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October 27, 2014

MR. WILLIAM CARROLL
PACIFIC CREST ENVIRONMENTAL
P.O. BOX 952
NORTH BEND, WA 98045

**Re: Opinion pursuant to WAC 173-340-515(5) on Proposed Remedial Action for the following Hazardous Waste Site:**

- **Name:** Penthouse Drapery Cleaners
- **Address:** 1752 Rainier Avenue South
- **Facility/Site No.:** 23408
- **VCP No.:** NW2278
- **Cleanup Site ID No.:** 3184

Dear Mr. Carroll:

Thank you for submitting documents regarding your proposed remedial action for the **Penthouse Drapery Cleaners** facility (Site) for review by the Washington State Department of Ecology (Ecology) under the Voluntary Cleanup Program (VCP). Ecology appreciates your initiative in pursuing this administrative option for cleaning up hazardous waste sites under the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

This letter constitutes an advisory opinion regarding a review of submitted documents/reports pursuant to requirements of MTCA and its implementing regulations, Chapter 70.105D RCW and Chapter 173-340 WAC, for characterizing and addressing the following releases at the Site:

- Total petroleum hydrocarbons in the gasoline range (TPH-G), tetrachloroethene (PCE) in Soil
- PCE, trichloroethylene (TCE), cis-1,2-dichloroethene (DCE), 1,1,1-trichloroethane (TCA), 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, and 1,4-dioxane in Ground Water
- PCE in Air

Ecology is providing this advisory opinion under the specific authority of RCW 70.105D.030(1)(i) and WAC 173-340-515(5).

This opinion does not resolve a person's liability to the state under MTCA or protect a person from contribution claims by third parties for matters addressed by the opinion. The state does not have the authority to settle with any person potentially liable under MTCA except in accordance with RCW 70.105D.040(4). The opinion is advisory only and not binding on Ecology.

Ecology's Toxics Cleanup Program has reviewed the following information regarding your proposed remedial actions:

1. Pacific Crest Environmental, 2014. *Draft Remedial Investigation Feasibility Study Report, Former Penthouse Drapery, 1752 Rainier Avenue South, Seattle, Washington.* July 28.

2. Pacific Crest Environmental, 2011. *Remedial Investigation-Feasibility Study Report, Former Penthouse Drapery, 1752 Rainier Avenue South, Seattle, Washington.* May 13.

3. Pacific Crest Environmental, 2010. *Sampling and Analysis Plan, Former Penthouse Drapery, 1752 Rainier Avenue South, Seattle, Washington, Ecology VCP # NW2278.* August 3.

4. Pacific Crest Environmental, 2010. *Data Summary Report, Former Penthouse Drapery, 1752 Rainier Avenue South, Seattle, Washington.* July 30.

The reports listed above will be kept in the Central Files of the Northwest Regional Office of Ecology (NWRO) for review by appointment only. Appointments can be made by calling the NWRO resource contact at (425) 649-7235 or sending an email to: nwro_public_request@ecy.wa.gov.

The Site is defined by the extent of contamination caused by the following releases:

- Total petroleum hydrocarbons in the gasoline range (TPH-G), tetrachloroethene (PCE) in Soil
- PCE, trichloroethylene (TCE), cis-1,2-dichloroethene (DCE), 1,1,1-trichloroethane (TCA), 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, and 1,4-dioxane in Ground Water
- PCE in Air

The Site is more particularly described in Enclosure A to this letter, which includes a detailed Site diagram. The description of the Site is based solely on the information contained in the documents listed above.

Based on a review of supporting documentation listed above, pursuant to **requirements contained in MTCA and its implementing regulations, Chapter 70.105D RCW and Chapter 173-340 WAC, for characterizing and addressing the releases at the Site, Ecology has determined:**

- The following comments from Ecology's previous opinion letter dated September 20, 2011 do not appear to have been addressed in the 2014 Remedial Investigation (RI) Feasibility Study (FS):

    - *An interpretation of stratigraphic conditions specific to the investigation area is needed to provide a basis for understanding PCE distribution in the subsurface. The grain size description in the RI/FS is not sufficient for Ecology to understand what kinds of deposits are controlling contaminant migration at this Site. Also, the description of geology in the text and the conditions shown on the cross sections need to be consistent (see Enclosure A, Site Description; Geology).*

    - *The discrepancy between ground water flow direction estimates based on elevation contouring and the actual shape of the PCE plume should be evaluated.*

    - *The vertical extent of soil and ground water contamination has not been determined at the Property. Specifically, PCE was still detectable in soil at a depth of 61 feet at the base of SB-5, suggesting the possibility it extends deeper. Ground water is also contaminated at this depth and the potential for deeper impact has not been explored. A search for water supply wells in the area needs to be made using Ecology's database and other standard sources.*

- The RI (Sections 1 and 2) does not adequately explain the source of 1,4-dioxane on the Site. The source of 1,4-dioxane is briefly described in Section 4.2.4.3 but this information should be presented earlier in the RI and clearly described. Additional sampling rounds that include analysis for 1,4-dioxane should include MW-9 to determine if the plume extends to the southeast off the Property.

- The horizontal and vertical extent of CVOC contamination extends further than is shown by the three RI cross-sections. Data from SCC1, SCC2, MW-14, MW-18, MW-19, MW-24D, MW-25D and MW28D indicate that the vertical extent of contamination has not been delineated at these locations and that should be shown on cross-sections. Also, a cross-section should be drawn to incorporate the MW-30 cluster with an interpretation of stratigraphy beneath Rainier Avenue. The text

(Section 3.3.2.2; page 3-9) states that two monitoring wells (MW-3; MW-13) and four DPE wells (DPE-2, DPE-3, DPE-6 and DPE-7) were sampled on September 24, 2012. However, the results of this sampling round do not appear to be included in any of the tables or figures.

- Highly-elevated concentrations of PCE detected in ground water at the Penthouse portion of the Property are not seen directly downgradient which suggests significant downward migration of PCE in the source area. No deep wells have been installed to confirm this possibility but electrical resistance heating electrodes are proposed to depths of nearly 50 feet below the ground surface in this area. The cleanup action plan will need to include wells or data points that will demonstrate that the source has been mitigated at depth.

- The text (Section 4.1; top of page 4-2) discusses the inferred eastern boundary of CVOC contamination in ground water and the distribution of contaminants east of Rainier Avenue based on the results from wells completed east of Rainier Avenue (well cluster MW-30). However, well cluster MW-30 is west of Rainier Avenue so the discussion needs to be revised accordingly. The Conceptual Site Model should incorporate more of the Site hydrogeology.

- The text (Section 4.2.4.3) discusses and Figure 14 shows the distribution of 1,4-dioxane in ground water on the Site. The text states that 1,4-dioxane has been detected in ground water as deep as 59 feet below the ground surface. The text and figures need to describe and illustrate the contaminant distribution in terms of the 3 identified aquifer zones. A cross-section showing the extent of 1.4-dioxane would be helpful.

- Ecology agrees (RI Section 2.2.2) that the Site qualifies for an exclusion from a terrestrial ecological evaluation; there are less than 1.5 acres of contiguous undeveloped land on or within 500 feet of the Site. The exclusion should be documented using the form at: http://www.ecy.wa.gov/programs/tcp/Policies/terrestrial/Forms_PrimaryExclusions.pdf

- The locations of all decommissioned monitoring wells such as MW-5 and MW-6 should be shown on Site Maps that show monitoring wells with a different symbol from existing wells.

- On Figure 2, the "Investigation Area" boundary does not include the area including the MW-30 monitoring well cluster.

- On Figure 6, ground water sampling locations (wells or borings) that were used to bound the approximate extent of DNAPL should also be shown. On Figure 6, the definition of 'PCE' should be 'tetrachloroethene'.

- The shallow zone ground water elevation data shown in Figure 12 should be contoured as shown in Figure 7 in the previous RI report dated May 13, 2011. Arrows should be used in addition to contouring which confirms the arrow directions.

- On Figures 12 and 13, the date of the potentiometric surface map data is shown as July 24, 2012 but the gauging date in Table 16 is July 23, 2012. The discussion of ground water flow is primarily based on this one round of ground water elevation data. Are there additional ground water elevation data that was collected after July 2012 that could be incorporated into the discussion? Additional and preferably more current ground water elevation measurement rounds should be used to show that the ground water flow directions indicated by the data are consistent.

- Figure 13 shows the deep zone potentiometric surface drawn from 3 data points (note: a triangulation would typically yield a single direction). There are additional data points listed in Table 16 which should be displayed on the figure and used in the contouring.

- On Figure 16, definitions of 'PCE' and 'TCE' are reversed. The depths of screened intervals of SCC1 and SCC2 provided in Table 7a should be added to Figure 16. The legend of Figure 16 needs to define the dash (-) symbol. The results for MW-1 say the sample was collected on August 7, 2012 but Table 7a says it was collected on July 25, 2012. According to Table 7a, the result for PCE in MW-1 should be shown as '<1.0'.

- On Figure 18, the results from the sample collected at 65 feet needs to be highlighted as exceeding the Method A cleanup level.

- On Figure 19, please correct "PCE & related CVOVs" and label South Grand Street.

- Ecology concurs with the proposed FS cleanup levels presented in RI Tables 1, 2 and 3.

- Table 6 should contain a column indicating which aquifer zone has been designated as the one the well is screened in based on lithology encountered and well screen depth. Table 6 should also include a note explaining why ground water levels were not measured in MW-1, MW-4, MW-7, MW-19 and MW-20 on July 23, 2014. The notes should include the definition of 'NE' used in the cleanup level row.

- Ecology concurs with the remedial alternative selected for Area 1 – electric resistive heating (ERH) and enhanced in-situ anaerobic bioremediation (Alternative 4). The draft cleanup action plan (dCAP) should describe the extent to which the area beneath Rainier Avenue South will be affected by the ERH.

- Ecology concurs with the remedial alternative selected for Area 2 – excavation and enhanced aerobic bioremediation (Alternative 2). The dCAP should include a contingency if contamination is found to extend deeper than the proposed excavation depth of 30 feet below the ground surface.

- Ecology concurs with the remedial alternative selected for Area 3 – enhanced reductive dechlorination and monitored natural attenuation (Alternative 2). The dCAP should include documentation that sufficient natural attenuation processes will be demonstrable on the Site to achieve cleanup in the stated time frame.

**This opinion does not represent a determination by Ecology that a proposed remedial action will be sufficient to characterize and address the specified contamination at the Site or that no further remedial action will be required at the Site upon completion of the proposed remedial action.** To obtain either of these opinions, you must submit appropriate documentation to Ecology and request such an opinion under the VCP. **This letter also does not provide an opinion regarding the sufficiency of any other remedial action proposed for or conducted at the Site.**
Please note that this opinion is based solely on the information contained in the documents listed above. Therefore, if any of the information contained in those documents is materially false or misleading, then this opinion will automatically be rendered null and void.

The state, Ecology, and its officers and employees make no guarantees or assurances by providing this opinion, and no cause of action against the state, Ecology, its officers or employees may arise from any act or omission in providing this opinion.

Again, Ecology appreciates your initiative in conducting independent remedial action and requesting technical consultation under the VCP. As the cleanup of the Site progresses, you may request additional consultative services under the VCP, including assistance in identifying applicable regulatory requirements and opinions regarding whether remedial actions proposed for or conducted at the Site meet those requirements.

If you have any questions regarding this opinion, please contact me at (425) 649-7064 or hvic461@ecy.wa.gov.

Sincerely,

Heather Vick, LHg
NWRO Toxics Cleanup Program

Enclosure: (1) A Site Description and Diagrams

cc: Sonia Fernandez, VCP Coordinator, Ecology

# Enclosure A

# Description and Diagrams of the Site

# Site Description

*This section provides Ecology's understanding and interpretation of Site conditions. It forms the basis for the conclusions and opinions expressed in the body of the letter.*

**Site and Property Definition:** The "Site" is the volumetric area that has been contaminated, and consists of partially comingled plumes that resulted from the following separate releases:

- Former Penthouse Drapery (now Seattle Collision Center) at 1752 Rainier Avenue South – releases of dry cleaning solvents including tetrachloroethene (PCE) with degradation products trichloroethylene (TCE) and 1,2-cis-dichloroethylene (DCE) in soil, ground water, and air.

- Belshaw (former subsidiary of Enodis and current subsidiary of AGA Foodservice) at various properties southeast of Former Penthouse Drapery – releases of metal cleaning solvents including 1,1,1-trichloroethane (1,1,1-TCA) as well as 1,4-dioxane, a solvent stabilizer; releases of petroleum hydrocarbons in the gasoline range (TPH-G) from a former underground storage tank (UST) system.

The estimated areal extent of the Site is shown on Figure 2 in the attached Site Diagrams. As illustrated, the Site includes the entire Penthouse property, portions of the adjoining properties to the south, and east, and a possible westward extension into the Rainier Avenue South right-of-way. The Site also appears to extend southward and eastward beyond Grand Street, based on PCE, TCE, and DCE detections in wells MW-1, MW-2, and MW-20.

*Property Definition:* The following King County tax parcels comprise the Property and are to be addressed by the cleanup:

| Property Affiliation | Parcel Number | Size (Acres) | Address | Former/Current Use |
|---|---|---|---|---|
| Penthouse | 7548301155 | 0.11 | 1752 Rainier Avenue S. | Penthouse Drapery/Seattle Collision Center |
| Penthouse | 7548301150 | 0.08 | None provided | |
| Penthouse | 7548301100 | 0.10 | None provided | |
| Belshaw | 7548301115 | 0.23 | 1762 Rainier Avenue S | Paint building; donut equipment manuf. |
| Belshaw | 7548301120 | 0.12 | None provided | |
| Belshaw | 1822300020 | 0.08 | 1765 22nd Avenue S | Welding shop; donut equipment manuf. |
| Belshaw | 7548301125 | 0.09 | 2100 S. Grand Street | Check cashing business |
| Belshaw | 1822300025 | 0.07 | 2110 S. Grand Street | Residence |
| Belshaw | 3881900515 | 0.35 | None provided | Parking |

Source: King County Parcelviewer webpage

Taken together, these nine parcels comprise the Property for purposes of this opinion letter. The Property includes most of the area between Rainier Avenue, 22nd Avenue South, South Holgate Street, and South State Street. The location of the Property within the Site is illustrated in a Site Diagram. Figure 2 of the Site Diagrams shows an area of "Affected Properties" which corresponds to the nine tax parcels identified in the table above.

Note also that two other property-related definitions are used in this letter to distinguish which area of the Site is being discussed. One of these is the "**Penthouse affiliation parcels**". This term is defined as the parcel at 1752 Rainier Avenue South (7548301155) as well as surrounding parcels to the south and east (see table above) and Figure 2 in the Site Diagrams.

A second group of parcels termed the **"Belshaw affiliation parcels"** in this letter adjoins the Penthouse property to the south and to the east across 22nd Avenue South, as illustrated on Figure 2 in the Site Diagrams. The western part of the Belshaw property is within the Property; the eastern part of the Belshaw affilation (i.e. east of 22nd Avenue South) is not. The table above contains the Belshaw affiliation parcels that are part of the Property.

*Site Definition.* The Site is defined as a PCE release from former dry cleaning operations on the Penthouse affilation parcels. Note that two other releases have occurred within the Property (see definition of areas in paragraph below) and at least one resulting plume has become comingled with the PCE release. These additional two releases are thus considered part of the Site. The first Belshaw release is 1,1,1-TCA which appears to have occurred on the Belshaw portion of the Property, based on detections of this compound in ground water at monitoring wells MW-8, MW-19, and DPE-1. Concentrations of 1,4-dioxane above the Method B cleanup level have been found to be co-located with the 1,1,1-TCA in ground water. The second Belshaw release consists of gasoline from one or two USTs on the Belshaw portion of the Property.

The Site has been divided into three areas based on the type of contamination found in ground water. Figure 19 in the Site Diagrams shows the three areas which include:

| Area | Contamination in Ground Water | Source | Comingled With: |
|---|---|---|---|
| 1 | PCE and related degradation products | Former Penthouse Drapery | Area 2 plume |
| 2 | 1,4-dioxane & 1,1,1-TCA | Belshaw - Paint and Welding | Area 1 plume |
| 3 | Petroleum hydrocarbons – TPH-G | Belshaw - UST system | None |

Finally, a larger area in which various investigations have taken placed is defined as the "Investigation Area" on Figure 2 in the Site Diagrams.

**Area and Property Description:** The Property is in the Rainier Valley business district, and is situated on Rainier Avenue South, the major thoroughfare serving the area. Commercial businesses line Rainier Avenue, and are scattered throughout the area. Residential properties are also present in close proximity to the Property. Directly across the street to the north are a new condominium development and a neighborhood with single-family homes. A large apartment complex and a defunct manufacturing facility are located to the east. The Property is approximately 500 feet south of Interstate 90.

**Property History and Current Use:**
*Penthouse Affiliation Parcels:* The Penthouse Drapery portion of the Property was developed by at least 1947 with the construction of a 4,790-square foot, masonry commercial building. A number of companies have occupied the building since then including Associated Industries Fabricators (aircraft parts manufacturing) from 1951 to 1970, two pool supply companies (1970 to 1980, Penthouse Drapery (~1980 to 1990), Don-Vinn Restaurant Equipment (1994 to 1998) and Seattle Collision Center (1998 to present). Seattle Collision Center is currently in operation on the Property in the existing building.

*Belshaw Affilation Parcels:* The remainder of the Property immediately south of the Penthouse Drapery affiliation parcels consists of the western portion of the Belshaw Brothers, Inc. (Belshaw) affiliation parcels. The Belshaw property was developed beginning in approximately 1924 when a bakery and restaurant equipment manufacturing facility began operation on the Property. As part of the manufacturing facility, a welding building and a paint building were formerly present in the eastern portion of this area. Prior to construction of the Assembly Building in 1988, Belshaw personnel reportedly disposed of spent solvents on unpaved portions of the Belshaw affiliation parcels to control overgrown weeds including Himalayan blackberries. There are several more Belshaw affiliation parcels present east of 22nd Avenue South (shown in Figure 2 of the Site Diagrams) but these are not considered part of the Site.

**Contaminant Sources and History of Releases:**
*Penthouse Affiliation Parcels:* Potential contaminant sources for this Site include dry cleaning fluid spills and disposal at the former dry cleaners. The dry cleaning fluid consisted principally of PCE. There is no record of specific locations of spills or leaks at the former Penthouse property, nor is any information available to Ecology on the dry cleaner operation. On the basis of dry cleaner operation dates, the release of PCE most likely occurred between 1980 and 1990.

*Belshaw Affiliation Parcels:* Sources include solvents used in manufacturing including 1,1,1-TCA. In addition, 1,4-dioxane was used as a solvent stabilizer. The solvent releases most likely occurred between the 1950s and 1990s. In addition, spent solvents were used for weed control on the unpaved Belshaw parcels. A former fueling station was located adjacent to the Former Welding Shop Building. An underground storage tank (UST) system located adjacent to the former welding shop was reportedly removed from this area at an unknown date.

**Physiographic Setting:** The Site is situated within and near the northern end of the Rainier Valley, between the Beacon Hill upland on the west and the Mt. Baker Ridge upland on the east. The uplands rise to elevations of 200 to 400 feet above sea level; the valley floor at the Site is at an elevation of approximately 70 feet above mean sea level. The axis along the lowest point of the valley approximately follows Rainier Avenue, sloping gently down to the southeast. The Site is close to the eastern edge of the valley, which is marked by a curving break in slope. On the

north, the break in slope is right at the boundary of the Site at South State Street. On the east, it is about 150 feet east of 22nd Avenue South, and on the west, considerably further away.

**Surface/Storm Water/Sanitary System:** Information regarding surface water bodies and storm water runoff and transport at and near the Site has not been presented in the RI/FS. Storm water utility information is particularly important because of the potential for preferential contaminant transport.

**Ecological Setting:** Information regarding the ecological setting has not been presented in the RI/FS. Ecology believes that some terrestrial habitat may be present in the landscaped residential neighborhood north of the Site, but this remains to be evaluated.

**Geology:** Geologic conditions in the investigation area have been thoroughly explored to a depth of about 70 feet below ground surface (bgs), but no genetic interpretation has been provided. The RI/FS presents a lithologic description as follows – 12 feet of fine sand, with interbedded silts and gravel, overlying interbedded silty fine sand and clay to the depth explored (Page 3-11). This description conflicts to some degree with the geologic cross sections (Figure 4 and 5), which show mostly silt with three or four beds of sand or silty gravelly sand.

**Ground Water:** The depth to water beneath the investigation area ranges from approximately 12 to 18 feet bgs. Below these depths are several water-bearing zones which largely coincide with sandy interbeds within the silt. These are termed the Shallow Zone, Intermediate Zone, and Deep Zone. A water bearing zone is also intermittently present between the Intermediate and Deep Zones. The top of the Shallow Zone appears to be the water table (unconfined conditions), whereas the deeper water bearing zones are confined, with potentiometric heads slightly below the water table.

Both horizontal and vertical ground water flow has been characterized at the Site. The vertical flow appears to be generally downward, based on declining heads with depth at monitoring well clusters where observation is possible. A downward vertical gradient is unexpected in a valley between two uplands but the nearest surface water body, Lake Washington, is a probable sink influencing the flow regime; the deeper water-bearing zones are most likely actively discharging there thus inducing downward flow from the shallow zone.

Lateral ground water flow directions, by contrast, are as expected for the situation - generally down valley to the south-southeast. However, there is a disconnect between the PCE distribution in ground water, and the various potentiometric surface contour maps - Figures 7, 8 and 9 in the RI/FS and Figure 5, 6, and 7 in the Data Summary Report. The PCE distribution shows transport almost directly southeast down Rainier Avenue, whereas the ground water contour maps show a more easterly or even northeasterly flow. It is possible the operation of the dual-phase extraction system between 2004 and 2007 in the eastern part of the Cleanup property

resulted in a slight lowering of ground water levels, thus implying continuing flow in that direction. However, even in 2010 the water levels at MW-26 remain anomalously depressed.

**Water Use:** Potable water is provided to the area by the City of Seattle. However, no information has been provided on whether water supply wells also exist in the area.

**Release and Extent of Contamination - Soil:** PCE contamination in soil extends to depths of greater than 70 feet below land surface (the full depth has not been determined) in the source area at the Penthouse property. The affected area appears to be on the order of 100 by 100 feet in plan dimension, although it may extend further to the east and west where the boundaries of the contaminated area have not been defined. Contaminated soil also extends more than 100 feet to the southeast (the southern edge has not been defined), associated with the PCE contaminant plume in ground water (see below). Soil PCE concentrations in this down gradient area are considerably less than in the source area.

The PCE has moved downward despite the presence of the dense silts underlying the Site. The silts must have a greater vertical permeability than expected or are discontinuous allowing vertical downward migration of the dense nonaqueous phase liquids (DNAPL). This condition coupled with a downward vertical gradient in ground water appears to have distributed the bulk of the PCE contamination downward directly below the source. PCE detected in soil downgradient of the source area likely was derived from the PCE transported in ground water.

Light non-aqueous phase liquids (LNAPL) have been found on the Site in the vicinity of the former UST system at the former welding shop building. DPE well DPE-2 had up to 2 feet of LNAPL prior to the initiation of the DPE system. During active remediation, LNAPL was recovered and contaminant concentrations declined steadily. Ground water sampling conducted in the July 2012 sampling round indicated that TPH-G and benzene concentrations were below MTCA Method A cleanup levels. Based on these results, it appears that LNAPL is no longer present in the subsurface near the former UST system.

**Extent of Contamination – Ground Water**: Extensive ground water monitoring data show a PCE plume extending southeastward over 350 feet from the source area. The PCE contamination is present in all three water bearing zones, and declines from near-free-product-level concentrations directly at the source to a few parts per billion at the distal edge of the plume.

TCE and DCE are also present in the plume at much lower concentrations than PCE. The compounds are breakdown products of PCE and indicate degradation is ongoing. However, the highest concentrations of TCE detected to date were in the well furthest upgradient (MW-23). This result may indicate a separate upgradient release (i.e., a different site).

The compound TCA has also been detected on the Belshaw property portion of the Cleanup property at MW-8, MW-19, and DPE-1. This compound is not a breakdown product of TCE, and appears to have been released from a separate source near these wells. An assessment of the extent of 1,4-dioxane was conducted in 2012 by sampling wells in which 1,1,1-TCA had been previously detected. The results indicated a plume of 1,4-dioxane at concentrations exceeding the Method B cleanup level (0.438 µg/L) extending southeast across the Belshaw affiliation parcels. The extent of the plume is unknown and potentially extends off-Property to the southeast.

**Investigation History:**

The following table is a chronology of investigative activities that have been conducted on the Property:

**Chronology of Field Investigative Activities – Penthouse Drapery Cleaners Site (NW2278)**

| Date | Property Affiliation | Field Investigative Activity |
|---|---|---|
| February 2002 | Belshaw | 8 soil borings: AW-SB-1 to AW-SB-8 |
| June 2002 | Belshaw | 11 soil borings: B-1 to B-10 and MW-7; 7 monitoring wells (MW-1 to MW-7) installed |
| February 2003 | Belshaw | 9 soil borings: B-11 to B-13 and MW-8 to MW-13; 6 monitoring wells installed; GPR survey for UST |
| May 2003 | Belshaw | 5 soil borings: MW-14, DPE-1 to DPE-3 and B-16; DPE pilot testing performed |
| October 2003 | Penthouse | 1 soil boring: MW-17; 1 monitoring well (MW-17) installed; 1 test pit (TP-1) excavated |
| February 2005 | Penthouse | 3 soil borings: (GMW-1 to GMW-3; 3 monitoring wells (GMW-1 to GMW-3) installed |
| May 2005 | Penthouse | 8 soil borings: MW-18 to MW-20, MW-21S, MW-21D, MW-22, MW-23 and HA-1; 3 continuous multi-tubing (CMT) wells (MW-18 to MW-20) and 4 monitoring wells (MW-21S, MW-21D, MW22 and MW-23) were installed |
| May 2008 | Penthouse | 2 soil borings: SCC-1 and SCC-2; soil and ground water samples collected |
| April 2009 | Penthouse and Belshaw | 15 soil borings: MW-24S, MW-24D, MW-25S, MW-25I, MW-25D, MW-26S, MW-26I, MW-26D, MW-27S, MW-27I, MW-27D, MW-28S, MW-28I, MW-28D and MW-29 |
| February 2010 to April 2011 | Penthouse | 4 soil borings: PH-SB-2 to PH-SB-5; 9 monitoring well borings (MW-30S, MW-30I, MW-30D, MW-31S, MW-31I, MW-30D, MW-32S, MW-32I, MW-32D) and wells installed; 1 subslab soil vapor sample and one ambient air sample; SVE pilot test after converting soil boring PH-SB-5 to a recovery well. |
| July 2012 | Penthouse | Underground utility video surveillance and underground utility survey; 8 deep soil borings: PH-SB-1, PH-SB-6, PH-SB-7, PH-SB-8, PH-SB-9, PH-SB-13, PH-SB-14 and PH-SB-15; 3 shallow soil borings: PH-SB-10 to PH-SB-12 |
| September 2012 | Belshaw | 9 soil borings: URS-SB-1 to URS-SB-9 |

Exploration of the investigation area began with a Phase I ESA in 1995, and was followed by

additional Phase I ESAs and multiple field sampling efforts between 2002 and the most recent RI activities in 2010. During this seven year period, at least 44 borings were drilled for various purposes to depths ranging up to 71.5 feet below ground surface (bgs); hundreds of soil samples were obtained for chemical analysis; and 66 ground water samples were obtained from specific locations or depth intervals. Multiple sampling events occurred at the majority of ground water monitoring wells.

Other field activities provided ancillary characterization data. Specifically, pilot testing for a dual-phase extraction (DPE) system was completed in 2003, and a DPE system was installed and operated between 2004 and 2007. There has also been recent testing for a soil vapor extraction (SVE) system.

An assessment of soil vapor intrusion was also completed in 2010. The assessment consisted of obtaining an ambient air sample and a below-floor -slab soil vapor sample at the Penthouse property for analysis of PCE and its' breakdown products.

The boundary of the contaminant plume within the three or four water bearing zones has been largely determined to the east and north, but not to the southeast, southwest, or west. The base of contaminant plume has also not been determined.

**Extent of Contamination – Air:**
An assessment of soil vapor intrusion was completed in 2010. The assessment consisted of obtaining an ambient air sample and a below-floor -slab soil vapor sample at the Penthouse property for analysis of PCE and its' breakdown products.

**Remedial Activities:**
In 2004, a dual-phase extraction (DPE) system was installed in Area 2 as an interim cleanup action that included six DPE wells (DPE-2 through DPE-7) to address TPH-G in soil and ground water. The DPE system ran on a continuous basis from May 2004 until monthly pulsing operations were implemented from May 2006 through March 2007 when a blower failed. A refurbished blower allowed the system to be operated until January 2008 when the blower failed again. An evaluation of the system performance indicated asymptotic results so natural attenuation monitoring was implemented. The DPE system reduced contaminant levels by an average of approximately 95%. A portion of the remediation area remains with concentrations exceeding the Method A cleanup level in area approximately 1,750 square feet in size.

In October 2010, a pilot test was conducted to assess the feasibility of using soil vapor extraction (SVE) as a remedial technology for reducing concentrations of CVOCs in soil and ground water at the Site. The objective of the SVE pilot test was to monitor the response of the vadose zone to

an induced vacumn using well RW-1 as an extraction well and monitoring points VMP-1 and VMP-2 as well as monitoring wells MW-24S, MW-25S and MW-26S as vacumn monitoring points.

The pilot test resulted in a low radius of SVE influence which was attributed to possibly the shallow screened interval depths of RW-1 (10 to 15 feet bgs) and VMP-1 and VMP-2 as well as soil heterogeneity.

# Site Diagrams

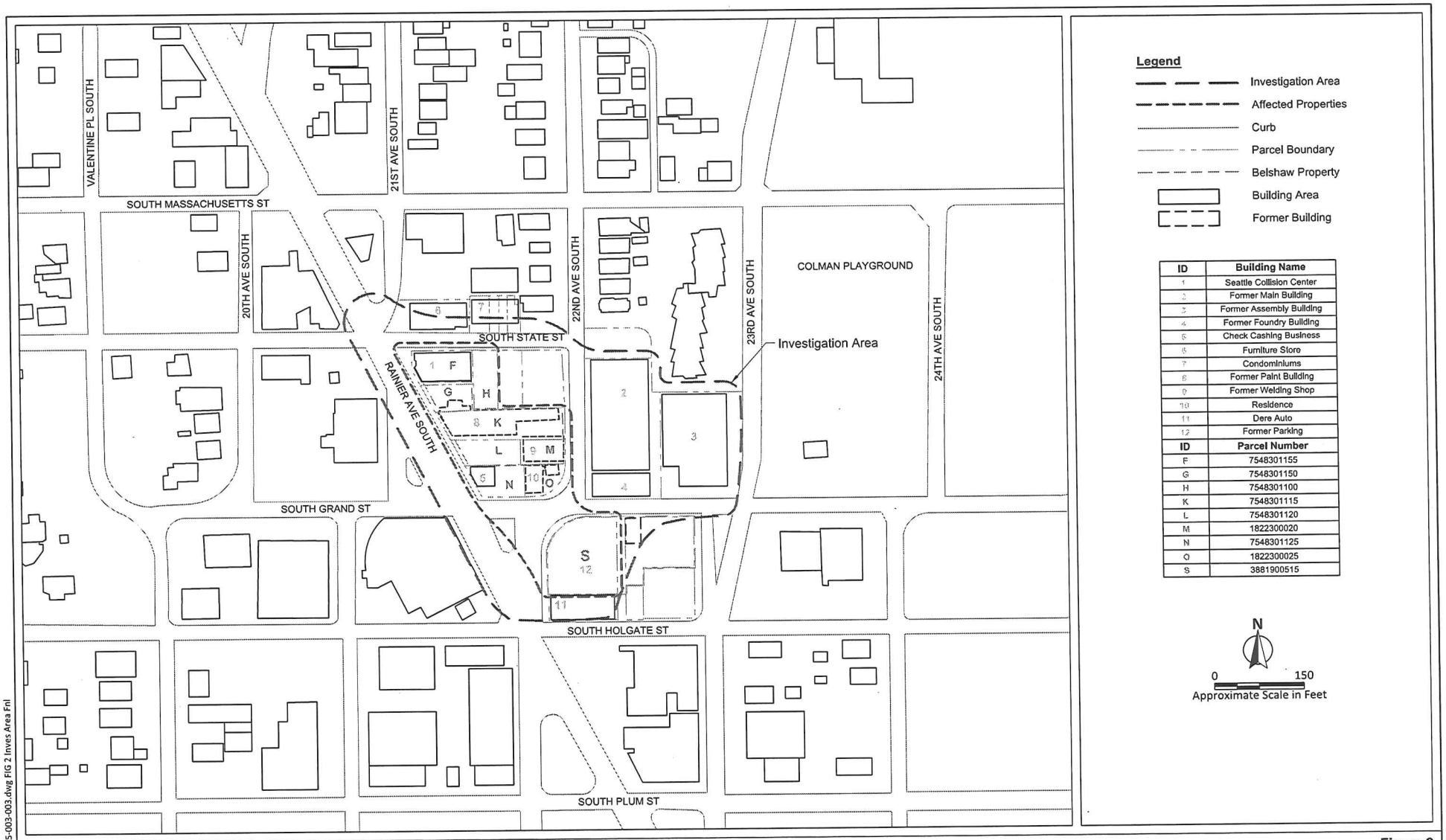


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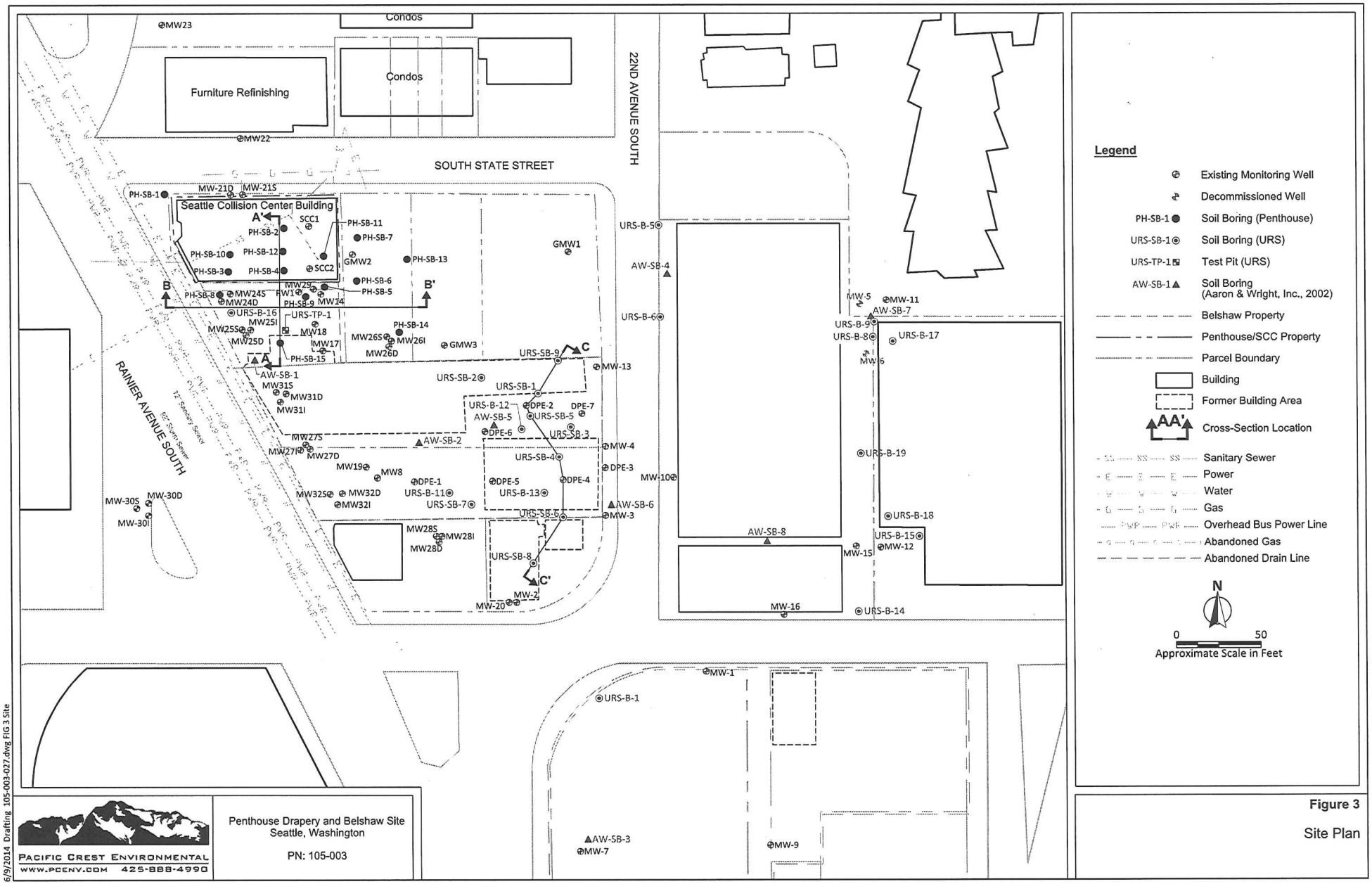
**Figure 2**

Investigation Area

2/17/2014 Drafting 105-003-003.dwg FIG 2 Inves Area Fnl




**Legend**

- Existing Monitoring Well
- Decommissioned Well
- PH-SB-1 Soil Boring (Penthouse)
- URS-SB-1 Soil Boring (URS)
- URS-TP-1 Test Pit (URS)
- AW-SB-1 Soil Boring (Aaron & Wright, Inc., 2002)
- Belshaw Property
- Penthouse/SCC Property
- Parcel Boundary
- Building
- Former Building Area
- AA' Cross-Section Location
- SS Sanitary Sewer
- E Power
- W Water
- G Gas
- OHP Overhead Bus Power Line
- Abandoned Gas
- Abandoned Drain Line

N

0 50

Approximate Scale in Feet

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**Figure 3**

Site Plan

6/9/2014 Drafting 105-003-027.dwg FIG 3 Site

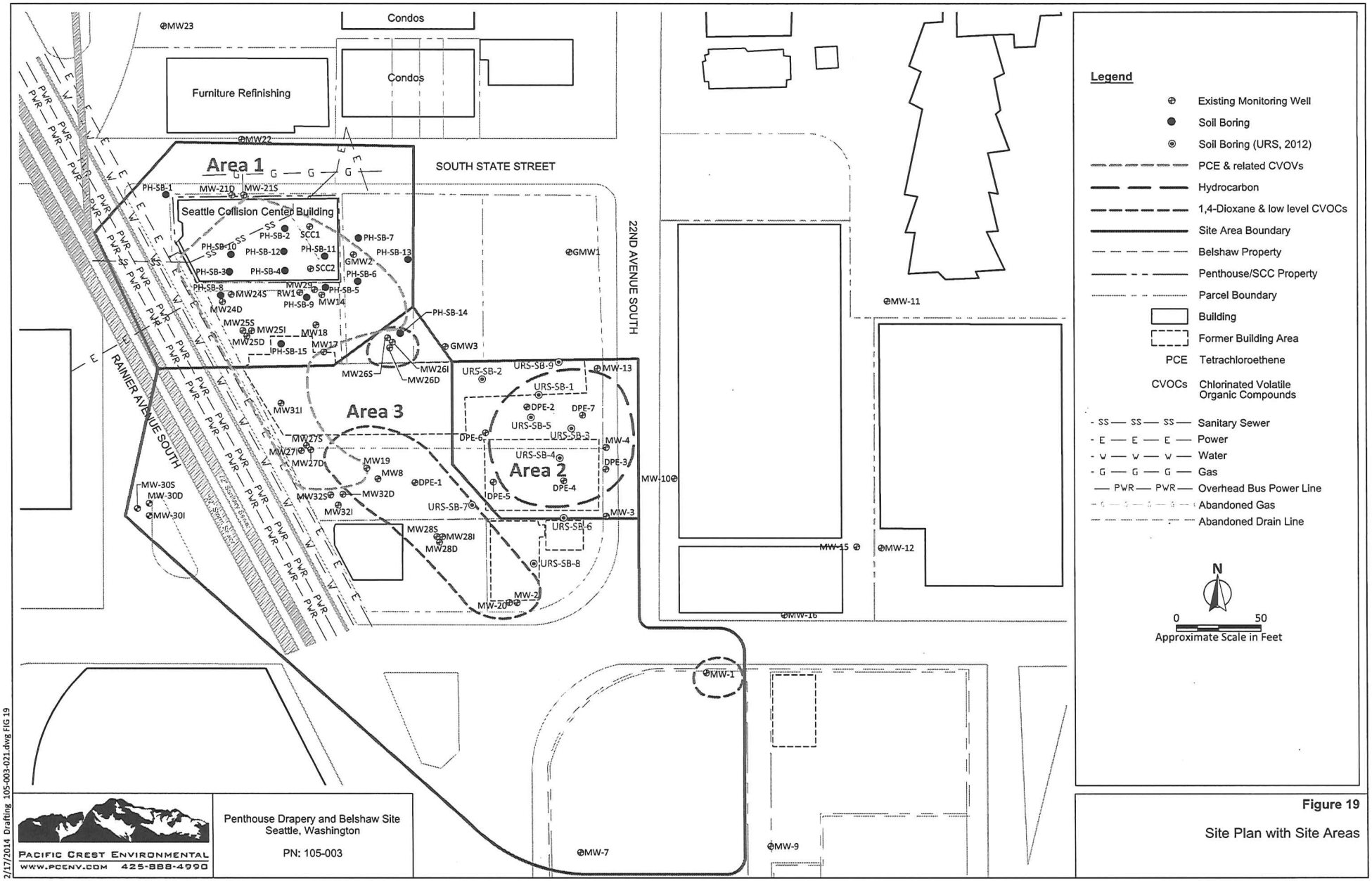


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**Figure 19**

Site Plan with Site Areas

2/17/2014 Drafting 105-003-021.dwg FIG 19