Second Periodic Review
CENEX Supply & Marketing Inc. Rinsate

300 Division St. East, Quincy, Grant County
Facility Site ID No. 33599645, Cleanup Site ID No. 370

Toxics Cleanup Program, Eastern Region

Washington State Department of Ecology
Spokane, Washington

December 2022

Document Information

This document is available in the Department of Ecology's CENEX Supply & Marketing Inc. Rinsate document repository[1].

Related Information

- Cleanup site ID: 370
- Facility site ID: 33599645

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[1] https://apps.ecology.wa.gov/gsp/CleanupSiteDocuments.aspx?csid=370
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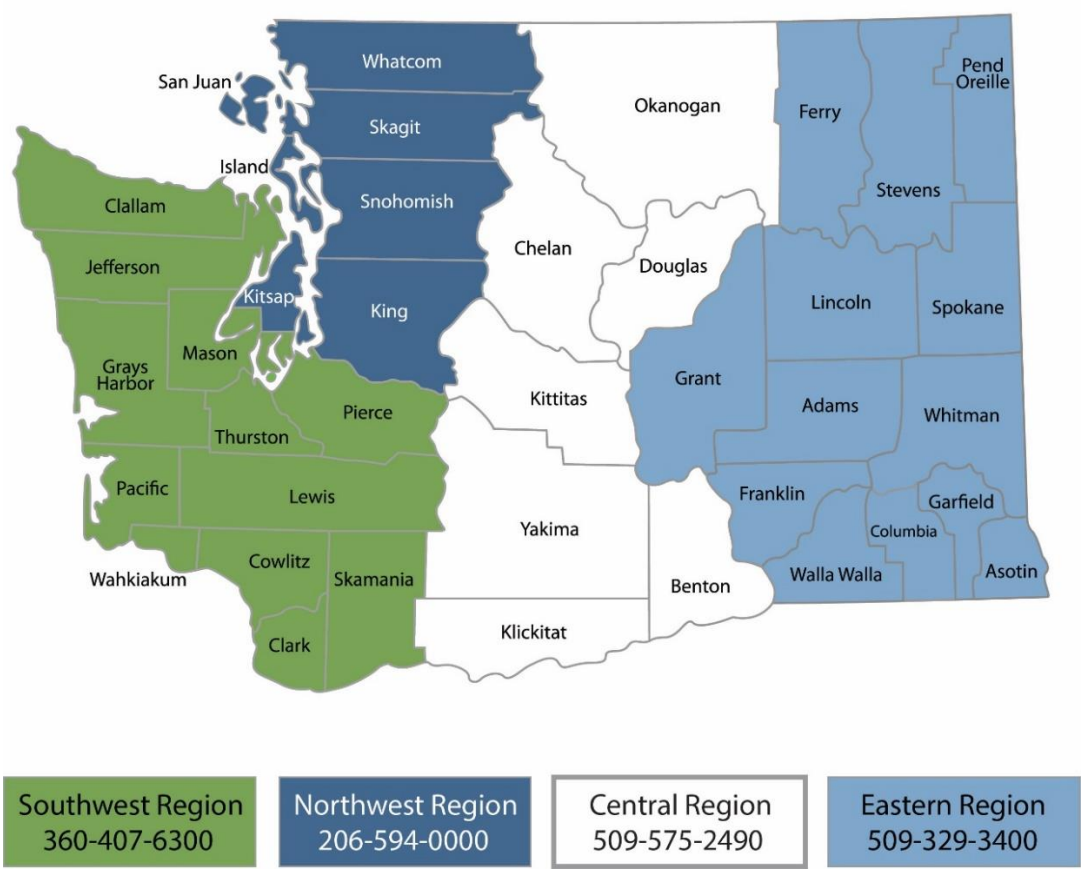
Department of Ecology's Regional Offices

Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	PO Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	PO Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	PO Box 46700 Olympia, WA 98504	360-407-6000

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Introduction

This report is the Washington State Department of Ecology's (Ecology) periodic review of the CENEX Supply & Marketing Inc. Rinsate site (Site) owned by CHS Inc., formerly CENEX Harvest States, in Quincy, Grant County. This review is required under the Model Toxics Control Act (MTCA), Chapter 70A.305D of the Revised Code of Washington (RCW). The purpose of the periodic review is to ensure that the cleanup remedy implemented at the Site remains protective of human health and the environment.

The cleanup remedy was implemented under Consent Decree No. DE-00TCPER-1815, dated February 22, 2001, between Ecology and CHS Inc. in compliance with the Cleanup Action Plan (CAP) (Ecology, 2001). The remedy is a groundwater microsparge (MS) system and a soil vapor extraction (SVE) system. Both systems have been operating since December 2001.

Groundwater compliance monitoring program (CMP) and performance air monitoring data and observations collected over an approximate eleven-year period (2010 through 2021) are summarized in this periodic review. Ecology completed the previous periodic review in 2009. The longer duration of this periodic review allowed CHS to implement recommended actions from the 2009 periodic review.

When evaluating whether human health and the environment continue to be protected, the following criteria under Washington Administrative Code (WAC) 173-340-420(4) are considered:

- The effectiveness of ongoing or completed cleanup actions;
- New scientific information for individual hazardous substances or mixtures present at the site;
- New applicable state and federal laws for hazardous substances present at the site;
- Current and projected site and resource uses;
- The availability and practicability of more permanent remedies; and
- The availability of improved analytical techniques to evaluate compliance with cleanup levels (CULs).

Ecology publishes notice of this periodic review in the *Site Register* and provides an opportunity for public comment. We will notify CHS of the results of this review.

Summary of Site Conditions

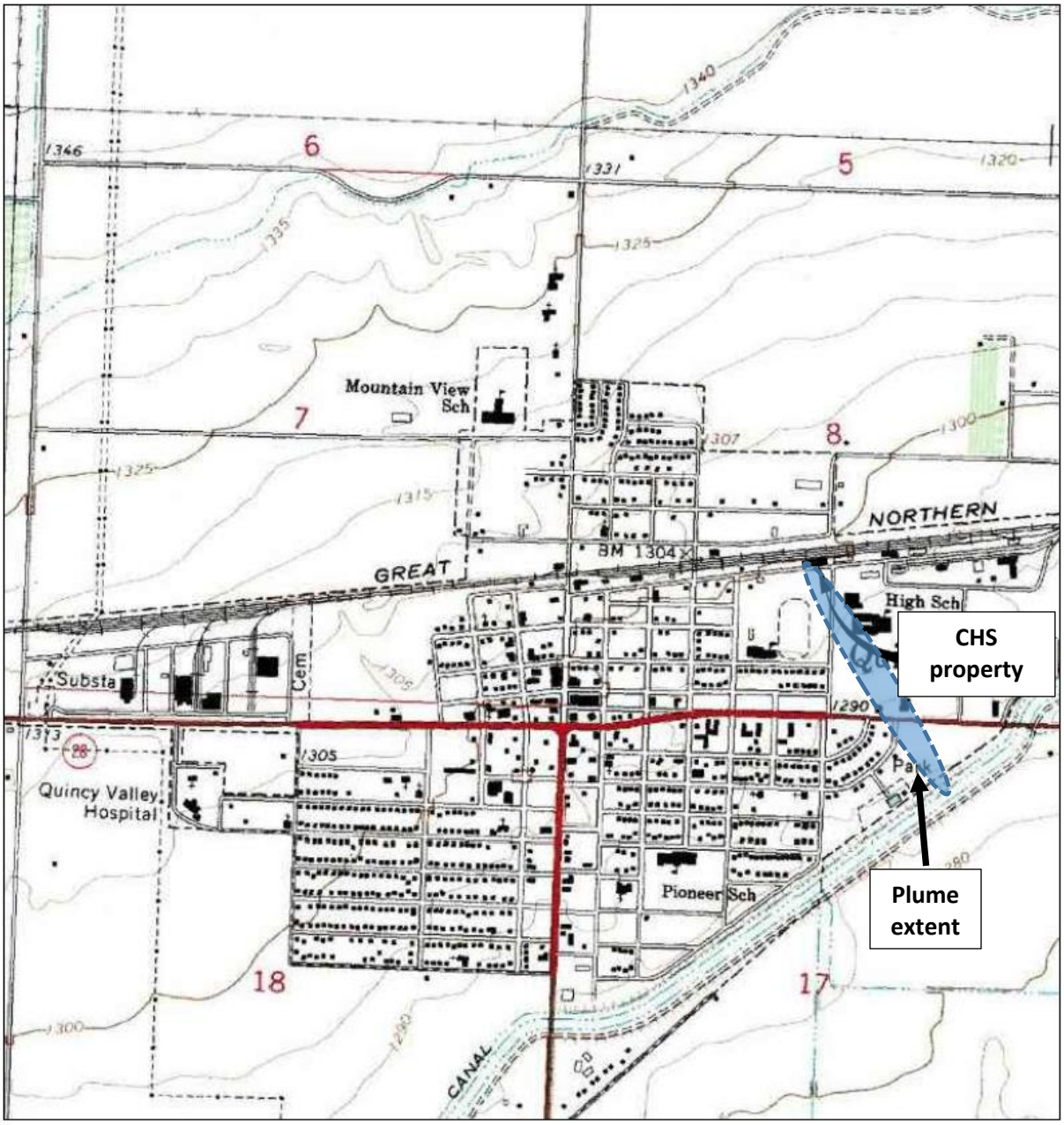
Site description

The CHS property includes a former rinsate pond and fumigant storage area (see figures 1 and 2). The former facilities are south of the BNSF Railway tracks on the north side of Division Street East, between 4th Avenue Southeast and 6th Avenue Southeast. CHS leased the property from BNSF Railway prior to purchase in 2004.

Figure 1 is a map showing the CHS property and groundwater contaminant plume that extends southeastward from the property. The CHS property and off-property areas with groundwater contamination sourced from the CHS property define the Site boundaries. The Site includes the CHS property along with commercial properties, a mobile home residential area, Quincy Middle School (formerly Quincy High School until spring 2019), City parkland, and the West Canal embankments and drainage ditch (Figure 2).

A mix of commercial and residential properties are north of the active BNSF railroad tracks. Properties immediately east and south of the CHS property are owned by Blakal Packaging Inc. An empty lot owned by the J.R. Simplot Company is west of the CHS property.

Figure 1. General location map



REFERENCE: 7.5 MINUTE USGS QUADRANGLE QUINCY, WASHINGTON. DATED 1966

Figure 2. Site location map (Farallon, 2019).

Site ownership and environmental covenants

The CHS property (source area) includes Grant County Parcel No. 040525053, which has an environmental covenant recorded. Contaminated groundwater extends from the CHS property southeast to near the West Canal drainage ditch. The Site includes the CHS property and all properties overlying the groundwater plume.

Table 1 lists property parcels where groundwater contamination originating from the CHS property likely is present. For several of these parcels, environmental covenants have not been filed.

Table 1. Site ownership, individual parcels

Grant Co. Parcel No.	Owner	Land Use	Environmental Covenant Recorded?
040525043	Blakal Packing Inc.	Commercial	Yes
040520000	Blakal Packing Inc.	Commercial	No
040481000	Blakal Packing Inc.	Commercial	No
040319000	Blakal Packing Inc.	Commercial	No
040320000	Blakal Packing Inc.	Commercial	No
040321000	Blakal Packing Inc.	Commercial	No
040322000	Blakal Packing Inc.	Commercial	No
040323000	Blakal Packing Inc.	Commercial	No
040463000	J.R. Simplot Co.	Commercial	Yes
040327000	School District #144	Track Field	Yes
040484000	School District #144	Car Parking	Yes
040090000	School District #144	Track Field	Yes
041209000	School District #144	Junior High School	Yes
041193000	School District #144	Bus Parking	Yes
041196000	School District #144	Bus Garage	Yes
040376001	David L. Graesch	Residential	No
151163000	City of Quincy	Park & Recreation	No

Site history

Western Farmers' Cooperative established a liquid fertilizer and soil fumigant storage facility on the property in 1974. CHS acquired the cooperative in 1982 and continued operations. Reportedly, a 2,000-gallon spill of the fumigant Telone occurred at the facility just prior to CHS assuming ownership.

CHS installed a concrete rinsate pad and concrete evaporation pond in 1986. Use of the pad and pond was discontinued in 1988. In 1990, the pond was emptied, and the residue applied to agricultural land. The pad and pond were dismantled and backfilled in place.

Facility operations ceased in 1991. CHS decontaminated and removed all fumigant aboveground storage tanks between 1994 and 1995. In 1997, rinsate pond soils and stockpiled

concrete were removed from the property, and the Site source area was covered with a six-inch layer of gravel (Ecology, 2001).

Site investigations

Ecology issued a dangerous waste compliance order (DE92HS-903) in April 1992 requiring CHS to develop a site assessment plan (SAP) for the former treatment pond and surrounding area. CHS submitted a SAP to Ecology in July 1992. The U.S. Environmental Protection Agency (EPA) conducted a limited site assessment of the former facility in May 1993, identifying elevated levels of several herbicides in soil near the former rinsate pad.

CHS implemented the SAP in June 1995. Work conducted under this compliance order included initial soil sampling, monitoring well installation, quarterly groundwater sampling, and removing impacted soils and concrete. Data collected from the SAP-directed investigations and monitoring events were compiled into a remedial investigation (RI) report and a supplement to the RI.

An RI was conducted in two parts, including an initial investigation by CHS and additional soil and groundwater investigations conducted by West Central Environmental Consultants (WCEC). The RI reports (WCEC, 1997a and 1997b) and associated feasibility study report (WCEC, 2000) summarize the nature and extent of contamination in soil, groundwater, and soil vapor.

Ecology and CHS entered into Agreed Order No. 98TC-E102 in 1998. Actions completed under the order included an MS/SVE pilot study, installing additional monitoring wells, and a draft feasibility study (WCEC, 2000).

Physical conditions

The Site is underlain by approximately 40 to 50 feet of generally fine- to medium-grained, sandy to silty soils. The soil unit is underlain by a thick sequence of layered basalt associated with the Columbia River Basalt Group.

A shallow alluvial groundwater aquifer has developed within the granular soils that overlie basalt bedrock. The alluvial aquifer is the primary groundwater unit monitored as part of the ongoing cleanup actions. Groundwater in the alluvial aquifer flows to the southeast at a rate of approximately 50 to 80 feet per year as shown in Figure A-3. Some groundwater from the alluvial aquifer discharges seasonally into a man-made drainage ditch that parallels the West Canal irrigation ditch (see figures A-2 and A-3). This drainage ditch is approximately 2,600 feet southeast of the CHS property. Seepage losses from the unlined West Canal locally and seasonally affect groundwater levels and flow direction in the alluvial aquifer.

Contaminant summary

The RI confirmed that former rinsate pond and fumigant storage area releases had contaminated shallow soils beneath the CHS property (source area). Shallow groundwater beneath and beyond the boundaries of the CHS property was found to be contaminated with several dissolved-phase volatile organic compounds (VOCs). Additional post-RI site investigation

work showed that groundwater contamination (plume) could be traced over 2,500 feet southeast of the CHS property to the edge of the West Canal (see figures A-4 and A-5).

Site cleanup

After the RI and feasibility study were final, Ecology and CHS entered into Consent Decree No. DE-00TCPER-1815. Ecology issued a final CAP in March 2001 that included:

- Asphalt capping of Site soils.
- MS and SVE systems to treat soil and groundwater near the former fumigant tank area, rinsate pad, and evaporation pond.
- Ongoing groundwater and soil vapor monitoring.
- Institutional controls.

Cleanup levels

Site CULs are developed for indicator hazardous substances (IHS) as defined in WAC 173-340-200 and established in accordance with WAC 173-340-703. IHS are established for primary risk-contributing chemicals in each medium of concern.

Ecology determined that two media at this Site are contaminated: soil and groundwater. We developed CULs for three soil contaminants and seven groundwater contaminants. The soil IHS are 1,2-dichloropropane (1,2-DCP), 1,1,2-trichloroethane (1,1,2-TCA), and 1,2,3-trichloropropane (1,2,3-TCP); groundwater IHSs are chloroform, 1,2-dibromoethane (EDB), 1,2-dichloroethane, 1,2-DCP, 1,1,2-TCA, 1,2,3-TCP, and vinyl chloride.

Shallow Site groundwater discharges to the West Canal drainage ditch. The West Canal is a man-made conveyance and surface water in the canal is not intended for any uses applied to naturally occurring surface water features. Further, this drainage ditch does not appear to be hydraulically connected to any natural surface water drainage systems in the area. Access to the West Canal is restricted by gates and fencing. As such, no CULs have been established for West Canal drainage ditch surface water. IHS concentrations in the drainage ditch must, however, meet the applicable groundwater CULs to protect shallow groundwater.

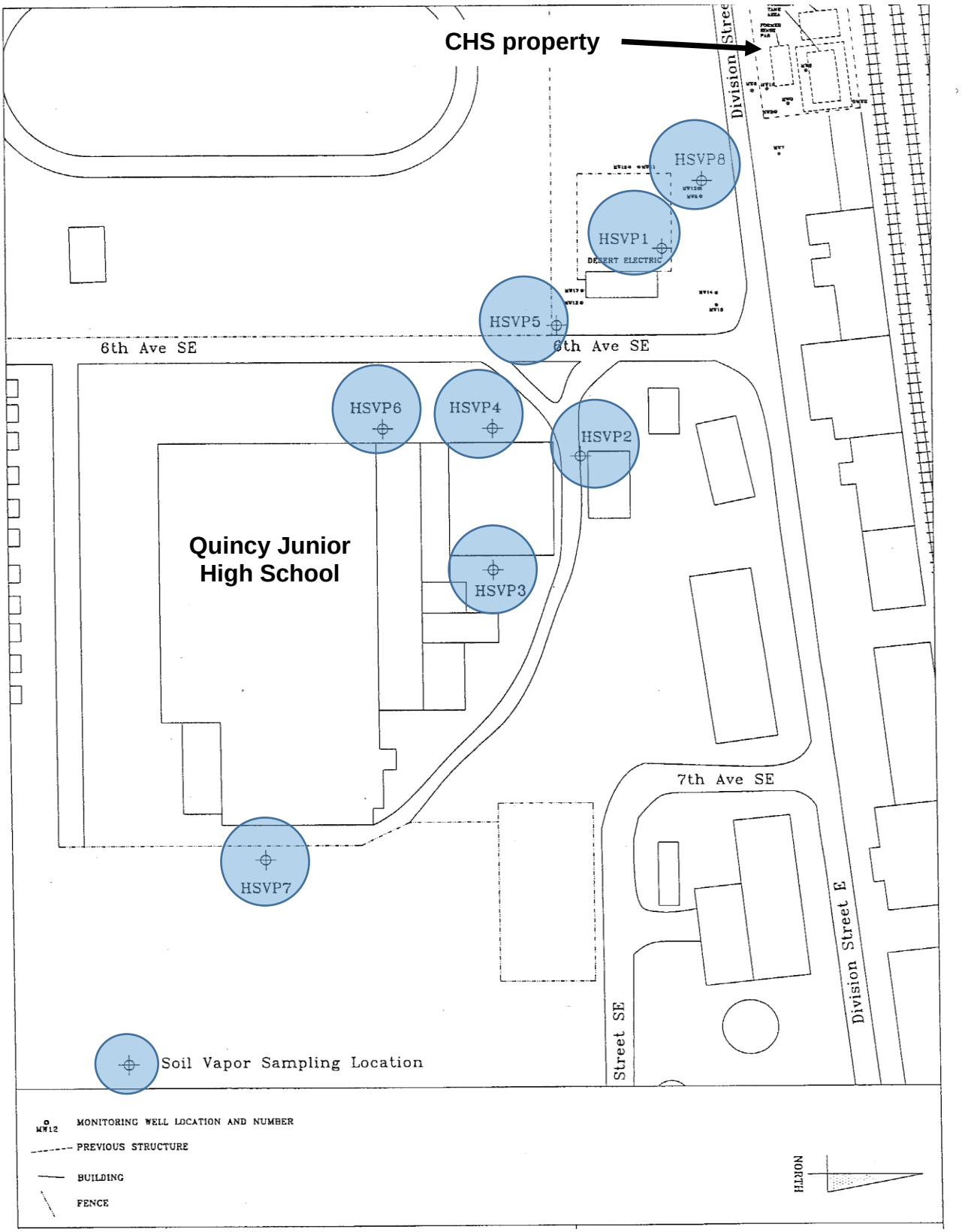


Figure 3. Soil vapor sampling locations (WCEC, 1998a)

The soil CULs are based on protection of groundwater, while the groundwater CULs are based on protection of drinking water (Table 2).

Table 2. Soil and groundwater cleanup levels

Indicator substance	Soil (mg/kg)	Groundwater (µg/l)
Chloroform	N/A	7.2 (Based on Method B)
1,2-Dibromoethane (EDB)	N/A	1.0 (Based on the PQL)
1,2-Dichloroethane	N/A	1.0 (Based on the PQL)
1,2-Dichloropropane	0.064 (Based on Method B)	1.0 (Based on the PQL)
1,1,2-Trichloroethane	0.076 (Based on Method B)	1.0 (Based on the PQL)
1,2,3-Trichloropropane	0.005 (Based on the PQL)	1.0 (Based on the PQL)
Vinyl chloride	N/A	1.0 (Based on the PQL)

mg/kg = milligrams per kilogram or parts per million
PQL = practical quantitation limit
µg/l = micrograms per liter or parts per billion

Restoration timeframe

Cleanup activities have been ongoing for 21 years. The CAP estimated a restoration timeframe of three years for soils and 10 years for groundwater. The 2009 periodic review indicated that site CULs would not be met by the end of the estimated 10-year cleanup and restoration period (2011). IHS concentrations in groundwater still exceed CULs in some monitoring wells. The vadose zone SVE and groundwater MS/SVE systems continue to capture low-level concentrations of vapor-phase IHS.

2009 periodic review

Key findings from the 2009 periodic review are below:

- Dissolved VOC concentrations in groundwater declined slowly in portions of the plume. The most notable reductions in contaminant concentrations in the source area occurred within the first few years of activating the groundwater and soil remediation systems. Cleanup progress within the dissolved-phase VOC plume slowed considerably by 2004/2005, and appeared to have reached near static conditions as of 2009.
- IHS concentrations in groundwater downgradient (southeast) from the source area did not decline or dissipate linearly; instead, contaminant “hot spots” were observed downgradient from the source area, including areas adjacent to the current junior high school (former Quincy High School).

- EDB and 1,1,2-TCA had been detected intermittently in source area monitoring wells between 2001 and 2009. They had been detected primarily in two monitoring wells (MW-20 and MW-29) located on the west side of the school.
- The longitudinal extent of the dissolved VOC plume had not been fully delineated when the 2009 periodic review was completed. Concentration data and trends from the wells located farthest from the CHS property suggested the contaminant plume extended some distance beyond and outside the existing well network.
- The dominant chlorinated VOCs in groundwater could biodegrade under anaerobic (low oxygen) geochemical conditions. While the MS/SVE system was capturing volatile contaminants in the source area, it was creating an oxygenated groundwater environment that adversely affected anaerobic biodegradation. Groundwater sampling was conducted from 2001 and 2005 to evaluate if natural attenuation processes were evident. This sampling did not show evidence of breakdown or attenuation products. It was concluded that natural attenuation due to chemical alteration/destruction was not effectively occurring.
- Contaminant mass comparisons of 1,2-DCP dissolved in groundwater were conducted using the Theissen-Polygon Method from December 2001 to September 2007. The area-weighted mass calculation approach indicated a 70-percent mass reduction (Farallon, 2007). The calculated mass reductions in the shallow and deep aquifer zones were most significant during the first few years following remediation system startup. In contrast, the estimated contaminant mass reduction from 2005 to 2008 was markedly lower — declining as little as 2 percent in 2008.
- As of 2009, environmental covenants had been filed for three properties (parcel no. 040525053, CHS property in Site source area; parcel no. 040525043, Blakal Packing Co. property; and parcel no. 040463000, J.R. Simplot Co. property). Table 1 identifies these three parcels, along with others identified as properties with suspected Site contamination that still need covenants.
- CENEX proposed adjusting the CULs for the three soil IHSs. The CUL for 1,2,3-TCP was set at the practical quantitation limit (PQL). However, the analytical technique has improved providing a lower PQL, so a proposed change to the CUL was made. Table 3 lists the revised soil CULs.

Table 3. Revised soil cleanup levels from the 2009 Periodic Review

Indicator substance	2001 CAP Cleanup Level (mg/kg)	Proposed Revised Method B formula value (mg/kg)	PQL (mg/kg)	Basis for Cleanup Level
1,2-Dichloropropane	0.064	0.000166	0.001	Method B
1,1,2-Trichloroethane	0.076	0.000214	0.001	Method B
1,2,3-Trichloropropane	0.005	0.00000123	0.001	PQL_1

mg/kg = milligrams per kilogram or parts per million
PQL = practical quantitation limit
[1] The cleanup level based on PQL was updated in 2012.

- Additional remedial action measures were needed to achieve the goals in the CAP and to ensure that the VOC plume did not continue to migrate downgradient. Key recommendations included:
    - Evaluating new and alternate technologies (including bench-scale, field, or pilot studies) with emphasis on in-situ treatment of chlorinated VOCs in groundwater.
    - Installing additional monitoring wells to fully delineate the dissolved VOC plume.
    - Recording environmental covenants for properties over the contaminant plume.
    - Sampling and analyzing groundwater from a nearby domestic water supply well southeast of the West Canal.
    - Including monitoring well MW-8 (upper basalt) in the quarterly groundwater sampling schedule.

Additional remedial actions

Additional actions taken by CHS immediately prior to and following the 2009 periodic review included:

- Evaluating alternative or innovative groundwater treatment technologies to determine if contaminant "hot spots" could be effectively treated. Laboratory bench and column testing occurred in 2010 and 2011 to assess using zero-valent nano-iron formulations as a hot-spot treatment. CHS also evaluated ex-situ air stripping in 2011 and 2012.
- Installing five groundwater monitoring wells (MW-34 through MW-38) in March 2007 to delineate the downgradient (southeast) extent of the contaminant plume (Farallon, 2007).
- Installing seven groundwater monitoring wells (MW-39 through MW-46) in 2010 and 2011 to further delineate the downgradient extent of the contaminant plume. This

included installing both shallow and deep wells as far southeast as the West Canal drainage ditch (Farallon, 2010).

- Collecting and analyzing water samples from a nearby residential water supply well located southeast of the West Canal in 2009 and 2014.
- Sampling surface water in the West Canal in 2014.
- Adding monitoring well MW-8 to the quarterly monitoring. MW-8 is screened within the upper portions of the basalt, and monitoring data from this well helps assess whether contaminants are migrating downward into the upper portions of the bedrock groundwater system.

2009–2014 supplemental remedial investigation and follow-up work

The following supplemental RI activities were conducted in June/July 2011 in response to the 2009 periodic review recommendations (Farallon, 2012):

- Drilling and sampling five source-zone soil borings.
- Sampling and analyzing soil gas from three of nine on-Site SVE wells.
- Installing and sampling three new groundwater monitoring wells.
- Conducting vapor-intrusion screening of downgradient residential areas lying over the groundwater plume.
- Recalculating soil CULs for all Site contaminants.

Source-zone soil sampling

Five soil borings (FB-1 through FB-5) were drilled at the source area (see Figure A-1) to assess residual soil contamination levels. Borings FB-1 and FB-2 were drilled within the former rinsate pond, and borings FB-3, FB-4, and FB-5 were installed at or next to the former fumigant aboveground storage tank area. Soil samples were collected for chemical analysis every 2.5 feet. Boring FB-3 was advanced to a maximum depth of 21.5 feet below ground surface (bgs). Remaining borings were advanced to 11.5 feet bgs. The results showed that, with only minor exceptions, residual pesticide concentrations were all below Site CULs.

SVE well soil gas sampling

Targeted soil gas sampling was performed at three of nine SVE wells (VEW-3, -5, and -8). The vapor extraction wells are shown on Figure A-1. Samples were collected using Summa canisters and analyzed via EPA Method Modified TO-15. These three wells were selected to provide coverage of the former rinsate pond, former fumigant tank area, and former rinse pad. 1,2-DCP was detected in the sample from VEW-5 at 120 micrograms per cubic meter ($\mu g/m^3$), exceeding the sub-slab soil gas draft screening value of 18 $\mu g/m^3$ in use at that time. VEW-5 is reportedly near the undocumented 2,000-gallon Telone spill.

Expanding the monitoring well network and groundwater sampling

One new deep (MW-44) and two new shallow (MW-45 and MW-46) monitoring wells were installed at the downgradient end of the contaminant plume to help further refine the plume's vertical and lateral limits. Groundwater samples showed 1,2-DCP in all three wells, and 1,2,3-TCP in two wells. The detected concentrations shortly after installation were below the groundwater CULs. The results further demonstrated that Site contaminants had migrated approximately 0.5 mile from the CHS property to the northern margins of the West Canal.

Vapor intrusion screening analysis

The CHS consultant (Farallon) evaluated possible vapor intrusion concerns associated with the groundwater plume. Specifically, a vapor intrusion screening analysis assessed whether 1,2-DCP and 1,2,3-TCP concentrations in groundwater posed risk for vapor intrusion into residential buildings west of the City of Quincy East Park. Concentration data for 1,2-DCP and 1,2,3-TCP from downgradient monitoring well MW-45 (closest to the residential properties) were used to perform the screening analysis. Screening-level modeling results indicated 1,2-DCP and 1,2,3-TCP concentrations in groundwater did not pose a potential vapor intrusion exposure pathway. As a result, no further assessment of the vapor intrusion pathway was warranted (Farallon, 2012).

Recalculating site soil cleanup levels

Ecology noted in the 2009 periodic review that the 2007 revisions to MTCA affected the methodology to determine contaminant concentrations in soil that are protective of groundwater. Farallon (2012) recalculated the MTCA Method B CUL values to better account for unsaturated vadose zone soil conditions. The proposed revised CULs were the most stringent MTCA Method B soil CULs for the following exposure pathways:

- Direct-contact ingestion
- Direct-contact ingestion and dermal contact
- Protection of potable groundwater exposure pathways for vadose zone soil

The recalculated MTCA Method B soil CULs for the IHS in vadose zone soil are:

- 1,2-DCP – 0.003 milligrams per kilogram (mg/kg)
- 1,1,2-TCA – 0.004 mg/kg
- 1,2,3-TCP – 0.001 mg/kg (PQL-based value)

The soil CULs in Table 3 are the 2009 levels based on the PQL. These values are all at or below the recalculated values (Farallon, 2012). The 2001 CAP was not amended to reflect these proposed soil CULs.

Alternative groundwater treatment technologies evaluation

In the 2009 periodic review, Ecology identified the need for further evaluation of improved cleanup technology options. Between 2010 and 2012, Farallon (2013) evaluated three alternative technologies: (1) in-situ application of zero-valent iron nanometer-sized particles,

(2) in-situ chemical oxidation (ISCO) using sodium persulfate and hydrogen peroxide, and (3) ex-situ air stripping. Farallon concluded that the alternative cleanup technologies would not help achieve groundwater CULs within a reasonable restoration timeframe.

On February 13, 2014, Ecology issued a letter acknowledging that CHS had satisfactorily completed the 2009 periodic review recommendations (Ecology, 2014). The parties agreed to implement the following action items:

- Add wells MW-10, MW-14, MW-19, MW-22, and MW-27 to the quarterly groundwater monitoring network.
- Repair, upgrade, and maintain the groundwater monitoring well network.
- Review the MS/SVE system and vadose zone SVE system operations and optimize remedial system performance.
- Re-evaluate off-Site soil sampling results.
- Collect surface water samples from the West Canal drainage ditch to assess IHS concentrations at this suspected groundwater discharge area.
- Resample groundwater from a nearby residential water supply well located downgradient of the Site.

CHS and Farallon implemented these recommended actions during 2014 and 2015. Results are in the 2014 Annual Report (Farallon, 2014b) and a series of related technical memoranda Farallon generated in 2014.

MS/SVE system adjustments (2015–present)

In 2015, the MS/SVE system was further adjusted to enhance contaminant removal from source-area soil and groundwater (Farallon, 2016a). This adjustment produced a short-term (six-month) increase in vapor-phase contaminant concentrations and provided additional evidence that remediation system optimization could help enhance rates of contaminant removal. The contaminant capture remained steady or declined, suggesting the enhancement was temporary. Contamination continues to be removed from the site at a steady, albeit lower, rate than initially observed following system enhancement. Piping and valve repairs improved the performance and contaminant capture efficiency of the vadose zone SVE system.

In July 2021, Ecology received from CHS and Farallon a proposal to modify the MS/SVE system operations. The proposal included a plan to operate the MS/SVE system on an alternating schedule with the system shut off for approximately three months beginning in July 2021 and restarted for about nine months beginning in October 2021. The three VEW well piping runs will be operated.

To assess system performance, air samples will be collected from each of the three VEW well piping runs: VEW-1 through VEW-3, VEW-4 through VEW-6, and VEW-7 through VEW-9. Air samples will be collected from each of the three piping prior to shut down or restart of the MS/SVE system. During the sample collection, the MS and SVE components of the 12 MSW wells would be turned off. Air samples from each of the three piping runs will be collected simultaneously, as feasible. Upon restart of the MS/SVE system, additional air samples will be collected from the same locations. The analytical results of the VEW air samples will be

compared to evaluate the effects of the temporary shut-down on soil gas concentrations. If the air samples collected from the individual piping runs indicates one or more of the piping runs does not contain IHS concentrations exceeding the laboratory PQL, the piping run(s) may be turned off to focus SVE air flow in areas where IHS are present in the vadose zone to maximize recovery. The air samples would be collected for IHS using Summa canisters and analyzed by U.S. Environmental Protection Agency Method TO-15 GC/MS.

Compliance Monitoring Network and Procedures

Compliance monitoring has been performed at the Site since 2001 under the Consent Decree and CAP (Ecology 2001). Compliance monitoring focuses on assessing IHS concentrations in groundwater and soil vapor extracted from soils at the CHS property by the MS/SVE system and the vadose zone SVE system. Monitoring details are in the quarterly and annual remedial action and groundwater compliance monitoring reports.

Supplemental data have been collected to support the compliance monitoring objectives at this Site. Supplemental sampling since the 2009 periodic review includes:

- A single-event sampling (2014) of surface water from the West Canal drainage ditch
- Groundwater sampling from a nearby residential water supply well located south of the West Canal, and southeast of the contaminant plume's known lateral and longitudinal limits
- Additional groundwater samples were collected in June 2020 from monitoring wells MW-18, MW-19, MW-21 through MW-23, and MW-27 adjacent to the Quincy Middle School

Performance air monitoring

Performance air monitoring samples are collected quarterly to evaluate contaminant removal rates from the MS/SVE and vadose zone SVE systems and to monitor the efficiency of the granular activated carbon filter treatment. The following vapor samples are collected:

- Effluent monitoring: Downstream of all granular carbon filters
- Breakthrough monitoring: Downstream of the first granular carbon filter
- Influent monitoring — MS/SVE-series wells: Vapor-phase contaminants drawn from the saturated zone
- Influent monitoring — VEW-series wells: Vapor-phase contaminants drawn from the vadose zone

Air samples are analyzed for VOCs by EPA Method 8260C or 8260D and EPA Method TO-15.

Groundwater compliance monitoring

Groundwater compliance monitoring is performed quarterly, and the groundwater-monitoring network includes 37 wells. There are 25 shallow monitoring wells (<30 feet deep) and 12 deep monitoring wells (approximately 45 feet deep). All wells monitor the alluvial with the exception

of MW-8, which is completed into the shallow basalt bedrock. Wells in the monitoring network generally are distributed longitudinally along the northwest-southeast axis of the contaminant plume (see Figure A-2).

Groundwater samples are collected using low-flow purging methods. Prior to sampling, depth to groundwater is measured in each well. During purging, field measurements of pH, temperature, specific conductivity, dissolved oxygen, and oxidation-reduction potential are collected. Groundwater samples are analyzed for VOCs by EPA Method 8260C or 8260D.

For this periodic review, groundwater quality data from 2010 to 2021 were evaluated to assess changes in contaminant concentrations over this approximate 10-year period. Recent groundwater quality data from 2018 to 2021 also are compared to Site CULs (Table 2) to assess cleanup action effectiveness, remedial progress, and anticipated timeframes to achieve Site cleanup.

The residual dissolved-phase 1,2-DCP mass in groundwater also is estimated annually using the Thiessen polygon method. Farallon (2018a) describes this data analysis method and includes a trend-analysis graph depicting the apparent decline in the estimated 1,2-DCP mass in groundwater from 2001 through 2017.

2014 surface water sampling – West Canal drainage ditch

Surface water samples were collected from the West Canal drainage ditch. Samples were collected at three locations: upstream of the groundwater plume discharge area, adjacent to the groundwater plume discharge area, and immediately downstream from the groundwater plume discharge area. Flow in the ditch was measured at the time of sampling using two separate measurement techniques.

2014 residential water supply well sampling

In June 2014, a groundwater sample was collected from a 65-foot-deep residential water supply well located approximately 450 feet southeast of well MW-43 and 150 feet southeast of the West Canal. The well log indicates groundwater in this well is likely coming from a water-bearing zone(s) within the upper portions of the basalt bedrock, directly below the surficial aquifer. CHS had previously sampled and tested groundwater from this well in 2009.

Compliance Monitoring Results

Compliance monitoring activities provide the basis for assessing the cleanup remedy's performance. Compliance monitoring data and results, including supplemental data collected since 2009, are summarized below.

Performance air monitoring

The MS/SVE and vadose zone SVE systems continue to capture low levels of VOCs. Between February 2016 and January 2021, the MSW-series MS/SVE wells and the VEW-series SVE wells together captured approximately 0.13 pounds of 1,2-DCP (as vapor) from the CHS property. A

small quantity of 1,2,3-TCP also has been removed and treated. The air monitoring data indicate that small quantities of vapor-phase VOCs are still being captured and removed by the existing remediation system. Ongoing removal of volatile contaminants from saturated and unsaturated zones at the CHS property continues to reduce contaminant concentrations in groundwater. Contaminant removal rates have increased after planned or equipment-related MS/SVE system shutdown events lasting several weeks or more. This observation suggests that a pulsed operation mode (periods of active and inactive remediation system operation) may enhance contaminant removal and is consistent with the 2021 Technical Memorandum Regarding Proposed Operational Modifications for the Microsparge/Soil Vapor Extraction System.

Groundwater

VOC contamination remains present at concentrations exceeding CULs in surficial aquifer groundwater. Contaminant concentrations within the shallow and deep portions of the surficial aquifer during the December 2018 sampling event are shown, respectively, in figures A-4 and A-5. A cross-sectional depiction of the groundwater contaminant plume is shown in Figure A-6. The subsections below summarize cleanup progress and documented concentration changes during the 2010 to 2021 period. The discussion focuses on groundwater conditions within the following Site areas:

- Source area (CHS property)
- Areas immediately southeast of the CHS property
- Areas near the Quincy Junior High School
- Areas between Quincy Junior High School and the West Canal drainage ditch

Source area – CHS property

Groundwater contaminant concentrations beneath the CHS property still exceed CULs within the shallow and deeper portions of the alluvial aquifer. 1,2-DCP and 1,2,3-TCP continue to be routinely detected in source-area groundwater.

Overall, IHS concentrations within source-area groundwater declined since 2010. Some short-term concentration increases were observed at selected wells. These were correlated with MS/SVE system optimization measures implemented over the past several years.

Areas immediately southeast of the CHS property

IHS concentrations in groundwater immediately downgradient (southeast) of the CHS property declined since the 2009 periodic review. Groundwater in this part of the Site is not directly influenced by MS/SVE operations. Observed contaminant reduction since 2009 likely can be attributed to previous removal actions (soil and debris) at the CHS property and ongoing remediation system operations. Some wells in this area have shown 10-fold (or more) reductions in contaminant concentrations over the past decade.

Areas near the Quincy Middle School

A portion of the groundwater plume passes directly beneath the western end of the school building and associated school property. Elevated concentration areas of 1,2-DCP, 1,2,3-TCP, and EDB are present in portions of the contaminant plume. These areas also were noted in the 2009 periodic review. IHS concentrations have remained above CULs at four shallow wells (MW-20, MW-28, MW-29, and MW-30) and one deep well (MW-31) near the school. Over the past decade, contaminant concentrations have declined by 50 to 75 percent at several wells in this area.

Areas between Quincy Middle School and the West Canal

The lower half of the groundwater plume extends from the southern end of the junior high school to the West Canal drainage ditch. Additional monitoring wells were installed after the 2009 periodic review to determine the full extent of the groundwater plume. IHS concentrations in this portion of the plume generally are lower than concentrations observed in areas near the school, but still exceed the CULs. IHS concentrations in several wells near the drainage ditch are near, or below, the CULs.

Domestic well near the West Canal

Farallon (2014b) sampled a residential well in June 2009 and June 2014. This well is approximately 150 feet southeast of the West Canal. No IHS were detected in groundwater samples collected in 2009 and 2014.

Surface water: West Canal drainage ditch

Farallon (2014b) sampled the West Canal drainage ditch on September 25, 2014, at three locations: upstream, downstream, and at the midpoint where the groundwater contaminant plume was thought to be discharging to the ditch next to well MW-43. No IHS were detected in these surface water samples.

Contaminant concentration trends

Trend analyses were performed to evaluate IHS concentration changes over time. Appendix B presents 1,2-DCP concentration trend plots for selected monitoring wells within the following Site areas:

- Source area (CHS property) – MW-16 and MW-24
- Areas immediately southeast of the CHS property – MW-6 and MW-25
- Areas near the Junior High School – MW-20 and MW-31
- Areas between the Junior High School and the West Canal drainage ditch – MW-38 and MW-43

Except for two source-area wells (MW-16 and MW-24), IHS concentrations have progressively declined over the past decade. Based on current concentration trends, and with certain exceptions, IHS concentrations in most wells hydraulically downgradient of the school likely will

be at or below the existing CULs within five years. Some wells closer to the school and the CHS property may require more than five years to reach CULs.

Contaminant reduction processes

The shallow SVE system operations at the CHS property continue to remove low levels of residual soil contamination from the vadose zone. These SVE operations help volatilize and capture residual vapor-phase contamination for subsequent treatment with a carbon filtration system and a biofilter.

Active source-area remediation continues to reduce the residual IHS mass within the groundwater system. Some contamination also may sorb or bind to the soil and sediment particles in the aquifer. Natural biological processes also may reduce contaminant concentrations in the groundwater system.

Groundwater containing low IHS concentrations discharges from the surficial aquifer to the West Canal drainage ditch. The small quantity of side bank seepage containing low groundwater contaminant concentrations quickly mixes with the comparatively large flow volume in West Canal drainage ditch. Surface water sampling in 2014 found no measurable evidence of Site IHS in the ditch water.

Current environmental conditions

Monitoring data demonstrate that environmental conditions at the Site continue to improve as IHS concentrations decline over time. Progress toward achieving CULs has been made since the 2009 periodic review. However, the pace of IHS reduction has not achieved original cleanup expectations and restoration timeframe estimations. Efforts to optimize existing source-area remedial operations have had a measurable effect on IHS capture and treatment.

Periodic Review

Effectiveness of the cleanup actions and effect on IHS trends

The early cleanup actions helped reduce contaminant mass within source-area soils and limited soil-to-groundwater contaminant migration.

Site cleanup continues to involve operating the MS/SVE system to remove residual contaminants from source-area groundwater; source-area SVE also captures and treats residual IHSs within vadose zone soils. These systems have provided sustained, low-level capture and treatment of residual contaminants at the CHS property since 2001.

Monitoring data indicate an overall decline in IHS concentrations within the off-Site groundwater plume, but natural attenuation of IHS appears limited.

The CAP anticipated a restoration timeframe of approximately 10 years to achieve Site-specific CULs. Current IHS concentrations and projected concentration trends show that additional time will be required to achieve Site cleanup. The overall risk to human health and the environment remains low due to limited exposure pathways. If current cleanup approaches are maintained,

with ongoing system optimization, CULs likely could be met within the next 10 years. Continued monitoring of IHS concentration trends will be necessary to evaluate the likelihood of this estimate. If feasible, supplemental actions may be needed to achieve cleanup in a shorter timeframe.

New scientific information for individual hazardous substances or mixtures present at the Site

EPA recently finalized a list of 20 chemicals to undergo risk evaluation under the Toxic Substances Control Act. Risk to the public and the environment from 1,2-DCP and EDB exposure, designated as "high-priority substances" was part of this evaluation (EPA, 2019a and 2019b). The outcome and recommendations from this review potentially may affect future 1,2-DCP and EDB CULs for this Site.

New applicable state and federal laws for hazardous substances present at the Site

MTCA Method B CULs for selected groundwater IHSs have changed since the 2009 periodic review. 1,2-DCP, 1,2,3-TCP and EDB have changed since early 2010. The groundwater CUL changes have not been formalized in a CAP amendment.

In May 2019, Ecology introduced MTCA Method B and C vapor intrusion screening values for indoor air. These screening values include VOC concentrations in shallow groundwater that may require a site-specific soil gas survey. MTCA Method B vapor intrusion screening values that apply to this Site are 10 micrograms per liter (µg/l) for 1,2-DCP and 0.27 µg/l for EDB. A groundwater screening value for vapor intrusion of 1,2,3-TCP has not been set.

Current and projected Site and resource uses

Site use has not substantively changed, and no changes are expected. The CHS property remains vacant, except for housing the remediation system infrastructure. These remediation system components likely will remain in place until the next periodic review.

Properties abutting or close to the CHS property are expected to remain mixed industrial (manufacturing), residential, and commercial land uses. Downgradient areas of the Site include commercial and residential land use, school district property, and park land (East Park). Existing activities and land use designations for these portions of the Site also are expected to remain relatively unchanged.

Availability and practicability of more permanent remedies

Several alternative groundwater treatment technologies were evaluated during the first few years of this periodic review period. The goal was to determine if other practicable and cost-effective remedial approaches were available to enhance treatment system effectiveness and possibly shorten the restoration timeframe. This analysis did not identify a readily viable or cost-effective alternative that would help achieve CULs more quickly than the current remedy.

The remedy was practicable and preferred from a cost-benefit standpoint during the 2009 periodic review. This determination has not changed.

Availability of improved analytical techniques to evaluate compliance with cleanup levels

WAC 173-340-830(2)(e) allows Ecology to consider modified analytical methods to provide lower quantitation limits. WAC 173-340-830(2)(f) requires that laboratories achieve the lowest PQLs consistent with the selected method and WAC 173-340-707. WAC 173-340-707(4) indicates that when the PQL is above the CUL, Ecology shall consider the availability of improved analytical techniques when performing periodic reviews. Following those reviews, Ecology may require using improved analytical techniques with lower PQLs and other appropriate actions.

A new EPA SW-846 method is available for EDB, 1,2-DCP, and 1,2,3-TCP analysis by EPA Method 8011. The standard PQL using Method 8011 is approximately 0.03 µg/l. CHS has been routinely reporting a PQL of 0.2 µg/l for all Site groundwater analyses since at least 2005 using EPA Method 8260, which is above the EDB Site CUL and current MTCA Method B CUL for groundwater of 0.02 µg/l. For 1,2,3-TCP, the 0.2 µg/l PQL is above the Site CUL and current MTCA Method B CUL of 0.00038 µg/l for groundwater. The 1,2-DCP Site CUL is higher than the 0.2 µg/l PQL.

At this time, Ecology will not require selective analysis of EDB, 1,2-DCP, and 1,2,3-TCP by EPA Method 8011. Using a 0.2 µg/l PQL would provide reliable quantitation below the EDB vapor intrusion screening level of 0.27 µg/l and satisfy analytical and remedial objectives at this Site. Similarly, the 0.2 µg/l PQL would provide reliable quantitation below the current vapor intrusion screening level for 1,2-DCP of 10 µg/l.

Conclusions

Although cleanup has not been achieved, Ecology's review of Site conditions and monitoring data demonstrates that human health and the environment continue to be protected. Key attributes of the cleanup work are summarized below, focusing on cleanup highlights, monitoring results, and contaminant observations since the 2009 periodic review.

Ongoing remediation status and cleanup progress

- Active remedial operations continue at the CHS property and include a groundwater MS/SVE system and a vadose zone SVE system. These remediation systems continue to remove small quantities of IHS from soil and groundwater. Residual IHS concentrations in source-area soils are low and expected to fall below Site-specific soil CULs.
- Volatile contaminant removal rates at the MS/SVE and vadose zone SVE systems appear to increase following remediation system shutdown events.
- Remediation system optimization efforts including pulsed MS/SVE system operation.

- The asphalt cap on the CHS property continues to limit precipitation infiltrating into the soil and prevents direct contact with contaminated soils.

Current understanding of Site contamination in groundwater and surface water

- The contaminated groundwater plume extends approximately 0.5 mile southeast to the vicinity of the West Canal.
- No groundwater contamination has been documented within the basalt groundwater system based on data from a single source-area monitoring well.
- Groundwater in the surficial aquifer seasonally discharges to the West Canal drainage ditch immediately adjacent to the West Canal. Sampling of West Canal drainage ditch surface water in 2014 found no measurable Site-related contaminants.

Vapor intrusion considerations and analysis

- Vapor samples within the former Quincy High School were collected during sampling events in 2000 and 2001. No Site-related VOCs were detected at concentrations above the method detection limit (1.0–1.4 parts per billion by volume).
- A model-based, screening level evaluation of possible vapor intrusion concerns associated with the off-Site groundwater contaminant plume was conducted in 2011. This screening analysis looked at whether 1,2-DCP and 1,2,3-TCP concentrations in groundwater potentially posed an unacceptable risk for vapor intrusion into residential buildings near the City of Quincy East Park. Modeling results indicated that IHS concentrations in groundwater likely would not cause vapor intrusion. The detected contaminant concentrations were below the groundwater draft screening levels presented in Ecology's 2009 vapor intrusion guidance. No further assessment of the vapor intrusion was recommended at that time.
- In 2019, Ecology updated the toxicity values for calculating indoor air CULs, based on updated toxicological information. At the time groundwater IHS concentrations in selected areas of the Site, including areas next to the Quincy Middle School, exceeded these updated vapor-intrusion-based screening levels. Since the updates, groundwater IHS concentrations have declined to below screening levels. Ecology received a Tier I Vapor Intrusion (VI) Assessment, Cenex Harvest States Cooperatives Site, Quincy, Washington from Farallon Consulting dated November 10, 2020. The VI assessment utilized the Johnson–Ettinger Model 6.0 to demonstrate there is not a VI risk at the Quincy Middle School. In addition, Ecology completed a vapor intrusion analysis using Ecology's *DRAFT Guidance for Evaluating Vapor Intrusion in Washington State* in November 2021. The Ecology VI assessment corroborated the conclusions made in the Farallon report. The current conditions do not represent a vapor intrusion risk to the Quincy Middle School. Potential pathways for human exposure to Site contaminants.

- Asphalt capping is maintained over contaminated soils at the CHS property. This physical barrier limits direct access to the soil and minimizes precipitation infiltration.
- Site conditions do not represent a vapor intrusion risk to the Quincy Middle School.
- Low-level vapor-phase VOCs from the vadose zone SVE and groundwater MS/SVE systems are captured and treated on-Site using granular activated carbon units. The treated vapors undergo additional biofiltration on-Site.
- Workers performing routine remediation-system operations and maintenance potentially could be exposed to Site contaminants. Strict adherence to established health and safety protocols minimizes potential exposure concerns.
- Nearby residents, commercial operations, businesses, and the Junior High School obtain potable water from the City of Quincy water system. No water supply wells are located within the immediate vicinity of the Site. The nearest City of Quincy water supply well (#5) is approximately 1,200 feet northeast of the Site's downgradient boundary, next to the West Canal. The Site is not located within a wellhead protection zone as defined in Washington regulations for the protection of public groundwater supply systems.
- Seasonal leakage of irrigation water from the West Canal into the underlying alluvial/shallow aquifer system is believed to restrict or greatly limit the potential migration of Site-related contaminants to areas southeast of the canal.
- Sampling at a residential water supply well located immediately southeast of the West Canal in 2009 and 2014 found no Site-related contaminants.

Remediation progress toward achieving cleanup levels

- Quarterly groundwater monitoring data indicate that the concentration and mass of dissolved VOCs in groundwater continue to slowly decline. IHS concentrations in the off-property portion of the groundwater plume remain highest in areas near to the Quincy Junior High School and decline down the plume axis. Contaminant concentrations in these areas have declined measurably since the 2009 periodic review.
- Cleanup actions since 2009 have continued to reduce IHS concentrations in groundwater throughout the Site. The cleanup efforts have not, however, achieved the Site-specific CULs for the most persistent contaminants within the estimated 10-year restoration timeframe in the CAP. Residual concentrations of 1,2-DCP, 1,2,3-TCP, and EDB still exceed CULs within the source area (CHS property) and the off-property groundwater plume.
- The current MTCA Method B CUL for 1,2-DCP in groundwater is 1.2 µg/l. The established CUL for 1,2-DCP at the Site is the Method B calculated value of 0.64 µg/l, which was adjusted to the PQL of 1 µg/l for EPA Method 8260.
- The current MTCA Method B CUL for 1,2,3-TCP in groundwater is 0.00038 µg/l. The cleanup level established in the CAP for the site is the calculated Method B value of 0.00625 µg/l, but was adjusted to the PQL of 1 µg/l. Since the 2009 periodic review, the

risk from potential exposure to 1,2,3-TCP in groundwater has been gradually adjusted downward. No federal or state maximum contaminant level for 1,2,3-TCP has been established. The Method B CUL is well below the current PQL-based Site CUL of 1 µg/l.

- The EDB CUL of 1 µg/l is based on the PQL for EPA Method 8260D. A method reporting limit of 0.2 µg/l has routinely been reported throughout this periodic review period. The limited distribution of EDB at this Site and the observed concentrations do not immediately justify pursuing an alternative analytical method at this time, particularly since it is below the groundwater vapor intrusion screening level.
- The IHS vinyl chloride, chloroform, 1,2-dichloroethane and 1,1,2-TCA have been detected intermittently at low concentrations in vapor samples from vapor extraction wells and the MS/SVE wells located at the CHS property.
- 1,1,2-TCA has been detected intermittently at three wells (MW-20, MW-24, and MW-25) since 2017. 1,2-dichloroethane has been detected twice since 2017 at MW-41. These limited detections of 1,1,2-TCA and 1,2-dichloroethane have all been below the PQL-based Site CUL of 1 µg/l. Vinyl chloride has not been detected in groundwater since 2017.
- Low-level chloroform detections, below the Site CUL of 7.2 µg/l, have been observed with some regularity at two shallow monitoring wells (MW-32 and MW-40) since 2017. MW-32 and MW-40 lie outside the footprint of the defined 1,2-DCP and 1,2,3-TCP groundwater plume, and the observed low-level chloroform detections may be associated with other local land use factors.
- Although the existing CUL for most IHS has been set at the PQL of 1 µg/l, the analytical laboratory CHS uses has routinely reported a PQL of 0.2 µg/l for VOCs in groundwater via EPA Method 8260. The ability to achieve lower method reporting limits may require re-evaluation of the readily achievable PQLs for the selected IHS. Any decision to potentially lower the current CULs based on the PQLs must consider the ability of existing remedial systems and contaminant reduction processes to effectively achieve and sustain these lower IHS concentrations.
- CHS evaluated several remedial technology options for targeted treatment of plume area hot spots after the 2009 periodic review. No viable or cost-effective remedial options were identified to address the low levels of residual contamination in these areas. Current remedial advancements have not altered this conclusion.
- If current cleanup approaches are maintained, with ongoing system optimization, CULs potentially can be met in most areas of the Site within the next 10 years.

Administrative and institutional controls

- The existing asphalt capping and remediation system infrastructure is routinely inspected by CHS to ensure the operability and integrity of the remediation system and groundwater monitoring network.

- Institutional controls (gates and fencing) remain in place to limit the potential for trespass on to the CHS property where the remediation systems are operating.
- Environmental covenants have been recorded for key properties with impacted groundwater. Remaining properties to be protected by environmental covenants have been identified but not recorded.
- Proposed CUL adjustments conducted in response to the 2009 periodic review and used to guide the ongoing cleanup work have not gone through a CAP amendment process involving formal public comment.

Recommendations

- Continue groundwater monitoring at an agreed upon frequency and sampling locations.
- Continue to optimize the MS/SVE system operations at the CHS property as proposed and approved by Ecology in August 2021.
- Continue to optimize the vadose zone SVE operations at the CHS property, where possible. Collect soil gas samples from individual SVE wells to assess any potential elevated IHS areas. Modify existing SVE operations according to the approved plan to address SVE wells that show the highest IHS vapor concentrations.
- Sample the domestic water supply well southeast of the West Canal at least once every five years for Site IHS.
- Record environmental covenants for all parcels within the Site.
- Prepare a comprehensive remediation performance evaluation as part of an annual report submitted a year prior to the next periodic review.

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Appendix A. Large Figures

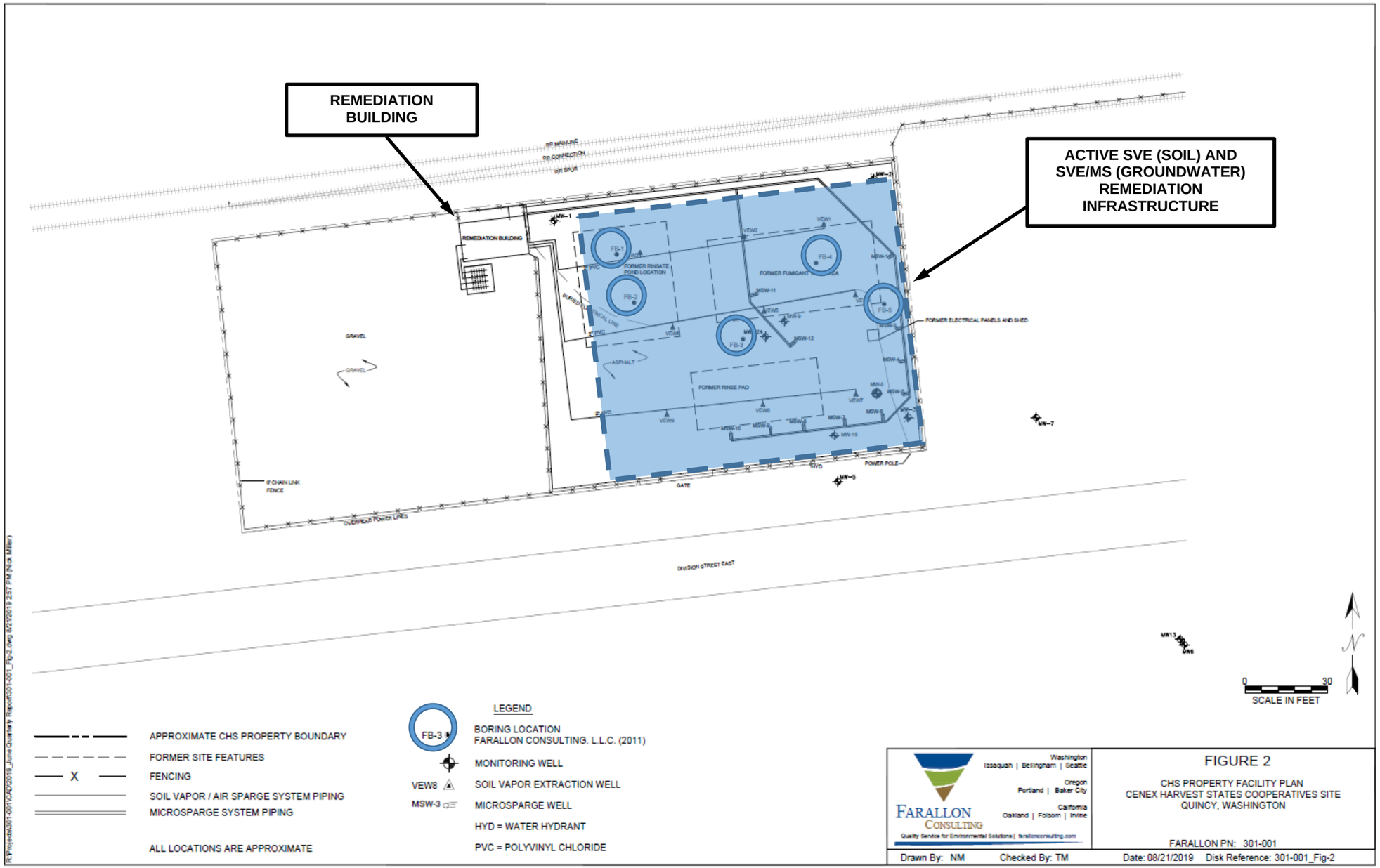

Figure A-1. CHS property — facility features (Farallon, 2019)

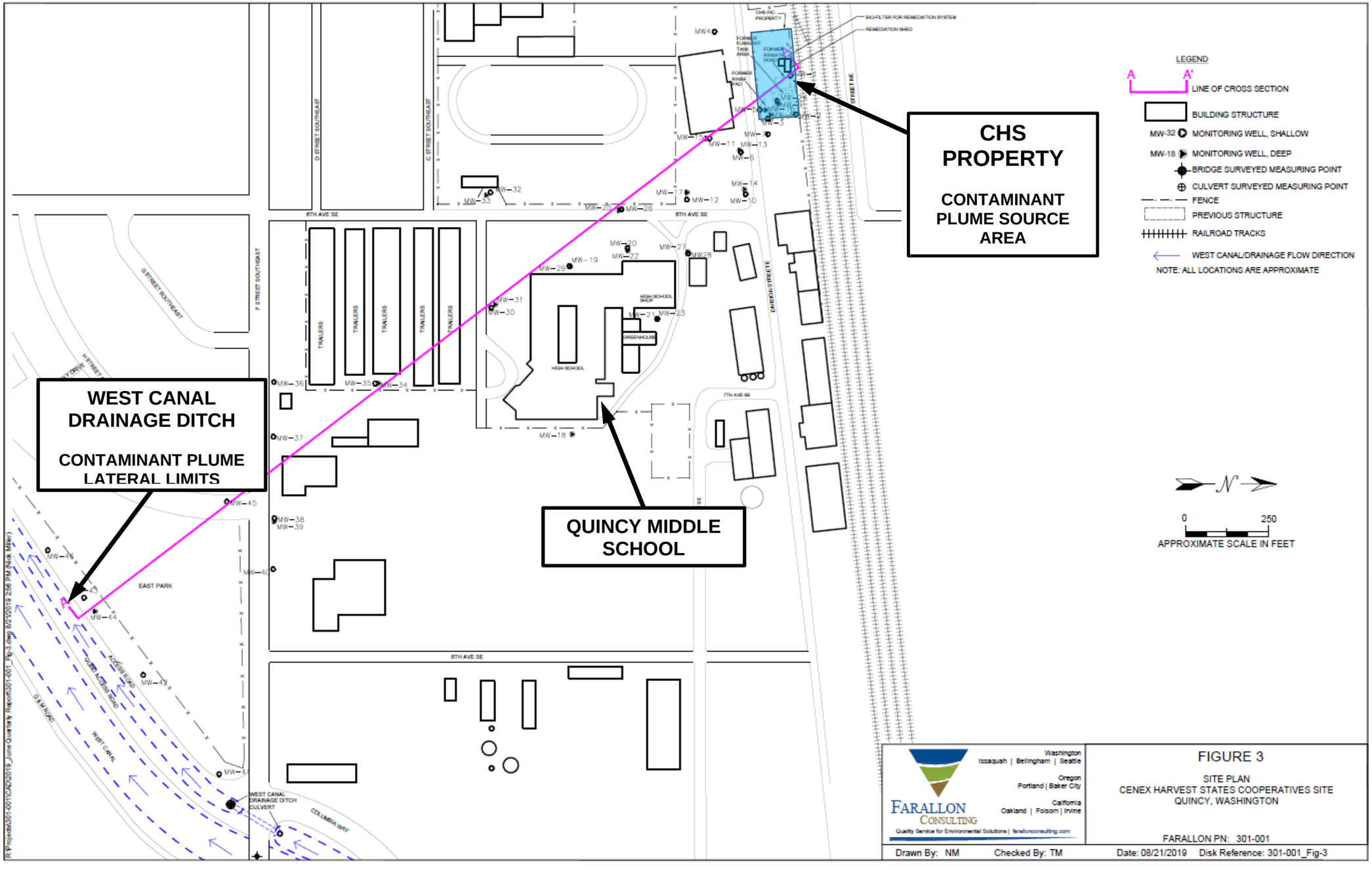

Figure A-2. Site setting and groundwater monitoring network (Farallon, 2019)

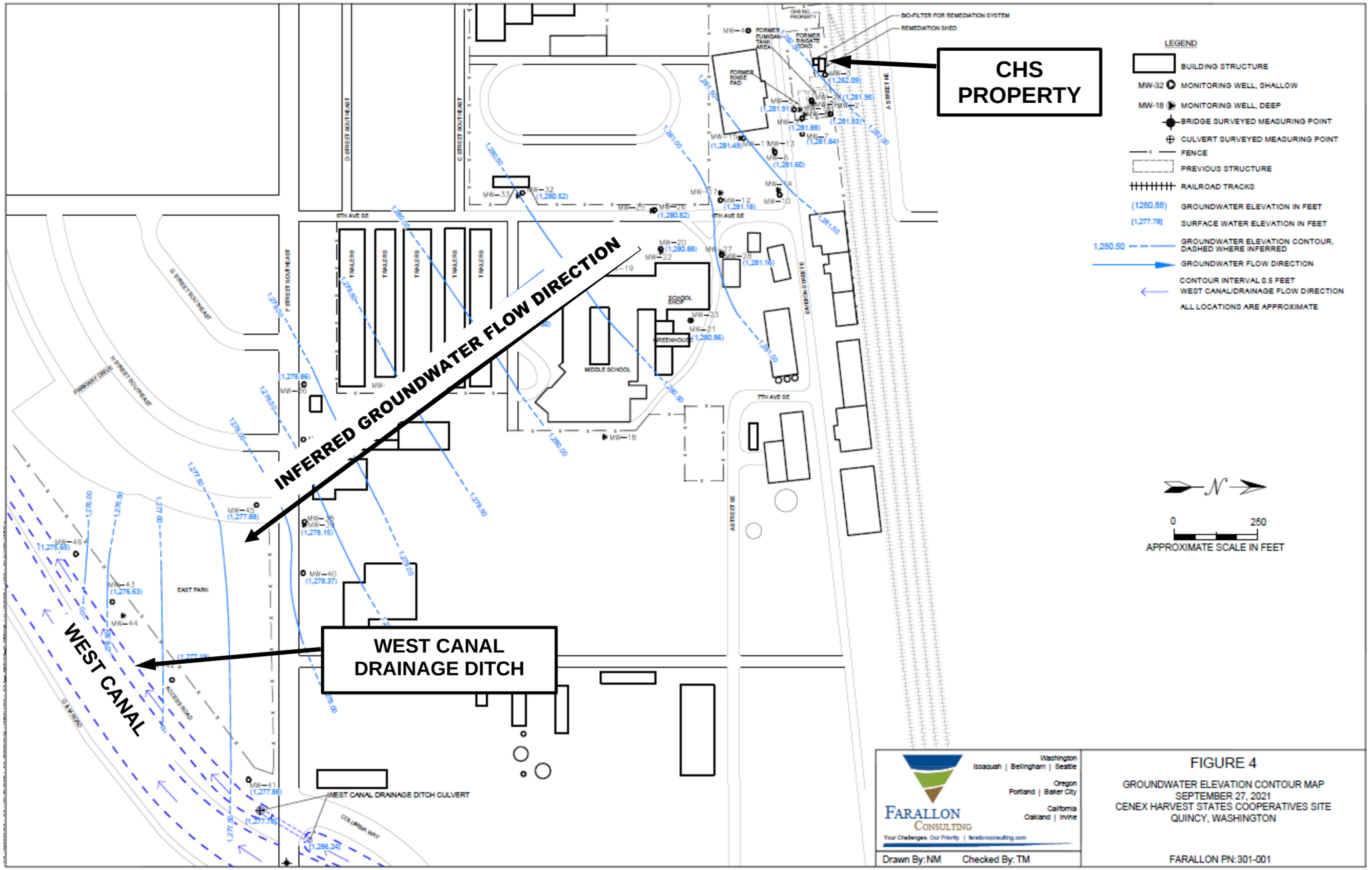

Figure A-3. Groundwater elevation and flow map, September 2021 (Farallon, 2021)

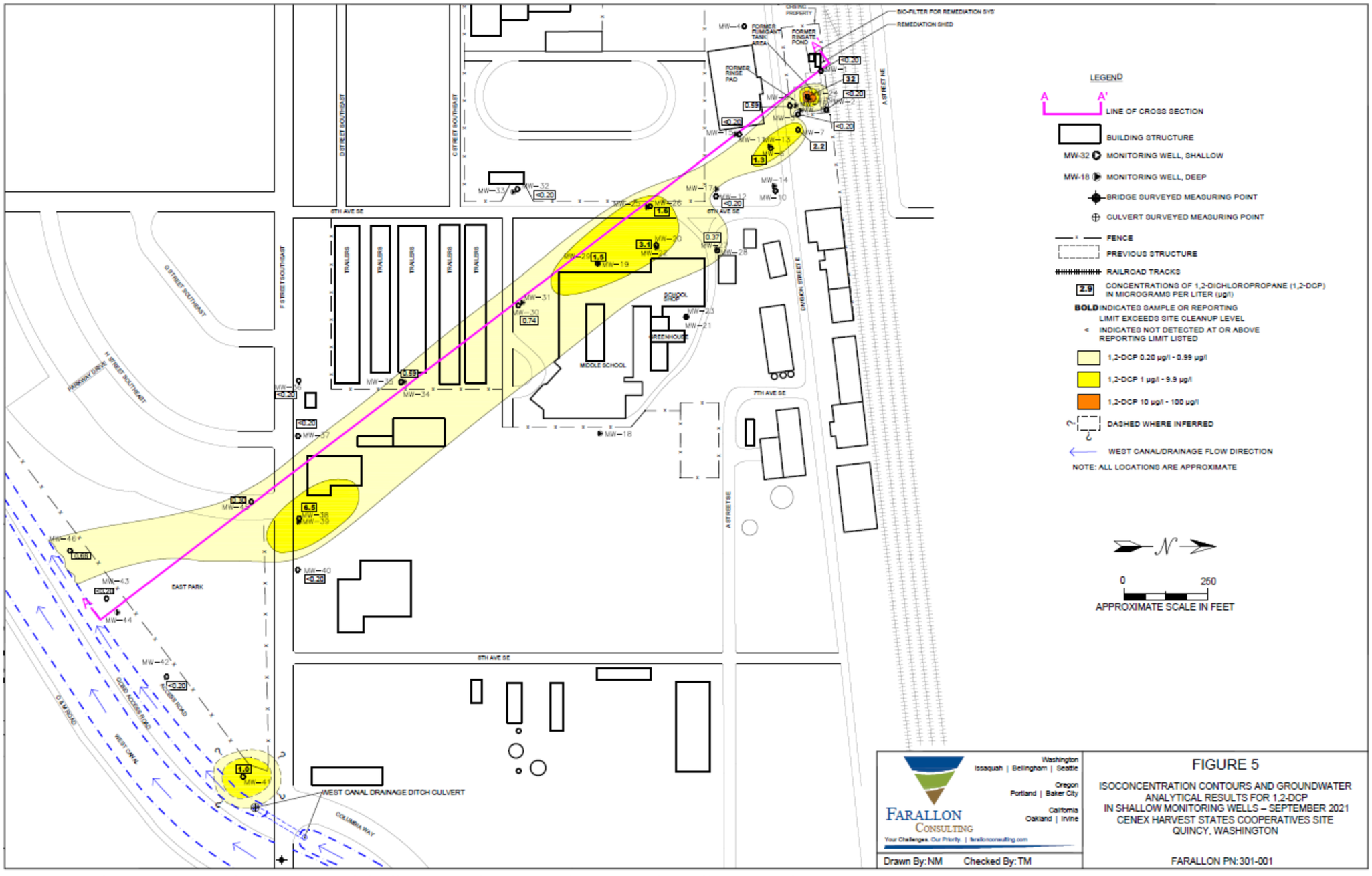

Figure A-4. Groundwater contaminant plume (shallow zone), September 2021 (Farallon, 2021)

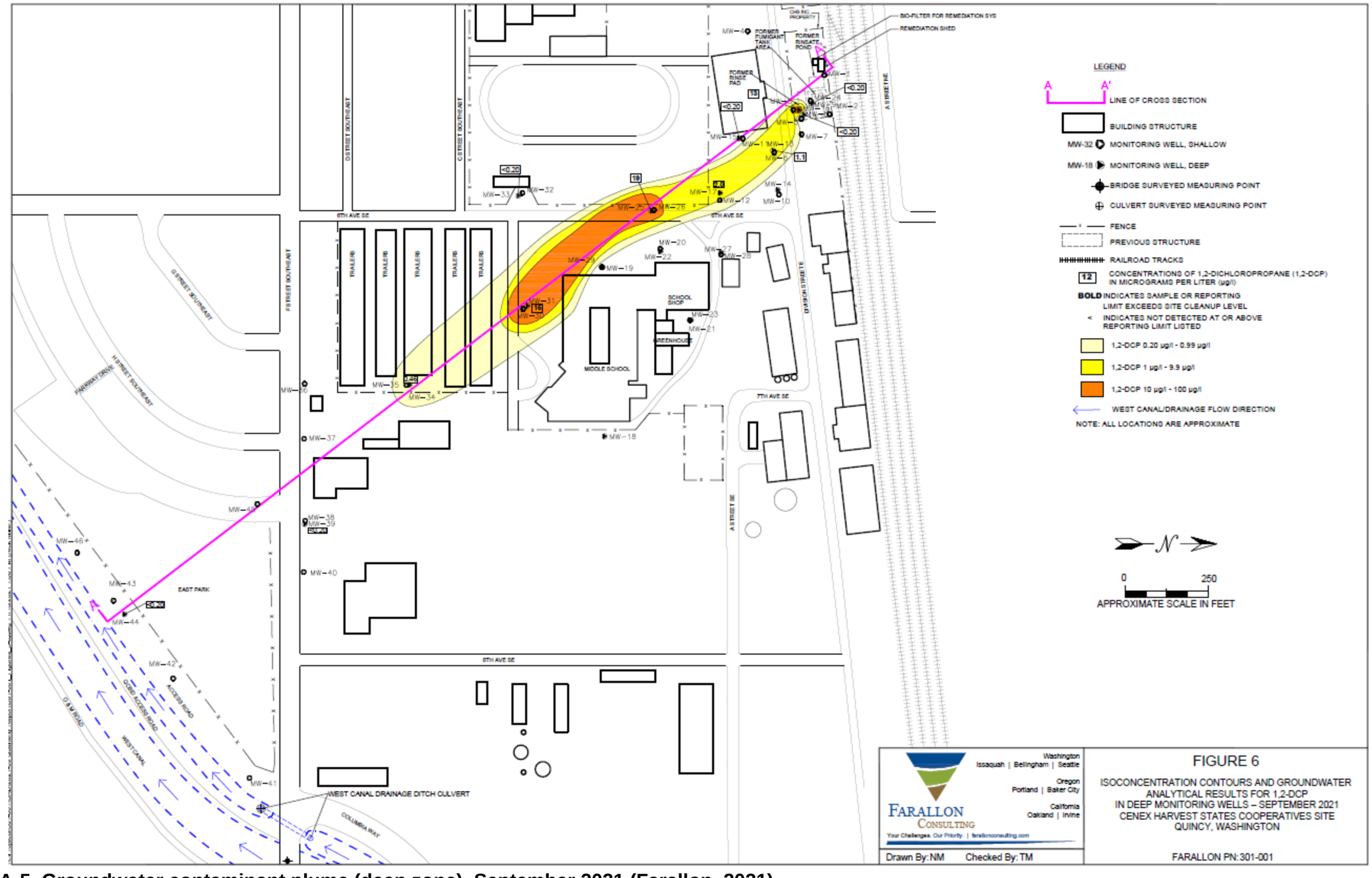

Figure A-5. Groundwater contaminant plume (deep zone), September 2021 (Farallon, 2021)

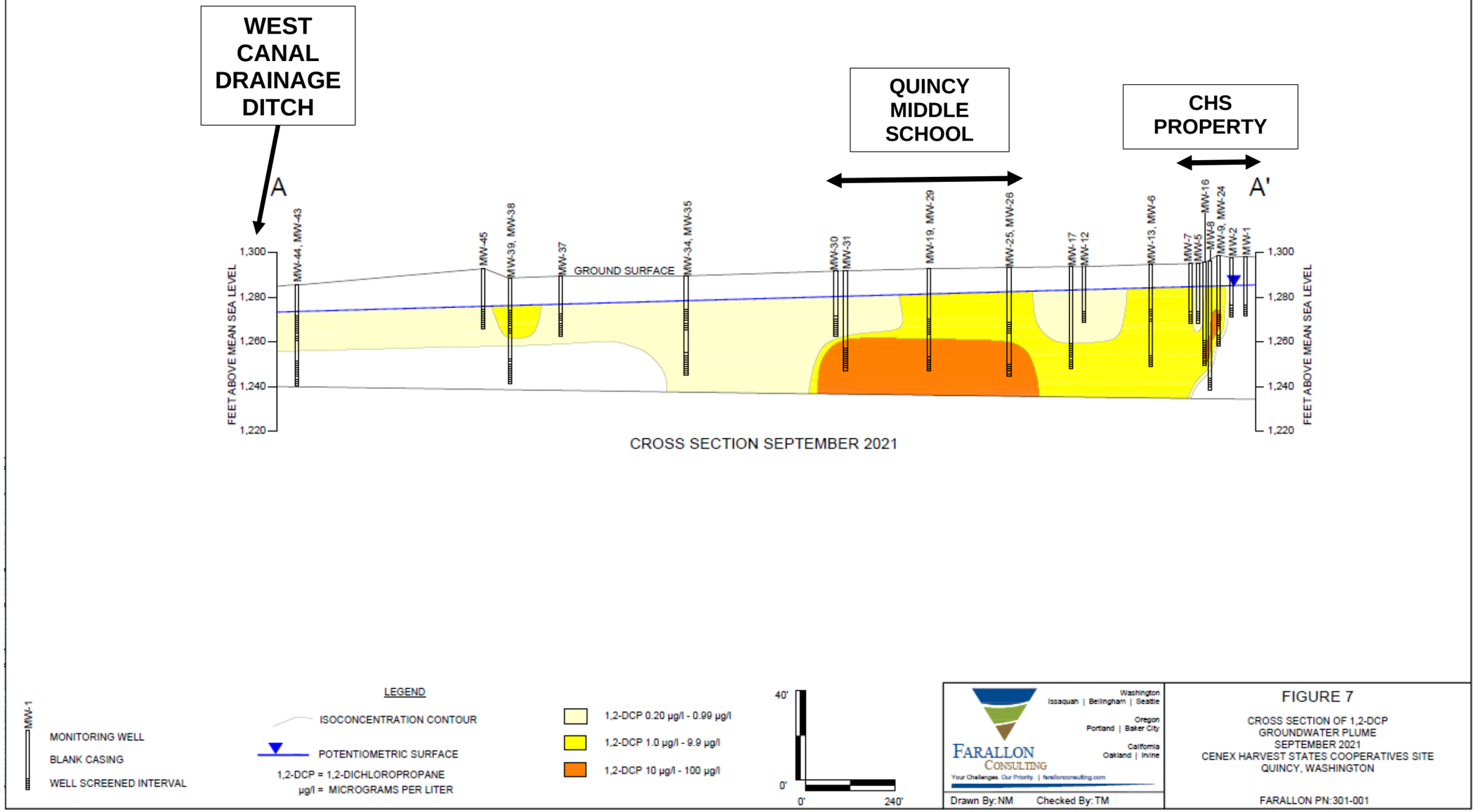

Figure A-6. Cross-sectional depiction of groundwater contaminant plume, September 2021 (Farallon, 2021)

Appendix B. Time-Series Groundwater Trend Plots

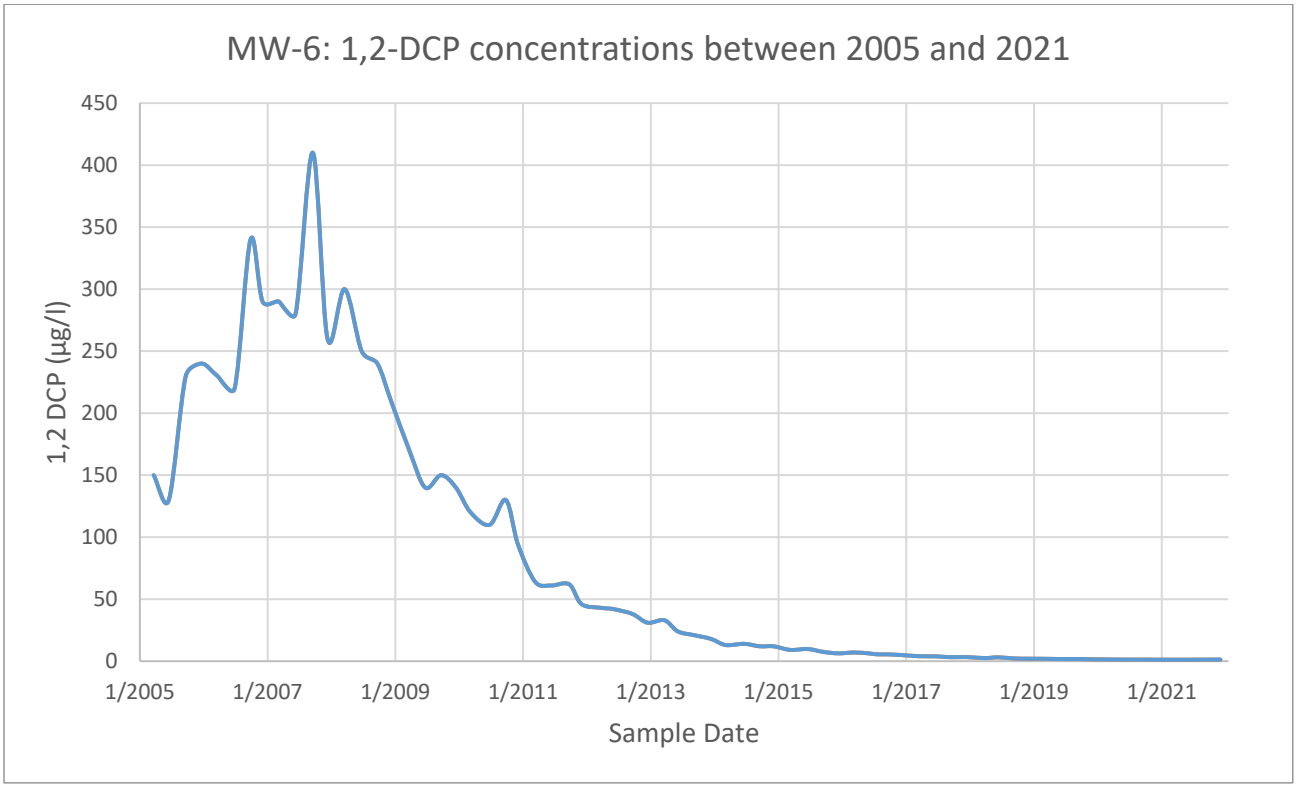

Figure B-1. MW-6 (shallow): Southeast of CHS property

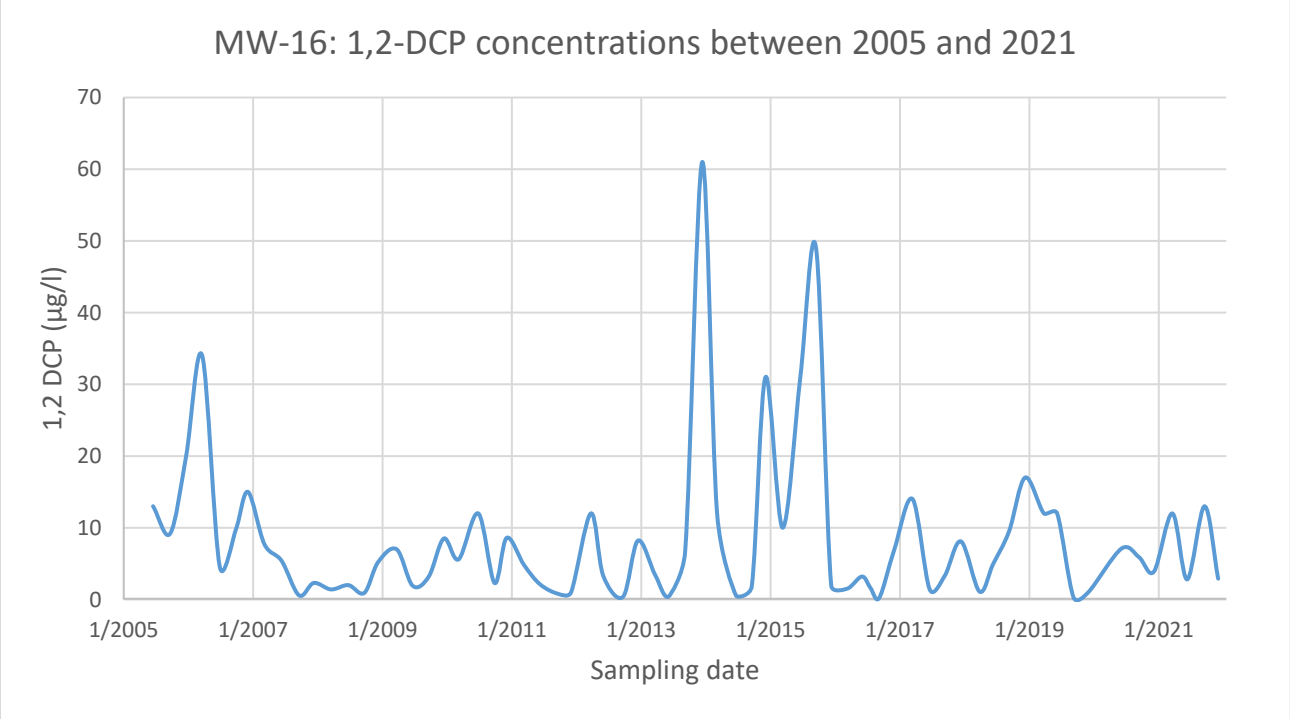

Figure B-2. MW-16 (deep): CHS property (source area)

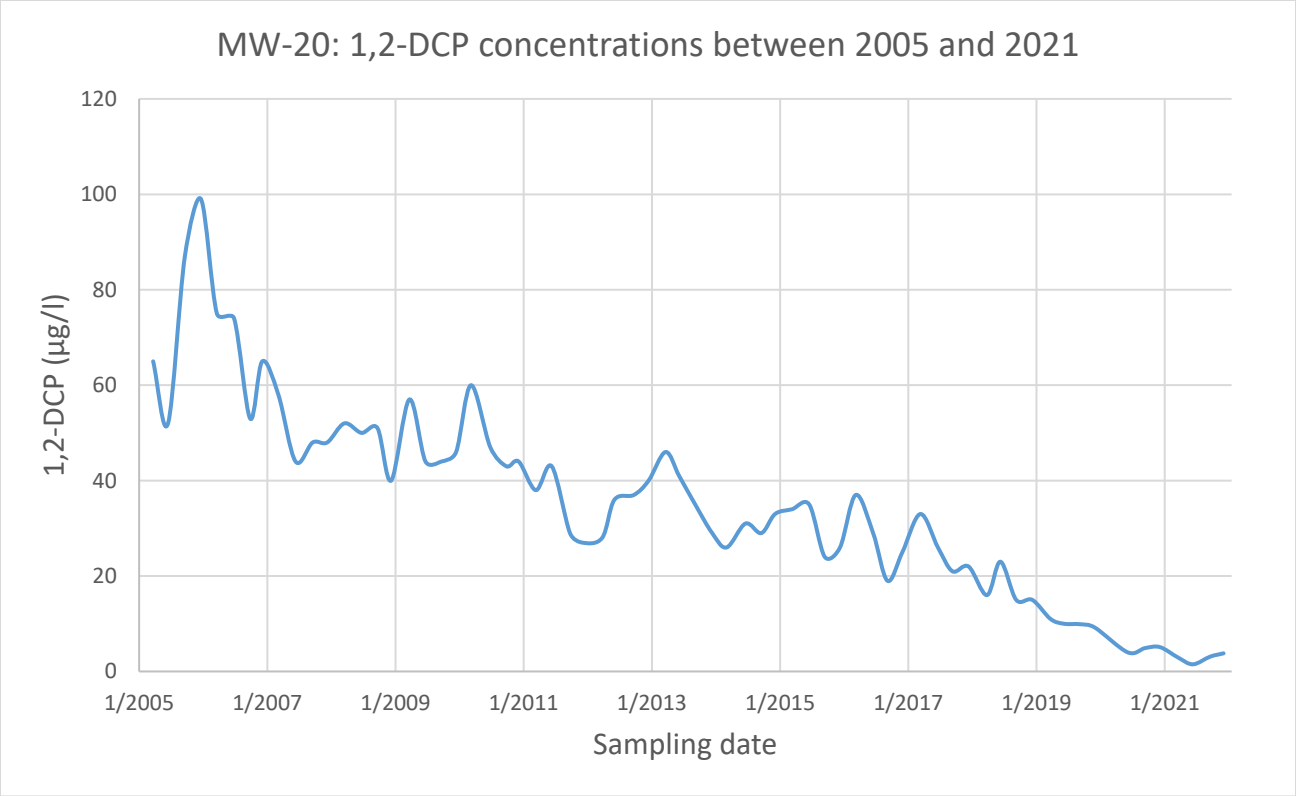

Figure B-3. MW-20 (shallow): Near Quincy Middle School

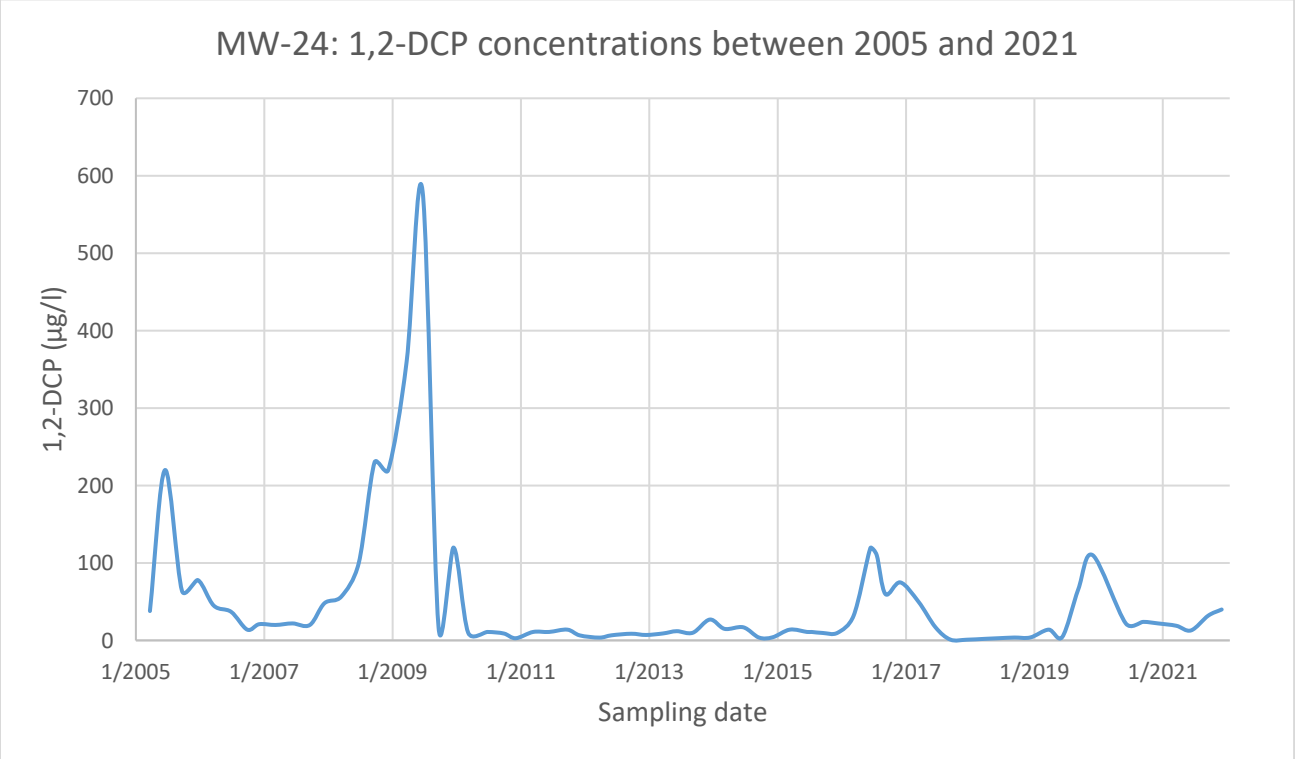

Figure B-4. MW-24 (shallow): CHS Property (source area)

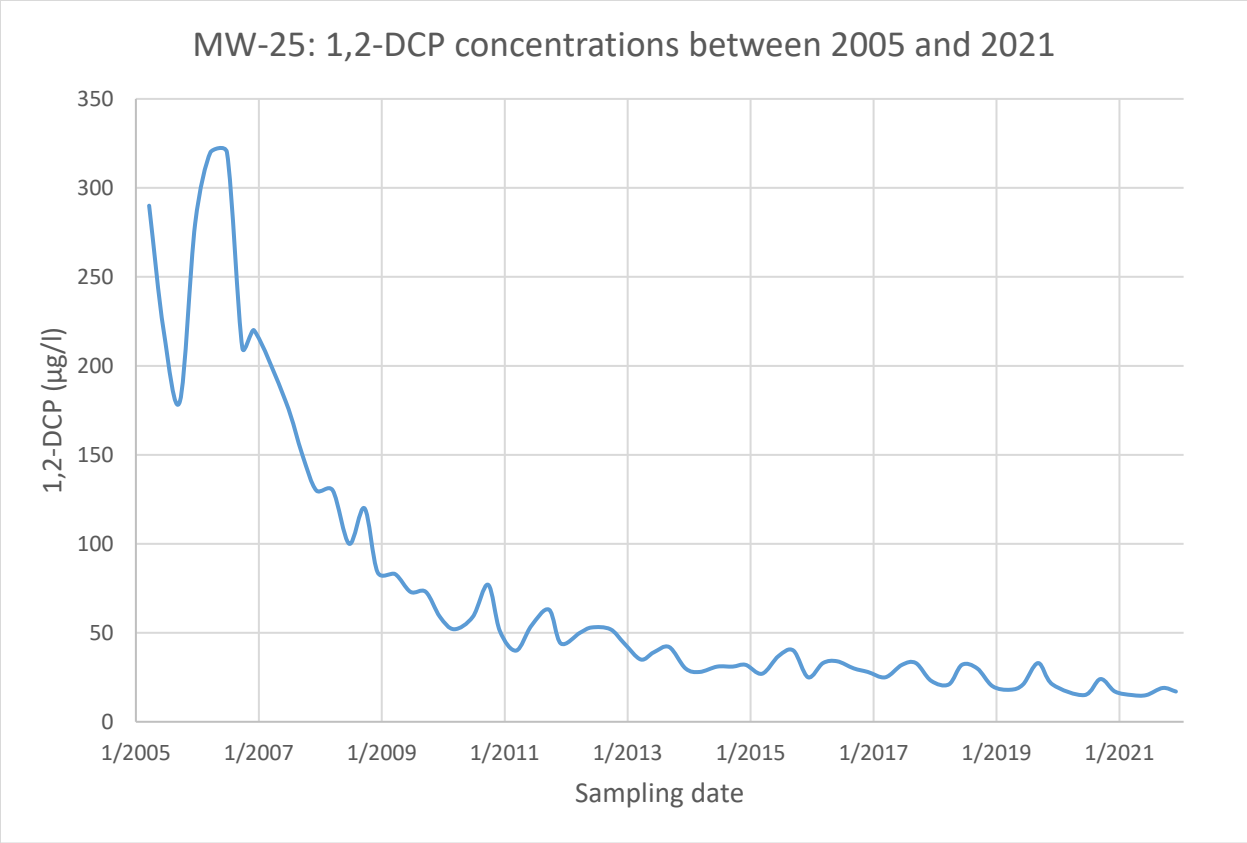

Figure B-5. MW-25 (deep): Southeast of CHS Property

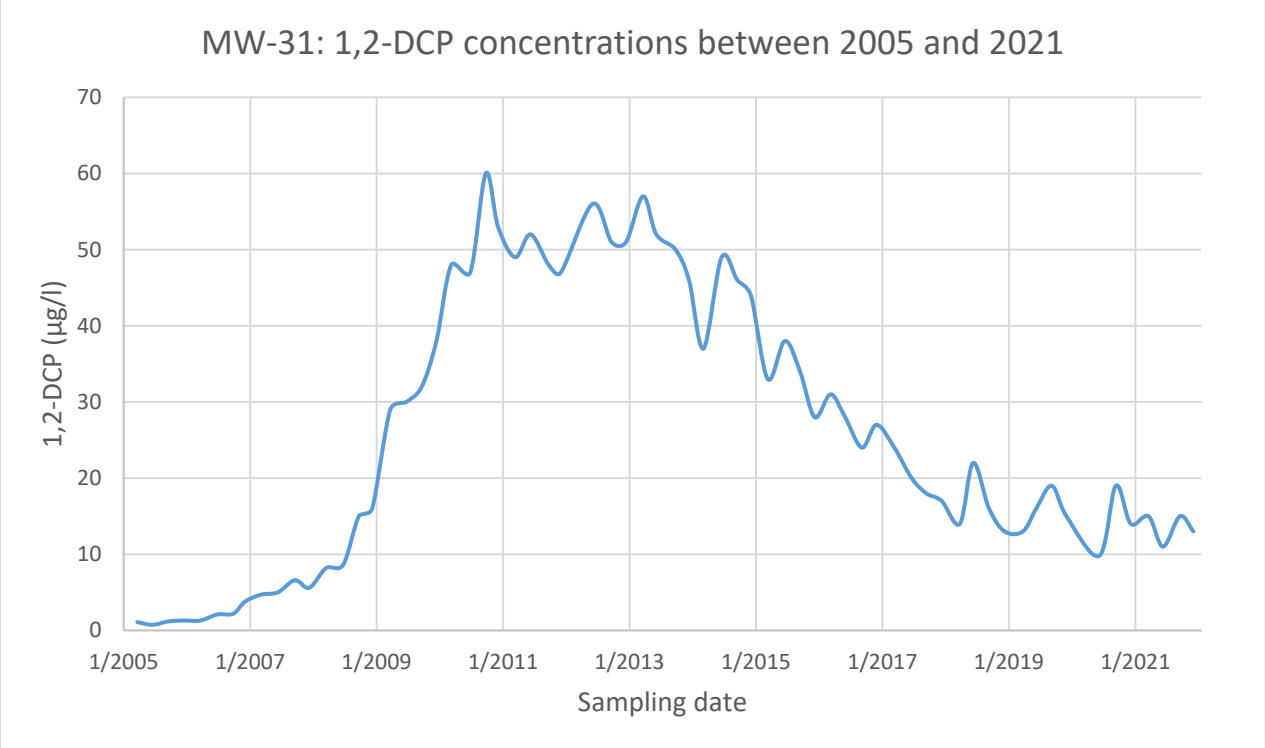

Figure B-6. MW-31 (deep): Near Quincy Middle School

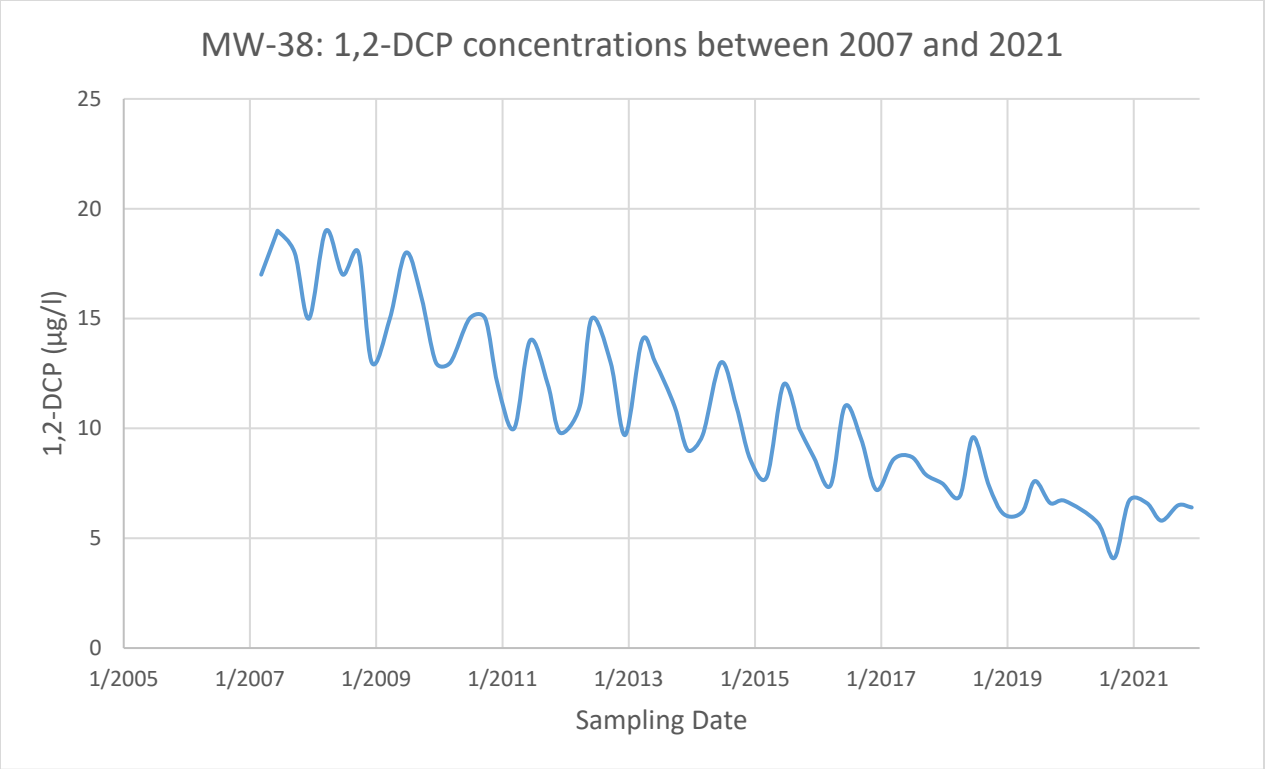

Figure B-7. MW-38 (shallow): Between Middle School and West Canal drainage ditch

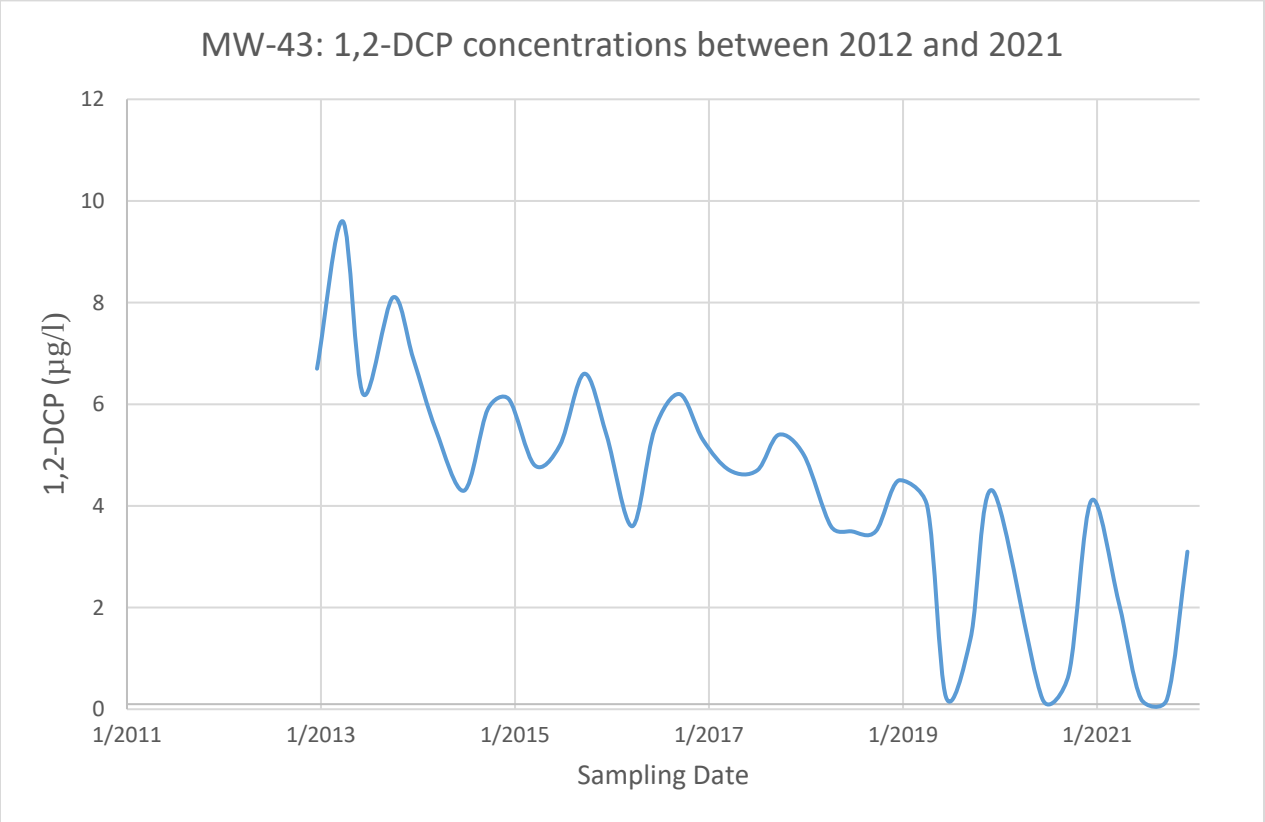

Figure B-8. MW-43 (shallow): Near West Canal drainage ditch