

# APPENDIX B. DETAILED DATA QUALITY REVIEW RESULTS

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**Table B-1. Results of the detailed data quality review for Task 2**

Study	Sampling date(s)	Media	Number of samples excluding field duplicates	Number of field duplicates	Sample collection method(s) and depth	Analyte group and analytical method	Analytical laboratory	Data validator	Data validation level <sup>a</sup>	Significant analytical issues	Reference
Boeing Development Center South Storm Drain Outlet 2010	October 5, 2010	surface sediment	3	1	Disposable plastic spoon (0-2 in)	PCBs (Aroclors): EPA 8082 TOC: EPA 9060M Total solids: EPA 160.3	ARI	CALIBRE Systems	EPA Stage 2A equivalent	none	CALIBRE. 2011. 2010 Annual sampling report, south storm drain system, Boeing Developmental Center. CALIBRE Systems, Seattle, WA.
Boeing Development Center South Storm Drain Outlet 2011	November 4, 2011	surface sediment	3	1	Disposable plastic spoon (0-2 in)	PCBs (Aroclors): EPA 8082 TOC: Plumb (1981) Total solids: EPA 160.3	ARI	CALIBRE Systems	EPA Stage 2A equivalent	none	CALIBRE. 2012. 2011 Annual sampling report, south storm drain system, Boeing Developmental Center. CALIBRE Systems, Seattle, WA.
Boeing Development Center South Storm Drain Outlet 2012	August 28, 2012	surface sediment	3	1	Disposable plastic spoon (0-2 in)	PCBs (Aroclors): EPA 8082A TOC: SM 5310-B Total solids: SM 2540-G	Eurofins Lancaster Laboratories	CALIBRE Systems	EPA Stage 2A equivalent	none	CALIBRE. 2013. 2012 Annual sampling report, south storm drain system, Boeing Developmental Center. CALIBRE Systems, Seattle, WA.
Boeing Development Center South Storm Drain Outlet 2013	September 16, 2013	surface sediment	3	1	Disposable plastic spoon (0-2 in)	PCBs (Aroclors): EPA 8082A TOC: SM 5310-B Total solids: SM 2540-G	Eurofins Lancaster Laboratories	CALIBRE Systems	EPA Stage 2A equivalent	none	CALIBRE. 2014. 2013 Annual sampling report, south storm drain system, Boeing Developmental Center. CALIBRE Systems, Seattle, WA.
Boeing Development Center South Storm Drain Outlet 2014	September 9, 2014	surface sediment	3	1	Disposable plastic spoon (0-2 in)	PCBs (Aroclors): EPA 8082A TOC: SM 5310-B Total solids: SM 2540-G	Eurofins Lancaster Laboratories	CALIBRE Systems	EPA Stage 2A equivalent	none	CALIBRE. 2015. 2014 Annual sampling report, south storm drain system, Boeing Developmental Center. CALIBRE Systems, Seattle, WA.
Boeing Development Center South Storm Drain Outlet 2015	September 10, 2015	surface sediment	3	1	Disposable plastic spoon (0-2 in)	PCBs (Aroclors): EPA 8082A Total solids: SM 2540-G	Eurofins Lancaster Laboratories, ARI (TOC only)	CALIBRE Systems	EPA Stage 2A equivalent	none	CALIBRE. 2016. 2015 Annual sampling report, south storm drain system, Boeing Developmental Center. CALIBRE Systems, Seattle, WA.
Boeing Plant 2 Additional Duwamish Sediment Other Area sampling	April 2015 - March 2017	surface sediment	97	0	0.2 m <sup>2</sup> powergrab (0 to up to 17 cm)	Grain size (subset): PSEP-GS PAHs (subset): EPA 8270D, EPA 8270D-SIM PCBs (Aroclors) (subset): EPA 8082, EPA 8082A Phthalates (subset), other SVOCs (subset): EPA 8270D, EPA 8270D-SIM TOC (subset): PLUMB (1981), PSEP TOC Total solids: SM 2540-G	ARI, Materials Testing & Consulting, Inc (grain size only)	Sayler Data Solutions, Inc.	EPA Stage 2B	none	Amec Foster Wheeler, DOF. 2017. Duwamish Sediment Other Area and Southwest Bank Corrective Measure and Habitat Project. Additional Duwamish sediment other area backfill sampling data report. Amec Foster Wheeler Environment & Infrastructure, Inc., and Dalton, Olmsted & Fuglevand, Inc.
Boeing Plant 2 Perimeter monitoring - End of Season 2013 (Event 2)	March 2013	surface sediment	43	4	Stainless steel powered 0.2 m <sup>2</sup> grab sampler (0-10 cm); each sample a composite of three grabs	Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: EPA 2540-B	ARI	Sayler Data Solutions, Inc.	EPA Stage 2B	none	AMEC. 2013. 2012-2013 Construction season completion report. AMEC Environment & Infrastructure, Inc, Lynwood, WA.
Boeing Plant 2 Perimeter monitoring - End of Season 2014 (Event 4)	March 2014	surface sediment	38	4	Stainless steel powered 0.2 m <sup>2</sup> grab sampler (0-10 cm); each sample a composite of three grabs	Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: EPA 2540-G	ARI	Sayler Data Solutions, Inc.	EPA Stage 2B	none	Dalton Olmsted & Fuglevand. 2014. Dredging construction season 2 (January to March 2014) completion report. Dalton, Olmsted & Fuglevand, Inc., AMEC, and Floyd Snider, Inc. , Seattle, WA.
Boeing Plant 2 Perimeter monitoring - End of Season 2015 (Event 7)	February-March 2015	surface sediment	56	6	Stainless steel powered 0.2 m <sup>2</sup> grab sampler (0-10 cm); each sample a composite of three grabs	Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: EPA 2540-G	ARI	Sayler Data Solutions, Inc.	EPA Stage 2B	none	AMEC Foster Wheeler. 2016. Corrective measure implementation report. AMEC Foster Wheeler Environment & Infrastructure, Inc., Dalton Olmsted & Fuglevand, Inc., and Floyd Snider, Inc, Seattle, WA.
Boeing Plant 2 Perimeter monitoring - Pre-dredge 2012 (Event 1)	December 2012	surface sediment	46	5	Stainless steel powered 0.2 m <sup>2</sup> grab sampler, except for 3 locations sampled using a hand core (0-10 cm); each sample a composite of three grabs	Metals: EPA 6010C, 200.8, 7471A PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: EPA 2540-B	ARI	Sayler Data Solutions, Inc.	EPA Stage 2B	none	AMEC. 2013. 2012-2013 Construction season completion report. AMEC Environment & Infrastructure, Inc, Lynwood, WA.
Boeing Plant 2 Perimeter monitoring - Pre-dredge 2013 (Event 3)	December 2013	surface sediment	38	4	Stainless steel powered 0.2 m <sup>2</sup> grab sampler (0-10 cm); each sample a composite of three grabs	Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: EPA 2540-G	ARI	Sayler Data Solutions, Inc.	EPA Stage 2B	none	Dalton Olmsted & Fuglevand. 2014. Dredging construction season 2 (January to March 2014) completion report. Dalton, Olmsted & Fuglevand, Inc., AMEC, and Floyd Snider, Inc. , Seattle, WA.
Boeing Plant 2 Perimeter monitoring - Pre-dredge 2014 (Event 6)	September 2014	surface sediment	56	6	Stainless steel powered 0.2 m <sup>2</sup> grab sampler (0-10 cm); each sample a composite of three grabs	Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: EPA 2540-G	ARI	Sayler Data Solutions, Inc.	EPA Stage 2B	none	AMEC Foster Wheeler. 2016. Corrective measure implementation report. AMEC Foster Wheeler Environment & Infrastructure, Inc., Dalton Olmsted & Fuglevand, Inc., and Floyd Snider, Inc, Seattle, WA.
Boeing Plant 2 Perimeter monitoring - Pre-SW Bank Excavation 2014 (Event 5)	July 2014	surface sediment	18	2	Stainless steel powered 0.2 m <sup>2</sup> grab sampler (0-10 cm); each sample a composite of three grabs	Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: EPA 2540-G	ARI	Sayler Data Solutions, Inc.	EPA Stage 2B	none	AMEC Foster Wheeler. 2016. Corrective measure implementation report. AMEC Foster Wheeler Environment & Infrastructure, Inc., Dalton Olmsted & Fuglevand, Inc., and Floyd Snider, Inc, Seattle, WA.

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Study	Sampling date(s)	Media	Number of samples excluding field duplicates	Number of field duplicates	Sample collection method(s) and depth	Analyte group and analytical method	Analytical laboratory	Data validator	Data validation level <sup>a</sup>	Significant analytical issues	Reference
Boeing Plant 2 Post-construction surface sed monitoring Year 0	February-March 2015	surface sediment	36	4	Stainless steel powered 0.2 m <sup>2</sup> grab sampler (0-10 cm); each sample a composite of three grabs	Dioxins/furans (subset): EPA 1613B Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A PAHs, phthalates, other SVOCs: EPA 8270D, 8270D-SIM Grain size (subset): PSEP (1986) TOC: Plumb (1981) Total solids: EPA 2540-G	ARI, Materials Testing & Consulting, Inc (grain size only)	Sayler Data Solutions, Inc.	EPA Stage 2B; EPA Stage 4 (dioxins/furans only)	none	AMEC Foster Wheeler. 2016. Corrective measure implementation report. AMEC Foster Wheeler Environment & Infrastructure, Inc., Dalton Olmsted & Fugelvand, Inc., and Floyd Snider, Inc, Seattle, WA.
Boeing Plant 2 Post-construction surface sed monitoring Year 1	March 2016	surface sediment	36	4	Stainless steel powered 0.2 m <sup>2</sup> grab sampler or hand collected with stainless steel spoon (0-10 cm)	Dioxins/furans (subset): EPA 1613 Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A PAHs, phthalates, other SVOCs: EPA 8270D, 8270D-SIM Grain size (subset): PSEP (1986) TOC: Plumb (1981) Total solids: EPA 2540-G	ARI, Materials Testing & Consulting, Inc (grain size only)	Sayler Data Solutions, Inc.	EPA Stage 2B; EPA Stage 4 (dioxins/furans only)	none	Amec Foster Wheeler. 2016. Post-construction surface sediment monitoring report--year 1. Amec Foster Wheeler Environment & Infrastructure, Inc., Seattle, WA.
Duwamish Diagonal 2010 monitoring	March 2010	surface sediment	23	3	0.1 m <sup>2</sup> van Veen grab sampler (0-10 cm)	Metals: EPA 6010C, 7471B PCBs (Aroclors): EPA 8082A Pesticides: EPA 8081B PAHs, phthalates, other SVOCs: EPA 8270D Grain size: ASTM D422 TOC: EPA 9060 Total solids: SM 2540-G	KCEL	King County	EPA Stage 2A equivalent	none	King County. 2015. Duwamish/Diagonal sediment remediation project, final 2010 monitoring report. Water and Land Resources Division, King County Department of Natural Resources and Parks, Seattle, WA.
Duwamish Diagonal 2011 monitoring	March 2011	surface sediment	23	3	0.1 m <sup>2</sup> van Veen grab sampler (0-6, 0-9, or 0-10 cm)	Metals: EPA 6010C, 7471B PCBs (Aroclors): EPA 8082A Pesticides: EPA 8081B PAHs, phthalates, other SVOCs: EPA 8270D Grain size: ASTM D422 TOC: EPA 9060 Total solids: SM 2540-G	KCEL	King County	EPA Stage 2A equivalent	none	King County. 2016. Duwamish Diagonal sediment remediation project: 2011 and 2012 monitoring report. Water and Land Resources Division, King County Department of Natural Resources and Parks, Seattle, WA.
Duwamish Diagonal 2012 monitoring	March-April 2012	surface sediment	22	3	0.1 m <sup>2</sup> van Veen grab sampler (0-6, 0-7, 0-8, or 0-10 cm)	Metals: EPA 6010C, 7471B PCBs (Aroclors): EPA 8082A Pesticides: EPA 8081B PAHs, phthalates, other SVOCs: EPA 8270D Grain size: ASTM D422 TOC: EPA 9060 Total solids: SM 2540-G	KCEL	King County	EPA Stage 2A equivalent	none	King County. 2016. Duwamish Diagonal sediment remediation project: 2011 and 2012 monitoring report. Water and Land Resources Division, King County Department of Natural Resources and Parks, Seattle, WA.
Duwamish Waterway Dredged Material Characterization	November 8-12, 2017	subsurface sediment	16	0	Vibracorer (16 composites of 2+ samples ranging in depth from 0 -3.7 ft to 0 -6.7 ft)	Ammonia as nitrogen (subset): EPA 350.1M Dioxins/furans (subset): EPA 1613B Grain size (subset): PSEP-GS Metals (subset): EPA 6020A, EPA 7471B PAHs (subset): EPA 8270D PBDEs (subset): EPA 1614 PCBs (Aroclors) (subset): EPA 8082A Pesticides (subset): EPA 8081B Phthalates, other SVOCs (subset): EPA 8270D Sulfide (subset): PSEP-Sulfides TOC (subset): PSEP-TOC Total solids (subset): PSEP-TS Total volatile solids (subset): EPA 160.4M	ALS	EcoChem	EPA Stage 2B; EPA Stage 4 (10% of dioxin/furan data only)	Three PBDE-010 results were rejected due to low LCS recovery	USACE. 2018. Memorandum for record. Determination regarding the suitability of maintenance dredged material from the Duwamish River navigation channel evaluated under Section 404 of the Clean Water Act for unconfined open-water disposal at the Elliott Bay nondispersive site. US Army Corps of Engineers.
Former Rhone-Poulenc Shoreline Investigation	December 22 and 23, 2011	porewater	7	1	PushPoint sampler	Metals: EPA 200.8, EPA 6010B, EPA 7470A PAHs, other SVOC: EPA 8260C pH: EPA 150.1 VOCs: EPA 8260C	ARI	AMEC	EPA Stage 2B equivalent	none	AMEC. 2012. Shoreline soil and groundwater characterization data report. Former Rhone-Poulenc site. AMEC Environment & Infrastructure, Inc., Seattle, WA.
Former Rhone-Poulenc Sediment Characterization	October 2011 and February 2012	surface sediment	24	3	Powergrab (0-10 cm)	Grain size: PSEP-GS Metals: EPA 200.8, EPA 6010B, EPA 7471A Other SVOCs: EPA 8081B, EPA 8270D, EPA 8270D-SIM PAHs: EPA 8270D, EPA 8270D-SIM (subset) PCBs (Aroclors): EPA 8082 Pesticides: EPA 8081B pH (subset): EPA 9045 Phthalates: EPA 8270D, EPA 8270D-SIM (subset) TOC: PLUMB (1981) Total solids: EPA 160.3	ARI	AMEC	EPA Stage 2B equivalent	none	AMEC. 2012. Sediment characterization data report. Former Rhone-Poulenc site. AMEC Environment & Infrastructure, Inc., Seattle, WA.

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Former Rhone-Poulenc Sediment Characterization	October 2011 and February 2012	subsurface sediment	82	9	Impact core (up to 13 ft deep)	Grain size (subset): PSEP-GS Metals (subset): EPA 200.8, EPA 6010B, EPA 7471A Other SVOCs (subset): EPA 8081B, EPA 8270D, EPA 8270D-SIM PAHs (subset): EPA 8270D, EPA 8270D-SIM PCBs (Aroclors) (subset): EPA 8082 Pesticides (subset): EPA 8081B Phthalates (subset): EPA 8270D, EPA 8270D-SIM TOC (subset): PLUMB (1981) Total solids (subset): EPA 160.3	ARI	AMEC	EPA Stage 2B equivalent	none	AMEC. 2012. Sediment characterization data report. Former Rhone-Poulenc site. AMEC Environment & Infrastructure, Inc., Seattle, WA.
Isaacson-Thompson RI sediment	February 2012	surface sediment	15	2	0.2 m <sup>2</sup> stainless-steel van Veen grab sampler (0-10 cm)	Dioxins/furans (subset): EPA 1613B Metals (subset): EPA 200.8 (As only), 6010B, 7471A PCBs (Aroclors): EPA 8082 PAHs, phthalates, other SVOCs: EPA 8270D, 8270D-SIM TOC: Plumb (1981) Total solids: EPA 160.3	ARI	Landau	EPA Stage 2B equivalent	none	Landau. 2014. Final remedial investigation report, Boeing-Isaacson Site. Landau Associates and AMEC Environment & Infrastructure, Inc., Edmonds, WA.
Isaacson-Thompson RI sediment	January-February 2012	subsurface sediment	53	7	Impact corer (depth varied from 2-10 ft to 3-11 ft)	Dioxins/furans (subset): EPA 1613B Metals (subset): EPA 200.8, 6010B, 7471A PCBs (Aroclors): EPA 8082 PAHs, phthalates, other SVOCs (subset): EPA 8270D, 8270D-SIM TOC: Plumb (1981) Total solids: EPA 160.3	ARI	Landau	EPA Stage 2B equivalent	none	Landau. 2014. Final remedial investigation report, Boeing-Isaacson Site. Landau Associates and AMEC Environment & Infrastructure, Inc., Edmonds, WA.
Isaacson-Thompson RI seep	March-September 2012	seep water	11	0	Grab sampler	Metals (subset): EPA 200.8, 1631E, 7196A PCBs (Aroclors): EPA 8082 PAHs, phthalates, other SVOCs (subset): EPA 8270D, 8270D-SIM VOCs: EPA 8260C Volatile and semi-volatile hydrocarbons: NWTPH-Dx-M, NWTPH-Gx Total dissolved solids: EPA 160.1 Chloride, nitrate, sulfate: EPA 300	ARI	Landau	EPA Stage 2B equivalent	none	Landau. 2014. Final remedial investigation report, Boeing-Isaacson Site. Landau Associates and AMEC Environment & Infrastructure, Inc., Edmonds, WA.
Jorgensen Backfill samples - Post-DSOA Dredge	March 2015	surface sediment	7	0	Stainless steel powered 0.2 m <sup>2</sup> grab sampler (0-10 cm), each sample is a composite of 3 grabs	Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: EPA 2540-G	ARI	Sayler Data Solutions, Inc.	EPA Stage 2B	none	AMEC Foster Wheeler. 2016. Corrective measure implementation report. AMEC Foster Wheeler Environment & Infrastructure, Inc., Dalton Olmsted & Fuglevand, Inc., and Floyd Snider, Inc, Seattle, WA.
Jorgensen Backfill samples - Pre-DSOA Dredge	November 24, 2014	surface sediment	6	0	Stainless steel powered 0.2 m <sup>2</sup> grab sampler (0-10 cm), each sample is a composite of 3 grabs	Metals: EPA 200.8, 6010C, 7471A PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: EPA 2540-G	ARI	Sayler Data Solutions, Inc.	EPA Stage 2B	none	AMEC Foster Wheeler. 2016. Corrective measure implementation report. AMEC Foster Wheeler Environment & Infrastructure, Inc., Dalton Olmsted & Fuglevand, Inc., and Floyd Snider, Inc, Seattle, WA.
King County CSO 2011 Sediment Characterization	August 29, 2011	surface sediment	6	0	0.1 m <sup>2</sup> van Veen grab sampler (0-10 cm)	Metals: EPA 6010C, 7471B PCBs (Aroclors): EPA 8082A SVOCs: EPA 8270D Grain size: ASTM D422 TOC: EPA 9060 Total solids: SM 2540-G	KCEL	King County	EPA Stage 2A equivalent	none	King County. 2012. CSO sediment quality characterization 2011 sediment sampling event. Draft report. King County Department of Natural Resources and Parks, Seattle, WA.
King County NPDES Receiving Water	January 2011-December 2012	surface water	12	4	Teflon bailer or modified van Dorn-style sampler (0.5 or 1 meter)	Metals: EPA 1631E, 1640, 6020A Hardness: SM 2340-B pH: field measured Salinity: SM 2520-B	KCEL	King County	EPA Stage 2A equivalent	none	Mickelson S. 2013. Receiving water characterization study. King County NPDES monitoring program. Final report. King County Department of Natural Resources and Parks, Marine and Sediment Assessment Group, Seattle, WA.
LDW ENR/AC Baseline Sampling	September and November 2016	surface sediment	18	0	Hand corer (0-10 cm) or powergrab sampler (0-10 cm)	Black carbon: Gustafsson (2001) Grain size: ASTM D422 PCBs (congeners): EPA 1668A TOC: EPA 9060	Alpha (black carbon, grain size, TOC), Frontier Analytical Laboratory (PCBs)	Sayler Data Solutions, Inc.	EPA Stage 2A; EPA Stage 4 (PCBs only)	none	Amec, DOF, Ramboll Environ, Floyd Snider, Geosyntec. 2017. Baseline data package. Enhanced natural recovery/activated carbon pilot study, Lower Duwamish Waterway. Final. Amec Foster Wheeler Environment & Infrastructure, Inc.; Dalton, Olmsted & Fuglevand, Inc.; Ramboll Environ; Floyd Snider; and Geosyntec Consultants.
LDW ENR/AC Baseline Sampling	September 2016 and January 2017	porewater	18	0	Syringe from surface sediment by diver or from grab sampler on sampling vessel	PCBs (congeners): EPA 1668A	Frontier Analytical Laboratory	Sayler Data Solutions, Inc.	EPA Stage 4	none	Amec, DOF, Ramboll Environ, Floyd Snider, Geosyntec. 2017. Baseline data package. Enhanced natural recovery/activated carbon pilot study, Lower Duwamish Waterway. Final. Amec Foster Wheeler Environment & Infrastructure, Inc.; Dalton, Olmsted & Fuglevand, Inc.; Ramboll Environ; Floyd Snider; and Geosyntec Consultants.



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LDW ENR/AC Pilot Study	October 2014	surface sediment	48	0	Powergrab (0 - 10 cm)	PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: SM 2540-G	ARI	LDC	EPA Stage 2A	none	LDWG. 2015. Validated LDW sediment data for ENR-AC pilot. Lower Duwamish Waterway Group, Seattle, WA.
LDW ENR/AC Pilot Study	October-November 2014	subsurface sediment	12	0	Vibracorer (0 - 1.5 or 2 ft)	PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: SM 2540-G	ARI	LDC	EPA Stage 2A	none	LDWG. 2015. Validated LDW sediment data for ENR-AC pilot. Lower Duwamish Waterway Group, Seattle, WA.
LDW ENR/AC Pilot Study Round 2	October 29, 2014	surface sediment	16	0	Powergrab (0 - 10 cm)	PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: SM 2540-G	ARI	LDC	EPA Stage 2A	none	LDWG. 2015. Validated LDW sediment data for ENR-AC pilot. Lower Duwamish Waterway Group, Seattle, WA.
LDW ENR/AC Pilot Study Round 2	November 3, 2014	subsurface sediment	4	0	Vibracorer (0 - 1.5 or 2 ft)	PCBs (Aroclors): EPA 8082A TOC: Plumb (1981) Total solids: SM 2540-G	ARI	LDC	EPA Stage 2A	none	LDWG. 2015. Validated LDW sediment data for ENR-AC pilot. Lower Duwamish Waterway Group, Seattle, WA.
LDW Groundwater Sampling for PCB Congeners and Aroclors	March 2017	surface water	6	1	Low-flow peristaltic pump	PCBs (Aroclors): EPA 8082A PCBs (congeners): EPA 1668C	ARI (Aroclors), Vista (congeners)	EcoChem	EPA Stage 2B (Aroclors); EPA Stage 4 (congeners)	none	Leidos. 2017. Lower Duwamish Waterway. Groundwater sampling for PCB congeners and Aroclors. Data report. Final. Leidos, Inc., Bothell, WA.
RARE Arsenic Accumulation Study	October 28-30, 2015	surface sediment	53	0	Grabs, as whole and sieved fractions (<63 µm, 63-250 µm)	Metals: EPA 6010 (subset), EPA 6020 <sup>b</sup>	ChemTech Consulting Group	EPA Region 10	EPA Stage 4	none	Kerns K, Michalsen M, Lotufo GR, Adams K, Duncan B, Hale E. 2017. Controlled field exposures suggest modes of arsenic accumulation in adult eastern softshell clams. Final. US Army Corps of Engineers and US Environmental Protection Agency, Seattle, WA.
RARE Arsenic Accumulation Study	October 27, 2015	porewater	15	0	DGT	Arsenic: EPA 200.8	MEL	EPA Region 10	EPA Stage 4	Data reported on an iron-normalized basis due to variations in iron in the DGT medium	Kerns K, Michalsen M, Lotufo GR, Adams K, Duncan B, Hale E. 2017. Controlled field exposures suggest modes of arsenic accumulation in adult eastern softshell clams. Final. US Army Corps of Engineers and US Environmental Protection Agency, Seattle, WA.
RARE Arsenic Accumulation Study	October 26, 2015	surface water	2	2	Grab	Hardness: EPA 200.7 Metals: EPA 200.7, EPA 200.8 <sup>b</sup>	ChemTech Consulting Group	EPA Region 10	EPA Stage 4	none	Kerns K, Michalsen M, Lotufo GR, Adams K, Duncan B, Hale E. 2017. Controlled field exposures suggest modes of arsenic accumulation in adult eastern softshell clams. Final. US Army Corps of Engineers and US Environmental Protection Agency, Seattle, WA.
Slip 1 Field Sampling and Data Report	May - June 2015	surface sediment	65	3	Manual or power grab (0-10 cm)	Black carbon: Gustafsson (2001) Grain size: ASTM D422 Metals: EPA 6010, EPA 6010C, EPA 6020, EPA 7471A, EPA 7471B PAHs, alkylated PAHs, other SVOC: EPA 8270D-SIM PCBs (Aroclors): EPA 8082 PCBs (congeners): EPA 1668C TOC: EPA 9060 Total solids: EPA 160.3	ARI (metals), Am Test, Inc. (grain size), ALS (black carbon, grain size, metals, PAHs, PCB Aroclors, TOC, total solids), Vista (PCB congeners)	Integral	EPA Stage 3 (conventionals, metals); EPA Stage 4 (PAHs, PCBs)	none	Integral. 2015. Slip 1 field sampling and data report. May/June 2015 sediment sampling, Lower Duwamish Waterway, Seattle, Washington. Integral Consulting Inc., Olympia, WA.
Slip 4 Early Action Area Long-Term Monitoring Year 1	July 2013	surface sediment	10	1	Hydraulic power grab sampler or stainless steel spoon (0-10 cm)	Metals (subset): EPA 6010C, 7471A PCBs (Aroclors): EPA 8082A PAHs, phthalates, other SVOCs (subset): EPA 8270D Grain size (subset): PSEP-GS TOC (subset): Plumb (1981) Total solids (subset): SM 2540-G	ARI	EcoChem	EPA Stage 4	none	Integral. 2014. Lower Duwamish Waterway Slip 4 Early Action Area: long-term monitoring data report year 1 (2013). Integral Consulting, Inc., Seattle, WA.
Slip 4 Early Action Area Long-Term Monitoring Year 3 (2015)	July 2, 2015	surface sediment	8	1	Hydraulic power grab sampler or stainless steel spoon (0-10 cm)	Metals: EPA 6010C, 7471A PCBs (Aroclors): EPA 8082A PAHs, phthalates, other SVOCs: EPA 8270D Grain size: PSEP-GS TOC: Plumb (1981) Total solids: SM 2540-G	ARI	EcoChem	EPA Stage 4	Non-detected benzyl alcohol results (n=4) were "R" qualified due to low LCS recovery	Integral. 2015. Lower Duwamish Waterway Slip 4 Early Action Area: long-term monitoring data report year 3 (2015). Integral Consulting, Inc., Seattle, WA.
Slip 4 Early Action Area, 8th Ave Terminals	October 2012	surface sediment	5	1	Diver-operated hand core (0 - 10 cm)	PCBs (Aroclors): EPA 8082A Grain size: PSEP-GS TOC: Plumb (1981) Total solids: SM 2540-B	ARI	EcoChem	EPA Stage 4	none	Integral. 2013. Slip 4 Early Action Area, 8th Avenue Terminals sediment sampling and analysis report. Integral Consulting, Seattle, WA.
Slip 4 Long-term Monitoring Year 5	July 24, 2017	surface sediment	8	1	Manual or power grab (0-10 cm)	Grain size: PSEP (1986) Metals: EPA 6010C, EPA 7471B PAHs: EPA 8270D PCBs (Aroclors): EPA 8082 Phthalates, other SVOCs: EPA 8270D TOC: PLUMB (1981) Total solids: SM 2540-G	ARI	EcoChem	EPA Stage 2B (SVOCs); EPA Stage 3 (conventionals and metals); EPA Stage 4 (PCBs)	none	Windward. 2018. Lower Duwamish Waterway Slip 4 Early Action Area. Long-term monitoring data report: year 5 (2017). Windward Environmental LLC, Seattle, WA.

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Study	Sampling date(s)	Media	Number of samples excluding field duplicates	Number of field duplicates	Sample collection method(s) and depth	Analyte group and analytical method	Analytical laboratory	Data validator	Data validation level <sup>a</sup>	Significant analytical issues	Reference
Slip 4 Removal Action Construction 2012	August 2011-February 2012	surface sediment	52	5	Stainless steel spade/spoon, van Veen grab sampler, or power grab sampler (0-10 cm)	Metals (subset): EPA 6010B, 7471A PCBs (Aroclors): EPA 8082 PAHs, phthalates, other SVOCs (subset): EPA 8270D TOC: Plumb (1981) Total solids: EPA 160.3	ARI	EcoChem	EPA Stage 4	none	Integral. 2012. Lower Duwamish Waterway Slip 4 early action area removal action completion report. Integral Consulting, Seattle, WA.
South Park Bridge replacement 2011 (Phase 1)	July 29, 2011	surface sediment	4	0	Surface sediment (0-2 cm) collected with 0.05 m <sup>2</sup> - stainless steel grab sampler and stainless steel spoon	PCBs (Aroclors): EPA 8082 Grain size: PSEP (1986) TOC: Plumb (1981) Total solids: EPA 160.3	ARI	EcoChem	EPA Stage 2B	none	Windward. 2012. South Park Bridge: pre and post dredge sediment evaluation Phase I and Phase II data report. Windward Environmental LLC, Seattle, WA.
South Park Bridge replacement 2012 (Phase 2)	March 27, 2012	surface sediment	4	0	Surface sediment (0-2 cm) collected with 0.1 m <sup>2</sup> - stainless steel van Veen grab sampler and stainless steel spoon	PCBs (Aroclors): EPA 8082 Grain size: PSEP (1986) TOC: Plumb (1981) Total solids: EPA 160.3	ARI	EcoChem	EPA Stage 2B	none	Windward. 2012. South Park Bridge: pre and post dredge sediment evaluation Phase I and Phase II data report. Windward Environmental LLC, Seattle, WA.
South Park Bridge replacement 2014 (Phase 4)	July 31, 2014	surface sediment	2	0	Surface sediment (0-2 cm) collected with a 0.1 m <sup>2</sup> - stainless steel van Veen grab sampler and stainless steel spoon	PCBs (Aroclors): EPA 8082A Grain size: PSEP (1986) TOC: Plumb (1981) Total solids: SM 2540-G	ARI	EcoChem	EPA Stage 2B	none	Windward. 2014. South Park Bridge: pre- and post-dredge sediment evaluation Phase IV data report. Windward Environmental LLC, Seattle, WA.
South Park Marina 2016 sampling	February 24-26, 2016	surface sediment	16	2	Vibracorer (0 - 6.6 ft cores) (upper interval)	PCBs (Aroclors): EPA 8082 PCBs (congeners): EPA 1668A TOC: SW 9060	Freidman & Bruya (PCB Aroclors), Vista Analytical Laboratory (PCB congeners), Fremont Analytical (TOC)	EcoChem	EPA Stage 2B (90% of the data); EPA Stage 4 (10% of the data)	none	TIG. 2016. Data report. 2016 soil, sediment, and catch basin sampling and analysis. Lower Duwamish Waterway Superfund Site. The Intelligence Group, Seattle, WA.
South Park Marina 2016 sampling	February 24-26, 2016	subsurface sediment	32	1	Vibracorer (0 - 6.6 ft cores) (lower intervals)	PCBs (Aroclors): EPA 8082 PCBs (congeners): EPA 1668A TOC: SW 9060	Freidman & Bruya (PCB Aroclors), Vista Analytical Laboratory (PCB congeners), Fremont Analytical (TOC)	EcoChem	EPA Stage 2B (90% of the data); EPA Stage 4 (10% of the data)	none	TIG. 2016. Data report. 2016 soil, sediment, and catch basin sampling and analysis. Lower Duwamish Waterway Superfund Site. The Intelligence Group, Seattle, WA.
South Park Slag and Sediment Results	August 4, 2017	surface sediment	10	0	Stainless steel spoon (0-10 cm)	Metals: EPA 6010D, EPA 6020A, EPA 7471B Total solids: SM 2540-G	Onsite Environmental, Inc.	Port of Seattle	EPA Stage 2A	none	POS. 2017. Slag results memorandum. Port of Seattle, Seattle, WA.
Surface Sediment Sampling at Outfalls in the Lower Duwamish Waterway	March-April 2011	surface sediment	160	11	Surface sediment using 1 m <sup>2</sup> modified Young's grab or Petite Ponar grab sampler (0 cm - 3-10 cm) or stainless steel spoon (0 cm to 9-10 cm)	Dioxins/furans (subset): EPA 1613B Metals: EPA 6010B, 7471A PCBs (Aroclors): EPA 8082 PAHs, phthalates, other SVOCs: EPA 8270D, 8270D-SIM Grain size: PSEP (1986) TOC: Plumb 1981 Total solids: EPA 160.3	ARI, Axy's Analytical (dioxins/furans only)	EcoChem	EPA Stage 2B, EPA Stage 4 (dioxins/furans only)	71 results for 9 SVOCs were rejected because of extremely low LCS/LCSD and/or MS/MSD recoveries (less than 10 percent). Rejected results include 25 results for 2,4-dinitrophenol; 10 results each for aniline and 3,3'-dichlorobenzidine; 9 results for hexachlorocyclopentadiene; 7 results for 4-chloroaniline; 4 results for 3-nitroaniline; 2 results for 4,6-dinitro-2-methylphenol; and 1 result for 2,4-dimethylphenol.	SAIC. 2011. Surface sediment sampling at outfalls in the Lower Duwamish Waterway, Seattle, WA. Prepared for Toxics Cleanup Program, Washington State Department of Ecology. Science Applications International Corporation, Bothell, WA.
T-115 Post-Dredge Sediment Characterization and Sand Cover Monitoring	March 10, 2010	surface sediment	4	0	0.06 m <sup>2</sup> Gray O'Hara boxcore (0-10 cm)	Dioxin/furans: EPA 1613B Grain size: PSEP-GS PAHs: EPA 8270C Phthalates, other SVOCs: EPA 8270C TOC: Plumb (1981)	CAS	Pyron Environmental	EPA Stage 4 equivalent	none	SEE. 2010. Post-dredge subsurface sediment characterization and sand cover monitoring report. Science and Engineering for the Environment, LLC, Seattle, WA.
T-115 Year 1 Sand Cover Monitoring and Recontamination Study	May 19, 2011	surface sediment	4	1	Powergrab (0 - 10 cm)	Dioxin/furans: EPA 1613B Grain size: PSEP-GS PAHs: EPA 8270-SIM TOC: PSEP-TOC Total solids: PSEP-TS	CAS	Pyron Environmental	EPA Stage 4 equivalent	none	SEE, TEC. 2012. T-115 year 1 sand cover monitoring and recontamination study report. Science and Engineering for the Environment, LLC and TEC, Inc., Seattle, WA.
T-115 Year 3 Final Sand Cover Monitoring	May 23, 2013	surface sediment	4	1	Powergrab (0 - 10 cm)	Dioxin/furans: EPA 1613 B Grain size: PSEP-GS PAHs: EPA 8270D-SIM TOC: PSEP-TOC Total solids: EPA 160.3 Total volatile solids: EPA 160.4	ALS	Pyron Environmental	EPA Stage 4 equivalent	none	SEE. 2013. T-115 year 3 final sand cover monitoring report. Science and Engineering for the Environment, LLC, Seattle, WA.

**Table B-1. Results of the detailed data quality review for Task 2**

Study	Sampling date(s)	Media	Number of samples excluding field duplicates	Number of field duplicates	Sample collection method(s) and depth	Analyte group and analytical method	Analytical laboratory	Data validator	Data validation level <sup>a</sup>	Significant analytical issues	Reference
T-117 Cleanup Action 2013 - Post-dredge perimeter sediment	May 12, 2014	surface sediment	5	1	Van Veen grab sampler (0-10 cm)	Dioxins/furans: EPA 1613B Metals: EPA 200.8, 1631E PAHs: EPA 8270D, 8270D-SIM PCBs (Aroclors): EPA 8082 Phthalates, other SVOCs: EPA 8270D TOC: EPA 9060	Friedman & Bruya, Ceres Analytical (dioxins/furans only), Fremont Analytical (TOC only)	AECOM	EPA Stage 2B; EPA Stage 4 (dioxins/furans only)	none	Port of Seattle. 2016. Removal action construction report. Phase 1: sediment and upland cleanup. Terminal 117 Cleanup. Port of Seattle, Seattle, WA.
T-117 Cleanup Action 2013 - Pre-dredge perimeter sediment	November 22, 2103	surface sediment	5	1	Van Veen grab sampler (0-10 cm)	Dioxins/furans: EPA 1613B Metals: EPA 200.8, 1631E PAHs: EPA 8270D, 8270D-SIM PCBs (Aroclors): EPA 8082 Phthalates, other SVOCs: EPA 8270D TOC: EPA 9060	Friedman & Bruya, Ceres Analytical (dioxins/furans only), Fremont Analytical (TOC only)	AECOM	EPA Stage 2B; EPA Stage 4 (dioxins/furans only)	4-Chloroaniline "R" qualified for all samples due to low LCS recovery	Port of Seattle. 2016. Removal action construction report. Phase 1: sediment and upland cleanup. Terminal 117 Cleanup. Port of Seattle, Seattle, WA.
T-117 Pre-operation Outfall Sediment Sampling	July 12, 2016	surface sediment	9	1	Grabs collected with van Veen dredge sampler or power grab sampler (0-10 cm)	PCBs (Aroclors): EPA 8082A Grain size: PSEP (1986) TOC: Plumb (1981) Total solids: SM 2540-G	ARI, Materials Testing & Consulting, Inc (grain size only)	Integral	EPA Stage 4	none	Integral. 2016. Results for pre-operation outfall sediment sampling at the Terminal 117 Early Action Area. Integral Consulting, Inc., Seattle, WA.

<sup>a</sup> If the reports for a particular dataset did not specify an EPA stage of data validation, Windward reviewed the methods and identified an equivalent stage.

<sup>b</sup> Analytical methods were inferred based on the EPA SOP cited in the report.

AC – activated carbon	LCS – laboratory control sample	POS – Port of Seattle
ALS – ALS Environmental Laboratories	LCSD – laboratory control sample duplicate	PSEP – Puget Sound Estuary Program
ARI – Analytical Resources, Inc.	LDC – Laboratory Data Consultants	RARE – regional applied research effort
ASTM – American Society for Testing and Materials	LDW – Lower Duwamish Waterway	RI – remedial investigation
CAS – Columbia Analytical Services	MEL – Manchester Environmental Laboratory	SIM – selected ion monitoring
CSO – combined sewer overflow	MS – matrix spike	SM – standard method
DGT – diffusive gradient in thin film	MSD – matrix spike duplicate	SOP – standard operating procedure
DSOA – Duwamish sediment other area	NPDES – National Pollutant Discharge Elimination System	SVOC – semivolatile organic compound
ENR – enhanced natural recovery	PAH – polycyclic aromatic hydrocarbon	T-115 – Terminal 115
EPA – US Environmental Protection Agency	PBDE – polybrominated diphenyl ether	T-117 – Terminal 117
KCEL – King County Environmental Laboratory	PCB – polychlorinated biphenyl	TOC – total organic carbon
		USACE – United States Army Corps of Engineers