(1) explain why bh's drilled deeper -

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PHASE II SUBSURFACE INVESTIGATION
LAND TITLE BUILDING PARKING LOT
1002 4TH STREET
BREMERTON, WASHINGTON

FARALLON PN: 603-001

Submitted by
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November 17, 1999

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1.0 INTRODUCTION

This Phase II Subsurface Investigation Report has been prepared by Farallon Consulting (Farallon) to document the results of a soil investigation conducted at the Land Title Building Parking Lot located at 1002 4th Street in Bremerton, Washington (herein referred to as the site, Figure 1). A limited site investigation (Phase I) was previously conducted at the site as discussed in the *Land Title Building Site Investigation Report* prepared by SECOR International Incorporated (SECOR) dated June 12, 1998. Soil vapor and soil matrix analytical results from the Phase I investigation indicated that a release of tetrachloroethene (PCE), trichloroethene (TCE), and associated chlorinated solvents had occurred at the site. SECOR recommended that additional characterization be performed at the site to "more fully define the lateral and vertical distribution of VOCs [volatile organic compounds] in subsurface soil and/or groundwater."

The Phase II investigation was conducted by Farallon to provide additional characterization data on the distribution of chlorinated solvents in the subsurface soil. The scope of work conducted by Farallon was in accordance with SECOR proposal dated July 9, 1998 for additional site investigation. Historical information regarding operation of a dry cleaners at the site and soil vapor and soil matrix analytical results from the Phase I investigation were used to identify sample locations for the Phase II investigation. The Phase II investigation focused on soil conditions in the east areas of the site due to historical activities in these areas and the reported presence of concentrations of PCE and associated VOCs in the soil gas vapors and soil (SECOR June 12, 1998). This report describes the site history and features, the Phase II investigation field activities, and presents results and conclusions for the site investigations completed to date.

For evaluation purposes, the results of the Phase I and II investigations are compared to the Model Toxics Control Act (MTCA) Method A soil cleanup levels (Chapter 173-340-740 WAC). It has not been established that these conservative cleanup levels are applicable to this site. However, this assumption appears reasonable based on the site location and adjacent land use and zoning. The applicable cleanup action levels for site cleanup are typically identified during the feasibility study and cleanup action planning stages of cleanup programs.

1.1 SITE DESCRIPTION AND HISTORY

The site is currently an asphalt parking lot with some perimeter landscaped areas. Warren Avenue and 4th Street are located to the east and south of the site, respectively (Figure 2). A multi-family residence is located west of the site and an alley and church are located to the north. Land use surrounding the site is predominantly residential with commercial establishments to the east.

The site surface slopes towards the southeast with approximately three feet elevation difference between the northwest and southeast sides of the site. Surface water runoff from the site flows to catch basins in the asphalt parking lot. Puget Sound is the nearest surface water body to the site, located approximately 2000 feet to the south. The Bremerton Naval Shipyard is situated to the south.

The site was occupied by a dry cleaning establishment from approximately 1940 to 1985. The Phase I report included a site plan showing the approximate former locations of a stoddard solvent dry cleaning machine, PCE dry cleaning machines, a dry cleaning machine sump and associated drain lines, and two former underground storage tanks (USTs). The approximate locations of these former features are shown on Figure 2.

1.2 SUMMARY OF PHASE I INVESTIGATION RESULTS

The Phase I investigation included the collection of soil vapor samples from approximately five feet below ground surface (bgs) at 16 soil vapor sample locations (SV-1 through SV-16) (Figure 2). PCE concentrations in the soil vapor samples ranged from 5.7 to 1,240 parts per million volume (ppmV). The Phase I investigation soil vapor sample analytical results are summarized on Table 1. Figure 3 shows an isoconcentration map for PCE in soil vapor generated by Farallon from the data presented in the Phase I report by SECOR.

The distribution of PCE concentrations in soil vapor suggests that two potential source areas are located on the site:

- A potential source in the vicinity of the north end of the former laundry machine sump and drains (Former Site Features 4 and 5, Figure 2), and;
- A potential source in the southeast portion of the site near the former location of the dry cleaning machine from 1961 to 1972 (Former Site Feature 1, Figure 2).

The widespread distribution of PCE in soil vapor as shown on Figure 3 is considered characteristic of an older release (greater than 10 years) where PCE concentrations have migrated laterally some distance from the source areas. The Phase I investigation soil vapor survey was not sufficient to fully characterize the vertical distribution of PCE in soil vapor.

The Phase I investigation also included analysis for benzene, toluene, ethyl benzene, and xylenes (BTEX) in soil vapor samples due to the former presence of a stoddard dry cleaning machine and an underground storage tank (UST) which was used to store gasoline and diesel (see Former Site Features 3 and 7, respectively, on Figure 2). The soil vapor sample points SV-10, SV-11, and SV-12 (Figure 3) were located adjacent to the former stoddard dry cleaning machine (Former Site Feature 3, Figure 2). BTEX concentrations were non-detect to very low at these sample points. The highest concentration of BTEX compounds detected was 16.3 ppmv toluene in SV-12. The

only detection of BTEX compounds from the sample points SV-1, SV-2, and SV-13, located adjacent to the former gasoline/diesel UST, was 0.25 ppmv benzene at sample point SV-1.

Soil matrix samples were collected during the Phase I investigation from four borings (SV-2, SV-7, SV-12, and SV-16; Figure 4) at depths ranging from eight to nine feet bgs. Analytical results from these borings are summarized on Table 2. The reported concentrations for PCE ranged from 0.27 milligrams per kilogram (mg/Kg) for the soil sample from boring SV-12 at eight feet bgs to 0.68 mg/kg for the sample from boring SV-7 at nine feet bgs. The sample from boring SV-7 was the only sample that exceeded the MTCA Method A cleanup level for PCE in soil of 0.5 mg/Kg. Boring SV-7 was located in the southeast corner of the site, just north of the former location of the dry cleaning machine from 1961 to 1972 (Former Site Feature 1, Figure 2).

The Phase I investigation did not encounter groundwater to the maximum total depth drilled of 20 feet bgs at boring SV-2. SECOR concluded that "soil and soil gas data indicated that PCE may be present at depth suggesting that the potential for impacts to groundwater exist at the site. Additional soil samples collected at depth and/or groundwater samples may be necessary to more completely evaluate site conditions."

2.0 PHASE II FIELD PROGRAM

The site's historical use and the results of the Phase I investigation indicate that the potential constituents of concern include dry cleaning solvents (PCE and stoddard solvent) associated with historical on-site dry cleaning operations. The scope of the Phase II investigation was described in the *Proposed Scope of Work and Cost Estimate, Land Title Building Parking Lot* prepared by SECOR and dated July 9, 1998. The Phase II investigation was designed to characterize soil conditions at areas of the site with elevated PCE and TCE concentrations in soil vapor that were identified during the Phase I investigation. The limited soil matrix data collected during the Phase I investigation was not sufficient to define the lateral or vertical extent of soil contamination.

The Phase II Field Program conducted by Farallon included the following work elements:

- Preparation of a health and safety plan (HASP) as required by MTCA and 29 CFR Part 1910.120;
- Locating underground utilities in the vicinity of the drilling locations;
- Advancing 16 hydraulic-push soil borings;
- Field screening soil samples from discrete intervals with a photoionization detector (PID);
- Collection of soil samples from each boring for laboratory analysis for chlorinated solvents using method United States Environmental Protection Agency (USEPA) Method 8021B, and;
- Preparation of a report to document results of the Phase II investigation.

The field program was performed during Friday and Saturday, September 24 and 25, 1999 to limit inference with use of the site as a parking lot. Soil samples were collected by Farallon from 12 borings (GP-1 to GP-12) utilizing a truck mounted hydraulic-push sampling system (Geoprobe GH-40) in accordance with the American Standard Materials Testing (ASTM) and USEPA standard protocols. A Farallon geologist supervised the advancement of the borings and described the lithology in accordance with the Unified Soil Classification System (USCS). Boring locations are shown on Figure 4 and boring logs are provided in Appendix A.

Borings were advanced until refusal, which occurred between 24 and 34 feet bgs. The soil samples were collected from a hydraulic-push sampling rod and field screened for volatile organic compounds (VOCs) using a photoionization detector (PID). Borings GP-1 through GP-5 were continuously sampled to provide detailed lithologic information on the soil underlying the site. The other borings at the site were sampled on approximately five-foot intervals. Soil samples were selected for analysis, based on field observations, which included PID screening and visual

observations. The selected samples were analyzed by USEPA Method 8021B on-site by a mobile laboratory.

Each soil sample was transferred directly from the hydraulic-push sampling rod into a laboratory prepared glass sample jar using a clean stainless steel utensil. The sample jars were immediately sealed with Teflon lined screw caps, labeled, and placed in a cooler on ice. After completion of each boring, Farallon submitted soil samples to the on-site laboratory following chain-of-custody procedures. Analytical results from the Phase II investigation field program are discussed in Section 3.

Groundwater was not encountered during the advancement of the soil borings; therefore, no groundwater samples were collected during the Phase II investigation. Based on regional groundwater information, it is expected that the depth to groundwater is 40 to 60 feet bgs underlying the site. The borings were filled with a cement-bentonite grout to the surface grade after sampling was completed.

3.0 PHASE II INVESTIGATION RESULTS

Soil underlying the site consists of silty sand and silt to depths of 25 to 27 feet bgs, except at boring GP-4 and GP-11 where silty sand extended to 30 and 32 feet bgs, respectively. Beneath the silty sand was a poorly graded gravel containing some silt and sand. Figure 5 is a cross section illustration of soil conditions from the northwest to southeast corner of the site. Boring logs from the Phase II investigation are provided in Appendix A.

PID measurements of the soil samples collected from the borings ranged from 0 to greater than 2000 units (GP-6 at seven feet bgs) and are recorded on the boring logs. In general, PID measurements were highest at depths less than 10 feet bgs and decreased with increasing depth, except at boring GP-7, which was highest at 12 feet bgs. At most borings, PID measurements were 0.0 units at the deepest sample collected. However, PID measurements greater than 0.0 units were recorded at the bottom of borings GP-6, GP-8 through GP-11 which were located near the potential source identified by SECOR at the former location of the dry cleaning machine (Former Site Feature 1, Figure 2); in borings GP-8, GP-9, and GP-10 which were located near the potential source identified by SECOR at the former laundry machine sump and drains (Former Site Features 4 and 5, Figure 2). PID measurements above background (0.0 units) at depth suggest that a vapor plume of VOCs extends below the total depth sampled.

A total of 37 soil samples from 11 borings were analyzed by the mobile laboratory for chlorinated solvents using USEPA Method 8021B for the Phase II investigation. No samples were analyzed from boring GP-12 due to time restrictions (work extended to the end of the day on Saturday) and the relatively low PID measurements recorded in samples from this boring. The soil analytical results from the Phase I and II investigations are summarized on Table 2. Laboratory analytical reports for the Phase II investigation are provided in Appendix B.

Soil analytical results from the Phase I and II investigations indicate the following:

- PCE was detected above the Laboratory Practical Quantification Limit (PQL) in all 41 samples analyzed;
- TCE was detected above the PQL in 14 of the 37 samples analyzed;
- Cis and trans-1,2-dichloroethene (DCE) were detected above the PQL in five and seven samples analyzed, respectively, and;
- 1,1-DCE and vinyl chloride were not detected in any of the soil samples analyzed.

PCE degrades in the environment to TCE, cis and trans-1,2-DCE, 1,1-DCE, and vinyl chloride, which are sometimes referred to as PCE daughter products. The presence of concentrations of PCE daughter products in soil samples collected for the Phase II investigation indicates that PCE degradation is occurring at the site. A detailed review of the PCE degradation mechanisms is beyond the scope of this brief report.

Concentrations of PCE in 10 of the 41 soil samples collected during the Phase I and II investigations exceeded the MTCA Method A soil cleanup level for PCE is 0.5 mg/Kg. The soil samples which had concentrations of PCE above the MTCA Method A cleanup level were collected from GP-3, GP-11, and SV-7, which were located near the former location of the dry cleaning machine (Former Site Feature 1, Figure 2) and GP-1, GP-4, and GP-5, which were located near former laundry machine sump and drains (Former Site Features 4 and 5, Figure 2). The highest concentration of PCE in soil was 7200 mg/Kg at boring GP-1 at six feet bgs (Table 2). This is over 14,000 times the MTCA Method A cleanup level of 0.5 mg/Kg PCE. The other nine soil samples that had concentrations of PCE above the MTCA Method A cleanup level for PCE ranged from 0.55 to 4.0 mg/Kg.

The PID measurement for the soil sample collected at seven feet bgs at boring GP-6 was the highest recorded at the site during the Phase II investigation. The soil matrix sample from this interval was not analyzed due to time constraints with the on-site laboratory and because the soil matrix sample from the adjacent SECOR boring SV-7 at nine feet bgs was analyzed and contained PCE concentrations above the MTCA Method A soil cleanup level.

PCE concentrations above the MTCA Method A cleanup level were reported in the deepest samples collected from four borings; however, only one sample each was collected from two of these borings (GP-11 and SV-7). The deepest sample collected from boring GP-3 at 30 feet bgs contained 1.4 mg/Kg PCE and from boring GP-5 at 18 feet bgs contained 1.1 mg/Kg PCE. The result from GP-3 indicates that concentrations of PCE extend into the gravel unit underlying the site, and possibly the groundwater, in the vicinity of the former location of the dry cleaning machine (Former Site Feature 1, Figure 2 and Figure 5). The available data do not indicate if PCE contamination in the vicinity of the former laundry machine sump and drains (Former Site Feature 4 and 5, Figure 2) extends to the gravel unit.

Only one of the 41 soil samples contained TCE at concentrations that exceeded the MTCA Method A cleanup level of 0.5 mg/Kg. This sample was the same sample that had concentrations of 7200 mg/Kg PCE (boring GP-1 at 6-feet bgs).

There are no MTCA Method A cleanup levels for cis and trans-1,2-DCE. The MTCA Method B formula values are 800 mg/Kg and 1,600 mg/Kg, respectively (CLARC II Ecology February 1996). The highest concentration detected for each of these compounds were reported in the sample from boring GP-1 at 6-feet bgs.

4.0 DATA GAPS

The results of the Phase I and II investigations have defined at least two areas on-site where past operating practices have released concentrations of PCE. The sources identified are the former location of the sump and laundry machine drain area located on the northern portion of the site (northern source area), and the former location of the dry cleaning machine located on the southeast corner of the site (southeastern source area). The Phase I and II investigations have not defined the lateral extent of PCE in the shallow soils to the north of the northern source area nor to the east of the southeastern source area.

The vertical extent of PCE in soils has not been adequately defined at either of the identified source areas. Concentrations of PCE were detected above the laboratory PQL at 26 feet bgs in the northern source area, but below the MTCA Method A cleanup levels. Concentrations of PCE were detected at 30 feet bgs in the southeastern source area above the MTCA Method A cleanup levels. These results indicate that concentrations of PCE in soils may occur at a greater depth than was reached by these investigations.

The concentrations of PCE and soil types encountered at depth indicate that it is likely that downward migration of PCE has occurred and that groundwater could potentially be impacted. The depth reached by the Phase I and II investigations did not encounter groundwater at the maximum depth of 34 feet bgs; however, regional information suggests that groundwater occurs at 40 to 60 feet bgs. Additional investigation is necessary to evaluate groundwater conditions beneath the site. The potential for off-site migration of PCE was not determined by the Phase I and II investigations.

Additional investigations should be conducted to obtain sufficient information to develop a remediation system design. Evaluation of the physical characteristics of the soil by a pilot test/feasibility study should be conducted to develop an effective cleanup action for the site conditions.

The data gaps identified for the site which will require additional information to develop a cleanup action plan (CAP) in accordance with MTCA include:

- Lateral extent of PCE in shallow soils to the east of on the southeastern portion of the site and to the north of the northern portion of the site;
- Vertical extent of PCE in soils in the northern and southeastern portion of the site;
- Evaluation of groundwater conditions beneath the site;
- Evaluation if off-site migration has occurred in groundwater and/or soils from the site;
- Physical characteristics of soil conditions for development of a feasibility study and remediation design.

Additional subsurface sampling will be necessary to address these data gaps.

5.0 CONCLUSIONS

Farallon has developed the following conclusions from the results of the Phase I and II investigations conducted at the site:

- There has been a release of PCE to the soil underlying the site. There are two potential source areas on-site: in the vicinity of the north end of the former laundry machine sump and drains and on the southeast portion of the site near the former location of the dry cleaning machine from 1961 to 1972;
- The concentrations of PCE exceed the MTCA Method A cleanup levels for PCE in shallow soils and at depths of up to 30 feet bgs. The high concentrations of PCE detected in the shallow soil present a potential risk to human health and the environment;
- Results of the soil gas survey conducted for the Phase I investigation indicates that the distribution of PCE in soil vapors is widespread, which is considered characteristic of an older release (greater than 10 years) where PCE concentrations have migrated laterally some distance from the source areas;
- The Phase I and II investigations have not defined the lateral extent of PCE in the shallow soils to the north of the northern source area nor to the east of the southeastern source area;
- The vertical extent of PCE in soils has not been adequately defined at either of the identified source areas;
- The distribution of VOCs in soil vapors and in the soil matrix suggest that there is the potential that groundwater is affected by concentrations of PCE and that off-site migration may have occurred.
- Additional investigation is necessary to sufficiently characterize the vertical extent of PCE in soil, evaluate groundwater conditions, and determine if off-site migration of PCE has occurred.

The results of these investigations indicate that there is a potential risk to human health and the environment. Additional investigation is necessary to fully characterize the PCE distribution at the site and to develop a Cleanup Action Plan. Remediation will be necessary at the site to meet the requirements for a No Further Action designation from Ecology. Selection of a technically feasible remedial technology for the site will require a Focused Feasibility Study and preparation of a Cleanup Action Plan to comply with MTCA.

6.0 LIMITATIONS

The interpretations and conclusions contained in this report are based on professional opinions with regard to the subject matter. These opinions have been arrived at in accordance with currently accepted hydrogeologic and engineering standards and practices applicable to this location and are subject to the following inherent limitations:

- **Accuracy of Information**. Certain information utilized by Farallon in this report has been obtained, reviewed, and evaluated from various sources believed to be reliable. Although Farallon's conclusions, opinions, and recommendations are based in part on such information, Farallon's services did not include the verification of its accuracy or authenticity. Should such information prove to be inaccurate or unreliable, Farallon reserves the right to amend or revise its conclusions, opinions, and/or recommendations.

- **Limitations**. Because Farallon's report is based on information, the accuracy of which has not been determined, and because Farallon's observations made during site reconnaissance are limited, Farallon cannot and does not guarantee that the site is free of hazardous or potentially hazardous materials or conditions, or that latent or undiscovered conditions will not become evident in the future. Since site activities beyond our control could change at any time after the completion of this report, our observations, findings, and opinions can only be considered valid as of the date of the report hereof. This report is prepared in accordance with the client contract and currently accepted industry standards, and no other warranties, representations, or certifications are made. Unless stated otherwise herein, this report is intended for and restricted to the sole use Marten & Brown and their respective client. No other person is authorized to use, interpret, or rely upon this report without written consent by Farallon. Farallon shall have no liability for such unauthorized use, interpretation, or reliance.

7.0 REFERENCES

SECOR International Incorporated. June 12, 1999. Land Title Building Site Investigation for 1002 4th Street, Bremerton, Washington.

SECOR International Incorporated. July 9, 1999. Proposed Scope of Work and Cost Estimate, Land Title Building Site Investigation for 1002 4th Street, Bremerton, Washington.

Washington State Department of Ecology. February 1996. Model Toxics Control Act Cleanup Levels and Risk Calculations (CLARC II) Update. Publication #94-145.

APPENDIX A
SOIL BORING LOGS
PHASE II SUBSURFACE INVESTIGATION
LAND TITLE BUILDING PARKING LOT
1002 4TH STREET
BREMERTON, WASHINGTON

Farallon PN: 603-001
November 17, 1999

APPENDIX B
SOIL SAMPLE LABORATORY ANALYTICAL REPORTS
AND CHAIN-OF-CUSTODY FORMS
PHASE ii SUBSURFACE INVESTIGATION
LAND TITLE BUILDING PARKING LOT
1002 4TH STREET
BREMERTON, WASHINGTON

Farallon PN: 603-001
November 17, 1999

FIGURES

TABLES

TABLE 1
SUMMARY OF SOIL GAS ANALYTICAL RESULTS[1]
LAND TITLE BUILDING PARKING LOT
BREMERTON, WASHINGTON
FARALLON PN: 603-001

Soil Boring	Sample Depth[2]	Analytical Results (ppmV)[3]							
		Benzene	Toluene	Ethyl Benzene	Total Xylenes	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	TCE	PCE
SV-1		0.25	(0.05)[4]	(0.05)	(0.05)	8.9	184	214	559
SV-2		(0.05)	(0.05)	(0.05)	(0.05)	4.1	121	45	1240
SV-3		(0.05)	62	0.16	0.56	(0.05)	0.8	0.8	34
SV-4		(0.05)	1.4	0.23	1.17	2.8	105	114	191
SV-5		(0.05)	11.5	0.2	0.72	(0.05)	0.78	0.8	7.9
SV-6		(0.05)	0.17	(0.05)	(0.05)	(0.05)	(0.05)	0.29	15.6
SV-7		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	0.23	189
SV-8		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	77
SV-9		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	0.25	165
SV-10		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	37.7
SV-11		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	0.44	1.5	57
SV-12		(0.05)	16.3	0.43	1.47	(0.05)	(0.05)	0.2	68
SV-13		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	5.7
SV-14		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	0.14	24.4
SV-15		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	0.26	0.57	3.99
SV-16		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	0.22	57

Notes:

1- Analytical Results from Land Title Building Site Investigation Report prepared by SECOR, dated June 12, 1998.

2- Depth below ground surface in feet

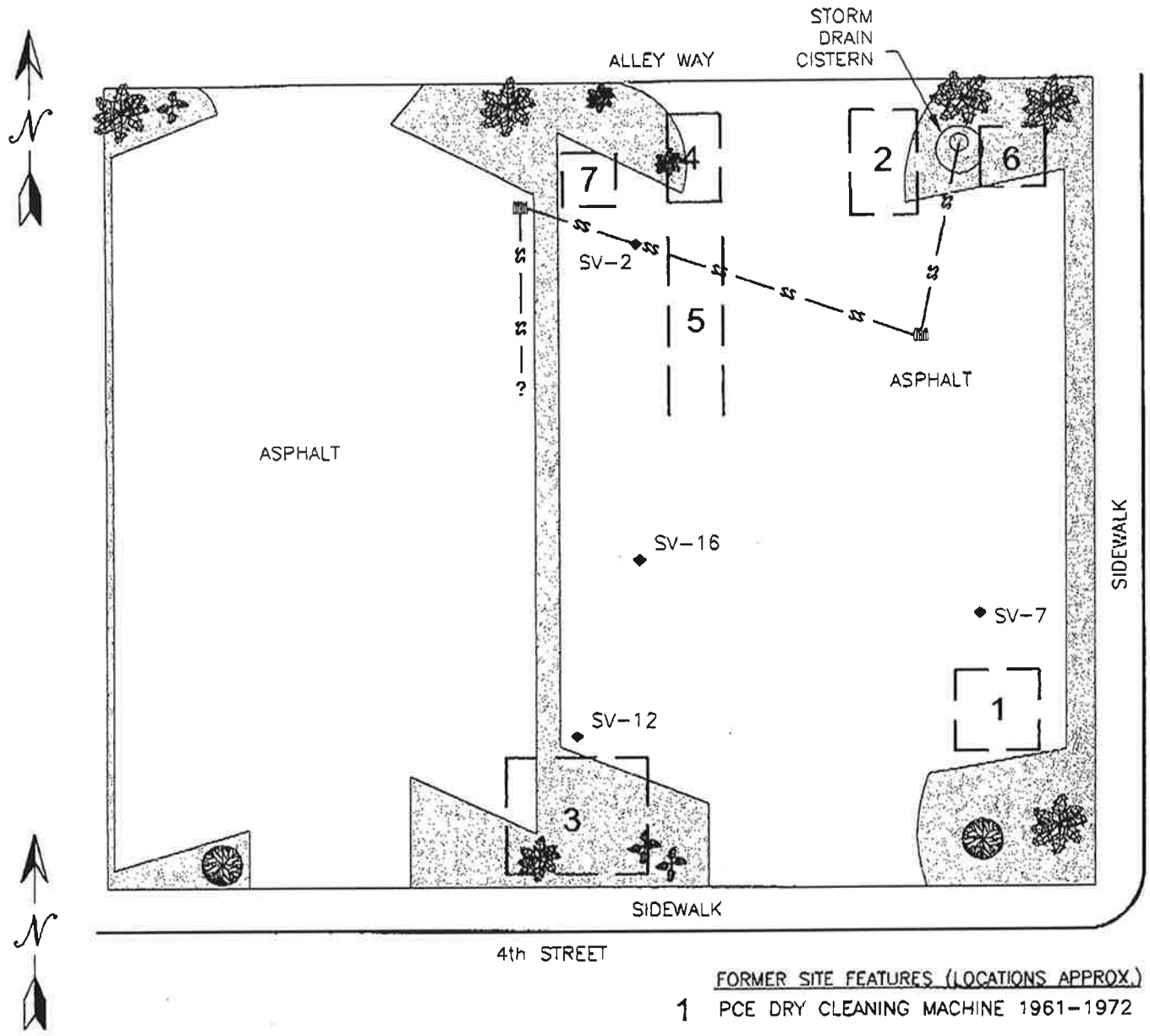
3- All analytical results reported in parts per million by volume (ppmV)

4- (0.05) indicates analyte not detected above enclosed analytical laboratory practical quantification limit (PQL)

TABLE 2
SUMMARY OF SOIL ANALYTICAL RESULTS
LAND TITLE BUILDING PARKING LOT
BREMERTON, WASHINGTON
FARALLON PN: 603-001

Sample Location	Sample Number	Sampled By	Depth (feet)[1]	Analytical Results (mg/kg)[2]					
				PCE[3]	TCE[3]	cis-1,2 DCE[3]	trans-1,2 DCE[3]	1,1 DCE[3]	VC[3]
GP-1	GP1-6	Farallon	6	**7200.00**	**30**	14	0.32	ND	ND
GP-1	GP1-10	Farallon	10	0.2	ND	ND	ND	ND	ND
GP-1	GP1-14	Farallon	14	0.09	0.17	ND	0.08	ND	ND
GP-1	GP1-17.5	Farallon	17.5	0.18	ND	ND	ND	ND	ND
GP-1	GP1-22	Farallon	22	0.17	ND	0.16	ND	ND	ND
GP-1	GP1-26	Farallon	26	0.18	0.16	ND	0.07	ND	ND
GP-2	GP2-6	Farallon	6	0.45	ND	ND	ND	ND	ND
GP-2	GP2-10	Farallon	10	0.46	ND	ND	ND	ND	ND
GP-2	GP2-14	Farallon	14	0.15	0.19	0.11	ND	ND	ND
GP-2	GP2-18	Farallon	18	0.4	0.24	ND	ND	ND	ND
GP-2	GP2-22	Farallon	22	0.28	0.12	ND	0.07	ND	ND
GP-2	GP2-26	Farallon	26	0.28	0.07	ND	ND	ND	ND
GP-3	GP3-14	Farallon	14	0.14	0.19	0.06	ND	ND	ND
GP-3	GP3-18	Farallon	18	**2.4**	0.1	ND	0.07	ND	ND
GP-3	GP3-22	Farallon	22	0.3	0.07	ND	0.07	ND	ND
GP-3	GP3-26	Farallon	26	**0.74**	0.17	ND	0.08	ND	ND
GP-3	GP3-30	Farallon	30	**1.4**	ND	ND	ND	ND	ND
GP-4	GP4-6	Farallon	6	0.44	ND	0.07	ND	ND	ND
GP-4	GP4-10	Farallon	10	**2.42**	0.24	ND	ND	ND	ND
GP-4	GP4-14	Farallon	14	0.30	ND	ND	ND	ND	ND
GP-4	GP4-18	Farallon	18	ND	ND	ND	ND	ND	ND
GP-5	GP5-6	Farallon	6	**0.89**	ND	ND	ND	ND	ND
GP-5	GP5-10	Farallon	10	**4.00**	0.08	ND	ND	ND	ND
GP-5	GP5-14	Farallon	14	0.09	ND	ND	ND	ND	ND
GP-5	GP5-18	Farallon	18	**1.10**	ND	ND	ND	ND	ND
GP-6	GP6-17	Farallon	17	0.36	0.10	ND	ND	ND	ND
GP-6	GP6-22	Farallon	22	0.35	ND	ND	ND	ND	ND
GP-6	GP6-27	Farallon	27	0.42	ND	ND	ND	ND	ND
GP-7	GP7-27	Farallon	27	0.27	ND	ND	ND	ND	ND
GP-7	GP7-32	Farallon	32	0.31	ND	ND	ND	ND	ND
GP-8	GP8-12	Farallon	12	0.30	ND	ND	ND	ND	ND
GP-8	GP8-17	Farallon	17	0.14	ND	ND	ND	ND	ND
GP9	GP9-12	Farallon	12	0.23	ND	ND	ND	ND	ND
GP9	GP9-17	Farallon	17	0.30	ND	ND	ND	ND	ND
GP10	GP10-12	Farallon	12	0.27	ND	ND	ND	ND	ND
GP10	GP10-17	Farallon	17	0.13	ND	ND	ND	ND	ND
GP11	GP11-7	Farallon	7	**0.55**	ND	ND	ND	ND	ND
SV-2	SV-2	Secor	8	0.43	ND	ND	ND	ND	ND
SV-7	SV-7	Secor	9	**0.68**	ND	ND	ND	ND	ND
SV-12	SV-12	Secor	8	0.27	ND	ND	ND	ND	ND
SV-16	SV-16	Secor	8	0.4	ND	ND	ND	ND	ND
MTCA Method A Cleanup Levels for Soil[5]				0.5	0.5	800	1600	1.67	0.526

1- Depth below surface in feet
2- All results in milligrams per kilogram (mg/kg)
3- PCE = Tetrachloroethene
TCE = Trichloroethene
Cis-1,2 DCE = Cis-1,2-Dichloroethane
Trans-1,2 DCE = Trans-1,2-Dichloroethane
1,1 DCE = 1,1-Dichloroethane
VC = Vinyl Chloride
4- ND = Not detected above the laboratory reporting limits
5- Model Toxics Control Act (MTCA) Chapter 173-340 WAC Method A soil cleanup levels for PCE and TCE and Method B soil cleanup levels (carcinogenic) for 1,2-DCE, cis and trans 1,2-DCE



FORMER SITE FEATURES (LOCATIONS APPROX.)

1. PCE DRY CLEANING MACHINE 1961–1972
2. PCE DRY CLEANING MACHINE 1972–1985
3. STODDARD DRY CLEANING MACHINE 1940–1945
4. SUMP FOR LAUNDRY MACHINE DRAINS
5. LAUNDRY MACHINE DRAINS
6. OIL UST FOR BOILER (REMODELED 1985)
7. GASOLINE/DIESEL UST'S

0 20 40

APPROXIMATE SCALE IN FEET

LEGEND

- STORM SEWER LINE
- CATCH BASIN
- LANDSCAPED AREA
- POTENTIAL SOURCE AREA

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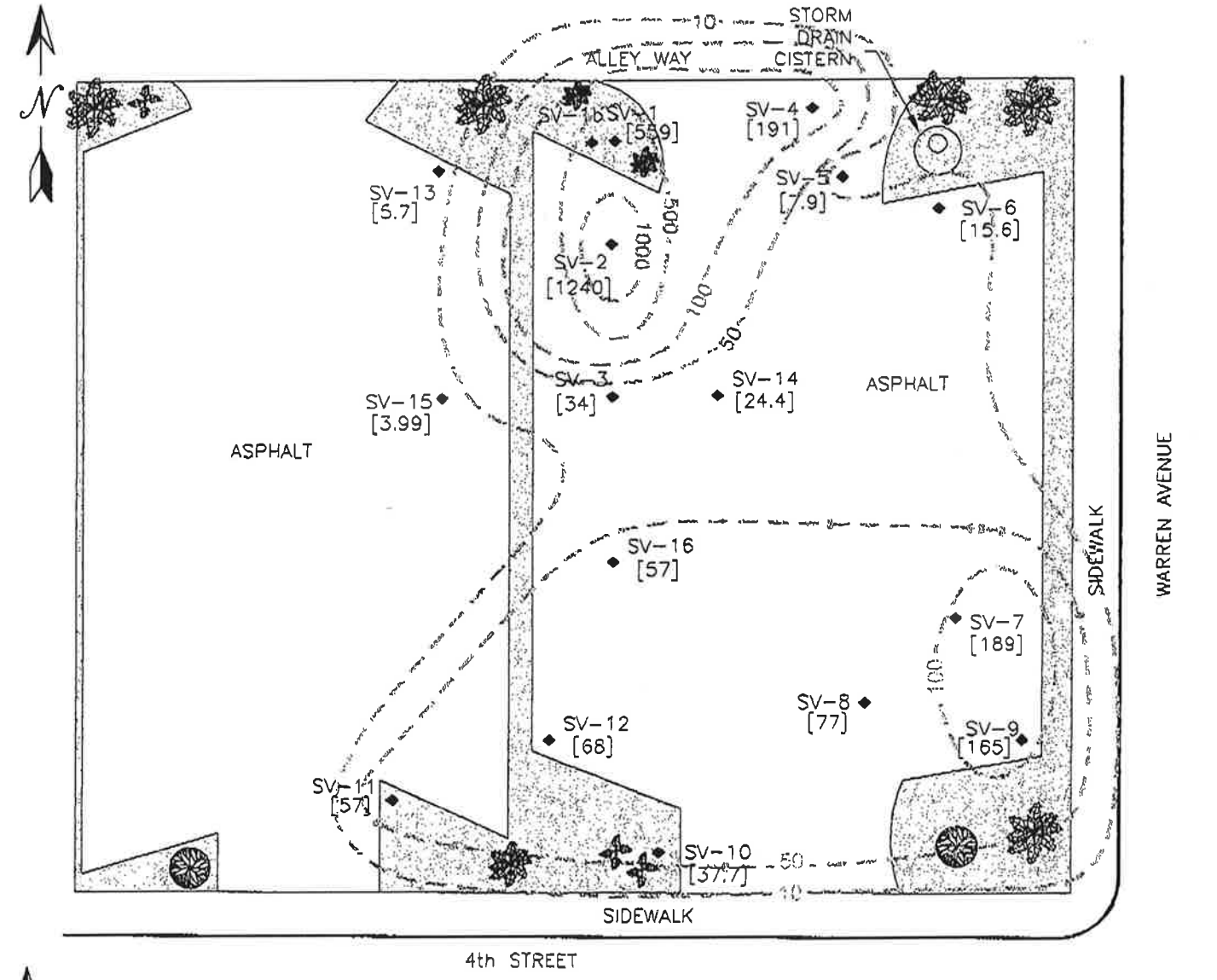
320 3rd Ave. NE, Suite 200
Issaquah, WA 98027

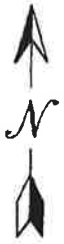
FIGURE 2

SITE FEATURES
AND POTENTIAL SOURCE AREAS
LAND TITLE BUILDING PARKING LOT
1002 4TH STREET
BREMERTON, WASHINGTON

FARALLON PN: 603-001

Drawn By: QDD	Checked By: CES	Date: 11/18/99	Disk Reference: 603001BASE





LEGEND

SV-12 ◆ SOIL VAPOR SAMPLE LOCATION (SECOR MAY 30, 1999)

[57] PCE CONCENTRATION IN PARTS PER MILLION BY VOLUME (ppmV)

50 PCE ISOCONCENTRATION CONTOURS (ppmv)

0 20 40

APPROXIMATE SCALE IN FEET

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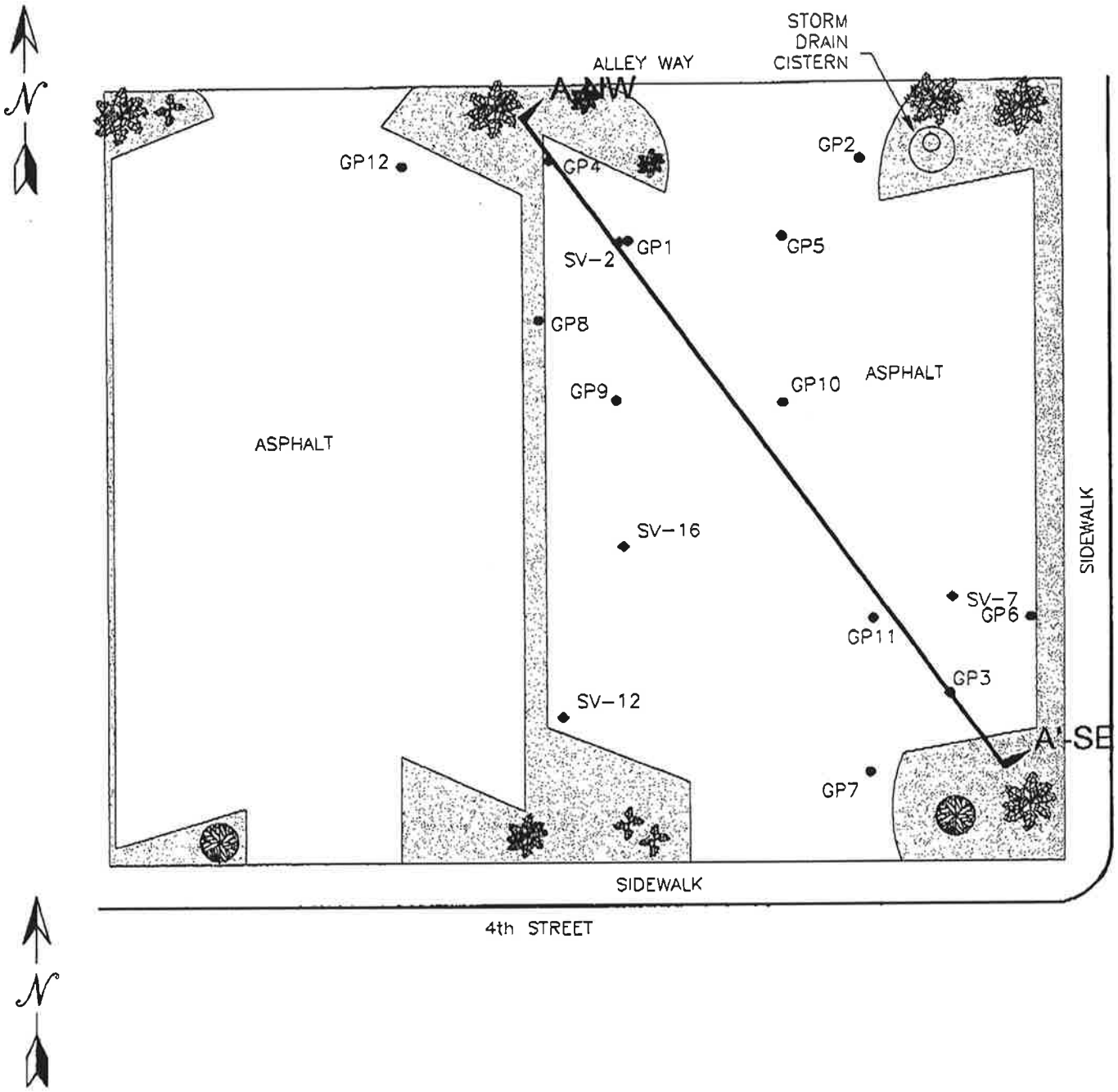
Issaquah, WA 98027

FIGURE 3

ISOCONCENTRATION MAP FOR PCE IN SOIL VAPOR 4 TO 6 FOOT INTERVAL
LAND TITLE BUILDING PARKING LOT
1002 4TH STREET
BREMERTON, WASHINGTON

FARALLON PN: 603-001

Drawn By: QDD	Checked By: CSS	Date: 10/21/99	Disk Reference: 603001BASE



LEGEND

GP7 ● SOIL BORING LOCATION FARALLON (SEPT 24-25, 1999)

SV-12 ◆ SOIL VAPOR LOCATION SECOR (MAY 30, 1999)

A-NW A'-SE CROSS SECTION LINE

0 20 40

APPROXIMATE SCALE IN FEET

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Issaquah, WA 98027

FIGURE 4

SOIL MATRIX SAMPLE LOCATIONS
AND CROSS SECTION LINE
LAND TITLE BUILDING PARKING LOT
1002 4TH STREET
BREMERTON, WASHINGTON

FARALLON PN: 603-001

Drawn By: ODD	Checked By: CSS	Date: 10/21/99	Disk Reference: 603001BASE

Farallon Consulting LLC
320 3rd Avenue NE, Suite 200
Issaquah, Washington 98027

Phone
(425) 427-0061

Fax
(425) 427-0067

To: Greg Costello
From: Peter
Company: Marten & Brown
Date: 11/18
Time:
FAX No: (206) 292-6301
Job No:
Phone No:
Pages (Including Cover):

Comments: – Have all the tables & figures (x-section is too big to FAX).

Hard Copy To Follow ___

November 24, 1999

Mr. Greg Costello
Marten & Brown LLP
1191 Second Avenue, Suite 200
Seattle, Washington 98101

RE: SCOPE OF WORK AND COST ESTIMATE
COMPLETE SITE CHARACTERIZATION AND FEASIBLITY STUDY
LAND TITLE BUILDING PARKING LOT
1002 4TH STREET
BREMERTON, WASHINGTON
FARALLON PN: 603-001

Dear Mr. Costello:

Farallon Consulting, LLC (Farallon) has prepared this scope of work and cost estimate to complete the site characterization, conduct a pilot test, and prepare a feasibility study for cleanup of tetrachloroethene (PCE) contamination at the Land Title Building Parking Lot located in Bremerton, Washington (herein referred to as the site). The purpose of completing the site characterization is to define the vertical and lateral extent of PCE concentrations in the soil, determine if groundwater has been impacted by the release of PCE, and to determine if off-site migration of PCE in soil or groundwater has occurred. The feasibility study will be conducted to develop a conceptual remedial design and a cost estimate for cleanup of PCE in soil, and possibly groundwater at the site.

A Phase I Soil Gas Survey investigation was completed by SECOR International at the site. Farallon conducted a Phase II Subsurface Investigation which included collection of 37 soil samples for laboratory analysis. The results of these investigations indicate that concentrations of PCE are widespread in the soil at the site and may extend to groundwater, which occurs regionally at a depth of 40 to 60 feet below ground surface (bgs). The Phase I and II investigations were not sufficient to delineate the vertical extent of PCE in the soil nor determine if groundwater is impacted. Farallon proposes the following scope of work to address these issues.

PROPOSED SCOPE OF WORK

The proposed scope of work will include the following:

- Collect shallow soil samples to the north of the northern source area and east of the southeast source area for analysis for PCE to define the lateral extent of PCE in shallow soils;
- Collect soil samples at depth in the north, southeast and southwest portion of the site for analysis for PCE;
- Install three groundwater monitoring wells in the north, southeast and southwest portion of the site;
- Measure groundwater levels and collect groundwater samples from the groundwater monitoring wells to estimate the groundwater gradient and for analysis for PCE;
- Install vapor extraction wells in the northern and southeastern source areas defined in the Phase II investigation for pilot testing of soil vapor extraction as potential cleanup alternative, and;
- Evaluate the results to develop a feasibility study, conceptual remedial design and cost estimate for cleanup of the site.

A more detailed description of the tasks to complete the proposed scope of work is provided below.

Task 1 - Project Management, Communications and Miscellaneous (Continuation)

This task will include coordination and management duties such as budgeting, personnel resources, subcontracting, permitting, progress reporting and communication with the client, legal counsel, and regulatory agency.

Task 4 – Installation of Groundwater Monitoring and Vapor Extraction Wells

Based on the results of the Phase I and II investigations, Farallon will install three groundwater monitoring wells at the locations shown on Figure 1 to evaluate groundwater conditions in close proximity to the defined source areas and to develop a groundwater gradient. The groundwater wells will be installed to a depth up to 60 feet bgs in accordance with WAC 173-160 guidelines. The wells will consist of two inch diameter PVC casing with traffic rated well heads. Soil cuttings will be placed in 55-gallon drums for on-site storage pending proper disposal. The cost for disposal of soil cuttings is not included with this cost estimate and will be provided once analytical results are available.

Vapor extraction wells will be installed on the site, two at each of the defined source areas (Figure 1). The vapor extraction wells will be installed to a depth of 20 feet bgs for extraction of vapors from 20 to six feet bgs. The well heads will consist of three-feet by three-foot vaults for further use in construction of a remedial system.

Task 5 –Sampling and Analysis of Soil and Groundwater

A total of 46 soil samples will be collected from the soil borings for installation of the groundwater monitoring and vapor extraction wells. Soil samples will be placed in laboratory prepared jars, sealed, labeled and transported to the laboratory on-ice for analysis. Farallon estimates a total of 17 soil samples will be analyzed for PCE by EPA Method 8021B. At least four soil samples collected in the vicinity of the former stoddard UST (MW-3, Figure 1) will be analyzed for TPH by Ecology Method NWTPH-Dx.

Groundwater samples will be collected from the three groundwater monitoring wells after the wells have been developed in accordance with standard protocols. Purge water will be stored in 55-gallon drums on-site pending the results of laboratory testing. The cost for disposal of purge water is not included with this cost estimate and will be provided once analytical results are available.

Groundwater samples collected from the groundwater monitoring wells will be analyzed for PCE by USEPA Method 8021B. The analytical results will be reviewed and used in conjunction with the pilot testing to develop a conceptual design. A field duplicate and trip blank will be included in the samples analyzed.

Task 6 – Pilot Testing

Farallon will conduct a pilot feasibility test of soil vapor extraction (SVE), which Farallon has identified as a potentially feasible cleanup technology for removal of PCE from the shallow soils. The purpose of the pilot testing is to evaluate the appropriateness of this technology to the site conditions. The objectives of the pilot testing are to:

- Estimate the radius of influence for air extraction for the subsurface conditions at the test locations;
- Evaluate if, and what type, of vapor emission treatment technology may be necessary, and;
- Collect specific design parameters for development of a detailed design and bid specifications.

The data will be used to evaluate the effectiveness of this technology and to develop a preliminary design. Analytical results of the vapor emissions will be used to determine an appropriate emission treatment technology to meet the permitting requirements and to estimate a schedule for site cleanup. The pilot testing will be conducted over a period of one week at the site and is not expected to significantly restrict the use of the site during the tests.

Task 7 –Feasibility Study and Conceptual Cleanup Action Design

Farallon will determine if groundwater has been impacted by PCE and degradation compounds such as trichloroethene, 1,2-dichloroethene, and vinyl chloride, and if there is a potential that off-site migration has occurred. The results of the pilot test and additional soil sampling will be used to evaluate if an SVE system is appropriate for the site conditions. If the results of the pilot testing indicate that an SVE system is appropriate for the site conditions, the results will be used

to determine permitting requirements, select appropriate equipment, develop a bid specification for construction of the system, and to estimate a schedule for site cleanup.

A feasibility study report will present the results of the soil and groundwater sampling and analysis, pilot testing, and will provide a conceptual design if the pilot testing results are sufficient. The feasibility study report will also include a preliminary cost estimate range and schedule for implementing the selected cleanup approach.

COST ESTIMATE AND SCHEDULE

The cost estimate to conduct this scope of work is $41,965. The estimated cost for each task is summarized in the attached Table 1. The work will be conducted on a time and materials basis in accordance with the terms and conditions previously agreed to. The cost estimate for the proposed scope of work may be modified if the scope of work or field program objectives change or if unforeseen conditions are encountered. Farallon has assumed that we will have unlimited access to the site. Electric power and potable water will be provided by Farallon for the pilot test. Farallon requests that access to the site for the pilot testing be arranged at least two weeks prior to mobilization to the site.

Farallon is prepared to conduct the groundwater sampling and pilot testing within two weeks of authorization to proceed. To approve the proposed scope of work and cost estimate, please sign both copies of the attached *Work Order*. A fully executed copy will be returned for your records. The groundwater sampling and pilot test will require four days on-site. We request that Farallon be provided a retainer for the work in advance of conducting the proposed work.

Farallon trusts that this provides sufficient information for your needs. Feel free to contact the undersigned at (425) 427-0061 if you have any questions or if you require additional information.

Sincerely,

Farallon Consulting, LLC

Peter Jewett
Principal

Clifford T. Schmitt
Principal

Attachments

TABLE 1
LAND TITLE BUILDING PARKING LOT FEASIBILITY STUDY
COST ESTIMATE
FARALLON PN: 603-001

Task 1- Project Management, Communications and Miscellaneous

Principal	2 hours @	$115 per hour =	$230
Senior Project Manager	8 hours @	$100 per hour =	$800
Project Geologist	32 hours @	$70 per hour =	$2,240
Clerical	4 hours @	$40 per hour =	$160
Travel			$75
	Task 1 Estimated Total		**$3,505**

Task 4 - Installation of Groundwater Monitoring and Vapor Extraction Wells

Senior Project Manager	8 hours @	$100 per hour =	$800
Staff Geologist	36 hours @	$60 per hour =	$2,160
Travel			$150
Equipment			$500
Utility Location			$150
Well Installation			$16,000
	Task 2 Estimated Total		**$19,760**

Task 5 - Sampling and Analysis of Soil and Groundwater

Senior Project Manager	4 hours @	$100 per hour =	$400
Staff Geologist	16 hours @	$60 per hour =	$960
Travel			$75
Equipment			$75
	Estimated Subtotal		**$1,510**

Laboratory
(17 soil, 3 groundwater, 2 QA/QC))

VOC	22 sample @	$120 per sample =	$2,640
WTPH-D extended	4 sample @	$95 per sample =	$380
	Estimated Subtotal		**$3,020**
	Task 5 Estimated Total		**$4,530**

TABLE 1
LAND TITLE BUILDING PARKING LOT FEASIBILITY STUDY
COST ESTIMATE
FARALLON PN: 603-001

Task 6 - Pilot Testing

Principal	2 hours @	$115 per hour =	$230
Senior Project Manager	8 hours @	$100 per hour =	$800
Staff Geologist	60 hours @	$60 per hour =	$3,600
Clerical	2 hours @	$45 per hour =	$90
Travel			$150
Equipment			$1,500
Per Diem			$300
	Estimated Subtotal		**$6,670**
Laboratory (emissions analysis)			
VOC	4 samples @	$200 per sample =	$800
Permitting			$1,200
	Estimated Subtotal		**$2,000**
	Task 6 Estimated Total		**$8,670**

Task 7 - Feasibility Study and Conceptual Cleanup Action Plan

Principal	6 hours @	$115 per hour =	$690
Senior Project Manager	12 hours @	$100 per hour =	$1,200
Project Engineer	40 hours @	$70 per hour =	$2,800
Clerical	8 hours @	$45 per hour =	$360
Drafting	10 hours @	$45 per hour =	$450
	Task 7 Estimated Total		**$5,500**
	ESTIMATED TOTAL		**$41,965**