



Cleanup Action Contingency Plan Cadet Manufacturing Company and Swan Manufacturing Company Sites

Prepared for
Port of Vancouver

 Port of Vancouver USA

March 2024

Cleanup Action Contingency Plan Cadet Manufacturing Company and Swan Manufacturing Company Sites

Prepared for

Port of Vancouver
3103 NW Lower River Road
Vancouver, WA 98660

Prepared by

Parametrix
5 SE Martin Luther King Jr. Boulevard, Suite 400
Portland, OR 97214
T. 503.233.2400 F. 1.855.542.6353
www.parametrix.com

March 2024 | 275-1940-006

Citation

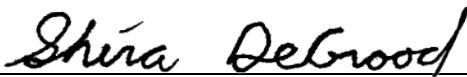
Parametrix. 2024. Cleanup Action Contingency Plan Cadet Manufacturing Company and Swan Manufacturing Company Sites. Prepared for Port of Vancouver by Parametrix, Portland, Oregon. March 2024.

Certification

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned whose seal is affixed below.



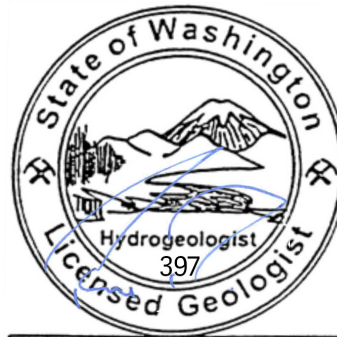
Prepared by Rick Malin, LHG



Reviewed by Shira DeGroot



Approved by Richard Roché, LHG



Richard Roché

3/29/2024

Contents

1. Introduction.....	1-1
1.1 Purpose	1-1
1.2 Supporting Plans.....	1-1
1.2.1 Groundwater Compliance Monitoring Plan	1-2
1.2.2 Operation Plan.....	1-3
1.3 Key Background Information	1-3
1.3.1 Hydrogeology	1-3
1.3.2 Nature and Extent of Contaminants in Groundwater	1-3
1.3.3 Groundwater Model Findings	1-4
2. Contingency Plan Decision Process	2-1
2.1 Trigger Level.....	2-1
2.2 Trigger Level Exceedance Response	2-2
2.3 Conceptual Site Model Assessment Response	2-2
2.4 Monitoring Well Network Assessment Response	2-2
2.5 Active Remedial Action Assessment Response	2-3
3. Summary.....	3-1
4. References.....	4-1

FIGURES

Figure 1-1. Site Location Map

Figure 1-2. Existing Site Area Well Network

Figure 1-3. Locations of CPU Carol Curtiss Wellfield, COV Water Station, and Swan Site

Figure 1-4. Model Contaminant Transport Plume & Particle Trace

Figure 1-5. Attenuation Monitoring Well Locations

Figure 1-6. Swan Source Area Monitoring Wells

Figure 1-7. Non-Swan/Cadet Source Area and Port/GWM Wellfield Area Monitoring Wells

Figure 1-8. Deep Zone Monitoring Wells

Figure 2-1. Contingency Plan Flowchart

Figure 2-2. Model Trigger Simulation Results

Contents (continued)

TABLES

Table 2-1. Groundwater Points of Compliance Monitoring Wells

Acronyms and Abbreviations

µg/L	micrograms per liter
AO	agreed order
Cadet	Cadet Manufacturing Company
CAP	cleanup action plan
CC	Carol Curtis
COC	contaminant of concern
COV	City of Vancouver
COV3	City of Vancouver water station WS-3
CPU	Clark Public Utilities
Ecology	Washington State Department of Ecology
GCMP	groundwater compliance monitoring plan
GWM	Great Western Malting
MNA	monitored natural attenuation
msl	mean sea level
MTCA	Model Toxics Control Act
P&T	groundwater pump and treat interim action
PAA	Pleistocene alluvial aquifer
PCE	tetrachloroethylene
POC	point of compliance
PSA	point of standards application
Swan	Swan Manufacturing Company
TCE	trichloroethylene
USA	unconsolidated sedimentary aquifer
VLL	Vancouver Lake Lowland
VOC	volatile organic compound

1. Introduction

This Cleanup Action Contingency Plan (Contingency Plan) has been developed as a requirement for implementation of the Cleanup Action Plan (CAP) associated with the Cadet Manufacturing Company (Cadet) and former Swan Manufacturing Company (Swan) sites located in Vancouver, Washington. The Cadet and former Swan sites are part of a larger cleanup site referred to in the Washington State Department of Ecology (Ecology) database as the “Vancouver Port of NuStar Cadet Swan” site (the “Site” or “Site area”). Figure 1-1 shows the area of the Site identified by Agreed Order (AO) DE 18152 (Ecology 2020) based on the historical maximum extent of volatile organic compound (VOC) contamination. In addition, the location and areas associated with Swan, Cadet, NuStar, and Kinder Morgan portions of the Site are included on Figure 1-1.

The CAP for the Swan and Cadet portions of the Site was issued by Ecology in September 2023 (Ecology 2023a). The selected cleanup action includes a combination of institutional controls (groundwater use restrictions), engineering controls (future building construction), and monitored natural attenuation (MNA). AO DE 21295, effective August 12, 2023 (Ecology 2023b), provides for implementation of the CAP and for development of planning and compliance documents, including a Groundwater Compliance Monitoring Plan (Parametrix 2024a), Operation Plan (Parametrix 2024b), and this Contingency Plan.

This Contingency Plan describes the criteria for assessing the cleanup action and specific procedures and actions for further assessment if the cleanup action is not performing as expected.

1.1 Purpose

Development of a contingency plan for the Site is a primary aspect of the selected remedy in compliance with the Model Toxics Control Act (MTCA) as defined in Washington Administrative Code (WAC) 173-340-360 and pursuant to requirements established in AO DE 21295. Since the cleanup action for the dispersed residual concentrations is monitored natural attenuation (MNA) and includes shutting down the groundwater pump and treat interim action (the P&T system), a component of protection monitoring is development of this Contingency Plan and implementation of response actions if MNA is not occurring as expected.

1.2 Supporting Plans

This Contingency Plan defines criteria, methods, and a decision matrix that will be used to determine actions that will be taken if MNA is not occurring as expected. These actions could include additional sampling or frequency of monitoring, further investigation, or potentially restarting the P&T system. Additional CAP required plans that are relevant for the Contingency Plan include the Groundwater Compliance Monitoring Plan and Operation Plan. These plans are summarized below.

1.2.1 Groundwater Compliance Monitoring Plan

The Groundwater Compliance Monitoring Plan (Parametrix 2024a) provides the groundwater monitoring program for the selected cleanup action. It identifies groups of monitoring wells that will be sampled as part of this program. Figure 1-2 shows the location of monitoring wells present in the vicinity of the Site.

After completion of prior interim actions, concentrations of trichloroethylene (TCE) and tetrachloroethylene (PCE) remain above MTCA cleanup levels, primarily in the former Swan source area. TCE, and to a lesser amount PCE, were the drivers of completed interim actions and assessment of remedial action alternatives in the CAP.

The purpose of the groundwater compliance monitoring is to demonstrate that PCE and TCE concentrations in groundwater remain below defined criteria during implementation of MNA as the selected cleanup action. The following information was used to develop the Groundwater Compliance Monitoring Plan, as described in the 2023 Feasibility Study (FS; Parametrix 2023) and the CAP:

- VOC concentrations in groundwater in 2022.
- Changes in VOC over time.
- Evaluation of a three-dimensional, finite difference groundwater flow and contaminant transport model under multiple cleanup action alternatives.

The following cleanup levels for groundwater at the Site are described in the CAP:

- TCE: 4 µg/L
- PCE: 5 µg/L

The current monitoring well network is shown in Figure 1-2. Monitoring wells included in the Groundwater Compliance Monitoring Plan are summarized below and in Figures 1-5 through 1-8. Additional information on these categories is provided in the following subsections.

- Attenuation Wells (Figure 1-5): shallow and intermediate zone monitoring wells located from the Swan source area towards COV3 to the north and the CC wellfield to the northeast. This area is downgradient and cross-gradient of the Swan source area, as predicted by the groundwater model (described further in Section 1.3.3). Includes 1) inner attenuation wells, located south of West 31st Street and within the capture area of P&T system (if re-start occurs), and 2) outer attenuation wells, situated north of West 31st Street and outside the capture area of P&T system.
- Swan Source Area Wells (Figure 1-6): primarily shallow zone wells, also includes two intermediate wells within the Swan source area to assess source area depletion.
- NuStar Facility Wells (Figure 1-7): shallow and intermediate zone wells north of the NuStar facility to confirm natural attenuation is occurring in this area.
- Port/GWM Wellfield Area Wells (Figure 1-7): intermediate zone wells in the Port/GWM wellfield area to confirm natural attenuation in this area.
- Deep Zone Monitoring Wells (Figure 1-8): deep zone wells where VOCs were regularly detected in 2022 to confirm that natural attenuation is occurring.

1.2.2 Operation Plan

The Operation Plan for the CAP (Parametrix 2024b) provides procedures for:

- Shutdown of the Port's P&T system;
- Maintenance during the shutdown period; and
- Potential re-start of the system.

A plan for permanent decommissioning of the P&T system will be developed in the future and submitted to Ecology for approval, as appropriate.

1.3 Key Background Information

Key background information used during the development of this Contingency Plan is summarized below. Additional information and analysis are provided in the FS (Parametrix 2023) and the CAP (Ecology 2023a).

1.3.1 Hydrogeology

Groundwater elevations on Site are described as the shallow, intermediate, and deep groundwater zones. These monitoring zones were adopted during the Swan, Cadet, and NuStar Remedial Investigation (RI) efforts to evaluate and describe groundwater quality at the Site (Parametrix 2010). The existing groundwater monitoring networks in and adjacent to the Site area are shown on Figure 1-2.

In the Swan and Cadet areas, the shallow unconsolidated sedimentary aquifer (USA) monitoring zone extends from ground surface to -10 feet mean sea level (msl; approximately 40 feet below ground surface) and corresponds to alluvial deposits. The intermediate USA monitoring zone extends from -10 feet msl to -100 feet msl and corresponds with catastrophic flood sand and gravel deposits. The deep zone extends below -100 feet msl down to the top of the Troutdale formation, which varies in elevation in the Site area. The deep zone corresponds with channel fill deposits and reworked Troutdale formation material. In the vicinity of the Site, the USA is also referred to as the Pleistocene alluvial aquifer (PAA).

1.3.2 Nature and Extent of Contaminants in Groundwater

Interim actions have been completed to treat volatile organic compounds, primarily TCE, and to a lesser amount PCE, in the vicinity of Swan and Cadet. Based on analytical results for groundwater samples collected in 2022, TCE and PCE concentrations in specific wells generally located in the vicinity of source area of the former Swan site remain slightly above the cleanup levels. Groundwater monitoring results from 2022 indicate:

- The overall extent of the Site's dissolved VOC plume continues to decrease. TCE and PCE concentrations greater than the selected cleanup levels are primarily limited to Port property.
- Completed remedial actions have significantly reduced concentrations of PCE and TCE within the source area.

- Within the shallow zone, VOC concentrations at the Site continue to show an overall declining trend. TCE and PCE concentrations in shallow zone wells are less than the cleanup level in Swan and Cadet wells, except for six wells located at the former Swan site and one well at the Cadet facility.
- Within the intermediate zone, VOC concentrations wells continue to decline and are less than the cleanup levels except for TCE at wells MW-05i, CM-MW-23i, CM-MW-28USA-120.5, MW-15i, and MW-37i. PCE concentrations in intermediate Swan and Cadet wells are less than cleanup levels.
- Within the deep zone, VOC concentrations have been declining over the last several years. PCE concentrations in the deep zone wells are less than the cleanup level.
- TCE is detected at higher concentrations than PCE.

1.3.3 Groundwater Model Findings

The Port initially developed a three-dimensional, finite difference groundwater flow and contaminant transport model for the Swan portion of the Site in 2002. Characterization of groundwater flow beneath the Swan site was complicated by a combination of small-scale and local variations in groundwater flow direction associated with local recharge characteristics, very low horizontal gradients, the influence of river stage elevations, and tidal fluctuations resulted in complicated water level interpretations. In addition, the flow of groundwater was heavily influenced by production well pumping. Thus, a groundwater flow model was developed to help with interpretation of groundwater flow in the project area.

The model was updated and used in 2021 during preparation of the FS to evaluate the effectiveness of the P&T interim action and predict contaminant distribution after shutdown of the P&T system. As part of this analysis, the model was used to assess potential risk to water supply wells operated by CPU, the City of Vancouver (COV), the Port, and Port tenants. The findings of the 2021 model assessment for the FS were detailed in a technical memorandum included in the FS and summarized below and in Figures 1-3 and 1-4. Note that the simulated plume development shown on Figures 1-3 and 1-4 represent a highly conservative source assumption that provides an upper limit on predicted transport concentrations associated with currently observed source concentrations.

The groundwater model predicted that, following shutdown of the P&T system, groundwater flow from the Site will be toward the northwest in response to high production pumping occurring at COV water station WS-3 (COV3) and scheduled pumping from the PAA at the CPU Carol Curtis (CC) wellfield (Figure 1-4). The COV3 water station and the CC wellfield are located approximately 1.4 miles northeast and 1.7 miles north, respectively, of the Swan source area. Additional information on primary assumptions and input variables for the model are described in detail in the FS (Parametrix 2023).

Groundwater model simulations were also completed as part of the 2021 FS effort. The purpose of the simulations was to determine a TCE concentration occurring in an inner zone attenuation monitoring well that could potentially result in a subsequent detection of TCE in a COV3 or CC well. Completed simulations were based on two types of source mass assumption: finite mass (representing a decreasing or depleting concentration contaminant source) and infinite mass (representing a constant never changing contaminant source concentration). For the Site, the finite depleting mass represents an actual scenario while the infinite mass assumption represents a worst-case assessment scenario.

Under the finite mass scenario, the model predicted that the average former Swan site source area TCE concentration present in 2020 would need to increase 48 times to result in a detection in a COV3 or CC production well. The TCE concentration occurring in an inner zone attenuation monitoring well under this condition would be 96 µg/L. For the infinite mass scenario, the maximum observed TCE concentration in a shallow former Swan source well during 2020 would need to increase 4.9 times to result in a detection in a COV3 or CC production well. Under this scenario, the TCE concentration occurring in an inner zone attenuation monitoring well under this condition would be 24.4 µg/L. In all cases, detection would occur in a COV3 well and not a CC well assuming a detection limit of 0.5 µg/L for TCE.

2. Contingency Plan Decision Process

This Cleanup Action Contingency Plan provides trigger levels, decision points, and responses to be implemented if warranted by data obtained during compliance groundwater monitoring events. The decision process identified in this Cleanup Action Contingency Plan was developed using MTCA requirements, Site groundwater monitoring data, and contaminant transport modeling. The groundwater model (Parametrix 2023) suggests that, following shutdown of the P&T system, the remaining very low concentrations of TCE from the Swan site (generally below cleanup levels) will attenuate.

The model suggests that TCE may also migrate to the northeast in response to COV3 and future CC wellfield pumping. TCE concentrations are likely to remain significantly below the standard detection limit of 0.5 µg/L and cleanup level of 4.0 µg/L. However, the most conservative scenario modeled (infinite source) predicts that very low TCE concentrations could migrate to COV3 and CC wellfields.

This contingency plan describes the responses and process to be implemented if a trigger level is exceeded in an attenuation monitoring well, as described in Section 1.2.1 and Figure 1-5. Figure 2-1 presents a contingency plan flowchart. The cleanup action contingency decision process is described in the following subsections.

2.1 Trigger Level

The Site's trigger level is the concentration of TCE that, if exceeded, will require action. TCE concentrations were identified as the trigger level based on data provided by the groundwater model, recent concentrations in groundwater monitoring wells, and because TCE concentrations were the drivers of completed interim actions. TCE is used for determining actions as other VOCs (including PCE) are generally not detected or detected a concentration lower than TCE.

As described in Section 1.3, groundwater modeling simulations were completed as part of the 2021 FS effort to determine a TCE concentration in an inner zone attenuation monitoring well that could potentially result in a subsequent detection of TCE in a COV3 or CC well. Completed simulations were based on two types of source mass assumption: finite mass (representing a decreasing or depleting concentration contaminant source) and infinite mass (representing a constant never changing contaminant source concentration). For the Site, the finite depleting mass represents an actual scenario while the infinite mass assumption represents a worst-case assessment scenario.

Under the finite mass scenario, the TCE concentration reported in an inner zone attenuation monitoring well would need to be 96 µg/L to result in a detection in a COV3 or CC production well. For the infinite mass scenario, the TCE concentration reported in an inner zone attenuation monitoring well would need to be greater than 24 µg/L to result in a detection in a COV3 or CC production well. Figure 2-2 presents a summary of these simulation results. In all cases, detection would occur in a COV3 well and not a CC well assuming a detection limit of 0.5 µg/L for TCE.

Based on model simulation results, the detection of TCE greater than 24 µg/L in an attenuation monitoring well would represent a trigger level exceedance. Attenuation monitoring wells are listed on Table 2-1 and yellow-highlighted on Figure 1-5.

2.2 Trigger Level Exceedance Response

As indicated on Figure 2-1, the initial steps in response to a trigger level exceedance are as follows:

1. If there is an *exceedance of the trigger level* (TCE at concentration greater than 24 µg/L) in an attenuation monitoring well listed on Table 2-1, a verification sample from the well shall be collected within 30 days of validation of an analytical laboratory data report where a trigger level exceedance is reported. The Ecology project manager shall also be notified of the trigger level exceedance.
2. If the verification *sample does not confirm* a TCE concentration greater than 24 µg/L, then the existing monitoring program will be maintained.
3. If the verification *sample confirms* a TCE concentration greater than 24 µg/L, then adjacent wells within the same monitoring zone shall be sampled within 30 days of validation of an analytical laboratory data report where a trigger level exceedance is reported. The Ecology project manager shall be notified that the verification sampled confirmed trigger level exceedance and informed of the additional wells to be sampled. The conceptual site model will be re-assessed (described below), which may result in updating the groundwater monitoring sample program.

2.3 Conceptual Site Model Assessment Response

As described in Step 3 of Section 2.2, wells adjacent to an attenuation well with a confirmed TCE concentration above the trigger level shall be sampled during the next scheduled monitoring event. In addition, an assessment of the conceptual site model shall be completed to determine if the model needs to be updated based on the groundwater compliance monitoring data.

The conceptual site model assessment shall include review of source assumptions, re-evaluation of other potential contaminant sources, and assessment of CPU and COV production well pumping data. Based on the assessment, the conceptual site model shall be updated as needed. The groundwater model may also be updated if any additional model analysis is needed.

After updating the conceptual site model, the assessment shall include determining if the existing monitoring well network is sufficient, specifically in the area where trigger level exceedance(s) occurred.

2.4 Monitoring Well Network Assessment Response

If the conceptual site model assessment identifies potential deficiencies in the groundwater monitoring network, a data gaps assessment shall be completed to determine if additional groundwater data are needed. If data gaps are identified, then the groundwater monitoring program may be revised, or additional monitoring wells may be installed in the attenuation area. Potential data gaps and proposed locations for additional monitoring wells will be discussed and approved by the Ecology project manager prior to updates to the groundwater monitoring program.

2.5 Active Remedial Action Assessment Response

If the conceptual site model assessment indicates the selected cleanup action is not performing as predicted, the potential risk to water supply wells will be re-evaluated. If this assessment indicates an unacceptable risk, the need of an active remedial action shall be assessed. The findings of the assessment, including recommended actions, shall be submitted to the Ecology project manager for review and approval. Active remedial actions could include re-starting the P&T system as detailed in the Operations Plan.

3. Summary

This Contingency Plan describes the criteria for assessing the cleanup action and specific procedures and actions for further assessment if the cleanup action is not performing as expected.

4. References

Ecology (Washington State Department of Ecology). 2008. Ecology's site specific approval of the February 2008 Vancouver Lake Lowlands Groundwater Model Summary Report and the two groundwater flow model versions, Base Case and Alternate Case. Unpublished memorandum by Craig Rankine, Washington State Department of Ecology to Patty Boyden, Port of Vancouver, Vancouver, Washington.

Ecology, 2020. Agreed Order DE 18152.

Ecology. 2023a. Cleanup Action Plan.

Ecology. 2023b. Agreed Order DE 18152.

Pacific Groundwater Group. 2021. Vancouver Lake Lowland Long-Term Contaminant Transport Analysis, Technical Memorandum. October 5, 2021.

Parametrix. 2010. Final Remedial Investigation Report, Cadet Manufacturing Company Site. Prepared for Port of Vancouver. May 2010.

Parametrix. 2011. Draft Interim Action Summary Report, Groundwater Pump and Treatment System, SMC and Cadet Sites. Prepared for the Port of Vancouver, Vancouver, Washington. June 2011.

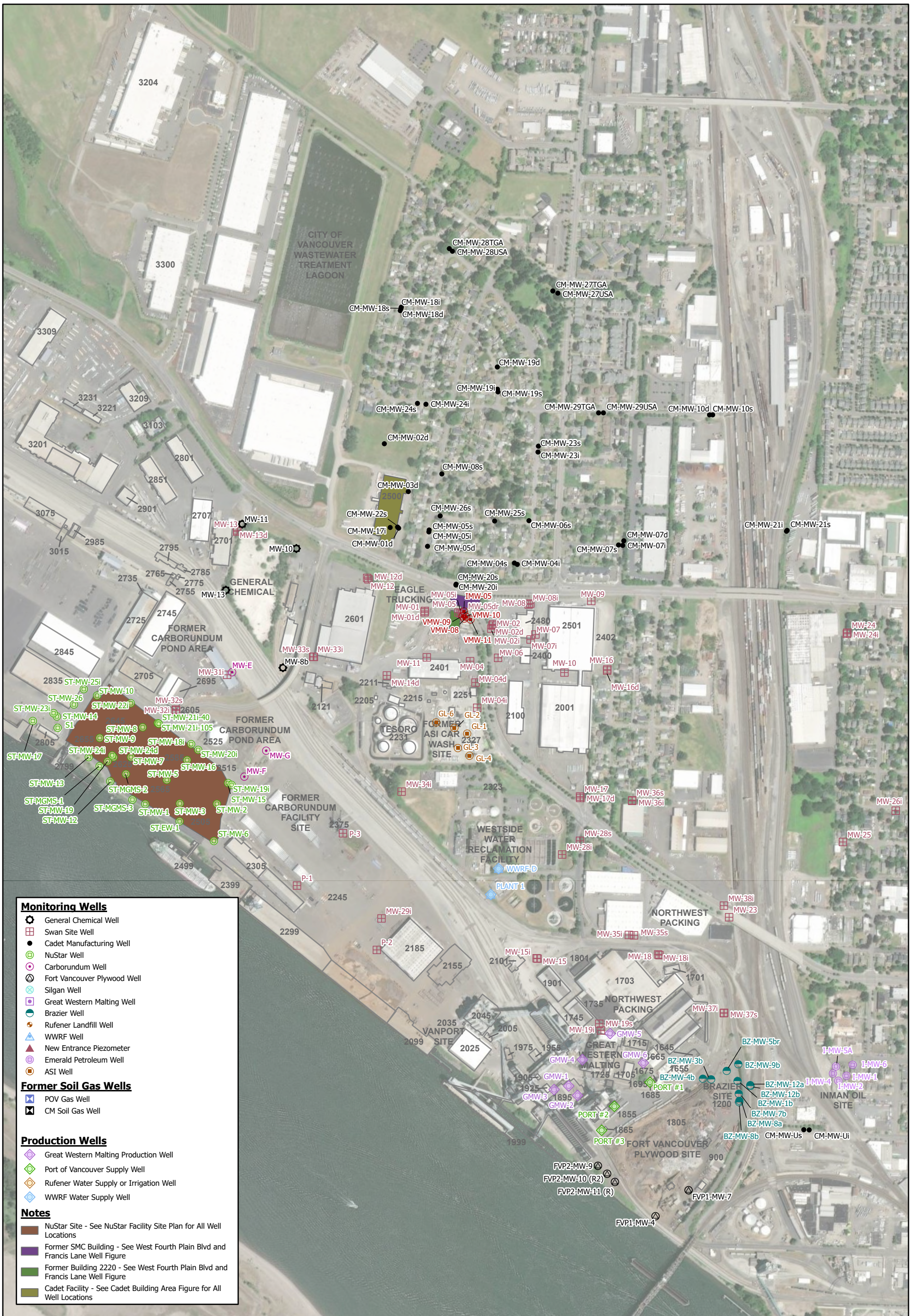
Parametrix. 2023. Feasibility Study, Cadet Manufacturing Company and Swan Manufacturing Company Portions, Vancouver Port of NuStar Swan Cadet Site. September 13, 2023.

Parametrix. 2024a. Groundwater Compliance Monitoring Plan Cadet Manufacturing Company and Swan Manufacturing Company Portions, Vancouver Port of Nustar Cadet Swan Site. Prepared for Port of Vancouver by Parametrix, Portland, Oregon. March 2024.

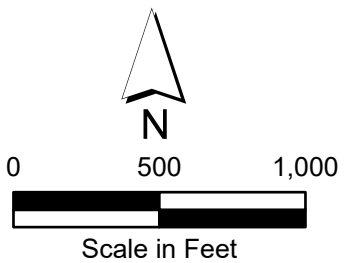
Parametrix. 2024b. Operation Plan for Cleanup Action Plan Groundwater Pump and Treat System Cadet Manufacturing Company and Swan Manufacturing Company Sites. Prepared for Port of Vancouver, USA by Parametrix, Portland, Oregon. March 2024.

Parametrix, S.S. Papadopoulos and Associates, Pacific Groundwater Group, and Keta Waters, Inc. 2008. Vancouver Lake Lowlands Groundwater Model Summary Report. Prepared by Parametrix. Prepared for the Port of Vancouver and Clark Public Utilities. Vancouver, Washington. February 2008.

Figures



**Figure 1-2:
Existing Site Area Well Networks**



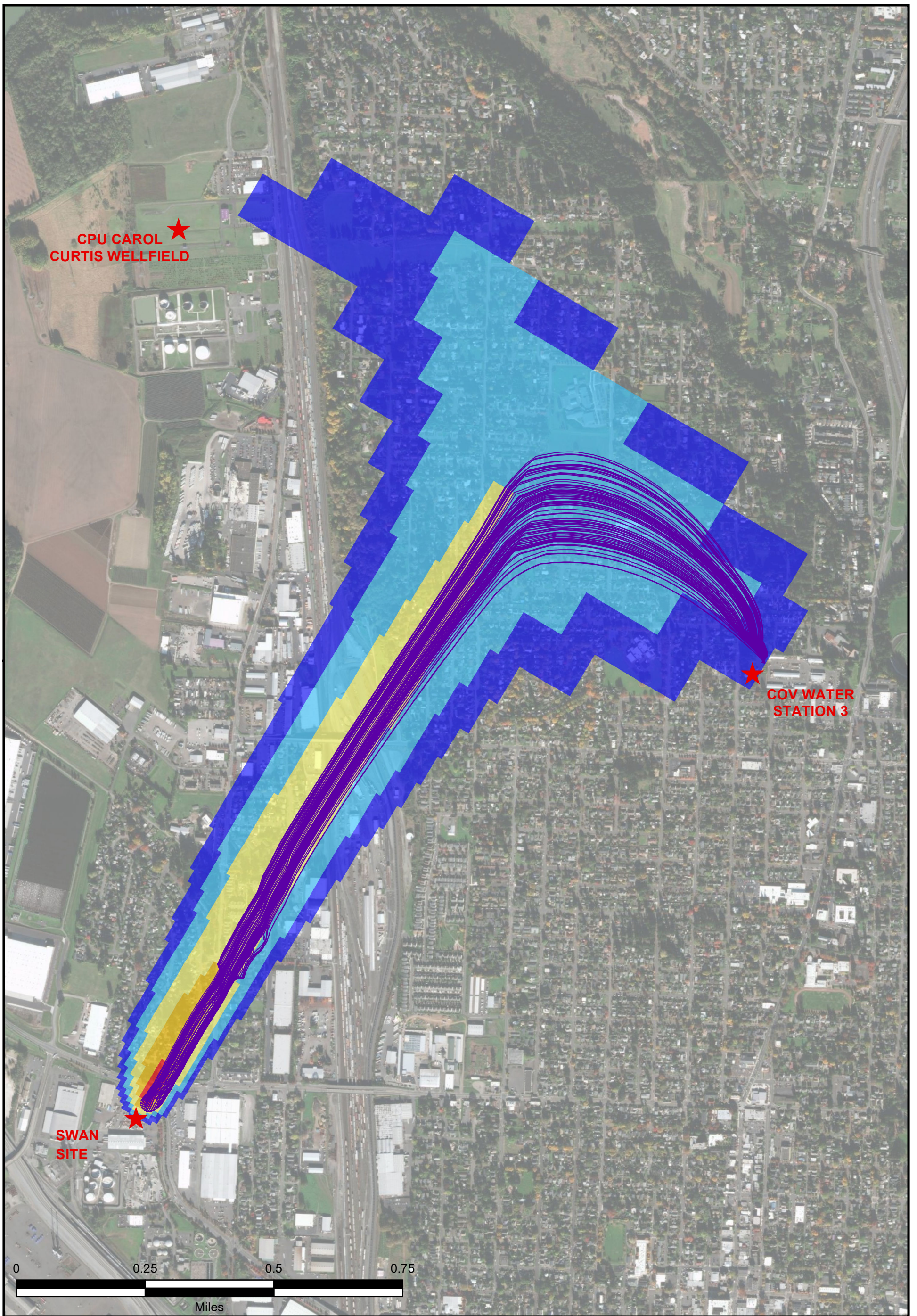


Parametrix Date: 1/18/2022 Path: \\parametrix.com\pmx\Port\Projects\Clients\1940-Port of Vancouver\275-1940-006-POV TCE\99Svcs\GIS\POV\MXD_PDF\2021\Mapdocs\Fig_1-2_CCCOV3_Locations.mxd

— Straight lines from Swan Source
 Area To CPU Curtis Wellfield:
 located 1.6 miles to the north
 To COV Water Station 3:
 located 1.4 miles to the northeast.

Figure 1-3
Location of CPU Carol
Curtis Wellfield, COV Water
Station, and Swan Site





Parametrix Date: 12/22/2021 Path: U:\Port\Projects\Clients\1940-Port of Vancouver\275-1940-006-POV TCE\99Svc\GIS\POV\MXD_PDF\2021\Mapdocs\Fig_2-1_SMC_Site_Overlay.mxd

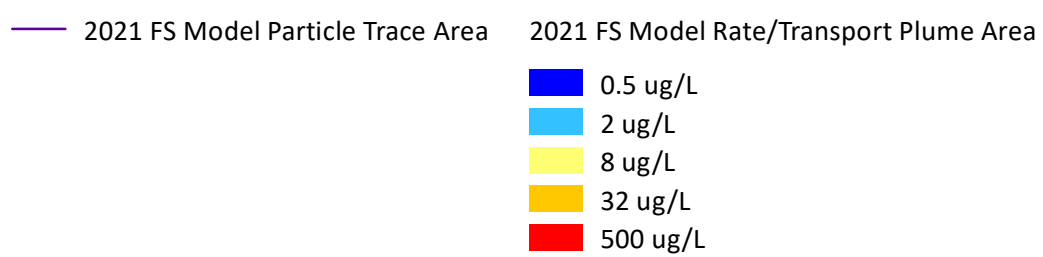
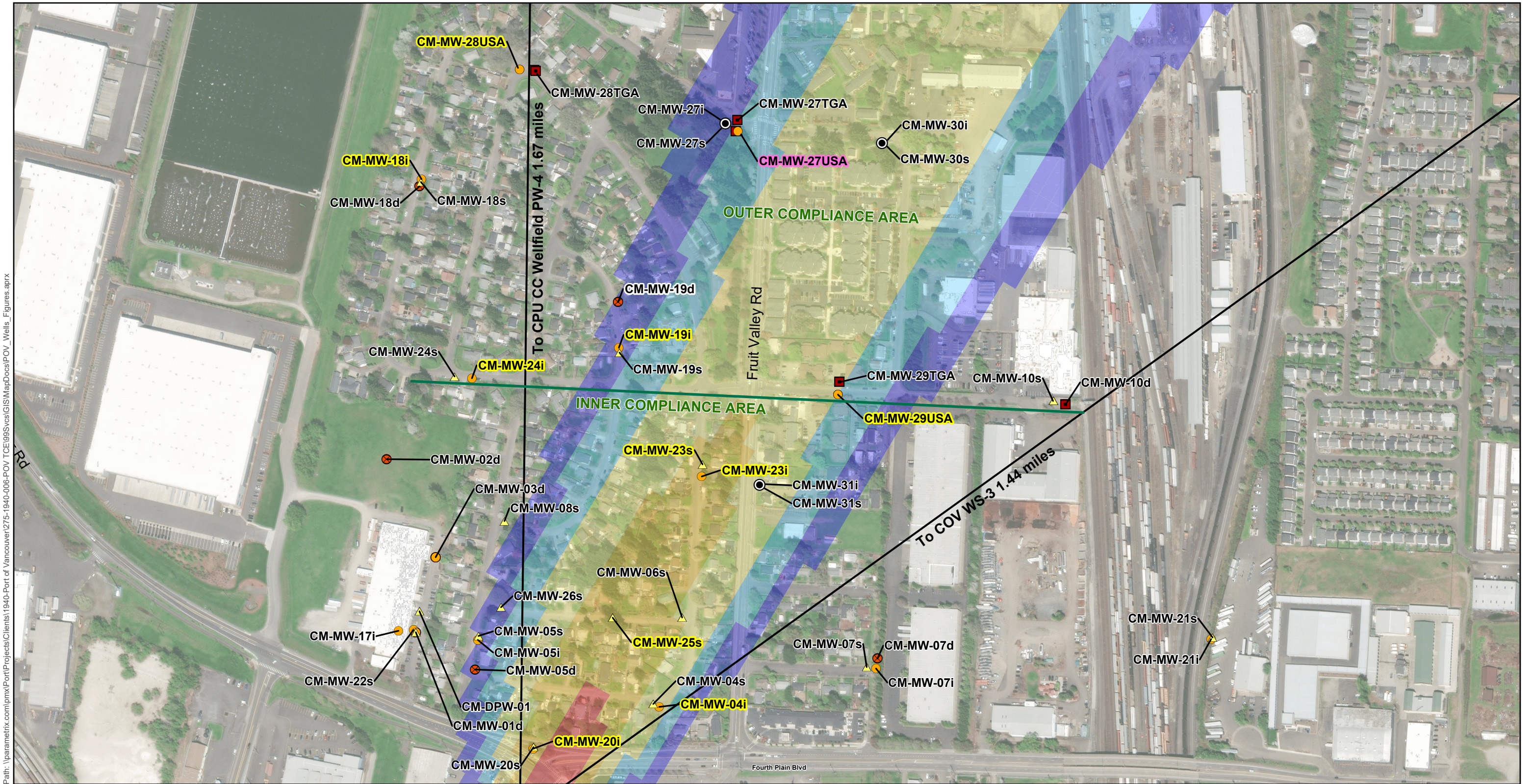


Figure 1-4
Model Contaminant
Transport Plume & Particle
Trace



PORT OF VANCOUVER, WASHINGTON



Path: \\parametrix.com\pmx\Port\Projects\Clients\1940-006-POV TCE99Svcs\GIS\MapDocs\POV_Wells_Figures.aprx

Parametrix Date: 9/1/2023

- CM-04 Multi-port Well Inoperable
- Potential New Compliance Well Location
- CM-04 Proposed Compliance Well

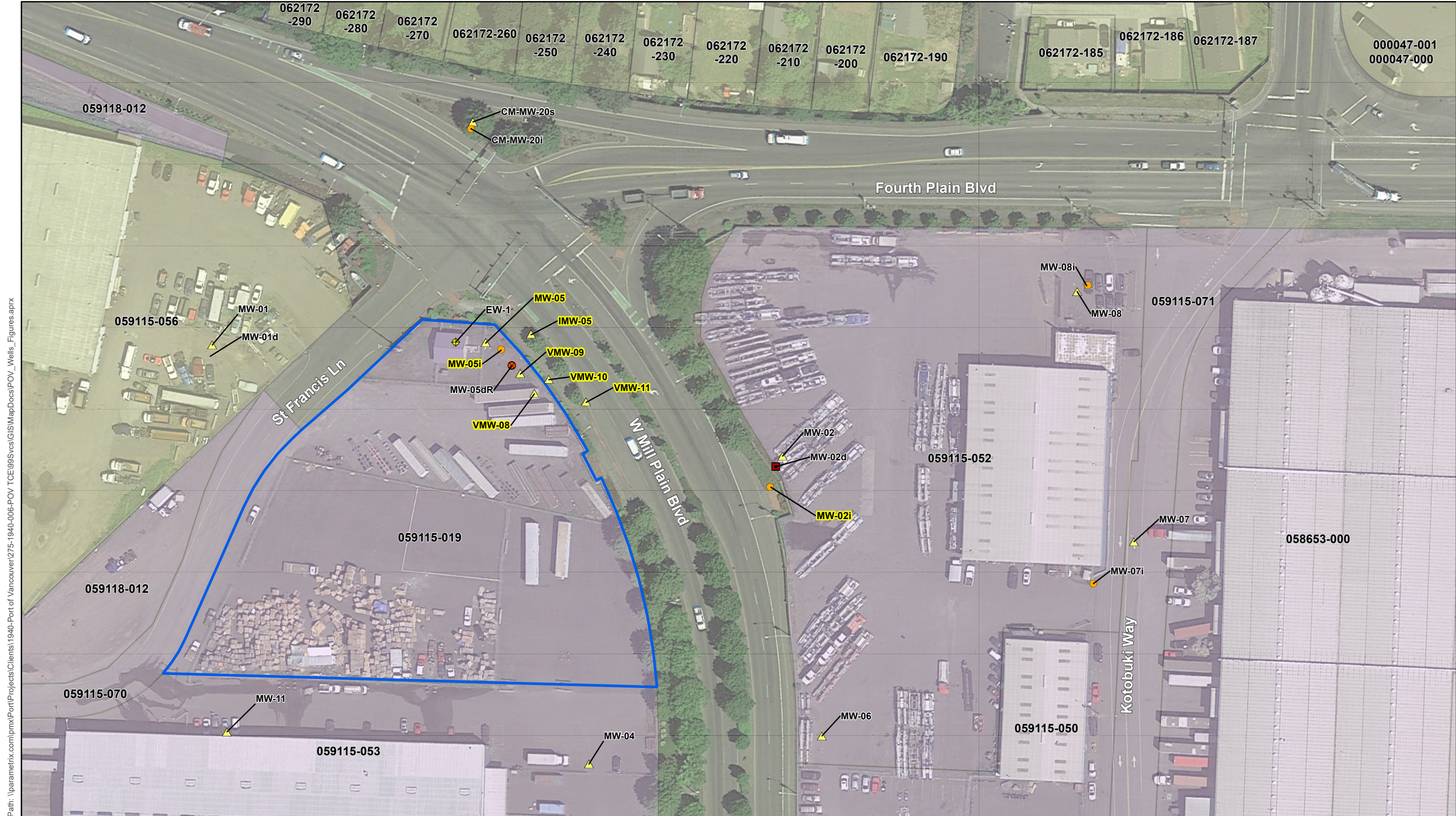
- ▲ Shallow USA Groundwater Monitoring Well
- Intermediate USA Groundwater Monitoring Well
- Deep USA Groundwater Monitoring Well
- TGA Monitoring Well

- 2021 FS Model Rate/Transport Plume Area
- 0.5 ug/L
 - 2 ug/L
 - 8 ug/L
 - 32 ug/L
 - 500 ug/L

**Figure 1-5
Attenuation Monitoring Well
Locations**



0 125 250 500 Feet

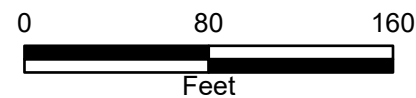


Path: \\parametrix.com\pmx\Port\Projects\Clients\1940-Port of Vancouver\275-1940-006-POV TCE199Svcs\GIS\MapDocs\POV_Wells_Figures.aprx

Parametrix

Date: 9/1/2023

Source: Clark County, Google Earth (Aerial May 2017)



Swan Source Area Monitoring Wells

Swan Site Property Boundary

Ownership

Port of Vancouver

Private

City of Vancouver ROW (No Fill)

Shallow USA Groundwater Monitoring Well

Intermediate USA Groundwater Monitoring Well

Deep USA Groundwater Monitoring Well

TGA Monitoring Well

GPTIA Extraction Well

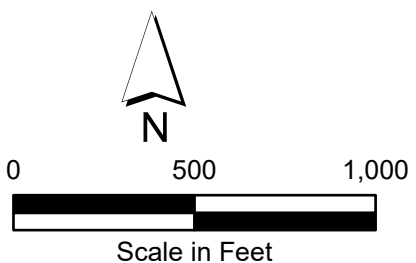
**Figure 1-6
Swan Site Monitoring Wells**

Cleanup Action Contingency Plan
Port of Vancouver, WA



Path: \\parametrix.com\Port\Projects\Clients\1940-006-POV\TCE99Svcs\GIS\MapDocs\POV_Wells_Figures.aprx

Parametrix Date: 9/1/2023



- Port/GWM Wellfield Area Monitoring Wells
- Non-Swan/Cadet Source Monitoring Wells

Figure 1-7: Non-Swan/Cadet Source and Port/GWM Wellfield Area Monitoring Wells

Figure 2-1: Contingency Plan Flowchart

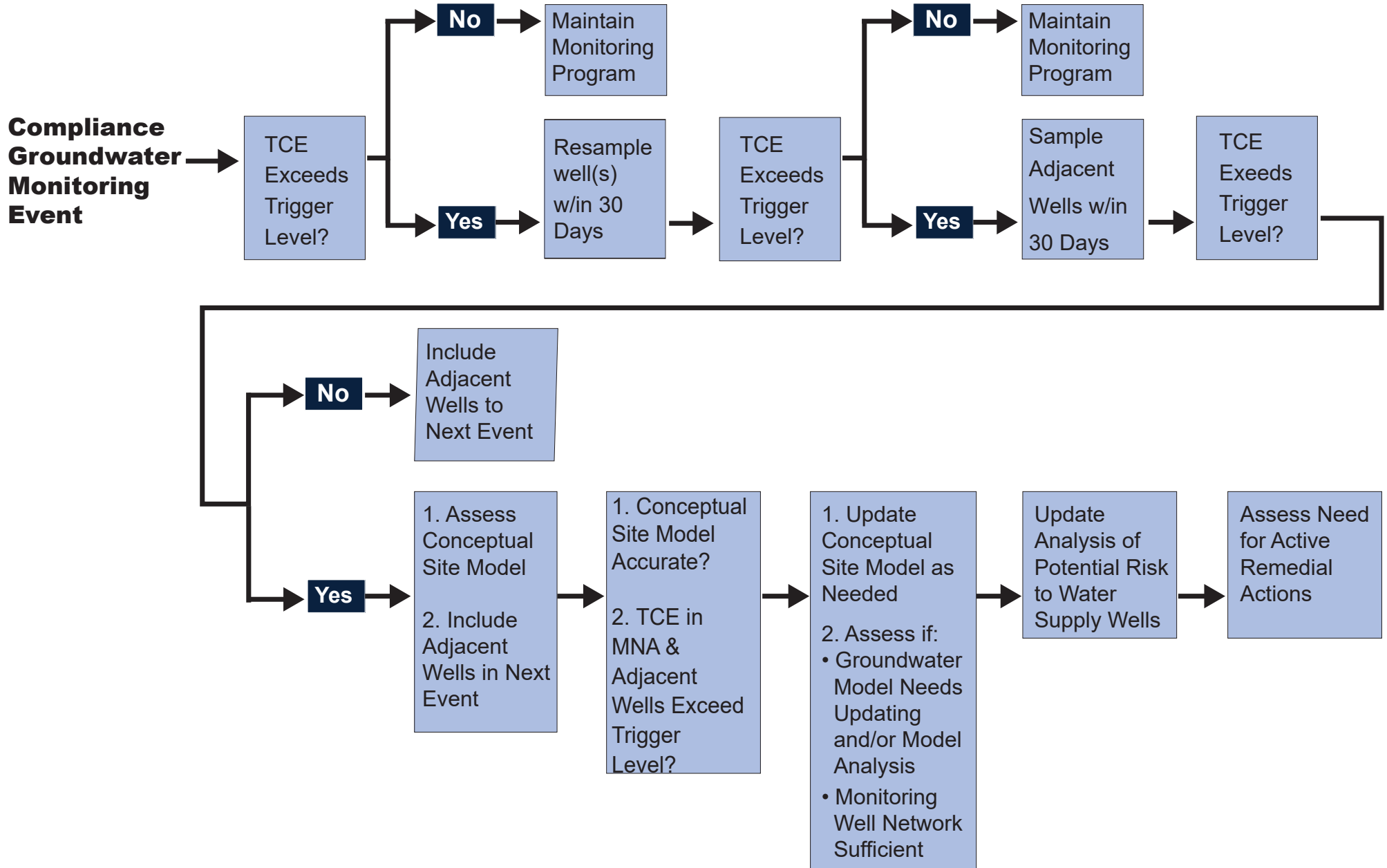


Figure 2-2: Multipliers for Triggers

Simulation	Initial Concentration Assumption	Initial Conc. (ug/L)	COV/CC Conc. (ug/L)	Inner Trigger Conc. (ug/L)
Finite Mass	2020 Average in Shallow & Intermediates Zones	4-139 (S) <35 (I) (1x)	0.01 / 0.005	N/S
Finite Mass	2020 Average Increased up to Detection in Prod. Wells	194-6,730 <1,635 (I) (48x)	0.5 / 0.25	96
Infinite Mass	2020 Max Observed in Shallow Zone	19-497 (1x)	0.12 / 0.01	N/S
Infinite Mass	2020 Max Increased up to Detection in Prod. Wells	82-2,420 (4.9x)	0.5 / 0.05	24.4

Tables

**Table 2-1 - Groundwater Points of Compliance Monitoring Wells
Cleanup Action Contingency Plan
Swan & Cadet Groundwater Monitoring Well Network**

Well Name	Water Quality Zone	Compliance Monitoring Function	Sample Schedule	Comments
Attenuation Monitoring Well				
These wells are used to monitor natural attenuation in the area north of Forth Plain Blvd. This area was historically impacted by the former Cadet site source. Groundwater modeling indicates that groundwater flow is toward the northeast/north with P&T system off. These wells will be monitored to verify occurrence of natural attenuation and resulting groundwater quality compliance. Attenuation monitoring wells consist of inner and outer wells. Inner wells are located south of West 31st Street representing historic area of P&T capture. Outer wells are located north of West 31st Street representing area beyond the historic P&T capture area.				
CM-DPW-01	shallow	Inner attenuation area monitoring well	Annual	Well is located adjacent to east side of Cadet facility where historically high VOC concentrations were detected. Well has longest continuous sample record of former Cadet monitoring wells. Well to be used to confirm continuing attenuation at the Cadet facility shallow zone.
CM-MW-4i	intermediate	Inner attenuation area monitoring well	Annual	Well is located northeast of the SMC source area and in the groundwater model determined post-P&T operation contaminant migration pathway. VOC concentrations are currently below cleanup levels. Well will be used to verify concentrations continue to attenuate.
CM-MW-20i	intermediate	Inner attenuation area monitoring well	Annual	Well is located north of the SMC source area and in the groundwater model determined post-P&T operation contaminant migration pathway. VOC concentrations are currently below cleanup levels. Well will be used to verify concentrations continue to attenuate.
CM-MW-23s	shallow	Inner attenuation area monitoring well	Annual	Well is located northeast of the SMC source area and in the groundwater model determined post-P&T operation contaminant migration pathway. VOC concentrations are currently below cleanup levels. Well will be used to verify concentrations continue to attenuate.
CM-MW-23i	intermediate	Inner attenuation area monitoring well	Annual	Well is located northeast of the SMC source area, adjacent to shallow CM-MW-23s, and located in the groundwater model determined post-P&T operation contaminant migration pathway. VOC concentrations are currently below cleanup levels. Well will be used to verify concentrations continue to attenuate.
CM-MW-25s	shallow	Inner attenuation area monitoring well	Annual	Well is located northeast of the SMC source area and located in the groundwater model determined post-P&T operation contaminant migration pathway. VOC concentrations are currently below cleanup levels. Well will be used to verify concentrations continue to attenuate.
CM-MW-18i	intermediate	Outer attenuation area monitoring well	Annual	Well is located north of the Cadet facility. This area is outside the groundwater model determined post-P&T operation contaminant migration pathway. Well will be used to verify VOC concentrations continue to remain at trace levels.
CM-MW-19i	intermediate	Outer attenuation area monitoring well	Annual	Well is located northeast of the Cadet facility. This area is located on the side of the groundwater model determined post-P&T operation contaminant migration pathway. Well will be used to verify VOC concentrations continue to remain at trace levels.
CM-MW-24i	intermediate	Outer attenuation area monitoring well	Annual	Well is located north of the Cadet facility. This area is outside the groundwater model determined post-P&T operation contaminant migration pathway. Well will be used to verify VOC concentrations continue to remain at trace levels.
CM-MW-28USA-050	intermediate	Outer attenuation area monitoring well	Annual	This shallow multi-port is located at northern outer edge monitoring location north of Cadet facility. Trace levels of TCE and PCE currently detected. Sample point will provide a shallow zone monitoring point at the north outer edge of the monitoring network to verify occurrence of attenuation in this area.
CM-MW-28USA-120.5	intermediate	Outer attenuation area monitoring well	Annual	This intermediate multi-port is located at northern outer edge monitoring location north of Cadet facility. Low levels of TCE and PCE currently detected. Sample point will provide a shallow zone monitoring point at the north outer edge of the monitoring network to verify occurrence of attenuation in this area.
CM-MW-29USA-060.5	intermediate	Outer attenuation area monitoring well	Annual	This intermediate multi-port is located on the eastern side of the groundwater model determined post-P&T operation migration pathway. Low levels of TCE and PCE currently detected. Sample point will be used to verify concentrations continue to attenuate.
CM-MW-29USA-100	intermediate	Outer attenuation area monitoring well	Annual	This intermediate multi-port is located on the eastern side of the groundwater model determined post-P&T operation migration pathway. Low levels of TCE and PCE currently detected. Sample point will be used to verify concentrations continue to attenuate.
CM-MW-29USA-140.5	intermediate	Outer attenuation area monitoring well	Annual	This intermediate multi-port is located on the eastern side of the groundwater model determined post-P&T operation migration pathway. Low levels of TCE and PCE currently detected. Sample point will be used to verify concentrations continue to attenuate.
SMC Source Area Monitoring Wells				
These wells are used to monitor natural attenuation of the former SMC source area. These source area wells will be monitored to verify continued decline of the source area.				
MW-02i	intermediate	Source area monitoring well	Semi-Annual	Well is located east of the SMC source area site. This well will provide a monitoring point to confirm attenuation is continuing to occur just east of the former SMC source area. Historic groundwater flow was toward the east of the SMC site in response to historic GWM production well pumping. VOC concentrations are below cleanup levels.
IMW-05	shallow	Source area monitoring well	Semi-Annual	Well appears to be adjacent to the SMC residual source area. TCE concentrations at cleanup level.
MW-05	shallow	Source area monitoring well	Semi-Annual	MW-05 is the closest shallow well to P&T system extraction well EW-1. Historically the highest TCE concentrations were detected at MW-05. TCE and PCE concentrations are above cleanup levels.
MW-05i	intermediate	Source area monitoring well	Semi-Annual	VOCs detected in well understood to be from outlying areas pulled past MW-05i by extraction well EW-1 pumping. Prior to P&T pumping VOC concentrations were not detected or at trace level. Well will be used to verify attenuation in the intermediate zone beneath the SMC source area.
VMW-08	shallow	Source area monitoring well	Semi-Annual	Source area shallow monitoring well. TCE and PCE concentration above cleanup levels.
VMW-09	shallow	Source area monitoring well	Semi-Annual	Source area shallow monitoring well. TCE and PCE concentration above cleanup levels.
VMW-10	shallow	Source area monitoring well	Semi-Annual	Source area shallow monitoring well. TCE and PCE concentration above cleanup levels.
VMW-11	shallow	Source area monitoring well	Semi-Annual	Source area shallow monitoring well. TCE and PCE concentration above cleanup levels.
Deep Zone Monitoring Wells				
These wells are used to monitor natural attenuation in the deep water quality zone of the USA. The deep zone is of limited areal extent in the project area and as a result shows muted influence to regional pumping and P&T pumping. These wells will be used to monitor contaminant concentrations in deep zone wells where VOCs are detected, determine if natural attenuation is occurring, and when resulting groundwater quality compliance occurs.				
MW-01d	deep	Deep zone attenuation monitoring	Bi-Annual	Well is located west of the SMC source area. TCE concentrations are detected above cleanup levels. Well will provide data on VOC concentration trends.
CM-MW-02d	deep	Deep zone attenuation monitoring	Bi-Annual	Well is located north of the Cadet facility. TCE concentrations are detected above cleanup levels. Well will provide data on VOC concentration trends.
CM-MW-01d-224	deep	Deep zone attenuation monitoring	Bi-Annual	Multi-port well is located on the east side of the Cadet facility. TCE concentrations are detected above cleanup levels. Well will provide data on VOC concentration trends.
CM-MW-03d-227	deep	Deep zone attenuation monitoring	Bi-Annual	Multi-port well is located on the east side northern end of the Cadet facility. TCE concentrations are detected above cleanup levels. Well will provide data on VOC concentration trends.
MW-05dr	deep	Deep zone attenuation monitoring	Bi-Annual	Well is located at the SMC source area. TCE concentrations are detected above cleanup levels. Well will provide data on VOC concentration trends.
CM-MW-05d	deep	Deep zone attenuation monitoring	Bi-Annual	Well is located east of the Cadet facility. TCE concentrations are detected above cleanup levels. Well will provide data on VOC concentration trends.
MW-12d	deep	Deep zone attenuation monitoring	Bi-Annual	Well is located west of the SMC source area. TCE concentrations are detected above cleanup levels. Well will provide data on VOC concentration trends.
MW-14d	deep	Deep zone attenuation monitoring	Bi-Annual	Well is located southwest of the SMC source area. VOC concentrations are below cleanup levels. Well will provide data on VOC concentration trends.
CM-MW-18d	deep	Deep zone attenuation monitoring	Bi-Annual	Well is located north of the Cadet facility. VOC concentrations are below cleanup levels. Well will provide data on VOC concentration trends.
CM-MW-19d	deep	Deep zone attenuation monitoring	Bi-Annual	Well is located northeast of the Cadet facility. TCE concentrations are above the cleanup level. Well will provide data on VOC concentration trends.
CM-MW-28USA-180	deep	Deep zone attenuation monitoring	Bi-Annual	Multi-port well is located on the north of the Cadet facility and is an outer edge of monitoring point. TCE concentrations are detected above cleanup levels. Well will provide data on VOC concentration trends.

Sample Schedule Note:

Annual scheduled wells will be sampled during March representing first quarter sampling event.
Semi-Annual scheduled wells will be sampled during March and August (representing third quarter event).
Bi-Annual scheduled wells will be sampled every other year during March. First Bi-Annual event will be during March 2025.