Winslow, Frank (ECY)

From: Winslow, Frank (ECY)
Sent: Friday, June 16, 2023 11:58 AM
To: 'Lisa Thompson'
Cc: Rake, Brandon; Riley Conkin; Suzy Stumpf
Subject: RE: Results Summary and Recommendation for Block 10 Site DPE System (VCP Project ID: XN0032)
Attachments: ENGINEERING ISSUE_SOIL VAPOR EXTRACTION.PDF; B10_Figures_Tables_Chart.pdf

Hi Lisa,

Ecology has received your request for concurrence for cessation of operation of the Block 10 NE DPE and SVE and system. This email focuses on the SVE system, as that follows the discussion within our April 19, 2023 intake meeting and rebound testing had been proposed to support potential shut-off of the SVE system. Shut off of the DPE system as a whole also pertains to whether or not cleanup of groundwater is sufficient. As further discussed below, Ecology's opinion on the sufficiency of groundwater cleanup must await submittal of a cleanup action completion report and our preparation of an opinion letter.

SVE System – Soil Gas and Soil Contamination

Ecology considered the attached EPA document on SVE during our review of your email. That document states:

> *Consider again the example of the perched water lens; the extracted vapor concentrations may fall rapidly during initial SVE operations as contaminants are removed in soil gas from the more permeable zones, but once the SVE operations cease, contaminant vapor concentrations build slowly back to the initial condition by diffusion from the clay and water lens as only a small fraction of the initial contaminant mass was removed.*

The following chart illustrates this phenomena:

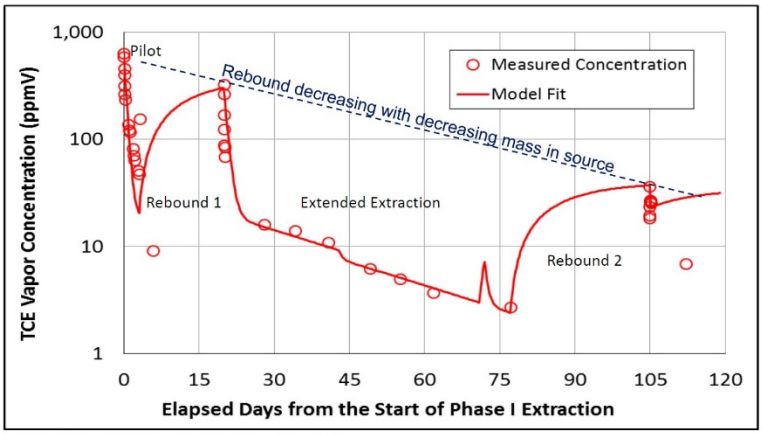


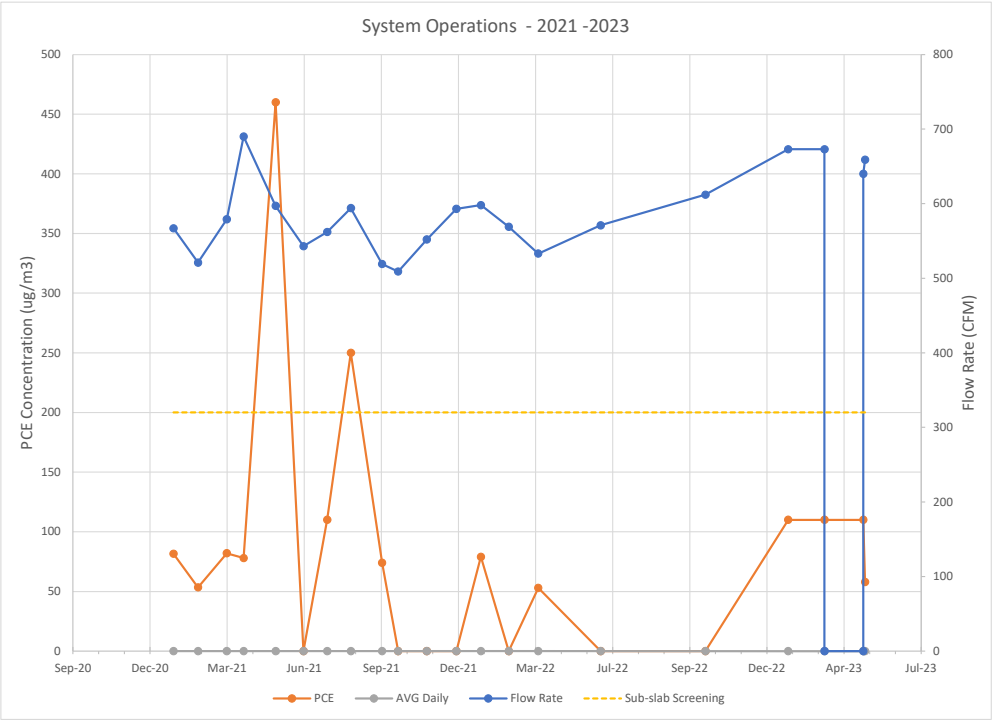
Figure 5. Parameter fit to SVE operations and periods of rebound

We recognize that the system has been in operation for 10 years and many concerns regarding rebound may be from sites operated for a significantly shorter duration and that the system has generally achieved asymptotic results. However, this is an important question, since no soil confirmation sampling is anticipated. Achievement of MTCA soil cleanup levels is much more clearly demonstrated through soil sampling than through asymptotic SVE discharge results. However, we recognize that additional soil sampling may not be practicable at this Site. Achieving asymptotic conditions shows a general diminishing return for continued operation; however, the tricky question becomes when those diminishing returns indicate that continued operation does not provide relative benefits greater than incremental costs. This is similar to Ecology's disproportionate cost analysis. However, within a DCA, this is a comparison between alternatives. In this case, the two compared alternatives are continuing operation or ceasing operations.

Based on the data presented in your Chart 1, Cumulative PCE Removal, and Table 3, Performance Monitoring, some PCE mass removal is still occurring as of April 2023. The EPA document includes the following discussion regarding assessing system performance for potential shutdown:

> *6 SYSTEM SHUTDOWN AND SITE CLOSURE*
>
> *Periodic SVE shutdowns to evaluate rebound will provide information necessary to assess progress toward remedial goals of absolute vapor concentrations or mass fluxes. An initial rebound test performed after the initial decay in extracted concentration will provide an indicator of source zones and a baseline for later comparison. The periodic evaluations illustrated in Figure 5 demonstrate a reduction in average source concentration of more than one order of magnitude.*
>
> *Over time, the cases of local rebound concentrations above applicable cleanup criteria are expected to decrease. Rebound testing will help identify locations where persistent high VOC levels warrant additional investigation for potential augmentation or locally aggressive treatment with an alternative technology (e.g., chemical oxidation, electrical resistance heating). Additionally, transport and exposure models can be used with rebound test results to estimate whether system closure may pose a risk to potential receptors.*
>
> *Methods for evaluating the rebound data are provided in U.S. ACE (2002) as summarized in Section 5.2. Additional details on the interpretation and use of periodic rebound testing are described by Brusseau et al. (2010, 2015). The key results from the rebound testing are reductions in equilibrium VOC vapor concentrations and VOC mass flux rates from the residual VOC sources. The use of these results as inputs for fate and transport modeling after SVE ceases is described at the end of this section.*

In general, assessment of continued SVE performance pertains to review of the rebound data. The overall system performance illustrated in Chart 1, Cumulative Vapor Phase PCE Removal does not present data in a sufficiently granular fashion to assess rebound. Therefore, Ecology prepared the following chart to exam the recent data more closely. Ecology notes that PCE in air results correlate well with average daily mass removal rates but PCE concentrations may be more easy to conceptualize.



The following conclusions can be made from this chart.

- The PCE concentration following the system shutdown in March-April dropped slightly. This suggests rebound was not occurring.
- The PCE in air concentrations have been fairly noisy; however, highest concentrations dropped between 2021 and 2023.
- The last sub-slab screening level (unrestricted) exceedances for PCE in discharge air were during two events during 2021.

In addition,

- The maximum soil gas concentration in most recent sampling were PCE 610 µg/m3 and TCE at 100 µg/m3. The PCE concentration exceeded the unrestricted screening level of 320 µg/m3, but was less than commercial screening level of 1,500 µg/m3. The TCE concentration slightly exceeded the commercial screening level of 95 µg/m3.

Ecology understands based on your email that operation of a sub-slab depressurization system (SSDS) will continue at the Site. Therefore, the structure occupants will continue to be protected from potential vapor intrusion. Ecology understands that this is a active SSDS; therefore, some additional mass removal may continue to take place (although most recent sampling results from SSD points were below detection limits).

Based on this analysis, Ecology concurs that the relative benefits of continued operation of the SVE system appear to be low. The shallow groundwater system has reportedly been drying up; therefore, the soil-to-groundwater pathway appears to likely be less viable. However, review of groundwater data were not part of Ecology's analysis and conclusions regarding the soil-to-groundwater pathway being incomplete are not being made by Ecology at this time. That conclusion would require a thorough analysis of available hydrogeological, contaminant, and operational data. Therefore, Ecology suggests the following:

The decision to discontinue operation of the SVE system appears to be defensible, provided that operation of the SSDS continues. Continued operation of the SSDS is considered advisable at this time, regardless of the SSDS sampling results.

Since Ecology has not yet provided our opinion regarding the soil-to-groundwater pathway, Ecology suggests that the SVE system not be decommissioned until following that opinion. Ecology anticipates providing our opinion following submittal of a Cleanup Action Completion Report for the Site.

<u>DPE System – Groundwater Contamination</u>

Ecology cannot offer concurrence at this time regarding discontinuing operation of the DPE system with respect to cleanup of contaminated groundwater. An opinion request with the submittal of the Cleanup Action Completion Report will result in our providing our opinion on whether cleanup at the Site has met the substantive requirements of MTCA. We recognize that operation of the SVE system may not be fully independent of the DPE system. Discontinuing operation of the DPE system at this time would be solely Farallon and JPM Chase's decision, although Ecology would conclude that continued operation of DPE wells generally appears to be warranted (most recent groundwater sampling results would appear to indicate relatively high concentrations still remain - to 350 µg/L PCE and 36 µg/L TCE). I do not know how much the operation of the DPE system can be adjusted to target remaining higher concentration areas; however, the reduction of the recovery effluent concentration to 30 µg/L in 2023 cannot alone be concluded to be a cleanup performance metric demonstrating that groundwater has been cleaned up to the maximum extent practicable.

Ecology notes that achieving cleanup levels for groundwater are generally demonstrated through 4-8 consecutive quarters of groundwater data below cleanup levels. The upper end of this is commonly cited for chlorinated VOCs in groundwater due to potential groundwater rebound effects. Continued active remediation would generally be expected until cleanup levels have been achieved. Making a case for sufficiency of cleanup of groundwater with such remaining concentrations may be challenging. This does not preclude the possibility of potentially transitioning continued O&M and monitoring to a post-NFA status. Under this scenario, Ecology would review O&M and monitoring data on a five-year basis during periodic reviews.

Understanding the groundwater at the Site also requires a detailed understanding of the "drying up" of the shallow groundwater system as well as the connectivity between aquifer zones. The Cleanup Action Report should present data supporting this case, including water level time trends and detailed sections showing the changes in water levels. Presentation of data demonstrating the discontinuity of the shallow groundwater system may have potential to support a case for why relative benefits of continued active cleanup may be low. We understand that such a case may be presented within the Cleanup Action Report for the deeper groundwater system as well. If a case can be made that the groundwater contamination is limited to the Property, and the plume(s) is stable or receding, then there may be potential to manage remaining groundwater contamination via institutional controls under an environmental covenant and conditional points of compliance. However, since a remedial system is currently in place and is apparently continuing to remove contaminant mass, in general, Ecology would conclude that continued operation appears to be warranted.

Closing

Please note that this email does not constitute a formal Ecology opinion, but simply indicates that we have no objections to discontinuing operation of the SVE system at this time.

We look forward to receipt of your Cleanup Action Completion Report and request for opinion. If you would like to discuss this email, then we can schedule a Teams call.

Thanks, Frank

Frank P. Winslow, LHG

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From: Lisa Thompson <lthompson@farallonconsulting.com>
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Subject: Results Summary and Recommendation for Block 10 Site DPE System (VCP Project ID: XN0032)

Frank,

As discussed during our Expedited VCP Intake Meeting on May 1, 2023, Farallon Consulting, L.L.C. (Farallon) has prepared this email on behalf of Stack House Acquisition LLC to provide the Washington State Department of Ecology (Ecology) with a summary of the cleanup action progress for the Block 10NE property in Seattle, Washington.

The Block 10 Site comprises the block between Republican Street to the north, Pontius Avenue North to the west, Harrison Street to the south, and Yale Avenue North to the east (Figure 1). The western half of the block is referred to as the Block 10 West property at 420 Pontius Avenue North (herein referred to as Block 10W) and the northeast portion of the block is referred to as the Block 10 Northeast property at 1265 Republican Street (herein referred to as Block 10NE). The two properties have been combined and are collectively referred to as the Block 10 Site under the Expedited Voluntary Cleanup Program (VCP) (VCP Project ID: XN0032).

This email includes a summary of the cleanup action progress for Block 10NE - specifically, a summary of the results of the recent pulsing of the Dual Phase Extraction (DPE) system and a recommendation for cessation of operation of the DPE system at Block 10NE because asymptotic conditions have been attained.

BACKGROUND

The Block 10NE interim action included localized shallow excavation of contaminated soil during redevelopment activities in 2013, and the subsequent installation of a remediation system including: 1) a DPE system; 2) a soil vapor extraction (SVE) system; and 3) a subslab depressurization system (SSDS). The Block 10NE remediation system was constructed to remediate concentrations of PCE and its degradation products from soil gas, soil, and groundwater at Block 10NE.

The remediation systems have been in operation since October 2013 and have effectively remediated COCs in soil gas, soil, and groundwater to the maximum extent practicable and eliminated the soil vapor to indoor air exposure pathway at Block 10NE. The DPE system daily mass recovery rate and mass recovered has reached asymptotic conditions as demonstrated by the system performance monitoring data, which is described in greater detail below.

BLOCK 10NE CLEANUP ACTION PROGRESS

System Description

The DPE system consists of 19 wells that remove both liquids and vapors from screened intervals below the static groundwater level (Figure 2). Each DPE well contains a Grundfos submersible pump that draws down the water column via a programmable pump cycle that turns on and off after a given time period. The SVE system consists of 16 wells with depths ranging from 15 to 30 feet bgs.

The SSDS consists of 6 wells located inside the restored Supply Laundry Building at Block 10NE (Figure 2). A vacuum is applied to each DPE, SVE, and SSDS well by the remediation system blower and the extracted vapors are collected, conveyed, and then discharged to the atmosphere.

System Performance

In 2023, Farallon continued DPE system operations at the Block 10NE property with collection of monthly water and air compliance samples. On January 26, 2023, Farallon participated in an Expedited VCP intake meeting for the Block 10 Site with Ecology and discussed the DPE system performance and asymptotic conditions. Based on the call with Ecology, Farallon proceeded with a pulsed operation of the DPE system to demonstrate and confirm the low potential for mass recovery rates to rebound once the DPE system was turned off.

From March 9 to April 24, 2023, the DPE system was pulsed off. During this period, operation of a select number of the SVE wells (SVE-7 through SVE-11 and SVE-17 through SVE-19) and the SSDS wells were continued to ensure the continued elimination of the potential vapor intrusion pathway for indoor air exposure. A summary of the system performance data pre- and post- pulsed system operations is provided below.

<u>Vapor Phase Recovery</u>

Rates of PCE mass recovery have decreased by an order of magnitude over time from an average of 0.017 pounds per day (lbs/day) in 2014 at system start up to 0.011 lbs per day in 2016 to 0.006 lbs/day or less since 2017. No significant increase in vapor phase concentrations was observed during the operational period from 2013 through 2022 when the DPE system was restarted following temporary shutdowns for annual soil gas and/or groundwater performance monitoring (Tables 1 and 2, Figures 3 and 4).

Overall system air samples were collected on April 24, 2023, immediately following the restart of the DPE system, and on April 26, 2023, after two days of system operation. The purpose of these samples was to evaluate whether pulsing the DPE system increased HVOC removal rates, and if the potential increased removal rates were sustained (Table 3).

Concentrations of PCE, TCE, and cis-1,2-DCE were similar pre- and post-pulsed DPE system operations (Table 3, Chart 1). These overall system air samples demonstrate that the DPE system influent concentrations and PCE removal rates have been very low and consistent since 2017. Further, the results of the air sampling during pulsed operations confirm that

pulsing the system does not substantially increase HVOC mass removal rates and confirms the de minimis mass removal rates (i.e. asymptotic conditions) observed since 2017.

The soil gas performance monitoring events from 2013 to 2022 demonstrate that concentrations of HVOCs in soil gas have exhibited a significant decreasing trend consistent with the decline and asymptotic mass removal rates observed for the DPE system (Table 2, Figure 4).

Water Phase Recovery

Since the DPE system startup in July 2013 through May 2023, approximately 1.5 million gallons of groundwater have been treated and discharged to the sanitary sewer, averaging 420 gallons per day or 0.3 gallons per minute. The water recovery rates confirm that the DPE system extracts low quantities of groundwater from the perched groundwater-bearing zone at the Block 10NE Property, essentially dewatering the perched zone and allowing for effective mass removal of PCE from the affected soil within the perched zone by SVE. Concentrations of HVOCs in groundwater prior to carbon treatment have not exceeded KCIW permit discharge limitations since system start up in 2013, and confirm low mass recovery with the influent concentration of PCE starting at 210 micrograms per liter (µg/l) at system startup to less than 30 µg/l from 2017 to current.

The performance groundwater monitoring events from 2013 to 2022 confirm that concentrations of HVOCs in groundwater have decreased by an order of magnitude (Table 1, Figure 3). The decreasing trends in groundwater concentrations are consistent with the overall decline and asymptotic mass removal rates observed for the DPE system.

Closing

The Block 10NE DPE system has operated effectively over the past 10 years and resulted in a significant removal and reduction in HVOC mass in soil gas, soil, and groundwater to the maximum extent practicable at Block 10NE. The recent pulsed operation of the DPE system further confirms the low potential for soil gas concentrations to rebound following system cessation, such that asymptotic conditions have been achieved (Table 3, Chart 1).

With Ecology's concurrence, Farallon will permanently cease operation of the DPE system and transition to operation only of the SSDS to ensure the continued elimination of the potential soil vapor to indoor air exposure pathway at Block 10NE.

Farallon also is in the process of preparing the Cleanup Action Report for the Block 10 Site to support the request for a No Further Action determination for the Block 10 Site.

Please contact Riley Conkin or Suzy Stumpf at 303-489-1032 or me if you have questions or comments.

Regards,

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Project Engineer

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