STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
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June 18, 2018

Mr. John Drake
Washington Industries, Inc.
17742 Talbot Road
Edmonds, WA 98026

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

- **Name:** Northwest Plating
- **Address:** 825 South Dakota Street, WA 98108
- **Facility/Site No.:** 2231
- **VCP No.:** NW2769
- **Cleanup Site ID No.:** 1361

Dear Mr. Drake:

Thank you for submitting documents regarding your proposed remedial action for the **Northwest Plating** 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:

- Volatile organic compounds (VOCs) including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-DCE) and vinyl chloride (VC) in soil, ground water and air.
- Cadmium, hexavalent chromium, nickel and zinc in soil and ground water.
- Cyanide in soil and ground water.
- Methylene chloride in soil.

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. Environmental Partners Inc., 2018. *Interim Action System As-Built and Startup Report, Former Northwest Plating Site, 825 South Dakota Street and 812 and 820 South Adams Street, Seattle, Washington.* April 17.

2. Environmental Partners Inc., 2017. *Annual Groundwater Monitoring Report for 2016 - 2017, Former Northwest Plating Site, 825 South Dakota Street and 812 and 820 South Adams Street, Seattle, Washington.* May 19.

3. Environmental Partners Inc., 2016. *Remedial Investigation Report, Former Northwest Plating Former Northwest Plating Site, 825 South Dakota Street and 812 and 820 South Adams Street, Seattle, Washington.* June 28.

4. Environmental Partners Inc., 2016. *Interim Action Work Plan, Former Northwest Plating Site, 825 South Dakota Street and 812 and 820 South Adams Street, Seattle, Washington.* April 18.

5. Environmental Partners Inc., 2013. *Work Plan for Vapor Intrusion Mitigation System Installation, Washington Industries, Inc. and Perine Properties.* June 28.

6. Environmental Partners Inc., 2013. *Vapor Intrusion Assessment, Washington Industries Inc. and Perine Properties.* May 17.

7. HartCrowser, Inc., 2012. *Historical Site Cleanup Summary, Northwest Plating Site.* October 3.

8. Sound Earth Strategies, 2011. *Groundwater Quality Evaluation, Perine Property.* July 28.

9. SoundEarth Strategies, Inc., 2011. *Air Quality Evaluation, Perine Property.* July 28.

10. SoundEarth Strategies, 2011. *Phase I Environmental Site Assessment.* January 27.

11. Herrera Environmental Consultants, Inc., 1999. *Ground Water Quality Investigation.* May 21.

12. GeoEngineers, 1990. *Phase 2 Environmental Site Assessment, Northwest Plating Company.* June 20.

13. GeoEngineers, 1989. *Phase 1 Environmental Site Assessment, Northwest Plating Company.* May 5.

The reports listed above will be kept in the Central Files of the Northwest Regional Office of Ecology (NWRO) for review by appointment only. You can make an appointment by completing a Request for Public Record form (https://www.ecology.wa.gov/About-us/Accountability-transparency/Public-records-requests) and emailing it to publicrecordsofficer@ecy.wa.gov, or contacting the Public Records Officer at (360) 407-6040.

A number of these documents are accessible in electronic format from the Site web page (https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=1361).

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

- PCE, TCE, cis-DCE and VC in soil, ground water and air.
- Cadmium, hexavalent chromium, nickel and zinc in soil and ground water.
- Cyanide in soil and ground water.
- Methylene chloride in soil.

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:**

- Ecology recognizes that a significant amount of characterization and remedial actions have been and are continuing to occur at this Site in recent years. Bringing this Site to a

No Further Action conclusion will require additional efforts and due to the complexity of the releases and the hydrogeological setting, will likely need to be completed under an Agreed Order process.

- This opinion entails a preliminary review of the 2016 Remedial Investigation (RI) report in an effort to identify major regulatory issues that include:

    - *Vapor Intrusion.* Ecology requests that a vapor intrusion study be conducted at A Better Roofing Co. located at 4126 Airport Way South as TCE concentrations in ground water are two orders of magnitude above the Method B screening level (1.55 micrograms per liter (µg/L). Please include any other commercial/residential buildings off-Property and within 100 feet of the TCE plume in the study.

    - *Chromium VI and Cyanide.* The widespread occurrence and potential transport of metals (in particular chromium VI, a carcinogen) and cyanide in soil and ground water on multiple parcels and right-of-ways.

    - TCE in soil on the west side of the Property still needs to be fully characterized (as listed as a data gap in the RI).

    - Multiple properties and businesses are potentially impacted by Site contaminants, including rights of way and utility corridors.

    - The complexity of determining indicator hazardous substances and selecting cleanup levels for this Site is beyond the scope of a VCP project with this complexity.

- Although the 2016 RI report was submitted prior to Ecology's recommended use of an RI checklist (which can be found at the following link: http://www.ecy.wa.gov/programs/tcp/policies/checklists), any revisions to the RI based on the comments in this letter should adhere to and incorporate the RI checklist to the extent possible. The following comments pertain to the RI report:

    - The Property is zoned for industrial land use based on current and master planned land uses by the City of Seattle. Ecology agrees that the Site meets the MTCA definition of an industrial property (WAC 173-340-200). Both parcels constituting the Property are completely covered by buildings and zoned for General Industrial use by the city of Seattle. However, the RI report (p. 1) indicates that a building in the southeast corner of the Northwest Plating parcel is not weather-tight and has limited structural integrity. In accordance with WAC 173-340-745 (B), access to the

general public is not allowed. Discarded items on the building exterior and in a doorway suggest use by transients as temporary shelter. The unused building needs to be repaired and made secure to prevent potential entry and occupation by humans due to the vapor pathway. Ecology also recommends fencing of the Property to prevent access.

- Section 1.1: The last sentence in the first paragraph says that the lateral extent of the Site is defined on Figure 2. The legend in Figure 2 provides symbols for the Site boundary, but the actual boundary is not shown on the figure. Please provide a corrected version of Figure 2 with the Site boundary.

- Section 1.1: The text (4th paragraph) is uncertain with regard to the number of structures with shared walls on the Washington Industries parcel. A Site visit should be conducted within the interior of the buildings so that this can be confirmed and documented in the report.

- Section 1.2.2: Based on the Gore sorber data and depending on the vapor intrusion pathway into the building, indoor air samples collected in the former AV-Pro lease space in 2004 and 2007 may be at lower concentrations than samples that could have been collected in the southern central portion of the building. Resampling of indoor air in more representative locations should be considered for confirmation of the original results. Ecology requires more current data that represent present conditions.

- Section 2.2.2: This section describes soil gas sampling and references Figure 2. Figure 2 contains many more soil gas sampling locations than are discussed in the section. The figure or the text needs to be revised for consistency. Figure 2 needs to show the locations of the indoor air samples collected on the Property in 2004.

- Section 2.2.3.1.1: Appendix B of the RI report contains soil boring and monitoring well installation logs, and the text describes the monitoring well installations. It appears that no measures were taken to prevent the potential downward vertical migration of pure-phase chlorinated solvents along the outer edge of the annular and bentonite seals, such as the typical installation of telescoping or conductor casing to prevent cross-contamination of, in this case, the intermediate water-bearing zone. Site-related VOCs have been detected in intermediate water-bearing zone monitoring wells MW-1i, MW-7iR, MW-8i, MW-15i and MW-20i. The presence of VOCs in the intermediate water-bearing zone is most likely due to either cross-contamination via the monitoring well boreholes in the source area, or to the downward migration of a dense non-aqueous phase liquid (DNAPL) through the intervening aquitard if it is discontinuous, thin, fractured or breached. Any future monitoring wells installed in the intermediate aquifer on the Site need to have telescoping or conductor casing

specified and installed as a precaution.

Please show and identify the locations of all decommissioned Site monitoring wells (i.e. MW-5) on all figures that show the monitoring well network.

- Section 2.2.4: Please add a description of how soil samples were selected for different analyses.

- Section 3.2: The well log search radius for drinking water wells should be at least 0.5 mile from the Site.

- Section 3.2.3: The RI exploration for deep ground water referenced a 1990 Phase II Environmental Site Assessment (ESA) that encountered a deep aquifer at depths of 26 and 39 feet below ground surface (bgs). Once these depths had been achieved, please describe the decision to go more than twice as deep (90 feet bgs) at a known DNAPL site. It appears that the 'deep' aquifer in the Phase 2 ESA was actually the intermediate aquifer characterized in the RI.

- Section 3.2.4: Please provide a table of ground water elevation data and vertical hydraulic gradients calculated from the data. Please discuss what appears to be ground water mounding at several monitoring well locations within the Northwest Plating parcel building. The mounding appears to occur during the winter months which suggests the mounding is related to storm water conveyance. The cause and potential effects of this occurrence should be described in the text.

- Section 4.1: Please include a figure(s) that shows the distribution of cyanide in soil.

- Section 5.0; 11th bullet: A Terrestrial Ecological Evaluation (TEE) is required per WAC 173-340-7490 to determine if cleanup levels that are protective of terrestrial species are applicable to the Site. The first step is to describe any undeveloped land in the Site vicinity and determine if the Site is excluded from having to conduct a TEE. A TEE exclusion form can be found at: https://fortress.wa.gov/ecy/publications/publications/ecy090300.pdf. An exclusion based on the presence of a surface cover would require emplacement of an Environmental Covenant on the Property. If the Site does not qualify for a TEE exclusion, then the process outlined in WAC 173-340-7490 must be followed to determine cleanup levels for the Site that are protective of terrestrial species.

- Section 6.0: The use of Method C cleanup levels on the Site would require that an Environmental Covenant be placed on the Property. Because the Site currently extends off the Property and onto other adjacent and nearby properties, each of those

property owners would be required to sign the Environmental Covenant. If that is not possible, more stringent cleanup levels will need to be developed for the Site and the conditional points of compliance adjusted.

- Section 6.0: Please include an attachment to the report that shows the calculations used to develop the Remediation Levels provided in the text and tables. Please note that Remediation Levels are not typically used in the VCP; their use at this Site would likely require public comment.

- Section 6.2: The non-potability determination of ground water (WAC 173-340-720) involves more than ground water not currently being used for drinking water. It is unlikely that ground water on the Site would be considered non-potable based on the physical and chemical characteristics of the contaminant sources, potential connectivity of aquifer zones and other hydrogeological characteristics of the Site. Based on the ground water data provided in the RI, the leaching pathway is considered complete.

- Section 6.2: The primarily upward vertical hydraulic gradient between the intermediate and shallow water-bearing zones measured on the Site is not expected to prevent the downward migration of a DNAPL and protect the intermediate aquifer. Because cis-1,2-DCE and trans-1,2-DCE are degradation products of PCE and TCE, there is the potential for concentrations to increase, so they should be retained as compounds of potential concern (COPC).

- Section 7.0: All of the detected Site contaminants in Table 19 should be considered COPCs until Site characterization is complete. Until characterization is complete, it is premature to set cleanup levels or remediation levels.

- Section 7.1: Figure 16 shows chromium VI concentrations in boxes. Some of the boxes showing total chromium and chromium VI appear to have the concentrations reversed from what is presented in Table 3. Figures showing iso-concentration contours at different depth ranges are also needed to better illustrate the distribution of chromium VI in soil on the Site. The lateral extent of chromium VI exceeding the Method A cleanup level extends off the Property to the north and the east. The vertical extent of chromium VI has not been determined.

- Section 7.2.1: The observed effect of buried utilities on the migration of the shallow aquifer VOC plume may be partial, with a split portion of the plume moving northwest in the general direction of the hydraulic gradient. Monitoring wells appear to be appropriately sited as sentinel wells to determine this possible direction of transport, but it would be useful to estimate the travel time to these locations.

- Section 7.3: Soil gas exceedances of PCE and TCE Site-specific sub-slab soil gas screening levels are attributed to the dissolved-phase plume under 'normal environmental conditions'. Based on the concentrations, the potential existence of pure-phase product needs to be considered.

- Section 9.0: The fourth bullet concludes that two separate sources of TCE have been released on the Property, resulting in a comingled TCE plume. Please investigate the possibility of any fingerprinting methodologies to distinguish between the two releases.

- Figure 5: The figure shows soil sample locations but it is unclear if the soil samples were collected at different times and at different depths. The symbols for each location should be changed to indicate that information.

- Figure 6: Monitoring wells MW-26s, MW-7s, MW-15s need to be added to the cross-section. Also, MW-8s is incorrectly labeled as MW-8. Please add the symbol for 'screened interval' to the legend. Contaminant concentrations in both the shallow and intermediate aquifers should be shown on the figure.

- Figure 7: Monitoring wells MW-5i and MW-20i should also be shown on the figure. Please add the symbol for screened interval to the legend. Contaminant concentrations in both aquifers should be shown on the figure.

- Figures 12 and 13: The figures show head differentials, but actual vertical hydraulic gradients should be calculated and plotted instead for comparison.

- Figure 16: In Figure 14, PCE in soil is shown to occur as deep as 13 feet below ground surface on the Site. Additional figures showing the distribution of PCE in soil at depths greater than 2 feet below ground surface need to be provided.

- Figure 16: The detection of chromium VI above the Method A cleanup level (54 milligrams per kilogram (mg/kg)) at a maximum depth of 90 feet bgs (in soil boring SB-15d) needs to be explained. The vertical extent of contamination was not determined at many locations where chromium VI exceeds the Method A cleanup level in soil but Ecology does not recommend further soil sampling at this time for chromium VI.

- Figures 18 through 22: Please include TCE data collected on the Perine parcel in the iso-concentration contouring.

- Figures 23 through 25: Please use the Method A cleanup level for TCE in ground

water to draw the TCE plume. Please also add figures showing impacts to the intermediate aquifer on different dates, including current data.

- Table 1: Please add installation dates and screened interval depths to the table. MW-7 is designated as a 'deep' monitoring well in the table and water level data is shown, but according to the text (Section 3.2.3), no deep monitoring wells were installed.

- Table 2: The RI should provide a comprehensive record of all soil sampling conducted on the Site. Please expand Table 2 to include all historical soil sampling data.

- Table 5: Please add the associated water-bearing zone after the well name in each row, as not all of the wells are named to indicate the zone in which they are screened.

- Tables 7 and 8 in Section 4.2 should not screen out any metals due to low frequency of detections. In particular, copper and lead were only analyzed in one sample each, which is insufficient to conclude that these metals do not occur in the intermediate aquifer.

- Attachment D: Transport mechanisms such as migration to groundwater and volatilization should be checked for some of the media of concern in the Conceptual Site Model. Because the plume in ground water extends off-Property, ambient air and the inhalation pathway as well as surface water should also be considered as potential exposure media.

- Please include ground water sampling field data sheets as appendices to future ground water monitoring reports.

**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 heather.vick@ecy.wa.gov.

Sincerely,

Heather Vick

Heather Vick, LHg
NWRO Toxics Cleanup Program

Enclosure: (1) A Description and Diagrams of the Site

cc: Thomas Morin, Environmental Partners, Inc.
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, and is the basis for the opinions expressed in the body of the letter.*

**Site:** The Site is defined as volatile organic compounds (VOCs) including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC) in soil, ground water and air; cadmium, hexavalent chromium, nickel and zinc in soil and ground water; cyanide in soil and ground water; and methylene chloride in soil. The Site is located at 825 South Dakota Street and 812 and 820 South Adams Street in Seattle, Washington (Property).

**Area and Property Description:** The Property is located in a commercial/industrial section of the area south of downtown Seattle known as the Industrial District. The Property is currently bordered to the north by Dakota Street South and Trade Marx Sign and Display; to the east by 9th Avenue South, Interstate 5 and Beacon Hill; to the south by Adams Street South and vacant property; and to the west by the BNSF railroad, A Better Roofing Co. and Airport Way South. The Property is situated at elevations of 20 to 25 feet above mean sea level and slopes gently to the west.

The Property corresponds to King County tax parcel numbers 7886101290 and 7886101280 which total 1.16 acres in size. Information regarding the two parcels comprising the Property is provided in the table below:

| Parcel No. | Address | Acres | Occupant | Land Use |
|---|---|---|---|---|
| 7886101290 | 825 S. Dakota St | 0.31 | Former Northwest Plating | Metal plating; anodizing |
| 7886101280 | 820 S. Adams St | 0.85 | Perine Danforth Company | Metal fastener manufacturing and sales |

**Property History and Current Use:** The Property was most likely first developed for residential land uses as shown on a 1936 historical aerial photograph (available on King County iMAP).

*Northwest Plating Parcel.* In 1957, the Northwest Plating Company began operations on parcel number 7886101290 as a metal electroplating business when the 12,800-square foot existing masonry building was constructed. Facility operations included cadmium, chromium, copper, nickel and zinc plating; anodizing; application of special metal coatings; metal inspection services; metal polishing and refinishing; and spray painting. The degreasing of metals was routinely performed as a step in the plating process. Solvents used for metals degreasing included primarily TCE and to a lesser extent PCE. Northwest Plating closed in 1989 following the discovery of releases of plating-operation and related chemicals to soil and ground water. Initial Site characterization activities at that time confirmed the presence of VOCs (predominantly TCE), hexavalent chromium and cyanide in soil and ground water.

In 1990, most of the plating process equipment and tanks were removed from the Northwest Plating parcel. Grossly-impacted soil adjacent to and under the equipment was also removed. In 1993, stored plating solutions and hazardous wastes were removed in addition to the remaining equipment. The concrete flooring and underlying contaminated soil and ground water remained in place.

In 2005, additional interim cleanup actions were performed, including excavation of hot spots near the former dip tanks, processing areas and floor trenches, and soil sampling and analyses. Approximately 150 cubic yards of impacted soil were removed and disposed of off-Site.

The Northwest Plating parcel currently contains the original slab-on-grade brick and masonry building with concrete floors. The parcel building improvements consist of what appear to be three separate structures of variable quality with shared walls. A building in the southeastern corner of the parcel is reportedly not weather tight and has limited structural integrity and utility.

*Perine Parcel.* Buildings were constructed on the Perrine parcel in the 1920s and the 1940s. Two buildings are currently located on the parcel. Building 1, a two-story brick and masonry building with a wood roof, was constructed for commercial use in 1957. Building 2 was added in 1996 and replaced two historical buildings. Building 2 is made of pre-fabricated steel and reinforced concrete-framed structure with a metal roof.

The Northwest Plating parcel is currently vacant. The Perrine parcel is still used for the manufacturing and production of metal fasteners at the Perine Danforth Company, a merger of the John Perine Company and Danforth Screw and Bolt.

**Sources of Contamination:** The sources of contamination on the Property are the former dip tanks at Northwest Plating (where degreasing was conducted), metal plating equipment, and chemicals used in the metal plating and anodizing operations. Chlorinated solvents used in degreasing operations (including PCE and TCE and metals related to the plating operations) were released to soil.

Releases also occurred on the Perine parcel from historic machine shop operations which affected shallow soils on that portion of the Property. The identified releases consisted of TCE and metals only; the former use of PCE is not documented on this parcel.

**Physiographic Setting:** The Site is located within the Puget Sound Lowland Physiographic Province, a north-south trending structural and topographic depression that is bordered on its west side by the Olympic Mountains, and to the east by the Cascade Mountain foothills. The Puget Sound Lowland is underlain by Tertiary volcanic and sedimentary bedrock, and has been filled to the present day land surface with Pleistocene-aged glacial and non-glacial sediments.

The Property is located at the eastern edge of the Duwamish River Valley physiographic subdivision just west of the base of Beacon Hill, an elongated north-south trending glacial landform.

**Surface/Storm Water System:** The closest surface water body to the Site is the Duwamish Waterway approximately 1 mile to the west. Surface water runoff in the area is captured in municipal storm drains (combined sanitary and storm water system) and piped to the Duwamish Waterway.

**Ecological Setting:** The Property is located in an area of industrial land uses. Properties in the Site vicinity are mostly covered with buildings and areas paved with asphalt and concrete. A greenbelt of undeveloped land is located to the east of the Site across Interstate 5.

**Geology:** Materials encountered on the Property include fine to medium sand to depths of 10 to 15 feet bgs, underlain by an approximate 10-foot thick silt layer that is continuous through most of the Property. A 5- to 10-foot thick sand layer occurs below the silt layer. A second silt layer occurs at depths of about 35 to 52 feet bgs; below that is a dense plastic clay that extends to the maximum depth explored of 90 feet bgs.

**Ground Water:** Ground water occurs in sand units on the Site as shallow and intermediate water bearing zones separated by silt-rich low permeability layers. A shallow unconfined aquifer occurs in the sand at depths of 7 to 12 feet bgs. Ground water in the shallow aquifer consistently flows to the northwest under a gradient of approximately 0.03 feet/foot.

Ground water in the intermediate water-bearing zone occurs under confined or semi-confined conditions in the sand unit below the silt layer; water levels in wells screened in the intermediate zone occur at 4 to 11 feet bgs. Ground water in the intermediate aquifer also flows consistently to the northwest.

A primarily upward vertical gradient has been inferred from ground water elevations measured in paired monitoring wells that are screened to represent each of the shallow and intermediate water-bearing zones. A deep water-bearing zone has been previously reported as occurring on the Site at depths of 26 to 39 feet bgs. Two deep soil borings (SB-15d and MW7ir) were advanced to total depths of 90 feet bgs in an attempt to reach this zone. No water-bearing media were encountered below approximately 35 feet bgs in either boring and no deep aquifer monitoring wells were installed.

In late 2016 and early 2017, monitoring wells MW5, MW-7i and MW7d were decommissioned due to improper screen placement. Monitoring wells MW-5 and MW-7d had both been installed in 1989 during original Site characterization activities. The screened interval of monitoring well MW-5 intercepted both the shallow and intermediate aquifers. This screen positioning (from 5 to 25 feet bgs) allowed direct communication between the two water-bearing units and increased the potential for Site contaminants to migrate from the shallow to the intermediate aquifer. Monitoring well MW-7d was constructed with the entire screened interval (34 to 39 feet bgs) placed below the apparent base of the intermediate aquifer and fully within the lower aquitard. Due to the screen placement, ground water samples collected from this well were not considered representative of formation water in the intermediate aquifer, and were therefore of limited value.

**Water Supply:** Drinking water is supplied to the Property by Seattle Public Utilities which obtains water from the Cedar and Tolt River watersheds. According to Ecology's well log data base, there are no drinking water wells within a half-mile radius of the Site.

**Soil Vapor Sampling:** Passive soil vapor sampling was conducted in 2013 using 41 Gore-sorber sampling points placed throughout the Northwest Plating parcel. The data indicated areas of likely releases of PCE, TCE and related degradation products (also some total petroleum hydrocarbons and BTEX) occur in the subsurface throughout the former Northwest Plating operations area.

Eighteen soil gas samples were collected and analyzed for either VOCs or halogenated VOCs (HVOCs) using EPA Method TO-15. The results indicated that PCE, TCE and related degradation products occur in soil gas beneath the Site at concentrations exceeding the corresponding Site-specific sub-slab soil gas screening levels.

**Release and Extent of Soil and Ground Water Contamination:**

*Soil*: Based on the passive soil vapor sampling results, releases from the degreasing and plating operations at the Northwest Plating and Perrine parcels appeared to have affected near surface soil (0 to 2 feet bgs) and deeper soil (greater than 2 feet bgs), and migrated downward to the water table (7 to 12 feet bgs). The passive soil vapor results initially aided in siting of direct-push soil borings for further characterization.

In March 2014, 32 direct-push soil borings (B-1 through B-32) were advanced on the Northwest Plating parcel. In July 2014, 16 direct push soil borings (B-33 through B-47) were advanced on the Perrine parcel. The borings were drilled for the collection of soil and ground water reconnaissance samples. Soil samples were analyzed for volatile organic compounds, chromium VI and chromium.

Soil samples collected from the borings indicated the presence of PCE in soil beneath the buildings on Property to a maximum depth of 13 feet bgs and a maximum concentration of 49 mg/kg. TCE was detected on both parcels to a maximum depth of 18 feet bgs and a maximum concentration of 610 mg/kg. Vinyl chloride was detected to a maximum depth of 3 feet bgs and to a maximum concentration of 1.5 mg/kg. Chromium VI was detected on both parcels to a maximum depth of 90 feet bgs and a maximum concentration of 910 mg/kg exceeding the Method A cleanup level.

*Ground Water*: Between July 2014 and November 2015, 20 additional direct-push soil borings (B-48 through B-69) were advanced for the installation of permanent monitoring wells. Soil samples were collected in 9 of the twenty borings. Maximum concentrations of PCE (4.9 micrograms per liter (µg/L), TCE (420 µg/L), cis-DCE (4.7 µg/L) and chromium VI (1,200 µg/L) were detected in ground water samples collected from the soil borings.

Monitoring wells completed in the shallow aquifer were screened from 15 to 20 feet bgs; in the intermediate aquifer wells were screened from 25 to 45 feet.

**Remedial Actions:**

A partial cleanup of the structure was completed in 1993 that focused on removing selected hazardous materials including hazardous wastes and plating solutions. Most of the remaining tanks and equipment were also removed at that time.

An interim remedial action was conducted in 2005 that consisted of decontamination of the Northwest Plating building and limited demolition; removal and disposal off-Site of hazardous and non-hazardous materials and equipment; excavation of soil hot spots near the former dip tanks, processing areas and floor trenches and soil sampling and analyses. A total of approximately 150 cubic yards of impacted soil were removed during the cleanup action.

In 2016, an interim action was conducted with the following objectives:

- To remove the mass of TCE and related VOCs within the vadose zone with the source area of the Site;
- To control vapor migration to the south onto the adjacent Perine Property; and
- To decrease contaminant mass in ground water within and near the source zone, thereby lessening the potential effects of vapor intrusion from volatilization from ground water.

Two soil vapor extraction (SVE) and enhanced reductive dechlorination (ERD) systems were emplaced as shown in the following table:

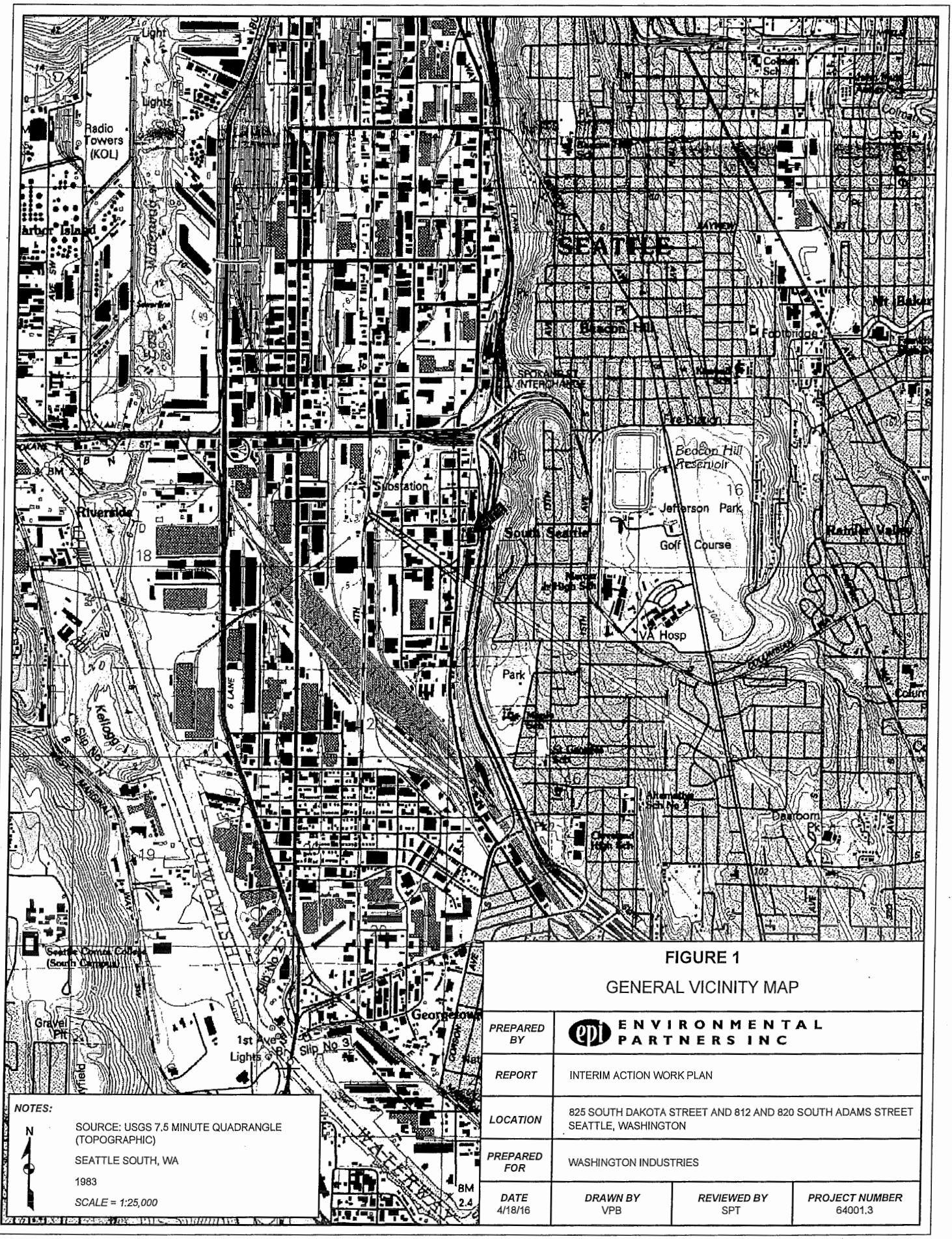
| SVE System | SVE Wells | ERD Wells | Period of Operation | Total VOCs Removed (lbs) |
|---|---|---|---|---|
| SVE System 1 | SVE-1 through SVE-7 | IJ-1 through IJ-6 | 5/1/17 to 6/30/17 | 87.5 |
| SVE System 2 | SVE-8 through SVE-13 | IJ-7 through IJ-15 | 12/4/17 to 2/26/18 | 3.57 |

The SVE and ERD wells were constructed of 4-inch diameter Schedule 40 polyvinyl chloride (PVC) pipe with a 10-foot long slotted (0.020") screen. The SVE and ERD wells were installed to approximately 15 feet bgs to correspond with the bottom of the shallow aquifer at the Site.

Shallow trenches were excavated for installation of conveyance piping for the SVE system. The trenching system layout is shown in the Site Diagrams. The existing concrete floor was cut to allow for the piping installation. The piping trenches were excavated with a backhoe to a maximum of 3.5 feet deep. Prior to backfilling, the SVE conveyance pipes were pressure-tested with compressed air until a pressure of 3 pounds per square inch was held for 30 minutes.

Two 400-pound granular activated carbon (GAC) vessels were provided for treating effluent vapors in the SVE system. Each injection well was inoculated with cultured strains to increase anaerobic bacterial populations.

# Site Diagrams




**NOTES:**

N

SOURCE: USGS 7.5 MINUTE QUADRANGLE (TOPOGRAPHIC)

SEATTLE SOUTH, WA

1983

*SCALE = 1:25,000*

## FIGURE 1

GENERAL VICINITY MAP

| | | | |
|---|---|---|---|
| *PREPARED BY* | ENVIRONMENTAL PARTNERS INC | | |
| *REPORT* | INTERIM ACTION WORK PLAN | | |
| *LOCATION* | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| *PREPARED FOR* | WASHINGTON INDUSTRIES | | |
| *DATE* 4/18/16 | *DRAWN BY* VPB | *REVIEWED BY* SPT | *PROJECT NUMBER* 64001.3 |

# Figures

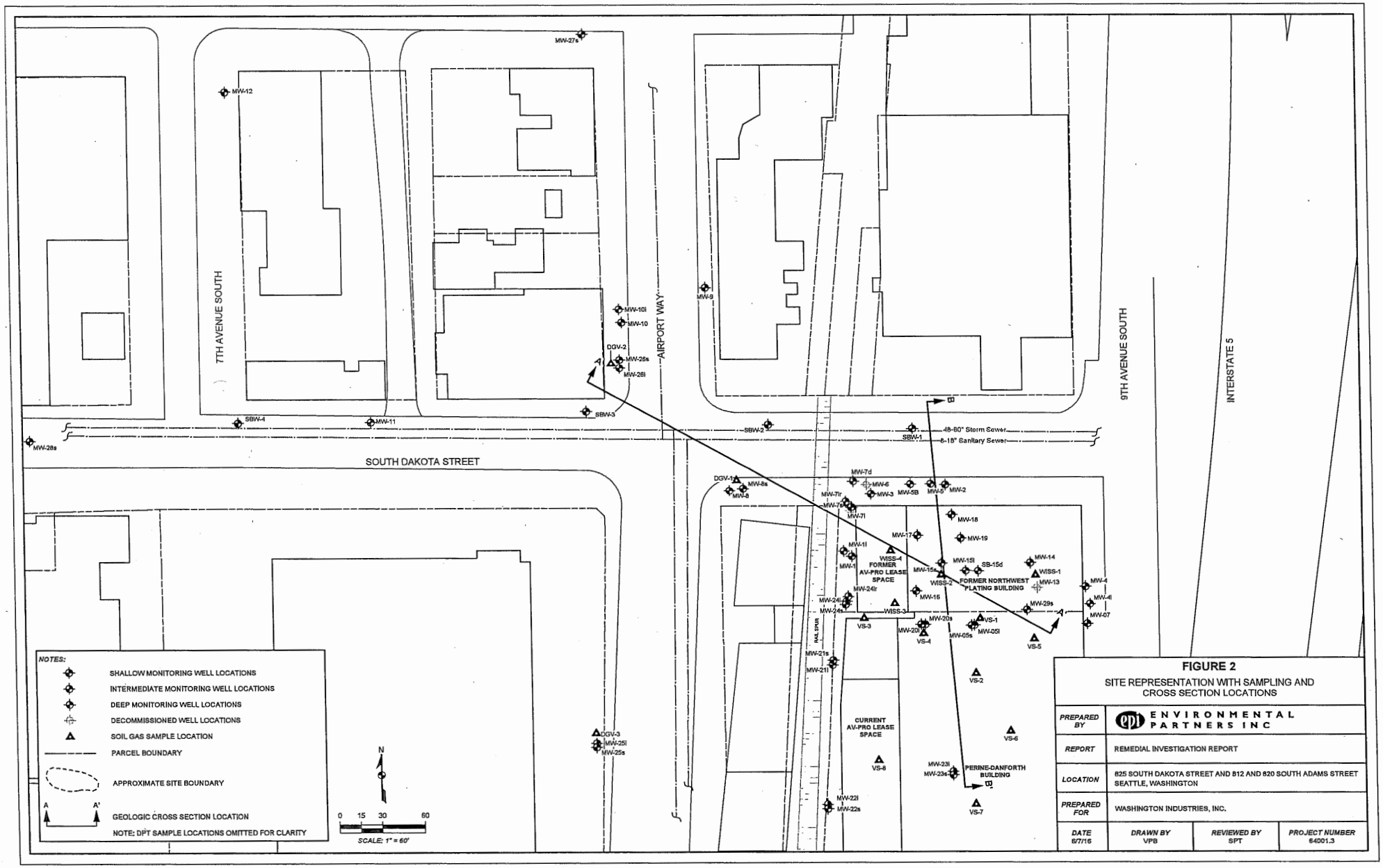
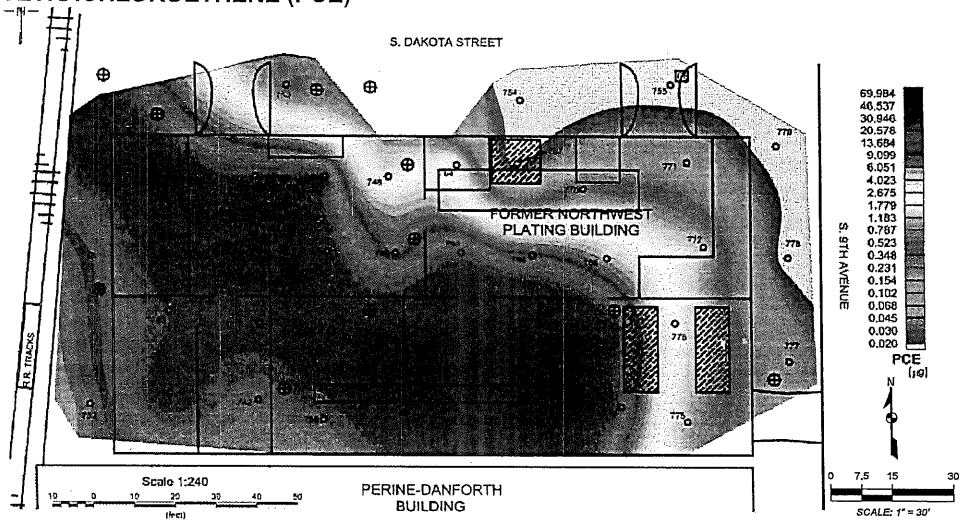



**FIGURE 2**

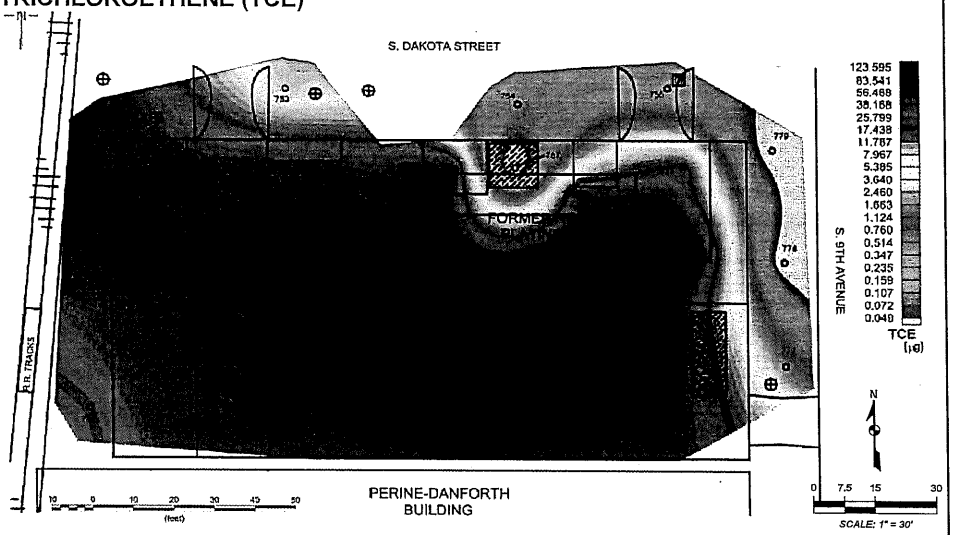
SITE REPRESENTATION WITH SAMPLING AND CROSS SECTION LOCATIONS

| | | | |
|---|---|---|---|
| PREPARED BY | ENVIRONMENTAL PARTNERS INC | | |
| REPORT | REMEDIAL INVESTIGATION REPORT | | |
| LOCATION | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| PREPARED FOR | WASHINGTON INDUSTRIES, INC. | | |
| DATE 6/7/16 | DRAWN BY VPB | REVIEWED BY SPT | PROJECT NUMBER 64001.3 |

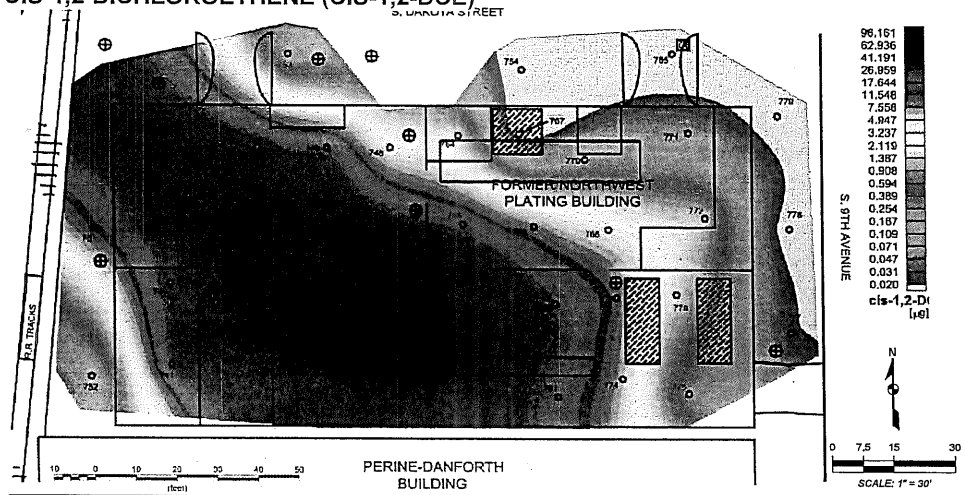
## TETRACHLOROETHENE (PCE)



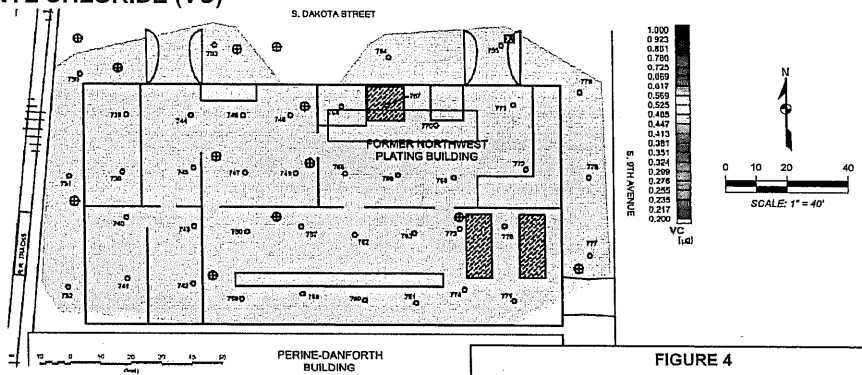

## TRICHLOROETHENE (TCE)




## CIS-1,2-DICHLOROETHENE (CIS-1,2-DCE)




## VINYL CHLORIDE (VC)




NOTES:

- PASSIVE SOIL VAPOR SAMPLING LOCATIONS

ALL RESULTS PRESENTED IN MICROGRAMS (µg)

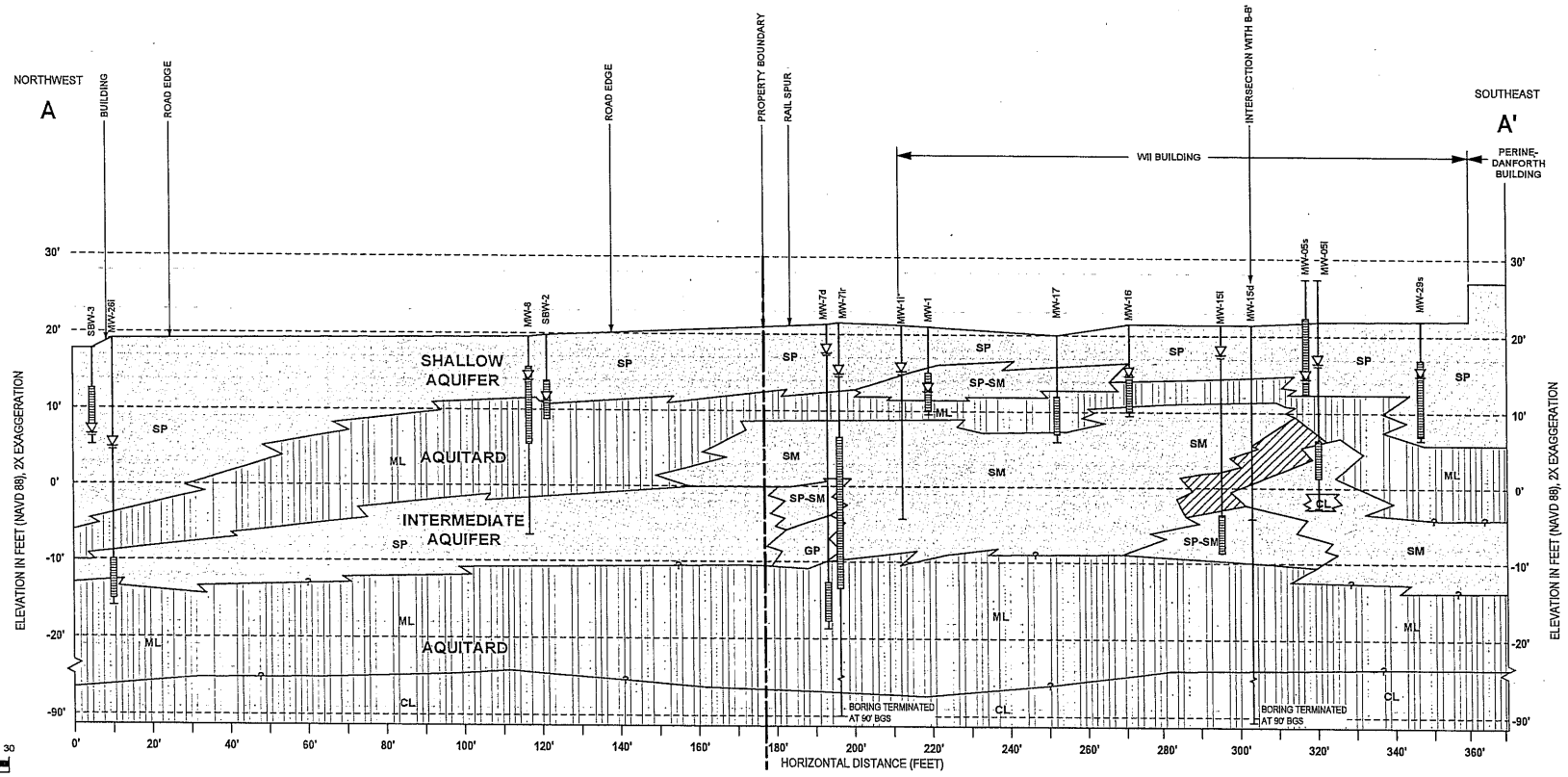
FIGURES ADAPTED FROM ORIGINAL 2014 DRAWINGS BY AMPLIFIED GEOCHEMICAL IMAGING, LLC

AMPLIFIED GEOCHEMICAL IMAGING, LLC

**FIGURE 4**

PASSIVE SOIL GAS SAMPLING LOCATIONS AND RESULTS FOR PCE, TCE, CIS-1,2-DCE, AND VC

| | | | |
|---|---|---|---|
| PREPARED BY | ENVIRONMENTAL PARTNERS INC | | |
| REPORT | REMEDIAL INVESTIGATION REPORT | | |
| LOCATION | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| PREPARED FOR | WASHINGTON INDUSTRIES, INC. | | |
| DATE 6/8/16 | DRAWN BY VPB | REVIEWED BY SPT | PROJECT NUMBER 64001.3 |




0 7.5 15 30

SCALE: 1" = 30'
2X VERTICAL EXAGGERATION

*NOTES:*

| | |
|---|---|
| SP | POORLY GRADED SANDS, GRAVELLY SANDS |
| SM | SILTY SANDS, SAND-SILT MIXTURES |
| SP-SM | POORLY GRADED/SILTY SANDS |
| SW | WELL GRADED SANDS, GRAVELLY SANDS |
| ML | INORGANIC SILTS, CLAYEY SILTS OF LOW TO MEDIUM PLASTICITY |
| CL | INORGANIC CLAYS, GRAVELLY, SANDY, AND SILTY CLAYS |
| GP | POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, OR SAND-GRAVEL-COBBLE MIXTURES |

INCREASING SILT CONTENT

MW-9 — MONITORING WELL LOCATION
TOP OF CASING ELEVATION
GROUNDWATER ELEVATION (MEASURED 11/30/2015)
SP / ML — SOIL CLASSIFICATIONS AND LOCATIONS ENCOUNTERED
BORING TERMINATION

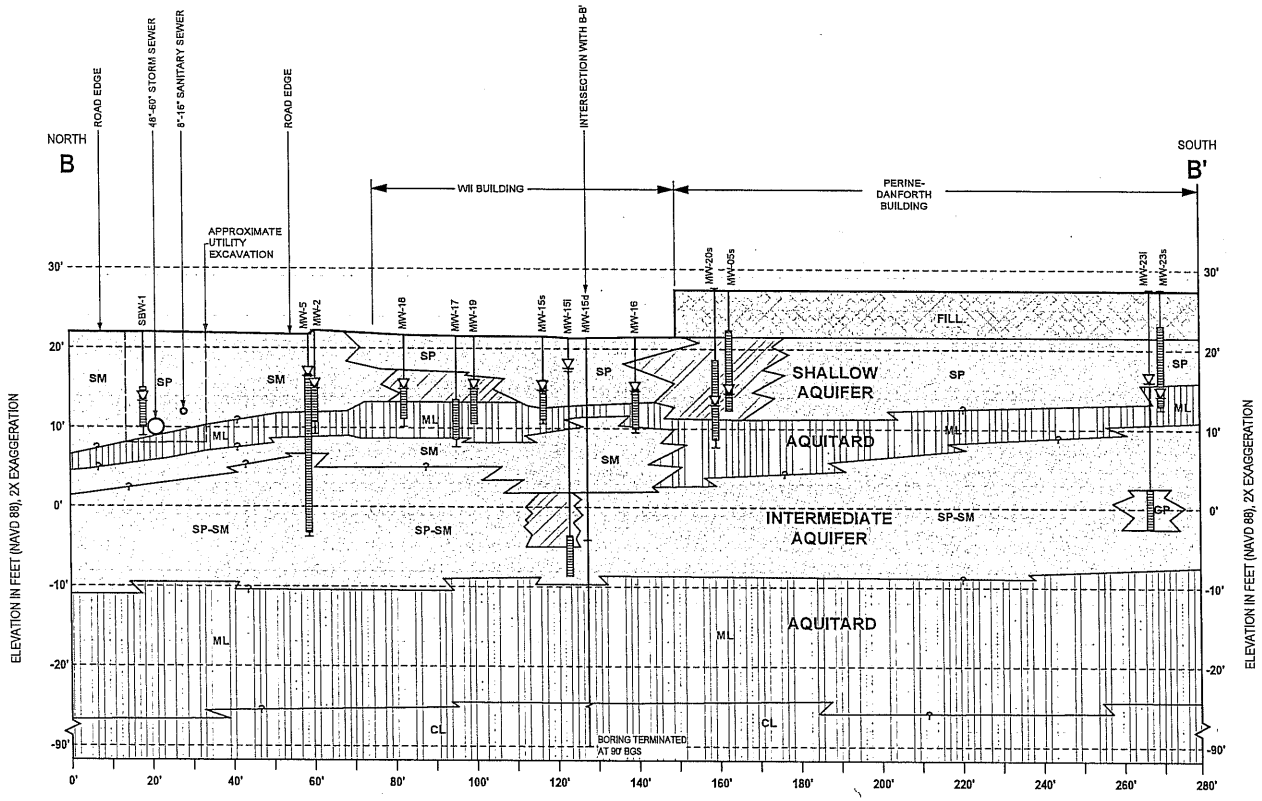
*NOTE: WELLS PROJECTED TO GEOLOGIC CROSS SECTION. FOR DISTANCE AND DIRECTION, SEE FIGURE 2 (SITE REPRESENTATION)*

** NO WELL CONSTRUCTION LOG AVAILABLE FOR MW-1I*

**FIGURE 6**

GEOLOGIC CROSS SECTION A-A'

| | | | |
|---|---|---|---|
| *PREPARED BY* | ENVIRONMENTAL PARTNERS INC | | |
| *REPORT* | REMEDIAL ACTION REPORT | | |
| *LOCATION* | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| *PREPARED FOR* | WASHINGTON INDUSTRIES, INC. | | |
| *DATE* 6/8/16 | *DRAWN BY* VPB | *REVIEWED BY* SPT | *PROJECT NUMBER* 64001.3 |




0 7.5 15 30

SCALE: 1" = 30'
2X VERTICAL EXAGGERATION

*NOTES:*

| | |
|---|---|
| SP | POORLY GRADED SANDS, GRAVELLY SANDS |
| SM | SILTY SANDS, SAND-SILT MIXTURES |
| SP-SM | POORLY GRADED/SILTY SANDS |
| ML | INORGANIC SILTS, CLAYEY SILTS OF LOW TO MEDIUM PLASTICITY |
| CL | INORGANIC CLAYS, GRAVELLY, SANDY, AND SILTY CLAYS |

INCREASING SILT CONTENT

MW-5 — MONITORING WELL LOCATION
— TOP OF CASING ELEVATION
— GROUNDWATER ELEVATION (MEASURED 11/30/2015)
SP / ML — SOIL CLASSIFICATIONS AND LOCATIONS ENCOUNTERED
— BORING TERMINATION

*NOTE: WELLS PROJECTED TO GEOLOGIC CROSS SECTION. FOR DISTANCE AND DIRECTION, SEE FIGURE 2 (SITE REPRESENTATION)*

**FIGURE 7**

GEOLOGIC CROSS SECTION B-B'

| | | | |
|---|---|---|---|
| *PREPARED BY* | ENVIRONMENTAL PARTNERS INC | | |
| *REPORT* | REMEDIAL ACTION REPORT | | |
| *LOCATION* | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| *PREPARED FOR* | WASHINGTON INDUSTRIES, INC. | | |
| *DATE* 6/8/16 | *DRAWN BY* VPB | *REVIEWED BY* SPT | *PROJECT NUMBER* 64001.3 |

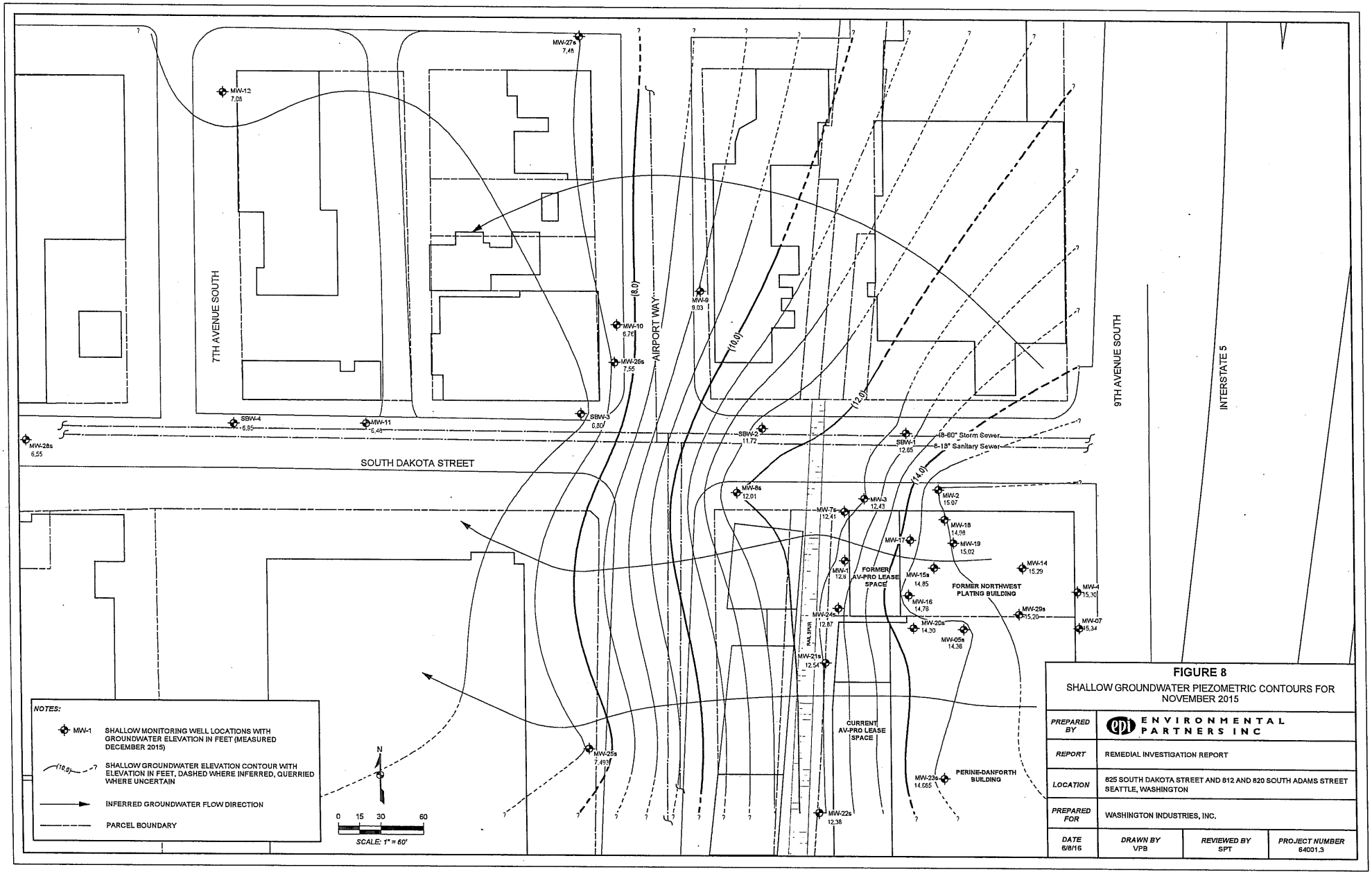



**FIGURE 8**

SHALLOW GROUNDWATER PIEZOMETRIC CONTOURS FOR NOVEMBER 2015

| | |
|---|---|
| PREPARED BY | ENVIRONMENTAL PARTNERS INC |
| REPORT | REMEDIAL INVESTIGATION REPORT |
| LOCATION | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON |
| PREPARED FOR | WASHINGTON INDUSTRIES, INC. |

| DATE | DRAWN BY | REVIEWED BY | PROJECT NUMBER |
|---|---|---|---|
| 6/8/16 | VPB | SPT | 64001.3 |

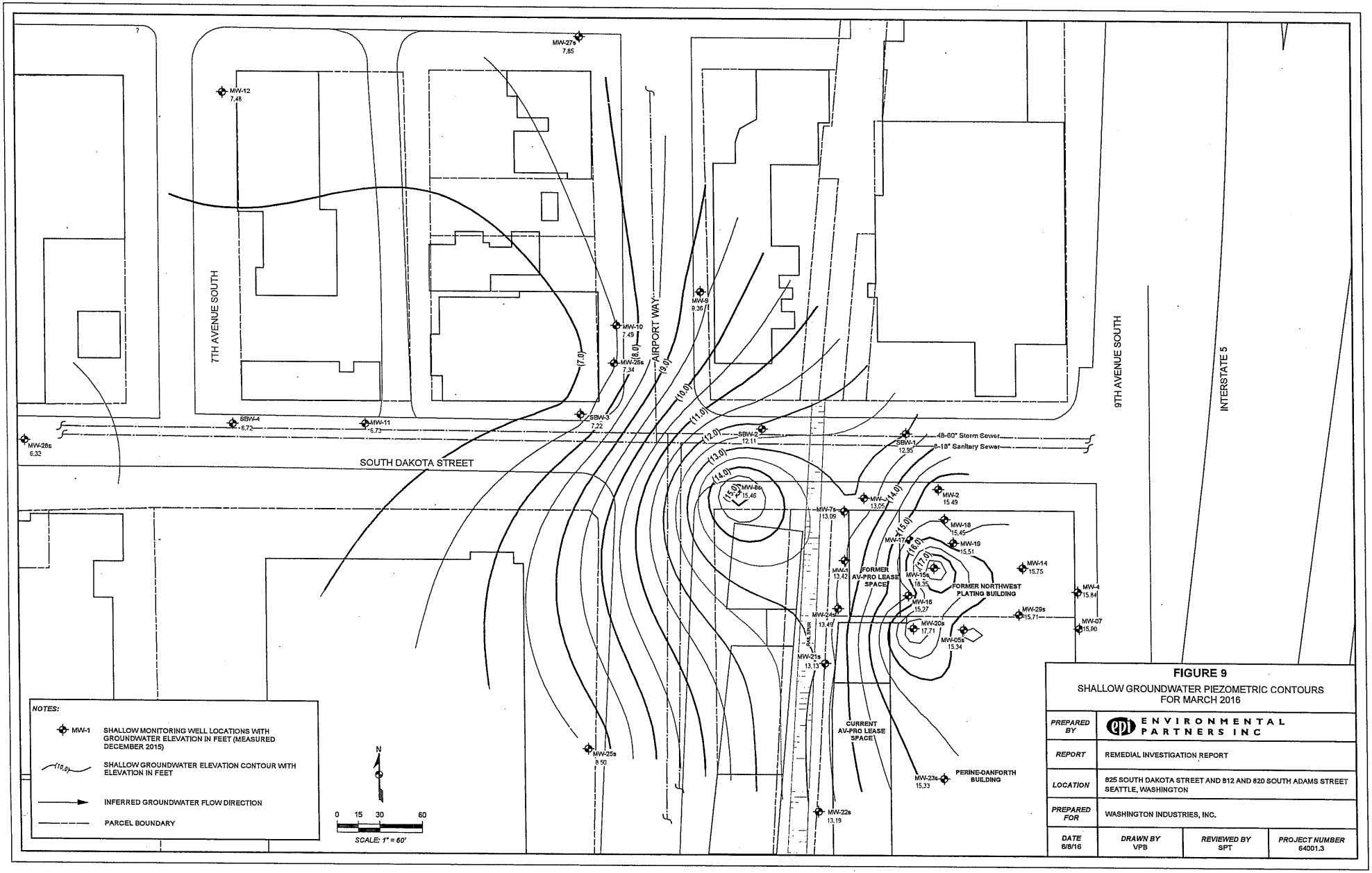



**FIGURE 9**

SHALLOW GROUNDWATER PIEZOMETRIC CONTOURS FOR MARCH 2016

| | | | |
|---|---|---|---|
| PREPARED BY | ENVIRONMENTAL PARTNERS INC | | |
| REPORT | REMEDIAL INVESTIGATION REPORT | | |
| LOCATION | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| PREPARED FOR | WASHINGTON INDUSTRIES, INC. | | |
| DATE 8/8/16 | DRAWN BY VPB | REVIEWED BY SPT | PROJECT NUMBER 64001.3 |

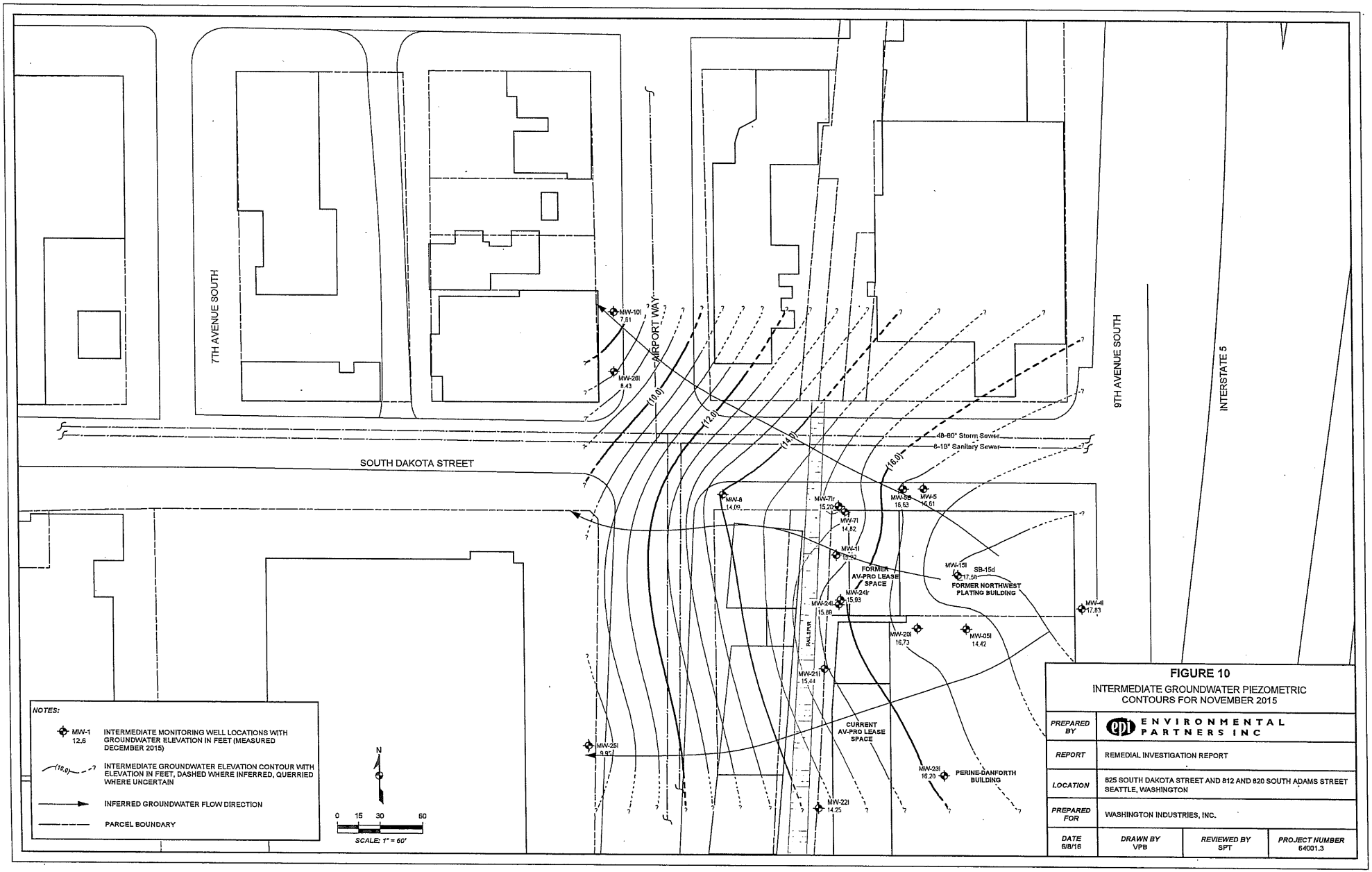



**FIGURE 10**

INTERMEDIATE GROUNDWATER PIEZOMETRIC CONTOURS FOR NOVEMBER 2015

| | | | |
|---|---|---|---|
| PREPARED BY | ENVIRONMENTAL PARTNERS INC | | |
| REPORT | REMEDIAL INVESTIGATION REPORT | | |
| LOCATION | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| PREPARED FOR | WASHINGTON INDUSTRIES, INC. | | |
| DATE 6/8/16 | DRAWN BY VPB | REVIEWED BY SPT | PROJECT NUMBER 64001.3 |

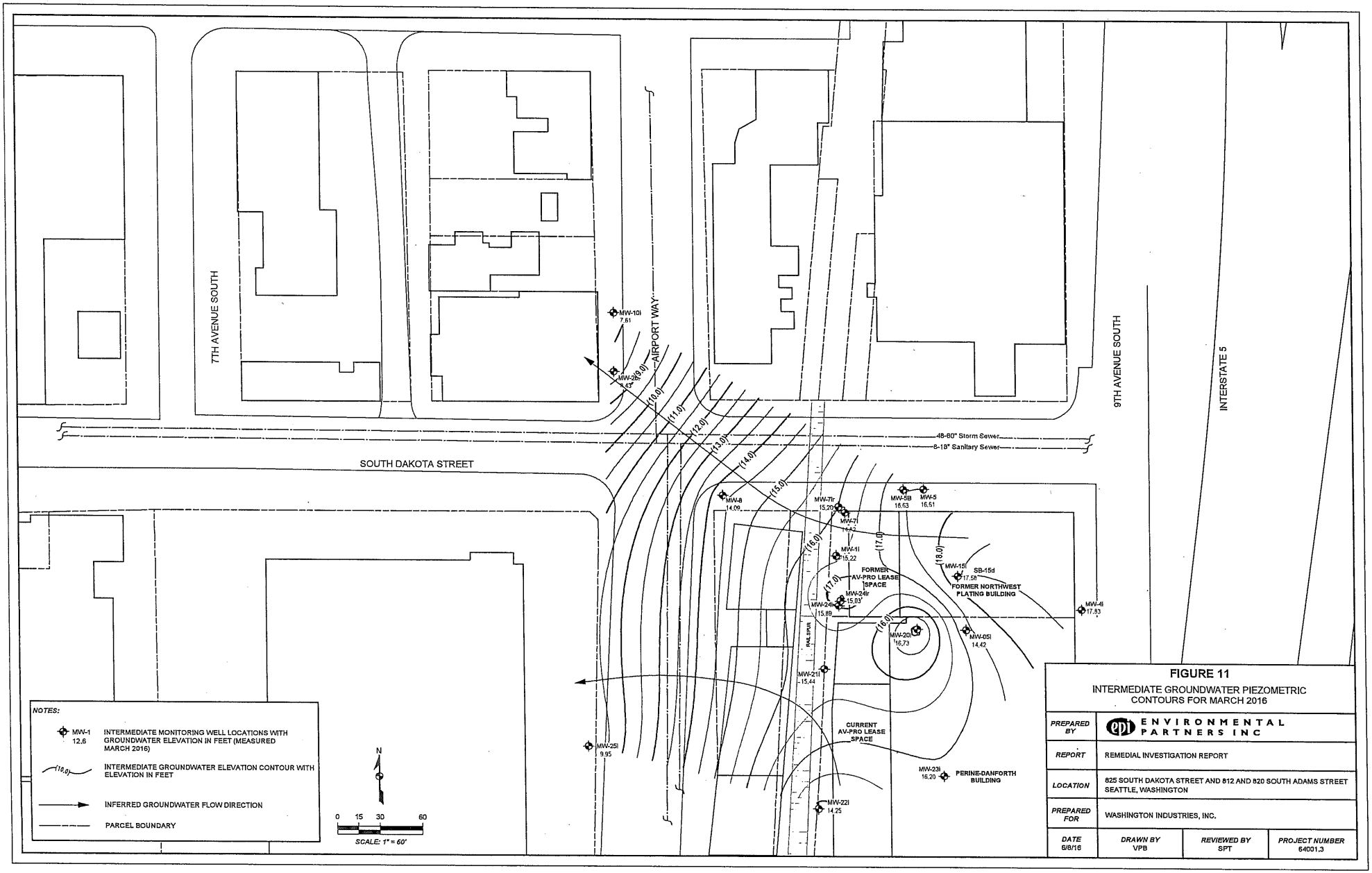



**FIGURE 11**

INTERMEDIATE GROUNDWATER PIEZOMETRIC CONTOURS FOR MARCH 2016

| | | | |
|---|---|---|---|
| PREPARED BY | ENVIRONMENTAL PARTNERS INC | | |
| REPORT | REMEDIAL INVESTIGATION REPORT | | |
| LOCATION | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| PREPARED FOR | WASHINGTON INDUSTRIES, INC. | | |
| DATE 6/8/16 | DRAWN BY VPB | REVIEWED BY SPT | PROJECT NUMBER 64001.3 |

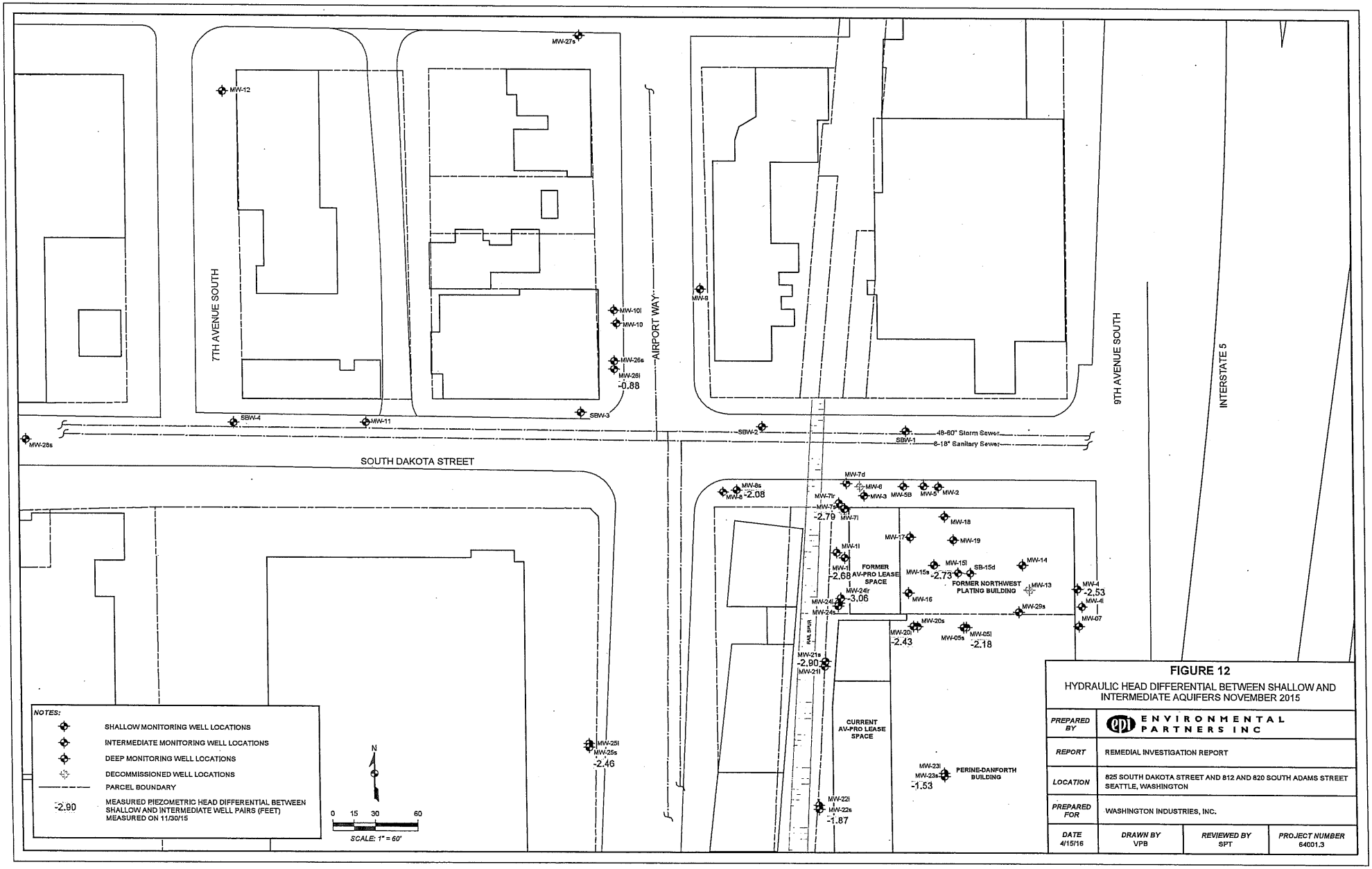
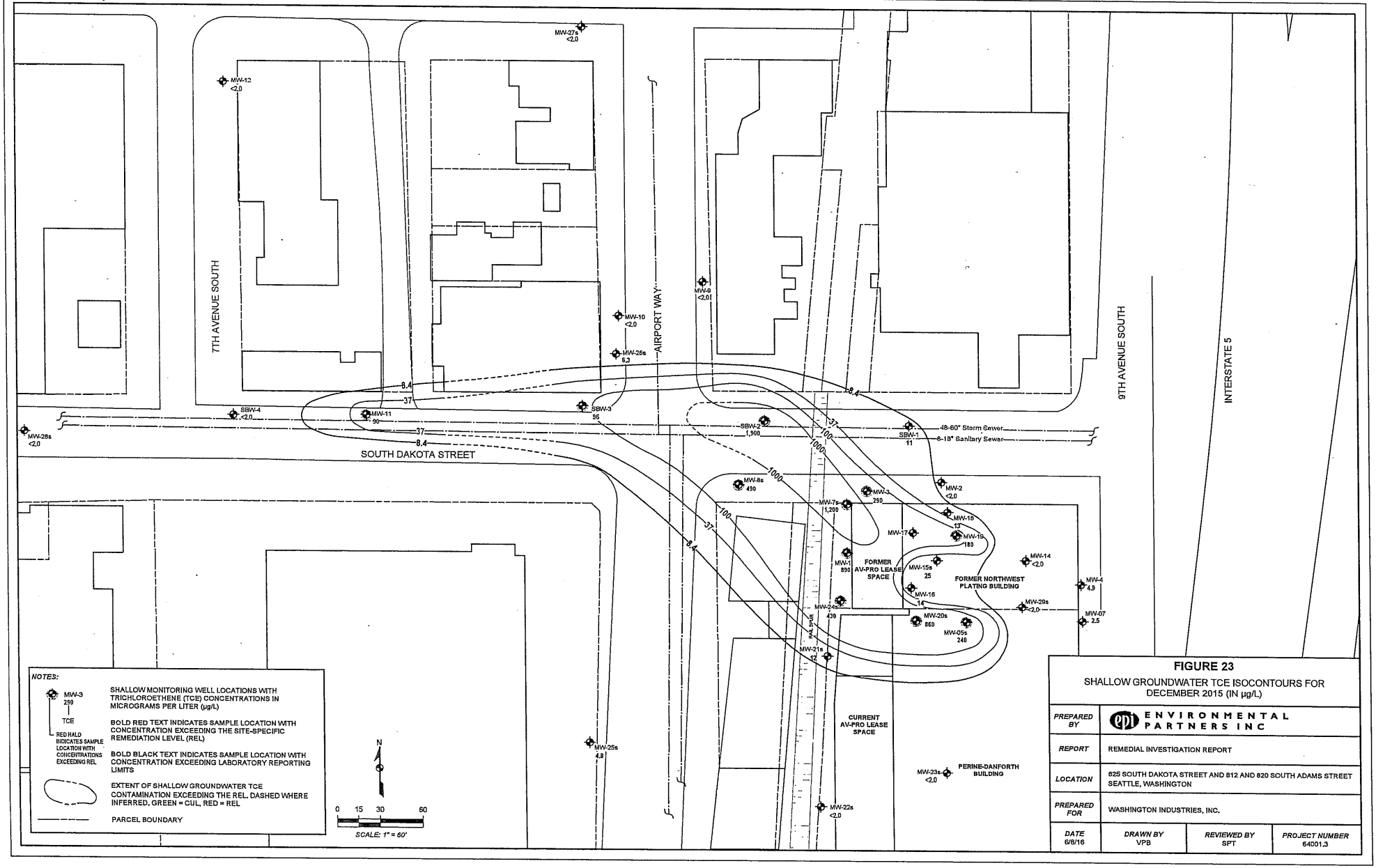



**FIGURE 12**

HYDRAULIC HEAD DIFFERENTIAL BETWEEN SHALLOW AND INTERMEDIATE AQUIFERS NOVEMBER 2015

| | |
|---|---|
| PREPARED BY | ENVIRONMENTAL PARTNERS INC |
| REPORT | REMEDIAL INVESTIGATION REPORT |
| LOCATION | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON |
| PREPARED FOR | WASHINGTON INDUSTRIES, INC. |

| DATE | DRAWN BY | REVIEWED BY | PROJECT NUMBER |
|---|---|---|---|
| 4/15/16 | VPB | SPT | 54001.3 |



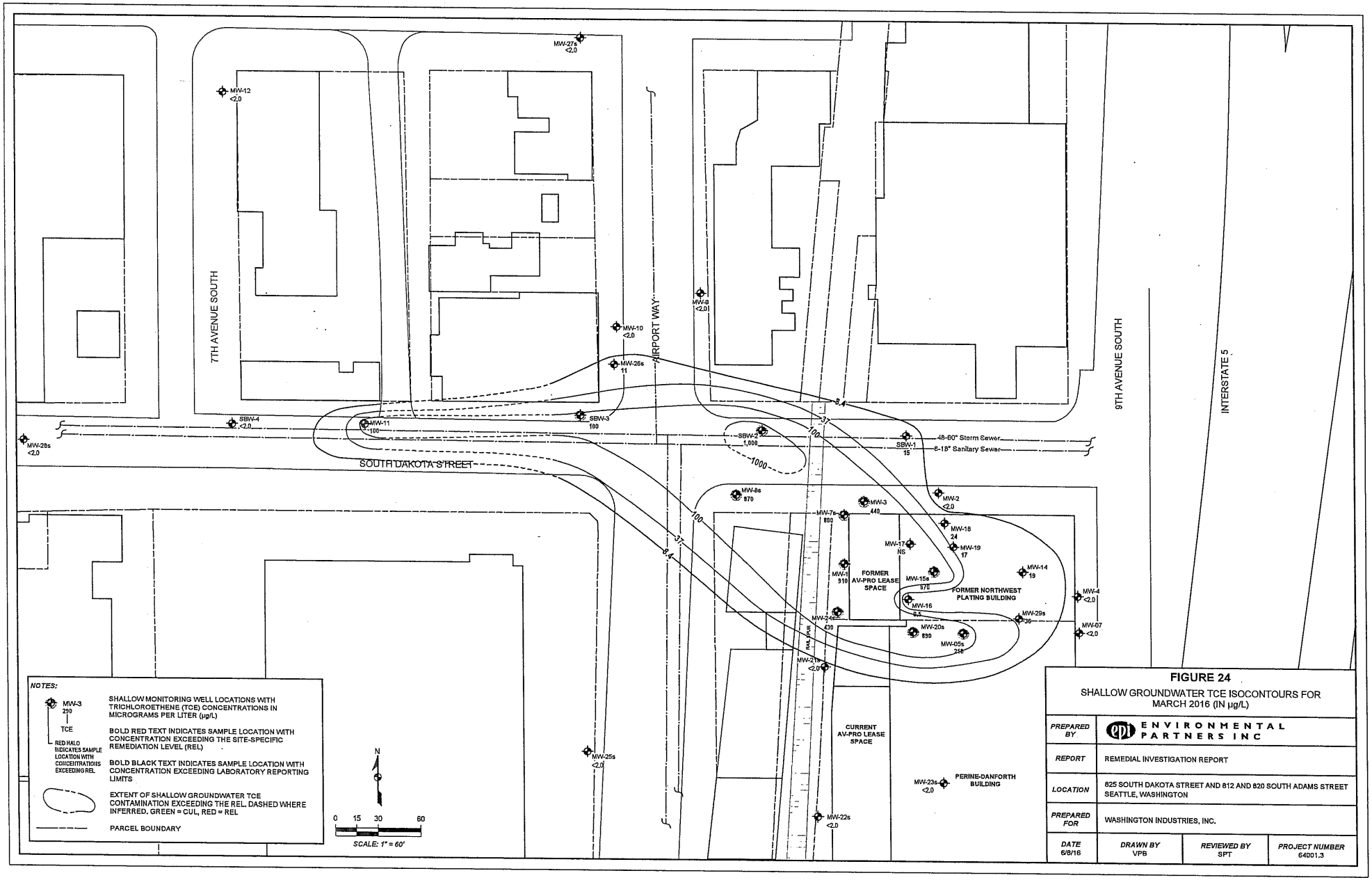

NOTES:

- MW-3 / 290 / TCE / RED HALO INDICATES SAMPLE LOCATION WITH CONCENTRATIONS EXCEEDING REL — SHALLOW MONITORING WELL LOCATIONS WITH TRICHLOROETHENE (TCE) CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)
- BOLD RED TEXT INDICATES SAMPLE LOCATION WITH CONCENTRATION EXCEEDING THE SITE-SPECIFIC REMEDIATION LEVEL (REL)
- BOLD BLACK TEXT INDICATES SAMPLE LOCATION WITH CONCENTRATION EXCEEDING LABORATORY REPORTING LIMITS
- EXTENT OF SHALLOW GROUNDWATER TCE CONTAMINATION EXCEEDING THE REL. DASHED WHERE INFERRED. GREEN = CUL, RED = REL
- PARCEL BOUNDARY

# FIGURE 23

SHALLOW GROUNDWATER TCE ISOCONTOURS FOR DECEMBER 2015 (IN µg/L)

| | | | |
|---|---|---|---|
| PREPARED BY | ENVIRONMENTAL PARTNERS INC | | |
| REPORT | REMEDIAL INVESTIGATION REPORT | | |
| LOCATION | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| PREPARED FOR | WASHINGTON INDUSTRIES, INC. | | |
| DATE 6/8/16 | DRAWN BY VPB | REVIEWED BY SPT | PROJECT NUMBER 64001.3 |




NOTES:

- MW-3 / 250 / TCE / RED HALO INDICATES SAMPLE LOCATION WITH CONCENTRATION(S) EXCEEDING REL — SHALLOW MONITORING WELL LOCATIONS WITH TRICHLOROETHENE (TCE) CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)
- BOLD RED TEXT INDICATES SAMPLE LOCATION WITH CONCENTRATION EXCEEDING THE SITE-SPECIFIC REMEDIATION LEVEL (REL)
- BOLD BLACK TEXT INDICATES SAMPLE LOCATION WITH CONCENTRATION EXCEEDING LABORATORY REPORTING LIMITS
- EXTENT OF SHALLOW GROUNDWATER TCE CONTAMINATION EXCEEDING THE REL. DASHED WHERE INFERRED. GREEN = CUL, RED = REL
- PARCEL BOUNDARY

**FIGURE 24**

SHALLOW GROUNDWATER TCE ISOCONTOURS FOR MARCH 2016 (IN µg/L)

| | | | |
|---|---|---|---|
| PREPARED BY | ENVIRONMENTAL PARTNERS INC | | |
| REPORT | REMEDIAL INVESTIGATION REPORT | | |
| LOCATION | 825 SOUTH DAKOTA STREET AND 812 AND 820 SOUTH ADAMS STREET SEATTLE, WASHINGTON | | |
| PREPARED FOR | WASHINGTON INDUSTRIES, INC. | | |
| DATE 6/8/16 | DRAWN BY VPB | REVIEWED BY SPT | PROJECT NUMBER 64001.3 |