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CLEANUP ACTION PROGRESS REPORT

WHIDBEY MARINE & AUTO SUPPLY 1689 MAIN STREET FREELAND, WASHINGTON

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> > Farallon PN: 454-001

For: Whidbey Marine & Auto Supply 1689 Main Street Freeland, Washington

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1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this progress report to document the results of the cleanup action related to the release of gasoline from the underground storage tank (UST) system at the Whidbey Marine & Auto Supply facility located at 1689 Main Street in Freeland, Washington (herein referred to as the Facility) (Figure 1). The cleanup action at the Facility is being conducted under the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program, and has been assigned Toxics Cleanup Program identification number NW1529.

This progress report details the installation, startup and optimization, and operations and maintenance (O&M) activities conducted from June through September 2006 for the soil vapor extraction (SVE) system that has been installed at the Facility. The SVE system was installed to address gasoline-range petroleum hydrocarbons in vadose zone soils that were identified during soil and groundwater investigations conducted previously in 2005 and 2006. The results of the June 2006 quarterly groundwater monitoring event conducted prior to the startup of the SVE system are also provided, along with a discussion of the groundwater monitoring results and overall progress of the cleanup action. Information pertaining to the installation of the SVE system is summarized in Section 3, SVE System Installation.



2.0 BACKGROUND

The fueling system at the Facility consists of one 8,000-gallon capacity gasoline UST, two 10,000-gallon capacity gasoline USTs, and a single 3,000-gallon capacity diesel UST. A single pump island is used to dispense fuel from three pump dispensers. An above ground propane tank is also present at the Facility. A Site Plan is provided on Figure 2.

Farallon was initially contracted to assess whether petroleum hydrocarbons had been released from a UST at the Facility as indicated by the fuel inventory reconciliation records for Tank 2 (Figure 2). Subsequently, three phases of field activities were conducted by Farallon at the Facility. Details on the environmental investigation activities conducted at the Facility to date were summarized in the Site Characterization Report, Whidbey Marine & Auto Supply, 1689 Main Street, Freeland, Washington, dated February 10, 2006 which was prepared by Farallon and submitted to Ecology and the Island County Health Department. The first phase of investigation consisted of reconnaissance sampling of soil using a direct-push drilling rig on October 17, 2005. The second phase of investigation was conducted between November 10 and 14, 2005 using sonic drilling methods and consisted of the installation of a single boring to the sea level aquifer located beneath the Facility at a depth of approximately 118 feet below ground surface (bgs). Reconnaissance groundwater samples were collected from the sea level aquifer, and the boring was subsequently backfilled to a total depth of approximately 65 feet bgs, where monitoring well MW-1 was installed in an apparent perched groundwater zone identified during drilling activities (Figure 2). Monitoring well MW-1 was constructed so that it could be used as both a monitoring well and an SVE well. The third phase of investigation was conducted between November 16 and 18, 2005, and consisted of the installation of groundwater monitoring wells MW-2 and MW-3 in the perched aquifer, soil boring B-7, and construction of SVE wells SVE-2S, SVE-2D, and SVE-3 which were installed at angles beneath the UST basin. The monitoring wells, SVE wells, and soil boring completed in third phase of investigation were installed using a hollow-stem auger drilling rig.

The results of these field investigations indicate that soil near Tank 2 from depths of about 15 to 65 feet bgs contains total petroleum hydrocarbons as gasoline-range organics (GRO) and benzene, toluene, ethylbenzene, and xylene (BTEX) constituents at concentrations above the Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Method A cleanup levels. A summary of soil analytical data is provided in Table 1.

Samples of the perched groundwater encountered at about 55 feet bgs also contained GRO and BTEX at concentrations above MTCA Method A cleanup levels. No free-phase gasoline was encountered in the monitoring wells. Silt layers encountered at approximately 60 feet bgs appear to have limited the vertical migration of GRO and BTEX in the subsurface. No soil samples collected below the silt layers (at depths greater than 65 feet bgs) contained either GRO or BTEX constituents at concentrations above MTCA cleanup levels. Laboratory results for reconnaissance groundwater samples collected from the sea level aquifer at approximately 118 feet bgs did not detect GRO or BTEX at levels at or above the laboratory reporting limits.



Groundwater samples collected from the initial round of monitoring on December 5, 2005 indicated that samples collected from monitoring well MW-1 contained concentrations of GRO and benzene above the MTCA Method A cleanup levels for groundwater. Although toluene, ethylbenzene, and xylenes were also detected in the groundwater sample from monitoring well MW-1, the concentrations were all below the MTCA Method A cleanup levels. The groundwater sample collected from monitoring well MW-2 contained a concentration of benzene above the MTCA Method A cleanup level for groundwater. GRO, toluene, ethylbenzene, and xylenes were also detected in the groundwater. GRO, toluene, ethylbenzene, and xylenes were also detected in the groundwater sample from monitoring well MW-2 at concentrations below the MTCA Method A cleanup levels. Neither GRO nor BTEX constituents were detected at concentrations at or above the laboratory reporting limits in the groundwater sample collected from monitoring well MW-3. The groundwater flow direction was determined to be to the west based on the December 2005 monitoring data, with monitoring well MW-2 situated in the down-gradient direction of groundwater flow from the area of the suspected release near Tank 2.

The investigation results indicate that petroleum-hydrocarbon impacted soil exists predominantly in the area directly beneath Tank 2 (Figure 2). Soils encountered at the Facility consist of dry sands above the approximately 10-foot thick perched groundwater zone present at about 55 to 65 feet bgs. The perched groundwater zone appears to be discontinuous as it was not encountered in soil boring B-7. The lateral extent of impacted groundwater within the perched zone has not been delineated. The three SVE wells were installed as angled borings beneath the area of the UST release with screened intervals placed to facilitate the extraction of gasoline vapors from the entire impacted area. In addition, monitoring well MW-1 was constructed as a potential dual purpose well with an extended screened interval of 30 feet for use for both groundwater monitoring and vapor extraction, if necessary (Figure 2). Results of a SVE pilot test conducted in December 2005 indicated that subsurface conditions at the Facility would be conducive for remediation using this technology.



3.0 SVE SYSTEM INSTALLATION

The Northwest Clean Air Agency issued Order of Approval to Construct #960 (OAC), dated June 7, 2006, for construction and operation of the SVE system at the Facility. The SVE system was designed to treat vadose zone soils impacted with GRO and BTEX constituents as identified in the three phases of soil and groundwater investigations described above. Trenching activities to connect the SVE wells to a regenerative blower and catalytic oxidizer (Catox) were completed from June 1 through June 7, 2006. The SVE system installation was completed on September 5, 2006. The delay between the start and finish of the installation of the SVE system was primarily a result of problems in obtaining electrical service for the system. A photo log of the construction activities is presented as Appendix A. As-built drawings of the treatment system is provided as Appendix B.

Monitoring well MW-1 and SVE wells SVE-2S, SVE-2D, and SVE-3 were connected to a manifold in the remediation compound area using 2-inch diameter schedule 40 polyvinyl chloride subsurface piping. Air flow from each well is controlled by valves installed at the manifold located within the remediation compound. Air flow from the manifold is directed to a water knockout tank assembly located on the upstream side of the blower inlet. A 5.5-horsepower Gast Model R6P155Q-50 regenerative blower capable of maximum free air flow rates of up to 280 cubic feet per minute (cfm) is used to extract vapors from the SVE wells. Extracted vapors are treated using a Catox unit manufactured by H2 Oil Recovery Equipment, Inc. of Bend, Oregon.

The electric Catox unit utilizes a shell and tube heat exchanger and electric immersion heaters to heat the inlet vapor stream prior to treatment through a precious metal monolithic catalyst bed. The catalyst bed converts volatile organic compounds to carbon dioxide and water.

The Catox system is designed so that the influent vapors are prevented from entering the Catox unit unless the unit is operating within the pre-set range of operating parameters. A vapor stream valve installed upstream of the heating units and catalyst bed in the Catox unit is closed until the unit achieves operating temperatures. Once the operating temperatures are achieved, the valve opens to allow vapors into the system for treatment. A second function of the valve is to automatically shut if the system experiences an alarm condition, isolating the source of vapors and allowing dilution air into the system. Alarm conditions that trigger shutdown of the vapor stream valve include:

- Power loss;
- Moisture separator high level exceedance;
- Heater temperature outside operating range;
- Catalyst temperature outside operating range;
- Catalyst differential pressure exceedance; or
- Process blower overload.



The Catox unit must be operated with inlet vapor concentrations below 20 percent of the lower explosive limit (LEL) of the influent gas. Concentrations above 20 percent LEL (approximately 3,000 parts per million volume [ppmv] for gasoline) require dilution via the dilution valve that supplies ambient air to the process air stream.

The Catox unit operates at a set point of 600 degrees Fahrenheit (°F) with a maximum limit of 1,200 °F for the heater elements. The operating temperature for the catalyst is 550 °F with the high temperature alarm set at 1,150 °F.

The Catox unit is rated for air flow rates of up to 300 cfm with an optimum target flow rate of 200 to 250 cfm. The manufacturer indicates that greater that 99 percent destruction of benzene or comparable volatile gases should be achieved with the catalytic beds currently installed in this unit, assuming concentrations at 20 percent LEL for benzene and a flow rate of less than 300 cfm. The destruction efficiency is greater at lower flow rates.

4.0 SVE SYSTEM STARTUP

Startup up activities for the SVE system were conducted between August 31 and September 13, 2006. Continuous operation of the SVE system began on September 13 following the readjustment of the differential pressure across the catalyst bed in the Catox unit which had been causing system shutdowns as a result of high pressure readings. Initially, vapors from only one well (MW-1) are being introduced into the system because higher influent vapor concentrations will cause the Catox unit to exceed the maximum operating temperature and automatically shut down as designed. Vapors will be introduced from the other SVE wells once the influent vapor concentrations from MW-1 decrease. The SVE treatment system monitoring requirements are specified in the OAC. The SVE system is being monitored at least weekly for the first month of operation, including measurement of influent vapor concentrations with a PID. Farallon is supplementing the PID measurements with periodic colorimetric tube readings and/or laboratory analyses to further evaluate treatment system performance.

An air sample collected using a colorimetric tube for gasoline from a sampling port downstream of the blower on September 8, 2006 showed a result of 1,700 parts per million vapor. Influent vapor concentrations of 843 parts per million were subsequently measured with a photionization detector (PID) on September 13, 2006. An initial influent air flow rate of 216 standard cubic feet per minute (scfm) was measured using an average of airflow readings from the 4-inch pipe at the influent side of the blower and from the 2-inch pipe located between the blower and Catox flame arrestor. An air sample was also collected for laboratory analysis on September 20, 2006 using a tedlar bag. The tedlar bag air sample was analyzed for GRO using Northwest Method NWTPH-Gx and BTEX using U.S. Environmental Protection Agency (EPA) Method 8021. A copy of the laboratory analytical report for the September 20, 2006 is provided in Appendix C. An initial contaminant extraction rate of 349 pounds per month (approximately 10 pounds per day) of GRO was estimated using the 600 microgram per liter (µg/l) analytical result for GRO from the tedlar bag air sample and the average air flow rate of 216 scfm. A considerably higher contaminant extraction rate of about 140 pounds per day was estimated using the colorimetric tube result for gasoline of 1,700 parts per million vapor and the average air flow rate of 216 scfm.

5.0 GROUNDWATER MONITORING

Groundwater monitoring conducted at the Facility on June 7, 2006 included obtaining depth to groundwater measurements and collecting groundwater samples from monitoring wells MW-1 through MW-3 (Figure 2). The June 2006 monitoring event was conducted prior to startup of the SVE system in September 2006 and represents baseline conditions at the Facility prior to commencement of cleanup. Details of the field activities and results are presented below.

5.1 FIELD METHODS

Farallon measured the depth to groundwater in each monitoring well prior to sampling using an electronic water level indicator. The monitoring wells were opened and the water levels allowed to equilibrate before measurement. The monitoring wells were also inspected for the presence of light nonaqueous-phase liquid (LNAPL) using an electronic oil/water interface probe. No LNAPL was present in any of the monitoring wells as indicated by the interface probe. The groundwater level in each monitoring well was measured to the surveyed reference point on the top of the well casing to derive the groundwater elevation at each monitoring well.

Prior to sampling, groundwater was purged from each monitoring well at a flow rate of approximately 200 milliliters per minute using a bladder pump. Field measurements were collected for pH, temperature, specific conductivity, dissolved oxygen, and oxidation/reduction potential during groundwater purging using a YSI Model 600XL water quality analyzer equipped with a flow-through cell. Groundwater samples were collected after the temperature, conductivity, and pH parameters stabilized. Stabilization was determined as a relative percent difference of less than 3 percent for temperature and conductivity and a change of ± 0.1 pH unit between readings for three consecutive measurements. The samples were collected by pumping groundwater directly from each well through the dedicated polyethylene tubing into laboratory-prepared containers. The samples were labeled, placed on ice, and transported for analysis following chain-of-custody protocols to CCI Analytical Laboratories, Inc. in Everett, Washington.

5.2 ANALYTICAL METHODS

The groundwater samples were analyzed for GRO by Northwest Method NWTPH-Gx and for BTEX by EPA Method 8021B.

5.3 GROUNDWATER MONITORING RESULTS

A copy of the laboratory analytical report for the June 7, 2006 groundwater monitoring event is provided in Appendix C. Table 1 presents a summary of the groundwater elevation data for the Facility. Table 2 presents the groundwater analytical results for June 2006 and previous quarterly monitoring events including a comparison to the corresponding MTCA Method A cleanup levels. A summary of the groundwater quality parameters measured in the field is summarized on Table 3.



5.3.1 Groundwater Elevation

The groundwater elevation at the Facility measured on June 7, 2006 ranged from 61.83 feet above mean sea level (msl) in monitoring well MW-2 to 63.48 feet above msl in monitoring well MW-1. Table 1 presents a summary of the groundwater elevation data for the Facility. The groundwater elevations measured in the monitoring wells were about 0.5 feet lower than the groundwater elevations measured during the previous monitoring event in December 2005. Figure 3 depicts the groundwater elevation contours as measured on June 7, 2006. As shown on Figure 3, the general groundwater flow direction at the Facility is to the west with an average hydraulic gradient of 0.02 foot per foot.

5.3.2 Analytical Results

The groundwater analytical data for samples collected on June 7, 2006 is summarized on Table 2. The analytical results indicated that GRO was detected above the MTCA Method A cleanup level of 800 μ g/l in the groundwater samples collected from monitoring wells MW-1 and MW-2 which contained concentrations of 5,800 and 2,800 μ g/l, respectively. The groundwater samples collected from monitoring wells MW-1 and MW-2 also contained concentrations of benzene above the MTCA Method A cleanup level of 5 μ g/l. Benzene was detected at 500 μ g/l in the sample collected from monitoring well MW-1 and at 440 μ g/l in the sample collected from monitoring well MW-2. Toluene, ethylbenzene, and xylenes were also detected in the groundwater samples collected from monitoring wells MW-1 and MW-2 at concentrations below the MTCA Method A groundwater cleanup levels. The groundwater sample collected from monitoring well MW-3 did not contain concentrations of GRO or BTEX constituents at or above the laboratory reporting limits.

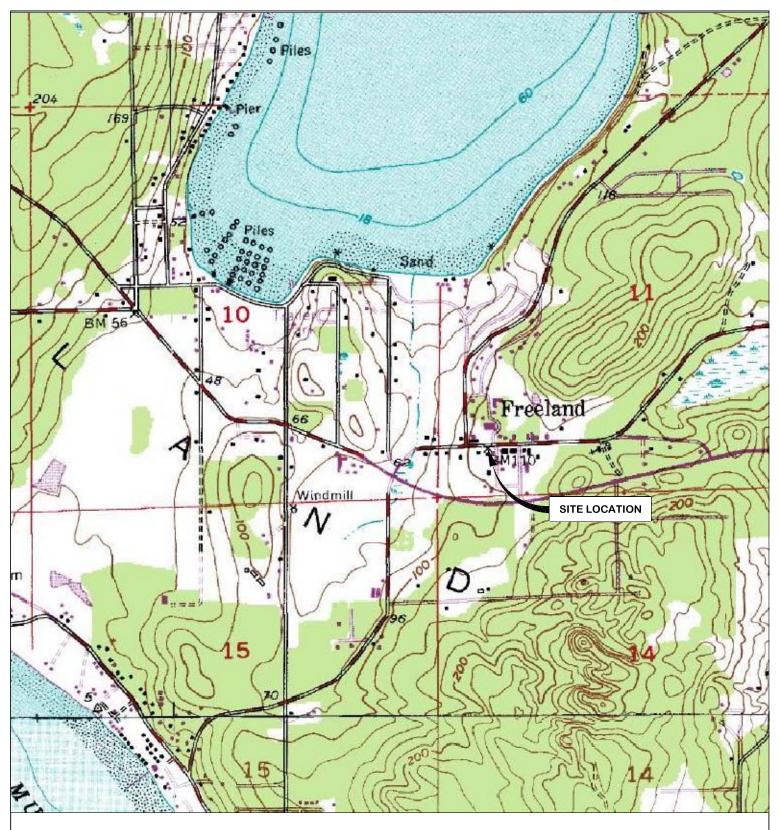
5.3.3 Purge Water Handling

The purge and decontamination water generated during the June 2006 monitoring event is being stored on the Facility in 55-gallon drums. There was approximately 5 gallons of purge and decontamination water generated during the June 2006 sampling event.

6.0 SUMMARY AND CONCLUSIONS

The SVE system has been operating continuously since September 13, 2006 and appears to be effectively removing and treating petroleum hydrocarbon vapors from the subsurface soils. Contaminant extraction rates were estimated between 10 and 140 pounds per day. The PID readings of influent vapor concentrations support the higher of the two estimated contaminant extraction rates. Currently, vapors are being extracted and treated from dual purpose monitoring/SVE well MW-1. As the vapor concentrations from MW-1 decrease, vapors will be introduced into the treatment system from the other three SVE wells at the Facility. PID measurements, periodic colorimetric tube readings, and laboratory analyses of influent vapor samples will used to further evaluate the performance of the treatment system. SVE system performance monitoring data, operation and maintenance activities, and the results of subsequent groundwater monitoring events will be documented in quarterly status and monitoring reports.

The data obtained from the December 2005 and June 2006 groundwater monitoring events indicate that GRO and benzene are present in perched groundwater beneath the Facility at concentrations above MTCA Method A groundwater cleanup levels. Groundwater elevation data from the June 2006 monitoring event indicates that the groundwater flow direction is to the west, and this finding is consistent with the December 2005 results. The next groundwater monitoring event will be conducted in October 2006. Farallon will evaluate potential additional characterization and groundwater remediation options based on the review of the upcoming October 2006 and previous groundwater monitoring results.



REFERENCE: 7.5 MINUTE USGS QUADRANGLE FREELAND, WASHINGTON. DATED 1993

REELAND WASHINGTON





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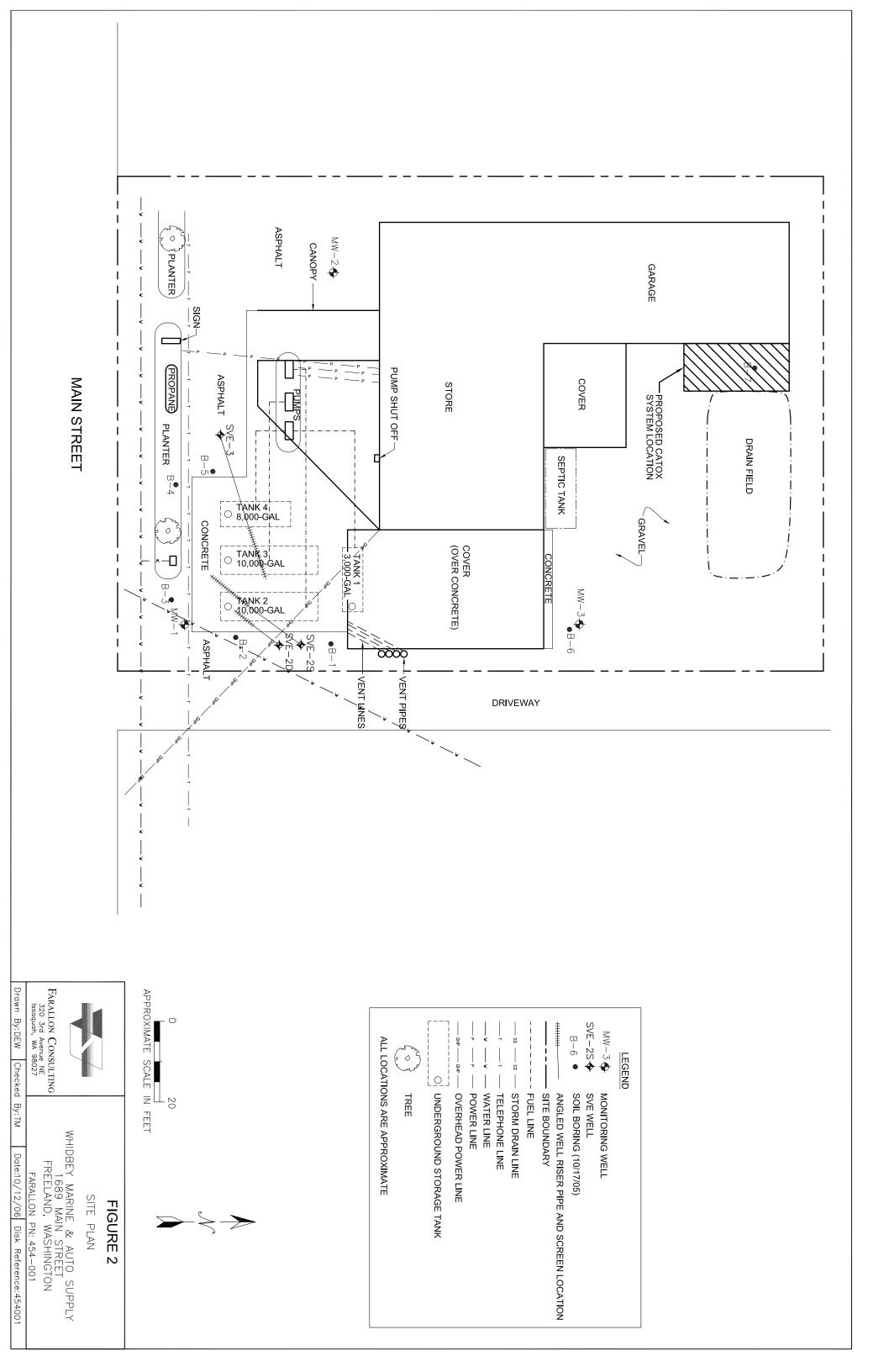
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FIGURE 1

SITE VICINITY MAP WHIDBEY MARINE & AUTO SUPPLY 1689 MAIN STREET FREELAND, WASHINGTON

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Date:1/25/06 Disk Reference: 454001



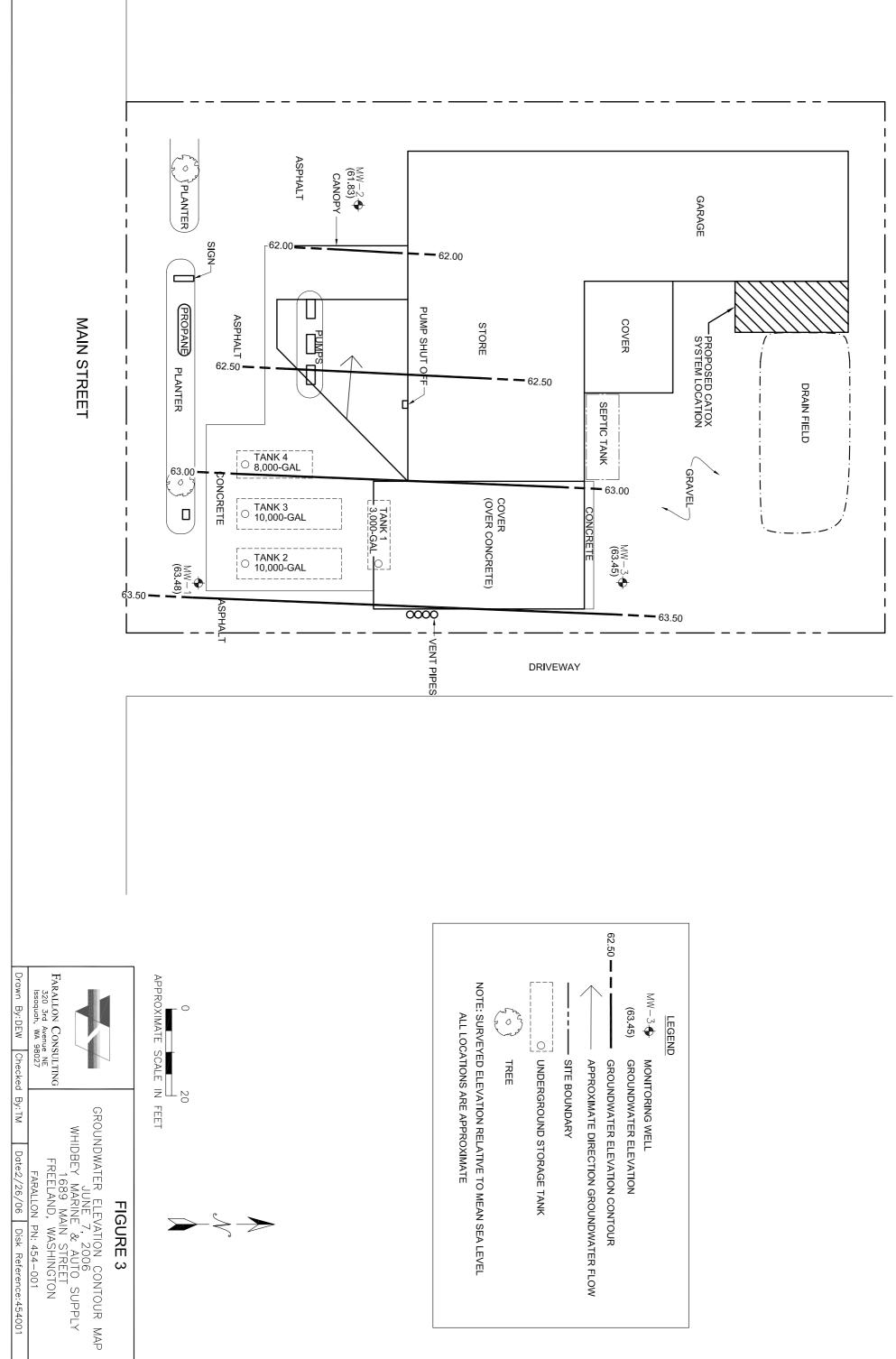


Table 1Groundwater Elevation DataWhidbey Marine & Auto SupplyFreeland, WashingtonFarallon PN: 454-001

Well Identification	Date	Elevation at Top of Well Casing (feet) ¹	Depth to Water (feet) ²	Groundwater Elevation (feet) ¹
MW-1/SVE-1	12/5/05	116.64	52.54	64.10
IVI VV - 1/ S V L-1	6/7/06	116.15 ³	52.67	63.48
MW-2	12/5/05	117.39	55.06	62.33
101 00 -2	6/7/06	117.39	55.56	61.83
MW-3	12/5/05	117.41	53.48	63.93
101 00 -5	6/7/06	117.41	53.96	63.45

NOTES:

¹Feet above mean sea level.

²Feet below top of well casing.

³Top of well casing elevation adjusted using change in total depth measurements before and after well casing length change following SVE system hookup.

Table 2Summary of Laboratory Analytical Results for GroundwaterWhidbey Marine & Auto SupplyFreeland, WashingtonFarallon PN: 454-001

			Analytical Results (micrograms per liter)				
Sample Location	Sample Identification	Sample Date	GRO ¹	Benzene ²	Toluene ²	Ethylbenzene ²	Xylenes ²
	MW1-118.5-CB	11/14/05	<100	<1.0	<1.0	<1.0	<2.0
MW-1	MW1-118.5-BTM	11/14/05	<100	<1.0	<1.0	<1.0	<2.0
101 00 - 1	MW1-120505	12/5/05	4,200	480	770	65	318
	MW1-060706	6/7/06	5,800	500	1,000	70	780
MW-2	MW2-120505	12/5/05	570	110	110	2.8	50
IVI VV -2	MW2-060706	6/7/06	2,800	440	540	15	430
	MW3-120505	12/5/05	<100	<1.0	<1.0	<1.0	<2.0
MW-3	FD-120505	12/5/05	<100	<1.0	<1.0	<1.0	<2.0
	MW3-060706	6/7/06	<50	<1	<1	<1	<3
MTCA Metho	MTCA Method A Cleanup Levels for						
Groundwater ³			800	5	1,000	700	1,000

NOTES:

<Indicates analyte not detected at or above the stated laboratory practical quantitation limit.

Results in **Bold** indicate concentration exceeds Washington State Department of Ecology Model Toxics Control Act Cleanup Regulation (MTCA) Method A cleanup levels for groundwater.

¹Analyzed by Northwest Method NWTPH-Gx.

²Analyzed by U.S. Environmental Protection Agency Method 8021B.

³MTCA Method A Cleanup Levels for Groundwater, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as amended February 2001. GRO = total petroleum hydrocarbons as gasoline-range organics

Table 3Summary of Field Parameter Measurements in GroundwaterWhidbey Marine & Auto SupplyFreeland, WashingtonFarallon PN: 454-001

		Field Measurements						
Well Identification	Date	pH	Temp. (°C)	Conductivit y (mS/cm)	DO (mg/l)	ORP (mV)		
MW-1	12/5/05	7.06	11.5	0.248	5.8	234.8		
101 00 - 1	6/7/06	5.20	13.4	0.373	14.95	473.9		
MW-2	12/5/05	7.17	12.06	0.233	5.91	224.5		
101 00 -2	6/7/06	5.59	15.4	0.340	11.15	487.9		
MW-3	12/5/05	7.31	11.00	0.304	2.02	180.9		
101 00 -3	6/7/06	5.51	13.9	0.337	11.80	488.2		

NOTES:

pH, temperature, conductivity, DO, and ORP measured in the field using YSI 600 XL with flow through cell.

°C = degrees Celsius

DO = dissolved oxygen

mg/l = milligrams per liter

 $m\mathbf{V} = millivolts$

ORP = oxidation/reduction potential mS/cm = millisiemens per centimeter

SITE PHOTOGRAPHS

Progress Report Whidbey Marine & Auto Supply Freeland, Washington Farallon PN: 454-001

- **Photograph 1**: MW-1/SVE-1 (4 inch well casing)
- Photograph 2: SVE piping connection to 4-inch well MW-1/SVE-1
- Photograph 3: Trench with line for SVE-3
- Photograph 4: SVE piping connection to angled SVE-3 well
- Photograph 5: Trench and SVE piping along the east property line
- Photograph 6: End of SVE piping in trench
- Photograph 7: SVE manifold, trench partially backfilled
- Photograph 8: Angled well SVE-3 backfilled and monument set over well head
- **Photograph 9**: Trench backfilled and paved, SVE-2S and SVE-2D in the foreground
- Photograph 10: SVE blower with water knock-out and SVE manifold in background
- Photograph 11: Catox Unit
- Photograph 12: Catox Control Panel

Site Photographs Progress Report Whidbey Marine & Auto Supply Freeland, Washington



Photograph 1: MW-1/SVE-1 (4 inch well casing)



Photograph 2: SVE piping connection to 4-inch well MW-1/SVE-1



Photograph 3: Trench with line for SVE-3



Photograph 4: SVE piping connection to angled SVE-3 well



Photograph 5: Trench and SVE piping along the east property line



Photograph 6: End of SVE piping in trench



Photograph 7: SVE manifold, trench partially backfilled



Photograph 8: Angled well SVE-3 backfilled and monument set over well head



Photograph 9: Trench backfilled and paved, SVE-2S and SVE-2D in the foreground



Photograph 10: SVE blower with water knock-out and SVE manifold in background



Photograph 11: Catox Unit



Photograph 12: Catox Control Panel