PRELIMINARY CONCEPTUAL SITE MODEL FOR THE FIVE POINTS TETRACHLOROETHENE PLUME

1.0 INTRODUCTION

1.1 Purpose and Objectives

The purpose and objectives of this conceptual site model (CSM) are to identify the site physical characteristics of the Five Points Tetrachloroethene (PCE) Plume (Five Points), and the nature and extent of contamination. A Site location map is presented as **Figure 1**.

1.2 CSM Approach

The study is to determine where the PCE impacts to groundwater originate, to delineate the vertical and horizontal extent of PCE contamination, to define the fate and transport parameters of PCE and to evaluate the risks and receptors of the groundwater impacts at the site. A review of previous data and newly acquired information was conducted in the production of this CSM. Information used in these evaluations included boring logs from municipal drinking water wells, monitoring wells, direct-push locations, excavation logs, as well as analytical results from groundwater and soil sampling. Water levels from monitoring wells were used to determine water table elevations.

1.2.1 Background

Environmental investigations at the Site were initiated by the detection of PCE in Woods Cross (WC) Drinking Water Wells. PCE was first detected in 1988 in WC Well #2 and in 1995 in WC Well #1 (**Figure 2**). WC Well #2 had detections of PCE at a concentration of 5.7 micrograms per liter (µg/L) in 1988 exceeding the drinking water maximum contaminant level (MCL) of 5 µg/L. Subsequent sampling of WC Well #2 has resulted in PCE concentrations ranging from non-detect to 3.74 µg/L.

In April 1995, PCE was first detected in WC Well #1 at a concentration of 2.78 µg/L. Since that time PCE has been consistently detected in WC Well #1, prompting investigation of this contamination. PCE concentrations in WC Well #1 exceeded the MCL in 1996, 1998, 1999, and 2006. WC Well #l was taken out of service on March 2, 1999, after PCE was detected at a concentration of 16.4 µg/L (UDEQ, 2006). The screened interval of WC Well #1 is over 200 feet long extending from 120 feet below ground surface (bgs) to 325 feet bgs. WC Well #2 was taken out of service in 2008 and is screened from 92 to 180 feet bgs.

1.3.2.1 Geographic Setting

The Five Points PCE plume is located within Davis County, Utah immediately west of the Wasatch Mountain Range. The topography of the area is the result of a delta and alluvial fan complex emanating from Bountiful's Mill Creek Canyon. Hydrogeologically, the area is referred to as the Bountiful sub area of the East Shore Area (Feth,1966). The East Shore Area is 40 miles long and ranges from 3 to 20 miles wide, encompassing the area along the east shore of the Great Salt Lake and the western front of the Wasatch Range. This hydrogeologic area is bounded by the Great Salt Lake on the west and the Wasatch Mountains on the east, between the mouths of the Bear River on the north and the Jordan River on the south (Bolke and Waddell, 1972). The area has been divided into three hydrogeologic sub areas: the Brigham sub area on the north, the Weber Delta sub area in the center, and the Bountiful sub area on the south (Thomas and Nelson, 1948). The Five Points PCE Plume site lies within the Bountiful sub area.

1.3.2.2 Physiography

The East Shore Area is situated within the Lake Bonneville Basin of the Great Basin section of the Basin and Range physiographic province. The Wasatch Fault, located a few miles to the east of the Five Points Area, separates the East Shore Area from the adjacent Wasatch Range section of the Middle Rocky Mountain physiographic province. The Lake Bonneville Basin, typical of Basin and Range physiography, is characterized by alternating, isolated, north-trending, block-faulted mountains and intermountain basins flanked by alluvial slopes (Clark et al.,1990).

The nature of the sedimentary deposits underlying the Five Points Area appears to have been influenced by former Lake Bonneville, the largest lake formed in the Basin and Range physiographic province during the Pleistocene Epoch (from 2 million to 10,000 years ago). Most of the Lake Bonneville shorelines visible today were formed 10,000 to 30,000 years ago. At its maximum extent, Lake Bonneville covered nearly 20,000 square miles, and was nearly 1,000 feet deep in the area of the present Great Salt Lake (Hintze, 1988). While Lake Bonneville existed, fluctuations of the lake level reworked the layers of cobbles, gravels, sands, silts, and clays into heterogeneous and laterally discontinuous mixtures of sediments. The unconsolidated sediments in the East Shore Area reach a maximum thickness of 6,000 to 9,000 feet in low-lying areas of the basin (Feth et al., 1966).

1.3.2.3 Topography

The area impacted by the Five Points PCE Plume in Bountiful and Woods Cross City, Utah may have been as long as 6,000 feet at its maximum extent when WC Well #2 was pumping. The suspected source of the PCE contamination, the Your Valet Cleaner (YVC) dry cleaning business, is located on an alluvial fan complex and delta terrace approximately one half mile south of Mill Creek. The alluvial fan complex slopes to the west northwest at a gradient of approximately 0.02 feet per feet (ft/ft) from the suspected source area to the most distal extent of the known impact WC #2. The Wasatch Mountains, approximately four miles to the east, rise abruptly from the valley floor to an elevation of over 9,500 feet. The Wasatch Fault lies to the east of the Five Points Area in a series of synthetic normal faults approximately 3500 feet to the east south east (UGS, website http://geology.utah.gov/online/c/c-106/c-106faults.pdf).

2.0 HYDROLOGY

2.1 Climate

The Five Points PCE Plume site receives low to moderate annual precipitation for the intermountain area. Meteorological data reported from the Bountiful-Val Verda Station has been evaluated and shows that the average annual precipitation is 23.37 inches. The annual rate of evapotranspiration is 41.30 inches resulting in an average annual loss of 17.93 inches to evaporation. The average annual temperature is 51.8 degrees Fahrenheit (ºF) with fluctuations ranging from over 100º F in summer months to below 0º F in winter months (WRCC, 2008).

2.2 Surface Hydrology

Regionally, surface runoff surrounding the Site flows to the west-northwest. There are a number of surface water bodies in the area, which range from streams, springs, and ponds as well as wells, ditches, and canals. Streams, canals and ditches eventually empty into a variety of wetlands, and from there into the Great Salt Lake, which is approximately three miles to the west-northwest of the Site. The nearest surface water body to the Five Points Area is the Mill Creek stream, located approximately one-half mile north of the Site, which has an average flow of nine cubic feet per second (cfs). Mill Creek receives run-off water via the municipal storm drain system and discharges into the wetlands of the Farmington Bay Waterfowl Management Area and the Great Salt Lake. The wetland area at the Farmington Bay Waterfowl Management Area is located approximately three miles downgradient of the Site and is the largest downstream wetlands area. There are approximately 12,000 acres of open water and 5,000 acres of marsh at the Farmington Bay Waterfowl Management Area (UDEQ, 1999).

3.0 REGIONAL GEOLOGY AND HYDROGEOLOGY

The geology and hydrogeology of the Bountiful sub area of the East Shore Area and the surrounding area have been discussed in a number of reports (e.g., Thomas and Nelson, 1948; Feth et al., 1966; Bolke and Waddell, 1972; Clark et, al., 1990; Anderson et. al., 1994). These reports and the data collected in previous investigations within the Five Points PCE plume area were used to compile this section. Previous investigations in the Five Points area include:

- Woods Cross City Monitoring of the Municipal Drinking Water Wells WC #1 and WC #2 (1989 – ongoing)
- Innovative Assessment / Analytical Results Report for the Site (1998-1999) Utah Department of Environmental Quality (UDEQ, 1998; UDEQ, 1999)
- Removal Assessment (1999 and 2003) EPA and their Superfund Technical Assessment Response Team (START) (UOS, 2000: UOS, 2003)
- Monitoring Well Installation / Site Inspection Analytical Results Report (UDEQ, 2006)
- Removal Action Report (ERM, 2007)

The East Shore Area lies within an elongate graben bounded by normal faulting along the Wasatch Fault zone to the east and an undefined fault zone near the shore of the Great Salt Lake to the west (Clark et al., 1990). Unconsolidated and semi-consolidated basin fill materials make up the majority of the subsurface. The basin fill material is composed of coarse grained alluvial and delta deposits near the Wasatch Mountains. Moving west from the mountains, the deposits become interbedded gravels, sands, and clays with fine-grained lacustrine deposits predominating near the Great Salt Lake (Clark. et al., 1990).

3.1 Site-Specific Geology and Hydrogeology

The geology and hydrogeology specifically associated with the Five Points PCE Plume area discussed in this section are the result of a review of subsurface soil direct-push boring logs, monitoring well boring logs, drinking water well boring logs, groundwater level data, and analytical results from environmental sampling at the site.

3.1.1 Near-Surface Soils

The suspected source area, the YVC dry cleaning business, and immediate surroundings are developed and covered with asphalt, concrete, and vegetated cover due to construction of roads, utilities, commercial buildings, and landscaping. Near-surface soils have been investigated and described using hand augers, backhoes, and direct-push drill rigs during soil sampling efforts in 1999, 2004, 2007, and 2010. Locations of near-surface soil sampling at the YVC location are shown on **Figure 3**. Boring logs from the April 2010 source area investigation of the YVC property are summarized on **Figure 4** as part of a conceptual, source area, subsurface, cross section. As shown on the cross section, up to 4 feet of fill material overlies native soils in the YVC area. Native soils are predominantly sandy clays and/or silty clays extending to depths of between 15 and 19 feet bgs. Ferric oxide stringers have been observed in several clayey cores, which may indicate that the clay dries out periodically and may provide vertical migration pathways (UOS, 2000). At depths greater than 19 feet bgs sandy gravels and gravelly sands are found. These sandy gravels present difficult drilling conditions, and many of the borings advanced in the area underlying the source area do not extend to depths much greater than 20 feet.

Similar near-surface soils were observed at distal locations to the Your Valet Cleaners site during drilling of downgradient monitoring wells. At a distance of approximately 200 feet to the northwest (MW-101) fill material was found to a depth of 7.5 feet bgs, where silty clays were then observed. A conceptual, cross section along the length of the Five Points PCE Plume is presented as **Figure 5**.

3.1.3 Deeper Subsurface Soils

The vadose zone underlying the Five Points Area is primarily composed of well graded (poorly sorted) alluvial sediments composed of sandy and gravelly cobbles, interbedded with occasional intervals of gravelly and cobbley clays and silts. The finer-grained sediments (clays and silts) that are interbedded with sand, gravels and cobbles are assumed to have been deposited during higher stands of Lake Bonneville. Boring logs from MW-101, WC Well #1, MW-103, and MW-1 are summarized as part of the cross section shown as **Figure 5**. In general fine grained sediments observed during the drilling appear to have been reworked by wave action in the former Lake Bonneville, resulting in gravels and cobbles in the clays. A significant clayey interval was observed in the MW-101 boring from approximately 36 to 40 feet bgs. This cobbley clay interval was dominated by fine grained silts and clays, appeared to be matrix supported, and was moist where intervals above and below were dry. This cobbley clay may act as a barrier to vertical subsurface flow. Similar finer grained intervals were encountered in MW-101

at depths of 96 to 97 feet bgs in the vadose zone and at depth of 155 to 160 and 209 to 211 feet bgs in the saturated interval.

Further from the source area in downgradient portions of the Five Points PCE plume, the subsurface is composed of sands and gravels with greater proportions of fine grained silts and clays. The borings from MW-102 and MW-103 were primarily composed of sandy gravels and gravelly sands interbedded with clayey intervals. The top 10 to 15 feet of the borings were dominantly clays which were underlain by coarser grained sediments. **Figure 6** presents a conceptual cross section across the western portion of the plume summarizing boring logs from MW-102, MW-103, MW-1 and MW-2.

A review of these conceptual cross sections shows that the subsurface is dominated by gravels and sands and is progressively finer grained in the western and southern directions. These gradations to finer grained sediments to the west and south is likely the result of increased distances from lacustrine, delta, and alluvial fan deposits coming from the Mill Creek Canyon and Meuler Park areas and larger areas associated with the former Lake Bonneville.

3.1.4 Depth to Groundwater

Based on groundwater grab samples collected during drilling (presented on **Figure 5** and **Figure 6**), the majority of contamination in the Five Points PCE plume appears to be at the top of the water table. The water table in the plume area varies in depth from approximately 160 feet bgs at the source area, to 100 feet bgs at distal locations near MW-1. In April 2010, during the drilling of MW-101, groundwater was first encountered in the borehole at 157 feet bgs. However, after well construction, the static water level in MW-101 rose to 143 feet bgs due to head pressure in the aquifer and suspected upward gradient. This suspected upward gradient combined with fine grained horizontal layers may prevent the plume from vertical migration. At western portions of the plume (MW-102, MW-03, MW1, and MW2) the depth to groundwater decreases as the topography slopes toward the west.

Groundwater elevations have reportedly declined throughout the Bountiful area as much as 50 feet between the late 1960s and the early 1990s (Clark et.al., 1990). Water level information collected as part of the previous investigations show that water levels have dropped at least 13 feet in Mall Well #1 from 1998 to 2006 when the water was no longer present in the well. Other Five Points monitoring wells that no longer are screened across the water table include the upgradient MW1 where water levels dropped at least 7.5 feet, MW-2 where water levels dropped at least 7 feet, Mall Well #2 where water levels

dropped at least 14 feet, and Mall Well #3 where water levels dropped at least 13 feet. Only the downgradient wells installed in 2004 (MW1 and MW2) were still screened across the water table at the beginning of 2010.

It appears that the decline in water table elevations in the area are the result of groundwater pumping at rates greater than the available recharge for culinary and irrigation purposes. Because the water table elevation has significantly declined over the recent past, wells MW-101, MW-102, and MW-103 were constructed using at least 20-foot long screened intervals.

Groundwater elevations measured in April and June, 2010 from monitoring wells installed in 2010 (MW-101, MW-102, MW-103) and the two monitoring wells installed in 2004 (MW1, and MW2) were used to create potentiometric surface maps presented as **Figure 7** and **Figure 8**, respectively. Because there is approximately 2000 feet between MW-101 located near the source area and the downgradient monitoring wells (MW-102, MW-103, MW1, and MW2) the contours shown on the potentiomentric surface map are equally spaced and are estimated. However, the overall flow direction is likely accurate.

Monitoring Well ID	Northing	Easting	Top of casing Elevation	Screened Interval (ft btoc)
MW-1	3478100.67	1531525.09	4356.20	82-112
MW-2	3477499.07	1531461.70	4358.66	95-115
MW-101	3478274.49	1533488.94	4401.53	155-185
MW-102	3479244.39	1532059.25	4363.90	115-135
MW-103	3478607.01	1531745.01	4359.97	105-125

3.1.2 Suspected Source Area

The YVC source area was investigated in 1999 and 2003 by UOS, in 2007 by Environmental Resource Management (ERM), and in 2010 by URS. During these investigations, direct push technology, excavation, and hand auger methods were employed. One underground storage tank was removed in 2007 as part of a removal action (ERM, 2007). PCE analytical results from soil sampling conducted as part of these source area investigations at the YVC property are summarized in tables on **Figure 3**.

As part of EPA Superfund Technical Assessment and Response Team sampling activities performed by UOS in 1999, the direct push drilling rig hit an obstruction at approximately 4 to 5 feet bgs at location DP-06 near the north west entrance of the YVC parking lot. The core interval was recovered "with liquid dripping from the core barrel". A colorless miscible cloudy liquid was collected using a bailer from this interval of retrieved core. The core interval had a photo ionization detector (PID) measurement of 2,000 parts per million (ppm) and a flame ionization detector (FID) measurement of 6%. Additionally, field notes detailing this boring indicate that a sweet solvent odor was observed (OUS, 2000). Analytical results from this product sample resulted in the detections of acetone and methyl ethy ketone but PCE was not detected above the reporting limit (OUS, 2000).

During trenching and excavation activities performed by ERM in 2007, the sewer line emanating form the YVC building was encountered at a depth of 4 feet bgs (ERM, 2007). This sewer line was exposed by a backhoe at location T5-CB approximately 5 feet from the northeast corner of the YVC building. Subsurface soil samples were collected adjacent to the sewer line and resulted in the detection of PCE at a concentration of 1,800 micrograms per kilogram (µg/kg) (ERM, 2007).

As part of direct-push investigations performed in 2010 by URS, the YVC sewer line was targeted as part of the effort to define the source area, and the extent of soil contamination. The sewer line was encountered with a hand auger and the top of the pipe was punctured while attempting to remove cobles from the auger hole. A backhoe was used to excavate the area where the sewer pipe broke and repairs were made. Subsurface soils underlying the sewer pipe were collected for analysis from the excavation at a southern point, the mid-point and northern point of the exposed sewer line. Analytical results from these excavation samples were 160, 150 and 85 µg/kg for the southern point, the mid-point and the northern point, respectively. It appears that the location of the URS excavation was further to the north and downpipe from the ERM 2007 excavation (**Figure 3**).

3.1.5 Aquifer Characteristics

Groundwater underlying the Five Points area exists within the southern portion of the "East Shore Aquifer" first described by Thomas and Nelson (1948). The East Shore Aquifer system is confined to the west and unconfined to the east and along the mountain front. Consolidated rocks in the mountains contain groundwater, but they are considered to be only a source of recharge to the East Shore Aquifer system (Anderson et al., 1994). The shallow aquifer has been described as being 60 to 250 feet bgs. The intermediate

aquifer is described as being 250 to 500 feet bgs. There has been little work in defining the boundaries between the aquifers since there are no substantial lithologic differences or large vertical head differences (Clark et al., 1990). Clark et al., (1990) report that the groundwater flow direction is generally towards the Great Salt Lake in a west northwest direction.

Clark et al., (1990) report that the shallow, intermediate, and deeper aquifers are hydraulically connected with one another in the Bountiful region. Observations from the monitoring well drilling in 2010 appear to confirm that the shallow and intermediate aquifers are in communication. The primary recharge area is located near the mountain front to the east, where soils are predominantly composed of permeable sands and gravel associated with stream outwash areas and alluvial fan deposits.

The shallow and deep aquifers most likely grade into a single aquifer in the recharge area located approximately one mile east of the site (Clark et al., 1990). The well logs from the monitoring wells installed at the Five Points PCE Plume site indicate that soils are mostly sand, silt, and gravel with a little clay.

3.1.5 Groundwater Flow Direction and Horizontal Hydraulic Gradient

The monitoring wells installed in 2010 (MW-101, MW-102, and MW-103) and the monitoring wells installed in 2004 (MW1 and MW2) were surveyed in June 2010 to determine their horizontal coordinates and vertical elevations. These data were used in combination with measured water levels to calculate the direction of groundwater flow and horizontal hydraulic gradients. As shown on **Figure 7** and **Figure 8,** groundwater flow directions based on water level measurements in April and June 2010 are to the southwest. This southwestern flow direction is not in agreement with the overall flow direction reported for the Bountiful sub area of the East Shore Area or the local groundwater flow directions calculated at the nearby Intermountain Waste Oil site to the northwest of the Five Points Area. Water level data from April 2010 has a flow direction of approximately 249º from north, and water level measurements from June 2010 resulted in a flow direction of 252º from north.

A horizontal hydraulic gradient of 0.026 ft/ft was calculated based on data presented in the Innovative Assessment / Analytical Results Report (UDEQ, 1999). This relatively steep gradient was calculated from wells in the source area which are currently dry. Water level data collected in April and June 2010 result in a much less steep gradient of 0.001 ft/ft across approximately 2000 feet of the Five Points PCE plume.

3.1.6 Vertical Hydraulic Gradient

As part of the monitoring well installation (MW-101, MW-102, and MW-103) conducted in March 2010, groundwater grab samples and depth to groundwater measurements were collected. Samples and measurements were collected in order to appropriately screen the wells (across the most impacted portion of the aquifer) and to determine relative vertical hydraulic gradients. Relative hydraulic gradients were estimated by dividing the difference in water level by the difference in mid-point of the water column. Although helpful, these vertical gradients may not be completely accurate because water levels may not have equilibrated at the time of measurement. **Table 1** lists PCE analytical results, and water level measurements from this sampling. The point used to measure depth to water levels was an immobile part of the drilling platform. A review of Table 1 shows that an upward vertical gradient exists across the first (155-165 feet below the drilling platform) and second (165-185 feet below the drilling platform) sampled intervals of the aquifer. The boring log from MW-101 shows that the aquifer near the source area is confined by a gravelly clayey sand (having approximately 35% clay).

Table 1
Groundwater Grab Samples Collected During Drilling

Monitoring Well Location	Date of Measurement	Depth of water column from ground surface (ft)	Depth to water from drilling platform (ft)	Gradient from previous sample	Upward or downward gradient from previous sample	PCE Concentration µg/L
MW-101	3/10/2010	155-165	165.30	NA	NA	56
		165-185	153.06	1.22	upward	12
		185-194	156.22	-0.16	downward	5.6
		195-205	156.32	-0.01	downward	3.3
		205-225	155.12	0.08	upward	1.9
MW-102	3/16/2010	105-125	115.30	NA	NA	0.13J
		125-145	116.90	-0.08	downward	ND
		145-165	118.35	-0.07	downward	ND
MW-103	3/19/2010	95-115	111.30	NA	NA	0.14J
		117-135	112.25	-0.04	downward	0.099J
		135-155	113.50	-0.07	downward	ND

3.1.6 Horizontal Extent of PCE Impacts

Available analytical data have been used to estimate the horizontal extent of the PCE impacts through various snapshots in the recent past. The plume map shown on **Figure 9** represents the estimated horizontal extent of the PCE impacts in September 1998. **Figure 10**, **Figure 11**, and **Figure 12** represent estimated extents of the PCE plume in November 1999, September 2006 and April 2010, respectively. Because the low flow sample result from MW-101 for PCE was non-detect, the April 2010 plume was contoured using the analytical results from the groundwater grab sample from MW-101. The bailer, groundwater grab, and low flow sample results for MW-101 collected in the spring of 2010 are all shown on **Figure 12**.

Vertical delineation of PCE stratification at MW-101 resulted for grab sampling during well drilling. Additional HoweDifferent sample techniques were employed samples collected from MW-101

A review of these plume dimension figures shows that the horizontal extent of the plume has retracted. This plume size reduction is surprising based on the fate and transport parameters of PCE. However, because WC Well #1 and WC Well #2 have both been taken out of service and have not been pumped regularly, groundwater velocities may have significantly decreased. Water table drawdowns associated with WC Well #1 and WC Well #2 pumping have been allowed to rebound, presumably by uncontaminated groundwater. Therefore, the plume size reduction shown between the September 2006 and April 2010 is understandable. WC Well #1 has been inactive since PCE was detected in February 1999 at a concentration of 16.4 µg/L and taken out of service (UDEQ, 2006). Additionally, a Woods Cross City Water representative has notified URS that WC Well #2 has been inoperable since the beginning of 2008 due to an inoperable pump (Conversation with Scott Anderson of Woods Cross City Water).

3.1.6 Vertical Extent of PCE Impacts

Groundwater grab samples collected during drilling, show that the Five Points PCE plume is primarily confined to the upper portion of the aquifer at the water table (**Figure 5** and **Table 1**). Groundwater grab samples were collected and analyzed overnight to screen the wells across the most impacted portion of the aquifer. These screening level results all show that the PCE concentrations rapidly decrease with depth. Measured concentrations of PCE in the plume are not high enough to significantly increase the density of the contaminated groundwater. Therefore, the plume is not inclined to dive based on density differences alone. The upward vertical gradient estimated during groundwater grab sampling near the source area (MW-101), combined with lower

permeability silt and clay layers, have likely prevented downward vertical migration of the plume.

4.0 PROPOSED ACTION

Because the Five Points Area has scant historical data and incomplete information due to declining water table elevations, additional sampling of the five existing monitoring wells is recommended. This sampling event will confirm the concentrations at monitoring wells that reported non-detect values for PCE (MW-101, MW-102, and MW-103) during the April 2010 sampling event. Hydrasleeves could be employed to reduce costs and define the plume stratification in the well column of MW-101. Due to difficulties collecting groundwater at the Five Points area, and because only one round of low-flow sampling has been conducted at the site, the transition to Hydrasleeve sampling would only slightly disrupt intra-well sample comparability.

Although a source area well may provide valuable information, a better assessment of the actual source area and the potentiometric surface is required prior to installation. Therefore, at this time it is not recommended to install a source area well at the YVC location. Alternatively, two (and possibly three) monitoring wells are recommended in the central and southern portions of the plume. These monitoring wells would delineate the southern edge of the plume and provide a better understanding of the potentiometric surface and groundwater flow direction underlying the Site. These wells can also provide more complete assessment of the hydraulic gradient near the source area. A monitoring well location upgradient of WC Well #1 would also act as a sentinel to determine if and when culinary water could be drawn from the well. Potential locations for additional monitoring wells are shown on **Figure 13**.

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Source Aerial Photograph : USDA, National Agricultural Imagery Progam (2006)

Municipal Well

Site

Notes:
- Intermountain Waste Oil site proposed to be added to NPL in 1999 for PCE, 1,1-DCA, and TCA groundwater contamination (UOS, 2003).
- The Klean Machine operated from 1969-1989 and the Golden Hanger operated from 1986-1988.
- Your Valley Cleaners is still operating. PCE was used in operation from 1964-2002 (UDEQ, 2006).

Vicinity & Site Location Map

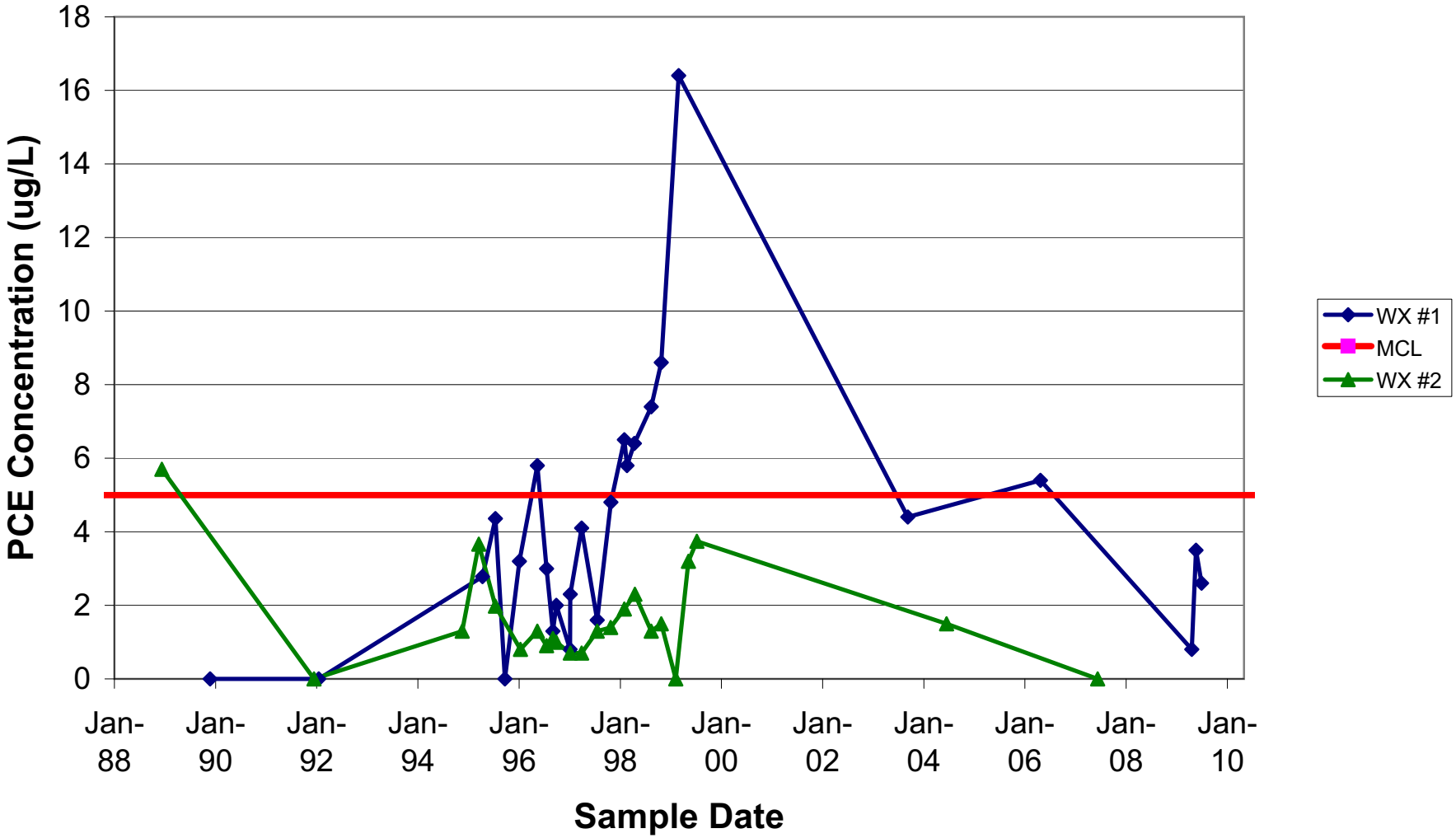
Five Points PCE Plume
Conceptual Site Model
Davis County, Utah

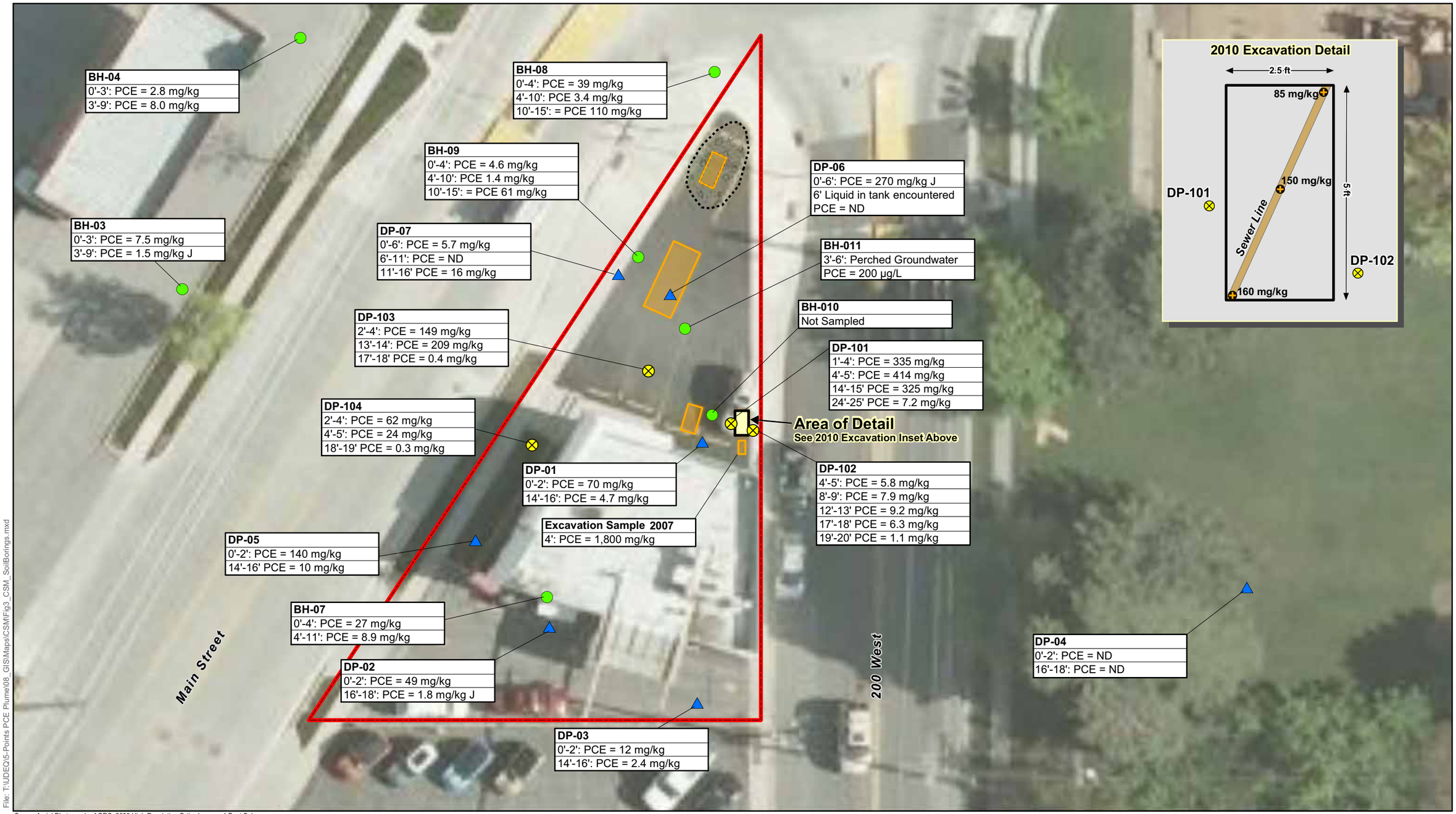
Utah Department of Environmental Quality
Division of Environmental Response and Remediation

URS

Figure 1

Figure 2
PCE Concentrations in Woods Cross Well #1 and Well #2





Source Aerial Photograph : AGRC; 2009 High Resolution Ortho-Imagery 1 Foot Color

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\CSM\Fig3_CSM_SoilBorings.mxd

- Geoprobe Sample Location - July 2003
- Geoprobe Sample Location - November 1999
- Geoprobe Sample Location
- Site
- Debris Field
- 2010 Excavation
- Historic Trench Locations

Notes:
- Samples from DP-01 to DP-07 collected in Nov 1999 (UDEQ, 2000), samples from BH-01 to BH-11 and BP-SO-01C to BP-SO-06C collected in July 2003 (UOS, 2003), historic excavations were dug in 2007 (ERM, 2007)
- Borings BP-SO-01C through BP-SO-06C were composite samples from excavation from locations depicted.
- J - Estimated
- ND - Non detect

N W E S

0 10 20 30 Feet

Soil Boring Locations and Known Soil Boring Data

Five Points PCE Plume Conceptual Site Model Davis County, Utah

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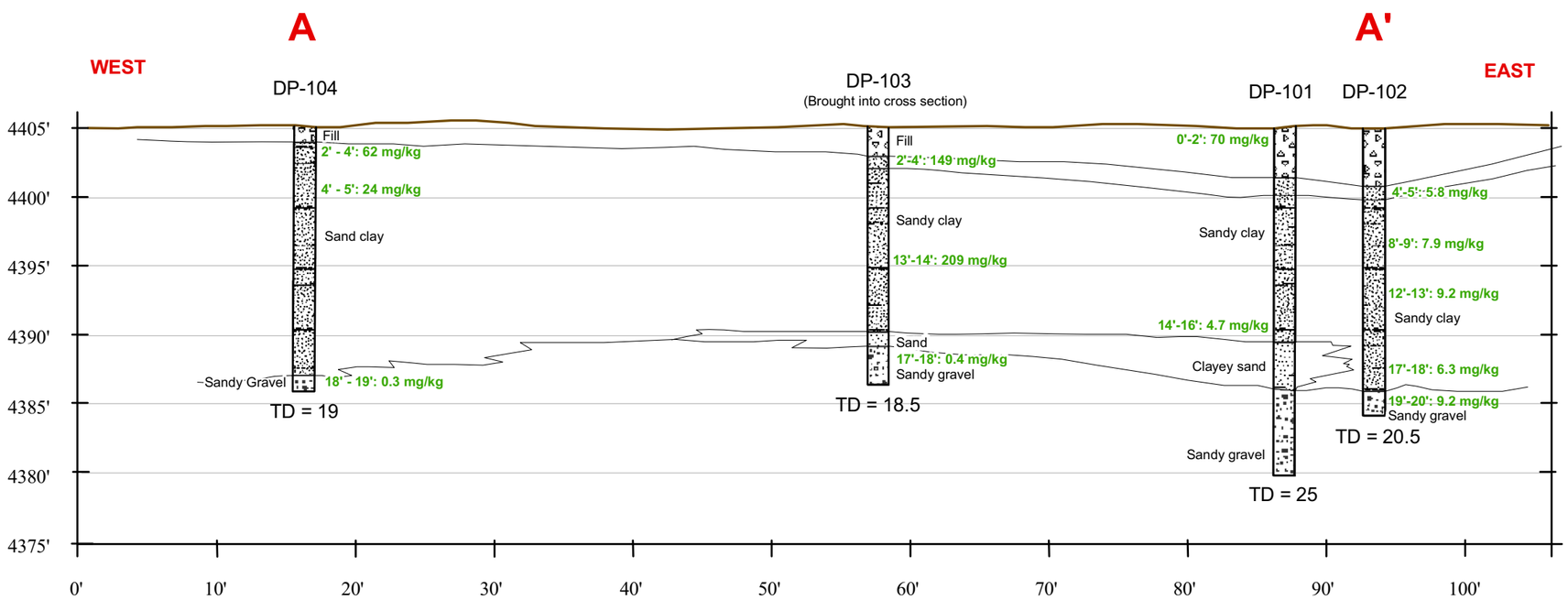
Figure 3



	Monitoring Well
5.6 µg/L	Screening Level PCE Concentration collected during drilling (mg/kg)
	Depth to Groundwater
A A'	Cross Section
	Clay
	Sand
	Gravel
	Site

Note:
J - value is estimated
mg/kg - milligrams per kilogram

5 0 5 10 Feet

Conceptual Cross Section
A - A'
June 2010

Five Points PCE Plume
Conceptual Site Model
Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

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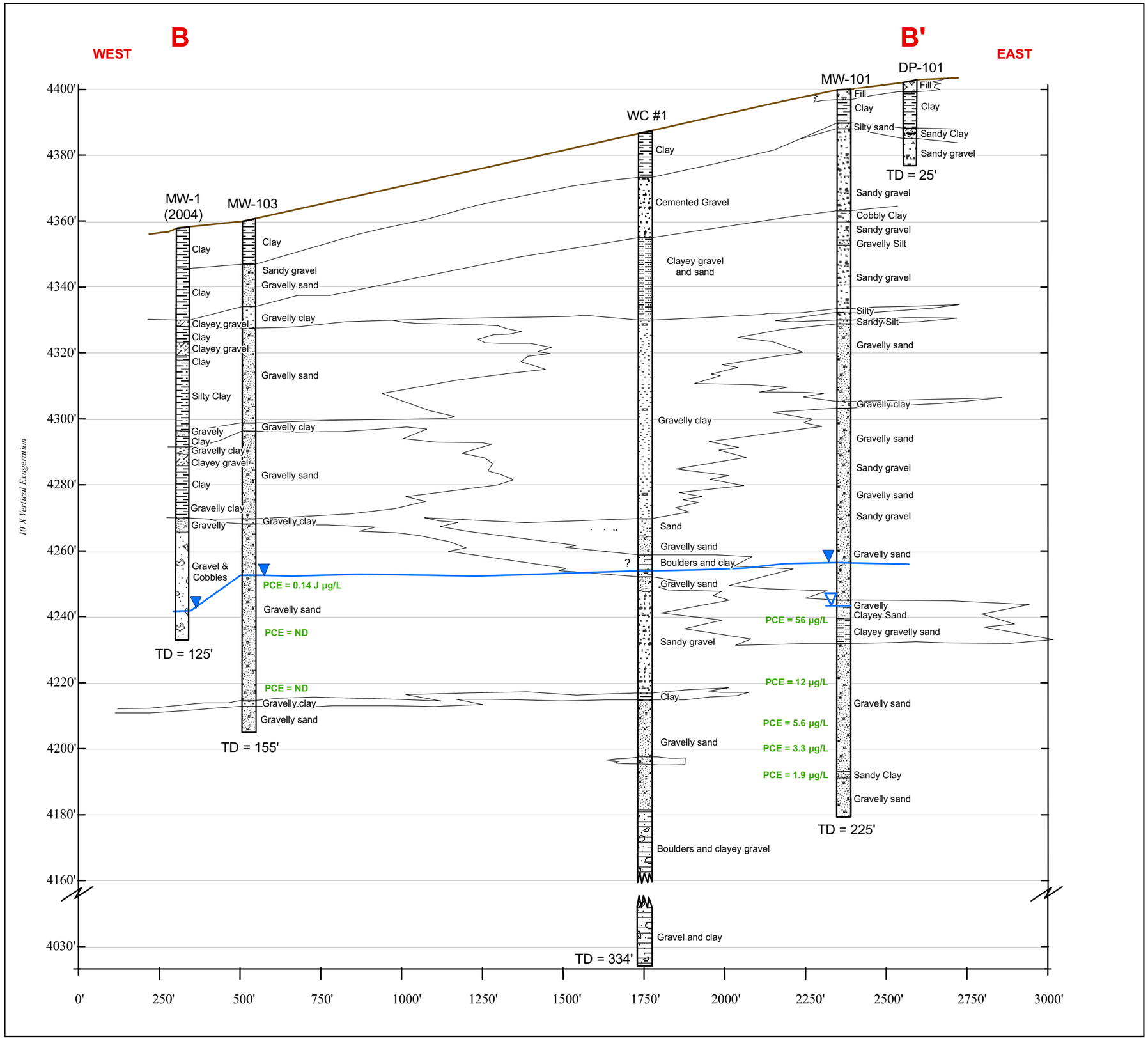
Figure 4

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\CSM\Fig4_A-A_X-section.mxd



Source Aerial Photograph : AGRC, 2009 High Resolution Ortho-Imagery 1 Foot Color

	Monitoring Well
5.6 µg/L	Screening Level PCE Concentration collected during drilling (mg/kg)
	Depth to Groundwater
	Depth to Groundwater encountered during drilling
B B'	Cross Section
	Clay
	Sand
	Gravel

Note:
At the date of figure production all elevations were approximate
J - value is estimated
mg/kg - milligrams per kilogram

150 0 150 300 Feet

Conceptual Cross Section
B - B'
June 2010

Five Points PCE Plume
Conceptual Site Model
Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

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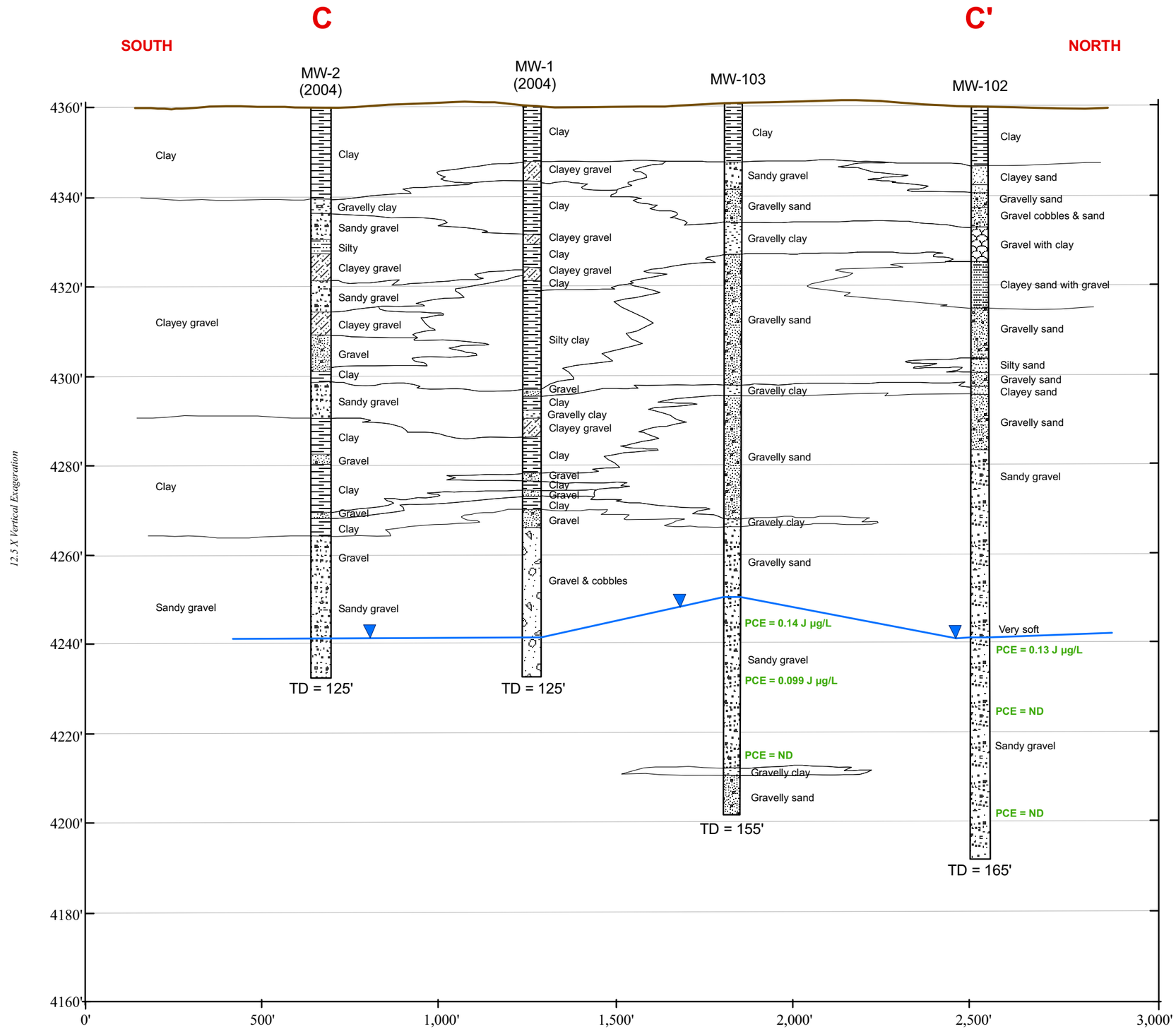
Figure 5

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\CSM\Fig1_X-section.mxd



Source Aerial Photograph : AGRC, 2009 High Resolution Ortho-Imagery 1 Foot Color

Monitoring Well

5.6 µg/L — Screening Level PCE Concentration collected during drilling (µg/L)

Depth to Groundwater

C C' — Cross Section

Clay

Sand

Gravel

Note:
J - value is estimated
µg/L - milligrams per liter

150 0 150 300 Feet

Conceptual Cross Section
C - C'
June 2010

Five Points PCE Plume
Conceptual Site Model
Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

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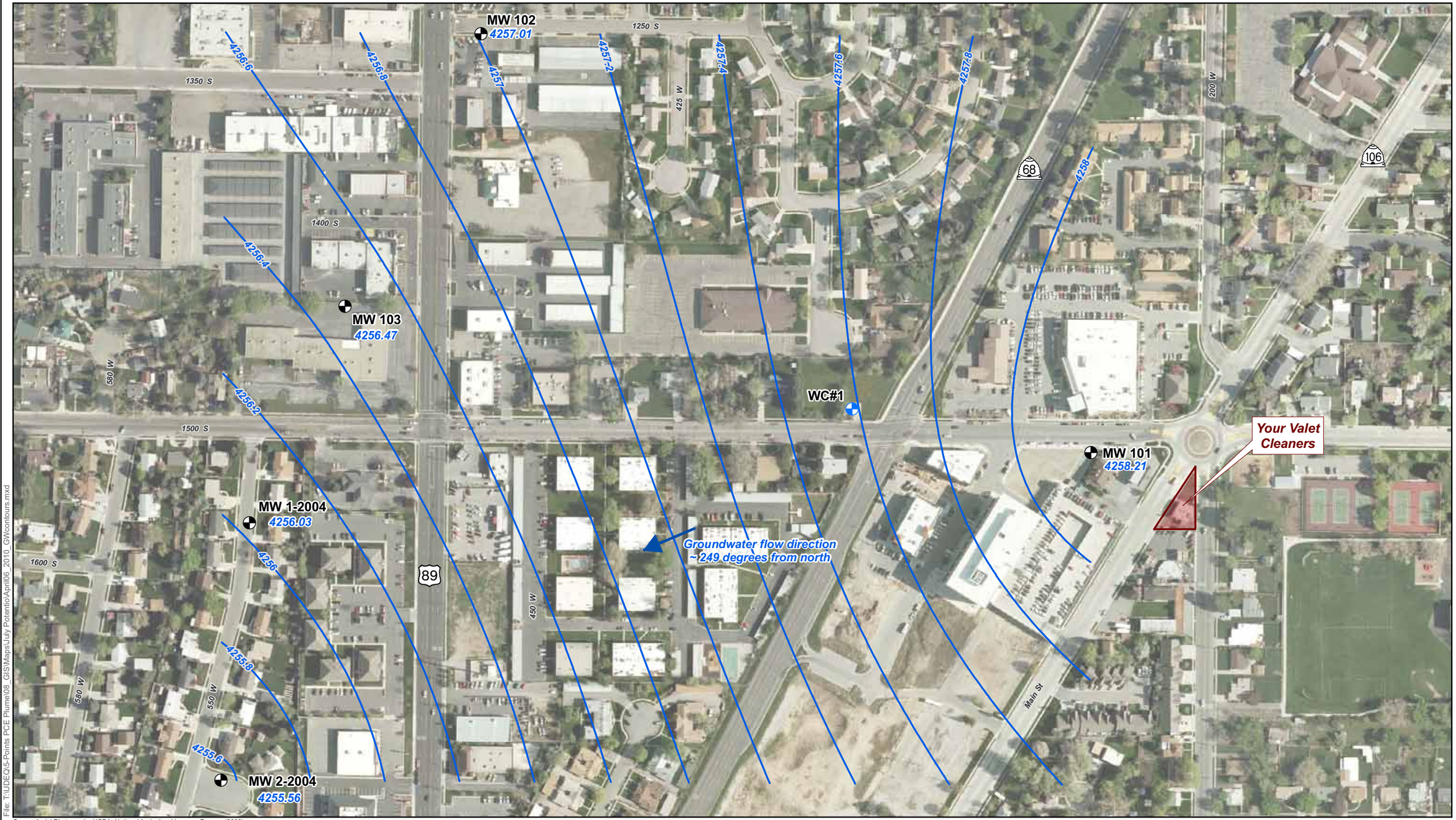
Figure 6

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\CSM\Fig_B-B_X-section.mxd



File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\July Potentio\April06_2010_GWcontours.mxd

Source Aerial Photograph : USDA, National Agricultural Imagery Progam (2009)

Monitoring Well

4256 — Groundwater Elevation Contour (feet above mean sea level)

Groundwater Flow Direction

Your Valet Cleaners Site

N W E S

0 110 220 330 Feet

Potentiometric Surface Map
April 2010

Five Points PCE Plume
Conceptual Site Model
Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

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Figure 7

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\June Potentio\June2010_GWcontours.mxd

Source Aerial Photograph : USDA, National Agricultural Imagery Progam (2009)

Monitoring Well

–4256– Groundwater Elevation Contour (feet above mean sea level)

Groundwater Flow Direction

Your Valet Cleaners Site

N W E S

0 110 220 330 Feet

Potentiometric Surface Map
June 2010

Five Points PCE Plume
Conceptual Site Model
Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

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Figure 8

September 1998 PCE Plume

WC#2 (1999) (1.3 ug/L)

WC#1 (1998) (8.6 ug/L)

MW2-1998 (190 ug/L)

Mall Well #2 (63.7 ug/L)

Mall Well #1 (310 ug/L)

MW1 - 1998 (ND)

Mall Well #3 (ND)

Your Valet Cleaners

200 ug/L

100 ug/L

50 ug/L

5 ug/L

1100 S
1200 S
1300 S
1400 S
1350 S
1150 S
1250 S
1050 S
1500 S
1600 S
1700 S
1900 S
1880 S
760 W
675 W
600 W
580 W
720 W
700 W
625 W
550 W
450 W
440 W
425 W
400 W
350 W
300 W
250 W
200 W
Main St
15
89
68
106

Source Aerial Photograph : USDA, National Agricultural Imagery Progam (2009)

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\CSM\Fig9_CSM_Sep1998_GW-Data.mxd

Municipal Well

Monitoring Well

PCE Contour (Dashed where inferred)

Site

PCE Concentrations (ug/L)

- 5 ug/L
- 50 ug/L
- 100 ug/L
- 200 ug/L

Notes:
- Plume estimated from Woods Cross sampling data (1996 and 1998) and UDEQ, 1999
- PCE - Tetrachloroethene
- ug/L - micrograms per liter
- (ND) - Non-Detect

N W E S

0 160 320 480 Feet

Conceptual Assesment of Plume Dimentions and Concentration September 1998

Five Points PCE Plume Conceptual Site Model Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

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Figure 9

November 1999
PCE Plume

WC#1
WC#2
(ND)
MW - 2 - 1998
(72 ug/L)
Mall Well #2
(100 ug/L)
Mall Well #1
(128.4 ug/L)
MW1 - 1998
(0.34 ug/L)
Mall Well #3
(4.4 ug/L)
Your Valet
Cleaners
100 ug/L
50 ug/L
5 ug/L

1100 S
1200 S
1300 S
1400 S
1500 S
1600 S
1700 S
1900 S
1880 S
1150 S
1250 S
1350 S
1050 S
760 W
675 W
600 W
580 W
720 W
700 W
625 W
580 W
550 W
450 W
440 W
425 W
400 W
350 W
300 W
250 W
200 W
Main St
15
89
68
106

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\CSM\Fig4_CSM_Nov1999_GW-Data.mxd

Source Aerial Photograph : USDA, National Agricultural Imagery Progam (2009)

Municipal Well

Monitoring Well

PCE Contour (Dashed where inferred)

Site

PCE Concentrations (ug/L)

- 5 ug/L
- 50 ug/L
- 100 ug/L
- 200 ug/L

N
W E
S

0 160 320 480
Feet

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\CSM\Fig10_CSM_Nov1999_GW-Data.mxd

Conceptual Assesment of Plume Dimentions and Concentration November 1999

Five Points PCE Plume Conceptual Site Model Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

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Figure 10

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\CSM\Fig5_CSM_Sep2006_GW-Data.mxd

Source Aerial Photograph : USDA, National Agricultural Imagery Progam (2009)

Municipal Well

Monitoring Well

PCE Contour (Dashed where inferred)

Site

PCE Concentrations (ug/L)

- *5 ug/L*
- *50 ug/L*
- *100 ug/L*

Notes:
- Plume estimated from UDEQ, 2006 and Woods Cross sampling data
- PCE - Tetrachloroethene
- ug/L - micrograms per liter

N W E S

0 160 320 480 Feet

Conceptual Assesment of Plume Dimentions and Concentration September 2006

Five Points PCE Plume Conceptual Site Model Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

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Figure 11

April 2010
PCE Plume

MW - 102
(ND)

MW - 103
(ND)

WC#1

WC#2

MW - 101
(56 ug/L grab,
7 ug/L bailer,
ND low flow)

100 ug/L

50 ug/L

5 ug/L

Your Valet
Cleaners

MW1 - 2004
(2.6 ug/L)

MW2 - 2004
(0.31 ug/L)

1150 S
1250 S
1350 S
1400 S
1500 S
1600 S
1700 S
1880 S
1900 S
1875 S
1200 S
1300 S
760 W
675 W
600 W
580 W
550 W
525 W
625 W
720 W
700 W
425 W
400 W
350 W
300 W
200 W
450 W
440 W
250 W
Main St
15
89
68
106

File: T:\UDEQ\5-Points PCE Plume\08_GIS\Maps\SAP\TimeSeries_GW\data\Fig2-1_2010_GW-Data.mxd

Source Aerial Photograph : USDA, National Agricultural Imagery Progam (2009)

Municipal Well

Monitoring Well

PCE Contour (Dashed where inferred)

Site

PCE Concentrations (ug/L)

- *5 ug/L*
- *50 ug/L*
- *100 ug/L*

Notes:
- Plume estimated from URS sampling in April 2010 and grab sampling conducted during drilling
- PCE - Tetrachloroethene
- ug/L - micrograms per liter
- (ND) - Non-Detect

N
W E
S

0 160 320 480
Feet

Conceptual Assesment of Plume Dimentions and Concentration April 2010

Five Points PCE Plume Conceptual Site Model Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

URS

Figure 12

Municipal Well

Monitoring Well

Potential Additional Monitoring Well

Site

PCE Contour (Dashed where inferred)

–4256– Groundwater Elevation Contour (feet above mean sea level)

PCE Concentrations (ug/L)

5 ug/L

50 ug/L

100 ug/L

N W E S

0 160 320 480 Feet

Conceptual Assesment of Plume Dimentions and Concentration Proposed Monitoring Well Locaitons

Five Points PCE Plume Conceptual Site Model Davis County, Utah

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

URS

Figure 13