T-91 SUBMERGED LANDS AREA PRELIMINARY INVESTIGATION

SURFACE SEDIMENT CHARACTERIZATION RESULTS

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Acronyms

2LAET	second lowest apparent effects threshold
ARI	Analytical Resources, Inc.
COC	chain of custody
CSL	cleanup screening level
dw	dry weight
Ecology	Washington State Department of Ecology
EPA	US Environmental Protection Agency
HPAH	high-molecular-weight polycyclic aromatic hydrocarbon
ID	identification
HPAH	high-molecular-weight polycyclic aromatic hydrocarbon
LAET	lowest apparent effects threshold
LPAH	low-molecular-weight polycyclic aromatic hydrocarbon
MLLW	mean lower low water
NAD83	North American Datum of 1983
OC	organic carbon
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Port	Port of Seattle
PSEP	Puget Sound Estuary Program
RL	reporting limit
SAP	sampling and analysis plan
SCO	sediment cleanup objective
SIM	selected ion monitoring
SM	standard method
SMS	Washington State Sediment Management Standards
SVOC	semivolatile organic compound
T-91	Terminal 91
TOC	total organic carbon

1 Introduction

This surface sediment data report for the Port of Seattle's (Port's) Terminal 91 (T-91) is required under Section VII(B) Task 2 of Amendment 1 to Washington State Department of Ecology (Ecology) / Port Agreed Order No. DE8938. The data presented herein were collected following the T-91 sediment sampling and analysis plan (SAP) (Windward 2017).

Data management procedures are described in Appendix A. Data tables are provided in Appendix B. Field notes, sample photographs, sample collection forms, and chain of custody (COC) forms are provided in Appendix C. Laboratory reports and the data validation report are provided in Appendix D.

2 Methods

2.1 FIELD METHODS

Surface sediment grabs were collected from 28 sampling locations using a pneumatic power grab sampler from a sampling vessel, in accordance with the SAP (Windward 2017).

Sediment samples were evaluated using the following sediment acceptance criteria:

- Sediment did not extrude from the upper face of the sampler.
- Overlying water was present (indicating minimal leakage).
- The sediment surface was relatively flat (indicating minimal disturbance or winnowing).
- A penetration depth of at least 11 cm was achieved.

2.2 FIELD DEVIATIONS

No field deviations from the SAP (Windward 2017) occurred during sampling activities.

2.3 ANALYTICAL METHODS

The sediment samples were analyzed for Washington State Sediment Management Standards (SMS) chemicals, total organic carbon (TOC), total solids, and grain size, as shown in Table 1.

Table 1. Analytical methods

Parameter Group	Method	Laboratory
Total metals	EPA 6020A/7471B	ARI
SVOCs	EPA 8270D/8270D-SIM/8081B	ARI
PCB Aroclors	EPA 8082A	ARI
TOC	PSEP (1986)	ARI
Total solids	SM 2540-G	ARI
Grain size	PSEP (1986)	MTC

ARI – Analytical Resources, Inc.
EPA – US Environmental Protection Agency
MTC – Materials Testing and Consulting, Inc.
PCB – polychlorinated biphenyl
PSEP – Puget Sound Estuary Program
SIM – selected ion monitoring
SM – standard method
SVOC – semi-volatile organic compound
TOC – total organic carbon

3 Results

3.1 LOCATIONS

Sediment grabs were collected on November 1 and 2, 2017. Samples were collected from all 28 targeted sampling locations. One field duplicate was also collected from location T91-2017-SS-12. Acceptable samples were collected after one or two sampling attempts, except at locations where rocks or riprap slopes were encountered (i.e., T91-2017-SS-07, T91-2017-SS-09, T91-2017-SS-10, and T91-2017-SS-25).

The sampling locations—provided in Table 2 and on Map 1—are consistent with the target coordinates specified in the SAP (Windward 2017) for all locations except the six following locations that were relocated:

- T91-2017-SS-11 and T91-2017-SS-15: not accessible due to boats in the vicinity
- T91-2017-SS-02: moved 16 ft off target and sampled during the flood tide to avoid shallow water
- T91-2017-SS-09, T91-2017-SS-10, and T91-2017-SS-25: moved approximately 10 ft off target to avoid rocks

Table 2. Sampling coordinates

Sample ID	Easting (ft)[a]	Northing (ft)[a]	Latitude (°N)[b]	Longitude (°W)[b]	Distance to Target (ft)	Depth (ft MLLW)
T91-2017-SS-01	1258107	234795	47.63312	-122.384021	0.3	-18
T91-2017-SS-02	1257891	234588	47.632524	-122.38494	16.1	-13
T91-2017-SS-03	1257991	234372	47.631947	-122.384467	3.8	-21
T91-2017-SS-04	1257764	233850	47.63052	-122.385336	3.3	-2
T91-2017-SS-05	1258131	233775	47.630332	-122.38384	2	-14
T91-2017-SS-06	1258095	233072	47.628399	-122.383929	0.5	-38
T91-2017-SS-07	1257718	232828	47.627707	-122.38544	0.7	-23
T91-2017-SS-08	1258101	232706	47.627398	-122.383867	2.3	-35
T91-2017-SS-09	1258629	234241	47.631658	-122.381869	10	-29
T91-2017-SS-10	1258850	234222	47.631615	-122.380947	9.4	-38
T91-2017-SS-11	1258579	233945	47.63051	-122.382063	112.1	-41
T91-2017-SS-12	1258856	233824	47.630493	-122.380906	2.9	-33
T91-2017-SS-13	1258709	233548	47.629744	-122.381481	3.2	-41
T91-2017-SS-14	1258554	233416	47.629365	-122.382094	0.6	-42
T91-2017-SS-15	1258834	233131	47.628798	-122.380896	72.8	-38
T91-2017-SS-16	1258825	232596	47.627128	-122.38092	3.1	-9
T91-2017-SS-17	1259224	234682	47.632879	-122.379479	2.5	-5
T91-2017-SS-18	1259409	234503	47.632399	-122.378715	2.7	0

Sample ID	Easting (ft)[a]	Northing (ft)[a]	Latitude (°N)[b]	Longitude (°W)[b]	Distance to Target (ft)	Depth (ft MLLW)
T91-2017-SS-19	1259264	234418	47.632149	-122.379302	1.1	-36
T91-2017-SS-20	1259511	234110	47.631327	-122.378276	2.4	0
T91-2017-SS-21	1259250	234041	47.631114	-122.379328	1.4	-34
T91-2017-SS-22	1259528	233691	47.630178	-122.378177	2.6	1
T91-2017-SS-23	1259380	233498	47.629634	-122.378749	1.3	-10
T91-2017-SS-24	1259223	233230	47.628895	-122.379376	2.3	-37
T91-2017-SS-25	1259513	233084	47.628483	-122.378159	10.8	3
T91-2017-SS-26	1259385	232818	47.627771	-122.37868	0.8	-7
T91-2017-SS-27	1259455	232485	47.626867	-122.378364	1.5	-5
T91-2017-SS-28	1259205	232536	47.626988	-122.379385	0.7	-38

[a] NAD83 Washington State Plane North coordinates – US survey feet.
[b] NAD83 Geographic coordinates – decimal degrees.
ID – identification
MLLW – mean lower low water
NAD83 – North American Datum of 1983

3.2 CHEMISTRY RESULTS

Metals and organic chemicals (i.e., polycyclic aromatic hydrocarbons [PAHs], semivolatile organic compounds [SVOCs], and polychlorinated biphenyls [PCBs]) data are summarized in Tables 3 through 5 and on Maps 2 through 4. Conventionals data (i.e., total solids, TOC, and grain size) are presented in Table 7. Appendix B includes metals, organics, and conventionals results for all samples (Table B1), as well as tables comparing each sample to appropriate SMS criteria (Tables B2 through B4).

3.2.1 Metals

Metals data are summarized in Table 3. Metals results for each sample were compared to SMS criteria (i.e., sediment cleanup objectives [SCOs] and cleanup screening levels [CSLs]) on a dry weight basis (Appendix B, Table B2). Mercury was the only metal with SMS criteria exceedances, which occurred at four sampling locations in the submerged lands area between Pier 90 and Pier 91 (Map 2).

Table 3. Metals data summary

Chemical (mg/kg dw)	Detection Frequency		Detected Results			RL[a]		SMS Criteria	
	Ratio	%	Min.	Max.	Mean[b]	Min.	Max.	SCO	CSL
Arsenic	29/29	100	1.64 J	29.9 J	7.15	na	na	57	93
Cadmium	29/29	100	0.03 J	1.44	0.38	na	na	5.1	6.7
Chromium	29/29	100	11.6	43.3	25.6	na	na	260	270
Copper	29/29	100	5.45 J	174 J	43.9	na	na	390	390
Lead	29/29	100	3.20 J	101 J	37.1	na	na	450	530

Chemical (mg/kg dw)	Detection Frequency		Detected Results			RL[a]		SMS Criteria	
	Ratio	%	Min.	Max.	Mean[b]	Min.	Max.	SCO	CSL
Mercury	26/29	90	0.0214 J	2.89 J	0.351	0.0261	0.0304	0.41	0.59
Silver	29/29	100	0.040 J	1.08	0.34	na	na	6.1	6.1
Zinc	29/29	100	19.0	335 J	98.6	na	na	410	960

[a] RL range for non-detect samples.

[b] Reported mean concentration is the average of the detected concentrations only; RLs were not included in the calculation of the mean concentration.

CSL – cleanup screening level
dw – dry weight
J – estimated concentration
na – not applicable (detection frequency is 100%)
RL – reporting limit
SCO – sediment cleanup objective
SMS – Washington State Sediment Management Standards

3.2.2 Organic chemicals (PAHs, phthalates, other SVOCs, and PCBs)

Sediment concentrations of the organic chemicals (PAHs, phthalates, other SVOCs, and PCBs) are summarized in Tables 4 and 5. The SMS criteria for many of these chemicals are organic carbon (OC) normalized when the sediment TOC values are between 0.5 and 3.5%. Seventeen samples had TOC values between 0.5 and 3.5%; results for these samples were OC normalized and compared to OC-normalized SMS criteria (i.e., SCOs and CSLs) (Table 4). Eleven samples had TOC values less than 0.5%, and one sample had a TOC value greater than 3.5%. The results for these samples were compared to dry weight criteria values (i.e., lowest apparent effects threshold [LAET] and second lowest apparent effects threshold [2LAET]) (Table 5). Results for all samples are presented on a dry weight basis in Appendix B (Table B1).

Table 4. Organic chemicals data summary (samples with 0.5 to 3.5% TOC)

Chemical	Detection Frequency		Detected Concentration			RL[a]		SMS	
	Ratio	%	Min.	Max.	Mean[b]	Min.	Max.	SCO	CSL
PAHs (mg/kg OC)									
2-Methylnaphthalene	15/17	88	0.982 J	8.32	4.07	3.50	7.70	38	64
Acenaphthene	14/17	82	0.994 J	13.0	6.62	4.39	7.70	16	57
Acenaphthylene	16/17	94	2.30 J	34.6	13.7	3.50	3.50	66	66
Anthracene	17/17	100	5.10 J	1,010 J	105	na	na	220	1,200
Benzo(a)anthracene	17/17	100	11.2	1210	132	na	na	110	270
Benzo(a)pyrene	17/17	100	24.0 J	862 J	150	na	na	99	210
Benzo(g,h,i)perylene	17/17	100	16.0	314	63.3	na	na	31	78
Total benzofluoranthenes	17/17	100	56.3	1,800	313	na	na	230	450
Chrysene	16/17	94	24.7	1,570	221	1.06	1.06	110	460
Dibenzo(a,h)anthracene	17/17	100	5.20	178	29.2	na	na	12	33
Dibenzofuran	16/17	94	1.39	13.8	5.83	7.70	7.70	15	58
Fluoranthene	17/17	100	16.0	2,990	283	na	na	160	1,200
Fluorene	16/17	94	2.20	37.8	11.7	7.70	7.70	23	79
Indeno(1,2,3-cd)pyrene	16/17	94	15.0	344	65.4	1.12	1.12	34	88
Naphthalene	17/17	100	2.10 J	26.1	11.0	na	na	99	170
Phenanthrene	17/17	100	10.2	178	58.5	na	na	100	480
Pyrene	17/17	100	20.4	1270	258	na	na	1,000	1,400
Total HPAHs	17/17	100	180.0 J	10,500 J	1490	na	na	960	5,300
Total LPAHs	17/17	100	25.0 J	1,270 J	204	na	na	370	780
Phthalates (mg/kg OC)									
Bis(2-ethylhexyl)phthalate	15/17	88	5.82	350	58.9	9.93	19.0	47	78
Butyl benzyl phthalate	4/17	24	1.70	11.0 J	4.98	1.12	7.70	4.9	64
Diethyl phthalate	5/17	29	2.30 J	3.00	2.62	1.06	13.0	61	110
Dimethyl phthalate	0/17	0	nd	nd	nd	1.06	13.0	53	53
Di-n-butyl phthalate	4/17	24	0.51 J	10.0 J	3.3	1.06	7.70	220	1,700

Chemical	Detection Frequency		Detected Concentration			RL[a]		SMS	
	Ratio	%	Min.	Max.	Mean[b]	Min.	Max.	SCO	CSL
Di-n-octyl phthalate	3/17	18	1.18	34.0	12.3	1.12	7.70	58	4,500
Other SVOCs (mg/kg OC)									
1,2,4-Trichlorobenzene	0/17	0	nd	nd	nd	0.27	3.40	0.81	1.8
1,2-Dichlorobenzene	0/17	0	nd	nd	nd	1.06	13.0	2.3	2.3
1,4-Dichlorobenzene	9/17	53	0.940 J	3.91	2.66	1.12	13.0	3.1	9
2,4-Dimethylphenol[c]	11/17	65	4.9 J	56.6 J	14	23.7	124	29[c]	29[c]
2-Methylphenol[c]	3/17	18	18.6 J	60.9	32.8	19.0	99.5	63[c]	63[c]
4-Methylphenol[c]	9/17	53	17.1 J	190	50.9	19.0	99.5	670 [c]	670 [c]
Benzoic acid[c]	1/17	6	189 J	189 J	na	19.0	995	650 [c]	650 [c]
Benzyl alcohol[c]	0/17	0	nd	nd	nd	18.9	99.5	57 [c]	73 [c]
Hexachlorobenzene	0/17	0	nd	nd	nd	0.027	0.092	0.38	2.3
Hexachlorobutadiene	0/17	0	nd	nd	nd	1.06	13.0	3.9	6.2
n-Nitrosodiphenylamine	0/17	0	nd	nd	nd	1.06	13.0	11	11
Pentachlorophenol[c]	1/17	6	94.7 J	94.7 J	na	95.1	498	360 [c]	690 [c]
Phenol[c]	15/17	88	11.0 J	163 J	52.0	56.9	58.8	420 [c]	1,200 [c]
PCBs (mg/kg OC)									
Total PCB Aroclors	17/17	100	2.10 J	33.7 J	16	na	na	12	65

[a] RL range for non-detect samples.

[b] Reported mean concentration is the average of the detected concentrations only; RLs were not included in the calculation of the mean concentration.

[c] SMS criteria are in units of µg/kg dw.

CSL – cleanup screening level
dw – dry weight
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
J – estimated concentration
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
na – not applicable
nd – not detected
OC – organic carbon
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
RL – reporting limit
SCO – sediment cleanup objective
SMS – Washington State Sediment Management Standards
SVOC – semivolatile organic compound
TOC – total organic carbon

Table 5. Organic chemicals data summary (for samples with < 0.5 or > 3.5% TOC)

Chemical	Detection Frequency		Detected Results			RL[a]		SMS	
	Ratio	%	Min.	Max.	Mean[b]	Min.	Max.	LAET	2LAET
PAHs (µg/kg dw)									
2-Methylnaphthalene	2/12	17	19.1 J	60.8	40.0	18.8	19.9	670	670
Acenaphthene	4/12	33	9.0 J	76.3	53	18.8	19.9	500	500
Acenaphthylene	7/12	58	5.9 J	269 J	48	7.5	19.9	1,300	1,300
Anthracene	9/12	75	6.7 J	680 J	120	18.8	19.9	960	960
Benzo(a)anthracene	11/12	92	6.1 J	881	180	19.1	19.1	1,300	1,600
Benzo(a)pyrene	10/12	83	13.6 J	2900 J	450	18.8	19.1	1,600	1,600
Benzo(g,h,i)perylene	10/12	83	12.7 J	1330	233	18.8	19.1	670	720
Total benzofluoranthenes	12/12	100	14.3 J	5500	751	na	na	3,200	3,600
Chrysene	12/12	100	9.2 J	1970	340	na	na	1,400	2,800
Dibenzo(a,h)anthracene	8/12	67	10.4 J	518	110	18.8	19.9	230	230
Dibenzofuran	6/12	50	5.8 J	93.1	30	18.8	19.9	540	540
Fluoranthene	12/12	100	8.4 J	1970 J	330	na	na	1,700	2,500
Fluorene	7/12	58	9.3 J	141	44	18.8	19.9	540	540
Indeno(1,2,3-cd)pyrene	10/12	83	12.0 J	1170	210	18.8	19.1	600	690
Naphthalene	7/12	58	10.0 J	139	34.2	18.8	19.9	2,100	2,100
Phenanthrene	10/12	83	8.1 J	888	270	18.8	19.1	1,500	1,500
Pyrene	12/12	100	7.0 J	2880	490	na	na	2,600	3,300
Total HPAHs	12/12	100	38.9 J	17840 J	2890	na	na	12,000	17,000
Total LPAHs	10/12	83	14.8 J	1930 J	480	18.8	19.1	5,200	5,200
Phthalates (µg/kg dw)									
Bis(2-ethylhexyl)phthalate	3/12	25	35.9 J	222	110	46.9	49.8	1,300	1,900
Butyl benzyl phthalate	2/12	17	10.8 J	12.0 J	11.4	18.8	58.0	63	900
Diethyl phthalate	2/12	17	20.1	21.3	20.7	18.8	58.0	200	1,200
Dimethyl phthalate	1/12	8	44.5 J	44.5 J	na	18.8	19.9	71	160

Chemical	Detection Frequency		Detected Results			RL[a]		SMS	
	Ratio	%	Min.	Max.	Mean[b]	Min.	Max.	LAET	2LAET
Di-n-butyl phthalate	1/12	8	6.2 J	6.2 J	na	18.8	58.0	1,400	1,400
Di-n-octyl phthalate	0/12	0	nd	nd	nd	18.8	58.0	6,200	6,200
Other SVOCs (µg/kg dw)									
1,2,4-Trichlorobenzene	0/12	0	nd	nd	nd	4.7	14.5	31	51
1,2-Dichlorobenzene	0/12	0	nd	nd	nd	18.8	58.0	35	50
1,4-Dichlorobenzene	1/12	8	61.0 J	61.0 J	na	18.8	19.9	110	110
2,4-Dimethylphenol	1/12	8	11.9 J	11.9 J	na	23.5	24.9	29	29
2-Methylphenol	1/12	8	19.1 J	19.1 J	na	18.8	58.0	63	63
4-Methylphenol	1/12	8	19.1 J	19.1 J	na	18.8	58.0	670	670
Benzoic acid	1/12	8	191 J	191 J	na	188	580	650	650
Benzyl alcohol	0/12	0	nd	nd	nd	18.8	58.0	57	73
Hexachlorobenzene	1/12	8	5.74	5.74	na	0.47	0.50	22	70
Hexachlorobutadiene	0/12	0	nd	nd	nd	18.8	58.0	11	120
n-Nitrosodiphenylamine	0/12	0	nd	nd	nd	18.8	58.0	28	40
Pentachlorophenol	1/12	8	95.4 J	95.4 J	na	93.9	290	360	690
Phenol	2/12	17	8.9 J	19.1 J	14	18.8	58.0	420	1,200
PCBs (µg/kg dw)									
Total PCB Aroclors	12/12	100	1.6 J	1031 J	93	na	na	130	1,000

[a] RL range for non-detect samples.

[b] Reported mean concentration is the average of the detected concentrations only; RLs were not included in the calculation of the mean concentration.

2LAET – second lowest apparent effects threshold
dw – dry weight
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
J – estimated concentration
LAET – lowest apparent effects threshold
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
na – not applicable
nd – not detected
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
RL – reporting limit
SMS – Washington State Sediment Management Standards
SVOC – semivolatile organic compound
TOC – total organic carbon

SMS criteria exceedances are summarized in Table 6. The locations with exceedances for PAHs and SVOCs are shown on Map 3. Locations with exceedances for total PCBs are shown on Map 4. The results for all the individual samples are presented in Appendix B (Table B3 and B4).

Table 6. Summary of SMS exceedances for organic chemicals

Chemical	SCO Exceedances	CSL Exceedances
PAHs		
Anthracene	1	0
Benzo(a)anthracene	2	1
Benzo(a)pyrene	9	3
Benzo(g,h,i)perylene	11	3
Total benzofluoranthenes	9	2
Chrysene	10	1
Dibenzo(a,h)anthracene	12	3
Fluoranthene	6	1
Fluorene	1	0
Indeno(1,2,3-cd)pyrene	10	3
Phenanthrene	3	0
Pyrene	2	0
Total HPAHs	7	2
Total LPAHs	0	1
Phthalates		
Bis(2-ethylhexyl)phthalate	0	2
Butyl benzyl phthalate	1	0
Other SVOCs		
1,4-Dichlorobenzene	4	0
2,4-Dimethylphenol	0	1
PCBs		
Total PCB Aroclors	9	1

CSL – cleanup screening level
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
SCO – sediment cleanup objective
SMS – Washington State Sediment Management Standards
SVOC – semi-volatile organic compounds

3.2.3 Conventionals

Total grain size fractions, TOC, and total solids results are presented in Table 7. In general, samples with lower TOC were predominantly composed of sand and contained lower percentages of total fines (i.e., silt and clay), while samples with higher TOC contained more fines and less sand.

Table 7. Conventionals data (% dw)

Sample Name	Sediment Grain size fractions					TOC	Total Solids
	Total Gravel	Total Sand	Total Silt	Total Clay	Total Fines[a]		
T91-2017-SS-01	18.8	74.6	5.3	1.3	6.6	0.35 J	80.50
T91-2017-SS-02	0.1	97.8	2.1 U	2.1 U	2.1 U	0.09	78.90
T91-2017-SS-03	0.1	65.8	29.4	4.5	33.9	0.74	61.86
T91-2017-SS-04	0.1 U	98.8	1.1U	1.1 U	1.1 U	0.06	78.17
T91-2017-SS-05	0.9	33.0	53	13.3	66	1.12 J	56.40
T91-2017-SS-06	1.6	73.5	18.1	6.8	24.9	0.53 J	71.73
T91-2017-SS-07	0.1	91.6	6.3	1.9	8.2	0.28	77.55
T91-2017-SS-08	1.1	95.7	3.1U	3.1U	3.1U	0.11 J	78.88
T91-2017-SS-09	22.9	54.3	16.7	6.1	22.8	1.69	74.49
T91-2017-SS-10	38.6	40.3	14.0	7.0	21.0	1.20 J	67.66
T91-2017-SS-11	8.1	38.8	36.0	17.1	53.1	3.97	55.56
T91-2017-SS-12	2.0	40.9	39.6	17.4	57.0	1.87 J	52.31
T91-2017-SS-29[b]	4.2	38.2	39.9	17.7	57.6	1.05 J	53.56
T91-2017-SS-13	0.2	54.4	31.5	13.9	45.4	1.34	59.45
T91-2017-SS-14	9.1	40.4	36.0	14.5	50.5	1.29 J	51.97
T91-2017-SS-15	21.5	59.2	11.8	7.7	19.5	1.46	71.43
T91-2017-SS-16	35.1	56.1	4.8	3.9	8.7	0.54 J	76.96
T91-2017-SS-17	1.9	55.1	33.9	9.2	43.1	0.74 J	33.76
T91-2017-SS-18	15.3	76.4	6.3	2.0	8.3	0.77 J	68.25
T91-2017-SS-19	3.6	63.2	27.1	6.2	33.3	1.68 J	49.47
T91-2017-SS-20	2.9	94.3	2.8U	2.8U	2.8U	0.24 J	76.51
T91-2017-SS-21	2.0	67.0	21.6	9.6	31.2	0.88 J	64.96
T91-2017-SS-22	9.3	89.3	1.3U	1.3U	1.3U	0.10 J	78.28
T91-2017-SS-23	13.9	77.5	6.4	2.2	8.6	0.31 J	75.14
T91-2017-SS-24	1.0	59.7	27.2	12.1	39.3	1.06 J	60.83
T91-2017-SS-25	19.5	76.9	3.7U	3.7U	3.7U	0.18 J	81.78
T91-2017-SS-26	14.1	80.4	3.1	2.3	5.4	0.32 J	76.93
T91-2017-SS-27	2.0	95.5	2.5U	2.5U	3.7U	0.12 J	77.42
T91-2017-SS-28	29.5	48.3	15.3	6.9	22.2	1.45	66.06

Note: Total solids data are reported on a wet weight basis. All other data are reported on a dry weight basis.

[a] Total fines is the sum of the total silt and total clay fractions.

[b] Field duplicate of sample T91-2017-SS-12.

J – estimated concentration

TOC – total organic carbon

U – not detected at given concentration

4 Data Quality Review

Independent data validation was performed on all results by Ecochem. A summary-level validation review was conducted. PCB Aroclor data reporting limits (RLs) were elevated based on non-target background interferences. All data were determined to be acceptable for use as qualified. No data were rejected.

The data validation report, with detailed information regarding every qualified sample, is presented in Appendix B. The qualifiers reported in Table 3 are those assigned in the validation report.

5 References

PSEP. 1986. Recommended protocols for measuring conventional sediment variables in Puget Sound. Prepared for the Puget Sound Estuary Program, US Environmental Protection Agency, Region 10. Tetra Tech, Seattle, WA.

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