BC Hydro
Power smart

Acid Rock Drainage and Metal Leachate Management Plan – Water Quality Annual Report: January 1 to December 31, 2016

Site C Clean Energy Project

March 31, 2017

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Acronyms

ARD-ML	acid rock drainage/metal leaching (or leachate)
CEMP	construction environmental management plan
EIS	Environmental Impact Statement
EPP	environmental protection plan
IDZ	initial dilution zone
LC50	lethal concentration 50
Non-PAG	non-potentially acid generating
PAG	potentially acid generating
RCC	roller-compacted concrete
RSEM	relocated surplus excavated materials
QP	Qualified Professional

1.0 Acid Rock Drainage and Metal Leachate Management Plan

1.1 Background and Reporting Requirements

The Acid Rock Drainage and Metal Leachate Monitoring Plan has been developed in accordance with the following regulatory conditions:

1. Condition 7 of the Site C Project's Decision Statement, issued to BC Hydro on October 14, 2014 and re-issued November 25, 2014, which requires BC Hydro to: "*…develop, in consultation with Environment Canada and Natural Resources Canada, a water quality management plan to address environmental effects to the aquatic environment from the Designated Project, including acid rock drainage and metal leaching."*

2. Condition 3 of the Site C Project's Environmental Assessment Certificate, (EAC #E14-02), issued to BC Hydro on October 14, 2014, which requires BC Hydro to: *"…develop a water quality monitoring program, [which] must be detailed in the Acid Rock Drainage and Metal Leachate Management Plan."*

The Site C Project's Construction Environmental Management Plan (CEMP; Revision 4 - July 26, 2016), Appendix E – Acid Rock Drainage and Metal Leachate Management Plan fulfills the requirements of the water quality management plan referenced in the above conditions.

This update satisfies the annual reporting requirements specified by these conditions, covering the reporting period from January 1 to December 31, 2016.

2.0 Overview of Site Activities in 2016

2.1 General Description of Site Activities

Site C construction activities continued through 2016, with a transition from a focus on site preparation activities to main civil works. Construction during the reporting period included continued site clearing and site preparation, completion of the worker accommodation camp, completion of the temporary construction bridge across the Peace River, construction of the temporary Moberly River construction bridge, and continued earth moving activities (e.g., building roads, left back stabilization excavation) in the dam site area, on both the north and south banks of the Peace River.

2.2 Dam Site Activities Related to ARD-ML

The geochemical characterization program identified the potential for acid rock drainage and metal leaching from bedrock present at the dam site. Specific construction activities and management of potentially acid generating (PAG) materials are described by area below. Areas discussed are shown in Figure 1.

Right Bank Earthworks

Right Bank Drainage Tunnel Portal

Development of the Right Bank Drainage Tunnel Portal was undertaken between August and October, 2016. The work was comprised of ground preparation and clearing of the portal area prior to installation of ground control measures and the application of shotcrete on the exposed bedrock. Any bedrock material excavated during construction was transported to the temporary storage in RSEM R6 prior to being relocated to the RSEM R5b.

Surface runoff and seepage water contacting the bedrock slopes was collected and conveyed to a temporary pond within RSEM R6 prior to being relocated by hydrovac truck to RSEM R5b.

Spillway Approach Channel Excavation

The Spillway Approach area constitutes a major excavation as part of the main civil works. A total of approximately 766,000 m^3 of bedrock was excavated and transported to the RSEM R5b and Area 23. A summary of bedrock ARD-ML characterization sampling conducted by Lorax Environmental is included in Appendix A.

Surface water from this excavation was collected in downslope ditches and conveyed to the RSEM R5b containment pond.

Moberly River Bridge

The construction of a temporary bridge was undertaken in early November 2016 to provide access to the RSEM R5a area across the Moberly River through winter months while the construction of the semi-permanent Moberly Construction Bridge was underway.

A small upslope excavation exposed bedrock at the east abutment in August, 2016. The exposure was sampled for ARD-ML characterization and covered with backfill as part of the bridge abutment and straw over upper portions of the exposure. Rock sampling and *in situ* pH and alkalinity tests conducted by Tetra Tech indicated the bedrock was PAG and had not reached onset of acid generation (Tetra Tech, Appendix C).

Surface and seepage water from this excavation was collected in a ditch and sampled for water quality (Lorax, Appendix A).

Dam Site Road Cuts

Minor amounts of bedrock were exposed during construction of the road cuts being used to haul excavated material from the Spillway Approach Channel Excavation. The exposed bedrock material was sampled for characterization (Lorax, Appendix A).

Surface and seepage water contacting these cuts is collected within the roadside ditches and conveyed to the RSEM R5b sediment pond.

Area 20 Legacy Stockpile

A temporary bedrock storage area was noted in September 2016 to contain stockpiled PAG material from recent construction and historical ARD-ML characterization testwork that was conducted on site. In October 2016, the materials were removed and PAG material was

relocated to RSEM R5b. The site was cleared of PAG material and was eventually enveloped by development of the Area 20 laydown area.

Left Bank Earthworks

Left Bank Stabilization Excavation

Work within the Left Bank Stabilization Excavation is ongoing to prepare the ground surface for the northern dam abutment. Construction activities during 2016 included removal and relocation of Non-PAG soils to the RSEM L3 facility. Bedrock is scheduled to be intercepted within the facility and will be relocated for management within the RSEM L5 facility.

Water drainage from the area is captured and conveyed to a settlement pond on the floodplain and drains via a rip-rap lined ditch to the Peace River. Water quality is monitored within the pond (Lorax Environmental, Appendix A).

River Road

River Road was constructed by Morgan Construction and Environmental Ltd. to serve as the main access route between the upper and lower benches along the right bank.

Bedrock was recovered from construction excavation along the River Road at Blind Corner. The material was relocated to a containment facility within the Howe Pit area for encapsulation starting in late September and early October of 2015.

Surface run-off from River Road and Blind Corner is captured within a limestone rip-rap lined ditch which conveys water to drainage culvert RR-11. Monitoring activities were conducted by Triton Environmental on behalf of Morgan from late 2015 through to October 14, 2016, and by Lorax Environmental on behalf of PRHP from September 6 through November 19, 2016. *In situ* water testing by BC Hydro's QP (Tetra Tech) commenced in September 2016, with monitoring on September 13 and October 27, 2016 (Appendix C). Freezing conditions from mid-November onwards precluded any additional monitoring.

Triton conducted periodic pH testing of water flowing within the ditch. A memo documenting temporal pH variability during a high flow rain event on June 15, 2016, is included in Appendix D. Iron oxide staining of the limestone rip-rap was noted following the high flow event, indicating chemical reactivity with the limestone and water had taken place.

Howe Pit

The Howe Pit area comprises an area which was previously disturbed for construction aggregate from soil and bedrock sources. Bedrock remains exposed in the area. No additional disturbance of the site has been conducted by BC Hydro as part of the Main Civil Works and the surface water quality in contact with the historical disturbance site is being monitored by BC Hydro. Future management options for this area are being considered by BC Hydro.

Surface drainage from this area is conveyed through cut-off ditches down to the limestone lined River Road catchment ditch. *In situ* water testing for pH and alkalinity suggests the water contained within the Howe Pit area has low pH, however, water flowing from the site has high alkalinity and circumneutral pH due to mixing with local surface waters (Tetra Tech Appendix C).

To the east of the historical quarry, bedrock excavated by Morgan from Blind Corner along River Road is stockpiled within an encapsulated facility. The facility was constructed with a compacted clay-base and perimeter ditch with a containment berm around the entire cell. Stockpiled PAG material was covered with a 20mil plastic liner secured with sandbags and heat-welded seams.

Relocated Surplus Excavation Areas (non-PAG containing)

RSEM L3

The RSEM L3 facility was constructed to contain non-PAG surplus material from the Left Bank Excavation. Periodic sampling of the material within the RSEM was conducted during construction which indicated only non-PAG material was stored within the facility.

Relocated Surplus Excavation Areas (PAG containing)

RSEM L5

The RSEM L5 is under early construction focusing on facility foundation preparation. The facility will be upstream from the dam and is permitted for long term storage of PAG material.

A temporary storage facility within the Garbage Creek gully within the RSEM L5 footprint was constructed in mid-October to store surplus PAG bedrock from construction of the nearby North Bank Road and the Garbage Creek Diversion access roads. The facility began receiving PAG on November 2, 2016. The PAG was covered with Non-PAG material. Upstream water diversion structures were constructed in late September to divert non-contact waters from flowing through the PAG storage facility.

Water quality monitoring of the creek discharge prior to placement of PAG on October 13, 2016, exceeded the criteria listed in CEMP Appendix E Table 2. This observation is considered to be representative of the natural background water quality as no disturbance of bedrock within this catchment had yet been undertaken. Following placement of the PAG material, the drainage culvert at the base of Garbage Creek was plugged which prevented free flow of water into the Peace River. Accumulated water above the culvert was pumped to a lined pond. The pond was discharged on November 9 and 12, 2016.

Monitoring of the instream monitoring locations and the sump water continued and is reported by Lorax in Appendix A.

RSEM L6

The RSEM L6 was not yet under construction during 2016. The facility will be downstream from the dam and will be used for storage of Non-PAG material from the left bank excavation. PAG material may be stored in the area subject to design restrictions. It is expected that the sediment pond in this area will receive PAG-contact water, hence its designation as ‘PAG-containing’ for water quality monitoring purposes.

RSEM R5a

Construction of the RSEM R5a facility commenced in December 2016. The facility will be upstream from the dam and will be permitted for long term storage of PAG material. At year end, the facility was still under construction and had not received any PAG material.

Monitoring of the baseline groundwater quality at RSEM R5a is reference in Section 3.1.3.

RSEM R5b

The RSEM R5b facility was approved for PAG placement as of July 29, 2016, under Leave to Construct #2A. Construction of the RSEM R5b facility was completed and began receiving PAG in early October. The facility will be located upstream of the dam and was the only operating PAG storage facility in 2016 while RSEM area R5a construction was in progress. The facility was at 80% capacity at year end.

The RSEM R5b containment pond received water conveyed from various Right Bank construction locations, including the Spillway Approach Channel, site access and haul roads. Additionally, PAG contact water was contained from within other Right Bank construction areas outside of the R5b catchment such as the Right Bank Drainage Tunnel, and transported to the R5b pond by hydrovac truck.

Monitoring of the water in RSEM R5b sediment pond is referenced in Section 3.1.1 and 3.1.2. Monitoring of the baseline groundwater quality at RSEM R5b is reference in Section 3.1.3.

RSEM R6

Within the RSEM R6 area, a short term storage facility was constructed for surplus excavated bedrock material from Right Bank Drainage Tunnel Portal development. Bedrock material placed in the facility was relocated to the RSEM R5b.

A temporary pond was constructed beside the temporary PAG material storage area for containment of PAG contact water collected from the Right Bank Drainage tunnel. Water within this facility was relocated to the RSEM R5b sediment pond by hydrovac truck.

Area 23

In November of 2017, Area 23 was approved for temporary surplus bedrock excavation through the winter months while construction of the RSEM R5a was completed. Material contained within this facility will be relocated to RSEM R5a prior to the 2017 freshet.

The facility was constructed with a perimeter ditch and collection pond for management of PAG contact water. At the end of 2016, no water was known to have flowed within the facility and the near surface materials contained in the facility were frozen.

3.0 Overview of Water Quality Monitoring Programs related to Acid Rock Drainage and Metal Leachate Management

The CEMP Appendix E identifies responsibilities specific to BC Hydro and the contractor. BC Hydro, as owner, and Peace River Hydro Partners, as main civil works contractor, engaged qualified professionals in acid rock drainage and metal leaching to assist with implementation of the various water quality monitoring programs identified in Table 1.

Table 1 Individual monitoring programs related to the ARD-ML Monitoring Plan

Program Description	Program Responsibility	Frequency	Duration	Geographic Extent	Monitoring Program Qualified Professional (QP), 2016
RSEM Sediment Pond Water Quality Water quality sampling, and installation and operation of data loggers for measurement of pH, turbidity and electrical conductivity from PAG containing RSEM sediment ponds.	Contractor	Hourly (*in situ* measurements) Daily (water quality sampling)	Ongoing from December 2016	Permitted PAG containing RSEM sediment ponds	Lorax Environmental
RSEM Sediment Pond Toxicity Collection of non-acute toxicity tests (96hr LC50) from water in PAG containing RSEM sediment ponds	BC Hydro	Bi-weekly (3), then monthly, and prior to discharge	Ongoing from November 2016	Permitted PAG containing RSEM sediment ponds	BC Hydro*
Groundwater Monitoring Install groundwater monitoring wells upgradient and downgradient of RSEM R5a and R5b, and water quality monitoring of groundwater.	Contractor	Quarterly	Ongoing from October 2016	RSEM R5a and RSEM R5b	Lorax Environmental
Peace River Mixing Dynamics and Water Quality Monitoring Model river mixing dynamics at each of the RSEM sites, establish location of Initial Dilution Zone (IDZ) sample sites, collection of water quality samples at established upstream, far-field downstream and IDZ locations.	BC Hydro	Monthly and during RSEM discharge events.	Ongoing from December 2016	Peace River at locations upstream and downstream of PAG containing RSEM areas	Ecofish Research Ltd., and Ecofor Consulting Ltd.

Program Description	Program Responsibility	Frequency	Duration	Geographic Extent	Monitoring Program Qualified Professional (QP), 2016
Peace River Baseline and Surface Water Quality Monitoring ** Establish baseline conditions for turbidity and water quality within the Peace River at upstream and far-field downstream locations.	BC Hydro	Quarterly	Throughout year, ongoing	Peace River, upstream and downstream of Main Civil Works	Saulteau EBA Environmental Services Joint Venture
Site Audits Inspect and monitor various non-RSEM potential ARD-ML sites, provide measures to mitigate against potential ARD-ML generation.	BC Hydro	Quarterly	Ongoing from June, 2016	Non-RSEM potential ARD-ML sites	Tetra Tech Canada Inc.

* Ecofish Research Limited, partnered with Ecofor, were engaged by BC Hydro in December of 2016 to act as QP going forward, but they did not conduct any toxicity monitoring in 2016. Toxicity samples in 2016 were collected directly by BC Hydro, as described below in section 3.1.2.

** This program does not fall under the requirements of the CEMP and is included here for completeness and in continuity with the 2015 Annual Water Quality Plan Update report dated October 31, 2016.

3.1 Summary of Implementation Status: Monitoring Programs

3.1.1 RSEM Sediment Pond Water Quality

RSEM R5b

In accordance with CEMP Appendix E S.7.2.2 and S.7.3.2 dataloggers were installed within the RSEM R5b pond for hourly measurement of pH, turbidity and electrical conductivity in proximity to the overflow discharge culverts. Water quality sampling was also conducted intermittently starting in October 2016, and then daily in accordance with CEMP Appendix E S.7.3.2 (Lorax, Appendix A) when the pond was considered to be operational in early December 2016.

Pond levels remained below the overflow culvert elevations, and no discharges occurred from the RSEM R5b sediment pond in 2016.

3.1.2 RSEM Sediment Pond Toxicity

RSEM R5b

Toxicity monitoring was initiated in RSEM R5b sediment pond on November 30, 2016 (shortly after the pond was commissioned), as per the requirements of S. 7.2.1 and S. 7.3.1 of the CEMP, Appendix E. Samples were collected by BC Hydro for acute toxicity testing (Rainbow Trout 96-h LC50) at the prescribed initial bi-weekly frequency, with the exception of the third bi-weekly sample which was delayed until the first week of January, 2017 due to holiday laboratory closure. There were no failures for the toxicity tests performed using water collected from RSEM R5b on November 30 or December 14, 2016; in both cases, 100% of the test fish survived in undiluted RSEM R5b pond water.

BC Hydro has engaged a QP (Ecofish/Ecofor) to conduct sampling of RSEM sediment pond water for non-acute toxicity testing starting in January 2017.

3.1.3 Groundwater Monitoring

RSEMs R5a and RSEM R5b

In accordance with CEMP Appendix E S.7.2.5 and S.7.3.3 groundwater monitoring wells were installed by Lorax in advance of the operation of RSEM areas R5b and R5a to monitor and to characterize potential effects to groundwater due to seepage from the RSEM facility.

For the RSEM R5b facility, well GW-10a was installed upgradient and wells GW-6, 7, and 8 were installed. In late October, 2016, well GW-10a was noted to be dry and was compromised. The upgradient well was replaced with well GW-10b in early December, 2016. Three rounds of sampling in wells GW-6, 7, and 8 were completed and two rounds in well GW-10b.

For the RSEM R5a facility, well GW-4 was installed upgradient, and wells GW-1, 2, and 3 were installed downgradient. Two rounds of sampling were conducted in wells GW-1, 2, 3, and 4 in 2016.

Further description of baseline sampling and the locations of the groundwater wells are included in Appendix A.

3.1.4 Peace River Mixing Dynamics and Water Quality Monitoring

In accordance with the CEMP Appendix E S. 6.1.1, BC Hydro retained Ecofish Research Ltd. in partnership with Ecofor Consulting Ltd. in December, 2016, as Qualified Professionals to model river mixing dynamics and to establish the location of the Initial Dilution Zone (IDZ) sample sites.

Initial field reconnaissance and preliminary modelling work was being completed at year end in planning for establishment of the IDZ sampling locations.

3.1.5 Peace River Baseline and Surface Water Quality Monitoring

This monitoring program was undertaken by Saulteau EBA Environmental Services Joint Venture on a quarterly basis in continuity with the 2015 program and the environmental impact statement (EIS, Volume 2 Appendix E[1]). The program has established baseline conditions within the Peace River prior to disturbance of bedrock and prior to any discharge of the RSEM pond facilities.

Water sampling events were conducted in March, June, September and December, 2016, at six established sampling locations for water quality (ranging from the upper future Site C reservoir to the confluence with the Pine River) and six additional stations for monitoring turbidity levels within the Peace River (located upstream and downstream of the future Site C dam location). The 2016 report on these sampling events is included in Appendix B.

3.1.6 Site Audits

In June 2016, BC Hydro retained Tetra Tech Canada Inc. (Tetra Tech) as QP(ARD) to inspect and monitor various non-RSEM potential PAG-ML construction areas. In accordance with the CEMP Appendix E S. 6.1.2, Tetra Tech completed site audits on September 13, October 27, and December 13, 2016.

The site audits included visual observation of the ARD-ML mitigation and PAG material management practices being conducted on site, review of the practices in accordance with the construction area Environmental Protection Plans (EPPs), and observation of any chance find bedrock exposures on site.

Independent verification sampling of rock contained within RSEM areas were conducted to identify potential onset of acid generating conditions, and *in situ* water testing (pH, alkalinity) was conducted in the Howe Pit area, along River Road, at the Moberly Construction Bridge East Abutment, and at the Roller-Compacted Concrete (RCC) Trial Plot excavation. Results of these tests are included in Appendix C. Materials were frozen during the December 13, 2016, site audit which precluded additional water sampling.

[1] Available online at: http://www.ceaa-acee.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_E.pdf

N

85th Ave Industrial Lands

240 Road

269 Road

Old Fort Road

Viewpoint Road

North Bank Road

Viewpoint

R5a

L5

L3

Left Bank Stabilization Excavation

Moberly River Temporary Bridge

R5b

L6

Worker Accommodation

Howe Pit

River Road

Blind Corner

Peace River

Stage 1 Diversion Inlet Coffer Dam

Peace River Construction Bridge

Moberly River

R6

Approach Channel

South Bank Erosion Protection Works

Area 23

Right Bank Drainage Tunnel

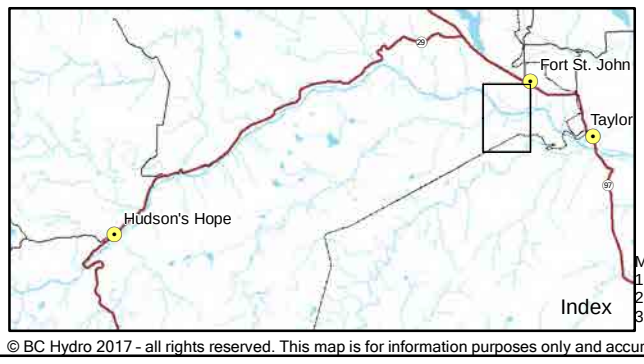
Temporary Substation (SCX)

Septimus Repeater Site (SUR)

Septimus Access Road

Septimus Siding and Loading Area

Pine River



Legend

PAG-contact RSEMs

Components

Dam Site Area

1:30,000

0 0.5 1 km

Map Notes:
1. Datum: NAD83
2. Projection: UTM Zone 10N
3. Orthophotos taken September 15, 2016.

BC Hydro

Overview Figure

Date	March 28, 2017	DWG NO	1016-C14-08835	R 0

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Construction of the Site C Clean Energy Project is subject to required regulatory and permitting approvals.

Path: X:\ArcGISProjects\MonitoringWaterQuality\2016AnnRep_ARD_1016_C14_08835.mxd

Appendix A

PEACE RIVER HYDRO PARTNERS

Acid Rock Drainage and Metal Leachate Management Plan
2016 Annual Monitoring Report



Project No. A416-1
31 March 2017

LORAX ENVIRONMENTAL

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1. Introduction

The purpose of this report is to summarize monitoring that was undertaken in 2016 to fulfill the requirements of the Acid Rock Drainage and Metal Leachate (ARD/ML) Management Plan for the Site C Clean Energy Project, which is Appendix E of the Construction Environmental Management Plan (CEMP) for the Project. More specifically, it is intended to meet the requirement for BC Hydro's annual summary report, outlined in Section 7.5 of the ARD/ML Management Plan, as well as the related request in a letter from the BC Hydro Rep Delegate, Main Civil Works to Peace River Hydro Partners (PRHP) dated 2 March, 2017 (File ID: 1016.Z.05.003.CMO.00665.LTR).

This report has been prepared by Lorax Environmental Services Ltd. (Lorax) on behalf of PRHP. Lorax has been retained to serve as the Qualified Professional (Acid Rock Drainage) by PRHP for the Main Civil Works Contract for the Site C Clean Energy Project.

This introduction is followed by three sections which provide the details of the monitoring programs and results obtained in 2016. These are PAG rock monitoring (Section 2), surface water quality (Section 3), and groundwater monitoring (Section 4). Recommendations are summarized in Section 5.

Lorax was retained and began work on the Site C Clean Energy Project in September, 2016. Since that time, sampling and analytical procedures have been established, as well as quality assurance / quality control (QA/QC) procedures for the rock, surface water and groundwater sampling programs. These programs were initiated in October, 2016. Laboratory analyses for all three programs has been undertaken by Maxxam Analytics Ltd., at its laboratory in Burnaby, B.C.

Rock sampling was undertaken in 2016 to characterize excavations, temporary and permanent stockpiles that existed at the time, on both the right and left banks of the Peace River. On the right bank, these include the Approach Channel and Right Bank Drainage Tunnel. On the left bank, these include activity at Garbage Creek, and sampling at the Left Bank Excavation Sediment Pond. Road cuts and legacy stockpiles were also characterized.

Water quality sampling was undertaken in 2016 at the RSEM R5b sediment pond on the right bank, and in the vicinity of RSEM L3, L5, and L6 on the left bank, as well as at the Left Bank Excavation. Water quality monitoring in the left bank areas was undertaken prior to the construction of RSEM sediment ponds.

Groundwater monitoring wells were installed at RSEM Area R5b and R5a late in the year. Four wells were installed at each RSEM Area, one upgradient and three downgradient of the RSEMs. The wells were installed prior to completion of the RSEMs. Downgradient wells were installed downgradient of the RSEM berms, which were under construction at the time. Three rounds of baseline sampling were undertaken at each of the eight groundwater monitoring wells in 2016.

2. PAG Rock Monitoring

2.1 Overview

The potential for ARD from various geologic materials to be disturbed at the Project site were characterized prior to site construction by KCB (2015). These analyses found that shale bedrock units are potentially acid generating (PAG), while the overburden materials are non-PAG (NPAG) and generally lack sulphide mineralization. Note that colluvial materials were not included in this baseline geochemical assessment. Colluvium may be defined as PAG or NPAG depending on the definitions provided in IET, (2015) which are described in section 2.2.1.

Monitoring of PAG rock exposures and excavations has been conducted in accordance with the *Acid Rock Drainage and Metal Leaching Management Plan* (Appendix A of EMP; Rev. 8). The monitoring program is intended to provide continuous characterization and identify areas of acid production of PAG stockpiles, active PAG excavations, and inactive PAG excavation areas. The objectives of this monitoring program are as follows:

- Confirm that the ML/ARD potential of bedrock is similar to what is predicted in geochemical characterization work conducted to develop water quality predictions.
- Provide continuous characterization of geologic material sent to various storage facilities
- Monitor PAG rock exposures to provide early warning of any PAG exposures that have become acidic.

A summary of the monitoring objectives are presented in Table 2-1. Regular sampling consists of onsite rinse pH measurements to determine the pH of mine rock, offsite acid base accounting (ABA) and metal analysis to confirm ARD potential and monitor metal enrichment.

Table 2-1:
SUMMARY OF PAG MONITORING OBJECTIVES BY EXPOSURE TYPE

Facility	Sample Frequency	Sample Distribution	Analysis	Sample type
RSEM Construction or TPSA	1 event per month of exposure	1/0.2 ha*	rinse pH	grab sample
Active Excavation Site	NA	1 sample per 5,000 m^3	rinse pH, ABA and metals	Drill Cuttings/grab sample
Inactive Excavation Site	1 event per month of exposure	1/0.2 ha, minimum of 3 per site*	rinse pH	Channel cut
PAG Encounters outside of main excavation zones	upon encounter	3 samples initially, then 1 sample per 2,000 m3	rinse pH, ABA and metals	Drill Cuttings/grab sample

Note: monitoring exposed surfaces for rinse pH is not required in when temperatures are below freezing.

2.1.1 Excavation and Stockpile Volumes

The location of site facilities is provided in Figure 2-1. Sources of PAG rock excavations on the right bank include excavation sites at the RCC Trial Dome, Drainage Portal, and the Approach Channel. The volume of right bank excavations of PAG rock are shown in Figure 2-2. Movement of PAG rock in 2016 also included PAG stockpiled in the Area 20 Temporary PAG Stockpile Area (TPSA) and the RSEM R5b TPSA. The volume of right bank PAG stockpiles is shown in Figure 2-3. These stockpiles were constructed prior to the availability of a permanent PAG storage area on the right bank. These temporary stockpiles were relocated to the RSEM R5b storage area once the facility was ready to receive PAG rock. The permanent RSEM R5b storage area began receiving rock in mid-October and reached its design capacity by mid-November. Upon completion of RSEM R5b PAG excavations began to be stored in the Area 23 TPSA. This stockpile will be removed to RSEM R5a for permanent storage in 2017.

Excavations of PAG rock on the left bank in 2016 consisted of excavations from the garbage creek diversion channel and haul road (garbage creek excavations) and were stored in the Garbage Creek TPSA. Excavation volume and stockpile volumes are reported in Figure 2-3 and Figure 2-4. The Garbage Creek TPSA is located within the RSEM L5 footprint, and will form the up gradient portion of the permanent RSEM L5 facility. This TPSA will not be relocated in the future.

628,000 630,000 632,000

6,234,000 6,232,000 6,230,000 6,228,000

N

Area 26

85th Ave. Industrial Lands

LEFT BANK

RESM L5

RESM L3

Left Bank Excavation

RESM R5a

Area 25

Area 27 (Howe Pit)

Left Bank Cofferdam

RESM R5b

RSEM L6

Right Bank Cofferdam

RIGHT BANK

Approach Channel

RESM R6

Area 23

Area 20

Area 21

Substation Laydown

628,000 630,000 632,000

LEGEND

Property Boundary

DATE SAVED:	Mar 28, 2017
DRAWN BY:	AL
REVIEWED:	NM
VERSION:	1

Coordinate System: *NAD 1983 UTM Zone 10N*
Projection: *Transverse Mercator*
Datum: *North American 1983*
Units: *Meter*

1:22,500

0 250 500 Meters

CLIENT:

PEACE RIVER HYDRO PARTNERS

LORAX ENVIRONMENTAL

PROJECT:

Site C Clean Energy Project

TITLE:

Site Facility Layout Map

PROJECT #: A416-2

FIGURE: 2-1

P:\@Drafting\SiteC\Drafting Figures\MXD\2016_Annual_Report\ARDMaps\SiteMap.mxd

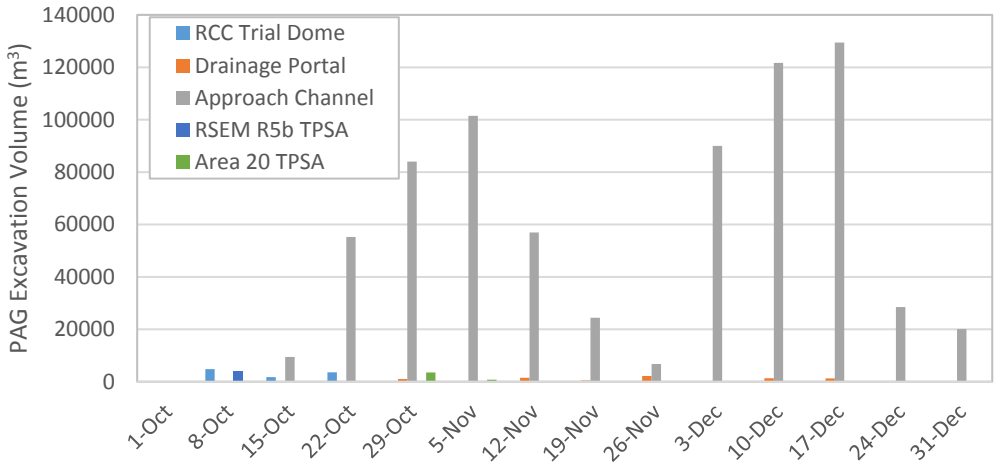

Figure 2-2: Volume and source of right bank PAG rock excavation.

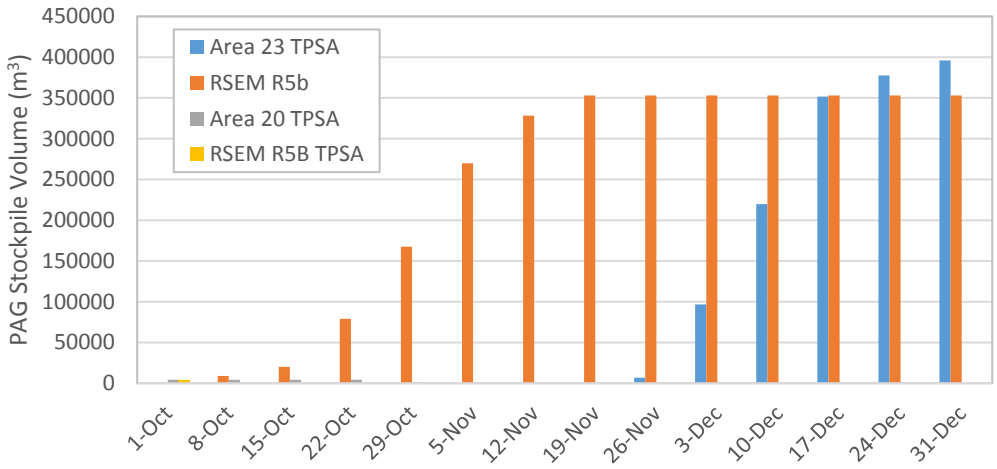

Figure 2-3: Volume of right bank PAG rock stockpiles.

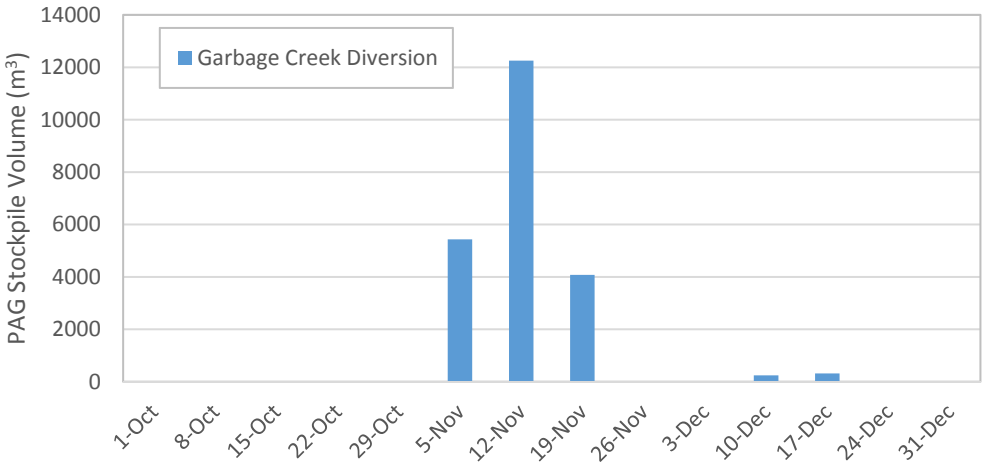

Figure 2-4: Volume and source of left bank PAG rock excavations.

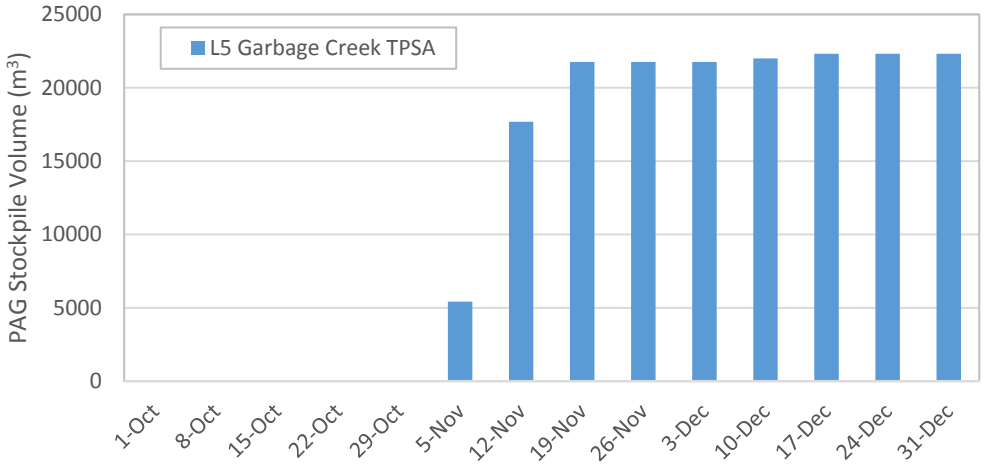

Figure 2-5: Mass of left bank PAG rock stockpiles.

2.1.2 Sample Distribution

A total of 139 field rinse-pH samples and 114 acid base accounting (ABA) samples were collected as part of the ML/ARD monitoring program between September and December, 2016. The number of samples collected from various locations across the site are outlined in Table 2-2 and shown in Figure 2-6.

Table 2-2:
Number, location and type of geochemical monitoring sample collected in 2016.

Location	Type	ABA	Field Rinse-pH
Approach Channel	Excavation	75	36
Right Bank Drainage Tunnel	Excavation	6	0
Garbage Creek	Excavation	25	11
Road Cuts	Rock Exposure	8	27
LBEX-SP	Sediment Pond	1	3
Area 20	Historic PAG Pile	0	23
R5b TPSA	Historic PAG Pile	0	32
Howe Pit	Historic PAG Exposure	0	10
Total		115	142

628,000 630,000 632,000

6,234,000 6,232,000 6,230,000 6,228,000

N

85th Ave. Industrial Lands

R5a Access Road

Garbage Creek Diversion & Haul Road

LEFT BANK

LBEX Sediment Pond

Howe Pit Pond

Temp MRB Access Road

R5b TPSA

MBR-South Abutment

RB Access Road

RBDT Stockpile

Approach Channel

Area 20 TPSA

RIGHT BANK

628,000 630,000 632,000

LEGEND

- Field Rinse-pH Only
- Lab Data
- Property Boundary

DATE SAVED:	Mar 28, 2017
DRAWN BY:	AL
REVIEWED:	NM
VERSION:	1

Coordinate System: *NAD 1983 UTM Zone 10N*
Projection: *Transverse Mercator*
Datum: *North American 1983*
Units: *Meter*

1:22,500

0 250 500 Meters

CLIENT:

PEACE RIVER HYDRO PARTNERS

LORAX ENVIRONMENTAL

PROJECT:

Site C Clean Energy Project

TITLE:

Location of ARD Monitoring Locations

PROJECT #: A416-2

FIGURE: 2-6

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2.2 Methods

2.2.1 ARD Classification

Criteria for classifying bedrock as NPAG, PAG or as currently acid generating are provided in the projects Technical Specifications (IET, 2015). The acid-generating potential of geologic material is defined by the ratio of neutralization potential (NP) to acid potential (AP). The NP/AP ratio, or net potential ratio (NPR), used to identify PAG and NPAG mine rock is defined as follows:

- . aterial with an NPR ≤ 2 is classified as PAG;
- Material with an NPR >2 is classified as NPAG; and,
- NPR is calculated from modified NP and AP based on sulphide-S.

In addition to the above ABA criteria, the technical specifications provide a definition for material that is considered acid generating:

- A sample is considered acid generating that has a pH < 5.5 when tested using traditional paste or rinse-pH method.

In the absence of test work on a specific rock exposure, all bedrock will be assumed PAG and overburden will be assumed to be NPAG (CEMP). Criteria for identifying ARD potential of transitional material (*i.e.*, bedrock and overburden contact) and colluvium in the absence of testwork is not described in the CEMP or in Technical Specifications (IET, 2015).

2.2.2 Sample Collection

Sample collection methods varied depending on the type of material being sampled. Samples collected from road cuts and excavation sites (*e.g.*, Garbage Creek and Approach Channel) were collected as linear trench samples, where an approx. 1 m cut perpendicular to the bedding plane was made with a pick or shovel into the excavation face. The samples were submitted for ABA testing at an analytical laboratory or rinse-pH testing at the on-site lab (field rinse-pH), depending on the purpose of sample collection.

Samples collected from PAG stockpiles (*e.g.*, R5B TPSA and Area 20) were collected from shallow test pits. Test pits of approx. 10 cm depth were dug with a shovel, and the sample was collected from the entire depth profile (*i.e.*, 0-10 cm). These samples were generally only analyzed for field rinse-pH, as the purpose of monitoring existing stockpiles is to identify if the material has become acid generating.

2.2.3 Sample Analysis

Acid base accounting was conducted by Maxxam Analytics in Burnaby, B.C. according to the modification of Sobek *et al.* (1978) *Field and Laboratory Methods Applicable to Overburdens and Minesoils* (Report EPA-600/2-78-054) (*i.e.,* Modification of Conventional EPA Neutralization Potential Determination by Addition of Hydrogen Peroxide). The procedure is outlined in MEND *Project 1.16.1c* (1991).

Total sulphur (S) and carbon (C) were determined using a Leco furnace. Total inorganic carbon (TIC) was determined by placing a sample in a glass test tube and acidified with 25% hydrochloric acid (HCl). The sample was boiled to evolve CO_2 which was measured by coulometric titration with the Carbon Dioxide Analyzer. Sulphate-S was determined by the procedure outlined in ASTM D2492-02, *Standard Test Method for Forms of Sulphur in Coal*. In this procedure sulphate-S is dissolved with HCl and measured gravimetrically after precipitation of barium chloride ($BaCl_2$). Sulphide-S was determined by leaching residue from the sulphate-S in a 1:7 nitric acid (HNO_3) to water ratio, according to the procedure by Sobek *et al.* (1978). The oxidized sulphide was then determined gravimetrically after precipitation with $BaCl_2$.

Solid phase metals were conducted on pulverized samples by digesting 0.500 g in aqua regia at 95°C for one hour. The extract was then diluted to 10.0 mL and analyzed for metals by ICP-MS.

Rinse-pH are conducted at an on-site lab so that results can be provided rapidly. The surface rinse-pH should be conducted on a dry sieve sorted < 2mm particle size fraction with no particle comminution. The procedure is based on that described in Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND, 2009). The standard operating procedure (SOP) for rinse-pH analysis used at site is provided in Appendix 2-A.

2.2.4 Quality Assurance and Quality Control

The quality assurance and quality control (QA/QC) program for the ABA and metals analysis involves a variety of internal laboratory protocols. This protocols involved duplicate samples and analytical standard analysis. One duplicate was measured for every 10 samples. Internal laboratory quality control adheres to a precision specification of $\pm$20% for metals and $\pm$30% for sulphur and carbon species. Neutralization potential precision specifications vary depending on the mass of NP ($\pm$20% if NP > 20; $\pm$15% if 20>NP>10; and, $\pm$5 $kgCaCO_3/t$ if NP<10 $kgCaCO_3/t$). Any laboratory duplicate result or standard that does not adhere to the precision specifications triggers a re-analysis. For complete analytical QAQC protocols see Appendix 2-B.

In order to confirm the reproducibility of results from the field rinse-pH measurements, a duplicate from 1 in 10 field rinse-pH sample is submitted to Maxxam for analysis. A comparison of field and laboratory rinse-pH measurements is provided in Figure 2-7. The results show that the accuracy of field pH measurements is sufficient to identify acidic samples. That is, all laboratory samples identified as acid generating (defined as pH < 5.6) were also defined as acid generating by the field rinse-pH results.

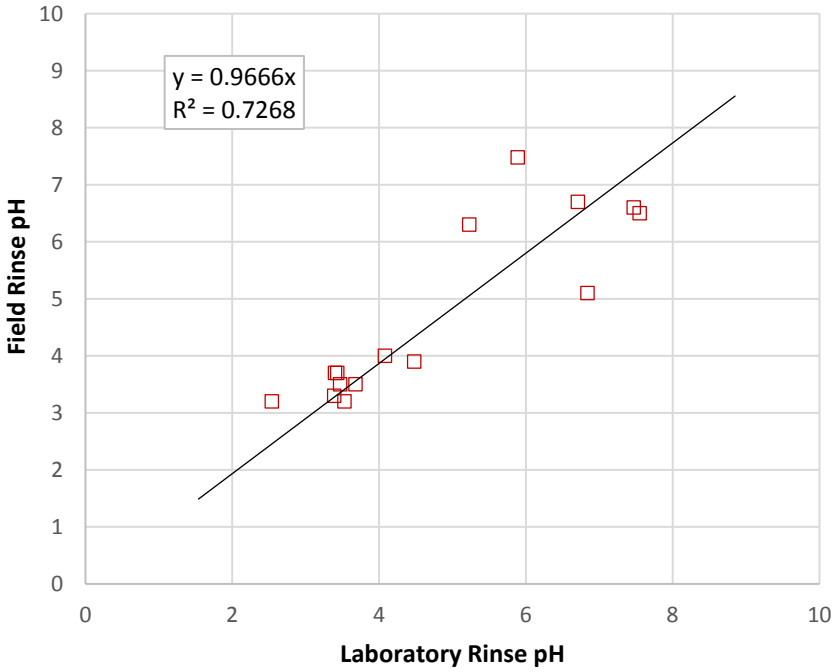


Figure 2-7: Comparison of field and laboratory rinse-pH measurements. Line shows best linear fit with coefficient of determination (R^2) and linear fit equation shown in upper left.

2.3 Monitoring Results

This section presents the monitoring results for various excavation and stockpiles. Complete monitoring results are presented in Appendix 2-C. In this section, sulphide acid potential (SAP) and modified NP are used to calculate NPR. All samples with NPR values < 2 are classified as PAG, and samples with a rinse-pH or paste pH < 5.6 are classified as acid generating (section 2.2.1). Metal enrichment is determined by comparing metal concentrations to average continental abundance (ACA) as reported by Price (1996) shown in Table 2-3.

Table 2-3:
Average continental crust abundance used to evaluate metal enrichment

Element	units	Average Continental Abundance
Ag	ppm	0.075
Al	%	8.23
As	ppm	1.8
Ba	ppm	425
Bi	ppm	0.17
Ca	%	4.15
Cd	ppm	0.15
Co	ppm	25
Cr	ppm	105
Cu	ppm	60
Fe	%	5.63
Hg	ppm	0.08
K	%	2.09
La	ppm	39
Mg	%	2.3
Mn	ppm	950
Mo	ppm	1.5
Na	%	2.36
Ni	ppm	84
P	%	0.105
Pb	ppm	12.5
Sb	ppm	0.2
Se	ppm	0.05
Sr	ppm	375
Th	ppm	9.6
U	ppm	2.7
Zn	ppm	70

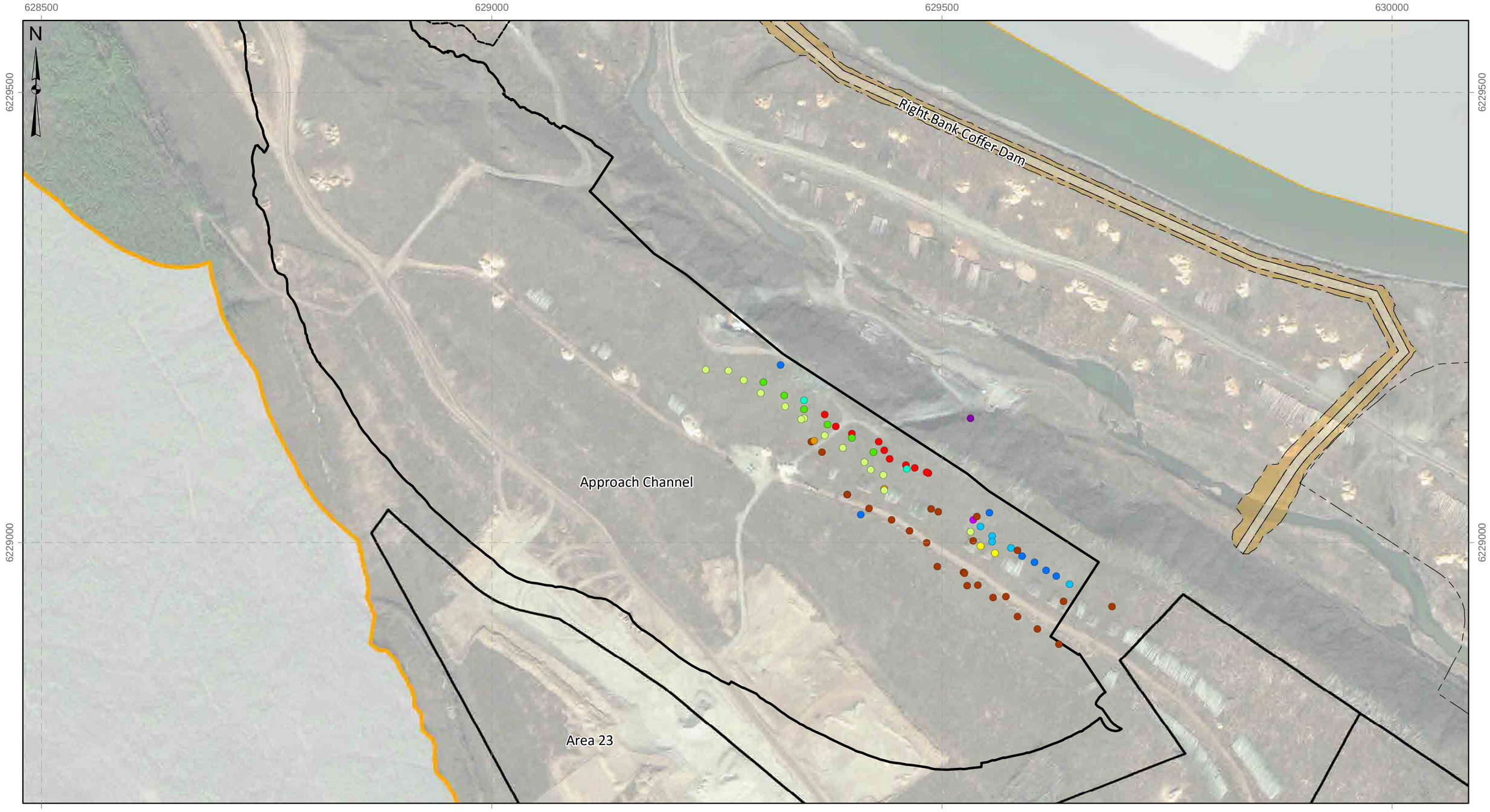
2.3.1 Approach Channel

The Approach Channel is excavated in benches of 3-4 m in height. Samples were obtained from the uppermost bench (460 m) down to the 440 m bench in 2016. A map showing sample location and elevations is provided in Figure 2-8. Bedrock units encountered over this elevation range are Units 10 (silty shale), Unit 9 (shale) and Unit 8 (silty shale). The median sulphide content for these rock units reported in the baseline geochemical analysis

was reported as 0.76 wt.%, 1.52 wt.% and 0.99 wt.%, respectively (KCB, 2015). All three units are expected to be acid generating within one year of exposure.

Select ABA results are plotted against sample elevation in Figure 2-9. These results generally show that acid base parameters show little variation between 460 and 440 m bench levels. Statistics for acid base accounting results are provided in in Table 2-4. All samples are classified as PAG based on NPR values. Only a single sample had a rinse-pH below 5.6, and would be classified as currently acid generating. All other samples had some NP available and have a circumneutral rinse and paste-pH, indicating that the material will initially produce neutral pH runoff.

The metal content of Approach Channel samples collected in 2016 are presented in Table 2-4. This table compares solid phase metal content to average continental abundance (ACA) as reported by Price (1996). The metals with median values that exceed 3x ACA are Ag, As and Cd, while the only metal to exceed 10x ACA is Se.



Legend

Elevation				
440m	445m	451m	ApproachChannelOutline	
443m	446m	454m	Dam/Dyke Crest	
444m	447m	457m	Dam/Dyke Toe	
	450m	460m	Site C Construction Area Boundary	

DATE SAVED:	Mar 28, 2017
DRAWN BY:	NM
REVIEWED:	AL
VERSION:	1

Coordinate System: *NAD 1983 UTM Zone 10N*
Projection: *Transverse Mercator*
Datum: *North American 1983*
Units: *Meter*

1:4,000

0 50 100 150 Meters

CLIENT: PEACE RIVER HYDRO PARTNERS

LORAX ENVIRONMENTAL

PROJECT: **Site C Clean Energy Project**

TITLE: Approach Channel ARD Monitoring Samples

PROJECT #: A416-2

FIGURE: 2-8

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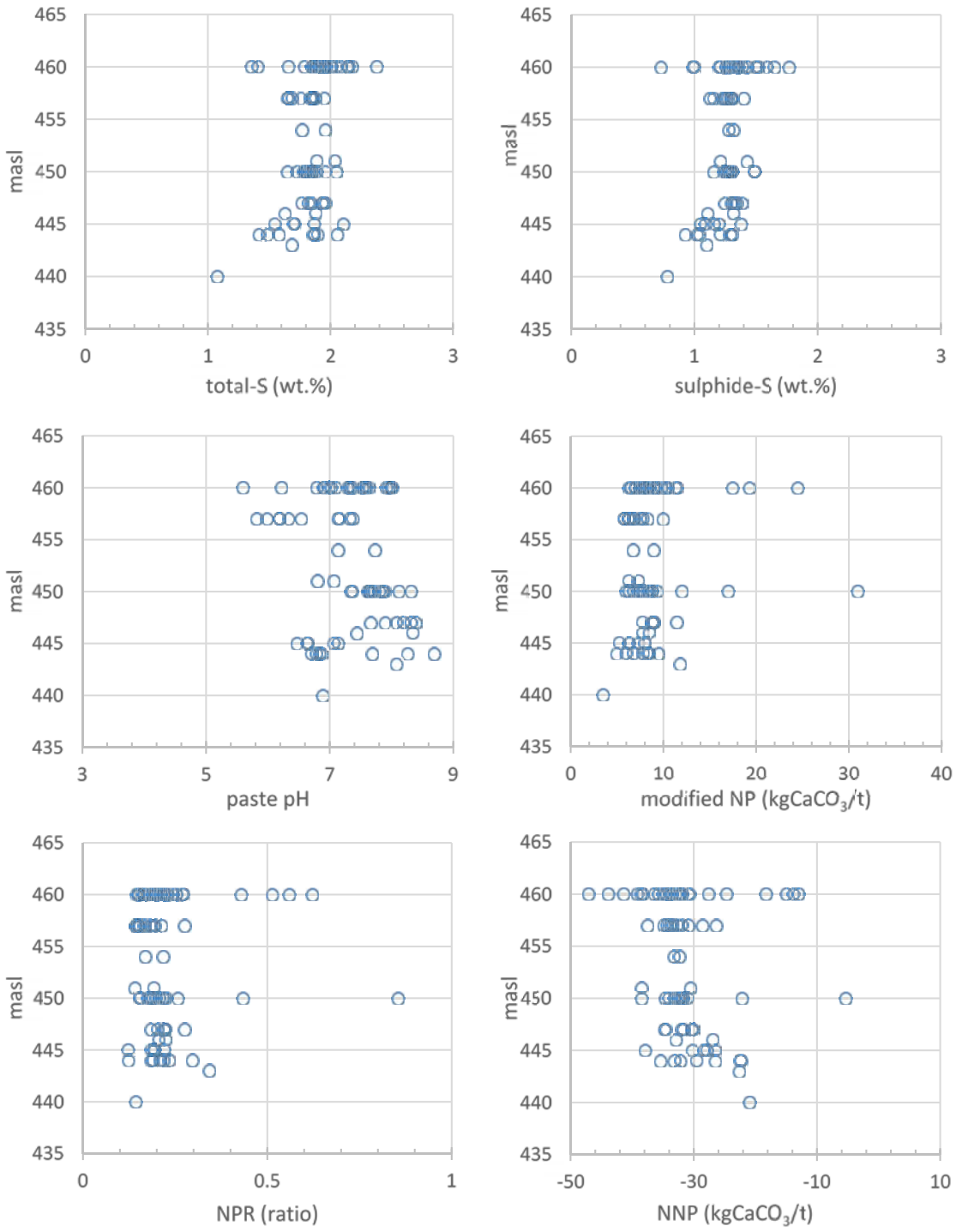


Figure 2-9: Acid base accounting results for approach channel samples plotted against elevation.

Table 2-4:
Acid base accounting and metal content statistics of Approach Channel samples

Parameter	units	Max	P90	P75	P50	P25	P10	Min
Field Rinse-pH	s.u.	9.43	9.35	8.78	7.66	7.24	6.85	6.39
Lab Rinse-pH	s.u.	8.85	7.76	7.29	6.69	6.01	5.35	4.99
Paste pH	s.u.	8.7	8.114	7.87	7.38	6.91	6.5	5.6
Total-S	wt.%	2.38	2.05	1.95	1.86	1.77	1.64	1.08
Sulphate-S (Na_2CO_3)	wt.%	0.21	0.15	0.12	0.1	0.09	0.08	0.06
Sulphate-S (HCl)	wt.%	0.13	0.08	0.07	0.04	0.035	0.03	0.01
Sulphide-S	wt.%	1.77	1.47	1.34	1.29	1.21	1.07	0.73
SAP	$kgCaCO_3/t$	55.3	45.84	41.9	40.3	37.8	33.32	22.8
Mod. NP	$kgCaCO_3/t$	31	11.5	9.15	8	6.8	6.3	3.5
NNP	ratio	-5.3	-22.34	-29	-32.1	-34.35	-38.04	-47
NPR	ratio	0.9	0.3	0.2	0.2	0.2	0.2	0.1
Ag	ppm	0.667	0.481	0.461	0.449	0.417	0.387	0.352
Al	%	0.84	0.811	0.7825	0.74	0.6975	0.659	0.63
As	ppm	15.7	14.71	14.3	13.85	13.575	12.58	11.7
Ba	ppm	303	257.8	206.5	92.5	65.2	58.56	45.6
Bi	ppm	0.37	0.351	0.35	0.33	0.3175	0.28	0.25
Ca	%	0.68	0.518	0.4625	0.405	0.39	0.369	0.33
Cd	ppm	0.96	0.87	0.795	0.745	0.6675	0.493	0.31
Co	ppm	9.9	9.61	9.33	9	8.6	7.85	6.9
Cr	ppm	16.4	15.43	14.4	13.6	12.575	11.79	11.5
Cu	ppm	41.2	40.11	39.85	37.9	34.55	31.18	27.2
Fe	%	6.21	2.383	2.2675	2.19	2.1	1.896	1.66
Hg	ppm	0.11	0.105	0.101	0.095	0.089	0.086	0.077
K	%	0.26	0.25	0.24	0.24	0.22	0.21	0.2
La	ppm	4.5	4.4	4.2	4.05	3.8	3.6	3.5
Mg	%	0.94	0.32	0.3	0.28	0.2575	0.24	0.21
Mn	ppm	260	81.8	74.5	70.5	65.75	61.8	58
Mo	ppm	4.78	4.426	4.33	3.945	3.17	1.886	1.2
Na	%	0.222	0.1991	0.1545	0.1185	0.075	0.0504	0.018
Ni	ppm	37.2	36.16	34.425	33.05	30.55	27.23	24.1
P	%	0.087	0.0783	0.07125	0.067	0.06275	0.06	0.056
Pb	ppm	62.1	18.81	18.6	18	16.95	16	14.5
Sb	ppm	0.67	0.2	0.18	0.11	0.1	0.099	0.08
Se	ppm	1.7	1.61	1.6	1.5	1.2	0.88	0.5
Sr	ppm	80.3	75.08	66.825	56.95	47.85	40.61	30.2
Th	ppm	7.5	7.2	6.925	6.75	6.6	6.39	5.8
U	ppm	1.5	1.4	1.325	1.3	1.3	1.19	1
Zn	ppm	199	159.8	149.25	141.5	131.75	111.5	98.3

Notes:
1. Metal values greater than or equal to 3 times the crustal concentration are shaded in light grey. Values greater than or equal to 10 times the crustal concentration are shaded in dark grey.
2. Average continental crustal abundances from Price (1997).

2.3.2 Right Bank Drainage Tunnel

In 2016, 7,700 m^3 of PAG material was excavated from the right bank drainage tunnel (RBDT). Most of the PAG excavations were produced when removing unstable material above and around the portal itself, rather than from the underground tunnel.

Acid base accounting results for the RBDT samples are provided in Table 2-5. All samples are classified as PAG based on NPR values. Three of the six samples have rinse pH values below 5.6 (ranging from 4.97 to 5.47), indicating that they are currently acid generating. The relatively low rinse pH of some RBDT samples is likely related to the shallow depth that they were collected. That is, weathering of PAG rock exposures along the naturally exposed slope likely resulted in NP depletion and the development of a mildly acidic in-situ pH. In the future, excavations from the RBDT will be from the tunnel itself, and will likely be more reflective of fresh bedrock which is expected to have a circumneutral pH when it is initially excavated (Klohn, 2015; and Approach Channel results in 2.3.1).

The metal content of RBDT samples collected in 2016 are presented in Table 2-5. All RBDT samples exceed 3x ACA for Ag and As, while five of six samples exceed 3x ACA for Cd. The only parameter to exceed 10x ACA is Se, which exceeds10x ACA in all samples.

Table 2-5:
Acid base accounting and metal content of RBDT samples

Parameter	units	RBDT #1	RBDT #2	RBDT #3	RBDT-01	RBDT-02	RBDT-03
Date		10/7/2016	10/7/2016	10/7/2016	12/1/2016	12/1/2016	12/1/2016
Lab Rinse pH	s.u.	5.47	5.05	6.51	4.97	6.4	7.15
Paste pH	s.u.	7.28	6.35	7.78	5.4	6.7	7.58
Total-S	wt.%	1.38	1.35	1.56	1.24	1.01	1.32
Sulphate-S	wt.%	0.07	0.1	0.06	0.21	0.15	0.05
Sulphide-S	wt.%	0.98	0.95	1.13	0.7	0.61	0.91
SAP	$kgCaCO_3/t$	30.6	29.7	35.3	21.9	19.1	28.4
Mod. NP	$kgCaCO_3/t$	6.3	5.8	8.3	4	21.5	10.8
NNP	ratio	-24.3	-23.9	-27	-17.9	2.4	-17.6
NPR	ratio	0.2	0.2	0.2	0.2	1.1	0.4
Ag	ppm	0.50	0.50	0.40	0.38	0.32	0.35
Al	%	0.88	0.84	0.9	0.72	0.68	0.67
As	ppm	14	15.2	15.6	11.9	12	18.4
Ba	ppm	257	254	207	221	306	174
Bi	ppm	0.3	0.3	0.3	0.26	0.23	0.25
Ca	%	0.39	0.41	0.45	0.53	1.06	0.58
Cd	ppm	0.40	0.60	0.50	0.57	0.50	0.52
Co	ppm	8.8	8.3	9	7.8	6.5	7
Cr	ppm	22	18	21	22.5	33.4	26.3
Cu	ppm	35.9	39.4	36	33	26.3	30.7
Fe	%	2.31	2.38	2.29	2.53	2.56	5.2
Hg	ppm	120	170	180	98	70	77
K	%	0.27	0.26	0.27	0.2	0.19	0.2
La	ppm	4	4	4	4.6	4.7	3.8
Mg	%	0.35	0.31	0.31	0.25	0.33	0.32
Mn	ppm	116	96	101	230	228	1910
Mo	ppm	3	3.8	3.5	3.16	2.99	3.22
Na	%	0.084	0.053	0.107	0.029	0.036	0.052
Ni	ppm	37.1	33.4	35.4	26	23.1	27
P	%	0.071	0.068	0.067	0.081	0.072	0.084
Pb	ppm	18.9	18	31.6	14.8	13.2	13.9
Sb	ppm	0.1	0.1	0.1	0.17	0.2	0.18
Se	ppm	1.2	1.7	1.8	1.1	0.8	1.0
Sr	ppm	57	53	64	48.3	46.1	52.3
Th	ppm	6	6.4	6	6.1	5.2	5.3
U	ppm	1.1	1.2	1.1	1.5	1	1
Zn	ppm	117	129	141	103	95.4	105

Notes:
1. Metal values greater than or equal to 3 times the crustal concentration are shaded in light grey. Values greater than or equal to 10 times the crustal concentration are shaded in dark grey.
2. Average continental crustal abundances from Price (1997).

2.3.3 Garbage Creek

Garbage creek excavations consist of material excavated to install the Garbage Creek diversion channel, and material excavated from the left bank haul road. A total of 22,300 m^3 of material was excavated from this area in 2016. The excavation sites are adjacent and all material is stored in the Garbage Creek TPSA, therefore, ABA results are not distinguished between the two. Samples were collected on a daily basis at the excavation site when excavations were taking place. Variations in geochemical characteristics are presented as a time series in Figure 2-10. Statistics on ABA results are shown in Table 2-6

The time series in Figure 2-10 shows that material excavated at Garbage Creek has an acidic in-situ pH, and is therefore classified as acid generating immediately upon excavation. The material has relatively low sulphide-S content (median of 0.05 wt.%), resulting in a relatively low SAP (median of 1.45 $kgCaCO_3/t$). Due to the lack of NP, a majority (22 of 24 samples) have NPR values <2, and are therefore classified as PAG.

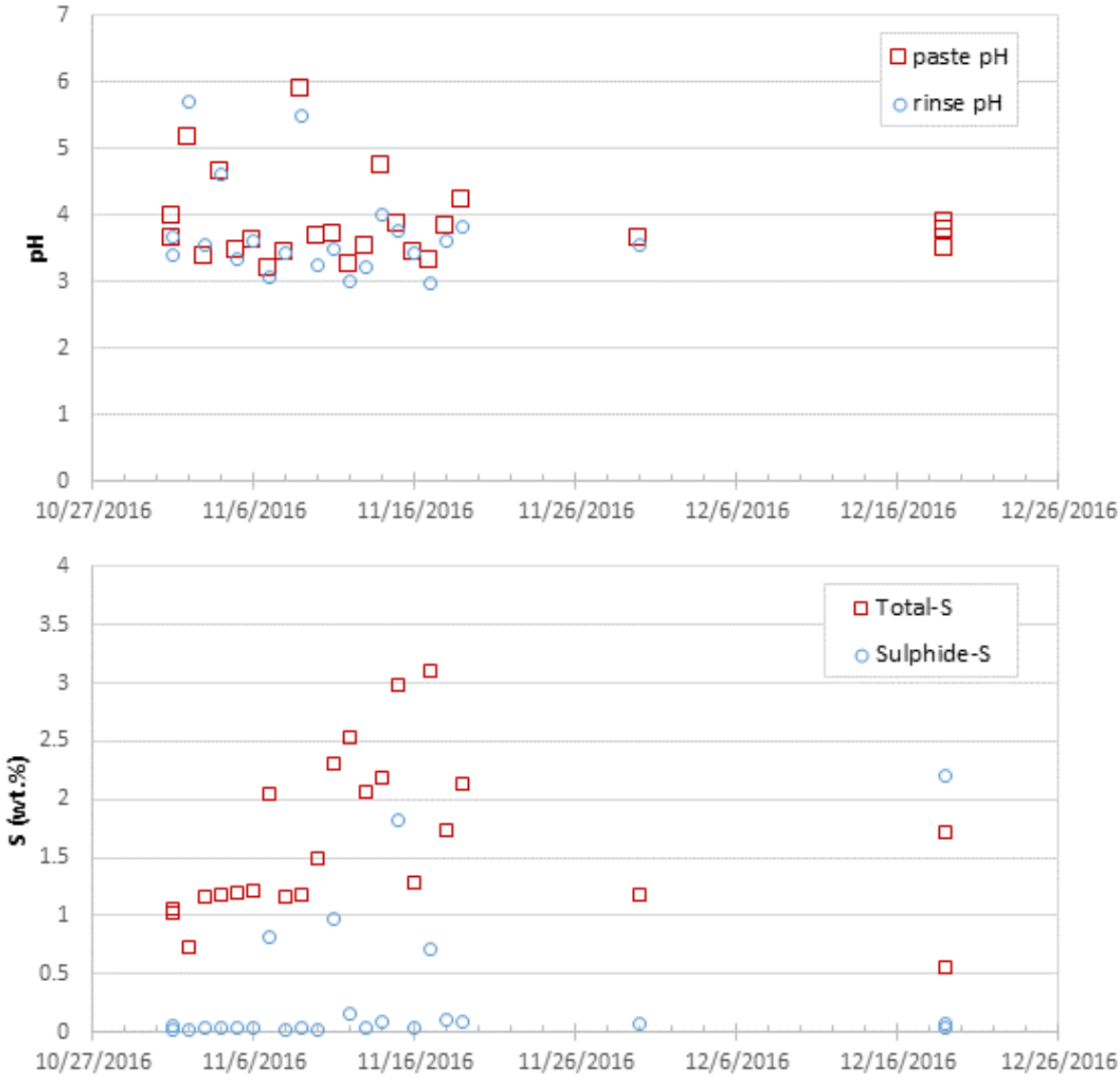


Figure 2-10: Time series plots showing paste pH and rinse pH results (top), and sulphide-S and total-S results (bottom) for samples collected at the garbage creek excavation site.

Table 2-6:
Acid base accounting and metal content of Garbage Creek samples

Parameter	units	Max	P90	P75	P50	P25	P10	Min
Lab Rinse pH	s.u.	5.71	4.62	3.77	3.55	3.34	3.06	2.99
Paste pH	s.u.	5.88	4.72	3.91	3.65	3.46	3.33	3.18
Total-S	wt.%	3.35	2.85	2.15	1.39	1.18	1.03	0.56
Sulphate-S (Na_2CO_3)	wt.%	2.11	1.86	1.49	1.06	0.9	0.53	0.41
Sulphate-S (HCl)	wt.%	1.95	1.8	1.39	0.93	0.83	0.49	0.32
Sulphide-S	wt.%	2.2	0.93	0.11	0.05	0.03	0.02	0.02
SAP	$kgCaCO_3/t$	68.8	29.1	3.5	1.45	0.9	0.6	0.6
Mod. NP	$kgCaCO_3/t$	12.5	-2.8	-4.95	-6.4	-8.1	-10	-12.8
NPR	ratio	13.9	-0.1	-0.5	-2.4	-6.0	-10.1	-15.5
Ag	ppm	0.355	-	-	0.204	-	-	0.166
Al	%	1.09	-	-	1.06	-	-	0.57
As	ppm	27.4	-	-	13.9	-	-	10
Ba	ppm	370	-	-	293	-	-	150
Bi	ppm	0.34	-	-	0.3	-	-	0.27
Ca	%	0.45	-	-	0.41	-	-	0.05
Cd	ppm	1.21	-	-	0.21	-	-	0.11
Co	ppm	18	-	-	2.4	-	-	0.9
Cr	ppm	17.9	-	-	16.4	-	-	9.8
Cu	ppm	34.7	-	-	15.5	-	-	7.95
Fe	%	3.42	-	-	2.66	-	-	1.71
Hg	ppm	0.124	-	-	0.101	-	-	0.062
K	%	0.55	-	-	0.24	-	-	0.23
La	ppm	8.1	-	-	4.8	-	-	3.7
Mg	%	0.2	-	-	0.05	-	-	0.05
Mn	ppm	169	-	-	17	-	-	10
Mo	ppm	19.3	-	-	12.9	-	-	7.5
Na	%	0.138	-	-	0.049	-	-	0.008
Ni	ppm	70.9	-	-	6.9	-	-	4.5
P	%	0.066	-	-	0.04	-	-	0.034
Pb	ppm	18.5	-	-	17.4	-	-	14.3
Sb	ppm	0.45	-	-	0.23	-	-	0.23
Se	ppm	9.1	-	-	3	-	-	1.4
Sr	ppm	97.1	-	-	47.3	-	-	25.5
Th	ppm	6.1	-	-	4.5	-	-	4.4
U	ppm	3.1	-	-	1.8	-	-	0.6
Zn	ppm	256	-	-	49.2	-	-	15.5

2.3.4 Road Cuts

Road cuts into PAG rock have been made at several locations along the right bank bank. The location of the various road cuts is outlined in Table 2-7. The main objective with road cut monitoring is to determine if and when the road cuts become acid generating by monitoring rinse pH. Generally, acid base accounting smaples are also collected from each newly identified road cut to confirm if the road cut has encountered PAG rock. Road cuts that have been monitored include: the Moberly River bridge south abutment (MRB south abutment); the temporary Moberly River bridge access road (temp MRB access road); the right bank access road (RB access road), and the R5a access road. Rinse pH and select ABA results for these road cuts are provided in Table 2-7 Rinse pH

The R5a access road was constructed for logging and haul truck access to the RSEM R5a area. Bedrock outcrops were identified at three locations along the road which were sampled December 9th to 12th, which was shortly after the completion of the Moberly River bridge which provided access to the area. The rinse pH for samples collected from R5a access road outcrops ranged from 5.85 to 3.22, with acidic material (pH < 5.6) sampled from each of the three outcrops.

The right bank access road connects the Memorial Bridge at the Peace River to site facilities on the upper terrace. Several cuts into PAG rock exist between km 2.5 and km 3.0 from the Memorial Bridge. Nine samples for rinse pH analysis were collected from this area in October 2016. These samples produced rinse pH values ranging from 3.4 to 6.5, with a majority (7 of 9) being classified as acid generating (pH < 5.6).

The temp MRB access road provides access to the south side of the temporary Moberly Bridge providing access to the RSEM R5a area. Three rinse pH samples were collected in November, 2016. Two of the samples produced circumneutral pH values, while the third sample was acidic (pH 3.59).

The Moberly Bridge South Abutment exposure is located at the south abutment of the Moberly Bridge. Rinse pH samples were collected from this bedrock exposures on October 16th, and again on November 11th. All six samples produced circumneutral rinse pH (ranging from pH 5.65 to 6.50), indicating that the exposure is not currently acid generating.

2.3.4.1 ABA Results

Eight road cut samples were submitted for ABA analysis in 2016. This includes five samples from the R5a access road, two samples from the RB access road, and a single sample from the MBR south abutment. All 8 samples had a relatively low sulphide-S content, ranging from 0.08 wt.% to 0.01 wt.%. A majority of the total-S can be extracted

by an HCl leach, indicating that it is present in a readily soluble form (*e.g.*, gypsum). The low sulphide content indicates that the road cuts are at an advanced weathering state, and there is little potential for additional acid generation from sulphide oxidation. Three of the eight samples had a circumneutral rinse pH and some remaining neutralization potential. These three samples are all classified as NPAG based on the NPR criteria (*i.e.*, NPR > 2.0).

Bedrock exposed in road cuts is shallow, and in many cases has been exposed since at least spring 2016. The rinse pH results, and lack of remaining sulphide AP, suggest that PAG material has already become acidic. The ABA results show that all samples that have remained at a neutral pH are classified as NPAG, and are not expected to become acid generating in the future.

Table 2-7:
Road cut acid base accounting and field rinse pH results

Area	Sample ID	Easting	Northing	Sample Date	Field rinse pH (s.u.)	paste pH (s.u.)	Total-S (wt.%)	Sulphate-S (Na2CO3) (wt.%)	Sulphate-S HCl (wt.%)	Sulphide-S (wt.%)	Mod. NP kgCaCO3/t	NPR ratio
R5a Access Road	WMRD0.75K-01	628225	6230462	12/9/2016	3.37	3.55	2.04	1.15	0.89	0.08	-6.3	-2.5
	WMRD0.75K-02	628219	6230441	12/9/2016	5.85	7.02	2.18	1.19	0.98	0.04	7.5	6
	WMRD0.75K-03	628214	6230415	12/9/2016	3.22	3.68	1.65	0.98	0.76	0.04	-5.5	-4.4
	WM1212-1	627923	6230924	12/12/2016	4.53	5.52	0.58	0.54	0.51	0.03	0.5	0.5
	WM1212-2	628037	6230799	12/12/2016	4.65	4.55	0.41	0.34	0.33	0.02	-1.5	-2.4
	WM-1215-1	628042	6230803	12/15/2016	3.44							
	WM-1215-2	628028	6230820	12/15/2016	3.3							
	WM-1215-3	627926	6230934	12/15/2016	3.66							
	WM-1215-4	627923	6230937	12/15/2016	5.13							
RB Access Road	RBRd km 2.75-01	628616	6229737	10/29/2016	4.0							
	RBRd km 2.75-02	628637	6229713	10/29/2016	3.9							
	RBRd km 2.75-03	628664	6229690	10/29/2016	4.0	4.34	0.65	0.54	0.51	0.03	-5.3	-5.7
	RBRd km 2.75-04	628715	6229628	10/29/2016	3.5							
	RBRd km 2.75-05	628688	6229661	10/29/2016	4.8							
	RBRd km 2.75-06	628687	6229694	10/29/2016	3.4							
	RBRd km 2.75-07	628599	6229689	10/29/2016	6.5	6.78	0.4	0.34	0.33	0.01	2.5	8
	RBRd km 2.75-08	628585	6229721	10/29/2016	6.5							
	RBRd km 2.75-09	628567	6229751	10/29/2016	4.9							
Temp MRB Access Road	RBRd-MR1-1111	628613	6229972	11/11/2016	6.44							
	RBRd-MR3-1111	628619	6229972	11/11/2016	6.93							
	RBRd-MR2-1111	628636	6229956	11/11/2016	3.59							
MRB South Abutment	MR-1	628506	6229979	10/16/2016	6.4							
	MR-2	628506	6229979	10/16/2016	6.5	7.18	0.17	-	0.09	0.03	8.5	9.1
	MR-3	628506	6229979	10/16/2016	6.3							
	MR-1-1111	628506	6229979	11/11/2016	5.65							
	MR-2-1111	628506	6229979	11/11/2016	6.14							
	MR-3-1111	628506	6229979	11/11/2016	6.47							

2.3.5 Left Bank Excavation Sediment Pond

The left bank excavation sediment pond (LBEX pond) was constructed in September, 2016 and collects water pumped down from the left bank excavation to settle out TSS before discharge to the Peace River via rock drain. The berms were constructed from colluvial material present at the pond site. The colluvium is derived from a mixture of bedrock and overburden. The bedrock derived colluvium contains weathered shale pieces, and had not been previously characterized for ARD potential.

Three composite samples were collected from the LBEX pond in September 2016. All three samples were submitted for field rinse pH, and one sample was sent to Maxxam for ABA analysis. The results are provided in Table 2-8 below. Two of the three samples had a rinse pH below 5.6 indicating that they are currently acidic. The laboratory results for L3-SP2 produced conflicting results. That is, the lab rinse pH was acidic, while the paste pH was circumneutral and the NPR indicates the sample should be classified as NPAG. These results are believed to be a result of the sample being a composite of different types of colluvium (*i.e.*, derived from both overburden and bedrock) composite sample containing a mixture of colluvium derived from shale and overburden. That is, rinse pH is measured from the < 2 mm particle size fraction, with no particle comminution. The paste pH and other ABA parameters are measured after the sample is pulverized. Crushing the sample releases NP present in larger particles that would otherwise be unavailable.

Sulphur speciation results show that the colluvial material is deplete in sulphide-S, with most S being present in relatively recalcitrant sulphate minerals, only extractible using Na_2CO_3. Due to the lack of sulphide mineralization, there is little potential for additional acid generation from sulphide oxidation in the colluvial material used to construct the LBEX pond berm. The lack of HCl extractable sulphate-S indicates that readably soluble sulphate minerals such as gypsum are not present, and sulphate is present in more recalcitrant sulphate minerals such as jarosite, alunite or barite.

Table 2-8:
Rinse pH and ABA results for samples collected from the LBEX pond berm

Sample ID	units	L3-SP1	L3-SP2	L3-SP3
Date Sampled		9/27/2016	9/27/2016	9/27/2016
Field Rinse pH	s.u.	4.5	3.9	6
Lab Rinse pH	s.u.	-	4.48	-
Paste pH	s.u.	-	6.59	-
Total-S	wt.%	-	1.24	-
Sulphate-S (HCl)	wt.%	-	<0.01	-
Sulphate-S (Na2CO3)	wt.%	-	1.12	-
Sulphide-S	wt.%	-	0.04	-
Mod. NP	kgCaCO3/t	-	16.8	-
NPR	ratio	-	15.5	-

2.3.6 Legacy Stockpiles

Prior to commissioning of RSEM R5b, temporary PAG stockpiles were located in Area 20 and within the RSEM R5b footprint had been established. Both TPSAs were relocated into the RSEM R5b in October or November 2016.

2.3.6.1 Area 20 TPSA

The Area 20 TPSA consisted of eight individual stockpiles located within a containment berm. The total volume of PAG in the facility was estimated to be 4,100 m^3. Two recent stockpiles contain rock that was excavated from the Moberly Bridge South Abutment. The remaining six stockpiles contain historic rock from previous BC Hydro excavations, including two instrumented test piles. The stockpiles were composed either entirely of shale bedrock, or a mixture of overburden and shale.

A total of 21 samples were collected from Area 20 TPSA. The field rinse pH results are provided in Table 2-9. The results show that portions of the Area 20 TPSA were acid generating when the sampling event occurred, with pH values ranging from 2.7 to 6.9.

Table 2-9:
Field rinse pH results for samples collected from Area 20 TPSA in September 2016

Statistic	Field rinse-pH
Max	6.9
P90	6.6
P75	6.5
P50	5.3
P25	3.1
P10	3.0
Min	2.7
n	21

2.3.6.2 RSEM R5b TPSA

The RSEM R5b TPSA consisted two piles located near the south end of the RSEM R5b area footprint adjacent to the natural slope. These piles are believed to have been deposited by BC Hydro's contractors during the Moberly River causeway work activities in spring of 2016. The volume of the TPSA was approximately 4,300 m3. This TPSA consisted of a large pile (the large pile) within the RSEM Area R5b starter dyke footprint, and a second smaller pile (the small pile) located outside the RSEM Area R5b footprint and between the

footprint and the Moberly River. The large pile contained weathered shale, while the small pile contained a mixture of top soil and overburden.

A total of d 32 samples were collected from RSEM R5b TPSA. The field rinse pH results are provided in Table 2-10. At R5b RSEM TPSA, field rinse pH testing showed that samples form the large pile were generally acidic, with a median pH of 4.1, and samples from the small pile were circum-neutral, with pH values ranging from 5.7 to 6.6.

Table 2-10:
Field rinse pH results for samples collected from the RSEM R5B TPSA small and large stockpiles.

Statistic	Small Pile	Large Pile
Max	6.6	6
P90	-	5.2
P75	6.5	4.6
P50	6.2	4.1
P25	5.9	3.6
P10	-	3.4
Min	5.7	3.1
n	6	26

Note: small pile consists of overburden and topsoil, while large pile consists of weathered shale.

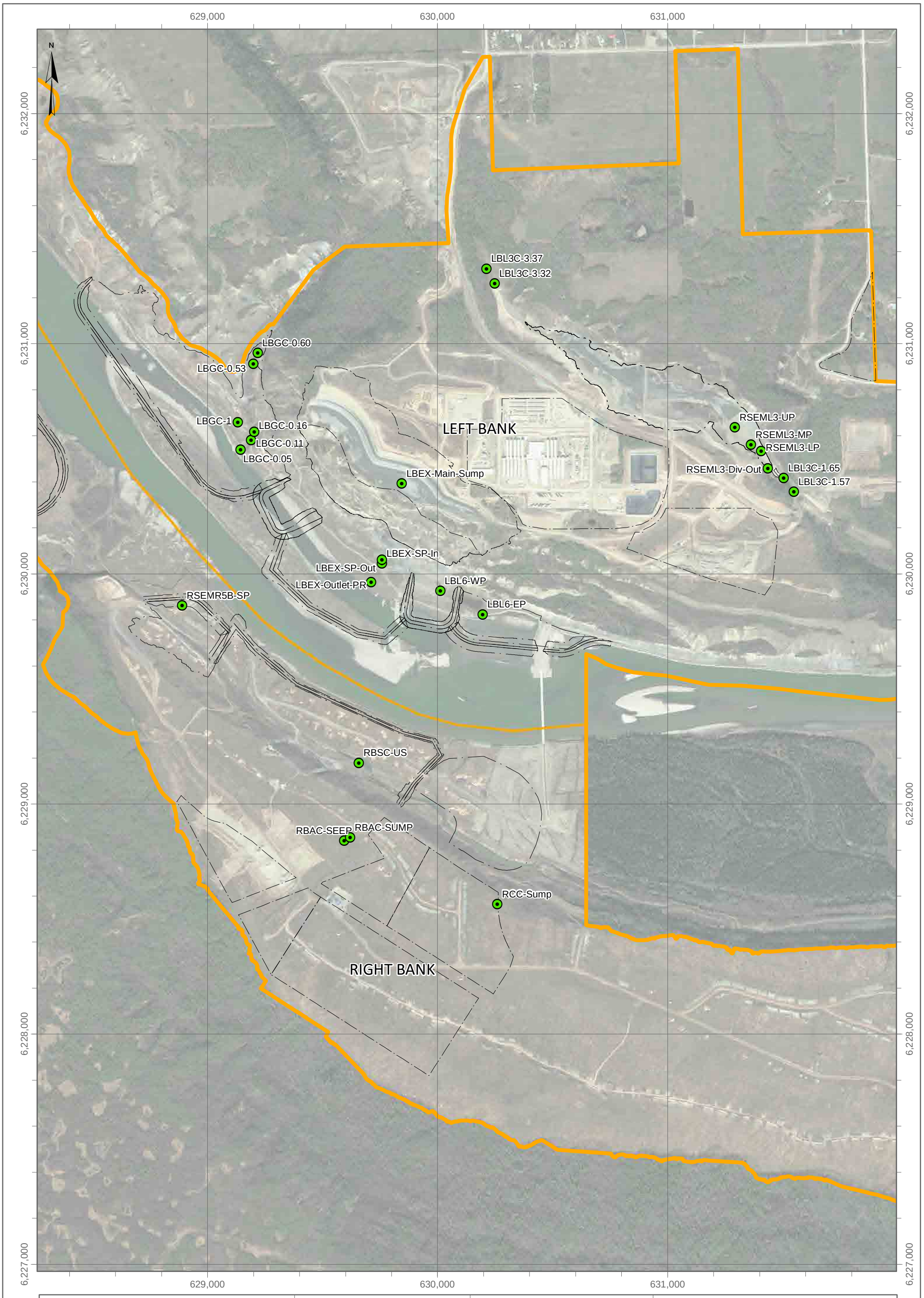
3. Surface Water Quality

3.1 Purpose & Objectives

The purpose of the 2016 Surface Water Quality monitoring program is to meet PRHP water quality monitoring requirements for PAG contact water as stated in Appendix E of the Construction Environmental Management Plan (CEMP). The primary objective is to collect water quality monitoring results for PAG-contact water that was discharged from RSEM sediment ponds and to monitor potential sources of ARD and metal leaching across the construction site. This section presents the water quality monitoring data from the PAG-containing RSEMs but also includes water quality monitoring results from other stations established in areas under PHRP control.

3.2 Monitoring Station Location Description and Frequency

Monitoring station locations were established on both the Left Bank and Right Bank of the Peace River within the Site C Project area. Figure 3-1 illustrates the monitoring station locations relative to the Peace River and also with respect to general outlines of the major project working areas. The two primary PAG-contact water monitoring sites established in 2016 are the discharge from the Sediment Pond at RSEM R5b on the Right Bank and RSEM L5 on the Left Bank.



LEGEND

- WQ Monitoring Location
- Property Boundary

DATE SAVED:	Mar 23, 2017
DRAWN BY:	AL
REVIEWED:	NM
VERSION:	1

Coordinate System: *NAD 1983 UTM Zone 10N*
Projection: *Transverse Mercator*
Datum: *North American 1983*
Units: *Meter*

1:15,000

0 250 500 Meters

CLIENT: PEACE RIVER HYDRO PARTNERS

LORAX ENVIRONMENTAL

PROJECT:

Site C Clean Energy Project

TITLE: Overall Site WQ Moniitoring Location

PROJECT #: A416-2

FIGURE: 3-1

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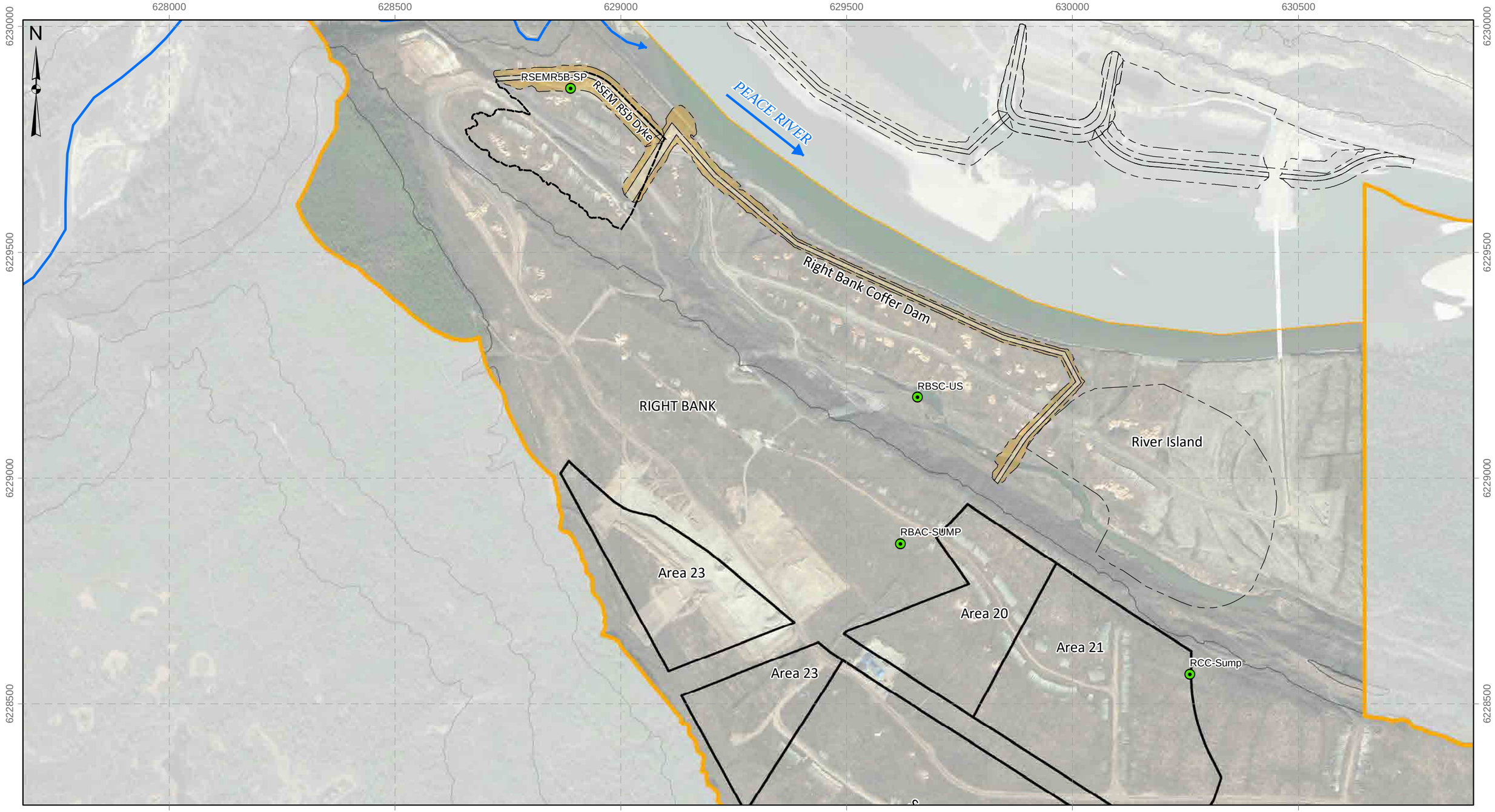
3.2.1 RSEM R5b Sediment Pond and other Right Bank Stations

RSEM-R5b was constructed in 2016 and a water quality monitoring station was established in the RSEM R5b sediment pond October 17. Although there was no surface water discharge in 2016, it did receive water from Right Bank construction areas that had PAG rock exposures. Water reporting to the R5b sediment pond was primarily from the Right Bank Approach Channel, which recieves PAG runoff water from the excavation and also intercepts upgradient groundwater . Water from the approach channel being diverted to RSEM R5b is monitored at RBAC-Sump and RBAC-Seep at the approach channel excavation. Water monitored at RBAC-Sump represents water in the collection ditch surrounding the Approach Channel, while water monitored at RBAC-Seep is upgradient groundwater being intercepted by the collection ditch. Hydro-vac trucks also transported water to the R5b sediment pond that was collected from the Roller Compacted Concrete excavation sump (RCC-Sump). The stations reporting to the RSEM R5b sediment pond are listed in

Table 3-1 and illustrated in Figure 3-2. The final station on the Right Bank is RBSC-US, which was originally the west end of a side channel to the Peace River, which was isolated from the river by November.

Table 3-1:
Right Bank Surface Water Quality Monitoring Stations

RSEM R5b Sediment Pond			
RSEMR5B-SP	628,889	6,229,863	RESM R5b Sediment Pond
Right Bank Cofferdam			
RBSC-US	629,657	6,229,179	Right Bank Peace River Side Channel Upstream within the Right Bank Cofferdam
RCC Excavation			
RCC-Sump	#N/A	#N/A	Water collection sump that receives water pumped from RCC excavation
Approach Channel			
RBAC-SUMP	629,619	6,228,855	Sump collecting runoff and diversion ditch water in Approach channel excavation
RBAC-SEEP	629,594	6,228,841	Upgradient seepage into the approach channel sump



Legend

- WQ Monitoring Location
- Dam/Dyke Crest
- Dam/Dyke Toe
- Site C Construction Area Boundary
- 5m Elevation Contour
- 50m Elevation Contour

DATE SAVED:	Mar 23, 2017
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Coordinate System: *NAD 1983 UTM Zone 10N*
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CLIENT: PEACE RIVER HYDRO PARTNERS

LORAX ENVIRONMENTAL

PROJECT:

Site C Clean Energy Project

TITLE: Right Bank Water Quality Monitoring Locations

PROJECT #: A416-2

FIGURE: 3-2

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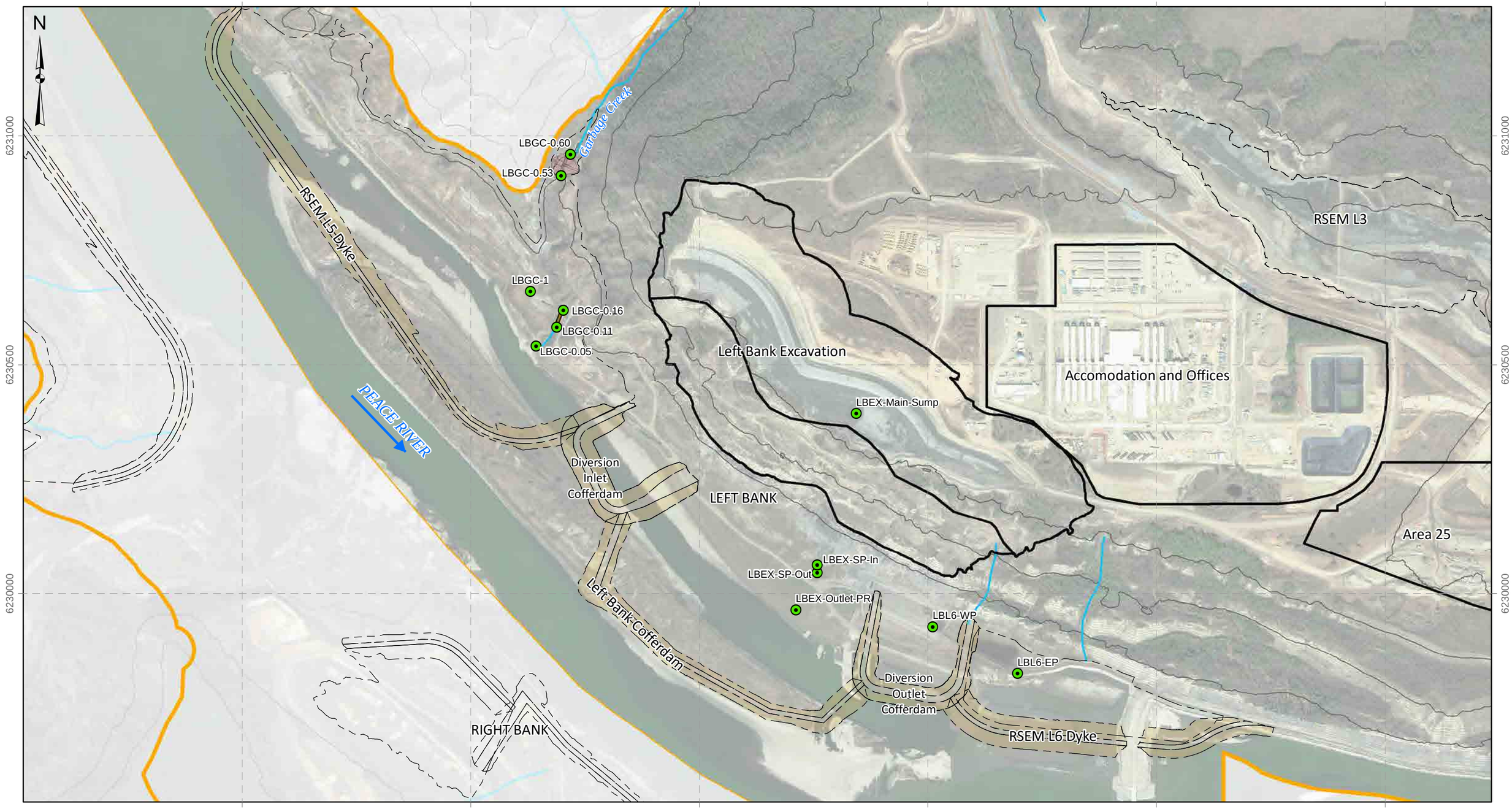
3.2.2 RSEM L5 – Garbage Creek

RSEM L5 area is disected by Garbage Creek and the sediment pond at RSEM L5 was not established in 2016 so three monitoring stations were established in the lower reaches of Garbage Creek (LBGC-1, LBGC-0.10, and LGGC-0.16). A monitoring station was also initiated upstream in Garbage Creek (LBGC-0.60) where water from the upper catchment is collected in a pond before being pumped around the Garbage Creek TPSA and discharged into the lower reach of the creek. The upper catchment of Garbage Creek includes urban areas, roads and the garbage dump. The stations on Garbage Creek are listed in Table 3-2 Figure 3-3.Station LBGC-0.16 is a sump located upstream of the culvert on Garbage Creek and collects groundwater that seeps into the base drain of the PAG storage area. This sump may also recieve runoff water from the surface of the PAG storage during runoff events. Periodically, LBGC-0.16 water was pumped to a lined sump at LBGC-1 where it was mixed with water diverted from the upstream reach of Garbage Creek (LBGC-0.60) at LBGC-1 and then discharged to LBGC-0.10. However, following the initial placement of PAG in Garbage Creek on November 2, near-freezing temperatures were sustained through 2016 and little to no runoff occured. LBGC-1 was discharged on November 9 and November 12, 2016.

Table 3-2:
RSEM L5 (Garbage Creek) Surface Water Quality Monitoring Stations

Station IDs	**Easting**	**Northing**	**Description**
LBGC-0.05	629,143	6,230,541	Garbage Creek at mouth of Peace River
LBGC-0.11	629,189	6,230,582	Garbage Creek at Culvert Outlet under L5 Access Road
LBGC-1	629,131	6,230,660	Lined pond to receiving drainage from Garbage Creek TPSA prior to discharge
LBGC-0.16	629,203	6,230,619	Garbage Creek Between toe of L5 Pile and Culvert inlet under L5 Access Road
LBGC-0.53	629,198	6,230,913	Garbage Creek at between diversion sump and temporary PAG storage area
LBGC-0.60	629,218	6,230,960	Garbage Creek at sump above Diversion Berm (Upstream Side)



Legend

- WQ Monitoring Location
- Creek
- Culvert
- Dam/Dyke Crest
- Dam/DykeToe
- Site C Construction Area Boundary
- 5m Elevation Contour
- 50m Elevation Contour

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CLIENT: PEACE RIVER HYDRO PARTNERS

LORAX ENVIRONMENTAL

PROJECT:

Site C Clean Energy Project

TITLE: Left Bank Water Quality Monitoring Locations

PROJECT #: A416-2

FIGURE: 3-3

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3.2.3 RSEM L6

RSEM L6 area was largely undeveloped in 2016 however two monitoring stations were established at ponds in this area. The west pond station (LBL6-WP) receives runoff from natural PAG bedrock exposures and historical road cuts on the slopes above the pond. The east pond station (LBL6-EP) receives runoff from natural overburden exposures on the slopes above the pond. No physical connection was observed between LBL6-WP and the Peace River and LBL6-EP was isolated and had fish removed in October. The stations in the L6 area are listed in Table 3-3 and illustrated in Figure 3-3.

Table 3-3
RSEM L6 Surface Water Quality Monitoring Stations

Station IDs	Easting	Northing	Description
LBL6-WP	630,011	6,229,927	RESM L6 West Pond
LBL6-EP	630,196	6,229,825	RESM L6 East Pond

3.2.4 Left Bank Excavation

The Left Bank Excavation exposed a large area of overburden materials south west of the Site C Camp. Left Bank Excavation exposures during 2016 were non-PAG and as a result monitoring stations in this area do not have the same monitoring requirements as PAG-containing RSEMs. Runoff from the Left Bank Excavation collects in a central sump (LBEX-Main-Sump) and is pumped to the Left Bank Excavation sediment pond (LBEX-SP-in). The water discharging from the LBEX-SP is monitored at LBEX-SP-out. Water from LBEX-SP-out mixes with runoff from the PAG bedrock exposure from above the pond and discharges to a side channel of the Peace River. The combined discharge prior to reaching the river is monitored at monitoring station LBEX-Outlet-PR. The stations in the LBEX area are listed in Table 3-4 and illustrated in Figure 3-3.

Table 3-3:
Left Bank Excavation Surface Water Quality Monitoring Stations

Station IDs	Easting	Northing	Description
LBEX-Main-Sump	629,843	6,230,393	Left Bank Excavation LB Main Sump
LBEX-SP-In	629,758	6,230,045	Left Bank Excavation Sediment Pond Inlet
LBEX-SP-Out	629,758	6,230,062	Left Bank Excavation Sediment Pond Outlet
LBEX-Outlet-PR	629,711	6,229,964	LBEX Outlet to Peace River

3.2.5 RSEM L3

RSEM L3 receives non-PAG overburden materials primarily from the Left Bank Excavation that fills a deeply incised creek valley. As it only contains non-PAG material, it does not have the same monitoring requirements as PAG-containing RSEMs. Upstream creek water (LBL3C-3.37) is intercepted in a sump (LBL3C-3.32) and diverted around the RSEM to the toe of the facility (RSEML3-Div-Out). Runofff from the surface of the RSEM and adjacent catchments is captured in a series of sumps (RSEML3-UP, RSEML3-MP, RSEML3-LP) that combine with RSEML3-Div-Out water and seepage water at the toe of the RSEM. This combined water is monitored at station LBL3C-1.65. Water discharging from this station mixes with stream flow from the 85th Ave. Industrial Lands and is measured at LBL3C-1.57 at the inlet to the culvert that lays under the main access road for the project camp. The stations in the RSEM L3 area are listed in Table 3-4 and illustrated in Figure 3-4.

Table 3-4:
RSEM L3 Surface Water Quality Monitoring Stations

Station IDs	Easting	Northing	Description
LBL3C-3.37	630,213	6,231,327	L3 Creek 50m upstream of Diversion Berm
LBL3C-3.32	630,248	6,231,262	L3 Creek at sump above Diversion Berm
RSEML3-UP	631,292	6,230,637	RSEM L3 Upper Pond on surface of RSEM
RSEML3-MP	631,362	6,230,563	RSEM L3 Middle Pond on surface of RSEM
RSEML3-LP	631,406	6,230,534	RSEM L3 Lower Pond on surface of RSEM
RSEML3-Div-Out	631,436	6,230,459	L3 Diversion Outlet at L3 Rip Rap
LBL3C-1.65	631,504	6,230,417	L3 Creek immediately downstream of L3 Rip-rap Toe
LBL3C-1.57	631,549	6,230,357	L3C at Culvert inlet under Road

630000 630500 631000 631500 632000 632500 633000

6231000

6230500

6230000

N

LBL3C-3.37

LBL3C-3.32

85Ave Industrial Land Conveyor System (Approximate)

From 85th Ave.
Industrial Lands

RSEM L3

RSEML3-UP

RSEML3-MP

RSEML3-LP

RSEML3-Div-Out

LBL3C-1.65

LBL3C-1.57

Accomodation and Offices

LEFT BANK

Area 25

Area 27

(Howe Pit)

Peace River

PEACE RIVER

630000 630500 631000 631500 632000 632500 633000

Legend

- WQ Monitoring Location
- Berm
- RSEM L3
- RSEM L3 Diversion
- Creek
- Culvert
- Site C Construction Area Boundary
- 5m Elevation Contour
- 50m Elevation Contour

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CLIENT: PEACE RIVER HYDRO PARTNERS

LORAX ENVIRONMENTAL

PROJECT:

Site C Clean Energy Project

TITLE: RSEM L3 and L3C Water Quality Monitoring Locations

PROJECT #: A416-2

FIGURE: 3-4

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3.2.6 Monitoring Frequency

The frequency of water quality monitoring at the site is summarized in Table 3-6. The highest frequency monitoring occurred at stations that had the greatest potential for direct discharge to the Peace River. As project construction evolved over time the likelihood that there would be discharge from a particular area changed and as a result the monitoring frequency also evolved.

During Summer 2016 the highest monitoring frequency occurred for field parameters within the Right Bank Coffer Dam footprint at station RBSC-US. Following the isolation of this area to prevent runoff from this to the river, monitoring frequency decreased in November. Frequent monitoring also occurred in the RSEM L5 area from water collection sump LBGC-1 and discharge LBGC-0.11, prior to the water in this area freezing in December. Conversely, monitoring frequency increased at RSEM R5b following the construction of the sediment pond, which was monitored daily after December 6.

Table 3-5:
Monitoring Frequency in 2016

	Station IDs	Lab Analyses	Field Analyses	First Sample Date	Last Sample Date
RSEM R5b Sediment Pond					
	RSEMR5B-SP	30	21	17-Oct-16	31-Dec-16
Right Bank Cofferdam					
	RBSC-US	3	180	16-Jul-16	18-Nov-16
RCC Excavation					
	RCC-Sump	1	0	29-Oct-16	29-Oct-16
Approach Channel					
	RBAC-SUMP	2	0	29-Oct-16	10-Nov-16
	RBAC-SEEP	2	1	1-Nov-16	8-Dec-16
RSEM L5					
	LBGC-0.05	0	1	14-Sep-16	14-Sep-16
	LBGC-0.11	2	130	2-Jul-16	13-Dec-16
	LBGC-1	16	12	13-Oct-16	13-Dec-16
	LBGC-0.16	0	12	2-Jul-16	10-Oct-16
	LBGC-0.53	1	3	16-Sep-16	3-Nov-16
	LBGC-0.60	2	43	2-Jul-16	13-Dec-16
RSEM L6					
	LBL6-WP	4	1	17-Sep-16	17-Nov-16
	LBL6-EP	5	1	17-Sep-16	17-Nov-16
RSEM L3					
	LBL3C-3.37	0	19	19-Jun-16	13-Nov-16
	LBL3C-3.32	4	16	19-Jun-16	18-Nov-16
	RSEML3-UP	2	5	19-Jun-16	10-Nov-16
	RSEML3-MP	1	1	10-Nov-16	11-Dec-16
	RSEML3-LP	1	8	19-Jun-16	14-Oct-16
	RSEML3-Div-Out	0	16	8-Sep-16	11-Sep-16
	LBL3C-1.65	0	5	8-Sep-16	10-Sep-16
	LBL3C-1.57	3	0	14-Oct-16	18-Nov-16
Left Bank Excavation					
	LBEX-Main-Sump	0	4	22-Oct-16	9-Nov-16
	LBEX-SP-In	1	0	16-Oct-16	16-Oct-16
	LBEX-SP-Out	4	24	16-Oct-16	14-Dec-16
	LBEX-Outlet-PR	0	10	19-Oct-16	24-Oct-16

3.3 Monitoring Results

Monitoring data is discussed below for discharge water quality from each of the five working areas described in Section 3.2. Data for key water quality parameters from the final discharge monitoring station within each working area are presented below. The RSEM Sediment Pond Discharge Limits presented in

Table 3-7 apply to PAG contact water that reports to RSEM sediment ponds and thus, are applied to water in the RSEM R5b sediment pond and LBGC-1. Data from all monitoring stations are provided in Appendix 3-A and compared to the British Columbia short-term water quality guidelines for the protection of aquatic life. A comprehensive dataset of field and laboratory data from all stations is provided in Appendix 3-B.

Table 3-6:
CEMP Discharge Limits for PAG-containing RSEM Sediment Ponds

Parameter	End of Pipe Discharge Limits (mg/L)
Cadmium	0.00029
Cobalt	0.55
Copper	0.011
Total Dissolved Solids	29.4
Zinc	0.033
pH	6 - 9

3.3.1 RSEM-R5b Sediment Pond

Water began to collect in the RSEM-R5b sediment pond in 2016 but there was no surface water discharge. RSEM Discharge Limits apply to this station.

3.3.1.1 Hardness, Conductivity, Total Suspended Solids, and pH

Hardness and conductivity followed similar trends at this station. Hardness was generally characterized as very hard with values ranging from 105 mg/L $CaCO_3$ (October 29, 2016) to 484 mg/L (December 18, 2016). Conductivity ranged from 1,460 µS/cm (December 24, 2016) to 2,820 µS/cm (December 19, 2016) (Appendix 3-A.1).

The TSS levels ranged from 4.8 mg/L (December 24, 2016) to 360 mg/L (October 29, 2016) with concentrations exceeding established discharge limits (29.4 mg/l) in 8 of 28 collected samples (Appendix 3-A.1; Figure 3-5). The pH in this station ranged from 7.67 (October 29, 2016) to 8.37 (December 25, 2016) and was similar among collection dates (Figure 3-6).

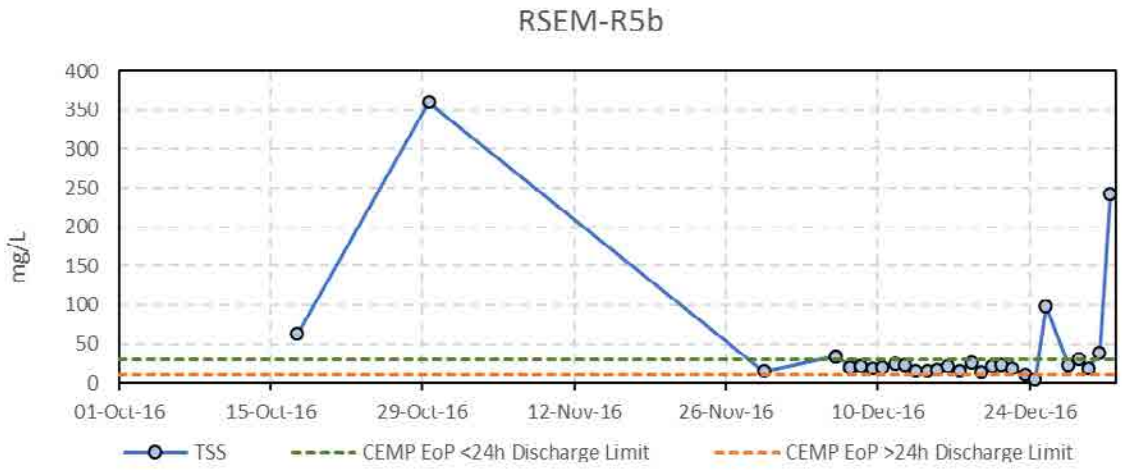


Figure 3-5: Time series profile for total dissolved solids (TSS) in RSEM-R5b compared to CEMP Discharge Limits.

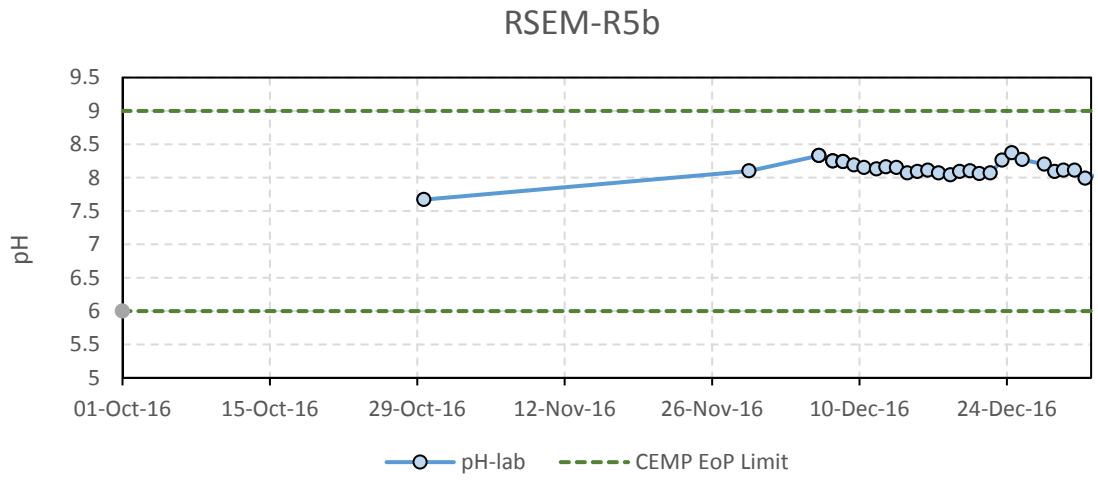


Figure 3-6: Time series profile for pH in RSEM-R5b compared to CEMP Discharge Limits.

3.3.1.2 Sulphate and Nitrogen Forms

Sulphate concentrations ranged from 53.1 mg/L (October 29, 2016) to 188 mg/L (December 18, 2016). Ammonia and nitrate remained at low concentrations, however elevated nitrite concentrations were noted for most of the collected samples (Appendix 3-A.1). Ammonia concentrations ranged from 0.12 mg/L (December 31, 2016) to 0.92 mg/L (December 18, 2016). Nitrite and nitrate concentrations ranged from 0.022 mg/L (October 29, 2016) to 0.31 mg/L (December 19, 2016) and from 0.19 mg/L (October 29, 2016) to 0.90 mg/L (December 28, 2016), respectively.

3.3.1.3 Metals

An elevated lead concentraion was recorded on one occasion coinciding with the maxima observed for TSS (Appendix 3-A.1) and thus, this peak value is mostly related to the TSS values. Lead concentrations ranged from < 0.0002 mg/L (December 24, 2016) to 0.007 mg/L (October 29, 2016). Total iron concentrations ranged from 0.11 mg/L (December 24, 2016) to 9.48 mg/L (October 29, 2016). However, dissolved iron was below 0.04 mg/L in all collected samples. It is likely that oxic conditions in these waters may promote the removal of dissolved iron from solution via (oxy)hydroxide precipitation, which has low solubility and therefore it is expected to be stable in these waters.

Dissolved cadmium exceeded discharge concentrations only in two occasions (up to 0.0008 mg/L; December 25, 2016; Figure 3-7). Copper concentrations exeeded discharge limits in two occasions (up to 0.013 mg/L; December 6, 2016) while only one exceedance was found for zinc (up to 0.06 mg/L;October 29, 2016), which coincided with maxima TSS. No exceedances were observed for cobalt.

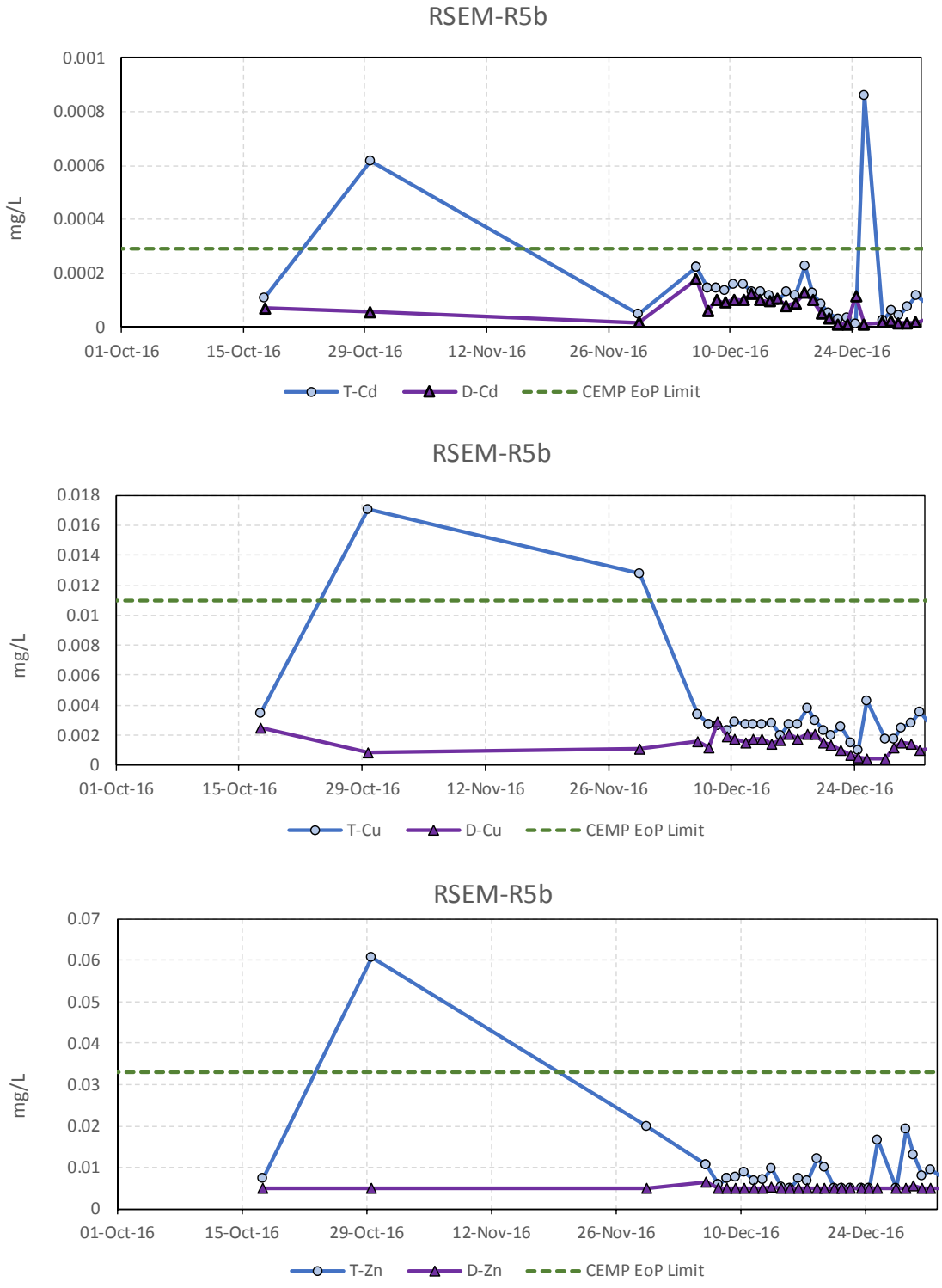


Figure 3-7: Concentrations of cadmium (Cd), copper (Cu) and zinc (Zn) for RSEM-R5b compared to CEMP Discharge Limits.

3.3.2 RSEM L5 Garbage Creek – Station LBGC-1

Runoff water from the surface of RSEM L5 TPSA and groundwater seeping into the toe drain was contained in a sump upstream of the culvert in the base of Garbage Creek. This water was pumped to a lined sump and then discharged on November 9 and November 12. RSEM Discharge Limits apply to this station following the initial PAG placement on November 2. A detailed discussion of the RSEM L5 monitoring system in Garbage Creek is provided in Section 3.2.

3.3.2.1 Hardness, Conductivity, Total Suspended Solids, and pH

Hardness and conductivity followed similar trends at LBGC-1. Hardness in this station was generally very hard, although some samples collected from November 5 to 11 of 2016 showed slightly lower hardness values (Appendix 3-A.2). Values ranged from 736 mg/L $CaCO_3$ (November 6, 2016) to 2,070 mg/L (November 16, 2016) and from 1,550 µS/cm (November 7-8, 2016) to 3,600 µS/cm (November 17, 2016) for hardness and conductivity, respectively.

The TSS levels ranged from 42.7 mg/L (November 3, 2016) to 638 mg/L (November 10, 2016) with concentrations exceeding established discharge limits for most of the collected samples (Figure 3-8). The pH in this station ranged from 7.43 (November 16, 2016) to 7.85 (November 11, 2016) and was similar among collection dates (Figure 3-9).

3.3.2.2 Sulphate and Nitrogen Forms

Sulphate concentrations ranged from 640 mg/L (November 8, 2016) to 2,330 mg/L (November 28, 2016; Appendix 3-A.2). Low concentrations of ammonia, nitrite and nitrate were recorded. Ammonia concentrations ranged from 0.14 mg/L (November 13, 2016) to 0.57 mg/L (October 13, 2016). Nitrite and nitrate concentrations ranged from < 0.005 mg/L (November 3-4, 2016) to 0.012 mg/L (November 13, 2016) and from < 0.02 mg/L (November 16-17, 2016) to 0.21 mg/L (November 8-9, 2016), respectively (Appendix 3-A.2).

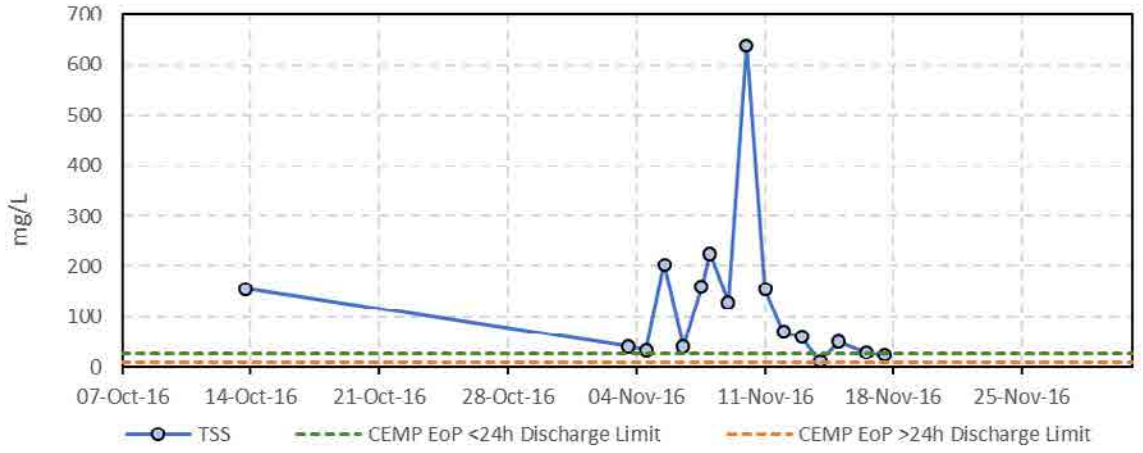


Figure 3-8: Time series profile for total suspended solids in LBGC-1 compared to CEMP Discharge Limits.

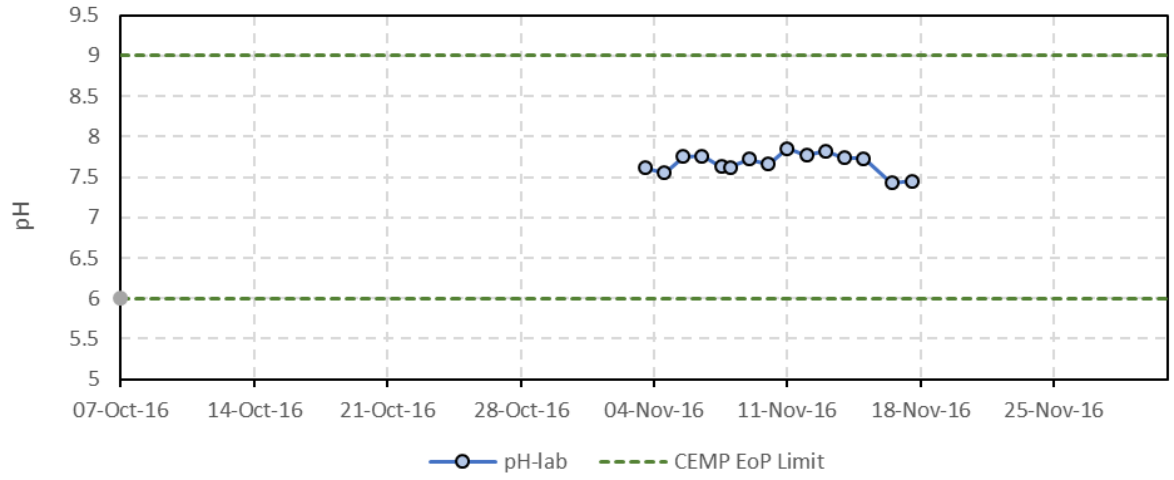


Figure 3-9: Time series profiles for pH in LBGC-1 compared to CEMP Discharge Limits.

3.3.2.3 Metals

Arsenic exceedances were generally associated with elevated TSS levels and are therefore related to the presence of particulates. Concentrations ranged from 0.00034 mg/L (November 11, 2016) to 0.009 mg/L (November 10, 2016; Appendix 3-A.2).

Elevated total iron concentrations ranged from 0.98 mg/L (November 15, 2016) to 32.9 mg/L (October 13, 2016), however dissolved forms of this element were significantly lower from 0.013 mg/L to 30.6 mg/L (Figure 3-10). As previously discussed (Section 3.3.1.3) this iron attenuation occurrence may relate to the precipitation of iron (oxy)hydroxides, which is evidenced by the low concentrations of dissolved iron relative to total iron.

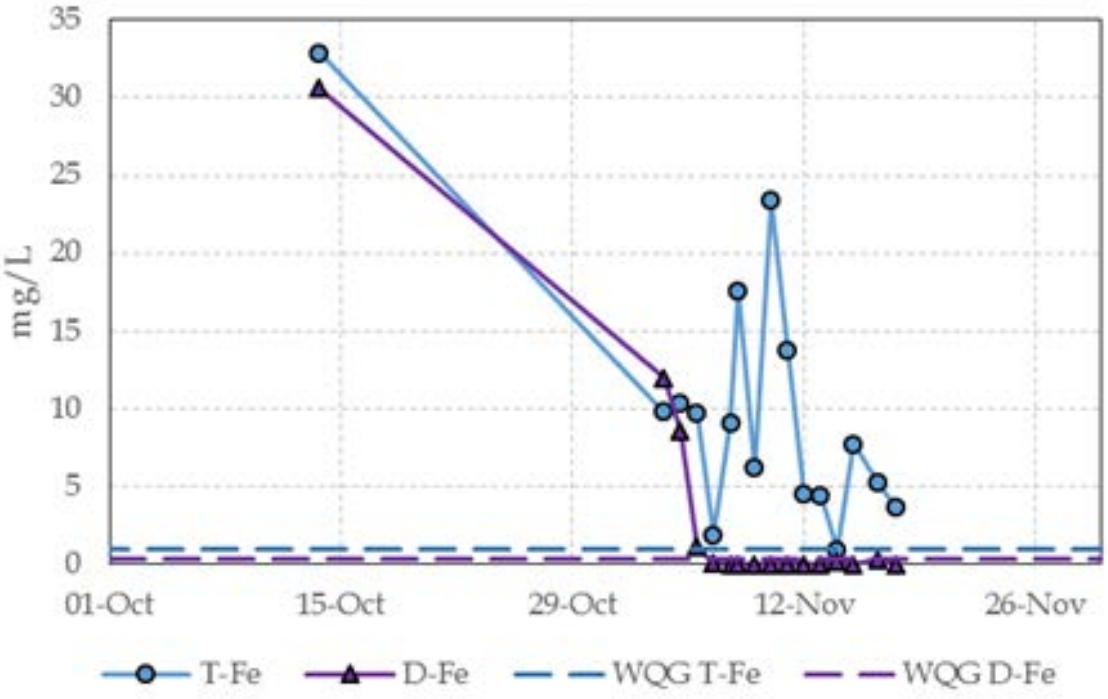


Figure 3-10: Total (T) and dissolved(D) iron (Fe) concentrations for LBGC-1 compared to applicable water quality guidelines (WQGs).

Manganese concentrations ranged from 1.88 mg/L (November 7, 2016) to 8.17 mg/L (November 16, 2016) (Appendix 3-A.2). Some complexation with manganese may occur in aquatic systems, for example iron/maganese-oxides generally form within oxygenated surface waters and can be removed from solution via sorption pathways. This process may occur in Garbage Creek waters, however no differences were observed between total and dissolved manganese forms.

In relation to discharge limits as defined in Table 3-7, total cadmium and zinc were the only elements that consistently exceeded applicable discharge limits. Concentrations ranged from 0.0003 mg/L (November 6, 2016) to 0.002 mg/L (October 13, 2016) and from 0.029 mg/L (November 6, 2016) to 0.59 mg/L (October 13, 2016; Figure 3-11) for cadmium and zinc, respectively. A few exceedances to discharge limits were recorded for copper with concentrations ranging from 0.0015 mg/L (November 16, 2016) to 0.025 mg/L (November 10, 2016; Figure 3-11). However, these exceedances generally coincided with elevated TSS values and a significant decrease in dissolved copper concentrations. No exceedances were observed for cobalt in any of the collected samples.

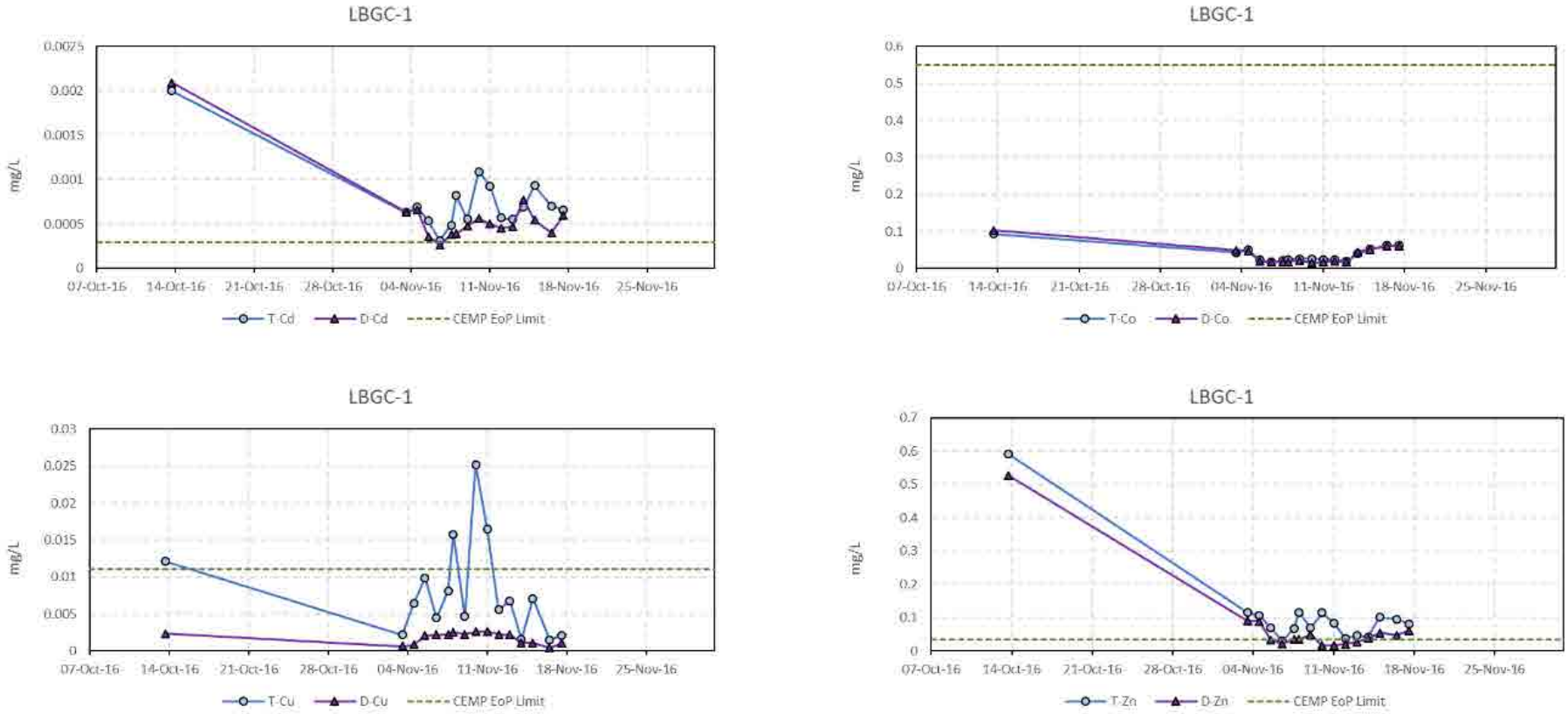


Figure 3-11: Concentrations of cadmium (Cd), cobalt (Co), copper (Cu) and zinc (Zn) for LGBC-1 compared to CEMP Discharge Limits.

3.3.2.4 Station LGBC-0.11

Water quality parameters for LGBC-0.11 are shown in Appendix 3-A.3. However, only two samples were collected from this station in 2016. RSEM Discharge Limits apply to this station. Water was characterized as very hard with values of 608 mg/L $CaCO_3$ and 2,120 mg/L $CaCO_3$. Conductivity values were 1,300 µS/cm and 4,060 µS/cm. One of the collected samples exceeded the TSS discharge limit with a value of 64.3 mg/L. The pH at this station was slightly basic (~ 8 pH units). Concentrations of ammonia, nitrite and nitrate remained low.

Elevated concentrations for total iron and manganese, were generally associated with elevated TSS (Appendix 3-A.3). Concentrations ranged from 1.08 mg/L to 26.3 mg/L and from 0.86 mg/L to 10.8 mg/L for iron and manganese, respectively. Dissolved iron increased up to 3.34 mg/L in one of the collected samples.

In relation to discharge limits, total cadmium (up to 0.0005 mg/L) and zinc (up to 0.19 mg/L) exceeded discharge limits on one occasion coinciding with the highest TSS value (Appendix 3-A.3). No exceedances were found for cobalt and copper in any of the collected samples.

3.3.3 RSEM L6

3.3.3.1 Station LBL6-WP

Water quality parameters for station LBL6-EP are shown in Appendix 3-A.4. RSEM Discharge Limits do not apply to this station as there was no PAG disturbance by PRHP. Four samples were collected from this station in 2016. Water was characterized as very hard with values ranging from 994 mg/L $CaCO_3$ to 1,440 mg/L $CaCO_3$. Conductivity values were 1,990 µS/cm and 2,210 µS/cm. TSS concentrations were measured as high as 43.8 mg/L on one occasion (November 2, 2016). The pH at this station was acidic with values ranging from 4.94 to 5.61. Aluminum concentrations were observed to range from 1.27 mg/L (November 17, 2016) to 6.43 mg/L (October 14, 2016). A decresing trend in concentrations over time was noticeable for aluminum. Relatively high concentrations of total cadmium (up to 0.016 mg/L), copper (approximately 0.014 mg/L) and zinc (up to 0.61 mg/L) were measured at this site.

3.3.3.2 Station LBL6-EP

Water quality parameters for station LBL6-WP are shown in Appendix 3-A.5. Four samples were collected from this station in 2016. Water was characterized as hard with values ranging from 102 mg/L $CaCO_3$ to 140 mg/L $CaCO_3$. Conductivity was measured in

two samples with values of 209 µS/cm and 279 µS/cm. Elevated TSS concentrations were measured on one occasion (up to 87.3 mg/L; November 16, 2016). The pH at this station was circun-neutral (~ 7.85). With the exception of two increased concentrations for total iron (up to 1.03 mg/L; November 10, 2016), all measured parameters met short-term WQGs.

3.3.4 Left Bank Excavation - Station LBEX-SP-OUT

Water quality parameters for LBL3C-1.57 are shown in Appendix 3-A.6. Up to four samples were collected from this station in 2016. Water was characterized as very hard with values ranging from 231 mg/L $CaCO_3$ to 303 mg/L $CaCO_3$. Conductivity values were 573 µS/cm and 678 µS/cm. TSS concentrations ranged up to 7.8 mg/L. The pH at this station was slightly basic (~ 8 pH units). With the exception of one elevated total iron concentration (2.13 mg/L; October 16, 2016), no other exceedances to short-term WQGs were found for the remaining parameters.

3.3.5 RSEM L3 - Station LBL3C-1.57

Water quality parameters for LBL3C-1.57 are shown in Appendix 3-A.7. Three samples were collected from this station in 2016. RSEM Discharge Limits do not apply to this station as RSEM is a non-PAG facility. Water was characterized as very hard with values ranging from 346 mg/L $CaCO_3$ to 463 mg/L $CaCO_3$. Conductivity values were 566 µS/cm and 941 µS/cm. All collected samples exceeded the TSS discharge limit with a maxima of 7,761 mg/L. The pH at this station was slightly basic (~ 8 pH units). Concentrations of ammonia, nitrite and/or nitrate remained low.

Elevated aluminum concentrations are generally related to elevated TSS values, concentrations ranged from 0.08 mg/L to 0.66 mg/L. Arsenic increased up to 0.005 mg/L; November 10, 2016 which coincided with maxima TSS. Total iron was occurred consistenly >2 mg/L in all collected samples. However this was not evidenced for the dissolved iron which had a maximum of 0.52 mg/L (November 10, 2016), which coincided with the highest TSS value.

Maximum cadmium (up to 0.0007 mg/L) and zinc (up to 0.35 mg/L) were observed (Appendix 3-A.7). A copper concentration of 0.022 mg/L; (November 10, 2016) occurred on one ocassion coindicing with maxima TSS.

3.4 2016 Data QAQC Summary

Data collected in 2016 as part of the site-wide surface water quality monitoring program were reviewed for quality assurance/quality control, and to identify potential improvements to the monitoring program for 2017 and onwards.

The 2016 QAQC program for water quality includes the following components:

- Field data input quality measures;
- Standard analytical laboratory QA/QC practices;
- Collection of blank samples;
- Collection of sample replicates;
- Comparison of sample total and dissolved metals.

Each component is summarized in the sections below:

3.4.1 Field Data Input QA/QC

The Ceres software is a multi-user desktop database management system (DBMS) designed for storing field water quality and rock sample monitoring data. EM monitors transfer information from field sheets into the Ceres database by manually entering water quality values using a popup form consisting of several input controls such as drop down lists and text boxes. Data input quality measures are implemented as soon as the EM monitor attempts to save the entered information. Each input field, if entered, is inspected and assessed for violations against specific range criteria for each water quality parameter. The user is not required to enter any specific water quality parameters if information is unavailable and the range criteria do not pertain to guideline exceedance limits, but rather, are intended to check for user inputs that fall outside the reasonable range of values for any given parameter. Error checking is also applied to missing descriptive text fields that are considered significant pieces of information or required for connecting related information. Table 3-7 provides a list of range checking or missing information criteria applied to water quality data entered during the input of new field sample records or edits to an existing record:

Table 3-7:
Ceres Water Quality Data Input QA/QC

Field	QA/QC Criterion
EM Monitor Name	Must enter a valid text string
Sample Date/time	Date must be on or before current time
pH	If value entered, then 1 <= pH <= 14 (s.u.)
Temperature	If value entered, then 0 < T <= 40 (°C)
Conductivity	If value entered, then 0 < Cond (mS/cm)
Turbidity	If value entered, then 0 < Turb < 10000 (NTU, AU)
Lab Sample Duplicate ID	If sample is Duplicate, then ID must be entered

3.4.2 Analytical Laboratory QA/QC practices

In general, the data collected for water quality samples in the Project area show reasonable overall quality and reliability. Quality control conducted by the analytical laboratory (Maxxam Analytics) included the preparation and analysis of blanks, sample duplicates and reference samples. Laboratory quality control data are included in the final test reports issued by the analytical laboratory, and indicate good precision, accuracy and contamination control in the laboratory test procedures.

3.4.3 Blanks

Blanks are samples that do not contain measurable levels of parameters of interest for the Project area, and are used to assess and control sample contamination (Clark 2013).

Overall, two field blanks were collected for the 2016 program (Table 3-8). Field blanks are used to detect potential contamination resulting from the sample collection method, handling, filtration, preservation, and exposure to the environment. They are typically collected by having the sampler pour DI water into clean sample bottles in the same environment in which actual samples are collected (but they do not come in contact with sample water), and are processed in the same manner (*i.e.*, they are exposed to the same potential sources of contamination as the sample).

Table 3-8:
Summary of Blank Samples Collected in 2016

Sample No.		**QG1217**		**QH3440**	
Stn.Code		**FIELDBLANK**		**FIELDBLANK**	
Collect Date/Time		**2016-12-10**		**2016-12-19**	
General, Anions, Nutrients					
Alkalinity-T	mg/L	<0.50		<0.50	
T-Hard	mg/L	<0.50		<0.50	
Conductivity-lab	uS/cm	1.8		<1.0	
TDS	mg/L	<10		<10	
pH-lab	pH	5.25		5.26	
Br	mg/L	<0.010		<0.010	
Cl	mg/L	<0.50		<0.50	
F	mg/L	<0.010		0.014	
D-SO4	mg/L	<0.50		<0.50	
N-NH3	mg/L	<0.0050		<0.0050	
N-NO2	mg/L	<0.0050		<0.0050	
N-NO3	mg/L	<0.020		<0.020	
PO4	mg/L	<0.0050		<0.0050	
TSS	mg/L	<4.0		<4.0	
Turbidity-lab	NTU	<0.10		<0.10	
DOC	mg/L	<0.50		<0.50	
TOC	mg/L	<0.50		<0.50	
Metals and Metalloids		**Dissolved**	**Total**	**Dissolved**	**Total**
Ag	mg/L	<0.000020	<0.000020	<0.000020	<0.000020
Al	mg/L	<0.0030	<0.0030	<0.0030	<0.0030
As	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
B	mg/L	<0.05	<0.05	<0.05	<0.05
Ba	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Be	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Bi	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Ca	mg/L	<0.050	<0.050	<0.050	<0.050
Cd	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
Co	mg/L	<0.00050	<0.00050	<0.00050	<0.00050
Cr	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Cu	mg/L	<0.00020	<0.00050	<0.00020	<0.00050
Fe	mg/L	<0.0050	<0.01	<0.0050	<0.01
Hg	mg/L	<0.000010	<0.000010	<0.000010	<0.000010
K	mg/L	<0.050	<0.050	<0.050	<0.050
Li	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Mg	mg/L	<0.050	<0.050	<0.050	<0.050
Mn	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Mo	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Na	mg/L	<0.050	<0.050	<0.050	<0.050
Ni	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Pb	mg/L	<0.00020	<0.00020	<0.00020	<0.00020
Sb	mg/L	<0.00050	<0.00050	<0.00050	<0.00050
Se	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
Si	mg/L	<0.1	<0.1	<0.1	<0.1
Sn	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Sr	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Ti	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Tl	mg/L	<0.000050	<0.000050	<0.000050	<0.000050
U	mg/L	<0.00010	<0.00010	<0.00010	<0.00010
V	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Zn	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Zr	mg/L	<0.00050	<0.00050	<0.00050	<0.00050

Shaded cells indicate value above method detection limit.

Of the two field blanks collected during the 2016 program, only two parameters occurred at levels above their corresponding method detection limit (MDL) and of measurable values, almost all parameters were less than 5-times the MDL. The results for the 2016 blank samples infer a high level of confidence that contamination did not occur in the sample set.

3.4.4 Replicates

Replicate samples are independent samples collected as close as possible from the same location at the same time in order to characterize environmental variability and the precision of the entire sampling and analytical process (Clark 2013).

The BC Field Sampling Manual (Clark 2013) provides the following acceptability criteria for field duplicates:

> *It should be expected that the Relative Percent Difference (RPD) is somewhat greater than that for laboratory duplicates. If one of a set of duplicate values is at or greater than five times the Method Detection Limit, then RPD values >20% indicate a possible problem, and > 50% indicate a definite problem, most likely either contamination or lack of sample representativeness.*

Overall, four field duplicates were collected as part of the 2016 surface water quality sampling program. It is typically recommended that QA/QC samples (blanks and replicates) comprise a minimum of 10% of sample collected (Clark 2013). As such, the total number of field duplicates (four) and blank samples (two, discussed above) collected in 2016 complies with the recommended 10% QA/QC minimum sample number for the 53 samples described in this report.

Table 3-9 presents duplicates collected in 2016 alongside all parameters with RPD values greater than 20% for each sample. The RPD was calculated for all parameters in duplicate samples where the reported parameter value was greater than 5-times the MDL in at least one of the samples. In general, water quality results were highly similar between field duplicates.

Only one sample (LBL3C-3.32) had parameter RPDs greater than 50% (D-Al and D-Fe). As such, a higher degree of environmental or sampling variability may be associated with D-Al and D-Fe compared to other parameters. This is partly attributed to the speciation of D-Al and D-Fe, which commonly occur in natural waters as oxyhydroxide colloids that may behave like suspended particulates (and are thus subject to settling and aggregation) but pass through a 0.45 micron filter and therefore constitute part of the dissolved metal fraction. Overall variability between duplicates during the 2016 sample program is

considered small, inferring a high level of confidence in the water quality monitoring dataset.

Table 3-9:
Comparison of 2016 duplicate samples

Station Code	Collection Date	Lab ID (Sample)	Lab ID (Duplicate)	Parameter	Units	Concentration			% RPD
						MDL	Sample	Duplicate	
LBL6-EP	2016-10-14	PU5499	PU5500	RPDs for all parameters fall within data acceptability criteria					
LBL3C-3.32	2016-11-10	QA2161	QA2162	D-Al	mg/L	0.003	0.0372	0.592	**176.35**
				D-Fe	mg/L	0.005	0.202	0.449	**75.88**
				D-Mn	mg/L	0.001	0.0056	0.0069	20.8
				D-S	mg/L	3	24.2	30.1	21.73
				D-Si	mg/L	0.1	5.01	6.47	25.44
RSEMR5B-SP	2016-12-09	QF9095	QF9096	D-Cu	mg/L	0.0002	0.00189	0.00128	38.49
				T-Al	mg/L	0.003	0.364	0.492	29.91
				T-Pb	mg/L	0.0002	0.00063	0.00048	27.03
RSEMR5B-SP	2016-12-19	QH3438	QH3439	RPDs for all parameters fall within data acceptability criteria					

MDL = Method detection limit
RPD = Relative percent difference
% RPD > 50% shown in bold font

3.4.5 Total versus Dissolved Metals

A dissolved metal concentration that is higher than the corresponding total metal concentration in water quality sample, where one of the set of measurements is at or greater than five times the MDL, may indicate potential contamination or analytical error.

Total and dissolved metals data for samples collected at the RSEM R5b station (ID: RSEMR5B-SP) in 2016 were compared to identify potential issues described above that may apply to the Project sampling program. This station was selected as it represents one of the largest datasets within the Project area sampling program.

A dissolved metal value was flagged as a potential issue if it was >20% higher than its corresponding total metal value in the same sample. Dissolved and total metal pairs were only included in this analysis if at least one of the values was greater than 5-times its MDL.

Seven out of the 53 samples presented in this report were identified as having at least one dissolved metal parameter higher than its total value (Table 3-10). Most samples presented only one parameter for which dissolved was greater than total, although samples collected November 29 and December 15 showed a higher number of parameters (11 and seven, respectively). Reported results for these and other samples collected on the same day may be subject to higher uncertainty compared to other samples; however, the low relative

number of incidents in which dissolved metals are higher than totals within the 2016 dataset overall suggests these events are unusual and do not measurably reduce the quality of the dataset.

Table 3-10:
Comparison 2016 Samples with Dissolved Metals Greater than Total (station RSEMR5B-SP)

Collection Date	Lab ID	Parameter	Units	Concentration[1]			% Dissolved > Total
				MDL	Total	Dissolved	
2016-11-29	QE0286	Ba	mg/L	0.001	0.245	0.366	149%
		Ca	mg/L	0.05	59	75	127%
		K	mg/L	0.05	3.11	4.42	142%
		Li	mg/L	0.005	0.16	0.287	179%
		Mg	mg/L	0.05	18.5	26.8	145%
		Mo	mg/L	0.001	0.0057	0.0098	172%
		Na	mg/L	0.05	184	326	177%
		S	mg/L	3	17.4	22.6	130%
		Se	mg/L	0.0001	0.002	0.00307	154%
		Sr	mg/L	0.001	0.254	0.374	147%
		U	mg/L	0.0001	0.00394	0.00648	164%
2016-12-15	QG6876	K	mg/L	0.05	6.1	7.4	121%
		Mg	mg/L	0.05	30	36.7	122%
		Mn	mg/L	0.001	0.0764	0.0932	122%
		Mo	mg/L	0.001	0.0134	0.0169	126%
		S	mg/L	3	40.3	54.6	135%
		Sr	mg/L	0.001	0.435	0.545	125%
		U	mg/L	0.0001	0.00749	0.00959	128%
2016-12-22	QH9551	Ni	mg/L	0.001	0.0071	0.009	127%
2016-12-23	QI3520	Li	mg/L	0.005	0.198	0.241	122%
2016-12-24	QI3521	Cd	mg/L	0.00001	0.00001	0.000114	1140%
2016-12-28	QI4827	Ni	mg/L	0.001	0.0041	0.0066	161%
2016-12-30	QI7788	Mo	mg/L	0.001	0.0085	0.0106	125%

1. Values shown for parameters for which at least one of the total or dissolved metal is greater than 5-times the MDL.

3.4.6 Sample Hold Time

Sample hold time is the length of time between collection of a water sample and its analysis by at the laboratory. In general, transport of samples from the Project site to the Maxxam depot in Fort St John typically occurs on the same day as sample collection. The Maxxam analytical laboratory receives the samples on the same night or following day.

Based on guidance from the analytical laboratory, parameters with the shortest hold-times (three days or less) include ammonia (if unpreserved), nitrate/nitrite, pH, and turbidity, meaning results for these parameters may be associated with higher uncertainty but the exceedances likely had relatively minor effect on the accuracy of the data (Table 3-11). All other parameters have hold-times of seven days or greater.

Table 3-11:
Recommended water quality sample hold times (Source: Maxxam Analytics)

Analytical Parameter	Hold Time
Alkalinity	14 Days
Ammonia	28 Days
Ammonia, Un-Preserved	3 Days
Bromide	28 Days
Chloride	28 Days
Chromium VI - Dissolved	30 Days
Chromium VI - Total	30 Days
Conductivity	28 Days
Dissolved Organic Carbon (DOC)	28 Days
Fluoride	28 Days
Metals – Dissolved	180 Days
Metals – Total	180 Days
Nitrate/Nitrite	3 Days
pH	15 Minutes
Phosphorus – Total	28 Days
Solids - TDS	7 Days
Solids – TSS	7 Days
Sulphate	28 Days
Total Organic Carbon (TOC)	28 Days
Total Nitrogen (TN)	28 Days
Turbidity	3 Days

3.4.7 2017 Data QAQC Plan

The 2017 water quality monitoring program will continue to incorporate the collection of QA/QC samples, including blanks and sample replicates.

As part of the 2017 monitoring program, water quality monitoring data entered into EQWIN will be screened against several QA/QC rules as data are imported. These rules have been built into the EQWIN program to provide an initial screen of data integrity and correct analytical laboratory reporting. The QA/QC rules include, but are not limited to:

- Screen all parameters against their corresponding discharge limit or water quality guideline, and flag any exceedances;
- Flag samples with dissolved metals higher than totals;
- Flag samples for which total nitrogen is lower than the sum of nitrate, nitrite, and ammonia;
- Flag samples with calculated charge balance greater than a pre-determined acceptability criterion;
- Flag samples for which TDS is lower than any major ion, or the sum thereof;
- For blank samples, flag any parameter (except pH or TDS) greater than its MDL.

4. Groundwater Monitoring

This summary of 2016 groundwater monitoring at Relocated Surplus Excavated Materials (RSEM) Areas R5a and R5b has been prepared by Lorax Environmental Services Ltd. (Lorax) in its role as Qualified Professional for Acid Rock Drainage and Metal Leaching (QP ARD) for the Main Civil Works for the Site C Clean Energy Project. The objectives, rationale and methodology for the groundwater monitoring program are outlined in the *Site C Clean Energy Project, Implementation Design, Technical Memorandum, Peace River and RSEM Discharge Groundwater Monitoring Program* (KCB and SNC-Lavalin, 2016). The Groundwater Monitoring Program as outlined in KCB and SNC-Lavalin (2016) is part of the Site C Clean Energy Project Water Quality Management Program for the construction of the RSEM storage areas, and is required under Conditional Water Licenses 132990 and 132991 issued to BC Hydro & Power Authority (BC Hydro) in June 2016 (KCB and SNC-Lavalin, 2016).

4.1 Groundwater Monitoring Program Description

RSEM Area R5a is located adjacent to the right (south) bank of the Peace River, immediately upstream of its confluence with the Moberly River. RSEM Area R5b is located adjacent to the right bank of the Peace River, immediately downstream of its confluence with the Moberly River. Both RSEM Areas R5a and R5b are located upstream of the future Site C dam.

The purpose of the 2016 groundwater monitoring was to establish baseline conditions and characterize groundwater quality up gradient and down gradient of both RSEM areas. The baseline results are intended to provide a reference against which future monitoring will be compared, thereby facilitating the assessment and identification of potential effects to groundwater and the Peace River associated with potentially acid generating (PAG) material stored in the RSEM areas.

Baseline groundwater monitoring at RSEM Areas R5a and R5b is described in detail in the reports *Baseline Groundwater Monitoring at RSEM Area R5a* (Lorax, 2017a) and *Baseline Groundwater Monitoring at RSEM Area R5b* (Lorax, 2017b). A summary of the 2016 groundwater monitoring program and monitoring results is provided in the following sections.

4.1.1 Groundwater Monitoring at RSEM Area R5a

Groundwater monitoring in 2016 comprised three sampling events at each of the four monitoring wells installed up gradient and down gradient of RSEM Area R5a. Monitoring well locations are shown in Figure 4-1. The up gradient well, GW-4 was dry after installation and a replacement well GW-4A was constructed approximately 75 m upstream and north of RSEM Area R5a.

Monitoring wells were sampled following procedures outlined in KCB and SNC-Lavalin, (2016). All wells were sampled for groundwater quality three times. The baseline groundwater monitoring program comprised the following three sampling rounds:

- Round 1 - November 27 to 29, 2016;
- Round 2 - December 7 to 9, 2016; and
- Round 3 - December 15 to 16, 2016.

Field parameters were monitored with a multi-parameter probe (YSI Professional Plus) coupled to an in-line flow-through cell during groundwater purging. Table 4-1 presents a summary of the 2016 sampling program, including sampling methods used at each well.

Table 4-1:
Summary of 2016 Groundwater Sampling Program at RSEM Area R5a

Well No.	Nov. 27 - 29, 2016	Dec. 7 - 9, 2016	Dec. 15 - 16, 2016	Sample Count
GW-1	PP	PP	PP	3
GW-2	SP	PP	PP	3
GW-3	PP	PP	PP	3
GW-4	dry	dry	dry	0
GW-4A	PP	PP	PP	3

Notes:
SP = submersible pump; PP = peristaltic pump

Samples were shipped to Maxxam Analytics laboratory in Burnaby, B.C. and analysed for physical parameters, anions, nutrients, and total and dissolved metals. Groundwater quality parameters and the corresponding detection limits for the data collected in 2016 are presented in Table 4-2.

Table 4-2:
Groundwater Quality Parameters and Detection Limits

Parameter	Symbol	Detection Limit	Units
Physical Parameters			
pH (lab)	pH	0.1	pH
Conductivity (lab)	EC	1	µS/cm
Total Dissolved Solids	TDS	10	mg/L
Total Suspended Solids	TSS	1	mg/L
Total Hardness ($CaCO_3$)	T-H	0.5	mg/L
Disolved Hardness ($CaCO_3$)	D-H	0.5	mg/L
Inorganics			
Alkalinity (Total as $CaCO_3$)	-	0.5	mg/L
Alkalinity (PP as $CaCO_3$)	-	0.5	mg/L
Bicarbonate (HCO_3)	HCO_3	0.5	mg/L
Carbonate (CO_3)	CO_3	0.5	mg/L
Hydroxide (OH)	OH	0.5	mg/L
Dissolved Chloride (Cl)	Cl	0.5	mg/L
Fluoride (F)	F	0.01	mg/L
Bromide (Br)	Br	0.01-0.1	mg/L
Anions and Nutrients			
Dissolved Sulphate (SO_4)	SO_4	0.5-5	mg/L
Total Sulphide	S	0.005	mg/L
Total Sulphide (as H_2S)	H_2S	0.005	mg/L
Total Ammonia (N)	NH_3	0.005	mg/L
Nitrite (N)	NO_2	0.005	mg/L
Nitrate (N)	NO_3	0.02	mg/L
Nitrate plus Nitrite (N)	$NO_3 + NO_2$	0.02	mg/L
Orthophosphate (P)	-	0.005	mg/L
Organic / Inorganic Carbon			
Total Organic Carbon	TOC	0.5	mg/L
Dissolved Organic Carbon	DOC	0.5	mg/L
Total and Dissolved Metals			
Silver	Ag	0.00002	mg/L
Aluminum	Al	0.003	mg/L
Arsenic	As	0.0001	mg/L
Boron	B	0.05	mg/L
Barium	Ba	0.001	mg/L
Beryllium	Be	0.0001	mg/L
Bismuth	Bi	0.001	mg/L
Calcium	Ca	0.05	mg/L

Parameter	Symbol	Detection Limit	Units
Cadmium	Cd	0.00001	mg/L
Cobalt	Co	0.0005	mg/L
Chromium	Cr	0.001	mg/L
Copper	Cu	0.0005 [1] / 0.0002 [2]	mg/L
Iron	Fe	0.01 [1] / 0.005 [2]	mg/L
Mercury	Hg	0.00001	mg/L
Potassium	K	0.05	mg/L
Lithium	Li	0.005	mg/L
Magnesium	Mg	0.05	mg/L
Manganese	Mn	0.001	mg/L
Molybdenum	Mo	0.001	mg/L
Sodium	Na	0.05	mg/L
Nickel	Ni	0.001	mg/L
Phosphorus	P	0.005 [1] / 0.002 [2]	mg/L
Lead	Pb	0.0002	mg/L
Sulfur	S	3	mg/L
Antimony	Sb	0.0005	mg/L
Selenium	Se	0.0001	mg/L
Silicon	Si	0.1	mg/L
Tin	Sn	0.005	mg/L
Strontium	Sr	0.001	mg/L
Titanium	Ti	0.005	mg/L
Thallium	Tl	0.00005	mg/L
Uranium	U	0.0001	mg/L
Vanadium	V	0.005	mg/L
Zinc	Zn	0.005	mg/L
Zirconium	Zr	0.0005	mg/L

Notes:
1. Detection Limit for Total Metal
2. Detection Limit for Dissolved Metal

627,000 627,500 628,000 628,500

6,232,000 6,231,500 6,231,000 6,230,500 6,230,000 6,229,500

N

GW-4A

GW-1

GW-2

GW-4 (Dry)

GW-3

RSEM Area R5a

RSEM Area R5b

PEACE RIVER

Moberley River

425 450 475 500 525 550 575 600 625

LEGEND

- GW Monitoring Well (2016)
- RSEM Dyke Crest
- RSEM Dyke Toe
- RSEM Boundary
- Site C Construction Area Boundary
- 25m Elevation Contour
- 5m Elevation Contour

DATE SAVED:	Mar 23, 2017
DRAWN BY:	AL
REVIEWED:	NM
VERSION:	1

Coordinate System: *NAD 1983 UTM Zone 10N*
Projection: *Transverse Mercator*
Datum: *North American 1983*
Units: *Meter*

1:8,000

0 100 200 300 Meters

CLIENT:

PEACE RIVER HYDRO PARTNERS

LORAX ENVIRONMENTAL

PROJECT:

Site C Clean Energy Project – 2016 Annual Report

TITLE:

Site Map of RSEM Area R5a and Monitoring Well Locations

PROJECT #: A416-6

FIGURE: 4-1

P:\@Drafting\SiteC\Drafting Figures\MXD\2016 Annual Report\Fig 4-1_RSEM R5a Monitoring Wells_20170323.mxd

4.1.2 Groundwater Monitoring at RSEM Area R5b

Groundwater monitoring in 2016 comprised three sampling events at each of the monitoring wells installed up gradient and down gradient of RSEM Area R5b. Monitoring well locations are shown in Figure 4-2. The down gradient well, GW-10 was damaged as a result of slope failure. The first attempt to install a replacement well resulted in a dry borehole at GW-10a. Replacement monitoring well GW-10b is located further upslope on the upper terrace.

Monitoring wells were sampled following procedures outlined in KCB and SNC-Lavalin, (2016). All new monitoring wells were sampled for groundwater quality three times, except GW-10 where no groundwater samples were collected. GW-10 was purged dry on October 4 and 11, 2016 as a result of small water columns and low well yields. GW-10 was subsequently damaged and could not be sampled on October 25, 2016 due to an obstruction at 4.75 metres below top of casing. The 2016 groundwater monitoring program comprised the following three sampling rounds:

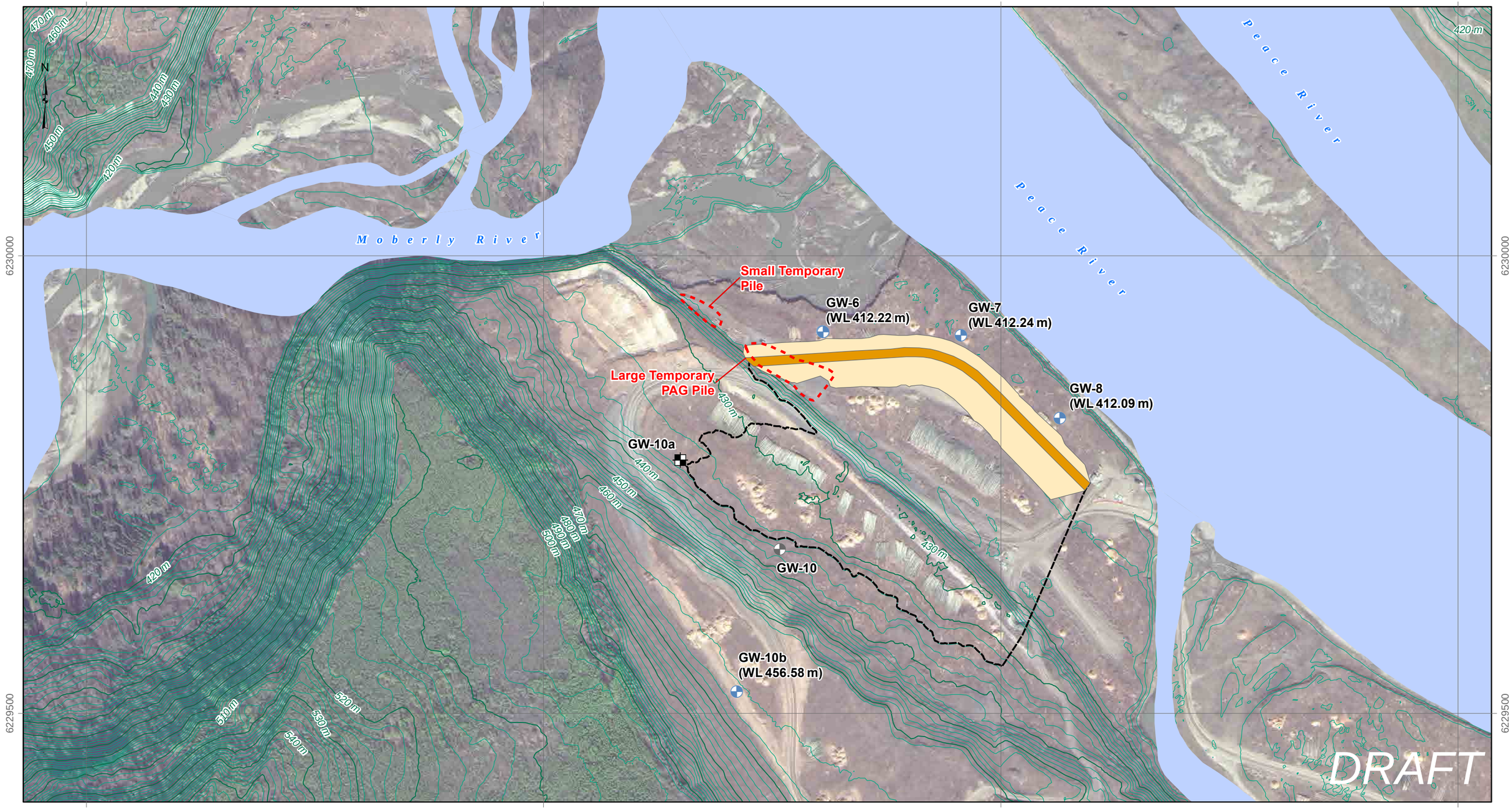
- Round 1 was conducted on October 2 and 3 at GW-6 to GW-8, and November 26, 2016 at GW-10b;
- Round 2 was completed on October 11 and 12 at GW-6 to GW-8, and December 8, 2016 at GW-10b; and
- Round 3 was carried out on October 24 and 25 at GW-6 to GW-8, and December 15, 2016 at GW-10b.

Field parameters were continuously monitored with a multi-parameter probe coupled to an in-line flow-through cell during groundwater purging at GW-10b. Table 4-3 presents a summary of the 2016 sampling program, including sampling methods used at each well.

Table 4-3:
Summary of 2016 Groundwater Sampling Program at RSEM Area R5b

Well No.	Oct. 2-3, 2016	Oct. 11-12, 2016	Oct. 24-25, 2016	Nov. 26, 2016	Dec. 8, 2016	Dec. 15, 2016	Sample Count
GW-6	IP	IP	IP	-	-	-	3
GW-7	IP	IP	IP	-	-	-	3
GW-8	IP	IP	IP	-	-	-	3
GW-10	Insufficient water *	Insufficient water *	Damaged (due to slope failure)				0
GW-10b	-	-	-	SP	SP	SP	3

Notes:
IP = inertial pump; SP = submersible pump
* GW-10 was purged dry due to a small water column (< 1m) and low well yields.



LEGEND

- Monitoring Well (2016)
- Monitoring Well (2016, Damaged)
- Borehole (2016)
- RSEM R5B Dyke Crest
- RSEM R5B Dyke
- R5B Fill (Approximate)
- Temporary Stockpile
- Watercourse
- Waterbody
- 10m Elevation Contour
- 2m Elevation Contour

DATE SAVED:	Mar 23, 2017
DRAWN BY:	GM
REVIEWED:	JH
VERSION:	1

Coordinate System: *NAD 1983 UTM Zone 10N*
Projection: *Transverse Mercator*
Datum: *North American 1983*
Units: *Meter*

1:4,000

0 100 200

Meters

CLIENT: PEACE RIVER HYDRO PARTNERS

LORAX ENVIRONMENTAL

PROJECT: **Site C Clean Energy Project – 2016 Annual Report**

TITLE: Site Map of RSEM Area R5b and Monitoring Well Locations

PROJECT #: A416-6

FIGURE: 4-2

P:\@Drafting\SiteC\Drafting Figures\MXD\2016 Annual Report\Fig 4-2_RSEM R5b Monitoring Wells_20170323.mxd

Samples were shipped to Maxxam Analytics laboratory in Burnaby, B.C. and analysed for physical parameters, inorganic parameters, anions, nutrients, and total and dissolved metals. Groundwater quality parameters and the corresponding detection limits for the data collected in 2016 are presented in Table 4-2.

4.2 Groundwater Monitoring Results

Groundwater quality at RSEM Areas R5a and R5b is summarized in terms of selected field-measured physical parameters, major ion chemistry, and trace elements at each of the monitoring wells. Where analytical results were reported as non-detect, the reportable detection limit (RDL) values were used for graphing purposes. The 2016 groundwater quality data for RSEM Areas R5a and R5b is tabulated separately in Appendix 4-A.

4.2.1 Groundwater Quality at RSEM Area R5a

4.2.1.1 Field-Measured Parameters and Major Ion Chemistry

Field-measured physical parameters (pH, SPC), in addition to sulphate and total alkalinity concentrations are presented in Figure 4-3. The relationship of major ion charge equivalents in RSEM Area R5a groundwater is presented in a Piper plot in Figure 4-4. Major ion chemistry is described in terms of groundwater composition types or hydrochemical facies as outlined in Freeze and Cherry, 1979.

Groundwater in RSEM Area R5a is circumneutral, with field-pH between 6.6 and 7.3 (Figure 4-3). Groundwater shows variable influence from weathering of sulphide minerals and/or dissolution of sulphate minerals, likely from in situ PAG bedrock on the valley floor and valley walls across RSEM Area R5a. This is evidenced by low to substantial sulphate concentrations which range from 36 to 1240 mg/L and variable salinity with field-SPC ranging from 490 to 2600 µS/cm (Figure 4-3).

Groundwater at GW-1, GW-2 and GW-4A was predominantly calcium-sulphate-type ($Ca\text{-}SO_4$), except for the first samples collected at GW-1 and GW-4A (Figure 4-4). The groundwater at all three wells was fresher in Round 1 and had significantly less SO_4 influence than subsequent samples. Round 1 samples at GW-4A and GW-1 were classified as calcium-bicarbonate-type ($Ca\text{-}HCO_3$) groundwater and $Ca\text{-}SO_4$-type groundwater with significant HCO_3 influence, respectively. All GW-2 samples were $Ca\text{-}SO_4$-type, however Round 1 was also characterized by fresher groundwater with slightly less SO_4 influence than subsequent samples. Field-SPC was characterized by a similar trend, with fresher groundwater in Round 1 than subsequent samples. Field-SPC measurements increased significantly at all three wells from 1090 µS/cm to 2360 and 2370 µS/cm at GW-1, 2080 µS/cm to 2560 to 2600 µS/cm at GW-2, and 1330 µS/cm to 1770 to 1790 µS/cm at

GW-4A between Round 1 and Rounds 2 and 3, respectively. The field-pH at all three wells was circumneutral, decreasing slightly between Round 1 (pH 6.6 to 7.1) and Rounds 2 and 3 (pH 6.6 to 6.8).

The groundwater at GW-3 was Ca-HCO_3-type. The spread in the data points largely reflects increased SO_4 influence between monitoring Rounds 1 and 3. Groundwater field-pH was circumneutral, ranging between pH 7.2 and 7.3. Field-SPC at GW-3 was the lowest in RSEM Area R5a, and consistent with typical shallow groundwater. Field-SPC increased from 490 to 590 µS/cm during monitoring at GW-3 in 2016.

Groundwater SO_4 concentrations paralleled field-SPC measurements and were highest in the north half of RSEM Area R5a, decreasing towards the north from GW-2 (912 to 1240 mg/L) to GW-1 (302 to 1090 mg/L) and GW-4A (297 to 648 mg/L). SO_4 levels were significantly lower at the south end of the RSEM area adjacent to the Moberly River at GW-3 (36 to 83 mg/L). SO_4 levels increased between Round 1 and Rounds 2 and 3 at GW-1, GW-2 and GW-4A, while increasing throughout monitoring at GW-3 in 2016.

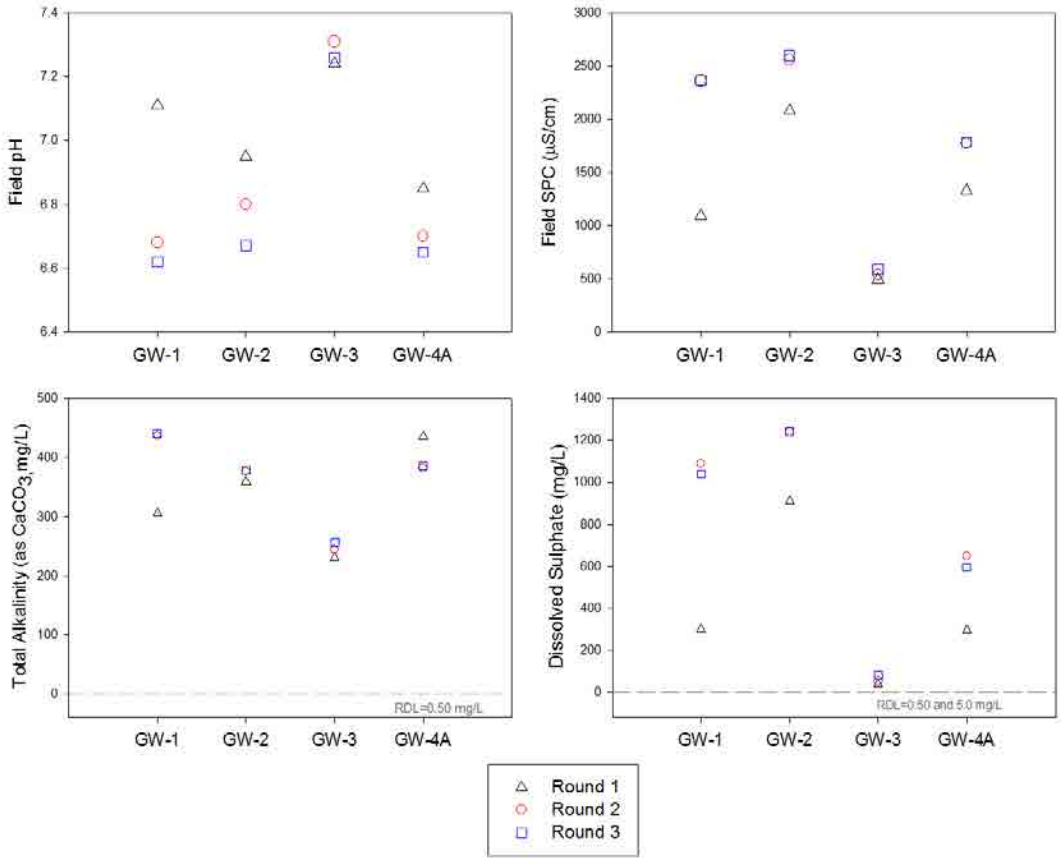


Figure 4-3: Field-Measured pH and SPC, and Total Alkalinity and Sulphate Concentrations in RSEM Area R5a Groundwater (2016)

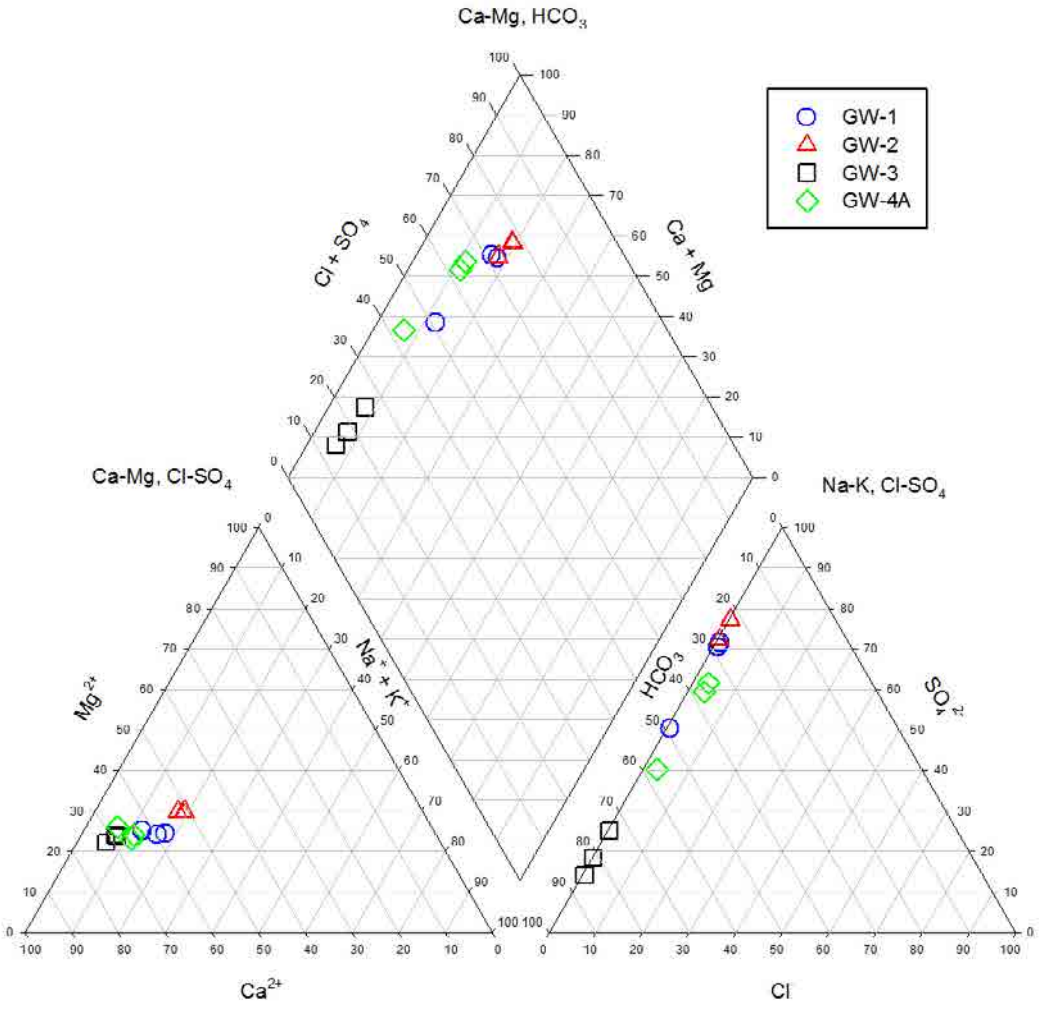


Figure 4-4: Piper Plot of RSEM Area R5a Groundwater Quality Data (2016).

4.2.1.2 Trace Elements

This section presents a review of trace element concentrations in groundwater across RSEM Area R5a. Selected parameters of concern (aluminum (Al), arsenic (As), cadmium (Cd), cobalt (Co), copper (Cu), lead (Pb), mercury (Hg), selenium (Se) and zinc (Zn)) are presented in Figure 4-5 and Figure 4-6. These parameters were selected from a group of parameters with end of pipe discharge limits for PAG containing RSEM ponds and British Columbia approved water quality guidelines for the protection of freshwater aquatic life (BC Hydro, 2016; BC MOE, 2017b).

Total suspended solids (TSS) concentrations ranged from below the RDL (1.0 mg/L) to 21 mg/L. TSS was highest at GW-4A (7 to 21 mg/L), with levels increasing slightly after

Round 1. The groundwater samples collected at GW-1 to GW-3 were characterized by low TSS levels, generally below 3 mg/L. The first sample collected at GW-2 (13.8 mg/L) had elevated TSS compared to subsequent samples (<1.0 mg/L).

Concentrations of dissolved Al were low, ranging from below the RDL (3.0 µg/L) to 20 µg/L. Dissolved Al was consistently detected in groundwater at GW-2 (4.3 to 8.0 µg/L) and GW-4A (4.0 to 20 µg/L). Dissolved Al levels were below the RDL in all samples collected at GW-1 and GW-3, except the last GW-1 (4.6 µg/L) sample.

Dissolved As concentrations in groundwater were low. Dissolved As levels were highest at GW-3 and GW-4A, ranging from 1.2 to 1.6 µg/L and 0.18 to 1.7 µg/L, respectively. Dissolved As increased at GW-4A from 0.18 µg/L in Round 1 to 1.5 and 1.7 µg/L in subsequent samples. In contrast, dissolved As levels at GW-1 and GW-2 were close to or below the RDL (0.10 µg/L).

Concentrations of dissolved Cd were very low at less than 0.2 µg/L. Dissolved Cd levels at GW-1, GW-2 and GW-4A ranged between 0.043 and 0.11 µg/L, 0.055 and 0.089 µg/L, and 0.063 and 0.15 µg/L, respectively. Dissolved Cd was not measured at GW-3 where levels were below the RDL (0.01 µg/L).

Dissolved Co concentrations were low, ranging from below the RDL (0.5 µg/L) to 1.6 µg/L. The highest levels were measured at GW-1 in Round 2 and 3 (1.4 and 1.6 µg/L); dissolved Co was non-detect in Round 1 (<0.5 µg/L). Dissolved Co was consistently measured at GW-3 (0.7 to 0.77 µg/L) and GW-4A (0.68 to 1.0 µg/L), but was only measured in the first sample at GW-2 (1.2 µg/L).

Dissolved Cu concentrations were low, ranging from below the RDL (0.2 µg/L) to 1.5 µg/L. The highest dissolved Cu concentration was measured at GW-4A (1.5 µg/L) in Round 1; subsequent samples were below the RDL.

Concentrations of dissolved Se were low, ranging from below the RDL (0.1 µg/L) to 0.5 µg/L. Dissolved Se was only measured above the RDL in Round 1 groundwater samples collected at GW-1, GW-3 and GW-4A.

Dissolved Pb, Hg and Zn levels were below the RDLs of 0.2, 0.01 and 5 µg/L in all three groundwater samples, respectively.

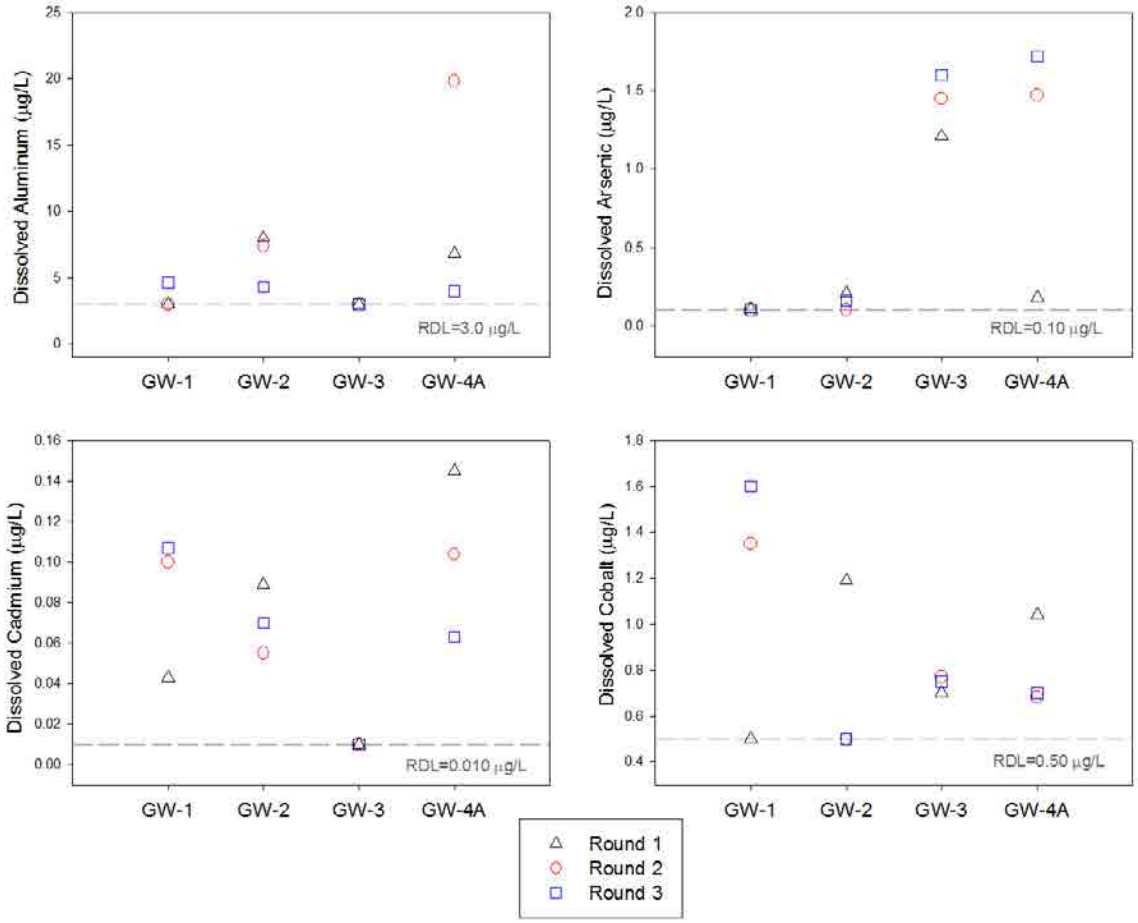


Figure 4-5: RSEM Area R5a Groundwater Quality Data for Dissolved Aluminum, Arsenic, Cadmium and Cobalt (2016).

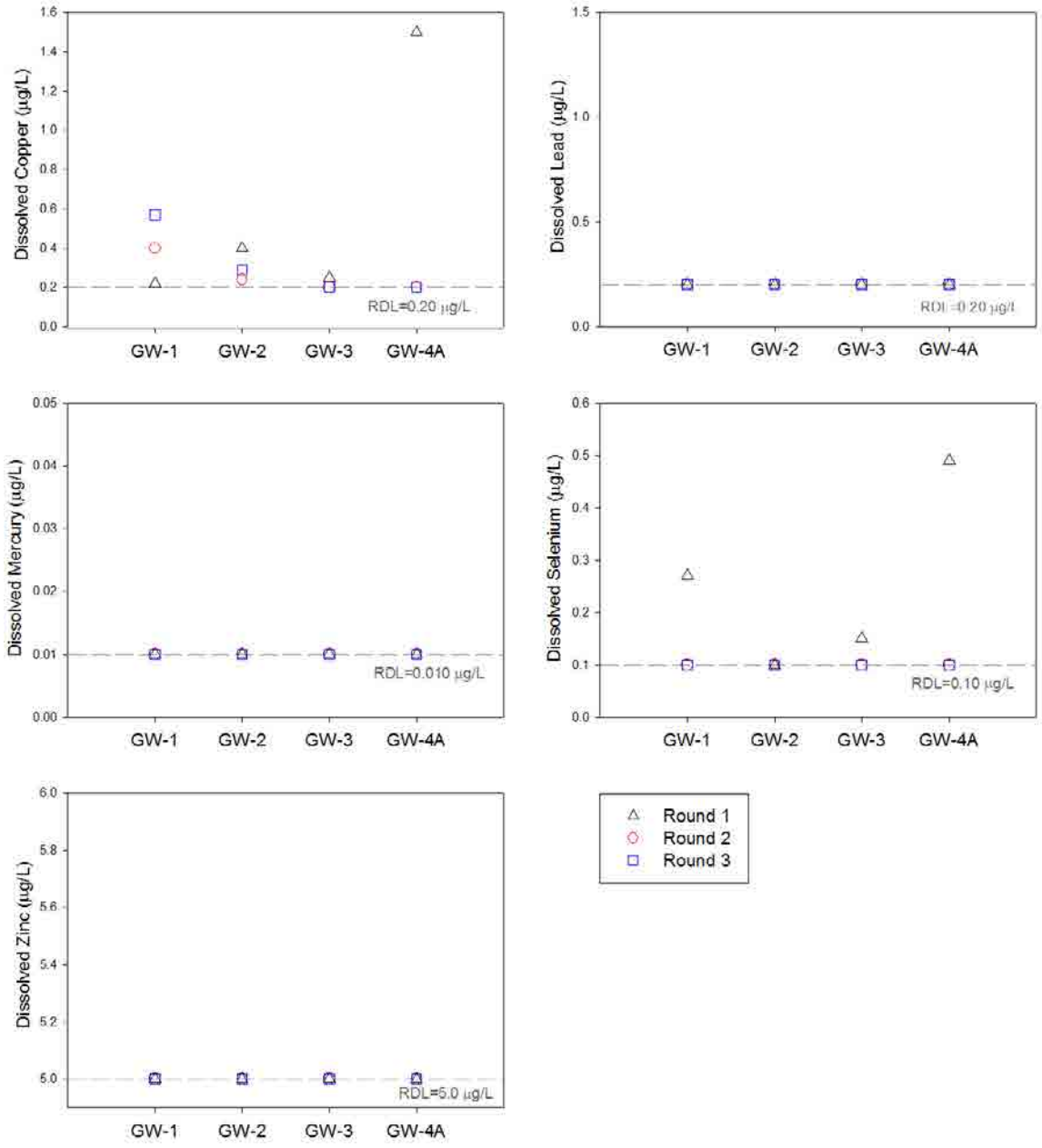


Figure 4-6: RSEM Area R5a Groundwater Quality Data for Dissolved Copper, Lead, Mercury, Selenium and Zinc (2016).

4.2.2 Groundwater Quality at RSEM Area R5b

4.2.2.1 Field-Measured Parameters and Major Ion Chemistry

Field-measured physical parameters (pH and SPC), in addition to sulphate and total alkalinity concentrations are presented in Figure 4-7. Total alkalinity was not analyzed in Rounds 1 and 2 at GW-6 to GW-8, therefore charge balance between major cations and major anions was used to calculate HCO_3 concentrations to facilitate graphing on a Piper plot. The relationship of major ion charge equivalents in RSEM Area R5b groundwater is presented in a Piper plot in Figure 4-8. Major ion chemistry is described in terms of groundwater composition types or hydrochemical facies as outlined in Freeze and Cherry, 1979.

Groundwater in RSEM Area R5b is predominantly circumneutral, with field-measured pH between 7 and 8 (Figure 4-7). One sample was characterized by slightly alkaline groundwater with pH 8.4 (GW-7 October 2, 2016). Groundwater wells show variable influence from weathering of sulphide minerals and/or dissolution of sulphate minerals, either from in situ PAG bedrock across RSEM Area R5b or legacy temporary PAG piles that were situated in the area prior to RSEM construction (the location of the temporary PAG piles are shown in Figure 4-2). This is evidenced by low to substantial sulphate concentrations which range from 24 to 690 mg/L and variable salinity with SPC ranging from 480 to 2090 µS/cm (Figure 4-7).

The groundwater at GW-7, GW-8 and GW-10b is Ca-HCO_3-type (Figure 4-8). Groundwater at GW-7 and GW-8 has similar proportions of dissolved Ca, magnesium (Mg) and sodium (Na), while GW-10b has slightly greater Ca influence. The spread in the data points largely reflects slightly greater SO_4 influence at GW-7 and GW-8 relative to GW-10b. The greater Ca and HCO_3 influence in groundwater at GW-10b, along with slightly lower field-SPC (480 to 490 µS/cm) relative to GW-7 (510 to 560 µS/cm) and GW-8 (620 to 730 µS/cm), suggests that groundwater on the upper terrace at GW-10b is fresher. Groundwater pH is circumneutral at GW-10b (pH 7.2 to 7.4), GW-8 (pH 7.7 to 7.9) and GW-7 (pH 7.7 to 8.4). A slight decrease in pH was observed at the three wells between Rounds 1 and 3.

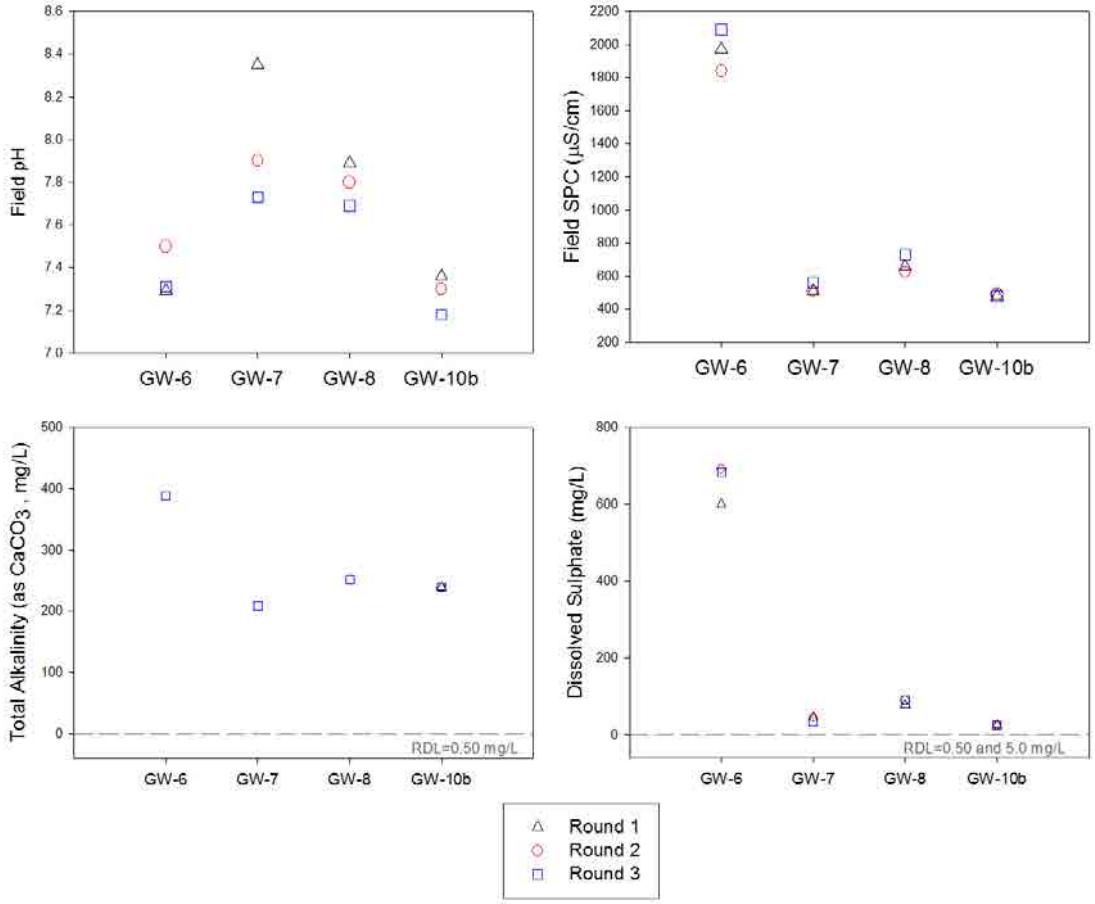


Figure 4-7: Field-Measured pH and SPC, and Total Alkalinity and Sulphate Concentrations in RSEM Area R5b Groundwater (2016)

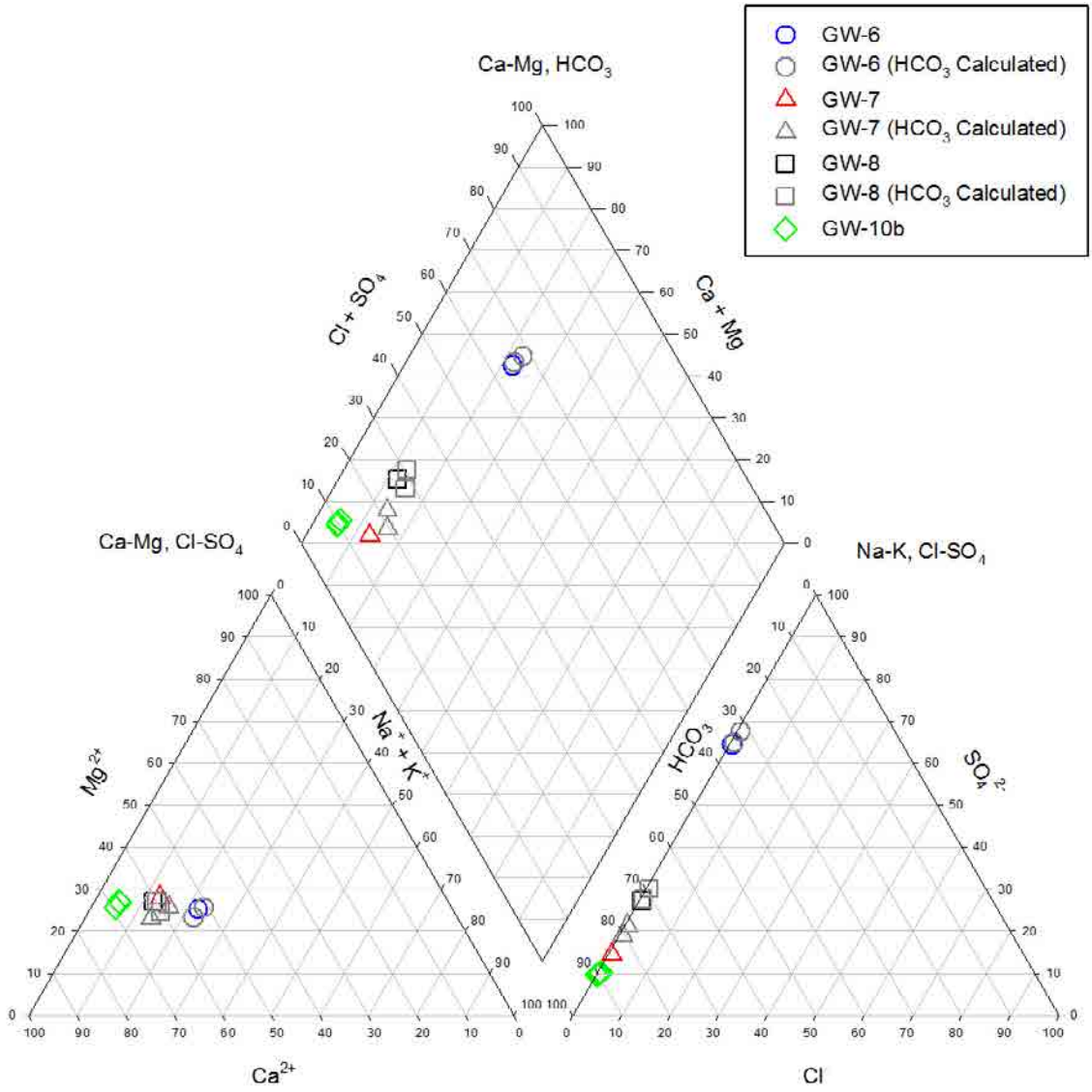


Figure 4-8: Piper Plot of RSEM Area R5b Groundwater Quality Data (2016).

The groundwater composition at GW-6 is Ca-SO_4-type. Groundwater at GW-6 has significantly greater SO_4 influence compared to the three other monitoring wells characterized by Ca-HCO_3-type groundwater. Field-pH at GW-6 was circumneutral (pH 7.3 to 7.5), while field-SPC was the highest measured in RSEM Area R5b with values between 1840 and 2090 µS/cm.

SO_4 concentrations were highest at GW-6 (600 to 690 mg/L), in contrast to SO_4 levels at GW-7 and GW-8 which were significantly lower, ranging between 34 and 91 mg/L. SO_4 levels were lowest on the upper terrace at GW-10b (24 to 26 mg/L).

4.2.2.2 Trace Elements

This section presents a review of trace element concentrations across RSEM Area R5b. Selected trace elements (dissolved Al, As, Cd, Co, Cu, Pb, Hg, Se and Zn) are presented in Figure 4-9 and Figure 4-10. These parameters were selected from a group of parameters with end of pipe discharge limits for PAG containing RSEM ponds and British Columbia approved water quality guidelines for the protection of freshwater aquatic life (BC Hydro, 2016; BC MOE, 2017b). The results can be summarized as follows:

Total suspended solids (TSS) concentrations ranged from 3.4 to 488 mg/L. TSS was highest at GW-6 (255 to 488 mg/L), with levels increasing after Round 1. The high TSS at GW-6 is consistent with the well screen partly intersecting silt to sandy silt. Groundwater samples collected at GW-7, GW-8 and GW-10b were characterized by low TSS levels, which were generally below 10 mg/L. The first two samples collected at GW-8 (24.8 mg/L in Round 1, 13.2 mg/L in Round 2) and the first sample collected at GW-10b (37.2 mg/L) had slightly elevated TSS in comparison with subsequent samples (< 8 mg/L).

Dissolved Al was measured in all groundwater samples, except at GW-10b where concentrations were less than or equal to the RDL (3.0 µg/L). Concentrations of dissolved Al ranged between 5.4 and 12.5 µg/L at GW-6 to GW-8, with the exception of the first sample collected at GW-6 (111 µg/L).

Concentrations of dissolved As were generally below 1 µg/L, except at GW-6 (0.97 and 1.3 µg/L) where the highest concentrations were measured. Dissolved As levels at GW-10b (0.6 to 0.83 µg/L) were comparable with those at GW-7 (0.67 to 1.0 µg/L) and slightly higher than levels at GW-8 (0.33 to 0.54 µg/L).

Dissolved Cd concentrations were very low and generally close to the RDLs of 0.005 and 0.01 µg/L. Dissolved Cd was detected in one sample at GW-6 (0.015 µg/L) and GW-7 (0.006 µg/L), and two samples at GW-8 (0.014 and 0.019 µg/L). The highest dissolved Cd concentrations were measured in groundwater at GW-10b (0.023 to 0.033 µg/L).

Concentrations of dissolved Co were close to or below the RDL of 0.5 µg/L. Dissolved Co levels were less than 1 µg/L in all groundwater samples, except the first sample collected at GW-6 (1.7 µg/L).

Concentrations of dissolved Cu were low in floodplain groundwater, with levels ranging from below RDL (0.2 µg/L) to 0.71 µg/L at GW-6 to GW-8. Dissolved Cu levels were highest at GW-10b (0.23 to 1.3 µg/L).

Dissolved Pb concentrations were low, ranging from below the RDLs (0.005 and 0.2 µg/L) to 0.52 µg/L. Dissolved Pb was lowest at GW-8 where Pb was not detected, and highest at GW-10b (0.21 to 0.52 µg/L).

Dissolved Hg levels were below the RDLs of 0.01 and 0.002 µg/L in all groundwater samples.

Concentrations of dissolved Se were low and generally below 1 µg/L. Dissolved Se levels at GW-6 to GW-8 were close to or below the RDL (0.1 µg/L). The highest Se levels were measured at GW-10b, ranging between 2.7 and 3.5 µg/L.

Dissolved Zn concentrations were close to or below the RDLs (0.5 and 5 µg/L), ranging between 0.7 and 7.9 µg/L where measurable. Two of three groundwater samples collected at GW-6, GW-8 and GW-10b were characterized by dissolved Zn levels below the RDL (5 µg/L). Dissolved Zn levels were highest at GW-7 (3.2 to 7.9 µg/L).

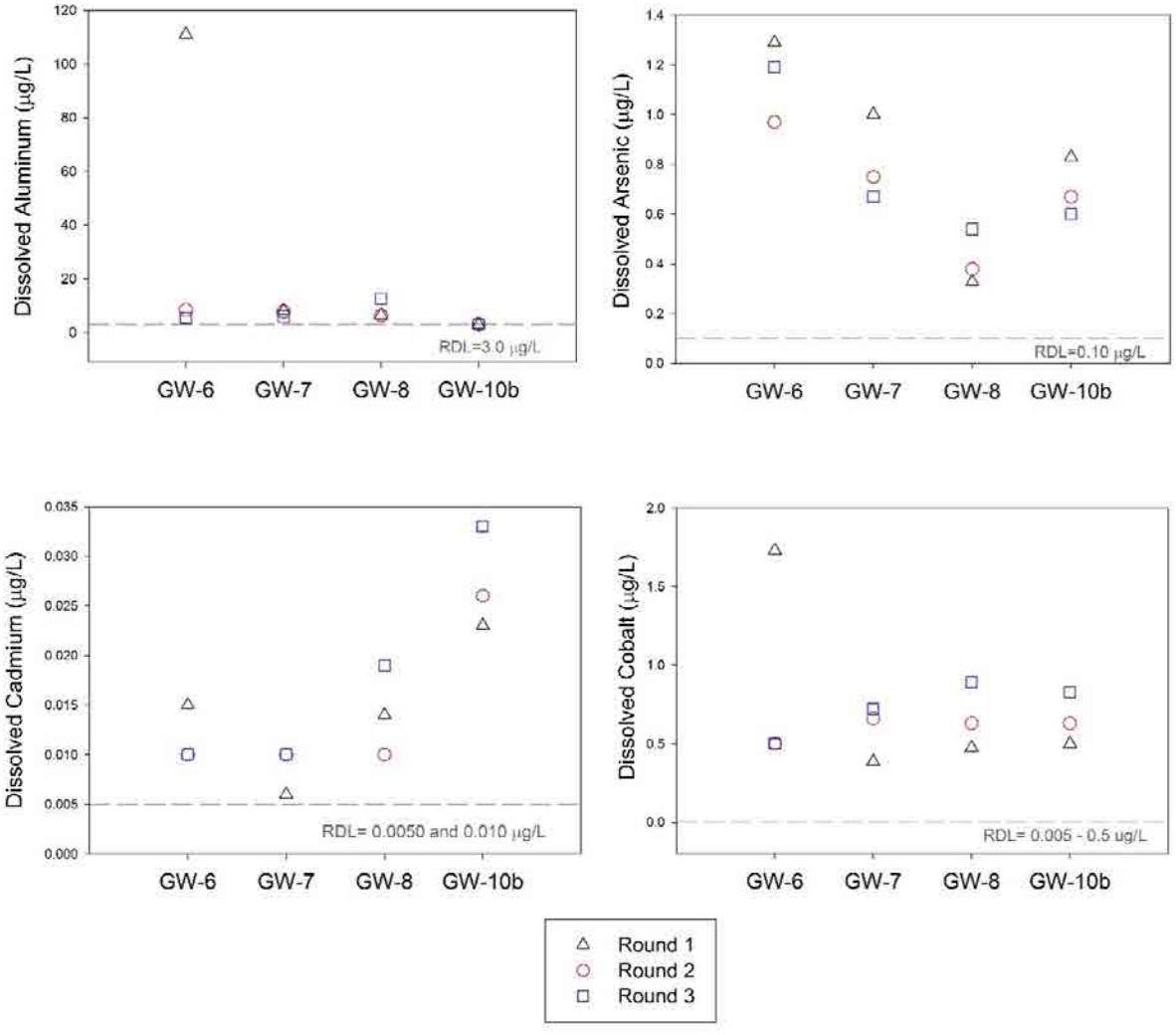


Figure 4-9: RSEM Area R5b Groundwater Quality Data for Dissolved Aluminum, Arsenic, Cadmium and Cobalt (2016).

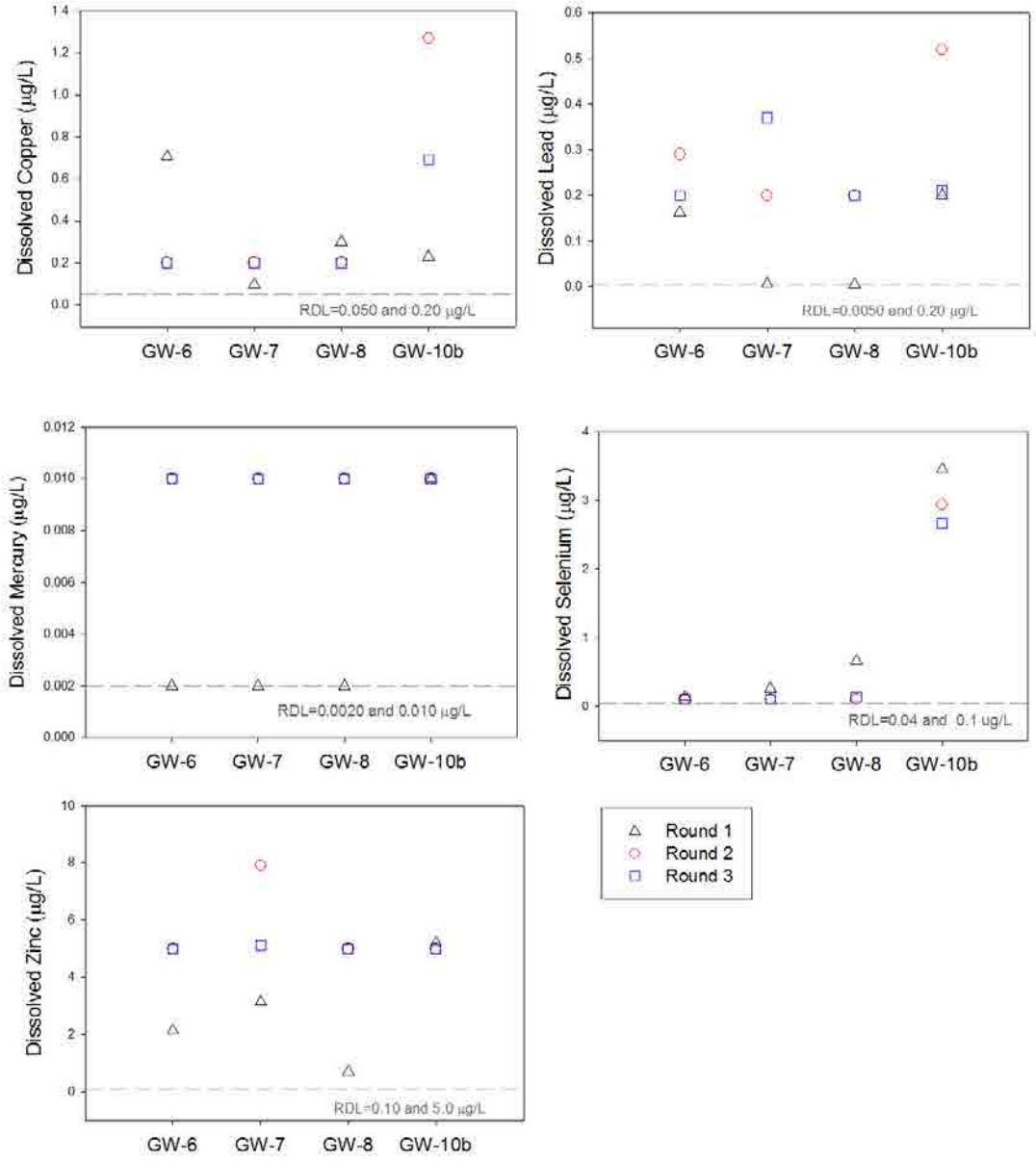


Figure 4-10: RSEM Area R5b Groundwater Quality Data for Dissolved Copper, Lead, Mercury, Selenium and Zinc (2016).

4.2.3 Groundwater Quality Assurance/Quality Control

Quality assurance and quality control (QA/QC) programs were implemented for the groundwater monitoring programs at RSEM Areas R5a and R5b. Groundwater samples were collected, preserved, stored, transported, and tested in accordance with the requirements set forth in the *Site C Clean Energy Project, Implementation Design*

Technical Memorandum, Peace River and RSEM Discharge Groundwater Monitoring Program (KCB and SNC-Lavalin, 2016).

Discrete QA/QC assessments were performed on the groundwater quality data sets of RSEM Areas R5a and R5b. Overall, the QA/QC programs indicate good precision, accuracy and contamination control in the laboratory test procedures, in addition to good contamination control, precision and sample homogeneity in the field sampling.

4.2.3.1 RSEM Area R5a

The QA/QC assessment of RSEM Area R5a groundwater quality data is described with respects to laboratory and field methods and observations below.

Laboratory Methods and Observations

MAXXAM Analytics in Burnaby, British Columbia completed the laboratory analysis of all groundwater samples collected in November and December 2016. Laboratory quality control included the preparation and analysis of blanks, sample duplicates, and reference samples. These samples monitored the internal testing processes at the laboratory. Test results are only reported if internal quality control criteria are met. Laboratory quality control data indicated good precision, accuracy and contamination control in the laboratory test procedures.

Groundwater samples collected at GW-1 to GW-3 and GW-4A were received/analysed within the laboratory recommended holding times for all tested parameters, except for laboratory pH which was also measured in the field at the time of sample collection.

Field Methods and Observations

Groundwater quality samples were collected from monitoring wells GW-1 to GW-3 and GW-4A over a three-week period between late November 2016 and mid-December 2016. Three groundwater samples were collected from each monitoring well.

Field quality control included monitoring indicator parameters during purging/sampling and the preparation of field and trip blanks and field replicates. The purpose of field quality control is to evaluate the potential for contamination associated with sampling, including sample collection, sample containers, preservatives, shipping, and sample processing at the lab. Field blank and trip blank analytical data are presented in Appendix 4-B (Table 1). Field replicate analytical data are presented in Appendix 4-B (Table 2).

The field blank and trip blank data indicate good overall contamination control with the majority of values below laboratory reportable detection limits (RDLs) (Appendix 4-B, Table 1). Several inorganic, anion, organic carbon, and total and dissolved metals parameters were measured at concentrations above RDLs in the field and trip blank

samples. Detected values were below the laboratory screening specifications (≤2 times RDLs) and fall within acceptable limits for all parameters, except bicarbonate and chloride in FB-1 and total copper in TRIP BLANK which were detected at concentrations slightly greater than two times the RDLs.

Field replicates were collected to evaluate variability associated with field collection methods and laboratory analytical methods. The precision of the field replicates was evaluated using relative percent difference (RPD). The following formula was used to calculate RPD:

$$RPD = 100 * \frac{|Result\ 1 - Result\ 2|}{Average\ (Result\ 1,\ Result\ 2)}$$

RPD values were determined for all water quality parameters with detectable concentrations greater than five times the RDLs. RPD values were not calculated for replicate samples with one or both parameter concentrations within five times the RDL, which is not considered to be representative of actual sample variability (or consistency) due to elevated analytical imprecision close to the RDL. The field replicate pair (GW-2, GW-2D) was characterized by RPD values ranging between 0% and 36%. No parameters had RPD values greater than 50% (Appendix 4-B, Table 2). Overall, the field replicates indicate good precision and sample homogeneity.

A comparison of the analytical results for total and dissolved metals was completed as a QA/QC check. The ratio of the dissolved concentration to total concentration (D/T, expressed as a percentage) was calculated for metal parameters where both concentrations were greater than five times the RDL (>5x RDL); D/T ratios are presented in Appendix 4-B (Table 3). There is a 20% allowable limit for dissolved values greater than total values (*i.e*. D/T 120%) for sample results >5x RDL, based on typical laboratory QA/QC criteria. All groundwater samples meet these criteria, with D/T ratios less than 116% (Appendix 4-B, Table 3).

4.2.3.2 RSEM Area R5b

The QA/QC assessment of RSEM Area R5b groundwater quality data is described with respects to laboratory and field methods and observations below.

Laboratory Methods and Observations

MAXXAM Analytics in Burnaby, British Columbia completed the laboratory analysis of all groundwater samples collected in October, November and December 2016. Laboratory quality control included the preparation and analysis of blanks, sample duplicates, and reference samples. These samples monitored the internal testing processes at the

laboratory. Test results are only reported if internal quality control criteria are met. Laboratory quality control data indicated good precision, accuracy and contamination control in the laboratory test procedures.

Groundwater samples GW-6, GW-7 and GW-8 exceeded recommended holding times of 3 days for orthophosphate in Round 1 (Oct 2/3, 2016). Holding times were exceeded due to the time required to deliver samples to the laboratory. All other groundwater samples were received/analysed within the recommended holding times for the tested parameters.

Field Methods and Observations

Groundwater quality samples were collected over approximately three-week periods at monitoring wells GW-6 to GW-8 in October 2016, and between late November and mid December 2016 at GW-10b. Three groundwater samples were collected from each monitoring well.

Field quality control included monitoring indicator parameters during purging/sampling and the preparation of field and trip blanks, and field replicates. The purpose of field quality control is to evaluate the potential for contamination associated with sampling, including sample collection, sample containers, preservatives, shipping, and sample processing at the lab. Field blank and trip blank analytical data are presented in Appendix 4-B (Table 1). Field replicate analytical data are presented in Appendix 4-B (Table 4).

The field blank and trip blank data indicate good overall contamination control with the majority of values below laboratory RDLs (Appendix 4-B, Table 1). Several inorganic, anion, organic carbon, and total and dissolved metals parameters were measured at concentrations above RDLs in the field and trip blank samples. Detected values were below the laboratory screening specifications (≤2 times RDLs) and fall within acceptable limits for all parameters, except bicarbonate and chloride in FB-1 and total copper in TRIP BLANK which were detected at concentrations slightly greater than two times the RDLs.

Field replicates were collected to evaluate variability associated with field collection methods and laboratory analytical methods. The precision of the field replicates was evaluated using RPD, as defined in Section 4.2.3.1. RPD values were determined for all water quality parameters with detectable concentrations greater than five times the RDLs. RPD values were not calculated for replicate samples with one or both parameter concentrations within five times the RDL, which is not considered to be representative of actual sample variability (or consistency) due to elevated analytical imprecision close to the RDL. The field replicate pair (GW-10B, GW-10D) was characterized by RPD values ranging between 0% and 41%. No parameters had RPD values greater than 50% (Appendix 4-B, Table 4). Overall, the field replicates indicate good precision and sample homogeneity.

A comparison of the analytical results for total and dissolved metals was completed as a QA/QC check. The ratio of the dissolved concentration to total concentration (D/T, expressed as a percentage) was calculated for metal parameters with both concentrations greater than five times the RDL (>5x RDL); D/T ratios are presented in Appendix 4-B (Table 5). There is a 20% allowable limit for dissolved values greater than total values (*i.e*. D/T 120%) for sample results >5x RDL, based on typical laboratory QA/QC criteria. All groundwater samples meet these criteria, with D/T ratios less than 119% (Appendix 4-B, Table 5).

5. Recommendations

Lorax, as PRHP's QP (ARD) made recommendations regarding sediment pond operation, PAG management, and implementation of water treatment facilities. A summary of the recommendations is provided below.

5.1 Environmental Monitoring

- Operating procedures for the collection and submission of water quality samples.
- Operating procedures for conducting rise pH at site
- Historic water quality monitoring from Garbage Creek indicates that concentrations of copper and zinc were significantly greater than RSEM discharge limits specified in CEMP v4 and were documented to be acidic during late summer and autumn. These historic conditions complicate the regulation of discharges from RSEM L5 but should preclude the requirement to specifically meet BC freshwater aquatic life guidelines.

5.2 RSEM Design

- Changes to material storage requirements and regulated discharge limits that have come into effect since the original design of RSEM R5b has increased the likelihood that effluent water chemistry will be unsuitable for discharge. Specifically, this refers to the storage of PAG rock and discharge criteria being revised from MMER limits to those specified in CEMP v4.
- Recommend RSEM sediment ponds be lined and/or that the base of the ponds be constructed of non-PAG material.
- Install a drain along the slopes upgradient of the RSEM to prevent groundwater entering the RSEM through the upgradient side of the facility.

5.3 Water Treatment

- Water treatment plants may be required to treat runoff on the Right Bank from
    - Area 23 temporary stockpile,
    - RCC dam excavation / approach channel, and
    - RSEM R5a.
- Water treatment plants may be required to treat runoff on the left bank from
    - L3 Temporary PAG stockpile, and

- RSEM L5.

- Establish non-toxic thresholds for water chemistry concentrations.
- Obtain or conduct water balance to determine range of flow expected from RSEM sediment ponds to establish design flow for treatment systems.
- The best location for the treatment system may not be at the point of RSEM discharge. Use water balance schematic to evaluate where concentrated PAG contact water can be captured and treated. Evaluate options where treated effluent can be combined with good quality site contact water (*i.e*. groundwater discharging into approach channel ditch) prior to being discharged from RSEM.
- Evaluate locations for constructing water storage ponds for treatment plant influent and effluent. Influent storage ponds may be required in the approach channel excavation to store peak flows during freshet until the treatment plant operating at 15 - 20 L/s can draw them down. Effluent ponds will be required to settle sludge.
- Establish on-site or off-site sludge disposal plan.
- Evaluate overall water conveyance system to combine concentrated drainages to a single treatment plant versus multiple treatment systems.

5.4 PAG Exposure Management

Guidance regarding general management of PAG exposures was provided by Lorax in the form of input to the *Acid Rock Drainage and Metal Leaching Management Plan* (Appendix A of EMP; Rev. 8). This guidance includes general recommendations for management of different types of PAG exposures that will be encountered during construction. Additional, specific recommendations regarding PAG exposure management not included in the EMP are listed below.

- Relocation of historic PAG rock piles to RSEM R5b.
- Exclude historic PAG rock piles from base layer of RSEM R5b.

6. Closure

This report was prepared for the use of Peace River Hydro Partners (PRHP). This report was prepared and reviewed by the Lorax technical personnel listed below.

Respectively Submitted,

Original signed by

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Environmental Geochemist

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Appendices

PEACE RIVER
HYDRO PARTNERS

Appendix 2: ML/ARD Monitoring

Appendix 2.A: Field Rinse pH Procedure

Appendix 2.B: Analytical QAQC

Appendix 2.C: ARD Monitoring Results

PEACE RIVER HYDRO PARTNERS

TECHNICAL MEMORANDUM

To:	**Ingrid Corson, Nicole Haakenson, PRHP**	**Date: October 5, 2016**
Cc:	**Katie Hill, PRHP**	**Project #: A416-1**
From:	**Nicole Marsh, John Dockrey**	
Subject:	**Rinse pH Procedure for Onsite Analysis of Rock samples**	

This document describes the recommended procedure, reporting requirements and QAQC measures to be taken in undertaking on site rinse pH measurements in support of ARD/ML Management for the Site C Clean Energy Project Main Civil Works. The procedure is based on that described in Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND, 2009). A sample Rinse pH Record is attached as Table 1, and an example of a Chain-of-Custody Form is provided at the end of this Memorandum.

Overview

The surface rinse pH should be conducted on a dry sieve sorted < 2mm particle size fraction with no particle crushing. The <2mm particle size fraction is considered to be representative of the finer particles, which due to their disproportionately greater particle surface area will determine the pore water chemistry.

Required Materials and Chemicals

Chemicals

- Standard buffer solutions, pH 4, 7 and 10.
- Distilled Water

Materials

- pH meter
- Plastic cups
- Stirring rod
- Wash bottle containing distilled water
- Balance, can be read to 0.1 g.
- Weigh trays
- Sieve

Care of pH Electrode

- The electrode should not remain in the sample longer than necessary for a reading, especially if it is more alkaline than pH 9.0, or more acidic than pH 2.0.
- The electrode should be washed with a jet of distilled water from a wash bottle after every measurement in a sample or buffer solution
- The electrode should not be permitted to dry out
- The electrode should be cleaned and suspended in pH 4 buffer or electrode storage solution for short term storage.
- When measuring pH of supernatant, care should be taken to avoid contact between the electrode and settled particles.

Calibration of pH Electrode

- Calibrate the pH probe using pH 4, 7 and 10 buffer solution before initiating rinse pH testing.
- Check calibration between each round of rinse pH samples by checking pH probe reading in pH 7 buffer solution. If the pH probe is ≥0.2 pH units off, re-calibrate the probe.
- After every tenth measurement, calibration is to be checked using both 4.0 and 7.0 buffers. If the pH probe is ≥0.2 pH units off, re-calibrate the probe.

Sample Preparation

- If samples are wet, collect subsample and air dry overnight
- Sieve a sample of at least 30 g using the sieve provided to obtain a grain size of <2 mm.

Test Procedure

1. Check calibration of pH probe before each round of analyses. If pH reading is ≥0.2 off, or if this is the first round of rinse pH samples, calibrate the pH probe using pH 4, 7 and 10 buffer solution.
2. Weigh 30 g of solids (prepared as described above) on scale and measure 30 ml of distilled water using graduated cylinder.
3. Combine liquid and solid, mix thoroughly for 5 seconds
4. Let the solution stand for 10 minutes
5. Insert the pH electrode into the container and stir the supernatant by gently swirling the electrode. Protect the electrode by taking care not to contact it with settled particles, move the electrode carefully about to insure removal of water film around the electrode.

6. When the reading remains constant, record the pH and temperature and remove the electrode from the supernatant. Carefully wash the electrode with distilled water. When all the pH measurements are completed, the electrode should be stored in a beaker containing pH 4 buffer or electrode storage solution.
7. Record results in data sheet provided with this procedure.

Quality Assurance and Quality Control

- Conducted duplicate test on 1 in 10 samples
- Send 1 in 10 samples into analytical laboratory for independent verification of rinse pH using chain of custody form attached to this document.

Rinse pH Test Record

Name:

Date:

Sample ID	Description	Sample Collection Date	Northing	Easting	Rinse pH	Temp	Time

Note: Temperature refers to temperature of supernatant measured by pH probe, time refers to time that rinse test initiated (e.g., when solids and liquids mixed)

Maxxam

ARD SAMPLE REQUISITION and CHAIN OF CUSTODY FORM

Maxxam Analytics, 3456 Gardner Court, Burnaby, BC V5G 3K4 — Phone: (604) 734-7276 Fax: (604) 731-2386

Attn: Ashley Leow, Said Zeinab & Tim O'Hearn — E-mail: aleow@maxxam.ca, szeinab@maxxam.ca, timohearn@maxxam.ca

Page: 1 of 1
Maxxam Project No:
ARD Job Number:

Company: Lorax (#3604) | **Project Name: Site C** | **Project No: A416-1**

Address:

Telephone: 604-688-7173 | **Fax:**

Email: john.dockrey@lorax.ca
bruce.mattson@lorax.ca, ingrid.Corson@prhp.ca

Contact Person: John Dockrey
Bruce Mattson, Ingrid Corson

Analysis Requested

	Sample ID		Sample Wt. (kg)	Sample Type & Condition	Rinse pH on <2mm fraction (MEND method)	Sobek ABA Package [Paste pH, Total S (by Leco) & NP]	Modified ABA Package [Paste pH, Total S (by Leco) & NP]	Siderite Corrected NP	Mod. ASTM 2492-02 Sulphur Speciation	Sulphate Sulphur (sulphide sulphur by difference)	Total Carbon	Carbonate Carbon: (CO2 HCl method)	Single Addition NAG	NAG Extract Analysis	Trace Metals on solids by Aqua Regia Digestion (Group 1DX)	Metals on solids: 4 acid (Group 1EX)	Ultra Trace Metals on solids by Aqua Regia Digestion (Group 1F-MS)	Whole Rock - Majors by ICP (Group 4A)	Whole Rock - Majors by XRF	Water Extraction: MEND-SFE	Water Extraction: SPLP	Water Extraction: MWMP	Water Extraction: TCLP	Mineralogy: Optical Microscopy on polished thin sections	Mineralogy: Rietveld XRD	Humidity Cell - MEND method	Humidity Cell - ASTM Method	Column Testing	Subaqueous Disposal Column Testing	Particle Size Analysis (Kinetic testing)	Particle Size Analysis (As received)
	Maxxam ID	Client ID																												
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Relinquished by:		Date:		Time:	10:00am	**Contact info to whom the invoice for the requested work should go to:**	**Maxxam Storage Policy:**
Received by:		Date:		Time:		Contact person: John Dockrey	Samples will be store for 3 months after analysis for no fee. Beyond 3 months a storage fee will apply.
Relinquished by:		Date:		Time:		Email:	
Received by:		Date:		Time:		Mailing Address:	

CCME QA/QC INTERPRETATION GUIDE - ENVIRONMENTAL SERVICES

Maxxam
A Bureau Veritas Group Company

QA/QC Sample Type	Frequency and Purpose	Application and Regulatory Criteria	Recommended Actions
LABORATORY			
Method Blank A laboratory control sample that is free of the target parameters and of any substance that may interfere with that analysis. A method blank is processed through the entire analytical method including any extraction, digestion or any other preparation procedure.	1 in 20 samples or 1 in batch (whichever is most frequent). Monitors laboratory background levels of target analytes and laboratory artifacts	Used for most analytical parameters. Target analytes should be less than (<) the reporting detection limit (RDL)	The laboratory will repeat the analysis for all samples in the batch, if unacceptable concentrations of target analytes are identified in the method blank. If re-runs are not available, the data is reported flagged.
Blank Spike (Laboratory Control Sample): A laboratory control sample free of the target analytes or interferences is fortified with a known concentration of all or selected target analytes. The blank spike is processed through the entire analytical method including any extraction, digestion or any other preparation procedure. Results are expressed as a percentage recovery.	1 in 20 samples or 1 in batch (whichever is most frequent). Monitors analyte recovery and potential loss during the preparation procedures (extraction efficiency). It also serves to validate the calibration of the instrumentation or technique.	Used for most parameters. EC, Salinity: 90% - 110% water; 80% - 120% soil Metals and Inorganics: 80% - 120%; HWS B 70% - 130% FOC, Methyl Mercury: 70% - 130% (all matrices) VOCs, THMs, BTEX except gases and ketones: 60% - 130% (water and soil) PHCs: 60% - 140% (water and soil) ABNs, CPs, PFOS, PAHs, OC Pest., Herb., PCBs, Volatile Gases & Ketones: 50% - 140% (water and soil); 30% - 130% for difficult compounds Dioxins & Furans: 70% - 140% (water and soil) 1,4-Dioxane: 70% - 130% waters; 60% - 140% soils	Re-extract/re-analyse all associated samples, if possible. If not, report the data flagged for all failing analytes. Re-analysis is performed if the LCS in a single analyte test or > 10% of the analytes in a multielement scan are outside the control limits by > 10% absolute.
Matrix Spike A second aliquot from a randomly chosen sample is fortified with a known concentration of target analytes. The sample is processed through the entire analytical method. Results are expressed as a percentage recovery.	1 in 20 samples or 1 in batch (whichever is most frequent). Evaluates any "matrix effects" that may exist in a sample due to its composition that may affect the recovery of analytes. An example is the presence of peat in soils, which tends to adsorb analytes such as benzene resulting in a poor matrix spike recovery.	Used for most analytical procedures. Matrix spike alert criteria apply when the MS targe concentration is ≥ the native analyte concentration. ABNs, CPs, PFOS, PAHs, 1,4-Dioxane, Pesticides & Herbicides, VOCs, THMs, BTEX,: 50% - 140%; 30% - 130% for difficult compounds PHCs, HWSB, Methyl Mercury: 60% - 140% Dioxins & Furans: 50% - 150% Metals and Inorganics, FOC: 70% - 130%	Re-analysis of the Matrix Spike is performed if the Matrix Spike for a single analyte test or 10% of the analytes in a multielement scan are outside the control limits by > 10% absolute. It should be noted that higher levels of uncertainty in the data are associated with situations when native analyte concentrations are >MS concentrations.
Laboratory Duplicates (RPD) A second aliquot from a randomly chosen sample within an analytical batch processed through the entire analytical method. Laboratory duplicates are expressed as the Relative Percent Difference (RPD) between the two results.	1 in 20 samples or 1 in batch (whichever is most frequent). Evaluates analytical precision and sample homogeneity.	Applicable for all analytical parameters. Acceptance criteria are either as tabulated below or < 2x RDL at low concentrations ABNs, CPs, PFOS, PAHs, 1,4-Dioxane, Ocs, PCBs, VOCs, BTEX: ≤30% waters and ≤50% soils PHCs: ≤30% (methanol extract); ≤40% (soil) Dioxins & Furans, Methyl-Hg: ≤30% waters and ≤40% solids FOC, NH4, Cr, Cr(VI), CN: ≤20% waters and ≤35% soils Metals & Inorganics: ≤20% waters and ≤30% soils HWSB, Ag, Al, Ba, Hg, K, Mo, Na, Pb, Sn, Sr, Ti: ≤40% soils; for waters, see above Salinity: ≤10% waters and <20% soils	**Laboratory duplicates collected from the same Methanol vial as the sample have a 30% RPD; if a second Methanol Vial is used, a RPD of 40% applies.** Re-analysis of affected samples may not necessarily be required, as these are subject to sampling and analytical variability. Data may be reported as flagged if samples are visibly non-homogenous. For organics whole-bottle tests, laboratory duplicates are essentially field duplicates.
Certified Reference Material (CRM) Purchased samples that have been certified by a recognized agency to contain specified levels of selected constituents, when measured by specified standard procedures. Results are expressed as a percentage of the design value.	During validation; optional otherwise. Used for validating the performance of a method including precision, extraction or digestion efficiency.	Applicable for all analytical parameters where CRMs are commercially available. Acceptable recovery ranges are provided by the supplier.	Repeat the analysis for all samples in the batch, if CRM % recovery is outside control limits.
Surrogate Recovery Surrogates are deuterated analogues or compounds not normally found in nature but have chemical and physical behaviour similar to the analytes of interest. Known surrogate concentrations are added to samples prior to analysis and recoveries are calculated and expressed as a percentage.	Every organic analysis, included in every sample. Monitors the efficiency of organic extractions, instrument performance and provides within-run quality control.	Applicable for all analytical parameters determined by Gas Chromatography or HPLC techniques. ABNs, CPs, PFOS, PAHs, 1,4-Dioxane, Ocs, PCBs, Herbicides, VOCs, BTEX: 50% - 140% (water and soil) PHCs (F2-F4): 60% - 140% (water and soil)	Repeat the analysis or qualify data, if interferences are suspected.
FIELD			
Blind Duplicates A second sample is collected at the same time and location in separate containers. Samples are homogenized where possible (ie alternate filling of sample and duplicate for waters and bowl mixing for soils). Samples are submitted to the laboratory without identifying them as duplicates. VOCs in soil should not be homogenized.	5% samples collected (ie. 1 in 20 samples); must be representative of all parameters. For programs with less than 20 samples, at least 1 field duplicate is required. Evaluates analytical precision, field precision and sample homogeneity. Has limited use for samples that cannot be homogenized (ie VOCs in soil).	These samples normally include higher variability due to the nature of the matrix, so field duplicates alert limits should be considerably broader than laboratory duplicates. Groundwater Samples: <40% Soil Samples: <60%	Evaluate sample homogeneity and field collection technique. Although specific regulatory guidance on field duplicate RPDs is provided, this parameter requires judgement on behalf of the QP to properly validate and apply project specific alert criteria for field duplicates.
Trip Blank A sample of analyte free media (supplied by the laboratory) taken to the site and returned to the laboratory unopened. The laboratory prepares the trip blank. A duplicate of the trip blank prepared at the same time is retained at the laboratory in a contaminant free location.	1 per VOC water submission. Identifies any potential cross-contamination that may occur from other samples, ambient conditions, or other sources that samples may be exposed.	Maxxam internal guideline and recommendation: Evaluate the impact on data for results >2x the RDL or that that approaches the concentration reported in the sample. Specifically for methanol vials: Travel methanol vial blank is reweighed at the laboratory and compared to tared weight to determine methanol loss. Prepared with every batch of pre-weighed vials.	Contact and engage the laboratory for assistance in qualifying the data. Analyze the laboratory trip blank duplicate retained by the laboratory. While the CCME guidelines list Trip Blanks as an acceptable QC parameter to include in analytical programs, specific alert criteria are not provided.
Trip Spike A sample prepared by the laboratory that is fortified with a known concentration of target analytes. This sample is shipped along with containers and is to be taken into the field, but returned unopened to the laboratory. Analysis is conducted and recoveries are reported expressed as a percentage.	1 per VOC water monitoring program. Monitors the breakdown or loss of analytes during the sampling process. Holding time, and temperature effects on concentration can be accessed.	Maxxam internal guidelines and recommendations: Usually volatile organics in water. May be applied to other analyses. Majority of VOCs: 60% - 130% Vinyl Chloride, Bomomethane, Chloromethane, Freon-12, Acetone, MIK & MIBK: 50% - 140%	Please note that in the absence of Regulatory prescribed warning or alert limits, Maxxam recommends these alert limits. Review storage conditions, temperatures of samples upon receipt.
Field Blank Supplied by the laboratory and prepared in the field by filling container with analyte free water.	1 per VOC monitoring program Determines if the field or transporting environments have contaminated the sample.	Applicable for most parameters. For methanol vials, a field blank should be used for every batch of methanol vials. Evaluate the impact on data for results >RDL or that that approach the concentration reported in the sample.	Evaluate any hits found in the sample that were also found in the trip blank. For methanol vials, also review the trip blank measurement to determine methanol loss.
Blind Known A purchased CRM (see above) or a sample previously analyzed by an accredited laboratory multiple times is submitted to the laboratory blind.	1 per remediation or large project. Evaluates laboratory accuracy and precision.	Ideal for long holding time tests such as metals in soil. Submission of the same blind known multiple times during a large project provides excellent monitoring of the laboratory precision and accuracy. Acceptable recovery ranges are provided by the supplier.	Contact the laboratory.

QC Protocols for samples (Whole Solids Analysis) – ARD Laboratory

Batch Sizes used:

Table 1: Static Testing (Solid Samples)

Method	Typical Batch Size*	CRM to use	QC
Soldis			
All NP Methods	40	KZK-1	1) Duplicate Split of Pulps every 10th sample (min. one duplicate split per set). These will be suffixed with "D". 2) CRMs inserted every 10th sample (min. one CRM per set).
Fizz	40	NA	
Paste pH	40	NA	
Rinse EC	40	NA	
Rinse pH	40	NA	
Sulphate (Acid Extraction)	40	ARG	

*This table represents typical batch sizes used in the ARD lab.

QC Requirements

Table 3. QC Assessment for Whole Solids Analysis

QC Test	Check	If Check Fails
Sulphur balance	Total Sulphur ≥ Sulphur as Sulphate	1) Re-analyze total and sulphate sulphur. 2) If both values are >10xRDL, and $\left[\frac{\text{Sulphate S - Total S}}{\text{Total S}} > 20\%\right]$ Re-analyse all samples in batch.
Carbon balance (if total carbon analysis requested)	Total Carbon ≥ Total Inorganic Carbon (TIC)	1) Re-analyze total and inorganic carbon. 2) If both values are >10xRDL, and $\left[\frac{\text{TIC - Total C}}{\text{Total C}} > 20\%\right]$ re-analyse all samples in batch*.
Sobek Neutralization potential consistent with fizz test.	NP does not exceed maximum NP indicated by acid strength and acid volume indicated by fizz	Re-analyze NP or provide explanation for discrepancy.
Modified NP pH	Terminal pH of modified NP within method prescribed range.	If fizz rating not equal to "none", repeat test if outside range.
Neutralization Potential consistent with paste pH	Negative NP has paste pH below 5.	Re-analyse both NP and paste pH. If result is outside of 15%, re-analyse entire batch for failed parameter.
Laboratory Duplicates (except NP)	If result >5RDL, Relative percent difference (RPD) better than ±30%	Re-analyze both samples for failed parameter. If difference from re-analysis is within required tolerance, re-analyze all samples in batch for failed parameter.
NP Lab Duplicates	• Relative percent difference (RPD) better than ±15% for NP > 20 kg/t • Relative percent difference (RPD) better than ±20% for 20>NP>10 kg/t. • Difference within ±5 kg/t for NP<10 kg/t	Re-analyze both samples for failed parameter. If difference from re-analysis is within required tolerance, re-analyze all samples in batch.
Control reference materials (CRM)	Relative difference from certified value better than ±15%	Re-analyze all samples between last passed CRM and next passed CRM.

Appendix 2.C-1 Acid Base Accounting and Total Metal Content of ARD Monitoring Samples

Maxxam Report Id	Maxxam Sample No	Sample ID	Date Sampled	Maxxam Date Received	Easting	Northing	Elevation masl	Location	SampleWeight	Sample Form	Paste pH	Paste EC	Lab Rinse pH	Rinse EC (on <2mm)	Total S
											pH Units	uS/cm	pH Units	uS/cm	wt%
B6A0421	PZ6250	457-01	11/9/2016	11/9/2016	629485	6229077	457	Approach Channel	6.51	Wet Coarse Rock	5.99	2520	5.37	2690	1.84
B6A0421	PZ6251	457-02	11/9/2016	11/9/2016	629483	6229078	457	Approach Channel	3.69	Wet Coarse Rock	7.14	2130	6.55	2000	1.69
B6A0421	PZ6252	457-03	11/9/2016	11/9/2016	629470	6229083	457	Approach Channel	5.91	Wet Coarse Rock	6.54	2730	5.44	2930	1.65
B6A0421	PZ6253	457-04	11/9/2016	11/9/2016	629460	6229086	457	Approach Channel	3.53	Wet Coarse Rock	6.19	2580	5.35	2910	1.66
B6A0421	PZ6254	457-05	11/9/2016	11/9/2016	629442	6229093	457	Approach Channel	4.77	Wet Coarse Rock	5.83	2310	5.29	3420	1.76
B6A0421	PZ6255	457-06	11/9/2016	11/9/2016	629436	6229102.5	457	Approach Channel	2.21	Wet Coarse Rock	6.34	2650	4.99	3260	1.88
B6A0421	PZ6256	457-07	11/9/2016	11/9/2016	629430	6229112	457	Approach Channel	2.995	Wet Coarse Rock	7.38	1160	6.05	1400	1.86
B6A0421	PZ6257	457-08	11/9/2016	11/9/2016	629400	6229121	457	Approach Channel	2.785	Wet Coarse Rock	7.16	1540	6.34	1490	1.85
B6A0421	PZ6258	457-09	11/9/2016	11/9/2016	629382	6229129	457	Approach Channel	4.475	Wet Coarse Rock	7.33	1830	7.29	1410	1.84
B6A0421	PZ6259	457-10	11/9/2016	11/9/2016	629370	6229142	457	Approach Channel	4.88	Wet Coarse Rock	6.19	2520	5.01	2940	1.95
B6A0421	PZ6230	460-01	11/9/2016	11/9/2016	629395	6229053	460	Approach Channel	6.315	Wet Coarse Rock	7.3	1590	6.78	1780	1.96
B6A0421	PZ6233	460-01	11/9/2016	11/9/2016	629395	6229053	460	Approach Channel	4.005	Wet Coarse Rock	6.8	1890	6.01	2110	2.18
B6A0421	PZ6231	460-02	11/9/2016	11/9/2016	629419	6229038	460	Approach Channel	6.055	Wet Coarse Rock	7.53	1450	6.99	1400	2.38
B6A0421	PZ6232	460-03	11/9/2016	11/9/2016	629444	6229025	460	Approach Channel	6.005	Wet Coarse Rock	7.96	1130	7.68	954	2.15
B6A0421	PZ6234	460-05	11/9/2016	11/9/2016	629464	6229013	460	Approach Channel	5.745	Wet Coarse Rock	7.03	1540	6.46	2120	1.95
B6A0421	PZ6235	460-06	11/9/2016	11/9/2016	629483	6229000	460	Approach Channel	5.75	Wet Coarse Rock	7.1	1730	6.87	1570	1.97
B6A0421	PZ6240	460-07	11/9/2016	11/9/2016	629524	6228967	460	Approach Channel	6.055	Wet Coarse Rock	7.38	1440	6.57	1420	2.01
B6A0421	PZ6241	460-08	11/9/2016	11/9/2016	629540	6228953	460	Approach Channel	4.385	Wet Coarse Rock	5.6	2140	5.13	2360	2.14
B6A0421	PZ6242	460-09	11/9/2016	11/9/2016	629557	6228939	460	Approach Channel	4.111	Wet Coarse Rock	6.9	1970	6.01	2180	1.85
B6A0421	PZ6243	460-10	11/9/2016	11/9/2016	629584	6228918	460	Approach Channel	6.635	Wet Coarse Rock	6.99	1810	5.98	1970	1.92
B6A0421	PZ6244	460-11	11/9/2016	11/9/2016	629606	6228904	460	Approach Channel	5.245	Wet Coarse Rock	7.34	1420	6.69	1450	1.9
B6A0421	PZ6245	460-12	11/9/2016	11/9/2016	629630	6228887	460	Approach Channel	5.405	Wet Coarse Rock	7.54	1510	6.61	1400	1.88
B6A0421	PZ6246	460-13	11/9/2016	11/9/2016	629635	6228935	460	Approach Channel	4.969	Wet Coarse Rock	6.22	1860	5.85	2350	2.01
B6A0421	PZ6247	460-14	11/9/2016	11/9/2016	629488	6229037	460	Approach Channel	5.385	Wet Coarse Rock	7.64	1230	7.81	1060	1.85
B6A0421	PZ6248	460-15	11/9/2016	11/9/2016	629367	6229100	460	Approach Channel	2.972	Wet Coarse Rock	7.29	1370	7.28	1110	2.05
B6A0421	PZ6249	460-16	11/9/2016	11/9/2016	629355	6229112	460	Approach Channel	3.061	Wet Coarse Rock	7.33	1210	7.44	1020	1.94
B692401	PU6275	AC-1	10/19/2016	10/19/2016	629496	6229034	460	Approach Channel	0.647	Wet Sediment w/ Rock	7.92		7.54	1400	1.88
B6B0926	QG0874	AC-1125-1	11/25/2016	12/1/2016	629532	6229138	440	Approach Channel	1.2	Wet Coarse Mudstone	6.89				1.08
B6B0926	QG0875	AC-1125-10	11/25/2016	12/1/2016	629532	6229012	450	Approach Channel	4.421	Wet Coarse Mudstone	7.62				1.86
B6B0926	QG0872	AC-1125-11	11/25/2016	12/1/2016	629436	6229060	454	Approach Channel	5.214	Wet Coarse Mudstone	7.74				1.77
B6B0926	QG0879	AC-1125-12	11/25/2016	12/1/2016	629358	6229113	454	Approach Channel	4.478	Wet Coarse Mudstone	7.14				1.96
B6B0926	QG0880	AC-1125-2	11/25/2016	12/1/2016	629553	6229033	444	Approach Channel	1.703	Wet Coarse Mudstone	7.69		7.41		1.9
B6B0926	QG0870	AC-1125-3	11/25/2016	12/1/2016	629410	6229031	444	Approach Channel	1.68	Wet Coarse Mudstone	8.7		8.85		1.42
B6B0926	QG0871	AC-1125-4	11/25/2016	12/1/2016	629321	6229197	444	Approach Channel	1.276	Wet Coarse Mudstone	8.27				1.87
B6B0926	QG0876	AC-1125-5	11/25/2016	12/1/2016	629461	6229082	446	Approach Channel	2.13	Wet Coarse Mudstone	7.44		6.91		1.63
B6B0926	QG0873	AC-1125-6	11/25/2016	12/1/2016	629347	6229158	446	Approach Channel	1.73	Wet Coarse Mudstone	8.35				1.88
B6B0926	QG0878	AC-1125-7	11/25/2016	12/1/2016	629347	6229138	450	Approach Channel	3.098	Wet Coarse Mudstone	7.35		6.27		1.79
B6B0926	QG0877	AC-1125-8	11/25/2016	12/1/2016	629421	6229081	450	Approach Channel	5.405	Wet Coarse Mudstone	7.37		5.89		1.8
B6B0926	QG0881	AC-1125-9	11/25/2016	12/1/2016	629436	6229058	450	Approach Channel	3.43	Wet Coarse Mudstone	7.64		6.84		1.8
B6B1573	QG3823	AC-1210-1	12/10/2016	12/4/2016	629238	6229192	450	Approach Channel	2.758	Wet/Frozen Mudstone	7.65				2.05
B6B1573	QG3832	AC-1210-10	12/10/2016	12/4/2016	629435	6229075	450	Approach Channel	3.666	Wet/Frozen Mudstone	8.32				1.73
B6B1573	QG3834	AC-1210-12	12/10/2016	12/4/2016	629302	6229178	447	Approach Channel	3.229	Wet/Frozen Mudstone	8.4				1.82
B6B1573	QG3835	AC-1210-13	12/10/2016	12/4/2016	629325	6229163	447	Approach Channel	3.222	Wet/Frozen Mudstone	8.32				1.93
B6B1573	QG3836	AC-1210-14	12/10/2016	12/4/2016	629347	6229148	447	Approach Channel	3.399	Wet/Frozen Mudstone	8.08				1.77
B6B1573	QG3837	AC-1210-15	12/10/2016	12/4/2016	629373	6229131	447	Approach Channel	4.654	Wet/Frozen Mudstone	7.9				1.85
B6B1573	QG3838	AC-1210-16	12/10/2016	12/4/2016	629400	6229116	447	Approach Channel	4.888	Wet/Frozen Mudstone	7.67				1.96
B6B1573	QG3839	AC-1210-17	12/10/2016	12/4/2016	629424	6229100	447	Approach Channel	5.009	Wet/Frozen Mudstone	8.2				1.94
B6B1573	QG3824	AC-1210-2	12/10/2016	12/4/2016	629263	6229191	450	Approach Channel	3.644	Wet/Frozen Mudstone	7.7				1.96
B6B1573	QG3825	AC-1210-3	12/10/2016	12/4/2016	629280	6229180	450	Approach Channel	4.727	Wet/Frozen Mudstone	7.81				1.83
B6B1573	QG3826	AC-1210-4	12/10/2016	12/4/2016	629299	6229166	450	Approach Channel	3.394	Wet/Frozen Mudstone	7.86				1.85
B6B1573	QG3827	AC-1210-5	12/10/2016	12/4/2016	629326	6229151	450	Approach Channel	4.011	Wet/Frozen Mudstone	7.67				1.81
B6B1573	QG3828	AC-1210-6	12/10/2016	12/4/2016	629344	6229137	450	Approach Channel	3.968	Wet/Frozen Mudstone	7.73				1.65
B6B1573	QG3829	AC-1210-7	12/10/2016	12/4/2016	629370	6229119	450	Approach Channel	4.183	Wet/Frozen Mudstone	7.88				1.78
B6B1573	QG3830	AC-1210-8	12/10/2016	12/4/2016	629390	6229105	450	Approach Channel	3.37	Wet/Frozen Mudstone	7.9				1.89
B6B1573	QG3831	AC-1210-9	12/10/2016	12/4/2016	629414	6229089	450	Approach Channel	2.781	Wet/Frozen Mudstone	8.13				1.83
B6B4401	QI0707	AC-1213-01	12/13/2016	12/23/2016	629535	6229025	443	Approach Channel	2.637	Wet Coarse Mudstone	8.09				1.69
B6B4401	QI0708	AC-1213-02	12/13/2016	12/23/2016	629543	6229018	445	Approach Channel	4.880	Wet Coarse Mudstone	6.64				1.71
B6B4401	QI0709	AC-1213-03	12/13/2016	12/23/2016	629556	6229007	445	Approach Channel	3.444	Wet Coarse Mudstone	7.14				1.87
B700742	QI9307	AC-1213-04	12/13/2016	1/4/2017	629556	6229001	445	Approach Channel	3.361	Wet Coarse Mudstone	7.07				1.70
B6B4401	QI0710	AC-1213-05	12/13/2016	12/23/2016	629577	6228994	445	Approach Channel	4.523	Wet Coarse Mudstone	6.65				1.55
B6B4401	QI0711	AC-1213-06	12/13/2016	12/23/2016	629589	6228985	444	Approach Channel	5.180	Wet Coarse Mudstone	6.71				1.58
B6B4401	QI0712	AC-1213-07	12/13/2016	12/23/2016	629603	6228978	444	Approach Channel	5.420	Wet Coarse Mudstone	6.84				1.49
B6B4401	QI0713	AC-1213-08	12/13/2016	12/23/2016	629616	6228969	444	Approach Channel	4.277	Wet Coarse Mudstone	6.88				1.86
B6B4401	QI0714	AC-1213-09	12/13/2016	12/23/2016	629627	6228963	444	Approach Channel	3.502	Wet Coarse Mudstone	6.79				2.06
B6B4401	QI0715	AC-1213-10	12/13/2016	12/23/2016	629642	6228954	445	Approach Channel	3.960	Wet Coarse Mudstone	6.48				2.11
B6B4401	QI0716	AC-1213-11	12/13/2016	12/23/2016	629543	6228996	451	Approach Channel	7.185	Wet Coarse Mudstone	6.81				2.04

Appendix 2.C-1 Acid Base Accounting and Total Metal Content of ARD Monitoring Samples

Maxxam Report Id	Maxxam Sample No	Sample ID	Date Sampled	Maxxam Date Received	Easting	Northing	Elevation masl	Location	SampleWeight	Sample Form	Paste pH	Paste EC	Lab Rinse pH	Rinse EC (on <2mm)	Total S
											pH Units	uS/cm	pH Units	uS/cm	wt%
B700742	QI9308	AC-1213-12	12/13/2016	1/4/2017	629559	6228988	451	Approach Channel	3.716	Wet Coarse Mudstone	7.07				1.89
B692401	PU6276	AC-2	10/19/2016	10/19/2016	629495	6228973	460	Approach Channel	0.78	Wet Sediment w/ Rock	8		7.8	949	1.86
B692401	PU6277	AC-3	10/19/2016	10/19/2016	629528	6228952	460	Approach Channel	1.033	Wet Sediment w/ Rock	7.59		7.22	1420	2.09
B692401	PU6278	AC-4	10/19/2016	10/19/2016	629539	6229029	460	Approach Channel	0.954	Wet Sediment w/ Rock	6.92		6.39	1430	1.41
B692401	PU6279	AC-5	10/19/2016	10/19/2016	629584	6228991	460	Approach Channel	1.005	Wet Sediment w/ Rock	8		7.76	1070	1.36
B692401	PU6280	AC-6	10/19/2016	10/19/2016	629689	6228929	460	Approach Channel	0.962	Wet Sediment w/ Rock	7.6		7.13	1430	1.66
B692401	PU6281	AC-7	10/19/2016	10/19/2016	629571	6228940	460	Approach Channel	0.792	Wet Sediment w/ Rock	8.01		7.58	1070	1.79
B692401	PU6282	AC-8	10/19/2016	10/19/2016	629525	6228966	460	Approach Channel	1.372	Wet Sediment w/ Rock	7.57		7.06	1370	1.91
B692401	PU6283	AC-9	10/19/2016	10/19/2016	629535	6229002	460	Approach Channel	1.068	Wet Sediment w/ Rock	8.02		7.81	850	1.87
B686972	PR3466	AREA 20-16	9/27/2016	10/4/2016	629605	6228589		Area 20 TPSA	2.601	Wet Sediment with Rock			5.23		
B686972	PR3467	AREA 20-2	9/27/2016	10/4/2016	629547	6228569		Area 20 TPSA	2.089	Wet Sediment with Rock			6.71		
B686972	PR3465	AREA 20-9	9/27/2016	10/4/2016	628729	6229904		Area 20 TPSA	1.700	Wet Sediment with Rock			2.54		
B6A0409	PZ6131	GC-1104	11/4/2016	11/9/2016	629270	6230523	457	Garbage Creek	3.23	Wet Coarse Rock / Sediment	4.64	966	4.62	1790	1.18
B6A0409	PZ6132	GC-1105	11/5/2016	11/9/2016	629263	6230549	446	Garbage Creek	3.493	Wet Coarse Rock / Sediment	3.46	1090	3.34	1650	1.19
B6A0409	PZ6133	GC-1106	11/6/2016	11/9/2016				Garbage Creek	2.02	Wet Coarse Rock / Sediment	3.61	910	3.62	2280	1.21
B6A0421	PZ6261	GC-1103	11/3/2016	11/9/2016	629266	6230516	436	Garbage Creek	2.443	Wet Sediment with Rock	3.37	1740	3.55	2010	1.16
B6A2614	QB0868	GC 1109	11/9/2016	11/16/2016				Garbage Creek	4.495	Wet Coarse Rock with Sediment	5.88	1220	5.5	2020	1.18
B6A2614	QB0869	GC 1110	11/10/2016	11/16/2016				Garbage Creek	5.725	Wet Coarse Rock with Sediment	3.67	3290	3.25	4910	1.49
B6A2614	QB0870	GC 1111	11/11/2016	11/16/2016				Garbage Creek	4.72	Wet Coarse Rock with Sediment	3.72	1400	3.48	2260	2.3
B6A2614	QB0871	GC 1112	11/12/2016	11/16/2016				Garbage Creek	2.74	Wet Coarse Rock with Sediment	3.26	1320	3.01	2530	2.53
B6A2614	QB0872	GC 1113	11/13/2016	11/16/2016				Garbage Creek	3.87	Wet Coarse Rock with Sediment	3.52	1790	3.21	2500	2.06
B6A4530	QC1593	GC 1114	11/14/2016	11/22/2016				Garbage Creek	5.715	Wet Coarse Rock with Sediment	4.75	1470	4.02	2460	2.19
B6A4530	QC1594	GC 1115	11/15/2016	11/22/2016	629374	6230294		Garbage Creek	4.42	Wet Coarse Rock with Sediment	3.86	1750	3.77	2850	2.98
B6A4530	QC1595	GC 1116	11/16/2016	11/22/2016	629255	6230544		Garbage Creek	3.795	Wet Coarse Rock with Sediment	3.44	2140	3.44	3680	1.28
B6A4530	QC1596	GC 1117	11/17/2016	11/22/2016	629255	6230544		Garbage Creek	3.795	Wet Coarse Rock with Sediment	3.31	1950	2.99	3390	3.1
B6A5075	QC5593	GC 1118	11/18/2016	11/23/2016	629255	6230544		Garbage Creek	2.927	Wet Sediment	3.84	2120	3.62	2620	1.74
B6A5075	QC5594	GC 1119	11/19/2016	11/23/2016	629255	6230544		Garbage Creek	4.625	Wet Sediment	4.23	1840	3.84	2380	2.13
B6A9568	QF2391	GC 1130	11/30/2016	12/6/2016				Garbage Creek	5.4	Wet Sediment / Rock	3.63	2020	3.56	2570	1.18
B6A0421	PZ6236	GC-02	11/1/2016	11/9/2016	629159	6230665		Garbage Creek	1.787	Wet Sediment	3.63	2060	3.39	1990	1.06
B6A0421	PZ6237	GC-04	11/1/2016	11/9/2016	629159	6230665		Garbage Creek	1.194	Wet Sediment	3.98	470	3.68	488	1.02
B6A0421	PZ6260	GC-1102	11/2/2016	11/9/2016	629274.2	6230510	436	Garbage Creek	2.848	Wet Sediment with Rock	5.17	1310	5.71	1470	0.73
B6A0810	PZ8612	GC-1107	11/7/2016	11/10/2016				Garbage Creek	4.969	Wet Coarse Rock with sediment	3.18	1440	3.06	2760	2.05
B6A0810	PZ8613	GC-1108	11/8/2016	11/10/2016				Garbage Creek	4.906	Wet Coarse Rock with sediment	3.44	1110	3.43	2570	1.16
B700746	QI9353	GC-1219-01	12/19/2016	1/4/2017	629278	6230507	434	Garbage Creek	1.465	Wet Coarse Rock/Sediment	3.50				0.56
B700746	QI9354	GC-1219-02	12/19/2016	1/4/2017	629279	6230550		Garbage Creek	1.845	Wet Coarse Rock/Sediment	3.89				3.35
B700746	QI9355	GC-1219-03	12/19/2016	1/4/2017	629252	6230572	444	Garbage Creek	1.543	Wet Coarse Rock/Sediment	3.78				1.71
B686972	PR3473	LXSP-2	9/27/2016	10/4/2016	629765	6230045		LBEX pond	5.320	Wet Sediment with Rock	6.59		4.48		1.24
B695587	PW6082	LBHR-2	10/18/2016	10/24/2016	629344	6230568		Garbage Creek	0.409	Wet Sediment w/ Rock	3.56		3.47	1860	1.25
B686972	PR3468	R5B-T18	9/27/2016	10/4/2016	628798	6229848		RSEM R5b TPSA (large)	1.114	Wet Sediment with Rock			6.84		
B686972	PR3470	R5B-T1-D	9/27/2016	10/4/2016	628802	6229872		RSEM R5b TPSA (large)	2.084	Wet Sediment with Rock			3.4		
B686972	PR3471	R5B-T21-D	9/27/2016	10/4/2016	628791	6229856		RSEM R5b TPSA (large)	2.111	Wet Sediment with Rock			3.53		
B686972	PR3469	R5B-T23	9/27/2016	10/4/2016	628682	6229938		RSEM R5b TPSA (small)	1.086	Wet Sediment with Rock			7.47		
B686972	PR3472	R5B-T8-D	9/27/2016	10/4/2016	628737	6229902		RSEM R5b TPSA (large)	2.370	Wet Sediment with Rock			3.43		
B690159	PT2804	RBDT PAG PILE #1	10/7/2016	10/7/2016	631623	6229160		RBDT	7.1	Wet Coarse Rock	7.28		5.47		1.38
B690159	PT2805	RBDT PAG PILE #2	10/7/2016	10/7/2016	631623	6229160		RBDT	7.75	Wet Coarse Rock	6.35		5.05		1.35
B690159	PT2806	RBDT PAG PILE #3	10/7/2016	10/7/2016	631623	6229160		RBDT	5.68	Wet Coarse Rock	7.78		6.51		1.56
B6B0926	QG0882	RBDT-1207-01	12/7/2016	12/1/2016	631623	6229160		RBDT	4.228	Wet Coarse Mudstone/Overburden	5.4		4.97		1.24
B6B0926	QG0883	RBDT-1207-02	12/7/2016	12/1/2016	631623	6229160		RBDT	2.231	Wet Coarse Mudstone/Overburden	6.7		6.4		1.01
B6B0926	QG0884	RBDT-1207-03	12/7/2016	12/1/2016	631623	6229160		RBDT	3.917	Wet Coarse Mudstone/Overburden	7.58		7.15		1.32
B6A0421	PZ6238	RBRDKM2.75-03	10/29/2016	11/9/2016	628664	6229690		RB Access Road	2.377	Wet Coarse Rock	4.34	232	4.08	129	0.65
B6A0421	PZ6239	RBRDKM2.75-07	10/29/2016	11/9/2016	628599	6229689		RB Access Road	0.725	Wet Coarse Rock	6.78	480	7.55	268	0.4
B6B2271	QG7323	WM1212-1	12/12/2016	12/16/2016	627923	6230924	410	R5a Access Road	3.651	Wet Coarse Rock/Sediment	5.52				0.58
B6B2271	QG7324	WM1212-2	12/12/2016	12/16/2016	628037	6230799	408	R5a Access Road	3.421	Wet Coarse Rock/Sediment	4.55				0.41
B6B1573	QG3840	WMRD0.75K-2016-12-09-01	12/9/2016	12/4/2016	628225	6230462	410	R5a Access Road	1.674	Wet/Frozen Mudstone	3.55				1.15
B6B1573	QG3841	WMRD0.75K-2016-12-09-02	12/9/2016	12/4/2016	628219	6230441	409	R5a Access Road	1.323	Wet/Frozen Mudstone	7.02				1.19
B6B1573	QG3842	WMRD0.75K-2016-12-09-03	12/9/2016	12/4/2016	628214	6230415	411	R5a Access Road	3.023	Wet/Frozen Mudstone	3.68				0.98
B689266	PS7784	MR-2	10/16/2016		628506	6229979		MRB South Abutment	2.569	Wet Coarse Rock	7.18				0.17

Appendix 2.C-1 Acid Base Accounting and Total Metal Content of ARD

Maxxam Report Id	Maxxam Sample No	Sample ID	Na2CO3 Extractable Sulphur	HCl Extractable Sulphur	HNO3 Extractable Sulphur	Non Extractable Sulphur (by diff.)	Acid Generation Potential	Mod. ABA Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As
			wt%	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%	ppm
B6A0421	PZ6250	457-01	0.12	0.07	1.3	0.47	40.6	5.8	NONE	-34.8	0.1										
B6A0421	PZ6251	457-02	0.11	0.05	1.25	0.39	39.1	8.3	NONE	-30.8	0.2										
B6A0421	PZ6252	457-03	0.12	0.07	1.16	0.42	36.3	10	NONE	-26.3	0.3										
B6A0421	PZ6253	457-04	0.11	0.07	1.13	0.46	35.3	6.8	NONE	-28.5	0.2										
B6A0421	PZ6254	457-05	0.14	0.09	1.23	0.44	38.4	5.8	NONE	-32.6	0.2										
B6A0421	PZ6255	457-06	0.12	0.07	1.27	0.54	39.7	7.8	NONE	-31.9	0.2										
B6A0421	PZ6256	457-07	0.09	0.04	1.3	0.52	40.6	6.3	NONE	-34.3	0.2										
B6A0421	PZ6257	457-08	0.1	0.05	1.31	0.49	40.9	7.5	NONE	-33.4	0.2										
B6A0421	PZ6258	457-09	0.09	0.04	1.3	0.5	40.6	6.8	NONE	-33.8	0.2										
B6A0421	PZ6259	457-10	0.12	0.07	1.4	0.48	43.8	6.3	NONE	-37.5	0.1										
B6A0421	PZ6230	460-01	0.09	0.04	1.28	0.64	40	8	NONE	-32	0.2										
B6A0421	PZ6233	460-01	0.12	0.05	1.65	0.48	51.6	7.8	NONE	-43.8	0.2										
B6A0421	PZ6231	460-02	0.1	0.03	1.77	0.58	55.3	8.3	NONE	-47	0.2										
B6A0421	PZ6232	460-03	0.09	0.02	1.59	0.54	49.7	8.3	NONE	-41.4	0.2										
B6A0421	PZ6234	460-05	0.11	0.06	1.43	0.46	44.7	10.3	NONE	-34.4	0.2										
B6A0421	PZ6235	460-06	0.09	0.04	1.5	0.43	46.9	7.8	NONE	-39.1	0.2										
B6A0421	PZ6240	460-07	0.09	0.03	1.39	0.59	43.4	7	NONE	-36.4	0.2										
B6A0421	PZ6241	460-08	0.18	0.13	1.43	0.58	44.7	6.5	NONE	-38.2	0.1										
B6A0421	PZ6242	460-09	0.12	0.08	1.26	0.51	39.4	24.5	SLIGHT	-14.9	0.6										
B6A0421	PZ6243	460-10	0.1	0.06	1.33	0.53	41.6	9.3	NONE	-32.3	0.2										
B6A0421	PZ6244	460-11	0.09	0.04	1.36	0.5	42.5	9	NONE	-33.5	0.2										
B6A0421	PZ6245	460-12	0.08	0.03	1.26	0.59	39.4	7.5	NONE	-31.9	0.2										
B6A0421	PZ6246	460-13	0.16	0.1	1.34	0.57	41.9	7	NONE	-34.9	0.2										
B6A0421	PZ6247	460-14	0.06	0.03	1.32	0.5	41.3	7.5	NONE	-33.8	0.2										
B6A0421	PZ6248	460-15	0.09	0.03	1.52	0.5	47.5	9	NONE	-38.5	0.2										
B6A0421	PZ6249	460-16	0.08	0.03	1.35	0.56	42.2	9.3	NONE	-32.9	0.2										
B692401	PU6275	AC-1	0.06	0.03	1.32	0.53	41.3	10.5	NONE	-30.8	0.3										
B6B0926	QG0874	AC-1125-1	0.09	0.06	0.78	0.24	24.4	3.5	NONE	-20.9	0.1	1.51	33.2	16	120	370	27.3	8	59	1.9	12.1
B6B0926	QG0875	AC-1125-10	0.08	0.04	1.27	0.55	39.7	7.5	NONE	-32.2	0.2	4.23	37.7	16.7	137	416	34.5	9	76	2.21	13.7
B6B0926	QG0872	AC-1125-11	0.08	0.04	1.28	0.45	40	6.8	NONE	-33.2	0.2	3.94	38.1	17.5	140	454	33.3	8.7	66	2.1	13.9
B6B0926	QG0879	AC-1125-12	0.12	0.08	1.32	0.56	41.3	9	NONE	-32.3	0.2	4.04	39.7	18.2	145	465	32.8	8.6	98	2.17	13.7
B6B0926	QG0880	AC-1125-2	0.09	0.04	1.31	0.55	40.9	7.8	NONE	-33.1	0.2	4.78	40.1	18.8	158	484	35.8	9.5	72	2.32	14.4
B6B0926	QG0870	AC-1125-3	0.08	0.03	1.02	0.37	31.9	9.5	NONE	-22.4	0.3	1.2	29.2	14.5	104	372	25.1	7.4	68	1.81	12.7
B6B0926	QG0871	AC-1125-4	0.09	0.04	1.3	0.53	40.6	8.5	NONE	-32.1	0.2	3.94	37.2	16.3	132	433	32.5	8.8	71	2.13	13.5
B6B0926	QG0876	AC-1125-5	0.09	0.06	1.11	0.46	34.7	7.8	NONE	-26.9	0.2	2.52	31.8	16	112	417	29.8	9.9	63	1.86	13.1
B6B0926	QG0873	AC-1125-6	0.08	0.03	1.32	0.53	41.3	8.5	NONE	-32.8	0.2	3.95	38.7	18.2	143	445	32.8	8.8	67	2.19	14
B6B0926	QG0878	AC-1125-7	0.09	0.06	1.25	0.48	39.1	6	NONE	-33.1	0.2	4.08	40.2	18.5	167	458	34.3	9.2	66	2.11	14
B6B0926	QG0877	AC-1125-8	0.09	0.06	1.29	0.45	40.3	6.3	NONE	-34	0.2	3.75	36.9	17.7	143	427	33.1	9	71	2.16	13.9
B6B0926	QG0881	AC-1125-9	0.09	0.06	1.27	0.47	39.7	7.3	NONE	-32.4	0.2	3.48	38.2	18.2	140	437	34.4	9.7	70	2.2	14.8
B6B1573	QG3823	AC-1210-1	0.21	0.04	1.49	0.52	46.6	12	NONE	-34.6	0.3	4.33	39.7	18.3	147	481	33.9	9	66	2.26	14
B6B1573	QG3832	AC-1210-10	0.12	0.03	1.25	0.45	39.1	17	NONE	-22.1	0.4	3.28	36.2	16.8	177	414	30.9	8.2	158	3.79	13.6
B6B1573	QG3834	AC-1210-12	0.13	0.03	1.3	0.49	40.6	9	NONE	-31.6	0.2	4.35	41.2	18	156	461	35.3	9.4	76	2.3	14.7
B6B1573	QG3835	AC-1210-13	0.12	0.03	1.39	0.51	43.4	8.8	NONE	-34.7	0.2	4.39	40	17.5	147	461	36.8	9.8	70	2.3	14.1
B6B1573	QG3836	AC-1210-14	0.13	0.04	1.25	0.48	39.1	8.8	NONE	-30.3	0.2	3.31	39.2	17.6	143	447	34.5	9.1	72	2.19	13.6
B6B1573	QG3837	AC-1210-15	0.13	0.04	1.31	0.5	40.9	9	NONE	-31.9	0.2	3.96	40	18	145	441	36.7	9.6	72	2.26	14.1
B6B1573	QG3838	AC-1210-16	0.16	0.05	1.35	0.56	42.2	7.8	NONE	-34.5	0.2	4.09	40	18.6	150	473	36.9	9.5	78	2.38	15.7
B6B1573	QG3839	AC-1210-17	0.14	0.04	1.33	0.57	41.6	11.5	SLIGHT	-30.1	0.3	4.48	39.3	17.8	144	465	36.1	9.3	74	2.33	15.1
B6B1573	QG3824	AC-1210-2	0.18	0.04	1.49	0.43	46.6	8.3	NONE	-38.4	0.2	4.19	40.1	18.8	140	482	33.7	8.9	60	2.13	14.4
B6B1573	QG3825	AC-1210-3	0.14	0.04	1.27	0.52	39.7	8.8	NONE	-31	0.2	3.76	40.3	18.6	155	483	33.7	8.9	64	2.21	13.7
B6B1573	QG3826	AC-1210-4	0.15	0.04	1.3	0.51	40.6	8.8	NONE	-31.9	0.2	3.92	39	18.2	137	462	34.3	9.2	58	2.17	14.3
B6B1573	QG3827	AC-1210-5	0.15	0.04	1.26	0.51	39.4	7.8	NONE	-31.7	0.2	3.88	40.7	18.6	159	460	34	9.2	64	2.19	14.2
B6B1573	QG3828	AC-1210-6	0.12	0.04	1.16	0.45	36.3	31	NONE	-5.3	0.9	3.97	33.8	15.6	181	388	28.5	7.2	260	6.21	12.6
B6B1573	QG3829	AC-1210-7	0.15	0.04	1.24	0.5	38.8	6.8	NONE	-32.1	0.2	4.02	40.1	18.7	152	471	35	8.8	70	2.24	14.6
B6B1573	QG3830	AC-1210-8	0.15	0.03	1.31	0.55	40.9	9.3	NONE	-31.7	0.2	4.51	39.5	18	149	461	34.4	9.1	77	2.41	14.5
B6B1573	QG3831	AC-1210-9	0.11	0.03	1.31	0.49	40.9	8.5	NONE	-32.4	0.2	4.42	39.8	18.3	139	461	37.2	9.8	76	2.29	13.9
B6B4401	QI0707	AC-1213-01	0.09	0.06	1.1	0.53	34.4	11.8	NONE	-22.6	0.3	2.89	32.4	62.1	199	667	30.1	8.5	80	1.93	15.1
B6B4401	QI0708	AC-1213-02	0.1	0.09	1.09	0.53	34.1	6.3	NONE	-27.8	0.2	2.93	34.1	19.9	134	427	30.9	8.8	73	1.97	13.7
B6B4401	QI0709	AC-1213-03	0.1	0.08	1.2	0.59	37.5	7.3	NONE	-30.2	0.2	3.25	37.3	17.9	118	418	30.7	9.4	71	2.10	13.2
B700742	QI9307	AC-1213-04	0.12	0.08	1.16	0.46	36.3	8.00	NONE	-28.3	0.2	2.66	34.7	19.6	131	428	32.4	9.0	67	1.95	13.5
B6B4401	QI0710	AC-1213-05	0.1	0.08	1.05	0.42	32.8	6.3	NONE	-26.5	0.2	1.89	28.8	16.4	105	381	26.6	7.9	128	2.49	12.4
B6B4401	QI0711	AC-1213-06	0.1	0.08	1.04	0.46	32.5	6	NONE	-26.5	0.2	1.85	28.3	16.7	107	393	26.4	7.4	62	1.79	12.0
B6B4401	QI0712	AC-1213-07	0.09	0.07	0.93	0.49	29.1	6.8	NONE	-22.3	0.2	1.26	27.2	15.3	98.3	352	24.1	6.9	59	1.66	11.7
B6B4401	QI0713	AC-1213-08	0.1	0.08	1.21	0.57	37.8	8.3	NONE	-29.5	0.2	2.88	31.4	17.0	128	402	29.9	9.4	66	1.98	13.8
B6B4401	QI0714	AC-1213-09	0.11	0.09	1.29	0.68	40.3	5	NONE	-35.3	0.1	4.33	37.7	18.7	132	459	30.1	8.6	64	2.13	13.6
B6B4401	QI0715	AC-1213-10	0.12	0.1	1.38	0.63	43.1	5.3	NONE	-37.8	0.1	4.39	36.8	18.4	121	451	33.0	9.0	65	2.22	13.7
B6B4401	QI0716	AC-1213-11	0.1	0.08	1.43	0.53	44.7	6.3	NONE	-38.4	0.1	4.42	37.2	18.9	140	444	32.6	8.8	72	2.20	13.6

Appendix 2.C-1 Acid Base Accounting and Total Metal Content of ARD

Maxxam Report Id	Maxxam Sample No	Sample ID	Na2CO3 Extractable Sulphur	HCl Extractable Sulphur	HNO3 Extractable Sulphur	Non Extractable Sulphur (by diff.)	Acid Generation Potential	Mod. ABA Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As
			wt%	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%	ppm
B700742	QI9308	AC-1213-12	0.11	0.07	1.21	0.61	37.8	7.30	NONE	-30.5	0.2	4.54	37.5	17.6	147	459	32.7	8.4	72	2.22	14.3
B692401	PU6276	AC-2	0.07	0.02	1.21	0.63	37.8	10.3	NONE	-27.5	0.3										
B692401	PU6277	AC-3	0.07	0.03	1.51	0.55	47.2	11.5	NONE	-35.7	0.2										
B692401	PU6278	AC-4	0.11	0.06	0.99	0.36	30.9	6.3	NONE	-24.6	0.2										
B692401	PU6279	AC-5	0.08	0.04	1	0.32	31.3	17.5	SLIGHT	-13.8	0.6										
B692401	PU6280	AC-6	0.08	0.04	1.2	0.42	37.5	19.3	SLIGHT	-18.2	0.5										
B692401	PU6281	AC-7	0.09	0.01	0.73	1.05	22.8	9.8	NONE	-13	0.4										
B692401	PU6282	AC-8	0.08	0.04	1.29	0.58	40.3	8.5	NONE	-31.8	0.2										
B692401	PU6283	AC-9	0.07	0.02	1.34	0.51	41.9	11.3	NONE	-30.6	0.3										
B686972	PR3466	AREA 20-16																			
B686972	PR3467	AREA 20-2																			
B686972	PR3465	AREA 20-9																			
B6A0409	PZ6131	GC-1104	1.03	0.97	0.04	0.17	1.3	-2.8	NONE	-4.1	-2.2										
B6A0409	PZ6132	GC-1105	0.93	0.78	0.04	0.37	1.3	-5	NONE	-6.3	-3.8										
B6A0409	PZ6133	GC-1106	1.12	0.93	0.03	0.25	0.9	-5.3	NONE	-6.2	-5.9										
B6A0421	PZ6261	GC-1103	1.14	0.99	0.04	0.13	1.3	-10.3	NONE	-11.6	-7.9										
B6A2614	QB0868	GC 1109	1.1	0.93	0.03	0.22	0.9	12.5	SLIGHT	11.6	13.9										
B6A2614	QB0869	GC 1110	1.3	1.19	0.02	0.28	0.6	-9.3	NONE	-9.9	-15.5										
B6A2614	QB0870	GC 1111	0.9	0.83	0.98	0.49	30.6	-6.5	NONE	-37.1	-0.2										
B6A2614	QB0871	GC 1112	1.87	1.84	0.15	0.54	4.7	-12.8	NONE	-17.5	-2.7										
B6A2614	QB0872	GC 1113	1.97	1.8	0.04	0.22	1.3	-7.5	NONE	-8.8	-5.8										
B6A4530	QC1593	GC 1114	1.71	1.69	0.08	0.42	2.5	-2.8	NONE	-5.3	-1.1										
B6A4530	QC1594	GC 1115	0.48	0.32	1.83	0.83	57.2	-7.8	NONE	-65	-0.1										
B6A4530	QC1595	GC 1116	1.05	0.95	0.04	0.29	1.3	-8	NONE	-9.3	-6.2										
B6A4530	QC1596	GC 1117	1.82	1.79	0.71	0.6	22.2	-12.8	NONE	-35	-0.6										
B6A5075	QC5593	GC 1118	1.71	1.41	0.1	0.23	3.1	-6.5	NONE	-9.6	-2.1										
B6A5075	QC5594	GC 1119	2.11	1.95	0.09	0.09	2.8	-3.8	NONE	-6.6	-1.4										
B6A9568	QF2391	GC 1130	1.06	0.86	0.07	0.25	2.2	-4.8	NONE	-7	-2.2										
B6A0421	PZ6236	GC-02	0.9	0.85	0.02	0.19	0.6	-8.8	NONE	-9.4	-14.7										
B6A0421	PZ6237	GC-04	0.86	0.83	0.05	0.14	1.6	-5	NONE	-6.6	-3.1										
B6A0421	PZ6260	GC-1102	0.63	0.58	0.02	0.13	0.6	3	NONE	2.4	5.0										
B6A0810	PZ8612	GC-1107	0.92	0.83	0.82	0.4	25.6	-7.8	NONE	-33.4	-0.3										
B6A0810	PZ8613	GC-1108	1.03	0.92	0.02	0.22	0.6	-6.3	NONE	-6.9	-10.5										
B700746	QI9353	GC-1219-01	0.49	0.45	0.03	0.08	0.9	-8.30	NONE	-9.20	-9.2	7.5	15.5	14.3	49.2	166	6.9	2.4	17	1.71	13.9
B700746	QI9354	GC-1219-02	0.41	0.35	2.20	0.80	68.8	-5.00	NONE	-73.8	-0.1	19.3	34.7	17.4	256	355	70.9	18	169	3.42	27.4
B700746	QI9355	GC-1219-03	1.42	1.38	0.07	0.26	2.2	-5.80	NONE	-8.00	-2.6	12.9	7.95	18.5	15.5	204	4.5	0.9	10	2.66	10
B686972	PR3473	LXSP-2	1.12	<0.01	0.04	1.2	1.3	16.8	SLIGHT	15.5	12.9										
B695587	PW6082	LBHR-2	1.05	0.91	0.01	0.33	0.3	-9.3	NONE	-9.6	-31.0										
B686972	PR3468	R5B-T18																			
B686972	PR3470	R5B-T1-D																			
B686972	PR3471	R5B-T21-D																			
B686972	PR3469	R5B-T23																			
B686972	PR3472	R5B-T8-D																			
B690159	PT2804	RBDT PAG PILE #1		0.07	0.98	0.33	30.6	6.3	NONE	-24.3	0.2	3	35.9	18.9	117	500	37.1	8.8	116	2.31	14
B690159	PT2805	RBDT PAG PILE #2		0.1	0.95	0.3	29.7	5.8	NONE	-23.9	0.2	3.8	39.4	18	129	500	33.4	8.3	96	2.38	15.2
B690159	PT2806	RBDT PAG PILE #3		0.06	1.13	0.37	35.3	8.3	NONE	-27	0.2	3.5	36	31.6	141	400	35.4	9	101	2.29	15.6
B6B0926	QG0882	RBDT-1207-01	0.26	0.21	0.7	0.33	21.9	4	SLIGHT	-17.9	0.2	3.16	33	14.8	103	379	26	7.8	230	2.53	11.9
B6B0926	QG0883	RBDT-1207-02	0.18	0.15	0.61	0.25	19.1	21.5	SLIGHT	2.4	1.1	2.99	26.3	13.2	95.4	319	23.1	6.5	228	2.56	12
B6B0926	QG0884	RBDT-1207-03	0.07	0.05	0.91	0.36	28.4	10.8	SLIGHT	-17.6	0.4	3.22	30.7	13.9	105	345	27	7	1910	5.2	18.4
B6A0421	PZ6238	RBRDKM2.75-03	0.54	0.51	0.03	0.11	0.9	-5.3	NONE	-6.2	-5.9										
B6A0421	PZ6239	RBRDKM2.75-07	0.34	0.33	0.01	0.06	0.3	2.5	NONE	2.2	8.3										
B6B2271	QG7323	WM1212-1	0.46	0.44	0.03	0.11	0.9	0.5	NONE	-0.4	0.6	1.79	30.5	16.5	120	325	12.1	4.6	104	2.11	11.4
B6B2271	QG7324	WM1212-2	0.35	0.31	0.02	0.08	0.6	-1.5	NONE	-2.1	-2.5	1.31	34.8	17.3	71.7	282	5.8	2.5	16	1.58	9.8
B6B1573	QG3840	WMRD0.75K-2016-12-09-01	2.04	0.89	0.08	0.18	2.5	-6.3	NONE	-8.8	-2.5	3.13	42.4	18.7	103	397	12.1	4.1	31	2.71	13.8
B6B1573	QG3841	WMRD0.75K-2016-12-09-02	2.18	0.98	0.04	0.17	1.3	7.5	NONE	6.2	5.8	5.83	34.8	15.5	120	218	40.4	12.2	379	3.32	13.7
B6B1573	QG3842	WMRD0.75K-2016-12-09-03	1.65	0.76	0.04	0.18	1.3	-5.5	NONE	-6.8	-4.2	2.69	36.7	17	123	459	12.6	4	41	1.8	11.4
B689266	PS7784	MR-2		0.09	0.03	0.05	0.9	8.50	NONE	7.60	9.4										

Appendix 2.C-1 Acid Base Accounting and Total Metal Content of ARD

Maxxam Report Id	Maxxam Sample No	Sample ID	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	Sc	Tl	Hg	Se	Te	Ga	S
			ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	ppm	%	%	%	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%
B6A0421	PZ6250	457-01																											
B6A0421	PZ6251	457-02																											
B6A0421	PZ6252	457-03																											
B6A0421	PZ6253	457-04																											
B6A0421	PZ6254	457-05																											
B6A0421	PZ6255	457-06																											
B6A0421	PZ6256	457-07																											
B6A0421	PZ6257	457-08																											
B6A0421	PZ6258	457-09																											
B6A0421	PZ6259	457-10																											
B6A0421	PZ6230	460-01																											
B6A0421	PZ6233	460-01																											
B6A0421	PZ6231	460-02																											
B6A0421	PZ6232	460-03																											
B6A0421	PZ6234	460-05																											
B6A0421	PZ6235	460-06																											
B6A0421	PZ6240	460-07																											
B6A0421	PZ6241	460-08																											
B6A0421	PZ6242	460-09																											
B6A0421	PZ6243	460-10																											
B6A0421	PZ6244	460-11																											
B6A0421	PZ6245	460-12																											
B6A0421	PZ6246	460-13																											
B6A0421	PZ6247	460-14																											
B6A0421	PZ6248	460-15																											
B6A0421	PZ6249	460-16																											
B692401	PU6275	AC-1																											
B6B0926	QG0874	AC-1125-1	1.1	<0.2	7.5	44.4	0.36	0.1	0.31	19	0.33	0.065	3.5	13	0.25	81.7	<0.001	<20	0.72	0.018	0.21	<0.1	4.3	0.06	105	0.7	0.07	1.9	1
B6B0926	QG0875	AC-1125-10	1.2	<0.2	6.9	43	0.78	0.12	0.31	21	0.44	0.065	3.7	11.7	0.3	111	<0.001	<20	0.69	0.062	0.22	<0.1	4.2	0.09	89	1.4	0.07	1.9	1.7
B6B0926	QG0872	AC-1125-11	1.2	<0.2	6.7	37.4	0.74	0.12	0.32	20	0.4	0.061	3.6	11.5	0.3	91.5	<0.001	<20	0.65	0.051	0.21	<0.1	4.2	0.08	98	1.4	0.06	1.8	1.66
B6B0926	QG0879	AC-1125-12	1.4	<0.2	6.7	30.2	0.67	0.11	0.35	23	0.6	0.058	3.8	14.4	0.28	92.6	<0.001	<20	0.74	0.019	0.24	<0.1	4.2	0.08	96	1.7	0.07	2.1	1.82
B6B0926	QG0880	AC-1125-2	1.4	<0.2	7.2	42.7	0.87	0.11	0.36	23	0.45	0.067	4.3	13.7	0.32	113	<0.001	<20	0.77	0.051	0.24	<0.1	4.5	0.1	105	1.5	0.08	2.2	1.83
B6B0926	QG0870	AC-1125-3	1	<0.2	6.2	62.7	0.31	0.12	0.27	19	0.38	0.072	3.7	16.4	0.25	112	0.001	<20	0.63	0.222	0.2	<0.1	3.7	0.06	95	0.5	0.06	1.6	1.3
B6B0926	QG0871	AC-1125-4	1.2	0.6	6.5	67.4	0.73	0.1	0.3	21	0.37	0.068	3.8	12.3	0.27	61.6	0.001	<20	0.72	0.172	0.23	<0.1	4.2	0.07	87	1.5	0.08	1.9	1.6
B6B0926	QG0876	AC-1125-5	1.3	0.2	6.4	67.4	0.51	0.11	0.31	19	0.4	0.083	4.4	14.5	0.24	74.8	0.001	<20	0.65	0.171	0.2	<0.1	4	0.09	90	0.9	0.09	1.8	1.47
B6B0926	QG0873	AC-1125-6	1.3	<0.2	6.9	61.5	0.7	0.11	0.36	20	0.38	0.062	3.6	11.6	0.27	65.4	<0.001	<20	0.68	0.13	0.22	<0.1	4.1	0.08	99	1.5	0.07	1.9	1.73
B6B0926	QG0878	AC-1125-7	1.3	<0.2	6.9	49.2	0.87	0.11	0.37	22	0.39	0.06	3.8	13	0.29	123	<0.001	<20	0.73	0.085	0.23	<0.1	4	0.09	90	1.7	0.07	2.1	1.6
B6B0926	QG0877	AC-1125-8	1.3	0.5	6.7	57	0.78	0.11	0.35	21	0.39	0.062	3.5	12.4	0.28	61.2	<0.001	<20	0.68	0.117	0.21	<0.1	4.2	0.07	91	1.5	0.08	1.8	1.67
B6B0926	QG0881	AC-1125-9	1.3	<0.2	6.8	66.8	0.71	0.11	0.35	22	0.37	0.067	4.1	12.6	0.28	67.9	<0.001	<20	0.74	0.156	0.23	<0.1	4.4	0.08	95	1.5	0.06	2.1	1.68
B6B1573	QG3823	AC-1210-1	1.4	<0.2	6.6	36.2	0.74	0.13	0.34	23	0.6	0.06	3.8	13.1	0.29	95.6	<0.001	<20	0.74	0.042	0.24	<0.1	4.3	0.09	104	1.6	0.06	2.2	1.91
B6B1573	QG3832	AC-1210-10	1.3	<0.2	6.6	62.6	0.72	0.1	0.32	25	0.5	0.065	4.3	12.9	0.54	57.3	<0.001	<20	0.78	0.144	0.23	<0.1	4.9	0.07	97	1.4	0.08	2	1.61
B6B1573	QG3834	AC-1210-12	1.4	<0.2	7.2	77.7	0.9	0.1	0.35	25	0.4	0.073	4.4	15	0.31	56.8	0.001	<20	0.84	0.195	0.26	<0.1	4.8	0.07	97	1.6	0.07	2.2	1.73
B6B1573	QG3835	AC-1210-13	1.3	<0.2	6.7	74.9	0.77	0.1	0.34	24	0.36	0.066	4	13.6	0.28	59.4	0.001	<20	0.77	0.206	0.24	<0.1	4.5	0.09	93	1.6	0.08	2.1	1.8
B6B1573	QG3836	AC-1210-14	1.3	<0.2	6.9	77.2	0.78	0.1	0.33	24	0.35	0.067	4	13.8	0.29	63.3	<0.001	<20	0.78	0.211	0.24	<0.1	4.6	0.07	89	1.2	0.07	2	1.61
B6B1573	QG3837	AC-1210-15	1.3	<0.2	6.8	74.9	0.81	0.09	0.34	24	0.37	0.068	4.2	13.6	0.28	50.9	<0.001	<20	0.79	0.2	0.24	<0.1	4.3	0.08	97	1.7	0.08	2	1.74
B6B1573	QG3838	AC-1210-16	1.3	<0.2	6.9	76.7	0.82	0.1	0.34	25	0.36	0.066	4.2	14.5	0.29	45.6	<0.001	<20	0.8	0.199	0.24	<0.1	4.6	0.07	110	1.5	0.08	2.1	1.89
B6B1573	QG3839	AC-1210-17	1.4	<0.2	6.9	80.3	0.76	0.11	0.33	25	0.51	0.069	4.2	15.1	0.28	58.7	0.001	<20	0.82	0.19	0.25	<0.1	4.5	0.08	101	1.6	0.07	2.2	1.8
B6B1573	QG3824	AC-1210-2	1.4	<0.2	6.8	43.8	0.7	0.13	0.34	21	0.44	0.059	3.6	12.4	0.29	87.6	<0.001	<20	0.72	0.064	0.23	<0.1	4.2	0.09	102	1.6	0.08	1.9	1.71
B6B1573	QG3825	AC-1210-3	1.3	0.3	6.4	48.2	0.77	0.1	0.34	24	0.47	0.06	3.7	13.8	0.29	90	<0.001	<20	0.81	0.075	0.25	<0.1	4.4	0.08	95	1.7	0.08	2.2	1.75
B6B1573	QG3826	AC-1210-4	1.3	0.3	6.6	46.8	0.68	0.11	0.33	23	0.41	0.061	3.9	14.4	0.3	115	<0.001	<20	0.77	0.075	0.24	<0.1	4.4	0.09	103	1.5	0.06	2.1	1.76
B6B1573	QG3827	AC-1210-5	1.3	<0.2	6.7	52.4	0.75	0.09	0.35	24	0.43	0.066	4	14.2	0.29	85.9	<0.001	<20	0.79	0.09	0.24	<0.1	4.5	0.07	107	1.6	0.07	2.1	1.72
B6B1573	QG3828	AC-1210-6	1.3	<0.2	5.8	52.8	0.68	0.11	0.28	26	0.68	0.056	4.4	12.5	0.94	134	0.001	<20	0.72	0.1	0.22	<0.1	4.8	0.09	85	1.1	0.07	1.9	1.48
B6B1573	QG3829	AC-1210-7	1.3	<0.2	7.2	58.6	0.78	0.08	0.35	25	0.4	0.067	4.2	16.3	0.31	91.8	<0.001	<20	0.84	0.099	0.26	<0.1	4.5	0.07	101	1.6	0.07	2.4	1.75
B6B1573	QG3830	AC-1210-8	1.4	0.4	7	56.9	0.79	0.08	0.35	25	0.47	0.07	4.4	14.2	0.32	64.6	<0.001	<20	0.84	0.111	0.25	<0.1	4.6	0.08	107	1.5	0.09	2.3	1.85
B6B1573	QG3831	AC-1210-9	1.4	<0.2	7.1	63.4	0.81	0.12	0.33	24	0.42	0.072	4.2	13.7	0.31	92.4	<0.001	<20	0.8	0.123	0.24	<0.1	4.5	0.09	103	1.4	0.07	2.1	1.75
B6B4401	QI0707	AC-1213-01	1.3	0.4	6.7	67.4	0.96	0.67	0.36	23	0.59	0.078	4.2	15.9	0.25	268	0.001	<20	0.73	0.153	0.24	<0.1	4.3	0.11	91	1.2	0.07	2.1	1.41
B6B4401	QI0708	AC-1213-02	1.4	1.0	7.1	66.9	0.66	0.22	0.34	21	0.39	0.087	4.1	13.8	0.25	232	0.001	<20	0.70	0.154	0.22	<0.1	4.0	0.13	87	1.2	0.08	1.9	1.49
B6B4401	QI0709	AC-1213-03	1.5	<0.2	7.0	62.4	0.61	0.20	0.33	23	0.44	0.084	4.5	13.2	0.25	238	0.001	<20	0.75	0.140	0.24	<0.1	4.1	0.13	77	1.2	0.06	2.1	1.62
B700742	QI9307	AC-1213-04	1.3	0.7	6.6	64.8	0.63	0.18	0.33	21	0.45	0.072	4.5	15.7	0.24	294	0.001	<20	0.73	0.137	0.23	<0.1	4.2	0.15	96	1.0	0.08	2.1	1.54
B6B4401	QI0710	AC-1213-05	1.1	0.5	6.6	54.7	0.43	0.19	0.28	20	0.42	0.067	3.9	13.0	0.34	257	0.001	<20	0.66	0.120	0.22	<0.1	3.9	0.12	86	0.7	0.07	1.9	1.30
B6B4401	QI0711	AC-1213-06	1.2	0.2	6.3	53.1	0.50	0.19	0.27	21	0.39	0.068	3.8	13.6	0.22	265	0.001	<20	0.67	0.108	0.22	<0.1	3.8	0.11	78	0.9	0.06	1.7	1.36
B6B4401	QI0712	AC-1213-07	1.1	0.3	6.2	52.4	0.35	0.20	0.25	20	0.39	0.074	3.9	13.5	0.21	303	0.001	<20	0.63	0.109	0.21	<0.1	3.6	0.11	92	0.6	0.06	1.8	1.23
B6B4401	QI0713	AC-1213-08	1.3	<0.2	6.7	56.3	0.59	0.19	0.30	22	0.49	0.081	4.2	15.4	0.24	245	0.001	<20	0.68	0.107	0.22	<0.1	4.0	0.14	87	1.2	0.06	2.1	1.58
B6B4401	QI0714	AC-1213-09	1.3	<0.2	7.1	58.4	0.90	0.18	0.33	23	0.40	0.063	3.9	12.0	0.26	208	<0.001	<20	0.75	0.123	0.25	<0.1	4.3	0.13	91	1.6	0.08	1.9	1.76
B6B4401	QI0715	AC-1213-10	1.3	0.6	6.9	55.6	0.75	0.18	0.35	23	0.39	0.066	4.1	11.8	0.27	246	0.001	<20	0.77	0.123	0.25	<0.1	4.2	0.15	92	1.4	0.07	2.0	1.79
B6B4401	QI0716	AC-1213-11	1.3	<0.2	7.5	40.8	0.83	0.20	0.33	24	0.46	0.068	4.1	11.6	0.28	206	0.001	<20	0.77	0.052	0.25	<0.1	4.2	0.14	88	1.6	0.07	2.3	1.73

Appendix 2.C-1 Acid Base Accounting and Total Metal Content of ARD

Maxxam Report Id	Maxxam Sample No	Sample ID	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	Sc	Tl	Hg	Se	Te	Ga	S
			ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	ppm	%	%	%	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%
B700742	QI9308	AC-1213-12	1.3	0.6	6.7	38.9	0.86	0.14	0.33	23	0.47	0.071	4.3	13.2	0.30	186	<0.001	<20	0.79	0.045	0.26	<0.1	4.5	0.15	94	1.6	0.08	2.2	1.79
B692401	PU6276	AC-2																											
B692401	PU6277	AC-3																											
B692401	PU6278	AC-4																											
B692401	PU6279	AC-5																											
B692401	PU6280	AC-6																											
B692401	PU6281	AC-7																											
B692401	PU6282	AC-8																											
B692401	PU6283	AC-9																											
B686972	PR3466	AREA 20-16																											
B686972	PR3467	AREA 20-2																											
B686972	PR3465	AREA 20-9																											
B6A0409	PZ6131	GC-1104																											
B6A0409	PZ6132	GC-1105																											
B6A0409	PZ6133	GC-1106																											
B6A0421	PZ6261	GC-1103																											
B6A2614	QB0868	GC 1109																											
B6A2614	QB0869	GC 1110																											
B6A2614	QB0870	GC 1111																											
B6A2614	QB0871	GC 1112																											
B6A2614	QB0872	GC 1113																											
B6A4530	QC1593	GC 1114																											
B6A4530	QC1594	GC 1115																											
B6A4530	QC1595	GC 1116																											
B6A4530	QC1596	GC 1117																											
B6A5075	QC5593	GC 1118																											
B6A5075	QC5594	GC 1119																											
B6A9568	QF2391	GC 1130																											
B6A0421	PZ6236	GC-02																											
B6A0421	PZ6237	GC-04																											
B6A0421	PZ6260	GC-1102																											
B6A0810	PZ8612	GC-1107																											
B6A0810	PZ8613	GC-1108																											
B700746	QI9353	GC-1219-01	1.8	2.5	4.5	25.5	0.21	0.23	0.3	14	0.05	0.034	3.7	9.8	0.05	293	<0.001	<20	0.57	0.049	0.24	<0.1	4.4	0.25	62	1.4	0.06	2.2	0.52
B700746	QI9354	GC-1219-02	3.1	<0.2	6.1	47.3	1.21	0.45	0.34	27	0.45	0.066	4.8	17.9	0.2	150	0.002	<20	1.06	0.008	0.23	<0.1	4.4	0.25	101	3	0.11	2.4	3.24
B700746	QI9355	GC-1219-03	0.6	2.3	4.4	97.1	0.11	0.23	0.27	33	0.41	0.04	8.1	16.4	0.05	370	<0.001	<20	1.09	0.138	0.55	<0.1	1.2	0.34	124	9.1	0.08	3.3	1.56
B686972	PR3473	LXSP-2																											
B695587	PW6082	LBHR-2																											
B686972	PR3468	R5B-T18																											
B686972	PR3470	R5B-T1-D																											
B686972	PR3471	R5B-T21-D																											
B686972	PR3469	R5B-T23																											
B686972	PR3472	R5B-T8-D																											
B690159	PT2804	RBDT PAG PILE #1	1.1	<0.5	6	57	0.4	0.1	0.3	26	0.39	0.071	4	22	0.35	257	0.002	<20	0.88	0.084	0.27	<0.1	4.4	<0.1	120	1.2	<0.2	2	1.36
B690159	PT2805	RBDT PAG PILE #2	1.2	<0.5	6.4	53	0.6	0.1	0.3	24	0.41	0.068	4	18	0.31	254	0.001	<20	0.84	0.053	0.26	<0.1	4.8	0.1	170	1.7	<0.2	2	1.34
B690159	PT2806	RBDT PAG PILE #3	1.1	<0.5	6	64	0.5	0.1	0.3	26	0.45	0.067	4	21	0.31	207	0.002	<20	0.9	0.107	0.27	<0.1	4.5	0.1	180	1.8	<0.2	2	1.5
B6B0926	QG0882	RBDT-1207-01	1.5	<0.2	6.1	48.3	0.57	0.17	0.26	23	0.53	0.081	4.6	22.5	0.25	221	0.002	<20	0.72	0.029	0.2	<0.1	3.9	0.1	98	1.1	0.07	2	1.12
B6B0926	QG0883	RBDT-1207-02	1	0.4	5.2	46.1	0.5	0.2	0.23	25	1.06	0.072	4.7	33.4	0.33	306	0.005	<20	0.68	0.036	0.19	<0.1	3.8	0.1	70	0.8	0.06	2.1	0.89
B6B0926	QG0884	RBDT-1207-03	1	0.2	5.3	52.3	0.52	0.18	0.25	23	0.58	0.084	3.8	26.3	0.32	174	0.003	<20	0.67	0.052	0.2	<0.1	3.7	0.09	77	1	0.06	1.8	1.21
B6A0421	PZ6238	RBRDKM2.75-03																											
B6A0421	PZ6239	RBRDKM2.75-07																											
B6B2271	QG7323	WM1212-1	1.1	1.7	6.6	49.5	0.52	0.18	0.29	22	0.57	0.087	3.6	16.7	0.16	468	0.002	<20	0.65	0.048	0.23	<0.1	4.1	0.16	89	0.6	0.04	1.9	0.5
B6B2271	QG7324	WM1212-2	0.9	1.7	6	56.4	0.05	0.13	0.34	19	0.19	0.064	3.1	11.2	0.09	505	0.002	<20	0.52	0.067	0.23	<0.1	4	0.1	82	1	0.06	1.9	0.35
B6B1573	QG3840	WMRD0.75K-2016-12-09-01	1.8	0.4	8.2	114	0.17	0.12	0.3	24	0.85	0.104	4.4	13.1	0.09	150	0.001	<20	0.62	0.089	0.26	<0.1	4.9	0.17	107	1.3	0.08	2	1.13
B6B1573	QG3841	WMRD0.75K-2016-12-09-02	1.8	0.4	5.7	76	1.01	0.21	0.3	29	1.22	0.067	6.9	19.9	0.35	258	0.003	<20	0.9	0.073	0.23	<0.1	4.1	0.2	59	1	0.05	2.7	1.17
B6B1573	QG3842	WMRD0.75K-2016-12-09-03	0.6	0.3	6.6	63.4	0.14	0.1	0.3	22	0.69	0.07	3.8	12.4	0.14	272	0.001	<20	0.68	0.021	0.26	<0.1	3.3	0.13	113	1.1	0.06	2.1	0.87
B689266	PS7784	MR-2																											

Appendix 2.C-2: Field Rinse pH Monitoring Results

SampleID	SampleLocation	Field Rinse pH	Field Temperature	Lab Paste pH	Lab Rinse pH	Date_Sampled	Easting	Northing	Elevation masl	Date_Analyzed
AC-1125-1	Approach Channel	6.39	19	6.89		11/25/2016	629532	6229138	440	12/7/2016
AC-1125-10	Approach Channel	7.62	19	7.62		11/25/2016	629532	6229012	450	12/7/2016
AC-1125-11	Approach Channel	6.45	19	7.74		11/25/2016	629436	6229060	454	12/7/2016
AC-1125-12	Approach Channel	7.66	19	7.14		11/25/2016	629358	6229113	454	12/8/2016
AC-1125-4	Approach Channel	6.94	18	8.27		11/25/2016	629321	6229197	444	12/7/2016
AC-1125-4-DUP	Approach Channel	6.91	19			11/25/2016	629321	6229197	444	12/7/2016
AC-1125-6	Approach Channel	6.71	18	8.35		11/25/2016	629347	6229158	446	12/7/2016
AC-1125-8	Approach Channel	7.48	19	7.37	5.89	11/25/2016	629421	6229081	450	12/7/2016
AC-1210-1	Approach Channel	8.57	20	7.65		12/10/2016	629238	6229192	450	12/11/2016
Ac-1210-10	Approach Channel	8.82	18	8.32		12/10/2016	629435	6229075	450	12/10/2016
Ac-1210-12	Approach Channel	9.31	19	8.4		12/10/2016	629302	6229178	447	12/11/2016
AC-1210-13	Approach Channel	9.43	19	8.32		12/10/2016	629325	6229163	447	12/11/2016
AC-1210-14	Approach Channel	9.37	19	8.08		12/10/2016	629347	6229148	447	12/10/2016
AC-1210-15	Approach Channel	8.81	18	7.9		12/10/2016	629373	6229131	447	12/11/2016
Ac-1210-16	Approach Channel	9.38	18	7.67		12/10/2016	629400	6229116	447	12/10/2016
AC-1210-17	Approach Channel	9.37	18	8.2		12/10/2016	629424	6229100	447	12/11/2016
AC-1210-2	Approach Channel	8.7	20	7.7		12/10/2016	629263	6229191	450	12/11/2016
AC-1210-3	Approach Channel	8.94	20	7.81		12/10/2016	629280	6229180	450	12/11/2016
Ac-1210-4	Approach Channel	8.73	20	7.86		12/10/2016	629299	6229166	450	12/11/2016
Ac-1210-5	Approach Channel	8.91	20	7.67		12/10/2016	629326	6229151	450	12/11/2016
Ac-1210-6	Approach Channel	8.32	20	7.73		12/10/2016	629344	6229137	450	12/11/2016
AC-1210-7	Approach Channel	8.74	20	7.88		12/10/2016	629370	6229119	450	12/11/2016
Ac-1210-8	Approach Channel	8.27	19	7.9		12/10/2016	629390	6229105	450	12/11/2016
AC-1210-9	Approach Channel	8.63	18	8.13		12/10/2016	629414	6229089	450	12/11/2016
AC-1213-01	Approach Channel	7.5	20	8.09		12/13/2016	629535	6229025	443	12/19/2016
AC-1213-02	Approach Channel	6.86	21.5	6.64		12/13/2016	629543	6229018	445	12/19/2016
AC-1213-03	Approach Channel	7.46	21.1	7.14		12/13/2016	629556	6229007	445	12/19/2016
AC-1213-04	Approach Channel	7.55	20.5	7.07		12/13/2016	629556	6229001	445	12/19/2016
AC-1213-05	Approach Channel	7.22	20.3	6.65		12/13/2016	629577	6228994	445	12/19/2016
AC-1213-06	Approach Channel	7.01	20.2	6.71		12/13/2016	629589	6228985	444	12/19/2016
AC-1213-07	Approach Channel	7.46	20	6.84		12/13/2016	629603	6228978	444	12/19/2016
Ac-1213-08	Approach Channel	7.75	20	6.88		12/13/2016	629616	6228969	444	12/19/2016
AC-1213-09	Approach Channel	7.26	20.1	6.79		12/13/2016	629627	6228963	444	12/19/2016
AC-1213-10	Approach Channel	7.33	19.9	6.48		12/13/2016	629642	6228954	445	12/19/2016
Ac-1213-11	Approach Channel	6.99	19.9	6.81		12/13/2016	629543	6228996	451	12/19/2016
Ac-1213-12	Approach Channel	6.84	19.8	7.07		12/13/2016	629559	6228988	451	12/19/2016
Area 20-1	Area 20 Temp PAG Stockpile (pile 1)	6.5	2.3			9/27/2016	629545	6228574		9/28/2016
Area 20-10	Area 20 Temp PAG Stockpile (Pile 5)	3.2	3.4			9/27/2016	629531	6228591		9/28/2016
Area 20-11	Area 20 Temp PAG Stockpile (Pile 6)	3	3.4			9/27/2016	629541	6228577		9/28/2016
Area 20-12	Area 20 Temp PAG Stockpile (Pile 5)	3	3.4			9/27/2016	629605	6228558		9/28/2016
Area 20-13	Area 20 Temp PAG Stockpile (Pile 5)	4.3	4			9/27/2016	629605	6228570		9/28/2016
Area 20-14	Area 20 Temp PAG Stockpile (Pile 5)	6.1	4			9/27/2016	629608	6228578		9/28/2016
Area 20-15	Area 20 Temp PAG Stockpile (Pile 5)	6.5	4			9/27/2016	629605	6228589		9/28/2016
Area 20-16	Area 20 Temp PAG Stockpile (Pile 5)	6.3	4		5.23	9/27/2016	629605	6228589		9/28/2016
Area 20-16 Duplicate	Area 20 Temp PAG Stockpile (Pile 5)	6.1	4			9/27/2016	629605	6228589		9/28/2016
Area 20-17	Area 20 Temp PAG Stockpile (Pile 5)	6.6	5.1			9/27/2016	629586	6228614		9/28/2016
Area 20-2	Area 20 Temp PAG Stockpile (pile 1)	6.7	2.3		6.71	9/27/2016	629547	6228569		9/28/2016
Area 20-2 Dulicate	Area 20 Temp PAG Stockpile (pile 1)	6.8	2.3			9/27/2016	629547	6228569		9/28/2016
Area 20-3	Area 20 Temp PAG Stockpile (pile 1)	5.3	2.3			9/27/2016	628784	6229875		9/28/2016
Area 20-4	Area 20 Temp PAG Stockpile (Pile 2)	6.6	2.3			9/27/2016	629571	6228562		9/28/2016
Area 20-5	Area 20 Temp PAG Stockpile (Pile 2)	6.9	2.3			9/27/2016	629581	6228570		9/28/2016
Area 20-7	Area 20 Temp PAG Stockpile (pile 3)	2.9	2.3			9/27/2016	629557	6228591		9/28/2016

Appendix 2.C-2: Field Rinse pH Monitoring Results

SampleID	SampleLocation	Field Rinse pH	Field Temperature	Lab Paste pH	Lab Rinse pH	Date_Sampled	Easting	Northing	Elevation masl	Date_Analyzed
Area 20-8	Area 20 Temp PAG Stockpile (Pile 4)	3.1	3.4			9/27/2016	628737	6229902		9/28/2016
Area 20-9	Area 20 Temp PAG Stockpile (Pile 4)	3.2	3.4		2.54	9/27/2016	628729	6229904		9/28/2016
Area20-1	Area 20	4.9	20			10/17/2016	629559	6228560		
Area20-2	Area 20	2.7	20			10/17/2016	629484	6228594		
Area20-3	Area 20	3.1	19			10/17/2016	629554	6228593		
Area20-4	Area 20	6.3	19			10/17/2016	629559	6228648		
Area20-5	Area 20	6.5	20			10/17/2016	629599	6228589		
GC-1	Garbage Creek	3.4	21			11/1/2016	629159	6230665		
GC-1219-01	Garbage Creek	3.12	18.2	3.5		12/19/2016	629278	6230507	434	12/21/2016
GC-1219-02	Garbage Creek	4.31	19.2	3.89		12/19/2016	629279	6230550	442	12/21/2016
GC-1219-03	Garbage Creek	3.43	19.1	3.78		12/19/2016	629252	6230572	444	12/21/2016
GC-02	Garbage Creek	3.3	21	3.63	3.39	11/1/2016	629159	6230665		
GC-2Duplicate	Garbage Creek	3.3	21			11/1/2016	629159	6230665		
GC-3	Garbage Creek	3.4	21			11/1/2016	629159	6230665		
GC-04	Garbage Creek	3.5	19	3.98	3.68	11/1/2016	629159	6230665		
HP D1	Ditch surrounding covered pile near howe pit, west	6.6	2.3			9/27/2016				9/28/2016
HP D2	Ditch surrounding covered pile near howe pit, south	6.7	2.3			9/27/2016				9/28/2016
HP D3	Ditch surrounding covered pile near howe pit, east	5.8	2.6			9/27/2016				9/28/2016
HP D4	Ditch surrounding covered pile near howe pit, north	6.7	2.3			9/27/2016				9/28/2016
HP1	Howe Pit	2.6	11.4			9/27/2016	632750	6230145		9/28/2016
HP2	Howe Pit	2.6	11.4			9/27/2016	632642	6230146		9/28/2016
HP3	Howe Pit	2.3	11.4			9/27/2016	632681	6230139		9/28/2016
HP4	Howe Pit	2.8	11.4			9/27/2016	632646	6230072		9/28/2016
HP5	Howe Pit	2.4	11.4			9/27/2016	632626	6230025		9/28/2016
HP6	Howe Pit	2.7	11.4			9/27/2016	632675	6230012		9/28/2016
L3-SP1	L3 Sediment Pond, North East	4.5	-			9/27/2016	629758	6230070		9/28/2016
L3SP-2	L3 Sediment Pond, North West	3.9	-			9/27/2016	629765	6230045		9/28/2016
L3-SP3	L3 Sediment Pond, South Central	6	-			9/27/2016	629758	6230062		9/28/2016
LBHR-1	Left bank haul road	4.41	20.7			10/18/2016	629344	6230568		
LBHR-2	Left bank haul road	3.5	20.6	3.56	3.47	10/18/2016	629344	6230568		
LBHR-3	Left bank haul road	3.61	20.7			10/18/2016	629344	6230568		
MR-1	MRB South Abutment	6.4	22			10/16/2016	628506	6229979		
MR-2	MRB South Abutment	6.5	22	7.18		10/16/2016	628506	6229979		
MR-3	MRB South Abutment	6.3	21			10/16/2016	628506	6229979		
MR-1-1111	MRB South Abutment	5.65	19			11/11/2016	628506	6229979		
MR-2-1111	MRB South Abutment	6.14	18.8			11/11/2016	628506	6229979		
MR-3-1111	MRB South Abutment	6.47	19			11/11/2016	628506	6229979		
R5b-T1	RSEM R5b TPSA (large)	3.9	5.1			9/27/2016	628802	6229872		9/28/2016
R5b-T10	RSEM R5b TPSA (large)	4.1	-			9/27/2016	628733	6229893		9/28/2016
R5b-T11	RSEM R5b TPSA (large)	3.5	-			9/27/2016	628739	6229880		9/28/2016
R5b-T12	RSEM R5b TPSA (large)	3.9	-			9/27/2016	628746	6229880		9/28/2016
R5b-T13	RSEM R5b TPSA (large)	3.6	9.2			9/27/2016	628758	6229872		9/28/2016
R5b-T14	RSEM R5b TPSA (large)	3.7	9.2			9/27/2016	628768	6229868		9/28/2016
R5b-T15	RSEM R5b TPSA (large)	4.1	8.3			9/27/2016	628779	6229862		9/28/2016
R5b-T16	RSEM R5b TPSA (large)	3.1	9.2			9/27/2016	628789	6229859		9/28/2016
R5b-T17	RSEM R5b TPSA (large)	4.2	9.2			9/27/2016	628797	6229853		9/28/2016
R5b-T18	RSEM R5b TPSA (large)	5.1	9.2		6.84	9/27/2016	628798	6229848		9/28/2016
R5b-T19	RSEM R5b TPSA (large)	5.3	8.3			9/27/2016	628789	6229859		9/28/2016
R5b-T1-D	RSEM R5b TPSA (large)	3.7	5.1		3.4	9/27/2016	628802	6229872		9/28/2016
R5b-T2	RSEM R5b TPSA (large)	4.6	5.5			9/27/2016	628795	6229872		9/28/2016
R5b-T20	RSEM R5b TPSA (large)	4.4	9.8			9/27/2016	628791	6229856		9/28/2016
R5b-T21	RSEM R5b TPSA (large)	3.2	9.8			9/27/2016	628791	6229856		9/28/2016

Appendix 2.C-2: Field Rinse pH Monitoring Results

SampleID	SampleLocation	Field Rinse pH	Field Temperature	Lab Paste pH	Lab Rinse pH	Date_Sampled	Easting	Northing	Elevation masl	Date_Analyzed
R5b-T21-D	RSEM R5b TPSA (large)	3.2	9.8		3.53	9/27/2016	628791	6229856		9/28/2016
R5b-T24 Duplicate	RSEM R5b TPSA (large)	5.9	8.3			9/27/2016	628676	6229938		9/28/2016
R5b-T3	RSEM R5b TPSA (large)	4.6	5.1			9/27/2016	628795	6229872		9/28/2016
R5b-T4	RSEM R5b TPSA (large)	4.9	5.5			9/27/2016	628776	6229879		9/28/2016
R5b-T5	RSEM R5b TPSA (large)	4.8	-			9/27/2016	628766	6229884		9/28/2016
R5b-T6	RSEM R5b TPSA (large)	4.1	5.1			9/27/2016	628756	6229888		9/28/2016
R5b-T7	RSEM R5b TPSA (large)	4	5.5			9/27/2016	628748	6229893		9/28/2016
R5b-T8	RSEM R5b TPSA (large)	3.6	-			9/27/2016	628737	6229902		9/28/2016
R5b-T8 Deep Duplicate	RSEM R5b TPSA (large)	3.6	5.5			9/27/2016	628737	6229902		9/28/2016
R5b-T8-D	RSEM R5b TPSA (large)	3.7	5.5		3.43	9/27/2016	628737	6229902		9/28/2016
R5b-T9	RSEM R5b TPSA (large)	6	8.3			9/27/2016	628729	6229904		9/28/2016
R5b-T22	RSEM R5b TPSA (small)	5.9	9.8			9/27/2016	628689	6229934		9/28/2016
R5b-T22	RSEM R5b TPSA (small)	6.5	9.8			9/27/2016	628689	6229934		9/28/2016
R5b-T22 Duplicate	RSEM R5b TPSA (small)	5.9	9.8			9/27/2016	628689	6229934		9/28/2016
R5b-T23	RSEM R5b TPSA (small)	6.6	10		7.47	9/27/2016	628682	6229938		9/28/2016
R5b-T24	RSEM R5b TPSA (small)	5.7	8.3			9/27/2016	628676	6229938		9/28/2016
R5b-T25	RSEM R5b TPSA (small)	6.5	10			9/27/2016	628669	6229942		9/28/2016
RBRd km 2.75 - 01	RB Access Road	4	21			10/29/2016	628616	6229737		
RBRd km 2.75 - 02	RB Access Road	3.9	21			10/29/2016	628637	6229713		
RBRDKM2.75-03	RB Access Road	4	21	4.34	4.08	10/29/2016	628664	6229690		
RBRd km 2.75 - 04	RB Access Road	3.5	21			10/29/2016	628715	6229628		
RBRd km 2.75 - 05	RB Access Road	4.8	21			10/29/2016	628688	6229661		
RBRd km 2.75 - 06	RB Access Road	3.4	21			10/29/2016	628687	6229694		
RBRDKM2.75-07	RB Access Road	6.5	21	6.78	7.55	10/29/2016	628599	6229689		
RBRd km 2.75 - 08	RB Access Road	6.5	21			10/29/2016	628585	6229721		
RBRd km 2.75 - 09	RB Access Road	4.9	21			10/29/2016	628567	6229751		
WM1212-1	R5A Access Road	4.53	20.5	5.52		12/12/2016	627923	6230924		12/13/2016
WM1212-2	R5A Access Road	4.65	20.5	4.55		12/12/2016	628037	6230799		12/13/2016
WM-1215-1	R5A Access Road	3.44	21.3			12/15/2016	628042	6230803	408	12/19/2016
WM-1215-2	R5A Access Road	3.3	21.5			12/15/2016	628028	6230820	409	12/19/2016
WM-1215-3	R5A Access Road	3.66	21.4			12/15/2016	627926	6230934	411	12/19/2016
WM-1215-4	R5A Access Road	5.13	21.5			12/15/2016	627923	6230937	411	12/19/2016
WMRD0.75K-2016-12-09-01	R5A Access Road	3.37	20	3.55		12/9/2016	628225	6230462	410	12/10/2016
WMRD0.75K-2016-12-09-02	R5A Access Road	5.85	20	7.02		12/9/2016	628219	6230441	409	12/10/2016
WMRD0.75K-2016-12-09-03	R5A Access Road	3.22	19	3.68		12/9/2016	628214	6230415	411	12/10/2016
RBRd-MR1-1111	Temp MRB Access Road	6.44	18.4			11/11/2016	628613	6229972		
RBRd-MR3-1111	Temp MRB Access Road	6.93	1.44			11/11/2016	628619	6229972		
RBRd-MR2-1111	Temp MRB Access Road	3.59	19			11/11/2016	628636	6229956		

Appendix 3: Surface Water Quality Monitoring

Appendix 3.A Surface Water Quality

Appendix 3.B-1 Surface Water Quality Laboratory Data

Appendix 3.B-2 Surface Water Quality Field Data

PEACE RIVER
HYDRO PARTNERS

Table 1: Water Quality Data from RSEM-R5b in 2016

Collection Date	17-Oct-16	29-Oct-16	29-Nov-16	6-Dec-16	7-Dec-16	8-Dec-16	9-Dec-16	10-Dec-16	11-Dec-16	12-Dec-16	13-Dec-16	14-Dec-16	15-Dec-16	16-Dec-16	17-Dec-16	18-Dec-16	19-Dec-16	20-Dec-16	21-Dec-16	22-Dec-16	23-Dec-16	24-Dec-16	25-Dec-16	27-Dec-16	28-Dec-16	29-Dec-16	30-Dec-16	31-Dec-16
Acute BC Water Quality Guidelines and RSEM End Of Pipe Guidelines (underlined)																												
pH-lab	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9										
TSS	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9
Cl	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
N-NH3	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	600	600	600	600	600	600	600	600	600
N-NO2	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7
N-NO3	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
T-As	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8
T-Cd	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
T-Co	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029
T-Cu	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
T-Fe	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
T-Pb	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	1	1	1	1	1	1	1	1	1
T-Mn	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
T-Mo	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
T-Ag	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	2	2	2	2	2	2	2	2	2
T-Zn	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
D-Cd	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033
D-Fe	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004
Parameters																				0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
pH-lab		7.67	8.10	8.33	8.25	8.24	8.19	8.15	8.13	8.16	8.15	8.07	8.09	8.11	8.07	8.04	8.09	8.10	8.06	8.07	8.26	8.37	8.27	8.20	8.09	8.11	8.11	7.99
TSS	62.8	360	15.3	34.3	20.5	21.8	18.3	20.8	24.3	22.5	16.0	16.0	17.0	21.8	15.3	26.8	14.3	22.0	23.8	18.5	10.3	4.8	98.3	23.0	30.5	19.0	38.3	243
Cl	39	2.5	160	200	190	190	200	190	210	210	200	210	180	240	240	260	260	200	210	160	180	140	160	150	170	170	200	140
N-NH3	0.57	0.27	0.38	0.41	0.35	0.27	0.44	0.37	0.61	0.38	0.25	0.22	0.22	0.12	0.31	0.92	0.36	0.38	0.40	0.40	0.30	0.16	0.19	0.25	0.15	0.17	0.21	0.12
N-NO2	0.0358	0.0219	0.0463	0.0625	0.0643	0.0649	0.0691	0.0684	0.0722	0.0794	0.0853	0.1	0.117	0.151	0.205	0.258	0.311	0.267	0.199	0.133	0.075	0.0431	0.0583	0.0389	0.0390			
N-NO3	0.234	0.193	0.815	0.686	0.803	0.794	0.849	0.822	0.846	0.878	0.893	0.903	0.866	0.845	0.828	0.805	0.677	0.601	0.812	0.860	0.837	0.776	0.770	0.772	0.903			
T-As	0.00148	0.00342	0.00083	0.00170	0.00159	0.00156	0.00165	0.00176	0.00176	0.00183	0.00168	0.00215	0.00131	0.00173	0.00183	0.00209	0.00193	0.00161	0.00147	0.00141	0.00104	0.00089	0.00208	0.00091	0.00108	0.00107	0.00152	0.00199
T-Cd	0.000107	0.000617	0.000048	0.000220	0.000143	0.000146	0.000135	0.000156	0.000157	0.000130	0.000132	0.000115	0.000096	0.000128	0.000116	0.000226	0.000127	0.000084	0.000054	0.000030	0.000035	0.00001	0.000857	0.000023	0.000063	0.000044	0.000073	0.000115
T-Co	0.00188	0.00530	0.00064	0.00134	0.00098	0.00121	0.00116	0.00129	0.00136	0.00133	0.00129	0.00136	0.00100	0.00136	0.00137	0.00163	0.0015	0.00155	0.00131	0.00125	0.00076	0.00077	0.00182	0.0005	0.00055	0.0005	0.00143	0.00170
T-Cu	0.00352	0.0171	0.0128	0.00343	0.00273	0.00269	0.00235	0.00293	0.00275	0.00277	0.00273	0.00281	0.00203	0.00274	0.00275	0.00383	0.0030	0.00233	0.00201	0.00254	0.00153	0.00098	0.00432	0.00178	0.00174	0.00250	0.00281	0.00353
T-Fe	0.749	9.48	0.736	0.772	0.541	0.434	0.388	0.418	0.39	0.505	0.276	0.286	0.306	0.297	0.376	0.581	0.455	0.623	0.351	0.336	0.257	0.11	2.21	0.238	0.356	0.217	1.04	1.95
T-Pb	0.00065	0.00754	0.00150	0.00090	0.00045	0.00102	0.00063	0.00051	0.00042	0.00045	0.00026	0.00042	0.00025	0.00045	0.00045	0.00050	0.0004	0.00045	0.00030	0.00024	0.00047	0.0002	0.00183	0.00039	0.00044	0.00035	0.00082	0.00141
T-Mn	0.475	0.172	0.0331	0.0638	0.0556	0.0681	0.0655	0.0742	0.0826	0.0792	0.0834	0.0881	0.0764	0.103	0.108	0.13	0.134	0.137	0.0980	0.0746	0.0324	0.0203	0.0929	0.0166	0.0294	0.0195	0.11	0.118
T-Mo	0.0050	0.001	0.0057	0.0146	0.0151	0.0133	0.0140	0.0145	0.0157	0.0147	0.0154	0.0162	0.0134	0.0168	0.0187	0.0201	0.0188	0.0156	0.0139	0.0126	0.0081	0.0073	0.0084	0.0074	0.0077	0.0090	0.0085	0.0090
T-Ag	0.00002	0.000072	0.000022	0.000077	0.000041	0.000031	0.000039	0.000053	0.000032	0.000026	0.000023	0.000030	0.00002	0.000024	0.000020	0.000032	0.00004	0.000022	0.00002	0.00002	0.00002	0.00002	0.000043	0.00002	0.00002	0.000025	0.00002	0.00002
T-Zn	0.0073	0.0608	0.0199	0.0106	0.0057	0.0074	0.0076	0.0087	0.0066	0.0071	0.0096	0.0053	0.005	0.0073	0.0066	0.0120	0.01	0.005	0.005	0.005	0.005	0.005	0.0166	0.005	0.0193	0.0129	0.0080	0.0093
D-Cd	0.000069	0.000056	0.000017	0.000178	0.00006	0.0001	0.000089	0.000102	0.000098	0.000124	0.000098	0.000095	0.000103	0.000078	0.000088	0.000127	0.000098	0.00005	0.000033	0.00001	0.00001	0.000114	0.00001	0.000017	0.000022	0.000014	0.000014	0.000017
D-Fe	0.283	0.0198	0.0720	0.0254	0.0220	0.0132	0.0170	0.0210	0.0248	0.0247	0.0271	0.0297	0.0184	0.0198	0.0303	0.0273	0.0358	0.0167	0.0112	0.0117	0.0094	0.0078	0.0051	0.0070	0.0085	0.0069	0.005	0.005
T-Hardness	255	105	224	305	348	338	341	367	407	378	368	384	340	444	430	484	470	432	396	463	301	311	397	332	380	391	384	422
Conductivity			1800	1960	2060	2130	2030	2220	2270	2320	2320	2460	2380	2480	2660	2810	2820	2430	2450	2190	1790	1460	1600	1540	1650	1770	2010	2020

Notes
Highlighted values were above water acute BC water quality guidelines or RSEM end of pipe guidelines
Values: Below detection limits
Concentrations reported as mg/L

Table 2: Water Quality Data for LBGC-1 in 2016.

Collection Date	13-Oct-16	3-Nov-16	4-Nov-16	5-Nov-16	6-Nov-16	7-Nov-16	8-Nov-16	9-Nov-16	10-Nov-16	11-Nov-16	12-Nov-16	13-Nov-16	14-Nov-16	15-Nov-16	16-Nov-16	17-Nov-16
Acute BC Water Quality Guidelines and RSEM End Of Pipe Guidelines (underlined)																
pH-lab	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9
TSS	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
Cl	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
N-NH3	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7
N-NO2	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
N-NO3	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8
T-As	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
T-Cd	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029
T-Co	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
T-Cu	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
T-Fe	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T-Pb	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002	0.160973002
T-Mn	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359	2.418359
T-Mo	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
T-Ag	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
T-Zn	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033
D-Al	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
D-Cd	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019	0.001019
D-Fe	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Parameters																
pH-lab		7.61	7.55	7.75	7.76	7.63	7.62	7.72	7.66	7.85	7.77	7.82	7.74	7.73	7.43	7.45
TSS	156	42.7	35.3	204	42.3	159	225	129	638	155	70	60.8	13.8	50.8	29.8	24.8
Cl	28	26	27	42	46	44	42	42	42	37	34	34	28	28	29	28
N-NH3	0.57	0.36	0.42	0.25	0.25	0.21	0.17	0.22	0.26	0.24	0.17	0.14	0.41	0.46	0.41	0.19
N-NO2	0.0031	0.005	0.005	0.0077	0.0065	0.0079	0.0111	0.008	0.0102	0.0084	0.0079	0.0122	0.0091	0.0057	0.009	0.0098
N-NO3	0.0944	0.094	0.044	0.147	0.156	0.197	0.211	0.213	0.151	0.154	0.127	0.134	0.05	0.031	0.02	0.02
T-As	0.00148	0.001	0.0009	0.00294	0.00083	0.00298	0.00617	0.00151	0.0093	0.00514	0.00172	0.00195	0.00034	0.00286	0.00068	0.00052
T-Cd	0.002	0.00063	0.000689	0.000534	0.000315	0.000489	0.00082	0.000553	0.00109	0.000925	0.000569	0.000553	0.000692	0.000933	0.000704	0.000661
T-Co	0.0934	0.042	0.0499	0.0233	0.0163	0.021	0.0237	0.026	0.0256	0.024	0.0236	0.02	0.0394	0.0514	0.0618	0.0625
T-Cu	0.0121	0.00219	0.00643	0.00989	0.00446	0.00814	0.0158	0.00467	0.0252	0.0165	0.00557	0.00679	0.00156	0.0071	0.0015	0.00208
T-Fe	32.9	9.81	10.4	9.77	1.91	9.05	17.6	6.19	23.4	13.8	4.51	4.48	0.982	7.73	5.24	3.73
T-Pb	0.00079	0.00035	0.0002	0.00378	0.00083	0.0036	0.00745	0.00135	0.0119	0.00672	0.00204	0.0025	0.0002	0.00366	0.0004	0.00053
T-Mn	5.33	6.33	7.11	2.88	2.08	1.88	1.9	2.55	2.24	2.29	2.9	2.65	6.4	6.81	8.17	8.11
T-Mo	0.001	0.0014	0.0014	0.0017	0.0013	0.0022	0.0028	0.0014	0.0047	0.003	0.0027	0.0022	0.0014	0.002	0.002	0.0017
T-Ag	0.00002	0.00002	0.00002	0.000066	0.000057	0.000223	0.000056	0.00003	0.000237	0.000109	0.000054	0.00007	0.00002	0.000057	0.00004	0.00002
T-Zn	0.592	0.114	0.106	0.0689	0.0299	0.0678	0.116	0.0682	0.115	0.0833	0.0376	0.0453	0.0418	0.101	0.095	0.0806
D-Al	0.0665	0.0504	0.0113	0.0164	0.063	0.0164	0.0164	0.014	0.0137	0.0121	0.0117	0.0118	0.008	0.0069	0.003	0.0051
D-Cd	0.00209	0.000634	0.000658	0.000356	0.000264	0.00038	0.000391	0.000473	0.000559	0.000499	0.000451	0.000469	0.000772	0.000542	0.000401	0.000594
D-Fe	30.6	12	8.58	1.18	0.0879	0.0212	0.0184	0.0327	0.0197	0.0237	0.0241	0.0147	0.154	0.021	0.353	0.0139
T-Hardness	1210	1800	1770	974	736	768	753	932	986	951	1160	1110	1550	1900	2070	2070
Conductivity			3310	1740	1550	1550	1550	1890	1810	1850	2200	2160	3350	3370	3580	3600

Notes
Highlighted values were above water acute BC water quality guidelines or RSEM end of pipe guidelines
Values: Below detection limits
Concentrations reported as mg/L

Table 3: Water Quality Data for LBGC-0.11 in 2016.

Collection date	10-Nov-16	6-Dec-16
Acute BC Water Quality Guidelines		
pH-lab	6 - 9	6 - 9
TSS	29.4	29.4
Cl	600	600
N-NH3	27.7	27.7
N-NO2	0.6	0.6
N-NO3	32.8	32.8
T-As	0.005	0.005
T-Cd	0.00029	0.00029
T-Co	0.55	0.55
T-Cu	0.011	0.011
T-Fe	1	1
T-Pb	0.17621	0.17621
T-Mn	2.55666	2.55666
T-Mo	2	2
T-Ag	0.003	0.003
T-Zn	0.033	0.033
D-Cd	0.001096	0.001096
D-Fe	0.35	0.35
Parameters		
pH-lab	8.00	7.70
TSS	23.8	64.3
Cl	42	24
N-NH3	0.15	0.58
N-NO2	0.005	0.005
N-NO3	0.154	0.02
T-As	0.00077	0.00095
T-Cd	0.000286	0.000526
T-Co	0.00723	0.112
T-Cu	0.00458	0.00138
T-Fe	1.08	26.3
T-Pb	0.00065	0.00049
T-Mn	0.862	10.8
T-Mo	0.0016	0.001
T-Ag	0.000038	0.00002
T-Zn	0.0135	0.195
D-Cd	0.000260	0.000432
D-Fe	0.0220	3.34
T-Hardness	608	2120
Conductivity	1300	4060

Notes
Highlighted values were above water acute BC water quality guidelines
Values: Below detection limits
Concentrations reported as mg/L

Table 4: Water Quality Data for LBL6-EP in 2016.

Collection Date	14-Oct-16	2-Nov-16	10-Nov-16	17-Nov-16
Acute BC Water Quality Guidelines				
pH-lab	6.5 - 9	6.5 - 9	6.5 - 9	6.5 - 9
TSS	29.4	29.4	29.4	29.4
Cl	600	600	600	600
N-NH3	24.5	24.5	24.5	24.5
N-NO2	0.06	0.06	0.06	0.06
N-NO3	32.8	32.8	32.8	32.8
T-As	0.005	0.005	0.005	0.005
T-Cd	0.0010961	0.0010961	0.001096113	0.001096113
T-Co	0.11	0.11	0.11	0.11
T-Cu	0.019202	0.019202	0.019202	0.019202
T-Fe	1	1	1	1
T-Pb	0.0999252	0.0999252	0.099925172	0.099925172
T-Mn	1.831544	1.831544	1.831544	1.831544
T-Mo	2	2	2	2
T-Ag	0.003	0.003	0.003	0.003
T-Zn	0.10275	0.10275	0.10275	0.10275
D-Al	0.1	0.1	0.1	0.1
D-Cd	0.0010961	0.0010961	0.001096113	0.001096113
D-Fe	0.35	0.35	0.35	0.35
Parameters				
pH-lab		7.95	7.95	7.85
TSS	3.1	5.5	27.3	87.3
Cl	0.84	3.8	1.4	1.4
N-NH3	0.016	0.064	0.018	0.022
N-NO2	0.002	0.005	0.005	0.005
N-NO3	0.002	0.02	0.056	0.02
T-As	0.00044	0.00042	0.00062	0.00121
T-Cd	0.000015	0.000025	0.000069	0.000036
T-Co	0.0005	0.0005	0.0005	0.00056
T-Cu	0.00088	0.00137	0.00271	0.00131
T-Fe	0.245	0.391	1.03	1.02
T-Pb	0.0002	0.0002	0.00066	0.00041
T-Mn	0.0110	0.0555	0.0189	0.116
T-Mo	0.001	0.0011	0.001	0.0013
T-Ag	0.00002	0.00002	0.00002	0.00002
T-Zn	0.005	0.0072	0.0078	0.005
D-Al	0.0115	0.0056	0.0142	0.003
D-Cd	0.000011	0.000011	0.000020	0.00001
D-Fe	0.0639	0.0284	0.0210	0.0230
T-Hardness	110	117	102	140
Conductivity			209	274

Notes
Highlighted values were above water acute BC water quality guidelines
Values: Below detection limits
Concentrations reported as mg/L

Table 5: Water Quality Data for LBL6-WP in 2016.

Collection Date	14-Oct-16	2-Nov-16	10-Nov-16	17-Nov-16
Acute BC Water Quality Guidelines				
pH-lab	6.5 - 9	6.5 - 9	6.5 - 9	6.5 - 9
TSS	29.4	29.4	29.4	29.4
Cl	600	600	600	600
N-NH3	24.5	24.5	24.5	24.5
N-NO2	0.06	0.06	0.06	0.06
N-NO3	32.8	32.8	32.8	32.8
T-As	0.005	0.005	0.005	0.005
T-Cd	0.0010961	0.0010961	0.001096113	0.001096113
T-Co	0.11	0.11	0.11	0.11
T-Cu	0.019202	0.019202	0.019202	0.019202
T-Fe	1	1	1	1
T-Pb	1.9738725	1.9738725	1.973872501	1.973872501
T-Mn	13.99542	13.99542	13.99542	13.99542
T-Mo	2	2	2	2
T-Ag	0.003	0.003	0.003	0.003
T-Zn	0.10275	0.10275	0.10275	0.10275
D-Al	0.1	0.1	0.1	0.1
D-Cd	0.0010961	0.0010961	0.001096113	0.001096113
D-Fe	0.35	0.35	0.35	0.35
Parameters				
pH-lab		4.94	5.16	5.61
TSS	3.6	43.8	12.5	24.3
Cl	0.56	1.0	1.2	0.65
N-NH3	0.026	0.029	0.040	0.013
N-NO2	0.002	0.005	0.005	0.005
N-NO3	0.0044	0.02	0.02	0.024
T-As	0.00048	0.00046	0.00025	0.00051
T-Cd	0.0137	0.0163	0.0103	0.0149
T-Co	0.0880	0.101	0.0599	0.0793
T-Cu	0.014	0.0141	0.00626	0.00864
T-Fe	0.467	0.623	0.197	0.496
T-Pb	0.00021	0.00038	0.0002	0.00034
T-Mn	2.53	3.66	2.06	3.07
T-Mo	0.001	0.001	0.001	0.001
T-Ag	0.00002	0.00002	0.00002	0.00002
T-Zn	0.578	0.61	0.351	0.455
D-Al	6.43	3.91	2.24	1.27
D-Cd	0.0182	0.0179	0.0121	0.0149
D-Fe	0.0509	0.0337	0.0242	0.0134
T-Hardness	1040	1410	994	1440
Conductivity			1990	2210

Table 6: Water Quality Data for LBL3C-1.57 in 2016.

Collection Date	14-Oct-16	10-Nov-16	18-Nov-16
Applicable Guidelines			
pH-lab	6 - 9	6 - 9	6 - 9
TSS	29.4	29.4	29.4
Cl	600	600	600
N-NH3	17.3	17.3	17.3
N-NO2	0.6	0.6	0.6
N-NO3	32.8	32.8	32.8
T-As	0.005	0.005	0.005
T-Cd	0.00109611	0.00109611	0.00109611
T-Co	0.11	0.11	0.11
T-Cu	0.019202	0.019202	0.019202
T-Fe	1	1	1
T-Pb	0.504	0.504	0.504
T-Mn	5.15	5.15	5.15
T-Mo	2	2	2
T-Ag	0.003	0.003	0.003
T-Zn	0.10275	0.10275	0.10275
D-Al	0.1	0.1	0.1
D-Cd	0.00109611	0.00109611	0.00109611
D-Fe	0.35	0.35	0.35
Parameters			
pH-lab		8.07	8.07
TSS	240	776	131
Cl	60	30	31
N-NH3	0.047	0.027	0.055
N-NO2	0.0028	0.05	0.0061
N-NO3	0.0334	0.2	0.051
T-As	0.00248	0.00531	0.00128
T-Cd	0.000573	0.000796	0.000647
T-Co	0.0159	0.0102	0.0196
T-Cu	0.00827	0.0225	0.00749
T-Fe	4.26	12.2	2.72
T-Pb	0.00245	0.0101	0.00176
T-Mn	0.742	0.415	0.829
T-Mo	0.0011	0.001	0.001
T-Ag	0.00002	0.000182	0.000039
T-Zn	0.356	0.193	0.348
D-Al	0.576	0.667	0.0838
D-Cd	0.000380	0.000083	0.000375
D-Fe	0.24	0.521	0.0641
T-Hardness	463	346	446
Conductivity		566	941

Notes
Highlighted values were above water acute BC water quality guidelines
Values: Below detection limits
Concentrations reported as mg/L

Table 7: Water Quality Data for LBEX-SP-OUT in 2016.

Collection Date	16-Oct-16	10-Nov-16	17-Nov-16	14-Dec-16
Applicable Guidelines				
pH-lab	6 - 9	6 - 9	6 - 9	6 - 9
TSS	29.4	29.4	29.4	29.4
Cl	600	600	600	600
N-NH3	17.3	17.3	17.3	17.3
N-NO2	0.06	0.06	0.06	0.06
N-NO3	32.8	32.8	32.8	32.8
T-As	0.005	0.005	0.005	0.005
T-Cd	0.00109611	0.00109611	0.00109611	0.00109611
T-Co	0.11	0.11	0.11	0.11
T-Cu	0.019202	0.019202	0.019202	0.019202
T-Fe	1	1	1	1
T-Pb	0.277	0.277	0.277	0.277
T-Mn	3.42	3.42	3.42	3.42
T-Mo	2	2	2	2
T-Ag	0.003	0.003	0.003	0.003
T-Zn	0.10275	0.10275	0.10275	0.10275
D-Al	0.1	0.1	0.1	0.1
D-Cd	0.00109611	0.00109611	0.00109611	0.00109611
D-Fe	0.35	0.35	0.35	0.35
Parameters				
pH-lab		8.1	8.11	7.88
TSS	3.7	4	7.8	4.8
Cl	0.74	1.1	0.97	0.77
N-NH3	0.56	0.67	0.81	0.74
N-NO2	0.0472	0.0401	0.0388	0.0364
N-NO3	1.35	1.23	1.11	1.32
T-As	0.00122	0.00035	0.0006	0.00061
T-Cd	0.00013	0.000043	0.00004	0.000041
T-Co	0.0012	0.00073	0.00075	0.00093
T-Cu	0.00529	0.00082	0.00137	0.00786
T-Fe	2.13	0.021	0.187	0.078
T-Pb	0.00159	0.0002	0.0009	0.00071
T-Mn	0.128	0.181	0.156	0.18
T-Mo	0.0192	0.0268	0.03	0.0356
T-Ag	0.00002	0.00002	0.00002	0.00002
T-Zn	0.0162	0.0078	0.0061	0.0167
D-Al	0.0259	0.0137	0.0165	0.0137
D-Cd	0.000203	0.000053	0.000028	0.000047
D-Fe	0.005	0.005	0.0062	0.005
T-Hardness	231	232	248	303
Conductivity		573	621	678

Appendix 3.B-1 Surface Water Quality Laboratory Data

Station Code	Sample ID (Class)	Collection Date	pH	Turbidity (NTU)	Cond (uS/cm)	TDS (mg/L)	TSS (mg/L)	T-Hard (mg/L)	D-Hard (mg/L)	ALK-T (mg/L)	Alk-PP (mg/L)	HCO3 (mg/L)	CO3 (mg/L)	OH (mg/L)	Cl (mg/L)	F (mg/L)	Br (mg/L)	D-SO4 (mg/L)	T-S2- (mg/L)	H2S (mg/L)	N-NH3 (mg/L)	N-NO2 (mg/L)	N-NO3 (mg/L)	N-NO2_NO3 (mg/L)	PO4 (mg/L)	TOC (mg/L)	DOC (mg/L)
FIELDBLANK	QE0418(B)	11/29/16 11:00	5.99	0.26	2.1	<10	<1.0	<0.50	<0.50	0.85	<0.50	1.04	<0.50	<0.50	3.7	<0.010	<0.010	<0.50	0.0070	0.0070	<0.0050	<0.0050	<0.020	<0.020	<0.0050	<0.50	<0.50
TripBlank	QE0419(B)	11/30/16 10:20	5.86	<0.10	1.9	<10	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.010	<0.010	<0.50	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	<0.020	<0.0050	0.74	<0.50
FIELDBLANK	QG1217(M)	12/10/16 10:40	5.25	<0.10	1.8	<10	<4.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.010	<0.010	<0.50			<0.0050	<0.0050	<0.020	<0.020	<0.0050	<0.50	<0.50
FIELDBLANK	QH3440(B)	12/19/16 12:35	5.26	<0.10	<1.0	<10	<4.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.014	<0.010	<0.50			<0.0050	<0.0050	<0.020	<0.020	<0.0050	<0.50	<0.50
HP-POND	PR6455(M)	9/27/16 12:00				1670	31.2	1040	1070						34	0.850	<0.10	1100			0.020	<0.0020	0.0024	0.0024	<0.0050		2.34
LBEX-SP-In	PU5539(M)	10/16/16 16:15				366	84.4	239	219						0.74	0.200	0.014	164			0.79	0.0533	1.87	1.92	0.0179	3.96	2.99
LBEX-SP-Out	PU5538(M)	10/16/16 16:00				368	3.7	231	239						0.74	0.230	0.014	172			0.56	0.0472	1.35	1.40	<0.0050	3.45	3.60
LBEX-SP-Out	QA2156(M)	11/10/16 11:00	8.10	1.57	573	368	<4.0	232	253	93.2	<0.50	114	<0.50	<0.50	1.1	0.200	<0.10	177			0.67	0.0401	1.23	1.28	<0.0050	3.81	4.05
LBEX-SP-Out	QB5532(M)	11/17/16 12:20	8.11	3.06	621	414	7.8	248	286	109	<0.50	133	<0.50	<0.50	0.97	0.220	<0.10	178			0.81	0.0388	1.11	1.15	<0.0050	4.53	3.73
LBEX-SP-Out	QG5341(M)	12/14/16 11:30	7.88	1.78	678	446	4.8	303	313	116	<0.50	142	<0.50	<0.50	0.77	0.230	<0.10	250			0.74	0.0364	1.32	1.35	<0.0050	4.77	3.42
LBGC-0.11	QA2154(M)	11/10/16 10:00	8.00	31.4	1300	972	23.8	608	627	117	<0.50	143	<0.50	<0.50	42	0.300	<0.10	493			0.15	<0.0050	0.154	0.154	0.0546	15.7	13.2
LBGC-0.11	QF4712(M)	12/6/16 2:00	7.70	133	4060	4010	64.3	2120	2150	200	<0.50	244	<0.50	<0.50	24	1.50	0.13	2850			0.58	<0.0050	<0.020	<0.020	<0.0050	5.95	4.52
LBGC-0.53	PY6177(M)	11/3/16 13:30	7.89			2810	46.3	1920	2000	309	<0.50	378	<0.50	<0.50	29	0.580	0.10	1650			0.29	<0.0050	0.994	0.994	0.0067	10.5	9.33
LBGC-0.60	PU5495(M)	10/13/16 16:00				596	56.6	332	341						41	0.270	0.073	212			0.10	0.0051	0.156	0.161	<0.0050	14.5	13.8
LBGC-0.60	QA2155(M)	11/10/16 10:30	7.97	2080	555	432	1290	350	264	102	<0.50	125	<0.50	<0.50	38	0.160	<0.10	130			0.080	<0.050	<0.20	<0.20	1.16	16.6	14.9
LBGC-1	PU5494(M)	10/13/16 16:15				2220	156	1210	1200						28	0.830	0.084	1400			0.57	0.0031	0.0944	0.0975	0.0064	9.08	6.40
LBGC-1	PY6124(M)	11/3/16 13:00	7.61			2810	42.7	1800	1850	160	<0.50	196	<0.50	<0.50	26	0.860	<0.10	1730			0.36	<0.0050	0.094	0.094	<0.0050	8.24	7.59
LBGC-1	PZ2558(M)	11/4/16 12:45	7.55		3310	3120	35.3	1770	1810	162	<0.50	198	<0.50	<0.50	27	0.940	<0.10	1960			0.42	<0.0050	0.044	0.044	<0.0050	8.23	7.71
LBGC-1	PZ2559(M)	11/5/16 12:30	7.75		1740	1380	204	974	856	130	<0.50	159	<0.50	<0.50	42	0.510	0.10	819			0.25	0.0077	0.147	0.155	<0.0050	14.6	12.3
LBGC-1	PZ2589(M)	11/6/16 12:45	7.76		1550	1190	42.3	736	773	126	<0.50	153	<0.50	<0.50	46	0.420	0.10	687			0.25	0.0065	0.156	0.163	0.0070	15.1	15.1
LBGC-1	PZ4379(M)	11/7/16 13:15	7.63	122	1550	1170	159	768	726	126	<0.50	154	<0.50	<0.50	44	0.430	<0.10	677			0.21	0.0079	0.197	0.205	0.0099	17.3	15.3
LBGC-1	PZ7373(M)	11/8/16 0:00	7.62		1550	1190	225	753	664	130	<0.50	159	<0.50	<0.50	42	0.490	<0.10	640	<0.0050	<0.0050	0.17	0.0111	0.211	0.222	<0.0050	20.3	13.5
LBGC-1	QA0673(M)	11/9/16 0:00	7.72		1890	1500	129	932	995	132	<0.50	160	<0.50	<0.50	42	0.510	<0.10	891	<0.0050	<0.0050	0.22	0.0080	0.213	0.221	0.0553	14.3	10.4
LBGC-1	QA1855(M)	11/10/16 0:00	7.66		1810	1480	638	986	974	138	<0.50	168	<0.50	<0.50	42	0.420	<0.10	869	<0.0050	<0.0053	0.26	0.0102	0.151	0.161	<0.0050	18.7	11.6
LBGC-1	QA2355(M)	11/11/16 0:00	7.85		1850	1510	155	951	1010	133	<0.50	162	<0.50	<0.50	37	0.460	<0.10	906	<0.0050	<0.0053	0.24	0.0084	0.154	0.162	<0.0050	12.3	10.5
LBGC-1	QA5183(M)	11/12/16 0:00	7.77		2200	1860	70.0	1160	1100	141	<0.50	172	<0.50	<0.50	34	0.580	<0.10	1120	<0.0050	<0.0053	0.17	0.0079	0.127	0.135	<0.0050	12.0	10.5
LBGC-1	QA5185(M)	11/13/16 0:00	7.82		2160	1800	60.8	1110	1070	140	<0.50	170	<0.50	<0.50	34	0.530	<0.10	1070			0.14	0.0122	0.134	0.147	<0.0050	12.0	9.31
LBGC-1	QA6857(M)	11/14/16 0:00	7.74	9.85	3350	3110	13.8	1550	1780	162	<0.50	198	<0.50	<0.50	28	0.82	<0.10	1860			0.41	0.0091	0.05	0.059	<0.0050	7.47	7.02
LBGC-1	QB1809(M)	11/15/16 0:00	7.73	64.2	3370	3200	50.8	1900	1850	170	<0.50	207	<0.50	<0.50	28	0.940		1860			0.46	0.0057	0.031	0.037	<0.0050	7.73	7.35
LBGC-1	QB3530(M)	11/16/16 12:00	7.43	39.5	3580	3380	29.8	2070	2030	162	<0.50	198	<0.50	<0.50	29	1.00	<0.10	2330			0.41	0.0090	<0.020	0.029	<0.0050	7.73	6.98
LBGC-1	QB5536(M)	11/17/16 13:00	7.45	41.6	3600	3460	24.8	2070	2110	170	<0.50	207	<0.50	<0.50	28	1.00	<0.10	1960			0.19	0.0098	<0.020	0.030	0.0220	9.62	6.74
LBL3C-1.57	PU5498(M)	10/14/16 16:30				766	240	463	442						60	0.320	0.318	272			0.047	0.0028	0.0334	0.0362	<0.0050	12.2	9.95
LBL3C-1.57	QA2165(M)	11/10/16 9:30	8.07	262	566	420	776	346	232	122	<0.50	149	<0.50	<0.50	30	0.180	<0.10	128			0.027	<0.050	<0.20	<0.20	0.0318	18.1	15.3
LBL3C-1.57	QB8118(M)	11/18/16 12:15	8.07	106	941	666	131	446	450	138	<0.50	169	<0.50	<0.50	31	0.330	0.12	282			0.055	0.0061	0.051	0.057	0.0062	16.1	13.1
LBL3C-3.32	PU5492(M)	10/15/16 15:30				970	3.3	604	621						1.2	0.140	<0.050	577			0.35	0.0305	2.68	2.71	<0.0050	4.35	4.05
LBL3C-3.32	QA2161(M)	11/10/16 8:30	8.05	40.4	461	348	17.8	186	183	114	<0.50	139	<0.50	<0.50	25	0.097	<0.10	82.3			0.033	<0.050	<0.20	<0.20	0.164	22.3	17.3
LBL3C-3.32	QA2162(D)	11/10/16 8:45	8.14	40.5	464	344	15.3	195	202	117	<0.50	142	<0.50	<0.50	25	0.097	0.107	79.5			0.032	<0.050	<0.20	<0.20	0.177	21.4	18.2
LBL3C-3.32	QB8119(M)	11/18/16 11:40	8.30	30.1	625	444	36.0	269	276	156	<0.50	191	<0.50	<0.50	31	0.110	0.13	120			0.036	<0.050	<0.20	<0.20	0.0675	23.0	20.3
LBL6-EP	PU5500(D)	10/14/16 13:30				138	4.7	109	112						0.99	0.052	<0.010	18.8			0.015	<0.0020	<0.0020	<0.0020	0.0054	3.54	2.65
LBL6-EP	PU5499(M)	10/14/16 13:30				168	3.1	110	112						0.84	0.054	<0.010	17.9			0.016	<0.0020	<0.0020	<0.0020	0.0057	3.48	2.92
LBL6-EP	PY6181(M)	11/2/16 15:30	7.95			118	5.5	117	114	91.9	<0.50	112	<0.50	<0.50	3.8	0.045	<0.010	19.3			0.064	<0.0050	<0.020	<0.020	0.0094	2.61	2.94
LBL6-EP	QA2158(M)	11/10/16 12:30	7.95	39.1	209	134	27.3	102	106	87.3	<0.50	106	<0.50	<0.50	1.4	0.054	<0.10	17.9			0.018	<0.0050	0.056	0.056	0.0533	4.32	2.32
LBL6-EP	QB5535(M)	11/17/16 13:25	7.85	14.7	274	160	87.3	140	136	123	<0.50	150	<0.50	<0.50	1.4	0.074	<0.10	18.9	0.0071	0.0080	0.022	<0.0050	<0.020	<0.020	0.0181	3.87	3.72
LBL6-WP	PU5537(M)	10/14/16 13:00				1970	3.6	1040	1380						0.56	1.50	<0.050	1440			0.026	<0.0020	0.0044	0.0044	<0.0050	1.64	1.65
LBL6-WP	PY6182(M)	11/2/16 16:00	4.94			1830	43.8	1410	1420	<0.50	<0.50	<0.50	<0.50	<0.50	1.0	1.20	<0.10	1230			0.029	<0.0050	<0.020	<0.020	<0.0050	1.97	1.59
LBL6-WP	QA2157(M)	11/10/16 12:00	5.16	3.73	1990	1820	12.5	994	1180	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	1.20	<0.10	1220			0.040	<0.0050	<0.020	<0.020	<0.0050	1.51	1.34
LBL6-WP	QB5534(M)	11/17/16 13:40	5.61	40.6	2210	2020	24.3	1440	1480	1.34	<0.50	1.63	<0.50	<0.50	0.65	1.10	<0.10	1380	<0.0050	<0.0050	0.013	<0.0050	0.024	0.024	0.0063	1.71	1.31
LBRR-D	PU5496(M)	10/14/16 12:00				1290	30.2	705	850						30	1.80	0.089	743			0.059	<0.0020	0.0818	0.0818	<0.0050	4.26	2.87
LBRR-D	QA2152(M)	11/10/16 8:45	5.45	85.0	3410	3450	88.8	2190	2350	1.20	<0.50	1.46	<0.50	<0.50	23	4.90	0.21	1970			0.067	<0.0050	0.266	0.266	0.0137	4.35	3.49
RBAC-SEEP	PY6180(M)	11/1/16 15:00	8.17			2210	<4.0	263	267	1180	<0.50	1440	<0.50	<0.50	610	0.140	1.40	14.6			0.039	<0.0050	1.69	1.69	<0.0050	1.23	2.16
RBAC-SEEP	QB8120(M)	11/18/16 13:30	8.19	68.4	823	532	69.0	256	247	324	<0.50	395	<0.50	<0.50	65	0.120	0.14	22.7			0.11	0.0106	0.274	0.284	<0.0050	2.50	2.33
RBAC-SUMP	PY0115(M)	10/29/16 14:00	8.19			776	18.8	206	203	484	<0.50	590	<0.50	<0.50	130	0.190	0.29	50.5			0.44	0.0225	0.525	0.548	0.0153	1.33	1.48

Appendix 3.B-1 Surface Water Quality Laboratory Data

Station Code	Sample ID (Class)	Collection Date	T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Li	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Si
			(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
FIELDBLANK	QE0418(B)	11/29/16 11:00	<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	0.093	<0.0010	<0.00050	<0.00050	<0.01	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010	<0.1
TripBlank	QE0419(B)	11/30/16 10:20	<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050	0.00399	<0.01	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010	<0.1
FIELDBLANK	QG1217(M)	12/10/16 10:40	<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050	<0.00050	<0.01	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010	<0.1
FIELDBLANK	QH3440(B)	12/19/16 12:35	<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050	<0.00050	<0.01	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010	<0.1
HP-POND	PR6455(M)	9/27/16 12:00	0.878	0.000032	0.00111	0.0433	0.000386	<0.000010	0.113	0.00398	264	0.00045	0.0704	0.00739	23.8	0.000143	0.0832	93.2	2.36	<0.0000020	0.00111	0.258	3.99	0.000523	6.54
LBEX-SP-In	PU5539(M)	10/16/16 16:15	0.179	0.00168	0.00039	0.0648	<0.00010	<0.0010	<0.05	0.000217	56.0	<0.0010	0.00249	0.00168	0.1	<0.00020	0.0060	24.1	0.12	<0.000010	0.0284	0.0091	4.76	0.00363	0.669
LBEX-SP-Out	PU5538(M)	10/16/16 16:00	1.89	0.00116	0.00122	0.0951	<0.00010	<0.0010	<0.05	0.000130	49.2	0.0026	0.00120	0.00529	2.13	0.00159	<0.0050	26.4	0.128	<0.000010	0.0192	0.0046	4.43	0.00617	3.11
LBEX-SP-Out	QA2156(M)	11/10/16 11:00	0.0295	0.00145	0.00035	0.12	<0.00010	<0.0010	<0.05	0.000043	53.2	<0.0010	0.00073	0.00082	0.021	<0.00020	<0.0050	24.0	0.181	<0.000010	0.0268	0.0034	3.95	0.00314	0.608
LBEX-SP-Out	QB5532(M)	11/17/16 12:20	0.0827	0.00164	0.00060	0.145	<0.00010	<0.0010	<0.05	0.000040	60.4	<0.0010	0.00075	0.00137	0.187	0.00090	<0.0050	23.7	0.156	<0.000010	0.0300	0.0037	4.44	0.00312	0.607
LBEX-SP-Out	QG5341(M)	12/14/16 11:30	0.0338	0.00185	0.00061	0.177	<0.00010	<0.0010	<0.05	0.000041	70.9	<0.0010	0.00093	0.00786	0.078	0.00071	<0.0050	30.6	0.18	<0.000010	0.0356	0.0050	5.64	0.00362	0.582
LBGC-0.11	QA2154(M)	11/10/16 10:00	0.323	<0.00050	0.00077	0.0721	<0.00010	<0.0010	0.072	0.000286	160	0.0014	0.00723	0.00458	1.08	0.00065	0.0203	50.6	0.862	<0.000010	0.0016	0.0252	10.5	0.00147	4.37
LBGC-0.11	QF4712(M)	12/6/16 2:00	0.797	<0.00050	0.00095	0.0340	0.00018	<0.0010	0.276	0.000526	500	<0.0010	0.112	0.00138	26.3	0.00049	0.0731	211	10.8	<0.000010	<0.0010	0.3	8.95	0.00014	6.12
LBGC-0.53	PY6177(M)	11/3/16 13:30	1.1	<0.00050	0.00070	0.0728	0.00021	<0.0010	0.168	0.000561	516	<0.0010	0.0455	0.00218	5.41	<0.00020	0.0501	154	5.22	<0.000010	0.0015	0.105	13.8	0.00096	6.69
LBGC-0.60	PU5495(M)	10/13/16 16:00	1.15	<0.00050	0.00131	0.0867	0.00010	<0.0010	0.059	0.000241	81.9	0.0018	0.00768	0.00543	2.75	0.00110	0.0135	31.0	0.448	<0.000010	0.0011	0.0270	11.5	0.00055	4.61
LBGC-0.60	QA2155(M)	11/10/16 10:30	12.6	<0.00050	0.00708	0.436	0.00116	<0.0010	<0.05	0.00194	89.4	0.0246	0.0163	0.0579	30.2	0.0205	0.0253	30.7	0.588	0.000013	<0.0010	0.0726	14.9	0.00068	21.4
LBGC-1	PU5494(M)	10/13/16 16:15	11	<0.00050	0.00148	0.0476	0.00182	<0.0010	0.178	0.00200	290	0.0020	0.0934	0.0121	32.9	0.00079	0.101	117	5.33	<0.000010	0.0010	0.298	9.21	0.00083	5.77
LBGC-1	PY6124(M)	11/3/16 13:00	0.352	<0.00050	0.00100	0.0460	<0.00010	<0.0010	0.202	0.000630	466	0.0022	0.0420	0.00219	9.81	0.00035	0.0520	155	6.33	<0.000010	0.0014	0.114	9.37	0.00177	5.45
LBGC-1	PZ2558(M)	11/4/16 12:45	0.223	<0.00050	0.00090	0.0348	<0.00010	<0.0010	0.181	0.000689	447	<0.0010	0.0499	0.00643	10.4	0.00020	0.0497	158	7.11	<0.000010	0.0014	0.132	9.32	0.00080	4.62
LBGC-1	PZ2559(M)	11/5/16 12:30	2.89	<0.00050	0.00294	0.134	0.00020	<0.0010	0.118	0.000534	254	0.0047	0.0233	0.00989	9.77	0.00378	0.0314	82.3	2.88	<0.000010	0.0017	0.0713	11.3	0.00120	8.1
LBGC-1	PZ2589(M)	11/6/16 12:45	0.693	<0.00050	0.00083	0.0579	<0.00010	<0.0010	0.1	0.000315	186	0.0014	0.0163	0.00446	1.91	0.00083	0.0245	66.1	2.08	<0.000010	0.0013	0.0481	11.6	0.00083	4.99
LBGC-1	PZ4379(M)	11/7/16 13:15	3.64	<0.00050	0.00298	0.143	0.00018	<0.0010	0.094	0.000489	198	0.0054	0.0210	0.00814	9.05	0.00360	0.0283	66.6	1.88	<0.000010	0.0022	0.0634	11.5	0.00186	9.83
LBGC-1	PZ7373(M)	11/8/16 0:00	5.55	<0.00050	0.00617	0.263	0.00031	<0.0010	0.082	0.000820	198	0.0090	0.0237	0.0158	17.6	0.00745	0.0302	63.1	1.9	<0.000010	0.0028	0.0717	12.0	0.00183	12.4
LBGC-1	QA0673(M)	11/9/16 0:00	0.815	<0.00050	0.00151	0.0869	<0.00010	<0.0010	0.109	0.000553	244	0.0015	0.0260	0.00467	6.19	0.00135	0.0277	78.2	2.55	<0.000010	0.0014	0.0756	10.5	0.00196	5.31
LBGC-1	QA1855(M)	11/10/16 0:00	6.62	0.00051	0.00930	0.354	0.00050	<0.0010	0.103	0.00109	260	0.0122	0.0256	0.0252	23.4	0.0119	0.0430	81.7	2.24	<0.000010	0.0047	0.0764	11.4	0.00251	12.2
LBGC-1	QA2355(M)	11/11/16 0:00	3.61	<0.00050	0.00514	0.222	0.00031	<0.0010	0.096	0.000925	249	0.0067	0.0240	0.0165	13.8	0.00672	0.0388	79.8	2.29	<0.000010	0.0030	0.0699	10.5	0.00195	8.04
LBGC-1	QA5183(M)	11/12/16 0:00	0.955	<0.00050	0.00172	0.116	<0.00010	<0.0010	0.131	0.000569	295	0.0018	0.0236	0.00557	4.51	0.00204	0.0356	103	2.9	<0.000010	0.0027	0.0636	9.95	0.00203	5.12
LBGC-1	QA5185(M)	11/13/16 0:00	1.23	<0.00050	0.00195	0.129	0.00011	<0.0010	0.114	0.000553	279	0.0024	0.0200	0.00679	4.48	0.00250	0.0332	99.9	2.65	<0.000010	0.0022	0.0567	9.67	0.00218	5.43
LBGC-1	QA6857(M)	11/14/16 0:00	0.154	<0.00050	0.00034	0.0607	<0.00010	<0.0010	0.185	0.000692	385	<0.0010	0.0394	0.00156	0.982	<0.00020	0.0483	143	6.4	<0.000010	0.0014	0.0955	7.44	0.00112	4.23
LBGC-1	QB1809(M)	11/15/16 0:00	1.99	<0.0010	0.00286	0.137	<0.00020	<0.0020	0.193	0.000933	479	0.0043	0.0514	0.0071	7.73	0.00366	0.047	171	6.81	<0.000010	<0.0020	0.131	9.88	0.00165	8.55
LBGC-1	QB3530(M)	11/16/16 12:00	0.403	<0.0010	0.00068	0.0598	<0.00020	<0.0020	0.235	0.000704	518	<0.0020	0.0618	0.0015	5.24	<0.00040	0.049	188	8.17	<0.000010	<0.0020	0.16	10.0	0.00133	6.08
LBGC-1	QB5536(M)	11/17/16 13:00	0.274	<0.00050	0.00052	0.0563	<0.00010	<0.0010	0.236	0.000661	504	<0.0010	0.0625	0.00208	3.73	0.00053	0.0537	197	8.11	0.000012	0.0017	0.159	10.6	0.00110	5.42
LBL3C-1.57	PU5498(M)	10/14/16 16:30	3.74	<0.00050	0.00248	0.145	0.00045	<0.0010	<0.05	0.000573	114	0.0036	0.0159	0.00827	4.26	0.00245	0.0248	43.4	0.742	<0.000010	0.0011	0.0458	7.28	0.00050	6.01
LBL3C-1.57	QA2165(M)	11/10/16 9:30	5.9	<0.00050	0.00531	0.327	0.00049	<0.0010	<0.05	0.000796	90.2	0.0104	0.0102	0.0225	12.2	0.0101	0.0136	29.4	0.415	<0.000010	<0.0010	0.0350	8.05	0.00040	11.3
LBL3C-1.57	QB8118(M)	11/18/16 12:15	3.51	<0.00050	0.00128	0.0988	0.00053	<0.0010	<0.05	0.000647	108	0.0019	0.0196	0.00749	2.72	0.00176	0.0237	42.7	0.829	<0.000010	<0.0010	0.0577	7.46	0.00063	5.59
LBL3C-3.32	PU5492(M)	10/15/16 15:30	0.0942	0.00065	0.00025	0.0433	<0.00010	<0.0010	<0.05	0.000065	135	<0.0010	<0.00050	0.00147	0.123	<0.00020	<0.0050	64.9	0.0708	<0.000010	0.0100	0.0019	4.09	0.0114	1.31
LBL3C-3.32	QA2161(M)	11/10/16 8:30	0.8	<0.00050	0.00113	0.0678	<0.00010	<0.0010	<0.05	0.000079	46.8	0.0015	<0.00050	0.00333	1.1	0.00065	<0.0050	16.8	0.0126	<0.000010	<0.0010	0.0056	8.72	0.00028	5.48
LBL3C-3.32	QA2162(D)	11/10/16 8:45	0.778	<0.00050	0.00116	0.0677	<0.00010	<0.0010	<0.05	0.000080	50.0	0.0015	<0.00050	0.00355	1.15	0.00066	<0.0050	16.9	0.0134	<0.000010	<0.0010	0.0058	9.02	0.00027	5.77
LBL3C-3.32	QB8119(M)	11/18/16 11:40	0.441	<0.00050	0.00103	0.0776	<0.00010	<0.0010	<0.05	0.000083	68.2	<0.0010	<0.00050	0.00350	0.794	0.00062	0.0053	24.0	0.0171	<0.000010	<0.0010	0.0060	9.41	0.00025	4.66
LBL6-EP	PU5500(D)	10/14/16 13:30	0.106	<0.00050	0.00043	0.0484	<0.00010	<0.0010	<0.05	<0.000010	32.0	<0.0010	<0.00050	0.00090	0.221	<0.00020	<0.0050	7.06	0.0100	<0.000010	<0.0010	<0.0010	1.53	0.00027	2.78
LBL6-EP	PU5499(M)	10/14/16 13:30	0.0924	<0.00050	0.00044	0.0482	<0.00010	<0.0010	<0.05	0.000015	32.4	<0.0010	<0.00050	0.00088	0.245	<0.00020	<0.0050	7.13	0.0110	<0.000010	<0.0010	0.0011	1.55	0.00026	2.61
LBL6-EP	PY6181(M)	11/2/16 15:30	0.206	<0.00050	0.00042	0.0542	<0.00010	<0.0010	<0.05	0.000025	34.1	<0.0010	<0.00050	0.00137	0.391	<0.00020	<0.0050	7.81	0.0555	<0.000010	0.0011	0.0015	0.937	0.00030	2.76
LBL6-EP	QA2158(M)	11/10/16 12:30	0.497	<0.00050	0.00062	0.0549	<0.00010	<0.0010	<0.05	0.000069	29.5	<0.0010	<0.00050	0.00271	1.03	0.00066	<0.0050	6.87	0.0189	<0.000010	<0.0010	0.0025	0.690	0.00032	2.6
LBL6-EP	QB5535(M)	11/17/16 13:25	0.209	<0.00050	0.00121	0.0786	<0.00010	<0.0010	<0.05	0.000036	41.9	<0.0010	0.00056	0.00131	1.02	0.00041	<0.0050	8.60	0.116	<0.000010	0.0013	0.0022	2.56	0.00014	3.15
LBL6-WP	PU5537(M)	10/14/16 13:00	5.01	<0.00050	0.00048	0.0137	0.00110	<0.0010	<0.05	0.0137	264	<0.0010	0.0880	0.0140	0.467	0.00021	0.0421	91.7	2.53	<0.000010	<0.0010	0.367	2.58	0.00389	1.42
LBL6-WP	PY6182(M)	11/2/16 16:00	4.49	<0.00050	0.00046	0.0181	0.00097	<0.0010	<0.05	0.0163	364	<0.0010	0.101	0.0141	0.623	0.00038	0.0396	122	3.66	<0.000010	<0.0010	0.447	3.55	0.00426	1.45
LBL6-WP	QA2157(M)	11/10/16 12:00	2.18	<0.00050	0.00025	0.0081	0.00043	<0.0010	<0.05	0.0103	257	<0.0010	0.0599	0.00626	0.197	<0.00020	0.0198	85.6	2.06	<0.000010	<0.0010	0.276	2.69	0.00311	0.908
LBL6-WP	QB5534(M)	11/17/16 13:40	2.75	<0.00050	0.00051	0.0165	0.00059	<0.0010	<0.05	0.0149	362	<0.0010	0.0793	0.00864	0.496	0.00034	0.0270	130	3.07	<0.000010	<0.0010	0.387	3.78	0.00423	1.22
LBRR-D	PU5496(M)	10/14/16 12:00	5.25	<0.00050	0.00160	0.0363	0.00143	<0.0010	<0.05	0.00260	175	<0.0010	0.0335	0.00529	2.87	<0.00020	0.0423	64.9	0.716	<0.000010	0.0027	0.196	5.51	0.00057	2.66
LBRR-D	QA2152(M)	11/10/16 8:45	22	<0.00050	<0.00010	0.0180	0.00621	<0.0010	0.125	0.0152	519	<0.0010	0.159	0.00960	0.447	<0.00020	0.212	217	2.41	<0.000010	<0.0010	1.08	11.2	0.00157	6.31
RBAC-SEEP	PY6180(M)	11/1/16 15:00	0.0146	<0.00050	0.00013	0.324	<0.00010	<0.0010	0.285	0.000013	64.6	<0.0010	<0.00050	<0.00050	0.018	<0.00020	1.22	24.6	0.0046	<0.000010	0.0026	<0.0010	4.47	0.00033	6.77
RBAC-SEEP	QB8120(M)	11/18/16 13:30	0.354	<0.00050	0.00080	0.381	<0.00010	<0.0010	<0.05	0.000052	74.7	0.0010	0.00106	0.00285	1.39	0.00084	0.0811	16.7	0.0503	<0.000010	0.0022	0.0045	2.61	0.00084	5.59
RBAC-SUMP	PY0115(M)	10/29/16 14:00	0.248	0.00088	0.00130	0.827	<0.00010	<0.0010	0.101	0.000021	54.8	<0.0010	0.00088	0.00096	0.39	0.00025	0.158	16.7	0.0227	<0.000010	0.0124	0.0062	2.87	0.00320	4.82

Appendix 3.B-1 Surface Water Quality Laboratory Data

Station Code	Sample ID (Class)	Collection Date	T-Ag	T-Na	T-Sr	T-S	T-Tl	T-Sn	T-Ti	T-U	T-V	T-Zn	T-Zr	D-Al	D-Sb	D-As	D-Ba	D-Be	D-Bi	D-B	D-Cd	D-Ca	D-Cr	D-Co
			(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
FIELDBLANK	QE0418(B)	11/29/16 11:00	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050	<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050
TripBlank	QE0419(B)	11/30/16 10:20	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050	<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050
FIELDBLANK	QG1217(M)	12/10/16 10:40	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050	<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050
FIELDBLANK	QH3440(B)	12/19/16 12:35	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050	<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050
HP-POND	PR6455(M)	9/27/16 12:00	<0.000010	51.9	0.652	355	0.0000580	<0.00020	<0.0020	0.00263	0.00115	0.744	<0.00010	0.202	<0.00010	0.00018	0.0398	0.000270	<0.000025	0.135	0.00427	261	<0.00050	0.0749
LBEX-SP-In	PU5539(M)	10/16/16 16:15	<0.000020	12.7	0.266	63.4	<0.000050	<0.0050	<0.0050	0.00636	<0.0050	0.0120	<0.00050	0.0052	0.00115	0.00038	0.0645	<0.00010	<0.0010	<0.05	<0.000010	47.3	<0.0010	<0.00050
LBEX-SP-Out	PU5538(M)	10/16/16 16:00	<0.000020	14.7	0.29	57.7	<0.000050	<0.0050	0.0340	0.00718	0.0052	0.0162	0.00068	0.0259	0.00169	0.00033	0.0645	<0.00010	<0.0010	<0.05	0.000203	57.9	<0.0010	0.00246
LBEX-SP-Out	QA2156(M)	11/10/16 11:00	<0.000020	13.1	0.269	65.7	<0.000050	<0.0050	<0.0050	0.00703	<0.0050	0.0078	<0.00050	0.0137	0.00140	0.00043	0.124	<0.00010	<0.0010	<0.05	0.000053	61.8	<0.0010	0.00068
LBEX-SP-Out	QB5532(M)	11/17/16 12:20	<0.000020	12.9	0.291	60.5	<0.000050	<0.0050	<0.0050	0.00802	<0.0050	0.0061	<0.00050	0.0165	0.00181	0.00053	0.153	<0.00010	<0.0010	<0.05	0.000028	71.3	<0.0010	0.00064
LBEX-SP-Out	QG5341(M)	12/14/16 11:30	<0.000020	16.8	0.34	82.0	<0.000050	<0.0050	<0.0050	0.00839	<0.0050	0.0167	<0.00050	0.0137	0.00178	0.00061	0.16	<0.00010	<0.0010	<0.05	0.000047	74.8	<0.0010	0.00089
LBGC-0.11	QA2154(M)	11/10/16 10:00	0.000038	49.3	0.428	172	<0.000050	<0.0050	<0.0050	0.00283	<0.0050	0.0135	<0.00050	0.0177	<0.00050	0.00050	0.0661	<0.00010	<0.0010	0.061	0.000260	165	<0.0010	0.00595
LBGC-0.11	QF4712(M)	12/6/16 2:00	<0.000020	243	1.37	850	<0.000050	<0.0050	0.0138	0.00311	<0.0050	0.195	<0.00050	0.0042	<0.00050	0.00013	0.0180	<0.00010	<0.0010	0.308	0.000432	511	<0.0010	0.123
LBGC-0.53	PY6177(M)	11/3/16 13:30	<0.000020	143	1.43	609	<0.000050	<0.0050	<0.0050	0.0117	<0.0050	0.0864	<0.00050	1.34	<0.00050	0.00064	0.0739	0.00024	<0.0010	0.154	0.000565	553	<0.0010	0.0470
LBGC-0.60	PU5495(M)	10/13/16 16:00	<0.000020	26.9	0.304	71.3	<0.000050	<0.0050	0.0200	0.00194	<0.0050	0.0224	0.00065	0.0229	<0.00050	0.00034	0.0462	<0.00010	<0.0010	0.055	0.000156	85.2	<0.0010	0.00733
LBGC-0.60	QA2155(M)	11/10/16 10:30	0.000439	20.1	0.301	37.9	0.000289	<0.0050	0.0499	0.00302	0.0384	0.171	0.00341	0.0150	<0.00050	0.00060	0.0398	<0.00010	<0.0010	<0.05	0.000202	71.5	<0.0010	0.00121
LBGC-1	PU5494(M)	10/13/16 16:15	<0.000020	129	0.833	490	<0.000050	<0.0050	0.0097	0.00412	<0.0050	0.592	<0.00050	0.0665	<0.00050	0.00037	0.0320	0.00012	<0.0010	0.162	0.00209	287	<0.0010	0.102
LBGC-1	PY6124(M)	11/3/16 13:00	<0.000020	162	1.13	637	<0.000050	<0.0050	0.0052	0.00465	<0.0050	0.114	<0.00050	0.0504	<0.00050	0.00065	0.0312	<0.00010	<0.0010	0.171	0.000634	478	<0.0010	0.0490
LBGC-1	PZ2558(M)	11/4/16 12:45	<0.000020	168	1.16	660	<0.000050	<0.0050	<0.0050	0.00350	<0.0050	0.106	<0.00050	0.0113	<0.00050	0.00041	0.0292	<0.00010	<0.0010	0.224	0.000658	459	<0.0010	0.0471
LBGC-1	PZ2559(M)	11/5/16 12:30	0.000066	83.6	0.661	298	0.000073	<0.0050	0.0525	0.00323	0.0082	0.0689	0.0267	0.0164	<0.00050	0.00029	0.0413	<0.00010	<0.0010	0.124	0.000356	211	<0.0010	0.0198
LBGC-1	PZ2589(M)	11/6/16 12:45	0.000057	68.6	0.521	224	<0.000050	<0.0050	0.0170	0.00250	<0.0050	0.0299	0.00064	0.0630	<0.00050	0.00026	0.0413	<0.00010	<0.0010	0.146	0.000264	201	<0.0010	0.0165
LBGC-1	PZ4379(M)	11/7/16 13:15	0.000223	65.1	0.562	234	0.000090	<0.0050	0.107	0.00296	0.0101	0.0678	0.00274	0.0164	<0.00050	0.00027	0.0567	<0.00010	<0.0010	0.1	0.000380	185	<0.0010	0.0178
LBGC-1	PZ7373(M)	11/8/16 0:00	0.000056	59.8	0.571	222	0.000105	<0.0050	0.0710	0.00338	0.0147	0.116	0.00187	0.0164	<0.00050	0.00030	0.0567	<0.00010	<0.0010	0.084	0.000391	164	<0.0010	0.0174
LBGC-1	QA0673(M)	11/9/16 0:00	0.000030	80.2	0.617	289	<0.000050	<0.0050	0.0081	0.00296	<0.0050	0.0682	0.00068	0.0140	<0.00050	0.00034	0.0662	<0.00010	<0.0010	0.111	0.000473	256	<0.0010	0.0222
LBGC-1	QA1855(M)	11/10/16 0:00	0.000237	76.8	0.668	300	0.000271	<0.0050	0.0455	0.00506	0.0206	0.115	0.00200	0.0137	<0.00050	0.00043	0.0587	<0.00010	<0.0010	0.089	0.000559	258	<0.0010	0.0146
LBGC-1	QA2355(M)	11/11/16 0:00	0.000109	76.2	0.628	297	0.000136	<0.0050	0.0349	0.00487	0.0129	0.0833	0.00183	0.0121	<0.00050	0.00034	0.0627	<0.00010	<0.0010	0.088	0.000499	266	<0.0010	0.0164
LBGC-1	QA5183(M)	11/12/16 0:00	0.000054	107	0.769	375	0.000055	<0.0050	0.0148	0.00483	<0.0050	0.0376	0.00063	0.0117	<0.00050	0.00020	0.0636	<0.00010	<0.0010	0.116	0.000451	284	<0.0010	0.0200
LBGC-1	QA5185(M)	11/13/16 0:00	0.000070	97.4	0.731	363	0.000061	<0.0050	0.0177	0.00503	<0.0050	0.0453	0.00087	0.0118	<0.00050	0.00045	0.0723	<0.00010	<0.0010	0.118	0.000469	275	<0.0010	0.0170
LBGC-1	QA6857(M)	11/14/16 0:00	<0.000020	147	0.994	588	<0.000050	<0.0050	<0.0050	0.00448	<0.0050	0.0418	<0.00050	0.008	<0.00050	0.0001	0.0654	<0.00010	<0.0010	0.223	0.000772	450	<0.0010	0.0448
LBGC-1	QB1809(M)	11/15/16 0:00	0.000057	177	1.17	752	<0.00010	<0.01	0.067	0.00544	<0.01	0.101	0.0014	0.0069	<0.00050	0.00016	0.0624	<0.00010	<0.0010	0.229	0.000542	461	<0.0010	0.0503
LBGC-1	QB3530(M)	11/16/16 12:00	<0.000040	207	1.26	816	<0.00010	<0.01	<0.01	0.00469	<0.01	0.095	<0.0010	<0.0030	<0.00050	0.00020	0.0486	<0.00010	<0.0010	0.237	0.000401	510	<0.0010	0.0601
LBGC-1	QB5536(M)	11/17/16 13:00	<0.000020	206	1.28	790	<0.000050	<0.0050	0.0053	0.00528	<0.0050	0.0806	<0.00050	0.0051	<0.00050	0.00024	0.0482	<0.00010	<0.0010	0.233	0.000594	523	<0.0010	0.0615
LBL3C-1.57	PU5498(M)	10/14/16 16:30	<0.000020	40.1	0.413	98.8	<0.000050	<0.0050	0.0372	0.00266	0.0060	0.356	0.00112	0.576	<0.00050	0.00049	0.0772	<0.00010	<0.0010	<0.05	0.000380	108	<0.0010	0.0109
LBL3C-1.57	QA2165(M)	11/10/16 9:30	0.000182	22.7	0.28	32.0	0.000127	<0.0050	0.0678	0.00195	0.0199	0.193	0.00169	0.667	<0.00050	0.00093	0.0656	<0.00010	<0.0010	<0.05	0.000083	56.6	<0.0010	0.00178
LBL3C-1.57	QB8118(M)	11/18/16 12:15	0.000039	35.4	0.376	96.7	<0.000050	<0.0050	0.0091	0.00270	<0.0050	0.348	0.00071	0.0838	<0.00050	0.00027	0.0614	<0.00010	<0.0010	<0.05	0.000375	108	<0.0010	0.0158
LBL3C-3.32	PU5492(M)	10/15/16 15:30	<0.000020	16.7	0.451	198	<0.000050	<0.0050	<0.0050	0.00766	<0.0050	<0.0050	<0.00050	0.0058	0.00070	0.00020	0.0450	<0.00010	<0.0010	<0.05	0.000049	138	<0.0010	<0.00050
LBL3C-3.32	QA2161(M)	11/10/16 8:30	0.000022	14.9	0.174	23.0	<0.000050	<0.0050	0.0085	0.00091	<0.0050	0.0247	0.00053	0.0372	<0.00050	0.00085	0.0554	<0.00010	<0.0010	<0.05	0.000029	44.8	<0.0010	<0.00050
LBL3C-3.32	QA2162(D)	11/10/16 8:45	0.000024	15.3	0.179	25.1	<0.000050	<0.0050	0.0079	0.00094	<0.0050	0.0233	0.00131	0.592	<0.00050	0.00094	0.0608	<0.00010	<0.0010	<0.05	0.000040	51.2	0.0011	<0.00050
LBL3C-3.32	QB8119(M)	11/18/16 11:40	<0.000020	20.1	0.263	40.0	<0.000050	<0.0050	<0.0050	0.00158	<0.0050	0.0202	0.00055	0.0266	<0.00050	0.00082	0.0663	<0.00010	<0.0010	<0.05	0.000038	70.1	<0.0010	<0.00050
LBL6-EP	PU5500(D)	10/14/16 13:30	<0.000020	1.65	0.12	5.9	<0.000050	<0.0050	<0.0050	0.00040	<0.0050	<0.0050	<0.00050	0.0054	<0.00050	0.00030	0.0478	<0.00010	<0.0010	<0.05	0.000010	32.7	<0.0010	<0.00050
LBL6-EP	PU5499(M)	10/14/16 13:30	<0.000020	1.72	0.119	6.5	<0.000050	<0.0050	<0.0050	0.00039	<0.0050	<0.0050	<0.00050	0.0115	<0.00050	0.00028	0.0479	<0.00010	<0.0010	<0.05	0.000011	32.9	<0.0010	<0.00050
LBL6-EP	PY6181(M)	11/2/16 15:30	<0.000020	2.16	0.127	7.1	<0.000050	<0.0050	<0.0050	0.00057	<0.0050	0.0072	<0.00050	0.0056	<0.00050	0.00027	0.0430	<0.00010	<0.0010	<0.05	0.000011	34.7	<0.0010	<0.00050
LBL6-EP	QA2158(M)	11/10/16 12:30	<0.000020	1.83	0.11	5.3	<0.000050	<0.0050	0.0067	0.00052	<0.0050	0.0078	<0.00050	0.0142	<0.00050	0.00021	0.0427	<0.00010	<0.0010	<0.05	0.000020	31.2	<0.0010	<0.00050
LBL6-EP	QB5535(M)	11/17/16 13:25	<0.000020	2.23	0.145	7.6	<0.000050	<0.0050	0.0051	0.00042	<0.0050	<0.0050	<0.00050	<0.0030	<0.00050	0.00056	0.0676	<0.00010	<0.0010	<0.05	<0.000010	40.3	<0.0010	<0.00050
LBL6-WP	PU5537(M)	10/14/16 13:00	<0.000020	19.3	0.301	371	<0.000050	<0.0050	<0.0050	0.00347	<0.0050	0.578	<0.00050	6.43	<0.00050	0.00025	0.0111	0.00149	<0.0010	<0.05	0.0182	354	<0.0010	0.115
LBL6-WP	PY6182(M)	11/2/16 16:00	<0.000020	26.6	0.376	478	<0.000050	<0.0050	<0.0050	0.00329	<0.0050	0.61	<0.00050	3.91	<0.00050	0.00011	0.0115	0.00085	<0.0010	<0.05	0.0179	385	<0.0010	0.0969
LBL6-WP	QA2157(M)	11/10/16 12:00	<0.000020	19.7	0.26	343	<0.000050	<0.0050	<0.0050	0.00181	<0.0050	0.351	<0.00050	2.24	<0.00050	0.00011	0.0082	0.00059	<0.0010	<0.05	0.0121	301	<0.0010	0.0754
LBL6-WP	QB5534(M)	11/17/16 13:40	<0.000020	27.5	0.386	497	<0.000050	<0.0050	<0.0050	0.00250	<0.0050	0.455	<0.00050	1.27	<0.00050	0.00023	0.0098	0.00042	<0.0010	<0.05	0.0149	376	<0.0010	0.0805
LBRR-D	PU5496(M)	10/14/16 12:00	<0.000020	25.2	0.497	204	<0.000050	<0.0050	<0.0050	0.00245	<0.0050	0.429	<0.00050	0.167	<0.00050	0.00017	0.0315	0.00023	<0.0010	<0.05	0.00306	205	<0.0010	0.0392
LBRR-D	QA2152(M)	11/10/16 8:45	<0.000020	42.3	1.59	822	0.000069	<0.0050	<0.0050	0.00159	<0.0050	2.14	<0.00050	7.17	<0.0010	<0.00020	0.0175	0.00236	<0.0020	0.116	0.0157	569	<0.0020	0.158
RBAC-SEEP	PY6180(M)	11/1/16 15:00	<0.000020	817	0.244	5.4	<0.000050	<0.0050	<0.0050	0.00607	<0.0050	<0.0050	<0.00050	0.0043	<0.00050	0.00019	0.343	<0.00010	<0.0010	0.234	<0.000010	67.7	<0.0010	<0.00050
RBAC-SEEP	QB8120(M)	11/18/16 13:30	<0.000020	118	0.219	8.2	<0.000050	<0.0050	0.0102	0.00323	<0.0050	0.0051	<0.00050	0.0040	<0.00050	0.00023	0.288	<0.00010	<0.0010	0.054	<0.000010	68.3	<0.0010	<0.00050
RBAC-SUMP	PY0115(M)	10/29/16 14:00	<0.000020	225	0.295	15.4	<0.000050	<0.0050	<0.0050	0.00579	<0.0050	<0.0050	<0.00050	0.0056	0.00106	0.00113	0.774	<0.00010	<0.0010	0.1	0.000045	53.5	<0.0010	0.00065

Appendix 3.B-1 Surface Water Quality Laboratory Data

Station Code	Sample ID (Class)	Collection Date	D-Cu	D-Fe	D-Pb	D-Li	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Si	D-Ag	D-Na	D-Sr	D-S	D-Tl	D-Sn	D-Ti	D-U	D-V	D-Zn	D-Zr
			(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
FIELDBLANK	QE0418(B)	11/29/16 11:00	0.00024	<0.0050	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050
TripBlank	QE0419(B)	11/30/16 10:20	0.00030	<0.0050	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050
FIELDBLANK	QG1217(M)	12/10/16 10:40	<0.00020	<0.0050	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050
FIELDBLANK	QH3440(B)	12/19/16 12:35	<0.00020	<0.0050	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050
HP-POND	PR6455(M)	9/27/16 12:00	0.00395	17.3	<0.000025	0.0861	101	2.53	<0.0000020	0.00070	0.276	4.27	0.00055	6.93	<0.000025	54.3	0.68	368	0.000027	<0.0010	<0.0025	0.00126	<0.0010	0.799	<0.00050
LBEX-SP-In	PU5539(M)	10/16/16 16:15	0.00089	<0.0050	<0.00020	<0.0050	24.5	0.0870	<0.000010	0.0218	0.0010	4.25	0.00571	0.371	<0.000020	14.2	0.297	54.5	<0.000050	<0.0050	<0.0050	0.00746	<0.0050	<0.0050	<0.00050
LBEX-SP-Out	PU5538(M)	10/16/16 16:00	0.00120	<0.0050	<0.00020	0.0058	22.9	0.12	<0.000010	0.0295	0.0089	4.96	0.00329	0.388	<0.000020	12.7	0.278	60.4	<0.000050	<0.0050	<0.0050	0.00637	<0.0050	0.0089	<0.00050
LBEX-SP-Out	QA2156(M)	11/10/16 11:00	0.00075	<0.0050	<0.00020	<0.0050	24.0	0.165	<0.000010	0.0281	0.0031	4.72	0.00338	0.52	<0.000020	13.7	0.29	66.2	<0.000050	<0.0050	<0.0050	0.00723	<0.0050	0.0051	<0.00050
LBEX-SP-Out	QB5532(M)	11/17/16 12:20	0.00078	0.0062	<0.00020	<0.0050	26.3	0.152	<0.000010	0.0336	0.0034	5.06	0.00364	0.609	<0.000020	14.6	0.323	68.8	<0.000050	<0.0050	<0.0050	0.00886	<0.0050	<0.0050	<0.00050
LBEX-SP-Out	QG5341(M)	12/14/16 11:30	0.00120	<0.0050	<0.00020	0.0054	30.6	0.159	<0.000010	0.0333	0.0054	5.60	0.00352	0.55	<0.000020	16.6	0.335	74.8	<0.000050	<0.0050	<0.0050	0.00904	<0.0050	0.0102	<0.00050
LBGC-0.11	QA2154(M)	11/10/16 10:00	0.00355	0.0220	<0.00020	0.0159	52.2	0.783	<0.000010	0.0014	0.0188	11.7	0.00164	4.37	<0.000020	51.7	0.412	205	<0.000050	<0.0050	<0.0050	0.00238	<0.0050	0.0103	<0.00050
LBGC-0.11	QF4712(M)	12/6/16 2:00	0.00021	3.34	<0.00020	0.0753	213	12.3	<0.000010	<0.0010	0.323	8.49	0.00019	5.51	<0.000020	253	1.37	839	<0.000050	<0.0050	<0.0050	0.00289	<0.0050	0.155	<0.00050
LBGC-0.53	PY6177(M)	11/3/16 13:30	0.00168	5.94	<0.00020	0.0580	152	5.3	<0.000010	0.0017	0.109	13.7	0.00105	7.18	<0.000020	139	1.51	616	<0.000050	<0.0050	<0.0050	0.0124	<0.0050	0.0864	<0.00050
LBGC-0.60	PU5495(M)	10/13/16 16:00	0.00290	0.0252	<0.00020	0.0135	31.2	0.503	<0.000010	0.0011	0.0257	12.7	0.00050	3.61	<0.000020	28.6	0.336	77.5	<0.000050	<0.0050	<0.0050	0.00202	<0.0050	0.0072	<0.00050
LBGC-0.60	QA2155(M)	11/10/16 10:30	0.00404	0.0529	<0.00020	<0.0050	20.8	0.187	<0.000010	<0.0010	0.0078	14.7	0.00049	4.86	<0.000020	19.3	0.223	44.7	<0.000050	<0.0050	<0.0050	0.00081	<0.0050	<0.0050	<0.00050
LBGC-1	PU5494(M)	10/13/16 16:15	0.00234	30.6	<0.00020	0.107	119	5.55	<0.000010	0.0010	0.325	9.47	0.00063	4.91	<0.000020	135	0.831	503	<0.000050	<0.0050	<0.0050	0.00182	<0.0050	0.527	<0.00050
LBGC-1	PY6124(M)	11/3/16 13:00	0.00063	12	<0.00020	0.0517	160	7.3	<0.000010	0.0010	0.135	9.31	0.00044	4.51	<0.000020	168	1.22	670	<0.000050	<0.0050	<0.0050	0.00345	<0.0050	0.0887	<0.00050
LBGC-1	PZ2558(M)	11/4/16 12:45	0.00085	8.58	<0.00020	0.0552	162	7.37	<0.000010	0.0017	0.125	9.00	0.00069	5.03	<0.000020	172	1.14	677	<0.000050	<0.0050	<0.0050	0.00364	<0.0050	0.0884	<0.00050
LBGC-1	PZ2559(M)	11/5/16 12:30	0.00205	1.18	<0.00020	0.0297	79.6	2.63	<0.000010	0.0012	0.0557	11.2	0.00079	4.19	<0.000020	80.3	0.582	288	<0.000050	<0.0050	<0.0050	0.00265	<0.0050	0.0321	<0.00050
LBGC-1	PZ2589(M)	11/6/16 12:45	0.00219	0.0879	<0.00020	0.0245	66.0	2.08	<0.000010	0.0012	0.0472	11.4	0.00074	3.98	<0.000020	66.8	0.513	228	<0.000050	<0.0050	<0.0050	0.00263	<0.0050	0.0218	<0.00050
LBGC-1	PZ4379(M)	11/7/16 13:15	0.00221	0.0212	<0.00020	0.0277	64.3	1.73	<0.000010	0.0012	0.0519	11.1	0.00127	3.96	<0.000020	61.7	0.51	227	<0.000050	<0.0050	<0.0050	0.00243	<0.0050	0.0335	<0.00050
LBGC-1	PZ7373(M)	11/8/16 0:00	0.00253	0.0184	<0.00020	0.0232	61.8	1.74	<0.000010	0.0013	0.0511	10.8	0.00136	3.64	<0.000020	60.8	0.514	214	<0.000050	<0.0050	<0.0050	0.00245	<0.0050	0.0339	<0.00050
LBGC-1	QA0673(M)	11/9/16 0:00	0.00222	0.0327	<0.00020	0.0285	86.3	2.48	<0.000010	0.0013	0.0730	11.2	0.00162	4.16	<0.000020	86.6	0.65	313	<0.000050	<0.0050	<0.0050	0.00287	<0.0050	0.0494	<0.00050
LBGC-1	QA1855(M)	11/10/16 0:00	0.00259	0.0197	<0.00020	0.0313	79.9	2.04	<0.000010	0.0021	0.0419	10.3	0.00176	4.14	<0.000020	77.8	0.648	323	<0.000050	<0.0050	<0.0050	0.00422	<0.0050	0.0155	<0.00050
LBGC-1	QA2355(M)	11/11/16 0:00	0.00266	0.0237	<0.00020	0.0302	82.8	2.19	<0.000010	0.0018	0.0455	10.6	0.00196	4.27	<0.000020	81.1	0.662	350	<0.000050	<0.0050	<0.0050	0.00408	<0.0050	0.0171	<0.00050
LBGC-1	QA5183(M)	11/12/16 0:00	0.00225	0.0241	<0.00020	0.0350	96.0	2.81	<0.000010	0.0019	0.0546	9.19	0.00207	3.94	<0.000020	95.9	0.736	374	<0.000050	<0.0050	<0.0050	0.00433	<0.0050	0.0193	<0.00050
LBGC-1	QA5185(M)	11/13/16 0:00	0.00220	0.0147	<0.00020	0.0367	93.4	2.48	<0.000010	0.0021	0.0459	9.40	0.00223	4.5	<0.000020	91.0	0.761	366	<0.000050	<0.0050	<0.0050	0.00471	<0.0050	0.0262	<0.00050
LBGC-1	QA6857(M)	11/14/16 0:00	0.00108	0.154	<0.00020	0.0581	159	7.21	<0.000010	0.0017	0.109	8.32	0.00138	4.71	<0.000020	164	1.11	656	<0.000050	<0.0050	<0.0050	0.00527	<0.0050	0.0367	<0.00050
LBGC-1	QB1809(M)	11/15/16 0:00	0.00107	0.0210	<0.00020	0.0563	171	7.34	<0.000010	0.0016	0.122	9.44	0.00150	4.44	<0.000020	179	1.25	699	<0.000050	<0.0050	<0.0050	0.00518	<0.0050	0.0535	<0.00050
LBGC-1	QB3530(M)	11/16/16 12:00	0.00043	0.353	<0.00020	0.0605	184	8.42	<0.000010	0.0015	0.151	10.1	0.00106	4.6	<0.000020	197	1.33	759	<0.000050	<0.0050	<0.0050	0.00429	<0.0050	0.0464	<0.00050
LBGC-1	QB5536(M)	11/17/16 13:00	0.00103	0.0139	<0.00020	0.0519	194	7.94	<0.000010	0.0014	0.152	10.3	0.00102	5	<0.000020	210	1.3	767	<0.000050	<0.0050	<0.0050	0.00510	<0.0050	0.0605	<0.00050
LBL3C-1.57	PU5498(M)	10/14/16 16:30	0.00212	0.24	<0.00020	0.0260	41.7	0.634	<0.000010	<0.0010	0.0312	7.94	0.00037	4.31	<0.000020	43.5	0.459	109	<0.000050	<0.0050	0.0129	0.00163	<0.0050	0.0772	<0.00050
LBL3C-1.57	QA2165(M)	11/10/16 9:30	0.00343	0.521	0.00047	0.0071	22.0	0.102	<0.000010	<0.0010	0.0101	7.82	0.00046	5.48	<0.000020	22.3	0.224	40.6	<0.000050	<0.0050	0.0169	0.00123	<0.0050	0.0294	0.00073
LBL3C-1.57	QB8118(M)	11/18/16 12:15	0.00473	0.0641	<0.00020	0.0237	43.8	0.797	<0.000010	0.0011	0.0442	7.19	0.00038	4.38	<0.000020	36.6	0.332	98.9	<0.000050	<0.0050	<0.0050	0.00230	<0.0050	0.134	<0.00050
LBL3C-3.32	PU5492(M)	10/15/16 15:30	0.00103	<0.0050	<0.00020	<0.0050	67.2	0.0731	<0.000010	0.0114	0.0017	4.39	0.0109	1.12	<0.000020	18.2	0.505	204	<0.000050	<0.0050	<0.0050	0.00834	<0.0050	<0.0050	<0.00050
LBL3C-3.32	QA2161(M)	11/10/16 8:30	0.00222	0.202	<0.00020	<0.0050	17.2	0.0056	<0.000010	<0.0010	0.0040	8.85	0.00021	5.01	<0.000020	15.6	0.182	24.2	<0.000050	<0.0050	<0.0050	0.00084	<0.0050	0.0091	0.00079
LBL3C-3.32	QA2162(D)	11/10/16 8:45	0.00263	0.449	0.00023	<0.0050	17.9	0.0069	<0.000010	<0.0010	0.0045	10.2	0.00024	6.47	<0.000020	16.0	0.181	30.1	<0.000050	<0.0050	0.0182	0.00087	<0.0050	0.0127	0.00131
LBL3C-3.32	QB8119(M)	11/18/16 11:40	0.00282	0.196	<0.00020	0.0053	24.4	0.0043	<0.000010	<0.0010	0.0052	9.47	0.00027	4.39	<0.000020	20.2	0.26	37.7	<0.000050	<0.0050	<0.0050	0.00170	<0.0050	0.0089	0.00069
LBL6-EP	PU5500(D)	10/14/16 13:30	0.00051	0.0640	<0.00020	<0.0050	7.35	0.0085	<0.000010	0.0010	<0.0010	1.58	0.00024	2.42	<0.000020	1.87	0.125	6.3	<0.000050	<0.0050	<0.0050	0.00040	<0.0050	<0.0050	<0.00050
LBL6-EP	PU5499(M)	10/14/16 13:30	0.00054	0.0639	<0.00020	<0.0050	7.15	0.0083	<0.000010	<0.0010	<0.0010	1.57	0.00021	2.39	<0.000020	1.86	0.125	6.0	<0.000050	<0.0050	<0.0050	0.00044	<0.0050	<0.0050	<0.00050
LBL6-EP	PY6181(M)	11/2/16 15:30	0.00061	0.0284	<0.00020	<0.0050	6.59	0.0315	<0.000010	0.0011	<0.0010	0.732	0.00027	2.28	<0.000020	1.61	0.122	6.0	<0.000050	<0.0050	<0.0050	0.00047	<0.0050	<0.0050	<0.00050
LBL6-EP	QA2158(M)	11/10/16 12:30	0.00094	0.0210	<0.00020	<0.0050	6.88	<0.0010	<0.000010	<0.0010	<0.0010	0.559	0.00032	2.25	<0.000020	1.88	0.114	6.0	<0.000050	<0.0050	<0.0050	0.00049	<0.0050	<0.0050	<0.00050
LBL6-EP	QB5535(M)	11/17/16 13:25	0.00075	0.0230	<0.00020	<0.0050	8.54	0.0385	<0.000010	0.0012	0.0015	2.48	0.00015	2.78	<0.000020	2.21	0.14	6.8	<0.000050	<0.0050	<0.0050	0.00040	<0.0050	<0.0050	<0.00050
LBL6-WP	PU5537(M)	10/14/16 13:00	0.0156	0.0509	<0.00020	0.0561	122	3.93	<0.000010	<0.0010	0.491	3.27	0.00543	1.63	<0.000020	25.4	0.433	499	<0.000050	<0.0050	<0.0050	0.00454	<0.0050	0.796	<0.00050
LBL6-WP	PY6182(M)	11/2/16 16:00	0.0103	0.0337	<0.00020	0.0397	112	3.62	<0.000010	<0.0010	0.432	3.31	0.00442	1.42	<0.000020	24.5	0.394	463	<0.000050	<0.0050	<0.0050	0.00294	<0.0050	0.584	<0.00050
LBL6-WP	QA2157(M)	11/10/16 12:00	0.00699	0.0242	<0.00020	0.0270	105	2.67	<0.000010	<0.0010	0.362	3.02	0.00347	0.849	<0.000020	24.0	0.298	397	<0.000050	<0.0050	<0.0050	0.00192	<0.0050	0.431	<0.00050
LBL6-WP	QB5534(M)	11/17/16 13:40	0.00562	0.0134	<0.00020	0.0263	131	3.05	<0.000010	<0.0010	0.385	3.76	0.00446	1.03	<0.000020	28.9	0.396	528	<0.000050	<0.0050	<0.0050	0.00213	<0.0050	0.432	<0.00050
LBRR-D	PU5496(M)	10/14/16 12:00	0.00228	0.106	<0.00020	0.0511	82.0	0.894	<0.000010	0.0031	0.237	6.71	0.00063	2.65	<0.000020	31.4	0.595	258	<0.000050	<0.0050	<0.0050	0.00156	<0.0050	0.401	<0.00050
LBRR-D	QA2152(M)	11/10/16 8:45	0.00796	0.408	<0.00040	0.208	226	2.4	<0.000010	<0.0020	1.07	12.6	0.00163	6.09	<0.000040	45.6	1.59	863	0.00017	<0.01	<0.01	0.00107	<0.01	2.21	<0.0010
RBAC-SEEP	PY6180(M)	11/1/16 15:00	0.00024	0.0075	<0.00020	1.29	23.7	0.0050	<0.000010	0.0028	<0.0010	4.66	0.00033	6.98	<0.000020	786	0.258	5.4	<0.000050	<0.0050	<0.0050	0.00620	<0.0050	<0.0050	<0.00050
RBAC-SEEP	QB8120(M)	11/18/16 13:30	0.00039	<0.0050	<0.00020	0.0885	18.6	0.0135	<0.000010	0.0032	0.0037	2.67	0.00101	5.19	<0.000020	132	0.207	7.1	<0.000050	<0.0050	<0.0050	0.00345	<0.0050	<0.0050	<0.00050
RBAC-SUMP	PY0115(M)	10/29/16 14:00	0.00047	0.0115	<0.00020	0.157	16.7	0.0167	<0.000010	0.0128	0.0055	2.77	0.00323	4.43	<0.000020	228	0.286	15.0	<0.000050	<0.0050	<0.0050	0.00576	<0.0050	<0.0050	<0.00050

Appendix 3.B-1 Surface Water Quality Laboratory Data

Station Code	Sample ID (Class)	Collection Date	pH	Turbidity (NTU)	Cond (uS/cm)	TDS (mg/L)	TSS (mg/L)	T-Hard (mg/L)	D-Hard (mg/L)	ALK-T (mg/L)	Alk-PP (mg/L)	HCO3 (mg/L)	CO3 (mg/L)	OH (mg/L)	Cl (mg/L)	F (mg/L)	Br (mg/L)	D-SO4 (mg/L)	T-S2- (mg/L)	H2S (mg/L)	N-NH3 (mg/L)	N-NO2 (mg/L)	N-NO3 (mg/L)	N-NO2_NO3 (mg/L)	PO4 (mg/L)	TOC (mg/L)	DOC (mg/L)
RBAC-SUMP	QA2159(M)	11/10/16 13:00	8.13	11.7	1440	858	14.8	300	265	457	<0.50	557	<0.50	<0.50	160	0.150	0.31	99.4			0.50	0.0695	0.549	0.619	0.0245	1.46	2.19
RBSC-US	PU5541(M)	10/17/16 11:00				592	<1.2	465	406						42	0.190	0.092	174			0.020	0.0032	0.0278	0.0310	<0.0050	5.36	2.64
RBSC-US	QA2160(M)	11/10/16 13:30	8.19	8.18	984	642	7.3	481	469	301	<0.50	367	<0.50	<0.50	43	0.210	<0.10	170			0.040	<0.0050	0.060	0.060	0.0119	2.46	2.75
RBSC-US	QB8121(M)	11/18/16 12:30	8.17	38.3	972	654	59.0	473	490	301	<0.50	367	<0.50	<0.50	37	0.210	<0.10	170			0.022	<0.0050	0.084	0.084	0.0066	4.11	3.49
RCC-Sump	PY0114(M)	10/29/16 13:00	8.25			410	9.5	291	301	282	<0.50	344	<0.50	<0.50	30	0.150	<0.10	53.0			0.27	0.0121	0.146	0.158	0.0147	1.48	1.98
RSEML3-LP	PU5493(M)	10/14/16 15:30				594	5.8	377	353						85	0.140	0.481	165			0.026	0.0045	<0.0020	0.0037	0.0557	16.8	15.6
RSEML3-MP	QA2164(M)	11/10/16 10:00	8.09	3.18	784	532	<4.0	360	367	101	<0.50	123	<0.50	<0.50	1.1	0.092	<0.10	259			2.2	0.0345	0.181	0.216	0.0153	5.16	5.67
RSEML3-UP	PU5497(M)	10/14/16 12:15				1370	151	894	878						49	0.730	0.209	711			0.036	0.0059	0.0836	0.0895	<0.0050	9.11	6.12
RSEML3-UP	QA2163(M)	11/10/16 10:30	7.98	1.83	1480	1210	<4.0	796	889	76.4	<0.50	93.2	<0.50	<0.50	1.7	0.120	<0.10	750			0.099	0.0242	3.25	3.27	0.0050	5.27	4.74
RSEMR5B-SP	PU5540(M)	10/17/16 10:30				480	62.8	255	262						39	0.190	0.089	88.3			0.57	0.0358	0.234	0.270	<0.0050	42.9	29.9
RSEMR5B-SP	PY0116(M)	10/29/16 15:00	7.67			178	360	105	91.3	48.0	<0.50	58.6	<0.50	<0.50	2.5	0.120	<0.10	53.1			0.27	0.0219	0.193	0.215	0.0166	11.3	9.25
RSEMR5B-SP	QE0286(M)	11/29/16 12:15	8.10	32.3	1800	1080	15.3	224	298	606	<0.50	739	<0.50	<0.50	160	0.180	0.47	74.2			0.38	0.0463	0.815	0.862	<0.0050	5.46	5.32
RSEMR5B-SP	QF4710(M)	12/6/16 3:35	8.33	23.2	1960	1190	34.3	305	308	644	5.48	773	6.58	<0.50	200	0.240	0.45	153			0.41	0.0625	0.686	0.749	<0.0050	16.5	17.6
RSEMR5B-SP	QF6036(M)	12/7/16 11:30	8.25	24.2	2060	1250	20.5	348	330	681	<0.50	830	<0.50	<0.50	190	0.230	0.51	124			0.35	0.0643	0.803	0.867	0.0334	16.6	13.3
RSEMR5B-SP	QF7759(M)	12/8/16 10:40	8.24	21.1	2130	1270	21.8	338	358	721	<0.50	879	<0.50	<0.50	190	0.240	0.50	143			0.27	0.0649	0.794	0.859	0.0276	8.62	7.25
RSEMR5B-SP	QF9096(D)	12/9/16 11:30	8.27	16.4	2110	1250	19.0	336	343	714	<0.50	872	<0.50	<0.50	210	0.250	0.49	138			0.48	0.0681	0.802	0.870	0.0417	13.8	11.0
RSEMR5B-SP	QF9095(M)	12/9/16 11:30	8.19	18.0	2030	1250	18.3	341	329	687	<0.50	838	<0.50	<0.50	200	0.220	0.49	136			0.44	0.0691	0.849	0.918	0.0518	14.7	11.0
RSEMR5B-SP	QG1216(M)	12/10/16 10:30	8.15	24.6	2220	1260	20.8	367	361	763	<0.50	931	<0.50	<0.50	190	0.260	0.51	148			0.37	0.0684	0.822	0.891	<0.0050	14.5	10.3
RSEMR5B-SP	QG1214(M)	12/11/16 14:45	8.13	18.7	2270	1290	24.3	407	387	776	<0.50	947	<0.50	<0.50	210	0.270	0.53	150			0.61	0.0722	0.846	0.918	<0.0050	14.4	10.9
RSEMR5B-SP	QG2782(M)	12/12/16 12:30	8.16	20.4	2320	1430	22.5	378	413	784	<0.50	956	<0.50	<0.50	210	0.240	0.52	149			0.38	0.0794	0.878	0.958	0.0222	17.2	10.7
RSEMR5B-SP	QG4597(M)	12/13/16 12:30	8.15	16.3	2320	1440	16.0	368	384	770	<0.50	940	<0.50	<0.50	200	0.270	0.56	150			0.25	0.0853	0.893	0.978	<0.0050	15.1	11.5
RSEMR5B-SP	QG5340(M)	12/14/16 13:15	8.07	15.7	2460	1470	16.0	384	415	839	<0.50	1020	<0.50	<0.50	210	0.260	0.55	164			0.22	0.100	0.903	1.00	0.0060	12.1	9.13
RSEMR5B-SP	QG6876(M)	12/15/16 12:15	8.09	17.9	2380	1490	17.0	340	411	777	<0.50	948	<0.50	<0.50	180	0.250	0.55	155			0.22	0.117	0.866	0.983	<0.0050	13.3	9.89
RSEMR5B-SP	QG9329(M)	12/16/16 12:00	8.11	16.6	2480	1560	21.8	444	452	815	<0.50	994	<0.50	<0.50	240	0.250	0.59	167			0.12	0.151	0.845	0.995	0.0219	11.0	8.18
RSEMR5B-SP	QH4307(M)	12/17/16 12:30	8.07	14.8	2660	1630	15.3	430	456	917	<0.50	1120	<0.50	<0.50	240	0.320	0.62	181			0.31	0.205	0.828	1.03	0.0285	12.2	9.43
RSEMR5B-SP	QH4250(M)	12/18/16 15:30	8.04	25.3	2810	1730	26.8	484	484	953	<0.50	1160	<0.50	<0.50	260	0.320	0.68	188			0.92	0.258	0.805	1.06	0.0293	12.2	9.87
RSEMR5B-SP	QH3438(M)	12/19/16 12:30	8.09	15.9	2820	1730	14.3	470	496	971	<0.50	1180	<0.50	<0.50	260	0.310	0.62	177			0.36	0.311	0.677	0.988	0.0248	11.6	8.87
RSEMR5B-SP	QH3439(D)	12/19/16 12:32	8.07	14.9	2820	1710	11.3	472	488	969	<0.50	1180	<0.50	<0.50	250	0.310	0.62	178			0.32	0.310	0.675	0.984	0.0266	11.6	8.05
RSEMR5B-SP	QH9172(M)	12/20/16 12:20	8.10	16.8	2430	1430	22.0	432	412	848	<0.50	1030	<0.50	<0.50	200	0.280	0.57	154			0.38	0.267	0.601	0.868	<0.0050	7.87	6.41
RSEMR5B-SP	QH6923(M)	12/21/16 9:15	8.06	24.1	2450	1470	23.8	396	406	799	<0.50	975	<0.50	<0.50	210	0.280	0.61	148			0.40	0.199	0.812	1.01	<0.0050	7.77	8.29
RSEMR5B-SP	QH9551(M)	12/22/16 10:20	8.07	13.7	2190	1290	18.5	463	392	724	<0.50	883	<0.50	<0.50	160	0.260	0.62	126			0.40	0.133	0.860	0.992	<0.0050	6.45	6.58
RSEMR5B-SP	QI3520(M)	12/23/16 13:15	8.26	4.20	1790	1040	10.3	301	262	608	<0.50	742	<0.50	<0.50	180	0.190	0.42	104			0.30	0.0750	0.837	0.912	0.0117	5.18	2.75
RSEMR5B-SP	QI3521(M)	12/24/16 11:30	8.37	2.13	1460	824	4.8	311	286	509	6.19	606	7.43	<0.50	140	0.170	0.32	77.1			0.16	0.0431	0.776	0.819	0.0063	4.07	2.65
RSEMR5B-SP	QI3522(M)	12/25/16 11:15	8.27	3.44	1600	902	98.3	397	283	546	<0.50	666	<0.50	<0.50	160	0.180	0.36	88.7			0.19	0.0583	0.770	0.828	0.0121	5.04	2.76
RSEMR5B-SP	QI3523(M)	12/27/16 13:30	8.20	7.00	1540	898	23.0	332	344	553	<0.50	675	<0.50	<0.50	150	0.190	0.35	79.9			0.25	0.0389	0.772	0.811	0.0150	3.84	2.39
RSEMR5B-SP	QI4827(M)	12/28/16 13:15	8.09	13.5	1650	1010	30.5	380	377	574	<0.50	700	<0.50	<0.50	170	0.210	0.37	91.4			0.15	0.0390	0.903	0.942	0.0263	4.37	3.65
RSEMR5B-SP	QI7550(M)	12/29/16 9:26	8.11		1770	1000	19.0	391	370	614	<0.50	748	<0.50	<0.50	170	0.190	0.39	100			0.17					4.67	
RSEMR5B-SP	QI7788(M)	12/30/16 10:20	8.11		2010	1170	38.3	384	399	689	<0.50	840	<0.50	<0.50	200	0.220	0.46	136			0.21					5.78	
RSEMR5B-SP	QI7780(M)	12/31/16 10:30	7.99		2020	1210	243	422	407	694	<0.50	847	<0.50	<0.50	140	0.230	0.50	135			0.12					4.37	
WP-DS	PY0117(M)	10/30/16 15:05	8.18			170	<4.0	134	142	132	<0.50	161	<0.50	<0.50	2.8	0.077	0.024	14.0			0.050	<0.0020	0.0696	0.0696	<0.0050	0.98	0.65
WP-DS	QH9547(M)	12/21/16 12:15	8.10	0.53	296	148	<4.0	145	147	141	<0.50	172	<0.50	<0.50	3.4	0.085	0.026	14.5			0.015	<0.0050	0.124	0.124	<0.0050	<0.50	0.67
WP-US	PY0118(M)	10/30/16 14:30	8.20			164	<4.0	132	146	131	<0.50	159	<0.50	<0.50	3.1	0.073	0.026	14.0			0.021	<0.0020	0.0815	0.0815	<0.0050	<0.50	0.53
WP-US	QH9546(M)	12/21/16 13:00	8.10	0.24	294	176	<4.0	141	146	136	<0.50	166	<0.50	<0.50	3.9	0.077	0.029	15.4			0.0099	<0.0050	0.126	0.126	<0.0050	<0.50	0.88

Notes:
Sample classes included in query: B,D,M
Where:
M= Primary sample
D= Duplicate sample
B= Blank sample

Appendix 3.B-1 Surface Water Quality Laboratory Data

Station Code	Sample ID (Class)	Collection Date	T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Li	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Si
			(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
RBAC-SUMP	QA2159(M)	11/10/16 13:00	0.17	0.00090	0.00095	0.488	<0.00010	<0.0010	0.108	0.000034	82.3	<0.0010	0.00125	0.00149	0.41	0.00030	0.18	22.9	0.0441	<0.000010	0.0114	0.0099	3.44	0.00345	4.68
RBSC-US	PU5541(M)	10/17/16 11:00	0.0262	<0.00050	0.00028	0.0725	<0.00010	<0.0010	0.054	0.000064	117	<0.0010	<0.00050	<0.00050	0.193	<0.00020	0.0388	42.1	0.126	<0.000010	0.0012	0.0110	4.30	0.00246	5.31
RBSC-US	QA2160(M)	11/10/16 13:30	0.12	<0.00050	0.00056	0.102	<0.00010	<0.0010	0.052	0.000071	127	<0.0010	0.00066	0.00148	0.405	<0.00020	0.0298	39.7	0.308	<0.000010	0.0012	0.0099	3.87	0.00134	5.01
RBSC-US	QB8121(M)	11/18/16 12:30	0.386	<0.00050	0.00097	0.133	<0.00010	<0.0010	0.051	0.000093	125	<0.0010	0.00063	0.00365	1.21	0.00088	0.0286	39.0	0.282	<0.000010	0.0013	0.0095	4.40	0.00145	5.44
RCC-Sump	PY0114(M)	10/29/16 13:00	0.275	0.00082	0.00101	0.377	<0.00010	<0.0010	0.067	0.000011	80.8	<0.0010	<0.00050	0.00111	0.349	0.00031	0.0143	21.6	0.0351	<0.000010	0.0087	0.0025	2.29	0.00162	4.64
RSEML3-LP	PU5493(M)	10/14/16 15:30	0.176	<0.00050	0.00119	0.0863	<0.00010	<0.0010	<0.05	0.000036	97.0	<0.0010	<0.00050	0.00178	0.294	<0.00020	0.0071	32.7	0.0097	<0.000010	<0.0010	0.0046	9.23	0.00024	3.58
RSEML3-MP	QA2164(M)	11/10/16 10:00	0.105	0.00291	0.00065	0.0601	<0.00010	<0.0010	<0.05	0.000023	81.9	0.0016	<0.00050	0.00235	0.187	<0.00020	<0.0050	37.8	0.0412	<0.000010	0.0307	0.0022	4.71	0.00454	0.998
RSEML3-UP	PU5497(M)	10/14/16 12:15	3.13	<0.00050	0.00175	0.104	0.00041	<0.0010	0.087	0.000485	236	0.0028	0.0130	0.00657	3.95	0.00284	0.0515	74.3	0.666	<0.000010	0.0011	0.0455	6.23	0.00061	6.67
RSEML3-UP	QA2163(M)	11/10/16 10:30	0.0257	0.00057	0.00018	0.0338	<0.00010	<0.0010	<0.05	0.000052	176	<0.0010	<0.00050	0.00146	0.039	<0.00020	0.0064	86.6	0.0312	<0.000010	0.0076	0.0020	4.14	0.00750	1.02
RSEMR5B-SP	PU5540(M)	10/17/16 10:30	0.394	<0.00050	0.00148	0.212	<0.00010	<0.0010	<0.05	0.000107	69.3	<0.0010	0.00188	0.00352	0.749	0.00065	0.0156	20.0	0.475	<0.000010	0.0050	0.0054	8.86	0.00057	4.37
RSEMR5B-SP	PY0116(M)	10/29/16 15:00	4.35	<0.00050	0.00342	0.507	0.00049	<0.0010	<0.05	0.000617	30.3	0.0070	0.00530	0.0171	9.48	0.00754	0.0075	7.07	0.172	<0.000010	<0.0010	0.0181	3.03	0.00083	7.25
RSEMR5B-SP	QE0286(M)	11/29/16 12:15	0.454	0.00053	0.00083	0.245	<0.00010	<0.0010	0.085	0.000048	59.0	<0.0010	0.00064	0.0128	0.736	0.00150	0.16	18.5	0.0331	<0.000010	0.0057	0.0055	3.11	0.00200	5.39
RSEMR5B-SP	QF4710(M)	12/6/16 3:35	0.535	0.00121	0.00170	0.366	<0.00010	<0.0010	0.221	0.000220	76.3	<0.0010	0.00134	0.00343	0.772	0.00090	0.272	27.9	0.0638	<0.000010	0.0146	0.0124	6.11	0.00371	6.5
RSEMR5B-SP	QF6036(M)	12/7/16 11:30	0.444	0.00123	0.00159	0.435	<0.00010	<0.0010	0.236	0.000143	86.8	<0.0010	0.00098	0.00273	0.541	0.00045	0.326	31.9	0.0556	<0.000010	0.0151	0.0108	6.26	0.00350	7.15
RSEMR5B-SP	QF7759(M)	12/8/16 10:40	0.285	0.00113	0.00156	0.37	<0.00010	<0.0010	0.19	0.000146	83.7	<0.0010	0.00121	0.00269	0.434	0.00102	0.278	31.2	0.0681	<0.000010	0.0133	0.0115	6.02	0.00363	6.42
RSEMR5B-SP	QF9096(D)	12/9/16 11:30	0.492	0.00114	0.00149	0.394	<0.00010	<0.0010	0.193	0.000130	84.3	<0.0010	0.00111	0.00246	0.36	0.00048	0.282	30.4	0.0643	<0.000010	0.0137	0.0106	6.24	0.00359	6.7
RSEMR5B-SP	QF9095(M)	12/9/16 11:30	0.364	0.00119	0.00165	0.397	<0.00010	<0.0010	0.204	0.000135	84.4	<0.0010	0.00116	0.00235	0.388	0.00063	0.287	31.6	0.0655	<0.000010	0.0140	0.0113	6.31	0.00360	6.71
RSEMR5B-SP	QG1216(M)	12/10/16 10:30	0.338	0.00125	0.00176	0.416	<0.00010	<0.0010	0.221	0.000156	92.7	<0.0010	0.00129	0.00293	0.418	0.00051	0.316	32.8	0.0742	<0.000010	0.0145	0.0114	6.51	0.00385	7.21
RSEMR5B-SP	QG1214(M)	12/11/16 14:45	0.38	0.00133	0.00176	0.461	<0.00010	<0.0010	0.222	0.000157	103	<0.0010	0.00136	0.00275	0.39	0.00042	0.328	36.1	0.0826	<0.000010	0.0157	0.0118	7.46	0.00400	8.04
RSEMR5B-SP	QG2782(M)	12/12/16 12:30	0.518	0.00130	0.00183	0.427	<0.00010	<0.0010	0.243	0.000130	94.5	<0.0010	0.00133	0.00277	0.505	0.00045	0.327	34.6	0.0792	<0.000010	0.0147	0.0119	6.55	0.00417	7.79
RSEMR5B-SP	QG4597(M)	12/13/16 12:30	0.377	0.00131	0.00168	0.431	<0.00010	<0.0010	0.259	0.000132	89.9	<0.0010	0.00129	0.00273	0.276	0.00026	0.337	35.0	0.0834	<0.000010	0.0154	0.0122	6.73	0.00383	6.79
RSEMR5B-SP	QG5340(M)	12/14/16 13:15	0.543	0.00131	0.00215	0.445	<0.00010	<0.0010	0.277	0.000115	92.5	<0.0010	0.00136	0.00281	0.286	0.00042	0.349	37.2	0.0881	<0.000010	0.0162	0.0122	6.91	0.00494	7.75
RSEMR5B-SP	QG6876(M)	12/15/16 12:15	0.548	0.00104	0.00131	0.365	<0.00010	<0.0010	0.18	0.000096	86.8	<0.0010	0.00100	0.00203	0.306	0.00025	0.271	30.0	0.0764	<0.000010	0.0134	0.0106	6.10	0.00322	6.64
RSEMR5B-SP	QG9329(M)	12/16/16 12:00	0.22	0.00135	0.00173	0.441	<0.00010	<0.0010	0.275	0.000128	116	<0.0010	0.00136	0.00274	0.297	0.00045	0.344	37.7	0.103	<0.000010	0.0168	0.0130	7.90	0.00424	7.94
RSEMR5B-SP	QH4307(M)	12/17/16 12:30	0.591	0.00136	0.00183	0.479	<0.00010	<0.0010	0.269	0.000116	108	<0.0010	0.00137	0.00275	0.376	0.00045	0.357	39.1	0.108	<0.000010	0.0187	0.0135	7.56	0.00413	8
RSEMR5B-SP	QH4250(M)	12/18/16 15:30	0.573	0.00151	0.00209	0.536	<0.00010	<0.0010	0.288	0.000226	120	0.0017	0.00163	0.00383	0.581	0.00050	0.397	44.7	0.13	<0.000010	0.0201	0.0149	8.04	0.00460	8.8
RSEMR5B-SP	QH3438(M)	12/19/16 12:30	0.384	0.0015	0.00193	0.524	<0.00020	<0.0020	0.286	0.000127	117	<0.0020	0.0015	0.0030	0.455	<0.00040	0.392	43.2	0.134	<0.000010	0.0188	0.0146	7.94	0.00419	8.53
RSEMR5B-SP	QH3439(D)	12/19/16 12:32	0.379	0.00150	0.00195	0.523	<0.00010	<0.0010	0.298	0.000112	121	<0.0010	0.00152	0.00301	0.406	0.00031	0.404	41.4	0.135	<0.000010	0.0199	0.0141	7.74	0.00452	8.84
RSEMR5B-SP	QH9172(M)	12/20/16 12:20	0.906	0.00119	0.00161	0.42	<0.00010	<0.0010	0.246	0.000084	109	0.0015	0.00155	0.00233	0.623	0.00045	0.321	38.7	0.137	<0.000010	0.0156	0.0116	7.56	0.00341	9.16
RSEMR5B-SP	QH6923(M)	12/21/16 9:15	0.508	0.00116	0.00147	0.391	<0.00010	<0.0010	0.221	0.000054	97.6	0.0015	0.00131	0.00201	0.351	0.00030	0.306	37.1	0.0980	<0.000010	0.0139	0.0097	6.99	0.00326	8.68
RSEMR5B-SP	QH9551(M)	12/22/16 10:20	0.196	0.00111	0.00141	0.427	<0.00010	<0.0010	0.185	0.000030	114	0.0016	0.00125	0.00254	0.336	0.00024	0.361	43.5	0.0746	<0.000010	0.0126	0.0071	6.86	0.00330	10.7
RSEMR5B-SP	QI3520(M)	12/23/16 13:15	0.146	0.00068	0.00104	0.285	<0.00010	<0.0010	0.113	0.000035	69.9	0.0289	0.00076	0.00153	0.257	0.00047	0.198	30.8	0.0324	<0.000010	0.0081	0.0063	4.78	0.00244	7.02
RSEMR5B-SP	QI3521(M)	12/24/16 11:30	0.0849	0.00066	0.00089	0.289	<0.00010	<0.0010	0.105	<0.000010	71.7	0.0015	0.00077	0.00098	0.11	<0.00020	0.176	32.1	0.0203	<0.000010	0.0073	0.0063	5.17	0.00260	6.56
RSEMR5B-SP	QI3522(M)	12/25/16 11:15	1.98	0.00080	0.00208	0.674	<0.00010	<0.0010	0.129	0.000857	97.4	0.0043	0.00182	0.00432	2.21	0.00183	0.225	37.4	0.0929	<0.000010	0.0084	0.0111	5.90	0.00296	10.1
RSEMR5B-SP	QI3523(M)	12/27/16 13:30	0.236	0.00071	0.00091	0.318	<0.00010	<0.0010	0.151	0.000023	75.8	0.0013	<0.00050	0.00178	0.238	0.00039	0.184	34.8	0.0166	<0.000010	0.0074	0.0070	5.14	0.00211	7.47
RSEMR5B-SP	QI4827(M)	12/28/16 13:15	0.23	0.00072	0.00108	0.346	<0.00010	<0.0010	0.121	0.000063	90.0	0.0030	0.00055	0.00174	0.356	0.00044	0.193	37.8	0.0294	<0.000010	0.0077	0.0041	5.67	0.00236	8.36
RSEMR5B-SP	QI7550(M)	12/29/16 9:26	0.281	0.00082	0.00107	0.371	<0.00010	<0.0010	0.142	0.000044	91.7	0.0019	<0.00050	0.00250	0.217	0.00035	0.237	39.2	0.0195	<0.000010	0.0090	0.0071	6.22	0.00319	8.56
RSEMR5B-SP	QI7788(M)	12/30/16 10:20	0.61	0.00086	0.00152	0.371	<0.00010	<0.0010	0.142	0.000073	87.9	0.0029	0.00143	0.00281	1.04	0.00082	0.251	40.0	0.11	<0.000010	0.0085	0.0097	5.81	0.00297	8.67
RSEMR5B-SP	QI7780(M)	12/31/16 10:30	1.16	0.00091	0.00199	0.433	<0.00010	<0.0010	0.155	0.000115	96.8	0.0031	0.00170	0.00353	1.95	0.00141	0.265	43.7	0.118	<0.000010	0.0090	0.0111	6.17	0.00326	9.84
WP-DS	PY0117(M)	10/30/16 15:05	0.0042	<0.00050	<0.00010	0.0529	<0.00010	<0.0010	<0.05	0.000014	40.1	<0.0010	<0.00050	<0.00050	0.019	<0.00020	0.0185	8.19	0.0026	<0.000010	0.0012	<0.0010	0.719	0.00043	1.54
WP-DS	QH9547(M)	12/21/16 12:15	0.0127	<0.00050	<0.00010	0.0579	<0.00010	<0.0010	<0.05	0.000017	42.0	<0.0010	<0.00050	<0.00050	0.038	<0.00020	0.0195	9.63	0.0058	<0.000010	0.0012	<0.0010	0.917	0.00057	1.74
WP-US	PY0118(M)	10/30/16 14:30	0.0097	<0.00050	<0.00010	0.0495	<0.00010	<0.0010	<0.05	0.000012	39.4	<0.0010	<0.00050	<0.00050	0.024	<0.00020	0.0193	8.08	0.0022	<0.000010	0.0012	<0.0010	0.739	0.00038	1.49
WP-US	QH9546(M)	12/21/16 13:00	0.0158	<0.00050	<0.00010	0.0491	<0.00010	<0.0010	<0.05	0.000011	42.6	<0.0010	<0.00050	<0.00050	0.024	<0.00020	0.0217	8.42	0.0034	<0.000010	<0.0010	<0.0010	0.892	0.00045	1.86

Notes:
Sample classes included in query: B,D,M
Where:
M= Primary sample
D= Duplicate sample
B= Blank sample

Appendix 3.B-1 Surface Water Quality Laboratory Data

Station Code	Sample ID (Class)	Collection Date	T-Ag	T-Na	T-Sr	T-S	T-Tl	T-Sn	T-Ti	T-U	T-V	T-Zn	T-Zr	D-Al	D-Sb	D-As	D-Ba	D-Be	D-Bi	D-B	D-Cd	D-Ca	D-Cr	D-Co
			(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
RBAC-SUMP	QA2159(M)	11/10/16 13:00	<0.000020	234	0.339	30.1	<0.000050	<0.0050	<0.0050	0.00676	<0.0050	<0.0050	<0.00050	0.0045	0.00088	0.00073	0.338	<0.00010	<0.0010	0.097	0.000020	69.4	<0.0010	0.00106
RBSC-US	PU5541(M)	10/17/16 11:00	<0.000020	42.4	0.472	64.9	<0.000050	<0.0050	<0.0050	0.00270	<0.0050	0.0118	<0.00050	<0.0030	<0.00050	0.00031	0.0811	<0.00010	<0.0010	<0.05	0.000062	103	<0.0010	<0.00050
RBSC-US	QA2160(M)	11/10/16 13:30	<0.000020	43.1	0.404	57.9	<0.000050	<0.0050	<0.0050	0.00246	<0.0050	0.0120	<0.00050	0.0042	<0.00050	0.00046	0.0961	<0.00010	<0.0010	<0.05	0.000039	123	<0.0010	<0.00050
RBSC-US	QB8121(M)	11/18/16 12:30	<0.000020	41.2	0.447	59.8	<0.000050	<0.0050	0.0082	0.00263	<0.0050	0.0140	<0.00050	0.0038	<0.00050	0.00034	0.113	<0.00010	<0.0010	0.051	0.000048	130	<0.0010	<0.00050
RCC-Sump	PY0114(M)	10/29/16 13:00	<0.000020	32.7	0.284	16.7	<0.000050	<0.0050	0.0090	0.00181	<0.0050	<0.0050	<0.00050	<0.0030	0.00079	0.00074	0.401	<0.00010	<0.0010	0.06	0.000012	85.5	<0.0010	<0.00050
RSEML3-LP	PU5493(M)	10/14/16 15:30	<0.000020	36.1	0.443	54.3	<0.000050	<0.0050	0.0055	0.00210	<0.0050	0.0145	<0.00050	0.0063	<0.00050	0.00076	0.0829	<0.00010	<0.0010	<0.05	0.000032	90.2	<0.0010	<0.00050
RSEML3-MP	QA2164(M)	11/10/16 10:00	<0.000020	14.0	0.343	97.4	<0.000050	<0.0050	<0.0050	0.0116	<0.0050	<0.0050	<0.00050	0.0052	0.00311	0.00047	0.0582	<0.00010	<0.0010	<0.05	0.000016	85.1	<0.0010	<0.00050
RSEML3-UP	PU5497(M)	10/14/16 12:15	<0.000020	55.2	0.729	239	<0.000050	<0.0050	0.0294	0.00501	<0.0050	0.182	0.00072	0.178	<0.00050	0.00022	0.0480	<0.00010	<0.0010	0.082	0.000219	225	<0.0010	0.0118
RSEML3-UP	QA2163(M)	11/10/16 10:30	<0.000020	19.2	0.531	273	<0.000050	<0.0050	<0.0050	0.0116	<0.0050	<0.0050	<0.00050	0.0049	0.00059	0.00026	0.0343	<0.00010	<0.0010	<0.05	0.000055	204	<0.0010	<0.00050
RSEMR5B-SP	PU5540(M)	10/17/16 10:30	<0.000020	23.8	0.192	25.0	<0.000050	<0.0050	0.0097	0.00271	<0.0050	0.0073	<0.00050	0.357	<0.00050	0.00109	0.232	<0.00010	<0.0010	<0.05	0.000069	70.7	<0.0010	0.00143
RSEMR5B-SP	PY0116(M)	10/29/16 15:00	0.000072	4.30	0.0861	19.8	0.000089	<0.0050	0.0200	0.00085	0.0176	0.0608	<0.00050	<0.0030	<0.00050	0.00029	0.0606	<0.00010	<0.0010	<0.05	0.000056	26.9	<0.0010	<0.00050
RSEMR5B-SP	QE0286(M)	11/29/16 12:15	0.000022	184	0.254	17.4	<0.000050	<0.0050	0.0080	0.00394	<0.0050	0.0199	<0.00050	0.0441	0.00083	0.00078	0.366	<0.00010	<0.0010	0.146	0.000017	75.0	<0.0010	0.00059
RSEMR5B-SP	QF4710(M)	12/6/16 3:35	0.000077	332	0.45	49.7	<0.000050	<0.0050	0.0090	0.00702	<0.0050	0.0106	<0.00050	0.0632	0.00124	0.00137	0.338	<0.00010	<0.0010	0.237	0.000178	77.9	<0.0010	0.00122
RSEMR5B-SP	QF6036(M)	12/7/16 11:30	0.000041	381	0.473	42.5	<0.000050	<0.0050	0.0121	0.00774	<0.0050	0.0057	<0.00050	0.0175	0.00110	0.00124	0.368	<0.00010	<0.0010	0.19	0.000060	82.8	<0.0010	0.00096
RSEMR5B-SP	QF7759(M)	12/8/16 10:40	0.000031	352	0.437	42.5	<0.000050	<0.0050	0.0079	0.00706	<0.0050	0.0074	<0.00050	0.0330	0.00118	0.00133	0.398	<0.00010	<0.0010	0.226	0.000100	90.7	<0.0010	0.00057
RSEMR5B-SP	QF9096(D)	12/9/16 11:30	0.000042	341	0.463	45.5	<0.000050	<0.0050	0.0063	0.00718	<0.0050	0.0109	<0.00050	0.0296	0.00141	0.00131	0.376	<0.00010	<0.0010	0.212	0.000081	85.5	<0.0010	0.00104
RSEMR5B-SP	QF9095(M)	12/9/16 11:30	0.000039	351	0.472	44.7	<0.000050	<0.0050	0.0073	0.00728	<0.0050	0.0076	0.00126	0.0293	0.00111	0.00145	0.369	<0.00010	<0.0010	0.209	0.000089	82.8	<0.0010	0.00099
RSEMR5B-SP	QG1216(M)	12/10/16 10:30	0.000053	367	0.494	46.3	<0.000050	<0.0050	0.0062	0.00773	<0.0050	0.0087	<0.00050	0.0325	0.00122	0.00140	0.388	<0.00010	<0.0010	0.228	0.000102	84.9	<0.0010	0.00121
RSEMR5B-SP	QG1214(M)	12/11/16 14:45	0.000032	414	0.54	55.2	<0.000050	<0.0050	0.0138	0.00821	<0.0050	0.0066	0.00064	0.0206	0.00123	0.00151	0.407	<0.00010	<0.0010	0.236	0.000098	98.2	<0.0010	0.00117
RSEMR5B-SP	QG2782(M)	12/12/16 12:30	0.000026	384	0.514	48.2	<0.000050	<0.0050	0.0122	0.00833	<0.0050	0.0071	<0.00050	0.0265	0.00137	0.00154	0.419	<0.00010	<0.0010	0.242	0.000124	102	<0.0010	0.00123
RSEMR5B-SP	QG4597(M)	12/13/16 12:30	0.000023	383	0.533	48.5	<0.000050	<0.0050	0.0115	0.00800	<0.0050	0.0096	<0.00050	0.0260	0.00131	0.00146	0.434	<0.00010	<0.0010	0.234	0.000098	95.1	<0.0010	0.00121
RSEMR5B-SP	QG5340(M)	12/14/16 13:15	0.000030	406	0.558	50.2	<0.000050	<0.0050	0.0105	0.00831	<0.0050	0.0053	0.00067	0.0280	0.00134	0.00185	0.462	<0.00010	<0.0010	0.25	0.000095	105	<0.0010	0.00126
RSEMR5B-SP	QG6876(M)	12/15/16 12:15	<0.000020	354	0.435	40.3	<0.000050	<0.0050	0.0165	0.00749	<0.0050	<0.0050	<0.00050	0.0216	0.00135	0.00148	0.419	<0.00010	<0.0010	0.242	0.000103	104	<0.0010	0.00122
RSEMR5B-SP	QG9329(M)	12/16/16 12:00	0.000024	421	0.554	56.0	<0.000050	<0.0050	<0.0050	0.0101	<0.0050	0.0073	<0.00050	0.0228	0.00147	0.00170	0.477	<0.00010	<0.0010	0.269	0.000078	117	<0.0010	0.00127
RSEMR5B-SP	QH4307(M)	12/17/16 12:30	0.000020	444	0.572	54.6	<0.000050	<0.0050	0.0177	0.00967	<0.0050	0.0066	<0.00050	0.0209	0.00149	0.00166	0.501	<0.00010	<0.0010	0.271	0.000088	112	<0.0010	0.00136
RSEMR5B-SP	QH4250(M)	12/18/16 15:30	0.000032	509	0.659	64.6	0.000052	<0.0050	0.0184	0.0108	<0.0050	0.0120	<0.00050	0.0194	0.00154	0.00172	0.529	<0.00010	<0.0010	0.305	0.000127	121	<0.0010	0.00142
RSEMR5B-SP	QH3438(M)	12/19/16 12:30	<0.000040	480	0.641	62.5	<0.00010	<0.01	<0.01	0.0104	<0.01	<0.01	<0.0010	0.0199	0.00164	0.00181	0.54	<0.00010	<0.0010	0.317	0.000098	124	<0.0010	0.00156
RSEMR5B-SP	QH3439(D)	12/19/16 12:32	0.000029	487	0.639	64.0	<0.000050	<0.0050	0.0201	0.0101	<0.0050	0.0077	0.00062	0.0182	0.00159	0.00185	0.541	<0.00010	<0.0010	0.295	0.000100	120	<0.0010	0.00151
RSEMR5B-SP	QH9172(M)	12/20/16 12:20	0.000022	399	0.551	55.3	<0.000050	<0.0050	0.0226	0.00902	<0.0050	<0.0050	0.00106	0.0202	0.00121	0.00131	0.411	<0.00010	<0.0010	0.253	0.000050	103	<0.0010	0.00141
RSEMR5B-SP	QH6923(M)	12/21/16 9:15	<0.000020	386	0.499	44.4	<0.000050	<0.0050	0.0115	0.00759	<0.0050	<0.0050	<0.00050	0.0164	0.00119	0.00130	0.388	<0.00010	<0.0010	0.218	0.000033	97.4	0.0010	0.00134
RSEMR5B-SP	QH9551(M)	12/22/16 10:20	<0.000020	397	0.557	43.5	<0.000050	<0.0050	0.0089	0.00683	<0.0050	<0.0050	<0.00050	0.0078	0.00114	0.00124	0.391	<0.00010	<0.0010	0.169	<0.000010	89.7	0.0015	0.00110
RSEMR5B-SP	QI3520(M)	12/23/16 13:15	<0.000020	236	0.374	27.7	<0.000050	<0.0050	<0.0050	0.00472	<0.0050	<0.0050	<0.00050	0.0076	0.00088	0.00108	0.273	<0.00010	<0.0010	0.141	<0.000010	50.0	0.0017	<0.00050
RSEMR5B-SP	QI3521(M)	12/24/16 11:30	<0.000020	223	0.375	26.6	<0.000050	<0.0050	<0.0050	0.00470	<0.0050	<0.0050	<0.00050	0.0098	0.00071	0.00076	0.263	<0.00010	<0.0010	0.115	0.000114	60.4	0.0011	<0.00050
RSEMR5B-SP	QI3522(M)	12/25/16 11:15	0.000043	274	0.484	32.2	0.000059	<0.0050	0.0459	0.00593	0.0062	0.0166	0.00071	0.0056	0.00087	0.00097	0.256	<0.00010	<0.0010	0.136	<0.000010	52.4	0.0014	<0.00050
RSEMR5B-SP	QI3523(M)	12/27/16 13:30	<0.000020	230	0.434	24.1	<0.000050	<0.0050	0.0079	0.00483	<0.0050	<0.0050	<0.00050	0.0056	0.00073	0.00087	0.291	<0.00010	<0.0010	0.119	0.000017	79.3	0.0013	<0.00050
RSEMR5B-SP	QI4827(M)	12/28/16 13:15	<0.000020	244	0.454	27.1	<0.000050	<0.0050	0.0083	0.00464	<0.0050	0.0193	<0.00050	0.0062	0.00080	0.00086	0.32	<0.00010	<0.0010	0.134	0.000022	82.9	0.0018	<0.00050
RSEMR5B-SP	QI7550(M)	12/29/16 9:26	0.000025	265	0.47	35.9	<0.000050	<0.0050	<0.0050	0.00571	<0.0050	0.0129	<0.00050	0.0050	0.00079	0.00100	0.335	<0.00010	<0.0010	0.135	0.000014	82.9	0.0015	<0.00050
RSEMR5B-SP	QI7788(M)	12/30/16 10:20	<0.000020	287	0.478	39.8	<0.000050	<0.0050	0.0239	0.00581	<0.0050	0.0080	<0.00050	0.0056	0.00083	0.00105	0.346	<0.00010	<0.0010	0.153	0.000014	92.3	0.0014	0.00072
RSEMR5B-SP	QI7780(M)	12/31/16 10:30	<0.000020	306	0.503	43.9	0.000054	<0.0050	0.0240	0.00645	<0.0050	0.0093	<0.00050	0.0066	0.00090	0.00108	0.355	<0.00010	<0.0010	0.149	0.000017	91.1	0.0014	0.00058
WP-DS	PY0117(M)	10/30/16 15:05	<0.000020	3.07	0.224	4.3	<0.000050	<0.0050	<0.0050	0.00042	<0.0050	<0.0050	<0.00050	<0.0030	<0.00050	0.00012	0.0582	<0.00010	<0.0010	<0.05	0.000012	42.0	<0.0010	<0.00050
WP-DS	QH9547(M)	12/21/16 12:15	<0.000020	3.73	0.246	7.7	<0.000050	<0.0050	<0.0050	0.00042	<0.0050	<0.0050	<0.00050	0.0036	<0.00050	<0.00010	0.0601	<0.00010	<0.0010	<0.05	0.000011	43.6	<0.0010	<0.00050
WP-US	PY0118(M)	10/30/16 14:30	<0.000020	3.11	0.216	4.2	<0.000050	<0.0050	<0.0050	0.00039	<0.0050	<0.0050	<0.00050	<0.0030	<0.00050	<0.00010	0.0517	<0.00010	<0.0010	<0.05	0.000011	43.9	<0.0010	<0.00050
WP-US	QH9546(M)	12/21/16 13:00	<0.000020	3.58	0.239	6.2	<0.000050	<0.0050	<0.0050	0.00041	<0.0050	<0.0050	<0.00050	0.0042	<0.00050	<0.00010	0.0508	<0.00010	<0.0010	<0.05	0.000012	43.7	<0.0010	<0.00050

Notes:
Sample classes included in query: B,D,M
Where:
M= Primary sample
D= Duplicate sample
B= Blank sample

Appendix 3.B-1 Surface Water Quality Laboratory Data

Station Code	Sample ID (Class)	Collection Date	D-Cu	D-Fe	D-Pb	D-Li	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Si	D-Ag	D-Na	D-Sr	D-S	D-Tl	D-Sn	D-Ti	D-U	D-V	D-Zn	D-Zr
			(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
RBAC-SUMP	QA2159(M)	11/10/16 13:00	0.00062	<0.0050	<0.00020	0.16	22.2	0.0338	<0.000010	0.0124	0.0087	3.05	0.00377	5.04	<0.000020	225	0.325	29.9	<0.000050	<0.0050	<0.0050	0.00609	<0.0050	<0.0050	<0.00050
RBSC-US	PU5541(M)	10/17/16 11:00	0.00048	0.0182	<0.00020	0.0293	36.0	0.0353	<0.000010	0.0011	0.0055	8.05	0.00157	5.62	<0.000020	31.2	0.376	52.9	<0.000050	<0.0050	<0.0050	0.00224	<0.0050	<0.0050	<0.00050
RBSC-US	QA2160(M)	11/10/16 13:30	0.00060	0.0153	<0.00020	0.0268	39.4	0.28	<0.000010	0.0011	0.0073	3.90	0.00145	5.15	<0.000020	42.3	0.409	63.5	<0.000050	<0.0050	<0.0050	0.00233	<0.0050	0.0158	<0.00050
RBSC-US	QB8121(M)	11/18/16 12:30	0.00116	0.0055	<0.00020	0.0315	39.9	0.217	<0.000010	0.0013	0.0076	4.24	0.00152	5.29	<0.000020	41.1	0.438	57.8	<0.000050	<0.0050	<0.0050	0.00279	<0.0050	0.0070	<0.00050
RCC-Sump	PY0114(M)	10/29/16 13:00	0.00043	<0.0050	<0.00020	0.0149	21.3	0.0265	<0.000010	0.0094	0.0017	2.44	0.00158	4.4	<0.000020	32.7	0.292	17.7	<0.000050	<0.0050	<0.0050	0.00172	<0.0050	<0.0050	<0.00050
RSEML3-LP	PU5493(M)	10/14/16 15:30	0.00130	0.0650	<0.00020	0.0066	31.1	0.0065	<0.000010	<0.0010	0.0038	9.07	0.00025	2.97	<0.000020	36.0	0.426	50.5	<0.000050	<0.0050	<0.0050	0.00213	<0.0050	0.0080	<0.00050
RSEML3-MP	QA2164(M)	11/10/16 10:00	0.00176	<0.0050	<0.00020	<0.0050	37.4	0.0403	<0.000010	0.0303	0.0017	4.58	0.00460	0.929	<0.000020	13.6	0.348	99.0	<0.000050	<0.0050	<0.0050	0.0114	<0.0050	<0.0050	<0.00050
RSEML3-UP	PU5497(M)	10/14/16 12:15	0.00127	0.1	<0.00020	0.0525	77.0	0.66	<0.000010	<0.0010	0.0423	6.43	0.00048	4.3	<0.000020	57.6	0.714	251	<0.000050	<0.0050	<0.0050	0.00458	<0.0050	0.0795	<0.00050
RSEML3-UP	QA2163(M)	11/10/16 10:30	0.00108	<0.0050	<0.00020	<0.0050	92.0	0.0304	<0.000010	0.0076	0.0018	4.83	0.00782	1.01	<0.000020	20.9	0.561	289	<0.000050	<0.0050	<0.0050	0.0116	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	PU5540(M)	10/17/16 10:30	0.00253	0.283	<0.00020	0.0166	20.7	0.452	<0.000010	0.0053	0.0041	9.32	0.00057	4.08	0.000021	25.1	0.213	25.9	<0.000050	<0.0050	0.0140	0.00151	<0.0050	<0.0050	0.00068
RSEMR5B-SP	PY0116(M)	10/29/16 15:00	0.00088	0.0198	<0.00020	<0.0050	5.87	<0.0010	0.000024	0.0018	<0.0010	2.22	0.00062	0.842	<0.000020	4.12	0.0590	16.8	<0.000050	<0.0050	<0.0050	0.00016	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QE0286(M)	11/29/16 12:15	0.00110	0.0720	<0.00020	0.287	26.8	0.0253	<0.000010	0.0098	0.0058	4.42	0.00307	5.03	<0.000020	326	0.374	22.6	<0.000050	<0.0050	<0.0050	0.00648	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QF4710(M)	12/6/16 3:35	0.00158	0.0254	<0.00020	0.27	27.6	0.0631	<0.000010	0.0141	0.0109	5.50	0.00372	5.58	<0.000020	321	0.418	45.8	<0.000050	<0.0050	<0.0050	0.00683	<0.0050	0.0064	<0.00050
RSEMR5B-SP	QF6036(M)	12/7/16 11:30	0.00115	0.0220	<0.00020	0.304	29.9	0.0465	<0.000010	0.0138	0.0092	5.58	0.00346	6.17	<0.000020	361	0.42	43.5	<0.000050	<0.0050	<0.0050	0.00724	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QF7759(M)	12/8/16 10:40	0.00288	0.0132	<0.00020	0.319	31.9	0.0254	<0.000010	0.0145	0.0092	6.02	0.00351	6.6	<0.000020	345	0.473	43.8	<0.000050	<0.0050	<0.0050	0.00736	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QF9096(D)	12/9/16 11:30	0.00128	0.0169	<0.00020	0.308	31.6	0.0565	<0.000010	0.0137	0.0098	5.69	0.00377	5.86	<0.000020	353	0.463	43.0	<0.000050	<0.0050	<0.0050	0.00723	<0.0050	0.0111	<0.00050
RSEMR5B-SP	QF9095(M)	12/9/16 11:30	0.00189	0.0170	<0.00020	0.308	29.6	0.0543	<0.000010	0.0139	0.0096	5.54	0.00320	5.79	<0.000020	338	0.47	43.5	<0.000050	<0.0050	<0.0050	0.00723	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QG1216(M)	12/10/16 10:30	0.00176	0.0210	<0.00020	0.304	36.1	0.0706	<0.000010	0.0150	0.0114	6.30	0.00375	6.36	<0.000020	377	0.475	47.6	<0.000050	<0.0050	<0.0050	0.00759	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QG1214(M)	12/11/16 14:45	0.00150	0.0248	<0.00020	0.325	34.4	0.0718	<0.000010	0.0148	0.0115	6.15	0.00368	7.04	<0.000020	374	0.485	50.6	<0.000050	<0.0050	<0.0050	0.00786	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QG2782(M)	12/12/16 12:30	0.00178	0.0247	<0.00020	0.349	38.6	0.0753	<0.000010	0.0164	0.0118	6.87	0.00433	7.52	<0.000020	416	0.53	51.1	<0.000050	<0.0050	<0.0050	0.00816	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QG4597(M)	12/13/16 12:30	0.00177	0.0271	<0.00020	0.326	35.7	0.0782	<0.000010	0.0161	0.0120	6.82	0.00378	6.19	<0.000020	412	0.537	44.4	<0.000050	<0.0050	<0.0050	0.00930	<0.0050	0.0053	<0.00050
RSEMR5B-SP	QG5340(M)	12/14/16 13:15	0.00139	0.0297	<0.00020	0.355	37.1	0.0900	<0.000010	0.0170	0.0120	6.86	0.00440	7.53	<0.000020	427	0.548	57.2	<0.000050	<0.0050	<0.0050	0.00958	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QG6876(M)	12/15/16 12:15	0.00170	0.0184	<0.00020	0.325	36.7	0.0932	<0.000010	0.0169	0.0117	7.40	0.00374	6.84	<0.000020	419	0.545	54.6	<0.000050	<0.0050	<0.0050	0.00959	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QG9329(M)	12/16/16 12:00	0.00208	0.0198	<0.00020	0.365	38.8	0.0964	<0.000010	0.0191	0.0126	7.81	0.00455	7.78	<0.000020	448	0.614	57.0	<0.000050	<0.0050	<0.0050	0.00980	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QH4307(M)	12/17/16 12:30	0.00178	0.0303	<0.00020	0.378	42.7	0.107	<0.000010	0.0189	0.0130	7.37	0.00419	8.07	<0.000020	476	0.602	60.8	<0.000050	<0.0050	<0.0050	0.0102	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QH4250(M)	12/18/16 15:30	0.00208	0.0273	<0.00020	0.392	44.2	0.123	<0.000010	0.0212	0.0135	8.29	0.00462	8.67	<0.000020	492	0.657	65.1	<0.000050	<0.0050	<0.0050	0.0109	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QH3438(M)	12/19/16 12:30	0.00210	0.0358	<0.00020	0.406	45.4	0.139	<0.000010	0.0208	0.0139	8.28	0.00441	8.43	<0.000020	513	0.66	65.1	<0.000050	<0.0050	<0.0050	0.0109	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QH3439(D)	12/19/16 12:32	0.00223	0.0331	<0.00020	0.416	45.7	0.14	<0.000010	0.0211	0.0141	8.31	0.00455	8.23	<0.000020	513	0.651	69.7	<0.000050	<0.0050	<0.0050	0.0109	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QH9172(M)	12/20/16 12:20	0.00148	0.0167	<0.00020	0.327	37.9	0.133	<0.000010	0.0153	0.0113	6.18	0.00351	7.93	<0.000020	387	0.522	52.8	<0.000050	<0.0050	<0.0050	0.00827	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QH6923(M)	12/21/16 9:15	0.00134	0.0112	<0.00020	0.329	39.6	0.105	<0.000010	0.0147	0.0105	6.16	0.00350	8.48	<0.000020	386	0.513	43.7	<0.000050	<0.0050	<0.0050	0.00762	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QH9551(M)	12/22/16 10:20	0.00101	0.0117	<0.00020	0.307	40.8	0.0577	<0.000010	0.0122	0.0090	6.01	0.00303	8.41	<0.000020	369	0.537	39.0	<0.000050	<0.0050	<0.0050	0.00720	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QI3520(M)	12/23/16 13:15	0.00070	0.0094	<0.00020	0.241	33.2	0.0011	<0.000010	0.0093	0.0054	4.85	0.00245	6.65	<0.000020	270	0.402	30.5	<0.000050	<0.0050	<0.0050	0.00527	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QI3521(M)	12/24/16 11:30	0.00049	0.0078	<0.00020	0.185	32.7	0.0022	<0.000010	0.0077	0.0053	4.85	0.00227	6.67	<0.000020	224	0.356	24.6	<0.000050	<0.0050	<0.0050	0.00475	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QI3522(M)	12/25/16 11:15	0.00048	0.0051	<0.00020	0.224	37.1	<0.0010	<0.000010	0.0097	0.0050	5.90	0.00251	7.07	<0.000020	270	0.392	34.7	<0.000050	<0.0050	<0.0050	0.00543	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QI3523(M)	12/27/16 13:30	0.00042	0.0070	<0.00020	0.189	35.5	0.0093	<0.000010	0.0076	0.0064	5.13	0.00239	7.39	<0.000020	230	0.393	24.9	<0.000050	<0.0050	<0.0050	0.00510	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QI4827(M)	12/28/16 13:15	0.00117	0.0085	<0.00020	0.206	41.3	0.0141	<0.000010	0.0088	0.0066	6.80	0.00263	7.85	<0.000020	268	0.424	32.3	<0.000050	<0.0050	<0.0050	0.00546	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QI7550(M)	12/29/16 9:26	0.00155	0.0069	<0.00020	0.242	39.6	0.0137	<0.000010	0.0095	0.0071	7.07	0.00307	7.58	<0.000020	265	0.466	32.8	<0.000050	<0.0050	<0.0050	0.00585	<0.0050	0.0054	<0.00050
RSEMR5B-SP	QI7788(M)	12/30/16 10:20	0.00141	<0.0050	<0.00020	0.271	40.9	0.0612	<0.000010	0.0106	0.0079	6.07	0.00310	8.61	<0.000020	304	0.494	44.5	<0.000050	<0.0050	<0.0050	0.00623	<0.0050	<0.0050	<0.00050
RSEMR5B-SP	QI7780(M)	12/31/16 10:30	0.00099	<0.0050	<0.00020	0.256	43.6	0.0525	<0.000010	0.0107	0.0079	6.09	0.00327	8.22	<0.000020	310	0.502	41.2	<0.000050	<0.0050	<0.0050	0.00648	<0.0050	<0.0050	<0.00050
WP-DS	PY0117(M)	10/30/16 15:05	<0.00020	0.0131	<0.00020	0.0196	9.14	0.0027	<0.000010	0.0012	<0.0010	0.875	0.00040	1.57	<0.000020	3.44	0.245	4.7	<0.000050	<0.0050	<0.0050	0.00042	<0.0050	<0.0050	<0.00050
WP-DS	QH9547(M)	12/21/16 12:15	0.00039	0.0135	<0.00020	0.0205	9.20	0.0038	<0.000010	0.0011	<0.0010	0.871	0.00047	1.78	<0.000020	3.57	0.258	5.2	<0.000050	<0.0050	<0.0050	0.00046	<0.0050	<0.0050	<0.00050
WP-US	PY0118(M)	10/30/16 14:30	<0.00020	0.0096	<0.00020	0.0209	8.82	0.0032	<0.000010	0.0011	<0.0010	0.891	0.00040	1.66	<0.000020	3.45	0.248	5.1	<0.000050	<0.0050	<0.0050	0.00044	<0.0050	<0.0050	<0.00050
WP-US	QH9546(M)	12/21/16 13:00	0.00030	0.0194	<0.00020	0.0212	8.90	0.0021	<0.000010	<0.0010	<0.0010	0.951	0.00046	1.78	<0.000020	3.81	0.26	4.8	<0.000050	<0.0050	<0.0050	0.00042	<0.0050	<0.0050	<0.00050

Notes:
Sample classes included in query: B,D,M
Where:
M= Primary sample
D= Duplicate sample
B= Blank sample

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBEX-Main-Sump	83_42665.689F	10/22/2016 16:32	F		8.02	2.2	
LBEX-Main-Sump	83_42681.474F	11/7/2016 11:23	F	520	8.01	3.9	11.4
LBEX-Main-Sump	83_42683.344F	11/9/2016 8:15	F	750	6.89	3.7	65.5
LBEX-Main-Sump	83_42683.347F	11/9/2016 8:20	F	620	6.67	3.9	43.6
LBEX-Outlet-PR	84_42662.406F	10/19/2016 9:45	F		7.23		15.8
LBEX-Outlet-PR	84_42662.462F	10/19/2016 11:05	F		7.21		15.6
LBEX-Outlet-PR	84_42662.61F	10/19/2016 14:39	F		7.05		10.8
LBEX-Outlet-PR	84_42663.382F	10/20/2016 9:10	F		7.00	5.2	17.7
LBEX-Outlet-PR	84_42663.587F	10/20/2016 14:05	F		6.75	8.3	18.2
LBEX-Outlet-PR	84_42664.408F	10/21/2016 9:48	F		7.10	5.2	105.0
LBEX-Outlet-PR	84_42664.592F	10/21/2016 14:12	F		7.10	7.5	28.1
LBEX-Outlet-PR	84_42665.479F	10/22/2016 11:30	F		7.35	5.9	
LBEX-Outlet-PR	84_42666.41F	10/23/2016 9:50	F	290	7.60	3.4	18.5
LBEX-Outlet-PR	84_42667.427F	10/24/2016 10:15	F	220	7.25	4.9	19.1
LBEX-SP-Out	13_42662.409F	10/19/2016 9:49	F		6.77		39.1
LBEX-SP-Out	13_42662.458F	10/19/2016 11:00	F		6.63		41.7
LBEX-SP-Out	13_42662.608F	10/19/2016 14:35	F		6.95		5.1
LBEX-SP-Out	13_42663.375F	10/20/2016 9:00	F		6.52	3.7	7.8
LBEX-SP-Out	13_42663.583F	10/20/2016 14:00	F		6.50	7.3	8.5
LBEX-SP-Out	13_42664.403F	10/21/2016 9:40	F		6.95	4.8	11.3
LBEX-SP-Out	13_42664.59F	10/21/2016 14:10	F		6.69	7.8	13.6
LBEX-SP-Out	13_42665.361F	10/22/2016 8:40	F		7.98	3.2	
LBEX-SP-Out	13_42666.406F	10/23/2016 9:45	F	760	7.10	3.1	12.4
LBEX-SP-Out	13_42667.42F	10/24/2016 10:05	F	790	6.98	4.9	7.3
LBEX-SP-Out	13_42668.426F	10/25/2016 10:13	F	760	7.63	2.8	7.3
LBEX-SP-Out	13_42669.506F	10/26/2016 12:08	F	770	7.84	3.5	5.8
LBEX-SP-Out	13_42670.419F	10/27/2016 10:04	F	320	7.78	3.0	13.3
LBEX-SP-Out	13_42671.415F	10/28/2016 9:58	F	560	6.54	3.4	15.5
LBEX-SP-Out	13_42672.592F	10/29/2016 14:13	F	780	7.60	3.8	4.8
LBEX-SP-Out	13_42673.374F	10/30/2016 8:59	F	630	6.43	3.5	2.1
LBEX-SP-Out	13_42675.597F	11/1/2016 14:19	F	680	7.14	0.8	8.7
LBEX-SP-Out	13_42677.581F	11/3/2016 13:57	F	680	7.83	0.9	3.1
LBEX-SP-Out	13_42681.484F	11/7/2016 11:37	F	620	7.60	0.5	66.9
LBEX-SP-Out	13_42682.708F	11/8/2016 16:59	F	730	8.54	2.3	9.5
LBEX-SP-Out	13_42683.729F	11/9/2016 17:30	F	720	8.51	2.1	13.0
LBEX-SP-Out	13_42685.486F	11/11/2016 11:40	F	560	8.12	0.9	29.0
LBEX-SP-Out	13_42687.688F	11/13/2016 16:30	F	310	7.15	1.0	25.5
LBEX-SP-Out	13-42718.479F	12/14/2016 11:30	F	500	7.65	0.2	2.5
LBGC-0.05	GC-0.05-42627.4785F	9/14/2016 11:29	F	3710	5.94	10.6	68.5
LBGC-0.11	GC-0.11-42553F	7/2/2016	F				93.7
LBGC-0.11	GC-0.11-42556F	7/5/2016	F				0.8
LBGC-0.11	GC-0.11-42557F	7/6/2016	F				149.0
LBGC-0.11	GC-0.11-42613F	8/31/2016	F	450	7.60		699.0
LBGC-0.11	GC-0.11-42620F	9/7/2016	F	1510	7.70	14.2	2850.0
LBGC-0.11	GC-0.11-42623.4729F	9/10/2016 11:21	F	2240	7.50	11.1	
LBGC-0.11	GC-0.11-42623.7F	9/10/2016 16:48	F	2170	7.50	11.3	
LBGC-0.11	GC-0.11-42626.5778F	9/13/2016 13:52	F	3650		12.6	76.5
LBGC-0.11	GC-0.11-42627.4389F	9/14/2016 10:32	F	3720	5.98	10.0	64.6
LBGC-0.11	GC-0.11-42629.4111F	9/16/2016 9:52	F	3210	6.50	10.8	816.0
LBGC-0.11	GC-0.11-42633.5118F	9/20/2016 12:17	F	2290	5.47	9.5	28.8
LBGC-0.11	GC-0.11-42637.5917F	9/24/2016 14:12	F	3320	6.41		26.6
LBGC-0.11	GC-0.11-42641.6042F	9/28/2016 14:30	F	3970	7.38	8.7	30.8
LBGC-0.11	GC-0.11-42643.5618F	9/30/2016 13:29	F	2720	5.49	10.5	45.0
LBGC-0.11	GC-0.11-42645.363F	10/2/2016 8:44	F	720	7.39	9.5	32.2
LBGC-0.11	GC-0.11-42645.509F	10/2/2016 12:13	F	1910	6.08	4.3	3818.0

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBGC-0.11	GC-0.11-42645.6354F	10/2/2016 15:15	F	2410	7.48	8.1	
LBGC-0.11	GC-0.11-42647.3826F	10/4/2016 9:11	F	4220	7.04	5.3	48.6
LBGC-0.11	GC-0.11-42647.6153F	10/4/2016 14:46	F	1100	7.02	4.0	618.0
LBGC-0.11	GC-0.11-42647.7271F	10/4/2016 17:27	F	1100	7.09	4.1	621.0
LBGC-0.11	GC-0.11-42648.3146F	10/5/2016 7:33	F	4450	7.76	5.1	38.3
LBGC-0.11	GC-0.11-42648.5181F	10/5/2016 12:26	F	970	7.69	4.3	
LBGC-0.11	GC-0.11-42648.7007F	10/5/2016 16:49	F	2210	7.64	5.1	2584.0
LBGC-0.11	GC-0.11-42649.3681F	10/6/2016 8:50	F	1230	7.77	3.8	
LBGC-0.11	GC-0.11-42650.3139F	10/7/2016 7:32	F	1200	7.78	3.2	3032.0
LBGC-0.11	GC-0.11-42650.4583F	10/7/2016 11:00	F	1560	7.62	3.5	1337.0
LBGC-0.11	GC-0.11-42650.625F	10/7/2016 15:00	F	2240	3.70	3.7	62.0
LBGC-0.11	GC-0.11-42651.3194F	10/8/2016 7:40	F	850	7.78	3.8	1822.0
LBGC-0.11	GC-0.11-42651.5201F	10/8/2016 12:29	F	550	7.62	2.3	3424.0
LBGC-0.11	GC-0.11-42651.6417F	10/8/2016 15:24	F	550	7.77	3.0	
LBGC-0.11	GC-0.11-42652.5201F	10/9/2016 12:29	F	650	8.07	3.4	2206.0
LBGC-0.11	GC-0.11-42652.6403F	10/9/2016 15:22	F	210	8.31	4.4	842.0
LBGC-0.11	GC-0.11-42653.3208F	10/10/2016 7:42	F	830	7.91	4.8	698.0
LBGC-0.11	GC-0.11-42653.5201F	10/10/2016 12:29	F	740	7.99	4.9	1242.0
LBGC-0.11	GC-0.11-42653.641F	10/10/2016 15:23	F	600	8.39	5.2	2427.0
LBGC-0.11	GC-0.11-42654.3507F	10/11/2016 8:25	F	1190	7.72	1.2	1240.0
LBGC-0.11	GC-0.11-42654.5965F	10/11/2016 14:19	F	170	8.18	3.1	1626.0
LBGC-0.11	GC-0.11-42654.7431F	10/11/2016 17:50	F	1720	8.05	3.8	1571.0
LBGC-0.11	GC-0.11-42655.3229F	10/12/2016 7:45	F	1150	8.05	1.2	1059.0
LBGC-0.11	GC-0.11-42655.5035F	10/12/2016 12:05	F	760	8.13	2.9	1241.0
LBGC-0.11	GC-0.11-42655.6854F	10/12/2016 16:27	F	1100	8.06	1.2	1295.0
LBGC-0.11	GC-0.11-42656.3194F	10/13/2016 7:40	F	1150	8.05	1.2	1059.0
LBGC-0.11	GC-0.11-42656.5139F	10/13/2016 12:20	F	1370	8.18	1.3	83.0
LBGC-0.11	GC-0.11-42656.6076F	10/13/2016 14:35	F	910	8.15	0.8	759.0
LBGC-0.11	GC-0.11-42657.3229F	10/14/2016 7:45	F	1550	7.47	0.5	82.0
LBGC-0.11	GC-0.11-42657.5208F	10/14/2016 12:30	F	1440	7.78	1.2	78.0
LBGC-0.11	GC-0.11-42658.3236F	10/15/2016 7:46	F	2160	7.23	1.3	89.9
LBGC-0.11	GC-0.11-42658.4826F	10/15/2016 11:35	F	2160	7.55	1.3	81.3
LBGC-0.11	GC-0.11-42658.6813F	10/15/2016 16:21	F	1410	7.62	1.1	35.0
LBGC-0.11	GC-0.11-42659.3264F	10/16/2016 7:50	F	3180	6.96	2.3	147.0
LBGC-0.11	GC-0.11-42659.5153F	10/16/2016 12:22	F	2570	7.49	2.0	54.1
LBGC-0.11	GC-0.11-42660.341F	10/17/2016 8:11	F	1880	6.91	2.1	32.6
LBGC-0.11	GC-0.11-42660.5083F	10/17/2016 12:12	F	1130	7.22	3.1	2554.0
LBGC-0.11	GC-0.11-42660.6438F	10/17/2016 15:27	F	1150	7.27	1.9	
LBGC-0.11	GC-0.11-42661.3542F	10/18/2016 8:30	F	540	7.48	1.0	1358.0
LBGC-0.11	GC-0.11-42661.5069F	10/18/2016 12:10	F	1700	7.34	3.2	53.0
LBGC-0.11	GC-0.11-42661.6597F	10/18/2016 15:50	F	1140	7.50	4.4	205.0
LBGC-0.11	8_42662.433F	10/19/2016 10:23	F	250	7.20	3.2	48.7
LBGC-0.11	8_42662.547F	10/19/2016 13:07	F	230	7.25	3.6	43.5
LBGC-0.11	8_42662.618F	10/19/2016 14:50	F	270	7.21	3.9	
LBGC-0.11	8_42663.385F	10/20/2016 9:15	F	1230	6.86	5.3	>4000
LBGC-0.11	8_42663.531F	10/20/2016 12:44	F	1700	7.20	9.8	>4000
LBGC-0.11	8_42663.61F	10/20/2016 14:39	F	1650	6.79	9.2	>4000
LBGC-0.11	8_42664.365F	10/21/2016 8:45	F	3130	6.61		>4000
LBGC-0.11	8_42664.486F	10/21/2016 11:40	F	1670	6.95		1566.0
LBGC-0.11	8_42664.569F	10/21/2016 13:40	F	1790	6.98		1333.0
LBGC-0.11	8_42665.372F	10/22/2016 8:55	F	1590	7.00	3.2	1652.0
LBGC-0.11	8_42665.458F	10/22/2016 10:59	F	1360	7.35	5.8	1852.0
LBGC-0.11	8_42665.633F	10/22/2016 15:12	F	1720	7.82	5.3	>4000

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBGC-0.11	8_42666.337F	10/23/2016 8:05	F	1790	7.05	3.2	1825.0
LBGC-0.11	8_42666.47F	10/23/2016 11:17	F	1310	7.25	3.9	2125.0
LBGC-0.11	8_42666.552F	10/23/2016 13:15	F	1200	7.11	3.8	1323.0
LBGC-0.11	8_42667.381F	10/24/2016 9:09	F	980		2.5	>4000
LBGC-0.11	8_42667.469F	10/24/2016 11:15	F	1130		3.9	1195.0
LBGC-0.11	8_42667.625F	10/24/2016 15:00	F	910		4.9	1165.0
LBGC-0.11	8_42668.378F	10/25/2016 9:05	F	1120	7.63	2.0	2848.0
LBGC-0.11	8_42668.566F	10/25/2016 13:35	F	1060	7.60	2.5	>4000
LBGC-0.11	8_42668.728F	10/25/2016 17:29	F	1120	7.62	2.0	>4000
LBGC-0.11	8_42669.326F	10/26/2016 7:50	F	1300	7.88	2.0	3559.0
LBGC-0.11	8_42669.52F	10/26/2016 12:29	F	2520	7.15	3.2	59.0
LBGC-0.11	8_42669.713F	10/26/2016 17:07	F	3170	7.19	4.1	67.0
LBGC-0.11	8_42670.406F	10/27/2016 9:45	F	1080	7.38	2.4	>4000
LBGC-0.11	8_42670.542F	10/27/2016 13:00	F	2140	7.14	3.3	675.0
LBGC-0.11	8_42671.376F	10/28/2016 9:01	F	3100	6.91	3.4	69.4
LBGC-0.11	8_42671.539F	10/28/2016 12:56	F	340	7.15	6.7	52.3
LBGC-0.11	8_42671.65F	10/28/2016 15:36	F	3920	6.37	5.8	1578.0
LBGC-0.11	8_42672.415F	10/29/2016 9:57	F	3200	7.43	3.4	>4000
LBGC-0.11	8_42672.574F	10/29/2016 13:46	F	1470	7.49	3.0	722.0
LBGC-0.11	8_42673.427F	10/30/2016 10:15	F	810	7.88	5.9	>4000
LBGC-0.11	8_42674.397F	10/31/2016 9:31	F	890	7.18	1.7	>4000
LBGC-0.11	8_42674.539F	10/31/2016 12:56	F	900	6.66	2.5	>4000
LBGC-0.11	8_42674.539FD	10/31/2016 12:56	FD	970	7.27	3.1	>4000
LBGC-0.11	8_42675.323F	11/1/2016 7:45	F	910	7.30	0.8	>4000
LBGC-0.11	8_42675.563F	11/1/2016 13:30	F	810	7.27	0.4	>4000
LBGC-0.11	8_42675.721F	11/1/2016 17:18	F	810	7.27	0.5	3137.0
LBGC-0.11	8_42676.344F	11/2/2016 8:15	F	860	7.31	1.0	1169.0
LBGC-0.11	8_42676.555F	11/2/2016 13:19	F	810	7.27	1.0	3625.0
LBGC-0.11	8_42676.722F	11/2/2016 17:19	F	740	6.99	0.4	>4000
LBGC-0.11	8_42677.326F	11/3/2016 7:50	F	890	7.46	0.3	2852.0
LBGC-0.11	8_42677.556F	11/3/2016 13:20	F	890	7.31	2.7	3314.0
LBGC-0.11	8_42678.323F	11/4/2016 7:45	F	730	8.05	0.6	>4000
LBGC-0.11	8_42678.558F	11/4/2016 13:24	F	670	7.01	1.6	>4000
LBGC-0.11	8_42678.724F	11/4/2016 17:22	F	220	7.34	6.0	47.2
LBGC-0.11	8_42679.34F	11/5/2016 8:09	F	210	7.73	1.0	>4000
LBGC-0.11	8_42679.492F	11/5/2016 11:49	F	670	7.51	1.9	>4000
LBGC-0.11	8_42680.3479999999F	11/6/2016 8:21	F	810	6.71	0.9	>4000
LBGC-0.11	8_42680.544F	11/6/2016 13:04	F	1530	7.17	2.2	96.8
LBGC-0.11	8_42680.663F	11/6/2016 15:54	F	800	7.25	2.0	>4000
LBGC-0.11	8_42681.326F	11/7/2016 7:50	F	810	8.01	3.9	2683.0
LBGC-0.11	8_42681.503F	11/7/2016 12:05	F	390	7.80	2.0	3427.0
LBGC-0.11	8_42681.656F	11/7/2016 15:45	F	670	7.47	5.5	>4000
LBGC-0.11	8_42682.342F	11/8/2016 8:12	F	910	7.65	6.9	>4000
LBGC-0.11	8_42682.549F	11/8/2016 13:11	F	1500	7.64	2.3	1570.0
LBGC-0.11	8_42682.68F	11/8/2016 16:19	F	840	7.93	3.0	>4000
LBGC-0.11	8_42683.337F	11/9/2016 8:05	F	760	7.56	2.0	>4000
LBGC-0.11	8_42683.531F	11/9/2016 12:45	F	720	8.05	3.2	>4000
LBGC-0.11	8_42683.705F	11/9/2016 16:55	F	700	8.07	3.6	>4000
LBGC-0.11	8_42684.327F	11/10/2016 7:51	F	650	7.95	1.0	>4000
LBGC-0.11	8_42684.543F	11/10/2016 13:02	F	680	7.77	1.5	>4000
LBGC-0.11	8_42685.41F	11/11/2016 9:50	F	530	8.43	5.3	3646.0
LBGC-0.11	8_42685.524F	11/11/2016 12:35	F		7.28	2.8	1565.0
LBGC-0.11	8_42685.61F	11/11/2016 14:39	F	670	8.08	6.0	3752.0

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBGC-0.11	8_42715F	12/11/2016	F	690	8.15	4.8	>4000
LBGC-0.11	8_42715.403F	12/11/2016 9:40	F	590	6.78	1.7	>4000
LBGC-0.11	8_42715.653F	12/11/2016 15:40	F	570	7.01	5.1	>4000
LBGC-0.11	8_42717.365F	12/13/2016 8:45	F	590	7.81	4.2	3696.0
LBGC-0.11	8_42717.385F	12/13/2016 9:14	F	1390	6.86	4.5	>4000
LBGC-0.11	8_42717.51F	12/13/2016 12:15	F	1520	6.99	4.5	>4000
LBGC-0.11	8_42717.535F	12/13/2016 12:50	F	1320	7.23	4.8	>4000
LBGC-0.11	8_42717.701F	12/13/2016 16:49	F	1210	7.25	5.4	>4000
LBGC-0.16	GC-0.16-42553F	7/2/2016	F				100.0
LBGC-0.16	GC-0.16-42557F	7/6/2016	F	2220	4.60		40.9
LBGC-0.16	GC-0.16-42598F	8/16/2016	F				8.6
LBGC-0.16	GC-0.16-42613F	8/31/2016	F	2470	7.20		
LBGC-0.16	GC-0.16-42620F	9/7/2016	F	1501	7.40	13.4	1444.0
LBGC-0.16	GC-0.16-42623.4674F	9/10/2016 11:13	F	2120	7.60	10.5	
LBGC-0.16	GC-0.16-42623.7049F	9/10/2016 16:55	F	2210	7.50	11.1	
LBGC-0.16	GC-0.16-42626.5111F	9/13/2016 12:16	F	3920		14.7	61.0
LBGC-0.16	GC-0.16-42627.4507F	9/14/2016 10:49	F	3970	4.73	12.1	26.3
LBGC-0.16	GC-0.16-42637.5785F	9/24/2016 13:53	F	3720	4.68		18.4
LBGC-0.16	GC-0.16-42643.5785F	9/30/2016 13:53	F	3720	4.68	12.3	18.4
LBGC-0.16	GC-0.16-42653F	10/10/2016	F				88.8
LBGC-0.53	GC-0.53-42629.4021F	9/16/2016 9:39	F	2610	6.80	11.8	24.0
LBGC-0.53	GC-0.53-42633.5007F	9/20/2016 12:01	F	3000	4.93	11.4	42.3
LBGC-0.53	GC-0.53-42641.6111F	9/28/2016 14:40	F	4180	4.88	10.5	46.3
LBGC-0.60	GC-0.60-42553F	7/2/2016	F				134.0
LBGC-0.60	GC-0.60-42556F	7/5/2016	F				169.0
LBGC-0.60	GC-0.60-42557F	7/6/2016	F	3080	5.86		154.0
LBGC-0.60	GC-0.60-42613F	8/31/2016	F	2200	6.90		
LBGC-0.60	GC-0.60-42620F	9/7/2016	F	1043	7.30	13.3	1733.0
LBGC-0.60	GC-0.60-42626.5431F	9/13/2016 13:02	F	3490		13.1	
LBGC-0.60	GC-0.60-42627.4681F	9/14/2016 11:14	F	2720	5.85	9.9	163.0
LBGC-0.60	GC-0.60-42629.3875F	9/16/2016 9:18	F	2850	5.84	10.1	677.0
LBGC-0.60	GC-0.60-42633.4951F	9/20/2016 11:53	F	2620	6.76	8.8	78.7
LBGC-0.60	GC-0.60-42637.5618F	9/24/2016 13:29	F	2720	5.49		45.0
LBGC-0.60	GC-0.60-42641.6188F	9/28/2016 14:51	F	3030	5.20	10.0	37.5
LBGC-0.60	GC-0.60-42643.5917F	9/30/2016 14:12	F	3320	6.41	10.3	26.6
LBGC-0.60	26_42664.563F	10/21/2016 13:30	F	940	7.73		656.0
LBGC-0.60	26_42665.395F	10/22/2016 9:29	F	1720	8.08	3.9	3472.0
LBGC-0.60	26_42665.469F	10/22/2016 11:15	F	1630	8.01	6.2	3508.0
LBGC-0.60	26_42665.604F	10/22/2016 14:30	F	800	8.00	4.9	3738.0
LBGC-0.60	26_42666.354F	10/23/2016 8:30	F	1570	7.19	3.7	3285.0
LBGC-0.60	26_42666.458F	10/23/2016 11:00	F	310	7.29	3.9	34.7
LBGC-0.60	26_42666.5F	10/23/2016 12:00	F	890	7.60	4.1	892.0
LBGC-0.60	26_42667.552F	10/24/2016 13:15	F	890		5.6	2202.0
LBGC-0.60	26_42668.588F	10/25/2016 14:07	F	340	7.61	2.5	857.0
LBGC-0.60	26_42669.531F	10/26/2016 12:45	F	1060	7.08	2.5	1025.0
LBGC-0.60	26_42670.383F	10/27/2016 9:12	F	910	7.07	2.4	934.0
LBGC-0.60	26_42671.39F	10/28/2016 9:22	F	890	7.12	3.0	>4000
LBGC-0.60	26_42672.433F	10/29/2016 10:24	F	940	7.58	1.9	2091.0
LBGC-0.60	26_42674.414F	10/31/2016 9:56	F	860	7.49	1.4	150.0
LBGC-0.60	26_42675.581F	11/1/2016 13:56	F	800	7.25	0.3	>4000
LBGC-0.60	26_42676.567F	11/2/2016 13:37	F	860	7.09	0.9	3306.0
LBGC-0.60	26_42677.568F	11/3/2016 13:38	F	910	7.84	2.5	>4000
LBGC-0.60	26_42678.581F	11/4/2016 13:56	F	690	7.12	1.2	>4000

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBGC-0.60	26_42679.458F	11/5/2016 11:00	F	670	7.73	1.0	129.0
LBGC-0.60	26_42680.328F	11/6/2016 7:52	F	720	7.13	1.1	982.0
LBGC-0.60	26_42681.542F	11/7/2016 13:00	F	720	7.12	3.5	>4000
LBGC-0.60	26_42681.688F	11/7/2016 16:30	F	680	7.48	5.5	>4000
LBGC-0.60	26_42682.524F	11/8/2016 12:35	F	2250	7.70	2.0	>4000
LBGC-0.60	26_42683.72F	11/9/2016 17:17	F	710	8.11	2.8	2380.0
LBGC-0.60	26_42684.556F	11/10/2016 13:20	F	690	7.83	1.3	>4000
LBGC-0.60	26_42685.431F	11/11/2016 10:20	F	620	8.12	2.0	>4000
LBGC-0.60	26_42685.524F	11/11/2016 12:35	F		8.10	6.1	3671.0
LBGC-0.60	26_42715F	12/11/2016	F	950	8.30	6.5	>4000
LBGC-0.60	26_42715.417F	12/11/2016 10:00	F	560	6.76	2.2	>4000
LBGC-0.60	26_42717.458F	12/13/2016 11:00	F	780	6.95	2.5	>4000
LBGC-0.60	26_42717.51F	12/13/2016 12:15	F	1190	7.19	2.1	>4000
LBGC-1	24_42680.341F	11/6/2016 8:11	F	1670	7.23	0.9	3.6
LBGC-1	24_42681.521F	11/7/2016 12:30	F	1570	7.59	4.3	72.0
LBGC-1	24_42681.635F	11/7/2016 15:15	F	1160	7.38	5.9	
LBGC-1	24_42682.542F	11/8/2016 13:00	F	2100	7.68	1.7	73.1
LBGC-1	24_42683.51F	11/9/2016 12:14	F	2310	7.43	4.6	95.3
LBGC-1	24_42684.525F	11/10/2016 12:36	F	2230	7.42	2.9	1242.0
LBGC-1	24_42685.424F	11/11/2016 10:10	F	540	7.42	0.5	127.0
LBGC-1	24_42685.524F	11/11/2016 12:35	F	2680	7.51	6.1	102.4
LBGC-1	24_42717.396F	12/13/2016 9:30	F	230	7.23	2.3	20.2
LBGC-1	24_42717.417F	12/13/2016 10:00	F	3360	6.41	2.4	12.1
LBGC-1	24_42717.486F	12/13/2016 11:40	F	3490	6.66	3.5	>4000
LBGC-1	24_42717.52F	12/13/2016 12:29	F	270	7.39	5.2	62.0
LBL3C-0.02	L3C-0.02-42619F	9/6/2016	F	297	7.70	11.8	103.3
LBL3C-0.02	28-42722.479F	12/18/2016 11:30	F	2380	7.30	0.2	
LBL3C-1.65	L3C-1.65-43463F	9/8/2016	F	1250	7.70		
LBL3C-1.65	L3C-1.65-42621.691F	9/8/2016 16:35	F	940	7.90		
LBL3C-1.65	L3C-1.65-42621.833F	9/8/2016 20:00	F	940	7.50		
LBL3C-1.65	L3C-1.65-42623.369F	9/10/2016 8:52	F	720	7.40	10.3	
LBL3C-1.65	L3C-1.65-42623.676F	9/10/2016 16:13	F	973	7.40	11.8	
LBL3C-3.32	L3C-3.32-42540F	6/19/2016	F				45.8
LBL3C-3.32	L3C-3.32-42544F	6/23/2016	F				30.0
LBL3C-3.32	L3C-3.32-42551F	6/30/2016	F				15.9
LBL3C-3.32	L3C-3.32-42556F	7/5/2016	F				2.7
LBL3C-3.32	L3C-3.32-42558F	7/7/2016	F	1660	7.55		1.3
LBL3C-3.32	L3C-3.32-42559F	7/8/2016	F	1650	7.31		4.9
LBL3C-3.32	L3C-3.32-42561F	7/10/2016	F	1550	7.65		3.3
LBL3C-3.32	L3C-3.32-42564F	7/13/2016	F	1520	7.65		2.6
LBL3C-3.32	L3C-3.32-42568F	7/17/2016	F	1730	7.70		10.7
LBL3C-3.32	L3C-3.32-42573F	7/22/2016	F	1950	8.25		38.7
LBL3C-3.32	L3C-3.32-42579F	7/28/2016	F	1300	7.42		16.9
LBL3C-3.32	L3C-3.32-42585F	8/3/2016	F	1400	7.00		3.4
LBL3C-3.32	L3C-3.32-42597F	8/15/2016	F	600	7.65	18.9	10.5
LBL3C-3.32	L3C-3.32-42598F	8/16/2016	F				6.4
LBL3C-3.32	L3C-3.32-42613F	8/31/2016	F	1057	7.00	10.6	36.3
LBL3C-3.32	L3C-3.32-42620.74F	9/7/2016 17:45	F	1100	7.60	12.7	11.7
LBL3C-3.37	L3C-3.37-42540F	6/19/2016	F				45.4
LBL3C-3.37	L3C-3.37-42544F	6/23/2016	F				35.7
LBL3C-3.37	L3C-3.37-42551F	6/30/2016	F				19.9
LBL3C-3.37	L3C-3.37-42556F	7/5/2016	F				4.7
LBL3C-3.37	L3C-3.37-42558F	7/7/2016	F	1740	7.39		11.4

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBL3C-3.37	L3C-3.37-42559F	7/8/2016	F	1750	7.40		10.5
LBL3C-3.37	L3C-3.37-42561F	7/10/2016	F	1560	7.55		8.4
LBL3C-3.37	L3C-3.37-42564F	7/13/2016	F	1570	7.60		3.9
LBL3C-3.37	L3C-3.37-42568F	7/17/2016	F	1750	7.73		13.6
LBL3C-3.37	L3C-3.37-42573F	7/22/2016	F	1980	8.15		39.5
LBL3C-3.37	L3C-3.37-42579F	7/28/2016	F	1370	7.53		18.5
LBL3C-3.37	L3C-3.37-42585F	8/3/2016	F	720	7.37		22.2
LBL3C-3.37	L3C-3.37-42597F	8/15/2016	F	650	7.69	13.7	11.5
LBL3C-3.37	L3C-3.37-42598F	8/16/2016	F				11.5
LBL3C-3.37	33_42670.576F	10/27/2016 13:50	F	390	7.92	2.7	24.5
LBL3C-3.37	33_42672.597F	10/29/2016 14:20	F	630	8.73	1.2	24.6
LBL3C-3.37	33_42683.469F	11/9/2016 11:15	F	310	7.23	1.2	59.4
LBL3C-3.37	33_42686.618F	11/12/2016 14:50	F	360	7.82	1.5	30.0
LBL3C-3.37	33_42687F	11/13/2016	F	430	7.92	2.8	29.6
LBL6-EP	L6-EP-42630.5F	9/17/2016 12:00	F	460	7.10	17.9	20.3
LBL6-WP	L6-WP-42630.4674F	9/17/2016 11:13	F	2310	4.60	14.4	15.5
LBPR-14.57	LPR-14.57-42596.376F	8/14/2016 9:02	F	200	7.59	11.9	5.9
LBPR-14.57	LPR-14.57-42601.341F	8/19/2016 8:11	F	200	7.68	12.5	16.8
LBPR-14.57	LPR-14.57-42617.443F	9/4/2016 10:38	F		8.00	8.8	1140.3
LBPR-14.57	LPR-14.57-42625.535F	9/12/2016 12:50	F		7.70	10.2	17.0
LBPR-14.57	LPR-14.57-42625.538F	9/12/2016 12:55	F		7.90	10.2	28.9
LBPR-14.57	LPR-14.57-42630.556F	9/17/2016 13:20	F		7.50	12.8	14.9
LBPR-14.57	LPR-14.57-42630.556D	9/17/2016 13:20	FD		7.50	12.8	17.9
LBPR-14.57	LPR-14.57-42630.559F	9/17/2016 13:25	F		7.60	12.7	13.2
LBPR-14.57	LPR-14.57-42639.624F	9/26/2016 14:58	F		8.20	10.6	9.8
LBPR-14.57	LPR-14.57-42639.624D	9/26/2016 14:59	FD		8.20	10.8	7.2
LBPR-14.57	LPR-14.57-42648.453F	10/5/2016 10:52	F			8.8	10.7
LBPR-14.57	LPR-14.57-42648.455F	10/5/2016 10:55	F			8.8	10.6
LBPR-14.57	LPR-14.57-42655.606F	10/12/2016 14:33	F			8.4	9.2
LBPR-14.57	LPR-14.57-42655.610F	10/12/2016 14:38	F			8.4	11.5
LBPR-14.57	34_42662.616F	10/19/2016 14:47	F			7.0	16.3
LBPR-14.57	34_42662.619F	10/19/2016 14:51	F			7.7	8.5
LBPR-14.57	34_42669.34F	10/26/2016 8:10	F			7.6	11.6
LBPR-14.57	34_42669.342F	10/26/2016 8:13	F			7.6	15.0
LBPR-14.57	34_42675.458F	11/1/2016 11:00	F			7.1	7.9
LBPR-14.57	34_42675.46F	11/1/2016 11:02	F			6.9	10.9
LBPR-3.20	LPR-3.20-42596.3583F	8/14/2016 8:36	F	210	7.43	11.8	6.3
LBPR-3.20	LPR-3.20-42601.3222F	8/19/2016 7:44	F	200	7.68	12.4	5.7
LBPR-3.20	LPR-3.20-42617.4271F	9/4/2016 10:15	F		7.90	9.0	1202.0
LBPR-3.20	LPR-3.20-42617.4271D	9/4/2016 10:15	FD		7.90	9.0	1235.3
LBPR-3.20	LPR-3.20-42625.5208F	9/12/2016 12:30	F		7.60	10.2	22.5
LBPR-3.20	LPR-3.20-42630.6007F	9/17/2016 14:25	F		7.50	12.7	17.8
LBPR-3.20	LPR-3.20-42639.6396F	9/26/2016 15:21	F		8.40	11.2	7.5
LBPR-3.20	LPR-3.20-42648.4285F	10/5/2016 10:17	F			8.8	11.2
LBPR-3.20	LPR-3.20-42655.5868F	10/12/2016 14:05	F			8.2	8.6
LBPR-3.20	35_42662.559F	10/19/2016 13:25	F			7.2	5.2
LBPR-3.20	35_42662.559FD	10/19/2016 13:25	FD			7.2	5.2
LBPR-3.20	35_42669.45F	10/26/2016 10:48	F			7.2	9.7
LBPR-3.20	35_42675.476F	11/1/2016 11:26	F			6.7	19.1
LBPR-3.99	36_42669.354F	10/26/2016 8:30	F	130	7.96	7.3	7.8
LBPR-3.99	36_42670.351F	10/27/2016 8:25	F	280	7.28	7.5	13.5
LBPR-3.99	36_42678.5F	10/28/2016 12:00	F	280	7.68	6.1	9.5
LBPR-3.99	36_42672.388F	10/29/2016 9:19	F	280	7.75	7.1	9.2

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBPR-3.99	36_42673.382F	10/30/2016 9:10	F	210	6.89	5.9	7.1
LBPR-3.99	36_42675.528F	11/1/2016 12:40	F	230	8.03	6.1	6.8
LBPR-3.99	36_42676.519F	11/2/2016 12:27	F	200	7.45	6.8	4.3
LBPR-3.99	36_42677.517F	11/3/2016 12:25	F	200	7.86	6.5	6.3
LBPR-3.99	36_42678.515F	11/4/2016 12:21	F	210	6.61	6.5	4.7
LBPR-3.99	36_42681.569F	11/7/2016 13:40	F	270	8.16	5.0	7.0
LBPR-3.99	36_42682.611F	11/8/2016 14:40	F	250	7.99	5.2	17.0
LBPR-3.99	36_42683.552F	11/9/2016 13:15	F	250	7.72	7.2	31.9
LBPR-3.99	36_42684.49F	11/10/2016 11:45	F	250	8.25	5.6	68.7
LBPR-3.99	36_42685.378F	11/11/2016 9:05	F	200	8.30	5.5	37.9
LBPR-3.99	36_42715.458F	12/11/2016 11:00	F	210	7.21	5.9	26.9
LBPR-5.10	LPR-5.10-42626.5944F	9/13/2016 14:16	F	237	8.40	12.2	15.3
LBPR-5.10	LPR-5.10-42627.5229F	9/14/2016 12:33	F	240	7.56	14.6	25.7
LBPR-5.10	LPR-5.10-42627.5438F	9/14/2016 13:03	F	240	7.50	14.8	21.7
LBPR-5.10	LPR-5.10-42627.5799F	9/14/2016 13:55	F	240	7.84	14.0	21.3
LBPR-5.10	LPR-5.10-42645.3715F	10/2/2016 8:55	F	180	7.80	10.5	7.6
LBPR-5.10	LPR-5.10-42645.5208F	10/2/2016 12:30	F	180	7.38	10.7	6.4
LBPR-5.10	LPR-5.10-42645.6736F	10/2/2016 16:10	F	180	8.03	10.8	8.3
LBPR-5.10	LPR-5.10-42647.3875F	10/4/2016 9:18	F	210	7.52	10.0	7.4
LBPR-5.10	LPR-5.10-42647.6194F	10/4/2016 14:52	F	210	7.75	9.8	11.9
LBPR-5.10	LPR-5.10-42647.7299F	10/4/2016 17:31	F	210	7.78	9.8	6.4
LBPR-5.10	LPR-5.10-42648.3222F	10/5/2016 7:44	F	240	7.74	9.3	4.9
LBPR-5.10	LPR-5.10-42648.5208F	10/5/2016 12:30	F	210	7.82	9.5	6.2
LBPR-5.10	LPR-5.10-42648.6979F	10/5/2016 16:45	F	240	7.98	8.3	6.2
LBPR-5.10	LPR-5.10-42649.3729F	10/6/2016 8:57	F	240	8.06	8.7	8.6
LBPR-5.10	LPR-5.10-42650.3201F	10/7/2016 7:41	F	240	8.04	8.4	5.3
LBPR-5.10	LPR-5.10-42650.4583F	10/7/2016 11:00	F	240	8.15	8.1	7.0
LBPR-5.10	LPR-5.10-42650.625F	10/7/2016 15:00	F	230	8.35	8.1	6.9
LBPR-5.10	LPR-5.10-42651.3167F	10/8/2016 7:36	F	150	8.04	7.7	16.1
LBPR-5.10	LPR-5.10-42651.5167F	10/8/2016 12:24	F	170	7.97	7.0	6.8
LBPR-5.10	LPR-5.10-42651.6382F	10/8/2016 15:19	F	150	8.06	8.1	28.7
LBPR-5.10	LPR-5.10-42652.3271F	10/9/2016 7:51	F	160	8.41	7.6	6.2
LBPR-5.10	LPR-5.10-42652.5229F	10/9/2016 12:33	F	210	8.41	7.8	8.7
LBPR-5.10	LPR-5.10-42652.6424F	10/9/2016 15:25	F	150	8.67	7.8	24.9
LBPR-5.10	LPR-5.10-42653.3236F	10/10/2016 7:46	F	150	8.60	6.8	13.1
LBPR-5.10	LPR-5.10-42653.5174F	10/10/2016 12:25	F	150	8.49	7.4	8.3
LBPR-5.10	LPR-5.10-42653.6382F	10/10/2016 15:19	F	150	8.59	8.2	24.8
LBPR-5.10	LPR-5.10-42654.3465F	10/11/2016 8:19	F	170	8.04	7.9	25.8
LBPR-5.10	LPR-5.10-42654.6007F	10/11/2016 14:25	F	170	8.22	8.7	30.1
LBPR-5.10	LPR-5.10-42654.7465F	10/11/2016 17:55	F	170	8.34	8.8	43.0
LBPR-5.10	LPR-5.10-42655.3264F	10/12/2016 7:50	F	200	8.18	7.8	9.3
LBPR-5.10	LPR-5.10-42655.4993F	10/12/2016 11:59	F	180	8.33	7.8	31.0
LBPR-5.10	LPR-5.10-42655.6889F	10/12/2016 16:32	F	170	8.30	8.5	39.8
LBPR-5.10	LPR-5.10-42656.3222F	10/13/2016 7:44	F	200	8.18	7.8	9.3
LBPR-5.10	LPR-5.10-42656.5104F	10/13/2016 12:15	F	170	8.43	8.2	77.8
LBPR-5.10	LPR-5.10-42656.6042F	10/13/2016 14:30	F	180	8.34	7.2	49.6
LBPR-5.10	LPR-5.10-42657.3194F	10/14/2016 7:40	F	210	7.43	6.1	7.6
LBPR-5.10	LPR-5.10-42657.5243F	10/14/2016 12:35	F	200	8.09	6.7	27.2
LBPR-5.10	LPR-5.10-42658.3201F	10/15/2016 7:41	F	230	7.49	8.3	8.8
LBPR-5.10	LPR-5.10-42658.4875F	10/15/2016 11:42	F	220	7.76	7.9	9.5
LBPR-5.10	LPR-5.10-42658.6785F	10/15/2016 16:17	F	230	7.86	8.3	7.2
LBPR-5.10	LPR-5.10-42659.3285F	10/16/2016 7:53	F	270	7.68	7.5	18.8
LBPR-5.10	LPR-5.10-42659.5236F	10/16/2016 12:34	F	310	8.05	7.3	77.8

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBPR-5.10	LPR-5.10-42660.3438F	10/17/2016 8:15	F	270	7.47	7.4	8.2
LBPR-5.10	LPR-5.10-42660.5104F	10/17/2016 12:15	F	200	7.89	7.6	31.9
LBPR-5.10	LPR-5.10-42660.6458F	10/17/2016 15:30	F	200	7.80	6.9	34.0
LBPR-5.10	LPR-5.10-42661.3507F	10/18/2016 8:25	F	180	8.04	6.5	4.3
LBPR-5.10	LPR-5.10-42661.5104F	10/18/2016 12:15	F	180	8.15	7.2	68.2
LBPR-5.10	LPR-5.10-42661.6632F	10/18/2016 15:55	F	180	8.07	7.4	38.4
LBPR-5.10	37_42662.42F	10/19/2016 10:05	F	200	7.25	3.2	43.6
LBPR-5.10	37_42662.548F	10/19/2016 13:09	F	230	7.25	3.6	51.6
LBPR-5.10	37_42662.619F	10/19/2016 14:52	F	250	7.21	4.5	
LBPR-5.10	37_42663.392F	10/20/2016 9:25	F	310	7.46	5.4	52.8
LBPR-5.10	37_42663.533F	10/20/2016 12:47	F	230	7.50	9.2	33.9
LBPR-5.10	37_42663.608F	10/20/2016 14:35	F	280	7.00	9.5	39.2
LBPR-5.10	37_42664.368F	10/21/2016 8:50	F	300	7.03		15.2
LBPR-5.10	37_42664.493F	10/21/2016 11:50	F	450	7.37		24.2
LBPR-5.10	37_42664.574F	10/21/2016 13:47	F	320	7.32		44.0
LBPR-5.10	37_42665.378F	10/22/2016 9:05	F	260	8.18	4.5	25.6
LBPR-5.10	37_42665.455F	10/22/2016 10:55	F	260	8.15	6.8	
LBPR-5.10	37_42665.625F	10/22/2016 15:00	F	380	8.05	5.6	97.0
LBPR-5.10	37_42666.338F	10/23/2016 8:07	F	290	7.23	3.1	39.5
LBPR-5.10	37_42666.469F	10/23/2016 11:15	F	390	7.80	5.2	39.5
LBPR-5.10	37_42666.556F	10/23/2016 13:21	F	280	7.25	3.8	40.9
LBPR-5.10	37_42667.378F	10/24/2016 9:05	F	250		3.2	7.9
LBPR-5.10	37_42667.465F	10/24/2016 11:10	F	280		3.9	9.0
LBPR-5.10	37_42667.635F	10/24/2016 15:15	F	290		5.3	15.6
LBPR-5.10	37_42668.384F	10/25/2016 9:13	F	240	8.01	6.9	11.7
LBPR-5.10	37_42668.563F	10/25/2016 13:31	F	340	7.81	7.2	44.0
LBPR-5.10	37_42668.727F	10/25/2016 17:27	F	260	7.99	8.0	13.9
LBPR-5.10	37_42669.324F	10/26/2016 7:46	F	150	8.21	7.5	23.1
LBPR-5.10	37_42669.517F	10/26/2016 12:25	F	300	7.94	7.5	86.1
LBPR-5.10	37_42669.71F	10/26/2016 17:03	F	250	7.78	7.7	72.0
LBPR-5.10	37_42670.403F	10/27/2016 9:40	F	270	7.56	7.0	19.4
LBPR-5.10	37_42670.538F	10/27/2016 12:54	F	290	7.68	8.6	48.0
LBPR-5.10	37_42671.368F	10/28/2016 8:50	F	260	7.79	6.5	24.0
LBPR-5.10	37_42671.528F	10/28/2016 12:40	F	310	7.26	6.7	36.7
LBPR-5.10	37_42671.652F	10/28/2016 15:39	F	310	7.03	7.4	48.5
LBPR-5.10	37_42672.418F	10/29/2016 10:02	F	320	7.81	6.0	11.6
LBPR-5.10	37_42672.568F	10/29/2016 13:38	F	380	7.92	6.5	13.6
LBPR-5.10	37_42673.431F	10/30/2016 10:20	F	240	7.83	5.8	15.9
LBPR-5.10	37_42674.4F	10/31/2016 9:36	F	290	7.49	4.8	100.3
LBPR-5.10	37_42674.537F	10/31/2016 12:53	F	810	6.67	6.0	22.5
LBPR-5.10	37_42674.537FD	10/31/2016 12:53	FD	860	7.40	6.3	11.9
LBPR-5.10	37_42675.319F	11/1/2016 7:40	F	850	7.60	4.7	18.8
LBPR-5.10	37_42675.558F	11/1/2016 13:23	F	260	7.51	4.3	11.5
LBPR-5.10	37_42675.715F	11/1/2016 17:09	F	240	7.63	5.0	53.0
LBPR-5.10	37_42676.34F	11/2/2016 8:10	F	210	7.52	4.8	18.9
LBPR-5.10	37_42676.551F	11/2/2016 13:14	F	230	7.46	6.0	6.9
LBPR-5.10	37_42676.72F	11/2/2016 17:17	F	230	7.25	5.4	16.3
LBPR-5.10	37_42677.323F	11/3/2016 7:45	F	220	7.67	4.2	19.5
LBPR-5.10	37_42677.549F	11/3/2016 13:10	F	210	7.78	6.4	30.1
LBPR-5.10	37_42678.319F	11/4/2016 7:39	F	220	8.21	5.7	11.3
LBPR-5.10	37_42678.556F	11/4/2016 13:21	F	230	7.21	6.4	17.6
LBPR-5.10	37_42678.725F	11/4/2016 17:24	F	660	7.27	1.5	>4000
LBPR-5.10	37_42679.344F	11/5/2016 8:15	F	210	7.73	5.7	16.4

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBPR-5.10	37_42679.491F	11/5/2016 11:47	F	240	7.74	6.1	40.4
LBPR-5.10	37_42680.353F	11/6/2016 8:28	F	220	7.47	4.9	13.5
LBPR-5.10	37_42680.546F	11/6/2016 13:06	F	380	7.52	6.6	16.3
LBPR-5.10	37_42680.665F	11/6/2016 15:57	F	460	7.36	6.4	4.0
LBPR-5.10	37_42681.33F	11/7/2016 7:55	F	250	7.95	3.5	24.5
LBPR-5.10	37_42681.507F	11/7/2016 12:10	F	570	7.56	5.9	24.3
LBPR-5.10	37_42681.66F	11/7/2016 15:50	F	250	7.93	5.9	51.2
LBPR-5.10	37_42682.34F	11/8/2016 8:10	F	1240	7.81	10.0	52.3
LBPR-5.10	37_42682.552F	11/8/2016 13:15	F	340	8.03	6.4	48.1
LBPR-5.10	37_42682.684F	11/8/2016 16:25	F	340	8.03	6.4	48.1
LBPR-5.10	37_42683.335F	11/9/2016 8:02	F	560	7.74	6.0	22.2
LBPR-5.10	37_42683.528F	11/9/2016 12:41	F	260	8.10	6.8	33.2
LBPR-5.10	37_42683.709F	11/9/2016 17:01	F	220	8.17	6.8	73.1
LBPR-5.10	37_42684.324F	11/10/2016 7:47	F	260	8.28	5.4	47.9
LBPR-5.10	37_42684.54F	11/10/2016 12:58	F	260	8.12	5.6	64.2
LBPR-5.10	37_42685.413F	11/11/2016 9:55	F	220	8.10	5.3	43.6
LBPR-5.10	37_42685.524F	11/11/2016 12:35	F		8.19	6.8	37.1
LBPR-5.10	37_42685.613F	11/11/2016 14:43	F	230	8.49	5.3	38.3
LBPR-5.10	37_42715F	12/11/2016	F	900	8.38	6.9	30.2
LBPR-5.10	37_42715.404F	12/11/2016 9:42	F	210	6.96	4.8	40.1
LBPR-5.10	37_42715.656F	12/11/2016 15:45	F	220	7.32	6.1	24.8
LBPR-5.10	37_42717.367F	12/13/2016 8:48	F	220	7.54	5.2	24.6
LBPR-5.10	37_42717.428F	12/13/2016 10:17	F	230	7.12	4.1	24.6
LBPR-5.10	37_42717.514F	12/13/2016 12:20	F	280	7.01	4.7	29.9
LBPR-5.10	37_42717.531F	12/13/2016 12:45	F	270	7.99	5.9	27.2
LBPR-5.10	37_42717.698F	12/13/2016 16:45	F	220	7.69	4.5	35.6
LBPR-5.30	LPR-5.30-42626.5903F	9/13/2016 14:10	F	235	8.40	12.6	14.6
LBPR-5.30	LPR-5.30-42626.6007F	9/13/2016 14:25	F	233	8.30	12.6	18.7
LBPR-5.30	LPR-5.30-42626.6049F	9/13/2016 14:31	F	232	8.40	12.8	29.1
LBPR-5.30	LPR-5.30-42626.6083F	9/13/2016 14:36	F	234	8.40	12.5	15.4
LBPR-5.30	LPR-5.30-42627.5076F	9/14/2016 12:11	F	230	7.41	13.9	13.5
LBPR-5.30	LPR-5.30-42627.5396F	9/14/2016 12:57	F	250	7.44	13.8	15.2
LBPR-5.30	LPR-5.30-42627.5743F	9/14/2016 13:47	F	230	7.93	14.9	20.2
LBPR-5.30	LPR-5.30-42645.3736F	10/2/2016 8:58	F	210	7.94	10.5	7.6
LBPR-5.30	LPR-5.30-42645.5264F	10/2/2016 12:38	F	2000	7.49	10.6	72.8
LBPR-5.30	LPR-5.30-42645.6785F	10/2/2016 16:17	F	180	8.15	10.8	11.2
LBPR-5.30	LPR-5.30-42647.391F	10/4/2016 9:23	F	230	7.60	10.1	4.9
LBPR-5.30	LPR-5.30-42647.6215F	10/4/2016 14:55	F	220	7.66	9.8	7.9
LBPR-5.30	LPR-5.30-42647.7319F	10/4/2016 17:34	F	220	7.68	10.1	12.2
LBPR-5.30	LPR-5.30-42648.3271F	10/5/2016 7:51	F	300	7.70	10.3	4.7
LBPR-5.30	LPR-5.30-42648.5229F	10/5/2016 12:33	F	300	7.71	9.3	12.2
LBPR-5.30	LPR-5.30-42648.6924F	10/5/2016 16:37	F	240	7.91	9.3	8.3
LBPR-5.30	LPR-5.30-42649.3632F	10/6/2016 8:43	F	210	7.90	9.3	8.8
LBPR-5.30	LPR-5.30-42650.3215F	10/7/2016 7:43	F	240	7.99	8.6	7.5
LBPR-5.30	LPR-5.30-42650.4583F	10/7/2016 11:00	F	240	8.30	8.1	5.8
LBPR-5.30	LPR-5.30-42650.625F	10/7/2016 15:00	F	240	8.41	7.7	8.4
LBPR-5.30	LPR-5.30-42651.3215F	10/8/2016 7:43	F	150	7.99	7.0	6.1
LBPR-5.30	LPR-5.30-42651.5375F	10/8/2016 12:54	F	150	8.36	7.7	48.0
LBPR-5.30	LPR-5.30-42651.6451F	10/8/2016 15:29	F	150	8.38	7.8	6.9
LBPR-5.30	LPR-5.30-42652.3313F	10/9/2016 7:57	F	170	8.64	7.7	5.8
LBPR-5.30	LPR-5.30-42652.5306F	10/9/2016 12:44	F	150	8.54	7.7	8.7
LBPR-5.30	LPR-5.30-42652.6472F	10/9/2016 15:32	F	150	8.54	7.8	8.8
LBPR-5.30	LPR-5.30-42653.3257F	10/10/2016 7:49	F	220	8.18	6.9	14.4

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBPR-5.30	LPR-5.30-42653.5278F	10/10/2016 12:40	F	190	8.31	7.4	14.8
LBPR-5.30	LPR-5.30-42653.6444F	10/10/2016 15:28	F	160	8.61	7.9	43.8
LBPR-5.30	LPR-5.30-42654.3389F	10/11/2016 8:08	F	190	7.97	8.1	10.2
LBPR-5.30	LPR-5.30-42654.5896F	10/11/2016 14:09	F	190	8.19	8.9	31.8
LBPR-5.30	LPR-5.30-42654.7389F	10/11/2016 17:44	F	210	8.23	8.5	76.9
LBPR-5.30	LPR-5.30-42655.3194F	10/12/2016 7:40	F	190	8.08	8.3	8.0
LBPR-5.30	LPR-5.30-42655.4951F	10/12/2016 11:53	F	170	8.34	8.3	36.2
LBPR-5.30	LPR-5.30-42655.6819F	10/12/2016 16:22	F	170	8.31	8.8	21.8
LBPR-5.30	LPR-5.30-42656.316F	10/13/2016 7:35	F	190	8.08	8.3	8.0
LBPR-5.30	LPR-5.30-42656.5056F	10/13/2016 12:08	F	180	8.34	8.2	82.5
LBPR-5.30	LPR-5.30-42656.6007F	10/13/2016 14:25	F	200	8.30	7.3	61.8
LBPR-5.30	LPR-5.30-42657.3146F	10/14/2016 7:33	F	200	7.42	6.8	10.6
LBPR-5.30	LPR-5.30-42657.5194F	10/14/2016 12:28	F	200	7.94	6.9	24.8
LBPR-5.30	LPR-5.30-42658.3153F	10/15/2016 7:34	F	210	7.40	8.3	7.4
LBPR-5.30	LPR-5.30-42658.4743F	10/15/2016 11:23	F	230	7.78	8.1	8.2
LBPR-5.30	LPR-5.30-42658.6729F	10/15/2016 16:09	F	230	7.89	8.4	8.9
LBPR-5.30	LPR-5.30-42659.3229F	10/16/2016 7:45	F	160	7.27	8.4	8.8
LBPR-5.30	LPR-5.30-42659.5104F	10/16/2016 12:15	F	1700	7.43	7.7	11.4
LBPR-5.30	LPR-5.30-42660.3382F	10/17/2016 8:07	F	290	7.23	8.4	10.6
LBPR-5.30	LPR-5.30-42660.5063F	10/17/2016 12:09	F	240	7.53	8.6	10.7
LBPR-5.30	LPR-5.30-42660.641F	10/17/2016 15:23	F	220	7.79	7.7	14.3
LBPR-5.30	LPR-5.30-42661.3458F	10/18/2016 8:18	F	180	8.03	6.7	5.7
LBPR-5.30	LPR-5.30-42661.5035F	10/18/2016 12:05	F	240	8.05	7.2	72.5
LBPR-5.30	LPR-5.30-42661.6563F	10/18/2016 15:45	F	180	8.05	7.7	45.5
LBPR-5.30	38_42662.431F	10/19/2016 10:20	F	210	7.23	3.0	24.4
LBPR-5.30	38_42662.545F	10/19/2016 13:05	F	210	7.23	3.5	52.6
LBPR-5.30	38_42662.617F	10/19/2016 14:49	F	220	7.27	3.7	48.5
LBPR-5.30	38_42663.396F	10/20/2016 9:30	F	290	7.43	5.4	21.9
LBPR-5.30	38_42663.534F	10/20/2016 12:49	F	450	7.20	9.8	45.9
LBPR-5.30	38_42663.604F	10/20/2016 14:30	F	330	6.80	9.9	28.0
LBPR-5.30	38_42664.374F	10/21/2016 8:59	F	360	6.70		25.2
LBPR-5.30	38_42664.497F	10/21/2016 11:55	F	340	7.38		44.1
LBPR-5.30	38_42664.578F	10/21/2016 13:53	F	370	7.31		25.4
LBPR-5.30	38_42665.382F	10/22/2016 9:10	F	290	8.18	4.7	47.5
LBPR-5.30	38_42665.451F	10/22/2016 10:50	F	520	7.67	6.9	55.0
LBPR-5.30	38_42665.63F	10/22/2016 15:07	F	400	8.00	5.9	45.2
LBPR-5.30	38_42666.333F	10/23/2016 8:00	F	320	7.16	3.5	47.4
LBPR-5.30	38_42666.465F	10/23/2016 11:10	F	360	7.77	6.4	60.9
LBPR-5.30	38_42666.559F	10/23/2016 13:25	F	290	7.16	3.8	48.0
LBPR-5.30	38_42667.375F	10/24/2016 9:00	F	260		3.2	39.8
LBPR-5.30	38_42667.458F	10/24/2016 11:00	F	310		4.1	19.8
LBPR-5.30	38_42667.646F	10/24/2016 15:30	F	350		5.7	16.6
LBPR-5.30	38_42668.373F	10/25/2016 8:57	F	260	7.95	8.4	16.4
LBPR-5.30	38_42668.566F	10/25/2016 13:35	F	340	7.73	7.0	22.3
LBPR-5.30	38_42668.724F	10/25/2016 17:22	F	270	7.95	8.0	46.0
LBPR-5.30	38_42669.319F	10/26/2016 7:40	F	160	8.38	8.1	36.3
LBPR-5.30	38_42669.515F	10/26/2016 12:21	F	2520	7.15	7.8	59.0
LBPR-5.30	38_42669.708F	10/26/2016 16:59	F	230	7.68	7.8	90.4
LBPR-5.30	38_42670.398F	10/27/2016 9:33	F	280	7.46	6.5	40.7
LBPR-5.30	38_42670.534F	10/27/2016 12:49	F	290	7.60	8.5	41.2
LBPR-5.30	38_42671.373F	10/28/2016 8:57	F	280	7.89	7.5	21.0
LBPR-5.30	38_42671.535F	10/28/2016 12:50	F	340	7.15	6.7	52.3
LBPR-5.30	38_42671.656F	10/28/2016 15:44	F	310	7.06	7.1	49.4

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBPR-5.30	38_42672.421F	10/29/2016 10:06	F	300	7.82	6.2	22.3
LBPR-5.30	38_42672.574F	10/29/2016 13:46	F	310	7.88	7.0	26.9
LBPR-5.30	38_42673.434F	10/30/2016 10:25	F	280	7.89	5.5	16.5
LBPR-5.30	38_42674.392F	10/31/2016 9:24	F	290	6.81	6.2	29.4
LBPR-5.30	38_42674.535F	10/31/2016 12:50	F	840	6.52	6.3	30.5
LBPR-5.30	38_42674.535FD	10/31/2016 12:50	FD	840	7.30	6.0	31.1
LBPR-5.30	38_42675.314F	11/1/2016 7:32	F	230	7.56	6.1	20.3
LBPR-5.30	38_42675.567F	11/1/2016 13:37	F	230	7.38	4.3	14.8
LBPR-5.30	38_42675.719F	11/1/2016 17:15	F	210	7.56	5.7	36.3
LBPR-5.30	38_42676.338F	11/2/2016 8:06	F	210	7.43	4.6	25.8
LBPR-5.30	38_42676.546F	11/2/2016 13:06	F	210	7.44	6.2	17.8
LBPR-5.30	38_42676.717F	11/2/2016 17:13	F	210	7.14	5.3	13.9
LBPR-5.30	38_42677.319F	11/3/2016 7:40	F	220	7.91	4.9	18.6
LBPR-5.30	38_42677.553F	11/3/2016 13:16	F	230	7.62	6.4	32.3
LBPR-5.30	38_42678.316F	11/4/2016 7:35	F	210	8.14	5.6	10.0
LBPR-5.30	38_42678.551F	11/4/2016 13:13	F	250	6.84	6.5	24.6
LBPR-5.30	38_42678.719F	11/4/2016 17:16	F	230	7.76	6.5	25.7
LBPR-5.30	38_42679.342F	11/5/2016 8:12	F	230	7.68	5.5	24.9
LBPR-5.30	38_42679.489F	11/5/2016 11:44	F	210	7.88	6.0	42.1
LBPR-5.30	38_42680.345F	11/6/2016 8:17	F	220	7.62	4.5	23.0
LBPR-5.30	38_42680.542F	11/6/2016 13:01	F	700	7.22	5.5	29.8
LBPR-5.30	38_42680.66F	11/6/2016 15:51	F	660	7.14	6.7	29.5
LBPR-5.30	38_42681.333F	11/7/2016 7:59	F	250	7.80	3.2	30.0
LBPR-5.30	38_42681.5F	11/7/2016 12:00	F	370	8.06	5.7	28.4
LBPR-5.30	38_42681.666F	11/7/2016 15:59	F	270	7.73	5.8	38.8
LBPR-5.30	38_42682.337F	11/8/2016 8:05	F	440	7.78	9.2	34.2
LBPR-5.30	38_42682.556F	11/8/2016 13:20	F	300	7.90	6.6	70.3
LBPR-5.30	38_42682.688F	11/8/2016 16:30	F	320	8.04	6.4	102.2
LBPR-5.30	38_42683.337F	11/9/2016 8:05	F	200	7.92	5.6	30.1
LBPR-5.30	38_42683.535F	11/9/2016 12:50	F	260	8.27	6.7	92.1
LBPR-5.30	38_42683.707F	11/9/2016 16:58	F	210	8.17	6.8	778.0
LBPR-5.30	38_42684.322F	11/10/2016 7:43	F	260	8.38	5.1	56.3
LBPR-5.30	38_42684.538F	11/10/2016 12:55	F	270	8.10	5.6	80.9
LBPR-5.30	38_42685.417F	11/11/2016 10:00	F	230	8.00	5.3	55.7
LBPR-5.30	38_42685.524F	11/11/2016 12:35	F	260	8.20	6.2	66.2
LBPR-5.30	38_42685.617F	11/11/2016 14:49	F	250	8.22	5.6	71.1
LBPR-5.30	38_42715F	12/11/2016	F	2800	8.34	6.3	109.8
LBPR-5.30	38_42715.406F	12/11/2016 9:45	F		6.95	4.5	62.6
LBPR-5.30	38_42715.658F	12/11/2016 15:47	F	230	7.15	4.9	39.1
LBPR-5.30	38_42717.368F	12/13/2016 8:50	F	230	7.82	5.9	26.0
LBPR-5.30	38_42717.434F	12/13/2016 10:25	F	230	7.00	4.2	26.7
LBPR-5.30	38_42717.516F	12/13/2016 12:23	F	290	7.05	4.9	32.5
LBPR-5.30	38_42717.528F	12/13/2016 12:40	F	230	7.95	5.5	39.8
LBPR-5.30	38_42717.694F	12/13/2016 16:40	F	230	7.78	4.2	31.2
LBPR-5.86	85_42662.408F	10/19/2016 9:47	F		7.40		9.8
LBPR-5.86	85_42662.465F	10/19/2016 11:10	F		7.43		9.7
LBPR-5.86	85_42662.613F	10/19/2016 14:42	F		7.56		
LBPR-5.86	85_42663.384F	10/20/2016 9:13	F		7.07	5.7	18.5
LBPR-5.86	85_42663.59F	10/20/2016 14:09	F		7.19	8.9	15.7
LBPR-5.86	85_42664.41F	10/21/2016 9:50	F		7.20	5.3	105.0
LBPR-5.86	85_42664.594F	10/21/2016 14:15	F		7.20	6.7	38.8
LBPR-5.86	85_42665.484F	10/22/2016 11:37	F		7.42	6.2	
LBPR-5.86	85_42666.412F	10/23/2016 9:53	F	270	7.40	6.4	18.8

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBPR-5.86	85_42667.431F	10/24/2016 10:20	F	270	7.27	5.1	28.2
LBPR-6.16	86_42662.408F	10/19/2016 9:48	F		7.18		10.4
LBPR-6.16	86_42662.469F	10/19/2016 11:15	F		7.21		11.2
LBPR-6.16	86_42662.613F	10/19/2016 14:43	F		7.26		
LBPR-6.16	86_42663.387F	10/20/2016 9:17	F		7.16	6.2	20.0
LBPR-6.16	86_42663.592F	10/20/2016 14:12	F		7.03	8.9	21.2
LBPR-6.16	86_42664.413F	10/21/2016 9:54	F		7.20	5.4	102.0
LBPR-6.16	86_42664.597F	10/21/2016 14:20	F		7.00	6.8	39.5
LBPR-6.16	86_42665.485F	10/22/2016 11:39	F		7.41	6.1	
LBPR-6.16	86_42666.416F	10/23/2016 9:59	F	280	7.60	5.0	17.9
LBPR-6.16	86_42667.435F	10/24/2016 10:27	F	260	7.29	5.1	14.0
LBPR-6.90	41-42593.506F	8/11/2016 12:08	F		7.53	13.6	5.5
LBPR-6.90	LPR-6.90-42593.5056F	8/11/2016 12:08	F		7.53	13.6	5.5
LBPR-6.90	41-42594.587F	8/12/2016 14:05	F	250	6.59	13.8	5.4
LBPR-6.90	41-42595.451F	8/13/2016 10:50	F	200	7.51	13.0	8.9
LBPR-6.90	LPR-6.90-42601.3611F	8/19/2016 8:40	F	200	7.66	12.5	3.6
LBPR-6.90	41-42616.441F	9/3/2016 10:35	F	232	8.20	10.4	113.0
LBPR-6.90	41-42616.688F	9/3/2016 16:30	F	244	8.10	9.7	654.7
LBPR-6.90	LPR-6.90-42617.4722F	9/4/2016 11:20	F		8.00	9.1	1155.7
LBPR-6.90	41-42617.503F	9/4/2016 12:05	F	233	8.30	9.7	1105.7
LBPR-6.90	41-42618.351F	9/5/2016 8:25	F	210	8.14	10.8	85.9
LBPR-6.90	41-42619.635F	9/6/2016 15:15	F	250	8.01	11.9	106.8
LBPR-6.90	41-42620.559F	9/7/2016 13:25	F	250	7.87	12.2	69.2
LBPR-6.90	41-42621.375F	9/8/2016 9:00	F	250	8.20	10.5	59.3
LBPR-6.90	41-42622.545F	9/9/2016 13:05	F	260	8.20	10.9	34.5
LBPR-6.90	41-42623.483F	9/10/2016 11:35	F	250	8.20	10.6	35.4
LBPR-6.90	41-42624.618F	9/11/2016 14:50	F	242	8.20	10.9	22.1
LBPR-6.90	LPR-6.90-42625.3472F	9/12/2016 8:20	F		7.10	9.7	19.4
LBPR-6.90	41-42625.384F	9/12/2016 9:13	F	222	8.20	10.2	26.0
LBPR-6.90	41-42626.556F	9/13/2016 13:20	F	235	8.50	13.0	17.7
LBPR-6.90	41-42627.558F	9/14/2016 13:23	F	223	8.40	14.0	12.0
LBPR-6.90	41-42628.351F	9/15/2016 8:25	F	233	8.40	11.8	14.8
LBPR-6.90	41-42629.392F	9/16/2016 9:24	F	231	8.30	13.1	11.2
LBPR-6.90	41-42630.352F	9/17/2016 8:27	F	229	8.10	12.6	12.6
LBPR-6.90	LPR-6.90-42630.584F	9/17/2016 14:01	F		8.00	13.1	13.8
LBPR-6.90	41-42630.584F	9/17/2016 14:01	F	224	8.30	13.3	13.8
LBPR-6.90	41-42631.658F	9/18/2016 15:48	F	210	8.15	12.1	8.4
LBPR-6.90	41-42632.406F	9/19/2016 9:45	F	210	8.12	12.1	7.7
LBPR-6.90	41-42633.424F	9/20/2016 10:11	F	215	7.90	12.3	16.6
LBPR-6.90	41-42634.382F	9/21/2016 9:10	F	215	8.40	12.2	17.0
LBPR-6.90	41-42635.382F	9/22/2016 9:10	F	215	8.40	12.2	17.0
LBPR-6.90	41-42637.363F	9/24/2016 8:42	F	212	8.30	12.1	8.8
LBPR-6.90	41-42638.364F	9/25/2016 8:44	F	212	8.20	12.3	8.8
LBPR-6.90	41-42639.592F	9/26/2016 14:13	F	214	8.20	13.6	7.7
LBPR-6.90	LPR-6.90-42639.6576F	9/26/2016 15:47	F		8.40	11.0	6.9
LBPR-6.90	41-42640.658F	9/27/2016 15:47	F	213	8.40	11.0	6.9
LBPR-6.90	41-42641.39F	9/28/2016 9:22	F	230	8.06	11.1	6.0
LBPR-6.90	41-42642.39F	9/29/2016 9:21	F	180	8.18	10.1	6.1
LBPR-6.90	41-42642.597F	9/29/2016 14:20	F	220	8.53	11.1	8.3
LBPR-6.90	41-42643.366F	9/30/2016 8:47	F	100	8.30	11.3	6.2
LBPR-6.90	41-42644.382F	10/1/2016 9:10	F	190	8.25	11.3	7.6
LBPR-6.90	41-42645.448F	10/2/2016 10:45	F	150	8.45	8.2	8.7
LBPR-6.90	41-42646.549F	10/3/2016 13:10	F	200	8.29	10.3	10.4

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBPR-6.90	41-42647.51F	10/4/2016 12:15	F	210	8.30	9.9	6.5
LBPR-6.90	LPR-6.90-42648.4792F	10/5/2016 11:30	F			9.1	7.7
LBPR-6.90	41-42648.559F	10/5/2016 13:25	F	220	8.34	9.4	9.8
LBPR-6.90	41-42649.549F	10/6/2016 13:10	F	210	7.82	8.8	6.9
LBPR-6.90	41-42650.542F	10/7/2016 13:00	F	200	8.00	8.0	5.3
LBPR-6.90	41-42651.542F	10/8/2016 13:00	F	210	8.29	7.8	10.4
LBPR-6.90	41-42652.372F	10/9/2016 8:55	F	200	8.00	7.0	5.3
LBPR-6.90	41-42653.361F	10/10/2016 8:40	F	160	8.34	7.8	7.3
LBPR-6.90	41-42654.363F	10/11/2016 8:43	F	180	8.01	7.2	12.5
LBPR-6.90	LPR-6.90-42655.6847F	10/12/2016 16:26	F			8.7	26.3
LBPR-6.90	41-42660.472F	10/17/2016 11:20	F	200	8.21	7.4	6.6
LBPR-6.90	41-42661.444F	10/18/2016 10:40	F	260	8.29	7.6	14.4
LBPR-6.90	41_42662.404F	10/19/2016 9:42	F			6.0	5.5
LBPR-6.90	41_42662.404FD	10/19/2016 9:42	FD	210	8.50	6.0	5.5
LBPR-6.90	41_42662.585F	10/19/2016 14:02	F	320	8.51	7.7	28.9
LBPR-6.90	41_42662.833F	10/19/2016 20:00	F				20.5
LBPR-6.90	41_42662.958F	10/19/2016 23:00	F				35.1
LBPR-6.90	41_42663.469F	10/20/2016 11:15	F	260	8.30	8.1	9.9
LBPR-6.90	41_42663.563F	10/20/2016 13:30	F	250		9.9	15.8
LBPR-6.90	41_42664.365F	10/21/2016 8:45	F	260	8.30	7.0	7.8
LBPR-6.90	41_42664.604F	10/21/2016 14:30	F			8.8	8.9
LBPR-6.90	41_42665.42F	10/22/2016 10:05	F	290	8.15	8.9	7.6
LBPR-6.90	41_42666.347F	10/23/2016 8:20	F	280	8.30	8.3	7.1
LBPR-6.90	41_42667.413F	10/24/2016 9:55	F	270	8.28	8.3	8.4
LBPR-6.90	41_42668F	10/25/2016	F	770	8.35	8.7	7.7
LBPR-6.90	41_42669.344F	10/26/2016 8:15	F	270	8.33	7.3	17.2
LBPR-6.90	41_42669.372F	10/26/2016 8:56	F			6.9	17.5
LBPR-6.90	41_42669.373F	10/26/2016 8:57	F	270	8.56	7.1	17.5
LBPR-6.90	41_42670.344F	10/27/2016 8:15	F	270	8.33	7.3	17.2
LBPR-6.90	41_42671.41F	10/28/2016 9:50	F	330	8.48	7.3	12.7
LBPR-6.90	41_42672.385F	10/29/2016 9:15	F	1740	8.60	8.1	12.3
LBPR-6.90	41_42673.409F	10/30/2016 9:49	F	210	7.98	5.5	5.9
LBPR-6.90	41_42674.438F	10/31/2016 10:30	F	280	8.77	7.5	12.1
LBPR-6.90	41_42675.396F	11/1/2016 9:30	F	210	8.08	5.8	7.3
LBPR-6.90	41_42675.618F	11/1/2016 14:50	F			5.8	7.4
LBPR-6.90	41_42677.389F	11/3/2016 9:20	F	230		7.9	6.3
LBPR-6.90	41_42678.392F	11/4/2016 9:25	F	290	7.02	8.3	7.1
LBPR-6.90	41_42679.564F	11/5/2016 13:32	F	260	7.97	6.5	12.8
LBPR-6.90	41_42680.365F	11/6/2016 8:45	F	310	8.65	5.9	15.9
LBPR-6.90	41_42682.42F	11/8/2016 10:05	F	210	7.71	6.2	12.5
LBPR-6.90	41_42683F	11/9/2016	F	130	8.42	5.0	34.2
LBPR-6.90	41_42684.359F	11/10/2016 8:37	F	210	7.90	4.2	59.3
LBPR-6.90	41_42685.319F	11/11/2016 7:40	F	320	8.51	7.7	28.9
LBPR-6.90	41_42685.319FD	11/11/2016 7:40	FD	230	7.65	4.9	59.2
LBPR-6.90	41_42685.632F	11/11/2016 15:10	F	240	8.30	6.7	7.8
LBPR-6.90	41_42685.632FD	11/11/2016 15:10	FD	270	8.65	6.5	36.1
LBPR-6.90	41_42715.39F	12/11/2016 9:22	F	250	8.29	8.3	7.1
LBPR-6.90	41_42715.39FD	12/11/2016 9:22	FD	310	8.35	3.9	25.0
LBPR-6.90	41_42715.645F	12/11/2016 15:29	F			8.8	8.9
LBPR-6.90	41_42715.645FD	12/11/2016 15:29	FD	280	8.33	4.1	25.6
LBPR-6.90	41_42717.549F	12/13/2016 13:11	F	260	8.30	7.0	7.8
LBPR-6.90	41_42717.549FD	12/13/2016 13:11	FD	270	8.29	3.8	20.9
LBPR-6.90	41_42717.716F	12/13/2016 17:11	F	250	8.15	7.2	7.9

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
LBPR-6.90	41_42717.716FD	12/13/2016 17:11	FD	270	8.30	4.1	18.7
LBPR-9.70	LPR-9.70-42620.4375F	9/7/2016 10:30	F	390	7.80	10.9	74.0
LBPR-9.70	LPR-9.70-42620.75F	9/7/2016 18:00	F	270	7.60	11.0	59.6
LBPR-9.76	LPR-9.76-42620.4479F	9/7/2016 10:45	F	280	7.70	10.5	73.1
LBPR-9.76	LPR-9.76-42620.7604F	9/7/2016 18:15	F	290	7.20	11.0	62.9
LBRR-D	RR-D-42619F	9/6/2016	F	1644	7.40	10.4	3656.0
LBRR-D	RR-D-42620.441F	9/7/2016 10:35	F	1700	7.70	9.7	3089.0
LBRR-D	RR-D-42620.7569F	9/7/2016 18:10	F	1500	7.70	11.0	
MRLB-0.53	MR-0.53-42593.13F	8/11/2016 3:07	F	260	8.00		13.1
MRLB-0.75	MR-0.75-42603F	8/21/2016	F				8.4
MRLB-0.75	46_42680.385F	11/6/2016 9:15	F	310	8.62	1.0	41.7
MRLB-0.75	46_42680.885F	11/6/2016 21:15	F		7.97	2.2	39.5
MRLB-0.75	46_42681.39F	11/7/2016 9:21	F	320	8.10	1.8	43.5
MRRB-0.45	MRRB-0.45-42630F	9/17/2016	F	233	8.30	12.8	34.9
MRRB-0.45	MRRB-0.45-42630D	9/17/2016	FD	232	8.20	14.2	40.6
MRRB-0.45	MRRB-0.45-42631F	9/18/2016	F	230	7.11	12.4	36.7
MRRB-0.45	MRRB-0.45-42631D	9/18/2016	FD	220	8.09	13.9	37.3
MRRB-0.45	MRRB-0.45-42632F	9/19/2016	F	230	8.07	11.8	31.5
MRRB-0.45	MRRB-0.45-42633F	9/20/2016	F	237	7.10	10.2	28.8
MRRB-0.45	MRRB-0.45-42633D	9/20/2016	FD	237	8.50	12.0	52.0
MRRB-0.45	MRRB-0.45-42634F	9/21/2016	F	238	8.30	9.6	32.4
MRRB-0.45	MRRB-0.45-42634D	9/21/2016	FD	227	8.30	11.4	31.2
MRRB-0.45	MRRB-0.45-42635F	9/22/2016	F	240	8.20	9.7	34.7
MRRB-0.45	MRRB-0.45-42635D	9/22/2016	FD	239	8.30	11.5	32.9
MRRB-0.45	MRRB-0.45-42637F	9/24/2016	F	240	8.50	9.5	27.2
MRRB-0.45	MRRB-0.45-42637D	9/24/2016	FD	239	8.50	11.2	27.2
MRRB-0.45	MRRB-0.45-42638F	9/25/2016	F	241	8.40	9.4	24.1
MRRB-0.45	MRRB-0.45-42638D	9/25/2016	FD	245	8.30	11.1	26.3
MRRB-0.45	MRRB-0.45-42639F	9/26/2016	F	244	8.40	10.2	21.0
MRRB-0.45	MRRB-0.45-42639D	9/26/2016	FD	241	8.20	12.9	21.6
MRRB-0.45	MRRB-0.45-42640F	9/27/2016	F	232	8.30	12.0	20.9
MRRB-0.45	MRR-0.45-42641.342F	9/28/2016 8:13	F	240	7.94	8.2	19.7
MRRB-0.45	MRR-0.45-42641.558F	9/28/2016 13:23	F	270	8.06	11.0	21.7
MRRB-0.45	MRR-0.45-42642.359F	9/29/2016 8:37	F	250	8.39	7.4	25.0
MRRB-0.45	MRR-0.45-42643.347F	9/30/2016 8:19	F	260	8.37	8.3	53.7
MRRB-0.45	MRR-0.45-42643.601F	9/30/2016 14:25	F	260	8.11	9.8	19.9
MRRB-0.45	MRR-0.45-42644.365F	10/1/2016 8:45	F	250	8.22	7.9	27.2
MRRB-0.45	MRR-0.45-42644.601F	10/1/2016 14:25	F	180	8.46	9.8	33.6
MRRB-0.45	MRR-0.45-42645.625F	10/2/2016 15:00	F	230	8.23	7.1	20.9
MRRB-0.45	MRR-0.45-42646.531F	10/3/2016 12:45	F	240	8.40	5.4	21.0
MRRB-0.45	MRR-0.45-42646.602F	10/3/2016 14:27	F	230	8.37	5.5	20.9
MRRB-0.45	MRR-0.45-42647.531F	10/4/2016 12:45	F	240	8.34	5.2	22.4
MRRB-0.45	MRR-0.45-42647.67F	10/4/2016 16:05	F	240	8.34	5.4	33.2
MRRB-0.45	MRR-0.45-42648.583F	10/5/2016 14:00	F	250	8.33	5.4	22.6
MRRB-0.45	MRR-0.45-42648.663F	10/5/2016 15:55	F	250	8.34	5.6	21.7
MRRB-0.45	MRR-0.45-42649.573F	10/6/2016 13:45	F	250	8.14	5.8	22.6
MRRB-0.45	MRR-0.45-42649.66F	10/6/2016 15:50	F	250	8.26	5.9	21.7
MRRB-0.45	MRR-0.45-42650.542F	10/7/2016 13:00	F	250	8.32	4.2	20.1
MRRB-0.45	MRR-0.45-42650.667F	10/7/2016 16:00	F	250	8.33	4.2	20.0
MRRB-0.45	MRR-0.45-42651.566F	10/8/2016 13:35	F	240	8.37	4.2	20.9
MRRB-0.45	MRR-0.45-42651.708F	10/8/2016 17:00	F	240	8.41	4.6	20.3
MRRB-0.45	MRR-0.45-42652.381F	10/9/2016 9:09	F	190	8.45	4.3	21.0
MRRB-0.45	MRR-0.45-42652.66F	10/9/2016 15:51	F	180	8.59	4.7	19.6

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
MRRB-0.45	MRR-0.45-42653.374F	10/10/2016 8:59	F	190	8.50	3.9	21.1
MRRB-0.45	MRR-0.45-42653.66F	10/10/2016 15:51	F	190	8.62	5.8	22.0
MRRB-0.45	MRR-0.45-42654.372F	10/11/2016 8:55	F	200	8.39	4.1	21.0
MRRB-0.45	MRR-0.45-42656.408F	10/13/2016 9:47	F	280	8.42	2.2	17.3
MRRB-0.45	MRR-0.45-42657.351F	10/14/2016 8:25	F	160	8.56	2.0	14.2
MRRB-0.45	MRR-0.45-42657.594F	10/14/2016 14:15	F	140	8.36	0.6	16.6
MRRB-0.45	MRR-0.45-42658.458F	10/15/2016 10:59	F	260	8.50	1.5	15.5
MRRB-0.45	MRR-0.45-42658.652F	10/15/2016 15:39	F	260	8.56	3.1	16.5
MRRB-0.45	MRR-0.45-42659.392F	10/16/2016 9:25	F	250	8.08	2.4	16.3
MRRB-0.45	MRR-0.45-42659.635F	10/16/2016 15:15	F	270	8.25	1.2	25.3
MRRB-0.45	MRR-0.45-42660.451F	10/17/2016 10:50	F	260	8.30	2.1	51.4
MRRB-0.45	MRR-0.45-42660.635F	10/17/2016 15:15	F	240	8.39	3.0	26.7
MRRB-0.45	MRR-0.45-42661.469F	10/18/2016 11:15	F	290	8.29	2.7	22.9
MRRB-0.45	MRR-0.45-42661.611F	10/18/2016 14:40	F	290	8.31	3.8	22.4
MRRB-0.45	47_42662.439F	10/19/2016 10:32	F	250	8.63	1.0	20.6
MRRB-0.45	47_42663.493F	10/20/2016 11:50	F	290	8.38	3.6	20.4
MRRB-0.45	47_42663.651F	10/20/2016 15:37	F	260	8.35	2.6	26.9
MRRB-0.45	47_42664.389F	10/21/2016 9:20	F	320	8.28	2.0	21.9
MRRB-0.45	47_42664.649F	10/21/2016 15:35	F	290	8.38	4.6	20.4
MRRB-0.45	47_42665.444F	10/22/2016 10:40	F	320	8.18	3.3	21.8
MRRB-0.45	47_42665.66F	10/22/2016 15:50	F	320	8.28	3.9	20.6
MRRB-0.45	47_42666.372F	10/23/2016 8:55	F	310	8.13	2.6	26.0
MRRB-0.45	47_42666.67F	10/23/2016 16:05	F	330	8.23	4.6	24.3
MRRB-0.45	47_42667.438F	10/24/2016 10:30	F	330	8.11	3.2	23.4
MRRB-0.45	47_42667.681F	10/24/2016 16:20	F	320	8.02	4.1	24.7
MRRB-0.45	47_42668.434F	10/25/2016 10:25	F	300	8.37	2.8	29.8
MRRB-0.45	47_42668.618F	10/25/2016 14:50	F	320	8.30	3.4	22.7
MRRB-0.45	47_42669.368F	10/26/2016 8:50	F	350	8.36	3.0	36.5
MRRB-0.45	47_42669.726F	10/26/2016 17:25	F	230	8.14	2.9	31.2
MRRB-0.45	47_42670.368F	10/27/2016 8:50	F	320	8.30	3.2	38.3
MRRB-0.45	47_42670.486F	10/27/2016 11:40	F	380	8.10	3.4	36.0
MRRB-0.45	47_42671.434F	10/28/2016 10:25	F	300	8.43	3.3	35.7
MRRB-0.45	47_42671.556F	10/28/2016 13:20	F	320	8.53	3.4	28.1
MRRB-0.45	47_42672.41F	10/29/2016 9:50	F	310	8.30	3.5	39.7
MRRB-0.45	47_42672.646F	10/29/2016 15:30	F	280	8.48	3.9	34.1
MRRB-0.45	47_42673.395F	10/30/2016 9:29	F	290	7.26	5.9	38.8
MRRB-0.45	47_42673.597F	10/30/2016 14:20	F	390	8.06	3.7	36.6
MRRB-0.45	47_42674.453F	10/31/2016 10:53	F	320	8.46	3.0	42.3
MRRB-0.45	47_42674.611F	10/31/2016 14:40	F	300	8.58	3.4	29.0
MRRB-0.45	47_42675.382F	11/1/2016 9:10	F	290	7.94	1.1	28.9
MRRB-0.45	47_42675.642F	11/1/2016 15:25	F	320	8.53	3.6	36.4
MRRB-0.45	47_42677.413F	11/3/2016 9:55	F	290		3.3	25.6
MRRB-0.45	47_42677.608F	11/3/2016 14:35	F	290	8.17	1.3	21.0
MRRB-0.45	47_42678.417F	11/4/2016 10:00	F	360	6.76	3.1	28.5
MRRB-0.45	47_42678.639F	11/4/2016 15:20	F	310		5.0	22.8
MRRB-0.45	47_42679.58F	11/5/2016 13:55	F	400	8.39	3.3	32.1
MRRB-0.45	47_42679.615F	11/5/2016 14:45	F	360		4.1	28.1
MRRB-0.45	47_42680.392F	11/6/2016 9:25	F	320	8.55	0.9	53.5
MRRB-0.45	47_42680.563F	11/6/2016 13:30	F	320	8.40	2.2	38.4
MRRB-0.45	47_42680.722F	11/6/2016 17:20	F	300	8.15	4.5	29.8
MRRB-0.45	47_42681.403F	11/7/2016 9:40	F	310	7.90	2.1	44.2
MRRB-0.45	47_42681.889F	11/7/2016 21:20	F		8.03	2.3	40.4
MRRB-0.45	47_42682.431F	11/8/2016 10:20	F	250	7.76	5.8	71.0

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
MRRB-0.45	47_42682.656F	11/8/2016 15:45	F	320	7.90	1.8	45.2
MRRB-0.45	47_42683.601F	11/9/2016 14:25	F	270	7.98	2.5	38.5
MRRB-0.45	47_42684F	11/10/2016	F	340	8.42	3.9	91.0
MRRB-0.45	47_42684.385F	11/10/2016 9:15	F	230	8.39	2.1	165.3
MRRB-0.45	47_42684.649F	11/10/2016 15:35	F		8.20	1.4	163.7
MRRB-0.63	MRRB-0.63-42603F	8/21/2016	F				8.1
MRRB-0.63	MR-0.63-42603F	8/21/2016	F				7.8
MRRB-0.63	48_42680.389F	11/6/2016 9:20	F	310	8.62	0.9	40.9
MRRB-0.63	48_42680.559F	11/6/2016 13:25	F	310	8.52	1.6	40.4
MRRB-0.63	48_42681.397F	11/7/2016 9:32	F	330	7.80	1.9	40.5
MRRB-0.63	48_42681.647F	11/7/2016 15:31	F	310	7.80	2.0	42.7
MRRB-0.63	48_42682.435F	11/8/2016 10:27	F	250	7.78	5.0	54.0
MRRB-0.63	48_42682.59F	11/8/2016 14:10	F	260	8.01	5.0	41.9
MRRB-0.63	48_42683F	11/9/2016	F	340	8.39	4.1	100.2
MRRB-0.63	48_42684.382F	11/10/2016 9:10	F	230	8.29	2.3	252.3
MRRB-0.63	48_42684.656F	11/10/2016 15:45	F	330	8.12	3.0	243.0
MR-SC	MR-SC-42630F	9/17/2016	F	234	8.50	12.7	37.4
MR-SC	MR-SC-42630D	9/17/2016	FD	232	8.30	14.2	40.3
MR-SC	MR-SC-42631F	9/18/2016	F	220	6.92	12.4	39.8
MR-SC	MR-SC-42631D	9/18/2016	FD	220	8.02	13.9	36.7
MR-SC	MR-SC-42632F	9/19/2016	F	220	8.10	11.9	35.3
MR-SC	MR-SC-42633F	9/20/2016	F	237	7.10	10.2	27.3
MR-SC	MR-SC-42633D	9/20/2016	FD	237	8.40	11.7	53.9
MR-SC	MR-SC-42634F	9/21/2016	F	238	8.40	9.4	34.0
MR-SC	MR-SC-42634D	9/21/2016	FD	238	8.50	11.3	31.8
MR-SC	MR-SC-42635F	9/22/2016	F	239	8.50	9.7	32.3
MR-SC	MR-SC-42635D	9/22/2016	FD	239	8.30	11.1	33.4
MR-SC	MR-SC-42637F	9/24/2016	F	241	8.50	9.5	29.6
MR-SC	MR-SC-42637D	9/24/2016	FD	237	8.50	11.3	27.9
MR-SC	MR-SC-42638F	9/25/2016	F	241	8.30	9.5	22.9
MR-SC	MR-SC-42638D	9/25/2016	FD	237	8.30	10.2	24.2
MR-SC	MR-SC-42639F	9/26/2016	F	244	8.30	10.4	21.7
MR-SC	MR-SC-42639D	9/26/2016	FD	241	8.30	12.0	24.1
MR-SC	MR-SC-42640F	9/27/2016	F	250	8.90	12.1	21.3
MR-SC	MR-SC-42641.3333F	9/28/2016 8:00	F	220	7.84	8.3	22.1
MR-SC	MR-SC-42641.5521F	9/28/2016 13:15	F	260	8.02	11.2	21.0
MR-SC	MR-SC-42642.3542F	9/29/2016 8:30	F	290	8.06	7.5	20.2
MR-SC	MR-SC-42643.3438F	9/30/2016 8:15	F	230	7.93	7.2	18.4
MR-SC	MR-SC-42643.5972F	9/30/2016 14:20	F	260	8.13	1.1	18.8
MR-SC	MR-SC-42644.3611F	10/1/2016 8:40	F	260	8.34	8.1	24.3
MR-SC	MR-SC-42644.5972F	10/1/2016 14:20	F	250	8.25	11.5	28.2
MR-SC	MR-SC-42645.6285F	10/2/2016 15:05	F	230	8.14	6.7	24.9
MR-SC	MR-SC-42646.5326F	10/3/2016 12:47	F	240	8.33	5.4	24.6
MR-SC	MR-SC-42646.6056F	10/3/2016 14:32	F	231	8.23	5.4	23.8
MR-SC	MR-SC-42647.5347F	10/4/2016 12:50	F	240	8.33	5.3	19.6
MR-SC	MR-SC-42647.6667F	10/4/2016 16:00	F	240	8.30	5.5	20.1
MR-SC	MR-SC-42648.5799F	10/5/2016 13:55	F	270	8.28	5.7	19.1
MR-SC	MR-SC-42648.6667F	10/5/2016 16:00	F	250	8.32	5.6	19.8
MR-SC	MR-SC-42649.5694F	10/6/2016 13:40	F	540	8.11	5.8	20.4
MR-SC	MR-SC-42649.6583F	10/6/2016 15:48	F	250	8.21	6.2	20.4
MR-SC	MR-SC-42650.5382F	10/7/2016 12:55	F	250	8.27	4.6	19.5
MR-SC	MR-SC-42650.6597F	10/7/2016 15:50	F	250	8.26	4.6	19.1
MR-SC	MR-SC-42651.5625F	10/8/2016 13:30	F	240	8.35	4.2	20.3

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
MR-SC	MR-SC-42651.7014F	10/8/2016 16:50	F	240	8.41	4.6	20.1
MR-SC	MR-SC-42652.3771F	10/9/2016 9:03	F	200	8.50	4.6	20.5
MR-SC	MR-SC-42652.659F	10/9/2016 15:49	F	180	8.57	4.8	18.9
MR-SC	MR-SC-42653.3722F	10/10/2016 8:56	F	190	8.49	4.4	20.6
MR-SC	MR-SC-42653.6576F	10/10/2016 15:47	F	190	8.46	6.1	19.7
MR-SC	MR-SC-42654.3688F	10/11/2016 8:51	F	190	8.49	4.2	19.4
MR-SC	MR-SC-42656.3924F	10/13/2016 9:25	F	260	8.46	2.3	17.8
MR-SC	MR-SC-42657.3438F	10/14/2016 8:15	F	150	8.55	1.2	16.2
MR-SC	MR-SC-42657.5833F	10/14/2016 14:00	F	120	8.45	16.0	16.2
MR-SC	MR-SC-42658.4438F	10/15/2016 10:39	F	260	8.55	1.6	15.4
MR-SC	MR-SC-42658.6458F	10/15/2016 15:30	F	260	8.26	4.1	15.5
MR-SC	MR-SC-42659.3854F	10/16/2016 9:15	F	260	8.07	3.8	16.7
MR-SC	MR-SC-42659.625F	10/16/2016 15:00	F	270	8.10	1.8	19.4
MR-SC	MR-SC-42660.4479F	10/17/2016 10:45	F	250	8.32	1.8	53.6
MR-SC	MR-SC-42660.625F	10/17/2016 15:00	F	240	8.52	4.2	27.1
MR-SC	MR-SC-42661.4653F	10/18/2016 11:10	F	290	8.32	2.7	26.3
MR-SC	MR-SC-42661.6076F	10/18/2016 14:35	F	280	8.30	3.3	22.5
MR-SC	74_42662.435F	10/19/2016 10:27	F	250	8.57	0.8	19.9
MR-SC	74_42662.663F	10/19/2016 15:55	F	260	8.39	2.8	23.4
MR-SC	74_42663.49F	10/20/2016 11:45	F	290	8.32	3.2	20.7
MR-SC	74_42663.646F	10/20/2016 15:30	F	290	8.40	4.4	21.8
MR-SC	74_42664.385F	10/21/2016 9:15	F	320	8.28	2.2	14.9
MR-SC	74_42664.656F	10/21/2016 15:45	F	310	8.26	3.7	22.1
MR-SC	74_42665.441F	10/22/2016 10:35	F	320	8.18	2.8	23.4
MR-SC	74_42665.667F	10/22/2016 16:00	F	330	8.19	4.8	24.1
MR-SC	74_42666.368F	10/23/2016 8:50	F	330	8.10	2.6	24.4
MR-SC	74_42666.677F	10/23/2016 16:15	F	330	7.97	3.8	24.7
MR-SC	74_42667.434F	10/24/2016 10:25	F	340	8.26	3.3	23.7
MR-SC	74_42667.615F	10/24/2016 14:45	F	330	8.24	3.8	22.5
MR-SC	74_42668.431F	10/25/2016 10:20	F	310	8.31	2.9	30.7
MR-SC	74_42668.722F	10/25/2016 17:20	F	290	8.06	3.8	31.5
MR-SC	74_42669.367F	10/26/2016 8:49	F	350	8.30	3.6	36.1
MR-SC	74_42669.483F	10/26/2016 11:35	F	330	8.10	2.8	32.3
MR-SC	74_42670.365F	10/27/2016 8:45	F	330	8.29	3.5	34.5
MR-SC	74_42670.552F	10/27/2016 13:15	F	320	8.57	3.9	33.8
MR-SC	74_42671.431F	10/28/2016 10:20	F	300	8.40	3.7	34.2
MR-SC	74_42671.628F	10/28/2016 15:05	F	270	8.40	4.2	32.8
MR-SC	74_42672.406F	10/29/2016 9:45	F	370	8.29	3.6	38.2
MR-SC	74_42672.601F	10/29/2016 14:25	F	390	8.03	3.4	36.5
MR-SC	74_42673.389F	10/30/2016 9:20	F	780	7.42	5.7	29.8
MR-SC	74_42673.608F	10/30/2016 14:35	F	330	8.69	2.8	30.6
MR-SC	74_42674.441F	10/31/2016 10:35	F	250	8.47	6.9	40.1
MR-SC	74_42674.642F	10/31/2016 15:25	F	320	8.53	3.6	36.4
MR-SC	74_42675.384F	11/1/2016 9:13	F	450	7.92	2.2	23.1
MR-SC	74_42675.611F	11/1/2016 14:40	F	280	8.14	1.1	24.5
MR-SC	74_42677.41F	11/3/2016 9:50	F	280		2.7	23.3
MR-SC	74_42677.635F	11/3/2016 15:15	F	280		3.7	25.1
MR-SC	74_42678.413F	11/4/2016 9:55	F	350	6.76	3.3	28.0
MR-SC	74_42678.611F	11/4/2016 14:40	F	370		3.5	28.2
MR-SC	74_42679.568F	11/5/2016 13:38	F	550	8.04	3.3	32.5
MR-SC	74_42679.721F	11/5/2016 17:18	F	280	8.12	3.8	29.5
MR-SC	74_42680.552F	11/6/2016 13:15	F	310	8.52	1.6	38.4
MR-SC	74_42681.642F	11/7/2016 15:25	F	320	8.20	1.9	41.7

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBAC-SEEP	22-42712F	12/8/2016	F	2070	8.37	0.0	
RBPR-15.97	PR-15.97-42596.381F	8/14/2016 9:08	F	200	7.83	12.5	4.9
RBPR-15.97	PR-15.97-42601.348F	8/19/2016 8:21	F	190	7.72	12.6	3.0
RBPR-15.97	PR-15.97-42617.45F	9/4/2016 10:48	F		8.10	9.1	59.7
RBPR-15.97	PR-15.97-42625.545F	9/12/2016 13:05	F		7.60	10.8	20.2
RBPR-15.97	PR-15.97-42625.545D	9/12/2016 13:05	FD		7.60	10.8	22.7
RBPR-15.97	PR-15.97-42630.566F	9/17/2016 13:35	F		7.60	12.8	13.8
RBPR-15.97	PR-15.97-42639.619F	9/26/2016 14:52	F		8.30	10.6	7.5
RBPR-15.97	PR-15.97-42648.447F	10/5/2016 10:44	F			8.7	12.4
RBPR-15.97	PR-15.97-42655.604F	10/12/2016 14:29	F			8.2	6.6
RBPR-15.97	49_42662.611F	10/19/2016 14:40	F			8.0	5.5
RBPR-15.97	49_42669.337F	10/26/2016 8:05	F			7.7	7.6
RBPR-15.97	49_42675.454F	11/1/2016 10:54	F			6.7	9.7
RBPR-3.20	RPR-3.20-42596.351F	8/14/2016 8:25	F	190	7.98	11.6	4.2
RBPR-3.20	RPR-3.20-42601.317F	8/19/2016 7:36	F	180	7.77	12.1	2.5
RBPR-3.20	RPR-3.20-42601.317D	8/19/2016 7:36	FD	180	7.77	12.1	2.5
RBPR-3.20	RPR-3.20-42617.419F	9/4/2016 10:04	F		7.70	9.1	88.1
RBPR-3.20	RPR-3.20-42625.514F	9/12/2016 12:20	F		7.50	10.1	12.1
RBPR-3.20	RPR-3.20-42630.594F	9/17/2016 14:15	F		7.40	12.1	8.3
RBPR-3.20	RPR-3.20-42639.638F	9/26/2016 15:18	F		8.30	11.0	5.8
RBPR-3.20	RPR-3.20-42639.638D	9/26/2016 15:19	FD		8.30	11.0	6.8
RBPR-3.20	RPR-3.20-42648.425F	10/5/2016 10:12	F			8.9	4.8
RBPR-3.20	RPR-3.20-42655.585F	10/12/2016 14:03	F			8.4	5.0
RBPR-3.20	RPR-3.20-42655.587F	10/12/2016 14:05	F			8.4	5.0
RBPR-3.20	50_42662.556F	10/19/2016 13:20	F			7.7	4.4
RBPR-3.20	50_42669.448F	10/26/2016 10:45	F			7.2	16.2
RBPR-3.20	50_42669.448FD	10/26/2016 10:45	FD			7.2	15.2
RBPR-3.20	50_42675.4729999999F	11/1/2016 11:21	F			6.8	7.2
RBPR-5.38	51-44098F	8/7/2016	F	230	7.39	15.2	8.7
RBPR-5.38	51-44015F	8/8/2016	F	220	7.62	16.5	8.5
RBPR-5.38	51-44101F	8/9/2016	F	250	7.45	15.9	7.7
RBPR-5.38	51-43732F	8/10/2016	F	200	7.28	16.1	7.1
RBPR-5.38	RPR-5.38-42593.464F	8/11/2016 11:08	F		7.55	15.1	7.2
RBPR-5.38	51-42593.464F	8/11/2016 11:08	F		7.55	15.1	7.2
RBPR-5.38	51-42594.569F	8/12/2016 13:40	F	260	6.48	16.8	6.9
RBPR-5.38	51-42595.427F	8/13/2016 10:15	F	210	7.68	14.3	7.3
RBPR-5.38	51-42596.356F	8/14/2016 8:32	F			13.4	6.3
RBPR-5.38	51-42596.379F	8/14/2016 9:06	F			13.4	6.0
RBPR-5.38	51-42596.399F	8/14/2016 9:35	F			13.5	6.0
RBPR-5.38	51-42596.453F	8/14/2016 10:53	F			13.3	7.8
RBPR-5.38	51-42596.604F	8/14/2016 14:30	F	220	6.30	16.0	8.6
RBPR-5.38	51-42597.442F	8/15/2016 10:37	F				7.1
RBPR-5.38	51-42597.604F	8/15/2016 14:30	F				6.8
RBPR-5.38	51-42598.349F	8/16/2016 8:22	F				7.0
RBPR-5.38	51-42598.569F	8/16/2016 13:39	F	210	7.71	16.2	5.0
RBPR-5.38	51-42599.431F	8/17/2016 10:20	F	220	7.71	15.5	4.6
RBPR-5.38	51-42599.603F	8/17/2016 14:29	F	220	7.67	17.0	4.0
RBPR-5.38	51-42600.403F	8/18/2016 9:40	F	240	7.86	17.6	6.1
RBPR-5.38	51-42600.552F	8/18/2016 13:15	F	230	7.56	18.6	5.2
RBPR-5.38	51-42601.1F	8/19/2016 2:21	F	210	7.39	16.0	4.1
RBPR-5.38	51-42601.314F	8/19/2016 7:32	F	340	7.59	16.5	9.1
RBPR-5.38	RPR-5.38-42601.329F	8/19/2016 7:53	F	270	7.66	16.8	8.6
RBPR-5.38	51-42602.356F	8/20/2016 8:33	F	310	8.36	15.0	7.6

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-5.38	51-42602.61F	8/20/2016 14:39	F	240	8.34	20.5	6.2
RBPR-5.38	51-42603.319F	8/21/2016 7:40	F	280	7.30	16.1	8.1
RBPR-5.38	51-42603.642F	8/21/2016 15:25	F	220	8.22	17.7	4.7
RBPR-5.38	51-42604.319F	8/22/2016 7:40	F	280	7.36	17.6	11.5
RBPR-5.38	51-42604.528F	8/22/2016 12:40	F	220	8.33	17.6	7.6
RBPR-5.38	51-42605.32F	8/23/2016 7:41	F	280	7.08	14.6	9.6
RBPR-5.38	51-42605.588F	8/23/2016 14:07	F	220	8.23	18.6	8.1
RBPR-5.38	51-42606.372F	8/24/2016 8:55	F	280	8.12	16.3	9.8
RBPR-5.38	51-42606.571F	8/24/2016 13:42	F	220	8.15	19.6	5.5
RBPR-5.38	51-42607.319F	8/25/2016 7:40	F	280	6.95	16.4	10.7
RBPR-5.38	51-42607.615F	8/25/2016 14:45	F	190	8.04	25.7	5.0
RBPR-5.38	51-42608.347F	8/26/2016 8:19	F	280	7.70	16.5	9.3
RBPR-5.38	51-42608.563F	8/26/2016 13:30	F	260	8.22	20.7	8.8
RBPR-5.38	51-42609.608F	8/27/2016 14:35	F	220	7.64	11.9	57.3
RBPR-5.38	51-42610.641F	8/28/2016 15:23	F	250	7.59	14.5	64.6
RBPR-5.38	51-42611.542F	8/29/2016 13:00	F	230	7.09	12.9	63.2
RBPR-5.38	51-42611.656F	8/29/2016 15:45	F	250	8.04	1.3	66.6
RBPR-5.38	51-42612.319F	8/30/2016 7:40	F	270	6.81	12.5	91.5
RBPR-5.38	51-42612.552F	8/30/2016 13:15	F	250	8.07	12.3	84.5
RBPR-5.38	51-42613.441F	8/31/2016 10:35	F	230	8.70	13.0	108.6
RBPR-5.38	51-42613.642F	8/31/2016 15:25	F	230	8.90	11.3	97.3
RBPR-5.38	51-42614.417F	9/1/2016 10:00	F	250	7.70	12.8	61.3
RBPR-5.38	51-42614.556F	9/1/2016 13:20	F	260	7.10	12.9	75.7
RBPR-5.38	51-42615.319F	9/2/2016 7:40	F	250	8.20	12.6	81.3
RBPR-5.38	51-42615.556F	9/2/2016 13:20	F	250	8.20	13.8	104.0
RBPR-5.38	51-42616.337F	9/3/2016 8:05	F	242	8.60	12.2	73.7
RBPR-5.38	51-42616.442F	9/3/2016 10:37	F	240	8.00	11.6	46.7
RBPR-5.38	51-42616.474F	9/3/2016 11:22	F	230	8.10	11.5	54.0
RBPR-5.38	51-42616.507F	9/3/2016 12:10	F	240	8.30	11.7	26.0
RBPR-5.38	51-42616.542F	9/3/2016 13:00	F	242	8.70	12.3	62.7
RBPR-5.38	RPR-5.38-42617.444F	9/4/2016 10:40	F		8.40	11.4	77.7
RBPR-5.38	51-42617.444F	9/4/2016 10:40	F	241	8.40	11.4	77.7
RBPR-5.38	51-42618.313F	9/5/2016 7:30	F	220	8.12	12.2	53.3
RBPR-5.38	51-42618.552F	9/5/2016 13:15	F	14300	7.81	14.3	46.0
RBPR-5.38	51-42619.333F	9/6/2016 8:00	F	240	8.26	11.3	101.3
RBPR-5.38	51-42619.444F	9/6/2016 10:40	F	220	8.31	11.2	104.8
RBPR-5.38	51-42619.522F	9/6/2016 12:32	F	240	8.21	11.7	107.5
RBPR-5.38	51-42620.33F	9/7/2016 7:55	F	230	8.29	11.2	91.0
RBPR-5.38	51-42620.58F	9/7/2016 13:55	F	250	7.66	13.8	79.9
RBPR-5.38	51-42621.306F	9/8/2016 7:20	F	230	8.15	11.2	69.1
RBPR-5.38	51-42621.365F	9/8/2016 8:45	F	250	8.11	13.7	71.1
RBPR-5.38	51-42622.316F	9/9/2016 7:35	F	270	8.40	11.2	55.8
RBPR-5.38	51-42622.507F	9/9/2016 12:10	F	260	8.30	12.1	70.8
RBPR-5.38	51-42623.438F	9/10/2016 10:30	F	251	8.10	11.7	54.0
RBPR-5.38	51-42623.59F	9/10/2016 14:10	F	227	8.30	12.9	60.6
RBPR-5.38	51-42624.566F	9/11/2016 13:35	F	223	8.60	11.8	40.1
RBPR-5.38	RPR-5.38-42625.321F	9/12/2016 7:42	F		7.00	9.9	29.0
RBPR-5.38	51-42625.344F	9/12/2016 8:15	F	223	8.80	10.2	28.5
RBPR-5.38	51-42625.571F	9/12/2016 13:42	F	221	8.60	12.8	49.6
RBPR-5.38	51-42626.384F	9/13/2016 9:13	F	225	8.50	11.0	38.5
RBPR-5.38	51-42626.436F	9/13/2016 10:28	F	219	8.50	12.8	39.4
RBPR-5.38	51-42627.501F	9/14/2016 12:01	F	221	8.40	15.2	30.3
RBPR-5.38	51-42628.312F	9/15/2016 7:29	F	222	8.40	11.3	30.3

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-5.38	51-42629.339F	9/16/2016 8:08	F	222	8.60	13.3	28.5
RBPR-5.38	51-42629.575F	9/16/2016 13:48	F	218	8.20	14.5	23.5
RBPR-5.38	51-42630.315F	9/17/2016 7:34	F	234	8.30	12.4	37.4
RBPR-5.38	RPR-5.38-42630.621F	9/17/2016 14:54	F		8.00	13.5	41.3
RBPR-5.38	51-42630.621F	9/17/2016 14:54	F	233	8.30	14.5	41.3
RBPR-5.38	51-42631.399F	9/18/2016 9:35	F	230	7.43	12.4	36.3
RBPR-5.38	51-42631.627F	9/18/2016 15:03	F	220	8.16	13.5	40.3
RBPR-5.38	51-42632.363F	9/19/2016 8:42	F	220	8.11	11.8	33.7
RBPR-5.38	51-42633.397F	9/20/2016 9:31	F	237	7.30	10.2	29.4
RBPR-5.38	51-42633.565F	9/20/2016 13:34	F	237	8.40	12.3	41.3
RBPR-5.38	51-42634.344F	9/21/2016 8:16	F	238	8.10	9.7	36.8
RBPR-5.38	51-42634.58F	9/21/2016 13:55	F	238	8.30	11.5	31.8
RBPR-5.38	51-42635.344F	9/22/2016 8:16	F	238	8.10	9.7	36.8
RBPR-5.38	51-42635.579F	9/22/2016 13:54	F	218	8.20	12.1	21.7
RBPR-5.38	51-42637.34F	9/24/2016 8:09	F	240	8.00	9.5	25.9
RBPR-5.38	51-42637.604F	9/24/2016 14:30	F	217	8.30	12.4	17.5
RBPR-5.38	51-42638.337F	9/25/2016 8:05	F	242	8.10	9.5	23.1
RBPR-5.38	51-42638.583F	9/25/2016 14:00	F	231	8.10	11.3	17.4
RBPR-5.38	51-42639.337F	9/26/2016 8:05	F	246	8.40	10.6	22.0
RBPR-5.38	51-42639.549F	9/26/2016 13:11	F	242	8.20	12.6	22.7
RBPR-5.38	RPR-5.38-42639.635F	9/26/2016 15:15	F		8.60	11.7	20.8
RBPR-5.38	51-42640.635F	9/27/2016 15:15	F	242	8.60	11.7	20.8
RBPR-5.38	51-42641.361F	9/28/2016 8:40	F	230	7.81	8.5	20.9
RBPR-5.38	51-42641.566F	9/28/2016 13:35	F	260	8.14	11.2	22.1
RBPR-5.38	51-42642.36F	9/29/2016 8:39	F	260	8.12	7.2	20.2
RBPR-5.38	51-42642.58F	9/29/2016 13:55	F	270	8.25	9.1	18.5
RBPR-5.38	51-42643.349F	9/30/2016 8:23	F	250	8.20	8.9	20.0
RBPR-5.38	51-42643.603F	9/30/2016 14:29	F	270	8.16	11.2	18.2
RBPR-5.38	51-42644.368F	10/1/2016 8:50	F	240	8.29	8.9	25.3
RBPR-5.38	51-42644.606F	10/1/2016 14:32	F	199	8.53	10.5	28.1
RBPR-5.38	51-42645.434F	10/2/2016 10:25	F	250	8.20	8.9	29.7
RBPR-5.38	51-42645.628F	10/2/2016 15:05	F	230	8.23	6.8	23.5
RBPR-5.38	51-42646.538F	10/3/2016 12:55	F	210	8.31	8.1	14.3
RBPR-5.38	51-42647.355F	10/4/2016 8:31	F	210	8.30	7.8	25.5
RBPR-5.38	51-42647.361F	10/4/2016 8:40	F	200	8.40	8.3	26.0
RBPR-5.38	51-42647.382F	10/4/2016 9:10	F	220	8.31	8.4	26.3
RBPR-5.38	51-42647.424F	10/4/2016 10:11	F	210	8.28	8.6	38.8
RBPR-5.38	51-42647.465F	10/4/2016 11:10	F	210	8.33	8.4	50.7
RBPR-5.38	51-42647.524F	10/4/2016 12:35	F	200	8.30	7.9	11.5
RBPR-5.38	51-42647.663F	10/4/2016 15:55	F	220	8.31	7.8	16.0
RBPR-5.38	RPR-5.38-42648.526F	10/5/2016 12:38	F			7.6	15.9
RBPR-5.38	51-42648.576F	10/5/2016 13:50	F	230	8.29	7.1	14.6
RBPR-5.38	51-42648.656F	10/5/2016 15:45	F	230	8.33	7.4	13.4
RBPR-5.38	51-42649.566F	10/6/2016 13:35	F	220	8.00	7.9	11.4
RBPR-5.38	51-42649.656F	10/6/2016 15:45	F	220	8.21	8.0	10.6
RBPR-5.38	51-42651.559F	10/8/2016 13:25	F	240	8.33	4.3	21.5
RBPR-5.38	51-42651.694F	10/8/2016 16:40	F	240	8.31	4.6	21.9
RBPR-5.38	51-42652.365F	10/9/2016 8:46	F	230	8.29	6.1	14.6
RBPR-5.38	51-42652.417F	10/9/2016 10:00	F			5.2	21.8
RBPR-5.38	51-42652.597F	10/9/2016 14:19	F			5.6	22.9
RBPR-5.38	51-42652.657F	10/9/2016 15:46	F	190	8.48	7.3	19.0
RBPR-5.38	51-42653.344F	10/10/2016 8:15	F	180	8.47	4.9	19.7
RBPR-5.38	51-42653.643F	10/10/2016 15:26	F	180	8.51	6.5	19.2

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-5.38	51-42654.351F	10/11/2016 8:25	F	230	8.19	6.2	19.1
RBPR-5.38	RPR-5.38-42655.627F	10/12/2016 15:03	F			8.6	19.6
RBPR-5.38	51-42660.455F	10/17/2016 10:55	F	250	8.24	1.9	53.2
RBPR-5.38	51-42660.639F	10/17/2016 15:20	F	220	8.44	5.1	17.3
RBPR-5.38	51-42661.462F	10/18/2016 11:05	F	280	8.23	3.1	25.2
RBPR-5.38	51-42661.604F	10/18/2016 14:30	F	280	8.23	4.1	25.2
RBPR-5.38	51_42662.422F	10/19/2016 10:07	F			1.2	20.5
RBPR-5.38	51_42662.422FD	10/19/2016 10:07	FD	270	8.36	1.2	20.5
RBPR-5.38	51_42662.563F	10/19/2016 13:30	F	290	8.28	5.7	14.3
RBPR-5.38	51_42663.486F	10/20/2016 11:40	F	290	8.22	3.9	21.1
RBPR-5.38	51_42663.642F	10/20/2016 15:25	F	280	8.29	8.3	21.4
RBPR-5.38	51_42664.382F	10/21/2016 9:10	F	310	8.21	3.2	23.6
RBPR-5.38	51_42664.653F	10/21/2016 15:40	F	290	8.18	6.4	16.9
RBPR-5.38	51_42665.438F	10/22/2016 10:30	F	330	8.01	3.9	23.1
RBPR-5.38	51_42665.663F	10/22/2016 15:55	F	300	8.14	5.9	16.7
RBPR-5.38	51_42666.365F	10/23/2016 8:45	F	330	8.05	7.1	25.6
RBPR-5.38	51_42666.674F	10/23/2016 16:10	F	330	7.87	4.1	25.9
RBPR-5.38	51_42667.431F	10/24/2016 10:20	F	330	8.23	7.7	23.2
RBPR-5.38	51_42667.611F	10/24/2016 14:40	F	310	8.18	5.4	19.2
RBPR-5.38	51_42668.427F	10/25/2016 10:15	F	310	8.30	3.6	31.6
RBPR-5.38	51_42668.719F	10/25/2016 17:15	F	290	7.95	8.0	30.1
RBPR-5.38	51_42669.361F	10/26/2016 8:40	F	320	8.26	7.8	35.0
RBPR-5.38	51_42669.379F	10/26/2016 9:06	F			3.3	35.6
RBPR-5.38	51_42669.381F	10/26/2016 9:08	F	280	8.22	7.3	35.6
RBPR-5.38	51_42669.479F	10/26/2016 11:30	F	320	8.01	4.4	31.3
RBPR-5.38	51_42669.549F	10/26/2016 13:10	F	280	8.65	5.6	21.9
RBPR-5.38	51_42670.361F	10/27/2016 8:40	F	320	8.26	7.8	35.0
RBPR-5.38	51_42670.549F	10/27/2016 13:10	F	280	8.65	5.6	21.9
RBPR-5.38	51_42671.427F	10/28/2016 10:15	F	280	8.37	4.3	35.8
RBPR-5.38	51_42671.642F	10/28/2016 15:25	F	260	8.42	5.7	27.6
RBPR-5.38	51_42672.403F	10/29/2016 9:40	F	300	8.27	4.6	31.7
RBPR-5.38	51_42672.615F	10/29/2016 14:45	F	290	8.08	6.2	13.6
RBPR-5.38	51_42673.401F	10/30/2016 9:37	F	230	7.75	4.9	32.3
RBPR-5.38	51_42673.604F	10/30/2016 14:30	F	350	8.55	5.2	25.0
RBPR-5.38	51_42674.451F	10/31/2016 10:50	F	280	8.44	3.5	48.0
RBPR-5.38	51_42674.649F	10/31/2016 15:35	F	280	8.53	4.3	27.0
RBPR-5.38	51_42675.378F	11/1/2016 9:05	F	210	8.07	5.8	6.9
RBPR-5.38	51_42675.604F	11/1/2016 14:30	F			1.9	22.2
RBPR-5.38	51_42675.604FD	11/1/2016 14:30	FD	290	7.98	1.9	22.2
RBPR-5.38	51_42677.406F	11/3/2016 9:45	F	260		4.6	21.1
RBPR-5.38	51_42677.632F	11/3/2016 15:10	F	220		7.1	14.0
RBPR-5.38	51_42678.41F	11/4/2016 9:50	F	270	7.15	7.7	8.0
RBPR-5.38	51_42679.576F	11/5/2016 13:50	F	270	7.93	5.7	16.5
RBPR-5.38	51_42679.719F	11/5/2016 17:15	F	230	8.08	4.5	23.3
RBPR-5.38	51_42680.382F	11/6/2016 9:10	F	270	8.47	3.9	28.3
RBPR-5.38	51_42680.549F	11/6/2016 13:10	F	280	8.42	5.9	23.1
RBPR-5.38	51_42682.428F	11/8/2016 10:17	F	270	7.71	6.1	42.4
RBPR-5.38	51_42682.626F	11/8/2016 15:02	F	250	8.20	5.7	15.6
RBPR-5.38	51_42683F	11/9/2016	F	320	8.44	2.5	81.2
RBPR-5.38	51_42684.372F	11/10/2016 8:56	F	230	7.82	5.1	633.7
RBPR-5.38	51_42684.66F	11/10/2016 15:50	F	310	8.21	1.1	53.7
RBPR-5.38	51_42685.333F	11/11/2016 7:59	F	290	8.28	5.7	14.3
RBPR-5.38	51_42685.333FD	11/11/2016 7:59	FD	210	7.67	5.2	54.8

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-5.38	51_42685.643F	11/11/2016 15:26	F				7.8
RBPR-5.38	51_42685.643FD	11/11/2016 15:26	FD	290	8.09	2.3	67.7
RBPR-5.38	51_42715.377F	12/11/2016 9:03	F	230	8.31	6.9	7.0
RBPR-5.38	51_42715.377FD	12/11/2016 9:03	FD	1960	8.63	3.0	110.7
RBPR-5.38	51_42715.635F	12/11/2016 15:14	F	250	8.27	8.3	6.2
RBPR-5.38	51_42715.635FD	12/11/2016 15:14	FD	800	8.56	5.4	106.3
RBPR-5.38	51_42717.54F	12/13/2016 12:58	F	310	8.21	3.2	23.6
RBPR-5.38	51_42717.54FD	12/13/2016 12:58	FD	330	8.36	2.5	105.0
RBPR-5.38	51_42717.708F	12/13/2016 16:59	F	290	8.18	6.4	16.9
RBPR-5.38	51_42717.708FD	12/13/2016 16:59	FD	300	8.28	3.7	99.8
RBPR-5.67	52-44116F	8/7/2016	F	240	7.49	14.6	10.4
RBPR-5.67	52-44030F	8/8/2016	F	240	7.55	14.7	9.4
RBPR-5.67	52-44121F	8/9/2016	F	230	7.41	14.3	6.8
RBPR-5.67	52-43802F	8/10/2016	F	240	7.26	14.8	6.6
RBPR-5.67	52-42593.48F	8/11/2016 11:31	F		7.48	14.8	6.6
RBPR-5.67	52-42594.575F	8/12/2016 13:48	F	230	6.57	14.7	5.6
RBPR-5.67	52-42595.583F	8/13/2016 14:00	F	210	7.38	14.2	8.0
RBPR-5.67	52-42596.364F	8/14/2016 8:44	F			13.2	5.7
RBPR-5.67	52-42596.382F	8/14/2016 9:10	F			13.3	6.9
RBPR-5.67	52-42596.409F	8/14/2016 9:49	F			13.4	5.8
RBPR-5.67	52-42596.464F	8/14/2016 11:08	F			13.5	6.9
RBPR-5.67	52-42596.614F	8/14/2016 14:44	F	210	8.13	15.6	7.9
RBPR-5.67	52-42597.456F	8/15/2016 10:57	F				7.1
RBPR-5.67	52-42597.615F	8/15/2016 14:45	F				6.1
RBPR-5.67	52-42598.366F	8/16/2016 8:47	F				5.5
RBPR-5.67	52-42598.574F	8/16/2016 13:47	F	210	7.90	15.1	4.8
RBPR-5.67	52-42599.42F	8/17/2016 10:05	F	210	7.75	13.3	3.7
RBPR-5.67	52-42599.611F	8/17/2016 14:40	F	200	7.71	15.8	3.7
RBPR-5.67	52-42600.411F	8/18/2016 9:52	F	210	7.90	14.2	4.3
RBPR-5.67	52-42600.559F	8/18/2016 13:25	F	200	7.72	18.5	4.3
RBPR-5.67	52-42601.107F	8/19/2016 2:34	F	200	7.64	15.5	3.6
RBPR-5.67	52-42601.319F	8/19/2016 7:40	F	250	8.06	15.5	10.8
RBPR-5.67	52-42602.365F	8/20/2016 8:45	F	240	8.50	15.4	4.9
RBPR-5.67	52-42602.617F	8/20/2016 14:48	F	230	8.52	18.8	4.1
RBPR-5.67	52-42603.33F	8/21/2016 7:55	F	220	8.00	15.1	5.5
RBPR-5.67	52-42603.632F	8/21/2016 15:10	F	200	8.42	14.3	4.4
RBPR-5.67	52-42604.333F	8/22/2016 7:59	F	220	7.22	16.0	7.2
RBPR-5.67	52-42604.535F	8/22/2016 12:51	F	210	8.52	15.6	5.1
RBPR-5.67	52-42605.33F	8/23/2016 7:55	F	230	7.68	13.9	6.6
RBPR-5.67	52-42605.576F	8/23/2016 13:50	F	200	8.30	17.7	5.2
RBPR-5.67	52-42606.389F	8/24/2016 9:20	F	190	8.21	15.1	6.0
RBPR-5.67	52-42606.563F	8/24/2016 13:30	F	190	8.03	20.4	4.7
RBPR-5.67	52-42607.33F	8/25/2016 7:55	F	220	7.80	15.2	6.7
RBPR-5.67	52-42607.622F	8/25/2016 14:55	F	190	8.13	22.7	5.5
RBPR-5.67	52-42608.351F	8/26/2016 8:26	F	230	8.05	14.4	5.9
RBPR-5.67	52-42608.568F	8/26/2016 13:38	F	220	8.25	16.6	6.0
RBPR-5.67	52-42609.573F	8/27/2016 13:45	F	190	7.74	11.4	39.0
RBPR-5.67	52-42610.649F	8/28/2016 15:35	F	230	7.92	13.7	72.8
RBPR-5.67	52-42611.549F	8/29/2016 13:10	F	230	7.47	12.3	49.2
RBPR-5.67	52-42611.667F	8/29/2016 16:00	F	230	8.11	12.5	48.6
RBPR-5.67	52-42612.326F	8/30/2016 7:50	F	250	7.51	11.9	68.2
RBPR-5.67	52-42612.563F	8/30/2016 13:30	F	230	7.61	12.0	60.8
RBPR-5.67	52-42613.455F	8/31/2016 10:55	F	240	8.70	11.5	87.1

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-5.67	52-42613.656F	8/31/2016 15:45	F	220	8.90	11.1	84.4
RBPR-5.67	52-42614.431F	9/1/2016 10:20	F	250	8.20	12.4	48.0
RBPR-5.67	52-42614.563F	9/1/2016 13:30	F	240	7.70	12.2	77.4
RBPR-5.67	52-42615.333F	9/2/2016 8:00	F	250	8.20	12.2	76.0
RBPR-5.67	52-42615.566F	9/2/2016 13:35	F	240	8.20	13.0	50.0
RBPR-5.67	52-42616.347F	9/3/2016 8:20	F	240	8.50	11.9	60.7
RBPR-5.67	52-42616.556F	9/3/2016 13:20	F	208	8.50	12.5	62.7
RBPR-5.67	52-42617.451F	9/4/2016 10:50	F	239	8.30	11.8	46.7
RBPR-5.67	52-42618.319F	9/5/2016 7:40	F	210	8.17	12.0	43.0
RBPR-5.67	52-42618.545F	9/5/2016 13:05	F	210	7.91	13.1	117.7
RBPR-5.67	52-42619.354F	9/6/2016 8:30	F	210	8.24	11.2	108.6
RBPR-5.67	52-42619.45F	9/6/2016 10:48	F	240	8.21	12.7	110.7
RBPR-5.67	52-42619.534F	9/6/2016 12:49	F	220	8.17	13.2	112.6
RBPR-5.67	52-42619.601F	9/6/2016 14:25	F	230	7.89	13.6	108.2
RBPR-5.67	52-42620.34F	9/7/2016 8:10	F	230	8.28	11.2	103.1
RBPR-5.67	52-42620.583F	9/7/2016 14:00	F	230	7.93	12.6	83.8
RBPR-5.67	52-42621.313F	9/8/2016 7:30	F	230	8.13	11.3	74.6
RBPR-5.67	52-42621.608F	9/8/2016 14:35	F	230	8.24	12.8	68.4
RBPR-5.67	52-42622.323F	9/9/2016 7:45	F	250	8.50	11.1	56.0
RBPR-5.67	52-42622.514F	9/9/2016 12:20	F	250	8.40	12.0	62.2
RBPR-5.67	52-42623.448F	9/10/2016 10:45	F	236	8.20	11.5	53.1
RBPR-5.67	52-42623.597F	9/10/2016 14:20	F	222	8.30	11.8	60.6
RBPR-5.67	52-42624.58F	9/11/2016 13:55	F	222	8.70	11.6	39.0
RBPR-5.67	52-42625.353F	9/12/2016 8:28	F	222	8.60	10.2	30.0
RBPR-5.67	52-42625.578F	9/12/2016 13:52	F	221	8.60	12.0	34.5
RBPR-5.67	52-42626.447F	9/13/2016 10:43	F	219	8.40	12.0	39.1
RBPR-5.67	52-42626.512F	9/13/2016 12:17	F	217	8.00	12.7	32.5
RBPR-5.67	52-42627.522F	9/14/2016 12:31	F	215	8.10	14.8	30.2
RBPR-5.67	52-42628.318F	9/15/2016 7:38	F	220	8.30	11.5	27.4
RBPR-5.67	52-42629.349F	9/16/2016 8:23	F	218	8.20	13.1	24.6
RBPR-5.67	52-42629.583F	9/16/2016 14:00	F	201	8.20	13.8	21.9
RBPR-5.67	52-42630.323F	9/17/2016 7:45	F	221	8.10	12.4	28.3
RBPR-5.67	52-42630.649F	9/17/2016 15:35	F	220	8.20	14.2	29.1
RBPR-5.67	52-42631.406F	9/18/2016 9:44	F	210	7.56	12.4	26.8
RBPR-5.67	52-42631.635F	9/18/2016 15:14	F	210	8.16	13.5	26.9
RBPR-5.67	52-42632.375F	9/19/2016 9:00	F	210	8.09	12.0	22.9
RBPR-5.67	52-42633.404F	9/20/2016 9:42	F	218	7.60	11.2	21.8
RBPR-5.67	52-42633.578F	9/20/2016 13:53	F	217	8.40	12.6	30.6
RBPR-5.67	52-42634.35F	9/21/2016 8:24	F	218	8.40	10.8	26.5
RBPR-5.67	52-42634.587F	9/21/2016 14:05	F	213	8.30	12.2	20.1
RBPR-5.67	52-42635.35F	9/22/2016 8:24	F	218	8.40	10.8	26.5
RBPR-5.67	52-42635.567F	9/22/2016 13:37	F	217	8.40	12.1	20.0
RBPR-5.67	52-42637.343F	9/24/2016 8:14	F	216	8.50	11.0	16.5
RBPR-5.67	52-42637.611F	9/24/2016 14:40	F	213	8.40	12.5	17.3
RBPR-5.67	52-42638.343F	9/25/2016 8:14	F	217	8.30	11.0	15.0
RBPR-5.67	52-42638.59F	9/25/2016 14:10	F	222	8.20	12.6	14.5
RBPR-5.67	52-42639.342F	9/26/2016 8:13	F	192	8.60	11.6	15.1
RBPR-5.67	52-42639.557F	9/26/2016 13:22	F	224	8.30	12.8	15.5
RBPR-5.67	52-42640.642F	9/27/2016 15:24	F	241	8.30	11.5	14.7
RBPR-5.67	52-42641.368F	9/28/2016 8:50	F	230	7.90	8.4	11.2
RBPR-5.67	52-42641.576F	9/28/2016 13:50	F	230	8.20	12.2	12.5
RBPR-5.67	52-42642.382F	9/29/2016 9:10	F	190	7.54	7.5	8.7
RBPR-5.67	52-42642.583F	9/29/2016 14:00	F	270	8.43	9.1	19.3

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-5.67	52-42643.353F	9/30/2016 8:29	F	230	8.23	8.9	9.7
RBPR-5.67	52-42643.608F	9/30/2016 14:35	F	170	8.16	9.8	9.0
RBPR-5.67	52-42644.373F	10/1/2016 8:57	F	90	8.33	8.9	11.3
RBPR-5.67	52-42644.608F	10/1/2016 14:35	F	190	8.15	9.8	22.6
RBPR-5.67	52-42645.44F	10/2/2016 10:33	F	170	8.15	8.8	13.6
RBPR-5.67	52-42645.63F	10/2/2016 15:07	F	200	8.20	10.1	11.8
RBPR-5.67	52-42646.54F	10/3/2016 12:57	F	210	8.30	8.8	12.3
RBPR-5.67	52-42647.521F	10/4/2016 12:30	F	200	8.28	8.5	29.4
RBPR-5.67	52-42647.66F	10/4/2016 15:50	F	200	8.30	8.6	9.5
RBPR-5.67	52-42648.573F	10/5/2016 13:45	F	210	8.30	8.1	9.8
RBPR-5.67	52-42648.653F	10/5/2016 15:40	F	220	8.36	8.2	10.1
RBPR-5.67	52-42649.563F	10/6/2016 13:30	F	210	7.96	8.4	9.0
RBPR-5.67	52-42649.653F	10/6/2016 15:40	F	230	8.24	8.2	10.0
RBPR-5.67	52-42650.528F	10/7/2016 12:40	F	200	8.10	7.9	7.6
RBPR-5.67	52-42650.646F	10/7/2016 15:30	F	200	8.35	7.3	8.6
RBPR-5.67	52-42651.556F	10/8/2016 13:20	F	200	8.28	6.9	9.1
RBPR-5.67	52-42651.601F	10/8/2016 14:25	F				10.5
RBPR-5.67	52-42651.639F	10/8/2016 15:20	F				11.7
RBPR-5.67	52-42651.691F	10/8/2016 16:35	F	210	8.26	7.0	12.9
RBPR-5.67	52-42651.715F	10/8/2016 17:10	F				12.6
RBPR-5.67	52-42652.427F	10/9/2016 10:15	F				17.5
RBPR-5.67	52-42652.472F	10/9/2016 11:20	F				18.3
RBPR-5.67	52-42652.501F	10/9/2016 12:02	F				18.6
RBPR-5.67	52-42652.504F	10/9/2016 12:06	F				16.9
RBPR-5.67	52-42652.546F	10/9/2016 13:06	F				18.8
RBPR-5.67	52-42652.59F	10/9/2016 14:10	F				18.5
RBPR-5.67	52-42652.625F	10/9/2016 15:00	F				18.1
RBPR-5.67	52-42652.658F	10/9/2016 15:48	F	200	8.42	7.3	18.6
RBPR-5.67	52-42652.667F	10/9/2016 16:00	F				18.6
RBPR-5.67	52-42653.346F	10/10/2016 8:18	F	180	8.49	7.1	18.4
RBPR-5.67	52-42653.645F	10/10/2016 15:29	F	170	8.26	8.2	18.9
RBPR-5.67	52-42654.353F	10/11/2016 8:28	F	200	8.05	6.9	11.7
RBPR-5.67	52-42660.458F	10/17/2016 11:00	F	240	8.23	6.0	14.1
RBPR-5.67	52-42660.642F	10/17/2016 15:25	F	210	8.25	6.2	9.0
RBPR-5.67	52-42661.458F	10/18/2016 11:00	F	240	8.28	5.8	9.1
RBPR-5.67	52-42661.601F	10/18/2016 14:25	F	240	8.22	6.6	9.1
RBPR-5.67	52_42662.566F	10/19/2016 13:35	F	220	8.57	6.9	8.5
RBPR-5.67	52_42663.483F	10/20/2016 11:35	F	240	8.30	6.7	7.8
RBPR-5.67	52_42663.639F	10/20/2016 15:20	F	250	8.29	8.3	7.1
RBPR-5.67	52_42664.378F	10/21/2016 9:05	F	250	8.27	6.4	7.9
RBPR-5.67	52_42664.649F	10/21/2016 15:35	F	270	8.32	7.9	8.1
RBPR-5.67	52_42665.434F	10/22/2016 10:25	F	250	8.15	7.2	7.9
RBPR-5.67	52_42665.66F	10/22/2016 15:50	F	280	8.12	7.8	8.5
RBPR-5.67	52_42666.361F	10/23/2016 8:40	F	250	8.13	6.8	9.0
RBPR-5.67	52_42666.67F	10/23/2016 16:05	F	260	7.82	7.2	10.0
RBPR-5.67	52_42667.427F	10/24/2016 10:15	F	250	8.29	6.9	9.4
RBPR-5.67	52_42667.608F	10/24/2016 14:35	F	250	8.28	7.0	7.8
RBPR-5.67	52_42668.424F	10/25/2016 10:10	F	250	8.35	6.8	10.3
RBPR-5.67	52_42668.715F	10/25/2016 17:10	F	230	7.90	7.9	10.0
RBPR-5.67	52_42669.358F	10/26/2016 8:35	F	250	8.32	6.6	13.6
RBPR-5.67	52_42669.379F	10/26/2016 9:06	F	260	8.30	6.7	12.4
RBPR-5.67	52_42669.476F	10/26/2016 11:25	F	270	8.02	7.0	12.8
RBPR-5.67	52_42669.545F	10/26/2016 13:05	F	270	8.71	6.5	13.5

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-5.67	52_42670.358F	10/27/2016 8:35	F	250	8.32	6.6	13.6
RBPR-5.67	52_42670.545F	10/27/2016 13:05	F	270	8.71	6.5	13.5
RBPR-5.67	52_42671.424F	10/28/2016 10:10	F	230	8.41	6.4	13.3
RBPR-5.67	52_42671.639F	10/28/2016 15:20	F	220	8.51	6.7	13.2
RBPR-5.67	52_42672.399F	10/29/2016 9:35	F	250	8.28	6.3	15.2
RBPR-5.67	52_42672.611F	10/29/2016 14:40	F	320	8.11	6.1	15.5
RBPR-5.67	52_42673.406F	10/30/2016 9:45	F	180	7.90	5.1	6.8
RBPR-5.67	52_42673.601F	10/30/2016 14:25	F	350	8.63	6.1	13.3
RBPR-5.67	52_42674.45F	10/31/2016 10:48	F	240	8.40	6.1	16.0
RBPR-5.67	52_42674.653F	10/31/2016 15:40	F	260	8.51	5.3	16.6
RBPR-5.67	52_42675.382F	11/1/2016 9:10	F	210	8.08	5.7	7.4
RBPR-5.67	52_42675.601F	11/1/2016 14:25	F	230	7.95	5.2	9.1
RBPR-5.67	52_42677.403F	11/3/2016 9:40	F	230		6.6	12.4
RBPR-5.67	52_42677.628F	11/3/2016 15:05	F	240		8.2	9.1
RBPR-5.67	52_42678.406F	11/4/2016 9:45	F	280	7.12	7.2	12.5
RBPR-5.67	52_42679.574F	11/5/2016 13:47	F	260	7.97	5.6	12.9
RBPR-5.67	52_42679.715F	11/5/2016 17:10	F	250	7.98	4.8	16.1
RBPR-5.67	52_42680.378F	11/6/2016 9:05	F	260	8.49	4.9	19.0
RBPR-5.67	52_42680.545F	11/6/2016 13:05	F	260	8.42	5.9	19.3
RBPR-5.67	52_42682.428F	11/8/2016 10:16	F	220	7.68	6.1	21.6
RBPR-5.67	52_42682.624F	11/8/2016 14:59	F	210	8.46	6.0	16.6
RBPR-5.67	52_42683F	11/9/2016	F	280	8.43	3.8	49.1
RBPR-5.67	52_42684.37F	11/10/2016 8:53	F	200	7.85	5.2	55.0
RBPR-5.67	52_42684.663F	11/10/2016 15:55	F	270	8.36	1.2	20.5
RBPR-5.67	52_42684.663FD	11/10/2016 15:55	FD	260	8.24	2.6	116.0
RBPR-5.67	52_42685.326F	11/11/2016 7:50	F	220	8.57	6.9	8.5
RBPR-5.67	52_42685.326FD	11/11/2016 7:50	FD	210	7.57	5.1	55.0
RBPR-5.67	52_42685.642F	11/11/2016 15:24	F				20.5
RBPR-5.67	52_42685.642FD	11/11/2016 15:24	FD	270	8.03	3.7	76.6
RBPR-5.67	52_42715.38F	12/11/2016 9:07	F	230	8.29	7.2	7.0
RBPR-5.67	52_42715.38FD	12/11/2016 9:07	FD	360	8.53	2.7	93.2
RBPR-5.67	52_42715.637F	12/11/2016 15:17	F	240	8.27	8.3	6.9
RBPR-5.67	52_42715.637FD	12/11/2016 15:17	FD	380	8.48	4.1	69.0
RBPR-5.67	52_42717.543F	12/13/2016 13:02	F	250	8.27	6.4	7.9
RBPR-5.67	52_42717.543FD	12/13/2016 13:02	FD	280	8.33	3.5	67.0
RBPR-5.67	52_42717.71F	12/13/2016 17:02	F	270	8.32	7.9	8.1
RBPR-5.67	52_42717.71FD	12/13/2016 17:02	FD	270	8.33	4.3	65.6
RBPR-6.00	53-44134F	8/7/2016	F	260	7.58	13.9	8.4
RBPR-6.00	53-44092F	8/8/2016	F	230	7.69	13.5	7.8
RBPR-6.00	53-44141F	8/9/2016	F	250	7.47	13.2	5.4
RBPR-6.00	53-43817F	8/10/2016	F	220	7.29	13.5	5.3
RBPR-6.00	53-42595.441F	8/13/2016 10:35	F	200	7.61	13.4	5.9
RBPR-6.00	53-42596.625F	8/14/2016 15:00	F	220	8.08	15.8	6.6
RBPR-6.00	53-42597.465F	8/15/2016 11:10	F				6.2
RBPR-6.00	53-42597.622F	8/15/2016 14:55	F				5.5
RBPR-6.00	53-42598.382F	8/16/2016 9:10	F				5.4
RBPR-6.00	53-42598.583F	8/16/2016 13:59	F	220	7.86	15.3	5.0
RBPR-6.00	53-42599.44F	8/17/2016 10:34	F	210	7.61	13.4	3.7
RBPR-6.00	53-42599.62F	8/17/2016 14:53	F	200	7.77	14.7	3.9
RBPR-6.00	53-42600.442F	8/18/2016 10:36	F	210	7.62	13.7	3.7
RBPR-6.00	53-42600.567F	8/18/2016 13:37	F	210	7.75	19.0	3.4
RBPR-6.00	53-42601.113F	8/19/2016 2:43	F	200	7.59	15.5	3.7
RBPR-6.00	53-42601.33F	8/19/2016 7:55	F	260	8.21	16.7	6.4

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-6.00	53-42602.372F	8/20/2016 8:55	F	240	8.41	14.5	4.4
RBPR-6.00	53-42602.631F	8/20/2016 15:09	F	230	8.58	18.4	4.6
RBPR-6.00	53-42603.34F	8/21/2016 8:10	F	220	8.17	14.0	5.3
RBPR-6.00	53-42603.624F	8/21/2016 14:58	F	200	8.09	13.9	4.3
RBPR-6.00	53-42604.344F	8/22/2016 8:15	F	220	7.80	15.5	7.4
RBPR-6.00	53-42604.556F	8/22/2016 13:20	F	200	8.48	15.5	5.2
RBPR-6.00	53-42605.337F	8/23/2016 8:05	F	220	8.20	12.4	6.9
RBPR-6.00	53-42605.607F	8/23/2016 14:34	F	190	8.29	18.6	8.5
RBPR-6.00	53-42606.382F	8/24/2016 9:10	F	220	8.18	14.8	5.8
RBPR-6.00	53-42606.583F	8/24/2016 14:00	F	20000	8.18	17.2	4.6
RBPR-6.00	53-42607.34F	8/25/2016 8:10	F	220	7.74	14.0	5.4
RBPR-6.00	53-42607.635F	8/25/2016 15:15	F	190	7.07	19.3	4.8
RBPR-6.00	53-42608.36F	8/26/2016 8:38	F	220	8.07	14.7	5.6
RBPR-6.00	53-42608.582F	8/26/2016 13:58	F	220	8.17	15.6	5.6
RBPR-6.00	53-42609.583F	8/27/2016 14:00	F	210	7.60	12.0	39.6
RBPR-6.00	53-42610.618F	8/28/2016 14:50	F	230	7.56	12.5	70.4
RBPR-6.00	53-42611.556F	8/29/2016 13:21	F	220	7.75	12.1	46.7
RBPR-6.00	53-42611.678F	8/29/2016 16:17	F	220	8.16	12.5	47.0
RBPR-6.00	53-42620.05F	8/30/2016 1:12	F	140	7.73	11.2	59.9
RBPR-6.00	53-42612.573F	8/30/2016 13:45	F	230	7.99	11.7	56.5
RBPR-6.00	53-42613.469F	8/31/2016 11:15	F	240	8.60	11.9	88.7
RBPR-6.00	53-42613.666F	8/31/2016 15:59	F	230	9.00	11.5	84.2
RBPR-6.00	53-42614.438F	9/1/2016 10:30	F	240	8.10	11.8	47.3
RBPR-6.00	53-42614.569F	9/1/2016 13:40	F	240	7.80	12.0	72.7
RBPR-6.00	53-42615.344F	9/2/2016 8:15	F	230	8.10	12.0	74.7
RBPR-6.00	53-42615.573F	9/2/2016 13:45	F	230	8.30	12.8	44.0
RBPR-6.00	53-42616.351F	9/3/2016 8:25	F	235	8.50	11.7	41.3
RBPR-6.00	53-42616.559F	9/3/2016 13:25	F	240	8.40	11.9	59.7
RBPR-6.00	53-42617.455F	9/4/2016 10:55	F	237	8.40	11.5	63.0
RBPR-6.00	53-42618.326F	9/5/2016 7:50	F	220	8.18	11.9	30.7
RBPR-6.00	53-42618.618F	9/5/2016 14:50	F	220	8.01	13.0	120.0
RBPR-6.00	53-42619.375F	9/6/2016 9:00	F	220	8.23	11.3	95.1
RBPR-6.00	53-42619.47F	9/6/2016 11:17	F	220	8.22	12.3	95.8
RBPR-6.00	53-42619.556F	9/6/2016 13:20	F	210	8.02	13.4	106.7
RBPR-6.00	53-42619.604F	9/6/2016 14:30	F	230	8.08	13.1	104.2
RBPR-6.00	53-42620.344F	9/7/2016 8:15	F	220	8.24	11.3	92.8
RBPR-6.00	53-42620.59F	9/7/2016 14:10	F	230	8.04	13.0	79.6
RBPR-6.00	53-42621.316F	9/8/2016 7:35	F	220	8.26	11.2	70.4
RBPR-6.00	53-42621.604F	9/8/2016 14:30	F	230	8.22	12.6	68.1
RBPR-6.00	53-42622.333F	9/9/2016 8:00	F	250	8.40	11.1	54.0
RBPR-6.00	53-42622.521F	9/9/2016 12:30	F	250	8.40	11.9	58.2
RBPR-6.00	53-42623.451F	9/10/2016 10:50	F	235	831.00	11.6	54.4
RBPR-6.00	53-42623.604F	9/10/2016 14:30	F	222	8.20	11.8	64.8
RBPR-6.00	53-42624.594F	9/11/2016 14:15	F	223	8.50	11.6	38.5
RBPR-6.00	53-42625.356F	9/12/2016 8:32	F	221	8.30	10.3	31.3
RBPR-6.00	53-42625.599F	9/12/2016 14:22	F	221	8.40	12.1	37.7
RBPR-6.00	53-42626.529F	9/13/2016 12:42	F	217	8.40	12.7	31.3
RBPR-6.00	53-42627.528F	9/14/2016 12:41	F	216	8.30	13.8	27.4
RBPR-6.00	53-42628.324F	9/15/2016 7:46	F	217	8.30	12.0	24.9
RBPR-6.00	53-42629.356F	9/16/2016 8:33	F	219	8.20	13.1	24.6
RBPR-6.00	53-42629.59F	9/16/2016 14:10	F	214	8.30	13.5	21.2
RBPR-6.00	53-42630.331F	9/17/2016 7:56	F	219	8.10	12.4	28.8
RBPR-6.00	53-42630.645F	9/17/2016 15:29	F	217	8.20	14.0	27.2

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-6.00	53-42631.41F	9/18/2016 9:50	F	200	7.66	12.3	23.9
RBPR-6.00	53-42631.639F	9/18/2016 15:20	F	210	8.17	13.5	25.7
RBPR-6.00	53-42632.38F	9/19/2016 9:07	F	210	8.13	12.0	22.0
RBPR-6.00	53-42633.408F	9/20/2016 9:48	F	215	7.70	11.3	22.1
RBPR-6.00	53-42633.584F	9/20/2016 14:01	F	217	8.50	12.6	31.4
RBPR-6.00	53-42634.36F	9/21/2016 8:38	F	215	8.10	11.0	24.7
RBPR-6.00	53-42634.601F	9/21/2016 14:25	F	216	8.40	12.4	21.0
RBPR-6.00	53-42635.36F	9/22/2016 8:38	F	215	8.10	11.0	24.7
RBPR-6.00	53-42635.573F	9/22/2016 13:45	F	239	8.40	11.7	31.5
RBPR-6.00	53-42637.347F	9/24/2016 8:20	F	213	8.50	11.2	15.5
RBPR-6.00	53-42637.618F	9/24/2016 14:50	F	213	8.40	12.6	17.5
RBPR-6.00	53-42638.347F	9/25/2016 8:19	F	216	8.40	11.2	14.5
RBPR-6.00	53-42638.594F	9/25/2016 14:15	F	230	8.20	12.2	15.1
RBPR-6.00	53-42639.347F	9/26/2016 8:20	F	215	8.20	11.6	14.9
RBPR-6.00	53-42639.563F	9/26/2016 13:30	F	221	8.30	12.9	15.1
RBPR-6.00	53-42640.646F	9/27/2016 15:30	F	220	8.30	11.3	14.0
RBPR-6.00	53-42641.373F	9/28/2016 8:57	F	230	7.90	11.0	10.7
RBPR-6.00	53-42641.592F	9/28/2016 14:12	F	220	8.17	12.3	11.7
RBPR-6.00	53-42642.385F	9/29/2016 9:15	F	210	8.04	7.5	7.5
RBPR-6.00	53-42642.587F	9/29/2016 14:05	F	270	8.48	9.0	18.4
RBPR-6.00	53-42643.356F	9/30/2016 8:32	F	230	8.28	9.2	17.5
RBPR-6.00	53-42643.61F	9/30/2016 14:38	F	80	8.22	9.1	8.8
RBPR-6.00	53-42644.374F	10/1/2016 8:59	F	120	8.24	9.2	12.1
RBPR-6.00	53-42644.61F	10/1/2016 14:39	F	100	8.13	9.5	22.7
RBPR-6.00	53-42645.442F	10/2/2016 10:37	F	230	8.39	8.5	16.9
RBPR-6.00	53-42645.632F	10/2/2016 15:10	F	200	8.27	10.2	10.5
RBPR-6.00	53-42646.542F	10/3/2016 13:00	F	210	8.30	8.9	12.5
RBPR-6.00	53-42647.369F	10/4/2016 8:51	F	210	8.32	8.5	26.5
RBPR-6.00	53-42647.394F	10/4/2016 9:28	F	210	8.29	8.4	26.9
RBPR-6.00	53-42647.435F	10/4/2016 10:26	F	210	8.29	8.5	31.7
RBPR-6.00	53-42647.476F	10/4/2016 11:25	F	210	8.30	8.6	37.8
RBPR-6.00	53-42647.517F	10/4/2016 12:25	F	210	8.29	8.5	39.7
RBPR-6.00	53-42647.658F	10/4/2016 15:48	F	210	8.30	8.7	10.3
RBPR-6.00	53-44183F	10/5/2016	F	230	8.41	8.3	10.0
RBPR-6.00	53-42648.569F	10/5/2016 13:40	F	210	8.30	8.4	9.7
RBPR-6.00	53-42649.559F	10/6/2016 13:25	F	210	7.85	8.7	7.6
RBPR-6.00	53-42649.649F	10/6/2016 15:35	F	230	8.23	8.5	9.5
RBPR-6.00	53-42650.524F	10/7/2016 12:35	F	210	8.01	7.8	9.0
RBPR-6.00	53-42650.649F	10/7/2016 15:35	F	200	8.42	7.3	8.6
RBPR-6.00	53-42651.552F	10/8/2016 13:15	F	200	8.28	6.9	9.8
RBPR-6.00	53-42651.688F	10/8/2016 16:30	F	210	8.15	7.2	14.4
RBPR-6.00	53-42652.367F	10/9/2016 8:49	F	210	8.01	7.0	9.0
RBPR-6.00	53-42652.66F	10/9/2016 15:51	F	160	8.46	7.3	12.9
RBPR-6.00	53-42653.349F	10/10/2016 8:22	F	150	8.47	7.9	8.4
RBPR-6.00	53-42653.649F	10/10/2016 15:34	F	150	8.36	8.0	7.7
RBPR-6.00	53-42654.356F	10/11/2016 8:32	F	180	8.06	7.1	10.1
RBPR-6.00	53-42656.167F	10/13/2016 4:00	F	130	8.69	6.9	11.9
RBPR-6.00	53-42656.372F	10/13/2016 8:55	F	110	8.56	5.2	6.1
RBPR-6.00	53-42657.469F	10/14/2016 11:15	F	210	8.56	2.0	11.8
RBPR-6.00	53-42660.462F	10/17/2016 11:05	F	200	8.25	6.5	14.5
RBPR-6.00	53-42660.645F	10/17/2016 15:29	F	190	8.29	6.0	7.1
RBPR-6.00	53-42661.455F	10/18/2016 10:55	F	230	8.28	5.9	266.1
RBPR-6.00	53-42661.597F	10/18/2016 14:20	F	250	8.21	7.1	266.1

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-6.00	53_42662.589F	10/19/2016 14:08	F	230	8.46	6.8	8.2
RBPR-6.00	53_42663.479F	10/20/2016 11:30	F	230	8.31	6.9	7.0
RBPR-6.00	53_42663.635F	10/20/2016 15:15	F	250	8.27	8.3	6.2
RBPR-6.00	53_42664.375F	10/21/2016 9:00	F	250	8.25	6.6	8.1
RBPR-6.00	53_42664.646F	10/21/2016 15:30	F	260	8.15	7.9	8.1
RBPR-6.00	53_42665.431F	10/22/2016 10:20	F	250	8.15	7.0	8.2
RBPR-6.00	53_42665.656F	10/22/2016 15:45	F	270	8.17	8.0	8.3
RBPR-6.00	53_42666.358F	10/23/2016 8:35	F	250	8.12	7.0	10.2
RBPR-6.00	53_42666.667F	10/23/2016 16:00	F	260	7.73	7.0	9.7
RBPR-6.00	53_42667.424F	10/24/2016 10:10	F	230	8.30	7.2	7.9
RBPR-6.00	53_42667.604F	10/24/2016 14:30	F	250	8.28	7.2	7.3
RBPR-6.00	53_42668.42F	10/25/2016 10:05	F	260	8.36	7.0	10.0
RBPR-6.00	53_42668.712F	10/25/2016 17:05	F	230	7.81	7.8	11.1
RBPR-6.00	53_42669.354F	10/26/2016 8:30	F	250	8.33	6.7	14.1
RBPR-6.00	53_42669.377F	10/26/2016 9:03	F	250	8.36	6.8	21.9
RBPR-6.00	53_42669.472F	10/26/2016 11:20	F	270	7.97	7.1	12.6
RBPR-6.00	53_42669.542F	10/26/2016 13:00	F	270	8.77	6.9	12.1
RBPR-6.00	53_42670.354F	10/27/2016 8:30	F	250	8.33	6.7	14.1
RBPR-6.00	53_42670.542F	10/27/2016 13:00	F	270	8.77	6.9	12.1
RBPR-6.00	53_42671.42F	10/28/2016 10:05	F	220	8.40	6.6	12.0
RBPR-6.00	53_42671.635F	10/28/2016 15:15	F	240	8.53	6.6	14.0
RBPR-6.00	53_42672.396F	10/29/2016 9:30	F	280	8.29	6.7	16.2
RBPR-6.00	53_42672.608F	10/29/2016 14:35	F	330	8.12	5.9	16.3
RBPR-6.00	53_42673.396F	10/30/2016 9:30	F	190	7.92	5.1	4.4
RBPR-6.00	53_42673.597F	10/30/2016 14:20	F	250	8.73	6.5	11.6
RBPR-6.00	53_42674.449F	10/31/2016 10:46	F	240	8.49	6.2	14.5
RBPR-6.00	53_42674.656F	10/31/2016 15:45	F	250	8.49	5.7	15.7
RBPR-6.00	53_42675.385F	11/1/2016 9:15	F	220	8.05	5.4	8.4
RBPR-6.00	53_42675.611F	11/1/2016 14:40	F	240	7.96	5.8	7.7
RBPR-6.00	53_42677.399F	11/3/2016 9:35	F	210		7.5	7.2
RBPR-6.00	53_42677.625F	11/3/2016 15:00	F	240		8.9	5.7
RBPR-6.00	53_42678.403F	11/4/2016 9:40	F	270	7.07	8.0	7.5
RBPR-6.00	53_42679.572F	11/5/2016 13:43	F	260	7.94	5.9	12.2
RBPR-6.00	53_42679.712F	11/5/2016 17:05	F	250	7.90	7.6	12.9
RBPR-6.00	53_42680.375F	11/6/2016 9:00	F	250	8.50	5.5	14.8
RBPR-6.00	53_42680.542F	11/6/2016 13:00	F	250	8.42	6.3	15.3
RBPR-6.00	53_42682.426F	11/8/2016 10:13	F	200	7.67	5.9	24.5
RBPR-6.00	53_42682.622F	11/8/2016 14:55	F	210	8.38	6.0	17.8
RBPR-6.00	53_42683F	11/9/2016	F	270	8.44	4.4	39.6
RBPR-6.00	53_42684.368F	11/10/2016 8:50	F	200	7.88	5.5	59.7
RBPR-6.00	53_42684.667F	11/10/2016 16:00	F	210	8.45	5.7	6.4
RBPR-6.00	53_42684.667FD	11/10/2016 16:00	FD	270	8.18	3.1	81.6
RBPR-6.00	53_42685.326F	11/11/2016 7:49	F	230	8.46	6.8	8.2
RBPR-6.00	53_42685.326FD	11/11/2016 7:49	FD	210	7.57	5.2	74.3
RBPR-6.00	53_42685.64F	11/11/2016 15:21	F				7.8
RBPR-6.00	53_42685.64FD	11/11/2016 15:21	FD	270	7.98	4.3	59.0
RBPR-6.00	53_42715.383F	12/11/2016 9:11	F	230	8.29	7.4	7.1
RBPR-6.00	53_42715.383FD	12/11/2016 9:11	FD	350	8.45	3.0	45.7
RBPR-6.00	53_42715.638F	12/11/2016 15:19	F	230		9.8	11.5
RBPR-6.00	53_42715.638FD	12/11/2016 15:19	FD	310	8.40	4.1	51.8
RBPR-6.00	53_42717.544F	12/13/2016 13:04	F	250	8.25	6.6	8.1
RBPR-6.00	53_42717.544FD	12/13/2016 13:04	FD	270	8.31	3.4	63.7
RBPR-6.00	53_42717.711F	12/13/2016 17:04	F	260	8.15	7.9	8.1

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-6.00	53_42717.711FD	12/13/2016 17:04	FD	270	8.33	4.0	44.2
RBPR-6.61	54-44146F	8/7/2016	F	250	7.42	13.6	8.6
RBPR-6.61	54-44117F	8/8/2016	F	240	7.47	13.1	7.1
RBPR-6.61	54-44198F	8/9/2016	F	270	7.42	13.4	5.8
RBPR-6.61	54-43842F	8/10/2016	F	230	7.45	13.9	5.3
RBPR-6.61	54-42595.594F	8/13/2016 14:15	F	180	7.30	14.0	6.7
RBPR-6.61	54-42596.633F	8/14/2016 15:12	F	210	8.08	14.7	7.3
RBPR-6.61	54-42597.481F	8/15/2016 11:32	F				5.9
RBPR-6.61	54-42597.63F	8/15/2016 15:07	F				5.7
RBPR-6.61	54-42598.39F	8/16/2016 9:22	F				5.2
RBPR-6.61	54-42598.6F	8/16/2016 14:21	F	210	7.68	13.8	5.2
RBPR-6.61	54-42599.412F	8/17/2016 9:53	F	200	7.82	12.1	3.5
RBPR-6.61	54-42599.631F	8/17/2016 15:08	F	200	7.68	13.6	3.4
RBPR-6.61	54-42600.457F	8/18/2016 10:58	F	200	7.70	13.0	7.4
RBPR-6.61	54-42600.576F	8/18/2016 13:50	F	200	7.78	14.5	5.4
RBPR-6.61	54-42601.125F	8/19/2016 3:00	F	200	7.54	14.0	2.9
RBPR-6.61	54-42601.34F	8/19/2016 8:10	F	190	8.32	14.5	6.6
RBPR-6.61	54-42602.382F	8/20/2016 9:10	F	230	8.33	13.5	3.6
RBPR-6.61	54-42602.642F	8/20/2016 15:25	F	230	8.43	17.7	3.5
RBPR-6.61	54-42603.349F	8/21/2016 8:23	F	190	8.20	13.0	3.7
RBPR-6.61	54-42603.611F	8/21/2016 14:40	F	200	8.21	14.6	4.5
RBPR-6.61	54-42604.365F	8/22/2016 8:45	F	190	8.13	15.7	4.4
RBPR-6.61	54-42604.566F	8/22/2016 13:35	F	210	8.30	15.7	4.6
RBPR-6.61	54-42605.347F	8/23/2016 8:20	F	200	8.18	11.8	5.0
RBPR-6.61	54-42605.623F	8/23/2016 14:57	F	180	8.21	17.3	4.7
RBPR-6.61	54-42606.354F	8/24/2016 8:30	F	220	7.92	13.8	4.5
RBPR-6.61	54-42606.59F	8/24/2016 14:10	F	160	7.99	22.6	4.0
RBPR-6.61	54-42607.351F	8/25/2016 8:25	F	190	8.01	14.9	4.7
RBPR-6.61	54-42607.649F	8/25/2016 15:35	F	240	7.03	19.2	4.3
RBPR-6.61	54-42608.372F	8/26/2016 8:55	F	200	7.37	12.8	3.9
RBPR-6.61	54-42608.599F	8/26/2016 14:23	F	190	8.06	16.1	3.8
RBPR-6.61	54-42609.646F	8/27/2016 15:30	F	210	7.90	11.6	81.9
RBPR-6.61	54-42610.583F	8/28/2016 13:59	F	230	7.72	11.2	70.0
RBPR-6.61	54-42611.569F	8/29/2016 13:39	F	200	7.75	11.6	33.6
RBPR-6.61	54-42611.701F	8/29/2016 16:50	F	200	8.14	12.1	33.2
RBPR-6.61	54-42612.347F	8/30/2016 8:20	F	200	7.92	11.1	38.8
RBPR-6.61	54-42612.667F	8/30/2016 16:00	F	210	8.22	11.4	43.0
RBPR-6.61	54-42613.49F	8/31/2016 11:45	F	210	8.90	11.6	61.0
RBPR-6.61	54-42613.684F	8/31/2016 16:25	F	220	8.70	11.5	73.9
RBPR-6.61	54-42614.542F	9/1/2016 13:00	F	220	7.40	11.0	101.5
RBPR-6.61	54-42614.59F	9/1/2016 14:10	F	230	7.80	11.2	98.3
RBPR-6.61	54-42615.361F	9/2/2016 8:40	F	220	8.30	11.2	110.7
RBPR-6.61	54-42615.583F	9/2/2016 14:00	F	220	8.20	11.7	113.3
RBPR-6.61	54-42616.365F	9/3/2016 8:45	F	218	8.50	10.5	105.7
RBPR-6.61	54-42616.457F	9/3/2016 10:58	F	240	8.20	11.2	18.3
RBPR-6.61	54-42616.486F	9/3/2016 11:40	F	220	8.00	11.1	23.3
RBPR-6.61	54-42616.526F	9/3/2016 12:38	F	220	8.10	11.2	53.7
RBPR-6.61	54-42616.569F	9/3/2016 13:40	F	229	8.50	10.9	40.7
RBPR-6.61	54-42617.476F	9/4/2016 11:25	F	220	8.60	10.7	99.3
RBPR-6.61	54-42618.337F	9/5/2016 8:05	F	210	8.19	11.8	103.0
RBPR-6.61	54-42618.507F	9/5/2016 12:10	F	200	7.99	11.9	97.0
RBPR-6.61	54-42619.385F	9/6/2016 9:15	F	230	8.12	11.1	76.7
RBPR-6.61	54-42619.486F	9/6/2016 11:40	F	230	8.11	11.9	87.4

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-6.61	54-42619.581F	9/6/2016 13:57	F	220	8.33	12.9	106.6
RBPR-6.61	54-42619.618F	9/6/2016 14:50	F	250	7.87	12.7	107.1
RBPR-6.61	54-42620.354F	9/7/2016 8:30	F	240	8.24	11.2	87.0
RBPR-6.61	54-42620.649F	9/7/2016 15:35	F	240	7.90	12.4	79.3
RBPR-6.61	54-42621.354F	9/8/2016 8:30	F	220	8.13	11.1	67.9
RBPR-6.61	54-42621.618F	9/8/2016 14:50	F	230	8.19	12.4	64.8
RBPR-6.61	54-42622.34F	9/9/2016 8:10	F	260	8.30	10.9	49.8
RBPR-6.61	54-42622.528F	9/9/2016 12:40	F	260	8.30	11.9	50.4
RBPR-6.61	54-42623.469F	9/10/2016 11:15	F	230	8.20	11.4	56.3
RBPR-6.61	54-42623.622F	9/10/2016 14:55	F	219	8.10	11.6	58.2
RBPR-6.61	54-42624.601F	9/11/2016 14:25	F	222	8.50	11.6	33.0
RBPR-6.61	54-42625.365F	9/12/2016 8:45	F	221	8.50	10.3	26.1
RBPR-6.61	54-42625.608F	9/12/2016 14:35	F	119	8.40	11.7	36.2
RBPR-6.61	54-42626.391F	9/13/2016 9:23	F	221	8.40	11.4	37.7
RBPR-6.61	54-42626.433F	9/13/2016 10:23	F	221	8.40	11.7	39.5
RBPR-6.61	54-42626.537F	9/13/2016 12:53	F	214	8.40	12.4	25.8
RBPR-6.61	54-42627.535F	9/14/2016 12:51	F	215	8.40	13.6	21.3
RBPR-6.61	54-42628.334F	9/15/2016 8:01	F	218	8.30	12.3	22.0
RBPR-6.61	54-42629.372F	9/16/2016 8:56	F	212	8.30	13.1	18.6
RBPR-6.61	54-42629.597F	9/16/2016 14:20	F	218	8.30	13.5	16.9
RBPR-6.61	54-42630.337F	9/17/2016 8:05	F	209	8.30	12.5	19.5
RBPR-6.61	54-42630.634F	9/17/2016 15:13	F	208	8.20	13.5	23.2
RBPR-6.61	54-42631.417F	9/18/2016 10:00	F	200	7.61	12.5	15.7
RBPR-6.61	54-42631.645F	9/18/2016 15:29	F	200	8.16	13.0	17.6
RBPR-6.61	54-42632.393F	9/19/2016 9:26	F	200	8.13	12.1	14.6
RBPR-6.61	54-42633.414F	9/20/2016 9:56	F	203	7.70	12.0	16.7
RBPR-6.61	54-42633.591F	9/20/2016 14:11	F	208	8.20	12.8	23.9
RBPR-6.61	54-42634.37F	9/21/2016 8:53	F	204	8.10	11.7	18.2
RBPR-6.61	54-42634.611F	9/21/2016 14:40	F	208	8.30	12.6	14.0
RBPR-6.61	54-42635.37F	9/22/2016 8:53	F	204	8.10	11.7	18.2
RBPR-6.61	54-42635.588F	9/22/2016 14:06	F	206	8.40	12.6	13.0
RBPR-6.61	54-42637.352F	9/24/2016 8:27	F	201	8.40	12.0	12.3
RBPR-6.61	54-42637.622F	9/24/2016 14:55	F	1250	8.10	12.6	11.8
RBPR-6.61	54-42638.351F	9/25/2016 8:26	F	201	8.20	11.9	10.3
RBPR-6.61	54-42638.597F	9/25/2016 14:20	F	241	8.30	12.3	11.2
RBPR-6.61	54-42639.353F	9/26/2016 8:29	F	202	8.30	12.6	10.9
RBPR-6.61	54-42639.574F	9/26/2016 13:46	F	205	8.20	13.1	10.4
RBPR-6.61	54-42640.651F	9/27/2016 15:37	F	190	8.40	11.5	9.5
RBPR-6.61	54-42641.381F	9/28/2016 9:08	F	220	8.14	11.2	7.8
RBPR-6.61	54-42641.611F	9/28/2016 14:40	F	220	8.25	12.1	8.1
RBPR-6.61	54-42642.387F	9/29/2016 9:17	F	200	8.04	7.5	6.8
RBPR-6.61	54-42642.59F	9/29/2016 14:10	F	190	8.54	9.0	9.7
RBPR-6.61	54-42643.358F	9/30/2016 8:35	F	210	8.40	8.3	16.2
RBPR-6.61	54-42643.613F	9/30/2016 14:42	F	220	8.30	11.0	7.0
RBPR-6.61	54-42644.378F	10/1/2016 9:05	F	220	8.24	9.3	10.2
RBPR-6.61	54-42644.613F	10/1/2016 14:43	F	190	8.38	8.5	11.1
RBPR-6.61	54-42645.444F	10/2/2016 10:39	F	110	8.25	8.5	10.8
RBPR-6.61	54-42645.635F	10/2/2016 15:15	F	200	8.31	10.5	8.0
RBPR-6.61	54-42646.543F	10/3/2016 13:02	F	200	8.29	9.6	10.5
RBPR-6.61	54-42647.514F	10/4/2016 12:20	F	200	8.28	9.1	12.4
RBPR-6.61	54-42647.656F	10/4/2016 15:45	F	210	8.25	9.5	7.5
RBPR-6.61	54-42648.566F	10/5/2016 13:35	F	210	8.31	8.2	8.1
RBPR-6.61	54-42648.646F	10/5/2016 15:30	F	250	8.53	8.9	8.0

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-6.61	54-42649.556F	10/6/2016 13:20	F	200	7.82	8.7	7.5
RBPR-6.61	54-42649.646F	10/6/2016 15:30	F	220	8.32	9.1	7.4
RBPR-6.61	54-42650.521F	10/7/2016 12:30	F	210	8.01	8.0	8.9
RBPR-6.61	54-42650.653F	10/7/2016 15:40	F	220	8.58	7.5	8.3
RBPR-6.61	54-42651.549F	10/8/2016 13:10	F	200	8.27	7.5	7.4
RBPR-6.61	54-42651.684F	10/8/2016 16:25	F	190	8.06	8.0	11.5
RBPR-6.61	54-42652.369F	10/9/2016 8:51	F	210	8.01	7.0	8.9
RBPR-6.61	54-42652.662F	10/9/2016 15:53	F	160	8.36	7.4	8.3
RBPR-6.61	54-42653.351F	10/10/2016 8:25	F	150	8.46	7.9	6.2
RBPR-6.61	54-42653.652F	10/10/2016 15:39	F	160	8.00	4.3	21.5
RBPR-6.61	54-42654.358F	10/11/2016 8:35	F	180	8.05	7.1	8.2
RBPR-6.61	54-42656.174F	10/13/2016 4:10	F	150	8.50	7.1	12.5
RBPR-6.61	54-42656.385F	10/13/2016 9:15	F	260	8.58	7.0	7.1
RBPR-6.61	54-42660.465F	10/17/2016 11:10	F	190	8.23	6.8	10.5
RBPR-6.61	54-42660.653F	10/17/2016 15:40	F	180	8.33	6.0	7.1
RBPR-6.61	54-42661.451F	10/18/2016 10:50	F	230	8.25	6.6	6.3
RBPR-6.61	54-42661.594F	10/18/2016 14:15	F	280	8.40	8.5	6.3
RBPR-6.61	54_42662.587F	10/19/2016 14:05	F	220	8.57	6.9	6.5
RBPR-6.61	54_42663.476F	10/20/2016 11:25	F	230	8.29	7.2	7.0
RBPR-6.61	54_42663.632F	10/20/2016 15:10	F	240	8.27	8.3	6.9
RBPR-6.61	54_42664.372F	10/21/2016 8:55	F	250	8.29	6.9	6.6
RBPR-6.61	54_42664.642F	10/21/2016 15:25	F	270	8.13	8.5	6.7
RBPR-6.61	54_42665.427F	10/22/2016 10:15	F	250	8.11	7.7	6.5
RBPR-6.61	54_42665.653F	10/22/2016 15:40	F	320	8.38	8.6	6.7
RBPR-6.61	54_42666.354F	10/23/2016 8:30	F	220	8.09	7.5	7.0
RBPR-6.61	54_42666.663F	10/23/2016 15:55	F	260	7.64	4.6	8.6
RBPR-6.61	54_42667.42F	10/24/2016 10:05	F	240	8.31	7.6	6.4
RBPR-6.61	54_42667.601F	10/24/2016 14:25	F	250	8.32	7.9	6.6
RBPR-6.61	54_42668.417F	10/25/2016 10:00	F	280	8.38	7.5	7.6
RBPR-6.61	54_42668.708F	10/25/2016 17:00	F	240	7.65	7.7	8.3
RBPR-6.61	54_42669.351F	10/26/2016 8:25	F	240	8.35	7.1	10.9
RBPR-6.61	54_42669.374F	10/26/2016 8:59	F	270	8.33	7.2	11.8
RBPR-6.61	54_42669.469F	10/26/2016 11:15	F	280	7.97	7.9	11.5
RBPR-6.61	54_42669.538F	10/26/2016 12:55	F	270	8.79	7.3	11.4
RBPR-6.61	54_42670.351F	10/27/2016 8:25	F	240	8.35	7.1	10.9
RBPR-6.61	54_42670.538F	10/27/2016 12:55	F	270	8.79	7.3	11.4
RBPR-6.61	54_42671.417F	10/28/2016 10:00	F	310	8.38	7.0	10.2
RBPR-6.61	54_42671.632F	10/28/2016 15:10	F	230	8.56	6.9	12.0
RBPR-6.61	54_42672.392F	10/29/2016 9:25	F	350	8.30	7.1	10.3
RBPR-6.61	54_42672.604F	10/29/2016 14:30	F	510	8.90	5.3	21.5
RBPR-6.61	54_42673.399F	10/30/2016 9:35	F	180	7.95	5.2	6.5
RBPR-6.61	54_42673.594F	10/30/2016 14:15	F	250	8.70	6.8	11.3
RBPR-6.61	54_42674.447F	10/31/2016 10:43	F	230	8.46	6.5	15.6
RBPR-6.61	54_42674.66F	10/31/2016 15:50	F	290	8.61	6.9	12.1
RBPR-6.61	54_42675.389F	11/1/2016 9:20	F	220	8.07	4.7	9.9
RBPR-6.61	54_42675.608F	11/1/2016 14:35	F	270	7.89	6.3	8.4
RBPR-6.61	54_42677.396F	11/3/2016 9:30	F	210		7.6	7.4
RBPR-6.61	54_42677.622F	11/3/2016 14:55	F	240		8.5	6.8
RBPR-6.61	54_42678.399F	11/4/2016 9:35	F	270	6.99	7.9	7.9
RBPR-6.61	54_42679.569F	11/5/2016 13:40	F	250	7.92	6.2	11.4
RBPR-6.61	54_42679.708F	11/5/2016 17:00	F	250	7.87	7.6	12.7
RBPR-6.61	54_42680.372F	11/6/2016 8:55	F	230	8.53	5.0	15.2
RBPR-6.61	54_42680.538F	11/6/2016 12:55	F	260	8.45	6.3	17.1

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-6.61	54_42682.424F	11/8/2016 10:11	F	210	7.67	5.9	13.6
RBPR-6.61	54_42682.618F	11/8/2016 14:50	F	210	8.27	6.0	17.5
RBPR-6.61	54_42683F	11/9/2016	F	260	8.44	4.5	34.5
RBPR-6.61	54_42684.363F	11/10/2016 8:42	F	200	7.86	5.6	56.2
RBPR-6.61	54_42684.669F	11/10/2016 16:03	F	210	8.50	6.0	5.5
RBPR-6.61	54_42684.669FD	11/10/2016 16:03	FD	250	8.23	3.4	68.5
RBPR-6.61	54_42685.323F	11/11/2016 7:45	F	220	8.57	6.9	6.5
RBPR-6.61	54_42685.323FD	11/11/2016 7:45	FD	210	7.56	5.6	61.4
RBPR-6.61	54_42685.637F	11/11/2016 15:17	F				35.1
RBPR-6.61	54_42685.637FD	11/11/2016 15:17	FD	270	7.87	4.6	61.8
RBPR-6.61	54_42715.386F	12/11/2016 9:16	F	260	8.30	8.1	9.9
RBPR-6.61	54_42715.386FD	12/11/2016 9:16	FD	320	8.43	3.7	50.5
RBPR-6.61	54_42715.641F	12/11/2016 15:23	F	250		9.9	15.8
RBPR-6.61	54_42715.641FD	12/11/2016 15:23	FD	270	8.37	4.0	51.3
RBPR-6.61	54_42717.547F	12/13/2016 13:07	F	250	8.29	6.9	6.6
RBPR-6.61	54_42717.547FD	12/13/2016 13:07	FD	270	8.30	3.6	55.2
RBPR-6.61	54_42717.713F	12/13/2016 17:07	F	270	8.13	8.5	6.7
RBPR-6.61	54_42717.713FD	12/13/2016 17:07	FD	270	8.29	3.8	49.3
RBPR-6.90	56-42593.494F	8/11/2016 11:52	F		7.48	13.3	4.7
RBPR-6.90	RPR-6.90-42593.494F	8/11/2016 11:52	F		7.48	13.3	4.7
RBPR-6.90	56-42594.58F	8/12/2016 13:55	F	270	6.55	13.1	3.9
RBPR-6.90	56-42595.444F	8/13/2016 10:40	F	190	7.50	12.5	5.9
RBPR-6.90	56-42596.646F	8/14/2016 15:30	F	210	8.14	14.4	6.8
RBPR-6.90	RPR-6.90-42601.333F	8/19/2016 7:59	F	190	7.76	12.6	3.6
RBPR-6.90	56-42616.424F	9/3/2016 10:10	F	218	8.30	10.2	97.8
RBPR-6.90	56-42616.681F	9/3/2016 16:20	F	226	8.30	10.2	105.1
RBPR-6.90	RPR-6.90-42617.485F	9/4/2016 11:38	F		8.10	10.1	52.3
RBPR-6.90	56-42617.486F	9/4/2016 11:40	F	233	8.40	10.6	118.7
RBPR-6.90	56-42618.34F	9/5/2016 8:10	F	200	8.18	11.5	96.5
RBPR-6.90	56-42619.625F	9/6/2016 15:00	F	230	8.10	12.7	101.6
RBPR-6.90	56-42620.635F	9/7/2016 15:15	F	240	7.77	12.7	80.5
RBPR-6.90	56-42621.361F	9/8/2016 8:40	F	230	8.18	11.1	65.2
RBPR-6.90	56-42622.538F	9/9/2016 12:55	F	250	8.20	11.7	50.2
RBPR-6.90	56-42623.479F	9/10/2016 11:30	F	228	8.00	11.3	51.2
RBPR-6.90	56-42624.615F	9/11/2016 14:45	F	224	8.20	11.3	33.3
RBPR-6.90	RPR-6.90-42625.356F	9/12/2016 8:32	F		7.30	10.1	25.8
RBPR-6.90	56-42625.39F	9/12/2016 9:21	F	240	8.40	10.0	19.4
RBPR-6.90	56-42626.549F	9/13/2016 13:10	F	217	8.30	12.5	24.9
RBPR-6.90	56-42627.55F	9/14/2016 13:12	F	210	8.40	13.2	20.4
RBPR-6.90	56-42628.342F	9/15/2016 8:13	F	213	8.20	12.2	21.3
RBPR-6.90	56-42629.384F	9/16/2016 9:13	F	212	8.30	13.0	18.8
RBPR-6.90	56-42630.345F	9/17/2016 8:17	F	207	8.10	12.5	17.6
RBPR-6.90	56-42630.578F	9/17/2016 13:52	F	208	8.30	14.2	17.8
RBPR-6.90	RPR-6.90-42630.578F	9/17/2016 13:52	F		8.00	14.0	17.8
RBPR-6.90	56-42631.653F	9/18/2016 15:41	F	200	8.12	13.2	15.6
RBPR-6.90	56-42632.403F	9/19/2016 9:40	F	190	8.12	12.1	13.5
RBPR-6.90	56-42633.42F	9/20/2016 10:05	F	201	7.80	12.1	16.7
RBPR-6.90	56-42634.376F	9/21/2016 9:02	F	202	8.30	11.8	16.2
RBPR-6.90	56-42635.376F	9/22/2016 9:02	F	202	8.30	11.8	16.2
RBPR-6.90	56-42637.358F	9/24/2016 8:36	F	200	8.30	12.1	10.3
RBPR-6.90	56-42638.361F	9/25/2016 8:40	F	199	8.00	12.0	9.7
RBPR-6.90	56-42639.585F	9/26/2016 14:02	F	203	8.20	13.4	8.8
RBPR-6.90	RPR-6.90-42639.654F	9/26/2016 15:42	F		8.30	11.0	8.0

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-6.90	56-42640.654F	9/27/2016 15:42	F	201	8.30	11.0	8.0
RBPR-6.90	56-42641.385F	9/28/2016 9:15	F	220	8.06	11.0	7.0
RBPR-6.90	56-42642.388F	9/29/2016 9:19	F	190	8.34	9.0	6.0
RBPR-6.90	56-42642.594F	9/29/2016 14:15	F	220	8.51	11.6	7.3
RBPR-6.90	56-42643.36F	9/30/2016 8:39	F	210	8.35	11.5	8.5
RBPR-6.90	56-42644.38F	10/1/2016 9:07	F	210	8.27	11.5	8.8
RBPR-6.90	56-42645.445F	10/2/2016 10:41	F	220	8.35	8.4	10.2
RBPR-6.90	56-42646.545F	10/3/2016 13:05	F	200	8.32	9.7	10.5
RBPR-6.90	56-42647.513F	10/4/2016 12:18	F	200	8.28	9.3	11.3
RBPR-6.90	RPR-6.90-42648.498F	10/5/2016 11:57	F			9.5	8.2
RBPR-6.90	56-42648.563F	10/5/2016 13:30	F	210	8.35	9.0	7.6
RBPR-6.90	56-42649.552F	10/6/2016 13:15	F	200	7.78	8.7	7.5
RBPR-6.90	56-42650.538F	10/7/2016 12:55	F	200	7.95	7.1	6.9
RBPR-6.90	56-42651.545F	10/8/2016 13:05	F	200	8.31	7.6	6.9
RBPR-6.90	56-42652.37F	10/9/2016 8:53	F	200	7.95	7.0	6.9
RBPR-6.90	56-42653.356F	10/10/2016 8:33	F	150	8.40	8.0	6.5
RBPR-6.90	56-42654.361F	10/11/2016 8:40	F	190	8.08	7.1	11.7
RBPR-6.90	RPR-6.90-42655.669F	10/12/2016 16:04	F			8.1	7.5
RBPR-6.90	56-42660.469F	10/17/2016 11:15	F	190	8.21	7.2	9.0
RBPR-6.90	56-42661.448F	10/18/2016 10:45	F	250	8.24	6.7	6.1
RBPR-6.90	55_42662.413F	10/19/2016 9:54	F			5.7	6.4
RBPR-6.90	55_42662.413FD	10/19/2016 9:54	FD	210	8.45	5.7	6.4
RBPR-6.90	55_42662.585F	10/19/2016 14:03	F	250	8.47	7.0	6.7
RBPR-6.90	55_42662.833F	10/19/2016 20:00	F				7.8
RBPR-6.90	55_42662.958F	10/19/2016 23:00	F				7.8
RBPR-6.90	55_42663.472F	10/20/2016 11:20	F	230	8.29	7.4	7.1
RBPR-6.90	55_42663.568F	10/20/2016 13:38	F	230		9.8	11.5
RBPR-6.90	55_42664.368F	10/21/2016 8:50	F	260	8.29	6.9	6.5
RBPR-6.90	55_42664.609F	10/21/2016 14:37	F			8.0	7.7
RBPR-6.90	55_42665.424F	10/22/2016 10:10	F	260	8.12	8.0	7.7
RBPR-6.90	55_42666.351F	10/23/2016 8:25	F	250	8.12	7.8	6.7
RBPR-6.90	55_42667.417F	10/24/2016 10:00	F	250	8.27	7.9	6.6
RBPR-6.90	55_42668F	10/25/2016	F	280	8.43	7.7	7.1
RBPR-6.90	55_42669.347F	10/26/2016 8:20	F	250	8.34	7.1	10.6
RBPR-6.90	55_42669.372F	10/26/2016 8:56	F	240	8.29	6.9	10.9
RBPR-6.90	55_42669.373F	10/26/2016 8:57	F			7.1	10.9
RBPR-6.90	55_42670.347F	10/27/2016 8:20	F	250	8.34	7.1	10.6
RBPR-6.90	55_42671.41F	10/28/2016 9:50	F	310	8.43	7.1	9.6
RBPR-6.90	55_42671.413F	10/28/2016 9:55	F	310	8.43	7.1	9.6
RBPR-6.90	55_42672.389F	10/29/2016 9:20	F	350	8.53	7.2	10.5
RBPR-6.90	55_42673.403F	10/30/2016 9:40	F	190	7.98	5.3	5.5
RBPR-6.90	55_42673.403FD	10/30/2016 9:40	FD	190	7.98	5.3	5.5
RBPR-6.90	55_42673.594F	10/30/2016 14:15	F	250	8.70	6.8	11.3
RBPR-6.90	55_42674.444F	10/31/2016 10:40	F	220	8.48	6.6	12.7
RBPR-6.90	55_42674.444FD	10/31/2016 10:40	FD	220	8.48	6.6	12.7
RBPR-6.90	55_42675.392F	11/1/2016 9:25	F	220	8.03	1.1	23.4
RBPR-6.90	55_42675.392FD	11/1/2016 9:25	FD	290	8.03	1.1	23.4
RBPR-6.90	55_42675.613F	11/1/2016 14:42	F			2.9	24.4
RBPR-6.90	55_42677.392F	11/3/2016 9:25	F	220		7.4	8.4
RBPR-6.90	55_42677.392FD	11/3/2016 9:25	FD	220		7.4	8.4
RBPR-6.90	55_42678.396F	11/4/2016 9:30	F	290	7.05	8.1	8.0
RBPR-6.90	55_42678.396FD	11/4/2016 9:30	FD	270	7.05	8.1	8.0
RBPR-6.90	55_42679.566F	11/5/2016 13:35	F	250	6.30	6.3	12.1

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBPR-6.90	55_42680.368F	11/6/2016 8:50	F	310	8.65	5.9	14.6
RBPR-6.90	55_42680.368FD	11/6/2016 8:50	FD	310	8.65	5.9	14.6
RBPR-6.90	55_42682.423F	11/8/2016 10:09	F	220	7.67	6.5	13.6
RBPR-6.90	55_42682.423FD	11/8/2016 10:09	FD	220	7.67	6.5	13.6
RBPR-6.90	55_42683F	11/9/2016	F	260	8.41	4.8	36.8
RBPR-6.90	55_42683.504F	11/9/2016 12:06	F	240	8.39	6.6	25.5
RBPR-6.90	55_42684.359F	11/10/2016 8:37	F	200	7.96	4.1	51.5
RBPR-6.90	55_42684.361F	11/10/2016 8:40	F	200	7.96	4.1	51.5
RBPR-6.90	55_42685.322F	11/11/2016 7:43	F	200	7.51	5.3	72.3
RBPR-6.90	55_42685.322FD	11/11/2016 7:43	FD	250	8.47	7.0	6.7
RBPR-6.90	55_42685.633F	11/11/2016 15:12	F	290	8.22	3.9	21.1
RBPR-6.90	55_42685.633FD	11/11/2016 15:12	FD	280	8.32	8.4	62.5
RBPR-6.90	55_42715.388F	12/11/2016 9:19	F	280	8.29	8.3	21.4
RBPR-6.90	55_42715.388FD	12/11/2016 9:19	FD	280	8.41	3.8	47.5
RBPR-6.90	55_42715.644F	12/11/2016 15:27	F			8.0	7.7
RBPR-6.90	55_42715.644FD	12/11/2016 15:27	FD	270	8.35	3.9	49.2
RBPR-6.90	55_42717.548F	12/13/2016 13:09	F	260	8.29	6.9	6.5
RBPR-6.90	55_42717.548FD	12/13/2016 13:09	FD	290	8.29	3.6	48.6
RBPR-6.90	55_42717.715F	12/13/2016 17:09	F	330	8.01	3.9	23.1
RBPR-6.90	55_42717.715FD	12/13/2016 17:09	FD	270	8.34	3.9	49.9
RBPR-7.10	56_42671.625F	10/28/2016 15:00	F	208	8.20	12.8	23.9
RBPR-7.10	56_42671.625FD	10/28/2016 15:00	FD	350	8.56	7.0	13.6
RBPR-7.10	56_42673.405F	10/30/2016 9:43	F	210	7.98	5.5	5.5
RBPR-7.10	56_42673.59F	10/30/2016 14:10	F	440	8.77	8.0	11.5
RBPR-7.10	56_42674.441F	10/31/2016 10:35	F	250	8.41	6.9	13.1
RBPR-7.10	56_42674.646F	10/31/2016 15:30	F	330	8.56	3.9	14.1
RBPR-7.10	56_42675.399F	11/1/2016 9:35	F	210	8.08	5.9	6.4
RBPR-7.10	56_42677.385F	11/3/2016 9:15	F	280		7.7	6.3
RBPR-7.10	56_42677.618F	11/3/2016 14:50	F	260		8.7	6.8
RBPR-7.10	56_42678.389F	11/4/2016 9:20	F	300	6.98	8.4	8.3
RBPR-7.10	56_42678.604F	11/4/2016 14:30	F	310		8.2	7.4
RBPR-7.10	56_42679.705F	11/5/2016 16:55	F	310	7.37	8.2	12.5
RBPR-7.10	56_42680.361F	11/6/2016 8:40	F	350	8.75	6.0	13.7
RBPR-7.10	56_42680.528F	11/6/2016 12:40	F	300	8.53	7.6	17.4
RBPR-7.10	56_42682.417F	11/8/2016 10:00	F	220	7.62	5.9	13.6
RBPR-7.10	56_42682.615F	11/8/2016 14:45	F	240	8.18	5.9	16.7
RBPR-7.10	56_42683.502F	11/9/2016 12:03	F	240	8.43	7.0	24.2
RBPR-7.10	56_42684.354F	11/10/2016 8:30	F	200	7.90	4.1	48.4
RBPR-7.10	56_42685.322F	11/11/2016 7:44	F	200	7.66	4.8	63.1
RBSC-DS	59-42567.337F	7/16/2016 8:05	F			12.6	
RBSC-DS	59-42572.417F	7/21/2016 10:00	F		7.30	8.8	7.0
RBSC-DS	59-42572.594F	7/21/2016 14:15	F		7.60	16.8	25.1
RBSC-DS	59-42573.49F	7/22/2016 11:45	F		7.47	17.4	13.2
RBSC-DS	59-42574.302F	7/23/2016 7:15	F		7.47	13.2	6.7
RBSC-DS	59-42575.285F	7/24/2016 6:50	F		7.20	12.6	10.7
RBSC-DS	59-42575.427F	7/24/2016 10:15	F		7.67	13.9	6.4
RBSC-DS	59-42575.583F	7/24/2016 14:00	F		8.11	20.7	5.3
RBSC-DS	59-42576.354F	7/25/2016 8:30	F		7.90	19.0	3.0
RBSC-DS	59-42576.583F	7/25/2016 14:00	F		7.74	20.3	3.5
RBSC-DS	59-42577.281F	7/26/2016 6:45	F		7.48	10.4	3.4
RBSC-DS	59-42577.438F	7/26/2016 10:30	F		7.76	20.0	6.3
RBSC-DS	59-42578.375F	7/27/2016 9:00	F		7.70	12.8	2.5
RBSC-DS	59-42578.625F	7/27/2016 15:00	F		8.04	23.2	2.7

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-DS	59-42579.375F	7/28/2016 9:00	F		7.73	15.0	1.9
RBSC-DS	59-42580.354F	7/29/2016 8:30	F		7.47	13.0	3.0
RBSC-DS	59-42580.479F	7/29/2016 11:30	F		7.73	19.3	2.2
RBSC-DS	59-42580.625F	7/29/2016 15:00	F		7.87	21.1	2.4
RBSC-DS	59-42581.396F	7/30/2016 9:30	F		7.49	14.5	2.0
RBSC-DS	59-42581.521F	7/30/2016 12:30	F		7.92	18.9	2.2
RBSC-DS	59-42582.375F	7/31/2016 9:00	F		7.58	12.5	3.4
RBSC-DS	59-42583.333F	8/1/2016 8:00	F		7.67	11.9	2.2
RBSC-DS	59-42583.5F	8/1/2016 12:00	F		7.74	20.5	3.0
RBSC-DS	59-42584.365F	8/2/2016 8:45	F		7.64	13.3	2.3
RBSC-DS	59-42584.604F	8/2/2016 14:30	F		7.83	22.0	2.2
RBSC-DS	59-42585.333F	8/3/2016 8:00	F		7.81	13.7	4.6
RBSC-DS	59-42585.479F	8/3/2016 11:30	F		7.78	19.2	5.0
RBSC-DS	59-42586.333F	8/4/2016 8:00	F		7.71	16.6	3.1
RBSC-DS	59-42587.333F	8/5/2016 8:00	F		7.38	15.4	5.3
RBSC-DS	59-42587.479F	8/5/2016 11:30	F		7.53	25.0	3.0
RBSC-DS	59-42587.583F	8/5/2016 14:00	F		7.62	23.1	3.2
RBSC-DS	59-42588.333F	8/6/2016 8:00	F		7.54	16.2	2.8
RBSC-DS	59-42588.604F	8/6/2016 14:30	F		7.76	20.9	3.5
RBSC-DS	59-42589.375F	8/7/2016 9:00	F		7.49	16.2	2.1
RBSC-DS	59-42589.5F	8/7/2016 12:00	F		7.55	16.4	7.8
RBSC-DS	59-42589.663F	8/7/2016 15:55	F		7.62	16.2	6.0
RBSC-DS	59-42590.354F	8/8/2016 8:30	F		6.82	14.9	44.6
RBSC-DS	59-42590.49F	8/8/2016 11:45	F		7.24	17.5	3.3
RBSC-DS	59-42591.417F	8/9/2016 10:00	F		7.64	14.8	21.6
RBSC-DS	59-42591.521F	8/9/2016 12:30	F		7.52	19.7	7.0
RBSC-DS	59-42592.417F	8/10/2016 10:00	F		7.21	17.0	17.9
RBSC-DS	59-42592.521F	8/10/2016 12:30	F		7.00	22.5	4.0
RBSC-DS	59-42592.604F	8/10/2016 14:30	F		7.50	21.5	8.6
RBSC-DS	59-42593.417F	8/11/2016 10:00	F		7.16	17.0	23.8
RBSC-DS	59-42593.521F	8/11/2016 12:30	F		7.33	26.3	7.1
RBSC-DS	59-42595.542F	8/13/2016 13:00	F		7.10	23.3	4.2
RBSC-DS	59-42596.5F	8/14/2016 12:00	F		7.67	23.9	10.7
RBSC-DS	59-42599.375F	8/17/2016 9:00	F		7.34	14.4	4.9
RBSC-DS	59-42600.646F	8/18/2016 15:30	F		7.59	21.2	4.3
RBSC-DS	59-42601.344F	8/19/2016 8:15	F		7.72	15.4	3.1
RBSC-DS	59-42602.389F	8/20/2016 9:20	F		8.07	20.1	9.5
RBSC-DS	59-42603.365F	8/21/2016 8:45	F		7.47	15.9	26.9
RBSC-DS	59-42603.667F	8/21/2016 16:00	F				5.6
RBSC-DS	59-42604.389F	8/22/2016 9:20	F		7.93	16.8	4.5
RBSC-DS	59-42605.365F	8/23/2016 8:45	F		7.62	13.1	15.6
RBSC-DS	59-42605.635F	8/23/2016 15:15	F		7.25	27.3	4.4
RBSC-DS	59-42606.321F	8/24/2016 7:42	F		7.03	14.9	3.2
RBSC-DS	59-42607.361F	8/25/2016 8:40	F		7.81	15.3	3.4
RBSC-DS	59-42608.396F	8/26/2016 9:30	F		7.04	14.3	6.8
RBSC-DS	59-42609.646F	8/27/2016 15:30	F		7.47	14.5	13.6
RBSC-DS	59-42610.594F	8/28/2016 14:15	F		7.38	13.2	37.6
RBSC-DS	59-42611.603F	8/29/2016 14:29	F		7.49	0.5	6.3
RBSC-DS	59-42612.382F	8/30/2016 9:10	F		7.45	12.2	6.4
RBSC-DS	59-42613.5F	8/31/2016 12:00	F		8.30	11.3	3.8
RBSC-DS	59-42615.417F	9/2/2016 10:00	F		7.90	11.0	2.9
RBSC-DS	59-42616.563F	9/3/2016 13:30	F		8.00	12.2	4.1
RBSC-DS	59-42618.438F	9/5/2016 10:30	F		7.28	14.1	3.7

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-DS	59-42619.417F	9/6/2016 10:00	F		7.72	10.5	2.4
RBSC-DS	59-42620.396F	9/7/2016 9:30	F		7.59	9.7	2.4
RBSC-DS	59-42620.833F	9/7/2016 20:00	F		8.10	11.5	19.3
RBSC-DS	59-42621.326F	9/8/2016 7:50	F		7.49	9.0	1.7
RBSC-DS	59-42621.833F	9/8/2016 20:00	F		8.00	10.5	10.0
RBSC-DS	59-42622.573F	9/9/2016 13:45	F		8.20	12.8	2.3
RBSC-DS	59-42622.813F	9/9/2016 19:30	F		8.30	12.3	8.5
RBSC-DS	59-42623.396F	9/10/2016 9:30	F		7.90	10.7	2.5
RBSC-DS	59-42623.844F	9/10/2016 20:15	F		8.10	12.7	4.7
RBSC-DS	59-42624.375F	9/11/2016 9:00	F		7.80	8.6	2.5
RBSC-DS	59-42624.844F	9/11/2016 20:15	F		8.10	10.0	4.6
RBSC-DS	59-42625.377F	9/12/2016 9:03	F		7.80	7.8	2.1
RBSC-DS	59-42625.823F	9/12/2016 19:45	F		7.90	15.0	10.0
RBSC-DS	59-42626.566F	9/13/2016 13:35	F		8.20	18.2	27.2
RBSC-DS	59-42626.769F	9/13/2016 18:27	F		8.10	15.7	5.6
RBSC-DS	59-42627.401F	9/14/2016 9:38	F		7.70	11.8	6.9
RBSC-DS	59-42627.757F	9/14/2016 18:10	F		8.10	15.7	5.7
RBSC-DS	59-42628.359F	9/15/2016 8:37	F		8.10	9.1	2.7
RBSC-DS	59-42628.813F	9/15/2016 19:30	F		8.10	13.7	10.6
RBSC-DS	59-42629.469F	9/16/2016 11:16	F		8.00	12.3	2.7
RBSC-DS	59-42629.76F	9/16/2016 18:15	F		8.10	14.5	5.6
RBSC-DS	59-42630.399F	9/17/2016 9:34	F		8.00	11.0	5.8
RBSC-DS	59-42630.74F	9/17/2016 17:45	F		8.10	11.7	8.8
RBSC-DS	59-42631.427F	9/18/2016 10:15	F		7.39	11.7	7.2
RBSC-DS	59-42631.75F	9/18/2016 18:00	F		8.00	10.1	5.0
RBSC-DS	59-42632.415F	9/19/2016 9:58	F		7.66	11.1	1.6
RBSC-DS	59-42632.767F	9/19/2016 18:25	F		8.50	11.7	4.2
RBSC-DS	59-42633.431F	9/20/2016 10:20	F		7.60	9.6	3.4
RBSC-DS	59-42633.625F	9/20/2016 15:00	F		8.10	15.8	2.6
RBSC-DS	59-42634.391F	9/21/2016 9:23	F		7.70	8.9	2.9
RBSC-DS	59-42634.635F	9/21/2016 15:15	F		7.80	16.8	3.6
RBSC-DS	59-42635.402F	9/22/2016 9:39	F		8.10	8.8	4.6
RBSC-DS	59-42635.625F	9/22/2016 15:00	F		8.00	16.0	3.6
RBSC-DS	59-42636.517F	9/23/2016 12:25	F		8.00	11.8	2.8
RBSC-DS	59-42636.819F	9/23/2016 19:40	F		8.20	12.6	3.7
RBSC-DS	59-42637.37F	9/24/2016 8:53	F		7.80	8.8	5.1
RBSC-DS	59-42637.705F	9/24/2016 16:55	F		8.10	13.5	5.4
RBSC-DS	59-42638.372F	9/25/2016 8:55	F		7.60	8.4	4.9
RBSC-DS	59-42638.767F	9/25/2016 18:25	F		7.80	13.8	3.0
RBSC-DS	59-42639.367F	9/26/2016 8:48	F		7.60	9.6	5.6
RBSC-DS	59-42639.813F	9/26/2016 19:30	F		8.00	14.0	4.1
RBSC-DS	59-42640.708F	9/27/2016 17:00	F		7.69	10.0	4.1
RBSC-DS	59-42641.392F	9/28/2016 9:25	F		7.81	11.2	3.1
RBSC-DS	59-42641.813F	9/28/2016 19:30	F		7.98	9.8	3.6
RBSC-DS	59-42642.767F	9/29/2016 18:25	F		7.95	10.4	4.4
RBSC-DS	59-42643.417F	9/30/2016 10:00	F		7.92	8.7	4.4
RBSC-DS	59-42643.826F	9/30/2016 19:50	F		7.44	8.1	4.1
RBSC-DS	59-42644.806F	10/1/2016 19:20	F		8.06	6.3	3.8
RBSC-DS	59-42645.416F	10/2/2016 9:59	F		8.31	7.8	7.6
RBSC-DS	59-42645.771F	10/2/2016 18:30	F		7.81	8.3	2.9
RBSC-DS	59-42646.785F	10/3/2016 18:50	F		7.81	7.1	2.4
RBSC-DS	59-42647.564F	10/4/2016 13:32	F		7.84	7.0	2.6
RBSC-DS	59-42648.833F	10/5/2016 20:00	F		7.62	7.0	2.0

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-DS	59-42649.691F	10/6/2016 16:35	F		7.72	7.2	2.3
RBSC-DS	59-42650.549F	10/7/2016 13:10	F		7.46	5.1	2.1
RBSC-DS	59-42651.531F	10/8/2016 12:45	F		7.84	6.5	2.1
RBSC-DS	59-42651.726F	10/8/2016 17:25	F				2.2
RBSC-DS	59-42652.75F	10/9/2016 18:00	F		7.79	6.6	2.7
RBSC-DS	59-42656.344F	10/13/2016 8:15	F		8.37	1.8	4.1
RBSC-DS	59-42658.507F	10/15/2016 12:10	F		8.00	0.3	10.8
RBSC-DS	59-42660.389F	10/17/2016 9:20	F		7.68	2.5	3.6
RBSC-DS	59-42661.441F	10/18/2016 10:35	F		7.88	5.5	15.1
RBSC-DS	59_42662.486F	10/19/2016 11:40	F		7.46	4.2	14.7
RBSC-DS	59_42663.354F	10/20/2016 8:30	F		7.79	3.9	2.4
RBSC-DS	59_42664.418F	10/21/2016 10:02	F		8.38	6.8	2.1
RBSC-DS	59_42664.863F	10/21/2016 20:43	F		7.93	6.9	3.4
RBSC-DS	59_42665.458F	10/22/2016 11:00	F		7.40	6.9	3.2
RBSC-DS	59_42665.858F	10/22/2016 20:35	F		7.75	6.5	4.0
RBSC-DS	59_42666.385F	10/23/2016 9:15	F		7.38	2.7	3.4
RBSC-DS	59_42666.83F	10/23/2016 19:55	F		7.94	6.4	3.4
RBSC-DS	59_42667.34F	10/24/2016 8:10	F		7.72	4.8	1.9
RBSC-DS	59_42667.892F	10/24/2016 21:25	F		7.99	5.7	3.3
RBSC-DS	59_42668.514F	10/25/2016 12:20	F		7.87	4.9	2.4
RBSC-DS	59_42668.927F	10/25/2016 22:15	F		7.95	4.7	5.2
RBSC-DS	59_42669.368F	10/26/2016 8:50	F		7.81	4.2	4.4
RBSC-DS	59_42669.878F	10/26/2016 21:05	F		7.90	4.4	4.7
RBSC-DS	59_42670.319F	10/27/2016 7:40	F		8.06	4.0	6.9
RBSC-DS	59_42670.901F	10/27/2016 21:38	F		8.17	4.2	5.0
RBSC-DS	59_42671.392F	10/28/2016 9:25	F		8.09	5.6	2.7
RBSC-DS	59_42671.866F	10/28/2016 20:47	F		8.11	4.1	5.6
RBSC-DS	59_42672.507F	10/29/2016 12:10	F		8.15	5.5	3.6
RBSC-DS	59_42672.901F	10/29/2016 21:38	F		8.11	4.0	4.2
RBSC-DS	59_42673.441F	10/30/2016 10:35	F		8.43	5.3	3.3
RBSC-DS	59_42673.876F	10/30/2016 21:01	F		8.08	4.5	3.9
RBSC-DS	59_42674.354F	10/31/2016 8:30	F		8.18	3.6	3.5
RBSC-DS	59_42674.8479999999F	10/31/2016 20:21	F		8.08	4.5	3.9
RBSC-DS	59_42675.569F	11/1/2016 13:40	F		7.69	1.4	3.6
RBSC-DS	59_42675.85F	11/1/2016 20:24	F		8.12	3.3	4.6
RBSC-DS	59_42676.382F	11/2/2016 9:10	F		7.75	1.6	13.5
RBSC-DS	59_42676.876F	11/2/2016 21:02	F		7.83	3.9	5.8
RBSC-DS	59_42677.587F	11/3/2016 14:05	F		7.86	4.9	11.0
RBSC-DS	59_42677.91F	11/3/2016 21:51	F		7.83	3.9	5.8
RBSC-DS	59_42678.444F	11/4/2016 10:40	F		7.43	3.3	2.8
RBSC-DS	59_42678.895F	11/4/2016 21:29	F		7.76	4.7	5.9
RBSC-DS	59_42679.846F	11/5/2016 20:18	F		7.81	4.5	4.6
RBSC-DS	59_42680.406F	11/6/2016 9:45	F		8.03	3.4	2.2
RBSC-DS	59_42680.885F	11/6/2016 21:15	F		7.81	4.5	4.6
RBSC-DS	59_42681.479F	11/7/2016 11:30	F		7.99	4.3	4.4
RBSC-DS	59_42681.851F	11/7/2016 20:25	F		7.89	3.5	3.8
RBSC-DS	59_42684.604F	11/10/2016 14:30	F		7.83	4.7	3.5
RBSC-DS	59_42685.302F	11/11/2016 7:15	F		7.15	1.0	13.5
RBSC-DS	59_42686.239F	11/12/2016 5:44	F		7.97	2.0	1.4
RBSC-DS	59_42686.948F	11/12/2016 22:45	F		7.65	5.5	1.6
RBSC-DS	59_42687.198F	11/13/2016 4:45	F		8.10	4.8	1.9
RBSC-DS	59_42687.908F	11/13/2016 21:47	F		7.02	2.3	1.0
RBSC-DS	59-42718.406F	12/14/2016 9:45	F	310	6.86	3.5	1.6

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-MS	60-42570.625F	7/19/2016 15:00	F		7.80	10.9	12.4
RBSC-MS	60-42571F	7/20/2016	F		7.40	10.9	14.4
RBSC-MS	60-42572.417F	7/21/2016 10:00	F		7.30		14.4
RBSC-MS	60-42572.594F	7/21/2016 14:15	F				1455.0
RBSC-MS	60-42573.323F	7/22/2016 7:45	F		7.10	12.4	15.8
RBSC-MS	60-42573.49F	7/22/2016 11:45	F		7.49	16.6	14.1
RBSC-MS	60-42574.302F	7/23/2016 7:15	F		7.78	12.2	14.7
RBSC-MS	60-42575.285F	7/24/2016 6:50	F		7.10	10.2	15.6
RBSC-MS	60-42575.427F	7/24/2016 10:15	F		7.45	12.0	18.5
RBSC-MS	60-42575.583F	7/24/2016 14:00	F		7.42	13.8	7.6
RBSC-MS	60-42576.271F	7/25/2016 6:30	F		7.30	10.2	15.7
RBSC-MS	60-42576.354F	7/25/2016 8:30	F		7.52	16.2	14.6
RBSC-MS	60-42576.583F	7/25/2016 14:00	F		7.76	17.7	15.8
RBSC-MS	60-42577.281F	7/26/2016 6:45	F		7.79	12.2	12.9
RBSC-MS	60-42577.438F	7/26/2016 10:30	F		7.75	14.6	25.1
RBSC-MS	60-42577.594F	7/26/2016 14:15	F		7.71	15.4	21.9
RBSC-MS	60-42578.375F	7/27/2016 9:00	F		7.87	13.9	9.3
RBSC-MS	60-42578.479F	7/27/2016 11:30	F		7.77	13.4	8.7
RBSC-MS	60-42578.625F	7/27/2016 15:00	F		7.81	15.8	10.1
RBSC-MS	60-42579.375F	7/28/2016 9:00	F		7.89	13.4	9.5
RBSC-MS	60-42579.583F	7/28/2016 14:00	F		7.77	16.9	8.6
RBSC-MS	60-42580.354F	7/29/2016 8:30	F		7.81	12.0	6.4
RBSC-MS	60-42580.479F	7/29/2016 11:30	F		7.65	15.9	7.8
RBSC-MS	60-42580.625F	7/29/2016 15:00	F		7.56	16.9	6.6
RBSC-MS	60-42581.396F	7/30/2016 9:30	F		7.66	13.0	6.0
RBSC-MS	60-42581.521F	7/30/2016 12:30	F		7.90	13.7	5.8
RBSC-MS	60-42581.604F	7/30/2016 14:30	F		7.84	14.8	5.8
RBSC-MS	60-42582.375F	7/31/2016 9:00	F		7.83	13.1	8.4
RBSC-MS	60-42582.479F	7/31/2016 11:30	F		7.80	12.4	6.1
RBSC-MS	60-42582.583F	7/31/2016 14:00	F		7.83	15.5	9.0
RBSC-MS	60-42583.333F	8/1/2016 8:00	F		7.93	11.6	7.6
RBSC-MS	60-42583.5F	8/1/2016 12:00	F		7.56	14.9	51.8
RBSC-MS	60-42584.365F	8/2/2016 8:45	F		7.97	10.4	13.4
RBSC-MS	60-42584.604F	8/2/2016 14:30	F		7.69	15.7	21.0
RBSC-MS	60-42585.333F	8/3/2016 8:00	F		7.78	10.8	6.2
RBSC-MS	60-42585.479F	8/3/2016 11:30	F		7.76	14.0	7.5
RBSC-MS	60-42585.583F	8/3/2016 14:00	F		7.53	18.6	8.8
RBSC-MS	60-42586.333F	8/4/2016 8:00	F		7.91	17.4	12.5
RBSC-MS	60-42586.479F	8/4/2016 11:30	F		7.76	18.1	8.2
RBSC-MS	60-42586.583F	8/4/2016 14:00	F		7.69	18.4	15.2
RBSC-MS	60-42587.333F	8/5/2016 8:00	F		7.76	14.8	7.7
RBSC-MS	60-42587.479F	8/5/2016 11:30	F		7.43	18.3	8.4
RBSC-MS	60-42587.583F	8/5/2016 14:00	F		7.53	21.0	7.7
RBSC-MS	60-42588.333F	8/6/2016 8:00	F		7.66	16.9	8.3
RBSC-MS	60-42588.542F	8/6/2016 13:00	F		7.56	17.5	5.2
RBSC-MS	60-42588.604F	8/6/2016 14:30	F		7.53	18.3	7.2
RBSC-MS	60-42589.375F	8/7/2016 9:00	F		7.41	14.2	5.0
RBSC-MS	60-42589.5F	8/7/2016 12:00	F		7.54	16.6	6.5
RBSC-MS	60-42589.663F	8/7/2016 15:55	F		7.49	16.8	6.2
RBSC-MS	60-42590.354F	8/8/2016 8:30	F		6.71	11.9	4.1
RBSC-MS	60-42590.49F	8/8/2016 11:45	F		7.11	11.4	5.3
RBSC-MS	60-42590.604F	8/8/2016 14:30	F		7.29	18.3	6.6
RBSC-MS	60-42591.417F	8/9/2016 10:00	F		7.27	14.5	12.9

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-MS	60-42591.521F	8/9/2016 12:30	F		7.42	18.6	31.3
RBSC-MS	60-42591.604F	8/9/2016 14:30	F		7.39	21.7	8.6
RBSC-MS	60-42592.417F	8/10/2016 10:00	F		7.27	14.5	6.6
RBSC-MS	60-42592.521F	8/10/2016 12:30	F		7.42	18.6	5.8
RBSC-MS	60-42592.604F	8/10/2016 14:30	F		7.17	21.2	4.3
RBSC-MS	60-42593.417F	8/11/2016 10:00	F		7.15	12.4	8.2
RBSC-MS	60-42593.521F	8/11/2016 12:30	F		7.30	17.6	9.3
RBSC-MS	60-42594.604F	8/12/2016 14:30	F		6.52	18.9	12.3
RBSC-MS	60-42595.542F	8/13/2016 13:00	F		7.09	17.8	10.6
RBSC-MS	60-42596.5F	8/14/2016 12:00	F		8.13	19.0	23.5
RBSC-MS	60-42597.479F	8/15/2016 11:30	F		7.45	12.1	25.0
RBSC-MS	60-42598.313F	8/16/2016 7:30	F		6.73	10.0	6.4
RBSC-MS	60-42599.375F	8/17/2016 9:00	F		7.57	10.0	8.0
RBSC-MS	60-42600.646F	8/18/2016 15:30	F		7.41	18.7	20.5
RBSC-MS	60-42601.344F	8/19/2016 8:15	F		8.00	16.7	9.8
RBSC-MS	60-42602.389F	8/20/2016 9:20	F		8.40	20.0	16.3
RBSC-MS	60-42602.656F	8/20/2016 15:45	F		8.40	15.2	11.6
RBSC-MS	60-42603.365F	8/21/2016 8:45	F		7.47	15.3	6.8
RBSC-MS	60-42604.389F	8/22/2016 9:20	F		7.90	17.9	8.5
RBSC-MS	60-42605.365F	8/23/2016 8:45	F		7.91	12.7	3.8
RBSC-MS	60-42606.321F	8/24/2016 7:42	F		7.33	13.7	3.4
RBSC-MS	60-42607.361F	8/25/2016 8:40	F		7.80	16.3	7.0
RBSC-MS	60-42608.396F	8/26/2016 9:30	F		7.30	13.5	11.1
RBSC-MS	60-42609.646F	8/27/2016 15:30	F		7.67	9.8	66.1
RBSC-MS	60-42610.594F	8/28/2016 14:15	F		7.31	0.4	25.3
RBSC-MS	60-42611.603F	8/29/2016 14:29	F		7.77	9.3	11.6
RBSC-MS	60-42612.382F	8/30/2016 9:10	F		7.94	8.1	7.7
RBSC-MS	60-42613.5F	8/31/2016 12:00	F		8.30	9.7	18.2
RBSC-MS	60-42615.417F	9/2/2016 10:00	F		7.80	8.9	4.7
RBSC-MS	60-42616.563F	9/3/2016 13:30	F		8.10	9.6	8.4
RBSC-MS	60-42618.438F	9/5/2016 10:30	F		0.48	12.4	4.1
RBSC-MS	60-42619.417F	9/6/2016 10:00	F		7.73	9.2	4.4
RBSC-MS	60-42620.396F	9/7/2016 9:30	F		7.90	8.1	3.8
RBSC-MS	60-42620.833F	9/7/2016 20:00	F		8.00	12.5	10.1
RBSC-MS	60-42621.326F	9/8/2016 7:50	F		7.95	6.6	4.0
RBSC-MS	60-42621.833F	9/8/2016 20:00	F		7.90	11.5	4.6
RBSC-MS	60-42622.573F	9/9/2016 13:45	F		8.10	10.8	4.0
RBSC-MS	60-42622.813F	9/9/2016 19:30	F		8.00	12.5	7.3
RBSC-MS	60-42623.396F	9/10/2016 9:30	F		8.10	11.8	5.1
RBSC-MS	60-42623.844F	9/10/2016 20:15	F		8.10	12.5	8.0
RBSC-MS	60-42624.375F	9/11/2016 9:00	F		8.10	6.9	3.9
RBSC-MS	60-42624.844F	9/11/2016 20:15	F		8.60	8.5	5.7
RBSC-MS	60-42625.397F	9/12/2016 9:31	F		8.20	6.7	2.7
RBSC-MS	60-42625.833F	9/12/2016 20:00	F		8.50	10.0	9.7
RBSC-MS	60-42626.74F	9/13/2016 17:45	F		8.50	15.0	16.6
RBSC-MS	60-42627.427F	9/14/2016 10:15	F		8.20	11.2	6.2
RBSC-MS	60-42627.74F	9/14/2016 17:45	F		8.30	15.5	17.5
RBSC-MS	60-42628.367F	9/15/2016 8:49	F		8.00	8.9	6.3
RBSC-MS	60-42628.826F	9/15/2016 19:50	F		8.20	12.3	5.3
RBSC-MS	60-42629.46F	9/16/2016 11:03	F		8.20	10.9	3.3
RBSC-MS	60-42629.771F	9/16/2016 18:30	F		8.10	13.5	6.0
RBSC-MS	60-42630.383F	9/17/2016 9:11	F		8.00	8.3	2.4
RBSC-MS	60-42630.722F	9/17/2016 17:20	F		8.10	12.5	13.6

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-MS	60-42631.433F	9/18/2016 10:23	F		7.44	9.6	3.9
RBSC-MS	60-42631.74F	9/18/2016 17:45	F		8.20	9.8	5.3
RBSC-MS	60-42632.424F	9/19/2016 10:11	F		7.41	8.8	3.8
RBSC-MS	60-42632.76F	9/19/2016 18:15	F		8.20	11.2	5.4
RBSC-MS	60-42633.438F	9/20/2016 10:30	F		7.40	8.9	5.7
RBSC-MS	60-42633.639F	9/20/2016 15:20	F		8.10	12.6	10.4
RBSC-MS	60-42634.399F	9/21/2016 9:34	F		7.50	8.4	4.1
RBSC-MS	60-42634.653F	9/21/2016 15:40	F		8.00	14.1	7.8
RBSC-MS	60-42635.409F	9/22/2016 9:49	F		8.00	8.0	4.3
RBSC-MS	60-42635.757F	9/22/2016 18:10	F		7.80	10.9	4.9
RBSC-MS	60-42648.32F	9/23/2016 7:40	F		7.90	9.7	7.7
RBSC-MS	60-42636.83F	9/23/2016 19:55	F		8.10	9.1	4.4
RBSC-MS	60-42637.377F	9/24/2016 9:03	F		7.60	7.3	4.0
RBSC-MS	60-42637.691F	9/24/2016 16:35	F		8.00	10.3	5.0
RBSC-MS	60-42638.376F	9/25/2016 9:02	F		7.90	7.9	2.7
RBSC-MS	60-42638.774F	9/25/2016 18:35	F		8.10	10.1	4.0
RBSC-MS	60-42639.374F	9/26/2016 8:59	F		7.90	8.9	5.3
RBSC-MS	60-42639.819F	9/26/2016 19:40	F		7.80	11.7	5.4
RBSC-MS	60-42640.726F	9/27/2016 17:25	F		7.68	10.1	5.2
RBSC-MS	60-42641.396F	9/28/2016 9:30	F		7.82	9.8	4.8
RBSC-MS	60-42641.819F	9/28/2016 19:40	F		7.91	9.5	4.8
RBSC-MS	60-42642.76F	9/29/2016 18:15	F		7.22	9.2	5.4
RBSC-MS	60-42643.402F	9/30/2016 9:39	F		7.98	9.2	4.9
RBSC-MS	60-42643.771F	9/30/2016 18:30	F		7.70	7.1	5.2
RBSC-MS	60-42644.816F	10/1/2016 19:35	F		7.91	7.4	5.9
RBSC-MS	60-42645.406F	10/2/2016 9:45	F		8.31	8.0	19.6
RBSC-MS	60-42645.778F	10/2/2016 18:40	F		7.79	7.2	4.3
RBSC-MS	60-42646.795F	10/3/2016 19:05	F		7.72	7.5	5.3
RBSC-MS	60-42647.568F	10/4/2016 13:38	F		7.83	6.4	6.0
RBSC-MS	60-42648.833F	10/5/2016 20:00	F		7.68	6.5	4.3
RBSC-MS	60-42649.701F	10/6/2016 16:50	F		7.81	6.9	3.6
RBSC-MS	60-42650.556F	10/7/2016 13:20	F		7.52	6.2	3.7
RBSC-MS	60-42651.521F	10/8/2016 12:30	F		7.88	7.9	4.1
RBSC-MS	60-42651.719F	10/8/2016 17:15	F				4.8
RBSC-MS	60-42652.743F	10/9/2016 17:50	F		7.58	8.4	5.0
RBSC-MS	60-42656.352F	10/13/2016 8:27	F		8.23	2.0	5.5
RBSC-MS	60-42658.499F	10/15/2016 11:59	F		8.01	0.3	30.0
RBSC-MS	60-42660.378F	10/17/2016 9:05	F		7.54	5.4	5.5
RBSC-MS	60-42661.42F	10/18/2016 10:05	F		7.97	5.3	9.3
RBSC-MS	60_42662.493F	10/19/2016 11:50	F		8.01	1.5	5.6
RBSC-MS	60_42663.347F	10/20/2016 8:20	F		7.79	3.9	5.2
RBSC-MS	60_42664.854F	10/21/2016 20:30	F		7.90	6.9	2.3
RBSC-MS	60_42664.906F	10/21/2016 21:45	F		8.38	6.8	30.1
RBSC-MS	60_42665.465F	10/22/2016 11:10	F		7.43	8.0	971.7
RBSC-MS	60_42665.8479999999F	10/22/2016 20:21	F		7.78	7.7	12.6
RBSC-MS	60_42666F	10/23/2016	F		8.22	4.3	7.9
RBSC-MS	60_42666.521F	10/23/2016 12:30	F		7.45	4.2	54.9
RBSC-MS	60_42667.378F	10/24/2016 9:05	F		7.89	4.8	13.4
RBSC-MS	60_42667.901F	10/24/2016 21:38	F		8.05	4.7	9.3
RBSC-MS	60_42668.51F	10/25/2016 12:15	F		8.01	4.3	18.2
RBSC-MS	60_42668.906F	10/25/2016 21:45	F		8.11	4.4	11.2
RBSC-MS	60_42669.358F	10/26/2016 8:35	F		7.81	4.3	11.1
RBSC-MS	60_42669.885F	10/26/2016 21:15	F		8.14	4.5	11.2

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-MS	60_42670.326F	10/27/2016 7:50	F		8.21	5.0	17.5
RBSC-MS	60_42670.892F	10/27/2016 21:24	F		8.11	4.6	13.0
RBSC-MS	60_42671.382F	10/28/2016 9:10	F		8.16	4.0	8.8
RBSC-MS	60_42671.856F	10/28/2016 20:32	F		7.99	4.1	8.2
RBSC-MS	60_42672.5F	10/29/2016 12:00	F		7.97	4.6	40.1
RBSC-MS	60_42672.888F	10/29/2016 21:18	F		8.01	4.1	21.7
RBSC-MS	60_42673.431F	10/30/2016 10:20	F		8.51	5.1	39.4
RBSC-MS	60_42673.892F	10/30/2016 21:24	F		7.91	4.8	7.2
RBSC-MS	60_42674.347F	10/31/2016 8:20	F		8.10	3.2	11.3
RBSC-MS	60_42674.856F	10/31/2016 20:32	F		7.91	4.8	7.2
RBSC-MS	60_42675.549F	11/1/2016 13:10	F		7.63	2.0	12.8
RBSC-MS	60_42675.86F	11/1/2016 20:38	F		7.99	3.0	9.5
RBSC-MS	60_42676.389F	11/2/2016 9:20	F		7.80	0.2	
RBSC-MS	60_42676.883F	11/2/2016 21:11	F		7.83	3.9	5.8
RBSC-MS	60_42677.587F	11/3/2016 14:05	F		8.65	5.5	
RBSC-MS	60_42677.901F	11/3/2016 21:38	F		7.70	3.9	5.6
RBSC-MS	60_42678.438F	11/4/2016 10:30	F		7.18	5.8	
RBSC-MS	60_42678.881F	11/4/2016 21:08	F		7.77	4.9	5.6
RBSC-MS	60_42679.853F	11/5/2016 20:28	F		7.87	4.4	5.3
RBSC-MS	60_42680.413F	11/6/2016 9:55	F		8.22	1.5	
RBSC-MS	60_42680.892F	11/6/2016 21:25	F		7.87	4.4	5.3
RBSC-MS	60_42681.4729999999F	11/7/2016 11:21	F		7.89	4.3	
RBSC-MS	60_42681.858F	11/7/2016 20:35	F		7.99	3.4	5.5
RBSC-MS	60_42684.615F	11/10/2016 14:45	F		7.68	3.6	5.2
RBSC-MS	60_42686.935F	11/12/2016 22:27	F		7.45	1.9	3.3
RBSC-MS	60_42687.188F	11/13/2016 4:30	F		6.86	2.1	1.9
RBSC-MS	60_42687.888F	11/13/2016 21:19	F		6.77		4.7
RBSC-US	16-42567.337F	7/16/2016 8:05	F		7.30	12.3	22.5
RBSC-US	16-42572.594F	7/21/2016 14:15	F		7.60	8.8	7.2
RBSC-US	16-42573.49F	7/22/2016 11:45	F		7.54	16.7	25.4
RBSC-US	16-42574.302F	7/23/2016 7:15	F		7.62	11.5	15.1
RBSC-US	16-42575.285F	7/24/2016 6:50	F		7.20	10.6	18.7
RBSC-US	16-42575.427F	7/24/2016 10:15	F		7.81	14.4	18.5
RBSC-US	16-42575.583F	7/24/2016 14:00	F		7.85	17.2	18.9
RBSC-US	16-42576.271F	7/25/2016 6:30	F		7.40	12.2	18.4
RBSC-US	16-42576.354F	7/25/2016 8:30	F		7.76	16.0	25.1
RBSC-US	16-42576.583F	7/25/2016 14:00	F		7.88	7.8	13.1
RBSC-US	16-42577.281F	7/26/2016 6:45	F		7.88	14.3	20.7
RBSC-US	16-42577.438F	7/26/2016 10:30	F		7.79	16.6	18.5
RBSC-US	16-42577.594F	7/26/2016 14:15	F		7.87	20.8	11.8
RBSC-US	16-42578.375F	7/27/2016 9:00	F		7.87	15.6	13.5
RBSC-US	16-42578.479F	7/27/2016 11:30	F		7.85	17.3	11.7
RBSC-US	16-42578.625F	7/27/2016 15:00	F		7.88	22.0	7.1
RBSC-US	16-42579.375F	7/28/2016 9:00	F		7.88	17.8	6.0
RBSC-US	16-42579.583F	7/28/2016 14:00	F		7.79	22.2	5.7
RBSC-US	16-42580.354F	7/29/2016 8:30	F		7.87	17.6	6.5
RBSC-US	16-42580.479F	7/29/2016 11:30	F		7.75	19.5	5.4
RBSC-US	16-42580.625F	7/29/2016 15:00	F		7.75	20.9	6.4
RBSC-US	16-42581.396F	7/30/2016 9:30	F		7.60	16.6	5.2
RBSC-US	16-42581.521F	7/30/2016 12:30	F		7.92	19.9	4.8
RBSC-US	16-42581.604F	7/30/2016 14:30	F		7.90	19.8	6.3
RBSC-US	16-42582.375F	7/31/2016 9:00	F		7.99	14.8	4.9
RBSC-US	16-42582.479F	7/31/2016 11:30	F		7.91	15.5	5.6

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-US	16-42582.583F	7/31/2016 14:00	F		7.89	17.4	5.9
RBSC-US	16-42583.333F	8/1/2016 8:00	F		7.94	14.5	5.7
RBSC-US	16-42583.5F	8/1/2016 12:00	F		7.98	18.2	5.2
RBSC-US	16-42584.365F	8/2/2016 8:45	F		8.06	16.6	6.6
RBSC-US	16-42584.604F	8/2/2016 14:30	F		8.08	21.0	6.5
RBSC-US	16-42585.333F	8/3/2016 8:00	F		7.94	17.3	5.9
RBSC-US	16-42585.479F	8/3/2016 11:30	F		8.01	19.0	6.3
RBSC-US	16-42585.583F	8/3/2016 14:00	F		8.03	21.7	5.8
RBSC-US	16-42586.333F	8/4/2016 8:00	F		8.09	18.8	6.2
RBSC-US	16-42586.479F	8/4/2016 11:30	F		7.93	22.5	5.4
RBSC-US	16-42586.583F	8/4/2016 14:00	F		7.78	23.1	5.6
RBSC-US	16-42587.333F	8/5/2016 8:00	F		7.85	18.0	5.4
RBSC-US	16-42587.479F	8/5/2016 11:30	F		7.76	18.0	5.5
RBSC-US	16-42587.583F	8/5/2016 14:00	F		7.72	22.8	6.4
RBSC-US	16-42588.333F	8/6/2016 8:00	F		7.85	19.3	4.7
RBSC-US	16-42588.542F	8/6/2016 13:00	F		7.71	20.8	4.8
RBSC-US	16-42588.604F	8/6/2016 14:30	F		7.60	20.5	10.1
RBSC-US	16-42589.375F	8/7/2016 9:00	F		7.87	18.9	4.3
RBSC-US	16-42589.5F	8/7/2016 12:00	F		7.70	18.0	3.6
RBSC-US	16-42589.663F	8/7/2016 15:55	F		7.80	18.2	4.0
RBSC-US	16-42590.354F	8/8/2016 8:30	F		6.64	17.0	4.7
RBSC-US	16-42590.49F	8/8/2016 11:45	F		7.46	18.4	4.1
RBSC-US	16-42590.604F	8/8/2016 14:30	F		7.60	23.4	5.4
RBSC-US	16-42591.417F	8/9/2016 10:00	F		7.44	19.3	4.9
RBSC-US	16-42591.521F	8/9/2016 12:30	F		7.55	20.4	5.4
RBSC-US	16-42591.604F	8/9/2016 14:30	F		7.57	23.0	5.1
RBSC-US	16-42592.417F	8/10/2016 10:00	F		7.70	20.7	4.8
RBSC-US	16-42592.521F	8/10/2016 12:30	F		7.68	22.3	4.8
RBSC-US	16-42592.604F	8/10/2016 14:30	F		7.55	24.6	8.0
RBSC-US	16-42593.417F	8/11/2016 10:00	F		7.75	20.3	4.2
RBSC-US	16-42593.521F	8/11/2016 12:30	F		7.60	21.1	4.0
RBSC-US	16-42594.604F	8/12/2016 14:30	F		6.55	24.8	11.1
RBSC-US	16-42595.542F	8/13/2016 13:00	F		7.15	17.9	15.8
RBSC-US	16-42596.5F	8/14/2016 12:00	F		6.52	19.5	20.6
RBSC-US	16-42597.479F	8/15/2016 11:30	F		6.69	15.1	23.9
RBSC-US	16-42598.313F	8/16/2016 7:30	F		6.72	10.2	3.3
RBSC-US	16-42599.375F	8/17/2016 9:00	F		7.89	11.0	12.2
RBSC-US	16-42600.646F	8/18/2016 15:30	F		7.76	15.6	2.5
RBSC-US	16-42601.344F	8/19/2016 8:15	F		7.35	15.3	5.4
RBSC-US	16-42602.389F	8/20/2016 9:20	F		8.14	17.2	2.9
RBSC-US	16-42602.656F	8/20/2016 15:45	F		8.40	20.9	2.7
RBSC-US	16-42603.365F	8/21/2016 8:45	F		7.88	15.3	2.8
RBSC-US	16-42604.389F	8/22/2016 9:20	F		7.93	18.3	2.6
RBSC-US	16-42605.365F	8/23/2016 8:45	F		7.99	15.1	2.9
RBSC-US	16-42606.321F	8/24/2016 7:42	F		7.95	17.3	2.6
RBSC-US	16-42607.361F	8/25/2016 8:40	F		7.77	20.3	3.2
RBSC-US	16-42608.396F	8/26/2016 9:30	F		7.51	18.7	3.3
RBSC-US	16-42609.646F	8/27/2016 15:30	F		7.60	9.0	4.1
RBSC-US	16-42610.594F	8/28/2016 14:15	F		7.54	15.9	3.3
RBSC-US	16-42611.603F	8/29/2016 14:29	F		7.74	13.2	3.6
RBSC-US	16-42612.382F	8/30/2016 9:10	F		7.73	12.8	3.7
RBSC-US	16-42613.5F	8/31/2016 12:00	F		8.20	13.9	4.0
RBSC-US	16-42615.417F	9/2/2016 10:00	F		7.80	11.9	7.1

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-US	16-42616.563F	9/3/2016 13:30	F		7.80	11.8	8.4
RBSC-US	16-42618.438F	9/5/2016 10:30	F		7.48	12.5	3.6
RBSC-US	16-42619.417F	9/6/2016 10:00	F		7.66	12.2	3.5
RBSC-US	16-42620.396F	9/7/2016 9:30	F		7.65	12.6	2.9
RBSC-US	16-42620.833F	9/7/2016 20:00	F		8.00	10.9	5.9
RBSC-US	16-42621.326F	9/8/2016 7:50	F		7.86	10.7	2.7
RBSC-US	16-42621.833F	9/8/2016 20:00	F		7.90	10.2	5.5
RBSC-US	16-42622.573F	9/9/2016 13:45	F		8.10	13.8	2.0
RBSC-US	16-42622.813F	9/9/2016 19:30	F		8.30	12.9	8.6
RBSC-US	16-42623.396F	9/10/2016 9:30	F		8.40	11.8	2.8
RBSC-US	16-42623.844F	9/10/2016 20:15	F		8.30	13.0	8.4
RBSC-US	16-42624.375F	9/11/2016 9:00	F		7.80	10.3	4.0
RBSC-US	16-42624.844F	9/11/2016 20:15	F		8.10	9.0	5.1
RBSC-US	16-42625.403F	9/12/2016 9:40	F		8.10	9.2	3.4
RBSC-US	16-42625.847F	9/12/2016 20:20	F		8.40	15.0	10.5
RBSC-US	16-42626.769F	9/13/2016 18:27	F		8.30	15.5	17.7
RBSC-US	16-42627.418F	9/14/2016 10:02	F		8.20	13.2	3.4
RBSC-US	16-42627.757F	9/14/2016 18:10	F		8.30	15.5	17.2
RBSC-US	16-42628.373F	9/15/2016 8:57	F		8.10	12.0	3.6
RBSC-US	16-42628.844F	9/15/2016 20:15	F		8.10	10.5	6.3
RBSC-US	16-42629.436F	9/16/2016 10:28	F		8.00	13.8	2.9
RBSC-US	16-42629.74F	9/16/2016 17:45	F		8.10	13.4	4.9
RBSC-US	16-42630.375F	9/17/2016 9:00	F		8.00	12.0	2.6
RBSC-US	16-42630.715F	9/17/2016 17:10	F		8.20	11.0	6.9
RBSC-US	16-42631.44F	9/18/2016 10:34	F		7.50	12.4	1.4
RBSC-US	16-42631.809F	9/18/2016 19:25	F		8.10	11.0	2.2
RBSC-US	16-42632.434F	9/19/2016 10:25	F		7.70	11.6	1.6
RBSC-US	16-42632.75F	9/19/2016 18:00	F		8.00	11.2	7.3
RBSC-US	16-42633.485F	9/20/2016 11:38	F		7.70	10.6	2.5
RBSC-US	16-42633.649F	9/20/2016 15:35	F		8.00	15.2	2.3
RBSC-US	16-42634.412F	9/21/2016 9:53	F		7.90	9.9	2.8
RBSC-US	16-42634.674F	9/21/2016 16:10	F		8.10	15.8	3.2
RBSC-US	16-42635.416F	9/22/2016 9:59	F		7.90	9.7	2.9
RBSC-US	16-42635.833F	9/22/2016 20:00	F		8.10	12.4	4.9
RBSC-US	16-42636.531F	9/23/2016 12:44	F		8.00	10.4	4.0
RBSC-US	16-42636.837F	9/23/2016 20:05	F		8.20	12.0	3.0
RBSC-US	16-42637.383F	9/24/2016 9:12	F		8.00	9.5	3.2
RBSC-US	16-42637.681F	9/24/2016 16:20	F		8.10	10.3	3.8
RBSC-US	16-42638.381F	9/25/2016 9:08	F		7.80	10.0	4.1
RBSC-US	16-42638.785F	9/25/2016 18:50	F		7.90	1.3	4.9
RBSC-US	16-42639.381F	9/26/2016 9:08	F		7.80	10.8	4.3
RBSC-US	16-42639.83F	9/26/2016 19:55	F		8.20	12.3	4.3
RBSC-US	16-42640.736F	9/27/2016 17:40	F		8.00	12.3	3.8
RBSC-US	16-42641.401F	9/28/2016 9:37	F		7.90	9.5	4.0
RBSC-US	16-42641.826F	9/28/2016 19:50	F		8.12	10.4	4.1
RBSC-US	16-42642.757F	9/29/2016 18:10	F		7.98	11.1	4.5
RBSC-US	16-42643.392F	9/30/2016 9:25	F		7.97	8.2	4.4
RBSC-US	16-42643.778F	9/30/2016 18:40	F		7.75	7.8	4.3
RBSC-US	16-42645.403F	10/2/2016 9:41	F		8.31	8.0	8.2
RBSC-US	16-42647.574F	10/4/2016 13:46	F		7.74	5.9	4.4
RBSC-US	16-42648.847F	10/5/2016 20:20	F		7.85	5.6	4.4
RBSC-US	16-42649.715F	10/6/2016 17:10	F		7.74	6.6	3.5
RBSC-US	16-42650.563F	10/7/2016 13:30	F		7.78	4.8	3.5

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RBSC-US	16-42651.517F	10/8/2016 12:25	F		7.89	3.1	3.3
RBSC-US	16-42652.736F	10/9/2016 17:40	F		7.62	5.4	6.0
RBSC-US	16-42656.368F	10/13/2016 8:50	F		8.20	2.0	7.0
RBSC-US	16-42658.493F	10/15/2016 11:50	F		8.01	0.2	2.9
RBSC-US	16-42661.368F	10/18/2016 8:50	F		7.45	2.7	15.5
RBSC-US	16_42662.503F	10/19/2016 12:05	F		7.62	2.1	4.6
RBSC-US	16_42663.337F	10/20/2016 8:05	F		7.50	1.7	4.5
RBSC-US	16_42664.837F	10/21/2016 20:05	F		7.68	4.4	4.5
RBSC-US	16_42664.9F	10/21/2016 21:36	F		8.32	4.9	8.3
RBSC-US	16_42665.507F	10/22/2016 12:10	F		7.15	6.5	4.5
RBSC-US	16_42665.869F	10/22/2016 20:51	F		7.73	5.8	11.3
RBSC-US	16_42666.538F	10/23/2016 12:55	F		7.30	2.3	5.2
RBSC-US	16_42666.822F	10/23/2016 19:43	F		8.19	4.4	4.6
RBSC-US	16_42667.34F	10/24/2016 8:10	F		7.72	4.2	5.5
RBSC-US	16_42667.909F	10/24/2016 21:49	F		8.01	4.0	4.8
RBSC-US	16_42668.583F	10/25/2016 14:00	F		7.67	6.2	10.6
RBSC-US	16_42668.913F	10/25/2016 21:55	F		8.11	3.9	5.9
RBSC-US	16_42669.344F	10/26/2016 8:15	F		7.78	5.0	11.2
RBSC-US	16_42669.892F	10/26/2016 21:25	F		8.02	4.8	12.6
RBSC-US	16_42670.337F	10/27/2016 8:05	F		8.21	5.0	3.4
RBSC-US	16_42670.885F	10/27/2016 21:15	F		7.87	4.7	5.5
RBSC-US	16_42671.375F	10/28/2016 9:00	F		7.85	1.1	7.4
RBSC-US	16_42671.856F	10/28/2016 20:32	F		7.93	4.2	5.9
RBSC-US	16_42672.438F	10/29/2016 10:30	F		7.86	4.5	6.2
RBSC-US	16_42672.875F	10/29/2016 21:00	F		7.99	4.2	6.3
RBSC-US	16_42673.427F	10/30/2016 10:15	F		8.30	3.1	6.2
RBSC-US	16_42673.884F	10/30/2016 21:13	F		8.01	4.0	6.0
RBSC-US	16_42674.34F	10/31/2016 8:10	F		8.15	2.5	6.9
RBSC-US	16_42674.865F	10/31/2016 20:45	F		8.01	4.0	6.0
RBSC-US	16_42675.361F	11/1/2016 8:40	F		7.25	1.4	8.2
RBSC-US	16_42675.867F	11/1/2016 20:49	F		8.22	3.1	5.9
RBSC-US	16_42676.396F	11/2/2016 9:30	F		7.82	1.1	7.8
RBSC-US	16_42676.891F	11/2/2016 21:23	F		7.83	3.9	5.8
RBSC-US	16_42677.587F	11/3/2016 14:05	F		8.25	4.0	16.1
RBSC-US	16_42677.89F	11/3/2016 21:22	F		7.66	3.7	7.1
RBSC-US	16_42678.378F	11/4/2016 9:05	F		7.78	2.9	9.9
RBSC-US	16_42678.872F	11/4/2016 20:56	F		7.86	4.7	7.6
RBSC-US	16_42679.865F	11/5/2016 20:45	F		7.88	4.4	7.6
RBSC-US	16_42680.424F	11/6/2016 10:10	F		7.87	1.2	5.3
RBSC-US	16_42680.865F	11/6/2016 20:45	F		7.88	4.4	7.6
RBSC-US	16_42681.467F	11/7/2016 11:12	F		7.92	4.1	7.3
RBSC-US	16_42681.865F	11/7/2016 20:45	F		7.85	3.8	7.6
RBSC-US	16_42684.625F	11/10/2016 15:00	F		7.33	2.1	7.3
RBSC-US	16_42685.351F	11/11/2016 8:25	F		7.21	2.0	11.5
RBSC-US	16_42686.228F	11/12/2016 5:29	F		7.97	0.1	3.6
RBSC-US	16_42686.933F	11/12/2016 22:24	F		6.76	2.5	3.1
RBSC-US	16_42687.185F	11/13/2016 4:27	F		7.84	2.7	3.7
RBSC-US	16_42687.885F	11/13/2016 21:14	F		6.63	0.1	4.2
RSEML3-Div-Out	L3-DivO-43446F	9/8/2016	F	1077	7.80		
RSEML3-Div-Out	L3-DivO-43376F	9/8/2016	F	1062	7.50		11.1
RSEML3-Div-Out	L3-DivOt-43456F	9/8/2016	F	1051	7.70		15.5
RSEML3-Div-Out	L3-DivO-42621.5833F	9/8/2016 14:00	F	1084	7.00		15.7
RSEML3-Div-Out	L3-DivO-42621.6097F	9/8/2016 14:38	F	1083	7.40		

Appendix 3.B-2 Surface Water Quality Field Data

Stn.Code	Sample ID	Collection Date	Sample Class	Conductivity	pH	Temp	Turbidity
				(uS/cm)	(pH)	(°C)	(NTU)
RSEML3-Div-Out	L3-DivO-42621.6111F	9/8/2016 14:40	F	1010	7.60		14.2
RSEML3-Div-Out	L3-DivO-42621.8021F	9/8/2016 19:15	F	1100	7.30		13.5
RSEML3-Div-Out	L3-DivO-42621.8125F	9/8/2016 19:30	F	1010	7.10		12.0
RSEML3-Div-Out	L3-DivO-42621.8194F	9/8/2016 19:40	F	1083	7.30		
RSEML3-Div-Out	L3-DivO-42622.4306F	9/9/2016 10:20	F	520	7.70	9.9	19.4
RSEML3-Div-Out	L3-DivO-42623.3646F	9/10/2016 8:45	F	1100	7.70	9.7	
RSEML3-Div-Out	L3-DivO-42623.375F	9/10/2016 9:00	F	520	7.80	10.3	75.7
RSEML3-Div-Out	L3-DivO-42623.6681F	9/10/2016 16:02	F	350	7.40	12.0	84.0
RSEML3-Div-Out	L3-DivO-42623.6729F	9/10/2016 16:09	F	960	7.70	11.9	
RSEML3-Div-Out	L3-DivO-42624.3333F	9/11/2016 8:00	F	640	7.70	10.5	20.4
RSEML3-Div-Out	L3-DivO-42624.3507F	9/11/2016 8:25	F	1210	7.70	10.4	
RSEML3-LP	RSEML3-LP-42540F	6/19/2016	F				79.4
RSEML3-LP	RSEML3-LP-42544F	6/23/2016	F				20.8
RSEML3-LP	RSEML3-LP-42551F	6/30/2016	F				4.2
RSEML3-LP	RSEML3-LP-42556F	7/5/2016	F				10.8
RSEML3-LP	RSEML3-LP-42558F	7/7/2016	F	1070	7.76		28.6
RSEML3-LP	RSEML3-LP-42559F	7/8/2016	F	880	8.48		18.0
RSEML3-LP	RSEML3-LP-42597F	8/15/2016	F	810	8.38	21.3	14.3
RSEML3-LP	RSEML3-LP-42598F	8/16/2016	F				15.8
RSEML3-MP	6-42715F	12/11/2016	F				23.0
RSEML3-UP	RSEML3-UP-42540F	6/19/2016	F				48.0
RSEML3-UP	RSEML3-UP-42544F	6/23/2016	F				8.2
RSEML3-UP	RSEML3-UP-42551F	6/30/2016	F				39.4
RSEML3-UP	RSEML3-UP-42559F	7/8/2016	F	1110	8.15		21.9
RSEML3-UP	5_42681F	11/7/2016	F		8.07		16.3
RSEMR5B-SP	15-42711.531F	12/7/2016 12:45	F	2080	7.90	0.0	
RSEMR5B-SP	15-42712.448F	12/8/2016 10:45	F	2070	8.37	0.0	
RSEMR5B-SP	15-42713.458F	12/9/2016 11:00	F	2090	8.39	0.0	
RSEMR5B-SP	15-42714.417F	12/10/2016 10:00	F	2150	8.16	0.0	
RSEMR5B-SP	15-42715.615F	12/11/2016 14:45	F	2230	7.61	0.0	
RSEMR5B-SP	15-42716.521F	12/12/2016 12:30	F	1800	7.47	0.1	
RSEMR5B-SP	15-42717.521F	12/13/2016 12:30	F	1730	7.34	0.3	
RSEMR5B-SP	15-42718.552F	12/14/2016 13:15	F	1750	7.69	0.2	
RSEMR5B-SP	15-42719.51F	12/15/2016 12:15	F	1800	7.46	0.3	
RSEMR5B-SP	15-42720.5F	12/16/2016 12:00	F	1960	7.85	0.2	
RSEMR5B-SP	15-42721F	12/17/2016	F	1920	7.49	0.2	
RSEMR5B-SP	15-42722.646F	12/18/2016 15:30	F	2090	7.78	0.2	
RSEMR5B-SP	15-42723.521F	12/19/2016 12:30	F	3140	7.56	0.2	
RSEMR5B-SP	15-42724.521F	12/20/2016 12:30	F	2670	7.39	0.2	
RSEMR5B-SP	15-42725.385F	12/21/2016 9:15	F	2660	7.54	0.2	
RSEMR5B-SP	15-42726.427F	12/22/2016 10:15	F	1820	7.82	0.9	9.7
RSEMR5B-SP	15-42727.563F	12/23/2016 13:30	F	1520	7.89	0.8	10.7
RSEMR5B-SP	15-42728.479F	12/24/2016 11:30	F	710	7.90	0.8	
RSEMR5B-SP	15-42729.469F	12/25/2016 11:15	F	980	7.80	5.9	
RSEMR5B-SP	15-42730.417F	12/26/2016 10:00	F	1000	1.00	1.0	
RSEMR5B-SP	15-42731.563F	12/27/2016 13:30	F	1120	7.98	0.6	
WP-DS	20-42725.49F	12/21/2016 11:45	F	330	7.45	0.6	2.4
WP-US	21-42725.51F	12/21/2016 12:15	F	310	7.85	0.5	2.2

Notes:

Sample classes included in query: F, FD

Where:

F= Field Measurement

D= Field Measurement Duplicate

Appendix 4: Groundwater Quality Monitoring

Appendix 4-A: Groundwater Quality Data

Appendix 4-B: Groundwater Quality Assurance/Quality Control

PEACE RIVER HYDRO PARTNERS

Table 1: 2016 Groundwater Quality Data for RSEM Area R5a

Sample ID	Sample Date/Time	Lab Sample ID	Field Parameters	pH (field)	Specific Conductance (field)	Temperature	Dissolved Oxygen	ORP	Comments	Physical Properties	pH (lab)	Conductivity (lab)	Total Dissolved Solids
				pH	µS/cm	°C	mg/L	mV			pH	uS/cm	mg/L
		Maxxam RDL		0.1	1						0.1	1	10
GW-1	27-Nov-2016 14:00	QD4990		7.11	1089	4.9	6.19	134.1	clear		7.83	1060	732
GW-1	07-Dec-2016 19:30	QF8820		6.68	2361	5.4	0.03	157.7	clear		7.78	2320	1940
GW-1	15-Dec-2016 16:45	QG8922		6.62	2367	5.9	0.87	117.3	clear		8.01	2350	1970
GW-2	28-Nov-2016 13:20	QE0414		6.95	2078	6.2	6.76	48	clear		7.91	2020	1660
GW-2	08-Dec-2016 18:00	QF8821		6.80	2558	6.4	n/a	118.1	clear		7.9	2540	2140
GW-2	16-Dec-2016 09:30	QG8923		6.67	2597	5.8	0.17	89.6	clear		8.07	2620	2270
GW-3	29-Nov-2016 11:00	QE0415		7.24	490	7.1	n/a	-52.7	clear		8.09	482	286
GW-3	09-Dec-2016 10:00	QF8822		7.31	538	7.2	n/a	-57.1	clear		8.11	533	364
GW-3	16-Dec-2016 12:05	QG8924		7.26	590	7.0	n/a	-91.5	clear		8.3	592	368
GW-4A	29-Nov-2016 17:50	QE0416		6.85	1328	5.1	5.38	95.9	clear		7.96	1310	908
GW-4A	08-Dec-2016 15:00	QF8823		6.70	1772	5.2	n/a	-49.9	clear		7.71	1720	1210
GW-4A	15-Dec-2016 14:00	QG8925		6.65	1785	5.1	0.82	-38	clear		8	1780	1360
GW-2D	28-Nov-2016 14:00	QE0417							clear		7.9	2020	1650
FB-1	29-Nov-2016 11:00	QE0418									5.99	2.1	<10
TRIP BLANK	30-Nov-2016 10:20	QE0419									5.86	1.9	<10

Table 1: 2016 Groundwater Quality Data for RSEM Area R5a

Sample ID	Sample Date/Time	Lab Sample ID	Total Suspended Solids	Total Hardness (CaCO3)	Disolved Hardness (CaCO3)	Inorganics	Alkalinity (Total as CaCO3)	Alkalinity (PP as CaCO3)	Bicarbonate (HCO3)	Carbonate (CO3)	Hydroxide (OH)
			mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	1	0.5	0.5		0.5	0.5	0.5	0.5	0.5
GW-1	27-Nov-2016 14:00	QD4990	1.1	543	518		305	<0.50	372	<0.50	<0.50
GW-1	07-Dec-2016 19:30	QF8820	<1.0	1230	1120		437	<0.50	534	<0.50	<0.50
GW-1	15-Dec-2016 16:45	QG8922	<1.0	1300	1190		440	<0.50	536	<0.50	<0.50
GW-2	28-Nov-2016 13:20	QE0414	13.8	1040	1060		359	<0.50	438	<0.50	<0.50
GW-2	08-Dec-2016 18:00	QF8821	<1.0	1290	1280		376	<0.50	459	<0.50	<0.50
GW-2	16-Dec-2016 09:30	QG8923	<1.0	1400	1290		378	<0.50	461	<0.50	<0.50
GW-3	29-Nov-2016 11:00	QE0415	1.8	253	262		230	<0.50	281	<0.50	<0.50
GW-3	09-Dec-2016 10:00	QF8822	2.7	274	262		244	<0.50	298	<0.50	<0.50
GW-3	16-Dec-2016 12:05	QG8924	2.9	326	285		256	<0.50	313	<0.50	<0.50
GW-4A	29-Nov-2016 17:50	QE0416	7	693	767		435	<0.50	530	<0.50	<0.50
GW-4A	08-Dec-2016 15:00	QF8823	17.1	984	900		382	<0.50	466	<0.50	<0.50
GW-4A	15-Dec-2016 14:00	QG8925	20.6	946	930		386	<0.50	471	<0.50	<0.50
GW-2D	28-Nov-2016 14:00	QE0417	19.6	1020	1090		355	<0.50	433	<0.50	<0.50
FB-1	29-Nov-2016 11:00	QE0418	<1.0	<0.50	<0.50		0.85	<0.50	1.04	<0.50	<0.50
TRIP BLANK	30-Nov-2016 10:20	QE0419	<1.0	<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50

Table 1: 2016 Groundwater Quality Data for RSEM Area R5a

Sample ID	Sample Date/Time	Lab Sample ID	Dissolved Chloride (Cl)	Fluoride (F)	Bromide (Br)	Anions and Nutrients	Dissolved Sulphate (SO4)	Total Sulphide	Total Sulphide (as H2S)	Total Ammonia (N)	Nitrite (N)	Nitrate (N)	Nitrate plus Nitrite (N)
			mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.5	0.01	0.01-0.1		0.5-5	0.005	0.005	0.005	0.005	0.02	0.02
GW-1	27-Nov-2016 14:00	QD4990	3.7	0.31	<0.10		302	<0.0050	<0.0050	0.014	<0.0050	0.039	0.039
GW-1	07-Dec-2016 19:30	QF8820	10	0.25	<0.10		1090	0.0067	0.007	0.93	<0.0050	<0.020	<0.020
GW-1	15-Dec-2016 16:45	QG8922	11	0.22	<0.10		1040	0.0051	0.005	0.91	<0.0050	<0.020	<0.020
GW-2	28-Nov-2016 13:20	QE0414	3.6	0.71	<0.10		912	0.0061	0.006	0.15	<0.0050	<0.020	<0.020
GW-2	08-Dec-2016 18:00	QF8821	3.6	0.95	<0.10		1240	<0.0050	<0.0050	0.33	<0.0050	<0.020	<0.020
GW-2	16-Dec-2016 09:30	QG8923	4.3	0.88	<0.10		1240	0.0078	0.008	0.34	<0.0050	<0.020	<0.020
GW-3	29-Nov-2016 11:00	QE0415	1.5	0.086	0.01		36.4	0.0053	0.006	0.072	<0.0050	<0.020	<0.020
GW-3	09-Dec-2016 10:00	QF8822	0.91	0.093	<0.10		53.3	0.0054	0.006	0.11	<0.0050	<0.020	<0.020
GW-3	16-Dec-2016 12:05	QG8924	1.5	0.086	<0.10		83.2	<0.0050	<0.0050	0.052	<0.0050	<0.020	<0.020
GW-4A	29-Nov-2016 17:50	QE0416	17	0.33	<0.10		297	0.0099	0.011	0.25	<0.0050	0.803	0.803
GW-4A	08-Dec-2016 15:00	QF8823	27	0.72	<0.10		648	0.005	0.005	0.89	<0.0050	<0.020	<0.020
GW-4A	15-Dec-2016 14:00	QG8925	27	0.65	<0.10		595	0.0092	0.01	0.83	<0.0050	<0.020	<0.020
GW-2D	28-Nov-2016 14:00	QE0417	3.8	0.71	<0.10		915	0.006	0.006	0.12	<0.0050	<0.020	<0.020
FB-1	29-Nov-2016 11:00	QE0418	3.7	<0.010	<0.010		<0.50	0.007	0.007	<0.0050	<0.0050	<0.020	<0.020
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.50	<0.010	<0.010		<0.50	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	<0.020

Table 1: 2016 Groundwater Quality Data for RSEM Area R5a

Sample ID	Sample Date/Time	Lab Sample ID	Orthophosphate (P)	Organic / Inorganic Carbon	TOC	DOC	Total Metals	T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi
			mg/L		mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.005		0.5	0.5		0.003	0.0005	0.0001	0.001	0.0001	0.001
GW-1	27-Nov-2016 14:00	QD4990	0.0075		1.3	0.74		0.0155	<0.00050	0.00012	0.0164	<0.00010	<0.0010
GW-1	07-Dec-2016 19:30	QF8820	<0.0050		0.79	1.12		0.0033	<0.00050	0.00011	0.0119	<0.00010	<0.0010
GW-1	15-Dec-2016 16:45	QG8922	<0.0050		<0.50	0.67		0.0045	<0.00050	0.00013	0.0096	<0.00010	<0.0010
GW-2	28-Nov-2016 13:20	QE0414	0.0068		0.71	<0.50		0.0372	<0.00050	0.00026	0.0245	<0.00010	<0.0010
GW-2	08-Dec-2016 18:00	QF8821	<0.0050		0.85	0.5		0.0079	<0.00050	<0.00010	0.0101	<0.00010	<0.0010
GW-2	16-Dec-2016 09:30	QG8923	<0.0050		<0.50	0.86		0.0045	<0.00050	0.00015	0.0097	<0.00010	<0.0010
GW-3	29-Nov-2016 11:00	QE0415	<0.0050		1.69	1.56		0.0094	0.00067	0.00122	0.104	<0.00010	<0.0010
GW-3	09-Dec-2016 10:00	QF8822	<0.0050		2.28	1.46		0.0044	<0.00050	0.00161	0.0952	<0.00010	<0.0010
GW-3	16-Dec-2016 12:05	QG8924	<0.0050		1.77	1.76		0.0045	<0.00050	0.00154	0.105	<0.00010	<0.0010
GW-4A	29-Nov-2016 17:50	QE0416	0.0138		2.73	1.89		0.0533	<0.00050	0.0003	0.0356	<0.00010	<0.0010
GW-4A	08-Dec-2016 15:00	QF8823	<0.0050		1.93	1.34		0.037	<0.00050	0.00154	0.0096	<0.00010	<0.0010
GW-4A	15-Dec-2016 14:00	QG8925	<0.0050		1.32	1.25		0.0045	<0.00050	0.00169	0.0087	<0.00010	<0.0010
GW-2D	28-Nov-2016 14:00	QE0417	<0.0050		1.3	<0.50		0.0537	<0.00050	0.00026	0.0237	<0.00010	<0.0010
FB-1	29-Nov-2016 11:00	QE0418	<0.0050		<0.50	<0.50		<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.0050		0.74	<0.50		<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010

Table 1: 2016 Groundwater Quality Data for RSEM Area R5a

Sample ID	Sample Date/Time	Lab Sample ID	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Li	T-Mg	T-Mn	T-Hg
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.05	0.00001	0.05	0.001	0.0005	0.0005	0.01	0.0002	0.005	0.05	0.001	0.00001
GW-1	27-Nov-2016 14:00	QD4990	0.105	0.000041	158	<0.0010	<0.00050	<0.00050	0.011	<0.00020	0.0403	36.2	0.0216	<0.000010
GW-1	07-Dec-2016 19:30	QF8820	0.283	0.000103	349	<0.0010	0.0014	<0.00050	<0.01	<0.00020	0.114	87	1.89	<0.000010
GW-1	15-Dec-2016 16:45	QG8922	0.305	0.0001	372	<0.0010	0.00151	<0.00050	0.017	<0.00020	0.122	91.1	1.97	<0.000010
GW-2	28-Nov-2016 13:20	QE0414	0.158	0.000107	272	0.001	0.00119	0.00066	0.604	<0.00020	0.121	86.4	0.243	<0.000010
GW-2	08-Dec-2016 18:00	QF8821	0.221	0.000063	324	<0.0010	<0.00050	<0.00050	0.035	<0.00020	0.178	117	0.0546	<0.000010
GW-2	16-Dec-2016 09:30	QG8923	0.234	0.00007	352	<0.0010	<0.00050	<0.00050	0.015	<0.00020	0.177	126	0.109	<0.000010
GW-3	29-Nov-2016 11:00	QE0415	<0.05	0.000032	76.4	<0.0010	0.00074	0.00066	0.303	<0.00020	0.0077	15	0.117	<0.000010
GW-3	09-Dec-2016 10:00	QF8822	<0.05	0.000012	80.6	<0.0010	0.00084	<0.00050	0.98	<0.00020	0.0088	17.7	0.19	<0.000010
GW-3	16-Dec-2016 12:05	QG8924	<0.05	0.00001	98.3	<0.0010	0.00077	<0.00050	1.37	<0.00020	0.0094	19.5	0.22	<0.000010
GW-4A	29-Nov-2016 17:50	QE0416	0.101	0.000156	200	<0.0010	0.00105	0.00403	0.174	<0.00020	0.0496	46.6	0.129	<0.000010
GW-4A	08-Dec-2016 15:00	QF8823	0.218	0.000114	294	<0.0010	0.00071	<0.00050	12.3	<0.00020	0.096	60.8	0.293	<0.000010
GW-4A	15-Dec-2016 14:00	QG8925	0.187	0.00006	281	<0.0010	0.00066	<0.00050	11.6	<0.00020	0.0841	59.5	0.29	<0.000010
GW-2D	28-Nov-2016 14:00	QE0417	0.163	0.000103	263	0.0014	0.00124	0.00079	0.676	<0.00020	0.123	87.3	0.249	<0.000010
FB-1	29-Nov-2016 11:00	QE0418	<0.05	<0.000010	0.093	<0.0010	<0.00050	<0.00050	<0.01	<0.00020	<0.0050	<0.050	<0.0010	<0.000010
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.05	<0.000010	<0.050	<0.0010	<0.00050	0.00399	<0.01	<0.00020	<0.0050	<0.050	<0.0010	<0.000010

Table 1: 2016 Groundwater Quality Data for RSEM Area R5a

Sample ID	Sample Date/Time	Lab Sample ID	T-Mo	T-Ni	T-K	T-Se	T-Si	T-Ag	T-Na	T-Sr	T-S	T-Tl	T-Sn	T-Ti	T-U
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.001	0.001	0.05	0.0001	0.1	0.00002	0.05	0.001	3	0.00005	0.005	0.005	0.0001
GW-1	27-Nov-2016 14:00	QD4990	<0.0010	<0.0010	3.89	0.00027	4.09	<0.000020	31	0.333	97.6	<0.000050	<0.0050	<0.0050	0.00215
GW-1	07-Dec-2016 19:30	QF8820	<0.0010	0.0029	5.71	<0.00010	7.02	<0.000020	108	0.763	361	<0.000050	<0.0050	<0.0050	0.00136
GW-1	15-Dec-2016 16:45	QG8922	<0.0010	0.0033	5.78	<0.00010	7.66	<0.000020	114	0.797	373	<0.000050	<0.0050	<0.0050	0.00146
GW-2	28-Nov-2016 13:20	QE0414	0.001	0.0078	3.28	<0.00010	5.59	<0.000020	97.1	0.626	301	<0.000050	<0.0050	<0.0050	0.00199
GW-2	08-Dec-2016 18:00	QF8821	<0.0010	0.0035	3.84	<0.00010	5.82	<0.000020	145	0.795	452	<0.000050	<0.0050	<0.0050	0.00185
GW-2	16-Dec-2016 09:30	QG8923	<0.0010	0.0036	4.21	<0.00010	6.41	<0.000020	155	0.866	464	<0.000050	<0.0050	<0.0050	0.00199
GW-3	29-Nov-2016 11:00	QE0415	0.0013	0.0019	1.39	0.00014	3.51	<0.000020	7.53	0.192	13.6	<0.000050	<0.0050	<0.0050	0.00383
GW-3	09-Dec-2016 10:00	QF8822	0.0011	0.0016	1.41	<0.00010	3.67	<0.000020	9.43	0.22	19.9	<0.000050	<0.0050	<0.0050	0.00173
GW-3	16-Dec-2016 12:05	QG8924	0.001	0.0015	1.45	<0.00010	4.23	<0.000020	11.9	0.236	27.2	<0.000050	<0.0050	<0.0050	0.0015
GW-4A	29-Nov-2016 17:50	QE0416	<0.0010	0.0033	7.7	0.00059	5.14	<0.000020	18.7	0.472	109	<0.000050	<0.0050	<0.0050	0.00327
GW-4A	08-Dec-2016 15:00	QF8823	<0.0010	0.0033	4.64	<0.00010	7.82	<0.000020	51.5	0.47	224	<0.000050	<0.0050	<0.0050	0.00068
GW-4A	15-Dec-2016 14:00	QG8925	<0.0010	0.0034	4.83	<0.00010	7.73	<0.000020	50.1	0.49	238	<0.000050	<0.0050	<0.0050	0.00079
GW-2D	28-Nov-2016 14:00	QE0417	0.0012	0.0085	3.37	<0.00010	5.87	<0.000020	97.4	0.628	316	<0.000050	<0.0050	<0.0050	0.002
FB-1	29-Nov-2016 11:00	QE0418	<0.0010	<0.0010	<0.050	<0.00010	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.0010	<0.0010	<0.050	<0.00010	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010

Table 1: 2016 Groundwater Quality Data for RSEM Area R5a

Sample ID	Sample Date/Time	Lab Sample ID	T-V	T-Zn	T-Zr	Dissolved Metals	D-Al	D-Sb	D-As	D-Ba	D-Be	D-Bi	D-B	D-Cd	D-Ca
			mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.005	0.005	0.0005		0.003	0.0005	0.0001	0.001	0.0001	0.001	0.05	0.00001	0.05
GW-1	27-Nov-2016 14:00	QD4990	<0.0050	<0.0050	<0.00050		<0.0030	<0.00050	0.00011	0.0154	<0.00010	<0.0010	0.104	0.000043	148
GW-1	07-Dec-2016 19:30	QF8820	<0.0050	<0.0050	<0.00050		<0.0030	<0.00050	<0.00010	0.0114	<0.00010	<0.0010	0.279	0.0001	314
GW-1	15-Dec-2016 16:45	QG8922	<0.0050	0.0098	<0.00050		0.0046	<0.00050	0.0001	0.0091	<0.00010	<0.0010	0.284	0.000107	340
GW-2	28-Nov-2016 13:20	QE0414	<0.0050	<0.0050	<0.00050		0.008	<0.00050	0.00021	0.026	<0.00010	<0.0010	0.163	0.000089	270
GW-2	08-Dec-2016 18:00	QF8821	<0.0050	<0.0050	<0.00050		0.0074	<0.00050	<0.00010	0.0093	<0.00010	<0.0010	0.233	0.000055	325
GW-2	16-Dec-2016 09:30	QG8923	<0.0050	<0.0050	<0.00050		0.0043	<0.00050	0.00016	0.0095	<0.00010	<0.0010	0.206	0.00007	328
GW-3	29-Nov-2016 11:00	QE0415	<0.0050	<0.0050	<0.00050		<0.0030	0.00068	0.00121	0.104	<0.00010	<0.0010	<0.05	<0.000010	80.1
GW-3	09-Dec-2016 10:00	QF8822	<0.0050	<0.0050	<0.00050		<0.0030	<0.00050	0.00145	0.0896	<0.00010	<0.0010	<0.05	<0.000010	77.6
GW-3	16-Dec-2016 12:05	QG8924	<0.0050	<0.0050	<0.00050		<0.0030	<0.00050	0.0016	0.0931	<0.00010	<0.0010	<0.05	<0.000010	84.9
GW-4A	29-Nov-2016 17:50	QE0416	<0.0050	<0.0050	<0.00050		0.0068	<0.00050	0.00018	0.0339	<0.00010	<0.0010	0.107	0.000145	221
GW-4A	08-Dec-2016 15:00	QF8823	<0.0050	<0.0050	<0.00050		0.0198	<0.00050	0.00147	0.0095	<0.00010	<0.0010	0.222	0.000104	263
GW-4A	15-Dec-2016 14:00	QG8925	<0.0050	<0.0050	<0.00050		0.004	<0.00050	0.00172	0.0088	<0.00010	<0.0010	0.198	0.000063	276
GW-2D	28-Nov-2016 14:00	QE0417	<0.0050	<0.0050	<0.00050		0.0081	<0.00050	0.00023	0.023	<0.00010	<0.0010	0.16	0.000099	288
FB-1	29-Nov-2016 11:00	QE0418	<0.0050	<0.0050	<0.00050		<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.0050	<0.0050	<0.00050		<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050

Table 1: 2016 Groundwater Quality Data for RSEM Area R5a

Sample ID	Sample Date/Time	Lab Sample ID	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Li	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.001	0.0005	0.0002	0.005	0.0002	0.005	0.05	0.001	0.00001	0.001	0.001	0.05	0.0001
GW-1	27-Nov-2016 14:00	QD4990	<0.0010	<0.00050	0.00022	<0.0050	<0.00020	0.0438	36.2	0.0228	<0.000010	<0.0010	<0.0010	4.06	0.00027
GW-1	07-Dec-2016 19:30	QF8820	<0.0010	0.00135	0.0004	0.0054	<0.00020	0.11	81	1.84	<0.000010	<0.0010	0.0026	5.6	<0.00010
GW-1	15-Dec-2016 16:45	QG8922	<0.0010	0.0016	0.00057	0.0155	<0.00020	0.121	83.8	1.99	<0.000010	<0.0010	0.0029	5.3	<0.00010
GW-2	28-Nov-2016 13:20	QE0414	<0.0010	0.00119	0.0004	0.624	<0.00020	0.12	93	0.244	<0.000010	0.001	0.0073	3.69	<0.00010
GW-2	08-Dec-2016 18:00	QF8821	<0.0010	<0.00050	0.00024	0.0146	<0.00020	0.173	115	0.0528	<0.000010	<0.0010	0.0036	3.71	<0.00010
GW-2	16-Dec-2016 09:30	QG8923	<0.0010	<0.00050	0.00029	0.0139	<0.00020	0.176	115	0.109	<0.000010	<0.0010	0.0038	3.68	<0.00010
GW-3	29-Nov-2016 11:00	QE0415	<0.0010	0.0007	0.00025	0.322	<0.00020	0.0076	15	0.115	<0.000010	0.0013	0.0017	1.4	0.00015
GW-3	09-Dec-2016 10:00	QF8822	<0.0010	0.00077	<0.00020	1	<0.00020	0.0081	16.6	0.176	<0.000010	0.0011	0.0015	1.3	0.0001
GW-3	16-Dec-2016 12:05	QG8924	<0.0010	0.00075	<0.00020	1.34	<0.00020	0.0089	17.8	0.207	<0.000010	0.0011	0.0015	1.29	<0.00010
GW-4A	29-Nov-2016 17:50	QE0416	<0.0010	0.00104	0.0015	0.182	<0.00020	0.0488	52.3	0.134	<0.000010	<0.0010	0.0036	8.88	0.00049
GW-4A	08-Dec-2016 15:00	QF8823	<0.0010	0.00068	<0.00020	10.9	<0.00020	0.0939	59.3	0.292	<0.000010	<0.0010	0.0035	4.53	<0.00010
GW-4A	15-Dec-2016 14:00	QG8925	<0.0010	0.0007	<0.00020	12.2	<0.00020	0.0947	58.5	0.299	<0.000010	<0.0010	0.0034	4.82	<0.00010
GW-2D	28-Nov-2016 14:00	QE0417	<0.0010	0.00113	0.00022	0.603	<0.00020	0.116	90.2	0.237	<0.000010	<0.0010	0.007	3.41	<0.00010
FB-1	29-Nov-2016 11:00	QE0418	<0.0010	<0.00050	0.00024	<0.0050	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.0010	<0.00050	0.0003	<0.0050	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010	<0.050	<0.00010

Table 1: 2016 Groundwater Quality Data for RSEM Area R5a

Sample ID	Sample Date/Time	Lab Sample ID	D-Si	D-Ag	D-Na	D-Sr	D-S	D-Tl	D-Sn	D-Ti	D-U	D-V	D-Zn	D-Zr	Metals Filtration and Preservation
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
		Maxxam RDL	0.1	0.00002	0.05	0.001	3	0.00005	0.005	0.005	0.0001	0.005	0.005	0.0005	
GW-1	27-Nov-2016 14:00	QD4990	4.14	<0.000020	31.8	0.32	102	<0.000050	<0.0050	<0.0050	0.00205	<0.0050	<0.0050	<0.00050	FIELD
GW-1	07-Dec-2016 19:30	QF8820	6.27	<0.000020	108	0.79	341	<0.000050	<0.0050	<0.0050	0.00144	<0.0050	<0.0050	<0.00050	FIELD
GW-1	15-Dec-2016 16:45	QG8922	6.87	<0.000020	103	0.742	360	<0.000050	<0.0050	<0.0050	0.00128	<0.0050	<0.0050	<0.00050	FIELD
GW-2	28-Nov-2016 13:20	QE0414	5.5	<0.000020	103	0.629	335	<0.000050	<0.0050	<0.0050	0.00199	<0.0050	<0.0050	<0.00050	FIELD
GW-2	08-Dec-2016 18:00	QF8821	5.66	<0.000020	139	0.801	404	<0.000050	<0.0050	<0.0050	0.00191	<0.0050	<0.0050	<0.00050	FIELD
GW-2	16-Dec-2016 09:30	QG8923	5.89	<0.000020	137	0.794	429	<0.000050	<0.0050	<0.0050	0.00185	<0.0050	<0.0050	<0.00050	FIELD
GW-3	29-Nov-2016 11:00	QE0415	3.65	<0.000020	7.41	0.195	13.7	<0.000050	<0.0050	<0.0050	0.0038	<0.0050	<0.0050	<0.00050	FIELD
GW-3	09-Dec-2016 10:00	QF8822	3.49	<0.000020	8.8	0.207	18.3	<0.000050	<0.0050	<0.0050	0.00159	<0.0050	<0.0050	<0.00050	FIELD
GW-3	16-Dec-2016 12:05	QG8924	3.69	<0.000020	10.7	0.229	23.8	<0.000050	<0.0050	<0.0050	0.00137	<0.0050	<0.0050	<0.00050	FIELD
GW-4A	29-Nov-2016 17:50	QE0416	5.76	<0.000020	20.3	0.435	115	<0.000050	<0.0050	<0.0050	0.00307	<0.0050	<0.0050	<0.00050	FIELD
GW-4A	08-Dec-2016 15:00	QF8823	6.72	<0.000020	50.2	0.458	209	<0.000050	<0.0050	<0.0050	0.00069	<0.0050	<0.0050	<0.00050	FIELD
GW-4A	15-Dec-2016 14:00	QG8925	7.43	<0.000020	51.4	0.484	218	<0.000050	<0.0050	<0.0050	0.00067	<0.0050	<0.0050	<0.00050	FIELD
GW-2D	28-Nov-2016 14:00	QE0417	5.86	<0.000020	101	0.622	329	<0.000050	<0.0050	<0.0050	0.0019	<0.0050	<0.0050	<0.00050	FIELD
FB-1	29-Nov-2016 11:00	QE0418	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050	FIELD
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050	FIELD

Table 2: 2016 Groundwater Quality Data for RSEM Area R5b

Sample ID	Sample Date/Time	Lab Sample ID	Field Parameters	pH (field)	Specific Conductance (field)	Temperature	Dissolved Oxygen	ORP	Comments	Physical Properties	pH (lab)	Conductivity (lab)	Total Dissolved Solids	Total Suspended Solids	Total Hardness (CaCO3)	Disolved Hardness (CaCO3)	Inorganics	Alkalinity (Total as CaCO3)
				pH	µS/cm	°C	mg/L	mV			pH	uS/cm	mg/L	mg/L	mg/L	mg/L		mg/L
		Maxxam RDL		0.1	1						0.1	1	10	1-20	0.5	0.5		0.5
GW-6	03-Oct-2016 10:30	PR6457		7.29	1970	5.1			cloudy, brown/grey				1270	255	806	748		
GW-6	12-Oct-2016 15:00	PT5622		7.50	1840	5.4			sl.cloudy, brownish				1380	413	949	818		
GW-6	25-Oct-2016 14:30	PW5654		7.31	2090	4.7			cloudy, grey		7.77	1820	1400	488	942	910		388
GW-7	02-Oct-2016 14:00	PR6456		8.35	510	6.0			clear				254	3.6	194	189		
GW-7	12-Oct-2016 11:00	PT5621		7.90	510	5.2			clear				270	3.4	211	208		
GW-7	24-Oct-2016 17:30	PW5652		7.73	560	5.4			clear		8.12	480	274	4.8	221	225		209
GW-8	03-Oct-2016 14:30	PR6458		7.89	660	6.2			clear - opal brown				330	24.8	249	254		
GW-8	11-Oct-2016 17:00	PT5620		7.80	624	6.0			clear				344	13.2	304	271		
GW-8	25-Oct-2016 11:30	PW5653		7.69	730	5.7			clear		8.12	628	364	7.4	314	289		251
GW-10B	26-Nov-2016 14:00	QD4989		7.36	479	6.8	6.03	57.5	clear		7.99	480	290	37.2	260	233		239
GW-10B	08-Dec-2016 11:30	QF8824		7.30	490	8.0	3.15	41.0	clear		8.18	464	266	3.5	251	243		238
GW-10B	15-Dec-2016 10:00	QG8926		7.18	480	7.3	3.12	37.0	clear		8.23	474	282	5.9	243	239		240
GW-10D	15-Dec-2016 11:00	QG8945									8.26	475	284	4.7	243	239		242
FB-1	29-Nov-2016 11:00	QE0418									5.99	2.1	<10	<1.0	<0.50	<0.50		0.85
TRIP BLANK	30-Nov-2016 10:20	QE0419									5.86	1.9	<10	<1.0	<0.50	<0.50		<0.50

Table 2: 2016 Groundwater Quality Data for RSEM Area R5b

Sample ID	Sample Date/Time	Lab Sample ID	Alkalinity (PP as CaCO3)	Bicarbonate (HCO3)	Carbonate (CO3)	Hydroxide (OH)	Dissolved Chloride (Cl)	Fluoride (F)	Bromide (Br)	Anions and Nutrients	Dissolved Sulphate (SO4)	Total Sulphide	Total Sulphide (as H2S)	Total Ammonia (N)	Nitrite (N)	Nitrate (N)	Nitrate plus Nitrite (N)	Orthophosphate (P)
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.5	0.5	0.5	0.5	0.5-1	0.01	0.01-0.1		0.5-5	0.005	0.005-0.0053	0.005	0.002-0.005	0.002-0.02	0.002-0.02	0.005
GW-6	03-Oct-2016 10:30	PR6457					5.3	0.97	<0.10		600	<0.0050	<0.0053	0.42	<0.0020	0.0048	0.0048	<0.0050
GW-6	12-Oct-2016 15:00	PT5622					6.3	0.9	<0.10		690	<0.0050	<0.0053	0.7	<0.0020	<0.0020	<0.0020	<0.0050
GW-6	25-Oct-2016 14:30	PW5654	<0.50	473	<0.50	<0.50	5.9	0.94	0.073		684	<0.0050	<0.0050	0.65	<0.0050	<0.020	<0.020	<0.0050
GW-7	02-Oct-2016 14:00	PR6456					<1.0	0.99	0.012		45	0.0072	0.008	0.13	0.0021	0.007	0.0091	0.035
GW-7	12-Oct-2016 11:00	PT5621					1.5	0.74	0.016		45	0.0067	0.007	0.18	<0.0020	<0.0020	<0.0020	0.0209
GW-7	24-Oct-2016 17:30	PW5652	<0.50	255	<0.50	<0.50	1.4	0.94	0.012		34.2	0.0087	0.009	0.13	<0.0050	<0.020	<0.020	<0.0050
GW-8	03-Oct-2016 14:30	PR6458					1.4	0.71	0.018		79	<0.0050	<0.0053	0.048	0.0034	0.0588	0.0622	<0.0050
GW-8	11-Oct-2016 17:00	PT5620					1.8	0.78	0.019		90	0.0058	0.006	0.069	<0.0020	0.0037	0.0037	0.0132
GW-8	25-Oct-2016 11:30	PW5653	<0.50	306	<0.50	<0.50	1.7	0.72	0.016		90.8	0.008	0.008	0.022	<0.0050	<0.020	<0.020	0.0065
GW-10B	26-Nov-2016 14:00	QD4989	<0.50	291	<0.50	<0.50	1.5	0.16	0.012		26.3	0.0054	0.006	0.019	0.0093	0.211	0.221	0.0502
GW-10B	08-Dec-2016 11:30	QF8824	<0.50	290	<0.50	<0.50	0.53	0.16	0.012		24.2	<0.0050	<0.0050	0.07	<0.0050	0.192	0.192	0.0084
GW-10B	15-Dec-2016 10:00	QG8926	<0.50	293	<0.50	<0.50	0.78	0.16	<0.10		25.2	0.0066	0.007	0.021	<0.0050	0.168	0.168	0.017
GW-10D	15-Dec-2016 11:00	QG8945	<0.50	296	<0.50	<0.50	0.91	0.16	0.011		28	0.0059	0.006	0.024	<0.0050	0.17	0.17	0.0124
FB-1	29-Nov-2016 11:00	QE0418	<0.50	1.04	<0.50	<0.50	3.7	<0.010	<0.010		<0.50	0.007	0.007	<0.0050	<0.0050	<0.020	<0.020	<0.0050
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.50	<0.50	<0.50	<0.50	<0.50	<0.010	<0.010		<0.50	<0.0050	<0.0050	<0.0050	<0.0050	<0.020	<0.020	<0.0050

Table 2: 2016 Groundwater Quality Data for RSEM Area R5b

Sample ID	Sample Date/Time	Lab Sample ID	Organic / Inorganic Carbon	TOC	DOC	Total Metals	T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co
				mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL		0.5	0.5		0.003	0.00002-0.0005	0.0001	0.001	0.00001-0.0001	0.000005 - 0.001	0.05	0.00001	0.05	0.0001-0.001	0.000005-0.0005
GW-6	03-Oct-2016 10:30	PR6457			5.24		3.47	0.000459	0.00389	0.203	0.000178	0.000088	0.151	0.000371	223	0.00601	0.00504
GW-6	12-Oct-2016 15:00	PT5622	6.25	6.25	6.95		4.86	<0.00050	0.00623	0.227	0.00023	<0.0010	0.153	0.000722	258	0.0092	0.00697
GW-6	25-Oct-2016 14:30	PW5654	5.96	5.96	5.18		5.15	<0.00050	0.00789	0.225	0.00035	<0.0010	0.151	0.000715	264	0.0101	0.00709
GW-7	02-Oct-2016 14:00	PR6456			3.35		0.0498	0.000155	0.00116	0.0388	<0.000010	<0.0000050	0.047	0.00001	56.1	0.00023	0.000401
GW-7	12-Oct-2016 11:00	PT5621	2.88	2.88	2.91		0.0245	<0.00050	0.00079	0.046	<0.00010	<0.0010	0.055	<0.000010	59.9	<0.0010	0.00066
GW-7	24-Oct-2016 17:30	PW5652	3.78	3.78	3.93		0.0111	<0.00050	0.0007	0.0487	<0.00010	<0.0010	0.06	<0.000010	61.4	<0.0010	0.0007
GW-8	03-Oct-2016 14:30	PR6458			2.93		0.306	0.000128	0.000402	0.0602	0.000024	<0.000010	0.036	0.000028	72	0.00055	0.000549
GW-8	11-Oct-2016 17:00	PT5620	1.98	1.98	1.98		0.139	<0.00050	0.00041	0.0551	<0.00010	<0.0010	<0.05	0.00002	83.7	<0.0010	0.00078
GW-8	25-Oct-2016 11:30	PW5653	1.46	1.46	1.72		0.051	<0.00050	0.00059	0.0573	<0.00010	<0.0010	<0.05	0.000026	91	<0.0010	0.00085
GW-10B	26-Nov-2016 14:00	QD4989	2.39	2.39	2.1		0.28	0.00072	0.00133	0.153	<0.00010	<0.0010	<0.05	0.000084	76.6	0.0055	0.00116
GW-10B	08-Dec-2016 11:30	QF8824	1.59	1.59	1.51		0.0157	<0.00050	0.00077	0.117	<0.00010	<0.0010	<0.05	0.000032	71.1	0.005	0.00154
GW-10B	15-Dec-2016 10:00	QG8926		1.17	0.88		0.116	<0.00050	0.00079	0.119	<0.00010	<0.0010	<0.05	0.000051	70.6	0.0035	0.00122
GW-10D	15-Dec-2016 11:00	QG8945		0.71	1.3		0.155	<0.00050	0.001	0.135	<0.00010	<0.0010	<0.05	0.000077	69.1	0.0037	0.00151
FB-1	29-Nov-2016 11:00	QE0418		<0.50	<0.50		<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	0.093	<0.0010	<0.00050
TRIP BLANK	30-Nov-2016 10:20	QE0419		0.74	<0.50		<0.0030	<0.00050	<0.00010	<0.0010	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050

Table 2: 2016 Groundwater Quality Data for RSEM Area R5b

Sample ID	Sample Date/Time	Lab Sample ID	T-Cu	T-Fe	T-Pb	T-Li	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-P	T-K	T-Se	T-Si	T-Ag	T-Na
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.00005-0.0005	0.01	0.00002-0.0002	0.005	0.05	0.001	0.000002-0.00001	0.00005-0.001	0.0001-0.001	0.005	0.05	0.00004-0.0001	0.1	0.000005-0.00002	0.05
GW-6	03-Oct-2016 10:30	PR6457	0.0124	15.4	0.00575	0.111	60.5	0.9	<0.0000020	0.00314	0.0124	0.327	3.48	0.000256	10.5	0.00009	101
GW-6	12-Oct-2016 15:00	PT5622	0.0238	25.3	0.00986	0.116	73.9	1.05	<0.000010	0.002	0.0191		3.76	0.00033	11.7	0.00016	122
GW-6	25-Oct-2016 14:30	PW5654	0.0225	23.8	0.0105	0.117	68.8	1.16	<0.000010	0.0018	0.0201		3.11	0.00028	12.2	0.000124	111
GW-7	02-Oct-2016 14:00	PR6456	0.000234	0.244	0.000032	0.0225	13.1	0.13	<0.0000020	0.00479	0.000976	0.0531	1.58	0.000285	4.91	<0.0000050	13.2
GW-7	12-Oct-2016 11:00	PT5621	<0.00050	1.07	<0.00020	0.0264	15	0.28	<0.000010	0.0036	<0.0010		1.31	<0.00010	4.96	<0.000020	15.8
GW-7	24-Oct-2016 17:30	PW5652	<0.00050	1.57	<0.00020	0.0287	16.6	0.758	<0.000010	0.0036	<0.0010		1.08	<0.00010	4.41	<0.000020	13.7
GW-8	03-Oct-2016 14:30	PR6458	0.0008	0.39	0.000187	0.0169	16.7	0.118	<0.0000020	0.00657	0.00123	0.0261	2.26	0.000644	4.24	0.00001	18.6
GW-8	11-Oct-2016 17:00	PT5620	0.0005	0.61	0.00024	0.0204	23.2	0.368	0.000051	0.0029	0.0014		1.87	0.00019	4.12	<0.000020	19.7
GW-8	25-Oct-2016 11:30	PW5653	<0.00050	0.656	<0.00020	0.0242	21	0.519	<0.000010	0.0031	0.0019		1.43	0.00016	4.04	<0.000020	17
GW-10B	26-Nov-2016 14:00	QD4989	0.00234	1.08	0.00056	0.0111	16.7	0.0713	<0.000010	0.0023	0.0063		2.12	0.00337	5.17	<0.000020	4.8
GW-10B	08-Dec-2016 11:30	QF8824	0.00212	0.118	0.00101	0.0127	17.9	0.0975	<0.000010	0.0025	0.0046		2.08	0.00292	4.86	0.00004	5.64
GW-10B	15-Dec-2016 10:00	QG8926	0.00177	0.547	0.00066	0.0108	16.1	0.127	<0.000010	0.0016	0.0041		1.94	0.00248	4.83	0.000021	5.01
GW-10D	15-Dec-2016 11:00	QG8945	0.00233	0.752	0.00081	0.0121	17.1	0.141	<0.000010	0.0018	0.0054		2.09	0.00245	4.9	0.000033	5.08
FB-1	29-Nov-2016 11:00	QE0418	<0.00050	<0.01	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010		<0.050	<0.00010	<0.1	<0.000020	<0.050
TRIP BLANK	30-Nov-2016 10:20	QE0419	0.00399	<0.01	<0.00020	<0.0050	<0.050	<0.0010	<0.000010	<0.0010	<0.0010		<0.050	<0.00010	<0.1	<0.000020	<0.050

Table 2: 2016 Groundwater Quality Data for RSEM Area R5b

Sample ID	Sample Date/Time	Lab Sample ID	T-Sr	T-S	T-Tl	T-Sn	T-Ti	T-U	T-V	T-Zn	T-Zr	Dissolved Metals	D-Al	D-Sb	D-As	D-Ba
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.001	3	0.000002-0.00005	0.0002-0.005	0.0005-0.005	0.000002-0.0001	0.0002-0.005	0.0001-0.005	0.0001-0.0005		0.003	0.00002-0.0005	0.0001	0.001
GW-6	03-Oct-2016 10:30	PR6457	0.569	213	0.000054	<0.00020	0.0655	0.00157	0.00961	0.0407	0.0121		0.111	0.000151	0.00129	0.117
GW-6	12-Oct-2016 15:00	PT5622	0.584	247	0.000104	<0.0050	0.0856	0.00125	0.0141	0.0767	0.00093		0.0084	<0.00050	0.00097	0.0956
GW-6	25-Oct-2016 14:30	PW5654	0.566	233	0.000104	<0.0050	0.0815	0.00143	0.0156	0.0849	0.00076		0.0054	<0.00050	0.00119	0.0818
GW-7	02-Oct-2016 14:00	PR6456	0.195	14	0.000003	<0.00020	0.00115	0.000351	0.00094	0.00438	<0.00010		0.00812	0.000154	0.001	0.0401
GW-7	12-Oct-2016 11:00	PT5621	0.208	14.8	<0.000050	<0.0050	<0.0050	0.00017	<0.0050	0.0078	<0.00050		0.0077	<0.00050	0.00075	0.0445
GW-7	24-Oct-2016 17:30	PW5652	0.206	11.7	<0.000050	<0.0050	<0.0050	0.00016	<0.0050	0.0058	<0.00050		0.0059	<0.00050	0.00067	0.0473
GW-8	03-Oct-2016 14:30	PR6458	0.229	24.1	0.000016	<0.00020	0.0085	0.000586	0.00085	0.0019	0.00043		0.00645	0.000132	0.000328	0.0546
GW-8	11-Oct-2016 17:00	PT5620	0.243	25.8	<0.000050	<0.0050	<0.0050	0.00046	<0.0050	<0.0050	<0.00050		0.0063	<0.00050	0.00038	0.0499
GW-8	25-Oct-2016 11:30	PW5653	0.247	27.4	<0.000050	<0.0050	<0.0050	0.00063	<0.0050	<0.0050	<0.00050		0.0125	<0.00050	0.00054	0.0521
GW-10B	26-Nov-2016 14:00	QD4989	0.203	8.3	<0.000050	<0.0050	<0.0050	0.0127	<0.0050	0.0118	<0.00050		<0.0030	0.00057	0.00083	0.127
GW-10B	08-Dec-2016 11:30	QF8824	0.215	8.5	<0.000050	<0.0050	<0.0050	0.011	<0.0050	<0.0050	<0.00050		0.003	<0.00050	0.00067	0.11
GW-10B	15-Dec-2016 10:00	QG8926	0.18	7	<0.000050	<0.0050	<0.0050	0.0088	<0.0050	<0.0050	<0.00050		<0.0030	<0.00050	0.0006	0.115
GW-10D	15-Dec-2016 11:00	QG8945	0.199	4.7	<0.000050	<0.0050	<0.0050	0.00974	<0.0050	0.0063	<0.00050		<0.0030	<0.00050	0.0006	0.111
FB-1	29-Nov-2016 11:00	QE0418	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050		<0.0030	<0.00050	<0.00010	<0.0010
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050	<0.0050	<0.00050		<0.0030	<0.00050	<0.00010	<0.0010

Table 2: 2016 Groundwater Quality Data for RSEM Area R5b

Sample ID	Sample Date/Time	Lab Sample ID	D-Be	D-Bi	D-B	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Li	D-Mg	D-Mn	D-Hg
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.00001 - 0.0001	0.000005-0.001	0.05	0.000005 - 0.00001	0.05	0.0001-0.001	0.000005-0.0005	0.00005-0.0002	0.005	0.000005-0.0002	0.005	0.05	0.001	0.000002-0.00001
GW-6	03-Oct-2016 10:30	PR6457	<0.000010	0.000006	0.138	0.000015	210	0.00027	0.00173	0.000707	6.69	0.000162	0.109	54.3	0.692	<0.0000020
GW-6	12-Oct-2016 15:00	PT5622	<0.00010	<0.0010	0.144	<0.000010	218	<0.0010	<0.00050	<0.00020	7.87	0.00029	0.109	66.2	0.684	<0.000010
GW-6	25-Oct-2016 14:30	PW5654	<0.00010	<0.0010	0.148	<0.000010	246	<0.0010	<0.00050	<0.00020	7.26	<0.00020	0.109	71.7	0.821	<0.000010
GW-7	02-Oct-2016 14:00	PR6456	<0.000010	0.000005	0.044	0.000006	55.6	<0.00010	0.000385	0.000095	0.142	0.000006	0.0215	12.3	0.131	<0.0000020
GW-7	12-Oct-2016 11:00	PT5621	<0.00010	<0.0010	<0.05	<0.000010	57.7	<0.0010	0.00066	<0.00020	1.08	<0.00020	0.0263	15.4	0.278	<0.000010
GW-7	24-Oct-2016 17:30	PW5652	<0.00010	<0.0010	0.059	<0.000010	61.1	<0.0010	0.00072	<0.00020	1.57	0.00037	0.0299	17.6	0.709	<0.000010
GW-8	03-Oct-2016 14:30	PR6458	<0.000010	<0.0000050	0.036	0.000014	72.4	<0.00010	0.000474	0.000298	0.0086	<0.0000050	0.0174	17.8	0.115	<0.0000020
GW-8	11-Oct-2016 17:00	PT5620	<0.00010	<0.0010	<0.05	<0.000010	74.9	<0.0010	0.00063	<0.00020	0.217	<0.00020	0.0216	20.4	0.378	<0.000010
GW-8	25-Oct-2016 11:30	PW5653	<0.00010	<0.0010	<0.05	0.000019	80.1	<0.0010	0.00089	<0.00020	0.49	<0.00020	0.0235	21.6	0.513	<0.000010
GW-10B	26-Nov-2016 14:00	QD4989	<0.00010	<0.0010	<0.05	0.000023	68.1	<0.0010	<0.00050	0.00023	0.0312	<0.00020	0.0117	15.3	0.0426	<0.000010
GW-10B	08-Dec-2016 11:30	QF8824	<0.00010	<0.0010	<0.05	0.000026	69.6	0.0012	0.00063	0.00127	0.0411	0.00052	0.012	16.8	0.0875	<0.000010
GW-10B	15-Dec-2016 10:00	QG8926	<0.00010	<0.0010	<0.05	0.000033	68.3	<0.0010	0.00083	0.00069	0.0337	0.00021	0.0126	16.6	0.129	<0.000010
GW-10D	15-Dec-2016 11:00	QG8945	<0.00010	<0.0010	<0.05	0.000032	67.5	<0.0010	0.00083	0.00064	0.0339	0.00022	0.0116	17	0.124	<0.000010
FB-1	29-Nov-2016 11:00	QE0418	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050	0.00024	<0.0050	<0.00020	<0.0050	<0.050	<0.0010	<0.000010
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.00010	<0.0010	<0.05	<0.000010	<0.050	<0.0010	<0.00050	0.0003	<0.0050	<0.00020	<0.0050	<0.050	<0.0010	<0.000010

Table 2: 2016 Groundwater Quality Data for RSEM Area R5b

Sample ID	Sample Date/Time	Lab Sample ID	D-Mo	D-Ni	D-P	D-K	D-Se	D-Si	D-Ag	D-Na	D-Sr	D-S	D-Tl	D-Sn	D-Ti	D-U	D-V
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		Maxxam RDL	0.00005-0.001	0.0001-0.001	0.002	0.05	0.00004-0.0001	0.1	0.000005-0.00002	0.05	0.001	3	0.000002-0.00005	0.0002-0.005	0.0005-0.005	0.000002-0.0001	0.0002-0.005
GW-6	03-Oct-2016 10:30	PR6457	0.00248	0.00288	0.129	2.94	0.000138	5.53	<0.0000050	97.3	0.55	192	0.000006	<0.00020	0.00402	0.00114	0.00059
GW-6	12-Oct-2016 15:00	PT5622	0.0019	<0.0010		2.85	<0.00010	5.38	<0.000020	113	0.548	234	<0.000050	<0.0050	<0.0050	0.00099	<0.0050
GW-6	25-Oct-2016 14:30	PW5654	0.0014	<0.0010		3.23	<0.00010	6.2	<0.000020	119	0.527	246	<0.000050	<0.0050	<0.0050	0.00074	<0.0050
GW-7	02-Oct-2016 14:00	PR6456	0.00461	0.001	0.0429	1.56	0.000262	4.6	<0.0000050	13	0.198	12.8	0.000005	<0.00020	<0.00050	0.000364	0.00074
GW-7	12-Oct-2016 11:00	PT5621	0.0036	<0.0010		1.29	<0.00010	4.32	<0.000020	17.5	0.221	14.8	<0.000050	<0.0050	<0.0050	0.00017	<0.0050
GW-7	24-Oct-2016 17:30	PW5652	0.0034	<0.0010		1.27	<0.00010	4.18	<0.000020	14.9	0.202	12.5	<0.000050	<0.0050	<0.0050	0.00016	<0.0050
GW-8	03-Oct-2016 14:30	PR6458	0.00687	0.000883	0.013	2.42	0.000656	3.53	<0.0000050	19.1	0.227	24.2	0.000006	<0.00020	<0.00050	0.000599	<0.00020
GW-8	11-Oct-2016 17:00	PT5620	0.0031	0.001		1.79	<0.00010	3.66	<0.000020	17.6	0.249	27.4	<0.000050	<0.0050	<0.0050	0.00048	<0.0050
GW-8	25-Oct-2016 11:30	PW5653	0.0031	0.0019		1.55	0.00014	3.76	<0.000020	17.7	0.249	29.4	<0.000050	<0.0050	<0.0050	0.00061	<0.0050
GW-10B	26-Nov-2016 14:00	QD4989	0.002	0.0018		2.04	0.00345	4.67	<0.000020	4.53	0.209	7.3	<0.000050	<0.0050	<0.0050	0.0121	<0.0050
GW-10B	08-Dec-2016 11:30	QF8824	0.0022	0.0029		1.99	0.00293	4.79	<0.000020	5.15	0.212	7.2	<0.000050	<0.0050	<0.0050	0.0106	<0.0050
GW-10B	15-Dec-2016 10:00	QG8926	0.0019	0.0025		1.96	0.00266	4.83	<0.000020	4.68	0.214	8.1	<0.000050	<0.0050	<0.0050	0.00896	<0.0050
GW-10D	15-Dec-2016 11:00	QG8945	0.002	0.0024		1.91	0.00264	4.78	<0.000020	4.94	0.215	7.8	<0.000050	<0.0050	<0.0050	0.00925	<0.0050
FB-1	29-Nov-2016 11:00	QE0418	<0.0010	<0.0010		<0.050	<0.00010	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.0010	<0.0010		<0.050	<0.00010	<0.1	<0.000020	<0.050	<0.0010	<3.0	<0.000050	<0.0050	<0.0050	<0.00010	<0.0050

Table 2: 2016 Groundwater Quality Data for RSEM Area R5b

Sample ID	Sample Date/Time	Lab Sample ID	D-Zn	D-Zr	Metals Filtration and Preservation
			mg/L	mg/L	
		Maxxam RDL	0.0001-0.005	0.0001-0.0005	
GW-6	03-Oct-2016 10:30	PR6457	0.00214	0.00014	FIELD
GW-6	12-Oct-2016 15:00	PT5622	<0.0050	<0.00050	FIELD
GW-6	25-Oct-2016 14:30	PW5654	<0.0050	<0.00050	FIELD
GW-7	02-Oct-2016 14:00	PR6456	0.00315	<0.00010	FIELD
GW-7	12-Oct-2016 11:00	PT5621	0.0079	<0.00050	FIELD
GW-7	24-Oct-2016 17:30	PW5652	0.0051	<0.00050	FIELD
GW-8	03-Oct-2016 14:30	PR6458	0.0007	<0.00010	FIELD
GW-8	11-Oct-2016 17:00	PT5620	<0.0050	<0.00050	FIELD
GW-8	25-Oct-2016 11:30	PW5653	<0.0050	<0.00050	FIELD
GW-10B	26-Nov-2016 14:00	QD4989	0.0052	<0.00050	FIELD
GW-10B	08-Dec-2016 11:30	QF8824	<0.0050	<0.00050	FIELD
GW-10B	15-Dec-2016 10:00	QG8926	<0.0050	<0.00050	FIELD
GW-10D	15-Dec-2016 11:00	QG8945	<0.0050	<0.00050	FIELD
FB-1	29-Nov-2016 11:00	QE0418	<0.0050	<0.00050	FIELD
TRIP BLANK	30-Nov-2016 10:20	QE0419	<0.0050	<0.00050	FIELD

Table 1: Field Blank and Trip Blank Analytical Results for RSEM Areas R5a and R5b

Sample ID			FB-1	TRIP BLANK
Sample Date/Time			2016/11/29	2016/11/30
Lab Sample ID			QE0418	QE0419
Parameter	**Units**	**RDL**		
Physical Properties				
pH (lab)	pH		5.99	5.86
Conductivity (lab)	uS/cm	1	2.1	1.9*
Total Dissolved Solids	mg/L	10	<10	<10
Total Suspended Solids	mg/L	1	<1.0	<1.0
Total Hardness (CaCO3)	mg/L	0.5	<0.50	<0.50
Disolved Hardness (CaCO3)	mg/L	0.5	<0.50	<0.50
Inorganics				
Alkalinity (Total as CaCO3)	mg/L	0.5	0.85*	<0.50
Alkalinity (PP as CaCO3)	mg/L	0.5	<0.50	<0.50
Bicarbonate (HCO3)	mg/L	0.5	1.04	<0.50
Carbonate (CO3)	mg/L	0.5	<0.50	<0.50
Hydroxide (OH)	mg/L	0.5	<0.50	<0.50
Dissolved Chloride (Cl)	mg/L	0.5	3.7	<0.50
Fluoride (F)	mg/L	0.01	<0.010	<0.010
Bromide (Br)	mg/L	0.01	<0.010	<0.010
Anions and Nutrients				
Dissolved Sulphate (SO4)	mg/L	0.5	<0.50	<0.50
Sulphide	mg/L	0.005	0.007*	<0.0050
Total Sulphide (as H2S)	mg/L	0.005	0.007*	<0.0050
Total Ammonia (N)	mg/L	0.005	<0.0050	<0.0050
Nitrite (N)	mg/L	0.005	<0.0050	<0.0050
Nitrate (N)	mg/L	0.02	<0.020	<0.020
Nitrate plus Nitrite (N)	mg/L	0.02	<0.020	<0.020
Orthophosphate (P)	mg/L	0.005	<0.0050	<0.0050
Organic/Inorganic Carbon				
TOC	mg/L	0.5	<0.50	0.74*
DOC	mg/L	0.5	<0.50	<0.50
Total Metals				
T-Al	mg/L	0.003	<0.0030	<0.0030
T-Sb	mg/L	0.0005	<0.00050	<0.00050
T-As	mg/L	0.0001	<0.00010	<0.00010
T-Ba	mg/L	0.001	<0.0010	<0.0010
T-Be	mg/L	0.0001	<0.00010	<0.00010
T-Bi	mg/L	0.001	<0.0010	<0.0010
T-B	mg/L	0.05	<0.05	<0.05
T-Cd	mg/L	0.00001	<0.000010	<0.000010
T-Ca	mg/L	0.05	0.093*	<0.050
T-Cr	mg/L	0.001	<0.0010	<0.0010
T-Co	mg/L	0.0005	<0.00050	<0.00050
T-Cu	mg/L	0.0005	<0.00050	0.00399
T-Fe	mg/L	0.01	<0.01	<0.01
T-Pb	mg/L	0.0002	<0.00020	<0.00020
T-Li	mg/L	0.005	<0.0050	<0.0050
T-Mg	mg/L	0.05	<0.050	<0.050
T-Mn	mg/L	0.001	<0.0010	<0.0010
T-Hg	mg/L	0.00001	<0.000010	<0.000010
T-Mo	mg/L	0.001	<0.0010	<0.0010
T-Ni	mg/L	0.001	<0.0010	<0.0010
T-P	mg/L		-	-
T-K	mg/L	0.05	<0.050	<0.050
T-Se	mg/L	0.0001	<0.00010	<0.00010
T-Si	mg/L	0.1	<0.1	<0.1
T-Ag	mg/L	0.00002	<0.000020	<0.000020
T-Na	mg/L	0.05	<0.050	<0.050

Table 1: Field Blank and Trip Blank Analytical Results for RSEM Areas R5a and R5b

Sample ID			**FB-1**	**TRIP BLANK**
Sample Date/Time			2016/11/29	2016/11/30
Lab Sample ID			QE0418	QE0419
T-Sr	mg/L	0.001	<0.0010	<0.0010
T-S	mg/L	3	<3.0	<3.0
T-Tl	mg/L	0.00005	<0.000050	<0.000050
T-Sn	mg/L	0.005	<0.0050	<0.0050
T-Ti	mg/L	0.005	<0.0050	<0.0050
T-U	mg/L	0.0001	<0.00010	<0.00010
T-V	mg/L	0.005	<0.0050	<0.0050
T-Zn	mg/L	0.005	<0.0050	<0.0050
T-Zr	mg/L	0.0005	<0.00050	<0.00050
Dissolved Metals				
D-Al	mg/L	0.003	<0.0030	<0.0030
D-Sb	mg/L	0.0005	<0.00050	<0.00050
D-As	mg/L	0.0001	<0.00010	<0.00010
D-Ba	mg/L	0.001	<0.0010	<0.0010
D-Be	mg/L	0.0001	<0.00010	<0.00010
D-Bi	mg/L	0.001	<0.0010	<0.0010
D-B	mg/L	0.05	<0.05	<0.05
D-Cd	mg/L	0.00001	<0.000010	<0.000010
D-Ca	mg/L	0.05	<0.050	<0.050
D-Cr	mg/L	0.001	<0.0010	<0.0010
D-Co	mg/L	0.0005	<0.00050	<0.00050
D-Cu	mg/L	0.0002	0.00024*	0.0003*
D-Fe	mg/L	0.005	<0.0050	<0.0050
D-Pb	mg/L	0.0002	<0.00020	<0.00020
D-Li	mg/L	0.005	<0.0050	<0.0050
D-Mg	mg/L	0.05	<0.050	<0.050
D-Mn	mg/L	0.001	<0.0010	<0.0010
D-Hg	mg/L	0.00001	<0.000010	<0.000010
D-Mo	mg/L	0.001	<0.0010	<0.0010
D-Ni	mg/L	0.001	<0.0010	<0.0010
D-P	mg/L		-	-
D-K	mg/L	0.05	<0.050	<0.050
D-Se	mg/L	0.0001	<0.00010	<0.00010
D-Si	mg/L	0.1	<0.1	<0.1
D-Ag	mg/L	0.00002	<0.000020	<0.000020
D-Na	mg/L	0.05	<0.050	<0.050
D-Sr	mg/L	0.001	<0.0010	<0.0010
D-S	mg/L	3	<3.0	<3.0
D-Tl	mg/L	0.00005	<0.000050	<0.000050
D-Sn	mg/L	0.005	<0.0050	<0.0050
D-Ti	mg/L	0.005	<0.0050	<0.0050
D-U	mg/L	0.0001	<0.00010	<0.00010
D-V	mg/L	0.005	<0.0050	<0.0050
D-Zn	mg/L	0.005	<0.0050	<0.0050
D-Zr	mg/L	0.0005	<0.00050	<0.00050
Metals Filtration and Preservation	-	-	FIELD	FIELD

Notes:

1. RDL = Reportable Detection Limit

* Detected values are <2x the RDL.

Yellow shading indicates detectable values

Table 2: Field Replicate Analytical Results for RSEM Area R5a

Sample ID			**GW-2**	**GW-2D**	**RPD**
Sample Date/Time			2016-11-28 13:20	2016-11-28 14:00	
Lab Sample ID			QE0414	QE0417	
Sample Type			Sample	Duplicate	
Parameter	**Units**	**RDL**			
Physical Properties					
pH (lab)	pH	-	7.91	7.90	-
Conductivity (lab)	uS/cm	1	2020	2020	0.0%
Total Dissolved Solids	mg/L	10	1660	1650	1%
Total Suspended Solids	mg/L	1	13.8	19.6	35%
Total Hardness (CaCO3)	mg/L	0.5	1040	1020	2%
Disolved Hardness (CaCO3)	mg/L	0.5	1060	1090	3%
Inorganics					
Alkalinity (Total as CaCO3)	mg/L	0.5	359	355	1%
Alkalinity (PP as CaCO3)	mg/L	0.5	<0.50	<0.50	-
Bicarbonate (HCO3)	mg/L	0.5	438	433	1%
Carbonate (CO3)	mg/L	0.5	<0.50	<0.50	-
Hydroxide (OH)	mg/L	0.5	<0.50	<0.50	-
Dissolved Chloride (Cl)	mg/L	0.5	3.6	3.8	5%
Fluoride (F)	mg/L	0.01	0.71	0.71	0.0%
Bromide (Br)	mg/L	0.10	<0.10	<0.10	-
Anions and Nutrients					
Dissolved Sulphate (SO4)	mg/L	5	912	915	0.3%
Sulphide	mg/L	0.005	0.0061	0.0060	-
Total Sulphide (as H2S)	mg/L	0.005	0.006	0.006	-
Total Ammonia (N)	mg/L	0.005	0.15	0.12	22%
Nitrite (N)	mg/L	0.005	<0.0050	<0.0050	-
Nitrate (N)	mg/L	0.02	<0.020	<0.020	-
Nitrate plus Nitrite (N)	mg/L	0.02	<0.020	<0.020	-
Orthophosphate (P)	mg/L	0.005	0.0068	<0.0050	-
Organic/Inorganic Carbon					
TOC	mg/L	0.5	0.71	1.3	-
DOC	mg/L	0.5	<0.50	<0.50	-
Total Metals					
T-Al	mg/L	0.003	0.0372	0.0537	36%
T-Sb	mg/L	0.0005	<0.00050	<0.00050	-
T-As	mg/L	0.0001	0.00026	0.00026	-
T-Ba	mg/L	0.001	0.0245	0.0237	3%
T-Be	mg/L	0.0001	<0.00010	<0.00010	-
T-Bi	mg/L	0.001	<0.001	<0.001	-
T-B	mg/L	0.05	0.158	0.163	-
T-Cd	mg/L	0.00001	0.000107	0.000103	4%
T-Ca	mg/L	0.05	272	263	3%
T-Cr	mg/L	0.001	0.001	0.0014	-
T-Co	mg/L	0.0005	0.00119	0.00124	-
T-Cu	mg/L	0.0005	0.00066	0.00079	-
T-Fe	mg/L	0.01	0.604	0.676	11%
T-Pb	mg/L	0.0002	<0.00020	<0.00020	-
T-Li	mg/L	0.005	0.121	0.123	2%
T-Mg	mg/L	0.05	86.4	87.3	1%
T-Mn	mg/L	0.001	0.243	0.249	2%
T-Hg	mg/L	0.00001	<0.000010	<0.000010	-
T-Mo	mg/L	0.001	0.001	0.0012	-
T-Ni	mg/L	0.001	0.0078	0.0085	9%
T-P	mg/L	-	-	-	-
T-K	mg/L	0.05	3.28	3.37	-
T-Se	mg/L	0.0001	<0.00010	<0.00010	-
T-Si	mg/L	0.1	5.59	5.87	5%
T-Ag	mg/L	0.00002	<0.000020	<0.000020	-
T-Na	mg/L	0.05	97.1	97.4	-
T-Sr	mg/L	0.001	0.626	0.628	0.3%
T-S	mg/L	3	301	316	5%

Table 2: Field Replicate Analytical Results for RSEM Area R5a

Sample ID			**GW-2**	**GW-2D**	**RPD**
Sample Date/Time			2016-11-28 13:20	2016-11-28 14:00	
Lab Sample ID			QE0414	QE0417	
Sample Type			Sample	Duplicate	
T-Tl	mg/L	0.00005	<0.000050	<0.000050	-
T-Sn	mg/L	0.005	<0.005	<0.005	-
T-Ti	mg/L	0.005	<0.005	<0.005	-
T-U	mg/L	0.0001	0.00199	0.0020	1%
T-V	mg/L	0.005	<0.005	<0.005	-
T-Zn	mg/L	0.005	<0.005	<0.005	-
T-Zr	mg/L	0.0005	<0.00050	<0.00050	-
Dissolved Metals					
D-Al	mg/L	0.003	0.008	0.0081	-
D-Sb	mg/L	0.0005	<0.00050	<0.00050	-
D-As	mg/L	0.0001	0.00021	0.00023	-
D-Ba	mg/L	0.001	0.026	0.023	12%
D-Be	mg/L	0.0001	<0.00010	<0.00010	-
D-Bi	mg/L	0.001	<0.001	<0.001	-
D-B	mg/L	0.05	0.163	0.160	-
D-Cd	mg/L	0.00001	0.000089	0.000099	11%
D-Ca	mg/L	0.05	270	288	6%
D-Cr	mg/L	0.001	<0.001	<0.001	-
D-Co	mg/L	0.0005	0.00119	0.00113	-
D-Cu	mg/L	0.0002	0.0004	0.00022	-
D-Fe	mg/L	0.005	0.624	0.603	3%
D-Pb	mg/L	0.0002	<0.00020	<0.00020	-
D-Li	mg/L	0.005	0.12	0.116	3%
D-Mg	mg/L	0.05	93	90.2	3%
D-Mn	mg/L	0.001	0.244	0.237	3%
D-Hg	mg/L	0.00001	<0.000010	<0.000010	-
D-Mo	mg/L	0.001	0.001	<0.001	-
D-Ni	mg/L	0.001	0.0073	0.0070	4%
D-P	mg/L	-	-	-	-
D-K	mg/L	0.05	3.69	3.41	8%
D-Se	mg/L	0.0001	<0.00010	<0.00010	-
D-Si	mg/L	0.1	5.5	5.86	6%
D-Ag	mg/L	0.00002	<0.000020	<0.000020	-
D-Na	mg/L	0.05	103	101	2%
D-Sr	mg/L	0.001	0.629	0.622	1%
D-S	mg/L	3	335	329	2%
D-Tl	mg/L	0.00005	<0.000050	<0.000050	-
D-Sn	mg/L	0.005	<0.005	<0.005	-
D-Ti	mg/L	0.005	<0.005	<0.005	-
D-U	mg/L	0.0001	0.00199	0.0019	5%
D-V	mg/L	0.005	<0.005	<0.005	-
D-Zn	mg/L	0.005	<0.005	<0.005	-
D-Zr	mg/L	0.0005	<0.00050	<0.00050	-
Metals Filtration and Preservation	-	-	FIELD	FIELD	-

Notes:

1. RDL = Reportable Detection Limit
2. RPD = Relative Percent Difference
3. Analyses were not performed, or RPD is not calculated for parameters where one or both of the concentrations were below the RDL.
4. RPD is not calculated where one or both of the measured concentrations are <5x RDL. The RPD is not considered to be representative of the actual sample variability due to elevated analytical imprecision close to the RDL.

Yellow shading indicates duplicate sample values which have a RPD greater than 50%.

Table 3: Comparison of Analytical Results for Dissolved and Total Metals for RSEM Area R5a

Sample ID	GW-1	GW-1	GW-1	GW-2	GW-2	GW-2	GW-3	GW-3	GW-3	GW-4a	GW-4a	GW-4a	FB-1	TRIP BLANK
Sample Date/Time	27-Nov-16	9-Dec-16	16-Dec-16	28-Nov-16	9-Dec-16	16-Dec-16	29-Nov-16	9-Dec-16	16-Dec-16	29-Nov-16	9-Dec-16	16-Dec-16	2016/11/30 10:20	2016/11/30 10:20
Lab Sample ID	QD4990	QF8820	QG8922	QE0414	QF8821	QG8923	QE0415	QF8822	QG8924	QE0416	QF8823	QG8925	QE0418	QE0419
Al (D/T)	-	-	-	-	-	-	-	-	-	-	54%	-	-	-
Sb (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
As (D/T)	-	-	-	-	-	-	99%	90%	104%	-	95%	102%	-	-
Ba (D/T)	94%	96%	95%	106%	92%	98%	100%	94%	89%	95%	99%	101%	-	-
Be (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bi (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B (D/T)	-	99%	93%	-	-	-	-	-	-	-	-	-	-	-
Cd (D/T)	-	97%	107%	83%	87%	100%	-	-	-	93%	91%	105%	-	-
Ca (D/T)	94%	90%	91%	99%	100%	93%	105%	96%	86%	111%	89%	98%	-	-
Cr (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Co (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cu (D/T)	-	-	-	-	-	-	-	-	-	37%	-	-	-	-
Fe (D/T)	-	-	-	103%	-	-	106%	102%	98%	105%	89%	105%	-	-
Pb (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Li (D/T)	109%	96%	99%	99%	97%	99%	-	-	-	98%	98%	113%	-	-
Mg (D/T)	100%	93%	92%	108%	98%	91%	100%	94%	91%	112%	98%	99%	-	-
Mn (D/T)	106%	97%	101%	100%	97%	100%	98%	93%	94%	104%	100%	103%	-	-
Hg (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mo (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ni (D/T)	-	-	-	94%	-	-	-	-	-	-	-	-	-	-
P (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K (D/T)	104%	98%	92%	113%	97%	87%	101%	92%	-	115%	98%	100%	-	-
Se (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Si (D/T)	101%	89%	90%	98%	97%	92%	104%	95%	86%	112%	86%	96%	-	-
Ag (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Na (D/T)	103%	100%	90%	106%	96%	88%	98%	93%	90%	109%	97%	103%	-	-
Sr (D/T)	96%	104%	93%	100%	101%	92%	102%	94%	97%	92%	97%	99%	-	-
S (D/T)	105%	94%	97%	111%	89%	92%	-	94%	88%	106%	93%	92%	-	-
Tl (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sn (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ti (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U (D/T)	95%	106%	88%	100%	103%	93%	99%	92%	91%	94%	101%	85%	-	-
V (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zn (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zr (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

1. D/T = ratio of the dissolved concentration to the total concentration, expressed as a percentage.
2. D/T ratios were calculated for metal parameters where both the dissolved and total concentrations were >5x the RDL.

Yellow shading indicates that the dissolved concentration >120% total concentration.

Table 4: Field Replicate Analytical Results for RSEM Area R5b

Sample ID			**GW-10B**	**GW-10D**	**RPD**
Sample Date/Time			**2016-12-15 10:00**	**2016-12-15 11:00**	
Lab Sample ID			**QG8926**	**QG8945**	
Sample Type			**Sample**	**Duplicate**	
Parameter	**Units**	**RDL**			
Physical Properties					
pH (lab)	pH	-	8.23	8.26	-
Conductivity (lab)	uS/cm	1	474	475	0%
Total Dissolved Solids	mg/L	10	282	284	1%
Total Suspended Solids	mg/L	1	5.9	4.7	23%
Total Hardness (CaCO3)	mg/L	0.5	243	243	0%
Disolved Hardness (CaCO3)	mg/L	0.5	239	239	0%
Inorganics					
Alkalinity (Total as CaCO3)	mg/L	0.5	240	242	1%
Alkalinity (PP as CaCO3)	mg/L	0.5	<0.50	<0.50	-
Bicarbonate (HCO3)	mg/L	0.5	293	296	1%
Carbonate (CO3)	mg/L	0.5	<0.50	<0.50	-
Hydroxide (OH)	mg/L	0.5	<0.50	<0.50	-
Dissolved Chloride (Cl)	mg/L	0.5	0.78	0.91	-
Fluoride (F)	mg/L	0.01	0.16	0.16	0%
Bromide (Br)	mg/L	0.01-0.1	<0.10	0.011	-
Anions and Nutrients					
Dissolved Sulphate (SO4)	mg/L	0.5	25.2	28	11%
Sulphide	mg/L	0.005	0.0066	0.0059	-
Total Sulphide (as H2S)	mg/L	0.0053	0.007	0.006	-
Total Ammonia (N)	mg/L	0.005	0.021	0.024	-
Nitrite (N)	mg/L	0.005	<0.0050	<0.0050	-
Nitrate (N)	mg/L	0.02	0.168	0.17	1%
Nitrate plus Nitrite (N)	mg/L	0.02	0.168	0.17	1%
Orthophosphate (P)	mg/L	0.005	0.017	0.0124	-
Organic/Inorganic Carbon					
TOC	mg/L	0.5	1.17	0.71	-
DOC	mg/L	0.5	0.88	1.3	-
Total Metals					
T-Al	mg/L	0.003	0.116	0.155	29%
T-Sb	mg/L	0.0005	<0.00050	<0.00050	-
T-As	mg/L	0.0001	0.00079	0.001	23%
T-Ba	mg/L	0.001	0.119	0.135	13%
T-Be	mg/L	0.0001	<0.00010	<0.00010	-
T-Bi	mg/L	0.001	<0.0010	<0.0010	-
T-B	mg/L	0.05	<0.05	<0.05	-
T-Cd	mg/L	0.00001	0.000051	0.000077	41%
T-Ca	mg/L	0.05	70.6	69.1	2%
T-Cr	mg/L	0.001	0.0035	0.0037	-
T-Co	mg/L	0.0005	0.00122	0.00151	-
T-Cu	mg/L	0.0005	0.00177	0.00233	-
T-Fe	mg/L	0.01	0.547	0.752	32%
T-Pb	mg/L	0.0002	0.00066	0.00081	-
T-Li	mg/L	0.005	0.0108	0.0121	-
T-Mg	mg/L	0.05	16.1	17.1	6%
T-Mn	mg/L	0.001	0.127	0.141	10%
T-Hg	mg/L	0.00001	<0.000010	<0.000010	-
T-Mo	mg/L	0.001	0.0016	0.0018	-
T-Ni	mg/L	0.001	0.0041	0.0054	27%
T-P	mg/L	-	-	-	-
T-K	mg/L	0.05	1.94	2.09	7%
T-Se	mg/L	0.0001	0.00248	0.00245	1%
T-Si	mg/L	0.1	4.83	4.9	1%
T-Ag	mg/L	0.00002	0.000021	0.000033	-
T-Na	mg/L	0.05	5.01	5.08	1%
T-Sr	mg/L	0.001	0.18	0.199	10%
T-S	mg/L	3	7	4.7	-
T-Tl	mg/L	0.00005	<0.000050	<0.000050	-
T-Sn	mg/L	0.005	<0.0050	<0.0050	-
T-Ti	mg/L	0.005	<0.0050	<0.0050	-
T-U	mg/L	0.0001	0.0088	0.00974	10%
T-V	mg/L	0.005	<0.0050	<0.0050	-
T-Zn	mg/L	0.005	<0.0050	0.0063	-
T-Zr	mg/L	0.0005	<0.00050	<0.00050	-
Dissolved Metals					
D-Al	mg/L	0.003	<0.0030	<0.0030	-
D-Sb	mg/L	0.0005	<0.00050	<0.00050	-
D-As	mg/L	0.0001	0.0006	0.0006	0%
D-Ba	mg/L	0.001	0.115	0.111	4%
D-Be	mg/L	0.0001	<0.00010	<0.00010	-
D-Bi	mg/L	0.001	<0.0010	<0.0010	-
D-B	mg/L	0.05	<0.05	<0.05	-

Table 4: Field Replicate Analytical Results for RSEM Area R5b

Sample ID			**GW-10B**	**GW-10D**	**RPD**
Sample Date/Time			**2016-12-15 10:00**	**2016-12-15 11:00**	
Lab Sample ID			**QG8926**	**QG8945**	
Sample Type			**Sample**	**Duplicate**	
Parameter	**Units**	**RDL**			
D-Cd	mg/L	0.00001	0.000033	0.000032	-
D-Ca	mg/L	0.05	68.3	67.5	1%
D-Cr	mg/L	0.001	<0.0010	<0.0010	-
D-Co	mg/L	0.0005	0.00083	0.00083	-
D-Cu	mg/L	0.0002	0.00069	0.00064	-
D-Fe	mg/L	0.005	0.0337	0.0339	1%
D-Pb	mg/L	0.0002	0.00021	0.00022	-
D-Li	mg/L	0.005	0.0126	0.0116	-
D-Mg	mg/L	0.05	16.6	17	2%
D-Mn	mg/L	0.001	0.129	0.124	4%
D-Hg	mg/L	0.00001	<0.000010	<0.000010	-
D-Mo	mg/L	0.001	0.0019	0.002	-
D-Ni	mg/L	0.001	0.0025	0.0024	-
D-P	mg/L	-	-	-	-
D-K	mg/L	0.05	1.96	1.91	3%
D-Se	mg/L	0.0001	0.00266	0.00264	1%
D-Si	mg/L	0.1	4.83	4.78	1%
D-Ag	mg/L	0.00002	<0.000020	<0.000020	-
D-Na	mg/L	0.05	4.68	4.94	5%
D-Sr	mg/L	0.001	0.214	0.215	0%
D-S	mg/L	3	8.1	7.8	-
D-Tl	mg/L	0.00005	<0.000050	<0.000050	-
D-Sn	mg/L	0.005	<0.0050	<0.0050	-
D-Ti	mg/L	0.005	<0.0050	<0.0050	-
D-U	mg/L	0.0001	0.00896	0.00925	3%
D-V	mg/L	0.005	<0.0050	<0.0050	-
D-Zn	mg/L	0.005	<0.0050	<0.0050	-
D-Zr	mg/L	0.0005	<0.00050	<0.00050	-
Metals Filtration and Preservation	-	-	FIELD	FIELD	-

Notes:
1. RDL = Reportable Detection Limit
2. RPD = Relative Percent Difference
3. Analyses were not performed, or RPD is not calculated for parameters where one or both of the concentrations were below the RDL.
4. RPD is not calculated where one or both of the measured concentrations are <5x RDL. The RPD is not considered to be representative of the actual

Yellow shading indicates duplicate sample values which have a RPD greater than 50%.

Table 5: Comparison of Analytical Results for Dissolved and Total Metals for RSEM Area R5b

Sample ID	GW-6	GW-6	GW-6	GW-7	GW-7	GW-7	GW-8	GW-8	GW-8	GW-10B	GW-10B	GW-10B	GW-10D	FB-1	TRIP BLANK
Sample Date/Time	2016/10/03 10:30	2016/10/12 15:00	2016/10/25 14:30	2016/10/02 14:00	2016/10/12 11:00	2016/10/24 17:30	2016/10/03 14:30	2016/10/11 17:00	2016/10/25 11:30	2016/11/26 14:00	2016/12/08 11:30	2016/12/15 10:00	2016/12/15 11:00	2016/11/29 11:00	2016/11/30 10:20
Lab Sample ID	PR6457	PT5622	PW5654	PR6456	PT5621	PW5652	PR6458	PT5620	PW5653	QD4989	QF8824	QG8926	QG8945	QE0418	QE0419
Al (D/T)	3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sb (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
As (D/T)	33%	16%	15%	86%	95%	96%	-	-	92%	62%	87%	76%	60%	-	-
Ba (D/T)	58%	42%	36%	103%	97%	97%	91%	91%	91%	83%	94%	97%	82%	-	-
Be (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bi (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cd (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ca (D/T)	94%	84%	93%	99%	96%	100%	101%	89%	88%	89%	98%	97%	98%	-	-
Cr (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Co (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cu (D/T)	6%	-	-	-	-	-	-	-	-	-	60%	-	-	-	-
Fe (D/T)	43%	31%	31%	58%	101%	100%	-	36%	75%	3%	35%	6%	5%	-	-
Pb (D/T)	3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Li (D/T)	98%	94%	93%	-	100%	104%	-	-	-	-	-	-	-	-	-
Mg (D/T)	90%	90%	104%	94%	103%	106%	107%	88%	103%	92%	94%	103%	99%	-	-
Mn (D/T)	77%	65%	71%	101%	99%	94%	97%	103%	99%	60%	90%	102%	88%	-	-
Hg (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mo (D/T)	-	-	-	-	-	-	105%	-	-	-	-	-	-	-	-
Ni (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P (D/T)	39%	-	-	81%	-	-	50%	-	-	-	-	-	-	-	-
K (D/T)	84%	76%	104%	99%	98%	118%	107%	96%	108%	96%	96%	101%	91%	-	-
Se (D/T)	-	-	-	-	-	-	102%	-	-	102%	100%	107%	108%	-	-
Si (D/T)	53%	46%	51%	94%	87%	95%	83%	89%	93%	90%	99%	100%	98%	-	-
Ag (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Na (D/T)	96%	93%	107%	98%	111%	109%	103%	89%	104%	94%	91%	93%	97%	-	-
Sr (D/T)	97%	94%	93%	102%	106%	98%	99%	102%	101%	103%	99%	119%	108%	-	-
S (D/T)	90%	95%	106%	-	-	-	100%	106%	107%	-	-	-	-	-	-
Tl (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sn (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ti (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U (D/T)	73%	79%	52%	-	-	-	102%	-	97%	95%	96%	102%	95%	-	-
V (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zn (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zr (D/T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
1. D/T = ratio of the dissolved concentration to the total concentration, expressed as a percentage.
2. D/T ratios were calculated for metal parameters where both the dissolved and total concentrations were >5x the RDL.

Yellow shading indicates that the dissolved concentration >120% total concentration.

Appendix B

Peace River and Site C Reservoir
2016 Quarterly Water Quality and Turbidity Monitoring Program - Part 1 of 3: Surface Water Quality
Reference CR#579778



PRESENTED TO

BC Hydro and Power Authority

MARCH 6, 2017
ISSUED FOR USE
FILE: 704-VENV03095-02

This "Issued for Review" document is provided solely for the purpose of client review and presents our interim findings and recommendations to date. Our usable findings and recommendations are provided only through an "Issued for Use" document, which will be issued subsequent to this review. Final design should not be undertaken based on the interim recommendations made herein. Once our report is issued for use, the "Issued for Review" document should be either returned to Saulteau EBA Environmental Services Joint Venture or destroyed.

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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of BC Hydro and Power Authority and their agents. Saulteau EBA Environmental Services Joint Venture does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than BC Hydro and Power Authority, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Saulteau EBA Environmental Services Joint Venture's Services Agreement. Saulteau EBA Environmental Services Joint Venture's General Conditions are provided in Appendix A of this report.

1.0 BACKGROUND

As part of the 2016 Quarterly Water Quality and Turbidity Monitoring Program (Monitoring Program), the Saulteau EBA Environmental Services Joint Venture (SEES JV) has conducted the 2016 sampling events (March to December) associated with Site C Clean Energy Project (Project) on behalf of the BC Hydro and Power Authority (BC Hydro).

The Monitoring Program included three monitoring components: 1) surface water (including turbidity monitoring stations) of the Peace River, 2) groundwater well monitoring for the (a) District of Taylor and (b) City of Fort St. John (b), and 3) residential groundwater well monitoring within the Site C Reservoir area. The information contained within this report pertains to the first of the three components: Surface Water Quality Monitoring of six (6) stations as well as the six (6) additional stations used for monitoring turbidity levels within the Peace River.

Site C is located along the Peace River and Pine River, in the City of Fort St. John region between the Districts of Hudson's Hope and Taylor, BC, accessible via Highways 97 and 29. A site location map is provided as Figure 1. Construction of the Site C Project Construction commenced on Jul 27, 2015 and in-water works on October 14, 2015. No water discharges from Relocated Surplus Excavated Material (RSEM) sediment ponds on-site had occurred as of the end of December 2016. Filling of the Site C Reservoir is scheduled to begin in 2022 and continue through to construction completion in 2024. The 2016 Monitoring Program is an annual study initiated in June 2015, prior to the start of Site C Project construction.

The 2016 Quarterly Water Quality and Turbidity Monitoring Program was conducted in conjunction with the 2016 Peace River and Site C Reservoir Water and Sediment Quality Monitoring Program (Reference CR#590512). For this reason, the Laboratory Certificates of Analysis (COA) included in Appendix A include data presented in Tables 1 to 6 of the Tables Section as well as additional data considered not directly related to Part 2a of the 2016 Monitoring Program.

The 2016 Monitoring Program involved quarterly sampling events that took place in March, June, September, and December. All surface water monitoring stations (stations) can be accessed on the Peace River by either boat or shoreline (while wearing chest waders). Monitoring station locations are identified in Figure 2.

The overall objectives of the Monitoring Program were to:

- Provide a qualitative description of the site conditions, including representative photographs and geospatially referenced locations of each station;
- Collect field measured and laboratory analyzed parameters at each sampling location, as per the Contract Reference CR#579778 requirements;
- Provide a description of sources of error and steps taken as part of quality assurance;
- Present the tabulated data in comparison to guidelines considered applicable to the Monitoring Program, as per as per the Contract Reference CR#579778 requirements:
  - The following memo report provides tabulated data, field observations, and discussion of results as compared to the British Columbia Approved and Working Water Quality Guidelines (BC MOE 2015 and 2016); and
- Provide technical guidance and training of field technicians involved in the field data collection tasks, allowing Saulteau First Nation (SFN) members to take on increasingly more duties and responsibilities within the field level tasks of the Monitoring Programs.

2.0 METHODS

The general procedures for water quality sampling included:

- Eight (8) surface water sample locations and six (6) turbidity monitoring station locations were identified for the Monitoring Program.
- Sampling within surface water flow (and bottle submerged) and away from the watercourse banks provides information on the quality of the channel flow and a general overview of water quality in the system. Areas of unusual flow characteristics (e.g. eddies or backwater areas), or floating debris was avoided. Samples collected at each turbidity monitoring station were intended for comparison against turbidity monitoring probe data recordings. Therefore, these samples were collected approximately 25 m from the bank in the estimated vicinity of the probe location.
- Water quality samples were collected from each station within 0.2 m depth from surface (unless otherwise noted in Tables 1 to 6). Water quality samples were collected quarterly throughout the year from each station in March, June, September, and December 2016.
- Samples were collected from near the bow via the side access of a jet engine boat, pointing the vessel upstream at all times to collect upstream flow representative samples and to avoid contamination that could be introduced to the sample from the vessel. Occasionally, tributary flow was considered too low for boat access, at which point field staff collected samples from the shoreline wearing chest waders or using a telescopic aluminum pole sampler in order to reach flowing water. Samples were collected facing upstream.
- In-situ surface water quality measurements were obtained using an YSI ProDSS Multimeter which recorded sample depth, specific conductivity, electrical conductivity, pH, temperature, dissolved oxygen, salinity, and turbidity of the source water. Turbidity station monitoring included the measurement of turbidity and temperature, only.
- Where possible, laboratory analysis bottles were filled directly from the water source to minimize cross contamination of samples collected at each station (i.e. surface water). Where additional handling was required, a new 1 L plastic bottle (i.e. routine sample bottle) was filled from the source, and sample water was decanted into other laboratory analysis bottles or filters.
- Decontamination of sampling equipment between monitoring locations by triple rinsing field parameter and sample collecting equipment.
- The use of clean, new nitrile gloves and filters at each new monitoring location during all water sampling.
- Required preservatives were added into the sample containers (e.g., dissolved metals and total metals – nitric acid, dissolved and total nutrients – sulfuric acid, dissolved and total mercury – hydrochloric acid).
- Where dissolved parameters were filtered by laboratory staff, the samples were not preserved in the field. Dissolved parameters filtered in the field (using new high capacity Waterra filters) were field preserved.
- The sample ID, date, and location on each container label was recorded using water resistant labelling.
- One blind duplicate sample was submitted per every 10 ambient samples submitted, unless otherwise noted.
- One trip blank and one field blank were submitted per event, unless otherwise noted. A trip blank was not available for the June event due to laboratory depot stock availability.
- Samples were stored in a cooler with ice packs to lower temperature and maintain them below 4°C.

- All field activities were recorded on formatted field data sheets concurrently with ongoing field activities and supported by GPS referencing at each monitoring station.
- Chain-of-custody forms including analytical selection were completed for the samples. The analytical testing for the 2016 monitoring event is derived from the British Columbia Approved Water Quality Guidelines (BC MOE 2016).
- Samples were delivered to the ALS Environmental laboratory depot in Fort St. John, BC.
- Field measurement and sample collection occurred during the following dates:
  - March Event: March 31 to April 1, 2016
  - June Event: May 29 to June 2, 2016
  - September Event: September 20 to 22, 2016
  - December Event: December 19 to 20, 2016

Field parameter measurements and laboratory analytical results are compiled in Tables 1 to 7.

3.0 REGULATORY GUIDELINES

"Water Quality Guidelines (WQG) provide policy direction to those making decisions affecting water quality. Although WQGs do not have any direct legal standing, once approved, BC WQGs must be considered in any decision affecting water quality made within the Ministry of Environment (MOE). WQGs are used to assess water quality and may be used as the basis for determining the allowable limits in waste discharge authorizations. Exceeding a WQG does not imply that unacceptable risk exists, but rather that the potential for adverse effects may be increased and additional investigation may be required" (BC MOE 2016).

The surface water quality analytical results of the Monitoring Program were compared against the British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture, which were developed to represent safe levels of substances that protect different water uses, including: drinking water, recreation, aquatic life, wildlife, and agriculture. Guidelines for freshwater aquatic life and short-term maximums were applied within the Monitoring Program. Short-term maximum or "acute" guidelines are set to protect against severe effects such as lethality or other equivalents to the most sensitive species and life stage over a defined short-term exposure period (BC MOE 2016), The requirement for applying long-term average guidelines is that 5 samples are collected at a station over a 30 day period,

The British Columbia Working Water Quality Guidelines (BC MOE 2015) were reviewed and determined not to be applicable for the Monitoring Program based on the parameters and sampling frequency selected (e.g. long-term average guidelines did not apply). Therefore, only guideline values under the approved set of guidelines were generated and presented in Tables 1 to 7.

The British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture (BC MOE 2016) for freshwater aquatic life and short-term maximums will be referred to as the BC WQG in this document, moving forward.

Guidelines for cadmium, copper, fluoride, lead, manganese, silver, and zinc are provided in Tables 1 to 6 as a referenced equation, which varies with hardness. Equations used to calculate the applicable guideline value for each hardness dependent parameter analyzed is provided in the notes of the table.

4.0 RESULTS

Results, both in-situ and laboratory, were compared between the sampling seasons and between stations (from upstream to downstream reaches). The objective of data analysis is to identify differences and identify parameter concentrations that are not suitable for freshwater aquatic life.

Water quality results are included within Tables 1 to 7 and the Appendix A (laboratory reports), attached to this memo, which includes the following for each sampling location:

- Field measurements, including sample depth, specific electrical conductivity, pH, temperature, dissolved oxygen (DO), salinity, and turbidity;
- Laboratory analytical results for each sample submitted, conducted for the following parameter analysis:
    - Physical parameters: colour, electrical conductivity, hardness, pH, total suspended solids (TSS), and total dissolved solids (TDS),
    - Anions and nutrients: bicarbonate, carbonate, hydroxide, total alkalinity, bromide, chloride, fluoride, nitrate, nitrite, Total Kjeldahl Nitrogen (TKN), total nitrogen, orthophosphate, dissolved and total phosphorus, silicate, and sulphate,
    - Dissolved and total organic carbon,
    - Microbiological parameters: E.coli, heterotrophic plate count (HPC), and total coliforms, and
    - Total and dissolved metals: aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, phosphorus, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium, and zinc;
- Laboratory analytical results for duplicate, trip blank, and field blank analysis conducted under Contract Reference CR#579778 and CR#590512;
- Field measurements and laboratory analytical results for Turbidity Monitoring Stations only included turbidity, temperature, and TSS. Laboratory analysis was suspended for the September 2016 turbidity monitoring sampling event due to malfunctioning probes requiring maintenance in October 2016. Analysis was conducted in December 2016. Field measurements were not conducted in full during the December 2016 turbidity monitoring event due to malfunctioning field equipment;
- Data interpretation and analysis for turbidity monitoring stations was considered outside of the scope of this contract (CR#579778); data is presented in Table 5.
- Exceedances of the British Columbia Approved Water Quality Guidelines (BC MOE 2016) are bolded and highlighted in grey; and
- Relative Percent Differences (RPD) between the laboratory results for the duplicate sample pairs are presented in Table 7.

The Surface Water Quality Results for the Site C Reservoir and Downstream Reach were obtained at the following lotic (riverine) monitoring stations, in order from upstream to downstream:

- Site C Reservoir:

- Peace 1: Upper Site C Reservoir (PR1)
- Peace 2: Middle Site C Reservoir (PR2)
- Halfway River Downstream (HD)
- Peace 3: Lower Site C Reservoir (PR3)
- Moberly River Downstream (MD)

- Downstream Reach:
  - Peace 4: Peace at Pine (PD1)
  - Pine River (PINE)

The Turbidity Monitoring Water Quality Results for the Site C Reservoir and Downstream Reach were obtained at the following lotic (riverine) monitoring stations, in order from upstream to downstream:

- Peace Above Moberly Left Bank (PAM-LB)
- Peace Above Moberly Right Bank (PAM-RB)
- Peace Above Pine Left Bank (PAP-LB)
- Peace Above Pine Right Bank (PAP-RB)
- Peace Above Taylor Left Bank (PAT-LB)
- Peace Above Spectra Left Bank (PAS-LB)

The Global Positioning System (GPS) coordinates of each sample location are presented within Tables 1 to 5 (Tables Section), a graphic representation of the location distribution of the samples is provided in Figure 2 (Figure Section). Photographs of Surface Water Quality Monitoring Stations (Photos 1 to 23) and of Turbidity Monitoring Stations (Photos 24 to 63) are presented within the Photograph Section of this report.

4.1 Surface Water Quality Results

PR1 is considered the most upstream sample location and PINE is considered the most downstream sample location within the sample set. Samples were collected from designated stations as per the Contract Reference CR#579778 relating to the aforementioned sample names. Peace River samples were collected from mid-channel flow locations (unless otherwise noted), isolating source water considered to be well mixed within the Peace River. Tributary river samples were collected upstream of the Peace River confluence to isolate mid-channel flow source prior to it mixing with the main Peace River channel. Generally, samples were collected approximately 150 m upstream of the confluence with the Peace River. Due to heavy precipitation generated runoff or ice cover, tributary samples were occasionally omitted from the Monitoring Programs due to safe access restrictions (i.e., extreme turbulence or large woody debris observed in channel).

Throughout the sampling events, dissolved oxygen, electrical conductivity and specific electrical conductivity remained generally stable within the Peace River from PR1 to PD1. Field measured water temperatures were generally consistent throughout the Peace River during each sampling event. The temperatures measured within tributaries was found to be lower than that of the Peace River, with the exception of the June event when temperatures within the tributaries were elevated above guideline and Peace River values. The pH values remained within guidelines throughout the sample set and events. The range of field measured pH values was 7.89 to 8.60

over the Monitoring Program. Laboratory analyzed pH is considered secondary to field measured pH by a calibrated instrument due to the exceeded hold times (15 minutes) of all laboratory analyzed pH values.

Colour, total dissolved solids, and turbidity were considered to be elevated throughout the sample set and over each sample event, but within normal range for natural water bodies (BC MELP 1998). The highest reported concentrations for these parameters was for the June event. These parameters were not compared against BC WQG, as short-term maximum guidelines were not provided in the publication. Hardness increased from upstream to downstream as tributary waters contributed to the flow; results varied between 82.0 to 225.0 mg/L for all samples collected during each event, which ranges from moderately soft to very hard water (ESRD 2014).

Anions and nutrients analyzed within the sample set were not observed to exceed the BC MOE 2016 guidelines, however, results for the tributary source waters were observed to be elevated relative to the Peace River samples. Total organic carbon (TOC) concentrations were within normal range (1 to 30 mg/L) or slightly elevated for natural waterbodies (BC MELP 1998). Dissolved organic carbon (DOC) concentrations were found to exceed the TOC concentration, which was attributed to the use of polyethersulfone based filters and is discussed further within the Discussion and QA/QC sections of this memo (Section 5.0).

Analysis of total and dissolved metals and metalloids were conducted for each event. Exceedances of BC WQG were observed for total iron at the Halfway River station (June and September) and Moberly River station (March, June, and September).

It was observed that *E.coli* concentrations ranged from less than 1 to 32 MPN[1] per 100 mL; samples collected during the June and September events were generally elevated over those collected during the March and December events. Total coliform concentrations ranged from less than 1 to 613 MPN per 100 mL; samples collected during the March, June, and September events were generally elevated over the December Event. Heterotrophic Plate Count (HPC) concentrations ranged from less than 1 to 880 Colony Forming Units (CFU) per 100 mL; the highest concentrations were analyzed during the March event. The British Columbia Approved Water Quality Guidelines do not provide comparison guidelines for bacteriological parameters.

No other exceedances of the BC WQG were observed within the sample sets.

4.2 Turbidity Monitoring Program

Turbidity Monitoring Station data interpretation and analytical comparison with station probe data recorded in 2016 is considered outside of the current scope of work of this report. Field measurements and laboratory analysis is presented in Table 5 and may be used to process the quality control and quality assurance of the recorded station probe data, and not intended to be analyzed for trends as a stand-alone data set.

There were no exceedances reported in comparison to the BC WQG for the data presented in Table 5 with the exception of the temperature measurement at Peace Above Pine (Left Bank at 17.9°C) on June 24, 2016, which exceeded the guideline value of 15°C. Guidelines representing freshwater aquatic life and short-term maximums do not include values for TSS or turbidity. Analysis of water sampled at the turbidity stations was suspended in September 2016 following the June 2016 event due to calibrations required and restarted in December 2016. Field measurements were recorded at all stations with the exception of the December 2016 event when field instrument malfunction was experienced.

In October 2016, system maintenance was performed on each turbidity monitoring station to address instrumentation issues observed within the satellite recorded data output. Photographs have been included in this report that provide visual representation of the Turbidity Monitoring station locations as well as instrumentation

[1] The *E.coli* and total coliform samples were analyzed using the Most Probable Number (MPN) method and reported as MPN units per 100 mL.

previously installed to provide continuous turbidity and temperature monitoring of the Peace River in the vicinity of the Site C project (Photographs 24 to 63).

5.0 DISCUSSION

Water quality parameters usually vary widely both temporally and spatially. Monitoring over a longer period and detailed assessment including statistical analyses is required to definitively establish if trends exist or if a parameter is problematic and/or to effectively determine its source. Sampling occurred over four events in 2016 between March and December at each sample location within the Monitoring Program, with the exception of some locations omitted due to unavailable access at the time of sampling (as noted in Table 1 to 4). The 2016 Monitoring Program is an annual study initiated in June 2015, prior to the start of Site C Project construction. Additional data scheduled for future years of field events is required to establish definitive trends. Comparisons between the 2016 data and the historical baseline data may establish if early trends are evident, although that is outside the current scope of Contract Reference CR#579778.

Field measured pH was neutral to slightly basic. Alkalinity (as $CaCO_3$), which is a measure of water's ability to neutralize acids, was consistent throughout the Monitoring Program. Temperature fluctuations are attributed to seasonal effects of the climate in the region.

DOC concentrations were consistently reported to be higher than TOC concentrations; DOC concentrations were also reported above 0 mg/L in field filtered deionized water provided by the lab. One potential source of organic carbon may be the sampling filtration equipment. ALS confirmed that this is a known contributor of organic carbon to analytical samples, and therefore, the concentrations reported are not considered to be an indicator of source water elevations. The TOC concentrations are considered stable and mostly within natural levels for a lotic system with elevated background turbidity conditions (BC MELP 1998).

Although the microbiological analysis during each event did indicate that microbiological cultures were present in some samples collected, the BC WQG applied did not provide a direct comparison for *E.coli*, HPC, and total coliforms. Open water bodies are subject to dynamic ecological relationships naturally present within surface water environments that receive runoff volumes from the surrounding watershed. The region where the project is located is subject to predominantly agricultural and natural land use; in addition to dense community settlements. The presence of bacteria within the open surface water environment is considered to be a normal occurrence for the Peace River watershed; it is understood that surface water collected in the area for drinking purposes is treated prior to use.

Metal parameters analyzed were consistently below the BC guidelines with the exception of infrequent and localized exceedances reported for total iron. A single exceedance is not an indication that adverse effects are present and no conclusive trend towards developing a potential risk for adverse effects can yet be established. The source(s) of the exceeded parameter cannot be conclusively determined. Many Peace River tributaries are large systems with a substantial flow rate draining from nearby communities, often characterized by high, vertical banks composed of fine materials. Given the location of exceedances, it is possible that the exceedances are the result of natural processes (i.e. regional geology and erosion).

5.1 Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) programs for water quality sampling are implemented to assess and/or quantify field, laboratory and data reduction quality.

Laboratory QA/QC reports are required by environmental laboratories accredited by the Canadian Association of Analytical Laboratories (CALA), such as ALS Environmental, and can be requested to be attached to the laboratory data or requested from the lab directly. Laboratory QA/QC data reviewed by the assessor is generally limited to percentage recovery of added surrogates. The reported detection limits (RDL) of the analytical methods are presented on the analytical reports.

Field quality control includes procedures and documentation, and collection of quality assurance samples. Field quality assurance sampling programs are used to measure the precision and accuracy of the field sampling using blank and duplicate samples.

The field sampling and laboratory testing reproducibility of the sample duplicate pairs is evaluated using the relative percentage difference (RPD) method, involving calculation of RPD as shown in the equation below:

$$RPD\ \% = [Sample - Duplicate]/(X)*100 \qquad \text{(Equation 1)}$$

In which X is the average concentration of the sample and the associated duplicate.

The duplicate analysis is compared to the sample by evaluating the RPD, where the target RPD is less than a 30% difference; RPD is only calculated for results that are higher than five times the laboratory detection limit (BC MELP 1998). Results of RPD analysis are presented in Table 7. The exceedances were noted in the following parameters: DOC, cadmium, manganese, total coliforms, HPC, and *E.coli*. Approximately 6.2% of duplicates were found to generate an exceedance of 30% RPD analysis, which is considered to be a minimal portion the total number of duplicate samples analyzed.

Trip or travel blanks are deionized water sealed in a bottle provided by the laboratory and are introduced for the purpose of travelling with the samples for the duration of the event. Elevations above the laboratory detection limit may indicate laboratory or transit introduced errors outside of the field methodology. The pH values reported for each field and trip blank were below the normal range of 6.5 to 9.0 and considered acidic. This is likely attributed to the acidity of the deionized water and not sampling and analytical methodologies. Brent Mack, an ALS representative, confirmed that the laboratory supplied deionized water typically has a low pH value. For this reason as well as limited hold times of 15 minutes, field measured pH and not laboratory analyzed pH is interpreted for data analysis. Otherwise, all other parameters in each of the trip blanks submitted had values below the analytical detection limit indicative that laboratory or transit introduced errors did not occur during the sampling events.

Field blank analysis is used for identifying the introduction of elevated parameter concentrations not attributed to the source water but by field sampling methodologies (or laboratory analysis). Table 6 indicates elevations above laboratory detection limits of total phosphorus in September and DOC for June and September field events. A one-time elevation of total phosphorus does not indicate major error. The relatively consistent elevation of field blank DOC above reported detection limits and TOC concentrations indicates the sample is subject to the addition of carbon through the field filtration process. The Waterra High Capacity filters utilize a polyethersulfone filtration paper, which potentially introduces organic carbon into the samples, as well as the field blank.

In general, the QA/QC program confirmed that the majority of blank and duplicates samples had parameter concentrations within acceptable quality ranges, therefore the overall analytical program is considered to accurately characterize water quality conditions at the sample stations.

6.0 RECOMMENDATIONS

The Monitoring Program was developed to monitor the local water quality conditions throughout the progression (construction and operation) of the Site C Project. A larger sample set will likely be required to determine if trends attributable to the Site C Project will be detectable. At this point in the Monitoring Program, statistical interpretation of the analytical results would be of limited value until more data is available.

DOC concentrations are consistently reported to be detectable within field blank samples and elevated over TOC concentrations in station samples. Based on conversations with ALS Environmental concerning the filtration methodology for field use, Tetra Tech recommends that 1 L of source water is used to flush polyethersulfone based filters prior to DOC collection and filtration. Metals analysis is not anticipated to be impacted by polyethersulfone based filtration methods.

There are no further recommendations provided for the Monitoring Program development at this time.

7.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of BC Hydro and their agents. Saulteau EBA Environmental Services Joint Venture does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than BC Hydro, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Saulteau EBA Environmental Services Joint Venture's Services Agreement. Saulteau EBA Environmental Services Joint Venture's General Conditions are provided in Appendix A of this report.

8.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Saulteau EBA Environmental Services Joint Venture





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Attachments: Tables (7)
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Appendix B – Tetra Tech EBA's General Conditions

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TABLES

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Table 7 2016 QAQC Duplicate Surface Water Quality Results

Table 1: March 2016 Event Surface Water Quality Results

				Future Site C Reservoir					Downstream of Reservoir	
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2016 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**UPPER SITE C RESERVOIR (PR1) or PEACE 1**	**MIDDLE SITE C RESERVOIR (PR2) or PEACE 2**	**Halfway (HD)**	**LOWER SITE C RESERVOIR (PR3) or PEACE 3**	**MOBERLY RIVER DOWNSTREAM (MD) or MOBERLY D/S**	**PEACE AT PINE (PD1) or PEACE 4**	**PINE SW (PINE)**
Sample Date				2-Apr-2016	3-Apr-2016	Not sampled due to unsafe access	01-Apr-16	01-Apr-16	01-Apr-16	01-Apr-16
GPS - Northing (10 UTM)				6207857	6229426		6231374	6230146	6226276	6223596
GPS - Easting (10 UTM)				566122	594889		628028	628620	640247	641710
Laboratory Identification Number				L1751250-5	L1751250-6		L1751131-10	L1751131-12	L1751131-11	L1751131-8
Matrix				surface water	surface water	-	surface water	surface water	surface water	surface water
Field Measurements										
Sample Depth	m	-	-	0.2	0.2	-	0.2	0.2	0.2	0.2
Specific Conductivity (EC)	µS/cm	-	-	-	-	-	110.4	136.3	109.2	177.3
pH	pH Units	-	6.5-9.0	-	-	-	8.00	7.98	7.97	7.89
Temperature	℃	-	15	-	-	-	2.7	0.2	2.5	1.8
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 [#1]	-	-	-	12.96	13.05	12.78	12.85
Salinity	parts per trillion	-	-	-	-	-	0.09	0.12	0.09	0.15
Turbidity	nephelometric units	-	-	-	-	-	8.3	46.8	12	25.5
Physical Parameters										
Colour	Col. Unit	5.0	-	5.3	<5.0	-	<5.0	13.3	<5.0	10.0
Electric Conductivity (EC)	µS/cm	2.0	-	187	195	-	197	264	196	330
Hardness as $CaCO_3$	µg/L	0.500	-	97,900	106,000	-	98,200	130,000	96,700	163,000
pH	pH Units	0.10	6.5-9.0	8.17	8.14	-	8.15	8.16	8.14	8.19
Total Suspended Solids (TSS)	µg/L	3000	-	<3000	9,200	-	7,600	53,800	14,000	14,500
Total Dissolved Solids (TDS)	µg/L	1000	-	100,000	105,000	-	103,000	146,000	104,000	180,000
Anions and Nutrients										
Bicarbonate as $CaCO_3$	µg/L	1000	-	82,100	83,700	-	83,500	119,000	84,800	141,000
Carbonate as $CaCO_3$	µg/L	1000	-	<1000	<1000	-	<1000	<1000	<1000	<1000
Hydroxide as $CaCO_3$	µg/L	1000	-	<1000	<1000	-	<1000	<1000	<1000	<1000
Total Alkalinity as $CaCO_3$	µg/L	1000	-	82,100	83,700	-	83,500	119,000	84,800	141,000
Bromide	µg/L	50	-	<50	<50	-	<50	<50	<50	<50
Chloride	µg/L	500	600,000	<500	<500	-	<500	540	<500	2230
Fluoride	µg/L	20	See equation [#3]	38	42	-	41	77	42	74
Nitrate and Nitrite (as N)	µg/L	25	-	65.6	63.8	-	67.4	25.1	70.5	119
Nitrate (as N)	µg/L	25	32,800	65.6	63.8	-	67.4	25.1	70.5	118
Nitrite (as N)	µg/L	5.0	60-600 [#4]	<1.0	<1.0	-	<1.0	<1.0	<1.0	1.8
Orthophosphate (as P)	µg/L	1.0	-	<1.0	<1.0	-	1.6	2.1	2.0	<1.0
Silicate (as SiO_2)	µg/L	500	-	4370	4210	-	6930	4200	3990	2470
Sulphate (SO4)	µg/L	1500	-	13,100	14,000	-	14,600	18,200	14,600	28,000
Anions Total	meq/L	-	-	1.92	1.97	-	1.98	2.78	2.01	3.47
Cations Total	meq/L	-	-	1.96	2.11	-	1.96	2.76	1.93	3.45
Ionic Balance	N/A	-	-	1	3.5	-	-0.4	-0.4	-1.9	-0.3
Organic Carbon										
Dissolved Organic Carbon (DOC)	µg/L	500	-	3080	2910	-	2280	4670	2340	2810
Total Organic Carbon (TOC)	µg/L	500	-	2230	2530	-	2600	5590	3040	3190
Biological										
E. Coli	MPN/100mL	1	-	-	<1	-	1	1	2	6
Heterotrophic Plate Count (HPC)	CFU/mL	1	-	-	36	-	470	600	490	880
Total Coliforms	MPN/100mL	1	-	-	5	-	136	205	172	261
Total Metals										
Aluminum	µg/L	5.0	-	35	221	-	246	1640	368	1260
Antimony	µg/L	0.50	-	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50
Arsenic	µg/L	1.0	-	<1.0	<1.0	-	<1.0	1.1	<1.0	<1.0
Barium	µg/L	20	-	31	39	-	38	150	40	125
Beryllium	µg/L	5.0	-	<5.0	<5.0	-	<5.0	<5.0	<5.0	<5.0
Bismuth	µg/L	200	-	<200	<200	-	<200	<200	<200	<200
Boron	µg/L	100	-	<100	<100	-	<100	<100	<100	<100
Cadmium	µg/L	0.050	-	<0.050	<0.050	-	<0.050	0.084	<0.050	0.071
Calcium	µg/L	100	-	29100	30800	-	29200	38200	29000	46000
Chromium	µg/L	0.50	-	<0.50	<0.50	-	0.55	2.76	0.75	2.02
Cobalt	µg/L	0.50	110	<0.50	<0.50	-	<0.50	1.16	<0.50	0.75
Copper	µg/L	1.0	See equation [#5]	1.3	1.6	-	1.2	3.7	1.4	2.7
Iron	µg/L	30	1000	45	290	-	339	**2270**	531	1560
Lead	µg/L	1.0	See equation [#6]	<1.0	<1.0	-	<1.0	1.2	<1.0	<1.0
Lithium	µg/L	50	-	<50	<50	-	<50	<50	<50	<50
Magnesium	µg/L	100	-	5970	6550	-	6430	9840	6410	12300
Manganese	µg/L	10	See equation [#7]	<10	<10	-	<10	51	11	25
Mercury	µg/L	0.20	-	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20
Molybdenum	µg/L	1.0	2000	<1.0	<1.0	-	<1.0	<1.0	<1.0	1.0
Nickel	µg/L	5.0	-	<5.0	<5.0	-	<5.0	5.2	<5.0	<5.0
Phosphorus	µg/L	300	-	<300	<300	-	<300	<300	<300	<300
Potassium	µg/L	2000	-	<2000	<2000	-	<2000	<2000	<2000	2300
Selenium	µg/L	1.0	2	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0
Silicon	µg/L	50	-	2170	2620	-	2550	5020	2810	3900
Silver	µg/L	0.050	0.1 or 3.0 [#8]	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050
Sodium	µg/L	2000	-	<2000	<2000	-	<2000	3400	<2000	4600
Strontium	µg/L	5	-	108	115	-	113	90.8	112	180
Thallium	µg/L	0.20	-	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20
Tin	µg/L	30	-	<30	<30	-	<30	<30	<30	<30
Titanium	µg/L	50	-	<50	<50	-	<50	62	<50	<50
Uranium	µg/L	0.20	-	0.45	0.50	-	0.48	0.48	0.49	0.52
Vanadium	µg/L	30	-	<30	<30	-	<30	<30	<30	<30
Zinc	µg/L	5.0	See equation [#9]	<5.0	10.5	-	<5.0	11.9	5.4	9.7
Dissolved Metals										
Aluminum	µg/L	10	100 [#10]	<10	<10	-	<10	36	12	27
Antimony	µg/L	0.50	-	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50
Arsenic	µg/L	1.0	-	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0
Barium	µg/L	20	-	30	35	-	33	116	33	99
Beryllium	µg/L	5.0	-	<5.0	<5.0	-	<5.0	<5.0	<5.0	<5.0
Bismuth	µg/L	200	-	<200	<200	-	<200	<200	<200	<200
Boron	µg/L	100	-	<100	<100	-	<100	<100	<100	<100
Cadmium	µg/L	0.050	See equation [#11]	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050
Calcium	µg/L	100	-	29400	31600	-	29100	36300	28700	45600
Chromium	µg/L	0.50	-	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50
Cobalt	µg/L	0.50	-	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50
Copper	µg/L	1.0	-	<1.0	<1.0	-	<1.0	1.3	<1.0	1.2
Iron	µg/L	30	350	<30	<30	-	<30	80	<30	<30
Lead	µg/L	1.0	-	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0
Lithium	µg/L	50	-	<50	<50	-	<50	<50	<50	<50
Magnesium	µg/L	100	-	5950	6540	-	6210	9580	6090	11900
Manganese	µg/L	10	-	<10	<10	-	<10	<10	<10	<10
Mercury	µg/L	0.20	-	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20
Molybdenum	µg/L	1.0	-	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0
Nickel	µg/L	5.0		<5.0	<5.0	-	<5.0	<5.0	<5.0	<5.0
Phosphorus	µg/L	300	-	<300	<300	-	<300	<300	<300	<300
Potassium	µg/L	2000	-	<2000	<2000	-	<2000	<2000	<2000	<2000
Selenium	µg/L	1.0	-	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0
Silicon	µg/L	50	-	2150	2190	-	2080	1350	2060	1190
Silver	µg/L	0.050	-	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050
Sodium	µg/L	2000	-	<2000	<2000	-	<2000	3600	<2000	4400
Strontium	µg/L	5.0	-	108	115	-	110	88.9	107	177
Thallium	µg/L	0.010	-	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010
Tin	µg/L	30	-	<30	<30	-	<30	<30	<30	<30
Titanium	µg/L	50	-	<50	<50	-	<50	<50	<50	<50
Uranium	µg/L	0.2	-	0.42	0.42	-	0.48	0.38	0.46	0.44
Vanadium	µg/L	30	-	<30	<30	-	<30	<30	<30	<30
Zinc	µg/L	5	-	6.9	8.0	-	<5.0	<5.0	<5.0	<5.0

NOTES:

BC MOE 2016	British Columbia Ministry of Environment (BC MOE). 2016. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, Bri
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin
#2	Guideline for ammonia varies with pH and temperature, derived from Table 26D of the BC MOE, 2016 BCWQGs
#3	Standard for fluoride varies with hardness. Calculated based on equation: -51.73 + 92.57*log(Hardness)
#4	Guideline/standard for nitrite varies with chloride concentrations.
#5	Water quality guideline for copper is calculated as 0.094(H)+2
#6	Standard for lead is 3 ug/L at H<8 mg/L, or calculated as e(1.273*ln(H)-1.460) when H>8 mg/L
#7	Guideline for manganese calculated as (0.01102*H)+0.54
#8	Criteria for silver varies with hardness, 0.1 µg/L at H<100 mg/L or 3.0 µg/L at H>100 mg/L
#9	Guideline for zinc calculated as 33+0.75*(H-90)
#10	Standard for aluminum varies with pH. Standard is 0.05 mg/L if pH is greater than or equal to 6.5, or calculated as $e^{(1.209-2.426(pH)+0.286K)}$ where $K=(pH)^2$
#11	Standard for cadmium is calculated as $e^{(1.03*ln(H)-5.274)}$
H	Hardness
-	No applicable standard/guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of one of the applicable standards/guidelines.
CFU	Colony Forming Units
MPN	Most Probable Number

Table 2: June 2016 Event Surface Water Quality Results

				Future Site C Reservoir					Downstream of Site C Reservoir	
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2016 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**UPPER SITE C RESERVOIR (PR1) or PEACE 1**	**MIDDLE SITE C RESERVOIR (PR2) or PEACE 2**	**HALFWAY RIVER DOWNSTREAM (HD)**	**LOWER SITE C RESERVOIR (PR3) or PEACE 3**	**MOBERLY RIVER DOWNSTREAM (MD)**	**PEACE AT PINE (PD1) or PEACE 4**	**PINE RIVER (PINE)**
Sample Date				30-May-2016	30-May-2016	30-May-2016	31-May-2016	2-Jun-2016	31-May-2016	31-May-2016
GPS - Northing (10 UTM)				6207857	6229426	6231488	6231374	6230146	6226276	6223596
GPS - Easting (10 UTM)				566122	594889	596649	628028	628620	640247	641710
Laboratory Identification Number				L1775540-1/ L1775541-2	L1775540-2/ L1775541-4	L1775540-3/ L1775541-3	L1776275-2/ L1776273-1	L1777575-2	L1776273-2/ L1776275-3	L1776273-3
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water
Field Measurements										
Sample Depth	m	-	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m	-	-	4.3	0.3	3.4	4.6	ns	2.5	2.1
Specific Conductivity (EC)	SPCµS/cm	-	-	177.0	182.2	330.0	195.5	84.1	174.4	186.6
pH	pH Units	-	6.5-9.0	8.60	8.22	8.38	8.20	8.35	8.23	8.38
Temperature	℃	-	15	4.7	5.4	9.6	6.0	14.0	6.6	12.1
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 #1	12.37	12.45	11.01	11.86	9.74	11.42	10.21
Salinity	parts per trillion	-	-	0.09	0.09	0.16	0.09	0.02	0.07	0.09
Turbidity	nephelometric units	-	-	1.4	5.2	119.0	14.4	38.0	21.3	20.0
Physical Parameters										
Colour	Col. Unit	5.0	-	6.5	6.7	28.3	8.6	15.9	9.0	12.2
Electrical Conductivity (EC)	µS/cm	2.0	-	-	-	-	-	-	-	-
Hardness as $CaCO_3$	µg/L	0.500	-	100,000	101,000	187,000	108,000	117,000	111,000	122,000
pH	pH Units	0.10	6.5-9.0	8.00	8.04	8.18	8.15	8.23	8.18	8.25
Total Suspended Solids (TSS)	µg/L	3000	-	<3000	14500	226000	20200	82500	38400	28700
Total Dissolved Solids (TDS)	µg/L	1000	-	108,000	119,000	226,000	119,000	139,000	123,000	129,000
Anions and Nutrients										
Total Alkalinity as $CaCO_3$	µg/L	1000	-	81,800	84,100	147,000	88,300	111,000	92,700	107,000
Ammonia, Total (as N)	µg/L	5	See narrative #2	<5.0	<5.0	12.0	<5.0	9.4	6.0	<5.0
Bromide (Br)	µg/L	50	-	<50	<50	<50	<50	-	<50	<50
Chloride (Cl)	µg/L	500	600,000	<500	<500	<500	<500	-	<500	540
Fluoride (F)	µg/L	20	See equation #3	40	41	93	45	-	48	59
Nitrate and Nitrite (as N)	µg/L	5.1	-	75.3	71.7	24.1	66.8	16	64.6	21.5
Nitrate (as N)	µg/L	50	32,800	75.3	71.7	24.1	66.8	16.0	64.6	21.5
Nitrite (as N)	µg/L	1.0	60-600 #4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Kjeldahl Nitrogen	µg/L	50	-	78	170	745	162	340	198	165
Total Nitrogen	µg/L	30	-	156	141	387	160	290	190	134
Orthophosphate (as P)	µg/L	1.0	-	<1.0	<1.0	4.4	<1.0	<1.0	<1.0	<1.0
Phosphorus (P)-Dissolved	µg/L	2.0	-	<2.0	<2.0	7.2	<2.0	<2.0	<2.0	<2.0
Phosphorus (P)-Total	µg/L	2.0	-	3.3	15.5	251	27.4	98.8	55.2	23.5
Silicate (as SiO2)	µg/L	500	-	4440	4380	3570	4420	-	4510	2240
Sulphate (SO4)	µg/L	300	-	13,100	13,300	37,500	15,500	-	16,900	12,300
Organic Carbon										
Dissolved Organic Carbon (DOC)	µg/L	500	-	3450	3480	7320	4630	8020	8770	4650
Total Organic Carbon (TOC)	µg/L	500	-	2690	2790	7820	3530	6610	3890	3660
Biological										
E. Coli	MPN/100mL	1	-	1	<1	32	3	-	8	8
Heterotrophic Plate Count (HPC)	CFU/mL	1	-	<1	<1	11	44	-	46	24
Total Coliforms	MPN/100mL	1	-	3	8	613	83	-	145	59
Total Metals										
Aluminum	µg/L	5.0	-	42.5	133	3580	552	1000	721	753
Antimony	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Arsenic	µg/L	0.50	-	<0.50	<0.50	2.33	<0.50	0.84	0.57	<0.50
Barium	µg/L	20	-	33	36	187	51	175	60	88
Beryllium	µg/L	1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bismuth	µg/L	0.050	-	<0.050	<0.050	0.102	<0.050	<0.050	<0.050	<0.050
Boron	µg/L	100	-	<100	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.0050	-	0.0171	0.0384	0.264	0.0431	0.0670	0.0634	0.0387
Calcium	µg/L	100	-	28800	28400	54900	32600	33200	33000	35300
Chromium	µg/L	1.0	-	<1.0	<1.0	6.5	1.0	1.9	1.3	1.2
Cobalt	µg/L	0.30	110	<0.30	<0.30	2.14	<0.30	0.74	0.39	0.40
Copper	µg/L	1.0	See equation #5	<1.0	1.0	6.8	1.4	2.9	1.8	1.3
Iron	µg/L	30	1000	64	277	**5140**	652	**1660**	984	935
Lead	µg/L	0.50	See equation #6	<0.50	<0.50	2.67	<0.50	0.92	<0.50	<0.50
Lithium	µg/L	1	-	1.3	1.4	9.4	2.0	4.5	2.2	4.3
Magnesium	µg/L	100	-	6070	6210	14700	7070	9010	7400	8130
Manganese	µg/L	0.10	See equation #7	2.59	6.49	73.1	10.8	30.8	15.1	14.6
Mercury	µg/L	0.0050	-	<0.0050	<0.0050	<0.025	<0.0050	0.0054	<0.0050	<0.0050
Molybdenum	µg/L	1.0	2000	<1.0	<1.0	2.9	1.0	<1.0	1.0	<1.0
Nickel	µg/L	1.0	-	<1.0	1.1	8.6	1.5	3.4	2.1	1.7
Phosphorus	µg/L	300	-	<300	<300	<300	<300	<300	<300	<300
Potassium	µg/L	2000	-	<2000	<2000	2200	<2000	<2000	<2000	<2000
Selenium	µg/L	0.050	-	0.231	0.246	1.44	0.350	0.247	0.380	0.435
Silicon	µg/L	50	-	2220	2390	9810	3090	3130	3480	2370
Silver	µg/L	0.020	0.1 or 3.0 #8	<0.020	<0.020	0.072	<0.020	0.020	<0.020	<0.020
Sodium	µg/L	2000	-	<2000	<2000	2900	<2000	2200	<2000	2000
Strontium	µg/L	5.0	-	111	109	236	122	77.7	126	112
Thallium	µg/L	0.20	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Tin	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Titanium	µg/L	10	-	<10	<10	97	14	29	19	18
Uranium	µg/L	0.20	-	0.47	0.47	0.89	0.51	0.27	0.50	0.26
Vanadium	µg/L	0.50	-	0.52	1.03	15.6	2.40	3.84	3.11	2.65
Zinc	µg/L	5.0	See equation #9	<5.0	<5.0	29.3	5.2	8.5	6.0	<5.0
Dissolved Metals										
Aluminum	µg/L	5.0	100 #10	<5.0	<5.0	13.7	<5.0	7.8	11.2	9.2
Antimony	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Arsenic	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Barium	µg/L	20	-	31	32	66	36	135	39	71
Beryllium	µg/L	1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bismuth	µg/L	0.050	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Boron	µg/L	100	-	<100	<100	<100	<100	<100	<100	<100
Cadmium	µg/L	0.0050	See equation #11	0.0115	0.0088	0.0182	0.0082	0.0078	0.0078	0.0107
Calcium	µg/L	100	-	30100	30300	52400	32000	32900	32900	36000
Chromium	µg/L	1.0	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cobalt	µg/L	0.30	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Copper	µg/L	1.0	-	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	<1.0
Iron	µg/L	30	350	<30	<30	32	<30	<30	<30	<30
Lead	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Lithium	µg/L	1	-	1.2	1.3	5.7	1.4	3.6	1.5	3.8
Magnesium	µg/L	100	-	6050	6040	13700	6780	8560	7090	7910
Manganese	µg/L	0.10	-	0.91	0.76	4.92	1.06	2.13	1.57	1.44
Mercury	µg/L	0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Molybdenum	µg/L	1.0	-	<1.0	<1.0	2.5	<1.0	<1.0	<1.0	<1.0
Nickel	µg/L	1.0	-	<1.0	<1.0	1.9	<1.0	1.1	<1.0	<1.0
Phosphorus	µg/L	300	-	<300	<300	<300	<300	<300	<300	<300
Potassium	µg/L	2000	-	<2000	<2000	<2000	<2000	<2000	<2000	<2000
Selenium	µg/L	0.050	-	0.268	0.268	1.26	0.316	0.176	0.356	0.445
Silicon	µg/L	50	-	2150	2170	1760	2110	1100	2110	1080
Silver	µg/L	0.020	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Sodium	µg/L	2000	-	<2000	<2000	2900	<2000	2100	<2000	<2000
Strontium	µg/L	5.0	-	108	108	227	118	73.8	123	109
Thallium	µg/L	0.20	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Tin	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Titanium	µg/L	10	-	<10	<10	<10	<10	<10	<10	<10
Uranium	µg/L	0.20	-	0.40	0.41	0.59	0.41	<0.20	0.41	<0.20
Vanadium	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Zinc	µg/L	5.0	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

NOTES:

BC MOE 2016	British Columbia Ministry of Environment (BC MOE). 2016. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin
#2	Guideline for ammonia varies with pH and temperature, derived from Table 26D of the BC MOE, 2016 BCWQGs
#3	Standard for fluoride varies with hardness. Calculated based on equation: -51.73 + 92.57*log(Hardness)
#4	Guideline/standard for nitrite varies with chloride concentrations.
#5	Water quality guideline for copper is calculated as 0.094(H)+2
#6	Standard for lead is 3 ug/L at H<8 mg/L, or calculated as e(1.273*ln(H)-1.460) when H>8 mg/L
#7	Guideline for manganese calculated as (0.01102*H)+0.54
#8	Criteria for silver varies with hardness, 0.1 µg/L at H<100 mg/L or 3.0 µg/L at H>100 mg/L
#9	Guideline for zinc calculated as 33+0.75*(H-90)
#10	Standard for aluminum varies with pH. Standard is 0.05 mg/L if pH is greater than or equal to 6.5, or calculated as $e^{(1.209-2.426(pH)+0.286K)}$ where $K=(pH)^2$
#11	Standard for cadmium is calculated as $e^{(1.03*ln(H)-5.274)}$
H	Hardness
-	No applicable standard/guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of one of the applicable standards/guidelines.
-	No applicable standard/guideline or analysis was not conducted.
CFU	Colony Forming Units
MPN	Most Probable Number

Table 3: September 2016 Event Surface Water Quality Results

				Future Site C Reservoir					Downstream of Site C Reservoir	
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2016 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**UPPER SITE C RESERVOIR (PR1) or PEACE 1**	**MIDDLE SITE C RESERVOIR (PR2) or PEACE 2**	**HALFWAY RIVER DOWNSTREAM (HD)**	**LOWER SITE C RESERVOIR (PR3) or PEACE 3**	**MOBERLY RIVER DOWNSTREAM (MD)**	**PEACE AT PINE (PD1) or PEACE 4**	**PINE RIVER (PINE)**
Sample Date				21-Sep-2016	21-Sep-2016	21-Sep-2016	21-Sep-2016	21-Sep-2016	21-Sep-2016	21-Sep-2016
GPS - Northing (10 UTM)				6207857	6229426	6231488	6231374	6230146	6226276	6223596
GPS - Easting (10 UTM)				566122	594889	596649	628028	628620	640247	641710
Laboratory Identification Number				L1832389-4	L1832389-2	L1832389-1	L1832388-2	L1832388-1	L1832388-3	L1832388-4
Matrix				surface water	surface water	-	surface water	surface water	surface water	surface water
Field Measurements										
Sample Depth	m	-	-	0.2	0.2	0.2	0.2	0.2	0.5	0.2
Specific Conductivity (EC)	SPCµS/cm	-	-	170.2	174.9	413.7	176.2	214.8	188.1	258.7
pH	pH Units	-	6.5-9.0	8.30	8.27	8.44	8.28	8.30	8.31	8.40
Temperature	°C	-	15	12.9	13.3	9.8	12.3	9.4	12.1	9.2
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 [#1]	10.05	10.22	11.06	10.13	11.22	10.17	11.05
Salinity	parts per trillion	-	-	0.08	0.08	0.20	0.08	0.10	0.09	0.12
Turbidity	nephelometric units	-	-	3.9	8.7	26.0	12.8	55.0	20.1	16.2
Physical Parameters										
Colour	Col. Unit	5.0	-	6.4	6.0	19.4	7.0	27.9	6.5	9.6
Electrical Conductivity (EC)	µS/cm	2.0	-	164	164	400	171	205	176	249
Hardness as $CaCO_3$	µg/L	0.500	-	83,300	82,300	225,000	86,400	-	-	137,000
pH	pH Units	0.10	6.5-9.0	7.97	8.03	8.30	8.04	8.10	8.06	8.20
Total Suspended Solids (TSS)	µg/L	3000	-	3600	22,500	35,300	22,200	40,200	36,900	17,500
Total Dissolved Solids (TDS)	µg/L	1000	-	91,800	91,600	249,000	96,600	156,000	126,000	149,000
Turbidity	NTU	0.10	-	3.36	6.22	30.0	11.3	48.1	16.8	13.5
Anions and Nutrients										
Bicarbonate as $CaCO_3$	µg/L	1000	-	78,900	78,900	176,000	82,300	108,000	84,200	125,000
Carbonate as $CaCO_3$	µg/L	1000	-	<1000	<1000	2200	<1000	<1000	<1000	<1000
Hydroxide as $CaCO_3$	µg/L	1000	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Total Alkalinity as $CaCO_3$	µg/L	1000	-	78,900	78,900	178,000	82,300	108,000	84,200	125,000
Ammonia, Total (as N)	µg/L	5	See narrative [#2]	<5.0	<5.0	<5.0	<5.0	5.5	5.1	<5.0
Bromide	µg/L	50	-	<50	<50	<50	<50	<50	<50	<50
Chloride	µg/L	500	600,000	<500	<500	<500	<500	<500	<500	640
Fluoride	µg/L	20	See equation [#3]	37	38	100	40	73	43	62
Nitrate and Nitrite (as N)	µg/L	5.1	-	50.8	46.9	<5.1	48.9	35.4	47.7	22.3
Nitrate (as N)	µg/L	50	32,800	50.8	46.9	<5.0	48.9	35.4	47.7	22.3
Nitrite (as N)	µg/L	1.0	60-600 [#4]	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Kjeldahl Nitrogen	µg/L	50	-	100	101	220	120	324	140	148
Total Nitrogen	µg/L	30	-	119	122	164	129	311	150	133
Orthophosphate (as P)	µg/L	1.0	-	1.2	1.1	2.2	2.4	2.5	1.5	<1.0
Phosphorus (P)-Dissolved	µg/L	2.0	-	<2.0	<2.0	5.4	3.1	5.9	2.9	2.6
Phosphorus (P)-Total	µg/L	2.0	-	7.2	14.3	27.7	15.2	42.4	27.8	18.3
Silicate (as SiO_2)	µg/L	500	-	4190	4200	3730	4080	3270	4160	2230
Sulphate (SO4)	µg/L	300	-	11,600	11,700	54,400	12,900	10,200	14,800	18,600
Anions Total	meq/L	-	-	1.82	1.83	4.7	1.92	-	-	2.91
Cations Total	meq/L	-	-	1.66	1.64	4.62	1.73	-	-	2.84
Ionic Balance	N/A	-	-	-4.6	-5.2	-0.8	-5.3	-	-	-1.3
Organic and Inorganic Carbon										
Dissolved Organic Carbon (DOC)	µg/L	500	-	6200	6700	9400	8300	10200	6300	5900
Total Organic Carbon (TOC)	µg/L	500	-	2800	2900	5900	3100	8300	3800	3300
Biological										
E. Coli	MPN/100mL	1	-	4	2	5	5	-	-	1
Heterotrophic Plate Count (HPC)	CFU/mL	1	-	44	25	72	64	-	-	48
Total Coliforms	MPN/100mL	1	-	225	91	276	201	-	-	111
Total Metals										
Aluminum	µg/L	5.0	-	87.6	122	748	264	-	-	449
Antimony	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	-	-	<0.50
Arsenic	µg/L	0.50	-	<0.50	<0.50	0.68	<0.50	-	-	<0.50
Barium	µg/L	20	-	31	33	115	40	-	-	94
Beryllium	µg/L	1.0	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0
Bismuth	µg/L	200	-	<200	<200	<200	<200	-	-	<200
Boron	µg/L	100	-	<100	<100	<100	<100	-	-	<100
Cadmium	µg/L	0.0050	-	0.0226	0.0319	0.0795	0.0399	-	-	0.0377
Calcium	µg/L	100	-	25300	25800	63500	26800	-	-	39200
Chromium	µg/L	1.0	-	<1.0	<1.0	1.3	<1.0	-	-	<1.0
Cobalt	µg/L	0.30	110	<0.30	<0.30	0.59	<0.30	-	-	0.46
Copper	µg/L	1.0	See equation [#5]	<1.0	<1.0	<1.0	<1.0	-	-	<1.0
Iron	µg/L	30	1000	129	194	**1290**	423	-	-	886
Lead	µg/L	0.50	See equation [#6]	<0.50	<0.50	0.55	<0.50	-	-	<0.50
Lithium	µg/L	1	-	<1.0	<1.0	8.0	1.4	-	-	5.9
Magnesium	µg/L	100	-	5530	5680	17700	6020	-	-	9560
Manganese	µg/L	0.10	See equation [#7]	3.15	5.04	23.8	8.28	-	-	19.9
Mercury	µg/L	0.0050	-	0.0055	0.0052	0.0069	0.0058	-	-	0.0068
Molybdenum	µg/L	1.0	2000	<1.0	<1.0	3.8	<1.0	-	-	<1.0
Nickel	µg/L	1.0	-	<1.0	<1.0	3.4	<1.5	-	-	<2.5
Phosphorus	µg/L	300	-	<300	<300	<300	<300	-	-	<300
Potassium	µg/L	2000	-	<2000	<2000	<2000	<2000	-	-	<2000
Selenium	µg/L	0.050	-	0.205	0.209	1.38	0.234	-	-	0.449
Silicon	µg/L	50	-	2220	2270	3250	2560	-	-	1830
Silver	µg/L	0.020	0.1 or 3.0 [#8]	<0.020	<0.020	<0.020	<0.020	-	-	<0.020
Sodium	µg/L	2000	-	<2000	<2000	3200	<2000	-	-	2500
Strontium	µg/L	5.0	-	99.2	100	318	101	-	-	126
Thallium	µg/L	0.20	-	<0.20	<0.20	<0.20	<0.20	-	-	<0.20
Tin	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	-	-	<0.50
Titanium	µg/L	10	-	<10	<10	17	<10	-	-	<10
Uranium	µg/L	0.20	-	0.37	0.38	0.78	0.40	-	-	0.31
Vanadium	µg/L	0.50	-	0.62	0.80	3.51	1.39	-	-	1.67
Zinc	µg/L	5.0	See equation [#9]	<5.0	<5.0	8.5	<5.0	-	-	10.7
Dissolved Metals										
Aluminum	µg/L	5.0	100 [#10]	<5.0	<5.0	14.0	<5.0	-	-	16.1
Antimony	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	-	-	<0.50
Arsenic	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	-	-	<0.50
Barium	µg/L	20	-	32	32	92	34	-	-	85
Beryllium	µg/L	1.0	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0
Bismuth	µg/L	200	-	<200	<200	<200	<200	-	-	<200
Boron	µg/L	100	-	<100	<100	<100	<100	-	-	<100
Cadmium	µg/L	0.0050	See equation [#11]	0.0075	0.0074	0.0183	0.0065	-	-	0.0097
Calcium	µg/L	100	-	24400	24100	62600	25300	-	-	39400
Chromium	µg/L	1.0	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0
Cobalt	µg/L	0.30	-	<0.30	<0.30	<0.30	<0.30	-	-	<0.30
Copper	µg/L	1.0	-	1.0	<1.0	1.0	<1.0	-	-	1.1
Iron	µg/L	30	350	<30	<30	35	<30	-	-	<30
Lead	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	-	-	<0.50
Lithium	µg/L	1	-	<1.0	<1.0	6.9	1.1	-	-	5.4
Magnesium	µg/L	100	-	5410	5350	16700	5620	-	-	9280
Manganese	µg/L	0.10	-	0.49	0.42	7.07	0.65	-	-	7.89
Mercury	µg/L	0.025	-	<0.025	<0.025	<0.025	<0.0050	-	-	<0.0050
Molybdenum	µg/L	1.0	-	<1.0	<1.0	3.5	<1.0	-	-	<1.0
Nickel	µg/L	1.0	-	<1.0	<1.0	1.8	<1.0	-	-	<1.0
Phosphorus	µg/L	300	-	<300	<300	<300	<300	-	-	<300
Potassium	µg/L	2000	-	<2000	<2000	<2000	<2000	-	-	<2000
Selenium	µg/L	0.050	-	0.177	0.199	1.29	0.217	-	-	0.462
Silicon	µg/L	50	-	2020	1990	1840	2000	-	-	1100
Silver	µg/L	0.020	-	<0.020	<0.020	<0.020	<0.020	-	-	<0.020
Sodium	µg/L	2000	-	<2000	<2000	2900	<2000	-	-	2400
Strontium	µg/L	5.0	-	104	103	306	102	-	-	128
Thallium	µg/L	0.20	-	<0.20	<0.20	<0.20	<0.20	-	-	<0.20
Tin	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	-	-	<0.50
Titanium	µg/L	10	-	<10	<10	<10	<10	-	-	<10
Uranium	µg/L	0.20	-	0.33	0.34	0.70	0.36	-	-	0.27
Vanadium	µg/L	0.50	-	<0.50	<0.50	<0.50	<0.50	-	-	<0.50
Zinc	µg/L	5.0	-	<5.0	<5.0	<5.0	<5.0	-	-	<5.0

NOTES:

BC MOE 2016	British Columbia Ministry of Environment (BC MOE). 2016. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Ca
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin
#2	Guideline for ammonia varies with pH and temperature, derived from Table 26D of the BC MOE, 2016 BCWQGs
#3	Standard for fluoride varies with hardness. Calculated based on equation: -51.73 + 92.57*log(Hardness)
#4	Guideline/standard for nitrite varies with chloride concentrations.
#5	Water quality guideline for copper is calculated as 0.094(H)+2
#6	Standard for lead is 3 ug/L at H<8 mg/L, or calculated as e(1.273*ln(H)-1.460) when H>8 mg/L
#7	Guideline for manganese calculated as (0.01102*H)+0.54
#8	Criteria for silver varies with hardness, 0.1 µg/L at H<100 mg/L or 3.0 µg/L at H>100 mg/L
#9	Guideline for zinc calculated as 33+0.75*(H-90)
#10	Standard for aluminum varies with pH. Standard is 0.05 mg/L if pH is greater than or equal to 6.5, or calculated as $e^{(1.209-2.426(pH)+0.286K)}$ where $K=(pH)^2$
#11	Standard for cadmium is calculated as $e^{(1.03*ln(H)-5.274)}$
H	Hardness
-	No applicable standard/guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of one of the applicable standards/guidelines.
MPN	Most Probable Number
CFU	Colony Forming Units

Table 4: December 2016 Event Surface Water Quality Results

				Future Site C Reservoir					Downstream of Site C Reservoir	
Parameter	**Unit**	**Reported Detection Limit (RDL)**	**BC MOE 2016 (Approved Guidelines for freshwater aquatic life and short-term maximum)**	**UPPER SITE C RESERVOIR (PR1) or PEACE 1**	**MIDDLE SITE C RESERVOIR (PR2) or PEACE 2**	**HALFWAY RIVER DOWNSTREAM (HD)**	**LOWER SITE C RESERVOIR (PR3) or PEACE 3**	**MOBERLY RIVER DOWNSTREAM (MD)**	**PEACE AT PINE (PD1) or PEACE 4**	**PINE RIVER (PINE)**
Sample Date				19-Dec-2016	19-Dec-2016	Not sampled due to unsafe access	20-Dec-2016	Not sampled due to unsafe access	20-Dec-2016	Not sampled due to ice cover
GPS - Northing (10 UTM)				6207857	6229426		6231374		6226276	
GPS - Easting (10 UTM)				566122	594889		628028		640247	
Laboratory Identification Number				L1872185-2	L1872185-1		L1872829-1		L1872829-2	
Matrix				surface water	surface water	-	surface water	surface water	surface water	surface water
Field Measurements										
Sample Depth	m	-	-	0.2	0.2	-	0.2	-	0.2	-
Specific Conductivity (EC)	SPCµS/cm	-	-	181.5	12.7	-	184.5	-	190.0	-
pH	pH Units	-	6.5-9.0	8.55	8.19	-	8.19	-	8.07	-
Temperature	°C	-	15	2.2	2.3	-	2.2	-	2.1	-
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 [#1]	12.97	12.72	-	12.59	-	12.85	-
Salinity	parts per trillion	-	-	0.09	0.09	-	0.09	-	0.09	-
Turbidity	nephelometric units	-	-	2.9	5.0	-	3.4	-	4.2	-
Physical Parameters										
Colour	Col. Unit	5.0	-	<5.0	<5.0	-	<5.0	-	6.4	-
Electrical Conductivity (EC)	µS/cm	2.0	-	185	188	-	190	-	196	-
Hardness as $CaCO_3$	µg/L	500	-	92000	93300	-	95000	-	97400	-
pH	pH Units	0.10	6.5-9.0	8.06	8.09	-	8.13	-	8.15	-
Total Suspended Solids (TSS)	µg/L	3000	-	<3000	8900	-	7200	-	10500	-
Total Dissolved Solids (TDS)	µg/L	1000	-	99800	101000	-	103000	-	106000	-
Turbidity	NTU	0.10	-	1.97	4.27	-	2.01	-	3.13	-
Anions and Nutrients										
Bicarbonate as $CaCO_3$	µg/L	1000	-	83600	84900	-	86700	-	88300	-
Carbonate as $CaCO_3$	µg/L	1000	-	<1000	<1000	-	<1000	-	<1000	-
Hydroxide as $CaCO_3$	µg/L	1000	-	<1000	<1000	-	<1000	-	<1000	-
Total Alkalinity as $CaCO_3$	µg/L	1000	-	83600	84900	-	86700	-	88300	-
Ammonia, Total (as N)	µg/L	5	See narrative [#2]	<5.0	<5.0	-	<5.0	-	<5.0	-
Bromide	µg/L	50	-	<50	<50	-	<50	-	<50	-
Chloride	µg/L	500	600,000	<500	<500	-	<500	-	<500	-
Fluoride	µg/L	20	See equation [#3]	39	39	-	38	-	39	-
Nitrate and Nitrite (as N)	µg/L	5.1	-	71.5	68.9	-	71.6	-	72.5	-
Nitrate (as N)	µg/L	50	32,800	71.5	68.9	-	71.6	-	72.5	-
Nitrite (as N)	µg/L	1.0	60-600 [#4]	<1.0	<1.0	-	<1.0	-	<1.0	-
Total Kjeldahl Nitrogen	µg/L	50	-	96	98	-	94	-	86	-
Total Nitrogen	µg/L	30	-	129	132	-	131	-	135	-
Orthophosphate (as P)	µg/L	1.0	-	<1.0	<1.0	-	<1.0	-	<1.0	-
Phosphorus (P)-Dissolved	µg/L	2.0	-	<2.0	<2.0	-	<2.0	-	<2.0	-
Phosphorus (P)-Total	µg/L	2.0	-	3.3	4.6	-	<2.0	-	2.3	-
Silicate (as SiO_2)	µg/L	500	-	4240	4320	-	4710	-	4670	-
Sulphate (SO4)	µg/L	300	-	13700	13900	-	14100	-	14800	-
Anions Total	meq/L	-	-	1.96	1.99	-	2.03	-	2.08	-
Cations Total	meq/L	-	-	1.84	1.86	-	1.9	-	1.95	-
Ionic Balance	N/A	-	-	-3.3	-3.4	-	-3.4	-	-3.4	-
Organic and Inorganic Carbon										
Dissolved Organic Carbon (DOC)	µg/L	500	-	2590	2720	-	2490	-	3060	-
Total Organic Carbon (TOC)	µg/L	500	-	2590	2500	-	2500	-	2290	-
Biological										
E. Coli	MPN/100mL	1	-	<1	<1	-	<1	-	<1	-
Heterotrophic Plate Count (HPC)	CFU/mL	1	-	12	18	-	19	-	10	-
Total Coliforms	MPN/100mL	1	-	<1	15	-	1	-	3	-
Total Metals										
Aluminum	µg/L	5.0	-	43.1	63.7	-	61.9	-	70.8	-
Antimony	µg/L	0.50	-	<0.50	<0.50	-	<0.50	-	<0.50	-
Arsenic	µg/L	0.50	-	<0.50	<0.50	-	<0.50	-	<0.50	-
Barium	µg/L	20	-	29	31	-	33	-	35	-
Beryllium	µg/L	1.0	-	<1.0	<1.0	-	<1.0	-	<1.0	-
Bismuth	µg/L	200	-	<200	<200	-	<200	-	<200	-
Boron	µg/L	100	-	<100	<100	-	<100	-	<100	-
Cadmium	µg/L	0.0050	-	0.0253	0.0233	-	0.0230	-	0.0272	-
Calcium	µg/L	100	-	26800	26700	-	27700	-	28600	-
Chromium	µg/L	1.0	-	2.3	<1.0	-	<1.0	-	<1.0	-
Cobalt	µg/L	0.30	110	<0.30	<0.30	-	<0.30	-	<0.30	-
Copper	µg/L	1.0	See equation [#5]	<1.0	<1.0	-	<1.0	-	<1.0	-
Iron	µg/L	30	1000	75	90	-	97	-	165	-
Lead	µg/L	0.50	See equation [#6]	<0.50	<0.50	-	<0.50	-	<0.50	-
Lithium	µg/L	1.0	-	<1.0	<1.0	-	<1.0	-	<1.0	-
Magnesium	µg/L	100	-	5710	5650	-	5920	-	6020	-
Manganese	µg/L	0.10	See equation [#7]	3.70	4.05	-	3.89	-	4.87	-
Mercury	µg/L	0.0050	-	<0.0050	<0.0050	-	<0.0050	-	0.0150	-
Molybdenum	µg/L	1.0	2000	<1.0	<1.0	-	<1.0	-	1.1	-
Nickel	µg/L	1.0	-	<1.0	<1.0	-	<1.0	-	1.2	-
Phosphorus	µg/L	300	-	<300	<300	-	<300	-	<300	-
Potassium	µg/L	2000	-	<2000	<2000	-	<2000	-	<2000	-
Selenium	µg/L	0.050	-	0.247	0.268	-	0.256	-	0.291	-
Silicon	µg/L	50	-	2130	2170	-	2290	-	2320	-
Silver	µg/L	0.020	0.1 or 3.0 [#8]	<0.020	<0.020	-	<0.020	-	<0.020	-
Sodium	µg/L	2000	-	<2000	<2000	-	<2000	-	<2000	-
Strontium	µg/L	5.0	-	107	107	-	107	-	112	-
Thallium	µg/L	0.20	-	<0.20	<0.20	-	<0.20	-	<0.20	-
Tin	µg/L	0.50	-	<0.50	<0.50	-	<0.50	-	<0.50	-
Titanium	µg/L	10	-	<10	<10	-	<10	-	<10	-
Uranium	µg/L	0.20	-	0.46	0.47	-	0.47	-	0.47	-
Vanadium	µg/L	0.50	-	<0.50	0.52	-	0.56	-	0.62	-
Zinc	µg/L	5.0	See equation [#9]	<5.0	<5.0	-	<5.0	-	<5.0	-
Dissolved Metals										
Aluminum	µg/L	5.0	100 [#10]	<5.0	<5.0	-	<5.0	-	<5.0	-
Antimony	µg/L	0.50	-	<0.50	<0.50	-	<0.50	-	<0.50	-
Arsenic	µg/L	0.50	-	<0.50	<0.50	-	<0.50	-	<0.50	-
Barium	µg/L	20	-	31	32	-	31	-	32	-
Beryllium	µg/L	1.0	-	<1.0	<1.0	-	<1.0	-	<1.0	-
Bismuth	µg/L	200	-	<200	<200	-	<200	-	<200	-
Boron	µg/L	100	-	<100	<100	-	<100	-	<100	-
Cadmium	µg/L	0.0050	See equation [#11]	0.0093	0.0108	-	<0.0050	-	0.0098	-
Calcium	µg/L	100	-	27000	27400	-	28200	-	28900	-
Chromium	µg/L	1.0	-	<1.0	<1.0	-	<1.0	-	<1.0	-
Cobalt	µg/L	0.30	-	<0.30	<0.30	-	<0.30	-	<0.30	-
Copper	µg/L	1.0	-	<1.0	<1.0	-	<1.0	-	<1.0	-
Iron	µg/L	30	350	<30	<30	-	<30	-	<30	-
Lead	µg/L	0.50	-	<0.50	<0.50	-	<0.50	-	<0.50	-
Lithium	µg/L	1	-	1.4	1.4	-	<1.0	-	1.0	-
Magnesium	µg/L	100	-	5970	6030	-	5980	-	6110	-
Manganese	µg/L	0.10	-	0.68	0.87	-	0.72	-	0.76	-
Mercury	µg/L	0.0050	-	<0.0050	<0.0050	-	<0.0050	-	0.0067	-
Molybdenum	µg/L	1.0	-	<1.0	<1.0	-	<1.0	-	<1.0	-
Nickel	µg/L	1.0	-	<1.0	<1.0	-	<1.0	-	<1.0	-
Phosphorus	µg/L	300	-	<300	<300	-	<300	-	<300	-
Potassium	µg/L	2000	-	<2000	<2000	-	<2000	-	<2000	-
Selenium	µg/L	0.050	-	0.245	0.238	-	0.260	-	0.281	-
Silicon	µg/L	50	-	2140	2100	-	2010	-	2030	-
Silver	µg/L	0.020	-	<0.020	<0.020	-	<0.020	-	<0.020	-
Sodium	µg/L	2000	-	<2000	<2000	-	<2000	-	<2000	-
Strontium	µg/L	5.0	-	106	108	-	103	-	106	-
Thallium	µg/L	0.20	-	<0.20	<0.20	-	<0.20	-	<0.20	-
Tin	µg/L	0.50	-	<0.50	<0.50	-	<0.50	-	<0.50	-
Titanium	µg/L	10	-	<10	<10	-	<10	-	<10	-
Uranium	µg/L	0.20	-	0.45	0.45	-	0.41	-	0.42	-
Vanadium	µg/L	0.50	-	<0.50	<0.50	-	<0.50	-	<0.50	-
Zinc	µg/L	5.0	-	<5.0	<5.0	-	<5.0	-	<5.0	-

NOTES:

BC MOE 2016	British Columbia Ministry of Environment (BC MOE). 2016. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin
#2	Guideline for ammonia varies with pH and temperature, derived from Table 26D of the BC MOE, 2016 BCWQGs
#3	Standard for fluoride varies with hardness. Calculated based on equation: -51.73 + 92.57*log(Hardness)
#4	Guideline/standard for nitrite varies with chloride concentrations.
#5	Water quality guideline for copper is calculated as 0.094(H)+2
#6	Standard for lead is 3 ug/L at H<8 mg/L, or calculated as e(1.273*ln(H)-1.460) when H>8 mg/L
#7	Guideline for manganese calculated as (0.01102*H)+0.54
#8	Criteria for silver varies with hardness, 0.1 µg/L at H<100 mg/L or 3.0 µg/L at H>100 mg/L
#9	Guideline for zinc calculated as 33+0.75*(H-90)
#10	Standard for aluminum varies with pH. Standard is 0.05 mg/L if pH is greater than or equal to 6.5, or calculated as $e^{(1.209-2.426(pH)+0.286K)}$ where $K=(pH)^2$
#11	Standard for cadmium is calculated as $e^{(1.03*ln(H)-5.274)}$
H	Hardness
-	No applicable standard/guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of one of the applicable standards/guidelines.
MPN	Most Probable Number
CFU	Colony Forming Units

Table 5: 2016 Turbidity Monitoring Station Water Quality Results

Parameter	Unit	Reported Detection Limit (RDL)	BC MOE 2016 (Approved Guidelines for freshwater aquatic life and short-term maximum)	Peace Above Moberly - Right Bank (PAM-RB)	Peace Above Moberly - Left Bank (PAM-LB)	Peace Above Pine - Right Bank (PAP-RB)	Peace Above Pine - Left Bank (PAP-LB)	Peace Above Taylor - Left Bank (PAT-LB)	Peace Above Spectra - Left Bank (PAS-LB)
GPS - Northing (10 UTM)				6232204	6232396	6227924	6229307	6225952	6224048
GPS - Easting (10 UTM)				627301	627684	637520	637222	641396	644405
Matrix				Surface Water					
March 2016 Sampling Event:									
Sample Date				31-Mar-2016	31-Mar-2016	31-Mar-2016	31-Mar-2016	31-Mar-2016	31-Mar-2016
Laboratory Identification Number				L1751131-1	L1751131-2	L1751131-3	L1751131-4	L1751131-5	L1751131-6
Field Measurements									
Sample Depth	m	-	-	0.3	0.3	0.3	0.3	0.3	0.3
Temperature	°C	-	15	2.8	2.8	3.3	2.3	2.0	3.0
Turbidity	nephelometric units	-	-	12.7	64.1	9.6	29.7	20.0	41.3
Physical Parameters									
Total Suspended Solids (TSS)	µg/L	3000	-	9200	66600	10900	44800	27800	48800
June 2016 Sampling Event:									
Sample Date				24-Jun-2016	24-Jun-2016	24-Jun-2016	24-Jun-2016	24-Jun-2016	24-Jun-2016
Laboratory Identification Number				L1789101-5	L1789101-4	L1789101-1	L1789101-2	L1789101-3	L1789101-6
Field Measurements									
Sample Depth	m	-	-	1.0	1.0	1.0	1.0	1.0	1.0
Temperature	°C	-	15	11.1	11.5	13.4	**17.9**	12.0	11.7
Turbidity	nephelometric units	-	-	17.2	11.0	131.9	12.2	20.5	56.9
Physical Parameters									
Total Suspended Solids (TSS)	µg/L	3000	-	21100	28200	236000	25000	29900	101000
September 2016 Sampling Event:									
Sample Date				21-Sep-2016	21-Sep-2016	21-Sep-2016	21-Sep-2016	21-Sep-2016	21-Sep-2016
Field Measurements									
Sample Depth	m	-	-	0.2	0.2	0.2	0.2	0.2	0.2
Temperature	°C	-	15	12.3	12.0	12.1	11.6	12.2	12.2
Turbidity	nephelometric units	-	-	12.2	18.5	17.1	19.9	20.8	240.0
Physical Parameters									
Total Suspended Solids (TSS)	µg/L	-	-	Laboratory Analysis suspended until repairs completed in October 2016					
Turbidity	NTU	-	-						
December 2016 Sampling Event:									
Sample Date				20-Dec-2016	20-Dec-2016	20-Dec-2016	20-Dec-2016	20-Dec-2016	20-Dec-2016
Laboratory Identification Number				L1872814-5	L1872814-6	L1872814-3	L1872814-4	L1872814-1	L1872814-2
Field Measurements									
Sample Depth	m	-	-	0.2	0.2	0.2	0.2	0.2	0.2
Temperature	°C	-	15	2.2	-	2.1	-	-	-
Turbidity	nephelometric units	-	-	3.4	-	4.3	-	-	-
Physical Parameters									
Total Suspended Solids (TSS)	µg/L	3000	-	7900	13100	8300	7800	8300	9400
Turbidity	NTU	0.10	-	2.84	5.20	3.17	3.17	3.04	3.21

NOTES:

BC MOE 2016	British Columbia Ministry of Environment (BC MOE). 2016. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.
-	No applicable standard/guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates an exceedance of one of the applicable standards/guidelines.

Table 6: 2016 QAQC Blank Samples Surface Water Quality Results

Parameter	Unit	BC MOE 2016 (Approved Guidelines for freshwater aquatic life and short-term maximum)	TRIP BLANKS			FIELD BLANKS			
			Trip Blank	Trip Blank	Trip Blank	Field Blank	Field Blank	Field Blank	Field Blank
Sample Date			April 2016	1-Sep-2016	20-Dec-2016	3-Apr-2016	21-Jun-2016	22-Sep-2016	19-Dec-2016
Laboratory Identification Number			L1751250-1	L1833109-1	L1872829-3	L1751250-2	L1786823-1	L1833036-6	L1872185-4
Matrix			surface water	surface water	-	surface water	surface water	surface water	surface water
Physical Parameters									
Colour	Col. Unit	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Electrical Conductivity (EC)	µS/cm	-	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0
Hardness as $CaCO_3$	µg/L	-	<500	<500	<500	<500	-	<500	<500
pH	pH Units	6.5-9.0	**5.52**	**5.41**	**5.33**	**5.47**	**5.52**	**5.37**	**5.41**
Total Suspended Solids (TSS)	µg/L	-	<3000	<3000	<3000	<3000	<3000	<3000	<3000
Total Dissolved Solids (TDS)	µg/L	-	<1000	<1000	<1000	<1000	<10000	-	<1000
Anions and Nutrients									
Bicarbonate as $CaCO_3$	µg/L	-	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Carbonate as $CaCO_3$	µg/L	-	<1000	<1000	<1000	<1000	-	<1000	<1000
Hydroxide as $CaCO_3$	µg/L	-	<1000	<1000	<1000	<1000	-	<1000	<1000
Total Alkalinity as $CaCO_3$	µg/L	-	<1000	<1000	<1000	<1000	<5.0	<1000	<1000
Ammonia, Total (as N)	µg/L	See narrative [#2]	-	<5.0	<5.0	-	-	<5.0	<5.0
Bromide	µg/L	-	<50	<50	<50	<50	-	<50	<50
Chloride	µg/L	600,000	<500	<500	<500	<500	-	<500	<500
Fluoride	µg/L	See equation [#3]	<20	<20	<20	<20	-	<20	<20
Nitrate and Nitrite (as N)	µg/L	-	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Nitrate (as N)	µg/L	32,800	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Nitrite (as N)	µg/L	60-600 [#4]	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Kjeldahl Nitrogen	µg/L	-	-	<50	<50	-	<50	<50	<50
Total Nitrogen	µg/L	-	-	<30	<30	-	<30	<30	<30
Orthophosphate (as P)	µg/L	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Phosphorus (P)-Total Dissolved	µg/L	-	-	<2.0	<2.0	-	<2.0	<2.0	<2.0
Phosphorus (P)-Total	µg/L	-	-	<2.0	<2.0	-	<2.0	2.1	<2.0
Silicate (as SiO_2)	µg/L	-	<500	<500	<500	<500	-	<500	<500
Sulphate (SO4)	µg/L	-	<300	<300	<300	<300	-	<300	<300
Anions Total	meq/L	-	<0.10	<0.10	<0.10	<0.10	-	<0.10	<0.10
Cations Total	meq/L	-	<0.10	<0.10	<0.10	<0.10	-	<0.10	<0.10
Ionic Balance	N/A	-	0	0	0	0	-	0	0
Organic and Inorganic Carbon									
Dissolved Organic Carbon (DOC)	µg/L	-	<500	Not Sampled	-	<500	**1950**	**4420**	**540**
Total Organic Carbon (TOC)	µg/L	-	<500	<500	<500	<500	<500	<500	<500
Biological									
E. Coli	MPN/100mL	14	<1	<1	<1	<1	-	<1	<1
Heterotrophic Plate Count (HPC)	CFU/mL	-	<1	<1	<1	<1	-	<1	<1
Total Coliforms	MPN/100mL	-	<1	<1	<1	<1	-	<1	<1
Total Metals									
Aluminum	µg/L	-	<10	<5.0	<5.0	<10	-	<5.0	<5.0
Antimony	µg/L	-	<0.50	<0.50	<0.50	<0.50	-	<0.50	<0.50
Arsenic	µg/L	-	<1.0	<0.50	<0.50	<1.0	-	<0.50	<0.50
Barium	µg/L	-	<20	<20	<20	<20	-	<20	<20
Beryllium	µg/L	-	<5.0	<1.0	<1.0	<5.0	-	<1.0	<1.0
Bismuth	µg/L	-	<200	<200	<200	<200	-	<200	<200
Boron	µg/L	-	<100	<100	<100	<100	-	<100	<100
Cadmium	µg/L	-	<0.050	<0.0050	<0.0050	<0.050	-	<0.0050	<0.0050
Calcium	µg/L	-	<100	<100	<100	<100	-	<100	<100
Chromium	µg/L	-	<0.50	<1.0	<1.0	<0.50	-	<1.0	<1.0
Cobalt	µg/L	110	<0.50	<0.30	<0.30	<0.50	-	<0.30	<0.30
Copper	µg/L	See equation [#5]	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0
Iron	µg/L	1000	<30	<30	<30	<30	-	<30	<30
Lead	µg/L	See equation [#6]	<1.0	<0.50	<0.50	<1.0	-	<0.50	<0.50
Lithium	µg/L	-	<50	<1.0	<1.0	<50	-	<1.0	<1.0
Magnesium	µg/L	-	<100	<100	<100	<100	-	<100	<100
Manganese	µg/L	See equation [#7]	<10	<0.10	<0.10	<10	-	<0.10	<0.10
Mercury	µg/L	-	<0.20	<0.0050	<0.0050	<0.20	-	<0.0050	<0.0050
Molybdenum	µg/L	2000	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0
Nickel	µg/L	-	<5.0	<1.0	<1.0	<5.0	-	<1.0	<1.0
Phosphorus	µg/L	-	<300	<300	<300	<300	-	<300	<300
Potassium	µg/L	-	<2000	<2000	<2000	<2000	-	<2000	<2000
Selenium	µg/L	-	<1.0	<0.050	<0.050	<1.0	-	<0.050	<0.050
Silicon	µg/L	-	<50	<50	<50	<50	-	<50	<50
Silver	µg/L	0.1 or 3.0 [#8]	<0.050	<0.020	<0.020	<0.050	-	<0.020	<0.020
Sodium	µg/L	-	<2000	<2000	<2000	<2000	-	<2000	<2000
Strontium	µg/L	-	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0
Thallium	µg/L	-	<0.20	<0.20	<0.20	<0.20	-	<0.20	<0.20
Tin	µg/L	-	<30	<0.50	<0.50	<30	-	<0.50	<0.50
Titanium	µg/L	-	<50	<10	<10	<50	-	<10	<10
Uranium	µg/L	-	<0.20	<0.20	<0.20	<0.20	-	<0.20	<0.20
Vanadium	µg/L	-	<30	<0.50	<0.50	<30	-	<0.50	<0.50
Zinc	µg/L	See equation [#9]	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0
Dissolved Metals									
Aluminum	µg/L	100 [#10]	-	-	-	<10	-	<5.0	<5.0
Antimony	µg/L	-	-	-	-	<0.50	-	<0.50	<0.50
Arsenic	µg/L	-	-	-	-	<1.0	-	<0.50	<0.50
Barium	µg/L	-	-	-	-	<20	-	<20	<20
Beryllium	µg/L	-	-	-	-	<5.0	-	<1.0	<1.0
Bismuth	µg/L	-	-	-	-	<200	-	<200	<200
Boron	µg/L	-	-	-	-	<100	-	<100	<100
Cadmium	µg/L	See equation [#11]	-	-	-	<0.050	-	<0.0050	<0.0050
Calcium	µg/L	-	-	-	-	<100	-	<100	<100
Chromium	µg/L		-	-	-	<0.50	-	<1.0	<1.0
Cobalt	µg/L	-	-	-	-	<0.50	-	<0.30	<0.30
Copper	µg/L	-	-	-	-	<1.0	-	<1.0	<1.0
Iron	µg/L	350	-	-	-	<30	-	<30	<30
Lead	µg/L	-	-	-	-	<1.0	-	<0.50	<0.50
Lithium	µg/L	-	-	-	-	<50	-	<1.0	<1.0
Magnesium	µg/L	-	-	-	-	<100	-	<100	<100
Manganese	µg/L	-	-	-	-	<10	-	<0.10	<0.10
Mercury	µg/L	-	-	-	-	<0.20	-	<0.0050	<0.0050
Molybdenum	µg/L	-	-	-	-	<1.0	-	<1.0	<1.0
Nickel	µg/L		-	-	-	<5.0	-	<1.0	<1.0
Phosphorus	µg/L	-	-	-	-	<300	-	<300	<300
Potassium	µg/L	-	-	-	-	<2000	-	<2000	<2000
Selenium	µg/L	-	-	-	-	<1.0	-	<0.050	<0.050
Silicon	µg/L	-	-	-	-	<50	-	<50	<50
Silver	µg/L	-	-	-	-	<0.050	-	<0.020	<0.020
Sodium	µg/L	-	-	-	-	<2000	-	<2000	<2000
Strontium	µg/L	-	-	-	-	<5.0	-	<5.0	<5.0
Thallium	µg/L	-	-	-	-	<0.010	-	<0.20	<0.20
Tin	µg/L	-	-	-	-	<30	-	<0.50	<0.50
Titanium	µg/L	-	-	-	-	<50	-	<10	<10
Uranium	µg/L	-	-	-	-	<0.20	-	<0.20	<0.20
Vanadium	µg/L	-	-	-	-	<30	-	<0.50	<0.50
Zinc	µg/L	-	-	-	-	<5.0	-	<5.0	<5.0

NOTES:

BC MOE 2016	British Columbia Ministry of Environment (BC MOE). 2016. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.
#1	Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin
#2	Guideline for ammonia varies with pH and temperature, derived from Table 26D of the BC MOE, 2016 BCWQGs
#3	Standard for fluoride varies with hardness. Calculated based on equation: -51.73 + 92.57*log(Hardness)
#4	Guideline/standard for nitrite varies with chloride concentrations.
#5	Water quality guideline for copper is calculated as 0.094(H)+2
#6	Standard for lead is 3 ug/L at H<8 mg/L, or calculated as e(1.273*ln(H)-1.460) when H>8 mg/L
#7	Guideline for manganese calculated as (0.01102*H)+0.54
#8	Criteria for silver varies with hardness, 0.1 µg/L at H<100 mg/L or 3.0 µg/L at H>100 mg/L
#9	Guideline for zinc calculated as 33+0.75*(H-90)
#10	Standard for aluminum varies with pH. Standard is 0.05 mg/L if pH is greater than or equal to 6.5, or calculated as $e^{(1.209-2.426(pH)+0.286K)}$ where $K=(pH)^2$
#11	Standard for cadmium is calculated as $e^{(1.03*ln(H)-5.274)}$
H	Hardness
-	No applicable standard/guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and shaded indicates analyzed values that exceed the RDL.
Reported detection limit (RDL)	Reported detection limit varied between sampling events, therefore, was not presented with Quality Assurance/ Quality Control results, which presents multiple events within the same table
MPN	Most Probable Number
CFU	Colony Forming Units

Table 7: 2016 QAQC Duplicate Surface Water Quality Results

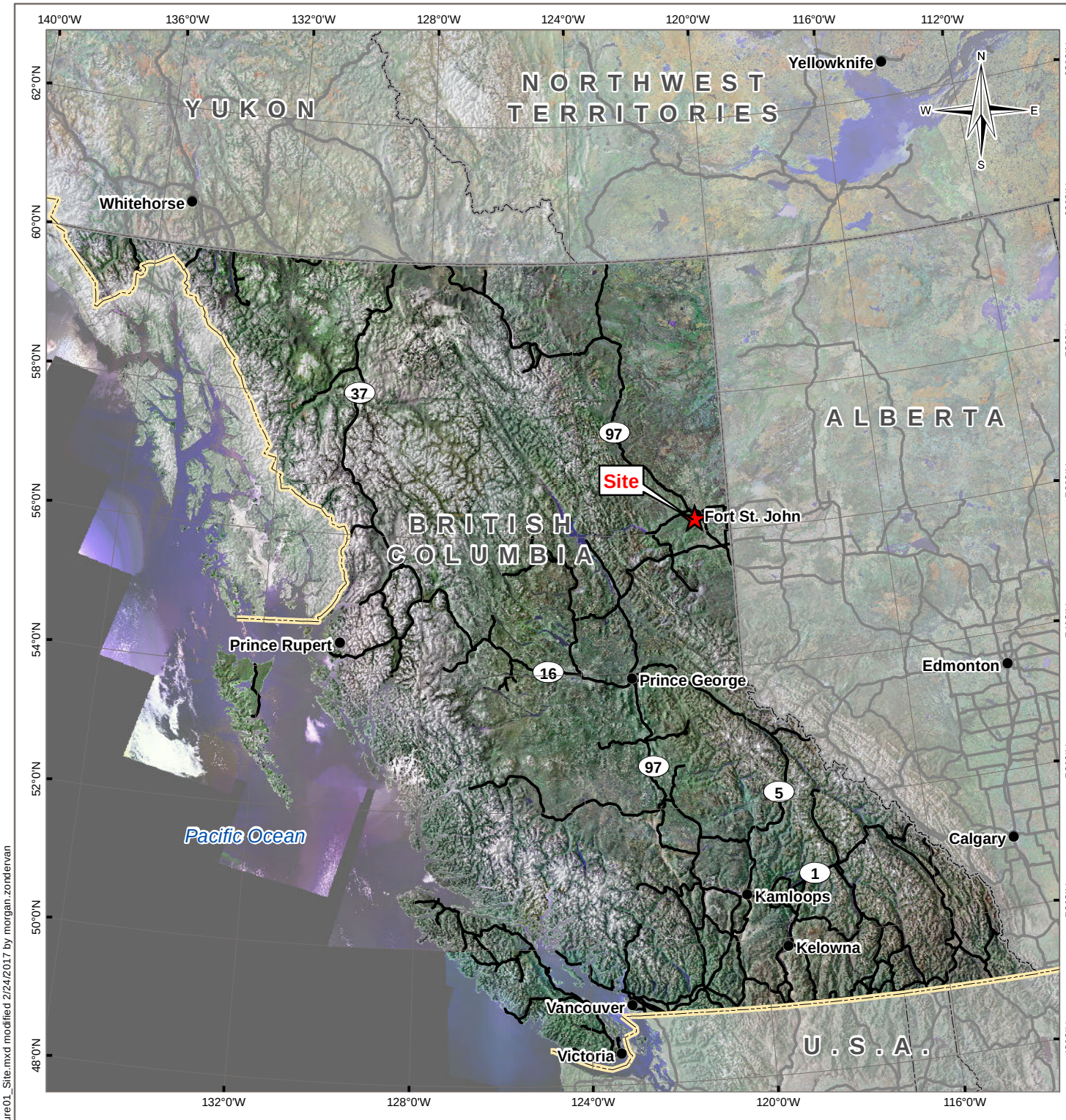
Parameter	Unit	MARCH EVENT DUPLICATE			JUNE EVENT DUPLICATE			SEPTEMBER EVENT DUPLICATE			DECEMBER EVENT DUPLICATE		
		PEACE 4	PEACE SW (Duplicate)	RPD Analysis	PINE RIVER (PINE)	DUPLICATE (DUP 1)	RPD Analysis	BEATTON RIVER (BEATTON)	DUPLICATE (DUP 2)	RPD Analysis	UPPER SITE C RESERVOIR (PR1) or PEACE 1	DUPLICATE (DUP 1)	RPD Analysis
Sample Date		1-Apr-2016	1-Apr-2016		31-May-2016	31-May-2016		20-Sep-2016	20-Sep-2016		19-Dec-2016	19-Dec-2016	
Laboratory Identification Number		L1751131-11	L1751131-9		L1776273-3	L1776273-4		L1831599-2	L1831599-3		L1872185-2	L1872185-3	
Matrix		surface water	surface water		surface water	surface water		surface water	surface water		surface water	surface water	
Physical Parameters													
Colour	Col. Unit	12	12	0	12.2	12.4	2	307	311	1	<5.0	<5.0	-
Electrical Conductivity (EC)	µS/cm	<5.0	<5.0	-	-	-	-	162	162	0	185	187	1
Hardness as $CaCO_3$	µg/L	196000	198000	1	122000	122000	0	-	-	-	92000	91500	-
pH	pH Units	8.14	8.12	0	8.25	8.26	0	7.44	7.43	0	8.06	8.07	0
Total Suspended Solids (TSS)	µg/L	96700	96900	0	28700	27300	5	136000	148000	8	<3000	<3000	-
Total Dissolved Solids (TDS)	µg/L	14000	16800	18	129000	133000	3	222000	208000	7	99800	99500	0
Anions and Nutrients													
Bicarbonate as $CaCO_3$	µg/L	-	-	-	-	-	-	37100	36800	1	83600	83400	0
Carbonate as $CaCO_3$	µg/L	84800	84100	1	-	-	-	<1000	<1000	-	<1000	<1000	-
Hydroxide as $CaCO_3$	µg/L	<1000	<1000	-	-	-	-	<1000	<1000	-	<1000	<1000	-
Total Alkalinity as $CaCO_3$	µg/L	<1000	<1000	-	-	-	-	37100	36800	1	83600	83400	0
Ammonia, Total (as N)	µg/L	84800	84100	1	<5.0	<5.0	-	13.8	14.5	5	<5.0	<5.0	-
Bromide	µg/L	<50	<50	-	<50	<50	-	<50	<50	-	<50	<50	-
Chloride	µg/L	<500	<500	-	540	540	-	620	620	0	<500	<500	-
Fluoride	µg/L	42	42	0	59	59	-	66	65	2	39	39	-
Nitrate and Nitrite (as N)	µg/L	70.5	70.9	1	21.5	21.1	-	6.3	5.2	19	71.5	72.5	1
Nitrate (as N)	µg/L	70.5	70.9	1	21.5	21.1	-	6.3	5.2	19	71.5	72.5	1
Nitrite (as N)	µg/L	-	-	-	<1.0	<1.0	-	<1.0	<1.0	-	<1.0	<1.0	-
Total Kjeldahl Nitrogen	µg/L	-	-	-	165	169	-	1230	1230	0	96	105	9
Total Nitrogen	µg/L	-	-	-	134	131	-	1020	1060	4	129	133	3
Orthophosphate (as P)	µg/L	<1.0	<1.0	-	<1.0	<1.0	-	10.9	11.7	7	<1.0	<1.0	-
Phosphorus (P)-Total Dissolved	µg/L	2.0	2.3	14	<2.0	<2.0	-	169	160	5	<2.0	<2.0	-
Phosphorus (P)-Total	µg/L	3990	4230	6	23.5	25.4	8	7010	6750	4	3.3	4.3	26
Silicate (as SiO_2)	µg/L	14600	14800	1	2240	2280	-	40300	40200	0	4240	4440	5
Sulphate (SO4)	µg/L	-	-	-	12300	12300	0	-	-	-	13700	13700	0
Anions Total	meq/L	2.01	2	0	-	-	-	-	-	-	1.96	1.96	-
Cations Total	meq/L	1.93	1.94	1	-	-	-	-	-	-	1.84	1.83	-
Organic and Inorganic Carbon													
Dissolved Organic Carbon (DOC)	µg/L	-	-	-	4650	3280	**35**	50700	48800	4	2590	2520	3
Total Organic Carbon (TOC)	µg/L	2340	2310	1	3660	3370	8	47400	47200	0	2590	2570	1
Biological													
E. Coli	MPN/100mL	3040	2910	4	8	5	**46**	-	-	-	<1	<1	-
Heterotrophic Plate Count (HPC)	CFU/mL	2	1	**67**	24	75	**103**	-	-	-	12	16	29
Total Coliforms	MPN/100mL	490	219	**76**	59	109	**60**	-	-	-	<1	1	-
Total Metals													
Aluminum	µg/L	368	421	13	753	772	2	-	-	-	43.1	-	-
Antimony	µg/L	<0.50	<0.50	-	<0.50	<0.50	-	-	-	-	<0.50	<0.50	-
Arsenic	µg/L	<1.0	<1.0	-	<0.50	<0.50	-	-	-	-	<0.50	<0.50	-
Barium	µg/L	40	41	2	88	89	1	-	-	-	29	29	0
Beryllium	µg/L	<5.0	<5.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Bismuth	µg/L	<200	<200	-	<0.050	0.064	-	-	-	-	<200	<200	-
Boron	µg/L	<100	<100	-	<100	<100	-	-	-	-	<100	<100	-
Cadmium	µg/L	<0.050	<0.050	-	0.0387	0.0358	8	-	-	-	0.0253	-	-
Calcium	µg/L	29000	29100	0	35300	35200	0	-	-	-	26800	26400	2
Chromium	µg/L	0.75	0.88	16	1.2	1.2	0	-	-	-	2.3	<1.0	-
Cobalt	µg/L	<0.50	<0.50	-	0.40	0.38	5	-	-	-	<0.30	<0.30	-
Copper	µg/L	1.4	1.5	7	1.3	1.3	0	-	-	-	<1.0	<1.0	-
Iron	µg/L	531	597	12	935	934	0	-	-	-	75	<30	-
Lead	µg/L	<1.0	<1.0	-	<0.50	<0.50	-	-	-	-	<0.50	<0.50	-
Lithium	µg/L	<50	<50	-	4.3	4.6	7	-	-	-	<1.0	<1.0	-
Magnesium	µg/L	6410	6430	0	8130	8130	0	-	-	-	5710	5670	1
Manganese	µg/L	11	12	9	14.6	14.4	1	-	-	-	3.70	-	-
Mercury	µg/L	<0.20	<0.20	-	<0.0050	<0.0050	-	-	-	-	<0.0050	<0.0050	-
Molybdenum	µg/L	<1.0	<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Nickel	µg/L	<5.0	<5.0	-	1.7	1.7	0	-	-	-	<1.0	<1.0	-
Phosphorus	µg/L	<300	<300	-	<300	<300	-	-	-	-	<300	<300	-
Potassium	µg/L	<2000	<2000	-	<2000	<2000	-	-	-	-	<2000	<2000	-
Selenium	µg/L	<1.0	<1.0	-	0.435	0.483	10	-	-	-	0.247	0.282	13
Silicon	µg/L	2810	2860	2	2370	2350	1	-	-	-	2130	2060	3
Silver	µg/L	<0.050	<0.050	-	<0.020	<0.020	-	-	-	-	<0.020	<0.020	-
Sodium	µg/L	<2000	<2000	-	2000	2000	0	-	-	-	<2000	<2000	-
Strontium	µg/L	112	112	0	112	111	1	-	-	-	107	106	1
Thallium	µg/L	<0.20	<0.20	-	<0.20	<0.20	-	-	-	-	<0.20	<0.20	-
Tin	µg/L	<30	<30	-	<0.50	<0.50	-	-	-	-	<0.50	<0.50	-
Titanium	µg/L	<50	<50	-	18	19	5	-	-	-	<10	<10	-
Uranium	µg/L	0.49	0.50	2	0.26	0.28	7	-	-	-	0.46	0.46	0
Vanadium	µg/L	<30	<30	-	2.65	2.69	1	-	-	-	<0.50	<0.50	-
Zinc	µg/L	5.4	<5.0	-	<5.0	5.2	-	-	-	-	<5.0	<5.0	-
Dissolved Metals													
Aluminum	µg/L	12	12	0	9.2	7.9	15	-	-	-	<5.0	41.1	-
Antimony	µg/L	<0.50	<0.50	-	<0.50	<0.50	-	-	-	-	<0.50	<0.50	-
Arsenic	µg/L	<1.0	<1.0	-	<0.50	<0.50	-	-	-	-	<0.50	<0.50	-
Barium	µg/L	33	34	3	71	71	0	-	-	-	31	32	3
Beryllium	µg/L	<5.0	<5.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Bismuth	µg/L	<200	<200	-	<0.050	<0.050	-	-	-	-	<200	<200	-
Boron	µg/L	<100	<100	-	<100	<100	-	-	-	-	<100	<100	-
Cadmium	µg/L	<0.050	<0.050	-	0.0107	0.0100	7	-	-	-	0.0093	0.0230	**85**
Calcium	µg/L	28700	28700	0	36000	35700	1	-	-	-	27000	26900	0
Chromium	µg/L	<0.50	<0.50	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Cobalt	µg/L	<0.50	<0.50	-	<0.30	<0.30	-	-	-	-	<0.30	<0.30	-
Copper	µg/L	<1.0	1.2	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Iron	µg/L	<30	<30	-	<30	<30	-	-	-	-	<30	41	-
Lead	µg/L	<1.0	<1.0	-	<0.50	<0.50	-	-	-	-	<0.50	<0.50	-
Lithium	µg/L	<50	<50	-	3.8	3.9	3	-	-	-	1.4	1.4	0
Magnesium	µg/L	6090	6160	1	7910	7880	0	-	-	-	5970	5930	1
Manganese	µg/L	<10	<10	-	1.44	1.37	5	-	-	-	0.68	2.69	**119**
Mercury	µg/L	<0.20	<0.20	-	<0.0050	<0.0050	-	-	-	-	<0.0050	<0.0050	-
Molybdenum	µg/L	<1.0	<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Nickel	µg/L	<5.0	<5.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Phosphorus	µg/L	<300	<300	-	<300	<300	-	-	-	-	<300	<300	-
Potassium	µg/L	<2000	<2000	-	<2000	<2000	-	-	-	-	<2000	<2000	-
Selenium	µg/L	<1.0	<1.0	-	0.445	0.450	1	-	-	-	0.245	0.232	5
Silicon	µg/L	2060	2070	0	1080	1040	4	-	-	-	2140	2240	5
Silver	µg/L	<0.050	<0.050	-	<0.020	<0.020	-	-	-	-	<0.020	<0.020	-
Sodium	µg/L	<2000	<2000	-	<2000	<2000	-	-	-	-	<2000	<2000	-
Strontium	µg/L	107	109	2	109	109	0	-	-	-	106	106	0
Thallium	µg/L	<0.010	<0.010	-	<0.20	<0.20	-	-	-	-	<0.20	<0.20	-
Tin	µg/L	<30	<30	-	<0.50	<0.50	-	-	-	-	<0.50	<0.50	-
Titanium	µg/L	<50	<50	-	<10	<10	-	-	-	-	<10	<10	-
Uranium	µg/L	0.46	0.46	0	<0.20	0.21	-	-	-	-	0.45	0.45	0
Vanadium	µg/L	<30	<30	-	<0.50	<0.50	-	-	-	-	<0.50	<0.50	-
Zinc	µg/L	<5.0	<5.0	-	<5.0	<5.0	-	-	-	-	<5.0	<5.0	-

NOTES: -

-	No applicable standard/guideline or analysis was not conducted.
Reported detection limit (RDL)	Reported detection limit varied between sampling events, therefore, was not presented with Quality Assurance/ Quality Control results, which presents multiple events within the same table
na	Not analyzed
ns	Not sampled
nr	Not required
<	Concentration is less than the laboratory detection limit indicated.
RPD	RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.
	RPDs have only been considered where a concentration is greater than the RDL
BOLD	RPDs greater than 30% are in bold
MPN	Most Probable Number
CFU	Colony Forming Units

FIGURES

Figure 1 Site Location
Figure 2 Water Quality Monitoring Station Location Plan



LEGEND

- Site Location
- Populated Place
- Major Road
- Provincial / Territorial / State Boundary
- International Border

NOTES
Base data source:
ESRI Data & Maps

STATUS
ISSUED FOR USE

WATER AND SEDIMENT QUALITY MONITORING PROGRAMS SITE C, FORT ST. JOHN, BC

Site Location

PROJECTION	DATUM	CLIENT
BC Albers	NAD83	BC hydro

Scale: 1:9,000,000
100 50 0 100
Kilometres

FILE NO. VENV03095-02_Figure01_Site.mxd

OFFICE	DWN	CKD	APVD	REV
Tt-VANC	MEZ	SL	DM	0

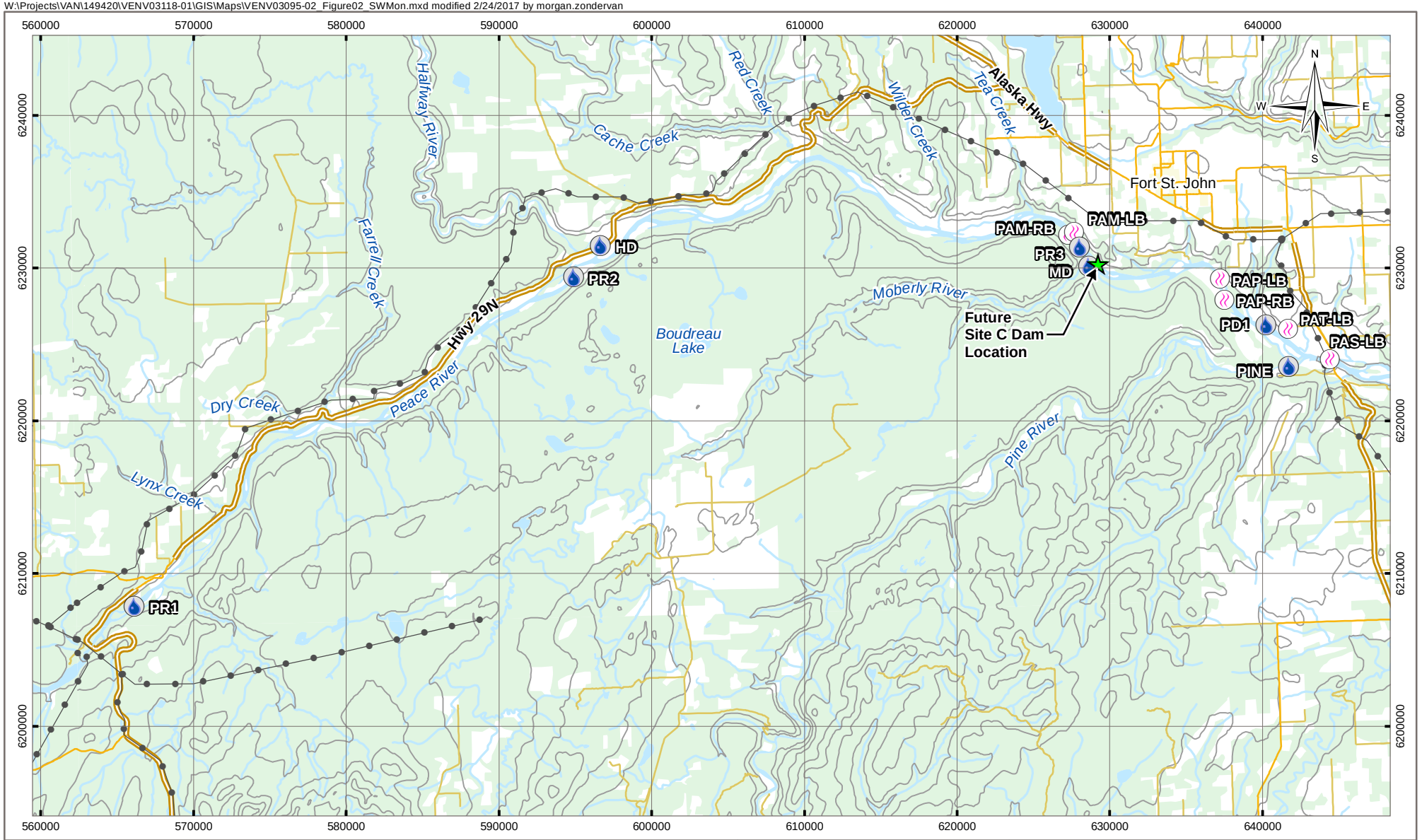
DATE February 24, 2017
PROJECT NO. ENV.VENV03095-02

TETRA TECH

Figure 1

W:\Projects\VAN\149420\VENV03118-01\GIS\Maps\VENV03095-02_Figure01_Site.mxd modified 2/24/2017 by morgan.zondervan

W:\Projects\VAN\149420\VENV03118-01\GIS\Maps\VENV03095-02_Figure02_SWMon.mxd modified 2/24/2017 by morgan.zondervan



LEGEND

- Surface Water Monitoring Station
- Turbidity Monitoring Station
- Future Site C Dam Location
- Highway
- Main Road
- Local Road
- Power Line
- Contour (100 m)
- Watercourse
- Waterbody
- Residential Area
- Wooded Area

NOTES
Base data source: CanVec 250K

STATUS
ISSUED FOR USE

Scale: 1:350,000
5 2.5 0 5
Kilometres

PROJECTION	DATUM
UTM Zone 10	NAD83

FILE NO.
VENV03095-02_Figure02_SWMon.mxd

CLIENT
BC hydro

TETRA TECH

WATER QUALITY AND TURBIDITY MONITORING FOR 2016 SITE C, FORT ST. JOHN, BC

Water Quality Monitoring Station Location Plan

OFFICE	DWN	CKD	APVD	REV
Tt-VANC	MEZ	SL	DM	0

DATE	PROJECT NO.
February 24, 2017	ENV.VENV03095-02

Figure 2

PHOTOGRAPHS

Photos 1 to 23	Surface Water Quality Monitoring Stations
Photos 24 to 63	Turbidity Monitoring Stations



Photo 1: Peace 1 Sampling Location, April 2, 2016



Photo 2: Peace 2 Sampling Location, April 2, 2016



Photo 3: Halfway River Sampling Location, access blocked by ice, April 1, 2016



Photo 4: Peace 3 Sampling Location, April 1, 2016



Photo 5: Moberly River Sampling Location, access blocked by ice, April 1, 2016



Photo 6: Pine River Sampling Location, access blocked by ice, April 1, 2016



Photo 7: Peace 4 Sampling Location, April 1, 2016



Photo 8: Peace 1 Sampling Location, May 30, 2016



Photo 9: Peace 2 Sampling Location, May 30,2016



Photo 10: Halfway River Sampling Location, May 30, 2016



Photo 11: Peace 3 Sampling Location, May 31, 2016



Photo 12: Moberly River Sampling Location, access blocked by ice, June 1, 2016



Photo 13: Pine River Sampling Location, access blocked by ice, June 1, 2016



Photo 14: Peace 4 Sampling Location, June 1, 2016



Photo 15: Peace 2 Sampling Location, September 22, 2016



Photo 16: Halfway River Sampling Location, September 22, 2016

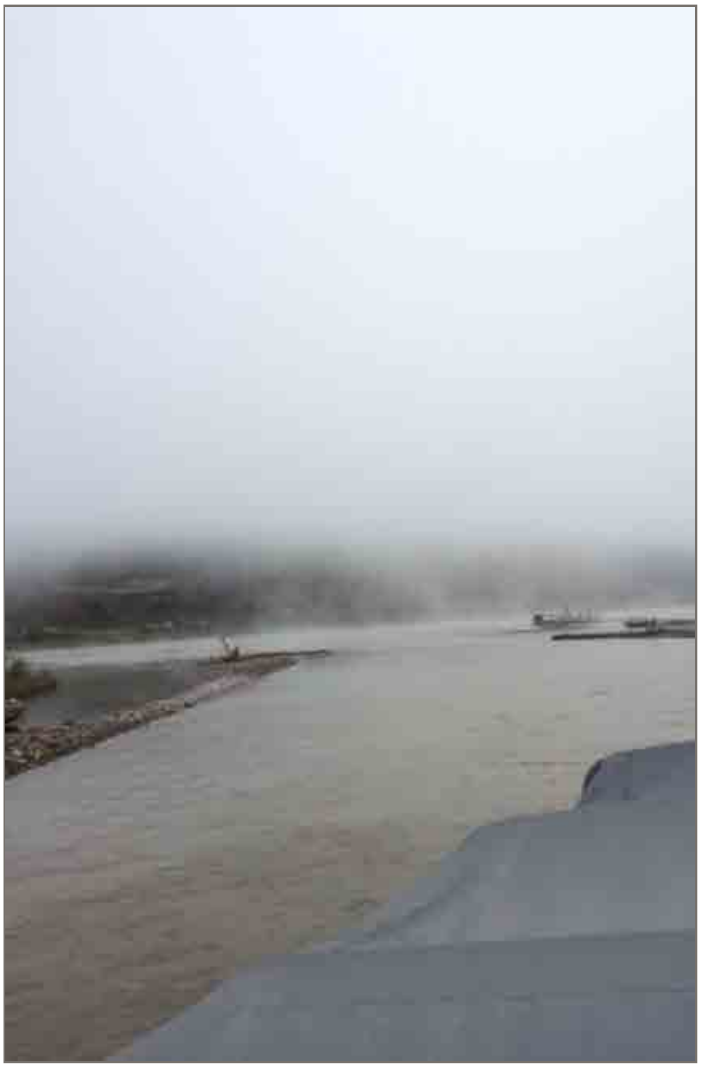


Photo 17: Moberly River Sampling Location, September 30, 2016



Photo 18: Peace 1 Sampling Location, May 30, 2016



Photo 19: Peace 2 Sampling Location, May 30, 2016



Photo 20: Halfway River Sampling Location, access blocked by ice, December 19, 2016



Photo 21: Peace 3 Sampling Location, December 19, 2016



Photo 22: Pine River Sampling Location, access blocked by ice, December 20, 2016



Photo 23: Peace 4 Sampling Location, June 1, 2016



Photo 24: Peace Above Taylor, Cabinet Location, March 31, 2016



Photo 25: Peace Above Taylor, Cabinet View (sunsaver controller mounted on left wall, NEON mounted within Pelican case, satellite communication wiring on roof of cabinet, external power placed on base), March 31, 2016



Photo 26: Peace Above Taylor, NEON housing opened to observe circuitry and internal power, March 31, 2016

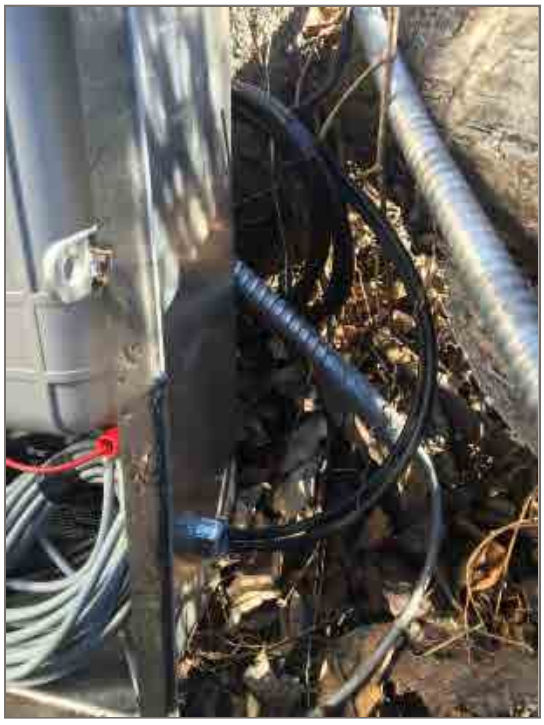


Photo 27: Peace Above Taylor, solar panels were mounted above cabinet and connected to terminal via a drilled and epoxy filled hole on cabinet), March 31, 2016



Photo 28: Peace Above Taylor, sampling location, March 31, 2016



Photo 29: Peace Above Moberly, Right Bank, cabinet location, March 31, 2016



Photo 30: Peace Above Moberly, Left Bank, sampling location, March 31, 2016aption



Photo 31: Peace Above Moberly, Left Bank, Cabinet View, March 31, 2016



Photo 32: Peace Above Pine, Right Bank, sampling location, March 31, 2016



Photo 33: Peace Above Pine, Right Bank, Cabinet Location, March 31, 2016



Photo 34: Peace Above Pine, Left Bank, sampling location, March 31, 2016

Photo 35: Peace Above Pine, Left Bank, Cabinet Location, March 31, 2016



Photo 36: Peace Above Pine, Left Bank, Cabinet View, March 31, 2016



Photo 37: Peace Above Spectra, Cabinet View, March 30, 2016



Photo 38: Peace Above Spectra, Cabinet mounted on wall above probe and surface water, March 30, 2016



Photo 39: Peace Above Taylor, Station location, June 2, 2016



Photo 40: Peace Above Taylor, terminal strip connection to NEON, June 2, 2016



Photo 41: Peace Above Taylor, cabinet location, June 2, 2016



Photo 42: Peace Above Moberly, Right Bank, Station location, June 2, 2016



Photo 43: Peace Above Pine, Right Bank, Station location upstream, June 2, 2016

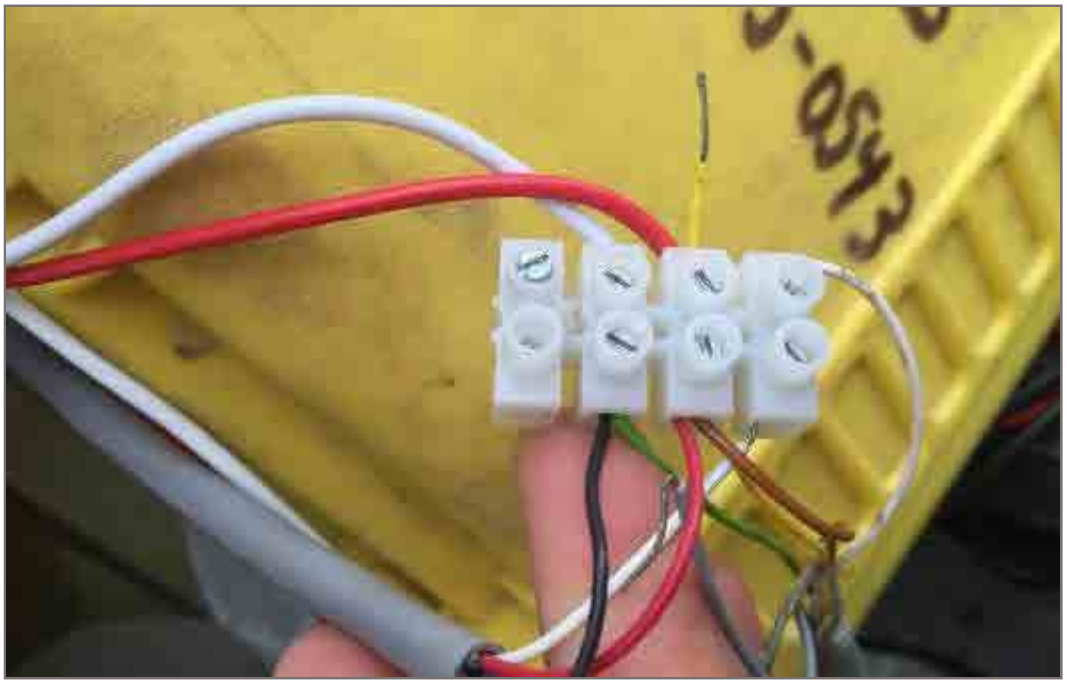


Photo 44: Peace Above Pine, Right Bank, terminal block, June 2, 2016



Photo 45: Peace Above Pine, Right Bank, sunsaver controller, June 2, 2016



Photo 46: Peace Above Pine, Right Bank, terminal strip connector, June 2, 2016



Photo 47: Peace Above Pine, Left Bank, Station location upstream, June 2, 2016



Photo 48: Peace Above Pine, Left Bank, Station location downstream and subject to backwater flow from proximity to island, June 2, 2016



Photo 49 Peace Above Pine, Left Bank, turbidity sensor, June 2, 2016



Photo 50: Peace Above Pine, Left Bank, turbidity sensor anchor, June 2, 2016



Photo 51: Peace Above Spectra, Station Location, May 31, 2016



Photo 52: Peace Above Taylor, Cabinet View, October 25, 2016



Photo 53: Peace Above Taylor, Turbidity Sensor, October 25, 2016



Photo 54: Peace Above Taylor, Station Location, October 25, 2016



Photo 55: Peace Above Moberly, Right Bank, Installing sensor cable conduit system, October 26, 2016



Photo 56: Peace Above Moberly, Right Bank, Station location, October 26, 2016



Photo 57: Peace Above Moberly, Left Bank, Station location; sensor cable conduit leading from cabinet down the bank and into water, October 26, 2016



Photo 58: Peace Above Moberly, Left Bank, Station location; sensor cable conduit leading from cabinet down the bank and into water, October 26, 2016



Photo 59: Peace Above Moberly, Right Bank, Station location, December 20, 2016



Photo 60: Peace Above Moberly, Left Bank, Station location, December 20, 2016



Photo 61: Peace Above Pine, Right Bank, Station location, December 20, 2016



Photo 62: Peace Above Pine, Left Bank, Station location, December 20, 2016



Photo 63: Peace Above Spectra, Station Location, December 20, 2016

APPENDIX A
LABORATORY REPORTS

Tetra Tech Canada Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 01-APR-16
Report Date: 28-FEB-17 16:08 (MT)
Version: FINAL REV. 2

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1751131

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03095
C of C Numbers: 14-507896
Legal Site Desc:

Comments:

28-FEB-2017 This report replaces the previous version and contains a Client Sample ID change, as requested.

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751131-1	L1751131-2	L1751131-3	L1751131-4	L1751131-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16
	Sampled Time	15:45	15:45	15:45	15:45	15:45
	Client ID	PAM-RB	PAM LB	PAP RB	PAP LB	TAYLOR
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)					
	Conductivity (uS/cm)					
	Hardness (as CaCO3) (ug/L)					
	pH (pH)					
	Total Suspended Solids (ug/L)	9200	66600	10900	44800	27800
	Total Dissolved Solids (ug/L)					
	Turbidity (NTU)					
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)					
	Alkalinity, Carbonate (as CaCO3) (ug/L)					
	Alkalinity, Hydroxide (as CaCO3) (ug/L)					
	Alkalinity, Total (as CaCO3) (ug/L)					
	Bromide (Br) (ug/L)					
	Chloride (Cl) (ug/L)					
	Fluoride (F) (ug/L)					
	Nitrate and Nitrite (as N) (ug/L)					
	Nitrate (as N) (ug/L)					
	Nitrite (as N) (ug/L)					
	Orthophosphate-Dissolved (as P) (ug/L)					
	Silicate (as SiO2) (ug/L)					
	Sulfate (SO4) (ug/L)					
	Anion Sum (meq/L)					
	Cation Sum (meq/L)					
	Cation - Anion Balance (%)					
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)					
	Total Organic Carbon (ug/L)					
Bacteriological Tests	E. coli (MPN/100mL)					
	HPC (CFU/1mL)					
	Coliform Bacteria - Total (MPN/100mL)					
Total Metals	Aluminum (Al)-Total (ug/L)					
	Antimony (Sb)-Total (ug/L)					
	Arsenic (As)-Total (ug/L)					
	Barium (Ba)-Total (ug/L)					
	Beryllium (Be)-Total (ug/L)					
	Bismuth (Bi)-Total (ug/L)					
	Boron (B)-Total (ug/L)					
	Cadmium (Cd)-Total (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1751131-6 Water 31-MAR-16 15:45 SPECTRA	L1751131-7 Water 31-MAR-16 15:45 TAYLOR SW	L1751131-8 Water 31-MAR-16 15:45 PINE SW	L1751131-9 Water 31-MAR-16 15:45 PEACE SW	L1751131-10 Water 31-MAR-16 15:45 PEACE 3
Sample ID **Description** **Sampled Date** **Sampled Time** **Client ID**						
WATER						
Physical Tests	Colour, True (CU)		6.0	10.0	<5.0	<5.0
	Conductivity (uS/cm)		240	330	198	197
	Hardness (as CaCO3) (ug/L)		117000	163000	96900	98200
	pH (pH)		8.13	8.19	8.12	8.15
	Total Suspended Solids (ug/L)	48800	15200	14500	16800	7600
	Total Dissolved Solids (ug/L)		131000	180000	103000	103000
	Turbidity (NTU)		24.9	30.3	16.2	9.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)		104000	141000	84100	83500
	Alkalinity, Carbonate (as CaCO3) (ug/L)		<1000	<1000	<1000	<1000
	Alkalinity, Hydroxide (as CaCO3) (ug/L)		<1000	<1000	<1000	<1000
	Alkalinity, Total (as CaCO3) (ug/L)		104000	141000	84100	83500
	Bromide (Br) (ug/L)		<50	<50	<50	<50
	Chloride (Cl) (ug/L)		960	2230	<500	<500
	Fluoride (F) (ug/L)		53	74	42	41
	Nitrate and Nitrite (as N) (ug/L)		85.4	119	70.9	67.4
	Nitrate (as N) (ug/L)		85.4	118	70.9	67.4
	Nitrite (as N) (ug/L)		<1.0	1.8	<1.0	<1.0
	Orthophosphate-Dissolved (as P) (ug/L)		1.4	<1.0	2.3	1.6
	Silicate (as SiO2) (ug/L)		3750	2470	4230	6930
	Sulfate (SO4) (ug/L)		19400	28000	14800	14600
	Anion Sum (meq/L)		2.52	3.47	2.00	1.98
	Cation Sum (meq/L)		2.46	3.45	1.94	1.96
	Cation - Anion Balance (%)		-1.3	-0.3	-1.5	-0.4
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)		2610	2810	2310	2280
	Total Organic Carbon (ug/L)		2970	3190	2910	2600
Bacteriological Tests	E. coli (MPN/100mL)		1	6	1	1
	HPC (CFU/1mL)		480	880	219	470
	Coliform Bacteria - Total (MPN/100mL)		248	261	141	136
Total Metals	Aluminum (Al)-Total (ug/L)		658	1260	421	246
	Antimony (Sb)-Total (ug/L)		<0.50	<0.50	<0.50	<0.50
	Arsenic (As)-Total (ug/L)		<1.0	<1.0	<1.0	<1.0
	Barium (Ba)-Total (ug/L)		65	125	41	38
	Beryllium (Be)-Total (ug/L)		<5.0	<5.0	<5.0	<5.0
	Bismuth (Bi)-Total (ug/L)		<200	<200	<200	<200
	Boron (B)-Total (ug/L)		<100	<100	<100	<100
	Cadmium (Cd)-Total (ug/L)		0.051	0.071	<0.050	<0.050

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751131-11	L1751131-12			
	Description	Water	Water			
	Sampled Date	31-MAR-16	31-MAR-16			
	Sampled Time	15:45	15:45			
	Client ID	PEACE 4	MOBERLY RIVER (MD)			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0	13.3			
	Conductivity (uS/cm)	196	264			
	Hardness (as CaCO3) (ug/L)	96700	130000			
	pH (pH)	8.14	8.16			
	Total Suspended Solids (ug/L)	14000	53800			
	Total Dissolved Solids (ug/L)	104000	146000			
	Turbidity (NTU)	13.7	52.2			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	84800	119000			
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000	<1000			
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000	<1000			
	Alkalinity, Total (as CaCO3) (ug/L)	84800	119000			
	Bromide (Br) (ug/L)	<50	<50			
	Chloride (Cl) (ug/L)	<500	540			
	Fluoride (F) (ug/L)	42	77			
	Nitrate and Nitrite (as N) (ug/L)	70.5	25.1			
	Nitrate (as N) (ug/L)	70.5	25.1			
	Nitrite (as N) (ug/L)	<1.0	<1.0			
	Orthophosphate-Dissolved (as P) (ug/L)	2.0	2.1			
	Silicate (as SiO2) (ug/L)	3990	4200			
	Sulfate (SO4) (ug/L)	14600	18200			
	Anion Sum (meq/L)	2.01	2.78			
	Cation Sum (meq/L)	1.93	2.76			
	Cation - Anion Balance (%)	-1.9	-0.4			
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	2340	4670			
	Total Organic Carbon (ug/L)	3040	5590			
Bacteriological Tests	E. coli (MPN/100mL)	2	1			
	HPC (CFU/1mL)	490	600			
	Coliform Bacteria - Total (MPN/100mL)	172	205			
Total Metals	Aluminum (Al)-Total (ug/L)	368	1640			
	Antimony (Sb)-Total (ug/L)	<0.50	<0.50			
	Arsenic (As)-Total (ug/L)	<1.0	1.1			
	Barium (Ba)-Total (ug/L)	40	150			
	Beryllium (Be)-Total (ug/L)	<5.0	<5.0			
	Bismuth (Bi)-Total (ug/L)	<200	<200			
	Boron (B)-Total (ug/L)	<100	<100			
	Cadmium (Cd)-Total (ug/L)	<0.050	0.084			

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751131-1	L1751131-2	L1751131-3	L1751131-4	L1751131-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16
	Sampled Time	15:45	15:45	15:45	15:45	15:45
	Client ID	PAM-RB	PAM LB	PAP RB	PAP LB	TAYLOR
Grouping	**Analyte**					
WATER						
Total Metals	Calcium (Ca)-Total (ug/L)					
	Chromium (Cr)-Total (ug/L)					
	Cobalt (Co)-Total (ug/L)					
	Copper (Cu)-Total (ug/L)					
	Iron (Fe)-Total (ug/L)					
	Lead (Pb)-Total (ug/L)					
	Lithium (Li)-Total (ug/L)					
	Magnesium (Mg)-Total (ug/L)					
	Manganese (Mn)-Total (ug/L)					
	Mercury (Hg)-Total (ug/L)					
	Molybdenum (Mo)-Total (ug/L)					
	Nickel (Ni)-Total (ug/L)					
	Phosphorus (P)-Total (ug/L)					
	Potassium (K)-Total (ug/L)					
	Selenium (Se)-Total (ug/L)					
	Silicon (Si)-Total (ug/L)					
	Silver (Ag)-Total (ug/L)					
	Sodium (Na)-Total (ug/L)					
	Strontium (Sr)-Total (ug/L)					
	Thallium (Tl)-Total (ug/L)					
	Tin (Sn)-Total (ug/L)					
	Titanium (Ti)-Total (ug/L)					
	Uranium (U)-Total (ug/L)					
	Vanadium (V)-Total (ug/L)					
	Zinc (Zn)-Total (ug/L)					
Dissolved Metals	Dissolved Mercury Filtration Location					
	Dissolved Metals Filtration Location					
	Aluminum (Al)-Dissolved (ug/L)					
	Antimony (Sb)-Dissolved (ug/L)					
	Arsenic (As)-Dissolved (ug/L)					
	Barium (Ba)-Dissolved (ug/L)					
	Beryllium (Be)-Dissolved (ug/L)					
	Bismuth (Bi)-Dissolved (ug/L)					
	Boron (B)-Dissolved (ug/L)					
	Cadmium (Cd)-Dissolved (ug/L)					
	Calcium (Ca)-Dissolved (ug/L)					
	Chromium (Cr)-Dissolved (ug/L)					

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1751131-6 Water 31-MAR-16 15:45 SPECTRA	L1751131-7 Water 31-MAR-16 15:45 TAYLOR SW	L1751131-8 Water 31-MAR-16 15:45 PINE SW	L1751131-9 Water 31-MAR-16 15:45 PEACE SW	L1751131-10 Water 31-MAR-16 15:45 PEACE 3
WATER						
Total Metals	Calcium (Ca)-Total (ug/L)		33800	46000	29100	29200
	Chromium (Cr)-Total (ug/L)		1.13	2.02	0.88	0.55
	Cobalt (Co)-Total (ug/L)		<0.50	0.75	<0.50	<0.50
	Copper (Cu)-Total (ug/L)		1.7	2.7	1.5	1.2
	Iron (Fe)-Total (ug/L)		853	1560	597	339
	Lead (Pb)-Total (ug/L)		<1.0	<1.0	<1.0	<1.0
	Lithium (Li)-Total (ug/L)		<50	<50	<50	<50
	Magnesium (Mg)-Total (ug/L)		8080	12300	6430	6430
	Manganese (Mn)-Total (ug/L)		15	25	12	<10
	Mercury (Hg)-Total (ug/L)		<0.20	<0.20	<0.20	<0.20
	Molybdenum (Mo)-Total (ug/L)		<1.0	1.0	<1.0	<1.0
	Nickel (Ni)-Total (ug/L)		<5.0	<5.0	<5.0	<5.0
	Phosphorus (P)-Total (ug/L)		<300	<300	<300	<300
	Potassium (K)-Total (ug/L)		<2000	2300	<2000	<2000
	Selenium (Se)-Total (ug/L)		<1.0	<1.0	<1.0	<1.0
	Silicon (Si)-Total (ug/L)		3130	3900	2860	2550
	Silver (Ag)-Total (ug/L)		<0.050	<0.050	<0.050	<0.050
	Sodium (Na)-Total (ug/L)		2500	4600	<2000	<2000
	Strontium (Sr)-Total (ug/L)		130	180	112	113
	Thallium (Tl)-Total (ug/L)		<0.20	<0.20	<0.20	<0.20
	Tin (Sn)-Total (ug/L)		<30	<30	<30	<30
	Titanium (Ti)-Total (ug/L)		<50	<50	<50	<50
	Uranium (U)-Total (ug/L)		0.50	0.52	0.50	0.48
	Vanadium (V)-Total (ug/L)		<30	<30	<30	<30
	Zinc (Zn)-Total (ug/L)		5.7	9.7	<5.0	<5.0
Dissolved Metals	Dissolved Mercury Filtration Location		LAB	LAB	LAB	LAB
	Dissolved Metals Filtration Location		LAB	LAB	LAB	LAB
	Aluminum (Al)-Dissolved (ug/L)		31	27	12	<10
	Antimony (Sb)-Dissolved (ug/L)		<0.50	<0.50	<0.50	<0.50
	Arsenic (As)-Dissolved (ug/L)		<1.0	<1.0	<1.0	<1.0
	Barium (Ba)-Dissolved (ug/L)		55	99	34	33
	Beryllium (Be)-Dissolved (ug/L)		<5.0	<5.0	<5.0	<5.0
	Bismuth (Bi)-Dissolved (ug/L)		<200	<200	<200	<200
	Boron (B)-Dissolved (ug/L)		<100	<100	<100	<100
	Cadmium (Cd)-Dissolved (ug/L)		<0.050	<0.050	<0.050	<0.050
	Calcium (Ca)-Dissolved (ug/L)		33900	45600	28700	29100
	Chromium (Cr)-Dissolved (ug/L)		<0.50	<0.50	<0.50	<0.50

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751131-11	L1751131-12			
	Description	Water	Water			
	Sampled Date	31-MAR-16	31-MAR-16			
	Sampled Time	15:45	15:45			
	Client ID	PEACE 4	MOBERLY RIVER (MD)			
Grouping	**Analyte**					
WATER						
Total Metals	Calcium (Ca)-Total (ug/L)	29000	38200			
	Chromium (Cr)-Total (ug/L)	0.75	2.76			
	Cobalt (Co)-Total (ug/L)	<0.50	1.16			
	Copper (Cu)-Total (ug/L)	1.4	3.7			
	Iron (Fe)-Total (ug/L)	531	2270			
	Lead (Pb)-Total (ug/L)	<1.0	1.2			
	Lithium (Li)-Total (ug/L)	<50	<50			
	Magnesium (Mg)-Total (ug/L)	6410	9840			
	Manganese (Mn)-Total (ug/L)	11	51			
	Mercury (Hg)-Total (ug/L)	<0.20	<0.20			
	Molybdenum (Mo)-Total (ug/L)	<1.0	<1.0			
	Nickel (Ni)-Total (ug/L)	<5.0	5.2			
	Phosphorus (P)-Total (ug/L)	<300	<300			
	Potassium (K)-Total (ug/L)	<2000	<2000			
	Selenium (Se)-Total (ug/L)	<1.0	<1.0			
	Silicon (Si)-Total (ug/L)	2810	5020			
	Silver (Ag)-Total (ug/L)	<0.050	<0.050			
	Sodium (Na)-Total (ug/L)	<2000	3400			
	Strontium (Sr)-Total (ug/L)	112	90.8			
	Thallium (Tl)-Total (ug/L)	<0.20	<0.20			
	Tin (Sn)-Total (ug/L)	<30	<30			
	Titanium (Ti)-Total (ug/L)	<50	62			
	Uranium (U)-Total (ug/L)	0.49	0.48			
	Vanadium (V)-Total (ug/L)	<30	<30			
	Zinc (Zn)-Total (ug/L)	5.4	11.9			
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB			
	Dissolved Metals Filtration Location	LAB	LAB			
	Aluminum (Al)-Dissolved (ug/L)	12	36			
	Antimony (Sb)-Dissolved (ug/L)	<0.50	<0.50			
	Arsenic (As)-Dissolved (ug/L)	<1.0	<1.0			
	Barium (Ba)-Dissolved (ug/L)	33	116			
	Beryllium (Be)-Dissolved (ug/L)	<5.0	<5.0			
	Bismuth (Bi)-Dissolved (ug/L)	<200	<200			
	Boron (B)-Dissolved (ug/L)	<100	<100			
	Cadmium (Cd)-Dissolved (ug/L)	<0.050	<0.050			
	Calcium (Ca)-Dissolved (ug/L)	28700	36300			
	Chromium (Cr)-Dissolved (ug/L)	<0.50	<0.50			

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751131-1	L1751131-2	L1751131-3	L1751131-4	L1751131-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16
	Sampled Time	15:45	15:45	15:45	15:45	15:45
	Client ID	PAM-RB	PAM LB	PAP RB	PAP LB	TAYLOR
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (ug/L)					
	Copper (Cu)-Dissolved (ug/L)					
	Iron (Fe)-Dissolved (ug/L)					
	Lead (Pb)-Dissolved (ug/L)					
	Lithium (Li)-Dissolved (ug/L)					
	Magnesium (Mg)-Dissolved (ug/L)					
	Manganese (Mn)-Dissolved (ug/L)					
	Mercury (Hg)-Dissolved (ug/L)					
	Molybdenum (Mo)-Dissolved (ug/L)					
	Nickel (Ni)-Dissolved (ug/L)					
	Phosphorus (P)-Dissolved (ug/L)					
	Potassium (K)-Dissolved (ug/L)					
	Selenium (Se)-Dissolved (ug/L)					
	Silicon (Si)-Dissolved (ug/L)					
	Silver (Ag)-Dissolved (ug/L)					
	Sodium (Na)-Dissolved (ug/L)					
	Strontium (Sr)-Dissolved (ug/L)					
	Thallium (Tl)-Dissolved (ug/L)					
	Tin (Sn)-Dissolved (ug/L)					
	Titanium (Ti)-Dissolved (ug/L)					
	Uranium (U)-Dissolved (ug/L)					
	Vanadium (V)-Dissolved (ug/L)					
	Zinc (Zn)-Dissolved (ug/L)					
Volatile Organic Compounds	Benzene (ug/L)					
	Ethylbenzene (ug/L)					
	Methyl t-butyl ether (MTBE) (ug/L)					
	Styrene (ug/L)					
	Toluene (ug/L)					
	ortho-Xylene (ug/L)					
	meta- & para-Xylene (ug/L)					
	Xylenes (ug/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Organochlorine Pesticides	Aldrin (ug/L)					
	alpha-BHC (ug/L)					
	beta-BHC (ug/L)					

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1751131-6 Water 31-MAR-16 15:45 SPECTRA	L1751131-7 Water 31-MAR-16 15:45 TAYLOR SW	L1751131-8 Water 31-MAR-16 15:45 PINE SW	L1751131-9 Water 31-MAR-16 15:45 PEACE SW	L1751131-10 Water 31-MAR-16 15:45 PEACE 3
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (ug/L)		<0.50	<0.50	<0.50	<0.50
	Copper (Cu)-Dissolved (ug/L)		<1.0	1.2	1.2	<1.0
	Iron (Fe)-Dissolved (ug/L)		32	<30	<30	<30
	Lead (Pb)-Dissolved (ug/L)		<1.0	<1.0	<1.0	<1.0
	Lithium (Li)-Dissolved (ug/L)		<50	<50	<50	<50
	Magnesium (Mg)-Dissolved (ug/L)		7960	11900	6160	6210
	Manganese (Mn)-Dissolved (ug/L)		<10	<10	<10	<10
	Mercury (Hg)-Dissolved (ug/L)		<0.20	<0.20	<0.20	<0.20
	Molybdenum (Mo)-Dissolved (ug/L)		<1.0	<1.0	<1.0	<1.0
	Nickel (Ni)-Dissolved (ug/L)		<5.0	<5.0	<5.0	<5.0
	Phosphorus (P)-Dissolved (ug/L)		<300	<300	<300	<300
	Potassium (K)-Dissolved (ug/L)		<2000	<2000	<2000	<2000
	Selenium (Se)-Dissolved (ug/L)		<1.0	<1.0	<1.0	<1.0
	Silicon (Si)-Dissolved (ug/L)		1840	1190	2070	2080
	Silver (Ag)-Dissolved (ug/L)		<0.050	<0.050	<0.050	<0.050
	Sodium (Na)-Dissolved (ug/L)		2400	4400	<2000	<2000
	Strontium (Sr)-Dissolved (ug/L)		129	177	109	110
	Thallium (Tl)-Dissolved (ug/L)		<0.010	<0.010	<0.010	<0.010
	Tin (Sn)-Dissolved (ug/L)		<30	<30	<30	<30
	Titanium (Ti)-Dissolved (ug/L)		<50	<50	<50	<50
	Uranium (U)-Dissolved (ug/L)		0.47	0.44	0.47	0.48
	Vanadium (V)-Dissolved (ug/L)		<30	<30	<30	<30
	Zinc (Zn)-Dissolved (ug/L)		<5.0	<5.0	<5.0	<5.0
Volatile Organic Compounds	Benzene (ug/L)		<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)		<0.50	<0.50	<0.50	<0.50
	Methyl t-butyl ether (MTBE) (ug/L)		<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)		<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)		<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)		<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)		<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)		<0.75	<0.75	<0.75	<0.75
	Surrogate: 4-Bromofluorobenzene (SS) (%)		97.9	95.6	99.1	98.2
	Surrogate: 1,4-Difluorobenzene (SS) (%)		100.1	99.7	100.1	100.2
Organochlorine Pesticides	Aldrin (ug/L)		<0.050	<0.050	<0.050	<0.050
	alpha-BHC (ug/L)		<0.050	<0.050	<0.050	<0.050
	beta-BHC (ug/L)		<0.10	<0.10	<0.10	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751131-11	L1751131-12			
	Description	Water	Water			
	Sampled Date	31-MAR-16	31-MAR-16			
	Sampled Time	15:45	15:45			
	Client ID	PEACE 4	MOBERLY RIVER (MD)			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (ug/L)	<0.50	<0.50			
	Copper (Cu)-Dissolved (ug/L)	<1.0	1.3			
	Iron (Fe)-Dissolved (ug/L)	<30	80			
	Lead (Pb)-Dissolved (ug/L)	<1.0	<1.0			
	Lithium (Li)-Dissolved (ug/L)	<50	<50			
	Magnesium (Mg)-Dissolved (ug/L)	6090	9580			
	Manganese (Mn)-Dissolved (ug/L)	<10	<10			
	Mercury (Hg)-Dissolved (ug/L)	<0.20	<0.20			
	Molybdenum (Mo)-Dissolved (ug/L)	<1.0	<1.0			
	Nickel (Ni)-Dissolved (ug/L)	<5.0	<5.0			
	Phosphorus (P)-Dissolved (ug/L)	<300	<300			
	Potassium (K)-Dissolved (ug/L)	<2000	<2000			
	Selenium (Se)-Dissolved (ug/L)	<1.0	<1.0			
	Silicon (Si)-Dissolved (ug/L)	2060	1350			
	Silver (Ag)-Dissolved (ug/L)	<0.050	<0.050			
	Sodium (Na)-Dissolved (ug/L)	<2000	3600			
	Strontium (Sr)-Dissolved (ug/L)	107	88.9			
	Thallium (Tl)-Dissolved (ug/L)	<0.010	<0.010			
	Tin (Sn)-Dissolved (ug/L)	<30	<30			
	Titanium (Ti)-Dissolved (ug/L)	<50	<50			
	Uranium (U)-Dissolved (ug/L)	0.46	0.38			
	Vanadium (V)-Dissolved (ug/L)	<30	<30			
	Zinc (Zn)-Dissolved (ug/L)	<5.0	<5.0			
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50			
	Ethylbenzene (ug/L)	<0.50	<0.50			
	Methyl t-butyl ether (MTBE) (ug/L)	<0.50	<0.50			
	Styrene (ug/L)	<0.50	<0.50			
	Toluene (ug/L)	<0.50	<0.50			
	ortho-Xylene (ug/L)	<0.50	<0.50			
	meta- & para-Xylene (ug/L)	<0.50	<0.50			
	Xylenes (ug/L)	<0.75	<0.75			
	Surrogate: 4-Bromofluorobenzene (SS) (%)	97.2	98.5			
	Surrogate: 1,4-Difluorobenzene (SS) (%)	101.2	99.8			
Organochlorine Pesticides	Aldrin (ug/L)	<0.050	<0.050			
	alpha-BHC (ug/L)	<0.050	<0.050			
	beta-BHC (ug/L)	<0.10	<0.10			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751131-1	L1751131-2	L1751131-3	L1751131-4	L1751131-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16
	Sampled Time	15:45	15:45	15:45	15:45	15:45
	Client ID	PAM-RB	PAM LB	PAP RB	PAP LB	TAYLOR
Grouping	**Analyte**					
WATER						
Organochlorine Pesticides	Lindane (gamma - BHC) (ug/L)					
	delta-BHC (ug/L)					
	cis-Chlordane (alpha) (ug/L)					
	trans-Chlordane (gamma) (ug/L)					
	2,4'-DDD (ug/L)					
	4,4'-DDD (ug/L)					
	2,4'-DDE (ug/L)					
	4,4'-DDE (ug/L)					
	2,4'-DDT (ug/L)					
	4,4'-DDT (ug/L)					
	Dieldrin (ug/L)					
	Endosulfan I (ug/L)					
	Endosulfan II (ug/L)					
	Endosulfan Sulfate (ug/L)					
	Endrin (ug/L)					
	Heptachlor (ug/L)					
	Heptachlor Epoxide (ug/L)					
	Methoxychlor (ug/L)					
	Mirex (ug/L)					
	cis-Nonachlor (ug/L)					
	trans-Nonachlor (ug/L)					
	Oxychlordane (ug/L)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1751131-6	L1751131-7	L1751131-8	L1751131-9	L1751131-10
Description	Water	Water	Water	Water	Water
Sampled Date	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16	31-MAR-16
Sampled Time	15:45	15:45	15:45	15:45	15:45
Client ID	SPECTRA	TAYLOR SW	PINE SW	PEACE SW	PEACE 3
Grouping / **Analyte**					
WATER					
Organochlorine Pesticides					
Lindane (gamma - BHC) (ug/L)		<0.010	<0.010	<0.010	<0.010
delta-BHC (ug/L)		<0.050	<0.050	<0.050	<0.050
cis-Chlordane (alpha) (ug/L)		<0.050	<0.050	<0.050	<0.050
trans-Chlordane (gamma) (ug/L)		<0.050	<0.050	<0.050	<0.050
2,4'-DDD (ug/L)		<0.0050	<0.0050	<0.0050	<0.0050
4,4'-DDD (ug/L)		<0.0050	<0.0050	<0.0050	<0.0050
2,4'-DDE (ug/L)		<0.0050	<0.0050	<0.0050	<0.0050
4,4'-DDE (ug/L)		<0.0050	<0.0050	<0.0050	<0.0050
2,4'-DDT (ug/L)		<0.0050	<0.0050	<0.0050	<0.0050
4,4'-DDT (ug/L)		<0.0050	<0.0050	<0.0050	<0.0050
Dieldrin (ug/L)		<0.050	<0.050	<0.050	<0.050
Endosulfan I (ug/L)		<0.0020	<0.0020	<0.0020	<0.0020
Endosulfan II (ug/L)		<0.0020	<0.0020	<0.0020	<0.0020
Endosulfan Sulfate (ug/L)		<0.0020	<0.0020	<0.0020	<0.0020
Endrin (ug/L)		<0.020	<0.020	<0.020	<0.020
Heptachlor (ug/L)		<0.10	<0.10	<0.10	<0.10
Heptachlor Epoxide (ug/L)		<0.0030	<0.0030	<0.0030	<0.0030
Methoxychlor (ug/L)		<0.030	<0.030	<0.030	<0.030
Mirex (ug/L)		<0.050	<0.050	<0.050	<0.050
cis-Nonachlor (ug/L)		<0.050	<0.050	<0.050	<0.050
trans-Nonachlor (ug/L)		<0.050	<0.050	<0.050	<0.050
Oxychlordane (ug/L)		<0.050	<0.050	<0.050	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751131-11	L1751131-12			
	Description	Water	Water			
	Sampled Date	31-MAR-16	31-MAR-16			
	Sampled Time	15:45	15:45			
	Client ID	PEACE 4	MOBERLY RIVER (MD)			
Grouping	**Analyte**					
WATER						
Organochlorine Pesticides	Lindane (gamma - BHC) (ug/L)	<0.010	<0.010			
	delta-BHC (ug/L)	<0.050	<0.050			
	cis-Chlordane (alpha) (ug/L)	<0.050	<0.050			
	trans-Chlordane (gamma) (ug/L)	<0.050	<0.050			
	2,4'-DDD (ug/L)	<0.0050	<0.0050			
	4,4'-DDD (ug/L)	<0.0050	<0.0050			
	2,4'-DDE (ug/L)	<0.0050	<0.0050			
	4,4'-DDE (ug/L)	<0.0050	<0.0050			
	2,4'-DDT (ug/L)	<0.0050	<0.0050			
	4,4'-DDT (ug/L)	<0.0050	<0.0050			
	Dieldrin (ug/L)	<0.050	<0.050			
	Endosulfan I (ug/L)	<0.0020	<0.0020			
	Endosulfan II (ug/L)	<0.0020	<0.0020			
	Endosulfan Sulfate (ug/L)	<0.0020	<0.0020			
	Endrin (ug/L)	<0.020	<0.020			
	Heptachlor (ug/L)	<0.10	<0.10			
	Heptachlor Epoxide (ug/L)	<0.0030	<0.0030			
	Methoxychlor (ug/L)	<0.030	<0.030			
	Mirex (ug/L)	<0.050	<0.050			
	cis-Nonachlor (ug/L)	<0.050	<0.050			
	trans-Nonachlor (ug/L)	<0.050	<0.050			
	Oxychlordane (ug/L)	<0.050	<0.050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Chromium (Cr)-Total	MB-LOR	L1751131-10, -11, -12, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L1751131-8
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1751131-10, -11, -12, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1751131-10, -11, -12, -7, -8, -9
Matrix Spike	Silicon (Si)-Total	MS-B	L1751131-10, -11, -12, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L1751131-10, -11, -12, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA Water Nitrite & Nitrate in Water (Calculation) EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

ECOLI-COLI-ENV-VA Water E.coli by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-DIS-CVAFS-VA Water Dissolved Hg in Water by CVAFS LOR=50ppt APHA 3030B/EPA 1631E (mod)

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

Reference Information

HG-TOT-CVAFS-VA Water Total Hg in Water by CVAFS LOR=50ppt EPA 1631E (mod)

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

HPC-PP-ENV-VA Water HPC by pour plate APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

OCP1-LL-SF-ECD-VA Water OCP-1 in Water by GCECD EPA METHODS 3510, 3630, 3660, 8081

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3630, 3660 and 8081, published by the United States Environmental Protection Agency (EPA). The procedure involves extraction of the entire water sample with dichloromethane. The extract then undergoes one or more of the following clean-up procedures (if required): silica gel clean-up and/or sulphur clean-up. The final extract is analyzed by dual capillary column gas chromatography with electron capture detection (GC/ECD).

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

Reference Information

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA	Water	Total coliform by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-507896

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1751131-COFC

COC Number: 14 - 507896

Page ____ of ____

Report To	TETRA TECH
Company:	
Contact:	Danielle MacDonald
Address	
Phone	780 886 3055
Invoice To	Same as Report To ☑ Yes ☐ No
	Copy of Invoice with Report ☑ Yes ☐ No
Company:	
Contact:	
Project Information	
ALS Quote #:	Q53931
Job #	VENV03095
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	L1751131

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ FDD (DIGITAL)
Quality Control (QC) Report with Report ☑ Yes ☐ No
☑ Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: danielle.macdonald@tetratech.com
Email 2: sarah.simon@bchydro.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: email 1
Email 2:

Oil and Gas Required Fields (client use)

Approver ID:	Cost Center:
GL Account:	Routing Code:
Activity Code:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)

- R ☑ Regular (Standard TAT if received by 3pm)
- P ☐ Priority (2-4 business days if received by 3pm)
- E ☐ Emergency (1-2 business days if received by 3pm)
- E2 ☐ Same day or weekend emergency if received by 10am - contact ALS for surcharge.

Specify Date Required for E2,E or P:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Routine	TOC (P)	DOC (unfiltered)	Total Coli, Ecoli, HPC (P)	Total metals (P)	Dissolved metals unfiltered unpres.	Pesticides	BTEX (P)	Total Mercury (P)	Dissolved Mercury unfiltered unpres.	TSS			Number of Containers
1	PAM-RB	March 31	15:45	water											X			
1	PAM LB		14:50												X			
1	PAP RB		17:25												X			
1	PAP LB		13:10												X			
1	Taylor		11:30												X			
1	Spectra	March 31	18:25												X			
12	Taylor SW	April 1	12:35		X	X	X	X	X	X	X	X	X	X				
12	Pine SW		13:30		X	X	X	X	X	X	X	X	X	X				
12	Peace SW		14:40		X	X	X	X	X	X	X	X	X	X				
12	Peace 3		16:00		X	X	X	X	X	X	X	X	X	X				
12	Peace 4		16:40		X	X	X	X	X	X	X	X	X	X				
12	Moberly D/S	April 1	15:30		X	X	X	X	X	X	X	X	X	X				

Turbidity Station

Surface Water

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client use)

TSS bottles are 500 mL sized. Some are 3/4 full

Surface water from Peace watershed all dissolved samples were not field filtered or preserved

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice packs Yes ☐ No ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
8	9	4			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: [signature]	Date:	Time:	Received by: Geoff	Date: Apr. 1/16	Time: 16:45	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 03-APR-16
Report Date: 12-APR-16 10:56 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1751250

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03095
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1751250-1 WATER TRIP BLANK	L1751250-2 WATER 03-APR-16 FIELD BLANK	L1751250-3 WATER 02-APR-16 17:00 DH11-15	L1751250-4 WATER 03-APR-16 15:10 DH11-45	L1751250-5 WATER 02-APR-16 14:30 PEACE 1
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0	<5.0	52.2	5.3
	Conductivity (uS/cm)	<2.0	<2.0	732	436	187
	Hardness (as CaCO3) (ug/L)	<500	<500	415000	66000	97900
	pH (pH)	5.52	5.47	7.64	9.48	8.17
	Total Suspended Solids (ug/L)	<3000	<3000	61300	30000	<3000
	Total Dissolved Solids (ug/L)	<1000	<1000	414000	273000	100000
	Turbidity (NTU)	<0.10	<0.10	63.4	24.6	1.24
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	<1000	<1000	384000	136000	82100
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000	<1000	<1000	72200	<1000
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	<1000
	Alkalinity, Total (as CaCO3) (ug/L)	<1000	<1000	384000	208000	82100
	Bromide (Br) (ug/L)	<50	<50	<250 DLDS	<250 DLDS	<50
	Chloride (Cl) (ug/L)	<500	<500	3300	7600	<500
	Fluoride (F) (ug/L)	<20	<20	120	<200 DLCI	38
	Nitrate and Nitrite (as N) (ug/L)	<5.1	<5.1	131	<25	65.6
	Nitrate (as N) (ug/L)	<5.0	<5.0	131	<25 DLDS	65.6
	Nitrite (as N) (ug/L)	<1.0	<1.0	<5.0 DLDS	<5.0 DLDS	<1.0
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0	<1.0	<1.0	131	<1.0
	Silicate (as SiO2) (ug/L)	<500	<500	13400	3980	4370
	Sulfate (SO4) (ug/L)	<300	<300	33300	12400	13100
	Anion Sum (meq/L)	<0.10	<0.10	8.48	4.62	1.92
	Cation Sum (meq/L)	<0.10	<0.10	8.76	4.55	1.96
	Cation - Anion Balance (%)	0.0	0.0	1.6	-0.8	1.0
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	<500	<500	870	13100	3080
	Total Organic Carbon (ug/L)	<500	<500	720	16400	2230 RRV
Bacteriological Tests	E. coli (MPN/100mL)	<1	<1		<1	
	HPC (CFU/1mL)	<1	<1		200	
	Coliform Bacteria - Total (MPN/100mL)	<1	<1		152	
Total Metals	Aluminum (Al)-Total (ug/L)	<10	<10	89	441	35
	Antimony (Sb)-Total (ug/L)	<0.50	<0.50	<0.50	0.87	<0.50
	Arsenic (As)-Total (ug/L)	<1.0	<1.0	2.0	<1.0	<1.0
	Barium (Ba)-Total (ug/L)	<20	<20	88	95	31
	Beryllium (Be)-Total (ug/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Bismuth (Bi)-Total (ug/L)	<200	<200	<200	<200	<200
	Boron (B)-Total (ug/L)	<100	<100	<100	<100	<100
	Cadmium (Cd)-Total (ug/L)	<0.050	<0.050	<0.050	0.213	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751250-6
	Description	WATER
	Sampled Date	03-APR-16
	Sampled Time	16:30
	Client ID	PEACE 2
Grouping	**Analyte**	
WATER		
Physical Tests	Colour, True (CU)	<5.0
	Conductivity (uS/cm)	195
	Hardness (as CaCO3) (ug/L)	106000
	pH (pH)	8.14
	Total Suspended Solids (ug/L)	9200
	Total Dissolved Solids (ug/L)	105000
	Turbidity (NTU)	8.04
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	83700
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000
	Alkalinity, Total (as CaCO3) (ug/L)	83700
	Bromide (Br) (ug/L)	<50
	Chloride (Cl) (ug/L)	<500
	Fluoride (F) (ug/L)	42
	Nitrate and Nitrite (as N) (ug/L)	63.8
	Nitrate (as N) (ug/L)	63.8
	Nitrite (as N) (ug/L)	<1.0
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0
	Silicate (as SiO2) (ug/L)	4210
	Sulfate (SO4) (ug/L)	14000
	Anion Sum (meq/L)	1.97
	Cation Sum (meq/L)	2.11
	Cation - Anion Balance (%)	3.5
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	2910
	Total Organic Carbon (ug/L)	2530
Bacteriological Tests	E. coli (MPN/100mL)	<1
	HPC (CFU/1mL)	36
	Coliform Bacteria - Total (MPN/100mL)	5
Total Metals	Aluminum (Al)-Total (ug/L)	221
	Antimony (Sb)-Total (ug/L)	<0.50
	Arsenic (As)-Total (ug/L)	<1.0
	Barium (Ba)-Total (ug/L)	39
	Beryllium (Be)-Total (ug/L)	<5.0
	Bismuth (Bi)-Total (ug/L)	<200
	Boron (B)-Total (ug/L)	<100
	Cadmium (Cd)-Total (ug/L)	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1751250-1	L1751250-2	L1751250-3	L1751250-4	L1751250-5
Description	WATER	WATER	WATER	WATER	WATER
Sampled Date		03-APR-16	02-APR-16	03-APR-16	02-APR-16
Sampled Time			17:00	15:10	14:30
Client ID	TRIP BLANK	FIELD BLANK	DH11-15	DH11-45	PEACE 1
Grouping / **Analyte**					
WATER					
Total Metals Calcium (Ca)-Total (ug/L)	<100	<100	86600	19800	29100
Chromium (Cr)-Total (ug/L)	<0.50	<0.50	<0.50	6.03	<0.50
Cobalt (Co)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Copper (Cu)-Total (ug/L)	<1.0	<1.0	21.1	50.3	1.3
Iron (Fe)-Total (ug/L)	<30	<30	1540	1350	45
Lead (Pb)-Total (ug/L)	<1.0	<1.0	<1.0	3.0	<1.0
Lithium (Li)-Total (ug/L)	<50	<50	<50	64	<50
Magnesium (Mg)-Total (ug/L)	<100	<100	48900	6130	5970
Manganese (Mn)-Total (ug/L)	<10	<10	25	63	<10
Mercury (Hg)-Total (ug/L)	<0.20	<0.20		<0.20	<0.20
Molybdenum (Mo)-Total (ug/L)	<1.0	<1.0	9.0	16.5	<1.0
Nickel (Ni)-Total (ug/L)	<5.0	<5.0	<5.0	11.6	<5.0
Phosphorus (P)-Total (ug/L)	<300	<300	<300	310	<300
Potassium (K)-Total (ug/L)	<2000	<2000	<2000	33600	<2000
Selenium (Se)-Total (ug/L)	<1.0	<1.0	<1.0	<1.0	<1.0
Silicon (Si)-Total (ug/L)	<50	<50	7080	2380	2170
Silver (Ag)-Total (ug/L)	<0.050	<0.050	<0.050	0.091	<0.050
Sodium (Na)-Total (ug/L)	<2000	<2000	10900	51600	<2000
Strontium (Sr)-Total (ug/L)	<5.0	<5.0	673	517	108
Thallium (Tl)-Total (ug/L)	<0.20	<0.20	<0.20	<0.20	<0.20
Tin (Sn)-Total (ug/L)	<30	<30	<30	<30	<30
Titanium (Ti)-Total (ug/L)	<50	<50	<50	<50	<50
Uranium (U)-Total (ug/L)	<0.20	<0.20	<0.20	<0.20	0.45
Vanadium (V)-Total (ug/L)	<30	<30	<30	<30	<30
Zinc (Zn)-Total (ug/L)	<5.0	<5.0	10.5	647	<5.0
Dissolved Metals Dissolved Mercury Filtration Location		FIELD		FIELD	FIELD
Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (ug/L)		<10	<10	68	<10
Antimony (Sb)-Dissolved (ug/L)		<0.50	<0.50	0.76	<0.50
Arsenic (As)-Dissolved (ug/L)		<1.0	1.1	<1.0	<1.0
Barium (Ba)-Dissolved (ug/L)		<20	82	74	30
Beryllium (Be)-Dissolved (ug/L)		<5.0	<5.0	<5.0	<5.0
Bismuth (Bi)-Dissolved (ug/L)		<200	<200	<200	<200
Boron (B)-Dissolved (ug/L)		<100	<100	<100	<100
Cadmium (Cd)-Dissolved (ug/L)		<0.050	<0.050	<0.050	<0.050
Calcium (Ca)-Dissolved (ug/L)		<100	86400	17300	29400
Chromium (Cr)-Dissolved (ug/L)		<0.50	<0.50	0.57	<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751250-6				
	Description	WATER				
	Sampled Date	03-APR-16				
	Sampled Time	16:30				
	Client ID	PEACE 2				
Grouping	**Analyte**					
WATER						
Total Metals	Calcium (Ca)-Total (ug/L)	30800				
	Chromium (Cr)-Total (ug/L)	<0.50				
	Cobalt (Co)-Total (ug/L)	<0.50				
	Copper (Cu)-Total (ug/L)	1.6				
	Iron (Fe)-Total (ug/L)	290				
	Lead (Pb)-Total (ug/L)	<1.0				
	Lithium (Li)-Total (ug/L)	<50				
	Magnesium (Mg)-Total (ug/L)	6550				
	Manganese (Mn)-Total (ug/L)	<10				
	Mercury (Hg)-Total (ug/L)	<0.20				
	Molybdenum (Mo)-Total (ug/L)	<1.0				
	Nickel (Ni)-Total (ug/L)	<5.0				
	Phosphorus (P)-Total (ug/L)	<300				
	Potassium (K)-Total (ug/L)	<2000				
	Selenium (Se)-Total (ug/L)	<1.0				
	Silicon (Si)-Total (ug/L)	2620				
	Silver (Ag)-Total (ug/L)	<0.050				
	Sodium (Na)-Total (ug/L)	<2000				
	Strontium (Sr)-Total (ug/L)	115				
	Thallium (Tl)-Total (ug/L)	<0.20				
	Tin (Sn)-Total (ug/L)	<30				
	Titanium (Ti)-Total (ug/L)	<50				
	Uranium (U)-Total (ug/L)	0.50				
	Vanadium (V)-Total (ug/L)	<30				
	Zinc (Zn)-Total (ug/L)	10.5				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (ug/L)	<10				
	Antimony (Sb)-Dissolved (ug/L)	<0.50				
	Arsenic (As)-Dissolved (ug/L)	<1.0				
	Barium (Ba)-Dissolved (ug/L)	35				
	Beryllium (Be)-Dissolved (ug/L)	<5.0				
	Bismuth (Bi)-Dissolved (ug/L)	<200				
	Boron (B)-Dissolved (ug/L)	<100				
	Cadmium (Cd)-Dissolved (ug/L)	<0.050				
	Calcium (Ca)-Dissolved (ug/L)	31600				
	Chromium (Cr)-Dissolved (ug/L)	<0.50				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1751250-1	L1751250-2	L1751250-3	L1751250-4	L1751250-5
Description	WATER	WATER	WATER	WATER	WATER
Sampled Date		03-APR-16	02-APR-16	03-APR-16	02-APR-16
Sampled Time			17:00	15:10	14:30
Client ID	TRIP BLANK	FIELD BLANK	DH11-15	DH11-45	PEACE 1
Grouping / **Analyte**					
WATER					
Dissolved Metals Cobalt (Co)-Dissolved (ug/L)		<0.50	<0.50	<0.50	<0.50
Copper (Cu)-Dissolved (ug/L)		<1.0	6.2	4.4	<1.0
Iron (Fe)-Dissolved (ug/L)		<30	<30	94	<30
Lead (Pb)-Dissolved (ug/L)		<1.0	<1.0	<1.0	<1.0
Lithium (Li)-Dissolved (ug/L)		<50	<50	66	<50
Magnesium (Mg)-Dissolved (ug/L)		<100	48300	5500	5950
Manganese (Mn)-Dissolved (ug/L)		<10	24	36	<10
Mercury (Hg)-Dissolved (ug/L)		<0.20		<0.20	<0.20
Molybdenum (Mo)-Dissolved (ug/L)		<1.0	8.3	15.8	<1.0
Nickel (Ni)-Dissolved (ug/L)		<5.0	<5.0	6.1	<5.0
Phosphorus (P)-Dissolved (ug/L)		<300	<300	<300	<300
Potassium (K)-Dissolved (ug/L)		<2000	<2000	36300	<2000
Selenium (Se)-Dissolved (ug/L)		<1.0	<1.0	<1.0	<1.0
Silicon (Si)-Dissolved (ug/L)		<50	6700	1850	2150
Silver (Ag)-Dissolved (ug/L)		<0.050	<0.050	<0.050	<0.050
Sodium (Na)-Dissolved (ug/L)		<2000	11000	52600	<2000
Strontium (Sr)-Dissolved (ug/L)		<5.0	670	469	108
Thallium (Tl)-Dissolved (ug/L)		<0.010	<0.010	<0.010	<0.010
Tin (Sn)-Dissolved (ug/L)		<30	<30	<30	<30
Titanium (Ti)-Dissolved (ug/L)		<50	<50	<50	<50
Uranium (U)-Dissolved (ug/L)		<0.20	<0.20	<0.20	0.42
Vanadium (V)-Dissolved (ug/L)		<30	<30	<30	<30
Zinc (Zn)-Dissolved (ug/L)		<5.0	14.3	36.5	6.9
Volatile Organic Compounds Benzene (ug/L)	<0.50	<0.50		<0.50	<0.50
Ethylbenzene (ug/L)	<0.50	<0.50		<0.50	<0.50
Methyl t-butyl ether (MTBE) (ug/L)	<0.50	<0.50		<0.50	<0.50
Styrene (ug/L)	<0.50	<0.50		<0.50	<0.50
Toluene (ug/L)	<0.50	<0.50		<0.50	<0.50
ortho-Xylene (ug/L)	<0.50	<0.50		<0.50	<0.50
meta- & para-Xylene (ug/L)	<0.50	<0.50		<0.50	<0.50
Xylenes (ug/L)	<0.75	<0.75		<0.75	<0.75
Surrogate: 4-Bromofluorobenzene (SS) (%)	104.6	99.0		106.1	105.6
Surrogate: 1,4-Difluorobenzene (SS) (%)	101.1	99.6		100.3	100.7
Organochlorine Pesticides Aldrin (ug/L)	<0.050	<0.050		<0.050	<0.050
alpha-BHC (ug/L)	<0.050	<0.050		<0.050	<0.050
beta-BHC (ug/L)	<0.10	<0.10		<0.10	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751250-6				
	Description	WATER				
	Sampled Date	03-APR-16				
	Sampled Time	16:30				
	Client ID	PEACE 2				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (ug/L)	<0.50				
	Copper (Cu)-Dissolved (ug/L)	<1.0				
	Iron (Fe)-Dissolved (ug/L)	<30				
	Lead (Pb)-Dissolved (ug/L)	<1.0				
	Lithium (Li)-Dissolved (ug/L)	<50				
	Magnesium (Mg)-Dissolved (ug/L)	6540				
	Manganese (Mn)-Dissolved (ug/L)	<10				
	Mercury (Hg)-Dissolved (ug/L)	<0.20				
	Molybdenum (Mo)-Dissolved (ug/L)	<1.0				
	Nickel (Ni)-Dissolved (ug/L)	<5.0				
	Phosphorus (P)-Dissolved (ug/L)	<300				
	Potassium (K)-Dissolved (ug/L)	<2000				
	Selenium (Se)-Dissolved (ug/L)	<1.0				
	Silicon (Si)-Dissolved (ug/L)	2190				
	Silver (Ag)-Dissolved (ug/L)	<0.050				
	Sodium (Na)-Dissolved (ug/L)	<2000				
	Strontium (Sr)-Dissolved (ug/L)	115				
	Thallium (Tl)-Dissolved (ug/L)	<0.010				
	Tin (Sn)-Dissolved (ug/L)	<30				
	Titanium (Ti)-Dissolved (ug/L)	<50				
	Uranium (U)-Dissolved (ug/L)	0.42				
	Vanadium (V)-Dissolved (ug/L)	<30				
	Zinc (Zn)-Dissolved (ug/L)	8.0				
Volatile Organic Compounds	Benzene (ug/L)	<0.50				
	Ethylbenzene (ug/L)	<0.50				
	Methyl t-butyl ether (MTBE) (ug/L)	<0.50				
	Styrene (ug/L)	<0.50				
	Toluene (ug/L)	<0.50				
	ortho-Xylene (ug/L)	<0.50				
	meta- & para-Xylene (ug/L)	<0.50				
	Xylenes (ug/L)	<0.75				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	103.1				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	100.4				
Organochlorine Pesticides	Aldrin (ug/L)	<0.050				
	alpha-BHC (ug/L)	<0.050				
	beta-BHC (ug/L)	<0.10				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID		L1751250-1	L1751250-2	L1751250-3	L1751250-4	L1751250-5
Description		WATER	WATER	WATER	WATER	WATER
Sampled Date			03-APR-16	02-APR-16	03-APR-16	02-APR-16
Sampled Time				17:00	15:10	14:30
Client ID		TRIP BLANK	FIELD BLANK	DH11-15	DH11-45	PEACE 1
Grouping	**Analyte**					
WATER						
Organochlorine Pesticides	Lindane (gamma - BHC) (ug/L)	<0.010	<0.010		<0.020 DLCI	<0.010
	delta-BHC (ug/L)	<0.050	<0.050		<0.050	<0.050
	cis-Chlordane (alpha) (ug/L)	<0.050	<0.050		<0.050	<0.050
	trans-Chlordane (gamma) (ug/L)	<0.050	<0.050		<0.050	<0.050
	2,4'-DDD (ug/L)	<0.0050	<0.0050		<0.0050	<0.0050
	4,4'-DDD (ug/L)	<0.0050	<0.0050		<0.0050	<0.0050
	2,4'-DDE (ug/L)	<0.0050	<0.0050		<0.0050	<0.0050
	4,4'-DDE (ug/L)	<0.0050	<0.0050		<0.0050	<0.0050
	2,4'-DDT (ug/L)	<0.0050	<0.0050		<0.0050	<0.0050
	4,4'-DDT (ug/L)	<0.0050	<0.0050		<0.0050	<0.0050
	Dieldrin (ug/L)	<0.050	<0.050		<0.050	<0.050
	Endosulfan I (ug/L)	<0.0020	<0.0020		<0.20 DLCI	<0.0020
	Endosulfan II (ug/L)	<0.0020	<0.0020		<0.0020	<0.0020
	Endosulfan Sulfate (ug/L)	<0.0020	<0.0020		<0.0020	<0.0020
	Endrin (ug/L)	<0.020	<0.020		<0.020	<0.020
	Heptachlor (ug/L)	<0.10	<0.10		<0.10	<0.10
	Heptachlor Epoxide (ug/L)	<0.0030	<0.0030		<0.0030	<0.0030
	Methoxychlor (ug/L)	<0.030	<0.030		<0.030	<0.030
	Mirex (ug/L)	<0.050	<0.050		<0.050	<0.050
	cis-Nonachlor (ug/L)	<0.050	<0.050		<0.050	<0.050
	trans-Nonachlor (ug/L)	<0.050	<0.050		<0.050	<0.050
	Oxychlordane (ug/L)	<0.050	<0.050		<0.050	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1751250-6				
	Description	WATER				
	Sampled Date	03-APR-16				
	Sampled Time	16:30				
	Client ID	PEACE 2				
Grouping	**Analyte**					
WATER						
Organochlorine Pesticides	Lindane (gamma - BHC) (ug/L)	<0.010				
	delta-BHC (ug/L)	<0.050				
	cis-Chlordane (alpha) (ug/L)	<0.050				
	trans-Chlordane (gamma) (ug/L)	<0.050				
	2,4'-DDD (ug/L)	<0.0050				
	4,4'-DDD (ug/L)	<0.0050				
	2,4'-DDE (ug/L)	<0.0050				
	4,4'-DDE (ug/L)	<0.0050				
	2,4'-DDT (ug/L)	<0.0050				
	4,4'-DDT (ug/L)	<0.0050				
	Dieldrin (ug/L)	<0.050				
	Endosulfan I (ug/L)	<0.0020				
	Endosulfan II (ug/L)	<0.0020				
	Endosulfan Sulfate (ug/L)	<0.0020				
	Endrin (ug/L)	<0.020				
	Heptachlor (ug/L)	<0.10				
	Heptachlor Epoxide (ug/L)	<0.0030				
	Methoxychlor (ug/L)	<0.030				
	Mirex (ug/L)	<0.050				
	cis-Nonachlor (ug/L)	<0.050				
	trans-Nonachlor (ug/L)	<0.050				
	Oxychlordane (ug/L)	<0.050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1751250-5	PEACE 1	WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Orthophosphate-Dissolved (as P)	MS-B	L1751250-1, -2, -3, -4, -5, -6
Matrix Spike	Silicon (Si)-Total	MS-B	L1751250-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Total	MS-B	L1751250-1, -2, -3, -4, -5, -6
Matrix Spike	Total Organic Carbon	MS-B	L1751250-4, -5
Matrix Spike	Dissolved Organic Carbon	MS-B	L1751250-5
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1751250-2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-DIS-CVAFS-VA Water Dissolved Hg in Water by CVAFS LOR=50ppt APHA 3030B/EPA 1631E (mod)

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

HG-TOT-CVAFS-VA Water Total Hg in Water by CVAFS LOR=50ppt EPA 1631E (mod)

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

HPC-PP-ENV-VA Water HPC by pour plate APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

OCP1-LL-SF-ECD-VA Water OCP-1 in Water by GCECD EPA METHODS 3510, 3610, 3630, 3660, 8081

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3610, 3630, 3660 & 8081, published by the United States Environmental Protection Agency (EPA). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to hexane followed by one or more of the following clean-up procedures (if required): alumina clean-up, silica gel clean-up and/or sulphur clean-up. The final extract is analysed by dual capillary column gas chromatography with electron capture detection (GC/ECD) and/or mass spectrometric detection (GC/MS).

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA	Water	Total coliform by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA8260B, 5021

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA8260B, 5021
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1751250-COFC

COC Number: 14 - 507897

Page ___ of ___

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech EBA	Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3pm)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 business days if received by 3pm)
Address:		☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 business days if received by 3pm)
		Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency if received by 10am – contact ALS for surcharge.
Phone:	780 886 3055	Email 1 or Fax	danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2	sarah.simon@bchydro.com	

Invoice To			Invoice Distribution	
	Same as Report To	☑ Yes ☐ No	Select Invoice Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report	☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:			Email 2	danielle.macdonald@tetratech.com
Contact:				

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENV03095	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)	L1751250	ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Routine	TDC (P)	DOC (Filtered + P)	Total Coli, Ecoli, HPC P	Total Metals (P)	Dissolved Metals F/P	Pesticides	BTEX	Total Mercury P	Dissolved Mercury F+P	Number of Containers
	TRIP Blank	—	—	water	X	X	X	X	X	X	X	X	X	X	
	Field Blank	April 3-2016			X	X	X	X	X	X	X	X	X	X	
	DH 11-15	April 2-2016	17:00		X	X	X		X	X					2
	DH 11-45	April 3-2016	15:10		X	X	X	X	X	X	X	X	X	X	
	Peace 1	April 2-2016	14:30		X	X	X	X	X	X	X	X	X	X	
	Peace 2 *	April 3-2016	16:30		X	X	X	X	X	X	X	X	X	X	

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	all dissolved samples filtered + preserved
Are samples for human drinking water use? ☐ Yes ☑ No	* Peace 2 - sampled April 2 for bacteria

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐	No ☒
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C	
7/9	9/10	2	8

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: April 13/16	Time: 17:30	Received by: Geoff	Date: Apr. 3/16	Time: 17:40	Received by: Reid Jeon	Date: 4 Apr	Time: 11:05

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALS Canada Ltd. Form 26 Front (26 June 2014)

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Tetra Tech Canada Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 30-MAY-16
Report Date: 28-FEB-17 16:09 (MT)
Version: FINAL REV. 2

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1775541

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03118-01
C of C Numbers: 14-487048
Legal Site Desc:

Comments:

28-FEB-2017 This report replaces the previous version and contains a Client Sample ID change, as requested.

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1775541-1 WATER 30-MAY-16 10:00 PEACE CANYON (PC1)	L1775541-2 WATER 30-MAY-16 10:40 UPPER SITE C RESERVOIR (PR1)	L1775541-3 WATER 30-MAY-16 12:40 HALFWAY RIVER-DOWNSTREAM (HD)	L1775541-4 WATER 30-MAY-16 12:00 MIDDLE SITE C RESERVOIR (PR2)
WATER					
Physical Tests	Colour, True (CU)	6.4	6.5	28.3	6.7
	Hardness (as CaCO3) (ug/L)	98700	100000	187000	101000
	pH (pH)	7.99	8.00	8.18	8.04
	Total Suspended Solids (ug/L)	<3000	<3000	226000	14500
	Total Dissolved Solids (ug/L)	117000	108000	226000	119000
Anions and Nutrients	Alkalinity, Total (as CaCO3) (ug/L)	82400	81800	147000	84100
	Ammonia, Total (as N) (ug/L)	<5.0	<5.0	12.0	<5.0
	Bromide (Br) (ug/L)	<50	<50	<50	<50
	Chloride (Cl) (ug/L)	<500	<500	<500	<500
	Fluoride (F) (ug/L)	40	40	93	41
	Nitrate and Nitrite (as N) (ug/L)	75.6	75.3	24.1	71.7
	Nitrate (as N) (ug/L)	75.6	75.3	24.1	71.7
	Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0	<1.0
	Total Kjeldahl Nitrogen (ug/L)	90	78	745	170
	Total Nitrogen (ug/L)	137	156	387	141
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0	<1.0	4.4	<1.0
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0	<2.0	7.2	<2.0
	Phosphorus (P)-Total (ug/L)	2.6	3.3	251 SFT	15.5
	Silicate (as SiO2) (ug/L)	4570	4440	3570	4380
	Sulfate (SO4) (ug/L)	13100	13100	37500	13300
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	2910	3450 RRV	7320	3480 RRV
	Total Organic Carbon (ug/L)	2460	2690 RRV	7820	2790 RRV
Total Metals	Aluminum (Al)-Total (ug/L)	31.2	42.5	3580	133
	Antimony (Sb)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50
	Arsenic (As)-Total (ug/L)	<0.50	<0.50	2.33	<0.50
	Barium (Ba)-Total (ug/L)	32	33	187	36
	Beryllium (Be)-Total (ug/L)	<1.0	<1.0	<1.0	<1.0
	Bismuth (Bi)-Total (ug/L)	<0.050	<0.050	0.102	<0.050
	Boron (B)-Total (ug/L)	<100	<100	<100	<100
	Cadmium (Cd)-Total (ug/L)	0.0194	0.0171	0.264	0.0384
	Calcium (Ca)-Total (ug/L)	28900	28800	54900	28400
	Chromium (Cr)-Total (ug/L)	<1.0	<1.0	6.5	<1.0
	Cobalt (Co)-Total (ug/L)	<0.30	<0.30	2.14	<0.30
	Copper (Cu)-Total (ug/L)	<1.0	<1.0	6.8	1.0
	Iron (Fe)-Total (ug/L)	66	64	5140	277
	Lead (Pb)-Total (ug/L)	<0.50	<0.50	2.67	<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1775541-1 WATER 30-MAY-16 10:00 PEACE CANYON (PC1)	L1775541-2 WATER 30-MAY-16 10:40 UPPER SITE C RESERVOIR (PR1)	L1775541-3 WATER 30-MAY-16 12:40 HALFWAY RIVER-DOWNSTREAM (HD)	L1775541-4 WATER 30-MAY-16 12:00 MIDDLE SITE C RESERVOIR (PR2)	
WATER						
Total Metals	Lithium (Li)-Total (ug/L)	1.2	1.3	9.4	1.4	
	Magnesium (Mg)-Total (ug/L)	6020	6070	14700	6210	
	Manganese (Mn)-Total (ug/L)	2.41	2.59	73.1	6.49	
	Mercury (Hg)-Total (ug/L)	<0.0050	<0.0050	<0.025 DLM	<0.0050	
	Molybdenum (Mo)-Total (ug/L)	<1.0	<1.0	2.9	<1.0	
	Nickel (Ni)-Total (ug/L)	<1.0	<1.0	8.6	1.1	
	Phosphorus (P)-Total (ug/L)	<300	<300	<300	<300	
	Potassium (K)-Total (ug/L)	<2000	<2000	2200	<2000	
	Selenium (Se)-Total (ug/L)	0.248	0.231	1.44	0.246	
	Silicon (Si)-Total (ug/L)	2210	2220	9810	2390	
	Silver (Ag)-Total (ug/L)	<0.020	<0.020	0.072	<0.020	
	Sodium (Na)-Total (ug/L)	<2000	<2000	2900	<2000	
	Strontium (Sr)-Total (ug/L)	110	111	236	109	
	Thallium (Tl)-Total (ug/L)	<0.20	<0.20	<0.20	<0.20	
	Tin (Sn)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	
	Titanium (Ti)-Total (ug/L)	<10	<10	97	<10	
	Uranium (U)-Total (ug/L)	0.46	0.47	0.89	0.47	
	Vanadium (V)-Total (ug/L)	<0.50	0.52	15.6	1.03	
	Zinc (Zn)-Total (ug/L)	<5.0	<5.0	29.3	<5.0	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (ug/L)	<5.0	<5.0	13.7	<5.0	
	Antimony (Sb)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
	Arsenic (As)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
	Barium (Ba)-Dissolved (ug/L)	31	31	66	32	
	Beryllium (Be)-Dissolved (ug/L)	<1.0	<1.0	<1.0	<1.0	
	Bismuth (Bi)-Dissolved (ug/L)	<0.050	<0.050	<0.050	<0.050	
	Boron (B)-Dissolved (ug/L)	<100	<100	<100	<100	
	Cadmium (Cd)-Dissolved (ug/L)	0.0078	0.0115	0.0182	0.0088	
	Calcium (Ca)-Dissolved (ug/L)	29800	30100	52400	30300	
	Chromium (Cr)-Dissolved (ug/L)	<1.0	<1.0	<1.0	<1.0	
	Cobalt (Co)-Dissolved (ug/L)	<0.30	<0.30	<0.30	<0.30	
	Copper (Cu)-Dissolved (ug/L)	<1.0	<1.0	1.2	<1.0	
	Iron (Fe)-Dissolved (ug/L)	<30	<30	32	<30	
	Lead (Pb)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
	Lithium (Li)-Dissolved (ug/L)	1.3	1.2	5.7	1.3	
	Magnesium (Mg)-Dissolved (ug/L)	5920	6050	13700	6040	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1775541-1	L1775541-2	L1775541-3	L1775541-4	
Description	WATER	WATER	WATER	WATER	
Sampled Date	30-MAY-16	30-MAY-16	30-MAY-16	30-MAY-16	
Sampled Time	10:00	10:40	12:40	12:00	
Client ID	PEACE CANYON (PC1)	UPPER SITE C RESERVOIR (PR1)	HALFWAY RIVER-DOWNSTREAM (HD)	MIDDLE SITE C RESERVOIR (PR2)	
Grouping / **Analyte**					
WATER					
Dissolved Metals Manganese (Mn)-Dissolved (ug/L)	0.84	0.91	4.92	0.76	
Mercury (Hg)-Dissolved (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Molybdenum (Mo)-Dissolved (ug/L)	<1.0	<1.0	2.5	<1.0	
Nickel (Ni)-Dissolved (ug/L)	<1.0	<1.0	1.9	<1.0	
Phosphorus (P)-Dissolved (ug/L)	<300	<300	<300	<300	
Potassium (K)-Dissolved (ug/L)	<2000	<2000	<2000	<2000	
Selenium (Se)-Dissolved (ug/L)	0.239	0.268	1.26	0.268	
Silicon (Si)-Dissolved (ug/L)	2160	2150	1760	2170	
Silver (Ag)-Dissolved (ug/L)	<0.020	<0.020	<0.020	<0.020	
Sodium (Na)-Dissolved (ug/L)	<2000	<2000	2900	<2000	
Strontium (Sr)-Dissolved (ug/L)	108	108	227	108	
Thallium (Tl)-Dissolved (ug/L)	<0.20	<0.20	<0.20	<0.20	
Tin (Sn)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
Titanium (Ti)-Dissolved (ug/L)	<10	<10	<10	<10	
Uranium (U)-Dissolved (ug/L)	0.43	0.40	0.59	0.41	
Vanadium (V)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
Zinc (Zn)-Dissolved (ug/L)	<5.0	<5.0	<5.0	<5.0	
Plant Pigments Chlorophyll a (ug/L)	0.622	0.614	2.41	1.72	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Iron (Fe)-Total	B	L1775541-3
Method Blank	Manganese (Mn)-Total	MB-LOR	L1775541-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Aluminum (Al)-Total	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Copper (Cu)-Total	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Total	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L1775541-1, -2, -4
Matrix Spike	Phosphorus (P)-Total	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Silicon (Si)-Total	MS-B	L1775541-1, -2, -3, -4
Matrix Spike	Silicon (Si)-Total	MS-B	L1775541-1, -2, -4
Matrix Spike	Total Nitrogen	MS-B	L1775541-1, -2, -4
Matrix Spike	Total Nitrogen	MS-B	L1775541-1, -2, -4
Matrix Spike	Total Nitrogen	MS-B	L1775541-3
Matrix Spike	Total Nitrogen	MS-B	L1775541-3
Matrix Spike	Total Kjeldahl Nitrogen	MS-B	L1775541-3

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SFT	Sample was filtered due to turbidity interference. Result reflects soluble analyte concentration.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Water	Chlorophyll a by Fluorometer	EPA 445.0

Reference Information

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-487048

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1775541-COFC

COC Number: 14 - 487048

Page ____ of ____

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech EBA Inc	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3pm)
Contact:	DANIELLE MACDONALD	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 business days if received by 3pm)
Address:	14940-123 AVE EDMONTON AB	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 business days if received by 3pm)
Phone:	780 886 3055	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency if received by 10am - contact ALS for surcharge.
		Email 1 or Fax	danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2	dave.hunter@bchydro.com	

Invoice To		Invoice Distribution	
	Same as Report To ☒ Yes ☐ No	Select Invoice Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☒ Yes ☐ No	Email 1 or Fax	same as above
Company:		Email 2	
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	QSS6SS	Approver ID:	Cost Center:
Job #:	VENN03118-01	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L1775541

ALS Contact: | Sampler: D. MacDonald P. Gauthier

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Routine as per quote	Chlorophyll A *	DOC as per quote (F/P)	TDC as per quote (F/P)	total metals + Hg (P)	dissolved metals + Hg (F/P)	as per quote	in addition to Ammonia as per QSS6SS	Silicate in addition to quote	Number of Containers
	Peace Canyon (PC1)	30-05-16	10:00 AM	water	✓	✓	✓	✓	✓	✓		✓	✓	8
	Upper Site C Reservoir (PR1)	30-05-16	10:40 AM		✓	✓	✓	✓	✓	✓		✓	✓	8
	~~Halfway River - Upstream (HD-U)~~													
	Halfway River - Downstream (HD-D)	30-05-16	12:40 PM		✓	✓	✓	✓	✓	✓		✓	✓	8
	Middle Site C Reservoir (PR2)		12:00 pm		✓	✓	✓	✓	✓	✓		✓	✓	8
	* HD-U = To be sampled May 31/2016 removed from this COC													

Drinking Water (DW) Samples' (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No ~~Peace~~ River	Please add: email 3: sarah.simon@bchydro.com
Are samples for human drinking water use? ☐ Yes ☑ No Surface Water	email 4: pgauthier2014@hotmail.com
	* Chlorophyll A - unfiltered; stored in 500ml plastic and filtered

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
8					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Phyllis Gauthier	MAY 30/16	3:25 pm	GeoF	May 30/16	15:25			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 02-JUN-16
Report Date: 16-JUN-16 16:31 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1777575

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03118-01
C of C Numbers: 14-487062
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1777575-1	L1777575-2			
	Description	Water	Water			
	Sampled Date	02-JUN-16	02-JUN-16			
	Sampled Time	09:15	09:40			
	Client ID	MOBERLY RIVER UPSTREAM	MOBERLY RIVER DOWNSTREAM			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	16.9	15.9			
	Hardness (as CaCO3) (ug/L)	116000	117000			
	pH (pH)	8.25	8.23			
	Total Suspended Solids (ug/L)	51100	82500			
	Total Dissolved Solids (ug/L)	137000	139000			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (ug/L)	109000	111000			
	Ammonia, Total (as N) (ug/L)	8.1	9.4			
	Nitrate and Nitrite (as N) (ug/L)	19.0	16.0			
	Nitrate (as N) (ug/L)	19.0	16.0			
	Nitrite (as N) (ug/L)	<1.0	<1.0			
	Total Kjeldahl Nitrogen (ug/L)	282 RRV	340			
	Total Nitrogen (ug/L)	275	290			
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0	<1.0			
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0	<2.0			
	Phosphorus (P)-Total (ug/L)	47.9	98.8			
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	6570	8020			
	Total Organic Carbon (ug/L)	6660	6610			
Total Metals	Aluminum (Al)-Total (ug/L)	845	1000			
	Antimony (Sb)-Total (ug/L)	<0.50	<0.50			
	Arsenic (As)-Total (ug/L)	0.66	0.84			
	Barium (Ba)-Total (ug/L)	162	175			
	Beryllium (Be)-Total (ug/L)	<1.0	<1.0			
	Bismuth (Bi)-Total (ug/L)	<0.050	<0.050			
	Boron (B)-Total (ug/L)	<100	<100			
	Cadmium (Cd)-Total (ug/L)	0.0540	0.0670			
	Calcium (Ca)-Total (ug/L)	31700	33200			
	Chromium (Cr)-Total (ug/L)	1.7	1.9			
	Cobalt (Co)-Total (ug/L)	0.53	0.74			
	Copper (Cu)-Total (ug/L)	2.3	2.9			
	Iron (Fe)-Total (ug/L)	1250	1660			
	Lead (Pb)-Total (ug/L)	0.68	0.92			
	Lithium (Li)-Total (ug/L)	4.1	4.5			
	Magnesium (Mg)-Total (ug/L)	8570	9010			
	Manganese (Mn)-Total (ug/L)	22.2	30.8			
	Mercury (Hg)-Total (ug/L)	<0.0050	0.0054			
	Molybdenum (Mo)-Total (ug/L)	<1.0	<1.0			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1777575-1	L1777575-2			
	Description	Water	Water			
	Sampled Date	02-JUN-16	02-JUN-16			
	Sampled Time	09:15	09:40			
	Client ID	MOBERLY RIVER UPSTREAM	MOBERLY RIVER DOWNSTREAM			
Grouping	**Analyte**					
WATER						
Total Metals	Nickel (Ni)-Total (ug/L)	2.9	3.4			
	Phosphorus (P)-Total (ug/L)	<300	<300			
	Potassium (K)-Total (ug/L)	<2000	<2000			
	Selenium (Se)-Total (ug/L)	0.246	0.247			
	Silicon (Si)-Total (ug/L)	2780	3130			
	Silver (Ag)-Total (ug/L)	<0.020	0.020			
	Sodium (Na)-Total (ug/L)	2000	2200			
	Strontium (Sr)-Total (ug/L)	73.6	77.7			
	Thallium (Tl)-Total (ug/L)	<0.20	<0.20			
	Tin (Sn)-Total (ug/L)	<0.50	<0.50			
	Titanium (Ti)-Total (ug/L)	26	29			
	Uranium (U)-Total (ug/L)	0.24	0.27			
	Vanadium (V)-Total (ug/L)	3.20	3.84			
	Zinc (Zn)-Total (ug/L)	6.2	8.5			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (ug/L)	5.1	7.8			
	Antimony (Sb)-Dissolved (ug/L)	<0.50	<0.50			
	Arsenic (As)-Dissolved (ug/L)	<0.50	<0.50			
	Barium (Ba)-Dissolved (ug/L)	135	135			
	Beryllium (Be)-Dissolved (ug/L)	<1.0	<1.0			
	Bismuth (Bi)-Dissolved (ug/L)	<0.050	<0.050			
	Boron (B)-Dissolved (ug/L)	<100	<100			
	Cadmium (Cd)-Dissolved (ug/L)	0.0091	0.0078			
	Calcium (Ca)-Dissolved (ug/L)	32300	32900			
	Chromium (Cr)-Dissolved (ug/L)	<1.0	<1.0			
	Cobalt (Co)-Dissolved (ug/L)	<0.30	<0.30			
	Copper (Cu)-Dissolved (ug/L)	1.1	<1.0			
	Iron (Fe)-Dissolved (ug/L)	<30	<30			
	Lead (Pb)-Dissolved (ug/L)	<0.50	<0.50			
	Lithium (Li)-Dissolved (ug/L)	3.5	3.6			
	Magnesium (Mg)-Dissolved (ug/L)	8510	8560			
	Manganese (Mn)-Dissolved (ug/L)	1.99	2.13			
	Mercury (Hg)-Dissolved (ug/L)	<0.0050	<0.0050			
	Molybdenum (Mo)-Dissolved (ug/L)	<1.0	<1.0			
	Nickel (Ni)-Dissolved (ug/L)	1.2	1.1			
	Phosphorus (P)-Dissolved (ug/L)	<300	<300			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1777575-1	L1777575-2			
	Description	Water	Water			
	Sampled Date	02-JUN-16	02-JUN-16			
	Sampled Time	09:15	09:40			
	Client ID	MOBERLY RIVER UPSTREAM	MOBERLY RIVER DOWNSTREAM			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Potassium (K)-Dissolved (ug/L)	<2000	<2000			
	Selenium (Se)-Dissolved (ug/L)	0.206	0.176			
	Silicon (Si)-Dissolved (ug/L)	1140	1100			
	Silver (Ag)-Dissolved (ug/L)	<0.020	<0.020			
	Sodium (Na)-Dissolved (ug/L)	2000	2100			
	Strontium (Sr)-Dissolved (ug/L)	72.4	73.8			
	Thallium (Tl)-Dissolved (ug/L)	<0.20	<0.20			
	Tin (Sn)-Dissolved (ug/L)	<0.50	<0.50			
	Titanium (Ti)-Dissolved (ug/L)	<10	<10			
	Uranium (U)-Dissolved (ug/L)	<0.20	<0.20			
	Vanadium (V)-Dissolved (ug/L)	<0.50	<0.50			
	Zinc (Zn)-Dissolved (ug/L)	<5.0	<5.0			
Plant Pigments	Chlorophyll a (ug/L)	3.41	3.92			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Alkalinity, Total (as CaCO3)	B	L1777575-1, -2
Duplicate	Nitrite (as N)	DLDS	L1777575-1, -2
Duplicate	Nitrate (as N)	DLDS	L1777575-1, -2
Duplicate	Nitrite (as N)	DLDS	L1777575-1, -2
Method Blank	Chromium (Cr)-Total	MB-LOR	L1777575-1, -2
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1777575-1, -2
Matrix Spike	Total Nitrogen	MS-B	L1777575-2
Matrix Spike	Phosphorus (P)-Total	MS-B	L1777575-1, -2
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1777575-1, -2
Matrix Spike	Total Organic Carbon	MS-B	L1777575-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L1777575-1
Matrix Spike	Total Organic Carbon	MS-B	L1777575-2
Matrix Spike	Dissolved Organic Carbon	MS-B	L1777575-2
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L1777575-1, -2
Matrix Spike	Cadmium (Cd)-Dissolved	MS-B	L1777575-1, -2
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L1777575-1, -2
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1777575-1, -2
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L1777575-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA Water Nitrite & Nitrate in Water (Calculation) EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

CARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA Water Chlorophyll a by Fluorometer EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

COLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Reference Information

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

Reference Information

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-487062

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1777575-COFC

COC Number: 14 - 487062

Page 1 of 1

Report To
Company: TETRA TECH EBA INC
Contact: DANIELLE MACDONALD
Address: 14940 123 AVE
EDMONTON AB T5V 1B4
Phone: 780.886.3055

Report Format / Distribution
Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ Yes ☐ No
☑ Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: danielle.macdonald@tetratech.com
Email 2: pgauthier@014@hotmail.com

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
R ☑ Regular (Standard TAT if received by 3pm)
P ☐ Priority (2-4 business days if received by 3pm)
E ☐ Emergency (1-2 business days if received by 3pm)
E2 ☐ Same day or weekend emergency if received by 10am – contact ALS for surcharge.
Specify Date Required for E2,E or P:

Invoice To Same as Report To ☑ Yes ☐ No
Copy of Invoice with Report ☑ Yes ☐ No
Company:
Contact:

Invoice Distribution
Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: danielle.macdonald@tetratech.com
Email 2:

Project Information
ALS Quote #: Q55655
Job #: VENV03118-01
PO / AFE:
LSD:

Oil and Gas Required Fields (client use)
Approver ID:
Cost Center:
GL Account:
Routing Code:
Activity Code:
Location:

ALS Lab Work Order # (lab use only): L1777575
ALS Contact: BRENT MACK
Sampler: D. MacDonald, P. GAUTHIER

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	AS PER Q55655	ROUTINE	TOC (P)	DOC (F/P)	CHLOROPHYLL A	TOTAL METALS (P)	TOTAL MERCURY (P)	DISSOLVED METALS (F/P)	DISSOLVED MERCURY (F/P)	AS PER Q53931	SILICATE, ANIONS	PESTICIDE	BACTERIA (T.COL, E.COLI, HPC)	BTEX	Number of Containers
	MOBERLY RIVER UPSTREAM (MU)	JUNE	09:15	Water		X	X	X	X	X	X	X	X						8
	MOBERLY RIVER DOWNSTREAM (MD)	2	09:40	Water		X	X	X	X	X	X	X	X						8
	~~FIELD BLANK~~					~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~13~~
	~~TRIP BLANK~~					~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~13~~

Short Holding Time

Rush Processing

as per quote

Drinking Water (DW) Samples[1] (client use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No Surface water
Are samples for human drinking water use? ☐ Yes ☑ No (RIVER)

Special Instructions / Specify Criteria to add on report (client Use)
Criteria: CDN DRINKING WATER QUALITY PKG
BC DRINKING WATER (PROV. GUIDELINE)
ADD EMAIL: DAVID.HUNTER@BCHYDRG.COM
(REPORT)
CHLOROPHYLL A - unfiltered, wrapped in foil and 500 mL

SAMPLE CONDITION AS RECEIVED (lab use only)
Frozen ☐ SIF Observations Yes ☐ No ☐
Ice packs Yes ☑ No ☐ Custody seal intact Yes ☐ No ☑
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
14			2.2	2	1

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Danielle MacDonald	Date: June 2, 2016	Time: 10:50	Received by: Geoff	Date: June 2/16	Time: 10:50	Received by: Rand JC	Date: 3 JUN	Time: 10:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1 If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 21-JUN-16
Report Date: 04-JUL-16 15:17 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1786823

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03118.01
C of C Numbers: 14-473214
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1786823-1 Water 21-JUN-16 10:00 FIELD BLANK	L1786823-2 Water 21-JUN-16 12:30 DUP1	L1786823-4 Water 21-JUN-16 12:30 WILLISTON-SHALLOW (W1-SHALLOW)	L1786823-5 Water 21-JUN-16 10:45 DINOSAUR-DEEP (D1-DEEP)	L1786823-6 Water 21-JUN-16 10:15 DINOSAUR-SHALLOW (D1-SHALLOW)
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0	8.2	46.9	<5.0
	pH (pH)	5.52	8.08	8.08	8.08	8.07
	Total Suspended Solids (ug/L)	<3000	<3000	<3000	7400	4600
	Total Dissolved Solids (ug/L)	<10000	120000	118000	113000	125000
Anions and Nutrients	Alkalinity, Total (as CaCO3) (ug/L)	<1000	79600	79900	81100	81700
	Ammonia, Total (as N) (ug/L)	<5.0	<5.0	<5.0	5.9	<5.0
	Nitrate and Nitrite (as N) (ug/L)	<5.1	60.6	61.2	68.0	67.6
	Nitrate (as N) (ug/L)	<5.0	60.6	61.2	68.0	67.6
	Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Kjeldahl Nitrogen (ug/L)	<50	75	79	110	84
	Total Nitrogen (ug/L)	<30	150	133	193	216
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0	1.1	<1.0	1.0	<1.0
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0	2.4	4.0	2.6	2.0
	Phosphorus (P)-Total (ug/L)	<2.0	4.9	3.8	17.7	8.1
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	1950 RRV	3110	8350	4830 RRV	10300 RRV
	Total Organic Carbon (ug/L)	<500	2730	2370 RRV	3160 RRV	2990 RRV
Plant Pigments	Chlorophyll a (ug/L)	<0.010	0.468	0.474	0.645	0.619

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Nitrite (as N)	DLDS	L1786823-1, -2, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1786823-1
Matrix Spike	Total Organic Carbon	MS-B	L1786823-2, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1786823-2, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Water	Chlorophyll a by Fluorometer	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Reference Information

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-473214

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1786823-COFC

COC Number: 14 - 473214

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetra Tech EBA Inc.	Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3pm)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 business days if received by 3pm)
Address:	14940-123 AVE	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 business days if received by 3pm)
		Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency if received by 10am – contact ALS for surcharge.
Phone:	Edmonton AB T5V 1B4 780 886 3055	Email 1 or Fax	danielle.macdonald@tetra tech.com	Specify Date Required for E2,E or P:
		Email 2	pgauthier2014@hotmail.com	

Invoice To	Same as Report To	☑ Yes ☐ No	Invoice Distribution	
	Copy of Invoice with Report	☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Company:			Email 1 or Fax	
Contact:			Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	QSS655	Approver ID:	Cost Center:
Job #:	VENV03118.01	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)	L1786823	ALS Contact:	Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	As per QSS655	Routine	TOC (P)	DOC (F/P)	Chlorophyll a	4 wrapped in foil (unfiltered)		Ammonia (P)	TKN (P)	Total Nitrogen (P)	Total Phosphorous (P)		HOLD	Number of Containers
	Field Blank	June 21	10:00	water		X	X	X	X			X	X	X	X			4
	DUP1	2016	12:30			X	X	X	X			X	X	X	X			4
	Williston - Deep (W1-Deep)		13:15			X	X	X	X			X	X	X	X		X	4
	Williston - Shallow (W1-Shallow)		12:30			X	X	X	X			X	X	X	X			4
	Dinosaur - Deep (D1-Deep)		10:45	~~10:45~~		X	X	X	X			X	X	X	X			4
	Dinosaur - Shallow (D1-Shallow)		10:15	~~10:15~~		X	X	X	X			X	X	X	X			4

W1-Deep- hold for further analysis confirmation (may be re-sampled June 22)

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No surface water	* BC ~~Hydro~~ Prov. Drinking Water Criteria as per QSS655
Are samples for human drinking water use? ☐ Yes ☑ No	* Please add dave.hunter@bchydro.com to report distribution

Frozen	☐		SIF Observations	Yes ☐	No ☐
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☒				

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
14	8/3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Danielle MacDonald	Date: June 21/16	Time: 15:25	Received by: Geoff	Date: June 21/16	Time: 15:25	Received by: Shelley	Date: June 22	Time: 11:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 21-JUN-16
Report Date: 04-JUL-16 17:09 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1786825

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03118-01
C of C Numbers: 14-473217
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1786825-1	L1786825-2			
	Description	Water	Water			
	Sampled Date	21-JUN-16	21-JUN-16			
	Sampled Time	15:00	15:05			
	Client ID	PEACE CANYON (PC1)	UPPER SITE C RESERVOIR (PR1)			
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0			
	pH (pH)	8.07	8.08			
	Total Suspended Solids (ug/L)	4700	5500			
	Total Dissolved Solids (ug/L)	121000	118000			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (ug/L)	79900	80500			
	Ammonia, Total (as N) (ug/L)	<5.0	<5.0			
	Nitrate and Nitrite (as N) (ug/L)	67.7	68.0			
	Nitrate (as N) (ug/L)	67.7	68.0			
	Nitrite (as N) (ug/L)	<1.0	<1.0			
	Total Kjeldahl Nitrogen (ug/L)	122	161			
	Total Nitrogen (ug/L)	169	166			
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0	2.5			
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0	<2.0			
	Phosphorus (P)-Total (ug/L)	14.1	13.5			
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	5480 RRV	5020 RRV			
	Total Organic Carbon (ug/L)	3080 RRV	3500 RRV			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Nitrite (as N)	DLDS	L1786825-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

Reference Information

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-473217

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1786825-COFC

COC Number: 14 - 473217

Page ____ of ____

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech EBA Inc	Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3pm)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 business days if received by 3pm)
Address:	14940-123 Ave Edmonton AB T5V 1B4	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 business days if received by 3pm)
		Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency if received by 10am - contact ALS for surcharge.
Phone:	780 886 3055	Email 1 or Fax	danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2	pgauthier2014@hotmail.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	same as above
Company:		Email 2	
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	QSS655	Approver ID:	Cost Center:
Job #:	VENV03118-01	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)	L1786825	ALS Contact:	Brent Mack	Sampler:	D. MacDonald P. Gauthier

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	As per QSS655	ROUTINE	TDC (P)	TKN (P)	Ammonia (P)	Total Nitrogen (P)	Total Phosphorus (F/P)	DOC (F/P)	Number of Containers
	Peace Canyon (PC1)	21-06-16	15:00	WATER		X	X	X	X	X	X	X	3
	Upper Site C Reservoir (PR1)	21-06-16	15:05	WATER		X	X	X	X	X	X	X	3

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No surface water	* BC Prov. drinking water guidelines
Are samples for human drinking water use? ☐ Yes ☑ No	* Please incl. dave.hunter@bchydro.com for report distribution

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐		SIF Observations	Yes ☐	No ☐
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
16			8/3		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	21-06-16	5:10pm	George	June 24/16	17:05	Shelby	June 22	11:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy

1. If any water samples are taken from a Regulated Drinking Water (DW) System please submit using an Authorized DW COC form

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 22-JUN-16
Report Date: 12-JUL-16 11:11 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1788272

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03118-01
C of C Numbers: 14-473213
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1788272-1 Water 22-JUN-16 09:00 W1-DEEP	L1788272-2 Water 22-JUN-16 16:20 PD1	L1788272-3 Water 22-JUN-16 10:00 PR3	L1788272-4 Water 22-JUN-16 16:40 PINE	L1788272-5 Water 22-JUN-16 13:00 HU
WATER						
Physical Tests	Colour, True (CU)	7.7	13.8	13.2	29.4	23.5
	pH (pH)	7.84	8.02	8.11	8.11	8.32
	Total Suspended Solids (ug/L)	<3000	57700	28700	418000	32900
	Total Dissolved Solids (ug/L)	121000	157000	143000	187000	238000
Anions and Nutrients	Alkalinity, Total (as CaCO3) (ug/L)	92500	90700	87800	110000	154000
	Ammonia, Total (as N) (ug/L)	<5.0	9.0	<5.0	7.8	<5.0
	Nitrate and Nitrite (as N) (ug/L)	61.4	58.5	60.0	79.1	<5.1
	Nitrate (as N) (ug/L)	61.4	58.5	60.0	79.1	<5.0
	Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Kjeldahl Nitrogen (ug/L)	85	211	157	757 RRV	231
	Total Nitrogen (ug/L)	172	193	185	505 DLM	251
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0	1.5	1.2	4.0	2.3
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0	2.7	2.1	6.6	3.2
	Phosphorus (P)-Total (ug/L)	5.9	47.5	35.5	318	58.4
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	4540 RRV	9860	10200	7110	6230
	Total Organic Carbon (ug/L)	2700 RRV	4980 RRV	3880 RRV	6100	5640
Plant Pigments	Chlorophyll a (ug/L)	1.11				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1788272-6	L1788272-7	L1788272-8		
Description	Water	Water	Water		
Sampled Date	22-JUN-16	22-JUN-16			
Sampled Time	11:46	11:30			
Client ID	HDD	PR2	DUP2		
Grouping / **Analyte**					
WATER					
Physical Tests Colour, True (CU)	22.8	12.0	12.2		
pH (pH)	8.33	8.10	8.11		
Total Suspended Solids (ug/L)	78900	19900	26200		
Total Dissolved Solids (ug/L)	238000	126000	138000		
Anions and Nutrients Alkalinity, Total (as CaCO3) (ug/L)	156000	81300	87800		
Ammonia, Total (as N) (ug/L)	5.6	<5.0	<5.0		
Nitrate and Nitrite (as N) (ug/L)	<5.1	66.3	61.8		
Nitrate (as N) (ug/L)	<5.0	66.3	61.8		
Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0		
Total Kjeldahl Nitrogen (ug/L)	334	78	148		
Total Nitrogen (ug/L)	239	165	206		
Orthophosphate-Dissolved (as P) (ug/L)	3.4	<1.0	1.1		
Phosphorus (P)-Total Dissolved (ug/L)	4.2	<2.0	<2.0		
Phosphorus (P)-Total (ug/L)	91.6	18.4	26.4		
Organic / Inorganic Carbon Dissolved Organic Carbon (ug/L)	11400	8160	5180		
Total Organic Carbon (ug/L)	6560 RRV	3650	3980 RRV		
Plant Pigments Chlorophyll a (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Nitrite (as N)	DLDS	L1788272-1, -2, -3, -4, -5, -6, -7
Duplicate	Nitrite (as N)	DLDS	L1788272-1, -2, -3, -4, -5, -6, -7
Duplicate	Nitrate (as N)	DLDS	L1788272-1, -2, -3, -4, -5, -6, -7
Duplicate	Nitrite (as N)	DLDS	L1788272-1, -2, -3, -4, -5, -6, -7
Duplicate	Nitrate (as N)	DLDS	L1788272-1, -2, -3, -4, -5, -6, -7
Duplicate	Nitrite (as N)	DLDS	L1788272-1, -2, -3, -4, -5, -6, -7
Duplicate	Nitrate (as N)	DLDS	L1788272-1, -2, -3, -4, -5, -6, -7
Duplicate	Nitrite (as N)	DLDS	L1788272-8
Matrix Spike	Total Organic Carbon	MS-B	L1788272-1
Matrix Spike	Total Organic Carbon	MS-B	L1788272-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L1788272-1
Matrix Spike	Phosphorus (P)-Total	MS-B	L1788272-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Total Kjeldahl Nitrogen	MS-B	L1788272-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Total Nitrogen	MS-B	L1788272-4
Duplicate	Total Kjeldahl Nitrogen	TKND	L1788272-1, -2, -3, -4, -5, -6, -7, -8

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
TKND	TKN duplication was poor due to interference from high nitrate, which causes negative bias on TKN.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA	Water	Chlorophyll a by Fluorometer	EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

Reference Information

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-473213

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Short Holding Time

Rush Processing

ALS Environmental
www.alsglobal.com

L1788272-COFC

COC Number 14 - 473213

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	TETRA TECH EBA INC	Select Report Format:	PDF EXCEL EDD (DIGITAL)	R Regular (Standard TAT if received by 3pm)
Contact:	DANIELLE MACDONALD	Quality Control (QC) Report with Report	Yes No	P Priority (2-4 business days if received by 3pm)
Address:	14940-123 AVE EDMONTON AB T5V 1B4	Criteria on Report - provide details below if box checked		E Emergency (1-2 business days if received by 3pm)
Phone:	780 886 3055	Select Distribution:	EMAIL MAIL FAX	E2 Same day or weekend emergency if received by 10am – contact ALS for surcharge.
		Email 1 or Fax	danielle.macdonald@tetratech.com	Specify Date Required for E2, E or P:
		Email 2	pgauthier2014@hotmail.com	

Invoice To		Invoice Distribution	
	Same as Report To: Yes No	Select Invoice Distribution:	EMAIL MAIL FAX
	Copy of Invoice with Report: Yes No		
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q55655	Approver ID:	Cost Center:
Job #:	VENVO3118-01	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L1788272

ALS Contact: BRENT MACK

Sampler: D. MACDONALD, P. Gauthier

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	As per Q55655:	Routine	TOC (F)	Ammonia (F)	TKN (F)	Total P (F)	DOC (F/P)	Chlorophyll a (250mL filtered)	Number of Containers
	W - Deep	June 22 2016	9:00	water		X	X	X	X	X	X	X	4
	PD1		16:20	WATER		X	X	X	X	X	X	X	4
	PR3		10:00	WATER		X	X	X	X	X	X	X	4
	PINE		16:40	WATER		X	X	X	X	X	X	X	4
	HU		13:00	WATER		X	X	X	X	X	X	X	4
	HDD		11:46	WATER		X	X	X	X	X	X	X	4
	PR2		11:30	WATER		X	X	X	X	X	X	X	4

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? Yes No — surface water	* Please add ~~Brent~~ dave.hunter@bchydro.com
Are samples for human drinking water use? Yes No	* BC prov. drinking water guidelines
	* chlorophyll a → 250 mL filtered

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen		SIF Observations	Yes	No	
Ice packs	Yes No	Custody seal intact	Yes	No	
Cooling Initiated					

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
8					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	JUNE 22/16	6:56	Geoff	June 22/16	18:56			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1 If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 25-JUN-16
Report Date: 04-JUL-16 15:14 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1789101

Project P.O. #: NOT SUBMITTED
Job Reference: VENV0309S-02
C of C Numbers: 14-473202
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1789101-1	L1789101-2	L1789101-3	L1789101-4	L1789101-5
Description	Water	Water	Water	Water	Water
Sampled Date	24-JUN-16	24-JUN-16	24-JUN-16	24-JUN-16	24-JUN-16
Sampled Time	18:40	18:50	16:06	11:00	19:30
Client ID	PAP-RB	PAP-LB	PAT-LB	PAM-LB	PAM-RB
Grouping **Analyte**					
WATER					
Physical Tests Total Suspended Solids (ug/L)	236000	25000	29900	28200	21100

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1789101-6				
	Description	Water				
	Sampled Date	24-JUN-16				
	Sampled Time	12:40				
	Client ID	SPECTRA				
Grouping	**Analyte**					
WATER						
Physical Tests	Total Suspended Solids (ug/L)	101000				

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-473202

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1789101-COFC

COC Number: 14 - 473202

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Danielle MacDonald	Select Report Format:	PDF EXCEL EDD (DIGITAL)	R Regular (Standard TAT if received by 3pm)
Contact:	TetraTech EBA Inc	Quality Control (QC) Report with Report	Yes No	P Priority (2-4 business days if received by 3pm)
Address:	14940-123 AVE EDMONTON T5V 1B4	Create an Report - provide details below if box checked		E Emergency (1-2 business days if received by 3pm)
		Select Distribution:	EMAIL MAIL FAX	E2 Same day or weekend emergency if received by 10am – contact ALS for surcharge.
Phone:	780-886 3055	Email 1 or Fax	danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2	dave.hunter@bchydro.com	

Invoice To		Invoice Distribution	
	Same as Report To: Yes No	Select Invoice Distribution:	EMAIL MAIL FAX
	Copy of Invoice with Report: Yes No		
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:		Approver ID:	Cost Center:
Job #:	VENV03095-02	G/L Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L1789101

ALS Contact: BRENT MACK

Sampler: D. MACDONALD

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TSS	Number of Containers
	PAP-RB	June 24	18:40	Water	X	1
	PAP-LB	2016	18:50		X	1
	PAT-LB		16:00		X	1
	PAM-LB		11:00		X	1
	PAM-RB		19:30		X	1
	SPECTRA		12:40		X	1

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report
Are samples taken from a Regulated DW System? Yes No — surface water	CCME CDN DRINKING WATER QUALITY GUIDELINES
Are samples for human drinking water use? Yes No	

LE CONDITION AS RECEIVED (lab use only)

Frozen		SIF Observations	Yes	No	
Ice packs	Yes No	Custody seal intact	Yes	No	
Cooling Initiated					

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
6	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Danielle MacDon	June 24/16	20:30	GEOFF	June 25/16	11:00	DG	June 26	11:30am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

2016

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

1.6°C

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 25-JUN-16
Report Date: 13-JUL-16 10:21 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1789102

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03118-01
C of C Numbers: 14-473203
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1789102-1				
	Description	Water				
	Sampled Date	24-JUN-16				
	Sampled Time	19:15				
	Client ID	MOBERLY DOWNSTREAM				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	28.7				
	pH (pH)	8.00				
	Total Suspended Solids (ug/L)	914000				
	Total Dissolved Solids (ug/L)	172000				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (ug/L)	104000				
	Ammonia, Total (as N) (ug/L)	21.3				
	Nitrate and Nitrite (as N) (ug/L)	40.7				
	Nitrate (as N) (ug/L)	40.7				
	Nitrite (as N) (ug/L)	<1.0				
	Total Kjeldahl Nitrogen (ug/L)	1720 RRV				
	Total Nitrogen (ug/L)	860 DLM				
	Orthophosphate-Dissolved (as P) (ug/L)	4.4				
	Phosphorus (P)-Total Dissolved (ug/L)	8.7				
	Phosphorus (P)-Total (ug/L)	950				
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	8870				
	Total Organic Carbon (ug/L)	23100				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Nitrite (as N)	DLDS	L1789102-1
Duplicate	Nitrite (as N)	DLDS	L1789102-1
Duplicate	Nitrate (as N)	DLDS	L1789102-1
Matrix Spike	Total Nitrogen	MS-B	L1789102-1
Matrix Spike	Total Nitrogen	MS-B	L1789102-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-473203

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1789102-COFC

COC Number: 14 - 473203

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	TetraTECH EBA INC	Select Report Format:	☑ PDF ☑ EXCEL ☐ LDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3pm)
Contact:	DANIELLE MACDONALD	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 business days if received by 3pm)
Address:	14940-123 AVE EDMONTON AB T5V 1B4	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 business days if received by 3pm)
		Select Distribution:	☑ EMAIL ☑ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency if received by 10am – contact ALS for surcharge.
Phone:	780 886 3055	Email 1 or Fax	danielle.macdonald@tetratech.com	Specify Date Required for E2, E or P:
		Email 2	dave.hunter@bchydro.com	

Invoice To		Invoice Distribution	
	Same as Report To ☐ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☐ Yes ☐ No		
Company		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q55655	Approver ID:	Cost Center:
Job #:	VENV03118-01	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)	L1789102	ALS Contact:	BRENT MACK	Sampler:	D. MacDonald

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	As Per Q55655	Routine	TDC (P)	TKN	Total Nitrogen	Total Phosphorous	Ammonia	DOC F/P	Number of Containers
	Moberly Downstream (MD)	June 24	19:15	water		X	X	X	X	X	X	X	3

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No Surface water	BC Prov. Drinking water guidelines
Are samples for human drinking water use? ☐ Yes ☐ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐			SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐		Custody seal intact	Yes ☐	No ☐	
Cooling Initiated	☐						

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
6							

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
D. MacDonald	June 24/16	20:30	Geoff	June 25/16	11:00		June 26 2016	11:30am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

1.6°C

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 20-SEP-16
Report Date: 04-OCT-16 17:06 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1831599

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03118
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1831599-1	L1831599-2	L1831599-3	L1831599-4	L1831599-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	20-SEP-16	20-SEP-16	20-SEP-16	20-SEP-16	20-SEP-16
	Sampled Time	08:20	08:45	08:48	09:09	09:20
	Client ID	PEACE AT BEATTON (PD2)	BEATTON RIVER (BEATTON)	DUPLICATE 2 (DUP2)	PEACE AT KISKATINAW (PD3)	KISKATINAW RIVER (KR)
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	6.9	307	311	11.2	48.9
	Conductivity (uS/cm)	182	162	162	188	340
	pH (pH)	8.08	7.44	7.43	8.09	8.41
	Total Suspended Solids (ug/L)	61600	136000	148000	65800	98400
	Total Dissolved Solids (ug/L)	127000	222000	208000	127000	288000
	Turbidity (NTU)	22.6	122	125	26.1	147
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	87800	37100	36800	89800	180000
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	6800
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	<1000
	Alkalinity, Total (as CaCO3) (ug/L)	87800	37100	36800	89800	187000
	Ammonia, Total (as N) (ug/L)	<5.0	13.8	14.5	5.1	32.8
	Bromide (Br) (ug/L)	<50	<50	<50	<50	<50
	Chloride (Cl) (ug/L)	<500	620	620	<500	620
	Fluoride (F) (ug/L)	36	66	65	38	73
	Nitrate and Nitrite (as N) (ug/L)	48.8	6.3	5.2	46.5	37.6
	Nitrate (as N) (ug/L)	48.8	6.3	5.2	46.5	33.2
	Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0	<1.0	4.3
	Total Kjeldahl Nitrogen (ug/L)	157	1230	1230	135	790
	Total Nitrogen (ug/L)	149	1020	1060	145	579 RRV
	Orthophosphate-Dissolved (as P) (ug/L)	1.6	10.9	11.7	1.3	3.9
	Phosphorus (P)-Total (ug/L)	43.8	169	160	44.0	129
	Silicate (as SiO2) (ug/L)	4300	7010	6750	4350	5130
	Sulfate (SO4) (ug/L)	14700	40300	40200	15100	14000
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	8600 RRV	50700	48800	9200 RRV	18300
	Total Organic Carbon (ug/L)	4400 RRV	47400	47200	4700 RRV	17400

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1831599-6	L1831599-7	L1831599-8		
	Description	Water	Water	Water		
	Sampled Date	20-SEP-16	20-SEP-16	20-SEP-16		
	Sampled Time	09:52	10:15	11:40		
	Client ID	PEACE AT POUCE COUPE (PD4)	POUCE COUPE (POUCE)	PEACE AT MANY ISLAND (PD5)		
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	21.0	156	24.8		
	Conductivity (uS/cm)	191	374	193		
	pH (pH)	8.09	7.94	8.04		
	Total Suspended Solids (ug/L)	114000	88900	127000		
	Total Dissolved Solids (ug/L)	132000	345000	135000		
	Turbidity (NTU)	34.0	116	37.1		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	90600	115000	91500		
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000	<1000	<1000		
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000	<1000	<1000		
	Alkalinity, Total (as CaCO3) (ug/L)	90600	115000	91500		
	Ammonia, Total (as N) (ug/L)	5.5	32.7	<5.0		
	Bromide (Br) (ug/L)	<50	<50	<50		
	Chloride (Cl) (ug/L)	<500	3020	<500		
	Fluoride (F) (ug/L)	40	113	42		
	Nitrate and Nitrite (as N) (ug/L)	45.0	110	43.6		
	Nitrate (as N) (ug/L)	45.0	101	43.6		
	Nitrite (as N) (ug/L)	<1.0	9.2	<1.0		
	Total Kjeldahl Nitrogen (ug/L)	198	1410	238		
	Total Nitrogen (ug/L)	195	1300	206		
	Orthophosphate-Dissolved (as P) (ug/L)	2.5	10.9	2.3		
	Phosphorus (P)-Total (ug/L)	53.0	151	80.6		
	Silicate (as SiO2) (ug/L)	4310	5820	4350		
	Sulfate (SO4) (ug/L)	16000	85900	17300		
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	10000 RRV	36800	7500		
	Total Organic Carbon (ug/L)	6900 RRV	37000	6400		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L1831599-2, -3, -5, -7, -8
Matrix Spike	Dissolved Organic Carbon	MS-B	L1831599-2, -3, -5, -7, -8
Matrix Spike	Total Organic Carbon	MS-B	L1831599-2, -3, -5, -7, -8
Matrix Spike	Total Organic Carbon	MS-B	L1831599-2, -3, -5, -7, -8
Matrix Spike	Total Organic Carbon	MS-B	L1831599-1, -4, -6
Matrix Spike	Fluoride (F)	MS-B	L1831599-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Total Nitrogen	MS-B	L1831599-1, -2, -3, -4, -6, -7, -8
Matrix Spike	Sulfate (SO4)	MS-B	L1831599-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sulfate (SO4)	MS-B	L1831599-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sulfate (SO4)	MS-B	L1831599-1, -2, -3, -4, -5, -6, -7, -8

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

Reference Information

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1831599-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm – business days)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	14940-123 Ave NW Edmonton, AB T5V 1B4	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
		Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	780-886-3055	Email 1 or Fax	danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2	pgauthier2014@hotmail.com	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	danielle.macdonald@tetratech.com
Contact:			

Project Information		Oil and Gas Required Fields (client use)			
ALS Quote #:	Q53931	Approver ID:		Cost Center:	
Job #:	VENV03118	GL Account:		Routing Code:	
PO / AFE:		Activity Code:			
LSD:		Location:			

ALS Lab Work Order # (lab use only): L1831599 | ALS Contact: Brent Mack | Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	Nutrients (P)	DOC (F/P)	Number of Containers
	Peace at Beatton (PD2)	20-09-16	8:20	Water	R	R	R	R	R	3
	Beatton River (Beatton)	20-09-16	8:45	Water	R	R	R	R	R	3
	Duplicate 2 (DUP 2)	20-09-16	8:48	Water	R	R	R	R	R	3
	Peace at Kiskatinaw (PD3)	20-09-16	9:09	Water	R	R	R	R	R	3
	Kiskatinaw River (KR)	20-09-16	9:20	Water	R	R	R	R	R	3
	Peace at Pouce Coupe (PD4)	20-09-16	9:52	Water	R	R	R	R	R	3
	Pouce Coupe (Pouce)	20-09-16	10:15	Water	R	R	R	R	R	3
	Peace at Many Islands (PD5)	20-09-16	11:40	Water	R	R	R	R	R	3

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No Are samples for human drinking water use? ☐ Yes ☑ No	Please use criteria: BC Approved Water Quality Guidelines; samples were taken from surface water

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
8°C					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: Sept 20/16	Time: 4:15	Received by: Amy Gallant	Date: Sept 20/16	Time: 4:15	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

[1] If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 21-SEP-16
Report Date: 03-OCT-16 18:25 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1832388

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03095
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1832388-1	L1832388-2	L1832388-3	L1832388-4	
	Description	Water	Water	Water	Water	
	Sampled Date	21-SEP-16	21-SEP-16	21-SEP-16	21-SEP-16	
	Sampled Time	08:55	08:40	09:20	09:41	
	Client ID	MOBERLY RIVER - DOWNSTREAM (MD)	LOWER SITE C RESERVOIR (PR3)	PEACE AT PINE (PD1)	PINE RIVER (PINE)	
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	27.9	7.0	6.5	9.6	
	Conductivity (uS/cm)	205	171	176	249	
	Hardness (as CaCO3) (ug/L)		86400		137000	
	pH (pH)	8.10	8.04	8.06	8.20	
	Total Suspended Solids (ug/L)	40200	22200	36900	17500	
	Total Dissolved Solids (ug/L)	156000		126000		
	TDS (Calculated) (ug/L)		96600		149000	
	Turbidity (NTU)	48.1	11.3	16.8	13.5	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	108000	82300	84200	125000	
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	
	Alkalinity, Total (as CaCO3) (ug/L)	108000	82300	84200	125000	
	Ammonia, Total (as N) (ug/L)	5.5	<5.0	5.1	<5.0	
	Bromide (Br) (ug/L)	<50	<50	<50	<50	
	Chloride (Cl) (ug/L)	<500	<500	<500	640	
	Fluoride (F) (ug/L)	73	40	43	62	
	Nitrate and Nitrite (as N) (ug/L)	35.4	48.9	47.7	22.3	
	Nitrate (as N) (ug/L)	35.4	48.9	47.7	22.3	
	Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0	<1.0	
	Total Kjeldahl Nitrogen (ug/L)	324	120	140	148	
	Total Nitrogen (ug/L)	311	129	150	133	
	Orthophosphate-Dissolved (as P) (ug/L)	2.5	2.4	1.5	<1.0	
	Phosphorus (P)-Total Dissolved (ug/L)	5.9	3.1	2.9	2.6	
	Phosphorus (P)-Total (ug/L)	42.4	15.2	27.8	18.3	
	Silicate (as SiO2) (ug/L)	3270	4080	4160	2230	
	Sulfate (SO4) (ug/L)	10200	12900	14800	18600	
	Anion Sum (meq/L)		1.92		2.91	
	Cation Sum (meq/L)		1.73		2.84	
	Cation - Anion Balance (%)		-5.3		-1.3	
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	10200	8300 RRV	6300 RRV	5900 RRV	
	Total Organic Carbon (ug/L)	8300	3100 RRV	3800 RRV	3300 RRV	
Bacteriological Tests	E. coli (MPN/100mL)		5		1	
	HPC (CFU/1mL)		64 PEHR		48 PEHR	
	Coliform Bacteria - Total (MPN/100mL)		201		111	
Total Metals	Aluminum (Al)-Total (ug/L)		264		449	
	Antimony (Sb)-Total (ug/L)		<0.50		<0.50	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1832388-1	L1832388-2	L1832388-3	L1832388-4	
Description	Water	Water	Water	Water	
Sampled Date	21-SEP-16	21-SEP-16	21-SEP-16	21-SEP-16	
Sampled Time	08:55	08:40	09:20	09:41	
Client ID	MOBERLY RIVER - DOWNSTREAM (MD)	LOWER SITE C RESERVOIR (PR3)	PEACE AT PINE (PD1)	PINE RIVER (PINE)	
Grouping **Analyte**					
WATER					
Total Metals Arsenic (As)-Total (ug/L)		<0.50		<0.50	
Barium (Ba)-Total (ug/L)		40		94	
Beryllium (Be)-Total (ug/L)		<1.0		<1.0	
Bismuth (Bi)-Total (ug/L)		<200		<200	
Boron (B)-Total (ug/L)		<100		<100	
Cadmium (Cd)-Total (ug/L)		0.0399		0.0377	
Calcium (Ca)-Total (ug/L)		26800		39200	
Chromium (Cr)-Total (ug/L)		<1.0		<1.0	
Cobalt (Co)-Total (ug/L)		<0.30		0.46	
Copper (Cu)-Total (ug/L)		<1.5 DLB		<2.0 DLB	
Iron (Fe)-Total (ug/L)		423		886	
Lead (Pb)-Total (ug/L)		<0.50		<0.50	
Lithium (Li)-Total (ug/L)		1.4		5.9	
Magnesium (Mg)-Total (ug/L)		6020		9560	
Manganese (Mn)-Total (ug/L)		8.28		19.9	
Mercury (Hg)-Total (ug/L)		0.0058		0.0068	
Molybdenum (Mo)-Total (ug/L)		<1.0		<1.0	
Nickel (Ni)-Total (ug/L)		<1.5 DLB		<2.5 DLB	
Phosphorus (P)-Total (ug/L)		<300		<300	
Potassium (K)-Total (ug/L)		<2000		<2000	
Selenium (Se)-Total (ug/L)		0.234		0.449	
Silicon (Si)-Total (ug/L)		2560		1830	
Silver (Ag)-Total (ug/L)		<0.020		<0.020	
Sodium (Na)-Total (ug/L)		<2000		2500	
Strontium (Sr)-Total (ug/L)		101		126	
Thallium (Tl)-Total (ug/L)		<0.20		<0.20	
Tin (Sn)-Total (ug/L)		<0.50		<0.50	
Titanium (Ti)-Total (ug/L)		<10		<10	
Uranium (U)-Total (ug/L)		0.40		0.31	
Vanadium (V)-Total (ug/L)		1.39		1.67	
Zinc (Zn)-Total (ug/L)		<5.0		10.7	
Dissolved Metals Dissolved Mercury Filtration Location		FIELD		FIELD	
Dissolved Metals Filtration Location		FIELD		FIELD	
Aluminum (Al)-Dissolved (ug/L)		<5.0		16.1	
Antimony (Sb)-Dissolved (ug/L)		<0.50		<0.50	
Arsenic (As)-Dissolved (ug/L)		<0.50		<0.50	
Barium (Ba)-Dissolved (ug/L)		34		85	

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1832388-1	L1832388-2	L1832388-3	L1832388-4	
	Description	Water	Water	Water	Water	
	Sampled Date	21-SEP-16	21-SEP-16	21-SEP-16	21-SEP-16	
	Sampled Time	08:55	08:40	09:20	09:41	
	Client ID	MOBERLY RIVER - DOWNSTREAM (MD)	LOWER SITE C RESERVOIR (PR3)	PEACE AT PINE (PD1)	PINE RIVER (PINE)	
Grouping	**Analyte**					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (ug/L)		<1.0		<1.0	
	Bismuth (Bi)-Dissolved (ug/L)		<200		<200	
	Boron (B)-Dissolved (ug/L)		<100		<100	
	Cadmium (Cd)-Dissolved (ug/L)		0.0065		0.0097	
	Calcium (Ca)-Dissolved (ug/L)		25300		39400	
	Chromium (Cr)-Dissolved (ug/L)		<1.0		<1.0	
	Cobalt (Co)-Dissolved (ug/L)		<0.30		<0.30	
	Copper (Cu)-Dissolved (ug/L)		<1.0		1.1	
	Iron (Fe)-Dissolved (ug/L)		<30		<30	
	Lead (Pb)-Dissolved (ug/L)		<0.50		<0.50	
	Lithium (Li)-Dissolved (ug/L)		1.1		5.4	
	Magnesium (Mg)-Dissolved (ug/L)		5620		9280	
	Manganese (Mn)-Dissolved (ug/L)		0.65		7.89	
	Mercury (Hg)-Dissolved (ug/L)		<0.0050		<0.0050	
	Molybdenum (Mo)-Dissolved (ug/L)		<1.0		<1.0	
	Nickel (Ni)-Dissolved (ug/L)		<1.0		<1.0	
	Phosphorus (P)-Dissolved (ug/L)		<300		<300	
	Potassium (K)-Dissolved (ug/L)		<2000		<2000	
	Selenium (Se)-Dissolved (ug/L)		0.217		0.462	
	Silicon (Si)-Dissolved (ug/L)		2000		1100	
	Silver (Ag)-Dissolved (ug/L)		<0.020		<0.020	
	Sodium (Na)-Dissolved (ug/L)		<2000		2400	
	Strontium (Sr)-Dissolved (ug/L)		102		128	
	Thallium (Tl)-Dissolved (ug/L)		<0.20		<0.20	
	Tin (Sn)-Dissolved (ug/L)		<0.50		<0.50	
	Titanium (Ti)-Dissolved (ug/L)		<10		<10	
	Uranium (U)-Dissolved (ug/L)		0.36		0.27	
	Vanadium (V)-Dissolved (ug/L)		<0.50		<0.50	
	Zinc (Zn)-Dissolved (ug/L)		<5.0		<5.0	
Volatile Organic Compounds	Benzene (ug/L)		<0.50		<0.50	
	Ethylbenzene (ug/L)		<0.50		<0.50	
	Methyl t-butyl ether (MTBE) (ug/L)		<0.50		<0.50	
	Styrene (ug/L)		<0.50		<0.50	
	Toluene (ug/L)		<0.50		<0.50	
	ortho-Xylene (ug/L)		<0.50		<0.50	
	meta- & para-Xylene (ug/L)		<0.50		<0.50	
	Xylenes (ug/L)		<0.75		<0.75	

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1832388-1	L1832388-2	L1832388-3	L1832388-4	
	Description	Water	Water	Water	Water	
	Sampled Date	21-SEP-16	21-SEP-16	21-SEP-16	21-SEP-16	
	Sampled Time	08:55	08:40	09:20	09:41	
	Client ID	MOBERLY RIVER - DOWNSTREAM (MD)	LOWER SITE C RESERVOIR (PR3)	PEACE AT PINE (PD1)	PINE RIVER (PINE)	
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Surrogate: 4-Bromofluorobenzene (SS) (%)		99.2		99.0	
	Surrogate: 1,4-Difluorobenzene (SS) (%)		102.3		102.5	
Organochlorine Pesticides	Aldrin (ug/L)		<0.050		<0.050	
	alpha-BHC (ug/L)		<0.050		<0.050	
	beta-BHC (ug/L)		<0.10		<0.10	
	Lindane (gamma - BHC) (ug/L)		<0.010		<0.010	
	delta-BHC (ug/L)		<0.050		<0.050	
	cis-Chlordane (alpha) (ug/L)		<0.050		<0.050	
	trans-Chlordane (gamma) (ug/L)		<0.050		<0.050	
	2,4'-DDD (ug/L)		<0.0050		<0.0050	
	4,4'-DDD (ug/L)		<0.0050		<0.0050	
	2,4'-DDE (ug/L)		<0.0050		<0.0050	
	4,4'-DDE (ug/L)		<0.0050		<0.0050	
	2,4'-DDT (ug/L)		<0.0050		<0.0050	
	4,4'-DDT (ug/L)		<0.0050		<0.0050	
	Dieldrin (ug/L)		<0.050		<0.050	
	Endosulfan I (ug/L)		<0.0020		<0.0020	
	Endosulfan II (ug/L)		<0.0020		<0.0020	
	Endosulfan Sulfate (ug/L)		<0.0020		<0.0020	
	Endrin (ug/L)		<0.020		<0.020	
	Heptachlor (ug/L)		<0.10		<0.10	
	Heptachlor Epoxide (ug/L)		<0.0030		<0.0030	
	Methoxychlor (ug/L)		<0.030		<0.030	
	Mirex (ug/L)		<0.050		<0.050	
	cis-Nonachlor (ug/L)		<0.050		<0.050	
	trans-Nonachlor (ug/L)		<0.050		<0.050	
	Oxychlordane (ug/L)		<0.050		<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Chromium (Cr)-Total	MB-LOR	L1832388-2, -4
Method Blank	Copper (Cu)-Total	MB-LOR	L1832388-2, -4
Method Blank	Manganese (Mn)-Total	MB-LOR	L1832388-2, -4
Method Blank	Nickel (Ni)-Total	MB-LOR	L1832388-2, -4
Matrix Spike	Dissolved Organic Carbon	MS-B	L1832388-1, -2, -3, -4
Matrix Spike	Total Organic Carbon	MS-B	L1832388-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1832388-2, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1832388-2, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1832388-2, -4
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1832388-2, -4
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1832388-2, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1832388-2, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA Water HPC by pour plate APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

OCP1-LL-SF-ECD-VA Water OCP-1 in Water by GCECD EPA METHODS 3510, 3630, 3660, 8081

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3630, 3660 and 8081, published by the United States Environmental Protection Agency (EPA). The procedure involves extraction of the entire water sample with dichloromethane. The extract then undergoes one or more of the following clean-up procedures (if required): silica gel clean-up and/or sulphur clean-up. The final extract is analyzed by dual capillary column gas chromatography with electron capture detection (GC/ECD).

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA Water Total coliform by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C

Reference Information

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1832388-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech	Select Report Format: ☑PDF ☑EXCEL ☑EDD (DIGITAL)	R ☑Regular (Standard TAT if received by 3 pm - business days)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	14940-123 Ave NW Edmonton, AB T5V 1B4	☑Criteria on Report - provide details below if box checked Select Distribution: ☑EMAIL ☐MAIL ☐FAX	E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	780-886-3055	Email 1 or Fax: danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2: pgauthier2014@hotmail.com	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	Analysis Request
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑EMAIL ☐MAIL ☐FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Company:		Email 1 or Fax: ebaaccountspayable@tetratech.com	
Contact:		Email 2: danielle.macdonald@tetratech.com	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENV03095	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L1832388 | ALS Contact: Brent Mack | Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3 (P)	DOC (F/P)	Total Metals (CSR+ICP+Hardness) & Hg (P)	Dissolved Metals (CSR+ICP+Hardness) & H (F/P)	Total Coliform, E. coli, HPC (P)	Pesticides (OCP1)	BTEX (P)	Number of Containers
	Moberly River - Downstream (MD)	21-09-16	8:55	Water	R	R	R	R	R						
	Lower Site C Reservoir (PR3)	21-09-16	8:40	Water	R	R	R	R	R	R	R	R	R	R	
	Peace at Pine (PD1)	21-09-16	9:20	Water	R	R	R	R	R						
	Pine River (Pine)	21-09-16	9:41	Water	R	R	R	R	R	R	R	R	R	R	

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: CCME Water Quality Guidelines for the Protection of Aquatic Life
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐	SIF Observations Yes ☐ No ☐		
Ice packs Yes ☑ No ☐	Custody seal intact Yes ☐ No ☐		
Cooling Initiated ☑			
INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C	
10			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	Sept 21/16	11:25	Geoff	Sep 24/16	11:15			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 21-SEP-16
Report Date: 03-OCT-16 18:29 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1832389

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03095
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1832389-1 Water 21-SEP-16 15:02 HALFWAY RIVER - DOWNSTREAM (HD)	L1832389-2 Water 21-SEP-16 14:22 MIDDLE SITE D RESERVOIR (PR2)	L1832389-3 Water 21-SEP-16 13:20 PEACE CANYON (PC1)	L1832389-4 Water 21-SEP-16 13:45 UPPER SITE C RESERVOIR (PR1)	
WATER						
Physical Tests	Colour, True (CU)	19.4	6.0	7.0	6.4	
	Conductivity (uS/cm)	400	164	164	164	
	Hardness (as CaCO3) (ug/L)	225000	82300		83300	
	pH (pH)	8.30	8.03	8.03	7.97	
	Total Suspended Solids (ug/L)	35300	22500	5800	3600	
	Total Dissolved Solids (ug/L)			87000		
	TDS (Calculated) (ug/L)	249000	91600		91800	
	Turbidity (NTU)	30.0	6.22	3.27	3.36	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	176000	78900	80300	78900	
	Alkalinity, Carbonate (as CaCO3) (ug/L)	2200	<1000	<1000	<1000	
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	
	Alkalinity, Total (as CaCO3) (ug/L)	178000	78900	80300	78900	
	Ammonia, Total (as N) (ug/L)	<5.0	<5.0	<5.0	<5.0	
	Bromide (Br) (ug/L)	<50	<50	<50	<50	
	Chloride (Cl) (ug/L)	<500	<500	<500	<500	
	Fluoride (F) (ug/L)	100	38	37	37	
	Nitrate and Nitrite (as N) (ug/L)	<5.1	46.9	50.9	50.8	
	Nitrate (as N) (ug/L)	<5.0	46.9	50.9	50.8	
	Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0	<1.0	
	Total Kjeldahl Nitrogen (ug/L)	220	101	95	100	
	Total Nitrogen (ug/L)	164	122	116	119	
	Orthophosphate-Dissolved (as P) (ug/L)	2.2	1.1	1.0	1.2	
	Phosphorus (P)-Total Dissolved (ug/L)	5.4	<2.0	<2.0	<2.0	
	Phosphorus (P)-Total (ug/L)	27.7	14.3	6.6	7.2	
	Silicate (as SiO2) (ug/L)	3730	4200	4410	4190	
	Sulfate (SO4) (ug/L)	54400	11700	11600	11600	
	Anion Sum (meq/L)	4.70	1.83		1.82	
	Cation Sum (meq/L)	4.62	1.64		1.66	
	Cation - Anion Balance (%)	-0.8	-5.2		-4.6	
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	9400 RRV	6700 RRV	6800 RRV	6200 RRV	
	Total Organic Carbon (ug/L)	5900 RRV	2900 RRV	2700 RRV	2800 RRV	
Bacteriological Tests	E. coli (MPN/100mL)	5	2		4	
	HPC (CFU/1mL)	72	25		44	
	Coliform Bacteria - Total (MPN/100mL)	276	91		225	
Total Metals	Aluminum (Al)-Total (ug/L)	748	122		87.6	
	Antimony (Sb)-Total (ug/L)	<0.50	<0.50		<0.50	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1832389-1	L1832389-2	L1832389-3	L1832389-4	
	Description	Water	Water	Water	Water	
	Sampled Date	21-SEP-16	21-SEP-16	21-SEP-16	21-SEP-16	
	Sampled Time	15:02	14:22	13:20	13:45	
	Client ID	HALFWAY RIVER - DOWNSTREAM (HD)	MIDDLE SITE D RESERVOIR (PR2)	PEACE CANYON (PC1)	UPPER SITE C RESERVOIR (PR1)	
Grouping	**Analyte**					
WATER						
Total Metals	Arsenic (As)-Total (ug/L)	0.68	<0.50		<0.50	
	Barium (Ba)-Total (ug/L)	115	33		31	
	Beryllium (Be)-Total (ug/L)	<1.0	<1.0		<1.0	
	Bismuth (Bi)-Total (ug/L)	<200	<200		<200	
	Boron (B)-Total (ug/L)	<100	<100		<100	
	Cadmium (Cd)-Total (ug/L)	0.0795	0.0319		0.0226	
	Calcium (Ca)-Total (ug/L)	63500	25800		25300	
	Chromium (Cr)-Total (ug/L)	1.3	<1.0		<1.0	
	Cobalt (Co)-Total (ug/L)	0.59	<0.30		<0.30	
	Copper (Cu)-Total (ug/L)	<2.5 DLB	<1.5 DLB		<1.5 DLB	
	Iron (Fe)-Total (ug/L)	1290	194		129	
	Lead (Pb)-Total (ug/L)	0.55	<0.50		<0.50	
	Lithium (Li)-Total (ug/L)	8.0	<1.0		<1.0	
	Magnesium (Mg)-Total (ug/L)	17700	5680		5530	
	Manganese (Mn)-Total (ug/L)	23.8	5.04		3.15	
	Mercury (Hg)-Total (ug/L)	0.0069	0.0052		0.0055	
	Molybdenum (Mo)-Total (ug/L)	3.8	<1.0		<1.0	
	Nickel (Ni)-Total (ug/L)	3.4	<1.0		<1.0	
	Phosphorus (P)-Total (ug/L)	<300	<300		<300	
	Potassium (K)-Total (ug/L)	<2000	<2000		<2000	
	Selenium (Se)-Total (ug/L)	1.38	0.209		0.205	
	Silicon (Si)-Total (ug/L)	3250	2270		2220	
	Silver (Ag)-Total (ug/L)	<0.020	<0.020		<0.020	
	Sodium (Na)-Total (ug/L)	3200	<2000		<2000	
	Strontium (Sr)-Total (ug/L)	318	100		99.2	
	Thallium (Tl)-Total (ug/L)	<0.20	<0.20		<0.20	
	Tin (Sn)-Total (ug/L)	<0.50	<0.50		<0.50	
	Titanium (Ti)-Total (ug/L)	17	<10		<10	
	Uranium (U)-Total (ug/L)	0.78	0.38		0.37	
	Vanadium (V)-Total (ug/L)	3.51	0.80		0.62	
	Zinc (Zn)-Total (ug/L)	8.5	<5.0		<5.0	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD		FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD		FIELD	
	Aluminum (Al)-Dissolved (ug/L)	14.0	<5.0		<5.0	
	Antimony (Sb)-Dissolved (ug/L)	<0.50	<0.50		<0.50	
	Arsenic (As)-Dissolved (ug/L)	<0.50	<0.50		<0.50	
	Barium (Ba)-Dissolved (ug/L)	92	32		32	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1832389-1 Water 21-SEP-16 15:02 HALFWAY RIVER - DOWNSTREAM (HD)	L1832389-2 Water 21-SEP-16 14:22 MIDDLE SITE D RESERVOIR (PR2)	L1832389-3 Water 21-SEP-16 13:20 PEACE CANYON (PC1)	L1832389-4 Water 21-SEP-16 13:45 UPPER SITE C RESERVOIR (PR1)	
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (ug/L)	<1.0	<1.0		<1.0	
	Bismuth (Bi)-Dissolved (ug/L)	<200	<200		<200	
	Boron (B)-Dissolved (ug/L)	<100	<100		<100	
	Cadmium (Cd)-Dissolved (ug/L)	0.0183	0.0074		0.0075	
	Calcium (Ca)-Dissolved (ug/L)	62600	24100		24400	
	Chromium (Cr)-Dissolved (ug/L)	<1.0	<1.0		<1.0	
	Cobalt (Co)-Dissolved (ug/L)	<0.30	<0.30		<0.30	
	Copper (Cu)-Dissolved (ug/L)	1.0	<1.0		1.0	
	Iron (Fe)-Dissolved (ug/L)	35	<30		<30	
	Lead (Pb)-Dissolved (ug/L)	<0.50	<0.50		<0.50	
	Lithium (Li)-Dissolved (ug/L)	6.9	<1.0		<1.0	
	Magnesium (Mg)-Dissolved (ug/L)	16700	5350		5410	
	Manganese (Mn)-Dissolved (ug/L)	7.07	0.42		0.49	
	Mercury (Hg)-Dissolved (ug/L)	<0.025 DLM	<0.025 DLM		<0.025 DLM	
	Molybdenum (Mo)-Dissolved (ug/L)	3.5	<1.0		<1.0	
	Nickel (Ni)-Dissolved (ug/L)	1.8	<1.0		<1.0	
	Phosphorus (P)-Dissolved (ug/L)	<300	<300		<300	
	Potassium (K)-Dissolved (ug/L)	<2000	<2000		<2000	
	Selenium (Se)-Dissolved (ug/L)	1.29	0.199		0.177	
	Silicon (Si)-Dissolved (ug/L)	1840	1990		2020	
	Silver (Ag)-Dissolved (ug/L)	<0.020	<0.020		<0.020	
	Sodium (Na)-Dissolved (ug/L)	2900	<2000		<2000	
	Strontium (Sr)-Dissolved (ug/L)	306	103		104	
	Thallium (Tl)-Dissolved (ug/L)	<0.20	<0.20		<0.20	
	Tin (Sn)-Dissolved (ug/L)	<0.50	<0.50		<0.50	
	Titanium (Ti)-Dissolved (ug/L)	<10	<10		<10	
	Uranium (U)-Dissolved (ug/L)	0.70	0.34		0.33	
	Vanadium (V)-Dissolved (ug/L)	<0.50	<0.50		<0.50	
	Zinc (Zn)-Dissolved (ug/L)	<5.0	<5.0		<5.0	
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50		<0.50	
	Ethylbenzene (ug/L)	<0.50	<0.50		<0.50	
	Methyl t-butyl ether (MTBE) (ug/L)	<0.50	<0.50		<0.50	
	Styrene (ug/L)	<0.50	<0.50		<0.50	
	Toluene (ug/L)	<0.50	<0.50		<0.50	
	ortho-Xylene (ug/L)	<0.50	<0.50		<0.50	
	meta- & para-Xylene (ug/L)	<0.50	<0.50		<0.50	
	Xylenes (ug/L)	<0.75	<0.75		<0.75	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1832389-1	L1832389-2	L1832389-3	L1832389-4	
	Description	Water	Water	Water	Water	
	Sampled Date	21-SEP-16	21-SEP-16	21-SEP-16	21-SEP-16	
	Sampled Time	15:02	14:22	13:20	13:45	
	Client ID	HALFWAY RIVER - DOWNSTREAM (HD)	MIDDLE SITE D RESERVOIR (PR2)	PEACE CANYON (PC1)	UPPER SITE C RESERVOIR (PR1)	
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Surrogate: 4-Bromofluorobenzene (SS) (%)	97.8	95.4		99.6	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	102.6	102.5		102.4	
Organochlorine Pesticides	Aldrin (ug/L)	<0.050	<0.050		<0.050	
	alpha-BHC (ug/L)	<0.050	<0.050		<0.050	
	beta-BHC (ug/L)	<0.10	<0.10		<0.10	
	Lindane (gamma - BHC) (ug/L)	<0.010	<0.010		<0.010	
	delta-BHC (ug/L)	<0.050	<0.050		<0.050	
	cis-Chlordane (alpha) (ug/L)	<0.050	<0.050		<0.050	
	trans-Chlordane (gamma) (ug/L)	<0.050	<0.050		<0.050	
	2,4'-DDD (ug/L)	<0.0050	<0.0050		<0.0050	
	4,4'-DDD (ug/L)	<0.0050	<0.0050		<0.0050	
	2,4'-DDE (ug/L)	<0.0050	<0.0050		<0.0050	
	4,4'-DDE (ug/L)	<0.0050	<0.0050		<0.0050	
	2,4'-DDT (ug/L)	<0.0050	<0.0050		<0.0050	
	4,4'-DDT (ug/L)	<0.0050	<0.0050		<0.0050	
	Dieldrin (ug/L)	<0.050	<0.050		<0.050	
	Endosulfan I (ug/L)	<0.0020	<0.0020		<0.0020	
	Endosulfan II (ug/L)	<0.0020	<0.0020		<0.0020	
	Endosulfan Sulfate (ug/L)	<0.0020	<0.0020		<0.0020	
	Endrin (ug/L)	<0.020	<0.020		<0.020	
	Heptachlor (ug/L)	<0.10	<0.10		<0.10	
	Heptachlor Epoxide (ug/L)	<0.0030	<0.0030		<0.0030	
	Methoxychlor (ug/L)	<0.030	<0.030		<0.030	
	Mirex (ug/L)	<0.050	<0.050		<0.050	
	cis-Nonachlor (ug/L)	<0.050	<0.050		<0.050	
	trans-Nonachlor (ug/L)	<0.050	<0.050		<0.050	
	Oxychlordane (ug/L)	<0.050	<0.050		<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Chromium (Cr)-Total	MB-LOR	L1832389-1, -2, -4
Method Blank	Copper (Cu)-Total	MB-LOR	L1832389-1, -2, -4
Method Blank	Manganese (Mn)-Total	MB-LOR	L1832389-1, -2, -4
Method Blank	Nickel (Ni)-Total	MB-LOR	L1832389-1, -2, -4
Matrix Spike	Dissolved Organic Carbon	MS-B	L1832389-1, -2, -3, -4
Matrix Spike	Total Organic Carbon	MS-B	L1832389-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1832389-1, -2, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1832389-1, -2, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1832389-1, -2, -4
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1832389-1, -2, -4
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1832389-1, -2, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1832389-1, -2, -4
Matrix Spike	Sulfate (SO4)	MS-B	L1832389-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

Reference Information

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA Water HPC by pour plate APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

OCP1-LL-SF-ECD-VA	Water	OCP-1 in Water by GCECD	EPA METHODS 3510, 3630, 3660, 8081

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3630, 3660 and 8081, published by the United States Environmental Protection Agency (EPA). The procedure involves extraction of the entire water sample with dichloromethane. The extract then undergoes one or more of the following clean-up procedures (if required): silica gel clean-up and/or sulphur clean-up. The final extract is analyzed by dual capillary column gas chromatography with electron capture detection (GC/ECD).

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA	Water	Total coliform by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

Reference Information

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1832389-COFC

COC Number 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech	Select Report Format: ☑PDF ☑EXCEL ☑EDD (DIGITAL)	R ☑Regular (Standard TAT if received by 3 pm - business days)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	14940-123 Ave NW Edmonton, AB T5V 1B4	☑Criteria on Report - provide details below if box checked Select Distribution: ☑EMAIL ☐MAIL ☐FAX	E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	780-886-3055	Email 1 or Fax danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2 pgauthier2014@hotmail.com	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑EMAIL ☐MAIL ☐FAX
Company:		Email 1 or Fax ebaaccountspayable@tetratech.com
Contact:		Email 2 danielle.macdonald@tetratech.com

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENV03095	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)	L1832389	ALS Contact: Brent Mack	Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	NH3,NO2,NO3,TKN,TN,TP,TDP,sol reactive	P TOC	F/P DOC	P Total Metals (CSR+ICP+Hardness) & Hg	F/P Dissolved Metals (CSR+ICP+Hardness) & Hg	P Pesticides (OCP1)	P BTEX	P Total Coliform, E. Coli, HPC			Number of Containers
	Halfway River - Downstream (HD)	21-09-16	15:02	Water	R	R	R	R	R	R	R	R	R	R	R			
	Middle Site C Reservoir (PR2)	21-09-16	14.22	Water	R	R	R	R	R	R	R	R	R	R	R			
	Peace Canyon (PC1)	21-09-16	13:20	Water	R	R	R	R	R	R								
	Upper Site C Reservoir (PR1)	21-09-16	1:45	Water	R	R	R	R	R	R	R	R	R	R	R			

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: CCME Water Quality Guidelines for the Protection of Aquatic Life
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐
Ice packs	Yes ☒	No ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated	☒			

INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C			
11					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	Sept 21/16	4:10		Sep 24/16	16:10			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 22-SEP-16
Report Date: 04-OCT-16 13:15 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1833036

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03118
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1833036-1	L1833036-2	L1833036-3	L1833036-4	L1833036-5
Description	Water	Water	Water	Water	Water
Sampled Date	22-SEP-16	22-SEP-16	22-SEP-16	22-SEP-16	22-SEP-16
Sampled Time	08:50	09:05	11:20	11:40	12:30
Client ID	WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (D1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 1 (DUP 1)
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	1.48	1.39	0.895	1.05	1.13

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1833036-6				
Description	Water				
Sampled Date	22-SEP-16				
Sampled Time	12:55				
Client ID	FIELD BLANK				
Grouping **Analyte**					
FILTER					
Plant Pigments Chlorophyll a (ug/L)	<0.010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1833036-1 Water 22-SEP-16 08:50 WILLISTON SHALLOW (W1 - SHALLOW)	L1833036-2 Water 22-SEP-16 09:05 WILLISTON DEEP (W1 - DEEP)	L1833036-3 Water 22-SEP-16 11:20 DINOSAUR SHALLOW (D1 - SHALLOW)	L1833036-4 Water 22-SEP-16 11:40 DINOSAUR DEEP (D1 - DEEP)	L1833036-5 Water 22-SEP-16 12:30 DUPLICATE 1 (DUP 1)
WATER						
Physical Tests	Colour, True (CU)	6.2	6.9	5.3	5.7	<5.0
	Conductivity (uS/cm)	161	166	167	167	168
	Hardness (as CaCO3) (ug/L)					
	pH (pH)	8.10	8.08	8.11	8.11	8.13
	Total Suspended Solids (ug/L)	<3000	<3000	<3000	3500	<3000
	Total Dissolved Solids (ug/L)	116000	108000	115000	110000	110000
	TDS (Calculated) (ug/L)					
	Turbidity (NTU)	1.66	1.60	2.75	2.49	2.80
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	78800	80300	82500	80700	82800
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	<1000
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	<1000
	Alkalinity, Total (as CaCO3) (ug/L)	78800	80300	82500	80700	82800
	Ammonia, Total (as N) (ug/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Bromide (Br) (ug/L)	<50	<50	<50	<50	<50
	Chloride (Cl) (ug/L)	<500	<500	<500	<500	<500
	Fluoride (F) (ug/L)	33	33	31	34	32
	Nitrate and Nitrite (as N) (ug/L)	43.4	43.9	51.8	51.3	51.7
	Nitrate (as N) (ug/L)	43.4	43.9	51.8	51.3	51.7
	Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Kjeldahl Nitrogen (ug/L)	104	105	92	101	90
	Total Nitrogen (ug/L)	165	132	131	134	133
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0	<2.0	2.3	2.0	<2.0
	Phosphorus (P)-Total (ug/L)	4.8	4.5	6.8	5.6	5.2
	Silicate (as SiO2) (ug/L)	4320	4310	4190	4390	4280
	Sulfate (SO4) (ug/L)	11200	11100	11500	11500	11400
	Anion Sum (meq/L)					
	Cation Sum (meq/L)					
	Cation - Anion Balance (%)					
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	6640 RRV	6520 RRV	6000 RRV	8600 RRV	8510 RRV
	Total Organic Carbon (ug/L)	2810 RRV	2780 RRV	2700 RRV	2720 RRV	2840 RRV
Bacteriological Tests	E. coli (MPN/100mL)					
	HPC (CFU/1mL)					
	Coliform Bacteria - Total (MPN/100mL)					
Total Metals	Aluminum (Al)-Total (ug/L)					
	Antimony (Sb)-Total (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833036-6				
	Description	Water				
	Sampled Date	22-SEP-16				
	Sampled Time	12:55				
	Client ID	FIELD BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0				
	Conductivity (uS/cm)	<2.0				
	Hardness (as CaCO3) (ug/L)	<500				
	pH (pH)	5.37				
	Total Suspended Solids (ug/L)	<3000				
	Total Dissolved Solids (ug/L)					
	TDS (Calculated) (ug/L)	<1000				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	<1000				
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000				
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000				
	Alkalinity, Total (as CaCO3) (ug/L)	<1000				
	Ammonia, Total (as N) (ug/L)	<5.0				
	Bromide (Br) (ug/L)	<50				
	Chloride (Cl) (ug/L)	<500				
	Fluoride (F) (ug/L)	<20				
	Nitrate and Nitrite (as N) (ug/L)	<5.1				
	Nitrate (as N) (ug/L)	<5.0				
	Nitrite (as N) (ug/L)	<1.0				
	Total Kjeldahl Nitrogen (ug/L)	<50				
	Total Nitrogen (ug/L)	<30				
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0				
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0				
	Phosphorus (P)-Total (ug/L)	2.1 RRV				
	Silicate (as SiO2) (ug/L)	<500				
	Sulfate (SO4) (ug/L)	<300				
	Anion Sum (meq/L)	<0.10				
	Cation Sum (meq/L)	<0.10				
	Cation - Anion Balance (%)	0.0				
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	4420 RRV				
	Total Organic Carbon (ug/L)	<500 RRV				
Bacteriological Tests	E. coli (MPN/100mL)	<1				
	HPC (CFU/1mL)	<1				
	Coliform Bacteria - Total (MPN/100mL)	<1				
Total Metals	Aluminum (Al)-Total (ug/L)	<5.0				
	Antimony (Sb)-Total (ug/L)	<0.50				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833036-1	L1833036-2	L1833036-3	L1833036-4	L1833036-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	22-SEP-16	22-SEP-16	22-SEP-16	22-SEP-16	22-SEP-16
	Sampled Time	08:50	09:05	11:20	11:40	12:30
	Client ID	WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (D1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 1 (DUP 1)
Grouping	**Analyte**					
WATER						
Total Metals	Arsenic (As)-Total (ug/L)					
	Barium (Ba)-Total (ug/L)					
	Beryllium (Be)-Total (ug/L)					
	Bismuth (Bi)-Total (ug/L)					
	Boron (B)-Total (ug/L)					
	Cadmium (Cd)-Total (ug/L)					
	Calcium (Ca)-Total (ug/L)					
	Chromium (Cr)-Total (ug/L)					
	Cobalt (Co)-Total (ug/L)					
	Copper (Cu)-Total (ug/L)					
	Iron (Fe)-Total (ug/L)					
	Lead (Pb)-Total (ug/L)					
	Lithium (Li)-Total (ug/L)					
	Magnesium (Mg)-Total (ug/L)					
	Manganese (Mn)-Total (ug/L)					
	Mercury (Hg)-Total (ug/L)					
	Molybdenum (Mo)-Total (ug/L)					
	Nickel (Ni)-Total (ug/L)					
	Phosphorus (P)-Total (ug/L)					
	Potassium (K)-Total (ug/L)					
	Selenium (Se)-Total (ug/L)					
	Silicon (Si)-Total (ug/L)					
	Silver (Ag)-Total (ug/L)					
	Sodium (Na)-Total (ug/L)					
	Strontium (Sr)-Total (ug/L)					
	Thallium (Tl)-Total (ug/L)					
	Tin (Sn)-Total (ug/L)					
	Titanium (Ti)-Total (ug/L)					
	Uranium (U)-Total (ug/L)					
	Vanadium (V)-Total (ug/L)					
	Zinc (Zn)-Total (ug/L)					
Dissolved Metals	Dissolved Mercury Filtration Location					
	Dissolved Metals Filtration Location					
	Aluminum (Al)-Dissolved (ug/L)					
	Antimony (Sb)-Dissolved (ug/L)					
	Arsenic (As)-Dissolved (ug/L)					
	Barium (Ba)-Dissolved (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833036-6				
	Description	Water				
	Sampled Date	22-SEP-16				
	Sampled Time	12:55				
	Client ID	FIELD BLANK				
Grouping	**Analyte**					
WATER						
Total Metals	Arsenic (As)-Total (ug/L)	<0.50				
	Barium (Ba)-Total (ug/L)	<20				
	Beryllium (Be)-Total (ug/L)	<1.0				
	Bismuth (Bi)-Total (ug/L)	<200				
	Boron (B)-Total (ug/L)	<100				
	Cadmium (Cd)-Total (ug/L)	<0.0050				
	Calcium (Ca)-Total (ug/L)	<100				
	Chromium (Cr)-Total (ug/L)	<1.0				
	Cobalt (Co)-Total (ug/L)	<0.30				
	Copper (Cu)-Total (ug/L)	<1.0				
	Iron (Fe)-Total (ug/L)	<30				
	Lead (Pb)-Total (ug/L)	<0.50				
	Lithium (Li)-Total (ug/L)	<1.0				
	Magnesium (Mg)-Total (ug/L)	<100				
	Manganese (Mn)-Total (ug/L)	<0.10				
	Mercury (Hg)-Total (ug/L)	<0.0050				
	Molybdenum (Mo)-Total (ug/L)	<1.0				
	Nickel (Ni)-Total (ug/L)	<1.0				
	Phosphorus (P)-Total (ug/L)	<300				
	Potassium (K)-Total (ug/L)	<2000				
	Selenium (Se)-Total (ug/L)	<0.050				
	Silicon (Si)-Total (ug/L)	<50				
	Silver (Ag)-Total (ug/L)	<0.020				
	Sodium (Na)-Total (ug/L)	<2000				
	Strontium (Sr)-Total (ug/L)	<5.0				
	Thallium (Tl)-Total (ug/L)	<0.20				
	Tin (Sn)-Total (ug/L)	<0.50				
	Titanium (Ti)-Total (ug/L)	<10				
	Uranium (U)-Total (ug/L)	<0.20				
	Vanadium (V)-Total (ug/L)	<0.50				
	Zinc (Zn)-Total (ug/L)	<5.0				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (ug/L)	<5.0				
	Antimony (Sb)-Dissolved (ug/L)	<0.50				
	Arsenic (As)-Dissolved (ug/L)	<0.50				
	Barium (Ba)-Dissolved (ug/L)	<20				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833036-1	L1833036-2	L1833036-3	L1833036-4	L1833036-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	22-SEP-16	22-SEP-16	22-SEP-16	22-SEP-16	22-SEP-16
	Sampled Time	08:50	09:05	11:20	11:40	12:30
	Client ID	WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (D1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 1 (DUP 1)
Grouping	**Analyte**					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (ug/L)					
	Bismuth (Bi)-Dissolved (ug/L)					
	Boron (B)-Dissolved (ug/L)					
	Cadmium (Cd)-Dissolved (ug/L)					
	Calcium (Ca)-Dissolved (ug/L)					
	Chromium (Cr)-Dissolved (ug/L)					
	Cobalt (Co)-Dissolved (ug/L)					
	Copper (Cu)-Dissolved (ug/L)					
	Iron (Fe)-Dissolved (ug/L)					
	Lead (Pb)-Dissolved (ug/L)					
	Lithium (Li)-Dissolved (ug/L)					
	Magnesium (Mg)-Dissolved (ug/L)					
	Manganese (Mn)-Dissolved (ug/L)					
	Mercury (Hg)-Dissolved (ug/L)					
	Molybdenum (Mo)-Dissolved (ug/L)					
	Nickel (Ni)-Dissolved (ug/L)					
	Phosphorus (P)-Dissolved (ug/L)					
	Potassium (K)-Dissolved (ug/L)					
	Selenium (Se)-Dissolved (ug/L)					
	Silicon (Si)-Dissolved (ug/L)					
	Silver (Ag)-Dissolved (ug/L)					
	Sodium (Na)-Dissolved (ug/L)					
	Strontium (Sr)-Dissolved (ug/L)					
	Thallium (Tl)-Dissolved (ug/L)					
	Tin (Sn)-Dissolved (ug/L)					
	Titanium (Ti)-Dissolved (ug/L)					
	Uranium (U)-Dissolved (ug/L)					
	Vanadium (V)-Dissolved (ug/L)					
	Zinc (Zn)-Dissolved (ug/L)					
Volatile Organic Compounds	Benzene (ug/L)					
	Ethylbenzene (ug/L)					
	Methyl t-butyl ether (MTBE) (ug/L)					
	Styrene (ug/L)					
	Toluene (ug/L)					
	ortho-Xylene (ug/L)					
	meta- & para-Xylene (ug/L)					
	Xylenes (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833036-6				
	Description	Water				
	Sampled Date	22-SEP-16				
	Sampled Time	12:55				
	Client ID	FIELD BLANK				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (ug/L)	<1.0				
	Bismuth (Bi)-Dissolved (ug/L)	<200				
	Boron (B)-Dissolved (ug/L)	<100				
	Cadmium (Cd)-Dissolved (ug/L)	<0.0050				
	Calcium (Ca)-Dissolved (ug/L)	<100				
	Chromium (Cr)-Dissolved (ug/L)	<1.0				
	Cobalt (Co)-Dissolved (ug/L)	<0.30				
	Copper (Cu)-Dissolved (ug/L)	<1.0				
	Iron (Fe)-Dissolved (ug/L)	<30				
	Lead (Pb)-Dissolved (ug/L)	<0.50				
	Lithium (Li)-Dissolved (ug/L)	<1.0				
	Magnesium (Mg)-Dissolved (ug/L)	<100				
	Manganese (Mn)-Dissolved (ug/L)	<0.10				
	Mercury (Hg)-Dissolved (ug/L)	<0.0050				
	Molybdenum (Mo)-Dissolved (ug/L)	<1.0				
	Nickel (Ni)-Dissolved (ug/L)	<1.0				
	Phosphorus (P)-Dissolved (ug/L)	<300				
	Potassium (K)-Dissolved (ug/L)	<2000				
	Selenium (Se)-Dissolved (ug/L)	<0.050				
	Silicon (Si)-Dissolved (ug/L)	<50				
	Silver (Ag)-Dissolved (ug/L)	<0.020				
	Sodium (Na)-Dissolved (ug/L)	<2000				
	Strontium (Sr)-Dissolved (ug/L)	<5.0				
	Thallium (Tl)-Dissolved (ug/L)	<0.20				
	Tin (Sn)-Dissolved (ug/L)	<0.50				
	Titanium (Ti)-Dissolved (ug/L)	<10				
	Uranium (U)-Dissolved (ug/L)	<0.20				
	Vanadium (V)-Dissolved (ug/L)	<0.50				
	Zinc (Zn)-Dissolved (ug/L)	<5.0				
Volatile Organic Compounds	Benzene (ug/L)	<0.50				
	Ethylbenzene (ug/L)	<0.50				
	Methyl t-butyl ether (MTBE) (ug/L)	<0.50				
	Styrene (ug/L)	<0.50				
	Toluene (ug/L)	0.64				
	ortho-Xylene (ug/L)	<0.50				
	meta- & para-Xylene (ug/L)	<0.50				
	Xylenes (ug/L)	<0.75				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833036-1	L1833036-2	L1833036-3	L1833036-4	L1833036-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	22-SEP-16	22-SEP-16	22-SEP-16	22-SEP-16	22-SEP-16
	Sampled Time	08:50	09:05	11:20	11:40	12:30
	Client ID	WILLISTON SHALLOW (W1 - SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (D1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 1 (DUP 1)
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Organochlorine Pesticides	Aldrin (ug/L)					
	alpha-BHC (ug/L)					
	beta-BHC (ug/L)					
	Lindane (gamma - BHC) (ug/L)					
	delta-BHC (ug/L)					
	cis-Chlordane (alpha) (ug/L)					
	trans-Chlordane (gamma) (ug/L)					
	2,4'-DDD (ug/L)					
	4,4'-DDD (ug/L)					
	2,4'-DDE (ug/L)					
	4,4'-DDE (ug/L)					
	2,4'-DDT (ug/L)					
	4,4'-DDT (ug/L)					
	Dieldrin (ug/L)					
	Endosulfan I (ug/L)					
	Endosulfan II (ug/L)					
	Endosulfan Sulfate (ug/L)					
	Endrin (ug/L)					
	Heptachlor (ug/L)					
	Heptachlor Epoxide (ug/L)					
	Methoxychlor (ug/L)					
	Mirex (ug/L)					
	cis-Nonachlor (ug/L)					
	trans-Nonachlor (ug/L)					
	Oxychlordane (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833036-6				
	Description	Water				
	Sampled Date	22-SEP-16				
	Sampled Time	12:55				
	Client ID	FIELD BLANK				
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Surrogate: 4-Bromofluorobenzene (SS) (%)	95.1				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	97.5				
Organochlorine Pesticides	Aldrin (ug/L)	<0.050				
	alpha-BHC (ug/L)	<0.050				
	beta-BHC (ug/L)	<0.10				
	Lindane (gamma - BHC) (ug/L)	<0.010				
	delta-BHC (ug/L)	<0.050				
	cis-Chlordane (alpha) (ug/L)	<0.050				
	trans-Chlordane (gamma) (ug/L)	<0.050				
	2,4'-DDD (ug/L)	<0.0050				
	4,4'-DDD (ug/L)	<0.0050				
	2,4'-DDE (ug/L)	<0.0050				
	4,4'-DDE (ug/L)	<0.0050				
	2,4'-DDT (ug/L)	<0.0050				
	4,4'-DDT (ug/L)	<0.0050				
	Dieldrin (ug/L)	<0.050				
	Endosulfan I (ug/L)	<0.0020				
	Endosulfan II (ug/L)	<0.0020				
	Endosulfan Sulfate (ug/L)	<0.0020				
	Endrin (ug/L)	<0.020				
	Heptachlor (ug/L)	<0.10				
	Heptachlor Epoxide (ug/L)	<0.0030				
	Methoxychlor (ug/L)	<0.030				
	Mirex (ug/L)	<0.050				
	cis-Nonachlor (ug/L)	<0.050				
	trans-Nonachlor (ug/L)	<0.050				
	Oxychlordane (ug/L)	<0.050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Aluminum (Al)-Total	MB-LOR	L1833036-6
Method Blank	Manganese (Mn)-Total	MB-LOR	L1833036-6
Method Blank	Tin (Sn)-Total	MB-LOR	L1833036-6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1833036-1, -2, -3, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1833036-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1833036-6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1833036-6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1833036-6
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1833036-6
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1833036-6
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1833036-6
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1833036-6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1833036-6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1833036-6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA Water Nitrite & Nitrate in Water (Calculation) EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-F-VA Filter Chlorophyll a by Fluorometer (Filter) EPA 445.0

This analysis is done using procedures modified from EPA Method 445.0. Chlorophyll-a is determined by a routine acetone extraction followed with analysis by fluorometry using the non-acidification procedure. This method is not subject to interferences from chlorophyll b.

CL-IC-N-VA Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

ECOLI-COLI-ENV-VA Water E.coli by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is

Reference Information

incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA	Water	HPC by pour plate	APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

OCP1-LL-SF-ECD-VA	Water	OCP-1 in Water by GCECD	EPA METHODS 3510, 3630, 3660, 8081

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3630, 3660 and 8081, published by the United States Environmental Protection Agency (EPA). The procedure involves extraction of the entire water sample with dichloromethane. The extract then undergoes one or more of the following clean-up procedures (if required): silica gel clean-up and/or sulphur clean-up. The final extract is analyzed by dual capillary column gas chromatography with electron capture detection (GC/ECD).

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA	Water	Total coliform by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1833036-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech	Select Report Format: ☑PDF ☑EXCEL ☑EDD (DIGITAL)	R ☑Regular (Standard TAT if received by 3 pm - business days)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	14940-123 Ave NW Edmonton, AB T5V 1B4	☑Criteria on Report - provide details below if box checked	E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	780-886-3055	Select Distribution: ☑EMAIL ☐MAIL ☐FAX	E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2 pgauthier2014@hotmail.com	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution: ☑EMAIL ☐MAIL ☐FAX
Company:		Email 1 or Fax ebaaccountspayable@tetratech.com
Contact:		Email 2 danielle.macdonald@tetratech.com

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENV03118	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L1833036

ALS Contact: Brent Mack

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TOP, TKN, NH3	DOC	Total Metals (CSR+ICP+Hardness) & Hg	Dissolved Metals (CSR+ICP+Hardness) & Hg	Pesticides (OCP1)	Chlorophyll a (field filtered 250 mL)	BTEX	Total Coliform, E. coli, HPC			Number of Containers
								P	F/P	P	F/P		F	P	P			
	Williston Shallow (W1 - Shallow)	22-09-16	8:50	Water	R	R	R	R	R				R					
	Williston Deep (W1 - Deep)	22-09-16	9:05	Water	R	R	R	R	R				R					
	Dinosaur Shallow (D1 - Shallow)	22-09-16	11:20	Water	R	R	R	R	R				R					
	Dinosaur Deep (D1 - Deep)	22-09-16	11:40	Water	R	R	R	R	R				R					
	Duplicate 1 (DUP 1)	22-09-16	12:30	Water	R	R	R	R	R				R					
	Field Blank	22-09-16	12:55	Water	R	R	R	R	R	R	R	R	R	R	R			

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC Standards for Drinking Water; sampled directly from surface water
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations ☐ Yes ☐ No

Ice packs ☐ Yes ☐ No ☐ Custody seal intact ☐ Yes ☐ No

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
14			6	7.2	3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: Sept 22/16	Time: 2:10	Received by: Geoff	Date: Sep 22/16	Time: 14:10	Received by: JC	Date: SEP 23 2016	Time: 11:25

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System please submit using an Authorized DW COC Form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
1 - 4376 Boban Drive
Nanaimo BC V9T 6A7

Date Received: 22-SEP-16
Report Date: 03-OCT-16 11:17 (MT)
Version: FINAL

Client Phone: 250-756-2256

Certificate of Analysis

Lab Work Order #: L1833109

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03095
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833109-1				
	Description	WATER				
	Sampled Date					
	Sampled Time					
	Client ID	TRAVEL BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0				
	Conductivity (uS/cm)	<2.0				
	Hardness (as CaCO3) (ug/L)	<500 HTC				
	pH (pH)	5.41				
	Total Suspended Solids (ug/L)	<3000				
	TDS (Calculated) (ug/L)	<1000				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	<1000				
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000				
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000				
	Alkalinity, Total (as CaCO3) (ug/L)	<1000				
	Ammonia, Total (as N) (ug/L)	<5.0				
	Bromide (Br) (ug/L)	<50				
	Chloride (Cl) (ug/L)	<500				
	Fluoride (F) (ug/L)	<20				
	Nitrate and Nitrite (as N) (ug/L)	<5.1				
	Nitrate (as N) (ug/L)	<5.0				
	Nitrite (as N) (ug/L)	<1.0				
	Total Kjeldahl Nitrogen (ug/L)	<50				
	Total Nitrogen (ug/L)	<30				
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0				
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0				
	Phosphorus (P)-Total (ug/L)	<2.0				
	Silicate (as SiO2) (ug/L)	<500				
	Sulfate (SO4) (ug/L)	<300				
	Anion Sum (meq/L)	<0.10				
	Cation Sum (meq/L)	<0.10				
	Cation - Anion Balance (%)	0.0				
Organic / Inorganic Carbon	Total Organic Carbon (ug/L)	<500				
Bacteriological Tests	E. coli (MPN/100mL)	<1				
	HPC (CFU/1mL)	<1				
	Coliform Bacteria - Total (MPN/100mL)	<1				
Total Metals	Aluminum (Al)-Total (ug/L)	<5.0				
	Antimony (Sb)-Total (ug/L)	<0.50				
	Arsenic (As)-Total (ug/L)	<0.50				
	Barium (Ba)-Total (ug/L)	<20				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833109-1				
	Description	WATER				
	Sampled Date					
	Sampled Time					
	Client ID	TRAVEL BLANK				
Grouping	**Analyte**					
WATER						
Total Metals	Beryllium (Be)-Total (ug/L)	<1.0				
	Bismuth (Bi)-Total (ug/L)	<200				
	Boron (B)-Total (ug/L)	<100				
	Cadmium (Cd)-Total (ug/L)	<0.0050				
	Calcium (Ca)-Total (ug/L)	<100				
	Chromium (Cr)-Total (ug/L)	<1.0				
	Cobalt (Co)-Total (ug/L)	<0.30				
	Copper (Cu)-Total (ug/L)	<1.0				
	Iron (Fe)-Total (ug/L)	<30				
	Lead (Pb)-Total (ug/L)	<0.50				
	Lithium (Li)-Total (ug/L)	<1.0				
	Magnesium (Mg)-Total (ug/L)	<100				
	Manganese (Mn)-Total (ug/L)	<0.10				
	Mercury (Hg)-Total (ug/L)	<0.0050				
	Molybdenum (Mo)-Total (ug/L)	<1.0				
	Nickel (Ni)-Total (ug/L)	<1.0				
	Phosphorus (P)-Total (ug/L)	<300				
	Potassium (K)-Total (ug/L)	<2000				
	Selenium (Se)-Total (ug/L)	<0.050				
	Silicon (Si)-Total (ug/L)	<50				
	Silver (Ag)-Total (ug/L)	<0.020				
	Sodium (Na)-Total (ug/L)	<2000				
	Strontium (Sr)-Total (ug/L)	<5.0				
	Thallium (Tl)-Total (ug/L)	<0.20				
	Tin (Sn)-Total (ug/L)	<0.50				
	Titanium (Ti)-Total (ug/L)	<10				
	Uranium (U)-Total (ug/L)	<0.20				
	Vanadium (V)-Total (ug/L)	<0.50				
	Zinc (Zn)-Total (ug/L)	<5.0				
Volatile Organic Compounds	Benzene (ug/L)	<0.50				
	Ethylbenzene (ug/L)	<0.50				
	Methyl t-butyl ether (MTBE) (ug/L)	<0.50				
	Styrene (ug/L)	<0.50				
	Toluene (ug/L)	<0.50				
	ortho-Xylene (ug/L)	<0.50				
	meta- & para-Xylene (ug/L)	<0.50				
	Xylenes (ug/L)	<0.75				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1833109-1				
	Description	WATER				
	Sampled Date					
	Sampled Time					
	Client ID	TRAVEL BLANK				
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Surrogate: 4-Bromofluorobenzene (SS) (%)	96.5				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	97.4				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Fluoride (F)	MS-B	L1833109-1
Matrix Spike	Uranium (U)-Total	MS-B	L1833109-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L1833109-1
Matrix Spike	Silicon (Si)-Total	MS-B	L1833109-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L1833109-1
Matrix Spike	Sulfate (SO4)	MS-B	L1833109-1
Matrix Spike	Sulfate (SO4)	MS-B	L1833109-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

ECOLI-COLI-BCDW-VA	Water	E.coli by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA	Water	HPC by pour plate	APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

Reference Information

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-BCDW-VA	Water	Total coliform by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L1833109-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	14940-123 Ave NW	☑ Criteria on Report - provide details below if box checked		E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
	Edmonton, AB T5V 1B4	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	780-886-3055	Email 1 or Fax	danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2	pgauthier2014@hotmail.com	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Company:		Email 1 or Fax	ebaaccountspayable@tetratech.com
Contact:		Email 2	danielle.macdonald@tetratech.com

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENV03095	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L1833109 **ALS Contact:** Brent Mack **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	NH3,NO2,NO3,TKN,TN,TP,TDP,sol reactive	TOC	~~BOD~~	Total Metals (CSR+HCP+Hardness) & Hg	~~Dissolved Metals (CSR+HCP+Hardness) & Hg~~	Pesticides (OCP1)	BTEX	Total Coliform, E. Coli, HPC			Number of Containers
	Travel Blank			Water	R	R	R	R	R	R	R	~~R~~	R	R	R			

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: CCME Water Quality Guidelines for the Protection of Aquatic Life
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated	☐			

INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
				Sep 22/16	14:10			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1 If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
14940-123 Ave., NW
Edmonton AB T5V 1B4

Date Received: 20-DEC-16
Report Date: 05-JAN-17 10:58 (MT)
Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L1872185

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03095
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1872185-1 WATER 19-DEC-16 13:05 PEACE 2 (PR2)	L1872185-2 WATER 19-DEC-16 10:18 PEACE 1 (PR1)	L1872185-3 WATER 19-DEC-16 09:18 DUPLICATE 1 (DUP 1)	L1872185-4 WATER 19-DEC-16 13:32 FIELD BLANK	
Sample ID						
Description						
Sampled Date						
Sampled Time						
Client ID						
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0	<5.0	<5.0	
	Conductivity (uS/cm)	188	185	187	<2.0	
	Hardness (as CaCO3) (ug/L)	93300	92000	91500	<500	
	pH (pH)	8.09	8.06	8.07	5.41	
	Total Suspended Solids (ug/L)	8900	<3000	<3000	<3000	
	TDS (Calculated) (ug/L)	101000	99800	99500	<1000	
	Turbidity (NTU)	4.27	1.97	1.89	<0.10	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	84900	83600	83400	<1000	
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000	<1000	<1000	<1000	
	Alkalinity, Total (as CaCO3) (ug/L)	84900	83600	83400	<1000	
	Ammonia, Total (as N) (ug/L)	<5.0	<5.0	<5.0	<5.0	
	Bromide (Br) (ug/L)	<50	<50	<50	<50	
	Chloride (Cl) (ug/L)	<500	<500	<500	<500	
	Fluoride (F) (ug/L)	39	39	39	<20	
	Nitrate and Nitrite (as N) (ug/L)	68.9	71.5	72.5	<5.1	
	Nitrate (as N) (ug/L)	68.9	71.5	72.5	<5.0	
	Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0	<1.0	
	Total Kjeldahl Nitrogen (ug/L)	98	96	105	<50	
	Total Nitrogen (ug/L)	132	129	133	<30	
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0	<1.0	<1.0	<1.0	
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0	<2.0	<2.0	<2.0	
	Phosphorus (P)-Total (ug/L)	4.6	3.3	4.3	<2.0	
	Silicate (as SiO2) (ug/L)	4320	4240	4440	<500	
	Sulfate (SO4) (ug/L)	13900	13700	13700	<300	
	Anion Sum (meq/L)	1.99	1.96	1.96	<0.10	
	Cation Sum (meq/L)	1.86	1.84	1.83	<0.10	
	Cation - Anion Balance (%)	-3.4	-3.3	-3.3	0.0	
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	2720	2590	2520	540 RRV	
	Total Organic Carbon (ug/L)	2500	2590	2570	<500	
Bacteriological Tests	E. coli (MPN/100mL)	<1	<1	<1	<1	
	HPC (CFU/1mL)	18	12	16	<1	
	Coliform Bacteria - Total (MPN/100mL)	15	<1	1	<1	
Total Metals	Aluminum (Al)-Total (ug/L)	63.7	43.1		<5.0	
	Antimony (Sb)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	
	Arsenic (As)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1872185-1	L1872185-2	L1872185-3	L1872185-4	
Description	WATER	WATER	WATER	WATER	
Sampled Date	19-DEC-16	19-DEC-16	19-DEC-16	19-DEC-16	
Sampled Time	13:05	10:18	09:18	13:32	
Client ID	PEACE 2 (PR2)	PEACE 1 (PR1)	DUPLICATE 1 (DUP 1)	FIELD BLANK	
Grouping / **Analyte**					
WATER					
Total Metals Barium (Ba)-Total (ug/L)	31	29	29	<20	
Beryllium (Be)-Total (ug/L)	<1.0	<1.0	<1.0	<1.0	
Bismuth (Bi)-Total (ug/L)	<200	<200	<200	<200	
Boron (B)-Total (ug/L)	<100	<100	<100	<100	
Cadmium (Cd)-Total (ug/L)	0.0233	0.0253		<0.0050	
Calcium (Ca)-Total (ug/L)	26700	26800	26400	<100	
Chromium (Cr)-Total (ug/L)	<1.0	2.3	<1.0	<1.0	
Cobalt (Co)-Total (ug/L)	<0.30	<0.30	<0.30	<0.30	
Copper (Cu)-Total (ug/L)	<1.0	<1.0	<1.0	<1.0	
Iron (Fe)-Total (ug/L)	90	75	<30	<30	
Lead (Pb)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	
Lithium (Li)-Total (ug/L)	<1.0	<1.0	<1.0	<1.0	
Magnesium (Mg)-Total (ug/L)	5650	5710	5670	<100	
Manganese (Mn)-Total (ug/L)	4.05	3.70		<0.10	
Mercury (Hg)-Total (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Molybdenum (Mo)-Total (ug/L)	<1.0	<1.0	<1.0	<1.0	
Nickel (Ni)-Total (ug/L)	<1.0	<1.0	<1.0	<1.0	
Phosphorus (P)-Total (ug/L)	<300	<300	<300	<300	
Potassium (K)-Total (ug/L)	<2000	<2000	<2000	<2000	
Selenium (Se)-Total (ug/L)	0.268	0.247	0.282	<0.050	
Silicon (Si)-Total (ug/L)	2170	2130	2060	<50	
Silver (Ag)-Total (ug/L)	<0.020	<0.020	<0.020	<0.020	
Sodium (Na)-Total (ug/L)	<2000	<2000	<2000	<2000	
Strontium (Sr)-Total (ug/L)	107	107	106	<5.0	
Thallium (Tl)-Total (ug/L)	<0.20	<0.20	<0.20	<0.20	
Tin (Sn)-Total (ug/L)	<0.50	<0.50	<0.50	<0.50	
Titanium (Ti)-Total (ug/L)	<10	<10	<10	<10	
Uranium (U)-Total (ug/L)	0.47	0.46	0.46	<0.20	
Vanadium (V)-Total (ug/L)	0.52	<0.50	<0.50	<0.50	
Zinc (Zn)-Total (ug/L)	<5.0	<5.0	<5.0	<5.0	
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
Aluminum (Al)-Dissolved (ug/L)	<5.0	<5.0	41.1	<5.0	
Antimony (Sb)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
Arsenic (As)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
Barium (Ba)-Dissolved (ug/L)	32	31	32	<20	
Beryllium (Be)-Dissolved (ug/L)	<1.0	<1.0	<1.0	<1.0	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1872185-1	L1872185-2	L1872185-3	L1872185-4	
Description	WATER	WATER	WATER	WATER	
Sampled Date	19-DEC-16	19-DEC-16	19-DEC-16	19-DEC-16	
Sampled Time	13:05	10:18	09:18	13:32	
Client ID	PEACE 2 (PR2)	PEACE 1 (PR1)	DUPLICATE 1 (DUP 1)	FIELD BLANK	
Grouping / **Analyte**					
WATER					
Dissolved Metals Bismuth (Bi)-Dissolved (ug/L)	<200	<200	<200	<200	
Boron (B)-Dissolved (ug/L)	<100	<100	<100	<100	
Cadmium (Cd)-Dissolved (ug/L)	0.0108	0.0093	0.0230	<0.0050	
Calcium (Ca)-Dissolved (ug/L)	27400	27000	26900	<100	
Chromium (Cr)-Dissolved (ug/L)	<1.0	<1.0	<1.0	<1.0	
Cobalt (Co)-Dissolved (ug/L)	<0.30	<0.30	<0.30	<0.30	
Copper (Cu)-Dissolved (ug/L)	<1.0	<1.0	<1.0	<1.0	
Iron (Fe)-Dissolved (ug/L)	<30	<30	41	<30	
Lead (Pb)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
Lithium (Li)-Dissolved (ug/L)	1.4	1.4	1.4	<1.0	
Magnesium (Mg)-Dissolved (ug/L)	6030	5970	5930	<100	
Manganese (Mn)-Dissolved (ug/L)	0.87	0.68	2.69	<0.10	
Mercury (Hg)-Dissolved (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Molybdenum (Mo)-Dissolved (ug/L)	<1.0	<1.0	<1.0	<1.0	
Nickel (Ni)-Dissolved (ug/L)	<1.0	<1.0	<1.0	<1.0	
Phosphorus (P)-Dissolved (ug/L)	<300	<300	<300	<300	
Potassium (K)-Dissolved (ug/L)	<2000	<2000	<2000	<2000	
Selenium (Se)-Dissolved (ug/L)	0.238	0.245	0.232	<0.050	
Silicon (Si)-Dissolved (ug/L)	2100	2140	2240	<50	
Silver (Ag)-Dissolved (ug/L)	<0.020	<0.020	<0.020	<0.020	
Sodium (Na)-Dissolved (ug/L)	<2000	<2000	<2000	<2000	
Strontium (Sr)-Dissolved (ug/L)	108	106	106	<5.0	
Thallium (Tl)-Dissolved (ug/L)	<0.20	<0.20	<0.20	<0.20	
Tin (Sn)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
Titanium (Ti)-Dissolved (ug/L)	<10	<10	<10	<10	
Uranium (U)-Dissolved (ug/L)	0.45	0.45	0.45	<0.20	
Vanadium (V)-Dissolved (ug/L)	<0.50	<0.50	<0.50	<0.50	
Zinc (Zn)-Dissolved (ug/L)	<5.0	<5.0	<5.0	<5.0	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Antimony (Sb)-Total	MB-LOR	L1872185-1, -2, -3, -4
Method Blank	Arsenic (As)-Total	MB-LOR	L1872185-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Copper (Cu)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Total Nitrogen	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Total Nitrogen	MS-B	L1872185-1, -2, -3, -4
Matrix Spike	Silicate (as SiO2)	MS-B	L1872185-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-VA Water E.coli by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA Water HPC by pour plate APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA	Water	Total coliform by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Short Holding Time
Rush Processing

Chain of Custody (COC) / Analytical Request Form

Toll Free: 1 800 668 9878

L1872185-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	14940-123 Ave NW Edmonton, AB T5V 1B4	☑ Criteria on Report - provide details below if box checked Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Phone:	780-885-3055	Email 1 or Fax	danielle.macdonald@tetratech.com	Specify Date Required for E2, E or P:
		Email 2	pgauthier2014@hotmail.com; Molly.Brewis@bchydro	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax	ebaaccountspayable@tetratech.com
Company:		Email 2	danielle.macdonald@tetratech.com
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENV03095	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-SpeciesAnions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3	DOC	Total Metals (CCME+ICP+Hardness) & Hg	Dissolved Metals (CCME+ICP+Hard) & Hg	Total Coliform, E. coli, HPC	Number of Containers
					P			P	F/P	P	F/P	P	
	~~Halfway River - Downstream (HR)~~	~~19-12-16~~		~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	
	Peace 2 (PR2)	19-12-16	13:05	Water	R	R	R	R	R	R	R	R	8
	Peace 1 (PR1)	19-12-16	10:18	Water	R	R	R	R	R	R	R	R	8
	~~Field Blank~~			~~Water~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	
	Duplicate 1 (DUP 1)	19-12-16	9:18	Water	R	R	R	R	R	R	R	R	8
	Trip Blank	19-12-16	13:32	Water	R	R	R	R	R	R	R	R	8

Drinking Water (DW) Samples' (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No Are samples for human drinking water use? ☐ Yes ☑ No	Please use criteria: BC Approved and Working Water Quality Guidelines for the protection of freshwater aquatic life (Updated May 2015); samples were taken from surface water; include molly.brewis@bchydro.com on report distribution

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
				4	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	Dec 19/16	3:01		Dec 19		JC	DEC 20 2016	11:23am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
14940-123 Ave., NW
Edmonton AB T5V 1B4

Date Received: 21-DEC-16
Report Date: 23-DEC-16 14:42 (MT)
Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L1872814

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03095
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1872814-1	L1872814-2	L1872814-3	L1872814-4	L1872814-5
	Description	WATER	WATER	WATER	WATER	WATER
	Sampled Date	20-DEC-16	20-DEC-16	20-DEC-16	20-DEC-16	20-DEC-16
	Sampled Time	01:19	01:15		00:10	00:35
	Client ID	PEACE AT TAYLOR (TAYLOR TURBIDITY)	PEACE AT SPECTRA (SPECTRA TURBIDITY)	PEACE AT PINE RIGHT BANK (PAP-RB)	PEACE AT PINE LEFT BANK (PAP-LB)	PEACE AT MOBERLY RIGHT BANK (PAM-RB)
Grouping	**Analyte**					
WATER						
Physical Tests	Total Suspended Solids (ug/L)	8300	9400	8300	7800	7900
	Turbidity (NTU)	3.04	3.21	3.17	3.17	2.84

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1872814-6				
	Description	WATER				
	Sampled Date	20-DEC-16				
	Sampled Time	00:30				
	Client ID	PEACE AT MOBERLY LEFT BANK (PAM-LB)				
Grouping	**Analyte**					
WATER						
Physical Tests	Total Suspended Solids (ug/L)	13100				
	Turbidity (NTU)	5.20				

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L1872814-COFC

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	14940-123 Ave NW Edmonton, AB T5V 1B4	☑ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	780-886-3055	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax danielle.macdonald@tetratech.com	Specify Date Required for E2,E or P:
		Email 2 pgauthier2014@hotmail.com	

Invoice To		Invoice Distribution
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax ebaaccountspayable@tetratech.com
Company:		Email 2 danielle.macdonald@tetratech.com
Contact:		

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENV03095	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: PHILLIS GAUTHIER

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Routine - TSS, turbidity	Number of Containers
	Peace at Taylor (Taylor Turbidity)	20-12-16	1:19	Water	R	1
	Peace at Spectra (Spectra Turbidity)	20-12-16	1:15	Water	R	1
	Peace at Pine Right Bank (PAP-RB)	20-12-16	12:00	Water	R	1
	Peace at Pine Left Bank (PAP-LB)	20-12-16	12:10	Water	R	1
	Peace at Moberly Right Bank (PAM-RB)	20-12-16	12:35	Water	R	1
	Peace at Moberly Left Bank (PAM-LB)	20-12-16	12:30	Water	R	1

Short Holding Time
Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC Approved and Working Water Quality Guidelines for the protection of freshwater aquatic life (Updated May 2015); samples were taken from surface water; include molly.brewis@bchydro.com on report distribution
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
		4/4			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time: 3:45	Received by:	Date:	Time:	Received by: SF	Date: Dec 21	Time: 10:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System please submit using an Authorized DW COC form.

Tetra Tech EBA Inc.
ATTN: Danielle MacDonald
14940-123 Ave., NW
Edmonton AB T5V 1B4

Date Received: 21-DEC-16
Report Date: 03-JAN-17 11:46 (MT)
Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L1872829

Project P.O. #: NOT SUBMITTED
Job Reference: VENV03095
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1872829-1	L1872829-2	L1872829-3		
	Description	WATER	WATER	WATER		
	Sampled Date	20-DEC-16	20-DEC-16			
	Sampled Time	11:37	12:59			
	Client ID	PEACE 3 (PR3)	PEACE 4 (PD1)	TRAVEL BLANK		
Grouping	**Analyte**					
WATER						
Physical Tests	Colour, True (CU)	<5.0	6.4	<5.0		
	Conductivity (uS/cm)	190	196	<2.0		
	Hardness (as CaCO3) (ug/L)	95000	97400	<500 HTC		
	pH (pH)	8.13	8.15	5.33		
	Total Suspended Solids (ug/L)	7200	10500	<3000		
	TDS (Calculated) (ug/L)	103000	106000	<1000		
	Turbidity (NTU)	2.01	3.13	<0.10		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (ug/L)	86700	88300	<1000		
	Alkalinity, Carbonate (as CaCO3) (ug/L)	<1000	<1000	<1000		
	Alkalinity, Hydroxide (as CaCO3) (ug/L)	<1000	<1000	<1000		
	Alkalinity, Total (as CaCO3) (ug/L)	86700	88300	<1000		
	Ammonia, Total (as N) (ug/L)	<5.0	<5.0	<5.0		
	Bromide (Br) (ug/L)	<50	<50	<50		
	Chloride (Cl) (ug/L)	<500	<500	<500		
	Fluoride (F) (ug/L)	38	39	<20		
	Nitrate and Nitrite (as N) (ug/L)	71.6	72.5	<5.1		
	Nitrate (as N) (ug/L)	71.6	72.5	<5.0		
	Nitrite (as N) (ug/L)	<1.0	<1.0	<1.0		
	Total Kjeldahl Nitrogen (ug/L)	94	86	<50		
	Total Nitrogen (ug/L)	131	135	<30		
	Orthophosphate-Dissolved (as P) (ug/L)	<1.0	<1.0	<1.0		
	Phosphorus (P)-Total Dissolved (ug/L)	<2.0	<2.0	<2.0		
	Phosphorus (P)-Total (ug/L)	<2.0	2.3	<2.0		
	Silicate (as SiO2) (ug/L)	4710	4670	<500		
	Sulfate (SO4) (ug/L)	14100	14800	<300		
	Anion Sum (meq/L)	2.03	2.08	<0.10		
	Cation Sum (meq/L)	1.90	1.95	<0.10		
	Cation - Anion Balance (%)	-3.4	-3.4	0.0		
Organic / Inorganic Carbon	Dissolved Organic Carbon (ug/L)	2490	3060			
	Total Organic Carbon (ug/L)	2500	2290 RRV	<500		
Bacteriological Tests	E. coli (MPN/100mL)	<1	<1	<1 PEHR		
	HPC (CFU/1mL)	19	10	<1		
	Coliform Bacteria - Total (MPN/100mL)	1	3	<1 PEHR		
Total Metals	Aluminum (Al)-Total (ug/L)	61.9	70.8	<5.0		
	Antimony (Sb)-Total (ug/L)	<0.50	<0.50	<0.50		
	Arsenic (As)-Total (ug/L)	<0.50	<0.50	<0.50		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1872829-1 WATER 20-DEC-16 11:37 PEACE 3 (PR3)	L1872829-2 WATER 20-DEC-16 12:59 PEACE 4 (PD1)	L1872829-3 WATER TRAVEL BLANK		
WATER						
Total Metals	Barium (Ba)-Total (ug/L)	33	35	<20		
	Beryllium (Be)-Total (ug/L)	<1.0	<1.0	<1.0		
	Bismuth (Bi)-Total (ug/L)	<200	<200	<200		
	Boron (B)-Total (ug/L)	<100	<100	<100		
	Cadmium (Cd)-Total (ug/L)	0.0230	0.0272	<0.0050		
	Calcium (Ca)-Total (ug/L)	27700	28600	<100		
	Chromium (Cr)-Total (ug/L)	<1.0	<1.0	<1.0		
	Cobalt (Co)-Total (ug/L)	<0.30	<0.30	<0.30		
	Copper (Cu)-Total (ug/L)	<1.0	<1.0	<1.0		
	Iron (Fe)-Total (ug/L)	97	165	<30		
	Lead (Pb)-Total (ug/L)	<0.50	<0.50	<0.50		
	Lithium (Li)-Total (ug/L)	<1.0	<1.0	<1.0		
	Magnesium (Mg)-Total (ug/L)	5920	6020	<100		
	Manganese (Mn)-Total (ug/L)	3.89	4.87	<0.10		
	Mercury (Hg)-Total (ug/L)	<0.0050	0.0150	<0.0050		
	Molybdenum (Mo)-Total (ug/L)	<1.0	1.1	<1.0		
	Nickel (Ni)-Total (ug/L)	<1.0	1.2	<1.0		
	Phosphorus (P)-Total (ug/L)	<300	<300	<300		
	Potassium (K)-Total (ug/L)	<2000	<2000	<2000		
	Selenium (Se)-Total (ug/L)	0.256	0.291	<0.050		
	Silicon (Si)-Total (ug/L)	2290	2320	<50		
	Silver (Ag)-Total (ug/L)	<0.020	<0.020	<0.020		
	Sodium (Na)-Total (ug/L)	<2000	<2000	<2000		
	Strontium (Sr)-Total (ug/L)	107	112	<5.0		
	Thallium (Tl)-Total (ug/L)	<0.20	<0.20	<0.20		
	Tin (Sn)-Total (ug/L)	<0.50	<0.50	<0.50		
	Titanium (Ti)-Total (ug/L)	<10	<10	<10		
	Uranium (U)-Total (ug/L)	0.47	0.47	<0.20		
	Vanadium (V)-Total (ug/L)	0.56	0.62	<0.50		
	Zinc (Zn)-Total (ug/L)	<5.0	<5.0	<5.0		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (ug/L)	<5.0	<5.0			
	Antimony (Sb)-Dissolved (ug/L)	<0.50	<0.50			
	Arsenic (As)-Dissolved (ug/L)	<0.50	<0.50			
	Barium (Ba)-Dissolved (ug/L)	31	32			
	Beryllium (Be)-Dissolved (ug/L)	<1.0	<1.0			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1872829-1	L1872829-2	L1872829-3		
Description	WATER	WATER	WATER		
Sampled Date	20-DEC-16	20-DEC-16			
Sampled Time	11:37	12:59			
Client ID	PEACE 3 (PR3)	PEACE 4 (PD1)	TRAVEL BLANK		
Grouping **Analyte**					
WATER					
Dissolved Metals Bismuth (Bi)-Dissolved (ug/L)	<200	<200			
Boron (B)-Dissolved (ug/L)	<100	<100			
Cadmium (Cd)-Dissolved (ug/L)	<0.0050	0.0098			
Calcium (Ca)-Dissolved (ug/L)	28200	28900			
Chromium (Cr)-Dissolved (ug/L)	<1.0	<1.0			
Cobalt (Co)-Dissolved (ug/L)	<0.30	<0.30			
Copper (Cu)-Dissolved (ug/L)	<1.0	<1.0			
Iron (Fe)-Dissolved (ug/L)	<30	<30			
Lead (Pb)-Dissolved (ug/L)	<0.50	<0.50			
Lithium (Li)-Dissolved (ug/L)	<1.0	1.0			
Magnesium (Mg)-Dissolved (ug/L)	5980	6110			
Manganese (Mn)-Dissolved (ug/L)	0.72	0.76			
Mercury (Hg)-Dissolved (ug/L)	<0.0050	0.0067			
Molybdenum (Mo)-Dissolved (ug/L)	<1.0	<1.0			
Nickel (Ni)-Dissolved (ug/L)	<1.0	<1.0			
Phosphorus (P)-Dissolved (ug/L)	<300	<300			
Potassium (K)-Dissolved (ug/L)	<2000	<2000			
Selenium (Se)-Dissolved (ug/L)	0.260	0.281			
Silicon (Si)-Dissolved (ug/L)	2010	2030			
Silver (Ag)-Dissolved (ug/L)	<0.020	<0.020			
Sodium (Na)-Dissolved (ug/L)	<2000	<2000			
Strontium (Sr)-Dissolved (ug/L)	103	106			
Thallium (Tl)-Dissolved (ug/L)	<0.20	<0.20			
Tin (Sn)-Dissolved (ug/L)	<0.50	<0.50			
Titanium (Ti)-Dissolved (ug/L)	<10	<10			
Uranium (U)-Dissolved (ug/L)	0.41	0.42			
Vanadium (V)-Dissolved (ug/L)	<0.50	<0.50			
Zinc (Zn)-Dissolved (ug/L)	<5.0	<5.0			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Boron (B)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Boron (B)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1872829-1, -2
Matrix Spike	Barium (Ba)-Total	MS-B	L1872829-1, -2
Matrix Spike	Barium (Ba)-Total	MS-B	L1872829-3
Matrix Spike	Cadmium (Cd)-Total	MS-B	L1872829-3
Matrix Spike	Calcium (Ca)-Total	MS-B	L1872829-1, -2
Matrix Spike	Calcium (Ca)-Total	MS-B	L1872829-3
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1872829-1, -2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1872829-3
Matrix Spike	Manganese (Mn)-Total	MS-B	L1872829-3
Matrix Spike	Silicon (Si)-Total	MS-B	L1872829-3
Matrix Spike	Sodium (Na)-Total	MS-B	L1872829-1, -2
Matrix Spike	Sodium (Na)-Total	MS-B	L1872829-3
Matrix Spike	Strontium (Sr)-Total	MS-B	L1872829-1, -2
Matrix Spike	Strontium (Sr)-Total	MS-B	L1872829-3
Matrix Spike	Uranium (U)-Total	MS-B	L1872829-3
Matrix Spike	Total Nitrogen	MS-B	L1872829-1, -2
Matrix Spike	Total Nitrogen	MS-B	L1872829-1, -2
Matrix Spike	Nitrate (as N)	MS-B	L1872829-3
Matrix Spike	Total Kjeldahl Nitrogen	MS-B	L1872829-1, -2, -3

Qualifiers for Individual Parameters Listed:

Qualifier	Description

Reference Information

HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA	Water	HPC by pour plate	APHA METHOD 9215

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.

Reference Information

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA Water Total coliform by Colilert APHA METHOD 9223

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Tetratech	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	R ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Danielle MacDonald	Quality Control (QC) Report with Report: ☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	14940-123 Ave NW Edmonton, AB T5V 1B4	☑ Criteria on Report - provide details below if box checked	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	780-886-3055	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax: danielle.macdonald@tetratech.com	Specify Date Required for E2, E or P:
		Email 2: pgauthier2014@hotmail.com; molly.brewis@bchydro	

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☑ Yes ☐ No	Email 1 or Fax: ebaaccountspayable@tetratech.com	
Company:		Email 2: danielle.macdonald@tetratech.com	
Contact:			

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q53931	Approver ID:	Cost Center:
Job #:	VENV03095	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Brent Mack	Sampler: PHILLIS GAUTHIER

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-Species/Anions by IC,NO2+NO2Calc	Color-True, EC, pH, TSS, TDS-Calc	Turbidity, Silicate, Ortho PO4, Ion Balance	TOC, TN, TP, TDP, TKN, NH3	DOC	Total Metals (CCME+ICP+Hardness) & Hg	Dissolved Metals (CCME+ICP+Hard) & Hg	Total Coliform, E. coli, HPC	BACTERIA	Number of Containers
	~~Moberly River - Downstream (MD)~~			Water	R	R	R	R	R	R	R	R		
	Peace 3 (PR3)	20-12-16	11:37	Water	R	R	R	R	R	R	R	R		8
	Peace 4 (PD1)	20-12-16	12:59	Water	R	R	R	R	R	R	R	R		8
	~~Pine River (Pine)~~			Water	R	R	R	R	R	R	R	R		
	TRAVEL BLANK (				R			R				R		4

L1872829-COFC

Short Holding Time

Rush Processing

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)	SAMPLE CONDITION AS RECEIVED (lab use only)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	Please use criteria: BC Approved and Working Water Quality Guidelines for the protection of freshwater aquatic life (Updated May 2015); samples were taken from surface water; include molly.brewis@bchydro.com on report distribution	Frozen ☐ SIF Observations Yes ☐ No ☐
Are samples for human drinking water use? ☐ Yes ☑ No	TRIP BLANK NOT FILTERED or Preserved	Ice packs Yes ☐ No ☐ Custody seal intact Yes ☐ No ☐
		Cooling Initiated ☐
		INITIAL COOLER TEMPERATURES °C:	FINAL COOLER TEMPERATURES °C: 4/4

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: DEC 20/16	Time: 3:38	Received by:	Date:	Time:	Received by: SRZ	Date: Dec 21	Time: 10:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

APPENDIX B
SEES JV GENERAL CONDITIONS

GENERAL CONDITIONS

GEOENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Saulteau EBA Environmental Services Joint Venture’s (SEES JV) Client (the Client). SEES JV does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than SEES JV’s Client unless otherwise authorized in writing by SEES JV. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of SEES JV. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where SEES JV submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed SEES JV’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by SEES JV shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of SEES JV’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except SEES JV. The Client warrants that SEES JV’s instruments of professional service will be used only and exactly as submitted by SEES JV.

Electronic files submitted by SEES JV have been prepared and submitted using specific software and hardware systems. SEES JV makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by SEES JV in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO SEES JV BY OTHERS

During the performance of the work and the preparation of the report, SEES JV may rely on information provided by persons other than the Client. While SEES JV endeavours to verify the accuracy of such information when instructed to do so by the Client, SEES JV accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

Appendix C

TETRA TECH

FIELD REPORT

SUMMARY DOCUMENT

Project:	Site C Clean Energy	**Date:**	March 1, 2017
Location:	Fort St. John, British Columbia	**Contractor:**	PRHP
Client:	BC Hydro	**Contractor's Rep:**	
Contact:	Greg Scarborough	**Contractor's Email:**	
Weather:		**Tetra Tech Representative:**	
File:		**Status:**	Summary Document

1.0 INTRODUCTION

In June 2016, BC Hydro retained Tetra Tech Canada Inc. (Tetra Tech) as QP(ARD) to inspect and monitor various non-RSEM potential PAG-ML construction areas. This Field Report has been compiled for BC Hydro by Tetra Tech Canada Inc. to summarize field data that was collected in relation to the acid rock drainage and metal leaching (ARD-ML) materials management on site for use in annual reporting requirements.

In accordance with the CEMP Appendix E - ARD-ML Management Plan, Section 6.1.2, Lara Reggin, P.Geo., and James Barr, P.Geo., of Tetra Tech completed site audits on September 13, October 27, and December 13, 2016.

2.0 SITE AUDIT 1, SEPTEMBER 13, 2016

The site visit and ARD-ML audit was comprised of visiting areas on site with stored or exposed shale rock, collecting field measurements for pH and alkalinity of standing and/or runoff water, and collecting rock samples for acid base accounting laboratory analysis. Refer to attached figures for specific site inspection locations for field pH tests and rock sample collection for the North Bank and South Bank respectively. An Oakton *PHTESTR30* pH meter was used to collect pH measurements, and semi-quantitative disposable test strips were used to estimate alkalinity of the water samples.

The following areas were visited and are included in this site audit:

- RSEM L3;
- River Road, From the Howe Pit Parking Area to the Culvert;
- Howe Pit;
- PRHP Temporary PAG Storage Area (South Bank);
- Tunnel excavation preparation area; and
- Moberly east bridge abutment.

2.1 Field Data - Rock Sample Analysis

Rock samples were collected from Area A Temporary PAG Storage (Table 2.1), the Moberly East Abutment PAG Exposure (Table 2.2) during the visit and were submitted for acid base accounting (ABA) laboratory analysis at ALS Minerals in North Vancouver. Results of the ABA analysis are summarized in Tables 2.1 and 2.2, and the Lab Certificate is attached. Refer to attached figures for location of the rock samples.

Tetra Tech Canada Inc.
Suite 1000 – 10th Floor, 885 Dunsmuir Street
Vancouver, BC V6C 1N5 CANADA
Tel 604.685.0275 Fax 604.684.6241

Table 2.1: Summary of field data for Area A Temporary PAG Storage, acid base accounting results, September 13, 2016

Sample ID	FIZZ Rating	MPA	NNP	NP	pH	Ratio (NP:MPA)	Total Sulphur	Sulphate S	Sulphide S	Inorganic Carbon (C)
Description	Unity	tCaCO 3/1Kt	tCaCO3/ 1Kt	tCaCO3/ 1Kt	Unity	Unity	%	%	%	%
PHRP TS1	1	14.1	-13	1	5.7	0.07	0.45	0.09	0.29	<0.05

Table 2.2: Summary of field data for Moberly East Abutment PAG Exposure, acid base accounting results, September 13, 2016

Sample ID	FIZZ Rating	MPA	NNP	NP	pH	Ratio (NP:MPA)	Total Sulphur	Sulphate S	Sulphide S	Inorganic Carbon (C)
Description	Unity	tCaCO3 /1Kt	tCaCO3 /1Kt	tCaCO3/ 1Kt	Unity	Unity	%	%	%	%
MEA 1	1	31.3	-24	7	6.9	0.22	1	0.08	0.78	0.07

2.2 Field Data – Insitu Water Testing

Insitu aqueous pH and total alkalinity measurements were collected at Blind Corner along River Road and the Howe Pit Area as shown in the attached figures and as described in Tables 2.3 and 2.4.

Table 2.3: Summary of field data for River Road at Blind Corner, insitu water testing, September 13, 2016

Location ID	Location Description	Water Flow (Estimated L/min)	pH / Alkalinity (ppm)	Comments
RR-Out	At culvert outflow into the Peace River	2 to 5	8.6 /180	Erosion of bank where water falls from culvert.
RR-A	Between cistern and lower limestone lined chimney ditch	2 to 5	8.3 / 180	Precipitate formed in base of ditch.
RR-B	At Blind Corner, at lower end of plastic ditch liner.	Trickle only	7.6 / 60	Iron oxide staining observed on limestone.
RR-C	At Blind Corner, at upper end of plastic ditch liner.	Trickle only	7.0 / 60	Iron oxide staining observed on limestone.
RR-D	In Upper Chimney (unlined)	1 to 2	8.5 / 180	Water very clear, no precipitate.

Table 2.4: Summary of field data for Howe Pit, insitu water testing, September 13, 2016

Location ID	Location Description	Water Flow (Estimated L/min)	pH / Alkalinity (ppm)	Comments
HP-A	Ditch adjacent to Morgan PAG Storage	none	9.2/ 40	Pooled water at east end of Storage
HP-B	Ditch within Mid Pit area,	6 to 10	6.5 / 60	Average of several measurements,
HP-C	Road Header Test Area	none	2.5 / 0	Strong iron oxide stain observed on face and pooling in front of freshly cut rock. Pooled water was stagnant and not flowing.

3.0 SITE AUDIT 2, OCTOBER 27, 2016

The site visit and ARD-ML audit was comprised of visiting areas on site with stored or exposed shale rock, collecting field measurements for pH and alkalinity of standing and/or runoff water, and collecting rock samples for acid base accounting laboratory analysis. Refer to attached figures for specific site inspection locations for field pH tests and rock sample collection for the North Bank and South Bank respectively. An Oakton PHTESTR30 pH meter was used to collect pH measurements, and semi-quantitative disposable test strips were used to estimate alkalinity of the water samples.

The following areas were visited and are included in this site audit:

1) Physical overview of the North Bank construction areas:
    a. Howe Pit
    b. River Road cut-bank and ditches
    c. RSEM L3
    d. RSEM L5
        i. Garbage Creek
2) Physical overview of South Bank construction areas:
    a. Drainage Tunnel portal
    b. RSEM R6
    c. RSEM R5b
    d. Area 23
    e. Area 20 Legacy PAG storage area
    f. Moberly East bridge abutment
    g. Spillway Approach Channel
    h. RCC Trial Plot
    i. Upper Moberly Road ditch
3) Meetings and discussions with onsite staff and contractors included:
    a. BC Hydro staff:
        i. Cam Forrester, Sr. Environmental Coordinator
        ii. Greg Scarborough, Manager, Project Environmental Risk Management
        iii. Josh Stoski, Site Environmental Team
    b. PRHP
        i. Craig Nistor, Environmental Manager
        ii. Bruce Mattson, PHRP QP (ARD) (Lorax)
        iii. John Dockrey PHRP QP (ARD) (Lorax)

3.1 Field Data - Rock Sample Analysis

One rock sample was collected from within the RSEM R5b during the visit and was submitted for acid base accounting (ABA) laboratory analysis at ALS Minerals in North Vancouver. Results of the ABA analysis are summarized in Table 3.1 and the Lab Certificate is attached. Refer to attached figure for the location of the rock sample.

Table 3.1: Summary of field data for RSEM R5b PAG Storage, acid base accounting results, October 27, 2016

Sample ID	FIZZ Rating	MPA	NNP	NP	Paste pH	Ratio (NP:MPA)	Total Sulphur	Sulphate S ($NaCO_3$ leach)	Sulphide S	Inorganic Carbon (C)
Description	**Unity**	**tCaCO3 /1Kt**	**tCaCO3 /1Kt**	**tCaCO3 /1Kt**	**Unity**	**Unity**	**%**	**%**	**%**	**%**
R5b-2016-10-27	1	53.1	-44	9	6.4	0.17	1.7	0.11	1.29	0.08

3.2 Field Data – Insitu Water Testing

Insitu aqueous pH and total alkalinity measurements were collected at the Howe Pit Area, Blind Corner along River Road, East Moberly Abutment PAG Exposure, and the RCC Test Plot Area shown in the attached figure and as described in Tables 3.2 through 3.5.

Table 3.2: Summary of field data for Howe Pit, insitu water testing, October 27, 2016

Location ID	Location Description	Water Flow	pH	Alkalinity (ppm)	Comments
HP-102716-01	Traverse to south side of pit along ditch feeding lower chimney ditch	flowing	8.1	160	Iron precipitate present in ditch
RR-102716-11	Standing water in gravel bench area of Howe pit	standing	8.03	60	
Wetland		standing	8.47	240	Provided by Josh Stoski, Nov 4, 2016. Wetland was iced over.
Flow beneath wetland		flowing	8.49	240	

Table 3.3: Summary of field data for River Road at Blind Corner, insitu water testing, October 27, 2016

Location ID	Location Description	Water Flow	pH	Alkalinity (ppm)	Comments
RR-102716-01	Upper chimney ditch at intersection with River Road	flowing	8.34	180	Yellowish-white precipitate noted
RR-102716-02	In River Road ditch at Blind Corner, beneath PAG exposure slope.	flowing	7.70	200	Large limestone rip-rap, iron oxide precipitate on limestone
RR-102716-03	In River Road ditch, between chimney ditches	flowing	3.95	0	Accumulated precipitate at bottom of ditch and covering limestone rip-rap. Location is below PAG slope
RR-102716-04	In River Road ditch, upstream of poly lining	flowing	4.64	0	Accumulated orange precipitate on bottom and on limestone rip-rap
RR-102716-05	In River Road ditch, downstream of PAG slope, upstream of lower chimney ditch	flowing	4.82	0	More limestone rip-rap not completely coated than in upstream location, rip rap fragment size is smaller.
RR-102716-06	In River Road ditch, downstream or PAG slope, upstream of lower chimney ditch	flowing	4.63	0	Iron oxide precipitate on limestone rip-rap. Approximately 100 south of exposed PAG slope
RR-102716-07	Just upstream of lower chimney ditch	flowing	4.63	0	Iron oxide precipitate on limestone rip-rap.
RR-102716-08	In River Road ditch just below intersection with lower chimney ditch	flowing	6.65	80	Abundant white precipitate
RR-102716-09	Culvert outflow	flowing	7.31	80	Abundant precipitate noted at outflow.
RR-102716-10	Approximately half-way up lower chimney ditch	flowing	8.10	120	Abundant precipitate noted.

Table 3.4: Summary of field data for southwest ditch of East Moberly Abutment, insitu water testing, October 27, 2016

Location ID	Location Description	Water Flow (Estimated L/min)	pH	Alkalinity (ppm)	Comments
EMA-102716-01	Standing water on southwest side of east bridge abutment	null	8.05	80	
		null	8.20	80	

Table 3.5: Summary of field data for RCC Trial Plot Area, insitu water testing, October 27, 2016

Location ID	Location Description	Water Flow (Estimated L/min)	pH	Alkalinity (ppm)	Comments
RCCTP-102716-01	Northeast collection point		8.0	180	Received water from southwest collection point.
RCCTP-102716-01	Southeast corner of catchment ditch		8.0	180	Seepage noted at overburden and shale contact

4.0 SITE AUDIT 3, DECEMBER 13, 2016

The site visit and ARD-ML audit was comprised of visiting areas on site with stored or exposed shale rock (PAG), or areas in construction for future storage of PAG. Due to the cold temperatures on site over previous weeks, no flowing water was observed on site and therefore no field measurements were collected for pH and alkalinity. Additionally, no rock samples were collected at this time.

The following areas were visited and are included in this site audit.

4) Construction areas visited on the Left Bank:
    a. Howe Pit
    b. River Road lower chimney and drainage culvert
    c. L3 Creek drainage culvert
    d. RSEM L5
        i. West Gully Diversion Channel
        ii. Garbage Creek
    e. LBX catchment pond
    f. RSEM L6 settlement ponds
5) Construction areas visited on the Right Bank:
    a. RSEM R5b (completed)
    b. RSEM R5a (in construction)
    c. Moberly temporary bridge
    d. Groundwater well GW-10b
    e. Area 23

f. Spillway Approach Channel
g. Right Bank Drainage Tunnel (RBDT)
h. RSEM R6

6) Meetings and discussions with onsite BC Hydro staff and contractors included:
   a. BC Hydro staff:
      i. Cam Forrester, Sr. Environmental Coordinator
      ii. Molly Brewis, Environmental Coordinator
      iii. Josh Stoski, Site Environmental Team
   b. Ecofish Research Ltd:
      i. Kevin Ganshorn, Biologist and Sr. Project Manager
   c. Ecofor Consulting Ltd:
      i. Mark Pokorski, Ecosystem Biologist

5.0 SUMMARY OF RECOMMENDATIONS AND MITIGATION

Howe Pit

Recommendation:

- Water management planning within Howe Pit is recommended to limit the amount of drainage effluent from Howe Pit that is being diverted to the River Road ditches (September, 2016).

Mitigative action:

- Further sampling in the area in October, 2016, indicated that mixing of surface water from a nearby wetland resulting in high alkalinity waters in the lower cut-off ditch.
- Long term solutions for management and mitigation of the Howe Pit area are being considered by BC Hydro.

River Road at Blind Corner

Recommendation:

- The limestone riprap in the River Road ditch has been placed to mitigate the acidic effluent from the rock cuts immediately adjacent to the ditch, and did not appear to have the capacity to mitigate a large flow event with water coming from the catchment drainage and Howe Pit. It is recommended that limestone riprap within the River Road ditches is refreshed periodically, and prior to the next anticipated high flow event at freshet (September, October, 2016).

Mitigation action:

- BC Hydro is implementing a limestone refresh program (spring 2017) in addition to a periodic water quality sampling program.

Area 20 Temporary PAG Storage

Recommendation:

- The temporary PAG storage area in Area 20 was not mitigated to limit exposure to air or water and there is evidence in ponding iron oxide precipitate that acidic drainage is occurring. This is confirmed by laboratory testing of a rock sample from one of the piles which reported a paste pH value of 5.9. A long term plan for

monitoring, mitigation and permanent storage of this material is in progress and needs to be finalized by PHRP (September 2016).

Mitigative action:

- PAG material was removed in October, 2016, and relocated to RSEM R5b. The facility was cleared and eventually enveloped by development of the Area 20 laydown area.

Moberly East Abutment Exposure

Recommendation:

- Drainage field pH measurement and confirmatory rock samples indicated that acid has not started to be produced. It is anticipated that acidic drainage could start to be produced in six to eight weeks from the date of exposure. This area should continue to be monitored until construction is complete and the PAG exposures are covered by the construction infill (September, 2016).

Mitigative action:

- The exposure was covered with backfill as part of the bridge abutment and straw cover added over upper portions of the exposure.

Area 23 Temporary PAG Storage Facility

Recommendation:

- A perimeter berm and possible inner perimeter ditch appeared to be in the process of construction by a dozer. A continuous perimeter ditch with connectivity to the pond did not appear to be in place on this site. These water management structures are required for this facility and completion of the ditch was to be closely monitored by BC Hydro personnel (December, 2016).

Mitigative action:

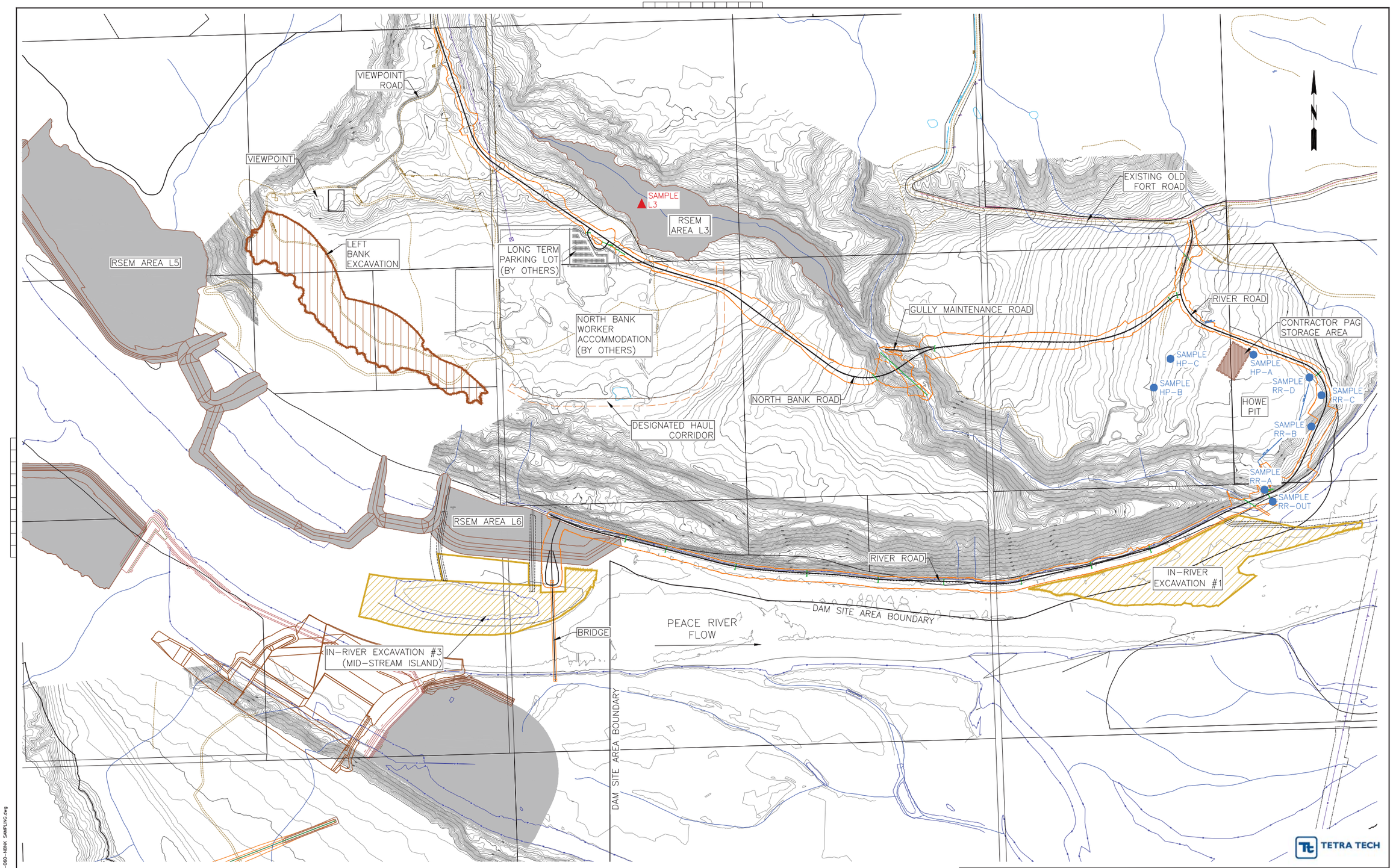
- The perimeter ditch was completed with connectivity to the pond.

ATTACHMENTS

SEPTEMBER 13, 2016 SITE AUDIT:

- Figure 1
- Figure 2
- Analytical Certificate

Tetra Tech Canada Inc.
Suite 1000 – 10th Floor, 885 Dunsmuir Street
Vancouver, BC V6C 1N5 CANADA
Tel 604.685.0275 Fax 604.684.6241



LEGEND:

- ROCK SAMPLE
- WATER SAMPLE

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REFERENCE DRAWINGS		

REF #	DRAWING NUMBER	TITLE
REFERENCE DRAWINGS		

NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP CIV	INSP STR	INSP MECH	INSP GEO	INSP ELEC	REV	ACPT
REVISIONS													

SITE C CLEAN ENERGY PROJECT

BC Hydro

DSGN	
INDEP CHK	
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DFTG CHK	
INSP	CIV / STR / MECH / GEO / ELEC
REV	
ACPT	

CLEAN ENERGY PROJECT - SITE C
ROADS - NORTH BANK

SAMPLING
PLAN

DATE 12 OCT 2016 | DIST

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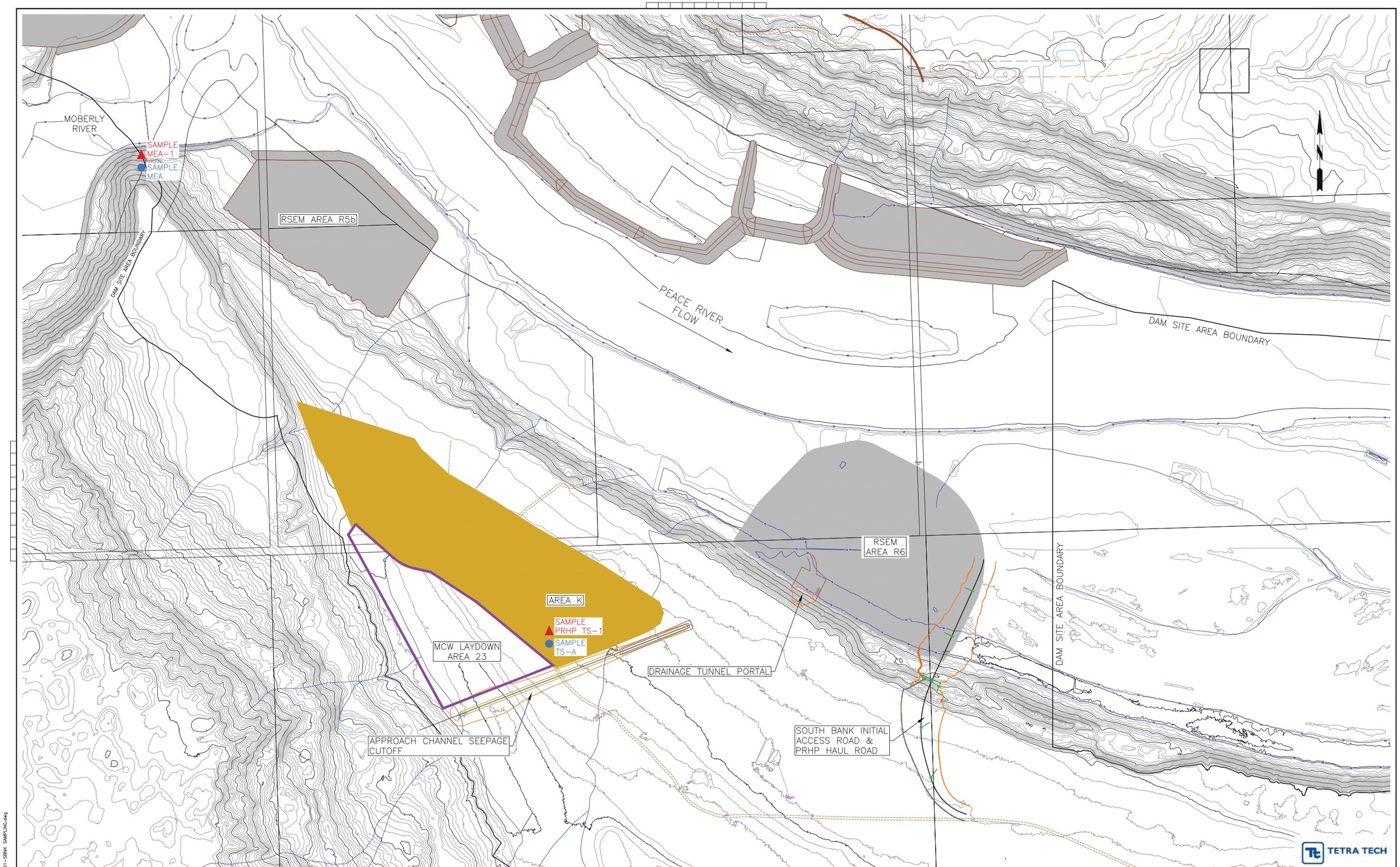

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- ROCK SAMPLE
- WATER SAMPLE

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REF#	DRAWING NUMBER	TITLE
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SITE C CLEAN ENERGY PROJECT

BC Hydro

DSGN
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CLEAN ENERGY PROJECT - SITE C
ROADS - SOUTH BANK

SAMPLING
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ALS Canada Ltd.
2103 Dollarton Hwy
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www.alsglobal.com

To: TETRA TECH EBA INC.
885 DUNSMUIR STREET
VANCOUVER BC V6C 1N5

Finalized Date: 7- OCT- 2016
Account: TGM

CERTIFICATE VA16157167

Project: V13103415- 05

This report is for 2 Rock samples submitted to our lab in Vancouver, BC, Canada on 16- SEP- 2016.

The following have access to data associated with this certificate:

LARA REGGIN		

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI- 21	Received Sample Weight
LOG- 22	Sample login - Rcd w/o BarCode
CRU- 31	Fine crushing - 70% <2mm
SPL- 21	Split sample - riffle splitter
PUL- 31	Pulverize split to 85% <75 um

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
S- IR07	Sulphide Sulphur (Leco)	LECO
C- GAS05	Inorganic Carbon (CO2)	
S- GRA06a	Sulfate Sulfur (HCl leachable)	WST- SEQ
OA- VOL08	Basic Acid Base Accounting	
S- IR08	Total Sulphur (Leco)	LECO
OA- ELE07	Paste pH	
S- GRA06	Sulfate Sulfur- carbonate leach	WST- SEQ

To: TETRA TECH EBA INC.
ATTN: LARA REGGIN
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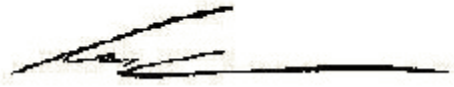
VANCOUVER BC V6C 1N5

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature: 
Colin Ramshaw, Vancouver Laboratory Manager

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To: TETRA TECH EBA INC.
885 DUNSMUIR STREET
VANCOUVER BC V6C 1N5

Finalized Date: 7- OCT- 2016
Account: TGM

Project: V13103415- 05

CERTIFICATE OF ANALYSIS VA16157167

Sample Description	Method Analyte Units LOR	WEI- 21 Recvd Wt. kg 0.02	OA- VOL08 FIZZ RAT Unity 1	OA- VOL08 MPA tCaCO3/1Kt 0.3	OA- VOL08 NNP tCaCO3/1Kt 1	OA- VOL08 NP tCaCO3/1Kt 1	OA- ELE07 pH Unity 0.1	OA- VOL08 Ratio (N Unity 0.01	S- IR08 S % 0.01	S- GRA06 S % 0.01	S- GRA06a S % 0.01	S- IR07 Sulphide % 0.01	C- GAS05 C % 0.05	C- GAS05 CO2 % 0.2
PHRP TS1		0.98	1	14.1	-13	1	5.7	0.07	0.45	0.09	0.08	0.29	<0.05	<0.2
MEA 1		1.22	1	31.3	-24	7	6.9	0.22	1.00	0.08	0.06	0.78	0.07	0.3

***** See Appendix Page for comments regarding this certificate *****

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: +1 (604) 984 0221 Fax: +1 (604) 984 0218
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To: TETRA TECH EBA INC.
885 DUNSMUIR STREET
VANCOUVER BC V6C 1N5

Finalized Date: 7- OCT- 2016
Account: TGM

Project: V13103415- 05

CERTIFICATE OF ANALYSIS VA16157167

CERTIFICATE COMMENTS

LABORATORY ADDRESSES

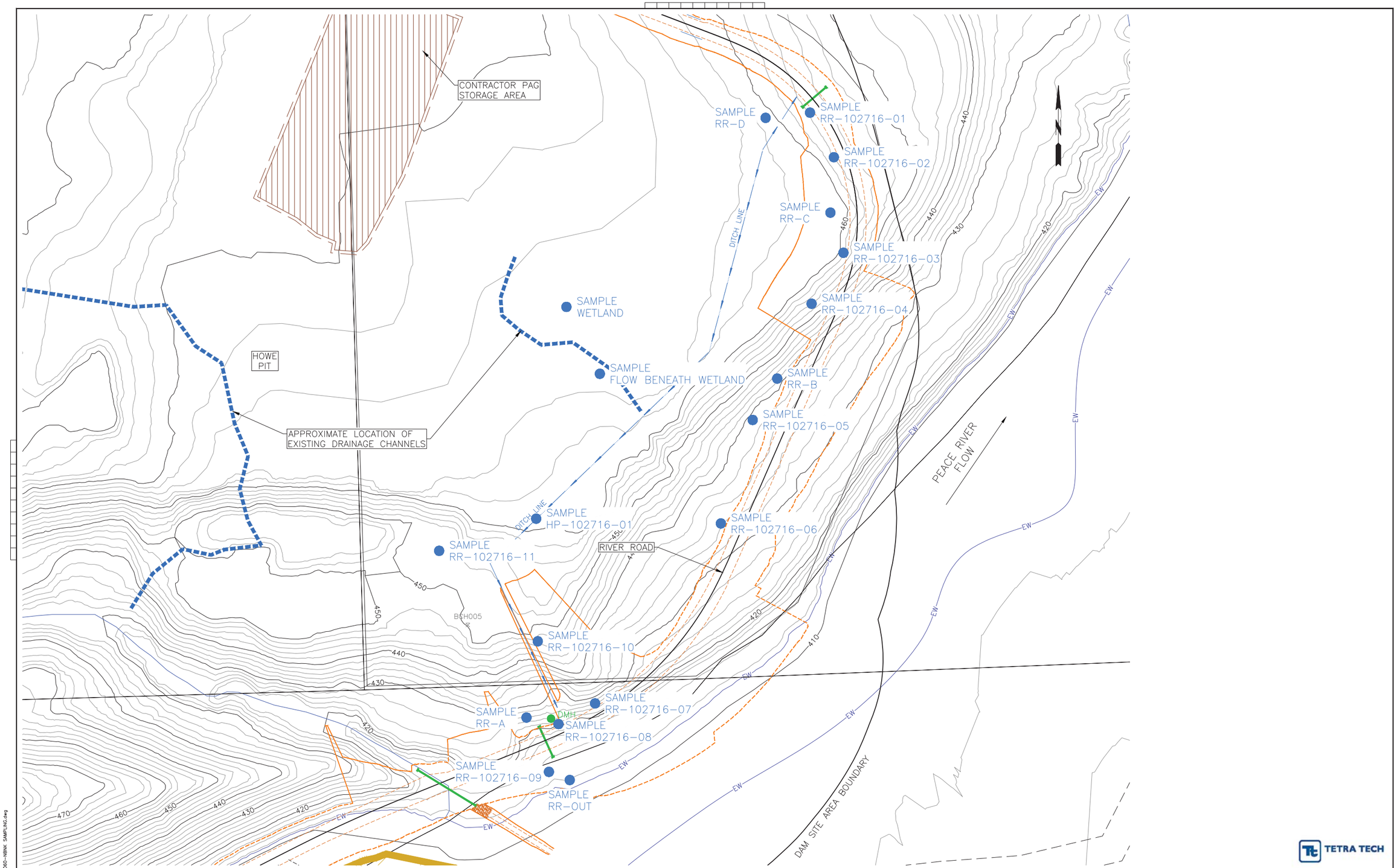
Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.

Applies to Method:			
C- GAS05	CRU- 31	LOG- 22	OA- ELE07
OA- VOL08	PUL- 31	S- GRA06	S- GRA06a
S- IR07	S- IR08	SPL- 21	WEI- 21

ATTACHMENTS

OCTOBER 27, 2016 SITE AUDIT:

- Figure 1
- Figure 2
- Figure 3
- Analytical Certificate



LEGEND:

- ROCK SAMPLE
- WATER SAMPLE

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TETRA TECH

SITE C CLEAN ENERGY PROJECT

BC Hydro

CLEAN ENERGY PROJECT - SITE C
ROADS - NORTH BANK

SAMPLING
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REV					
ACPT					

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VIEWPOINT ROAD
VIEWPOINT
GARBAGE CREEK PAG STORAGE
RSEM AREA L5
LEFT BANK EXCAVATION
LONG TERM PARKING LOT (BY OTHERS)
RSEM AREA L3
NORTH BANK WORKER ACCOMMODATION (BY OTHERS)
DESIGNATED HAUL CORRIDOR
NORTH BANK ROAD
GULLY MAINTENANCE ROAD
EXISTING OLD FORT ROAD
RIVER ROAD
CONTRACTOR PAG STORAGE AREA
SAMPLE HP-C
SAMPLE HP-A
SAMPLE HP-B
HOWE PIT
APPROXIMATE LOCATION OF EXISTING DRAINAGE CHANNELS
FIGURE 1
RSEM AREA L6
RIVER ROAD
IN-RIVER EXCAVATION #1
DAM SITE AREA BOUNDARY
PEACE RIVER FLOW
BRIDGE
IN-RIVER EXCAVATION #3 (MID-STREAM ISLAND)
DAM SITE AREA BOUNDARY
TETRA TECH

LEGEND:
- ROCK SAMPLE
- WATER SAMPLE

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REVISIONS													

SITE C CLEAN ENERGY PROJECT

BC Hydro

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REV						
ACPT						

CLEAN ENERGY PROJECT - SITE C
ROADS - NORTH BANK

SAMPLING PLAN

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MOBERLY RIVER

SAMPLE EMA-102716-01

RSEM AREA R5b

SAMPLE R5B-2016-10-27

DAM SITE AREA BOUNDARY

PEACE RIVER FLOW

NORTH BRIDGE APPROACH

RIVER ROAD

DAM SITE AREA BOUNDARY

PARALLEL HAUL ROAD / R6 DYKE SHARED ROAD

RSEM AREA R6

AREA K

MCW LAYDOWN AREA 23

DRAINAGE TUNNEL PORTAL

SAMPLE RCCTP-102716-01

SOUTH BANK INITIAL ACCESS ROAD & PRHP HAUL ROAD

APPROACH CHANNEL SEEPAGE CUTOFF

AREA A HAULING ROAD

TETRA TECH

LEGEND:

- ROCK SAMPLE
- WATER SAMPLE

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REF#	DRAWING NUMBER	TITLE
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REVISIONS													

SITE C CLEAN ENERGY PROJECT

BC Hydro

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INSP	CIV / STR / MECH / GEO / ELEC
REV	
ACPT	
DATE	21 NOV 2016
DIST	

CLEAN ENERGY PROJECT - SITE C
ROADS - SOUTH BANK

SAMPLING PLAN

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To: TETRA TECH EBA INC.
885 DUNSMUIR STREET
VANCOUVER BC V6C 1N5

Finalized Date: 18- NOV- 2016
Account: TGM

CERTIFICATE VA16188709

This report is for 1 Rock sample submitted to our lab in Vancouver, BC, Canada on 1- NOV- 2016.

The following have access to data associated with this certificate:

J. BARR		

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI- 21	Received Sample Weight
LOG- 22	Sample login - Rcd w/o BarCode
CRU- 31	Fine crushing - 70% <2mm
SPL- 21	Split sample - riffle splitter
PUL- 31	Pulverize split to 85% <75 um

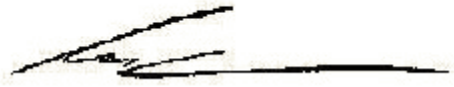
ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
S- IR07	Sulphide Sulphur (Leco)	LECO
C- GAS05	Inorganic Carbon (CO2)	
S- GRA06a	Sulfate Sulfur (HCl leachable)	WST- SEQ
OA- VOL08	Basic Acid Base Accounting	
S- IR08	Total Sulphur (Leco)	LECO
OA- ELE07	Paste pH	
S- GRA06	Sulfate Sulfur- carbonate leach	WST- SEQ

To: TETRA TECH EBA INC.
ATTN: J. BARR
150- 1715 DICKSON AV
KELOWNA BC V1Y 9G6

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature: 
Colin Ramshaw, Vancouver Laboratory Manager

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www.alsglobal.com

To: TETRA TECH EBA INC.
885 DUNSMUIR STREET
VANCOUVER BC V6C 1N5

Finalized Date: 18- NOV- 2016
Account: TGM

CERTIFICATE OF ANALYSIS VA16188709

Sample Description	Method Analyte Units LOR	WEI- 21 Recvd Wt. kg 0.02	OA- VOL08 FIZZ RAT Unity 1	OA- VOL08 MPA tCaCO3/1Kt 0.3	OA- VOL08 NNP tCaCO3/1Kt 1	OA- VOL08 NP tCaCO3/1Kt 1	OA- ELE07 pH Unity 0.1	OA- VOL08 Ratio (N Unity 0.01	S- IR08 S % 0.01	S- GRA06 S % 0.01	S- GRA06a S % 0.01	S- IR07 Sulphide % 0.01	C- GAS05 C % 0.05	C- GAS05 CO2 % 0.2
R5B- 10- 28- 2016		1.46	1	53.1	-44	9	6.4	0.17	1.70	0.07	0.11	1.29	0.08	0.3

***** See Appendix Page for comments regarding this certificate *****

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
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To: TETRA TECH EBA INC.
885 DUNSMUIR STREET
VANCOUVER BC V6C 1N5

Finalized Date: 18- NOV- 2016
Account: TGM

CERTIFICATE OF ANALYSIS VA16188709

CERTIFICATE COMMENTS

LABORATORY ADDRESSES

Applies to Method: Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.

C- GAS05	CRU- 31	LOG- 22	OA- ELE07
OA- VOL08	PUL- 31	S- GRA06	S- GRA06a
S- IR07	S- IR08	SPL- 21	WEI- 21

Appendix D

This document provides pH sampling data collected during high flow/runoff in the limestone lined ditches along River Road and the south perimeter of Howe Pit. Samples were collected June 15-16 during high rainfall event that resulted in measureable ditch flows for the first time during the project.

June 15, 2016 pH sampling

	
Limestone chimney drain from the Howe Pit south perimeter cut-off ditch.	Limestone chimney drain pH 5.9
	
River Rd ditch at ~12+500.	River Rd ditch at ~12+500 pH 3.3

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Cross-drain culvert at ~12+420 River Rd.	Cross-drain culvert at ~12+420 River Rd pH 3.6
	
Ditch flow from River Road entering Peace River side-channel.	Ditch flow from River Road entering Peace River side-channel pH 4.7
	
Peace River side-channel, ~20 m d/s of the ditch flow confluence.	Peace River side-channel, ~20 m d/s of the ditch flow confluence pH 4.7

	
Peace River side-channel, ~50 m d/s of the ditch flow confluence.	Peace River side-channel, ~50 m d/s of the ditch flow confluence pH 7.5
	
Peace River side-channel, ~100 m d/s of the ditch flow confluence.	Peace River side-channel, ~100 m d/s of the ditch flow confluence pH 7.5.
	
Peace River side-channel, ~200 m d/s of the ditch flow confluence.	Peace River side-channel, ~200 m d/s of the ditch flow confluence pH 7.8.

	
Peace River side-channel, u/s of L3 and the River Rd. ditch flow confluence.	Peace River side-channel, u/s of L3 and the River Rd. ditch flow confluence pH 7.9

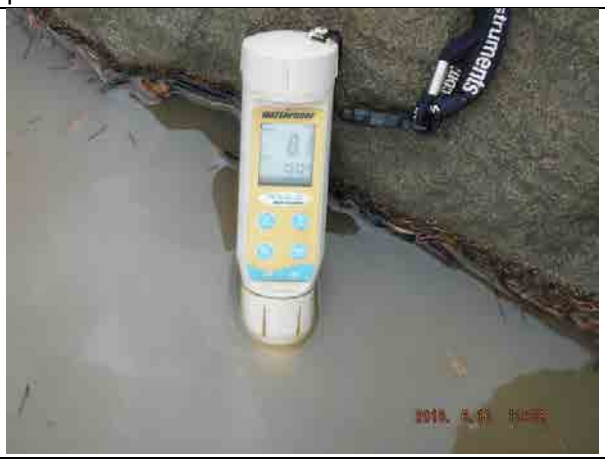
June 16, 2016 pH sampling in the morning (ditch flow decreasing)

	
Limestone chimney drain from the Howe Pit south perimeter cut-off ditch. (pH in cut-off ditch at top of slope above was 5.3)	Limestone chimney drain pH 6.8
	
River Rd ditch at ~12+500.	River Rd ditch at ~12+500 pH 5.7

	
Cross-drain culvert at ~12+420 River Rd.	Cross-drain culvert at ~12+420 River Rd pH 6.5
	
Ditch flow from River Road entering Peace River side-channel.	Ditch flow from River Road entering Peace River side-channel pH 7.2
	
Peace River side-channel, ~100 m d/s of the ditch flow confluence.	Peace River side-channel, ~100 m d/s of the ditch flow confluence pH 7.6

June 16, 2016 pH sampling in the afternoon (standing water in ditch; not flowing)

	
Limestone chimney drain from the Howe Pit south perimeter cut-off ditch.	Limestone chimney drain pH 7.5
	
River Rd ditch at ~12+500.	River Rd ditch at ~12+500 pH 7.3
	
Cross-drain culvert at ~12+420 River Rd.	Cross-drain culvert at ~12+420 River Rd pH sample not collected; insufficient water present.

	
Ditch flow from River Road entering Peace River side-channel (no visible discharge in the afternoon).	No visible discharge from River Road ditch flow entering Peace River side-channel in the afternoon pH 8.0
	
Peace River side-channel, ~100 m d/s of the ditch flow confluence.	Peace River side-channel, ~100 m d/s of the ditch flow confluence pH 8.1