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PLUME EATER™ TECHNOLOGY PILOT TEST REPORT

Time Oil Co. Facility #01-399
Poulsbo, Washington

INTRODUCTION

This report presents the results of the Plume Eater™ Technology (PET) pilot test conducted by Sound Environmental Strategies Corporation (SES) on November 22, 2006. The purpose of the test was to evaluate the applicability of the PET as a remediation technology for Time Oil Co. Facility No. 01-399, located at 19740 Viking Way Northwest in Poulsbo, Washington (the property). The scope of the pilot test included the following objectives:

- Develop PET pilot test protocols.
- Complete the pilot test field activities within an 8-hour timeframe, per the requirement of the Puget Sound Clean Air Agency.
- Evaluate the potential effectiveness of the PET on groundwater within the very dense soil encountered during previous subsurface investigations at the property.

PROPERTY LOCATION AND DESCRIPTION

The property consists of an approximately 17,250-square foot parcel located at the intersection of Viking Way Northwest and Northwest Liberty Road in Poulsbo, Washington (Figure 1). The property is occupied by a currently vacant convenience store, which is surrounded by paved parking areas and perimeter landscaping. The property is bound by a NAPA Auto Parts store to the north and residential/retail commercial properties to the east. Recreational vehicle dealerships are situated to the south and southwest across Northwest Liberty Road and across Viking Way Northwest.

Three gasoline underground storaqe tanks (USTs) and six fuel dispensers situated on two pump islands formerly were located on the property (Figure 2). An 8,000-gallon UST and a 12,000-gallon UST were installed in 1970, and a 6,000-gallon UST was installed in 1974. All three tanks were constructed with single-wall carbon steel.

The property is situated at an elevation of approximately 85 feet above sea level on a slightly southward-facing slope. Regional topography slopes southeast toward Liberty Bay, which is located approximately 0.25 miles southeast of the property.

Stratigraphy: The property is underlain by glacial till consisting of very dense, gravelly, silty sand. Sand grains become nominally coarser with increasing depth between 20 to 25 feet below ground surface (bgs) and silt content decreases over the same depth interval. This change in liothology may represent a transition from glacial till to glacial advance sand. Dense, silty to slightly-silty sand extends throughout the maximum depth of 43.5 feet bgs explored by SES in 2005 and 2006. The boring logs for the Plume Eater injection well (MW-12) and the surrounding observation wells (MW-03, MW-05, MW-10, and MW-14) are presented in Appendix A

Hydrogeology: Groundwater was encountered at depths ranging from 18.92 feet below ground surface (MW-01) to 34.62 feet below ground surface (MW-06) in the wells installed at the property. The groundwater flow direction on December 21, 2006 was towards the east-northeast

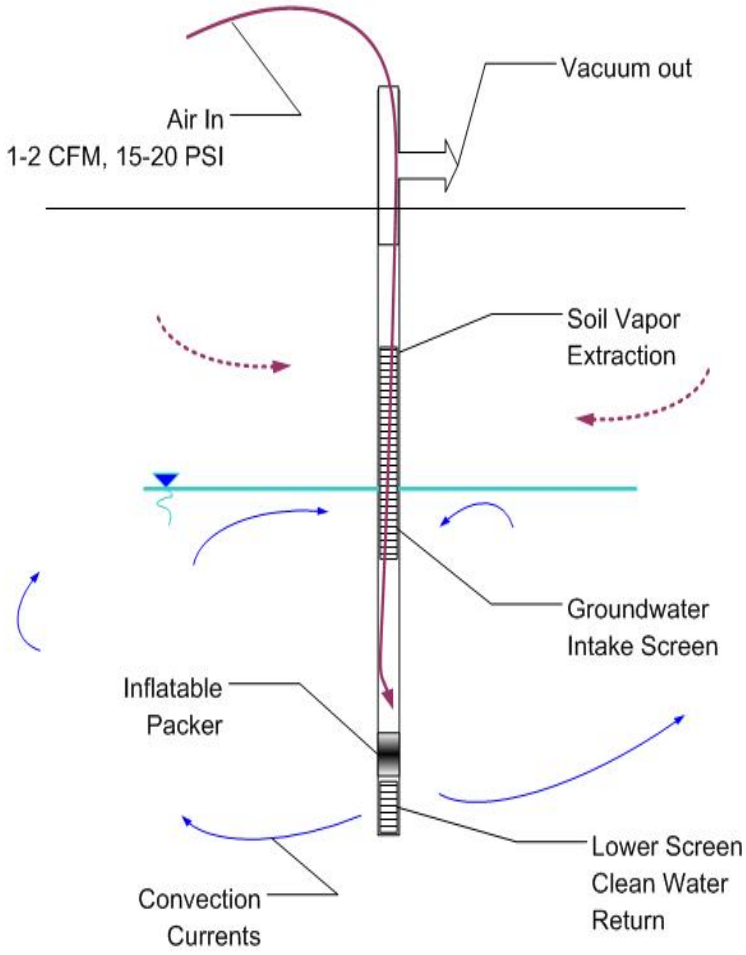
at a gradient of 0.116 feet per feet. The observation wells used in the pilot test are screened from 20 to 40 feet bgs.

THE PLUME EATER™ TECHNOLOGY

The Plume Eater™ Technology is a patented system (USPTO #s 7,007,759, 7,077,208, and others pending) that provides: in-well air stripping, air sparging, and the injection of cleaned, oxygenated water that continually flushes the surrounding soil and promotes aerobic bio-remediation. Unlike other groundwater recirculation wells equipped with multiple screen intervals, the convection currents generated by the PET pull the dissolved contamination toward the top screen of the treatment well rather than the bottom screen. Once inside the well, the volatile contaminants are air-stripped from the groundwater and the concentration of dissolved oxygen in the groundwater increases. The air-stripped and oxygenated groundwater is then injected back into the surrounding subsurface through the bottom screen of the treatment well.

Continuous flushing of the surrounding soil with cleaned, oxygenated water below the top of the water table while simultaneously pulling air through the vadose zone above will act as an oxygen source for aerobic bacteria within the subsurface, resulting in exponential bacterial population growth, thereby facilitating bioremediation of the residual petroleum contamination. The PET treatment efficiency is increased by extending the uppermost screen well into the vadose zone and applying a vacuum to the top of the well. This raises the water column within the PET well, thereby extending the zone in which air stripping occurs and increasing the pressure with which the cleaned water is injected back into the saturated soil surrounding the PET well. The vacuum has the added benefit of reducing or even eliminating the need for separate soil vapor extraction wells, which minimizes the expenses associated with well installation and trenching.

The PET system has been engineered for easy extraction and servicing, has no subsurface moving parts, and requires a relatively small amount of low-pressure air to operate. The following figure illustrates the subsurface vapor and groundwater flow paths:



PILOT TEST EQUIPMENT

The basic concept of this test was to power a Plume Eater™ Technology system with helium, an inert gas that dissolves in water but is not consumed by naturally occurring bacteria. If the helium is detected in surrounding observation wells, then the PET may be an appropriate remediation technology for the property.

PET Well Construction: On September 25, 2006, the pilot test well (MW-12) was installed. Details are provided in the boring log for MW-12, included in Appendix A. The 4-inch well was installed with two 0.010-slot screens: the top extends from 20 to 35 feet bgs, and the lower

screen extends from 45 to 50 feet bgs. Additional well completion details are illustrated in Figure 3.

Plume Eater Well Insert Construction: The 40-foot PET well insert was constructed with a 38-foot gas-lift passage and a clean water return intake situated at an elevation of approximately 8 feet above the groundwater table (Photograph #1 in Appendix B).

Observation Wells: Prior to conducting the pilot test, the depths to groundwater were measured in the test well and surrounding monitoring wells. These measurements were used to select the appropriate depths at which the helium collector tubes should be placed. The 5-foot helium collector tubes consisted of 1-inch sch. 40 PVC, into the sides of which several small holes had been drilled. The top of these helium detector tubes were placed in the observation wells below the surface of the groundwater. The helium collector tubes were attached to 0.5-inch Tygon tubing, the other end of which extended to above the surface of the ground and was connected to a 600-psi-rated ball valve.

The observation well MW-02 was located 12.5 feet away from the PET injection well (MW-12), observation well MW-10 was located at a distance of 10.5 feet from MW-12, and observations wells MW-14 and MW-05 were located 30 and 40 from the injection well, respectively (Figure 2).

Helium: Compressed balloon-grade helium was used to power the PET injection well. Three tanks, rated at 300-cubic feet capacity each, were emptied during this study. The gas-supply line connecting the tanks and the PET well cap was equipped with a pressure regulator and a flow-rate indicator (Photograph #2).

Helium Detector: The presence of helium was confirmed using a Varian PHD-4 Portable Helium Detector, model 969-4600. Rated to detect helium at concentrations as low as 4 parts per million, this instrument served as a rapid and reliable field instrument. However, when opening the ball valve attached to the helium collector tubes, the brief surge of captured gas overwhelmed the instrument's ability to quantify helium concentrations. When helium was present, a warning indicator suggested that the incoming concentration was above the instruments sensitivity range. Therefore, the instrument could only be utilized as a qualitative indicator for the presence or absence of helium.

Photographs of the pilot test are presented in Appendix B

PILOT TEST PROCEDURES

The testing procedures relied on the following assumptions:

- The PET was capable of generating convection currents in the dense surrounding soil;
- Helium would dissolve into the groundwater after processing through the PET remediation well;
- Vadose zone helium would not be detected;
- Dissolved helium would be transported by the groundwater convection currents;
- Helium would transfer from the liquid phase and into the gas phase when passing through the holes in the collector tubes;
- Off-gassing helium would travel up the connection tubing and be collected behind the above-surface ball valve;

- Sufficient helium would collected within 1 hour to be subsequently detected;

The pilot testing process schematic is illustrated in Figure 4.

The test was conducted by connecting the air-supply line of the Plume Eater^{TM} injection well to the tank of compressed helium. The helium was injected at a rate of 18 to 20 liters per minute. Each of the three helium tanks maintained sufficient injection flow rates and pressure for approximately 2.5 hours.

Hourly monitoring for helium was initiated at 8:45 A.M. on November 22, 2006. Monitoring was conducted by connecting the ball valve to the intake port of the helium detector with a section of Tygon tubing. After the ball valve and detector line was sufficiently purged of any fugitive helium and the detector displayed a steady reading of 0 parts per million, the ball valve was opened and the results were recorded.

RESULTS

Helium was not detected in any of the observation well during the 9:45 A.M. sampling event, approximately one hour after the helium injection began.

The first positive indication for the presence of groundwater-transported helium occurred during the 10:45 A.M. sampling event in observation well MW-02, which is located in a cross- to down-gradient hydrologic position, just over 12 feet from the PET injection well. This well continued to test positive for the presence of helium during subsequent hourly monitoring events. After approximately 4 hours, helium also was detected in observation well MW-10, which is located in an up-gradient hydrologic position, approximately 11.5 feet from the PET injection well. This well also continued to test positive for the presence of helium during subsequent hourly monitoring events.

Observation wells MW-14 (30 feet away) and MW-05 (40 feet away) did not test positive for the presence of helium during the 8-hour test.

CONCLUSIONS

Based on a review of the results of the pilot test, SES makes the following conclusions:

- Helium dissolved relatively rapidly into the groundwater via the PET injection well and was detected in the two closest observation wells (MW-02 and MW-10) within 2 to 4 hours of beginning the pilot test. The fact that helium was not observed in the more distant observation wells (MW-14 and MW-05) supports the assumption that helium released into the vadose zone would not be detected under the test conditions. The detection of helium in the nearest down-gradient observation well (MW-02) 2 hours prior to the detection of helium in a similarly distant up-gradient observation well (MW-10) further supports this assumption as the dissolved helium will preferentially flow in the direction of groundwater flow.

- Considering the relatively rapid appearance of dissolved helium in observation wells located approximately 12 feet from the injection well, PET appears to be an appropriate remedial strategy for the contamination present beneath the property. A longer duration

pilot study test or an interim action injection event would be necessary to more accurately assess the PET's vectors of influence and identify appropriate well spacing intervals.

- In addition to well MW-12, which is currently equipped with the required PET screening intervals, monitoring well MW-11 has been also constructed with two screened intervals that would allow for the installation of Plume Eater™ well that location, if requested.

CLOSING

Sound Environmental Strategies Corporation appreciates the opportunity to work with you on this project. Please contact the undersigned at (206) 306-1900 if you have any questions or require additional information upon your review of the Second Quarter 2006 report.

Respectfully,

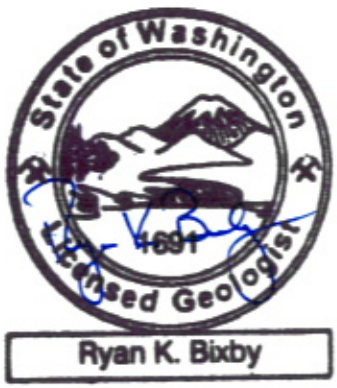
Sound Environmental Strategies Corporation

Erin K. Rothman
Project Scientist

Ryan K. Bixby, LG #1691
Geoscience Project Manager

Attachments: Figure 1, Property Location Map
Figure 2, PET Helium Injection Well and Observation Wells
Figure 3, Plume Eater™ Well Design and Completion Details
Appendix A, Boring Logs
Appendix B, Property Photographs

MH/RB: syh



FIGURES

SOUND ENVIRONMENTAL STRATEGIES www.soundenvironmental.com	N	Date: January 24, 2007 Drawn By: D. Richardson Chk By: C. Cook SES Project No.: 0440-038 File ID: 01-399 fig 1 to v2.doc	Time Oil Co. Facility No. 01-399 19740 Viking Way Northwest Poulsbo, Washington	**FIGURE 1** Property Location Map

LEGEND

- MW-01 — MONITORING WELL LOCATION
- UST — FORMER UNDERGROUND STORAGE TANK
- FORMER EXCAVATION AREAS

MW-08

MW-04
(75.08')

Pump Island 2

MW-16

MW-09

MW-11

Pump Island 1

MW-15

MW-02

HELIUM DETECTED AT MW-02 IN LESS THAN 2 HOURS (~12 FEET AWAY)

MW-10

MW-12

LOCATION OF PLUME EATER HELIUM INJECTION

HELIUM DETECTED AT MW-10 IN LESS THAN 4 HOURS (~10.5 FEET AWAY)

Former 12,000 Gallon UST

Former 8,000 Gallon UST

Former 6,000 Gallon UST

MW-01

MW-14

MW-05

MW-13

TRASH / STORAGE

FORMER JACKPOT FOODMART
19740 VIKING WAY NORTHWEST

LANDSCAPED AREA

N

DRIVEWAY

SIDEWALK

OHP

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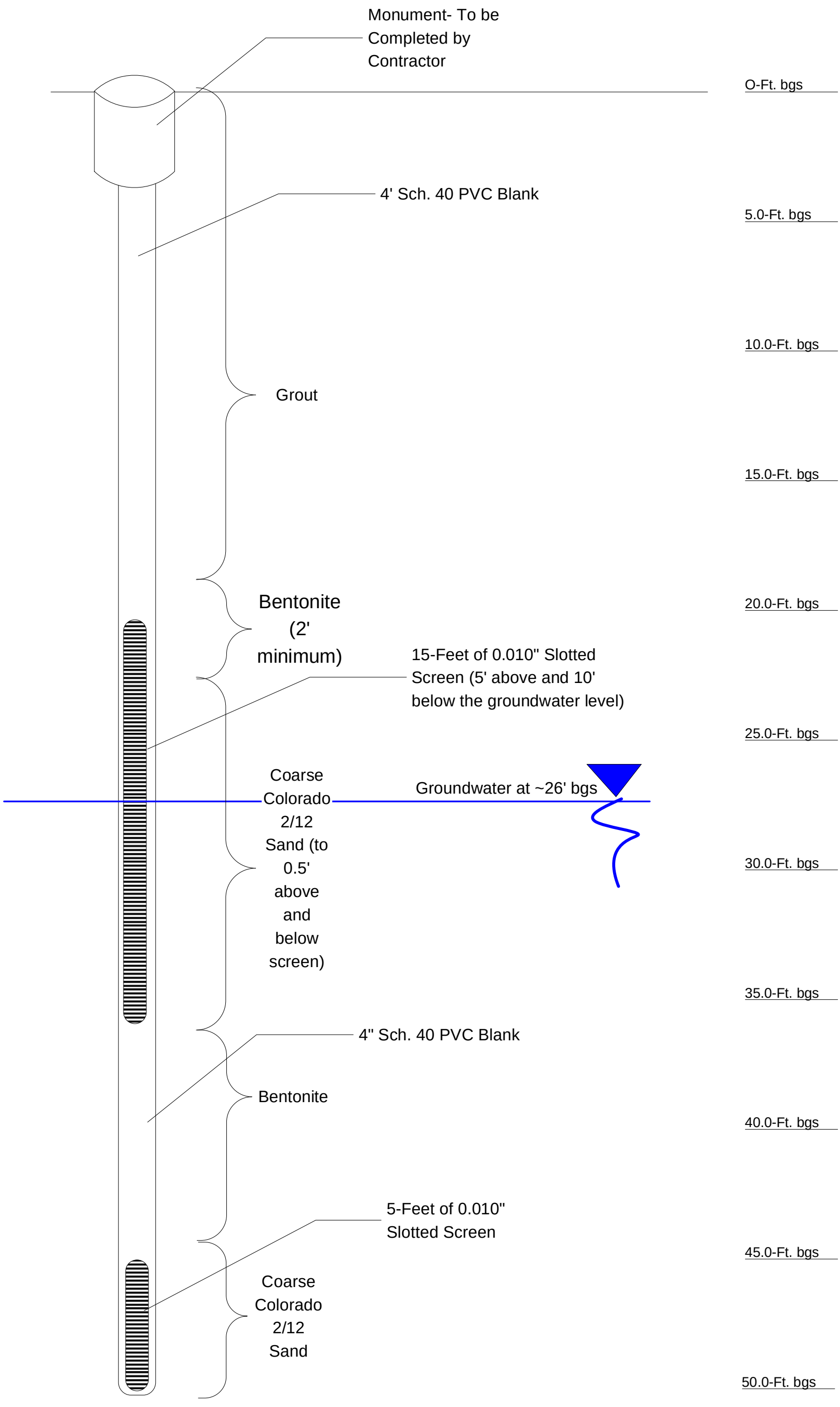
DATE: 01/15/07
DRAWN BY: BAD
CHECKED BY: RKB
CAD FILE: 01-399 2006 PET EL

PROJECT NAME: TIME OIL CO. FACILITY NO. 01-399
SES PROJECT NUMBER: 0440-038-04
STREET ADDRESS: 19740 VIKING WAY NORTHWEST
CITY, STATE: POULSBO, WASHINGTON

REGION:

0 5 10 20
APPROXIMATE SCALE IN FEET 1 INCH = 10 FEET

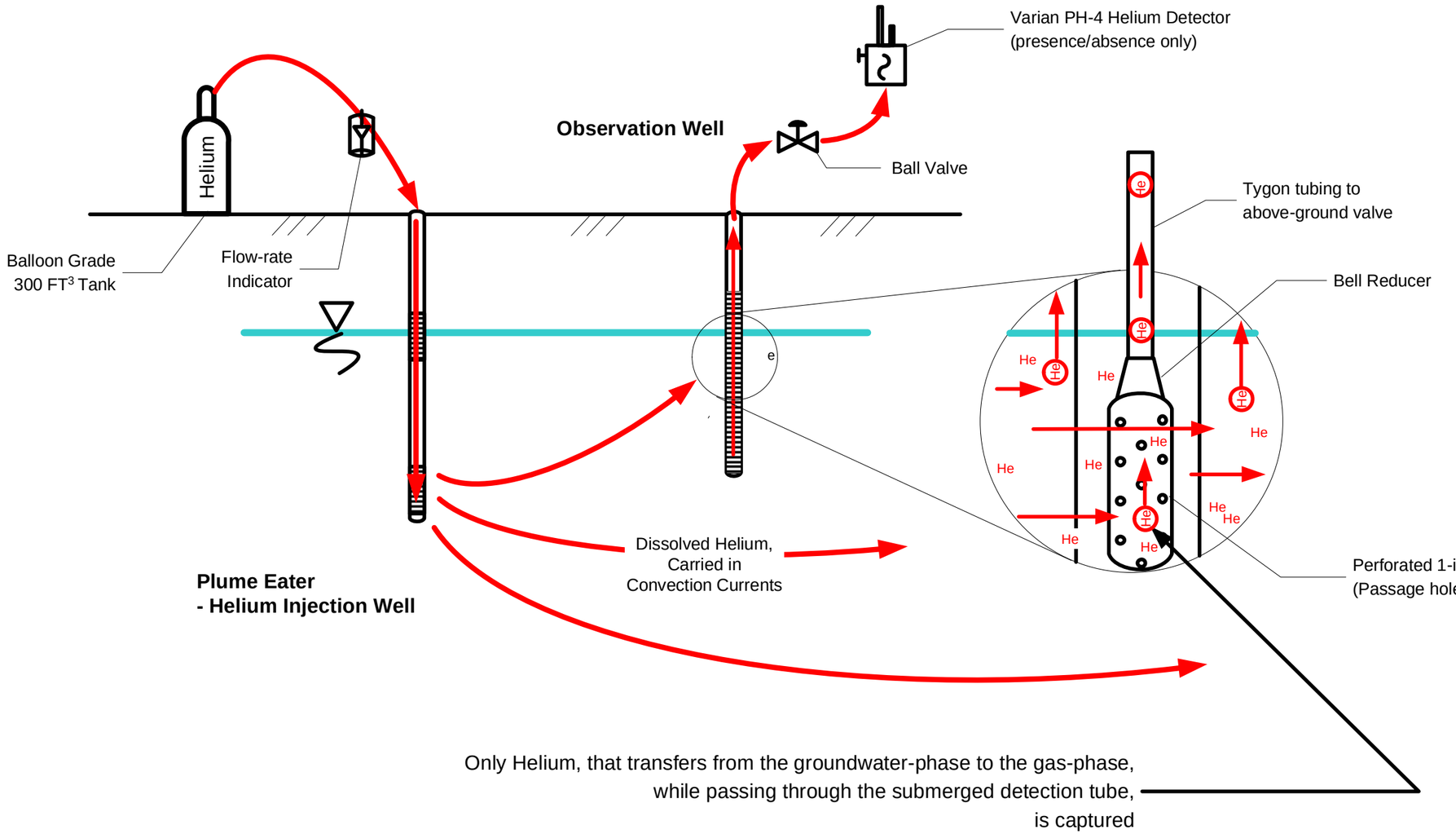
FIGURE 2
PET HELIUM INJECTION WELL AND OBSERVATION WELLS



SOUND ENVIRONMENTAL STRATEGIES

Time Oil Co. Facility No. 01-399
Plume Eater Well Design and Completion Specifications

Plume Eater™ Technology
Pilot Test Process Schematic:



Only Helium, that transfers from the groundwater-phase to the gas-phase, while passing through the submerged detection tube, is captured

SOUND ENVIRONMENTAL STRATEGIES

Time Oil Co. Facility No. 01-399
Plume Eater Technology
Pilot Test Process Schematic

APPENDIX A
Boring Logs

Log of Exploratory Boring:

Notes
Two-inch diameter monitoring well installed in northwest portion of property.

Drilling Co./Driller:	Cascade / Andy
Drilling Method:	Hollow-stem auger
Location:	10' East of NW corner of property
Surface Condition:	Asphalt
Total Depth:	40.5
First GW Depth:	29

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
0								Asphalt		
4	14 18 23		100		MW-3-4		SM	Damp, dense, silty, gravelly SAND, medium brown, no hydrocarbon odor	Dp	
9	8 12 14		100		MW-3-10		SM	Damp, medium dense, silty, gravelly SAND, medium brown, no hydrocarbon odor	Dp	
14	28 50/6		60		MW-3-15		SM	Damp, very dense, silty, gravelly SAND, medium brown, no hydrocarbon odor	Dp	
19	17 27 30	0.0	100		MW-3-20		SM ML	Damp, very dense, silty, gravelly SAND, medium brown, no hydrocarbon odor Damp, very hard, sandy SILT with gravel, medium brown, no hydrocarbon odor	Dp	
24	24 15	0.0	100		MW-3-24		SM	Damp, dense, silty SAND, medium brown, no hydrocarbon odor	Dp	

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Time Oil Co. Facility # 01-399
19740 Viking Way Northwest
Poulsbo, Washington

Date Started: 11/7/2005
Date Finished: 11/7/2005
Logged By: CSC
Chk By: DHG
SES Project No.: 0440-038
File ID.: F:\SESGIN~1\PROJECTS\0440-038-04 POULSBO.GPJ

BORING LOG
MW03

Log of Exploratory Boring:

Notes
Two-inch diameter monitoring well installed in northwest portion of property.

Drilling Co./Driller:	Cascade / Andy
Drilling Method:	Hollow-stem auger
Location:	10' East of NW corner of property
Surface Condition:	Asphalt
Total Depth:	40.5
First GW Depth:	29

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
25	19						SM			
26										
27										
28										
29									▼	
30	50/3		100		MW-3-30		SM	Wet, very dense, silty, gravelly SAND, medium brown, no hydrocarbon odor	Wet	
31										
32										
33										
34	8									
35	18	0.0	100		MW-3-35		SM	Wet, very dense, silty, gravelly coarse SAND, gray, no hydrocarbon odor	Wet	
36	32									
37										
38										
39										
40	32		80		MW-3-40		SM	Wet, very dense, silty coarse SAND, gray, no hydrocarbon odor	Wet	
41	50/6									
42								Boring terminated at 40.5 feet below ground surface. Two-inch diameter monitoring well installed using 10/20 silica sand from 40.5 feet to 18 feet below ground surface, 10-slot screen from 40 feet to 20 feet, bentonite chips from 18 feet to 2 feet. Completed with a concrete flush-mounted monument.		
43										
44										
45										
46										
47										
48										
49										
50										

Log of Exploratory Boring:

Notes
Two-inch diameter monitoring well installed in southeast portion property.

Drilling Co./Driller:	Cascade / Andy
Drilling Method:	Hollow-stem auger
Location:	25' Southwest of southeast corner of existing convenience store
Surface Condition:	Asphalt
Total Depth:	43.5
First GW Depth:	34

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
0								Asphalt		
5	15 50/6	0.0	100		MW-5-5		SM	Dry, very dense, silty, gravelly SAND, orange to light brown at depth, no hydrocarbon odor (subrounded gravel)	Dry	
10	13 14 18	1.1	75		MW-5-10		SM	Dry, dense, silty SAND with gravel, light brown at depth, no hydrocarbon odor (subrounded gravel)	Dry	
15	8 13 18	>2000	100		MW-5-15		SM ML	Dry, medium dense, silty SAND with gravel, light brown at depth, no hydrocarbon odor (subrounded gravel) Damp, stiff, damp, fine sandy, clayey SILT, light brown, no hydrocarbon odor	Dp/Dry	
20	18 22 31	0.0	60		MW-5-20		SM	Damp, medium dense, gravelly, silty SAND, light brown, no hydrocarbon odor	Dp	
25	15 18		100				SM	Damp, dense, gravelly, silty SAND, light brown, no hydrocarbon odor	Dp	

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Time Oil Co. Facility # 01-399
19740 Viking Way Northwest
Poulsbo, Washington

Date Started: 11/8/2005
Date Finished: 11/8/2005
Logged By: CSC
Chk By: DHG
SES Project No.: 0440-038
File ID.: F:\SESGIN~1\PROJECTS\0440-038-04 POULSBO.GPJ

BORING LOG
MW05

Log of Exploratory Boring:

Notes
Two-inch diameter monitoring well installed in southeast portion property.

Drilling Co./Driller:	Cascade / Andy
Drilling Method:	Hollow-stem auger
Location:	25' Southwest of southeast corner of existing convenience store
Surface Condition:	Asphalt
Total Depth:	43.5
First GW Depth:	34

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
25	21	0.0			MW-5-25		SM			
26										
27										
28										
29	23						SM			
30	25 27	0.0	80		MW-5-30		ML	Medium dense, damp, gravelly, silty SAND, light brown, no hydrocarbon odor Damp, very hard, sandy SILT, light brown, no hydrocarbon odor	Dp	
31										
32										
33										
34	30								▼	
35	33 40	0.0	100		MW-5-35		SM	Wet, very dense, silty SAND with gravel, light brown, no hydrocarbon odor	Wet	
36										
37										
38										
39	8									
40	10 12	1.4	100		MW-5-40		SM	Wet, medium dense, silty SAND with gravel, light brown, no hydrocarbon odor	Wet	
41										
42		1.4			MW-5-42		ML			
43	50/6		75				SM	Wet, very hard, wet, sandy SILT, medium brown, no hydrocarbon odor Wet, very dense, silty fine to coarse SAND, brown with black and white sand grains, no hydrocarbon odor	Wet	
44								Boring terminated at 43.5 feet below ground surface. Two-inch diameter monitoring well installed using 10/20 silica sand from 43.5 feet to 20 feet below ground surface, 10-slot screen from 42.5 feet to 22.5 feet, bentonite chips from 20 feet to 2 feet. Completed with a concrete flush-mounted monument.		
45										
46										
47										
48										
49										
50										

Log of Exploratory Boring:

Notes
Four-inch diameter monitoring well installed east of the former UST excavation area

Drilling Co./Driller:	Cascade / Andy
Drilling Method:	Hollow-stem auger
Location:	97' from NW corner of building and 27.5' from SW corner
Surface Condition:	Gravel
Total Depth:	40.5
First GW Depth:	25

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
0										
1										
2										
3										
4	3									
5	3		50				SM	Moist, loose, gravelly, silty medium to fine SAND, very dark grayish brown (10YR 3/2), no hydrocarbon odor	Mst	
6	4									
7										
8										
9	10									
10	8		100		B06-10		SM	(Same as previous) Medium dense, grayish brown, no hydrocarbon odor	Mst	
11	8									
12										
13										
14										
15	21		100		B06-15		SM	Damp, very dense, gravelly, silty medium to fine SAND, dark grayish brown (10YR 4/2), no hydrocarbon odor	Dp	
16	50/6									
17										
18										
19										
20	18		100		B06-20		SM	Damp, very dense, gravelly, silty fine SAND, light brownish gray (2.5Y 6/2), no hydrocarbon odor	Dp	
21	50/6									
22										
23										
24										
25	12									
	26		80				SM	Moist, very dense, silty coarse to medium SAND with gravel, dark	Mst/Wet ▼	

Log of Exploratory Boring:

Notes
Four-inch diameter monitoring well installed east of the former UST excavation area

Drilling Co./Driller:	Cascade / Andy
Drilling Method:	Hollow-stem auger
Location:	97' from NW corner of building and 27.5' from SW corner
Surface Condition:	Gravel
Total Depth:	40.5
First GW Depth:	25

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
25	28				B06-25		SM	gray (5Y 4/1), very faint hydrocarbon odor Damp, very dense, silty fine SAND, dark gray, very faint hydrocarbon odor		
26										
27	21 50/6		70		B06-27.5		SM	(Same as previous) Very faint hydrocarbon odor	Wet	
28							ML SM	Damp, very dense, sandy SILT, laminated, grayish brown (2.5Y 5/2), no hydrocarbon odor (Silt lense)		
29	18							Moist, very dense, silty medium to fine SAND with gravel, dark gray (5Y 4/1), no hydrocarbon odor		
30	25 34		100		B06-30		SM	(Same as previous) Wet, no hydrocarbon odor	Wet	
31										
32	11 14		100		B06-32 B99-32		SM	Wet, very dense, silty coarse to fine SAND with gravel, dark gray, no hydrocarbon odor	Wet	
33	20									
34										
35			100		B06-35		SM	Wet, very dense, gravelly, silty coarse to fine SAND, greenish gray (GLEY1 5/10Y), very faint hydrocarbon odor	Wet	
36										
37	11 12		100		B06-37		SM	(Same as previous) No hydrocarbon odor	Wet	
38	14									
39	7									
40	8 9		100		B06-40		SM	(Same as previous) No hydrocarbon odor	Wet	
41								Boring terminated at 40.5 feet below ground surface. Four-inch diameter monitoring well installed as depicted above right, using 4-inch diameter PVC, 0.010 slot screen, 2-12 silica sand, bentonite chips, and concrete seal. B-06 was renamed MW-10 upon completion.		
42										
43										
44										
45										
46										
47										
48										
49										
50										

Log of Exploratory Boring:

Notes
Installed four-inch diameter PlumeEater well with two screened intervals.

Drilling Co./Driller:	Cascade / Scott
Drilling Method:	HSA/Dames & Moore
Location:	Between MW-02, MW-10, and MW-05
Surface Condition:	Asphalt
Total Depth:	45
First GW Depth:	27

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
0								Asphalt.		
1								Drill cuttings: Damp, fine- to coarse-grained Silty SAND, olive-brown, with fine to coarse gravel (FILL).		
2							SM			
3								Damp to moist, very dense, fine- to coarse-grained Silty SAND, olive-brown, some fine to coarse subrounded gravel. No petroleum hydrocarbon odor, no discoloration.		
4										
5					B-08-05					
6	30 38 41	0.0	100						Dp	
7										
8										
9							SM			
10					B-08-10					
11	18 30 41	0.0	100					Same as above. No petroleum hydrocarbon odor, no petroleum hydrocarbon discoloration.	Dp	
12										
13										
14										
15					B-08-15					
16	60/6"	0.0	100				SM	Moist, very dense, fine- to coarse-grained Silty SAND, brown, with fine to coarse subrounded gravel. No petroleum hydrocarbon odor, no discoloration.	Mst	
17	40 47 50		100		B-08-18				Mst	
18					B-08-19.5					
19	42 48 53		100				SP	Moist, very dense, fine- to coarse-grained SAND, grey-brown, some silt, trace fine gravel. No petroleum hydrocarbon odor, no discoloration.	Mst	
20	51				B-08-21					

SOUND ENVIRONMENTAL STRATEGIES
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Time Oil Co. Facility # 01-399
19740 Viking Way Northwest
Poulsbo, Washington

Date Started: 9/25/2006
Date Finished: 9/25/2006
Logged By: AIS
Chk By: RKB
SES Project No.: 0440-038
File ID.: F:\SESGIN~1\PROJECTS\0440-038-04 POULSBO.GPJ

BORING LOG
B-08/MW-12

Log of Exploratory Boring:

Notes
Installed four-inch diameter PlumeEater well with two screened intervals.

Drilling Co./Driller:	Cascade / Scott
Drilling Method:	HSA/Dames & Moore
Location:	Between MW-02, MW-10, and MW-05
Surface Condition:	Asphalt
Total Depth:	45
First GW Depth:	27

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
20	60/6"	0.0	100				SP	- increased silt content.	Mst	
21					B-08-22.5		SM	Moist, very dense, fine- to medium-grained Silty SAND, grey-brown. No petroleum hydrocarbon odor, no discoloration.		
22	30 38 47	0.0	100						Mst	
					B-08-24					
23	27 35 40	0.0	100					Moist, very dense, fine- to coarse-grained SAND, grey-brown, weak petroleum hydrocarbon odor, no discoloration.	Mst	
24					B-08-25.5		SP			
25	36 40 44	0.0	100					- trace fine to coarse subangular to subrounded gravel. No petroleum hydrocarbon odor.	Mst	
					B-08-27					
26	30 37		100					Moist to wet, very dense, fine-grained silty SAND, olive-grey, some medium-grained sand.	Mst	
27	42				B-08-28.5		SM		▽	
28	28 33 37	0.0	100					- becomes wet, with fine-grained sand interbeds (~0.5' thick). No petroleum hydrocarbon odor, no discoloration. - olive-brown silt lens (2" thick), laminated, with FeO2 staining.	Wet	
					B-08-30					
29	30 37 40		100				SP	Wet, very dense, fine- to coarse-grained SAND, olive-grey, some fine subrounded gravel. No petroleum hydrocarbon odor, no discoloration.	Wet	
30					B-08-31.5					
31	37 43 45	0.0	100					Wet, very dense, fine-grained Silty SAND, olive-brown, with hard laminated silt lenses (~6' thick), occasional fine subrounded gravel.	Wet	
					B-08-33					
32	25 38 40	0.0	100				SM		Mst	
33					B-08-34.5					
34	28 33 36	0.0	100						Wet	
					B-08-36			Wet, very dense, fine- to coarse-grained SAND, grey. No petroleum hydrocarbon odor, no discoloration.		
35	28 33 40	0.0	100						Wet	
36					B-08-37.5					
37	21 32 37		100				SP		Wet	
					B-08-39					
38	33 60/6"	0.0	100						Wet	
39					B-08-40.5					
	46 60/6"	0.0	100						Wet	
40										

Log of Exploratory Boring:

Notes
Installed four-inch diameter PlumeEater well with two screened intervals.

Drilling Co./Driller:	Cascade / Scott
Drilling Method:	HSA/Dames & Moore
Location:	Between MW-02, MW-10, and MW-05
Surface Condition:	Asphalt
Total Depth:	45
First GW Depth:	27

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
40										
41	33 40 60		100		B-08-42		SP			
42					B-08-43.5		SM	Wet, very dense, fine- to medium-grained Silty SAND, grey-brown, some coarse-grained sand.	Wet	
43	45 60/6"	0.0	100				SP	Wet, very dense, fine-grained SAND, olive-brown, trace fine rounded gravel. No petroleum hydrocarbon odor, no discoloration.	Wet	
44	60/6"		100		B-08-45		ML	Moist, hard SILT, grey, with fine sand lenses, laminated, slightly cemented. No petroleum hydrocarbon odor, no discoloration.	Mst	
45								Terminated at 45 feet below ground surface (bgs). Groundwater was encountered at 27 feet bgs during drilling. Boring was completed as monitoring well/remediation well MW-12 on 9/25/06.		
46								WELL COMPLETION DETAILS:		
47								0.0 to 20.0 feet: 4-inch diameter, flush-threaded Schedule 40 PVC blank riser pipe.		
48								20.0 to 30.0 feet: 4-inch diameter, flush-threaded Schedule 40 PVC well screen with 0.020-inch machine slots.		
49								30.0 to 40.0 feet: 4-inch diameter, flush-threaded Schedule 40 PVC blank riser pipe.		
50								40.0 to 45.0 feet: 4-inch diameter, flush-threaded Schedule 40 PVC well screen with 0.020-inch machine slots and PVC end cap.		
51								0.0 to 2.0: concrete flush mount monument and cement seal.		
52								2.0 to 19.0: medium bentonite chips.		
53								19.0 to 31.0: 10 x 20 Colorado Silica Sand.		
54								31.0 to 39.0: medium bentonite chips.		
55								39.0 to 45.0: 10 x 20 Colorado Silica Sand.		
56										
57										
58										
59										
60										

Log of Exploratory Boring:

Notes
Installed four-inch diameter PlumeEater well with two screened intervals.

Drilling Co./Driller:	Cascade / Scott
Drilling Method:	HSA/Dames & Moore
Location:	19' north from NW Liberty Rd sidewalk.
Surface Condition:	Asphalt
Total Depth:	46.5
First GW Depth:	27

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
0								Asphalt.		
1								Damp, medium dense, fine- to coarse-grained Silty SAND, olive-brown, with fine to coarse gravel (FILL). No petroleum hydrocarbon odor, no discoloration.		
2										
3										
4										
5	12				B-10-05		SM			
6	14	0.0	100						Dp	
7	15									
8										
9										
10					B-10-10					
11	28							Moist, very dense, fine- to coarse-grained Silty SAND, brown, with fine to coarse subrounded gravel. No petroleum hydrocarbon odor, no discoloration.		
12	32	45.1	100						Mst	
13	42						SM			
14										
15					B-10-15					
16	50							Moist, very dense, fine- to coarse-grained Silty SAND, olive-brown, with fine to coarse rounded to subrounded gravel, cobbles, slightly cemented. No petroleum hydrocarbon odor, no discoloration.		
17	60/6"	143	100				SM		Mst	
18										
19										
20							SP-SM			

SOUND ENVIRONMENTAL STRATEGIES
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Time Oil Co. Facility # 01-399
19740 Viking Way Northwest
Poulsbo, Washington

Date Started: 9/26/2006
Date Finished: 9/26/2006
Logged By: AIS
Chk By: RKB
SES Project No.: 0440-038
File ID.: F:\SESGIN~1\PROJECTS\0440-038-04 POULSBO.GPJ

BORING LOG
B-10/MW-14

Log of Exploratory Boring:

Notes
Installed four-inch diameter PlumeEater well with two screened intervals.

Drilling Co./Driller:	Cascade / Scott
Drilling Method:	HSA/Dames & Moore
Location:	19' north from NW Liberty Rd sidewalk.
Surface Condition:	Asphalt
Total Depth:	46.5
First GW Depth:	27

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
20	32 37 42	56	100		B-10-20		SP-SM	Moist, very dense, fine-grained SAND to silty SAND, grey-brown, some medium-grained sand. Moderate petroleum hydrocarbon odor, no discoloration.	Mst	
25	28 32 35	56.5	100		B-10-25		SP	Moist, very dense, fine- to coarse-grained SAND, olive-brown. Moderate petroleum hydrocarbon odor, no discoloration.	Mst	
27									▽	
28	25 26 32	0.0	100		B-10-27.5			Wet, very dense, fine-grained Silty SAND, olive-brown, with silt lenses, laminated, FeO2 staining. No petroleum hydrocarbon odor, no discoloration.	Wet	
30	44 60/6"	1,259	100		B-10-30		SM	- becomes fine- to medium-grained, some coarse-grained sand. Strong petroleum hydrocarbon odor, no discoloration.	Wet	
35	46 30 34	15.4	100		B-10-35		SP	Wet, very dense, fine- to coarse-grained SAND, grey, little to no fines. Weak petroleum hydrocarbon odor, no discoloration.	Wet	
40							SM			

Log of Exploratory Boring:

Notes
Installed four-inch diameter PlumeEater well with two screened intervals.

Drilling Co./Driller:	Cascade / Scott
Drilling Method:	HSA/Dames & Moore
Location:	19' north from NW Liberty Rd sidewalk.
Surface Condition:	Asphalt
Total Depth:	46.5
First GW Depth:	27

Moisture Content:
Dry = Dry, Dp = Damp, Mst = Moist, Wet = Wet

Hydrocarbon Odor: NO = no odor, VFO = very faint odor
WO = weak odor, MO = moderate odor, SO = strong odor

Water Levels
▼ After Completion
▽ During Drilling

Depth (feet)	Blow Count	PID	Sample Recovery	Sample Interval	Sample ID	Lithography	USCS Class	Description	Moisture Content	Well Detail
40	46 60/6"	148	100		B-10-40		SM	Wet, very dense, fine- to coarse-grained Silty SAND, grey, with fine to coarse subrounded to rounded gravel, some clay. Weak petroleum hydrocarbon odor, no discoloration.	Wet	
41										
42										
43										
44								Wet, very dense, fine- to coarse-grained SAND, grey, with fine subangular to subrounded gravel, little to no fines. No petroleum hydrocarbon odor, no discoloration.		
45	35				B-10-45		SP			
46	40 42	0.0	100						Wet	
47								Terminated at 45 feet below ground surface (bgs). Groundwater was encountered at 27 feet bgs during drilling. Boring was completed as monitoring well/remediation well MW-14 on 9/26/06.		
48								WELL COMPLETION DETAILS:		
49								0.0 to 20.0 feet: 4-inch diameter, flush-threaded Schedule 40 PVC blank riser pipe.		
50								20.0 to 30.0 feet: 4-inch diameter, flush-threaded Schedule 40 PVC well screen with 0.020-inch machine slots.		
51								30.0 to 40.0 feet: 4-inch diameter, flush-threaded Schedule 40 PVC blank riser pipe.		
52								40.0 to 45.0 feet: 4-inch diameter, flush-threaded Schedule 40 PVC well screen with 0.020-inch machine slots and PVC end cap.		
53								0.0 to 2.0: concrete flush mount monument and cement seal.		
54								2.0 to 19.0: medium bentonite chips.		
55								19.0 to 31.0: 10 x 20 Colorado Silica Sand.		
56								31.0 to 39.0: medium bentonite chips.		
57								39.0 to 45.0: 10 x 20 Colorado Silica Sand.		
58										
59										
60										

APPENDIX B
Photographs

Photograph 1. The Plume Eater™ Technology system well insert, prior to down-well placement.

Photograph 2. The Plume Eater™ Technology system injecting helium during pilot test.

SOUND ENVIRONMENTAL STRATEGIES www.soundenvironmental.com	SES Project No.: 0440-038-04 Date: January 25, 2007 Drawn By: MJH Chk By: RKB File ID: 01-399 PET Photos.doc	**PROPERTY PHOTOGRAPHS** Time Oil Co. Facility No. 01-399 19740 Viking Avenue Northwest Poulsbo, Washington