

**State of Oregon
Department of Environmental Quality**

Memorandum

Date: November 9, 2015

To: ECSI FILE #3798

Through: Bruce Gilles, Manager, DEQ Headquarters Cleanup and Emergency Response Section *BHG 11/9/15*

From: Joe Westersund, Dry Cleaner Program Coordinator

Subject: Former Progress Dry Cleaners
Staff Memorandum in support of a No Further Action determination

This document presents the basis for the Oregon Department of Environmental Quality's (DEQ's) recommended No Further Action (NFA) determination for the Former Progress Dry Cleaners site in Beaverton, Oregon. Following implementation of a remedial action by DEQ, laboratory testing has shown residual contaminant concentrations in soil, groundwater, and indoor air are within acceptable risk levels when controlled as described in this memorandum.

The NFA determination meets the requirements of Oregon Administrative Rules Chapter 340 Division 122, Sections 010 to 0140 and ORS 465.200 through 465.455.

The proposal is based on information documented in the administrative record for this site. A copy of the administrative record index is presented at the end of this memorandum.

1. BACKGROUND

Site location.

The site is located at:

- Address: 8602 SW Hall Boulevard in Beaverton, Washington County, Oregon (Figure 1).
- Latitude 45.458161° North, longitude -122.783951° West
- Tax lot 1S126BC00200, Township 1 South, Range 1 West, Section 26

Site setting.

The Progress Cleaners site is the westernmost tenant space in a strip mall occupying a 5.61 acre property owned by Hudson Investment Company (HIC). The former dry cleaner site is inactive and has been vacant since 2007.

The adjacent space in the strip mall is currently occupied by a printer cartridge refill business. Other spaces in the strip mall are also in active commercial use. A sports bar occupies a separate building approximately 60 feet north of the site building. Areas not occupied by buildings are primarily asphalt parking lot.

The strip mall property is bordered by roadways to the east and south, by a residential area to the north, and to the west by an embankment that slopes down to Highway 217.

Hydrogeologic setting.

The site is generally flat with a gentle slope toward the west. Local geology is variable, consisting of inter-bedded silt, clay, sand, and gravel overlying Columbia River Basalt. Basalt occurs at relatively shallow depths in the area (~30 feet) based on wells completed at the nearby GAF/Mattel facility (ECSI #2195). Shallow groundwater is present at approximately 15 feet below ground surface (bgs), and flows westerly towards Highway 217.

A shallower, seasonal perched aquifer at about 3 feet bgs was observed beneath the building in shallow borings and also in the soil removal excavation. It is likely due to stormwater accumulation, possibly a result of improperly functioning storm drain lines. The nearest surface water is in wetlands associated with Fanno Creek, which are located about 0.3 miles to the west.

Site history.

Based on aerial photographs, the site was undeveloped until the main site building was constructed in the early 1960s. The former Progress Dry Cleaners opened in 1963 and operated continuously until early 2007. Perchloroethylene (PCE) releases to soil beneath the building appear to have occurred at the western part of the former dry cleaning space, where the dry cleaning machine was located, from a drain line located along the western building foundation, and leakage through the floor.

The former dry cleaner space is inactive and has been vacant since 2007. All dry cleaning equipment has been removed from the building.

2. BENEFICIAL LAND AND WATER USE DETERMINATIONS

Land use.

The site is zoned Commercial | Community Service¹. The City of Beaverton allows residential use in this zoning classification, but the site does not have any current residential uses, and DEQ is not aware of any plans to redevelop the site to include residential uses. Therefore, residential is not considered a current or reasonably likely future land use. The strip mall property is bordered by roadways to the east and south, by a residential area to the north, and to the west by an embankment that leads down to Highway 217.

Groundwater use.

A Beneficial Water Use Determination (BWUD) for the area was completed in 2002 for the GAF/Mattel site, located 0.1 miles southwest of the site. The results of that survey are considered sufficient for water use determination for this site.

¹ According to the City of Beaverton website, accessed September 25, 2014, and a phone conversation with Jason Turinsky of the City of Beaverton Planning Department on January 15, 2015.

The BWUD identified domestic and irrigation use for deep groundwater in the Columbia River Basalt formation. Oregon Water Resources Department records identified several domestic wells that were drilled in the 1950s and 1960s. Efforts to field locate these wells were unsuccessful. Because the property and surrounding area are served by public water systems, future domestic use of the nearby groundwater is unlikely.

The nearest water supply wells in the area are located at the Redtail Golf Course (formerly the Progress Downs Golf Course), about 0.2 miles east of the site. The golf course wells are several hundred feet deep and draw water from the Columbia River Basalt aquifer. No shallow wells are located in the area. The golf course wells, in addition to the Crescent Grove Cemetery well, were sampled for VOCs during the early stages of the GAF/Mattel site investigation. VOCs were not detected in any of the wells.

Surface water use.

No surface water features are next to or near the site. Wetlands associated with Fanno Creek are about 1,500 feet to the west but there is no direct pathway for shallow groundwater or site stormwater to reach there.

3. INVESTIGATION AND CLEANUP WORK

HIC completed initial site investigation prior to entering the DEQ Dry Cleaner Program. The investigation indicated historical releases of dry cleaning solvent occurred in the western part of the former dry cleaning space where the dry cleaning machine was located.

Soil and shallow groundwater samples collected under and near the former dry cleaning space contained PCE and its degradation products trichloroethene (TCE), cis- and trans-1,2-dichloroethene (cis-DCE and trans-DCE), and vinyl chloride (VC). Air samples collected in the former dry cleaning space also contained these chemicals. Some concentrations exceeded DEQ human health risk-based concentrations (RBCs) for applicable exposure scenarios, including occupational vapor intrusion into the building and occupational air inhalation.

In October and November 2007, DEQ's contractor completed an Interim Removal Measure (IRM) inside the former dry cleaner space. A 135 square foot section of the concrete floor at the former location of the dry cleaning machine was removed and soil was excavated down to 10 feet bgs. Confirmation sampling showed that contaminated soil was successfully removed to levels below RBCs for vapor intrusion on three sides. Some contaminated soil exceeding RBCs was left in place at the bottom and west side of the excavation to avoid undermining the wall of the building. The excavation was backfilled with sand and a mixture of EHC and EHC-A, bioremediation substrates made by Adventus Corporation of Freeport, Illinois. A PVC pipe sub-slab venting system and 15-mil vapor barrier were installed at the top of the excavation before the concrete slab was re-poured. A fan was installed in line with the sub-slab pipe to draw air from below the floor slab to the outside atmosphere.

The heating, ventilation and air conditioning (HVAC) system in the former dry cleaner space was also modified in November 2008 to provide increased fresh air intake (about 1.2 air

changes/hour)² and to add an activated carbon filter. However, the HVAC operates on a thermostat, so the impact of these changes may be weather-dependent.

DEQ installed four wells in 2008 and completed eight rounds of groundwater monitoring to assess the effectiveness of the bioremediation treatment for residual contamination in soil and groundwater beneath and downgradient of the building. The treatment was successful in degrading PCE and TCE to daughter products cis-1,2 DCE and vinyl chloride. Vinyl chloride readily degrades to non-toxic breakdown products in aerobic settings found downgradient of treatment areas.

Multiple rounds of indoor air sampling have also been completed. Indoor air concentrations measured prior to the IRM were reduced by a factor of 100 or more as a result of the source removal and vapor intrusion controls.

HIC completed an investigation in March 2013 that included two soil borings outside the exterior western building wall (O’Gara, 2013). Elevated contaminant levels were detected in one of the borings, with PCE detected at up to 760 mg/kg.

A gap in the concrete floor developed around the edge of the IRM excavation, due to shrinking of the new concrete as it dried and / or settling associated with the bioremediation substrate. DEQ took additional action in March 2014 to address the property owner’s concerns about that gap and to attempt to eliminate the need for active (fan-driven) vapor intrusion controls. A 30-mil vapor barrier and 2-inch concrete slab was installed over the entire floor of the former dry cleaner space, except areas near internal and external doors. Unfortunately, sampling after this installation showed that running the vent fan was still necessary to keep indoor concentrations below RBCs. However, the vent fan system remains effective at keeping indoor air concentrations below RBCs.

References for more detailed descriptions of the work above can be found in the Administrative Record section at the end of this report. Sample locations are shown on Figures 2 through 7, and sample results are included in tables A-1, A-2, A-3, and A-4 in the appendix.

4. RISK EVALUATION

Conceptual site model.

PCE, TCE, DCE, and VC contamination remains in soil under the building, particularly near the western wall, and under the landscaping and parking lot between there and the Highway 217 embankment. Contamination is present in soil and (when present) shallow perched groundwater.

Areas affected by the contamination are covered with concrete or asphalt, except for a landscaped area approximately 6 to 10 feet wide on the west side of the building. Based on soil

² Based on the building volume (21,000 cubic feet) and an air exchange rate of 300 cubic feet per minute, when the HVAC is operating there is an exchange of indoor air every 70 minutes.

sampling results³, the contamination in the landscaped area is four feet or more bgs, and thus direct contact with contaminated soil or groundwater soil is not a complete pathway under current site conditions.

Current and reasonably likely receptors at the site include:

- Workers at the (currently vacant) former dry cleaner site and neighboring business that may be impacted through vapor intrusion
- Workers excavating in the affected area of the parking lot or under the building slab that may be exposed through direct contact

To evaluate human exposure to residual chemical contamination requires an assessment of the type and extent of that exposure. DEQ publishes risk-based concentrations (RBCs) for common contaminants and exposure scenarios. These RBCs are conservative estimates of safe levels of contaminants in soil, groundwater and air. Table 1 shows potential exposure pathways and receptors for this site, and identifies applicable RBCs for risk screening.

Table 1. Identification of applicable RBCs, based on pertinent pathways and receptors

Pathway	Receptor	RBC is Applicable?	Basis for selection/exclusion
SOIL			
Ingestion, dermal contact, and inhalation	Residential	No	See Note 1.
	Urban residential	No	
	Occupational	Yes	
	Construction worker	Yes	
	Excavation worker	Yes	
Volatilization to outdoor air	Residential	No	See Note 1.
	Urban residential	No	
	Occupational	Yes	
Vapor intrusion into buildings	Residential	No	See Note 2.
	Urban residential	No	
	Occupational	Yes	
Leaching to groundwater	Residential	No	See Note 3.
	Urban residential	No	
	Occupational	No	
GROUNDWATER			
Ingestion and inhalation from tap water	Residential	No	See Note 4.
	Urban residential	No	
	Occupational	No	
Volatilization to outdoor air	Residential	No	See Note 1.
	Urban residential	No	
	Occupational	Yes	
Vapor intrusion into buildings	Residential	No	See Note 2.
	Urban residential	No	

³ GP-2 and GP-3 from January 2003

	Occupational	Yes	
Groundwater in excavation	Construction and excavation worker	Yes	
AIR			
Inhalation	Residential	No	See Note 1.
	Urban residential	No	
	Occupational	Yes	

Notes:

1. Because the site currently only has commercial uses and contamination has not affected neighboring residential properties, residential and urban residential risk scenarios do not apply.
2. Because there are engineering controls on site (the vapor barriers and subslab depressurization system), vapor intrusion into buildings was assessed directly through air sampling rather than through soil or groundwater RBCs.
3. Groundwater at and near the site is not used for drinking. This pathway is therefore not considered, in accordance with Section B.3.2.4 of DEQ's Risk-Based Decision Making guidance⁴.
4. City water is available in the area. Local groundwater is not currently used for drinking water and is not likely to be used for this purpose in the future.

Contaminant concentrations.

Table 2: Soil Samples

		Highest concentration in areas not removed during IRM (mg/kg)				
		PCE	TCE	cis-DCE	trans-DCE	VC
Soil Samples		760	24.5	13.2	0.225	0.9
RBCs	Lowest Applicable RBC	36	2.8	620	200	2.2
	Occupational Vapor Intrusion into Buildings	36	2.8	-	200	2.2
	Occupational DC ⁵	940	46	2,000	9,200	3.9
	Construction Worker DC ⁵	1,600	120	620	4,500	30
	Excavation Worker DC ⁵	44,000	3,400	17,000	130,000	830
	Occupational Volatilization to Outdoor Air	-	96	-	-	89

⁴ <http://www.deq.state.or.us/lq/rbdrm.htm>

⁵ RBC for soil ingestion, dermal contact, and inhalation

Table 3: Air Samples

		Highest post-IRM concentration (ug/m ³) when sub-slab depressurization system is operating				
		PCE	TCE	cis-DCE	trans-DCE	VC
Indoor Air Samples		34	0.64	0.52	-	0.026
Outdoor Air Samples		0.21	0.06	0.012	-	-
RBC	Occupational Inhalation	47	3.0	-	260	2.8

Table 4: Monitoring Well Groundwater Samples

		Highest post-IRM concentration (ug/L)				
		PCE	TCE	cis-DCE	trans-DCE	VC
Groundwater Samples (including all since IRM)		197	1,750	13,000	72.6	17,600
RBCs	Lowest Applicable RBC	5,400	430	24,000	14,000	910
	Occupational Volatilization to Outdoor Air	-	19,000	-	1,800,000	6,800
	Occupational Vapor Intrusion into Buildings	32,000	3,300	-	350,000	910
	Construction & Excavation Worker Groundwater in Excavation	5,400	430	24,000	14,000	1,200

Table 4 includes groundwater data from the monitoring wells on site. Data from temporary direct push wells is not included because all direct-push groundwater samples were collected prior to the IRM soil removal⁶.

Yellow shading indicates concentrations that exceed an applicable RBC. RBCs shown are from June 7, 2012 and are current as of the date of this report.

Human health risk.

As shown in Table 2, soil concentrations are below all applicable RBCs with the exception of vapor intrusion into buildings. However, since there are vapor intrusion mitigation measures in place (the vapor barriers and sub-slab depressurization system), indoor air sampling is a better measure of the potential risk for this pathway. Indoor air concentrations are below applicable RBCs as discussed below.

Table 3 shows that since installation of the subslab depressurization fan in 2008, indoor air samples have not exceeded relevant RBCs while that system is operating. (Samples collected while the vent fan was off for testing purposes were above RBCs, indicating that operating the

⁶ Direct-push groundwater sample data is available in table A-4.

system continues to be necessary.) Therefore, soil and indoor air do not present an unacceptable risk to site users provided the sub-slab depressurization system is operating.

As Table 4 shows, VC from some post-IRM groundwater samples exceeded the Occupational Volatilization to Outdoor Air RBC. However, background air samples collected in conjunction with indoor air sampling (Table 3) were at or close to the detection limit, far below the RBC. This pathway therefore can also be eliminated as a source of unacceptable risk. VC from some groundwater samples also exceeded the Vapor Intrusion into Buildings scenario but, as mentioned previously, indoor air risks are being handled with the sub-slab depressurization system.

Table 4 also shows that TCE and VC in some post-IRM groundwater samples exceeded RBCs for the Construction & Excavation Worker Groundwater in Excavation scenario. Based on this data, future construction or excavation in the contaminated area would require protective measures for site workers if groundwater is encountered. Site groundwater levels vary from 14 to 20 feet below ground surface (bgs) and are likely below the depth of utilities on site, reducing the likelihood that excavation workers would be exposed. Perched groundwater at 4 feet bgs was encountered during the IRM excavation but does not appear to extend beyond the building footprint based on a series of soil borings advanced outside the building.

Ecological risk.

Affected areas of the site consist of the building, paved areas of the parking lot, and a narrow area of landscaping in between. There is no significant ecological habitat on site, so a formal ecological health risk evaluation was not conducted.

5. RECOMMENDATION

Based on sample results for soil, groundwater, indoor air, and outdoor air, acceptable risk levels will not be exceeded if (1) the subslab depressurization system is kept in operation to control indoor air concentrations and (2) personal protective equipment or other precautions are used if groundwater is encountered during construction and excavation work at the site. A No Further Action determination is recommended for this site. This NFA applies to reasonably likely exposure scenarios based on occupational use, and does not apply to residential site use.

If soil or groundwater from the area affected by contamination (beneath the footprint of the former dry cleaner space, under the western building wall, and under the landscaping and parking lot between there and the Highway 217 embankment) is disturbed or generated during future site development or other intrusive work, it should be sampled for possible contamination and appropriately managed per all applicable local, State and Federal regulations.

In an agreement between DEQ and HIC signed July 20, 2015, the DEQ Dry Cleaner Program agreed to conduct indoor air sampling every 5 years to verify that operating the sub-slab depressurization system remains necessary.

6. ADMINISTRATIVE RECORD

Callin Environmental, 2001, *Phase II Environmental Site Assessment Report*, January 2003.

DEQ, 2002. Remedial Action Record of Decision for GAF-Mattel Facility ECSI No. 2195, Beaverton, Oregon. February 28, 2002.

DEQ, 2012. *Risk-Based Concentrations for Individual Chemicals*. Revision June 7, 2012.

Evren, 2006, *Technical Memorandum, Indoor Air Quality Assessment, Progress Cleaners, 8602 SW Hall Boulevard, Beaverton, Oregon*, December 18, 2006.

Hart Crowser, 2008, *IRM Completion Report, Former Progress Dry Cleaners, Beaverton, Oregon*, January 31, 2008.

Hart Crowser, 2014, *Remedial Action Completion Report, Former Progress Dry Cleaners, Beaverton, Oregon*, August 18, 2014.

O’Gara, 2004, *Progress Dry Cleaners Site Investigation*, January 6, 2004.

O’Gara, 2006, *Sampling Inside Progress Cleaners*, December 4, 2006.

O’Gara, 2008, Inside Air Testing, Tim O’Gara, October 1, 2008

O’Gara, 2009a, Inside Air Testing, Tim O’Gara, January 16, 2009

O’Gara, 2009b, Air and Ground Water Testing at Progress Cleaners, Tim O’Gara, July 13, 2009

O’Gara, 2009c, Inside Air Testing at Progress Cleaners, Tim O’Gara, November 10, 2009

O’Gara, 2010a, Inside Air Testing at Progress Cleaners, February 18, 2010

O’Gara, 2010b, Air and Ground Water Testing at Progress Cleaners, Tim O’Gara, September 27, 2010

O’Gara, 2011, Air Testing at Progress Cleaners, Tim O’Gara, May 18, 2011

O’Gara, 2012, Air Testing at Progress Cleaners, Tim O’Gara, March 6, 2012

O’Gara, 2013, Outside Soil Samples, Proposed Excavation Area, April 1, 2013

PBS, 2007, *Progress Cleaners Monitoring Report*, January 8, 2007

PBS, 2008a, *VOC Testing Report, Former Progress Cleaners Site, Beaverton, Oregon*, March 1, 2008

PBS, 2008b, *Progress Cleaners Summa Canister Air Monitoring Report, Former Progress Cleaners Site, Beaverton, Oregon*, April 8, 2008.

ATTACHMENTS

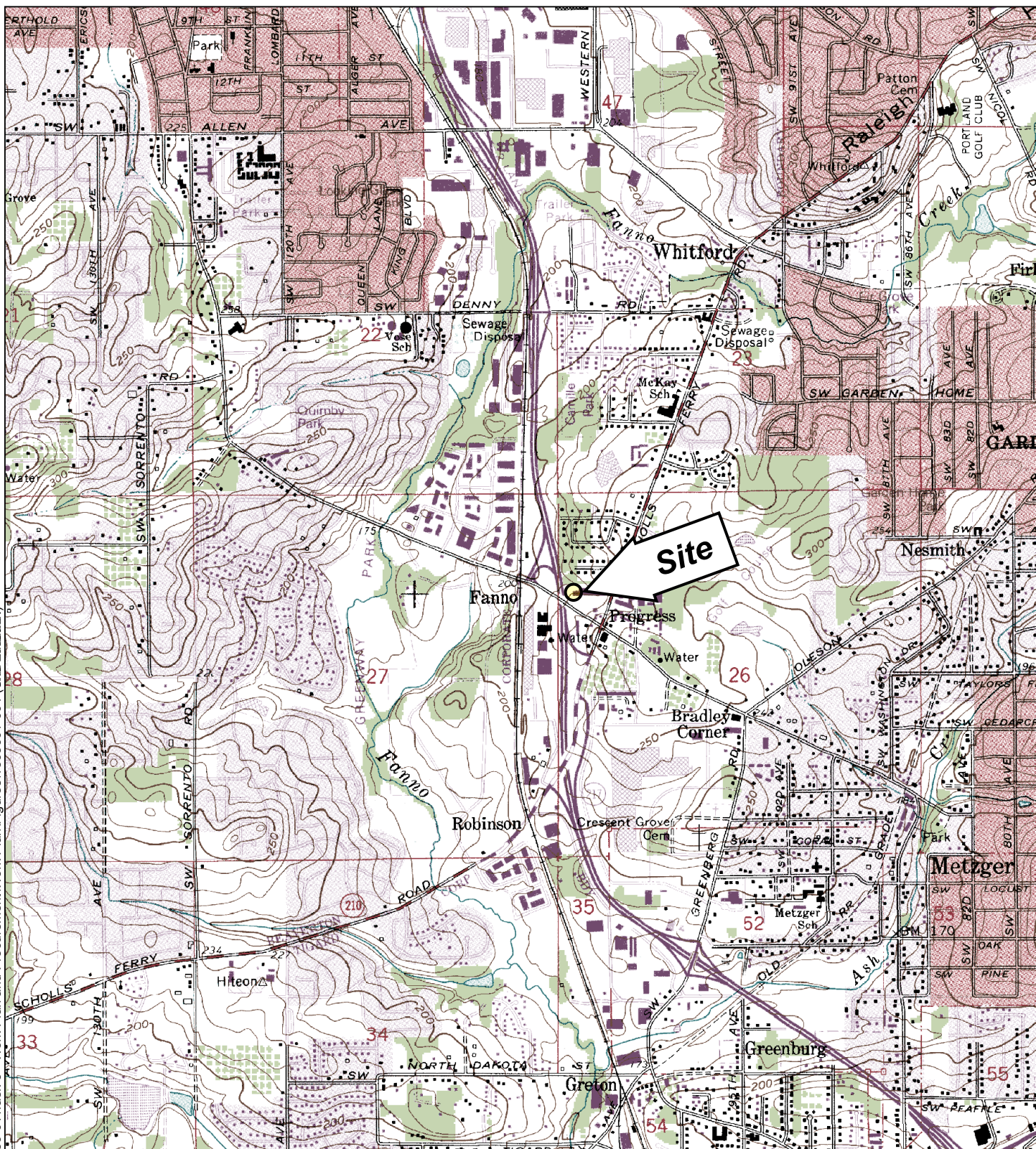
Figures:

1. Site Vicinity map
2. Pre-IRM Soil Sampling Locations Outside the Building
3. Soil Sampling Locations Inside the Building
4. Soil Sampling on the Boundaries of the IRM Excavation
5. Post-IRM Soil Sampling Locations Outside the Building
6. Air sampling Locations
7. Monitoring Well Locations

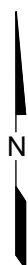
Tables:

- A-1. Soil Sampling Results
- A-2. Air Sampling Results
- A-3. Monitoring Well Groundwater Sampling Results
- A-4. Direct Push Groundwater Sampling Results

Figure 1
Site Vicinity map



0 2,000 4,000
Scale in Feet



Source: Base map prepared from the USGS 7.5-minute quadrangle of Beaverton, Oregon, photorevised 1984.

Former Progress Dry Cleaners
8602 SW Hall Boulevard, Beaverton, Oregon

Site Location Map

15656-01/Task 5

6/14

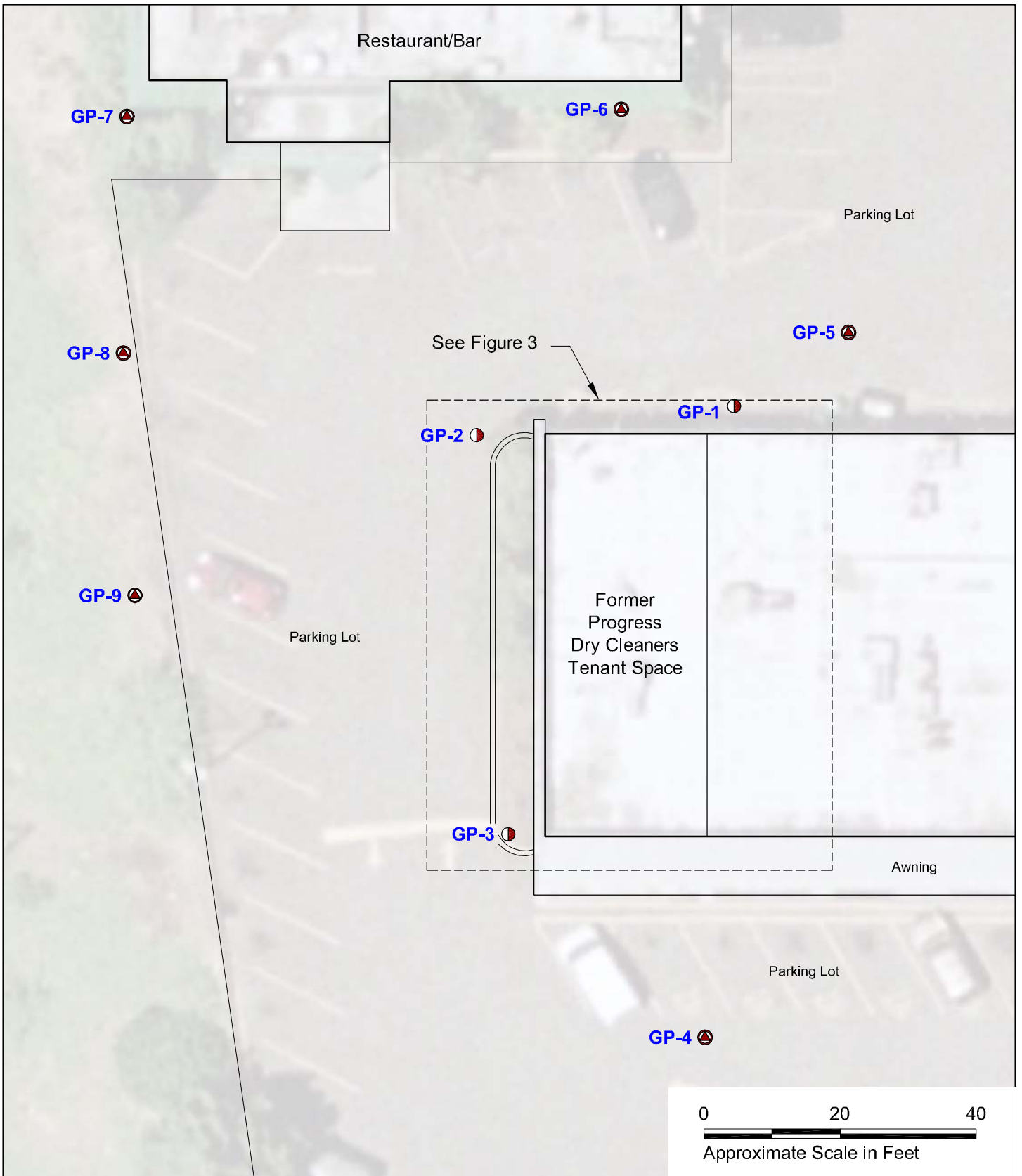


Figure

1

Figure 2

Pre-IRM Soil Sampling Locations Outside the Building



GP-1 Push Probe Location and Number (Jan. 2003)

GP-4 Push Probe Location and Number (Dec. 2003)



Source: Google Earth, and Figure 2 Boring Locations (dated 1/6/06)
by Tim O'Gara Consulting Hydrogeologist.

Former Progress Dry Cleaners
8602 SW Hall Boulevard, Beaverton, Oregon

Site Vicinity Plan

15656-00/Task 3

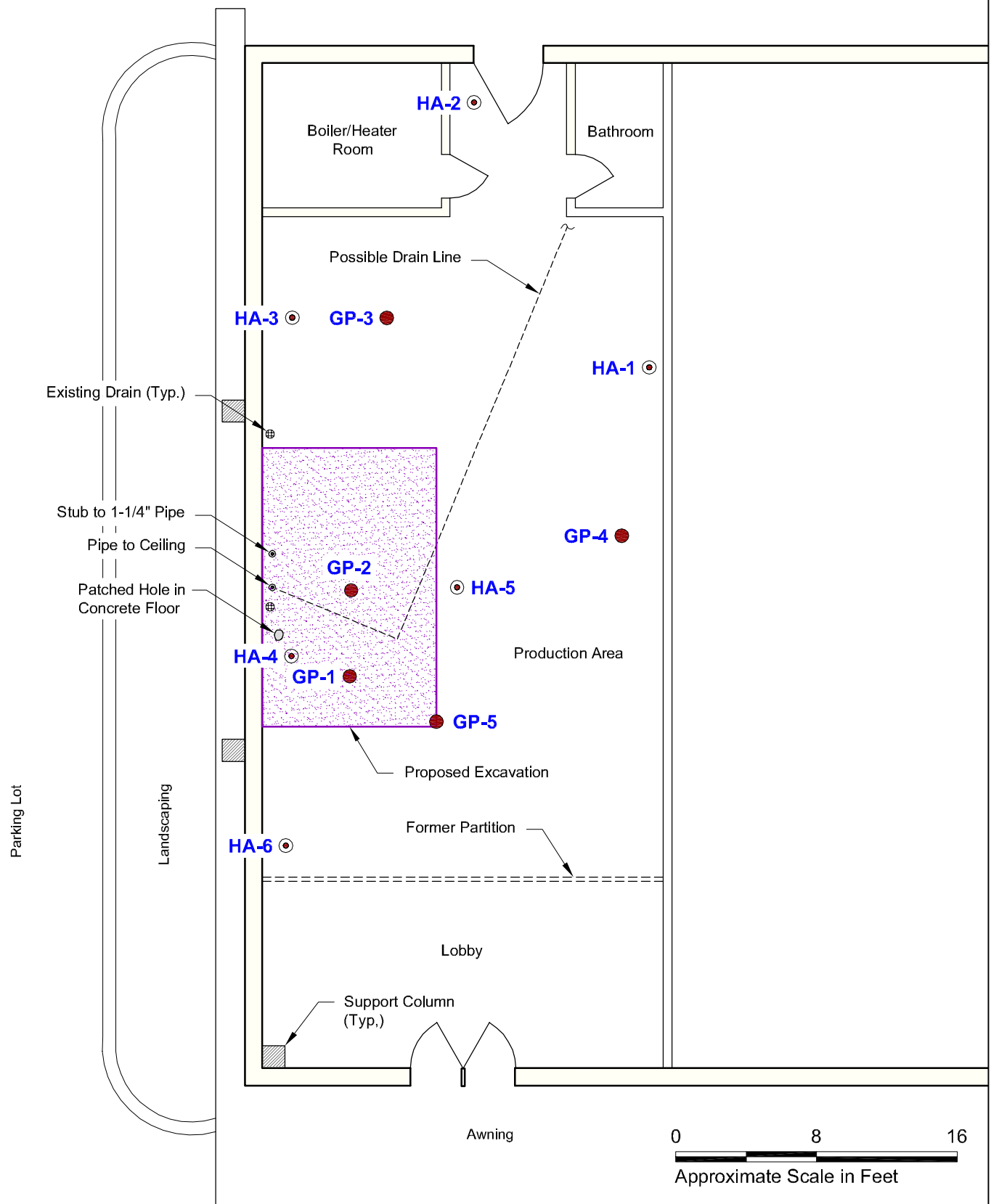
8/07



Figure

2

Figure 3
Soil Sampling Locations Inside the Building



HA-1 ● Hand Auger Boiring Location and Number (Jan. 2003)

GP-4 ● Push Probe Location and Number (Nov. 2006)



Former Progress Dry Cleaners
8602 SW Hall Boulevard, Beaverton, Oregon

Site Plan

15656-00/Task 3

8/07



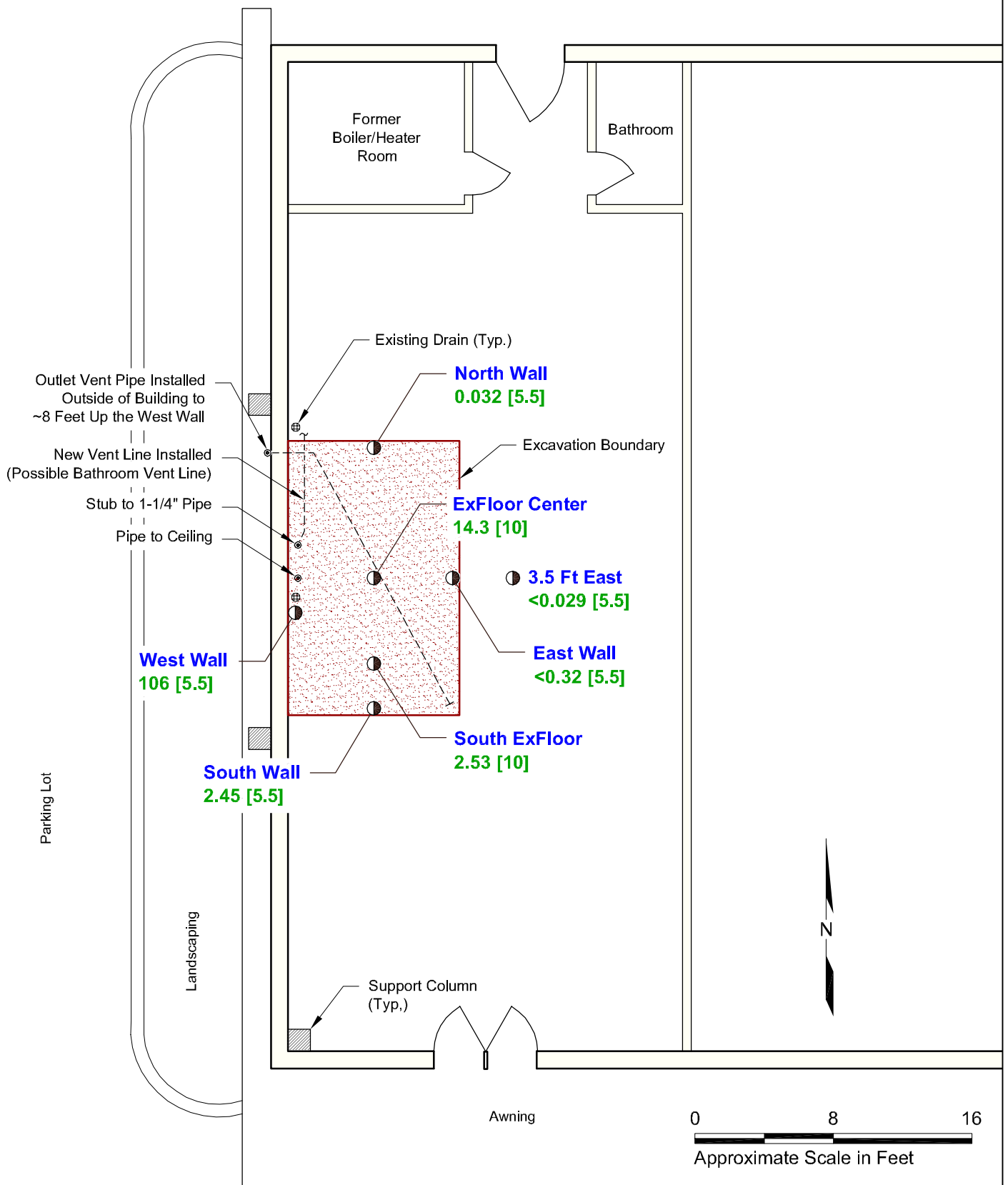
Figure

3

Source: Google Earth, and on site reconnaissance by Hart Crowser personnel.

Figure 4

Soil Sampling on the Boundaries of the IRM Excavation



West Wall ● Confirmation Soil Sample and Designation (Approximate Location)

106 [5.5] PCE Concentration in mg/kg and [Depth in Feet]

Source: On site reconnaissance by Hart Crowser personnel.

Former Progress Dry Cleaners
8602 SW Hall Boulevard, Beaverton, Oregon

Site Plan

15656-00/Task 5

11/07



Figure

2

Figure 5
Post-IRM Soil Sampling Locations Outside the Building

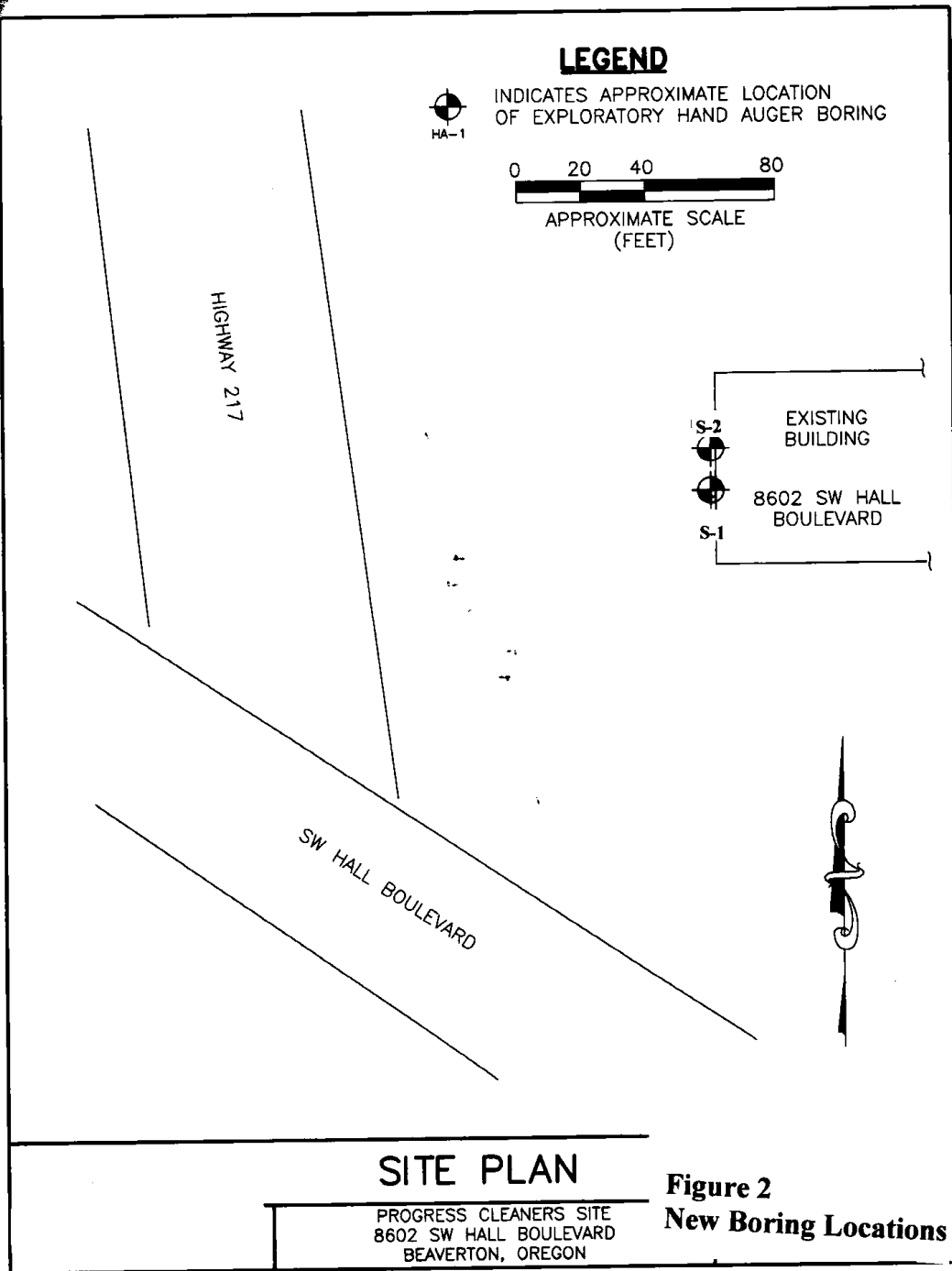
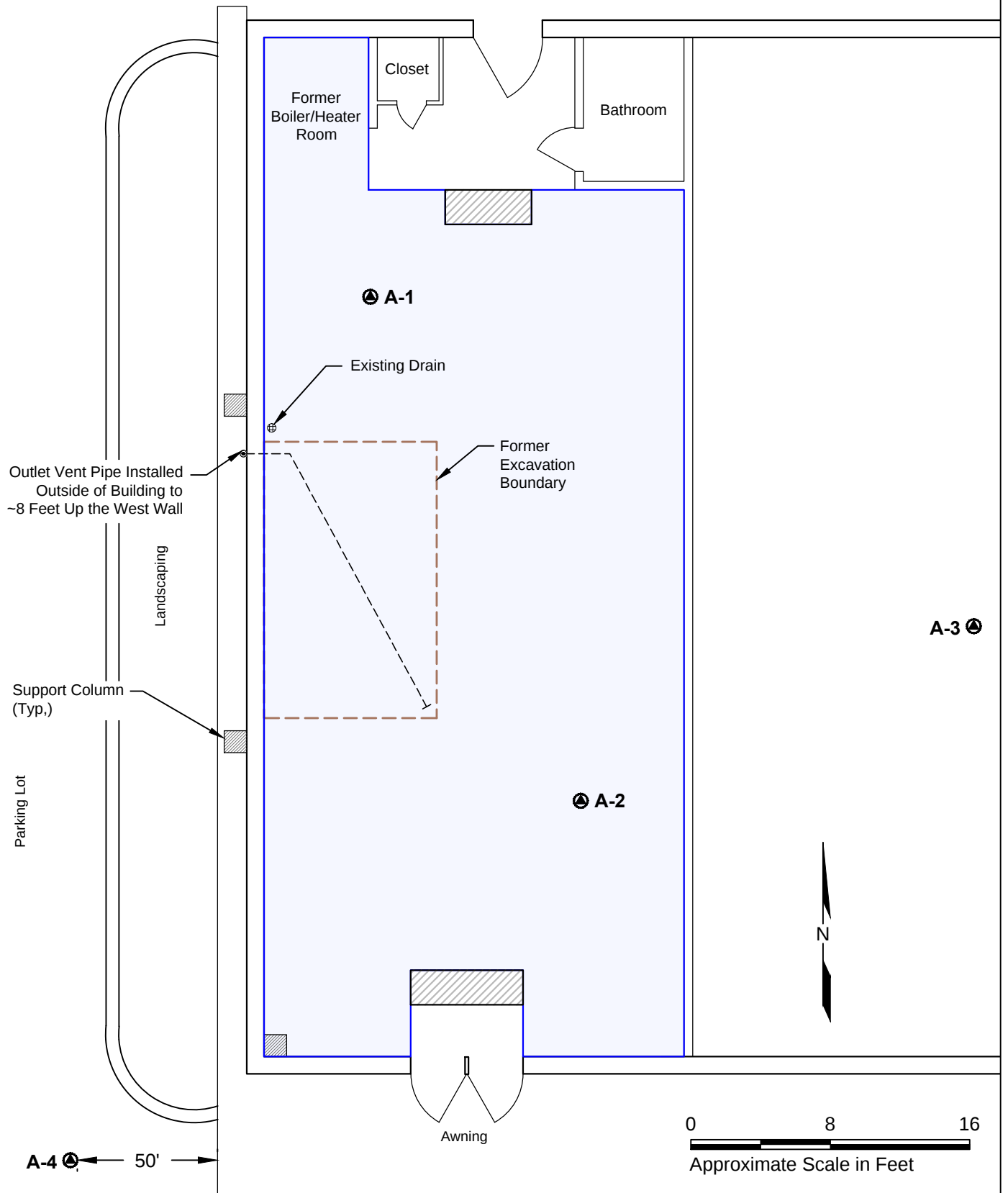


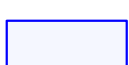
Figure 6
Air sampling Locations



A-1 Ambient Air Sample Name and Approximate Location



Ramp (Gradient of 1"/12")



Vapor Barrier Boundary

Source: On site reconnaissance by Hart Crowser personnel.

Former Progress Dry Cleaners
8602 SW Hall Boulevard, Beaverton, Oregon

Site Plan

15656-01/Task 5

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Figure

2

Figure 7
Monitoring Well Locations

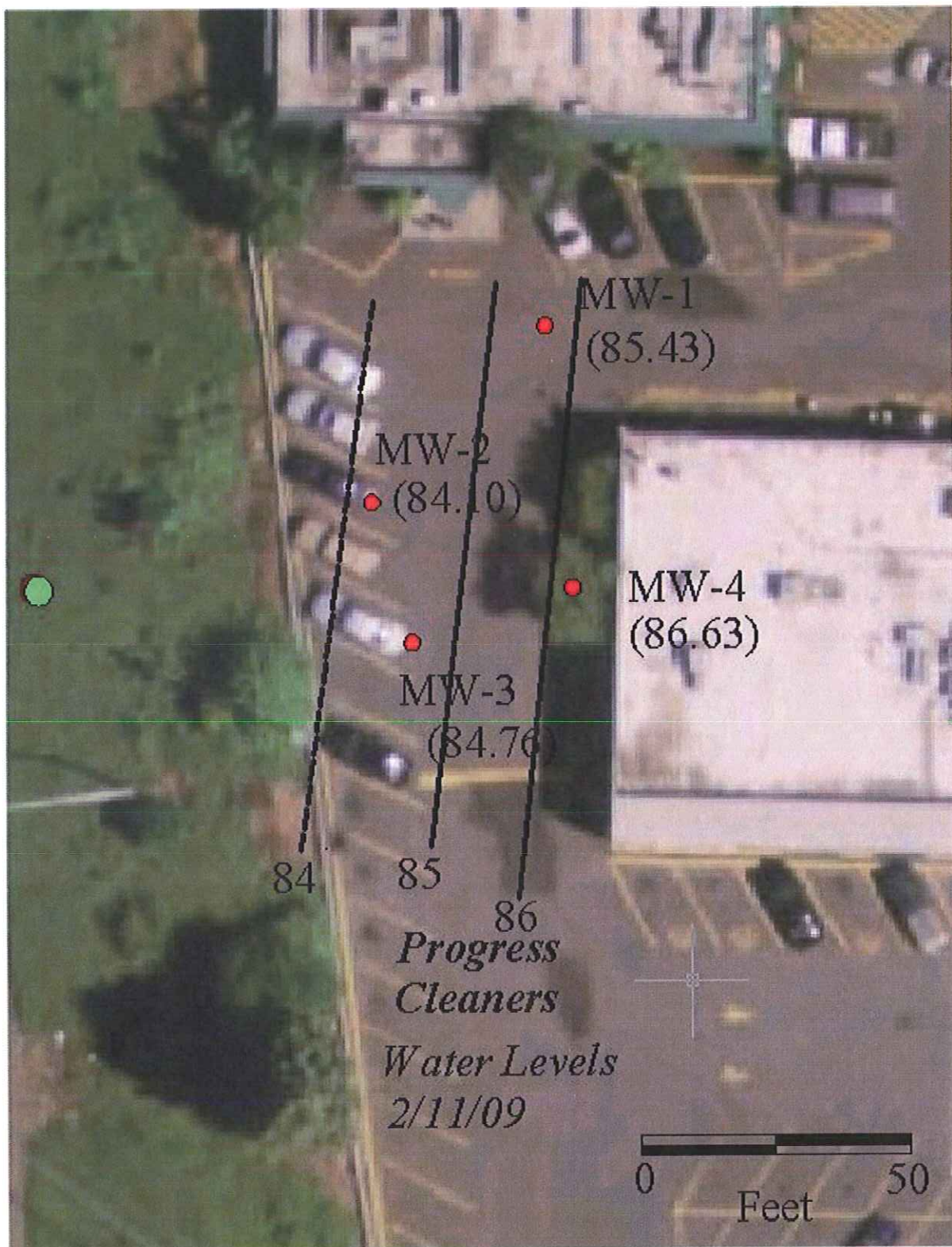


Figure 7. Monitoring Well Locations

Table A-1: Soil Sampling Results

Sample ID	Depth (feet)	Date	Analyte Concentration (mg/kg)					Other Contaminants Detected
			Tetrachloroethene (PCE)	Trichloroethene (TCE)	cis-1,2-Dichloroethene (cis-DCE)	trans-1,2-Dichloroethene (trans-DCE)	Vinyl chloride	
GP1-4'	4	1/15/2003	<0.1	NA	NA	NA	NA	
GP1-8'	8	1/15/2003	<0.1	NA	NA	NA	NA	
GP2-4'	4	1/15/2003	<0.1	NA	NA	NA	NA	
GP2-7'	7	1/15/2003	0.5	0.3	2.9	<0.1	0.9	
GP2-15'	15	1/15/2003	2.8	3.9	4	<0.1	0.3	
GP2-20'	20	1/15/2003	<0.1	10	13.2	NA	<0.2	
GP3-6'	6	1/15/2003	<0.1	NA	NA	NA	NA	
GP3-20'	20	1/15/2003	<0.1	NA	NA	NA	NA	
HA1-16"	16"	1/15/2003	<0.1	NA	NA	NA	NA	
HA2-16"	16"	1/15/2003	<0.1	NA	NA	NA	NA	
HA3-16"	16"	1/15/2003	<0.1	NA	NA	NA	NA	
HA4-16"	16"	1/15/2003	0.3	NA	NA	NA	NA	
HA5-16"	16"	1/15/2003	<0.1	NA	NA	NA	NA	
HA6-16"	16"	1/15/2003	<0.1	NA	NA	NA	NA	
GP-4-6	6	12/24/2003	ND	ND	ND	ND	ND	
GP-4-13	13	12/24/2003	ND	ND	ND	ND	ND	
GP-4-19	19	12/24/2003	ND	ND	ND	ND	ND	
GP-5-8	8	12/24/2003	ND	ND	ND	ND	ND	
GP-5-10	10	12/24/2003	ND	ND	ND	ND	ND	
GP-6-12	12	12/24/2003	ND	ND	ND	ND	ND	
GP-6-18	18	12/24/2003	ND	ND	ND	ND	ND	
GP-7-8	8	12/24/2003	ND	ND	ND	ND	ND	
GP-7-15	15	12/24/2003	ND	ND	ND	ND	ND	
GP-8-8	8	12/24/2003	ND	ND	ND	ND	ND	
GP-8-12	12	12/24/2003	ND	ND	ND	ND	ND	
GP-9-8	8	12/24/2003	ND	ND	ND	ND	ND	
GP-9-13	13	12/24/2003	0.052	0.015	ND	ND	ND	
GP-1-5	5	11/17/2006	36.4	1.78	1.35	0.014	0.056	
GP-1-13	13	11/17/2006	ND	ND	ND	ND	ND	
GP-2-5	5	11/17/2006	321	0.288	ND	ND	ND	
GP-2-11	11	11/17/2006	0.835	0.376	0.613	0.011	0.51	
GP-3-2	2	11/17/2006	0.022	ND	ND	ND	ND	
GP-3-5	5	11/17/2006	ND	ND	ND	ND	ND	
GP-4-5	5	11/17/2006	ND	ND	ND	ND	ND	
GP-5-4	4	11/17/2006	0.25	0.034	0.015	ND	0.05	
Samples at Boundaries of IRM Excavation								
Ex Floor Center	10	10/24/2007	14.3	7.97	10.4	0.225	0.506	
North Wall	5.5	10/25/2007	0.0317	<0.0317	1.1	0.0443	0.697	
West Wall	5.5	10/26/2007	106	3.36	0.48	<0.123	<0.123	1,2,4-TMB: 0.199 1,3,5-TMB: 0.128
South ExFloor	5.5	10/26/2007	2.53	0.65	0.848	<0.031	<0.031	
South Wall	5.5	10/24/2007	2.45	2.48	2.59	<0.0313	0.368	1,2,4-TMB: 0.0338
3.5 ft. East	3.5	10/25/2007	<0.0286	<0.0286	<0.286	<0.286	0.292	
East Wall	5.5	10/25/2007	<0.0317	0.12	0.248	0.0875	0.1	
S-1-5	5	3/7/2013	ND	ND	ND	--	--	--
S-1-10	10	3/7/2013	ND	ND	ND	--	--	--
S-2-5	5	3/7/2013	253	24.5	6.9	--	--	--
S-2-10	10	3/7/2013	760	19.1	ND	--	--	--
S-2-12.5	12.5	3/7/2013	381	ND	ND	--	--	--
Pathway			DEQ Risk-Based Concentrations					
Vapor Intrusion Into Buildings (Occupational)			36	2.8	-	200	2.2	1,2,4-TMB: 1,000 1,3,5-TMB: -
Direct Contact Occupational Exposure			940	46	2,000	9,200	3.9	1,2,4-TMB: 2,000 1,3,5-TMB: 10,000
Direct Contact Construction Worker			1,600	120	620	4,500	30	1,2,4-TMB: 2,000 1,3,5-TMB: 3,100
Direct Contact Excavation Worker			44,000	3,400	17,000	130,000	830	1,2,4-TMB: 54,000 1,3,5-TMB: 86,000

Notes:

RBC values from June 7, 2012 revision

10

Concentrations exceed Occupational Vapor Intrusion into Buildings RBC

Soil removed during 2007 IRM

NA

Not Analyzed

ND

Not Detected

TMB

Trimethylbenzene

--

Data not provided

Table A-2: Air Sampling Results

Sample ID	Date	Analyte Concentration (ug/m3)					Other Detected Contaminants	Notes
		Tetrachloro-ethene (PCE)	Trichloro-ethene (TCE)	cis-1,2-Dichloroethene (cis-DCE)	trans-1,2-Dichloroethene (trans-DCE)	Vinyl Chloride (VC)		
Indoor Air								
Central Area	11/6/2006	59	40.0					Evren, 2006
Boiler Room	11/6/2006	8	4.0					
Bathroom	11/6/2006	2,254	191.0					
Southern Area	11/6/2006	1,983	298.0					
Adjacent Space	11/6/2006	907	<100					
Roof	11/6/2006	8	<2					
IRM Soil Removal (October and November 2007)								
Inside Sample	3/13/2008	720	22	22	<1.7	0.012		
Floor sealing and fan installation								
Inside Front	9/9/2008	29	0.64	0.52	<0.020	0.0099		
Inside Back	9/9/2008	25	0.59	0.5	<0.020	0.012		
HVAC Adjustment								
Inside Front	12/31/2008	2	0.046	<0.0099	<0.02	0.0077		
Inside Rear	12/31/2008	2	0.054	<0.0099	<0.055	<0.0064		
Inside Front	6/29/2009	21	0.24	0.14	ND	ND		
Inside Back	6/29/2009	21	0.5	0.16	ND	ND		
Floor Repair								
Inside Front	10/20/2009	7	0.16	0.08	<0.020	0.021		
Inside Back	10/20/2009	6.9	0.18	0.086	<0.020	0.026		
Inside Front	2/2/2010	1.7	0.14	0.02	<0.020	0.011		
Inside Back	2/2/2010	2.5	0.3	0.029	<0.020	<0.0089		
Inside Front	4/13/2010	1.6	0.12	0.059	<0.020	<0.0051		
Inside Back	4/13/2010	2.7	0.13	<0.0099	<0.020	<0.0051		
Inside Front	9/8/2010	5.1	0.082	0.017	<0.020	0.012		
Inside Back	9/8/2010	5.7	0.077	0.018	<0.020	0.013		
Inside Front	4/29/2011	1.7	0.03	<0.099	<0.020	<0.0051		
Inside Back	4/29/2011	1.9	0.03	<0.099	<0.020	0.02		
Inside Front (Air-1)	9/14/2011	2.6	0.14	0.48	<0.079	<0.051	Benzene: 1.1 Carbon tetrachloride: 0.48 Chloroform: 0.45 Chloromethane: 1.1 Ethylbenzene: 1.6	
Inside Back (Air-2)	9/14/2011	6.0	0.11	0.26	<0.079	<0.051	Benzene: 0.67 Carbon tetrachloride: 0.46 Chloroform: 0.36 Chloromethane: 0.95 Ethylbenzene: 0.91	
Air 2 Front	6/19/2012	4.4	<0.11	<0.079	<0.079	<0.051	Benzene: 0.51 Carbon tetrachloride: 0.43 Chloroform: 0.17 Chloromethane: 0.95 Ethylbenzene: 0.42	
Air 1 Back	6/19/2012	6.2	<0.11	0.17	<0.079	<0.051	Benzene: 0.67 Carbon tetrachloride: 0.44 Chloroform: 0.36 Chloromethane: 0.95 Ethylbenzene: 0.48	
Air-2 Front	9/12/2012	200	19	11	0.13	0.061		Subslab vent fan turned off for one week prior to sampling. Cracks again noted around excavation patch.
Air-2 Back	9/12/2012	190.0	14	7.9	<0.079	<0.051		
Front	10/23/2012	4.2	0.21	<0.079	<0.079	<0.051	Benzene: 0.70 Carbon tetrachloride: 0.48 Chloroform: 0.21 Chloromethane: 0.78 Ethylbenzene: 0.33	With subslab vent fan turned back on
Back	10/23/2012	4.5	0.23	0.1	<0.079	<0.051	Benzene: 0.23 Carbon tetrachloride: 0.076 Chloroform: 0.050 Chloromethane: 0.41 Ethylbenzene: 0.084	
Vapor Barrier Installation (March 2014)								
A-1	4/21/2014	8.8	<1.1	1.1	<0.79	<0.51		Subslab fan (and building HVAC) was turned off starting in March 2014 to test whether it is still needed.
A-2	4/21/2014	9.5	<1.1	1.4	<0.79	<0.51		
A-3 Neighboring Space	4/21/2014	8.1	1.4	1.5	<0.79	<0.51		
A-1	5/21/2014	51	9.1	9.5	<0.79	<0.51		
A-2	5/21/2014	40	7.5	7.1	<0.79	<0.51		
A-3 Neighboring Space	5/21/2014	12	3.3	2.3	<0.79	<0.51		
A-1	7/7/2014	34	<1.1	<0.79	<0.79	<0.51		Subslab vent fan and building HVAC was turned back on in June 2014, 30 days ahead of the 7/7/2014 sampling.
A-2	7/7/2014	25	<1.1	<0.79	<0.79	<0.51		
A-3 Neighboring Space	7/7/2014	2.3	<1.1	<0.79	<0.79	<0.51		
Outdoor Air								
Outside Sample	3/13/2008	<2.4	<1.6	<1.5	<1.7	<1.1		
Outside Background	9/9/2008	0.21	0.042	<0.0099	<0.020	<0.0064		
Outside Background	6/29/2009	0.13	ND	0.012	ND	ND		
Outside Background	10/20/2009	0.12	0.06	<0.0099	<0.020	<0.0064		
Outside Background	4/13/2010	0.066	0.024	<0.0099	<0.020	<0.0051		
A-4 Background	4/21/2014	<1.4	<1.1	<0.79	<0.79	<0.51		
A-4 Background	5/21/2014	<1.4	<1.1	<0.79	<0.79	<0.51		
A-4 Background	7/7/2014	<1.4	<1.1	<0.79	<0.79	<0.51		
Pathway								
Indoor Air Inhalation (Occupational)		47	3.0	>Pv	260	2.8		

Notes:

RBC values from June 7, 2012 revision

29 Yellow shading indicates concentrations exceed RBCs for Indoor Air in Occupational Exposure Scenario

>Pv

RBC exceeds the vapor pressure of the pure chemical. The constituent cannot create an unacceptable risk through this pathway.

Note: RBCs for indoor air are not applicable to vent sample. Vent samples are well below applicable soil gas RBCs

Table A-3: Monitoring Well Sampling Results

	Analyte Concentration (ug/L)					
	Tetrachloroethene (PCE)	Trichloroethene (TCE)	cis-1,2-Dichloroethene (cis-DCE)	trans-1,2-Dichloroethene (trans-DCE)	Vinyl chloride	Other Contaminants Detected
MW-1						
7/2/2008	<5	<5	188	<5	282	-
10/28/2008	<1	3.2	100	1.6	160	1,1-Dichloroethene: 1.0
2/11/2009	<1	1.2	740	6.7	970	1,1-Dichloroethene: 1.9
6/29/2009	<1	131	2,050	13.8	17,600	
9/8/2010	<1	1.63	151	1.28	231	
4/29/2011	<1	14.2	980	4.66	144	
9/14/2011	<0.24	0.36	39	0.47	92	-
1/23/2012	0.4	0.44	100	1	160	
MW-2						
7/2/2008	118	1,420	800	<10	179	-
10/28/2008	110	920	960	5.8	740	1,1-Dichloroethene: 2.6
2/11/2009	73	620	13,000	50	1,400	Acetone: 35 2-Butanone: 35 Chlorobenzene: 5.4 1,1-Dichloroethene: 8.5
6/29/2009	142	1,280	12,900	68.4	3,140	
9/8/2010	15.1	61	1,300	10.8	2,560	
4/29/2011	197	1,750	8,540	43.1	5,050	
9/14/2011	83	160	1,300	6.7	740	Chlorobenzene: 0.46 Chloroethane: 2.1 1,1-Dichloroethene: 2.3
1/23/2012	19	89	6,700	29	7,600	Acetone: 13 Chlorobenzene: 2.3 Chloroethane: 10 1,1-Dichloroethene: 3.6 Toluene: 0.45
MW-3						
7/2/2008	<5	<5	197	<5	19.4	-
10/28/2008	<1	4.2	150	<1	66	-
2/11/2009	<1	<1	220	<1	94	-
6/29/2009	<1	3.73	658	3.41	375	
9/8/2010	<1	138	1,690	5.01	148	
4/29/2011	<1	540	2,970	5.62	277	
9/14/2011	0.94	310	1,800	6.1	330	1,1-Dichloroethene: 9.4
1/23/2012	0.85	110	1,000	3.3	100	1,1-Dichloroethene: 2.6
MW-4						
7/2/2008	<40	<40	1,760	<40	312	-
10/28/2008	<1	1.2	4,500	25	2,400	Acetone: 64 1,1-Dichloroethene: 7.0 2-Butanone (MEK): 42
2/11/2009	<1	<1	4,200	22	1,700	2-Butanone: 430 1,1-Dichloroethene: 3.3
6/29/2009	<1	<1	3,400	16.8	1,610	
9/8/2010	<1	<1	1,320	15.8	1,140	
4/29/2011	<1	172	10,700	72.6	1,730	
9/14/2011	<0.24	<2.9	200	2.1	170	1,1-Dichloroethene: 0.78
1/23/2012	4.2	83	2,300	11	580	Chlorobenzene: 0.42 1,1-Dichloroethene: 2.3
Pathway						
DEQ Risk-Based Concentrations						
Volatilization to Outside Air (Occupational)	>S	19,000	>S	1,800,000	6,800	
Vapor Intrusion Into Buildings (Occupational)	32,000	3,300	>S	350,000	910	
Groundwater in Excavation	5,400	430	24,000	14,000	1,200	

Notes:

RBC values from June 7, 2012 revision

1,400

Yellow Shaded Concentrations exceed Vapor Intrusion RBCs

970

Bolded Concentrations exceed Groundwater in Excavation RBCs

>S

RBC exceeds the solubility limit, so this contaminant cannot present an unacceptable risk in groundwater

<

Analyte was not detected above the listed detection limit

Table A-4: Direct Push Groundwater Sampling Results

Sample	Date	Analyte Concentration (ug/L)			
		Tetrachloroethene (PCE)	Trichloroethene (TCE)	cis-1,2-Dichloroethene (cis-DCE)	Vinyl chloride
PC-GW-1	1/15/2003	23	50	271	168
PC-GW-2	1/15/2003	48	48	4,280	154
PC-GW-3	1/15/2003	7	16	24	ND
GP-4-W	12/24/2003	ND	ND	ND	ND
GP-5-W	12/24/2003	ND	ND	ND	12.4
GP-6-W	12/24/2003	ND	ND	115	23.5
GP-7-W	12/24/2003	ND	ND	37.5	61.2
GP-8-W	12/24/2003	ND	1.12	739	1,010
GP-9-W	12/24/2003	516	2,100	603	304
GP-1-W	11/17/2006	17,300	1,670	4	194
GP-2-W	11/17/2006	16,000	981	16.5	336
GP-3-W	11/17/2006	10.5	4.3	ND	ND
GP-4-W	11/17/2006	4.28	ND	ND	3
GP-5-W	11/17/2006	494	19	ND	527
Pathway	DEQ Risk-Based Concentrations				
Volatilization to Outside Air (Occupational)	---	>S	19,000	>S	6,800
Vapor Intrusion Into Buildings (Occupational)	---	32,000	3,300	>S	910
Groundwater in Excavation	---	5,400	430	24,000	1,200

Notes:

RBC values from June 7, 2012 revision

1,400

Yellow Shaded Concentrations exceed Vapor Intrusion RBCs

970

Bolded Concentrations exceed Groundwater in Excavation RBCs

>S

RBC exceeds the solubility limit, so this contaminant cannot present an unacceptable risk in groundwater

<

Analyte was not detected above the listed detection limit