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TECHNICAL MEMORANDUM

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FROM: Antea Group

DATE: June 9, 2022

SUBJECT: Supplemental Remedial Investigation - Vancouver Bulk Terminal – Additional Stormwater Investigation

1.0 INTRODUCTION

Antea®Group (Antea Group) is pleased to present this Technical Memorandum pertaining to the results of the additional stormwater sampling activities performed at the Port of Vancouver bulk terminal at 2735 NW Harborside Drive in Vancouver, Washington (Site; see Figures 1 and 2). The sampling was conducted as part of the Supplemental Remedial Investigation (SRI) process. For a detailed Site history, a summary of relevant historical investigations, Site operations, Site geology, and hydrogeology please see the *Supplemental Remedial Investigation Work Plan* (SRIWP) for the Port of Vancouver bulk terminal dated December 18, 2020.

Initial stormwater sampling activities were performed between March and June of 2021 and were subsequently reported in Antea Group's December 16, 2021 *Supplemental Remedial Investigation – Vancouver Bulk Terminal – Stormwater Investigation* Technical Memorandum. Additional assessment was recommended following the initial investigation. A scope of work, sampling methods, analytical results, ship loading schedules, precipitation data, and a discussion of the findings of the additional investigation are presented below.

1.1 REGULATORY CONTEXT

The SRIWP was prepared in accordance with the Model Toxics Control Act (MTCA) as defined in Washington Administrative Code (WAC) 173-340-350 and pursuant to Agreed Order (AO) No. DE 15806 ("AO DE 15806") between the Washington State Department of Ecology (Ecology) and the Port of Vancouver (Port), NuStar, and Kinder Morgan Bulk Terminals (KMBT) (collectively the "Parties"). AO DE 15806 requires the Parties to conduct a Supplemental RI for certain hazardous substances which may include, but are not limited to, ammonia, nitrate, copper, and other metals. The Port, in addition to being the landowner, historically exported copper concentrate and other bulk materials beginning in approximately 1982, and between approximately 1994 and December 31st, 2021 KMBT and its predecessor (Hall Buck Marine) managed the export of copper concentrate and bentonite clay at the operational area. Starting January 1st, 2022, operation of the copper concentrate facility is being

handled by Metro Ports (a Nautilus Company) under agreement with the Port. NuStar handles fertilizers at their leasehold on Port property.

In December 2017, copper was detected in groundwater samples collected from the NuStar facility. Ecology issued a Potentially Liable Persons (PLP) status letter to KBMT on May 2, 2018, and after response comments, issued a determination of KBMT as a PLP under RCW 70.105D.040 via letter on July 19, 2018.

In early 2018, Ecology announced that they would also be requiring additional investigation at the NuStar Leasehold to evaluate two additional Constituents of Potential Concern (COPCs), ammonia and nitrate, associated with the historical and current handling of fertilizer at the NuStar facility. Preliminary data indicated that ammonia, nitrate, and copper (and other related metals) have commingled with the solvent plume at the Site. In accordance with MTCA, Ecology prepared AO DE 15806 requiring the Parties to prepare an SRIWP, Supplemental RI report, and Feasibility Study for hazardous substances, including but not limited to ammonia, nitrate, copper and related metals, and volatile organic compounds (VOCs).

Stormwater was identified as a potential pathway for copper concentrate COPCs in the SRIWP, and KMBT initiated several rounds of stormwater sample collection and analysis prior to termination of their operations at the facility to determine the nature and extent of any impacts. The results of this sampling will be included in the Supplemental Remedial Investigation Report to be submitted at the conclusion of all media investigation activities.

2.0 INVESTIGATION OBJECTIVES

The purpose of the additional stormwater investigation was to supplement the findings of the initial 2021 investigation with assessment of spatial distribution of metals at distance from the former KMBT operational area as well as to ascertain if other sources of metals are present. To ascertain the spatial distribution of metals surrounding the former KMBT operational area, and to identify other potential sources, eighteen additional sample locations were added (Figure 3). The rationale for the new sample locations is detailed below.

Due to elevated concentrations of lead, manganese, and zinc detected in samples collected in 2021 from sample point SW-1, additional sampling of upstream and nearby source areas was necessary. To determine if the Harborside Drive vehicular traffic corridor is potentially contributing to the elevated concentrations reported at sample point SW-1, three catch basins (SW-1A, SW-1B, SW-1C) along Harborside Drive southeast of SW-1 were sampled. Additionally, a single catch basin (SW-1D) which flows to the east stormwater treatment system was sampled to identify if the Harborside Drive vehicular traffic corridor is a source of metals which extends outside the west stormwater treatment stormwater system drainage basin.

To determine the extent and magnitude of metals contamination to stormwater at distance from the former KMBT operational area two sample locations (Port-1 and Port-2) were added northwest of SW-2 to assess paved surfaces to the northwest. Two sample locations (SW-3A and SW-3B) were added to the northwest of SW-3. Three stormwater sample locations (SW-5A, SW-5B, SW-5C) were added to the northwest of SW-5 to further delineate impacts northwest of the ship loader building. A single sample location (SW-5D) was added south of the conveyor between buildings 2645 and 2655 to assess the area immediately south of the conveyor. A single sample location (SW-6A) was added on Berth 8 to determine the westerly extent of impact and if the offloading operations to the west are a potential source.

To further delineate sources from the rail corridor an additional three catch basins or manways (SW-7East, SW-7WestA, SW-7WestB) within the railyard were sampled from conveyance structures to the north and southeast at locations upstream from sample location SW-7. These locations are manways or catch basins where stormwater from separate drainage areas enter the stormwater main heading to the Port's west stormwater treatment pond. Samples were collected from effluent pipes that are not submerged and flow is separate and discharging to the stormwater main lines. West and east sample locations were selected to differentiate between west and east source areas.

Two additional sample locations (NuStar-1 and NuStar-2) were added southeast of SW-6 at the request of NuStar to assess impacts at areas of historical investigations.

3.0 SCOPE OF WORK COMPLETED

An additional eighteen catch basins were identified to supplement the initial 2021 investigation. Most of the additional sample locations are located distant from the former KMBT operational area to assess spatial distribution of metals at the Port. Sampling methods included accessing manholes and storm drains and using laboratory provided containers to directly collect flowing stormwater prior to any filters or in-line treatment (where applicable). Where sample bottles could not be placed directly into the stormwater, peristaltic pumps and single use disposable tubing were used to collect samples. Samples being analyzed for dissolved metals were filtered in the field using a peristaltic pump and 0.45 micron filter capsules.

Samples were collected on December 30, 2021 from SW-1A, SW-1B, SW-1C, SW-1D, SW-3A, SW-3B, SW-5A, SW-5B, SW-5C, SW-5D, SW-6A, SW-7East, SW-7WestA, SW-7WestB, Port-1, Port-2, NuStar-1, and NuStar-2. Immediately after sampling, samples were packed on ice and prepared for transport or shipping to the selected laboratory in accordance with standard chain-of-custody procedures. Samples were analyzed for arsenic, cadmium, chromium, lead, manganese, nickel, selenium, silver, and zinc by EPA Method 6020A, hexavalent chromium by EPA Method 3500-CR B, and mercury by EPA Method 1631E.

Sample locations are presented on Figure 3.

3.1 SHIP LOADING SCHEDULE AND PRECIPITATION DATA

Stormwater samples were collected from the Site when sufficient precipitation generated discharge to the identified sample locations and during ship loading activities to accurately characterize stormwater discharge during bulk material movement.

Precipitation data was collected from the Hayden Island rain gauge located approximately two miles southeast of the Site. Variations in total precipitation amounts are expected between the Site and the rain gauge. Samples were collected when flow through the conveyance structures was observed.

Ship Loading Operations	Stormwater Sample Date	Total 24-Hour Precipitation Amount*
12/29/21 to 12/31/21	12/30/21	0.17 inches

***Rain gauge data from the Hayden Island Rain Gauge, raw hourly data presented in Appendix A.**

4.0 SCREENING LEVEL EVALUATION

Draft screening values were included in September of 2020 for the SRIWP. Screening stormwater results against the most conservative screening levels for total metals in surface water, none of the stormwater samples collected exceeded the most stringent screening levels for selenium or hexavalent chromium.

Concentrations of total metals; **arsenic, cadmium, chromium, copper, lead, manganese, low level mercury, nickel, silver, and zinc** exceeded the most conservative screening levels for one or more receptor pathways. The use of surface water screening values was only used as a baseline to identify areas of potential concern. Stormwater in the investigation area is conveyed to the port's Terminal 4 stormwater treatment pond prior to discharge to the Columbia River. Therefore, the analytical results are not representative of stormwater concentrations reaching the Columbia River.

To assess Harborside Drive as a potential source area sample locations SW-1A, SW-1B, SW-1C, and SW-1D were sampled. The sample locations SW-1A, SW-1B, SW-1C, and SW-1D contained elevated concentrations of arsenic, cadmium, copper, lead, manganese, and zinc exceeded the most conservative screening levels. Additionally, concentrations of total metals; chromium, nickel, and silver exceeded the most conservative screening levels at sample locations SW-1B and SW-1D.

Samples collected from SW-3A and SW-3B displayed mixed results with some metals concentrations being higher at greater distance from the former KMBT operational area while other metals concentrations decreased with distance. Total metal concentrations of manganese and zinc were reported at higher concentrations than those reported from SW-3. Total metals concentrations of copper and lead were reported at lower concentrations than those reported from SW-3.

The step out locations SW-5A, SW-5B, and SW-5C generally displayed a decreasing trend with distance from SW-5 with concentrations of total metals; copper, lead, and zinc exceeding the most conservative screening level in samples from all three locations. Total metals; cadmium, manganese, nickel, and zinc concentrations were higher in SW-5C than SW-5A or SW-5B though concentrations were less than concentrations reported from SW-5. Sample location SW-5D to the south of SW-5 exceeded the most conservative screening values for total metals; arsenic, cadmium, copper, lead, manganese, and zinc. Concentrations were generally similar or less than the concentrations of these metals reported from samples collected from SW-5. Sample location SW-6A located on Berth 8 contained concentrations of total metals; cadmium, copper, lead, manganese, and zinc at concentrations exceeding the most conservative screening levels. Concentrations were lower than those reported from sample location SW-6.

Delineation of the rail corridor and offloading area upstream of sample location SW-7 was split into east and west drainage areas. All three sample locations; SW-7East, SW-7WestA, and SW-7WestB all contained concentrations of total metals; arsenic, cadmium, copper, lead, manganese, and zinc above the most conservative screening levels. Concentrations of total metals from SW-7East were lower than the concentrations reported from both SW-7WestA and SW-7WestB indicating that although the drainage from the east rail corridor is a source of these metals the area surrounding the offloading building west of SW-7 is a more significant source area. Of the total metals which exceeded the most conservative screening levels from the western drainage area sample locations, all but total copper were reported at higher concentrations from SW-7WestB whereas total copper was higher at SW-7WestA. With the exception of a sample collected from SW-6 in

June 2021, the total copper concentration collected from SW-7WestB was the highest collected during the stormwater investigation portion of the SRI.

Delineation of metals impacts at sample locations Port-1 and Port-2 generally display a decreasing trend with distance from SW-2. Total metals; cadmium, copper, lead, manganese, and zinc exceeded the most conservative screening levels from Port-1. Total metals; copper and lead exceeded the most conservative screening levels from Port-2 with total lead being higher in concentration in Port-2 than Port-1.

Sample location NuStar-1, approximately 400 feet east of the copper concentrate conveyor and ship loader, contained the lowest concentrations for most total metals of all samples, though the sample did contain a total copper concentration exceeding the most conservative screening level. NuStar-2, located over 800 feet further east of the conveyor and ship loader, contained concentrations of total metals; copper, lead, manganese, and zinc exceeding the most conservative screening levels, though they were also considerably lower than those samples closer to the conveyor and shiploader (excluding NuStar 1) and comparable to those found in Port 1 and Port 2 .

Stormwater analytical data is presented in Table 1. Stormwater concentrations from the original sample locations are displayed on Figure 4 through Figure 10. Additional stormwater sample locations and concentrations are displayed on Figure 11 and Figure 12.

5.0 CONCLUSIONS

Stormwater samples were collected from eighteen sample locations on and around the former KMBT operational area at the Vancouver Bulk Terminal on December 30, 2021. Sampling activities were performed during a suitable rain event which provided enough precipitation to cause sheet flow of stormwater across paved surfaces and through stormwater conveyance structures.

Concentrations of total metals; **arsenic, cadmium, chromium, copper, lead, manganese, low level mercury, nickel, silver, and zinc** exceeded the most conservative screening levels for one or more pathways. Metals analysis of stormwater samples show concentrations of total metals; chromium, nickel, and silver exceeding the most conservative screening values only around the Harborside Drive drainage area.

Attachments:

Table 1 – Stormwater Analytical Data
Table 2 – Screening Values
Table 3 – Screening Values – Hardness Dependent Calculations for Fresh Surface Water

Figure 1 – Project Area Location Map
Figure 2 – Phase I Investigation Area
Figure 3 – Additional Stormwater Sample Locations
Figure 4 – Total Arsenic Stormwater Concentrations
Figure 5 – Total Cadmium Stormwater Concentrations
Figure 6 – Total Copper Stormwater Concentrations
Figure 7 – Total Lead Stormwater Concentrations
Figure 8 – Total Manganese Stormwater Concentrations
Figure 9 – Total Zinc Stormwater Concentrations
Figure 10 – Total Low-Level Mercury Stormwater Concentrations
Figure 11 – Additional Stormwater Sample Locations and Dissolved Analytical Data
Figure 12 – Additional Stormwater Sample Locations and Total Analytical Data

Appendix A – Rain Gauge Data

Table 1
Stormwater Analytical Data
Supplemental Remedial Investigation
Port of Vancouver, Washington

LOCATION ID	Date	STORMWATER ANALYTICAL DATA											
		Arsenic (ug/L)	Arsenic (ug/L)	Cadmium (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Chromium (ug/L)	Chromium, Hexavalent (ug/L)	Chromium, Hexavalent (ug/L)	Copper (ug/L)	Copper (ug/L)	Lead (ug/L)	Lead (ug/L)
Fraction		D	T	D	T	D	T	D	T	D	T	D	T
SW-1	3/5/2021	2.23	**5.78**	1.07	**1.98**	6.88	14.8	0.44 *	0.28	281	**802**	37.8	**89.8**
SW-1	4/24/2021	0.98	**1.06**	0.818	**0.913**	0.7	0.97	< 50 * [c]	**< 50 * [c]**	238	**293**	1.6	**3.77**
SW-1A	12/30/2021	0.58	**4.94**	0.19	**2.48**	1.57	32.7	< 50	**< 50 [c]**	36	**776**	5.15	**135**
SW-1B	12/30/2021	5.92	**8.55**	4.6	**8.34**	55.6	**93.8**	< 50	**< 50 [c]**	1,120	**2,040**	207	**379**
SW-1C	12/30/2021	1.45	**11.4**	1.87	**5.37**	6.21	49.6	< 50	**< 50 [c]**	237	**2,620**	26.5	**239**
SW-1D	12/30/2021	4.89	**10.8**	2.91	**6.31**	38.5	**90.9**	< 50	**< 50 [c]**	978	**2,500**	162	**387**
SW-2	3/5/2021	2.06	**6.16**	0.553	**0.905**	0.26	0.52	0.13 *	0.22	82.9	**599**	1.45	**18.4**
SW-2	4/24/2021	19.2	**32.7**	1.65	**2.47**	0.86	0.99	< 50 * [c]	**< 50 * [c]**	1,030	**1,380**	5.46	**15.6**
SW-3	3/5/2021	5.02	**15.8**	0.647	**1.44**	1.81	4.71	0.28 *	0.33	507	**1,890**	20.1	**76.1**
SW-3	4/24/2021	9.48	**10.8**	0.898	**1.1**	1.19	1.97	< 50 * [c]	**< 50 * [c]**	998	**1,120**	0.668	**8.75**
SW-3	6/11/2021	3.17	**10.3**	0.656	**1.48**	0.81	5.55	< 50 [c]	**< 50 [c]**	434	**1,610**	1.13	**68.2**
SW-3A	12/30/2021	2.5	**9.55**	3.14	**1.75**	0.41	2.89	< 50 [c]	**< 50 [c]**	257	**295**	1.42	**15.8**
SW-3B	12/30/2021	2.88	**12.6**	1.11	**1.24**	0.48	4.13	< 50 [c]	**< 50 [c]**	68.5	**316**	1.33	**18.6**
SW-4	3/5/2021	2.19	**6.25**	0.193	0.502	0.88	2.43	0.54 *	0.39	157	**680**	3.73	**31.8**
SW-4	4/24/2021	2.56	**2.68**	0.49	0.493	0.84	0.97	< 50 * [c]	**< 50 * [c]**	754	**792**	1.42	**3.01**
SW-5	3/5/2021	6.18	**14.6**	0.863	**2.18**	0.41	4.27	0.19 *	0.13	311	**1,430**	1.54	**46.7**
SW-5	4/24/2021	11.1	**12.5**	2.28	**3.01**	0.85	2.12	< 50 * [c]	**< 50 * [c]**	1,430	**1,960**	0.195	**8**
SW-5	6/11/2021	10.7	**11.1**	1.74	**1.98**	1.85	2.74	< 50 [c]	**< 50 [c]**	1,180	**1,320**	10.1	**20.9**
SW-5A	12/30/2021	0.32 J	**1**	0.157	0.276	0.22	1.2	< 50 [c]	**< 50 [c]**	47.9	**223**	0.644	**15**
SW-5B	12/30/2021	0.37 J	**0.52**	0.195	0.239	0.23	0.45	< 50 [c]	**< 50 [c]**	78.6	**138**	1.07	**5.81**
SW-5C	12/30/2021	0.27 J	**0.73**	1.15	**1.2**	0.34	1.22	< 50 [c]	**< 50 [c]**	34.5	**93.3**	0.554	**5.8**
SW-5D	12/30/2021	0.47 J	**2.97**	0.063	**1.17**	0.94	18.6	< 50 [c]	**< 50 [c]**	51.6	**557**	1.34	**29.5**
SW-6	3/5/2021	5.75	**11**	1.57	**1.98**	0.72	1.36	0.094 *	0.15	861	**1,670**	21.3	**46.8**
SW-6	4/24/2021	4.83	**6.11**	5.95	**6.35**	0.37 J	1.36	< 50 * [c]	**< 50 * [c]**	2,380	**2,720**	0.921	**15.2**
SW-6	6/11/2021	3.48	**8.75**	10.7	**11.1**	0.43	1.51	< 50 [c]	**< 50 [c]**	2,700	**3,490**	6.22	**51.3**
SW-6A	12/30/2021	0.18 J	**1.39**	1.47	**1.58**	0.18 J	2.02	< 50 [c]	**< 50 [c]**	39.3	**180**	0.256	**12.9**
SW-7	5/3/2021	1.96	**2.23**	0.739	**0.819**	0.73	1.12	< 50 * [c]	**< 50 * [c]**	436	**489**	1.47	**6.24**
SW-7	5/24/2021	1.5	**3**	0.547	**0.79**	0.72	2.61	< 50 * [c]	**< 50 * [c]**	273	**468**	3.34	**28.7**
SW-7East	12/30/2021	0.32 J	**2.67**	1.4	**2.43**	0.66	9.69	< 50 [c]	**< 50 [c]**	73.1	**557**	2.48	**49.1**
SW-7WESTA	12/30/2021	0.81	**3.66**	7.02	**7.48**	0.79	3.42	< 50 [c]	**< 50 [c]**	2,620	**3,470**	6.84	**33.3**
SW-7WESTB	12/30/2021	0.79	**8.46**	8.22	**8.01**	1.06	7.36	< 50 [c]	**< 50 [c]**	342	**1,860**	6.84	**78.3**
PORT-1	12/30/2021	0.29 J	**0.7**	1.68	**1.78**	0.55	1.06	< 50 [c]	**< 50 [c]**	115	**146**	1.06	**2.99**
PORT-2	12/30/2021	0.26 J	**0.46 J**	0.17	0.182	0.20 J	0.6	< 50 [c]	**< 50 [c]**	29.5	**60.5**	0.878	**3.79**
NUSTAR-1	12/30/2021	0.13 J	**0.11 J**	0.039	0.03	0.19 J	0.21	< 50 [c]	**< 50 [c]**	13.5	**14.5**	0.183	0.326
NUSTAR-2	12/30/2021	0.25 J	**0.99**	0.202	0.339	0.28	3.32	< 50 [c]	**< 50 [c]**	6.08	**65.5**	0.222	**5.79**
Screening Levels [a]		--	**0.018**	--	**0.72**	--	**74** [b]	--	**10**	--	**11**	--	**2.5**

LOCATION ID	Date	STORMWATER ANALYTICAL DATA											
		Manganese (ug/L)	Manganese (ug/L)	Mercury (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Selenium (ug/L)	Silver (ug/L)	Silver (ug/L)	Zinc (ug/L)	Zinc (ug/L)
Fraction		D	T	D	T	D	T	D	T	D	T	D	T
SW-1	3/5/2021	110	**176**	0.0022	0.00453	9.7	17	< 0.2	0.3 J	0.354	1.03	723	**1,300**
SW-1	4/24/2021	118	**60.4**	0.0109	**0.0122**	7.03	6.82	0.3 J	0.3 J	0.024	0.067	505	**549**
SW-1A	12/30/2021	30.5	**335**	0.00158	0.00287	1.66	24.5	< 0.2	0.2 J	0.055	1	94	**1,350**
SW-1B	12/30/2021	578	**957**	0.0028	0.00325	43.2	**72.2**	0.3 J	0.3 J	1.78	**3.25**	2,060	**3,760**
SW-1C	12/30/2021	250	**653**	0.00179	0.00335	8.37	38.7	< 0.2	0.5 J	0.302	2.83	696	**2,330**
SW-1D	12/30/2021	378	**833**	0.00175	0.00746	28.2	**63.7**	0.2 J	0.4 J	1.29	**3.28**	1,430	**3,230**
SW-2	3/5/2021	18.2	26.9	0.00227	0.00977	0.68	1.54	0.2 J	0.4 J	0.034	0.406	74.5	**223**
SW-2	4/24/2021	64.3	**66.2**	0.00462	0.00833	3.02	3.19	0.8 J	0.8 J	0.031	0.142	403	**445**
SW-3	3/5/2021	36.7	**77.4**	0.00107	0.00217	1.72	4.32	0.3 J	0.7 J	0.555	2.14	245	**503**
SW-3	4/24/2021	153	**155**	0.0145	0.00974	5.24	5.9	1.1	1	0.010 J	0.152	485	**531**
SW-3	6/11/2021	86.8	**134**	0.00698	0.00311	4.18	7.27	1.1	1.3	< 0.009	1.16	332	**725**
SW-3A	12/30/2021	409	**364**	0.00086	0.00041 J	7.95	6.7	< 0.2	< 0.2	0.022	0.295	1,180	**1,000**
SW-3B	12/30/2021	290	**323**	0.00012 J	0.00019 J	6.23	8.25	< 0.2	< 0.2	0.020 J	0.328	635	**753**
SW-4	3/5/2021	19.1	30.9	0.00391	0.00155	1.06	2.04	< 0.2	0.3 J	0.075	0.799	134	**241**
SW-4	4/24/2021	53.4	**54**	0.0174	**0.0182**	2.52	1.91	0.4 J	0.4 J	0.049	0.07	373	**368**
SW-5	3/5/2021	78.2	**107**	0.00346	0.00146	3.15	5.49	0.5 J	0.7 J	0.025	1.28	427	**721**
SW-5	4/24/2021	352	**315**	0.013	0.00555	14.4	14.6	2.1	2.2	< 0.009	0.178	1,610	**1,710**
SW-5	6/11/2021	167	**168**	0.00251	0.00209	7.99	8.53	1.4	1.4	0.132	0.256	969	**999**
SW-5A	12/30/2021	12.7	21.3	0.00194	0.00123	0.5	1.15	< 0.2	< 0.2	< 0.009	0.239	105	**144**
SW-5B	12/30/2021	13.5	14.8	0.00127	0.00408	1.41	0.65	< 0.2	< 0.2	0.02	0.111	182	**191**
SW-5C	12/30/2021	228	**223**	0.00061	0.00031 J	4.45	4.57	< 0.2	< 0.2	< 0.009	0.094	349	**353**
SW-5D	12/30/2021	8.51	**99**	0.00194	0.0025	0.63	7.54	< 0.2	< 0.2	0.023	0.598	35.7	**344**
SW-6	3/5/2021	61.9	**70.4**	0.00361	0.00421	3.77	4.44	0.5 J	0.6 J	0.48	1.1	786	**949**
SW-6	4/24/2021	302	**301**	0.0164	**0.0133**	18	17.6	2.5	2.7	0.018 J	0.274	3,950	**4,240**
SW-6	6/11/2021	280	**290**	0.00937	0.00641	15.5	16.6	2.6	2.8	0.045	0.927	4,890	**5,020**
SW-6A	12/30/2021	246	**274**	0.00115	0.00042 J	4.74	5.94	< 0.2	< 0.2	0.011 J	0.277	660	**745**
SW-7	5/3/2021	101	**103**	0.0149	**0.0123**	3.84	4.17	0.4 J	0.4 J	0.018 J	0.082	349	**371**
SW-7	5/24/2021	61.8	**77.9**	0.0123	**0.0123**	2.59	4.71	0.3 J	0.3 J	0.013 J	0.252	266	**386**
SW-7East	12/30/2021	91.1	**172**	0.00197	0.00141	3.58	10.2	< 0.2	< 0.2	0.025	0.514	456	**825**
SW-7WESTA	12/30/2021	417	**447**	0.00074	0.00096	10.1	12.2	< 0.2	< 0.2	0.157	0.744	1,210	**1,310**
SW-7WESTB	12/30/2021	760	**716**	0.00145	0.00188	13	16.7	< 0.2	0.4 J	0.145	1.82	1,500	**1,560**
PORT-1	12/30/2021	510	**555**	0.00071	0.0006	9.43	9.05	< 0.2	< 0.2	0.015 J	0.045	543	**604**
PORT-2	12/30/2021	42.6	49.4	0.00156	0.00187	1.74	1.38	< 0.2	< 0.2	0.023	0.071	65	75.9
NUSTAR-1	12/30/2021	4.83	4.56	0.00282	0.0026	0.37	0.28	< 0.2	< 0.2	< 0.009	< 0.009	42.6	32.7
NUSTAR-2	12/30/2021	38.9	**83.1**	0.00201	0.00051	1.61	4.29	< 0.2	< 0.2	< 0.009	0.064	71.8	**149**
Screening Levels [a]		--	**50**	--	**0.012**	--	**52**	--	**5**	--	**3.2**	--	**105**

NOTES:

BOLD	- Bold text indicates a concentration above most stringent screening value for surface water direct contact, protective of aquatic life, or protective of human health pathways, see the Draft Vancouver Screening Values Table. PQLs were not used for initial screening purposes.
µg/L	- Micrograms per liter
Metals	- Total and Dissolved Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Nickel, Selenium, Silver and Zinc by EPA Method 6020A.
Mercury	- Total and Dissolved Low Level Mercury by EPA Method 1631E.
Hexavalent Chromium	- Total and Dissolved Hexavalent Chromium by EPA Method 218.6
Trivalent Chromium	- Trivalent Chromium calculated by subtracting Hexavalent Chromium from Total Chromium. Where non detect values for Hexavalent Chromium the MRL was subtracted from the Total Chromium value.
J	- The identification of the analyte is acceptable; the reported value is an estimate
B	- The same analyte is found in the associated blank
*	- Sample collected prior to the StormwaterBIOCHAR catch basin insert filters.
--	- Not established, not analyzed, or not applicable for the purpose of this initial scope of work.
a	- See the Draft Vancouver Screening Values Table.
b	- Screening value for trivalent chromium.
c	- Total and Dissolved Hexavalent Chromium by EPA Method 3500-CR B
	- Catch basins fitted with filter sock/media. Samples collected post filter media with the exception of samples collected on 6/11/21.
	- Untreated stormwater.

Table 2
Screening Values
Supplemental Remedial Investigation
Port of Vancouver, Washington

Chemicals of Interest	PQL (r) (µg/L)	Surface Water (µg/L)										
		Direct Contact				Protective of Aquatic Life				Protective of Human Health		
		Method B Noncancer Eq. 730-1	Method B Cancer Eq. 730-2	Method C Noncancer Eq. 730-1 adjusted	Method C Cancer Eq. 730-2 adjusted	Aquatic Life Fresh/Acute 173-201A WAC	Aquatic Life Fresh/Acute CWA 304	Aquatic Life Fresh/Chronic 173-201A WAC	Aquatic Life Fresh/Chronic CWA 304	Human Health Fresh Water 173-201A WAC	Human Health Fresh Water 40 CFR 131.45	Human Health Fresh Water CWA 304
Metals												
Arsenic (a)	2	18	0.098	44	2.5	360	340	190	150	10	0.018	0.018
Cadmium (b)	0.1	41 (c)	--	100 (c)	--	3.7 (c, s)	1.8 (c, s)	1 (c, s)	0.72 (c, s)	--	--	--
Chromium Total (d, g)	0.5	--	--	--	--	--	--	--	--	--	--	--
Chromium III (e, g)	2	240,000	--	610,000	--	550 (s)	570 (s)	180 (s)	74 (s)	--	--	--
Chromium VI (f, g)	0.5	490	--	1,200	--	15	16	10	11	--	--	--
Copper (i)	5	2,900	--	7,200	--	17 (s)	--	11 (s)	--	1,300	--	1,300
Lead (j)	0.05	--	--	--	--	65 (s)	65 (s)	2.5 (s)	2.5 (s)	--	--	--
Manganese (k)	5	--	--	--	--	--	--	--	--	--	--	50
Mercury (l)	0.02	--	--	--	--	2.1	1.4	0.012	0.77	--	--	--
Nickel (n)	0.1	1,100	--	2,800	--	1,400 (s)	470 (s)	160 (s)	52 (s)	150	80	610
Selenium (o)	2	2,700	--	6,800	--	20	--	5	--	120	60	170
Silver (p)	2	26,000	--	65,000	--	3.4 (s)	3.2 (s)	--	--	--	--	--
Zinc (q)	5	17,000	--	41,000	--	110 (s)	120 (s)	100 (s)	120 (s)	2,300	1,000	7,400

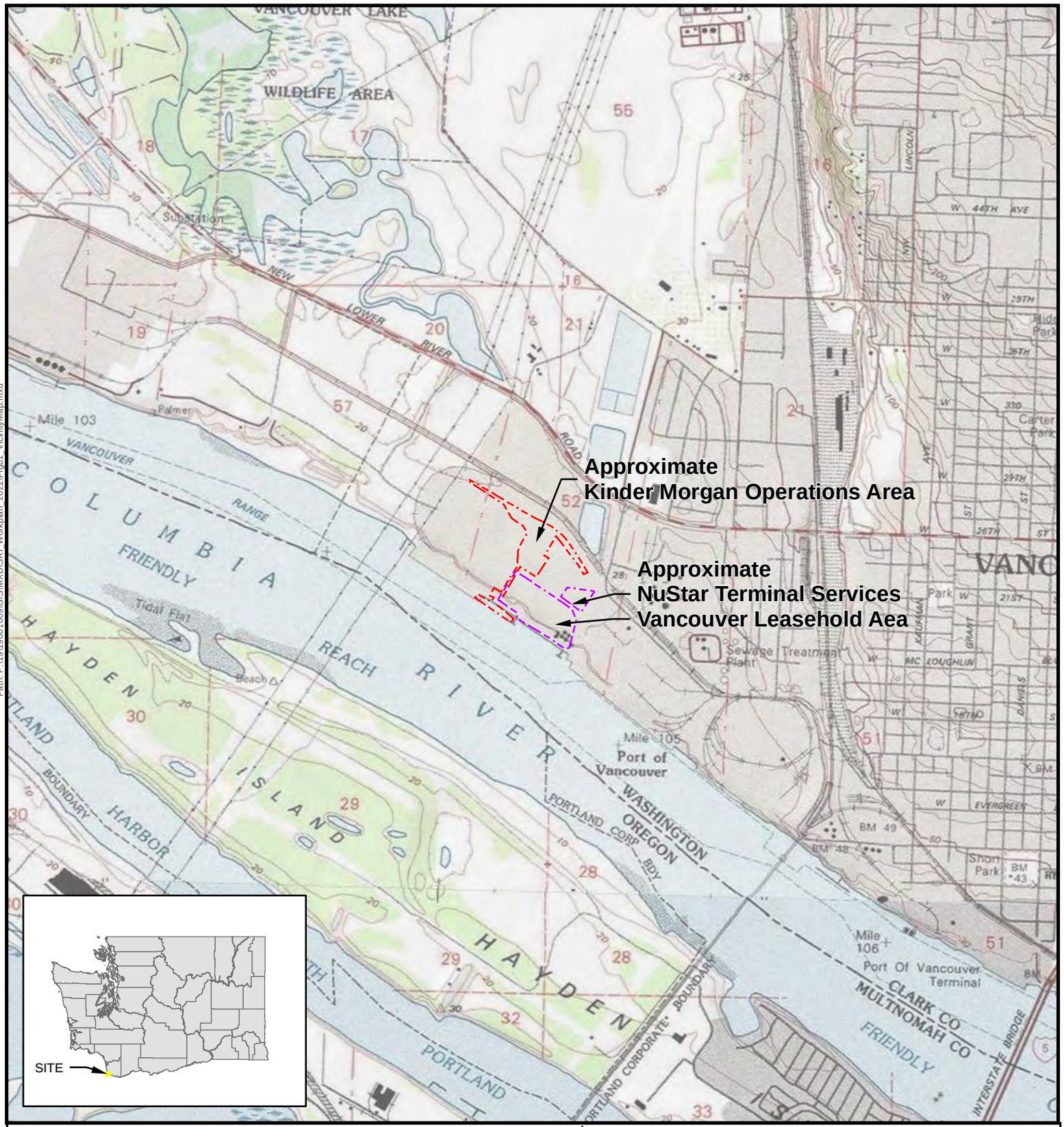
NOTES:
-- = Not established, Not applicable, or Not available
µg/L = Micrograms per liter
All values taken from the CLARC Master Spreadsheet with the exception of the PQL's
Practical Quantitation Limits (PQL) - PQLs are believed to be consistent with industry standards, Manchester Environmental Laboratory levels supplied by Ecology, and/or the lowest level EPA approved analytical methods readily available.

(a) Arsenic (inorganic) CAS# 7440-38-2; inorganic arsenic speciates into AS (III) and AS (V)
(b) Cadmium (potable groundwater) CAS# 7440-43-9
(c) Cadmium (nonpotable surface water) CAS# 7440-43-9a; fresh surface water criteria for the protection of aquatic life changes
(d) Chromium (total) CAS# 7440-47-3
(e) Chromium III CAS# 16065-83-1; fresh surface water criteria for the protection of aquatic life changes based in the hardness of the
(f) Chromium VI CAS# 18540-29-9
(g) CLARC does not provide pre-calculated standard Method B or C formula values for total chromium. CLARC does provide pre-calculated standard Method B and C formula values for chromium III and chromium VI. Assessors should test for total chromium first and then test for chromium VI only if the concentration for total chromium exceeds the cleanup level for chromium VI. If chromium VI is present at the site, then the concentration of chromium III is determined by subtracting the chromium VI concentration from the total chromium concentration. If chromium VI is NOT present at the site, then the site assessor may assume that the measured concentration of total chromium is the concentration of chromium III. If there is documented evidence that chromium VI was never used at the site,
(h) For groundwater, the total chromium federal and Washington State Maximum Contaminant Level is 100 µg/L, and CLARC contains the value from the Method A Groundwater Table (Table 720-1) of 50 µg/L. The Method A number assumes that a portion of the chromium is hexavalent; if all of the chromium is trivalent, then the Method A number is 100 µg/L.
(i) Copper CAS# 7440-50-8; fresh surface water criteria for the protection of aquatic life changes based in the hardness of the water at the site (CLARC table bases values on hardness of 100 mg/L)
(j) Lead CAS# 7439-92-1; fresh surface water criteria for the protection of aquatic life changes based in the hardness of the water at the site (CLARC table bases values on hardness of 100 mg/L)
(k) Manganese (non-diet) CAS# 7439-96-5; use non-diet since not a food source; modified per EPA recommendation using EPA IRIS for an oral reference of 0.0467 mg/kg-day
(l) Mercury CAS#7439-97-6
(m) Methyl Mercury CAS# 22967-92-6; formed from inorganic mercury by the actions of microbes that live in aquatic systems, primarily attributed to anaerobic bacteria in sediments
(n) Nickel (soluble salts) CAS# 7440-02-0; Nickel refinery dust (CAS# E715532) is a mixture of many nickel compounds, with nickel subsulfide (CAS# 12035-72-2) being the major constituent. These both are pertinent for air quality but not water and soil. Fresh surface water criteria for the protection of aquatic life changes based in the hardness of the water at the site (CLARC table bases values on hardness of 100 mg/L)
(o) Selenium and compounds CAS# 7782-49-2
(p) Silver CAS# 7440-22-4; fresh surface water criteria for the protection of aquatic life changes based in the hardness of the water at the site (CLARC table bases values on hardness of 100 mg/L)
(q) Zinc CAS# 7440-66-6; fresh surface water criteria for the protection of aquatic life changes based in the hardness of the water at the site (CLARC table bases values on hardness of 100 mg/L)
(r) Lowest PQL's were used; all PQL's came from Parm Stored 6020B method, except mercury (Parm Stored 7470) and Chromium VI (Parm Stored 3500Cr-C)
(s) Fresh surface water criteria for the protection of aquatic life changes based in the hardness of the water at the site (CLARC table bases values on hardness of 100 mg/L), Once sire specific hardness is determined calculations will be made for these values.

Table 3
Screening Values - Hardness Dependent Calculations for Fresh Surface Water
Supplemental Remedial Investigation
Port of Vancouver, Washington

Chemicals of Interest	PQL (r) (µg/L)	Source Hardness (mg/L)	Aquatic Life Fresh/Acute 173-201A WAC Conversion Factor (CF)	Aquatic Life Fresh/Acute 173-201A WAC (µg/L)	Aquatic Life Fresh/Acute CWA 304 Conversion Factor (CF)	Aquatic Life Fresh/Acute CWA 304 (µg/L)	Aquatic Life Fresh/Chronic 173-201A WAC Conversion Factor (CF)	Aquatic Life Fresh/Chronic 173-201A WAC (µg/L)	Aquatic Life Fresh/Chronic CWA 304 Conversion Factor (CF)	Aquatic Life Fresh/Chronic CWA 304 (µg/L)
Metals										
Cadmium	1	100	0.944	3.7	0.944	1.8	0.909	1.0	0.909	0.72
Chromium III	2	100	0.316	549	0.316	570	0.860	178	0.860	74
Copper	5	100	0.960	17	--	--	0.960	11	--	--
Lead	5	100	0.791	65	0.791	65	0.791	2.5	0.791	2.5
Nickel	2	100	0.998	1,415	0.998	468	0.997	157	0.997	52
Silver	2	100	0.85	3.4	0.85	3.2	--	--	--	--
Zinc	25	100	0.978	114	0.978	117	0.986	105	0.986	118

NOTES:
-- = Not established, Not applicable, or Not available
µg/L = Micrograms per liter
Hardness concentration taken from CLARC Update: August 2020 - Calculations, page 307.
Conversion Factors from WAC 173-201A (Table 240), and the EPA Clean Water Act 304 (National Recommended Aquatic Life Criteria Table)
Practical Quantitation Limits (PQL) - PQLs are believed to be consistent with industry standards, Manchester Environmental Laboratory levels supplied by Ecology, and/or the lowest level EPA approved analytical methods readily available.



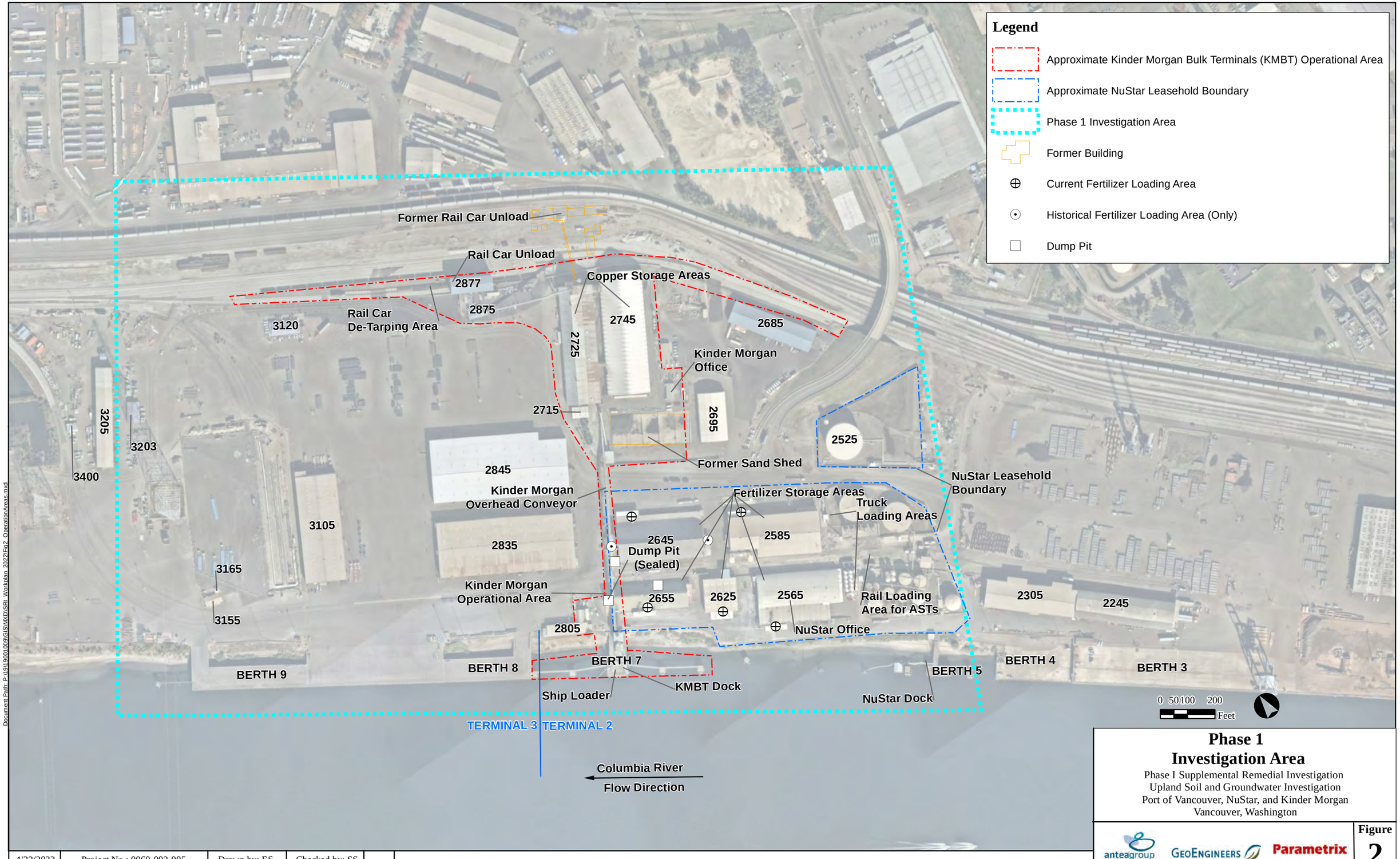
Project Area Location Map

Phase I Supplemental Remedial Investigation
Upland Soil and Groundwater Investigation
Port of Vancouver, NuStar, and Kinder Morgan
Vancouver, Washington

anteagroup GeoEngineers Parametrix

Figure 1

Project:
Produced By: estrandhagen
Approved By:
Print Date: 4/21/2022
Path: P:\19\19001009\GIS\MXD\SRI Workplan 2022\Fig01 VicinityMap.mxd



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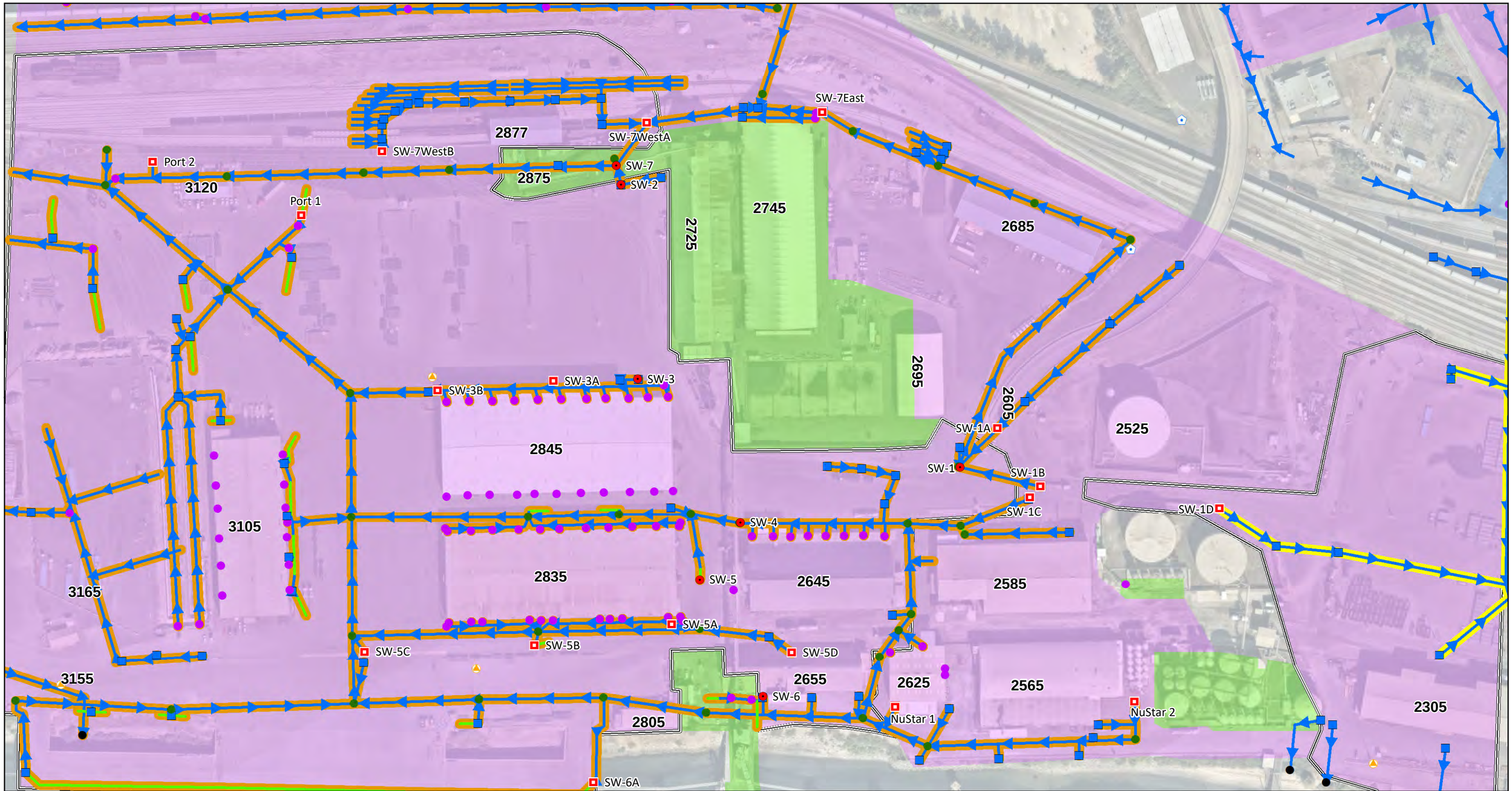
Phase 1 Investigation Area

Phase I Supplemental Remedial Investigation
Upland Soil and Groundwater Investigation
Port of Vancouver, NuStar, and Kinder Morgan
Vancouver, Washington

anteagroup GeoEngineers Parametrix

Figure 2

4/22/2022	Project No.: 0060-002-005	Drawn by: ES	Checked by: SS	



Legend

- Stormwater Sample Location
- Additional Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stormwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Note:
(H) - Hexavalent

0 50 100 200 300 400 Feet

FIGURE 3

ADDITIONAL STORMWATER SAMPLE LOCATIONS
AND DISSOLVED ANALYTICAL DATA
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	*MB*	*1:2,400*
DATE	**REVIEWED BY**	**MAP SCALE**
3/18/2022	*BJ*	*1 INCH = 200 FEET*

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SW-7		
Date	5/3/2021	5/24/2021
Arsenic	2.23	**3**

SW-2		
Date	3/5/2021	4/24/2021
Arsenic	**6.16**	**32.7**

SW-3			
Date	3/5/2021	4/24/2021	6/11/2021 *
Arsenic	**15.8**	**10.8**	**10.3**

SW-4		
Date	3/5/2021	4/24/2021
Arsenic	**6.25**	**2.68**

SW-5			
Date	3/5/2021	4/24/2021	6/11/2021 *
Arsenic	**14.6**	**12.5**	**11.1**

SW-6			
Date	3/5/2021	4/24/2021	6/11/2021 *
Arsenic	**11**	**6.11**	**8.75**

SW-1		
Date	3/5/2021	4/24/2021
Arsenic	**5.78**	1.06

Legend

- Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stormwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Notes:
SW-1, SW-2, SW-4, and SW-7 are Untreated Samples
SW-3, SW-5, and SW-6 are Post Port Filter Sock/Media Sample Locations
All concentrations are in mircorgams per liter
Bold Text Exceeds most stringent screening value for surface water direct contact, protective of aquatic life, or protective of human health, see Vancouver Screening Values Table
* - Sample collected prior to the StormwaterBIOCHAR catch basin insert filters

0 50 100 200 300 400 Feet

FIGURE 4

TOTAL ARSENIC STORMWATER CONCENTRATIONS
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	*MB*	*1:2,400*
DATE	REVIEWED BY	MAP SCALE
8/20/2021	*BJ*	*1 INCH = 200 FEET*

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SW-7		
Date	5/3/2021	5/24/2021
Cadmium	0.819	**0.79**

SW-2		
Date	3/5/2021	4/24/2021
Cadmium	**0.905**	**2.47**

SW-3			
Date	3/5/2021	4/24/2021	6/11/2021 *
Cadmium	**1.44**	**1.1**	**1.48**

SW-4		
Date	3/5/2021	4/24/2021
Cadmium	0.502	0.493

SW-5			
Date	3/5/2021	4/24/2021	6/11/2021 *
Cadmium	**2.18**	**3.01**	**1.98**

SW-6			
Date	3/5/2021	4/24/2021	6/11/2021 *
Cadmium	**1.98**	**6.35**	**11.1**

SW-1		
Date	3/5/2021	4/24/2021
Cadmium	**1.98**	**0.913**

SW-7 SW-2 SW-3 SW-4 SW-5 SW-6 SW-1

2877 2875 3120 2745 2725 2685 2695 2605 2525 2845 3105 3165 3155 2645 2585 2655 2625 2565 2805 2305

Legend

- Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stormwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Notes:
SW-1, SW-2, SW-4, and SW-7 are Untreated Samples
SW-3, SW-5, and SW-6 are Post Port Filter Sock/Media Sample Locations
All concentrations are in mircorgams per liter
Bold Text Exceeds most stringent screening value for surface water direct contact, protective of aquatic life, or protective of human health, see Vancouver Screening Values Table
* - Sample collected prior to the StormwaterBIOCHAR catch basin insert filters

0 50 100 200 300 400 Feet

FIGURE 5

TOTAL CADMIUM STORMWATER CONCENTRATIONS
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	*MB*	*1:2,400*
DATE	**REVIEWED BY**	**MAP SCALE**
8/20/2021	*BJ*	*1 INCH = 200 FEET*

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SW-7		
Date	5/3/2021	5/24/2021
Copper	**489**	**468**

SW-2		
Date	3/5/2021	4/24/2021
Copper	**599**	**1380**

SW-1		
Date	3/5/2021	4/24/2021
Copper	**802**	**293**

SW-3			
Date	3/5/2021	4/24/2021	6/11/2021 *
Copper	**1890**	**1120**	**1610**

SW-4		
Date	3/5/2021	4/24/2021
Copper	**680**	**792**

SW-5			
Date	3/5/2021	4/24/2021	6/11/2021 *
Copper	**1430**	**1960**	**1320**

SW-6			
Date	3/5/2021	4/24/2021	6/11/2021 *
Copper	**1670**	**2720**	**3490**

Legend

- Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stormwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Notes:
SW-1, SW-2, SW-4, and SW-7 are Untreated Samples
SW-3, SW-5, and SW-6 are Post Port Filter Sock/Media Sample Locations
All concentrations are in mircorgams per liter
Bold Text Exceeds most stringent screening value for surface water direct contact, protective of aquatic life, or protective of human health, see Vancouver Screening Values Table
* - Sample collected prior to the StormwaterBIOCHAR catch basin insert filters

0 50 100 200 300 400 Feet

FIGURE 6

TOTAL COPPER STORMWATER CONCENTRATIONS
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	*MB*	*1:2,400*
DATE	REVIEWED BY	MAP SCALE
8/20/2021	*BJ*	*1 INCH = 200 FEET*

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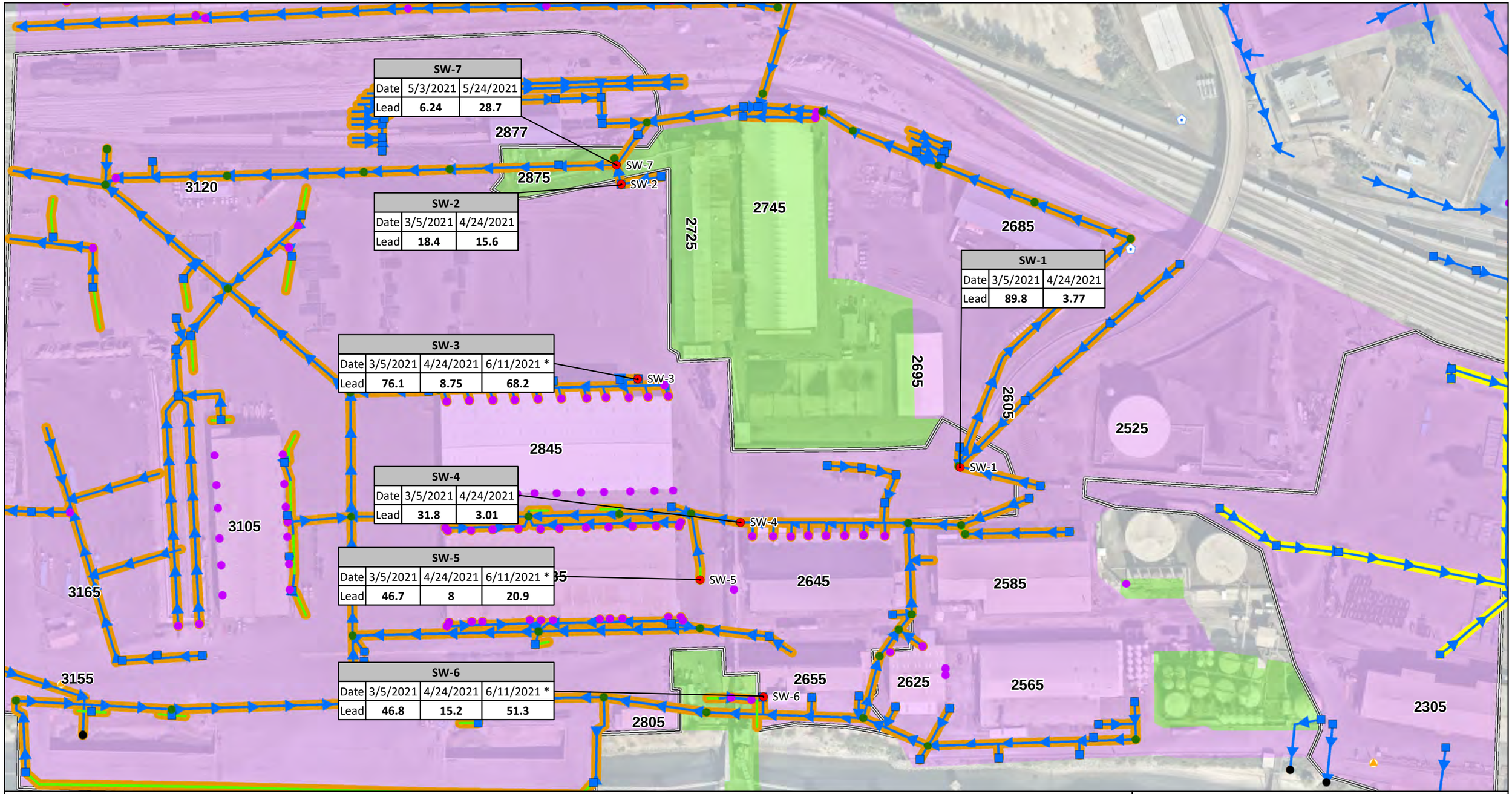

Legend

- Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stormwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Notes:
SW-1, SW-2, SW-4, and SW-7 are Untreated Samples
SW-3, SW-5, and SW-6 are Post Port Filter Sock/Media Sample Locations
All concentrations are in mircorgams per liter
Bold Text Exceeds most stringent screening value for surface water direct contact, protective of aquatic life, or protective of human health, see Vancouver Screening Values Table
* - Sample collected prior to the StormwaterBIOCHAR catch basin insert filters

0 50 100 200 300 400 Feet

FIGURE 7

TOTAL LEAD STORMWATER CONCENTRATIONS
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	*MB*	*1:2,400*
DATE	REVIEWED BY	MAP SCALE
8/20/2021	*BJ*	*1 INCH = 200 FEET*

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SW-7		
Date	5/3/2021	5/24/2021
Manganese	**103**	**77.9**

SW-2		
Date	3/5/2021	4/24/2021
Manganese	26.9	**66.2**

SW-3			
Date	3/5/2021	4/24/2021	6/11/2021 *
Manganese	**77.4**	**155**	**134**

SW-4		
Date	3/5/2021	4/24/2021
Manganese	30.9	**54**

SW-5			
Date	3/5/2021	4/24/2021	6/11/2021 *
Manganese	**107**	**315**	**168**

SW-6			
Date	3/5/2021	4/24/2021	6/11/2021 *
Manganese	**70.4**	**301**	**290**

SW-1		
Date	3/5/2021	4/24/2021
Manganese	**176**	**60.4**

SW-7 SW-2 SW-3 SW-4 SW-5 SW-6 SW-1

2877 2875 2845 2805 3120 3105 3165 3155 2725 2745 2695 2685 2605 2525 2645 2655 2625 2585 2565 2305

Legend

- Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stormwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Notes:
SW-1, SW-2, SW-4, and SW-7 are Untreated Samples
SW-3, SW-5, and SW-6 are Post Port Filter Sock/Media Sample Locations
All concentrations are in mircorgams per liter
Bold Text Exceeds most stringent screening value for surface water direct contact, protective of aquatic life, or protective of human health, see Vancouver Screening Values Table
* - Sample collected prior to the StormwaterBIOCHAR catch basin insert filters

0 50 100 200 300 400 Feet

FIGURE 8

TOTAL MANGANESE STORMWATER CONCENTRATIONS
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	*MB*	*1:2,400*
DATE	**REVIEWED BY**	**MAP SCALE**
8/20/2021	*BJ*	*1 INCH = 200 FEET*

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SW-7		
Date	5/3/2021	5/24/2021
Zinc	371	386

SW-2		
Date	3/5/2021	4/24/2021
Zinc	223	445

SW-3			
Date	3/5/2021	4/24/2021	6/11/2021 *
Zinc	503	531	725

SW-4		
Date	3/5/2021	4/24/2021
Zinc	241	368

SW-5			
Date	3/5/2021	4/24/2021	6/11/2021 *
Zinc	721	1710	999

SW-6			
Date	3/5/2021	4/24/2021	6/11/2021 *
Zinc	949	4240	5020

SW-1		
Date	3/5/2021	4/24/2021
Zinc	1300	549

Legend

- Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stormwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Notes:
SW-1, SW-2, SW-4, and SW-7 are Untreated Samples
SW-3, SW-5, and SW-6 are Post Port Filter Sock/Media Sample Locations
All concentrations are in mircorgams per liter
Bold Text Exceeds most stringent screening value for surface water direct contact, protective of aquatic life, or protective of human health, see Vancouver Screening Values Table
* - Sample collected prior to the StormwaterBIOCHAR catch basin insert filters

0 50 100 200 300 400 Feet

FIGURE 9

TOTAL ZINC STORMWATER CONCENTRATIONS
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	*MB*	*1:2,400*
DATE	REVIEWED BY	MAP SCALE
8/20/2021	*BJ*	*1 INCH = 200 FEET*

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SW-7		
Date	5/3/2021	5/24/2021
Low Level Total Mercury	**0.0123**	**0.0123**

SW-2		
Date	3/5/2021	4/24/2021
Low Level Total Mercury	0.00977	0.00833

SW-3			
Date	3/5/2021	4/24/2021	6/11/2021 *
Low Level Total Mercury	0.00217	0.00974	0.00311

SW-4		
Date	3/5/2021	4/24/2021
Low Level Total Mercury	0.00155	**0.0182**

SW-5			
Date	3/5/2021	4/24/2021	6/11/2021 *
Low Level Total Mercury	0.00146	0.00555	0.00209

SW-6			
Date	3/5/2021	4/24/2021	6/11/2021 *
Low Level Total Mercury	0.00421	**0.0133**	0.00641

SW-1		
Date	3/5/2021	4/24/2021
Low Level Total Mercury	0.00453	**0.0122**

Legend

- Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stormwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Notes:
SW-1, SW-2, SW-4, and SW-7 are Untreated Samples
SW-3, SW-5, and SW-6 are Post Port Filter Sock/Media Sample Locations
All concentrations are in mircorgams per liter
Bold Text Exceeds most stringent screening value for surface water direct contact, protective of aquatic life, or protective of human health, see Vancouver Screening Values Table
* - Sample collected prior to the StormwaterBIOCHAR catch basin insert filters

0 50 100 200 300 400 Feet

FIGURE 10

TOTAL LOW LEVEL MERCURY STORMWATER CONCENTRATIONS
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	*MB*	*1:2,400*
DATE	REVIEWED BY	MAP SCALE
8/20/2021	*BJ*	*1 INCH = 200 FEET*

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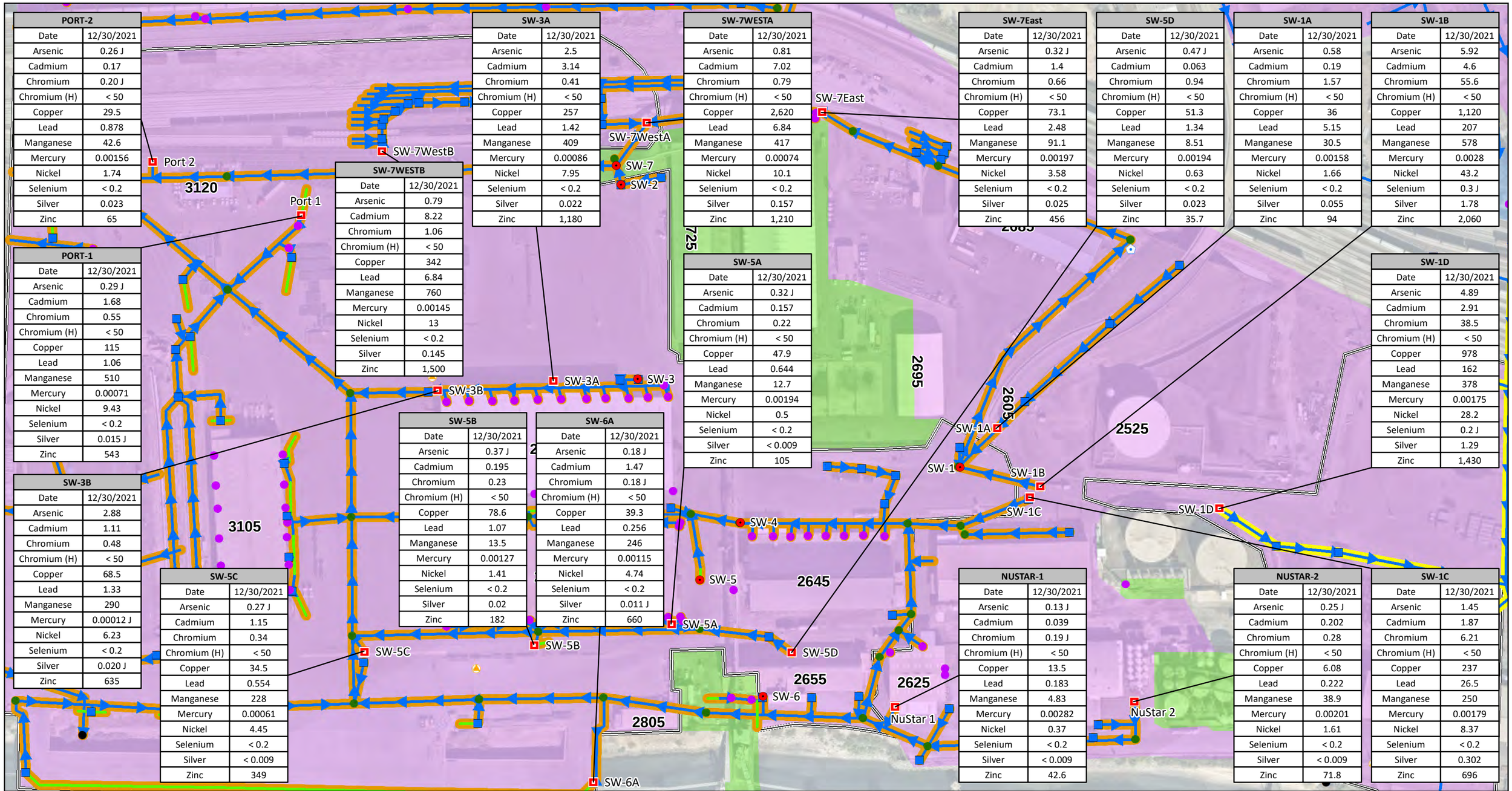

PORT-2	
Date	12/30/2021
Arsenic	0.26 J
Cadmium	0.17
Chromium	0.20 J
Chromium (H)	< 50
Copper	29.5
Lead	0.878
Manganese	42.6
Mercury	0.00156
Nickel	1.74
Selenium	< 0.2
Silver	0.023
Zinc	65

PORT-1	
Date	12/30/2021
Arsenic	0.29 J
Cadmium	1.68
Chromium	0.55
Chromium (H)	< 50
Copper	115
Lead	1.06
Manganese	510
Mercury	0.00071
Nickel	9.43
Selenium	< 0.2
Silver	0.015 J
Zinc	543

SW-3B	
Date	12/30/2021
Arsenic	2.88
Cadmium	1.11
Chromium	0.48
Chromium (H)	< 50
Copper	68.5
Lead	1.33
Manganese	290
Mercury	0.00012 J
Nickel	6.23
Selenium	< 0.2
Silver	0.020 J
Zinc	635

SW-7WESTB	
Date	12/30/2021
Arsenic	0.79
Cadmium	8.22
Chromium	1.06
Chromium (H)	< 50
Copper	342
Lead	6.84
Manganese	760
Mercury	0.00145
Nickel	13
Selenium	< 0.2
Silver	0.145
Zinc	1,500

SW-3A	
Date	12/30/2021
Arsenic	2.5
Cadmium	3.14
Chromium	0.41
Chromium (H)	< 50
Copper	257
Lead	1.42
Manganese	409
Mercury	0.00086
Nickel	7.95
Selenium	< 0.2
Silver	0.022
Zinc	1,180

SW-5B	
Date	12/30/2021
Arsenic	0.37 J
Cadmium	0.195
Chromium	0.23
Chromium (H)	< 50
Copper	78.6
Lead	1.07
Manganese	13.5
Mercury	0.00127
Nickel	1.41
Selenium	< 0.2
Silver	0.02
Zinc	182

SW-6A	
Date	12/30/2021
Arsenic	0.18 J
Cadmium	1.47
Chromium	0.18 J
Chromium (H)	< 50
Copper	39.3
Lead	0.256
Manganese	246
Mercury	0.00115
Nickel	4.74
Selenium	< 0.2
Silver	0.011 J
Zinc	660

SW-5C	
Date	12/30/2021
Arsenic	0.27 J
Cadmium	1.15
Chromium	0.34
Chromium (H)	< 50
Copper	34.5
Lead	0.554
Manganese	228
Mercury	0.00061
Nickel	4.45
Selenium	< 0.2
Silver	< 0.009
Zinc	349

SW-7WESTA	
Date	12/30/2021
Arsenic	0.81
Cadmium	7.02
Chromium	0.79
Chromium (H)	< 50
Copper	2,620
Lead	6.84
Manganese	417
Mercury	0.00074
Nickel	10.1
Selenium	< 0.2
Silver	0.157
Zinc	1,210

SW-5A	
Date	12/30/2021
Arsenic	0.32 J
Cadmium	0.157
Chromium	0.22
Chromium (H)	< 50
Copper	47.9
Lead	0.644
Manganese	12.7
Mercury	0.00194
Nickel	0.5
Selenium	< 0.2
Silver	< 0.009
Zinc	105

SW-7East	
Date	12/30/2021
Arsenic	0.32 J
Cadmium	1.4
Chromium	0.66
Chromium (H)	< 50
Copper	73.1
Lead	2.48
Manganese	91.1
Mercury	0.00197
Nickel	3.58
Selenium	< 0.2
Silver	0.025
Zinc	456

NUSTAR-1	
Date	12/30/2021
Arsenic	0.13 J
Cadmium	0.039
Chromium	0.19 J
Chromium (H)	< 50
Copper	13.5
Lead	0.183
Manganese	4.83
Mercury	0.00282
Nickel	0.37
Selenium	< 0.2
Silver	< 0.009
Zinc	42.6

SW-5D	
Date	12/30/2021
Arsenic	0.47 J
Cadmium	0.063
Chromium	0.94
Chromium (H)	< 50
Copper	51.3
Lead	1.34
Manganese	8.51
Mercury	0.00194
Nickel	0.63
Selenium	< 0.2
Silver	0.023
Zinc	35.7

SW-1A	
Date	12/30/2021
Arsenic	0.58
Cadmium	0.19
Chromium	1.57
Chromium (H)	< 50
Copper	36
Lead	5.15
Manganese	30.5
Mercury	0.00158
Nickel	1.66
Selenium	< 0.2
Silver	0.055
Zinc	94

NUSTAR-2	
Date	12/30/2021
Arsenic	0.25 J
Cadmium	0.202
Chromium	0.28
Chromium (H)	< 50
Copper	6.08
Lead	0.222
Manganese	38.9
Mercury	0.00201
Nickel	1.61
Selenium	< 0.2
Silver	< 0.009
Zinc	71.8

SW-1B	
Date	12/30/2021
Arsenic	5.92
Cadmium	4.6
Chromium	55.6
Chromium (H)	< 50
Copper	1,120
Lead	207
Manganese	578
Mercury	0.0028
Nickel	43.2
Selenium	0.3 J
Silver	1.78
Zinc	2,060

SW-1D	
Date	12/30/2021
Arsenic	4.89
Cadmium	2.91
Chromium	38.5
Chromium (H)	< 50
Copper	978
Lead	162
Manganese	378
Mercury	0.00175
Nickel	28.2
Selenium	0.2 J
Silver	1.29
Zinc	1,430

SW-1C	
Date	12/30/2021
Arsenic	1.45
Cadmium	1.87
Chromium	6.21
Chromium (H)	< 50
Copper	237
Lead	26.5
Manganese	250
Mercury	0.00179
Nickel	8.37
Selenium	< 0.2
Silver	0.302
Zinc	696

Legend

- Stormwater Sample Location
- Additional Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stromwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Note:
(H) - Hexavalent

0 50 100 200 300 400 Feet

FIGURE 11

ADDITIONAL STORMWATER SAMPLE LOCATIONS
AND DISSOLVED ANALYTICAL DATA
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	MB	1:2,400
DATE	REVIEWED BY	MAP SCALE
3/18/2022	BJ	1 INCH = 200 FEET

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PORT-2	
Date	12/30/2021
Arsenic	**0.46 J**
Cadmium	0.182
Chromium	0.6
Chromium (H)	**< 50**
Copper	**60.5**
Lead	**3.79**
Manganese	49.4
Mercury	0.00187
Nickel	1.38
Selenium	< 0.2
Silver	0.071
Zinc	75.9

PORT-1	
Date	12/30/2021
Arsenic	**0.7**
Cadmium	**1.78**
Chromium	1.06
Chromium (H)	**< 50**
Copper	**146**
Lead	**2.99**
Manganese	**555**
Mercury	0.0006
Nickel	9.05
Selenium	< 0.2
Silver	0.045
Zinc	**604**

SW-3B	
Date	12/30/2021
Arsenic	**12.6**
Cadmium	**1.24**
Chromium	4.13
Chromium (H)	**< 50**
Copper	**316**
Lead	**18.6**
Manganese	**323**
Mercury	0.00019 J
Nickel	8.25
Selenium	< 0.2
Silver	0.328
Zinc	**753**

SW-7WESTB	
Date	12/30/2021
Arsenic	**8.46**
Cadmium	**8.01**
Chromium	7.36
Chromium (H)	**< 50**
Copper	**1,860**
Lead	**78.3**
Manganese	**716**
Mercury	0.00188
Nickel	16.7
Selenium	0.4 J
Silver	1.82
Zinc	**1,560**

SW-3A	
Date	12/30/2021
Arsenic	**9.55**
Cadmium	**1.75**
Chromium	2.89
Chromium (H)	**< 50**
Copper	**295**
Lead	**15.8**
Manganese	**364**
Mercury	0.00041 J
Nickel	6.7
Selenium	< 0.2
Silver	0.295
Zinc	**1,000**

SW-7WESTA	
Date	12/30/2021
Arsenic	**3.66**
Cadmium	**7.48**
Chromium	3.42
Chromium (H)	**< 50**
Copper	**3,470**
Lead	**33.3**
Manganese	**447**
Mercury	0.00096
Nickel	12.2
Selenium	< 0.2
Silver	0.744
Zinc	**1,310**

SW-7East	
Date	12/30/2021
Arsenic	**2.67**
Cadmium	**2.43**
Chromium	9.69
Chromium (H)	**< 50**
Copper	**557**
Lead	**49.1**
Manganese	**172**
Mercury	0.00141
Nickel	10.2
Selenium	< 0.2
Silver	0.514
Zinc	**825**

SW-5D	
Date	12/30/2021
Arsenic	**2.97**
Cadmium	**1.17**
Chromium	18.6
Chromium (H)	**< 50**
Copper	**557**
Lead	**29.5**
Manganese	**99**
Mercury	0.0025
Nickel	7.54
Selenium	< 0.2
Silver	0.598
Zinc	**344**

SW-1A	
Date	12/30/2021
Arsenic	**4.94**
Cadmium	**2.48**
Chromium	32.7
Chromium (H)	**< 50**
Copper	**776**
Lead	**135**
Manganese	**335**
Mercury	0.00287
Nickel	24.5
Selenium	0.2 J
Silver	1.0
Zinc	**1,350**

SW-1B	
Date	12/30/2021
Arsenic	**8.55**
Cadmium	**8.34**
Chromium	**93.8**
Chromium (H)	**< 50**
Copper	**2,040**
Lead	**379**
Manganese	**957**
Mercury	0.00325
Nickel	**72.2**
Selenium	0.3 J
Silver	**3.25**
Zinc	**3,760**

SW-1D	
Date	12/30/2021
Arsenic	**10.8**
Cadmium	**6.31**
Chromium	**90.9**
Chromium (H)	**< 50**
Copper	**2,500**
Lead	**387**
Manganese	**833**
Mercury	0.00746
Nickel	**63.7**
Selenium	0.4 J
Silver	**3.28**
Zinc	**3,230**

SW-5B	
Date	12/30/2021
Arsenic	**0.52**
Cadmium	0.239
Chromium	0.45
Chromium (H)	**< 50**
Copper	**138**
Lead	**5.81**
Manganese	14.8
Mercury	0.00408
Nickel	0.65
Selenium	< 0.2
Silver	0.111
Zinc	**191**

SW-6A	
Date	12/30/2021
Arsenic	**1.39**
Cadmium	**1.58**
Chromium	2.02
Chromium (H)	**< 50**
Copper	**180**
Lead	**12.9**
Manganese	**274**
Mercury	0.00042 J
Nickel	5.94
Selenium	< 0.2
Silver	0.277
Zinc	**745**

SW-5A	
Date	12/30/2021
Arsenic	**1.0**
Cadmium	0.276
Chromium	1.2
Chromium (H)	**< 50**
Copper	**223**
Lead	**15**
Manganese	21.3
Mercury	0.00123
Nickel	1.15
Selenium	< 0.2
Silver	0.239
Zinc	**144**

SW-5C	
Date	12/30/2021
Arsenic	**0.73**
Cadmium	**1.2**
Chromium	1.22
Chromium (H)	**< 50**
Copper	**93.3**
Lead	**5.8**
Manganese	**223**
Mercury	0.00031 J
Nickel	4.57
Selenium	< 0.2
Silver	0.094
Zinc	**353**

NUSTAR-1	
Date	12/30/2021
Arsenic	**0.11 J**
Cadmium	0.03
Chromium	0.21
Chromium (H)	**< 50**
Copper	**14.5**
Lead	0.326
Manganese	4.56
Mercury	0.0026
Nickel	0.28
Selenium	< 0.2
Silver	< 0.009
Zinc	32.7

NUSTAR-2	
Date	12/30/2021
Arsenic	**0.99**
Cadmium	0.339
Chromium	3.32
Chromium (H)	**< 50**
Copper	**65.5**
Lead	**5.79**
Manganese	**83.1**
Mercury	0.00051
Nickel	4.29
Selenium	< 0.2
Silver	0.064
Zinc	**149**

SW-1C	
Date	12/30/2021
Arsenic	**11.4**
Cadmium	**5.37**
Chromium	49.6
Chromium (H)	**< 50**
Copper	**2,620**
Lead	**239**
Manganese	**653**
Mercury	0.00335
Nickel	38.7
Selenium	0.5 J
Silver	2.83
Zinc	**2,330**

Port 1
Port 2
3120
3105
SW-7WestB
SW-7WestA
SW-7
SW-2
SW-7East
SW-3A
SW-3
SW-3B
SW-5B
SW-5C
SW-5A
SW-5D
SW-5
SW-4
SW-6
SW-6A
SW-1A
SW-1
SW-1B
SW-1C
SW-1D
NuStar 1
NuStar 2
2725
2695
2685
2645
2655
2625
2805
2525
2605

Legend

- Stormwater Sample Location
- Additional Stormwater Sample Location
- Spill Kit
- Spill Containment Shed
- Other Feature
- Catch Basin
- Manhole
- Outfall
- Trench Drain
- Stormwater Pipe, Flow Direction
- East Stormwater System
- West Stormwater System
- Port ISG, 134 Acres
- Stormwater Drainage Basin
- Sanitary Sewer Drainage Basin
- Ponds

Note:
(H) - Hexavalent

Notes:
All concentrations are in mircorgams per liter
Bold Text Exceeds most stringent screening value for surface water direct contact, protective of aquatic life, or protective of human health, see the Screening Values Table.

0 50 100 200 300 400 Feet

FIGURE 12

ADDITIONAL STORMWATER SAMPLE LOCATIONS
AND TOTAL ANALYTICAL DATA
SHORE TERMINALS, LLC. VANCOUVER FACILITY
VANCOUVER, WASHINGTON

PROJECT NO.	PREPARED BY	REF SCALE
Kinder Morgan	*MB*	*1:2,400*
DATE	REVIEWED BY	MAP SCALE
3/18/2022	*BJ*	*1 INCH = 200 FEET*

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Hayden Island Rain Gage - 1740 N. Jantzen Beach Ctr.
PROVISIONAL, UNCORRECTED RAW DATA FROM THE CITY OF PORTLAND HYDRA NETWORK.
Data are the number of tips of the rain gage bucket.
Each tip is 0.01 inches of rainfall.
 [-, missing data]
Dates and times are PACIFIC STANDARD TIME.

	Daily	Hourly data -->																						
Date	Total	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
31-DEC-2021	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-DEC-2021	17	0	0	0	0	0	0	3	6	0	0	0	3	0	2	2	0	0	0	0	0	1	0	0	0
29-DEC-2021	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
28-DEC-2021	21	0	0	0	0	0	0	0	0	0	0	0	9	8	1	0	0	0	1	1	0	0	0	0	1
27-DEC-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-DEC-2021	3	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
25-DEC-2021	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
24-DEC-2021	29	0	0	1	16	4	0	0	1	0	1	0	1	0	0	0	0	1	0	1	0	1	2	0	0
23-DEC-2021	8	7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-DEC-2021	20	0	0	0	0	0	0	0	0	1	0	1	0	2	4	0	2	0	0	0	0	0	0	1	9
21-DEC-2021	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	6	5	2	0
20-DEC-2021	49	4	4	3	1	7	4	2	0	1	5	3	8	5	2	0	0	0	0	0	0	0	0	0	0
19-DEC-2021	84	5	6	7	5	2	0	0	0	1	4	3	5	6	2	1	4	1	8	7	4	4	7	0	2
18-DEC-2021	151	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	13	24	19	18	13	15	12	21	12
17-DEC-2021	18	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	4	2	2
16-DEC-2021	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-DEC-2021	47	0	0	0	0	0	0	0	0	5	4	3	2	2	1	3	4	3	2	1	2	3	5	5	2
14-DEC-2021	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-DEC-2021	42	3	14	4	1	0	0	0	0	2	2	5	0	0	0	0	0	2	0	0	0	0	0	2	7
12-DEC-2021	32	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	4	0	0	0	3	12	8	1	1
11-DEC-2021	127	2	3	11	12	7	16	11	11	9	9	7	5	5	7	1	0	0	0	5	0	0	0	0	6
10-DEC-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09-DEC-2021	11	0	0	0	0	0	0	0	0	0	0	3	4	2	1	0	1	0	0	0	0	0	0	0	0
08-DEC-2021	2	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
07-DEC-2021	10	0	0	1	0	0	1	0	1	0	0	0	0	0	1	3	0	1	0	2	0	0	0	0	0
06-DEC-2021	69	3	2	0	0	4	5	12	7	9	2	5	7	2	6	1	0	0	1	0	0	1	1	0	1
05-DEC-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04-DEC-2021	12	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	1	1	4	2	0	0	0
03-DEC-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02-DEC-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01-DEC-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0