LIMITED PHASE II SITE INVESTIGATION

Villa One-Hour Cleaners at Lakewood Towne Center Lakewood, Washington

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July 1, 2003

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Introduction

This report summarizes field activities and analytical results of a limited Phase II site investigation conducted at tenant space #3 occupied by Villa One-Hour Cleaners located at the northwest corner of the Lakewood Towne Center complex in Lakewood, Washington (Figure 1). Since the Lakewood Towne Center site characterization project began in the summer of 2000, Herrera Environmental Consultants, Inc. (Herrera) has prepared and provided the following deliverables:

Date	Deliverables
May 2000	Phase I Environmental Site Assessment
February 2001	Phase II Environmental Site Assessment
March 2001	Ground Water Quarterly Status Report (first quarter)
June 2001	Ground Water Quarterly Status Report (second quarter)
September 2001	Ground Water Quarterly Status Report (third quarter)
January 2002	Ground Water Monitoring Annual Summary Report (fourth quarter and first year summary)
February 2002	Updated Phase I Environmental Site Assessment
March 2002	Ground Water Quarterly Status Report (fifth quarter)
June 2002	Limited Phase II Site Investigation and Ground Water Quarterly Status Report (sixth quarter)
October 2002	Ground Water Quarterly Status Report (seventh quarter)
January 2003	Ground Water Monitoring Annual Summary Report (eighth quarter and second year summary)
April 2003	Ground Water Quarterly Status Report (ninth quarter)

Analytical results of samples collected during these field investigations indicate that a dry cleaner solvent, perchloroethylene (PCE), has been detected in ground water across the northwest portion of the site. The main source was identified by the presence of elevated PCE and its degradation by-products in shallow ground water near the former East Concourse building, which was occupied by a dry cleaner between 1968 and 1987. As part of site characterization activities and the implementation of a ground water monitoring program for the Lakewood Towne Center site, seven ground water monitoring wells were installed in the following locations:

- MW-1s (shallow), MW-1m (mid depth), and MW-1d (deep) in the source area
- MW-2d (deep) upgradient of the source area
- MW-3 (shallow) at the northwest property boundary (approximately 1,300 feet downgradient of the source area)

- MW-4 (shallow) immediately downgradient of the source area
- MW-5 (shallow) immediately downgradient of the source area.

Monitoring and analytical results from quarterly sampling events conducted since the monitoring program began in July/September 2000 indicate continued presence of residual PCE contamination in ground water, particularly within the 1968-1987 Plaza Cleaners source area located in the north-central portion of the mall property (Figure 2; Herrera 2003b, 2002c). PCE and biodegradation by-products exceeding Model Toxics Control Act (MTCA) method A and B ground water cleanup levels continue to be found near the water table with low PCE concentrations found at the deeper wells. PCE degradation has occurred in the source area at shallow depth, as indicated by the increased concentrations of vinyl chloride and presence of other PCE degradation by-products detected in shallow well MW-1s (Figure 2). Low concentrations of some contaminants have spread downgradient across the northwest quadrant of the Lakewood Towne Center site at levels below MTCA method A and B criteria (Herrera 2003b, 2002c).

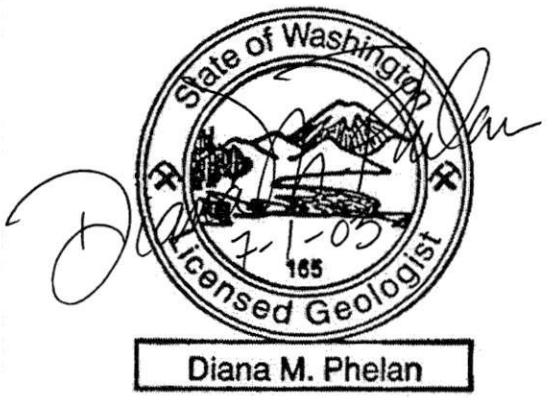
In spring of 2002, additional limited Phase II site assessment work was performed to address the potential for recent contamination associated with dry cleaner activities at the northwest corner and other portions of the mall property (Herrera 2002a). A release of PCE had been reported at the northwest corner of the mall property associated with dry cleaning operations beneath the building in an earlier investigation. Subsequent sampling of ground water from monitoring well MW-3 and soil boring SB-3 (Figure 2) indicated low concentrations of PCE and two biodegradation by-products; none of the compounds detected in ground water at these sampling locations exceeded MTCA method A and B cleanup criteria. Concentrations were low enough to have originated from the original identified source area or the cleaners operating in Building N1.

Objective and Scope

The objectives of this limited Phase II site investigation focused on 1) confirming the presence of PCE-contaminated subsurface soils found beneath the floor slab at tenant space #3 occupied by Villa One-Hour Cleaners during an earlier investigation, and 2) determine whether a possible source exists beneath the tenant space, attributing to PCE and two of its biodegradation by-products detected in ground water collected from well MW-3 and from borings installed at the northwest corner of the mall property.

The scope of work for the limited Phase II site investigation included advancing one soil boring inside the dry cleaner facility using a hollow-stem drilling method, installing a temporary well in the borehole after advancing into ground water, and collecting soil and ground water samples for chemical analysis. The findings and conclusions presented in this report are based on the evaluation of field data and analytical results obtained during previous Phase II field investigations, quarterly monitoring events, and this limited Phase II field investigation.

Work for this limited Phase II site investigation was performed in accordance with generally acceptable professional standards and practices for the type of work performed. While information regarding subsurface conditions, including soil and ground water quality, is believed to be generally representative of conditions at the site, conditions may change within short distances. Additional subsurface materials and contaminants may be present at locations not investigated during this study.



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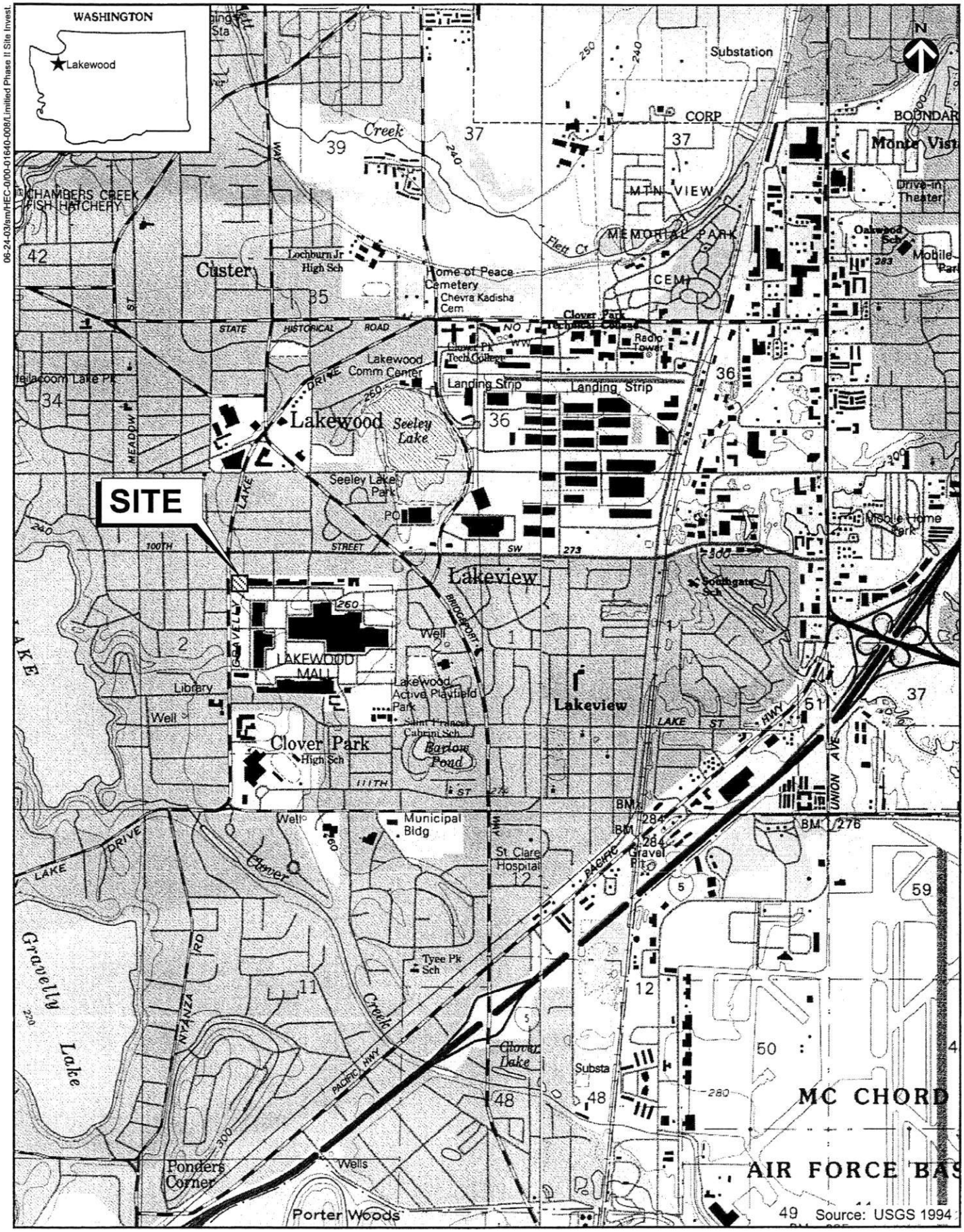

Figure 1. Vicinity map of Villa One-Hour Cleaners site and Lakewood Towne Center (formerly Lakewood Mall), Lakewood, Washington.

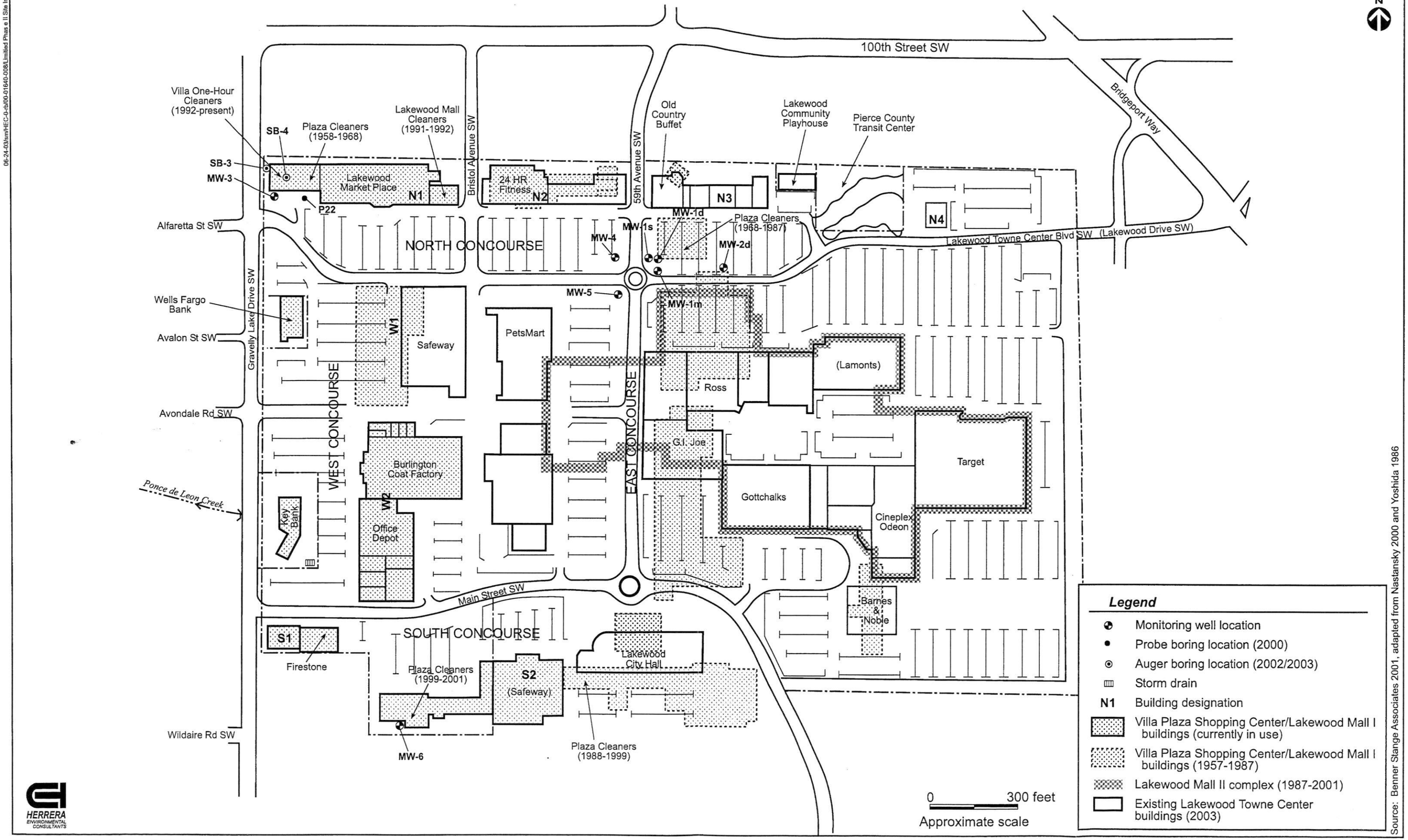

Figure 2. Lakewood Mall configurations (1957 through 2003) and sampling locations, Lakewood, Washington.

Site Background

Site Location and Description

The Lakewood Towne Center property consists of a 100-acre mall complex, located at 5731 Main Street SW in the city of Lakewood, Washington, approximately 6 miles southwest of downtown Tacoma (Figure 1). The Villa One-Cleaners is located at the northwest corner of the mall complex, in tenant space #3 of Building N1 (currently Suite 'O'), 6111 Lakewood Towne Center Boulevard SW. The dry cleaner site is situated within the southeast quarter of the northwest quarter of section 2, township 19 north, range 2 east of the Willamette meridian, in Pierce County, Washington (USGS 1994).

The mall property is bounded by the Lakewood Pavilion shopping center and mixed commercial/retail businesses to the north, Gravelly Lake Drive SW to the west, single-family and multi-unit residential properties to the southwest, St. Francis Cabrini Elementary School grounds to the southeast, and more single-family residential properties to the east.

The entire mall property has undergone extensive renovations and redevelopment; demolition and construction work began in October 2001. Prior to redevelopment, the mall property was divided into two components (Figure 2):

- Lakewood Mall I, composed of eleven separate buildings, was the former Villa Plaza shopping center constructed in 1957, with renovations to the buildings made in 1986 and 1989. This portion of the mall was subdivided into the North, West, South, and East Concourses. The original East Concourse was demolished in 1989 to make way for the Lakewood Mall II complex. The eastern half of the original South Concourse was demolished early in 2001 to make way for the new Lakewood City Hall building. The northern building of the original West Concourse was demolished in 2001 to make way for the new Safeway store building. Exteriors of the remaining West and North Concourse buildings were being renovated; no renovations were planned for the interior portions (Herrera 2002b, 2000).

- Lakewood Mall II, constructed in 1989, replaced the original East Concourse and consisted of five large individual department store buildings connected by an enclosed mall. Separate Barnes & Noble bookstore and 12-screen Cineplex Odeon movie theater buildings were added in 1996. Currently, most of Lakewood Mall II has been demolished; the former Lamonts, Target, and Gottschalks department store buildings, the movie theater complex, and the bookstore building are all that remains of the Lakewood Mall II complex.

For the purposes of this report, historical references to the property will use Lakewood Mall I and II designations, current conditions will refer to the Lakewood Towne Center (owned by MBK Northwest), and the entire mall property will be referred to as Lakewood Mall (including parcels owned by others).

Villa One-Hour Cleaners operated as an onsite dry cleaning facility in tenant space #3 at Building N1 from 1992 until February 2003, when the equipment was taken out of service and removed from the site by the end of March 2003 (Nastansky personal communication 2003). Dry cleaning equipment was operated within the east-central portion of the tenant space (Nastansky personal communication 2003), including an enclosed aboveground storage tank that contained dry cleaning solvents. Since March 2003, Villa One-Hour Cleaners has operated as a drop off/pick up service at this location, with dry cleaning operations conducted at an offsite facility.

Previous Investigations

Hillmann 1998/1999 Phase II Site Assessment

In December 1998 and January 1999, Hillmann Environmental Company (Hillmann) of Seattle, Washington conducted a Phase II site assessment near Building N1 to determine whether soil and ground water had been impacted by potential releases of hazardous substances from Villa One-Hour Cleaners (Hillmann 1998, 1999). The Phase II study involved collection of soil and ground water samples using the push probe sampling method from selected locations outside the dry cleaning facility and surrounding a reported former heating oil tank located in the alley behind the dry cleaner facility. A hand auger soil sample also was collected from beneath the building floor. The results indicated the following:

- One soil sample collected from inside the dry cleaner facility approximately 1.5 feet below the concrete floor slab was found to contain 0.99 milligrams per kilogram (mg/kg) PCE, which was above the Model Toxics Control Act (MTCA) method A soil cleanup level of 0.5 mg/kg. PCE was either detected below the MTCA cleanup level or below laboratory detection limits for soil and ground water samples collected from the two probes drilled north of the building. In 2001, MTCA revisions were adopted that lowered the soil method A cleanup levels for PCE to 0.05 mg/kg and TCE to 0.03 mg/kg. Two other subsurface soil samples would have slightly exceeded the revised cleanup levels.

- Ground water samples collected surrounding a reported former heating oil tank behind the building were analyzed for diesel and heavier-than-diesel petroleum hydrocarbons. These samples were found to contain 1.9 and 3.0 milligrams per liter (mg/L) diesel-range hydrocarbons, above the MTCA ground water cleanup level of 1.0 mg/L. Soil samples collected just above the water table at each probe location were found to be below

the laboratory detection limits for diesel-range hydrocarbons. A follow-up investigation including 10 ground water samples using push probe sampling at locations north and in the planting strip to the west was conducted. All 10 samples were found to be below laboratory detection limits for diesel-range hydrocarbons, including a sample co-located with the earlier sampling that had contained elevated total petroleum hydrocarbons (TPH) levels. A determination was made that TPH detected in their earlier study no longer existed in the area, either because ground water flow direction had changed or because the contamination had naturally attenuated. Hillmann also concluded that TPH had not migrated to this location from other onsite or offsite sources.

Herrera Phase I/II Environmental Site Assessments and Ground Water Quarterly Sampling Events (2000 through 2003)

This section summarizes the results of two Phase I environmental site assessments of the Lakewood Towne Center, including one conducted in spring of 2000 (Herrera 2000) and an updated Phase I study completed in February 2002 (Herrera 2002b), two Phase II environmental site assessments, including one conducted in summer of 2000 and another in spring of 2002 (Herrera 2001, 2002a), and ground water quarterly sampling events conducted between July 2000 and February 2003 (Herrera 2002c, 2003a and b).

A Phase II field investigation was conducted in the summer of 2000 to address the potential for area-wide contamination associated with use of septic systems over the first 20 years of operation, as well as other environmental concerns identified in the 2000 phase I study of Lakewood Mall. Results of samples collected during the field investigations indicated the presence of elevated perchloroethylene (PCE) and its degradation by-products in shallow ground water near the north end of the former East Concourse building, where a dry cleaning business operated between 1968 and 1987. Low PCE concentrations also were found in ground water at probe borings and monitoring wells installed across the northwest portion of the mall property.

Results from the 2000 and 2002 Phase II field investigations, and quarterly ground water sampling at monitoring well MW-3 since July 2000 pertinent to this limited Phase II field investigation included the following:

- Probe boring P22 was drilled near tenant spaces in Building N1 occupied by the existing Villa One-Hour Cleaners and a former Plaza Cleaners location (1958 to 1968) (Figure 2). Ground water samples collected on July 13, 2000 from P22 indicated low concentrations of PCE (0.72 µg/L) and cis 1,2-dichloroethene (cis DCE; 1.0 µg/L), with concentrations below revised MTCA method A and B cleanup criteria.

- Soil boring SB-3 was installed downgradient within a planter strip west of Building N1 to assess ground water quality for contaminants associated with current and former dry cleaning facilities that occupied tenant spaces

in the western half of Building N1 (Figure 2). Ground water samples collected on March 1, 2002 from SB-3 indicated low concentrations of PCE (0.51 µg/L), trichloroethene (TCE; 0.26 µg/L), and cis DCE (1.0 µg/L), with all three concentrations below revised MTCA method A and B cleanup criteria.

- Since July 2000, ground water samples have been collected from monitoring well MW-3, installed downgradient adjacent to the southwest corner of Building N1, to monitor concentrations of PCE and its degradation byproducts detected in probe borings installed across the northwest portion of the mall property during the 2000 field investigation. PCE and cis DCE have consistently been detected in ground water, with concentrations well below the revised MTCA method A cleanup level of 5 µg/L for PCE and the method B cleanup level of 80 µg/L for cis DCE (Figure 3). TCE was detected in ground water from MW-3 one time in February 2002 (0.31 µg/L), at a concentration well below the method A cleanup level of 5 µg/L.

HVOC concentrations in samples collected at all three locations surrounding Building N1 indicate consistent levels across the area over a three-year period (Table 1).

Table 1. HVOC results in ground water (µg/L) collected during previous investigations in the northwest corner of Lakewood Towne Center.

Analyte	*MTCA method A or B ground water cleanup levels* [a]	Probe boring P22 (July 2000)	Soil boring SB-3 (March 2002)	Monitoring well MW-3 (July 2000 to February 2003) [b]
Perchloroethylene (PCE)	*5.0*	0.72	0.51	0.52 – 0.69
cis 1,2-Dichloroethene (cis DCE)	*80*	1.0	1.0	0.23 – 1.3
Trichloroethylene (TCE)	*5.0*	ND (0.20)	0.26	ND (0.20) – 0.31

HVOC values in ground water reported in micrograms per liter (µg/L).
ND (0.20) Constituent not detected above the practical quantitation limit shown in parentheses.
[a] Model Toxics Control Act (MTCA) method A and B potable ground water cleanup levels (Ecology 2001a, b).
[b] HVOC results for samples collected from MW-3 during quarterly sampling events between July 2000 and February 2003 (Herrera 2003a, b; 2002c; 2001).

Two dry cleaning facilities besides Villa One-Hour Cleaners have operated in tenant spaces at Building N1 as identified during the 2000 Phase I environmental site assessment conducted for the former Lakewood Mall (Herrera 2000), including the 1958-1968 Plaza Cleaners and the 1991-1992 Lakewood Mall Cleaners (Figure 2).

Regional Geology and Hydrogeology

The Lakewood Towne Center property and most of the Central Pierce County area are situated on an extensive upland glacial drift plain. The drift plain originated from glacial and

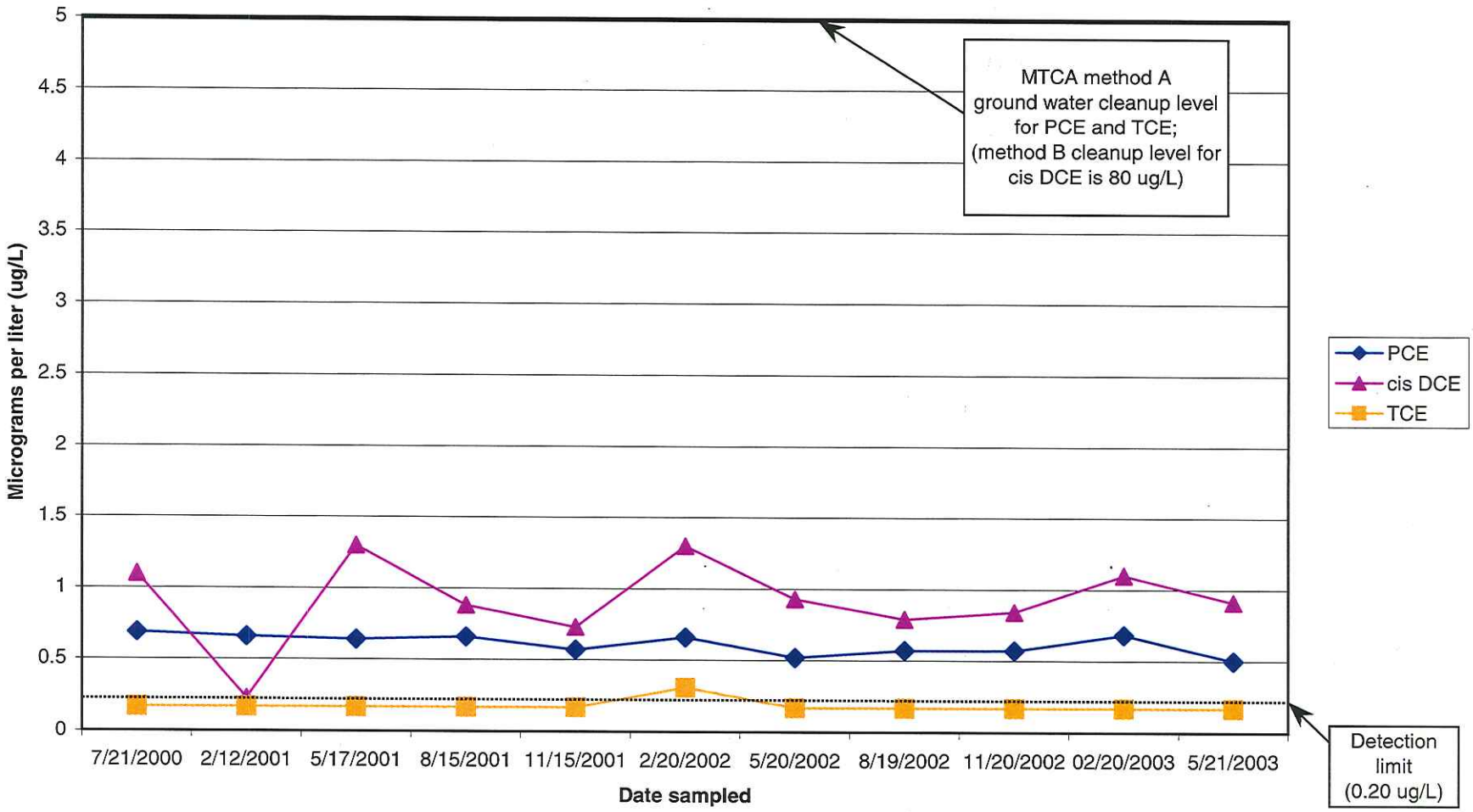

Figure 3. HVOC concentrations in ground water (ug/L) at MW-3, Lakewood Towne Center, Lakewood, Washington.

glaciofluvial processes associated with the Vashon Glaciation. The drift plain is dotted with small lakes and swamps occupying depressions called kettles. Melting blocks of glacial ice buried in the drift formed kettles. The plain is bounded on the west by Puget Sound, and extends to the foothills of the Cascade mountain range to the east. Major drainages incising the drift plain include the Puyallup River to the north and east, and the Nisqually River to the south.

The general stratigraphy in Central Pierce County and in the vicinity of the subject site consists of a series of Pleistocene age glacial and nonglacial sediments overlying Tertiary bedrock at a depth of about 2,000 feet below ground surface (Hall and Othberg 1974). The surficial soils encountered onsite during onsite and nearby environmental site investigations consist of openwork coarse sand and gravel with cobbles and trace amount of silt. This gravel unit is called the Steilacoom Gravels, representing a facies of recessional outwash as a result of deltas formed in proglacial lakes (Walters and Kimmel 1968). Based on several gravel pit mines identified in the area, the thickness of Steilacoom gravels in the vicinity of the subject site can vary between 20 to 60 feet. Underlying the Steilacoom gravels is a very dense glacial till deposit, known as the Vashon Till, consisting of impermeable sandy silt with variable amounts of gravel and clay.

The area topography is relatively flat to slightly hummocky at an elevation of 260 feet above mean sea level. Based on historical information, the mall was developed on a marsh that had occupied the east-central portion of the property. A layer of peat reportedly exists beneath the Target store building, based on information gathered for development of Lakewood Mall II and concern for the presence and build-up of methane gas (Nastansky 2000).

The Lakewood Towne Center property and vicinity has a poorly developed overland flow drainage system, due to the high infiltration capacity of gravelly soil and level topography. Aquifers primarily are recharged by precipitation in this area, averaging approximately 38 inches annually. Prior to development of the mall in 1957, the marsh drained into Ponce de Leon Creek to the west, which eventually drains into Lake Steilacoom located 0.5 miles west of the mall property. The marsh and creek were diverted into a storm water drainage system beneath the property during the development of Villa Plaza shopping center and later the Lakewood Mall II complex, which continues to discharge into Ponce de Leon Creek (Nastansky 2000). Based on observations of running water in some of the drains and water levels measured in nearby probe borings, ground water appears to feed the storm water drainage system. No other continuously flowing streams or surface water channels in or out of the mall property and surrounding area have been observed.

Limited Phase II Site Investigation Summary

The field investigation consisted of collecting and testing subsurface soil and ground water samples for potential contaminants associated with prior use of dry cleaning solvents at Villa One-Hour Cleaners in Lakewood Towne Center. All drilling activities were conducted under the direction of a Washington state-licensed geologist. Field procedures, including sample collection and handling, drilling activities, and decontamination procedures, are described in detail in Appendix A. The boring log for auger-drilled SB-4 installed inside tenant space #3 is provided in Appendix B.

The limited Phase II field work for the Villa One-Hour Cleaners facility was conducted on May 20, 2003 using the following subcontractor services:

- Jeff Davies Drilling of Seattle, Washington conducted drilling and well installation services by hollow-stem auger drilling.
- OnSite Environmental Inc. of Redmond, Washington conducted laboratory analyses of soil and ground water samples.

Sampling Locations

The location of soil boring SB-4 was established based on the former location of dry cleaning equipment and operations, and the westerly assumed direction of ground water flow. No evidence of a concrete patch was observed across the floor surface indicating the probable location of a hand auger soil sample collected during the 1998/1999 Hillmann field investigations. Boring SB-4 was installed inside the tenant space about 6.5 feet west of the east wall, downgradient of the former location of dry cleaning equipment and operations area. A visible stain was noted on the east wall, indicating possible exhaust stains from dry cleaning equipment. Drilling space was limited due to vertical clearance to an area between ceiling/roof joists allowing clearance for the drill rig mast and overhead utilities. The boring location was marked on the floor surface prior to drilling activities using a 100-foot measuring tape and spray paint (Figure 4).

Following utility clearance and prior to drilling activities, a concrete coring contractor was retained to cut and remove two 16-inch square concrete cutouts to expose soil beneath the concrete floor. The second cutout was completed in case drilling refusal at the first location was encountered.

Soil Sample Collection from Drilled Borings

Soil boring SB-4 was drilled with a hollow-stem auger drill rig to a maximum depth of 21.5 feet. Soil samples were collected at 2.5-foot depth intervals until ground water was encountered. Soil

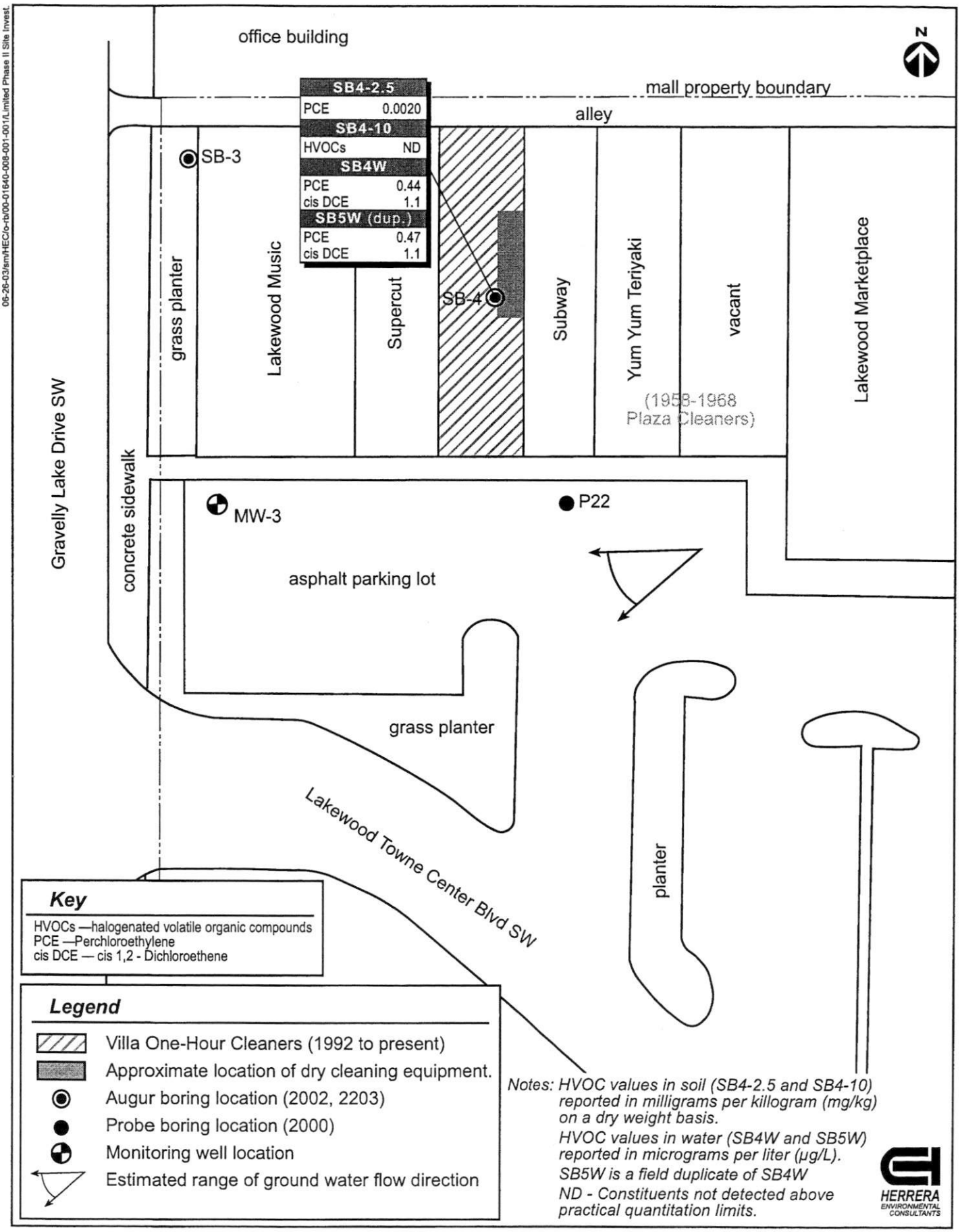

Figure 4. HVOC results for soil (mg/kg) and ground water (µg/L) samples collected from boring SB-4 at Villa One-Hour Cleaners in Lakewood Towne Center.

samples were retrieved using a decontaminated split spoon soil sampler and were visually classified for lithology, screened for the presence of volatile organic vapors using a photoionization detector (PID), and observed for moisture content indicating the presence of ground water.

Soil samples collected from boring SB-4 were selected for chemical analysis based on field screening results and field observations. The sample collected at the 2.5-foot depth interval from SB-4 (sample SB4-2.5) was selected based on an elevated PID reading and to assess subsurface soils directly beneath the concrete floor slab for potential presence of dry cleaning solvents associated with leaks and/or spills. The sample collected at the 10-foot depth interval (sample SB4-10) was selected to assess vertical extent of potential contamination below the concrete floor, and to coincide with the assumed water table zone of fluctuation. Both samples were labeled and then stored in chilled coolers prior to being hand-delivered to the laboratory.

Ground Water Sample Collection from a Temporary Monitoring Well

A ground water sample was collected from a temporary monitoring well installed in SB-4 borehole (SB4W). A 5-foot long, 0.010-inch slotted PVC screen with blank riser pipe was placed in the borehole 2.5 to 3 feet below the water table. The auger was pulled back to expose the screen to the formation, while placing a sand filter pack in the annular space between the screen and borehole. The temporary well was developed and sampled using a low-flow purge method with clean, dedicated polyethylene tubing and a peristaltic pump. Prior to well development and sampling, static water level was measured using an electronic water level indicator by lowering the probe through the PVC casing. One to two gallons of water were removed to improve water clarity, prior to sample collection. The sample was collected by directly filling 40-milliter vials provided by the analytical laboratory with the same tubing used for well development. Vials for volatile organics analysis contained two drops of hydrochloric acid added for sample preservation. Care was taken to ensure that no bubbles or headspace were present. Immediately upon filling, each container was securely capped, labeled, and placed into a chilled cooler for storage prior to and during delivery to the analytical laboratory. The date and time of each sample collected was recorded in the field notebook, on the boring log, and on the sample chain-of-custody form.

After soil and ground water samples were collected, the well casing was removed and the borehole backfilled with bentonite chips, then sealed at the surface with concrete.

Sample Analyses

Soil samples collected at 2.5- and 10-foot depth intervals (samples SB4-2.5 and SB4-10), and ground water samples from soil boring SB-4 (sample SB4W and its field duplicate SB5W) were submitted under chain-of-custody protocol to the laboratory for halogenated volatile organic compounds (HVOCs) using the U.S. Environmental Protection Agency (EPA) Method 8260B.

The complete laboratory analytical report and a data quality assurance review summary of all analytical results of soil and ground water samples collected during the limited Phase II site investigation are included in Appendix C.

Results

Subsurface Conditions

Soil encountered during drilling of SB-4 primarily consists of dark grayish brown, slightly silty gravel, with variable amounts of sand and cobbles. This gravel unit appeared similar to soils encountered nearby during drilling of soil borings MW-3 and SB-3, and to those described for the openwork gravel outwash deposit known as the Steilacoom Gravels formation. The boring was drilled to a maximum depth of 21.5 feet; the base of the gravel unit was not reached.

No soil staining or chemical-like odors were noted in any of the soil samples retrieved from boring SB-4. PID readings above background levels were detected in samples collected directly beneath the concrete floor slab and at the 2.5-foot depth interval, with readings of 6.2 and 7.1 parts per million (ppm), respectively. No PID readings were detected in samples collected from the remaining sample intervals. No PID readings were detected in soil collected 1.7 feet below the floor slab at the second concrete cutout located about 8.5 feet north of SB-4.

A static water level was measured at 17.70 feet below floor level in the temporary well installed in borehole SB-4. Based on monitoring data and results of previous investigations and quarterly sampling events conducted across the mall property, ground water flow direction is generally to the west-southwest.

Data Quality Assurance Review

The soil and ground water samples collected from boring SB-4 were analyzed for halogenated volatile organic compounds. All analytical results were determined to be acceptable for use based on the data quality assurance review presented in Appendix C.

Soil Analytical Results

Analytical results of soil samples collected from boring SB-4 during the field investigation are summarized in Table 2 and illustrated in Figure 4. Results indicate PCE detected in soil collected from the 2.5-foot depth interval at a concentration of 0.002 mg/kg, well below the MTCA method A soil cleanup level of 0.05 mg/kg. No PCE or other HVOCs were detected above practical quantitation limits in the sample collected at the 10-foot depth interval from SB-4.

Table 2. HVOC results for soil (mg/kg) and ground water (µg/L) samples collected from soil boring SB-4 at Villa One-Hour Cleaners, Lakewood Towne Center.

Sample Identification	PCE	cis DCE
Soil (mg/kg)		
MTCA method A and B soil cleanup levels	*0.05* [a]	*800* [b]
SB4-2.5	0.0020	ND (0.0010)
SB4-10	ND (0.0010)	ND (0.0010)
Ground Water (µg/L)		
MTCA method A and B ground water cleanup levels	*5* [a]	*80* [b]
SB4W	0.44	1.1
SB5W *	0.47	1.1

Soil values reported in milligrams per kilogram (mg/kg) on a dry weight basis.
Ground water values reported in micrograms per liter (µg/L).
ND (0.0010) Constituent not detected above the practical quantitation limit shown in parentheses.
* Sample SB5W is a field duplicate of SB4W.
[a] Model Toxics Control Act (MTCA) method A cleanup levels (Ecology 2001a).
[b] MTCA method B cleanup levels (Ecology 2001b).

Ground Water Analytical Results

Analytical results of ground water sample SB4W (and field duplicate SB5W) collected from soil boring SB-4 are summarized in Table 2 and illustrated in Figure 4. Results indicate PCE (0.47 µg/L) and cis DCE (1.1 µg/L) detected at concentrations below MTCA method A and B cleanup criteria (5 µg/L for PCE and 80 µg/L for cis DCE).

Conclusions

The purpose of this limited Phase II site investigation was to confirm the presence of PCE-contaminated soil found during an earlier investigation beneath tenant space #3 occupied by Villa One-Hour Cleaners, and to determine whether it is a possible source area for PCE and cis DCE found in ground water during subsequent field investigations conducted at the northwest corner of the mall property. Results of the limited Phase II site investigation conducted at Villa One-Hour Cleaners in May 2003 are discussed below.

A release of dry cleaning solvent (PCE) was identified in soil collected beneath the floor slab inside tenant space #3, as evidenced by low level contamination found in the sample from 2.5 feet below the floor slab at SB-4, and a hand auger soil sample collected 1.5 feet below the floor slab during an earlier investigation. Boring SB-4 was installed near the former dry cleaning operation area, and it is assumed that the hand auger sample also was collected in the same area, although no evidence of a concrete patch was observed across the floor surface. Sample SB4-2.5 had a PCE concentration (0.0020 mg/kg) well below the MTCA method A cleanup level of 0.05 mg/kg; the previous 1.5-foot depth sample from the hand auger borehole had a concentration (0.99 mg/kg), above the cleanup criteria. No PCE or other halogenated volatile organic compounds were detected above practical quantitation limits in soil collected at the 10-foot depth interval at SB-4. Because the PCE-impacted soil is covered by the building, eliminating leaching of contaminants due to rainfall infiltration, and the lack of significant water table fluctuations observed in the area based on ground water levels consistently measured between 16 and 18 feet below ground surface at nearby monitoring well MW-3 since July 2000, it is unlikely that contaminated soil directly beneath tenant space #3 is a source area attributing to PCE and degradation by-products in ground water identified at P22, SB-3, MW-3, and SB-4.

The PCE and cis DCE concentrations detected in ground water collected from SB-4 are consistent to those detected in samples collected during earlier field investigations (P22 in 2000 and SB-3 in 2002) and from monitoring well MW-3 during quarterly sampling events (see Table 1). The presence of PCE and its breakdown products, not identified at other non-source sampling locations across the northwest portion of the mall property, indicates ground water contamination may be associated with either the 1968-1987 Plaza Cleaners source identified in the north-central portion of the mall property, or separate dry cleaning activities conducted at two other locations in Building N1. None of the compounds detected at well MW-3, and from borings P22, SB-3, and SB-4 exceeded MTCA method A or B cleanup criteria.

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APPENDIX A

Field Procedures

Field Procedures

This appendix documents the procedures used to perform the limited Phase II site investigation described in this report, including:

- Drilling and soil sampling using hollow-stem auger drilling method
- Temporary well installation and ground water sampling procedures
- Sample jars, sample handling, and chain-of-custody procedures
- Field equipment decontamination procedures.

The soil boring log for SB-4 is provided in Appendix B.

Sample Designation

Samples were designated by a three-digit alphanumeric system referencing the boring location number and sample number within the location. The letters 'SB' followed by a number denoted sample collected from the soil boring, followed by an additional suffix denoting either the depth interval of the soil sample, or the letter 'W' for water sample. For example, SB4-2.5 denotes the soil sample collected at the 2.5-foot depth interval at soil boring location 4, and SB4W denotes the water sample collected at SB-4.

Drilling and Sampling Procedures

Pre-Drilling Activities

Prior to commencing drilling activities, Underground Utility Location Service (UULS) was notified of the intent to drill. UULS subsequently contacted participating agencies or companies with underground utilities in the area. These utility companies marked the locations of their utility lines and equipment.

In addition, a private utility locating company, APS, Inc. of Issaquah, Washington, was retained to locate underground utilities at proposed boring locations situated on private property.

Following utility clearance but prior to drilling activities, a concrete coring company was retained by Lakewood Towne Center management to cut and remove two 16-inch square concrete cutouts of the floor slab inside tenant space #3 to expose the soil beneath.

Soil Sampling from Auger-Drilled Borings

Soil boring SB-4 was drilled to a maximum depth of 21.5 feet using a limited access auger drill rig equipped with 3.25-inch inside diameter hollow-stem auger flights and a mast height of 10

feet to allow ceiling height clearance during drilling activities inside the tenant space. Discrete soil samples for soil classification, field screening, and chemical analysis were collected at 2.5-foot depth intervals using a drive split-spoon sampler 18 inches long by 2-inches outside diameter. The sampler was driven using a 140-pound downhole hammer with a drop of 30 inches. Following retrieval, each sample was logged by a geologist for soil lithology and field screened for indications of contamination. Soils encountered during drilling were visually inspected for staining, classified in accordance with the USCS (ASTM D2488-90), and observed for coloration using Munsell soil color charts.

Collected soil samples were field-screened for the presence of volatile organic vapors using a Photovac® Microtip 2020 photoionization detector (PID). The PID is designed to detect and measure volatile organic compound vapors in air. The PID was calibrated using 100 parts per million (ppm) isobutylene standard gas. Pertinent geologic and hydrogeologic subsurface conditions and PID readings were recorded on the soil boring log (Appendix B).

Soil samples collected for chemical analysis were prepared by removing soil from the sampler and placement directly into jars provided by the analytical laboratory. Each sample was uniquely labeled denoting the sample identification number and depth, date and time sampled, and job number. Soil samples were then placed into a chilled cooler for storage prior to delivery to the laboratory.

Ground Water Sampling from Temporary Monitoring Well

Ground water samples were collected from a temporary monitoring well installed in boring SB-4 drilled inside tenant space #3. The well was constructed of 1.25-inch inside diameter Schedule 40 polyvinyl chloride (PVC) blank casing flush threaded to 0.010-inch slot machine cut PVC well screen. The well was sealed with a flush threaded PVC bottom cap. Depth to water was determined by the field geologist based on observation of the moisture content in soil samples collected from the boring location. The well was installed at the bottom of the auger-drilled boring drilled approximately 3 feet below the water table. The auger was pulled back to expose the 5-foot PVC screen section to the formation, while placing a silica sand filter pack in the annular space between the well screen and borehole. Prior to well development, static water level was measured with an electric water level indicator. The temporary well was developed and sampled using a low-flow purge method with clean, dedicated polyethylene tubing and a peristaltic pump. General procedures for collecting ground water samples from temporary wells installed in auger-drilled borings were as follows:

1. Prior to sampling, static water level was measured by lowering an electronic water level meter probe inside the temporary well. Static water level measurements were taken to the nearest 0.01 feet relative to the ground surface. Record the time, date, and measurement in the field notebook and soil boring log.

2. Flexible polyethylene tubing was threaded down to the screened well casing, with the tube intake located in the middle or slightly above the

middle of the screened interval. This ensured that most of the water pumped was drawn directly from the formation, with little mixing of casing water or disturbance to the sampling zone. Water from the screened interval was pumped to the surface using a peristaltic pump.

3. The well was developed by purging using the peristaltic pump at a rate less than 1 liter per minute, keeping a constant water level.

4. Samples were collected after development was completed (until the water removed was of generally clear quality). Samples were collected directly from the tubing into sample containers provided by the analytical laboratory. Care was taken to ensure that no bubbles or headspace were present. Immediately upon filling, each container was securely capped, labeled, and placed into a chilled cooler for storage prior to delivery to the analytical laboratory. The date and time of each sample collected was recorded in the field notebook and on the chain-of-custody form.

5. Dedicated tubing used for purging and sampling ground water from the well was pulled out and discarded into a plastic garbage bag to be disposed of at a solid waste disposal facility. The PVC temporary well then was pulled out of the borehole and discarded into a plastic garbage bag to be disposed of at a solid waste disposal facility.

6. The borehole was backfilled from the bottom with bentonite chips and capped at the surface with concrete.

Decontamination Procedures

Decontamination was performed on all sampling equipment potentially exposed to contaminated soil and ground water prior to leaving each area of concern. All sampling equipment, except for clean, dedicated PVC well screen and casing, and polyethylene tubing was decontaminated prior to entry in the field. In addition, chemical-resistant gloves worn by sample handlers were changed between sampling locations.

Decontamination of Soil Sampling Equipment

The following decontamination procedure was used for soil sampling equipment, including split-spoon samplers:

- Rinse with tap water
- Scrub with water and phosphate-free liquid detergent
- Rinse with tap water.

The electronic water level indicator was rinsed with deionized water following use.

Decontamination of Drilling Equipment

Drilling equipment, including sections of hollow-stem drill augers, was decontaminated using a high-temperature pressure washer following use. Decontamination fluids generated during decontamination of drilling equipment and development water purged from the temporary well were contained in a 55-gallon drum.

Sample Handling

All samples collected during this investigation were handled according to the procedures described in this section.

Sample Containers and Labeling

Samples were placed in containers supplied by the analytical laboratory appropriate for the analyses to be performed. Water samples collected for halogenated VOC analysis were placed in 40-ml vials with two drops of hydrochloric acid for sample preservation. Sample container labels were completed at the time of collection using a permanent waterproof pen or marker. Sample labels included the following information:

- Project name
- Sample identification (including site designation, sample number, and depth interval collected)
- Date and time of collection.

Sample Storage

Immediately following sample collection, sample containers were placed into a chilled cooler for storage prior to delivery to the analytical laboratory. Care was taken to ensure that sample holding times were not exceeded during periods of storage. Sample containers were placed into plastic Ziploc bags to protect labels from moisture in the cooler.

Chain of Custody

Following collection, sample information was recorded on a chain-of-custody form. The purpose of this record is to account for the possession (or custody) of each sample from the time it is collected until laboratory testing and reporting is complete. The signature of each person in possession of the samples must be recorded on the chain-of-custody form. Information recorded on the chain-of-custody record included the following:

- Project name and location
- Project number

- Names of project manager and sampling personnel
- Sample identification
- Sample matrix (soil or water)
- Date and time of collection (for each sample)
- Analysis requested (for each sample)
- Number of sample containers (for each sample)
- Signature, date, and time (for each person releasing or accepting sample custody).

Sample Shipment and Delivery

Samples collected during this field investigation were hand-delivered to the analytical laboratory.

Sample Documentation

All sampling activities during this investigation were documented in a dedicated field notebook. The notebook was labeled with the project name, project identification number, dates of field activities, and name of the field coordinator. All relevant activities were recorded in the field notebook during the period of the field investigation. Entries into the field notebook were made in permanent ink. Corrections were made by placing a single line through the original entry accompanied by the initials of the person entering the correction. At a minimum, information in the field notebook included:

- Date and atmospheric conditions
- Major activities to be performed
- Names of sampling personnel present (including subcontractors)
- Time of arrival at site, set-up, sample collection, and completion at each sample station
- Soil descriptions (except where recorded on boring logs)
- Start and stop times of work by subcontractors
- Any unusual events or occurrences.

Disposal of Investigation-Derived Waste

Disposal of Incidental Trash

Incidental trash generated during this investigation (including discarded gloves, used Ziploc bags, paper towels, polyethylene tubing, filters, and food packaging) were placed in plastic trash bags and disposed of as solid waste into a dumpster at Herrera's office in Seattle, Washington.

Disposal of Soil Cuttings

Soil cuttings generated during auger drilling of boring SB-4 was stored in a 55-gallon drum. A low PCE concentration of 0.002 milligrams per kilogram (mg/kg) was detected in the soil sample collected from the 2.5-foot depth interval at SB-4. No contaminants were found above practical quantitation limits in the soil sample collected from the 10-foot depth interval at SB-4. Although low concentrations of PCE and cis DCE were detected in ground water collected from SB-4, soil cuttings generated during drilling of SB-4 were dry, believed to be soil from the vadose zone that augered up to the surface, and did not come in contact with the contaminated ground water. All soil generated from drilling activities was considered to be non-contaminated and was eventually incorporated with other redevelopment activities taken place within the mall property.

Decontamination Fluids and Purge Water Disposal

Decontamination fluids and purge water generated during auger drilling, well development, and ground water sampling activities were contained in a 55-gallon drum. All decontamination fluids and purge water were picked up and transported to the Emerald Services, Inc. facility in Seattle, Washington for treatment and disposal as hazardous waste (F002) at the Philip Environmental Services Corporation facility in Renton, Washington (EPA Site No. WAH000012971).

APPENDIX B

Boring Log

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SOIL BORING RECORD

Boring # SB-4
Total depth 21.5 feet
Sheet 1 of 2

Project name VILLA
Project number C00-01640-008
Client MBK Northwest, Inc.
HEC rep. Diana Phelan

Drilling Contractor Jeff Davies Drilling
Location Inside tenant space #3 of Building N1, Lakewood Towne Center
Start date 5/20/03
Compl. date 5/20/03

Drilling method Hollow-stem auger
Sampling method SPT; 2.5-ft interval
Ground elevation Not available
Air monitoring (Y/N) Yes
Instrument(s) Microtip 2020 PID

Instrument reading (ppm)	Sample type, interval	% recovery	Blow Counts	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
							4.5-inch concrete floor slab (no rebar), crushed gravel
6.2	SPT	55	16 18 19		1 2	SM	Dense, very dark gray (10YR 4/2) silty SAND with gravel and occasional cobbles, dry to moist.
7.1	SB4-2.5 SPT	45	14 36 50 for 3"		3 4	SP-SM/ GP-GM	Very dense, grayish brown (2.5Y 5/2) slightly silty SAND/GRAVEL, with occasional cobbles, dry to moist.
					5		
Not measured	SPT	No recovery	32 35 32		6		Same as above, very dense.
					7		Difficult drilling due to cobbles from 7.5 to 10 feet.
0.0	SPT	20	11 13 13		8 9	GP-GM	Medium dense, dark grayish brown (2.5Y 4/2) slightly silty GRAVEL, with sand and cobbles, dry to moist.
					10		
0.0	SPT	60	10 25 22		11		Same as above, dense.
					12		
0.0	SPT	45	12 22 29		13 14		Same as above, very dense.
					15		
0.0	SPT	40	17 50 for 6"	▽	16		Same as above, very dense. Ground water encountered during drilling at 16.5 feet
				▼	17		below floor grade; static water level measured at 17.70 feet below floor grade.
0.0	SPT	35	7 16 11		18 19	GP-GM/ GP	Medium dense, dark grayish brown to olive brown (2.5Y 4/2, 4/3) slightly silty to trace amounts of silt, sandy GRAVEL, with cobbles, wet.

HERRERA
ENVIRONMENTAL
CONSULTANTS

SOIL BORING RECORD

Boring # SB-4
Total depth 21.5 feet
Sheet 2 of 2

Project name VILLA
Project number C00-01640-008
Client MBK Northwest, Inc.
HEC rep. Diana Phelan

Drilling Contractor Jeff Davies Drilling
Location Inside tenant space #3 of Building N1, Lakewood Towne Center
Start date 5/20/03
Compl. date 5/20/03

Drilling method Hollow-stem auger
Sampling method SPT; 2.5-ft interval
Ground elevation Not available
Air monitoring (Y/N) Yes
Instrument(s) Microtip 2020 PID

Instrument reading (ppm)	Sample type, interval	% recovery	Blow Counts	Water level (feet)	Depth (feet, BGS)	Soil group	Soil description
					20		
Not measured	SPT	55	7 14 15		21	SP-SM/ GP-GM	Dense, olive brown (2.5Y 4/3) slightly silty SAND/ GRAVEL, with cobbles, wet.
					22		Boring drilled to 20 feet; sampled to 21.5 feet; installed a temporary well and collected SB4W sample; backfilled borehole with bentonite chips and concrete surface.
					23		
					24		
					25		
					26		
					27		
					28		
					29		
					30		
					31		
					32		
					33		
					34		
					35		
					36		
					40		
					41		

APPENDIX C

Laboratory Analytical Report and Data Quality Assurance Review Summary

OnSite
Environmental Inc.
Analytical Testing and Mobile Laboratory Services

May 30, 2003

Peter Jowise
Herrera Environmental Consultants, Inc.
2200 6th Avenue, Suite 1100
Seattle, WA 98121

Re: Analytical Data for Project C00-01640-008
Laboratory Reference No. 0305-159

Dear Peter:

Enclosed are the analytical results and associated quality control data for samples submitted on May 21, 2003.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

Case Narrative

Samples were collected on May 20, 2003. Samples were maintained at the laboratory at 4°C and followed SW846 analysis and extraction methods.

Halogenated Volatiles EPA 8260B (Soil) Analysis

Any QA/QC issues associated with this extraction and analysis will be indicated with a footnote reference and discussed in detail on the Data Qualifier page.

Halogenated Volatiles EPA 8260B (Water) Analysis

Any QA/QC issues associated with this extraction and analysis will be indicated with a footnote reference and discussed in detail on the Data Qualifier page.

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B

page 1 of 2

Date Extracted:	5-27-03
Date Analyzed:	5-27-03
Matrix:	Soil
Units:	mg/kg (ppm)
Lab ID:	05-159-01
Client ID:	**SB4-2.5'**

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.0010
Chloromethane	ND		0.0010
Vinyl Chloride	ND		0.0010
Bromomethane	ND		0.0010
Chloroethane	ND		0.0010
Trichlorofluoromethane	ND		0.0010
1,1-Dichloroethene	ND		0.0010
Iodomethane	ND		0.0052
Methylene Chloride	ND		0.0052
(trans) 1,2-Dichloroethene	ND		0.0010
1,1-Dichloroethane	ND		0.0010
2,2-Dichloropropane	ND		0.0010
(cis) 1,2-Dichloroethene	ND		0.0010
Bromochloromethane	ND		0.0010
Chloroform	ND		0.0010
1,1,1-Trichloroethane	ND		0.0010
Carbon Tetrachloride	ND		0.0010
1,1-Dichloropropene	ND		0.0010
1,2-Dichloroethane	ND		0.0010
Trichloroethene	ND		0.0010
1,2-Dichloropropane	ND		0.0010
Dibromomethane	ND		0.0010
Bromodichloromethane	ND		0.0010
2-Chloroethyl Vinyl Ether	ND		0.0052
(cis) 1,3-Dichloropropene	ND		0.0010
(trans) 1,3-Dichloropropene	ND		0.0010

gpc 6/6/03

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B

page 2 of 2

Lab ID: 05-159-01
Client ID: SB4-2.5'

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.0010
Tetrachloroethene	0.0020		0.0010
1,3-Dichloropropane	ND		0.0010
Dibromochloromethane	ND		0.0010
1,2-Dibromoethane	ND		0.0010
Chlorobenzene	ND		0.0010
1,1,1,2-Tetrachloroethane	ND		0.0010
Bromoform	ND		0.0010
Bromobenzene	ND		0.0010
1,1,2,2-Tetrachloroethane	ND		0.0010
1,2,3-Trichloropropane	ND		0.0010
2-Chlorotoluene	ND		0.0010
4-Chlorotoluene	ND		0.0010
1,3-Dichlorobenzene	ND		0.0010
1,4-Dichlorobenzene	ND		0.0010
1,2-Dichlorobenzene	ND		0.0010
1,2-Dibromo-3-chloropropane	ND		0.0052
1,2,4-Trichlorobenzene	ND		0.0010
Hexachlorobutadiene	ND		0.0052
1,2,3-Trichlorobenzene	ND		0.0010

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	103	60-137
Toluene, d8	115	71-129
4-Bromofluorobenzene	131	60-149

6/6/03

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B

Date Extracted:	5-27-03
Date Analyzed:	5-27-03
Matrix:	Soil
Units:	mg/kg (ppm)
Lab ID:	05-159-02
Client ID:	**SB4-10'**

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.0010
Chloromethane	ND		0.0010
Vinyl Chloride	ND		0.0010
Bromomethane	ND		0.0010
Chloroethane	ND		0.0010
Trichlorofluoromethane	ND		0.0010
1,1-Dichloroethene	ND		0.0010
Iodomethane	ND		0.0052
Methylene Chloride	ND		0.0052
(trans) 1,2-Dichloroethene	ND		0.0010
1,1-Dichloroethane	ND		0.0010
2,2-Dichloropropane	ND		0.0010
(cis) 1,2-Dichloroethene	ND		0.0010
Bromochloromethane	ND		0.0010
Chloroform	ND		0.0010
1,1,1-Trichloroethane	ND		0.0010
Carbon Tetrachloride	ND		0.0010
1,1-Dichloropropene	ND		0.0010
1,2-Dichloroethane	ND		0.0010
Trichloroethene	ND		0.0010
1,2-Dichloropropane	ND		0.0010
Dibromomethane	ND		0.0010
Bromodichloromethane	ND		0.0010
2-Chloroethyl Vinyl Ether	ND		0.0052
(cis) 1,3-Dichloropropene	ND		0.0010
(trans) 1,3-Dichloropropene	ND		0.0010

6/6/03

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B

page 2 of 2

Lab ID: 05-159-02
Client ID: SB4-10'

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.0010
Tetrachloroethene	ND		0.0010
1,3-Dichloropropane	ND		0.0010
Dibromochloromethane	ND		0.0010
1,2-Dibromoethane	ND		0.0010
Chlorobenzene	ND		0.0010
1,1,1,2-Tetrachloroethane	ND		0.0010
Bromoform	ND		0.0010
Bromobenzene	ND		0.0010
1,1,2,2-Tetrachloroethane	ND		0.0010
1,2,3-Trichloropropane	ND		0.0010
2-Chlorotoluene	ND		0.0010
4-Chlorotoluene	ND		0.0010
1,3-Dichlorobenzene	ND		0.0010
1,4-Dichlorobenzene	ND		0.0010
1,2-Dichlorobenzene	ND		0.0010
1,2-Dibromo-3-chloropropane	ND		0.0052
1,2,4-Trichlorobenzene	ND		0.0010
Hexachlorobutadiene	ND		0.0052
1,2,3-Trichlorobenzene	ND		0.0010

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	101	60-137
Toluene, d8	118	71-129
4-Bromofluorobenzene	129	60-149

gpc 6/6/03

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B
METHOD BLANK QUALITY CONTROL
page 1 of 2

Date Extracted:	5-27-03
Date Analyzed:	5-27-03
Matrix:	Soil
Units:	mg/kg (ppm)
Lab ID:	MB0527S1

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.0010
Chloromethane	ND		0.0010
Vinyl Chloride	ND		0.0010
Bromomethane	ND		0.0010
Chloroethane	ND		0.0010
Trichlorofluoromethane	ND		0.0010
1,1-Dichloroethene	ND		0.0010
Iodomethane	ND		0.0050
Methylene Chloride	ND		0.0050
(trans) 1,2-Dichloroethene	ND		0.0010
1,1-Dichloroethane	ND		0.0010
2,2-Dichloropropane	ND		0.0010
(cis) 1,2-Dichloroethene	ND		0.0010
Bromochloromethane	ND		0.0010
Chloroform	ND		0.0010
1,1,1-Trichloroethane	ND		0.0010
Carbon Tetrachloride	ND		0.0010
1,1-Dichloropropene	ND		0.0010
1,2-Dichloroethane	ND		0.0010
Trichloroethene	ND		0.0010
1,2-Dichloropropane	ND		0.0010
Dibromomethane	ND		0.0010
Bromodichloromethane	ND		0.0010
2-Chloroethyl Vinyl Ether	ND		0.0050
(cis) 1,3-Dichloropropene	ND		0.0010
(trans) 1,3-Dichloropropene	ND		0.0010

6/6/03

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B
METHOD BLANK QUALITY CONTROL
page 2 of 2

Lab ID: MB0527S1

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.0010
Tetrachloroethene	ND		0.0010
1,3-Dichloropropane	ND		0.0010
Dibromochloromethane	ND		0.0010
1,2-Dibromoethane	ND		0.0010
Chlorobenzene	ND		0.0010
1,1,1,2-Tetrachloroethane	ND		0.0010
Bromoform	ND		0.0010
Bromobenzene	ND		0.0010
1,1,2,2-Tetrachloroethane	ND		0.0010
1,2,3-Trichloropropane	ND		0.0010
2-Chlorotoluene	ND		0.0010
4-Chlorotoluene	ND		0.0010
1,3-Dichlorobenzene	ND		0.0010
1,4-Dichlorobenzene	ND		0.0010
1,2-Dichlorobenzene	ND		0.0010
1,2-Dibromo-3-chloropropane	ND		0.0050
1,2,4-Trichlorobenzene	ND		0.0010
Hexachlorobutadiene	ND		0.0050
1,2,3-Trichlorobenzene	ND		0.0010

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	105	60-137
Toluene, d8	120	71-129
4-Bromofluorobenzene	126	60-149

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B
MS/MSD QUALITY CONTROL

Date Extracted: 5-27-03
Date Analyzed: 5-27-03

Matrix: Soil
Units: mg/kg (ppm)

Lab ID: 05-139-03

Compound	Sample Amount	Spike Amount	MS	Percent Recovery	MSD	Percent Recovery	Recovery Limits	Flags
1,1-Dichloroethene	ND	0.0500	0.0417	83	0.0440	88	30-153	
Benzene	ND	0.0500	0.0409	82	0.0371	74	58-140	
Trichloroethene	ND	0.0500	0.0429	86	0.0397	79	38-130	
Toluene	ND	0.0500	0.0414	83	0.0387	77	28-147	
Chlorobenzene	ND	0.0500	0.0411	82	0.0388	78	47-131	

	RPD	RPD Limit	Flags
1,1-Dichloroethene	5	11	
Benzene	10	11	
Trichloroethene	8	11	
Toluene	7	10	
Chlorobenzene	6	11	

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Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
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HALOGENATED VOLATILES by EPA 8260B

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Date Extracted:	5-22-03
Date Analyzed:	5-22-03
Matrix:	Water
Units:	ug/L (ppb)
Lab ID:	05-159-03
Client ID:	**SB4W**

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.20
Chloromethane	ND		0.20
Vinyl Chloride	ND		0.20
Bromomethane	ND		0.20
Chloroethane	ND		0.20
Trichlorofluoromethane	ND		0.20
1,1-Dichloroethene	ND		0.20
Iodomethane	ND		1.0
Methylene Chloride	ND		1.0
(trans) 1,2-Dichloroethene	ND		0.20
1,1-Dichloroethane	ND		0.20
2,2-Dichloropropane	ND		0.20
(cis) 1,2-Dichloroethene	1.1		0.20
Bromochloromethane	ND		0.20
Chloroform	ND		0.20
1,1,1-Trichloroethane	ND		0.20
Carbon Tetrachloride	ND		0.20
1,1-Dichloropropene	ND		0.20
1,2-Dichloroethane	ND		0.20
Trichloroethene	ND		0.20
1,2-Dichloropropane	ND		0.20
Dibromomethane	ND		0.20
Bromodichloromethane	ND		0.20
2-Chloroethyl Vinyl Ether	ND		1.0
(cis) 1,3-Dichloropropene	ND		0.20
(trans) 1,3-Dichloropropene	ND		0.20

SAE 6/16/03

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B

Lab ID: 05-159-03
Client ID: SB4W

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.20
Tetrachloroethene	0.44		0.20
1,3-Dichloropropane	ND		0.20
Dibromochloromethane	ND		0.20
1,2-Dibromoethane	ND		0.20
Chlorobenzene	ND		0.20
1,1,1,2-Tetrachloroethane	ND		0.20
Bromoform	ND		1.0
Bromobenzene	ND		0.20
1,1,2,2-Tetrachloroethane	ND		0.20
1,2,3-Trichloropropane	ND		0.20
2-Chlorotoluene	ND		0.20
4-Chlorotoluene	ND		0.20
1,3-Dichlorobenzene	ND		0.20
1,4-Dichlorobenzene	ND		0.20
1,2-Dichlorobenzene	ND		0.20
1,2-Dibromo-3-chloropropane	ND		1.0
1,2,4-Trichlorobenzene	ND		0.20
Hexachlorobutadiene	ND		0.20
1,2,3-Trichlorobenzene	ND		0.20

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	122	63-130
Toluene, d8	95	78-113
4-Bromofluorobenzene	100	77-109

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Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B

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Date Extracted:	5-22-03
Date Analyzed:	5-22-03
Matrix:	Water
Units:	ug/L (ppb)
Lab ID:	05-159-04
Client ID:	**SB5W**

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.20
Chloromethane	ND		0.20
Vinyl Chloride	ND		0.20
Bromomethane	ND		0.20
Chloroethane	ND		0.20
Trichlorofluoromethane	ND		0.20
1,1-Dichloroethene	ND		0.20
Iodomethane	ND		1.0
Methylene Chloride	ND		1.0
(trans) 1,2-Dichloroethene	ND		0.20
1,1-Dichloroethane	ND		0.20
2,2-Dichloropropane	ND		0.20
(cis) 1,2-Dichloroethene	1.1		0.20
Bromochloromethane	ND		0.20
Chloroform	ND		0.20
1,1,1-Trichloroethane	ND		0.20
Carbon Tetrachloride	ND		0.20
1,1-Dichloropropene	ND		0.20
1,2-Dichloroethane	ND		0.20
Trichloroethene	ND		0.20
1,2-Dichloropropane	ND		0.20
Dibromomethane	ND		0.20
Bromodichloromethane	ND		0.20
2-Chloroethyl Vinyl Ether	ND		1.0
(cis) 1,3-Dichloropropene	ND		0.20
(trans) 1,3-Dichloropropene	ND		0.20

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Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B

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Lab ID: 05-159-04
Client ID: **SB5W**

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.20
Tetrachloroethene	0.47		0.20
1,3-Dichloropropane	ND		0.20
Dibromochloromethane	ND		0.20
1,2-Dibromoethane	ND		0.20
Chlorobenzene	ND		0.20
1,1,1,2-Tetrachloroethane	ND		0.20
Bromoform	ND		1.0
Bromobenzene	ND		0.20
1,1,2,2-Tetrachloroethane	ND		0.20
1,2,3-Trichloropropane	ND		0.20
2-Chlorotoluene	ND		0.20
4-Chlorotoluene	ND		0.20
1,3-Dichlorobenzene	ND		0.20
1,4-Dichlorobenzene	ND		0.20
1,2-Dichlorobenzene	ND		0.20
1,2-Dibromo-3-chloropropane	ND		1.0
1,2,4-Trichlorobenzene	ND		0.20
Hexachlorobutadiene	ND		0.20
1,2,3-Trichlorobenzene	ND		0.20

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	127	63-130
Toluene, d8	102	78-113
4-Bromofluorobenzene	100	77-109

gpc 6/6/03

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B
METHOD BLANK QUALITY CONTROL

Date Extracted: 5-22-03
Date Analyzed: 5-22-03

Matrix: Water
Units: ug/L (ppb)

Lab ID: MB0522W1

Compound	Results	Flags	PQL
Dichlorodifluoromethane	ND		0.20
Chloromethane	ND		0.20
Vinyl Chloride	ND		0.20
Bromomethane	ND		0.20
Chloroethane	ND		0.20
Trichlorofluoromethane	ND		0.20
1,1-Dichloroethene	ND		0.20
Iodomethane	ND		1.0
Methylene Chloride	ND		1.0
(trans) 1,2-Dichloroethene	ND		0.20
1,1-Dichloroethane	ND		0.20
2,2-Dichloropropane	ND		0.20
(cis) 1,2-Dichloroethene	ND		0.20
Bromochloromethane	ND		0.20
Chloroform	ND		0.20
1,1,1-Trichloroethane	ND		0.20
Carbon Tetrachloride	ND		0.20
1,1-Dichloropropene	ND		0.20
1,2-Dichloroethane	ND		0.20
Trichloroethene	ND		0.20
1,2-Dichloropropane	ND		0.20
Dibromomethane	ND		0.20
Bromodichloromethane	ND		0.20
2-Chloroethyl Vinyl Ether	ND		1.0
(cis) 1,3-Dichloropropene	ND		0.20
(trans) 1,3-Dichloropropene	ND		0.20

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Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B
METHOD BLANK QUALITY CONTROL
Page 2 of 2

Lab ID: MB0522W1

Compound	Results	Flags	PQL
1,1,2-Trichloroethane	ND		0.20
Tetrachloroethene	ND		0.20
1,3-Dichloropropane	ND		0.20
Dibromochloromethane	ND		0.20
1,2-Dibromoethane	ND		0.20
Chlorobenzene	ND		0.20
1,1,1,2-Tetrachloroethane	ND		0.20
Bromoform	ND		1.0
Bromobenzene	ND		0.20
1,1,2,2-Tetrachloroethane	ND		0.20
1,2,3-Trichloropropane	ND		0.20
2-Chlorotoluene	ND		0.20
4-Chlorotoluene	ND		0.20
1,3-Dichlorobenzene	ND		0.20
1,4-Dichlorobenzene	ND		0.20
1,2-Dichlorobenzene	ND		0.20
1,2-Dibromo-3-chloropropane	ND		1.0
1,2,4-Trichlorobenzene	ND		0.20
Hexachlorobutadiene	ND		0.20
1,2,3-Trichlorobenzene	ND		0.20

Surrogate	Percent Recovery	Control Limits
Dibromofluoromethane	126	63-130
Toluene, d8	92	78-113
4-Bromofluorobenzene	101	77-109

spz 6/6/03

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

HALOGENATED VOLATILES by EPA 8260B
MS/MSD QUALITY CONTROL

Date Extracted: 5-22-03
Date Analyzed: 5-22-03

Matrix: Water
Units: ug/L (ppb)

Lab ID: 05-159-04

Compound	Sample Amount	Spike Amount	MS	Percent Recovery	MSD	Percent Recovery	Recovery Limits	Flags
1,1-Dichloroethene	ND	10.0	10.6	106	10.3	103	69-113	
Benzene	ND	10.0	9.85	99	10.1	101	71-128	
Trichloroethene	ND	10.0	8.61	86	8.69	87	82-122	
Toluene	ND	10.0	8.82	88	9.37	94	54-118	
Chlorobenzene	ND	10.0	9.16	92	9.49	95	85-103	

	RPD	RPD Limit	Flags
1,1-Dichloroethene	3	15	
Benzene	3	10	
Trichloroethene	1	12	
Toluene	6	15	
Chlorobenzene	4	6	

5/30 5/16/03

Date of Report: May 30, 2003
Samples Submitted: May 21, 2003
Lab Reference: 05-159
Project: C00-01640-008

% MOISTURE

Date Analyzed: 5-27-03

Client ID	Lab ID	% Moisture
SB4-2.5'	05-159-01	4.0
SB4-10'	05-159-02	4.0

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

D - Data from 1:____ dilution.

E - The value reported exceeds the quantitation range, and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

G - Insufficient sample quantity for duplicate analysis.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeniety. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.

O - Hydrocarbons outside the defined gasoline range are present in the sample.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD is outside control limits due to sample inhomogeniety.

X - Sample extract treated with a silica gel cleanup procedure.

Y - Sample extract treated with a silica gel/acid cleanup procedure.

Z -

ND - Not Detected at PQL
MRL - Method Reporting Limit
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

Chain of Custody

Page 1 of 1

OnSite Environmental Inc.
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • Fax: (425) 885-4603

Company: HERRERA ENVIRONMENTAL CONSULTANTS
Project Number: C00-01640-008
Project Name: VILLA
Project Manager: PETER JOWISE
Sampled by: DIANA M. PHELAN

Turnaround Request (in working days)

(Check One)

☐ Same Day ☐ 1 Day
☐ 2 Day ☐ 3 Day
☒ Standard (7 working days)
☐ _____ (other)

Laboratory Number: 05-159

Requested Analysis

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx	Volatiles by 8260B	Halogenated Volatiles by 8260B	Semivolatiles by 8270C	PAHs by 8270C / SIM	PCBs by 8082	Pesticides by 8081A	Herbicides by 8151A	Total RCRA Metals (8)	TCLP Metals	HEM by 1664	VPH	EPH	% Moisture
1	SB4-2.5'	5-20-03	1115	S	2					X											X
2	SB4-10'		1400	S	1					X											X
3	SB4W		1445	W	4					X											
4	SB5W		1600	W	4					X											

	Signature	Company	Date	Time
Relinquished by	Diana M. Phelan	HERRERA	5-21-03	7:10
Received by		OnSite	5/21/03	7:10
Relinquished by				
Received by				
Relinquished by				
Received by				

Comments/Special Instructions:

Reviewed by/Date

Reviewed by/Date

Chromatograms with final report ☐

DISTRIBUTION LEGEND: White - OnSite Copy Yellow - Report Copy Pink - Client Copy

Data Quality Assurance Review Summary

A data quality assurance review was performed on analytical data from soil and ground water samples collected at the Lakewood Towne Center site in Lakewood, Washington. The laboratory's performance was reviewed in accordance with quality control specifications outlined by the analytical methods and the U.S. Environmental Protection Agency (EPA) functional guidelines for organic data review (U.S. EPA 1994).

Two ground water samples (including one field duplicate) and two soil samples were collected for chemical analysis on May 20, 2003. OnSite Environmental Inc. of Redmond, Washington analyzed all samples for halogenated volatile organic compounds (HVOCs) using U.S. EPA Method 8260B.

Quality control data submitted by the laboratory were reviewed; raw laboratory data were not provided or reviewed. A review of the laboratory report and data validation results is summarized below. The water HVOC results were determined to be acceptable for use and no data were qualified.

Holding Times

All samples were analyzed within the maximum holding time (14 days) for U.S. EPA Method 8260B.

Laboratory Reporting Limits

The laboratory reporting (practical quantitation) limits for HVOC constituents in water are below regulatory criteria (i.e., WAC 173-340), with the exception of 1,1-dichloroethene (1,1-DCE). The MTCA method B ground water cleanup criterion for 1,1-DCE is 0.0729 µg/L (Ecology 2001), which is less than the practical quantitation limit of 0.20 µg/L. Therefore, the usability of 1,1-DCE data for the water samples is limited.

Blank Analysis

Method blanks were analyzed at the required frequency. The method blanks did not contain reportable levels of HVOC constituents above their practical quantitation limits, and no data have been qualified. No field blanks were collected.

Surrogate Analysis

Three surrogate compounds were analyzed with the project samples and the method blank in accordance with the method. As shown in Table C-1, surrogate recovery values for each compound were within their respective laboratory control limit ranges.

Table C-1. Water and soil HVOC surrogate recovery results.

Compound	Water Sample Percent Recoveries	Laboratory QC Limits—Water	Soil Sample Percent Recoveries	Laboratory QC Limits—Soil
Dibromofluoromethane	122-126	63-130	101-105	60-137
Toluene-d8	92-102	78-113	115-120	71-129
4-Bromofluorobenzene	100-101	77-109	126-131	60-149

Matrix Spike Analysis

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the required frequency. Matrix spike levels were 10 to 50 times the laboratory reporting (practical quantitation) limits. Percent recovery and relative percent difference (RPD) results were correctly calculated.

The soil MS/MSD analysis was performed on a batch sample. As shown in Table C-2, percent recovery and RPD values for all five HVOC constituents were within their respective laboratory control limit ranges.

Table C-2. Soil HVOC MS/MSD results.

Compound	MS % Recovery	MSD % Recovery	Laboratory % Recovery Limits	MS/MSD RPD Results	Laboratory RPD QC Limits
1,1-Dichloroethene	83	88	30-153	5	0-11
Benzene	82	74	58-140	10	0-11
Trichloroethene	86	79	38-130	8	0-11
Toluene	83	77	28-147	7	0-10
Chlorobenzene	82	78	47-131	6	0-11

The water MS/MSD analysis was performed on sample SB5W. As shown in Table C-3, percent recovery and RPD values for all five HVOC constituents were within their respective laboratory control limit ranges.

Table C-3. Water HVOC MS/MSD results.

Compound	MS % Recovery	MSD % Recovery	Laboratory % Recovery Limits	MS/MSD RPD Results	Laboratory RPD QC Limits
1,1-Dichloroethene	106	103	69-113	3	0-15
Benzene	99	101	71-128	3	0-10
Trichloroethene	86	87	82-122	1	0-12
Toluene	88	94	54-118	6	0-15
Chlorobenzene	92	95	85-103	4	0-6

Field Duplicate Analysis

Water sample SB5W was analyzed as the field duplicate of water sample SB4W. As shown in Table C-4, the relative percent difference (RPD) values between results of detected compounds were within the 30 percent control limit (or within the practical quantitation limit if either result is less than 5 times the practical quantitation limits) established by the laboratory. No data were qualified due to field duplicate results.

Table C-4. Water HVOC field duplicate results for detected compounds.

Compound	PQL (µg/L)	Sample SB4W (µg/L)	Field Duplicate SB5W (µg/L)	Relative Percent Difference	Difference/ PQL [a]
Tetrachloroethene (PCE)	0.20	**0.44**	**0.47**	NA	0.15
cis 1,2-Dichloroethene (cis DCE)	0.20	1.1	1.1	0	NA

Boldface type values are less than 5 times the practical quantitation limit (PQL).
[a] The difference between duplicate results divided by the PQL is used to assess results if either the result is less than 5 times the PQL.
NA Not applicable.

References

Ecology. 2001. Cleanup Levels and Risk Calculations under the Model Toxics Control Act Cleanup Regulation (CLARC). Washington State Department of Ecology, Toxics Cleanup Program. Publication Number 94-145, updated August 2001.

U.S. EPA. 1983. Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, Washington, D.C. EPA600/4-79-020.

U.S. EPA. 1986. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846. Office of Solid Waste and Emergency Response. U.S. Environmental Protection Agency, Washington, D.C.

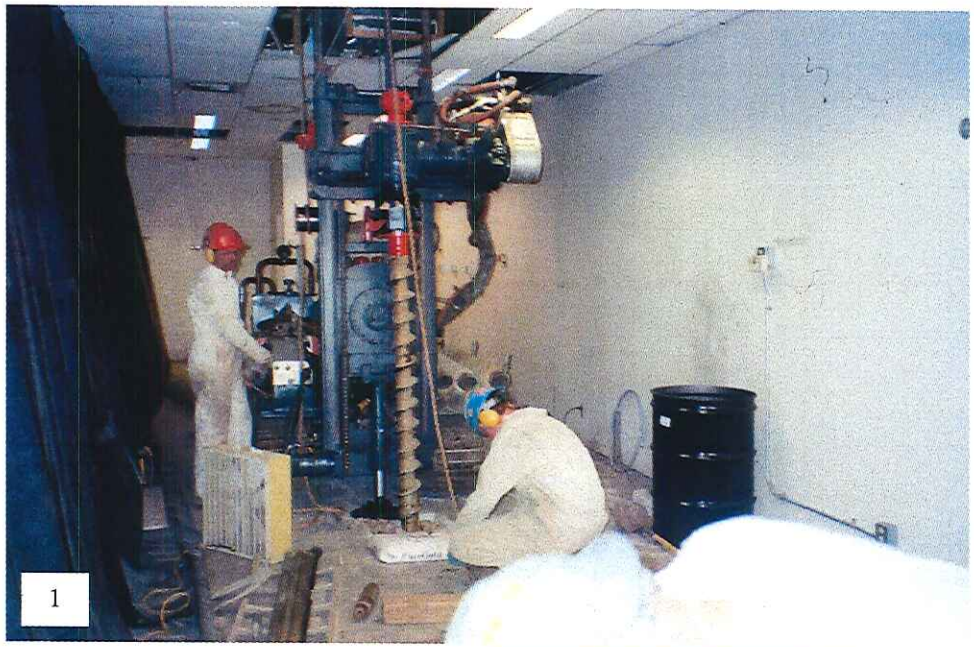
U.S. EPA. 1994. U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection Agency, Washington, D.C. EPA 540/R-94-012.

APPENDIX D

Photographic Documentation

Limited Phase II Site Investigation
Villa One-Hour Cleaners at Lakewood Towne Center
Lakewood, Washington
Photographic Log

Photo Number	Photo Description
1	Drilling at soil boring SB-4 located inside and eastern half of the tenant space occupied by Villa One-Hour Cleaners. The stain on the wall to the right of the drill rig is where the former dry cleaning equipment and operations were conducted.
2	View of the tenant space after drilling activities was completed, looking to the north-northeast. The square cutout in the foreground was soil boring SB-4 location, with the second square cutout north of SB-4 in the background.
3	View of the tenant space, looking to the south.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