Site C Clean Energy Project

Fisheries and Aquatic Habitat Monitoring and Follow-up Program

Peace River Physical Habitat Monitoring Program (Mon-3)

Construction Year 1 (2015)

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October 17, 2016

TECHNICAL MEMORANDUM

DATE October 17, 2016 **PROJECT No.** 1520767-000-TM-Rev0

TO Dave Hunter
BC Hydro

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MON-3 PEACE RIVER PHYSICAL HABITAT MONITORING PROGRAM 2015

This technical memorandum presents the field data collected as part of a fieldwork program carried out between July 2015 and October 2015. The purpose of the fieldwork program was to collect baseline cross sectional profile data and substrate grain size data at selected transects along the Peace River.

1.0 INTRODUCTION / OBJECTIVES

The Peace River Physical Habitat Monitoring Program (Mon-3) is designed to assess the effects of the Site C Clean Energy Project (the Project) on physical habitat in the Site C Diversion Headpond and in the Peace River downstream of the Project during both construction and operation. One component of the Program involves collecting physical habitat data to serve as a baseline dataset for monitoring changes in physical habitat along Peace River during construction and operation of the Project.

The 2015 field program included measurements of channel cross sections and the size of riverbed material in the main channel of the Peace River. Channel cross section measurements were obtained by both boat and foot surveys and riverbed material data were collected using the Wolman Pebble Count sampling method (Wolman 1954).

2.0 METHODS

2.1 Cross Section Profiles Locations

The 2015 field program involved sampling 30 of 50 channel morphology transects designated for sampling as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3; Golder 2015). The 30 transects sampled in 2015 included 12 transects in the footprint of the Site C Diversion Headpond and 18 transects between the Project's dam site and the Pine River confluence.

Transects locations are presented below in Table 1, sorted upstream to downstream.

Table 1: Transects locations surveyed in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3; UTM Zone 10V).

Transect Identifier	Survey Date	Left Bank[a] (Transect Start)		Right Bank[a] (Transect End)	
		Easting (m)	Northing (m)	Easting (m)	Northing (m)
Transect US12	July 9, 2015	616127	6233874	615835	6233283
Transect US11	July 9, 2015	617002	6233312	616648	6232709
Transect US10	July 9, 2015	619308	6232508	619140	6231648
Transect US9	July 9, 2015	620268	6232665	620260	6231563
Transect US8	July 9, 2015	623285	6233361	623541	6232725
Transect US7	July 16, 2015	625548	6233588	625447	6233182
Transect US6	July 12, 2015	627148	6232966	626833	6232624
Transect US5	July 12, 2015	628331	6231622	627869	6231270
Transect US4	July 10, 2015	628501	6231310	628086	6230905
Transect US3	July 10, 2015	628846	6231010	628280	6230599
Transect US2	July 10, 2015	629005	6230872	628354	6230366
Transect US1	July 15, 2015	629461	6230481	628795	6229816
Transect DS1	July 14, 2015	630670	6229758	630133	6228783
Transect DS2	July 14, 2015	630856	6229716	630577	6228620
Transect DS3	July 8, 2015	631314	6229624	631318	6228389
Transect DS4	July 12, 2015	631894	6229580	632071	6228420
Transect DS5	July 14, 2015	632409	6229718	632843	6228578
Transect DS6	July 14, 2015	632669	6229861	633151	6228740
Transect DS7	July 11, 2015	633063	6230053	633503	6228942
Transect DS8	October 3, 2015	633504	6230441	633976	6229267
Transect DS9	October 3, 2015	633901	6230725	634432	6229522
Transect DS10	October 3, 2015	634272	6230691	634617	6229672
Transect DS11	October 3, 2015	634801	6230531	634810	6229795
Transect DS12	October 3, 2015	635315	6230462	635324	6229897
Transect DS13	October 3, 2015	635823	6230523	636048	6229939
Transect DS14	July 18, 2015	637680	6228779	637153	6228588
Transect DS15	July 10, 2015	638221	6227477	637861	6227040
Transect DS16	July 11, 2015	639668	6226526	639517	6226047
Transect DS17	July 11, 2015	640442	6226405	640277	6225729
Transect DS18	July 11, 2015	642362	6224867	642029	6224567

[a] As viewed facing downstream.

2.2 Cross Section Profiles Surveys

Cross section data were collected using two methods:

a) **GPS Total Station Surveys**. An ALTUS APS-3 (GPS RTK) total station and benchmark system were used to measure ground elevations on the banks and elevations in wadeable areas of Peace River near the shorelines. Water surface elevations were also collected. Topography/elevations were measured along the established cross sections and extended away from the wetted channel to the bankfull width. The maximum wadeable depth was of the order of 0.6 m.

b) **River Depth Surveys**. A SonTek RiverSurveyor® M9 dual beam Acoustic Doppler Current Profiler (ADCP) system was used to perform depth surveys and to measure riverbed bathymetry. The transducer of the ADCP was mounted 0.20 m below the water surface with a minimum measurable depth of 0.14 m below the ADCP transducer. Thus, the minimum measurable water depth was 0.4 m during the surveys. Water velocity data were collected but were not processed or presented in this report; these data are archived for future use if required.

During the river depth data collection, the ALTUS APS-3 (GPS RTK) system was attached to the ADCP system and the local coordinates were transmitted to the ADCP unit and incorporated into the raw data by the ADCP data collection software. The two survey methods were referenced to the same datum and had overlap where possible so they could be spliced together to produce a single data set.

2.3 Grain Size Measurements (Pebble Count)

Grain size measurements were conducted at select channel cross sections using the Wolman Pebble Count method (Wolman 1954). Typically one sample plot at each cross section was selected for the pebble count (Table 2). Sample plot selection considered personal safety, site access, presence of representative materials of the river substrate, active channel morphology landforms, and consistency with previous grain size survey programs (summarized in Golder 2014). The pebble count used a grid sampling approach that followed a set protocol:

- A sample collection net was used to select the area for the pebble count. The sampling net was 13.7 metres long by 9.7 metres wide, and with a rectangular grid mesh pattern, and with a size of 0.4 metres.
- Pebbles falling directly under the grid nodes were measured with a ruler along the b-axis and values were recorded in the field forms.
- If the particle sizes were too small to be measured by a ruler, a sand gauge reference card was used to appropriately classify particle sizes.
- 300 measurements were collected at each sample plot.

Field pebble measurements for each site are presented in Appendix A, along with material class size definitions.

Table 2: Pebble count sample plot locations surveyed in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3; UTM Zone 10V).

Site Identifier	Survey Date	Easting (m)	Northing (m)	Site Identifier	Survey Date	Easting (m)	Northing (m)
US-12 MC	July 19, 2015	615742	6233749	DS-1 MC	July 14, 2015	630377	6229640
US-11 MC	July 20, 2015	616406	6233138	DS-1 RB	July 14, 2015	630266	6229609
US-10 RB	July 20, 2015	617828	6232536	DS-2 MC	July 14, 2015	630695	6229502
US-10 MC	July 20, 2015	619471	6232255	DS-3 MC	July 8, 2015	631039	6229416
US-9 MC	July 19, 2015	620089	6231937	DS-4 RB	July 12, 2015	631647	6229342
US-8 RB	July 19, 2015	623493	6232798	DS-5 LB	July 15, 2015	632406	6229676
US-8 MC	July 16, 2015	624098	6233588	DS-5 RB	July 15, 2015	632514	6229368
US-7 MC	July 16, 2015	625902	6233497	DS-6 LB	July 8, 2015	632644	6229700
US-7 LB	July 16, 2015	625560	6233531	DS-7 RB	July 14, 2015	633193	6229534
US-6 RB	July 12, 2015	626861	6232628	DS-9 MC	October 2, 2015	634188	6229962
US-6 MC	July 12, 2015	626675	6233060	DS-14 MC	July 18, 2015	637361	6228850
US-5 RB-1	July 15, 2015	627949	6231359	DS-14 RB	July 19, 2015	636960	6229322
US-5 RB-2	July 16, 2015	627448	6231992	DS-15 RB	July 18, 2015	637884	6227501
US-4 RB	July 16, 2015	628164	6230987	DS-16 RB	July 18, 2015	639760	6226007
US-3 MC	July 7, 2015	628598	6230850	DS-17 MC	July 18, 2015	640359	6226073
US-2 RB	July 15, 2015	628641	6230430	DS-18 MC	July 19, 2015	642273	6224794
US-1 RB	July 7, 2015	628933	6230041	DS-18 RB	July 18, 2015	642038	6224570

3.0 RESULTS

3.1 Cross Section Profiles

River cross section profiles were measured at 30 transects in 2015 to provide channel profile data. Survey transect locations are shown in Maps 1 to 9 (attached) and cross section profiles are presented in Figure 1 to Figure 30. Several cross sections extended over mid-channel islands and were not surveyed on foot across the entire islands. For these locations, interpolated elevations were estimated from freely available topographic data (GeoGratis 2015).

Main geometric parameters at each transect are summarized in Table 3. Cross section data indicate the following main morphological characteristics for the study area:

- The average channel bankfull width of the Peace River in the study area is approximately 500 m wide and varies from approximately 300 m to approximately 1300 m.
- The mean bankfull depth is typically 2.5 m but varies from approximately 1.5 m to approximately 5 m. The deeper channel depths typically occur in the narrower sections of the river with steep banks on both sides where the entire flow is occupying a single channel at all water levels. Shallower channels typically occur where the river occupies a number of channels.

- Side channels are typical for the upstream-most cross sections (i.e., Transect US12 to US7) and for the cross sections immediately downstream of the Project's dam site (Transect DS1 to DS11). The river channel between the two areas typically has a single-thread main channel river form (planform) with limited side channels or flood plain areas.

Table 3: Main geometric parameters of transects surveyed in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3).

Transect ID	Bankfull Width (m)	Estimated High Water Level (m)	Mean Bankfull Depth (m)	Bankfull Elevation (m)
Transect US12	552.13	421.15	2.70	419.40
Transect US11	542.75	419.86	2.28	419.34
Transect US10	386.77	418.33	2.93	417.67
Transect US9	438.58	417.41	1.84	416.36
Transect US8	617.94	415.89	2.02	415.58
Transect US7	292.03	414.08	5.03	414.88
Transect US6	426.79	413.76	4.16	414.75
Transect US5	344.03	413.51	4.37	413.42
Transect US4	447.50	413.50	3.34	413.05
Transect US3	538.45	413.63	2.64	412.94
Transect US2	532.20	413.26	2.25	412.75
Transect US1	555.71	413.74	2.10	412.70
Transect DS1	1106.84	413.60	2.31	412.64
Transect DS2	1112.95	413.57	1.68	412.51
Transect DS3	1194.46	413.50	1.48	412.48
Transect DS4	1146.84	413.46	2.25	412.45
Transect DS5	1158.32	413.88	2.14	412.44
Transect DS6	1123.14	413.88	2.44	412.43
Transect DS7	1176.54	413.18	2.34	412.30
Transect DS8	1255.21	414.76	3.36	412.67
Transect DS9	1259.11	413.56	2.63	412.20
Transect DS10	1043.50	412.02	2.70	411.65
Transect DS11	696.71	411.50	2.02	409.50
Transect DS12	326.24	408.31	2.85	408.31
Transect DS13	407.71	409.94	2.91	408.76
Transect DS14	485.03	408.00	2.98	408.00
Transect DS15	515.01	407.98	3.16	407.60
Transect DS16	352.64	407.00	3.62	406.39
Transect DS17	540.43	407.89	3.41	406.81
Transect DS18	418.79	406.04	4.35	406.04
Statistics				
Minimum	292.03	-	1.48	-
Mean	697.68	-	2.81	-
Maximum	1259.11	-	5.03	-

Figure 1 to Figure 30 are shown with a uniform elevation axis (395 m to 430 m) and with two different distance axes. Narrower channels are shown over 800 m and wider channels are shown over 1400 m.

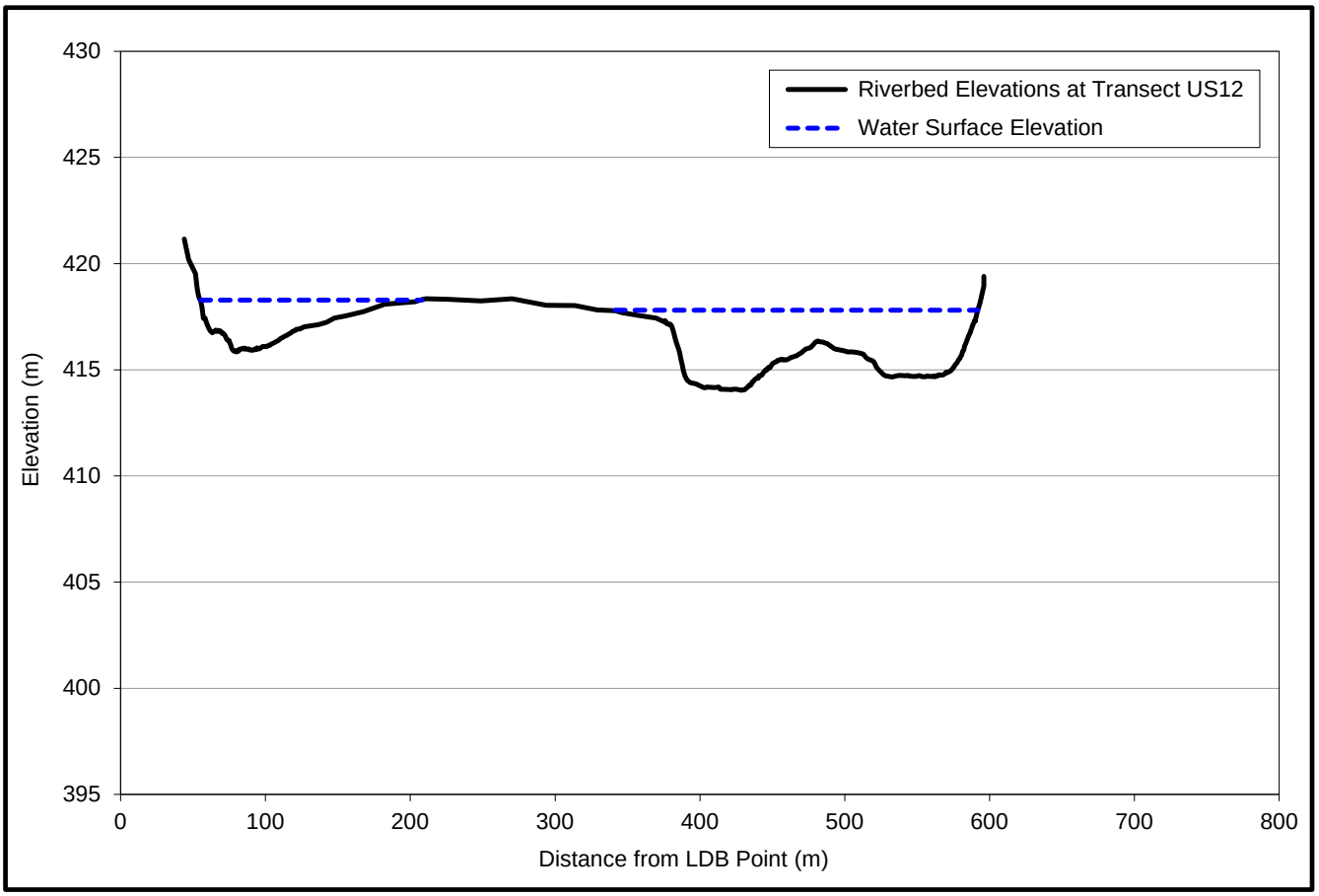

Figure 1: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US12, 2015.

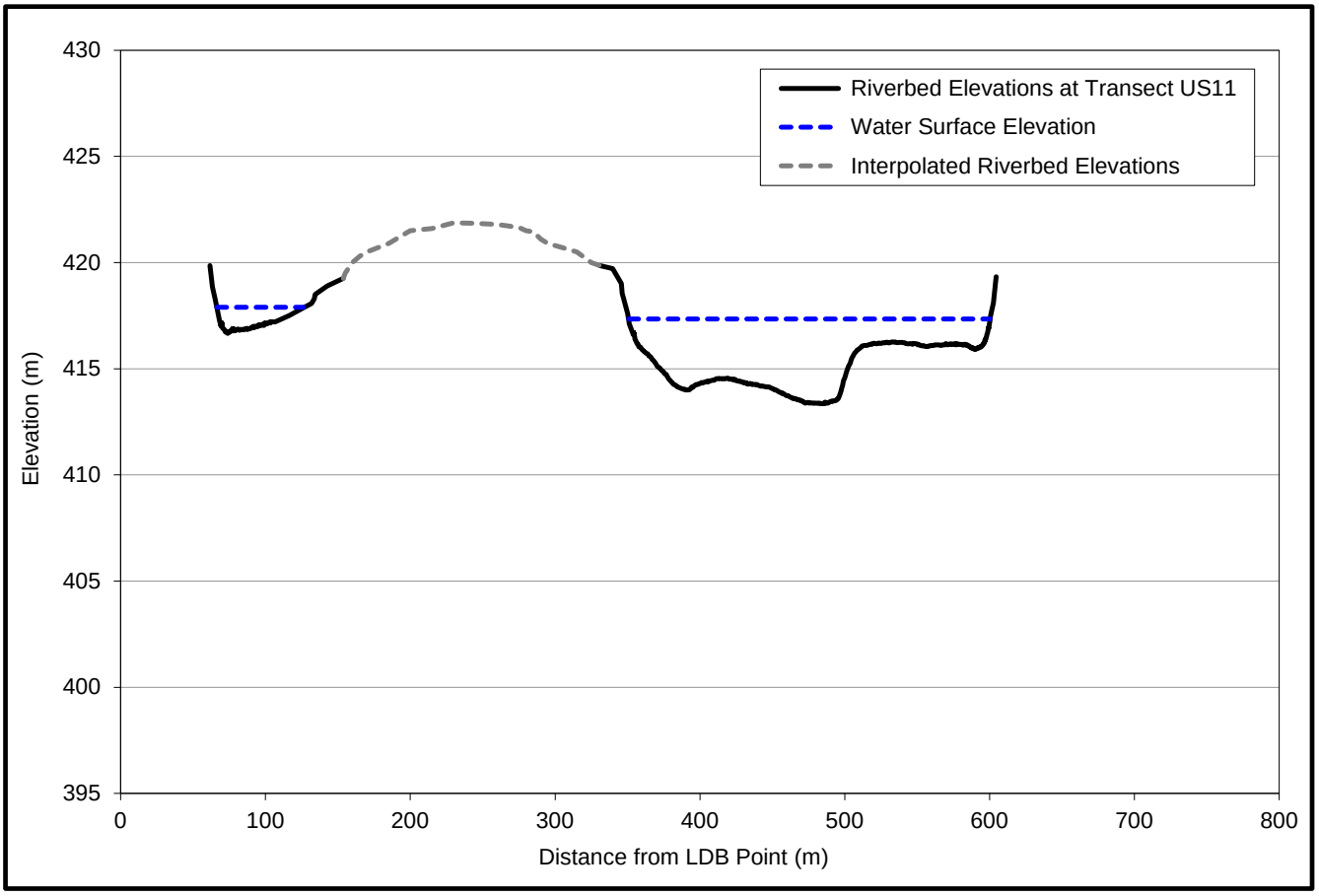

Figure 2: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US11, 2015.

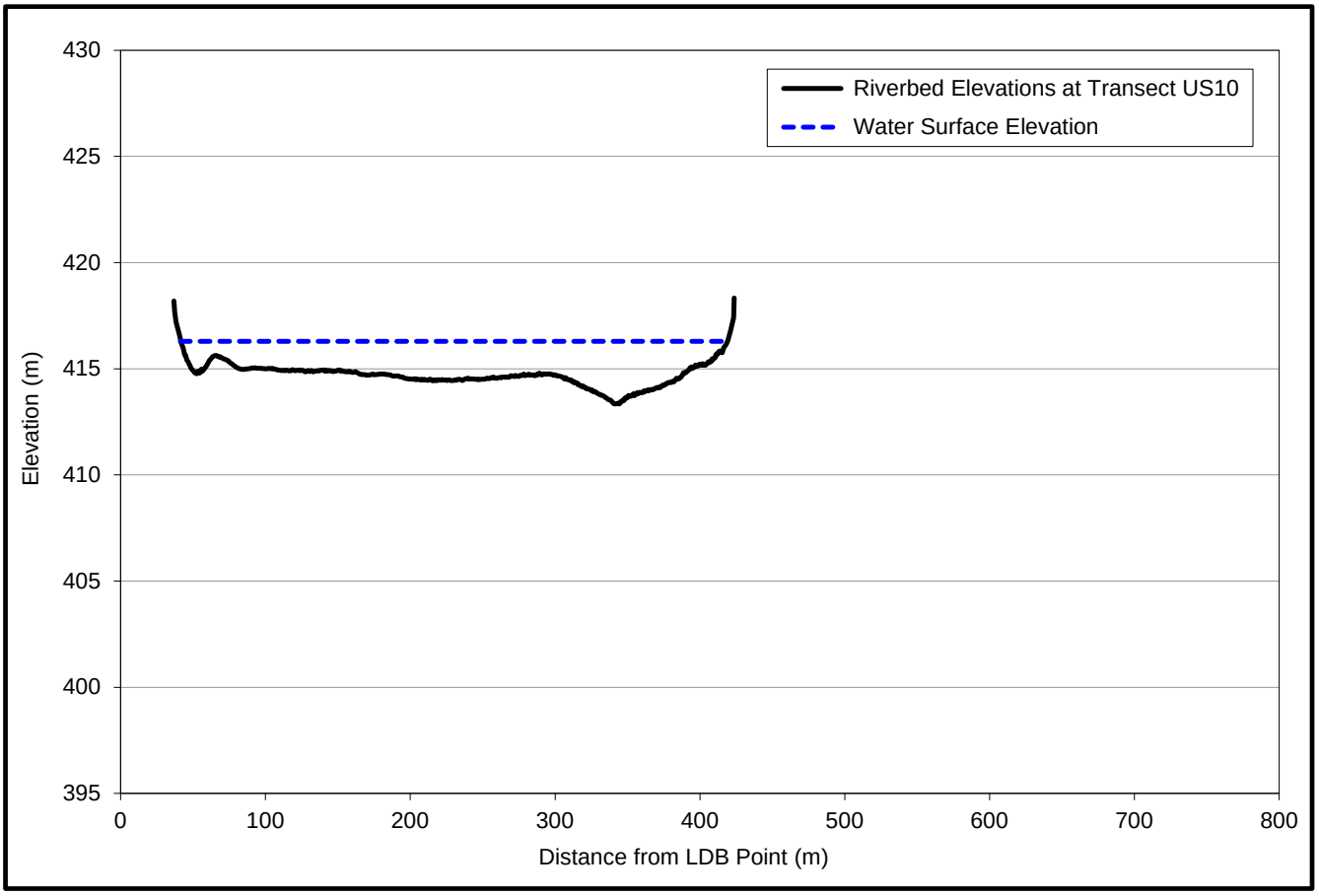

Figure 3: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US10, 2015.

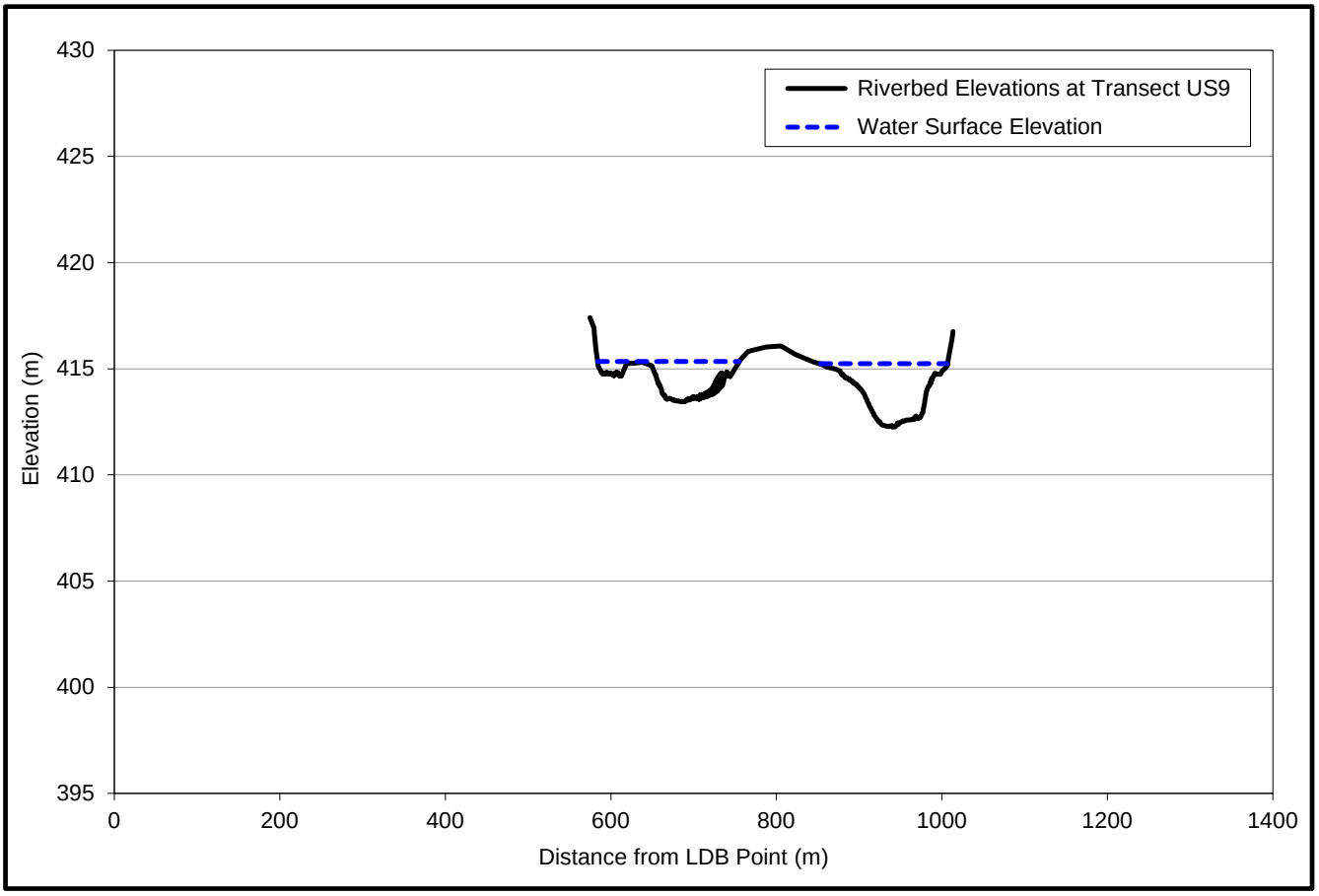

Figure 4: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US9, 2015.

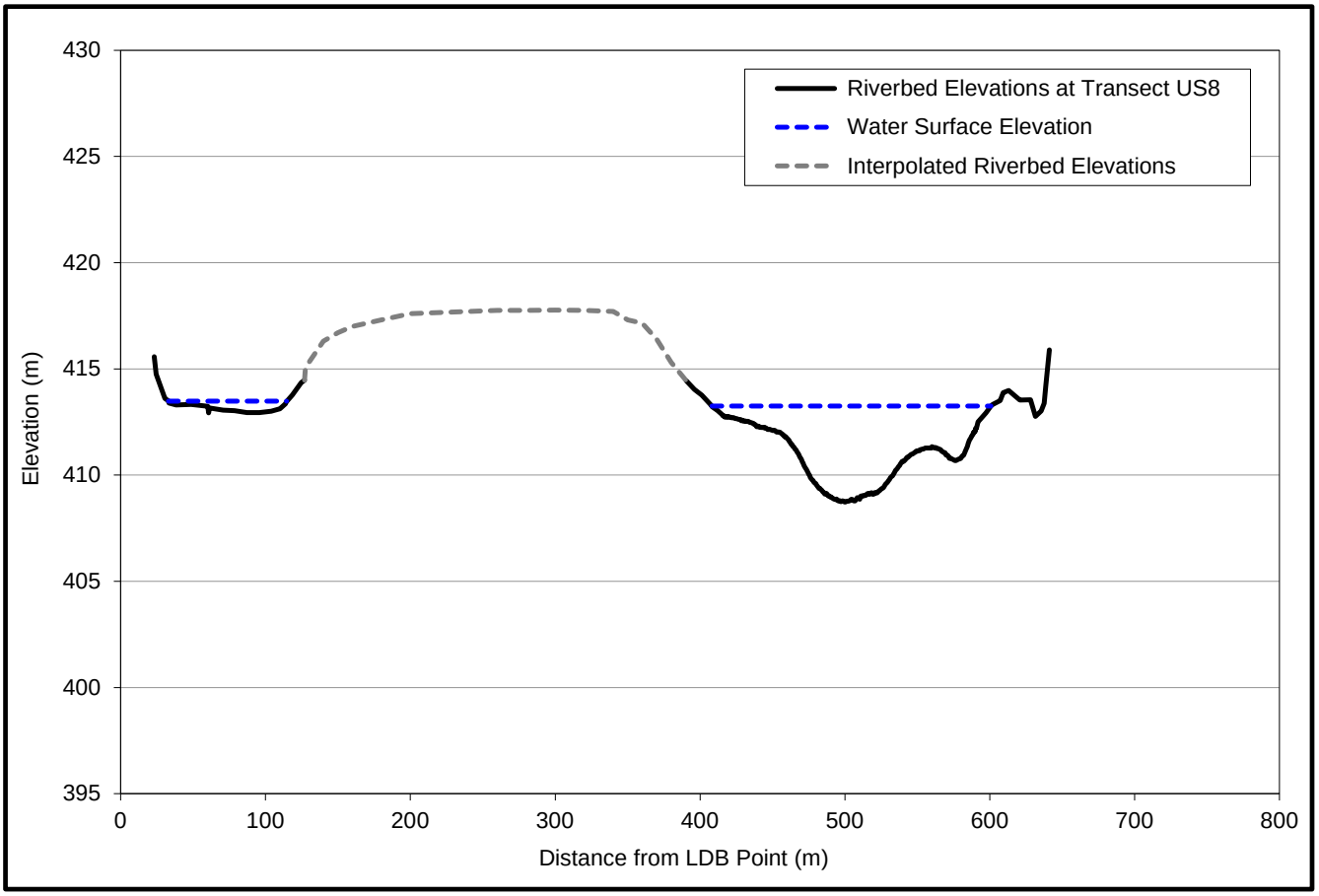

Figure 5: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US8, 2015.

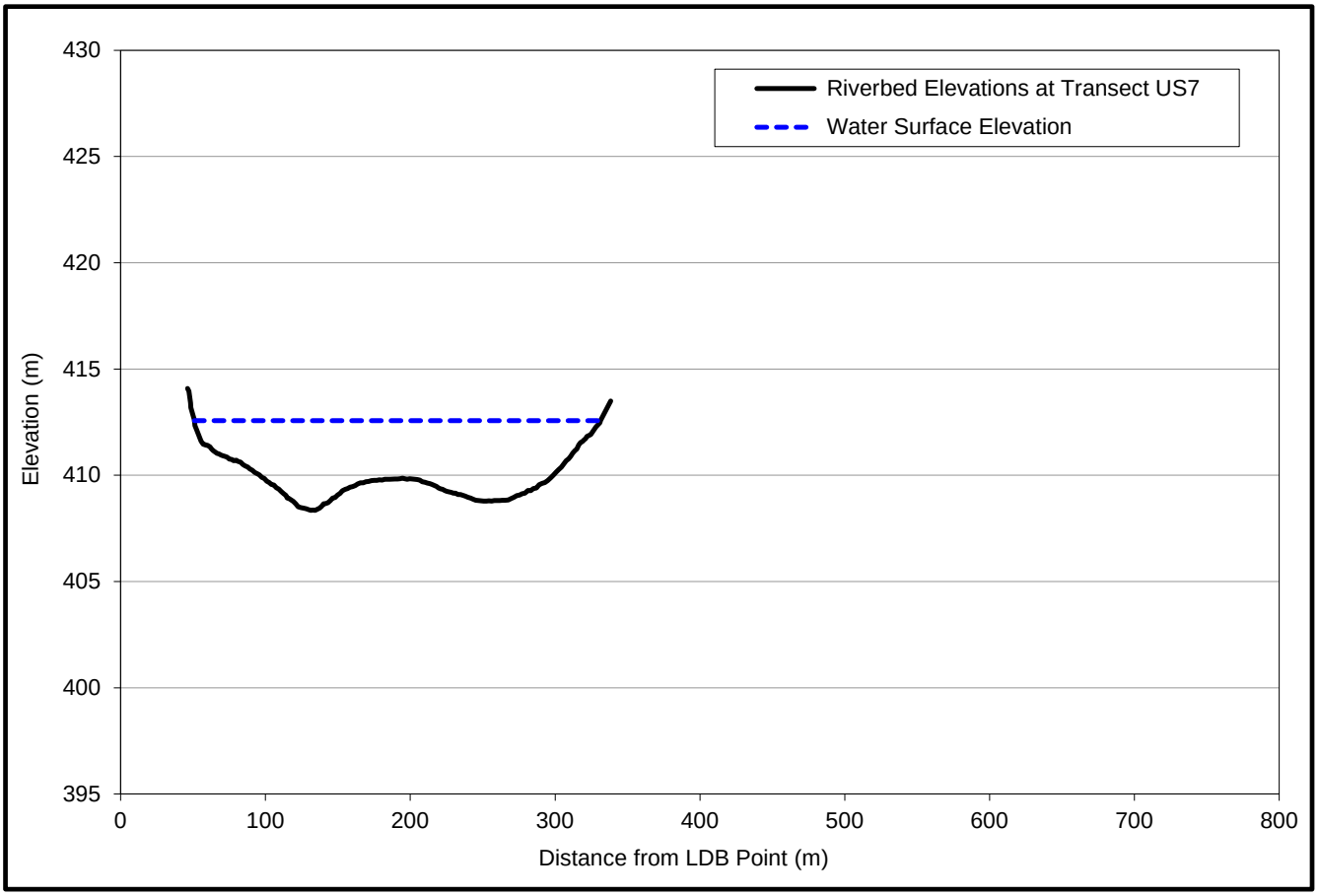

Figure 6: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US7, 2015.

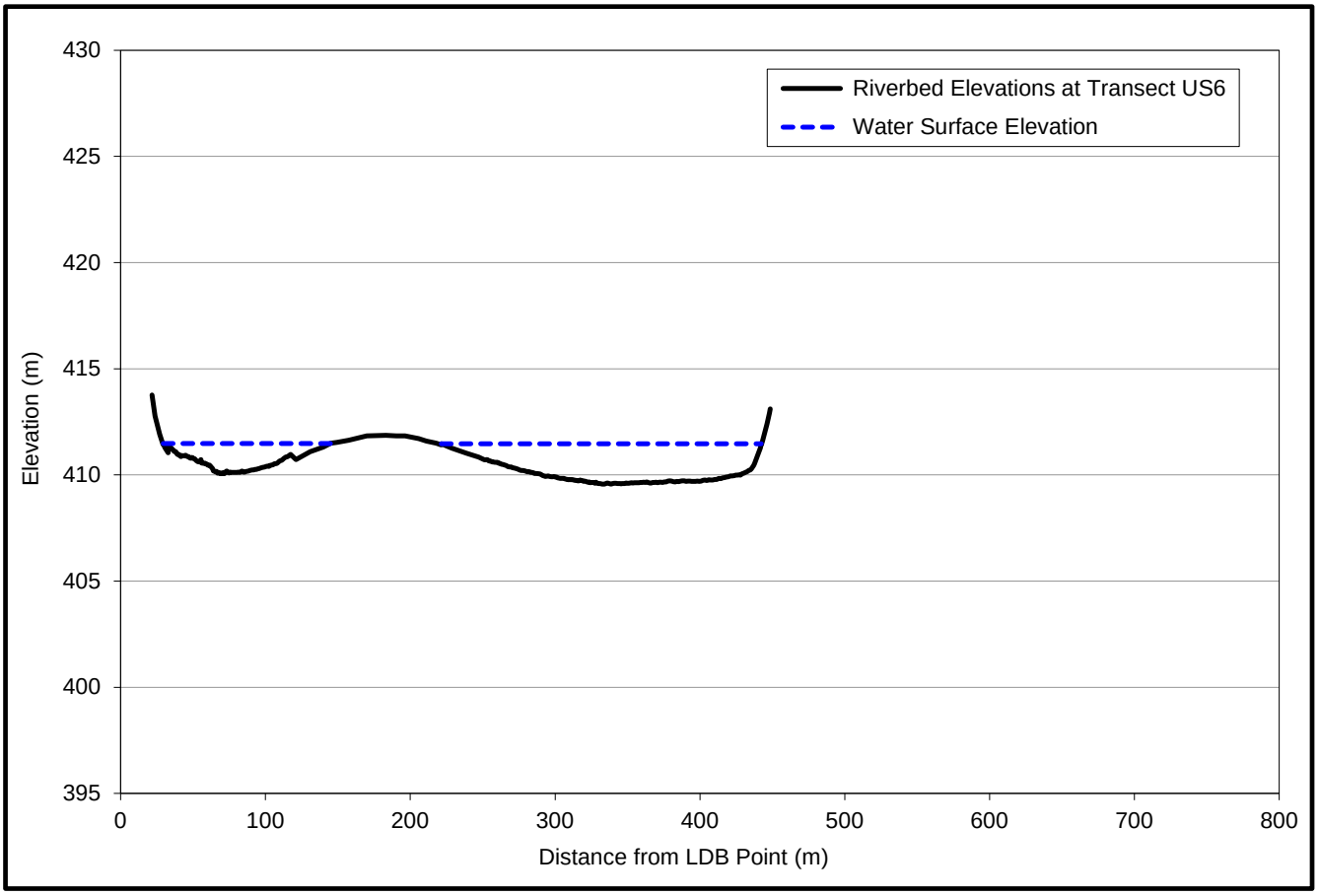

Figure 7: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US6, 2015.

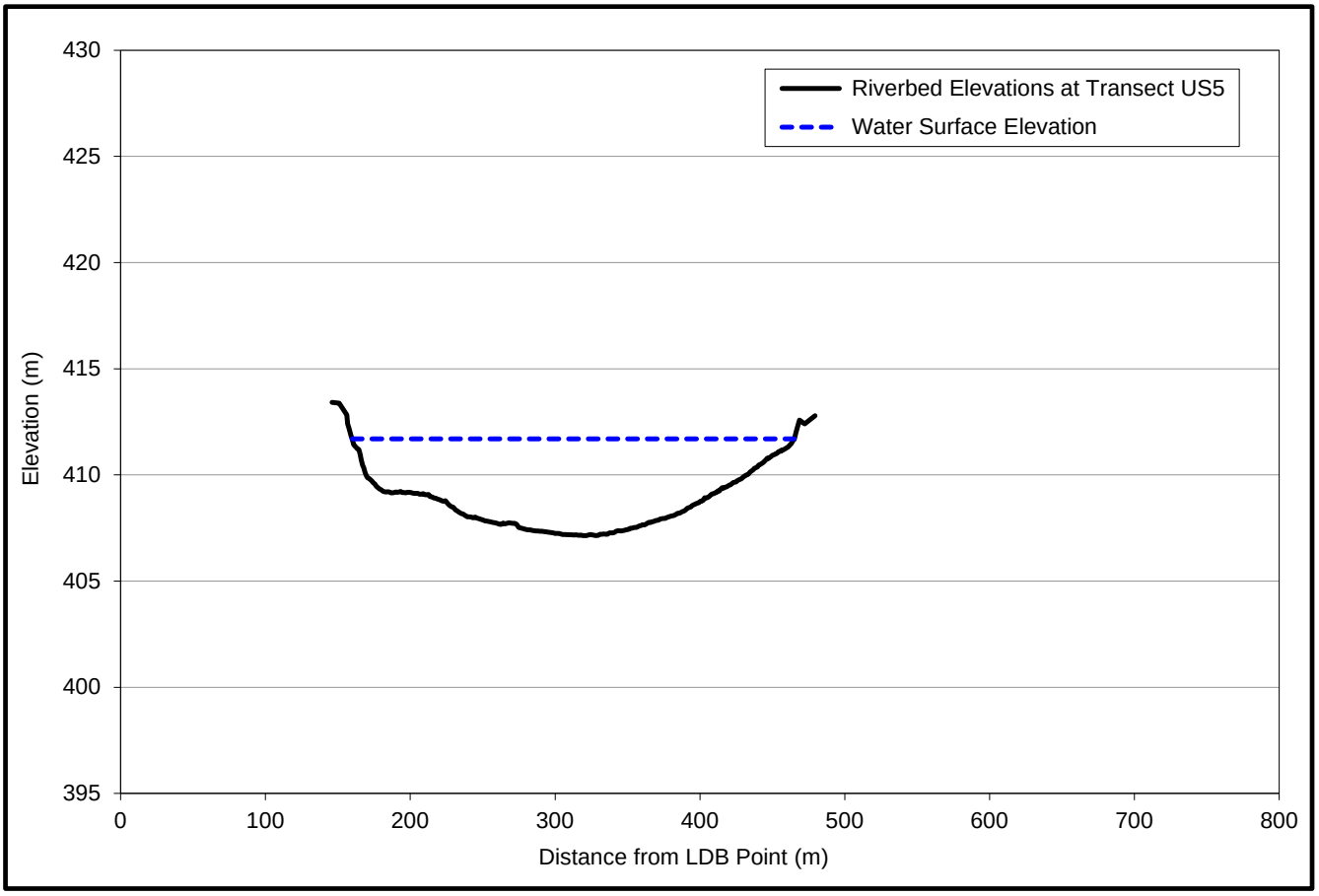

Figure 8: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US5, 2015.

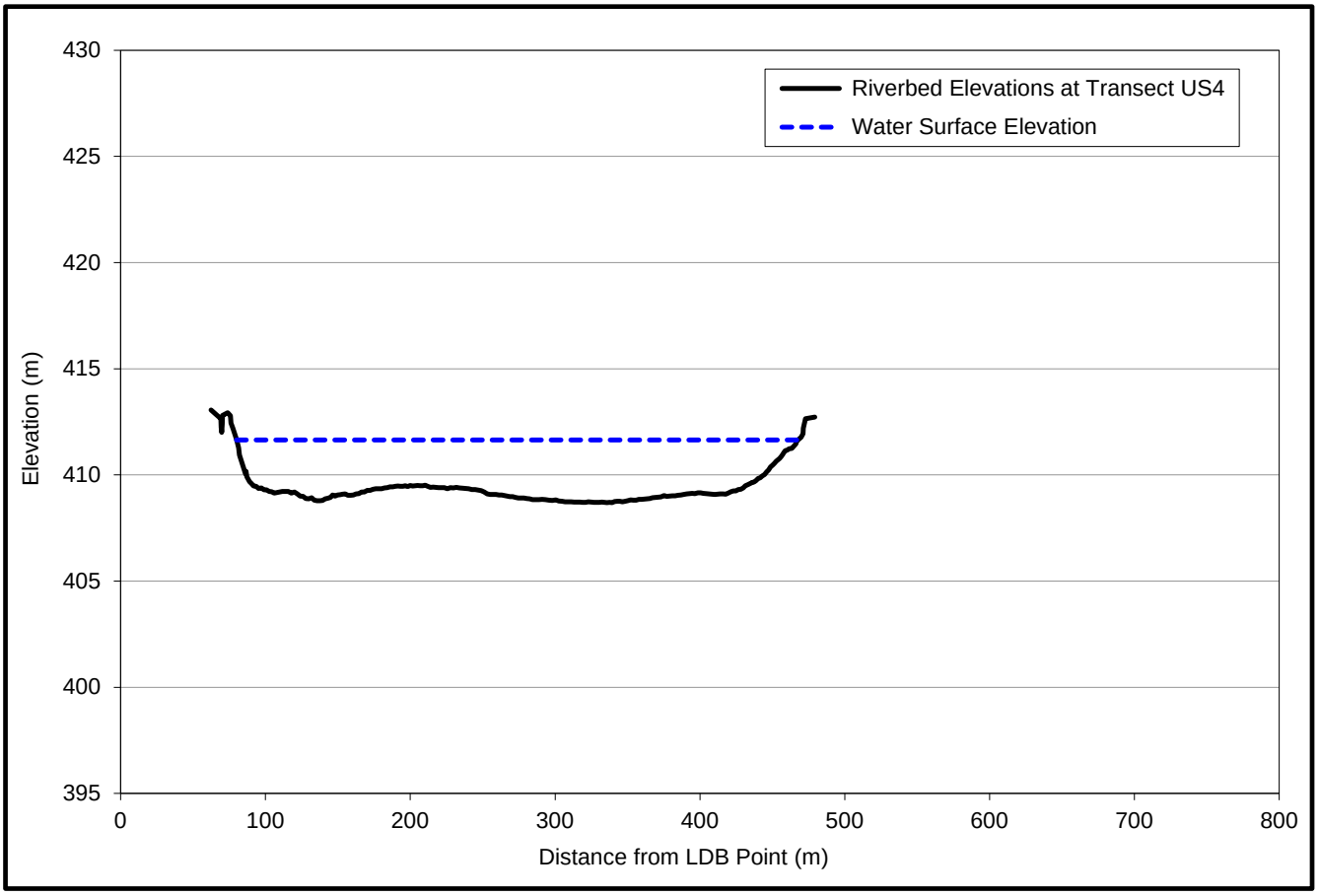

Figure 9: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US4, 2015.

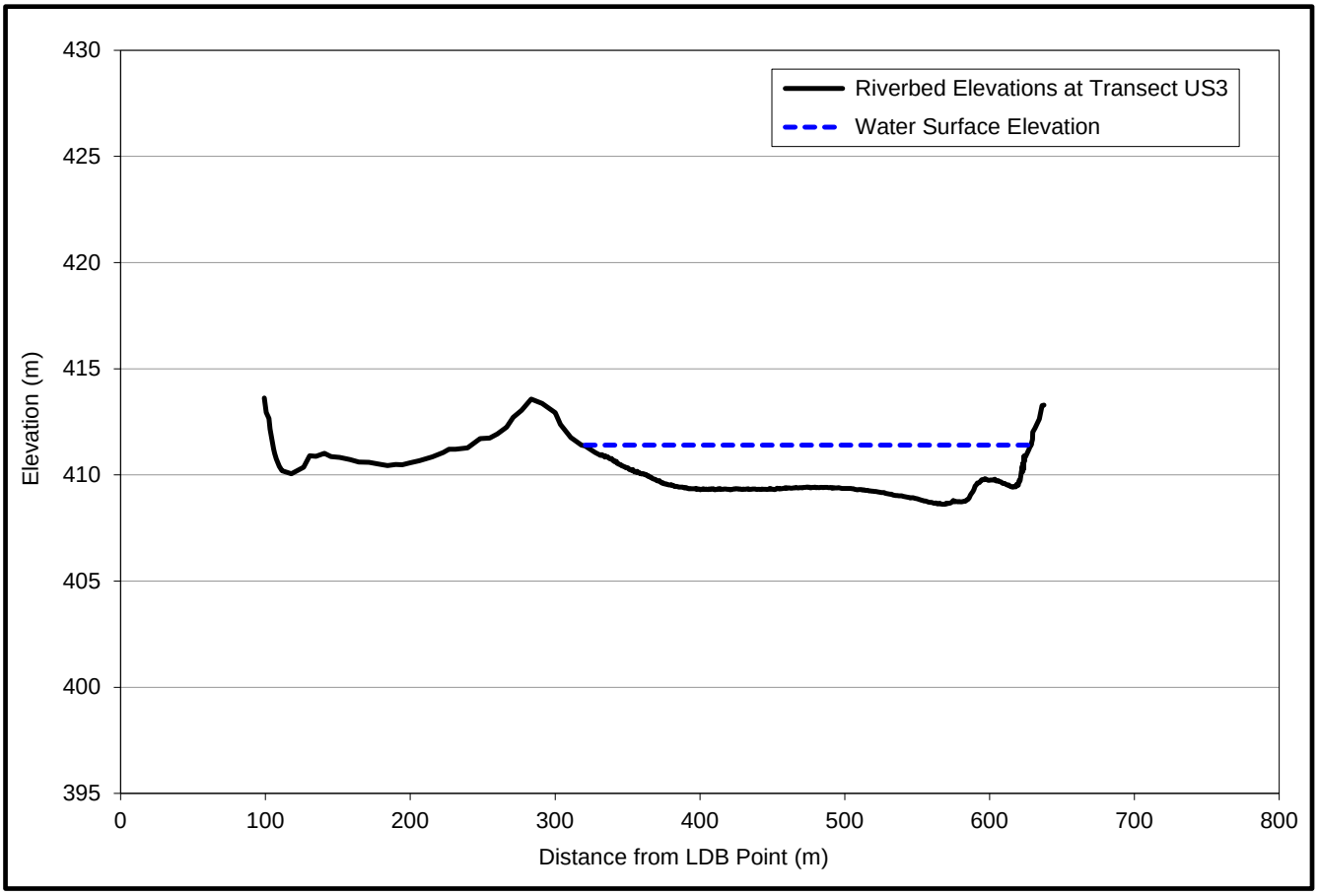

Figure 10: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US3, 2015.

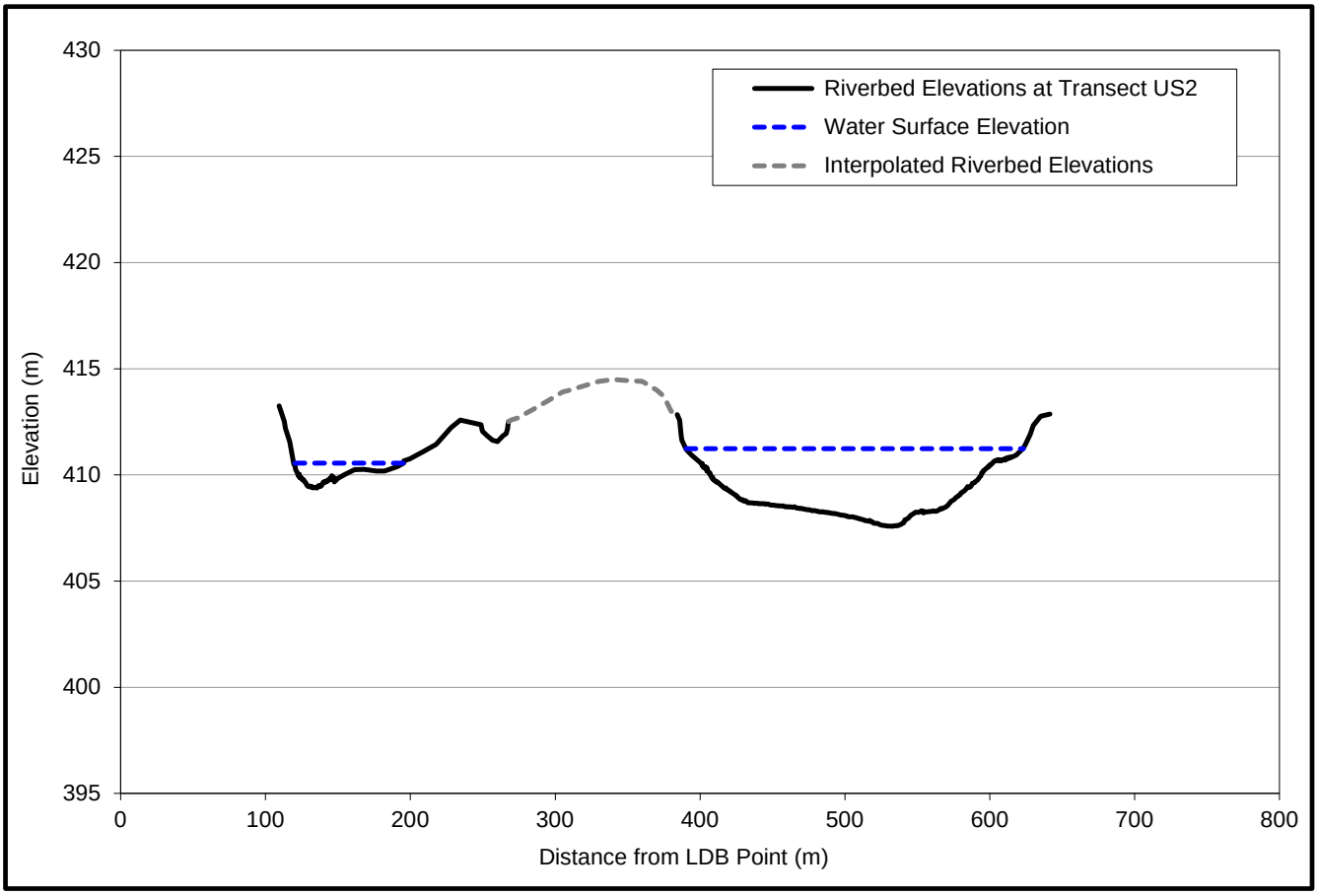

Figure 11: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US2, 2015.

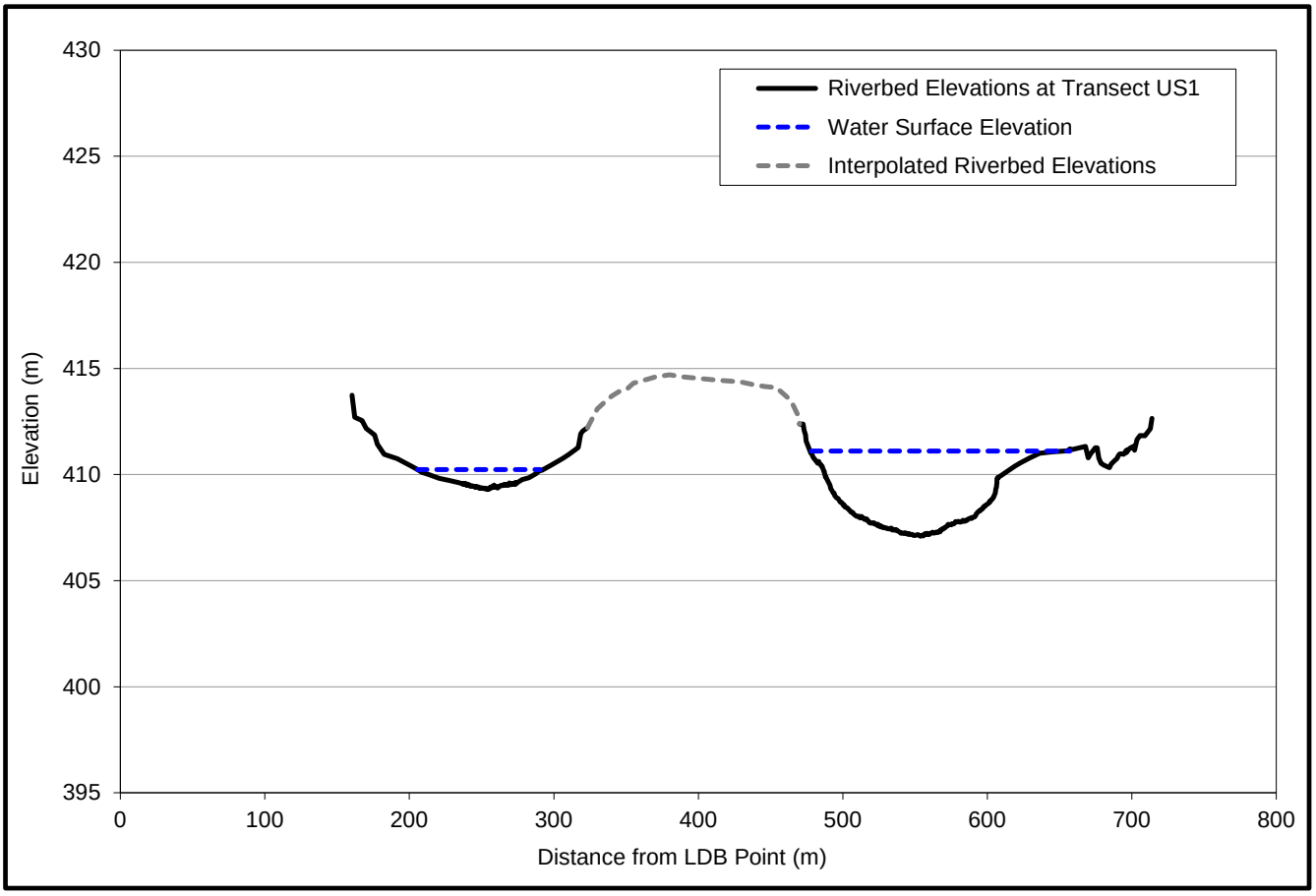

Figure 12: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect US1, 2015.

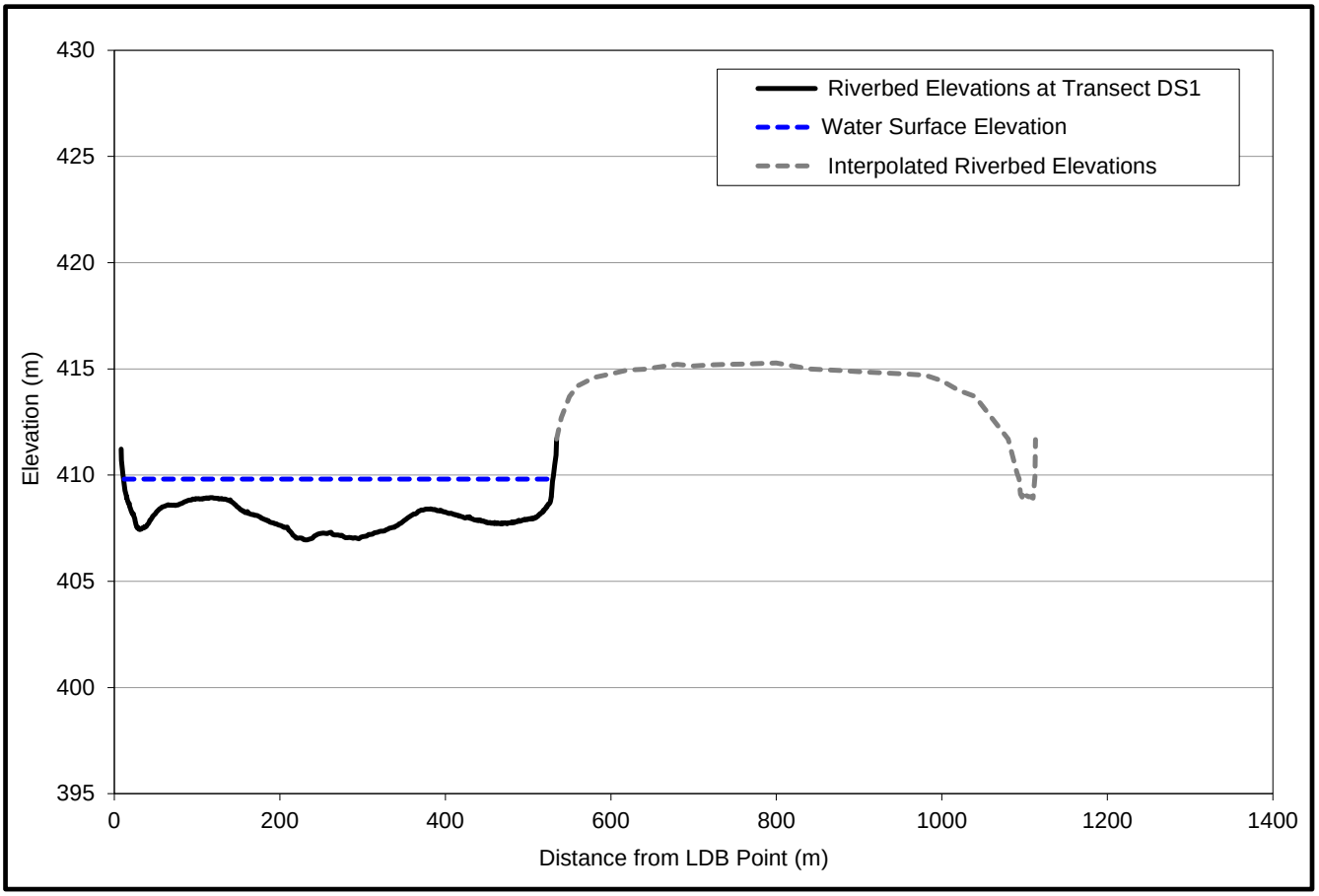

Figure 13: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS1, 2015.

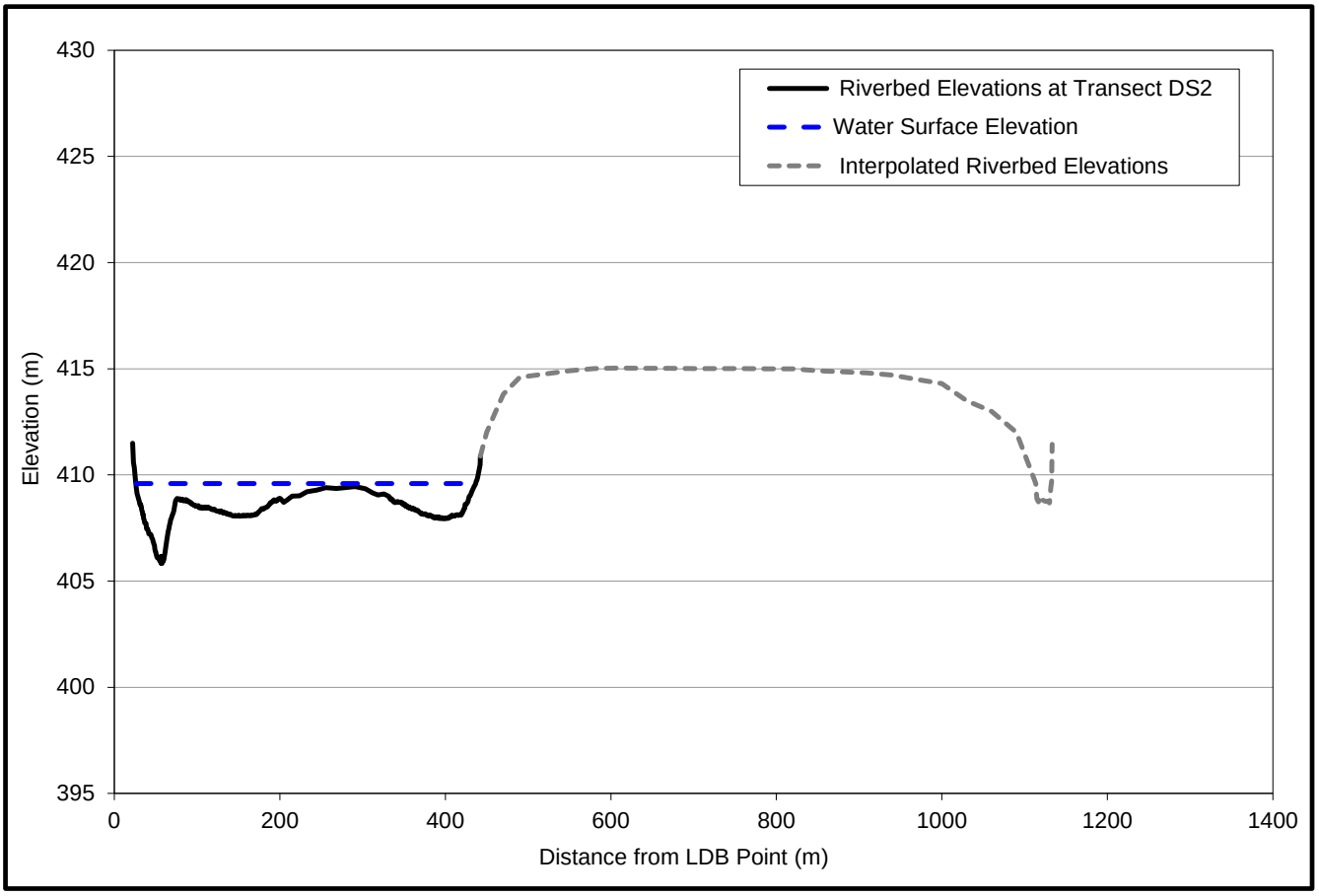

Figure 14: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS2, 2015.

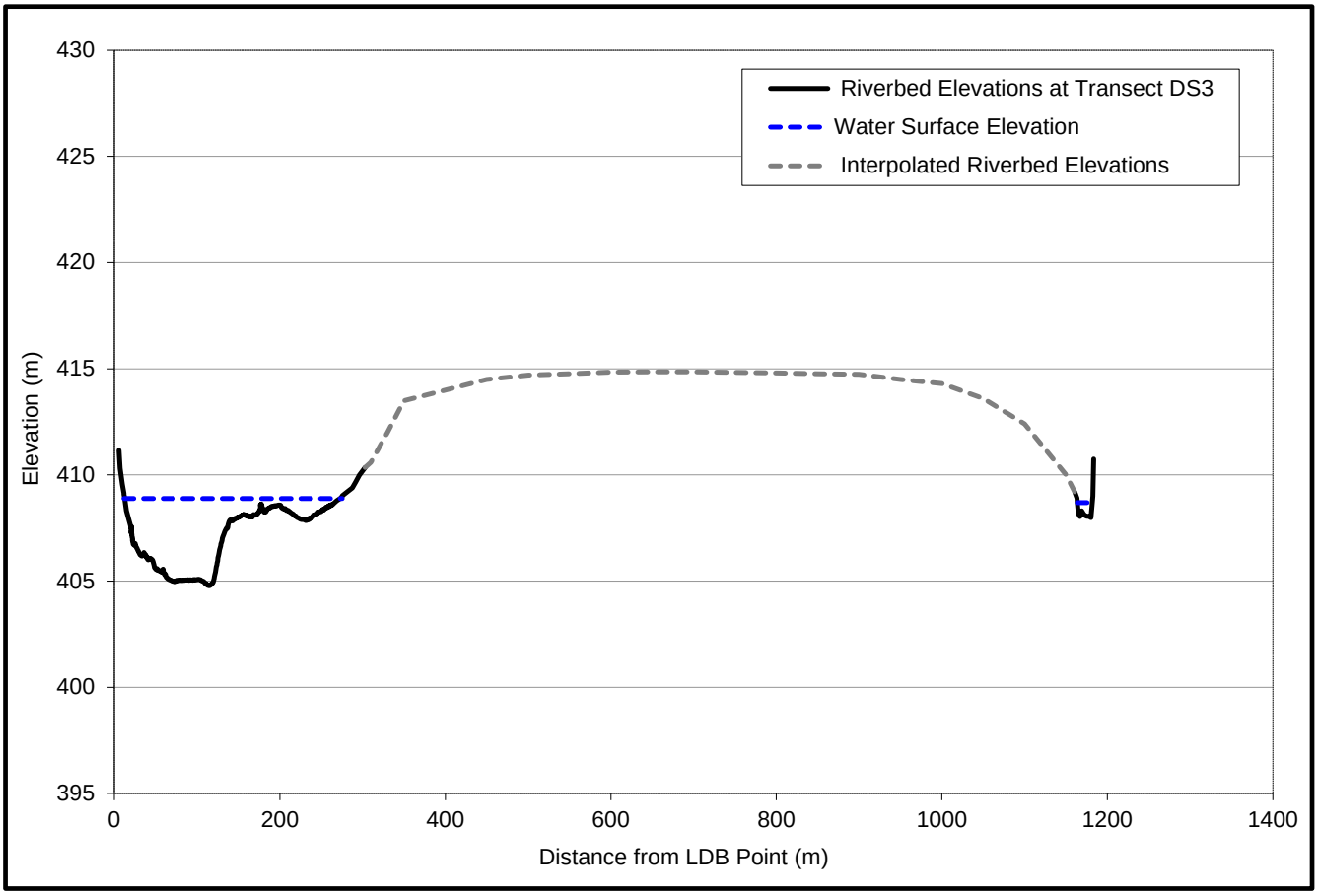

Figure 15: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS3, 2015.

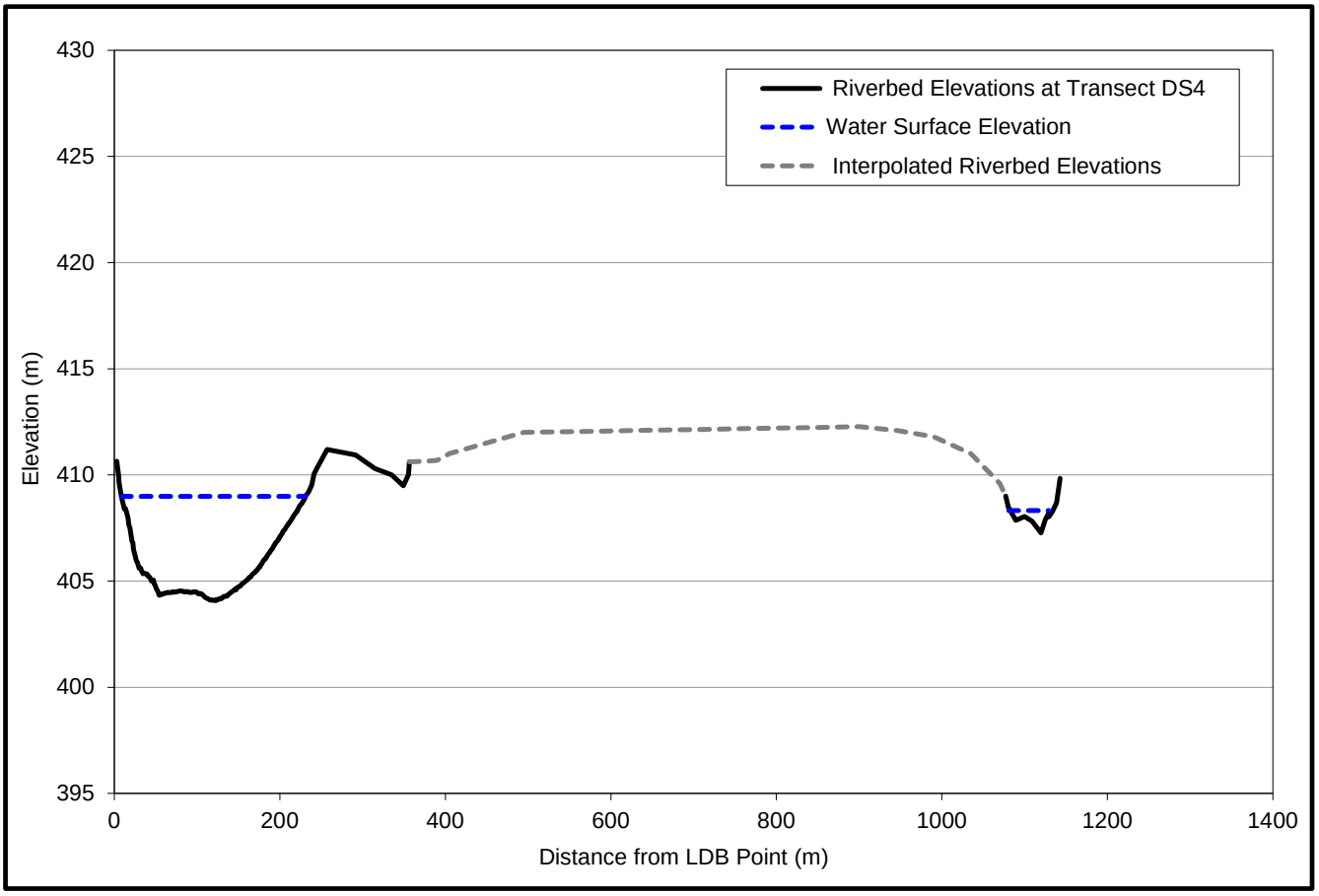

Figure 16: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS4, 2015.

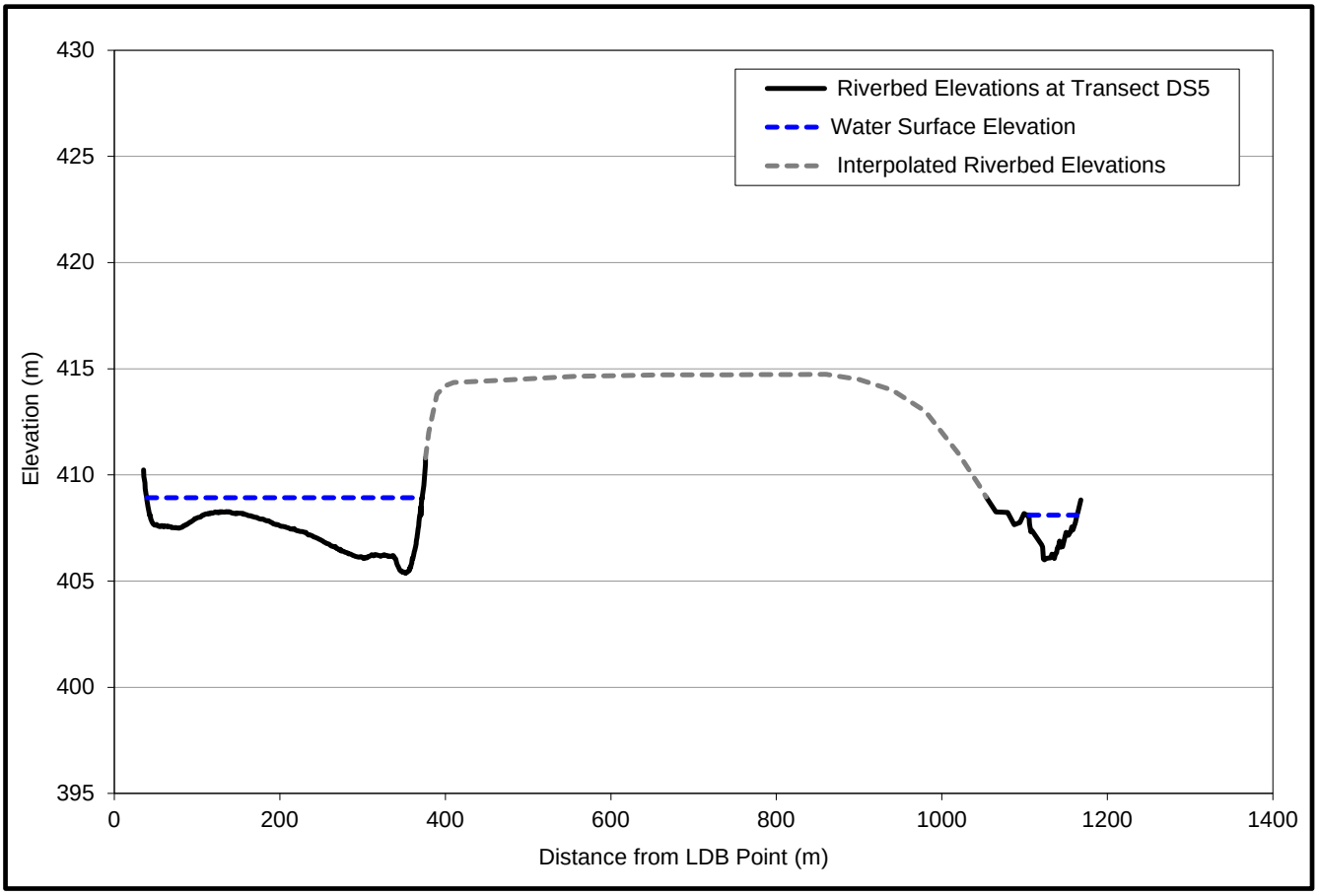

Figure 17: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS5, 2015.

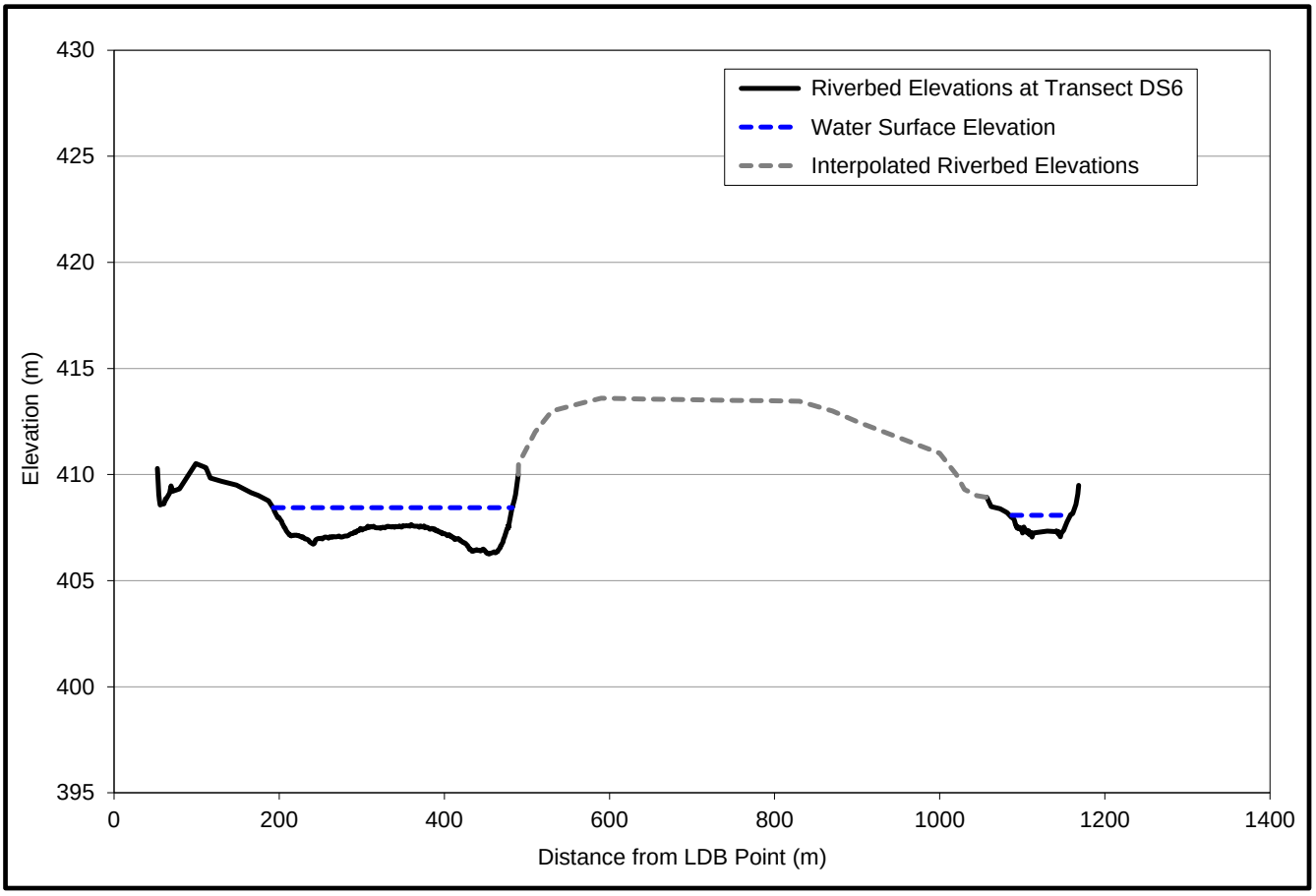

Figure 18: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS6, 2015.

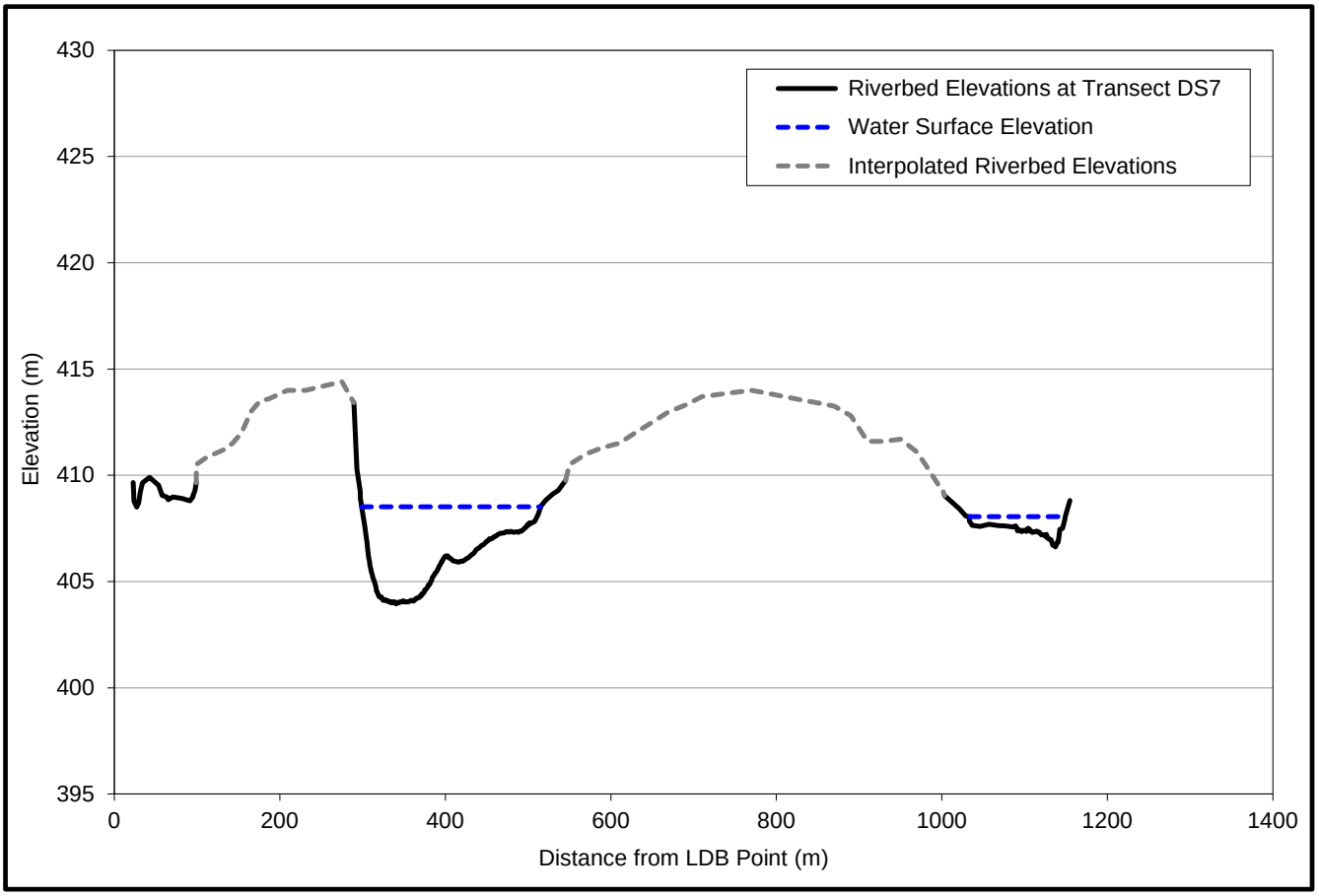

Figure 19: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS7, 2015.

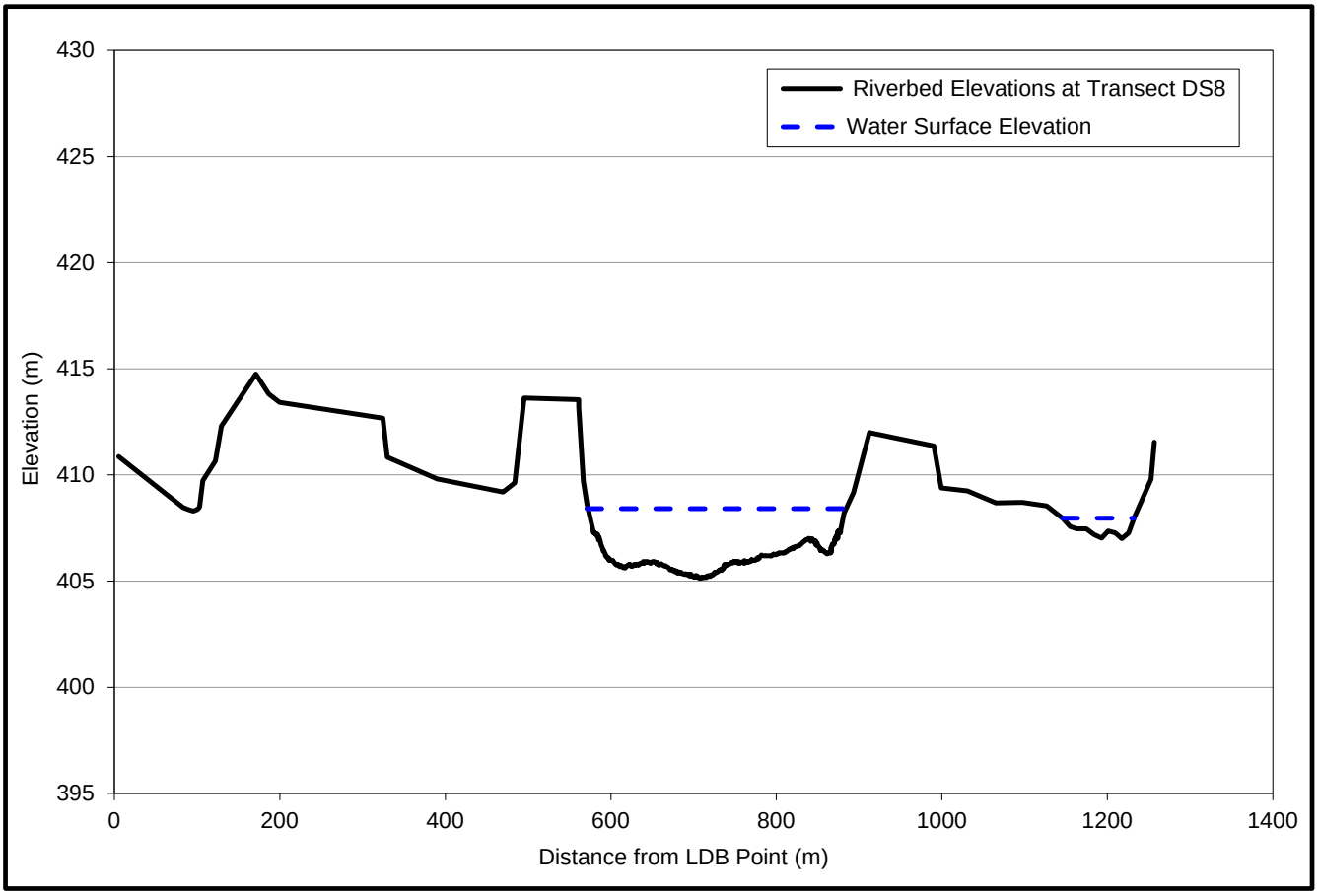

Figure 20: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS8, 2015.

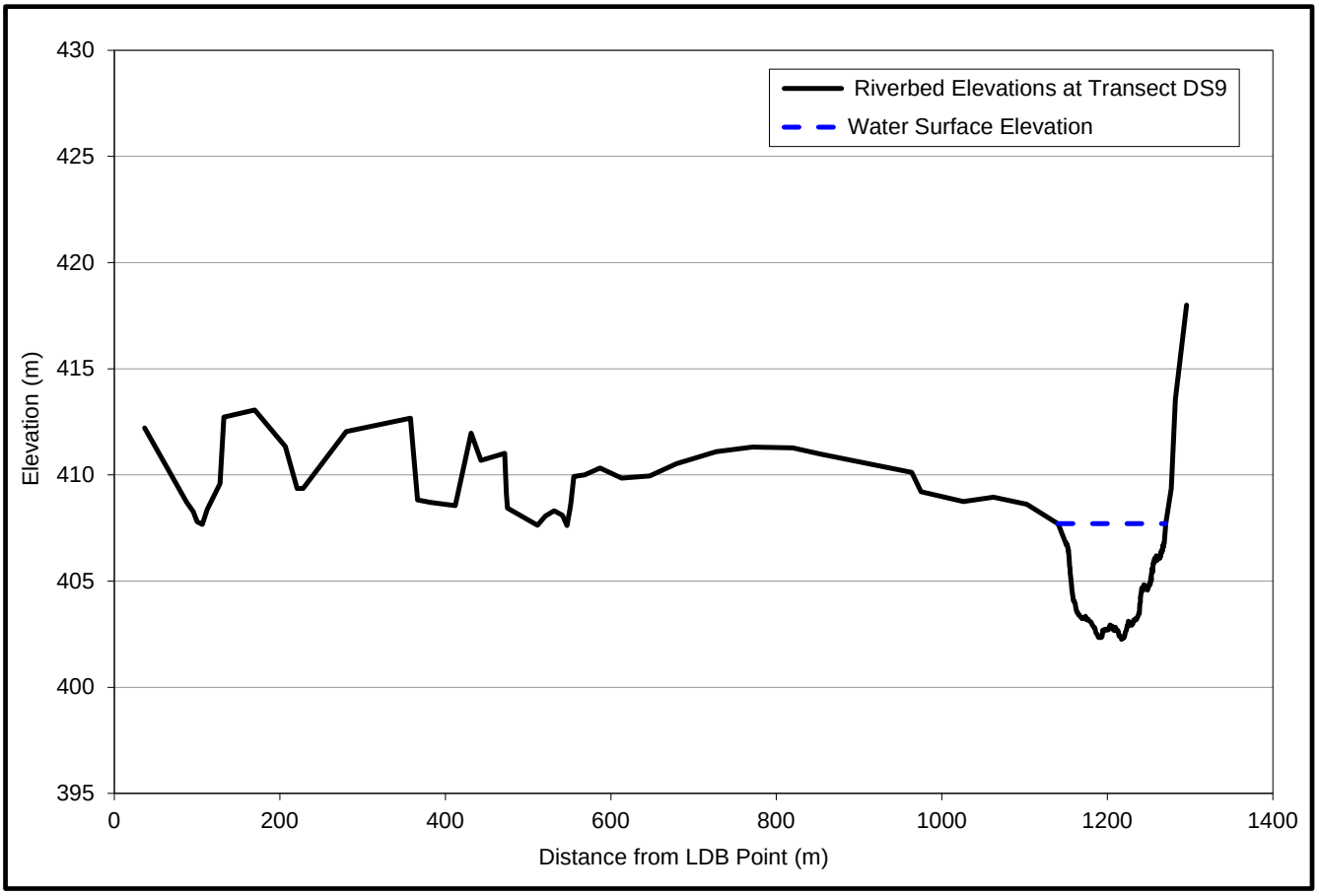

Figure 21: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS9, 2015.

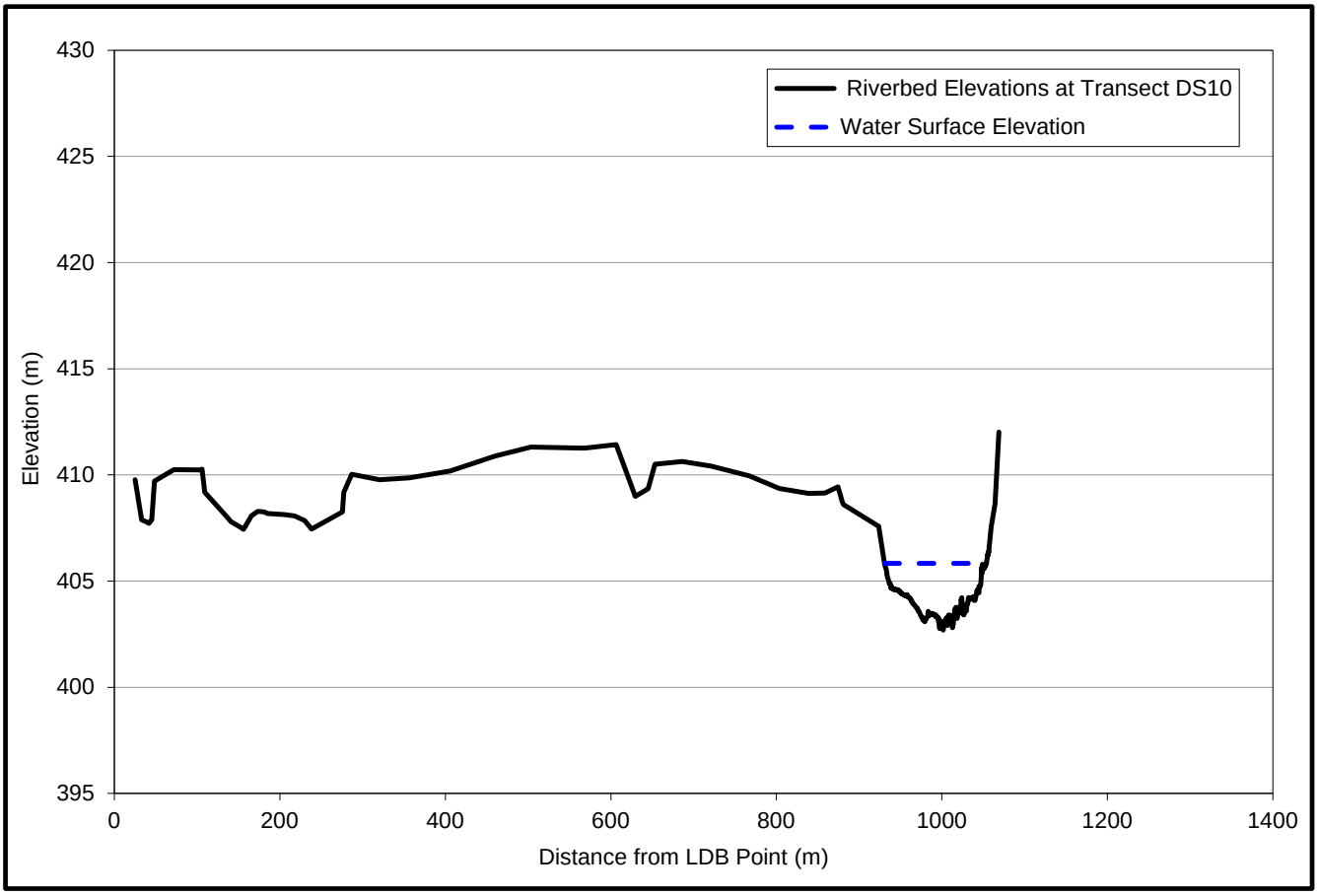

Figure 22: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS10, 2015.

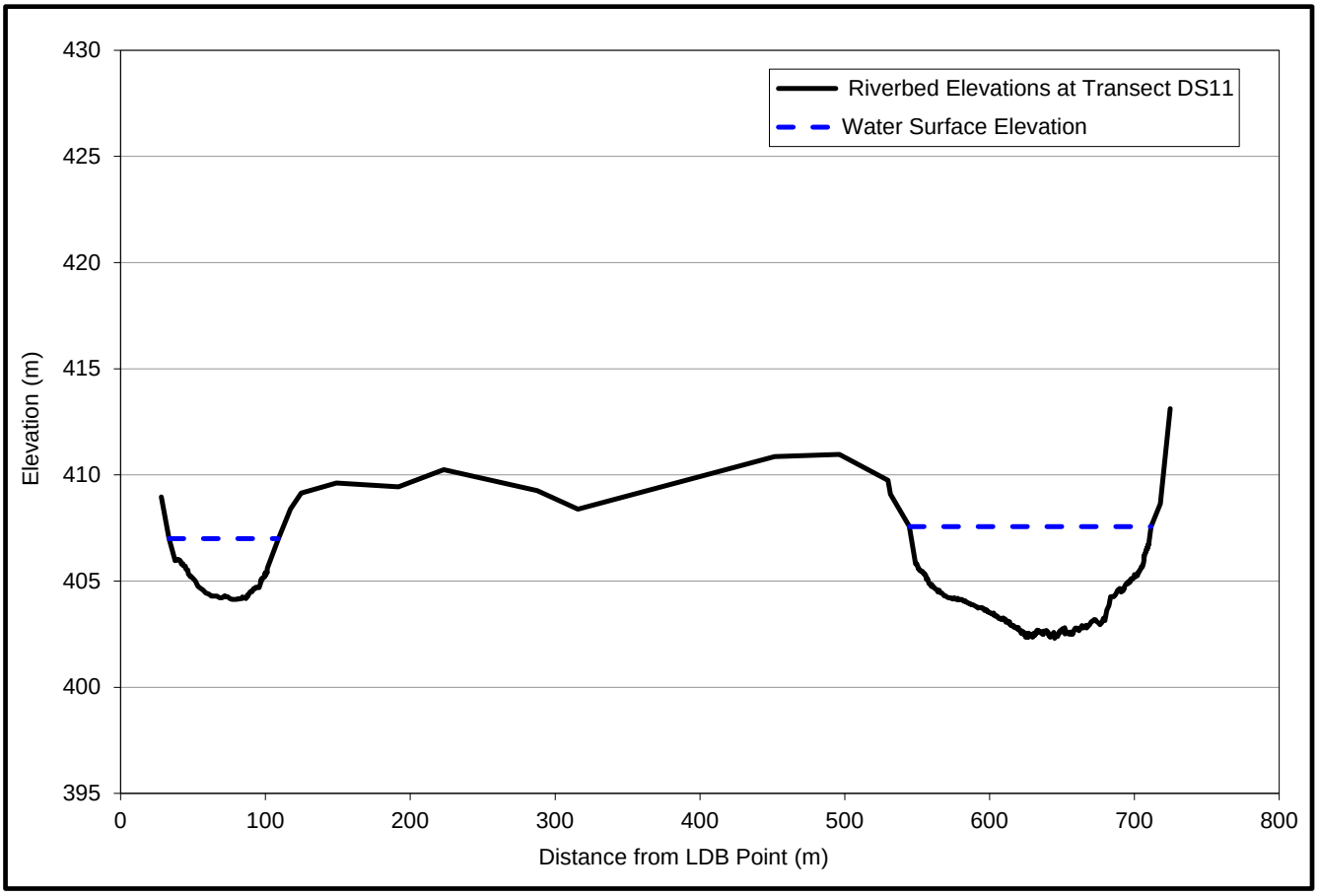

Figure 23: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS11, 2015.

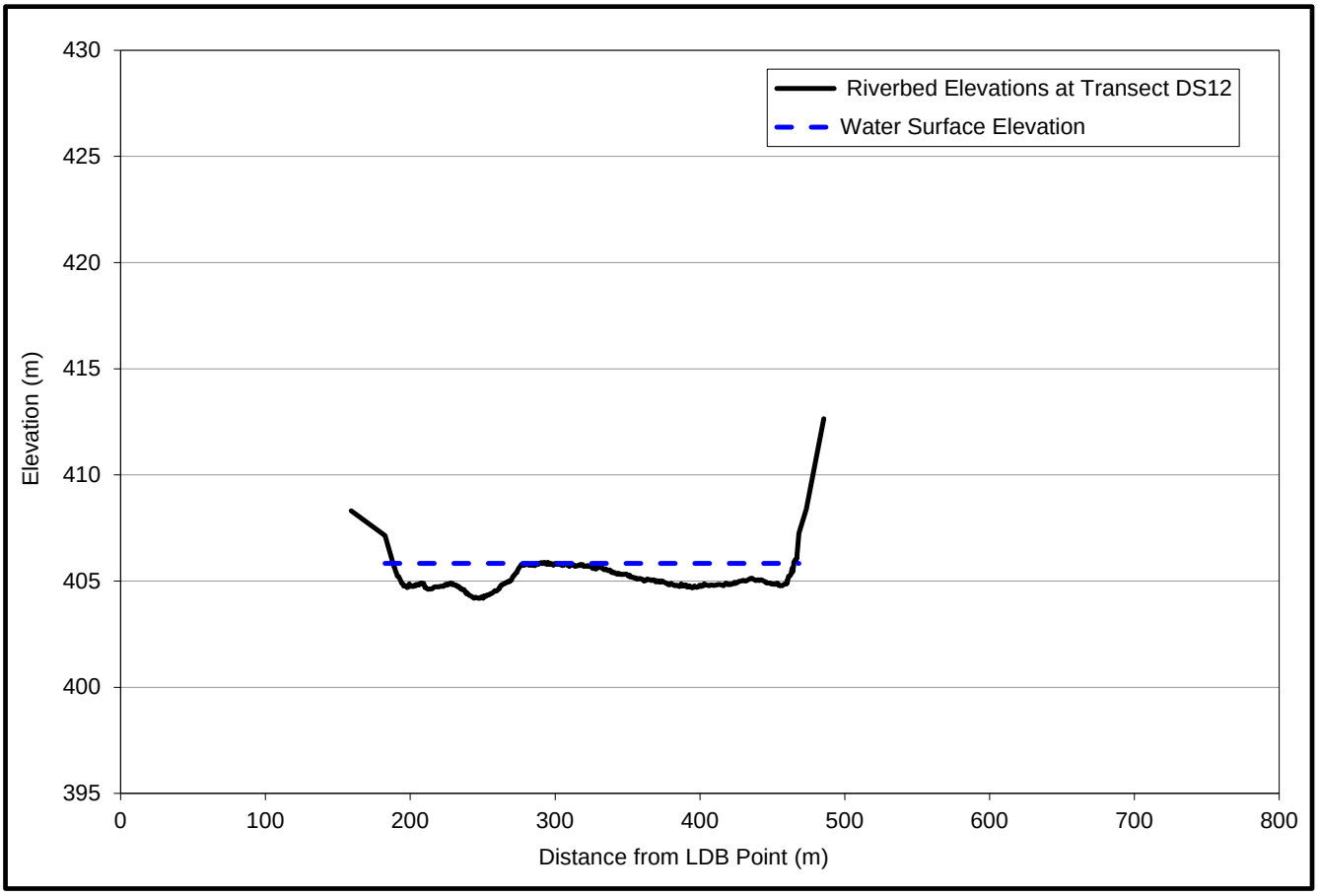

Figure 24: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS12, 2015.

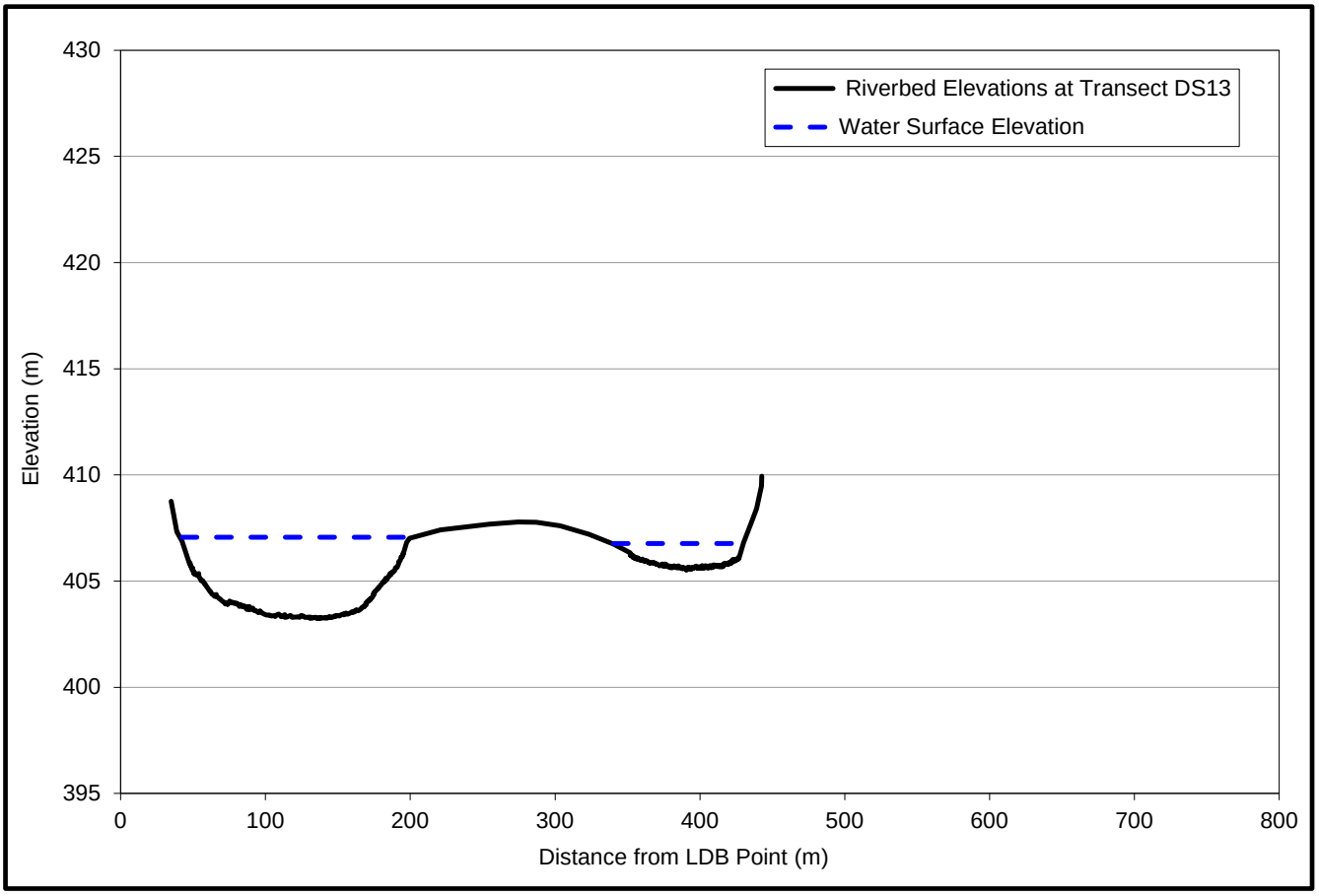

Figure 25: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS13, 2015.

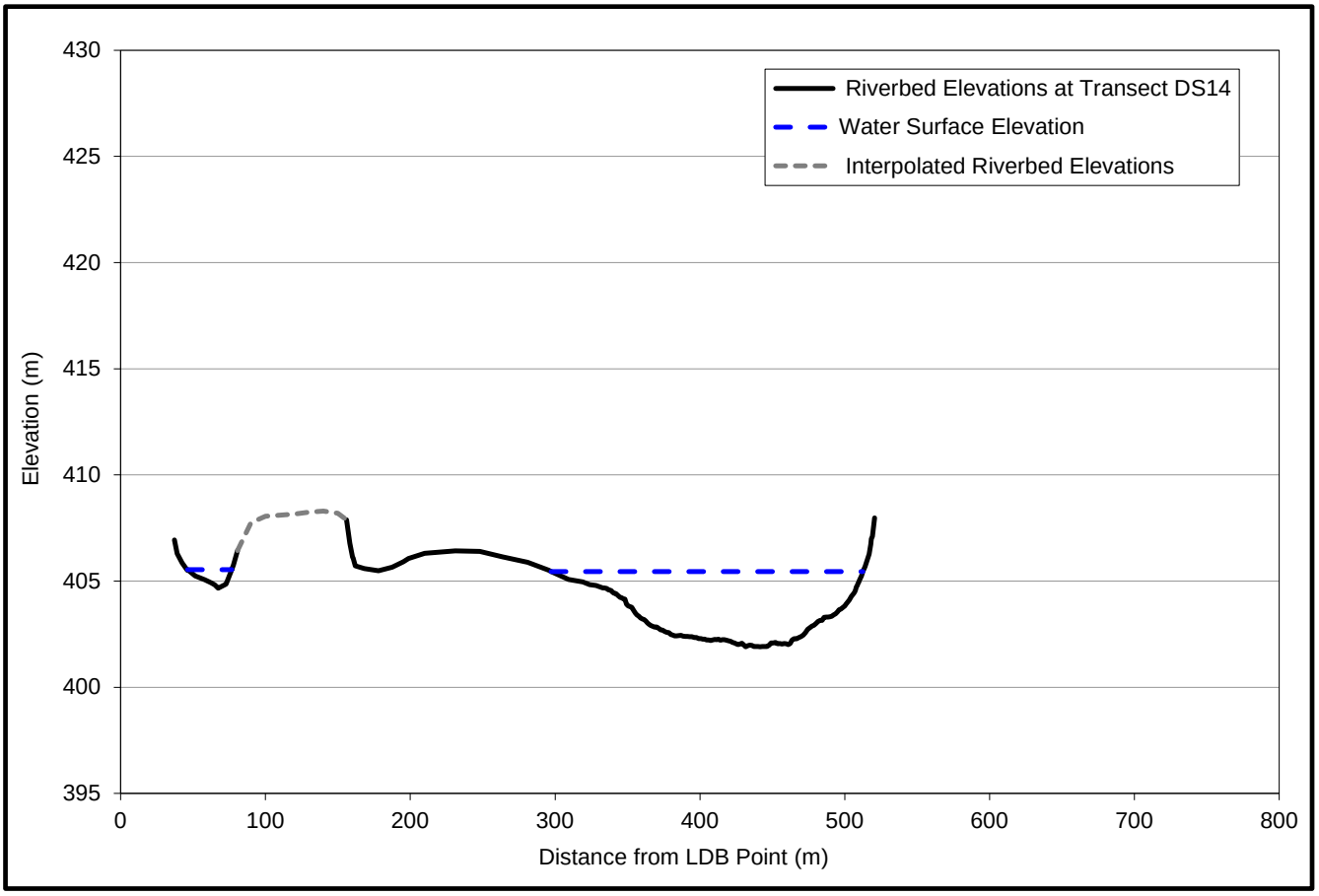

Figure 26: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS14, 2015.

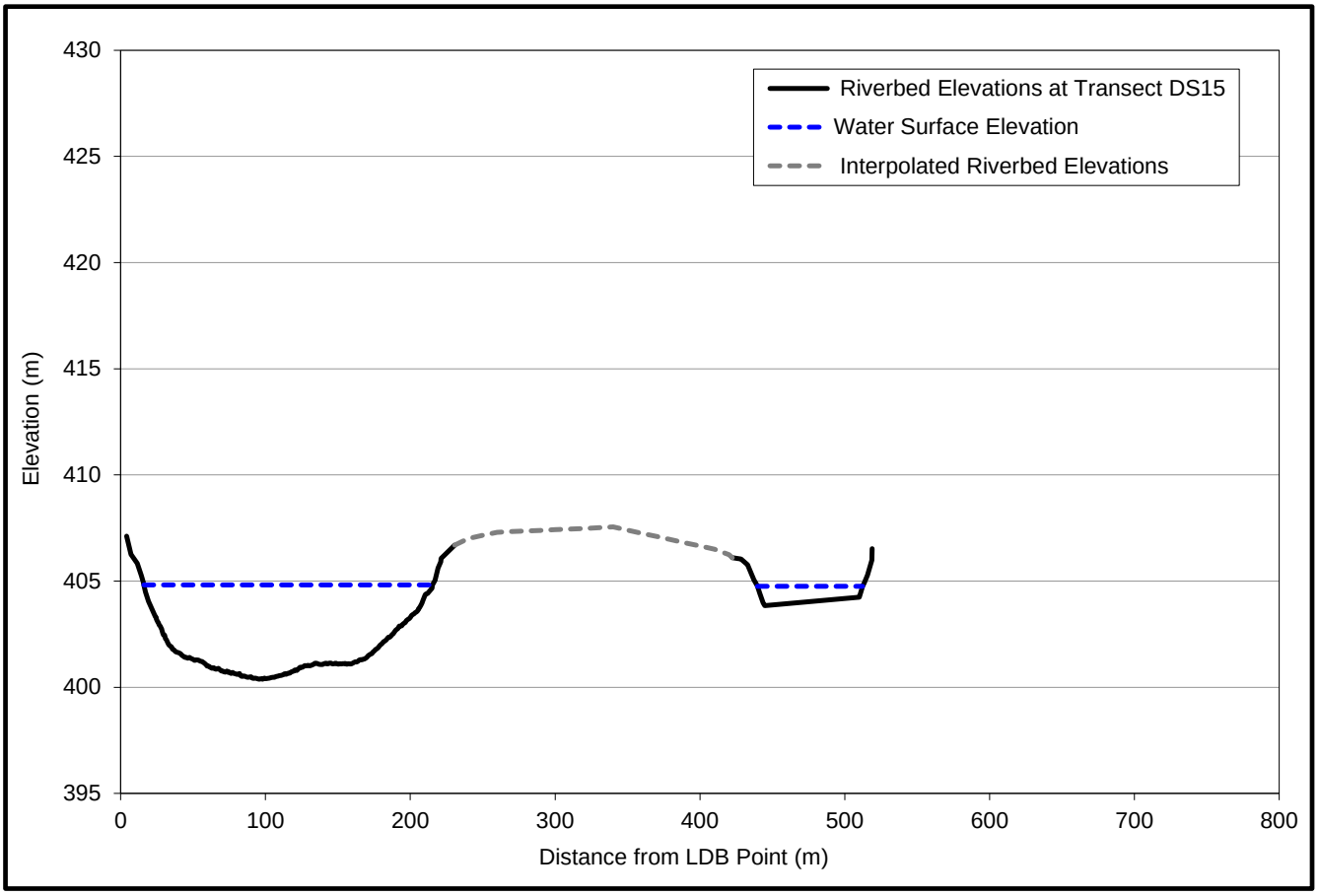

Figure 27: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS15, 2015.

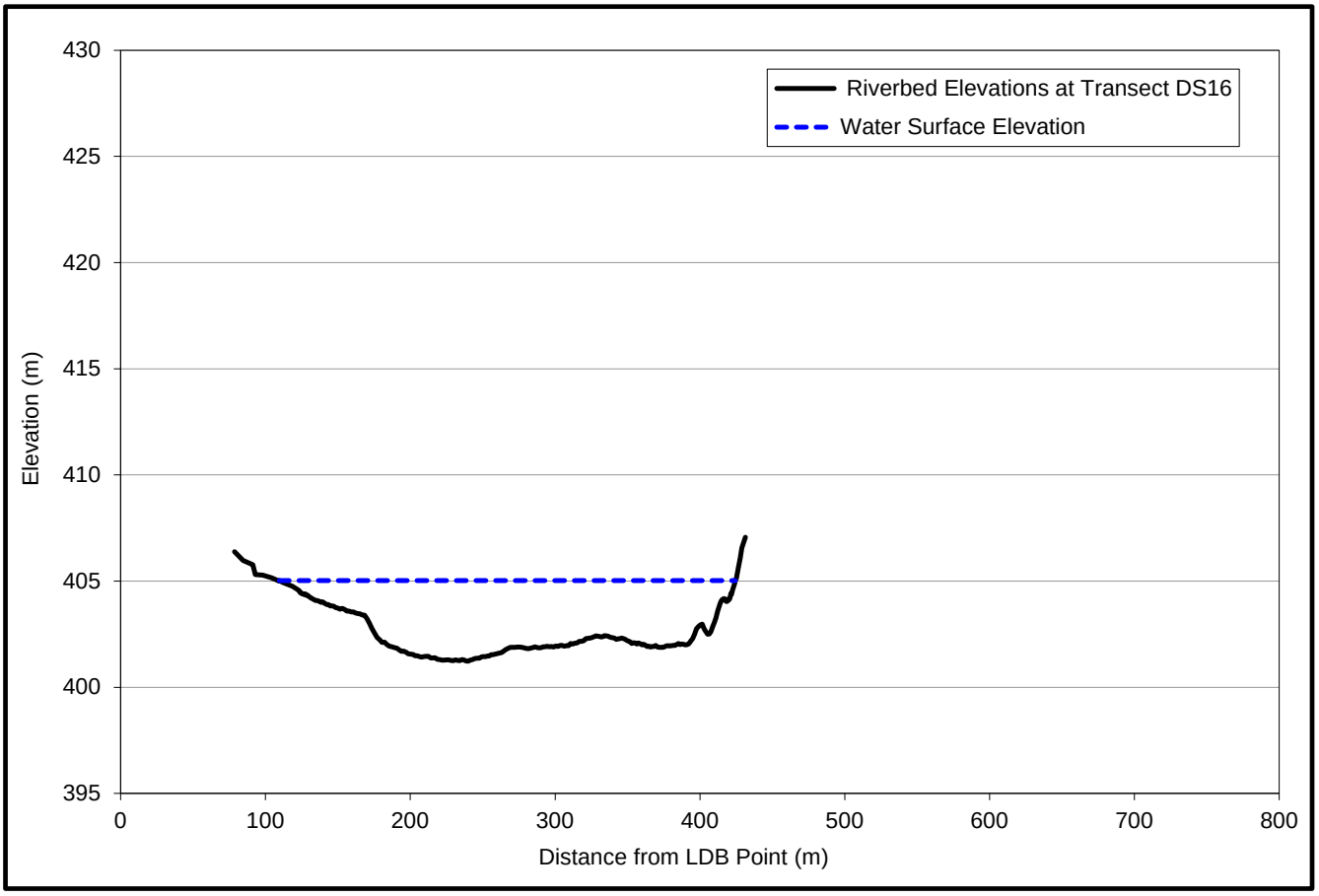

Figure 28: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS16, 2015.

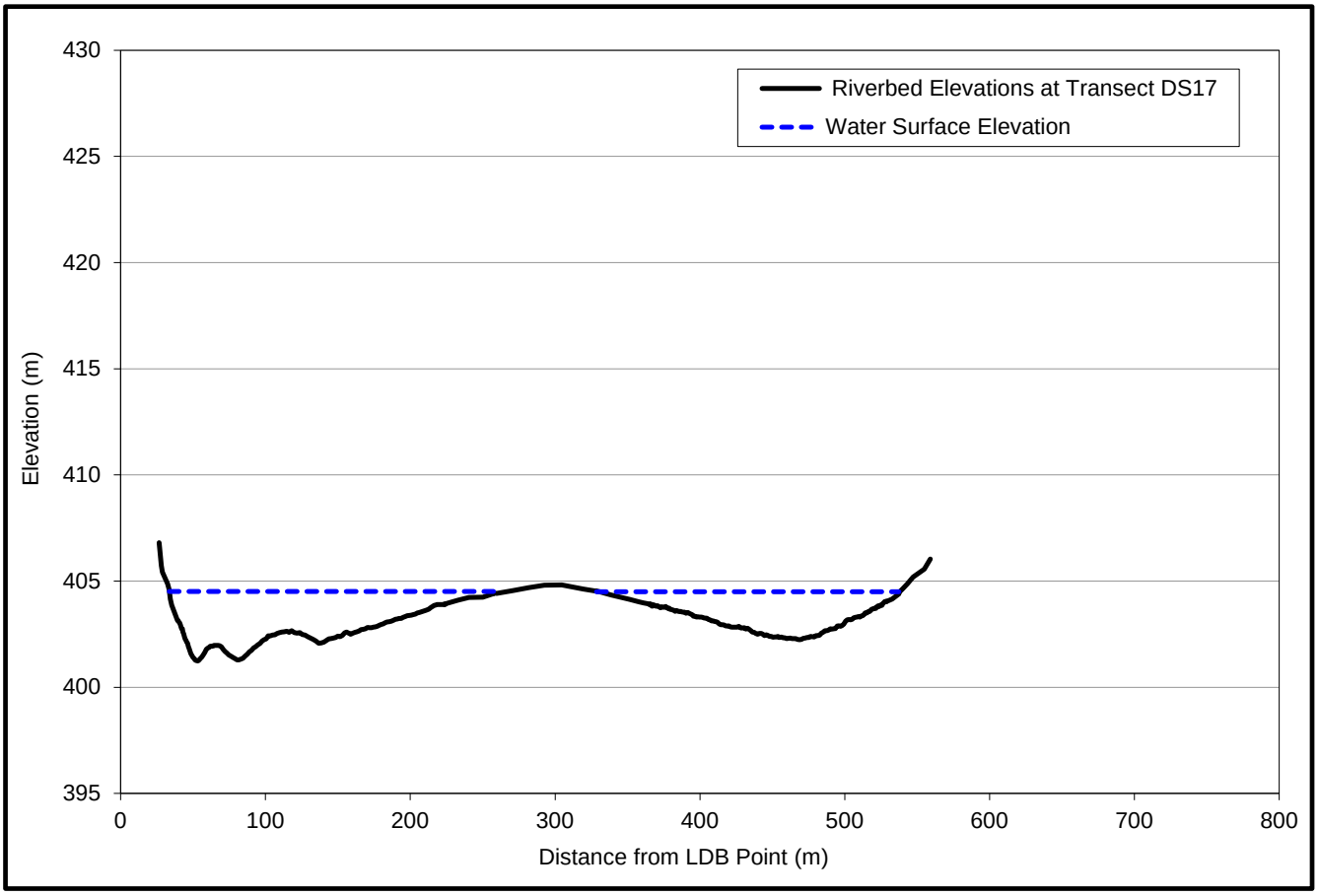

Figure 29: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS17, 2015.

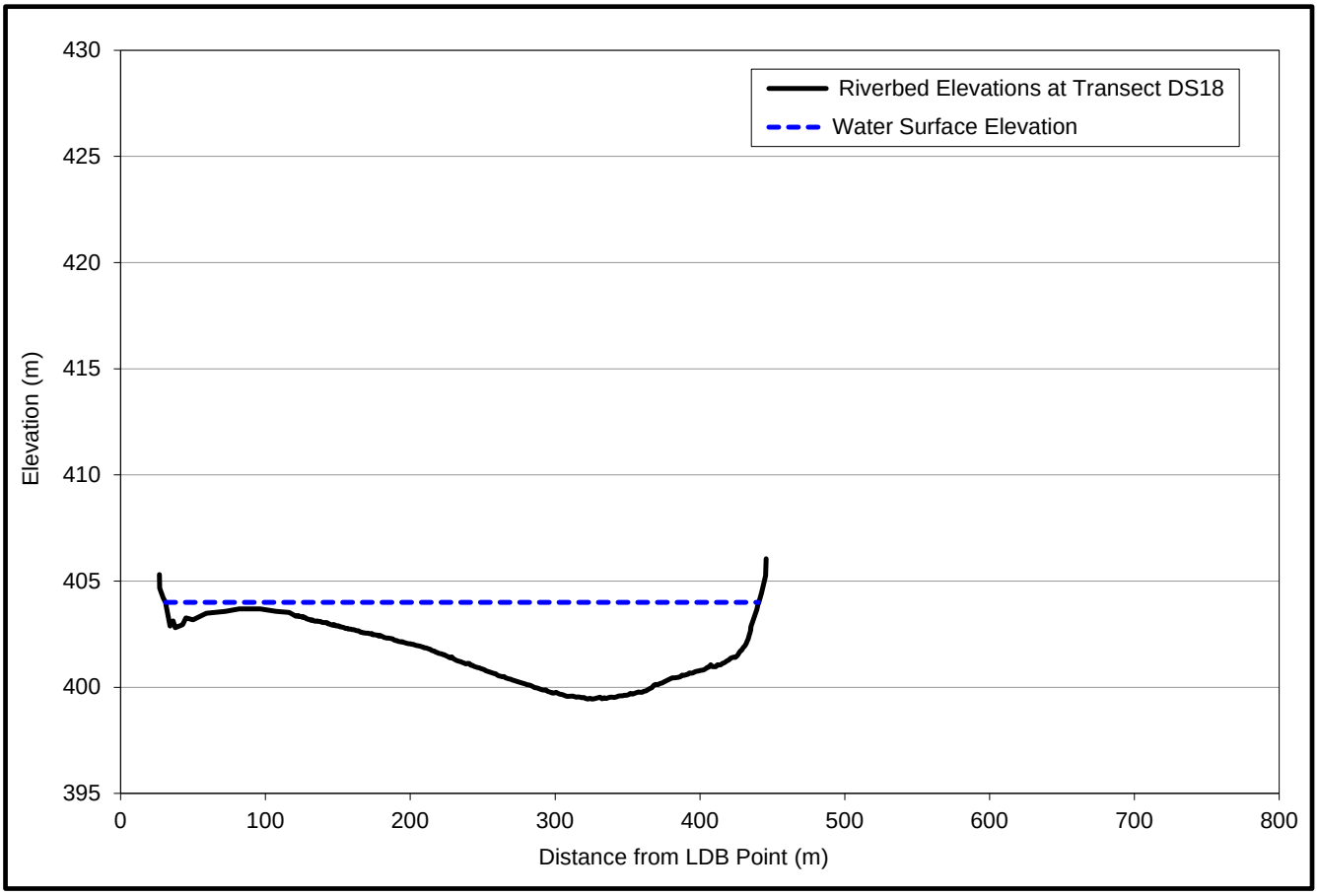

Figure 30: Cross section survey results for BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3) at Transect DS18, 2015.

3.2 Grain Size Measurements (Pebble Count)

Grain size measurements were collected at 34 sample plots located at or in the vicinity of sampled cross section profiles. For each sample plot, three charts were produced based on pebble count data showing the grain size distribution, the 16th, 35th, 50th 84th and 90th percentile size classes, and the percent of material by substrate type.

Grain size measurement sample plot locations are shown in Maps 1 to 9 (attached), and data are shown by specific sample plot locations in Figure 31 to Figure 57. The dominant substrate material for study area was gravel (70% of the sizes sampled). Gravel-sized material at sample plot locations were typically medium to very coarse gravel. The sub-dominant material was cobble (28% of the sizes sampled). The cobble-sized material were typically small to medium cobble. The remaining sediments (2% of the measurements collected) were mostly sand-sized with some silt and clay. Larger materials such as large cobble and boulder were not typical for the surveyed area but were found in some sample plot locations.

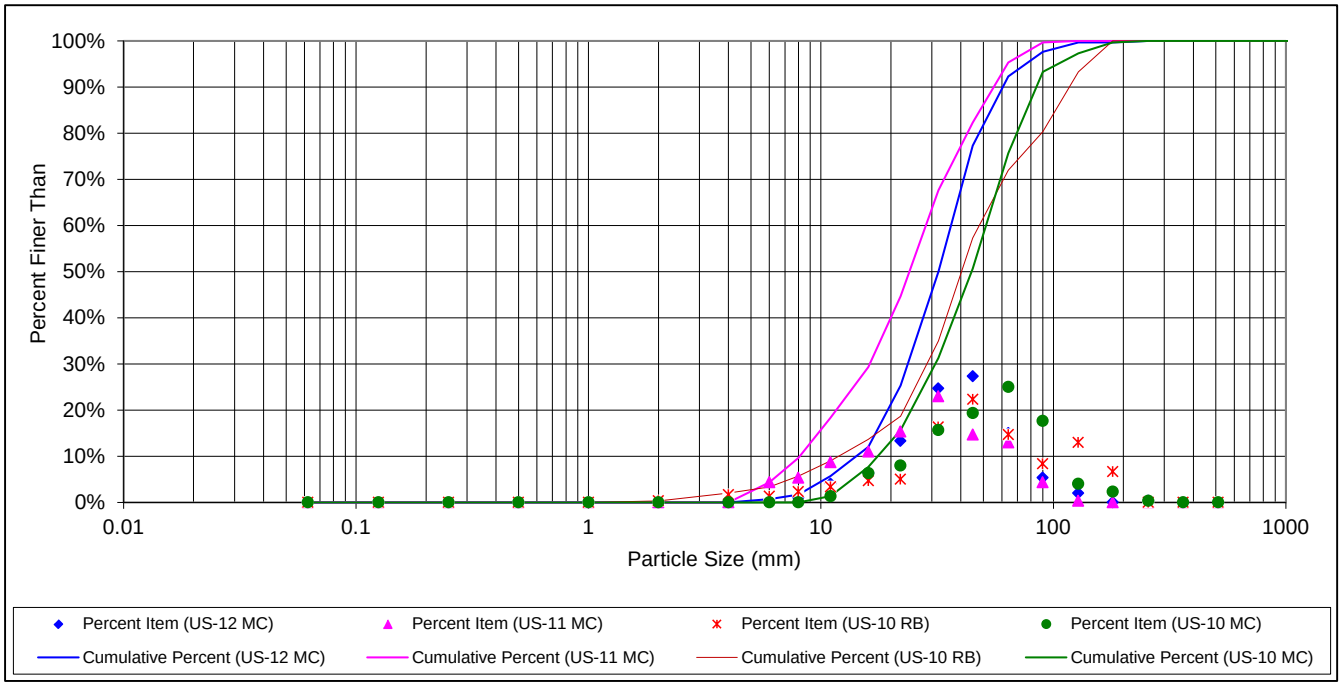

Figure 31: Grain size distribution at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-12 MC, US-11 MC, US-10 RB, and US-10 MC.

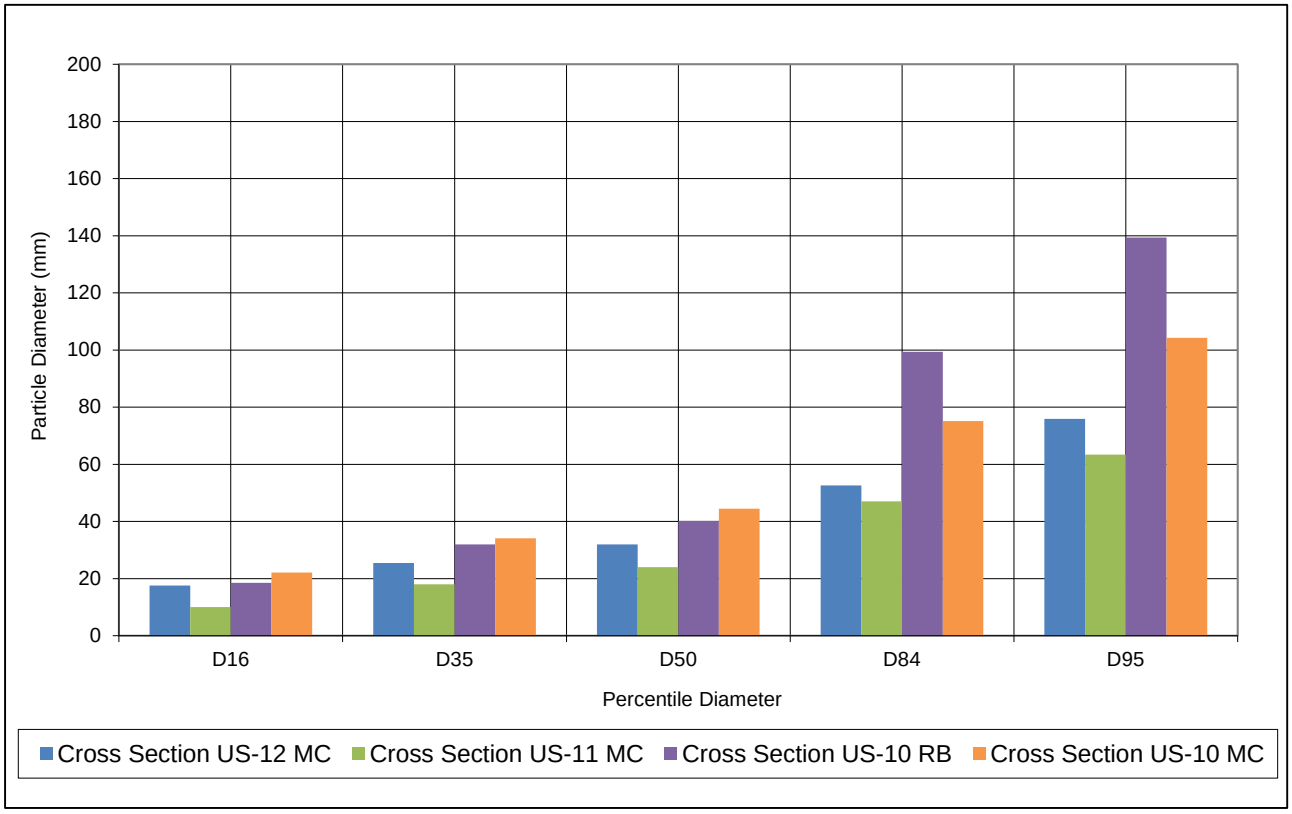

Figure 32: Sample percentile diameter at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-12 MC, US-11 MC, US-10 RB, and US-10 MC.

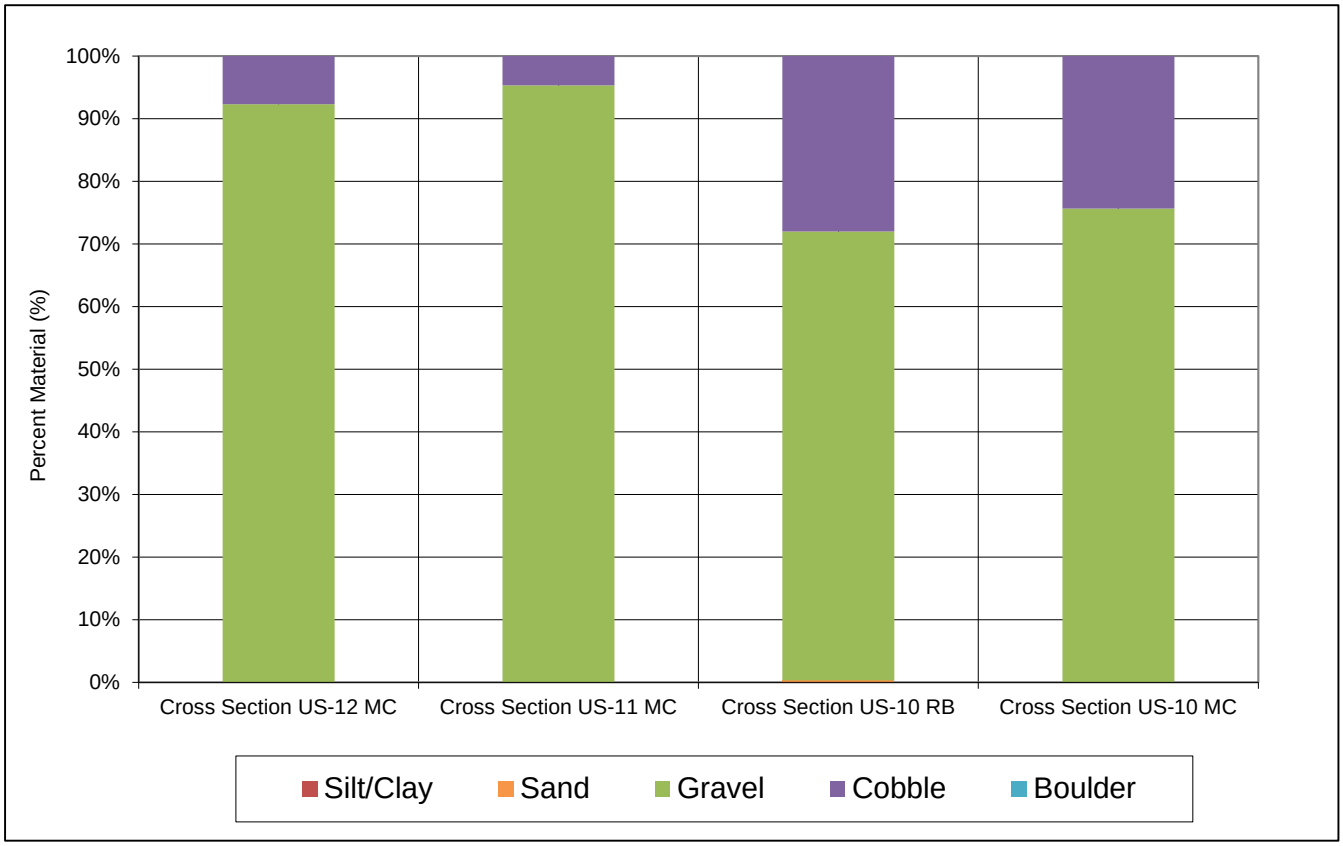

Figure 33: Percent Material by Substrate Type at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-12 MC, US-11 MC, US-10 RB, and US-10 MC.

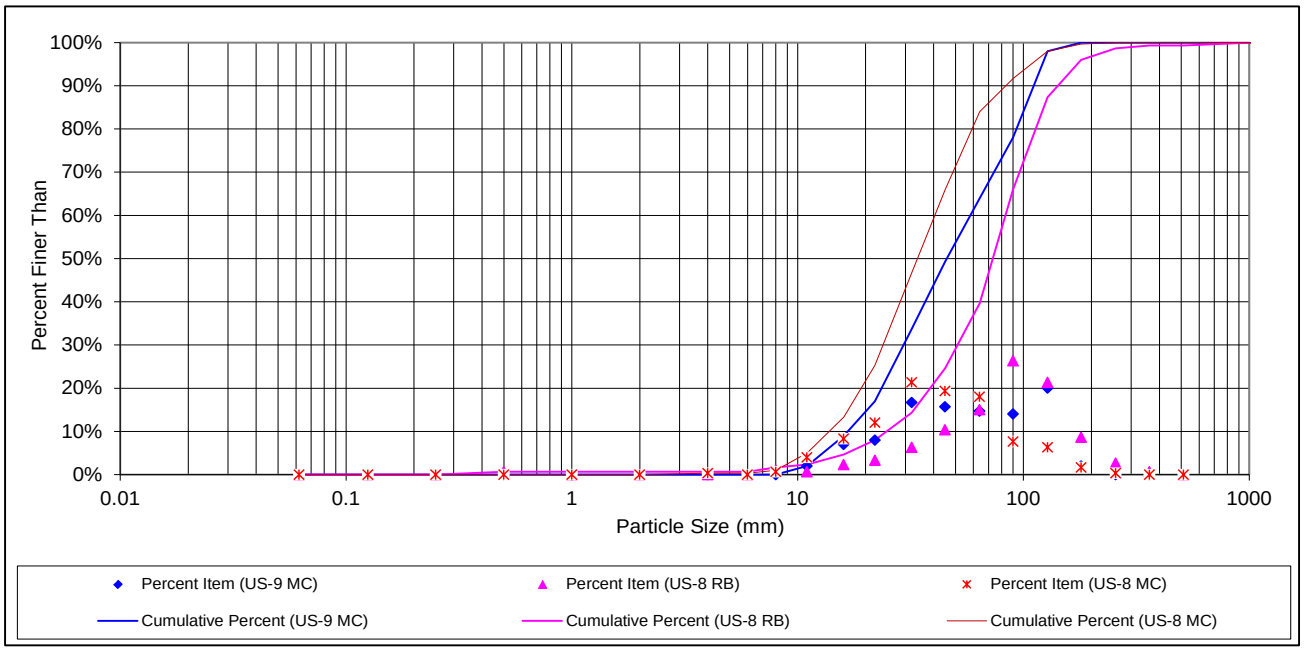

Figure 34: Grain size distribution at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-9 MC, US-8 RB, and US-8 MC.

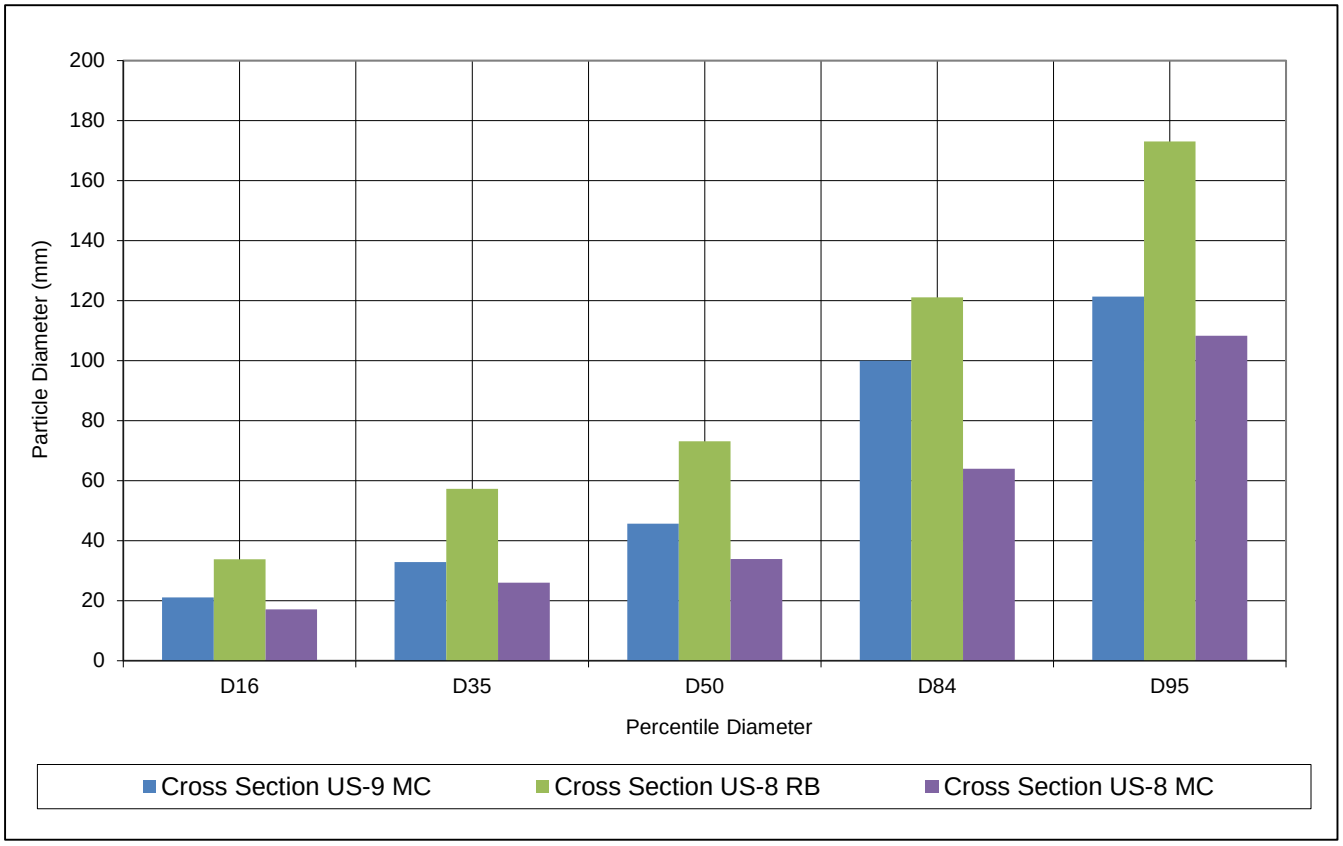

Figure 35: Sample percentile diameter at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-9 MC, US-8 RB, and US-8 MC.

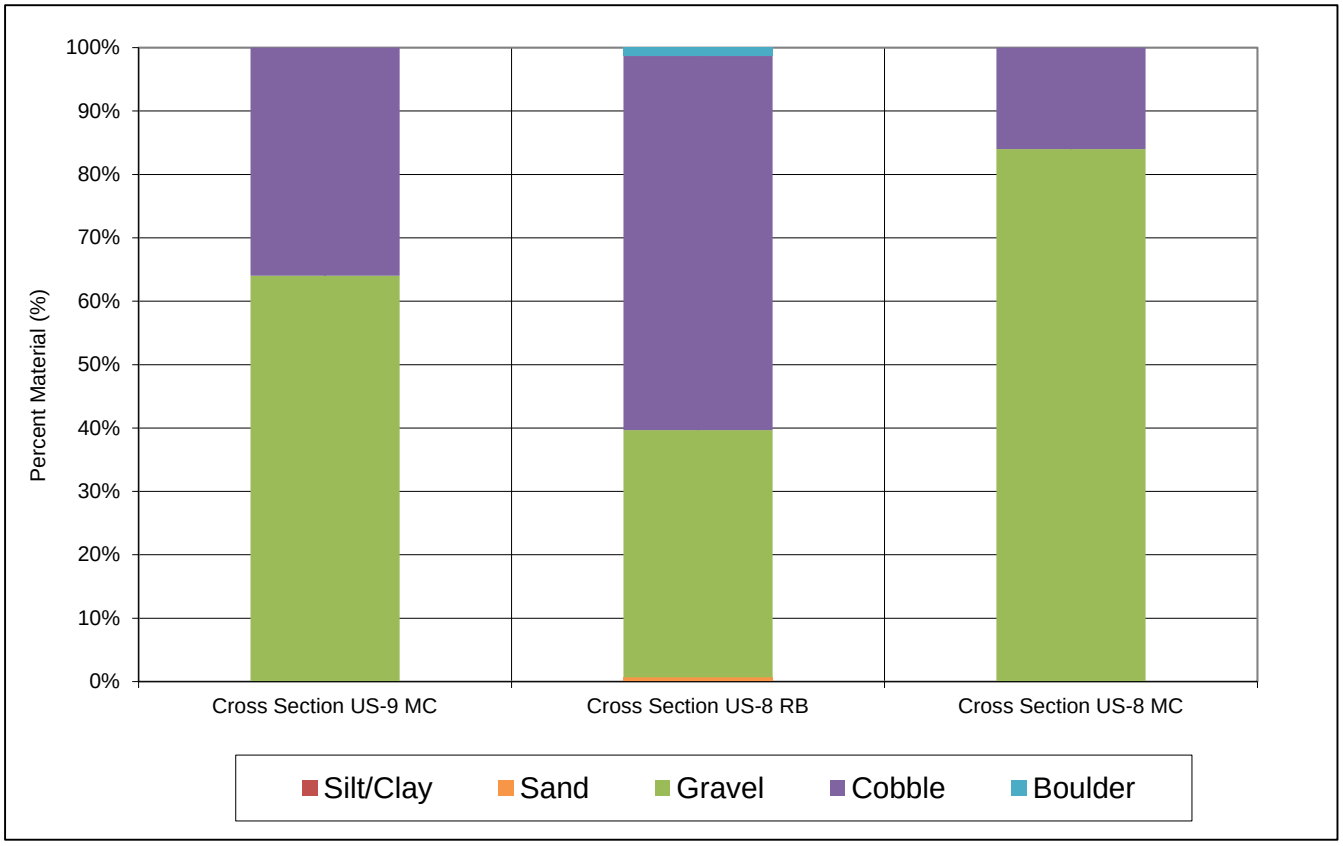

Figure 36: Percent material by substrate type at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-9 MC, US-8 RB, and US-8 MC.

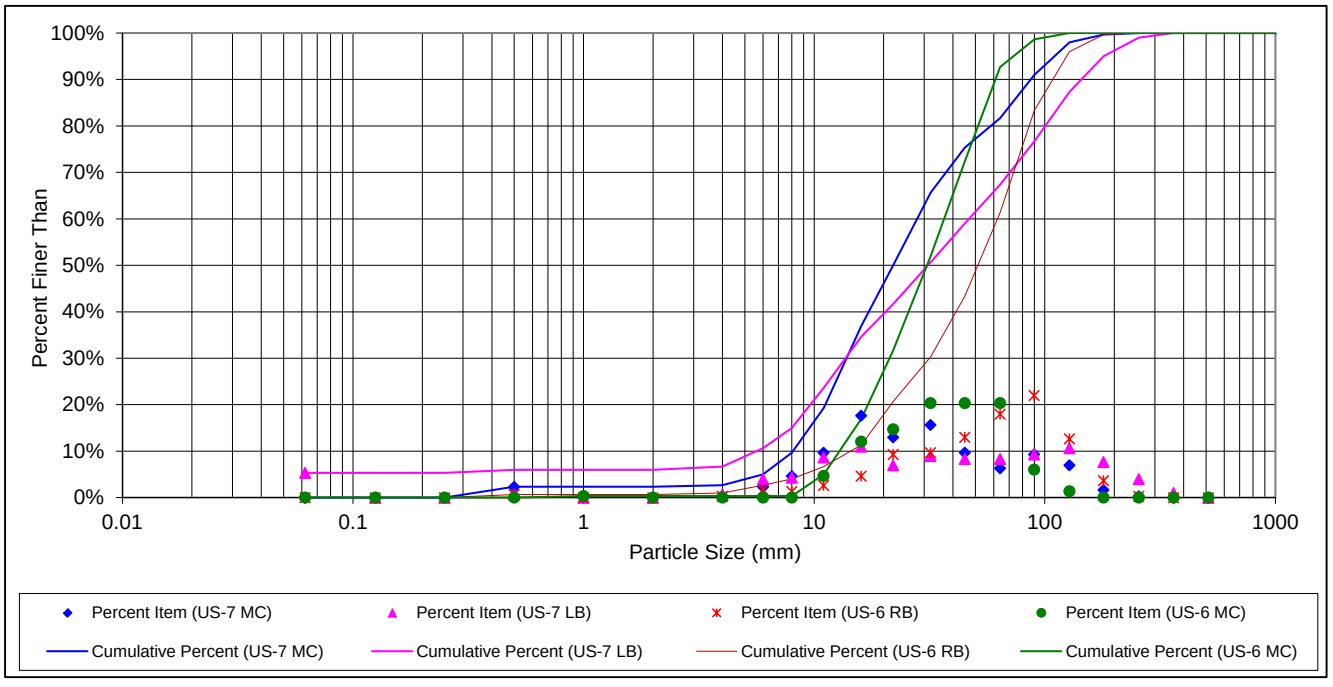

Figure 37: Grain size distribution at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-7 MC, US-7 LB, US-6 RB, and US-6 MC.

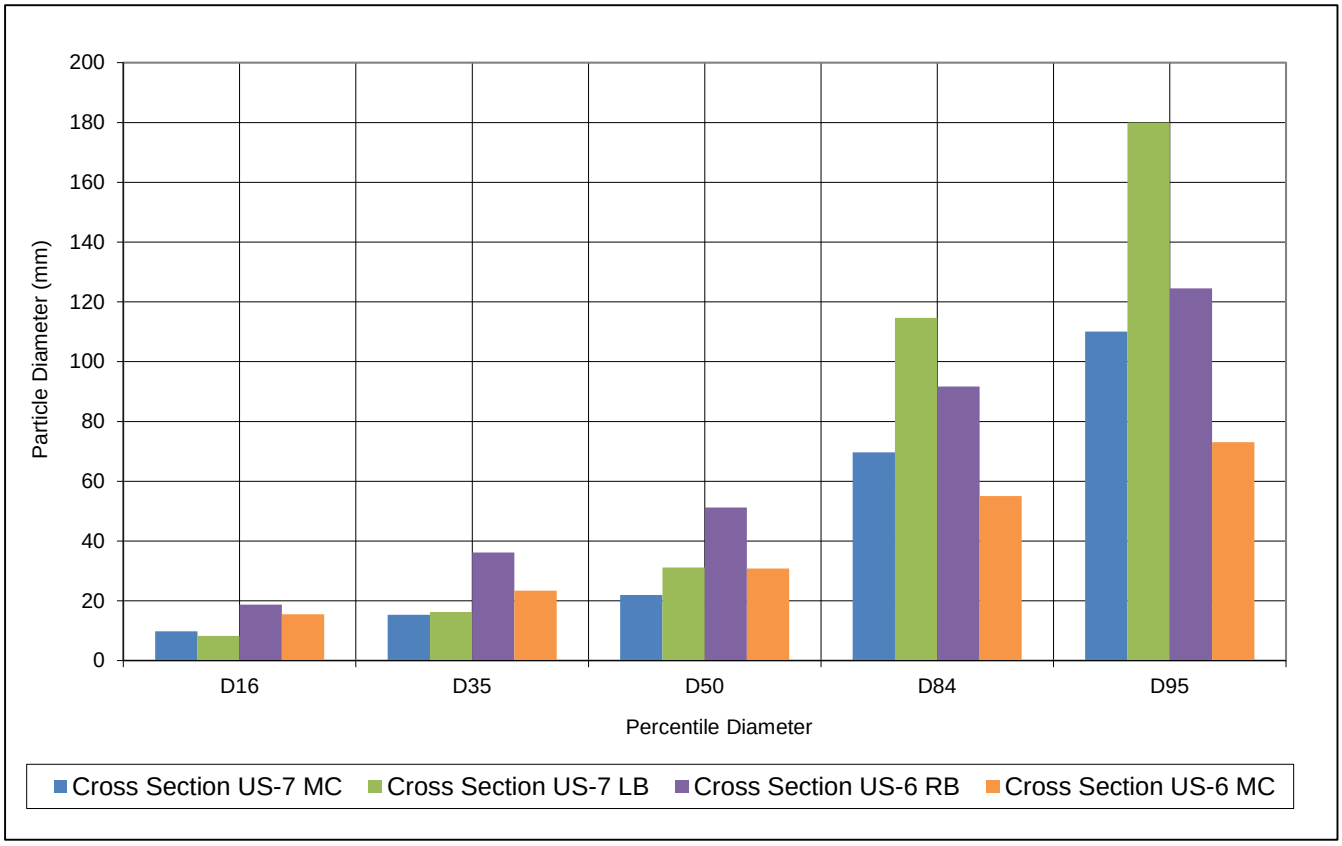

Figure 38: Sample percentile diameter at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-7 MC, US-7 LB, US-6 RB, and US-6 MC.

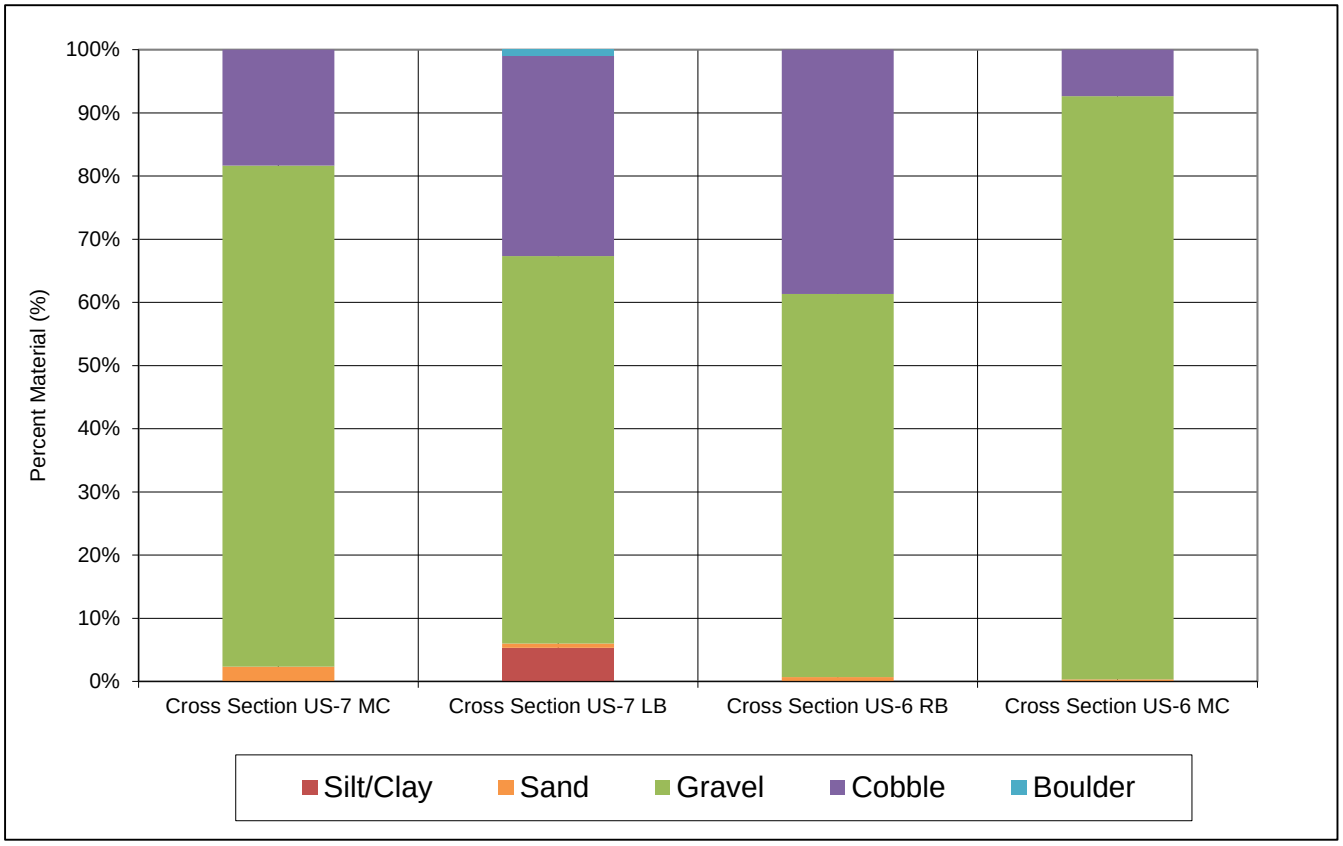

Figure 39: Percent material by substrate type at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-7 MC, US-7 LB, US-6 RB, and US-6 MC.

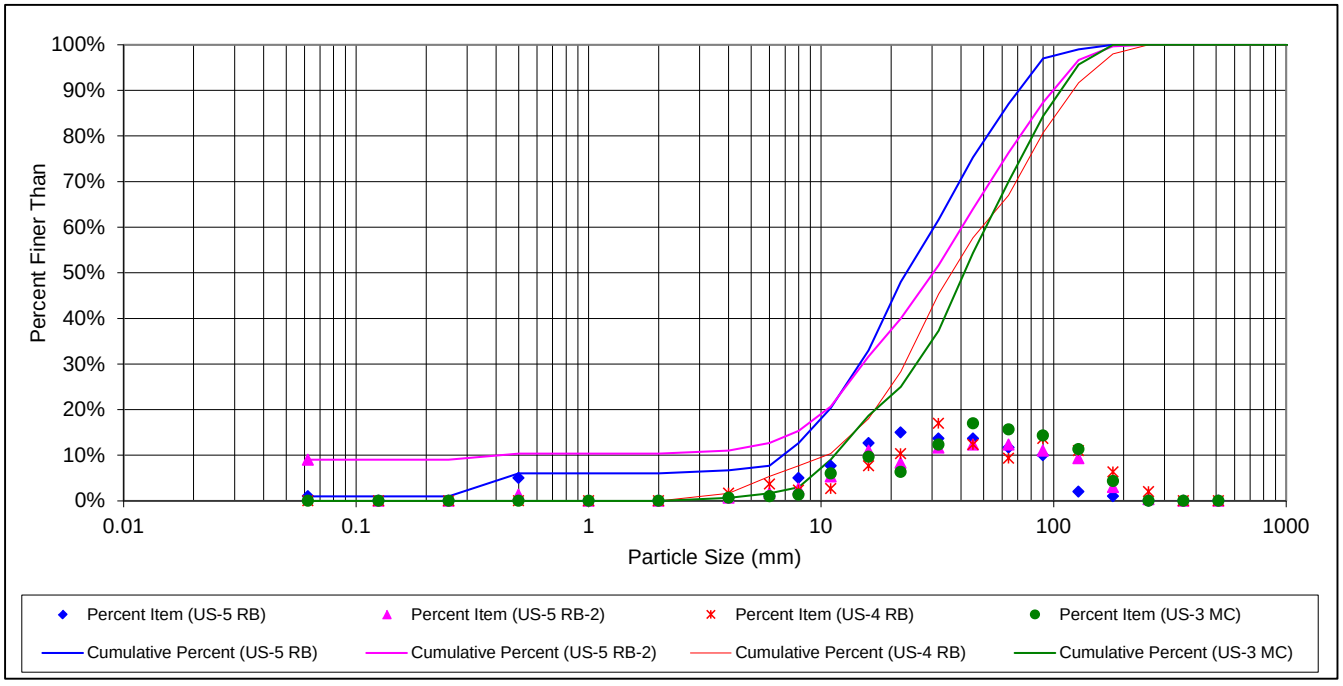

Figure 40: Grain size distribution at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-5 RB, US-5 RB-2, US-4 RB, and US-3 MC.

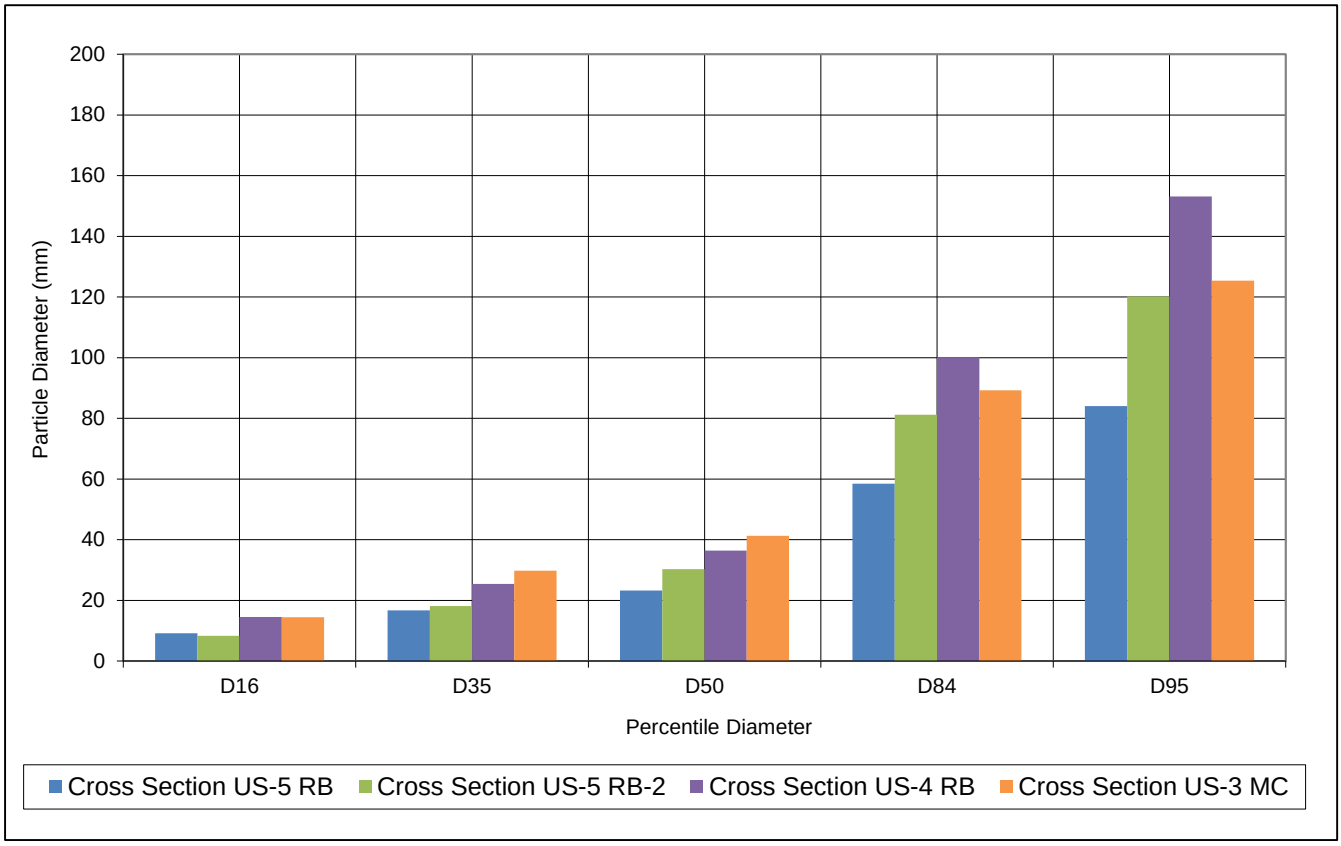

Figure 41: Sample percentile diameter at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-5 RB, US-5 RB-2, US-4 RB, and US-3 MC.

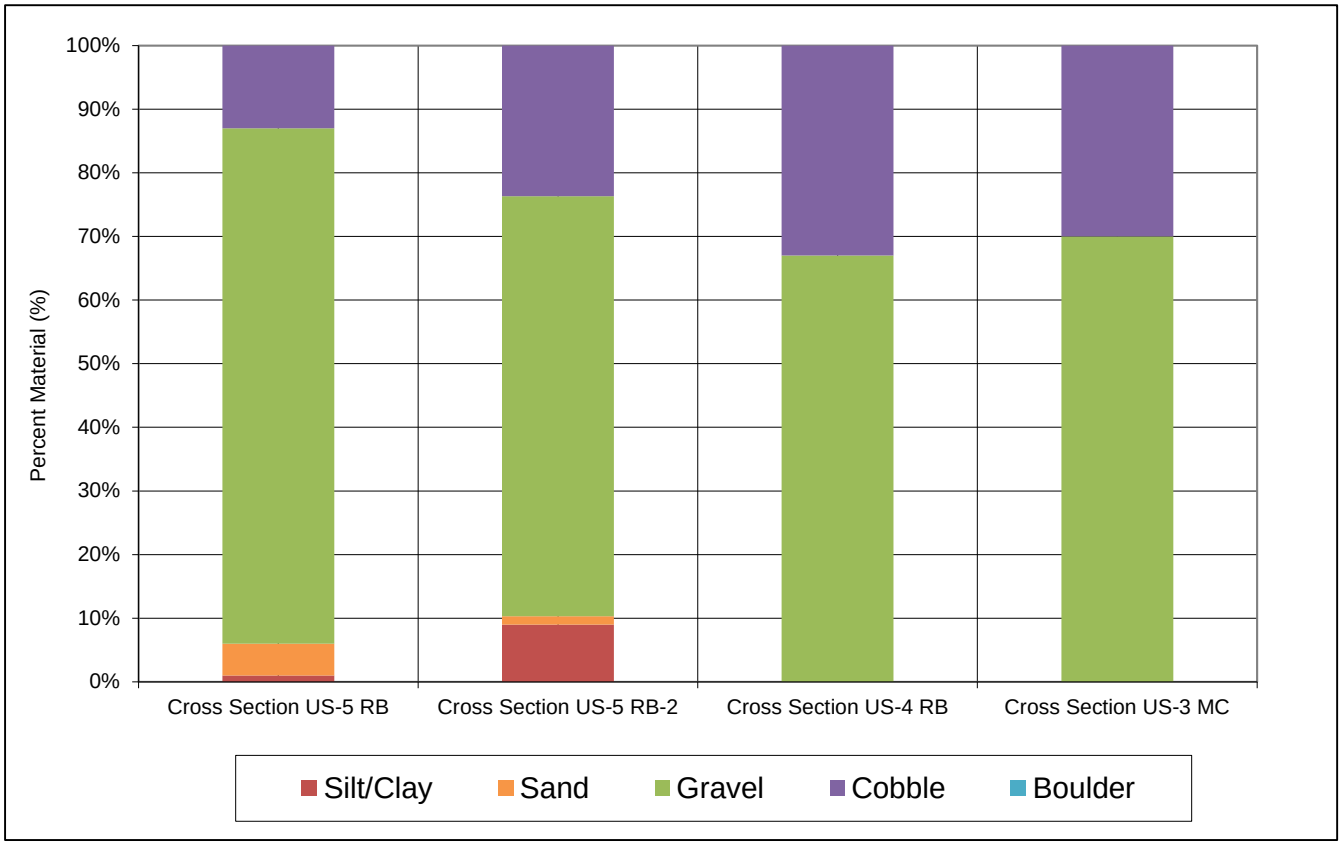

Figure 42: Percent material by substrate type at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-5 RB, US-5 RB-2, US-4 RB, and US-3 MC.

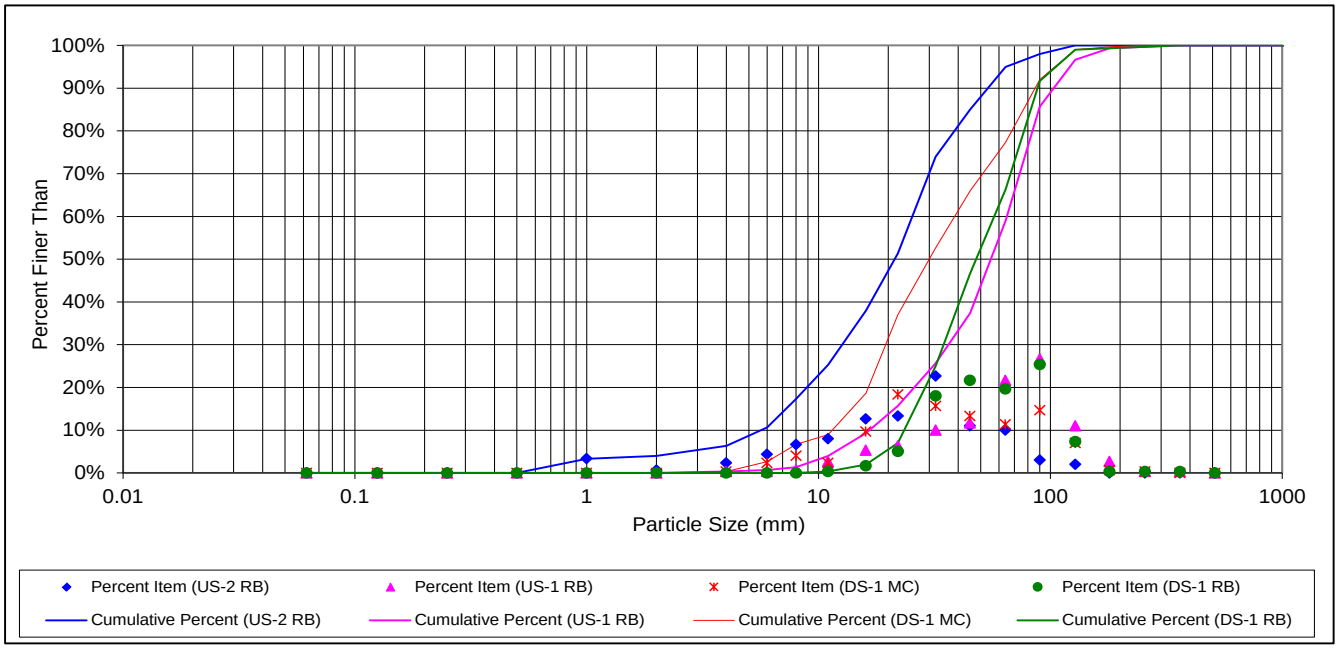

Figure 43: Grain size distribution at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-2 RB, US-1 RB, DS-1 MC, and DS-1 RB.

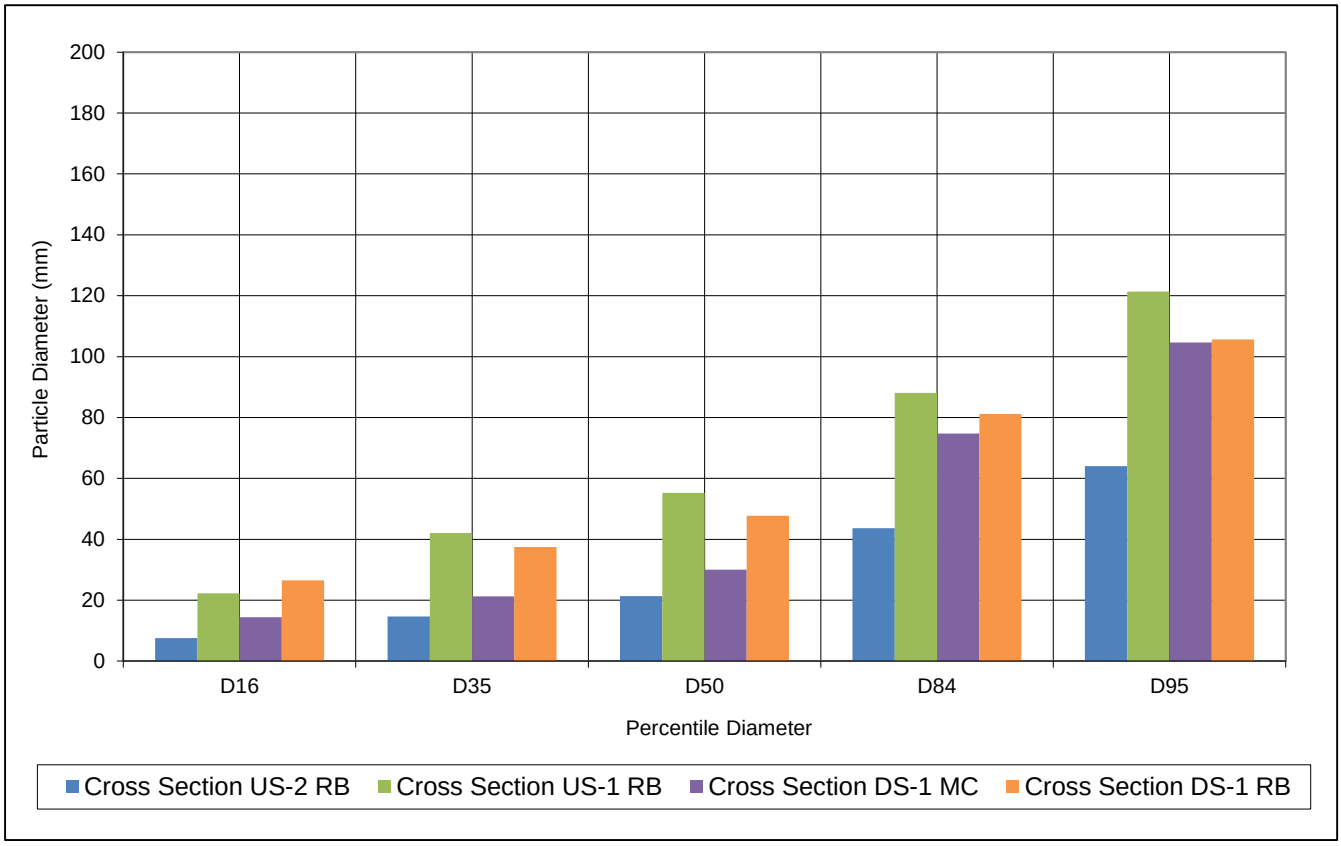

Figure 44: Sample percentile diameter at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-2 RB, US-1 RB, DS-1 MC, and DS-1 RB.

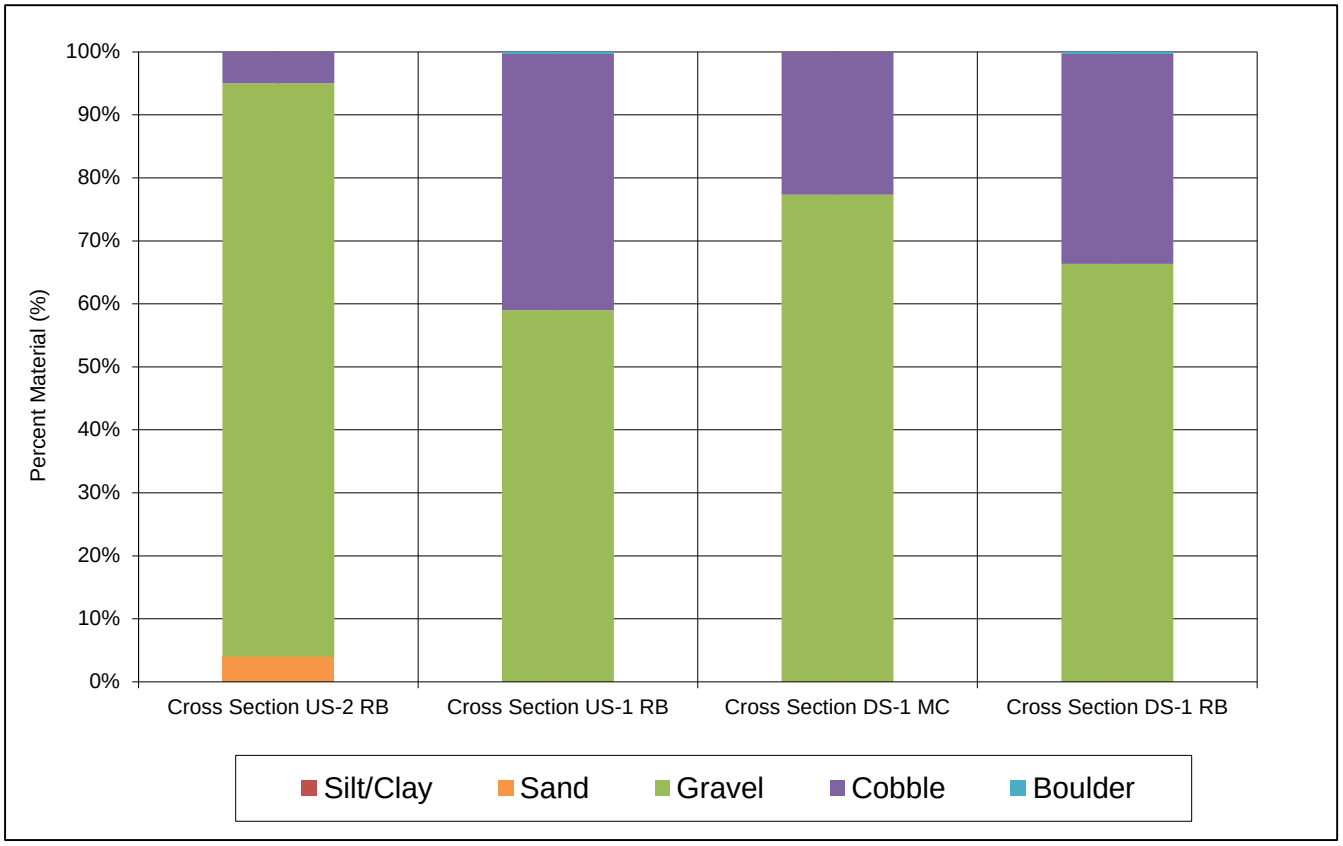

Figure 45: Percent material by substrate type at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections US-2 RB, US-1 RB, DS-1 MC, and DS-1 RB.

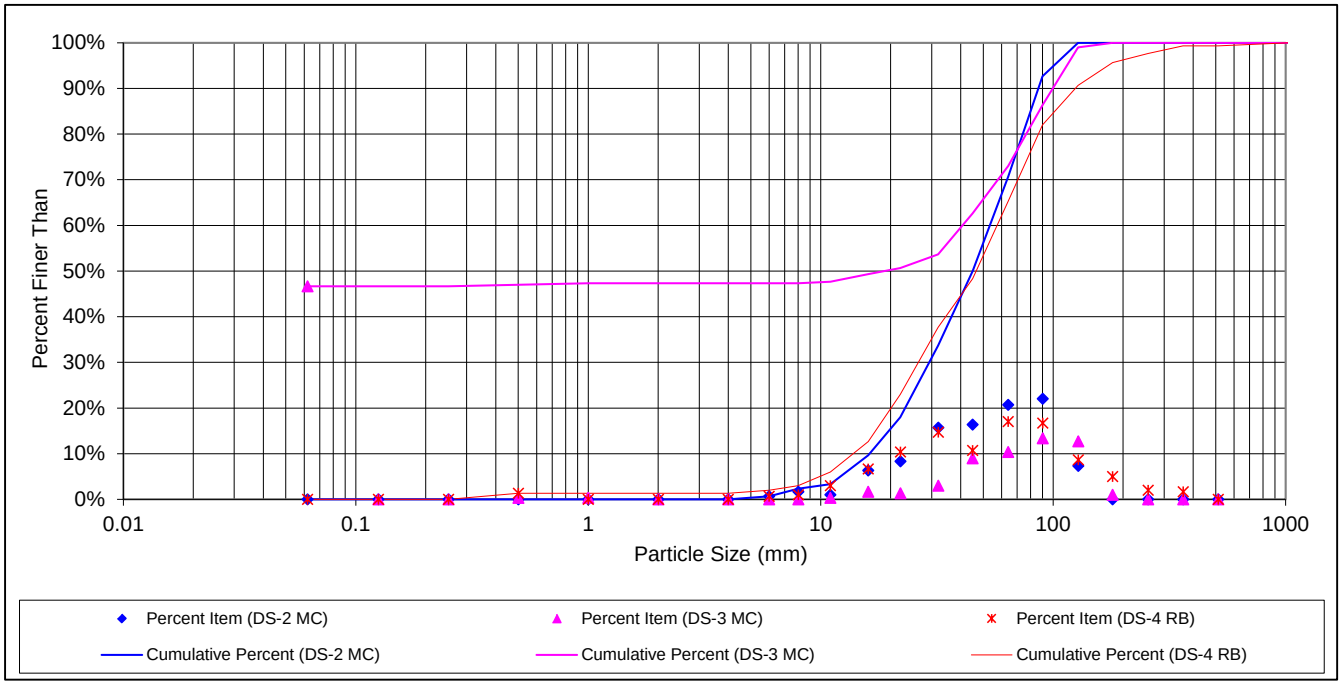

Figure 46: Grain size distribution at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross Sections DS-2 MC, DS-3 MC, and DS-4 RB.

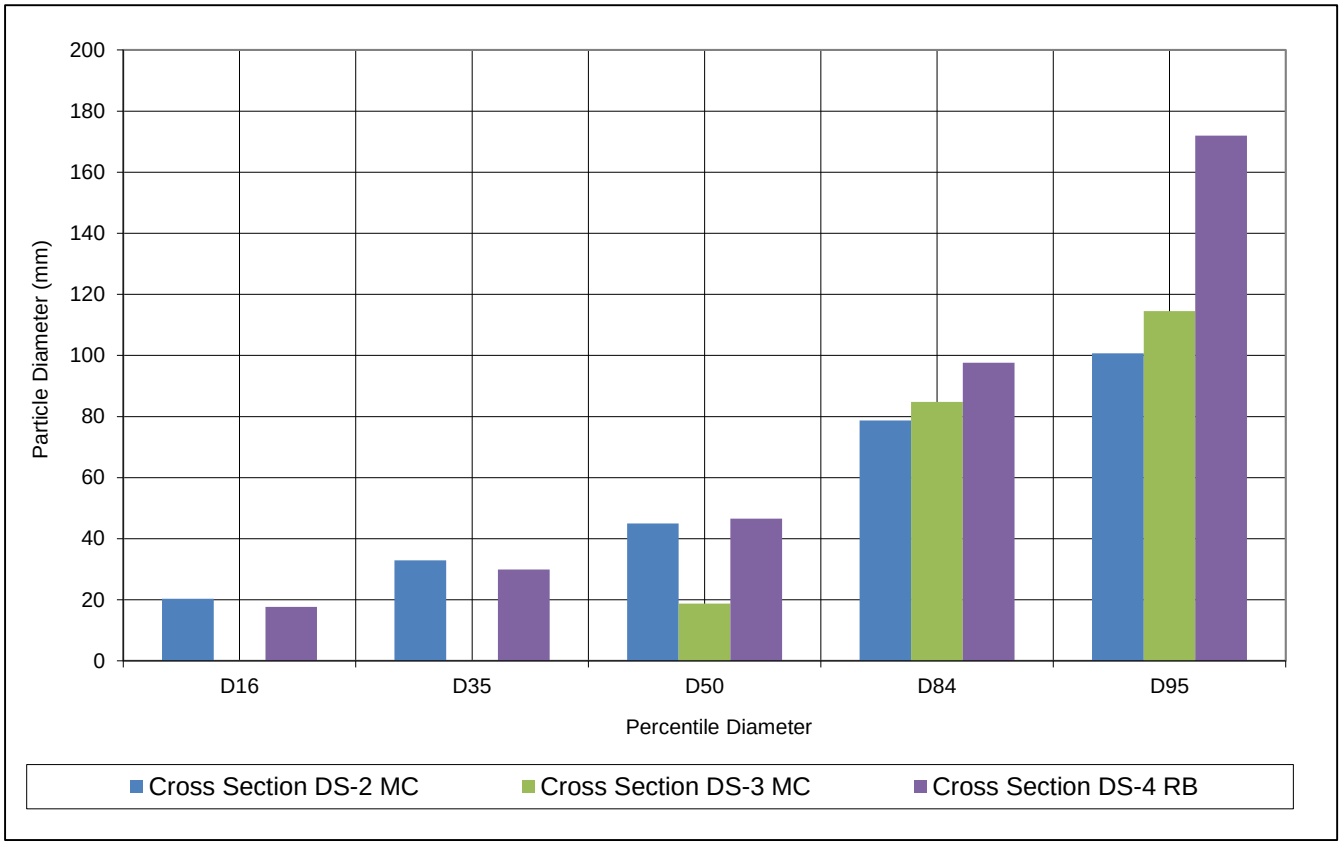

Figure 47: Sample percentile diameter at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross Sections DS-2 MC, DS-3 MC, and DS-4 RB.

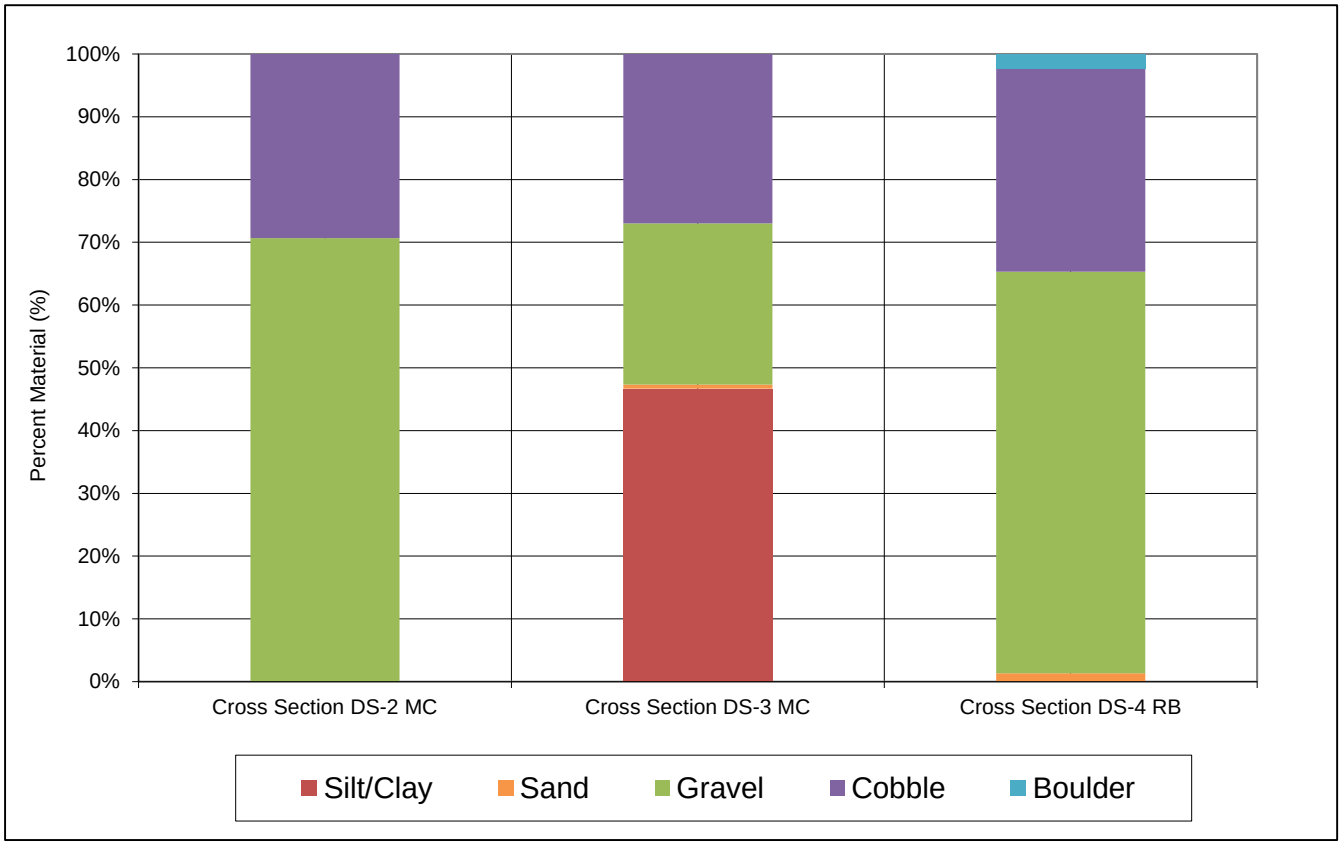

Figure 48: Percent material by substrate type at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-2 MC, DS-3 MC, and DS-4 RB.

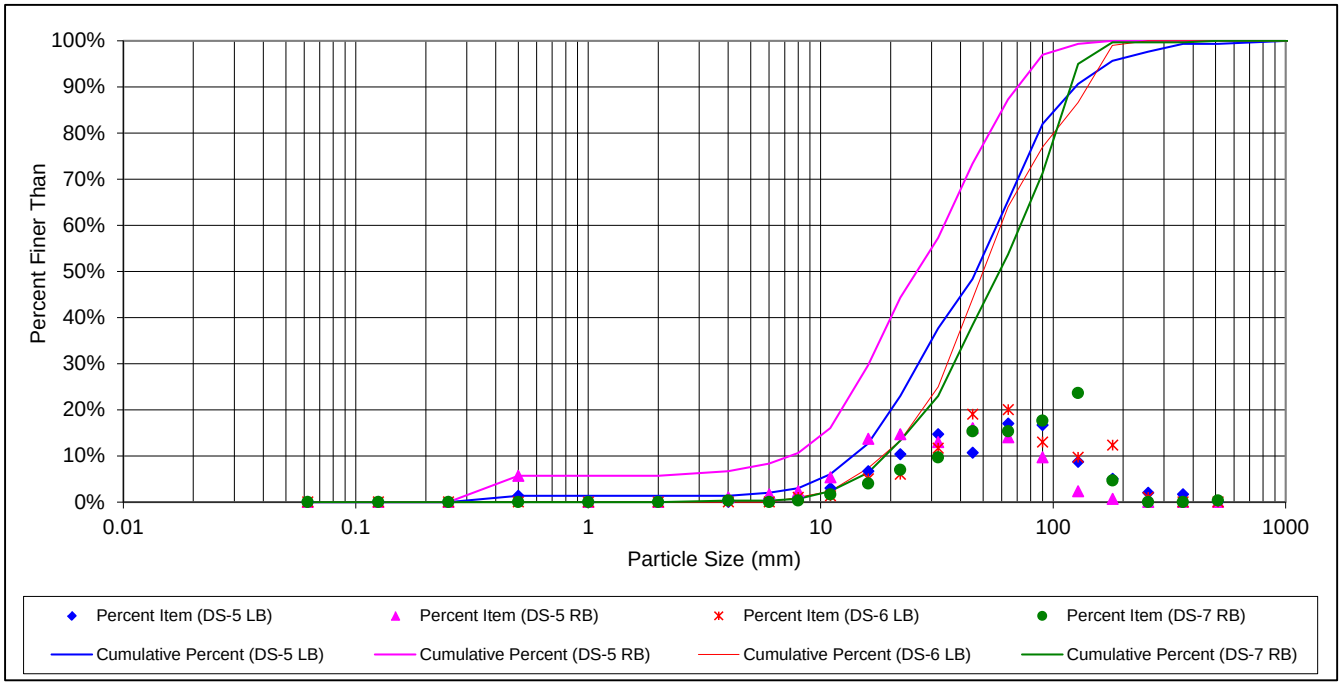

Figure 49: Grain size distribution at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-5 LB, DS-6 RB, DS-6 LB, and DS-7 RB.

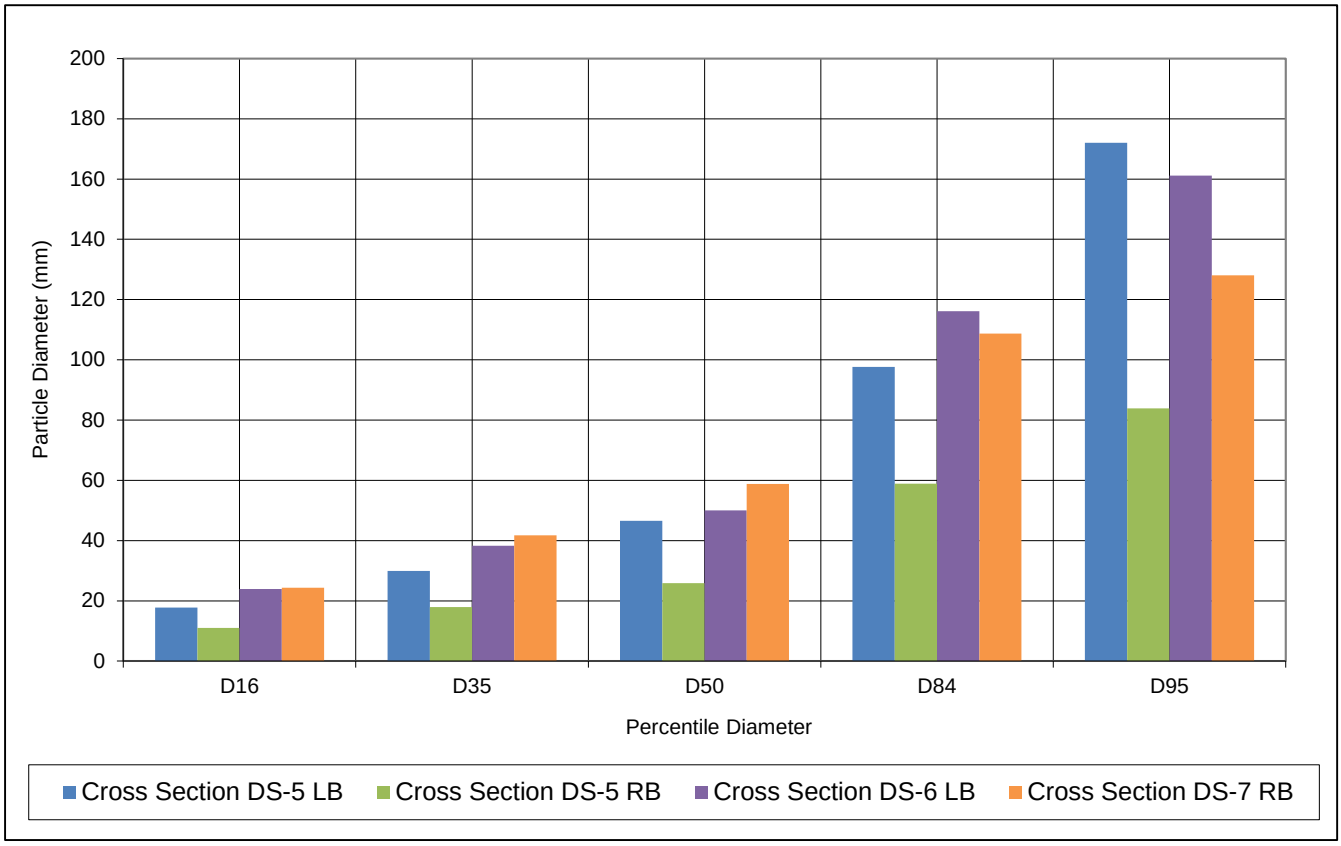

Figure 50: Sample percentile diameter at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-5 LB, DS-6 RB, DS-6 LB, and DS-7 RB.

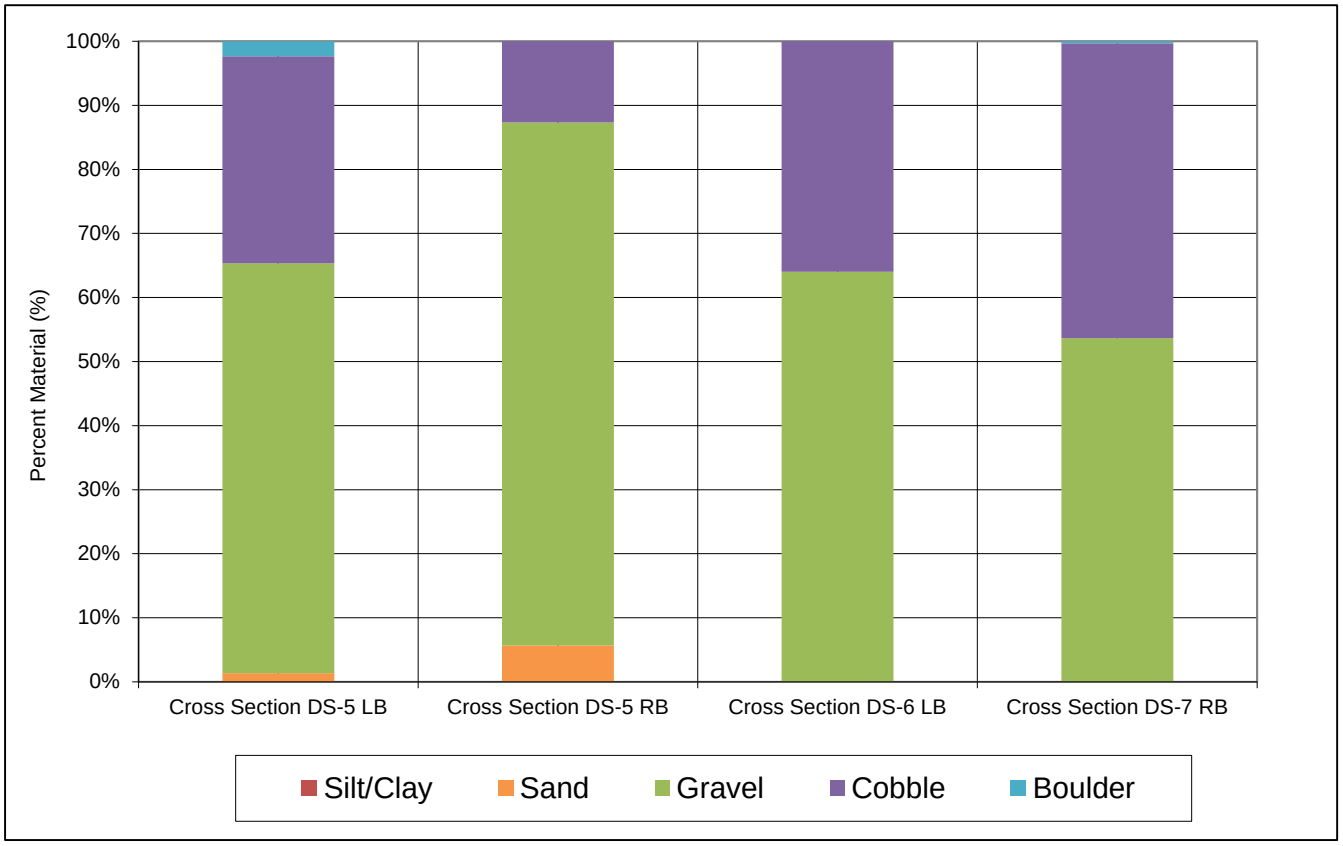

Figure 51: Percent material by substrate type at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-5 LB, DS-6 RB, DS-6 LB, and DS-7 RB.

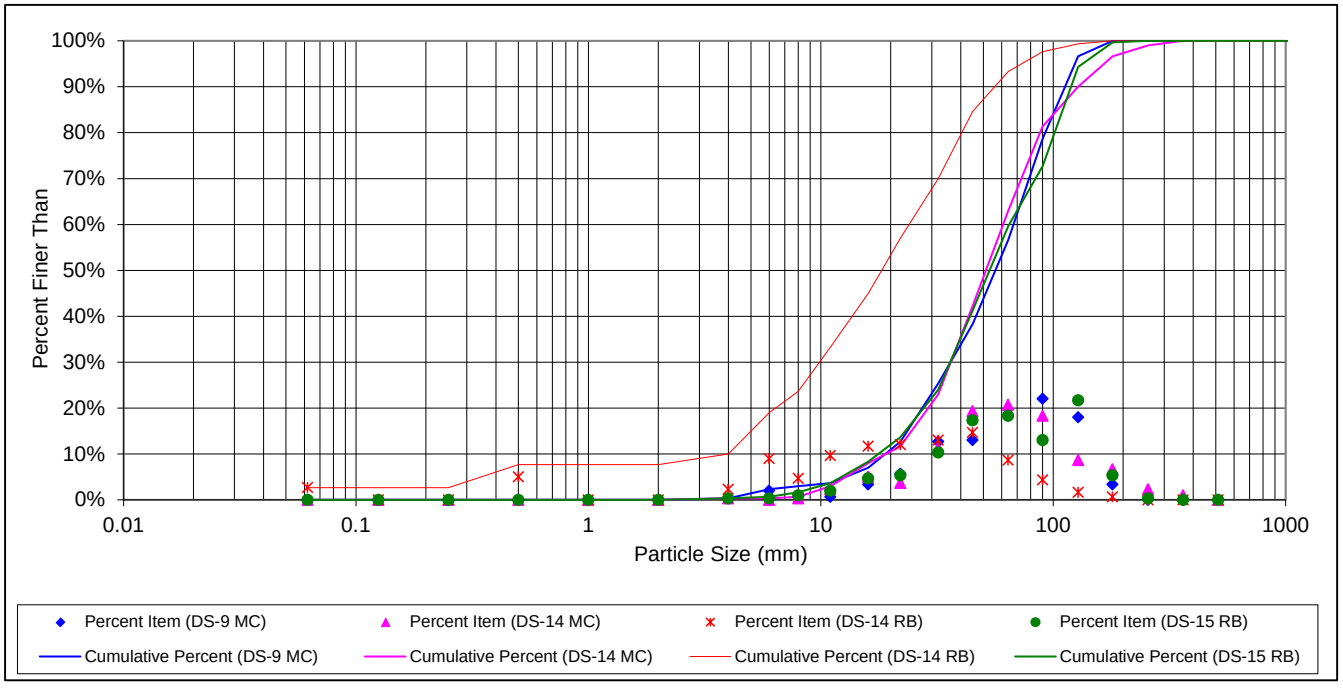

Figure 52: Grain size distribution at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-9 MC, DS-14 MC, DS-14 RB, and DS-15 RB.

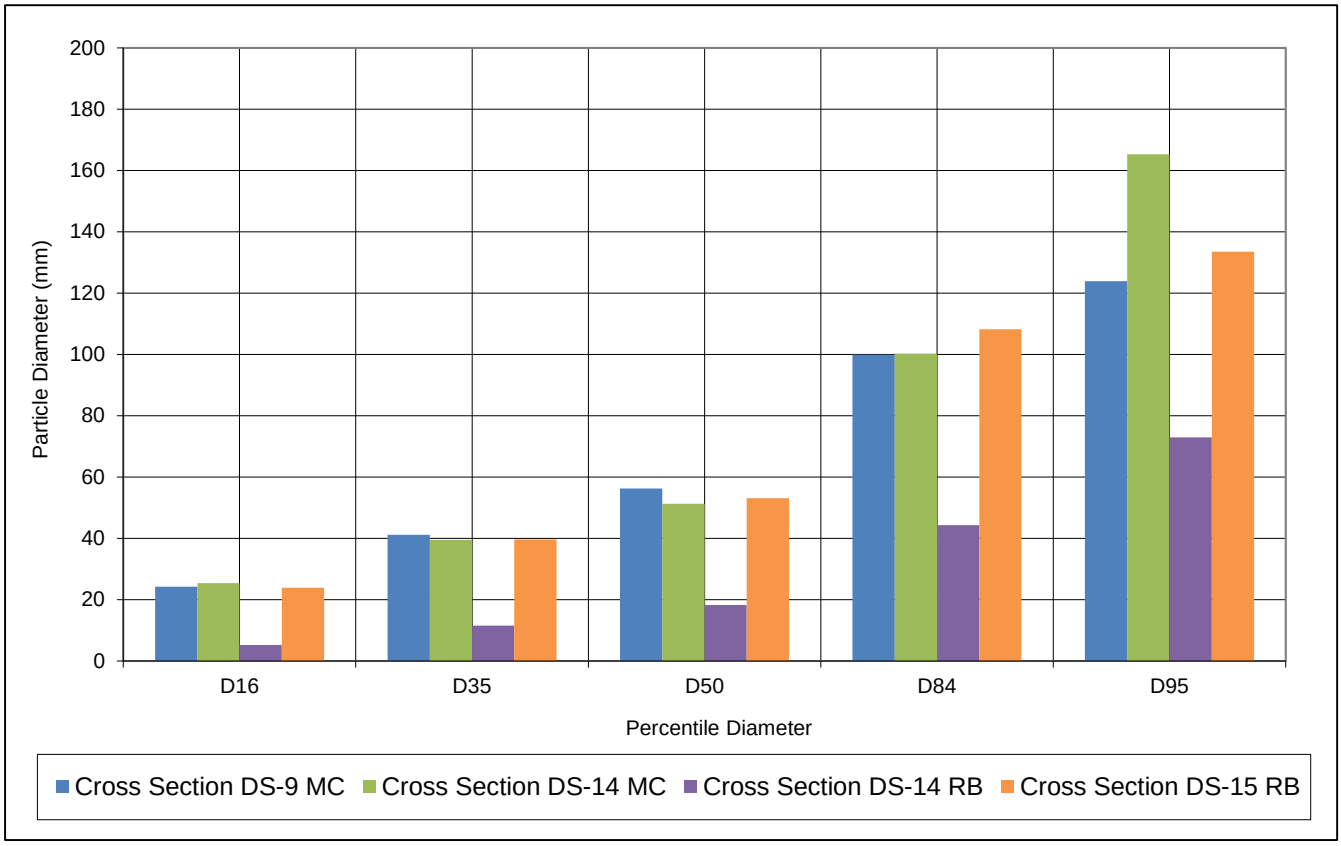

Figure 53: Sample percentile diameter at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-9 MC, DS-14 MC, DS-14 RB, and DS-15 RB.

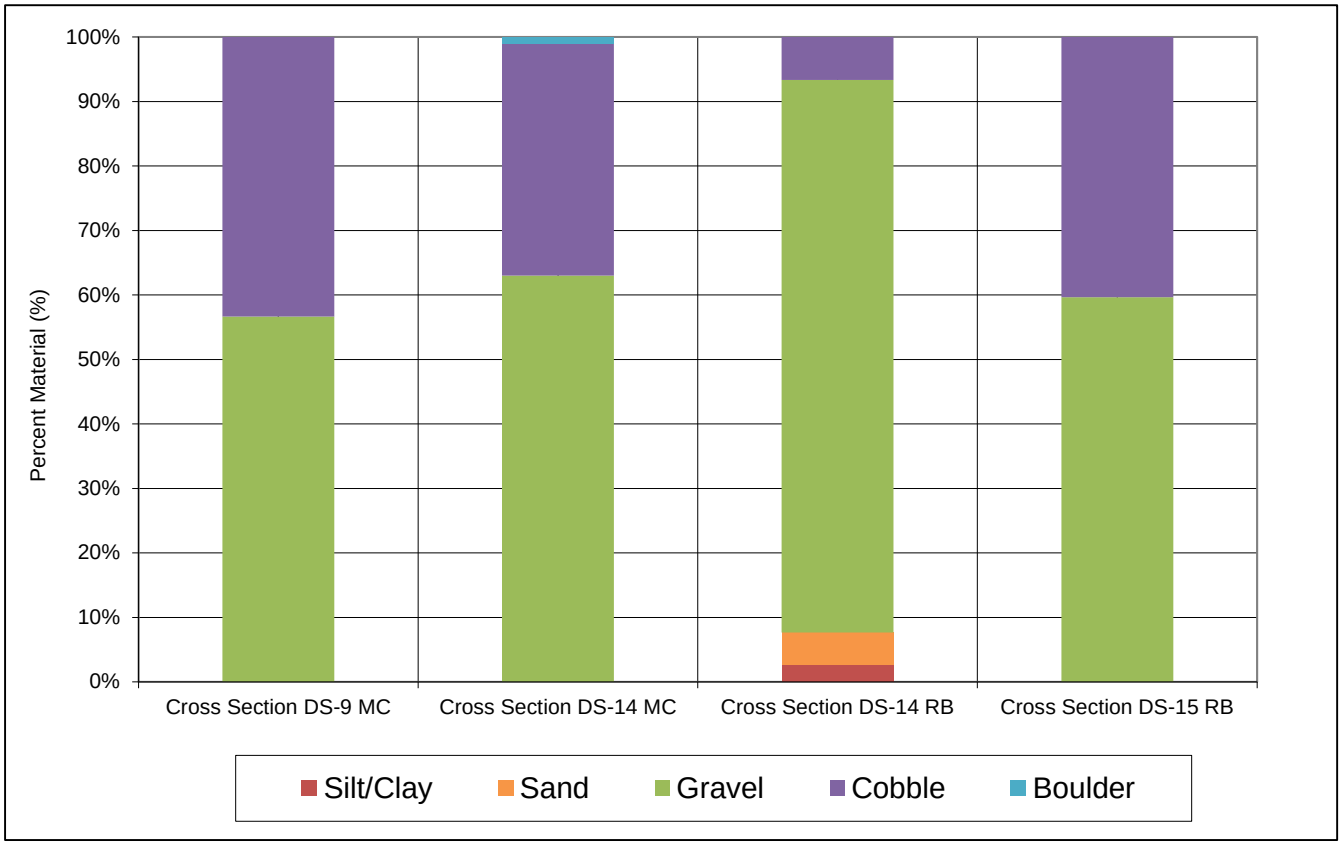

Figure 54: Percent material by substrate type at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-9 MC, DS-14 MC, DS-14 RB, and DS-15 RB.

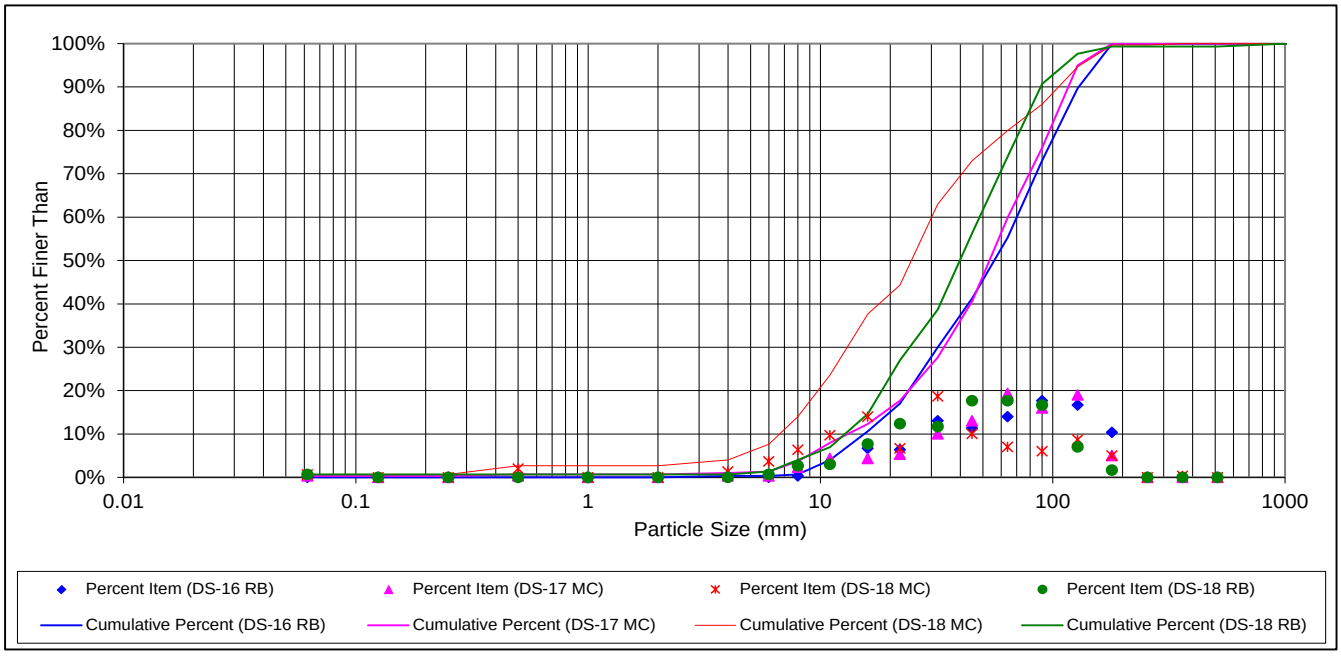

Figure 55: Grain size distribution at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-16 RB, DS-17 MC, DS-18 MC, and DS-18 RB.

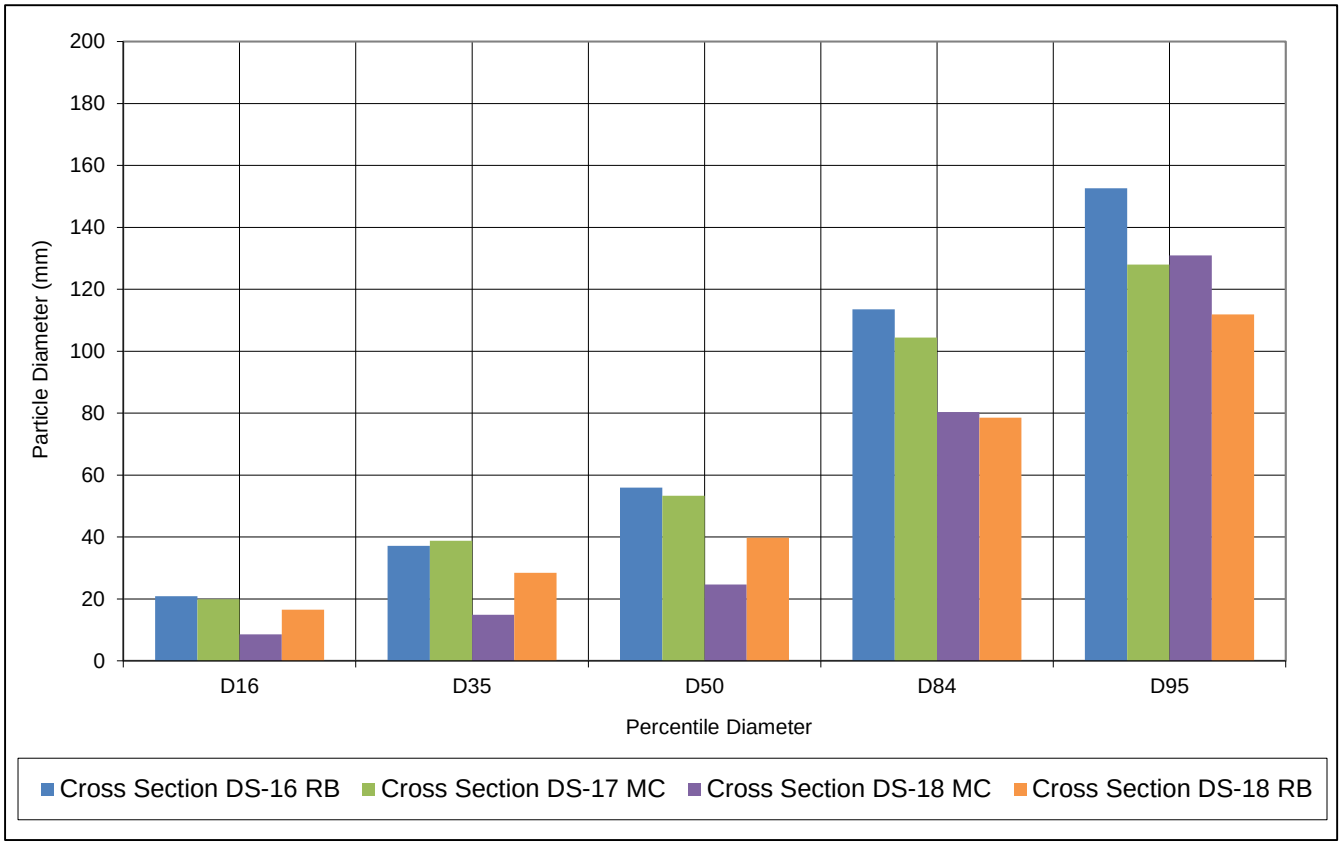

Figure 56: Sample percentile diameter at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-16 RB, DS-17 MC, DS-18 MC, and DS-18 RB.

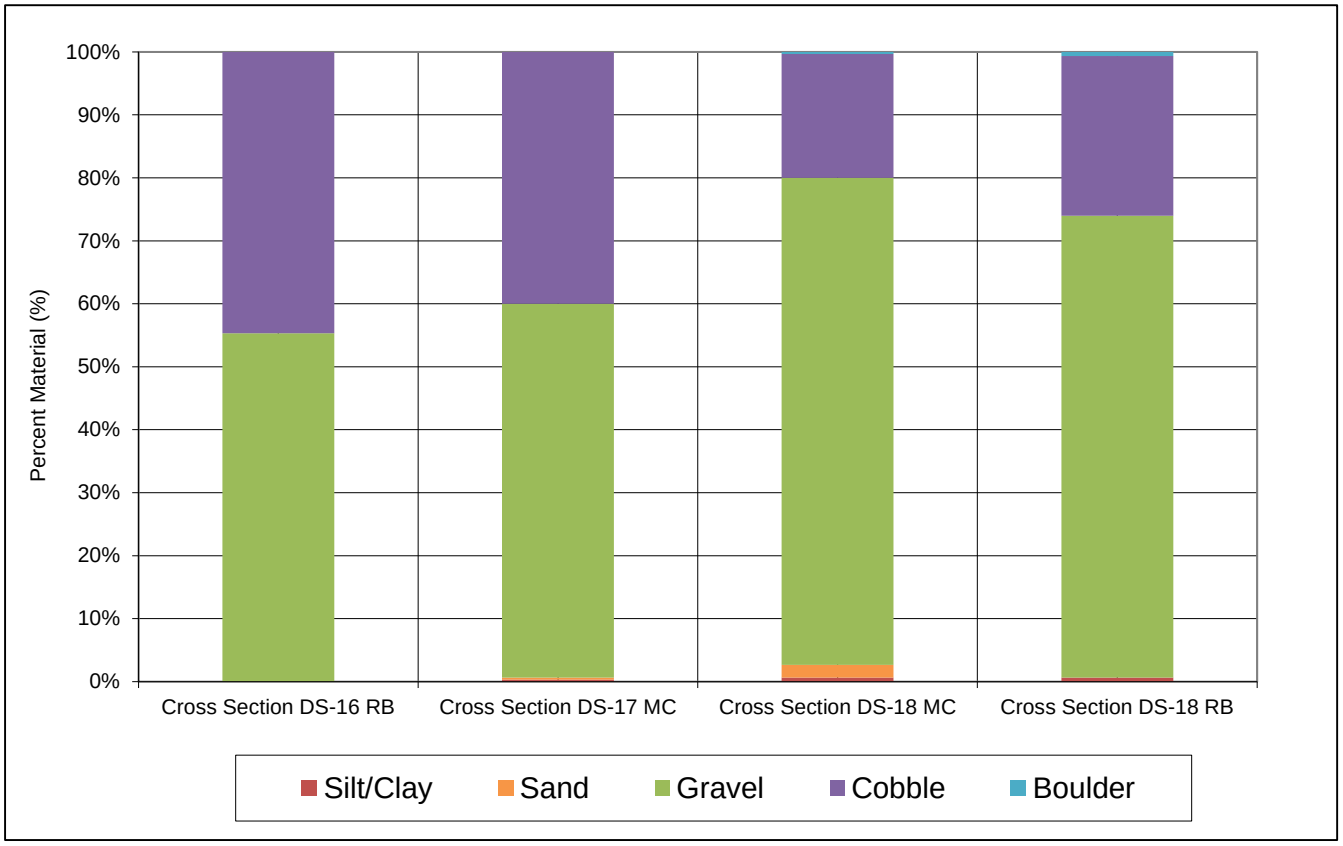

Figure 57: Percent material by substrate type at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Cross sections DS-16 RB, DS-17 MC, DS-18 MC, and DS-18 RB.

4.0 SUMMARY

River channel cross sections were surveyed at 30 locations, and included 12 cross sections in the Site C Diversion Headpond and 18 cross sections between the dam site and the Pine River confluence. The bankfull river width varied between approximately 300 m and 1260 m. The mean bankfull depth varied between approximately 1 m and 5.2 m. In total, portions of 13 cross sections contain interpolated data because these areas were not accessed as part of the on-foot survey. Future surveys should confirm the interpolated portions.

Riverbed grain size data were collected using the Wolman Pebble Count method. Sampled substrates indicate that the Peace River is predominantly a gravel bed river with some occurrences of cobbles and sands. Boulders and silts/clays were less commonly observed at sample plot locations.

5.0 CLOSURE

We trust that this document meets you present requirements. If you have any questions or comments, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Dan Ciobotaru, B.Sc., P.Geo.
Hydrologist

Rowland Atkins, M.Sc., P.Geo
Geomorphologist

DC/RA/cmc

ATTACHMENTS: Peace River Physical Habitat Monitoring Program (Mon-3), 2015 Maps 1 to 9
Appendix A: Peace River Physical Habitat Monitoring Program (Mon-3) Pebble Count Data

n:\active\2015\3 proj\1520767 bch_site c_fsj\07 deliverables\physical habitat reporting\1520767-000-tm-rev0-sitec physical habitat baseline 17oct_16.docx

6.0 REFERENCES

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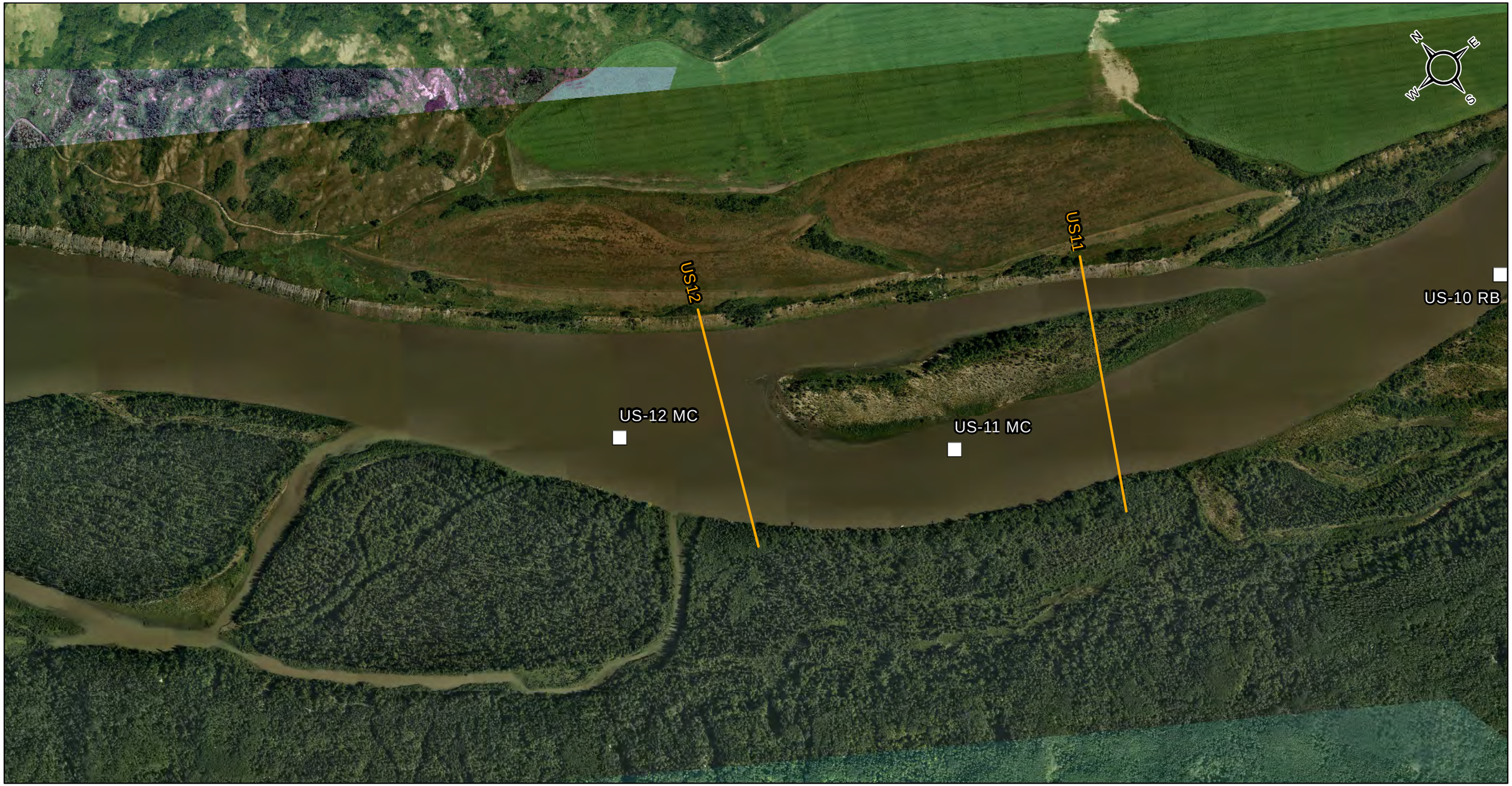
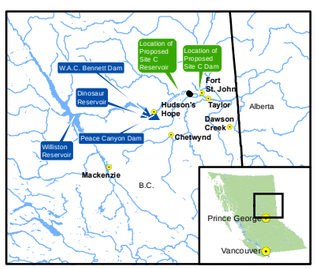
Wolman, M.G., 1954. A Method of Sampling Coarse River-Bed Material. Transactions of the American Geophysical Union 35 (6):951-956.

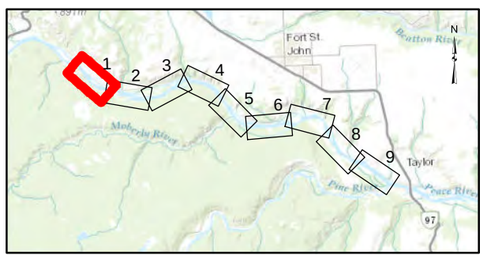




Map Notes:
1. Datum/Projection: NAD83/UTM Zone 10N
2. Imagery: Copyright © 20090927 Esri and its licensors. Source:DigitalGlobe WV01. Used under license, all rights reserved.
3. Water features: CanVec © Department of Natural Resources Canada. All rights reserved.
4. Transportation features: CanVec © Department of Natural Resources Canada. All rights reserved.
5. Topographic base: Esri, NRCAN, GeoBase, and the GIS User Community.
6. Project Number 1520767

Legend

- Site C Project
- Upstream Transect
- Downstream Transect
- Grain Size Plot Location



1:10,000

0 300 Metres

SITE C CLEAN ENERGY PROJECT

BC hydro | Golder Associates

Peace River Physical Habitat Monitoring Program (Mon-3), 2015 Map 1 of 9

Date	Feb. 3, 2016	DWG NO	1016-C14-B5161	R a

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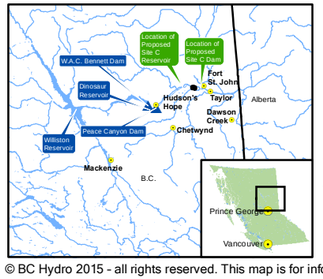

Map Notes:
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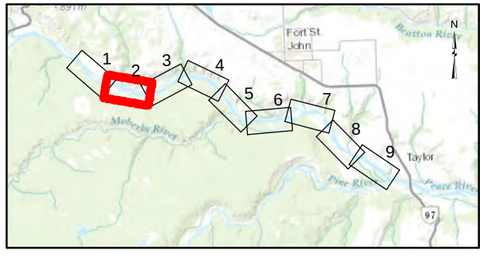
3. Water features: CanVec © Department of Natural Resources Canada. All rights reserved.
4. Transportation features: CanVec © Department of Natural Resources Canada. All rights reserved.
5. Topographic base: Esri, NRCAN, GeoBase, and the GIS User Community.
6. Project Number 1520767

Legend

- Site C Project
- Upstream Transect
- Downstream Transect
- Grain Size Plot Location



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0 300 Metres

SITE C CLEAN ENERGY PROJECT

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Peace River Physical Habitat Monitoring Program (Mon-3), 2015 Map 2 of 9

Date	Feb. 3, 2016	DWG NO	1016-C14-B5161	R a

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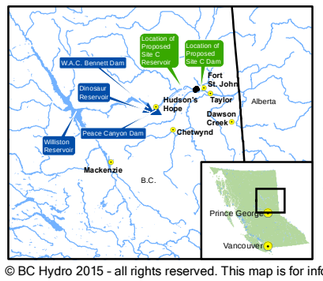
Construction of the Site C Clean Energy Project is subject to required regulatory approvals including environmental certification.



Map Notes:
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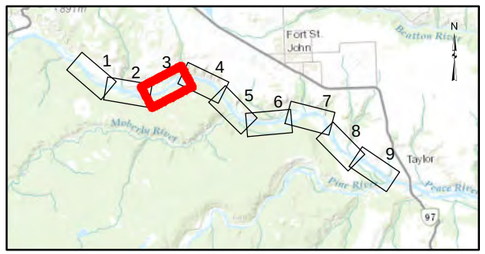
5. Topographic base: Esri, NRCAN, GeoBase, and the GIS User Community.
6. Project Number 1520767

Legend

- Site C Project
- Upstream Transect
- Downstream Transect
- Grain Size Plot Location



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0 300 Metres

SITE C CLEAN ENERGY PROJECT

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Peace River Physical Habitat Monitoring Program (Mon-3), 2015 Map 3 of 9

Date	Feb. 3, 2016	DWG NO	1016-C14-B5161	R a

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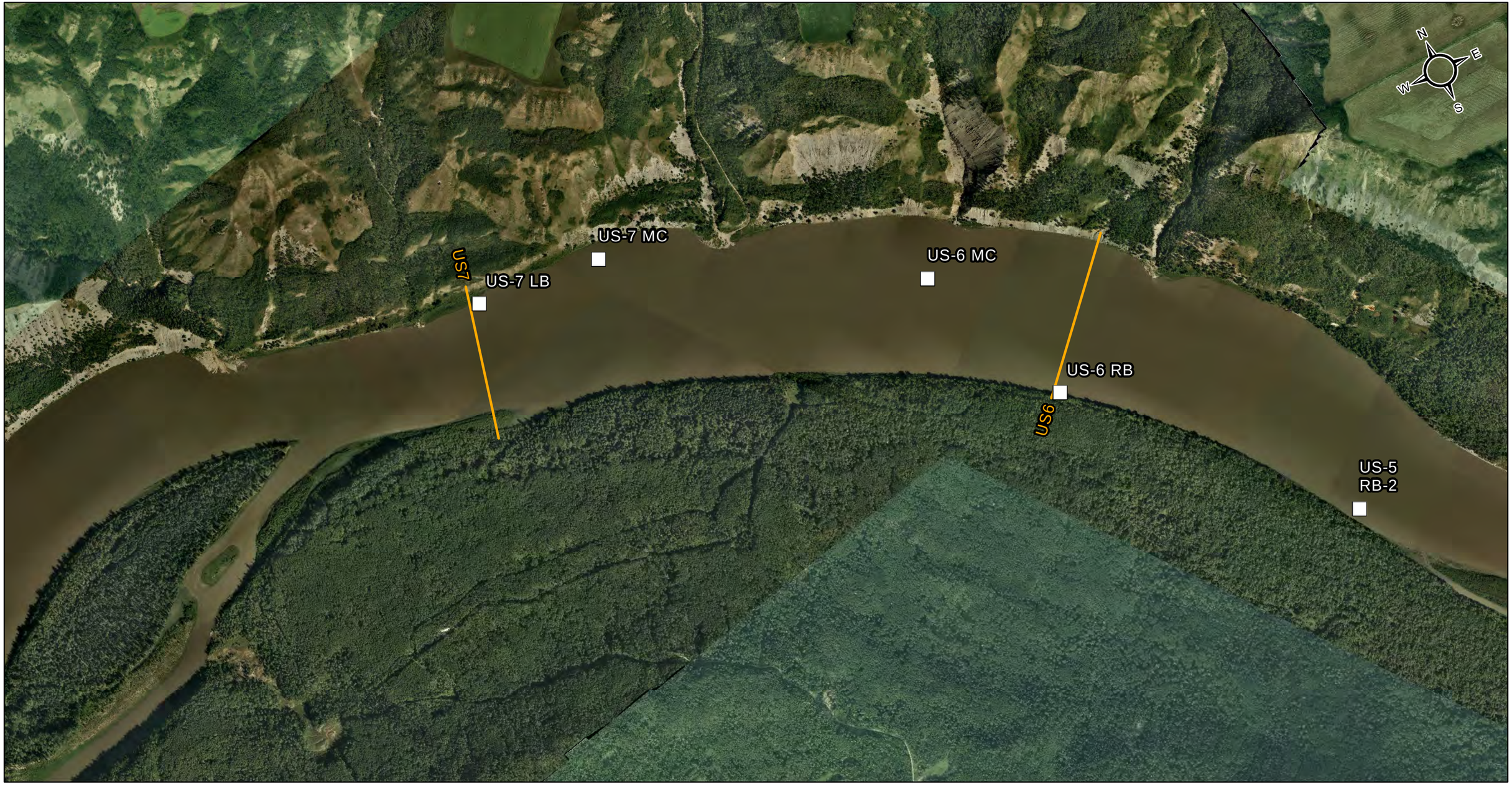

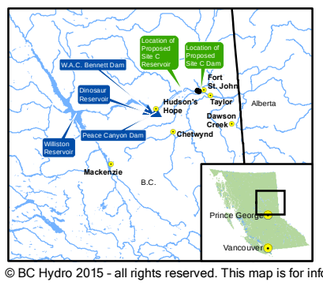

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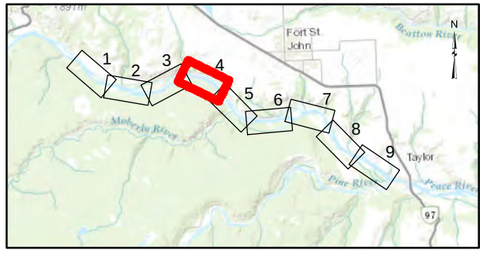
6. Project Number 1520767

Legend

- Site C Project
- Upstream Transect
- Downstream Transect
- Grain Size Plot Location



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SITE C CLEAN ENERGY PROJECT

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Peace River Physical Habitat Monitoring Program (Mon-3), 2015 Map 4 of 9

Date	Feb. 3, 2016	DWG NO	1016-C14-B5161	R a

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US-5
RB-2

US-5 RB

US-4 RB

US-3 MC

US-2 RB

US-1 RB

DS-1 MC

DS-1 RB

US5

US4

US3

US2

US1

DS1

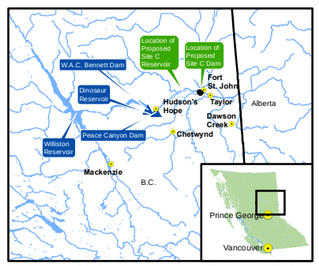
N

E

S

W

Moberly River



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Legend

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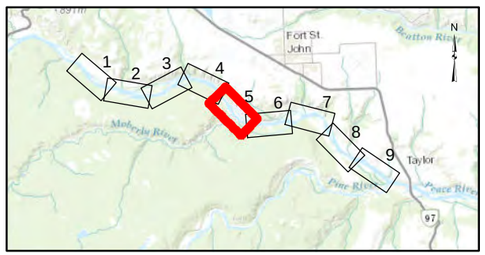

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SITE C CLEAN ENERGY PROJECT

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Peace River Physical Habitat Monitoring Program (Mon-3), 2015 Map 5 of 9

Date	Feb. 3, 2016	DWG NO	1016-C14-B5161	R a

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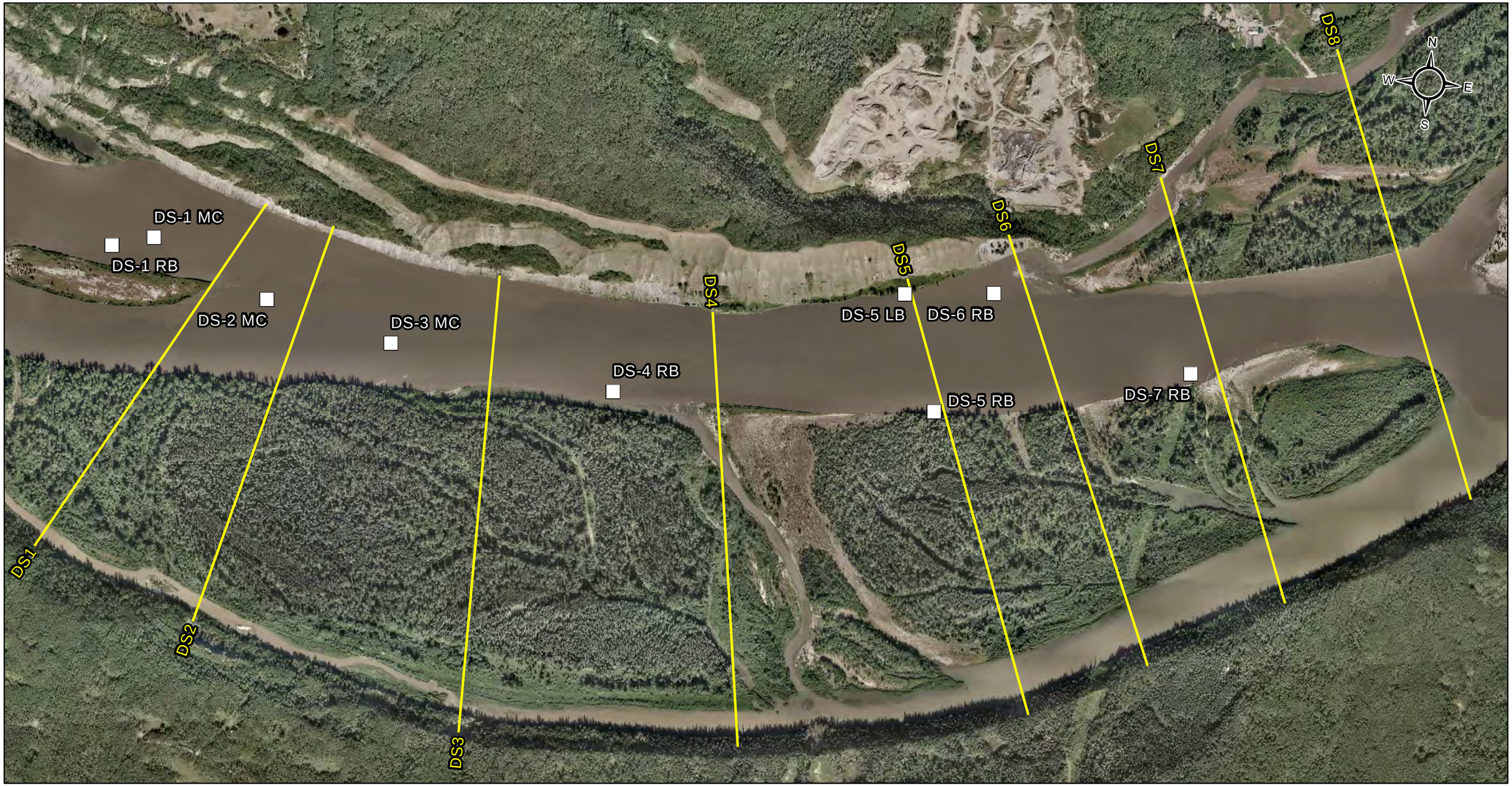

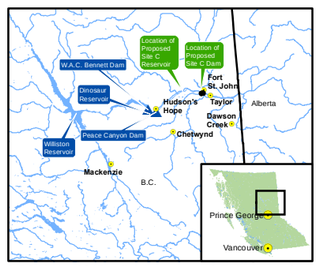

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Legend

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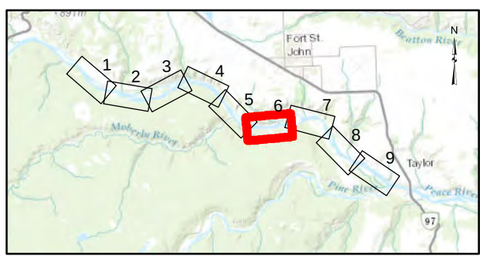
- Upstream Transect
- Downstream Transect
- Grain Size Plot Location



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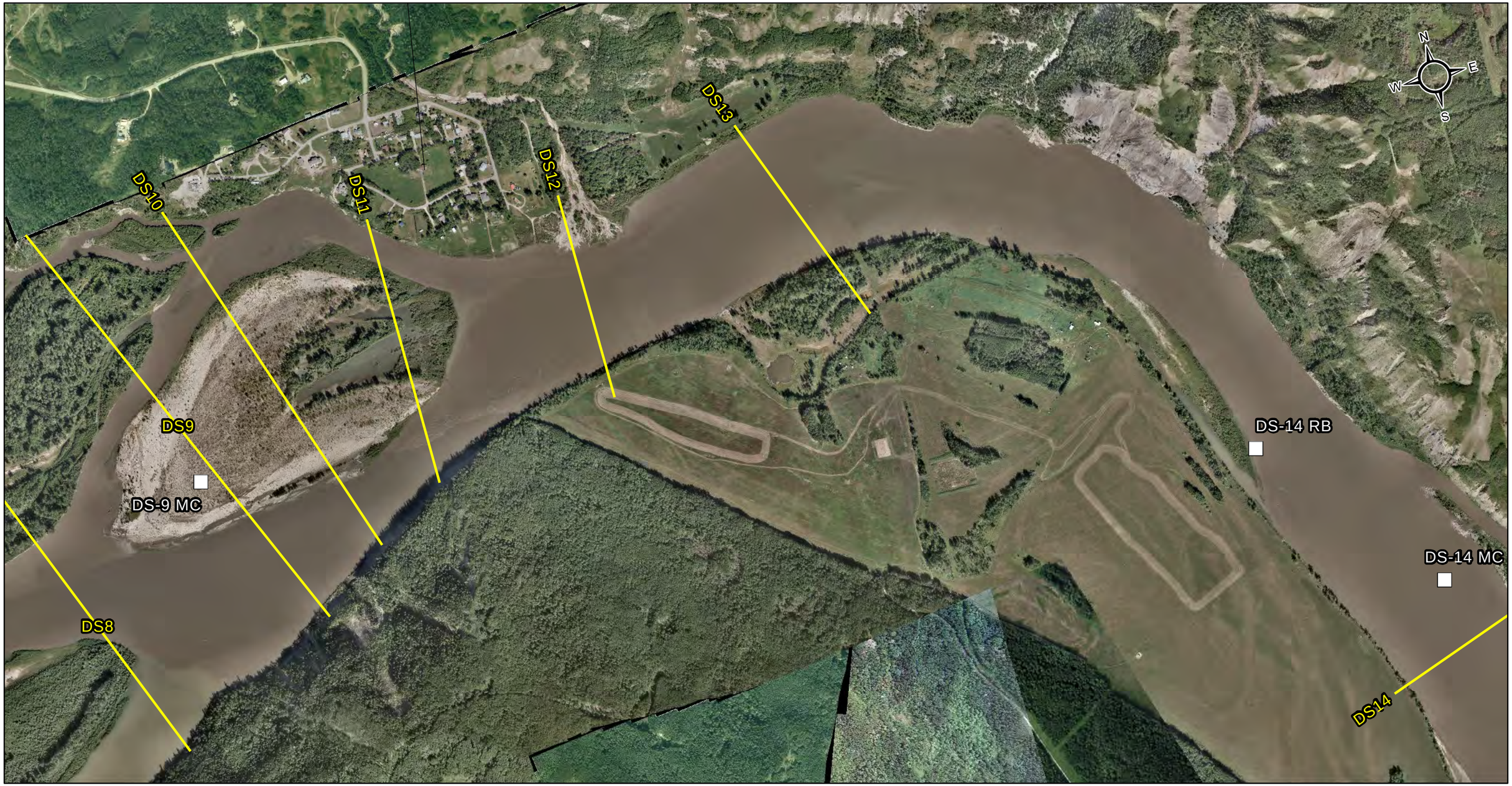
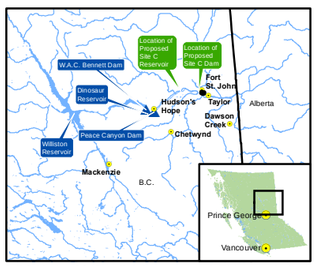
Peace River Physical Habitat Monitoring Program (Mon-3), 2015 Map 6 of 9

Date	Feb. 3, 2016	DWG NO	1016-C14-B5161	R a





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Legend

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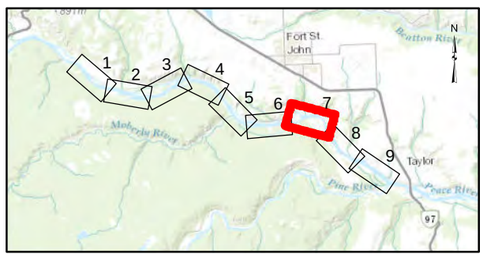

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Date	Feb. 3, 2016	DWG NO	1016-C14-B5161	R a

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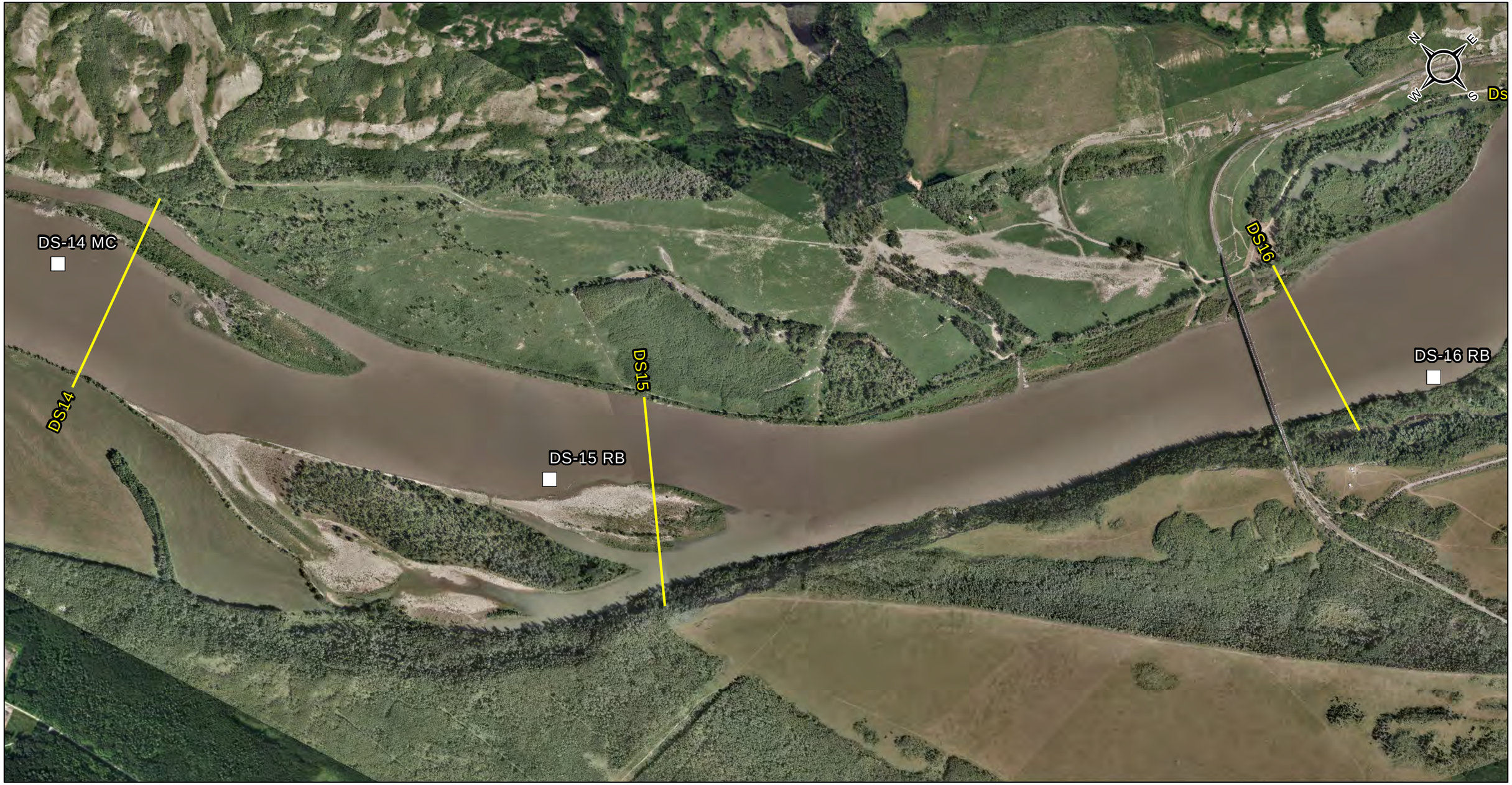

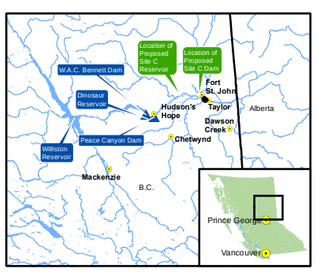

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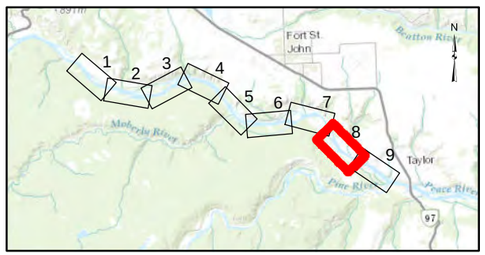

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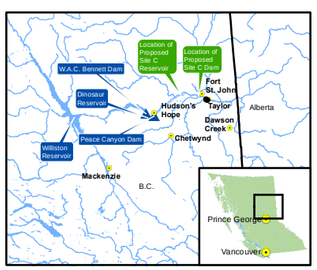

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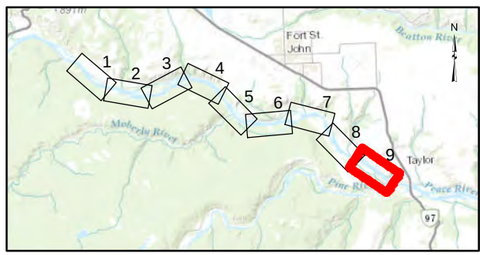

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Appendix A:
Peace River Physical Habitat Monitoring Program (Mon-3) Pebble Count Data

Table 1: Pebble Count Data (by site) at grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3). Sizes presented are in millimetres (mm).

Count	Transect US-12 MC						Transect US-11 MC					Transect US-10 RB						Transect US-10 MC						Transect US-9 MC						Transect US-8 RB					
1	97	31	18	35	37	43	11	30	17	13	11	129	39	30	40	104	16	51	33	127	65	87	56	103	27	73	104	13	59	143	109	92	63	109	59
2	25	32	44	55	41	45	32	48	31	28	26	24	48	99	51	41	32	39	14	46	92	120	36	126	91	102	114	34	118	121	131	57	125	118	54
3	103	81	32	25	21	40	12	11	21	26	15	146	39	25	42	44	52	79	38	27	40	83	28	44	46	41	62	55	107	89	85	73	82	48	125
4	64	41	41	18	33	37	39	57	13	36	17	46	33	116	29	34	80	21	23	33	61	31	75	81	59	100	29	19	22	73	12	106	54	0.5	41
5	107	45	23	15	184	27	40	27	26	61	89	40	92	47	28	26	3	121	65	96	10	31	71	88	42	40	24	36	71	39	51	100	184	81	45
6	11	67	10	15	36	60	13	38	34	32	35	56	91	13	25	51	32	52	41	21	44	20	80	111	32	55	55	21	102	30	81	38	131	140	65
7	71	50	30	21	21	28	15	15	20	8	57	130	11	41	44	13	73	20	39	70	49	177	25	56	24	48	102	106	29	114	26	8	46	60	27
8	21	27	43	32	42	27	34	21	9	11	41	119	109	9	135	42	33	59	54	26	19	145	24	123	52	98	43	45	29	43	134	47	94	19	22
9	63	56	11	41	52	35	59	17	30	9	30	9	140	57	36	2	55	49	43	50	53	148	56	25	44	19	17	18	76	28	85	72	68	58	85
10	18	29	10	26	26	26	38	15	71	10	43	25	30	89	82	15	124	64	49	62	43	54	90	39	117	105	113	49	87	109	10	87	95	27	81
11	46	45	37	33	11	18	8	10	9	12	49	12	52	61	44	32	41	30	35	15	44	30	22	117	111	82	15	109	96	47	72	22	76	55	64
12	51	27	52	45	41	26	52	25	45	44	94	32	117	29	41	17	40	64	19	24	167	45	86	18	45	45	60	118	26	89	12	89	145	33	85
13	32	9	114	67	23	18	18	37	10	18	18	105	52	132	18	46	146	51	88	39	16	90	95	36	47	125	35	123	55	85	150	52	207	78	24
14	25	8	51	32	33	18	29	32	50	5	6	37	74	75	38	43	48	37	17	25	32	36	22	14	35	11	82	25	14	81	16	139	86	97	87
15	21	65	27	45	24	26	52	51	32	6	63	42	21	33	44	10	56	25	49	17	44	79	15	40	42	41	30	52	37	45	111	62	618	71	63
16	25	58	41	30	37	41	22	42	15	32	6	13	118	3	44	83	68	42	21	21	15	74	12	15	58	26	85	19	35	174	84	72	14	68	67
17	20	31	57	25	44	25	10	17	21	27	23	93	67	13	100	31	27	41	73	47	25	10	31	116	50	54	18	25	40	30	104	55	54	141	32
18	9	43	14	15	28	26	36	6	8	20	33	30	25	91	141	30	37	34	22	15	57	25	135	17	10	43	49	100	61	101	89	75	72	75	55
19	37	5	34	27	19	55	19	6	5	48	14	85	105	180	72	11	90	60	28	15	68	37	34	47	107	40	35	32	72	86	58	86	39	32	8
20	69	48	15	26	18	30	20	8	61	35	85	67	12	101	22	127	36	34	26	14	47	25	38	13	14	56	143	51	75	65	94	17	120	79	100
21	45	45	36	49	15	49	17	25	61	11	65	25	52	32	16	59	131	48	48	28	40	115	38	11	14	43	13	24	99	136	61	157	100	33	122
22	52	46	44	35	8	35	30	22	15	8	9	32	83	41	50	28	30	57	44	33	11	119	64	49	17	92	41	13	113	66	45	45	225	50	116
23	55	60	42	34	40	30	12	9	21	27	43	65	43	28	64	37	15	65	29	30	50	46	49	103	27	30	34	115	128	325	41	133	103	112	103
24	31	62	24	25	33	40	37	22	47	40	60	58	10	31	84	10	30	41	60	54	39	72	85	24	24	120	15	18	127	107	77	34	46	28	52
25	41	70	17	22	29	15	50	18	7	8	80	34	47	37	105	22	34	14	71	41	46	37	180	154	51	24	31	42	111	76	74	98	85	118	22
26	16	38	13	26	28	20	17	16	20	31	23	26	165	104	29	25	91	86	30	45	62	39	74	109	129	55	90	115	25	88	104	117	103	71	156
27	21	35	16	26	28	18	34	17	24	35	34	125	133	94	41	84	110	47	27	63	58	19	54	21	16	67	14	129	56	266	73	35	73	35	118
28	46	50	10	40	48	12	48	21	35	25	33	58	113	36	19	42	73	55	14	51	74	107	48	14	76	87	42	26	24	96	10	109	65	138	112
29	45	7	42	40	16	19	34	6	24	15	72	43	88	41	71	99	11	44	22	45	123	90	23	38	27	10	38	136	32	108	65	20	122	48	104
30	26	58	34	18	31	27	12	83	68	8	27	45	3	7	40	20	5	70	56	16	33	55	22	65	66	99	102	24	82	89	90	134	33	63	100
31	13	73	20	22	30	19	8	41	31	18	50	6	57	12	63	21	10	45	60	53	67	27	80	20	80	54	27	23	48	8	166	116	58	77	81
32	87	31	14	29	43	31	23	42	15	33	26	4	40	20	54	22	152	27	57	79	38	68	63	40	63	90	20	39	98	60	38	46	69	0.5	86
33	39	60	36	13	43	24	58	20	22	10	23	30	56	15	14	92	44	15	25	59	34	85	42	51	85	130	69	99	68	78	188	38	44	107	57
34	23	74	9	29	31	18	31	29	23	25	26	24	47	49	30	133	24	34	37	76	62	37	17	52	55	25	15	31	11	77	100	108	29	89	622
35	75	39	42	42	15	24	45	11	25	13	49	37	34	63	48	61	36	38	41	24	21	225	64	26	57	77	34	85	22	217	20	44	41	127	142
36	55	38	34	90	44	24	13	37	41	25	50	43	73	24	120	48	27	59	52	48	64	67	47	25	114	36	51	115	107	71	28	33	55	98	64
37	19	89	33	24	37	14	27	25	15	29	24	17	32	46	26	28	7	20	18	19	15	60	18	81	76	32	23	80	53	50	184	53	37	75	114
38	23	61	21	47	21	51	43	35	24	26	6	41	10	40	20	94	31	47	44	25	53	26	16	32	44	30	65	30	35	57	34	111	61	83	27
39	19	120	9	27	22	33	16	9	76	47	7	6	33	142	53	44	99	49	78	52	77	12	72	57	94	15	22	30	111	94	76	53	26	147	44
40	6	71	41	52	43	38	27	40	30	34	18	113	41	8	110	30	33	31	18	53	70	75	28	12	26	31	112	68	80	97	75	158	102	51	77
41	53	55	41	35	43	40	25	52	7	33	55	6	19	65	35	175	52	69	52	47	22	73	12	82	30	30	77	81	54	113	133	55	64	29	112
42	48	18	35	23	62	25	7	9	29	9	22	51	99	79	34	22	27	23	27	23	25	38	40	126	18	65	19	9	71	34	14	70	35	59	55
43	54	22	49	35	21	30	30	26	44	66	6	27	96	38	142	54	8	27	73	38	74	103	23	46	58	13	90	100	62	75	90	22	59	39	39
44	53	27	47	54	21	11	16	10	12	54	9	87	43	32	113	144	39	37	67	68	29	34	86	120	22	37	39	39	12	65	101	41	111	87	119
45	23	95	28	30	39	16	16	20	18	51	16	148	46	35	129	4	37	35	11	54	65	60	72	25	20	41	34	29	83	19	212	29	131	23	50
46	20	17	23	19	82	25	17	32	15	18	12	12	33	32	54	57	36	60	45	82	52	30	78	21	34	101	16	71	29	195	118	82	112	88	98
47	65	28	32	25	17	37	30	18	47	50	13	7	22	25	34	52	44	60	46	70	34	77	95	56	32	119	22	68	106	75	18	67	67	65	35
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49	30	17	43	14	39	41	18	23	29	81	53	59	8	57	27	106	29	41	36	65	51	30	55	100	14	97	44	33	33	138	104	15	90	152	32
50	52	22	30	55	38	10	17	13	28	6	28	69	121	122	33	32	36	23	53	27	23	13	78	26	106	61	80	22	31	138	134	93	73	102	68

Table 1: Continued.

Count	Transect US-8 MC						Transect US-7 MC						Transect US-7 LB						Transect US-6 RB						Transect US-6 MC						Transect US-5 RB					
1	132	35	28	22	15	51	137	11	19	16	68	0.5	6	46	12	0.06	35	136	43	71	15	74	31	87	86	54	21	12	61	18	0.5	0.06	0.06	33	12	8
2	67	10	78	27	17	91	25	36	12	61	34	5	0.06	29	99	0.06	18	120	47	74	178	27	74	39	27	74	22	10	65	31	24	93	11	89	0.06	0.5
3	94	15	31	28	16	44	18	74	12	51	36	15	64	48	107	28	24	37	18	19	17	34	49	80	18	26	23	73	16	30	37	13	22	0.5	0.06	0.06
4	11	24	18	20	17	47	14	116	102	27	38	25	25	227	5	66	69	19	75	58	127	26	46	97	17	48	15	34	31	11	18	22	13	4	0.06	16
5	26	37	44	12	38	29	17	6	146	28	22	6	9	172	29	88	43	82	52	61	95	77	151	114	10	26	22	21	33	21	0.06	20	0.06	5	0.06	76
6	56	13	106	37	18	57	8	11	25	39	19	27	49	53	74	0.06	16	0.06	113	22	22	54	40	107	17	25	28	13	50	15	38	0.06	13	23	24	10
7	77	23	27	18	78	41	0.5	19	74	30	18	50	26	149	72	0.06	45	12	80	119	94	29	26	234	1	30	15	35	17	34	0.5	23	88	35	11	17
8	21	51	65	22	106	45	17	5	27	33	14	25	21	174	62	141	300	11	88	36	89	59	62	88	31	46	11	15	12	17	0.5	0.06	62	24	6	19
9	106	24	33	25	55	114	26	77	35	86	14	15	173	17	16	30	7	0.06	131	33	23	51	67	66	32	22	58	30	13	33	65	0.06	41	0.5	58	14
10	45	27	37	26	27	25	10	10	17	75	11	98	92	15	91	38	52	35	21	58	37	32	65	89	36	20	46	47	24	84	0.5	0.06	84	0.5	0.5	17
11	27	67	42	55	35	26	69	18	14	10	18	50	103	90	25	38	215	5	75	59	25	14	32	32	26	49	33	45	82	38	65	27	0.06	0.5	16	0.5
12	25	41	47	80	59	24	115	10	10	13	7	15	13	27	14	198	299	43	67	21	69	11	71	56	14	49	20	47	36	14	7	25	103	0.5	46	18
13	35	67	22	45	61	9	13	42	0.5	15	71	75	24	8	15	105	18	10	36	67	65	95	48	73	11	54	34	42	33	33	13	57	13	39	25	12
14	54	44	96	35	39	64	10	27	25	26	15	37	0.06	92	8	39	3	9	6	0.5	90	34	32	89	27	40	80	69	24	40	27	19	0.06	0.5	25	22
15	13	64	55	49	8	22	17	7	126	33	63	11	69	7	13	0.06	103	9	41	87	26	66	10	50	14	36	43	26	34	39	35	0.06	0.06	40	11	32
16	30	129	49	33	52	20	8	28	127	14	15	77	66	107	136	122	54	23	28	81	82	16	24	16	23	23	28	26	49	28	35	73	96	34	0.5	37
17	47	15	13	67	15	10	207	11	91	26	30	12	18	127	9	74	76	15	88	65	59	63	103	107	26	19	17	31	33	36	7	0.06	0.06	35	6	21
18	104	53	99	63	25	80	85	6	85	20	22	27	24	11	11	67	128	7	73	24	26	82	61	30	19	11	76	35	9	38	8	57	9	104	6	24
19	12	42	13	15	12	56	25	25	8	11	84	65	102	65	53	10	143	11	33	27	87	12	35	49	9	20	43	20	34	34	0.06	49	0.06	59	26	48
20	46	45	51	33	46	39	12	38	38	25	19	34	30	19	10	72	205	78	27	46	90	53	33	86	11	20	50	57	19	65	0.06	26	51	30	17	9
21	67	35	42	20	16	20	11	9	43	50	72	29	12	46	8	145	24	14	83	89	85	123	28	9	14	27	43	36	54	27	0.06	116	12	10	15	0.5
22	44	66	65	26	55	12	8	26	37	111	27	90	40	168	18	38	12	15	50	48	59	94	98	34	20	32	43	27	53	20	23	0.06	0.06	50	23	4
23	45	75	24	56	17	88	30	142	61	21	20	15	19	18	155	214	76	31	95	11	119	77	54	51	27	83	50	24	42	48	0.06	0.06	0.06	64	17	14
24	25	12	47	19	36	24	8	62	0.5	38	15	8	34	23	11	85	21	37	95	140	30	16	144	58	44	11	45	12	54	47	21	32	0.06	91	10	46
25	131	47	13	26	44	47	9	91	103	11	59	8	7	62	15	8	181	7	80	34	17	20	17	64	15	18	61	36	13	29	0.06	47	0.06	7	28	83
26	30	28	101	95	60	97	19	66	44	10	48	19	10	34	43	5	125	0.5	139	131	32	34	9	109	20	23	67	64	58	21	0.06	42	56	0.5	18	0.06
27	31	98	37	4	92	58	15	56	76	44	98	24	14	15	12	104	125	111	63	57	113	124	48	60	24	52	12	29	39	22	0.06	17	34	20	44	0.06
28	16	48	37	49	60	8	16	54	24	25	26	16	6	22	14	180	33	32	133	88	14	12	54	64	30	30	14	53	32	88	0.06	27	18	0.5	60	0.06
29	50	32	21	60	11	20	14	14	18	0.5	18	24	142	31	11	5	21	198	41	70	14	50	101	40	43	31	43	13	44	62	10	0.5	16	21	4	0.06
30	61	34	10	15	30	69	18	70	94	13	46	36	17	13	7	41	92	206	23	81	22	93	95	6	32	25	25	50	99	49	13	0.5	39	0.5	51	0.5
31	9	54	12	27	23	65	35	17	18	100	73	16	13	15	20	46	36	0.5	35	76	59	19	97	54	26	40	53	20	18	26	0.06	14	25	62	0.06	24
32	40	26	25	43	118	32	13	16	72	93	17	146	5	9	33	165	29	7	68	26	24	88	27	33	77	21	23	19	29	19	0.06	44	21	6	0.06	7
33	33	130	28	80	114	52	8	47	26	42	12	100	131	9	44	9	5	123	19	92	114	65	65	3	26	19	15	16	22	24	27	47	0.06	120	22	0.5
34	14	29	17	34	32	51	10	9	24	18	100	16	116	12	72	71	168	9	74	124	134	6	22	9	35	49	17	18	19	25	29	0.06	58	0.06	7	43
35	19	45	11	11	53	12	48	14	17	33	15	14	7	197	13	67	72	83	17	18	49	44	7	6	35	17	33	51	35	49	23	44	98	0.06	20	46
36	21	46	24	79	30	58	12	30	36	0.5	39	80	57	11	15	20	74	10	68	33	5	38	84	105	47	19	16	67	47	30	0.06	47	24	39	21	9
37	31	38	17	28	41	43	124	10	12	26	16	68	5	28	260	4	48	23	38	26	139	64	28	92	36	48	17	45	27	125	6	0.06	45	0.06	0.5	51
38	22	22	19	26	22	44	27	50	31	9	99	10	46	21	60	6	5	94	13	22	57	90	65	45	11	49	51	13	55	53	88	0.06	17	92	17	14
39	36	59	38	20	175	28	7	49	31	67	126	4	14	166	115	104	172	7	46	117	44	17	77	18	12	16	29	64	38	22	18	0.06	12	74	17	11
40	20	40	32	22	57	32	9	27	20	14	18	53	11	17	27	38	177	0.06	35	27	64	9	73	33	48	17	105	11	14	13	44	17	0.06	10	13	28
41	24	55	29	16	32	127	26	85	8	11	10	14	103	75	76	54	24	94	8	76	52	0.5	55	41	91	29	52	13	26	18	0.06	21	15	34	130	49
42	27	49	11	33	107	39	12	20	16	16	12	15	14	16	155	66	0.06	15	99	13	90	111	61	18	33	15	42	12	52	47	0.06	11	0.06	55	0.5	28
43	29	20	16	54	63	39	160	14	96	13	92	20	15	10	232	62	0.06	11	17	85	116	20	33	34	16	57	43	48	22	43	15	23	9	37	51	10
44	28	27	33	20	23	77	20	35	40	31	12	0.5	45	12	72	30	68	48	44	18	20	123	76	18	42	31	34	63	11	37	0.06	83	12	12	0.5	51
45	58	39	48	45	61	54	80	21	5	18	41	21	17	103	25	48	0.06	19	70	129	70	60	50	62	47	23	31	29	12	43	97	10	7	12	8	0.5
46	20	93	20	44	43	16	23	14	23	29	30	8	64	10	0.06	28	146	113	98	38	7	49	41	17	71	26	74	27	42	59	20	0.06	0.06	31	7	28
47	26	32	26	21	23	37	10	11	10	23	88	29	115	16	0.06	93	49	172	82	52	52	78	66	9	37	41	54	42	57	45	77	0.5	37	25	66	41
48	30	42	23	9	190	34	25	15	14	17	17	8	114	102	245	36	9	18	33	44	61	15	41	125	46	16	70	47	47	26	46	19	26	14	105	9
49	18	51	10	25	40	27	35	68	32	48	16	21	47	130	46	9	0.06	53	44	64	58	96	89	106	16	47	44	15	46	58	64	23	16	16	39	0.06
50	21	86	70	30	69	39	22	16	44	13	10	5	13	31	5	41	44	184	14	35	21	21	8	15	55	62	13	10	43	51	9	0.06	8	0.5	24	15

Table 1: Continued.

Count	Transect US-5 RB-2						Transect US-4 RB						Transect US-3 MC						Transect US-2 RB						Transect US-1 RB					Transect DS-1 MC					
1	20	13	80	43	20	0.5	26	147	0.5	8	17	47	19	195	4	138	97	29	92	112	7	56	32	152	37	18	23	11	48	18	44	45	128	93	59
2	9	15	64	31	14	43	93	12	69	5	33	15	102	96	65	13	20	5	108	9	95	55	23	85	21	6	23	43	43	82	18	129	50	78	17
3	0.5	31	0.5	16	11	38	92	15	123	97	9	69	80	51	122	41	20	18	68	45	6	62	59	123	10	35	26	46	49	62	93	92	66	143	74
4	22	12	7	75	14	35	26	47	32	0.5	129	59	3	5	39	72	27	83	139	18	5	38	123	40	13	8	10	56	10	65	96	83	78	69	58
5	137	12	27	30	0.5	0.06	87	9	10	46	27	17	94	31	12	31	36	40	46	4	119	17	45	13	16	14	14	5	33	65	15	10	22	18	72
6	38	8	12	12	24	42	0.06	24	19	20	0.06	66	13	8	29	65	47	28	63	29	44	35	39	144	39	29	32	1	36	70	76	9	31	32	117
7	57	34	33	11	16	69	0.06	65	24	87	15	0.06	13.5	6	166	69	81	3	13	134	17	42	70	41	16	11	36	54	58	11	69	167	18	80	10
8	65	17	45	11	13	18	26	100	23	8	34	82	44	118	93	30	32	4	28	37	43	9	34	86	23	49	6	49	16	30	85	155	102	31	52
9	118	18	5	12	7	53	54	96	11	53	3	0.06	57	41	109	62	107	17	88	58	36	65	12	28	35	12	42	13	14	8	96	45	54	48	92
10	60	10	34	59	55	73	58	0.5	107	26	89	18	45	195	15	12	47	16	44	12	14	14	18	11	4	41	28	11	2	9	106	70	21	64	81
11	20	23	31	19	35	0.5	5	30	63	38	12	0.06	34	27	7	36	19	19	36	62	42	22	24	99	22	11	32	45	41	16	24	73	76	52	52
12	0.5	12	113	12	76	30	54	22	13	8	19	78	30	77	147	235	7	38	40	59	46	49	27	74	13	9	34	22	14	97	48	57	45	78	30
13	12	27	36	54	22	35	85	12	38	38	65	13	22	43	82	23	8	72	77	11	144	81	50	10	50	19	25	71	21	67	76	60	24	65	52
14	7	29	56	44	65	0.5	20	57	18	22	10	9	75	156	54	77	87	133	8	26	74	24	53	46	26	8	10	32	7	23	17	48	122	83	67
15	41	0.5	25	20	57	18	21	10	44	51	9	34	7	5	12	20	91	24	53	72	153	66	40	60	19	22	13	26	22	54	76	20	72	57	6
16	17	42	0.5	24	50	0.5	14	25	51	13	16	107	58	6	103	17	67	11	14	42	6	63	13	16	7	8	4	91	24	68	56	70	60	94	41
17	9	11	19	24	8	51	43	15	8	20	38	73	34	85	44	172	88	21	25	36	63	34	93	119	34	83	32	6	25	40	73	65	16	43	55
18	45	14	69	23	22	0.5	30	14	105	15	34	77	18	20	27	24	14	47	64	83	8	64	23	38	21	21	7	39	32	18	31	63	82	13	48
19	44	61	40	33	61	16	5	82	25	102	17	86	12	67	30	55	124	114	51	3	12	114	39	89	1	15	11	23	47	57	29	78	4	81	29
20	18	14	43	16	23	18	25	57	70	7	31	131	67	19	20	59	15	22	11	19	123	32	108	35	3	11	12	8	1	42	9	62	33	168	52
21	92	26	51	7	23	84	0.06	105	89	92	107	92	22	119	16	13	25	30	50	26	11	134	12	26	9	22	32	25	32	15	46	13	88	136	9
22	32	27	64	21	0.5	49	0.06	39	14	9	0.06	32	25	28	11	59	33	129	45	11	51	15	15	15	30	19	51	18	30	102	118	38	49	38	39
23	77	16	40	20	66	65	65	25	69	8	135	37	27	26	31	39	31	96	18	78	32	66	9	10	46	94	63	24	54	66	54	87	75	32	49
24	59	22	16	11	8	27	9	44	54	12	10	63	8	29	193	12	48	125	35	68	39	133	26	94	23	15	7	18	31	42	74	69	50	74	20
25	85	3	141	37	83	5	0.5	14	0.06	77	15	35	81	129	29	36	41	49	15	14	76	94	38	52	15	29	40	2	7	76	54	31	92	73	41
26	32	12	140	22	17	71	58	34	27	18	47	13	17	17	66	104	49	28	134	19	64	23	26	51	14	21	32	7	23	25	47	23	28	68	62
27	45	11	26	7	36	96	66	26	34	54	0.06	68	26	25	98	26	51	21	66	14	34	118	24	126	19	29	19	10	32	57	75	20	20	60	39
28	21	15	57	31	21	17	14	107	130	37	64	0.06	33	3	27	36	79	29	25	13	61	101	36	13	18	1	36	32	13	30	39	47	29	38	9
29	33	17	97	9	74	0.06	37	94	111	31	121	43	62	8	22	21	5	21	15	77	33	33	74	51	11	12	49	32	30	8	17	60	71	117	121
30	57	12	20	16	16	11	18	205	29	29	97	0.06	70	16	112	31	40	22	113	122	32	52	10	62	18	47	16	46	10	29	20	62	36	93	25
31	9	63	0.5	29	16	24	32	27	16	93	76	0.06	22	29	41	70	6	86	76	82	9	54	143	81	26	27	83	56	31	59	49	86	59	40	289
32	9	7	57	77	61	23	35	10	21	57	0.06	36	41	14	17	34	49	65	21	63	13	129	27	39	11	23	6	28	20	32	69	17	69	64	106
33	19	14	79	23	86	25	64	14	12	8	0.06	18	9	5	115	204	31	131	34	149	30	122	35	36	23	7	40	17	37	94	100	54	57	68	34
34	4	73	37	21	38	14	99	17	79	7	101	0.06	95	28	70	28	47	110	46	44	23	87	88	14	19	20	23	7	33	55	49	54	80	44	44
35	13	79	69	12	30	38	13	24	79	81	15	0.06	85	74	72	119	56	43	90	84	38	52	35	54	31	20	34	20	52	34	28	75	23	12	21
36	7	26	9	7	82	59	136	105	59	14	155	0.06	101	41	109	35	81	31	34	22	67	62	39	58	27	1	74	7	14	82	77	41	62	54	16
37	20	25	51	18	78	15	0.06	42	35	23	12	110	115	25	31	106	18	39	65	65	118	68	23	18	36	20	10	125	72	89	25	13	58	74	25
38	17	23	39	18	64	22	67	42	51	61	27	0.06	41	12	191	66	37	16	26	11	99	14	13	7	31	27	107	27	31	73	100	73	42	13	38
39	35	46	67	35	40	25	44	24	29	12	55	62	100	15	161	27	5	30	98	119	35	28	37	49	59	13	28	24	11	27	18	46	15	92	87
40	18	31	34	8	55	19	110	16	10	12	33	35	33	41	43	77	48	175	106	28	37	38	19	68	12	18	1	90	28	34	31	52	61	79	77
41	11	41	14	20	41	30	11	31	48	37	69	0.06	62	117	9	56	145	26	11	45	53	67	85	34	7	16	5	33	7	57	86	42	24	83	68
42	9	89	119	28	17	16	13	58	6	49	47	34	54	141	29	51	9	62	52	12	13	106	119	46	37	5	45	18	3	15	92	14	74	18	31
43	15	10	0.5	21	83	24	39	33	9	44	46	0.06	43	161	58	156	115	29	78	33	91	95	15	18	1	7	21	14	27	35	61	79	52	60	140
44	13	42	49	17	58	86	49	19	105	23	0.06	123	110	121	83	14	119	14	10	30	26	19	27	25	97	12	4	32	7	109	87	137	93	54	76
45	10	32	10	12	39	57	26	22	10	152	130	0.06	84	43	10	15	90	24	54	15	38	90	90	28	6	18	9	32	6	86	34	93	45	66	61
46	0.5	8	24	18	88	22	85	49	52	81	0.06	71	30	25	152	9	5	67	50	115	9	103	17	92	30	37	1	82	13	70	29	65	77	55	91
47	9	35	23	7	46	33	43	38	55	6	46	18	35	22	60	38	36	6	78	29	114	22	11	27	30	23	62	58	53	114	107	79	90	88	233
48	55	57	0.06	22	18	43	17	17	47	39	25	67	9	19	70	17	27	74	16	47	63	65	49	61	6	14	6	45	15	16	36	33	43	58	79
49	13	11	17	10	57	11	25	22	34	41	13	32	28	83	61	67	17	26	70	71	28	17	19	43	8	72	50	18	52	55	91	36	71	95	68
50	48	8	73	21	31	6	13	75	4	20	91	0.06	131	14	29	163	82	140	25	33	20	69	130	9	24	1	59	10	50	14	79	46	64	47	14

Table 1: Continued.

Count	Transect DS-1 RB						Transect DS-2 MC						Transect DS-3 MC						Transect DS-4 RB						Transect DS-5 LB						Transect DS-5 RB					
1	17	67	16	16	7	18	89	40	26	73	35	18	96	80	98	5	40	64	57	0.06	109	0.06	83	83	31	19	60	128	66	20	39	21	48	81	16	39
2	19	21	41	48	12	23	12	25	38	15	31	43	52	84	14	52	30	24	0.06	75	0.06	78	0.06	0.06	69	35	30	94	15	588	29	30	41	75	49	7
3	64	95	55	19	22	47	34	54	65	16	80	36	99	42	61	42	56	19	83	0.06	0.06	88	88	0.06	73	74	90	51	26	58	54	34	33	9	41	25
4	74	31	115	35	31	51	67	24	42	70	68	83	60	14	46	27	94	66	0.06	0.06	0.06	127	0.06	73	74	123	19	14	28	62	82	16	21	81	112	58
5	21	18	6	16	75	74	42	64	17	80	40	32	38	9	43	30	13	11	67	0.06	26	94	0.06	45	109	110	77	22	133	29	44	27	59	32	38	52
6	74	19	73	16	17	34	54	32	110	27	54	45	94	78	71	42	94	62	53	113	60	149	31	95	21	11	248	16	23	69	42	9	20	51	28	3
7	11	14	27	77	32	80	11	22	44	32	95	40	19	61	20	62	27	43	45	74	0.06	0.06	50	0.06	29	27	168	67	26	22	39	41	70	41	0.5	73
8	61	23	98	58	74	7	28	99	29	71	48	55	17	48	81	73	53	19	0.06	73	0.06	0.06	92	68	127	47	52	17	168	65	55	30	75	95	58	70
9	39	89	18	33	83	20	26	79	56	76	47	43	44	97	13	59	29	24	0.06	75	0.06	56	0.06	84	52	18	115	86	20	50	100	62	5	58	12	79
10	93	5	59	17	13	32	38	42	53	65	78	31	85	85	18	47	44	12	42	41	41	13	93	0.06	23	11	85	183	106	28	47	15	54	14	14	25
11	79	21	31	54	13	17	62	53	31	25	72	57	13	24	23	118	67	37	129	114	0.06	0.06	0.06	89	175	15	32	90	8	258	30	40	8	72	0.5	15
12	24	76	93	5	30	64	34	57	69	57	23	43	47	35	24	74	17	86	0.06	46	42	0.06	71	86	38	25	46	60	65	31	68	50	18	88	22	58
13	96	15	59	32	22	20	69	68	101	38	73	60	36	34	69	67	83	75	24	77	103	104	0.06	60	37	14	19	89	20	50	42	36	41	98	0.5	15
14	13	21	17	37	70	104	46	31	19	84	35	20	89	43	47	16	38	37	0.06	57	78	0.06	1	0.06	112	38	55	57	46	100	14	52	11	0.5	35	26
15	18	21	54	7	57	38	28	73	89	64	62	68	53	59	14	77	57	38	43	0.06	0.06	0.06	0.06	0.06	15	114	47	78	38	79	19	9	17	34	13	21
16	44	14	39	15	23	33	73	41	39	69	18	51	23	39	58	59	63	74	52	0.06	0.06	37	0.06	77	63	56	275	38	40	88	20	113	27	25	81	16
17	83	5	49	23	6	69	38	29	89	86	86	65	67	42	72	19	68	31	49	111	0.06	0.06	102	0.06	114	84	15	79	9	27	43	26	9	10	82	16
18	13	7	11	5	17	27	49	85	25	35	86	73	100	32	20	11	39	28	32	94	0.06	47	0.06	11	43	6	111	0.5	58	11	16	44	48	22	37	36
19	39	17	25	25	21	77	68	214	57	87	35	75	35	51	16	54	58	68	0.06	29	0.06	0.06	0.06	0.06	73	25	234	154	22	27	14	19	81	28	0.5	11
20	81	53	38	26	42	24	25	21	73	63	67	84	23	25	13	37	35	25	39	0.06	21	51	97	0.06	74	33	20	53	71	125	5	9	31	21	44	69
21	122	60	75	11	18	9	32	32	36	31	37	38	43	80	5	36	62	30	0.06	0.06	42	47	0.06	74	50	74	30	100	29	60	65	20	66	77	36	40
22	10	22	101	24	68	157	30	23	39	32	22	81	55	38	41	7	61	19	117	104	0.06	0.06	37	49	284	42	100	25	17	38	44	0.5	17	0.5	81	63
23	29	37	28	45	81	63	65	19	92	83	76	16	77	64	83	27	7	49	35	91	35	34	85	0.06	77	10	87	75	39	56	22	0.5	23	54	47	12
24	134	70	45	19	20	67	45	34	104	67	79	58	79	76	38	40	44	58	0.06	16	63	0.06	30	0.06	71	25	27	62	18	49	16	35	0.5	107	4	13
25	8	92	11	50	7	33	29	114	24	25	39	54	69	34	15	7	25	90	46	0.06	118	38	0.06	0.06	90	23	18	42	16	61	77	8	22	38	16	66
26	22	44	43	28	37	20	49	26	313	50	89	24	20	92	41	74	66	84	45	0.06	47	0.06	0.06	67	8	40	27	64	26	75	19	14	21	54	37	8
27	107	84	91	61	18	74	46	26	32	35	63	116	24	28	84	62	50	77	96	96	41	0.06	0.06	61	55	40	10	40	47	113	15	6	22	20	37	15
28	23	8	64	26	8	19	30	26	70	44	52	39	63	50	20	54	77	75	0.06	56	0.06	0.06	28	0.06	195	32	56	78	22	148	18	18	17	163	30	45
29	11	17	45	31	46	30	73	50	62	42	97	44	43	65	26	16	46	25	47	82	22	113	0.06	21	49	50	22	145	63	82	89	44	7	31	40	20
30	57	27	13	64	97	20	34	66	95	75	60	37	7	80	32	73	71	53	0.06	106	0.06	28	0.06	0.06	29	24	17	38	61	141	55	9	12	52	32	56
31	99	31	40	18	32	67	87	26	35	13	66	40	16	37	98	59	66	77	0.06	89	117	0.06	0.06	0.06	24	15	38	48	34	59	43	19	58	26	23	16
32	12	13	75	37	85	86	33	17	96	36	69	41	20	77	31	24	49	79	0.5	0.06	77	0.06	0.06	44	27	45	86	11	108	78	10	40	54	0.5	31	48
33	75	15	58	17	77	33	24	146	40	70	60	96	28	49	34	89	27	74	80	35	15	0.06	0.06	0.06	16	43	14	57	20	131	25	15	13	22	45	9
34	16	35	33	19	20	20	60	22	51	38	113	67	25	43	36	30	43	27	0.06	0.06	64	0.06	0.06	43	41	73	172	98	22	41	0.5	40	50	20	46	56
35	21	50	74	4	25	15	54	22	54	41	64	36	98	51	41	26	86	49	0.06	0.06	16	14	0.06	0.06	12	14	14	71	15	86	18	18	45	22	62	0.5
36	18	14	55	15	17	24	76	87	34	95	46	55	71	39	125	31	47	21	0.06	0.06	54	0.06	63	0.06	35	60	31	15	88	45	126	7	21	19	86	39
37	23	98	43	8	94	34	34	27	31	55	77	75	51	75	67	51	86	27	0.06	68	0.06	0.06	77	0.06	36	71	16	22	31	71	5	58	15	49	66	23
38	43	21	29	95	58	84	42	35	76	81	48	57	72	14	65	41	48	65	78	59	0.06	89	0.06	79	34	78	26	9	5	89	4	38	19	0.5	17	29
39	15	92	64	13	71	55	29	92	72	34	53	53	96	26	96	29	38	52	90	0.06	0.06	67	31	57	189	138	7	19	42	0.5	34	12	9	43	16	17
40	7	13	20	22	33	21	35	45	39	47	79	94	60	42	104	39	36	33	0.06	0.06	37	83	99	84	40	51	14	59	54	293	30	16	45	22	13	24
41	21	28	24	71	208	13	78	22	116	53	26	28	70	70	25	52	42	26	95	0.06	144	47	102	104	85	95	93	33	29	25	23	47	30	29	12	18
42	29	8	18	12	40	24	23	40	70	66	47	52	55	73	75	23	19	22	78	42	0.06	54	0.06	86	62	31	21	48	60	24	75	19	72	29	16	0.5
43	77	26	19	86	44	29	112	47	38	63	58	81	55	19	32	21	15	96	104	18	103	41	0.06	90	27	270	22	73	143	100	57	31	14	7	20	0.5
44	82	14	87	12	22	24	111	26	46	33	93	53	19	107	34	46	21	16	0.06	105	39	45	62	94	19	20	68	136	32	115	52	29	57	65	12	14
45	41	76	22	96	31	65	95	20	74	73	27	75	16	64	52	24	7	52	0.06	58	0.06	0.06	0.06	0.06	41	550	134	41	62	0.5	43	6	10	22	20	9
46	7	40	84	20	90	37	85	46	39	78	23	31	92	118	41	23	81	29	0.06	0.06	62	40	50	0.06	46	126	89	46	15	32	57	20	157	20	39	0.5
47	52	24	23	47	47	35	57	33	31	121	29	30	51	70	73	50	24	26	97	0.06	95	0.06	87	0.06	31	24	0.5	122	245	17	11	53	16	43	79	12
48	50	25	44	17	73	17	39	34	51	66	60	30	14	19	77	17	76	18	0.06	0.06	115	0.06	105	0.06	25	80	69	108	70	48	30	16	23	14	0.5	49
49	23	43	16	35	22	25	82	54	74	19	43	65	88	25	103	120	15	17	0.06	0.06	0.06	36	102	0.06	52	31	18	16	58	19	28	35	39	14	25	17
50	47	100	28	33	5	108	32	27	70	34	29	42	49	48	54	72	20	55	114	0.06	0.06	0.06	0.06	96	46	135	22	87	64	10	15	51	25	31	11	54

Table 1: Continued.

Count	Transect DS-6 LB						Transect DS-7 RB						Transect DS-9 MC						Transect DS-14 MCB						Transect DS-14 RB						Transect DS-15 RB					
1	110	30	20	14	36	34	54	45	98	66	102	131	13	66	34	117	78	138	164	38	73	34	34	27	0.06	18	3	104	39	6	42	37	48	29	33	127
2	66	43	12	47	68	58	35	80	103	27	17	106	49	62	145	75	34	30	90	36	48	136	57	20	8	16	5	5	43	10	35	70	124	97	14	48
3	222	107	17	38	31	79	95	26	64	45	117	75	14	126	74	62	30	86	89	66	14	257	248	52	62	10	34	86	30	50	45	65	73	45	86	14
4	50	49	173	42	110	54	64	38	106	69	59	117	7	70	118	12	47	30	14	127	19	136	30	10	22	55	51	17	21	10	57	101	31	18	44	90
5	28	49	7	28	36	108	124	154	110	27	50	43	1	77	146	16	22	46	42	26	72	117	20	148	15	16	18	37	10	21	33	113	113	112	120	25
6	67	81	40	11	130	84	117	77	13	74	96	67	32	71	33	125	41	24	66	35	24	111	90	76	46	40	36	0.06	32	10	18	83	54	43	142	59
7	82	133	54	146	43	63	61	12	84	91	75	46	44	27	25	43	119	90	55	57	45	14	57	29	38	31	15	21	8	39	79	45	72	68	47	59
8	133	23	19	139	34	15	38	40	34	39	178	34	18	77	92	6	50	94	92	49	43	42	38	49	6	5	74	77	17	8	117	46	78	19	89	36
9	19	19	47	77	53	130	73	73	132	104	37	140	28	117	69	48	56	32	28	42	46	52	57	43	30	8	18	17	10	15	86	163	60	63	109	32
10	40	18	47	47	60	55	18	103	107	77	18	21	6	37	66	82	19	108	94	168	133	90	45	28	36	33	22	15	33	24	56	40	52	127	83	39
11	79	142	76	28	117	46	99	56	51	16	52	41	9	13	68	5	39	85	65	39	213	158	165	59	0.06	4	65	0.06	70	43	36	115	38	18	19	37
12	68	56	30	27	41	60	21	120	17	16	113	78	14	27	109	40	64	92	53	73	74	28	42	23	22	34	10	11	58	26	110	112	36	15	26	63
13	57	174	22	46	7	145	114	102	95	116	96	103	27	89	71	94	114	34	230	51	48	82	81	45	37	49	7	12	101	33	29	51	103	85	166	74
14	24	37	9	72	95	66	45	20	105	55	39	29	15	95	61	82	81	38	99	16	9	57	114	64	41	23	111	38	53	0.5	45	106	12	78	102	26
15	16	46	61	166	34	62	33	75	65	24	35	32	4	28	75	77	99	40	52	34	21	13	64	76	6	5	80	48	47	6	152	111	25	93	26	46
16	119	59	16	42	27	122	64	74	16	164	75	15	18	7	65	40	114	75	69	59	111	64	51	26	20	39	168	0.06	6	147	43	26	4	35	103	119
17	30	32	33	63	61	76	43	31	133	56	81	82	20	23	111	107	85	27	44	8	100	86	26	52	6	86	50	24	19	21	116	16	127	54	9	100
18	37	39	31	15	56	41	57	30	19	122	104	119	16	24	114	22	35	96	54	180	71	74	63	108	6	4	68	18	43	16	48	57	42	24	91	66
19	122	130	18	142	27	37	120	31	96	34	37	58	23	65	101	56	12	83	34	38	178	126	37	74	6	12	114	49	0.5	10	44	55	34	91	38	45
20	25	70	12	41	16	27	18	106	102	48	84	79	27	43	103	109	22	56	15	34	66	14	37	74	25	19	44	48	11	0.5	25	39	77	76	105	30
21	72	43	78	136	203	63	123	55	16	91	107	104	35	86	18	96	114	82	36	84	41	61	80	134	13	5	39	24	0.5	49	24	67	53	68	97	47
22	20	44	134	34	33	42	111	11	39	15	55	35	21	48	17	58	30	44	83	46	18	52	11	72	15	50	18	0.06	29	124	51	107	14	130	66	133
23	73	102	38	16	61	108	43	72	43	95	70	55	51	6	70	8	73	49	3	68	123	19	24	165	32	4	17	16	28	0.5	117	70	64	14	142	14
24	22	30	48	50	27	66	15	33	81	21	21	17	27	91	90	27	48	120	32	62	19	176	33	81	37	61	40	21	0.5	23	33	119	53	16	43	8
25	24	27	11	131	57	62	25	45	86	18	100	47	8	135	84	10	35	63	76	35	82	39	44	54	10	28	16	0.5	41	41	10	60	121	126	65	16
26	160	39	29	16	97	91	77	64	25	38	9	77	36	104	37	145	53	57	46	56	81	77	23	54	5	8	10	10	21	0.5	105	122	179	55	59	94
27	44	28	42	130	38	37	96	24	121	48	108	54	25	9	16	72	93	90	11	49	86	23	41	11	25	14	12	51	26	16	58	148	75	126	67	19
28	103	22	80	155	54	61	57	430	128	143	22	35	4	99	57	108	79	84	115	24	62	85	109	34	11	33	70	14	12	16	16	57	106	109	64	35
29	33	29	57	25	60	61	9	63	37	55	106	56	30	35	48	56	56	92	87	31	86	57	87	20	60	6	14	0.5	36	18	20	27	7	81	112	26
30	79	37	28	51	28	178	42	100	78	10	99	29	11	65	130	52	95	39	47	29	63	15	46	29	11	8	21	25	34	11	96	129	41	12	81	48
31	53	44	177	16	44	103	51	29	38	95	144	16	65	26	34	4	54	21	35	125	9	37	39	170	57	9	25	22	38	0.5	95	91	186	27	18	45
32	15	48	32	46	40	76	106	87	51	17	51	71	102	46	42	28	49	30	165	36	28	37	63	33	10	21	14	40	17	10	108	30	53	92	23	125
33	20	125	145	65	74	85	94	10	21	106	14	74	57	58	53	130	73	71	23	24	83	45	12	164	32	5	8	46	76	32	77	99	69	28	99	45
34	38	83	48	51	158	155	39	112	21	72	65	128	31	31	78	61	21	123	84	54	78	58	67	55	29	13	32	15	11	8	116	58	22	48	59	34
35	80	17	103	152	57	40	96	26	114	55	32	33	44	91	21	105	71	32	47	34	31	64	30	49	7	20	9	19	25	0.5	49	58	134	7	64	21
36	50	32	124	8	45	116	89	31	37	139	86	68	19	135	65	34	78	32	93	40	78	15	53	169	6	7	6	0.06	24	18	55	108	121	75	107	9
37	101	80	34	33	42	18	30	91	54	63	19	23	39	19	12	27	99	39	194	55	36	180	79	21	47	36	4	35	15	5	51	93	43	33	55	142
38	10	61	94	46	65	57	26	40	105	56	70	67	6	32	21	48	72	88	40	230	154	27	92	46	61	13	10	39	0.5	34	47	96	40	36	28	27
39	36	49	43	34	54	112	131	42	48	25	46	57	21	64	23	40	68	65	75	68	23	26	42	35	5	35	6	0.06	0.5	28	46	106	83	24	35	42
40	32	13	65	96	137	40	7	32	110	115	77	68	24	80	101	45	102	35	36	30	32	15	97	40	32	12	23	18	39	6	74	91	14	61	9	52
41	29	43	34	72	89	18	37	86	29	13	106	112	14	104	14	18	44	111	68	49	22	34	127	216	21	25	31	18	29	3	80	120	19	38	104	33
42	48	155	59	187	140	33	44	23	42	61	69	31	13	73	23	29	55	40	13	26	28	62	78	49	9	33	44	46	4	48	33	46	57	35	49	13
43	47	14	20	65	53	48	39	69	83	60	66	4	23	43	33	58	94	116	71	43	113	300	41	40	6	27	16	23	11	7	20	56	24	106	130	32
44	21	70	41	128	46	16	97	139	32	41	39	90	9	29	5	22	69	30	78	51	127	63	104	80	29	23	19	44	0.5	24	106	36	9	40	44	18
45	87	37	113	29	142	146	20	128	110	64	90	134	15	111	65	23	111	29	34	56	28	33	52	49	9	43	71	13	6	44	74	52	59	27	24	57
46	47	144	33	144	114	129	99	18	109	38	101	38	14	64	73	48	14	29	87	25	105	43	65	16	6	30	12	7	10	13	59	46	26	5	72	10
47	97	29	24	155	20	83	76	60	59	118	71	61	11	55	6	82	51	72	100	59	41	68	48	277	16	16	0.5	18	13	11	27	23	107	114	120	27
48	89	58	44	149	75	154	65	39	24	101	44	69	30	52	17	120	86	79	60	125	40	52	34	10	61	15	90	10	15	10	45	127	135	56	45	22
49	36	39	45	40	64	69	35	27	47	61	23	20	20	40	29	78	39	88	65	51	152	80	26	16	7	17	25	28	5	42	145	41	79	109	39	21
50	55	29	30	91	103	138	66	52	78	134	108	94	21	13	34	93	46	75	21	115	204	16	34	33	22	6	86	42	36	58	135	39	19	66	66	35

Table 1: Continued.

Count	Transect DS-16 RB						Transect DS-17 MC						Transect DS-18 MC						Transect DS-18 RB					
1	13	20	52	20	9	110	43	28	61	0.06	109	110	16	78	15	114	30	132	15	26	75	99	23	69
2	33	166	24	99	101	103	34	120	25	30	70	71	4	13	9	31	74	8	15	35	59	46	25	54
3	70	34	41	49	154	102	41	37	126	55	50	48	100	25	8	10	92	13	64	24	27	67	48	14
4	180	160	64	74	97	122	73	23	113	142	39	21	14	8	60	4	32	20	8	17	93	72	17	24
5	41	23	18	122	103	119	78	20	47	112	31	123	66	20	10	14	18	27	40	50	58	15	18	65
6	13	95	21	54	28	25	41	101	10	20	112	64	7	15	12	15	0.5	13	37	8	46	14	36	776
7	72	20	76	117	20	47	36	134	44	128	52	15	15	5	167	26	8	33	39	140	139	20	72	8
8	11	29	39	120	44	55	62	42	33	8	9	31	5	59	24	34	27	8	27	56	81	43	43	17
9	99	24	31	105	41	125	132	102	117	52	121	126	16	6	116	23	114	68	38	5	60	19	16	84
10	35	179	65	82	44	128	34	35	102	54	36	35	10	125	25	6	18	16	50	10	23	19	6	101
11	27	35	76	146	63	109	20	165	76	120	92	17	300	22	24	32	19	12	50	14	37	53	104	31
12	59	116	85	23	20	116	63	30	47	105	110	78	7	6	65	121	78	12	20	15	22	68	41	55
13	16	66	107	45	76	16	51	7	96	49	71	24	132	5	148	157	7	15	66	66	26	24	0.06	15
14	66	23	11	55	30	17	14	94	58	148	17	122	135	14	26	21	85	18	88	44	80	124	49	26
15	12	40	86	77	89	9	8	100	55	71	25	27	27	112	170	41	12	37	92	15	45	21	32	29
16	50	27	50	80	104	84	31	70	67	94	7	81	35	17	33	23	47	38	15	9	61	60	16	48
17	24	55	92	15	7	71	38	8	65	13	53	56	5	28	57	34	37	87	94	45	17	81	42	89
18	30	75	165	108	86	152	107	115	133	117	102	35	7	0.5	25	102	32	37	113	41	19	13	68	16
19	156	127	54	19	52	96	38	35	35	80	13	119	10	91	9	57	19	49	18	33	14	43	56	37
20	53	31	99	145	18	60	36	66	47	5	12	21	54	4	31	16	33	13	21	26	85	44	21	14
21	65	56	20	32	34	73	125	13	18	105	33	69	64	18	92	29	27	142	39	38	0.06	14	27	155
22	25	26	18	26	54	59	58	80	42	106	63	45	11	21	26	10	39	107	94	45	66	14	20	176
23	104	66	12	45	53	47	121	68	47	30	82	10	44	10	8	52	13	31	30	56	116	70	70	43
24	55	76	27	14	68	75	66	104	47	93	46	33	74	26	23	21	27	57	10	40	21	38	68	61
25	15	54	131	13	138	73	14	107	118	68	21	52	63	50	7	26	50	36	109	122	65	61	20	47
26	13	166	90	15	33	56	85	49	67	54	81	28	26	8	26	7	12	23	27	43	18	62	32	75
27	36	10	45	81	145	37	8	135	30	12	26	29	138	59	137	27	95	98	49	25	17	76	42	88
28	101	98	97	116	26	70	97	34	29	73	39	73	10	86	137	17	12	9	7	46	17	71	51	49
29	81	34	83	48	96	32	46	21	11	35	121	22	0.5	38	27	10	140	15	22	69	36	59	56	85
30	85	34	30	28	67	47	26	10	31	9	54	46	11	15	120	116	18	10	59	32	56	53	35	31
31	12	15	130	28	23	32	94	95	56	81	43	74	0.5	45	30	26	9	9	19	34	21	10	68	41
32	175	21	56	63	126	82	109	15	80	91	35	54	31	38	14	13	26	15	59	30	17	65	55	64
33	70	71	66	150	22	31	108	29	64	77	63	76	7	49	27	79	13	8	17	49	87	32	12	90
34	47	72	124	121	74	108	27	122	67	49	63	28	40	83	16	11	38	95	42	28	58	36	58	36
35	24	45	37	16	50	135	90	101	27	56	144	50	71	55	29	127	46	31	81	36	50	33	102	21
36	15	86	107	164	43	130	43	28	4	47	12	50	14	12	25	114	77	0.06	9	34	25	27	38	13
37	56	30	127	18	27	43	10	13	72	30	54	63	37	46	7	0.5	92	17	9	32	68	18	70	33
38	40	140	101	72	42	48	127	8	60	0.5	143	72	25	14	125	30	58	112	22	17	10	115	70	60
39	92	88	81	47	25	68	65	26	11	117	60	39	75	35	29	6	12	8	19	67	25	45	141	85
40	86	64	11	117	18	26	133	76	10	102	57	19	32	10	168	7	34	23	18	70	65	15	10	98
41	90	27	94	44	133	60	20	74	86	71	76	41	23	15	9	15	0.5	31	67	7	68	21	39	44
42	108	87	10	11	59	14	11	155	63	64	21	108	13	41	9	10	94	18	57	16	53	76	35	34
43	20	66	14	47	25	23	144	44	109	10	101	40	33	7	19	33	15	10	17	711	9	7	59	75
44	37	51	4	104	77	18	107	11	140	28	64	49	16	64	101	37	21	31	30	7	44	77	45	51
45	41	45	95	149	9	23	38	87	55	59	74	63	16	11	5	69	13	30	35	63	22	56	77	96
46	141	11	16	131	21	46	68	160	9	26	42	14	23	6	5	74	9	49	36	63	111	107	78	23
47	100	23	45	138	44	105	83	103	98	23	59	80	32	23	11	35	152	39	22	36	39	24	123	14
48	69	174	95	58	33	44	34	54	21	18	36	130	9	12	122	11	29	114	7	30	81	108	86	40
49	32	180	48	130	154	79	64	65	73	100	23	54	32	10	22	44	0.06	23	58	49	38	31	18	48
50	96	51	77	89	172	15	49	82	13	54	39	97	9	4	134	87	25	37	49	57	27	43	68	96

Table 2: Material type classes for pebble count data collected as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3), 2015.

Material Type Class	Size range (mm)
Silt/clay	< 0.062
Very fine sand	0.062 - 0.125
Fine sand	0.125 - 0.25
Medium sand	0.25 - 0.5
Coarse sand	0.5 - 1
Very coarse sand	1 - 2
Very fine gravel	2 - 4
Fine gravel	4 - 8
Medium gravel	8 - 16
Coarse gravel	16 - 32
Very coarse gravel	32 - 64
Small cobble	64 - 90
Medium cobble	90 - 128
Large cobble	128 - 180
Very large cobble	180 - 256
Small boulder	256 - 512
Medium boulder	512 - 1024
Large boulder	1024 - 2048
Very large boulder	2048 - 4096

Table 3: Pebble count summary statistics from grain size sampling plots sampled in 2015 as part of BC Hydro's Peace River Physical Habitat Monitoring Program (Mon-3).

Site Identifier	Percentile Diameter (mm)					Percent Material by Substrate Type (%)				
	D16	D35	D50	D84	D95	Silt/Clay	Sand	Gravel	Cobble	Boulder
US-12 MC	18	25	32	53	76	0	0	92	8	0
US-11 MC	10	18	24	47	63	0	0	95	5	0
US-10 RB	19	32	40	99	139	0	0	72	28	0
US-10 MC	22	34	44	75	104	0	0	76	24	0
US-9 MC	21	33	46	100	121	0	0	64	36	0
US-8 RB	34	57	73	121	173	0	1	39	59	1
US-8 MC	17	26	34	64	108	0	0	84	16	0
US-7 MC	10	15	22	70	110	0	2	79	18	0
US-7 LB	8	16	31	115	180	5	1	61	32	1
US-6 RB	19	36	51	92	124	0	1	61	39	0
US-6 MC	16	23	31	55	73	0	0	92	7	0
US-5 RB-1	9	17	23	58	84	1	5	81	13	0
US-5 RB-2	8	18	30	81	120	9	1	66	24	0
US-4 RB	15	25	36	100	153	0	0	67	33	0
US-3 MC	14	30	41	89	125	0	0	70	30	0
US-2 RB	8	15	21	44	64	0	4	91	5	0
US-1 RB	22	42	55	88	121	0	0	59	41	0
DS-1 MC	14	21	30	75	105	0	0	77	23	0
DS-1 RB	27	37	48	81	106	0	0	66	33	0
DS-2 MC	20	33	45	79	101	0	0	71	29	0
DS-3 MC	--	--	19	85	115	47	1	26	27	0
DS-4 RB	18	30	47	98	172	0	1	64	32	2
DS-5 LB	18	30	47	98	172	0	1	64	32	2
DS-5 RB	11	18	26	59	84	0	6	82	13	0
DS-6 LB	24	38	50	116	161	0	0	64	36	0
DS-7 RB	24	42	59	109	128	0	0	54	46	0
DS-9 MC	24	41	56	100	124	0	0	57	43	0
DS-14 MC	25	40	51	100	165	0	0	63	36	1
DS-14 RB	5	12	18	44	73	3	5	86	7	0
DS-15 RB	24	40	53	108	134	0	0	60	40	0
DS-16 RB	21	37	56	114	153	0	0	55	45	0
DS-17 MC	20	39	53	104	128	0	0	59	40	0
DS-18 MC	9	15	25	80	131	1	2	77	20	0
DS-18 RB	17	28	40	79	112	1	0	73	25	1

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