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T E C H N I C A L M E M O R A N D U M

TO: Tim Mullin – Washington State Department of Ecology

cc: Mark Myers – Williams Kastner PLLC

FROM: Donald Lance, L.G., L.H.G., Senior Geologist
Peter Jewett, L.G., L.E.G., Principal

DATE: May 16, 2017

RE: **IN-SITU CHEMICAL OXIDATION**
REMEDIATION OF TETRACHLOROETHENE IN GROUNDWATER
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET, OLYMPIA, WASHINGTON
VCP NO. SW0370
FARALLON PN: 663-010

Farallon Consulting, L.L.C. (Farallon) has revised this technical memorandum at the request of the Washington State Department of Ecology (Ecology) to modify the scope of work for the use of in-situ chemical oxidation (ISCO) for remediation of tetrachloroethene (PCE) in groundwater as part of the cleanup action at the former Allison's Norge Village at 120 Northeast Turner Street in Olympia, Washington (herein referred to as the Property). In-situ injection of the oxidant sodium permanganate is planned for groundwater treatment, and will be conducted in conjunction with continued operation of the soil vapor extraction (SVE) system at the Property. Modification of the scope of work responds to review comments provided by Ecology in the opinion letter regarding Further Action at Eastside Laundry Allison's Norge Village dated March 8, 2017, from Mr. Tim Mullin of Ecology to Mr. Kevin Stormans of Stormans, Inc.

PROPERTY BACKGROUND

The Property currently is developed with a single-story brick masonry building that was constructed in the early 1960s and historically has consisted of four separate tenant suites (Figure 1). Dry cleaning operations were conducted in the northern suite from approximately 1962 until early 2012. The dry cleaner suite was renovated in 2013, and currently is occupied by a compounding pharmacy.

Remedial investigations conducted at the Property by Farallon and others identified PCE in soil and groundwater at concentrations exceeding Washington State Model Toxics Control Act

Cleanup Regulation (MTCA) Method A cleanup levels. The primary source area of PCE is beneath the dry cleaner suite on the Property and is associated with releases from several dry cleaning machines that historically operated there. Two minor source areas identified southeast and southwest of the Property building are related to historical outdoor surface discharges of dry cleaning wastewater and sludge. PCE concentrations detected in soil samples collected from borings advanced inside the dry cleaner suite decreased with depth proximate to the primary source area.

CLEANUP ACTION PROGRESS SUMMARY

An SVE system was installed at the Property in 2006 to remove concentrations of PCE in soil and reduce the source of PCE to groundwater. Operation of the SVE system was initiated in April 2007. An estimated 604 pounds of PCE have been removed from soil in the vadose zone during intermittent SVE operation through February 2017. As discussed below, PCE was removed from the Property during a remedial excavation conducted in the former dry cleaner suite in December 2012.

Performance soil sampling was conducted at the Property in August 2011 to evaluate the progress of soil cleanup resulting from operation of the SVE system. Results from the performance soil sampling are presented in the *Cleanup Action Progress Report, March 2011 to May 2012, Allison's Norge Village (Aka Eastside Laundry), 120 Northeast Turner Street, Olympia, Washington* dated August 21, 2012, prepared by Farallon. Soil borings EB-15, EB-16, EB-17, and IB-6 were advanced in 2011 as close as practicable to prior borings EB-7, MW-6/SVE-12S, SB-1, and IB-3, respectively, which were drilled in 2001 and 2004 (Figure 2). Soil samples were collected from the 2011 borings at depth intervals matching those of the prior boring samples, which allowed a comparison of PCE concentrations in soil prior to installation of the SVE system and after approximately 5 years of intermittent SVE system operation. The comparison showed significant reductions in PCE concentrations for each soil sample interval compared, confirming that operation of the SVE system has been effective in reducing PCE mass in soil across the Property (Figure 2).

Additional subsurface investigation was performed at the Property in November 2012 inside the dry cleaner suite and the south-adjoining suite (currently occupied by a barber shop) to evaluate the extent of PCE in shallow soil proximate to the primary PCE source area. Eleven direct-push borings were advanced to depths of between 14.5 and 20 feet below ground surface (bgs), and soil samples were collected for analysis (Figure 3). Based on the investigation analytical results, two phases of remedial excavation were undertaken inside the dry cleaner suite to excavate and dispose of accessible shallow soil with high concentrations of PCE.

A total of approximately 140 tons of PCE-contaminated soil was excavated to depths of 5.5 to 7 feet below the floor surface of the dry cleaner suite and transported off the Property for disposal at a Subtitle D landfill under a Contained-In determination from Ecology dated November 16, 2012. The remedial excavations removed soil with the highest PCE concentrations from beneath the dry cleaner suite, with the exception of one area along the eastern side of the excavation final limits that could not be removed because of the presence of an interior structural support for the building.

Following completion of the excavation, two new vertical SVE wells were installed inside the former dry cleaner suite to remediate residual concentrations of PCE in soil that were not accessible by excavation. Residual concentrations of PCE exceeding the MTCA Method A cleanup level remain in the southern portion of the former dry cleaner suite at depths of between approximately 10 and 25 feet below the floor surface. A localized area of shallow PCE soil contamination, assumed to be the result of vapor-phase transport along a subsurface utility line, was identified beneath the southwestern portion of the barber shop.

The SVE system was restarted in October 2015, and has run continuously to date other than during system shut-downs caused by periodic local power outages.

PCE has been detected in groundwater at concentrations consistently exceeding the MTCA Method A groundwater cleanup level in samples collected from monitoring wells MW-2 and MW-5 in a localized area west of and proximate to the western side of the dry cleaner suite (Figure 4). PCE has been detected at concentrations intermittently exceeding the MTCA Method A cleanup level in groundwater samples collected from monitoring well MW-7, located southeast of the dry cleaner suite. PCE historically has been detected at concentrations exceeding the MTCA Method A cleanup level in groundwater samples collected from monitoring well MW-11, but has not exceeded the cleanup level since 2011.

Depths to groundwater in monitoring wells MW-2 and MW-5 have ranged from between approximately 70 and 86 feet bgs during groundwater monitoring events conducted between 2001 and 2016. Historical groundwater flow direction in the vicinity has been west to southwest, with a very low to flat gradient.

The extent of concentrations of PCE in groundwater exceeding the MTCA Method A cleanup level has been consistently bounded cross- and down-gradient of the source areas identified at the Property, based on analytical results for the groundwater samples collected from monitoring wells MW-9, MW-10, MW-12, and MW-13 between November 2009 and March 2017 (Figure 4).

CHEMICAL OXIDATION TECHNICAL BACKGROUND

Several types of chemical oxidants are potentially applicable to the cleanup of PCE in groundwater at the Property, including ozone, Fenton's Reagent, sodium persulfate, and sodium permanganate ($NaMnO_4$). In-depth information on available oxidants is provided in the *Technical and Regulatory Guidance for In Situ Chemical Oxidation of Contaminated Soil and Groundwater* dated January 2005, prepared by the Interstate Technology & Regulatory Council.

Farallon recommends the use of $NaMnO_4$ as the chemical oxidant to clean up PCE in groundwater because it:

- Has been documented to be effective in degrading PCE and its degradation compounds;
- Is the most environmentally stable oxidant available;

- Is safer to handle than other chemical oxidants with respect to its chemical characteristics and reactivity; and
- Enables easy monitoring of the distribution of $NaMnO_4$ within the subsurface due to its distinct purple color.

The oxidative reaction between $NaMnO_4$ and PCE breaks the bonds between carbon atoms, and dechlorinates the individual molecules, resulting primarily in the production of carbon dioxide. The reaction between $NaMnO_4$ and dissolved PCE is as follows:

$$3C_2Cl_4 \text{ (PCE)} + 4NaMnO_4 + 4H_2O \rightarrow 6CO_2 + 4MnO_2 + 4Na + 12Cl^- + 8H^+$$

In this reaction, several by-products, including carbon dioxide, manganese dioxide, sodium, chloride, and hydrogen ions, may be generated and released to groundwater. The by-products of this reaction are either innocuous or will react with aquifer materials and subsequently stabilize.

$NaMnO_4$ that may migrate in groundwater from the planned injection points (existing monitoring wells MW-2 and MW-5) will be consumed by soil and organic compounds in groundwater within a short distance of the injection points. Because the subsurface lithology and groundwater flow direction at the Property is well documented, migration of $NaMnO_4$ to a significant distance or in an untraceable direction is unlikely. Boring logs for monitoring wells MW-2 and MW-5 are provided in Attachment A.

Long-term $NaMnO_4$ injections can cause buildup of manganese dioxide solids on the soil particles, which can reduce soil permeability over time. Because the mass of $NaMnO_4$ to be injected and the resulting mass of precipitated manganese dioxide will be low relative to the pore volume of the sands and gravels in the treatment zone, potential significant changes in soil permeability in the treatment area due to the volume of $NaMnO_4$ injected is not anticipated.

SCOPE OF WORK

The scope of work includes:

- Preparing a Health and Safety Plan (HASP) specific to the ISCO events;
- Obtaining an Underground Injection Control (UIC) permit from Ecology;
- Conducting one to two ISCO events, which will consist of injecting $NaMnO_4$ solution directly into monitoring wells MW-2 and MW-5;
- Conducting performance groundwater monitoring following each ISCO event; and
- Evaluating the data, and providing the findings and results from the ISCO events in an annual cleanup action progress report for the Property.

HASP PREPARATION

Farallon will prepare and implement a Property-specific HASP for the field work in accordance with the requirements of Chapter 296-62 of the Washington Administrative Code and Part 1910.120 of Title 29 of the Code of Federal Regulations.

UIC PERMITTING

Farallon will complete the Ecology UIC well registration process to register monitoring wells MW-2 and MW-5 as Type 5X26 Class 5 injection wells for the purpose of improving groundwater quality at a voluntary cleanup site. The UIC registration form will be completed, and required supporting documentation will be submitted to Ecology for review and approval before the injections are conducted.

ISCO EVENT(S)

Groundwater treatment will consist of injecting the $NaMnO_4$ solution into monitoring wells MW-2 and MW-5 to treat the groundwater-bearing zone between approximately 80 and 115 feet bgs within an estimated radius of 10 to 15 feet from the monitoring wells. This treatment zone represents the approximate volume of soil accessible for infiltration by the $NaMnO_4$ solution proximate to the screen intervals of the monitoring wells. One injection event will be conducted, followed by several months of performance groundwater monitoring to assess the effectiveness of the $NaMnO_4$ in decreasing concentrations of PCE. A second injection event may be conducted if PCE concentrations in groundwater have not decreased to the MTCA Method A cleanup level.

A sufficient mass of $NaMnO_4$ will be injected to oxidize and degrade the PCE, which has been detected at concentrations ranging between approximately 60 and 370 micrograms per liter in groundwater samples collected from monitoring wells MW-2 and MW-5 beginning in March 2010 (Figure 4). Approximately 10,000 gallons of 5 percent $NaMnO_4$ solution will be injected into the monitoring wells. These volumes were calculated assuming a 25 percent soil porosity in the treatment zone, as represented by a 10- to 15-foot horizontal radius and a vertical thickness of up to 25 feet around the two wells. The $NaMnO_4$ will be injected using low pressure to provide an anticipated injection rate of between approximately 8 and 10 gallons per minute for each well.

Hepure Technologies of Flemington, New Jersey will provide the $NaMnO_4$ product as a 40 percent remediation-grade solution. The $NaMnO_4$ product is designed specifically for in-situ treatment of groundwater, and contains very low quantities of impurities relative to permanganate products used in industrial applications. Hepure Technologies has extensive experience supplying oxidants for groundwater treatment uses.

The $NaMnO_4$ product will be diluted with clean water to a concentration of approximately 5 percent, and will be injected into the wells by a Farallon subcontractor with specialized experience and equipment for handling and injecting permanganate solutions. The $NaMnO_4$ product will be shipped directly to the subcontractor, and will be present on the Property for only the time required to complete the injection. Neutralization solutions, temporary containment measures, and absorbents will be used to mitigate potential oxidant spills. The injection plan

provides for injecting all available $NaMnO_4$ solution into the injection wells. However, if a small volume of solution remains following the injection event, it will be neutralized with an antioxidant, and disposed of in accordance with applicable regulations.

Slow-release permanganate candles may be deployed in monitoring well MW-7 to address the intermittent detections of PCE at concentrations exceeding the MTCA Method A cleanup level. The permanganate candles consist of potassium permanganate particles encapsulated in paraffin wax and formed into rods or cylinders that will be suspended within the submerged and screened portion of the monitoring well. The permanganate candles deliver slow and sustained releases of permanganate to the surrounding formation via advection and diffusion. A small in-well circulation pump will be used to enhance permanganate distribution and facilitate oxidation of residual PCE in groundwater and soil proximate to the well.

Permanganate candles will be considered for use in monitoring wells MW-2 and MW-5 if additional reduction of PCE concentrations is needed following completion of the $NaMnO_4$ injections.

PERFORMANCE GROUNDWATER MONITORING

Performance groundwater monitoring will be conducted following completion of each injection event to assess the effectiveness of the $NaMnO_4$ in oxidizing the PCE in groundwater. To assess the distribution and persistence of $NaMnO_4$ in groundwater, groundwater samples will be examined in the field for the visual presence of $NaMnO_4$ as purple to pink water coloration. Spent permanganate commonly will impart a yellowish or brownish tone to groundwater, which may be noticeable in groundwater proximate to the injection wells. Field colorimetric analysis also will be conducted to evaluate potential increases in manganese concentrations exceeding the background level. Background manganese concentrations previously were established for monitoring wells MW-5 and MW-9 through MW-13. The groundwater samples will be collected from injection wells MW-2 and MW-5; from adjacent monitoring well MW-11; and from down-gradient monitoring wells MW-9, MW-10, and MW-12 at weekly intervals for 2 weeks, and then monthly for up to 3 months. Groundwater levels will be measured and the groundwater parameters dissolved oxygen, oxidation-reduction potential, pH, temperature, and specific conductance will be monitored at each well during the performance groundwater monitoring events. During the initial 2 weeks of performance groundwater monitoring, groundwater samples from monitoring well MW-13 also will be visually examined to confirm that $NaMnO_4$ in groundwater does not extend southwest of the injection area.

Following confirmation of the effective depletion of $NaMnO_4$ from monitoring wells MW-2 and MW-5, groundwater samples will be collected from the designated monitoring wells monthly for up to 3 months, and submitted for laboratory analysis for PCE and its degradation products (trichloroethene, cis-1,2-dichloroethene, trans-1,2-dichlorethene, and vinyl chloride) by U.S. Environmental Protection Agency Method 8260B.

If PCE continues to be detected at concentrations exceeding the MTCA Method A cleanup level in groundwater samples collected from monitoring wells MW-2 and MW-5 at the conclusion of

performance groundwater monitoring for the first $NaMnO_4$ injection event, a second $NaMnO_4$ injection event may be conducted, and the performance groundwater monitoring process will be repeated. Quarterly confirmational groundwater monitoring will be implemented when PCE concentrations in groundwater samples collected from monitoring wells MW-2 and MW-5 have decreased to less than the MTCA Method A cleanup level.

DATA EVALUATION AND REPORTING

Data collected during the $NaMnO_4$ injection and performance groundwater monitoring events will be evaluated and reported in the annual cleanup action progress report for the Property.

Farallon trusts that this technical memorandum provides sufficient information for your needs. Please contact Peter Jewett or Donald Lance at (425) 295-0800 if you have questions or require additional information.

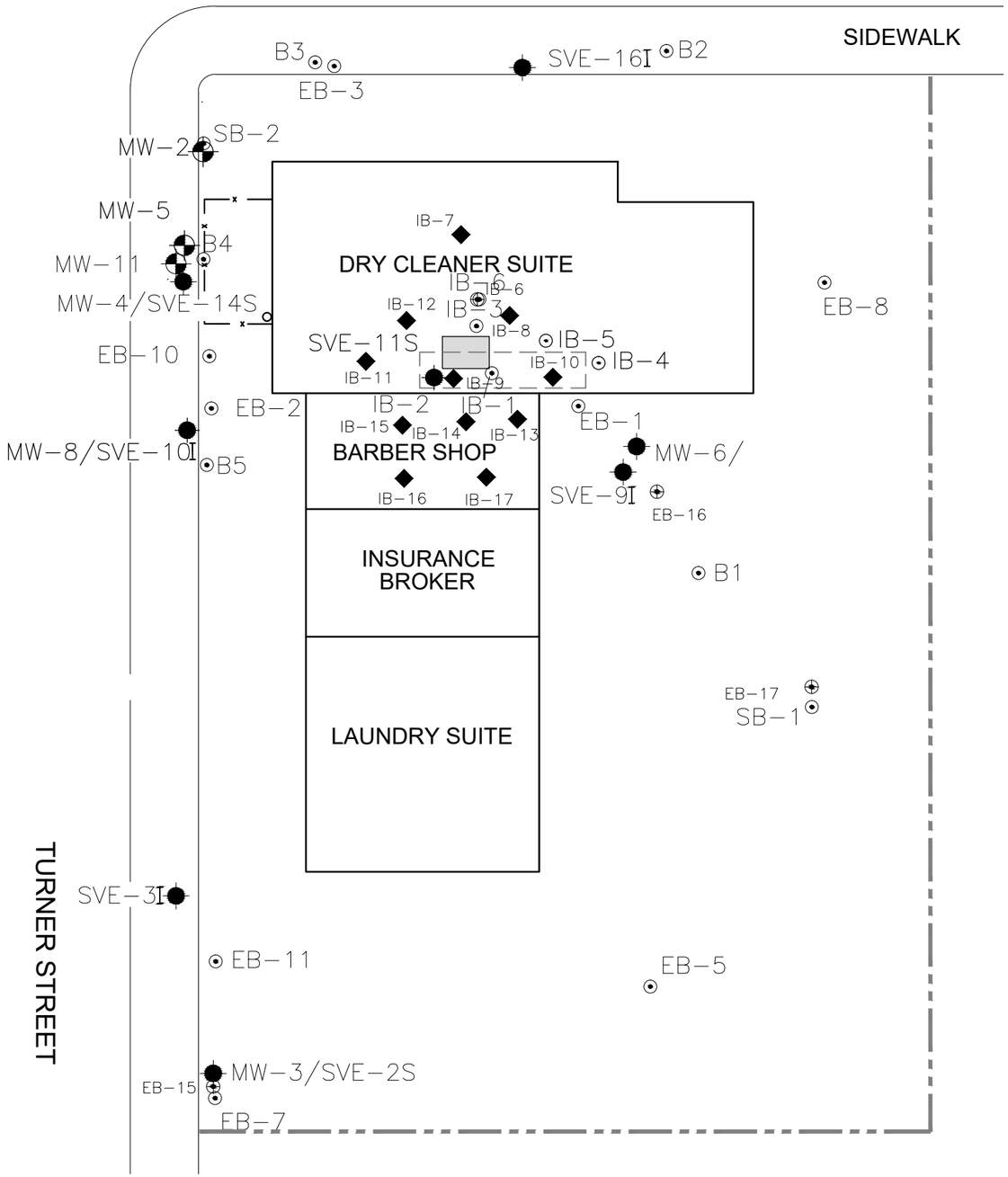
Attachments: Figure 1, *Property Plan (Pre-2013)*
Figure 2, *Property Plan Showing Soil Analytical Results*
Figure 3, *Interior Boring Locations and Soil Analytical Results*
Figure 4, *Property Plan Showing Groundwater Analytical Results*
Attachment A, Boring Logs

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FIGURES

IN-SITU CHEMICAL OXIDATION
REMEDIATION OF TETRACHLOROETHENE IN GROUNDWATER
Allison's Norge Village
120 Northeast Turner Street,
Olympia, Washington

Farallon PN: 663-010



LEGEND

- SOIL BORING LOCATION (SEPTEMBER 2012)
- SOIL BORING LOCATION (AUGUST 2011)
- MW-7 GROUNDWATER MONITORING WELL
- SVE-14 SOIL VAPOR EXTRACTION WELL
  - S INDICATES SHALLOW ZONE
  - I INDICATES INTERMEDIATE ZONE
- SOIL BORING LOCATION (PRE-2011)
- FORMER DRY CLEANING MACHINE
- FORMER COIN-OPERATED DRY CLEANING MACHINES
- SVE SOIL VAPOR EXTRACTION

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

N

0 20

APPROXIMATE SCALE IN FEET

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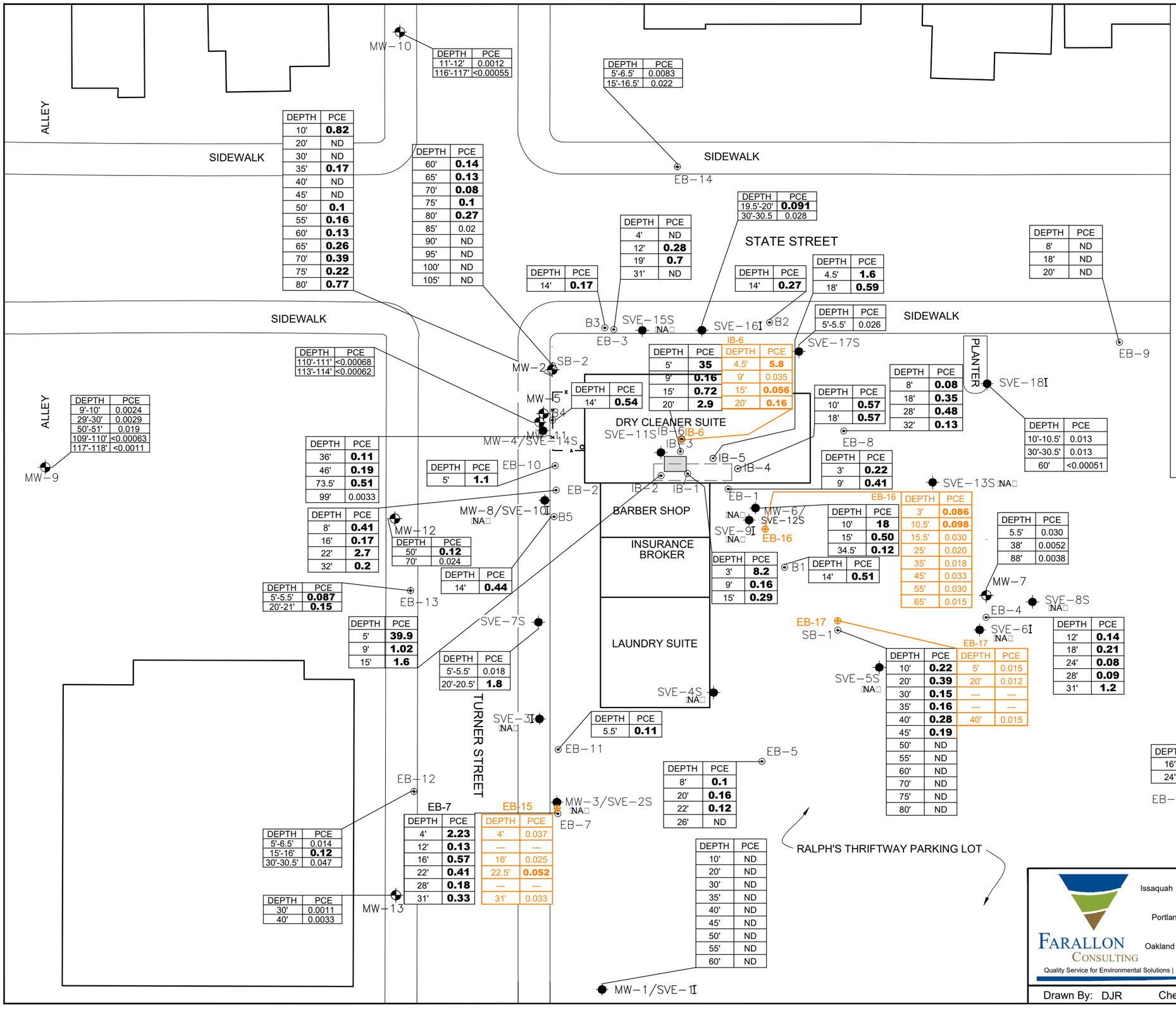
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FIGURE 1

PROPERTY PLAN (PRE-2013)
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DJR Checked By: DML Date: 9/28/2016 Disk Reference: 663-010a.dwg



DEPTH	PCE
11'-12'	0.0012
116'-117'	<0.00055

DEPTH	PCE
5'-6.5'	0.0083
15'-16.5'	0.022

DEPTH	PCE
10'	**0.82**
20'	ND
30'	ND
35'	**0.17**
40'	ND
45'	ND
50'	**0.1**
55'	**0.16**
60'	**0.13**
65'	**0.26**
70'	**0.39**
75'	**0.22**
80'	**0.77**

DEPTH	PCE
60'	**0.14**
65'	**0.13**
70'	**0.08**
75'	**0.1**
80'	**0.27**
85'	0.02
90'	ND
95'	ND
100'	ND
105'	ND

DEPTH	PCE
19.5'-20'	**0.091**
30'-30.5	0.028

DEPTH	PCE
4'	ND
12'	**0.28**
19'	**0.7**
31'	ND

DEPTH	PCE
14'	**0.17**

DEPTH	PCE
14'	**0.27**

DEPTH	PCE
4.5'	**1.6**
18'	**0.59**

DEPTH	PCE
8'	ND
18'	ND
20'	ND

DEPTH	PCE
5'-5.5'	0.026

DEPTH	PCE
110'-111'	<0.00068
113'-114'	<0.00062

DEPTH	PCE
5'	**35**
9'	**0.16**
15'	**0.72**
20'	**2.9**

DEPTH	PCE
4.5'	**5.8**
9'	0.035
15'	**0.056**
20'	**0.16**

DEPTH	PCE
14'	**0.54**

DEPTH	PCE
10'	**0.57**
18'	**0.57**

DEPTH	PCE
8'	**0.08**
18'	**0.35**
28'	**0.48**
32'	**0.13**

DEPTH	PCE
10'-10.5'	0.013
30'-30.5'	0.013
60'	<0.00051

DEPTH	PCE
9'-10'	0.0024
29'-30'	0.0029
50'-51'	0.019
109'-110'	<0.00063
117'-118'	<0.0011

DEPTH	PCE
36'	**0.11**
46'	**0.19**
73.5'	**0.51**
99'	0.0033

DEPTH	PCE
5'	**1.1**

DEPTH	PCE
3'	**0.22**
9'	**0.41**

DEPTH	PCE
8'	**0.41**
16'	**0.17**
22'	**2.7**
32'	**0.2**

DEPTH	PCE
50'	**0.12**
70'	0.024

DEPTH	PCE
14'	**0.44**

DEPTH	PCE
3'	**8.2**
9'	**0.16**
15'	**0.29**

DEPTH	PCE
14'	**0.51**

DEPTH	PCE
3'	**0.086**
10.5'	**0.098**
15.5'	0.030
25'	0.020
35'	0.018
45'	0.033
55'	0.030
65'	0.015

DEPTH	PCE
10'	**18**
15'	**0.50**
34.5'	**0.12**

DEPTH	PCE
5.5'	0.030
38'	0.0052
88'	0.0038

DEPTH	PCE
5'-5.5'	**0.087**
20'-21'	**0.15**

DEPTH	PCE
5'	**39.9**
9'	**1.02**
15'	**1.6**

DEPTH	PCE
5'-5.5'	0.018
20'-20.5'	**1.8**

DEPTH	PCE
5.5'	**0.11**

DEPTH	PCE
8'	**0.1**
20'	**0.16**
22'	**0.12**
26'	ND

DEPTH	PCE
10'	ND
20'	ND
30'	ND
35'	ND
40'	ND
45'	ND
50'	ND
55'	ND
60'	ND

DEPTH	PCE
10'	**0.22**
20'	**0.39**
30'	**0.15**
35'	**0.16**
40'	**0.28**
45'	**0.19**
50'	ND
55'	ND
60'	ND
70'	ND
75'	ND
80'	ND

DEPTH	PCE
5'	0.015
20'	0.012
---	---
---	---
40'	0.015

DEPTH	PCE
12'	**0.14**
18'	**0.21**
24'	**0.08**
28'	**0.09**
31'	**1.2**

DEPTH	PCE
5'-6.5'	0.014
15'-16'	**0.12**
30'-30.5'	0.047

DEPTH	PCE
30'	0.0011
40'	0.0033

DEPTH	PCE
4'	**2.23**
12'	**0.13**
16'	**0.57**
22'	**0.41**
28'	**0.18**
31'	**0.33**

DEPTH	PCE
4'	0.037
---	---
16'	0.025
22.5'	**0.052**
---	---
31'	0.033

DEPTH	PCE
16'	ND
24'	ND

LEGEND

- MW-7 — GROUNDWATER MONITORING WELL
- SVE-14 — SOIL VAPOR EXTRACTION WELL
  - S INDICATES SHALLOW ZONE
  - I INDICATES INTERMEDIATE ZONE
- SOIL BORING LOCATION
- DRY CLEANING MACHINE
- FORMER COIN-OPERATED DRY CLEANING AREA
- SVE — SOIL VAPOR EXTRACTION

ALL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)
DEPTH IN FEET BELOW GROUND SURFACE
PCE = TETRACHLOROETHENE
BOLD = DENOTES CONCENTRATIONS EXCEEDING THE MODEL TOXICS CONTROL ACT CLEANUP REGULATION (MTCA) METHOD A SOIL CLEANUP LEVEL (0.05 mg/kg)
ND = NOT DETECTED AT OR EXCEEDING THE LABORATORY PQL
NA = NOT ANALYZED
--- = NOT SAMPLED

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE
2. SOURCE MAP: G-LOGICS, INC.

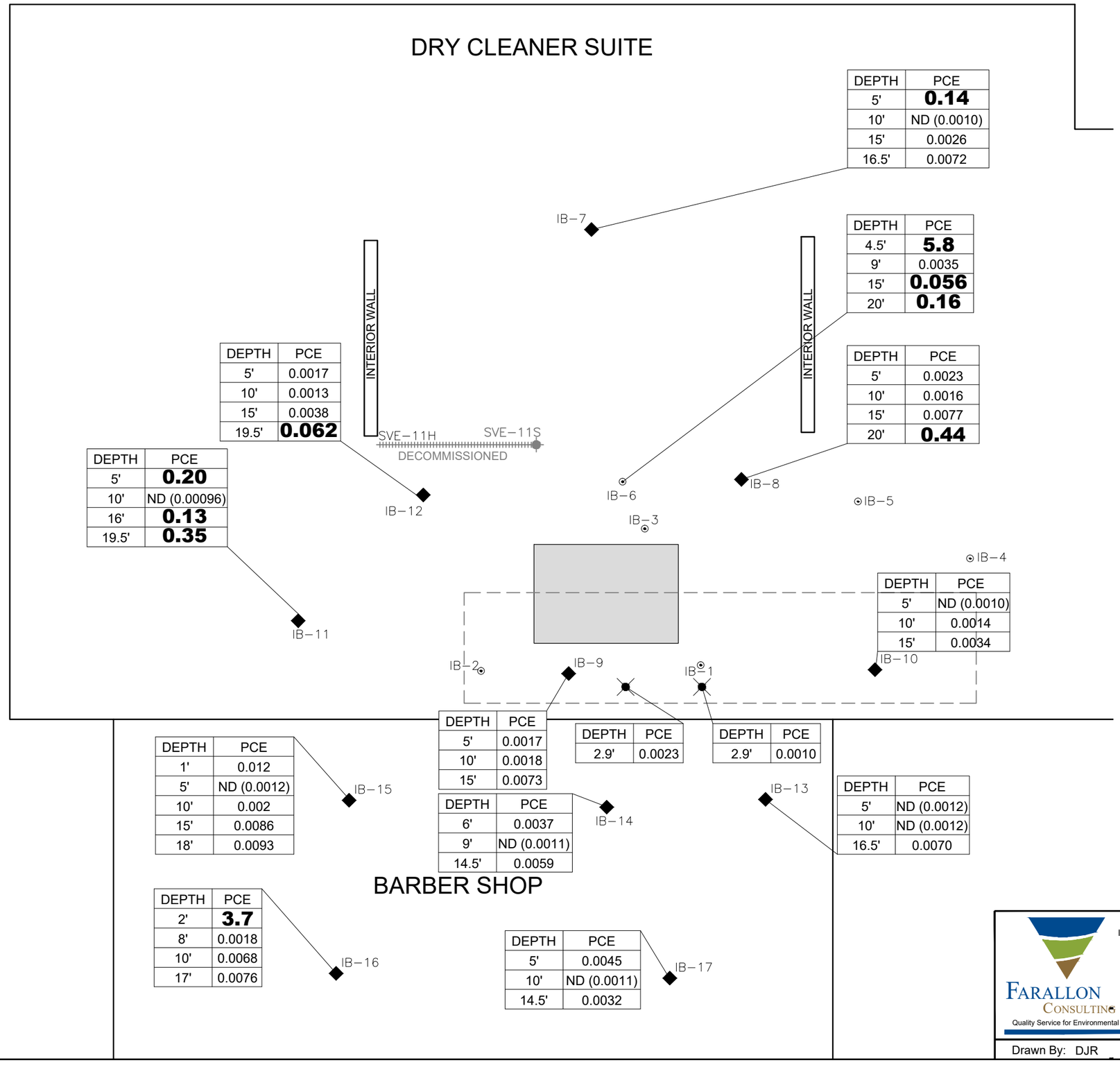
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FIGURE 2

PROPERTY PLAN SHOWING
SOIL ANALYTICAL RESULTS
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DJR | Checked By: DLM | Date: 9/28/2016 | Disk Reference: 663-010_isco.dwg



DEPTH	PCE
5'	**0.14**
10'	ND (0.0010)
15'	0.0026
16.5'	0.0072

DEPTH	PCE
4.5'	**5.8**
9'	0.0035
15'	**0.056**
20'	**0.16**

DEPTH	PCE
5'	0.0017
10'	0.0013
15'	0.0038
19.5'	**0.062**

DEPTH	PCE
5'	0.0023
10'	0.0016
15'	0.0077
20'	**0.44**

DEPTH	PCE
5'	**0.20**
10'	ND (0.00096)
16'	**0.13**
19.5'	**0.35**

DEPTH	PCE
5'	ND (0.0010)
10'	0.0014
15'	0.0034

DEPTH	PCE
5'	0.0017
10'	0.0018
15'	0.0073

DEPTH	PCE
2.9'	0.0023

DEPTH	PCE
2.9'	0.0010

DEPTH	PCE
1'	0.012
5'	ND (0.0012)
10'	0.002
15'	0.0086
18'	0.0093

DEPTH	PCE
6'	0.0037
9'	ND (0.0011)
14.5'	0.0059

DEPTH	PCE
5'	ND (0.0012)
10'	ND (0.0012)
16.5'	0.0070

DEPTH	PCE
2'	**3.7**
8'	0.0018
10'	0.0068
17'	0.0076

DEPTH	PCE
5'	0.0045
10'	ND (0.0011)
14.5'	0.0032

LEGEND

IB-7 — INTERIOR BORING LOCATION (SEPTEMBER 2012)

SVE-11 — SOIL VAPOR EXTRACTION WELL
S INDICATES SHALLOW ZONE
H INDICATES HORIZONTAL WELL

IB-1 — INTERIOR BORING LOCATION (PRE-2011)

GRAB SAMPLE LOCATION

FORMER DRY CLEANING MACHINE

FORMER COIN-OPERATED DRY CLEANING AREA

ALL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)

PCE = TETRACHLOROETHENE

BOLD = DENOTES PCE CONCENTRATIONS EXCEEDING THE MODEL TOXICS CONTROL ACT CLEANUP REGULATION METHOD A SOIL CLEANUP LEVEL (0.05 mg/kg)

ND = NOT DETECTED AT OR EXCEEDING THE LABORATORY PQL (PROVIDED IN PARENTHESES)

NOTE:

1. ALL LOCATIONS ARE APPROXIMATE

0 5

APPROXIMATE SCALE IN FEET

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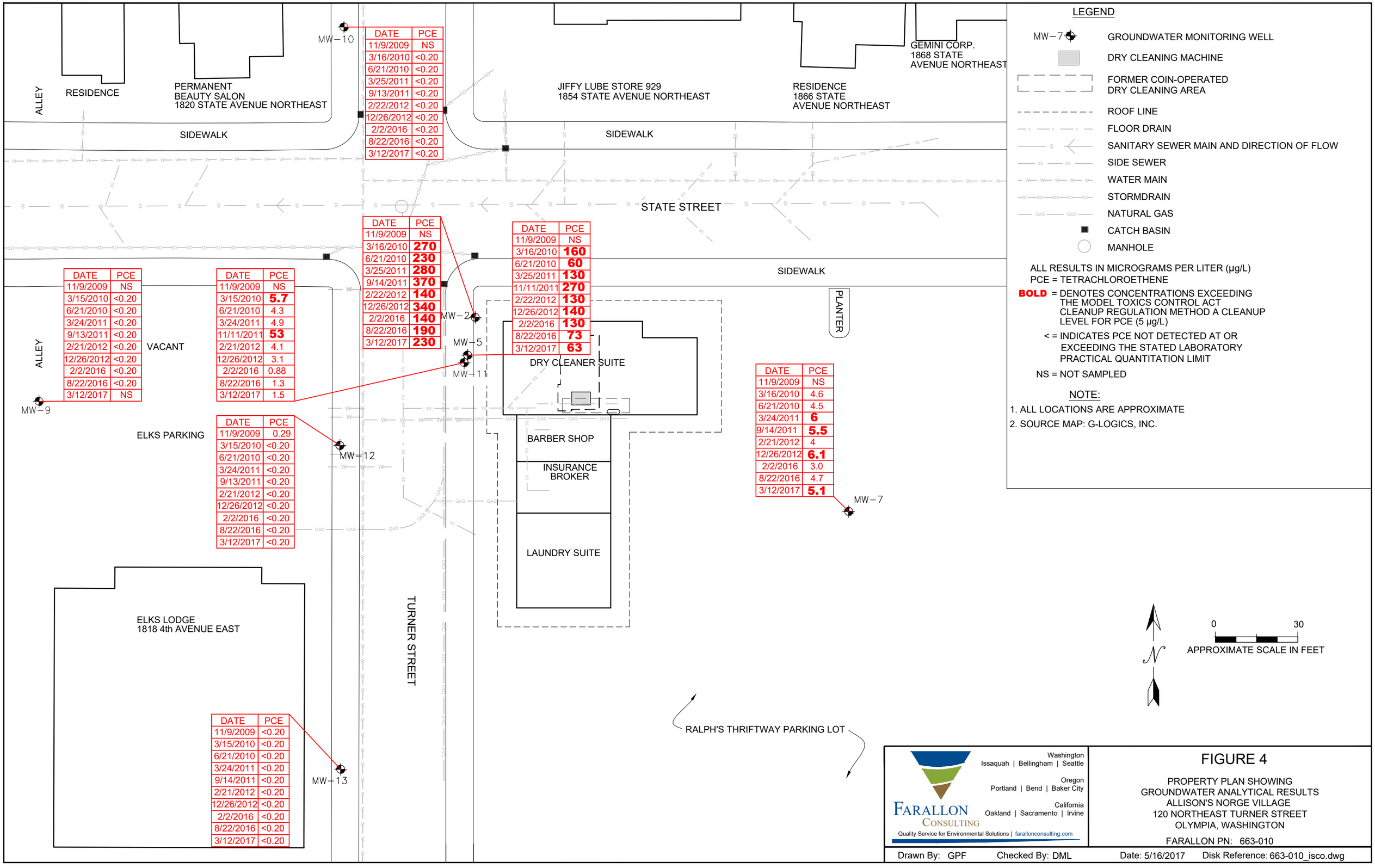
California
Oakland | Sacramento | Irvine

FIGURE 3

INTERIOR BORING LOCATIONS
AND SOIL ANALYTICAL RESULTS
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: DJR Checked By: DLM Date: 9/28/2016 Disk Reference: 663-010_isco.dwg



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FIGURE 4

PROPERTY PLAN SHOWING
GROUNDWATER ANALYTICAL RESULTS
ALLISON'S NORGE VILLAGE
120 NORTHEAST TURNER STREET
OLYMPIA, WASHINGTON

FARALLON PN: 663-010

Drawn By: GPF Checked By: DML Date: 5/16/2017 Disk Reference: 663-010_isco.dwg

ATTACHMENT A
BORING LOGS

IN-SITU CHEMICAL OXIDATION
REMEDIATION OF TETRACHLOROETHENE IN GROUNDWATER
Allison's Norge Village
120 Northeast Turner Street,
Olympia, Washington

Farallon PN: 663-010

01-0161-c-mw2_pg1.vsd

Depth in feet	BLOWS/6 inches	INTERVAL	SAMPLE NUMBER	SOIL DESCRIPTION	Recovery %	USCS	PID (ppmv in headspace)	WELL CONSTRUCTION
0				Surface: Asphalt Asphalt pavement (two inches) and subbase gravel.		ML		8" Boring Well Box Well Cap Concrete Seal 2" PVC Blank Bentonite Seal
5								
10								
15								
20								
25								
30								

Drilling Method: Hollow Auger	**Date:** 8-22-2001	**Other Information:** This boring was located 4 ft. from SB-2. Drilled down to 60 ft. before sampling. See SB-2 log for soils information.
Drilling Company: Cascade Drilling	**Weather:** Rain	
Boring Diameter: Eight inches	**Page** 1 of 4	
Logged By: Rob Yates		

g-logics

Boring/Well Log
Eastside Laundry
116 North Turner St.
Olympia, Washington

MW-2

01-0161-c-mw2_pg2.vsd

Depth in feet	BLOWS/6 inches	INTERVAL	SAMPLE NUMBER	SOIL DESCRIPTION	Recovery %	USCS	PID (ppmv in headspace)	WELL CONSTRUCTION
30								8" Boring
35								Bentonite Seal; 2" PVC Blank
40								
45								
50								Grout
55								
60								

Drilling Method: Hollow Auger	Date: 8-22-2001	Other Information:
Drilling Company: Cascade Drilling	Weather: Rain	See page 1.
Boring Diameter: Eight inches	Page 2 of 4	
Logged By: Rob Yates		

g-logics

Boring/Well Log
Eastside Laundry
116 North Turner St.
Olympia, Washington

MW-2

01-0161-c-mw2_pg3.vsd

Depth in feet	BLOWS/6 inches	INTERVAL	SAMPLE NUMBER	SOIL DESCRIPTION	Recovery %	USCS	PID (ppmv in headspace)	WELL CONSTRUCTION
60	50 for 6		- 60	Clayey Gravel, olive-brown, wet, very dense, little to no silty sand.	30	GC		8" Boring
65	50 for 6		- 65	Same	40			2" PVC Blank
70	50 for 6		- 70	Silty sandy gravel with clay, olive-brown, moist, very dense	40	GM		Grout
75	50 for 6		- 75	Same	75			Bentonite Seal
80	26/ 50 for 6		- 80	Fine to medium silty sand, brown, moist, very dense Silty sandy gravel, olive-brown, moist, very dense	50	SP GM		2" PVC Screen
85	45/ 50 for 6		- 85	Same sandy gravel, wet, very dense encountered groundwater at 86ft.	75	GW		
90								

Drilling Method:	Hollow Auger	**Date:**	8-22-2001
Drilling Company:	Cascade Drilling	**Weather:**	Rain
Boring Diameter:	Eight inches	**Page**	3 of 4
Logged By:	Rob Yates		

Other Information:

Stopped drilling for 15 minutes at 70 ft. to check for potential groundwater; no water present in open boring. Repeated process at 80 ft., same result.

g-logics

Boring/Well Log
Eastside Laundry
116 North Turner St.
Olympia, Washington

MW-2

01-0161-c-mw2_pg4.vsd

Depth in feet	BLOWS/6 inches	INTERVAL	SAMPLE NUMBER	SOIL DESCRIPTION	Recovery %	USCS	PID (ppmv in headspace)	WELL CONSTRUCTION
90	50 for 6		- 90	Well-graded medium to coarse gravel, wet, very dense, little to no fine sands	100	GW		8" Boring; Sand
95	50 for 6		- 95	Same	50			2" PVC Screen
100	38/ 50 for 6		- 100	Same	75			
105	18 26 48		- 105	Poorly graded fine sandy silt, gray, moist, very dense Stopped drilling at 105ft.	100	ML		

Drilling Method: Hollow Auger	Date: 8-22-2001	Other Information: Bentonite used from 47 ft. to 75 ft. (30% solids, per manufacturing specification)
Drilling Company: Cascade Drilling	Weather: Rain	
Boring Diameter: Eight inches	Page 4 of 4	
Logged By: Rob Yates		

g-logics

Boring/Well Log
Eastside Laundry
116 North Turner St.
Olympia, Washington

MW-2

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-5

Client: Wilbur Allison
Project: Allison's Norge Village
Location: Olympia, Washington

Farallon PN: 663-010

Logged By: Greg Lish

Date/Time Started:	12/9/04 0825	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	12/10/04 1450	**Drive Hammer (lbs.):**	300
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	100.0
Drilling Foreman:	Steve Choate	**Total Well Depth (ft bgs):**	100
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Boring/Well Construction Details
0		No samples collected from 0-20' below ground surface. See EB-10 boring log for lithology.						Cap; Concrete
5								
10								Bentonite Chips
15								Blank Casing
20		Poorly-graded SAND (95% sand, 5% silt), fine sand, light grey-brown, medium dense, moist, no odor.	SP	95	14-17 -24	66.5	MW5-21	
		SILT (100%), light brown with red-brown mottling, hard, moist, no odor.	ML GM	60	37- 50/3"	110		
		Silty GRAVEL with sand (50% gravel, 30% silt, 20% sand), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.		40	50/6"	92.3		
25								

Well Construction Information

Monument Type:	Flush-Mount	**Filter Pack:**	#2/12 medium sand	**Ground Surface Elevation (ft):**	200.12
Casing Diameter (inches):	2	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	199.77
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite Chips	**Boring Abandonment:**	NA
Screened Interval (ft bgs):	85-100			**Surveyed Location:** X: NA	Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-5

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
25		Silty GRAVEL with sand (50% gravel, 30% silt, 20% sand), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor, cobbles.	GM		20	50/6"	99.1			
		Poorly-graded SAND with gravel (55% sand, 40% gravel, 5% silt), fine to coarse sand, fine to coarse gravel, brown, very dense, moist, no odor.	SP		35	50/6"	84.6			
		Silty GRAVEL with sand (55% gravel, 25% silt, 20% sand), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.	GM		50	32-50/6"	102			
30		Silty GRAVEL with sand (60% gravel, 20% sand, 20% silt), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.	GM		10	50/6"	106			Bentonite Chips
		Silty GRAVEL with sand (45% gravel, 35% silt, 20% sand), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.	GM		20	65/6"	86.5			
		Silty GRAVEL with sand (50% gravel, 25% sand, 25% silt), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.	GM		25	50/6"	63.3			
35		Poorly-graded SAND with gravel (70% sand, 25% gravel, 5% silt), fine sand, coarse gravel, brown, very dense, moist, no odor.	SP		30	55/6"	79.5			Blank Casing
		Sandy SILT with gravel (40% silt, 30% gravel, 30% sand), fine to coarse gravel, fine to medium sand, light brown, hard, moist, no odor.	ML / GP		20	60/6"	64.4	MW5-36		
		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.	GM		20	55/6"	36.3			
40		Silty GRAVEL with sand (60% gravel, 20% sand, 20% silt), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.	SM		20	38-50/6"	31.2			
		Silty SAND with gravel (50% sand, 30% gravel, 20% silt), fine to coarse sand, fine gravel, brown, very dense, moist, no odor.	SP		5	50/6"	33.1			
		No recovery.			0	60/6"				
		Poorly-graded SAND with gravel (85% sand, 15% gravel), fine to medium sand, fine gravel, dark brown, very dense, moist, no odor, broken cobble in sampler.	SP		30	50/6"	25.6	MW5-43		
45		Poorly-graded GRAVEL with silt and sand (50% gravel, 40% sand, 10% silt), fine to coarse gravel, medium to coarse sand, light brown, very dense, wet, no odor.	GP-GM		35	60/6"	8.1			
		Silty GRAVEL with sand (70% gravel, 15% silt, 15% sand), fine to coarse gravel, brown, very dense, wet, no odor, cobbles.	GM		35	50/6"	8.8	MW5-46		
50					35	50/6"	8.4			
					25	50/6"	8.4			
					30	50/6"	9.3			Bentonite Chips
		Poorly-graded GRAVEL with silt and sand (50% gravel, 40% sand, 10% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, wet, no odor.	GP-GM		35	70/6"	9.9			
					35	60/6"	9.3			
55		Silty GRAVEL with sand (45% gravel, 35% sand, 20% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, wet, no	GM		40	50/6"	9.8			Blank

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 85-100

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips

Ground Surface Elevation (ft): 200.12
Top of Casing Elevation (ft): 199.77
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-5

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
	odor.							Casing
	No recovery, broken cobble in sampler.		5	70/6"	8.7			
	Poorly-graded GRAVEL with silt and sand (50% gravel, 40% sand, 10% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, wet, no odor.	GP-GM	15	50/6"	8.7			
60	Silty GRAVEL with sand (45% gravel, 35% sand, 20% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, wet, no odor.	GM	15	50/6"	7.4			
	Poorly-graded GRAVEL with silt and sand (50% gravel, 40% sand, 10% silt), fine to coarse gravel, medium to coarse sand,brown, very dense, wet, no odor.	GP-GM	25	50/6"	7.3			
	Silty GRAVEL with sand (45% gravel, 35% sand, 20% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, wet, no odor.	GM	30	60/6"	8.7			
65	No recovery, broken cobble in sampler.		5	50/6"	8.3			
	Poorly-graded GRAVEL with silt and sand (50% gravel, 40% sand, 10% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, wet, no odor, cobbles.	GP-GM	10	50/6"				
			15	50/6"	42.6			
			15	50/6"	45.2			
70			15	50/6"	34.3			Bentonite Chips
	Poorly-graded GRAVEL with sand (50% gravel, 45% sand, 5% silt), fine to coarse gravel, fine to medium sand, brown, very dense, moist, no odor.	GP	15	70/6"	133			
	Poorly-graded SAND with gravel (70% sand, 25% gravel, 5% silt), fine to medium sand, fine gravel, brown, very dense, moist, no odor.	SP	45	50/6"	101	MW5-73.5		
75	Poorly-graded GRAVEL with sand (70% gravel, 25% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.	GP	15	50/6"	9.4			Blank Casing
	76.0-79.0 GRAVEL with sand, minor silt (70% fine ot coarse gravel, 20% medium to coarse sand, 10% silt), brown, very dense, wet, no odor.	GP-GM	40	60/6"	10.7			
				70/6"	7.9			
	79.0-80.5 SAND (100% fine sand), brown, very dense, wet, no odor.	SP		38-50/6"	12.9	MW5-79		
80	80.5-82.0 SAND, trace gravel, trace silt (95% fine sand, <5% fine gravel, <5% silt), brown, very dense, moist, no odor.	SP	80	50/6"	12.2			Bentonite Chips
	82.0-82.5 Gravelly SAND, trace silt (55% fine sand, 40% fine to coarse grave, 5% silt), brown, very dense, moist, no odor.	SP	40	55/6"	11.9			Blank Casing
	82.5-83.5 Contact with GRAVEL, minor sand, minor silt (75% fine to coarse gravel, 15% fine to coarse sand, 10% silt), olive brown, very dense, moist, no odor.	GP-GM	15	60/6"	11.8			
85	83.5-86.5 GRAVEL with sand, minor silt (70% fine to coarse gravel,	GP-GM	25	50/6"	11.3			

Well Construction Information

Monument Type:	Flush-Mount	**Filter Pack:**	#2/12 medium sand	**Ground Surface Elevation (ft):**	200.12
Casing Diameter (inches):	2	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	199.77
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite Chips	**Boring Abandonment:**	NA
Screened Interval (ft bgs):	85-100			**Surveyed Location:** X: NA	Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-5

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
90		20% fine to coarse sand, 10% silt), olive brown, very dense, moist, no odor.	GW		30	55/6"	12.0			
		86.5-88.0 GRAVEL with sand, trace silt (75% fine to coarse gravel, 20% medium to coarse sand, 5% silt), brown, very dense, wet, no odor.	GW		25	50/6"	12.5			
		88.0-91.0 GRAVEL, minor sand, trace silt (90% fine to coarse gravel, 10% coarse sand, <5% silt), brown, very dense, wet, no odor.			35	50/6"	12.8			Screen
		91.0-92.5 GRAVEL with sand, trace silt (75% fine to coarse gravel, 20% medium to coarse sand, 5% silt), brown, very dense, wet, no odor.	GW		40	50/6"	10.7			
		92.5-100.0 GRAVEL, minor sand, trace silt (85% fine to coarse gravel, 15% medium to coarse sand, <5% silt), brown, very dense, wet, no odor.	GW		25	50/6"	11.7			
95					20	50/6"	10.6			Sand Pack
					30	50/6"	10.4			
					30	50/6"	10.7			
100					30	50/6"	11.0	MW5-99		

Well Construction Information

Monument Type:	Flush-Mount	**Filter Pack:**	#2/12 medium sand
Casing Diameter (inches):	2	**Surface Seal:**	Concrete
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite Chips
Screened Interval (ft bgs):	85-100		

Ground Surface Elevation (ft): 200.12
Top of Casing Elevation (ft): 199.77
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

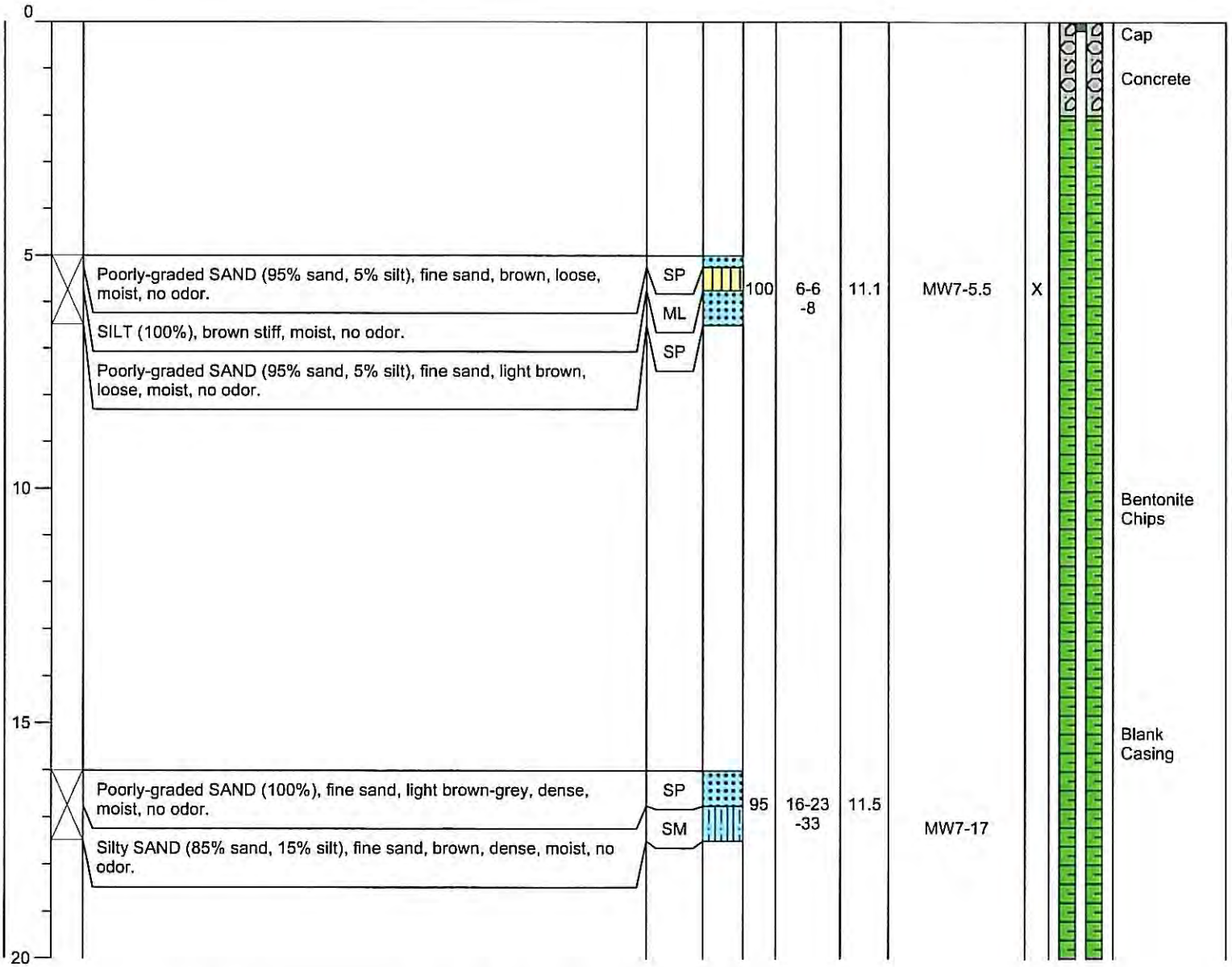
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-7

Client: Wilbur Allison
Project: Allison's Norge Village
Location: Olympia, Washington
Farallon PN: 663-010
Logged By: Greg Lish

Date/Time Started:	12/13/04 0815	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	12/14/04 1151	**Drive Hammer (lbs.):**	300
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	100.5
Drilling Foreman:	Steve Choate	**Total Well Depth (ft bgs):**	100
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
5		Poorly-graded SAND (95% sand, 5% silt), fine sand, brown, loose, moist, no odor.	SP		100	6-6 -8	11.1	MW7-5.5	X	
		SILT (100%), brown stiff, moist, no odor.	ML							
		Poorly-graded SAND (95% sand, 5% silt), fine sand, light brown, loose, moist, no odor.	SP							
15		Poorly-graded SAND (100%), fine sand, light brown-grey, dense, moist, no odor.	SP		95	16-23 -33	11.5	MW7-17		
		Silty SAND (85% sand, 15% silt), fine sand, brown, dense, moist, no odor.	SM							



Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 85-100
Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips
Ground Surface Elevation (ft): 202.26
Top of Casing Elevation (ft): 201.88
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-7

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
30		Poorly-graded GRAVEL with sand (55% gravel, 40% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.	GP		20	32-50/6"	10.0			Bentonite Chips
		Silty GRAVEL with sand (65% gravel, 20% silt, 15% sand), fine to coarse gravel, fine sand, brown, very dense, moist, no odor.	GM							
		Silty GRAVEL with sand (65% gravel, 20% silt, 15% sand), fine to coarse gravel, fine to coarse sand, brown, very dense, moist, no odor.	GM		15	50/6"	6.3			
35		No recovery.			0	50/6"	-			Blank Casing
		Silty GRAVEL with sand (50% gravel, 30% sand, 20% silt), fine to coarse gravel, fine to medium sand, brown with light brown mottling, very dense, wet, no odor.	GM		20	55/6"	3.5	MW7-38	X	
40		Silty GRAVEL with sand (70% gravel, 15% fsand, 15% silt), fine to coarse gravel, fine to coarse sand, light brown, very dense, moist, no odor.	GM		25	50/6"	4.3			
		Silty GRAVEL with sand (50% gravel, 25% silt, 25% sand), fine to coarse gravel, fine to coarse sand, brown, very dense, wet, no odor, cobbles.	GM		40	60/6"	5.3			

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 85-100

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips

Ground Surface Elevation (ft): 202.26
Top of Casing Elevation (ft): 201.88
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

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975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-7

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
45		Silty GRAVEL with sand (50% gravel, 25% silt, 25% sand), fine to coarse gravel, fine to coarse sand, brown, very dense, wet, no odor, cobbles.	GM		30	50/6"	5.2			
		Poorly-graded GRAVEL with silt and sand (70% gravel, 20% sand, 10% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, wet, no odor.	GP-GM		40	50/6"	4.5			
50		Silty GRAVEL with sand (65% gravel, 20% sand, 15% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, wet, no odor.	GM		35	50/6"	5.3			Bentonite Chips
		Poorly-graded SAND with silt and gravel (50% sand, 40% gravel, 10% silt), medium to coarse sand, fine to coarse gravel, brown, very dense, moist, no odor.	SP-SM		25	50/6"	5.5			
55		Poorly-graded GRAVEL with silt and sand (50% gravel, 40% sand, 10% silt), coarse gravel, fine to medium sand, brown, very dense, wet, no odor.	GP-GM		5	50/6"	5.8			Blank Casing
		Poorly-graded SAND with silt and gravel (55% sand, 35% gravel, 10% silt), medium to coarse sand, fine gravel, brown, very dense, moist, no odor, broken cobble in sampler.	SP-SM		20	60/6"	6.0			
60		No recovery.			0	60/6"	-			
		No recovery, cobble stuck in shoe of sampler.			0	60/6"	-			
65		Poorly-graded GRAVEL with silt and sand (60% gravel, 30% sand, 10% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, moist, no odor.	GP-GM		35	60/6"	4.1			
		Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, moist, no odor.	GM		10	60/6"	4.8			

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 85-100

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips

Ground Surface Elevation (ft): 202.26
Top of Casing Elevation (ft): 201.88
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-7

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
70		Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, moist, no odor.	GM		15	60/6"	5.2			Bentonite Chips
		Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, moist, no odor.	GM		5	70/6"	7.5			
75		Poorly-graded GRAVEL with silt and sand (70%gravel, 20% sand, 10% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, moist, no odor.	GP-GM		30	60/6"	6.1			Blank Casing
		Poorly-graded GRAVEL with silt and sand (70%gravel, 20% sand, 10% silt), fine to coarse gravel, medium to coarse sand, brown, very dense, moist, no odor.	GP-GM		30	60/6"	5.4			
80		No recovery, cobble in sampler.			0	60/6"	-			Bentonite Chips
		No recovery.			0	60/6"	-			Blank Casing
85		No recovery, cobble in sampler.			15	70/4"	5.7			
		Silty GRAVEL with sand (70% gravel, 15% sand, 15% silt), fine to coarse gravel, medium to coarse sand, light brown, very dense, wet, no odor.	GM			75/2"	4.3	MW7-88	X	▽
90		Silty GRAVEL with sand (70% gravel, 15% sand, 15% silt), fine to coarse gravel, medium to coarse sand, light brown, very dense, wet, no odor.	GM			50/6"	7.2			Screen
		Poorly-graded GRAVEL with sand (80%gravel, 15% sand, 5% silt), fine to coarse gravel, medium to coarse sand, light brown, very dense,	GP			50/6"	8.7			

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 85-100
Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips
Ground Surface Elevation (ft): 202.26
Top of Casing Elevation (ft): 201.88
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

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Log of Boring: MW-7

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
		wet, no odor.								
95		Poorly-graded GRAVEL with sand (75% gravel, 20% sand, 5% silt), fine to coarse gravel, fine to coarse sand, light brown, very dense, wet, no odor.	GP			50/6"	9.4			Sand Pack
		Poorly-graded GRAVEL with sand (75% gravel, 20% sand, 5% silt), fine to coarse gravel, fine to coarse sand, light brown, very dense, wet, no odor.	GP			50/6"	8.8			
00										End Cap

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 85-100

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips

Ground Surface Elevation (ft): 202.26
Top of Casing Elevation (ft): 201.88
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

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Issaquah, WA 98027

Log of Boring: MW-9

Client: Mr. W. Allison
Project: Allison's Norge Village
Location: Olympia, WA
Farallon PN: 663-010
Logged By: J. Schmitt

Date/Time Started:	8/23/06	**Sampler Type:**	NA
Date/Time Completed:	8/24/06; 1300	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic 50K	**Depth of Water ATD (ft bgs):**	88
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	131
Drilling Foreman:	Rodney	**Total Well Depth (ft bgs):**	116.5
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Silty SAND, fine, brown, moist, no odor, loose.	SM		50					
5		Sandy SILT, fine sand, brown, moist, no odor, loose.	ML		100		0.8	MW9-6-7 (0736)		
10		SAND, fine to medium, trace to minor silt, brown, moist, loose, no odor.	SP				1.0	MW9-9-10 (0740)		
15		No recovery.			0					
20		Silty SAND, fine to medium, with gravel, brown, moist, no odor.	SM		100		1.8	MW9-16-17 (0750)		
		SAND, fine to medium, with silt and fine to coarse gravel, brown, moist, no odor.	SP-SM				1.0	MW9-19-20 (0752)		
25		Silty SAND, fine, with fine to coarse gravel, brown, moist, no odor.	SM		100		1.1	MW9-25 (0804)		
30		Silty GRAVEL, fine to coarse, trace fine sand, olive brown, moist.	GP-GM				3.0	MW9-23-30 (0808)		
35							2.3	MW9-30-31 (0848)		
40							2.5	MW9-40-41 (0936)		
45							26	MW9-45-46 (0944)		
50		Silty GRAVEL, fine to coarse, with cobbles, trace fine to coarse sand, olive brown, moist, no odor.	GP-GM				0.5	MW9-50-51 (1028)		Bentonite Chips
55		Sitly GRAVEL, fine to coarse, minor fine to coarse sand, olive brown, moist.	GP-GM				0.8	MW9-55-56 (1043)		
60		Silty GRAVEL, fine to coarse, with medium to coarse sand, olive brown, dense, moist, no odor.	GM				1.3	MW9-60-61 (1108)		Blank Casing
65						NA				
70							1.6	MW9-70-71 (1250)		
75										

Well Construction Information

Monument Type: Flush-Mount Steel
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 111.5-116.5

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite chips

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): 197.73
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

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Log of Boring: MW-9

Depth (feet bgs.)	Lithologic Description	USCS	PID (ppm)	Sample ID	Well Construction Details
75					
80	Silty GRAVEL, fine to coarse, with medium to coarse sand, olive brown, moist, no odor.	GM	1.0	MW9-80-81 (1355)	
85					
90			1.4	MW9-90-91 (1414)	
95	Trends to GRAVEL, fine to coarse, with medium to coarse sand, minor silt.	GP			
100	Coloration trends grey.	GP		MW9-100-101 (1618)	
105	SILT with fine SAND, grey, stiff, organics present including woody debris.	ML			
110	Silty SAND, fine to medium, dark greyish brown to black with lenses of SP.	SM		MW9-109-110 (1635)	Bentonite Seal
115	Same as above, fine rounded gravel present.	SM			Screen
120	Lenses SP and SM (fine) trending to GP-GM.	SM			Sand Pack
125	SILT, with fine sand, grey-green, stiff, moist, no odor.	ML		MW9-117-118 (0756)	
130	Same as above, trace fine sand.	ML		MW9-123-124 (0800)	
135	Brownish coloration, less dense, moist to wet, organics present.	SM			
140	Silty SAND, fine, moist, brown, no odor.			MW9-129 (0828)	
145					
150					

Well Construction Information

Monument Type: Flush-Mount Steel
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 111.5-116.5

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite chips

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): 197.73
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

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Log of Boring: MW-10

Client: Mr. W. Allison
Project: Allison's Norge Village
Location: Olympia, WA
Farallon PN: 663-010
Logged By: J. Schmitt

Date/Time Started:	8/24/06; 1555	**Sampler Type:**	NA
Date/Time Completed:	8/25/06; 1700	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic 50K	**Depth of Water ATD (ft bgs):**	102
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	124
Drilling Foreman:	Rodney	**Total Well Depth (ft bgs):**	114
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Gravelly SAND, with silt, dark brown, moist.	SP-SM							Concrete
5		Silty SAND, fine, brown to red brown, moist.	SM							
		No Recovery.								
10		SILT, with fine sand and minor gravel, brown to red brown, inter-bedded with 2" thick medium SAND with minor silt, moist.	ML-SM				2.4	MW-10-11-12 (1600)		
15		SAND, fine to medium, well sorted, gray brown, trace silt, moist to wet.	SP				3.7	MW-10-14-15 (1615)		
20		Silty SAND, fine, with trace gravel, light brown to tan, wet. Grades to SILT, with fine sand.	ML-SM				0.3	MW-10-20-21 (1645)		
25		SILT, minor fine sand, trace gravel, gray brown, moist.	ML							
		Poorly sorted SAND with gravel and trace silt, gray brown, moist.	SP				0.8	MW-10-26-27 (1700)		
30		Gravelly SILT, with sand, gray, moist, dense to very dense.	GM							
		Silty GRAVEL, trace to minor sand, slightly moist, gray brown.	GM				0.2	MW-10-32-33 (1715)		
35		Silty GRAVEL, with minor sand, gray brown, moist.	GM				0.5	MW-10-37-38		
		Sandy GRAVEL, with minor silt, gray brown, moist.	GP-GM							
40		Sandy GRAVEL, minor silt, brown to gray brown, moist.	GM							
		Silty GRAVEL, minor sand, gray brown, moist.	GM		100		4.2	MW-10-43 (0918)		
45		Gravelly SILT to silty GRAVEL, with sand, gray brown/olive gray, moist.	GM		100					
		Gravelly SILT to Silty GRAVEL, with sand (well graded silt, gravel, and sand)	GM		100		8.7	MW-10-48-49 (0948)		Bentonite Chips
50		Silty GRAVEL, fine, with sand (well graded silt, sand, and gravel).	GM		100					
55		Silty GRAVEL, minor sand, gray brown to olive gray, dense, moist.	GM		100					
60		Well graded GRAVEL with silt and sand, gray brown, moist.	GW			NA				Blank Casing
65		Sandy GRAVEL, fine to coarse, sand is medium to coarse, with silt, gray brown, moist to wet.	GW		100		4.9	MW-10-67-68 (1140)		
70		Sandy GRAVEL, sand is medium to coarse, with minor silt, gravel subrounded with trace cobbles, gray brown, moist to wet.	GP							
75										

Well Construction Information

Monument Type: Flush-Mount Steel
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 109-114

Filter Pack: #2/12 Sand
Surface Seal: Concrete
Annular Seal: Bentonite chips

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): 199.18
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

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Log of Boring: MW-10

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
75							10.9	MW-10-76-77 (1209)		
80		SAND, fine to medium, with minor silt and gravel, brown to gray brown, wet.	SP							
85							3.2	MW-10-86-87 (1409)		
90		Gravelly SILT/silty GRAVEL, fine to coarse, with sand, gray brown, moist to wet.	GP-GM							
95		Silty sandy GRAVEL, fine to coarse sand, brown, wet to saturated.	GM				1.1	MW-10-96		
100		Silty sandy GRAVEL, fine, sand is coarse, brown to gray brown, saturated at 102'.	GW							
105		GRAVEL, with silt and fine to coarse sand, brown, saturated.	GP-GM				6.5	MW-10-106-107 (1500)		.010 Slot Screen Blank Casing
110					85					Sand Pack
115		Gravelly SILT, with minor sand, dense, wet to moist, dark gray brown.	ML				1.9	MW-10-113-114 (1546)		
120							3.9	MW-10-116-117 (1555)		Bentonite Chips
125		Silty SAND, fine, with trace gravel, dark gray to olive gray, wet.	SM							
130										
135										
140										
145										
150										

Well Construction Information

Monument Type: Flush-Mount Steel
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 109-114

Filter Pack: #2/12 Sand
Surface Seal: Concrete
Annular Seal: Bentonite chips

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): 199.18
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

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Issaquah, WA 98027

Log of Boring: MW-11

Client: Safeco
Project: Allison's Norge Village
Location: Olympia, Washington
Farallon PN: 663-010
Logged By: J. Schmitt

Date/Time Started:	8/21/06 1100	**Sampler Type:**	NA
Date/Time Completed:	8/22/06 1600	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic 50K	**Depth of Water ATD (ft bgs):**	88
Drilling Company:	CDI	**Total Boring Depth (ft bgs):**	131
Drilling Foreman:	Rodney	**Total Well Depth (ft bgs):**	116
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Hand dug to 5-feet - Lithology not observed.	NA							Concrete
5		SAND, fine to medium, brown, loose, moist.	SP		UK		11.8			
10										
15		SILT, with fine sand, brown, moist, no odor.	ML		100		11.8			
20		Silty SAND, fine, brown, moist.	SM		100		10.7			
25		Silty GRAVEL, fine to coarse, trace fine sand, grayish brown, very dense, moist, no odor.	GM		100		116			
30					100		10.4			
35					100		6.7			
40		GRAVEL, fine to coarse, with medium to coarse sand, trace to minor silt, brown, moist, no odor.	GP		100		12.4			
45		Silty GRAVEL, fine to coarse, minor medium to coarse sand, brown, moist, no odor.	GM		100		20.9			
50		Silty GRAVEL, fine to coarse, trace medium to coarse sand, olive gray, moist, no odor	GM		100		10.2			
55							5.4			Blank Well Pipe
60		Silty GRAVEL, fine to coarse, trave medium to coarse sand, olive brown, moist, no odor.	GM				5.2			
65							5.4			Bentonite Chips
70		GRAVEL,. with sand and silt, moist, no odor.	GP-GM		100	NA	4.8			
75							3.2			
							13.0			

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2"
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 110.7-115.7

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite chips

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

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Log of Boring: MW-11

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
75										
80		Silty GRAVEL with sand, brown to olive brown, nodules of tan silt, moist, no odor.	GM				27.1			
85		GRAVEL in silty sand matrix, moist to very moist, brown to olive brown.	GM				2.1			
90		No Recovery.	GP				3.1			
95		GRAVEL, fine to coarse, trace silt, trace fine to coarse sand, tan, wet.	GP				1.6			
100							1.4			
105		Silty SAND, fine to medium, gray, medium dense, no odor, trending siltier with depth, dark brown, wet.	SM				2.0 2.1 2.7	MW11-104-105 (0845)		
110		Same as above, contains trace to minor fine to coarse gravel.	SM				1.8	MW11-110-111 (0940)		Sand Pack
115		Silty SAND, fine, with fine to coarse gravel.	SM				1.0	MW11-113-114 (1015)		Screen
120		SILT, with fine to coarse gravel, trace fine sand, brown, moist.	ML		50					Well Sump
125		Same as above, with organic silt (peat), dark brown to back, crumbly, slightly moist. (peat is about 30% of sample volume, unstratified).	ML				2.1	MW11-118-120 (1155)		Bentonite Chips
130		SILT (organic), dark brown to black, trace to minor fine gravel, moist, no odor.	ML				1.4	MW11-123-124 (1200)		
135		SILT, minor fine to coarse gravel, very stiff, dry.	ML							
140		Same as above, mixed in with green clay, unstratified, dry.								
145										
150										

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2"
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 110.7-115.7

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite chips

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

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Log of Boring: MW-12

Client: Wilbur Allison
Project: Allison's Norge Village
Location: Olympia, Washington

Farallon PN: 663-010

Logged By: Javan Ruark

Date/Time Started:	10/14/09 0910	**Sampler Type:**	4" Steel
Date/Time Completed:	10/15/09 1330	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic Rig	**Depth of Water ATD (ft bgs):**	82
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	111
Drilling Foreman:	Rodney	**Total Well Depth (ft bgs):**	109
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		0-.3' Concrete	CO							Cap
		.3-4.8' SILT (100%), brown to tan, moist, no odor, roots.	ML							Concrete
5		5-5.5' SILT (100%), brown to tan, moist, no odor, roots.	ML		20	NA				Bentonite Chips
		7.5-8.5' SILT (90% silt, 10% sand), fine sand, brown to grey, moist, no odor.	ML		40	NA				Casing
10		10-14' No recovery.	BLANK							Bentonite Chips
		14-15' SILT (95% silt, 5% sand), fine sand, brown to grey, moist, no odor.	ML		50	NA				
15		16-18' SILT (85% silt, 10% sand, 5% gravel), fine sand, fine gravel, brown to grey, moist, no odor, roots, pine cones.	ML		50	NA				
										Casing
20										

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 104-109

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips

Ground Surface Elevation (ft): G:\Forms and Templ
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

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Log of Boring: MW-12

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
20		20-20.5' SILT (85% silt, 10% sand, 5% gravel), fine sand, fine gravel, brown to grey, moist, no odor, roots, pine cones.	ML		75	NA				Bentonite Chips
		20.5-21.5' Silty SAND (85% sand, 15% silt), fine sand, brown, moist, no odor.	SM							
		22-23' Silty SAND (85% sand, 15% silt), fine sand, brown, moist, no odor.	SM		75	NA				
		23-23.5' SILT (90% silt, 5% sand, 5% gravel), fine sand, coarse gravel, brown to grey, moist, no odor.	ML							
25		24-26' Silty GRAVEL (75% gravel, 20% silt, 5% sand), fine to coarse gravel, fine sand, grey, moist, no odor.	GM		70	NA				
		27-29' Gravelly SILT (70% silt, 20% gravel, 10% sand), coarse gravel, fine sand, grey, moist, no odor.	ML		100	NA				Casing
		29-30.5' SILT with gravel (80% silt, 20% gravel), coarse gravel, grey, moist, no odor.			75	NA				
30							1.7	MW12-30		Bentonite Chips
		31-32.5' SILT with gravel (85% silt, 15% gravel), fine to coarse gravel, grey, moist, no odor.	ML		75	NA				
		33-35' SILT with gravel (85% silt, 15% gravel), fine to coarse gravel, grey, moist, no odor.	ML		100	NA				
35		35-38' SILT with gravel (80% silt, 15% gravel, 5% sand), fine to coarse gravel, fine sand, grey, moist, no odor.			100	NA				
					100	NA				
		38-39' SILT with gravel (80% silt, 15% gravel, 5% sand), fine gravel, fine sand, grey, moist, no odor.								Casing
40		39.5-40' SILT with gravel (80% silt, 15% gravel, 5% sand), fine gravel, fine sand, grey, moist, no odor.	ML		75	NA	0.9	MW12-40		Blank Casing
		40-42' Silty GRAVEL (65% gravel, 35% silt), fine gravel, grey, moist, no odor.	GM							
		42-42.5' Silty SAND (70% sand, 20% silt, 10% gravel), fine sand, coarse gravel, grey, moist, no odor.	SM		100	NA				
		42.5-44' Silty SAND with gravel (70% sand, 15% silt, 15% gravel), fine sand, fine gravel, grey, moist, no odor.	ML		100	NA				

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 104-109

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips

Ground Surface Elevation (ft): G:\Forms and Templa
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

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Log of Boring: MW-12

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
45		44-46' Gravelly SILT (70% silt, 25% gravel, 5% sand), coarse gravel, fine sand, grey, moist, no odor.								
		46-50' SILT with gravel (75% silt, 15% gravel, 10% sand), fine to coarse gravel, fine sand, grey, moist, no odor.			100	NA				
					100	NA				Blank Casing
50		50-53.5' Sandy SILT with gravel (70% silt, 15% sand, 15% gravel), fine fine to medium sand, fine gravel, grey, moist, no odor.			100	NA	1.6	MW12-50	X	Bentonite Chips
					100	NA				
		53.5-54.5' Silty SAND with gravel (70% sand, 15% silt, 15% gravel), fine to coarse sand, fine gravel, grey, moist, no odor.	SM							
55		54.5-57' Gravelly SILT (60% silt, 30% gravel, 10% sand), fine to coarse gravel, fine to medium sand, grey, moist, no odor.	ML		100	NA				
		57-59' Gravelly SILT (65% silt, 30% gravel, 5% sand), fine to coarse gravel, fine to medium sand, grey, moist, no odor.			100	NA				Casing
		59-59.5' Poorly graded SAND with silt and gravel (70% sand, 20% gravel, 10% silt), medium to coarse sand, fine gravel, grey, moist, no odor.	SP-SM		100	NA				
60			ML				1.7	MW12-60		Bentonite Chips
		59.5-60.5' Gravelly SILT (70% silt, 25% gravel, 5% sand), coarse gravel, fine sand, grey, moist, no odor.	SM		100	NA				
		60.5-61' Silty SAND (80% sand, 20% silt), fine sand, brown, moist, no odor.			100	NA				
		61-61.5' Silty SAND (75% sand, 20% silt, 5% gravel), fine sand, fine gravel, brown to grey, moist, no odor.	GM							
65		61.5-63' Silty SAND (65% sand, 25% silt, 10% gravel), fine sand, coarse gravel, brown to grey, moist, no odor.	ML		100	NA				
		63-63.5' Silty SAND (85% sand, 15% silt), fine sand, grey, moist, no odor.								
		63.5-65' Silty GRAVEL (75% gravel, 15% silt, 10% sand), fine to coarse gravel, fine sand, grey, moist, no odor.			100	NA				
		65-67' SILT with gravel (75% silt, 20% gravel, 5% sand), coarse gravel, fine sand, grey, moist, no odor.								Casing

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 104-109

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips

Ground Surface Elevation (ft): G:\Forms and Templ
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

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Log of Boring: MW-12

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
70		67-67.5' Gravelly SILT (70% silt, 20% gravel, 10% sand), fine gravel, fine sand, grey, moist, no odor.			70	NA	1.1	MW12-70	X	Bentonite Chips
		67.5-70' Gravelly SILT (60% silt, 30% gravel), fine to coarse gravel, fine to medium sand, grey, moist, no odor.								
		70-71' Gravelly SILT (70% silt, 25% gravel, 5% sand), fine gravel, fine to medium sand, grey, moist, no odor.								
		71-72.5' SILT with gravel (75% silt, 25% gravel), coarse gravel, grey, moist, no odor.	ML		80	NA				
		73-73.5' SILT (90% silt, 5% gravel, 5% sand), fine gravel, fine sand, grey, moist, no odor.	SP-SM							
75		73.5-75' Poorly graded SAND with silt (85% sand, 10% silt, 5% gravel), fine to medium sand, fine gravel, brown, moist, no odor.			100	NA				
		75-77.5' Poorly graded SAND with silt (90% sand, 10% silt), fine sand, brown, moist, no odor.								
		77.5-78.5' Silty GRAVEL (65% gravel, 25% silt, 10% sand), fine gravel, fine sand, grey, moist, no odor.	GM		100	NA				Casing
		78.5-80' Silty GRAVEL (75% gravel, 15% silt, 10% sand), fine to coarse gravel, fine sand, grey, moist, no odor.								
80		80-82.5' Gravelly SILT (70% silt, 20% gravel, 10% sand), fine to coarse gravel, fine to medium sand, grey, moist to wet, no odor.	ML		100	NA	9.8	MW12-80		Bentonite Chips
		82.5-83' Silty GRAVEL (75% gravel, 20% silt, 5% sand), fine gravel, fine sand, grey, wet, no odor.	GM		100	NA				
		83-85' Gravelly SILT (70% silt, 20% gravel, 10% sand), fine to coarse gravel, fine to medium sand, grey, wet, no odor.	ML							
85		85-85.5' SILT (85% silt, 10% gravel, 5% sand), coarse gravel, fine sand, grey, wet, no odor.			100	NA				
		85.5-87.5' Silty GRAVEL (75% gravel, 20% silt, 5% sand), fine to coarse gravel, fine to medium sand, brown to grey, wet, no odor.	GM							
		87.5-90' Silty GRAVEL (75% gravel, 15% silt, 10% sand), fine to coarse gravel, fine to medium sand, grey, wet, no odor.			100	NA				Casing
90		90-91' Silty GRAVEL (70% gravel, 20% silt, 10% sand), fine to coarse gravel, fine to medium sand, brown, wet, no odor.			75	NA				Bentonite Chips
		91-91.5' Poorly graded GRAVEL with silt (85% gravel, 10% silt, 5% sand), fine to coarse gravel, medium to coarse sand, brown, wet, no odor.	GP-GM							
		92-92.5' Poorly graded GRAVEL with silt (85% gravel, 10% silt, 5%	GP-GM		75	NA				
			GM							

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 104-109

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips

Ground Surface Elevation (ft): G:\Forms and Templa
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: MW-12

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
		sand), fine to coarse gravel, medium to coarse sand, brown, wet, no odor.								
95		92.5-93.5' Silty GRAVEL (70% gravel, 30% silt), fine to coarse gravel, brown, wet, no odor.	GM		100	NA				
		94-96.8' Silty GRAVEL (70% gravel, 30% silt), fine to coarse gravel, brown, wet, no odor.			75	NA				
		96.8-97' SILT with sand (80% silt, 15% sand, 5% gravel), fine to medium sand, coarse gravel, grey, wetm, no odor.	ML							
		97-97.5' Silty GRAVEL (70% gravel, 25% silt, 5% sand), fine to coarse gravel, fine to medium sand, brown, wet, no odor.	GM		100	NA				Casing
100		98-99' Silty GRAVEL (70% gravel, 25% silt, 5% sand), fine to coarse gravel, fine to medium sand, brown, wet, no odor.	GM		100	NA				Bentonite Chips
		99-99.2' SILT (85% silt, 10% gravel, 5% sand), coarse gravel, fine sand, brown, wet, no odor.	ML							
		99.2-99.5' Silty GRAVEL (65% gravel, 25% silt, 10% sand), fine to coarse gravel, fine to medium sand, brown, wet, no odor.	SM		100	NA				
		99.5-101' SILT (90% silt, 5% gravel, 5% sand), coarse gravel, fine sand, brown, wet, no odor.	ML							Sand Pack
105		101-101.5' Silty SAND (80% sand, 15% silt, 5% gravel), fine to medium sand, coarse gravel, grey, wet, no odor.	SP-SM		100	NA				Screen
		101.5-103' SILT (85% silt, 10% gravel, 5% sand), fine gravel, fine sand, grey, wet, no odor.								
		103-106.5' Poorly graded SAND with silt and gravel (75% sand, 15% gravel, 10% silt), fine to medium sand, coarse gravel, grey, wet, no odor.	ML		100	NA				
		106.5-107' SILT (80% silt, 10% gravel, 10% sand), fine to medium sand, fine gravel, grey, moist, no odor.	SP							
110		107-107.5' Poorly graded SAND (85% sand, 10% gravel, 5% silt), fine to medium sand, coarse gravel, grey, wet, no odor.	ML				1.5	MW12-108.5		
		101.5-103' SILT (85% silt, 10% gravel, 5% sand), fine gravel, fine sand, grey, wet, no odor.	CL		50	NA				
		109-110' Lean CLAY with gravel (85% clay, 15% gravel), coarse gravel, grey, moist, no odor.								

Well Construction Information

Monument Type: Flush-Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 104-109

Filter Pack: #2/12 medium sand
Surface Seal: Concrete
Annular Seal: Bentonite Chips

Ground Surface Elevation (ft): G:\Forms and Templa
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA