/FS:

- ***Work Plan*** for the RI/FS of the SSSMGP Site Bellingham, Washington (August 6, 2010). The Work Plan provides information on existing data for the SSSMGP Site and the sampling strategy and design to meet the data needs for completing the RI/FS. The Work Plan also describes the project management strategy for implementing and reporting RI/FS activities for the Site, including project team responsibilities and schedule.
- ***Sampling and Analysis Plan*** (Appendix B of the Work Plan) for the RI/FS of the SSSMGP Site, Bellingham, Washington (August 6, 2010). The SAP describes the procedures for conducting field activities and presents the proposed laboratory analyses for samples collected in the field.
- ***Quality Assurance Project Plan*** (QAPP; Appendix C of the Work Plan) for the RI/FS of the SSSMGP Site, Bellingham, Washington (August 6, 2010). The QAPP describes analytical method reporting limit goals, field and laboratory quality assurance/quality control (QA/QC) requirements and reporting requirements for the RI/FS for the Site.

- ***Project Health and Safety Plan*** (Appendix D of the Work Plan) for the RI/FS of the SSSMGP Site, Bellingham, Washington (August 6, 2010). The HASP has been prepared in accordance with WAC 173-340-810, applicable Washington Industrial Safety and Health Act (WISHA) regulations, and project requirements. It addresses those activities associated with work to be performed at the Site.

The Work Plan described an environmental investigation designed to meet the data needs for completing the RI/FS. Data collected in that investigation were summarized in the Interim Data Report (Herrenkohl Consulting and Landau Associates 2011a). An evaluation of that data resulted in the identification of remaining data gaps and recommendations for additional investigation activities to fulfill the data needs for completing the RI/FS. Those additional investigation activities were conducted in July 2011, February 2012, October 2012, and February 2013 in accordance with *Addendums No. 1, No. 2, No. 3 and No. 4, Sampling and Analysis Plan and Quality Assurance Project Plan*, respectively (SAP/QAPP Addendums 1, 2, 3, and 4 Herrenkohl Consulting and Landau Associates 2011b,c; 2012; and 2013). Sampling and testing completed in accordance with Addendum 1 included laboratory analysis of some archived soil and sediment samples, additional soil vapor sampling, and a bivalve reconnaissance within the pocket beach area of the Site. For Addendum 2, soil and sediment borings were drilled and monitoring wells installed at four additional locations (HS/MW-46, HS/MW-53, HS/MW-54 and HS/MW-55) to further delineate contamination associated with the Site and define the Site boundary[1]. For Addendum 3, soil borings were drilled (GP-56 and GP-57) to further delineate soil and groundwater contamination associated with the Site and define the Site boundary. An evaluation of vapor intrusion as a potential exposure pathway at the Spinnaker Reach Condominiums was completed in accordance with Addendum 4.

The City and PSE submitted a draft remedial investigation report (draft RI report) to Ecology in April 2014 for review. The draft RI report included an evaluation of all data collected and analyzed as described in the original Work Plan and subsequent four addenda. After receiving Ecology's preliminary comments on the draft RI report in August 2014, the City and PSE provided a response to those preliminary comments and met with Ecology to discuss specific comments on December 3, 2014 and February 24, 2015. Based on those meetings and written communications including a revised set of comment responses by Ecology on May 14, 2015, the City and PSE have agreed to conduct supplemental sampling to address groundwater quality data gaps and sediment sampling to further define the Site boundary and nature and extent of contamination in the sediments. The data gaps to be addressed include:

- Insufficient data to define the Site boundary and nature and extent of contamination in sediments onsite;

[1] For the purpose of this document, the term "boundary" refers to the Preliminary SSSMGP Site Boundary as set out in Exhibit A to the 2010 Agreed Order. The Preliminary SSSMGP Site Boundary may not encompass the full lateral extent of contamination associated with the former MGP. The final Site boundary will be based on the full extent of contamination and could be larger or smaller than that originally identified in Exhibit A of the Agreed Order.

- Insufficient data to evaluate the direct contact and seafood consumption pathways for human exposure to Site sediments; and

- Insufficient data to characterize water quality conditions at the point of discharge from groundwater to surface water downgradient of MW-28.

Following this introduction, the document has been organized into four sections. Sections 2 and 3 describe the field and analytical approach for the additional sediment and groundwater investigations, respectively. Section 4 describes the handling of investigation-derived waste. References are presented in Section 5.

Figures and tables are provided after the report text.

2 SEDIMENT INVESTIGATION

Additional sediment investigation activities will be completed during the summer or fall of 2015 to address data gaps identified by Ecology during their review of the draft RI report. Surface and subsurface sediment samples will be collected to provide additional chemical data to further define the Site boundary and nature and extent of contamination onsite. The additional chemistry data will also be used to further evaluate the direct contact and seafood consumption pathways for human exposure to Site sediments, and consideration of risks to benthic organisms. For proposed station locations located in the intertidal zone, from +10 ft to -4 ft mean lower low water (MLLW), the 0-2 ft below mudline sample will be collected and analyzed to evaluate both human health exposure pathways; samples collected 0-12 cm below mudline will be used to evaluate compliance with Sediment Management Standards (SMS) criteria. The most likely scenario for direct contact with sediment is clam harvesting, which is expected to be limited to the upper 2 feet of sediment based on a clam survey previously conducted at the Site. For proposed sample locations located within the subtidal zone (greater than -4 ft MLLW), a 0-12 cm below mudline sample will be collected to evaluate the seafood consumption pathway and compliance with SMS criteria.

Surface sediment (0-12 cm) will be collected from 19 locations. Subsurface sediment cores will be collected from 14 sampling locations up to a depth of 12 ft below mudline. Proposed sediment sample locations and testing are shown on Figure 1 and defined further in Table 1. Where sample locations are located within areas of eelgrass as shown on Figure 1, the sampling vessel will be securely positioned on station with the least amount of sediment disturbance and impact on local eelgrass beds.

Field investigation and laboratory analysis methods described in the SAP and QAPP will be used for this additional sediment investigation, except for activities that warrant the use of new or modified methods. This section presents only those field sampling and laboratory testing methods that are not contained in the SAP and QAPP or that deviate from the methods described therein.

2.1 STATION POSITIONING

Station positioning and the locations of each sediment station will be determined onboard the sampling vessel using global positioning system (GPS) with an accuracy of about ±3 m. Station coordinates (NAD83 with recent corrections) along with water depth will be documented for each sampling location on field log forms. The water depth in feet will be converted to an elevation (MLLW) based on visual measurements taken from the tide staff during sampling.

2.2 SURFACE SEDIMENT SAMPLING

Surface sediment samples (0-12 cm) will be collected from 19 station locations using a 0.1 m^2 van Veen sampler or equivalent following methods described in the SAP. Refer to Figure 1 and

Table 1. Enough sediment volume will be collected from all locations for both conventional and chemical testing as described in Section 2.4.

2.3 SUBSURFACE SEDIMENT SAMPLING

Subsurface sediment samples will be collected from 14 station locations using a vibracore coring system deployed from a research vessel (refer to Figure 1 and Table 1). The vibracorer uses a hydraulic or electric system that vibrates and drives a length of 4-inch outer diameter aluminum tube into the sediment. A continuous sediment sample is retained within the core tube with the aid of a stainless steel core cutter/catcher. Prior to sampling, each core tube and core catcher will be decontaminated following the procedures outlined in the SAP or a new decontaminated core and catcher will be used for each sample.

The vibracore coring system should be capable of collecting a continuous core to the maximum sediment depth required at the site of 12 feet below mudline[2]. Depth of penetration versus depth of recovery will be closely monitored during the collection of the cores. The *in situ* depth to the top of the section will be recorded for each section. After removing the core tube from the water, the tube will be marked with an indelible marker identifying the station and core section and may be wrapped with transparent tape to prevent loss or damage of the marking, if necessary. The core tube may be cut into smaller sections (e.g., 4 ft) for transport to the processing area. The core sections will be labeled with the station number and the top and bottom sample depths below the mudline.

Sediment at the end of each tube section will be visually classified for qualitative sample characteristics. Changes from the top to the bottom of each section of the tube will be noted and recorded on the core log sheet. The core ends will then be covered with aluminum foil, a protective cap, and duct tape to prevent leakage. The core sections will be stored upright in a container chilled with ice to approximately 4°C. A full core tube section will limit disturbance during storage and transport.

The cores will be transported to land and processed as described below. If a core is considered unacceptable during sectioning (see below), another core may need to be collected from the station.

2.3.1 Core Sample Acceptability

As the core is pulled from the water, it will be visually evaluated for penetration and release of sediment from the tube. Caution will be used to prevent disturbance of the surface of the sediment when the core is laid at an angle during removal from the drive head. The core catcher will be inspected for rocks or other obstacles that may have plugged the core while penetrating. A core may be rejected if there is doubt about its representativeness. The actual penetration

[2] A 14-ft core tube will be used to obtain the 12-ft penetration depth at each station.

depth and sample recovery will also be compared and documented. A sample recovery of 75% or greater will be considered acceptable and representative of an individual location.

Sediment depth and sample characteristics in the core will be used to determine if the desired depth has been sampled. If the core length is less than the desired depth, recovery is below 75%, or the core shows signs of disturbance, another core will be attempted at that station. The longer core of the two will be sectioned and analyzed. The second core will be retained in case problems such as excessive disturbance are discovered during the core cutting procedure. Secondary cores will not be used if the first core is acceptable. Additional stations may have to be selected if after 3 attempts at a station, an acceptable core is not obtained.

2.3.2 Core Compaction

Compaction will be estimated (measured recovery/penetration) and will be used to determine *in situ* sampling depths. Recovered cores of at least 75% will be "expanded" to their penetration depth to compensate for core compaction.

2.3.3 Core Processing

In this investigation, compositing will be performed within individual locations at up to 2 ft intervals (or based on lithology[3]) to ensure that adequate sediment is available for the required analyses. Core sections not used for analysis may be archived for possible future analysis.

Core sections will be extruded at the core processing station located in the lower park (area to-be-determined). Core sections will be extruded onto a stainless steel tray or aluminum sheeting using a core extruder (a plunger-style device that pushes the sample through the core tube). The core section will then be split lengthwise with a stainless-steel knife. This process produces a generally intact core for visual classification and description of the sediments with depth.

Prior to composite sampling, photographs of the intact cores will be taken. Sediment composite samples will be processed according to the following step-by-step procedure.

1. Transfer sediment section from core to a clean stainless steel bowl and cover with aluminum foil.
2. Stir the composite sample until the sample is of uniform color and texture. If any material (e.g., wood debris, shells, rocks) has to be removed from the sample, note it and other sediment properties in the field logbook or on the sample description sheet.
3. Fill jars and containers for required testing and archive.

[3] Composite samples will not be collected across different lithological units.

4. Seal each glass container in a plastic bag in case of breakage. Place in ice chest and pack samples to minimize the chances of breaking.

5. Decontaminate the equipment as described in the SAP.

Collect excess sediment from the composite and dispose of as investigation derived waste, as described in the SAP and summarized in Section 4.

2.4 CHEMICAL TESTING

Surface sediment samples from 11 Site locations (MGP-SS-13 through MGP-SS-23) will be analyzed for total organic carbon (TOC) and SMS metals and semivolatile organic compounds (SVOCs) listed in SMS (refer to Table 1) following methods described in the QAPP and summarized in Table 2.

In addition, total mercury will be analyzed in sediment collected from the remaining 8 locations (MGP-SS-24 through MGP-SS-31) due to a shortened holding time of 28 days required for analysis (Tables 1 and 2). Sediment will also be archived from each station for possible future analysis, as needed.

A total of 3 subsurface sediment samples collected from each of 7 stations (MGP-SB-13 through MGP-SB-19) will be analyzed for TOC, SMS metals and SVOCs (refer to Tables 1 and 2). Remaining sediment samples collected from all 14 core stations will be archived for possible future analysis, as needed.

Laboratory QC procedures for conventional and chemical analyses will be completed by the laboratories as required for each analytical protocol and as indicated in the QAPP.

Laboratory reporting requirements are also provided in the QAPP.

3 GROUNDWATER INVESTIGATION

Two temporary well points (MGP-WP-01 and MGP-WP-02) will be installed and groundwater samples will be collected for laboratory analysis. The two well points will be located along the shoreline, 50 ft and 100 feet north of MW-46 to provide additional groundwater data downgradient of MW-28 (refer to Section 3.1). Well point locations are shown on Figure 2; including existing Site wells proposed for additional groundwater sampling (refer to Section 3.2). Proposed well locations may be adjusted based on field conditions. This section describes the planned well point installation and construction and the sampling and analysis procedures that differ from those described in the SAP and QAPP.

3.1 WELL POINT INSTALLATION AND CONSTRUCTION

To further characterize water quality conditions at the point of discharge from groundwater to surface water downgradient of MW-28, well points will be installed at two locations along the beach, 50 ft and 100 ft northeast of MW-46 for two separate groundwater sampling events. At the two beach locations (WP-01 and WP-02), groundwater will be sampled from temporary hand-driven, well points. Sampling of the temporary wells will be timed so that groundwater samples are collected at the point in the tidal cycle when bay water dilution of the groundwater is the least (see below).

A stainless steel well point consisting of a 0.010-inch slot size, wire-wrapped screen[4] above a drive point will be hand driven at each of the two locations. The well points will be installed 1.5 ft to 2 ft below the water interface by hammer-driving the well point to depth. Alternatively, hand-auger borings will be advanced using a 2-inch outside diameter auger attached to a rotohammer and stand. Once drilled to depth, the auger will be removed and the well point will be advanced into the open hole. The hole may collapse after predrilling with the rotohammer/auger setup, but should assist with installation of the well point to the correct depth. Pre-drilling the boring with the rotohammer/auger setup would likely increase the turbidity of groundwater initially, but would be used as backup in case driving the well point screen is initially unsuccessful due to site conditions (e.g., coarse-grained materials).

3.2 GROUNDWATER SAMPLING

Two rounds of groundwater samples will be collected from each of the new well points following well point installation at the point of the tidal cycle when bay water dilution of the groundwater is the least (i.e. the time of lowest conductivity in groundwater). Samples will be collected using dedicated polyethylene tubing and a peristaltic pump. The point during the tidal cycle of least bay water dilution will be determined by measuring the conductivity in water at MW-46 over two full tidal cycles prior to the sampling event. Conductivity will be recorded at

[4] The screen length will be determined in the field based on site conditions. A sediment sample will be collected from the screen interval depth at each location after groundwater collection. The sample will be archived (frozen) for possible future chemical analysis.

both the predicted times of high and low tides, plus one hour before and after each of these tidal maximums. During the first round of groundwater sampling, groundwater samples will also be collected from existing Site wells MW-28, MW-34, MW-36, MW-40, MW-42, MW-46, and MW-55 (Figure 2). The groundwater samples will be collected using the procedures described in the SAP with the following exceptions for MW-46, WP-01, and WP-02:

- Field parameters will be measured at multiple depths prior to purging to confirm the depth of the freshwater and saltwater interface.
- If a freshwater/saltwater interface is observed, the intake end of the tubing will be lowered to a depth above the interface.

Field geochemical parameters (ferrous iron, dissolved oxygen, oxygen reduction potential, conductivity, and turbidity) will be measured in groundwater collected from the new well points and selected existing Site wells.

Water level data will be measured for all lower Site monitoring wells and well points sampled following procedures in the SAP.

The first round of groundwater sampling will be scheduled for the fourth quarter of 2015. The second round of groundwater sampling will be scheduled for first quarter of 2016.

3.3 LABORATORY ANALYSES

The groundwater samples collected from the new well points and existing monitoring wells will be analyzed for:

- Hardness by Method SM2340B.
- Total and dissolved arsenic, lead, selenium, and silver by EPA Method 6020 with a collision cell.
- Benzene by EPA 8021B modified for low level analysis.
- cPAHs by EPA Method 8270D with low-level analysis and silica-gel cleanup.
- Weak Acid Dissolvable (WAD) cyanide by Standard Method 4500CNI

Since water samples at stations MW-46, WP-01, and WP-02 are expected to be turbid upon collection, samples will be centrifuged at the laboratory before analysis, following Analytical Resource Inc. (ARI) standard operating procedure (SOP) 1151 for separation of solids by centrifuge (Modified Method EPA-823-B-01-002 – refer to Attachment A).

Target reporting limits for each analysis will be those specified in the QAPP with the following exceptions:

- For the total and dissolved metals the laboratory instruments will be set to report the method detection limit (MDL) as well as the reporting limit. Detailed analyte lists, MDLs and reporting limits for this modification are summarized in Table 3 and described

in Addendum 2 of the SAP/QAPP (Herrenkohl Consulting and Landau Associates 2011c). During data validation, concentrations observed between the MDL and the reporting limit will be identified and qualified as estimated values.

- For cPAHs, the laboratory will use EPA Method 8270D- low level analysis with a silica gel cleanup to achieve a reporting limit of 0.01 µg/L.

3.4 WELL POINT ABANDONMENT

Well points will be removed from the sediment after sampling is complete and the holes will be filled with hydrated bentonite chips. The locations of the temporary beach well points will be accurately measured by surveyors to evaluate groundwater elevations and allow follow-up sampling at the same locations, if necessary.

4 INVESTIGATION-DERIVED WASTE

Investigation-derived waste, including remaining sediment, purge water and decontamination water, will be containerized in Washington State Department of Transportation (WSDOT)-approved 55-gal drums, labeled, and stored onsite pending analysis for proper disposal in accordance with applicable regulations.

5 REFERENCES

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Table 1. Proposed Sediment Sampling Locations and Testing

Station	Northing (ft)	Easting (ft)	Depth (bgs)	Metals[1]	SVOCs[2]	TOC[3]	Archive
Surface Sediment Samples			(cm)				
MGP-SS-13	636458.33	1237681.34	0 to 12	✓	✓	✓	*
MGP-SS-14	636637.58	1237819.30	0 to 12	✓	✓	✓	*
MGP-SS-15	636552.18	1237564.32	0 to 12	✓	✓	✓	*
MGP-SS-16	636731.54	1237702.37	0 to 12	✓	✓	✓	*
MGP-SS-17	636967.93	1237906.26	0 to 12	✓	✓	✓	*
MGP-SS-18	636879.74	1238149.56	0 to 12	✓	✓	✓	*
MGP-SS-19	636787.79	1238293.48	0 to 12	✓	✓	✓	*
MGP-SS-20	637061.42	1238416.49	0 to 12	✓	✓	✓	*
MGP-SS-21	637174.81	1238203.72	0 to 12	✓	✓	✓	*
MGP-SS-22	637254.55	1237817.66	0 to 12	✓	✓	✓	*
MGP-SS-23	636925.61	1237473.60	0 to 12	✓	✓	✓	*
MGP-SS-24	636349.78	1237577.81	0 to 12	Hg	A	A	*
MGP-SS-25	636544.39	1237214.43	0 to 12	Hg	A	A	*
MGP-SS-26	637077.20	1237126.44	0 to 12	Hg	A	A	*
MGP-SS-27	637478.02	1237030.15	0 to 12	Hg	A	A	*
MGP-SS-28	637509.31	1237690.97	0 to 12	Hg	A	A	*
MGP-SS-29	637968.67	1237642.87	0 to 12	Hg	A	A	*
MGP-SS-30	638132.74	1238234.77	0 to 12	Hg	A	A	*
MGP-SS-31	637642.80	1238375.19	0 to 12	Hg	A	A	*
Sediment Core Samples[4]			(ft)				
MGP-SB-13	636458.33	1237681.34	0 to 2	✓	✓	✓	*
			2 to 4	✓	✓	✓	*
			6 to 8	✓	✓	✓	*
			10 to 12	A	A	A	*
MGP-SB-14	636637.58	1237819.30	0 to 2	✓	✓	✓	*
			2 to 4	✓	✓	✓	*
			6 to 8	✓	✓	✓	*
			10 to 12	A	A	A	*
MGP-SB-15	636552.18	1237564.32	0 to 2	✓	✓	✓	*
			2 to 4	✓	✓	✓	*
			6 to 8	✓	✓	✓	*
			10 to 12	A	A	A	*
MGP-SB-16	636731.54	1237702.37	0 to 2	✓	✓	✓	*
			2 to 4	✓	✓	✓	*
			6 to 8	✓	✓	✓	*
			10 to 12	A	A	A	*
MGP-SB-17	636967.93	1237906.26	0 to 2	✓	✓	✓	*
			2 to 4	✓	✓	✓	*
			6 to 8	✓	✓	✓	*
			10 to 12	A	A	A	*
MGP-SB-18	636879.74	1238149.56	0 to 2	✓	✓	✓	*
			2 to 4	✓	✓	✓	*
			6 to 8	✓	✓	✓	*
			10 to 12	A	A	A	*
MGP-SB-19	636787.79	1238293.48	0 to 2	✓	✓	✓	*
			2 to 4	✓	✓	✓	*
			6 to 8	✓	✓	✓	*
			10 to 12	A	A	A	*
MGP-SB-20 to MGP-SB-25	See surface MGP-SB-20	samples for to -25 data	0 to 2	A	A	A	*
			2 to 4	A	A	A	*
			6 to 8	A	A	A	*
			10 to 12	A	A	A	*
MGP-SB-31	637642.80	1238375.19	0 to 2	A	A	A	*
			2 to 4	A	A	A	*
			6 to 8	A	A	A	*
			10 to 12	A	A	A	*
Total Baseline Samples Analyzed				**40**	**32**	**32**	

Notes for Table 1:

[1] Metals analysis will include arsenic, cadmium, chromium, copper, lead, mercury, silver, zinc (SMS Metals). Hg = mercury only.
[2] SVOCs, as listed in the SMS, will be analyzed by EPA Method SW8270 SIM or low levels.
[3] TOC: Total organic carbon will be analyzed by EPA Method SW9060 modified for sediment analysis.
[4] Selection of sediment samples for analysis may change during the field.
✓ Planned for analysis.
* Enough sediment from each location will be archived for possible future analysis.
A Sample archived for possible future analysis, as necessary.

Note: Field duplicate samples will be collected at a frequency of 1 per 20 field samples or 1 per sampling event (analyze metals, SVOCs, and TOC only). No field blank samples will be collected for this study. Archive samples will be collected for all sample depths for possible future analysis.

Table 2. Required Containers, Preservatives, and Holding Times for Sediment and Groundwater Analyses

Analysis Type	Method	Container Size	Holding Time[1]	Preservation
Sediments				
SVOCs	EPA Method 8270D/SIM	250-mL glass w/Teflon lid	14 days extraction/40 days analysis 1 year until analysis	Ice (4°C) Frozen (-18°C)
Metals	EPA Method 6010/6020/7471	125-mL glass w/Teflon lid	6 months/28 days[2] 2 years until analysis (except mercury)[2]	Ice (4°C) Frozen (-18°C)
TOC	EPA Method SW9060	125-mL glass w/Teflon lid	14 days 6 months	Ice (4°C) Frozen (-18°C)
Archive Samples	--	Two (2) 250-mL glass w/ Teflon lid, include 2-3 cm headspace	--	Frozen (-18°C)
Groundwater				
Total and Dissolved Arsenic, Lead, Selenium, Silver	EPA Method 6020 with collision cell	One 1-liter HDPE	6 months extraction/analysis	Ice (4°C), HNO_3 pH<2
Benzene	EPA Method 8021B	Three 40-mL glass w/ Teflon lined Septum lid	14 days extraction/analysis	1+1 HCl to a pH <2 Ice (4°C)
cPAHs	EPA Method 8270D low level	Two 1-liter amber glass	7 days extraction/40 days analysis	Ice (4°C)
Hardness	SM2340B	One 500-mL HDPE	--	Ice (4°C)
WAD Cyanide	Standard Method 4500CNI	One 500-mL HDPE	48 hour extraction/analysis	Ice (4°C)

Notes: All holding times are from the date of sampling. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis without being qualified.

[1]Storage temperatures and maximum holding times for physical/chemical analyses and sediment toxicity tests (PSEP 1997a,b, Ecology 2015).

[2]Holding time for mercury is 28 days frozen (-18°C) for sediments. Holding time for the other metals is 6 months.

Table 3. Modified Groundwater Analytical Methods, Target Reporting Limits, and Method Detection Limits

Analyte	Analytical Method	Target Reporting Limits (a)	Method Detection Limits
Metals (b)			
Arsenic	EPA Method 6020 with collision cell	0.5 µg/L	0.12 µg/L
Lead	EPA Method 6020 with collision cell	20 µg/L	1.55 µg/L
Selenium	EPA Method 6020 with collision cell	50 µg/L	4.99 µg/L
Silver	EPA Method 6020 with collision cell	3.0 µg/L	0.43 µg/L
cPAHs	EPA Method 8270D low level	0.018 µg/L	0.01 µg/L

(a) Reporting limits goals are based on current laboratory data and may be modified during the investigation process as methodology is refined. Laboratory reporting will be based on the lowest standard on the calibration curve. Instances may arise where high sample concentrations, nonhomogeneity of samples, or matrix interferences preclude achieving the desired reporting limits.

(b) Groundwater samples will be analyzed for both total and dissolved metals.

N

BB-29

BB-26

BB-09

MGP-SS-27

Bellingham Bay

MGP-SS-29

BB-23

MGP-SS-26

MGP-SS-28

MGP-SS-30

MGP-SS/SB-23

MGP-SS/SB-25

MGP-SS/SB-22

BB-19

MGP-SS/SB-31

MGP-SS/SB-15

MGP-SS/SB-16

MGP-SS/SB-17

MGP-SS/SB-24

MGP-SS/SB-14

MGP-SS/SB-21

MGP-SS/SB-13

MGP-SS/SB-18

Lower Boulevard Park

MGP-SS/SB-20

MGP-SS/SB-19

Residential Property

Upper Boulevard Park

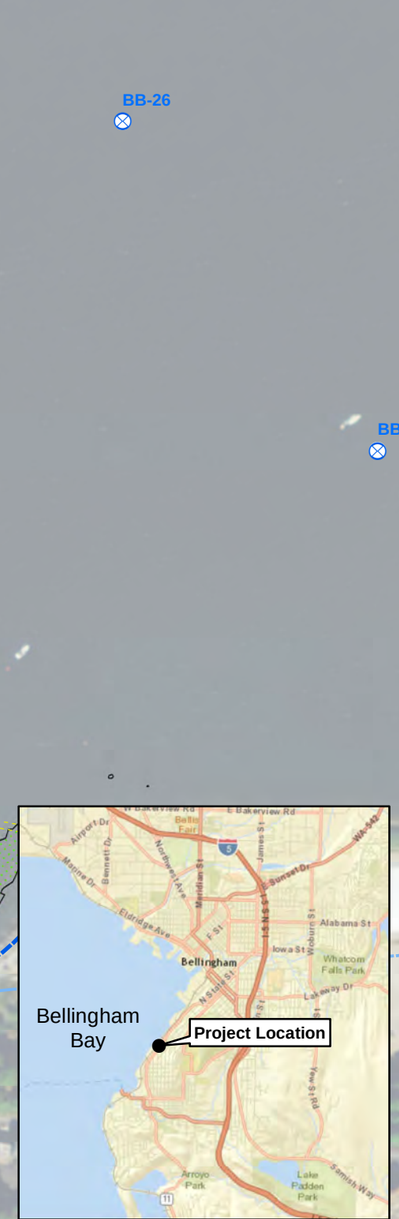
Removed Gas Holder Tank #1

Removed Gas Holder Tank #3

Gas Holder Tank #2

Electric/Generator Building

South State Street



Legend

- Proposed Surface Sediment Location
- Proposed Surface Sediment Sample and Sediment Core Location
- Bellingham Bay Regional Background Sediment Sample Locations
- Crawl Space/Ambient Air Sample Locations
- Bivalve Sample Locations
- GeoProbe Soil Boring
- Hollow-Stem Auger Soil Boring
- Hand Auger
- Monitoring Well
- Sediment Boring
- Surface Sediment
- Stormwater
- Selected Existing Site Structures
- Former Gas Holder Tanks
- Buried Pipe
- Mean Lower Low Water (Elev = 0)
- Mean High Tide
- Inner Harbor Line
- Proposed Over Water Walkway
- Preliminary Site Boundary
- Eelgrass Survey

Notes

1. Horizontal Datum: NAD 83 (HARN), U.S. Survey Feet.
2. Vertical Datum: Mean Lower Low Water (MLLW), Feet.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 300 600

Scale in Feet

Data Sources: BergerABAM, 2010: Steele and Assoc, 2011; ESRI World Imagery.

LANDAU ASSOCIATES

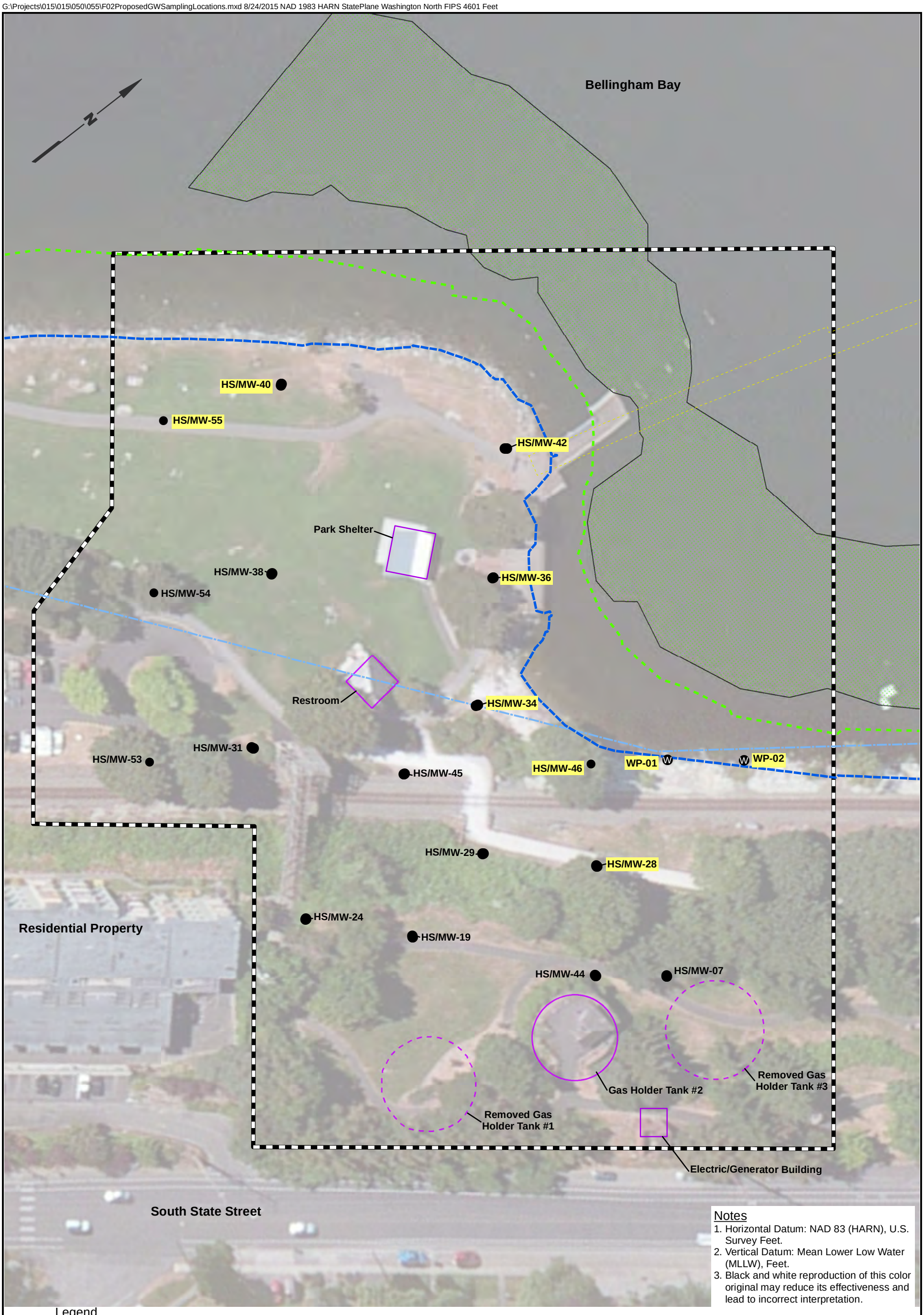
Herrenkohl Consulting LLC

South State Street
Manufactured Gas Plant
RI/FS
Bellingham, Washington

Proposed Sediment Sampling Locations

Figure
1

G:\Projects\015\015\050\055\F02ProposedGWSamplingLocations.mxd 8/24/2015 NAD 1983 HARN StatePlane Washington North FIPS 4601 Feet



Notes
1. Horizontal Datum: NAD 83 (HARN), U.S. Survey Feet.
2. Vertical Datum: Mean Lower Low Water (MLLW), Feet.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Legend

- HS/MW-19 ● Monitoring Well
- WP-01 Ⓦ Well Point
- Groundwater Contours
- Existing Site Structures
- Former Gas Holder Tanks
- Mean Lower Low Water (Elev = 0)
- Mean High Tide
- Inner Harbor Line
- Proposed Over Water Walkway
- Preliminary Site Boundary
- Eelgrass Survey
- MW-28 Monitoring Well/Well Point to be Sampled

0 60 120
Scale in Feet

Data Sources: BergerABAM, 2010: Steele and Assoc, 2011; ESRI World Imagery.

LANDAU ASSOCIATES

Herrenkohl Consulting LLC

South State Street
Manufactured Gas Plant
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Bellingham, Washington

Proposed Groundwater Sampling Locations

Figure
2