

G-LOGICS

SUMMARY REPORT  
SITE REMEDIATION AND  
GROUNDWATER MONITORING

AUGUST 2, 2007

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Logical Solutions for Complex Problems

August 2, 2007  
G-Logics Project Number 01-0356-F

William E. Hooe, D.D.S., M.S.  
Dr. William Hooe  
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**Subject:       Summary Report  
                  Site Remediation and  
                  Groundwater Monitoring  
                  Former Auto Service Station  
                  2800 Martin Luther King Way South  
                  Seattle, WA 98144**

Dear Dr. Hooe:

This letter summarizes remediation and sampling activities conducted at the referenced property in Seattle. The work was originally conducted on behalf of the former owner Mr. Bruce Biesold, commencing in January 2005 and continuing until June 2007. Remediation methods at the property included excavation and removal of tanks, hoists, and piping, and treatment of contaminated soil and groundwater by ozone-sparging and injection of Fenton's Reagent. The initial remediation scope was summarized in G-Logics Cleanup Action Report dated October 31, 2005.

### **Background**

The site consists of a 0.25-acre lot containing a vacant auto-repair garage. The property was developed as a gasoline station and operated from 1955 until 1989. Auto-repair businesses operated out of the gas station building during the 1990s until early 2004. Three underground storage tanks (two gasoline USTs and one used oil UST) were removed in 1989 (summarized in G-Logics Phase I Site Assessment report dated January 11, 2005). Other service-station equipment, including two vehicle hoists, a heating oil UST, an

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oil/water separator, and a floor drain sump were removed under the direction of G-Logics in February 2005 (the removal work was summarized in G-Logics Phase II Assessment and Equipment Removal report dated March 17, 2005).

Four rounds of drilling with soil and groundwater sampling and monitoring well installations were conducted between February 2005 and July 2006. All boring and monitoring well locations are shown on Figure 1.

A groundwater sample collected from Boring GL-4 in February 2005 contained 5,900 ug/L gasoline. Contamination was not identified in other areas of the property during the February sampling (other than a limited area near a heating oil UST).

Additional soil borings were conducted in June 2005 to assess the area near GL-4. Borings conducted in this area (borings P1 through P11) indicated that gasoline-impacted soil and groundwater was present in the area surrounding the west pump island. The extent of contamination beneath the city-owned sidewalk (if present) was not determined. The depth of impacted soil was generally between 15 to 20 feet, with the highest concentrations located on the north, south, and west sides of the west pump island (Borings P7, P8, and P9). Photo-ionization detector (PID) field-screening results for soil samples collected from P1 through P11 are presented on Figure 2. Soil types encountered during drilling included sand at 14 to 20 feet underlain by silt and clay.

Laboratory results for the June 2005 soil samples confirmed that the highest concentrations of gasoline were found in borings P7, P8, and P9 at a depth of 15 to 20 feet (Table 1). Gasoline and BTEX concentrations exceeded Ecology's MTCA Method A cleanup levels in all three borings. Significantly lower concentrations of gasoline and BTEX were detected in borings conducted near the east pump island (P1, P3, and P6), and 20 feet south of the west island (P11). Soil samples collected from the remaining borings contained no detectable gas or BTEX.

Due to elevated concentrations of gasoline in groundwater at monitoring well MW-3 (discussed in the Groundwater Sampling and Analysis section below), G-Logics conducted additional soil borings in the area upgradient to the north and northeast in June 2006 (Borings P12 through P16), and installed monitoring wells MW-4 and MW-5. Concentrations of gasoline and BTEX were either non-detect or were below the Method A cleanup levels in the upgradient borings, indicating that the zone of contamination was limited to the area surrounding the west pump island.

## Ozone Treatment

Based on the findings of site-exploration work conducted in June 2005, the installation and operation of an ozone-treatment system was identified as a feasible remedial method for the remaining impacted area at this site (discussed in G-Logics Cleanup Action Report dated October 31, 2005).

Five ozone injection points (IP-1 to IP-5) were installed on August 18, 2005, using 8-inch hollow stem augers (the IP locations are shown in Figure 3). Monitoring wells MW-1, MW-2, and MW-3 were also installed to monitor groundwater concentrations during remediation activities. Ceramic ozone diffusers were installed at the bottom of each injection point, at a depth of 19 to 22 feet. The diffusers were connected to an ozone generator located in the service station building with continuous 100-foot lengths of 1-inch diameter EPDM hosing. The ozone system began operation on August 26, 2005.

The equipment has the following engineering specifications.

- Two pounds of ozone production per day.
- Injection pressures of up to 30 pounds per square inch.

In July 2006, ozone flow to injection points 1, 2, and 3 was stopped and all flow from the ozone injection system was directed to injection points 4 and 5 (in the area near monitoring well MW-3). Based on discussions with the ozone generator manufacturer's representative, additional adjustments were made to the system. These mainly included removing the non-ozonated feed to the manifold to increase the flow/pressure to the ozone generator. In addition, excess length was removed from the injection hoses to minimize the head loss due to friction. The net effects were a pressure increase from 25 psi to 40 psi at the ozone generator and a flow rate increase from 35 standard cubic feet per hour (SCFH) to 40 SCFH.

In August 2006, the ozone injection system was augmented with a second compressor. This compressor was connected directly to the manifold to provide the primary source of air flow to the wells. The original compressor was then dedicated to the ozone generator. The ozone was then introduced into the primary air-flow, allowed to mix, and then carried into the manifold and the injection points. With the addition of the new compressor, flow was restored to all injection points and increased the overall flow rate from 40 SCFH to 200 SCFH. The ozone generation rate remained 40 SCFH.

The system was shut down in December 2006 for compressor repairs. By early January 2007, the repaired compressor was reinstalled and the system was brought back on-line. Ozone was then injected into the primary compressed-air feed with a total flow rate of 200 SCFH at 30 psi. The flow rates at the manifolds were adjusted to provide 1 SCFM to injection points 4 and 5 and 0.4 SCFM to injection points 1, 2, and 3. The ozone generator was rated to produce 750 ppm ozone at these flow rates. The ozone system was shut down in June 2007, due to degradation and plugging/fouling of the injection points.

### **Fenton's Reagent Applications**

To supplement remediation conducted by ozone injection, several applications of Fenton's Reagent (hydrogen peroxide and an iron catalyst) was conducted between January and March 2007. This method is also known as In-Situ Chemical Oxidation. Fenton's Reagent rapidly breaks down hydrocarbons, creating carbon dioxide, water, and heat as by-products.

On December 30, 2006, a horizontal pipe for Fenton's application was installed in an area upgradient of the west pump island (Figure 3). The 40-foot-long, perforated pipe was laid horizontally in a trench at a depth of between 6 to 7 feet below ground surface (due to caving, the pipe could not be installed at a greater depth. The pipe was capped on the north end and a non-perforated riser was located at the south end. The pipe was wrapped with geotextile prior to being placed into the trench and backfilled.

On January 4, 2007, a buffered, iron-catalyst was introduced into the Fenton's application pipe and in monitoring wells MW-1, MW-3, and MW-4. This was followed by introduction of 165 gallons (approximately 1,500 pounds) of 17% H<sub>2</sub>O<sub>2</sub> into the horizontal application pipe and 120 gallons of 12% H<sub>2</sub>O<sub>2</sub> into each of the monitoring wells MW-1, MW-3, and MW-4. Approximately 330 gallons of 12% H<sub>2</sub>O<sub>2</sub> was also introduced into MW-3 on February 28.

In mid-March 2007, an additional Fenton's application well (treatment well TW-1) was installed immediately west of the west pump island. The well was stainless-steel-cased and included a stainless-steel mesh screen at 16 to 19 feet below grade. On March 23, 150 gallons of 17% H<sub>2</sub>O<sub>2</sub> was introduced into TW-1 and 50 gallons was introduced into the horizontal application pipe. On March 30, 12% H<sub>2</sub>O<sub>2</sub> was applied in quantities of 30 gallons to the horizontal pipe, 150 gallons into TW-1, 220 gallons into MW-3, and 75 gallons into MW-4. For all applications, foaming was noted in the surrounding surface areas indicating a destructive reaction of hydrocarbons.

## Groundwater Sampling and Analysis

Groundwater samples were collected from wells MW-1 through MW-3 beginning in August 2005, and from MW-4 and MW-5 beginning in June 2006. Sampling was conducted by peristaltic pump using low-flow sampling methods. Prior to sampling, approximately 10 gallons of water was purged from each well. For most sampling periods, groundwater purged from MW-3 and MW-5 was noted to have a strong gasoline odor and a sheen. No free petroleum product was encountered in the wells.

Depth to groundwater typically ranged from 9 to 11 feet between December and February, and 12 to 13 feet between August and October. Relative groundwater elevations are summarized in Table 2. The estimated groundwater flow direction based on elevation data was consistently to the south-southwest. The inferred groundwater flow gradient and April 2007 elevations are shown on Figure 3.

Groundwater samples were submitted to Advanced Analytical Laboratory for analysis of gasoline and BTEX by Ecology Method NWTPH-G and EPA Method 8021B. Elevated concentrations of gasoline exceeding Method A cleanup levels were detected initially in samples MW-2 and MW-3. Gasoline concentrations in MW-3 declined from 45,000 ug/L to 6,600 ug/L during the first four months of ozone system operation (August to December 2006). Concentrations of gasoline in MW-2 also declined during the first four months (2,000 ug/L to 820 ug/L). However, gasoline concentrations in MW-3 rebounded in March 2006 to a level of 22,000 ug/L. A maximum concentration of 53,000 ug/L was detected in June 2006. Gasoline concentrations in MW-3 slowly declined between November 2006 (48,000 ug/L) and April 2007 (19,000 ug/L).

Monitoring well MW-5 was installed in the sidewalk downgradient to MW-3 in June 2006. Gasoline concentrations in MW-5 were typically one-half of the MW-3 concentrations between June 2006 and February 2007. However, concentrations in MW-5 were approximately 2 to 3 times higher than MW-3 in March and April 2007 (42,000 to 65,000 ug/L).

Well samples MW-1 and MW-4 have consistently contained no detectable gasoline or BTEX. Well MW-2 has contained gasoline concentrations that fluctuate from 470 ug/L to 1,400 ug/L during 2006 and 2007. Table 3 summarizes the results of groundwater analysis from August 2005 to April 2007.

## Conclusions

Significant remedial work has been completed at this site. Notably, removal of service station equipment including USTs, hydraulic hoists, fuel piping, an oil-water separator and sump has occurred.

Multiple site explorations also have been conducted to identify areas of subsurface contamination. Based on the completed explorations, gasoline-range contaminants were discovered along the western margins of the property. To address this area, both ozone and Fenton's Reagent were introduced into the subsurface, with some indications of contaminant reduction. However, after nearly two years of aggressive treatment, elevated contaminant concentrations remain in this area. This may be due to an off property source or due to presence of silts, clays, and native organics that are not allowing the ozone or Fenton's reagent to adequately disperse through the subsurface strata. Fluctuating groundwater levels may also affect the dissolution of residual petroleum into groundwater and restrict application of treatment products. As such, continued remediation of this area by ozone and Fenton's treatment does not appear to be practical or cost effective.

As noted in previous reports and workplans, direct excavation of the contaminated soil would likely be very expensive and difficult due to the depth of contamination and the proximity of the adjacent Martin Luther King Way sidewalk, arterial road, and subsurface utilities. However, additional remedial options could include air sparging/soil vapor extraction and enhanced monitored natural attenuation. As part of future site development, a vapor barrier should be installed beneath new building foundations and floor slabs. These systems should be integrated into the new construction plans for a cost-effective approach (for instance, direct excavation of contamination could become a reasonable option if shoring is to be employed for construction purposes).

The Washington State Department of Ecology (Ecology) was initially notified of the contamination and the proposed cleanup for the property in 2005. Ecology should also be notified regarding future remedial actions and proposed developments.

## Limitations

Site explorations are non-comprehensive by nature and are unlikely to identify all environmental problems or eliminate all risk. This report is a qualitative assessment. G-Logics offers a range of environmental exploration services to suit the needs of our clients, including more quantitative explorations. Although risk can never be eliminated,

The logo for G-Logics, featuring the word "g-logics" in a stylized, lowercase font with a small graphic element above the "g".

more detailed and extensive explorations yield more information, which may help to better understand and manage site risks. Since such detailed services involve greater expense, we ask our clients to participate in identifying the level of service that will provide them with an acceptable level of risk. Please contact the signatories of this report if you would like to discuss this issue of risk further.

Land use, site conditions (both on-site and off-site), and other factors will change over time. Since site activities and regulations beyond our control could change at any time after the completion of this report, our observations, findings, and opinions can be considered valid only as of the date of the site visit.

The property owner is solely responsible for notifying all governmental agencies, and the public at large, of the existence, release, treatment, or disposal of any hazardous materials identified at the project site. G-Logics assumes no responsibility or liability whatsoever for any claim, loss of property value, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

This report is prepared for the sole use of our client. The scope of services performed during this assessment may not be appropriate for the needs of other users. Re-use of this document or the findings, conclusions, or recommendations presented herein, are at the sole risk of said user(s). Any party other than our client who would like to use this report shall notify G-Logics of such intended use by executing the "Permission and Conditions for Use and Copying" contained in this document. Based on the intended use of the report, G-Logics may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements will release G-Logics from any liability resulting from the use of this report by any unauthorized party.

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## Closing

We appreciate this opportunity to provide our services to you. Please contact us at your convenience with any questions regarding our work or findings.

Sincerely,  
G-Logics, Inc.



Rob Roberts  
Project Chemist

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Figure 2:	PID Results - June 2005 Sampling
Figure 2:	Remediation Plan and GW Elevations

## ATTACHMENTS

Attachment A: Permission and Conditions for Use and Copying

## REFERENCES

American Society for Testing and Materials, 1997, Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process: West Conshohocken, Penn., American Society for Testing and Materials, Designation E 1903 -97, 13 p.

G-Logics, *Phase I Environmental Site Assessment, Former Gas Station, 2800 Martin Luther King Way South, Seattle WA*, report dated January 11, 2005.

G-Logics, *Phase II Site Assessment and Equipment Removal, Former Gas Station, 2800 Martin Luther King Way South, Seattle WA*, dated March 17, 2005.

G-Logics, *Workplan for Site Remediation, 2800 Martin Luther King Way South, Seattle, WA*, dated July 8, 2005.

G-Logics, *Cleanup Action Report, Former Gas Station, 2800 Martin Luther King Way South, Seattle, WA*, report dated October 31, 2005.

G-Logics, *Remediation System Overview, Former Gas Station, 2800 Martin Luther King Way South, Seattle, WA*, letter dated February 9, 2007.

Washington Department of Ecology (Ecology), 2001, *The Model Toxics Control Act Cleanup Regulation*, chapter 173-340 WAC: Olympia, Wash., Washington State Department of Ecology Publication No 94-06, Amended February 12, 2001

# TABLES

TABLE 1

Soil Sample Analysis, TPH and BTEX (1), Units in mg/kg  
 Sampling June 6, 2005 (P1 through P11) and June 22, 2006 (P12 to P16, MW-4 and MW-5)  
 2800 MLK, Seattle, Washington

Boring	Sample Name	Depth (feet)	PID (ppmv)	NWTPH-Gx (Gasoline-range)	Benzene	Toluene	Ethyl-benzene	Xylenes
P1	P1-4	4	1.0	--	--	--	--	--
	P1-8	8	1.4	--	--	--	--	--
	P1-12	12	1.4	nd	nd	nd	nd	0.16
	P1-16	16	5.3	nd	0.37	0.082	nd	nd
P2	P2-4	4	0.1	--	--	--	--	--
	P2-8	8	0.1	--	--	--	--	--
	P2-12	12	0.3	--	--	--	--	--
	P2-16	16	--	nd	nd	nd	nd	nd
	P2-20	20	0.3	--	--	--	--	--
P3	P3-4	4	0.7	--	--	--	--	--
	P3-8	8	1.3	--	--	--	--	--
	P3-12	12	4.2	nd	nd	nd	nd	nd
	P3-16	16	68	52.0	0.075	nd	0.60	1.90
	P3-20	20	4.6	nd	nd	nd	nd	nd
P4	P4-8	8	2.0	--	--	--	--	--
	P4-12	12	1.9	--	--	--	--	--
	P4-14	14	1.9	nd	nd	nd	nd	nd
	P4-14-Dup	14	--	nd	nd	nd	nd	nd
	P4-20	20	1.8	--	--	--	--	--
P5	P5-12	12	1.5	--	--	--	--	--
	P5-15	15	1.4	nd	nd	nd	nd	nd
	P5-19	19	1.4	--	--	--	--	--
P6	P6-4	4	0.9	--	--	--	--	--
	P6-12	12	1.1	nd	nd	nd	nd	nd
	P6-12-dup	12	--	nd	nd	nd	nd	nd
	P6-16	16	74	16.0	0.26	0.05	nd	0.03
	P6-18	18	1.6	nd	nd	nd	nd	nd
P7	P7-12	12	--	nd	nd	nd	nd	nd
	P7-16	16	1.4	--	--	--	--	--
	P7-18	18	118	6,000 J	25.0 J	18.0 J	12.0 J	39.0 J
P8	P8-12	12	5.0	nd	nd	nd	nd	nd
	P8-16	16	>450	4,000	7.0	10.0	45.0	31.0
	P8-20	20	2.5	80.0	0.16	0.04	0.63	4.0

TABLE 1

Soil Sample Analysis, TPH and BTEX (1), Units in mg/kg

Sampling June 6, 2005 (P1 through P11) and June 22, 2006 (P12 to P16, MW-4 and MW-5)

2800 MLK, Seattle, Washington

Boring	Sample Name	Depth (feet)	PID (ppmv)	NWTPH-Gx (Gasoline range)	Benzene	Toluene	Ethylbenzene	Xylenes
P9	P9-12	12	4.3	nd	nd	nd	nd	nd
	<del>P9-15</del>	15	<b>60</b>	<b>1300</b>	<b>14.0</b>	2.20	nd	4.10
	P9-16	16	12	--	--	--	--	--
	<del>P9-20</del>	20	<b>32</b>	<b>53.0</b>	nd	nd	nd	0.30
P10	P10-12	12	0.1	--	--	--	--	--
	<del>P10-16</del>	16	0.6	<b>40.0</b>	<b>0.034</b>	0.05	0.35	1.60
	P10-20	20	3.2	--	--	--	--	--
P11	P11-12	12	1.1	nd	nd	nd	nd	nd
	P11-16	16	0.5	--	--	--	--	--
	P11-20	20	1.4	--	--	--	--	--
P12	P12-4	4	--	nd	nd	nd	nd	nd
	P12-15	15	--	nd	nd	nd	nd	nd
P13	P13-20	20	--	nd	nd	nd	nd	nd
P14	P14-16	16	--	nd	nd	nd	nd	nd
P15	P15-20	20	--	nd	nd	nd	nd	nd
P16	P16-16	16	--	nd	nd	nd	nd	nd
	P16-20	20	--	nd	nd	nd	nd	nd
MW-4	MW4-20	20	--	nd	nd	nd	nd	nd
MW-5	MW5-12	12	--	nd	nd	nd	nd	nd
	MW5-16	16	--	nd	nd	nd	nd	0.16
	MW5-20	20	--	22	0.03	nd	0.06	0.36
<b>MTCA Method A Cleanup Level (2)</b>				<b>100(a)/30(b)</b>	<b>0.03</b>	<b>7.0</b>	<b>6.0</b>	<b>9.0</b>

Notes:

- Refer To Site Diagram For Sampling Locations.
- (1) TPH by NWTPH-Gx Methods, BTEX by Method 8021B
- (2) Method A Soil Cleanup Levels (mg/kg). Unrestricted Land Use, Amendments Adopted August 2001. Most Conservative Cleanup Level \*
- \* Exceeding These Levels Do Not Necessarily Trigger Requirements For Cleanup Action Under MTCA.
- (a) Soil Cleanup Level For Gasoline With No Detectable Benzene In The Soil.
- (b) Soil Cleanup Level For Gasoline With Detectable Benzene In The Soil
- DUP Duplicate Sample For QA/QC Purpose
- nd Concentration Less Than The Laboratory Method Detection Limit
- 27 Bold Number(s) Indicates Concentration Detected. Bold for PID readings indicates value greater than 5 ppmv
- 250 Bold Number(s) and Shading Indicates Concentration Exceeds MTCA Method A Cleanup Level.
- Sample Not Analyzed.
- J Analytical Laboratory Estimated Number

TABLE 2  
Groundwater Depth Measurements  
Former Service Station, 2800 MLK Way South, Seattle, WA

Sampling Designation	Sampling Location	Sampling Date	Elevation Top of PVC Casing (ft.)*	Depth to Top of Screen (ft.)	Bottom of Screen (ft.)	Well Diameter (inches)	Depth to Water (ft.)	Calculated Elevations (ft.)
MW-1	Monitoring Well	8/19/05	97.92	13	23	2	13.01	84.91
		10/27/05	97.92				12.62	85.30
		1/12/06	97.92				9.03	88.89
		3/2/06	97.92				10.56	87.36
		6/28/06	97.92				12.42	85.50
		12/1/06	97.92				9.33	88.59
		12/6/06	97.92				9.72	88.20
		2/28/07	97.92				11.04	86.88
		3/7/07	97.92				11.14	86.78
		4/11/07	97.92				11.06	86.86
MW-2	Monitoring Well	8/19/05	96.25	13	23	2	13.02	83.23
		10/27/05	96.25				13.62	82.63
		1/12/06	96.25				5.77	90.48
		3/2/06	96.25				11.82	84.43
		4/13/06	96.25				13.06	83.19
		6/28/06	96.25				12.40	83.85
		9/11/06	96.25				13.84	82.41
		12/1/06	96.25				10.65	85.60
		12/6/06	96.25				10.20	86.05
		1/12/07	96.25				11.06	85.19
		2/28/07	96.25				11.65	84.60
		3/7/07	96.25				11.43	84.82
		4/11/07	96.25				11.07	85.18
		MW-3	Monitoring Well				8/19/05	97.43
10/27/05	97.43			13.42	84.01			
1/12/06	97.43			8.84	88.59			
3/2/06	97.43			10.90	86.53			
4/13/06	97.43			11.92	85.51			
6/28/06	97.43			12.17	85.26			
8/13/06	97.43			13.91	83.52			
9/11/06	97.43			13.77	83.66			
11/17/06	97.43			10.56	86.87			
12/1/06	97.43			9.78	87.65			
12/6/06	97.43			10.01	87.42			
1/12/07	97.43			10.90	86.53			
2/28/07	97.43			11.12	86.31			
3/7/07	97.43			11.17	86.26			
4/11/07	97.43			11.04	86.39			
MW-4	Monitoring Well	6/28/06	98.36	10	20	2	12.40	85.96
		12/1/06	98.36				9.90	88.46
		12/6/06	98.36				10.21	88.16
		2/28/07	98.36				11.43	86.93
		3/7/07	98.36				11.49	86.87
4/11/07	98.36	11.27	87.09					
MW-5	Monitoring Well	6/28/06	97.20	10	20	1	12.09	85.11
		9/11/06	97.20				13.63	83.57
		11/17/06	97.20				10.57	86.63
		12/1/06	97.20				9.75	87.45
		1/12/07	97.20				10.85	86.35
		2/28/07	97.20				11.05	86.15
		3/7/07	97.20				11.11	86.09
4/11/07	97.20	10.96	86.24					

\* The project benchmark is the top of the walkway at the southwest corner of the building and was assigned an elevation of 100-foot. All well elevations were surveyed by G-Logics, Inc. on August 12, 2005.

TABLE 3  
Groundwater Analysis Results: Gasoline, BTEX, <sup>(1)</sup> and Lead<sup>(2)</sup> - Units in µg/L  
Former Service Station, 2800 Martin Luther King Way South

Monitoring Well ID	Sample Name	Sampling Date	TPH (Gasoline range)	Benzene	Toluene	Ethylbenzene	Xylenes	Lead
MW-1	MW-1	08/19/05	nd	nd	nd	nd	nd	-
	MW-1	10/27/05	nd	nd	nd	nd	nd	-
	MW-1	12/27/05	nd	nd	nd	nd	nd	-
	MW-1	03/02/06	nd	nd	nd	nd	nd	-
	MW-1	04/11/07	nd	nd	nd	nd	nd	-
MW-2	MW-2	08/19/05	<del>2,000</del>	nd	10	81	91	-
	MW-2	10/27/05	<del>2,300</del>	nd	nd	89	93	nd
	MW-2	12/27/05	<del>820</del>	nd	nd	21	66	-
	MW-2	03/02/06	<del>1,500</del>	nd	3.9	23	60	-
	MW-2	04/13/06	<del>470</del>	nd	1.4	6.9	15	-
	MW-2	09/12/06	<del>580</del>	nd	1.6	2.9	6.2	-
	MW-2	02/12/07	<del>1,400</del>	1.4	3.5	16	85	-
	MW-2	02/28/07	<del>1,200</del>	1.8	3.7	13	60	-
	MW-2	04/11/07	<del>1,200</del>	nd	2.8	11	63	-
MW-3	MW-3	08/19/05	<del>44,000</del>	4.1	18	<del>780</del>	<del>3,600</del>	-
	MW-3 DUP	08/19/05	<del>45,000</del>	4.9	18	<del>810</del>	<del>3,700</del>	-
	MW-3	10/27/05	<del>17,000</del>	nd	38	580	<del>3,000</del>	nd
	MW-3	12/27/05	<del>6,600</del>	<del>5.0</del>	22	200	<del>1,100</del>	-
	MW-3	03/02/06	<del>22,000</del>	nd	26	450	<del>4,200</del>	-
	MW-3	04/13/06	<del>33,000</del>	nd	3.4	<del>700</del>	<del>3,100</del>	-
	MW-3	06/28/06	<del>53,000</del>	nd	17	530	<del>2,600</del>	-
	MW-3	09/12/06	<del>14,000</del>	nd	5.6	180	<del>1,100</del>	-
	MW-3	10/13/06	<del>1,400</del>	nd	1.0	26	98	-
	MW-3	11/17/06	<del>48,000</del>	nd	34	490	<del>4,100</del>	-
	MW-3	02/12/07	<del>36,000</del>	nd	10	280	<del>1,600</del>	-
	MW-3	02/28/07	<del>22,000</del>	nd	5.9	200	<del>1,400</del>	-
	MW-11 (dup)	02/28/07	<del>22,000</del>	nd	5.1	220	<del>1,400</del>	-
	MW-3	03/07/07	<del>21,000</del>	nd	18	170	<del>1,000</del>	-
	MW-3 dup	03/07/07	<del>19,000</del>	nd	24	160	960	-
MW-3	04/11/07	<del>19,000</del>	nd	5.5	110	<del>1,100</del>	-	
MW-4	MW-4	06/28/06	nd	nd	nd	nd	nd	-
	MW-4	03/07/07	nd	nd	nd	nd	nd	-
	MW-4	04/11/07	nd	nd	nd	nd	nd	-
MW-5	MW-5	06/28/06	<del>21,000</del>	nd	14	290	920	-
	MW-5	09/12/06	<del>2,500</del>	nd	nd	34	60	-
	MW-5	11/17/06	<del>23,000</del>	nd	52	450	<del>1,700</del>	-
	MW-5	02/12/07	<del>37,000</del>	nd	33	<del>1,600</del>	<del>2,800</del>	-
	MW-5	02/28/07	<del>29,000</del>	nd	24	550	<del>1,800</del>	-
	MW-5	03/07/07	<del>42,000</del>	<del>11.0</del>	24	<del>740</del>	<del>2,500</del>	-
MW-5	04/11/07	<del>65,000</del>	nd	79	<del>850</del>	<del>4,000</del>	-	
MTCA Method A Cleanup Level <sup>(3)</sup>			1,000 <sup>(a)</sup> /800 <sup>(b)</sup>	5	1,000	700	1,000	15

Notes:

- (1) TPH by NWTPH-Gx Methods BTEX by Method 8021B
- (2) Lead by EPA Method 7010
- Not Analyzed
- (a) Groundwater Cleanup Level For Gasoline With No Detectable Benzene.
- (b) Groundwater Cleanup Level For Gasoline With Detectable Benzene.
- nd Concentration Less Than The Laboratory Method Detection Limit.
- nd Bold Number(s) Indicates Concentration Detected.
- 250 Bold Number(s) and Shading Indicates Concentration Exceeds MTCA Method A Cleanup Level.
- (3) Exceeding These Levels Do Not Necessarily Trigger Requirements For Cleanup Action Under MTCA.

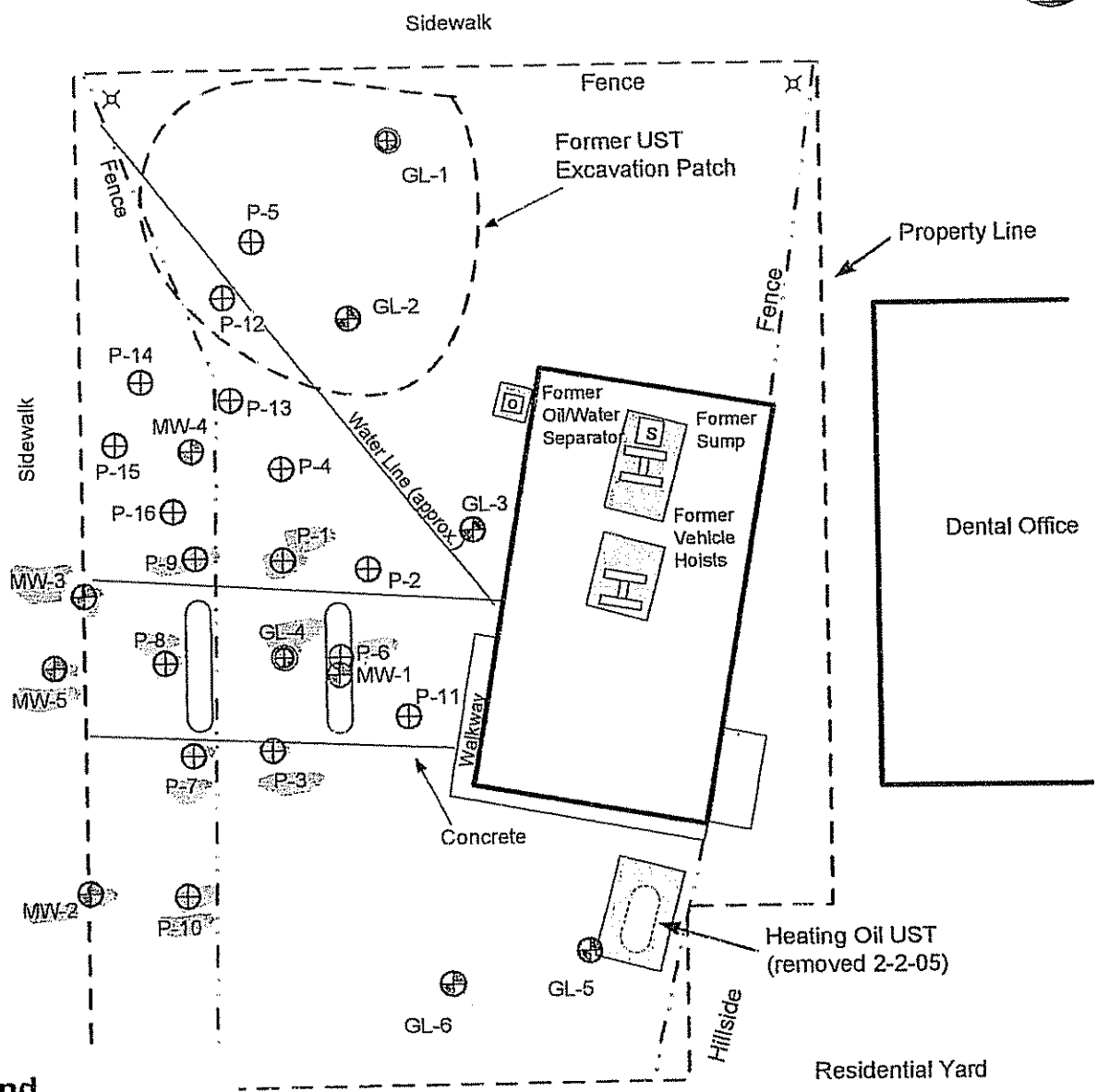
# FIGURES



South McClellan Street



Martin Luther King Way South



**Legend**

- MW-1 Monitoring Well (Installed Aug. 2005 or July 2006)
- P-1 Geoprobe Boring (P1 to P11 June 2005, P12 to P16 July 2006)
- GL-2 Auger Boring Location (Feb. 2005)
- GL-1 Auger Boring w/GW sample (Feb. 2005)
- Area of Excavation (Feb. 2005)

Approximate Drawing Scale: 1" = 20'

0 ft. 12 ft. 20 ft. 40 ft.

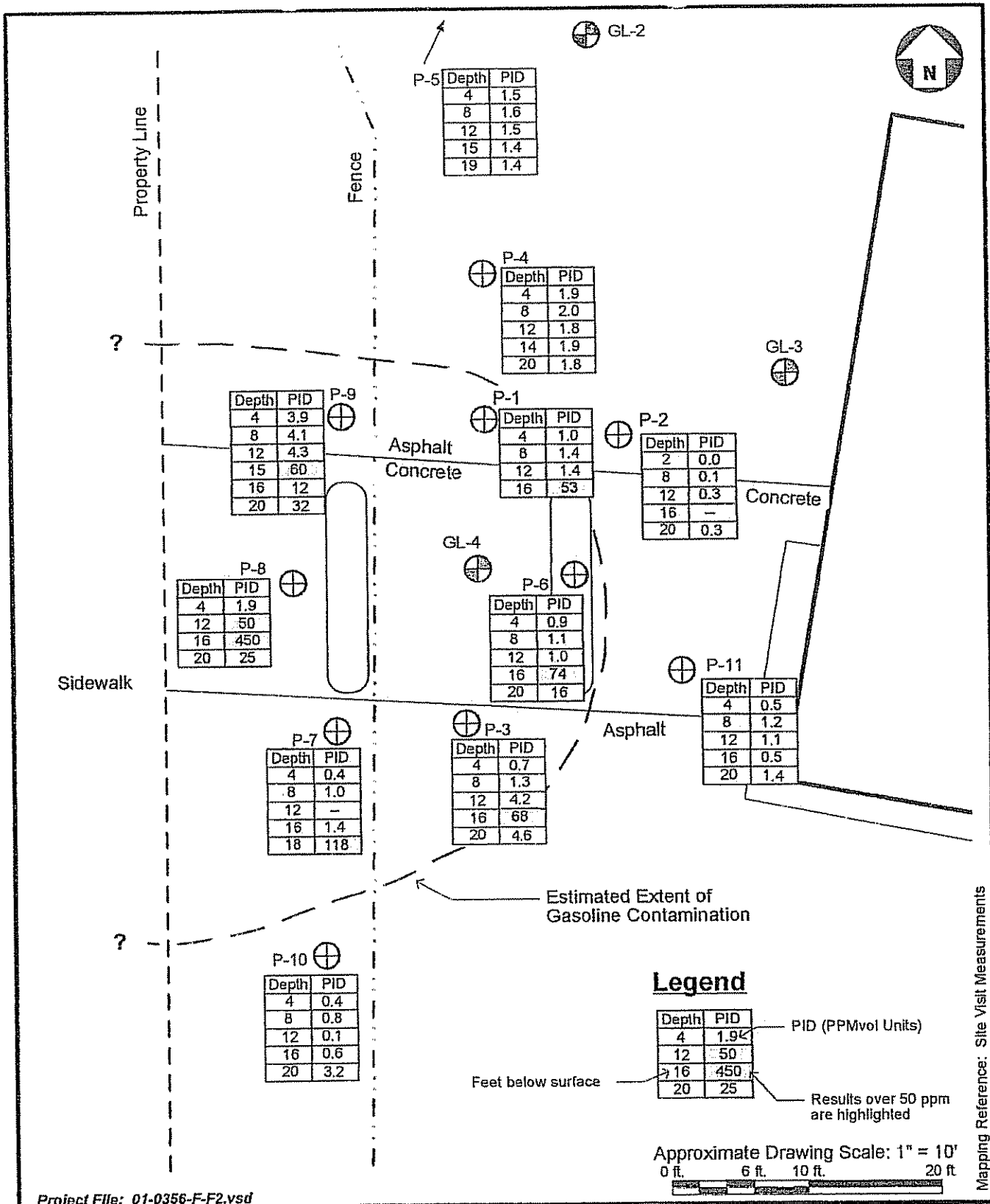
Mapping Reference: Site Visit Measurements, King Co. Assessor, and City of Seattle GIS photo (1999).

Project File: 01-0356-F-F1.vsd

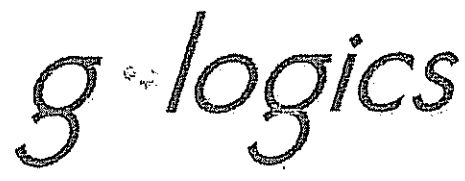
*g·logics*

**Site Diagram – Soil Borings**  
 Former Gas Station  
 2800 Martin Luther King Way South  
 Seattle, Washington

Figure  
 1



Project File: 01-0356-F-F2.vsd



**PID Results – June 2005**  
 Former Gas Station  
 2800 Martin Luther King Way S  
 Seattle, WA

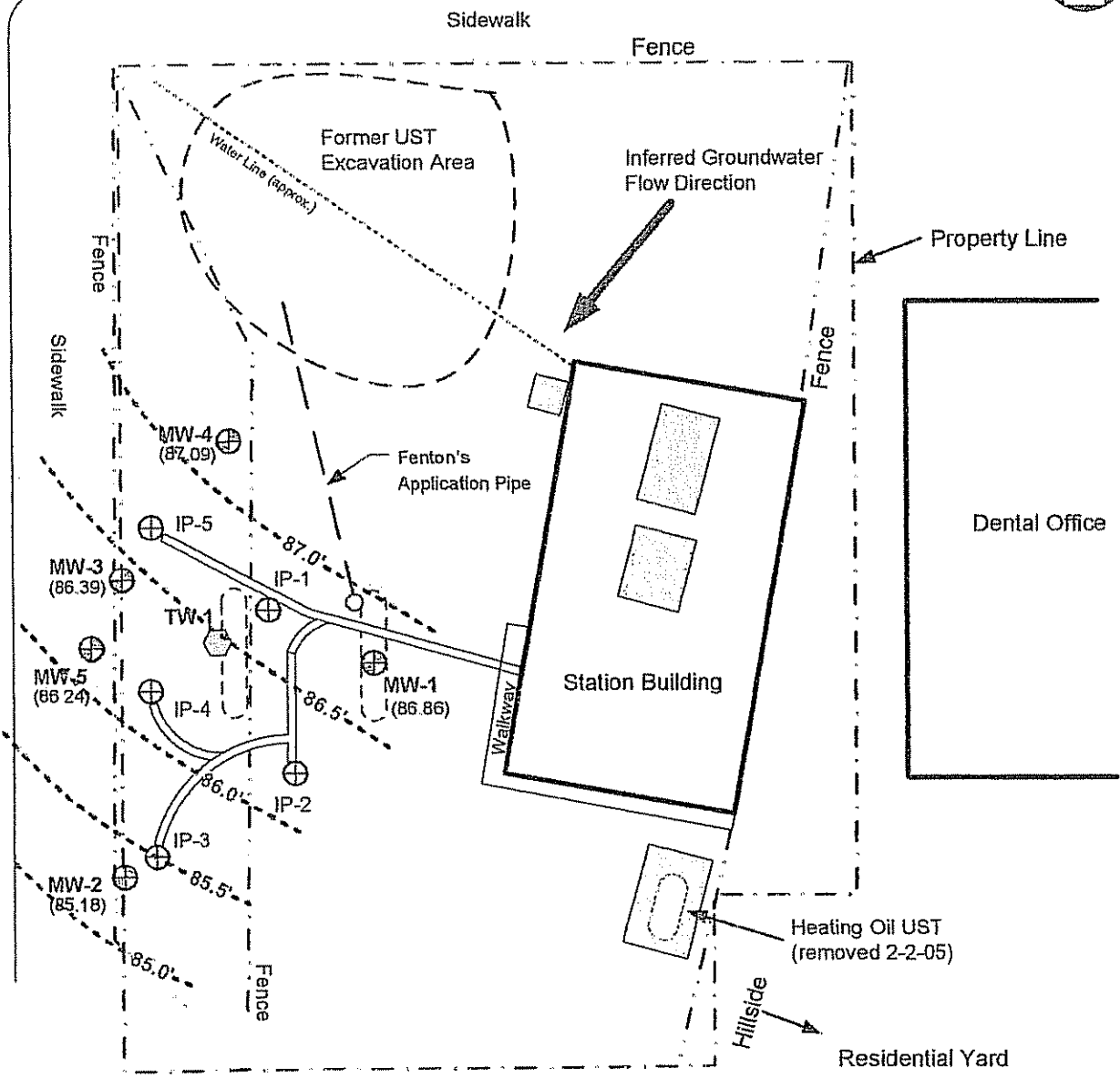
**Figure**  
**2**

Mapping Reference: Site Visit Measurements

South McClellan Street



Martin Luther King Way South



**Legend**

- ⊕ MW-1 Monitoring Well (with relative 4-11-07 GW elevation in feet)
- ⊕ TW-1 Treatment Well (installed 3-19-07)
- ⊕ IP-3 Ozone Injection Point (installed August 2005)
- Former Pump Island
- ▭ Area of Excavation (Feb. 2005)

Approximate Drawing Scale: 1" = 20'  
 0 ft. 12 ft. 20 ft. 40 ft.

Mapping Reference: Site Visit Measurements, King Co. Assessor, and City of Seattle GIS photo (1999)

Project File: 01-0366-F-F3.vsd



**Remediation and GW Elevation Plan**  
 Former Gas Station  
 2800 Martin Luther King Way South  
 Seattle, Washington

**Figure**  
 3

# ATTACHMENTS

Permission and Conditions for Use and Copying Form

Summary Report Site Remediation and Groundwater Monitoring  
Former Auto Service Station, 2800 Martin Luther King Way South  
Seattle, WA 98144

G-Logics Project 01-0356-F  
August 2, 2007

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