

**NW Natural Pre-Remedial Design Data Gaps Sampling  
Gasco Sediments Site – Spring 2020  
Field Change Request Form**

**Project Name:** Gasco Sediments Cleanup Action      **Subconsultant:** Anchor QEA, LLC

**Field Activity:** Subsurface Sediment Sampling      **Request Number:** 10

**To:** Hunter Young, U.S. Environmental Protection Agency      **Date:** April 8, 2020

**Field Change Request (FCR) Title:** Additional Perimeter Subsurface Sediment Core Collection and Analyses to Determine Final Project Area


In September through October 2019, NW Natural performed the majority of the pre-remedial design data gaps sampling activities in accordance with the U.S. Environmental Protection Agency (EPA)-approved Gasco Sediments Site *Revised Pre-Remedial Design Data Gaps Work Plan* (DGWP). Some of the nearshore core locations were not accessible due to low river elevations. The completed sampling included the collection of all proposed data gaps sampling subsurface sediment cores shown in Figure 1 (labeled PDI-XX) surrounding the perimeter of the Interim Project Area. As discussed in Section 3.1.1 of the DGWP, these perimeter cores were collected and analyzed to identify the Final Project Area extents based on the presence of principal threat waste (PTW)-nonaqueous phase liquids (NAPL) and exceedances of the Record of Decision (ROD) Table 21 remedial action levels (RALs) and PTW-highly toxic thresholds. No PTW-NAPL was identified in the outermost perimeter cores, so that objective is achieved. However, as shown in Figure 1 and summarized in Table 1, surface and subsurface bulk sediment concentration exceedances of the ROD Table 21 RALs or PTW-highly toxic thresholds were detected at 12 core stations (see purple circles in Figure 1) along the outermost perimeter of the Interim Project Area. Due to the distance between these stations and the nearest clean stations, NW Natural proposes to further refine the project area by collecting additional subsurface sediment cores channelward of these 12 stations. Chemical analyses of samples collected from these stations would be compared against the ROD Table 21 RAL and PTW-highly toxic thresholds. All other existing perimeter stations are laterally bounded and will define the Final Project Area extents during remedial design using the lines of evidence identified in Section 3 of the EPA-approved *Final Pre-Remedial Basis of Design Technical Evaluations Work Plan*.

NW Natural proposes to collect 15 additional perimeter subsurface sediment cores at the stations shown in Figure 1 with the geographic coordinates provided in Table 2. Surface and subsurface sediment will be sampled and analyzed within each core for comparison against the ROD Table 21 RAL and PTW-highly toxic thresholds consistent with the data gaps sampling objectives and sampling design discussed in Section 3.4.1 of the DGWP to determine the vertical depth of contamination (DOC). In addition, the sediments will be sampled and analyzed consistent with Section 3.2.1.1.1 of the DGWP (navigation channel area) to support any necessary chemical isolation capping evaluations if RAL or PTW-highly toxic thresholds are identified. All sample collection methods and chemical analyses will be consistent with Sections 3.2.1.2.1 and 3.4.2 of the DGWP and the associated detailed procedures specified in Appendices A and B of the DGWP. In addition, the DOC chemical analyses approach will be performed consistent with the EPA-approved Field Change Request Form No. 8 dated November 15, 2019. Lastly, to confirm the PTW-NAPL line of evidence has been achieved, the full recovered depth of each core will be visually observed for the presence of PTW-NAPL using the site-specific definition identified in Section 3.1.1 of the DGWP.

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Nik Bacher, Anchor QEA		April 8, 2020
<b>Respondent Field Coordinator (or Designee)</b>	<b>Signature</b>	<b>Date</b>

**Approval:**

Ryan Barth, Anchor QEA		April 8, 2020
<b>Respondent Project Lead</b>	<b>Signature</b>	<b>Date</b>

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# Tables

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**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Screening Value	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	2,3,7,8-Tetrachlorodibenzofuran (TCDF)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	cPAH/BaPEq TEQ (EPA 1993) (U=1/2 max limit)	Total DDx (U=1/2 max limit)	Total PAH (U=1/2 max limit)	Total PCB Aroclors (U=1/2 max limit)
Navigation Channel RAL	0.003	--	1	--	0.002	--	650	170,000	1,000
PTW-Highly Toxic Threshold	0.01	0.04	0.2	0.6	0.01	774,000	7,050	--	200
<b>Sample</b>									
<b>PDI-013SC-A</b>									
2-3 feet	0.00044	0.00068	0.00187	0.00183	0.00033	142,000	97	2,200,000	20
3-4 feet	0.00050	0.00051	0.00019	0.00023	0.00019	15,000	7	130,000	2
4-5 feet	0.00015	0.00021	0.00016	0.00018	0.00030	4,500	7	37,000	2
10-11 feet	0.00015	0.00009	0.00007	0.00011	0.00017	3	3	103	2
11-12 feet	0.00020	0.00009	0.00012	0.00015	0.00022	3	3	209	2
<b>PDI-013SC-B</b>									
7.6-9.6 feet	--	--	--	--	--	3	--	150	--
9.6-12 feet	--	--	--	--	--	3	--	110	--
<b>PDI-014SC-A</b>									
2-3 feet	0.00028	0.00172	0.00442	0.00610	0.00046	52,200	154	820,000	10
3-4 feet	0.00082	0.00143	0.00274	0.00415	0.00049	16,800	52	260,000	9
4-5 feet	0.00007	0.00006	0.00004	0.00005	0.00007	13	2	269	2
5-6 feet	0.00007	0.00006	0.00006	0.00009	0.00010	4	3	325	2
6-7 feet	0.00008	0.00008	0.00005	0.00008	0.00008	4	2	75	1
12-13 feet	0.00008	0.00004	0.00005	0.00005	0.00005	12	3	240	2
13-13.5 feet	0.00010	0.00005	0.00009	0.00006	0.00010	6	3	120	2
<b>PDI-014SC-B</b>									
7.5-9.5 feet	--	--	--	--	--	3	--	102	--
9.5-11.5 feet	--	--	--	--	--	5	--	1,300	--
11.5-13.5 feet	--	--	--	--	--	3	--	91	--
<b>PDI-015SC-A</b>									
7-8 feet	0.00134	0.00204	0.00247	0.00176	0.00047	1,060,000	292	31,000,000	38
8-9 feet	0.00029	0.00015	0.00015	0.00019	0.00025	48	3	5,110	2
9-10 feet	0.00009	0.00003	0.00004	0.00004	0.00011	16	3	495	2
14-15 feet	0.00025	0.00012	0.00009	0.00011	0.00018	16	3	205	2
15-16 feet	0.00020	0.00014	0.00010	0.00012	0.00015	15	3	289	2
<b>PDI-015SC-B</b>									
6.4-8.4 feet	--	--	--	--	--	369,000	--	11,400,000	--
8.4-10.4 feet	--	--	--	--	--	61	--	1,880	--
10.4-12.4 feet	--	--	--	--	--	7	--	264	--
12.4-14.4 feet	--	--	--	--	--	21	--	392	--
14.4-16 feet	--	--	--	--	--	4	--	64	--
<b>PDI-017SC-A</b>									
0-1 feet	0.00030	0.00023	0.00079	0.00069	0.00031	29,000	23	430,000	2
1-2 feet	0.00029	0.00024	0.00013	0.00020	0.00024	20,700	21	269,000	1
2-3 feet	0.00010	0.00019	0.00023	0.00008	0.00009	20,000	12	260,000	2
3-4 feet	0.00007	0.00012	0.00005	0.00007	0.00009	4,300	5	46,000	2
4-5 feet	0.00010	0.00053	0.00066	0.00010	0.00008	20,400	12	234,000	7
5-6 feet	0.00094	0.00921	0.00443	0.00031	0.00009	6,900	14	120,000	9
6-7 feet	0.00009	0.00005	0.00004	0.00005	0.00008	33	3	3,200	2
9-10 feet	0.00010	0.00007	0.00009	0.00009	0.00010	3	2	100	1
10-11.4 feet	0.00010	0.00005	0.00008	0.00007	0.00009	3	3	69	2

**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Screening Value	1,2,3,7,8- Pentachlorodibenzo- p-dioxin (PeCDD)	2,3,4,6,7,8- Hexachlorodibenzofuran (HxCDF)	2,3,4,7,8- Pentachlorodibenzofuran (PeCDF)	2,3,7,8- Tetrachlorodibenzofuran (TCDF)	2,3,7,8- Tetrachlorodibenzo- p-dioxin (TCDD)	cPAH/BaPEq TEQ (EPA 1993) (U=1/2 max limit)	Total DDx (U=1/2 max limit)	Total PAH (U=1/2 max limit)	Total PCB Aroclors (U=1/2 max limit)
<b>PDI-017SC-B</b>									
4.9-6.9 feet	--	--	--	--	--	13,700	--	159,000	--
6.9-8.9 feet	--	--	--	--	--	12	--	781	--
8.9-10.9 feet	--	--	--	--	--	3	--	68	--
10.9-11.4 feet	--	--	--	--	--	3	--	39	--
<b>PDI-018SC-A</b>									
6-7 feet	0.00296	0.02280	0.00842	0.00154	0.00034	88,000	27	1,200,000	40
7-8 feet	0.00080	0.00913	0.00289	0.00055	0.00043	19,400	15	260,000	30
8-9 feet	0.00021	0.00013	0.00009	0.00018	0.00024	9	2	216	2
9-10 feet	0.00006	0.00005	0.00005	0.00006	0.00006	3	2	33	2
11-12 feet	0.00011	0.00009	0.00007	0.00013	0.00013	4	2	41	2
12-13.4 feet	0.00017	0.00009	0.00009	0.00015	0.00019	27	3	244	2
<b>PDI-018SC-B</b>									
5.8-7.8 feet	--	--	--	--	--	83,000	--	1,000,000	--
7.8-9.8 feet	--	--	--	--	--	2	--	37	--
9.8-11.8 feet	--	--	--	--	--	5	--	51	--
11.8-13.2 feet	--	--	--	--	--	3	--	33	--
<b>PDI-021SC-A</b>									
13-14 feet	0.00022	0.00012	0.00033	0.00013	0.00015	13	2	118	1
14-15.4 feet	0.00035	0.00025	0.00032	0.00027	0.00028	21,500	2	242,000	2
<b>PDI-021SC-B</b>									
5.7-7.7 feet	--	--	--	--	--	7,000	--	62,900	--
7.7-9.7 feet	--	--	--	--	--	127,000	--	1,500,000	--
9.7-11.7 feet	--	--	--	--	--	6,700	--	61,000	--
11.7-13.7 feet	--	--	--	--	--	289	--	2,730	--
13.7-15.4 feet	--	--	--	--	--	200	--	2,100	--
<b>PDI-022SC-A</b>									
1-2 feet	0.00033	0.00256	0.00125	0.00025	0.00029	23,000	10	290,000	11
2-3 feet	0.00007	0.00010	0.00006	0.00007	0.00011	17,000	5	250,000	2
3-4 feet	0.00017	0.00009	0.00012	0.00015	0.00017	4,400	5	61,000	2
4-5 feet	0.00008	0.00007	0.00006	0.00007	0.00007	55,000	15	810,000	1
5-6 feet	0.00009	0.00005	0.00004	0.00005	0.00007	3	2	117	1
6-7 feet	0.00006	0.00006	0.00004	0.00005	0.00006	4	2	59	1
11-12 feet	0.00009	0.00004	0.00004	0.00009	0.00016	3	2	32	2
12-13.1 feet	0.00006	0.00004	0.00005	0.00003	0.00004	5	3	64	2
<b>PDI-022SC-B</b>									
5.5-7.5 feet	--	--	--	--	--	14	--	252	--
7.5-9.5 feet	--	--	--	--	--	3	--	37	--
9.5-11.5 feet	--	--	--	--	--	3	--	38	--
11.5-13.1 feet	--	--	--	--	--	3	--	37	--
<b>PDI-023SC-A</b>									
4-5 feet	0.00033	0.00010	0.00006	0.00008	0.00012	120,000	74	2,600,000	5
5-6 feet	0.00036	0.00042	0.00021	0.00036	0.00039	55,000	256	1,100,000	4
6-7 feet	0.00014	0.00010	0.00008	0.00011	0.00018	4	3	1,760	2
7-8 feet	0.00006	0.00002	0.00003	0.00005	0.00009	3	9	411	2
11-12 feet	0.00031	0.00036	0.00012	0.00016	0.00025	4	3	32	2
12-12.5 feet	0.00026	0.00021	0.00012	0.00018	0.00028	4	3	65	2

**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Screening Value	1,2,3,7,8- Pentachlorodibenzo- p-dioxin (PeCDD)	2,3,4,6,7,8- Hexachlorodibenzofuran (HxCDF)	2,3,4,7,8- Pentachlorodibenzofuran (PeCDF)	2,3,7,8- Tetrachlorodibenzofuran (TCDF)	2,3,7,8- Tetrachlorodibenzo- p-dioxin (TCDD)	cPAH/BaPEq TEQ (EPA 1993) (U=1/2 max limit)	Total DDx (U=1/2 max limit)	Total PAH (U=1/2 max limit)	Total PCB Aroclors (U=1/2 max limit)
<b>PDI-023SC-B</b>									
0-2 feet	--	--	--	--	--	--	108	--	42
2-4 feet	--	--	--	--	--	--	76	--	13
4-6 feet	--	--	--	--	--	--	50	--	2
6-8 feet	--	--	--	--	--	--	3	--	2
6.3-8.3 feet	--	--	--	--	--	4	--	773	--
8.3-10.3 feet	--	--	--	--	--	4	--	252	--
10.3-12.5 feet	--	--	--	--	--	4	--	35	--
<b>PDI-024SC-A</b>									
2-3 feet	0.00100	0.00369	0.00977	0.01760	0.00163	55,300	76	1,150,000	16
3-4 feet	0.00043	0.00143	0.00219	0.00183	0.00033	61,800	44	1,200,000	6
4-5 feet	0.00007	0.00005	0.00004	0.00005	0.00008	530	2	11,000	2
5-6 feet	0.00006	0.00004	0.00004	0.00004	0.00007	20	2	421	2
10-11 feet	0.00010	0.00007	0.00006	0.00005	0.00007	3	3	32	2
11-12.1 feet	0.00010	0.00005	0.00012	0.00011	0.00013	3	3	3	2
<b>PDI-024SC-B</b>									
0-2 feet	0.00158	0.00464	0.01150	0.02140	0.00076	--	88	--	32
2-4 feet	0.00128	0.00455	0.01190	0.02300	0.00100	--	192	--	102
4-6 feet	0.00006	0.00004	0.00006	0.00005	0.00008	--	2	--	1
6-8 feet	0.00008	0.00005	0.00006	0.00006	0.00009	--	3	--	2
10-12.1 feet	--	--	--	--	--	4	--	57	--
<b>PDI-025SC-A</b>									
2-3 feet	0.00011	0.00009	0.00030	0.00045	0.00013	29,600	14	503,000	4
3-4 feet	0.00008	0.00002	0.00002	0.00002	0.00017	9	3	494	2
4-5 feet	0.00007	0.00004	0.00004	0.00005	0.00008	4	2	479	2
6-7 feet	0.00009	0.00004	0.00007	0.00006	0.00008	3	3	47	2
7-8 feet	0.00007	0.00004	0.00005	0.00006	0.00008	4	3	34	2
<b>PDI-028SC-A</b>									
10-11 feet	0.00106	0.00069	0.00252	0.00297	0.00058	150,000	239	5,500,000	14
11-12 feet	0.00009	0.00005	0.00006	0.00007	0.00010	11	2	307	1
12-13 feet	0.00009	0.00005	0.00007	0.00004	0.00008	32	2	900	2
13-14.2 feet	0.00010	0.00004	0.00010	0.00006	0.00007	15	3	620	2
<b>PDI-028SC-B</b>									
6.7-8.7 feet	--	--	--	--	--	8,320	--	267,000	--
8.7-10.7 feet	--	--	--	--	--	181,000	--	6,100,000	--
10.7-12.7 feet	--	--	--	--	--	69	--	1,300	--
12.7-14.2 feet	--	--	--	--	--	4	--	256	--
<b>PDI-030SC-A</b>									
0-1 feet	0.00043	0.00115	0.00087	0.00136	0.00036	300	8	4,800	--
1-2 feet	0.00005	0.00004	0.00003	0.00002	0.00004	51	2	439	1
10-11 feet	0.00007	0.00005	0.00008	0.00005	0.00007	3	3	33	2
11-11.8 feet	0.00021	0.00010	0.00009	0.00012	0.00016	3	3	28	2
<b>PDI-030SC-B</b>									
5.9-7.9 feet	--	--	--	--	--	2	--	21	--
7.9-9.9 feet	--	--	--	--	--	2	--	27	--
9.9-11.8 feet	--	--	--	--	--	2	--	22	--

**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Screening Value	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	2,3,7,8-Tetrachlorodibenzofuran (TCDF)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	cPAH/BaPEq TEQ (EPA 1993) (U=1/2 max limit)	Total DDx (U=1/2 max limit)	Total PAH (U=1/2 max limit)	Total PCB Aroclors (U=1/2 max limit)
<b>PDI-032SC-A</b>									
0-1 feet	0.00039	0.00219	0.00882	0.00759	0.00026	133	2	2,790	
1-2 feet	0.00004	0.00023	0.00085	0.00075	0.00004	32	2	331	1
11-12 feet	0.00010	0.00004	0.00004	0.00007	0.00013	3	2	59	2
12-12.8 feet	0.00013	0.00005	0.00005	0.00008	0.00018	4	3	158	2
<b>PDI-032SC-B</b>									
5.8-7.8 feet	--	--	--	--	--	3	--	49	--
7.8-9.8 feet	--	--	--	--	--	3	--	77	--
9.8-11.8 feet	--	--	--	--	--	3	--	73	--
11.8-12.8 feet	--	--	--	--	--	4	--	118	--
<b>PDI-036SC-A</b>									
0-1 feet	0.00007	0.00012	0.00020	0.00037	0.00007	3,680	7	41,000	1
1-2 feet	0.00023	0.00017	0.00021	0.00028	0.00014	19,300	35	254,000	1
2-3 feet	0.00006	0.00004	0.00004	0.00005	0.00007	989	2	14,000	1
3-4 feet	0.00010	0.00005	0.00005	0.00007	0.00009	3	2	181	2
11-12 feet	0.00015	0.00009	0.00007	0.00011	0.00014	3	2	31	1
12-13.4 feet	0.00016	0.00011	0.00010	0.00010	0.00016	3	3	441	2
<b>PDI-036SC-B</b>									
4.2-6.2 feet	--	--	--	--	--	2	--	43	--
6.2-8.2 feet	--	--	--	--	--	2	--	64	--
8.2-10.2 feet	--	--	--	--	--	7	--	118	--
10.2-12.2 feet	--	--	--	--	--	2	--	26	--
12.2-13.4 feet	--	--	--	--	--	2	--	422	--
<b>PDI-039SC-A</b>									
0-1 feet	0.00009	0.00011	0.00020	0.00037	0.00015	29	3	357	2
1-2 feet	0.00014	0.00009	0.00015	0.00016	0.00013	11	2	98	2
12-13 feet	0.00009	0.00005	0.00006	0.00007	0.00009	4	3	29	3
13-13.7 feet	0.00011	0.00009	0.00007	0.00007	0.00012	3	3	3	2
<b>PDI-039SC-B</b>									
3.8-5.8 feet	--	--	--	--	--	3	--	27	--
5.8-7.8 feet	--	--	--	--	--	3	--	3	--
7.8-9.8 feet	--	--	--	--	--	5	--	37	--
9.8-11.8 feet	--	--	--	--	--	3	--	27	--
11.8-13.7 feet	--	--	--	--	--	3	--	3	--
<b>PDI-040SC-A</b>									
0-1 feet	0.00055	0.00226	0.00762	0.01040	0.00035	11,000	26	220,000	11
1-2 feet	0.00009	0.00012	0.00015	0.00080	0.00012	440	6	4,300	1
2-3 feet	0.00007	0.00004	0.00004	0.00005	0.00007	11	2	225	2
9-10 feet	0.00010	0.00007	0.00008	0.00010	0.00010	3	2	34	1
10-11.3 feet	0.00016	0.00009	0.00013	0.00018	0.00015	3	2	30	2
<b>PDI-040SC-B</b>									
5.3-7.3 feet	--	--	--	--	--	3	--	27	--
7.3-9.3 feet	--	--	--	--	--	3	--	34	--
9.3-11.3 feet	--	--	--	--	--	4	--	37	--

**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Screening Value	1,2,3,7,8- Pentachlorodibenzo- p-dioxin (PeCDD)	2,3,4,6,7,8- Hexachlorodibenzofuran (HxCDF)	2,3,4,7,8- Pentachlorodibenzofuran (PeCDF)	2,3,7,8- Tetrachlorodibenzofuran (TCDF)	2,3,7,8- Tetrachlorodibenzo- p-dioxin (TCDD)	cPAH/BaPEq TEQ (EPA 1993) (U=1/2 max limit)	Total DDx (U=1/2 max limit)	Total PAH (U=1/2 max limit)	Total PCB Aroclors (U=1/2 max limit)
<b>PDI-042SC-A</b>									
1-2 feet	0.00108	0.00660	0.01970	0.02680	0.00101	10,700	67	190,000	24
2-3 feet	0.00008	0.00012	0.00030	0.00048	0.00012	91	2	1,210	2
3-4 feet	0.00008	0.00004	0.00004	0.00005	0.00008	5	2	98	2
12-13 feet	0.00013	0.00008	0.00022	0.00011	0.00012	3	2	27	2
13-13.8 feet	0.00036	0.00011	0.00024	0.00016	0.00018	3	2	3	2
<b>PDI-042SC-B</b>									
3.9-5.9 feet	--	--	--	--	--	3	--	29	--
5.9-7.9 feet	--	--	--	--	--	3	--	31	--
7.9-9.9 feet	--	--	--	--	--	3	--	3	--
9.9-11.9 feet	--	--	--	--	--	3	--	3	--
11.9-13.8 feet	--	--	--	--	--	3	--	3	--
<b>PDI-044SC-A</b>									
0-1 feet	0.00048	0.00174	0.00366	0.00461	0.00044	1,990	27	40,200	11
1-2 feet	0.00047	0.00162	0.00523	0.00866	0.00065	18,900	43	200,000	16
2-3 feet	0.00012	0.00008	0.00026	0.00048	0.00009	560	2	3,500	2
3-4 feet	0.00005	0.00003	0.00003	0.00004	0.00006	5	2	66	2
11-12 feet	0.00011	0.00007	0.00013	0.00008	0.00011	3	3	3	1
12-12.8 feet	0.00012	0.00010	0.00007	0.00013	0.00019	4	2	38	2
<b>PDI-044SC-B</b>									
7.1-9.1 feet	--	--	--	--	--	3	--	3	--
9.1-11.1 feet	--	--	--	--	--	3	--	24	--
11.1-12.8 feet	--	--	--	--	--	3	--	29	--
<b>PDI-046SC-A</b>									
1-2 feet	0.00110	0.00238	0.00565	0.01570	0.00121	19,000	43	330,000	21
2-3 feet	0.00008	0.00023	0.00040	0.00064	0.00013	2,090	10	23,000	8
3-4 feet	0.00011	0.00006	0.00008	0.00018	0.00008	330	7	2,400	1
12-13 feet	0.00006	0.00003	0.00003	0.00003	0.00005	3	3	28	1
13-13.5 feet	0.00006	0.00002	0.00003	0.00004	0.00006	3	2	31	1
<b>PDI-046SC-B</b>									
7.8-9.8 feet	--	--	--	--	--	3	--	3	--
9.8-11.8 feet	--	--	--	--	--	3	--	27	--
11.8-13.5 feet	--	--	--	--	--	3	--	56	--
<b>PDI-047SC-A</b>									
1-2 feet	0.00367	0.03150	0.09570	0.16000	0.00491	10,300	780	128,000	106
2-3 feet	0.00400	0.00917	0.00962	0.04620	0.00443	784	285	11,700	37
3-4 feet	0.00008	0.00064	0.00243	0.00261	0.00008	81	22	1,700	7
11-12 feet	0.00006	0.00003	0.00003	0.00004	0.00006	3	2	26	1
12-13.2 feet	0.00008	0.00003	0.00003	0.00004	0.00007	3	2	3	2
<b>PDI-047SC-B</b>									
0-2 feet	0.00007	0.00388	0.01390	0.01460	0.00015	--	4,080	--	46
2-4 feet	0.00181	0.00495	0.01740	0.01730	0.00189	--	137	--	31
4-6 feet	0.00007	0.00005	0.00005	0.00006	0.00007	--	2	--	1
6-8 feet	0.00009	0.00004	0.00003	0.00004	0.00007	--	2	--	1
9.5-11.5 feet	--	--	--	--	--	3	--	24	--
11.5-13.2 feet	--	--	--	--	--	3	--	28	--



**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Screening Value	1,2,3,7,8- Pentachlorodibenzo- p-dioxin (PeCDD)	2,3,4,6,7,8- Hexachlorodibenzofuran (HxCDF)	2,3,4,7,8- Pentachlorodibenzofuran (PeCDF)	2,3,7,8- Tetrachlorodibenzofuran (TCDF)	2,3,7,8- Tetrachlorodibenzo- p-dioxin (TCDD)	cPAH/BaPEq TEQ (EPA 1993) (U=1/2 max limit)	Total DDx (U=1/2 max limit)	Total PAH (U=1/2 max limit)	Total PCB Aroclors (U=1/2 max limit)
<b>PDI-084SC-A<sup>1</sup></b>									
1-2 feet	0.00022	0.00108	0.00434	0.00590	0.00012	1,700	38	54,000	33
2-3 feet	0.00167	0.03500	0.11700	0.13400	0.00086	13,000	183	220,000	89
3-4 feet	0.00035	0.00483	0.03570	0.05690	0.00017	4,100	360	62,000	103
4-5 feet	0.00036	0.00579	0.01470	0.01780	0.00038	1,010	562	13,100	73
5-6 feet	0.00227	0.06860	0.04120	0.20700	0.00120	3,900	224	69,000	55
6-7 feet	0.00115	0.02080	0.06500	0.08580	0.00061	8,720	143	140,000	42
7-8 feet	0.00018	0.00384	0.01160	0.01040	0.00010	2,500	750	38,200	60
8-9 feet	0.00122	0.01130	0.04220	0.06750	0.00088	1,800	1,170	33,000	92
9-10 feet	0.00085	0.01210	0.02140	0.03690	0.00068	2,420	537	41,000	50
10-11 feet	0.00150	0.00959	0.01080	0.00245	0.00046	9,600	47	100,000	18
11-12 feet	0.00051	0.00695	0.01150	0.00743	0.00020	720	27	11,000	14
12-13 feet	0.00012	0.00005	0.00004	0.00005	0.00025	3	3	156	2
13-14 feet	0.00009	0.00005	0.00003	0.00005	0.00009	88	4	1,360	2
14-15 feet	0.00006	0.00005	0.00004	0.00005	0.00006	43	3	106	2
15-16 feet	0.00013	0.00007	0.00013	0.00009	0.00008	3	3	29	2
16-17 feet	0.00014	0.00008	0.00009	0.00007	0.00006	3	3	3	2
<b>PDI-084SC-B<sup>1</sup></b>									
0-2 feet	0.00106	0.00259	0.00770	0.01090	0.00044	336	36	6,000	30
2-4 feet	0.00432	0.05640	0.20600	0.30100	0.00280	2,700	260	39,000	64
4-6 feet	0.00059	0.00917	0.02580	0.02400	0.00040	985	560	12,200	30
6-8 feet	0.00013	0.00244	0.00906	0.01180	0.00006	8,110	772	120,000	88
8-10 feet	--	--	--	--	--	955	--	11,000	--
10-12 feet	--	--	--	--	--	1,400	--	14,000	--
12-14 feet	--	--	--	--	--	4	--	37	--
14-16 feet	--	--	--	--	--	37	--	37	--
16-17 feet	--	--	--	--	--	3	--	37	--
<b>PDI-095SC-B<sup>1</sup></b>									
0-2 feet	0.00199	0.01790	0.02260	0.04590	0.00221	3,720	996	67,000	43
2-4 feet	0.00019	0.00025	0.00259	0.00493	0.00029	16,200	1,400	290,000	82
4-6 feet	0.00163	0.01350	0.01660	0.03780	0.00106	35,700	676	510,000	17
6-8 feet	0.00233	0.01740	0.00453	0.00171	0.00065	25,000	3	310,000	33
8-10 feet	--	--	--	--	--	17,000	--	220,000	--
10-12 feet	--	--	--	--	--	17,900	--	190,000	--
12-14 feet	--	--	--	--	--	965	--	11,300	--
<b>PDI-097SC-B<sup>1</sup></b>									
0-2 feet	0.00192	0.02360	0.08500	0.16400	0.00194	2,100	152	68,000	80
2-4 feet	0.00096	0.00801	0.03210	0.05190	0.00086	17,500	1,370	240,000	32
4-6 feet	0.00205	0.01310	0.01340	0.00223	0.00061	18,800	7	201,000	31
6-8 feet	0.00139	0.00582	0.00685	0.00088	0.00040	11,000	6	100,000	2
8-10 feet	--	--	--	--	--	11,400	--	120,000	--
10-12 feet	--	--	--	--	--	1,260	--	14,000	--
12-14 feet	--	--	--	--	--	8,000	--	68,000	--
14-16 feet	--	--	--	--	--	2,000	--	17,000	--
16-17.6 feet	--	--	--	--	--	340	--	4,300	--

**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Screening Value	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	2,3,7,8-Tetrachlorodibenzofuran (TCDF)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	cPAH/BaPEq TEQ (EPA 1993) (U=1/2 max limit)	Total DDx (U=1/2 max limit)	Total PAH (U=1/2 max limit)	Total PCB Aroclors (U=1/2 max limit)
<b>PDI-099SC-B<sup>1</sup></b>									
0-2 feet	0.00096	0.01590	0.04630	0.07550	0.00123	2,630	140	51,500	218
2-4 feet	0.00145	0.04070	0.02480	0.19300	0.00122	2,390	3,400	34,600	62
4-6 feet	0.00082	0.02780	0.17000	0.24600	0.00049	13,000	21,000	200,000	151
6-8 feet	0.00222	0.01540	0.00798	0.00389	0.00071	11,000	27	110,000	23
8-10 feet	--	--	--	--	--	9,000	--	80,000	--
10-12 feet	--	--	--	--	--	3,500	--	31,000	--
12-14 feet	--	--	--	--	--	2,200	--	22,000	--
14-15.6 feet	--	--	--	--	--	466	--	4,530	--
<b>PDI-100SC-J</b>									
1-2 feet	0.00021	0.00024	0.00023	0.00023	0.00020	5,910	2	46,900	2
2-3 feet	0.00020	0.00019	0.00023	0.00022	0.00019	17,000	9	150,000	2
3-4 feet	0.00028	0.00013	0.00017	0.00022	0.00022	8,600	2	71,000	2
4-5 feet	0.00099	0.00823	0.00201	0.00050	0.00017	12,000	5	150,000	14
5-6 feet	0.00073	0.00611	0.00196	0.00029	0.00011	34,300	12	400,000	18
6-7 feet	0.00005	0.00004	0.00003	0.00004	0.00005	23	2	315	2
7-8 feet	0.00005	0.00005	0.00003	0.00003	0.00004	5	2	80	2
8-9 feet	0.00007	0.00004	0.00003	0.00003	0.00009	5	3	962	2
9-10 feet	0.00005	0.00004	0.00003	0.00003	0.00004	3	2	27	2
10-11 feet	0.00004	0.00003	0.00003	0.00003	0.00005	4	2	38	2
<b>PDI-101SC-J</b>									
1-2 feet	0.00084	0.00204	0.00488	0.01180	0.00071	316,000	88	2,400,000	18
2-3 feet	0.00029	0.00050	0.00198	0.00334	0.00033	16,900	36	120,000	14
3-4 feet	0.00107	0.00334	0.00706	0.01340	0.00078	17,200	40	131,000	13
<b>AN-1-5</b>									
0-0.3 feet	--	--	--	--	--	194	--	1,676	--
0.3-0.7 feet	--	--	--	--	--	5	--	61	--
1-1.3 feet	--	--	--	--	--	3	--	35	--
<b>AN-2-5</b>									
0-0.3 feet	--	--	--	--	--	360	--	3,159	--
0.3-0.7 feet	--	--	--	--	--	5	--	54	--
1-1.3 feet	--	--	--	--	--	3	--	3	--
<b>C258</b>									
1-5 feet	--	--	--	--	--	32,000	10	270,000	3
5-9 feet	--	--	--	--	--	25,000	19	290,000	9
9-10 feet	--	--	--	--	--	5,200	--	57,000	--
<b>C272</b>									
1-5 feet	--	--	--	--	--	9	0.3	114	3
5-8.5 feet	--	--	--	--	--	191	0.2	1,185	2
<b>C311<sup>1</sup></b>									
1-5 feet	--	--	--	--	--	16,000	240	240,000	34
5-9 feet	--	--	--	--	--	2,800	10	32,000	3
13-19.5 feet	--	--	--	--	--	1,700	1	14,000	3
<b>C312</b>									
1-5 feet	--	--	--	--	--	710	300	9,600	19
5-8 feet	--	--	--	--	--	3	1	44	1

**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Screening Value	1,2,3,7,8- Pentachlorodibenzo- p-dioxin (PeCDD)	2,3,4,6,7,8- Hexachlorodibenzofuran (HxCDF)	2,3,4,7,8- Pentachlorodibenzofuran (PeCDF)	2,3,7,8- Tetrachlorodibenzofuran (TCDF)	2,3,7,8- Tetrachlorodibenzo- p-dioxin (TCDD)	cPAH/BaPEq TEQ (EPA 1993) (U=1/2 max limit)	Total DDx (U=1/2 max limit)	Total PAH (U=1/2 max limit)	Total PCB Aroclors (U=1/2 max limit)
<b>DGS-06SC</b>									
1-4 feet	--	--	--	--	--	10,000	16	90,000	32
4-8 feet	--	--	--	--	--	510	3	5,900	33
8-12 feet	--	--	--	--	--	76	3	790	32
12-16 feet	--	--	--	--	--	66	3	66	33
16-16.6 feet	--	--	--	--	--	60	3	60	32
<b>DGS-08SC</b>									
1-4 feet	--	--	--	--	--	18,000	65	310,000	120
4-8 feet	--	--	--	--	--	61,000	16	1,800,000	33
8-9.3 feet	--	--	--	--	--	62	3	62	33
<b>DGS-11SC</b>									
1-4 feet	--	--	--	--	--	74,000	48	2,000,000	140
1.5-8.2 feet	--	--	--	--	--	94,000	32	2,300,000	31
4-8 feet	--	--	--	--	--	72,000	16	2,000,000	32
8-12 feet	--	--	--	--	--	12,000	16	190,000	32
12-16 feet	--	--	--	--	--	62	3	580	31
16-17.5 feet	--	--	--	--	--	61	3	61	30
<b>DGS-13SC</b>									
1-4 feet	--	--	--	--	--	4,900	46	72,000	31
4-8 feet	--	--	--	--	--	62	3	3,000	31
8-12 feet	--	--	--	--	--	65	3	65	32
12-16 feet	--	--	--	--	--	61	3	61	32
16-17 feet	--	--	--	--	--	64	3	64	32
<b>DGS-20SC</b>									
1-4 feet	--	--	--	--	--	62	3	530	32
4-8 feet	--	--	--	--	--	61	3	570	31
8-12 feet	--	--	--	--	--	61	3	61	31
12-13.7 feet	--	--	--	--	--	65	3	65	33
<b>DGS-23SC</b>									
1-4 feet	--	--	--	--	--	64	3	630	33
4-8 feet	--	--	--	--	--	61	3	61	31
8-12 feet	--	--	--	--	--	65	3	65	33
12-14.4 feet	--	--	--	--	--	63	3	63	32
<b>DGS-25SC</b>									
1-4 feet	--	--	--	--	--	64	3	64	31
4-8 feet	--	--	--	--	--	62	3	720	32
8-12 feet	--	--	--	--	--	63	3	63	32
12-14.5 feet	--	--	--	--	--	66	3	66	32
<b>DGS-28SC</b>									
1-4 feet	--	--	--	--	--	59	3	59	49
4-8 feet	--	--	--	--	--	63	3	63	33
8-9 feet	--	--	--	--	--	61	3	61	33
<b>DGS-30SC</b>									
1-4 feet	--	--	--	--	--	116	3	4,500	32
4-8 feet	--	--	--	--	--	60	3	710	32
8-12 feet	--	--	--	--	--	64	3	609	30
12-13.9 feet	--	--	--	--	--	63	3	63	30

**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Screening Value	1,2,3,7,8- Pentachlorodibenzo- p-dioxin (PeCDD)	2,3,4,6,7,8- Hexachlorodibenzofuran (HxCDF)	2,3,4,7,8- Pentachlorodibenzofuran (PeCDF)	2,3,7,8- Tetrachlorodibenzofuran (TCDF)	2,3,7,8- Tetrachlorodibenzo- p-dioxin (TCDD)	cPAH/BaPEq TEQ (EPA 1993) (U=1/2 max limit)	Total DDx (U=1/2 max limit)	Total PAH (U=1/2 max limit)	Total PCB Aroclors (U=1/2 max limit)
<b>DGS-37SC<sup>1</sup></b>									
1-4 feet	--	--	--	--	--	1,700	270	25,000	410
4-8 feet	--	--	--	--	--	3,000	230	43,000	160
8-12 feet	--	--	--	--	--	14,000	2,100	240,000	240
12-16 feet	--	--	--	--	--	22,000	16	230,000	180
16-19 feet	--	--	--	--	--	5,900	16	58,000	32
<b>GS-C2</b>									
0-2 feet	--	--	--	--	--	48,000	--	950,000	--
5-7 feet	--	--	--	--	--	13,000	--	170,000	--
<b>GS-C5</b>									
0-2 feet	--	--	--	--	--	150	--	1,700	--
5-7 feet	--	--	--	--	--	13	--	210	--
13-15 feet	--	--	--	--	--	0	--	6	--
<b>GS-D2</b>									
0-2 feet	--	--	--	--	--	39	--	472	--
5-7 feet	--	--	--	--	--	7	--	81	--
<b>GS-D4</b>									
0-2 feet	--	--	--	--	--	7	--	92	--
5-7 feet	--	--	--	--	--	3	--	42	--
<b>GS-D5</b>									
1.5-2 feet	--	--	--	--	--	864	--	21,300	--
<b>SC-S109</b>									
0-2 feet	0.00055	0.00061	0.00150	0.00350	0.00021	20,260	9	343,900	11
2-4 feet	0.00016	0.00008	0.00037	0.00059	0.00004	2,427	1	28,234	8
4-6 feet	0.00016	0.00013	0.00015	0.00041	0.00014	1,706	3	27,073	8
6-8 feet	0.00006	0.00011	0.00022	0.00063	0.00003	883	1	25,822	7
8-10 feet	0.00053	0.00240	0.00110	0.00032	0.00012	34,712	0	515,400	15
10-11.3 feet	0.00051	0.00130	0.00053	0.00140	0.00068	226,610	0	3,220,000	120
<b>SD072<sup>1</sup></b>									
0-3 feet	--	--	--	--	--	910	39	51,000	140
<b>WR-VC-56</b>									
0-8.7 feet	--	--	--	--	--	2,500	1,700	30,000	720

**Table 1**  
**Perimeter Core Subsurface Bulk Sediment Concentrations**

Notes:

 : exceeds applicable ROD Table 21 RAL or PTW-highly toxic thresholds

-- : no data available

PDI-xxx-A indicates samples measured in a DOC core.

PDI-xxx-B indicates samples measured in a capping demonstration core.

PDI-xxx-J indicates samples measured in an interim project area refinement core.

1. NW Natural acknowledges that the ROD Table 21 site-wide RALs are applicable to these nearshore cores; however, for the purposes of this Field Change Request identifying additional perimeter core locations in the navigation channel, the samples in these cores were screened against the ROD Table 21 navigation channel RALs.

BaPEq: benzo(a)pyrene equivalent

cm: centimeter

cPAH: carcinogenic PAH

DDx: the sum of dichlorodiphenyldichloroethane, dichlorodiphenyldichloroethylene, and dichlorodiphenyltrichloroethane

DOC: depth of contamination

EPA: U.S. Environmental Protection Agency

max: maximum

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

PDI: Pre-Design Investigation

ROD: Portland Harbor Record of Decision (2017)

PTW: principal threat waste

RAL: remedial action level

TEQ: toxic equivalence quotient

**Table 2**

**Additional Perimeter Interim Project Area Subsurface Sediment Core Sampling Locations**

<b>Location ID</b>	<b>Easting (X)</b>	<b>Northing (Y)</b>
PDI-146	7623274.17	706250.82
PDI-147	7623374.07	706316.87
PDI-148	7623407.33	706178.50
PDI-149	7623519.63	706288.71
PDI-150	7623678.31	706252.67
PDI-151	7623857.28	706273.33
PDI-152	7623925.22	706100.49
PDI-153	7623897.34	706006.74
PDI-154	7624037.95	705902.91
PDI-155	7624178.42	705820.40
PDI-156	7624309.00	705778.00
PDI-157	7625187.85	705189.60
PDI-158	7625217.74	705088.66
PDI-159	7625332.21	705015.29
PDI-160	7625443.27	704942.66

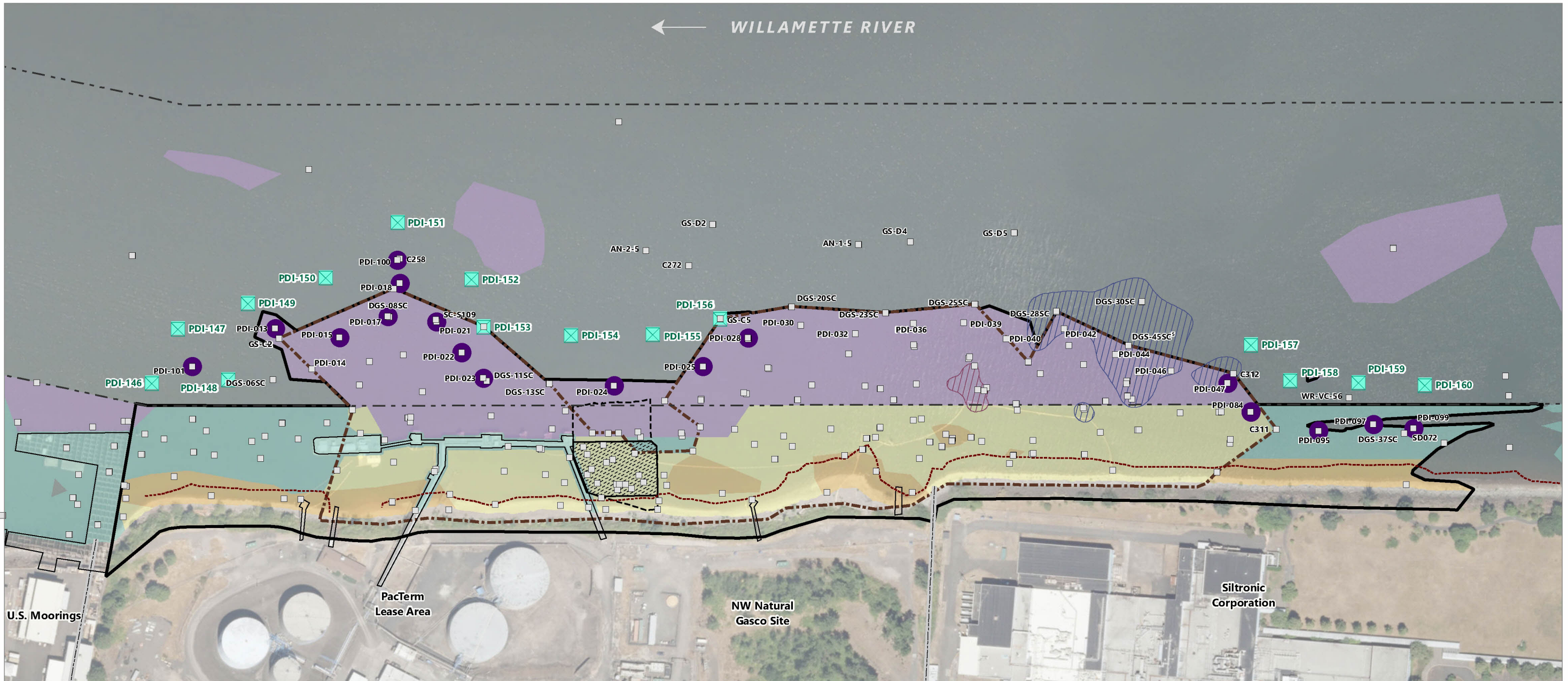
Notes:

Coordinates are in North American Datum of 1983 (HARN91) Oregon State Plane North, International Feet.

HARN91: High Accuracy Reference Network 91

# Figure

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**LEGEND:**

Navigation Channel	ROD-Identified SMAs (EPA 2017) Included in the Gasco Sediments Site Interim Project Area <sup>2</sup>	Existing Subsurface Sample Location
Structures	<b>ROD SMA Technology<sup>2</sup></b>	Proposed Additional Perimeter Subsurface Core
Property Line	Cap	Core Location Contains One or More Laterally Unbounded RAL Exceedances On Perimeter of Interim Project Area
Tar Body Removal Action Area (RAPP, Anchor 2005)	Dredge	
Tar Body Removal Action Pilot Cap	Dredge in Nav-FMD	
PTW-NAPL Boundary	Dredge with Cap	
Approximate Riprap Boundary <sup>1</sup>	2010 Transition Zone Water Vinyl Chloride Area 1 Boundary (Anchor QEA 2012) <sup>3</sup>	
	Area 2 – Detected CVOCs in TZW and One Subsurface Sediment Location <sup>4</sup>	

**NOTES:**

- Estimated from side scan sonar survey conducted by Blue Water Engineering April 2011.
- All depicted SMA technology and PTW contours taken from the Portland Harbor Superfund Site Record of Decision (2017) without application of the EPA Explanation of Significant Differences (ESD; EPA 2018), which is not yet finalized.
- Boundary taken from Draft Engineering Evaluation/Cost Analysis, Appendix A, Figure 4.2. Transition zone water screening level exceedances of cis-1,2-dichloroethene identified within this vinyl chloride boundary.
- Boundary taken from Gasco Sediments Site Statement of Work, Figure 1 (EPA 2009).
- Only visual observations of PTW-NAPL were performed at these core locations (i.e., no chemical results available).
- Bathymetry surveyed by DEA 2018. Topography surveyed by Geometrix 2011.
- Arrow indicates direction of flow of river.
- Horizontal datum is NAD83 (HARN 91) Oregon State Plane North, International Feet.
- Vertical datum is City of Portland (COP), Feet.
- Aerial imagery from City of Portland 2018.

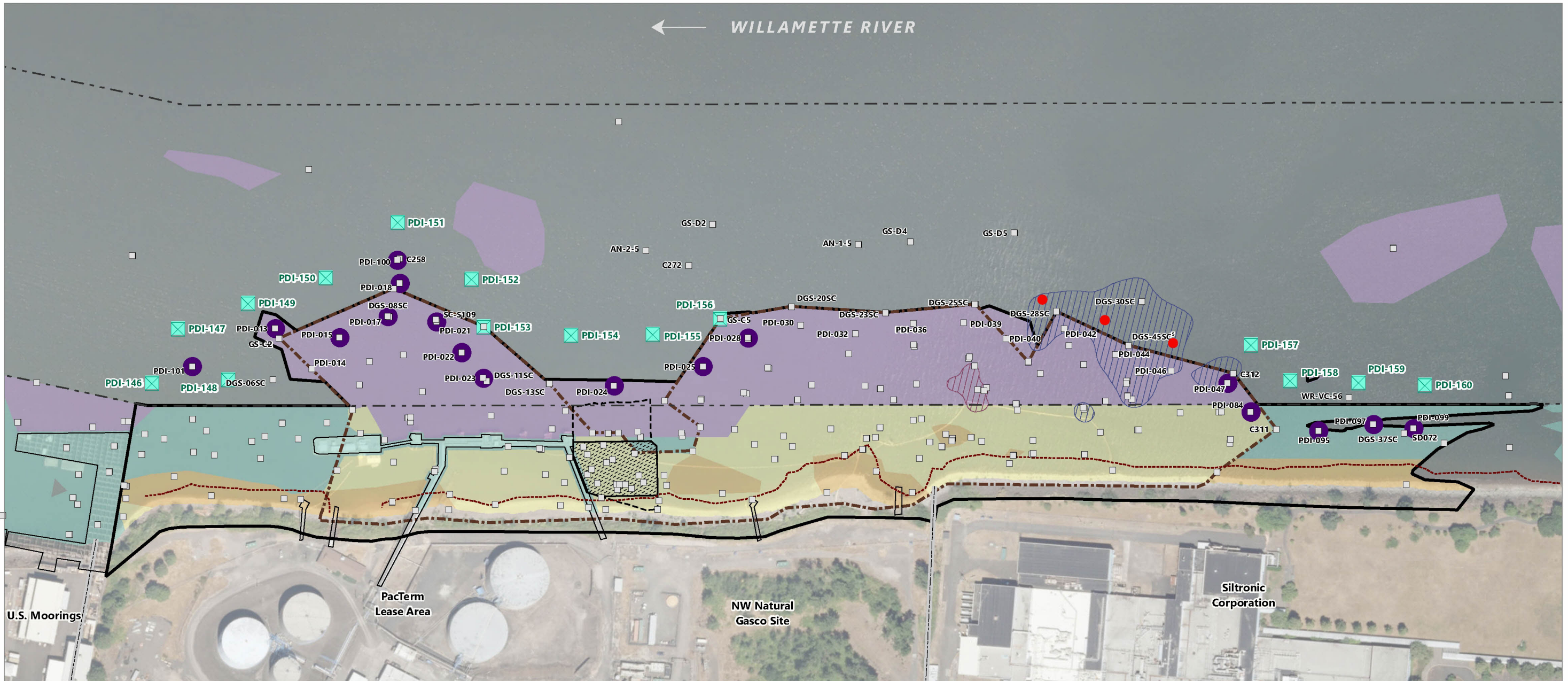
Publish Date: 2020/04/08, 2:06 PM | User: alesueur  
 Filepath: \\orcas\gis\Jobs\NW\_Natural\_Gas\_0029\Gasco\_Sediments\Maps\Reports\PDI2020SpringPlan\FSP\AQ\_Fig1\_AdditionalSampling.mxd



**Figure 1**  
**Proposed Additional Subsurface Sediment Core Locations to Laterally Bound ROD Table 21 Exceedances on Perimeter of Interim Project Area**

Field Change Request No. 10  
 Gasco Sediments Cleanup Action





**LEGEND:**

<ul style="list-style-type: none"> <li> Navigation Channel</li> <li> Structures</li> <li> Property Line</li> <li> Tar Body Removal Action Area (RAPP, Anchor 2005)</li> <li> Tar Body Removal Action Pilot Cap</li> <li> PTW-NAPL Boundary</li> <li> Approximate Riprap Boundary<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li> ROD-Identified SMAs (EPA 2017) Included in the Gasco Sediments Site Interim Project Area<sup>2</sup></li> <li><b>ROD SMA Technology<sup>2</sup></b></li> <li> Cap</li> <li> Dredge</li> <li> Dredge in Nav-FMD</li> <li> Dredge with Cap</li> <li> 2010 Transition Zone Water Vinyl Chloride Area 1 Boundary (Anchor QEA 2012)<sup>3</sup></li> <li> Area 2 - Detected CVOCs in TZW and One Subsurface Sediment Location<sup>4</sup></li> </ul>	<ul style="list-style-type: none"> <li> Existing Subsurface Sample Location</li> <li> Proposed Additional Perimeter Subsurface Core</li> <li> Core Location Contains One or More Laterally Unbounded RAL Exceedances On Perimeter of Interim Project Area</li> <li> EPA's Proposed Sample Locations</li> </ul>
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**NOTES:**

1. Estimated from side scan sonar survey conducted by Blue Water Engineering April 2011.
2. All depicted SMA technology and PTW contours taken from the Portland Harbor Superfund Site Record of Decision (2017) without application of the EPA Explanation of Significant Differences (ESD; EPA 2018), which is not yet finalized.
3. Boundary taken from Draft Engineering Evaluation/Cost Analysis, Appendix A, Figure 4.2. Transition zone water screening level exceedances of cis-1,2-dichloroethene identified within this vinyl chloride boundary.
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9. Vertical datum is City of Portland (COP), Feet.
10. Aerial imagery from City of Portland 2018.

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**Figure 1**  
**Proposed Additional Subsurface Sediment Core Locations to Laterally Bound ROD Table 21 Exceedances on Perimeter of Interim Project Area**

Field Change Request No. 10  
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