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23 April 2012

Mr. Christopher Maurer
VCP Site Manager
Toxics Cleanup Program, HQ
Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

Dear Mr. Mauer:

Regarding: **Site Investigation Summary Report for the Short Stop 1 Site, 6317 California Avenue SW, Seattle, WA Ecology Facility ID No. 92888299; VCP Project No. NW1610**

This letter summarizes environmental conditions at the subject property. The more recent environmental investigation work (2006 to present), conducted by Coles Environmental Consulting, Inc. (CEC), has been performed under the Voluntary Cleanup Program. This letter report will briefly discuss the site's environmental background, present the results of CEC's investigation, and offer recommendations for future work leading to site closure.

Work completed during the past year was initiated, as requested by Ecology, to fill several data gaps concerning: 1) subsurface conditions at the former gasoline tanks' pit; 2) the current status of vadose-soil contamination near the dry cleaner; and 3) the groundwater conditions off site in the downgradient direction from the dry cleaner. Investigating the former UST excavation pit filled a key data gap because of the lack of documentation for the 1991 UST decommissioning and subsequent cleanup effort.

Background

Contaminated soil from a UST decommissioning was remediated on site during mid April 1991 according to a Phase II report prepared by Stemen Environmental, Inc. (Stemen, 2002). Further, releases of dry-cleaning wastes also were noted during their Phase II investigation. Samples of soil and groundwater collected on 25 September 2001, as part of the Phase II investigation, confirmed the release of gasoline and halogenated hydrocarbons.

A subsequent investigation was initiated by Stemen Environmental, Inc. during March 2003 (Stemen, 2003a). Five monitoring wells were installed on 5-6 March 2003. The wells all had a depth of approximately 32 feet below ground surface (bgs). After conducting the first groundwater monitoring round, the report stated that no gasoline or volatile organic compounds (VOCs) were detected in any of the five samples. However, the laboratory report attached to Stemen's report indicated that MW-3 contained 2.8 μg/l tetrachloroethene (PCE) compared to a MTCA cleanup concentration of 5.0 μg/l PCE. The second groundwater monitoring round was performed by Stemen on 23 July 2003 (Stemen, 2003b). Reported PCE concentrations ranged from 1.7 μg/l (MW-1) to 74 μg/l (MW-2). The third groundwater monitoring round was performed by Stemen on 7 December 2003 (Stemen, 2003c). The stated PCE concentrations ranged from not-detected (MW-1) to 39 μg/l (MW-5).

No post Stemen environmental investigations are known to have been conducted at the site until the quarterly groundwater monitoring effort was restarted in February 2007 by CEC. Thus, the five monitoring wells were not sampled for over three years. This hiatus did allow the natural attenuation process an opportunity to reduce the concentrations of PCE in the groundwater. Subsequent sampling rounds were conducted by CEC through February 2012. Results for all of CEC's groundwater sampling rounds are presented later.

Site Setting

The subject site is located about 500 feet northwest of the intersection of California Avenue SW and Fauntleroy Way SW in West Seattle, Washington. Location details are as follows:

NW quarter of Section 26, Township 24 North, Range 3 East
47° 32' 45.90" N; 122° 23' 15.16" W
5 <u>46</u> 085.63 m East; **52** <u>66</u> 032.90 m North.

Figure 1 is a recent aerial photograph of the subject site and the immediately surrounding area (dated 20 June 2010 from Google Earth). It shows the subject site with the approximate property boundary outlined in yellow. South of the southern boundary is SW Eddy Street, which is an undeveloped right-of-way. The topography of the site slopes steeply in the direction of SW Eddy Street.

Figure 2 is a site diagram showing key site features, including all of the environmental sampling points used by CEC (monitoring wells and push-probe locations). The building has two tenants operating two businesses. The dry cleaner occupies the southern end of the building. A convenience store occupies the northern end of the building. The vegetated portion of the property is raised well above the alley to the west and SW Eddy Street to the southwest. SW Eddy does not extend far to the southwest. It also is basically an alley. An arrow on Eddy Street shows the surface sloping to the southwest. Because groundwater's surface (and flow) often mirrors the topography of an area (albeit subdued compared to the surface), it was originally assumed, as a first approximation, that groundwater flow from the site follows the direction of SW Eddy Street and continues under the surface-water drainage channel. This later was confirmed with groundwater elevation measurements. Figure 3 shows a typical groundwater flow pattern observed at the site by CEC.

The geology of the site was reviewed, based on a recent geologic map by Troost, et al. (2005). The map indicates that a contact between two upper Pleistocene glacial deposits is located approximately under the center of the site. This contact is shown generally following the strike of the drainage channel discussed above. The northern deposit is defined as Vashon till (Qvt) that consists of poorly sorted sediments (a wide range of particle sizes from silt to sand to cobbles), which are generally dense but with sand lenses present that are less dense (subglacial melt-out till). The southern deposit is defined as Advance Outwash Deposits (Qva) and consists of "well-sorted sand and gravel deposited by streams issuing from advancing ice sheet". It is further defined as "predominantly medium grained sand...".

Based on the boring logs of Stemen (2003a) and CEC (2011a), the geology of the site is mostly medium sands to the total depth of 32 feet bgs. It appears to be more closely aligned with the Advance Outwash Deposits rather than the Vashon till. Contacts between geologic units on maps of such a large scale as Troost, et al. (2005) are approximate, at best, for the scale of the subject site. Therefore, CEC concludes that the geology of the subsurface is primarily medium, unconsolidated sand, consistent with Stemen's logs and CEC's logs.

The medium, well-sorted sands under the subject site probably have relatively high hydraulic conductivity and therefore, a relatively high potential for groundwater and contaminant migration. It seems reasonable to assume that halogenated hydrocarbons (in this case, PCE and its degradation products) and gasoline will be subject to natural attenuation under these conditions (mainly through migration and dilution with some chemical and microbial degradation).

February 2011 Push Probe Soil Sampling Event

Field Activities. Based on the 5 January 2011 work plan (CEC, 2011b), seven push-probe holes were installed at the site on 21-22 February 2011. Figure 2 shows the locations of the seven probes, as well as the existing five monitoring wells. At the request of Ecology, one probe was converted into a downgradient, off-site monitoring well (MW-6). This well was placed in the right-of-way of SW Eddy Street, downgradient of the dry cleaner. The purpose of this monitoring well was to determine whether significant off-site migration of either gasoline or PCE had occurred. The well was placed about 10 feet north of the City's sanitary sewer line. Samples were collected consistent with Ecology, 2004.

Geophysical Survey Results. As part of the private utility locate effort, Mountain View Locating conducted a ground-penetrating radar (GPR) survey of the site. Six unknown anomalies were observed around the building. Figure 2 shows the locations of these anomalies. Without excavating these six areas, the sources for the anomalies presently are unknown.

Soil Analysis Results. Table 1 provides the analysis results for the 16 soil samples collected during the February 2011 push probe investigation. The samples analyzed for gasoline were by Method NWTPH-Gx. All of the samples collected were analyzed for the full list of VOCs by Method 8260B. The table lists all of the analytes that were detected. For each sample, the concentrations of detected analytes are highlighted in red. If any concentrations exceed the corresponding MTCA Method A Soil Cleanup Levels for Unrestricted Land Use, they are underlined. Only nine of the detected analytes have Cleanup Levels provided in Chapter 173-340 WAC, Table 740-1.

Two sources of contamination are recognized for this site. The first is the former gasoline tank pit where gasoline-contaminated soil was removed in 1991 during the decommissioning of the underground gasoline storage tanks. The other source is the dry cleaner operation. PCE contamination has been detected in the shallow soil surrounding the dry-cleaner portion of the building. It is believed that waste PCE was spilled on the surface in the past, both in front of, and behind, the dry cleaner.

Table 1 indicates that gasoline was detected primarily in the deep (13-18 feet deep) soil samples. This indicates that some residual gasoline is present in the deeper soils that were not removed during the UST decommissioning. Figure 4 provides data flags with the soil analysis results for gasoline (NWTPH-Gx) shown for these deeper samples. The deeper samples reflect past migration of gasoline contamination downgradient from the UST area. Groundwater levels have been observed to vary between approximately 11 feet below ground surface (bgs) to 14 feet bgs, depending on the season and the well location. Samples from this depth interval were chosen for display because it has been assumed that the gasoline contamination contacted the groundwater at the bottom of the UST pit and then migrated laterally downgradient on the surface of the water. Thus, these samples approximately represent the concentration of residual contamination at the soil/groundwater interface and associated smear zone.

The approximate plume outline shown in Figure 4 is based only on the results for analysis of soil samples collected from the seven February 2011 probes. The darker colored plume shows concentrations exceeding 4,000 mg/kg gasoline. The lighter colored plume shows concentrations exceeding 100 mg/kg gasoline which is the MTCA Method A Soil Cleanup Level. While the PP-5 samples weren't analyzed for gasoline by Method NWTPH-Gx, they were analyzed for VOCs by Method 8260B. No gasoline-related VOCs were detected indicating it is unlikely that gasoline is present at this location.

These soil analysis results for gasoline need to be interpreted in conjunction with the groundwater analysis data (discussed below) in order to develop a conceptual site model for the fate and transport of the gasoline contamination. First, the VOC results for the soil data indicate that the gasoline likely is highly weathered (old) because the more volatile and soluble constitutes (e.g., benzene and toluene) are mostly gone. No benzene was detected in any sample except for a sample from PP-3 taken directly under the asphalt. This is interpreted as a recent parking lot spill from an automobile and not related to the UST. The only sample with toluene detected was from the downgradient probe PP-6 (17-18 feet bgs). Additionally, only low levels of xylene isomers and 1,2,4 trimethylbenzene were detected in the MW-6 soil sample. Second, no gasoline constituents have been detected in the groundwater samples collected by CEC with the exception that barely detectable constituents (xylene isomers) were found during the most recent sampling round (14 February 2012). This observation is not considered to be significant and does not change CEC's interpretation of the full data set. From these results, the conceptual site model for gasoline is that the plume shown in Figure 4 is mostly stable and confined primarily to the deep soil. No significant migration of gasoline constituents has been observed. Because of the depth of this stabilized plume, vapor intrusion and direct contact are very unlikely exposure pathways.

For the PCE analysis results shown in Table 1, the highest concentrations observed were found in the shallow soil in front of, and behind, the dry cleaner. This observations supports the contention that surface spills of PCE is the primary source for the PCE found at the site. Vertical migration allowed the PCE to reach the groundwater. The samples collected from PP-3, near deteriorate asphalt at the dry cleaner's front door, show a rapid decrease in PCE and TCE (trichloroethene, a degradation product of PCE) concentrations with depth. This observation also supports the surface source thesis for PCE.

A relative high PCE concentration in the deep soil sample (2,940 μg/kg) from PP-6 suggests that downgradient migration has occurred and that the deeper soil still contains the compound. However, the deep soil sample analyzed from MW-6, farther downgradient, indicates that the migration has been limited because this sample only had about 13% of the PCE concentration (381 μg/kg) observed in the PP-6 sample. The PCE detected in the former gasoline pit samples (PP-1 and PP-2), which are upgradient from the dry cleaner, are interpreted as fill material that may have originated in the excavation wall near the dry cleaner (see Figure 3, which shows the outline of the excavation pit) and was moved to this location during the excavation pit's backfill operation.

Groundwater Monitoring 2007-2012

CEC initially conducted four quarters of groundwater monitoring at the site during 2007. This was intended to be a restart of the original groundwater investigation implemented by Stemen Environmental, Inc. that had ended in December 2003. The existing five wells installed by Stemen were utilized for this effort. For the first monitoring event, the five samples were analyzed for the full suite of VOCs by EPA Method 8260B. The purpose was to confirm whether any gasoline contaminants were present in addition to PCE (and related degradation products, as reported by Stemen, 2002, 2003a, 2003b, and 2003c). With no gasoline constituents detected in this first monitoring round, samples from subsequent rounds were analyzed only for chlorinated compounds. Because some samples from the later 2004 quarterly rounds detected PCE at concentrations just above the MTCA Method A Cleanup Level for Groundwater (5 μg/l), as provided in Chapter 173-340 WAC, Table 720-1, two additional rounds were conducted in 2008 and 2009. Finally, with the addition of MW-6, a new round of quarterly sampling was begun in March 2011. While the results from these earlier rounds have been provided in previous reports, this section will summarize the data from all of ten monitoring rounds.

The dates for CEC's groundwater monitoring events were:

19 February 2007
21 May 2007
20 August 2007
20 November 2007
25 August 2008
15 January 2009
23 March 2011
24 June 2011
27 September 2011, and
14 February 2012.

For each of the ten monitoring events, the wells were opened and allowed to equilibrate with atmospheric conditions for at least 30 minutes prior to measuring groundwater levels. After the groundwater-level measurements were collected, the wells were purged, in turn, of at least three well volumes. Field parameters were measured between each well volume to be assured that after purging, the three measurements all agreed within a variation of 10 percent. A peristaltic pump was used for the sampling.

Field measurements included pH, conductivity, and temperature. After purging, samples were collected in VOA vials, placed in an ice chest, and delivered to Apex Laboratories, Beaverton, OR for analysis under proper chain-of-custody forms. Once the samples had been collected, dissolved oxygen (DO) and the redox conditions (Eh) were measured on samples brought to the surface. All purge waters were stored on site in drums for later disposal.

Site Hydrogeology

Figure 3 shows CEC's interpretation of the potentiometric surface and groundwater flow patterns for the March 2011 groundwater monitoring round. This diagram is consistent with the results from the other nine rounds but adds MW-6 to the flow net. The results also are consistent with the area's plunging topography down SW Eddy Street (see Figure 2). Thus, the groundwater generally flows south, with a probable southwest component, toward SW Eddy Street. Based on the topography and the presence of a large sewer line that runs down SW Eddy Street, it is assumed that the water flows south toward SW Eddy Street and then turns to the southwest to follow the topography and the sewer line. From the topography and anecdotal information, a pre-development creek was present at SW Eddy Street which helps explain the topography and flow pattern. The upper portion of the area was filled during development by the City. Because the flow patterns for each of the ten monitoring rounds are similar, it indicates that seasonal effects on the flow are minimal. This also is demonstrated by the generally uniform groundwater chemistry and the minimal decrease in water levels during the dry season.

Groundwater Analysis Results

Figure 5 presents a diagram with data flags for the groundwater analysis results for all ten groundwater monitoring rounds completed by CEC from February 2007 through February 2012. PCE is emphasized because, with several minor exceptions, it was the only compound detected during all ten groundwater monitoring events. The exceptions included very low concentrations of two PCE decomposition compounds found in four samples and the xylene isomers found in the most recent sample from MW-4. These detected analytes are denoted with asterisks in the data flags.

From the data shown in Figure 5, PCE was detected in monitoring well MW-1 only once (15 January 2009) at a concentration of 0.62 μg/l. However, this value was close to the method reporting limit (MRL) of 0.5 μg/l. Consequently, it is uncertain whether the result is valid or a spurious laboratory value. For MW-2, it was detected twice. The 20 November 2007 sample is shown with 0.57 μg/l present. Consistent with the 15 January 2009 MW-1 sample, it may not be a valid concentration. However, the 15 January 2009 sample is shown with 1.88 μg/l detected.

For the ten sampling rounds conducted by CEC, only five groundwater samples had PCE detected at concentrations exceeding the MTCA Groundwater Cleanup Level of 5 μg/l (underlined in the data flag on Figure 5). The 25 August 2008 sample from MW-3 had 9.26 μg/l detected which was the highest concentration detected in any sample. The 25 August 2008 sample from MW-4 had 7.17 μg/l detected. The 15 January 2009 sample from MW-4 had 5.01 μg/l detected. The 20 November 2008 sample from MW-5 had 5.44 μg/l detected. Finally, the 24 June 2011 sample from MW-6 had 8.02 μg/l detected.

For MW-3, MW-4, and MW-5, PCE was detected in all of the pre-2011 samples except for those collected on 19 February 2007. No PCE has been detected in any samples from MW-1 through MW-5 during the past four quarterly monitoring rounds. This indicates that groundwater on site no longer appears to be significantly contaminated. This observation is consistent with the effects of natural attenuation. While PCE has been detected in the new, downgradient well MW-6 for the past four quarterly rounds, the last two rounds had concentrations below the MTCA concentration. If this trend of low concentrations continues for the next two quarterly rounds, it may be possible to close the groundwater issue with Ecology.

Notwithstanding the observation that the MTCA cleanup level occasionally has been exceeded in groundwater samples collected from this site, there is no known direct exposure pathway for PCE in groundwater to reach either human or ecological receptors. This is because of the depth of the groundwater; the fact that drinking water is provided by the City, not from local wells; and the lack of a surface exposure for the groundwater in an ecological habitat. Moreover, the PCE concentration in the first downgradient sample from MW-6 indicates that only minimal PCE has migrated off site. It is noteworthy that the highest concentrations observed were all from the three wells closest to, and surrounding the dry cleaner facility. This tends to suggest that the contamination is localized with minimal migration downgradient. The highest soil concentrations observed also were near the facility (PP-3, PP-4, and PP-6). PP-6 had the highest PCE concentration in a deep soil sample which was near MW-3. Again, MW-3 had the highest groundwater concentration observed. Even with the significant soil and groundwater concentrations immediately downgradient of the dry cleaner facility, the new downgradient well MW-6 failed to detect substantial PCE in recent groundwater sample and only modest PCE in the soil/groundwater interface sample.

Finally, in spite of observing relatively high gasoline concentrations in deep soil samples between PP-3 and PP-6, no gasoline contamination was detected in downgradient groundwater samples from either MW-3 (located within the higher concentration portion of the plume shown in Figure 4) or MW-6. As suggested above, this tends to support the contention that the gasoline contamination is stabilized and not leaching detectable concentrations of gasoline constituents into the local groundwater.

Conclusions

The following conclusions are offered for this subsurface investigation:

- Soil samples collected from seven push probes indicate that significant gasoline contamination is still present in the deeper soil (12-18 feet bgs). The contaminated plume extends from the UST pit downgradient to the northern edge of SW Eddy Street. However, the lack of gasoline constituents in the groundwater samples indicates that the plume is stabilized in the soil and not contributing detectable contamination to the groundwater.

- Gasoline and several of its VOC constituents were found in deep soil samples at concentrations significantly above MTCA Method A Soil Cleanup Levels. Because the contaminated area shown in Figure 4 is deep (12-18 feet bgs), it is very unlikely that excavations in the future will reach this depth and expose trench workers. Also, there appears to be no significant impact to the local groundwater by gasoline contamination. Finally, with the more volatile constituents mostly gone (e.g., benzene) and considering the depth of the contamination, vapor intrusion seems unlikely. Therefore, no human or ecological receptors are likely to come into contact with residual contamination for it to represent either a human or an ecological risk. Natural attenuation will continue to degrade this contamination over time.

- Relatively high concentrations of PCE were found in shallow soil samples around the dry cleaner facility. Lower concentrations were found in the vadose zone at all of the probe sites. A deep downgradient soil sample (PP-6) had the third highest concentration of PCE. These results confirm that the dry cleaner facility contributed PCE to the surface soils which has migrated to the groundwater (see below). The deeper soil contamination accounts for the low concentrations found in the groundwater. The fact that the groundwater concentrations are not higher attest to the stability of the PCE contamination in the soil, similar to that observed for the gasoline contamination.

- The concentrations of residual PCE in the groundwater samples were very low and only infrequently above the MTCA Method A Cleanup Level of 5.0 μg/l. Further, no pathways to human or ecological receptors presently are known to exist in the immediate area (the area is urban and sufficiently developed such that ecological habitat is limited and human exposure through groundwater is not expected given that potable water is supplied by the City). Notwithstanding the regulations in WAC Chapter 173-340, residual PCE's presence does not appear to represent either a realistic human or ecological risk.

- The direction of groundwater flow is consistent with the site topography, being south toward SE Eddy Street. It is then assumed to flow to the southwest along with the topographical plunge down SE Eddy Street. The large sanitary sewer line also runs down SW Eddy Street which likely provides a preferential pathway to complement the steep topography. The concentrations of gasoline in the soil and PCE in the groundwater are consistent with this flow pattern. As mentioned in CEC's 8 April 2008 report (CEC, 2008), the fact that MW-4, located slightly upgradient from the dry cleaner facility, had PCE present supports Stemen's (2002) contention that some contamination was the result of a broken drain pipe which flowed to the east.

- Consistent with conclusions from the 8 April 2008 report, groundwater levels generally change seasonally as expected, but the variations were minor. Also, the potentiometric surface and groundwater flow patterns changed very little over time.

- For the past four quarterly groundwater monitoring rounds, no PCE was detected in groundwater samples collected for any of the five on-site wells. PCE was detected in the off-site, downgradient well (MW-6). Except for the 24 June 2011 sample, levels have been below 5.0 μg/l, including the last two rounds. Should the subsequent two rounds also find concentrations below 5.0 μg/l in this well, the groundwater issue should be considered closed.

Recommendations

- Pending Ecology's concurrence, continue quarterly groundwater monitoring only for downgradient well MW-6 for at least two more quarterly rounds. If PCE levels in this well continue to be below MTCA's cleanup level, request that Ecology close the groundwater issue at this site.

- Excavate shallow PCE-impacted soil around the perimeter of the dry cleaning facility. Depending on the amount of residual contamination that may exist in this area after the removal, consider installing a soil venting system along the three sides of the facility. It may be necessary to remove soil directly under the building if, and when, it is demolished in the future should site renovation be considered. With excavation equipment available at that time, check GPR anomalies around the facility.

- Allow natural attenuation to continue to degrade the gasoline contamination.

Please call me at 503-636-3102 or email me at dcolescec@comcast.net should you have any question concerning this summary report.

Sincerely yours,

David G. Coles, M.S., L.G.
Principal, Geochemist

Attachments: five diagrams
one data table

expires 01/08/13

cc: Bud Pontius
Project File

References:

(CEC, 2008) Coles Environmental Consulting, Inc., *Final Groundwater Monitoring Report for the Short Stop 1 Site, 6311/6317, California Avenue, SW, Seattle, WA*, (TCP ID #NW1610), dated 9 April 2008.

(CEC, 2009) Coles Environmental Consulting, Inc., *Status Report on the VCP Project for the Short Stop 1 Site, 6317 California Ave., SW, Seattle, Washington (Facility ID No: 92888299; VCP Project No.: NW1610)*, dated 13 July 2009.

(CEC, 2011a) Coles Environmental Consulting, Inc., *Site Investigation Report for the Short Stop 1 Site, 6317 California Ave., SW, Seattle, Washington (Facility ID No.: 92888299; VCP Project No.: NW1610)*, dated 56 July 2011.

(CEC, 2011b) Coles Environmental Consulting, Inc., *Proposal for a Pre-Closure Subsurface Investigation at the Short Stop 1 Site, 6317 California Ave., SW, Seattle, Washington (Facility ID No.: 92888299; VCP Project No.: NW1610)*, dated 5 January 2011.

(Stemen, 2002) Stemen Environmental, Inc., *Phase II Environmental Site Assessment Report, Property Located 6317 California Avenue, S.W., Seattle, Washington*, dated 13 January 2002.

(Stemen, 2003a) Stemen Environmental, Inc., *Monitoring Well Installation and Quart[er]ly Groundwater Monitoring Report, Short Stop Site, 6317 California Avenue, S.W., Seattle, Washington, Ecology Site #101565*, dated 15 May 2003.

(Stemen, 2003b) Stemen Environmental, Inc., *Groundwater Monitoring Report, Short Stop Site, 6317 California Avenue, S.W., Seattle, Washington*, dated 25 July 2003.

(Stemen, 2003c) Stemen Environmental, Inc., *Groundwater Monitoring Report, Short Stop Site, 6317 California Avenue, S.W., Seattle, Washington*, dated 15 December 2003.

Troost, K. G., Booth, Wisher, and Shimel, *The Geologic Map of Seattle, A Progress Report*, USGS Open-File Report 2005-1252, V. 1.0 (2005). Downloaded from the Pacific Northwest Center for Geologic Mapping Studies, U. of Washington (http://geomapnw.ess.washington.edu).

Washington Department of Ecology, *Chapter 173-340 WAC, MODEL TOXICS CONTROL ACT--CLEANUP*, updated 10/12/07 (Table 720-1: Method A Cleanup Levels for Ground Water and Table 7403.1: Method A Soil Cleanup Levels for Unrestricted Land Uses).

(Ecology 2004) Washington Department of Ecology, *Collecting and Preparing Soil Samples for VOC Analysis*, Implementation Memorandum #5, dated 17 June 2004.

NORTH

Google Earth photograph, 20 June 2010. Property line shown (yellow) is approximate.

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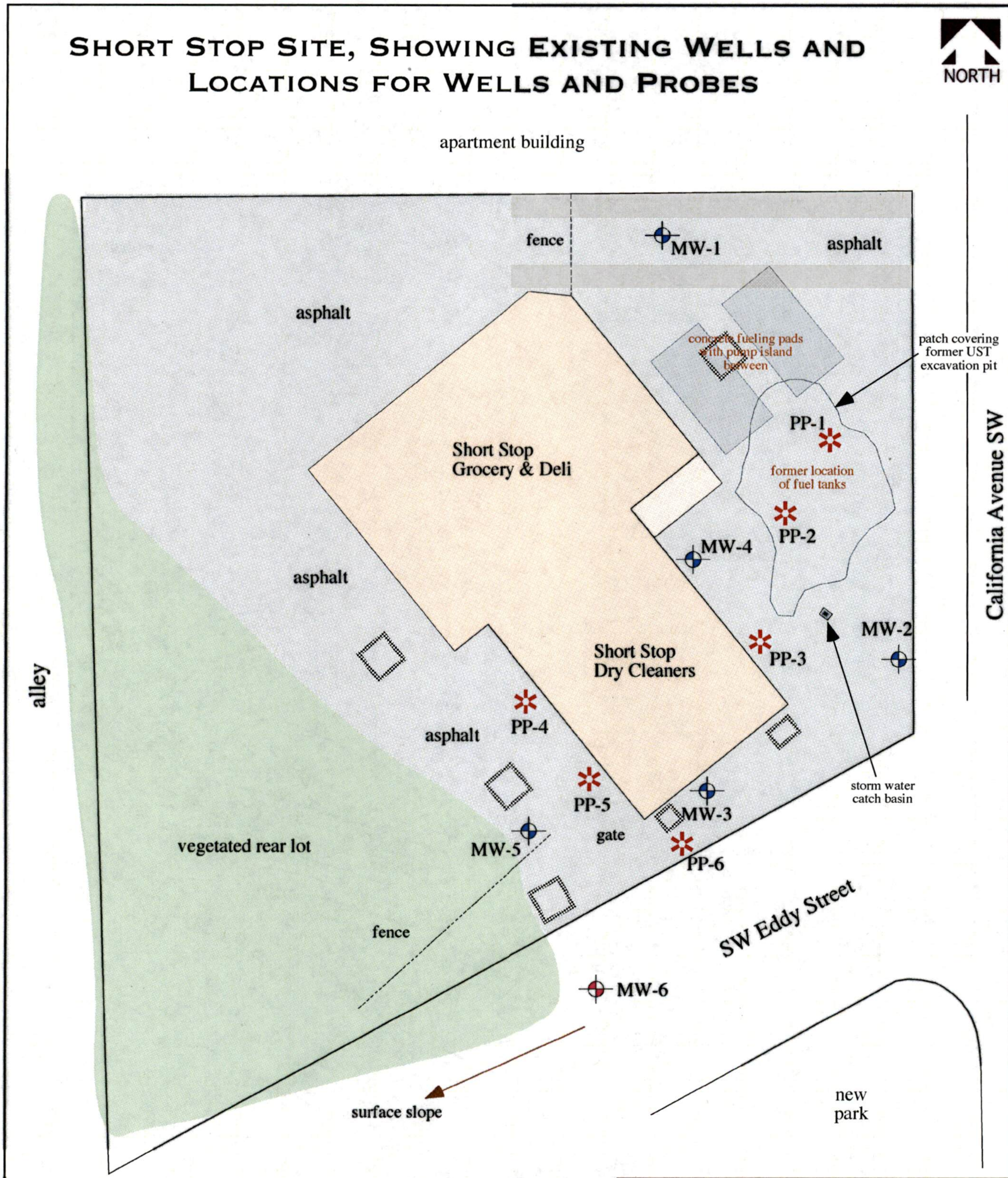
Figure 1. Aerial photograph showing site features at the Short Stop 1 site, 6317 California Avenue, SW, Seattle, WA.

Short Stop Site, Showing Existing Wells and Locations for Wells and Probes



= 2/11probe locations

= 2/11 GPR anomaly

= 2/11 monitoring-well location

= existing monitoring-well locations

Note: Locations of site features approximate. Well locations based on diagrams from Stemen Environmental, Inc. (15 May 2003). Well designations from stamped numbers on well monuments.

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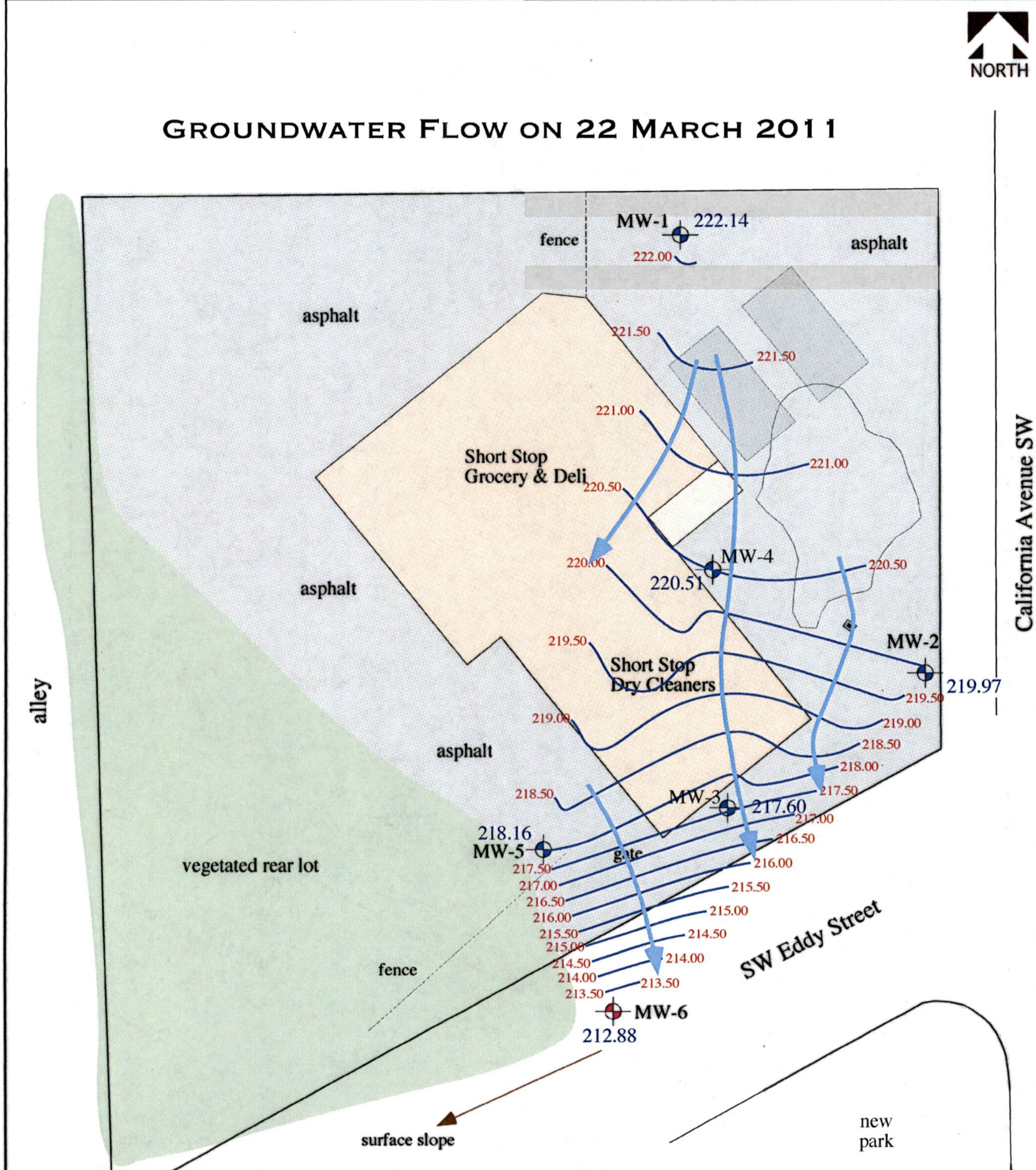
Figure 2. Diagram showing site features and monitoring wells at the Short Stop 1 site, 6317 California Avenue, SW, Seattle, WA.



GW gradients north to south:
MW-1 to MW-4 = 0.03 ft/ft
MW-4 to MW-3 = 0.07 ft/ft
MW-5 to MW-6 = 0.17 ft/ft

= 2/11 monitoring-well location

= existing monitoring-well locations

Note: Locations of site features approximate. Well locations based on diagrams from Stemen Environmental, Inc. (15 May 2003). Well designations from stamped numbers on well monuments.

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		Rev. 0

Figure 3. Diagram showing the 22 March 2011 groundwater flow at the Short Stop 1 site, 6317, California Avenue, SW, Seattle, WA.

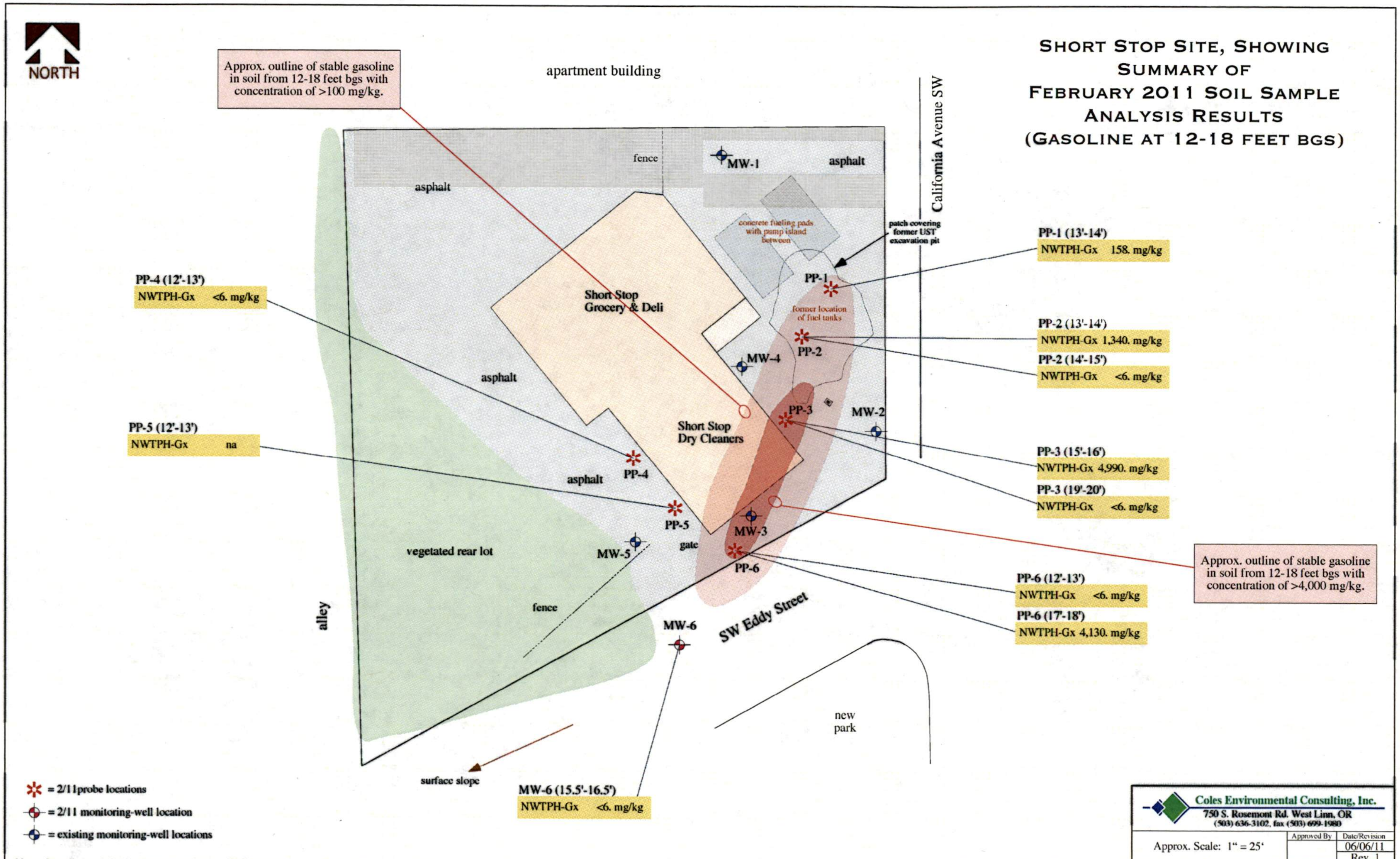

Figure 4. Diagram showing gasoline analysis results for soil samples collected in February 2011, Short Stop 1 site, West Seattle, WA.

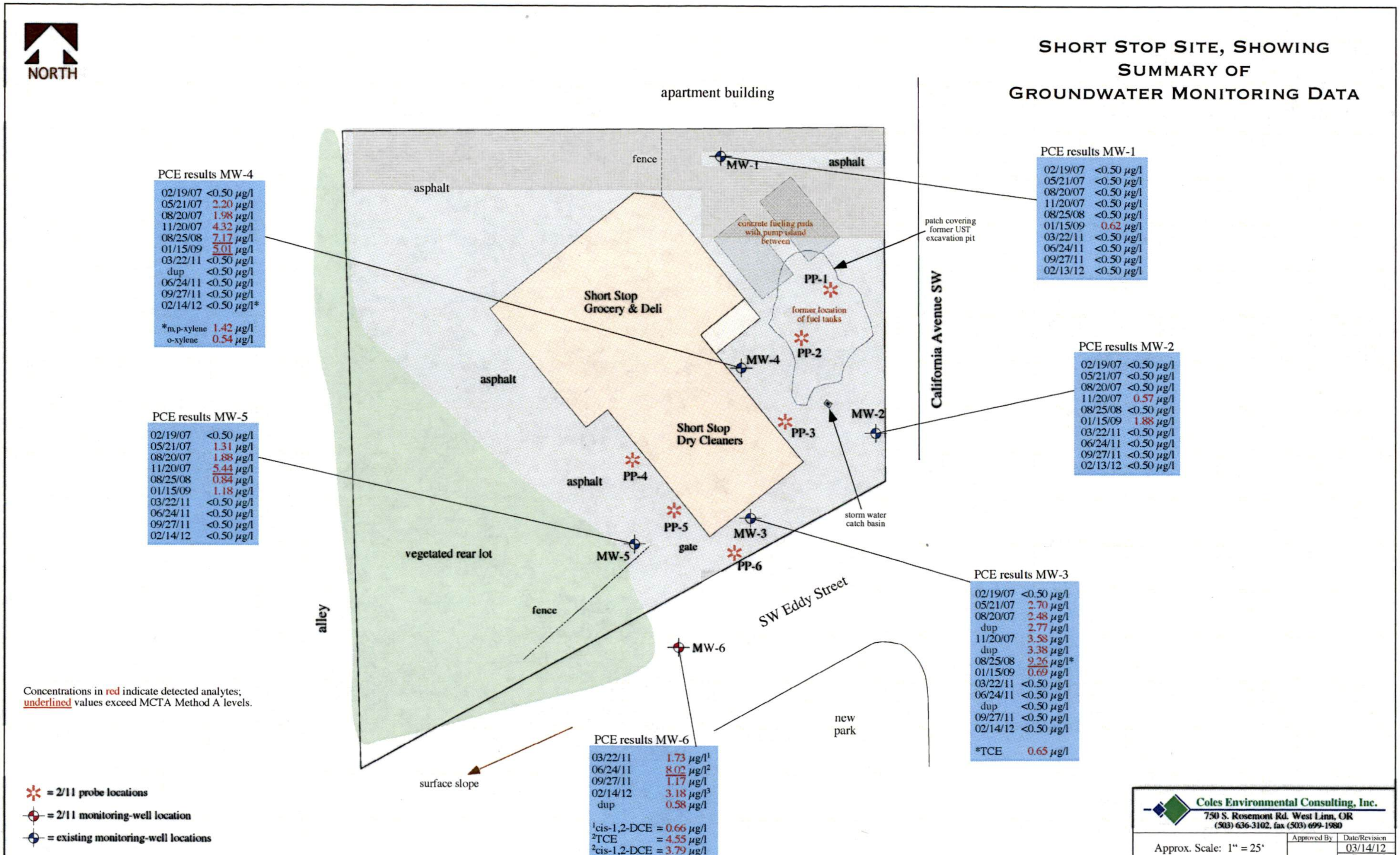

Figure 5. Diagram showing analysis results for groundwater monitoring rounds at the Short Stop 1 site, 6317, California Avenue, SW, Seattle, WA.

Table 1. Soil sample analysis results for the 21-22 February 2011 subsurface investigation at the Short Stop 1 site, 6317 California Avenue, SW, Seattle, WA.

Sample Location (depth interval)	-Gx(mg/kg)	VOCs (8260B) (μg/kg)													chlorinated VOCs (8260B) (μg/kg)			
	gasoline	benzene	toluene	ethylbenzene	o-xylene	m,p-xylene	n-propylbenzene	n-butylbenzene	sec-butylbenzene	isiopropyl-benzene	4-isiopropyl-toluene	1,2,4-trimethyl-benzene	1,3,5-trimethyl-benzene	naphthalene	**PCE**	**TCE**	cis-1,2 DCE	trans-1,2 DCE
PP-1 (10.5-11.5)	<6.	<31.	<62.	<31.	33.4	78.6	<31.	<62.	<62.	<62.	<62.	163.	68.1	<124.	575.	<31.	<31.	<31.
PP-1 (13-14)	158.	<16.	65.3	<33.	<33.	112.	38.5	142.	87.5	<65.	<65.	90.8	<65.	<131.	<33.	<33.	<33.	<33.
PP-2 (13-14)	1,340.	<31.	<125.	<62.	<62.	<125.	66.3	4,070.	1,700.	<125.	1,180.	<125.	<125.	<250.	499.	<62.	<62.	<62.
PP-2 (14-15)	<6.	<14.	<57.	<28.	<28.	<56.	<28.	93.9	<57.	<57.	<57.	<57.	<57.	<113.	35.1	<28.	<28.	<28.
PP-3 (1.5-2)	na	178	<53.	<26.	<26.	<53.	<26.	<53.	<53.	<53.	<53.	<53.	<53.	<106.	18,300.	6,750.	693.	46.7
PP-3 (8.5-9)	na	<14	<54.	<27.	<27.	<54.	<27.	<54.	<54.	<54.	<54.	<54.	<54.	<108.	484.	31.9	<27.	<27.
PP-3 (15-16)	4,990.	<170.	<680.	2,840.	354.	3,170.	41,600.	32,500.	7,900.	6,420.	7,360.	51,700.	42,600.	2,800.	<340.	<340.	<340.	<340.
PP-3 (19-20)	<6.	<15.	<61.	<30.	<30.	<61.	<30	<61.	<61.	<61.	<61.	<61.	<61.	<121.	<30.	<30.	<30.	<30.
PP-4 (0.5-1.5)	na	<13.	<51.	<26.	<26.	<51.	<26.	<51.	<51.	<51.	<51.	<51.	<51.	<102.	4,440.	31.2	<26.	<26.
PP-4 (12-13)	<6.	<14.	<57.	<28.	<28.	<57.	<28.	<57.	<57.	<57.	<57.	<57.	<57.	<114.	558.	48.2	<28.	<28.
PP-5 (3-4)	na	<16.	<62.	<31.	<31.	<62.	<31.	<62.	<62.	<62.	<62.	<62.	<62.	<125.	150.	<31.	<31.	<62.
PP-5 (12-13)	na	<16.	<65.	<32.	<32.	<65.	<32.	<65.	<65.	<65.	<65.	<65.	<65.	<130.	482.	<32.	<32.	<32.
PP-6 (6-7)	na	<14.	<58.	<29.	<29.	<58.	<29.	<58.	<58.	<58.	<58.	<58.	<58.	<116.	300.	<29.	<29.	<58.
PP-6 (12-13)	<6.	>14.	<58.	<29.	<29.	<58.	<29.	<58.	<58.	<58.	<58.	<58.	<58.	<115.	274.	<29.	<29.	<58
PP-6 (17-18)	4,130.	>405.	34,800.	42,200.	43,000.	182,000.	35,200.	11,200.	3,820.	8,620.	6,070.	179,000.	58,500.	19,100.	2,940.	<809.	<809.	<809.
MW-6 (15.5-16.5)	<6.	<16.	<64.	<32.	<32.	74.9	>32.	<64.	<64.	<64.	<64.	100.	<64.	<127.	381.	40.0	<32.	<64.
MTCA Method A Soil Cleanup Levels for Unrestricted Land Use	100.	30.	7,000.	6,000.	----9,000.----		nd	nd	nd	nd	nd	nd	nd	5,000.	50.	30.	nd	nd
EPA's Regional Screening Levels for Residential Soil) Dec. 2009	nd	1,100.	5,000,000.	5,400.	----630,000.----		3,400,000.	nd	nd	nd	nd	62,000.	780,000.	3,600.	550.	2,800.	780,000.	150,000.

na = not analyzed. nd = data not available. Detected values highlighted in red and underline if above MTCA Method A Soil Cleanup Levels (for compounds with cleanup levels defined).

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