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Memorandum

Date:	21 February 2020
To:	Ken Thiessen, Oregon Department of Environmental Quality
Copies to:	Chris Kimmel, Landau Associates Jason Hegdahl, Cascade Corporation Debbie Taege, The Boeing Company
From:	Cindy Bartlett, R.G., Brent Miller, P.E. Geosyntec Consultants
Subject:	Data Gaps Investigation Work Plan – East Multnomah County Troutdale Sandstone Aquifer Remedy (ECSI 1479) Geosyntec Project Number: PNG0564S19

This work plan outlines a proposed data gaps investigation for the East Multnomah County (EMC) Troutdale Sandstone Aquifer (TSA) remedy. The EMC remedy for the dissolved VOC plume is being conducted jointly between the Cascade Corporation (Cascade) and The Boeing Company (Boeing) under the Oregon Department of Environmental Quality (DEQ's) Consent Order No. WMCSR-NWR-96-08. Proposed borehole/well locations are located on the Cascade property located at 2525 NE 201st Avenue in Gresham, Oregon (Figure 1).

1. PURPOSE AND OBJECTIVES

The purpose of this work is to further evaluate the upper TSA and collect additional data to better understand possible causes for recent increases in trichloroethene (TCE) concentrations at monitoring wells D-17(ds), CMW-17(ds), and CMW-18(ds), located in the "mound area" of the Site. TCE concentrations at these three wells have increased in recent years, in contrast with other areas of the TSA dissolved plume where TCE concentrations have decreased to levels near or below the cleanup level (or maximum contaminant limit [MCL] of 5 micrograms per liter [µg/L]). TCE and groundwater elevation trends for each of the three mounds wells are provided in Figures 2, 3, and 4.

The proposed boreholes/wells are located on Cascade property within the mound area as shown on Figure 1. Based on the results from this data gap investigation, additional boreholes/wells may be considered, including to the west near monitoring well D-17(ds).

The additional data obtained from this investigation is expected to provide subsurface information to update the conceptual site model for the mound area on a finer scale, to determine the nature of the recent TCE increases, and to facilitate further optimization of the existing remedial systems and/or help identify potentially alternative remedial strategies. Specifically, data collection objectives include the following:

- Obtain subsurface soil data to better understand soil types/lithology (e.g. weathering, fractures, grain sizes/pore space, degree of cementation etc.) in areas between existing boreholes/wells. The data will be used to evaluate stratigraphy/lithology and identify any potential preferred pathways. For example, finer grained layers may not transmit groundwater and/or contaminant flow, either historically or currently if near extraction wells.
- Install groundwater monitoring wells to obtain groundwater samples at a higher resolution/closer spacing than currently exists in the mound area. These wells may also be utilized in the future, if appropriate, as part of the remediation system, such as SVE, groundwater extraction, and/or other alternatives.
- Provide data to refine the conceptual site model in order to target remediation more accurately (spatially and with depth).

2. SUBSURFACE INVESTIGATION

Field methods, target depths, well construction, and IDW management will be completed as described in the 2019 SVE Rebound and Expansion Work Plan (Geosyntec, 2019), with the exception that wells will be constructed of 4-inch rather than 2-inch PVC to allow for potential future conversion to an extraction well (i.e. SVE or pumping). Specific information regarding locations, drilling, and well installation is described in the following sections.

Borehole Locations and Drilling

Three borehole/well locations are proposed in the northern portion of the Site along the erosional truncation of the Troutdale Gravel Aquifer (TGA) and underlying confining unit 1 (CU1). The northern three proposed locations are near where Shepard Springs formerly daylighted and discharged TCE-impacted groundwater at the ground surface. The southern three borehole/well locations are proposed between extraction wells EW-14 and EW-2. These six locations were selected to characterize subsurface information beneath the TGA/CU1 truncation and Shepard Springs, along the southern portion of the Site to further characterize this area, and to provide information at closer spacing between existing well locations. For reference, site geology and hydrogeology are described more

thoroughly in the RI report (Emcon and Landau Associates, 1995) or regionally in Swanson, et al., 1993.

The boreholes will be drilled using sonic drilling methods. Telescoping drilling methods (i.e. a stepdown) will be used at the contact between the TGA and CU1. The boreholes will be drilled using 9-inch casing and 6-inch diameter core barrel, and a bentonite seal approximately 5-10 feet thick will be placed in the base of the 9-inch drill casing depth (top of the CU1) and allowed to set prior to advancement into the CU1 (and underlying TSA). Following placement of the seal, the drill casing will be stepped down to 8-inch casing and a 6-inch core barrel, and the borehole will be advanced to the target depth.

Soil will be cored continuously, characterized/logged, and field screened for VOCs during drilling using a photoionization detector meter (PID). Particular attention will be paid to fractures (e.g. orientation, frequency, quality [RQD]); the degree of weathering and alteration, cementation presence and type (e.g. iron or silica); presence and thickness of interbedded siltstones; and presence/absence of water (e.g. percent saturation). Core from the central borehole completed in the northern portion of the mound area will be retained in core boxes for potential additional characterization.

Target depths for the borings will be where groundwater is first encountered in the TSA plus 20 feet to allow for a 30-foot-long screen with 10 feet above groundwater. The screen will span the water table so portions of the screen will be saturated and unsaturated to allow for groundwater sampling and potentially vapor extraction. For reference, first encountered groundwater is estimated to occur at 99 to 118 feet bgs (elevation range 13-23 ft relative to mean sea level [msl]) based on groundwater measurements from nearby groundwater monitoring wells over the last five years. Based on these water level ranges and the planned 30-foot screen lengths, the target depths of the boreholes may be up to a maximum depth of 140 feet bgs. However, the final screen placement depths will depend on where groundwater is encountered during drilling of each borehole.

Well Installation and Construction

Once the target depth is reached, a monitoring well will be constructed in the borehole. The wells will be constructed of 4-inch diameter, schedule 40 polyvinyl chloride (PVC), with a 0.01-inch (10-slot) screen and 10/20 (or equivalent) silica sand filter pack. Bentonite grout will be placed from the top of the filter pack to within 3 ft of the ground using a tremie pipe. A concrete surface seal will extend from the surface to the top of the bentonite grout. The well will be completed as an above ground well with an 8-inch diameter steel protective casing and three 2-inch diameter concrete filled steel protective bollards.

Well Development and Sampling

Wells will be allowed to rest for at least 24 hours prior to development to allow time for the bentonite grout and concrete to cure. Wells will be developed by pumping and surging until the water runs clear (less than approximately 50 nephelometric turbidity units [NTUs]), 10 wells volumes are removed, and/or water parameters stabilize (e.g. turbidity, conductivity, temperature remain within 10%).

Groundwater samples will be obtained from the wells using passive samplers or using low flow purging and sampling methods with a submersible pump, depending on the planned long-term use of the wells for regular monitoring or remediation. If the wells will be used for regular groundwater monitoring, passive diffusion bag (PDBs) will be used. The PDBs will be placed approximately 5-ft off the bottom of the well and allowed to equilibrate for a minimum of 2 weeks prior to sample collection. Samples will be submitted for analytical testing of VOCs by EPA Method 8260 on a standard turn-around-time (1-2 weeks).

Investigation Derived Waste

Investigation derived waste (IDW) will consist of soil cuttings and water generated during drilling, well development, and sampling. Soil cuttings will be stored on-site in drums or roll-off boxes, dewatered as necessary, pending characterization and off-site permitted disposal.

Water will be stored on-site in totes or a larger water storage container and solids will be settled out. Water will be treated through the on-site Central Treatment System. Remaining/settled solids will be added to a soil roll off box prior to characterization and disposal.

3. DATA EVALUATION AND REPORTING

The lithologic data obtained from this investigation will be used to better inform our understanding of subsurface conditions and to update the conceptual site model on a finer scale. Soil data from borehole logs will provide lithological data that may help inform the conceptual site model regarding any degree of fracturing, cementation, interbedded siltstones, etc. that could potentially have significant impact on contaminant transport and groundwater flow.

Groundwater samples from the wells will provide information to evaluate variability and provide additional sampling and potential remediation points across the mound area.

Results of the drilling and well sampling will be discussed in a report to be provided to DEQ.

Ultimately the data and monitoring wells may be used for refinement of the remedy. If additional remedial design is feasible and likely, a remedial design work plan will be prepared and submitted for DEQ review. Under this scenario, we will request a meeting with DEQ to discuss potential remedy changes.

SCHEDULE AND NOTIFICATIONS

Based on the driller's estimate, these borings/wells can be completed in approximately 12 days, with an additional 2 days for well development (14 days total field time). The wells will be sampled following development. We anticipate approximately 3-4 weeks in total project duration.

DEQ will be notified of the project schedule in advance of the field work.

REFERENCES:

Geosyntec, 2019. East Multnomah County Groundwater TSA Remedy (ECSI 1479), SVE Expansion and Rebound Testing Work Plan. 29 January 2019.

Emcon and Landau Associates, 1995. Remedial Investigation and Feasibility Study, Troutdale Sandstone Aquifer, Part 1: Remedial Investigation (final report); Part 2: Endangerment Assessment. 6 October 1995.

Swanson, R.D., McFarland, W.D., Gonthier, J.B., and Wilkinson, J.M., 1993, A description of hydrogeologic units in the Portland basin, Oregon and Washington; U.S. Geological Survey Water Resources Investigations Report 90-4196.

ATTACHMENTS:

Figure 1: Monitoring and Extraction Well Locations
Figure 2: TCE Concentration Profile CMW-17(ds) TSA Remedy
Figure 3: TCE Concentration Profile CMW-18(ds) TSA Remedy
Figure 4: TCE Concentration Profile D-17(ds) TSA Remedy

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Legend

- Proposed Boring Locations
- CU1 Soil Sample Borings
- Springs
- CU1 Monitoring Wells
- Decommissioned TSA Monitoring Well
- Decommissioned Soil Vapor Monitoring Well
- Soil Vapor Extraction Well
- Upper & Lower TSA Monitoring Well
- Upper TSA Monitoring Well
- Lower TSA Monitoring Well
- Soil Vapor Extraction and Groundwater Monitoring Well
- Lower TSA Extraction Well
- Decommissioned Extraction Well
- Extracted Groundwater Conveyance
- Extraction Well Power Line
- Angled VMW Screen Direction and Location
- Soil Vapor Extraction Piping
- Structure
- Boeing Property Boundary
- Cascade Corporation Property Boundary
- Approximate Area of TGA/CU1 Truncation

N

0 120 Feet

Proposed Data Gaps Boring Locations

East Multnomah County

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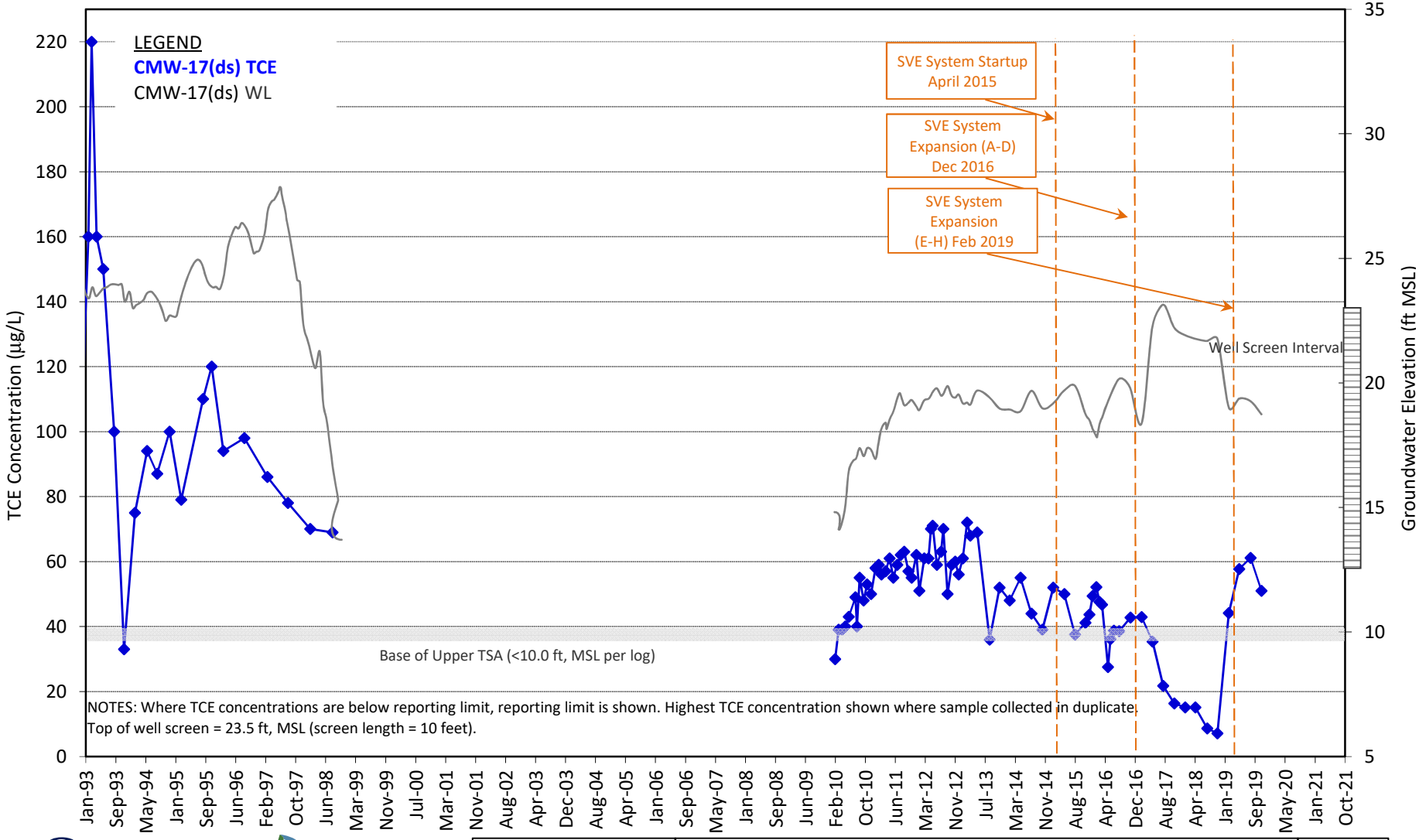
Santa Barbara | February 2020

Figure 1

SantaBarbara-01\\santabarbara-01\data\GIS\PNG0564 - Cascade\Projects\2019\TSA 2019 Annual Report\Fig01_Proposed_Data_Gaps_Boring_Locations.mxd 2/13/2020 (Author: gcatlin) 10:42:19 PM



NOTES: Where TCE concentrations are below reporting limit, reporting limit is shown. Highest TCE concentration shown where sample collected in duplicate.
Top of well screen = 23.5 ft, MSL (screen length = 10 feet).

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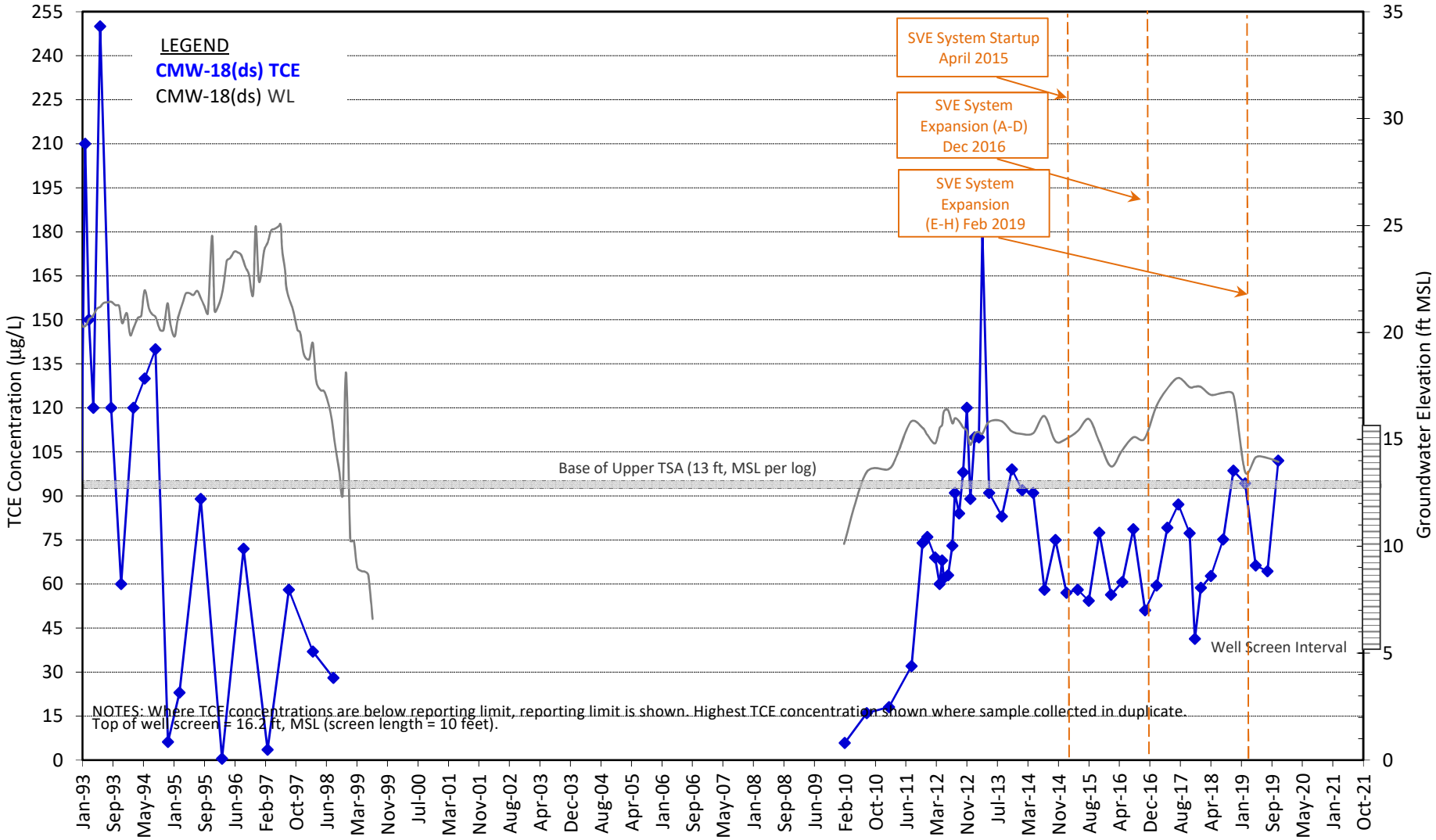
Cascade Corporation Gresham, Oregon	**TCE Concentration Profile CMW-17(ds)** **TSA Remedy**	Figure 2



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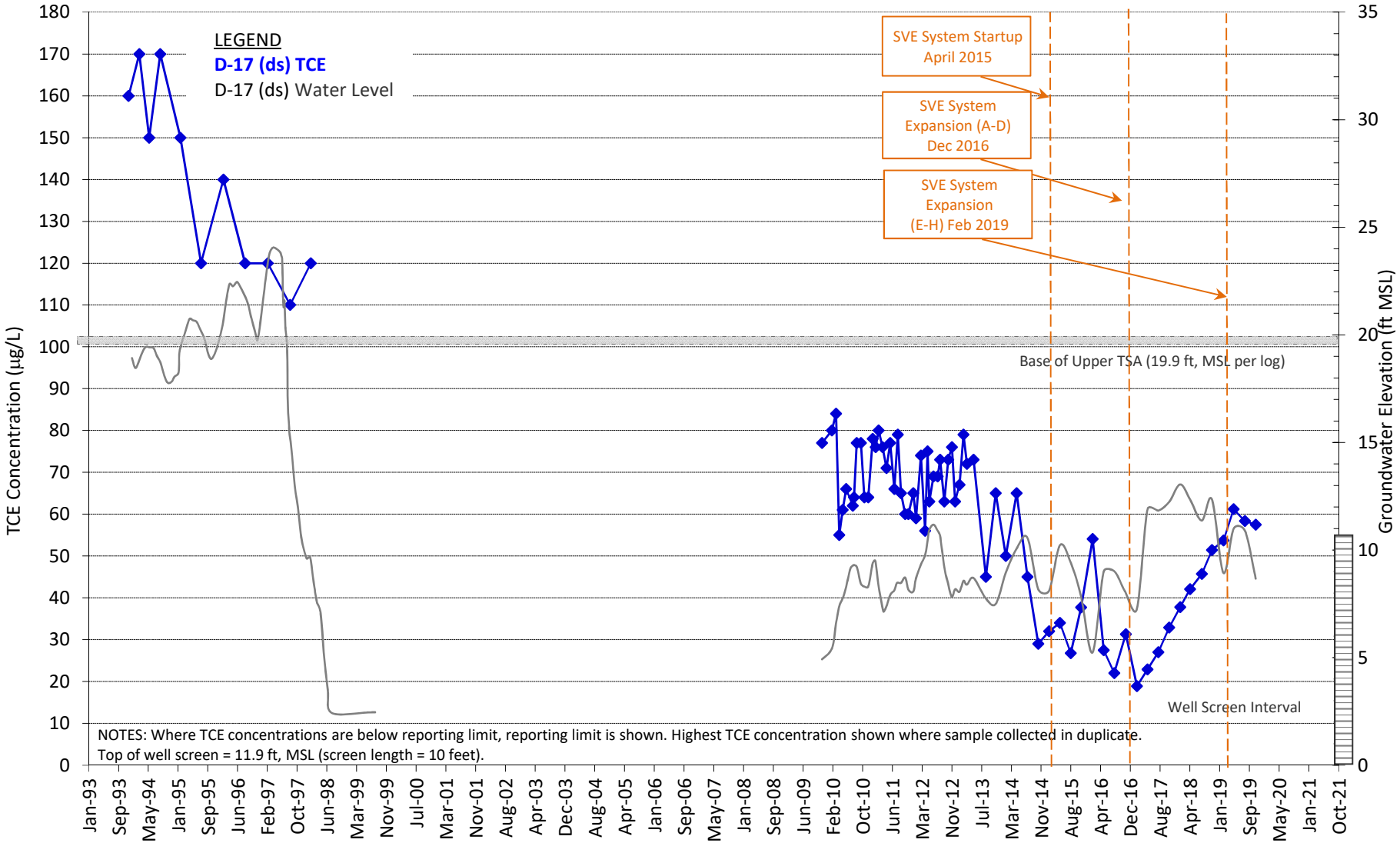
Cascade Corporation Gresham, Oregon	**TCE Concentration Profile CMW-18(ds) TSA Remedy**	Figure 3



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Cascade Corporation Gresham, Oregon	**TCE Concentration Profile D-17(ds)** **TSA Remedy**	Figure 4