



**SITE INVESTIGATION REPORT  
FORMER COLUMBIA STREET MGP SITE  
OLYMPIA, WASHINGTON**

**NOVEMBER 26, 2008**

**FOR  
PUGET SOUND ENERGY, INC.**

**Site Investigation Report  
Former Columbia Street MGP Site  
File No. 0186-774-00**

**November 26, 2008**

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**SITE INVESTIGATION REPORT  
FORMER COLUMBIA STREET MGP SITE  
OLYMPIA, WASHINGTON  
FOR  
PUGET SOUND ENERGY**

**1.0 INTRODUCTION**

This report presents the results of a field investigation conducted between August and October 2008 at the Former Columbia Street Manufactured Gas Plant (MGP) Site (the “site”), located at 320 Columbia Street NW in Olympia, Washington. A vicinity map showing the site location is presented in Figure 1. The primary objective of the investigation was to assess the potential presence of soil and/or groundwater contamination related to the former MGP that operated at the site in the early 1900s. The site history and previous investigations are summarized in the Sampling and Analysis Plan (SAP; GeoEngineers 2008).

**2.0 FIELD EXPLORATION PROGRAM**

The field investigation was performed in general accordance with the SAP. Figure 2 shows the locations of the subsurface explorations completed during this study, and the locations of borings previously completed in 2006 by Environmental Partners, Inc. (EPI 2006). Field work for this study was conducted between August 6 and October 6, 2008, and consisted of two main phases.

During the first phase of field work, seven test pits were excavated at locations coinciding with, or adjacent to, the former primary MGP facilities, including the generator, wash boxes, scrubbers, purifiers, and gas holders (Figure 2). The purpose of the test pits was to explore for possible relic structures or buried debris related to the former MGP facility, to observe and document soil and groundwater conditions, and to allow sampling of soil above the groundwater table. Two soil samples were submitted for laboratory analysis from each test pit except TP-6. Only one soil sample, obtained from 2.5 feet below ground surface (bgs), was submitted from TP-6. Deeper soil samples submitted from adjacent test pits and borings provided vertical characterization data in the vicinity of TP-6.

During the second phase of field work, eight soil borings were drilled to varying depths using hollow-stem auger drilling methods. The boring depths ranged from 20 to 50 feet bgs. The purpose of the soil borings was to assess the potential presence of contamination in soil below the groundwater table. Saturated soil conditions were encountered at approximately 7 feet bgs during drilling. Continuous soil cores were collected from the borings for visual observation and lithologic logging. Discrete soil samples were selected from the continuous cores for field screening and potential chemical analysis. Two to four soil samples were submitted for chemical analysis from each boring based on review of the lithologic and field screening data.

Four of the soil borings were completed as groundwater monitoring wells. Wells MW-1 and MW-2 were completed to a depth of 20 feet bgs and screened across the groundwater table. Wells MW-3 and MW-4 were completed to depths of 44.5 feet bgs and 28.5 feet bgs, respectively, and were screened below the groundwater table.

Groundwater samples were collected from the four new monitoring wells (MW-1 through MW-4) and from two pre-existing wells (wells MW-6 and MW-10; see Figure 2) on August 26 and October 6, 2008 using low-flow purging and sampling techniques. The groundwater samples collected on August 26 were not filtered. Both filtered and unfiltered groundwater samples were collected on October 6.

Because of site constraints (vegetation, utilities, site structures), the locations of one test pit (TP-6) and three soil borings/monitoring wells (MW-2, MW-3, and SB-6) were shifted relative to the locations proposed in the SAP. Otherwise, there were no significant deviations from the SAP.

Soil samples submitted for analysis from the test pits and soil borings were obtained from depths that were considered most likely to be contaminated based on field screening results. Field screening consisted of visual observation, water sheen screening, and headspace organic vapor screening using a photoionization detector (PID). Field screening methods are discussed further in the SAP. Field screening results and subsurface conditions observed in the explorations are summarized in the test pit logs, monitoring well logs, and boring logs (Appendix A).

The test pits were backfilled with the original soil excavated from each test pit and/or clean imported fill (sand and gravel). The four soil borings that were not completed as monitoring wells (SB-5 through SB-8) were abandoned by filling the boreholes with cement-bentonite grout.

Additional details regarding field procedures, including field quality assurance/quality control (QA/QC) sampling, are provided in the SAP.

### **3.0 ANALYTICAL TESTING**

Soil and groundwater samples collected during the field investigation were analyzed for one or more of the following constituents based on previous investigation results (EPI 2006) and site history:

- Gasoline-, diesel-, and/or heavy oil-range total petroleum hydrocarbons (TPH);
- Benzene, toluene, ethylbenzene, and xylenes (BTEX);
- Semivolatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs);
- Metals (arsenic, chromium, copper, lead, and mercury); and
- Cyanide.

### **4.0 RESULTS**

This section presents the results of the field investigation. The results consist of: (1) observed soil conditions, (2) observed groundwater conditions, and (3) analytical testing results.

#### **4.1 SOIL CONDITIONS**

Near-surface conditions encountered in the test pits and borings generally consisted of several inches of asphalt pavement overlying 1.5 to 4 feet of fine to medium sand with varying amounts of silt and gravel, interpreted as structural fill. Man-made materials were encountered in several of the test pits. These materials consisted primarily of concrete slabs/blocks, bricks, wood, concrete and metal pipe, and other metal debris.

Soils encountered below the structural fill generally consisted of gray to brown, fine to coarse sand with variable amounts of silt, gravel, and shell fragments. This material is interpreted as hydraulic fill from dredging of Budd Inlet in the late 1800s and early 1900s. The soils encountered in the borings were generally homogenous in nature; no significant change in lithology that might indicate a transition from hydraulic fill to underlying native deposits was observed. In addition, laterally continuous horizons of soil with apparent low permeability (such as silt or clay) were not observed in the borings.

Soil field screening results are documented on the logs contained in Appendix A. Only two soil samples exhibited significant field-screening evidence of potential petroleum-related contamination. These two

samples (one obtained from 6.5 feet bgs in test pit TP-3, and the other obtained from 7 feet bgs in boring SB-6) were collected from approximately the same location and depth. Both samples exhibited an apparent petroleum sheen when a small quantity of the soil was placed in distilled water, and both yielded headspace organic vapor concentrations (PID readings) greater than 100 parts per million. The sample collected from test pit TP-3 was submitted for chemical analysis and is identified as sample TP3-6.5 in the summary table of soil analytical results (Table 2). Evidence of coal tar or tar oil was not encountered in any of the test pits or soil borings. Furthermore, groundwater that seeped into the test pits during excavation did not exhibit a sheen or other apparent visual evidence of contamination.

## **4.2 GROUNDWATER CONDITIONS**

Saturated soil conditions were encountered at depths of 6 to 8 feet bgs during test pit excavation and drilling. The depth to groundwater measured in monitoring wells on August 26 and October 6, 2008, prior to purging and sampling the wells, was approximately 5 to 6 feet bgs. Groundwater level measurements are summarized in Table 1. Potentiometric maps produced from the August and October groundwater level data are presented in Figures 3 and 4, respectively. Based on the potentiometric maps, the inferred groundwater migration direction is generally toward the west. The apparent average horizontal hydraulic gradient in October (0.002) was approximately two times greater than the average gradient in August (0.001). The October groundwater level data (Figure 4) may be more representative of equilibrium groundwater conditions than the August data (Figure 3), as the August data were collected only four to six days after wells MW-1 through MW-4 were installed and developed.

The difference in groundwater levels measured at shallow/deep well pair MW-2/MW-3 indicates a slight upward vertical gradient ranging between approximately 0.0007 (August) and 0.004 (October) at this location.

## **4.3 ANALYTICAL TESTING RESULTS**

The analytical testing results for soil and groundwater samples, including field duplicate quality control (QC) samples, are summarized in Tables 2 and 3, respectively. Washington State Model Toxics Control Act (MTCA) cleanup levels for soil and groundwater (Washington Administrative Code 173-340-720 and -740) also are shown in Tables 2 and 3 for comparison. Analytical results for field QC blank samples (equipment rinsate blanks and trip blanks) are summarized in Table 4. Laboratory analytical reports are included in Appendix B.

### **4.3.1 Soil Analytical Results**

Several constituents were detected in soil at concentrations exceeding MTCA Method A cleanup levels. These exceedances are highlighted in Table 2 and shown in Figure 5. For completeness, soil data from the 2006 EPI investigation (EPI 2006) also are included in Figure 5.

Carcinogenic PAHs (cPAHs) were detected in several soil samples at concentrations exceeding the MTCA Method A cleanup level for total cPAHs (toxic equivalent concentration; Washington Administrative Code 173-340-708[8][e]). With one exception, the cPAH exceedances occurred in samples obtained from depths of 7 feet bgs or shallower. The exception was a sample obtained from 18 feet bgs in boring SB-7. The total cPAH concentration in this sample (0.15 milligrams per kilogram [mg/kg]) slightly exceeded the MTCA Method A cleanup level of 0.1 mg/kg. The highest total cPAH concentration was detected in the soil sample obtained from 4 feet bgs in test pit TP-7 (Figure 5). This sample had a total cPAH concentration of 120 mg/kg, which is the same concentration that was reported in a soil sample collected at this location in 2006 (in previous boring B-5).

Several other constituents were detected in soil at concentrations exceeding MTCA Method A cleanup levels, including gasoline- and heavy oil-range TPH, benzene, lead, and mercury. These constituents were detected above MTCA cleanup levels less frequently than cPAHs, and they were generally collocated with cPAHs, as shown in Table 2 and Figure 5.

Four soil samples were submitted for chemical analysis during the 2006 EPI investigation (from borings B-2, B-3, B-5, and B-6; see Figure 5). All four samples were collected from a depth of 4 feet bgs. Two of these samples (B-3 and B-5) had total cPAH concentrations that exceeded the MTCA Method A cleanup level. The cPAH concentrations in these samples (7.6 and 120 mg/kg, respectively) were similar to the cPAH concentrations detected in soil during the current study. No other constituents were detected above MTCA Method A cleanup levels in the soil samples collected during the 2006 EPI investigation.

#### **4.3.2 Groundwater Analytical Results**

Total arsenic and total lead were the only constituents detected at concentrations exceeding MTCA Method A cleanup levels in the unfiltered groundwater samples collected on August 26, 2008. Total arsenic concentrations exceeded the MTCA Method A cleanup level in all six monitoring wells; total lead concentrations exceeded the MTCA Method A cleanup level in one well (MW-3). These arsenic and lead exceedances are highlighted in Table 3 and shown in Figure 6. For completeness, groundwater data from the 2006 EPI site investigation (EPI 2006) also are included in Figure 6. Only one groundwater sample (MW-2) collected on August 26 contained detectable cPAHs. The total cPAH toxic equivalent concentration in this sample was less than the corresponding MTCA Method A cleanup level.

Based on the elevated total arsenic and total lead concentrations in the groundwater samples collected on August 26, 2008, the monitoring wells were sampled again on October 6, 2008. Both filtered and unfiltered groundwater samples were collected on October 6 to evaluate dissolved and total concentrations of arsenic and lead. The analytical results for these samples are included in Table 3 and Figure 6. Total and dissolved arsenic concentrations in five of the six wells sampled in October exceeded the MTCA Method A cleanup level. Total lead concentrations in October were less than the MTCA Method A cleanup level in all six monitoring wells. Dissolved lead was not detected in these samples.

Total lead concentrations in groundwater were greater than dissolved lead concentrations, suggesting that the lead may be sorbed to suspended solids in the groundwater. The analytical results for total and dissolved arsenic do not exhibit the same consistent relationship, which suggests that arsenic occurrence in site groundwater is not significantly impacted by the presence of suspended solids.

Seven groundwater samples were submitted for chemical analysis during the 2006 EPI investigation (from borings B-2 through B-6 and wells MW-6 and MW-10; see Figure 6). All of these samples were collected using a peristaltic pump and low-flow sampling techniques. The groundwater grab samples collected from borings were obtained by placing the peristaltic pump suction tubing inside a temporary, continuous well screen installed from the ground surface to 12 feet bgs in each borehole. Two of the groundwater grab samples (B-3 and B-5) had total cPAH concentrations that exceeded the MTCA Method A cleanup level. In addition, arsenic concentrations exceeded the MTCA Method A cleanup level in six groundwater samples. No other constituents were detected above MTCA Method A cleanup levels in the groundwater samples collected during the 2006 EPI investigation.

#### **4.3.3 Quality Assurance/Quality Control Data Review**

GeoEngineers reviewed the QA/QC data included with the laboratory analytical reports to assess the quality of the project analytical data. No significant data quality exceptions requiring further action were noted in the laboratory reports or during our review and none of the data was rejected. Based on our review, it is GeoEngineers' opinion that the analytical data are of acceptable quality for their intended use.

With one exception, the field duplicate sample results presented in Tables 2 and 3 were similar to the associated primary sample results, indicating minimal heterogeneity of soil and groundwater samples. The exception is the mercury results reported for primary/duplicate soil sample pair TP4-7.0/TP4-7.0-Dup. Primary sample TP4-7.0 had a mercury concentration of 7.1 mg/kg, whereas duplicate sample TP4-7.0-Dup had a concentration of 0.83 mg/kg. This result suggests that concentrations of mercury in soil at the subject property can vary over short distances.

Equipment rinsate blank and trip blank results are presented in Table 4. No constituents were detected in the rinsate or trip blanks, indicating that the project analytical data were not affected by equipment decontamination or sample handling/transport procedures.

## 5.0 INVESTIGATION-DERIVED WASTE MANAGEMENT

Soil exhibiting visual evidence of potential petroleum contamination (staining) was encountered above a concrete slab in test pit TP-1. Approximately 15 cubic yards of this soil were stockpiled and covered with plastic sheeting on-site, and a three-point composite sample of the stockpiled soil (sample STK-Comp-1) was submitted for waste characterization analysis. Concrete debris removed from test pits also was stockpiled on-site. Drill cuttings, monitoring well development and purge water, and equipment decontamination water were stored on-site in 55-gallon drums pending receipt of analytical data. A sample of the well development and purge water (sample P-08-26-08) was submitted for waste characterization analysis. Laboratory analytical reports for the waste characterization samples are included in Appendix B.

The stockpiled soil was characterized based on the analytical results for composite sample STK-Comp-1. The results for this sample are included in Table 2. Drill cuttings were characterized based on the analytical results for soil boring samples. Well development and purge water was characterized based on the analytical results for groundwater samples and the associated waste characterization sample. Based on the analytical testing results, the stockpiled soil was transported to CEMEX/Rinker Materials in Everett, Washington, for disposal. The concrete debris was transported for disposal at United Recycling in Snohomish, Washington. The drums containing drill cuttings, well development/purge water, and equipment decontamination water were transported to Puget Sound Energy's South King Facility in Kent, Washington, for disposal.

## 6.0 CONCLUSIONS

The analytical results obtained during this study expand upon the information provided in the 2006 EPI report. Beneath some portions of the site, soil above and within the seasonal zone of groundwater fluctuation contains hazardous substances at concentrations exceeding MTCA cleanup levels. This soil contamination coincides with the location of several former MGP facilities. Analytical and field screening results in numerous explorations did not identify evidence of free-phase product or coal tar residuals at the site. The primary constituent of concern at the site appears to be cPAHs. Other constituents detected above cleanup levels are present less frequently, and occur within the broader footprint of cPAH impacts.

Analytical results obtained during this study suggest that historical MGP operations have had only minor, if any, impacts on groundwater beneath the site. While arsenic was detected at concentrations above the MTCA Method A cleanup level beneath most of the site, this constituent does not appear to be related to past site activities based on soil analytical results. The arsenic detections in groundwater may represent a larger arsenic plume in the site vicinity.

Lead was the only constituent detected at concentrations exceeding MTCA cleanup levels in both soil and groundwater. However, the single lead exceedance in groundwater (sample MW-3) may be of limited significance because it only slightly exceeded the cleanup level on a totals basis, and is likely associated with the presence of suspended solids in the groundwater sample.

EPI detected cPAHs at concentrations exceeding the MTCA Method A cleanup level in two groundwater grab samples collected during their 2006 investigation. These exceedances are likely not representative of groundwater conditions beneath the site, but rather, are an artifact of the sampling method used. The groundwater grab samples were obtained from temporary well screens installed in hollow-stem auger boreholes. Samples collected by this technique often appear to be biased high when compared to groundwater analytical results from monitoring wells. Groundwater monitoring wells provide more representative data due to their superior construction (e.g., filter packs and annular seals) and the well development techniques employed. cPAHs were detected in only one groundwater sample (MW-2) obtained during the current study. The detected cPAH concentration in this sample was an order of magnitude less than the MTCA cleanup level.

## 7.0 LIMITATIONS

GeoEngineers has prepared this report for the exclusive use of Puget Sound Energy, its authorized agents, and regulatory agencies. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions.

Our interpretation of subsurface conditions for this study is based on field observations, field screening, and chemical analytical results obtained from widely spaced samples. It is always possible that contamination exists at locations or depths not identified by this study.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with our general agreement with PSE (Contract No. 4600001763) and with generally accepted environmental and earth science practices in this area at the time this report was prepared. The conclusions and opinions presented in this report are based on our professional knowledge, judgment, and experience. No warranty or other conditions, expressed or implied, should be understood.

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Please refer to Appendix C titled "Report Limitations and Guidelines for Use" for additional information pertaining to the use of this report.

## 8.0 REFERENCES

Environmental Partners, Inc. (EPI) 2006. *Summary of Findings – Historical Review and Focused Baseline Environmental Assessment, Parcels 7850-02-00100, 9900-00-06800, and 9900-08-32500 in Thurston County, 320 Columbia Street NW, Olympia, Washington.* Letter submitted to Mr. John Sullivan and Mr. Barry Ziker. September 13, 2006.

GeoEngineers. 2008. *Sampling and Analysis Plan, Former Columbia Street Manufactured Gas Plant Site, 320 Columbia Street NW, Olympia, Washington.* Letter submitted to Puget Sound Energy. July 16, 2008.

**Table 1**  
**Measured Groundwater Levels in Monitoring Wells**  
**Former Columbia Street MGP**  
**Olympia, Washington**

Monitoring Well	Screened Interval (feet bgs)	Top-of-Casing Elevation <sup>1</sup> (feet)	Date	Measured Depth to Groundwater <sup>2</sup>	Calculated Groundwater Elevation (feet)
MW-1	5.0-20.0	8.42	8/26/08	4.74	3.68
			10/6/08	4.64	3.78
MW-2	5.0-20.0	8.96	8/26/08	5.33	3.63
			10/6/08	5.23	3.73
MW-3	39.5-44.5	8.92	8/26/08	5.27	3.65
			10/6/08	5.08	3.84
MW-4	23.5-28.5	9.00	8/26/08	5.30	3.70
			10/6/08	5.18	3.82
MW-6	15 <sup>3</sup>	8.97	8/26/08	5.37	3.60
			10/6/08	5.37	3.60
MW-10	15 <sup>3</sup>	9.02	8/26/08	5.31	3.71
			10/6/08	5.25	3.77

Notes:

bgs = Below ground surface

TOC = Top of well casing

<sup>1</sup>Elevations are referenced to an arbitrary benchmark (concrete curb) near the site with an assigned elevation of 10 feet.

<sup>2</sup>Water levels measured with an electronic water level indicator.

<sup>3</sup>Approximate depth to bottom of well casing measured with an electronic water level indicator on October 6, 2008. This well was installed by others.

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Table 2  
Soil Analytical Results (in mg/kg)  
Former Columbia Street MGP  
Olympia, Washington

Location	Sample ID <sup>1</sup>	Date	Depth (ft bgs)	BTEX <sup>4</sup>					Total Petroleum Hydrocarbons			Metals <sup>6</sup>						Total Cyanide <sup>3</sup>	
				Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Gasoline-Range <sup>4</sup>	Diesel-Range <sup>5</sup>	Heavy Oil-Range <sup>5</sup>	Arsenic	Chromium (total) <sup>7</sup>	Chromium VI	Copper	Lead	Mercury		Cadmium
TP-1/MW-1	TP1-3.0	8/6/08	3.0	<0.020	<0.051	<0.051	<0.051	<0.051	<5.1	<b>110</b>	<b>690</b>	<12	<b>22</b>	--	<b>18</b>	<b>310</b>	<b>0.63</b>	--	<b>0.534</b>
	TP1-4.0	8/12/08	4.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MW1-2-070	8/22/08	7.0	<0.020	<0.059	<0.059	<0.059	<0.059	<5.9	<30	<b>160</b>	<12	<b>14</b>	--	<b>9.1</b>	<6.0	<0.30	--	<0.052
	MW1-5-130	8/22/08	13.0	<b>0.021</b>	<0.061	<0.061	<0.061	<0.061	--	<33	<65	--	--	--	--	--	--	--	--
	MW1-9-200	8/22/08	20.0	<0.020	<0.079	<0.079	<0.079	<0.079	--	<32	<64	--	--	--	--	--	--	--	--
TP-2/MW-3	TP2-4.5	8/6/08	4.5	<0.020	<0.047	<0.047	<0.047	<0.047	<4.7	<b>62</b>	<b>300</b>	<11	<b>14</b>	--	<b>13</b>	<b>130</b>	<0.26	--	<b>0.417</b>
	TP2-7.5	8/12/08	7.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	MW3-03-080	8/20/08	8.0	<0.020	<0.063	<0.063	<0.063	<0.063	<6.3	<30	<60	<12	<b>13</b>	--	<b>7.9</b>	<6.0	<0.30	--	<b>0.318</b>
	MW3-13-280	8/20/08	27.5	<0.020	<0.063	<0.063	<0.063	<0.063	--	<30	<60	--	--	--	--	--	--	--	--
	MW3-22-450	8/20/08	44.5	<0.020	<0.067	<0.067	<0.067	<0.067	--	<31	<61	--	--	--	--	--	--	--	--
TP-3/SB-6	TP3-2.5	8/6/08	2.5	<b>0.021</b>	<0.054	<0.054	<0.054	<0.054	<b>11</b>	<b>540</b>	<b>2,400</b>	<11	<b>15</b>	--	<b>77</b>	<b>600</b>	<b>9.2</b>	--	<b>0.244</b>
	TP3-6.5	8/6/08	6.5	<b>0.31</b>	<0.70 U1	<b>2.2</b>	<b>0.90</b>	<0.14	<b>130</b>	<33	<66	<13	<b>15</b>	--	<b>6.6</b>	<b>20</b>	<0.33	--	<0.065
	SB6-5-130	8/22/08	13.0	<0.020	<0.055	<0.055	<0.055	<0.055	<5.5	<27	<53	--	--	--	--	--	--	--	--
	SB6-9-200	8/22/08	20.0	<0.020	<0.055	<0.055	<0.055	<0.055	--	<30	<60	--	--	--	--	--	--	--	--
TP-4	TP4-3.5	8/6/08	3.5	<0.020	<0.048	<0.048	<0.048	<0.048	<4.8	<b>200</b>	<b>810</b>	<11	<b>14</b>	--	<b>22</b>	<b>600</b>	<b>29</b>	--	<b>0.208</b>
	TP4-7.0	8/6/08	7.0	<0.020	<0.055	<0.055	<0.055	<0.055	<5.5	<b>54</b>	<b>280</b>	<13	<b>12</b>	--	<b>15</b>	<b>74</b>	<b>7.1</b>	--	<b>0.154</b>
	TP4-7.0-Dup <sup>+</sup>	8/6/08	7.0	<0.020	<0.072	<0.072	<0.072	<0.072	<7.2	<b>43</b>	<b>170</b>	<14	<b>19</b>	--	<b>20</b>	<b>89</b>	<b>0.83</b>	--	<b>0.282</b>
TP-5/SB-5	TP5-3.5	8/6/08	3.5	<0.020	<0.052	<0.052	<0.052	<0.052	--	<26	<53	<11	<b>14</b>	--	<b>6.5</b>	<5.3	<0.26	--	<0.048
	TP5-6.0	8/6/08	6.0	<0.020	<0.060	<0.060	<0.060	<0.060	--	<31	<63	<13	<b>14</b>	--	<b>11</b>	<6.3	<0.31	--	<0.056
	SB5-9-220	8/21/08	22.0	<0.020	<0.065	<0.065	<0.065	<0.065	--	<31	<61	<b>15</b>	<b>14</b>	--	<b>6.2</b>	<6.1	<0.30	--	<0.101
	SB5-18-400	8/21/08	40.0	<0.020	<0.059	<0.059	<0.059	<0.059	--	<30	<60	<12	<b>19</b>	--	<b>12</b>	<6.0	<0.30	--	<b>0.241</b>
	SB5-18-400-D*	8/21/08	40.0	<0.020	<0.067	<0.067	<0.067	<0.067	--	<30	<60	<12	<b>19</b>	--	<b>11</b>	<6.0	<0.30	--	<b>0.274</b>
TP-6	TP6-2.5	8/12/08	2.5	<0.020	<0.045	<0.045	<0.045	<0.045	<4.5	<35	<b>220</b>	<11	<b>11</b>	--	<b>11</b>	<b>21</b>	<b>9.1</b>	--	<b>0.060</b>
TP-7/SB-7	TP7-4.0	8/6/08	4.0	<b>0.28</b>	<b>0.29</b>	<0.086	<b>0.23</b>	<b>0.088</b>	--	<b>800</b>	<b>3,900</b>	<14	<b>23</b>	--	<b>44</b>	<b>2,800</b>	<0.35	--	<b>2.12</b>
	TP7-7.0	8/6/08	7.0	<0.020	<0.059	<0.059	<0.059	<0.059	--	<29	<b>71</b>	<12	<b>17</b>	--	<b>7.1</b>	<b>18</b>	<0.29	--	<0.052
	SB7-6-180	8/21/08	18.0	<0.020	<0.053	<0.053	<0.053	<0.053	--	<29	<57	--	--	--	--	--	--	--	--
	SB7-14-340	8/21/08	34.0	<0.020	<0.071	<0.071	<0.071	<0.071	--	<31	<63	--	<0.71	--	--	--	--	--	--
	SB7-19-500	8/21/08	50.0	<0.020	<0.075	<0.075	<0.075	<0.075	--	<33	<65	--	--	--	--	--	--	--	--
MW-4	MW4-02-040	8/20/08	4.0	<0.020	<0.062	<0.062	<0.062	<0.062	<6.2	<31	<b>130</b>	<12	<b>21</b>	--	<b>21</b>	<b>330</b>	<0.30	--	<b>0.247</b>
	MW4-03-060	8/20/08	6.0	<0.020	<0.057	<0.057	<0.057	<0.057	<5.7	<26	<b>57</b>	<11	<b>14</b>	--	<b>8.2</b>	<5.3	<0.26	--	<0.110
	MW4-08-160	8/20/08	16.0	<0.020	<0.063	<0.063	<0.063	<0.063	--	<31	<63	--	--	--	--	--	--	--	--
	MW4-15-300	8/20/08	28.5	<0.020	<0.063	<0.063	<0.063	<0.063	--	<30	<60	--	--	--	--	--	--	--	--
SB-8	SB8-1-020	8/22/08	2.0	<b>0.024</b>	<0.055	<0.055	<0.055	<0.055	<5.5	<b>270</b>	<b>840</b>	<11	<b>21</b>	--	<b>74</b>	<b>140</b>	<b>8.4</b>	--	<0.052
	SB8-3-060	8/22/08	6.0	<0.025	<0.12	<0.12	<0.12	<0.12	<12	<b>180</b>	<b>1,300</b>	<11	<b>11</b>	--	<b>7.8</b>	<b>19</b>	<0.28	--	<b>0.059</b>
	SB8-6-120	8/22/08	12.0	<0.023	<0.12	<0.12	<0.12	<0.12	--	<b>52</b>	<b>88</b>	--	--	--	--	--	--	--	--
	SB8-10-200	8/22/08	20.0	<0.020	<0.054	<0.054	<0.054	<0.054	--	<28	<56	--	--	--	--	--	--	--	--
Stockpile	STK-Comp-1	8/22/08	SP	<0.020	<0.065	<0.065	<0.065	<0.065	<6.5	<35	<b>270</b>	<12	<b>21</b>	<1.2	<b>28</b>	<b>180</b>	<b>0.57</b>	<b>0.61</b>	--
MTCA Cleanup Level				0.03	7	6	9 (b)	9 (b)	30/100	2,000	2,000	20	19/2,000	19	3,000	250	2	2	1,600

Notes: (see notes on page 1)

Table 3  
Groundwater Analytical Results  
Former Columbia Street MGP  
Olympia, Washington

Location	Screened Interval (ft bgs)	Date	Sample ID	BTEX <sup>2</sup> (ug/L)					Total Petroleum Hydrocarbons			SVOCs <sup>4</sup> (ug/L)								Metals <sup>6</sup> (ug/L)							Total Cyanide <sup>8</sup> (mg/L)	
				Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Gasoline-Range <sup>2</sup> (ug/L)	Diesel-Range <sup>3</sup> (mg/L)	Heavy Oil-Range <sup>3</sup> (mg/L)	ncPAHs		cPAHs						Total Arsenic	Dissolved Arsenic <sup>7</sup>	Total Chromium	Total Copper	Total Lead	Dissolved Lead <sup>7</sup>	Total Mercury		
												Benzo(g,h,i)perylene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene									Total cPAHs (TEC) <sup>5</sup>
MW-1	5.0-20.0	8/26/08 10/6/08	MW-1 MW-1	<0.50 --	<0.50 --	<0.50 --	<1.0 --	<1.0 --	<100 --	<0.25 --	<0.40 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0072 --	<b>24</b> <b>16</b>	-- <b>17</b>	<b>22</b> --	<b>12</b> --	<b>3.2</b> <b>2.3</b>	-- <1.0	<0.50 --	<0.005 --	
MW-2	5.0-20.0	8/26/08 10/6/08	MW-2 MW-2	<0.50 --	<0.50 --	<0.50 --	<1.0 --	<1.0 --	<100 --	<0.25 --	<0.40 --	<b>0.061</b> --	<b>0.012</b> --	<b>0.0099</b> --	<b>0.020</b> --	<0.0095 --	<b>0.021</b> --	<b>0.026</b> --	<0.0095 --	<b>0.028</b> --	<b>10</b> <b>12</b>	-- <b>11</b>	<b>13</b> --	7.1 --	<b>5.1</b> <b>3.6</b>	-- <1.0	<0.50 --	<0.005 --
MW-3	39.5-44.5	8/26/08 8/26/08 10/6/08	MW-3 D-08-26-08* MW-3	<0.50 <0.50 --	<0.50 <0.50 --	<0.50 <0.50 --	<1.0 <1.0 --	<1.0 <1.0 --	<100 <100 --	<0.26 <0.25 --	<0.41 <0.40 --	<0.0095 <0.0095 --	<0.0095 <0.0095 --	<0.0095 <0.0095 --	<0.0095 <0.0095 --	<0.0095 <0.0095 --	<0.0095 <0.0095 --	<0.0095 <0.0095 --	<0.0072 <0.0072 --	<b>83</b> <b>84</b> <b>52</b>	-- -- <b>34</b>	<b>43</b> <b>45</b> --	<b>40</b> <b>40</b> --	<b>18</b> <b>18</b> <b>7.2</b>	-- -- <1.0	<0.50 <0.50 --	<0.005 <0.005 --	
MW-4	23.5-28.5	8/26/08 10/6/08	MW-4 MW-4	<0.50 --	<0.50 --	<0.50 --	<1.0 --	<1.0 --	<100 --	<0.25 --	<0.41 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0072 --	<b>120</b> <b>57</b>	-- <b>42</b>	<b>52</b> --	<b>26</b> --	<b>6.2</b> <b>3.9</b>	-- <1.0	<0.50 --	<0.005 --
MW-6	15 <sup>1</sup>	8/26/08 10/6/08	MW-6 MW-6	<0.50 --	<0.50 --	<0.50 --	<1.0 --	<1.0 --	<100 --	<0.25 --	<0.40 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0072 --	<b>5.6</b> <3.3	-- <3.0	<b>13</b> --	<11 --	<b>2.2</b> <b>8.6</b>	-- <1.0	<0.50 --	<0.005 --
MW-10	15 <sup>1</sup>	8/26/08 10/6/08	MW-10 MW-10	<0.50 --	<0.50 --	<0.50 --	<1.0 --	<1.0 --	<100 --	<0.25 --	<0.40 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0095 --	<0.0072 --	<b>12</b> <b>11</b>	-- <b>10</b>	<11 --	<11 --	<1.1 <b>4.7</b>	-- <1.0	<0.50 --	<0.005 --
MTCA Cleanup Level				<b>5</b>	<b>1,000</b>	<b>700</b>	<b>1,000 (a)</b>	<b>1,000 (a)</b>	<b>800/1,000</b>	<b>0.5</b>	<b>0.5</b>	--	--	--	--	--	--	--	--	<b>0.1</b>	<b>5</b>	<b>5</b>	<b>50</b>	<b>590</b>	<b>15</b>	<b>15</b>	<b>2</b>	<b>0.2</b>

Notes:

ug/L = Micrograms per liter

mg/L = Milligrams per liter

BTEX = Benzene, toluene, ethylbenzene and xylenes

SVOCs = Semivolatile organic compounds

ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons

cPAHs = Carcinogenic polycyclic aromatic hydrocarbons

ft bgs = Feet below ground surface

MTCA = Washington State Model Toxics Control Act

\* Field duplicate sample

-- = Constituent not analyzed or cleanup level not established

<sup>1</sup>Approximate depth to bottom of well casing measured with an electronic water level indicator on October 6, 2008. This well was installed by others.

<sup>2</sup>BTEX analyzed by Ecology Method NWTPH-Gx/BTEX or EPA Method 8021B; gasoline-range hydrocarbons analyzed by Ecology Method NWTPH-Gx. Gasoline-range cleanup level is 800 ug/L when benzene is present and 1,000 ug/L when benzene is not present.

<sup>3</sup>Analyzed by Ecology Method NWTPH-Dx.

<sup>4</sup>Analyzed by EPA Method 8270D/SIM. The target analyte list included 78 compounds. Results for all cPAH compounds are shown; results for other SVOCs are shown only if the compound was detected in at least one sample.

<sup>5</sup>Toxic equivalent concentration, calculated using MTCA TEC methodology (WAC 173-340-708[8][e]). For non-detected cPAHs, one-half the practical quantitation limit was used in the calculation.

<sup>6</sup>Analyzed by EPA Method 200.8/7470A.

<sup>7</sup>Groundwater samples analyzed for dissolved arsenic and dissolved lead were field-filtered with a 45 micron filter.

<sup>8</sup>Analyzed by EPA Method 335.4.

Yellow-highlighted values are MTCA Method A cleanup levels for groundwater (WAC 173-340-720[3]).

Blue-highlighted values are MTCA Method B cleanup levels (standard formula values) for groundwater (WAC 173-340-720[4][b]).

Green-highlighted values are Federal Primary Maximum Contaminant Levels (MCLs) (40 C.F.R. 141).

(a) Total value for all xylenes.

Detections are shown in bold typeface.

Gray shading indicates value exceeds the associated MTCA cleanup level when rounded to the same number of significant figures as the cleanup level.

Chemical analyses (except cyanide) performed by OnSite Environmental Inc. in Redmond, WA; cyanide analysis performed by Analytical Resources Inc. in Seattle, WA.

**Table 4**  
**Field Quality Control Blank Analytical Results**  
 Former Columbia Street MGP  
 Olympia, Washington

Sample ID	Date	BTEX <sup>1</sup> (ug/L)					Total Petroleum Hydrocarbons			SVOCs <sup>3</sup> (ug/L)	Total Metals <sup>4</sup> (ug/L)					Total Cyanide <sup>5</sup> (mg/L)
		Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Gasoline-Range <sup>1</sup> (ug/L)	Diesel-Range <sup>2</sup> (mg/L)	Heavy Oil-Range <sup>2</sup> (mg/L)		Arsenic	Chromium	Copper	Lead	Mercury	
Trip Blank	8/6/08	<0.50	<0.50	<0.50	<1.0	<1.0	<100	--	--	--	--	--	--	--	--	--
Trip Blank	8/12/08	<0.50	<0.50	<0.50	<1.0	<1.0	<100	--	--	--	--	--	--	--	--	--
Trip Blank	8/20/08	<0.50	<0.50	<0.50	<1.0	<1.0	--	--	--	--	--	--	--	--	--	--
Trip Blank	8/21/08	<0.50	<0.50	<0.50	<1.0	<1.0	--	--	--	--	--	--	--	--	--	--
Trip Blank	8/22/08	<0.50	<0.50	<0.50	<1.0	<1.0	--	--	--	--	--	--	--	--	--	--
SB6-8-185-rinsate	8/22/08	<0.50	<0.50	<0.50	<1.0	<1.0	<100	<0.26	<0.41	ND	<3.3	<11	<11	<1.1	<0.50	<0.005
SB6-9-200-rinsate	8/22/08	<0.50	<0.50	<0.50	<1.0	<1.0	<100	<0.26	<0.41	ND	<3.3	<11	<11	<1.1	<0.50	<0.005
Rinse-08-26-08	8/26/08	<0.50	<0.50	<0.50	<1.0	<1.0	<100	<0.25	<0.40	ND	<3.3	<11	<11	<1.1	<0.50	<0.005
Trip Blank	8/26/08	<0.50	<0.50	<0.50	<1.0	<1.0	--	--	--	--	--	--	--	--	--	--

Notes:

ug/L = Micrograms per liter

mg/L = Milligrams per liter

BTEX = Benzene, toluene, ethylbenzene and xylenes

SVOCs = Semivolatile organic compounds

ND = Not detected above analytical method reporting limits.

<sup>1</sup>BTEX analyzed by Ecology Method NWTPH-Gx/BTEX or EPA Method 8021B; gasoline-range hydrocarbons analyzed by Ecology Method NWTPH-Gx.

<sup>2</sup>Analyzed by Ecology Method NWTPH-Dx.

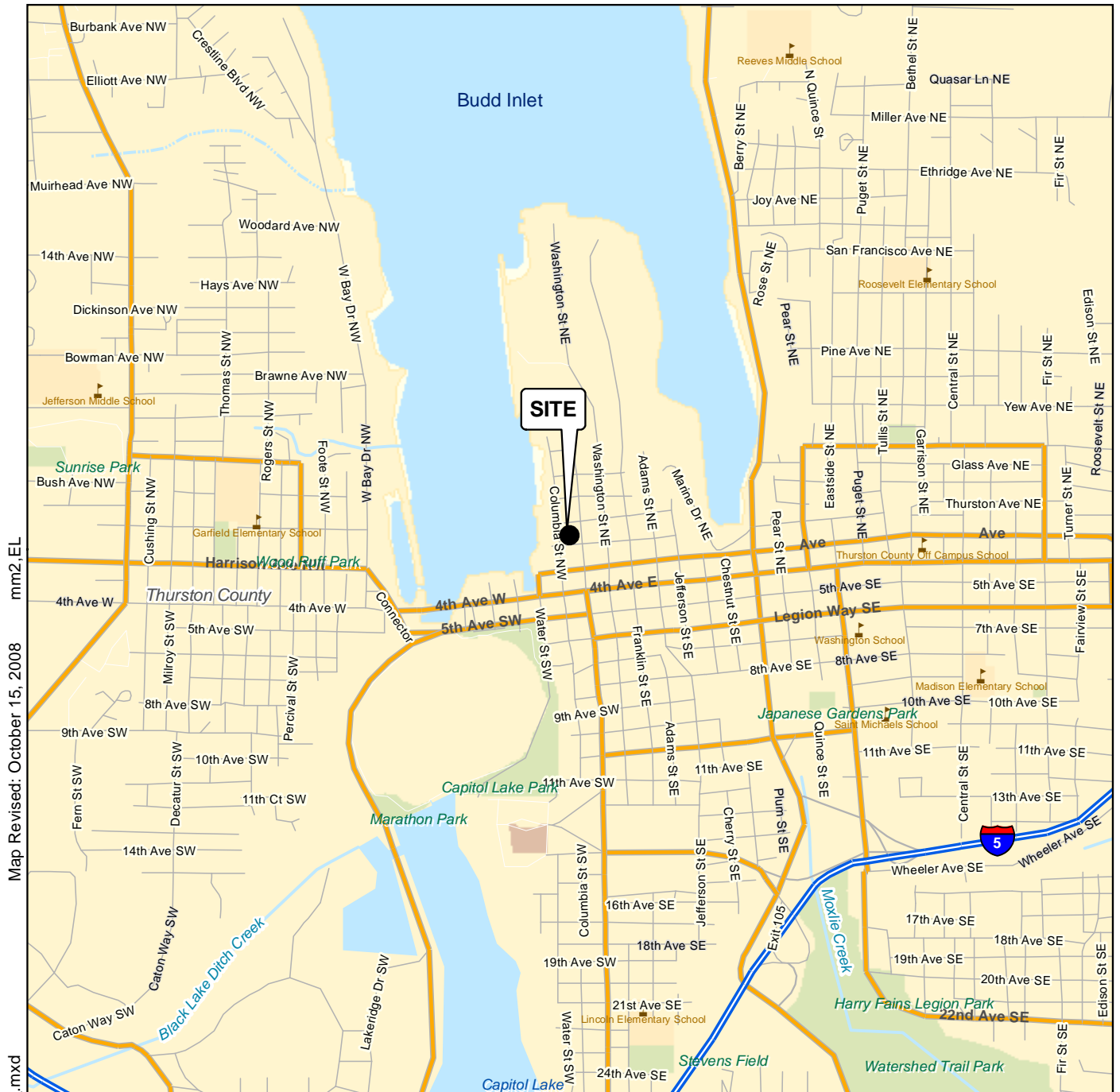
<sup>3</sup>Analyzed by EPA Method 8270D/SIM. The target analyte list included 78 compounds.

<sup>4</sup>Analyzed by EPA Method 200.8/7470A.

<sup>5</sup>Analyzed by EPA Method 335.4.

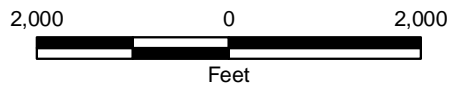
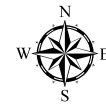
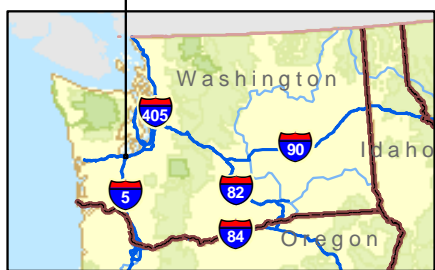
Chemical analyses (except cyanide) performed by OnSite Environmental Inc. in Redmond, WA; cyanide analysis performed by Analytical Resources Inc. in Seattle, WA.

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Map Revised: October 15, 2008 mm2.EL

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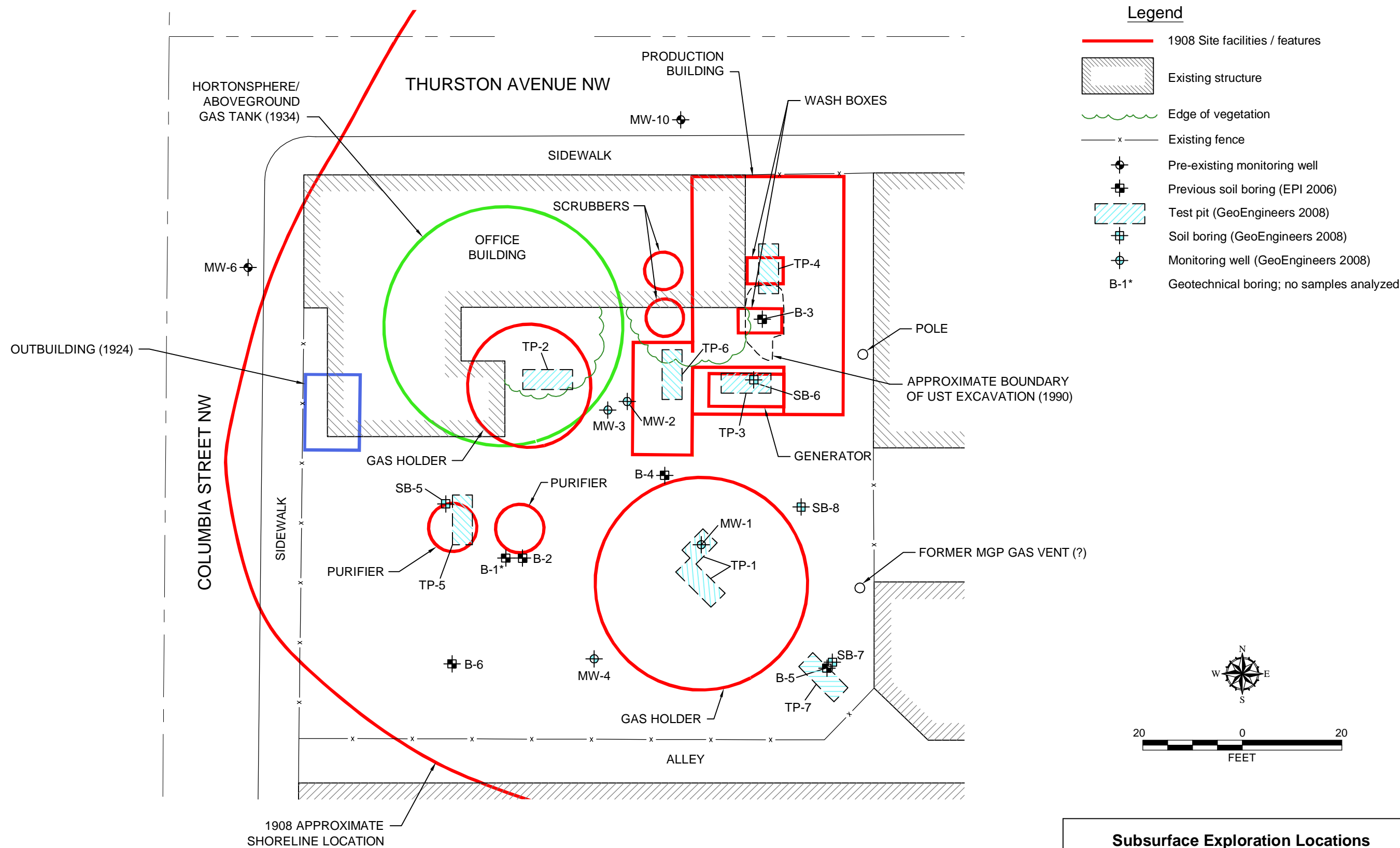
**Notes:**

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps, Street Maps 2005  
 Transverse Mercator, Zone 10 N North, North American Datum 1983  
 North arrow oriented to grid north

<b>Vicinity Map</b>	
Former Columbia Street MGP Site Olympia, Washington	
	<b>Figure 1</b>

P:\010186774\001\TASK 0100 - FIELD INVESTIGATION\CAD\0186774\01\_Fig 2.DWG\TAB.FIG 2 MODIFIED BY TRICHAUD ON NOV 12, 2008 - 9:11

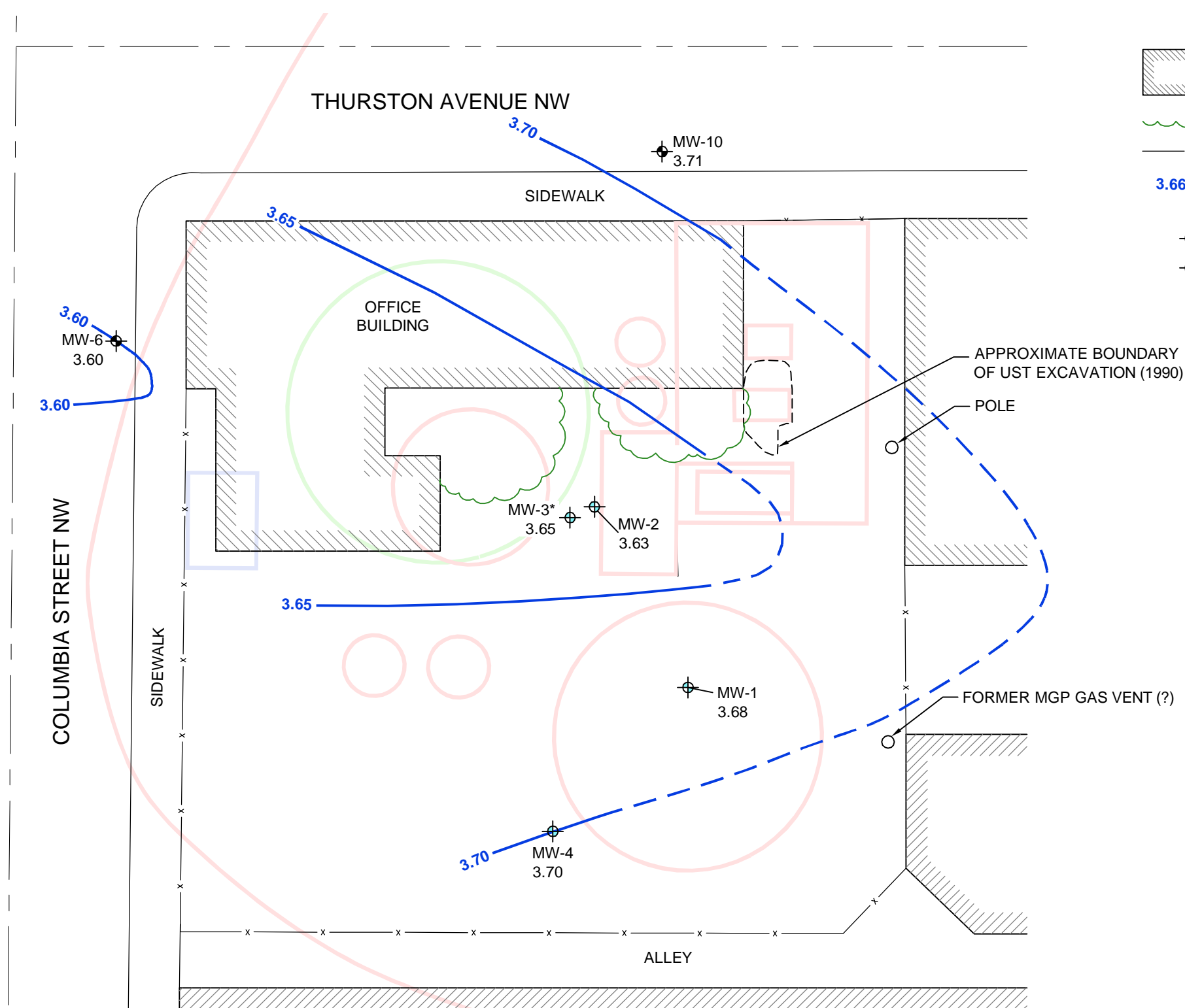


**Notes**

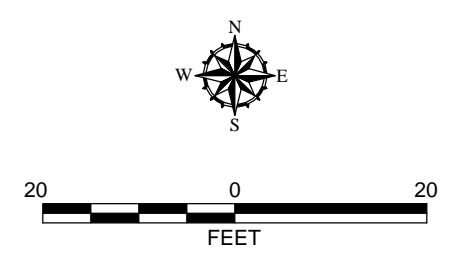
1. The locations of all features shown are approximate.
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<b>Subsurface Exploration Locations</b>	
Former Columbia Street MGP Site Olympia, Washington	
<b>GEOENGINEERS</b>	<b>Figure 2</b>

P:\010186774\00\TASK 0100 - FIELD INVESTIGATION\CAD\0186774\01\_Fig 3.DWG\TAB:FIG 3 MODIFIED BY THICHAUD ON NOV 12, 2008 - 17:13



- Legend**
- Existing structure
  - Edge of vegetation
  - Existing fence
  - 3.66 Interpolated groundwater elevation contour (feet); dashed where inferred
  - Pre-existing monitoring well
  - Monitoring well (GeoEngineers 2008)
- \* Well MW-3 screened from 39.5-44.5 feet bgs; water level not used for contouring.

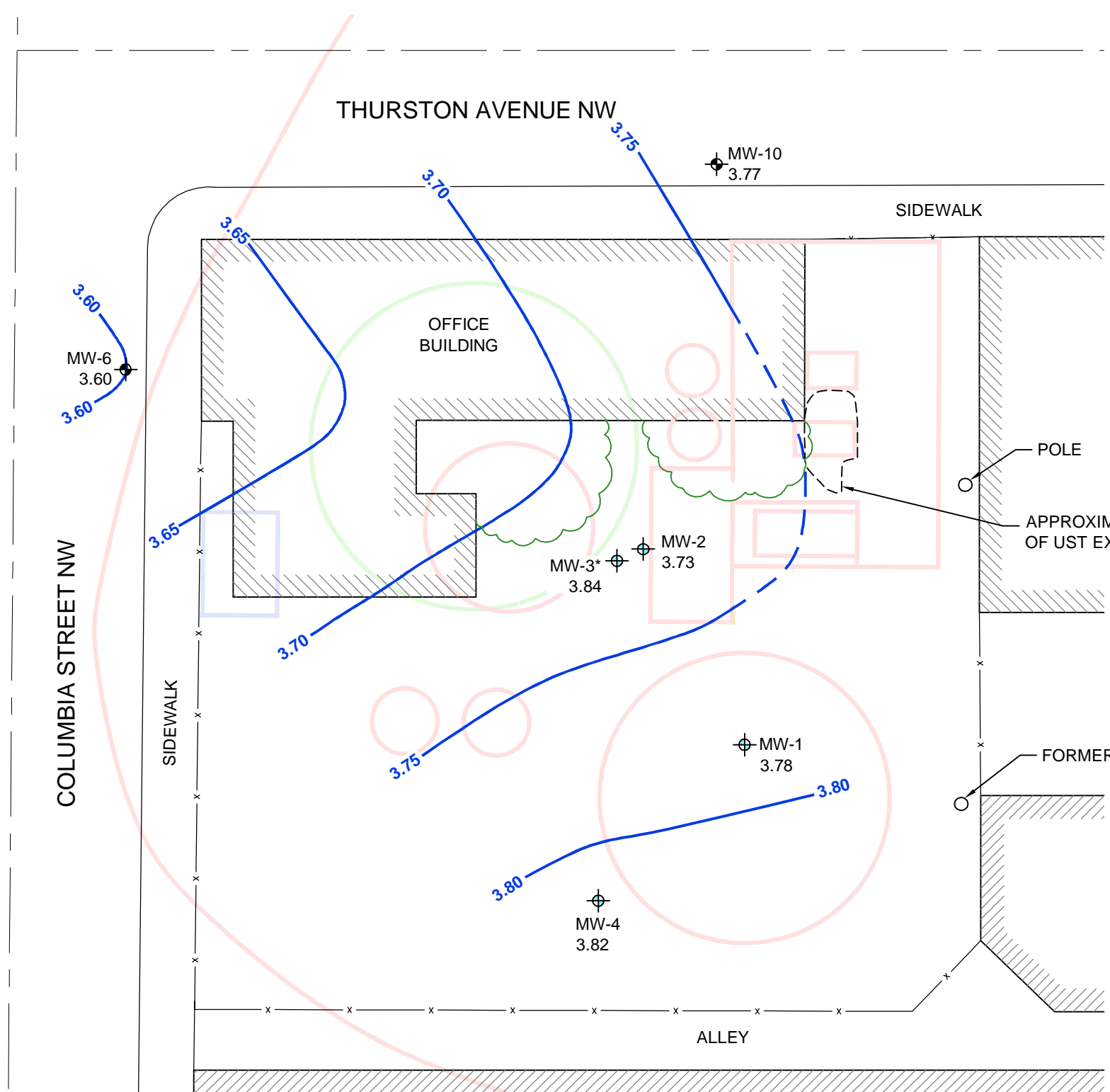


**Notes**

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

<b>Groundwater Potentiometric Surface Map August 26, 2008</b>	
Former Columbia Street MGP Site Olympia, Washington	
<b>GEOENGINEERS</b>	<b>Figure 3</b>

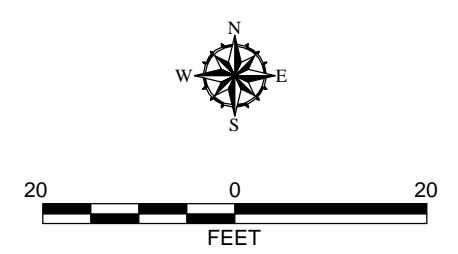
P:\010186774\001\TASK 0100 - FIELD INVESTIGATION\CAD\0186774\01\_Fig 4.DWG\TAB:FIG 4 MODIFIED BY THICHAUD ON NOV 12, 2008 - 8.45



**Legend**

- Existing structure / features
- Edge of vegetation
- Existing fence
- 3.66 Interpolated groundwater elevation contour (feet); dashed where inferred
- Pre-existing monitoring well
- Monitoring well (GeoEngineers 2008)

\* Well MW-3 screened from 39.5-44.5 feet bgs; water level not used for contouring.



- Notes**
1. The locations of all features shown are approximate.
  2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

**Groundwater Potentiometric Surface Map**  
**October 6, 2008**




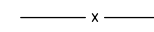


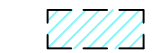



Former Columbia Street MGP Site  
 Olympia, Washington

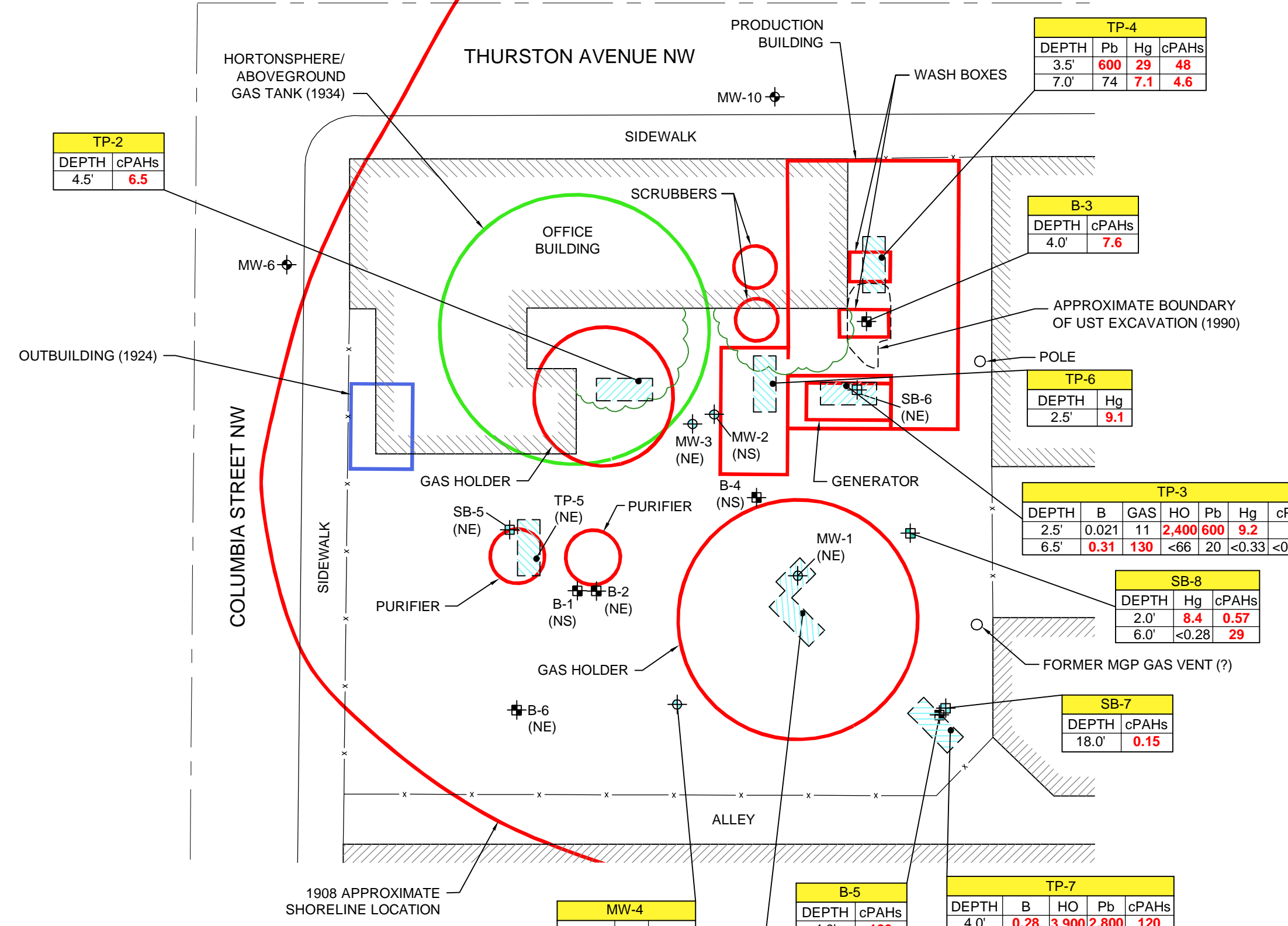
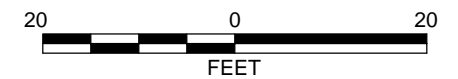
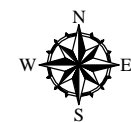
**GEOENGINEERS**

**Figure 4**

P:\010186774\001\TASK 0100 - FIELD INVESTIGATION\CAD\0186774\01\_Fig 5.DWG\TAB:FIG 5 MODIFIED BY TRICHAUD ON NOV 12, 2008 - 9:12

**Legend**

-  1908 Site facilities / features
  -  Existing structure
  -  Edge of vegetation
  -  Existing fence
  -  Pre-existing monitoring well
  -  Previous soil boring (EPI 2006); all soil samples collected at 4 ft bgs
  -  Test pit (GeoEngineers 2008)
  -  Test pit sidewall soil sampling location
  -  Soil boring (GeoEngineers 2008)
  -  Monitoring well (GeoEngineers 2008)
- Soil results in mg/kg
- cPAHs = Total carcinogenic polycyclic aromatic hydrocarbons – toxic equivalent concentration
- B = Benzene
- GAS = Gasoline-range hydrocarbons
- HO = Heavy oil-range hydrocarbons
- Pb = Lead
- Hg = Mercury
- (NS) = No soil samples analyzed
- (NE) = No MTCA exceedances
- Red/bold** values exceed MTCA Method A cleanup levels



TP-2	
DEPTH	cPAHs
4.5'	<b>6.5</b>

TP-4			
DEPTH	Pb	Hg	cPAHs
3.5'	<b>600</b>	<b>29</b>	<b>48</b>
7.0'	74	<b>7.1</b>	<b>4.6</b>

B-3	
DEPTH	cPAHs
4.0'	<b>7.6</b>

TP-6	
DEPTH	Hg
2.5'	<b>9.1</b>

TP-3						
DEPTH	B	GAS	HO	Pb	Hg	cPAHs
2.5'	0.021	11	<b>2,400</b>	<b>600</b>	<b>9.2</b>	<b>31</b>
6.5'	<b>0.31</b>	<b>130</b>	<66	20	<0.33	<0.0066

SB-8		
DEPTH	Hg	cPAHs
2.0'	<b>8.4</b>	<b>0.57</b>
6.0'	<0.28	<b>29</b>

SB-7	
DEPTH	cPAHs
18.0'	<b>0.15</b>

MW-4		
DEPTH	Pb	cPAHs
4.0'	<b>330</b>	<b>0.38</b>

B-5	
DEPTH	cPAHs
4.0'	<b>120</b>

TP-7				
DEPTH	B	HO	Pb	cPAHs
4.0'	<b>0.28</b>	<b>3,900</b>	<b>2,800</b>	<b>120</b>
7.0'	<0.020	71	18	<b>1.4</b>

TP-1		
DEPTH	Pb	cPAHs
3.0'	<b>310</b>	<b>2.3</b>

**Notes**

- The locations of all features shown are approximate.
- This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

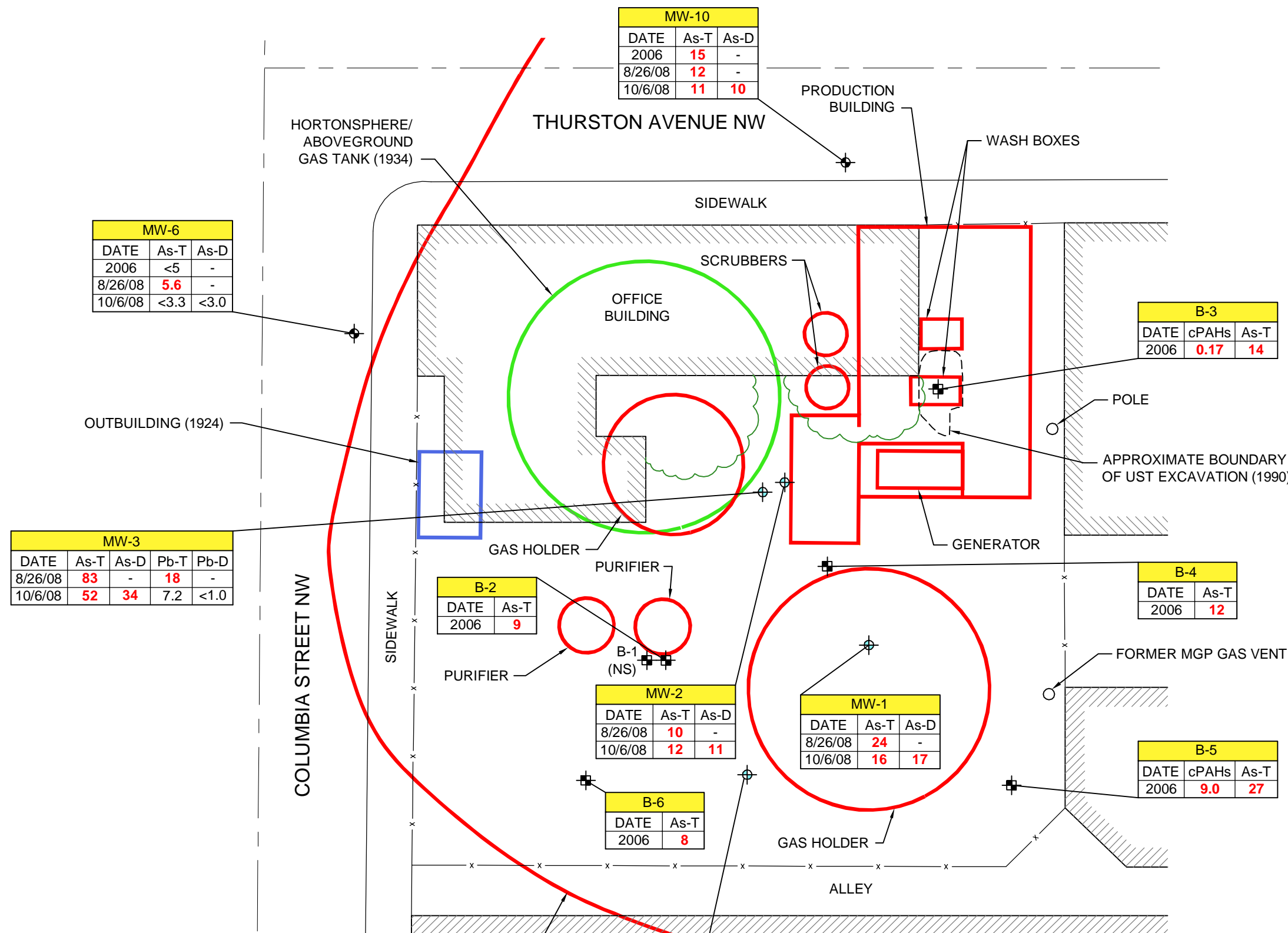
**Constituents Detected Above MTCA Method A Cleanup Levels in Soil**

Former Columbia Street MGP Site  
Olympia, Washington



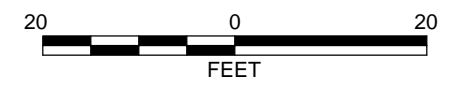
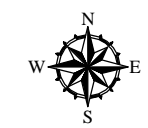
**Figure 5**

P:\010186774\001\TASK 0100 - FIELD INVESTIGATION\CAD\0186774\01\_Fig 6.DWG\TAB:FIG 6 MODIFIED BY TRICHAUD ON NOV 13, 2008 - 12:39



**Legend**

- 1908 Site facilities / features
  - Existing structure
  - Edge of vegetation
  - Existing fence
  - Pre-existing monitoring well
  - Previous soil boring (EPI 2006); all groundwater samples collected from upper 4-6 ft of saturated zone
  - Monitoring well (GeoEngineers 2008)
- Groundwater results in ug/L
- As-T = Total arsenic
  - As-D = Dissolved arsenic
  - Pb-T = Total lead
  - Pb-D = Dissolved lead
  - cPAHs = Total carcinogenic polycyclic aromatic hydrocarbons - toxic equivalent concentration
  - (NS) = No groundwater samples analyzed
  - Red/bold** values exceed MTCA Method A cleanup levels



MW-6			
DATE	As-T	As-D	
2006	<5	-	
8/26/08	<b>5.6</b>	-	
10/6/08	<3.3	<3.0	

MW-10			
DATE	As-T	As-D	
2006	<b>15</b>	-	
8/26/08	<b>12</b>	-	
10/6/08	<b>11</b>	<b>10</b>	

MW-3					
DATE	As-T	As-D	Pb-T	Pb-D	
8/26/08	<b>83</b>	-	<b>18</b>	-	
10/6/08	<b>52</b>	<b>34</b>	7.2	<1.0	

B-2		
DATE	As-T	
2006	<b>9</b>	

B-3		
DATE	cPAHs	As-T
2006	<b>0.17</b>	<b>14</b>

B-4	
DATE	As-T
2006	<b>12</b>

MW-2		
DATE	As-T	As-D
8/26/08	<b>10</b>	-
10/6/08	<b>12</b>	<b>11</b>

MW-1		
DATE	As-T	As-D
8/26/08	<b>24</b>	-
10/6/08	<b>16</b>	<b>17</b>

B-5		
DATE	cPAHs	As-T
2006	<b>9.0</b>	<b>27</b>

B-6	
DATE	As-T
2006	<b>8</b>

MW-4		
DATE	As-T	As-D
8/26/08	<b>120</b>	-
10/6/08	<b>57</b>	<b>42</b>

**Notes**

- The locations of all features shown are approximate.
- This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

**Constituents Detected Above MTCA Method A Cleanup Levels in Groundwater**

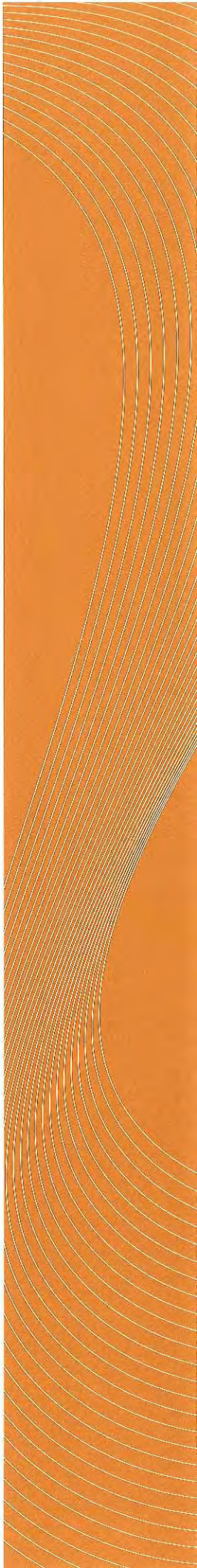
Former Columbia Street MGP Site  
Olympia, Washington

**Figure 6**



***APPENDIX A***  
***TEST PIT LOGS, BORING LOGS, AND WELL***  
***CONSTRUCTION DIAGRAMS***

---



## SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS <small>(LITTLE OR NO FINES)</small>		<b>GW</b>	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>GP</b>	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		SAND AND SANDY SOILS		<b>GM</b>	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN SANDS <small>(LITTLE OR NO FINES)</small>		<b>GC</b>	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>SW</b>	WELL-GRADED SANDS, GRAVELLY SANDS
		SAND AND SANDY SOILS		<b>SP</b>	POORLY-GRADED SANDS, GRAVELLY SAND
FINE GRAINED SOILS	SILTS AND CLAYS	SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>SM</b>	SILTY SANDS, SAND - SILT MIXTURES
		CLEAN SANDS <small>(LITTLE OR NO FINES)</small>		<b>SC</b>	CLAYEY SANDS, SAND - CLAY MIXTURES
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>ML</b>	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>CL</b>	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>OL</b>	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>MH</b>	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
HIGHLY ORGANIC SOILS	SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>CH</b>	INORGANIC CLAYS OF HIGH PLASTICITY	
	SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>OH</b>	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY	
	SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		<b>PT</b>	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

### Sampler Symbol Descriptions

- 2.4-inch I.D. split barrel
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

## ADDITIONAL MATERIAL SYMBOLS

SYMBOLS		TYPICAL DESCRIPTIONS
GRAPH	LETTER	
	<b>CC</b>	Cement Concrete
	<b>AC</b>	Asphalt Concrete
	<b>CR</b>	Crushed Rock/ Quarry Spalls
	<b>TS</b>	Topsoil/ Forest Duff/Sod



Measured groundwater level in exploration, well, or piezometer



Groundwater observed at time of exploration



Perched water observed at time of exploration



Measured free product in well or piezometer

### Stratigraphic Contact



Distinct contact between soil strata or geologic units



Gradual change between soil strata or geologic units



Approximate location of soil strata change within a geologic soil unit

### Laboratory / Field Tests

- %F Percent fines
- AL Atterberg limits
- CA Chemical analysis
- CP Laboratory compaction test
- CS Consolidation test
- DS Direct shear
- HA Hydrometer analysis
- MC Moisture content
- MD Moisture content and dry density
- OC Organic content
- PM Permeability or hydraulic conductivity
- PP Pocket penetrometer
- SA Sieve analysis
- TX Triaxial compression
- UC Unconfined compression
- VS Vane shear

### Sheen Classification

- NS No Visible Sheen
- SS Slight Sheen
- MS Moderate Sheen
- HS Heavy Sheen
- NT Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

## KEY TO EXPLORATION LOGS

Date Excavated: 8/6/08, 8/12/08

Logged by: SHL

Equipment: Backhoe (8/6/08), excavator (8/12/08)

Surface Elevation (ft):

Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0					AC	2 inches asphalt			
	☒	1			SP	Brown fine to medium sand with occasional gravel (moist)	NS	0	Brick and wood debris Concrete debris (pipes)
					SM	Gray to black silty sand (moist)			
	☒	2	CA			Black silty sand (moist)	SS	0	
					CC	Concrete slab			
	☒	3	CA		SP	Brown fine to medium sand with occasional gravel (moist)	NS	0	
5	Moderate caving observed at 1 feet bgs. Concrete slab encountered at 3 feet bgs. Broke through slab on 8/12/08 to facilitate installation of monitoring well MW-1. No groundwater seepage observed.								
10									
15									
20									
25									

Note: See Figure A-1 for explanation of symbols.

**LOG OF TEST PIT TP-1**



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

FIGURE A-2  
 Sheet 1 of 1

V6 ENV/TPIT P:\018677400\TASK\0100 - FIELD INVESTIGATION\FINALS\018677400.GPJ GEIV6 - 1.GDT 11/13/08

Date Excavated: 8/6/08, 8/12/08

Logged by: SHL

Equipment: Backhoe (8/6/08), excavator (8/12/08)

Surface Elevation (ft):

Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0					AC	3 inches asphalt			
	☒	1			SP	Brown fine to medium sand with gravel (moist)	NS	0	Roots
									Brick and shell fragments
									Concrete debris
	☒	2	CA		SP	Gray medium sand with shell fragments (moist)	NS	0	
5					CC	Concrete slab			
					SP	Brown fine to medium sand with occasional gravel (moist)			
	☒	3	CA			(wet)	NS	0	
						Minor caving observed at 2 feet bgs. Concrete slab encountered at 4.5 feet bgs. Broke through slab on 8/12/08 to facilitate installation of monitoring wells MW-2 and MW-3. Groundwater seepage observed at 7 feet bgs.			
10									
15									
20									
25									

Note: See Figure A-1 for explanation of symbols.

**LOG OF TEST PIT TP-2**



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

FIGURE A-3  
 Sheet 1 of 1







V6 ENV/TPIT P:\018677400\TASK\0100 - FIELD INVESTIGATION\FINALS\018677400.GPJ GEIV6 - 1.GDT 11/13/08

Date Excavated: 8/6/08

Logged by: SHL

Equipment: Backhoe

Surface Elevation (ft):

Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0	☒	1			AC SP	3 inches asphalt	NS	0	Pipe
					SM	Brown fine to medium sand with gravel (moist)			
	☒	2	CA		SM	Black silty sand (moist)	SS	0	
					CC SP	Concrete slab			
	☒	3			SP	Brown/gray medium sand with shell fragments (moist)	NS	0	
5	☒	4	CA			(wet)	MS	407	
<p>Minor caving observed at 2 feet bgs. Moderate groundwater seepage observed at 6.5 feet bgs.</p>									
10									
15									
20									
25									

Note: See Figure A-1 for explanation of symbols.

V6 ENV/TPIT P:\010186774\001\TASK\0100 - FIELD INVESTIGATION\FINALS\018677400.GPJ GEIV6 - 1.GDT 11/13/08

**LOG OF TEST PIT TP-3**



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

FIGURE A-4  
Sheet 1 of 1

Date Excavated: 8/6/08

Logged by: SHL

Equipment: Backhoe

Surface Elevation (ft):

Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0	☒	1			AC	3 inches asphalt			
					SP	Brown fine to medium sand with gravel (moist)	NS	0	
					CC	Concrete slab			
					SP	Brown to black, fine to medium sand (moist)			
	☒	2	CA				NS	0	
					SP	Brown medium sand with shell fragments (moist)			
5									
	☒	3	CA			(wet)	NS	0	
						Heavy caving observed at 1 feet bgs. Moderate groundwater seepage observed at 7 feet bgs.			
10									
15									
20									
25									

Note: See Figure A-1 for explanation of symbols.

V6 ENV/TPIT P:\010186774\001\TASK\0100 - FIELD INVESTIGATION\FINALS\018677400.GPJ GEIV6 - 1.GDT 11/13/08

**LOG OF TEST PIT TP-4**



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

FIGURE A-5  
 Sheet 1 of 1

Date Excavated: 8/6/08

Logged by: SHL

Equipment: Backhoe

Surface Elevation (ft):

Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0	<input checked="" type="checkbox"/>	1			AC	3 inches asphalt			
					SP	Brown fine to medium sand with occasional gravel (moist)	NS	0	Concrete debris Roots
					SP	Brown medium sand with shell fragments (moist)			
	<input checked="" type="checkbox"/>	2	CA			(Grades to gray)	NS	0	
5	<input checked="" type="checkbox"/>	3	CA			(Abundant shells)	NS	0	
<p>Minor caving observed at 3 feet bgs. Moderate groundwater seepage observed at 6 feet bgs.</p>									
10									
15									
20									
25									

Note: See Figure A-1 for explanation of symbols.

**LOG OF TEST PIT TP-5**



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

FIGURE A-6  
 Sheet 1 of 1

V6 ENV/TPIT P:\018677400\TASK 0100 - FIELD INVESTIGATION\FINALS\018677400.GPJ GEIV6 - 1.GDT 11/12/08

Date Excavated: 8/12/08

Logged by: SHL

Equipment: Excavator

Surface Elevation (ft):

Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0					AC	3 inches asphalt			
	☒	1			SP	Brown fine to medium sand with gravel (moist)	NS	0	Concrete block Metal debris  4-inch steel pipe
	☒	2	CA		SP	Brown to gray medium sand with shells (moist)	NS	0	
5									
	☒	3					NS	0	
						Heavy caving observed at 2 feet bgs. Heavy groundwater seepage observed at 7 feet bgs.			
10									
15									
20									
25									

Note: See Figure A-1 for explanation of symbols.

V6 ENV/TPIT P:\01018677400\TASK\0100 - FIELD INVESTIGATION\FINALS\018677400.GPJ GEIV6 - 1.GDT 11/13/08

**LOG OF TEST PIT TP-6**

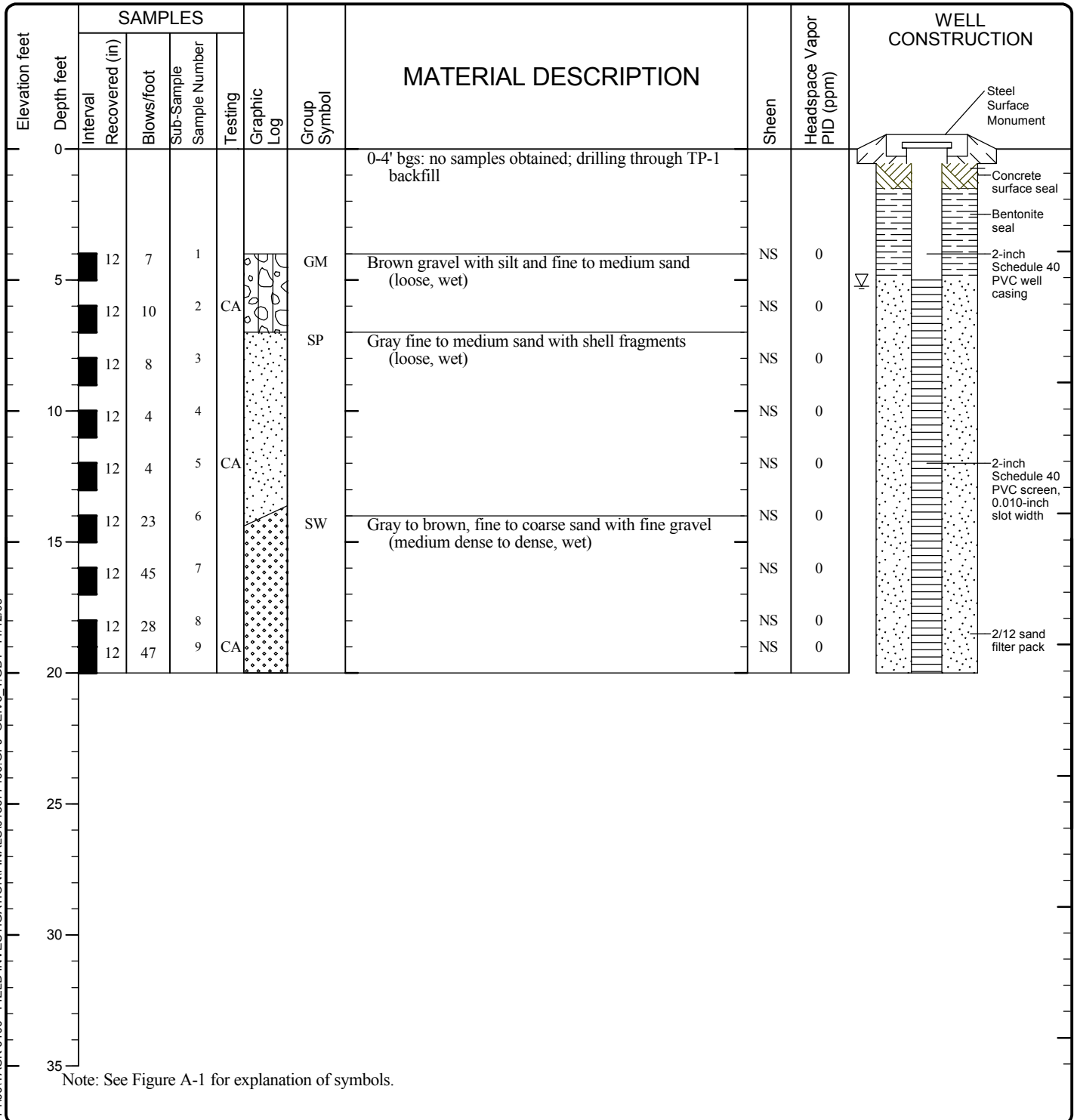


Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

FIGURE A-7  
 Sheet 1 of 1



Date(s) Drilled	8/22/08	Logged By	SHL	Checked By	RCL
Drilling Contractor	Cascade Drilling	Drilling Method	Hollow-Stem Auger	Sampling Methods	D&M Sampler
Auger Data	4.25" ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	
Total Well Depth (ft)	20	Ground Surface Elevation (ft)	8.92	Groundwater Elevation (ft)	3.68
Vertical Datum	Arbitrary Benchmark (assigned elev. = 10 ft)	Datum/System		Easting(x):	Northing(y):



V6 ENVWELL P:00186774001TASK 0100 - FIELD INVESTIGATION\FINAL\S018677400.GPJ GEIV6 1.GDT 11/12/08

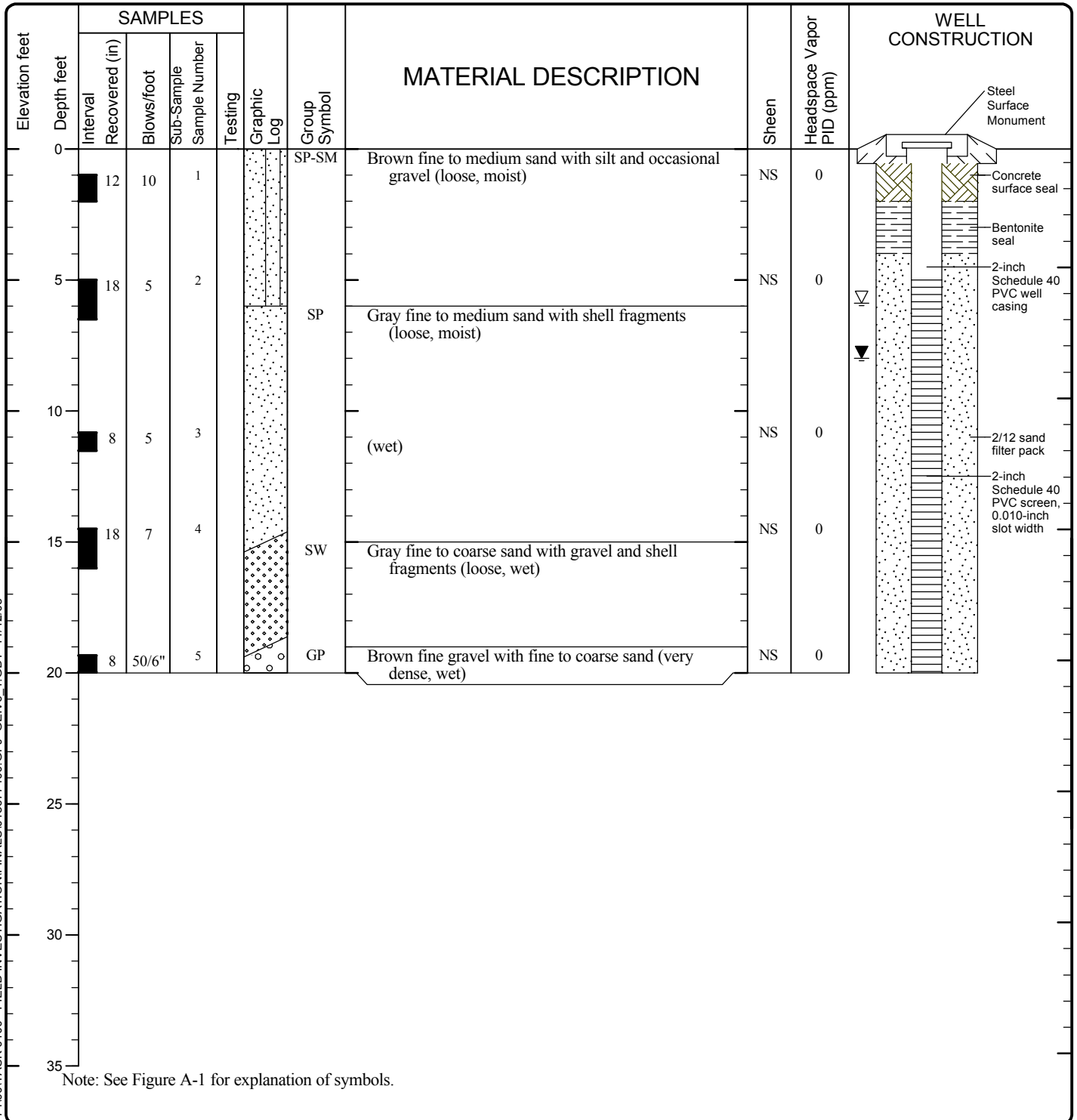
### LOG OF MONITORING WELL MW-1



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Figure A-9  
 Sheet 1 of 1

Date(s) Drilled	8/21/08	Logged By	SHL	Checked By	RCL
Drilling Contractor	Cascade Drilling	Drilling Method	Hollow-Stem Auger	Sampling Methods	D&M Sampler
Auger Data	4.25" ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	
Total Well Depth (ft)	20	Ground Surface Elevation (ft)	9.52	Groundwater Elevation (ft)	3.63
Vertical Datum	Arbitrary Benchmark (assigned elev. = 10 ft)	Datum/System		Easting(x):	Northing(y):



V6 ENVWELL P:00186774001TASK 0100 - FIELD INVESTIGATION\FINAL\S018677400.GPJ - GEIV6\_1.GDT - 11/12/08

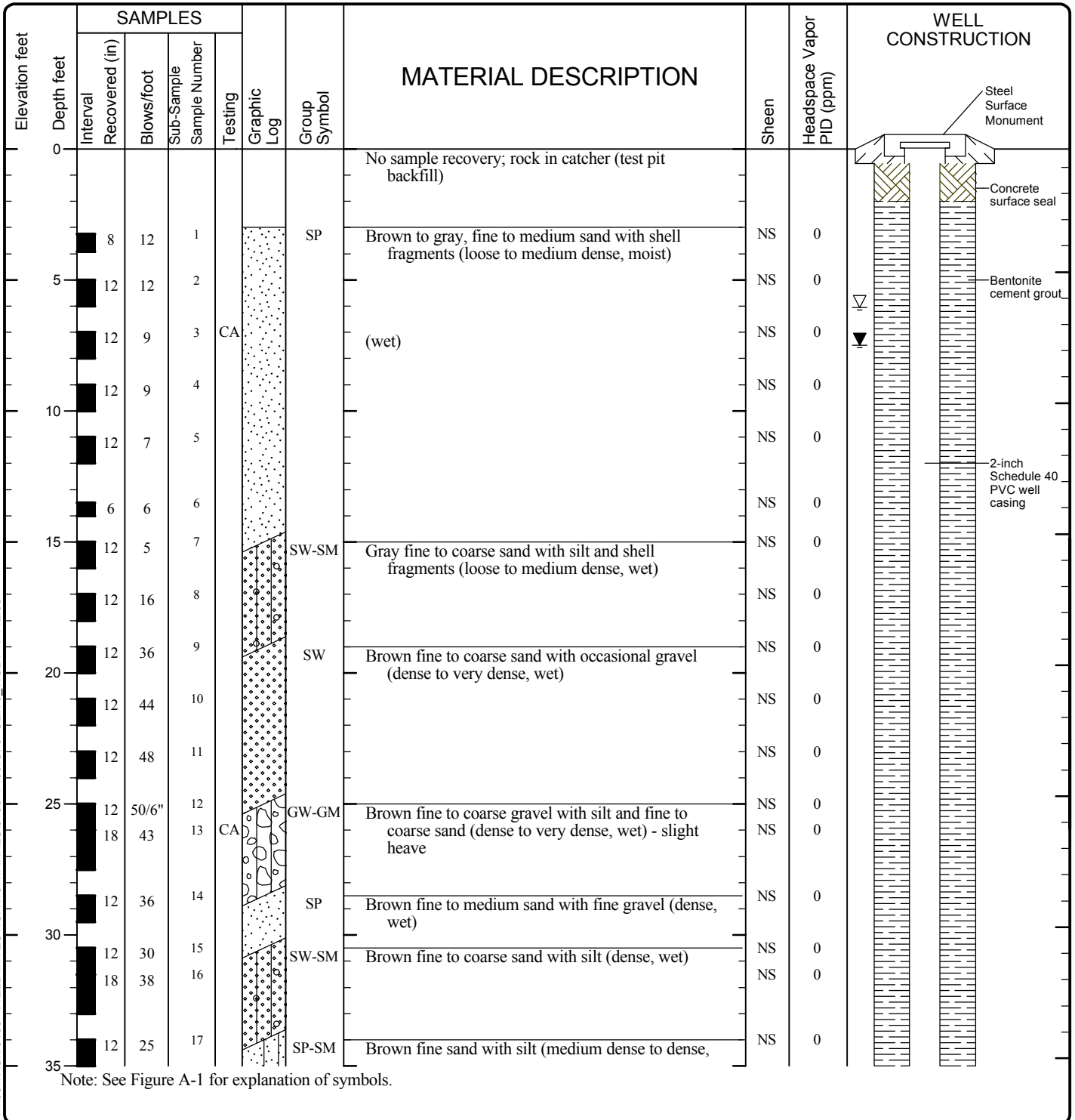
### LOG OF MONITORING WELL MW-2



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Figure A-10  
 Sheet 1 of 1

Date(s) Drilled	8/20/08	Logged By	SHL	Checked By	RCL
Drilling Contractor	Cascade Drilling	Drilling Method	Hollow-Stem Auger	Sampling Methods	D&M Sampler
Auger Data	4.25" ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	
Total Well Depth (ft)	44.5	Ground Surface Elevation (ft)	9.70	Groundwater Elevation (ft)	3.65
Vertical Datum	Arbitrary Benchmark (assigned elev. = 10 ft)	Datum/System		Easting(x):	Northing(y):



### LOG OF MONITORING WELL MW-3

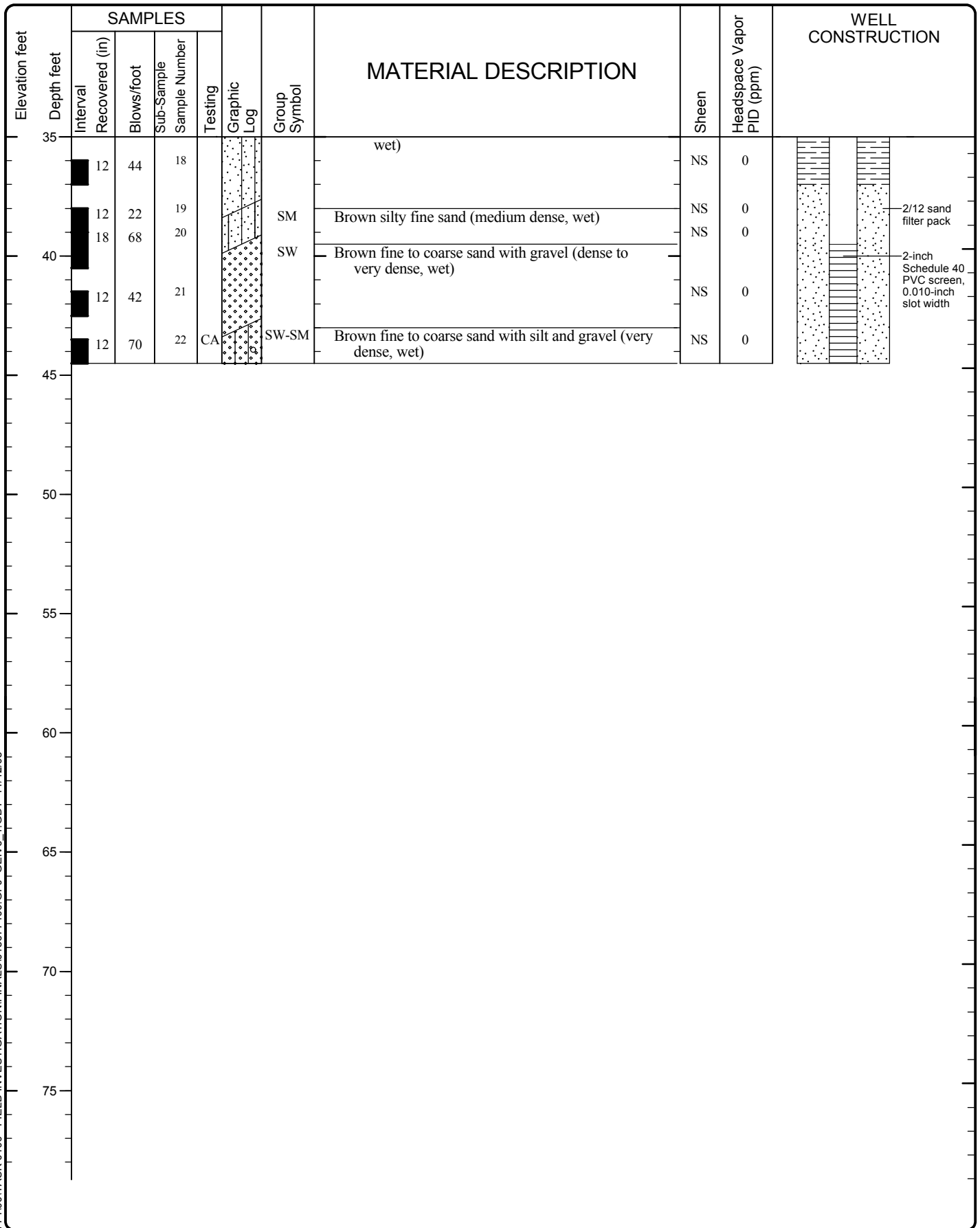


Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Figure A-11  
 Sheet 1 of 2

V6 ENVWELL P:\00186774\001TASK 0100 - FIELD INVESTIGATION\FINAL\S018677400.GPJ GEIV6\_1.GDT 11/12/08

V6 ENVWELL P:\00186774\001TASK 0100 - FIELD INVESTIGATION\FINAL\S018677400.GPJ GEIV6\_1.GDT 11/12/08



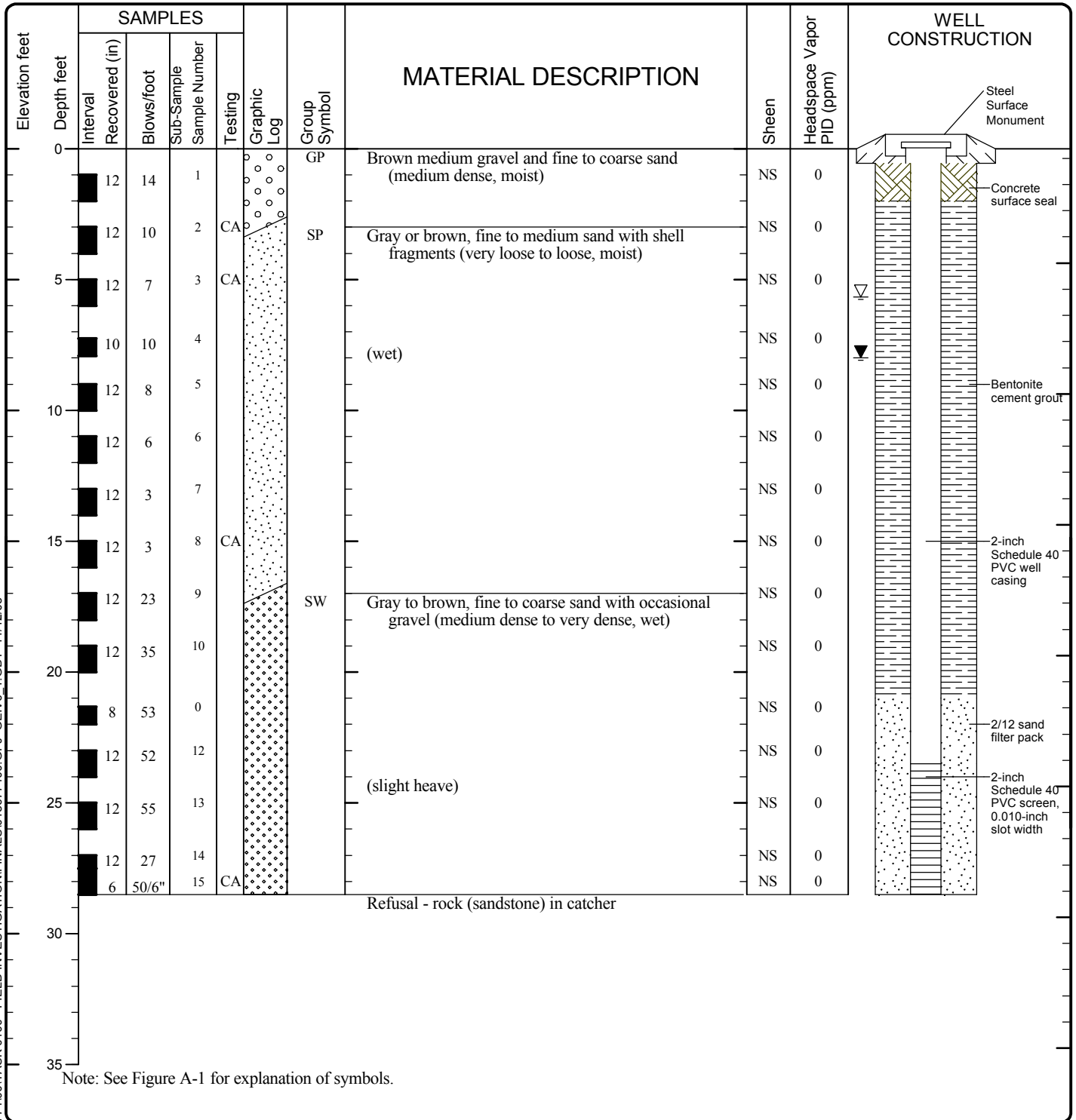
**LOG OF MONITORING WELL MW-3 (continued)**



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Figure A-11  
 Sheet 2 of 2

Date(s) Drilled	8/20/08	Logged By	SHL	Checked By	RCL
Drilling Contractor	Cascade Drilling	Drilling Method	Hollow-Stem Auger	Sampling Methods	D&M Sampler
Auger Data	4.25" ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	
Total Well Depth (ft)	28.5	Ground Surface Elevation (ft)	9.37	Groundwater Elevation (ft)	3.7
Vertical Datum	Arbitrary Benchmark (assigned elev. = 10 ft)	Datum/System		Easting(x):	Northing(y):



### LOG OF MONITORING WELL MW-4



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Figure A-12  
 Sheet 1 of 1

V6 ENVWELL P:\00186774\001TASK 0100 - FIELD INVESTIGATION\FINAL\S018677400.GPJ GEIV6 1.GDT 11/12/08

Date(s) Drilled	8/21/08	Logged By	SHL	Checked By	RCL
Drilling Contractor	Cascade Drilling	Drilling Method	Hollow-Stem Auger	Sampling Methods	D&M Sampler
Auger Data	4.25" ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	
Total Depth (ft)	40	Surface Elevation (ft)		Groundwater Level (ft. bgs)	6
Vertical Datum		Datum/System		Easting(x): Northing(y):	

Depth feet	SAMPLES					Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	NOTES
	Interval Recovered (in)	Blows/foot	Sub-Sample Number	Testing								
0								SP	Brown to gray, fine to medium sand with shell fragments (very loose to medium dense, moist)	NS	0	
12	14	8								NS	0	
24	12	9								NS	0	
36	12	8	1							NS	0	
48	12	8	2						(wet)	NS	0	
60	12	10	3							NS	0	
72	12	15	4							NS	0	
84	12	7	5							NS	0	
96	12	2	6							NS	0	
108	12	5	7							NS	0	
120	12	3	8							NS	0	
132	12		9	CA						NS	0	
144	12	3	10					SP-SM	Gray coarse sand with silt (very loose, wet)	NS	0	
156	12	12	11					SW	Gray fine to coarse sand with gravel (medium dense to dense, wet)	NS	0	
168	12	28	12							NS	0	
180	12	35	13							NS	0	
192	12	87	14					SW-SM	Gray fine to coarse sand with silt and gravel (medium dense to very dense, wet)	NS	0	
204	12	48	15							NS	0	
216												
228												
240												
252												
264												
276												
288												
300												
312												
324												
336												
348												
360												

Note: See Figure A-1 for explanation of symbols.

V6\_ENVBORING P:\0186774\001\TASK\_0100 - FIELD INVESTIGATION\FINAL\018677400.GPJ\_GEIV6\_1.GDT\_11/13/08

### LOG OF BORING SB-5



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Figure A-13  
 Sheet 1 of 2

Depth feet	SAMPLES					Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	NOTES
	Interval Recovered (in)	Blows/foot	Sub-Sample Number	Testing								
35	12	28	16						NS	0		
		36	17				SP-SM	Brown/orange fine to medium sand with silt (dense to very dense, wet)	NS	0		
40		61	18	CA					NS	0		
45												
50												
55												
60												
65												
70												
75												

**LOG OF BORING SB-5 (continued)**



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Date(s) Drilled	8/22/08	Logged By	SHL	Checked By	RCL
Drilling Contractor	Cascade Drilling	Drilling Method	Hollow-Stem Auger	Sampling Methods	D&M Sampler
Auger Data	4.25" ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	
Total Depth (ft)	20	Surface Elevation (ft)		Groundwater Level (ft. bgs)	7
Vertical Datum		Datum/System		Easting(x):	Northing(y):

Depth feet	SAMPLES					Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	NOTES
	Interval Recovered (in)	Blows/foot	Sub-Sample Number	Testing								
0									0-4' bgs: no samples obtained; drilling through TP-3 backfill			
5	12	7	1				SP	Brown medium to coarse sand with gravel (loose, moist)	NS	0		
	12	7	2						HS	144		
	12	6	3				SP	Gray medium to coarse sand with shells and occasional fine gravel (loose to medium dense, wet)	NS	0		
10	12	13	4						NS	0		
	12	23	5	CA			SP	Gray medium to coarse sand (medium dense, wet)	NS	0		
	12	22	6						NS	0		
15	18	22	7				SP	Brown medium to coarse sand with gravel (medium dense to very dense, wet)	NS	0		
	12	65	8						NS	0		
20	18	66	9	CA					NS	0		
25												
30												
35												

Note: See Figure A-1 for explanation of symbols.

### LOG OF BORING SB-6



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Figure A-14  
 Sheet 1 of 1

V6\_ENVBORING P:\0186774\001\TASK\_0100 - FIELD INVESTIGATION\FINALS\018677400.GPJ\_GEIV6\_1.GDT\_11/13/08

Date(s) Drilled	8/21/08	Logged By	SHL	Checked By	RCL
Drilling Contractor	Cascade Drilling	Drilling Method	Hollow-Stem Auger	Sampling Methods	D&M Sampler
Auger Data	4.25" ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	
Total Depth (ft)	50	Surface Elevation (ft)		Groundwater Level (ft. bgs)	8
Vertical Datum		Datum/System		Easting(x):	Northing(y):

Depth feet	SAMPLES				Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	NOTES
	Interval Recovered (in)	Blows/foot	Sub-Sample Number	Testing							
0						SW	Brown fine to coarse sand with gravel (loose to medium dense, moist)	NS	0		
2	2	20						NS	0		
6	6	6						NS	0		
5	12	4				SP	Gray fine to medium sand with shell fragments (loose, moist)	NS	0		
	12	6	1			SM	Black silty fine to medium sand (loose, moist)	NS	0		
	12	12	2			SW	Gray fine to coarse sand with shell fragments and occasional gravel (loose to medium dense, wet)	NS	0		
10	12	4	3					NS	0		
	12	24	4			SW	Gray to brown, fine to coarse sand with occasional gravel (medium dense to very dense, wet)	NS	0		
15	12	22	5					NS	0		
	12	25	6	CA				NS	0		
	12	51	7					NS	0		
20	12	44	8			SW-SM	Brown fine to coarse sand with silt and fine gravel (medium dense to very dense, wet)	NS	0		
	12	44	9					NS	0		
25	8	60	10					NS	0		
	12	46	11					NS	0		
30	12	42	12					NS	0		
	12	15	13					NS	0		
	12	51	14	CA		SP-SM	Gray fine sand with silt (medium dense to very dense, wet)	NS	0		
35											

Note: See Figure A-1 for explanation of symbols.

V6 ENVBORING P:\0186774\001\TASK 0100 - FIELD INVESTIGATION\FINALS\018677400.GPJ\_GEIV6\_1.GDT 11/13/08

### LOG OF BORING SB-7



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Figure A-15  
 Sheet 1 of 2

Depth feet	SAMPLES				Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	NOTES
	Interval Recovered (in)	Blows/foot	Sub-Sample Number	Testing							
35	12	37	15				Gray fine sand with silt (medium dense to very dense, wet)	NS	0		
	12	45	16								
	12	46	17								
40	12	35	18								
	12	22	19	CA							
45											
50											
55											
60											
65											
70											
75											

**LOG OF BORING SB-7 (continued)**



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Date(s) Drilled	8/22/08	Logged By	SHL	Checked By	RCL
Drilling Contractor	Cascade Drilling	Drilling Method	Hollow-Stem Auger	Sampling Methods	D&M Sampler
Auger Data	4.25" ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	
Total Depth (ft)	20	Surface Elevation (ft)		Groundwater Level (ft. bgs)	7
Vertical Datum		Datum/System		Easting(x):	Northing(y):

Depth feet	SAMPLES					Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	NOTES
	Interval Recovered (in)	Blows/foot	Sub-Sample Number	Testing								
0								SP-SM	Brown fine to medium sand with silt and gravel, wood debris (dense, moist)	SS	0	
	12	33	1	CA				SP	Brown fine to medium sand with fine gravel and wood (dense, moist)	NS	0	
	6	39	2					SW	Gray fine to coarse sand with gravel and shell fragments (loose to medium dense, wet)	NS	0	
5	12	5	3	CA				NS		0		
	12	5	4					NS	0			
	12	15	5					NS	0			
10								NS	0			
	6	28	6	CA				NS	0			
	12	54	7					SP	Gray fine to medium sand (very dense, wet)	NS	0	
15								SW-SM	Brown fine to coarse sand with silt and occasional fine gravel (dense, wet)	NS	0	
	8	30	8					SP	Gray fine to medium sand (very dense, wet)	NS	0	
	8	71	9					NS	0			
	12	86	10	CA				NS	0			
20												
25												
30												
35												

Note: See Figure A-1 for explanation of symbols.

### LOG OF BORING SB-8



Project: Former Columbia Street MGP Site  
 Project Location: 320 Columbia Street NW, Olympia, WA  
 Project Number: 0186-774-00

Figure A-16  
 Sheet 1 of 1

V6 ENVBORING P:\0186774\00\TASK 0100 - FIELD INVESTIGATION\FINALS\018677400.GPJ\_GEIV6\_1.GDT 11/13/08



***APPENDIX B***  
***LABORATORY ANALYTICAL REPORTS\****

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\*Electronic copies of laboratory analytical reports will be submitted separately on CD-ROM upon request.



***APPENDIX C***  
***REPORT LIMITATIONS AND GUIDELINES FOR USE***

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## **APPENDIX C REPORT LIMITATIONS AND GUIDELINES FOR USE<sup>1</sup>**

This appendix provides information to help you manage your risks with respect to the use of this report.

### **READ THESE PROVISIONS CLOSELY**

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering, geology and environmental science) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory “limitations” provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these “Report Limitations and Guidelines for Use” apply to your project or site.

### **ENVIRONMENTAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS**

This report has been prepared for use by Puget Sound Energy, their authorized agents, and regulatory agencies. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, an environmental site assessment or remedial action study conducted for a property owner may not fulfill the needs of a prospective purchaser of the same property. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and project site. No one except Puget Sound Energy should rely on this environmental report without first conferring with GeoEngineers. This report should not be applied for any purpose or project except the one originally contemplated.

### **THIS ENVIRONMENTAL REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS**

This report applies to the Former Columbia Street MGP Site in Olympia, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

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<sup>1</sup> Developed based on material provided by ASFE, Professional Firms Practicing in the GeoSciences, [www.asfe.org](http://www.asfe.org).

## **RELIANCE CONDITIONS FOR THIRD PARTIES**

We have prepared this report for the exclusive use of Puget Sound Energy, their authorized agents, and regulatory agencies. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions.

## **ENVIRONMENTAL REGULATIONS ARE ALWAYS EVOLVING**

Some substances may be present in the site vicinity in quantities or under conditions that may have led, or may lead, to contamination of the subject site, but are not included in current local, state or federal regulatory definitions of hazardous substances or do not otherwise present current potential liability. GeoEngineers cannot be responsible if the standards for appropriate inquiry, or regulatory definitions of hazardous substance, change or if more stringent environmental standards are developed in the future.

## **SUBSURFACE CONDITIONS CAN CHANGE**

This environmental report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, by new releases of hazardous substances, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying this report to determine if it is still applicable.

## **MOST ENVIRONMENTAL FINDINGS ARE PROFESSIONAL OPINIONS**

Our interpretations of subsurface conditions and remedial alternatives are based on field observations and chemical analytical data from the sampling locations at the site documented in this report. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ – sometimes significantly – from those indicated in this report. There is always a potential that areas of contamination exist in portions of the site that were not sampled or tested during this or previous studies. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions or related remedial costs.

## **DO NOT REDRAW THE EXPLORATION LOGS**

Environmental scientists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in an environmental report should never be redrawn for inclusion in other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.