



Hatfield
CONSULTANTS

Environmental Specialist Since 1974



REGIONAL AQUATICS MONITORING

in support of the

JOINT OIL SANDS MONITORING PLAN

Final 2015 Program Report – Appendices

April 2016

Prepared for:

Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA)
Edmonton, Alberta



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JOINT OIL SANDS MONITORING PLAN

2015 Program Report – Appendices

Prepared for:

**ALBERTA ENVIRONMENTAL MONITORING,
EVALUATION AND REPORTING AGENCY**

Prepared by:

**HATFIELD CONSULTANTS
KILGOUR AND ASSOCIATES LTD.
and WESTERN RESOURCE SOLUTIONS**

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APPENDICES

Appendix A

Estimating Area of Land Change for the Athabasca Oil Sands Region

A ESTIMATING AREA OF LAND CHANGE FOR THE ATHABASCA OIL SANDS REGION

A.1 INTRODUCTION

This appendix documents the methods used to quantify the location, extent, and type of land change in the Athabasca oil sands region as of 2015 related to oil sands operations that were under construction or operational in 2015.

This land change information was used to designate sampling stations and locations as *baseline* and *test* and to provide information for the hydrologic analysis of potential effects of oil sands activities.

A.2 METHODS

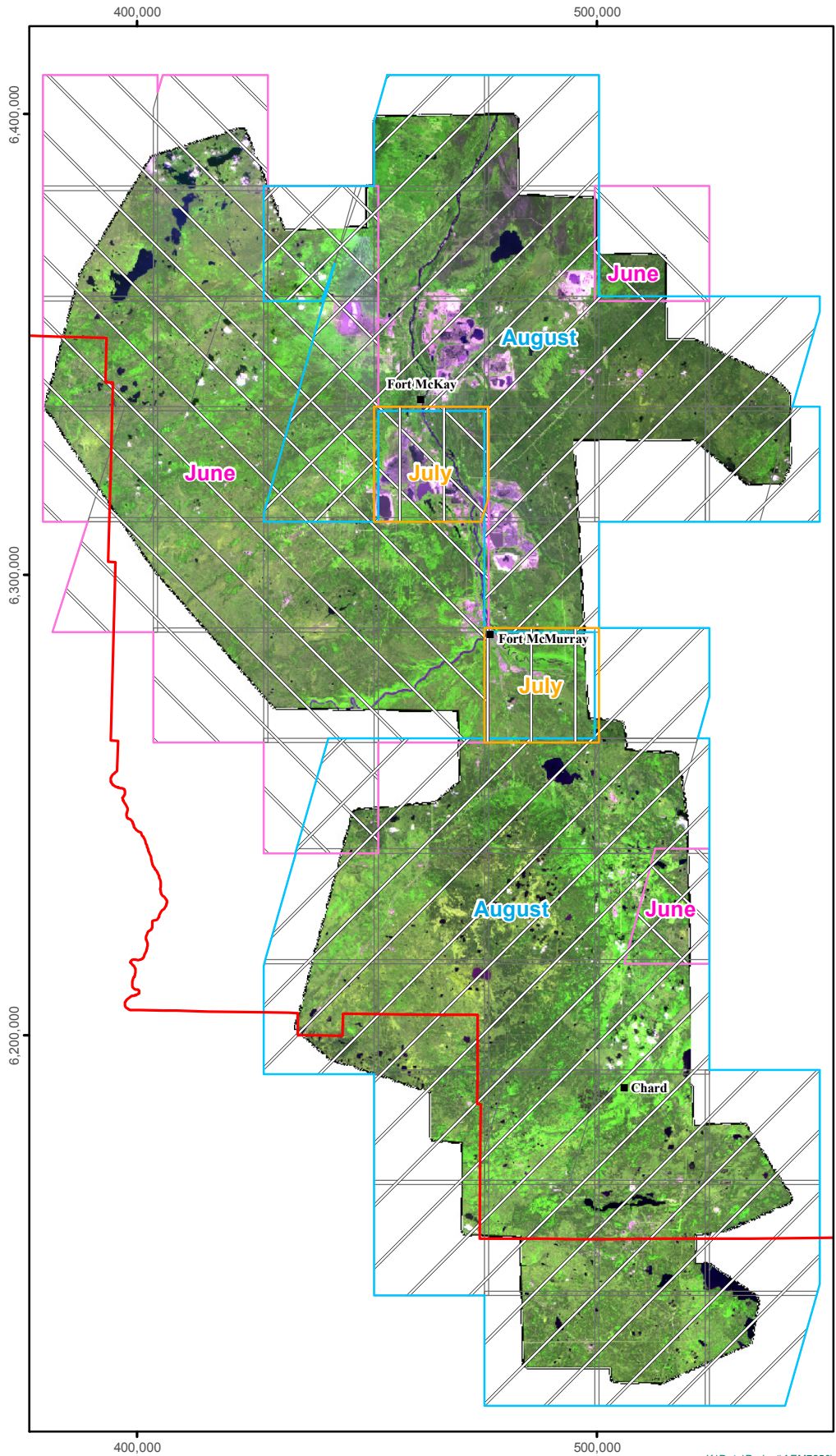
A.2.1 Satellite Imagery Acquisition

Since 2006, Hatfield has used SPOT-5 10-m satellite imagery for land change analysis. However, in 2014 satellite imagery was acquired from RapidEye, which provides multi-spectral imagery in 5-m resolution. The change to RapidEye in 2014 was made in anticipation of the decommissioning of the SPOT-5 satellite scheduled in 2015, with the goal to use a similar spatial and spectral resolution sensor for consistent mapping. Given the SPOT-5 satellite sensor has been decommissioned as per the schedule (<http://www.satimagingcorp.com/satellite-sensors/other-satellite-sensors/spot-5/>), Hatfield continued acquiring RapidEye imagery in 2015. RapidEye offers higher spatial resolution imagery with additional “Blue” and “Red-Edge” bands, which provides consistency with SPOT-5 imagery, while providing improved confidence in the land-use mapping analysis.

A total of 70 satellite images (42 north of Fort McMurray and 28 south of Fort McMurray) were acquired on June 17, 20, 27, 28 and 29, July 22 and 28, and August 10 and 30, 2015 (Figure A.2-1).

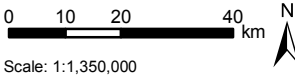
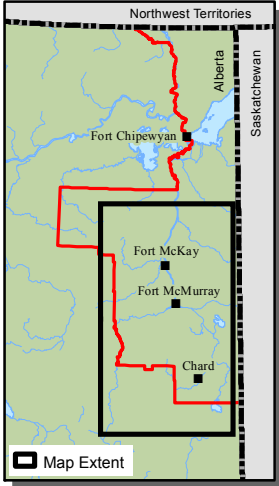
RapidEye images were obtained as a Level 3A ortho-rectified product, where radiometric, sensor, and geometric corrections were applied. The Level 3A products met a positional accuracy of six metres (12.7 m CE90), which was suitable for land use mapping.

Figure A.2-1 Illustration of the RapidEye scenes acquired in 2015.



Legend

- Regional Municipality of Wood Buffalo Boundary



Scale: 1:1,350,000
 Projection: NAD 1983 UTM Zone 12N

Data Source:
 RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.



A.2.2 Atmospheric Correction

Atmospheric correction was applied to minimize atmospheric effects (e.g., haze). The objective of atmospheric correction was to retrieve the surface reflectance from satellite imagery by removing the atmospheric effects to improve image quality for visual interpretation and land use classification. Atmospheric correction was applied to the RapidEye images using industry standard tools within PCI Geomatica 2015 image processing software (PCI Geomatics).

A.2.3 Colour-Balancing, Enhancement, and Mosaicking

Hatfield performed a process to produce a single image mosaic for the JOSMP Area of Interest (AOI), using an automatic mosaicking procedure available in PCI Geomatica 2015. Manual adjustment of the mosaic “cutlines” were conducted in order to create a seamless mosaic.

A.2.4 Classification of Land Change

To ensure consistency, the areas of land use change in 2015 were digitized beginning with the 2014 classification product (JOSMP 2015, Appendix A). The new digitized polygons were coded to the following two land-change classes:

1. Hydrologically Closed-Circuited – developed areas where there is no natural exchange of water with the rest of the watershed (e.g., mine open pit, mine infrastructure, tailings ponds, etc.); and
2. Not Hydrologically Closed-Circuited – developed areas where there is natural exchange of water with the rest of the watershed (e.g., cleared land and bare ground).

Draft land change maps were then distributed to oil sands operators in fall 2015 for review and comment, and a final set of land change maps was then prepared.

A GIS overlay analysis was performed to estimate the area of each land change class in each of the major watersheds of the Lower Athabasca River. The results of the overlay analysis were exported to MS Excel[®] for data summary, including:

1. The area of each watershed with land change as of 2015, summarized by land change type; and
2. The percentage of total watershed area with land change as of 2015, summarized by type of land change.

A.3 RESULTS

Table A.3-1 provides a tabular summary of the land change in each of the major watersheds by each land change type, for oil sands projects within the Athabasca oil sands region. These land change areas are also shown in Figure A.3-1 and Figure A.3-2 for the area north of Fort McMurray, and in Figure A.3-3 and Figure A.3-4 for the area south of Fort McMurray.

Land change as of 2015 was estimated to be approximately 128,486 ha, which was an increase from 123,990 ha in 2014. The total area of land change represented approximately 3.49% of the total area, compared to 3.47% in 2014. The percentage of the area of watersheds with land change as of 2015 varied from less than 1% for many watersheds (watersheds of the MacKay, Horse, Pierre, and Upper Beaver rivers), to 1% to 5% for watersheds of the Steepbank, Calumet, Firebag, Ells, Christina, and Hangingstone

ivers, to more than 10% for watersheds of the Muskeg River, Fort Creek, Mills Creek, Tar River, Shipyard Lake, Poplar Creek, and McLean Creek, as well as for the smaller Athabasca River tributaries between Fort McMurray and the confluence of the Firebag River.

Table A.3-1 Total area and percentage of land change in watersheds of the Athabasca oil sands region related to oil sands development in 2015.

Watershed	Total Watershed Area (ha)	Watershed Area with Land Change (ha)					
		Not-Closed Circuited (ha)		Closed-Circuited (ha)		Watershed Total (ha and %)	
		Area (ha)	Percent	Area (ha)	Percent		
Calumet River	17,523	135	0.77	70	0.40	205	1.17
Christina River ¹	1,340,198	13,269	0.99	1,814	0.14	15,083	1.13
Ells River	270,945	3,621	1.34	360	0.13	3,982	1.47
Firebag River ¹	646,993	3,492	0.54	4,046	0.63	7,539	1.17
Fort Creek	6,640	3,400	51.21	2,192	33.02	5,593	84.23
Hangingstone River	106,572	1,517	1.42	16	0.02	1,533	1.44
Horse River	215,740	1,849	0.86	157	0.07	2,006	0.93
MacKay River	556,871	4,396	0.79	763	0.14	5,160	0.93
McLean Creek	4,643	937	20.17	609	13.12	1,546	33.29
Mills Creek	1,424	206	14.48	723	50.77	929	65.25
Muskeg River ²	143,304	9,108	6.36	14,786	10.32	23,894	16.67
Original Poplar ³	28,388	1,716	6.04	3,802	13.39	5,518	19.44
Pierre River	13,824	18	0.13	0	0.00	18	0.13
Shipyard Lake	5,113	726	14.20	3,982	77.87	4,707	92.07
Steepbank River	136,395	4,142	3.04	1,414	1.04	5,556	4.07
Tar River	33,264	1,404	4.22	9,929	29.85	11,333	34.07
Upper Beaver River	18,796	41	0.22	82	0.43	123	0.65
Minor Athabasca River Tributaries ^{2,4}	135,132	7,860	5.82	25,902	19.17	33,762	24.98
Total	3,681,765	57,836	1.57	70,650	1.92	128,486	3.49
Lac La Biche ⁵	864,496	641	0.07	101	0.01	742	0.09

¹ The total watershed areas of the Christina River and Firebag River were increased in 2015 to include the portions of the watersheds that were within the province of Saskatchewan.

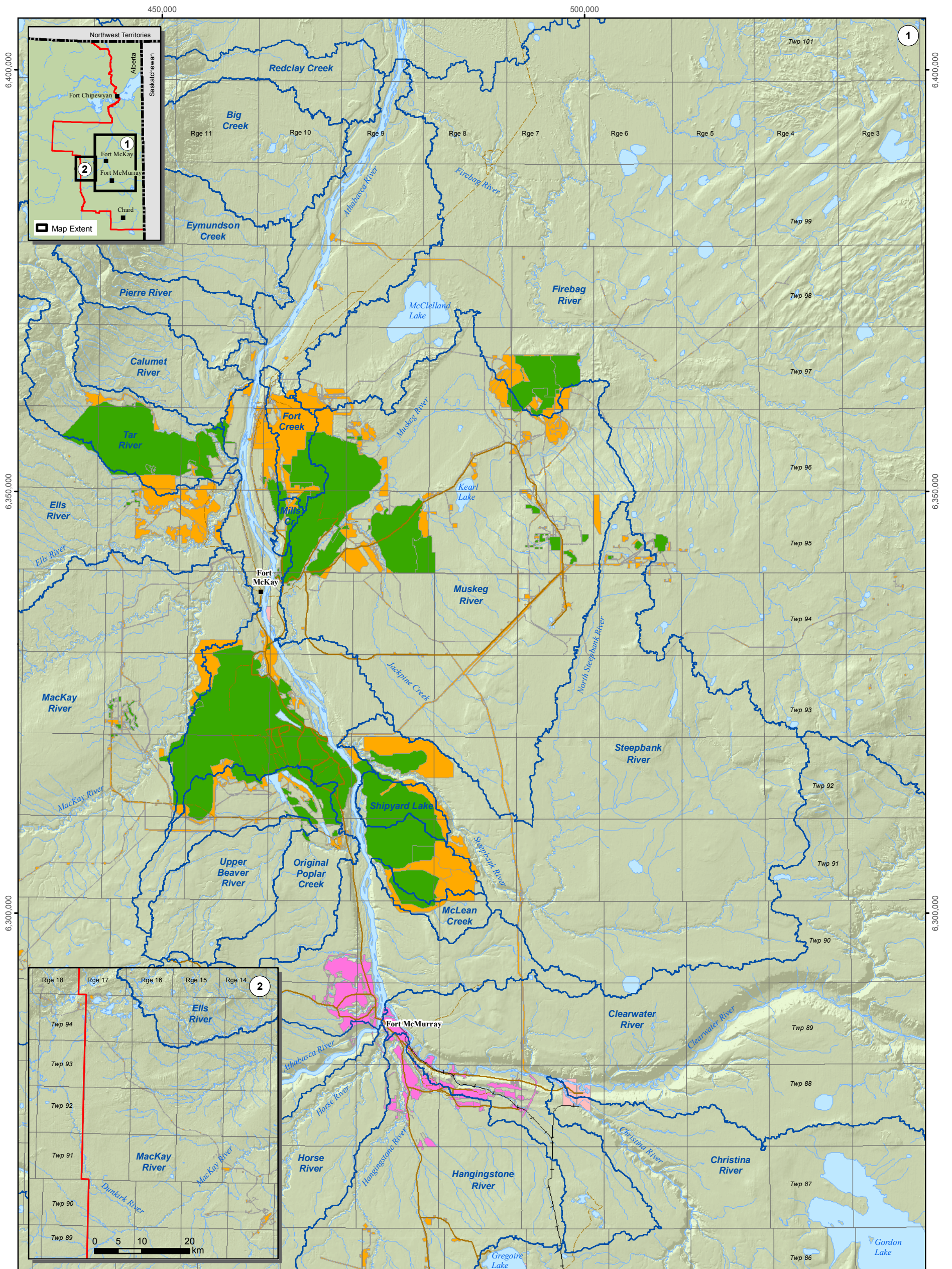
² Land change areas within the Muskeg River and Minor Athabasca River Tributaries watersheds were reduced slightly in 2015 due to the removal of non-oil sands development from the calculation of land change areas (specifically, the Hammerstone Quarry and Fort McKay Industrial Park and access roads).

³ Original Poplar refers to the Poplar Creek watershed prior to the Beaver Creek diversion, while "Upper Beaver" refers to that part of the Beaver Creek drainage that now drains into Poplar Creek as a result of the Beaver Creek diversion. Drainage boundaries were estimated from maps in Syncrude Canada Ltd. (1977).

⁴ Refers to Athabasca River tributaries from upstream of Fort McMurray to the mouth of the Firebag River excluding the watersheds explicitly listed in this table.

⁵ The Lac La Biche watershed was added in 2011 given some of the Canadian Natural Kirby project is located within this watershed. This watershed, however, is not part of the Athabasca oil sands region currently monitored under the JOSMP.

Figure A.3-1 Land change classes derived from 5-m RapidEye (June, July, and August 2015) multispectral satellite imagery, north of Fort McMurray.



Legend

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Town of Fort McMurray
- Land Change Area as of 2015^e**
 - Not Hydrologically Closed-Circuited
 - Hydrologically Closed-Circuited

Data Sources:
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, and First Nation Reserve from 1:250,000 National Topographic Data Base (NTDB), East Athabasca River, in the Muskeg River Watershed derived by RAMP, 2011.
 b) Hillshade from 1:20,000 Government of Alberta DEM.
 c) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.
 d) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.
 e) Land Change Areas Delineated from 5-m RapidEye (June, July, and August 2015) Multispectral Imagery.

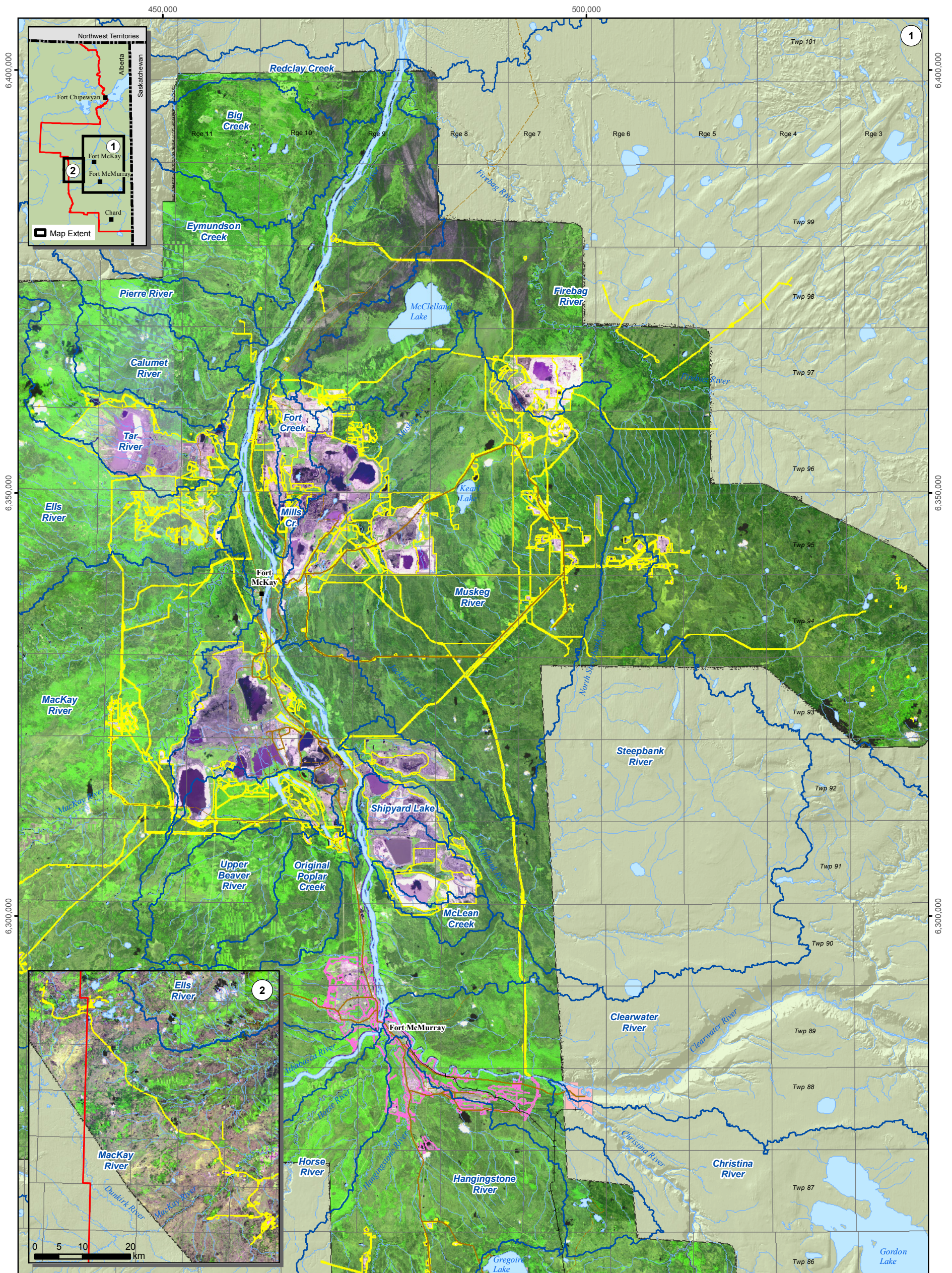
Township and Range designations are relative to W4M.

0 2.5 5 10 km

Scale: 1:450,000
 Projection: NAD 1983 UTM Zone 12N



Figure A.3-2 Land change classes overlaid on mosaics of RapidEye (June, July, and August 2015) multispectral satellite imagery, north of Fort McMurray.



Legend

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Town of Fort McMurray
- Land Change Area as of 2015^e

Data Sources:
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, and First Nation Reserve from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed derived by RAMP, 2011.
 b) Hillshade from 1:20,000 Government of Alberta DEM.
 c) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.
 d) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.
 e) Land Change Areas Delineated from 5-m RapidEye (June, July, and August 2015) Multispectral Imagery.

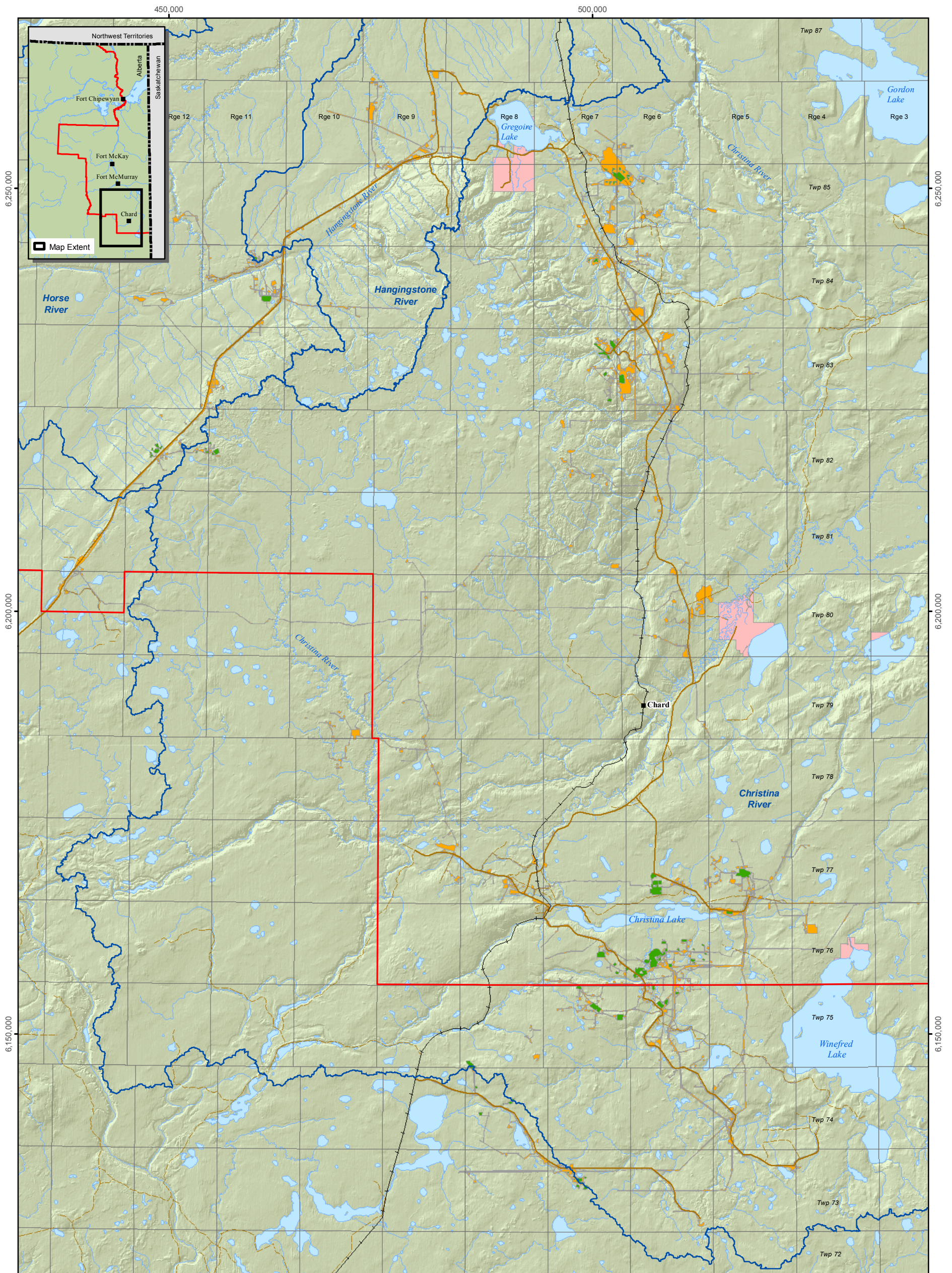
Township and Range designations are relative to W4M.

0 2.5 5 10 km

Scale: 1:450,000
 Projection: NAD 1983 UTM Zone 12N



Figure A.3-3 Land change classes derived from 5-m RapidEye (June, July, and August 2015) multispectral satellite imagery, south of Fort McMurray.



Legend

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Land Change Area as of 2015^e**
 - Not Hydrologically Closed-Circuited
 - Hydrologically Closed-Circuited

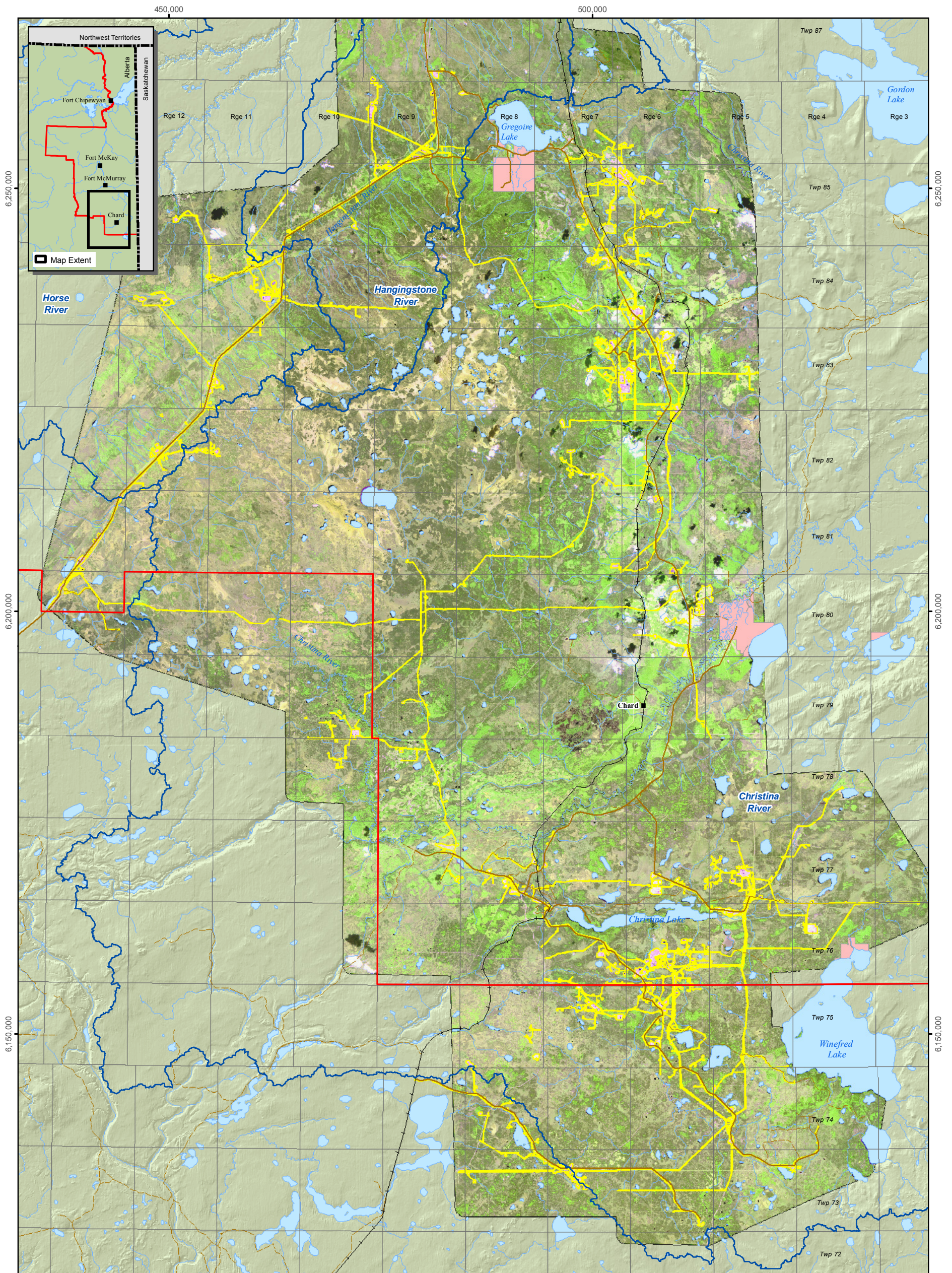
Data Sources:
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, and First Nation Reserve from 1:250,000 National Topographic Data Base (NTDB); East Athabasca Road, in the Muskeg River Watershed derived by RAMP, 2011.
 b) Hillshade from 1:20,000 Government of Alberta DEM.
 c) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.
 d) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.
 e) Land Change Areas Delineated from 5-m RapidEye (June, July, and August 2015) Multispectral Imagery.
 Township and Range designations are relative to W4M.

0 2.5 5 10 km










Scale: 1:450,000
 Projection: NAD 1983 UTM Zone 12N



Figure A.3-4 Land change classes overlaid on mosaics of RapidEye (June, July, and August 2015) multispectral satellite imagery, south of Fort McMurray.




Legend

-  Lake/Pond
-  River/Stream
-  Watershed Boundary
-  Major Road
-  Secondary Road
-  Railway
-  First Nations Reserve
-  Regional Municipality of Wood Buffalo Boundary
-  Land Change Area as of 2015^e

Data Sources:
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, and First Nation Reserve from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed derived by RAMP, 2011.
 b) Hillshade from 1:20,000 Government of Alberta DEM.
 c) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.
 d) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.
 e) Land Change Areas Delineated from 5-m RapidEye (June, July, and August 2015) Multispectral Imagery.

Township and Range designations are relative to W4M.

0 2.5 5 10 km 

Scale: 1:450,000
 Projection: NAD 1983 UTM Zone 12N





Appendix B

Quality Assurance and Quality Control Procedures for the 2015 Water Year



B QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES FOR THE 2015 WATER YEAR

B.1 QUALITY ASSURANCE PROCEDURES

Each technical monitoring component is required to complete a series of procedures to facilitate the collection of high quality data. Environment Canada (2010) defines quality assurance (QA) as:

Plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure that the collection of data of known quality matches the intended use of the data.

The following sections present the general procedures used by the implementation team for all data collection, handling, and management. More detailed information regarding quality control for each technical component follows the presentation of this general information.

A more detailed explanation of the sampling procedures used by the implementation team can be found in Appendix A4 of the RAMP Technical Design and Rationale document (RAMP 2009b or www.ramp-alberta.org).

B.1.1 Field Staff Training

All personnel participating in 2015 WY field studies were professional biologists/engineers or technicians with specific training in the subject-matter area in which they were involved. Field crews were assembled based on level of expertise and seniority. Although qualifications varied based on level of experience, crews typically included a field crew leader who may be either a BSc- or Master's- level professional and a trained environmental field technician (BSc or Dip Tech). All field-crew members had experience collecting data in support of scientifically-defensible environmental monitoring programs.

Field crew responsibilities were clearly established prior to beginning fieldwork through the use of Field Work Instructions (FWIs) prepared by the component or task leader. FWIs contained detailed information regarding sampling locations (e.g., coordinate location, access method), appropriate collection methods, and required supporting variables (e.g., water velocity, field water chemistry). FWIs were prepared and discussed prior to each field sampling trip (typically when the crew was still in the office).

All 2015 WY crew members had been trained in field sampling techniques through traditional education (i.e., university or college), work experience, and participation in workshops/seminars. In addition, crews had training in Standard First Aid and CPR, as well as any oil sands-specific site training that may have been necessary to access mine sites. In many cases, field personnel have additional training related to the Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods (TDG) Regulations, Pleasure Craft Operator certification (as required by the Federal government), swift water rescue, ice safety training, and wilderness first aid.

B.1.2 Field Operations

B.1.2.1 Equipment

Sampling gear and equipment used for the field programs were maintained at the offices of the respective team members (i.e., Hatfield – Fort McMurray and North Vancouver). Each component manager (i.e., lead consultant responsible for a component) controlled specialized field equipment used to complete field studies. When necessary, routine maintenance was conducted according to manufacturer's instructions to ensure valid data collection.

General field equipment/materials used during field surveys (all components) included:

- provincial sampling permits (e.g., fish collection permits from Alberta Environment and Parks);
- waterproof paper/data sheets, waterproof labels, indelible markers, pencils, pens, and other stationery (for recording data);
- topographical maps, hydrographic charts, and/or aerial photos of the oil sands area;
- Garmin® 60CSx, 62s, 76CSx Global Positioning System (GPS) for obtaining data on sampling station position (latitude and longitude; accurate to approximately ± 15 m);
- digital camera (to record sampling areas, specimens captured, unusual features in the environment, etc.);
- instruments for measuring the following water quality variables in situ: temperature, dissolved oxygen, conductivity, pH, water velocity, and depth;
- miscellaneous equipment: rope, measuring tape, coolers, plastic buckets, and tool box;
- waterproof clothing, including chest waders, rain suits, rubber boots, etc.;
- floater jackets and/or survival suits, first aid kit, and other safety equipment (including boat safety equipment); and
- publications and previous reports for reference.

Field operations were coordinated through the Hatfield Fort McMurray office. This included coordination of personnel, sample handling and shipping, and end-of-day safety check-ins for field crews.

Information regarding specialized field equipment used for the program is provided in the following sections.

B.1.2.2 Data Collection, Data Tracking and Field Data Sheets

Prior to every field program, fieldwork instructions (FWIs) were prepared by the component manager. These FWIs provided technical detail on all field data collection activities planned for the program and were reviewed by all members of the field crew prior to starting the field program. The following general data were typically recorded for field sampling activities (with some minor variability among technical components):

- date and time of sampling;
- weather conditions during sampling;
- sample numbers;
- station location (UTM coordinate, datum, zone);
- full names of field crew members;
- sampling methods/gear used;
- number of samples collected (water/sediment/benthos), number of specimens retained/released/dissected/archived (biota), number of measurements taken (climate and hydrology);
- volume of sample collected (water/sediment);
- number of samples in a composite sample;
- handling techniques, preservation methods, sampling containers used; and
- photographs of sampling stations.

Field data were collected according to procedures used for all previous RAMP and JOSMP studies (as described in RAMP 2009b and JOSMP 2015).

B.1.3 Laboratory Analyses

Laboratories used to analyze water and sediment samples are required to be accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Responsibilities associated with this accreditation include participation in an annual performance evaluation assessment of the laboratory's procedures, methods, and internal quality control.

Other sample analyses, such as benthic invertebrate sorting and taxonomy, fish tissue chemistry, and fish ageing, are conducted by small independent laboratories or boutique consulting companies. These laboratories and companies are required to conduct QA/QC procedures that are considered industry standard for the respective disciplines. For example, QA/QC procedures for benthic invertebrate taxonomy are required to meet or exceed guidelines established by Environment Canada (2010) for environmental effects monitoring (EEM) studies.

B.1.4 Data Management

Field data were entered into Microsoft Excel[®] spreadsheets to facilitate production of tables, figures, etc., for reports.

Information on samples collected (biota/benthos/sediment/water) were carefully recorded on field data sheets, and secured at the end of each field day. All data sheets, field notes, photographs, maps, and other supporting documentation were filed within appropriate team members' secure offices. All hard-copy information will be retained for five years after the sampling date.

All products of field sampling (e.g., field notes, analytical results) were checked upon receipt for errors, analytical limits, and reasonable results and, prior to data analysis and reporting, all entered data were checked for possible transcription errors.

B.1.5 Sample Management

All samples were handled (including preservation, storage, and shipping) in accordance with established procedures (RAMP 2009b) and with guidelines from respective laboratories. Sample tracking was conducted by field crew leaders (or Fort McMurray-based team members).

Detailed lists of samples shipped to analytical laboratories were made, such that samples could be tracked from point of shipment to the laboratory (water/sediment/benthic taxonomy). Chain of Custody (COC) forms (commonly issued by the receiving laboratory) were used to notify receiving laboratories of the number and type of samples that were being shipped. Information provided on this sheet included date, project, sample type (fish, sediment, water, benthic invertebrates, etc.), sampling location, sender's name, and any preservation added/required. Sample numbers of all specimens/containers collected, corresponding to field sample numbers, were listed. A description of each sample shipped was provided (i.e., station number, sediment, date and time collected, analyses to be performed). The receiver was required to check the shipping list to ensure all samples were accounted for and in good condition, and to confirm (via e-mail) samples were received, the date of receipt, and analyses to be performed. To facilitate this process, a standard COC form was used by the Hatfield team, which simplified the management of sample processing and analysis.

B.1.6 Quality Assurance Plan

In 2002, a formal RAMP-specific Quality Assurance Plan (QAP) was developed and implemented to cover all routine QA-related activities for the project. These methods were used in the 2015 WY by the Hatfield team to ensure consistency of methods among years. Activities covered in the QAP included:

- pre-field meetings to discuss field methods (i.e., FWIs) and specifics of field tasks;
- post-field meetings to discuss results of the field activities and identify areas for improvement in future;
- routine check-ins with component leaders (24 or 48-hour interval) during field work, as required;
- designation of a staff member for each component/trip (i.e., water quality, fall field trip) to track sample handling, labeling (including COC forms), shipping, and to confirm timely receipt of samples by the analytical laboratory;
- internal check of COC forms by component leaders upon the return of the field crew (to confirm analyses requested were correct);
- internal check of data upon receipt from external labs; and
- internal check of entered field data for transcription errors.

B.2 QUALITY CONTROL PROCEDURES

Quality control (QC) is a component of QA that pertains to internal techniques used to measure and assess data quality (APHA 1989, in RAMP 2009b). QC activities for each technical component used in the 2015 WY are described below.

B.2.1 Climate and Hydrology Component

B.2.1.1 Quality Control Activities

The collection and processing of climatic and hydrologic data was subject to the following field and in-office quality control procedures to ensure that the published data were as accurate as possible:

- Stream discharge measurements and water level surveys were performed in accordance with standard procedures. Each discharge measurement was qualified according to the criteria presented in the standard operating procedures in RAMP (2009b), based on observations of station conditions and analysis of the collected data;
- Sensors deployed at climatic and hydrologic monitoring stations were calibrated on a regular basis. Sensors at climatic stations have been rotated with spare units on a two-year frequency and the units retrieved from the field were recalibrated by the manufacturer. Calibration curves for pressure transducers were verified prior to installation. Consistency between water level surveys and pressure transducer readings was checked during every field visit for all stations. Pressure transducers were exchanged with calibrated sensors after being installed for two years at year-round stations unless a deviation from surveyed water levels was observed at which time sensors were exchanged prior to the standard two-year service;
- Manual discharge measurements and concurrent water levels were compared on a plot of stage versus discharge, to check for consistency between measurements and consistency with previously established stage-discharge relationships. Rating curve shifts due to changes in channel geometry, beaver dams and obstructions or roughness changes were accounted for by revision of stage-discharge rating curves or application of backwater shift corrections;
- Snow course surveys were performed according to standard protocols as presented in RAMP (2009b);
- Apparent transducer elevations were calculated after each field visit as the difference between the surveyed water surface elevation and the sensor reading. The history of apparent transducer elevations was plotted for each station to check for physical sensor movement or calibration drift. Continuous water levels measured by the transducer were subsequently converted to elevations, adjusting for movement or drift;
- Rainfall, snowfall, air temperature, humidity, and wind speed data from automated climate sensors were compared to other local and regional records, as well as manual observations recorded during station visits;
- All discharge measurements and site visit records were prepared by one person and checked by another;

- Velocity distributions at measurement cross sections were plotted and reviewed to ensure reasonable variation in velocity with flow depth and bed roughness;
- Hydrographs calculated from continuous water level measurements and the stage-discharge rating curve were compared to manual measurements on the same plot. The resulting hydrographs were reviewed for consistency;
- Anomalies in the hydrographs, such as rapid changes in water level or discharge, were examined in detail to confirm authenticity. In cases where the data were inconsistent with other local and regional data (for instance, an isolated high water reading, without a subsequent recession curve), they were interpreted or discarded; and
- Hydrographs calculated for different stations in the same region were compared to identify anomalies and verify similarity in the timing and magnitude of runoff responses. Hydrographs were also analyzed to ensure anticipated effects such as time lag, attenuation by river, or lake routing and increments in discharge with drainage area were apparent in the records.

B.2.2 Water Quality Component

B.2.2.1 Continuous Water Quality Monitoring

The collection and processing of continuous water quality monitoring data from data sondes were subject to the following field and in-office quality control procedures to ensure that the published data were as accurate as possible:

- Data sondes were deployed in housings designed to minimize potential for sinking into sediment and sensor burial. Data sondes were deployed inside perforated polyvinyl chloride (PVC) pipes that allowed unimpeded flow around sensors. Housings were angled to discourage settling of sediment on sensors. Sensors were placed facing downstream to minimize damage from impacts from detritus;
- Data sondes were equipped with a central wiper system that cleaned sensors every 15 minutes, prior to each measurement to minimize impacts from fouling of sensors by sediment and biota;
- Data collection and processing were performed in accordance with standard procedures. Time series were assessed using procedures modified from RISC (2006), Wagner et al (2006), and recommendations from data sonde manufacturers (YSI 2012, 2014);
- Data sonde sensors were cleaned and calibrated roughly monthly. Deployed data sondes were removed during field visits and transported back to a laboratory for cleaning and calibration. Deployed data sondes were swapped with freshly cleaned and calibrated units during field visits;
- Sensor calibration drift between calibration periods was corrected using industry-standard software (Aquatic Informatics Aquarius Springboard™) and standard procedures (RISC 2006, Wagner et al 2006);
- Data quality was assessed by comparing the magnitude and pattern of data to typical magnitudes and patterns in the region. Where multiple data sondes were deployed in a waterway, the concurrently-recorded data were compared in an effort to identify anomalous data;

- Copies of original, unmodified time series were always preserved. Modifications to time series (“corrections”) were independent of the “raw” data;
- Data transmitted in near-real time via telemetry were monitored to ensure data were not lost due to station and sensor malfunction, and were within reasonable ranges; and
- Data were collected and stored redundantly by telemetry, internally on the data sonde, and externally on a datalogger located on land. This reduced the possibility of inadvertent data loss. Data were archived and backed up in an Aquarius™ database.

Data gaps in the JOSMP data sonde records that occurred in the 2015 WY are described in Table B.2-1.

Table B.2-1 Descriptions of data gaps in the JOSMP data sonde records in the 2015 WY.

Station	AEMERA Nomenclature	Location	Managing Entity	Data Gap Begins	Data Gap Ends	Variables Affected	Reasons for Gap
M8	AB07DA0980	Athabasca River above Firebag River	AEMERA	11-Aug-2015	22-Sep-2015	DO, pH	Suspected faulty sensors.
F11	AB07DC0110	Firebag River near the mouth	AEMERA	20-May-2015	9-Aug-2015	DO, pH, conductivity, turbidity	Probable sensor burial.
				14-Sep-2015	21-Sep-2015	DO, pH, conductivity, turbidity	Probable sensor burial.
				14-Oct-2015	31-Oct-2015	DO, pH, conductivity, turbidity	Probable sensor burial.
MU1	AB07DA0610	Muskeg River at gauge	AEMERA	22-Jul-2015	12-Aug-2015	DO, pH, conductivity, turbidity	Probable stranding of sonde on land due to falling water level.
				20-Oct-2015	31-Oct-2015	DO, pH, conductivity, turbidity	Probably sensor burial.
MU4	AB07DA0475	Muskeg River upstream of Stanley Creek	AEMERA	11-Jul-2015	7-Aug-2015	DO, pH, conductivity, turbidity	Probable sensor burial or stranding.
STB RIFF 7	AB07DA1010	Steepbank River, 27 km upstream of mouth	Hatfield	18-Sep-2015	21-Sep-2015	DO, pH, conductivity, turbidity	Probable sensor burial or stranding.

DO = dissolved oxygen

B.2.2.2 Discrete Water Quality Sampling

Methods

Field Collections

The following precautions were used in the field during the collection of water samples to prevent sample contamination:

- all sample bottles were provided to the sampling team as “certified clean” by the respective laboratories;

- to minimize ambient contamination of ultra-trace mercury samples, these samples were collected using the “clean-hands/dirty-hands” technique, as described by the Biogeochemical Analytical Service Laboratory;
- grab samples were collected upstream of the boat and/or the person collecting the sample to avoid disturbing the substrate or otherwise contaminating the sample;
- nitrile gloves were worn during sample collection;
- sample containers were kept covered during collection of composite samples; and
- during winter sampling, auger holes were thoroughly purged and cleared of ice prior to sampling to minimize potential contamination from auger disturbance.

Three types of QA/QC samples were collected as part of the surface water quality QA/QC program, including field blanks, trip blanks, and field duplicates. Field blanks were used to assess potential contamination of samples during collection, handling, and transport and were prepared in the field by filling sample bottles with de-ionized water provided by the lab. Trip blanks were prepared in the analytical laboratory with de-ionized water prior to sampling and kept sealed for the duration of the sampling trip; these were used to evaluate potential contamination from the sample container and the efficacy of storage conditions. Field duplicates were used to assess environmental heterogeneity and laboratory precision, and prepared in the field by filling a second complete set of sample bottles congruently with the standard field sample set. In the 2015 WY, 25 field blanks, 25 trip blanks and 27 sets of duplicates QA/QC samples were collected and submitted to the lab using “dummy” station codes and were analyzed for the same variables as the station samples.

Analytical results from the field and trip blanks were compared to analytical detection limits. Variable concentrations greater than five times the detection limit in the blank samples may demonstrate analytical error or potential contamination of samples during sample collection or analysis. This threshold is based on the Practical Quantitation Limit (PQL) defined by the United States Environmental Protection Agency (USEPA 1985), and takes into account the potential for reduced accuracy when concentrations approach or are below Method Detection Limits (MDLs). This criterion was not applied to pH, which is expected to be above the laboratory-reported MDL in the deionized water used to prepare blanks. Blanks with variable concentrations below or near detection limits represent samples that were collected, handled, and analyzed without contamination or potential errors. Analytical results for duplicate samples were compared, and the relative percent difference (RPD, difference between data values/mean of data values, multiplied by 100%) was calculated for each variable. RPDs greater than 20% were noted as potentially unacceptable levels of precision. However, because precision decreases as the variable concentration approaches the detection limit, RPDs greater than 20% were considered to be of significance only if variable concentrations in both samples were greater than five times the detection limit. This target of 20% RPD between duplicates matches QA thresholds used internally by contracted laboratories for most variables measured, although acceptable internal laboratory RPDs for some organic compounds (e.g., CCME hydrocarbons, some PAHs, etc.) may be higher (e.g., 30% or 40%).

Sample Analysis

Chemical laboratories analyzed a number of their own QA/QC samples to ensure that sample contamination did not occur during analysis and that results reported were precise and accurate. A method blank, consisting of a de-ionized water sample prepared at the initiation of the analysis, was used to assess potential contamination during analyses. A sample split into two aliquots (split sample, also called a laboratory duplicate) was used to assess the precision of the analyses. Spiked samples, reference standards, and other controls were used by the analytical laboratories to establish the accuracy and precision of the analyses.

All laboratory QA/QC samples were assessed using in-house laboratory protocols to identify potential contamination and determine the precision and accuracy of the analyses, where these data were provided with analytical results. Any deviations from QA/QC criteria were identified in the laboratory reports and are noted in the results section.

Any anomalous values identified in laboratory reports were followed up with the laboratory to determine if the value was a measurable value or due to a transcription or analytical error.

Initial Lab Data Screening

Upon receipt of water quality data from the analytical laboratory, a series of standard checks were performed to screen for potential data quality issues. These allowed potential re-analysis of samples to verify questionable data, or generate data for missing variables. The following data checks were performed:

- verification that all required variables and samples were analyzed;
- verification that data were reported using the appropriate units;
- verification that analyses were done with the appropriate detection limit;
- field versus laboratory data comparisons for variables with parallel field and laboratory data (pH, specific conductivity);
- logic checks: presence of zero values, comparisons of TDS and conductivity, hardness and alkalinity, total and dissolved phosphorus, total and dissolved organic carbon, total and dissolved metals, measured and calculated TDS;
- checking for outliers using graphical methods, and based on expected concentration ranges in the sampled waters; and
- checking field-collected data for completeness, and unexpected values and trends.

If results of initial data screening indicated that there were deficiencies or potential data quality issues, the analytical laboratory was contacted and re-analysis of the variables in question in the affected samples was requested. If data were verified by the analytical laboratory, but remained questionable based on the above evaluation, qualifiers were added to affected concentrations in the project data set for consideration during data summary and analysis, or data were excluded from further analysis (and identified in the report as excluded, with the corresponding reasons).

Results and Discussion

Trip Blanks

Twenty-five trip blanks were collected during the 2015 WY covering all months; 147 variables were measured in each trip blank (Table B.2-2, Table B.2-3). The results of the trip blank analyses suggest that the corresponding water samples were largely free of contamination with some exceptions. The following variables were detected at a concentration greater than five times the MDL:

- dissolved metals including molybdenum (four samples) and tin (three samples), boron, chlorine, and zinc (one sample each); all these exceedances occurred between February and September;
- total metals including strontium (15 samples), barium (eight samples), boron and molybdenum (seven samples each), tin (six samples), manganese (four samples), and antimony, chlorine, lead, and thorium (one sample each); all of these exceedances occurred from January to September; and
- more than 50% of PAH species (out of total 45 species) were detected at a concentration greater than five times the MDL in almost all months (see Table B.2-2 and Table B.2-3 for details).

Field Blanks

Twenty-five field blanks were collected during the 2015 WY covering all months; 149 variables were measured in each field blank (Table B.2-4, Table B.2-5). The results of the field blank analyses suggest that the corresponding water samples were largely free of contamination with some exceptions. The following variables were detected at a concentration greater than five times the MDL:

- dissolved metals including tin (three samples), mercury and molybdenum (two samples each), chlorine (two samples each), and boron, lithium, manganese, and methyl mercury (one sample each); all of these exceedances occurred in May, July, August, or September 2015;
- total metals including strontium (20 samples), barium (16 samples), manganese, molybdenum, and tin (eight samples each), boron (five samples), antimony (four samples), chlorine (three samples), mercury (two samples), and arsenic, methyl mercury, nickel, and thorium (one sample each); all these exceedances occurred from January to September 2015; and
- more than 50% of PAHs species (out of total 45 species) were detected at a concentration greater than five times the MDL in almost all months but not necessarily all variables in same month (see Table B.2-4 and Table B.2-5 for details).

Generally, values greater than five times the MDL were similar between field blanks and trip blanks with respect to specific analytes and frequencies of occurrence, suggesting these measurements in field blanks related primarily to laboratory practices rather than field techniques. A possible exception was ultra-trace total and methyl mercury, where all laboratory trip blanks were below detection but several field blanks showed measurable concentrations; for these two variables, it is possible that contamination (e.g., atmospheric) during sampling may have contributed to measured environmental concentrations.

Duplicate Samples

Twenty-seven sets of duplicate samples were collected from different sampling stations during the 2015 WY covering all months; 157 variables were measured in each set of duplicate samples (Table B.2-6, Table B.2-7). The RPDs were greater than five times the detection limit and the RPDs were greater than 20% for the following variables:

- conventional variables including total dissolved solids (four samples: June at EL2, July at CHL-1 and ST1, and October at HAR-1), total suspended solids (four samples: May at PO1, June at STB RIFF 7, July at ST1, and August at PO1), and turbidity (two samples: June at STB RIFF 7 and September at M3);
- major ions including chloride (one sample; September at M3) fluoride (one sample: January at PO1), and sulfate (one sample: May at MU1);
- major nutrients including nitrate (two samples: September at M3 and October at ATR-DD-C), total Kjeldahl nitrogen (two samples: May at M3 and October at ATR-DD-C), dissolved phosphorus (one sample: July at CHR-3), and total phosphorus (two samples: June at STB RIFF 7 and October at ATR-DD-C);
- general organics including naphthenic acids (four samples: May at PO1, June at EL2 and STB RIFF 7, and August at PO1) and oilsands extractable acids (five samples: January at PO1, May at HA1, July at M6, August at PO1, and September at BER-2); and
- more than 50% of total and dissolved metals and PAH species were detected at greater than 20% RPD between duplicates; this occurred in all months but not necessarily all variables in same month (see Table B.2-6 and Table B.2-7 for details).

Several water quality variables showed duplicate RPD values above the QC assessment criterion of 20%, especially for PAHs. Generally, high RPDs were less common for duplicate samples collected in November and December 2014, and January, February, and June 2015 (i.e., 0 to 10% of total observations), while high RPDs were more common (i.e., 10 to 30% of total observations) for samples collected in March, May, July, August, September, and October 2015.

Conclusions

Overall, data collected for the water quality component during the 2015 WY were of high quality. Several metals and PAH species frequently showed values in trip and field blanks that were greater than five times the MDL; general consistency in results between trip and field blanks suggests the source of these measureable values in blanks is related to laboratory analyses rather than field sampling techniques, storage or transportation (with the possible exception of ultra-trace mercury and methyl mercury, in which trip blank values were always non-detectable).

Several water quality variables showed duplicate RPD values above the QC assessment criterion of 20%, especially for PAHs. Generally, high RPDs were less common for duplicate samples collected in November and December 2014, and January, February, and June 2015 (i.e., 0 to 10% of total observations), while high RPDs were more common (i.e., 10 to 30% of total observations) for samples collected in March, May, July, August, September, and October 2015.

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Table B.2-2 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Trip Blanks																					
				Nov	Dec	Jan	Feb	Mar	May #1	May #2	Jun #1	Jun #2	Jul #1	Jul #2	Jul #3	Aug #1	Aug #2	Sep #1	Sep #2	Sep #3	Sep #4	Sep #5	Oct #1	Oct #2	
Dissolved Metals (Cont'd.)																									
Titanium	AITF	mg/L	0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	
Uranium	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	
Vanadium	AITF	mg/L	0.00002	<0.000020	<0.000020	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	
Zinc	AITF	mg/L	0.00009	0.00009	0.00009	0.00018	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	0.00018	0.0001	<0.00009	0.00023	0.00029	<0.00009	0.00024	<0.00009	0.00037	0.00032	0.00027	0.00011	
Total Metals																									
Aluminum	AITF	mg/L	0.0002	<0.0002	<0.0004	0.0003	0.0003	0.0003	0.0002	0.0002	0.0002	0.0003	0.0002	0.0003	0.0002	0.0003	0.0002	0.0003	0.0002	0.0003	0.0002	0.0003	0.0006	0.0003	
Antimony	AITF	mg/L	0.000001	<0.000041	<0.000002	0.000004	<0.000001	0.000003	<0.000001	<0.000001	<0.000001	0.000002	0.000002	0.000004	0.000005	0.000002	<0.000001	0.000005	<0.000001	0.000005	<0.000001	0.000003	0.000004	0.000001	0.000003
Arsenic	AITF	mg/L	0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	0.000005	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004
Barium	AITF	mg/L	0.000007	<0.000008	<0.000004	0.0000087	0.000024	0.000013	0.000056	0.000021	0.000031	0.000036	0.00003	0.000132	0.000023	0.000028	0.000007	0.000011	0.000042	0.000022	0.000041	0.000048	0.000012	0.000012	
Beryllium	AITF	mg/L	0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	0.00001	<0.000008		
Bismuth	AITF	mg/L	0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	0.000003	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	0.000003	
Boron	AITF	mg/L	0.0001	<0.0002	<0.0002	0.0003	0.0003	0.0005	0.0007	<0.0001	0.0008	0.0005	0.0005	0.0006	0.0003	0.0006	0.0009	0.0005	0.0006	0.0003	0.0005	0.0005	0.0003	0.0003	
Cadmium	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	
Chlorine	AITF	mg/L	0.04	<0.04	0.05	<0.04	<0.04	0.05	<0.04	0.11	<0.04	<0.04	<0.04	<0.04	0.44	0.1	<0.04	<0.04	<0.04	0.00007	<0.04	<0.04	<0.04	0.08	
Chromium	AITF	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00007	0.00004	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00009	0.00009	
Cobalt	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	
Copper	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00009	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	<0.00005	
Iron	AITF	mg/L	0.0007	<0.0008	<0.0007	<0.0007	<0.0007	<0.0007	0.0008	0.0007	<0.0007	0.0007	<0.0007	<0.0007	0.0009	<0.0007	<0.0007	<0.0007	0.0008	0.0009	<0.0007	<0.0007	<0.0007	0.002	
Lead	AITF	mg/L	0.000003	<0.000003	<0.000003	<0.000003	0.000004	<0.000003	<0.000003	<0.000003	0.000003	0.000004	0.000005	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	0.000005	0.000005	
Lithium	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.0001	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Manganese	AITF	mg/L	0.000005	<0.00002	<0.00001	0.000016	0.000013	0.000006	<0.000005	0.000024	0.000008	<0.000005	0.00007	0.000013	<0.000005	0.000032	0.000021	0.000012	0.000031	0.000037	0.000028	0.000013	0.000015	0.000014	
Mercury	BASL	ng/L	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	
Methyl Mercury	BASL	ng/L	0.01	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Molybdenum	AITF	mg/L	0.000002	<0.000002	<0.000005	0.000003	0.000007	<0.000002	<0.000002	<0.000002	0.000004	0.000004	0.000013	0.000004	0.000011	0.000076	0.000058	<0.000002	0.000005	0.000009	0.000045	0.000017	0.000004	0.000006	
Nickel	AITF	mg/L	0.000008	<0.000008	<0.000008	0.000008	<0.000008	<0.000008	<0.000008	0.000018	<0.000008	<0.000008	0.000023	0.000009	<0.000008	<0.000008	<0.000008	<0.000008	0.000016	0.000022	<0.000008	<0.000008	0.000011	0.000008	
Selenium	AITF	mg/L	0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	
Silver	AITF	mg/L	0.000002	<0.000002	<0.000003	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	
Strontium	AITF	mg/L	0.000001	<0.000016	<0.000012	0.000009	0.00001	0.000048	0.000042	0.000017	0.000036	0.000029	0.000024	0.000014	0.000008	0.000008	<0.000001	<0.000001	0.000019	0.000017	0.000018	0.000009	0.000003	0.000003	
Thallium	AITF	mg/L	0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	0.0000025	<0.0000009	<0.0000009	0.0000012	0.0000018	<0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	
Thorium	AITF	mg/L	0.0000009	<0.0000009	<0.0000011	<0.0000009	0.0000047	<0.0000009	<0.0000009	0.000002	<0.0000009	<0.0000009	<0.0000009	<0.0000009	0.0000057	<0.0000009	<0.0000009	<0.0000009	-	<0.0000009	<0.0000009	<0.0000009	<0.0000009	0.0000027	
Tin	AITF	mg/L	0.000003	<0.000017	<0.000009	0.000011	0.000021	0.000014	0.000005	0.000023	0.000008	0.000004	0.000029	0.000012	0.000015	0.000013	0.000008	0.000008	0.000024	0.000014	0.000021	<0.000003	<0.000003	0.000009	0.000009
Titanium	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00007	0.00006	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00015	0.00015	
Uranium	AITF	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	
Vanadium	AITF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00004	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	
Zinc	AITF	mg/L	0.0001	0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	0.0001	0.0002	0.0003	<0.0001	0.0003	0.0004	0.0002	0.0003	0.0002	0.0004	0.0003	0.0003	0.0003	0.0002
General Organics																									
Benzene	ALS/AITF	mg/L	0.0001,0.0005	<0.0005	<0.0005																				

Table B.2-2 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Trip Blanks																				
				Nov	Dec	Jan	Feb	Mar	May #1	May #2	Jun #1	Jun #2	Jul #1	Jul #2	Jul #3	Aug #1	Aug #2	Sep #1	Sep #2	Sep #3	Sep #4	Sep #5	Oct #1	Oct #2
PAHs (Cont'd.)																								
Benzo[j,k]fluoranthenes	AXYS	ng/L	multiple	-	-	-	-	-	-	-	<0.056	<0.048	<0.026	<0.034	<0.08	<0.103	<0.046	<0.109	<0.103	<0.092	<0.073	<0.064	0.072	-
Biphenyl	AXYS	ng/L	multiple	<1.496	<1.496	0.8	0.43	0.513	0.284	0.637	0.505	0.591	0.532	0.468	0.507	1.6	0.554	0.788	0.652	0.346	0.608	0.464	0.885	-
C1 Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	<0.831	0.854	<0.274	0.274	0.233	<0.111	<0.157	0.392	0.384	0.63	0.304	<0.167	1.24	<0.112	<0.16	<0.146	<0.221	<0.224	<0.161	0.455	-
C1-Acenaphthenes	AXYS	ng/L	multiple	<0.296	<0.296	<0.249	<0.156	<0.193	<0.229	<0.484	<0.076	<0.078	<0.031	<0.047	<0.115	<0.351	<0.119	<0.238	<0.161	<0.211	<0.263	<0.298	<0.147	-
C1-Benzo[a]anthracenes/Chrysi	AXYS	ng/L	multiple	<0.202	<0.202	<0.028	<0.044	<0.035	<0.047	0.086	<0.033	<0.043	0.151	0.114	<0.064	0.31	0.119	<0.064	<0.095	<0.079	<0.063	<0.047	0.075	-
C1-Benzofluoranthenes/Benzop	AXYS	ng/L	multiple	<0.573	<0.573	0.156	<0.166	<0.064	<0.244	<0.233	<0.097	<0.049	0.523	<0.079	<0.116	<0.249	<0.085	<0.11	<0.267	0.288	<0.193	<0.158	<0.093	-
C1-Biphenyls	AXYS	ng/L	multiple	<4.062	<4.062	0.638	0.51	0.707	0.233	0.287	0.377	0.303	0.489	0.375	1.74	4.39	1.45	0.805	0.498	0.439	0.365	0.354	0.665	-
C1-Dibenzothiophenes	AXYS	ng/L	multiple	<0.304	<0.304	<0.13	<0.173	<0.12	<0.12	0.151	<0.121	<0.097	0.976	0.182	<0.179	<0.264	<0.146	<0.143	<0.158	<0.133	<0.12	<0.142	<0.129	-
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	<0.719	<0.719	0.211	-	<0.107	<0.124	<0.163	<0.133	0.208	0.382	0.342	<0.101	1.02	<0.07	<0.138	<0.18	<0.201	<0.16	<0.206	0.142	-
C1-Fluorenes	AXYS	ng/L	multiple	<2.582	<2.582	0.513	<0.162	0.292	0.736	0.43	0.454	0.482	0.831	0.615	1.28	<0.542	1.13	0.404	1.06	8.68	<0.483	<0.473	0.323	-
C1-Naphthalenes	AXYS	ng/L	multiple	10.100	<9.571	1.46	2.72	1.6	1.3	1.45	5.97	7.88	4.2	3.53	4.19	10.1	5.66	6.71	4.9	2.82	7.52	2.51	8.19	-
C2 Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	<0.678	<0.678	<0.14	<0.122	<0.087	0.221	0.34	0.186	0.192	0.768	0.324	0.699	0.7	0.497	0.207	0.446	0.709	<0.136	<0.088	0.327	-
C2-Benzo[a]anthracenes/Chrysi	AXYS	ng/L	multiple	<0.243	<0.243	<0.045	<0.066	<0.043	<0.094	<0.096	<0.073	<0.054	<0.028	<0.044	<0.05	<0.17	<0.044	<0.079	<0.125	<0.094	<0.076	<0.056	<0.037	-
C2-Benzofluoranthenes/Benzop	AXYS	ng/L	multiple	<0.336	<0.336	0.272	<0.126	<0.046	<0.108	<0.167	<0.097	<0.087	0.377	<0.061	0.14	<0.233	<0.075	<0.136	<0.267	0.256	<0.16	<0.135	<0.101	-
C2-Biphenyls	AXYS	ng/L	multiple	<18.832	<18.832	1.88	1.26	2.58	0.233	0.296	0.151	0.257	0.593	0.375	4.52	1.14	3.65	0.483	0.471	0.488	0.317	0.427	0.458	-
C2-Dibenzothiophenes	AXYS	ng/L	multiple	<1.052	<1.052	<0.096	<0.083	<0.086	0.519	0.474	0.155	<0.194	3.32	0.718	0.289	0.707	0.646	0.251	0.247	1.29	<0.25	<0.245	<0.053	-
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	<0.711	<0.711	<0.158	<0.081	<0.126	<0.112	<0.145	<0.062	<0.157	0.715	0.279	<0.119	0.332	<0.107	<0.152	<0.18	<0.223	<0.174	<0.153	0.199	-
C2-Fluorenes	AXYS	ng/L	multiple	<1.430	<1.430	0.393	<0.125	0.564	0.677	2.15	<0.245	0.382	1.34	0.748	0.954	1.42	1.15	0.671	0.486	0.456	0.423	<0.496	0.44	-
C2-Naphthalenes	AXYS	ng/L	multiple	<5.743	<5.743	1.8	2.04	1.61	1.77	1.63	3.51	4.34	4.28	3.32	4.34	7.98	4.43	3.82	4.74	3.05	4.2	2.56	4.06	-
C3-Dibenzothiophenes	AXYS	ng/L	multiple	<1.256	<1.256	<0.141	<0.078	<0.078	0.176	0.312	<0.097	0.132	3.32	0.622	0.642	0.337	1.2	<0.251	1.75	2.09	<0.1	<0.112	<0.048	-
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	<0.666	<0.666	<0.079	<0.072	<0.06	<0.116	<0.1	<0.075	<0.074	0.379	<0.052	<0.084	<0.263	<0.041	<0.078	<0.099	<0.152	<0.131	<0.093	<0.08	-
C3-Fluorenes	AXYS	ng/L	multiple	<2.417	<2.417	0.581	<0.249	<0.109	0.83	1.62	<0.157	0.359	2.18	1.05	3.36	0.676	1.41	1.63	<0.284	0.903	0.266	<0.772	0.794	-
C3-Naphthalenes	AXYS	ng/L	multiple	<2.467	<2.467	1.22	0.711	0.4	1.37	1.31	0.912	1.01	1.98	1.39	2.11	3.59	2.09	1.3	1.38	1.7	0.539	<0.44	1.37	-
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	<0.621	<0.621	<0.055	<0.052	<0.045	0.247	0.336	<0.061	<0.044	0.558	0.179	0.349	0.484	0.114	<0.152	<0.148	0.394	<0.108	<0.124	0.103	-
C4-Dibenzothiophenes	AXYS	ng/L	multiple	<1.093	<1.093	0.405	<0.109	0.186	0.424	0.881	0.176	0.276	2.61	0.561	0.73	0.174	0.437	0.225	0.506	1.52	0.133	0.169	0.155	-
C4-Naphthalenes	AXYS	ng/L	multiple	<1.739	<1.739	<0.127	<0.118	<0.074	<0.136	<0.143	<0.148	0.196	1.53	0.566	0.631	1.29	0.8	<0.423	6.8	0.54	<0.282	<0.265	<0.222	-
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	<1.988	<1.988	0.603	<0.126	<0.109	0.686	<0.206	<0.148	0.217	1.36	0.502	1.16	0.539	0.788	<0.137	3.04	<0.233	<0.195	0.168	0.323	-
Chrysene	AXYS	ng/L	multiple	<0.162	0.166	0.125	0.109	0.065	0.1	0.095	0.069	0.077	0.066	0.069	0.057	0.218	0.07	0.081	0.071	0.069	0.07	0.035	0.105	-
Dibenz[a,h]anthracene	AXYS	ng/L	multiple	<0.201	<0.201	<0.051	<0.119	<0.117	<0.127	<0.185	<0.196	<0.144	<0.05	<0.056	<0.073	<0.242	<0.064	<0.178	<0.239	<0.157	<0.218	<0.149	<0.052	-
Dibenzothiophene	AXYS	ng/L	multiple	<0.429	<0.429	0.957	<0.075	<0.103	0.074	<0.076	0.085	0.072	0.09	0.088	<0.12	0.217	<0.077	<0.073	<0.067	<0.11	<0.096	<0.122	0.146	-
Fluoranthene	AXYS	ng/L	multiple	<0.550	<0.550	0.464	0.264	0.257	0.251	0.27	0.22	0.643	0.226	0.274	0.153	0.957	0.139	0.302	0.218	0.249	0.201	0.196	0.284	-
Fluorene	AXYS	ng/L	multiple	<0.353	<0.353	0.524	0.142	0.118	<0.12	<0.166	0.269	0.223	0.19	0.194	<0.148	0.423	<0.124	<0.137	<0.165	<0.181	<0.161	<0.196	0.132	-
Indeno[1,2,3-cd]pyrene	AXYS	ng/L	multiple	<0.145	<0.145	0.089	<0.071	<0.05	<0.118	<0.173	<0.061	0.094	0.035	0.06	<0.054	0.129	<0.056	<0.112	<0.17	<0.095	<0.141	<0.111	0.109	-
Naphthalene	AXYS	ng/L	multiple	<7.210	<7.210	2.23	2	1.51	1.76	1.84	3.52	3.48	2.86	2.02	3.3	12.8	5.67	4.54	9.86	2.81	6.6	1.94	3.7	-
Phenanthrene	AXYS	ng/L	multiple	<1.394	1.580	1.99	0.713	0.731	0.66	0.822	0.732	0.877	0.687	0.628	0.475	1.93	0.531	0.59	0.662	0.686	0.58	0.504	0.605	-
Pyrene	AXYS	ng/L	multiple	<0.359	<0.359	0.228	0.22	0.2	0.192	0.175	0.139	2.56	0.148	0.167	0.193	3.51	0.173	0.518	0.195	0.249	0.198	0.186	0.192	-
Retene	AXYS	ng/L	multiple	<0.407	<0.407	<0.169	<0.126	0.162	0.158	<0.206	<0.148	0.166	0.317	0.142	<0.149	0.519	<0.12	0.128	<0.156	<0.233	<0.195	<0.159	0.282	-

Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-3 Concentrations of water quality variables observed in trip blanks for stations managed by AEMERA, 2015 WY.

Variables	Laboratory	Units	Detection Limit	Concentrations in Trip Blanks			
				July	Aug	Sept	Oct
Conventional Variables							
Total Alkalinity (as CaCO ₃)	Maxxam	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Conductivity	Maxxam	mg/L	1	<1	<1	<1	<1
Dissolved Organic Carbon	Maxxam	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Hardness (as CaCO ₃)	Maxxam	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
pH	Maxxam	mg/L	-	4.82	5.01	4.85	4.82
Total Dissolved Solids	Maxxam	mg/L	10	<10	<10	<10	<10
Total Organic Carbon	Maxxam	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Total Suspended Solids	Maxxam	mg/L	1	<1	<1	1.3	<1
True Colour	Maxxam	mg/L	2	2.9	<2	<2	<2
Turbidity	Maxxam	mg/L	0.1	<0.1	<0.1	<0.1	<0.1
Major Ions							
Bicarbonate (HCO ₃)	Maxxam	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO ₃)	Maxxam	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Calcium (Ca)	Maxxam	mg/L	0.3	<0.3	<0.3	<0.3	<0.3
Chloride (Cl)	Maxxam	mg/L	1	<1	<1	<1	<1
Magnesium (Mg)	Maxxam	mg/L	0.2	<0.2	<0.2	<0.2	<0.2
Potassium (K)	Maxxam	mg/L	0.3	<0.3	<0.3	<0.3	<0.3
Sodium (Na)	Maxxam	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Hydroxide (OH)	Maxxam	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Sulfate (SO ₄)	Maxxam	mg/L	1	<1	<1	<1	<1
Sulphide	Maxxam	mg/L	0.0019	<0.0019	0.0023	0.0031	<0.0019
Major Nutrients							
Total Ammonia (as N)	Maxxam	mg/L	0.05	<0.05	<0.05	<0.05	<0.05
Nitrate (as N)	Maxxam	mg/L	0.003	<0.003	<0.003	0.0034	<0.003
Nitrite (as N)	Maxxam	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Nitrate plus Nitrite (as N)	Maxxam	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl Nitrogen	Maxxam	mg/L	0.05	<0.05	<0.05	<0.05	<0.05
Total Nitrogen	Maxxam	mg/L	0.055	<0.055	<0.055	<0.055	<0.055

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Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-3 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Trip Blanks			
				July	Aug	Sept	Oct
Major Nutrients (Cont'd)							
Orthophosphate	Maxxam	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Dissolved Phosphorus	Maxxam	mg/L	0.003	0.005	<0.003	<0.003	<0.003
Total Phosphorus	Maxxam	mg/L	0.003	0.003	<0.003	0.003	<0.003
Dissolved Metals							
Aluminum	AITF	mg/L	0.00013	0.0002	<0.00013	0.00028	0.00019
Antimony	AITF	mg/L	0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Arsenic	AITF	mg/L	0.000003	0.000004	<0.000003	<0.000003	<0.000003
Barium	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Beryllium	AITF	mg/L	0.000009	<0.000009	<0.000009	<0.000009	<0.000009
Bismuth	AITF	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Boron	AITF	mg/L	0.00013	0.00053	0.00046	0.00031	0.00025
Cadmium	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Chlorine	AITF	mg/L	0.03	<0.03	<0.03	<0.03	<0.03
Chromium	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Copper	AITF	mg/L	0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Iron	AITF	mg/L	0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Lead	AITF	mg/L	0.000004	<0.000004	<0.000004	<0.000004	<0.000004
Lithium	AITF	mg/L	0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Manganese	AITF	mg/L	0.00001	0.00002	0.00001	0.00002	0.00001
Mercury	AITF	ng/L	0.08	<0.08	<0.08	<0.08	<0.08
Methyl Mercury	AITF	ng/L	0.01	<0.010	<0.010	<0.010	<0.010
Molybdenum	AITF	mg/L	0.000002	0.000007	0.000051	<0.000002	0.000005
Nickel	AITF	mg/L	0.000006	0.000008	<0.000006	<0.000006	<0.000006
Selenium	AITF	mg/L	0.00004	<0.00004	<0.00004	<0.00004	<0.00004
Silver	AITF	mg/L	0.000001	0.000001	<0.000001	<0.000001	<0.000001
Strontium	AITF	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Thallium	AITF	mg/L	0.0000004	0.0000005	0.000001	0.0000014	0.0000004
Thorium	AITF	mg/L	0.0000008	<0.0000008	<0.0000008	<0.0000008	<0.0000008

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Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-3 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Trip Blanks			
				July	Aug	Sept	Oct
Dissolved Metals (Cont'd.)							
Tin	AITF	mg/L	0.000003	0.000013	0.000009	0.000015	0.000008
Titanium	AITF	mg/L	0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Uranium	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Vanadium	AITF	mg/L	0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Zinc	AITF	mg/L	0.00009	0.0002	<0.00009	0.00026	<0.00009
Total Metals							
Aluminum	AITF	mg/L	0.0002	0.0002	0.0002	0.0003	0.0005
Antimony	AITF	mg/L	0.000001	0.000001	0.000003	<0.000001	0.000001
Arsenic	AITF	mg/L	0.000004	0.000004	<0.000004	<0.000004	<0.000004
Barium	AITF	mg/L	0.000007	#	0.000013	0.000022	0.00001
Beryllium	AITF	mg/L	0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Bismuth	AITF	mg/L	0.000001	<0.000001	<0.000001	<0.000001	<0.000001
Boron	AITF	mg/L	0.0001	#	0.0005	0.0004	0.0002
Cadmium	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Chlorine	AITF	mg/L	0.04	<0.04	<0.04	<0.04	<0.04
Chromium	AITF	mg/L	0.00003	<0.00003	<0.00003	<0.00003	0.00003
Cobalt	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Copper	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	0.00012
Iron	AITF	mg/L	0.0007	<0.0007	<0.0007	<0.0007	<0.0007
Lead	AITF	mg/L	0.000003	<0.000003	#	<0.000003	0.000006
Lithium	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Manganese	AITF	mg/L	0.000005	0.000025	0.000016	0.000019	0.000012
Mercury	AITF	ng/L	0.06	<0.06	<0.06	<0.06	<0.06
Methyl Mercury	AITF	ng/L	0.01	<0.010	<0.010	<0.010	<0.010
Molybdenum	AITF	mg/L	0.000002	0.000007	#	<0.000002	0.000005
Nickel	AITF	mg/L	0.000008	0.000009	<0.000008	<0.000008	0.000012
Selenium	AITF	mg/L	0.00006	<0.00006	<0.00006	<0.00006	<0.00006
Silver	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Strontium	AITF	mg/L	0.000001	<0.000001	0.000002	0.000004	0.000002

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Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-3 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Trip Blanks			
				July	Aug	Sept	Oct
Total Metals (Cont'd.)							
Thallium	AITF	mg/L	0.0000009	<0.0000009	0.000001	0.0000016	<0.0000009
Thorium	AITF	mg/L	0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009
Tin	AITF	mg/L	0.000003	0.000013	0.000009	0.000016	0.000008
Titanium	AITF	mg/L	0.00005	<0.00005	0.00005	<0.00005	<0.00005
Uranium	AITF	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium	AITF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Zinc	AITF	mg/L	0.0001	0.0002	<0.0001	0.0003	0.0003
General Organics							
Benzene	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
BTEX	AITF	mg/L	0.01	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
m,p-xylene	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
o-Xylene	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Toluene	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
F1 Hydrocarbons (C6-C10)	AITF	mg/L	0.01	<0.010	<0.010	<0.010	<0.010
F2 Hydrocarbons(C10-C16)	AITF	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
F3 Hydrocarbons(C16-C34)	AITF	mg/L	0.02	<0.02	<0.02	<0.02	<0.02
F4 Hydrocarbons(C34-C50)	AITF	mg/L	0.02	<0.02	<0.02	<0.02	<0.02
Naphthenic Acids	AITF	mg/L	0.08	<0.08	<0.08	<0.08	<0.08
Oilsands Acid Extractable	AITF	mg/L	0.1	<0.1	<0.1	<0.1	<0.1
Phenols	AITF	mg/L	0.002	0.0075	0.0064	0.0032	0.0076
PAHs							
Acenaphthene	AXYS	ng/L	multiple	0.236	0.381	<0.193	<0.174
Acenaphthylene	AXYS	ng/L	multiple	0.036	0.261	<0.066	<0.109
Anthracene	AXYS	ng/L	multiple	0.064	<0.211	<0.067	<0.071
Benz[a]anthracene	AXYS	ng/L	multiple	0.024	0.048	<0.031	<0.038
Benzo[a]pyrene	AXYS	ng/L	multiple	<0.082	<0.089	<0.068	<0.118
Benzo[b]fluoranthene	AXYS	ng/L	multiple	<0.049	<0.061	<0.043	<0.076
Benzo[e]pyrene	AXYS	ng/L	multiple	<0.081	0.113	<0.068	<0.118

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Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-3 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Trip Blanks			
				July	Aug	Sept	Oct
PAHs (Cont'd.)							
Benzo[ghi]perylene	AXYS	ng/L	multiple	0.063	0.183	<0.076	0.116
Benzo[j,k]fluoranthenes	AXYS	ng/L	multiple	<0.058	<0.069	<0.047	<0.088
Biphenyl	AXYS	ng/L	multiple	0.401	0.956	0.502	0.391
C1-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	0.592	1.23	<0.117	<0.132
C1-Acenaphthenes	AXYS	ng/L	multiple	<0.044	<0.168	<0.097	<0.126
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	0.215	0.201	<0.039	<0.063
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	multiple	<0.129	<0.103	<0.097	<0.160
C1-Biphenyls	AXYS	ng/L	multiple	0.306	2.16	0.358	0.268
C1-Dibenzothiophenes	AXYS	ng/L	multiple	<0.032	<0.203	<0.105	<0.156
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	0.627	0.616	<0.088	<0.141
C1-Fluorenes	AXYS	ng/L	multiple	0.666	2.37	0.266	<0.372
C1-Naphthalenes	AXYS	ng/L	multiple	1.61	7.59	14.4	3.17
C2-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	0.605	0.759	0.278	<0.085
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	0.038	<0.130	<0.043	<0.064
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	multiple	<0.069	<0.096	<0.097	<0.136
C2-Biphenyls	AXYS	ng/L	multiple	0.386	0.646	0.173	<0.149
C2-Dibenzothiophenes	AXYS	ng/L	multiple	0.798	<0.656	0.21	<0.178
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	0.483	0.632	<0.102	<0.087
C2-Fluorenes	AXYS	ng/L	multiple	1.07	0.811	0.255	0.476
C2-Naphthalenes	AXYS	ng/L	multiple	3.16	5.96	6.09	3.25
C3-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	-	-	<0.054	<0.098
C3-Dibenzothiophenes	AXYS	ng/L	multiple	0.719	0.684	<0.117	<0.221
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	<0.058	<0.141	<0.077	<0.092
C3-Fluorenes	AXYS	ng/L	multiple	1.11	1.36	0.516	0.843
C3-Naphthalenes	AXYS	ng/L	multiple	1.26	2.58	1.14	0.997
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	0.503	0.434	<0.095	<0.074
C4-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	-	-	<0.073	<0.127
C4-Dibenzothiophenes	AXYS	ng/L	multiple	0.614	0.621	0.206	<0.178
C4-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	-	-	<0.077	<0.070

#

Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-3 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Trip Blanks			
				July	Aug	Sept	Oct
PAHs (Cont'd.)							
C4-Naphthalenes	AXYS	ng/L	multiple	0.301	0.895	<0.118	<0.165
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	0.784	0.874	<0.139	<0.413
Chrysene	AXYS	ng/L	multiple	0.179	0.151	0.063	0.049
Dibenz[a,h]anthracene	AXYS	ng/L	multiple	<0.059	<0.148	<0.095	<0.180
Dibenzothiophene	AXYS	ng/L	multiple	0.087	0.154	0.08	<0.167
Fluoranthene	AXYS	ng/L	multiple	0.466	0.708	0.21	0.212
Fluorene	AXYS	ng/L	multiple	0.253	0.304	<0.087	<0.099
Indeno[1,2,3-cd]pyrene	AXYS	ng/L	multiple	<0.062	<0.055	<0.078	<0.090
Naphthalene	AXYS	ng/L	multiple	1.86	12.2	4.9	4.68
Perylene	AXYS	ng/L	multiple	-	-	<0.072	<0.130
Phenanthrene	AXYS	ng/L	multiple	0.956	1.59	0.621	0.423
Pyrene	AXYS	ng/L	multiple	0.281	1.82	0.172	0.271
Retene	AXYS	ng/L	multiple	0.484	0.411	<0.139	<0.413

Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-4 Concentration of water quality variables observed in field blanks for stations managed by Hatfield Consultants, 2015 WY.

Variables	Laboratory	Units	Detection Limit	Concentrations in Field Blanks																				
				Nov	Dec	Jan	Feb	Mar	May #1	May #2	Jun #1	Jun #2	Jul #1	Jul #2	Jul #3	Aug #1	Aug #2	Sep #1	Sep #2	Sep #3	Sep #4	Sep #5	Oct #1	Oct #2
Conventional Variables																								
Alkalinity (Total as CaCO ₃)	ALS/Maxxam	mg/L	0.5,2	<2	<2	<2	<2	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Conductivity	ALS/Maxxam	mg/L	0.2,1	1.7	0.77	0.6	<0.2	0.86	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.7
Dissolved Organic Carbon	ALS/Maxxam	mg/L	0.5,1	<1	1.8	1.7	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.59
Hardness (as CaCO ₃)	ALS/Maxxam	mg/L	0.5,1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
pH	ALS/Maxxam	mg/L	0.1	5.0	4.6	5.06	5.37	5.03	4.76	4.79	4.77	4.66	4.86	5.31	5.24	5.37	5.11	5.07	5.2	5.33	5.11	4.91	5.01	5.3
Total Dissolved Solids	ALS/Maxxam	mg/L	10,12	<12	<12	<12	<10	<10	<10	24	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total Organic Carbon	ALS/Maxxam	mg/L	0.5,1	<1	<1	<1	<1	<1	<0.5	0.51	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.57
Total Suspended Solids	ALS/Maxxam	mg/L	1,3	<3	<3	<3	<3	<3	<1	<1	1.3	<1	<1	<1	<1	<1	<1	1.3	<1	<1	<1	<1	<1	<1
True Colour	ALS/Maxxam	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Turbidity	ALS/Maxxam	mg/L	0.1	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1	<0.1	0.15	<0.1	<0.1	<0.1	<0.1	<0.1
Major Ions																								
Bicarbonate	ALS/Maxxam	mg/L	5	<5	<5	<5	<5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbonate	ALS/Maxxam	mg/L	0.5,5	<5	<5	<5	<5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloride	ALS/Maxxam	mg/L	0.5,1	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Calcium	ALS/Maxxam	mg/L	0.3,0.5,1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Magnesium	ALS/Maxxam	mg/L	0.1,0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Potassium	ALS/Maxxam	mg/L	0.3,0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Sodium	ALS/Maxxam	mg/L	0.5,1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hydroxide	ALS/Maxxam	mg/L	0.5,5	<5	<5	<5	<5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulfate	ALS/Maxxam	mg/L	0.3/1	0.5	<0.3	<0.3	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphide	ALS/Maxxam	mg/L	0.0015/0.0019	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	0.0031	<0.0019	<0.0019	<0.0019	0.0023	<0.0019	<0.0019	<0.0019	<0.0019	0.0022	<0.0019
Major Nutrients																								
Total Ammonia (as N)	ALS/Maxxam	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate (as N)	ALS/Maxxam	mg/L	0.003,0.02,0.054	<0.054	<0.022	<0.02	<0.02	<0.02	<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
Nitrite (as N)	ALS/Maxxam	mg/L	0.003,0.01	-	-	<0.01	<0.01	<0.01	<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
Nitrate plus Nitrite (as N)	ALS/Maxxam	mg/L	0.003,0.005,0.022	-	-	<0.022	<0.022	<0.022	<0.003	<0.003	<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
Total Kjeldahl Nitrogen	ALS/Maxxam	mg/L	0.05,0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Nitrogen	ALS/Maxxam	mg/L	0.055,1	-	-	-	-	-	<1	<1	<1	<1	<0.055	<0.055	<0.055	<0.055	<0.055	<0.055	<0.055	<0.055	<0.055	<0.055	<0.055	<0.055
Orthophosphate	ALS/Maxxam	mg/L	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
Dissolved Phosphorus	ALS/Maxxam	mg/L	0.001,0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	0.004	0.003	0.003	0.005	0.005	0.003	<0.003	0.003	<0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Total Phosphorus (P)	ALS/Maxxam	mg/L	0.001,0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	0.003	<0.003	<0.003	<0.003	0.003	<0.003	0.003	0.003	0.004	<0.003	0.003	0.003	0.003	0.003	<0.003
Dissolved Metals																								
Aluminum	AITF	mg/L	0.00013	<0.00014	<0.00013	<0.00013	0.00025	<0.00013	0.00015	0.00018	0.00019	<0.00013	0.00016	0.00024	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	0.00025	0.00021	<0.00013	0.00017	0.00031
Antimony	AITF	mg/L	0.000008,0.00002	<0.00002	<0.00008	<0.00008	0.00009	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	0.00032	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Arsenic	AITF	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	0.000032	<0.000003	<0.000003	<0.000003	0.000005	<0.000003	0.000006	0.000003	<0.000003	0.000003	<0.000003	0.000003	<0.000003	<0.000003
Barium	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	0.00018	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	<0.00005	<0.00005	<0.00005
Beryllium	AITF	mg/L	0.000009	<0.00001	<0.00001	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Bismuth	AITF	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	0.000005	<0.000003	<0.000003	<0.000003
Boron	AITF	mg/L	0.00013	<0.00018	<0.00021	0.00014	0.0003	0.00052	0.00031	0.00031	0.00036	0.00026	0.0003	0.00025	0.0006	0.00046	0.00037	0.00032	0.00054	0.00017	0.00036	0.00013	0.0003	0.00029
Cadmium	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Calcium	AITF	mg/L	0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Chlorine	AITF	mg/L	0.03,0.1	<0.1	0.1	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	0.06	<0.03	0.1	0.43	0.16	<0.03	0.06	<0.03	<0.03	<0.03	<0.03	<0.03	0.05
Chromium	AITF	mg/L	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	<0.0001	<0.0001	<0.0001
Cobalt	AITF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	0.000002	<0.000002	<0.000002													

Table B.2-4 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Field Blanks																				
				Nov	Dec	Jan	Feb	Mar	May #1	May #2	Jun #1	Jun #2	Jul #1	Jul #2	Jul #3	Aug #1	Aug #2	Sep #1	Sep #2	Sep #3	Sep #4	Sep #5	Oct #1	Oct #2
PAHs (Cont'd.)																								
Benzo[e]pyrene	AXYS	ng/L	multiple	-	-	-	-	-	-	-	<0.078	<0.065	<0.037	<0.088	<0.128	1.01	<0.067	<0.112	<0.247	0.227	<0.112	<0.247	<0.053	<0.08
Benzo[ghi]perylene	AXYS	ng/L	multiple	<0.125	<0.125	0.215	<0.046	<0.086	<0.077	<0.069	0.271	<0.101	0.065	<0.082	<0.081	1.42	<0.054	<0.146	<0.196	<0.119	<0.093	0.217	0.211	0.132
Benzo[k]fluoranthenes	AXYS	ng/L	multiple	-	-	-	-	-	-	-	0.067	<0.048	<0.027	<0.066	<0.085	1.1	<0.048	<0.082	<0.187	<0.061	<0.074	<0.187	0.048	<0.06
Biphenyl	AXYS	ng/L	multiple	<1.496	<1.496	0.776	0.466	0.453	0.496	0.713	0.561	0.549	1.03	0.696	0.589	1.56	0.602	0.423	<0.375	0.426	0.441	1.02	0.567	0.687
C1 Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	<0.831	<0.831	0.444	0.487	<0.104	<0.149	<0.101	0.56	0.223	0.14	<0.256	<0.207	1.82	<0.222	<0.183	<0.317	<0.202	<0.135	<0.317	0.489	0.602
C1-Acenaphthenes	AXYS	ng/L	multiple	<0.296	<0.296	<0.141	<0.149	<0.145	<0.175	<0.138	<0.065	<0.113	0.046	<0.248	<0.143	<0.397	<0.112	<0.244	<0.357	<0.176	<0.21	<0.357	<0.155	<0.127
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	<0.202	<0.202	0.108	<0.05	<0.066	<0.048	<0.049	0.107	<0.05	0.159	0.077	<0.047	0.574	<0.052	<0.101	<0.292	<0.071	<0.052	<0.292	0.099	0.077
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	multiple	<0.573	<0.573	0.168	<0.119	<0.124	0.221	<0.125	<0.133	<0.137	<0.088	<0.099	<0.111	<0.339	<0.092	<0.194	<0.406	<0.228	<0.134	<0.406	<0.084	<0.088
C1-Biphenyls	AXYS	ng/L	multiple	<4.062	<4.062	0.698	0.619	0.601	0.416	0.501	0.388	0.405	0.745	0.425	0.548	4.23	0.495	0.453	<0.272	0.367	0.417	1.37	0.624	0.647
C1-Dibenzothiophenes	AXYS	ng/L	multiple	0.362	<0.304	<0.113	<0.138	<0.1	<0.116	<0.096	<0.113	<0.113	<0.054	<0.236	<0.261	<0.432	<0.234	<0.233	<0.361	<0.158	0.217	<0.361	<0.088	<0.099
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	<0.719	<0.719	0.612	-	<0.12	<0.112	0.152	0.337	<0.126	0.411	0.377	<0.064	2.5	<0.108	<0.246	<0.462	<0.201	<0.15	<0.462	<0.155	0.334
C1-Fluorenes	AXYS	ng/L	multiple	<2.582	<2.582	0.351	0.345	<0.207	0.396	0.46	0.444	0.507	0.59	0.409	0.541	3.4	0.529	0.501	<0.661	<0.393	0.391	<0.661	0.615	0.682
C1-Naphthalenes	AXYS	ng/L	multiple	<9.571	<9.571	1.88	2.51	1.87	1.32	2.34	8.47	7.26	6.56	9.29	6.2	10.3	7.63	4.8	3.42	3.11	4.56	6.35	5.3	5.08
C2 Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	<0.678	<0.678	<0.089	0.218	<0.145	0.175	0.115	0.443	0.178	0.331	0.15	0.184	1.0	0.235	0.443	0.708	<0.094	<0.15	0.209	0.188	0.305
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	<0.243	<0.243	<0.042	<0.047	<0.04	<0.073	<0.049	<0.069	<0.059	0.167	<0.06	<0.07	<0.246	<0.07	<0.11	<0.225	<0.11	<0.064	<0.225	<0.056	<0.061
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	multiple	<0.336	<0.336	0.216	<0.089	<0.135	0.121	<0.095	<0.086	<0.085	<0.048	<0.083	<0.088	<0.304	<0.092	<0.194	<0.325	0.139	<0.134	<0.325	<0.086	<0.161
C2-Biphenyls	AXYS	ng/L	multiple	<18.832	<18.832	1.84	2.1	1.93	0.691	1.13	0.203	0.268	0.5	0.722	0.412	1.0	0.225	0.262	<0.401	0.396	0.407	1.19	0.402	0.507
C2-Dibenzothiophenes	AXYS	ng/L	multiple	<1.052	<1.052	0.186	<0.108	<0.101	0.277	0.482	0.268	<0.15	0.632	0.256	<0.233	0.908	0.729	0.642	0.955	<0.105	<0.08	<0.233	<0.145	<0.143
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	<0.711	<0.711	<0.07	<0.056	<0.134	0.224	<0.092	<0.091	<0.067	0.334	0.378	<0.059	1.23	<0.062	<0.17	<0.347	<0.156	<0.165	<0.347	0.154	0.169
C2-Fluorenes	AXYS	ng/L	multiple	<1.430	<1.430	0.245	0.196	0.699	0.149	<0.161	0.994	<0.287	1.0	0.845	<0.738	2.13	0.597	1.06	0.894	0.477	0.401	0.611	0.654	0.718
C2-Naphthalenes	AXYS	ng/L	multiple	<5.743	<5.743	1.68	1.84	1.78	2	2.27	4.49	4	3.02	4.36	3.5	8.18	4.84	3.79	3.21	3.3	2.83	4.21	3.82	3.84
C3-Dibenzothiophenes	AXYS	ng/L	multiple	<1.256	<1.256	<0.071	<0.086	<0.049	0.325	0.272	<0.092	<0.154	0.759	<0.175	<0.155	<0.362	0.737	0.285	0.999	<0.187	<0.143	0.288	0.179	0.23
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	<0.666	<0.666	<0.088	<0.081	<0.079	<0.129	<0.064	<0.105	<0.055	<0.036	<0.091	<0.039	<0.3	<0.051	<0.106	<0.275	<0.142	<0.121	<0.106	<0.056	<0.07
C3-Fluorenes	AXYS	ng/L	multiple	<2.417	<2.417	0.991	<0.15	<0.129	0.303	<0.134	1.02	0.205	2.97	2.51	1.6	1.92	1.6	1.45	1.29	1.56	0.632	0.684	1.41	0.969
C3-Naphthalenes	AXYS	ng/L	multiple	<2.467	<2.467	1.2	0.637	0.344	1.3	0.914	0.914	1.41	2.8	1.34	3.33	1.64	1.22	1.19	0.295	0.427	2.54	1.39	1.28	
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	<0.621	<0.621	0.111	<0.08	<0.131	0.194	0.116	0.081	<0.066	0.298	0.298	<0.07	0.883	<0.095	0.216	0.712	<0.199	<0.106	<0.095	<0.05	0.101
C4-Dibenzothiophenes	AXYS	ng/L	multiple	<1.093	<1.093	0.291	0.186	0.152	0.763	0.478	0.565	0.829	0.532	1.2	0.332	1.1	0.84	0.209	<0.478	0.213	0.332	0.251	0.19	0.191
C4-Naphthalenes	AXYS	ng/L	multiple	<1.739	<1.739	<0.136	<0.182	<0.122	0.31	0.289	0.153	<0.156	0.594	0.32	<0.105	0.877	<0.15	<0.435	<0.408	<0.196	<0.097	<0.15	<0.173	0.21
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	<1.988	<1.988	0.415	<0.154	<0.152	0.42	0.385	<0.14	<0.131	0.592	0.399	<0.138	2.03	<0.184	0.487	<0.531	<0.21	0.127	<0.184	0.099	0.192
Chrysene	AXYS	ng/L	multiple	<0.162	<0.162	0.241	0.126	0.074	0.093	0.104	0.12	0.066	0.084	0.049	0.042	1.37	0.052	0.147	0.21	0.07	0.06	0.068	0.084	0.106
Dibenz[a,h]anthracene	AXYS	ng/L	multiple	<0.201	<0.201	0.073	<0.191	<0.112	<0.072	<0.115	0.077	<0.272	<0.047	<0.064	<0.133	0.254	<0.069	<0.168	<0.401	<0.137	<0.176	<0.069	0.063	<0.065
Dibenzothiophene	AXYS	ng/L	multiple	0.429	<0.429	0.743	<0.062	<0.052	0.067	<0.035	0.088	<0.072	0.096	<0.106	<0.126	0.23	<0.105	<0.11	<0.23	<0.097	<0.083	<0.105	0.175	0.158
Fluoranthene	AXYS	ng/L	multiple	<0.550	<0.550	0.701	0.369	0.262	0.216	0.276	0.513	0.182	0.242	0.164	0.12	3.64	0.12	0.501	0.365	0.256	0.194	0.338	0.276	0.295
Fluorene	AXYS	ng/L	multiple	0.4	<0.353	0.506	0.169	0.121	<0.089	0.071	0.248	0.161	0.371	<0.349	<0.144	0.509	<0.179	<0.159	<0.248	<0.206	<0.131	<0.179	0.169	0.152
Indeno[1,2,3-cd]pyrene	AXYS	ng/L	multiple	<0.145	<0.145	0.264	<0.058	<0.108	<0.088	0.097	0.141	<0.124	0.084	<0.095	<0.093	1.17	<0.063	<0.155	<0.22	<0.135	<0.101	0.083	0.141	<0.091
Naphthalene	AXYS	ng/L	multiple	7.21	<7.21	2.62	2.09	2.11	2.07	3.42	4.33	2.19	21.3	4.68	5.78	12.3	8.03	3.89	2.01	2.3	3.09	6.11	3.9	4.69
Phenanthrene	AXYS	ng/L	multiple	1.394	1.440	1.78	0.835	0.673	0.556	0.736	0.901	0.528	0.698	0.415	0.432	3.11	0.549	0.728	0.729	0.717	0.638	0.59	0.678	0.715
Pyrene	AXYS	ng/L	multiple	<0.359	<0.359	0.471	0.251	0.181	0.137	0.18	1.23	0.143	0.191	0.118	0.172	5.73	0.183	0.413	0.343	0.227	0.174	0.622	0.229	0.262
Retene	AXYS	ng/L	multiple	<0.407	<0.407	0.153	0.172	<0.152	<0.122	0.108	<0.14	<0.131	0.151	<0.186	<0.138	0.593	<0.184	0.284	<0.531	<0.21	0.145	0.188	0.127	0.293

Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-5 Concentrations of water quality variables observed in field blanks for stations managed by AEMERA, 2015 WY.

Variables	Laboratory	Units	Detection Limit	Concentrations in Field Blanks				
				May	July	Aug	Sept	Oct
Conventional Variables								
Alkalinity (Total as CaCO ₃)	Maxxam	mg/L	0.5	-	<0.5	<0.5	<0.5	<0.5
Conductivity	Maxxam	mg/L	1	-	<1	<1	<1	<1
Dissolved Organic Carbon	Maxxam	mg/L	0.5	-	<0.5	<0.5	<0.5	<0.5
Hardness (as CaCO ₃)	Maxxam	mg/L	0.5	-	<0.5	<0.5	<0.5	<0.5
pH	Maxxam	mg/L	-	-	4.94	4.99	4.79	5.02
Total Dissolved Solids	Maxxam	mg/L	10	-	<10	<10	<10	<10
Total Organic Carbon	Maxxam	mg/L	0.5	-	<0.5	<0.5	<0.5	<0.5
Total Suspended Solids	Maxxam	mg/L	1	-	<1	<1	<1	<1
True Colour	Maxxam	mg/L	2	-	<2	<2	<2	<2
Turbidity	Maxxam	mg/L	0.1	-	<0.1	<0.1	<0.1	<0.1
Major Ions								
Bicarbonate	Maxxam	mg/L	0.5	-	<0.5	<0.5	<0.5	<0.5
Carbonate	Maxxam	mg/L	0.5	-	<0.5	<0.5	<0.5	<0.5
Chloride	Maxxam	mg/L	1	-	<1	<1	<1	<1
Calcium	Maxxam	mg/L	0.3	-	<0.3	<0.3	<0.3	<0.3
Magnesium	Maxxam	mg/L	0.2	-	<0.2	<0.2	<0.2	<0.2
Potassium	Maxxam	mg/L	0.3	-	<0.3	<0.3	<0.3	<0.3
Sodium	Maxxam	mg/L	0.5	-	<0.5	<0.5	<0.5	<0.5
Hydroxide	Maxxam	mg/L	0.5	-	<0.5	<0.5	<0.5	<0.5
Sulfate	Maxxam	mg/L	1,3	<3	<1	<1	<1	<1
Sulphide	Maxxam	mg/L	0.0019	-	<0.0019	<0.0019	<0.0019	<0.0019
Major Nutrients								
Total Ammonia (as N)	Maxxam	mg/L	0.05	-	<0.05	<0.05	<0.05	<0.05
Nitrate (as N)	Maxxam	mg/L	0.003	-	<0.003	<0.003	<0.003	<0.003
Nitrite (as N)	Maxxam	mg/L	0.003	-	<0.003	<0.003	<0.003	<0.003
Nitrate plus Nitrite (as N)	Maxxam	mg/L	0.005	-	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl Nitrogen	Maxxam	mg/L	0.05	-	<0.05	<0.05	<0.05	<0.05
Total Nitrogen	Maxxam	mg/L	0.055	-	<0.055	<0.055	<0.055	<0.055

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Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-5 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Field Blanks				
				May	July	Aug	Sept	Oct
Major Nutrients (Cont'd.)								
Orthophosphate	Maxxam	mg/L	0.003	-	<0.003	<0.003	<0.003	<0.003
Dissolved Phosphorus	Maxxam	mg/L	0.003	-	0.005	<0.003	<0.003	<0.003
Total Phosphorus (P)	Maxxam	mg/L	0.003	-	0.003	0.003	<0.003	<0.003
Dissolved Metals								
Aluminum	ATIF	mg/L	0.00013	0.00015	0.00024	0.00013	0.00023	0.00013
Antimony	ATIF	mg/L	0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Arsenic	ATIF	mg/L	0.000003	0.000003	<0.000003	0.000004	<0.000003	<0.000003
Barium	ATIF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Beryllium	ATIF	mg/L	0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009
Bismuth	ATIF	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Boron	ATIF	mg/L	0.00013	0.0005	0.00035	0.00069	0.0003	0.00025
Cadmium	ATIF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Calcium	ATIF	mg/L	0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Chlorine	ATIF	mg/L	0.03	0.2	<0.03	<0.03	<0.03	<0.03
Chromium	ATIF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	ATIF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Copper	ATIF	mg/L	0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Iron	ATIF	mg/L	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Lead	ATIF	mg/L	0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004
Lithium	ATIF	mg/L	0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Manganese	ATIF	mg/L	0.00001	0.00001	0.00001	0.00001	0.00002	0.00001
Mercury	ATIF	ng/L	0.08	<0.08	<0.08	<0.08	0.08	<0.08
Methyl Mercury	ATIF	ng/L	0.01	<0.01	<0.01	<0.01	<0.010	<0.01
Molybdenum	ATIF	mg/L	0.000002	0.000005	0.000024	0.000018	<0.000002	0.000005
Nickel	ATIF	mg/L	0.000006	<0.000006	0.000006	<0.000006	<0.000006	0.000007
Selenium	ATIF	mg/L	0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
Silver	ATIF	mg/L	0.000001	<0.000001	0.000002	<0.000001	<0.000001	<0.000001
Strontium	ATIF	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007

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Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-5 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Field Blanks				
				May	July	Aug	Sept	Oct
Dissolved Metals (Cont'd.)								
Thallium	ATIF	mg/L	0.000004	0.0000016	0.0000016	0.0000009	0.0000011	<0.0000004
Thorium	ATIF	mg/L	0.0000008	<0.0000008	<0.0000008	<0.0000008	<0.0000008	<0.0000008
Tin	ATIF	mg/L	0.000003	# 0.000026	0.000013	0.000012	<0.000003	0.000008
Titanium	ATIF	mg/L	0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Uranium	ATIF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Vanadium	ATIF	mg/L	0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Zinc	ATIF	mg/L	0.00009	0.00016	0.00016	<0.00009	0.00022	0.00018
Total Metals								
Aluminum	ATIF	mg/L	0.0002	0.0002	0.0003	0.0003	0.0003	0.0006
Antimony	ATIF	mg/L	0.000001	0.000003	0.000001	0.000003	<0.000001	<0.000001
Arsenic	ATIF	mg/L	0.000004	0.000008	<0.000004	0.000004	<0.000004	<0.000004
Barium	ATIF	mg/L	0.000004	# 0.000027	0.000053	# 0.000027	0.000014	0.00001
Beryllium	ATIF	mg/L	0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Bismuth	ATIF	mg/L	0.000001	0.000001	<0.000001	0.000001	<0.000001	<0.000001
Boron	ATIF	mg/L	0.0001	0.0005	0.0004	# 0.0007	0.0004	0.0002
Cadmium	ATIF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Calcium	ATIF	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorine	ATIF	mg/L	0.04	# 0.21	<0.04	<0.04	<0.04	<0.04
Chromium	ATIF	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00004
Cobalt	ATIF	mg/L	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Copper	ATIF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.00012
Iron	ATIF	mg/L	0.0007	<0.0007	<0.0007	<0.0007	<0.0007	<0.0007
Lead	ATIF	mg/L	0.000003	0.000004	0.000004	<0.000003	<0.000003	<0.000003
Lithium	ATIF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Manganese	ATIF	mg/L	0.000005	0.000024	0.000022	0.000022	0.000016	0.000012
Mercury	ATIF	ng/L	0.06	<0.06	<0.06	<0.06	0.08	<0.06
Methyl Mercury	ATIF	ng/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum	ATIF	mg/L	0.000002	# 0.000011	0.000024	# 0.000029	<0.000002	0.000005
Nickel	ATIF	mg/L	0.000008	0.000022	<0.000008	<0.000008	<0.000008	0.000009

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Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-5 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Field Blanks				
				May	July	Aug	Sept	Oct
Total Metals (Cont'd.)								
Selenium	ATIF	mg/L	0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006
Silver	ATIF	mg/L	0.000002	<0.000002	0.000002	<0.000002	<0.000002	<0.000002
Strontium	ATIF	mg/L	0.000001	0.000043	0.000005	0.000026	0.000025	0.000002
Thallium	ATIF	mg/L	0.0000009	0.0000023	0.0000016	0.0000013	0.0000018	<0.0000009
Thorium	ATIF	mg/L	0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009	<0.0000009
Tin	ATIF	mg/L	0.000003	0.000034	0.000013	0.000016	<0.000003	0.000008
Titanium	ATIF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Uranium	ATIF	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium	ATIF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001
Zinc	ATIF	mg/L	0.0001	0.0003	0.0003	<0.0001	0.0003	0.0002
General Organics								
F1 Benzene	ATIF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
F1 BTEX	ATIF	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
F1 Ethylbenzene	ATIF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
F1 Hydrocarbons (C6-C10)	ATIF	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
F1 m,p-xylene	ATIF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
F1 o-Xylene	ATIF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
F1 Toluene	ATIF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
F2 Hydrocarbons(C10-C16)	ATIF	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
F3 Hydrocarbons(C16-C34)	ATIF	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
F4 Hydrocarbons(C34-C50)	ATIF	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Naphthenic Acids	ATIF	mg/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Oilsands Acid Extractable	ATIF	mg/L	0.1	<0.1	<0.1	<0.1	0.1	<0.1
Phenols	ATIF	mg/L	0.002	-	0.0074	0.0061	0.0035	0.0063
PAHs								
Acenaphthene	AXYS	ng/L	multiple	-	0.225	0.272	<0.160	<0.182
Acenaphthylene	AXYS	ng/L	multiple	-	0.051	0.145	<0.105	<0.207
Anthracene	AXYS	ng/L	multiple	-	0.062	<0.210	<0.079	<0.061
Benz[a]anthracene	AXYS	ng/L	multiple	-	0.703	<0.044	<0.041	<0.030

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Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-5 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Field Blanks				
				May	July	Aug	Sept	Oct
PAHs (Cont'd.)								
Benzo[a]pyrene	AXYS	ng/L	multiple	-	0.66	<0.147	<0.115	<0.109
Benzo[b]fluoranthene	AXYS	ng/L	multiple	-	0.851	<0.097	<0.073	<0.074
Benzo[e]pyrene	AXYS	ng/L	multiple	-	0.935	<0.144	<0.115	<0.109
Benzo[ghi]perylene	AXYS	ng/L	multiple	-	1.22	<0.125	<0.082	<0.070
Benzo[j,k]fluoranthenes	AXYS	ng/L	multiple	-	0.596	<0.108	<0.079	<0.080
Biphenyl	AXYS	ng/L	multiple	-	0.497	0.757	0.567	0.322
C1 Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	-	0.673	<0.232	0.18	<0.151
C1-Acenaphthenes	AXYS	ng/L	multiple	-	<0.034	<0.173	<0.176	<0.182
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	-	1.9	<0.086	<0.057	<0.060
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	multiple	-	2.35	<0.254	<0.179	<0.124
C1-Biphenyls	AXYS	ng/L	multiple	-	0.424	0.841	0.317	<0.168
C1-Dibenzothiophenes	AXYS	ng/L	multiple	-	0.164	<0.371	<0.117	<0.197
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	-	1.34	<0.204	<0.141	<0.139
C1-Fluorenes	AXYS	ng/L	multiple	-	0.861	0.771	0.606	<0.449
C1-Naphthalenes	AXYS	ng/L	multiple	-	1.96	17.6	15	2.18
C2 Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	-	0.675	0.3	0.371	0.164
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	-	2.39	<0.138	<0.098	<0.077
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	multiple	-	1.28	<0.201	<0.129	<0.113
C2-Biphenyls	AXYS	ng/L	multiple	-	0.438	0.3	0.286	<0.128
C2-Dibenzothiophenes	AXYS	ng/L	multiple	-	0.741	<0.440	18.9	<0.253
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	-	1.52	<0.235	3.62	<0.100
C2-Fluorenes	AXYS	ng/L	multiple	-	1.8	1.74	0.608	0.299
C2-Naphthalenes	AXYS	ng/L	multiple	-	3.36	6.64	5.36	2.94
C3-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	-	-	-	<0.079	<0.077
C3-Dibenzothiophenes	AXYS	ng/L	multiple	-	0.644	<0.255	<0.119	<0.224
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	-	0.781	<0.154	<0.117	<0.115
C3-Fluorenes	AXYS	ng/L	multiple	-	2	1.01	1.78	1.2
C3-Naphthalenes	AXYS	ng/L	multiple	-	1.43	1.69	1.33	0.753
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	-	0.646	<0.100	0.256	<0.130

#

Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-5 (Cont'd.)

Variables	Laboratory	Units	Detection Limit	Concentrations in Field Blanks				
				May	July	Aug	Sept	Oct
PAHs (Cont'd.)								
C4-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	multiple	-	-	-	<0.087	<0.071
C4-Dibenzothiophenes	AXYS	ng/L	multiple	-	0.691	0.261	0.278	0.274
C4-Fluoranthenes/Pyrenes	AXYS	ng/L	multiple	-	-	-	<0.088	<0.075
C4-Naphthalenes	AXYS	ng/L	multiple	-	0.556	<0.196	90.6	<0.191
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	multiple	-	3.65	0.463	14.1	<0.120
Chrysene	AXYS	ng/L	multiple	-	0.923	0.111	0.112	0.065
Dibenz[a,h]anthracene	AXYS	ng/L	multiple	-	0.173	<0.234	<0.100	<0.152
Dibenzothiophene	AXYS	ng/L	multiple	-	0.096	<0.120	<0.085	<0.243
Fluoranthene	AXYS	ng/L	multiple	-	1	0.355	0.319	0.257
Fluorene	AXYS	ng/L	multiple	-	0.261	0.253	<0.100	<0.087
Indeno[1,2,3-cd]pyrene	AXYS	ng/L	multiple	-	0.609	<0.142	<0.086	<0.071
Naphthalene	AXYS	ng/L	multiple	-	2.19	7.33	5.31	2.84
Perylene	AXYS	ng/L	multiple	-	-	-	<0.121	<0.119
Phenanthrene	AXYS	ng/L	multiple	-	0.985	0.695	0.732	0.529
Pyrene	AXYS	ng/L	multiple	-	1.12	0.483	0.282	0.26
Retene	AXYS	ng/L	multiple	-	0.406	0.22	0.197	<0.120

#

Indicates sample with reported concentration greater than five times the analytical detection limit.

Table B.2-6 Observations exceeding 20% relative percent difference (RPD) in monthly duplicate water quality samples collected by Hatfield Consultants, 2015 WY.

Variables	Nov (PO1)	Dec (PO1)	Jan (PO1)	Feb (MUR-1)	Mar (PO1)	May #1 (HA1)	May #2 (PO1)	Jun #1 (EL2)	Jun #2 (STB RIFF 7)	Jul #1 (CHL-1)	Jul #2 (CHR-3)	Jul #3 (M6)	Aug #1 (MCC-1)	Aug #2 (PO1)	Sep #1 (ATR-DD-C)	Sep #2 (BER-2)	Sep #3 (EL2)	Sep #4 (M3)	Sep #5 (SHL-1)	Oct #1 (ATR-DD-C)	Oct #2 (HAR-1)
Conventional Variables																					
Alkalinity (Total as CaCO ₃)	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (as CaCO ₃)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-	-	-	-	-	-	-	22.9	-	37.0	-	-	-	-	-	-	-	-	-	-	25.9
Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Suspended Solids	33.3	33.3	50.0	-	-	-	69.9	-	85.7	29.8	-	-	66.7	39.6	166.0	-	-	-	29.8	-	42.4
True Colour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	-	-	-	-	-	-	-	-	43.8	-	-	-	-	-	-	-	-	-	38.1	-	-
Major Ions																					
Bicarbonate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.2	-	-
Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	196	-	-	-	-	-	-	-	-	-	-	21.1	-	-	-	-	-	-	-	-	-
Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoride	-	-	21.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphide	-	-	-	-	40.0	84.0	-	-	-	22.9	-	-	-	-	-	67.6	66.7	-	-	-	-
Nutrients and BOD																					
Total Ammonia (as N)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate (as N)	-	-	-	-	-	-	-	-	-	-	-	-	-	24.0	-	-	-	-	32.7	-	43.9
Nitrite (as N)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate plus Nitrite (as N)	-	-	-	-	-	-	-	-	-	-	-	-	-	24.0	-	-	-	41.4	-	43.9	
Total Kjeldahl Nitrogen	-	-	-	-	-	-	47.1	-	-	-	-	35.6	-	-	-	-	-	-	-	44.9	
Total Nitrogen	-	-	-	-	-	-	-	-	-	-	-	35.6	-	-	-	-	-	-	-	46.2	
Orthophosphate	-	-	-	-	-	-	-	-	-	-	-	-	-	22.2	66.7	-	-	-	-	-	
Dissolved Phosphorus	-	-	-	27.9	-	-	-	-	-	98.3	-	-	-	-	40.0	-	-	-	-	-	66.7
Total Phosphorus	-	-	-	-	-	-	-	-	83.7	-	-	-	-	-	-	-	28.6	-	-	141.1	
Biochemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorophyll <i>a</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Metals																					
Aluminum	-	-	-	-	-	-	-	-	-	68.4	-	-	-	-	99.0	-	-	-	-	-	-
Antimony	-	-	-	-	-	-	30.9	-	-	-	21.3	58.8	-	-	-	-	-	-	35.0	-	-
Arsenic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	-	-	-	-	-	-	-	-	-	-	-	87.2	-	-	-	-	-	-	-	-	-
Bismuth	50	53.3	123.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.2	136.0	-
Boron	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	33.3	22.2	-	-	-	-	-	22.2	50.0	-	22.2	-	-	-	40.0	28.6	-	-	-	-	-
Calcium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorine	-	-	-	-	-	-	-	-	-	83.5	-	-	-	-	-	-	-	-	-	-	-
Chromium	-	66.7	-	40.0	-	-	-	-	-	-	40.0	66.7	-	40.0	-	-	-	66.7	-	-	66.7
Cobalt	-	-	24.4	-	-	-	-	-	-	30.8	-	-	-	-	-	-	-	-	-	-	-
Copper	-	-	-	-	-	71.0	27.8	20.6	-	23.7	21.8	-	-	-	-	-	25.5	-	40.0	42.1	-
Mercury	28.6	-	-	-	-	-	-	-	-	-	42.9	-	144.8	-	-	-	-	-	56.1	-	-
Methyl Mercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58.8	-	20.5
Iron	-	-	-	-	-	31.4	-	-	-	-	-	-	-	-	-	-	-	-	21.2	-	-
Lead	-	-	92.3	-	22.2	28.8	-	25.0	-	85.7	-	-	-	-	46.2	-	-	21.3	22.2	40.0	63.3
Lithium	-	-	27.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	-	-	-	-	-	-	45.5	-	-	-	-	-	-	21.7	-	-	-	-	96.3	-	-
Molybdenum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.7	-	48.8	-	-	-

Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
 # Analytes differ by > 20% between duplicates and both concentrations are > 5 times the detection limit.

Table B.2-6 (Cont'd.)

Variables	Nov	Dec	Jan (PO1)	Feb (MUR-1)	Mar (PO1)	May #1 (HA1)	May #2 (PO1)	Jun #1 (EL2)	Jun #2 (STB RIFF 7)	Jul #1 (CHL-1)	Jul #2 (CHR-3)	Jul #3 (M6)	Aug #1 (MCC-1)	Aug #2 (PO1)	Sep #1 (ATR-DD-C)	Sep #2 (BER-2)	Sep #3 (EL2)	Sep #4 (M3)	Sep #5 (SHL-1)	Oct #1 (ATR-DD-C)	Oct #2 (HAR-1)
Dissolved Metals (Cont'd.)																					
Selenium	-	50.0	22.2	-	-	-	22.2	31.6	-	-	-	40.0	28.6	-	52.6	-	-	-	-	46.2	-
Silver	28.6	-	-	-	-	100.0	-	142.9	-	-	-	133.3	28.6	-	-	50.0	66.7	66.7	-	100.0	-
Strontium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	40	21.4	47.6	-	-	-	93.6	-	23.5	44.9	-	36.5	64.4	113.5	103.1	111.1	-	25.6	26.1	60.9	88.4
Thorium	50	23.6	92.7	-	88.1	-	55.5	24.8	-	-	-	-	-	-	-	143.0	-	-	-	87.9	143.3
Tin	43.1	62.5	33.3	-	70.0	93.3	100.0	-	-	105.6	33.3	121.6	66.7	20.7	-	53.3	142.9	42.9	58.8	53.5	30.3
Titanium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.3	-
Uranium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	-	-	-	31.6	-	-	-	45.2	-	-	-	24.0	-	-	-	-	-	-	-	-	-
Zinc	23.8	-	-	-	-	77.6	49.6	-	-	89.4	66.7	98.5	23.4	47.2	44.8	-	31.1	-	-	-	40.6
Total Metals																					
Aluminum	-	-	34.9	-	33.0	-	44.2	-	20.8	38.3	-	20.2	-	92.1	-	-	-	-	68.0	32.4	-
Antimony	-	-	-	-	-	-	30.3	-	-	-	21.3	58.1	-	-	-	-	-	-	76.7	-	-
Arsenic	-	-	-	-	-	-	-	-	-	-	-	54.2	-	-	-	-	-	-	-	-	-
Barium	-	-	-	-	-	-	-	-	-	-	-	47.4	-	-	-	-	-	-	-	-	-
Beryllium	-	38.5	-	-	-	-	-	-	-	-	-	47.8	-	64.6	55.6	94.1	-	28.6	-	-	-
Bismuth	-	84.2	109.1	-	-	120.0	75.0	-	-	-	-	60.0	-	111.1	-	140.0	-	-	22.2	123.1	152.9
Boron	-	-	-	-	-	-	-	-	-	-	-	50.7	-	-	-	-	-	-	-	-	-
Cadmium	22.2	-	-	40.0	-	-	22.2	-	66.7	50.0	-	66.7	22.2	58.8	-	-	22.2	-	76.9	40.0	-
Calcium	-	-	-	-	-	-	-	-	-	-	-	59.3	-	-	-	-	-	-	-	-	-
Chlorine	-	-	-	-	-	-	-	-	-	82.6	-	55.6	-	-	-	-	-	-	-	-	-
Chromium	-	-	162.4	27.6	-	-	42.5	-	-	82.4	41.5	12.6	-	68.0	-	-	44.1	-	-	42.2	37.5
Cobalt	-	-	-	-	-	-	44.0	-	-	-	-	43.6	-	171.1	-	-	-	-	-	37.7	-
Copper	-	-	-	21.5	-	-	24.9	21.9	-	47.1	26.9	47.9	-	28.6	-	-	21.4	-	37.0	-	-
Iron	-	-	-	-	-	-	54.5	-	-	-	-	34.0	-	42.9	-	-	-	-	31.8	38.9	-
Lead	-	-	32.3	20.7	31.6	-	56.7	-	-	47.1	-	47.4	-	74.7	86.5	-	-	-	33.3	49.9	-
Lithium	-	-	-	-	-	-	-	-	-	-	-	51.2	-	-	-	-	-	-	-	-	-
Manganese	-	-	-	-	-	-	26.2	-	-	-	-	52.9	-	-	-	-	-	-	-	-	-
Mercury	-	-	-	-	-	34.3	-	-	31.1	-	79.4	-	163.1	-	-	-	-	-	-	-	53.8
Methyl Mercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	-	-	-	-	-	-	-	-	-	-	-	50.6	-	-	-	-	-	-	-	-	-
Nickel	-	-	-	-	-	-	-	-	-	58.8	-	29.7	-	-	46.9	4.6	-	-	23.4	33.9	-
Selenium	-	50.0	-	-	-	36.4	-	47.6	-	-	-	-	53.7	-	40.0	1000.0	-	23.5	-	-	20.7
Silver	-	57.1	-	-	-	-	-	107.7	40.0	-	-	-	22.2	-	-	33.3	-	-	-	100.0	40.0
Strontium	-	-	-	-	-	-	-	-	-	-	-	53.5	-	-	-	-	-	-	-	-	-
Thallium	20.8	21.8	-	27.5	-	86.1	86.3	-	50.0	44.9	-	25.6	54.8	49.3	36.7	35.3	84.8	-	70.0	56.7	72.0
Thorium	-	-	91.2	-	33.1	-	-	24.4	-	-	-	47.5	62.1	-	33.5	36.7	-	23.6	-	59.8	94.5
Tin	22.2	20.7	66.7	-	57.1	21.8	56.0	-	23.6	106.4	63.8	158.6	60.9	-	-	-	84.6	-	-	59.5	30.3
Titanium	-	-	-	-	-	-	29.0	-	-	-	-	24.1	27.3	77.0	-	-	-	-	45.0	37.9	30.0
Uranium	-	-	-	-	-	-	-	-	-	-	-	61.7	-	-	-	-	-	-	-	-	-
Vanadium	-	-	-	-	-	-	42.1	48.0	-	22.2	-	25.2	-	65.3	-	-	-	-	-	34.5	-
Zinc	30.6	-	-	-	36.4	-	54.5	-	-	100.0	22.2	61.3	-	87.5	43.9	-	40.0	-	75.0	40.0	-
General Organics																					
F1 Benzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F1 Ethylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F1 BTEX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F1 m,p-xylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F1 o-Xylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F1 Toluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F1 Hydrocarbons (C6-C10)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F2 Hydrocarbons(C10-C16)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F3 Hydrocarbons(C16-C34)	27.6	27.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F4 Hydrocarbons(C34-C50)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthenic Acids	-	-	-	-	-	61.1	50.2	35.8	59.5	-	-	-	-	39.5	-	-	-	-	-	-	-
Oilsands Acid Extractable	-	-	29.6	-	-	29.8	-	-	-	-	-	28.6	-	10.7	50.0	51.2	-	22.2	-	66.7	-
Phenols	-	-	-	-	-	-	26.1	-	31.9	-	-	91.2	-	54.2	23.5	-	-	-	51.2	-	-

Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
 # Analytes differ by > 20% between duplicates and both concentrations are > 5 times the detection limit.

Table B.2-6 (Cont'd.)

Variables	Nov	Dec	Jan (PO1)	Feb (MUR-1)	Mar (PO1)	May #1 (HA1)	May #2 (PO1)	Jun #1 (EL2)	Jun #2 (STB RIFF 7)	Jul #1 (CHL-1)	Jul #2 (CHR-3)	Jul #3 (M6)	Aug #1 (MCC-1)	Aug #2 (PO1)	Sep #1 (ATR-DD-C)	Sep #2 (BER-2)	Sep #3 (EL2)	Sep #4 (M3)	Sep #5 (SHL-1)	Oct #1 (ATR-DD-C)	Oct #2 (HAR-1)
PAHs																					
Acenaphthene	-	-	-	-	24.3	-	20.3	-	-	-	-	-	-	-	-	-	-	-	22.2	-	-
Acenaphthylene	-	-	27.5	-	82.8	-	-	-	-	-	40.0	-	-	46.1	-	-	-	-	-	-	-
Anthracene	-	-	-	-	44.7	-	-	-	27.6	-	60.7	-	-	-	-	-	-	-	-	-	-
Benzo[a]anthracene	-	-	20.3	-	21.5	46.5	69.8	-	28.6	22.6	-	-	-	32.3	24.3	-	-	-	-	-	116.6
Benzo[b,j,k]fluoranthene	29.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo[a]pyrene	-	-	-	-	-	-	70.1	-	-	-	-	-	-	39.3	63.4	-	-	-	-	-	89.1
Benzo[b]fluoranthene	-	-	-	-	-	27.6	73.6	-	-	-	-	-	-	63.3	-	-	-	-	-	-	457.3
Benzo[e]pyrene	-	-	-	-	-	-	-	-	-	-	-	24.8	-	37.8	-	-	-	-	-	-	85.8
Benzo[ghi]perylene	-	-	29.8	-	37.1	30.7	54.6	-	-	-	38.5	30.7	-	-	68.7	-	-	-	-	20.7	54.2
Benzo[j,k]fluoranthenes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57.5
Biphenyl	-	-	-	47.1	38.3	27.0	33.6	-	-	-	-	-	118.6	35.4	29.7	50.8	-	-	42.7	-	4.3
C1 Phenanthrenes/Anthracenes	-	-	-	47.2	48.0	-	78.1	-	-	28.1	25.9	24.7	-	-	-	92.7	-	-	34.8	-	113.0
C1-Acenaphthenes	-	-	-	-	-	-	-	-	-	3533.3	93.3	-	-	-	-	-	-	-	-	-	3.9
C1-Benzo[a]anthracenes/Chrysenes	-	-	41.1	26.2	-	33.9	79.2	32.5	-	42.5	-	63.6	-	29.5	40.8	-	-	-	-	-	111.8
C1-Benzofluoranthenes/Benzopyrenes	34.8	-	-	-	-	-	116.3	32.6	-	5.7	-	97.2	-	50.2	99.4	-	-	-	-	-	127.1
C1-Biphenyls	-	-	-	24.5	28.0	26.6	19.3	-	-	42.2	38.4	-	-	95.6	-	-	-	-	-	60.1	10.1
C1-Dibenzothiophenes	41.1	42.0	44.0	-	-	70.4	79.1	-	24.7	136.6	-	144.8	-	-	-	-	-	-	-	3.6	120.6
C1-Fluoranthenes/Pyrenes	-	-	-	-	-	23.2	63.3	-	-	10.2	-	20.8	-	-	39.6	-	-	-	32.4	-	88.2
C1-Fluorenes	-	-	-	-	71.2	-	44.4	-	38.2	29.9	-	41.2	-	100.5	-	-	-	-	34.3	-	49.6
C1-Naphthalenes	-	-	-	-	50.7	-	34.5	-	52.3	9.8	34.8	-	-	44.4	33.1	29.9	27.4	47.2	23.1	3.1	20.8
C2 Phenanthrenes/Anthracenes	-	-	23.0	-	31.2	26.3	60.1	-	-	63.1	-	30.6	-	32.0	-	-	-	-	24.4	-	135.2
C2-Benzo[a]anthracenes/Chrysenes	-	-	29.7	-	21.2	-	78.5	-	-	-	-	60.7	-	32.6	32.9	-	-	-	32.0	-	117.1
C2-Benzofluoranthenes/Benzopyrenes	-	-	27.9	-	-	-	108.4	-	-	-	-	49.8	-	46.1	-	-	-	-	-	-	642.9
C2-Biphenyls	-	-	-	20.1	42.7	-	74.6	-	32.4	140.8	77.1	60.0	90.6	55.0	47.4	35.0	-	-	66.4	-	24.8
C2-Dibenzothiophenes	20.4	-	-	-	-	22.0	54.1	-	-	54.2	39.2	77.4	37.2	-	-	-	-	-	-	-	152.5
C2-Fluoranthenes/Pyrenes	-	-	-	-	-	24.0	72.6	44.4	23.7	30.1	22.9	54.5	-	22.8	26.0	-	25.6	-	-	-	99.3
C2-Fluorenes	-	-	-	79.5	63.9	25.9	40.7	-	-	24.0	59.6	51.9	26.5	-	31.9	62.4	25.7	41.6	34.2	91.9	-
C2-Naphthalenes	-	-	-	-	65.9	35.1	24.8	-	-	-	58.8	-	26.7	-	-	-	62.8	40.9	-	-	29.0
C3-Benzo[a]anthracenes/Chrysenes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	143.4
C3-Dibenzothiophenes	-	-	-	-	-	22.4	63.8	21.2	-	76.3	40.3	60.7	-	-	-	47.7	-	-	-	-	134.8
C3-Fluoranthenes/Pyrenes	-	-	-	65.0	28.9	82.9	70.4	53.8	48.4	-	93.1	104.5	20.7	32.3	21.8	-	56.3	90.7	-	-	97.8
C3-Fluorenes	-	-	-	-	39.5	-	34.0	-	-	-	44.8	78.1	-	-	108.3	46.1	-	-	-	-	146.9
C3-Naphthalenes	-	-	-	26.5	63.0	-	54.1	-	-	27.5	55.8	136.4	-	41.1	32.4	42.0	-	-	39.4	21.8	59.9
C3-Phenanthrenes/Anthracenes	23.6	-	-	64.8	32.2	-	66.0	-	-	26.2	33.6	28.3	-	46.3	-	36.3	-	-	-	-	134.7
C4-Benzo[a]anthracenes/Chrysenes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C4-Dibenzothiophenes	33.4	45.7	-	-	50.1	48.9	53.9	-	-	45.1	31.3	88.0	-	23.2	-	-	28.6	-	39.8	-	141.4
C4-Fluoranthenes/Pyrenes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45.8	-	-	31.9	58.8	-	140.2
C4-Naphthalenes	-	26.8	66.1	52.6	48.5	-	59.8	-	-	-	60.5	35.5	46.9	25.9	22.8	61.5	31.1	59.6	-	-	141.5
C4-Phenanthrenes/Anthracenes	-	21.2	-	-	71.2	29.9	82.6	-	25.2	50.0	-	54.7	-	-	27.2	22.7	-	36.0	-	-	144.3
Chrysene	-	-	23.3	-	-	22.0	56.6	21.0	-	38.5	-	-	-	-	31.2	-	-	21.2	-	-	86.1
Dibenz[a,h]anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	618.4
Dibenzothiophene	-	-	-	-	-	-	72.5	-	-	-	-	-	-	-	-	-	-	-	-	-	31.9
Fluoranthene	26.8	-	-	-	27.4	28.4	38.5	27.4	-	21.9	-	-	-	-	34.7	42.9	-	-	-	-	24.2
Fluorene	-	-	-	-	51.9	-	-	-	-	25.3	-	-	33.2	32.8	-	-	-	-	-	-	22.9
Indeno[1,2,3-cd]pyrene	-	-	-	-	-	20.1	-	-	-	22.6	22.5	-	-	-	57.7	-	-	-	-	26.7	66.0
Naphthalene	-	-	-	-	21.6	-	-	55.6	34.5	-	37.7	-	-	53.3	33.9	25.3	-	41.4	-	-	19.5
Perylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.6	-	-	23.5	-	-	35.3
Phenanthrene	-	-	-	-	47.5	28.4	43.9	-	-	-	-	-	-	-	-	20.7	-	-	-	-	49.8
Pyrene	-	-	-	-	46.4	-	42.2	-	27.2	35.2	-	-	-	27.9	26.4	26.7	-	-	-	-	34.6
Retene	-	-	-	-	-	-	48.4	54.5	97.7	-	-	-	-	-	51.4	-	-	-	-	-	81.4
% variables >20% RPD	3	0	8	3	16	14	29	10	9	17	16	26	6	21	13	4	9	12	10	27	6

Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
Analytes differ by > 20% between duplicates and both concentrations are > 5 times the detection limit.

Table B.2-7 Observations exceeding 20% relative percent difference (RPD) in monthly duplicate water quality samples collected by AEMERA, 2015 WY.

Variables	May #1 (MU1)	May #2 (MU1)	July (ST1)	Aug (MA1)	Sept (MU1)	Oct (ELLS RIFF 3)
Conventional Variables						
Alkalinity (Total as CaCO ₃)	-	-	-	-	-	-
Conductivity	-	-	-	-	-	-
Dissolved Organic Carbon	-	-	-	-	-	-
Hardness (as CaCO ₃)	-	-	-	-	-	-
pH	-	-	-	-	-	-
Total Dissolved Solids	-	-	21	-	-	-
Total Organic Carbon	-	-	-	-	-	-
Total Suspended Solids	-	-	133	-	144	70
True Colour	-	-	-	-	-	-
Turbidity	-	-	-	-	-	-
Major Ions						
Bicarbonate	-	-	-	-	-	-
Carbonate	-	-	-	-	-	-
Chloride	-	-	-	-	-	-
Calcium	-	-	-	-	-	-
Magnesium	-	-	-	-	-	-
Potassium	-	-	-	-	-	-
Sodium	-	-	-	-	-	-
Sulfate	-	114	-	-	-	-
Fluoride	-	-	-	-	-	-
Hydroxide	-	-	-	-	-	-
Sulphide	-	-	-	56	-	-
Nutrients and BOD						
Total Ammonia (as N)	-	-	-	-	-	-
Nitrate (as N)	-	-	-	-	-	-
Nitrite (as N)	-	-	-	-	-	-
Nitrate plus Nitrite (as N)	-	-	-	-	-	-
Total Kjeldahl Nitrogen	-	-	-	-	-	-
Total Nitrogen	-	-	-	-	-	-
Orthophosphate	-	-	-	-	-	-
Dissolved Phosphorus	-	-	-	-	-	-
Total Phosphorus	-	-	-	-	-	-
Biochemical Oxygen Demand	-	-	-	-	-	-
Chlorophyll <i>a</i>	-	-	-	-	-	-
Dissolved Metals						
Aluminum	-	-	-	-	-	-
Antimony	-	-	-	-	24	-
Arsenic	-	-	-	-	-	-
Barium	-	-	-	-	-	-
Beryllium	-	-	-	-	-	-
Bismuth	-	-	-	55	-	-
Boron	-	-	-	-	-	-

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and both concentrations are > 5 times the detection limit.

Table B.2-7 (Cont'd.)

Variables	May #1 (MU1)	May #2 (MU1)	July (ST1)	Aug (MA1)	Sept (MU1)	Oct (ELLS RIFF 3)
Dissolved Metals (Cont'd.)						
Cadmium	-	-	-	22	-	-
Calcium	-	-	-	-	-	-
Chlorine	-	-	-	-	-	-
Chromium	-	-	-	29	-	40
Cobalt	-	-	-	-	-	-
Copper	21	-	23	28	70	-
Mercury	-	-	-	-	46	-
Methyl Mercury	-	-	-	-	-	-
Iron	-	-	-	-	-	-
Lead	30	-	-	-	40	41
Lithium	-	-	-	-	-	-
Manganese	26	-	-	-	-	-
Molybdenum	-	-	-	-	-	-
Nickel	-	-	-	-	-	-
Selenium	-	-	-	-	-	29
Silver	-	67	40	-	-	-
Strontium	-	-	-	-	-	-
Thallium	43	29	-	92	-	27
Thorium	64	-	-	-	-	41
Tin	43	21	-	-	-	30
Titanium	-	-	-	-	-	30
Uranium	-	-	-	-	-	-
Vanadium	-	-	-	-	-	-
Zinc	-	60	-	63	-	24
Total Metals						
Aluminum	-	-	-	-	-	-
Antimony	-	-	-	-	24	-
Arsenic	-	-	-	-	-	-
Barium	-	-	-	-	-	-
Beryllium	-	-	37	-	-	-
Bismuth	108	-	-	55	-	-
Boron	-	-	-	-	-	-
Cadmium	-	-	-	33	-	-
Calcium	-	-	-	-	-	-
Chlorine	-	-	-	-	-	-
Chromium	-	-	-	-	-	43
Cobalt	-	-	-	-	-	-
Copper	33	23	-	-	91	65
Iron	-	-	-	-	-	-
Lead	50	-	-	-	33	-
Lithium	-	-	-	-	-	-
Manganese	-	-	-	-	-	-
Mercury	-	-	-	-	31	-

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and both concentrations are > 5 times the detection limit.

Table B.2-7 (Cont'd.)

Variables	May #1 (MU1)	May #2 (MU1)	July (ST1)	Aug (MA1)	Sept (MU1)	Oct (ELLS RIFF 3)
Total Metals (Cont'd.)						
Methyl Mercury	-	-	-	-	-	-
Molybdenum	-	-	-	-	-	-
Nickel	-	21	-	-	39	-
Selenium	-	-	40	52	-	40
Silver	-	-	-	29	-	-
Strontium	-	-	-	-	-	-
Thallium	-	-	29	25	-	32
Thorium	63	-	-	-	-	33
Tin	127	70	27	-	-	40
Titanium	-	-	-	-	-	38
Uranium	-	-	-	-	-	-
Vanadium	-	-	-	-	-	-
Zinc	-	37	-	-	-	96
General Organics						
F1 Benzene	-	-	-	-	-	-
F1 Ethylbenzene	-	-	-	-	-	-
F1 BTEX	-	-	-	-	-	-
F1 m,p-xylene	-	-	-	-	-	-
F1 o-Xylene	-	-	-	-	-	-
F1 Toluene	-	-	-	-	-	-
F1 Hydrocarbons (C6-C10)	-	-	-	-	-	-
F2 Hydrocarbons(C10-C16)	-	-	-	-	-	-
F3 Hydrocarbons(C16-C34)	-	-	-	-	-	-
F4 Hydrocarbons(C34-C50)	-	-	-	-	-	-
Naphthenic Acids	-	33	-	-	-	41
Oilsands Acid Extractable	-	29	-	-	-	40
Phenols	-	-	-	-	-	22
PAHs						
Acenaphthene	-	-	-	-	-	-
Acenaphthylene	-	-	27	-	-	-
Anthracene	-	-	-	-	-	-
Benz[a]anthracene	-	-	-	-	-	-
Benzo(b,j,k)fluoranthene	-	-	-	-	-	-
Benzo[a]pyrene	-	-	-	-	-	-
Benzo[b]fluoranthene	-	-	-	-	-	-
Benzo[e]pyrene	-	-	-	-	-	-
Benzo[ghi]perylene	-	-	-	-	-	-
Benzo[j,k]fluoranthenes	-	-	-	-	-	-
Biphenyl	-	-	-	32	-	-
C1 Phenanthrenes/Anthracenes	-	-	131	33	-	-
C1-Acenaphthenes	-	-	-	-	-	-
C1-Benzo[a]anthracenes/Chrysenes	-	-	-	-	-	-
C1-Benzofluoranthenes/Benzopyrenes	-	-	-	-	-	-

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and both concentrations are > 5 times the detection limit.

Table B.2-7 (Cont'd.)

Variables	May #1 (MU1)	May #2 (MU1)	July (ST1)	Aug (MA1)	Sept (MU1)	Oct (ELLS RIFF 3)
PAHs (Cont'd.)						
C1-Biphenyls	-	-	28	35	65	-
C1-Dibenzothiophenes	-	-	-	-	-	-
C1-Fluoranthenes/Pyrenes	-	-	-	-	-	-
C1-Fluorenes	-	-	-	-	-	-
C1-Naphthalenes	-	-	-	-	42	-
C2 Phenanthrenes/Anthracenes	-	-	-	-	-	-
C2-Benzo[a]anthracenes/Chrysenes	-	-	-	-	-	-
C2-Benzofluoranthenes/Benzopyrenes	-	-	-	-	-	-
C2-Biphenyls	-	-	26	61	-	-
C2-Dibenzothiophenes	-	-	-	-	-	-
C2-Fluoranthenes/Pyrenes	-	-	-	-	-	-
C2-Fluorenes	-	-	-	-	21	-
C2-Naphthalenes	-	-	-	21	-	-
C3-Benzo[a]anthracenes/Chrysenes	-	-	-	-	-	-
C3-Dibenzothiophenes	-	-	-	-	-	-
C3-Fluoranthenes/Pyrenes	-	-	22	-	-	-
C3-Fluorenes	-	-	-	-	27	-
C3-Naphthalenes	-	-	-	-	51	-
C3-Phenanthrenes/Anthracenes	-	-	-	-	-	-
C4-Benzo[a]anthracenes/Chrysenes	-	-	-	-	-	-
C4-Dibenzothiophenes	-	-	-	-	-	-
C4-Fluoranthenes/Pyrenes	-	-	-	-	-	-
C4-Naphthalenes	-	-	-	41	68	-
C4-Phenanthrenes/Anthracenes	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-
Dibenz[a,h]anthracene	-	-	25	-	-	-
Dibenzothiophene	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-
Fluorene	-	-	-	37	-	-
Indeno[1,2,3-cd]pyrene	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-
Perylene	-	-	-	-	-	-
Phenanthrene	-	-	-	-	-	-
Pyrene	-	-	-	-	-	-
Retene	-	-	68	28	-	-
% variables >20% RPD	9	8	14	15	14	14

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and both concentrations are > 5 times the detection limit.

B.2.3 Benthic Invertebrate Communities Component

B.2.3.1 Quality Control Activities – Field

Field methods used for benthic invertebrate collection followed accepted methods for environmental effects monitoring (Anderson 1990, Environment Canada 2012). Instruments used for measuring supporting variables (e.g., temperature, dissolved oxygen, conductivity, pH, water velocity, and depth) were calibrated according to manufacturer instructions (generally daily for water quality meters).

B.2.3.2 Quality Control Activities – Laboratory

Taxonomic samples were sorted and identified by Dr. Jack Zloty of Summerland, BC, who has analyzed benthic invertebrate samples on behalf of RAMP and now under the JOSMP consistently since RAMP began. Laboratory methods used by Dr. Zloty in 2015 included re-sorting 5% of samples as a confirmation of the overall sorting efficiency of all samples. In 2015, a total of 41 samples were re-sorted. Sorted portions were verified by an independent analyst. As a result of large volumes of organic material and low abundance in some samples collected from depositional reaches, a minimum removal efficiency of 90% was considered acceptable (as for previous RAMP studies). This objective is considered acceptable by Environment Canada under current Environmental Effects Monitoring (EEM) strategies (Environment Canada 2012). Sorting efficiency was calculated based on the following formula:

$$\text{sorting efficiency} = \left(1 - \frac{A}{A+B}\right) * 100$$

Where,

A is the number of animals found in the re-sorted sample; and

B is the number of animals found in the original sorting of that sample

Cordillera Consulting Inc. of Summerland, BC, received 10% of the sorted benthos samples for taxonomic verification and quality control (see Attachment 1). Cordillera followed the quality control procedures outlined by the Society for Freshwater Science (SFS 2015), which involves a complete re-identification and re-enumeration of samples. A total of 41 samples were audited in 2015. Errors relating to misidentification, enumeration, and resolution were recorded during the audit. The errors were used to calculate three measures of accuracy: (1) percent total identification error rate (% error), (2) percent difference in enumeration (PDE), and (3) percent taxonomic disagreement (PTD).

$$[1] \text{ \% error} = \frac{\text{sum of incorrect identifications}}{\text{total organisms counted in audit}} * 100$$

$$[2] \text{ PDE} = 100 * \frac{|n_1 - n_2|}{n_1 + n_2}$$

Where, n_1 is the enumeration rate by the original taxonomist and n_2 is the enumeration rate by the auditing taxonomist.

$$[3] \text{ PTD} = \left(1 - \frac{a}{N}\right) * 100$$

Where, a is the sum of enumeration errors and N is the sum of misidentification errors for a sample.

The data quality objectives were:

- % misidentification error \leq 5%;
- PDE \leq 5%; and
- PTD \leq 15%.

B.2.3.3 Quality Control Activities – Results

All resorted samples passed the sorting-efficiency check. Invertebrate sorting efficiency was always $>95\%$, with a mean of 98% (Table B.2-8); therefore, the data quality objective of 90% sorting efficiency was achieved.

The data quality objectives for percent error (1.2%), PDE (0.7%) and PTD (4.4%; Table B.2-9) were met on average. Three of the 41 samples failed to meet one of the three data quality objectives related to taxonomic accuracy. The report by Cordillera Consulting concluded that there was acceptable alignment of taxonomic identification between the original (Zloty) and the Cordillera audit (see attached report, Cordillera Consulting 2015).

There was an 8.7% misidentification error rate for sample GRL-1-9, which was related principally to Jack Zloty counting amphipods as *Hyalella azteca*, and Cordillera counting amphipods as *Hyalella* spp. Cordillera also identified six Pisidiidae as Pisidium. Cordillera and Zloty disagreed on the genus of Ceratopogonidae, which Cordillera confirmed was somewhat subjective. Cordillera found individuals of the chironomids *Paralouterborniella*, *Polypedilum* and *Potthastia longimana*, which Zloty did not find.

Sample ISL-1-9 had 13.9% misidentification error rate, and a PTD of 19%. All of the disagreements occurred in animals from the coarse materials. Zloty had identified chironomids as *Chironomus*, *Einfeldia* and *Tanytarsus*; what Zloty had identified as *Einfeldia* were identified by Cordillera as *Chironomus*. The two genera are highly similar morphologically.

Samples CLR-D2-3 had 5.5% PDE and 18% PTD. The differences were related to treatment of Pisidium and Sphaerium. Zloty classified several as “Pisidium/Sphaerium” (i.e., two genera from the same family, essentially elevating the counts to family level), whereas Cordillera treated many of those difficult individuals as Pisidiidae (i.e., elevated to the family).

For samples that failed a component of the QA/QC audit, the changes in taxonomy (assuming the changes are correct) would have resulted in the following:

- GRL-1: no difference in abundance, but an increase in richness from 30 to 33 (10% change);
- ISL-1: an increase in abundance from 35 to 36 (3% change) and a decrease in richness from 9 to 8 (11% change); and
- CLR-D2: an increased in abundance from 121 to 135 (12% change) and an increase in richness from 18 to 21 (17% change).

These differences in richness are well within the range of values typically observed among replicates within a reach. The effect of taxonomic errors in the three samples that ‘failed’ QA/QC is therefore within the background noise.

Table B.2-8 Results of quality control checks on sorting efficiency of benthic invertebrate samples, 2015.

Replicate Samples	% Sorting efficiency
GIC-1 #5	$[1-(17/(843+17))] * 100 = 98.0$
EMR-2 #2	$[1-(6/(335+3))] * 100 = 97.7$
GRL-1 #7	$[1-(7/(324+7))] * 100 = 97.9$
GAL-1 #3	$[1-(8/(417+8))] * 100 = 98.1$
NAL-1 #6	$[1-(9/(264+9))] * 100 = 96.7$
JOL-1 #10	$[1-(18/(943+18))] * 100 = 98.4$
ISL-1 #1	$[1-(1/(45+1))] * 100 = 97.8$
SHL-1 #3	$[1-(45/(1722+45))] * 100 = 97.5$
CHL-1 #10	$[1-(6/(340+6))] * 100 = 98.3$
MCL-1 #5	$[1-(18/(871+18))] * 100 = 98.0$
KEL-1 #7	$[1-(25/(797+25))] * 100 = 97.0$
CAR-D2 #8	$[1-(40/(1248+40))] * 100 = 96.9$
BRC-D1 #4	$[1-(17/(553+17))] * 100 = 97.0$
CLR-D1 #3	$[1-(1/(93+1))] * 100 = 98.9$
CLR-D2 #2	$[1-(5/(254+5))] * 100 = 98.1$
ELR-D1 #4	$[1-(0/(33+0))] * 100 = 100$
FOC-D1 #1	$[1-(0/(18+0))] * 100 = 100$
FIR-D1 #5	$[1-(0/(11+0))] * 100 = 100$
BER-D2 #3	$[1-(5/(194+5))] * 100 = 97.5$
POC-D1 #5	$[1-(8/(374+8))] * 100 = 99.7$
CHR-D3 #3	$[1-(2/(72+2))] * 100 = 97.3$
CHR-D1 #1	$[1-(25/(1099+25))] * 100 = 97.8$
CHR-D2 #9	$[1-(2/(106+2))] * 100 = 98.2$
CHR-D4 #3	$[1-(37/(1426+37))] * 100 = 97.5$
SAC-D1 #2	$[1-(35/(969+35))] * 100 = 96.5$
SUC-D1 #5	$[1-(7/(191+7))] * 100 = 96.5$
SUC-D2 #10	$[1-(2/(147+2))] * 100 = 98.7$
UNC-D2 #10	$[1-(26/(896+26))] * 100 = 97.2$
CAR-D1 #2	$[1-(5/(243+5))] * 100 = 98.0$
UNC-D3 #4	$[1-(36/(795+36))] * 100 = 95.7$
JAC-D1 #6	$[1-(1/(71+1))] * 100 = 98.6$
JAC-D2 #5	$[1-(0/(12+0))] * 100 = 100$
MUR-D2 #2	$[1-(25/(999+25))] * 100 = 97.6$
MUR-D3 #2	$[1-(12/(755+12))] * 100 = 98.4$
BIC-D1 #1	$[1-(0/(32+0))] * 100 = 100$
EYV-D1 #3	$[1-(0/(39+0))] * 100 = 100$
PIR-D1 #4	$[1-(6/(197+6))] * 100 = 97.0$
TAR-D1 #6	$[1-(0/(63+6))] * 100 = 100$
GRR-E1 #3	$[1-(16/(450+16))] * 100 = 96.6$
HRR-E1 #3	$[1-(17/(362+17))] * 100 = 95.5$
TAR-E2 #3	$[1-(11/(345+11))] * 100 = 96.9$

Note: Mean efficiency – 98%; 41 samples - ~5% of all samples.

Table B.2-9 Results of the audit checks on sorting and identification accuracy of benthic invertebrate samples, 2015.

Reach	Replicate	% Error	PDE	PTD
GRL-1	9	8.7	0	11
GAL-1	10	4.3	1.7	9
NAL-1	4	1.4	0.5	4
JOL-1	7	0	3.2	6
ISL-1	9	13.9	1.4	19
SHL-1	4	0	0.5	7
CHL-1	3	0	0.5	2
MCL-1	3	0.9	1.3	5
KEL-1	5	2.2	0.4	5
FLC-1	2	0	0	4
EMR-2	2	0.6	0	6
CAR-D2	10	0	0.3	2
BCR-D1	6	0	0	0
CLR-D1	8	0	2.3	4
CLR-D2	3	0	5.5	18
ELR-D1	6	0	0	0
FIR-D1	5	0	0	0
BER-D2	9	1.7	0.4	5
POC-D1	4	0	0	0
CHR-D3	5	0	0.48	1
CHR-D1	3	0	0.9	2
CHR-D2	8	0	2.4	5
CHR-D4	4	0	1.7	5
SAC-D1	9	0.9	0	12
SUC-D1	5	0	0	2
SUC-D2	6	3.2	0.8	5
UNC-D2	4	3.3	0	5
CAR-D1	7	0	0.7	4
UNC-D3	7	0	0	0
JAC-D1	5	2.9	0.5	8
JAC-D2	1	1.4	0.3	3
MUR-D2	1	1.4	0	7
MUR-D3	1	1.2	0.3	3
BIC-D1	5	0	0	2
EYC-D1	3	0	0	0
PIR-D1	7	1	1	6
TAR-D1	4	0	0	0
TAR-D1	8	0	0.8	2
HHR-E1	1	0	0	0
JAR-E1	1	0	0	0
JAR-E1	2	0	0	0
Average		1.2	0.7	4.4

PDE = percent difference in enumeration; PTD = percent taxonomic disagreement

Bold samples are those which failed to meet acceptable limits.

Note: Accuracies above their limit are shaded (i.e. % error < 5%; PDE ≤ 5; PTD ≤ 15).

Table B.2-10 Changes in measurement endpoints of benthic invertebrate communities based on the results of the audit, 2015.

Reach	Replicate	Abundance		Richness	
		Difference	% Change	Difference	% Change
GRL-1	9	0	0.0	3	10.0
GAL-1	10	-10	-3.4	-1	-3.1
NAL-1	4	-2	-0.9	-1	-5.0
JOL-1	7	-4	-6.3	-1	-4.8
ISL-1	9	1	2.9	-1	-11.1
SHL-1	4	-1	-1.0	-1	-5.9
CHL-1	3	-1	-1.0	-2	-8.7
MCL-1	3	-3	-2.7	-1	-4.5
KEL-1	5	-3	-0.8	2	5.3
FLC-1	2	0	0.0	0	0.0
EMR-2	2	0	0.0	2	14.3
CAR-D2	10	-1	-0.6	1	4.5
BCR-D1	6	0	0.0	0	0.0
CLR-D1	8	2	4.7	2	100.0
CLR-D2	3	14	11.6	3	16.7
ELR-D1	6	0	0.0	0	0.0
FIR-D1	5	0	0.0	0	0.0
BER-D2	9	-1	-0.8	0	0.0
POC-D1	4	0	0.0	0	0.0
CHR-D3	5	-2	-1.0	0	0.0
CHR-D1	3	-4	-1.8	0	0.0
CHR-D2	8	1	5.0	0	0.0
CHR-D4	4	-6	-3.4	-2	-9.5
SAC-D1	9	0	0.0	-1	-3.4
SUC-D1	5	0	0.0	-1	-4.2
SUC-D2	6	2	1.6	0	0.0
UNC-D2	4	0	0.0	0	0.0
CAR-D1	7	-1	-1.3	-2	-11.1
UNC-D3	7	0	0.0	0	0.0
JAC-D1	5	-3	-1.1	0	0.0
JAC-D2	1	1	0.7	0	0.0
MUR-D2	1	0	0.0	3	10.3
MUR-D3	1	-1	-0.6	-1	-5.3
BIC-D1	5	0	0.0	0	0.0
EYC-D1	3	0	0.0	0	0.0
PIR-D1	7	-1	-1.1	0	0.0
TAR-D1	4	0	0.0	0	0.0
TAR-D1	8	-3	-1.6	0	0.0
HHR-E1	1	0	0.0	0	0.0
JAR-E1	1	1	2.4	1	2.4
JAR-E1	2	0	0.0	0	0.0

Bold samples are those which failed to meet acceptable limits.

Note: Negative changes represent greater values of measurement endpoints by T1.

B.2.3.4 Quality Control Activities – Data Analysis

Data were received in electronic format (Microsoft Excel®) from the taxonomists. All data were checked upon data entry for transcription errors or other inconsistencies. Data analysis was conducted iteratively, using duplicate data files for processing. Original data were retained in back-up files. Printed output from statistical analyses was retained in project files in the event that analyses may be reviewed and reproduced if needed. Data analyses and reporting were reviewed by a senior ecologist that had previous experience in the analysis of the JOSMP benthos data. The results were also reviewed by two principal ecologists, again both experienced with the JOSMP benthos data.

B.2.4 Sediment Quality Component

The sediment quality QA/QC program was conducted to assess potential sample contamination during collection and analysis, the precision and accuracy of chemical and toxicological analyses, and environmental heterogeneity.

B.2.4.1 Methods

The following field procedures were used to prevent sample contamination:

- at a given station before sampling, equipment was washed with Alconox® metals-free soap and rinsed with ambient site water, rinsed with hexane then acetone, and triple-rinsed with ambient water prior to sample collection;
- sample grabs were kept only if they contained no large foreign objects, obtained adequate sediment penetration depth, and were not overfilled or leaking; and
- technicians wore powder-free nitrile gloves during equipment washing and sampling.

Split samples (in which a single, large sample was subsampled) and duplicate samples (in which two unique samples were taken from the same location) were collected in fall 2015 from lower Ells River (station ELR-D1) and Sunday Creek (station SUC-D2). SPL-1-1 and DUP-1-1 were split and duplicate samples, respectively, taken from station ELR-D1, while SPL-2-1 and DUP-2-1 were split and duplicate samples, respectively, taken from station SUC-D2.

Duplicate samples were taken to assess environmental heterogeneity. The relative percent difference (RPD, difference between data values/average of data values, multiplied by 100%) in the results obtained for the split and duplicate samples was calculated. Analytes for which the relative percent difference between the duplicate or split sample and the station sample exceeded 20% (with concentrations greater than five times the detection limit in both samples) were considered to exhibit high environmental variability or potentially unacceptable levels of imprecision.

In addition, a sampling-equipment rinsate blank was collected at two sampling locations in fall 2015. Sampling equipment (i.e., Ekman dredge, stainless-steel tray, and spoons) was washed with Alconox® soap, ambient water, hexane, acetone, and deionized water as per the standard operating procedures. The rinsate sample was then collected by washing down the dredge with deionized water, which was collected into the tray (containing spoons) and decanted into sample analysis bottles. PAHs were analyzed in the rinsates (at ng/L) by AXYS Analytical Services (the same laboratory that analyzed PAHs in sediments), while metals were analyzed in this rinsate (at mg/L) by AITF in Edmonton, Alberta.

Concentrations of metals in sediments were compared against five times their analytical detection limit and PAHs were assessed against five times the laboratory blank concentration, to assess potential sample contamination related to equipment.

B.2.4.2 Results and Discussion

Duplicate Samples

Concentrations of several PAHs differed by greater than 20% between duplicate samples collected at stations ELR-D1 and SUC-D2 but none were greater than five times the detection limit. Concentrations of most organic compounds, excluding PAHs, were within 20% of each duplicate sample collected at station ELR-D1; Fraction 2, 3, 4, and total hydrocarbons exceeded this criterion at station ELR-D1 (Table B.2-11). Concentrations of all organic compounds, excluding PAHs, were within 20% of each duplicate sample collected at station SUC-D2 (Table B.2-12).

Concentrations of several metals measured in duplicate sediments differed by greater than 20% between duplicate samples and were greater than five times the detection limit at stations ELR-D1 and SUC-D2 (Table B.2-11 and Table B.2-12). The reason for the large discrepancies in concentrations of metals between duplicate samples was unknown, and was unexpected given the similarity in concentrations of other analytes, and the consistency in results observed in previous years.

Split Samples

Concentrations of most PAHs differed by greater than 20% between split samples ELR-D1 and SPL-1-1, but none of these were greater than five times detection limit. Concentrations of some PAHs differed by greater than 20% between split samples SUC-D2 and SPL-2-1. Most total metal concentrations in split sample SPL-1-1 differed by greater than 20% from ELR-D1, with many greater than five times the detection limit. A number of total metal concentrations in split sample SPL-2-1 differed by greater than 20% from SUC-D2, with approximately half of those being greater than five times the detection limit. With the exception of F2, F3, F4, and total hydrocarbons, no hydrocarbons differed in concentration by more than 20% between split samples SPL-1-1 and ELR-D1. No hydrocarbons differed in concentration by more than 20% between split samples SPL-2-1 and SUC-D2 (Table B.2-11 and Table B.2-12).

Results between split samples generally exhibited higher RPDs than those between duplicate samples, contrary to what would be expected given duplicates capture both analytical and environmental variability and splits are meant to capture primarily analytical variability. The higher RPDs between splits suggests that within-sample heterogeneity may have been greater in sediments from stations from which splits were taken than in sediments from stations from which duplicates were taken.

Rinsate Samples

Concentrations of some metals (total and dissolved) were more than five times the analytical detection limit in rinsate samples collected in fall 2015. Most metals that had concentrations that exceeded five times the analytical detection limit in rinsate samples were similar between the two rinsate samples, such as total and dissolved aluminum, total and dissolved barium, and total and dissolved boron (Table B.2-13).

PAHs detected in both rinsate samples (RIN-1 and RIN-2) collected in September 2015 were all reported at less than five times the detection limits (Table B.2-14).

B.2.4.3 Conclusions

Results of QA/QC of sediment samples collected for the JOSMP in 2015 generally indicated high variability in PAHs and metals among both duplicate and split samples.

Results of rinsate (equipment blank) samples in 2015 were consistent with those collected in previous years, showing no PAHs concentrations greater than five times the detection limit. Results of the rinsate analyses suggested that rinsing of sampling equipment with deionized water and/or solvent, or scrubbing with Alconox[®] may have been insufficient to remove all traces of ambient water and particulates prior to collecting the rinsate sample; however, rinsate concentrations were generally very low relative to concentrations measured in sediment (e.g., for PAHs, parts per trillion in rinsate versus parts per million in sediment) and so were unlikely to substantially affect measured concentrations in sediment. Regardless, clean technique remains critical in sampling of sediments, particularly for strongly hydrophobic variables like many PAHs.

Table B.2-11 Relative percent difference between duplicate and split sediment quality samples, Eils River (ELR-D1), September 2015.

Analyte	Laboratory	Unit	DL	Station ELR-D1	Split SPL-1-1	Duplicate DUP-1-1	RPD ¹ from ELR-D1	
							Split SPL-1-1	Duplicate DUP-1-1
Organic Compounds								
Benzene	ALS	mg/kg	0.005	<0.005	<0.005	<0.005	-	-
CCME Fraction 1 (BTEX)	ALS	mg/kg	10	<10	<10	<10	-	-
CCME Fraction 1 (C6-C10)	ALS	mg/kg	10	<10	<10	<10	-	-
CCME Fraction 2 (C10-C16)	ALS	mg/kg	80	243	365	223	40.1	48.3
CCME Fraction 3 (C16-C34)	ALS	mg/kg	80	2320	3540	2110	41.6	50.6
CCME Fraction 4 (C34-C50)	ALS	mg/kg	80	1540	2180	1310	34.4	49.9
Total Hydrocarbons (C6-C50)	ALS	mg/kg	80	4100	6090	3640	39.1	50.4
Ethylbenzene	ALS	mg/kg	0.015	<0.015	<0.015	<0.015	-	-
m+p-Xylene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	-	-
o-Xylene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	-	-
Toluene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	-	-
Xylenes	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	-	-
PAHs								
Acenaphthene	AXYS	mg/kg	-	0.00291	0.00231	0.00276	23.0	5.3
Acenaphthylene	AXYS	mg/kg	-	<0.000143	<0.000258	<0.000295	-	-
Anthracene	AXYS	mg/kg	-	<0.0016	<0.006940	<0.001740	-	-
Benz[a]anthracene	AXYS	mg/kg	-	0.00468	<0.012400	0.00716	-	41.9
Benzo[a]pyrene	AXYS	mg/kg	-	0.0157	0.0223	0.0260	34.7	49.4
Benzo[b,j,k]fluoranthene	AXYS	mg/kg	-	0.0436	0.0617	0.0616	34.5	34.3
Benzo[g,h,i]perylene	AXYS	mg/kg	-	0.0331	0.0488	0.052	38.3	44.4
Biphenyl	AXYS	mg/kg	-	0.00189	0.000802	0.000702	80.8	91.7
C1-Acenaphthenes	AXYS	mg/kg	-	0.000792	<0.001210	0.000884	-	11.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.427	0.564	0.747	27.6	54.5

Analytes differ by > 20% between duplicates but one or both concentrations are < 5 times the detection limit.

Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

¹ Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit. Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent differences is valid only for analytical values that are at least five times the detection limit.

Table B.2-11 (Cont'd.)

Analyte	Laboratory	Unit	DL	Station ELR-D1	Split SPL-1-1	Duplicate DUP-1-1	RPD ¹ from ELR-D1	
							Split SPL-1-1	Duplicate DUP-1-1
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	0.301	0.493	0.5	48.4	49.7
C1-Biphenyls	AXYS	mg/kg	-	0.0022	0.00078	0.000966	95.3	78.0
C1-Dibenzothiophenes	AXYS	mg/kg	-	0.0698	0.0751	0.039	7.3	56.6
C1-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.576	0.659	0.875	13.4	41.2
C1-Fluorenes	AXYS	mg/kg	-	0.0291	0.0169	0.0259	53.0	11.6
C1-Naphthalenes	AXYS	mg/kg	-	0.00717	0.00435	0.00392	49.0	58.6
C1-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.0618	0.0928	0.101	40.1	48.2
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.706	0.254	1.21	94.2	52.6
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	0.194	1.04	0.324	137.1	50.2
C2-Biphenyls	AXYS	mg/kg	-	0.00424	0.26	0.00324	193.6	26.7
C2-Dibenzothiophenes	AXYS	mg/kg	-	0.541	0.00407	0.982	197.0	57.9
C2-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	1.16	0.733	2.03	45.1	54.5
C2-Fluorenes	AXYS	mg/kg	-	0.0954	1.44	0.136	175.1	35.1
C2-Naphthalenes	AXYS	mg/kg	-	0.0457	0.0918	0.0272	67.1	50.8
C2-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.172	0.021	0.283	156.5	48.8
C3-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.281	0.28	0.547	0.4	64.3
C3-Dibenzothiophenes	AXYS	mg/kg	-	1.72	2.78	3.11	47.1	57.6
C3-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.975	0.87	1.79	11.4	59.0
C3-Fluorenes	AXYS	mg/kg	-	0.258	0.241	0.396	6.8	42.2
C3-Naphthalenes	AXYS	mg/kg	-	0.105	0.0779	0.107	29.6	1.9
C3-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.641	0.779	1.05	19.4	48.4
C4-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.0953	0.0674	0.188	34.3	65.4
C4-Dibenzothiophenes	AXYS	mg/kg	-	2.48	2.52	4.1	1.6	49.2
C4-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.629	0.637	0.992	1.3	44.8
C4-Naphthalenes	AXYS	mg/kg	-	0.126	0.159	0.199	23.2	44.9
C4-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	2.38	2.36	3.74	0.8	44.4

Analytes differ by > 20% between duplicates but one or both concentrations are < 5 times the detection limit.

Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

¹ Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit. Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent differences is valid only for analytical values that are at least five times the detection limit.

Table B.2-11 (Cont'd.)

Analyte	Laboratory	Unit	DL	Station ELR-D1	Split SPL-1-1	Duplicate DUP-1-1	RPD ¹ from ELR-D1	
							Split SPL-1-1	Duplicate DUP-1-1
Chrysene	AXYS	mg/kg	-	0.151	0.204	0.215	29.9	35.0
Dibenz[a,h]anthracene	AXYS	mg/kg	-	0.00901	<0.01630	0.01310	-	37.0
Dibenzothiophene	AXYS	mg/kg	-	0.00971	0.00513	0.00707	61.7	31.5
Fluoranthene	AXYS	mg/kg	-	0.00466	0.007	0.00785	40.1	51.0
Fluorene	AXYS	mg/kg	-	0.00357	0.001790	0.00212	66.4	51.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/kg	-	0.0155	0.0231	0.0229	39.4	38.5
Naphthalene	AXYS	mg/kg	-	0.00101	0.00109	0.00103	7.6	2.0
Perylene	AXYS	mg/kg	-	0.0641	0.0892	0.115	32.7	56.8
Phenanthrene	AXYS	mg/kg	-	0.031	0.0238	0.027	26.3	13.8
Pyrene	AXYS	mg/kg	-	0.04	0.0488	0.057	19.8	35.1
Retene	AXYS	mg/kg	-	0.103	0.156	0.202	40.9	64.9
Total Metals								
Total Aluminum (Al)	ALS	mg/kg	50	725	931	1140	24.9	44.5
Total Antimony (Sb)	ALS	mg/kg	0.1	<0.1	<0.1	0.1	-	-
Total Arsenic (As)	ALS	mg/kg	0.1	3.81	6.08	7.08	45.9	60.1
Total Barium (Ba)	ALS	mg/kg	0.5	22.8	31.3	34.9	31.4	41.9
Total Beryllium (Be)	ALS	mg/kg	0.1	<0.1	<0.1	0.19	-	-
Total Bismuth (Bi)	ALS	mg/kg	0.2	<0.2	<0.2	<0.2	-	-
Total Boron (B)	ALS	mg/kg	5	<5.0	<5.0	<5.0	-	-
Total Cadmium (Cd)	ALS	mg/kg	0.02	0.02	0.03	0.045	36.7	76.9
Total Calcium (Ca)	ALS	mg/kg	50	1070	1570	1630	37.9	41.5
Total Chromium (Cr)	ALS	mg/kg	0.5	1.8	2.7	3.20	40.0	56.0
Total Cobalt (Co)	ALS	mg/kg	0.1	2.14	3.24	3.61	40.9	51.1
Total Copper (Cu)	ALS	mg/kg	0.5	1.24	2.07	2.40	50.2	63.7
Total Iron (Fe)	ALS	mg/kg	50	6020	9620	10700	46.0	56.0

Analytes differ by > 20% between duplicates but one or both concentrations are < 5 times the detection limit.

Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

¹ Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit. Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent differences is valid only for analytical values that are at least five times the detection limit.

Table B.2-11 (Cont'd.)

Analyte	Laboratory	Unit	DL	Station ELR-D1	Split SPL-1-1	Duplicate DUP-1-1	RPD ¹ from ELR-D1	
							Split SPL-1-1	Duplicate DUP-1-1
Total Lead (Pb)	ALS	mg/kg	0.5	1.52	2.18	2.76	35.7	57.9
Total Lithium (Li)	ALS	mg/kg	2	<2	<2	2.00	-	-
Total Magnesium (Mg)	ALS	mg/kg	20	513	701	705	31.0	31.5
Total Manganese (Mn)	ALS	mg/kg	1	128	192	224	40.0	54.5
Total Mercury (Hg)	ALS	mg/kg	0.005	0.0076	0.0120	0.0194	44.9	87.4
Total Molybdenum (Mo)	ALS	mg/kg	0.1	0.28	0.39	0.46	32.8	48.6
Total Nickel (Ni)	ALS	mg/kg	0.5	3.24	5.43	6.14	50.5	61.8
Total Phosphorus (P)	ALS	mg/kg	50	157	153	229	2.6	37.3
Total Potassium (K)	ALS	mg/kg	100	170	220	260	25.6	41.9
Total Selenium (Se)	ALS	mg/kg	0.2	<0.2	<0.2	<0.2	-	-
Total Silver (Ag)	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	-	-
Total Sodium (Na)	ALS	mg/kg	50	<50	<50	<50	-	-
Total Strontium (Sr)	ALS	mg/kg	0.5	9.2	12	14.4	26.4	44.1
Total Thallium (Tl)	ALS	mg/kg	0.05	<0.05	<0.05	0.051	-	-
Total Tin (Sn)	ALS	mg/kg	2	<2	<2	<2	-	-
Total Titanium (Ti)	ALS	mg/kg	1	28.2	49	42.5	53.9	40.5
Total Uranium (U)	ALS	mg/kg	0.05	0.139	0.292	0.236	71.0	51.7
Total Vanadium (V)	ALS	mg/kg	0.2	6.09	9	10.3	38.6	51.4
Total Zinc (Zn)	ALS	mg/kg	2	8.3	10.8	20.1	26.2	83.1
Total Zirconium (Zr)	ALS	mg/kg	1	3.9	7.3	6.3	60.7	47.1

Analytes differ by > 20% between duplicates but one or both concentrations are < 5 times the detection limit.

Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

¹ Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit. Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent differences is valid only for analytical values that are at least five times the detection limit.

Table B.2-12 Relative percent difference between duplicate and split sediment quality samples, Sunday Creek (SUC-D2), September 2015.

Analyte	Laboratory	Unit	DL	Station SUC-D2	Split SPL-2-1	Duplicate DUP-2-1	RPD ¹ from ELR-D1	
							Split SPL-2-1	Duplicate DUP-2-1
Organic Compounds								
Benzene	ALS	mg/kg	0.005	<0.005	<0.005	<0.005	-	-
CCME Fraction 1 (BTEX)	ALS	mg/kg	10	<10	<10	<10	-	-
CCME Fraction 1 (C6-C10)	ALS	mg/kg	10	<10	<10	<10	-	-
CCME Fraction 2 (C10-C16)	ALS	mg/kg	20	<20	<20	<20	-	-
CCME Fraction 3 (C16-C34)	ALS	mg/kg	20	<20	<20	<20	-	-
CCME Fraction 4 (C34-C50)	ALS	mg/kg	20	<20	<20	<20	-	-
Total Hydrocarbons (C6-C50)	ALS	mg/kg	20	<20	<20	<20	-	-
Ethylbenzene	ALS	mg/kg	0.015	<0.015	<0.015	<0.015	-	-
m+p-Xylene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	-	-
o-Xylene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	-	-
Toluene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	-	-
Xylenes	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	-	-
PAHs								
Acenaphthene	AXYS	mg/kg	-	<0.000162	<0.000178	<0.000237	-	-
Acenaphthylene	AXYS	mg/kg	-	<0.000100	<0.000189	<0.000083	-	-
Anthracene	AXYS	mg/kg	-	<0.000048	<0.000044	<0.000043	-	-
Benz[a]anthracene	AXYS	mg/kg	-	<0.000033	<0.000052	<0.000029	-	-
Benzo[a]pyrene	AXYS	mg/kg	-	<0.000096	<0.000105	<0.000099	-	-
Benzo[b,j,k]fluoranthene	AXYS	mg/kg	-	<0.000139	<0.000159	<0.000147	-	-
Benzo[g,h,i]perylene	AXYS	mg/kg	-	<0.000082	0.000099	<0.000050	-	-
Biphenyl	AXYS	mg/kg	-	<0.000144	<0.000167	<0.000195	-	-
C1-Acenaphthenes	AXYS	mg/kg	-	<0.000144	<0.000153	<0.000204	-	-
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	<0.000049	0.000275	<0.000067	-	-

Analytes differ by > 20% between duplicates but one or both concentrations are < 5 times the detection limit.

Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

¹ Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit. Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent differences is valid only for analytical values that are at least five times the detection limit.

Table B.2-12 (Cont'd.)

Analyte	Laboratory	Unit	DL	Station SUC-D2	Split SPL-2-1	Duplicate DUP-2-1	RPD ¹ from ELR-D1	
							Split SPL-2-1	Duplicate DUP-2-1
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	<0.000120	<0.000149	<0.000164	-	-
C1-Biphenyls	AXYS	mg/kg	-	<0.000140	<0.000171	<0.000217	-	-
C1-Dibenzothiophenes	AXYS	mg/kg	-	<0.000136	<0.000097	<0.000084	-	-
C1-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	<0.000111	0.000415	<0.000126	-	-
C1-Fluorenes	AXYS	mg/kg	-	<0.000086	<0.000138	<0.000145	-	-
C1-Naphthalenes	AXYS	mg/kg	-	<0.000171	<0.000174	<0.000271	-	-
C1-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	<0.000094	<0.000077	<0.000123	-	-
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	<0.000142	0.000495	<0.000111	-	-
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	<0.000162	<0.000198	<0.000113	-	-
C2-Biphenyls	AXYS	mg/kg	-	<0.000105	0.00013	<0.000152	-	-
C2-Dibenzothiophenes	AXYS	mg/kg	-	<0.000132	<0.000098	<0.000064	-	-
C2-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	<0.000081	0.000867	<0.000071	-	-
C2-Fluorenes	AXYS	mg/kg	-	<0.000100	<0.000106	<0.000081	-	-
C2-Naphthalenes	AXYS	mg/kg	-	0.000673	0.00103	0.000843	41.9	22.4
C2-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.000098	0.000071	<0.000033	32.0	-
C3-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.000085	<0.000076	<0.000042	-	-
C3-Dibenzothiophenes	AXYS	mg/kg	-	0.000183	<0.000054	0.000139	-	27.3
C3-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	<0.000180	0.000536	<0.000148	-	-
C3-Fluorenes	AXYS	mg/kg	-	<0.000202	<0.000184	<0.000214	-	-
C3-Naphthalenes	AXYS	mg/kg	-	<0.000160	<0.000190	<0.000200	-	-
C3-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	<0.000067	<0.000147	<0.000058	-	-
C4-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	<0.000075	<0.000074	<0.000068	-	-
C4-Dibenzothiophenes	AXYS	mg/kg	-	0.000232	0.000327	0.00032	34.0	31.9
C4-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	<0.000096	0.000258	<0.000104	-	-
C4-Naphthalenes	AXYS	mg/kg	-	<0.000158	<0.000178	<0.000246	-	-

Analytes differ by > 20% between duplicates but one or both concentrations are < 5 times the detection limit.

Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

¹ Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit. Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent differences is valid only for analytical values that are at least five times the detection limit.

Table B.2-12 (Cont'd.)

Analyte	Laboratory	Unit	DL	Station SUC-D2	Split SPL-2-1	Duplicate DUP-2-1	RPD ¹ from ELR-D1	
							Split SPL-2-1	Duplicate DUP-2-1
C4-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.000459	0.000295	0.000187	43.5	84.2
Chrysene	AXYS	mg/kg	-	0.000051	0.000127	0.000064	85.4	22.6
Dibenz[a,h]anthracene	AXYS	mg/kg	-	<0.000143	<0.000184	<0.000087	-	-
Dibenzothiophene	AXYS	mg/kg	-	<0.000044	<0.000064	<0.000076	-	-
Fluoranthene	AXYS	mg/kg	-	0.000057	0.000047	0.000054	19.2	5.4
Fluorene	AXYS	mg/kg	-	<0.000087	<0.000088	<0.000078	-	-
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/kg	-	<0.000094	<0.000102	0.0001	-	-
Naphthalene	AXYS	mg/kg	-	0.000351	0.000401	0.00032	13.3	9.2
Perylene	AXYS	mg/kg	-	0.000704	0.000917	0.000737	26.3	4.6
Phenanthrene	AXYS	mg/kg	-	0.000071	0.000086	0.000075	19.1	5.5
Pyrene	AXYS	mg/kg	-	0.000066	0.000114	0.000059	53.3	11.2
Retene	AXYS	mg/kg	-	0.000569	0.000549	0.000436	3.6	26.5
Total Metals								
Total Aluminum (Al)	ALS	mg/kg	50	511	405	641	23.1	22.6
Total Antimony (Sb)	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	-	-
Total Arsenic (As)	ALS	mg/kg	0.1	0.79	0.53	1.09	39.4	31.9
Total Barium (Ba)	ALS	mg/kg	0.5	6.65	5.5	6.8	18.9	1.8
Total Beryllium (Be)	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	-	-
Total Bismuth (Bi)	ALS	mg/kg	0.2	<0.2	<0.2	<0.2	-	-
Total Boron (B)	ALS	mg/kg	5	<5.0	<5.0	<5.0	-	-
Total Cadmium (Cd)	ALS	mg/kg	0.02	<0.02	<0.02	<0.02	-	-
Total Calcium (Ca)	ALS	mg/kg	50	395	1590	907	120.4	78.6
Total Chromium (Cr)	ALS	mg/kg	0.5	1.15	0.68	1.07	51.4	7.2
Total Cobalt (Co)	ALS	mg/kg	0.1	0.45	0.39	0.66	14.3	37.8
Total Copper (Cu)	ALS	mg/kg	0.5	<0.5	<0.5	<0.5	-	-

Analytes differ by > 20% between duplicates but one or both concentrations are < 5 times the detection limit.

Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

¹ Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit. Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent differences is valid only for analytical values that are at least five times the detection limit.

Table B.2-12 (Cont'd.)

Analyte	Laboratory	Unit	DL	Station SUC-D2	Split SPL-2-1	Duplicate DUP-2-1	RPD ¹ from ELR-D1	
							Split SPL-2-1	Duplicate DUP-2-1
Total Iron (Fe)	ALS	mg/kg	50	1500	1010	1720	39.0	13.7
Total Lead (Pb)	ALS	mg/kg	0.5	<0.5	<0.5	0.54	-	-
Total Lithium (Li)	ALS	mg/kg	2	<2	<2	<2	-	-
Total Magnesium (Mg)	ALS	mg/kg	20	306	888	606	97.5	65.8
Total Manganese (Mn)	ALS	mg/kg	1	31.4	41.8	49	28.4	44.2
Total Mercury (Hg)	ALS	mg/kg	0.005	<0.005	<0.005	<0.005	-	-
Total Molybdenum (Mo)	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	-	-
Total Nickel (Ni)	ALS	mg/kg	0.5	0.74	0.51	0.97	36.8	26.9
Total Phosphorus (P)	ALS	mg/kg	50	51	51	70	0.0	31.4
Total Potassium (K)	ALS	mg/kg	100	<100	<100	<100	-	-
Total Selenium (Se)	ALS	mg/kg	0.2	<0.2	<0.2	<0.2	-	-
Total Silver (Ag)	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	-	-
Total Sodium (Na)	ALS	mg/kg	50	<50	<50	<50	-	-
Total Strontium (Sr)	ALS	mg/kg	0.5	3.81	3.45	3.8	9.9	0.5
Total Thallium (Tl)	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	-	-
Total Tin (Sn)	ALS	mg/kg	2	<2	<2	<2	-	-
Total Titanium (Ti)	ALS	mg/kg	1	21.7	18.3	23.0	17.0	5.8
Total Uranium (U)	ALS	mg/kg	0.05	0.056	0.06	0.056	6.9	0.0
Total Vanadium (V)	ALS	mg/kg	0.2	1.77	0.99	1.7	56.5	6.4
Total Zinc (Zn)	ALS	mg/kg	2	2.5	2.1	3.2	17.4	24.6
Total Zirconium (Zr)	ALS	mg/kg	1	<1	<1	<1	-	-

Analytes differ by > 20% between duplicates but one or both concentrations are < 5 times the detection limit.

Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

¹ Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit. Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent differences is valid only for analytical values that are at least five times the detection limit.

Table B.2-13 Concentration of metals in water used to rinse sediment sampling equipment (rinsate blanks), September 2015.

Analyte	Laboratory	Units	DL	Rinsate sample	
				RIN-1	RIN-2
Dissolved Metals					
Aluminum (Al)	AITF	mg/L	0.00013	0.00254	0.00188
Antimony (Sb)	AITF	mg/L	0.000008	<0.000008	0.000009
Arsenic (As)	AITF	mg/L	0.000003	0.000026	0.000016
Barium (Ba)	AITF	mg/L	0.00005	0.0003	0.00032
Beryllium (Be)	AITF	mg/L	0.000009	<0.000009	<0.000009
Bismuth (Bi)	AITF	mg/L	0.000003	<0.000003	<0.000003
Boron (B)	AITF	mg/L	0.00013	0.00383	0.00342
Cadmium (Cd)	AITF	mg/L	0.000002	<0.000002	<0.000002
Calcium (Ca)	AITF	mg/L	0.03	0.12	0.11
Chlorine (Cl)	AITF	mg/L	0.03	<0.03	<0.03
Chromium (Cr)	AITF	mg/L	0.0001	0.0001	<0.0001
Cobalt (Co)	AITF	mg/L	0.000002	0.000004	0.000004
Copper (Cu)	AITF	mg/L	0.00008	0.00048	0.00041
Iron (Fe)	AITF	mg/L	0.0006	0.0047	0.0034
Lead (Pb)	AITF	mg/L	0.000004	0.000014	0.000025
Lithium (Li)	AITF	mg/L	0.00002	0.00006	0.00004
Manganese (Mn)	AITF	mg/L	0.00001	0.00034	0.00028
Molybdenum (Mo)	AITF	mg/L	0.000002	0.000017	0.000045
Nickel (Ni)	AITF	mg/L	0.000006	0.000051	0.000052
Selenium (Se)	AITF	mg/L	0.00004	<0.00004	<0.00004
Silver (Ag)	AITF	mg/L	0.000001	<0.000001	<0.000001
Strontium (Sr)	AITF	mg/L	0.00007	0.00096	0.0008
Thallium (Tl)	AITF	mg/L	0.0000004	0.0000007	<0.0000004
Thorium (Th)	AITF	mg/L	0.0000008	<0.0000008	<0.0000008
Tin (Sn)	AITF	mg/L	0.000003	<0.000003	<0.000003
Titanium (Ti)	AITF	mg/L	0.00008	0.0001	0.00011
Uranium (U)	AITF	mg/L	0.000002	<0.000002	<0.000002
Vanadium (V)	AITF	mg/L	0.00002	<0.00002	<0.00002
Zinc (Zn)	AITF	mg/L	0.00009	0.00124	0.00156
Total Metals					
Aluminum (Al)	AITF	mg/L	0.0002	0.0316	0.0165
Antimony (Sb)	AITF	mg/L	0.000001	0.000008	0.000009
Arsenic (As)	AITF	mg/L	0.000004	0.00003	0.00002
Barium (Ba)	AITF	mg/L	0.000004	0.000399	0.000476
Beryllium (Be)	AITF	mg/L	0.000008	<0.000008	<0.000008
Bismuth (Bi)	AITF	mg/L	0.000001	<0.000001	<0.000001
Boron (B)	AITF	mg/L	0.0001	0.0047	0.0037
Cadmium (Cd)	AITF	mg/L	0.000002	<0.000002	<0.000002
Calcium (Ca)	AITF	mg/L	0.01	0.12	0.13
Chlorine (Cl)	AITF	mg/L	0.04	<0.04	<0.04
Chromium (Cr)	AITF	mg/L	0.00003	0.00013	0.0001

Indicates the sample concentration was greater than five times the sample detection limit (DL)

Table B.2-13 (Cont'd.)

Analyte	Laboratory	Units	DL	Rinsate sample	
				RIN-1	RIN-2
Total Metals (Cont'd.)					
Cobalt (Co)	AITF	mg/L	0.000002	0.000008	0.000006
Copper (Cu)	AITF	mg/L	0.00005	0.00049	0.00049
Iron (Fe)	AITF	mg/L	0.0007	0.022	0.0152
Lead (Pb)	AITF	mg/L	0.000003	0.000017	0.000025
Lithium (Li)	AITF	mg/L	0.00005	0.00008	0.00005
Manganese (Mn)	AITF	mg/L	0.000005	0.000432	0.000397
Molybdenum (Mo)	AITF	mg/L	0.000002	0.000017	0.000049
Nickel (Ni)	AITF	mg/L	0.000008	0.000052	0.000061
Selenium (Se)	AITF	mg/L	0.00006	<0.00006	<0.00006
Silver (Ag)	AITF	mg/L	0.000002	<0.000002	<0.000002
Strontium (Sr)	AITF	mg/L	0.000001	0.00096	0.000931
Thallium (Tl)	AITF	mg/L	0.0000009	0.0000010	<0.0000009
Thorium (Th)	AITF	mg/L	0.0000009	<0.0000009	<0.0000009
Tin (Sn)	AITF	mg/L	0.000003	<0.000003	<0.000003
Titanium (Ti)	AITF	mg/L	0.00005	0.00054	0.00048
Uranium (U)	AITF	mg/L	0.000003	<0.000003	<0.000003
Vanadium (V)	AITF	mg/L	0.00001	0.00007	0.00004
Zinc (Zn)	AITF	mg/L	0.0001	0.0012	0.0017

Indicates the sample concentration was greater than five times the sample detection limit (DL)

Table B.2-14 Concentration of PAHs in water used to rinse sediment sampling equipment (rinsate blanks), September 2015.

			RIN-1		RIN-2	
			DL	Rinsate	DL	Rinsate
Acenaphthene	AXYS	ng/L	0.589	<0.589	0.589	<0.589
Acenaphthylene	AXYS	ng/L	0.372	<0.372	0.372	<0.372
Anthracene	AXYS	ng/L	0.186	0.495	0.186	0.298
Benz[a]anthracene	AXYS	ng/L	0.117	<0.117	0.117	<0.117
Benzo[a]pyrene	AXYS	ng/L	0.234	<0.234	0.234	<0.234
Benzo[b,j,k]fluoranthene	AXYS	ng/L	0.309	<0.309	0.309	<0.309
Benzo[g,h,i]perylene	AXYS	ng/L	0.277	<0.277	0.277	<0.277
Biphenyl	AXYS	ng/L	1.827	<1.827	1.827	<1.827
C1-Acenaphthenes	AXYS	ng/L	1.036	<1.036	1.036	<1.036
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.433	<0.433	0.433	<0.433
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.349	<0.349	0.349	<0.349
C1-Biphenyls	AXYS	ng/L	0.831	<0.831	0.831	<0.831
C1-Dibenzothiophenes	AXYS	ng/L	7.253	<7.253	7.253	<7.253
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	0.553	<0.553	0.553	<0.553
C1-Fluorenes	AXYS	ng/L	1.183	<1.183	1.183	<1.183
C1-Naphthalenes	AXYS	ng/L	6.357	13.8	6.357	11.000
C1-Phenanthrenes/Anthracenes	AXYS	ng/L	11.642	<11.642	11.642	<11.642
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.365	<0.365	0.365	<0.365
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.723	<0.723	0.723	<0.723
C2-Biphenyls	AXYS	ng/L	36.553	<36.553	36.553	<36.553
C2-Dibenzothiophenes	AXYS	ng/L	2.155	2.420	2.155	2.780
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	1.500	<1.500	1.500	<1.500
C2-Fluorenes	AXYS	ng/L	2.559	<2.559	2.559	<2.559
C2-Naphthalenes	AXYS	ng/L	6.287	<6.287	6.287	<6.287
C2-Phenanthrenes/Anthracenes	AXYS	ng/L	1.044	1.14	1.044	<1.044
C3-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.203	<0.203	0.203	<0.203
C3-Dibenzothiophenes	AXYS	ng/L	2.461	<2.461	2.461	<2.461
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	0.885	<0.885	0.885	<0.885
C3-Fluorenes	AXYS	ng/L	4.465	<4.465	4.465	<4.465
C3-Naphthalenes	AXYS	ng/L	3.221	<3.221	3.221	<3.221
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	0.954	<0.954	0.954	<0.954
C4-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.180	<0.180	0.180	<0.180
C4-Dibenzothiophenes	AXYS	ng/L	2.637	<2.637	2.637	<2.637
C4-Fluoranthenes/Pyrenes	AXYS	ng/L	0.184	<0.184	0.184	<0.184
C4-Naphthalenes	AXYS	ng/L	3.679	<3.679	3.679	<3.679
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	3.122	<3.122	3.122	<3.122
Chrysene	AXYS	ng/L	0.238	<0.238	0.238	<0.238
Dibenz[a,h]anthracene	AXYS	ng/L	0.285	<0.285	0.285	<0.285
Dibenzothiophene	AXYS	ng/L	0.364	0.543	0.364	<0.364
Fluoranthene	AXYS	ng/L	0.666	0.714	0.666	<0.666

* Values shown for the detection limit (DL) are concentrations found in the laboratory blank.

Indicates the sample concentration was greater than five times the sample detection limit.

Table B.2-14 (Cont'd.)

			RIN-1		RIN-2	
			DL	Rinsate	DL	Rinsate
Fluorene	AXYS	ng/L	0.403	0.511	0.403	<0.403
Indeno[1,2,3-c,d]-pyrene	AXYS	ng/L	0.204	<0.204	0.204	<0.204
Naphthalene	AXYS	ng/L	13.550	<13.550	13.550	<13.550
Perylene	AXYS	ng/L	0.242	<0.242	0.242	<0.242
Phenanthrene	AXYS	ng/L	1.736	3.77	1.736	2.190
Pyrene	AXYS	ng/L	1.304	<1.304	1.304	<1.304
Retene	AXYS	ng/L	0.589	<0.589	0.589	<0.589

* Values shown for the detection limit (DL) are concentrations found in the laboratory blank.

Indicates the sample concentration was greater than five times the sample detection limit.

B.2.5 Fish Populations Component

B.2.5.1 Quality Control Activities – Field

Field activities for fish and fish habitat sampling were conducted in accordance with field methods considered to be standard scientific practice (e.g., Environment Canada 2010) and methods used in previous RAMP studies (RAMP 2009b). All field personnel were trained in the proper use of all field equipment to ensure accurate and safe data collection. Instruments used for measuring supporting field water quality variables (e.g., temperature, dissolved oxygen, conductivity, pH, water velocity, and depth) were calibrated according to recommendations from the respective manufacturer (as frequently as daily for pH and dissolved oxygen meters). Site and reach locations were recorded using a GPS unit. All sampling details (e.g., date, time, methods used, personnel, measurements) were recorded on project-specific field data sheets and/or in waterproof field books. Upon completion of the fieldwork, all datasheets and field books were stored in a fireproof cabinet in the Hatfield office.

Sample shipping (e.g., for fish livers sent to Chris Kennedy) was conducted using Hatfield-provided Chain of Custody (COC) forms.

B.2.5.2 Quality Control Activities – Laboratory

Fish Ageing

Results of fish ageing analyses by North/South Consultants included a description of QC techniques used. All ageing structures were viewed (read) a minimum of two times. If both estimates were consistent, the final age was assigned; however, if the age estimates were not consistent, the ageing structure was read a third time. If consistency was not achieved following three readings, the ageing structure was not deemed readable and no age was assigned. All readings were conducted independently from each other (i.e., each reading was conducted “blind” or without knowledge of the previous reading). Quality control and quality assurance was then conducted by an alternate ageing technician on at least 10% of randomly selected structures (unless readings one and two were conducted by different technicians, in which case the quality control and quality assurance was already completed). The QA/QC readings were also conducted “blind” to determine consistency and accuracy.

Data were received in electronic format (Microsoft Excel®) from the analytical laboratory. All data were checked upon data entry for transcription errors or other inconsistencies. Analysis of collected data was done using an iterative approach, using duplicate data files for processing. Original data were retained in back-up files for the project.

Estimates of age exhibited low variability between the two readings (Table B.2-15). Out of the 899 structures that had QA/QC analyses performed, 79 age estimates had a confidence rating of “good”; 768 age estimates had a confidence rating of “fair”; 43 age estimates had a confidence rating of “poor, and one age estimate had a confidence rating of “very poor”. An explanation of the confidence index for analyzing fish ageing structures is provided in Table B.2-16.

Table B.2-15 QA/QC results for age estimates of fish captured during the Wild Fish Health surveys, fall 2015.

Reach	Date	Structure	Species	Fish #	Age	Confidence Index	QA/QC Age
AC-DS	1-Oct-15	OT	LKCH	25	2	F	2
AC-DS	1-Oct-15	OT	LKCH	26	1	F	1
AC-DS	1-Oct-15	OT	LKCH	27	2	F	2
AC-DS	1-Oct-15	OT	LKCH	28	2	F	2
AC-US	1-Oct-15	OT	LKCH	25	4	F	4
AC-US	1-Oct-15	OT	LKCH	26	2	F	3
AC-US	1-Oct-15	OT	LKCH	27	4	F	3
AC-US	1-Oct-15	OT	LKCH	28	2	F	2
ER-L	2-Oct-15	OT	LKCH	13	3	F	2
ER-L	2-Oct-15	OT	LKCH	14	2	F	2
ER-L	2-Oct-15	OT	LKCH	15	2	F	1
ER-L	2-Oct-15	OT	LKCH	16	2	F	2
ER-M	4-Oct-15	OT	LKCH	33	3	F	4
ER-M	4-Oct-15	OT	LKCH	34	3	F	3
ER-M	4-Oct-15	OT	LKCH	35	3	F	3
ER-M	4-Oct-15	OT	LKCH	36	3	F	3
ER-U	5-Oct-15	OT	LKCH	33	3	F	3
ER-U	5-Oct-15	OT	LKCH	34	3	F	2
ER-U	5-Oct-15	OT	LKCH	35	2	F	2
ER-U	5-Oct-15	OT	LKCH	36	3	F	3
DC-U	5-Oct-15	OT	LKCH	29	3	F	3
DC-U	5-Oct-15	OT	LKCH	30	3	F	2
DC-U	5-Oct-15	OT	LKCH	31	2	F	2
DC-U	5-Oct-15	OT	LKCH	32	2	P	2
DC-M	2-Oct-15	OT	LKCH	5	2	F	2
DC-M	2-Oct-15	OT	LKCH	6	2	F	2
DC-L	2-Oct-15	OT	LKCH	5	2	F	3
DC-L	2-Oct-15	OT	LKCH	6	1	F	1
DC-L	2-Oct-15	OT	LKCH	7	1	F	1
DC-L	2-Oct-15	OT	LKCH	8	2	F	3
MR-L	25-Sep-15	OT	LNDC	1	4	P	4
MR-L	25-Sep-15	OT	LNDC	2	3	P	2
MR-L	25-Sep-15	OT	LNDC	3	2	P	2

Note: See Table B.2-16 for an explanation of the confidence index codes.

FR=fin ray; OT=otolith; LKCH=lake chub; LNDC=longnose dace; SLSC=slimy sculpin; TRPR=trout perch.

Table B.2-15 (Cont'd.)

Reach	Date	Structure	Species	Fish #	Age	Confidence Index	QA/QC Age
MR-L	25-Sep-15	FR	LNDC	4	1	F	1
MR-L	25-Sep-15	OT	LNDC	33	3	F	2
MR-L	25-Sep-15	FR	LNDC	34	1	F	1
MR-L	25-Sep-15	FR	LNDC	35	1	F	1
MR-L	25-Sep-15	FR	LNDC	36	1	F	1
MR-M	25-Sep-15	OT	LNDC	13	1	F	1
MR-M	25-Sep-15	OT	LNDC	14	1	F	1
MR-M	25-Sep-15	FR	LNDC	15	2	F	2
MR-M	25-Sep-15	OT	LNDC	16	2	F	2
MR-U	29-Sep-15	OT	LNDC	13	3	F	2
MR-U	29-Sep-15	OT	LNDC	14	2	F	1
MR-U	29-Sep-15	OT	LNDC	15	1	F	0
MR-U	29-Sep-15	OT	LNDC	16	2	F	2
JAR-F1	28-Sep-15	OT	SLSC	5	4	G	4
JAR-F1	28-Sep-15	OT	SLSC	6	4	G	5
JAR-F1	28-Sep-15	OT	SLSC	7	1	G	2
JAR-F1	28-Sep-15	OT	SLSC	8	1	G	2
SUC-F1	30-Sep-15	OT	SLSC	1	4	G	4
SUC-F1	30-Sep-15	OT	SLSC	2	3	G	4
SUC-F1	30-Sep-15	OT	SLSC	3	3	G	3
SUC-F1	30-Sep-15	OT	SLSC	4	4	G	4
M0-US	14-Sep-15	OT	TRPR	1	5	F	5
M0-US	14-Sep-15	OT	TRPR	2	5	F	5
M0-US	14-Sep-15	OT	TRPR	3	5	F	5
M0-US	14-Sep-15	OT	TRPR	4	4	F	4
M0-US	14-Sep-15	OT	TRPR	5	3	F	3
M0-US	14-Sep-15	OT	TRPR	6	2	F	3
M0-US	14-Sep-15	OT	TRPR	7	2	F	2
M0-DS	15-Sep-15	OT	TRPR	1	4	F	3
M0-DS	15-Sep-15	OT	TRPR	2	3	F	3
M0-DS	15-Sep-15	OT	TRPR	3	3	F	3
M0-DS	15-Sep-15	OT	TRPR	4	3	F	3
M0-DS	15-Sep-15	OT	TRPR	5	3	F	3
M0-DS	15-Sep-15	OT	TRPR	6	4	F	3
M0-DS	15-Sep-15	OT	TRPR	7	3	F	3
M0-DS	15-Sep-15	OT	TRPR	8	3	F	3
M2	9-Sep-15	OT	TRPR	1	2	F	2
M2	9-Sep-15	OT	TRPR	2	4	F	4
M2	9-Sep-15	OT	TRPR	3	3	F	3
M2	9-Sep-15	OT	TRPR	4	3	F	4
M2	9-Sep-15	OT	TRPR	5	2	F	2
M2	9-Sep-15	OT	TRPR	6	4	F	3
M2	9-Sep-15	OT	TRPR	7	1	F	2
M2	9-Sep-15	OT	TRPR	8	3	F	3
M3	11-Sep-15	OT	TRPR	1	3	F	3
M3	11-Sep-15	OT	TRPR	2	2	F	2
M3	11-Sep-15	OT	TRPR	3	2	F	3
M3	11-Sep-15	OT	TRPR	4	3	F	3

Note: See Table B.2-16 for an explanation of the confidence index codes.

FR=fin ray; OT=otolith; LKCH=lake chub; LNDC=longnose dace; SLSC=slimy sculpin; TRPR=trout perch.

Table B.2-15 (Cont'd.)

Reach	Date	Structure	Species	Fish #	Age	Confidence Index	QA/QC Age
M3	11-Sep-15	OT	TRPR	5	2	F	2
M3	11-Sep-15	OT	TRPR	6	4	F	4
M3	11-Sep-15	OT	TRPR	7	2	F	2
M3	11-Sep-15	OT	TRPR	8	3	F	3
M4-US	10-Sep-15	OT	TRPR	1	3	F	3
M4-US	10-Sep-15	OT	TRPR	2	4	F	4
M4-US	10-Sep-15	OT	TRPR	3	3	F	3
M4-US	10-Sep-15	OT	TRPR	4	3	F	3
M4-DS	10-Sep-15	OT	TRPR	1	3	F	3
M4-DS	10-Sep-15	OT	TRPR	2	6	F	5
M4-DS	10-Sep-15	OT	TRPR	3	4	F	4
M4-DS	10-Sep-15	OT	TRPR	4	3	F	3

Note: See Table B.2-16 for an explanation of the confidence index codes.

FR=fin ray; OT=otolith; LKCH=lake chub; LNDC=longnose dace; SLSC=slimy sculpin; TRPR=trout perch.

Table B.2-16 Explanation of the index used to classify confidence in estimates of fish age.

Confidence Indices and Abbreviations	Qualitative Characteristics (Pattern Clarity)	Quantitative Characteristics (Repeatability)
Very Good (VG)	annuli are clear with no interpretation problems	Reader always gets the same age
Good (G)	annuli are clear with a few easy interpretation problems	Reader would get the same age most of the time for fish <10 years, within one year for fish 11 to 20 years
Fair (F)	annuli are fairly clear with some areas presenting easy and moderate interpretation problems	Reader would be within 1 year most of the time for fish <10 years and 2 to 3 years for fish >10 years
Poor (P)	annuli are fairly unclear presenting a number of difficult interpretation problems	Reader would be within 2 to 3 years most of the time for fish <15 years and 4 to 5 years for fish >15 years
Very Poor (VP)	annuli are very unclear presenting significant interpretation problems	Reader has little confidence in repeatability of age within 4 to 5 years

Fish Livers

The results of fish liver microsomal ethoxyresorufin O-deethylase (EROD) analyses by BioWest Environmental Research Consultants included a description of QA/QC techniques used. The method used followed a modified standard published protocol (Hodson et al. 1991) as in Gourley and Kennedy (2009). Documentation exists for the time samples were in transport and storage prior to analyses, the identification of any transport issues, sample codes and relevant sampling information, the relabeling of any samples, and checks on labels to ensure legibility. To ensure that the QA/QC chain continues unbroken into the laboratory, a spreadsheet was prepared that documented a chain of information on all procedural steps. All microsomal preparations were prepared by a single individual to ensure the consistency of the subcellular preparations. To date, there are no reference materials/standards/calibration tissues for EROD analysis. All EROD measurements were performed randomly on

samples, in duplicate, and conducted “blind” to determine consistency and accuracy. One rainbow trout microsomal preparation was used on each EROD assay plate to ensure that there was no inter-plate variability. The use of statistical techniques identified samples with a >20% coefficient of variance, and the ability to identify nonconformance (outliers) and carry out corrective action.

B.2.6 Acid-Sensitive Lakes Component

Field sampling for the Acid-Sensitive Lakes component was conducted by personnel from Alberta Environment and Parks (AEP). Field quality control procedures followed by AEP are presented in Section B.2.6.1. The water samples collected at each lake were analyzed by the University of Alberta’s Limnology Laboratory. The laboratory used a series of set procedures described in Section B.2.6.2. The analytical quality control procedures used in the Limnology laboratory are identical to those used in previous RAMP/JOSMP studies (e.g., RAMP 2013).

B.2.6.1 Quality Control Activities – Field

The collection of water samples by AEP followed standard practices for quality control of samples to avoid contamination. Field instruments (e.g., water quality meters) were maintained so as to maximize data quality (i.e., proper calibration according to manufacturer specifications). QC procedures included the following:

- collection of samples away from the influence of the boat or float plane (i.e., to minimize chance of sample contamination from fuel that may be in the water);
- all sampling equipment was thoroughly cleaned between lakes;
- sample containers were tripled-rinsed prior to filling (cap included);
- sample containers were filled to the top (i.e., no head space);
- samples were stored under cool (4°C) conditions and in the dark (i.e., in a refrigerator); and
- samples were submitted to the appropriate analytical laboratory within established maximum holding period (typically 48 hours).

In 2015, five duplicate samples, six field blanks and five trip blanks were collected and analyzed for both conventional and metal variables. In total, 24% of the sampling effort was dedicated to quality control. In addition, 11 duplicate samples were collected and sent to Maxxam Analytics for comparison to the results reported by the Limnology Laboratory.

B.2.6.2 Quality Control Activities – Laboratory

The University of Alberta Limnology Laboratory maintains an internal QA/QC program to maximize quality of analytical results. The program includes the use of standard reference samples and periodic comparison samples (i.e., blanks) sent to other laboratories. In the event that QC objectives are not achieved, corrective actions are initiated to determine the cause. The laboratory prepares standard QC samples for each group of analyses from analytical grade chemicals or standard reference samples.

Annually, ten samples of known chemistry are submitted by Environment Canada's National Water Research Institute (NWRI) for blind analysis and comparison. Twice a year, quality control samples are sent to the University of Alberta Limnology Laboratory by the Norwegian Institute for Water Research for analysis and comparison.

In all cases, analytical samples were run along with standard laboratory reference samples to create a standard results curve. QC solutions were then run in duplicate. If results for controls were consistent for a series of analyses, no additional QC testing was required. If results from QC samples were divergent from standards, corrective action was initiated to determine the cause and results that may be affected. When new QC samples were prepared, each one was tested against the previous QC sample (for a given variable) to assess comparability. The results of the QC samples analyzed by the laboratory are presented in the original laboratory reports.

B.2.6.3 Analysis of Field Quality Control Samples

The relative percent differences for each variable in the duplicate samples are presented in Table B.2-17 to Table B.2-19 for dissolved metals, total metals and conventional variables, respectively. The variability was ranked as "low-moderate" for the dissolved metals and "moderate" for the total metals. The conventional variables showed a greater degree of precision with four of the five samples ranked as having "low" variability and the fourth "moderate" variability.

There were no dissolved metal variables in the field and trip blanks exceeding the detection limit criterion. Seven total metal variables exceeded this criterion including barium, boron manganese, molybdenum, tin and strontium (Table B.2-20). Seven conventional variables exceeded the detection limit criterion including most of the nitrogen variables (total nitrogen, total dissolved nitrogen, and total Kjeldahl nitrogen), colour, dissolved organic carbon, total dissolved solids, and total suspended solids (Table B.2-21). The nitrogen variables were unusually high in all the field and trip blanks, exceeding 60 µg/L.

The comparison of the conventional variables between the two laboratories was complicated by large differences in the detection limits of some variables. The University of Alberta was historically chosen for the former RAMP because it was capable of obtaining lower levels of nutrients and base cations than the commercial laboratories. The higher Maxxam detection limits were used in applying the detection limit criterion. The result was that a significant number of the variables in each sample were excluded. Table B.2-22 presents the results of the laboratory comparison for the 11 samples. Eight of the 11 samples were rated as having a "high" degree of variability or difference between the two laboratories. The greatest discrepancies between the two laboratories were observed in colour and in the base cations, especially in magnesium and calcium.

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Table B.2-17 Relative percent differences in dissolved metals between duplicate samples collected from five ASL component lakes, 2015.

Dissolved Metal	Units	MDL	Lake ID WF1			Lake ID S1			Lake ID BM7			Lake ID CM1			Lake ID SM2		
			24-Aug-15			26-Aug-15			27-Aug-01			25-Aug-15			28-Aug-15		
			Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)
Ag	µg/L	0.001	-	-	-	0.0005	0.0005	0	-	-	-	-	-	-	-	-	-
Al	µg/L	0.13	8.53	8.61	0.9	1.79	1.71	4.6	86.4	80.5	7.1	21.6	21.6	0	15.5	15.3	1.3
As	µg/L	0.003	0.287	0.309	7.4	0.156	0.167	6.8	0.236	0.225	4.8	0.431	0.412	4.5	0.219	0.22	0.5
Ba	µg/L	0.05	11.9	11.9	0	3.67	3.74	1.9	3.71	3.39	9	24.9	25	0.4	2.31	2.04	12.4
B	µg/L	0.13	12.3	13.4	8.6	5.4	6.15	13	2.3	2	14	6.87	7.03	2.3	9.34	9.37	0.3
Be	µg/L	0.009	0.0045	0.0045	0	0.0045	0.0045	0	-	-	-	-	-	-	0.0045	0.0045	0
Bi	µg/L	0.003	-	-	-	-	-	-	0.01	0.025	85.7	0.0015	0.0015	0	0.0015	0.0015	0
Ca	mg/L	0.03	10.2	10.3	1	8.43	7.5	11.7	0.28	0.25	11.3	13.8	13.7	0.7	2.36	2.39	1.3
Cd	µg/L	0.002	0.001	0.001	0	-	-	-	0.014	0.015	6.9	-	-	-	-	-	-
Cl	mg/L	0.03	-	-	-	2.25	2.1	6.9	-	-	-	-	-	-	0.33	0.18	58.8
Co	µg/L	0.002	0.014	0.014	0	-	-	-	0.114	0.103	10.1	0.024	0.026	8	0.015	0.014	6.9
Cr	µg/L	0.1	-	-	-	0.05	0.05	0	-	-	-	0.3	0.3	0	0.05	0.05	0
Cu	µg/L	0.08	-	-	-	-	-	-	-	-	-	0.73	0.75	2.7	-	-	-
Fe	µg/L	0.6	31.4	31.3	0.3	-	-	-	198	185	6.8	291	288	1	14.2	13.2	7.3
Li	µg/L	0.02	3.22	3.19	0.9	2.62	2.36	10.4	0.41	0.39	5	4.73	4.8	1.5	1.73	1.76	1.7
Mn	µg/L	0.01	1.32	1.29	2.3	0.11	0.12	8.7	27.3	25	8.8	5.12	5.31	3.6	0.61	0.69	12.3
Mo	µg/L	0.002	0.093	0.098	5.2	0.54	0.563	4.2	0.019	0.021	10	0.292	0.292	0	-	-	-
Ni	µg/L	0.006	0.088	0.088	0	0.003	0.003	0	0.233	0.213	9	0.976	1.01	3.4	-	-	-
Pb	µg/L	0.004	-	-	-	-	-	-	0.03	0.036	18.2	0.036	0.039	8	-	-	-
Sb	µg/L	0.008	-	-	-	-	-	-	-	-	-	0.043	0.041	4.8	-	-	-
Se	µg/L	0.04	0.02	0.02	0	0.02	0.02	0	0.02	0.02	0	0.02	0.02	0	0.02	0.02	0
Sn	µg/L	0.003	0.017	0.013	26.7	-	-	-	0.016	0.029	57.8	-	-	-	-	-	-
Sr	µg/L	0.07	31.5	31.6	0.3	45.1	41.9	7.4	1.83	1.7	7.4	33	33	0	7.34	7.42	1.1
Th	µg/L	0.0008	-	-	-	-	-	-	0.0046	0.0087	61.7	0.0264	0.0214	20.9	0.0004	0.0004	0
Ti	µg/L	0.08	-	-	-	-	-	-	0.69	0.7	1.4	0.85	0.89	4.6	-	-	-
Tl	µg/L	0.0004	0.0047	0.0069	37.9	0.0046	0.0051	10.3	0.0136	0.0175	25.1	0.0038	0.0077	67.8	0.0055	0.0008	149.2
U	µg/L	0.002	-	-	-	0.295	0.303	2.7	-	-	-	0.117	0.114	2.6	0.001	0.001	0
V	µg/L	0.02	0.16	0.16	0	-	-	-	0.32	0.31	3.2	0.17	0.17	0	0.12	0.1	18.2
Z	µg/L	0.09	0.86	0.88	2.3	-	-	-	3.13	2.92	6.9	0.62	0.52	17.5	0.75	0.8	6.5
Variability Rating (%)			Moderate: 10.5 %			Low: 0%			Moderate: 18%			Low: 8.3%			Moderate: 10%		

Note: Shaded values represent non-detectable concentrations with the value equivalent to one-half the detection limit.

Table B.2-18 Relative percent differences in total metals between duplicate samples collected from five ASL component lakes, 2015.

Total Metal	Units	MDL	Lake ID WF1			Lake ID S1			Lake ID BM7			Lake ID CM1			Lake ID SM2		
			24-Aug-15			26-Aug-15			27-Aug-15			25-Aug-15			28-Aug-15		
			Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)
Ag	µg/L	0.002	-	-	-	0.001	0.001	0	-	-	-	-	-	-	-	-	-
Al	µg/L	0.2	290	286	1.4	7.9	5.9	29	223	228	2.2	40	32.7	20.1	37.5	50.4	29.4
As	µg/L	0.004	0.483	0.483	0	0.177	0.177	0	0.285	0.271	5	0.517	0.477	8	0.24	0.243	1.2
Ba	µg/L	0.004	22.1	21.7	1.8	3.9	4.1	5	5.9	5.83	1.2	26.7	26.6	0.4	5.38	5.43	0.9
B	µg/L	0.1	14	14.8	5.6	6	6.7	11	4.5	3.6	22.2	7.7	7.9	2.6	10.8	11.2	3.6
Be	µg/L	0.008	-	-	-	0.004	0.004	0	-	-	-	-	-	-	0.004	0.004	0
Bi	µg/L	0.001	0.001	0.011	166.7	-	-	-	0.01	0.025	85.7	0.0005	0.0005	0	0.0005	0.0005	0
Ca	mg/L	0.01	11.6	11.6	0	8.59	7.95	7.7	0.34	0.33	3	14.5	14.3	1.4	2.62	2.61	0.4
Cd	µg/L	0.002	0.035	0.034	2.9	0.011	0.025	77.8	0.019	0.017	11.1	-	-	-	-	-	-
Cl	mg/L	0.04	-	-	-	2.25	2.26	0.4	-	-	-	-	-	-	0.34	0.19	56.6
Co	µg/L	0.002	0.208	0.196	5.9	-	-	-	0.135	0.141	4.3	0.035	0.036	2.8	0.031	0.032	3.2
Cr	µg/L	0.03	0.56	0.59	5.2	-	-	-	0.29	0.29	0	0.34	0.33	3	-	-	-
Cu	µg/L	0.05	-	-	-	-	-	-	0.23	0.41	56.3	0.88	0.78	12	-	-	-
Fe	µg/L	0.7	469	448	4.6	11.2	9	21.8	319	319	0	360	345	4.3	66.7	67.6	1.3
Li	µg/L	0.05	3.26	3.26	0	2.65	2.53	4.6	0.52	0.5	3.9	4.95	4.86	1.8	1.87	1.86	0.5
Mn	µg/L	0.005	64.9	63.6	2	12.8	11.9	7.3	31.7	31.2	1.6	9.21	9.11	1.1	50.8	50.2	1.2
Mo	µg/L	0.002	0.153	0.151	1.3	0.547	0.591	7.7	0.032	0.042	27	0.31	0.302	2.6	0.035	0.026	29.5
Ni	µg/L	0.008	1.04	1.04	0	0.004	0.004	0	0.327	0.357	8.8	1.09	1.2	9.6	0.034	0.054	45.5
Pb	µg/L	0.003	0.359	0.344	4.3	0.052	0.009	141	0.084	0.094	11.2	0.04	0.048	18.2	0.045	0.048	6.5
Sb	µg/L	0.001	0.022	0.029	27.5	0.012	0.015	22.2	0.024	0.024	0	0.044	0.042	4.7	0.012	0.012	0
Se	µg/L	0.06	-	-	-	0.03	0.03	0	0.03	0.03	0	-	-	-	0.03	0.03	0
Sn	µg/L	0.003	0.018	0.013	32.3	-	-	-	0.017	0.029	52.2	-	-	-	-	-	-
Sr	µg/L	0.001	36.4	36.5	0.3	46.3	44.5	4	2.23	2.27	1.8	34.7	34.4	0.9	8.29	8.22	0.8
Th	µg/L	0.0009	0.0115	0.0162	33.9	-	-	-	0.0047	0.0088	60.7	0.0267	0.0217	20.7	0.00045	0.00045	0
Ti	µg/L	0.05	5.74	5.39	6.3	-	-	-	2.79	2.74	1.8	1.24	1.03	18.5	0.86	0.86	0
Tl	µg/L	0.0009	0.0048	0.007	37.3	0.0046	0.0052	12.2	0.0138	0.0177	24.8	0.0038	0.0078	69	-	-	-
U	µg/L	0.003	0.044	0.038	14.6	0.345	0.386	11.2	-	-	-	0.13	0.125	3.9	0.0015	0.0015	0
V	µg/L	0.01	0.82	0.75	8.9	-	-	-	0.77	0.8	3.8	0.23	0.23	0	0.16	0.2	22.2
Z	µg/L	0.1	6.2	6.1	1.6	-	-	-	3.7	3.9	5.3	0.6	0.6	0	1.2	1.4	15.4
Hg inorg.	ng/L	0.06	1.32	1.85	33.4	-	-	-	3.52	3.47	1.4	1.73	1.72	0.6	1.02	1.18	14.5
Hg methyl	ng/L	0.01	0.277	0.308	10.6	0.005	0.005	0	0.083	0.074	11.5	0.086	0.123	35.4	-	-	-
Variability Rating (%)			Moderate: 23.1%			Moderate: 23.8%			Moderate: 25.9%			Moderate: 16.0%			Moderate: 20.8%		

Note: Shaded values represent non-detectable concentrations with the value equivalent to one-half the detection limit.

Table B.2-19 Relative percent differences in conventional variables between duplicate samples collected from five ASL component lakes, 2015.

Variable	Units	MDL	Lake ID WF5			Lake ID CM1			Lake ID S1			Lake ID BM7			Lake ID SM2		
			24-Aug-15			25-Aug-15			26-Aug-15			27-Aug-15			28-Aug-15		
			Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)
Total phosphorus	µg/L	3	126	135	6.9	-	-	-	-	-	-	63	56	11.8	43	46	6.7
Total dissolved phosphorus	µg/L	5	-	-	-	-	-	-	1	1	0	-	-	-	-	-	-
Ammonium	µg/L	3	591	568	4	16	16	0	2	2	0	-	-	-	-	-	-
Nitrate+Nitrite	µg/L	2	-	-	-	14	14	0	1	1	0	1	1	0	1	1	0
Nitrite	µg/L	1	-	-	-	-	-	-	1	1	0	-	-	-	1	1	0
Total nitrogen	µg/L	7	3,650	3,800	4	553	550	0.5	402	397	1.3	932	1,050	11.9	2,600	2,590	0.4
Total dissolved nitrogen	µg/L	7	2,140	2,130	0.5	541	543	0.4	313	307	1.9	413	403	2.5	1,280	1,240	3.2
Total Kjeldahl nitrogen	µg/L	7	3642	3790	4	539	536	1	402	397	1	932	1050	12	2600	2590	0.4
Dissolved sodium	mg/L	0.016	0.88	1.38	44.2	1.89	1.87	1.1	2.01	2.05	2	0.21	0.21	0	1.15	1.77	42.5
Dissolved potassium	mg/L	0.009	1.04	1.06	1.9	0.63	0.64	1.6	1.16	1.18	1.7	0.22	0.23	4.4	0.74	0.24	102
Dissolved calcium	mg/L	0.005	10.14	10.08	0.6	14.4	14.4	0	8.24	8.24	0	0.27	0.28	3.6	2.55	2.54	0.4
Dissolved magnesium	mg/L	0.01	4.14	4.09	1.2	3.51	3.5	0.3	1.76	1.78	1.1	0.14	0.14	0	1.11	1.13	1.8
Chloride	mg/L	0.03	0.15	0.15	0	-	-	-	2.38	2.37	0.4	-	-	-	0.21	0.2	4.9
Sulphate	mg/L	0.04	2.52	2.47	2	6.22	6.25	0.5	1.01	1.02	1	0.02	0.02	0	0.02	0.02	0
Dissolved organic carbon	mg/L	0.1	39.2	38.5	1.8	18.2	18.6	2.2	8.3	8.3	0	26.4	26	1.5	29.7	27.9	6.3
Dissolved inorganic carbon	mg/L	0.2	6.3	6.3	0	9	8.9	1.1	6.2	6	3.3	-	-	-	-	-	-
Gran alkalinity	mg/L	0.3	29.4	29.3	0.1	36.9	37.2	0.8	24.7	24.6	0.6	0.15	0.15	0	6.45	6.91	6.9
pH	mg/L	-	7.47	7.43	0.5	7.74	7.72	0.3	7.7	7.71	0.1	4.61	4.58	0.7	6.99	7.07	1.1
Conductivity	µS/cm	-	77.6	77.2	0.5	93.9	93.9	0	64.3	64.8	0.8	13.55	13.6	0.4	22.6	22.7	0.4
Colour	mg/L PtCo	1	122	122	0.2	166	167	0.8	8	8	6.4	103	122	16.9	144	22	147
Turbidity	NTU	-	25	15	50.3	1.04	0.85	19.6	0.32	0.28	13.3	7.82	8.43	7.5	26.9	24.8	8.1
Total dissolved solids	mg/L	0.04	92	110	17.8	92	98	6.3	52	26	66.7	66	70	5.9	66	82	21.6
Total suspended solids	mg/L	0.05	85	83	2.4	2	1	66.7	1	0.03	190	11	15	30.8	14	14	0
Chlorophyll a	µg/L	0.2	189	172	9.3	-	-	-	-	-	-	7.9	7.9	0.6	61.8	59.5	3.7
Variability Rating (%)			Low: 9.5%			Low: 5.3%			Low: 4.5%			Low: 5.3%			Moderate: 19.0%		

Note: Shaded values represent non-detectable concentrations with the value equivalent to one-half the detection limit.

Table B.2-20 Values of total metals in field and trip blanks exceeding five times the method detection limit.

Variable	Units	MDL	Field Banks					Trip Blanks				
			NE723	CM215	S315	BM315	SM120	S320	BM320	SM 125	CM220	NE718
Ba	µg/L	0.004	-	-	-	-	0.029	-	-	-	0.036	0.023
B	µg/L	0.1	-	-	0.6	0.6	-	-	0.9	-	-	-
Mn	µg/L	0.005	-	-	-	-	0.04	-	-	-	-	-
Mo	µg/L	0.002	-	-	-	-	-	-	-	-	-	0.031
Ni	µg/L	0.008	-	-	-	0.042	-	-	-	-	-	-
Sn	µg/L	0.003	-	-	-	-	0.022	-	-	-	-	-
Sr	µg/L	0.001	0.008	0.018	0.008	0.031	0.031	0.008	0.014	0.006	-	0.007

Table B.2-21 Values of conventional variables in field and trip blanks exceeding five times the method detection limit.

Variable	Units	MDL	Field Banks						Trip Blanks			
			NE723	CM215	S315	BM315	SM120	NE272	S320	BM320	SM 125	NE275
Total nitrogen	µg/L	7	61	59	60	63	58	61	62	61	60	61
Total dissolved nitrogen	µg/L	7	60	60	-	-	-	-	-	-	-	-
Total Kjeldahl nitrogen	µg/L	7	61	59	60	63	58	61	62	61	60	61
Dissolved organic carbon	mg/L	0.1	0.9	2.0	-	-	-	-	0.6	-	-	-
Colour	mg/L	1	-	-	-	-	32	-	-	-	-	-
Total dissolved solids	mg/L	0.04	-	-	-	-	-	14	-	-	-	-
Total suspended solids	mg/L	0.05	5.0	1.0	1.0	-	-	-	1.00	-	-	-

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Table B.2-22 Comparison of conventional variables in 11 samples analyzed by Maxxam Analytics and University of Alberta Limnology laboratory.

Variable	Units	MDL Max.	Lake ID BM11			Lake ID NE6			Lake ID NE7			Lake ID NE8			Lake ID WF7			Lake ID WF5			NE720 (WF5 replicate)			NE723 (field blank)			Lake ID WF4			Lake ID BM10			Lake ID WF5		
			Max.	UoA	RPD (%)	Max.	UoA	RPD (%)	Max.	UoA	RPD (%)	Max.	UoA	RPD (%)	Max.	UoA	RPD (%)	Max.	UoA	RPD (%)	Max.	UoA	RPD (%)	Max.	UoA	RPD (%)	Max.	UoA	RPD (%)	Max.	UoA	RPD (%)	Max.	UoA	RPD (%)
Total phosphorus	µg/L	3	-	-	-	76	141	59.9	26	29	10.9	16	37	79.2	-	-	-	180	135	28.6	170	126	29.7	1.5	0.5	0	45	52	14.4	250	239	4.5	18	20	10.5
Total dissolved phosphorus	µg/L	3	-	-	-	25	10	85.7	7	10	35.3	-	-	-	-	-	-	-	-	-	-	-	-	1.5	1	0	20	17	16.2	44	57	25.7	-	-	-
Ammonium	µg/L	50	25	1.5	0	25	10	85.7	25	13	63.2	-	-	-	-	-	-	610	568	7.1	610	591	3.2	25	1.5	0	-	-	-	-	-	-	-	-	-
Nitrate+Nitrite	µg/L	5	2.5	1	0	2.5	1	0	2.5	1	0	2.5	1	0	2.5	1	0	-	-	-	-	-	-	2.5	1	0	2.5	1	0	2.5	1	0	2.5	1	0
Nitrite	µg/L	3	1.5	0.5	0	1.5	2	28.6	1.5	5	107.7	-	-	-	-	-	-	-	-	-	-	-	-	1.5	0.5	0	-	-	-	-	-	-	1.5	0.5	0
Total nitrogen	µg/L	55	400	405	1.2	1700	1,550	9.2	1200	957	22.5	810	863	6.3	1300	1,230	5.5	7400	3,800	64.3	7100	3,650	64.2	-	-	-	2200	2,170	1.4	4800	4,100	15.7	1100	1,040	5.6
Total Kjeldahl nitrogen	µg/L	50	400	405	1.2	1700	1,550	9.2	1200	957	22.5	810	863	6.3	1300	1,230	5.5	7,400	3,790	64.5	7,100	3,642	64.4	-	-	-	2,200	2,170	1.4	4,800	4,100	15.7	1100	1,040	5.6
Dissolved sodium	mg/L	0.5	-	-	-	1.9	1.99	4.6	0.25	0.88	111.5	-	-	-	-	-	-	-	-	-	-	-	-	7.7	0.008	199.6	7.8	8.08	3.5	1.1	8.3	153.2	-	-	-
Dissolved potassium	mg/L	0.3	-	-	-	0.41	0.51	21.7	0.15	0.05	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved calcium	mg/L	0.3	23	24.1	4.8	19	19.18	0.9	3.6	3.61	0.3	4.5	4.52	0.4	13	13.18	1.4	0.15	10.08	194.1	0.15	10.1	194.2	14	0.003	199.9	12	14.4	18.4	5.1	11.8	79.1	0.3	5.63	179.8
Dissolved magnesium	mg/L	0.2	9.8	10.14	3.4	4.4	4.47	1.6	1.1	1.09	0.9	1.4	1.39	0.7	4.5	4.51	0.2	0.1	4.09	190.5	0.1	4.14	190.6	6.1	0.005	199.7	3.6	6.05	50.8	1.7	3.61	71.9	0.2	1.91	162.1
Chloride	mg/L	1	-	-	-	1.9	1.07	55.9	1.1	0.08	172.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	mg/L	1	6.4	6.43	0.5	0.25	0.08	103	0.64	0.55	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	18.16	14.5	-	-	-	-	-	-
Dissolved organic carbon	mg/L	0.5	5.1	6.6	25.6	17	16.6	2.4	23	22.7	1.3	23	20.6	11	32	29.7	7.5	36	38.5	6.7	36	39.2	8.5	-	-	-	47	42.2	10.8	43	43.2	0.5	27	26	3.8
Total alkalinity	mg/L	0.5	95	92.6	2.6	63	59	6.2	4.6	6.68	36.9	8.2	11	27.4	41	40	2.5	32	30.2	5.8	31	30.2	2.6	0.25	0.15	0	41	39	5	43	41.9	2.6	12	15.2	23.5
pH	mg/L		7.97	7.96	0.1	8.13	8.76	7.5	6.4	6.51	1.7	6.83	6.95	1.7	7.8	8.28	6	7.37	7.43	0.8	7.32	7.47	2	5.09	5.86	14.1	7.53	7.7	2.2	7.49	7.83	4.4	7.14	7.28	1.9
Conductivity	µS/cm		200	200	0	120	124	2.9	23	22.5	2.2	30	29	2.4	90	90.8	0.9	78	77.2	1	78	77.6	0.5	0.5	0.79	44.4	130	134	3.2	100	103	2.5	44	43.5	1.1
Colour	mg/L PtCo		9.8	15.6	45.7	53	63.6	18.2	180	249.5	32.4	140	195	33	62	90.3	37.2	77	121.5	44.8	76	122	46.2	1	1	0	89	139	43.9	120	179	39.3	69	104	40.8
Turbidity	NTU	0.1	1.1	1.23	11.2	12	15	24.8	6.9	8.13	16.4	0.63	1.39	75.2	0.83	0.8	3.7	19	14.9	24.2	12	24.9	69.9	-	-	-	3.5	3.65	4.2	17	19.5	13.7	1.3	1.39	6.7
Total dissolved solids	mg/L	10	110	112	1.8	96	118	20.6	64	52	20.7	56	48	15.4	88	96	8.7	92	110	17.8	110	92	17.8	5	0.02	0	160	152	5.1	140	146	4.2	72	56	25
Total suspended solids	mg/L	1	-	-	-	17	21	21.05	9.3	4	79.7	-	-	-	-	-	-	140	83	51.1	140	85	48.9	-	-	-	11	8	31.6	50	44	12.8	2.7	12	126.5
Variability Rating (%)			Moderate: 13.3%			High: 47.6%			High: 57.1			High: 30.8%			Low: 8.3%			High: 57.1%			High: 57.1%			High: 30.8%			Moderate: 17.6%			High:31.3%			High:40.0%		

Note: Shaded values represent non-detectable concentrations with the value equivalent to one-half the detection limit.

Max. = Maxxam Analytics, UoA = University of Alberta Limnology Laboratory.

Methods and QC Report 2015

Project ID: AMERA RAMP

Cordillera
Consulting

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Project Overview

Hatfield Consulting Group along with AEMERA were awarded a contract for JOSMP RAMP for monitoring in Alberta.

The sampling was conducted in the first 2 weeks of September, and samples were sent directly to Jack Zloty for initial analysis and taxonomy. Cordillera Consulting received 10% of the samples for taxonomic verification and QAQC in Mid-March, 2016.

Quality control was conducted using procedures outlined by the Society for Freshwater Science¹.

Cordillera Taxonomists

The taxonomists for this project were certified by the Society of Freshwater Science (SFS) Taxonomic Certification Program at level 2 which is the required certification for CABIN projects:

Sue Salter: Group 1 General Arthropods (West); Group 2 EPT (East/West) and Group 3 Chironomids (East/West)

Scott Finlayson: Group 1 General Arthropods (East/West); Group 2 EPT (East/West) and Group 3 Chironomids (East/West)

Adam Bliss: Group 1 General Arthropods (East/West); Group 2 EPT (East/West)

Rita Avery: Group 2 EPT (East/West)

Samples Chosen for Taxonomic QC

Table 1: List of samples chosen at random for Taxonomic QAQC

Site	Site Code	Replicate
Athabasca River Delt	FLC-1	2
Athabasca River Delt	EMR-2	2
CABIN	HHR-E1	1
CABIN	JAR-E1-1	
CABIN	JAR-E1-2	
Lakes	GRL-1	9
Lakes	GAL-1	10
Lakes	NAL-1	4
Lakes	JOL-1	7
Lakes	ISL-1	9
Lakes	SHL-1	4
Lakes	CHL-1	3
Lakes	MCL-1	3
Lakes	KEL-1	5
Tributaries	CAR-D2	10
Tributaries	BCR-D1	6
Tributaries	CLR-D1	8
Tributaries	CLR-D2	3
Tributaries	ELR-D1	6
Tributaries	FIR-D1	5
Tributaries	BER-D2	9
Tributaries	POC-D1	4
Tributaries	CHR-D3	5
Tributaries	CHRD-1	3
Tributaries	CHRD-2	8
Tributaries	CHRD-4	4
Tributaries	SAC-D1	9
Tributaries	SUC-D1	5
Tributaries	SUC-D2	6
Tributaries	UNC-D2	4
Tributaries	CAR-D1	7
Tributaries	UNC-D3	7
Tributaries	JAC-D1	5
Tributaries	JAC-D2	1
Tributaries	MUR-D2	1
Tributaries	MUR-D3	1
Tributaries	TAR-D1	4
Tributaries	BIC-D1	5
Tributaries	EYC-D1	3
Tributaries	PIR-D1	7
Tributaries	TAR-D1	8

Taxonomic Effort

Taxonomists at Cordillera Consulting identify organisms based on The Standard Taxonomic Effort lists compiled by the CABIN manual⁴, SAFIT², and PNAMP³ where the condition and maturity of the organism enabled.

A summary of major levels of identification is listed below.

Table 2: Standard Taxonomic Effort

Group	Taxa	Level of Identification
Insects	Coleoptera	Genus
	Chironomidae	Genus
	Diptera	Genus
	Ephemeroptera	Genus
	Heteroptera	Genus
	Lepidoptera	Genus
	Megaloptera	Genus
	Odonata	Genus
	Plecoptera	Genus
	Trichoptera	Genus
Non-Insects	Amphipoda	Family/Genus
	Bryozoa	Phylum
	Bivalvia	Genus
	Cnidaria	Family/Genus
	Collembola	Family/Genus
	Decapoda	Family/Genus
	Gastropoda	Genus
	Hirudinea	Family/Genus
	Hydrachnidae	Family/Genus
	Isopoda	Family/Genus
	Clitellata (Oligochaeta)	Family/Genus
	Polychaeta	Family/Genus
	Cladocera	
	Copepoda	
	Ostracoda	
	Nemata	
	Terrestrial (Non-aquatic)	
	Porifera	
Platyhelminthes		

- Chironomidae was identified to genus/species level where possible and was aided by slide mounts. CMC-10 was used to clear and mount the slides.
- Oligochaeta was identified to family/genus level with the aid of slide mounts. CMC-10 was used to clear and mount the slides.

QAQC Protocols

Quality control protocol involved complete, blind re-identification and re-enumeration by a SFS-certified taxonomist.

Samples for taxonomic quality control were randomly selected.

The auditing taxonomist calculated and recorded three types of errors:

1. Misidentification error
2. Enumeration error
3. Resolution error

These errors were used to conduct 3 separate measures of accuracy:

a) The percent total identification error rate (% Error) is calculated as:

$$\frac{\text{Sum of incorrect identifications}}{\text{total organisms counted in audit}} * (100)$$

The acceptable identification error rate of audited samples should not exceed 5%.

b) Percent difference in enumeration (PDE) which quantifies the consistency of specimen counts in samples. Acceptable limits for $PDE \leq 5$.

*Where resolution within a genus was the only difference in identification those numbers were included in the calculation of PTD

$$PDE = 100x \frac{|n_1 - n_2|}{n_1 + n_2}$$

c) Percent taxonomic disagreement (PTD) quantifies the precision between two taxonomists by comparing the level of taxonomic results. Acceptable limits for $PTD \leq 15$.

$$PTD = \left(1 - \left[\frac{a}{N}\right]\right) * 100$$

Error Summary

Table 3: Summary of taxonomic error following QC. Red* indicates where QC audit has failed to meet acceptable limits.

Site	Coarse			Fine		
	% Error	PDE	PTD	% Error	PDE	PTD
GRL-1	4.8	0.0	10	10.7*	0.0	11
GAL-1	4.7	0.9	6	3.6	3.1	13
NAL-1	20.0*	0.0	7	0.0	0.5	4
JOL-1	0.0	0.0	6.1	0.0	0.0	11
ISL-1	35.7*	3.7	43*	0.0	0.0	5
SHL-1	0.0	0.0	14	0.0	0.9	2
CHL-1	0.0	1.1	2	0.0	0.0	2
MCL-1	0.0	0.0	0	1.4	2.0	8
KEL-1	0.0	0.5	2	4.6	0.3	9
FLC-1	0.0	1.5	9	0.0	1.1	2
EMR-2	0.0	0.0	8	1.5	0.0	2
CAR-D2	0.0	1.10	3	0.0	1.8	3
BCR-D1	0.0	0.0	0	0.0	0.0	0
CLR-D1	0.0	0.0	0	0.0	2.4	5
CLR-D2	0.0	0.0	16*	0.0	9.6	19*
ELR-D1	na	na	na	0.0	0.0	0
FIR-D1	0.0	0.0	0	0.0	0.0	0
BER-D2	0.0	0.0	0	2.0	0.5	6
POC-D1	na	na	na	0.0	0.0	0
CHR-D3	na	na	na	0.0	0.48	1
CHRD-1	0.0	1.2	2	0.0	0.8	2
CHRD-2	0.0	33.3*	50*	0.0	0.0	0
CHRD-4	0.0	3.7	7	0.0	1.4	5
SAC-D1	0.0	0.0	15	1.3	0.0	11
SUC-D1	0.0	0.0	50*	0.0	0.0	1
SUC-D2	0.0	1.54	3	6.8*	0.0	7
UNC-D2	0.0	0.0	0	8.3*	0.0	13
CAR-D1	0.0	1.4	5	0.0	0.0	3
UNC-D3	0.0	0.0	0	0.0	0.0	0
JAC-D1	0.0	0.0	3	4.0	0.8	9
JAC-D2	0.0	0.0	3	1.8	0.5	4
MUR-D2	3.3	0.0	5	0.0	0.0	8
MUR-D3	0.8	0.4	2	2.4	0.0	5
TAR-D1	na	na	na	0.0	0.0	0
BIC-D1	0.0	0.0	0	0.0	0.0	2
EYC-D1	0.0	0.0	0	0.0	0.0	0
PIR-D1	20.0*	9.1*	33*	0.0	0.5	4
TAR-D1	na	na	na	0.0	0.8	2
HHR-E1	na	na	na	0.0	0.0	0
JAR-E1-1	na	na	na	0.0	0.0	0
JAR-E1-2	na	na	na	0.0	0.0	0

Error Rationale

There will always be disagreements between taxonomists regarding the degree of taxonomic resolution in immature and small specimens and when laboratories make use of different keys for certain groups. Cordillera taxonomists follow lists of Standard Taxonomic Effort and will identify to the prescribed level of identifications outlined in those lists (CABIN manual⁴, SAFIT², and PNAMP³). It is always possible that some taxa found by the original taxonomist were overlooked in QC as organisms are lost in transfer. Identification within certain groups carry discrepancy due to the inherent difficulty of identification such as in Chironomidae, Oligochaeta and Mollusca.

Common enumeration errors were found throughout the project. The following table lists some of the systemic errors through the project and provides rational for samples that did not meet acceptable limits or error. Other notes can be found in the appended spreadsheet provided.

Site	Error Rational
GRL-1	<ul style="list-style-type: none"> Differences in Ceratopogonidae genera are distinguished by the length of anal saetae and can be subjective. This is a disputed group. Reference: Merritt, R.W., K.W. Cummins, M. B. Berg. (2007) Keys for Order Amphipoda have suggested leaving identification at genus level. Cordillera taxonomists followed the STE outline for this group so difference arose in taxonomic resolution. Reference: Ecoanalysts Inc (2008); Thorp and Rogers (2016) Differences in Menetus and Promenetus identification were due to the presence of the medial keel. Reference: Merritt, R.W., K.W. Cummins, M. B. Berg. (2007)
NAL-1	<ul style="list-style-type: none"> Differences in Ceratopogonidae genera are distinguished by the length of anal saetae and can be subjective. This is a disputed group. Reference: Merritt, R.W., K.W. Cummins, M. B. Berg. (2007)
ISL-1	<ul style="list-style-type: none"> Cordillera identified all <i>Einfeldia</i> as <i>Chironomus</i>. All the chironomids for this sample were slide mounted by Cordillera taxonomists and checked by 2 auditors.
CRL-D2	<ul style="list-style-type: none"> At genus level organisms in Order Bivalvia are distinguished based on symmetry, which can be subjective and difficult to determine in smaller organisms. Cordillera taxonomists were confident leaving identification at the family level which caused resolution errors.
CHRD-2	<ul style="list-style-type: none"> Errors in this sample were skewed because of the low number of organisms
SUC-D1	<ul style="list-style-type: none"> Errors in this sample were skewed because of the low number of organisms
SUC-D2	<ul style="list-style-type: none"> Cordillera taxonomists keyed organisms from Order Cladocera to genus <i>Ilyocryptus</i> using Reference: Thorp and Rogers (2016). This is the most recent key available
UNC-D2	<ul style="list-style-type: none"> Cordillera taxonomists keyed organisms from Order Cladocera to genus <i>Ilyocryptus</i> using Reference: Thorp and Rogers (2016). This is the most recent key available
PIR-D1	<ul style="list-style-type: none"> Differences in Ceratopogonidae genera are distinguished by the length of anal saetae and can be subjective. This is a disputed group. Reference: Merritt, R.W., K.W. Cummins, M. B. Berg. (2007) This sample also had resolution errors in Order Trichoptera where Cordillera Taxonomists were able to identify to family level.

Discussion

Cordillera Taxonomists found that overall there was acceptable alignment of taxonomic identification between the original taxonomist and our audit, with the exception of a few resolution discrepancies.

References

¹ Society for Freshwater Science Taxonomic Certification Program. Quality Control Procedure for Sample-Based Taxonomic Effort. www.freshwater-science.org.

² Southwest Association of Freshwater Invertebrate Taxonomists. (2015). www.safit.org

³ Pacific Northwest Aquatic Monitoring Partnership (Accessed 2015). www.pnamp.org

⁴ McDermott, H., Paull, T., Strachan, S. (May 2014). Laboratory Methods: Processing, Taxonomy, and Quality Control of Benthic Macroinvertebrate Samples, Environment Canada. ISBN: 978-1-100-25417-3

Taxonomic Keys

Cordillera taxonomists routinely seek out new literature to ensure the most accurate identification keys are being utilized. Texts listed below are not reflective of the exhaustive list of resources that we use for identification. A more complete list of taxonomic resources can be found at Southwest Association of Freshwater Invertebrate Taxonomists. (2015). <http://www.safit.org>

Brook, Arthur R. and Leonard A. Kelton. 1967. Aquatic and semiaquatic Heteroptera of Alberta, Saskatchewan and Manitoba (Hemiptera) *Memoirs of the Entomological Society of Canada*. No. 51.

Brown HP & White DS (1978) Notes on Separation and Identification of North American Riffle Beetles (Coleoptera: Dryopidea: Elmidae). *Entomological News* 89 (1&2): 1-13

Clifford, Hugh F. 1991. *Aquatic Invertebrates of Alberta*. University of Alberta Press Edmonton, Alberta.

EcoAnalysts Inc. 2008. Key to the Freshwater Malacostraca (Crustacea) of the Mid-Atlantic Region. Prepared for U.S Environmental Protection Agency.

Epler, John. 2001 *The Larval Chironomids of North and South Carolina*. <http://home.earthlink.net/~johneppler/>

Epler, John. *Identification Manual for the Water Beetles of Florida*. <http://home.earthlink.net/~johneppler/>

Epler, John. *Identification Manual for the Aquatic and Semi-aquatic Heteroptera of Florida*. <http://home.earthlink.net/~johneppler/>

Jacobus, Luke and Pat Randolph. 2005. Northwest Ephemeroptera Nymphs. Manual from Northwest Biological Assessment Working Group. Moscow Idaho 2005. Not Published.

Jacobus LM, McCafferty WP (2004) Revisionary Contributions to the Genus *Drunella* (Ephemeroptera : Ephemerellidae). *Journal of the New York Entomological Society* 112: 127-147

Jacobus LM, McCafferty WP (2003) Revisionary Contributions to North American *Ephemerella* and *Serratella* (Ephemeroptera : Ephemerellidae). *Journal of the New York Entomological Society* 111 (4): 174-193.

- Kathman, R.D., R.O. Brinkhurst. 1999. Guide to the Freshwater Oligochaetes of North America. Aquatic Resources Center, College Grove, Tennessee.
- Larson, D.J., Y. Alarie, R.E. Roughly. 2005. Predaceous Diving Beetles (Coleoptera: Dytiscidae) of the Nearctic Region. NRC-CNRC Research Press. Ottawa.
- Merritt, R.W., K.W. Cummins, M. B. Berg. (eds.). 2007. An introduction to the aquatic insects of North America, 4th. Kendall/Hunt, Dubuque, IA
- Morihara DK, McCafferty WP (1979) The Baetis Larvae of North American (Ephemeroptera: Baetidae). Transactions of the American Entomological Society 105: 139-221.
- Needham, James, M. May, M. Westfall Jr. 2000. Dragonflies of North America. Scientific Publishers. Gainesville FL.
- Prescott David, R.C. and Medea M. Curteanu. 2004. Survey of Aquatic Gastropods of Alberta. Species at Risk Report No. 104. ISSN: 1496-7146 (Online Edition)
- Needham, K. 1996. An Identification Guide to the Nymphal Mayflies of British Columbia. Publication #046 Resource Inventory Committee, Government of British Columbia.
- Oliver, Donald R. and Mary E. Roussel. 1983. The Insects and Arachnids of Canada Part 11. The Genera of larval midges of Canada. Biosystematics Research Institute. Ottawa, Ontario. Research Branch, Agriculture Canada. Publication 1746.
- Proctor, H. The 'Top 18' Water Mite Families in Alberta. Zoology 351. University of Alberta, Edmonton, Alberta.
- Rogers, D.C. and M. Hill, 2008. Key to the Freshwater Malacostraca (Crustacea) of the mid-Atlantic Region. EPA-230-R-08-017. US Environmental Protection Agency, Office of Environmental Information, Washington, DC.
- Stewart, Kenneth W. and Bill Stark. 2002. The Nymphs of North American Stonefly Genera (Plecoptera). The Caddis Press. Columbus Ohio.
- Stewart, Kenneth W. and Mark W. Oswood. 2006 The Stoneflies (Plecoptera) of Alaska and Western Canada. The Caddis Press.
- Stonedahl, Gary and John D. Lattin. 1986. The Corixidae of Oregon and Washington (Hemiptera: Heteroptera). Technical Bulletin 150. Oregon State University, Corvallis Oregon.
- Thorp, J. H. and A. P. Covich [Eds.] 1991. Ecology and classification of North American freshwater invertebrates. Academic Press, San Diego.
- Thorp and Rogers. (Eds). 2016. Keys to Nearctic Fauna. 4th Ed. Vol II. Academic Press, London, UK.
- Tinerella, Paul P. and Ralph W. Gunderson. 2005. The Waterboatmen (Insecta: Heteroptera: Corixidae) of Minisota. Publication No.23 Dept. Of Entomology, North Dakota State University, Fargo, North Dakota, USA.
- Trond Andersen, Peter S. Cranston & John H. Epler (Eds) (2013) Chironomidae of the Holarctic Region: Keys and Diagnoses. Part 1. Larvae. *Insect Systematics and Evolution Supplements* 66: 1-571.
- Weiderholm, Torgny (Ed.) 1983. The larvae of Chironomidae (Diptera) of the Holarctic region. Entomologica Scaninavica. Supplement No. 19.
- Westfall, Minter J. Jr. and May, Michael L. 1996. Damselflies of North America. Scientific Publishers, Gainesville, FL.
- Wiggins, Glenn B. 1998. Larvae of the North American Caddisfly Genera (Tricoptera) 2nd ed. University of Toronto Press. Toronto Ontario.

Appendix C

**Climate and Hydrology
Component**

C CLIMATE AND HYDROLOGY COMPONENT

This appendix summarizes data collected for the JOSMP Climate and Hydrology component in the 2015 water year (WY). The 2015 WY was defined as the period from November 1, 2014 to October 31, 2015. The appendix includes descriptions of the climate and hydrometric stations used to collect these data, along with other station-related information.

C.1 2015 CLIMATE AND HYDROLOGY STATIONS

A list of the climate and hydrometric stations is provided in Table C.1-1.

Table C.1-1 Climate, hydrometric, and snowcourse stations monitored for the JOSMP during the 2015 WY.

Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
C1	Aurora Climate Station	475229	6344053	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, wind speed and direction
C2	Horizon Climate Station	443364	6360510	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, barometric pressure, wind speed and direction
C3	Steepbank Climate Station	473950	6320500	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, barometric pressure, wind speed and direction
C4	Pierre Climate Station	460898	6378737	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, barometric pressure, wind speed and direction
C5	Surmont Climate Station	502542	6230964	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, barometric pressure, wind speed and direction
L1	McClelland Lake	483398	6372186	all year	water level, total precipitation, relative humidity, air temperature, water temperature
L2	Kearl Lake	484815	6351080	all year	water level, total precipitation, relative humidity, air temperature, water temperature
L4	Namur Lake near the outlet	402886	6370260	all year	water level, discharge, water temperature
S2	Jackpine Creek at Canterra Road	474971	6344091	all year	water level, discharge, water temperature
S3	Iyininim Creek above Kearl Lake	489423	6345196	open-water	water level, discharge, rainfall, water temperature

¹ Station began operation during the 2015 open-water season.

² Station operated by WSC.

Table C.1-1 (Cont'd.)

Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
S5	Muskeg River above Stanley Creek	479761	6356759	all year	water level, discharge, water temperature
S5A	Muskeg River above Muskeg Creek	476042	6351803	all year	water level, discharge, barometric pressure, water temperature
07DA008/S07	Muskeg River near Fort McKay	465552	6338804	all year ¹	water level, discharge, water temperature
S9	Kearl Lake Outlet	483983	6347020	all year	water level, discharge, water temperature
S10A	Wapasu Creek near the mouth	488573	6358554	all year	water level, discharge, water temperature
S11	Poplar Creek at Highway 63 (07DA007)	471972	6307825	all year	water level, discharge, water temperature
S12	Fort Creek at Highway 63	462620	6363554	open-water	water level, discharge, water temperature
S14A	Ells River at the CNRL Bridge	455738	6344944	all year	water level, discharge, water temperature
S15A	Tar River near the mouth	458458	6353439	open-water	water level, discharge, water temperature
S16A	Calumet River near the mouth	458096	6362020	open-water	water level, discharge, water temperature
S20A	Muskeg River Upland	492230	6354940	open-water	water level, discharge, water temperature
S22	Muskeg Creek near the mouth	480969	6349071	all year	water level, discharge, water temperature
07DB001/S26	MacKay River near Fort McKay	458019	6341008	all year ¹	discharge
07DC001/S27	Firebag River near the mouth	487914	6389855	all year ¹	discharge
07CE002/S29	Christina River near Chard	508211	6187940	all year ¹	discharge
S31	Hangingstone Creek at North Star Road	469812	6236089	open-water	water level, discharge, rainfall, water temperature
S32	Surmont Creek at Highway 881	490250	6254524	open-water	water level, discharge, water temperature
S33	Muskeg River at the Aurora North/MRM Boundary	474878	6350204	all year	water level, discharge, water temperature
S34	Tar River above CNRL Lake	440745	6361662	all year	water level, discharge, water temperature
S36	McClelland Lake Outlet above Firebag River	490635	6384056	all year	water level, discharge, water temperature
S37	East Jackpine Creek near the 1300 ft. contour	487850	6325416	open-water	water level, discharge, water temperature
07DA006/S38	Steepbank River near Fort McMurray	475296	6317398	all year ¹	discharge
07DA018/S39	Beaver River above Syncrude	465560	6311437	all year ¹	discharge
S40	MacKay River at Petro-Canada Bridge	444949	6314178	all year	water level, discharge, rainfall, water temperature

¹ Station began operation during the 2015 open-water season.

² Station operated by WSC.

Table C.1-1 (Cont'd.)

Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
07DD001/S46	Athabasca River at the Embarras Airport	470241	6463208	all year ¹	discharge
S47A	Christina River near the mouth	505048	6272065	all year	water level, discharge, water temperature
S48	Big Creek	470817	6389113	open-water	water level, discharge, water temperature
S49	Eymundson Creek near the mouth	465473	6372694	open-water	water level, discharge, water temperature
S50A	Redclay Creek	474881	6400224	open-water	water level, discharge, water temperature
S51	High Hills River near the mouth	533925	6291921	all year	water level, discharge, water temperature
S53	Dover River near the mouth	451453	6337015	all year	water level, discharge, water temperature
S54	Dunkirk River near Fort MacKay	395815	6302066	all year	water level, discharge, water temperature
S55	Gregoire River near the mouth	510184	6259986	all year	water level, discharge, water temperature
S56	Jackfish River below Christina Lake	493741	6169693	all year	water level, discharge, water temperature
S57	Sunday Creek above Christina Lake	506210	6158391	all year	water level, discharge, water temperature
S58	Sawbones Creek above Christina Lake	511412	6167165	open-water	water level, discharge, water temperature
S60	Unnamed Creek South of Christina Lake	511145	6159877	open-water	water level, discharge, water temperature
S61	Christina River Above Statoi Leismer	466037	6193791	all year	water level, discharge, water temperature
S62	Birch Creek at Highway 881	492149	6163182	all year	water level, discharge, water temperature
S63	Sunday Creek at Highway 881	494283	6157255	all year	water level, discharge, water temperature
S64	Unnamed Creek East of Christina Lake	517644	6163643	open-water	water level, discharge, water temperature
S65	North Green Stockings Creek at East Athabasca Highway	489845	6333039	open-water	water level, discharge, water temperature
S66	Steepbank River below North Steepbank Confluence	491458	6302625	all year	water level, discharge, water temperature
07DC005/S42	Clearwater River above Christina River	504427	6279666	all year ¹	discharge
S43	Firebag River above Suncor Firebag	531704	6354796	all year	water level, discharge, rainfall, water temperature
S44	Pierre River near Fort McKay (Formerly 07DA013)	460769	6369299	open-water	water level, discharge, water temperature
S45	Ells River above Joslyn Creek Diversion	440325	6342418	all year	water level, discharge, water temperature

¹ Station began operation during the 2015 open-water season.

² Station operated by WSC.

Table C.1-1 (Cont'd.)

Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
CANR-JP-A	Canterra Road - Jackpine	483996	6347096	winter	snow depth, snow water equivalent
CANR-MD-A	Canterra Road – Mixed Deciduous	484720	6351034	winter	snow depth, snow water equivalent
CANR-FL-A	Canterra Road – Flat, Low-Lying	484780	6351200	winter	snow depth, snow water equivalent
CANR-OP-A	Canterra Road – Open	484961	6351023	winter	snow depth, snow water equivalent
NEX-OP-A	Nexen – Open	508424	6252327	winter	snow depth, snow water equivalent
NEX-FL-A	Nexen – Flat, Low-Lying	508410	6252086	winter	snow depth, snow water equivalent
NEX-JP-A	Nexen - Jackpine	508747	6251781	winter	snow depth, snow water equivalent
NEX-MD-A	Nexen – Mixed Deciduous	508954	6251566	winter	snow depth, snow water equivalent
CNRL-MD-A	CNRL – Mixed Deciduous	443492	6360713	winter	snow depth, snow water equivalent
CNRL-OP-A	CNRL – Open	443019	6360667	winter	snow depth, snow water equivalent
CNRL-JP-A	CNRL – Jackpine	440856	6361728	winter	snow depth, snow water equivalent
CNRL-FL-A	CNRL – Flat, Low-Lying	440918	6361759	winter	snow depth, snow water equivalent
MCLL-MD-A	McClelland Lake – Mixed Deciduous	483431	6372120	winter	snow depth, snow water equivalent
MCLL-OP-A	McClelland Lake – Open	483350	6372121	winter	snow depth, snow water equivalent
MCLL-JP-A	McClelland Lake – Jackpine	482898	6369515	winter	snow depth, snow water equivalent
MCLL-FL-A	McClelland Lake – Flat, Low-Lying	482843	6369496	winter	snow depth, snow water equivalent

¹ Station began operation during the 2015 open-water season.

² Station operated by WSC.

Note: Canterra Road snow course stations were located on or near Kearn Lake, McClelland Lake snow course stations were located on or near McClelland Lake, Nexen snow course stations were located on or near Sucker Lake (located on the Nexen Long Lake property), and CNRL snow course stations were located on or near Horizon Lake (located on the CNRL Horizon property).

C.2 CLIMATE DATA COLLECTED IN THE 2015 WATER YEAR

Climate data were collected in the region during the 2015 WY by the JOSMP, Environment Canada, and other organizations. This appendix focuses on data collected at JOSMP stations and incorporates data from government agencies to provide context and supplement the JOSMP information.

C.2.1 JOSMP Climate Data

In the 2015 WY, JOSMP collected climate data from five comprehensive climate stations, climate sensors at two JOSMP lake stations, and through the use of four additional rainfall stations located in conjunction with select JOSMP hydrometric stations. The following sections of this appendix present the data collected during the 2015 WY.

C.2.1.1 Aurora Climate Station (C1)

The Aurora climate station (C1) is located in the Muskeg River watershed and monitored air temperature, wind speed and direction, total precipitation, solar radiation, and relative humidity during the 2015 WY. Table C.2-1 lists the data collected at the station. Monthly summary statistics for the 2015 WY are presented in Table C.2-2, and collected data are provided in the database on the RAMP website.

Table C.2-1 Data collected at the JOSMP Aurora Climate Station (C1), 2015 WY.

Climate Element and Sensor	Variable	Units	Derivation
Air Temperature - Rotronic HC2-S3 thermistor	Minimum	°C	Minimum of 1 minute means from readings every 5 sec.
	Mean	°C	Mean of readings every 5 sec.
	Maximum	°C	Maximum of 1 minute means from readings every 5 sec.
Total Precipitation - OTT Pluvio2 weighing precipitation gauge	Total	mm	Sum of 0.01 mm readings.
Depth of Snow on Ground - Campbell Scientific SR50 sonic level sensor	Total	cm	Mean of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity - Rotronic HC2-S3 humidity sensor	Mean	%	Mean of readings every 5 sec.
Global Solar Radiation - Licor pyranometer	Mean	W/m ²	Mean of readings every 5 sec.
Wind Speed and Direction - RM Young 05103-19 wind vane and propeller	Mean Direction	degrees	Direction of daily mean wind vector from readings averaged every 5 sec.
	Mean Speed	km/h	Daily mean wind speed from readings averaged every 5 sec.
	Peak Gust Speed	km/h	Maximum scalar wind speed from 5 sec readings.
	2 min. Gust Speed	km/h	Maximum of 2 minute scalar wind speed means from readings every 5 sec.
	10 min. Gust Speed	km/h	Maximum of 10 minute scalar wind speed means from readings every 5 sec.
Datalogger Type		Telemetry Type	
Campbell Scientific CR1000		Raven HSPA Cellular Modem	

Table C.2-2 Summary of monthly climate data collected at the JOSMP Aurora Climate Station (C1) during the 2015 WY.

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Global Solar Radiation (W/m ²)	Average Wind Speed (km/h)	Average Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)								2 min. (km/h)	10 min. (km/h)
Nov-2014	-29.5	-11.7	8.4	6.2	9.9	82.4	14.8	6.2	177	46.8	33.1	28.4
Dec-2014	-34.5	-13.8	2.1	8.6	17.0	86.4	2.7	3.1	154	32.4	24.7	19.7
Jan-2015	-33.8	-15.3	5.8	27.2	21.8	82.7	6.2	4.9	154	33.9	24.4	21.8
Feb-2015	-37.5	-17.5	0.2	17.9	40.7	74.6	31.4	6.0	140	33.2	25.0	22.7
Mar-2015	-31.9	-4.7	17.0	20.8	23.8	69.9	91.2	5.6	151	55.3	42.3	36.0
Apr-2015	-15.5	4.7	26.1	2.3	0.0	48.3	173.2	7.7	154	50.7	36.7	30.2
May-2015	-4.9	11.5	30.1	26.4	0.0	45.9	246.8	6.2	153	44.7	34.1	30.1
Jun-2015	-1.1	17.2	33.9	26.9	0.0	56.2	241.6	5.7	185	57.4	37.8	31.3
Jul-2015	5.2	17.9	33.0	64.5	0.0	70.3	185.2	4.7	195	56.2	34.7	27.9
Aug-2015	1.4	17.1	30.9	19.6	0.0	67.7	160.1	4.7	188	43.6	28.7	23.3
Sep-2015	-3.3	9.3	24.0	55.3	0.0	73.9	92.9	4.4	186	49.9	35.1	27.8
Oct-2015	-5.3	5.1	25.5	5.5	0.0	74.6	45.9	5.9	170	50.7	34.4	28.8
2015 WY Annual	-15.9	1.6	19.8	281.3	-	69.4	107.6	5.4	167	46.2	32.6	27.3

Note: E = Estimated; M = Missing; A = Partial Average; See additional notes in sections C.2.1.1 and C.2.1.7.

C.2.1.2 Horizon Climate Station (C2)

The Horizon climate station (C2) is located in the Tar River watershed and was established in October 2008 and became fully operational in June 2009. The Horizon station monitored air temperature, wind speed and direction, solar radiation, relative humidity, barometric pressure, snow depth, and total precipitation during the 2015 WY. Table C.2-3 lists the data collected at the station. Monthly summary statistics for the 2015 WY are presented in Table C.2-4, and collected data are provided in the database on the RAMP website.

Table C.2-3 Data collected at the JOSMP Horizon Climate Station (C2), 2015 WY.

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature - HMP45C212 thermistor	Minimum	°C	Minimum of 1 minute means from readings every 5 seconds.
	Mean	°C	Mean of readings every 5 seconds.
	Maximum	°C	Maximum of 1 minute means from readings every 5 seconds.
Total Precipitation - Geonor weighing precipitation gauge	Total	mm	Sum of 0.05 mm readings every 15 minutes.
Depth of Snow on Ground - Campbell Scientific SR50 sonic level sensor	Total	cm	Mean of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity - HMP45C212 humidity sensor	Mean	%	Mean of readings every 5 seconds.
Global Solar Radiation - Kipp and Zonen SP Lite 2 pyranometer	Mean	W/m ²	Mean of readings every 5 seconds.
Barometric pressure - RM Young 61302V barometric pressure sensor	Mean	kPa	Mean of readings every 5 seconds.
Wind Speed and Direction - RM Young 05103-10 wind vane and propeller	Mean Direction	degrees	Direction of daily mean wind vector from readings averaged every 5 seconds.
	Mean Speed	km/h	Daily mean wind speed from readings averaged every 5 seconds.
	Peak Gust Speed	km/h	Maximum scalar wind speed from 5 second readings.
	2 min. Gust Speed	km/h	Maximum of 2 minute scalar wind speed means from readings every 5 seconds.
	10 min. Gust Speed	km/h	Maximum of 10 minute scalar wind speed means from readings every 5 seconds.
Datalogger Type		Telemetry Type	
Campbell Scientific CR1000		Raven X HSPA Cellular Modem	

Table C.2-4 Summary of monthly climate data collected at the JOSMP Horizon Climate Station (C2) during the 2015 WY.

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Global Solar Radiation (W/m ²)	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov-2014	-31.6	-12.3	10.5	2.6	11.9	83.9	34.2	96.9	6.6	203	54.1	36.6	33.5
Dec-2014	-33.2	-13.7	4.4	1.7	18.6	90.2	14.4	94.9	5.3	194	41.8	29.7	28.3
Jan-2015	-33.8	-15.0	8.7	11.8	25.4	84.7	25.7	98.3	5.6	188	55.7	40.2	36.0
Feb-2015	-35.8	-17.7	2.1	8.9	43.5	79.0	61.4	97.3	6.7	176	33.5	24.8	21.6
Mar-2015	-30.1	-4.3	16.7	25.8	12.4	69.5	119.7	96.1	7.7	196	56.9	40.7	35.1
Apr-2015	-16.8	4.0	24.0	4.5	0.0	50.5	216.7	96.3	9.9	190	58.9	43.3	35.9
May-2015	-5.2	11.1	29.0	8.4	0.0	46.3	275.5	97.0	8.5	175	44.1	28.2	25.8
Jun-2015	-2.1	16.2	32.1	32.5	0.0	59.6	260.7	96.4	7.3	219	46.3	33.7	26.7
Jul-2015	3.7	17.2	30.6	0.0	0.0	71.2	186.4	96.1	6.4	224	45.2	32.5	30.7
Aug-2015	1.3	15.9	29.3	0.0	0.0	71.5	171.8	96.2	6.7	226	45.7	30.8	24.7
Sep-2015	-4.4	8.5	24.2	3.0	0.0	75.0	115.4	96.1	6.6	237	51.8	33.3	26.7
Oct-2015	-6.1	4.4	26.2	2.0	0.0	76.3	64.5	96.3	7.5	208	48.8	35.5	31.9
2015 WY Annual	-16.2	1.2	19.8	101.2		71.5	128.9	96.5	7.1	203	48.6	34.1	29.7

Note: E = Estimated; M = Missing; A = Partial Average. See additional notes in sections C.2.1.2 and C.2.1.7.

C.2.1.3 Steepbank Climate Station (C3)

The Steepbank climate station (C3) is located in the Steepbank River watershed and was upgraded to a full climate station in November 2010. During the 2015 WY, air temperature, wind speed and direction, solar radiation, relative humidity, barometric pressure, snow depth, and total precipitation data were collected at this station as described in Table C.2-5. Monthly summary statistics for the 2015 WY are presented in Table C.2-6, and collected data are provided in the database on the RAMP website.

Table C.2-5 Data collected at the JOSMP Steepbank Climate Station (C3), 2015 WY.

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature - Rotronic HC2-S3 thermistor	Minimum	°C	Minimum of 1 minute means from readings every 5 sec.
	Mean	°C	Mean of readings every 5 sec.
	Maximum	°C	Maximum of 1 minute means from readings every 5 sec.
Total Precipitation - OTT Pluvio2 weighing precipitation gauge	Total	mm	Sum of 0.01 mm readings.
Depth of Snow on Ground - Campbell Scientific SR50 sonic level sensor	Total	cm	Mean of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity - Rotronic HC2-S3 humidity sensor	Mean	%	Mean of readings every 5 sec.
Global Solar Radiation - Kipp and Zonen SP Lite 2 pyranometer	Mean	W/m ²	Mean of readings every 5 sec.
Barometric pressure - RM Young 61302V barometric pressure sensor	Mean	kPa	Recorded for every minute and averaged per 1 hour.
Wind Speed and Direction - RM Young 05103-10 wind vane and propeller	Mean Direction	degrees	Direction of daily mean wind vector from readings averaged every 5 sec.
	Mean Speed	km/h	Daily mean wind speed from readings averaged every 5 sec.
	Peak Gust Speed	km/h	Maximum scalar wind speed from 5 sec readings.
	2 min. Gust Speed	km/h	Maximum of 2 minute scalar wind speed means from readings every 5 sec.
	10 min. Gust Speed	km/h	Maximum of 10 minute scalar wind speed means from readings every 5 sec.
Datalogger Type		Telemetry Type	
Campbell Scientific CR1000		Raven X HSPA Cellular Modem	

Table C.2-6 Summary of monthly climate data collected at the JOSMP Steepbank Climate Station (C3) during the 2015 WY.

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Total Global Solar Radiation (W/m ²)	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov-2014	-30.0	-11.7	9.9	9.5	12.4	84.5	26.7	98.1	7.4	183	46.9	33.8	28.3
Dec-2014	-34.5	-13.4	4.0	12.2	23.2	87.7	13.2	97.6	6.4	167	36.8	26.9	24.1
Jan-2015	-36.8	-14.8	6.4	24.7	24.8	83.6	17.3	98.0	7.0	163	42.6	33.3	29.0
Feb-2015	-39.4	-17.5	1.5	16.1	47.5	76.3	51.6	98.5	8.6	153	46.6	38.6	34.3
Mar-2015	-32.1	-4.2	15.5	16.9	0.0	70.4	108.0	97.3	7.6	154	58.7	44.2	37.5
Apr-2015	-16.9	4.8	24.0	3.4	0.0	48.8	192.8	97.4	10.3	155	50.0	37.9	33.8
May-2015	-4.1	11.2	28.9	21.4	0.0	49.0	254.6	98.0	9.2	137	53.3	42.7	35.6
Jun-2015	-1.5	16.8	32.2	38.7	0.0	58.5	248.7	97.4	7.8	174	54.7	41.6	35.8
Jul-2015	3.3	17.7	31.9	76.4	0.0	71.0	185.9	97.0	6.5	191	51.3	34.6	31.7
Aug-2015	2.7	17.1	30.5	20.6	0.0	66.9	171.0	97.2	7.2	191	41.1	28.8	23.6
Sep-2015	-3.9	9.5	24.2	48.8	0.0	73.2	107.0	97.1	7.1	181	53.7	26.7	21.9
Oct-2015	-5.3	5.6	26.1	8.2	0.0	73.5	63.1	97.3	8.0	180	42.8	27.7	24.3
2015 WY Annual	-16.5	1.8	19.6	296.8	-	70.3	120.0	97.6	7.8	169	48.2	34.7	30.0

Note: E = Estimated; M = Missing; A = Partial Average. See additional notes in sections C.2.1.3 and C.2.1.7.

C.2.1.4 Pierre Climate Station (C4)

The Pierre climate station (C4) is located in the Pierre River watershed and was installed on July 25, 2011. This station monitored air temperature, wind speed and direction, solar radiation, relative humidity, barometric pressure, snow depth, and total precipitation during the 2015 WY. Table C.2-7 provides a list of the data collected at the station. Monthly summary statistics for the 2015 WY are presented in Table C.2-8, and collected data are provided in the database on the RAMP website.

Table C.2-7 Data collected at the JOSMP Pierre Climate Station (C4), 2015 WY.

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature - HMP45C212 thermistor	Minimum	°C	Minimum of 1 minute means from readings every 5 sec.
	Mean	°C	Mean of readings every 5 sec.
	Maximum	°C	Maximum of 1 minute means from readings every 5 sec.
Total Precipitation - OTT Pluvio2 weighing precipitation gauge	Total	mm	Sum of 0.01 mm readings
Depth of Snow on Ground - Campbell Scientific SR50 sonic level sensor	Total	cm	Average of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity - HMP45C212 humidity sensor	Mean	%	Mean of readings every 5 sec.
Global Solar Radiation - Kipp and Zonen SP Lite 2 pyranometer	Mean	W/m ²	Mean of readings every 5 sec.
Barometric pressure - RM Young 61205V barometric pressure sensor	Mean	kPa	Mean of readings every 5 sec.
Wind Speed and Direction - RM Young 05103-10 wind vane and propeller	Mean Direction	degrees	Direction of daily mean wind vector from readings averaged every 5 sec.
	Mean Speed	km/h	Daily mean wind speed from readings averaged every 5 sec.
	Peak Gust Speed	km/h	Maximum scalar wind speed from 5 sec readings.
	2 min. Gust Speed	km/h	Maximum of 2 minute scalar wind speed means from readings every 5 sec.
	10 min. Gust Speed	km/h	Maximum of 10 minute scalar wind speed means from readings every 5 sec.
Datalogger Type		Telemetry Type	
Campbell Scientific CR1000		Raven X HSPA Cellular Modem	

Table C.2-8 Summary of monthly climate data collected at the JOSMP Pierre Climate Station (C4) during the 2015 WY.

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Total Global Solar Radiation (W/m ²)	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov-2014	-33.6	-12.5	10.5	9.6	12.8	84.3	25.8	98.5	4.3	157	46.7	24.4	21.2
Dec-2014	-35.1	-14.3	1.7	17.1	21.7	88.5	11.9	98.0	3.8	162	37.8	21.5	16.8
Jan-2015	-35.6	-16.2	9.3	17.7	29.0	84.0	18.1	98.4	4.0	165	54.4	37.6	30.8
Feb-2015	-39.3	-18.2	1.0	22.4	40.2	76.9	46.2	98.9	4.5	146	34.2	20.3	16.2
Mar-2015	-33.7	-5.7	16.3	34.5	16.6	72.0	104.4	98.0	4.8	161	46.6	32.2	23.1
Apr-2015	-18.4	3.6	24.9	8.3	0.0	54.0	194.1	97.8	7.1	177	55.0	34.1	27.7
May-2015	-7.1	10.4	29.9	20.4	0.0	50.6	244.3	98.4	5.8	166	47.4	26.5	21.5
Jun-2015	-3.3	15.9	32.1	30.3	0.0	63.1	237.6	97.8	5.2	196	56	38.9	27.6
Jul-2015	1.6	16.6	29.9	68.7	0.0	76.4	174	97.5	4.1	195	44.6	25.5	19.1
Aug-2015	-2.6	15.6	29.7	28.3	0.0	74.2	163.3	97.6	4.5	215	46.8	27.7	23.8
Sep-2015	-6.4	7.9	25.1	55.3	0.0	77.6	108.2	97.6	4.3	218	46.2	33.1	25.6
Oct-2015	-7.8	4.1	25.9	12.8	0.0	78.3	59.8	97.7	5.1	186	47.5	33.7	26.5
2015 WY Annual	-18.4	0.6	19.7	325.3	-	73.3	115.6	98	4.8	179	46.9	29.6	23.3

Note: E = Estimated; M = Missing; A = Partial Average. See additional notes in sections C.2.1.4 and C.2.1.7.

C.2.1.5 Surmont Climate Station (C5)

The Surmont climate station (C5) is located in the Christina River watershed and was installed on October 16, 2011. During the 2015 WY, air temperature, relative humidity, total precipitation, snow depth, wind speed and direction, and barometric pressure data were collected at this station as described in Table C.2-9. Monthly summary statistics for the 2015 WY are presented in Table C.2-10 and collected data are provided in the database on the RAMP website.

Table C.2-9 Data collected at the JOSMP Surmont Climate Station (C5), 2015 WY.

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature - HMP45C212 thermistor	Minimum	°C	Minimum of 1 minute means from readings every 5 sec.
	Mean	°C	Mean of readings every 5 sec.
	Maximum	°C	Maximum of 1 minute means from readings every 5 sec.
Total Precipitation - OTT Pluvio2 weighing precipitation gauge	Total	mm	Sum of 0.01 mm readings
Depth of Snow on Ground - Campbell Scientific SR50 sonic level sensor	Total	cm	Mean of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity - HMP45C212 humidity sensor	Mean	%	Mean of readings every 5 sec.
Global Solar Radiation - Kipp and Zonen SP Lite 2 pyranometer	Mean	W/m ²	Mean of readings every 5 sec.
Barometric pressure - RM Young 61302V barometric pressure sensor	Mean	kPa	Mean of readings every 5 sec.
Wind Speed and Direction - RM Young 05103-10 wind vane and propeller	Mean Direction	degrees	Direction of daily mean wind vector from readings averaged every 5 sec.
	Mean Speed	km/h	Daily mean wind speed from readings averaged every 5 sec.
	Peak Gust Speed	km/h	Maximum scalar wind speed from 5 sec readings.
	2 min. Gust Speed	km/h	Maximum of 2 minute scalar wind speed means from readings every 5 sec.
	10 min. Gust Speed	km/h	Maximum of 10 minute scalar wind speed means from readings every 5 sec.
Datalogger Type		Telemetry Type	
Campbell Scientific CR1000		Raven X HSPA Cellular Modem	

Table C.2-10 Summary of monthly climate data collected at the JOSMP Surmont Climate Station (C5) during the 2015 WY.

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Total Global Solar Radiation (W/m ²)	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov-2014	-31.7	-11.8	8.8	21.5	13.4	82.4	20.7	95.1	6.9	235	48.2	32.7	28.7
Dec-2014	-31.3	-11.5	8.6	12.1	17.0	86.1	11.8	94.7	4.8	209	40.6	24.3	21.0
Jan-2015	-31.8	-11.9	8.5	21.1	9.8	78.4	23.7	95.1	7.0	241	52.4	37.0	31.3
Feb-2015	-36.1	-15.7	3.0	36.7	35.9	76.5	51.4	95.5	7.2	220	47.2	33.1	27.7
Mar-2015	-33.0	-2.5	18.0	15.7	2.0	65.7	107.5	94.8	7.0	215	67.6	40.1	34.9
Apr-2015	-18.1	3.6	23.0	15.9	0.0	51.6	178.4	94.6	7.7	207	48.6	30.6	25.4
May-2015	-6.4	10.0	27.9	34.0	0.0	50.3	233.8	95.3	7.1	186	44.3	30.8	23.5
Jun-2015	-2.1	15.5	30.1	38.5	0.0	60.4	227.4	94.8	6.6	221	46.9	30.3	22.1
Jul-2015	5.1	17.4	30.5	50.4	0.0	64.7	206.9	94.5	6.3	235	51.4	32.5	24.4
Aug-2015	0.1	15.7	28.6	79.0	0.0	68.9	162.7	94.6	5.8	216	48.4	25.5	23.2
Sep-2015	-3.4	8.5	22.4	47.9	0.0	73.7	104.2	94.5	5.5	226	51.9	31.2	26.0
Oct-2015	-6.8	5.5	25.0	18.3	0.0	70.1	65.5	94.6	7.2	228	45.9	30.2	24.8
2015 WY Annual	-16.3	1.9	19.5	391.0	-	69.1	116.2	94.8	6.6	220	49.5	31.5	26.1

Note: E = Estimated; M = Missing; A = Partial Average. See additional notes in sections C.2.1.5 and C.2.1.7.

C.2.1.6 Climate Variables at Other JOSMP Stations

Table C.2-11 summarizes the climate variables monitored at JOSMP stations other than the Aurora, Horizon, Steepbank, Pierre, and Surmont climate stations.

Total precipitation was monitored at stations L1 (using Pluvio 2 weighing gauge) and L2 (using a Geonor weighing gauge), with rainfall also being measured from May to October of 2015 at stations S3, S31, S40, and S43 using tipping bucket rain gauges.

Barometric pressure was monitored at Station S5A throughout the 2015 WY.

Table C.2-12 and Table C.2-13 provide a monthly summary of the climate data collected at these JOSMP stations. Collected data are included in the database on the RAMP website. Daily cumulative precipitation and rainfall depths at the various stations were compared to precipitation recorded at other regional stations in Table C.2-12 and Figure C.2-1.

Table C.2-11 Climate data collected at other JOSMP stations, 2015.

Station	Variable	Sensor
L1 McClelland Lake	Total Precipitation	Ott Pluvio 2 weighing gauge
	Water Temperature	Ott PLS built-in thermistor
	Air Temperature	HMP45C212 thermistor
	Relative Humidity	HMP45C212 humidity sensor
L2 Kearl Lake	Precipitation	Geonor precipitation gauge
	Water Temperature	Ott PLS built-in thermistor
	Air Temperature	HMP45C212 thermistor
	Relative Humidity	HMP45C212 humidity sensor
S3 Iyininim Creek above Kearl Lake	Rainfall	Texas Electronics TE525 tipping bucket
S5A Muskeg River above Muskeg Creek	Barometric Pressure	RM Young 61302V barometric pressure sensor
S31 Hangingstone Creek at North Star Road	Rainfall	Texas Electronics TE525 tipping bucket
S40 MacKay River at Petro-Canada Bridge	Rainfall	Texas Electronics TE525 tipping bucket
S43 Firebag River upstream of Suncor Firebag	Rainfall	Texas Electronics TE525 tipping bucket

Table C.2-12 Summary of climate data collected at McClelland Lake (L1) and Kearl Lake (L2) during the 2015 WY.

Station	L1 McClelland Lake				L2 Kearl Lake			
Period of Operation	Nov 1, 2014 to Oct 31, 2015	Nov 1, 2014 to Oct 31, 2015	Nov 1, 2014 to Oct 31, 2015	Nov 1, 2014 to Oct 31, 2015	Nov 1, 2014 to Oct 31, 2015	Nov 1, 2014 to Oct 31, 2015	Nov 1, 2014 to Oct 31, 2015	Nov 1, 2014 to Oct 31, 2015
Month	Precipitation Depth	Water Temperature	Air Temperature	Relative Humidity	Precipitation Depth	Water Temperature	Air Temperature	Relative Humidity
	(mm)	(°C)	(°C)	(%)	(mm)	(°C)	(°C)	(%)
Nov-2014	8.8	1.9	-11.8	87.4	17.2	6.4	-11.7	84.5
Dec-2014	10.5	1.1	-14.3	90.3	14.4	4.1	-13.7	87.2
Jan-2015	21.6	0.9	-16.1	85.9	39.1	2.9	-15.4	83.7
Feb-2015	18.5	0.6	-18.6	77.7	31.9	2.3	-17.6	75.5
Mar-2015	28.9	0.6	-6.5	70.6	49.8	2.0	-5.2	70.7
Apr-2015	6.6	5.7	2.9	55.0	18.6	1.8	4.1	51.9
May-2015	10.1	12.8	11.3	51.6	24.0	5.3	11.6	48.3
Jun-2015	18.2	19.5	16.8	61.8	44.9	11.5	16.6	62.1
Jul-2015	52.8	21.0	17.7	74.1	80.5	15.6	17.6	73.8
Aug-2015	19.2	19.7	16.8	72.5	34.1	16.8	16.8	71.8
Sep-2015	52.5	12.6	9.3	74.6	72.1	13.1	9.2	76.0
Oct-2015	14.8	6.8	4.8	76.1	26.2	9.1	5.2	76.0
Annual Sum	262.4	-	-	-	453.0	-	-	-
Annual Mean	-	8.6	1.0	73.1	-	7.6	1.5	71.8

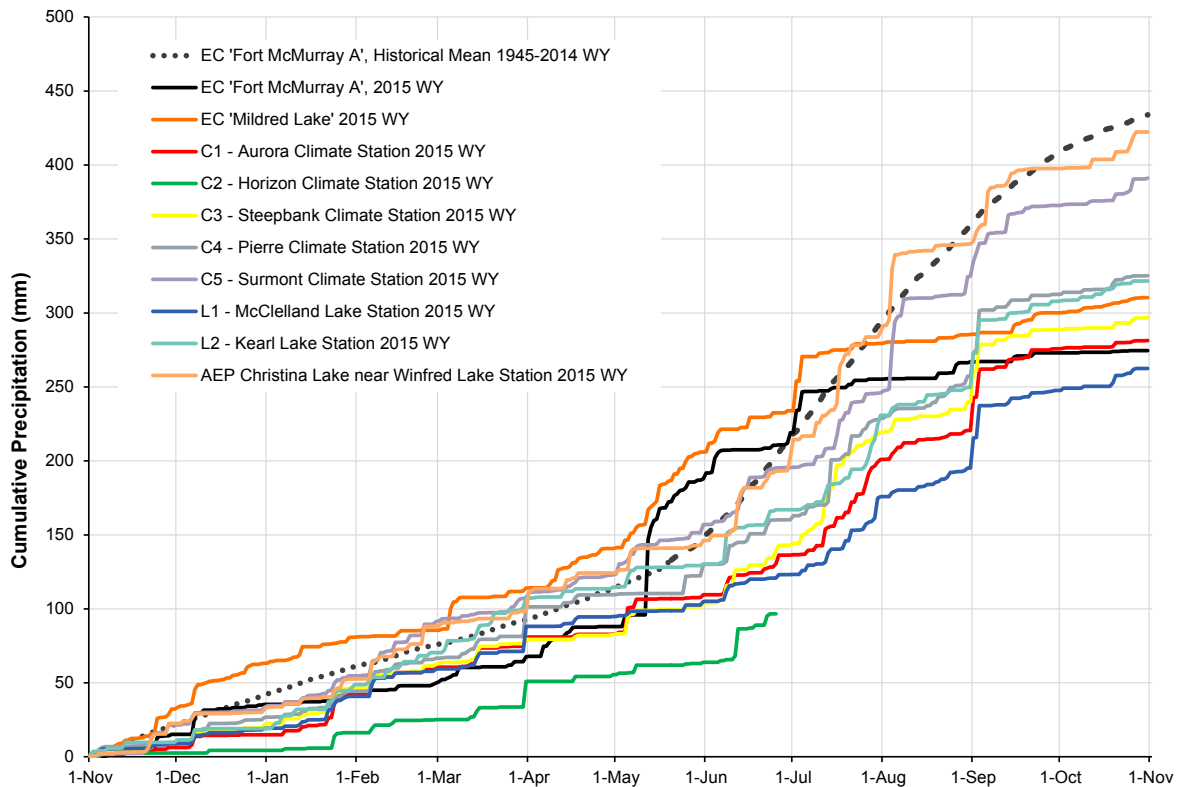
Note: E = Estimated; M = Missing; A = Partial Average. See additional notes in sections C.2.1.6 and C.2.1.7.

Table C.2-13 Summary of rainfall (mm) and atmospheric pressure (kPa) data collected at other JOSMP stations during the 2015 WY.

Month	S3	S19	S40	S43	S5A
	Iyininim Creek above Kearn Lake	Tar River Lowland Tributary near the mouth	MacKay River at Petro-Canada Bridge	Firebag River above Suncor Firebag	Muskeg River above Muskeg Creek
	Rainfall (mm)	Rainfall (mm)	Rainfall (mm)	Rainfall (mm)	Atmospheric Pressure (kPa)
Nov-2013	-	-	-	-	98.5
Dec-2013	-	-	-	-	98.0
Jan-2015	-	-	-	-	98.4
Feb-2015	-	-	-	-	98.9
Mar-2015	-	-	-	-	97.9
Apr-2015	-	-	-	-	97.7
May-2015	25.0 A	19.6	34.3	0.0 P	98.3
Jun-2015	17.8 A	37.8	43.4	6.9 P	97.6
Jul-2015	100.3	56.1	84.3	95.5 E	97.3
Aug-2015	34.9 A	54.1	18.5	12.4 E	97.5
Sep-2015	8.9 A	44.5	32.5	14.7 A	97.5
Oct-2015	14.7	12.4	5.6	8.9	97.6
Annual Sum	201.6 A	224.5	218.7	138.4 A	-
Annual Mean	-	-	-	-	97.9

Note: E = Estimated; M = Missing; A = Partial Average. See additional notes in sections C.2.1.6 and C.2.1.7.

Figure C.2-1 Cumulative precipitation measured at climate stations in the Athabasca oil sands region, 2015 WY.



Note: The cumulative total precipitation record at C2 was incomplete due to a data gap from June 27 to August 15, 2015 which prevents cumulative total precipitation from being calculated.

C.2.1.7 Data Access

JOSMP Climate and Hydrology data are available online through the RAMP website (www.ramp-alberta.org). The 2015 WY data are published to the RAMP website in May 2015 upon the completion of the QA/QC process for data management and the final technical report. The following notes apply to the monthly climate data (summarized above) and to the daily data, which are publicly available and provided in the RAMP database:

- precipitation measurements, including tipping bucket rain gauges, do not differentiate between rainfall and snowfall; therefore, the values recorded represent total precipitation for the associated period of record;
- wind direction is reported in degrees clockwise from north;
- reported monthly climate data include extreme minimum and maximum temperature data; mean temperature and relative humidity; and total precipitation and solar radiation; and
- reported annual values include extreme minimum and maximum temperature; mean temperature, relative humidity and solar radiation; and total precipitation.

C.2.1.8 2015 Snow Course Survey Results

Snow course surveys were completed at sites representing four general terrain types across the JOSMP study area:

- Flat low lying areas (FL);
- Open land or lake areas (OP);
- Mixed deciduous (MD); and
- Jackpine (JP).

Locations of the snow course surveys are shown on Figure 3.1-1 of the main report.

Snow course surveys were completed from February 2 to 5, March 4 to 15, and March 31 to April 2, 2015. The results organized by land cover type are shown in Table C.2-14 and organized by region in Table C.2-15. Snow survey data are also available through the RAMP website.

Table C.2-14 Summary of the JOSMP snow course surveys organized by land cover type, winter 2015.

Terrain Type	Survey ID	February (Feb 2 to 5, 2015)		March (Mar 4 to 15, 2015)		April (Mar 31 to Apr 2, 2015)	
		Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)
Flat Low Lying	CANR-FL-A	46	70	-	-	22	63
	CNRL-FL-A	35	48	51	53	22	78
	MCLL-FL-A	35	43	39	65	24	95
	NEX-FL-A	32	5	48	50	-	-
	Mean	37	42	46	56	22	79
Open Land/Lake Area	CANR-OP-A	16	48	-	-	4	10
	CNRL-OP-A	15	48	21	27	-	-
	MCLL-OP-A	14	40	22	58	3	25
	NEX-OP-A	7	8.0	30	30	-	-
	Mean	13	36	24	38	3	18
Mixed Deciduous	CANR-MD-A	32	50	-	-	18	48
	CNRL-MD-A	32	60	47	36	19	73
	MCLL-MD-A	21	33	36	68	18	73
	NEX-MD-A	31	55	40	41	11	28
	Mean	29	50	41	48	16	56
Jackpine	CANR-JP-A	30	40	-	-	18	50
	CNRL-JP-A	28	38	37	55	30	60
	MCLL-JP-A	17	33	27	55	76	47
	NEX-JP-A	23	28	50	52	-	-
	Mean	24	35	38	54	41	52

SWE = snow water equivalent

Note: Underlined mean values denote the maximum observed values for a given terrain type in 2015. These values are plotted in Figure 4.1-4 of the main report.

Table C.2-15 Summary of the RAMP snow course surveys organized by region, winter 2015.

Region	Survey ID	February (Feb 2 to 5, 2015)		March (Mar 4 to 15, 2015)		April (Mar 31 to Apr 2, 2015)	
		Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)
Kearl Lake Area	CANR-FL-A	46	70	-	-	22	63
	CANR-OP-A	32	50	-	-	18	48
	CANR-MD-A	30	40	-	-	18	50
	CANR-JP-A	16	48	-	-	4	10
	Mean	31	52	-	-	15	43
CNRL Lake Area	CNRL-FL-A	32	5	48	50	-	-
	CNRL-OP-A	31	55	40	41	11	28
	CNRL-MD-A	23	28	50	52	-	-
	CNRL-JP-A	7	8.0	30	30	-	-
	Mean	23	24	42	43	11	28
McClelland Lake Area	MCLL-FL-A	35	48	51	53	22	78
	MCLL-OP-A	32	60	47	36	19	73
	MCLL-MD-A	28	38	37	55	30	60
	MCLL-JP-A	15	48	21	27	-	-
	Mean	28	49	39	43	24	70
Sucker Lake Area	NEX-FL-A	35	43	39	65	24	95
	NEX-OP-A	21	33	36	68	18	73
	NEX-MD-A	17	33	27	55	76	47
	NEX-JP-A	14	40	22	58	3	25
	Mean	22	37	31	62	30	60

SWE = snow water equivalent

C.3 HYDROMETRIC DATA COLLECTED IN THE 2015 WY

Hydrometric data for the region were collected throughout the 2015 WY. JOSMP Climate and Hydrology data are available online through the RAMP website (www.ramp-alberta.org). The 2015 WY data are published to the RAMP website in May 2015 upon the completion of the QA/QC process for data management and the final technical report.

C.3.1 JOSMP Hydrometric Data

Hydrometric data, including water level and discharge, were collected at regional hydrometric stations during the 2015 WY. These data were collected at hydrometric monitoring stations where near-continuous water level data were recorded using pressure transducers and data loggers. Discharge rating curves, developed and maintained for each station, were applied to derive streamflow values from the recorded water level data. Suspended sediment samples were also collected at JOSMP hydrometric stations during the open-water period of the 2015 WY. Table C.3-1 provides a summary of the equipment at each JOSMP hydrometric station during the 2015 WY, including types of data loggers, pressure transducers, and telemetry.

Table C.3-1 Equipment deployed at JOSMP hydrometric stations, 2015 WY.

Station	Data Logger Type	Pressure Transducer Type	Telemetry Type
L1	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
L2	Campbell Scientific CR-1000	Ott PLS	Raven X HSPA Cellular Modem
L4	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S2	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S3	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S5	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S5A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S9	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S10/S10A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S11	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S14A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S15A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S16A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S20	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S20A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S22	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S31	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S32	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem

Table C.3-1 (Cont'd.)

Station	Data Logger Type	Pressure Transducer Type	Telemetry Type
S33	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S34	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S36	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S37	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S40	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S43	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S44	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S45	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S47A	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S48	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S49	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S50A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S51	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S53	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S54	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S55	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S56	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S57	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S58	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S60	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S61	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S62	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S63	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S64	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S65	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S66	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter

C.3.1.1 Water Level and Discharge

Table C.3-2 provides a summary of JOSMP hydrometric monitoring in the 2015 WY. Data quality for the 2015 WY was generally good (28 of 48 locations) with challenges encountered due to wildlife, high water levels, and equipment attrition affecting the 2015 WY hydrometric record at 20 stations as described below. The quality assessment of each station record was based on an assessment matrix that considered the number and quality of discharge measurements made during the year, the quality and extent of the stage-discharge rating curve, and the completeness of the data record.

Wildlife and Environmental Challenges

The following wildlife and environmental challenges were addressed in the 2015 WY:

- The precipitation record at the C2 Horizon Climate Station was affected by insect fouling from June 27, 2015 to August 15, 2015. This resulted in the loss of meaningful precipitation data for this period;
- Damage to the tipping bucket rain gauge at station S3, Iyininim Creek above Kearl Lake, caused by wildlife, resulted in the loss of rainfall data from May 8, 2015 to June 13, 2015, and August 27, 2015 to September 14, 2015;
- Gaps in rainfall data occurred at station S43, Firebag River upstream of the Suncor Firebag Project, from May 10, 2015 to June 14, 2015 and August 17, 2015 to September 13, 2015. These gaps were caused by damage to the tipping bucket rain gauge by wildlife;
- Damage to station S47A, Christina River near the mouth, caused by wildlife, resulted in data gaps from March 30, 2015 to April 17, 2015 and October 21 to 29, 2015; and
- Damage by wildlife to station S50A Redclay Creek, resulted in a data gap from May 18, 2015 to June 16, 2015.

Data Logger Malfunctions and Attrition

The following data logger malfunctions and equipment challenges were addressed in the 2015 WY:

- Data gaps at S14A, Ells River at the CNRL Bridge, from August 10, 2015 to September 17, 2015 occurred as a result of equipment malfunction;
- Several gaps in January and February 2015 occurred at station S22, Muskeg Creek near the mouth, due to power supply failures;
- Several gaps in November and December 2014 occurred at station S31, Hangingstone Creek at North Star Road, due to a weak station battery and power supply failures;
- Data gaps from December 22, 2014 to January 13, 2015 occurred at station S36, McClelland Lake Outlet above Firebag River, due to power supply failures;
- A data gap at station S44, Pierre River near Fort McKay, occurred from September 1 to 13, 2015 due to a faulty solar controller and failure of the station power supply;

- A data gap from October 27 to 31, 2015 occurred at station S45, Ells River above Joslyn Creek Diversion, due to a faulty solar controller and failure of the station power supply;
- A data gap at station S47A, Christina River near the mouth, occurred from January 6 to 10, 2015 due to weak station batteries and power supply failure;
- Data gaps from May 15, 2015 to June 10, 2015 at station S58, Sawbones Creek above Christina Lake, occurred due to a faulty power supply;
- A faulty solar controller and subsequent power supply failure at station S62, Birch Creek at Highway 881, caused a data gap from February 25, 2015 to March 6, 2015;
- A data gap from January 15, 2015 to February 6, 2015 occurred at station S63, Sunday Creek at Highway 881, due to disconnection of the station power supply;
- A faulty solar controller and subsequent failure of the station power supply at station S65, North Green Stockings Creek at East Athabasca Highway, resulted in a data gap from August 13 to 25, 2015; and
- Weak batteries and failure of the power supply at station S66, Steepbank River below North Steepbank confluence, resulted in a data gap from March 19, 2015 to May 1, 2015.

Data Quality

Data quality at the following seven stations was compromised due to backwater effects, caused by conditions such as beaver activity:

- S02 Jackpine Creek at Canterra Road;
- S09, Kearn Lake outlet;
- S10A Wapasu Creek near the mouth;
- S36, McClelland Lake outlet above Firebag River;
- S58, Sawbones Creek above Christina Lake;
- S62, Birch Creek at Highway 881; and
- S64, unnamed creek east of Christina Lake.

Table C.3-2 Summary of hydrometric monitoring undertaken in support of the JOSMP during the 2015 WY.

Watershed and Station	Catchment Area (km ²)	Monitored Period 2015 WY	Percent of Open-Water Period Record Available 2015 WY	Instantaneous Maximum Discharge (Water Year: Nov 1 2014 – Oct 31 2015)			Maximum Daily Discharge (Water Year: Nov 1 2014 - Oct 31 2015)		Minimum Daily Discharge (Open Water Season: May 1 - Oct 31 2015)		Catchment Runoff Depth (Open Water Season: May 1 - Oct 31 2015)	
				Date and Time	Discharge (m ³ /s)	Data Grade/ Comments	2015 WY (m ³ /s)	Historical mean (m ³ /s)	2015 WY (m ³ /s)	Historical mean (m ³ /s)	2015 WY (mm)	Historical mean (mm)
Athabasca River												
S46 - Athabasca River near Embarras Airport	156,000.0	Nov 1 - Oct 31	100	-	-	-	1310	2844	345	543	65.5	118.7
Muskeg River Watershed												
S2 - Jackpine Creek at Canterra Road	342.0	Nov 1 - Oct 31	100	May 14, 23:00	2.62	-	2.6	13.0	0.04	0.25	29.0	29.0
S3 - Iyininim Creek above Kearl Lake	39.3	May 10 - Oct 31	100	May 5, 2:45	0.988	-	0.9	-	0.02	0.02	73.2	73.2
S5 - Muskeg River above Stanley Creek	396.0	Nov 1 - Oct 31	100	Apr 20, 13:00	2.16	-	2.0	9.0	0.09	0.19	24.5	72.9
S5A - Muskeg River above Muskeg Creek	521.0	Nov 1 - Oct 31	100	Apr 15, 1:45	2.83	Ice	0.0	10.2	0.00	0.35	0.0	68.4
S7 - Muskeg River near Fort McKay (07DA008)	1457	Nov 1 - Oct 31	100	-	-	-	0.0	0.0	0.00	0.00	0.0	0.0
S9 - Kearl Lake Outlet	76.5	Nov 1 - Oct 31	100	NA	NA	-	0.2	1.7	0.002	0.02	6.8	45.4
S10A - Wapasu Creek near the mouth	90.7	Nov 1 - Oct 31	100	May 14 22:30*	1.08	Several occurrences over 24 hour period	1.1	5.8	0.03	0.06	56.9	99.2
S20 - Muskeg River upland	157.0	May 2 - Oct 31	100	May 15, 22:45	0.791	-	0.7	-	0.03	0.05	20.1	67.2
S22 - Muskeg Creek near the mouth	323.0	Nov 1 - Oct 31	0	May 12, 17:15	2.539	-	0.0	15.7	0.00	0.14	0.0	72.8
S33 - Muskeg River at Aurora/Albian boundary	897.0	Nov 1 - Oct 31	100	May 15, 18:15	4.576	-	4.5	17.2	0.15	0.44	25.0	68.6
S37 - East Jackpine Creek near the 1300 m Contour	47.4	May 5 - Oct 31	100	Sep 4, 23:30*	0.601	Several occurrences over 24 hour period	0.5	-	0.01	0.01	44.1	109.8
S65 – North Green Stockings Creek at East Athabasca Hwy	23.0	May 1 - Oct 31	100	May 9, 1:00	0.477	-	1.6	-	0.02	0.01	60.7	140.4
Steepbank River Watershed												
S38 - Steepbank River near Fort McMurray (07DA006)	1,320	Nov 1 - Oct 31	100	-	-	-	17.1	37.4	1.37	1.65	52.7	105.9
S66 – Steepbank River below North Steepbank River	1,193	Nov 1 - Oct 31	100	Jul 16, 22:45	15.8	-	1.6	-	1.47	0.97	53.0	106.9
Firebag River Watershed												
S27 - Firebag River near the mouth (07DC001)	5,987.6	Nov 1 - Oct 31	100	-	-	-	51	129.2	13.30	15.62	58.2	102.5
S36 - McClelland Lake Outlet above Firebag River	367.0	Nov 1 - Oct 31	99	Jun 13, 3:00*	1.16	Several occurrences over 24 hour period	1.0	3.4	0.39	0.36	25.8	27.1
S43 - Firebag River above Suncor Firebag Project	2,381.0	Nov 1 - Oct 31	99	Apr 18, 16:45	34.9	Ice	22.1	90.2	4.00	5.23	52.4	121.5
Athabasca River West Tributaries												
S44 - Pierre River near Fort McKay (07DA013)	123.0	May 1 - Oct 31	93	Apr 29, 14:30	0.930	-	0.9	1.4	0.01	0.03	19.8	48.1
S48 - Big Creek	304	May 1 - Oct 31	100	May 14, 1:00	1.35	-	1.0	-	0.13	0.19	13.7	36.1
S49 - Eymundson Creek near the Mouth	320.0	May 1 - Oct 31	100	May 2, 8:30*	1.74	Several occurrences over 24 hour period	1.6	-	0.17	0.22	21.2	64.8
S50A - Redclay Creek	180.0	May 1 - Oct 31	85	Apr 29, 19:15*	1.40	Several occurrences over 24 hour period	1.4	-	0.12	0.13	24.5	55.3
Ells River Watershed												
S14A - Ells River at CNRL Bridge	2,420.0	Nov 1 - Oct 31	100	Apr 20, 17:00	50.5	Ice	25.7	55.9	0.98	2.43	28.0	72.6
S45 - Ells River above Joslyn Creek diversion	2,231.0	Nov 13 - Oct 23	99	Apr 21, 2:15	21.7	Ice	17.6	37.7	0.88	2.71	27.8	79.9
L4/S52 – Namur Lake near the Outlet	164	Nov 1 - Oct 31	100	May 16, 2:45	0.745	-	0.7	1.6	0.10	0.028	31.9	76.6

Notes:

See Section C.3.1.1 for details of missing data.

Means were calculated from years with greater than 85% of data for the required period.

Instantaneous maximum discharge values for the 2015 WY were derived from data collected at a 15 minute interval.

* Date and time of first occurrence of instantaneous maximum discharge value is presented if multiple same magnitude values occurred in same hydrologic event.

Table C.3-2 (Cont'd.)

Watershed and Station	Catchment Area (km ²)	Monitored Period 2015 WY	Percent of Open-Water Period Record Available 2015 WY	Instantaneous Maximum Discharge (Water Year: Nov 1 2014 – Oct 31 2015)			Maximum Daily Discharge (Water Year: Nov 1 2014 - Oct 31 2015)		Minimum Daily Discharge (Open Water Season: May 1 - Oct 31 2015)		Catchment Runoff Depth (Open Water Season: May 1 - Oct 31 2015)	
				Date and Time	Discharge (m ³ /s)	Data Grade/ Comments	2015 WY (m ³ /s)	Historical mean (m ³ /s)	2015 WY (m ³ /s)	Historical mean (m ³ /s)	2015 WY (mm)	Historical mean (mm)
Mackay River Watershed												
S26 - MacKay River near Fort McKay (07DB001)	5,569.3	Nov 1 - Oct 31	99	-	-	-	35	109.7	2.05	3.60	23.8	67.4
S40 - MacKay River at Petro-Canada Bridge	4,090.0	Nov 1 - Oct 31	100	Apr 25, 4:00	29.7	-	27	67.9	1.67	2.61	26.3	74.0
S53 - Dover River near the mouth	963	Nov 1 - Oct 31	100	Apr 18, 12:45	11.6	Ice	7	22.5	0.18	0.30	18.1	40.3
S54 - Dunkirk River near Fort McKay	1,570.0	Nov 1 - Oct 31	100	Apr 22, 13:15	26.2	Ice	18	34.7	0.62	0.69	26.6	80.4
Tar River Watershed												
S15A - Tar River near the mouth	332.0	April 29 - Oct 31	100	Apr 22, 12:15	1.81	-	1.7	2.8	0.04	0.16	13.5	39.0
S34 - Tar River above CNRL Lake	146.0	Nov 1 - Oct 31	100	Jun 13, 4:45	3.59	-	2.9	5.8	0.11	0.09	33.9	83.7
Calumet River Watershed												
S16A / S16A / CR-1 - Calumet River	169.0	May 1 - Oct 31	0	May 16, 18:15*	0.437	Several occurrences over 24 hour period	0.0	2.2	0.00	0.02	0.0	19.9
Poplar River Watershed												
S11 - Poplar Creek at Highway 63 (07DA007)	151	Nov 1 - Oct 31	99	Apr 17, 7:30	2.59	Ice	2.4	12.9	0.01	0.06	29.7	147.2
S39 - Beaver River above Syncrude (07DA018)	164.8	Nov 1 - Oct 31	99	-	-	-	1.4	9.4	0.05	0.13	23.5	78.4
Clearwater River Tributaries												
S29 - Christina River near Chard (07CE002)	4,862.9	Nov 1 - Oct 31	100	-	-	-	25.8	101.3	5.83	6.42	32.4	80.2
S31 - Hangingstone Creek near the mouth	119.0	Nov 1 - Oct 31	100	Apr 19, 11:15	1.80	Ice	1.5	8.2	0.05	0.18	30.1	135.1
S32 - Surmount Creek at Highway 881	157.0	May 1 - Oct 31	100	Apr 19, 12:00	2.32	Ice	1.7	-	0.08	0.12	33.3	119.6
S42 - Clearwater River above Christina River (07CD005)	17,016.6	Nov 1 - Oct 31	98	-	-	-	81.0	195.6	47.00	59.83	51.9	86.8
S47A - Christina River near the mouth	13,284.0	Nov 1 - Oct 31	99	Apr 18, 1:15	73.7	-	67.2	182.4	10.89	17.00	28.5	74.2
S51 - High Hills River near the mouth	1,588.0	Nov 1 - Oct 31	99	Apr 17, 20:30	10.5	Ice	5.9	52.6	3.17	2.47	42.0	99.6
S55 - Gregoire River above the Christina River	1,015.0	Nov 1 - Oct 31	99	Apr 19, 19:45	7.77	Ice	6.9	35.3	0.14	0.65	20.2	73.5
S56 - Jackfish River below Christina Lake	1,290.0	Nov 1 - Oct 31	100	May 12, 20:00*	7.50	Several occurrences over 24 hour period	7.4	54.7	1.46	0.78	36.1	55.1
S57 - Sunday Creek above Christina Lake	374.0	Nov 1 - Oct 31	100	May 12, 0:00	4.87	Estimated	4.7	28.0	0.08	0.17	43.5	119.0
S58 - Sawbones Creek above Christina Lake	126.0	May 1 - Oct 31	100	Aug 9, 6:15	0.572	Backwater	0.6	-	0.08	0.07	25.2	101.1
S60 - unnamed creek south of Christina Lake	140.0	May 6 - Oct 31	100	Apr 21, 23:00	0.999	-	1.0	-	0.01	0.04	22.8	131.0
S61 - Christina River above Statoil Leismer	1,028.0	May 10 - Oct 31	100	Apr 19, 11:45	10.4	Ice	8.4	31.2	1.11	1.41	32.6	139.2
S62 - Birch Creek at Hwy 881	197.0	May 18 - Oct 31	100	Apr 22, 7:00*	1.97	Several occurrences over 24 hour period	1.9	-	0.03	0.26	32.1	117.9
S63 - Sunday Creek at Hwy 881	135.0	May 6 - Oct 31	100	Apr 17, 12:00	1.50	Several occurrences over 24 hour period	1.4	7.8	0.00	0.02	38.8	108.8
S64 - unnamed creek east of Christina Lake	171.0	May 15 - Oct 31	100	Aug 6, 13:30	1.66	Backwater	1.6	-	0.07	0.17	25.4	124.5

Notes:

See Section C.3.1.1 for details of missing data.

Means were calculated from years with greater than 85% of data for the required period.

Instantaneous maximum discharge values for the 2015 WY were derived from data collected at a 15 minute interval.

* Date and time of first occurrence of instantaneous maximum discharge value is presented if multiple same magnitude values occurred in same hydrologic event.

Table C.3-2 (Cont'd.)

Water Level Stations	Catchment Area (km ²)	Monitored Period 2015 WY	Percent of Open-Water Period Record Available 2015 WY	Maximum Water Level		Minimum Water Level	
				2015 WY (m)	Historic mean (m)	2015 WY (m)	Historic mean (m)
L1 - McClelland Lake (Firebag River Watershed)	204.0	Nov 1 - Oct 31	100	-	294.680	-	-
L2 - Kearl Lake (Muskeg River Watershed)	71.6	Nov 1 - Oct 31	99	332.377	332.131	-	331.636
L4/S52 - Namur Lake near the Outlet (Ells River Watershed)	164	Nov 1 - Oct 31	100	98.288	98.215	-	97.791

* See Section C.3.1.1 for details of missing data.
 Means were calculated from years with greater than 85% of data for the required period.

C.3.1.2 Suspended Sediment

Suspended sediment samples were collected at 40 JOSMP streamflow stations for a total of 174 measurements in the 2015 WY. The total suspended sediment (TSS) data are provided in Table C.3-3. Discharge (Q) shown in the table is the manual discharge measurement at the time the sample was collected.

Table C.3-3 Suspended sediment data collected at JOSMP hydrometric stations during the 2015 WY.

Station		Apr 27 to May 19	June 9 to 19	Aug 7 to 18	Sept 4 to 24	Oct 12 to 30
S02	TSS (mg/L)	*	2.7	4.0	*	*
	Q (m ³ /s)	2.51	0.748	0.388	1.05	0.392
S03	TSS (mg/L)	25.8	2.7	*	*	3.3
	Q (m ³ /s)	*	0.215	0.053	0.157	0.074
S5	TSS (mg/L)	<3.0	6.0	3.3	4.7	4.7
	Q (m ³ /s)	1.45	0.828	0.274	0.574	0.333
S5A	TSS (mg/L)	2.0	4.7	24	<1.0	*
	Q (m ³ /s)	1.76	1.23	0.427	0.486	0.398
S9	TSS (mg/L)	<3.0	4.0	9.3	*	13
	Q (m ³ /s)	0.016	0.003	0.004	0.084	0.084**
S10A	TSS (mg/L)	7.2	2.0	2.7	2.0	<1.0
	Q (m ³ /s)	0.863	0.330	0.164	0.460	0.157
S11	TSS (mg/L)	9.9	8.7	13.0	23.0	12.0
	Q (m ³ /s)	2.17	0.151	0.018	0.030	1.42
S14A	TSS (mg/L)	217	2.7	26.0	>1.0	1.3
	Q (m ³ /s)	24.0	4.84	2.23	2.44	1.99
S15A	TSS (mg/L)	20.2	8.0	11.0	10.0	14.0
	Q (m ³ /s)	0.954	0.036	0.675	0.178	0.248
S16A	TSS (mg/L)	*	1.3	2.7	*	2.7
	Q (m ³ /s)	0.251	0.036	0.007	0.053	0.030
S20A	TSS (mg/L)	<3.0	*	4.0	*	*
	Q (m ³ /s)	0.645	0.298	0.122	0.196	0.103
S22	TSS (mg/L)	5.0	2.0	2.7	2.0	<1.0
	Q (m ³ /s)	1.02	0.781	0.436	0.653	0.268
S31	TSS (mg/L)	11.5	6.0	4.7	*	2.7
	Q (m ³ /s)	1.32	0.279	0.167	0.158	0.152
S32	TSS (mg/L)	52.2	5.3	19.0	*	*
	Q (m ³ /s)	1.34	0.417	0.421	0.197	0.143
S33	TSS (mg/L)	*	4.0	4.7	*	2.0
	Q (m ³ /s)	2.96	1.78	0.997	1.77	0.691
S34	TSS (mg/L)	54.9	8.0	3.3	2.7	>1.0
	Q (m ³ /s)	0.724	0.199	0.242	0.192	0.139
S36	TSS (mg/L)	13.4	2.7	2.7	*	>1.0
	Q (m ³ /s)	1.02	0.681	0.442	0.852	0.508
S37	TSS (mg/L)	4.2	7.3	3.3	2.0	*
	Q (m ³ /s)	*	0.214	0.134	0.245	0.128
S40	TSS (mg/L)	65.4	3.3	2.0	2.0	2.0
	Q (m ³ /s)	26.9	4.62	6.73	3.06	1.82
S43	TSS (mg/L)	33.2	4.0	4.0	2.7	2.0
	Q (m ³ /s)	23.4	9.89	6.15	8.39	6.74

* Not measured.

** No manual measurement available, continuous discharge value displayed.

Table C.3-3 (Cont'd.)

Station		Apr 27 to May 19	June 9 to 19	Aug 7 to 18	Sept 4 to 24	Oct 12 to 30
S44	TSS (mg/L)	32.2	7.3	2.0	*	2.7
	Q (m ³ /s)	*	0.179	0.040	0.113	0.088
S45	TSS (mg/L)	102.000	2.70	*	*	*
	Q (m ³ /s)	17.4	4.08	2.14	2.49	2.28
S47A	TSS (mg/L)	89.90	21.00	41.0	2.7	3.3
	Q (m ³ /s)	53.4	27.0	41.9	16.00	12.4
S48	TSS (mg/L)	66.8	11.0	8.0	9.3	8.0
	Q (m ³ /s)	0.806	0.326	0.149	0.231	0.205
S49	TSS (mg/L)	605.00	450	76.00	*	6.70
	Q (m ³ /s)	*	0.649	0.284	0.253	0.213
S50A	TSS (mg/L)	15.0	9.3	17.0	*	3.3
	Q (m ³ /s)	*	0.233	0.206	0.188	0.220
S51	TSS (mg/L)	17.4	45.0	10.0	8.0	2.7
	Q (m ³ /s)	4.76	6.28	4.72	*	3.20
S53	TSS (mg/L)	58.8	5.3	2.0	5.0	2.7
	Q (m ³ /s)	4.73	1.35	0.705	0.403	0.406
S54	TSS (mg/L)	*	4.7	22.0	*	2.7
	Q (m ³ /s)	11.8	1.83	2.87	1.81	0.951
S55	TSS (mg/L)	135	8.7	10.0	2.7	1.3
	Q (m ³ /s)	6.13	1.95	1.52	0.546	0.434
S56	TSS (mg/L)	8.6	2.0	2.0	>1.0	>1.0
	Q (m ³ /s)	7.32	3.03	3.33	2.27	1.79
S57	TSS (mg/L)	7.0	3.3	4.0	4.0	<1.0
	Q (m ³ /s)	3.68	0.652	1.78	1.11	0.383
S58	TSS (mg/L)	5.1	2.0	4.7	2.7	1.3
	Q (m ³ /s)	0.369	0.091	0.566	0.260	0.129
S60	TSS (mg/L)	5.5	19.0	4.7	1.3	1.3
	Q (m ³ /s)	0.648	0.125	0.449	0.217	0.089
S61	TSS (mg/L)	10.8	7.3	10.0	4.7	3.3
	Q (m ³ /s)	4.83	1.87	3.66	1.92	1.44
S62	TSS (mg/L)	9.6	5.3	5.3	6.0	2.0
	Q (m ³ /s)	1.32	0.447	0.393	0.295	0.281
S63	TSS (mg/L)	<3.0	2.7	3.3	>1.0	2.0
	Q (m ³ /s)	1.12	0.186	0.552	0.337	0.165
S64	TSS (mg/L)	5.6	8.7	2.7	2.0	1.3
	Q (m ³ /s)	0.490	0.078	1.19	0.287	0.132
S65	TSS (mg/L)	285	53	13.0	15.0	8.0
	Q (m ³ /s)	0.288	0.154	0.064	0.121	0.041
S66	TSS (mg/L)	4.4	2.7	2.7	1.3	2.7
	Q (m ³ /s)	5.07	3.67	3.88	3.41	1.59

* Not measured.

** No manual measurement available, continuous discharge value displayed.

C.3.2 Water Data from Industry

Several oil sands operators provided operational water withdrawal and water release data to the JOSMP, as summarized in Table C.3-4.

Table C.3-4 Summary of water withdrawals and releases for active (operating or under construction) oil sands projects, used in the water balance analysis for the 2015 WY.

Operator	Watershed	Activity	Annual Volume (Million m ³)	Location	Timestep
Canadian Natural Resources Ltd.	Christina and Athabasca	Water withdrawals	0.031	Various	Daily
		Water releases	0.039	Various	Daily
	Athabasca	Withdrawals from Athabasca River	22.98	459004 E, 6353835 N	Daily
	Calumet	Water releases	0.064	456734 E, 6358390 N	Daily
Fort Hills Oilsnads Project	Athabasca	Withdrawals from Athabasca River	0.237	460126 E, 6356296 N	Daily
		Water releases	0.152	461735 E, 6356676 N	Daily
Imperial Oil Resources	Muskeg	Water releases	0.152	461735 E, 6356676 N	Daily
	Firebag	Water releases	0.399	Various	Daily
	Athabasca	Withdrawals from Athabasca River	29.54	469833 E, 63800519 N	Daily
MEG Energy Corp.	Christina	Water withdrawals	0.031	Various	Daily
Nexen	Christina	Water withdrawals	0.015	Various	Daily
Shell Canada Energy	Athabasca	Withdrawals from Athabasca River	12.27	461422 E, 6346082 N	Daily
	Muskeg	Water releases	1.75	Various	Daily
Statoil Canada Ltd.	Christina	Water withdrawals	0.015	Various	Daily
Suncor Energy Inc.	Athabasca	Withdrawals from Athabasca River	17.51	471864 E, 6317853 N	Daily
		Releases to the Athabasca River	3.00	Various	Daily
	Mackay	Water withdrawals	0.019	Various	Daily
Syncrude Canada Ltd.	Athabasca	Water releases	3.21	Various	Daily
		Withdrawals from Athabasca River	38.19	469584 E, 6320596 N	Daily
	Muskeg	Aurora Clean Water Diversion to Stanley Creek	3.766	472955 E, 6355575 N	Daily
	Poplar Creek	Diversion from Beaver Creek into Poplar Creek	1.419	470853 E, 6307683 N	Daily

Note: The above data were used in the water balance calculations described in Section 5. Not all information received from industry was included in the water balance calculations, including: (i) data classified as muskeg dewatering, groundwater extraction, or other processes not affecting natural surface watercourses and waterbodies; and (ii) focal project withdrawal and discharges occurring on days when observed *test* monitoring did not occur (e.g., during winter months for open-water monitoring stations, or when data collection was prevented due to forest fires or other reasons).

C.3.3 Hydrometric Data from Government Agencies

Daily discharge data are published by Environment Canada, including data for WSC hydrometric stations that are within the JOSMP study area. As daily discharge data for the 2015 WY were not yet published at the time of production of this report, provisional daily discharge data were provided by the WSC and included in this report. Provisional data were provided for the following WSC hydrometric stations that are within the JOSMP study area:

- Athabasca River below McMurray (07DA001);
- Athabasca River at Embarras Airport (07DD001);
- Beaver River above Syncrude (07DA018);
- Clearwater River at Draper (07CD001);
- Christina River near Chard (07CE002);
- Firebag River near the mouth (07DC001);
- Hangingstone River at Fort McMurray (07CD004);
- MacKay River near Fort MacKay (07DB001);
- Muskeg River near Fort McKay (07DA008); and
- Steepbank River near Fort McMurray (07DA006).

Data were also provided by Alberta Environment and Parks for stations within the JOSMP study area. During the 2015 WY, this included provisional daily water level data collected at the Christina Lake near Winefred Lake (07CE906) lake level monitoring station.

C.3.4 2015 WY Hydrographs with Historical Context

Hydrographs of discharge and water level for the 2015 WY measured at lotic and lentic JOSMP stations, respectively are presented in Figure C.3-1 to Figure C.3-51. Historical maximum, minimum, and median daily values are also provided to assist with interpretation. Stations L4, S51, S55, S57, S58, S60, S61, S62, S63, S64, S65, and S66 do not contain more than four years of historical data, and are shown as individual years for these stations. In all cases, the current year was excluded from the calculation of the historical context, so that the current year was compared to the previous years.

Figure C.3-1 Water level of McClelland Lake (Station L1) during the 2015 WY, compared to historical values.

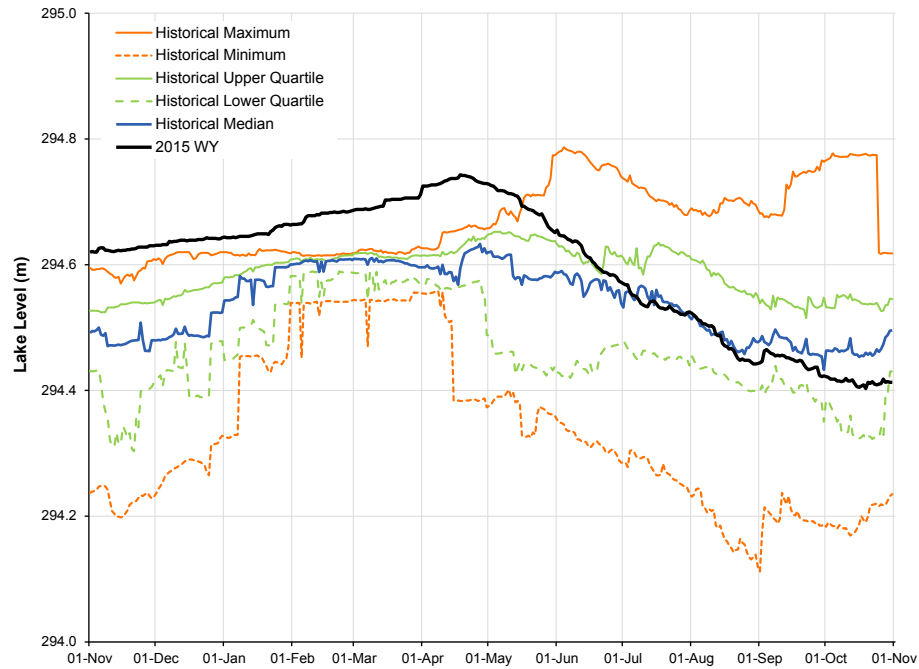


Figure C.3-2 Water level of Kearl Lake (Station L2) during the 2015 WY compared, to historical values.

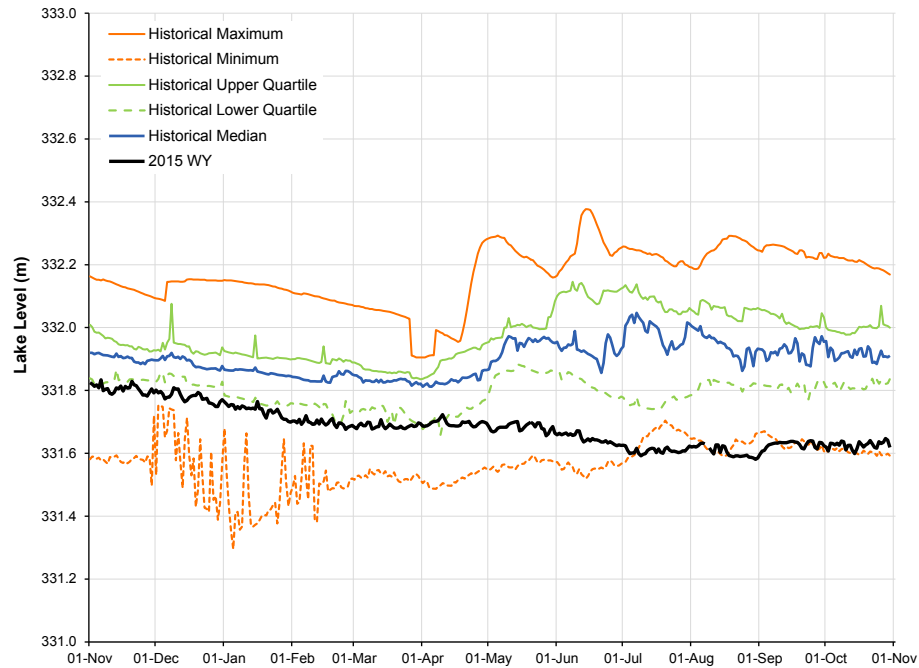


Figure C.3-3 Water level of Namur Lake near the outlet (Station L4) during the 2015 WY.

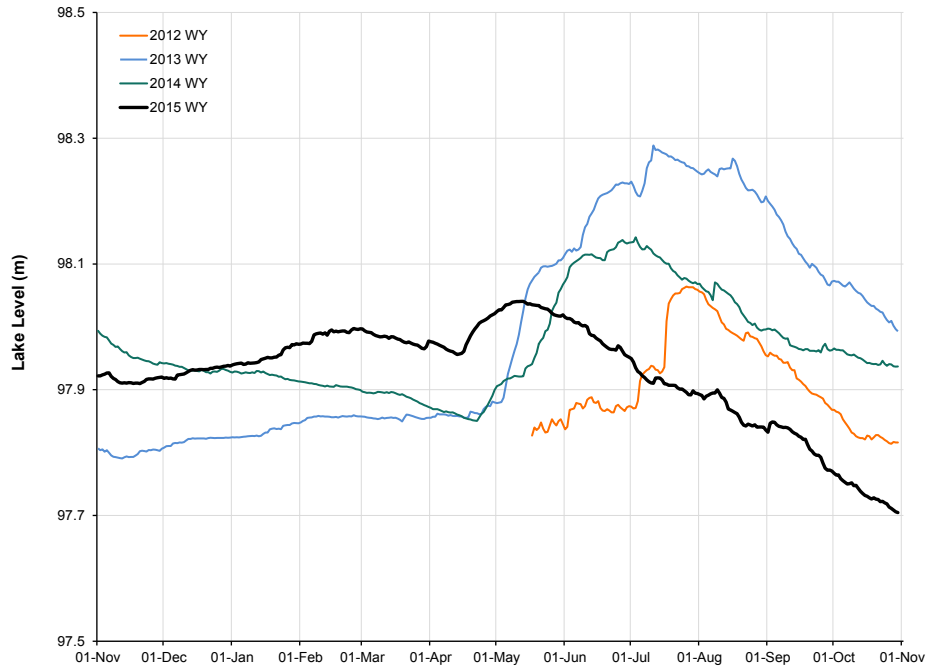


Figure C.3-4 Discharge of Jackpine Creek at Canterra Road (Station S2) during the 2015 WY, compared to historical values.

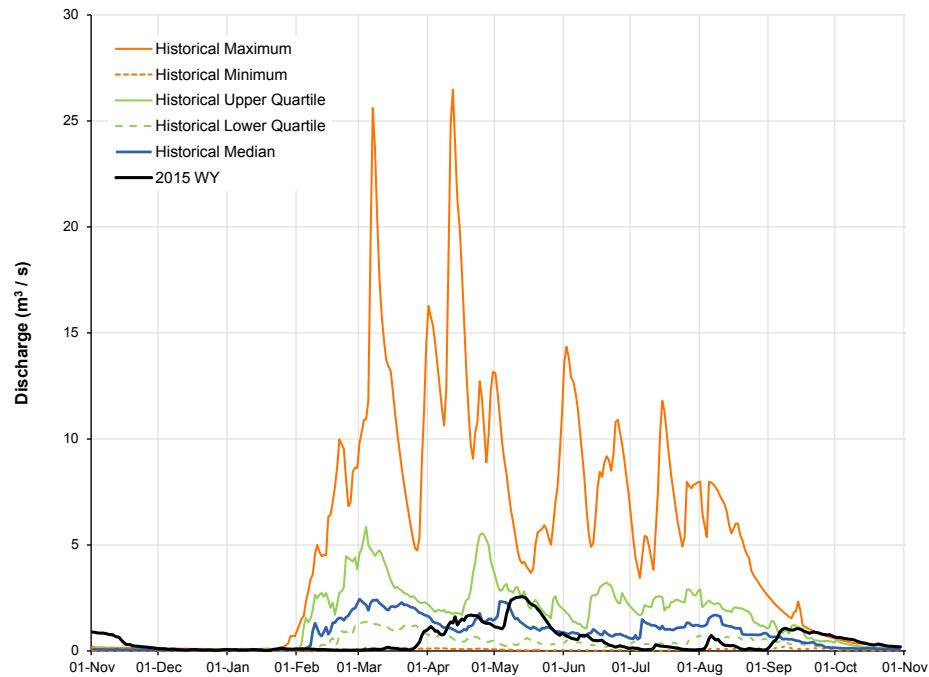


Figure C.3-5 Discharge of Iyininin Creek above Kearl Lake (Station S3) during the 2015 WY, compared to historical values.

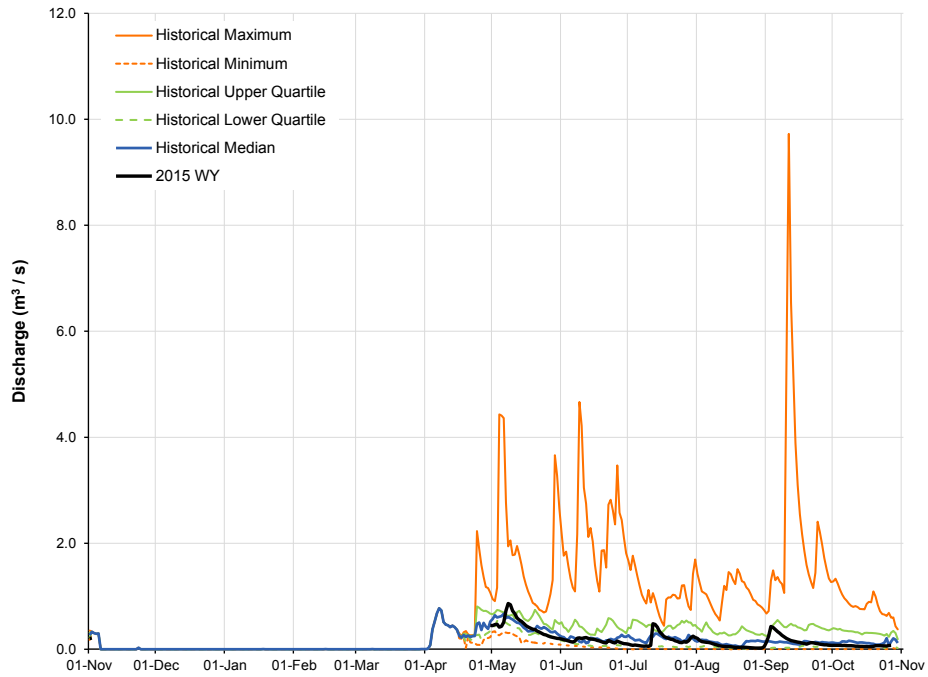


Figure C.3-6 Discharge of the Muskeg River above Stanley Creek (Station S5) for the 2015 WY, compared to historical values.

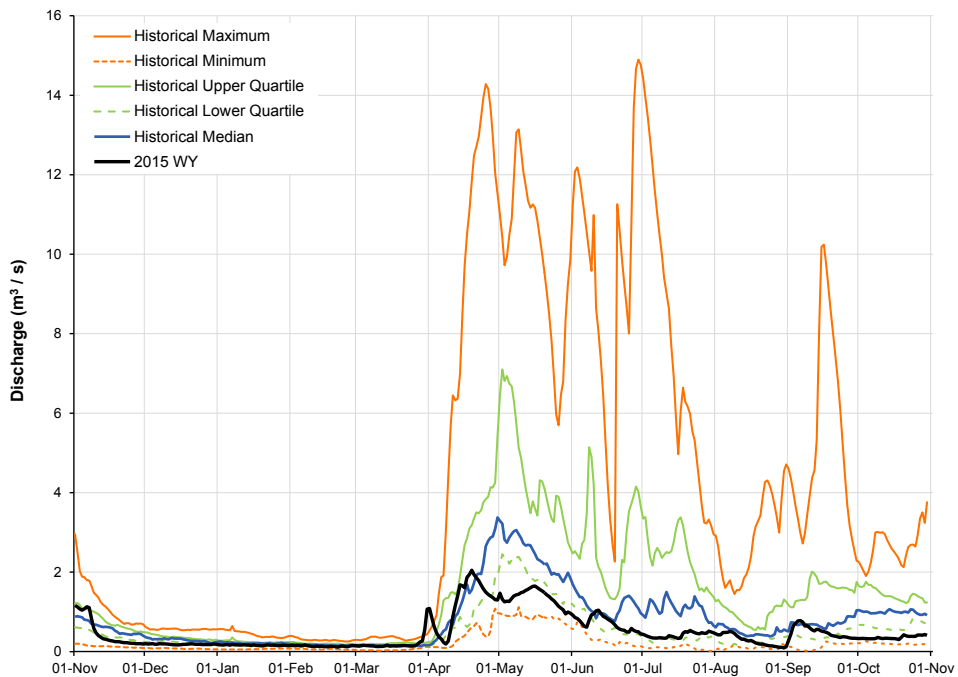


Figure C.3-7 Discharge of the Muskeg River above Muskeg Creek (Station S5A) for the 2015 WY, compared to historical values.

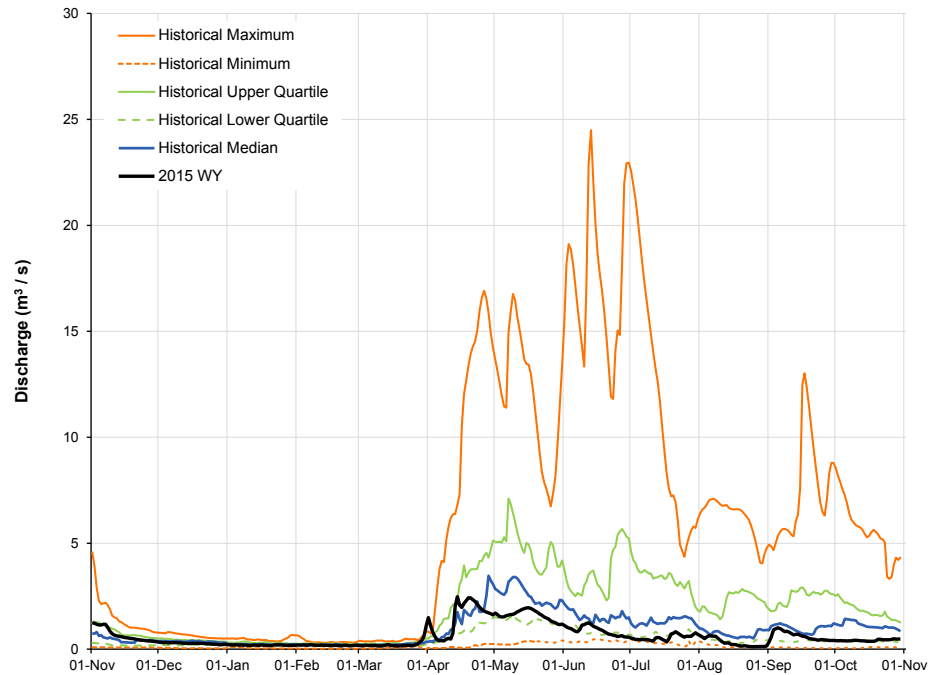
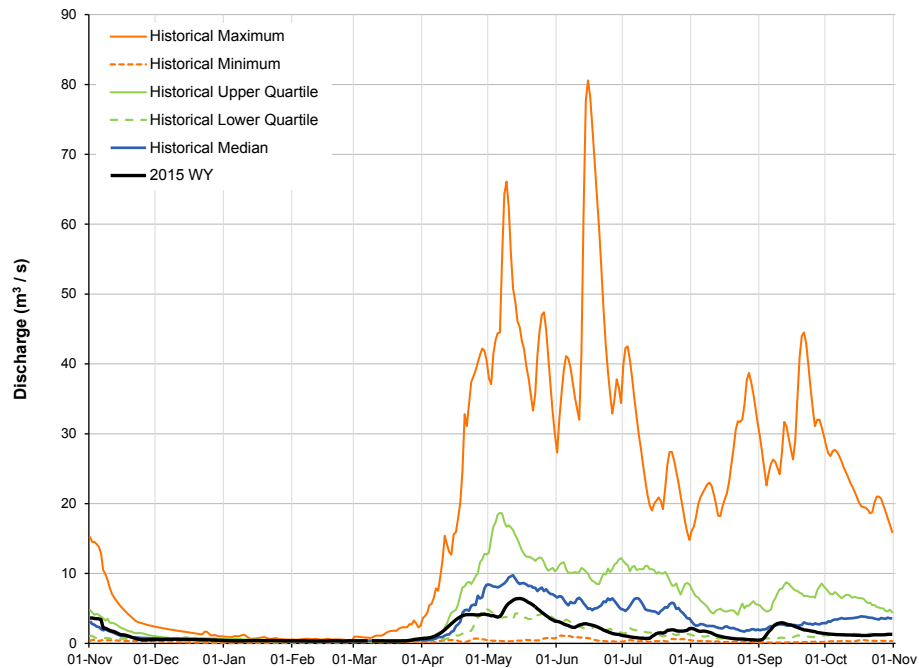


Figure C.3-8 Discharge of the Muskeg River near Fort McKay (Station S7) for the 2015 WY, compared to historical values.



Note: Hydrograph was developed using provisional WSC data from station 07DA008 from November 1, 2014 to October 31, 2015.

Figure C.3-9 Discharge of the Kearl Lake Outlet (Station S9) for the 2015 WY, compared to historical values.

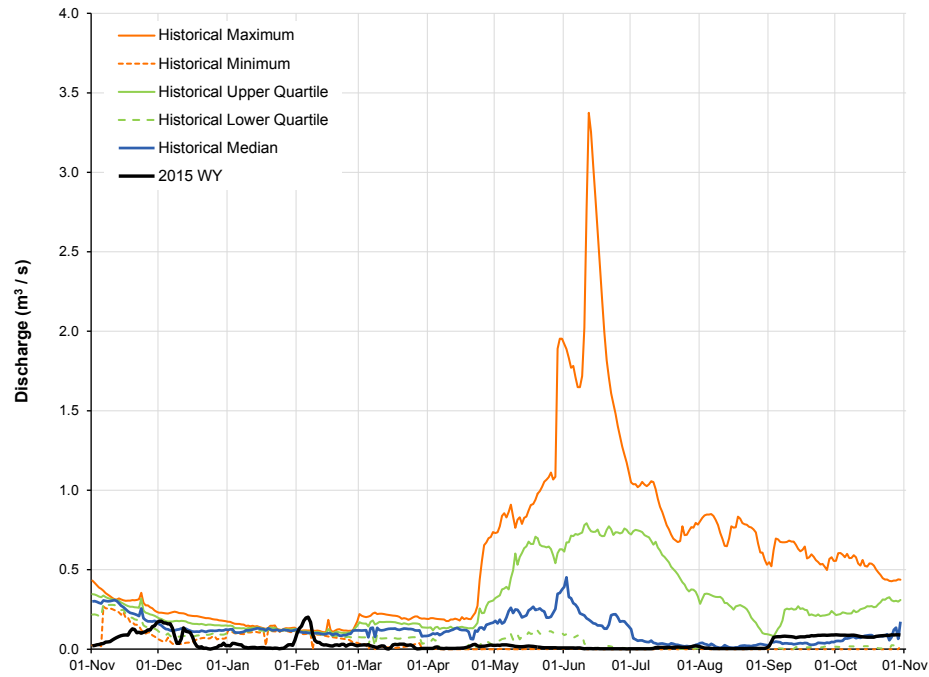


Figure C.3-10 Discharge of Wapasu Creek near the mouth at Canterra Road (Station S10A) for the 2015 WY, compared to historical values.

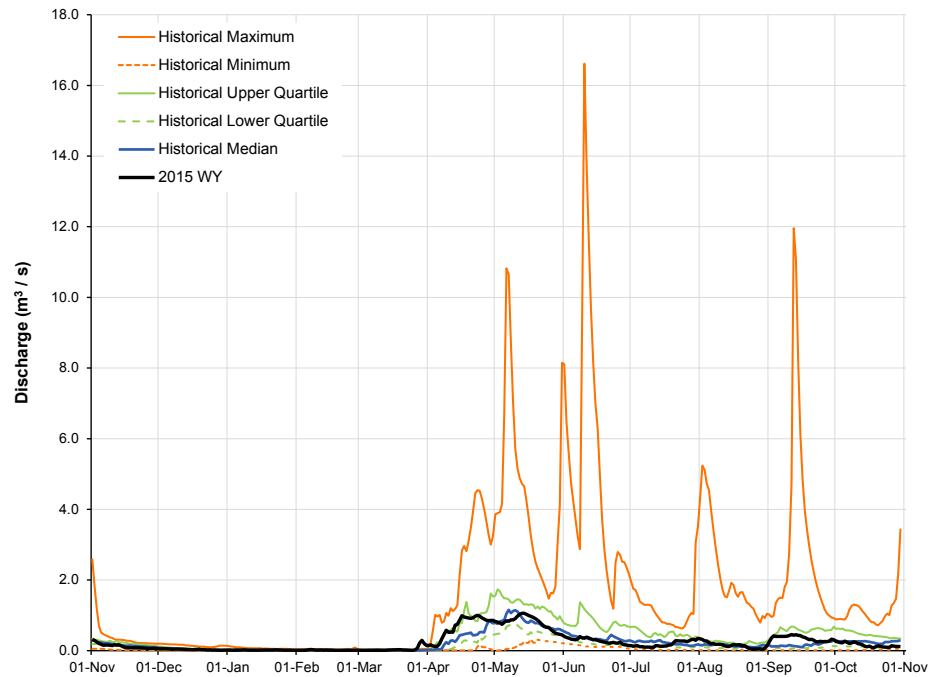
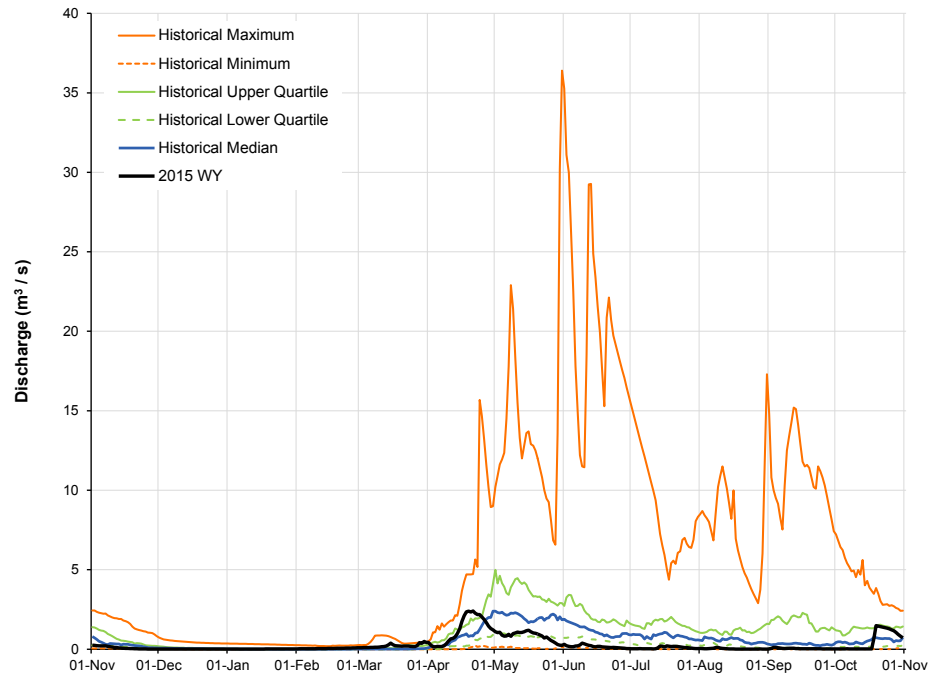
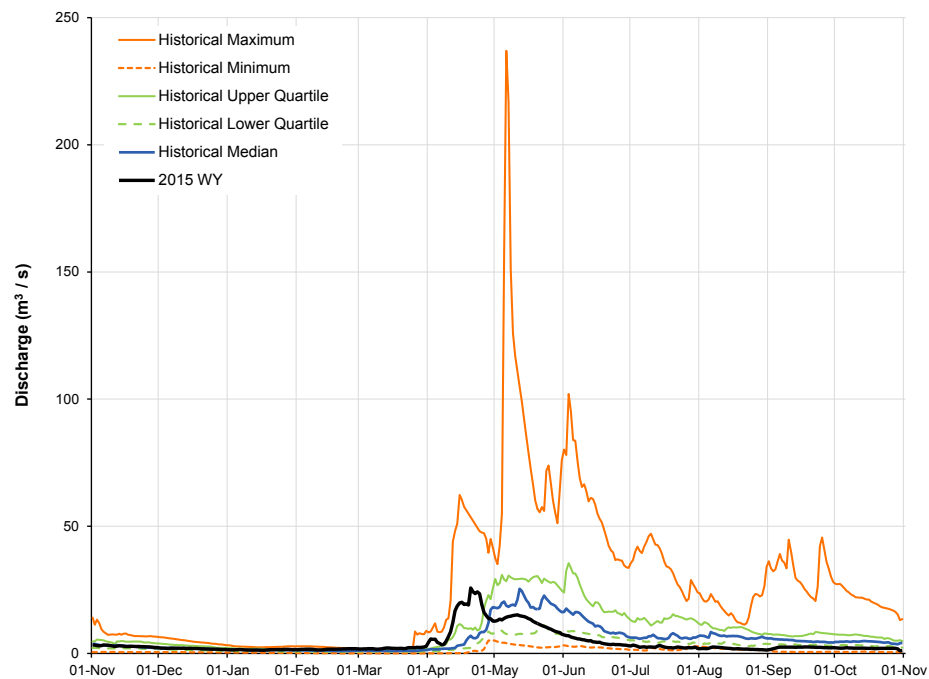


Figure C.3-11 Discharge of Poplar Creek at Highway 63 (Station S11) for the 2015 WY, compared to historical values.



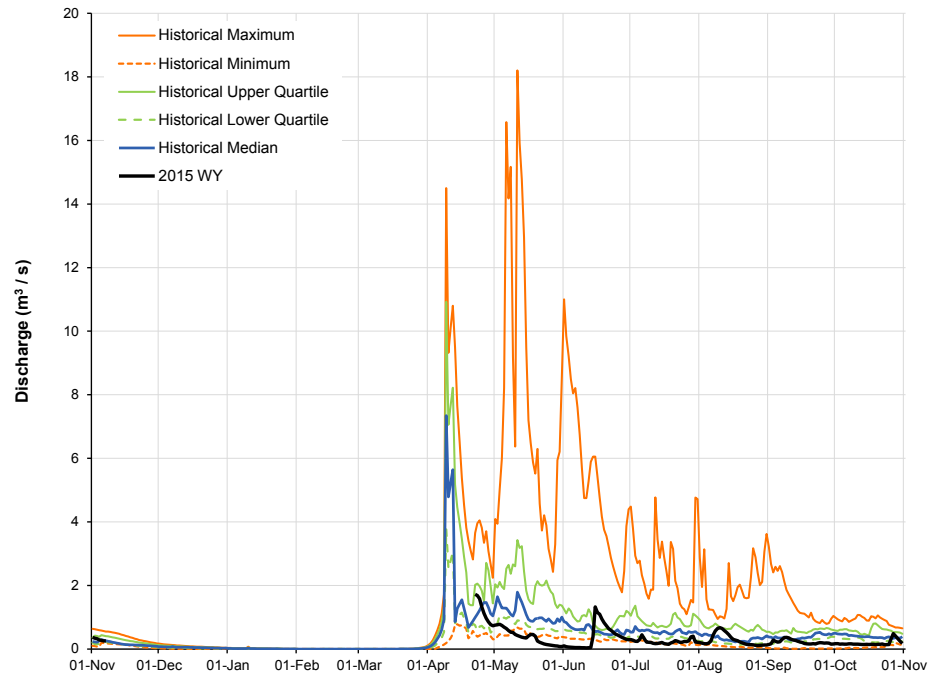
Note: Historical statistics were based on data from WSC Station 07DA007 (1973 to 1986) and RAMP/JOSMP Station S11 (1996 to 2014).

Figure C.3-12 Discharge of the Ells River at the CNRL Bridge (Station S14A) for the 2015 WY, compared to historical values.



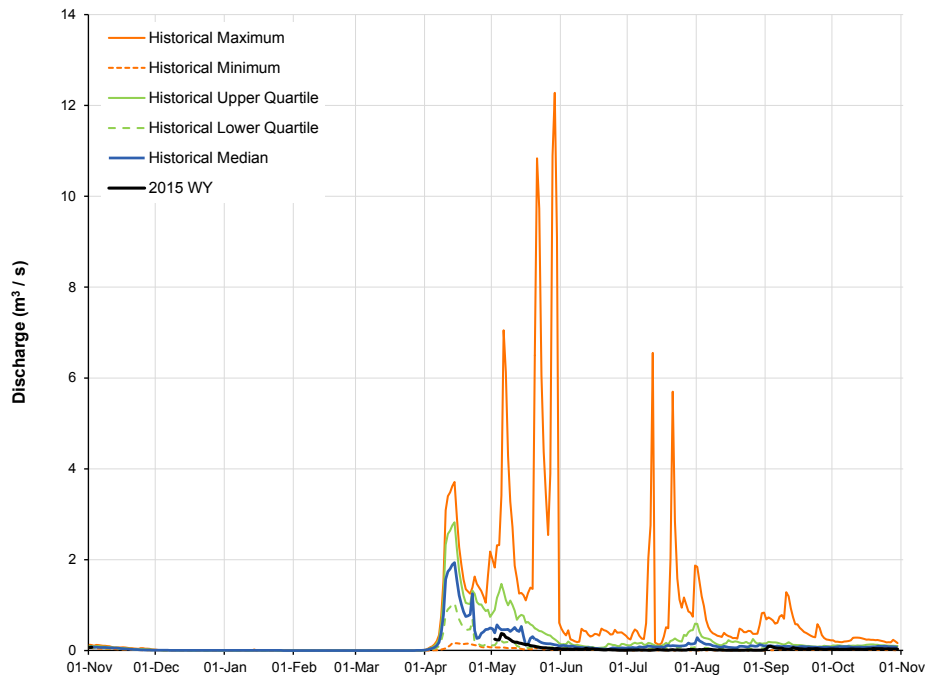
Note: Historical statistics were based on data from WSC Station 07DA017 (1975 to 1986) and RAMP/JOSMP Station S14A (2004 to 2014).

Figure C.3-13 Discharge of the Tar River near the mouth (Station S15A) for the 2015 WY, compared to historical values.



Note: Historical statistics were based on data from WSC Station 07DA015 (1975 to 1977), RAMP Station S15 (2001 to 2006), and RAMP/JOSMP Station S15A (2007 to 2014).

Figure C.3-14 Discharge of the Calumet River near the mouth (Station S16A) for the 2015 WY, compared to historical values.



Note: Historical statistics were based on data from WSC Station 07DA014 (1975 to 1977), RAMP Station S16 (2001 to 2005), CNRL Station CR1 (2006 to 2009), and RAMP/JOSMP Station S16A (2010 to 2014).

Figure C.3-15 Discharge of the Muskeg River upland (Station S20A) for the 2015 WY, compared to historical values.

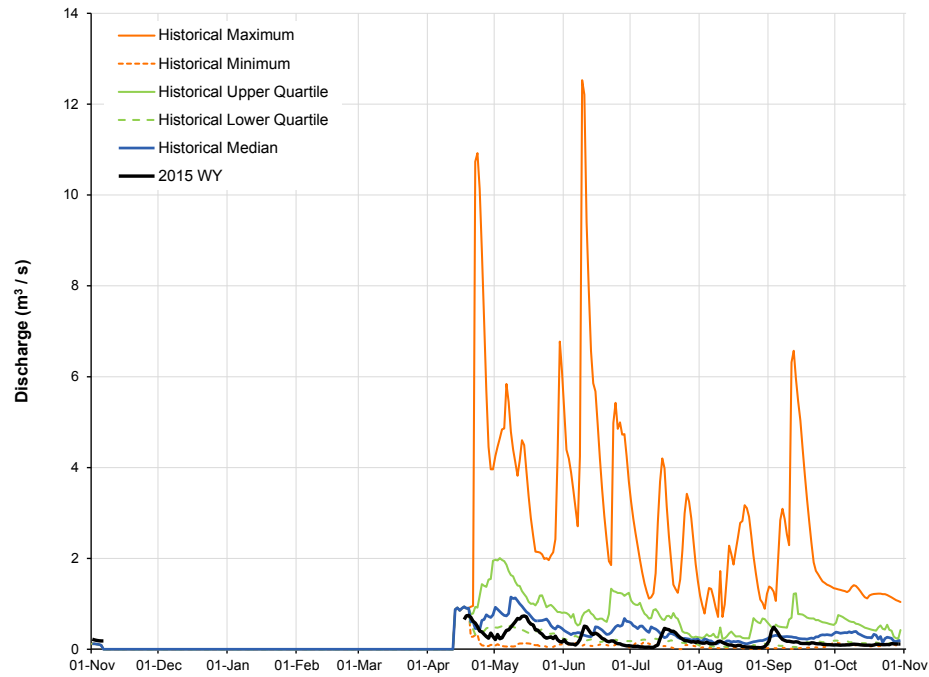


Figure C.3-16 Discharge of Muskeg Creek near the mouth (Station S22) for the 2015 WY, compared to historical values.

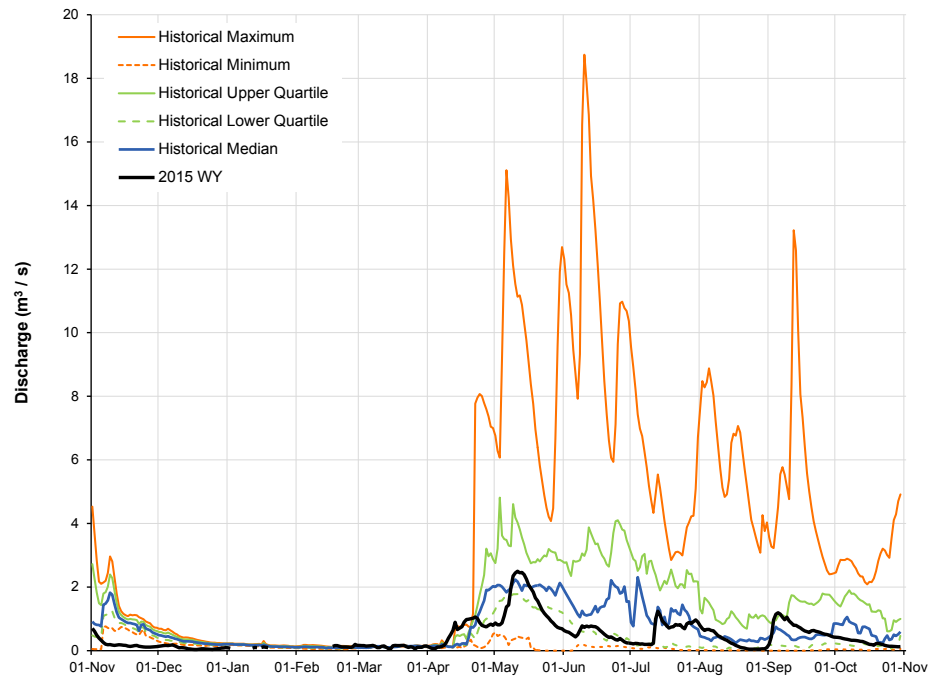
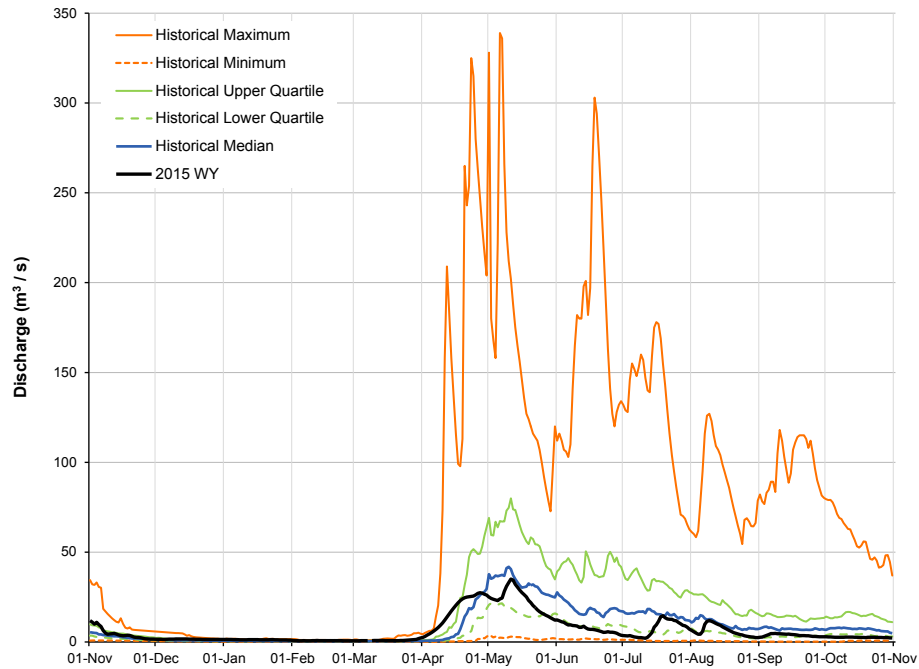
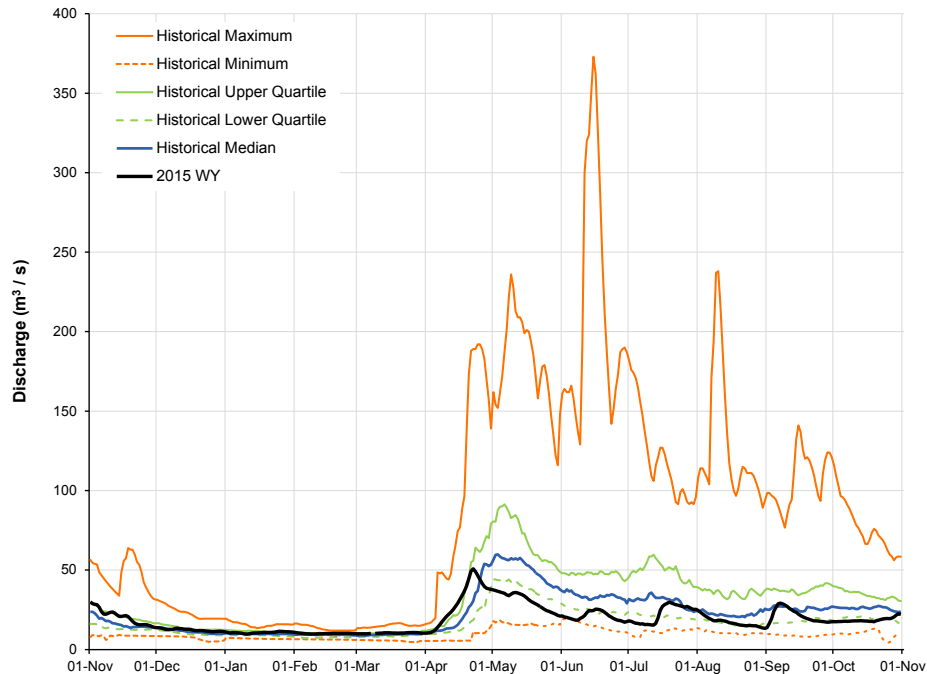


Figure C.3-17 Discharge of the MacKay River near Fort McKay (Station S26) for the 2015 WY, compared to historical values.



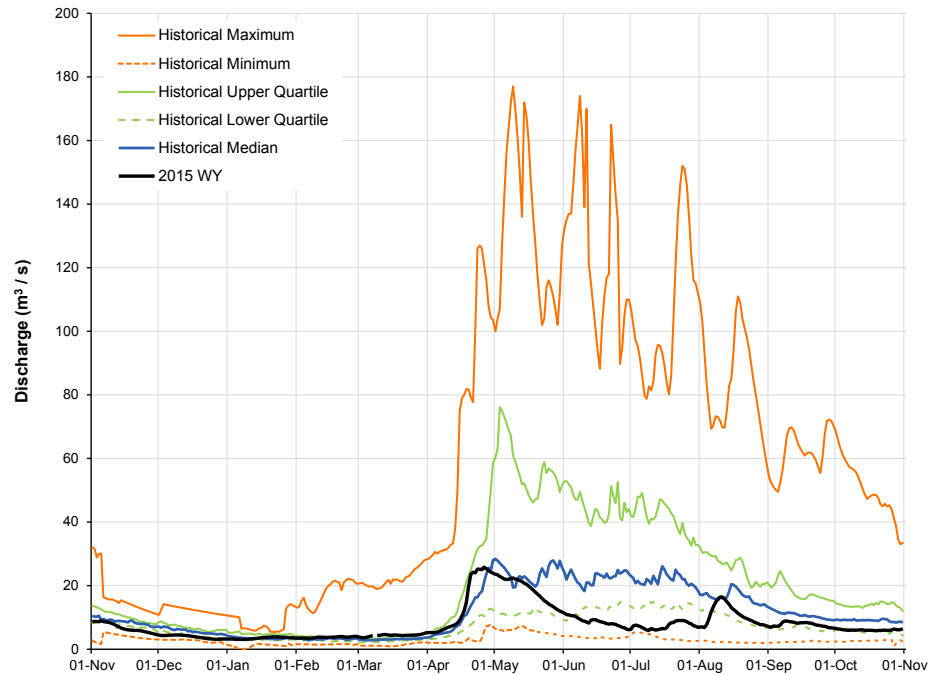
Note: Hydrograph was developed using provisional WSC data from station 07DB001 from November 1, 2014 to October 31, 2015.

Figure C.3-18 Discharge of the Firebag River near the mouth (Station S27) for the 2015 WY, compared to historical values.



Note: Hydrograph was developed using provisional WSC data from station 07DB001 from November 1, 2014 to October 31, 2015.

Figure C.3-19 Discharge of the Christina River near Chard (Station S29) for the 2015 WY, compared to historical values.



Note: Hydrograph was developed using provisional WSC data from Station 07CE002 from November 1, 2014 to October 31, 2015.

Figure C.3-20 Discharge of Hangingstone Creek at North Star Road (Station S31) for the 2015 WY, compared to historical values.

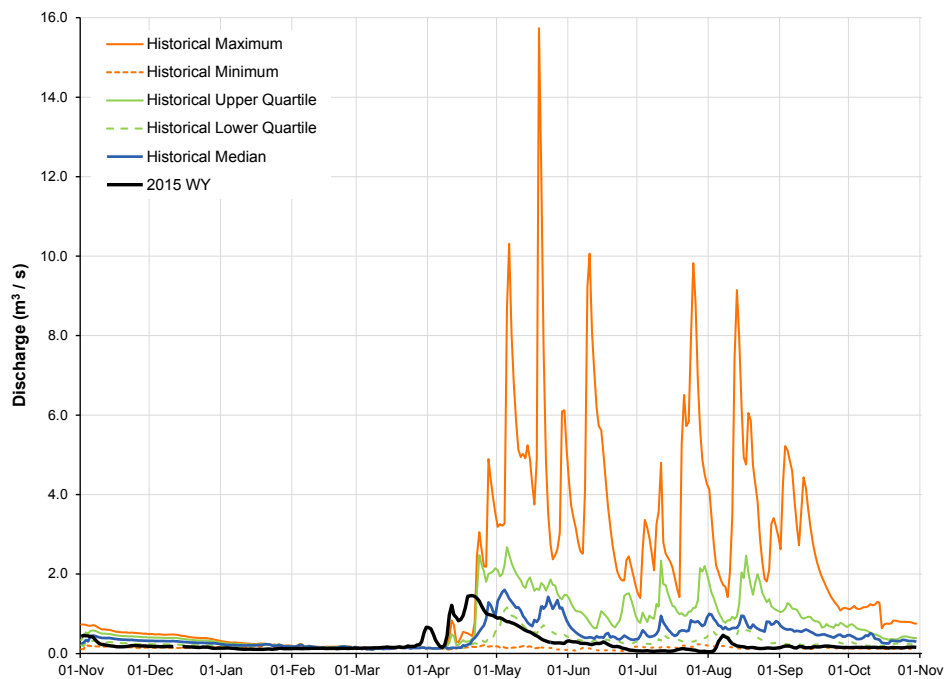


Figure C.3-21 Discharge of Surmont Creek at Highway 881 (Station S32) for the 2015 WY, compared to historical values.

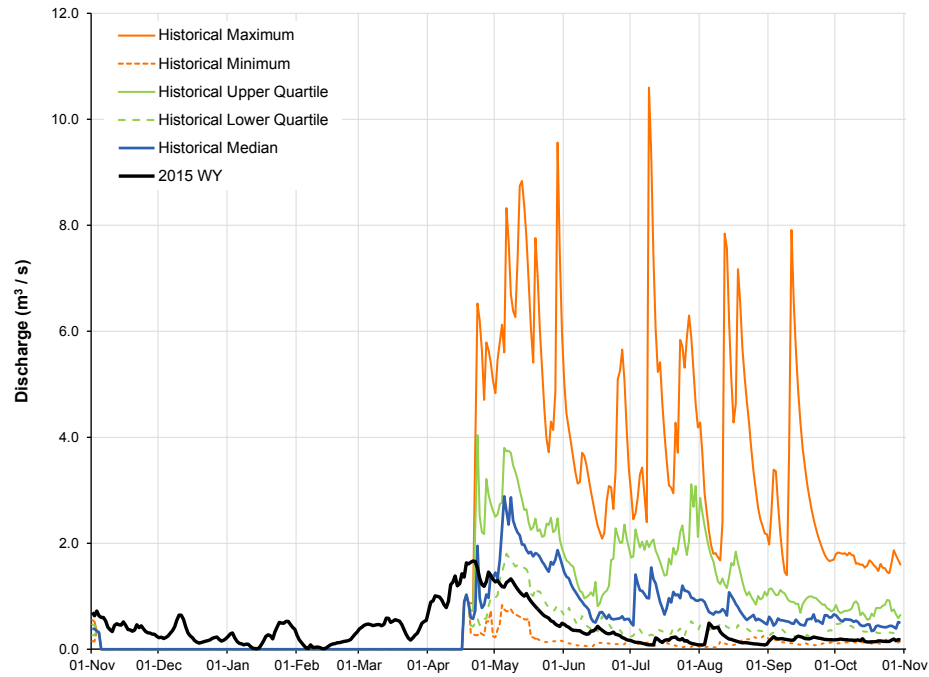


Figure C.3-22 Discharge of the Muskeg River at the Aurora North/MRM boundary (Station S33) for the 2015 WY, compared to historical values.

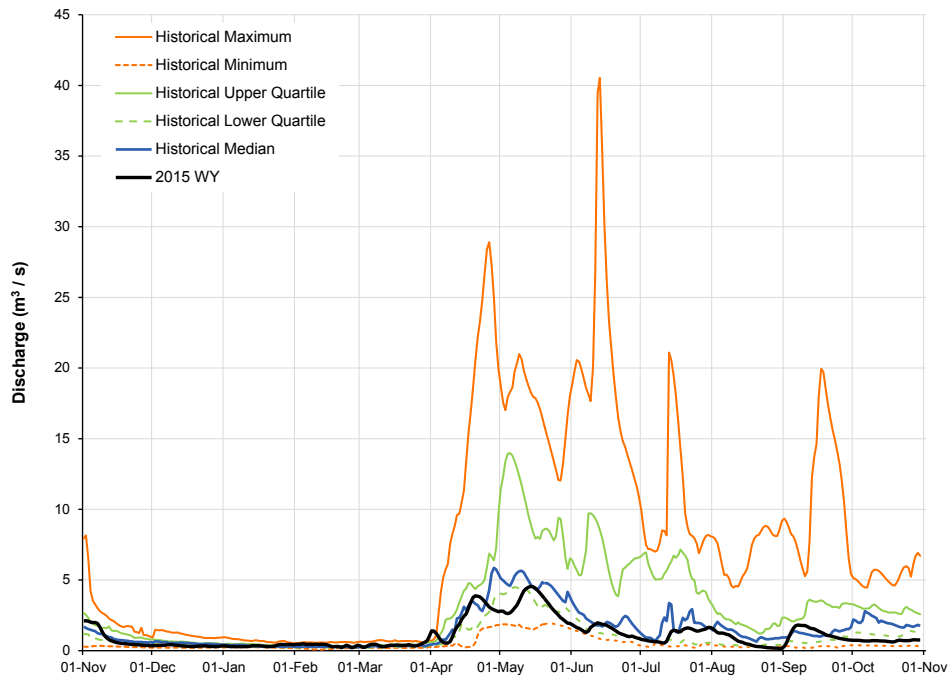


Figure C.3-23 Discharge of the Tar River above the CNRL Lake (Station S34) for the 2015 WY, compared to historical values.

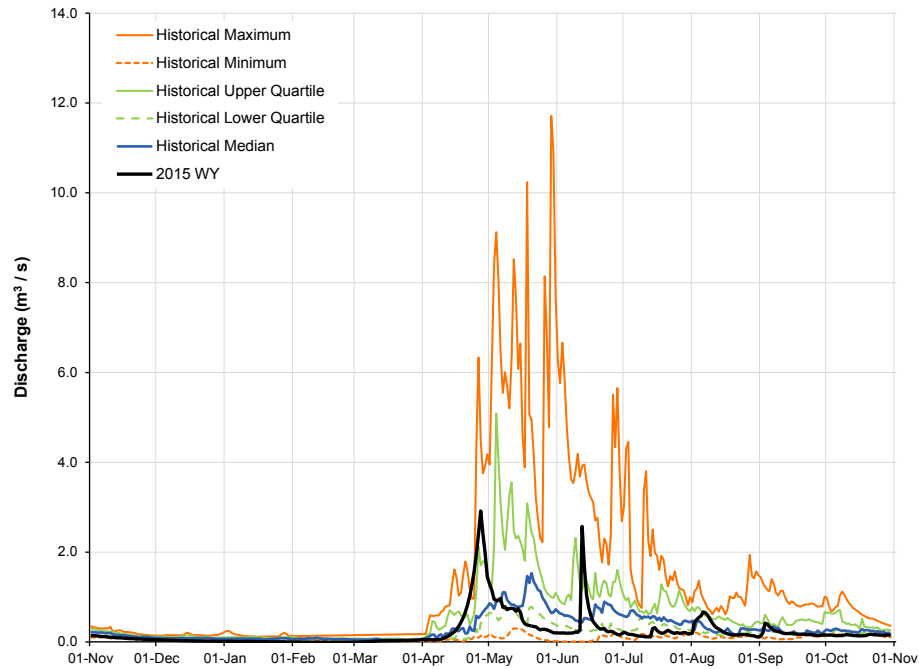


Figure C.3-24 Discharge of the McClelland Lake Outlet above the Firebag River (Station S36) for the 2015 WY, compared to historical values.

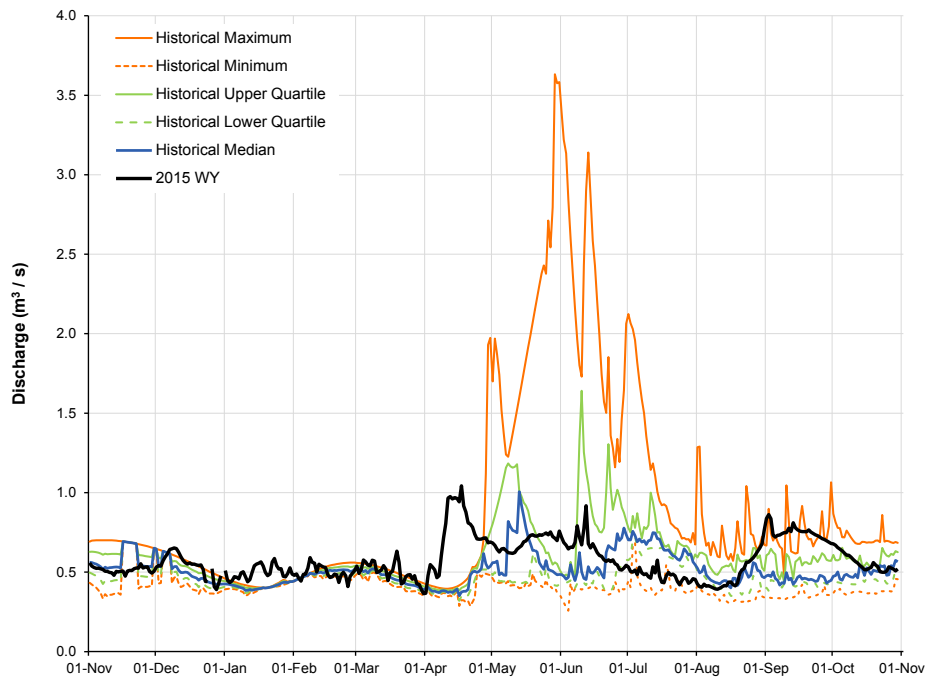


Figure C.3-25 Discharge of East Jackpine Creek near the 1,300 ft. Contour (Station S37) for the 2015 WY, compared to historical values.

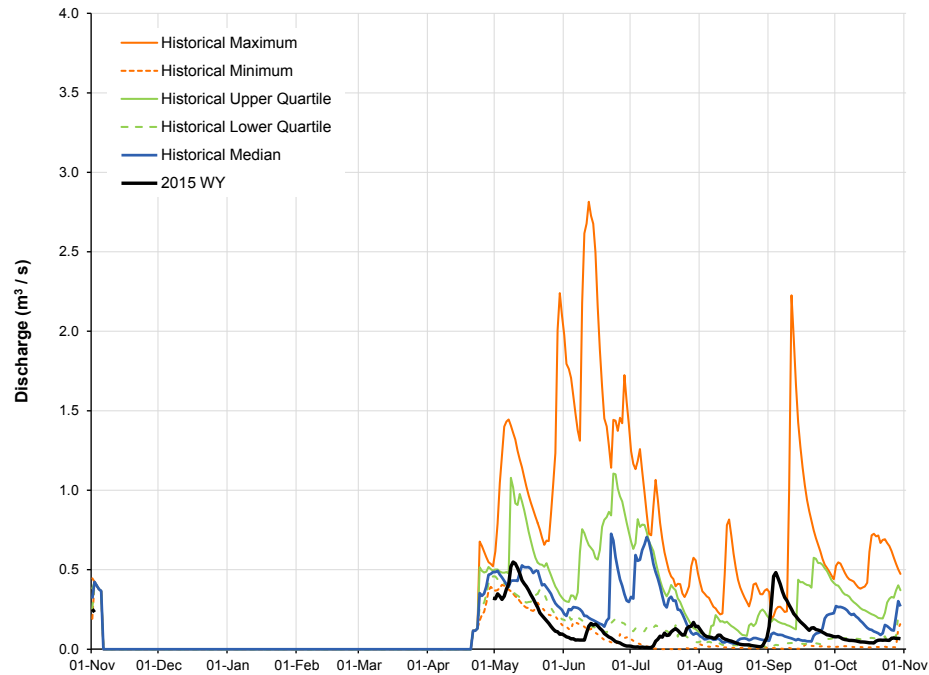
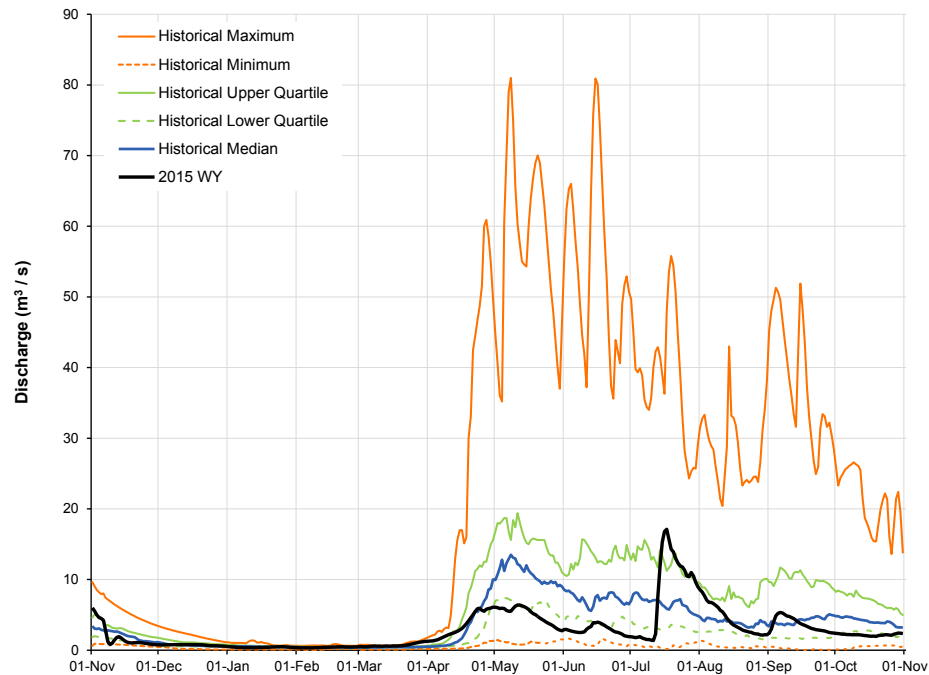
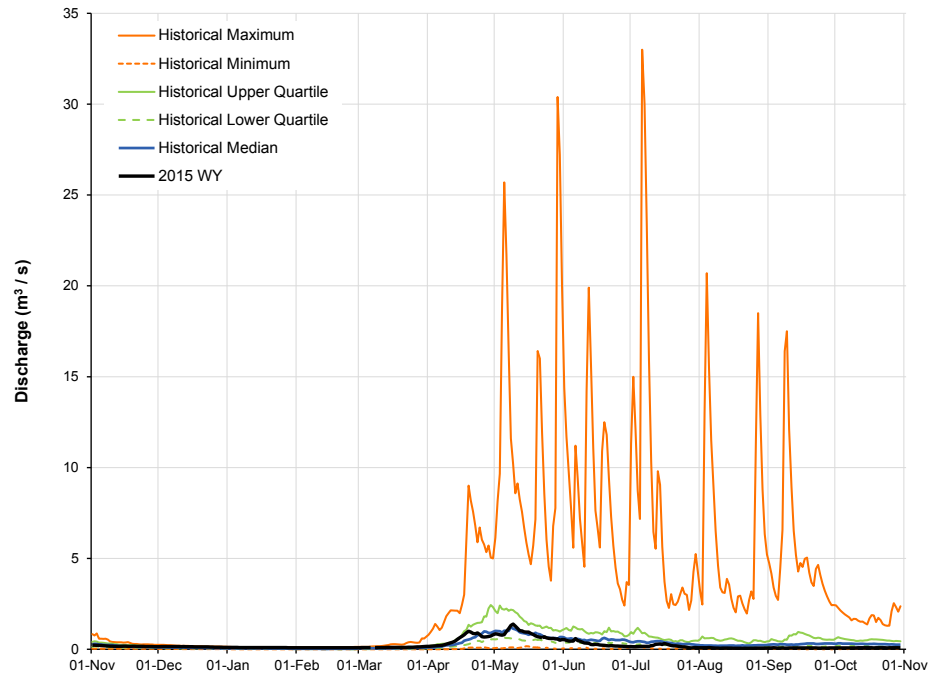


Figure C.3-26 Discharge of the Steepbank River near Fort McMurray (Station S38) for the 2015 WY, compared to historical values.



Note: Hydrograph was developed using provisional WSC data from station 07DA006 from November 1, 2014 to October 31, 2015.

Figure C.3-27 Discharge of the Beaver River above Syncrude (Station S39) for the 2015 WY, compared to historical values.



Note: Hydrograph was developed using provisional WSC data from station 07DA018 from November 1, 2014 to October 31, 2015.

Figure C.3-28 Discharge of the Mackay River at Petro-Canada Bridge (Station S40) for the 2015 WY, compared to historical values.

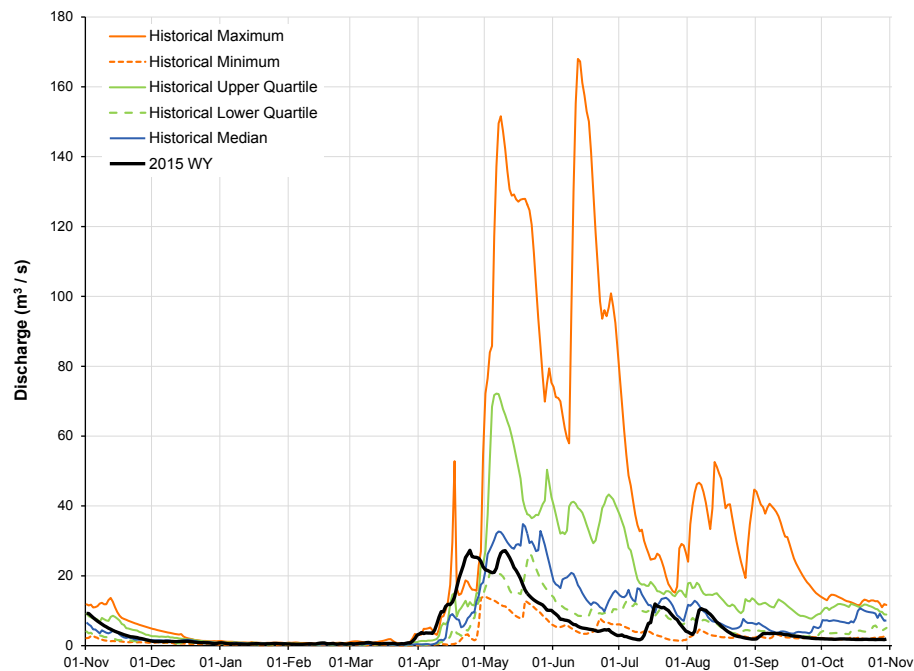
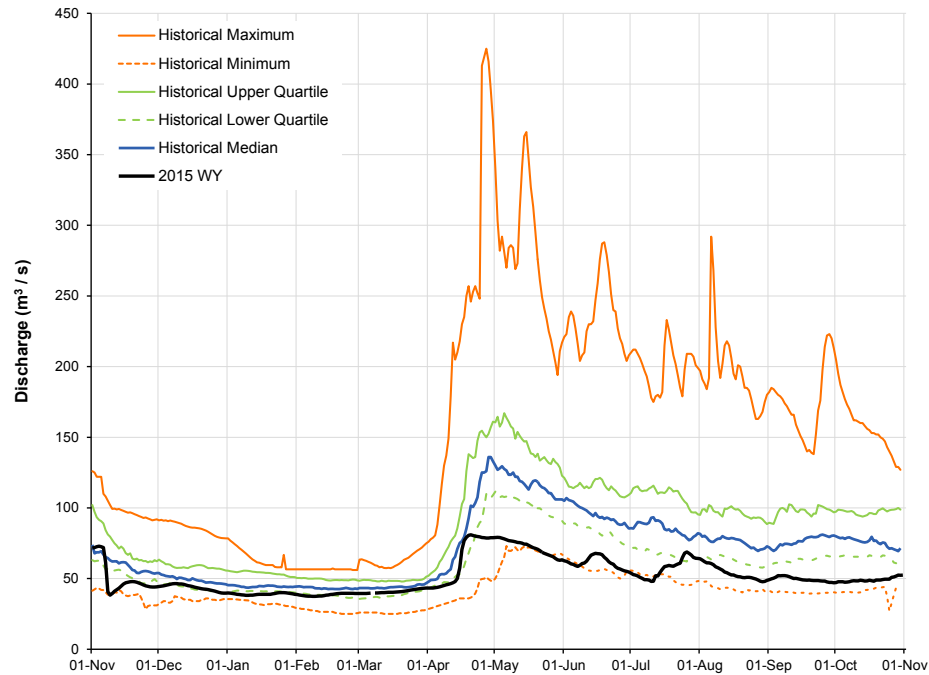


Figure C.3-29 Discharge of the Clearwater River located above Christina River (Station S42) for the 2015 WY, compared to historical values.



Note: Hydrograph was developed using provisional WSC data from station 07CD005 from November 1, 2014 to October 31, 2014.

Figure C.3-30 Discharge of the Firebag River above Suncor Firebag (Station S43) for the 2015 WY, compared to historical values.

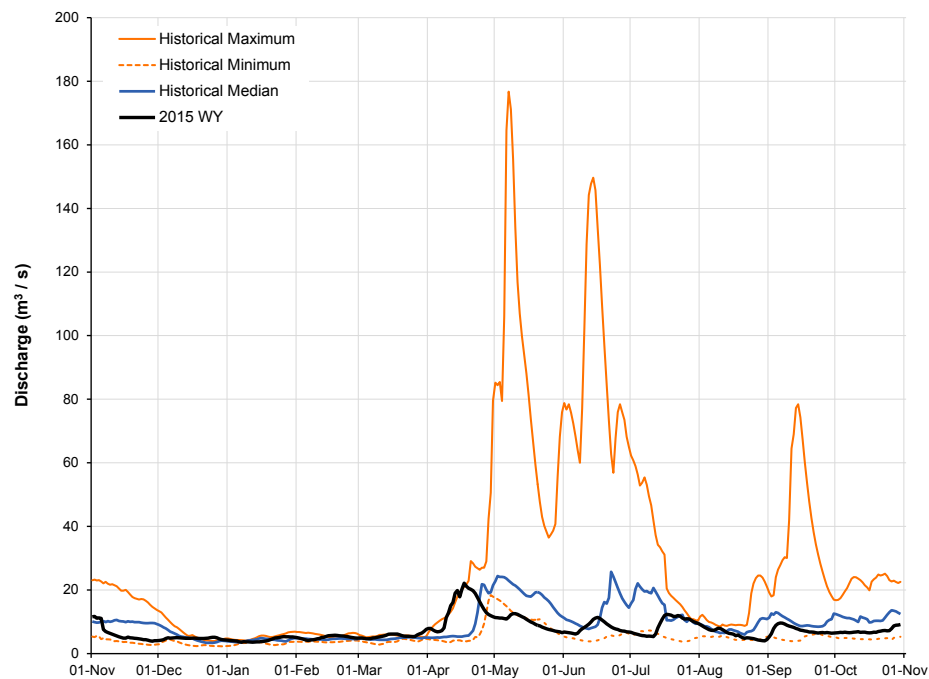
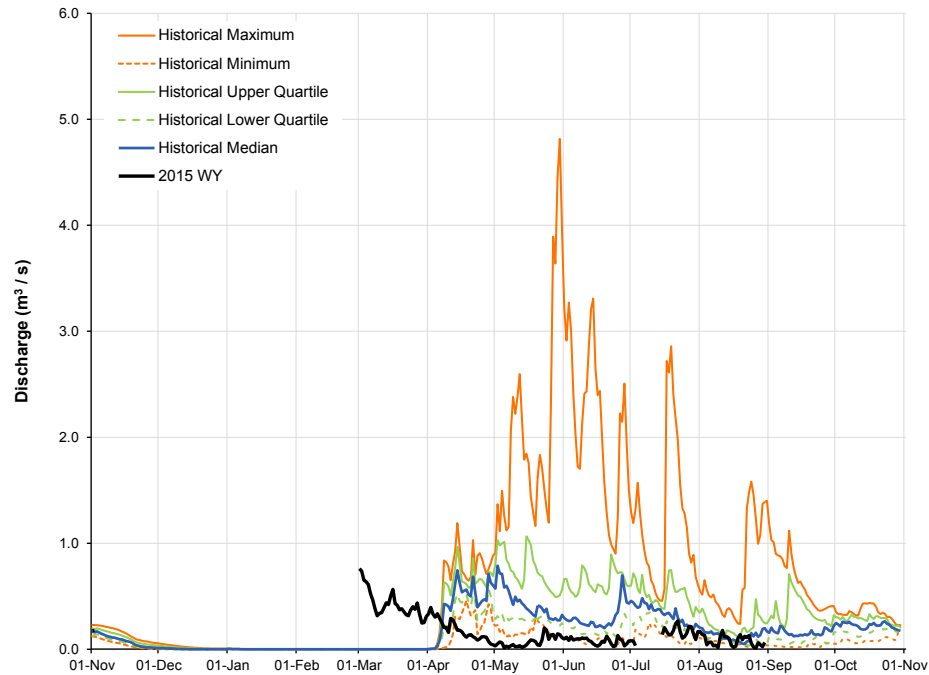


Figure C.3-31 Discharge of the Pierre River near Fort McKay (Station S44) for the 2015 WY, compared to historical values.



Note: Historical statistics were based on data from WSC Station 07DA013 (1975 to 1977) and RAMP/JOSMP Station S44 (2009 to 2014).

Figure C.3-32 Discharge of the Ells River above the Joslyn Creek diversion (Station S45) for the 2015 WY, compared to historical values.

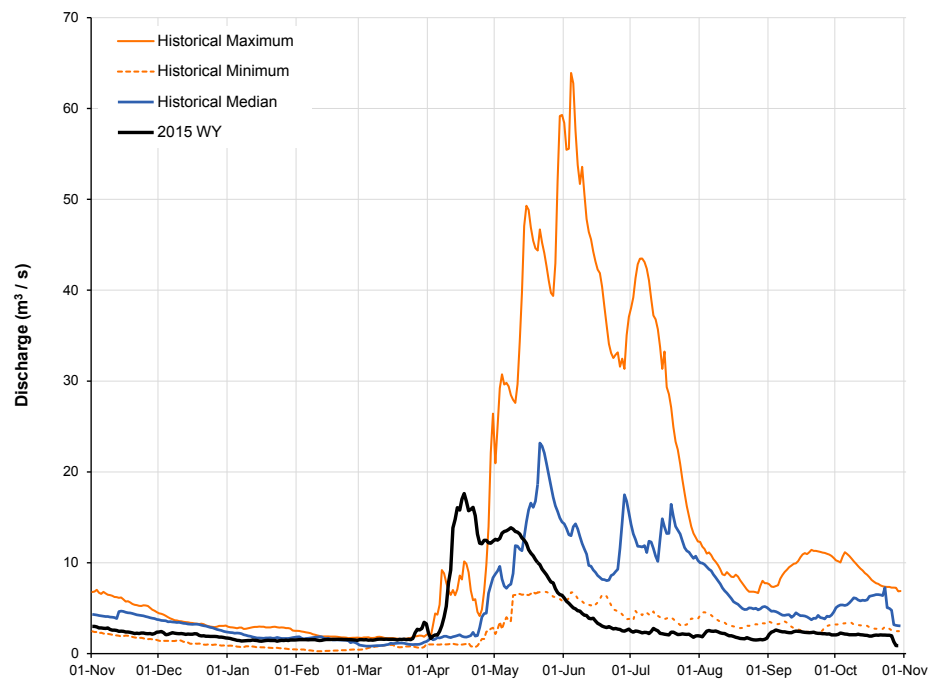
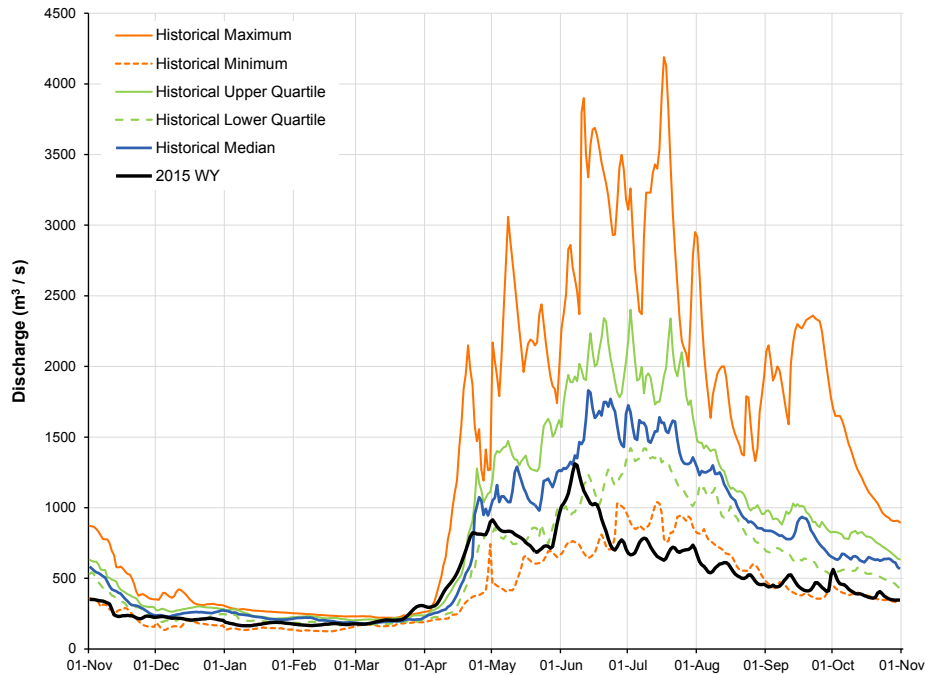
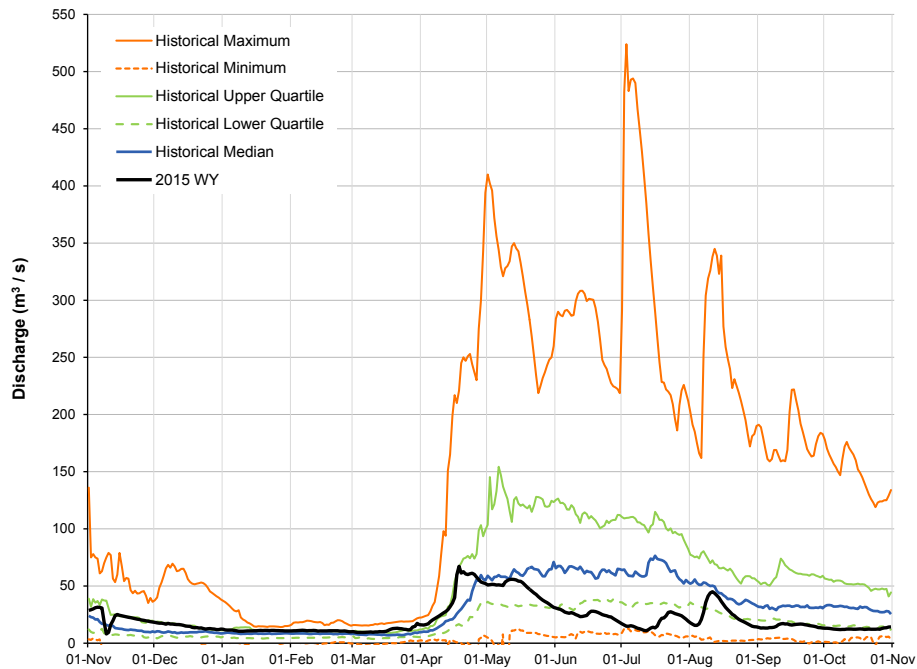


Figure C.3-33 Discharge of the Athabasca River near Embarras Airport (07DD001) for the 2015 WY, compared to historical values.



Note: Historical statistics were based on data from WSC Station 07DD001 (1971 to 1984) and RAMP/JOSMP Station S46 (2011 to 2014).

Figure C.3-34 Discharge of Christina River near the mouth (Station S47A) for the 2015 WY, compared to historical values.



Note: Historical statistics from 1967 to 2013 were estimated by calculating the difference between the measured flow at Clearwater River above Christina River, WSC Station 07CD005 and Clearwater River above Draper, WSC Station 07CD001, and using data from RAMP/JOSMP Station S47/47A (2011 to 2014).

Figure C.3-35 Discharge of Big Creek (Station S48) for the 2015 WY, compared to historical values.

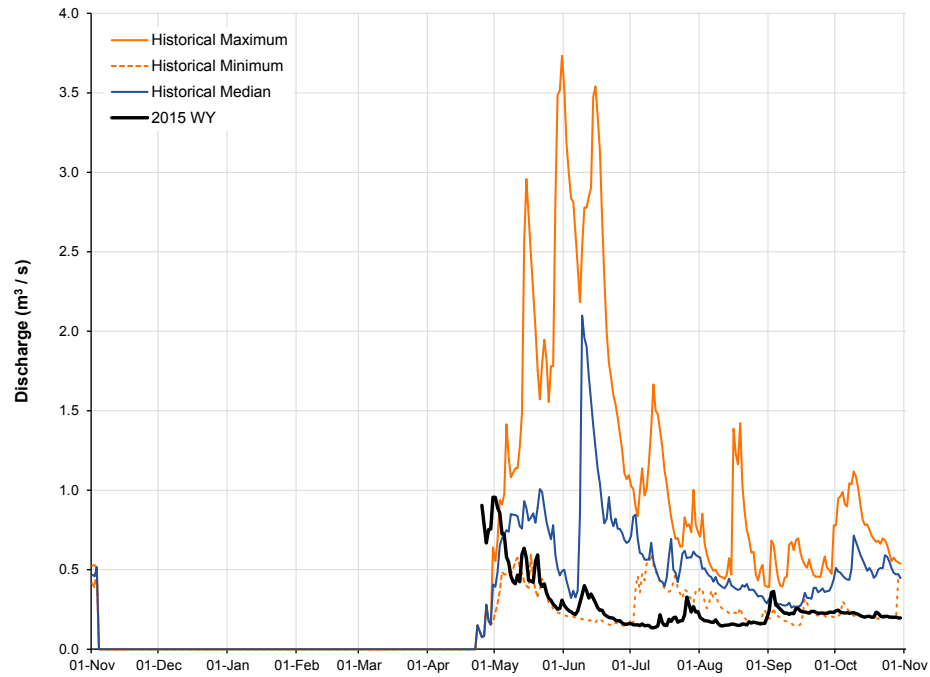


Figure C.3-36 Discharge of Eymundson Creek near the mouth (Station S49) for the 2015 WY, compared to historical values.

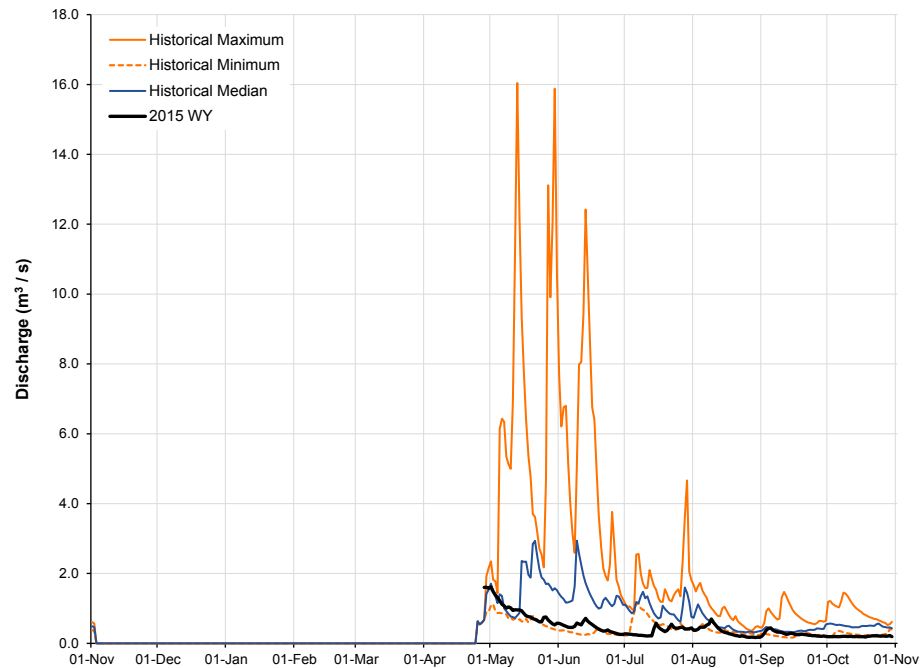


Figure C.3-37 Discharge hydrograph of Redclay Creek (Station S50A) for the 2015 WY, compared to historical values.

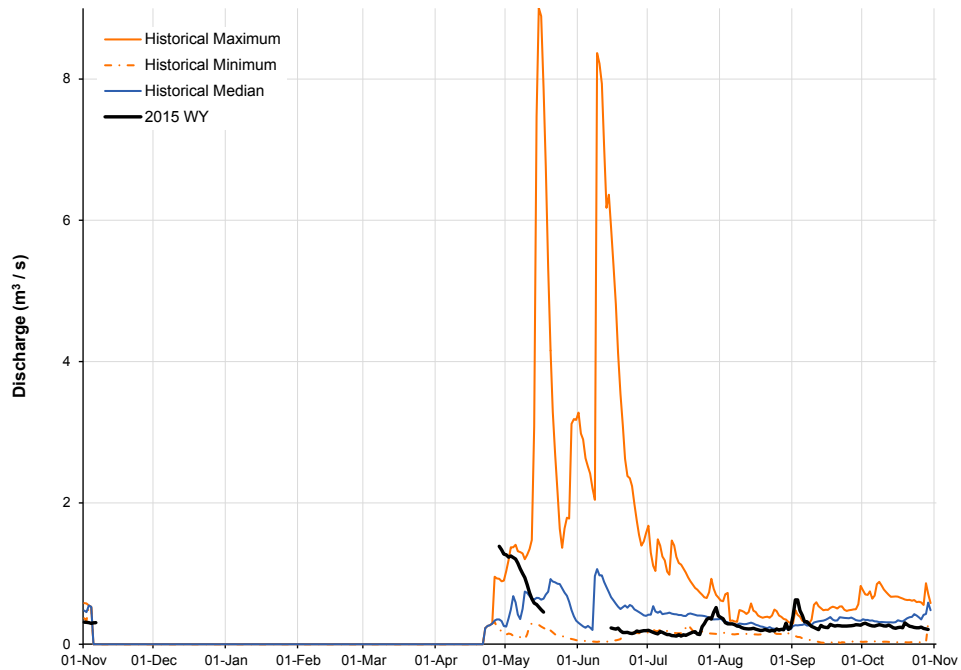


Figure C.3-38 Discharge of High Hills River above the Clearwater River (Station S51) for the 2012, 2013, 2014, and 2015 WYs.

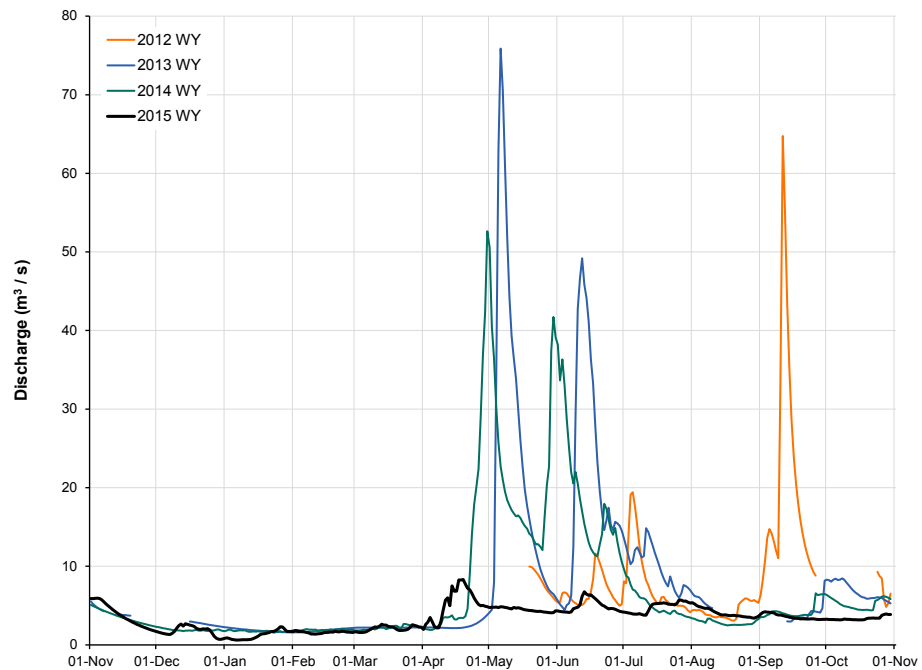
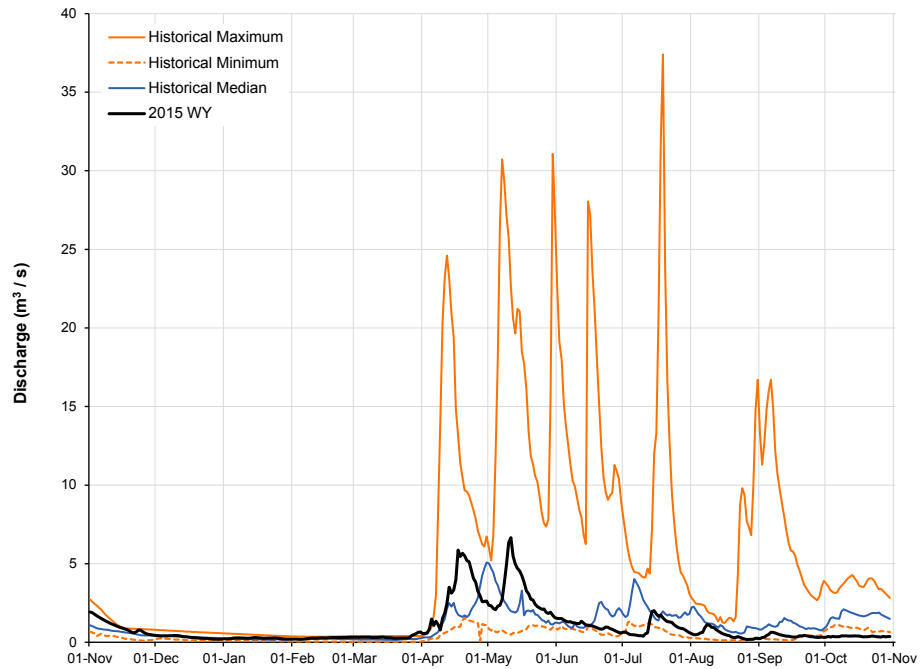
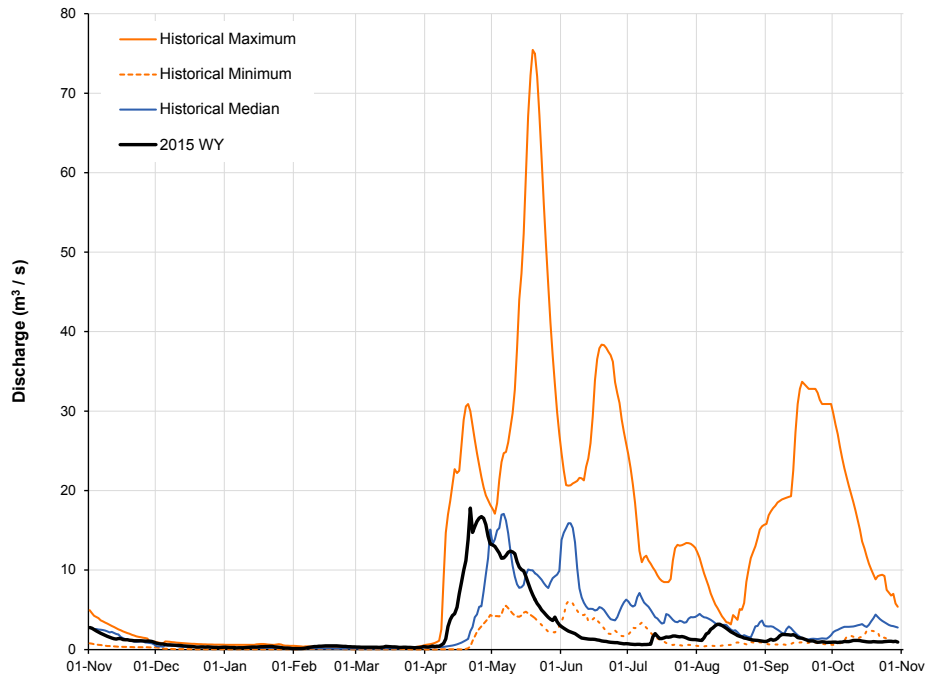


Figure C.3-39 Discharge of the Dover River near the mouth (Station S53) for the 2015 WY, compared to historical values.



Note: Historical statistics were based on data from WSC Station 07DB002 (1975 to 1977), and RAMP/JOSMP Station S53 (2012 to 2014).

Figure C.3-40 Discharge of the Dunkirk River near Fort MacKay (Station S54) for the 2015 WY, compared to historical values.



Note: Historical statistics were based on data from WSC Station 07DB003 (1975 to 1979), and RAMP/JOSMP Station S54 (2012 to 2014).

Figure C.3-41 Discharge of the Gregoire River above the Christina River (Station S55) for the 2012, 2013, 2014, and 2015 WYs.

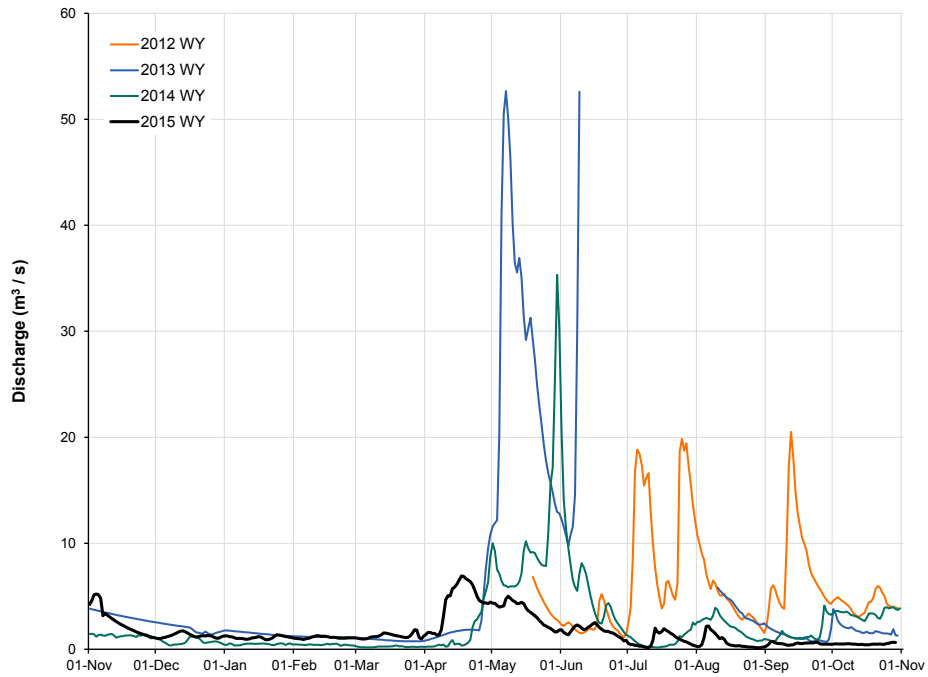
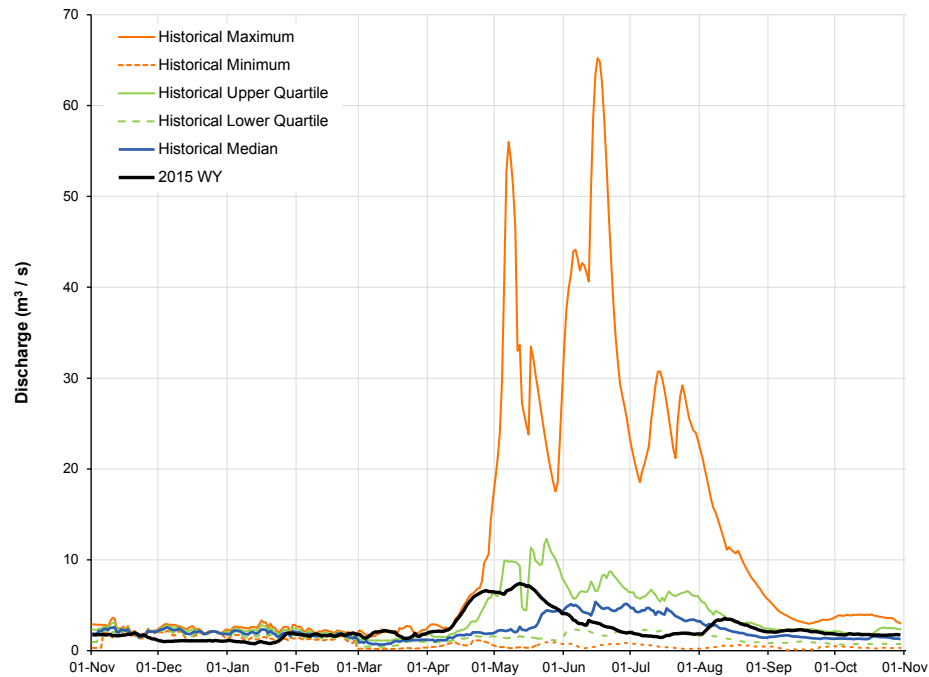


Figure C.3-42 Discharge of the Jackfish River below Christina (Station S56) for the 2015 WY, compared to historical values.



Note: Historical statistics were based on data from WSC Station 07CE005 (1982 to 1995), and JOSMP Station S56 (2012 to 2014).

Figure C.3-43 Discharge of Sunday Creek above Christina Lake (Station S57) for the 2012, 2013, 2014, and 2015 WYs.

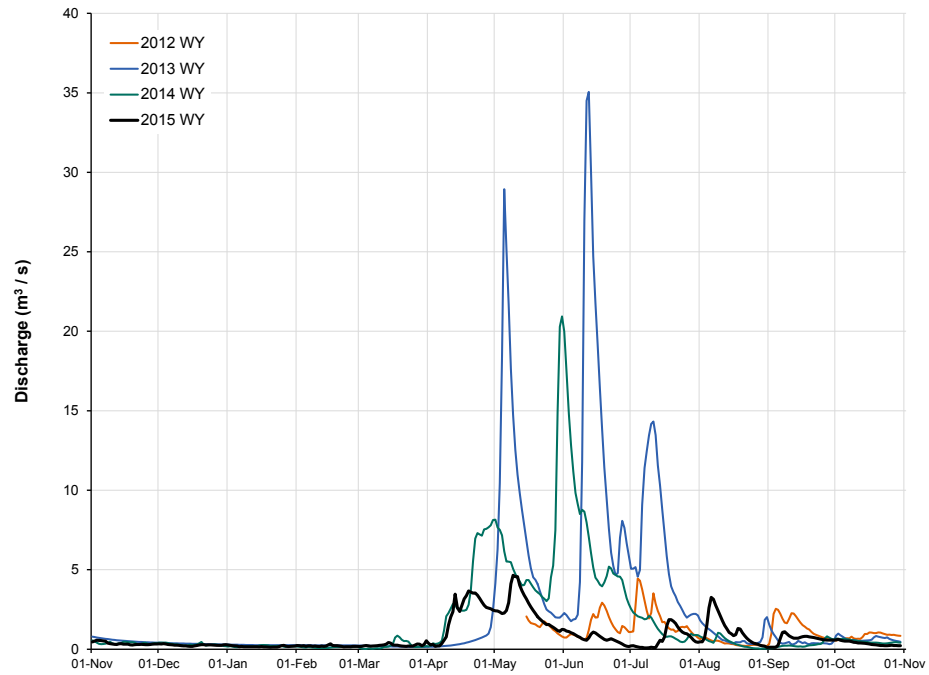


Figure C.3-44 Discharge of Sawbones Creek above Christina Lake (Station S58) for the 2012, 2013, 2014, and 2015 WYs.

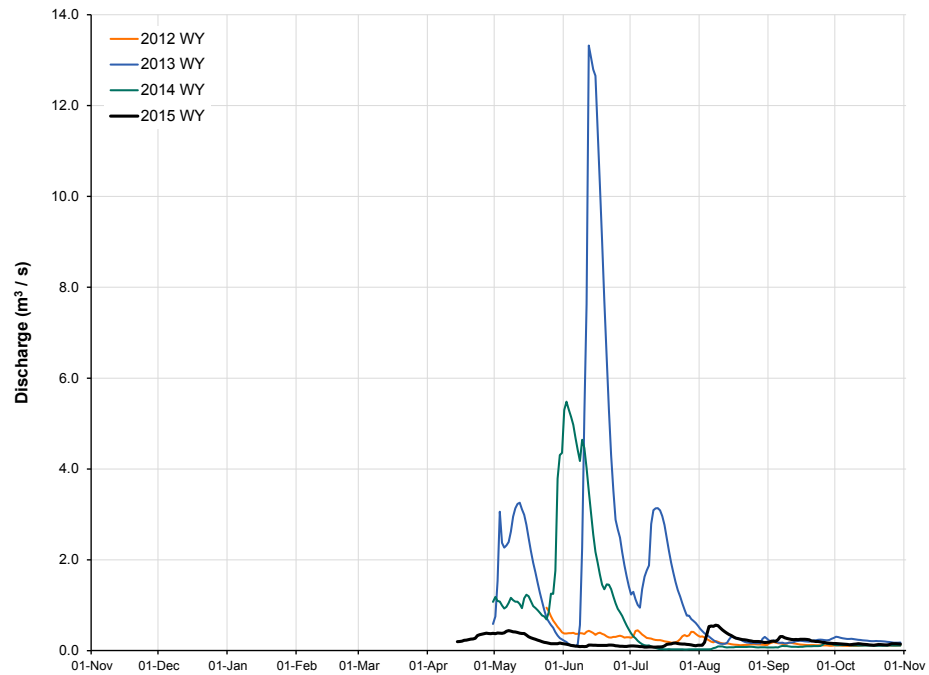


Figure C.3-45 Discharge of the unnamed creek south of Christina Lake (Station S60) for the 2013, 2014, and 2015 WYs.

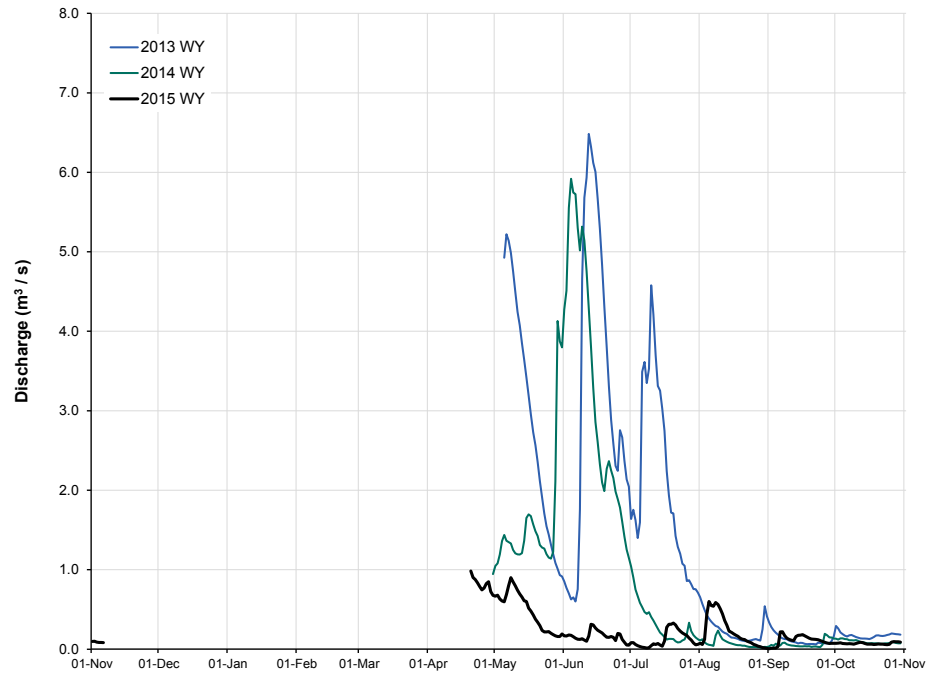


Figure C.3-46 Discharge of the Christina River above Statoil Leismer (Station S61) for the 2013, 2014, and 2015 WYs.

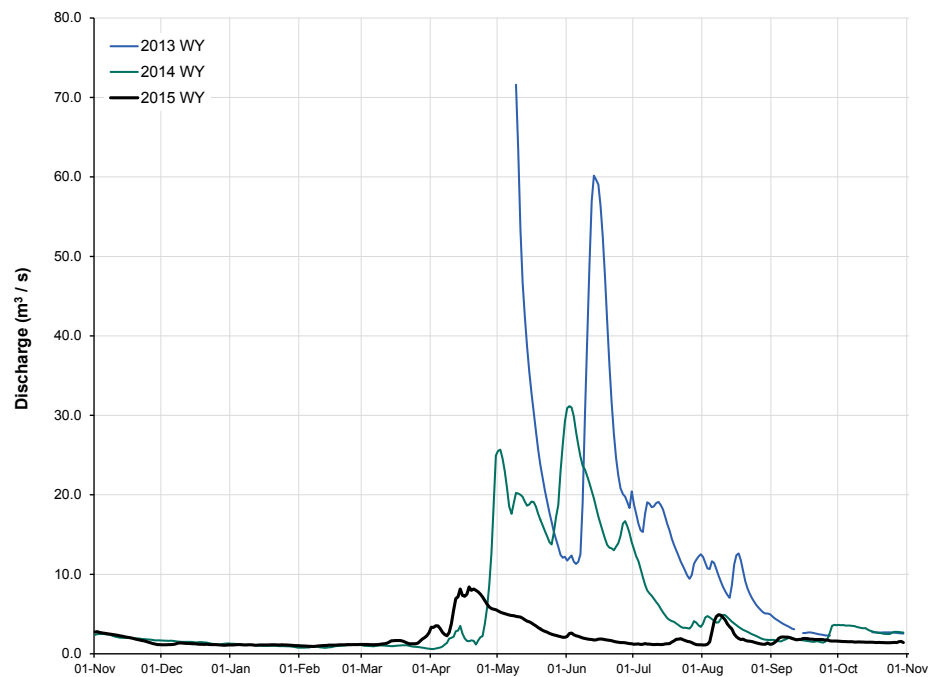


Figure C.3-47 Discharge of Birch Creek at Highway 881 (Station S62) for the 2013, 2014, and 2015 WYs.

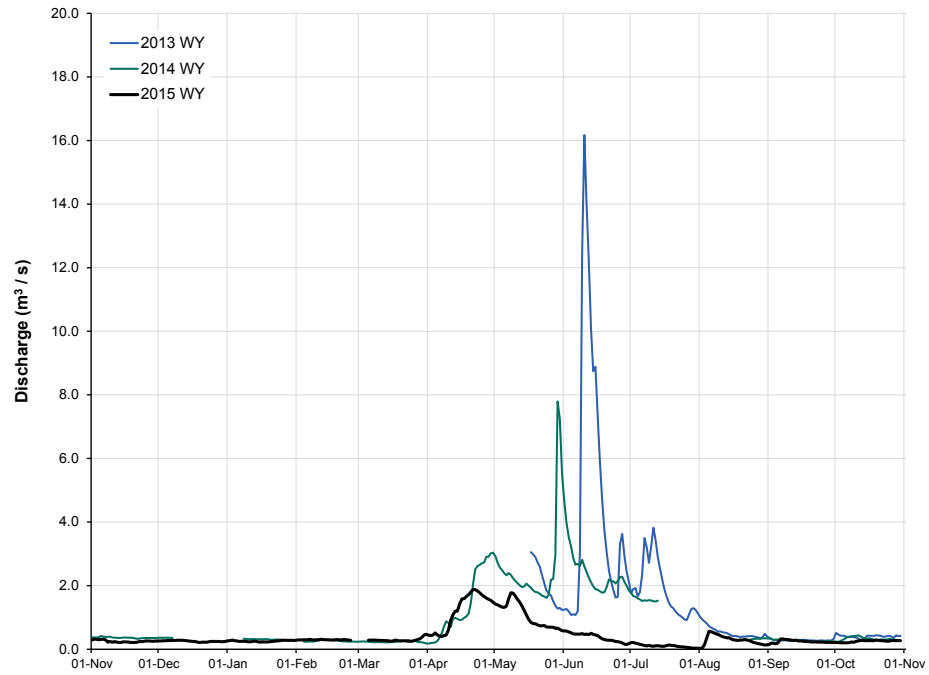


Figure C.3-48 Discharge of Sunday Creek at Highway 881 (Station S63) for the 2013, 2014, and 2015 WYs.

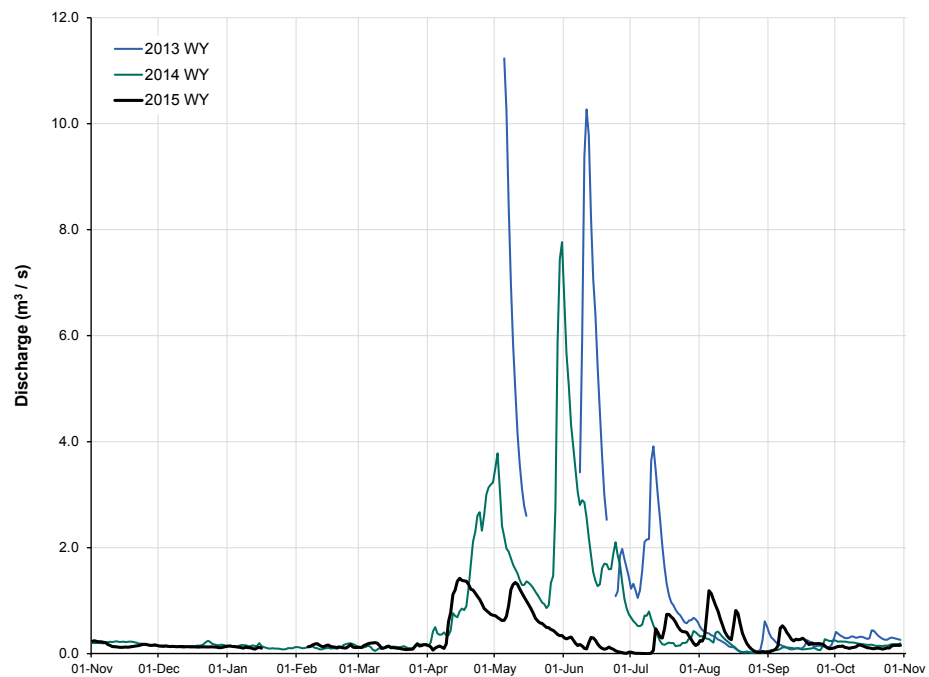


Figure C.3-49 Discharge of the unnamed creek east of Christina Lake (Station S64) for the 2013, 2014, and 2015 WYs.

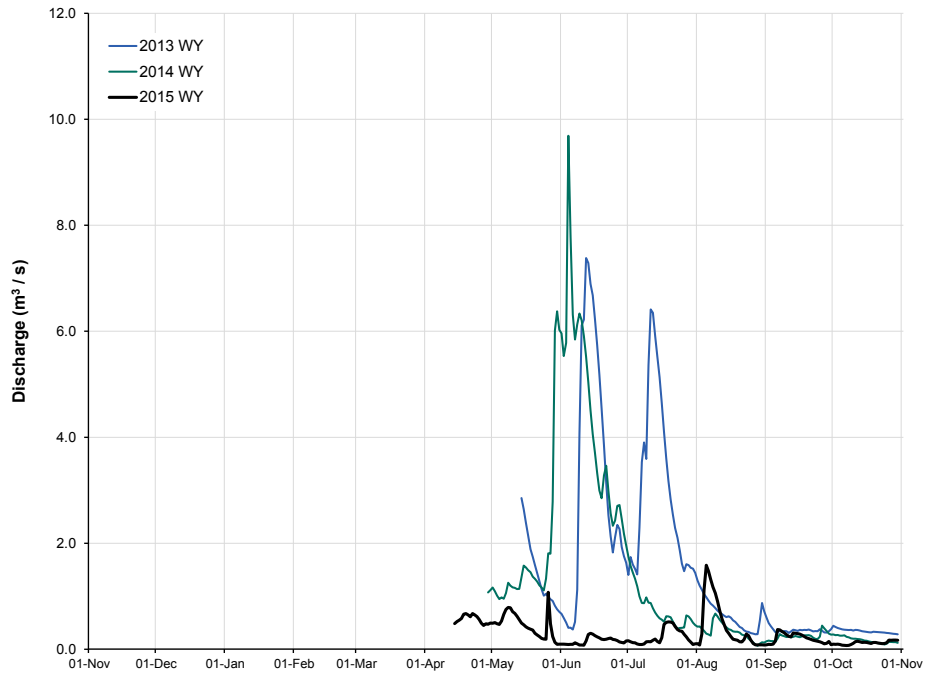


Figure C.3-50 Discharge of North Green Stockings Creek at East Athabasca Hwy (Station S65) for the 2014 and 2015 WYs.

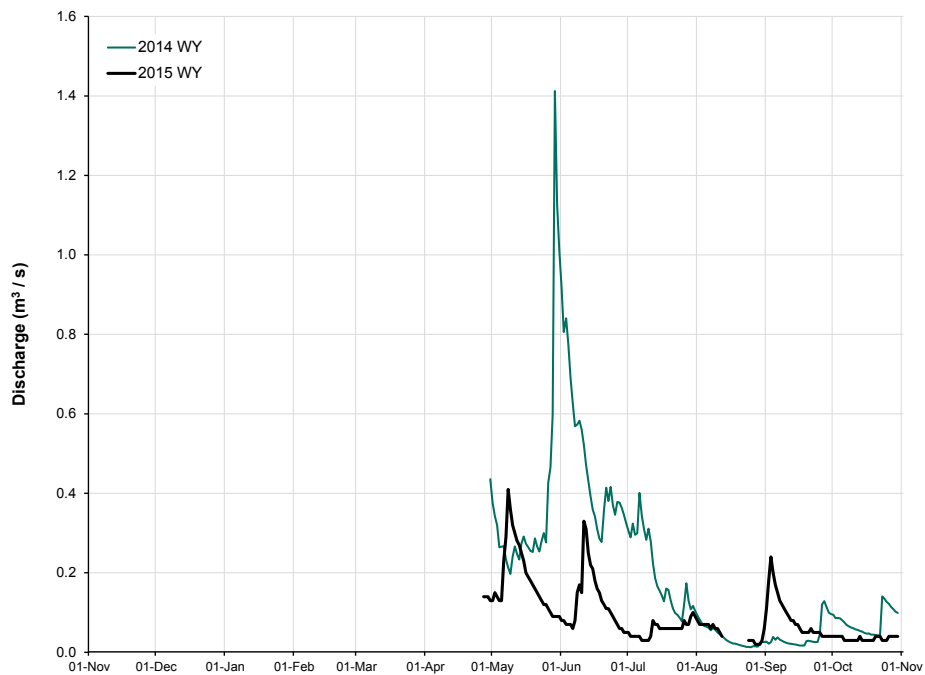
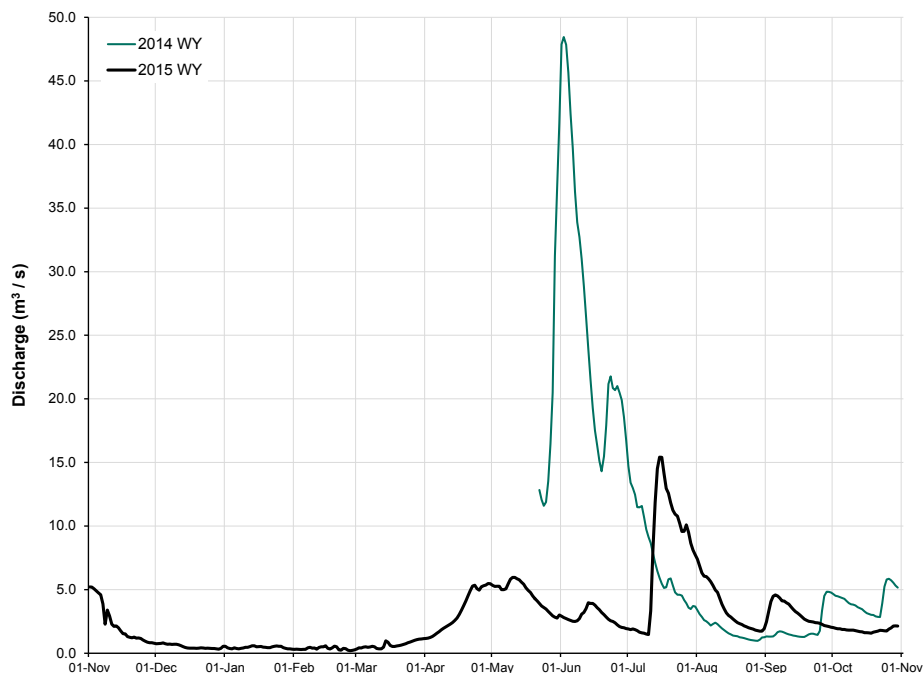


Figure C.3-51 Discharge of the Steepbank River below the North Steepbank River (Station S66) for the 2014 and 2015 WYs.



C.4 NATURALIZED FLOW CALCULATION

C.4.1 Introduction

A water balance approach was used to assess hydrologic impacts on the flow regime experienced at the mouth of major tributaries to the Athabasca River within the oil sands region. This analytical approach is considered useful in that the difference between observed and naturalized flows can be calculated using recorded and calculated flow inputs and outputs.

The water balance approach involved the calculation of a naturalized hydrograph by accounting for flow inputs and outputs that have affected the observed hydrograph at a particular location. A naturalized hydrograph for a location was calculated by adding back into the observed hydrograph, flows that would have occurred under natural conditions, and subtracting flows that would not have occurred naturally, but have been added to the system through human intervention (i.e., flows added as a result of industrial activity such as industrial flow releases and land-use changes). The observed hydrograph and the naturalized hydrograph were compared to assess the impacts to the flow regime at the specified location. Details of the procedure are provided below.

C.4.2 Rationale

C.4.2.1 Water Balance

In general, the water balance for a partially-developed watershed (that is, a watershed that has been affected by land clearing, hydrologic isolation, and water withdrawals and discharges from watercourses) may be considered as follows:

$$Q_{nat} = Q_{Obs} + Q_w - Q_r + Q_{HI} - Q_c \quad (1)$$

Where,

- Q_{nat} is the calculated *baseline* or naturalized hydrograph;
- Q_{obs} is the *test* hydrograph, which was observed;
- Q_w are the focal project water withdrawals from the watercourse;
- Q_r are the focal project water discharges to the watercourse;
- Q_{HI} is the natural runoff that would have occurred in the watershed, but was intercepted or closed-circuited by focal projects; and
- Q_c is the incremental increase in runoff caused by cleared land within the watershed.

For watersheds monitored as part of the JOSMP, the observed discharge was the discharge measured at streamflow stations near the watershed outlet.

Water withdrawals and discharges were obtained from industry reports. In most cases, daily discharges were reported. In other cases the withdrawal or discharge was reported as a monthly or annual volume, and the corresponding daily discharges were estimated by the JOSMP.

The natural flow, Q_{nat} was initially unknown and estimated by solving Equation 1 using information on the other components of the water balance. Because some of the other components were not known precisely, and because the water balance equation omits factors such as changes in surface water discharge in response to groundwater extraction, Q_{nat} was referred to as “naturalized”, rather than “natural”.

The effects of clearing and hydrologic isolation were estimated as discussed in the following sections.

C.4.2.2 Effect of Clearing

The effect of clearing was estimated by assuming a 20% increase in mean runoff depth in cleared areas. This assumption provided an approximate estimate of increased runoff. A more precise assessment would require consideration of the following factors:

- The effect of clearing on runoff is not well defined and may vary significantly depending on the soil type, initial vegetation, and other factors; and
- When land is cleared, the runoff is frequently treated in settling ponds, which may have sufficient capacity to attenuate the runoff and appreciably affect the discharge hydrograph.

Using an assumption of a constant increase in mean runoff depth was considered to be appropriate for reviewing changes in flow characteristics when evaluated at the mouth of the tributaries, because the cleared area is usually small compared to the total watershed area.

C.4.2.3 Closed-Circuited Areas

Closed-circuited (or hydrologically isolated) areas were delineated based on satellite imagery and reviewed by oil sands operators (Table C.4-1). It was assumed that zero runoff was released to the environment from closed-circuited areas.

The definition of “effective area” used in the water balance analyses was the area of the watershed remaining after removal of the closed-circuited areas. The effective area included both cleared and natural areas that were not closed-circuited by development activities. All areas of the watershed that were not closed-circuited were included in the effective area for the purpose of the water balance analyses. The effective area as defined for this analysis may include areas that were ineffective in the classic hydrological sense of areas that do not contribute runoff to the stream during normal (up to 1:2 year) runoff events.

Table C.4-1 Area of each watershed that was cleared or hydrologically closed-circuited, 2015.

Watershed	Total Area¹ (km²)	Closed-Circuit Area (km²)	Cleared Area (km²)
Athabasca River ²	156,000	664.8	130.0
Muskeg River	1,433	147.9	91.1
Steepbank River	1,364	14.1	41.4
Tar River	333	99.3	14.0
MacKay River	5,569	7.6	44.0
Calumet River	175	0.7	1.3
Firebag River	6,770	40.5	34.9
Ells River	2,709	3.6	36.2
Christina River ²	13,402	18.1	132.7
Hangingstone River	1,066	0.2	15.2
Poplar Creek	284	38.0	17.2
Fort Creek	66.4	21.9	34.0

¹ area is reported for the stream monitoring station

² values reported for all oil sands projects

C.4.3 Water Balance Procedure

In order to calculate the naturalized hydrograph, the observed discharge was first adjusted to remove the effects of industrial water withdrawals and discharges. The resulting discharge represented the observed runoff (R) from the contributing portion of the watershed. The observed runoff was then converted to a naturalized runoff depth (d), accounting for the effects of clearing. The naturalized runoff depth was used

to calculate the naturalized discharge for the watershed (HydB). The natural flow that would have occurred from industrially closed-circuited areas (R_n), and the incremental flow from cleared areas (R_i) were also calculated. This process is as follows:

$$R = Q_{Obs} + Q_w - Q_r \quad (2)$$

$$d = \frac{R}{[A_E + (A_C \times F)]} \times C \quad (3)$$

$$Q_{nat} = \frac{A \times d}{C} \quad (4)$$

$$Q_{HI} = \frac{A_{HI} \times d}{C} \quad (5)$$

$$Q_c = \frac{A_C \times d \times F}{C} \quad (6)$$

Where,

- A is the total watershed area (km^2);
- A_C is the cleared area in the watershed (km^2);
- A_E is the effective area (i.e., $A - A_{HI}$) (km^2);
- A_{HI} is the closed-circuited area (km^2);
- C is the conversion factor from $\text{m}^3/\text{s}/\text{km}^2$ to mm/yr ;
- d is the naturalized runoff depth (mm);
- F is the adjustment factor to account for clearing (0.20); and
- R is the observed runoff from the effective area adjusted for reported industrial withdrawals and discharges (m^3/s).

The water balance calculation was done at a daily time step.

C.4.4 Previously Published Estimates

Naturalized flows provided in the RAMP reports in 2005 to 2007 (RAMP 2006; 2007, 2007) were estimated using methods similar to, but slightly different than the procedure described above. Estimates for 2005 to 2007 were revised to be consistent with the method used for 2008 to 2015, which reflected more accurately a naturalized water balance, and these revisions were presented in the RAMP 2008 report (RAMP 2009a). The assumption of differences in runoff response between upland and lowland terrain, previously applied to closed-circuited areas, was not applied due to the lack of a reliable and consistent approach for all watersheds.

C.4.5 Results of 2015 Water Year Naturalized Flow Calculation

The results from these calculations for the 2015 WY are presented in Table C.4-2 to Table C.4-12.

Table C.4-2 Summary of the naturalized flow calculation for JOSMP Station S46, Athabasca River near Embarras Airport.

NOTES

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	15,600,000	12,998	66,482.62	15,533,517
JOSMP site (km ²)	156,000.0	130.0	664.8	155,335.2
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY	Observed (m ³ /s)	Endpoint	Baseline	
			Baseline (m ³ /s)	% change of natural
	14464.069	Annual Sum (million cumecs)	14641.295	-1.210%
	642.891	Mean open-water season (1-May : 31-Oct)	650.093	-1.108%
	210.670	Mean winter discharge (1-Nov : 31-Mar)	214.435	-1.755%
	1310.000	Annual maximum daily discharge	1319.436	-0.715%
	345.000	Open-water season minimum daily discharge	349.946	-1.413%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	14464.069
Closed-circuit loss	million m ³	-62.397
Incremental runoff from land clearing	million m ³	2.440
Withdrawals from the stream	million m ³	-120.722
Releases into the stream	million m ³	6.362
Diversion into/out of watershed	million m ³	0.000
Tributary changes	million m ³	-2.909
Incremental volume	million m ³	-177.226
Naturalized Hydrograph	million m ³	14641.295
Incremental volume	% of natural	-0.012
Naturalized Runoff Depth	mm	93.85

Table C.4-3 Summary of the naturalized flow calculation for WSC Station 07DA008 (JOSMP Station S7), Muskeg River near Fort McKay.

NOTES	

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
JOSMP site (ha)	145,700	9,108	14,786	130,914
JOSMP site (km ²)	1,457.0	91.1	147.9	1,309.1
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m ³ / s)	Endpoint		Baseline (m ³ / s)	% change of natural
53.671	Annual Sum (million cumecs)		51.983	3.247%
2.153	Mean open-water season (1-May: 31-Oct)		2.108	2.128%
0.750	Mean winter discharge (1-Nov: 31-Mar)		0.675	11.068%
6.430	Annual maximum daily discharge		6.684	-3.796%
0.460	Open-water season minimum daily discharge		0.440	4.568%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	53.671
Closed-circuit loss	million m ³	-5.275
Incremental runoff from land clearing	million m ³	0.650
Withdrawals from the stream	million m ³	0.000
Releases into the stream	million m ³	6.314
Diversion into/out of watershed	million m ³	0.000
Tributary changes	million m ³	0.000
Incremental volume	million m ³	1.688
Naturalized Hydrograph	million m ³	51.983
Incremental volume	% of natural	3.247%
Naturalized Runoff Depth	mm	35.68

Table C.4-4 Summary of the naturalized flow calculation for WSC Station 07DA006 (JOSMP Station S38), Steepbank River near Fort McMurray.

NOTES

	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
JOSMP site (ha)	132,000	4,142	1,414	130,586
JOSMP site (km ²)	1,320.0	41.4	14.14	1,305.86
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY	Observed (m ³ / s)	Endpoint	Baseline	
			Baseline (m ³ / s)	% change of natural
	89.944	Annual Sum (million cumecs)	90.345	-0.444%
	4.396	Mean open-water season (1-May: 31-Oct)	4.416	-0.444%
	0.841	Mean winter discharge (1-Nov: 31-Mar)	0.844	-0.444%
	17.100	Annual maximum daily discharge	17.176	-0.444%
	1.370	Open-water season minimum daily discharge	1.376	-0.444%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	89.944
Closed-circuit loss	million m ³	-0.968
Incremental runoff from land clearing	million m ³	0.567
Withdrawals from the stream	million m ³	0.000
Releases into the stream	million m ³	0.000
Diversion into/out of watershed	million m ³	0.000
Tributary changes	million m ³	0.000
Incremental volume	million m ³	-0.401
Naturalized Hydrograph	million m ³	90.345
Incremental volume	% of natural	-0.44%
Naturalized Runoff Depth	mm	68.44

Table C.4-5 Summary of the naturalized flow calculation for JOSMP Station S15A, Tar River near the mouth.

NOTES

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
JOSMP site (ha)	33,200	1,404	9,929	23,271
JOSMP site (km ²)	332.0	14.0	99.3	232.7
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY	Observed (m ³ / s)	Endpoint	Baseline	
			Baseline (m ³ / s)	% change of natural
	5.413	Annual Sum (million cumecs)	7.631	-29.06%
	0.282	Mean open-water season (1-May: 31-Oct)	0.398	-29.06%
	-	Mean winter discharge (1-Nov: 31-Mar)	-	-
	1.722	Annual maximum daily discharge	2.427	-29.06%
	0.038	Open-water season minimum daily discharge	0.054	-29.06%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	5.413
Closed-circuit loss	million m ³	-2.282
Incremental runoff from land clearing	million m ³	0.065
Withdrawals from the stream	million m ³	0.000
Releases into the stream	million m ³	0.000
Diversion into/out of watershed	million m ³	0.000
Tributary changes	million m ³	0.000
Incremental volume	million m ³	-2.218
Naturalized Hydrograph	million m ³	7.631
Incremental volume	% of natural	-29.06%
Naturalized Runoff Depth	mm	22.98

Table C.4-6 Summary of the naturalized flow calculation for WSC Station 07DB001 (JOSMP Station S26), MacKay River near Fort McKay.

NOTES	

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
JOSMP site (ha)	556,930	4,396	763	556,167
JOSMP site (km ²)	5,569.3	44.0	7.6	5,561.7
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY		Baseline	
Observed (m ³ / s)	Endpoint	Baseline (m ³ / s)	% change of natural
203.494	Annual Sum (million cumecs)	203.471	0.01%
8.479	Mean open-water season (1-May: 31-Oct)	8.478	0.009%
1.870	Mean winter discharge (1-Nov: 31-Mar)	1.870	0.021%
35.000	Annual maximum daily discharge	34.994	0.016%
2.050	Open-water season minimum daily discharge	2.050	0.021%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	203.494
Closed-circuit loss	million m ³	-0.279
Incremental runoff from land clearing	million m ³	0.321
Withdrawals from the stream	million m ³	-0.019
Releases into the stream	million m ³	0.000
Diversion into/out of watershed	million m ³	0.000
Tributary changes	million m ³	0.000
Incremental volume	million m ³	0.023
Naturalized Hydrograph	million m ³	203.471
Incremental volume	% of natural	0.011%
Naturalized Runoff Depth	mm	36.53

Table C.4-7 Summary of the naturalized flow calculation for JOSMP Station S16A, Calumet River near the mouth.

NOTES	

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
JOSMP site (ha)	16,900	135	70	16,830
JOSMP site (km ²)	169.0	1.4	0.7	168.3
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY		Baseline	
Observed (m ³ / s)	Endpoint	Baseline (m ³ / s)	% change of natural
0.703	Annual Sum (million cumecs)	0.641	9.785%
0.044	Mean open-water season (1-May: 31-Oct)	0.0424	4.244%
-	Mean winter discharge (1-Nov: 31-Mar)	0.0000	0.000%
0.372	Annual maximum daily discharge	0.3731	-0.254%
0.0053	Open-water season minimum daily discharge	0.0053	-0.254%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	0.703
Closed-circuit loss	million m ³	-0.003
Incremental runoff from land clearing	million m ³	0.001
Withdrawals from the stream	million m ³	0.000
Releases into the stream	million m ³	0.064
Diversion into/out of watershed	million m ³	0.000
Tributary changes	million m ³	0.000
Incremental volume	million m ³	0.063
Naturalized Hydrograph	million m ³	0.641
Incremental volume	% of natural	9.79%
Naturalized Runoff Depth	mm	3.79

Table C.4-8 Summary of the naturalized flow calculation for WSC Station 07DC001 (JOSMP Station S27), Firebag River near the mouth.

NOTES	

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
JOSMP site (ha)	598,760	3,492	4,046	594,714
JOSMP site (km ²)	5,987.6	34.9	40.5	5,947.1
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m ³ / s)	Endpoint		Baseline (m ³ / s)	% change of natural
594.707	Annual Sum (million cumecs)		597.650	-0.492%
21.916	Mean open-water season (1-May: 31-Oct)		22.026	-0.503%
12.965	Mean winter discharge (1-Nov: 31-Mar)		13.033	-0.521%
50.800	Annual maximum daily discharge		50.910	-0.216%
13.300	Open-water season minimum daily discharge		13.375	-0.559%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	594.707
Closed-circuit loss	million m ³	-4.039
Incremental runoff from land clearing	million m ³	0.697
Withdrawals from the stream	million m ³	0.000
Releases into the stream	million m ³	0.399
Diversion into/out of watershed	million m ³	0.000
Tributary changes	million m ³	0.000
Incremental volume	million m ³	-2.943
Naturalized Hydrograph	million m ³	597.650
Incremental volume	% of natural	-0.492%
Naturalized Runoff Depth	mm	99.81

Table C.4-9 Summary of the naturalized flow calculation for JOSMP Station S14A, EIs River at the CNRL Bridge.

NOTES	

LAND AREAS				
	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
JOSMP site (ha)	242,000	3,621	360	241,640
JOSMP site (km ²)	2,420.0	36.2	3.60	2,416.4
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m ³ / s)	Endpoint		Baseline (m ³ / s)	% change of natural
130.143	Annual Sum (million cumecs)		129.947	0.15%
4.270	Mean open-water season (1-May: 31-Oct)		4.263	0.15%
2.036	Mean winter discharge (1-Nov: 31-Mar)		2.033	0.15%
25.720	Annual maximum daily discharge		25.681	0.15%
0.970	Open-water season minimum daily discharge		0.969	0.15%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	130.1426
Closed-circuit loss	million m ³	-0.1933
Incremental runoff from land clearing	million m ³	0.389
Withdrawals from the stream	million m ³	0.000
Releases into the stream	million m ³	0.000
Diversion into/out of watershed	million m ³	0.000
Tributary changes	million m ³	0.000
Incremental volume	million m ³	0.196
Naturalized Hydrograph	million m ³	129.947
Incremental volume	% of natural	0.150%
Naturalized Runoff Depth	mm	53.70

Table C.4-10 Summary of the naturalized flow calculation for JOSMP Station S47A, Christina River near the mouth.

NOTES

LAND AREAS	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	1,303,805	1,301,991	1,814	1,301,991
JOSMP site (km ²)	13,038.0	13,019.9	18.1	13,019.9
Incremental Runoff from clearing			Factor	20%

RESULTS SUMMARY		Baseline	
Observed (m ³ / s)	Endpoint	Baseline (m ³ / s)	% change of natural
671.541	Annual Sum (million cumecs)	671.161	0.06%
24.087	Mean open-water season (1-May : 31-Oct)	24.074	0.054%
14.093	Mean winter discharge (1-Nov : 31-Mar)	14.084	0.058%
67.194	Annual maximum daily discharge	67.154	0.060%
10.891	Open-water season minimum daily discharge	10.885	0.053%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	671.541
Closed-circuit loss	million m ³	-0.934
Incremental runoff from land clearing	million m ³	1.366
Withdrawals from the stream	million m ³	-0.091
Releases into the stream	million m ³	0.04
Diversion into/out of watershed	million m ³	0.00
Tributary changes	million m ³	0.00
Incremental volume	million m ³	0.381
Naturalized Hydrograph	million m ³	671.161
Incremental volume	% of natural	0.06%
Naturalized Runoff Depth	mm	51.48

Table C.4-11 Summary of the naturalized flow calculation for WSC Station 07CD004, Hangingstone River at Fort McMurray.

NOTES	

LAND AREAS				
	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
JOSMP site (ha)	96,200	1,517	16.00	96,184
JOSMP site (km ²)	962.0	15.2	0.2	961.8
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m ³ / s)	Endpoint		Baseline (m ³ / s)	% change of natural
35.910	Annual Sum (million cumecs)		35.803	0.30%
1.495	Mean open-water season (1-May: 31-Oct)		1.491	0.30%
0.366	Mean winter discharge (1-Nov: 31-Mar)		0.365	0.30%
4.510	Annual maximum daily discharge		4.497	0.30%
0.456	Open-water season minimum daily discharge		0.455	0.30%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	35.910
Closed-circuit loss	million m ³	-0.006
Incremental runoff from land clearing	million m ³	0.113
Withdrawals from the stream	million m ³	0.000
Releases into the stream	million m ³	0.000
Diversion into/out of watershed	million m ³	0.000
Tributary changes	million m ³	0.000
Incremental volume	million m ³	0.107
Naturalized Hydrograph	million m ³	35.803
Incremental volume	% of natural	0.30%
Naturalized Runoff Depth	mm	37.22

Table C.4-12 Summary of the naturalized flow calculation for JOSMP Station S11 (WSC Station 07DA007), Poplar Creek at Highway 63.

NOTES	

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
RAMP site (ha)	15,100	89	55.00	15,045
RAMP site (km ²)	151.0	0.9	0.6	150.5
Incremental Runoff from clearing			Factor	20%

RESULTS SUMMARY	Observed (m ³ /s)	Endpoint	Baseline	
			Baseline (m ³ /s)	% change of natural
	8.707	Annual Sum (million cumecs)	7.288	19.475%
	0.288	Mean open-water season (1-May : 31-Oct)	0.200	43.946%
	0.075	Mean winter discharge (1-Nov : 31-Mar)	0.075	-0.246%
	2.406	Annual maximum daily discharge	2.412	-0.246%
	0.006	Open-water season minimum daily discharge	0.006	-0.246%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m ³	8.707
Closed-circuit loss	million m ³	-0.027
Incremental runoff from land clearing	million m ³	0.009
Withdrawals from the stream	million m ³	0.000
Releases into the stream	million m ³	0.000
Diversion into/out of watershed	million m ³	3.662
Tributary changes	million m ³	0.000
Incremental volume	million m ³	3.644
Naturalized Hydrograph	million m ³	7.288
Incremental volume	% of natural	0.195
Naturalized Runoff Depth	mm	48.26

C.5 INVENTORY OF CLIMATE AND HYDROLOGIC DATA AVAILABILITY

An inventory of the climate and hydrologic data collected by the JOSMP is provided in Table C.5-1 and Table C.5-2. These data will be available on the RAMP website from May 2015. In addition to the data collected by JOSMP, data from the following sources contributed to the analyses in this report:

- Water Survey of Canada (WSC: <http://www.wsc.ec.gc.ca/>): Provisional WSC hydrologic data were used when final data were not yet available. In the database, data for a joint WSC/JOSMP station are provided starting with the year in which RAMP/JOSMP monitoring began. To provide regional context, JOSMP stations are identified where historical WSC data are available to extend the record length.
- Alberta Environment and Parks (AEP: www.alberta.ca/apps/basins/default.aspx?Basin=2).
- Environment Canada (EC: http://climate.weatheroffice.gc.ca/climateData/canada_e.html): Provisional EC climate data were used when final data were not yet available.
- Industry Data: Volumes of water released and withdrawn were supplied by oil sands companies.

Table C.5-1 Inventory of hydrologic data collected by the RAMP and JOSMP.

Hydrometric Station	Data Type	From	To
S01 - Alsands Drain	Discharge	1995-08-10	2002-12-31
	Water Level	1997-04-16	2002-12-30
S02 - Jackpine Creek at Canterra Road	Discharge	1995-05-06	2015-10-31
	Water Level	1997-04-17	2015-10-31
	Water Temperature	2007-10-20	2015-10-31
S03 - Iyininim Creek above Kearl Lake	Total Rainfall	1999-04-30	2015-10-31
	Discharge	1989-01-18	2015-10-31
	Water Level	1989-04-20	2015-10-31
	Water Temperature	2011-08-15	2015-10-31
S04 - Blackfly Creek near the mouth	Discharge	1989-02-15	1998-10-27
S04A - Blackfly Creek near the mouth	Discharge	2007-04-25	2007-10-25
	Water Level	2007-04-25	2007-10-25
S05 - Muskeg River above Stanley Creek	Discharge	2003-05-04	2015-10-31
	Water Level	2003-02-12	2015-10-31
	Water Temperature	2010-06-26	2015-10-31
S05A - Muskeg River above Muskeg Creek	Station Pressure	2002-03-16	2015-10-31
	Discharge	1995-08-11	2015-10-31
	Water Level	1997-04-17	2015-10-31
	Water Temperature	2004-09-01	2015-10-31
S06 - Mills Creek at Highway 63	Discharge	1997-04-16	2015-03-31
	Water Level	1997-04-16	2015-03-31
	Water Temperature	2010-09-19	2015-03-31

Table C.5-1 (Cont'd.)

Hydrometric Station	Data Type	From	To
S07 - Muskeg River near Fort McKay (07DA008)	Discharge ¹	1998-03-01	2015-10-31
	Water Level	2000-01-01	2015-10-31
	Water Temperature	2010-06-22	2015-10-31
S08 - Stanley Creek near the mouth	Water Level	1999-09-14	2003-10-14
S09 - Kearl Lake Outlet	Discharge	1989-01-18	2015-10-31
	Water Level	1989-01-18	2015-10-31
	Station Pressure	1999-04-07	2001-04-20
	Water Temperature	2011-04-26	2015-10-31
S10 - Wapasu Creek at Canterra Road	Discharge	1997-05-08	2012-08-12
	Water Level	1997-05-08	2012-08-12
	Water Temperature	2008-01-01	2012-08-12
S10A - Wapasu Creek near the mouth	Discharge	2012-08-13	2015-10-31
	Water Level	2012-08-13	2015-10-31
	Water Temperature	2012-08-13	2015-10-31
S11 - Poplar Creek at Highway 63 (07DA007)	Discharge ²	1996-04-20	2015-10-31
	Water Level	1995-05-05	2015-10-31
	Water Temperature	2008-05-14	2015-10-31
S12 - Fort Creek at Highway 63	Discharge	2000-04-02	2014-10-31
	Water Level	2000-04-02	2014-10-31
	Water Temperature	2011-08-08	2014-10-31
S13 - Shell Pond 3 Outlet	Discharge	2000-03-02	2002-12-07
	Water Level	2000-03-02	2002-12-07
S14 - Ells River above Joslyn Creek	Discharge ³	2001-03-15	2007-10-24
	Water Level	2001-05-13	2007-10-24
S14A - Ells River at CNRL Bridge	Discharge ³	2004-10-30	2015-10-31
	Water Level	2004-10-30	2015-10-31
	Water Temperature	2005-07-14	2015-10-31
S15 - Tar River near the mouth (07DA015)	Discharge ⁴	2001-05-09	2006-10-28
	Water Level	2001-05-09	2006-10-28
S15A - Tar River near the mouth	Discharge ⁴	2007-05-01	2015-10-31
	Water Level	2007-05-01	2015-10-31
	Water Temperature	2007-09-21	2015-10-31

Table C.5-1 (Cont'd.)

Hydrometric Station	Data Type	From	To
S16 - Calumet River near the mouth	Daily Maximum Temperature	2001-06-11	2005-10-11
	Daily Minimum Temperature	2001-06-11	2005-10-11
	Daily Mean Temperature	2001-06-11	2005-10-11
	Total Rainfall	2001-06-11	2005-05-02
	Total Snowfall	2001-06-11	2005-03-23
	Total Precipitation	2001-06-11	2005-05-02
	Discharge ⁵	2001-05-12	2004-10-31
	Water Level	2001-05-12	2004-10-31
	Water Temperature	2003-05-27	2004-10-31
S16A - Calumet River near the mouth	Discharge ⁵	2010-04-12	2015-10-31
	Water Level	2010-05-12	2015-10-31
	Water Temperature	2011-07-27	2015-10-31
S17 - Tar River upland tributary	Discharge	2001-05-12	2003-06-24
	Water Level	2001-05-12	2004-10-31
S18A - Calumet River upland tributary	Discharge	2002-06-10	2009-10-25
	Water Level	2002-06-10	2009-10-25
S19 - Tar River lowland tributary near the mouth	Total Rainfall	2002-06-13	2005-12-31
	Total Precipitation	2006-01-01	2009-10-22
	Total Rainfall	2010-04-22	2014-10-31
	Discharge	2001-05-09	2014-10-31
	Water Level	2001-05-09	2014-10-31
	Water Temperature	2012-04-23	2014-10-31
S20/S20A - Muskeg River upland	Discharge	2001-05-08	2015-10-31
	Water Level	2001-05-08	2015-10-31
	Water Temperature	2012-04-24	2015-10-31
S21 - Shelley Creek near the mouth	Water Level	2001-05-14	2003-10-14
S22 - Muskeg Creek near the mouth	Discharge	1989-01-17	2015-10-31
	Water Level	1989-01-17	2015-10-31
	Water Temperature	2012-04-24	2015-10-31
S23 - Aurora Boundary Weir	Discharge	2001-01-01	2002-12-31
	Water Level	2001-01-01	2002-12-31
S24 - Athabasca River below Eymundson Creek	Discharge	2001-06-20	2015-03-31
	Water Level	2001-06-20	2015-03-31
	Water Temperature	2010-08-11	2015-03-31
S25 - Susan Lake Outlet	Discharge	2002-06-11	2014-10-31
	Water Level	2002-06-11	2014-10-31
	Water Temperature	2012-05-19	2014-10-31
S26 - MacKay River near Fort McKay (07DB001)	Discharge ⁶	2001-03-01	2012-10-31

Table C.5-1 (Cont'd.)

Hydrometric Station	Data Type	From	To
S27 - Firebag River near the mouth (07DC001)	Discharge ⁷	2002-01-01	2012-10-31
	Water Level	2002-01-01	2010-02-28
S28 - Khahago Creek below Blackfly Creek	Discharge	1989-01-19	2007-10-25
	Water Level	1989-01-19	2007-10-25
S29 - Christina River near Chard (07CE002)	Discharge ⁸	2002-01-13	2010-10-31
	Total Rainfall	2002-07-08	2003-10-10
S31 - Hangingstone Creek at North Star Road	Discharge	2002-04-10	2015-10-31
	Water Level	2002-04-10	2015-10-31
	Total Rainfall	2010-04-23	2015-10-31
S32 - Surmount Creek at Highway 881	Discharge	2002-05-18	2015-10-31
	Water Level	2002-01-14	2015-10-31
	Water Temperature	2008-06-24	2015-10-31
S33 - Muskeg River at Aurora/Shell Boundary	Discharge	2003-01-29	2015-10-31
	Water Level	2003-04-30	2015-10-31
	Water Temperature	2009-11-01	2015-10-31
S34 - Tar River above CNRL Lake	Discharge	2005-04-26	2015-10-31
	Water Level	2005-04-26	2015-10-31
	Water Temperature	2008-04-08	2015-10-31
S35 - McClelland Lake Outlet	Water Level	2008-06-29	2008-10-08
S36 - McClelland Lake Outlet above Firebag River	Discharge	2008-05-14	2015-10-31
	Water Level	2008-05-14	2015-10-31
	Water Temperature	2011-07-27	2015-10-31
S37 - East Jackpine Creek near the 1300 m Contour	Discharge	2007-09-22	2015-10-31
	Water Level	2007-09-22	2015-10-31
	Water Temperature	2012-04-25	2015-10-31
S38 - Steepbank River near Fort McMurray (07DA006)	Discharge ⁹	2009-01-01	2012-10-31
S39 - Beaver River above Syncrude (07DA018)	Discharge ¹⁰	2009-01-01	2012-10-31
S40 - MacKay River at Petro-Canada Bridge	Discharge	2008-01-01	2015-10-31
	Water Level	2008-01-01	2015-10-31
	Total Rainfall	2010-04-23	2015-10-31
	Water Temperature	2008-09-19	2015-10-31
S42 - Clearwater River above Christina River (07CD005)	Discharge ¹¹	2009-01-01	2012-10-31
S43 - Firebag River above Suncor Firebag	Discharge	2009-05-01	2015-10-31
	Water Level	2009-05-01	2015-10-31
	Total Rainfall	2010-04-12	2015-10-31
	Water Temperature	2009-09-18	2015-10-31

Table C.5-1 (Cont'd.)

Hydrometric Station	Data Type	From	To
S44 - Pierre River near Fort McKay (07DA013)	Discharge ¹²	2009-05-01	2015-10-31
	Water Level	2009-05-01	2015-10-31
	Water Temperature	2011-07-27	2015-10-31
S45 - Ells River above Joslyn Creek Diversion	Discharge	2009-06-13	2015-10-31
	Water Level	2009-06-13	2015-10-31
	Water Temperature	2009-06-13	2015-10-31
S46 - Athabasca River near Embarras Airport	Discharge ¹³	2011-08-16	2015-03-31
	Water Level	2011-08-16	2015-03-31
	Water Temperature	2011-08-16	2015-03-31
S47/S47A - Christina River near the mouth	Discharge	2011-07-28	2015-10-31
	Water Level	2011-07-28	2015-10-31
	Water Temperature	2011-07-28	2015-10-31
S48 - Big Creek near the mouth	Discharge	2011-04-23	2015-10-31
	Water Level	2011-04-23	2015-10-31
	Water Temperature	2011-04-23	2015-10-31
S49 - Eymundson Creek near the mouth	Discharge	2011-07-27	2015-10-31
	Water Level	2011-07-27	2015-10-31
	Water Temperature	2011-07-27	2015-10-31
S50 - Redclay Creek	Discharge	2011-04-23	2011-10-29
	Water Level	2011-04-23	2011-10-29
	Water Temperature	2011-04-23	2011-10-29
S50A - Redclay Creek	Discharge	2012-04-26	2015-10-31
	Water Level	2012-04-26	2015-10-31
	Water Temperature	2012-04-26	2015-10-31
S51 - High Hills River near the mouth	Discharge	2012-05-20	2015-10-31
	Water Level	2012-05-20	2015-10-31
	Water Temperature	2012-05-20	2015-10-31
S53 - Dover River near the mouth	Discharge ¹⁴	2012-05-18	2015-10-31
	Water Level	2012-05-18	2015-10-31
	Water Temperature	2012-05-18	2015-10-31
S54 - Dunkirk River near Fort MacKay	Discharge ¹⁵	2012-05-17	2015-10-31
	Water Level	2012-05-17	2015-10-31
	Water Temperature	2012-05-17	2015-10-31
S55 - Gregoire River near the mouth	Discharge	2012-05-20	2015-10-31
	Water Level	2012-05-20	2015-10-31
	Water Temperature	2012-05-20	2015-10-31

Table C.5-1 (Cont'd.)

Hydrometric Station	Data Type	From	To
S56 - Jackfish River below Christina Lake	Discharge ¹⁶	2012-05-16	2015-10-31
	Water Level	2012-05-16	2015-10-31
	Water Temperature	2012-05-16	2015-10-31
S57 - Sunday Creek above Christina Lake	Discharge	2012-05-16	2015-10-31
	Water Level	2012-05-16	2015-10-31
	Water Temperature	2012-05-16	2015-10-31
S58 - Sawbones Creek above Christina Lake	Discharge	2012-05-25	2015-10-31
	Water Level	2012-05-25	2015-10-31
	Water Temperature	2012-05-25	2015-10-31
S60 - unnamed creek south of Christina Lake	Discharge	2013-05-06	2015-10-31
	Water Level	2013-05-06	2015-10-31
	Water Temperature	2013-05-06	2015-10-31
S61 - Christina River above Statoil Leismer	Discharge	2013-05-10	2015-10-31
	Water Level	2013-05-10	2015-10-31
	Water Temperature	2013-05-10	2015-10-31
S62 - Birch Creek at Highway 881	Discharge	2013-05-18	2015-10-31
	Water Level	2013-05-18	2015-10-31
	Water Temperature	2013-05-18	2015-10-31
S63 - Sunday Creek above Christina Lake	Discharge	2013-05-06	2015-10-31
	Water Level	2013-05-06	2015-10-31
	Water Temperature	2013-05-06	2015-10-31
S64 - unnamed creek east of Christina Lake	Discharge	2013-05-15	2015-10-31
	Water Level	2013-05-15	2015-10-31
	Water Temperature	2013-05-15	2015-10-31
S65 – North Green Stockings Creek at East Athabasca Highway	Discharge	2013-08-18	2015-10-31
	Water Level	2013-08-18	2015-10-31
	Water Temperature	2013-08-18	2015-10-31
S66 – Steepbank River below North Steepbank Confluence	Discharge	2015-05-23	2015-10-31
	Water Level	2015-05-23	2015-10-31
	Water Temperature	2015-05-23	2015-10-31
CR1 - Calumet River	Discharge ⁵	2005-05-04	2009-10-18

Table C.5-1 (Cont'd.)

Hydrometric Station	Data Type	From	To
L1 - McClelland Lake	Daily Maximum Temperature	2007-03-29	2015-10-31
	Daily Minimum Temperature	2007-03-29	2015-10-31
	Daily Mean Temperature	2007-02-09	2015-10-31
	Total Rainfall	2002-08-09	2015-10-31
	Total Precipitation	2006-04-15	2015-10-31
	Relative Humidity	2006-09-06	2015-10-31
	Discharge	1997-06-22	2006-09-02
	Water Level	1997-06-22	2015-10-31
L2 - Kearl Lake	Water Temperature	2008-03-14	2015-10-31
	Daily Maximum Temperature	2008-01-01	2015-10-31
	Daily Minimum Temperature	2008-01-01	2015-10-31
	Daily Mean Temperature	2007-09-25	2015-10-31
	Total Precipitation	2008-01-01	2015-10-31
	Relative Humidity	2007-09-25	2015-10-31
	Discharge	2007-04-26	2007-10-17
L3 - Isadore's Lake	Water Level	1989-01-19	2015-10-31
	Water Temperature	2007-09-25	2015-10-31
L4 - Namur Lake	Water Level	2000-02-22	2015-03-31
	Water Temperature	2011-10-31	2015-03-31
L4 - Namur Lake	Water Level	2012-05-18	2015-10-31
	Water Temperature	2012-05-18	2015-10-31
	Discharge	2012-05-18	2015-10-31

Historical discharge data were available from WSC for JOSMP stations in similar locations.

- ¹ S07 – Muskeg River near Fort McKay (07DA008) 1974 to present.
- ² S11 – Poplar Creek at Highway 63 (Poplar Creek near Fort McMurray 07DA007) 1972 to 1986.
- ³ S14/S14A – Ells River above Joslyn Creek/Ells River at CNRL Bridge (Ells River near the mouth 07DA017) 1975 to 1986.
- ⁴ S15/S15A – Tar River near the mouth (Tar River near Fort McKay 07DA015) 1975 to 1977.
- ⁵ S16/CR1/S16A – Calumet River near the mouth (Calumet River near Fort McKay 07DA014) 1975 to 1977.
- ⁶ S26 – MacKay River near Fort McKay (07DB001) 1972 to present.
- ⁷ S27 – Firebag River near the mouth (07DC001) 1971 to present.
- ⁸ S29 – Christina River near Chard (07CE002) 1982 to present.
- ⁹ S38 – Steepbank River near Fort McMurray (07DA006) 1972 to present.
- ¹⁰ S39 – Beaver River above Syncrude (07DA018) 1975 to present.
- ¹¹ S42 – Clearwater River above Christina River (07CD005) 1966 to present.
- ¹² S44 – Pierre River near Fort McKay (07DA013) 1975 to 1977.
- ¹³ S46 – Athabasca River near Embarras Airport (Athabasca River at Embarras Airport 07DD011) 1971 to 1984.
- ¹⁴ S53 – Dover River near the mouth (Dover River near the Mouth 07DB002) 1975 to 1977.
- ¹⁵ S54 – Dunkirk River near Fort McKay (Dunkirk River near Fort McKay 07DB003) 1975 to 1979.
- ¹⁶ S56 – Jackfish River below Christina Lake (Jackfish River below Christina Lake 07CE005) 1982 to 1995.

Table C.5-2 Inventory of climate data collected by the RAMP and JOSMP.

Climate Station	Data Type	From	To
C1 – Aurora Climate Station	Daily Maximum Temperature	1995-05-10	2015-10-31
	Daily Minimum Temperature	1995-05-10	2015-10-31
	Daily Mean Temperature	1988-03-11	2015-10-31
	Total Rainfall	1995-05-10	2008-12-31
	Total Snowfall	1996-01-01	2008-12-31
	Total Precipitation	1988-03-10	2015-10-31
	Snow on the Ground	1995-10-26	2015-10-31
	Speed of Extreme Gust	1995-05-10	2015-10-31
	Global Solar Radiation (RF1)	1988-03-11	2015-10-31
	Relative Humidity	1995-05-10	2015-10-31
	Maximum 2-Minute Wind Speed	1995-05-10	2015-10-31
	Maximum 10-Minute Wind Speed	1995-05-10	2015-10-31
	C2 – Horizon Climate Station	Daily Maximum Temperature	2008-10-16
Daily Minimum Temperature		2008-10-16	2015-10-31
Daily Mean Temperature		2008-10-16	2015-10-31
Snow on the Ground		2009-01-01	2015-10-31
Speed of Extreme Gust		2008-10-16	2015-10-31
Global Solar Radiation (RF1)		2008-10-16	2015-10-31
Station pressure		2008-10-16	2015-10-31
Relative Humidity		2008-10-16	2015-10-31
Maximum 2-Minute Wind Speed		2008-10-16	2015-10-31
Maximum 10-Minute Wind Speed		2008-10-16	2015-10-31
Total Precipitation		2009-06-11	2015-10-31
C3 – Steepbank Climate Station	Daily Maximum Temperature	2010-11-03	2015-10-31
	Daily Minimum Temperature	2010-11-03	2015-10-31
	Daily Mean Temperature	2010-11-03	2015-10-31
	Snow on the Ground	2010-11-03	2015-10-31
	Speed of Extreme Gust	2010-11-03	2015-10-31
	Global Solar Radiation (RF1)	2010-11-03	2015-10-31
	Station pressure	2010-11-03	2015-10-31
	Relative Humidity	2010-11-03	2015-10-31
	Maximum 2-Minute Wind Speed	2010-11-03	2015-10-31
	Maximum 10-Minute Wind Speed	2010-11-03	2015-10-31
	Total Precipitation	2009-08-13	2015-10-31

Table C.5-2 (Cont'd.)

Climate Station	Data Type	From	To
C4 – Pierre Climate Station	Daily Maximum Temperature	2011-07-25	2015-10-31
	Daily Minimum Temperature	2011-07-25	2015-10-31
	Daily Mean Temperature	2011-07-25	2015-10-31
	Snow on the Ground	2011-07-25	2015-10-31
	Speed of Extreme Gust	2011-07-25	2015-10-31
	Global Solar Radiation (RF1)	2011-07-25	2015-10-31
	Station pressure	2011-07-25	2015-10-31
	Relative Humidity	2011-07-25	2015-10-31
	Maximum 2-Minute Wind Speed	2011-07-25	2015-10-31
	Maximum 10-Minute Wind Speed	2011-07-25	2015-10-31
	Total Precipitation	2011-07-25	2015-10-31
C5 – Surmont Climate Station	Daily Maximum Temperature	2011-10-16	2015-10-31
	Daily Minimum Temperature	2011-10-16	2015-10-31
	Daily Mean Temperature	2011-10-16	2015-10-31
	Snow on the Ground	2011-10-16	2015-10-31
	Speed of Extreme Gust	2011-10-16	2015-10-31
	Global Solar Radiation (RF1)	2011-10-16	2015-10-31
	Station pressure	2011-10-16	2015-10-31
	Relative Humidity	2011-10-16	2015-10-31
	Maximum 2-Minute Wind Speed	2011-10-16	2015-10-31
	Maximum 10-Minute Wind Speed	2011-10-16	2015-10-31
	Total Precipitation	2011-10-16	2015-10-31

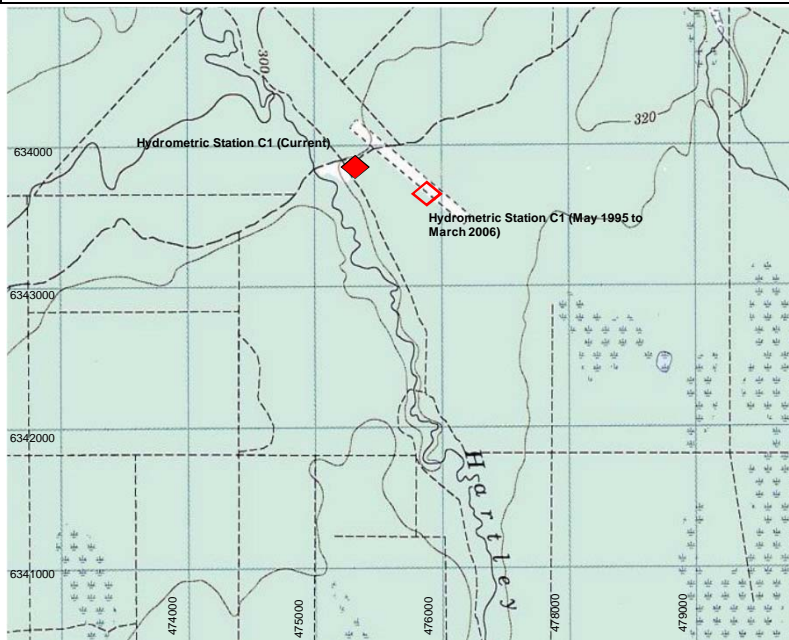
C.6 UPDATED STATION DESCRIPTION SHEETS

Updated station description sheets are provided below for all stations that were active in the 2015 WY.

Revised March 22, 2016

Location and Purpose:

Established in May 1995 to monitor climate conditions in the Muskeg River basin. Formerly Station 271 for the OSLO project-1988 data available.



Map Grid Based on UTM NAD 27

Station Details

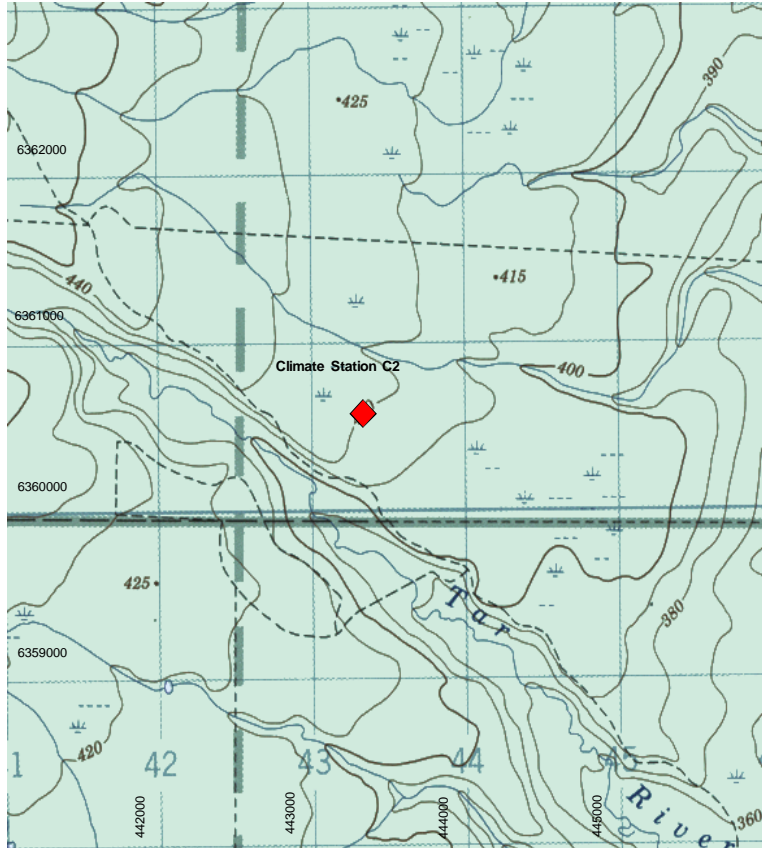
Variables Measured:	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation
Telemetry:	Cellular
Period of Record:	March 1996 to Present
Station Operation:	Year Round
Access:	Truck via Canterra Road/ Jackpine Mine
UTM Coordinates:	475230 E, 6344049 N (NAD83)
Lat/Long:	57°14'20" N, 111°24'37" W (NAD83)
Station Elevation:	308 m
NTS Map:	73M/10



Revised 22 March, 2016

Location and Purpose:

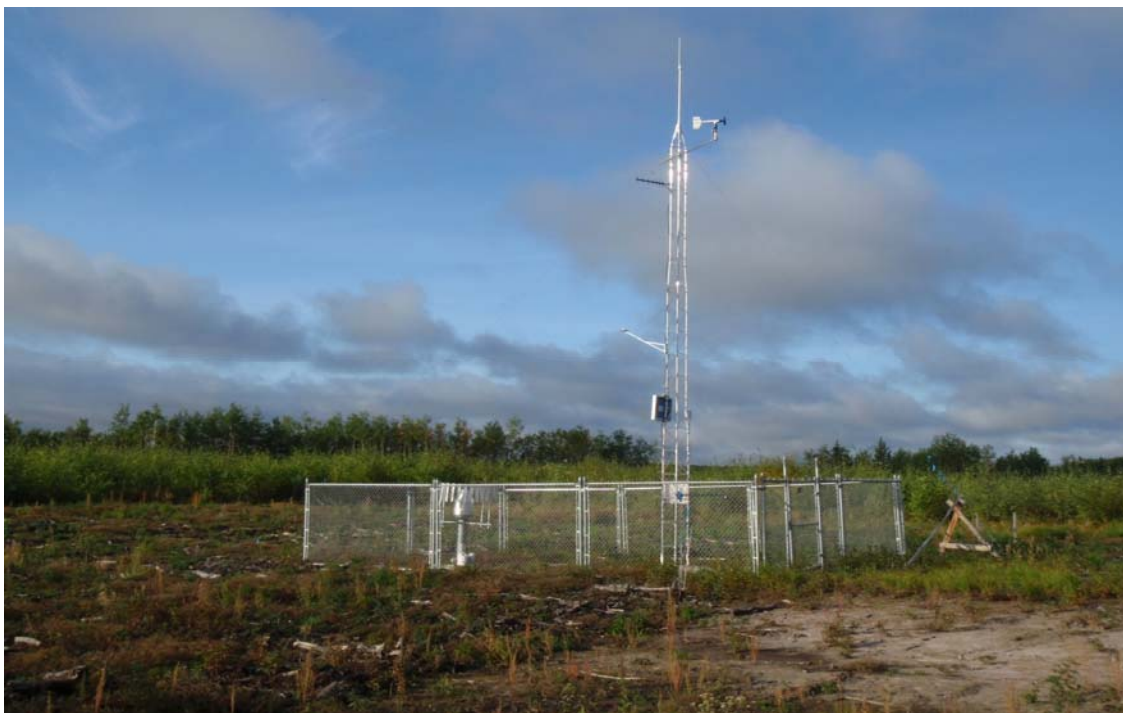
Established in October 2008 to monitor climate conditions in the Tar River basin.



Map Grid Based on UTM NAD 27

Station Details

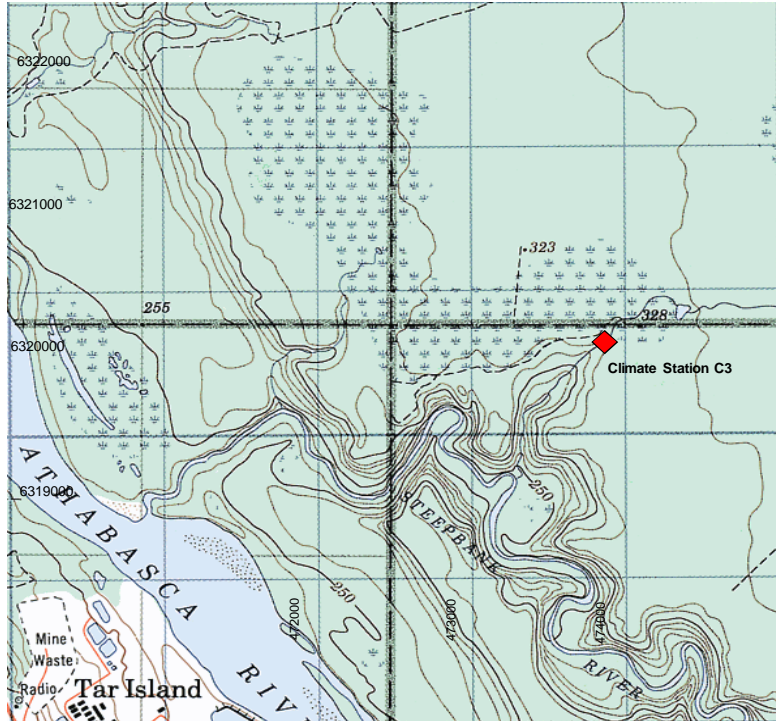
Variables Measured:	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric
Telemetry:	Cellular
Period of Record:	October 1998 to Present
Station Operation:	Year Round
Access:	4WD truck via Canadian Natural Horizon
UTM Coordinates:	443364 E, 6360515 N (NAD83)
Lat/Long:	57°23'02" N, 111°56'31" W (NAD83)
Station Elevation:	412 m
NTS Map:	74E/05



Revised March 22, 2016

Location and Purpose:

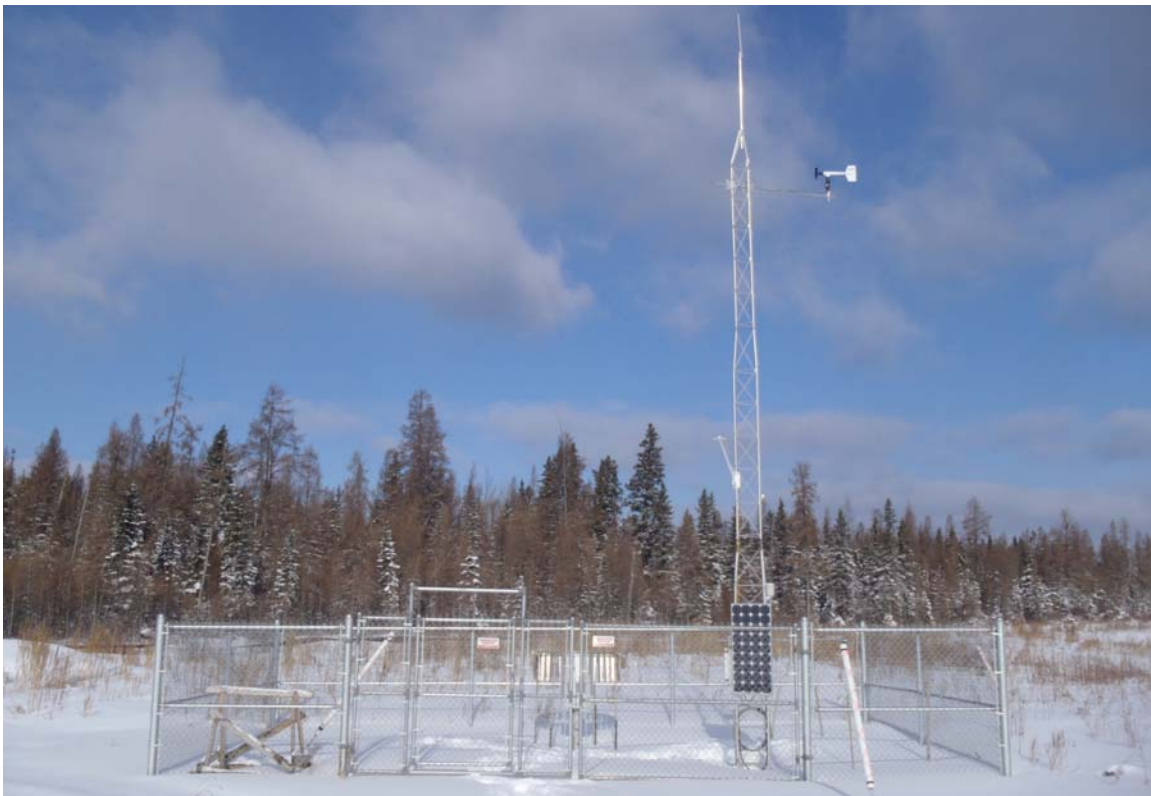
Established in August 2009 to monitor precipitation in the northwest Steepbank River area, and upgraded to a full climate station in November 2010.



Map Grid Based on UTM NAD 27

Station Details

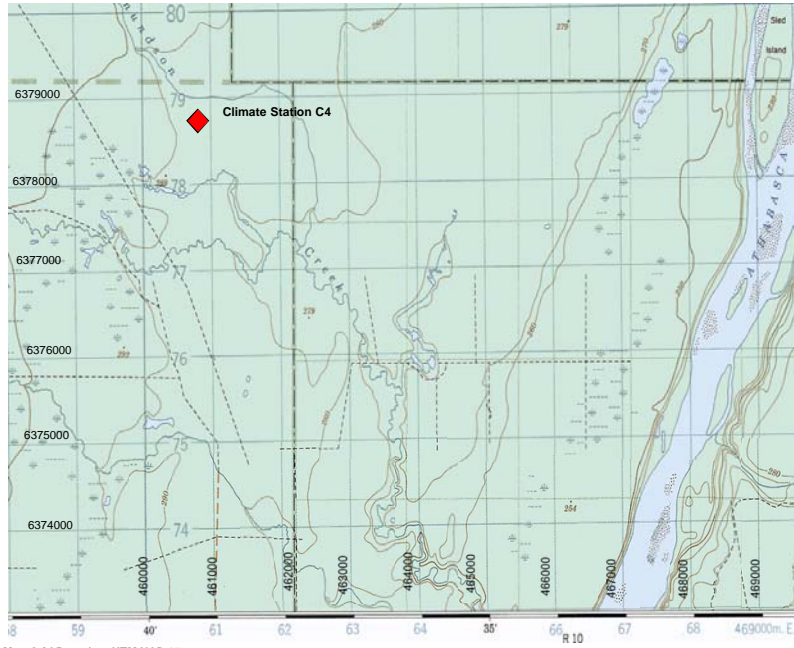
Variables Measured:	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation
Telemetry:	Cellular
Period of Record:	August 2009 to Present
Station Operation:	Year Round
Access:	4WD truck via Suncor
UTM Coordinates:	473950 E, 6320500 N (NAD83)
Lat/Long:	57°01'38" N, 111°25'45" W (NAD83)
Station Elevation:	328 m
NTS Map:	74E/03



Revised March 22, 2016

Location and Purpose:

Established in July 2011 to monitor climate conditions on the west side of the Athabasca River, north of all current development.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured:

Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric pressure

Telemetry:

Cellular

Period of Record:

July 2011 to Present

Station Operation:

Year Round

Access:

Helicopter

UTM Coordinates:

460853 E, 6378740 N (NAD83)

Lat/Long:

57°32'58" N, 111°39'14" W (NAD83)

Station Elevation:

291 m

NTS Map:

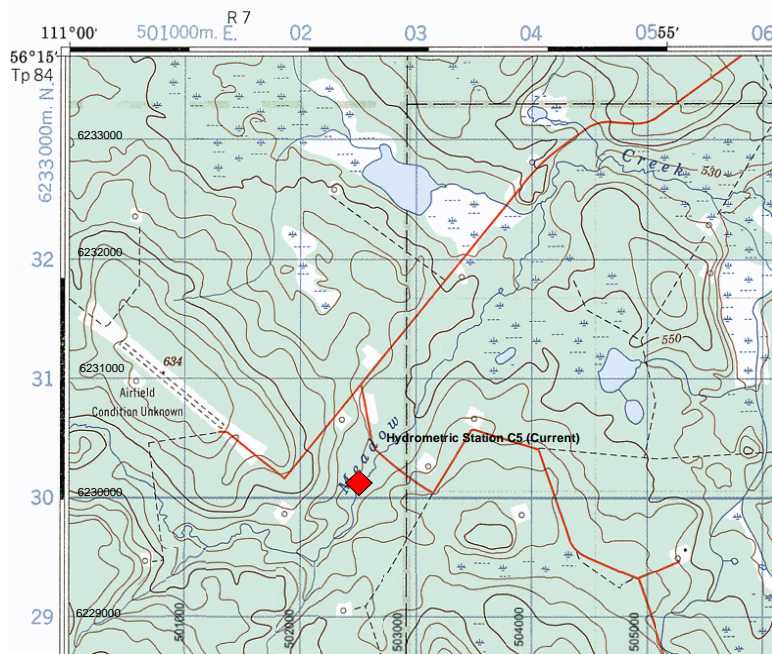
74E/12



Revised March 22, 2016

Location and Purpose:

Established in October 2011 to monitor climate conditions between Fort McMurray and Christina Lake.



Station Details

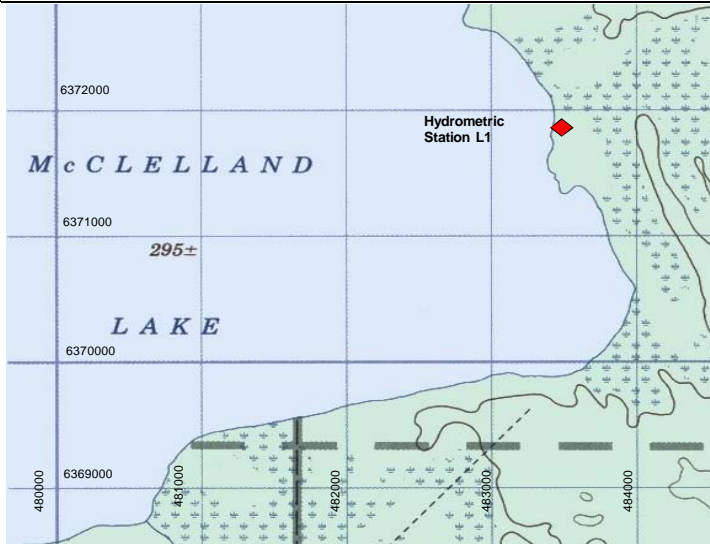
Variables Measured:	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric pressure
Telemetry:	Cellular
Period of Record:	October 2011 to Present
Station Operation:	Year Round
Access:	Truck via Hwy 881 and Surmont Project
UTM Coordinates:	502542 E, 6230964 N (NAD83)
Lat/Long:	56°13'24" N, 110°57'32" W (NAD83)
Station Elevation:	555 m
NTS Map:	74D/02



Revised March 16, 2016

Location and Purpose:

Established on the East side of McClelland Lake, 12 km North West of the Kearsarge project to monitor for Suncor Fort Hills EIA predictions.



Map Grid Based on UTM NAD 27



Looking North West across the lake from the station. June, 2013

Station Details

Variables Measured: Water level, Water Temperature, Precipitation, Air Temperature, Relative Humidity

Telemetry: Cellular

Period of Record: July 1997 to Present

Station Operation: Year Round

Access: Helicopter

Drainage Area: 191 km²

UTM Coordinates: 483430 E, 6371950 N (NAD83)

Lat/Long: 57°29'30" N, 111°16'37" W (NAD83)

NTS Map: 74E/06

Benchmark Information

BM1: RAMP L1-01
Elevation: 294.865 m
Basis: Level survey RAMP L1-1
Location: Next to Fence Enclosure
Description: Iron Rod

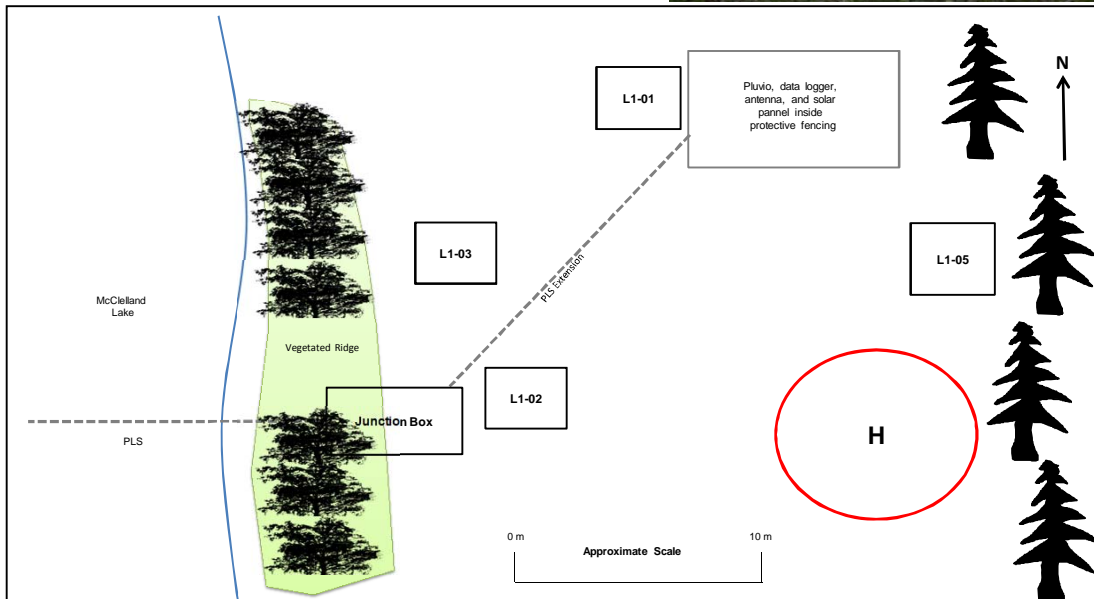
BM2: RAMP L1-02
Elevation: 295.051 m
Basis: Level survey
Location: 20m West of station
Description: 3/4" Pipe

BM3: RAMP L1-03
Elevation: 294.664
Basis: Level survey RAMP L1-1
Location: 10 m West of station
Description: 3/4" Pipe

BM5: RAMP L1-05
Elevation: 295.253
Basis: Level survey RAMP L1-2
Location: 25 m East of station
Description: 3/4" Pipe



Looking North toward the Station near the junction box. August, 2013



Location and Purpose:

Established to monitor water levels in Kearl Lake, in order to assess potential effects of nearby oilsands activities and to aid in water balance calculations for the lake. Several climate variables are also measured to compliment data gathered at RAMP climate stations in the region.



Map Grid Based on UTM NAD 27



View across Kearl Lake at Station L2

Station Details

Variables Measured: Water Level, Water Temperature, Air Temperature, Precipitation, Relative Humidity

Telemetry: Cellular

Period of Record: May 1999 to Present

Station Operation: Year Round

Access: 2WD access via Canterra Road

Relative Location: Approx. 24 km SW (straight line) of Hwy 63 - East Athabasca Hwy intersection

Drainage Area: 71.6 km²

UTM Coordinates: 484839 E, 6351065 N (NAD83)

Lat/Long: 57°18'8.3" N, 111°15'5.8" W (NAD83)

NTS Map: 74E/06

Benchmark Information

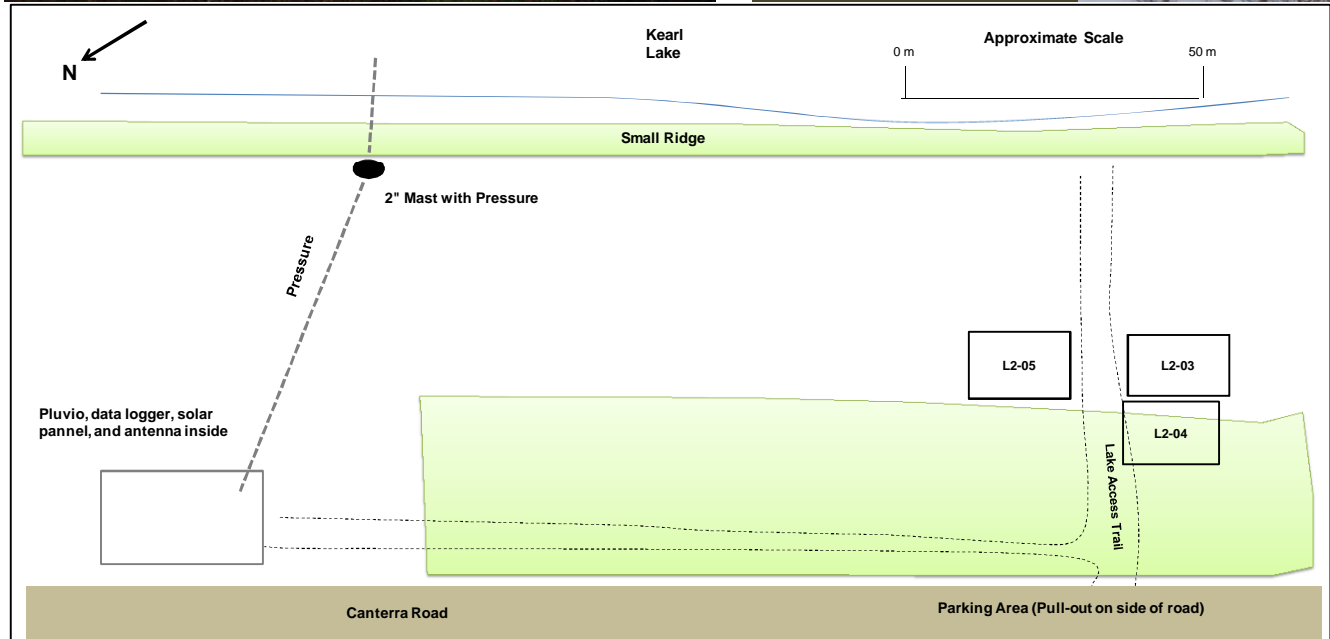
BM: RAMP L2-03
Elevation: 332.417 m
Basis: Level Survey from L2-01
Location: South of lake access trail
Description: 3/4" Pipe with flagging

BM: RAMP L2-04
Elevation: 333.226 m
Basis: Level survey from L2-01
Location: South of lake access trail by previous Rebar BM
Description: 3/4" Pipe with coupling

BM: RAMP L2-05
Elevation: 332.812 m
Basis: Level Survey from L2-01
Location: North of lake access trail
Description: 3/4" Pipe with flagging



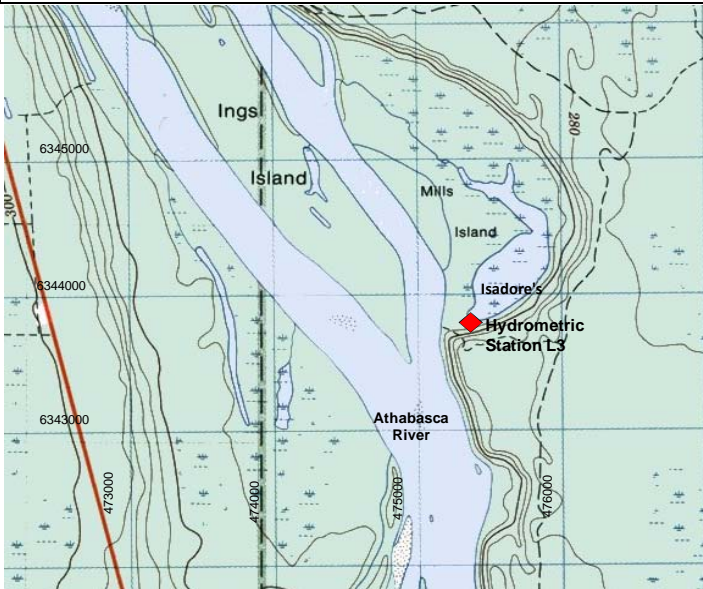
Equipment inside fencing at RAMP Lake Station L2, Kearl Lake



Revised March 16, 2016

Location and Purpose:

Established to monitor water levels on Isadore's Lake, in order to assess the effects of nearby oilsands operations. Operation of this station ceased on March 31, 2015.



Map Grid Based on UTM NAD 27



View of the right shoreline of Isadore's Lake (RAMP L3)

Station Details

Variables Measured: Water level, Water Temperature
Telemetry: Cellular
Period of Record: February 2000 to March 2015
Station Operation: Open water (April-October)
Access: Summer: Jet Boat via Athabasca River, footpath; Winter: Helicopter
Relative Location: Approx. 2 km South of Hwy 63 - Sycrude Aurora Access intersection
Drainage Area: 14.2 km²
UTM Coordinates: 463305 E, 6342967 N (NAD83)
Lat/Long: 57°13'42" N, 111°36'28" W (NAD83)
NTS Map: 74E/04

Benchmark Information

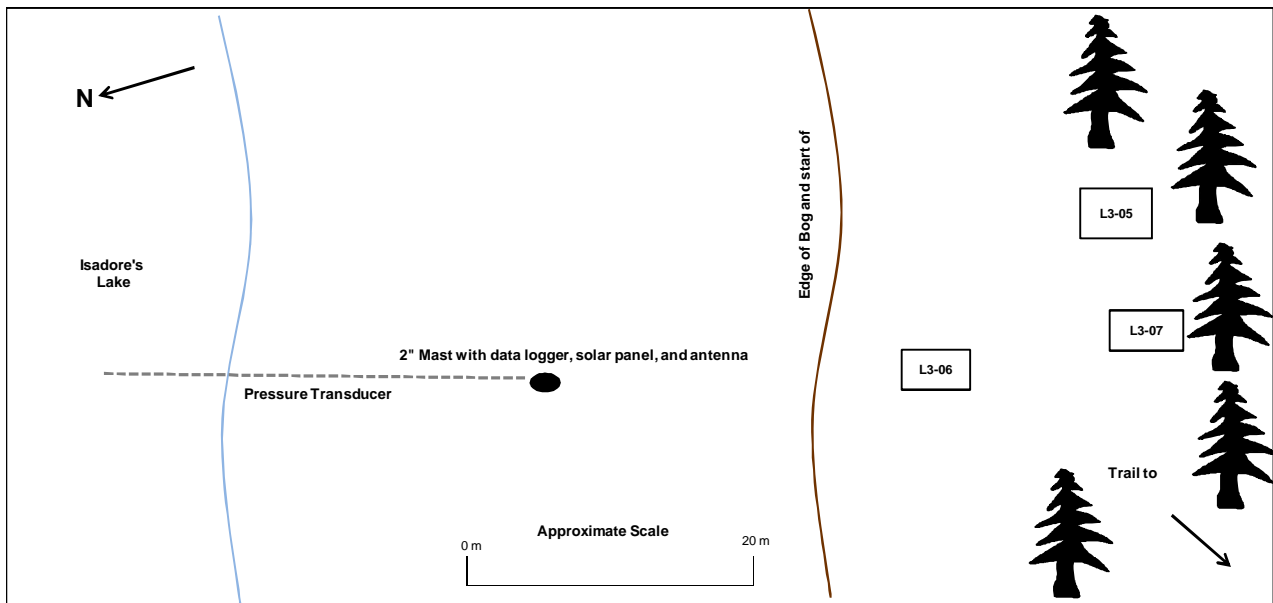
BM: RAMP L3-05
Elevation: 235.537 m
Basis: Level Survey from L3-02
Location: 35 m SE of data logger
Description: 3/4" Pipe with pink flagging

BM: RAMP L3-06
Elevation: 234.619 m
Basis: Level Survey from L3-02
Location: 30 m South of data logger
Description: 3/4" Pipe with pink flagging

BM: RAMP L3-07
Elevation: 235.380 m
Basis: Level Survey from L3-02
Location: 35 m South of data logger
Description: 3/4" Pipe with pink flagging



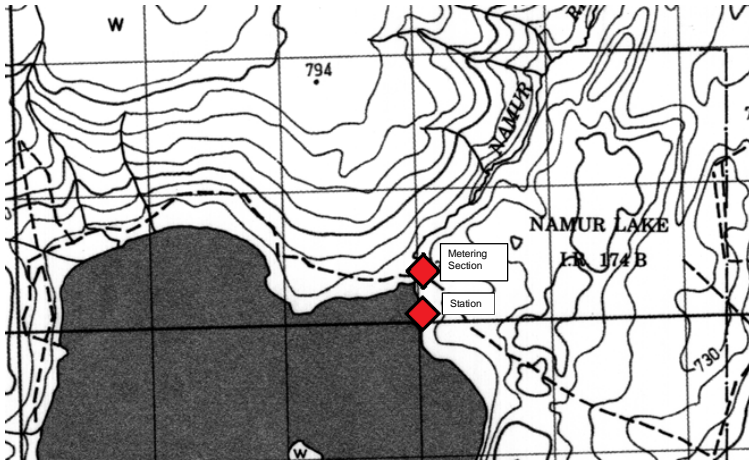
RAMP Lake Station L3, Isadore's Lake; Foreground: BM L3-6 and 2" Pipe Equipment Mast Background: View across Isadore's Lake



Revised March 16, 2016

Location and Purpose:

Established on the North-Eastern shore of Namur Lake. Located 300m South East of the outlet this station was established to monitor water levels and discharge from the Lake as part of the Joint Oilsands Monitoring Program.



Map Grid Based on UTM NAD 27

Station Details

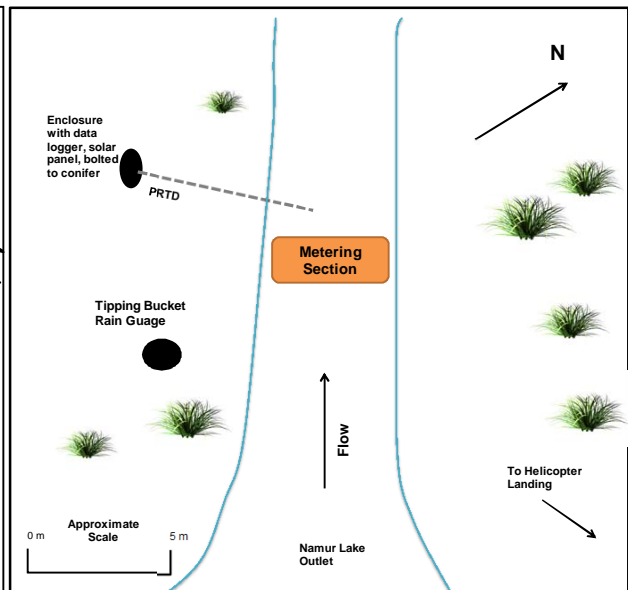
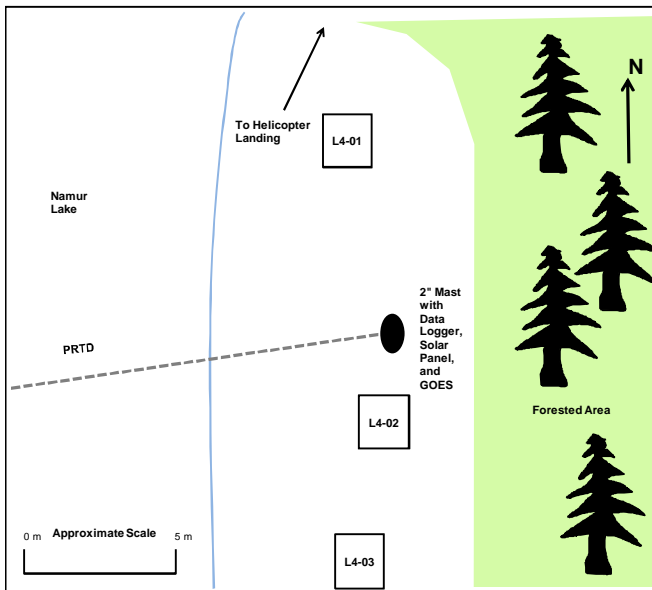
Variables Measured: Discharge, water level, water temperature
Telemetry: GOES - 07DA909
Period of Record: May 2012 to Present
Station Operation: Year Round
Access: Helicopter
Drainage Area: 164 km² (RAMP)
UTM Coordinates: 402886 E, 6370260 N (NAD83)
Lat/Long: 57°27'
NTS Map: 84H/07

Measurement Details

Channel: The channel is approximately 7 m wide and it has trapezoidal edges. The substrate is made up of predominantly sand. This river can be waded throughout most of the year. The lake substrate is predominately cobble near the station.
Control: Outlet of the lake acts as the control for this station.
Metering Section: The metering section is located 20 m downstream from the outlet on the North end of the lake.

Benchmark Information

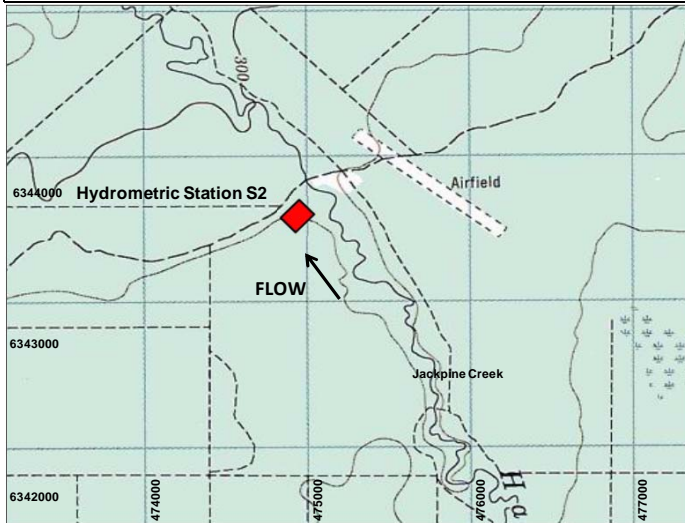
BM: RAMP L4-01
Elevation: 100.000 m
Basis: Assumed
Location: 4 m North West of station
Description: 3/4" Pipe
BM: RAMP L4-02
Elevation: 100.082 m
Basis: Level Survey from RAMP L4-01
Location: 5m South East of station
Description: 3/4" Pipe
BM: RAMP L4-03
Elevation: 100.140 m
Basis: Level Survey from RAMP L4-01
Location: 2 m South East of station
Description: 3/4" Pipe



Revised March 16, 2016

Location and Purpose:

Established to monitor discharge on Jackpine Creek upstream of the Muskeg River. Replaced an Environment Canada hydrometric station (07DA009) that previously operated at the original site from 1975 to 1993. Station was moved to present location in 2000 to allow road access and avoid beaver dam activity.



Map Grid Based on UTM NAD 27



Upstream view of Jackpine Creek at RAMP hydrometric station S2

Station Details

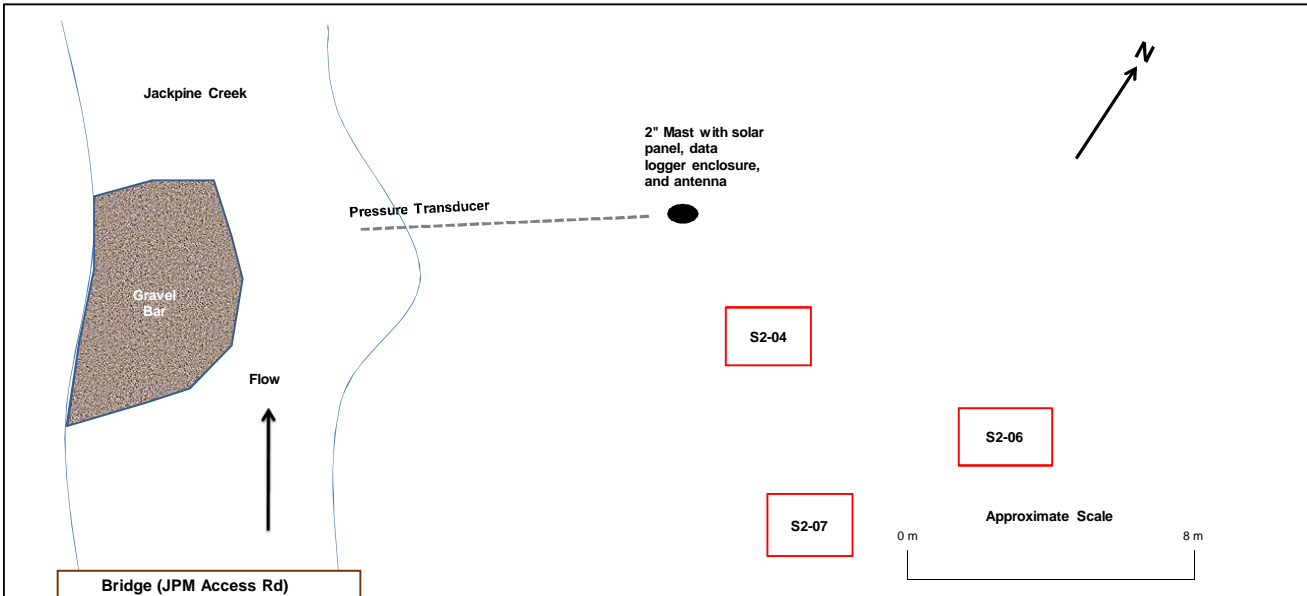
Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 1995 to Present
Station Operation: Year Round
Access: 2WD road via Shell Jackpine Mine
Relative Location: Approx. 12 km SW of Hwy 63 - Shell MRM Access intersection
Drainage Area: 342 km²
UTM Coordinates: 474961 E, 6344087 N (NAD83)
Lat/Long: 57°14'21" N, 111°24'53" W (NAD83)
NTS Map: 74E/3

Measurement Details:

Channel: Trapezoidal channel edges, and approximately 10 m in width. Channel bed primarily made up of cobble, with subdominant sand.
Control: A riffle approx. 20 m downstream of the station acts as the control
Metering Section: The metering section is located approx. 10 m upstream of the station. Under most flow conditions, the channel can be waded, however during high water, due to fast flow and deep water, it may be necessary to use a kick boat or boat in order to perform a discharge measurement.

Benchmark Information

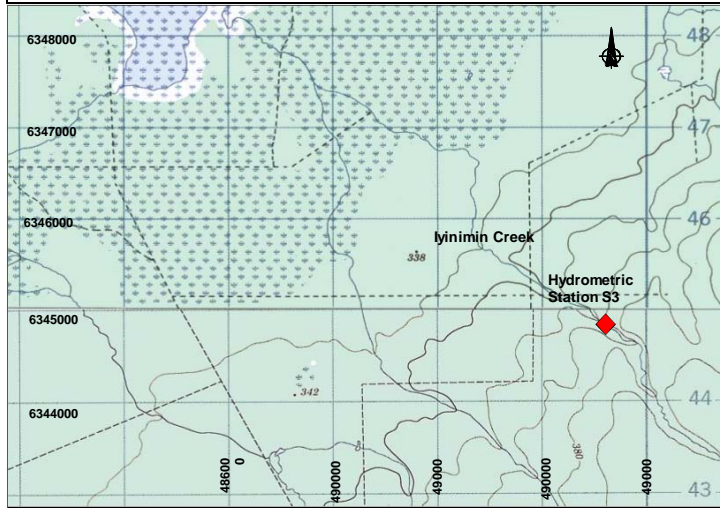
BM: RAMP S2-05
Elevation: 297.670 m
Basis: Level survey from S02-02
Location: 3/4" pipe 5 metres south of logger
Description: 3/4" Pipe
BM: RAMP S2-06
Elevation: 298.420 m
Basis: Level Survey from RAMP S2-04
Location: 20m ESE of data logger
Description: 3/4" Pipe
BM: RAMP S2-07
Elevation: 298.432 m
Basis: Level Survey from RAMP S2-06
Location: 15 m SSE of data logger
Description: 3/4" Pipe with pink flagging



Revised March 16, 2016

Location and Purpose:

Established to monitor discharge on Iyininim Creek upstream of Kearl Lake. This station was intended to characterize runoff from the North/West slopes of Muskeg Mountain and provide input to Kearl Lake water balance calculations. The station is located approx. 10 km (straight line) WNW of the intersection of the East Athabasca Hwy and Canterra Rd.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured: Discharge, water level, water temperature, rainfall
Telemetry: Cellular
Period of Record: May 1995-Oct. 1999; May 2001-Present
Station Operation: Open water (April-October)
Access: Helicopter
Drainage Area: 39.3 km²
UTM Coordinates: 489491 E, 6345029 N (NAD83)
Lat/Long: 57° 15' 00" N, 111° 10' 27" W
NTS Map: 74E/06

Measurement Details:

Channel: The channel is approx. 3 m wide with trapezoidal edges. The channel bed is composed mainly of silt, with some cobble-boulder sized rocks
Control: A riffle, along with debris, located approx. 40 m downstream comprises the channel control
Metering Section: Flow measured across from the station. During normal flow conditions the channel can be waded



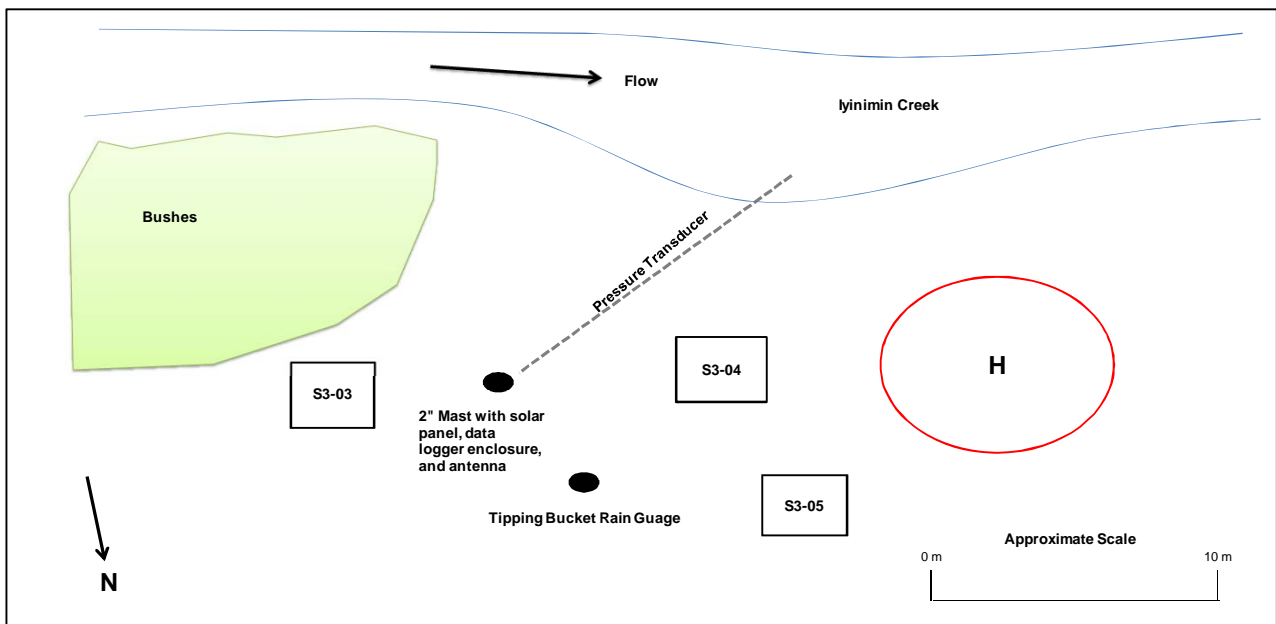
RAMP Station S3, Iyininim Creek, cross-stream view

Benchmark Information

BM: RAMP S3-03
Elevation: 361.382 m
Basis: Level Survey from S3-02
Location: 3 m East of data logger
Description: 3/4" Pipe with pink flagging

BM: RAMP S3-04
Elevation: 361.565 m
Basis: Level Survey from RAMP S3-3
Location: 5 m West of data logger
Description: 3/4" Pipe with pink flagging

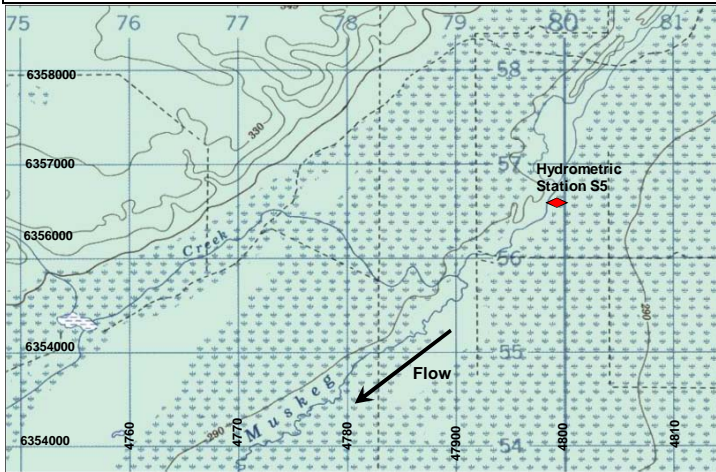
BM: RAMP S3-05
Elevation: 361.588 m
Basis: Level Survey from RAMP S3-3
Location: 10 m NW of data logger
Description: 3/4" Pipe with pink flagging



Revised 16 March, 2016

Location and Purpose:

Established to monitor discharge on the Muskeg River above disturbed watersheds. Decommissioned in 1996, station was reactivated in 2003 in accordance with regulatory monitoring of nearby oilsands operations. Station is located approx. 20 km NE of the Hwy 63 - Syncrude Aurora Access intersection.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: Aug 1995-Dec 1996, Feb 2003-Present
Station Operation: Year Round
Access: Helicopter
Drainage Area: 396 km²
UTM Coordinates: 479760 E, 6356755 N (NAD83)
Lat/Long: 57°21'11" N, 111°20'10" W (NAD83)
NTS Map: 74E/06

Measurement Details:

Channel: Channel is approx. 10 m wide, with relatively straight edges. Channel bed composed mainly of silt/organics.
Control: The channel acts as the primary control.
Metering Section: Flow measurements are conducted about 10 m downstream of the station, near the helicopter landing area. A cableway is used in open water conditions.

Benchmark Information

BM: RAMP S5-01
Elevation: 98.369 m
Basis: Level survey from S5-03
Location: 4 m North of data logger
Description: Old 3/4" Pipe

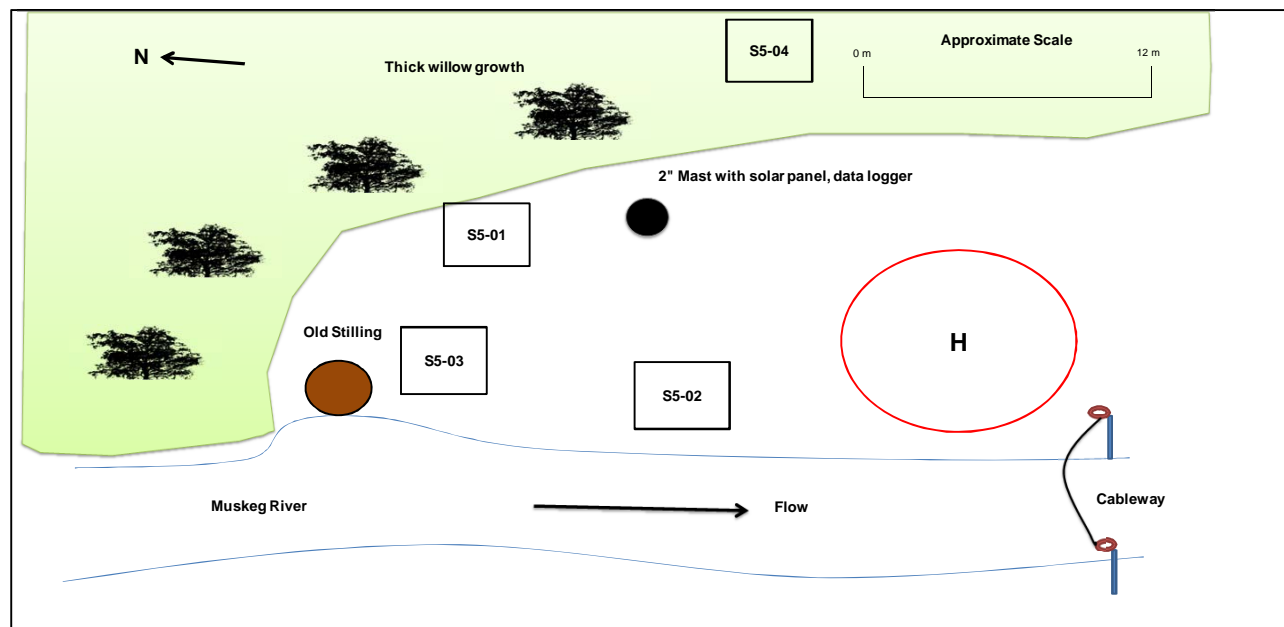
BM: RAMP S5-02
Elevation: 98.516 m
Basis: Level Survey from RAMP S5-01
Location: 8 m SW of data logger
Description: 3/4" Pipe with pink flagging

BM: RAMP S5-3
Elevation: 98.400 m
Basis: Unknown
Location: Close to old stilling well
Description: T-Post

BM: RAMP S5-4
Elevation: 98.923 m
Basis: Level Survey from RAMP S5-2
Location: 10m SE of station
Description: Lag bolt in conifer



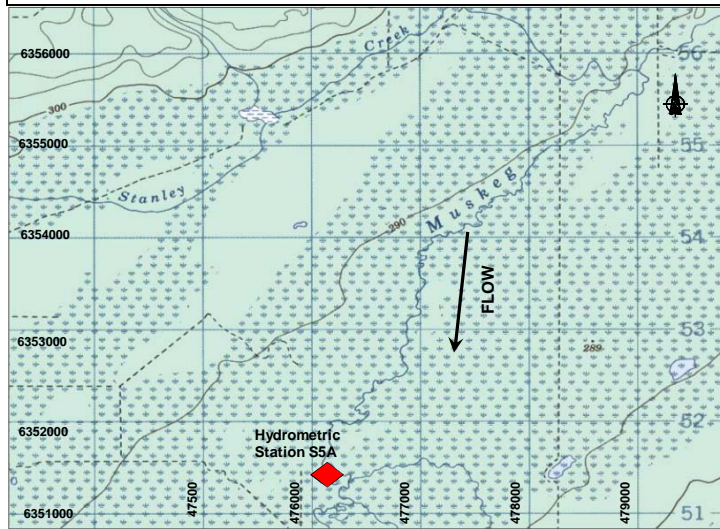
RAMP Station S5, Muskeg River Above Stanley Creek, view upstream of the station and the old stilling well



Revised 16 March, 2016

Location and Purpose:

Established to monitor discharge on the Muskeg River upstream of disturbed watersheds. The station was relocated in 1998 to allow road access, and is approximately 14 km ENE of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



Looking downstream from Station S5A

Station Details

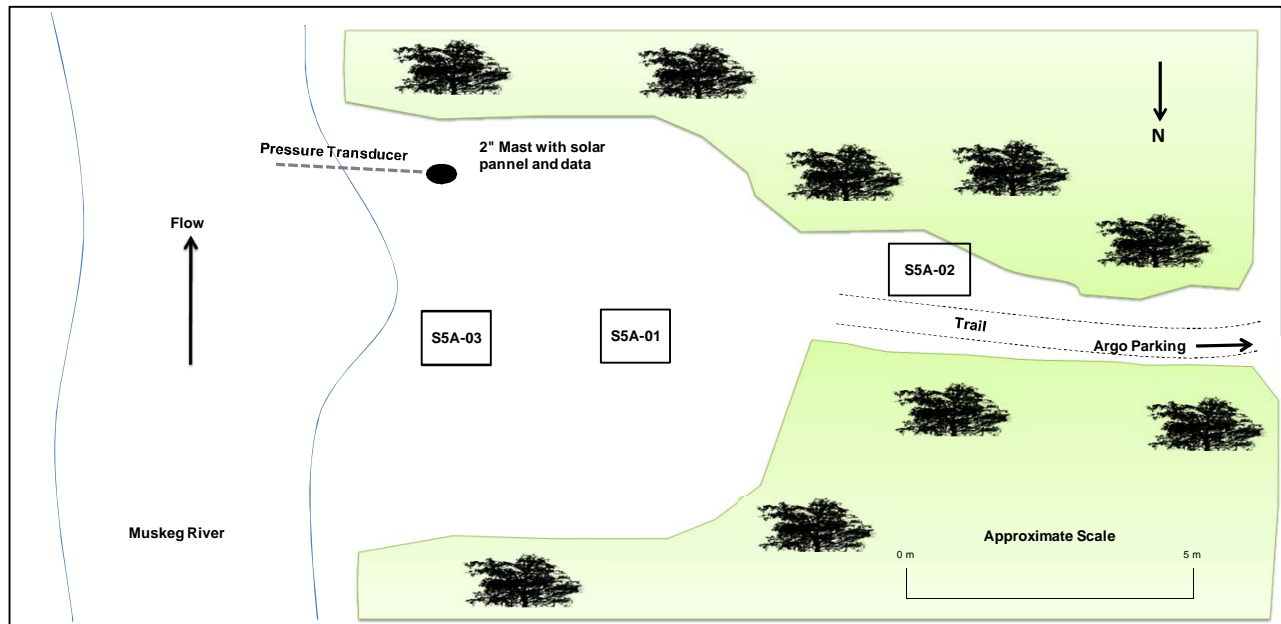
Variables Measured:	Discharge, water level, water temperature, barometric pressure
Telemetry:	Cellular
Period of Record:	August 1995 to Present
Station Operation:	Year Round
Access:	Argo via Shell MRM mine access
Drainage Area:	521 km ²
UTM Coordinates:	476100 E, 6351600 N (NAD83)
Lat/Long:	57°18'30" N, 111°23'43" W (NAD83)
NTS Map:	74E/06

Measurement Details:

Channel:	The channel is approx. 14 m wide and has relatively straight edges. The dominant bed material is silt, with layers of organics and woody debris present.
Control:	The channel morphology serves as the hydrologic control
Metering Section:	The metering section is located adjacent to the station, and a kick-boat is required to perform discharge measurements, due to deep water.

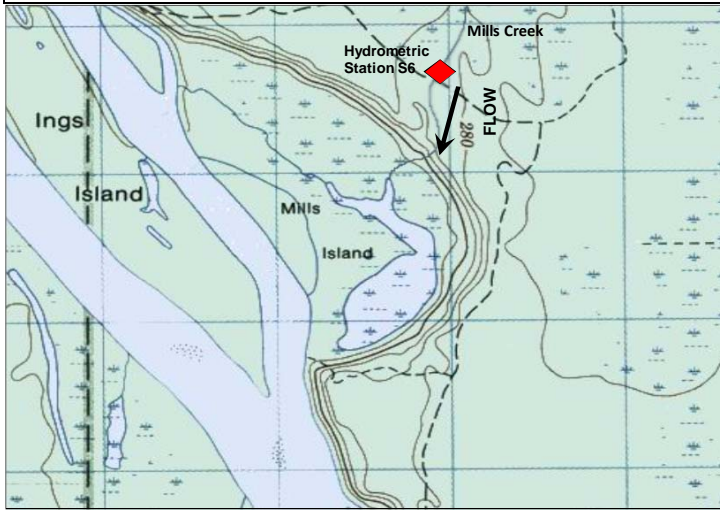
Benchmark Information

BM:	RAMP S5A-01
Elevation:	282.697 m
Basis:	Geodetic survey
Location:	4 m NW of data logger
Description:	T-Post
BM:	RAMP S5A-02
Elevation:	282.159 m
Basis:	Level Survey from S5A-01
Location:	10 m West of data logger
Description:	3/4" Pipe with pink flagging
BM:	RAMP S5A-03
Elevation:	282.352 m
Basis:	Level Survey from RAMP S5A-01
Location:	3 m North of data logger
Description:	3/4" Pipe with pink flagging



Location and Purpose:

Established to monitor discharge on Mills Creek, downstream of the Mills Creek fen, to provide insight into water quality effects on Isadore's Lake. The original plywood and timber pile V-notch weir was replaced with steel piles and a sheet steel weir in October 2005. The station is located 500m SE of the Hwy 63 - Syncrude Aurora Mine Access intersection. Operation of this station ceased on March 31, 2015.



Map Grid Based on UTM NAD 27



V-notch weir at Station S6, looking upstream at Mills Creek

Station Details

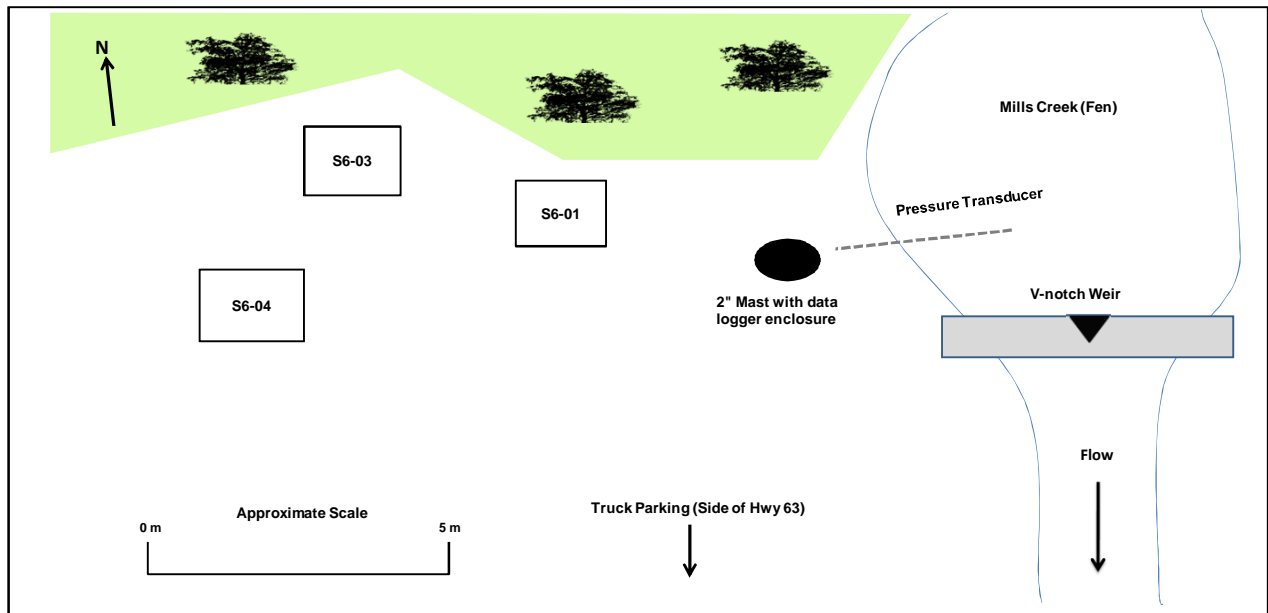
Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	May 1997 to March 2015.
Station Operation:	Year Round
Access:	2WD road access along Hwy 63 (paved)
Drainage Area:	9 km ²
UTM Coordinates:	463829 E, 6344743 N (NAD83)
Lat/Long:	57°14'44" N, 111°35'57" W (NAD83)
NTS Map:	74E/04

Measurement Details:

Channel:	The channel is approx. 1 m wide and very shallow, with trapezoidal edges. The bed substrate is comprised of cobbles.
Control:	The v-notch weir (weir equation does not apply) provides majority of control.
Metering Section:	The metering section is located 3 m downstream of the weir, and the channel can be waded at all water levels.

Benchmark Information

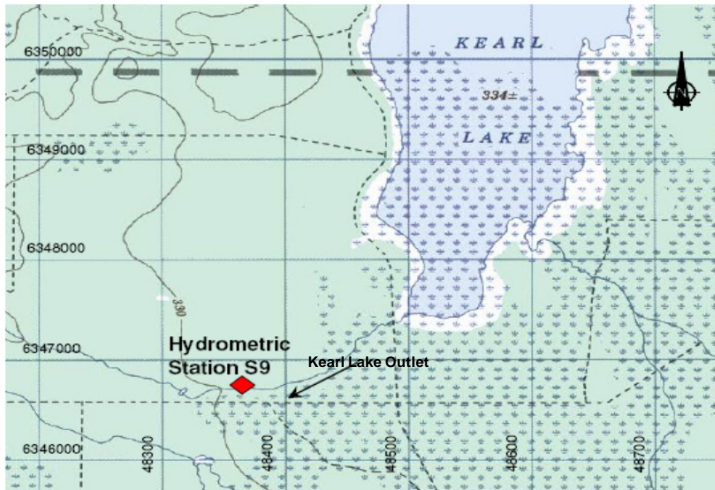
BM:	RAMP S6-01
Elevation:	273.541 m
Basis:	Survey date unknown
Location:	4 m NW of data logger
Description:	Rebar in white PVC
BM:	RAMP S6-03
Elevation:	274.105 m
Basis:	Level Survey from RAMP S6-01
Location:	6 m NW of data logger
Description:	3/4" Pipe with pink flagging
BM:	RAMP S6-04
Elevation:	274.113 m
Basis:	Level Survey from RAMP S6-01
Location:	7 m West of data logger
Description:	3/4" Pipe with pink flagging



Revised 16 March, 2016

Location and Purpose:

Established to monitor discharge on the Kearl Lake Outlet channel to provide data for the Kearl Lake water balance and to assess the effects of development on the lake. The station was relocated approximately 50m downstream in November 2005 to avoid the influence of beaver dams. The station is located approximately 15 km (straight line) NW of the Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



Downstream view of RAMP Hydrometric Station S9, Kearl Lake Outlet

Station Details

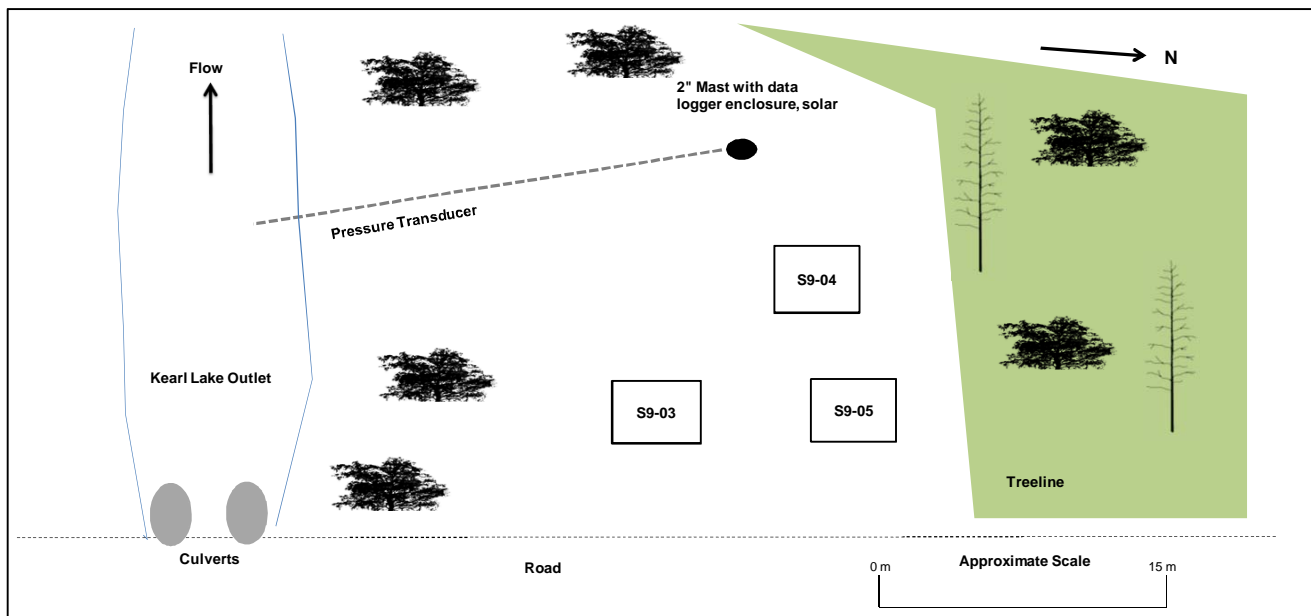
Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 2000-Oct. 2002, Apr. 2006-Present
Station Operation: Year Round
Access: 4WD road access
Drainage Area: 76.5 km²
UTM Coordinates: 483962 E, 6346990 N (NAD83)
Lat/Long: 57°15'56.38" N, 111°15'57.27" W (NAD83)
NTS Map: 74E/06

Measurement Details

Channel: The channel is approx. 7 m wide with trapezoidal edges. The bed material is dominantly silt and organics.
Control: Downstream beaver activity provides the hydrologic control on this channel reach.
Metering Section: Flow is measured adjacent to the station. The channel can be waded under normal flow conditions.

Benchmark Information

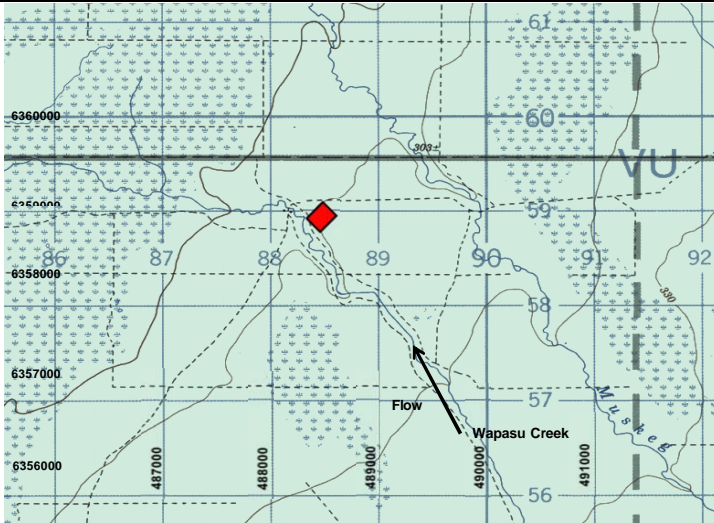
BM: RAMP S9-03
Elevation: 330.384 m
Basis: Level Survey from RAMP S9-05
Location: 10 m East of data logger
Description: 3/4" Pipe with pink flagging
BM: RAMP S9-04
Elevation: 330.329 m
Basis: Level Survey from BM: RAMP S9-05
Location: 6 m NE of data logger
Description: 3/4" Pipe with pink flagging
BM: RAMP S9-05
Elevation: 330.635 m
Basis: Level Survey from previous BM: RAMP S9-01
Location: 10 m NE of data logger
Description: 3/4" Pipe with pink flagging



Revised 16 March, 2016

Location and Purpose:

Established to measure discharge on Wapasu Creek upstream of the Muskeg River to monitor effects of nearby oilsands activity. Extensive beaver activity since 2009 has flooded most of the area around hydrometric station S10. As a result, in August 2012 the station was relocated (from 490350 m E 6355500 m N) approximately 3 km downstream. Located approx. 20 km NW of the East Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



Upstream view of Wapasu Creek at Station S10A

Station Details

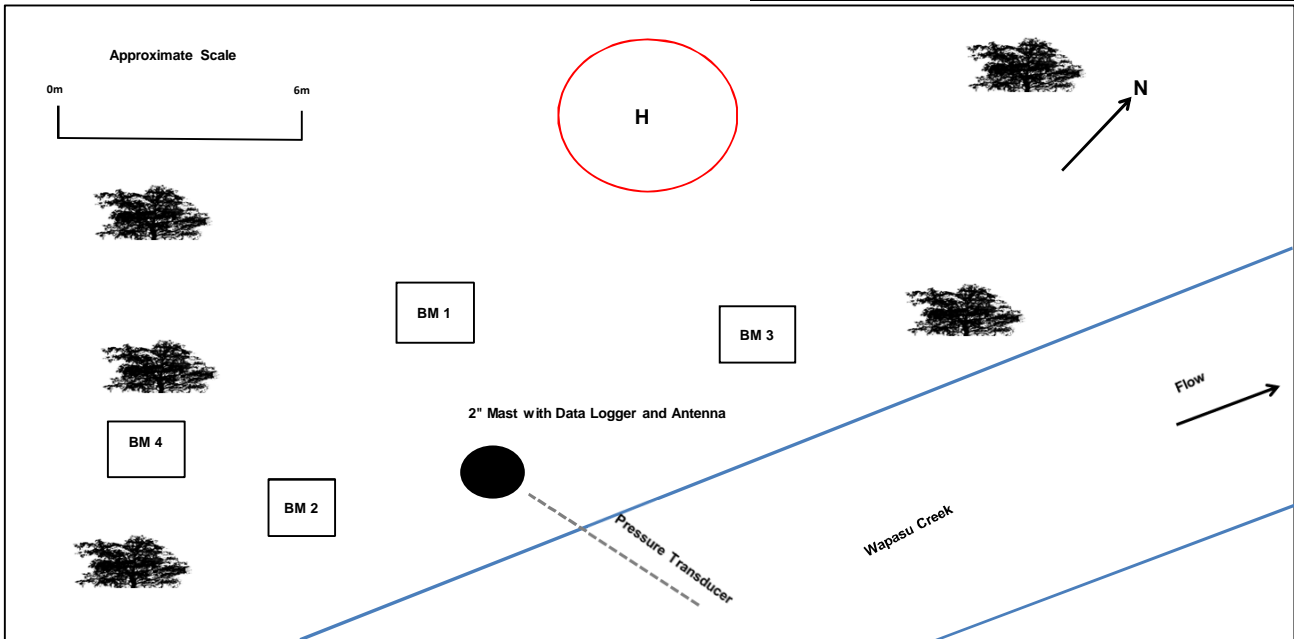
Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	Mar 1998-Oct 1999; May 2001-Present
Station Operation:	Year Round
Access:	Helicopter
Drainage Area:	101 km ²
UTM Coordinates:	488573 m E, 6358554 m N (NAD83)
Lat/Long:	57°22'11"N, 111°11'24"W (NAD83)
NTS Map:	74E/06

Measurement Details

Channel:	The channel is approx. 6 m wide, with trapezoidal edges. The bed material is composed of a mixture of cobble and sand.
Control:	A riffle located approx. 30 m downstream serves as the hydrologic control for this reach.
Metering Section:	The metering section is located adjacent to the station. The channel can be waded under normal flow conditions.

Benchmark Information

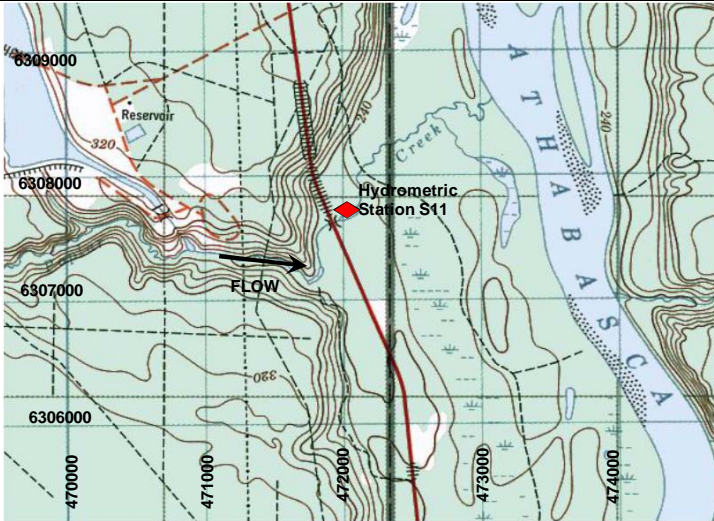
BM:	RAMP S10A-01
Elevation:	100.261 m
Basis:	Level Survey from RAMP S10A-02
Location:	5 m NW of data logger
Description:	3/4" Pipe with pink flagging
BM:	RAMP S10A-02
Elevation:	100.000 m
Basis:	Assumed
Location:	5 m West of data logger
Description:	3/4" Pipe with pink flagging
BM:	RAMP S10A-03
Elevation:	100.138 m
Basis:	Level Survey from RAMP S10A-02
Location:	6 m North of data logger
Description:	3/4" Pipe with pink flagging
BM:	RAMP S10A-04
Elevation:	100.766 m
Basis:	Level Survey from RAMP S10A-03
Location:	15 m West of data logger
Description:	3/4" Pipe



Revised 02 March, 2016

Location and Purpose:

Established to monitor discharge on Poplar Creek upstream of the Athabasca River. The station is located 50 m downstream of the bridge at Hwy 63. Water Survey of Canada station (07DA007) operated in this general location from 1973 to 1986. The rationale for this station is to extend the measurement record of WSC station 07DA007.



Map Grid Based on UTM NAD 27



Station Details

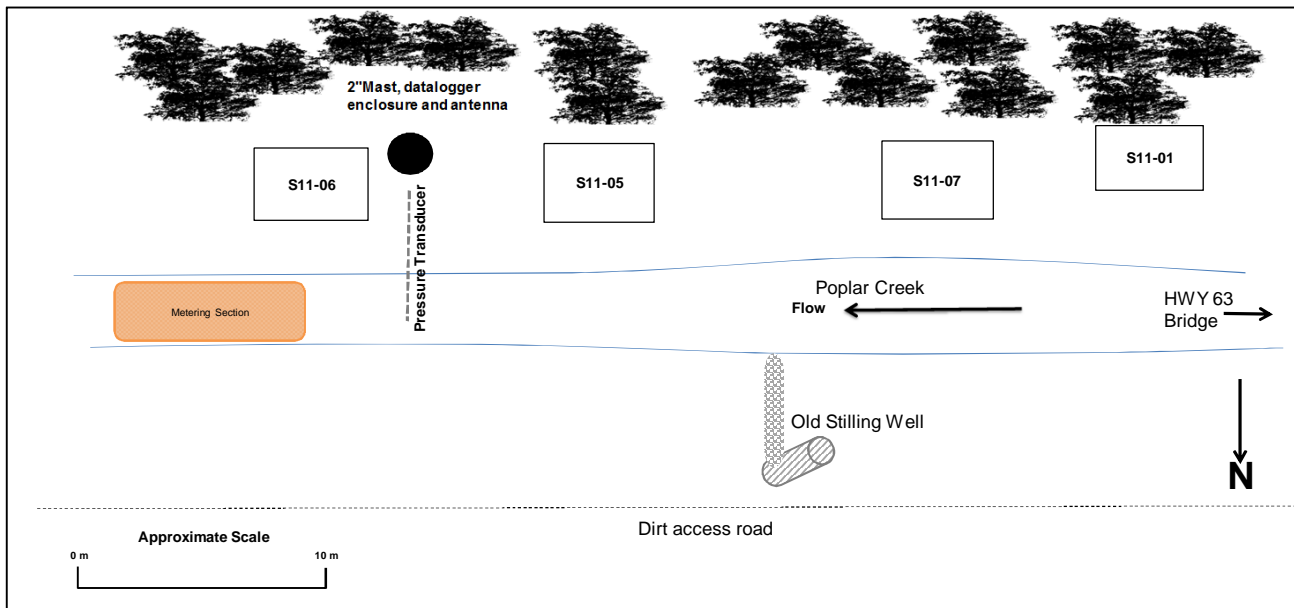
Variables Measured:	Discharge, water level, water temperature
Period of Record:	May 1997 to Present
Station Operation:	Year Round
Access:	Seasonal dirt road off Hwy 63
Drainage Area:	151 km ² (WSC)
UTM Coordinates:	472000 E, 6307650 N (NAD83)
Lat/Long:	56°54'46" N, 111°27'44" W (NAD83)
NTS Map:	74D/14

Measurement Details

Channel	The channel is a straight reach 7 m wide, the substrate is made up almost entirely of cobbles.
Control	The site is located 5 m downstream of a riffle with an additional riffle acting as a control 40 m downstream.
Metering Section	Measurements are conducted by wading across the river 5 m downstream of the station.

Benchmark Information

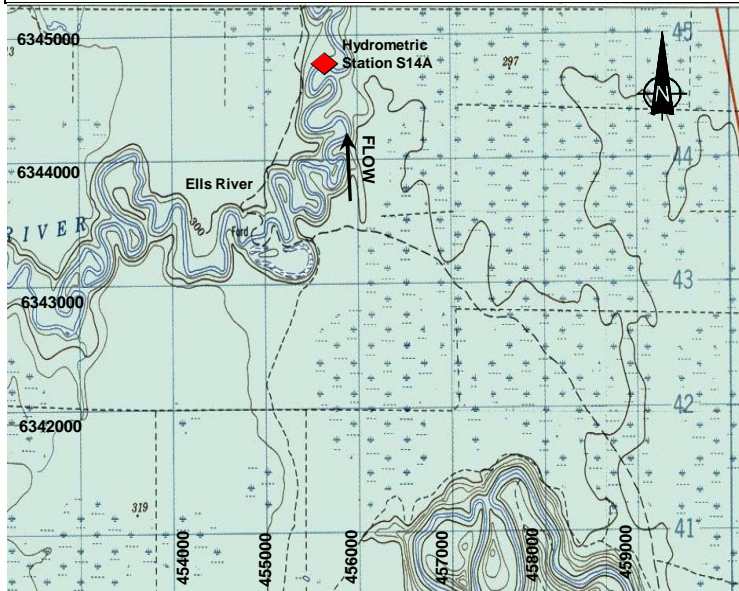
BM:	RAMP S11-01
Elevation:	242.081 m
Basis:	Level survey from decommissioned BM
Location:	On Right Bank, 30 m Upstream from logger
Description:	ASCM marker, square pin next to orange stake
BM:	RAMP S11-05
Elevation:	242.212 m
Basis:	Level Survey from RAMP S11-01
Location:	7 m W of datalogger
Description:	3/4" Pipe
BM:	RAMP S11-06
Elevation:	242.579 m
Basis:	Level Survey from RAMP S11-01
Location:	3 m E of datalogger
Description:	3/4" Pipe
BM:	RAMP S11-07
Elevation:	242.100 m
Basis:	Level Survey from RAMP S11-01
Location:	12 m W of datalogger
Description:	3/4" Pipe



Revised March 22, 2016

Location and Purpose:

Established in 2001 to monitor discharge in the vicinity of the inactive WSC station 07DA017. Replaced by station S14A in 2004 to utilize road access. Located 50 m upstream from the bridge that crosses the Ells river on the CNRL highway.



Map Grid Based on UTM NAD 27



Looking Upstream 20 m North East of the station. August, 2013.

Station Details

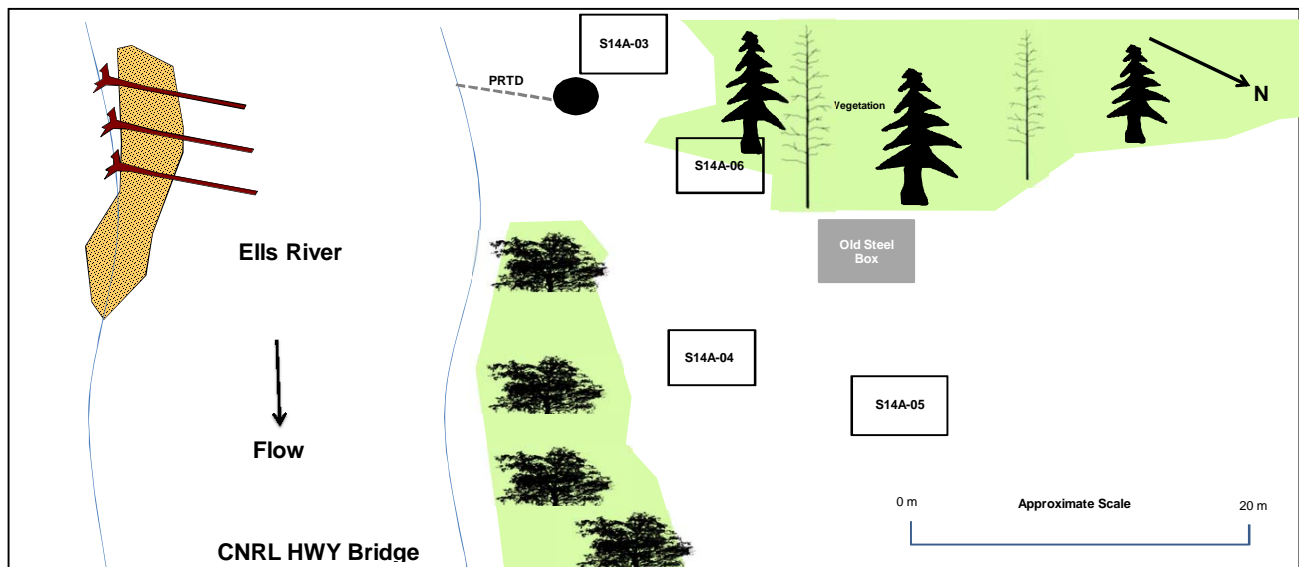
Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	October 2004 to Present
Station Operation:	Year Round
Access:	2WD road access
Drainage Area:	2450 km ²
UTM Coordinates:	455748 E, 6344947 N (NAD83)
Lat/Long:	57°14'44" N, 111°43'56" W (NAD83)
NTS Map:	74E/04

Measurement Details

Channel	The Channel is approximately 27 m wide and made up of cobble and sand substrate. It can be waded at low water levels, otherwise a belly boat is required.
Control	A riffle downstream acts as the control for this station.
Metering Section	The metering section is located 15 m downstream from the station on a straight reach of the river. The banks are well defined on both sides

Benchmark Information

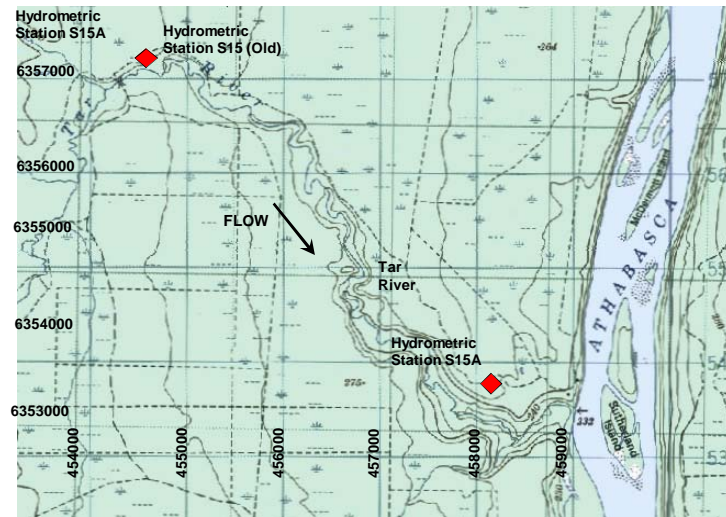
BM:	RAMP S14A-03
Elevation:	100.083
Basis:	Level survey based on S14A-01
Location:	3 m South West of station
Description:	3/4" Pipe
BM:	RAMP S14A-04
Elevation:	100.407
Basis:	Level survey based on RAMP S14A-03
Location:	5 m South East of station
Description:	3/4" Pipe
BM:	RAMP S14A-05
Elevation:	100.686
Basis:	Level survey based on RAMP S14A-03
Location:	5 m North East of station
Description:	3/4" Pipe
BM:	RAMP S14A-06
Elevation:	99.932
Basis:	Level survey based on RAMP S14A-03
Location:	Lg Bolt in old logger tree
Description:	3/4" Pipe



Revised March 21, 2016

Location and Purpose:

Established on May 1, 2007 to replace station S15 which had poor hydraulic conditions. The purpose of the station is to monitor for Canadian Natural EIA predictions by monitoring discharge and water level on the Tar River below development where flow is diverted out of the channel by Canadian Natural. Located 16km North of Fort McKay.



Map Grid Based on UTM NAD 27



Looking downstream from near the station.

Looking upstream from near the station.

Station Details

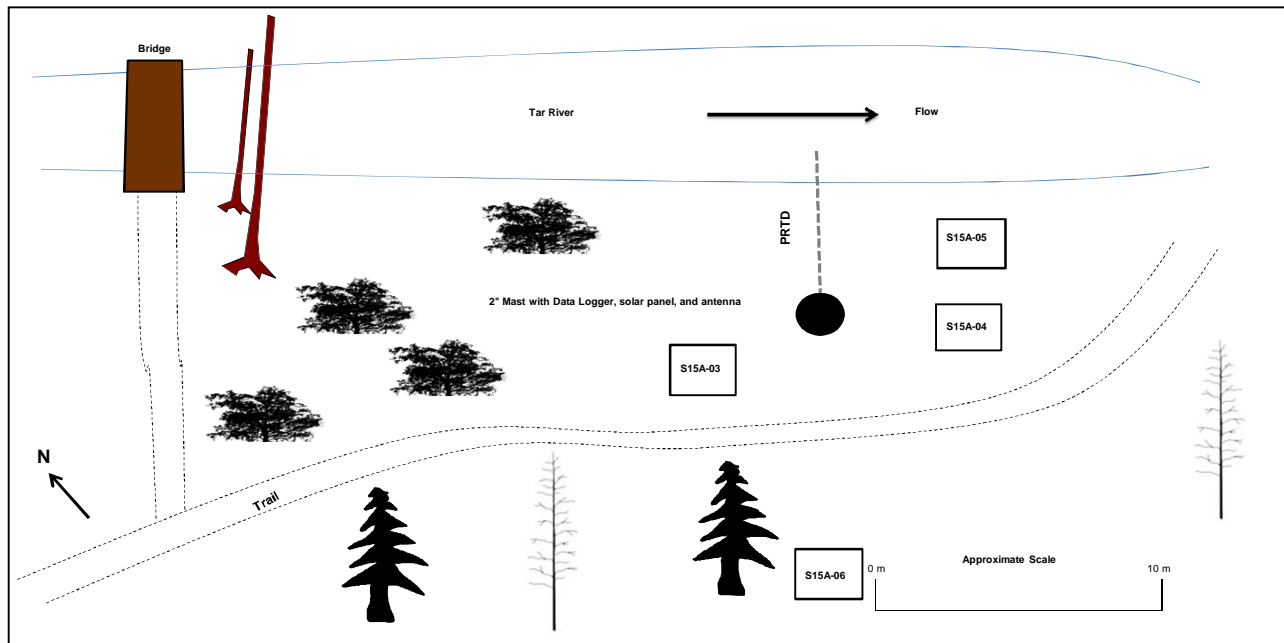
Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	May 2007 to Present
Station Operation:	Year Round
Access:	4WD road via Canadian Natural Horizon
Drainage Area:	333 km ²
UTM Coordinates:	458395 E, 6353391 N (NAD83)
Lat/Long:	57°19'17.57" N, 111°41'27.08" W (NAD83)
NTS Map:	74E/05

Measurement Details

Channel	The channel is approximately 7m wide and it has trapezoidal edges. The substrate is made up of predominately silt and sand. This station can be waded throughout most of the open water season.
Control	This river is controlled by the channel morphology at this station. During periods of high water in the Athabasca River this station can be effected by backwater.
Metering Section	The metering section is located across from the station on a straight reach of the river. Both banks are well defined.

Benchmark Information

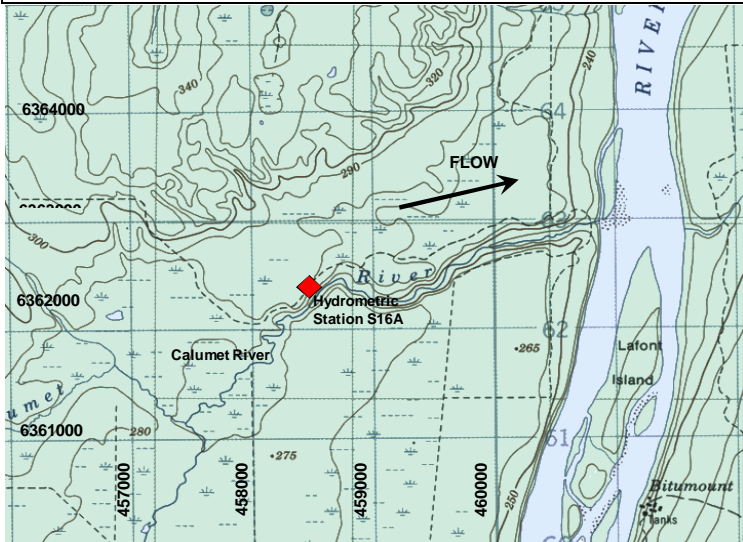
BM:	RAMP S15A-03
Elevation:	100.000 m
Basis:	Assumed
Location:	3 m South of station
Description:	3/4" Pipe
BM:	RAMP S15A-04
Elevation:	99.815 m
Basis:	Level Survey from RAMP S15A-01
Location:	2 m East of station
Description:	3/4" Pipe
BM:	RAMP S15A-05
Elevation:	99.929 m
Basis:	Level Survey from RAMP S15A-01
Location:	3 m North East of station
Description:	3/4" Pipe
BM:	RAMP S15A-06
Elevation:	100.125 m
Basis:	Level Survey from RAMP S15A-05
Location:	15 m Southwest of station
Description:	Bolt in tree



Revised March 22, 2016

Location and Purpose:

Established to monitor discharge on the Calumet River near the Mouth. Located approximately 3 km West of Lafont Island on the Athabasca river and 2 km upstream from abandoned Environment Canada hydrometric station (07DA014) which operated from 1975-1977. Station was operated as S16 from 2001-2004, CR-1 from 2005-2009 by CNRL Horizon, and as S16A from 2010-Present.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 2001 to Present
Station Operation: Open water (April-October)
Access: Helicopter
Drainage Area: 174 km²
UTM Coordinates: 458382 E, 6362451 N (NAD83)
Lat/Long: 57°24'10" N, 111°41'33" W(NAD83)
NTS Map: 74E/05

Measurement Details

Channel: The channel is approximately 4 m wide and it has trapezoidal edges. The substrate is made up of predominately silt and sand. There are weeds growing in the channel. This station can be waded throughout the open water season.

Control: A small riffle acts as the hydrologic control for this station.

Metering Section: The metering section is located downstream from the station near the river crossing from the heli pad.

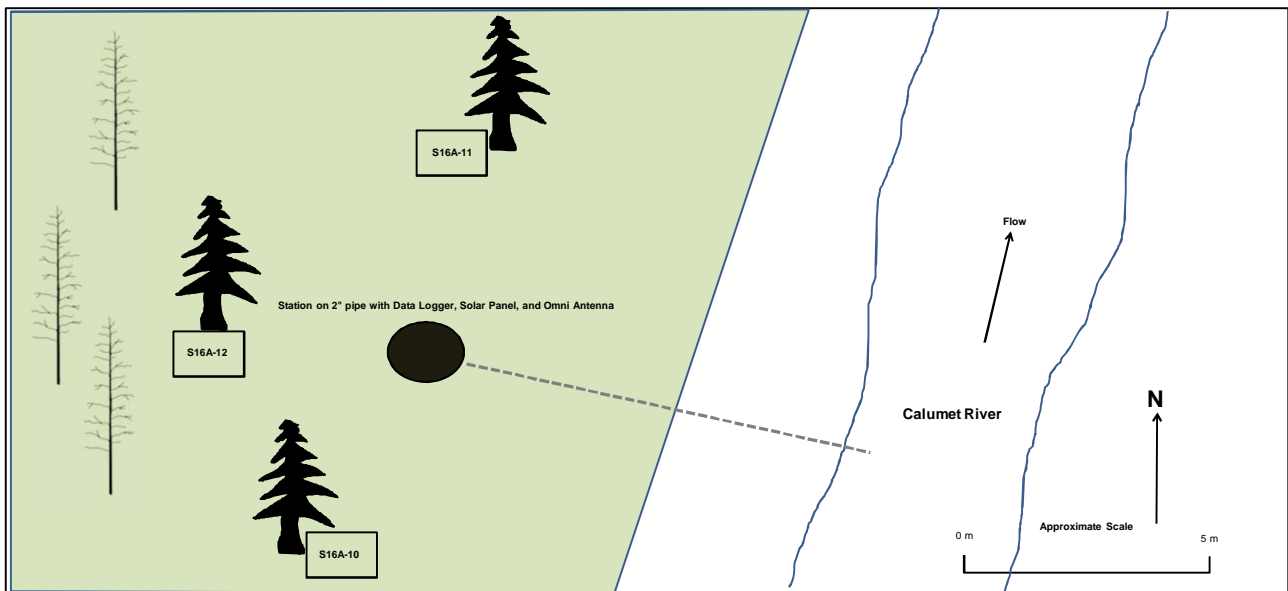


Benchmark Information

BM: RAMP S16A-10
Elevation: 100.000 m
Basis: Assigned arbitrary elevation
Location: 5 m South of Monitoring Station
Description: Lag bolt in conifer tree

BM: RAMP S16A-11
Elevation: 101.133 m
Basis: Level Survey from RAMP S16A-10
Location: 6 m North of Monitoring Station
Description: Lag bolt in conifer tree

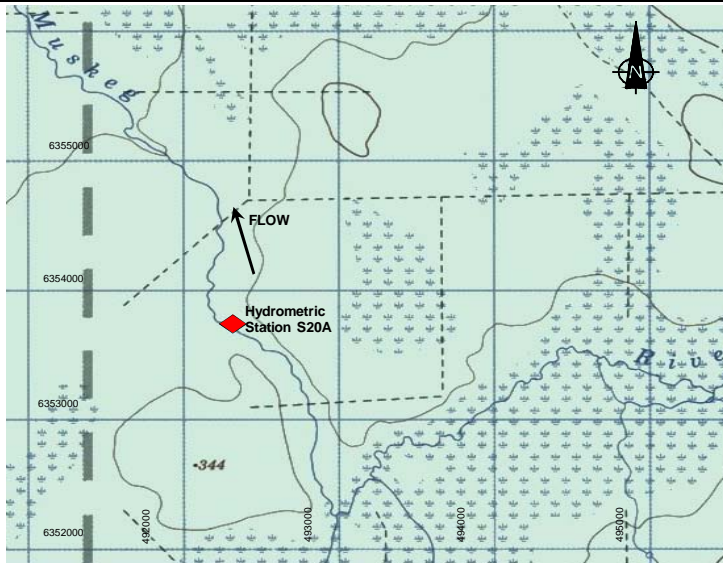
BM: RAMP S16A-12
Elevation: 102.638 m
Basis: Level Survey from RAMP S16A-10
Location: 5 m West of Monitoring Station
Description: Lag bolt in conifer tree



Revised March 22, 2016

Location and Purpose:

Established to monitor discharge on the upper reach of the Muskeg River, upstream of oilsands operations. Station S20 (49178 E, 6354787 N) was relocated approximately 1 km upstream in May 2013, due to backwater effects caused by beaver activity. The station is located approx. 15 km NNW of the East Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



Downstream view from RAMP Hydrometric Station S20A, Muskeg River Upland

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 2001 to Present
Station Operation: Open water (April-October)
Access: 2WD access on Canterra Rd. via Kearl Project Access Road
Drainage Area: 154 km²
UTM Coordinates: 492230 E, 6354940 N (NAD83)
Lat/Long: 57°20'14" N, 111°07'45" W (NAD83)
NTS Map: 74E/06

Measurement Details

Channel: The channel is approx. 8 m wide with trapezoidal, but steep edges. The dominant substrate on the channel bed is silt, with subdominant cobble present.

Control: A riffle about 30 m downstream of the station provides the hydrologic control.

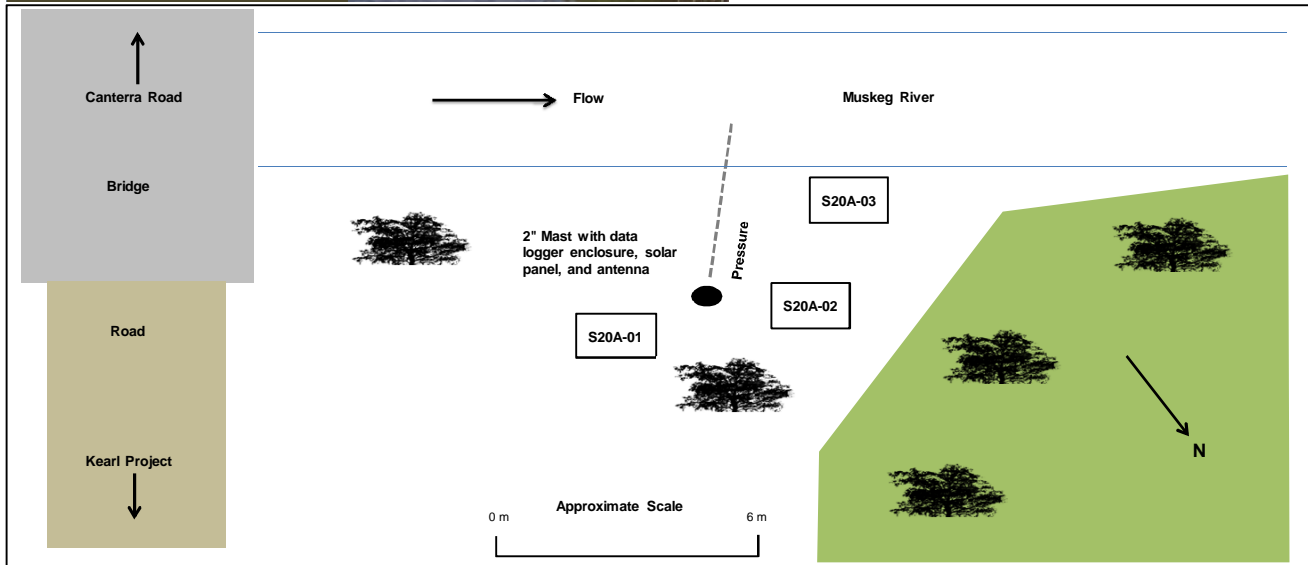
Metering Section: The metering section is located approx. 10 m downstream of the station, and can be waded safely during normal flow conditions.

Benchmark Information

BM: RAMP S20A-01
Elevation: 330.905 m
Basis: Level survey from RAMP S20A-02
Location: 2 m NE of data logger
Description: 3/4" Pipe

BM: RAMP S20A-02
Elevation: 330.902 m
Basis: Assumed Local Datum
Location: 2 m NW of data logger
Description: 3/4" Pipe

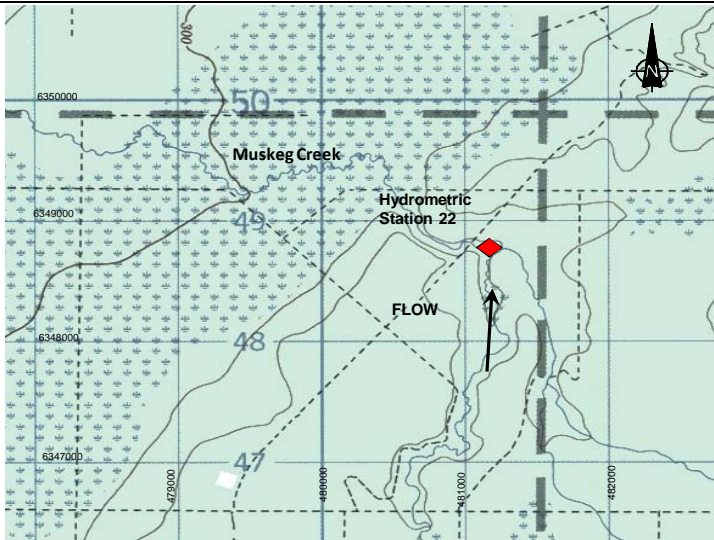
BM: RAMP S20A-03
Elevation: 330.820 m
Basis: Level survey from RAMP S20A-02
Location: 4 m West of data logger
Description: 3/4" Pipe



Revised March 22, 2016

Location and Purpose:

Established to monitor discharge on Muskeg Creek upstream of the Muskeg River, to provide predictions for effects of nearby oilsands operations. The station is located approximately 19 km NW of the East Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



Looking upstream from Station S22
Muskeg Creek near the Mouth

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 2001 to Present
Station Operation: Open water (April-October)
Access: 2WD road access on Canterra Road
Drainage Area: 323 km²
UTM Coordinates: 481036 E, 6348856 N (NAD83)
Lat/Long: 57°17'3.5" N, 111°18'56.5" W (NAD83)
NTS Map: 74E/06

Measurement Details

Channel: The channel is approx. 6 m wide, with trapezoidal edges. The dominant bed substrate is cobble, with sand.

Control: A riffle approx. 50 m downstream of the station acts as the control for this reach.

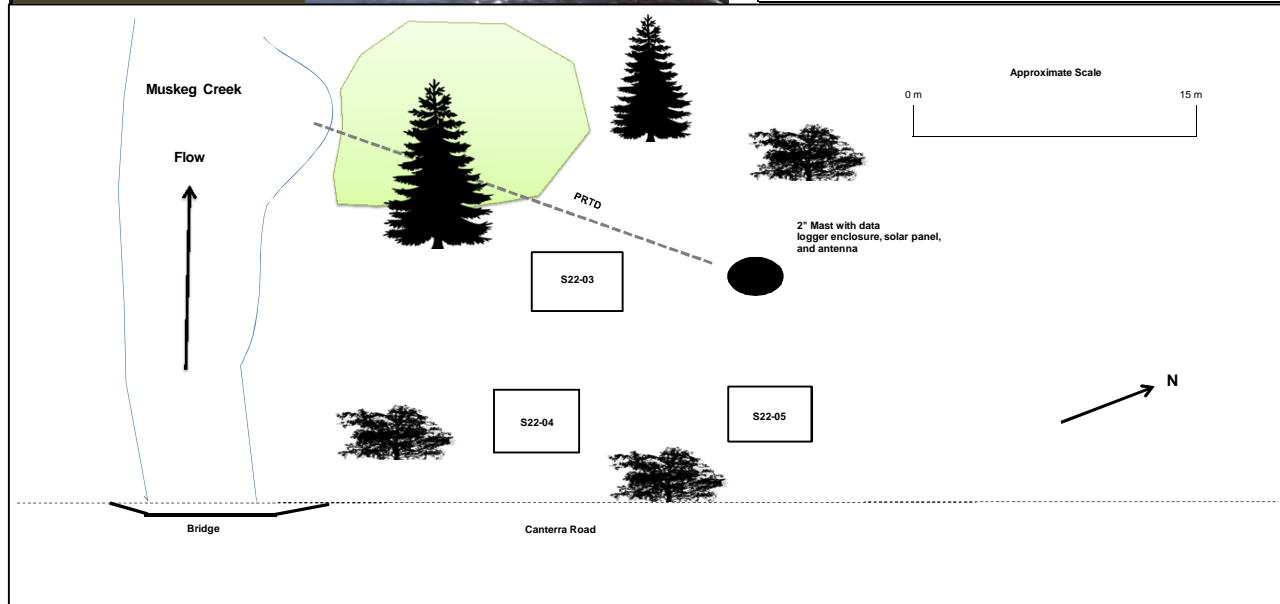
Metering Section: The open-water metering section is located 4 m upstream of the station and the winter metering section is approx. 40 m downstream. The channel can be waded during normal flow conditions.

Benchmark Information

BM: RAMP S22-03
Elevation: 305.577 m
Basis: Level Survey from S22-02
Location: 3 m West of data logger
Description: 3/4" Pipe with flagging

BM: RAMP S22-04
Elevation: 305.713 m
Basis: Level Survey from RAMP S22-01
Location: 5 m SW of data logger
Description: 3/4" Pipe with pink flagging

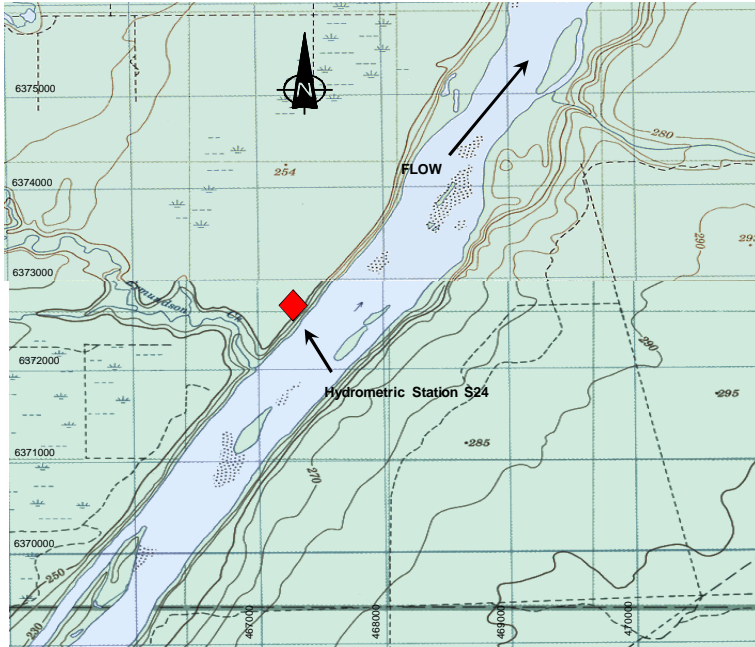
BM: RAMP S22-05
Elevation: 306.078 m
Basis: Level Survey from RAMP S22-01
Location: 1 m SE of data logger
Description: 3/4" Pipe with pink flagging



Revised 25 February, 2015

Location and Purpose:

Station is located 35 km downstream from Fort MacKay. This station was established as a downstream monitoring point of oil sands development in 2001. Operation of this station ceased on March 31, 2015.



Map Grid Based on UTM NAD 27



Station Details

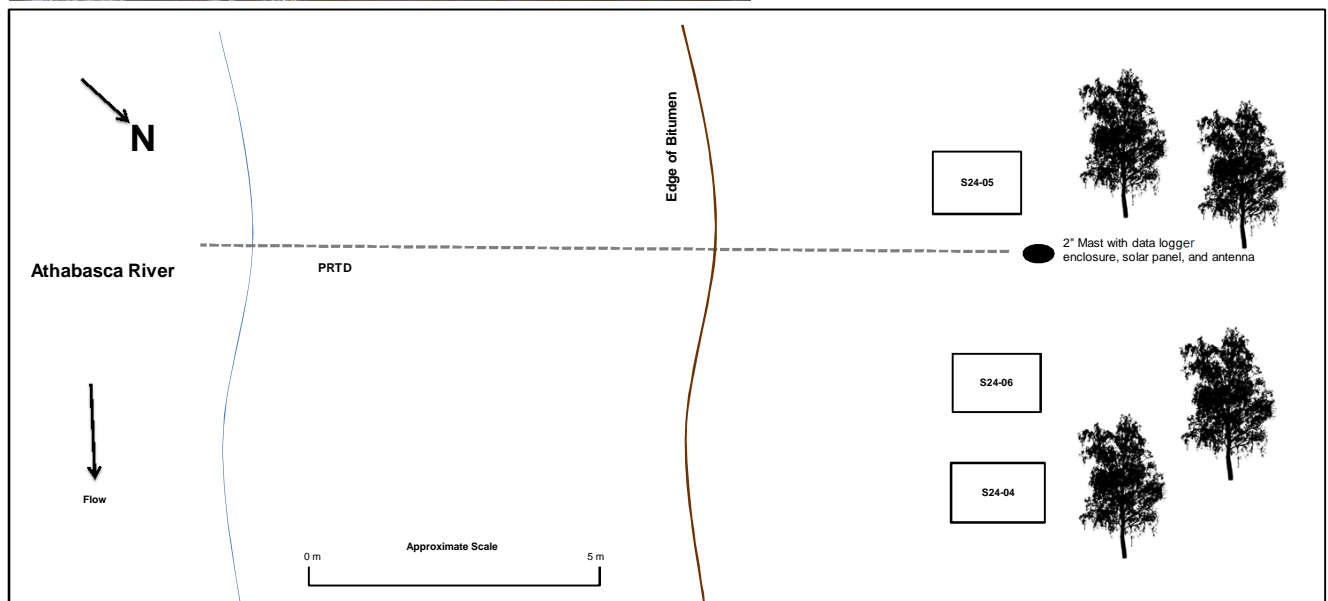
Variables Measured: Discharge, water level, water temperature
Period of Record: May 2001 to March 2015
Station Operation: Year Round
Access: Boat (summer) or helicopter (winter)
Drainage Area: 146,000 km²
Station Coordinates: 466313 E, 6372760 N (NAD83)
Flow Coordinates: 467570 E, 6375010 N (NAD 83)
Station Lat/Long: 57°29'46"
NTS Map: 74E/05

Measurement Details

Channel: Channel width is about 600 m at the monitoring station, and 450 m at the flow measurement reach. The deepest part of the channel is near the left bank, and sand bars typically appear near the right bank across from the monitoring station during low flows. Banks are steep on both sides and reasonably stable.
Control: Channel narrows 2.6 km downstream from continuous monitoring station.
Metering Section: Located 2.6 km downstream from monitoring station where channel narrows to 450 m. Measurements are conducted from a boat.

Benchmark Information

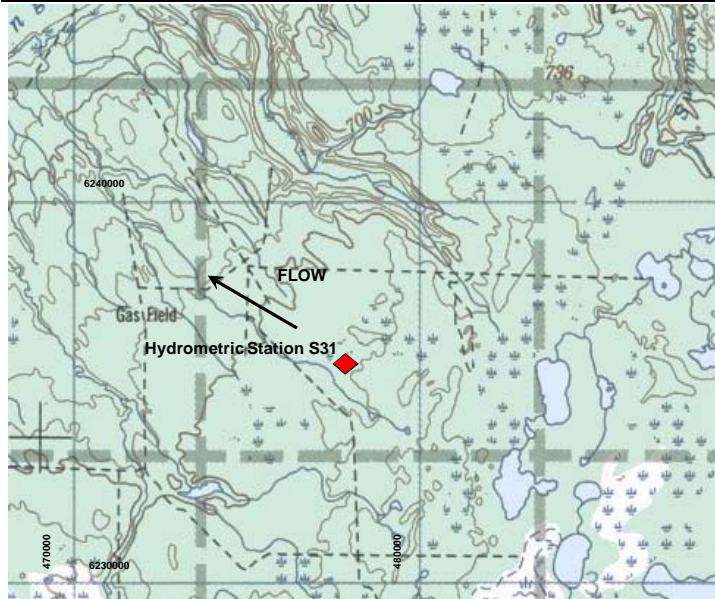
- BM:** RAMP S24-02
- Elevation:** 231.347
- Basis:** Geodetic
- Location:** 2 m North of data logger
- Description:** T-Post - Destroyed by ice, 05-2013
- BM:** RAMP S24-03
- Elevation:** 230.366 m
- Basis:** Level Survey from RAMP S24-02
- Location:** 8 m South of data logger
- Description:** 3/4" Pipe - Destroyed by ice, 05-2013
- BM:** RAMP S24-04
- Elevation:** 230.838 m
- Basis:** Level Survey from RAMP S24-02
- Location:** 5 m North of data logger
- Description:** 3/4" Pipe with pink flagging
- BM:** RAMP S24-05
- Elevation:** 231.065
- Basis:** Level Survey from RAMP S24-04
- Location:** 1.5 m South of data logger
- Description:** 3/4" Pipe with pink flagging
- BM:** RAMP S24-06
- Elevation:** 230.725 m
- Basis:** Level Survey from RAMP S24-04
- Location:** 8 m South of data logger
- Description:** 3/4" Pipe with pink flagging



Revised 02 March 2016

Location and Purpose:

Established to monitor discharge on Hangingsstone Creek. The site is accessed via North Star Road off Hwy 63, located 1.7km North of the Algar Tower East rest stop. The rationale for this site is to monitor the Suncor Meadow Creek EIA predictions. Station was moved to south side of North Star Road in November 2014 due to power line construction on north side of North Star Road. Station was moved back to the original site on the North side of North Star Road in October 2015.



Map Grid Based on UTM NAD 27



Looking upstream on Hangingsstone Creek from Station S31

Station Details

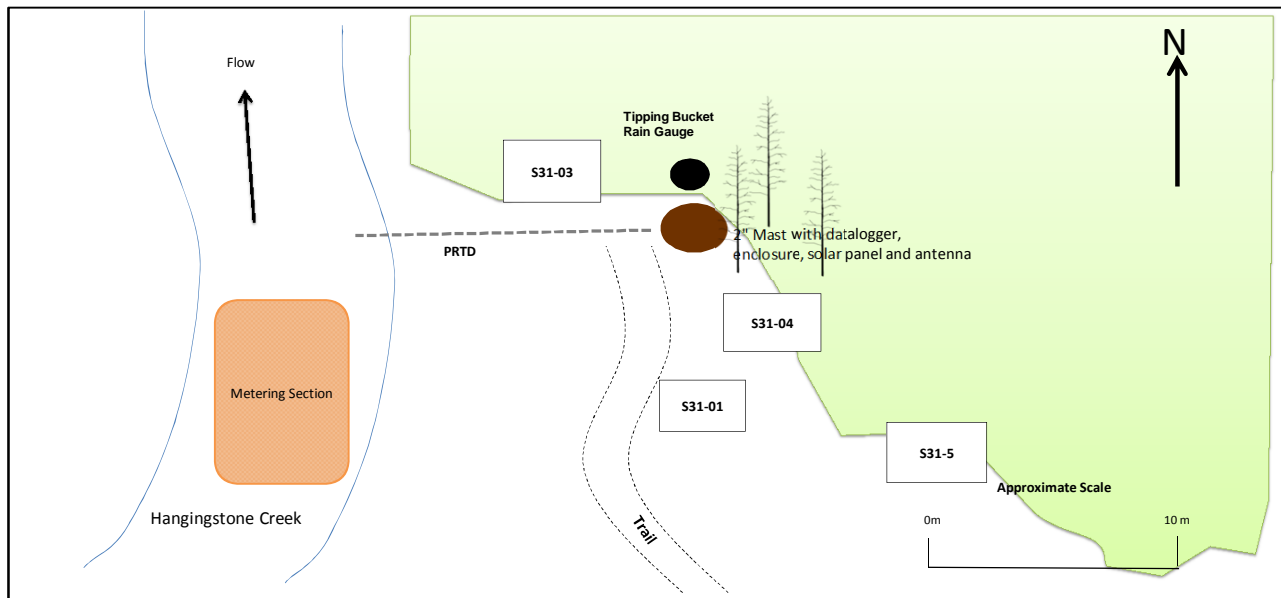
Variables Measured:	Discharge, water level, water temperature, rainfall
Period of Record:	April 2004 to Present
Station Operation:	Year Round
Access:	2WD road via North Star Road
Drainage Area:	119 km ²
UTM Coordinates:	476969 E, 6236095 N (NAD83)
Lat/Long:	56°16'9"N, 111°22'19"W (NAD83)
NTS Map:	74D/06

Measurement Details

Channel	The channel is roughly 7.5m wide and the bed mostly consists of silts.
Control	The channel pools at the top of a short riffle 15m downstream of monitoring station.
Metering Section	Measurements are conducted at a straight reach of the channel 7m upstream of the monitoring station. This section can be easily waded across in order to conduct measurements. The channel regularly remains open during the winter.

Benchmark Information

BM:	RAMP S31-01
Elevation:	100.128m
Basis:	Level Survey from RAMP S31-03
Location:	8m S of data logger
Description:	T-post
BM:	RAMP S31-03
Elevation:	99.726m
Basis:	Level Survey from RAMP S31-01
Location:	5m NW of data logger
Description:	3/4" Pipe
BM:	RAMP S31-04
Elevation:	99.947m
Basis:	Level Survey from RAMP S31-03
Location:	3m SW of data logger
Description:	3/4" Pipe
BM:	RAMP S31-05
Elevation:	99.896m
Basis:	Level Survey from RAMP S31-03
Location:	15m SW of data logger
Description:	3/4" Pipe



Location and Purpose:

Established to monitor discharge on Surmont Creek. The site is located 1.6 km East of the Stony Mountain Rd and Hwy 881 intersection. The rationale for this site is to monitor Suncor Meadow Creek EIA predictions.



Map Grid Based on UTM NAD 27



Station Details

Variables Measured: Discharge, water level, water temperature
Period of Record: April 2004 to Present
Station Operation: Open water (April-October)
Access: 2WD road via Hwy 881
Drainage Area: 157 km²
UTM Coordinates: 490252 E, 6254511 N (NAD83)
Lat/Long: 56°26'6"N, 111°9'29"W (NAD83)
NTS Map: 74D/06

Measurement Details

Channel: The channel is roughly 7 m wide and the dominant bed type is sand and silt.
Control: The channel morphology is the control for this site.
Metering Section: Measurements are conducted by wading across at the straight reach downstream of the Hwy 881 bridge, 5 m upstream of the monitoring station.

Benchmark Information

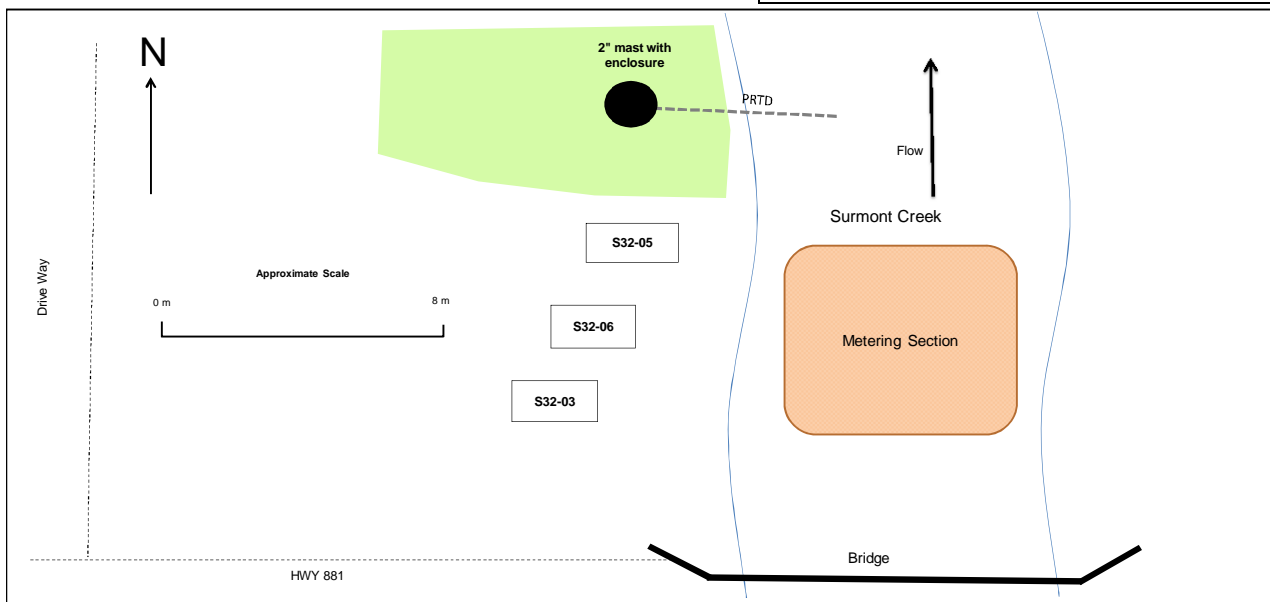
BM: RAMP S32-02
Elevation: 98.981 m
Basis: Assumed
Location: 3 m South of data logger
Description: Rebar, decommissioned

BM: RAMP S32-03
Elevation: 99.118 m
Basis: Level Survey from RAMP S32-02
Location: 10 m South of data logger
Description: 3/4" Pipe with pink flagging

BM: RAMP S32-04
Elevation: 99.366 m
Basis: Level Survey from RAMP S32-02
Location: 15 m South of data logger
Description: 3/4" Pipe, decommissioned

BM: RAMP S32-05
Elevation: 98.801 m
Basis: Level Survey from RAMP S32-02
Location: 4 m South of data logger
Description: 3/4" Pipe with pink flagging

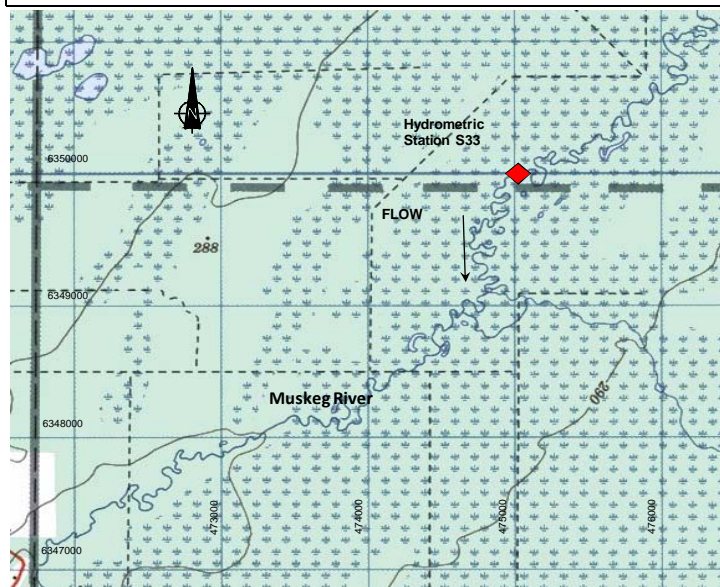
BM: RAMP S32-06
Elevation: 98.668 m
Basis: Level Survey from RAMP S32-02
Location: 7 m South of data logger
Description: 3/4" Pipe with pink flagging



Revised March 22, 2016

Location and Purpose:

Established in April 2003 to monitor discharge on the Muskeg River at the Syncrude Aurora North -Shell Muskeg River Mine lease boundary, in compliance with monitoring requirements LOC # 040365. The station is located approx. 13 km NE of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



Upstream view at RAMP Hydrometric Station S33, Muskeg River at the Aurora/Shell Boundary

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: April 2003 to Present
Station Operation: Year Round
Access: Argo from Shell Muskeg River Mine
Drainage Area: 897 km²
UTM Coordinates: 474876 E, 6350204 N (NAD83)
Lat/Long: 57°17'39" N, 111°25'1" W (NAD83)
NTS Map: 74E/06

Measurement Details

Channel: The channel is approx. 8 m wide, with relatively straight edges. The dominant bed material is silt, with layers of organics and some woody debris

Control: The channel morphology serves as the hydrologic control for this stream reach.

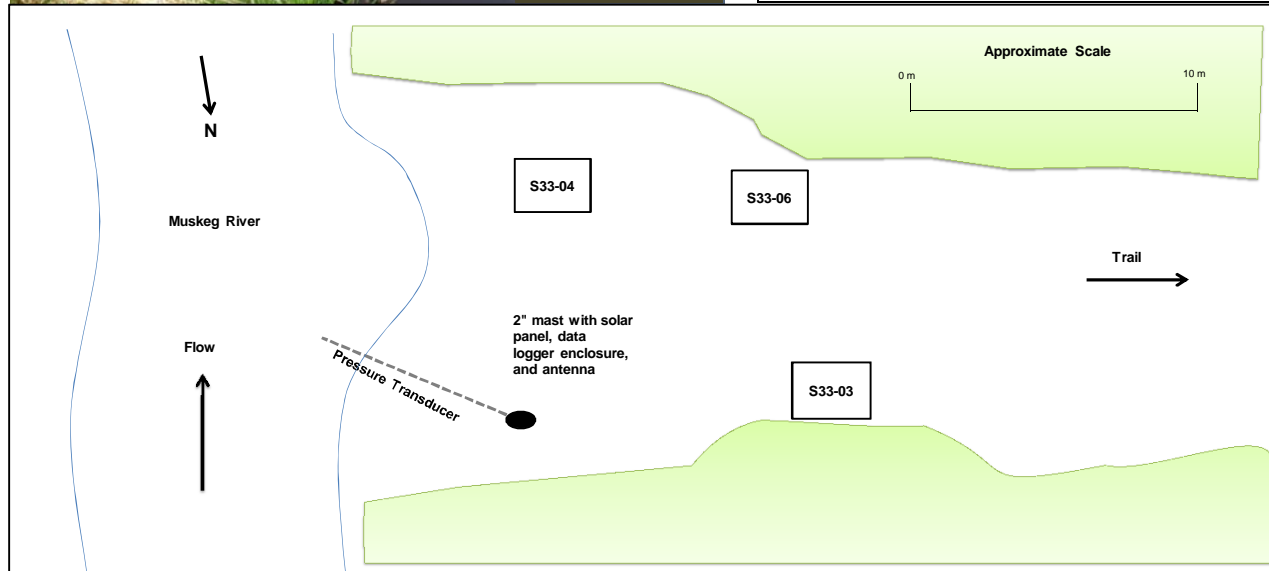
Metering Section: The metering section is located adjacent to the station, and the channel requires the use of a kick-boat to conduct a flow measurement, due to deep water.

Benchmark Information

BM: RAMP S33-03
Elevation: 281.308 m
Basis: Level survey from RAMP S33-02
Location: 3 m West of data logger
Description: 3/4" Pipe with pink flagging

BM: RAMP S33-04
Elevation: 281.481 m
Basis: Level survey from previous RAMP S33-03
Location: 8 m South of data logger
Description: 3/4" Pipe with pink flagging

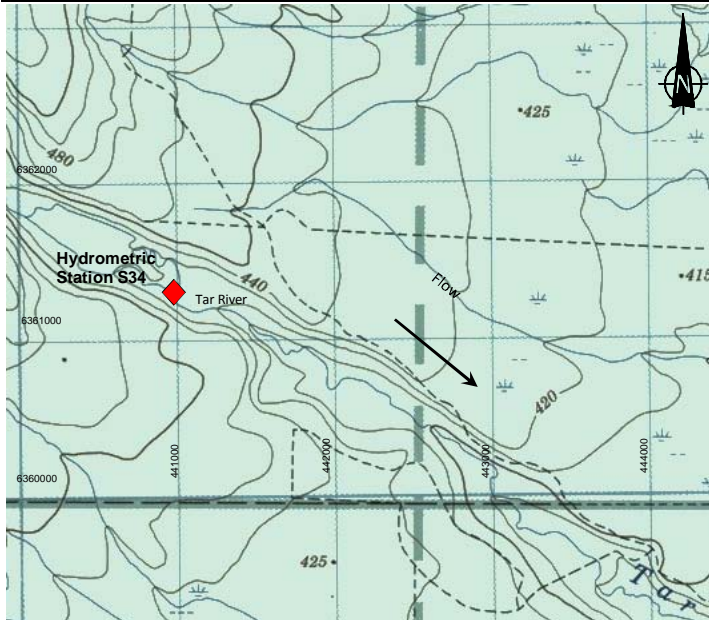
BM: RAMP S33-06
Elevation: 281.494 m
Basis: Level Survey from RAMP S33-03
Location: 7 m SW of data logger
Description: 3/4" Pipe with pink flagging



Revised March 22, 2016

Location and Purpose:

Established in April 2005 to monitor discharge on the Tar River above the CNRL Compensation Lake for management purposes. Located 1 km North East of the CNRL compensation lake.



Map Grid Based on UTM NAD 27



Looking North toward the station. June, 2013

Looking upstream from near the station.

Station Details

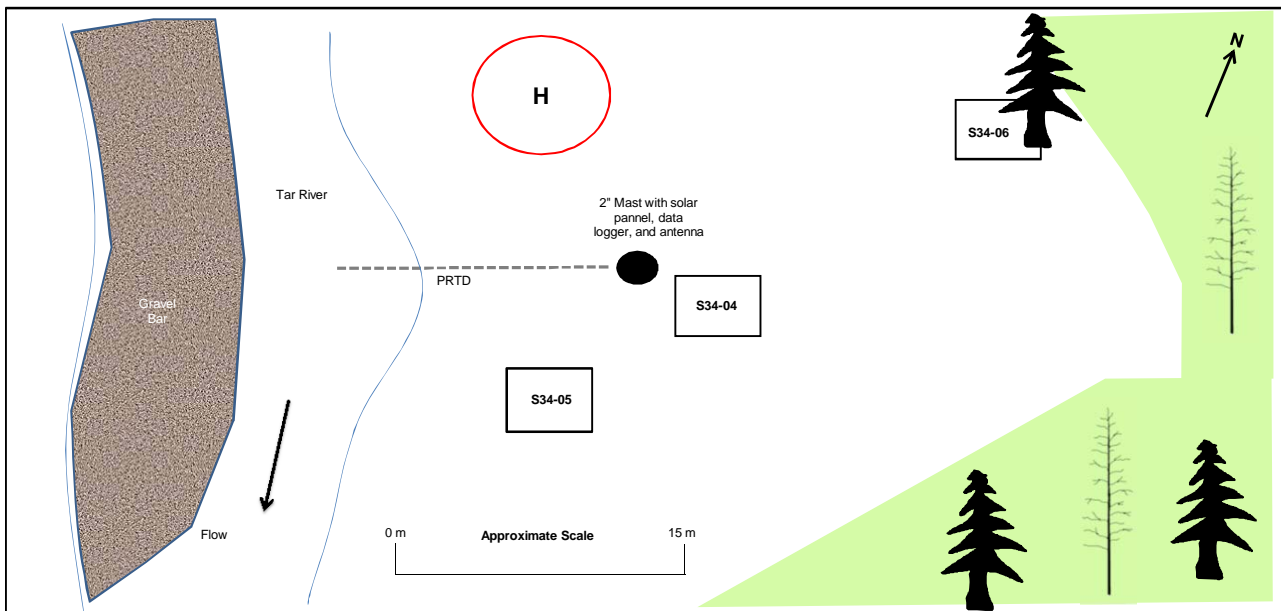
Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	April 2005 to Present
Station Operation:	Year Round
Access:	Helicopter
Drainage Area:	134 km ²
UTM Coordinates:	440712 E, 6361615 N (NAD83)
Lat/Long:	57°23'38.84" N, 111°59'10.17" W (NAD83)
NTS Map:	74E/05

Measurement Details

Channel	The channel is roughly 4 m wide and the dominant bed type is sand and gravel. This river can be waded throughout the open water season.
Control	A downstream riffle is the control for this site.
Metering Section	Measurements are conducted by wading across near the station.

Benchmark Information

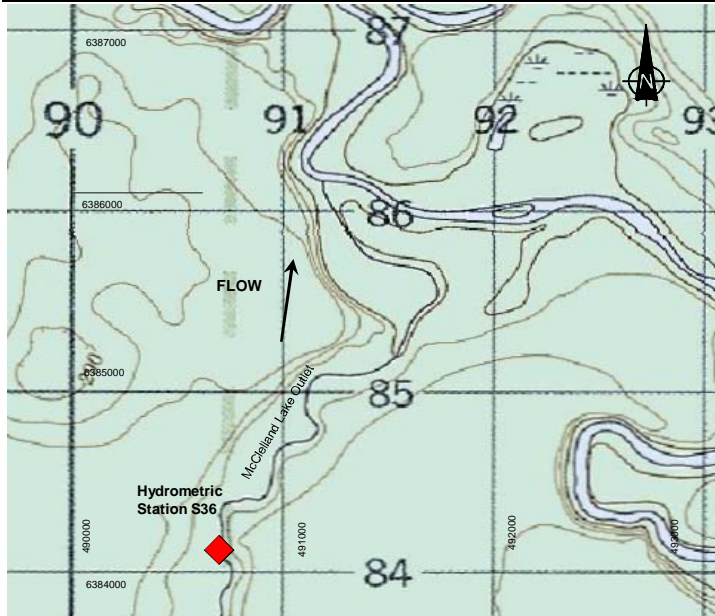
BM:	RAMP S34-04
Elevation:	98.659
Basis:	Level Survey from RAMP S34-01
Location:	2 m East of station
Description:	3/4" Pipe
BM:	RAMP S34-05
Elevation:	98.271
Basis:	Level Survey from RAMP S34-04
Location:	8 m South of station
Description:	3/4" Pipe
BM:	RAMP S34-06
Elevation:	99.401
Basis:	Level Survey from RAMP S34-04
Location:	30 m North of station
Description:	Lag Bolt in tree



Revised March 22, 2016

Location and Purpose:

Established in May 2008 to assist in monitoring runoff from McClelland Lake and surrounding areas. Station is located 14 km NE of McClelland Lake.



Map Grid Based on UTM NAD 27



Station Details

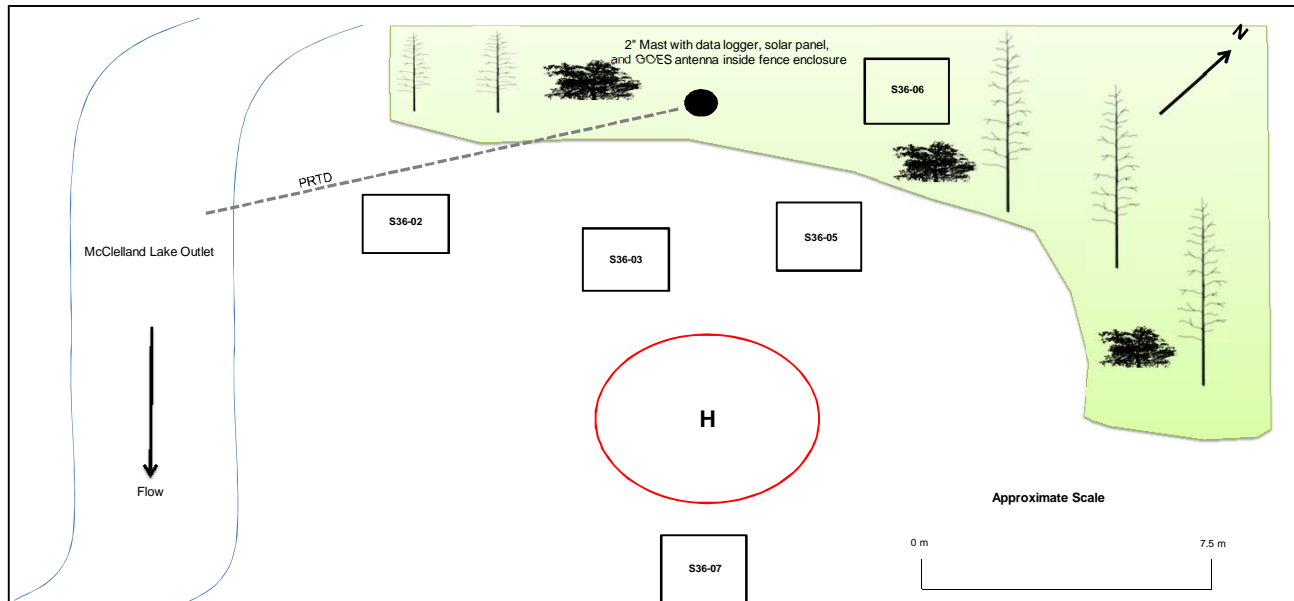
Variables Measured:	Discharge, water level, water temperature
Telemetry:	GOES-07DC902
Period of Record:	May 2008 to Present
Station Operation:	Year Round
Access:	Helicopter
Drainage Area:	368 km ² (RAMP)
UTM Coordinates:	490626 E, 6384064 N (NAD83)
Lat/Long:	57°35'56"N, 111°9'25"W (NAD83)
NTS Map:	74E/11

Measurement Details

Channel	The channel is roughly 7 m wide and the dominant bed type is sand and silt. There is some weeds growing along the banks. The river at this site can be waded throughout most of the open water season.
Control	The control for this reach consists of downstream beaver dams
Metering Section	Measurements are conducted by wading the river 5m downstream from the station

Benchmark Information

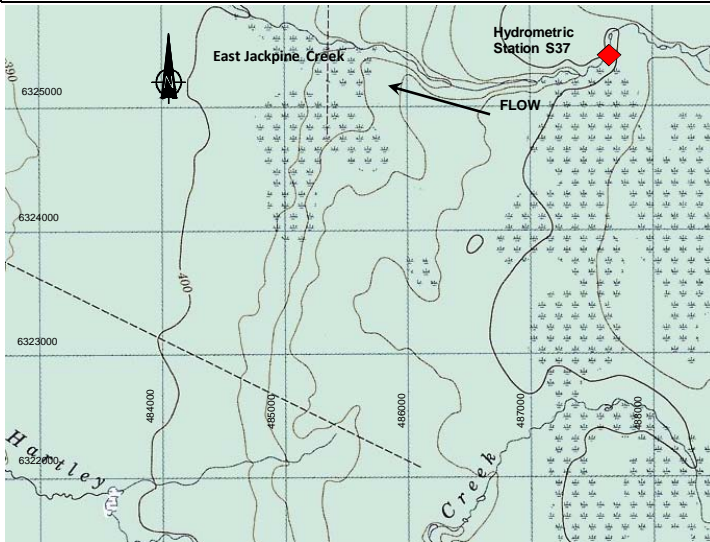
BM:	RAMP S36-04
Elevation:	100.482 m
Basis:	Level Survey from RAMP S36-02
Location:	8 m West of logger
Description:	3/4" Pipe
BM:	RAMP S36-05
Elevation:	100.395 m
Basis:	Level Survey from RAMP S36-02
Location:	3/4" Pipe 6 m SW of Mast
Description:	3/4" Pipe
BM:	RAMP S36-06
Elevation:	100.530 m
Basis:	Level Survey from RAMP S36-02
Location:	6 m NE of station
Description:	Lag bolt
BM:	RAMP S36-07
Elevation:	100.256 m
Basis:	Level Survey from RAMP S36-06
Location:	15 m SE of station
Description:	Lag bolt



Revised 22 March, 2016

Location and Purpose:

Established to monitor discharge on an upland reference location in the Muskeg River catchment. The station is located approx. 28 km SE of the Hwy 63 - MRM Access Rd. intersection.



Map Grid Based on UTM NAD 27



Upstream view of East Jackpine Creek at Station S37

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular with radio relay
Period of Record: September 2007 to Present
Station Operation: Open water (April-October)
Access: Helicopter
Drainage Area: 47.4 km²
UTM Coordinates: 487840 E, 6325424 N (NAD83)
Lat/Long: 57°4'19.4" N, 111°12'2.0" W (NAD83)
NTS Map: 74E/03

Measurement Details

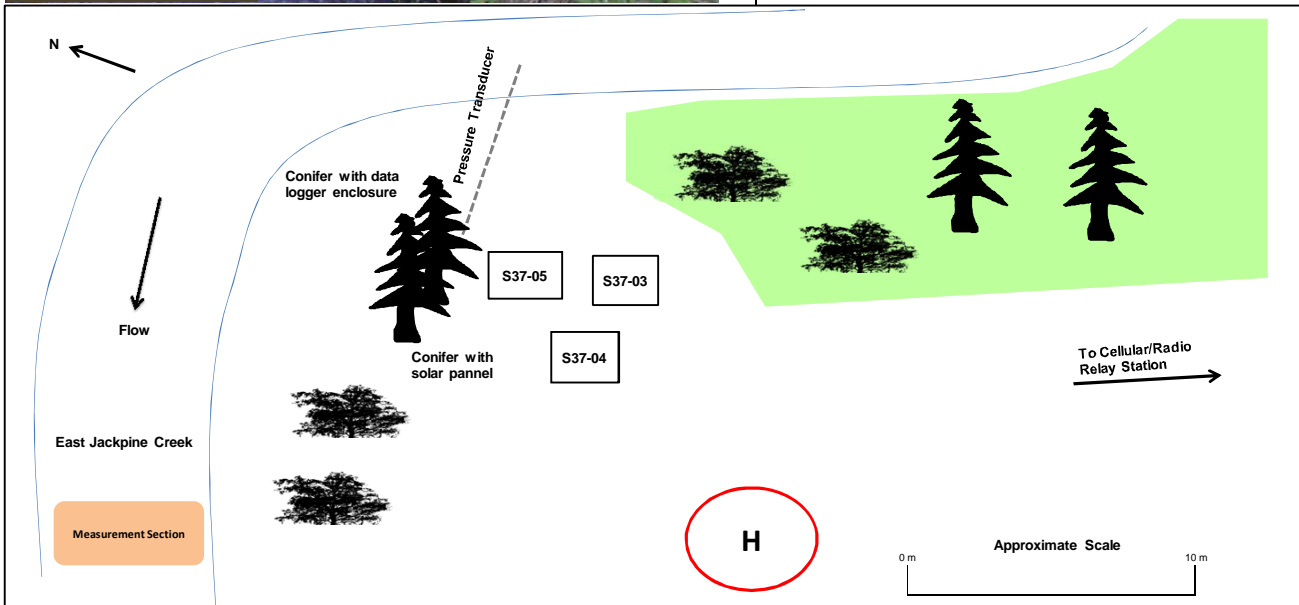
Channel: The channel is approx. 5 m wide at the measurement section, with trapezoidal edges. Dominant substrate includes cobble and gravel.
Control: A riffle approx. 6 m downstream of the measurement section serves as the hydrologic control for the reach.
Metering Section: The measurement section is located approx. 30 m downstream of the station, and can be waded under normal flow conditions.

Benchmark Information

BM: RAMP S37-03
Elevation: 100.850 m
Basis: Assumed
Location: 3 m South of data logger
Description: 3/4" Pipe with pink flagging

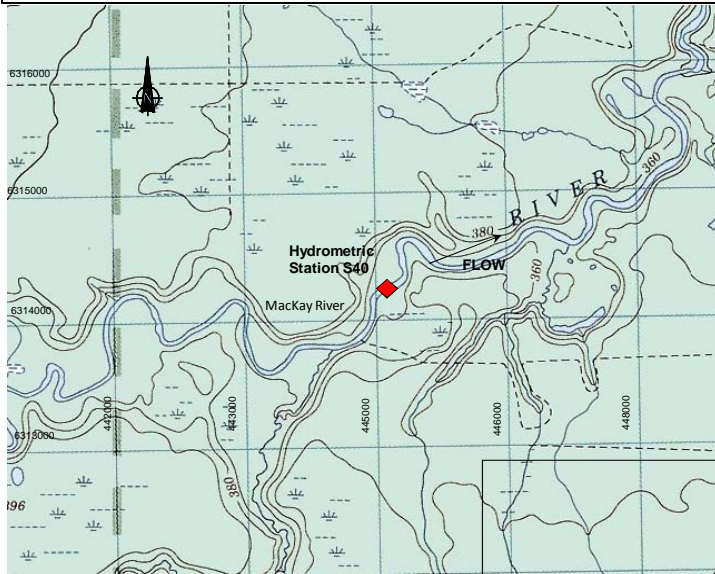
BM: RAMP S37-04
Elevation: 101.072 m
Basis: Level Survey from RAMP S37-03
Location: 4 m SW of data logger
Description: 3/4" Pipe with flagging

BM: RAMP S37-05
Elevation: 101.194 m
Basis: Level Survey from RAMP S37-03
Location: 1.5 m from data logger
Description: 3/4" Pipe with pink flagging



Location and Purpose:

Established to monitor discharge on the MacKay River as an upstream reference for the Suncor Dover and MacKay River developments. The station is located 30m downstream of the Petro-Canada Bridge, approximately 30 km west of the the HWY 63 and Suncor Road intersection.



Map Grid Based on UTM NAD 27



Looking North West towards the station. June, 2013

Looking upstream from near the station

Station Details

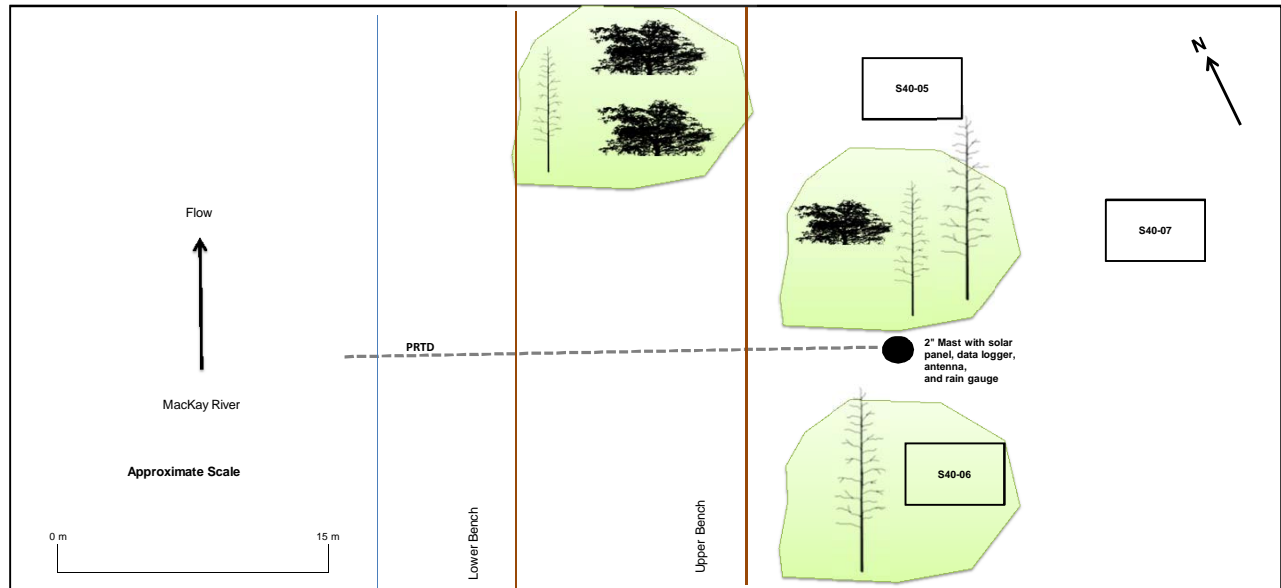
Variables Measured:	Discharge, water level, water temperature, rainfall
Telemetry:	Cellular
Period of Record:	January 2008 to Present
Station Operation:	Year Round
Access:	Truck
Drainage Area:	5290 km ²
UTM Coordinates:	445023 E, 6314256 N (NAD83)
Lat/Long:	56°58'7"N, 111°54'15"W (NAD83)
NTS Map:	74D/13

Measurement Details

Channel	The channel is 30 m wide. The substrate is made up of mostly cobble. Channel is wadeable during low flows.
Control	The control is a downstream riffle.
Metering Section	Measurements are conducted on the straight reach downstream of the bridge near the station by wading or boat.

Benchmark Information

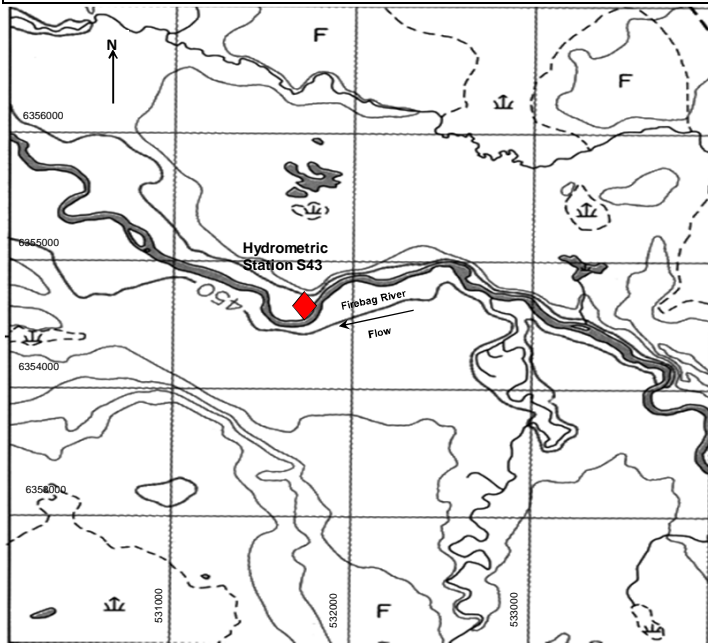
BM:	RAMP S40-05
Elevation:	100.121 m
Basis:	Assumed
Location:	Level Survey from RAMP S40-01
Description:	3/4" Pipe
BM:	RAMP S40-06
Elevation:	100.067 m
Basis:	Level Survey from RAMP S40-01
Location:	3 m South of station
Description:	3/4" Pipe
BM:	RAMP S40-07
Elevation:	100.232 m
Basis:	Level Survey from RAMP S40-01
Location:	4 m South of station
Description:	3/4" Pipe
BM:	RAMP S40-08
Elevation:	100.330 m
Basis:	Level Survey from RAMP S40-06
Location:	Bolt on Bridge
Description:	Lag Bolt Marked with Orange Paint



Revised March 22, 2016

Location and Purpose:

Established in May 2009 to monitor discharge on the Firebag River upstream of oilsands operations. Located 45 km East of Kearl Lake.



Map Grid Based on UTM NAD 27



Looking downstream from near the station. August, 2013.

Looking South West towards the station. August, 2013.

Station Details

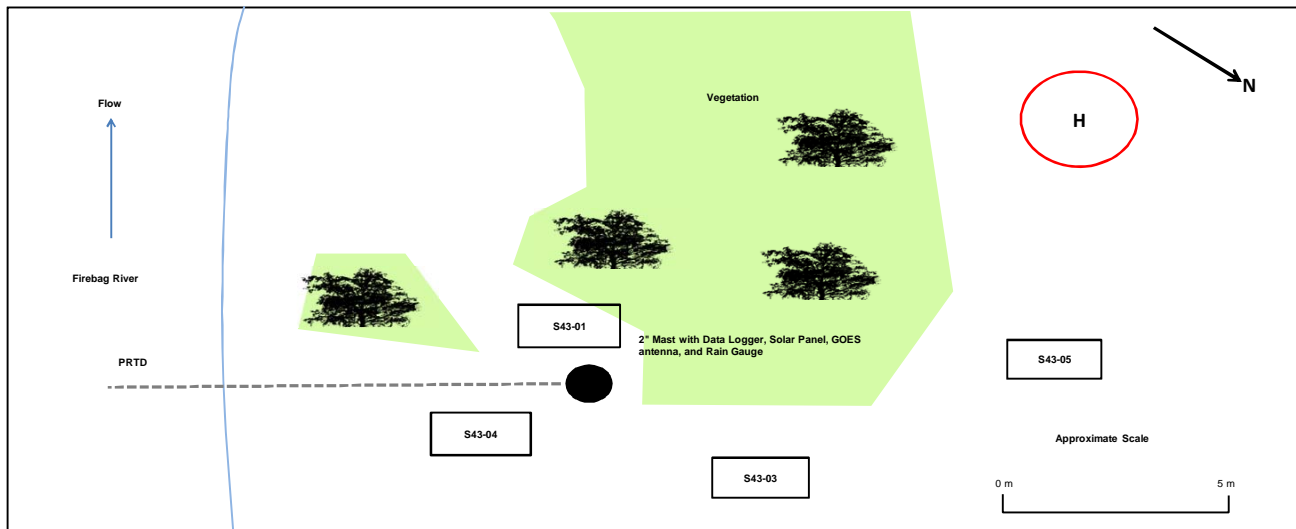
Variables Measured: Discharge, water level, water temperature, rainfall
Telemetry: GOES-07DC903
Period of Record: May 2009 to Present
Station Operation: Year Round
Access: Helicopter
Drainage Area: 2,382 km² (RAMP)
UTM Coordinates: 531528 E, 6354782 N (NAD83)
Lat/Long: 57°20'05" N, 110°28'35" W (NAD83)
NTS Map: 74E/08

Measurement Details

Channel: The channel is a straight reach 36m wide, the substrate is made up of mostly cobble and sand. Channel can only be waded during periods of low water levels in the open water season.
Control: A small riffle about 50 m downstream of the station acts as the control at this station.
Metering Section: Measurements are conducted between the station and the downstream control using a boat or by wading across the river during low water levels.

Benchmark Information

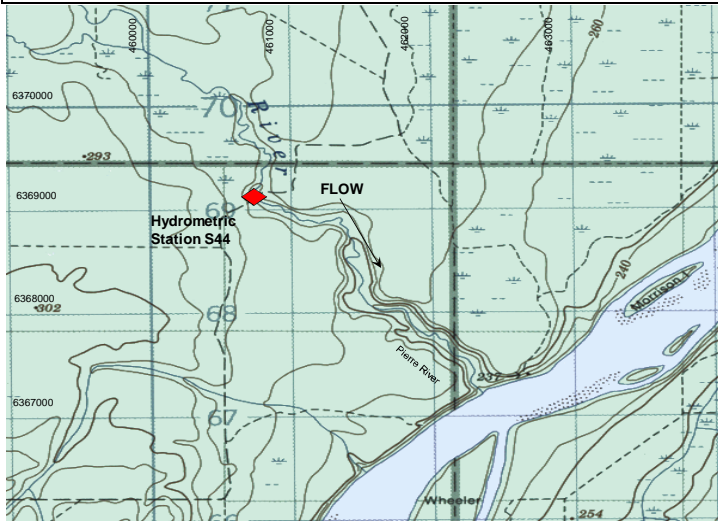
BM: RAMP S43-01
Elevation: 100.270 m
Basis: Assumed
Location: 1 m South of station
Description: 3/4" Pipe
BM: RAMP S43-03
Elevation: 100.113 m
Basis: Level Survey from RAMP S43-01
Location: 5 m North of station
Description: 3/4" Pipe
BM: RAMP S43-04
Elevation: 100.338 m
Basis: Level Survey from RAMP S43-01
Location: 1 m East of station
Description: 3/4" Pipe
BM: RAMP S43-05
Elevation: 101.523 m
Basis: Level Survey from RAMP S43-01
Location: 10 m NE of station
Description: lag bolt



Revised March 22, 2016

Location and Purpose:

Established to monitor baseline discharge on the Pierre River prior to the Shell Pierre River Mine development. Installed near the abandoned Environment Canada hydrometric station 07DA013 that operated from 1975 to 1977. Station is located 15 km north of the CNRL Horizon Mine.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	1975-77; May 2009-Present
Station Operation:	Open water (April-October)
Access:	Helicopter
Drainage Area:	123 km ²
UTM Coordinates:	460775 E, 6369400 N (NAD83)
Lat/Long:	57°27'52.5" N, 111°39'14.9" W (NAD83)
NTS Map:	74E/05

Measurement Details

Channel	The channel is approximately 3.5 m wide. The substrate is mostly made up of cobble. Water levels are generally very low and can be easily waded throughout the open water season.
Control	The control at this station is a downstream riffle.
Metering Section	Measurements are conducted by wading across the river near the station.

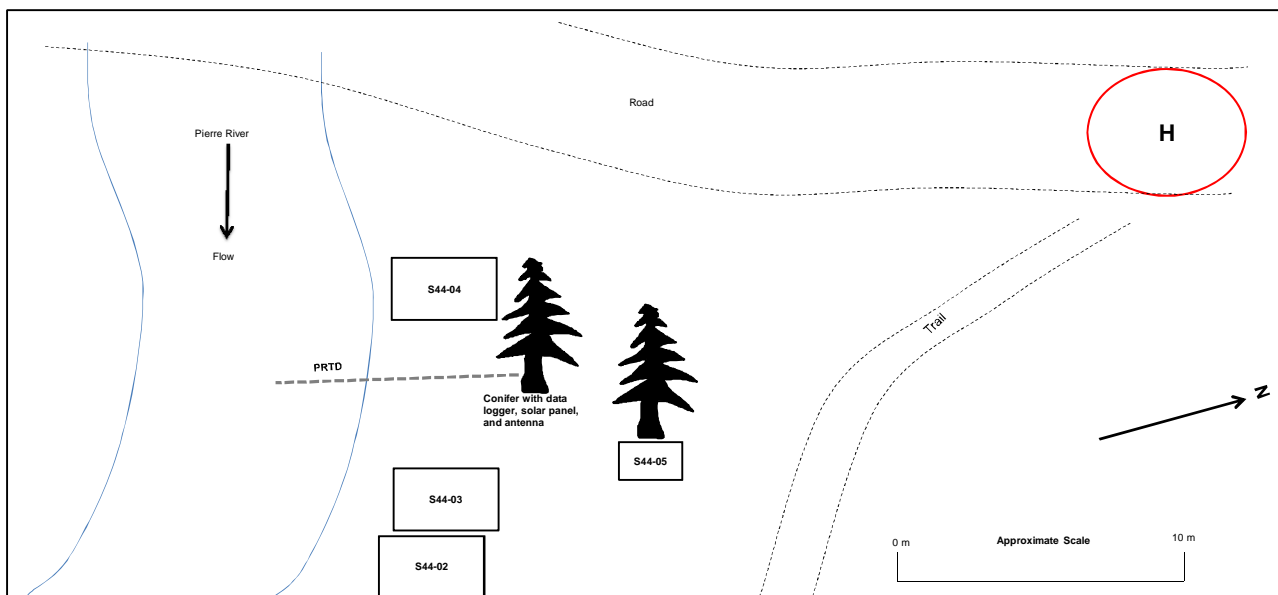


Looking upstream from near the station. September, 2013.

Looking North towards the station September, 2013.

Benchmark Information

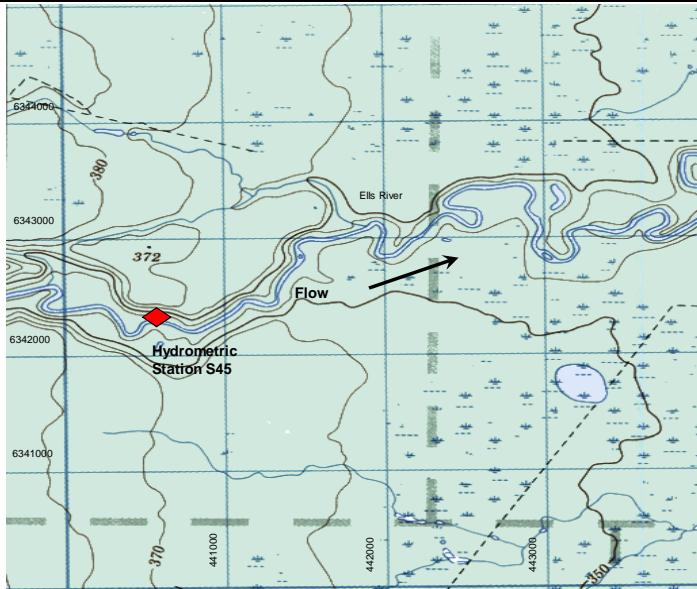
BM:	RAMP S44-02
Elevation:	99.878 m
Basis:	Assumed
Location:	8 m East of station
Description:	3/4" Pipe
BM:	RAMP S44-03
Elevation:	99.810 m
Basis:	Level Survey from RAMP S44-01
Location:	6 m East of station
Description:	3/4" Pipe
BM:	RAMP S44-04
Elevation:	100.073 m
Basis:	Level Survey from RAMP S44-01
Location:	2 m West of station
Description:	3/4" Pipe
BM:	RAMP S44-05
Elevation:	100.054 m
Basis:	Level Survey from RAMP S44-02
Location:	Tree 6 m North of station
Description:	Lag Bolt in Tree



Revised March 21, 2016

Location and Purpose:

Established to monitor discharge on the Ells River upstream of the proposed Joslyn Creek Diversion and the Fort McKay water intake. Located 19 km South West of the Canadian Natural Horizon mine.



Map Grid Based on UTM NAD 27



Looking upstream from near the station. September, 2013

Looking South towards the station. June, 2013

Station Details

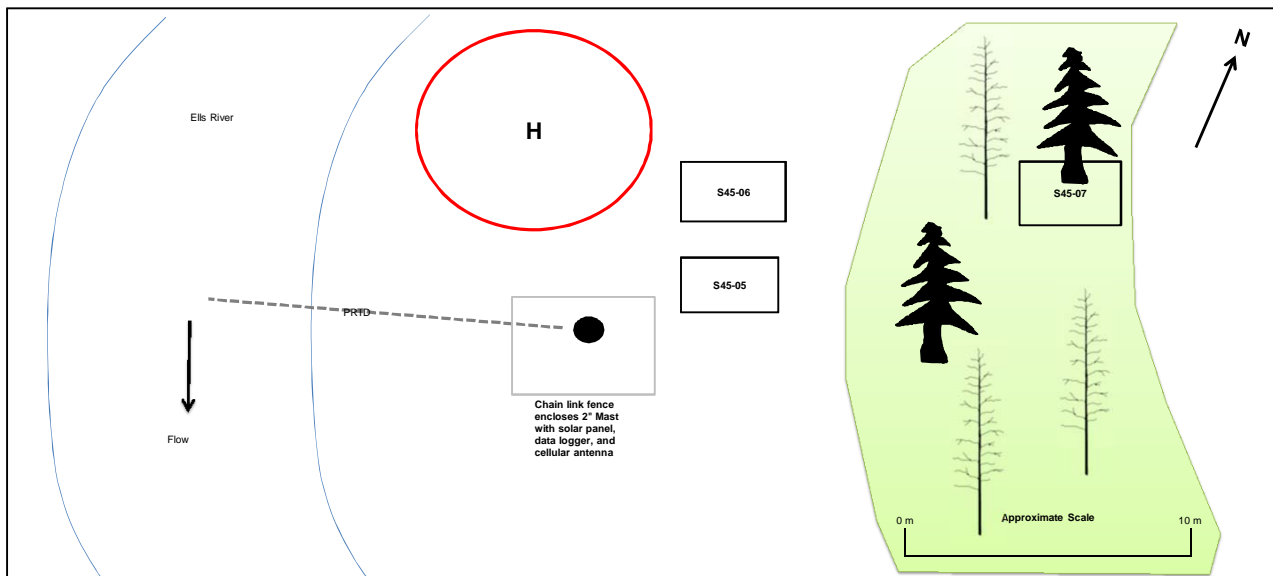
Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	June 2009 to Present
Station Operation:	Year Round
Access:	Helicopter
Drainage Area:	2450 km ²
UTM Coordinates:	440605 E, 6342459 N (NAD83)
Lat/Long:	57°13'17" N, 111°59'01" W (NAD83)
NTS Map:	74E/04

Measurement Details

Channel	The channel is approximately 30 m wide. The substrate is mostly made up of cobbles. During the open water season the river can only be waded during periods of lower water levels at this location.
Control	This station has a downstream riffle that acts as the control.
Metering Section	The metering section is located near the station, upstream of the bend to the east.

Benchmark Information

BM:	RAMP S45-05
Elevation:	99.809m
Basis:	Level Survey from RAMP S45-03
Location:	6 m West of station
Description:	3/4" Pipe
BM:	RAMP S45-06
Elevation:	99.880 m
Basis:	Level Survey from RAMP S45-03
Location:	3 m North of station
Description:	3/4" Pipe
BM:	RAMP S45-07
Elevation:	101.472 m
Basis:	Level Survey from RAMP S45-06
Location:	25 m Northeast of station on bench
Description:	Bolt in conifer tree



H

S45-06

S45-05

S45-07

Chain link fence encloses 2" Mast with solar panel, data logger, and cellular antenna

0 m

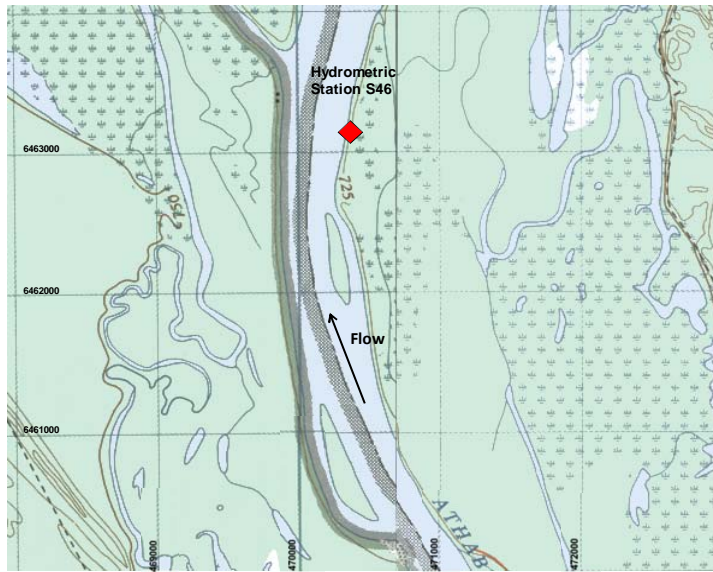
Approximate Scale

10 m

Revised 25 February, 2015

Location and Purpose:

Station is located 14 km downstream from the Embarras airport. The station was established to monitor the Athabasca River downstream of all oil sands development. Operation of this station ceased on March 31, 2015.



Map Grid Based on UTM NAD 27



Looking across the Athabasca River from the right bank at station S46

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: GOES-07DD911
Period of Record: August 2011 to Present
Station Operation: Year Round
Access: Helicopter
Drainage Area: 156,000 km²
UTM Coordinates: 470241 E, 6463206 N (NAD83)
Lat/Long: 58°18'32" N, 111°30'28" W (NAD83)
NTS Map: 74L/05/06

Measurement Details

Channel: Channel width is about 400 m. The deepest part of the channel is near the right bank, and sand bars typically occur in the centre of the channel at low flow periods.

Control: An island located 1.5 km downstream of monitoring station is likely the control.

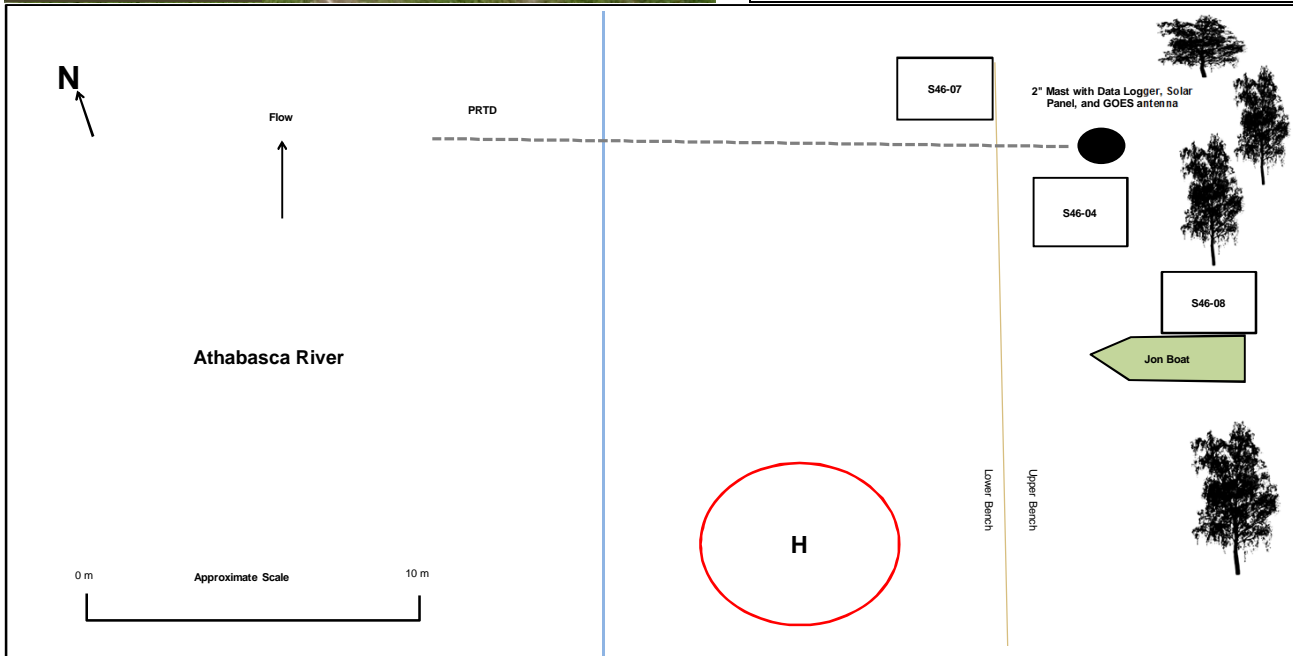
Metering Section: Located adjacent to the monitoring station. Measurements are conducted from a boat in the open water season or under the ice in winter.

Benchmark Information

BM: RAMP S46-04
Elevation: 99.748
Basis: Datum transfer from previous S46-01
Location: 2 m South of data logger
Description: 3/4" Pipe with orange flagging

BM: RAMP S46-07
Elevation: 99.860 m
Basis: Level Survey from RAMP S46-04
Location: Birch tree 5 m NE station
Description: Lag bolt

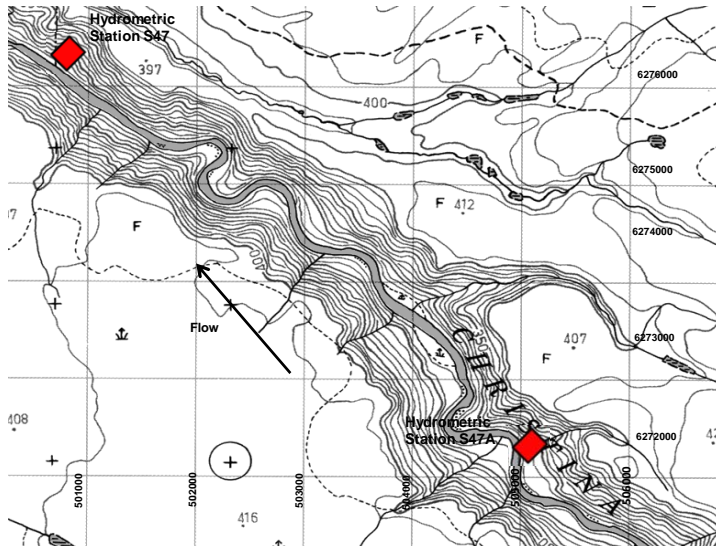
BM: RAMP S46-08
Elevation: 97.901
Basis: Level Survey from RAMP S46-04
Location: Behind berm near boat, 5m SE of station
Description: 3/4" Pipe



Revised 02 March, 2016

Location and Purpose:

Established to monitor discharge on the Christina River near the mouth and downstream of all development in the Christina watershed. The station was moved from S47 to the current location in October 2012 to a location with better hydraulics. The station is located 12.3 km southeast of the Clearwater River confluence.



Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: GOES
Period of Record: May 2011 to Present
Station Operation: Year Round
Access: Helicopter
Drainage Area: 13,284 km²
UTM Coordinates: 505048 E, 6272065 N (NAD83)
Lat/Long: 56°35'34"N, 110°55'4"W (NAD83)
NTS Map: 74D/10

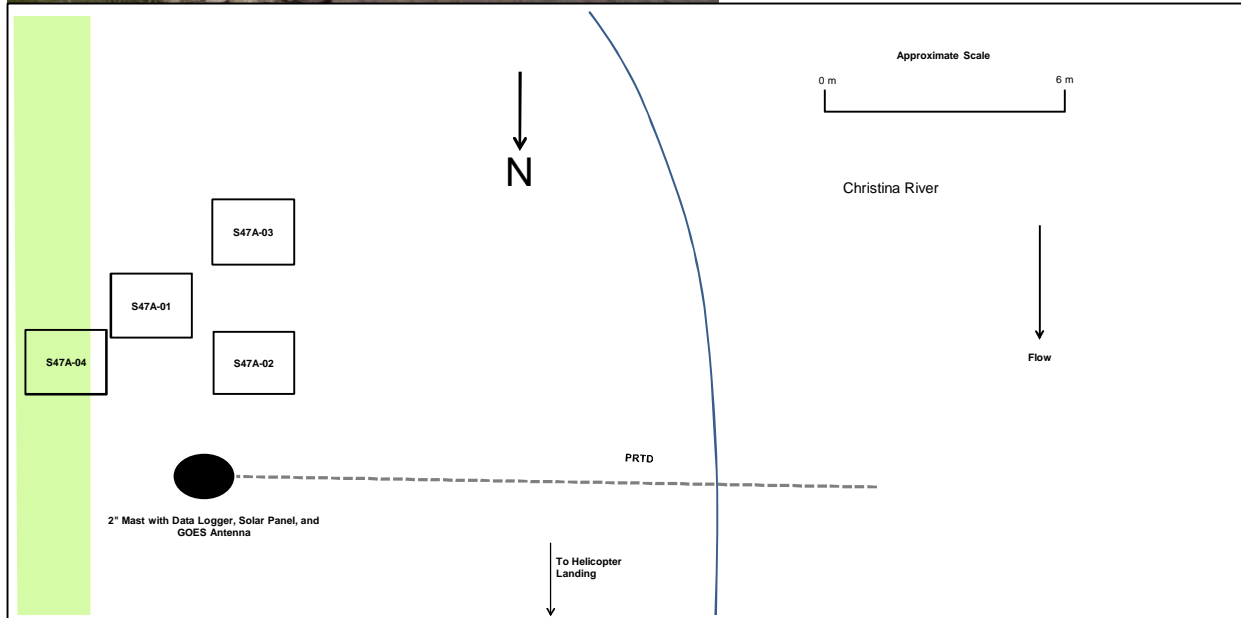
Measurement Details

Channel: The monitoring station is located on the inside of a large bend, out of the main flow. The channel is roughly 50 m across with a bed of cobbles and boulders.
Control: A number of short riffle and runs beginning 200m downstream of the station appear during low flow, for the remainder of the year the channel morphology serves as a control.
Metering Section: The metering sections is located 9.9km downstream from the monitoring station. The channel at the metering section is very straight and roughly 70 m across, the bed consists of mostly cobbles. Measurements are conducted using a boat and wading, depending on water levels.



Benchmark Information

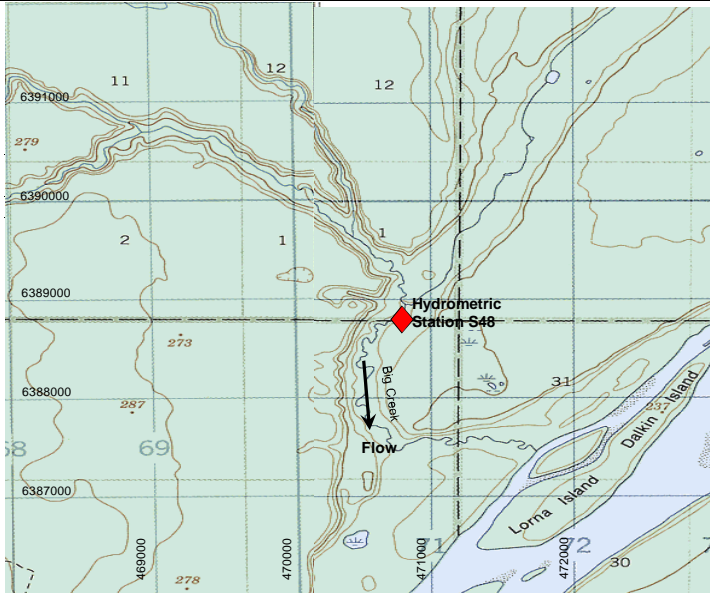
BM: RAMP S47A-01
Elevation: 100.096 m
Basis: Assumed
Location: 6 m SE of data logger
Description: 3/4" Pipe
BM: RAMP S47A-02
Elevation: 99.884 m
Basis: Level Survey from RAMP S47A-01
Location: 5 m South of data logger
Description: 3/4" Pipe
BM: RAMP S47A-03
Elevation: 99.579 m
Basis: Level Survey from RAMP S47A-01
Location: 7 m South of data logger
Description: 3/4" Pipe
BM: RAMP S47A-04
Elevation: 100.833m
Basis: Level Survey from RAMP S47A-01
Location: 10m ESE of logger
Description: Lag bolt in conifer



Revised March 22, 2016

Location and Purpose:

Established to monitor water level and discharge on Big Creek near the mouth to establish baseline conditions prior to construction of the Pierre River and Teck Frontier mines. Located 2 km North West of Lorna Island on the Athabasca River.



Map Grid Based on UTM NAD 27



Looking South towards the station from the left bank of

Looking downstream from near the station.

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular with radio relay
Period of Record: May 2011 to Present
Station Operation: Open water (April-October)
Access: Helicopter
Drainage Area: 304 km²
UTM Coordinates: 470894 E, 6389207 N (NAD83)
Lat/Long: 57°38'39" N, 111°29'15" W (NAD83)
NTS Map: 74E/11

Measurement Details

Channel: The channel is approximately 5 m wide. The substrate is mostly made up of silt and sand. At this location the river can be waded throughout the open water season due to fairly low flows

Control: This site is controlled by the channel morphology and downstream beaver activity.

Metering Section: The metering section is located near the station.

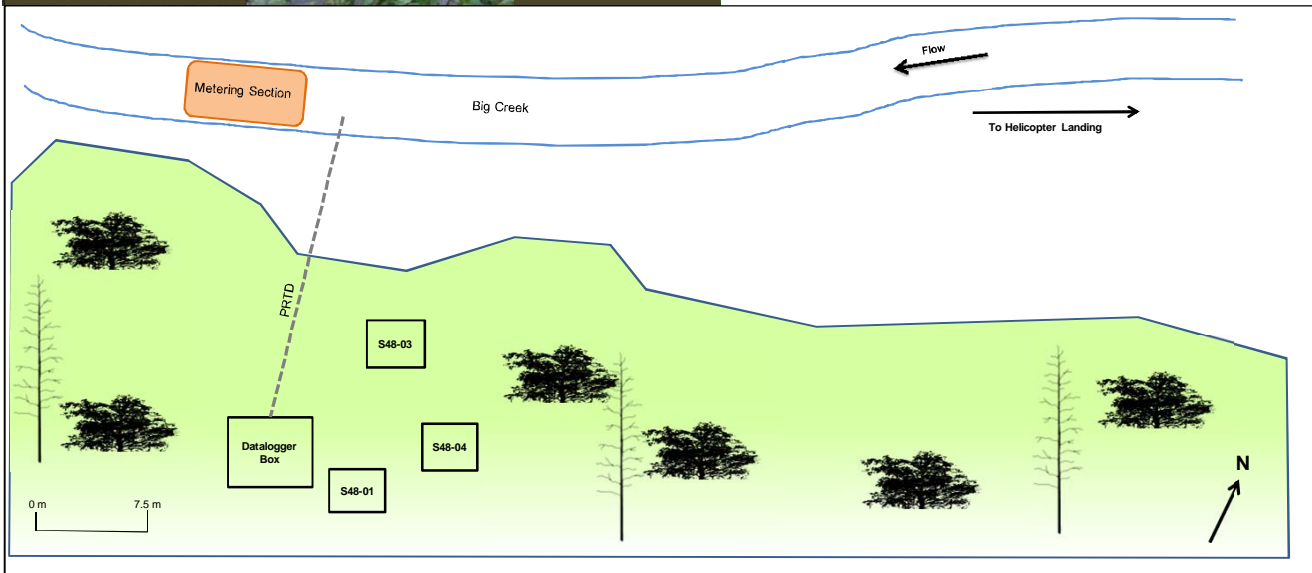
Benchmark Information

BM: RAMP S48-01
Elevation: 100.198 m
Basis: Assumed
Location: 2 m Southeast of station
Description: 3/4" Pipe

BM: RAMP S48-03
Elevation: 99.798 m
Basis: Level Survey from RAMP S48-01
Location: 6 m Northeast of station
Description: 3/4" Pipe

BM: RAMP S48-04
Elevation: 99.671 m
Basis: Level Survey from RAMP S48-01
Location: 6 m East of station
Description: 3/4" Pipe

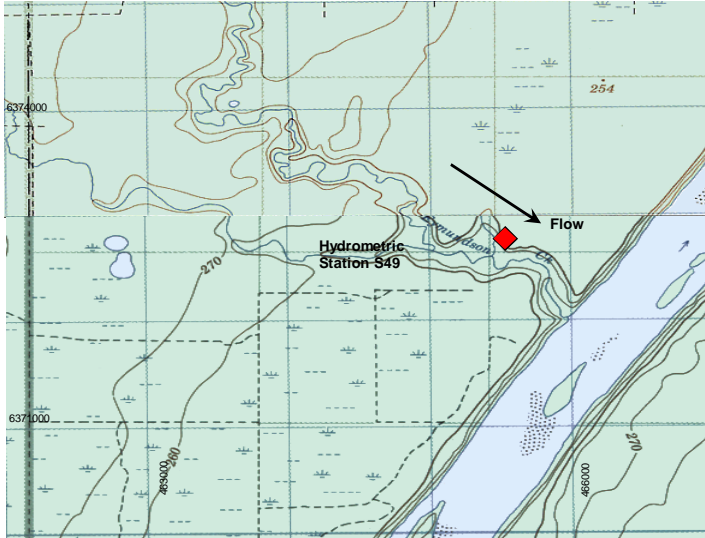
BM: RAMP S48-05
Elevation: 99.750 m
Basis: Level Survey from RAMP S48-04
Location: 8 m Southeast of station
Description: Lag bolt in tree



Revised March 22, 2016

Location and Purpose:

Established to monitor water level and discharge on Eymundson Creek near the mouth to establish baseline conditions prior to construction of the Pierre River Mine. Located 20 km North West of the Syncrude Aurora Mine.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 2011 to Present
Station Operation: Open water (April-October)
Access: Helicopter
Drainage Area: 243 km²
UTM Coordinates: 465524 E, 6372768 N (NAD83)
Lat/Long: 57°29'46"N, 111°34'30"W (NAD83)
NTS Map: 74E/12

Measurement Details

Channel: The channel has trapezoidal banks approximately 7 m wide. The substrate is mostly made of silt and sand. During the open water season the river can be waded except during periods of high water levels.
Control: The channel morphology is the control at this station.
Metering Section: The metering section is located near the station.

Benchmark Information

BM: RAMP S49-01
Elevation: 100.000 m
Basis: Assumed
Location: 6 m North of station
Description: 3/4" Pipe

BM: RAMP S49-03
Elevation: 99.935 m
Basis: Level Survey from RAMP S49-01
Location: 5 m NE of data logger
Description: 3/4" Pipe

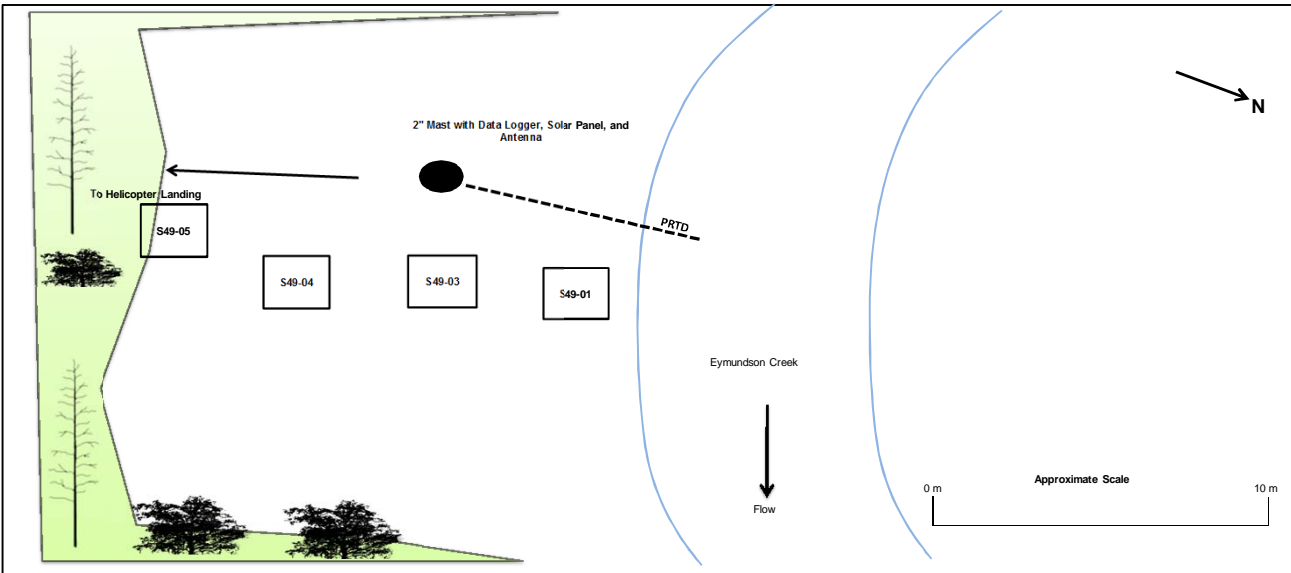
BM: RAMP S49-04
Elevation: 100.290 m
Basis: Level Survey from RAMP S49-01
Location: 7 m East of station
Description: 3/4" Pipe

BM: RAMP S49-05
Elevation: 100.392 m
Basis: Level Survey from RAMP S49-04
Location: 20 m South-Southeast of station
Description: Lag Bolt in Tree



Looking South West towards the station.

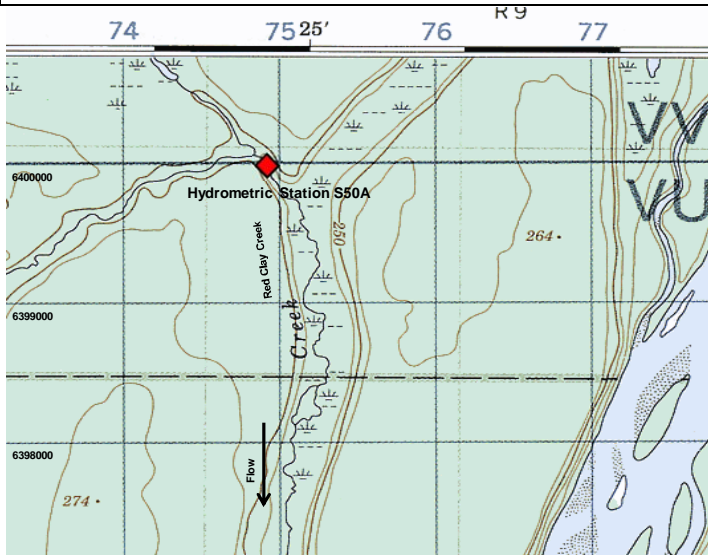
Looking upstream from near the station September, 2013



Revised March 22, 2016

Location and Purpose:

Established to monitor water level and discharge on Red Clay Creek near the mouth to establish baseline conditions prior to construction of the Pierre River Mine. The station was relocated (from 475701 E, 6395073 N) in April 2012 to avoid influence from beaver dams. Located 47 km North of the Syncrude Aurora mine development.



Map Grid Based on UTM NAD 27

Station Details

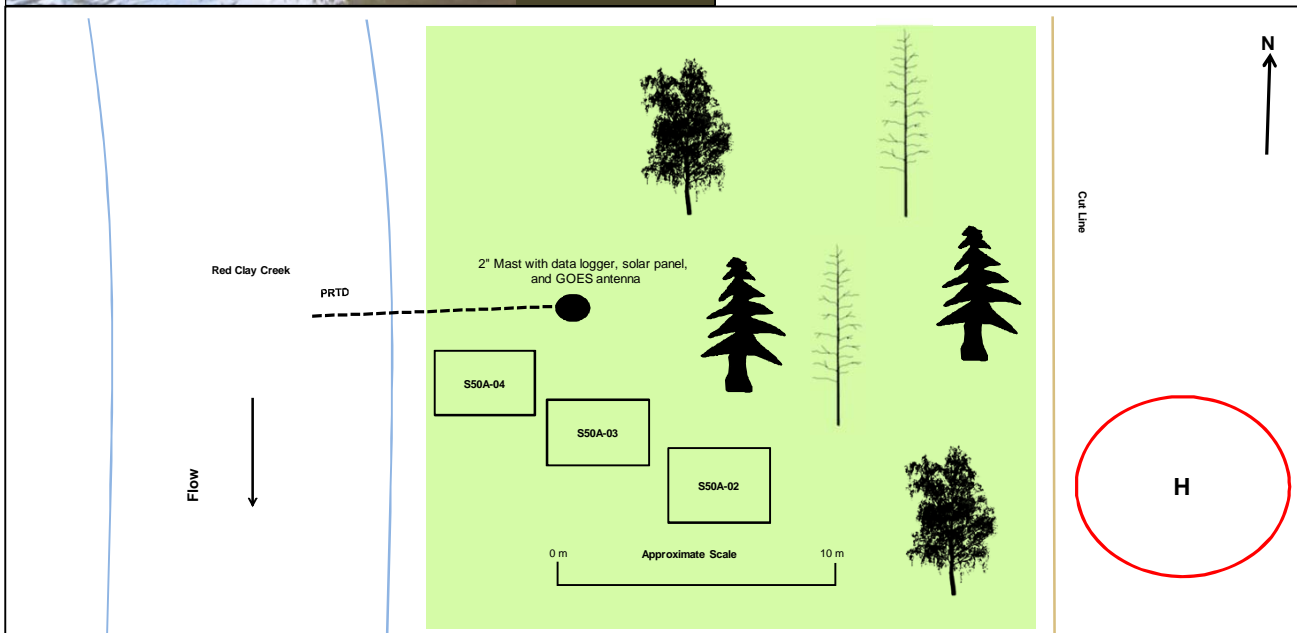
Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	May 2011 to Present
Station Operation:	Open water (April-October)
Access:	Helicopter
Drainage Area:	187 km ²
UTM Coordinates:	474881 E, 6400224 N (NAD83)
Lat/Long:	57°44'36"N, 111°25'16"W (NAD83)
NTS Map:	74E/11

Measurement Details

Channel	The channel is roughly 8 m wide and the dominant bed type is sand. The river at this site can be waded throughout the open water season.
Control	The channel morphology is the control for this site.
Metering Section	Measurements are conducted by wading across the straight reach of the river 10 m upstream of the PT.

Benchmark Information

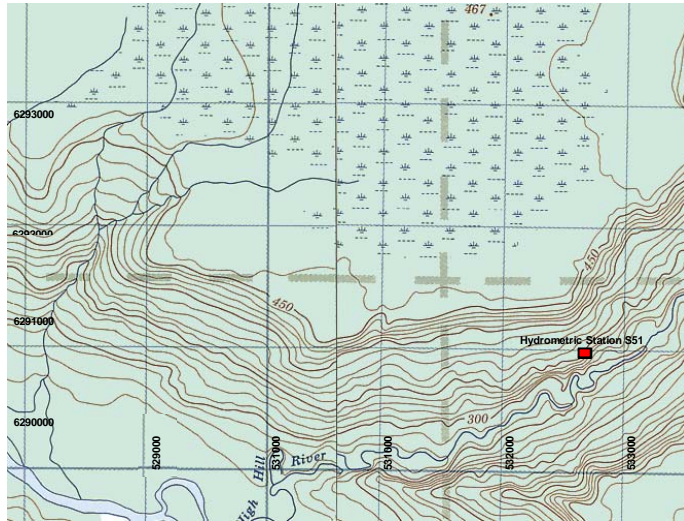
BM:	RAMP S50A-02
Elevation:	100.160 m
Basis:	Level Survey from RAMP S50A-01
Location:	8 m South of station
Description:	3/4" Pipe
BM:	RAMP S50A-03
Elevation:	99.392 m
Basis:	Level Survey from RAMP S50A-02
Location:	7 m South West of Logger
Description:	3/4" Pipe
BM:	RAMP S50A-04
Elevation:	99.208
Basis:	Level Survey from RAMP S50A-02
Location:	10 m South East of Logger
Description:	3/4" Pipe



Revised 02 March 2016

Location and Purpose:

Established to monitor discharge on High Hills River upstream of the confluence with the Clearwater River. The station was installed to act as an unaffected reference stream for the Alberta Oilsands Region. The monitoring station is located 5 km northeast of the Clearwater River confluence.



Map Grid Based on UTM NAD 27



Looking downstream at Station S51
High Hills River

Station Details

Variables Measured: Discharge, water level, water temperature

Telemetry: GOES-07CD901

Period of Record: May 2012 to Present

Station Operation: Year-round

Access: Helicopter

Drainage Area: 1,588 km²

UTM Coordinates: 533925 mE, 6291921 mN (NAD83)

Lat/Long: 56°45'42"N, 110°28'2"W (NAD83)

NTS Map: 74D/16

Measurement Details

Channel: The channel is roughly 19 m wide and the bed consists of cobbles and gravel.

Control: A small riffle exists 25 m downstream of the station before the channel drastically turns along a steep cutbank.

Metering Section: The metering section is located 40 m upstream of the station. The channel is shallow enough to be waded at low flow, but requires a kickboat at higher flows.

Benchmark Information

BM: RAMP S51-01

Elevation: 100.000 m

Basis: Assumed

Location: 3 m SE of data logger

Description: 3/4" Pipe

BM: RAMP S51-02

Elevation: 100.076 m

Basis: Level Survey from RAMP S51-01

Location: 3 m S of data logger

Description: 3/4" Pipe

BM: RAMP S51-03

Elevation: 100.484 m

Basis: Level Survey from RAMP S51-01

Location: 2 m W of data logger

Description: 3/4" Pipe

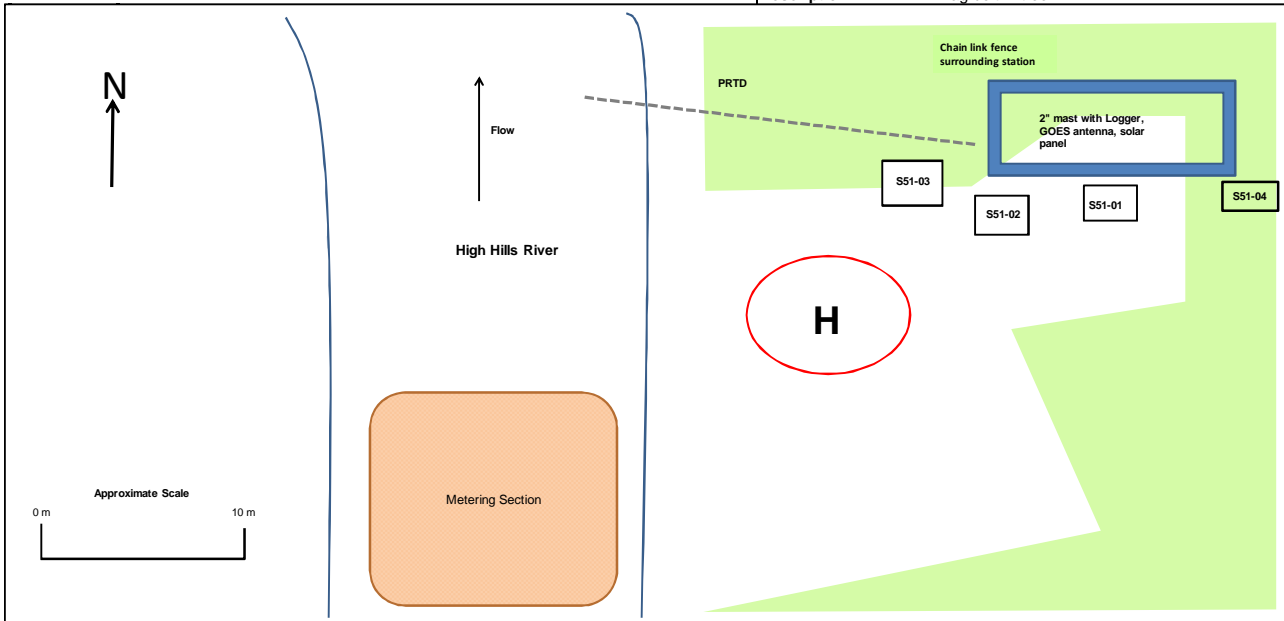
BM: RAMP S51-04

Elevation: 100.025 m

Basis: Level Survey from RAMP S51-01

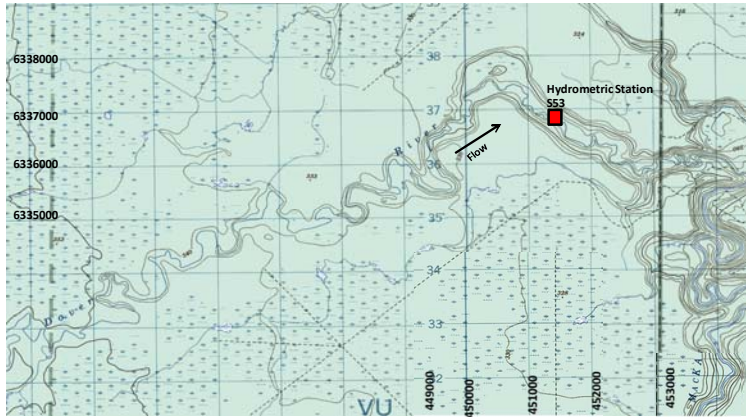
Location: 7 m W of data logger

Description: Lag bolt in tree



Location and Purpose:

Established to monitor discharge on the Dover River upstream of the MacKay River. Water Survey of Canada operated nearby hydrometric site 07DB002 on the Dover River between 1975-77 at 57°10'12"N, 111°47'38"W. The station is located 10 km West of the town Fort McKay.



Map Grid Based on UTM NAD 27



Looking West towards station. August, 2013

Looking downstream from near the station. September, 2013

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular with radio relay
Period of Record: May 2012 to Present
Station Operation: Year-round
Access: Helicopter
Drainage Area: 451453 mE, 6337015 mN (NAD83)
UTM Coordinates: 57°10'25"N, 111°48'10"W (NAD83)
Lat/Long: 74E/04
NTS Map:

Measurement Details

Channel: The channel is roughly 15 m wide and the dominant bed type is cobble and small boulder. The river at this site can be waded throughout most of the open water season.
Control: There is a downstream riffle that acts as the control at this station.
Metering Section: Measurements are conducted by wading across the straight reach of the river 5 m downstream from the station. A boat is required during high flow periods.

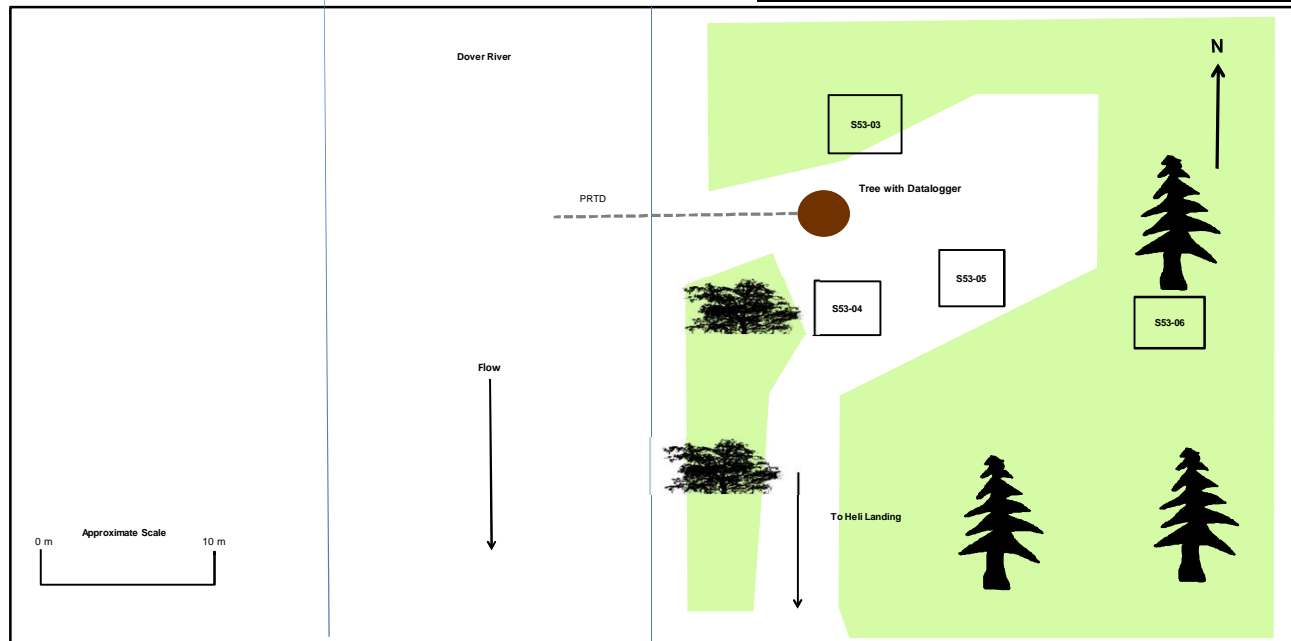
Benchmark Information

BM: RAMP S53-03
Elevation: 100.361 m
Basis: Assumed
Location: Level Survey from RAMP S53-02
Description: 3/4" Pipe

BM: RAMP S53-04
Elevation: 100.165 m
Basis: Level Survey from RAMP S53-03
Location: 2 m South East of station
Description: 3/4" Pipe

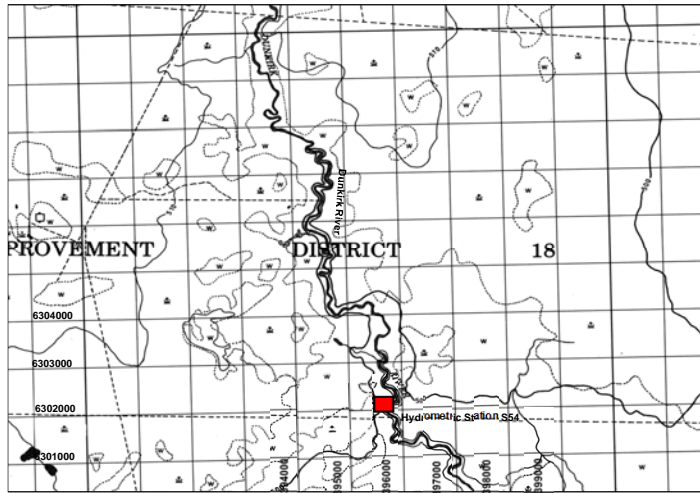
BM: RAMP S53-05
Elevation: 100.388 m
Basis: Level Survey from RAMP S53-03
Location: 5 m East of station
Description: 3/4" Pipe

BM: RAMP S53-06
Elevation: 100.229 m
Basis: Level Survey from RAMP S53-04
Location: Conifer Tree 9 m East of station
Description: Lag Bolt in Conifer Tree



Location and Purpose:

Established to monitor discharge on the Dunkirk River upstream of the confluence with the MacKay River. Water Survey of Canada operated a nearby hydrometric station 07DB003 (at 56°51'20" N, 112°42'40" W) between 1975 and 1979. The station is located approximately 80 km West of Fort McMurray.



Map Grid Based on UTM NAD 27



Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: GOES-07DB003
Period of Record: May 2012 to Present
Station Operation: Year-round
Access: Helicopter
Drainage Area: 1,570 km² (WSC)
UTM Coordinates: 395815 E, 6302066 N (NAD83)
Lat/Long: 56°51'2"N, 112°42'29"W (NAD83)
NTS Map: 84A/15

Measurement Details

Channel: The channel is roughly 25 m wide and the dominant bed type is sand and silt. The river at this site can be waded during periods of lower water levels of the open water season.

Control: The channel morphology acts as the control at this site.

Metering Section: Measurements are conducted by wading across the straight reach of the river near the station. A boat is required during high flow.

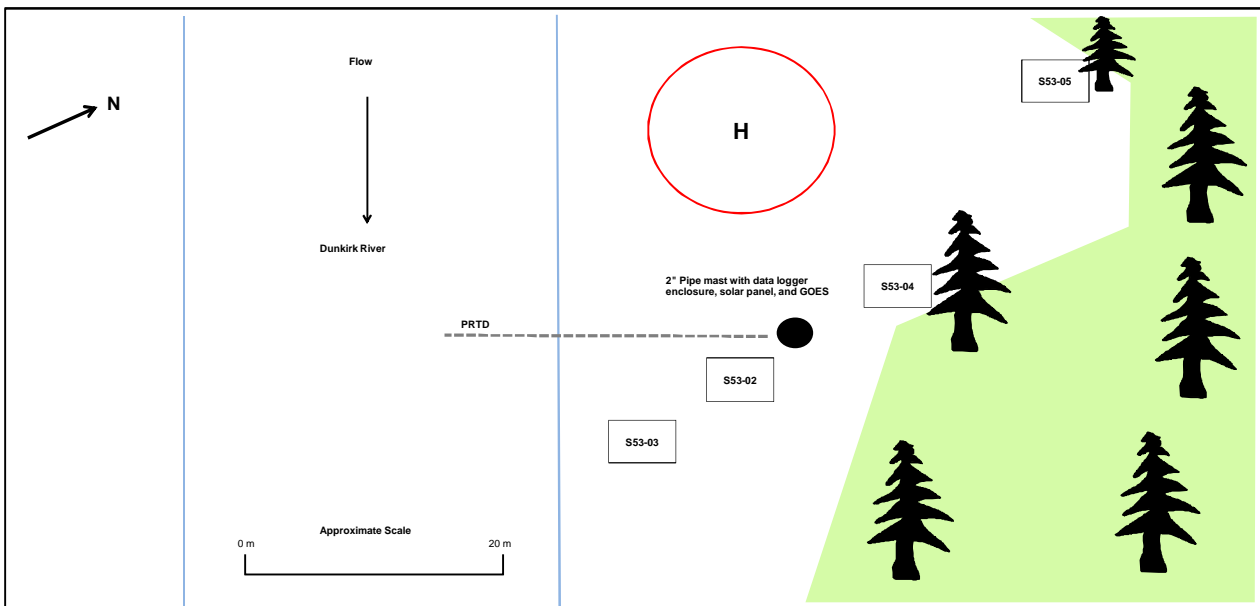
Benchmark Information

BM: RAMP S54-02
Elevation: 99.699 m
Basis: Level Survey from RAMP S54-01
Location: 2 m South East of station
Description: 3/4" Pipe

BM: RAMP S54-03
Elevation: 99.908 m
Basis: Level Survey from RAMP S54-01
Location: 6 m South East of station
Description: 3/4" Pipe

BM: RAMP S54-04
Elevation: 100.062 m
Basis: Level Survey from RAMP S54-01
Location: 5 m NW of logger
Description: Lag bolt

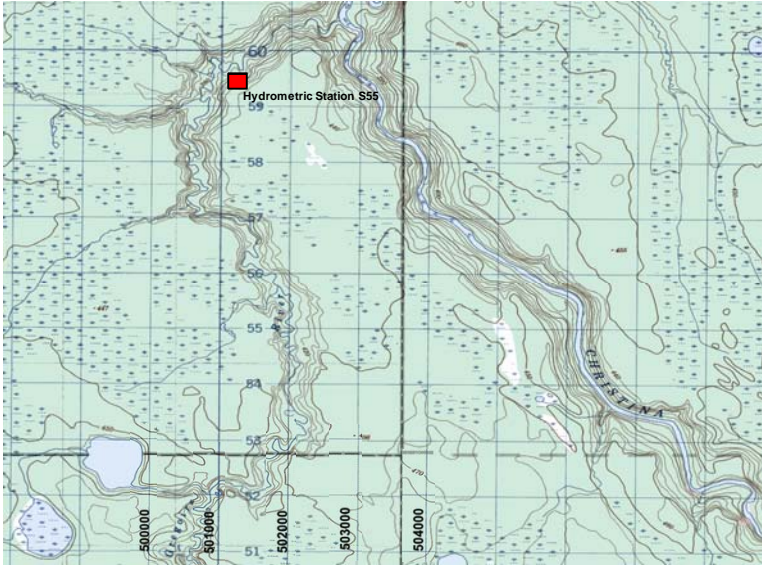
BM: RAMP S54-05
Elevation: 100.032 m
Basis: Level Survey from RAMP S54-02
Location: 25 m NW of logger
Description: Lag bolt in conifer



Revised 02 March, 2016

Location and Purpose:

Established to monitor discharge on the Gregoire River downstream of the Nexen Long Lake development. The station is located 1.7 km southeast of the Christina River confluence.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured: Discharge, water level, water temperature

Telemetry: Cellular with radio relay

Period of Record: May 2012 to Present

Station Operation: Year-round

Access: Helicopter

Drainage Area: 1,015 km²

UTM Coordinates: 510184 mE, 6259986 mN (NAD83)

Lat/Long: 56°29'3"N, 110°50'4"W (NAD83)

NTS Map: 74D/07

Measurement Details

Channel: The channel is roughly 14 m wide and the substrate is dominated by boulders and cobbles.

Control: A downstream riffle acts as channel control

Metering Section: The metering section is near the station where the channel can be waded, during higher flows a cableway approx. 100m downstream is used.

Benchmark Information

BM: RAMP S55-01
Elevation: 100.000 m
Basis: Assumed
Location: Bolt in Spruce tree
Description: 2" Bolt

BM: RAMP S55-05
Elevation: 99.811 m
Basis: Level Survey from RAMP S55-01
Location: 4 m N of data logger
Description: 3/4" Pipe with pink flagging

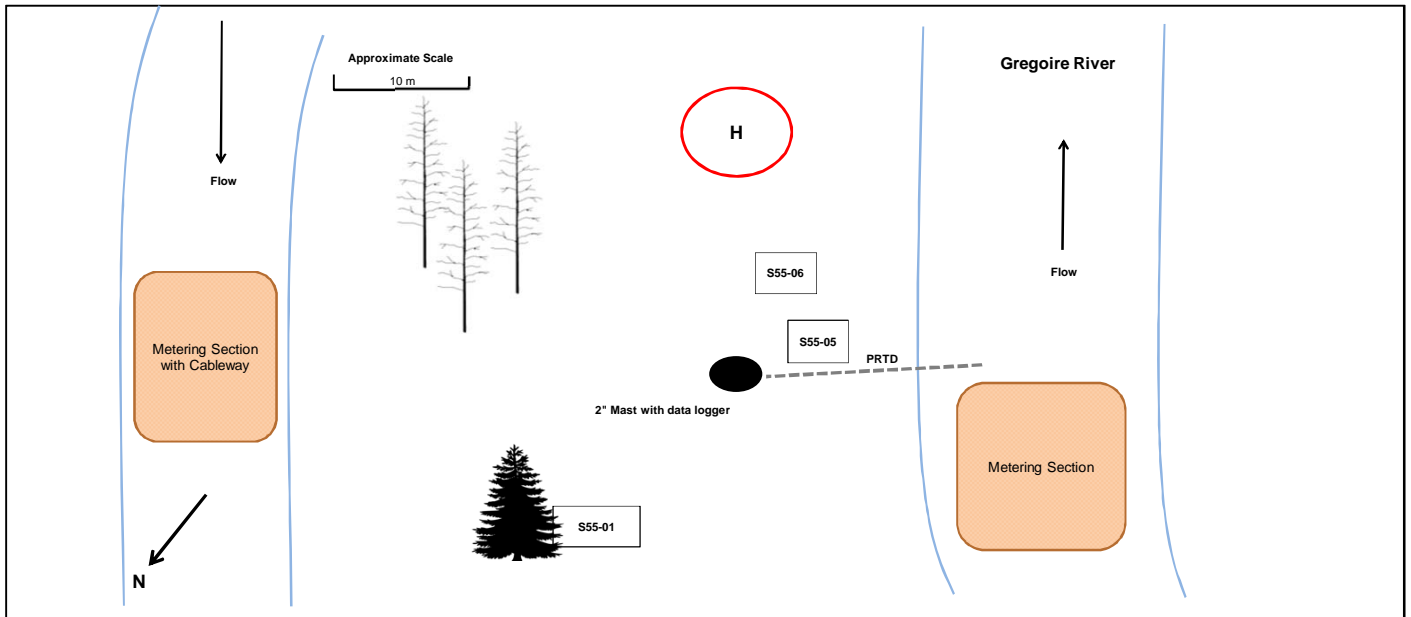
BM: RAMP S55-06
Elevation: 100.275 m
Basis: Level Survey from RAMP S55-01
Location: 2 m SE of data logger
Description: 3/4" Pipe with pink flagging



Looking across Gregoire River from the left bank at Station S55



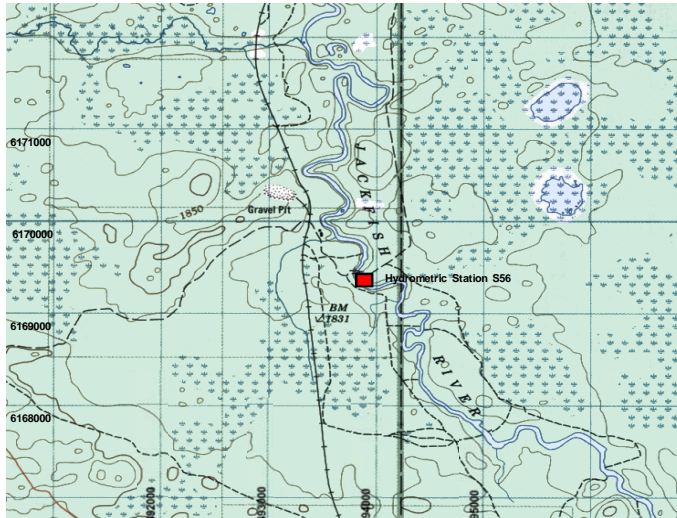
View of Station S55 and the helicopter landing area



Revised 02 March 2016

Location and Purpose:

Established to monitor discharge on the Jackfish River downstream of Christina Lake and upstream of the Christina River. The station is located 3.4 km NW of the town of Conklin, 100 m downstream of the Jackfish River bridge on Hwy 881. The Water Survey of Canada operated hydrometric station 07CE005 at this location between 1982 and 1995.



Map Grid Based on UTM NAD 27



Looking cross-stream at Jackfish River from the right bank at monitoring station S56

Station Details

Variables Measured: Discharge, water level, water temperature

Telemetry: Cellular

Period of Record: May 2012 to Present

Station Operation: Year-round

Access: 2WD road via Hwy 881

Drainage Area: 1,290 km² (WSC)

UTM Coordinates: 493741 mE, 6169693 mN (NAD83)

Lat/Long: 55°40'22"N, 111° 5'58"W (NAD83)

NTS Map: 73M/11

Benchmark Information

Channel The channel is roughly 22 m across, the bed is dominated by gravel with some boulders found throughout.

Control The channel morphology serves as a control for this station location.

Metering Section The metering section is located near the station and can be crossed by wading during low flows, a boat is required during high flow

Benchmark Information

BM: RAMP S56-01

Elevation: 100.000 m

Basis: Assumed

Location: 3 m SE of data logger

Description: T-post (damaged)

BM: RAMP S56-02

Elevation: 99.967 m

Basis: Level Survey from RAMP S56-01

Location: 2 m E of data logger

Description: 3/4" Pipe

BM: RAMP S56-03

Elevation: 100.051 m

Basis: Level Survey from RAMP S56-01

Location: 4 m S of data logger

Description: 3/4" Pipe

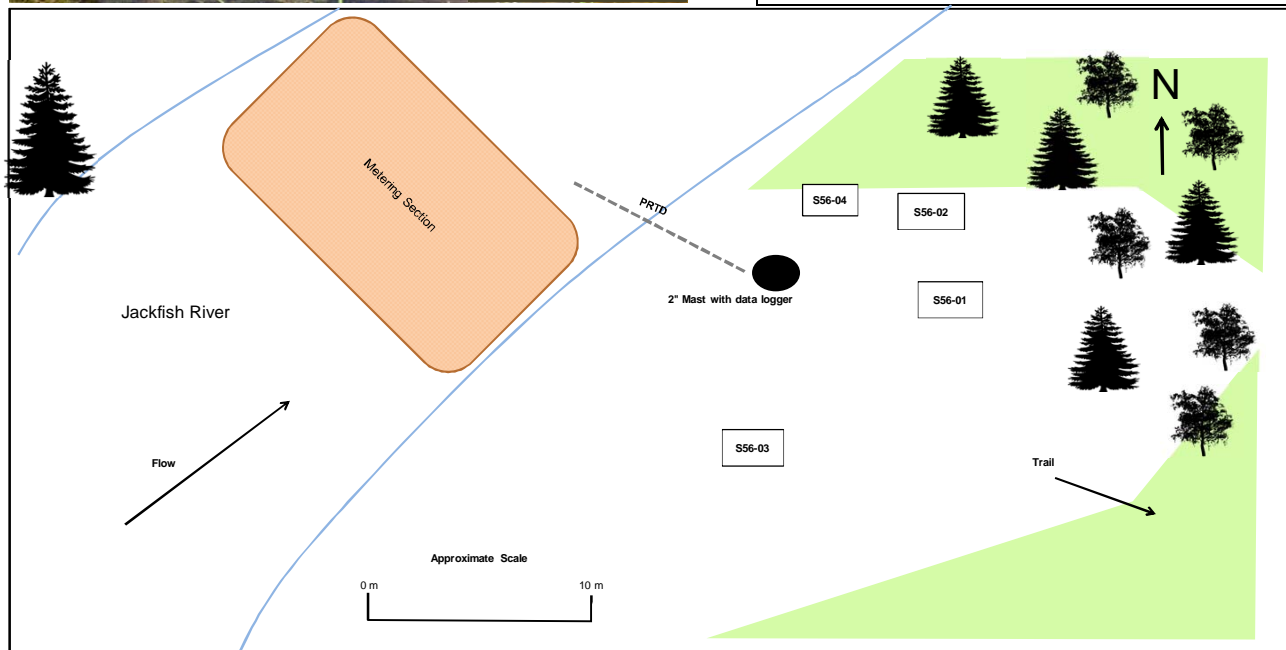
BM: RAMP S56-04

Elevation: 100.056 m

Basis: Level Survey from RAMP S56-01

Location: 3 m NW of data logger

Description: 3/4" Pipe



Revised 02 March 2016

Location and Purpose:

Established to monitor discharge on Sunday Creek upstream of Christina Lake and downstream of both Devon and Cenovus. This station is located 1.6 km northeast of Cenovus Christina Lake main security gate and 13 km from Conklin.



Map Grid Based on UTM NAD 27



Looking upstream at Sunday Creek from the right bank at monitoring station S57

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 2012 to Present
Station Operation: Year-round
Access: 2WD road via Cenovus Christina Lake Mine
Drainage Area: 374 km²
UTM Coordinates: 506210 mE, 6158391 mN (NAD83)
Lat/Long: 55°34'17"N, 110°54'46"W (NAD83)
NTS Map: 73M/10

Measurement Details

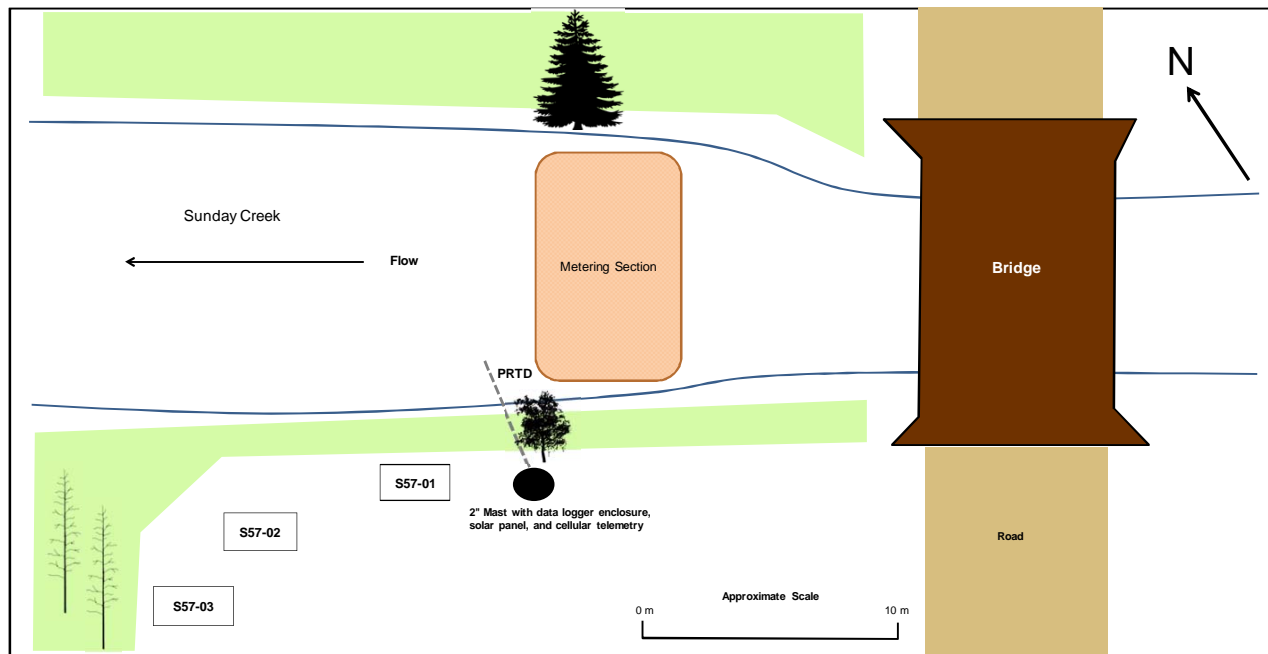
Channel: The channel is roughly 13 m wide with a dominant substrate of sand and silts.
Control: The channel morphology serves as a control for this station.
Metering Section: The metering section is located near the station. This straight reach can be easily crossed by wading.

Benchmark Information

BM: RAMP S57-01
Elevation: 100.000 m
Basis: Assumed
Location: 2 m West of data logger
Description: 3/4" Pipe

BM: RAMP S57-02
Elevation: 99.961 m
Basis: Level Survey from RAMP S57-01
Location: 5 m West of data logger
Description: 3/4" Pipe

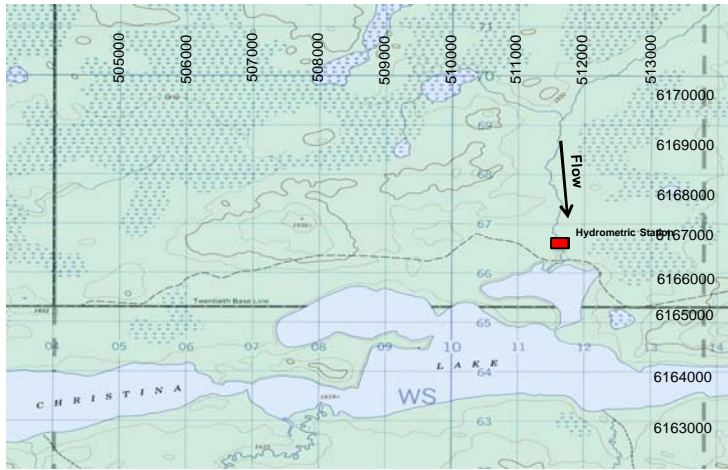
BM: RAMP S57-03
Elevation: 100.060 m
Basis: Level Survey from RAMP S57-01
Location: 8 m West of data logger
Description: 3/4" Pipe



Revised 02 March 2016

Location and Purpose:

Established to monitor discharge on Sawbones Creek upstream of Christina Lake and downstream of both MEG and Cenovus. This station is located 4.5 km northwest of the MEG Energy Airport, 20 m upstream of the Sawbones Creek bridge on the main MEG Energy access road.



Map Grid Based on UTM NAD 27



Looking downstream from near the station. 2013.

Station Details

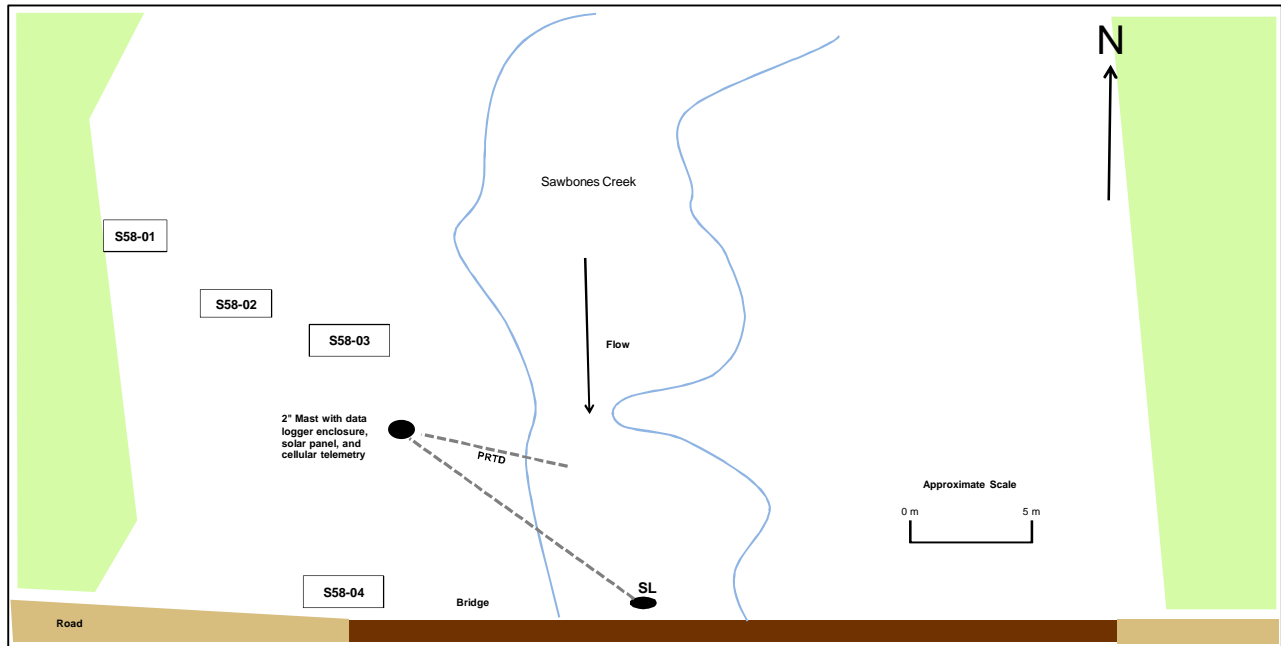
Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 2012 to Present
Station Operation: Open water (April-October)
Access: 2WD road via the MEG Energy Mine
Drainage Area: 126 km²
UTM Coordinates: 511412 mE, 6167165 mN (NAD83)
Lat/Long: 55°39'76"N, 110°49'16"W (NAD83)
NTS Map: 73M/10

Measurement Details

Channel: The channel is roughly 5 m across and is generally too deep to wade. The monitoring station is located just past a large bend, the substrate is made up of organics.
Control: The channel morphology serves as a control for this station.
Metering Section: The metering section is located under the bridge 20 m downstream of the station. This is a straight reach and retains defined banks throughout the entire open water season, measurements are done from a boat.

Benchmark Information

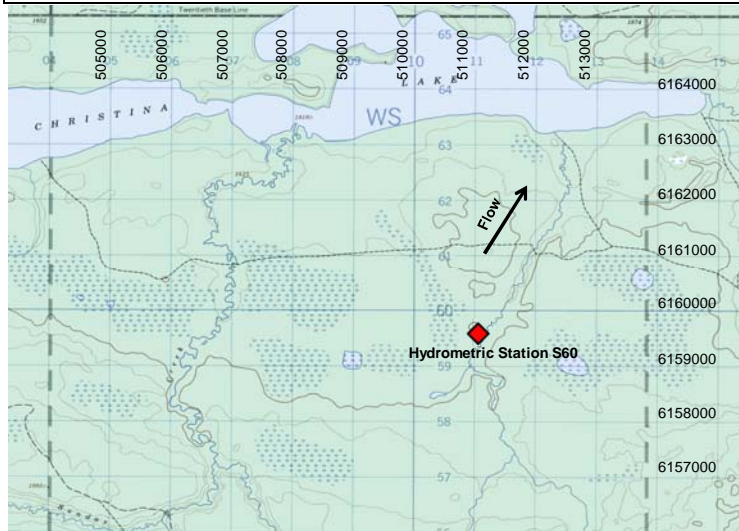
BM: RAMP S58-01
Elevation: 100.000 m
Basis: Assumed
Location: 6 m W of data logger
Description: 3/4" Pipe
BM: RAMP S58-02
Elevation: 99.929 m
Basis: Level Survey from RAMP S58-01
Location: 5 m SW of data logger
Description: 3/4" Pipe
BM: RAMP S58-03
Elevation: 99.905 m
Basis: Level Survey from RAMP S58-01
Location: 5 m S of data logger
Description: 3/4" Pipe
BM: RAMP S58-04
Elevation: 100.629 m
Basis: Level Survey from RAMP S58-01
Location: RB side of stream on bridge
Description: Corner of I-beam on bridge



Revised March 02, 2016

Location and Purpose:

Established to monitor discharge on Unnamed Creek upstream of Christina Lake. The purpose of this station is to help define regional characteristics and inputs into Christina Lake. The Station is located approximately 16 km east of Conklin.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	May 2013 to Present
Station Operation:	Year Round
Access:	2WD road via Cenovus Christina Lake Site
Drainage Area:	140 km ²
UTM Coordinates:	511145 E, 6159877 N (NAD83)
Lat/Long:	55°35'5" N, 110°49'24" W (NAD83)
NTS Map:	73M/10

Measurement Details

Channel	The channel is approximately 4 m across and too deep to wade most of the open water season. The substrate is predominantly organics with some rock under and around the bridge.
Control	The bridge and bridge rip rap acts as the control at this station.
Metering Section	The metering section is located 40 m upstream around the bend where the river straightens out. During higher flows a boat is required.

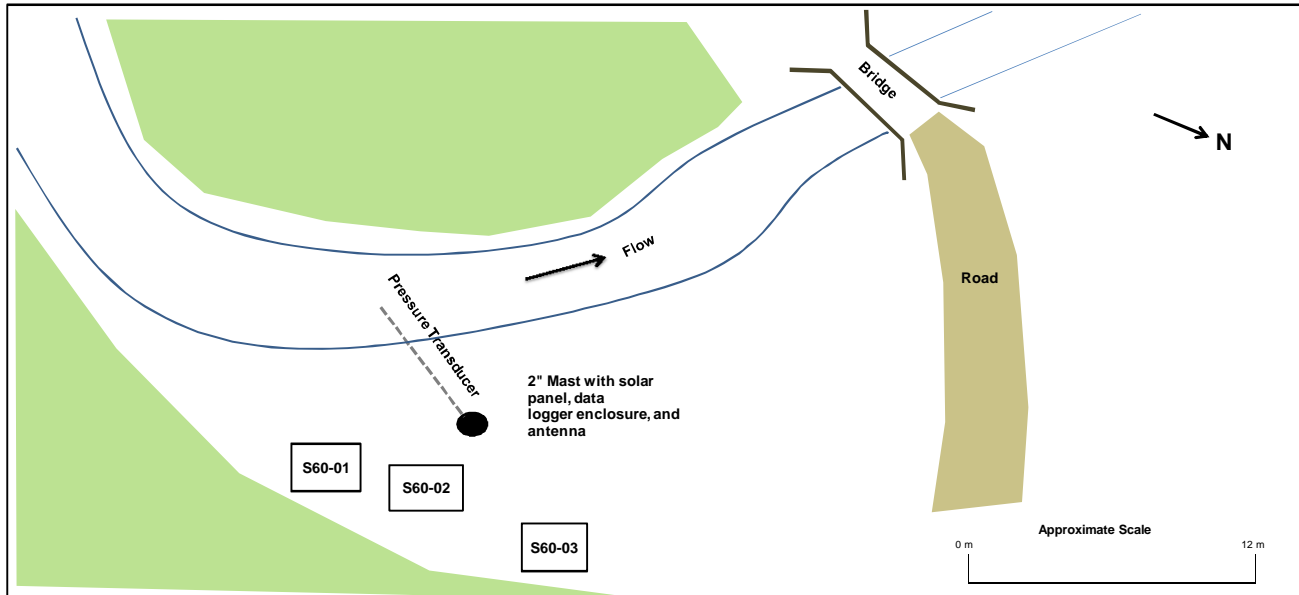


Equipment, benchmarks, and a cross-channel view of the flooded river in May, 2013. View from

Upstream view at station S60. 2013

Benchmark Information

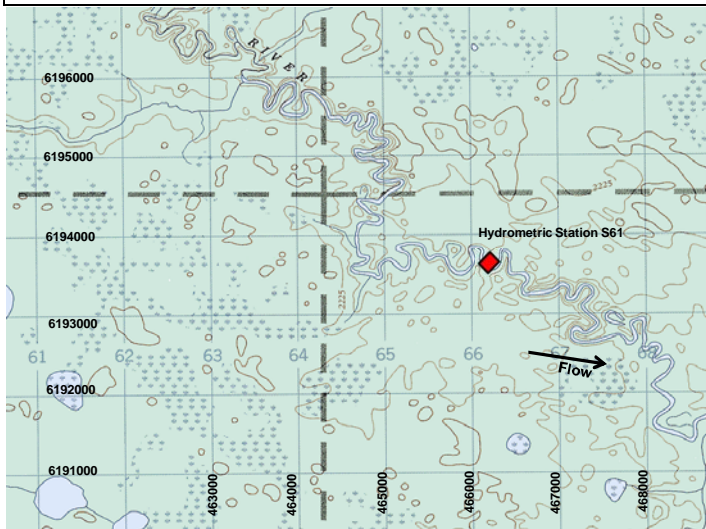
BM:	RAMP S60-01
Elevation:	100.000 m
Basis:	Assumed Local Datum
Location:	8 m NE of data logger
Description:	3/4" Pipe
BM:	RAMP S60-02
Elevation:	99.947 m
Basis:	Level Survey from RAMP S60-01
Location:	4 m East of data logger
Description:	3/4" Pipe
BM:	RAMP S60-03
Elevation:	99.798 m
Basis:	Level Survey from RAMP S60-01
Location:	6 m East of data logger
Description:	3/4" Pipe



Revised 02 March 2016

Location and Purpose:

Established in May 2013 to monitor discharge in the upper reaches of the Christina River upstream of Statoi Leismer and to act as a reference site for the Christina River. The station is located 40 km northwest of Conklin.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	May 2013 to Present
Station Operation:	Year Round
Access:	Helicopter
Drainage Area:	1.028 km ²
UTM Coordinates:	466037 E, 6193791 N (NAD83)
Lat/Long:	55°53'18" N, 111°32'35" W (NAD83)
NTS Map:	74M/13

Measurement Details

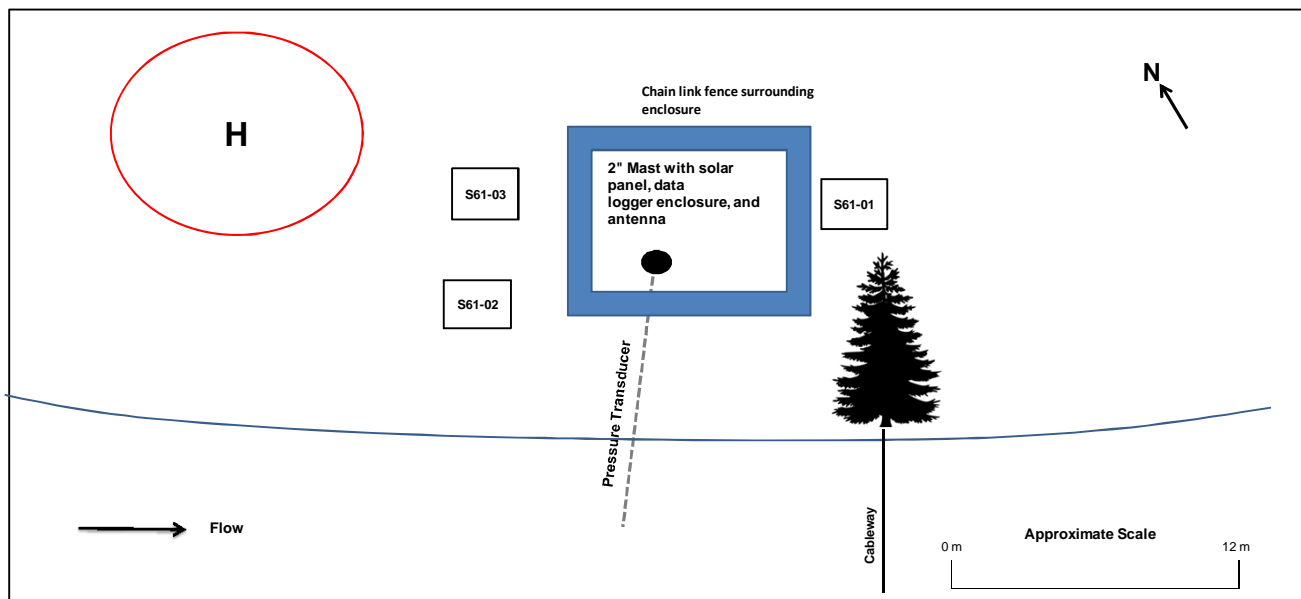
Channel	Trapezoidal edge and approximately 20 m across. The substrate is predominantly made up of silt and sand.
Control	The channel morphology acts as the control at this station.
Metering Section	The metering section is across from the station. During high water a cableway is used. During low flow periods the channel becomes shallow enough to wade.

Benchmark Information

BM:	RAMP S61-01
Elevation:	100.000 m
Basis:	Assumed Local Datum
Location:	6 m South of data logger
Description:	3/4" Pipe
BM:	RAMP S61-02
Elevation:	100.525 m
Basis:	Level Survey from RAMP S61-01
Location:	8 m SW of data logger
Description:	3/4" Pipe
BM:	RAMP S61-03
Elevation:	100.020 m
Basis:	Level Survey from RAMP S61-01
Location:	4 m NW of data logger
Description:	3/4" Pipe

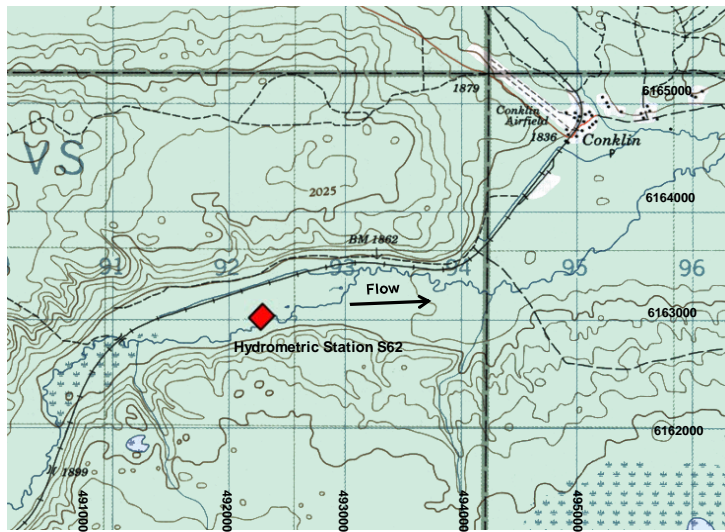


Upstream view at RAMP Hydrometric Station S61, Christina River above Statoi Leismer



Location and Purpose:

Established to monitor discharge on Birch Creek upstream of Christina Lake in order to increase understanding of regional characteristics and help define inputs into Christina Lake. The station is located 3 km southwest of Conklin.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	May 2013 to Present
Station Operation:	Year Round
Access:	2WD road via Hwy 881
Drainage Area:	197 km ²
UTM Coordinates:	492149 E, 6163182 N (NAD83)
Lat/Long:	55°36'53" N, 111°7'24" W (NAD83)
NTS Map:	74M/11

Measurement Details

Channel	The channel is approximately 7 m wide and it has trapezoidal edges. The substrate is made up of predominantly silt and sand.
Control	The downstream culvert acts as the control during higher flow. A beaver dam 5m US of the culvert acts as a control in lower flow
Metering Section	The metering section is located across from the station on a straight reach of the river. The banks are steep on either side and the flow is well confined.

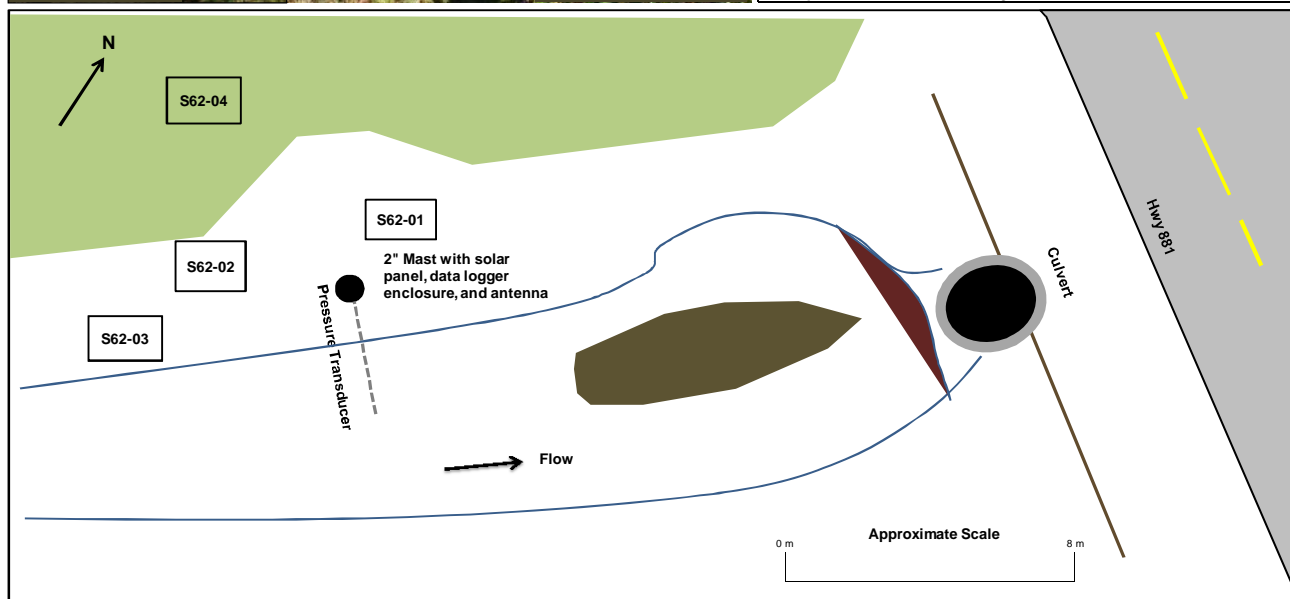


Looking North East towards station. September, 2013

Looking upstream from near the station. September, 2013

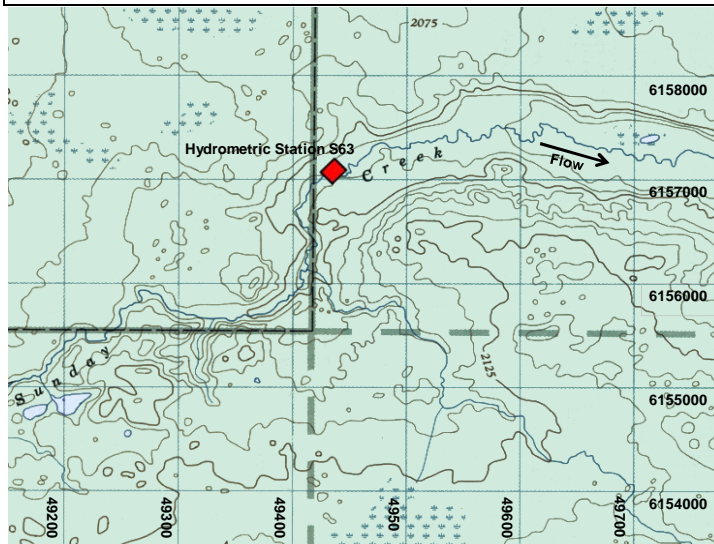
Benchmark Information

BM:	RAMP S62-01
Elevation:	100.000 m
Basis:	Assumed Local Datum
Location:	2 m North of data logger
Description:	3/4" Pipe
BM:	RAMP S62-02
Elevation:	99.949 m
Basis:	Level Survey from RAMP S62-01
Location:	5 m West of data logger
Description:	3/4" Pipe
BM:	RAMP S62-03
Elevation:	100.034 m
Basis:	Level Survey from RAMP S62-01
Location:	8 m West of data logger
Description:	3/4" Pipe
BM:	RAMP S62-04
Elevation:	100.101 m
Basis:	Level Survey from RAMP S62-01
Location:	NW of data logger
Description:	Lag bolt in tree



Location and Purpose:

Established to monitor discharge on Sunday Creek upstream of Cenovus and Devon oilsands developments. The station is located along Hwy 881 approximately 8 km south of Conklin.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured:	Discharge, water level, water temperature
Telemetry:	Cellular
Period of Record:	May 2013 to Present
Station Operation:	Year Round
Access:	2WD road via Hwy 881
Drainage Area:	135 km ²
UTM Coordinates:	494283 E, 6157255 N (NAD83)
Lat/Long:	55°33'41" N, 111°5'26" W (NAD83)
NTS Map:	74M/10

Measurement Details

Channel	The channel is approximately 6 m wide and it has trapezoidal edges. The substrate is predominantly sand and cobble. There has been beaver activity upstream of the station. This station can be waded for most of the open water season.
Control	The culvert acts as the control at this station
Metering Section	The metering section is located across from the station on a straight reach of the river. The banks are well defined.

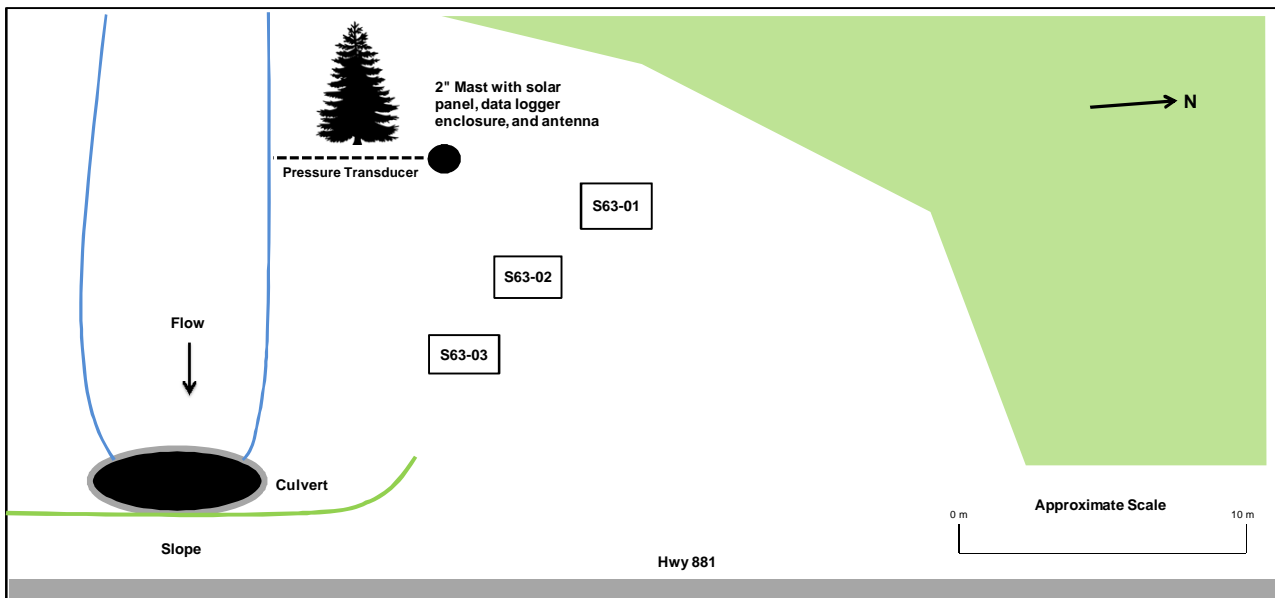
Benchmark Information

BM:	RAMP S63-01
Elevation:	100.000 m
Basis:	Assumed Local Datum
Location:	5 m NE of data logger
Description:	3/4" Pipe
BM:	RAMP S63-02
Elevation:	99.830 m
Basis:	Level Survey from RAMP S63-01
Location:	7 m East of data logger
Description:	3/4" Pipe
BM:	RAMP S63-03
Elevation:	99.459 m
Basis:	Level Survey from RAMP S63-01
Location:	10 m East of data logger
Description:	3/4" Pipe



Upstream view at Station S63

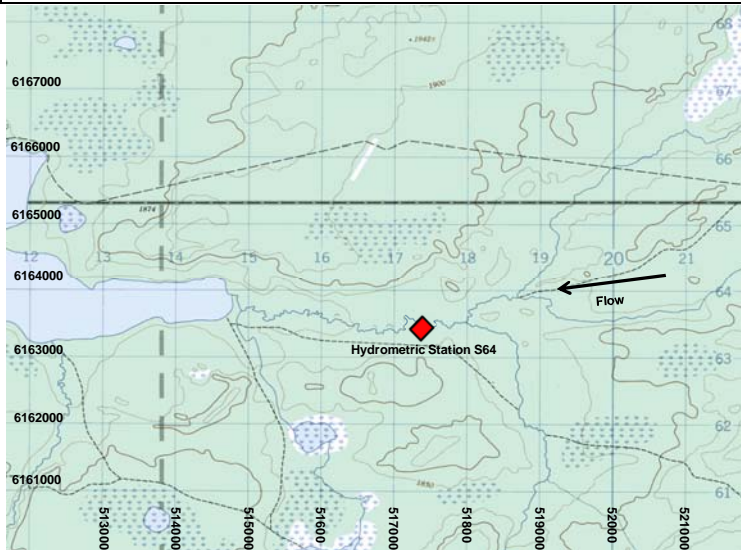
Downstream view at RAMP Hydrometric Station S63, Sunday Creek at Hwy 881



Revised 02 March, 2016

Location and Purpose:

Established to monitor discharge on Unnamed Creek East of Christina Lake, in order to help define regional characteristics and inputs into Christina Lake. The station is located approximately 3 km east of the eastern tip of Christina Lake.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 2013 to Present
Station Operation: Year Round
Access: 2WD road via MEG Energy Mine Access, Argo
Drainage Area: 171 km²
UTM Coordinates: 517644 E, 6163643 N (NAD83)
Lat/Long: 55°37'6" N, 110°43'11" W (NAD83)
NTS Map: 73M/10

Measurement Details

Channel: The channel is approximately 5 m across and too deep to wade most of the open water season. The substrate is predominately organics.
Control: The channel morphology acts as the downstream control at this station.
Metering Section: The metering section is located 40 m downstream around the bend where the river straightens out. Stream can be waded under lower flows.



Looking downstream at Unnamed Creek from station S64

Looking West at station S64, Unnamed Creek East of Christina Lake

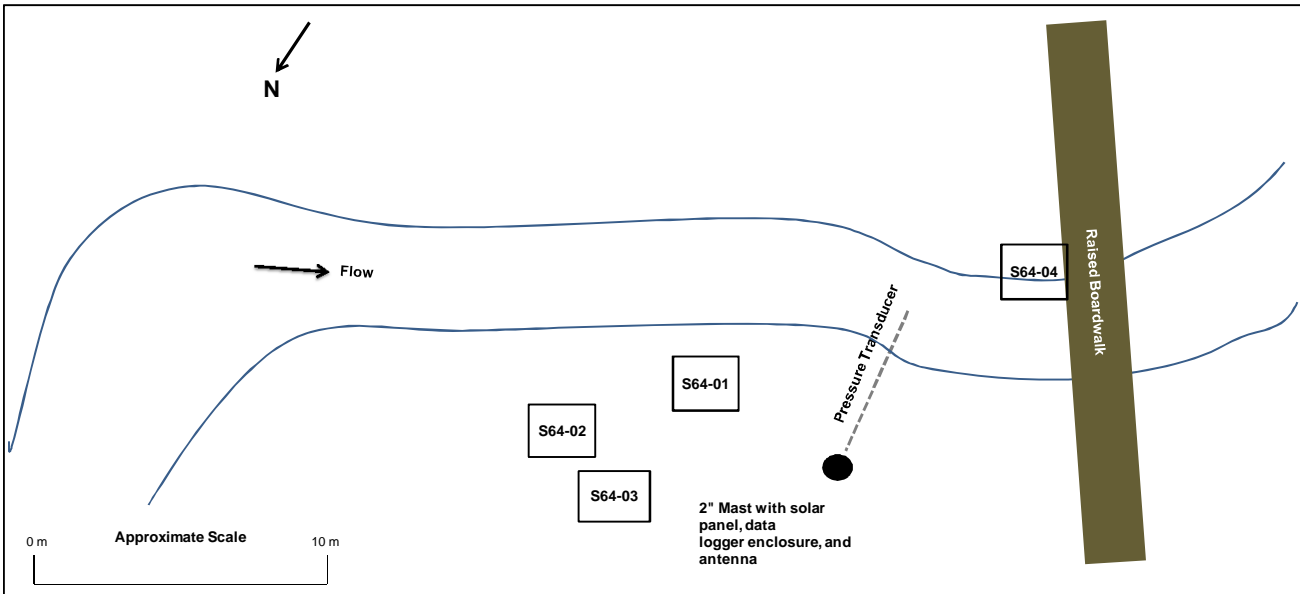
Benchmark Information

BM: RAMP S64-01
Elevation: 100.063 m
Basis: Level Survey from RAMP S64-03
Location: 6 m SE of data logger
Description: 3/4" Pipe

BM: RAMP S64-02
Elevation: 99.802 m
Basis: Level Survey from RAMP S64-03
Location: 11 m East of data logger
Description: 3/4" Pipe

BM: RAMP S64-03
Elevation: 99.849 m
Basis: Level Survey from RAMP S64-02
Location: 8 m East of data logger
Description: 3/4" Pipe

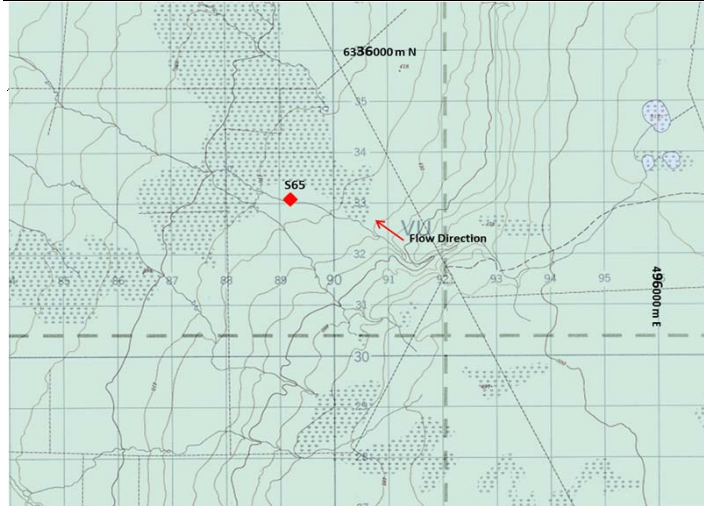
BM: RAMP S64-04
Elevation: 100.265 m
Basis: Level Survey from RAMP S64-03
Location: 15 m NW of data logger
Description: LB Edge of foot bridge piling



Revised March 22, 2016

Location and Purpose:

Established to monitor discharge on Green Stockings Creek in order to quantify upstream baseline inputs into the Muskeg Creek watershed. Station is located 25 km east of the Muskeg River Road and East Athabasca Highway intersection.



Map Grid Based on UTM NAD 27



Downstream view of North Green Stockings Creek at Station S65

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: Cellular
Period of Record: May 2014 to Present
Station Operation: Open water
Access: Truck access via East Athabasca Hwy
Drainage Area: 23 km²
UTM Coordinates: 489845 mE, 6333039 mN (NAD83)
Lat/Long: 57°8'25"N, 111°10'4"W (NAD83)
NTS Map: 74E/3

Measurement Details

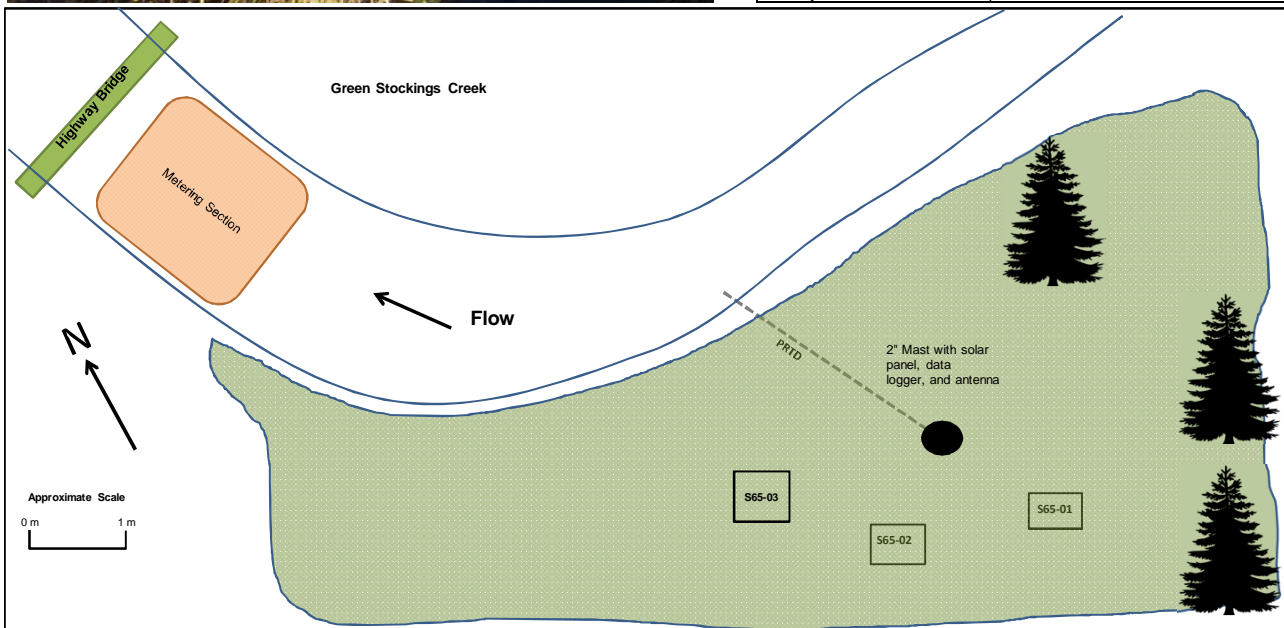
Channel: The channel is roughly 2 m wide and the bed consists of sand and gravel.
Control: A small riffle and a narrowing channel exist 50 m downstream of the station under the bridge
Metering Section: The metering section is located 30 m downstream of the station. The channel is shallow enough to be waded.

Benchmark Information

BM: RAMP S65-01
Elevation: 100.000 m
Basis: Assumed
Location: 5 m S of data logger
Description: 3/4" Pipe

BM: RAMP S65-02
Elevation: 99.732 m
Basis: Level Survey from RAMP S65-01
Location: 5 m SW of data logger
Description: 3/4" Pipe

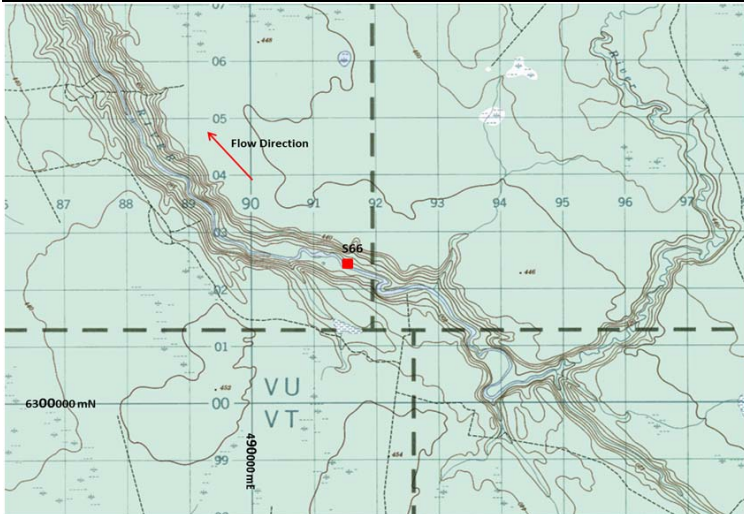
BM: RAMP S65-03
Elevation: 99.623 m
Basis: Level Survey from RAMP S65-01
Location: 6 m W of data logger
Description: 3/4" Pipe



Revised March 22, 2016

Location and Purpose:

Established to monitor discharge on the Steepbank River below the North Steepbank confluence. The purpose of this station is to gather baseline data, upstream of oil sands operations, and to provide information used in lower Steepbank River flow and sediment transport modeling. The station is located 25 km north of the Fort McMurray Airport.



Map Grid Based on UTM NAD 27

Station Details

Variables Measured: Discharge, water level, water temperature
Telemetry: GOES
Period of Record: May 2014 to Present
Station Operation: Year-round
Access: Helicopter
Drainage Area: 1,193 km²
UTM Coordinates: 491458 mE, 6302625 mN (NAD83)
Lat/Long: 56°51'47"N, 111°7'45"W (NAD83)
NTS Map: 74E/14

Measurement Details

Channel The channel is roughly 19m wide and the bed consists of boulders, cobbles, and gravel.

Control A riffle made up of cobble and boulders exists approximately 20 m downstream of the station and adjacent to the helicopter landing area.

Metering Section The metering section is located adjacent to the station. The channel is shallow enough to be waded during low flow, but a boat or use of the cableway is necessary in high flow.



Upstream view of the Steepbank River at Station S66

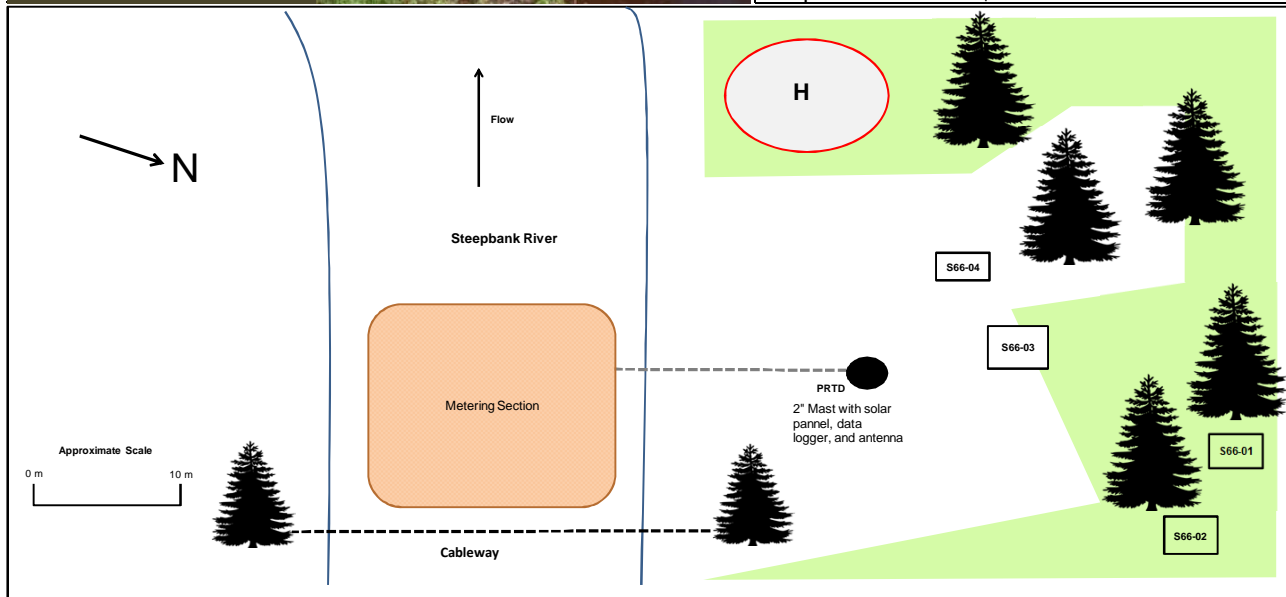
Benchmark Information

BM: RAMP S66-01
Elevation: 100.177 m
Basis: Assumed
Location: Tree 10 m E of data logger
Description: Lag bolt

BM: RAMP S66-02
Elevation: 100.064 m
Basis: Level Survey from RAMP S66-01
Location: Tree 12 m N of data logger
Description: Lag bolt

BM: RAMP S66-03
Elevation: 99.583 m
Basis: Level Survey from RAMP S66-01
Location: 5 m NW of data logger
Description: 3/4" Pipe

BM: RAMP S66-04
Elevation: 99.519 m
Basis: Level Survey from RAMP S66-01
Location: 7 m W of data logger
Description: 3/4" Pipe



C.7 STATION VISIT RECORDS AND MANUAL MEASUREMENTS

Records of the manual hydrometric measurements made during each station visit are provided below the station description sheets. The perceived quality and expected precision of each manual discharge measurement was assessed considering the hydraulic conditions, at the measurement section, at the time of the measurement.

Climate Station Measurement / Site Visit Record

Site: C1 - Aurora (Shell) Climate Station

UTM Location: 475734 E, 6343967 N

Site Visit Date:

January 19, 2015



Datalogger Details:	Before	After
Data Logger Clock:	15:01	-
Computer Clock:	15:02	-
Battery Voltage:	13.2	-
Data Logger Panel Temperature °C:	-11.4	-
Air Temperature °C:	-12.3	-
Relative Humidity (%):	90.5	-
Wind Speed (km/h):	8.7	-
Wind Direction (deg):	12	-
Solar Radiation (W/m ²):	5.330	-
Precipitation, Bucket Filtered (mm):	500.1	-
Precipitation, 15 min Filtered (mm):	0.0	-
Precipitation Gauge Tested:	No	
SR50 Snow Depth (cm):	22.7	-
Two Measured Snow Depths (cm):	24.0	27.0
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	13:00
End Time (MST):	13:15
Station Condition:	Snowy
Weather:	Overcast, calm

Notes:

Field Personnel:	TR, GG	Trip Date:	19-Jan-15
Data Entry Personnel:	TR	Date:	19-Jan-15
Data Check Personnel:	CJ	Date:	21-Jan-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C1 - Aurora (Shell) Climate Station

UTM Location: 475734 E, 6343967 N

Site Visit Date:

February 17, 2015



Datalogger Details:	Before	After
Data Logger Clock:	12:59	-
Computer Clock:	12:58	-
Battery Voltage:	14.3	-
Data Logger Panel Temperature °C:	-13.6	-
Air Temperature °C:	-13.8	-
Relative Humidity (%):	61.1	-
Wind Speed (km/h):	2.5	-
Wind Direction (deg):	48	-
Solar Radiation (W/m ²):	238.120	-
Precipitation, Bucket Filtered (mm):	0.0	-
Precipitation, 15 min Filtered (mm):	0.0	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	33.5	-
Two Measured Snow Depths (cm):	38.9	41.8
Snow Depth Sensor Tested:	No	
Desiccant:	Good	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	12:48
End Time (MST):	13:16
Station Condition:	Good
Weather:	Sunny

Notes:

- Replaced modem
- Network RSSI: -57

Field Personnel:	GG, TR	Trip Date:	17-Feb-15
Data Entry Personnel:	GG	Date:	17-Feb-15
Data Check Personnel:	SM	Date:	23-Mar-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C1 - Aurora (Shell) Climate Station

UTM Location: 475734 E, 6343967 N

Site Visit Date:

May 12, 2015



Datalogger Details:	Before	After
Data Logger Clock:	14:31	-
Computer Clock:	14:30	-
Battery Voltage:	13.3	-
Data Logger Panel Temperature °C:	26.8	-
Air Temperature °C:	23.9	-
Relative Humidity (%):	15.7	-
Wind Speed (km/h):	9.0	-
Wind Direction (deg):	104	-
Solar Radiation (W/m ²):	678.437	-
Precipitation, Bucket Filtered (mm):	590.59	591.10
Precipitation, 15 min Filtered (mm):	0.00	0.35
Precipitation Gauge Tested:	Yes	
Snow Depth (cm):	0.0	-
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	14:28
End Time (MST):	14:45
Station Condition:	Good
Weather:	Clear, light breeze

Notes:

Field Personnel:	SM, TR	Trip Date:	12-May-15
Data Entry Personnel:	SM	Date:	12-May-15
Data Check Personnel:	SM	Date:	5-Jun-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C1 - Aurora (Shell) Climate Station

UTM Location: 475734 E, 6343967 N

Site Visit Date:

August 11, 2015



Datalogger Details:	Before	After
Data Logger Clock:	16:29	-
Computer Clock:	16:27	-
Battery Voltage:	13.1	-
Data Logger Panel Temperature (°C):	28.9	-
Air Temperature (°C):	27.8	-
Relative Humidity (%):	29.4	-
Wind Speed (km/h):	18.8	-
Wind Direction (deg):	256	-
Solar Radiation (W/m ²):	458.140	-
Precipitation, Bucket Filtered (mm):	690.93	-
Precipitation, 15 min Filtered (mm):	0.00	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	45.7	-
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	26631	-

Station Visit Details:	
Start Time (MST):	16:20
End Time (MST):	16:30
Station Condition:	Good
Weather:	Partial cloud, calm, 25C

Notes:

Field Personnel:	TR, JC	Trip Date:	11-Aug-15
Data Entry Personnel:	TR	Date:	11-Aug-15
Data Check Personnel:	CJ	Date:	25-Aug-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C1 - Aurora (Shell) Climate Station

UTM Location: 475734 E, 6343967 N

Site Visit Date:

October 15, 2015



Datalogger Details:	Before	After
Data Logger Clock:	11:59	-
Computer Clock:	11:57	-
Battery Voltage:	13.8	-
Data Logger Panel Temperature °C:	7.1	-
Air Temperature °C:	7.3	-
Relative Humidity (%):	63.4	-
Wind Speed (km/h):	7.2	-
Wind Direction (deg):	235	-
Solar Radiation (W/m ²):	332.330	-
Precipitation, Bucket Filtered (mm):	755.28	-
Precipitation, 15 min Filtered (mm):	0.00	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	77.3	-
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	11:55
End Time (MST):	12:15
Station Condition:	Good
Weather:	Clear, calm

Notes:

- Emptied water from Pluvio precipitation gauge, added antifreeze mixture to prepare the instrument for winter
- Removed vegetation from area below the snow depth sensor, and removed spider webs from the underside of the instrument

Field Personnel:	TR, GG	Trip Date:	15-Oct-15
Data Entry Personnel:	TR	Date:	15-Oct-15
Data Check Personnel:	SM	Date:	6-Nov-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

February 2, 2015



Hatfield
CONSULTANTS

Datalogger Details:	Before	After
Data Logger Clock:	9:04	9:28
Computer Clock:	9:02	9:25
Battery Voltage:	12.4	12.6
Data Logger Panel Temperature °C:	-25.3	-
Air Temperature °C:	-23.7	-
Relative Humidity (%):	88.9	-
Barometric Pressure (kpa):	96.90	-
Wind Speed (km/h):	4.4	-
Wind Direction (deg):	235	-
Solar Radiation (W/m ²):	25.900	-
Precip_15_min (mm):	0.00	0.00
Precip_New_15 (mm):	0.00	136.09
Precipitation Gauge Tested:	Yes	
SR50 Snow Depth (cm):	25.5	-
Two Measured Snow Depths (cm):	-	-
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	8:55
End Time (MST):	9:44
Station Condition:	Good
Weather:	Clear

Notes:
 - Installed new Geonor precipitation bucket
 - Replaced batteries

Snow Core Data (Federal Snow Tube)	
No. of tube sections used (<i>min. 2</i>):	2
Driving Wrench Used:	No
Bulk Method Used?:	Yes

Field Personnel:	MP SM	Trip Date:	2-Feb-15
Data Entry Personnel:	MP SM	Date:	2-Feb-15
Data Check Personnel:	SM	Date:	7-Apr-15
Entered Digitally in the Field:	Yes		

Snow Core Data:	Snow Depth (cm)			Total Core Length (cm)	Empty Tube Weight	Tube Weight (inc. snow)	Snow Water Equivalent (cm)	Density (%)
	With Dirt Plug	Plug Length	Without Dirt plug					
Core #1	33.0	1.0	32.0	11.0	24.0	32.0	8.0	-
Core #2	29.0	1.0	28.0	15.0		-	-	-
Snow Core Average:			30.0				2.0	6.7%

Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

March 4, 2015



Datalogger Details:	Before	After
Data Logger Clock:	9:31	9:55
Computer Clock:	9:29	9:53
Battery Voltage:	8.9	14.7
Data Logger Panel Temperature °C:	-	-
Air Temperature °C:	-22.6	-23.7
Relative Humidity (%):	60.7	70.5
Barometric Pressure (kpa):	97.63	96.77
Wind Speed (km/h):	3.0	6.7
Wind Direction (deg):	152	173
Solar Radiation (W/m ²):	5.180	286.450
Precip_15_min (mm):	0.00	0.00
Precip_New_15 (mm):	0.00	186.56
Precipitation Gauge Tested:	No	
SR50 Snow Depth (cm):	41.9	42.8
Two Measured Snow Depths (cm):	42.5	-
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	9:25
End Time (MST):	9:50
Station Condition:	Snow covered
Weather:	Clear, calm

Notes:

- Installed new CS106 barometric sensor (S/N: K3330003)
- Uploaded new program to data logger to operate new sensor
- Replaced 2 batteries
- Added antifreeze to precipitation bucket

Field Personnel:	TR MP	Trip Date:	4-Mar-15
Data Entry Personnel:	TR	Date:	4-Mar-15
Data Check Personnel:	SM	Date:	7-Apr-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

April 27, 2015



Datalogger Details:	Before	After
Data Logger Clock:	8:32	8:59
Computer Clock:	8:30	8:56
Battery Voltage:	11.2	13.7
Data Logger Panel Temperature °C:	8.6	11.0
Air Temperature °C:	7.6	8.6
Relative Humidity (%):	35.8	35.1
Barometric Pressure (kpa):	96.80	96.81
Wind Speed (km/h):	4.8	7.7
Wind Direction (deg):	156	153
Solar Radiation (W/m ²)	460.712	557.712
Geonor Last 15 min	217.00	216.94
Precip_15 (mm):	0.00	0.00
Precipitation Gauge Tested:	No	
Snow Depth (cm):	4.8	1.7
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	8:29
End Time (MST):	9:05
Station Condition:	Good
Weather:	Clear, calm

Notes:

- Repaired solar panel by bypassing the built-in solar controller, and deploying a Sun saver within the enclosure
- Replaced batteries
- Uploaded program to reinstate modem

Field Personnel:	SM TR	Trip Date:	27-Apr-15
Data Entry Personnel:	SM	Date:	27-Apr-15
Data Check Personnel:	SM	Date:	5-Jun-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

June 17, 2015



Datalogger Details:	Before	After
Data Logger Clock:	8:08	10:19
Computer Clock:	8:06	10:16
Battery Voltage:	14.6	14.6
Data Logger Panel Temperature °C:	13.8	16.5
Air Temperature °C:	10.9	11.2
Relative Humidity (%):	44.7	44.4
Barometric Pressure (kpa):	97.25	97.24
Wind Speed (km/h):	12.2	6.8
Wind Direction (deg):	50	267
Solar Radiation (W/m ²):	436.034	357.959
Precip_min (mm):	256.80	258.28
Precip_15 (mm):	0.00	257.16
Precipitation Gauge Tested:	Yes	
Snow Depth (cm):	3.9	0.8
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	Yes	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	8:04
End Time (MST):	10:38
Station Condition:	Good
Weather:	Partly cloudy, breezy

Notes:

- Instruments were replaced for calibration. Serial numbers were recorded in field note book
- Emptied antifreeze from Geonor
- Trimmed vegetation and removed debris from compound
- Deleted old programs from CR1000 data logger to free up storage space

Field Personnel:	SM RM	Trip Date:	17-Jun-15
Data Entry Personnel:	SM	Date:	17-Jun-15
Data Check Personnel:	SM	Date:	1-Oct-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

August 25, 2015



Datalogger Details:	Before	After
Data Logger Clock:	13:45	-
Computer Clock:	13:42	-
Battery Voltage:	13.8	-
Data Logger Panel Temperature °C:	19.9	-
Air Temperature °C:	17.5	-
Relative Humidity (%):	67.2	-
Barometric Pressure (kpa):	96.98	-
Wind Speed (km/h):	6.7	-
Wind Direction (deg):	24	-
Solar Radiation (W/m ²):	234.800	-
Precip_min (mm):	49.67	-
Precip_15 (mm):	0.00	-
Precipitation Gauge Tested:	Yes	
Snow Depth (cm):	18.7	-
Measured Snow Depth at SR50 (cm):	0	
Snow Depth Sensor Tested:	No	
Desiccant:	Needs Attention	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	13:40
End Time (MST):	14:50
Station Condition:	Good
Weather:	Cloudy, calm

Notes:

- Secured Geonor wiring to ensure good connectivity
- Unthreaded transducer mount screw one turn to reduce noise caused by resonance in the instrument chassis

Field Personnel:	GG JC	Trip Date:	25-Aug-15
Data Entry Personnel:	GG	Date:	25-Aug-15
Data Check Personnel:	SM	Date:	1-Oct-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

February 17, 2015



Datalogger Details:	Before	After
Data Logger Clock:	12:53	-
Computer Clock:	12:52	-
Battery Voltage:	15.2	-
Data Logger Panel Temperature °C:	-	-
Air Temperature °C:	-17.4	-
Relative Humidity (%):	77.1	-
Barometric Pressure (kpa):	-	-
Wind Speed (km/h):	6.8	-
Wind Direction (deg):	146	-
Solar Radiation (W/m ²):	233.300	-
Precipitation, Bucket Filtered (mm):	630.15	-
Precipitation, 15 min Filtered (mm):	0.00	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	35.6	-
Measured Snow Depth at SR50 (cm):	38.3	
Snow Depth Sensor Tested:	No	
Desiccant:	Good	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	12:46
End Time (MST):	12:54
Station Condition:	Good
Weather:	Clear

Notes:

Field Personnel:	MP, SM	Trip Date:	17-Feb-15
Data Entry Personnel:	MP	Date:	17-Feb-15
Data Check Personnel:	SM	Date:	7-Apr-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

February 27, 2015



Datalogger Details:	Before	After
Data Logger Clock:	10:28	-
Computer Clock:	10:27	-
Battery Voltage:	15.1	-
Data Logger Panel Temperature °C:	-	-
Air Temperature °C:	-13.7	-
Relative Humidity (%):	78.7	-
Barometric Pressure (kpa):	98.74	98.71
Wind Speed (km/h):	1.3	-
Wind Direction (deg):	160	-
Solar Radiation (W/m ²):	218.172	-
Precipitation, Bucket Filtered (mm):	-	-
Precipitation, 15 min Filtered (mm):	0.00	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	47.9	-
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	10:15
End Time (MST):	10:50
Station Condition:	Good
Weather:	Overcast, calm

Notes:
 -Replaced barometric sensor with new CS106
 -Updated data logger program to operate new barometric sensor

Field Personnel:	SM, JB	Trip Date:	27-Feb-15
Data Entry Personnel:	SM	Date:	27-Feb-15
Data Check Personnel:	SM	Date:	7-Apr-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

April 22, 2015



Hatfield
CONSULTANTS

Datalogger Details:	Before	After
Data Logger Clock:	10:13	-
Computer Clock:	10:11	-
Battery Voltage:	14.6	-
Data Logger Panel Temperature °C:	8.9	-
Air Temperature °C:	8.7	-
Relative Humidity (%):	43.1	-
Barometric Pressure (kpa):	97.43	-
Wind Speed (km/h):	12.0	-
Wind Direction (deg):	118	-
Solar Radiation (W/m ²):	611.213	-
Precipitation, Bucket Filtered (mm):	658.56	-
accumulated Precip unfiltered (mm):	0.00	0.20
Precipitation Gauge Tested:	Yes	
Snow Depth (cm):	0.0	-
Measured Snow Depth at SR50 (cm):	0	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	10:09
End Time (MST):	10:23
Station Condition:	Good
Weather:	Clear, breezy

Notes:
No snow cover

Field Personnel:	GG SM	Trip Date:	22-Apr-15
Data Entry Personnel:	GG	Date:	22-Apr-15
Data Check Personnel:	SM	Date:	5-Jun-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

July 6, 2015



Datalogger Details:	Before	After
Data Logger Clock:	12:13	-
Computer Clock:	12:12	-
Battery Voltage:	14.1	-
Data Logger Panel Temperature °C:	25.2	-
Air Temperature °C:	23.9	-
Relative Humidity (%):	31.6	-
Barometric Pressure (kpa):	97.60	-
Wind Speed (km/h):	8.6	-
Wind Direction (deg):	220	-
Solar Radiation (W/m ²):	516.333	-
Precipitation, Bucket Filtered (mm):	723.07	-
Precipitation, 15 min Filtered (mm):	0.00	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	-0.6	-
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	12:00
End Time (MST):	12:25
Station Condition:	Good
Weather:	Mix of sun and cloud, breezy

Notes:

- Precipitation was recorded in past 48 hours
- Antifreeze needs to be emptied from precipitation gauge next visit

Field Personnel:	SM AJ	Trip Date:	6-Jul-15
Data Entry Personnel:	SM	Date:	6-Jul-15
Data Check Personnel:	SM	Date:	4-Aug-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

August 28, 2015



Datalogger Details:	Before	After
Data Logger Clock:	16:44	-
Computer Clock:	16:43	-
Battery Voltage:	14.1	-
Data Logger Panel Temperature °C:	29.5	-
Air Temperature °C:	25.4	-
Relative Humidity (%):	26.8	-
Barometric Pressure (kpa):	96.54	-
Wind Speed (km/h):	3.2	-
Wind Direction (deg):	272	-
Solar Radiation (W/m ²):	229.810	-
Precipitation, Bucket Filtered (mm):	0.00	-
Precipitation, 15 min Filtered (mm):	0.00	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	-0.6	-
Measured Snow Depth at SR50 (cm):	0	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	16:44
End Time (MST):	16:49
Station Condition:	Good
Weather:	Sunny, calm

Notes:

-Corroded battery terminal needs to be cleaned during the next field visit

Field Personnel:	GG JC	Trip Date:	28-Aug-15
Data Entry Personnel:	GG	Date:	28-Aug-15
Data Check Personnel:	SM	Date:	1-Oct-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

December 11, 2015



Hatfield
CONSULTANTS

Datalogger Details:	Before	After
Data Logger Clock:	9:39	-
Computer Clock:	9:37	-
Battery Voltage:	12.6	-
Data Logger Panel Temperature °C:	-1.5	-
Air Temperature °C:	-1.3	-
Relative Humidity (%):	86.8	-
Barometric Pressure (kpa):	96.92	-
Wind Speed (km/h):	10.4	-
Wind Direction (deg):	164	-
Solar Radiation (W/m ²):	8.177	-
Precipitation, Bucket Filtered (mm):	1021.77	-
Precipitation, 15 min Filtered (mm):	0.00	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	10.0	-
Measured Snow Depth at SR50 (cm):	10	
Snow Depth Sensor Tested:	Yes	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	9:35
End Time (MST):	9:49
Station Condition:	Good
Weather:	Overcast, breezy

Notes:
-Removed corrosion from battery terminals

Field Personnel:	SM JC	Trip Date:	11-Dec-15
Data Entry Personnel:	SM	Date:	11-Dec-15
Data Check Personnel:	SM	Date:	15-Dec-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

January 11, 2015



Hatfield
CONSULTANTS

Datalogger Details:	Before	After
Data Logger Clock:	12:02	
Computer Clock:	12:04	
Battery Voltage:	14.6	
Data Logger Panel Temperature °C:	-19.3	
Air Temperature °C:	-23.0	
Relative Humidity (%):	74.6	
Barometric Pressure (kpa):	99.29	
Wind Speed (km/h):	3.5	
Wind Direction (deg):	180	
Solar Radiation (W/m ²):	156.270	
Precipitation, Bucket Filtered (mm):	0.13	
Precipitation, 15 min Filtered (mm):	0.00	
Precipitation Gauge Tested:	Yes	
Snow Depth (cm):	21.0	30.0
Measured Snow Depth at SR50 (cm):	23.8	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):		

Station Visit Details:	
Start Time (MST):	11:55
End Time (MST):	12:10
Station Condition:	Good
Weather:	Clear

Notes:

Field Personnel:	GG DW	Trip Date:	11-Jan-15
Data Entry Personnel:	GG	Date:	11-Jan-15
Data Check Personnel:	SM	Date:	7-Apr-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

March 13, 2015



Datalogger Details:	Before	After
Data Logger Clock:	12:42	13:21
Computer Clock:	12:40	13:19
Battery Voltage:	13.9	13.5
Data Logger Panel Temperature °C:	-	-
Air Temperature °C:	12.2	13.9
Relative Humidity (%):	37.0	31.7
Barometric Pressure (kpa):	97.82	97.78
Wind Speed (km/h):	11.7	6.4
Wind Direction (deg):	168	258
Solar Radiation (W/m ²):	467.230	463.685
Precipitation, Bucket Filtered (mm):	497.57	497.57
Precipitation, 15 min Filtered (mm):	0.00	0.00
Precipitation Gauge Tested:	No	
Snow Depth (cm):	36.6	35.9
Measured Snow Depth at SR50 (cm):	36	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	12:39
End Time (MST):	13:30
Station Condition:	Good
Weather:	Clear, breezy

Notes:

- Replaced barometric pressure sensor with new CS106
- Updated data logger program to operate new barometric sensor

Snow Core Data (Federal Snow Tube)	
No. of tube sections used (<i>min. 2</i>):	2
Driving Wrench Used:	No
Bulk Method Used?:	No

Field Personnel:	SM, DW	Trip Date:	13-Mar-15
Data Entry Personnel:	SM	Date:	13-Mar-15
Data Check Personnel:	SM	Date:	7-Apr-15
Entered Digitally in the Field:	Yes		

Snow Core Data:	Snow Depth (cm)			Total Core Length (cm)	Empty Tube Weight	Tube Weight (inc. snow)	Snow Water Equivalent (cm)	Density (%)
	With Dirt Plug	Plug Length	Without Dirt plug					
Core #1	39.5	0.5	39.0	19.0	35.0	41.0	6.0	15.4%
Core #2	43.0	1.0	42.0	22.0		44.0	9.0	21.4%
Snow Core Average:			40.5				7.5	18.4%

Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

May 11, 2015



Hatfield
CONSULTANTS

Datalogger Details:	Before	After
Data Logger Clock:	14:17	-
Computer Clock:	14:17	-
Battery Voltage:	13.4	-
Data Logger Panel Temperature °C:	27.3	-
Air Temperature °C:	21.8	-
Relative Humidity (%):	16.8	-
Barometric Pressure (kpa):	98.40	-
Wind Speed (km/h):	9.1	-
Wind Direction (deg):	59	-
Solar Radiation (W/m ²):	667.200	-
Precipitation, Bucket Filtered (mm):	530.95	-
Precipitation, 15 min Filtered (mm):	0.00	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	-0.6	-
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	14:12
End Time (MST):	14:23
Station Condition:	Good
Weather:	Clear, calm, 20C

Notes:

Field Personnel:	TR, CJ	Trip Date:	11-May-15
Data Entry Personnel:	CJ	Date:	11-May-15
Data Check Personnel:	SM	Date:	5-Jun-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

August 18, 2015



Hatfield
CONSULTANTS

Datalogger Details:	Before	After
Data Logger Clock:	12:07	-
Computer Clock:	12:07	-
Battery Voltage:	13.6	-
Data Logger Panel Temperature °C:	-	-
Air Temperature °C:	18.6	-
Relative Humidity (%):	72.4	-
Barometric Pressure (kpa):	-	-
Wind Speed (km/h):	5.1	-
Wind Direction (deg):	161	-
Solar Radiation (W/m ²):	125.000	-
Precipitation, Bucket Filtered (mm):	166.41	-
Precipitation, 15 min Filtered (mm):	-	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	-	-
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	12:05
End Time (MST):	12:25
Station Condition:	Good
Weather:	-

Notes:
-Precipitation gauge was emptied

Field Personnel:	DW SG	Trip Date:	18-Aug-15
Data Entry Personnel:	DW	Date:	18-Aug-15
Data Check Personnel:	SM	Date:	1-Oct-15
Entered Digitally in the Field:	No		

Climate Station Measurement / Site Visit Record

Site: C5 - Surrmont Climate Station

UTM Location: 502542 E, 6230964 N

Site Visit Date:

February 3, 2015



Datalogger Details:	Before	After
Data Logger Clock:	16:19	
Computer Clock:	16:18	
Battery Voltage:	14.5	
Data Logger Panel Temperature °C:	-19.2	
Air Temperature °C:	-21.0	
Relative Humidity (%):	68.1	
Barometric Pressure (kpa):	95.66	
Wind Speed (km/h):	1.3	
Wind Direction (deg):	274	
Solar Radiation (W/m ²):	15.420	
Precipitation, Bucket Filtered (mm):	408.68	
Precipitation, 15 min Filtered (mm):	0.00	
Precipitation Gauge Tested:	Yes	
Snow Depth (cm):	14.9	
Measured Snow Depth at SR50 (cm):	8.2	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	

Station Visit Details:	
Start Time (MST):	16:10
End Time (MST):	16:32
Station Condition:	Good
Weather:	Clear

Notes:
 Measured snow depths: 17.8 cm and 5.5 cm

Field Personnel:	MP, GG	Trip Date:	3-Feb-15
Data Entry Personnel:	MP, GG	Date:	3-Feb-15
Data Check Personnel:	SM	Date:	7-Apr-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C5 - Surrmont Climate Station

UTM Location: 502542 E, 6230964 N

Site Visit Date:

March 23, 2015



Hatfield
CONSULTANTS

Datalogger Details:	Before	After
Data Logger Clock:	16:19	-
Computer Clock:	16:18	-
Battery Voltage:	14.7	-
Data Logger Panel Temperature °C:	-	-
Air Temperature °C:	2.2	-
Relative Humidity (%):	55.4	-
Barometric Pressure (kpa):	94.75	94.80
Wind Speed (km/h):	2.9	-
Wind Direction (deg):	66	-
Solar Radiation (W/m ²):	109.909	-
Precipitation, Bucket Filtered (mm):	-	-
Precipitation, 15 min Filtered (mm):	0.00	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	16.0	-
Measured Snow Depth at SR50 (cm):	5.0	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	16:10
End Time (MST):	17:35
Station Condition:	Good
Weather:	Cloudy

Notes:
 Manual snow depth measurements: 7 cm, and 3 cm
 Replaced barometric sensor with new CS106 (SN: K3310009)
 Updated data logger program to operate new barometric sensor

Field Personnel:	GG, NC	Trip Date:	23-Mar-15
Data Entry Personnel:	GG	Date:	23-Mar-15
Data Check Personnel:	SM	Date:	7-Apr-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C5 - Surrmont Climate Station

UTM Location: 502542 E, 6230964 N

Site Visit Date:

May 11, 2015



Datalogger Details:	Before	After
Data Logger Clock:	11:14	-
Computer Clock:	12:13	-
Battery Voltage:	14.4	-
Data Logger Panel Temperature °C:	18.4	-
Air Temperature °C:	15.7	-
Relative Humidity (%):	19.0	-
Barometric Pressure (kpa):	95.54	-
Wind Speed (km/h):	4.5	-
Wind Direction (deg):	11	-
Solar Radiation (W/m ²):	729.323	-
Precipitation, Bucket Filtered (mm):	241.44	-
Precipitation, 15 min Filtered (mm):	0.00	2.00
Precipitation Gauge Tested:	Yes	
Snow Depth (cm):	10.5	-
Measured Snow Depth at SR50 (cm):	0.0	
Snow Depth Sensor Tested:	Yes	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	11:11
End Time (MST):	11:30
Station Condition:	Good
Weather:	Sunny

Notes:
Emptied antifreeze from precipitation gauge

Field Personnel:	GG NC	Trip Date:	11-May-15
Data Entry Personnel:	GG	Date:	11-May-15
Data Check Personnel:	SM	Date:	5-Jun-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C5 - Surrmont Climate Station

UTM Location: 502542 E, 6230964 N

Site Visit Date:

July 31, 2015



Hatfield
CONSULTANTS

Datalogger Details:	Before	After
Data Logger Clock:	14:59	-
Computer Clock:	14:57	-
Battery Voltage:	14.1	-
Data Logger Panel Temperature °C:	24.9	-
Air Temperature °C:	23.3	-
Relative Humidity (%):	32.7	-
Barometric Pressure (kpa):	95.04	-
Wind Speed (km/h):	7.8	-
Wind Direction (deg):	294	-
Solar Radiation (W/m ²):	216.210	-
Precipitation, Bucket Filtered (mm):	0.00	-
Precipitation, 15 min Filtered (mm):	0.90	-
Precipitation Gauge Tested:	No	
Snow Depth (cm):	19.1	-
Measured Snow Depth at SR50 (cm):	-	
Snow Depth Sensor Tested:	No	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	14:51
End Time (MST):	15:03
Station Condition:	Good
Weather:	Cloudy, calm

Notes:

Field Personnel:	GG NC	Trip Date:	31-Jul-15
Data Entry Personnel:	GG	Date:	31-Jul-15
Data Check Personnel:	SM	Date:	4-Aug-15
Entered Digitally in the Field:	Yes		

Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station

UTM Location: 502542 E, 6230964 N

Site Visit Date:

December 4, 2015



Datalogger Details:	Before	After
Data Logger Clock:	14:37	15:54
Computer Clock:	14:36	15:53
Battery Voltage:	12.9	12.9
Data Logger Panel Temperature °C:	1.0	1.0
Air Temperature °C:	1.5	1.1
Relative Humidity (%):	65.7	68.3
Barometric Pressure (kpa):	93.27	93.30
Wind Speed (km/h):	3.7	6.1
Wind Direction (deg):	294	323
Solar Radiation (W/m ²):	21.130	10.388
Precipitation, Bucket Filtered (mm):	251.72	251.71
Precipitation, 15 min Filtered (mm):	0.00	0.00
Precipitation Gauge Tested:	No	
Snow Depth (cm):	16.6	14.4
Measured Snow Depth at SR50 (cm):	11.0	
Snow Depth Sensor Tested:	Yes	
Desiccant:	Replaced	
Logger# (if Δ):	-	-

Station Visit Details:	
Start Time (MST):	14:30
End Time (MST):	16:00
Station Condition:	Good
Weather:	Cloudy, light breeze, +1

Notes:
 Exchanged sensors for calibration:

Model	SN. installed	SN. removed
SR50A	4267	1758
SPLite2	114287 (sens. 72.2)	102349 (sens. 71.0)
RMV05103	20208	102890
HMP45C212	C2414	C2231

Field Personnel:	SM NC	Trip Date:	4-Dec-15
Data Entry Personnel:	NC	Date:	4-Dec-15
Data Check Personnel:	SM	Date:	15-Dec-15
Entered Digitally in the Field:	Yes		

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: January 13, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.778	-
Water (°C):	0.9	-
Air Temp (°C):	-12.4	-
RH (%):	82.3%	-
Precipitation (mm):	0.00	-
Battery (Main):	12.7	-
Datalogger Clock:	13:24	-
Laptop Clock:	13:25	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

Measurement Details:	
Start Time (MST):	13:18
End Time (MST):	13:45
Station Condition:	Good
Weather:	Overcast, -12C

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L1-01	1.373	296.238		294.865	294.865	Rod Beside Station
L1-03			1.567	294.671	294.664	3/4" Pipe 10m W of Station
L1-02			1.181	295.057	295.036	3/4" Pipe 20m W of station
Turn						
Temporary BM	1.558	296.219		294.661		-
Water Level:	Cut		1.569	294.650	Time WL Surveyed:	13:41
L1-02			1.162	295.057	295.036	3/4" Pipe 20m W of station
L1-03			1.547	294.672	294.664	3/4" Pipe 10m W of Station
L1-01			1.350	294.869	294.865	Rod Beside Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

Datalogger / Station Notes:

General Notes:

WL Survey Summary	Before	After	Field Personnel:	DW, MP	Trip Date:	13-Jan-2015
Average WL:	294.650	-	Data Entry Personnel:	DW, MP	Date:	13-Jan-2015
Closing Error:	-0.004	-	Data Check Personnel:	MP	Date:	26-Jan-2015
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.872	-				

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: February 5, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.795	-
Water (°C):	0.7	-
Air Temp (°C):	-21.7	-
RH (%):	73.8%	-
Precipitation (mm):	0.00	-
Battery (Main):	14.3	-
Datalogger Clock:	11:41	-
Laptop Clock:	11:41	-
Enclosure Dessicant	Good	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

Datalogger / Station Notes:

General Notes:

Measurement Details:	
Start Time (MST):	11:30
End Time (MST):	11:51
Station Condition:	Gate frozen
Weather:	Clear, light breeze, -25 C

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L1-01	1.268	296.133		294.865	294.865	Rod Beside Station
L1-03			1.464	294.669	294.664	3/4" Pipe 10m W of Station
L1-02			1.077	295.056	295.036	3/4" Pipe 20m W of station
Turn						
Temporary BM	1.440	296.122		294.682		-
Water Level:	Cut		1.456	294.666		Time WL Surveyed: 11:49
L1-02			1.064	295.058	295.036	3/4" Pipe 20m W of station
L1-03			1.451	294.671	294.664	3/4" Pipe 10m W of Station
L1-01			1.256	294.866	294.865	Rod Beside Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary		Before	After	Field Personnel:	
Average WL:	294.666	-		TR, CJ	Trip Date: 5-Feb-2015
Closing Error:	-0.001	-		Data Entry Personnel: CJ	Date: 5-Feb-2015
WL Check:	0.001	-		Data Check Personnel: DW	Date: 24-Feb-2015
Transducer Elevation	293.871	-		Entered Digitally in the Field: Yes	

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake
 UTM Location: 483430 E, 6371950 N

Site Visit Date: March 7, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.817	-
Water (°C):	0.4	-
Air Temp (°C):	2.1	-
RH (%):	61.1%	-
Precipitation (mm):	0.00	-
Battery (Main):	12.4	13.0
Datalogger Clock:	15:16	-
Laptop Clock:	15:16	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

Measurement Details:	
Start Time (MST):	15:12
End Time (MST):	15:54
Station Condition:	Good
Weather:	Sunny, 2C

Datalogger / Station Notes:
 - Change vent tube next time

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L1-01	1.449	296.314		294.865	294.865	Rod Beside Station
L1-02			1.257	295.057	295.051	3/4" Pipe 20m W of station
L1-03			1.639	294.675	294.664	3/4" Pipe 10m W of Station
Water Level:						
Water Level:	Cut		1.626	294.688	Time WL Surveyed:	15:42
Temporary BM			1.613	294.701	0.000	-
Turn						
Temporary BM	1.592	296.293		294.701		-
Water Level:	Cut		1.603	294.690	Time WL Surveyed:	15:48
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level: Cut						
Water Level: Cut						
L1-03			1.617	294.676	294.664	3/4" Pipe 10m W of Station
L1-02			1.234	295.059	295.051	3/4" Pipe 20m W of station
L1-01			1.427	294.866	294.865	Rod Beside Station

WL Survey Summary	Before	After	Field Personnel:	GG, MP	Trip Date:	7-Mar-2015
Average WL:	294.689	-	Data Entry Personnel:	GG	Date:	7-Mar-2015
Closing Error:	-0.001	-	Data Check Personnel:	MP	Date:	23-Mar-2015
WL Check:	0.002	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.872	-				

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake
 UTM Location: 483430 E, 6371950 N

Site Visit Date: April 18, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.862	0.863
Water (°C):	7.7	7.7
Air Temp (°C):	12.2	11.68
RH (%):	32.8	32.4
Precipitation (mm):	0.00	0.00
Battery (Main):	10.4	13.1
Datalogger Clock:	13:27	14:04
Laptop Clock:	13:27	14:04
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

Datalogger / Station Notes:
 -Battery failing, new batteries installed.
 -May need new solar controller.

General Notes:

Measurement Details:	
Start Time (MST):	13:10
End Time (MST):	14:10
Station Condition:	Good
Weather:	Sunny, 10C

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L1-01	1.923	296.788		294.865	294.865	Rod Beside Station
L1-03			2.106	294.682	294.664	3/4" Pipe 10m W of Station
L1-02			1.730	295.058	295.051	3/4" Pipe 20m W of station
Water Level:						
Water Level:	Cut		2.045	294.743	Time WL Surveyed:	13:47
Temporary BM			2.191	294.597	0.000	-
Turn						
Temporary BM	2.172	296.769		294.597		-
Water Level:	Cut		2.024	294.745	Time WL Surveyed:	13:55
L1-02			1.709	295.060	295.051	3/4" Pipe 20m W of station
L1-03			2.087	294.682	294.664	3/4" Pipe 10m W of Station
L1-01			1.902	294.867	294.865	Rod Beside Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary		Before	After	Field Personnel:		GG, RM	Trip Date:	18-Apr-2015
Average WL:		294.744	-	Data Entry Personnel:	GG		Date:	18-Apr-2015
Closing Error:		-0.002	-	Data Check Personnel:	GG		Date:	28-May-2015
WL Check:		0.002	-	Entered Digitally in the Field:	Yes			
Transducer Elevation		293.882	-					

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: May 10, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.845	-
Water (°C):	9.2	-
Air Temp (°C):	10.7	-
RH (%):	54.1%	-
Precipitation (mm):	0.00	-
Battery (Main):	12.6	-
Datalogger Clock:	11:08	-
Laptop Clock:	11:08	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

Datalogger / Station Notes:
-Tripod moving by 3mm in soggy ground during survey.

General Notes:

Measurement Details:	
Start Time (MST):	11:00
End Time (MST):	11:25
Station Condition:	Station area flooded
Weather:	Clear, calm, 10 C

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L1-01	1.784	296.649		294.865	294.865	Rod Beside Station
L1-03			1.971	294.678	294.664	3/4" Pipe 10m W of Station
L1-02			1.600	295.049	295.051	3/4" Pipe 20m W of station
Water Level:	Cut	0.598	2.532	294.715	Time WL Surveyed:	11:16
L1-02			1.600	295.049	295.051	3/4" Pipe 20m W of station
Turn						
L1-02	1.583	296.632		295.049	295.051	3/4" Pipe 20m W of station
Water Level:	Cut	0.598	2.517	294.713	Time WL Surveyed:	11:18
L1-02			1.583	295.049	295.051	3/4" Pipe 20m W of station
L1-03			1.951	294.681	294.664	3/4" Pipe 10m W of Station
L1-01			1.767	294.865	294.865	Rod Beside Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	TR, CJ	Trip Date:	10-May-2015
Average WL:	294.714	-	Data Entry Personnel:	CJ	Date:	10-May-2015
Closing Error:	0.000	-	Data Check Personnel:	GG	Date:	28-May-2015
WL Check:	0.002	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.869	-				

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake
 UTM Location: 483430 E, 6371950 N

Site Visit Date: June 14, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.730	
Water (°C):	18.9	
Air Temp (°C):	17.1	
RH (%):	36.3%	
Precipitation (mm):	0.00	
Battery (Main):	11.5	14.1
Datalogger Clock:	12:29	
Laptop Clock:	12:28	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

Measurement Details:	
Start Time (MST):	12:23
End Time (MST):	13:08
Station Condition:	Good
Weather:	Sunny, windy, 20c

Datalogger / Station Notes:

- Solar panel output: 18V
- Switched out solar controller
- 1 battery was corroded. Replaced both batteries
- Batt: 13.19V after new batteries installed, 14.1V after survey

General Notes:

- Emptied precipitation gauge

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
L1-01	1.698	296.563		294.865	294.865	Rod Beside Station
L1-03			1.882	294.681	294.664	3/4" Pipe 10m W of Station
L1-02			1.512	295.051	295.051	3/4" Pipe 20m W of station
Water Level:	Cut	0.342	2.292	294.613	Time WL Surveyed:	12:58
Temporary BM			2.292	294.271	0.000	-
Turn						
Temporary BM	2.316	296.587		294.271		-
Water Level:	Cut	0.342	2.316	294.613	Time WL Surveyed:	13:02
L1-02			1.534	295.053	295.051	3/4" Pipe 20m W of station
L1-03			1.903	294.684	294.664	3/4" Pipe 10m W of Station
L1-01			1.719	294.868	294.865	Rod Beside Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	GG, MK	Trip Date:	14-Jun-2015
Average WL:	294.613	-	Data Entry Personnel:	GG	Date:	14-Jun-2015
Closing Error:	-0.003	-	Data Check Personnel:	DW	Date:	1-Sep-2015
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.883	-				

Level Survey Equipment:	
Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: August 17, 2015



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.597	
Water (°C):	20.0	
Air Temp (°C):	22.8	
RH (%):	45.3%	
Precipitation (mm):	66.84	
Battery (Main):	14.0	
Datalogger Clock:	13:14	
Laptop Clock:	13:14	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	9631	
PT# (if Δ):	-	
Vent Tube Dessicant	Replaced	

Datalogger / Station Notes:

General Notes:

<u>Measurement Details:</u>	
Start Time (MST):	13:10
End Time (MST):	13:40
Station Condition:	Good
Weather:	Sunny, 27C

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L1-01	1.670	296.535		294.865	294.865	Rod Beside Station
L1-03			1.856	294.679	294.664	3/4" Pipe 10m W of Station
L1-02			1.487	295.048	295.051	3/4" Pipe 20m W of station
Water Level:	Cut	0.350	2.416	294.469	Time WL Surveyed:	13:30
			2.416	294.119		
Turn						
	2.405	296.524		294.119		
Water Level:	Cut	0.350	2.405	294.469	Time WL Surveyed:	13:30
L1-02			1.474	295.050	295.051	3/4" Pipe 20m W of station
L1-03			1.843	294.681	294.664	3/4" Pipe 10m W of Station
L1-01			1.659	294.865	294.865	Rod Beside Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

<u>WL Survey Summary</u>		Before	After	<u>Field Personnel:</u>		DW, SG	Trip Date:
Average WL:		294.469	-	Data Entry Personnel:	DW		17-Aug-2015
Closing Error:		0.000	-	Data Check Personnel:	DW		1-Sep-2015
WL Check:		0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation		293.872	-				

<u>Level Survey Equipment:</u>	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake
 UTM Location: 483430 E, 6371950 N

Site Visit Date: Sept. 12 2015



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.589	
Water (°C):	14.4	
Air Temp (°C):	15.4	
RH (%):	73.2%	
Precipitation (mm):	0.00	
Battery (Main):	12.9	
Datalogger Clock:	10:42	
Laptop Clock:	10:42	
Enclosure Dessoricant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessoricant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	10:41
End Time (MST):	11:20
Station Condition:	Good
Weather:	Overcast, breezy

Datalogger / Station Notes:
 -No visible flow at S35, see photos

General Notes:
 - WL fluctuating 8.0 cm - grade survey as fair
 - Installed BM 4; lag bolt in birch tree

<u>Level Survey:</u>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
L1-01	1.752	296.617		294.865	294.865	Rod Beside Station
L1-03			1.938	294.679	294.664	3/4" Pipe 10m W of Station
L1-02			1.569	295.048	295.051	3/4" Pipe 20m W of station
L1-04			1.390	295.227	295.227	Lag bolt on Birch tree 3m SE of station
Water Level:	Cut	0.365	2.523	294.459	Time WL Surveyed:	11:10
Temporary BM			2.523	294.094	0.000	-
Turn						
Temporary BM	2.513	296.607		294.094		-
Water Level:	Cut	0.365	2.513	294.459	Time WL Surveyed:	11:15
L1-04			1.380	295.227	295.227	Lag bolt on Birch tree 3m SE of station
L1-02			1.560	295.047	295.051	3/4" Pipe 20m W of station
L1-03			1.927	294.680	294.664	3/4" Pipe 10m W of Station
L1-01			1.743	294.864	294.865	Rod Beside Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	SM, TL	Trip Date:	12-Sep-2015
Average WL:	294.459	-	Data Entry Personnel:	SM	Date:	12-Sep-2015
Closing Error:	0.001	-	Data Check Personnel:	DW	Date:	28-Sep-2015
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.870	-				

<u>Level Survey Equipment:</u>	
Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: October 17, 2015



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.539	-
Water (°C):	6.2	-
Air Temp (°C):	8.6	-
RH (%):	54.2%	-
Precipitation (mm):	0.00	-
Battery (Main):	13.1	-
Datalogger Clock:	9:29	-
Laptop Clock:	9:29	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<u>Datalogger / Station Notes:</u>

<u>General Notes:</u>
-Precip gauge needs antifreeze next visit
-Installed BM5
-WL moving ~4cm

<u>Measurement Details:</u>	
Start Time (MST):	9:24
End Time (MST):	9:49
Station Condition:	Good
Weather:	Sunny, windy, 5C

<u>Level Survey:</u>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L1-02	1.064	296.115		295.051	295.051	3/4" Pipe 20m W of station
L1-04			0.882	295.233	295.227	3/4" Pipe 20m W of station
L1-05			0.863	295.252	0.000	3/4 pipe 25m E of station
L1-03			1.432	294.683	294.664	3/4" Pipe 20m W of station
Water Level:	Cut	0.159	1.869	294.405	Time WL Surveyed:	9:43
L1-02			1.064	295.051	295.051	3/4" Pipe 20m W of station
Turn						
L1-02	1.040	296.091		295.051	295.051	3/4" Pipe 20m W of station
Water Level:	Cut	0.159	1.845	294.405	Time WL Surveyed:	9:46
L1-03			1.409	294.682	294.664	3/4" Pipe 20m W of station
L1-05			0.838	295.253		3/4 pipe 25m E of station
L1-04			0.857	295.234	295.227	3/4" Pipe 20m W of station
L1-02			1.040	295.051	295.051	3/4" Pipe 20m W of station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	GG, TR	Trip Date:	17-Oct-2015
Average WL:	294.405	-	Data Entry Personnel:	GG	Date:	17-Oct-2015
Closing Error:	0.000	-	Data Check Personnel:	JC	Date:	12-Nov-2015
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.866	-				

<u>Level Survey Equipment:</u>	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake
 UTM Location: 483430 E, 6371950 N

Site Visit Date: December 12, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.54	-
Water (°C):	1.2	-
Air Temp (°C):	-4.3	-
RH (%):	81.5%	-
Precipitation (mm):	0.00	-
Battery (Main):	12.4	-
Datalogger Clock:	9:46	-
Laptop Clock:	9:46	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

Measurement Details:	
Start Time (MST):	9:35
End Time (MST):	10:20
Station Condition:	Not calling in
Weather:	Cloudy, calm, -5c

Datalogger / Station Notes:

General Notes:

- Bucket looks good.
- Tried to adjust RSSI, best was -104.
- Modem may need to be replaced next visit.

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L1-02	1.078	296.129		295.051	295.051	3/4" Pipe 20m W of station
L1-03			1.441	294.688	294.664	3/4" Pipe 10m W of Station
L1-01			1.252	294.877	294.865	Rod Beside Station
Water Level:						
	Cut		1.705	294.424	Time WL Surveyed: 9:53	
L1-02			1.078	295.051	295.051	3/4" Pipe 20m W of station
Turn						
L1-02	1.037	296.088		295.051	295.051	3/4" Pipe 20m W of station
Water Level:						
	Cut		1.661	294.427	Time WL Surveyed: 9:57	
L1-01			1.212	294.876	294.865	Rod Beside Station
L1-03			1.400	294.688	294.664	3/4" Pipe 10m W of Station
L1-02			1.037	295.051	295.051	3/4" Pipe 20m W of station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:						
	Cut				Time WL Surveyed:	
Water Level:						
	Cut				Time WL Surveyed:	

WL Survey Summary		Before	After	Field Personnel:		GG JC	Trip Date:	12-Dec-2015
Average WL:		294.426	-	Data Entry Personnel:		GG	Date:	12-Dec-2015
Closing Error:		0.000	-	Data Check Personnel:		GG	Date:	5-Jan-2015
WL Check:		0.003	-	Entered Digitally in the Field:		Yes		
Transducer Elevation		293.886	-					

Level Survey Equipment:	
Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: January 7, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.894	
Water (°C):	3.2	
Air Temp (°C):	-17.5	
RH (%):	79.5%	
Precipitation (mm):	0.00	
Battery (Main):	13.6	
Datalogger Clock:	11:17	
Laptop Clock:	11:18	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

Datalogger / Station Notes:
-Emptied geonor of snow and added anti-freeze

General Notes:

Measurement Details:	
Start Time (MST):	11:15
End Time (MST):	11:40
Station Condition:	Good
Weather:	Overcast, calm, -20C

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L2-04	0.948	334.174		333.226	333.226	Pipe with coupling by rebar
L2-05			1.357	332.817	332.798	Pipe w/flagging north of trail
L2-03			1.752	332.422	332.394	Pipe w/flagging south by trail
Turn						
Temporary BM	2.312	334.099		331.787		-
Water Level:	Cut		2.347	331.752	Time WL Surveyed:	11:33
L2-03			1.677	332.422	332.394	Pipe w/flagging south by trail
L2-05			1.281	332.818	332.798	Pipe w/flagging north of trail
L2-04			0.873	333.226	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	TR, GG	Trip Date:	7-Jan-2015
Average WL:	331.752	-	Data Entry Personnel:	TR	Date:	7-Jan-2015
Closing Error:	0.000	-	Data Check Personnel:	CJ	Date:	21-May-2015
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.858	-				

Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: February 4, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.901	
Water (°C):	2.5	
Air Temp (°C):	-13.4	
RH (%):	61.7%	
Precipitation (mm):	0.06	
Battery (Main):	15.1	
Datalogger Clock:	13:19	
Laptop Clock:	13:19	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

Datalogger / Station Notes:

General Notes:

Measurement Details:	
Start Time (MST):	13:15
End Time (MST):	13:44
Station Condition:	Good
Weather:	Clear, calm, -15C

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L2-04	0.887	334.113		333.226	333.226	Pipe with coupling by rebar
L2-03			1.687	332.426	332.394	Pipe w/flagging south by trail
L2-05			1.286	332.827	332.798	Pipe w/flagging north of trail
Water Level:	Cut		2.400	331.713	Time WL Surveyed:	13:38
Temporary BM			2.330	331.783	0.000	-
Turn						
Temporary BM	2.312	334.095		331.783		-
Water Level:	Cut		2.382	331.713	Time WL Surveyed:	13:41
L2-05			1.268	332.827	332.798	Pipe w/flagging north of trail
L2-03			1.669	332.426	332.394	Pipe w/flagging south by trail
L2-04			0.868	333.227	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	SM, CJ	Trip Date:	4-Feb-2015
Average WL:	331.713	-	Data Entry Personnel:	SM	Date:	4-Feb-2015
Closing Error:	-0.001	-	Data Check Personnel:	CJ	Date:	21-May-2015
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.812	-				

Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: March 2, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.869	
Water (°C):	2.1	
Air Temp (°C):	-15.7	
RH (%):	74.8%	
Precipitation (mm):	0.20	
Battery (Main):	15.2	
Datalogger Clock:	10:33	
Laptop Clock:	10:34	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

Measurement Details:	
Start Time (MST):	10:20
End Time (MST):	11:00
Station Condition:	Good
Weather:	Overcast, windy, -18C

Datalogger / Station Notes:
-Anitfreeze level in precip. gauge is good

General Notes:

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L2-04	0.846	334.072		333.226	333.226	Pipe with coupling by rebar
L2-05			1.243	332.829	332.812	Pipe w/flagging north of trail
L2-03			1.644	332.428	332.417	Pipe w/flagging south by trail
Water Level:	Cut		2.390	331.682	Time WL Surveyed:	10:44
Temporary BM			2.383	331.689	0.000	-
Turn						
Temporary BM	2.357	334.046		331.689		-
Water Level:	Cut		2.363	331.683	Time WL Surveyed:	10:50
L2-03			1.617	332.429	332.417	Pipe w/flagging south by trail
L2-05			1.215	332.831	332.812	Pipe w/flagging north of trail
L2-04			0.820	333.226	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	MP, TR	Trip Date:	2-Mar-2015
Average WL:	331.683	-	Data Entry Personnel:	MP	Date:	2-Mar-2015
Closing Error:	0.000	-	Data Check Personnel:	CJ	Date:	21-May-2015
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.814	-				

Lake Site Measurement / Site Visit Record

Site: L2 Kearn Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: April 25, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.84	
Water (°C):	1.8	
Air Temp (°C):	2.2	
RH (%):	34.0%	
Precipitation (mm):	0.00	
Battery (Main):	14.6	
Datalogger Clock:	11:11	
Laptop Clock:	11:11	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

Datalogger / Station Notes:

General Notes:

-Geonor tested, results good

Measurement Details:	
Start Time (MST):	11:04
End Time (MST):	11:33
Station Condition:	Good
Weather:	Sunny, light breeze, 2C

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L2-04	0.920	334.146		333.226	333.226	Pipe with coupling by rebar
L2-03			1.717	332.429	332.417	Pipe w/flagging south by trail
L2-05			1.315	332.831	332.812	Pipe w/flagging north of trail
Turn						
L2-05	1.297	334.128		332.831	332.812	Pipe w/flagging north of trail
Water Level:	Cut		2.442	331.686	Time WL Surveyed:	11:27
L2-05			1.297	332.831	332.812	Pipe w/flagging north of trail
L2-03			1.698	332.430	332.417	Pipe w/flagging south by trail
L2-04			0.901	333.227	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	GG, RM	Trip Date:	25-Apr-2015
Average WL:	331.685	-	Data Entry Personnel:	GG	Date:	25-Apr-2015
Closing Error:	-0.001	-	Data Check Personnel:	CJ	Date:	21-May-2015
WL Check:	0.002	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.845	-				

Lake Site Measurement / Site Visit Record

Site: L2 Kearn Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: May 13, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.882	
Water (°C):	3.8	
Air Temp (°C):	21.2	
RH (%):	25.5%	
Precipitation (mm):	0.00	
Battery (Main):	14.1	
Datalogger Clock:	12:20	
Laptop Clock:	12:21	
Enclosure Dessicant	Good	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

Datalogger / Station Notes:

General Notes:

Measurement Details:	
Start Time (MST):	12:20
End Time (MST):	12:45
Station Condition:	Good
Weather:	Clear, light breeze, 20C

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L2-04	0.654	333.880		333.226	333.226	Pipe with coupling by rebar
L2-05			1.049	332.831	332.812	Pipe w/flagging north of trail
L2-03			1.450	332.430	332.417	Pipe w/flagging south by trail
Turn						
Temporary BM	2.497	333.856		331.359		-
Water Level:	Cut	0.341	2.497	331.700	Time WL Surveyed:	12:42
L2-03			1.424	332.432	332.417	Pipe w/flagging south by trail
L2-05			1.023	332.833	332.812	Pipe w/flagging north of trail
L2-04			0.628	333.228	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	TR, MK	Trip Date:	13-May-2015
Average WL:	331.701	-	Data Entry Personnel:	TR	Date:	13-May-2015
Closing Error:	-0.002	-	Data Check Personnel:	CJ	Date:	14-Aug-2015
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.819	-				

Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: June 19, 2015



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.842	
Water (°C):	10.4	
Air Temp (°C):	18.2	
RH (%):	36.9%	
Precipitation (mm):	0.00	
Battery (Main):	14.2	
Datalogger Clock:	11:15	
Laptop Clock:	11:15	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<u>Datalogger / Station Notes:</u>

<u>General Notes:</u>

<u>Measurement Details:</u>	
Start Time (MST):	11:12
End Time (MST):	11:30
Station Condition:	Good
Weather:	Sunny, windy, 21C

<u>Level Survey:</u>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
L2-04	0.777	334.003		333.226	333.226	Pipe with coupling by rebar
L2-03			1.573	332.430	332.417	Pipe w/flagging south by trail
L2-05			1.171	332.832	332.812	Pipe w/flagging north of trail
Water Level:	Cut		2.363	331.640	Time WL Surveyed:	11:22
Temporary BM			2.422	331.581	0.000	-
Turn						
Temporary BM	2.404	333.985		331.581		-
Water Level:	Cut		2.341	331.644	Time WL Surveyed:	11:24
L2-05			1.153	332.832	332.812	Pipe w/flagging north of trail
L2-03			1.557	332.428	332.417	Pipe w/flagging south by trail
L2-04	0.761			333.224	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	GG, MK	Trip Date:	19-Jun-2015
Average WL:	331.642	-	Data Entry Personnel:	GG	Date:	19-Jun-2015
Closing Error:	0.002	-	Data Check Personnel:	CJ	Date:	14-Aug-2015
WL Check:	0.004	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.800	-				

<u>Level Survey Equipment:</u>	
Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Lake Site Measurement / Site Visit Record

Site: L2 Kearn Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: August 8, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.827	0.655
Water (°C):	14.0	18.5
Air Temp (°C):	27.0	23.45
RH (%):	42.1%	60.3%
Precipitation (mm):	0.00	0.00
Battery (Main):	13.9	14.0
Datalogger Clock:	13:32	14:10
Laptop Clock:	13:33	14:10
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	304012	304016
Vent Tube Dessicant	-	

Measurement Details:	
Start Time (MST):	13:32
End Time (MST):	14:11
Station Condition:	Good
Weather:	Sunny, 25C

Datalogger / Station Notes:

General Notes:
-Replaced PLS for calibration

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L2-04	0.827	334.053		333.226	333.226	Pipe with coupling by rebar
L2-05			1.221	332.832	332.812	Pipe w/flagging north of trail
L2-03			1.628	332.425	332.417	Pipe w/flagging south by trail
Water Level:	Cut		2.423	331.630	Time WL Surveyed:	14:01
L2-03			1.628	332.425	332.417	Pipe w/flagging south by trail
Turn						
L2-03	1.606	334.031		332.425	332.417	Pipe w/flagging south by trail
Water Level:	Cut		2.401	331.630	Time WL Surveyed:	14:03
L2-03			1.606	332.425	332.417	Pipe w/flagging south by trail
L2-05			1.198	332.833	332.812	Pipe w/flagging north of trail
L2-04			0.804	333.227	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	GG, TR	Trip Date:	8-Aug-2015
Average WL:	331.630	-	Data Entry Personnel:	GG	Date:	8-Aug-2015
Closing Error:	-0.001	-	Data Check Personnel:	CJ	Date:	14-Aug-2015
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.803	-				

Level Survey Equipment:	
Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: September 9, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.776	
Water (°C):	13.6	
Air Temp (°C):	17.1	
RH (%):	58.5%	
Precipitation (mm):	0.00	
Battery (Main):	14.1	
Datalogger Clock:	15:14	
Laptop Clock:	15:15	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Replaced	

Measurement Details:	
Start Time (MST):	15:10
End Time (MST):	15:50
Station Condition:	Good
Weather:	Partial cloud, 15C

Datalogger / Station Notes:

General Notes:

-Junction box mast needs to be stabilized or replaced

-PLS cable was under some tension from mast movement, and possible wildlife activity near transducer-see photos

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
L2-04	0.705	333.931		333.226	333.226	Pipe with coupling by rebar
L2-03			1.507	332.424	332.417	Pipe w/flagging south by trail
L2-05			1.099	332.832	332.812	Pipe w/flagging north of trail
Water Level:	Cut		2.298	331.633	Time WL Surveyed:	15:44
L2-05			1.099	332.832	332.812	Pipe w/flagging north of trail
Turn						
L2-05	1.083	333.915		332.832	332.812	Pipe w/flagging north of trail
Water Level:	Cut		2.282	331.633	Time WL Surveyed:	15:48
L2-05			1.083	332.832	332.812	Pipe w/flagging north of trail
L2-03			1.491	332.424	332.417	Pipe w/flagging south by trail
L2-04			0.688	333.227	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	SM, JC	Trip Date:	9-Sep-2015
Average WL:	331.633	-	Data Entry Personnel:	JC	Date:	9-Sep-2015
Closing Error:	-0.001	-	Data Check Personnel:	CJ	Date:	6-Oct-2015
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.857	-				

Level Survey Equipment:	
Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: October 22, 2015



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.773	-
Water (°C):	8.7	-
Air Temp (°C):	11.1	-
RH (%):	54.7%	-
Precipitation (mm):	0.00	-
Battery (Main):	14.7	-
Datalogger Clock:	11:20	-
Laptop Clock:	11:22	-
Enclosure Dessicant	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	11:18
End Time (MST):	12:10
Station Condition:	Good
Weather:	Sunny, breezy, 10C

<u>Datalogger / Station Notes:</u>

<u>General Notes:</u>
-Replaced Geonor bucket fluid with antifreeze mix
-Stabilized junction box mast

<u>Level Survey:</u>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L2-04	0.521	333.747		333.226	333.226	Pipe with coupling by rebar
L2-05			0.914	332.833	332.812	Pipe w/flagging north of trail
L2-03			1.314	332.433	332.417	Pipe w/flagging south by trail
Water Level:						
L2-03	Cut		2.102	331.645	Time WL Surveyed:	11:39
L2-03			1.314	332.433	332.417	Pipe w/flagging south by trail
Turn						
L2-03	1.292	333.725		332.433	332.417	Pipe w/flagging south by trail
L2-03	Cut		2.084	331.641	Time WL Surveyed:	11:41
L2-03			1.292	332.433	332.417	Pipe w/flagging south by trail
L2-05			0.893	332.832	332.812	Pipe w/flagging north of trail
L2-04			0.499	333.226	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	GG, JC	Trip Date:	22-Oct-2015
Average WL:	331.643	-	<u>Data Entry Personnel:</u>	GG	Date:	22-Oct-2015
Closing Error:	0.000	-	<u>Data Check Personnel:</u>	GG	Date:	26-Oct-2015
WL Check:	0.004	-	<u>Entered Digitally in the Field:</u>	Yes		
Transducer Elevation	330.870	-				

<u>Level Survey Equipment:</u>	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: December 9, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.822	-
Water (°C):	3.4	-
Air Temp (°C):	5.4	-
RH (%):	95.4%	-
Precipitation (mm):	0.00	-
Battery (Main):	13.3	-
Datalogger Clock:	11:03	-
Laptop Clock:	10:04	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

Measurement Details:	
Start Time (MST):	10:01
End Time (MST):	10:17
Station Condition:	Good
Weather:	Snow, -2C

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
L2-04	0.850	334.076		333.226	333.226	Pipe with coupling by rebar
L2-05			1.243	332.833	332.812	Pipe w/flagging north of trail
L2-03			1.647	332.429	332.417	Pipe w/flagging south by trail
Water Level:	Cut		2.422	331.654	Time WL Surveyed: 10:10	
Temporary BM			2.406	331.670	0.000	-
Turn						
Temporary BM	2.386	334.056		331.670		-
Water Level:	Cut		2.401	331.655	Time WL Surveyed: 10:14	
L2-03			1.627	332.429	332.417	Pipe w/flagging south by trail
L2-05			1.223	332.833	332.812	Pipe w/flagging north of trail
L2-04			0.831	333.225	333.226	Pipe with coupling by rebar
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

Datalogger / Station Notes:

General Notes:

WL Survey Summary	Before	After	Field Personnel:	GG DW	Trip Date:	9-Dec-2015
Average WL:	331.655	-	Data Entry Personnel:	GG	Date:	9-Dec-2015
Closing Error:	0.001	-	Data Check Personnel:	GG	Date:	6-Jan-2016
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.833	-				

Level Survey Equipment:	
Level #:	
Make & Model:	-
Serial #:	-

Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: January 14, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.994	-
Water (°C):	2.7	-
Battery (Main):	12.3	13.2
Datalogger Clock:	13:12	-
Laptop Clock:	13:11	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Replaced	

Measurement Details:	
Start Time (MST):	13:00
End Time (MST):	13:35
Station Condition:	Good
Weather:	Overcast, -8C

Datalogger / Station Notes:

General Notes:
-PT readings fluctuating, no kinks in vent tube
-BM5 may have shifted

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L3-07	0.947	236.347		235.400	235.400	3/4" Pipe 12m South of data logger
L3-05			0.821	235.526	235.537	3/4" Pipe 12m SE of data logger
L3-06			1.622	234.725	234.722	3/4" Pipe 7m South of data logger
Water Level:	Cut		2.587	233.760	Time WL Surveyed:	13:28
Temporary BM			2.585	233.762	0.000	-
Turn						
Temporary BM	2.572	236.334		233.762		-
Water Level:	Cut		2.574	233.760	Time WL Surveyed:	13:31
L3-06			1.608	234.726	234.722	3/4" Pipe 7m South of data logger
L3-05			0.808	235.526	235.537	3/4" Pipe 12m SE of data logger
L3-07			0.936	235.398	235.400	3/4" Pipe 12m South of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	MP, DW	Trip Date:	14-Jan-2015
Average WL:	233.760	-	Data Entry Personnel:	DW	Date:	14-Jan-2015
Closing Error:	0.002	-	Data Check Personnel:	CJ	Date:	21-Jan-2015
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.766	-				

Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: February 9, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.949	
Water (°C):	2.3	
Battery (Main):	0.6	
Datalogger Clock:	15:15	
Laptop Clock:	19:12	
Enclosure Dessicant		Good
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant		Good

Datalogger / Station Notes:

General Notes:

Measurement Details:	
Start Time (MST):	15:00
End Time (MST):	15:30
Station Condition:	Good
Weather:	Light snow, -20 C

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L3-07	0.719	236.119		235.400	235.400	3/4" Pipe 12m South of data logger
L3-05			0.599	235.520	235.537	3/4" Pipe 12m SE of data logger
L3-06			1.390	234.729	234.722	3/4" Pipe 7m South of data logger
Water Level:	Cut		2.391	233.728	Time WL Surveyed:	15:18
Temporary BM			2.399	233.720	0.000	-
Turn						
Temporary BM	2.387	236.107		233.720		-
Water Level:	Cut		2.379	233.728	Time WL Surveyed:	15:21
L3-06			1.380	234.727	234.722	3/4" Pipe 7m South of data logger
L3-05			0.587	235.520	235.537	3/4" Pipe 12m SE of data logger
L3-07			0.710	235.397	235.400	3/4" Pipe 12m South of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	TR, CJ	Trip Date:	9-Feb-2015
Average WL:	233.728	-	Data Entry Personnel:	CJ	Date:	9-Feb-2015
Closing Error:	0.003	-	Data Check Personnel:	CJ	Date:	25-May-2015
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.779	-				

Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: March 10, 2015



Datalogger Details:	Before	After
Transducer Reading (m):	0.909	
Water (°C):	1.9	
Battery (Main):	13.8	
Datalogger Clock:	11:37	
Laptop Clock:	11:36	
Enclosure Dessoricant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessoricant	Good	

Measurement Details:	
Start Time (MST):	11:30
End Time (MST):	11:56
Station Condition:	Good
Weather:	Sunny, -10 C

Datalogger / Station Notes:

General Notes:

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L3-07	0.623	236.023		235.400	235.400	3/4" Pipe 12m South of data logger
L3-05			0.506	235.517	235.537	3/4" Pipe 12m SE of data logger
L3-06			1.279	234.744	234.722	3/4" Pipe 7m South of data logger
Water Level:	Cut		2.318	233.705	Time WL Surveyed:	11:43
Temporary BM			2.069	233.954	0.000	-
Turn						
Temporary BM	2.048	236.002		233.954		-
Water Level:	Cut		2.298	233.704	Time WL Surveyed:	11:48
L3-06			1.258	234.744	234.722	3/4" Pipe 7m South of data logger
L3-05			0.485	235.517	235.537	3/4" Pipe 12m SE of data logger
L3-07			0.602	235.400	235.400	3/4" Pipe 12m South of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After	Field Personnel:	DW, GG	Trip Date:	10-Mar-2015
Average WL:	233.705	-	Data Entry Personnel:	DW, GG	Date:	10-Mar-2015
Closing Error:	0.000	-	Data Check Personnel:	CJ	Date:	25-May-2015
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.796	-				

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake
 UTM Location (Station):

402886 E, 6370260 N

Site Visit Date:
 Site Visit Time (MST):

January 11, 2015

09:45



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)
RB	1.00	0.00	0.00		0.000				0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	1.40	0.42	0.15	0.29	0.023					0.88	0.43	0.27	0.020	0.11	0.002	3%
2	1.85	0.48	0.15	0.32	0.051					0.88	0.45	0.33	0.045	0.15	0.007	8%
3	2.30	0.49	0.16	0.33	0.067					0.88	0.38	0.33	0.059	0.12	0.007	9%
4	2.60	0.50	0.15	0.33	0.050					0.88	0.30	0.35	0.044	0.11	0.005	6%
5	2.90	0.51	0.16	0.34	0.059					0.88	0.30	0.35	0.052	0.11	0.005	7%
6	3.20	0.51	0.15	0.33	0.055					0.88	0.28	0.36	0.048	0.10	0.005	6%
7	3.45	0.55	0.10	0.33	0.050					0.88	0.23	0.45	0.044	0.10	0.004	6%
8	3.65	0.57	0.10	0.34	0.049					0.88	0.23	0.47	0.043	0.11	0.005	6%
9	3.90	0.55	0.13	0.34	0.041					0.88	0.28	0.42	0.036	0.12	0.004	5%
10	4.20	0.58	0.14	0.36	0.027					0.88	0.30	0.44	0.024	0.13	0.003	4%
11	4.50	0.55	0.11	0.33	0.021					0.88	0.33	0.44	0.018	0.14	0.003	3%
12	4.85	0.58	0.04	0.31	0.042					0.88	0.30	0.54	0.037	0.16	0.006	8%
13	5.10	0.58	0.03	0.31	0.051					0.88	0.19	0.55	0.045	0.10	0.005	6%
14	5.23	0.52	0.07	0.30	0.031					0.88	0.15	0.45	0.027	0.07	0.002	2%
15	5.40	0.52	0.12	0.32	0.031					0.88	0.21	0.40	0.027	0.08	0.002	3%
16	5.65	0.52	0.20	0.36	0.043					0.88	0.30	0.32	0.038	0.10	0.004	5%
17	6.00	0.52	0.15	0.34	0.047					0.88	0.33	0.37	0.041	0.12	0.005	6%
18	6.30	0.49	0.15	0.32	0.029					0.88	0.30	0.34	0.026	0.10	0.003	3%
19	6.60	0.45	0.15	0.30	0.021					0.88	0.33	0.30	0.018	0.10	0.002	2%
20	6.95	0.45	0.15	0.30	-0.001					0.88	0.32	0.30	-0.001	0.10	0.000	0%
21	7.25	0.35	0.16	0.26	0.022					0.88	0.43	0.19	0.019	0.08	0.002	2%
LB	7.80	0.00	0.00		0.00				0.00	0.88	0.28	0.00	0.000	0.00	0.000	
Total Flow														0.079	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -At outlet

Meas. Start Time (MST):	10:40
Meas. End Time (MST):	11:09
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Good
Weather:	Sunny, -25C

Flow characteristics:

Total Flow:	0.079	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.31	(m ²)
Wetted Width:	6.80	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.02	

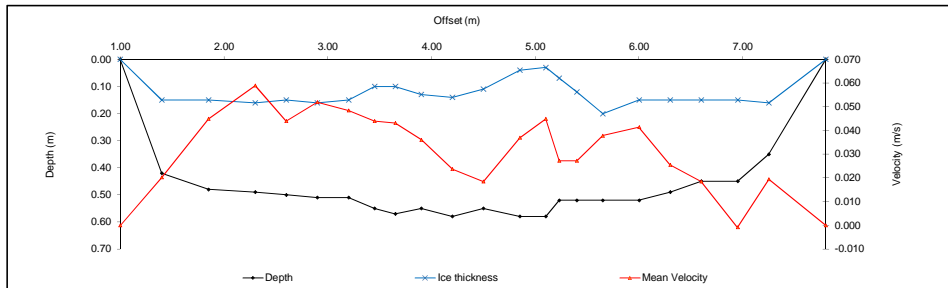
Logger Details:

	Before	After
Transducer Reading (m):	0.737	0.725
Water (°C):	0.5	0.5
Datalogger Clock:	09:53	10:10
Laptop Clock:	09:52	10:09
Battery (Main):	12.6	12.5
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- ADV test passed
- Changed batteries



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-03	0.585	100.712	0.727	100.127	100.127	3/4" Pipe 2m SE of Station
L4-02			0.644	100.068	100.055	3/4" Pipe 5m SE of Station
L4-01			0.727	99.985	100.000	3/4" Pipe 4m NW of Station
Water Level:	Cut			97.940	Time WL Surveyed:	10:20
Temporary BM			2.762	97.950	0.000	-
Turn						
Temporary BM	2.739	100.689		97.950		-
Water Level:	Cut		2.745	97.944	Time WL Surveyed:	10:23
L4-01			0.704	99.985	100.000	3/4" Pipe 4m NW of Station
L4-02			0.623	100.068	100.055	3/4" Pipe 5m SE of Station
L4-03			0.564	100.125	100.127	3/4" Pipe 2m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:	97.942	-
Closing Error:	0.002	-
WL Check:	0.004	-
Transducer Elevation	97.205	-

Field Personnel:	DW, GG	Trip Date:	11-Jan-15
Data Entry Personnel:	DW	Date:	11-Jan-15
Data Check Personnel:	MP	Date:	29-Jan-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: February 10, 2015
Site Visit Time (MST): 10:10

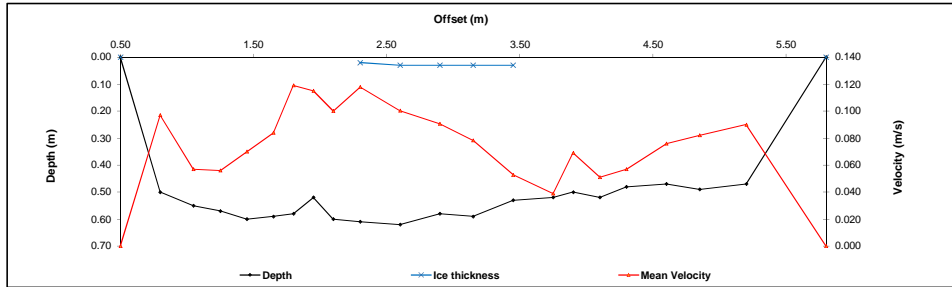


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)
LB	0.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	0.80	0.50		0.30	0.097					1.00	0.28	0.50	0.097	0.14	0.013	6%
2	1.05	0.55		0.33	0.057					1.00	0.23	0.55	0.057	0.12	0.007	3%
3	1.25	0.57		0.34	0.056					1.00	0.20	0.57	0.056	0.11	0.006	3%
4	1.45	0.60		0.36	0.070					1.00	0.20	0.60	0.070	0.12	0.008	4%
5	1.65	0.59		0.35	0.084					1.00	0.18	0.59	0.084	0.10	0.009	4%
6	1.80	0.58		0.35	0.119					1.00	0.15	0.58	0.119	0.09	0.010	5%
7	1.95	0.52		0.31	0.115					1.00	0.15	0.52	0.115	0.08	0.009	4%
8	2.10	0.60		0.36	0.100					1.00	0.18	0.60	0.100	0.11	0.011	5%
9	2.30	0.81	0.02	0.37	0.134					0.88	0.25	0.59	0.118	0.15	0.017	8%
10	2.60	0.62	0.03	0.37	0.114					0.88	0.30	0.59	0.100	0.18	0.018	9%
11	2.90	0.58	0.03	0.35	0.103					0.88	0.28	0.55	0.091	0.15	0.014	7%
12	3.15	0.59	0.03	0.35	0.089					0.88	0.28	0.56	0.078	0.15	0.012	6%
13	3.45	0.53	0.03	0.32	0.060					0.88	0.30	0.50	0.053	0.15	0.008	4%
14	3.75	0.52		0.31	0.039					1.00	0.23	0.52	0.039	0.12	0.005	2%
15	3.90	0.50		0.30	0.069					1.00	0.18	0.50	0.069	0.09	0.006	3%
16	4.10	0.52		0.31	0.051					1.00	0.20	0.52	0.051	0.10	0.005	3%
17	4.30	0.48		0.29	0.057					1.00	0.25	0.48	0.057	0.12	0.007	3%
18	4.60	0.47		0.28	0.076					1.00	0.28	0.47	0.076	0.13	0.010	5%
19	4.85	0.49		0.29	0.082					1.00	0.30	0.49	0.082	0.15	0.012	6%
20	5.20	0.47		0.28	0.090					1.00	0.48	0.47	0.090	0.22	0.020	10%
RB	5.80	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
Total Flow														0.207	100%	

Flow Measurement Details:

Metering Section Location (describe):
-At outlet

Meas. Start Time (MST):	11:23
Meas. End Time (MST):	11:58
Equipment:	ADV
Method:	Wading
River Condition:	Partially frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, breezy, -24C



Flow characteristics:

Total Flow:	0.207	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.58	(m ²)
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.754	-
Water (°C):	0.4	-
Datalogger Clock:	10:19	-
Laptop Clock:	10:18	-
Battery (Main):	13.1	12.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-Lots of noise in WL data, checked vent tube, looks ok

General Notes:

-Ice in middle of stream only

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-03	0.823	100.950		100.127	100.127	3/4" Pipe 2m SE of Station
L4-01			0.964	99.986	100.000	3/4" Pipe 4m NW of Station
L4-02			0.882	100.068	100.055	3/4" Pipe 5m SE of Station
Water Level:	Cut		2.964	97.986		Time WL Surveyed: 10:35
Temporary BM			2.957	97.993	0.000	
Turn						
Temporary BM	3.007	101.000		97.993		
Water Level:	Cut		3.017	97.983		Time WL Surveyed: 10:42
L4-02			0.931	100.069	100.055	3/4" Pipe 5m SE of Station
L4-01			1.014	99.986	100.000	3/4" Pipe 4m NW of Station
L4-03			0.872	100.128	100.127	3/4" Pipe 2m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.985	-
Closing Error:	-0.001	-
WL Check:	0.003	-
Transducer Elevation	97.231	-

Field Personnel:

GG, MP	Trip Date:	10-Feb-15	
Data Entry Personnel:	GG	Date:	10-Feb-15
Data Check Personnel:	MP	Date:	26-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station):

402886 E, 6370260 N

Site Visit Date:

March 11, 2015

Site Visit Time (MST):

13:05



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)
RB	3.30	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	3.60	0.45		0.27	0.257					1.00	0.30	0.45	0.257	0.14	0.035	5%
2	3.90	0.42		0.25	0.315					1.00	0.30	0.42	0.315	0.13	0.040	6%
3	4.20	0.35		0.21	0.218					1.00	0.30	0.35	0.218	0.11	0.023	4%
4	4.50	0.44		0.26	0.154					1.00	0.30	0.44	0.154	0.13	0.020	3%
5	4.80	0.45		0.27	0.226					1.00	0.30	0.45	0.226	0.14	0.031	5%
6	5.10	0.45		0.27	0.224					1.00	0.30	0.45	0.224	0.14	0.030	5%
7	5.40	0.45		0.27	0.194					1.00	0.30	0.45	0.194	0.14	0.026	4%
8	5.70	0.50		0.30	0.246					1.00	0.30	0.50	0.246	0.15	0.037	6%
9	6.00	0.50		0.30	0.199					1.00	0.30	0.50	0.199	0.15	0.030	5%
10	6.30	0.55		0.33	0.161					1.00	0.30	0.55	0.161	0.16	0.027	4%
11	6.60	0.55		0.33	0.188					1.00	0.30	0.55	0.188	0.17	0.031	5%
12	6.90	0.57		0.34	0.260					1.00	0.30	0.57	0.260	0.17	0.044	7%
13	7.20	0.58		0.35	0.270					1.00	0.30	0.58	0.270	0.17	0.047	7%
14	7.50	0.60		0.36	0.228					1.00	0.30	0.60	0.228	0.18	0.041	6%
15	7.80	0.58		0.35	0.239					1.00	0.30	0.58	0.239	0.17	0.042	7%
16	8.10	0.58		0.35	0.235					1.00	0.30	0.58	0.235	0.17	0.041	6%
17	8.40	0.50		0.30	0.236					1.00	0.30	0.50	0.236	0.15	0.035	6%
18	8.70	0.50		0.30	0.205					1.00	0.30	0.50	0.205	0.15	0.031	5%
19	9.00	0.40		0.24	0.140					1.00	0.30	0.40	0.140	0.12	0.017	3%
20	9.30	0.38		0.23	0.070					1.00	0.40	0.38	0.070	0.15	0.011	2%
LB	9.80	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00		0.00	0.000	
Total Flow														0.637	100%	

Flow Measurement Details:

Metering Section Location (describe):
-At outlet

Meas. Start Time (MST):	13:54
Meas. End Time (MST):	14:16
Equipment:	ADV
Method:	Wading
River Condition:	Open channel, ice along banks
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, -1C

Flow characteristics:

Total Flow:	0.637	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.98	(m ²)
Wetted Width:	6.50	(m)
Hydraulic Depth:	0.46	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.10	

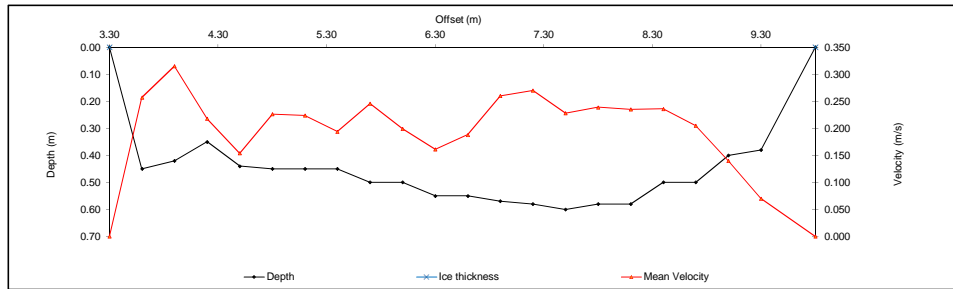
Logger Details:

	Before	After
Transducer Reading (m):	0.751	
Water (°C):	0.3	
Datalogger Clock:	13:13	
Laptop Clock:	13:12	
Battery (Main):	14.7	
Battery:		Good
Battery Serial #:	-	
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

- BM 1 looks to have moved

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-03	0.891	101.018		100.127	100.127	3/4" Pipe 2m SE of Station
L4-01			1.038	99.980	99.977	3/4" Pipe 4m NW of Station
L4-02			0.947	100.071	100.071	3/4" Pipe 5m SE of Station
Water Level:	Cut		3.041	97.977	Time WL Surveyed:	13:21
Temporary BM			2.872	98.146	0.000	-
Turn						
Temporary BM	2.843	100.989		98.146		-
Water Level:	Cut		3.009	97.980	Time WL Surveyed:	13:25
L4-02			0.917	100.072	100.071	3/4" Pipe 5m SE of Station
L4-01			1.011	99.978	99.977	3/4" Pipe 4m NW of Station
L4-03			0.863	100.126	100.127	3/4" Pipe 2m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	97.979	-
Closing Error:	0.001	-
WL Check:	0.003	-
Transducer Elevation	97.228	-

Field Personnel:

	SM, DW	Trip Date:	11-Mar-15
Data Entry Personnel:	SM	Date:	11-Mar-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date:
Site Visit Time (MST):

April 16, 2015
10:55

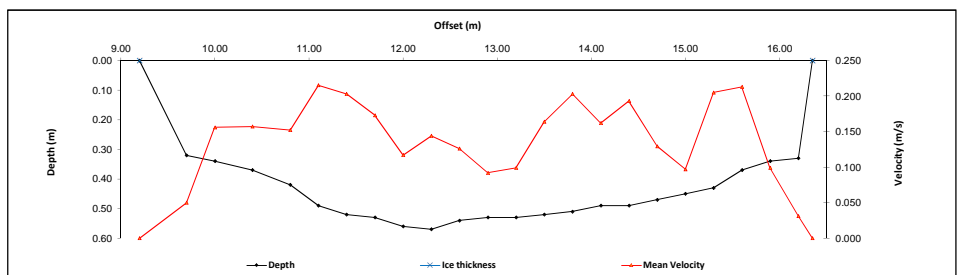


Flow Measurement:										Measured Data					Calculated Data				
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)			
RB	16.35	0.00	0.00							1.00	0.08	0.00	0.000	0.00	0.000				
1	16.20	0.33		0.20	0.031				1.00	0.22	0.33	0.031	0.07	0.002	1%				
2	15.90	0.34		0.20	0.099				1.00	0.30	0.34	0.099	0.10	0.010	2%				
3	15.60	0.37		0.22	0.213				1.00	0.30	0.37	0.213	0.11	0.024	5%				
4	15.30	0.43		0.26	0.205				1.00	0.30	0.43	0.205	0.13	0.026	6%				
5	15.00	0.45		0.27	0.097				1.00	0.30	0.45	0.097	0.14	0.013	3%				
6	14.70	0.47		0.28	0.129				1.00	0.30	0.47	0.129	0.14	0.018	4%				
7	14.40	0.49		0.29	0.193				1.00	0.30	0.49	0.193	0.15	0.028	6%				
8	14.10	0.49		0.29	0.162				1.00	0.30	0.49	0.162	0.15	0.024	5%				
9	13.80	0.51		0.31	0.203				1.00	0.30	0.51	0.203	0.15	0.031	7%				
10	13.50	0.52		0.31	0.164				1.00	0.30	0.52	0.164	0.16	0.026	6%				
11	13.20	0.53		0.32	0.099				1.00	0.30	0.53	0.099	0.16	0.016	3%				
12	12.90	0.53		0.32	0.092				1.00	0.30	0.53	0.092	0.16	0.015	3%				
13	12.60	0.54		0.32	0.126				1.00	0.30	0.54	0.126	0.16	0.020	4%				
14	12.30	0.57		0.34	0.144				1.00	0.30	0.57	0.144	0.17	0.025	5%				
15	12.00	0.56		0.34	0.117				1.00	0.30	0.56	0.117	0.17	0.020	4%				
16	11.70	0.53		0.32	0.173				1.00	0.30	0.53	0.173	0.16	0.028	6%				
17	11.40	0.52		0.31	0.203				1.00	0.30	0.52	0.203	0.16	0.032	7%				
18	11.10	0.49		0.29	0.215				1.00	0.30	0.49	0.215	0.15	0.032	7%				
19	10.80	0.42		0.25	0.152				1.00	0.35	0.42	0.152	0.15	0.022	5%				
20	10.40	0.37		0.22	0.157				1.00	0.40	0.37	0.157	0.15	0.023	5%				
21	10.00	0.34		0.20	0.156				1.00	0.35	0.34	0.156	0.12	0.019	4%				
22	9.70	0.32		0.19	0.050				1.00	0.40	0.32	0.050	0.13	0.006	1%				
LB	9.20	0.00	0.00						1.00	0.25	0.00	0.000	0.00	0.000					
Total Flow														0.459	100%				

Flow Measurement Details:

Metering Section Location (describe):
-Usual location at outlet

Meas. Start Time (MST):	11:35
Meas. End Time (MST):	11:58
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 10C



Flow characteristics:

Total Flow:	0.459	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.12	(m ²)
Wetted Width:	7.15	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.15	(m/s)
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	0.750	0.745
Water (°C):	1.6	1.8
Datalogger Clock:	11:10	12:17
Laptop Clock:	11:09	12:16
Battery (Main):	14.4	14.5
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-03	0.842	100.969		100.127	100.127	3/4" Pipe 2m SE of Station
L4-01			0.993	99.976	99.977	3/4" Pipe 4m NW of Station
L4-02			0.897	100.072	100.071	3/4" Pipe 5m SE of Station
Water Level:	Cut		3.012	97.957	Time WL Surveyed:	11:13
Temporary BM			2.939	98.030	0.000	-
Turn						
Temporary BM	2.925	100.955		98.030		-
Water Level:	Cut		2.994	97.961	Time WL Surveyed:	11:15
L4-02			0.882	100.073	100.071	3/4" Pipe 5m SE of Station
L4-01			0.977	99.978	99.977	3/4" Pipe 4m NW of Station
L4-03			0.826	100.129	100.127	3/4" Pipe 2m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
L4-01	0.977	100.954		99.977		
Water Level:	Cut		2.994	97.960	Time WL Surveyed:	12:11
Water Level:	Cut		2.978	97.961	Time WL Surveyed:	12:13
L4-01	0.962	100.939		99.977		

WL Survey Summary

	Before	After
Average WL:	97.959	97.961
Closing Error:	-0.002	-
WL Check:	0.004	-0.001
Transducer Elevation	97.209	97.216

Field Personnel:

SM, GG	Trip Date:	16-Apr-15
SM	Date:	16-Apr-15
GG	Date:	28-May-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date:

May 8, 2015

Site Visit Time (MST):

10:30



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)
RB	29.20	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	29.40	0.42		0.25	0.139					1.00	0.25	0.42	0.129	0.11	0.014	2%
2	29.70	0.42		0.25	0.180					1.00	0.30	0.42	0.180	0.13	0.023	3%
3	30.00	0.46		0.28	0.206					1.00	0.30	0.46	0.206	0.14	0.028	4%
4	30.30	0.50		0.30	0.184					1.00	0.30	0.50	0.184	0.15	0.028	4%
5	30.60	0.52		0.31	0.133					1.00	0.30	0.52	0.133	0.16	0.021	3%
6	30.90	0.56		0.34	0.188					1.00	0.30	0.56	0.188	0.17	0.032	4%
7	31.20	0.56		0.34	0.222					1.00	0.30	0.56	0.222	0.17	0.037	5%
8	31.50	0.58		0.35	0.224					1.00	0.30	0.58	0.224	0.17	0.038	5%
9	31.80	0.59		0.35	0.218					1.00	0.30	0.59	0.218	0.18	0.039	5%
10	32.10	0.61		0.37	0.217					1.00	0.30	0.61	0.217	0.18	0.040	6%
11	32.40	0.62		0.37	0.217					1.00	0.30	0.62	0.217	0.19	0.040	6%
12	32.70	0.63		0.38	0.207					1.00	0.30	0.63	0.207	0.19	0.039	6%
13	33.00	0.64		0.38	0.201					1.00	0.30	0.64	0.201	0.19	0.039	5%
14	33.30	0.66		0.40	0.221					1.00	0.30	0.66	0.221	0.20	0.044	6%
15	33.60	0.66		0.40	0.211					1.00	0.30	0.66	0.211	0.20	0.042	6%
16	33.90	0.66		0.40	0.190					1.00	0.30	0.66	0.190	0.20	0.038	5%
17	34.20	0.60		0.36	0.211					1.00	0.30	0.60	0.211	0.18	0.038	5%
18	34.50	0.56		0.34	0.225					1.00	0.30	0.56	0.225	0.17	0.038	5%
19	34.80	0.54		0.32	0.207					1.00	0.30	0.54	0.207	0.16	0.034	5%
20	35.10	0.44		0.26	0.169					1.00	0.35	0.44	0.169	0.15	0.026	4%
21	35.50	0.42		0.25	0.156					1.00	0.45	0.42	0.156	0.19	0.029	4%
22	36.00	0.32		0.19	0.023					1.00	0.50	0.32	0.023	0.16	0.004	1%
23	36.50	0.22		0.13	0.007					1.00	0.15	0.22	0.007	0.03	0.000	0%
LB	36.30	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
Total Flow														0.709	100%	

Flow Measurement Details:

Metering Section Location (describe):
-At outlet

Meas. Start Time (MST):	10:55
Meas. End Time (MST):	11:15
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, breezy, 5C

Flow characteristics:

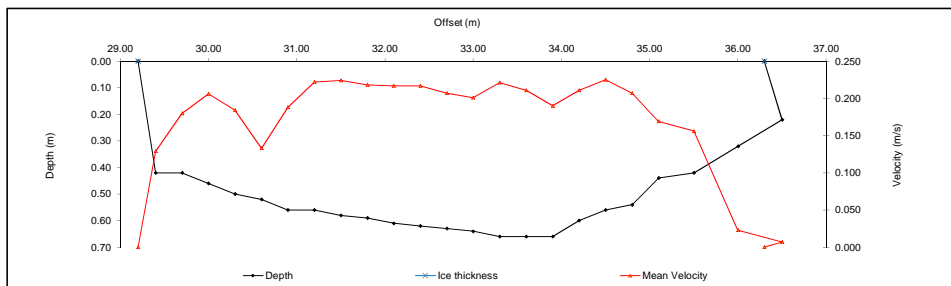
Total Flow:	0.709	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.75	(m ²)
Wetted Width:	7.30	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	0.823	0.822
Water (°C):	6.5	5.9
Datalogger Clock:	10:32	11:25
Laptop Clock:	10:32	11:25
Battery (Main):	14.5	14.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-03	0.451	100.578		100.127	100.127	3/4" Pipe 2m SE of Station
L4-01			0.602	99.976	99.977	3/4" Pipe 4m NW of Station
L4-02			0.507	100.071	100.071	3/4" Pipe 5m SE of Station
Water Level:	Cut		2.544	98.034	Time WL Surveyed:	10:36
Temporary BM			2.775	97.803		-
Turn						
Temporary BM	2.741	100.544		97.803		-
Water Level:	Cut		2.509	98.035	Time WL Surveyed:	10:37
L4-02			0.471	100.073	100.071	3/4" Pipe 5m SE of Station
L4-01			0.568	99.976	99.977	3/4" Pipe 4m NW of Station
L4-03			0.416	100.128	100.127	3/4" Pipe 2m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
L4-01	0.568	100.544		99.976		
Water Level:	Cut		2.505	98.039	Time WL Surveyed:	11:27
Water Level:	Cut		2.487	98.039	Time WL Surveyed:	11:28
L4-01	0.350	100.526		99.976		

WL Survey Summary	Before	After
Average WL:	98.035	98.039
Closing Error:	-0.001	-
WL Check:	0.001	0.000
Transducer Elevation	97.212	97.217

Field Personnel:	TR, CJ	Trip Date:	8-May-15
Data Entry Personnel:	CJ	Date:	8-May-15
Data Check Personnel:	GG	Date:	28-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake
 UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: June 9, 2015
 Site Visit Time (MST): 09:50

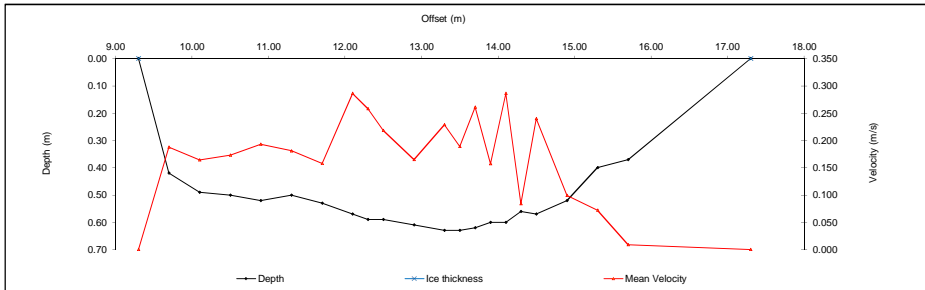


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)
RB	9.30	0.00	0.00	0.25	0.000	0.188	0.000	0.000	0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	9.70	0.42		0.25	0.188					1.00	0.40	0.42	0.188	0.17	0.032	5%
2	10.10	0.49		0.29	0.164					1.00	0.40	0.49	0.164	0.20	0.032	5%
3	10.50	0.50		0.30	0.173					1.00	0.40	0.50	0.173	0.20	0.035	6%
4	10.90	0.52		0.31	0.193					1.00	0.40	0.52	0.193	0.21	0.040	7%
5	11.30	0.50		0.30	0.181					1.00	0.40	0.50	0.181	0.20	0.036	6%
6	11.70	0.53		0.32	0.158					1.00	0.40	0.53	0.158	0.21	0.033	6%
7	12.10	0.57		0.34	0.286					1.00	0.30	0.57	0.286	0.17	0.049	8%
8	12.30	0.59		0.35	0.258					1.00	0.20	0.59	0.258	0.12	0.030	5%
9	12.50	0.59		0.35	0.218					1.00	0.30	0.59	0.218	0.18	0.039	6%
10	12.90	0.61		0.37	0.165					1.00	0.40	0.61	0.165	0.24	0.040	7%
11	13.30	0.63		0.38	0.229					1.00	0.30	0.63	0.229	0.19	0.043	7%
12	13.50	0.63		0.38	0.189					1.00	0.20	0.63	0.189	0.13	0.024	4%
13	13.70	0.62		0.37	0.261					1.00	0.20	0.62	0.261	0.12	0.032	5%
14	13.90	0.60		0.36	0.157					1.00	0.20	0.60	0.157	0.12	0.019	3%
15	14.10	0.60		0.36	0.286					1.00	0.20	0.60	0.286	0.12	0.034	6%
16	14.30	0.56		0.34	0.094					1.00	0.20	0.56	0.094	0.11	0.009	2%
17	14.50	0.57		0.34	0.240					1.00	0.30	0.57	0.240	0.17	0.041	7%
18	14.90	0.52		0.31	0.099					1.00	0.40	0.52	0.099	0.21	0.021	3%
19	15.30	0.40		0.24	0.072					1.00	0.40	0.40	0.072	0.16	0.012	2%
20	15.70	0.37		0.22	0.009					1.00	1.00	0.37	0.009	0.37	0.003	1%
LB	17.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.80	0.00	0.000	0.00	0.000	
Total Flow														0.605	100%	

Flow Measurement Details:

Metering Section Location (describe): -At outlet

Meas. Start Time (MST):	11:46
Meas. End Time (MST):	12:29
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, 18C



Flow characteristics:

Total Flow:	0.605	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.59	(m ²)
Wetted Width:	8.00	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.17	(m/s)
Reynolds Number:	6.26E+04	
Froude Number:	0.08	

Logger Details:

	Before	After	\$52
Transducer Reading (m):	0.794	0.780	0.561
Water (°C):	12.5	13.9	13.9
Datalogger Clock:	10:11	13:21	12:19
Laptop Clock:	10:10	13:19	12:19
Battery:	13.6	14.1	14.3
Battery Condition:	-	Good	new
Battery Serial #:	-	-	1205001
Enclosure Deseccant:	-	Replaced	new
Vent Tube Deseccant:	-	Good	new
PTW (if replaced):	-	-	298579
Logger# (if replaced):	-	-	25583

Datalogger / Station Notes:

- Installed a new station 50m from outlet, PT and TBRG
- WL very noisy
- Check S52 logger program, 15min WL and temp. data irregular and could not get precip. data to show

General Notes:

- Water level fluctuating 3cms first survey, moving 8cm during second

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-03		100.626		100.127	100.127	3/4" Pipe 2m SE of Station
L4-01	0.499		0.640	99.977	99.977	3/4" Pipe 4m NW of Station
L4-02			0.555	100.071	100.071	3/4" Pipe 5m SE of Station
Water Level:	Cut	0.432	3.058	98.000	Time WL Surveyed: 10:00	
Temporary BM			3.058	97.568	0.000	-
Turn						
Temporary BM	3.038	100.606		97.568		
Water Level:	Cut	0.432	3.038	98.000	Time WL Surveyed: 10:03	
L4-02			0.535	100.071	100.071	3/4" Pipe 5m SE of Station
L4-01			0.630	99.976	99.977	3/4" Pipe 4m NW of Station
L4-03			0.479	100.127	100.127	3/4" Pipe 2m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
L4-01	0.629	100.606		99.977		
Water Level:	Cut	0.280	2.895	97.991	Time WL Surveyed: 13:23	
Water Level:	Cut	0.280	2.877	97.990	Time WL Surveyed: 13:25	
L4-01	0.610	100.587		99.977		

WL Survey Summary

	Before	After
Average WL:	98.000	97.991
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	97.206	97.211

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

GG, TR, TB	Trip Date:	9-Jun-15
Data Entry Personnel: GG	Date:	9-Jun-15
Data Check Personnel: DW	Date:	1-Sep-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake
 UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: August 14, 2015
 Site Visit Time (MST): 08:00

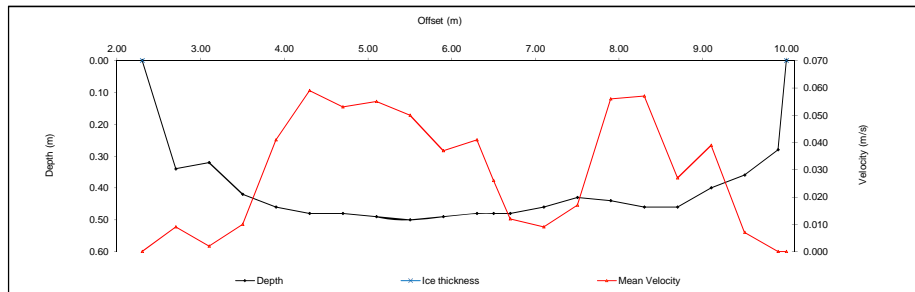


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)
Rb	2.30	0.00	0.00	0.20	0.000	0.009	0.000	0.000	0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	2.70	0.34		0.20	0.009					1.00	0.40	0.34	0.009	0.14	0.001	1%
2	3.10	0.32		0.19	0.002					1.00	0.40	0.32	0.002	0.13	0.000	0%
3	3.50	0.42		0.25	0.010					1.00	0.40	0.42	0.010	0.17	0.002	2%
4	3.90	0.46		0.28	0.041					1.00	0.40	0.46	0.041	0.18	0.008	7%
5	4.30	0.48		0.29	0.059					1.00	0.40	0.48	0.059	0.19	0.011	10%
6	4.70	0.48		0.29	0.053					1.00	0.40	0.48	0.053	0.19	0.010	9%
7	5.10	0.49		0.29	0.055					1.00	0.40	0.49	0.055	0.20	0.011	10%
8	5.50	0.50		0.30	0.050					1.00	0.40	0.50	0.050	0.20	0.010	9%
9	5.90	0.49		0.29	0.037					1.00	0.40	0.49	0.037	0.20	0.007	7%
10	6.30	0.48		0.29	0.041					1.00	0.30	0.48	0.041	0.14	0.006	5%
11	6.50	0.48		0.29	0.026					1.00	0.20	0.48	0.026	0.10	0.002	2%
12	6.70	0.48		0.29	0.012					1.00	0.30	0.48	0.012	0.14	0.002	2%
13	7.10	0.46		0.28	0.009					1.00	0.40	0.46	0.009	0.18	0.002	2%
14	7.50	0.43		0.26	0.017					1.00	0.40	0.43	0.017	0.17	0.003	3%
15	7.90	0.44		0.26	0.056					1.00	0.40	0.44	0.056	0.18	0.010	9%
16	8.30	0.46		0.28	0.057					1.00	0.40	0.46	0.057	0.18	0.010	10%
17	8.70	0.46		0.28	0.027					1.00	0.40	0.46	0.027	0.18	0.005	5%
18	9.10	0.40		0.24	0.039					1.00	0.40	0.40	0.039	0.16	0.006	6%
19	9.50	0.36		0.22	0.007					1.00	0.40	0.36	0.007	0.14	0.001	1%
20	9.90	0.28		0.17	0.000					1.00	0.25	0.28	0.000	0.07	0.000	0%
LB	10.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	1.00	0.05	0.00	0.000	0.00	0.000	
Total Flow														0.108	100%	

Flow Measurement Details:

Metering Section Location (describe): -At outlet

Meas. Start Time (MST):	8:40
Meas. End Time (MST):	9:20
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Overcast, windy



Flow characteristics:

Total Flow:	0.108	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	3.25	(m ²)
Wetted Width:	7.70	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.03	(m/s)
Reynolds Number:	1.30E+04	
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	0.692	0.702
Water (°C):	17.5	17.1
Datalogger Clock:	08:01	09:33
Laptop Clock:	08:00	09:35
Battery:	12.8	13.2
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Replaced	-
PT# (if replaced):	352306	-
Logger# (if replaced):	20962	-

Datalogger / Station Notes:

- Update sheet to include S52 logger details
- WL: 0.427
- Temp: 17
- V: 14.0
- Rain: 0
- Desiccants replaced

General Notes:

- 20cm waves causing WL fluctuations during survey
- Tipping bucket on angle: fixed, tested
- Wind affecting flow at outlet of lake, graded as fair

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-02	0.724	100.795		100.071	100.071	3/4" Pipe 5m SE of Station
L4-03			0.669	100.126	100.127	3/4" Pipe 2m SE of Station
L4-01			0.819	99.976	99.977	3/4" Pipe 4m NW of Station
Water Level:	Cut	0.190	3.105	97.880		Time WL Surveyed: 8:12
Temporary BM			3.105	97.690	0.000	
Turn						
Temporary BM	3.080	100.770		97.690		
Water Level:	Cut	0.190	3.080	97.880		Time WL Surveyed: 8:13
L4-01			0.793	99.977	99.977	3/4" Pipe 4m NW of Station
L4-03			0.643	100.127	100.127	3/4" Pipe 2m SE of Station
L4-02			0.699	100.071	100.071	3/4" Pipe 5m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
L4-01	0.794	100.771		99.977		
Water Level:	Cut	0.300	3.184	97.877		Time WL Surveyed: 9:30
Water Level:	Cut	0.300	3.172	97.881		Time WL Surveyed: 9:32
L4-01	0.776	100.753		99.977		

WL Survey Summary

	Before	After
Average WL:	97.850	97.879
Closing Error:	0.000	-
WL Check:	0.000	-0.004
Transducer Elevation	97.188	97.177

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	DW, JC	Trip Date:	14 Aug, 15
Data Check Personnel:	DW, JC	Date:	14-Aug-15
Entered Digitally in the Field:	Yes	Date:	1-Sep-15

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: September 15, 2015
Site Visit Time (MST): 09:15

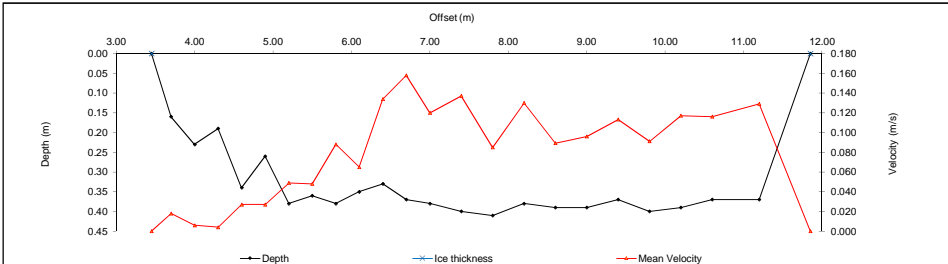


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)
RB	3.45	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	3.70	0.16		0.10	0.018					1.00	0.28	0.16	0.018	0.04	0.001	0%
2	4.00	0.23		0.14	0.006					1.00	0.30	0.23	0.006	0.07	0.000	0%
3	4.30	0.19		0.11	0.004					1.00	0.30	0.19	0.004	0.06	0.000	0%
4	4.60	0.34		0.20	0.027					1.00	0.30	0.34	0.027	0.10	0.003	1%
5	4.90	0.26		0.16	0.027					1.00	0.30	0.26	0.027	0.08	0.002	1%
6	5.20	0.38		0.23	0.049					1.00	0.30	0.38	0.049	0.11	0.006	2%
7	5.50	0.36		0.22	0.048					1.00	0.30	0.36	0.048	0.11	0.005	2%
8	5.80	0.38		0.23	0.088					1.00	0.30	0.38	0.088	0.11	0.010	4%
9	6.10	0.35		0.21	0.065					1.00	0.30	0.35	0.065	0.11	0.007	3%
10	6.40	0.33		0.20	0.134					1.00	0.30	0.33	0.134	0.10	0.013	5%
11	6.70	0.37		0.22	0.158					1.00	0.30	0.37	0.158	0.11	0.018	7%
12	7.00	0.38		0.23	0.120					1.00	0.35	0.38	0.120	0.13	0.016	6%
13	7.40	0.40		0.24	0.137					1.00	0.40	0.40	0.137	0.16	0.022	8%
14	7.80	0.41		0.25	0.085					1.00	0.40	0.41	0.085	0.16	0.014	5%
15	8.20	0.38		0.23	0.130					1.00	0.40	0.38	0.130	0.15	0.020	7%
16	8.60	0.39		0.23	0.089					1.00	0.40	0.39	0.089	0.16	0.014	5%
17	9.00	0.39		0.23	0.096					1.00	0.40	0.39	0.096	0.16	0.015	6%
18	9.40	0.37		0.22	0.113					1.00	0.40	0.37	0.113	0.15	0.017	6%
19	9.80	0.40		0.24	0.091					1.00	0.40	0.40	0.091	0.16	0.015	5%
20	10.20	0.39		0.23	0.117					1.00	0.40	0.39	0.117	0.16	0.018	7%
21	10.60	0.37		0.22	0.116					1.00	0.50	0.37	0.116	0.19	0.021	8%
22	11.20	0.37		0.22	0.129					1.00	0.63	0.37	0.129	0.23	0.030	11%
LB	11.85	0.00	0.00		0.00		0.00		0.00	1.00	0.33	0.00	0.000	0.00	0.000	
Total Flow														0.266	100%	

Flow Measurement Details:

Metering Section Location (describe): -30m downstream of the outlet

Meas. Start Time (MST):	10:03
Meas. End Time (MST):	10:31
Equipment:	ADV
Method:	Wading
River Condition:	Low low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, light breeze, 8C



Flow characteristics:

Total Flow:	0.266	(m ³ /s)
Perceived Measurement Quality:	Good	
Method:	Wading	
Cross Section Area:	2.80	(m ²)
Wetted Width:	8.40	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.619	0.620
Water (°C):	12.0	12.4
Datalogger Clock:	09:18	10:59
Laptop Clock:	09:18	10:59
Battery (Main):	12.5	13.0
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PTB (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Installed BM4 - lag bolt in conifer 6m N of logger
- SS2 PLS reading: 0.412
- WT: 11.3
- DL clock: 10:00
- laptop clock: 10:00
- Station battery voltage: 14.2

General Notes:

- Watch out for wasp nest in ground 2m behind BM2

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-03	0.740	100.867		100.127	100.127	3/4" Pipe 2m SE of Station
L4-01			0.891	99.976	99.977	3/4" Pipe 4m NW of Station
L4-02			0.780	100.087	100.071	3/4" Pipe 5m SE of Station
L4-04			0.732	100.135	0.000	Lag bolt in conifer 6m N of logger
Water Level:	Cut		3.037	97.830	Time WL Surveyed:	9:33
Temporary BM			2.978	97.889		-
Turn						
Temporary BM	2.933	100.822		97.889		-
Water Level:	Cut		2.996	97.826	Time WL Surveyed:	9:35
L4-04			0.696	100.136		Lag bolt in conifer 6m N of logger
L4-02			0.732	100.090	100.071	3/4" Pipe 5m SE of Station
L4-01			0.846	99.976	99.977	3/4" Pipe 4m NW of Station
L4-03			0.695	100.127	100.127	3/4" Pipe 2m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
L4-01	0.846	100.822		99.976		
Water Level:	Cut		2.992	97.830	Time WL Surveyed:	10:49
Water Level:	Cut		2.960	97.827	Time WL Surveyed:	10:50
L4-01	0.811	100.787		99.976		

WL Survey Summary

	Before	After
Average WL:	97.828	97.829
Closing Error:	0.000	-
WL Check:	0.004	0.003
Transducer Elevation	97.209	97.209

Field Personnel:

Personnel	Role	Trip Date
TL, CJ		15-Sep-15
CJ		15-Sep-15
DW		28-Sep-15
Yes		

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake
 UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: October 18, 2015
 Site Visit Time (MST): 08:25

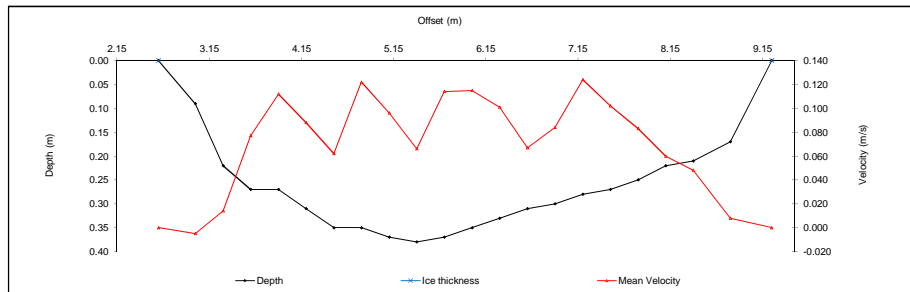


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)
Rb	9.25	0.00	0.00	0.10	0.000	0.00	0.000	0.00	0.000	1.00	0.23	0.00	0.000	0.00	0.000	0%
1	8.90	0.17		0.13	0.048					1.00	0.42	0.17	0.008	0.07	0.001	0%
2	8.40	0.21		0.13	0.060					1.00	0.35	0.21	0.048	0.07	0.004	2%
3	8.10	0.22		0.13	0.060					1.00	0.30	0.22	0.060	0.07	0.004	3%
4	7.80	0.25		0.15	0.083					1.00	0.30	0.25	0.083	0.07	0.006	4%
5	7.50	0.27		0.16	0.102					1.00	0.30	0.27	0.102	0.08	0.008	6%
6	7.20	0.28		0.17	0.124					1.00	0.30	0.28	0.124	0.08	0.010	7%
7	6.90	0.30		0.18	0.084					1.00	0.30	0.30	0.084	0.09	0.008	5%
8	6.60	0.31		0.19	0.067					1.00	0.30	0.31	0.067	0.09	0.006	4%
9	6.30	0.33		0.20	0.101					1.00	0.30	0.33	0.101	0.10	0.010	7%
10	6.00	0.35		0.21	0.115					1.00	0.30	0.35	0.115	0.11	0.012	8%
11	5.70	0.37		0.22	0.114					1.00	0.30	0.37	0.114	0.11	0.013	9%
12	5.40	0.38		0.23	0.066					1.00	0.30	0.38	0.066	0.11	0.008	5%
13	5.10	0.37		0.22	0.096					1.00	0.30	0.37	0.096	0.11	0.011	7%
14	4.80	0.35		0.21	0.122					1.00	0.30	0.35	0.122	0.11	0.013	9%
15	4.50	0.35		0.21	0.062					1.00	0.30	0.35	0.062	0.11	0.007	5%
16	4.20	0.31		0.19	0.088					1.00	0.30	0.31	0.088	0.09	0.008	6%
17	3.90	0.27		0.16	0.112					1.00	0.30	0.27	0.112	0.08	0.009	6%
18	3.60	0.27		0.16	0.077					1.00	0.30	0.27	0.077	0.08	0.006	4%
19	3.30	0.22		0.13	0.014					1.00	0.30	0.22	0.014	0.07	0.001	1%
20	3.00	0.09		0.05	-0.005					1.00	0.35	0.09	-0.005	0.03	0.000	0%
LB	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.20	0.00	0.000	0.00	0.000	0%
Total Flow														0.143	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -15m upstream of station

Meas. Start Time (MST):	8:50
Meas. End Time (MST):	9:10
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 12C



Flow characteristics:

Total Flow:	0.143	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.74	(m ²)
Wetted Width:	6.65	(m)
Hydraulic Depth:	0.26	(m)
Mean Velocity:	0.08	(m/s)
Reynolds Number:	1.50E+04	
Froude Number:	0.05	

Lake Logger Details:

	Before	After
Transducer Reading (m):	0.331	0.519
Water (°C):	7.4	7.1
Datalogger Clock:	08:29	09:34
Laptop Clock:	08:28	09:33
Battery:	12.8	12.8
Battery Condition:	-	Good
Battery Serial #:	-	Low
Enclosure Descendant:	-	Replaced
Vent Tube Descendant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-03	0.744	100.871		100.127	100.127	3/4" Pipe 2m SE of Station
L4-02			0.800	100.071	100.071	3/4" Pipe 5m SE of Station
L4-01			0.895	99.976	99.977	3/4" Pipe 4m NW of Station
Water Level:	Cut	0.064	3.203	97.732	Time WL Surveyed: 8:30	
Temporary BM			3.203	97.668	0.000	
Turn						
Temporary BM	3.180	100.848		97.668		
Water Level:	Cut	0.064	3.180	97.732	Time WL Surveyed: 8:32	
L4-01			0.871	99.977	99.977	3/4" Pipe 4m NW of Station
L4-02			0.777	100.071	100.071	3/4" Pipe 5m SE of Station
L4-03			0.720	100.128	100.127	3/4" Pipe 2m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
L4-01	0.871	100.848		99.977		
Water Level:	Cut	0.066	3.180	97.734	Time WL Surveyed: 9:28	
Water Level:	Cut	0.066	3.154	97.735	Time WL Surveyed: 9:30	
L4-01	0.847	100.824		99.977		

WL Survey Summary

	Before	After
Average WL:	97.732	97.735
Closing Error:	-0.001	-
WL Check:	0.000	-0.002
Transducer Elevation	97.201	97.216

Level Survey Equipment:

Level #:	Laval#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Datalogger / Station Notes:

General Notes:
 - WL fluctuating 5cm during survey

Field Personnel:

Data Entry Personnel:	GG
Date:	18-Oct-15
Entered Digitally in the Field:	Yes
Trip Date:	18-Oct-15
Data Check Personnel:	DW
Date:	23-Oct-15

Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake
 UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: December 3, 2015
 Site Visit Time (MST): 08:30

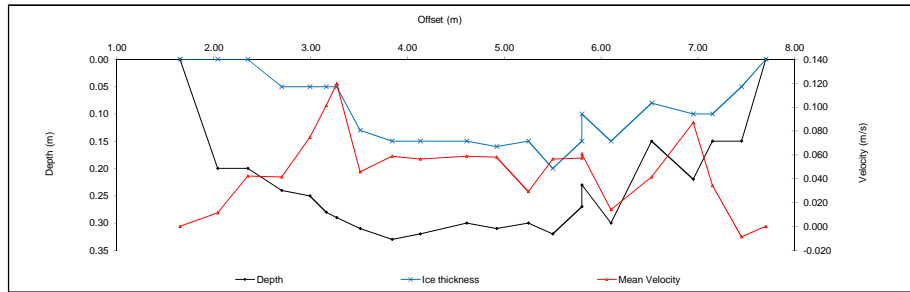


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to Bottom of Ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of Total Flow (%)
Rb	7.70	0.00	0.00	0.10	0.000				0.000	0.88	0.13	0.00	0.000	0.00	0.000	-1%
1	7.45	0.15	0.05	0.10	0.039				0.88	0.27	0.10	-0.009	0.03	0.000		
2	7.15	0.15	0.10	0.13	0.099				0.88	0.25	0.05	0.034	0.01	0.000	1%	
3	6.95	0.22	0.10	0.16	0.047				0.88	0.32	0.12	0.087	0.04	0.003	7%	
4	6.52	0.15	0.08	0.12	0.016				0.88	0.43	0.07	0.041	0.03	0.001	3%	
5	6.10	0.30	0.15	0.23	0.069				0.88	0.36	0.15	0.014	0.05	0.001	2%	
6	5.80	0.23	0.10	0.17	0.065				0.88	0.15	0.13	0.061	0.02	0.001	3%	
7	5.80	0.27	0.15	0.21	0.064				0.88	0.15	0.12	0.057	0.02	0.001	2%	
8	5.50	0.32	0.20	0.26	0.033				0.88	0.28	0.12	0.056	0.03	0.002	4%	
9	5.25	0.30	0.15	0.23	0.066				0.88	0.29	0.15	0.029	0.04	0.001	3%	
10	4.92	0.31	0.16	0.24	0.067				0.88	0.32	0.15	0.058	0.05	0.003	6%	
11	4.61	0.30	0.15	0.23	0.064				0.88	0.40	0.15	0.059	0.06	0.003	8%	
12	4.13	0.32	0.15	0.24	0.047				0.88	0.39	0.17	0.056	0.07	0.004	8%	
13	3.84	0.33	0.15	0.24	0.052				0.88	0.31	0.18	0.059	0.06	0.003	7%	
14	3.51	0.31	0.13	0.22	0.136				0.88	0.29	0.18	0.046	0.05	0.002	5%	
15	3.27	0.29	0.05	0.17	0.115				0.88	0.18	0.24	0.120	0.04	0.005	11%	
16	3.16	0.28	0.05	0.17	0.085				0.88	0.14	0.23	0.101	0.03	0.003	7%	
17	2.99	0.25	0.05	0.15	0.047				0.88	0.23	0.20	0.075	0.05	0.003	8%	
18	2.70	0.24	0.05	0.15	0.048				0.88	0.32	0.19	0.041	0.06	0.003	6%	
19	2.35	0.20	0.00	0.10	0.048				0.88	0.33	0.20	0.042	0.07	0.003	6%	
20	2.04	0.20	0.00	0.10	0.013				0.88	0.35	0.20	0.011	0.07	0.001	2%	
LB	1.65	0.00	0.00	0.00	0.00				0.88	0.20	0.00	0.000	0.00	0.000		
Total Flow														0.0442	100%	

Flow Measurement Details:

Metering Section Location (describe):
at outlet

Meas. Start Time (MST): 9:33
 Meas. End Time (MST): 10:09
 Equipment: ADV#1
 Flow Meter Make & Model: Sontek Flowtracker
 Flow Meter Serial #: P3398
 Method:
 River Condition: frozen
 Channel Edges: Trapezoidal Edge (e.g. stream)
 Quality/Error (see reverse): Good
 Weather: cloudy, calm, 0c



Flow characteristics:

Total Flow:	0.044	(m ³ /s)
Perceived Measuremt Quality:	Good	
Cross Section Area:	0.87	(m ²)
Wetted Width:	6.05	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.05	(m/s)
Reynolds Number:	4.15E+03	
Froude Number:	0.04	

Lake Logger Details:

	Before	After
Transducer Reading (m):	0.486	
Water (°C):	0.6	
Datalogger Clock:	09:53	
Laptop Clock:	08:31	
Battery:	12.7	
Battery Condition:	Replaced	
Battery Serial #:	Ice	
Enclosure Descicant:	Replaced	
Vant Tube Descicant:	Good	
PT# (if replaced):		
Logger# (if replaced):		

Outlet Logger Details:

	Before	After
Transducer Reading (m):	0.212	
Water (°C):	0.7	
Datalogger Clock:	10:24	
Laptop Clock:	09:24	
Battery:	13.1	
Battery Condition:	Good	
Battery Serial #:	Good	
Enclosure Descicant:	Good	
Vant Tube Descicant:	Good	
PT# (if replaced):		
Logger# (if replaced):		

Datalogger / Station Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
L4-01	1.115	101.092		99.977	99.977	3/4" Pipe 4m NW of Station
L4-03			0.963	100.129	100.127	3/4" Pipe 2m SE of Station
L4-02			1.019	100.073	100.071	3/4" Pipe 5m SE of Station
Water Level:	Cut		3.407	97.685		Time WL Surveyed: 8:36
Temporary BM			3.388	97.704	0.000	
Turn						
Temporary BM	3.363	101.067		97.704		
Water Level:	Cut		3.380	97.687		Time WL Surveyed: 8:40
L4-02			0.991	100.076	100.071	3/4" Pipe 5m SE of Station
L4-03			0.936	100.131	100.127	3/4" Pipe 2m SE of Station
L4-01			1.087	99.980	99.977	3/4" Pipe 4m NW of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.686	-
Closing Error:	-0.003	-
WL Check:	0.002	-
Transducer Elevation	97.200	-

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

General Notes:

ADV test passed

Field Personnel:

Data Entry Personnel:	GG, JM
Date:	3-Dec-15
Entered Digitally in the Field:	Yes
Trip Date:	3-Dec-15
Data Check Personnel:	SG
Date:	12-Jan-16

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: January 19, 2015
 Site Visit Time (MST): 13:30

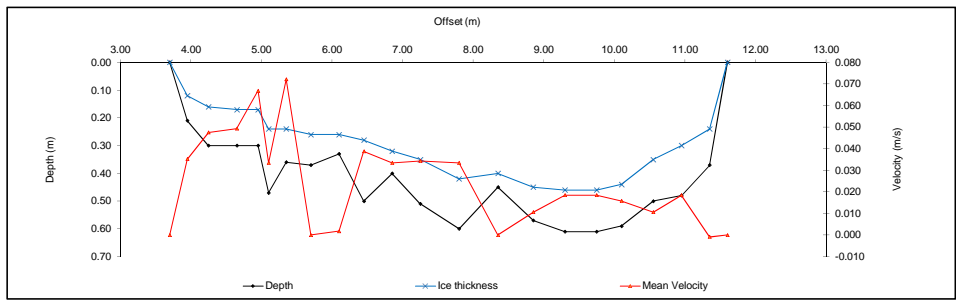


Flow Measurement:																
Measured Data											Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	3.70	0.00	0.00	0.17	0.000	0.000	0.000	0.000	0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	3.95	0.21	0.12	0.17	0.040					0.88	0.27	0.09	0.035	0.02	0.001	3%
2	4.25	0.30	0.16	0.23	0.054					0.88	0.35	0.14	0.048	0.05	0.002	8%
3	4.65	0.30	0.17	0.24	0.056					0.88	0.35	0.13	0.049	0.05	0.002	8%
4	4.95	0.30	0.17	0.24	0.076					0.88	0.23	0.13	0.067	0.03	0.002	7%
5	5.10	0.47	0.24	0.36	0.038					0.88	0.20	0.23	0.033	0.05	0.002	6%
6	5.35	0.36	0.24	0.30	0.082					0.88	0.30	0.12	0.072	0.04	0.003	9%
7	5.70	0.37	0.26	0.32	0.000					0.88	0.38	0.11	0.000	0.04	0.000	0%
8	6.10	0.33	0.26	0.30	0.002					0.88	0.38	0.07	0.002	0.03	0.000	0%
9	6.45	0.50	0.28	0.39	0.044					0.88	0.38	0.22	0.039	0.08	0.003	12%
10	6.85	0.40	0.32	0.36	0.038					0.88	0.40	0.08	0.033	0.03	0.001	4%
11	7.25	0.51	0.35	0.43	0.039					0.88	0.48	0.16	0.034	0.08	0.003	9%
12	7.80	0.60	0.42	0.51	0.038					0.88	0.55	0.18	0.033	0.10	0.003	12%
13	8.35	0.45	0.40	0.43	0.000					0.88	0.53	0.05	0.000	0.03	0.000	0%
14	8.85	0.57	0.45	0.51	0.012					0.88	0.48	0.12	0.011	0.06	0.001	2%
15	9.30	0.61	0.46	0.54	0.021					0.88	0.45	0.15	0.018	0.07	0.001	5%
16	9.75	0.61	0.46	0.54	0.021					0.88	0.40	0.15	0.018	0.06	0.001	4%
17	10.10	0.59	0.44	0.52	0.018					0.88	0.40	0.15	0.016	0.06	0.001	3%
18	10.55	0.50	0.35	0.43	0.012					0.88	0.43	0.15	0.011	0.06	0.001	2%
19	10.95	0.48	0.30	0.39	0.021					0.88	0.40	0.18	0.018	0.07	0.001	5%
20	11.35	0.37	0.24	0.31	-0.001					0.88	0.33	0.13	-0.001	0.04	0.000	0%
LB	11.60	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.88	0.13	0.00	0.000	0.00	0.000	
Total Flow														0.028	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -10m downstream of bridge

Meas. Start Time (MST):	14:03
Meas. End Time (MST):	14:32
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, -12C



Flow characteristics:

Total Flow:	0.028	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.04	(m ²)
Wetted Width:	7.90	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	0.653	
Water (°C):	0.2	
Datalogger Clock:	13:32	
Laptop Clock:	13:32	
Battery:	13.6	
Battery Condition:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-07	2.434	300.866		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.442	298.424	298.420	3/4" Pipe 20m ESE of logger
S02-05			3.193	297.673	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut		4.063	296.803	Time WL Surveyed: 14:36	
Temporary BM			3.935	296.931	0.000	
Turn						
Temporary BM	3.908	300.839		296.931		
Water Level:	Cut		4.038	296.801	Time WL Surveyed: 14:41	
S02-05			3.165	297.674	297.670	3/4" Pipe 5m South of logger
S02-06			2.415	298.424	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.408	298.431	298.432	3/4" Pipe 15m SSE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	296.802	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	296.149	-

Field Personnel:

Field Personnel:	TR, GG	Trip Date:	19-Jan-15
Data Entry Personnel:	TR	Date:	19-Jan-15
Data Check Personnel:	CJ	Date:	20-Jan-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: February 17, 2015
 Site Visit Time (MST): 13:30

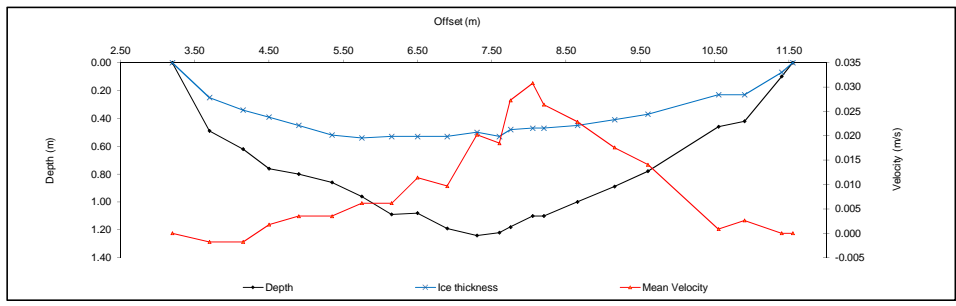


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	11.55	0.00	0.00		0.000		0.000		0.000	0.88	0.08	0.00	0.000	0.00	0.000	
1	11.40	0.10	0.07	0.09	0.000					0.88	0.33	0.03	0.000	0.01	0.000	0%
2	10.90	0.42	0.23	0.33	0.003					0.88	0.42	0.19	0.003	0.08	0.000	0%
3	10.55	0.46	0.23	0.35	0.001					0.88	0.65	0.23	0.001	0.15	0.000	0%
4	9.60	0.78	0.37	0.58	0.016					0.88	0.70	0.41	0.014	0.29	0.004	9%
5	9.15	0.89	0.41	0.65	0.020					0.88	0.48	0.48	0.018	0.23	0.004	9%
6	8.65	1.00	0.45	0.73	0.026					0.88	0.48	0.55	0.023	0.26	0.006	13%
7	8.20	1.10	0.47	0.79	0.030					0.88	0.30	0.63	0.026	0.19	0.005	11%
8	8.05	1.10	0.47	0.79	0.035					0.88	0.23	0.63	0.031	0.14	0.004	10%
9	7.75	1.18	0.48	0.83	0.031					0.88	0.23	0.70	0.027	0.16	0.004	10%
10	7.60	1.22	0.53	0.88	0.021					0.88	0.23	0.69	0.018	0.16	0.003	8%
11	7.30	1.24	0.50	0.87	0.023					0.88	0.35	0.74	0.020	0.26	0.005	12%
12	6.90	1.19	0.53	0.86	0.011					0.88	0.40	0.66	0.010	0.26	0.003	6%
13	6.50	1.08	0.53	0.81	0.013					0.88	0.38	0.55	0.011	0.21	0.002	5%
14	6.15	1.09	0.53	0.81	0.007					0.88	0.38	0.56	0.006	0.21	0.001	3%
15	5.75	0.96	0.54	0.75	0.007					0.88	0.40	0.42	0.006	0.17	0.001	2%
16	5.35	0.86	0.52	0.69	0.004					0.88	0.43	0.34	0.004	0.14	0.001	1%
17	4.90	0.80	0.45	0.63	0.004					0.88	0.43	0.35	0.004	0.15	0.001	1%
18	4.50	0.76	0.39	0.58	0.002					0.88	0.38	0.37	0.002	0.14	0.000	1%
19	4.15	0.62	0.34	0.48	-0.002					0.88	0.40	0.28	-0.002	0.11	0.000	0%
20	3.70	0.49	0.25	0.37	-0.002					0.88	0.48	0.24	-0.002	0.11	0.000	0%
LB	3.20	0.00	0.00		0.00		0.00		0.00	0.88	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.044	100%	

Flow Measurement Details:

Metering Section Location (describe): -3m downstream of bridge

Meas. Start Time (MST):	14:10
Meas. End Time (MST):	14:35
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -13 C



Flow characteristics:

Total Flow:	0.044	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.43	(m ²)
Wetted Width:	8.35	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	0.680	
Water (°C):	0.1	
Datalogger Clock:	13:38	
Laptop Clock:	13:38	
Battery:	14.8	
Battery Condition:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:
 -installed new modem
 -RSSI: -88

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-07	2.378	300.810		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.387	298.423	298.420	3/4" Pipe 20m ESE of logger
S02-05			3.131	297.679	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut		3.973	296.837	Time WL Surveyed:	14:42
Temporary BM			3.837	296.973	0.000	-
Turn						
Temporary BM	3.808	300.781		296.973		-
Water Level:	Cut		3.942	296.839	Time WL Surveyed:	14:45
S02-05			3.100	297.681	297.670	3/4" Pipe 5m South of logger
S02-06			2.357	298.424	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.349	298.432	298.432	3/4" Pipe 15m SSE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	296.838	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	296.158	-

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	17-Feb-15
Data Check Personnel:	TR	Date:	17-Feb-15
Entered Digitally in the Field:	CJ	Date:	23-Feb-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: March 3, 2015
 Site Visit Time (MST): 13:25

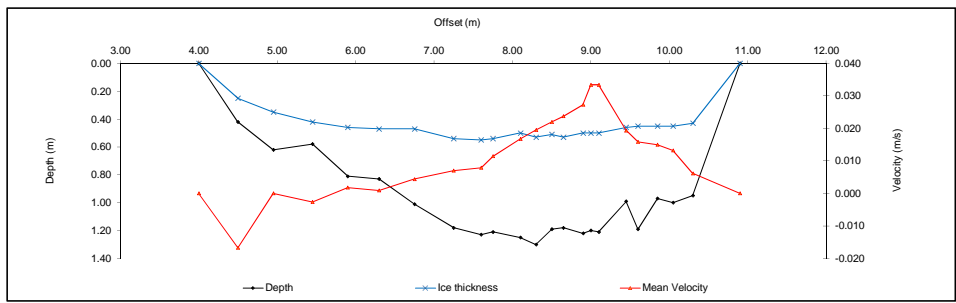


Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	10.90	0.00	0.00		0.000		0.000		0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	10.30	0.95	0.43	0.69	0.007					0.88	0.43	0.52	0.006	0.22	0.001	4%
2	10.05	1.00	0.45	0.73	0.015					0.88	0.23	0.55	0.013	0.12	0.002	4%
3	9.85	0.97	0.45	0.71	0.017					0.88	0.23	0.52	0.015	0.12	0.002	5%
4	9.60	1.19	0.45	0.82	0.018					0.88	0.20	0.74	0.016	0.15	0.002	6%
5	9.45	0.99	0.46	0.73	0.022					0.88	0.25	0.53	0.019	0.13	0.003	7%
6	9.10	1.21	0.50	0.86	0.038					0.88	0.22	0.71	0.033	0.16	0.005	14%
7	9.00	1.20	0.50	0.85	0.038					0.88	0.10	0.70	0.033	0.07	0.002	6%
8	8.90	1.22	0.50	0.86	0.031					0.88	0.17	0.72	0.027	0.13	0.003	9%
9	8.65	1.18	0.53	0.86	0.027					0.88	0.20	0.65	0.024	0.13	0.003	8%
10	8.50	1.19	0.51	0.85	0.025					0.88	0.17	0.68	0.022	0.12	0.003	7%
11	8.30	1.30	0.53			1.15	0.015	0.68	0.024	1.00	0.20	0.77	0.020	0.15	0.003	8%
12	8.10	1.25	0.50	0.88	0.019					0.88	0.27	0.75	0.017	0.21	0.003	9%
13	7.75	1.21	0.54	0.88	0.013					0.88	0.25	0.67	0.011	0.17	0.002	5%
14	7.60	1.23	0.55	0.89	0.009					0.88	0.25	0.68	0.008	0.17	0.001	4%
15	7.25	1.18	0.54	0.86	0.008					0.88	0.43	0.64	0.007	0.27	0.002	5%
16	6.75	1.01	0.47	0.74	0.005					0.88	0.48	0.54	0.004	0.26	0.001	3%
17	6.30	0.83	0.47	0.65	0.001					0.88	0.43	0.36	0.001	0.15	0.000	0%
18	5.90	0.81	0.46	0.64	0.002					0.88	0.42	0.35	0.002	0.15	0.000	1%
19	5.45	0.58	0.42	0.50	-0.003					0.88	0.48	0.16	-0.003	0.08	0.000	-1%
20	4.95	0.62	0.35	0.49	0.000					0.88	0.48	0.27	0.000	0.13	0.000	0%
21	4.50	0.42	0.25	0.34	-0.019					0.88	0.48	0.17	-0.017	0.08	-0.001	-4%
LB	4.00	0.00	0.00		0.00		0.00		0.00	0.88	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.038	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -3m downstream of bridge

Meas. Start Time (MST):	14:30
Meas. End Time (MST):	15:00
Equipment:	ADV
Method:	Ice
River Condition:	Thick ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, -18C



Flow characteristics:

Total Flow:	0.038	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.16	(m ²)
Wetted Width:	6.90	(m)
Hydraulic Depth:	0.46	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	0.673	
Water (°C):	0.1	
Datalogger Clock:	13:32	
Laptop Clock:	13:32	
Battery:	14.8	
Battery Condition:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Good
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

- Omni antenna cable replaced
- Checked RSSI: -81

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-07	2.419	300.851		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.429	298.422	298.420	3/4" Pipe 20m ESE of logger
S02-05			3.175	297.676	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut			296.818		Time WL Surveyed: 15:10
Temporary BM			3.967	296.884	0.000	-
Turn						
Temporary BM	3.941	300.825		296.884		-
Water Level:	Cut		4.009	296.816		Time WL Surveyed: 15:13
S02-05			3.148	297.677	297.670	3/4" Pipe 5m South of logger
S02-06			2.405	298.420	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.394	298.431	298.432	3/4" Pipe 15m SSE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	296.817	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	296.144	-

Field Personnel:

	MP, TR	Trip Date:	3-Mar-15
Data Entry Personnel:	MP	Date:	3-Mar-15
Data Check Personnel:	CJ	Date:	23-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: April 23, 2015
 Site Visit Time (MST): 11:18



Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	8.00	0.00			0.000			0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	8.40	0.22	0.13	0.042					1.00	0.45	0.22	0.042	0.10	0.004	0%
2	8.90	0.40	0.24	0.199					1.00	0.50	0.40	0.199	0.20	0.040	2%
3	9.40	0.45	0.27	0.230					1.00	0.50	0.45	0.230	0.23	0.052	3%
4	9.90	0.49	0.29	0.241					1.00	0.50	0.49	0.241	0.25	0.059	4%
5	10.40	0.48	0.29	0.315					1.00	0.50	0.48	0.315	0.24	0.076	5%
6	10.90	0.44	0.26	0.279					1.00	0.50	0.44	0.279	0.22	0.061	4%
7	11.40	0.65	0.39	0.295					1.00	0.50	0.65	0.295	0.33	0.096	6%
8	11.90	0.62	0.37	0.310					1.00	0.50	0.62	0.310	0.31	0.096	6%
9	12.40	0.62	0.37	0.353					1.00	0.50	0.62	0.353	0.31	0.109	7%
10	12.90	0.61	0.37	0.367					1.00	0.50	0.61	0.367	0.31	0.112	7%
11	13.40	0.59	0.35	0.411					1.00	0.50	0.59	0.411	0.30	0.121	7%
12	13.90	0.58	0.35	0.481					1.00	0.50	0.58	0.481	0.29	0.139	9%
13	14.40	0.55	0.33	0.447					1.00	0.50	0.55	0.447	0.28	0.123	7%
14	14.90	0.53	0.32	0.263					1.00	0.50	0.53	0.263	0.27	0.070	4%
15	15.40	0.53	0.32	0.190					1.00	0.50	0.53	0.190	0.27	0.050	3%
16	15.90	0.56	0.34	0.471					1.00	0.50	0.56	0.471	0.28	0.132	8%
17	16.40	0.46	0.28	0.477					1.00	0.50	0.46	0.477	0.23	0.110	7%
18	16.90	0.39	0.23	0.388					1.00	0.50	0.39	0.388	0.20	0.076	5%
19	17.40	0.40	0.24	0.305					1.00	0.50	0.40	0.305	0.20	0.061	4%
20	17.90	0.40	0.24	0.329					1.00	0.40	0.40	0.329	0.16	0.053	3%
RB	18.20	0.00	0.00	0.00				0.00	1.00	0.15	0.00	0.000	0.00	0.000	
Total Flow													1.64	100%	

Flow Measurement Details:

Metering Section Location (describe): -5m downstream of bridge

Meas. Start Time (MST):	11:50
Meas. End Time (MST):	12:12
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 8C

Flow characteristics:

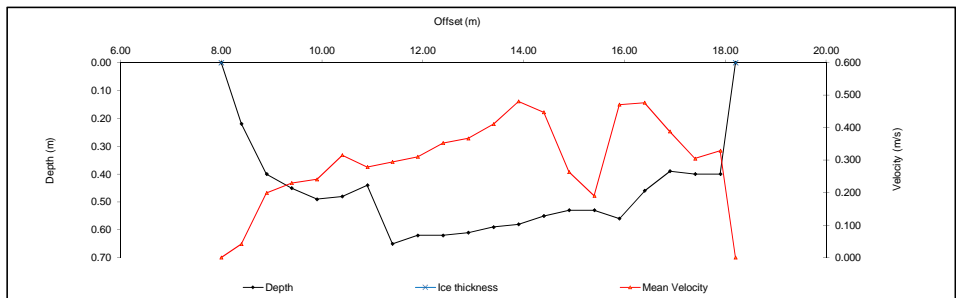
Total Flow:	1.64	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.93	(m ²)
Wetted Width:	10.20	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.33	(m/s)
Froude Number:	0.15	

Logger Details:

	Before	After
Transducer Reading (m):	0.921	0.922
Water (°C):	3.8	3.8
Datalogger Clock:	11:24	12:22
Laptoe Clock:	11:24	12:22
Battery:	14.0	14.6
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-07	2.182	300.614		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.199	298.415	298.420	3/4" Pipe 20m ESE of logger
S02-05			2.930	297.684	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut		3.540	297.074	Time WL Surveyed:	11:39
Temporary BM			3.883	296.731	0.000	-
Turn						
Temporary BM	3.868	300.599		296.731		-
Water Level:	Cut		3.523	297.076	Time WL Surveyed:	11:42
S02-05			2.913	297.686	297.670	3/4" Pipe 5m South of logger
S02-06			2.183	298.416	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.166	298.433	298.432	3/4" Pipe 15m SSE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S02-06	2.183	300.599		298.416		
Water Level:	Cut		3.522	297.077	Time WL Surveyed:	12:18
Water Level:	Cut		3.502	297.078	Time WL Surveyed:	12:19
S02-06	2.164	300.580		298.416		

WL Survey Summary

	Before	After
Average WL:	297.075	297.078
Closing Error:	-0.001	-
WL Check:	0.002	-0.001
Transducer Elevation	296.154	296.156

Field Personnel:

GG, SM	Trip Date:	23-Apr-15
SM	Date:	23-Apr-15
CJ	Date:	24-Apr-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: May 12, 2015
 Site Visit Time (MST): 14:50

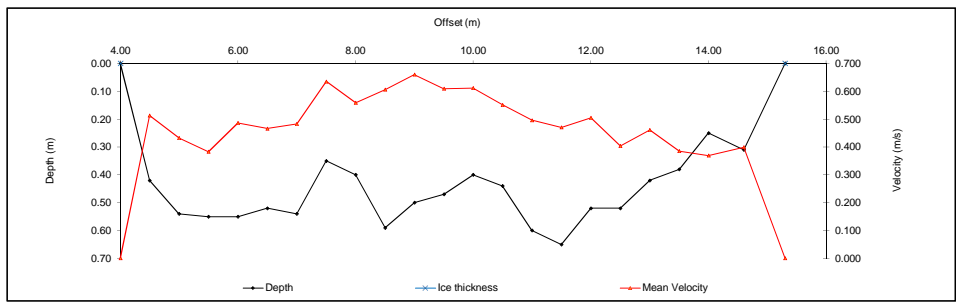


Measured Data													Calculated Data				
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
RB	4.00	0.00	0.00							1.00	0.25	0.00	0.000	0.00	0.000		
1	4.50	0.42		0.25	0.513					1.00	0.50	0.42	0.513	0.21	0.108	4%	
2	5.00	0.54		0.32	0.432					1.00	0.50	0.54	0.432	0.27	0.117	5%	
3	5.50	0.55		0.33	0.383					1.00	0.50	0.55	0.383	0.28	0.105	4%	
4	6.00	0.55		0.33	0.486					1.00	0.50	0.55	0.486	0.28	0.134	5%	
5	6.50	0.52		0.31	0.466					1.00	0.50	0.52	0.466	0.26	0.121	5%	
6	7.00	0.54		0.32	0.483					1.00	0.50	0.54	0.483	0.27	0.130	5%	
7	7.50	0.35		0.21	0.635					1.00	0.50	0.35	0.635	0.18	0.111	4%	
8	8.00	0.40		0.24	0.559					1.00	0.50	0.40	0.559	0.20	0.112	4%	
9	8.50	0.59		0.35	0.606					1.00	0.50	0.59	0.606	0.30	0.179	7%	
10	9.00	0.50		0.30	0.660					1.00	0.50	0.50	0.660	0.25	0.165	7%	
11	9.50	0.47		0.28	0.609					1.00	0.50	0.47	0.609	0.24	0.143	6%	
12	10.00	0.40		0.24	0.611					1.00	0.50	0.40	0.611	0.20	0.122	5%	
13	10.50	0.44		0.26	0.551					1.00	0.50	0.44	0.551	0.22	0.121	5%	
14	11.00	0.60		0.36	0.496					1.00	0.50	0.60	0.496	0.30	0.149	6%	
15	11.50	0.65		0.39	0.470					1.00	0.50	0.65	0.470	0.33	0.153	6%	
16	12.00	0.52		0.31	0.505					1.00	0.50	0.52	0.505	0.26	0.131	5%	
17	12.50	0.52		0.31	0.403					1.00	0.50	0.52	0.403	0.26	0.105	4%	
18	13.00	0.42		0.25	0.461					1.00	0.50	0.42	0.461	0.21	0.097	4%	
19	13.50	0.38		0.23	0.385					1.00	0.50	0.38	0.385	0.19	0.073	3%	
20	14.00	0.25		0.15	0.369					1.00	0.55	0.25	0.369	0.14	0.051	2%	
21	14.60	0.31		0.19	0.399					1.00	0.65	0.31	0.399	0.20	0.080	3%	
LB	15.30	0.00	0.00		0.00					1.00	0.35	0.00	0.000	0.00	0.000		
Total Flow														2.51	100%		

Flow Measurement Details:

Metering Section Location (describe):
-12m downstream of bridge

Meas. Start Time (MST):	15:10
Meas. End Time (MST):	15:30
Equipment:	ADV
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 26C



Flow characteristics:

Total Flow:	2.51	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.02	(m ²)
Wetted Width:	11.30	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.50	(m/s)
Froude Number:	0.24	

Logger Details:

	Before	After
Transducer Reading (m):	0.992	0.992
Water (°C):	9.1	9.2
Datalogger Clock:	14:56	15:32
Laptop Clock:	14:55	15:32
Battery:	13.6	13.6
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-07	2.301	300.733		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.308	298.425	298.420	3/4" Pipe 20m ESE of logger
S02-05			3.041	297.692	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut		3.581	297.152		Time WL Surveyed: 15:04
Temporary BM			2.741	297.992	0.000	
Turn						
Temporary BM	2.721	300.713		297.992		
Water Level:	Cut		3.561	297.152		Time WL Surveyed: 15:06
S02-05			3.021	297.692	297.670	3/4" Pipe 5m South of logger
S02-06			2.288	298.425	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.281	298.432	298.432	3/4" Pipe 15m SSE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S02-05	3.022	300.714		297.692		
Water Level:	Cut		3.561	297.153		Time WL Surveyed: 15:36
Water Level:	Cut		3.544	297.152		Time WL Surveyed: 15:38
S02-05	3.004	300.696		297.692		

WL Survey Summary

	Before	After
Average WL:	297.152	297.153
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	296.160	296.161

Field Personnel:

Data Entry Personnel:	TR, SM	Trip Date:	12-May-15
Data Check Personnel:	TR	Date:	12-May-15
Entered Digitally in the Field:	CJ	Date:	25-Jun-15

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: June 12, 2015
 Site Visit Time (MST): 13:20



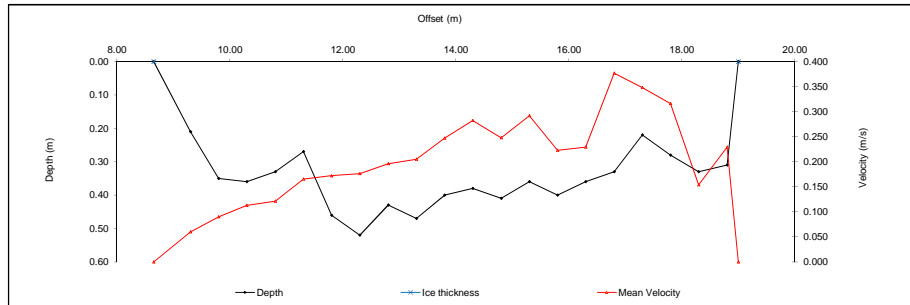
Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	19.00	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	18.80	0.31		0.19	0.229					1.00	0.35	0.31	0.229	0.11	0.025	3%
2	18.30	0.33		0.20	0.154					1.00	0.50	0.33	0.154	0.17	0.025	3%
3	17.80	0.28		0.17	0.316					1.00	0.50	0.28	0.316	0.14	0.044	6%
4	17.30	0.22		0.13	0.348					1.00	0.50	0.22	0.348	0.11	0.038	5%
5	16.80	0.33		0.20	0.377					1.00	0.50	0.33	0.377	0.17	0.062	8%
6	16.30	0.36		0.22	0.229					1.00	0.50	0.36	0.229	0.18	0.041	6%
7	15.80	0.40		0.24	0.223					1.00	0.50	0.40	0.223	0.20	0.045	6%
8	15.30	0.36		0.22	0.292					1.00	0.50	0.36	0.292	0.18	0.053	7%
9	14.80	0.41		0.25	0.248					1.00	0.50	0.41	0.248	0.21	0.051	7%
10	14.30	0.38		0.23	0.282					1.00	0.50	0.38	0.282	0.19	0.054	7%
11	13.80	0.40		0.24	0.247					1.00	0.50	0.40	0.247	0.20	0.049	7%
12	13.30	0.47		0.28	0.205					1.00	0.50	0.47	0.205	0.24	0.048	6%
13	12.80	0.43		0.25	0.196					1.00	0.50	0.43	0.196	0.22	0.042	6%
14	12.30	0.52		0.31	0.176					1.00	0.50	0.52	0.176	0.26	0.046	6%
15	11.80	0.46		0.28	0.172					1.00	0.50	0.46	0.172	0.23	0.040	5%
16	11.30	0.27		0.16	0.165					1.00	0.50	0.27	0.165	0.14	0.022	3%
17	10.80	0.33		0.20	0.121					1.00	0.50	0.33	0.121	0.17	0.020	3%
18	10.30	0.36		0.22	0.113					1.00	0.50	0.36	0.113	0.18	0.020	3%
19	9.80	0.35		0.21	0.090					1.00	0.50	0.35	0.090	0.18	0.016	2%
20	9.30	0.21		0.13	0.060					1.00	0.57	0.21	0.060	0.12	0.007	1%
LB	8.65	0.00	0.00		0.000		0.000		0.000	1.00	0.33	0.00	0.000	0.00	0.000	
Total Flow														0.748	100%	

Flow Measurement Details:

Metering Section Location (describe):
-10m downstream of bridge

Meas. Start Time (MST):	13:40
Meas. End Time (MST):	14:00
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20 C



Flow characteristics:

Total Flow:	0.748	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.56	(m ²)
Wetted Width:	10.35	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.21	(m/s)
Reynolds Number:	6.48E+04	
Froude Number:	0.11	

Logger Details:

	Before	After
Transducer Reading (m):	0.742	0.742
Water (°C):	16.1	16.3
Datalogger Clock:	13:23	14:38
Laptop Clock:	13:22	14:08
Battery:	13.7	13.6
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-07	2.242	300.674		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.244	298.430	298.420	3/4" Pipe 20m ESE of logger
S02-05			2.979	297.695	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut	0.170	3.931	296.913	296.913	Time WL Surveyed: 13:28
Temporary BM			3.931	296.743	0.000	-
Turn						
Temporary BM	3.868	300.611		296.743		
Water Level:	Cut	0.170	3.868	296.913	296.913	Time WL Surveyed: 13:29
S02-05			2.918	297.693	297.670	3/4" Pipe 5m South of logger
S02-06			2.182	298.429	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.179	298.432	298.432	3/4" Pipe 15m SSE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S02-05	2.916	300.610		297.694	297.694	
Water Level:	Cut	0.161	3.868	296.902	296.902	Time WL Surveyed: 14:05
Water Level:	Cut	0.161	3.845	296.902	296.902	Time WL Surveyed: 14:06
S02-05	2.892	300.586		297.694		

WL Survey Summary

	Before	After
Average WL:	296.913	296.902
Closing Error:	0.000	0.000
WL Check:	0.000	0.000
Transducer Elevation	296.171	296.160

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	TR	Trip Date:	12-Jun-15
Data Check Personnel:	CJ	Date:	25-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: August 11, 2015
 Site Visit Time (MST): 15:00

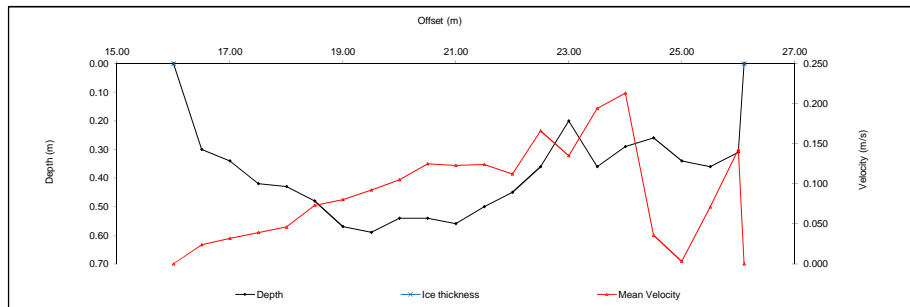


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	26.10	0.00	0.00		0.000				0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	26.00	0.31		0.19	0.143					1.00	0.30	0.31	0.143	0.09	0.013	3%
2	25.50	0.36		0.22	0.071					1.00	0.50	0.36	0.071	0.18	0.013	3%
3	25.00	0.34		0.20	0.003					1.00	0.50	0.34	0.003	0.17	0.001	0%
4	24.50	0.26		0.16	0.036					1.00	0.50	0.26	0.036	0.13	0.005	1%
5	24.00	0.29		0.17	0.213					1.00	0.50	0.29	0.213	0.15	0.031	8%
6	23.50	0.36		0.22	0.194					1.00	0.50	0.36	0.194	0.18	0.035	9%
7	23.00	0.20		0.12	0.135					1.00	0.50	0.20	0.135	0.10	0.014	3%
8	22.50	0.36		0.22	0.166					1.00	0.50	0.36	0.166	0.18	0.030	8%
9	22.00	0.45		0.27	0.112					1.00	0.50	0.45	0.112	0.23	0.025	6%
10	21.50	0.50		0.30	0.124					1.00	0.50	0.50	0.124	0.25	0.031	8%
11	21.00	0.56		0.34	0.123					1.00	0.50	0.56	0.123	0.28	0.034	9%
12	20.50	0.54		0.32	0.125					1.00	0.50	0.54	0.125	0.27	0.034	9%
13	20.00	0.54		0.32	0.105					1.00	0.50	0.54	0.105	0.27	0.028	7%
14	19.50	0.59		0.35	0.092					1.00	0.50	0.59	0.092	0.30	0.027	7%
15	19.00	0.57		0.34	0.080					1.00	0.50	0.57	0.080	0.29	0.023	6%
16	18.50	0.48		0.29	0.073					1.00	0.50	0.48	0.073	0.24	0.018	5%
17	18.00	0.43		0.26	0.046					1.00	0.50	0.43	0.046	0.22	0.010	3%
18	17.50	0.42		0.25	0.039					1.00	0.50	0.42	0.039	0.21	0.008	2%
19	17.00	0.34		0.20	0.032					1.00	0.50	0.34	0.032	0.17	0.005	1%
20	16.50	0.30		0.18	0.024					1.00	0.50	0.30	0.024	0.15	0.004	1%
LB	16.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.388	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -8m downstream of bridge

Meas. Start Time (MST):	15:20
Meas. End Time (MST):	15:38
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast



Flow characteristics:

Total Flow:	0.388	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.04	(m ²)
Wetted Width:	10.10	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.10	(m/s)
Reynolds Number:	3.79E+04	
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.746	0.493
Water (°C):	18.2	21.5
Datalogger Clock:	15:03	16:09
Laptop Clock:	15:02	16:09
Battery:	13.5	13.4
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	268453	326858
Logger# (if replaced):	14563	-

Datalogger / Station Notes:

-Water level record suggests that a downstream beaver dam released on 29-July

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-07	2.923	301.355		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.925	298.430	298.420	3/4" Pipe 20m ESE of logger
S02-05			3.659	297.696	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut	0.221	4.657	296.919		Time WL Surveyed: 15:11
S02-05			3.659	297.696	297.670	3/4" Pipe 5m South of logger
Turn						
S02-05	3.622	301.318		297.696	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut	0.221	4.617	296.922		Time WL Surveyed: 15:12
S02-05			3.622	297.696	297.670	3/4" Pipe 5m South of logger
S02-06			2.988	298.430	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.887	298.431	298.432	3/4" Pipe 15m SSE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S02-05	3.620	301.316		297.696		Time WL Surveyed: 16:14
Water Level:	Cut	0.119	4.498	296.936		Time WL Surveyed: 16:15
Water Level:	Cut	0.119	4.471	296.937		
S02-05	3.593	301.289		297.696		

WL Survey Summary

	Before	After
Average WL:	296.921	296.937
Closing Error:	0.001	
WL Check:	0.003	-0.001
Transducer Elevation	296.175	296.444

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, JC	Trip Date:	11-Aug-15
Data Check Personnel:	TR	Date:	11-Aug-15
Entered Digitally in the Field:	CJ	Date:	14-Aug-15

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: September 10, 2015
 Site Visit Time (MST): 14:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	3.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	3.50	0.63		0.38	0.091					1.00	0.50	0.63	0.091	0.32	0.029	3%
2	4.00	0.66		0.40	0.131					1.00	0.50	0.66	0.131	0.33	0.043	4%
3	4.50	0.61		0.37	0.088					1.00	0.50	0.61	0.088	0.31	0.027	3%
4	5.00	0.57		0.34	0.194					1.00	0.50	0.57	0.194	0.29	0.055	5%
5	5.50	0.56		0.34	0.203					1.00	0.50	0.56	0.203	0.28	0.057	5%
6	6.00	0.50		0.30	0.201					1.00	0.50	0.50	0.201	0.25	0.050	5%
7	6.50	0.58		0.35	0.156					1.00	0.50	0.58	0.156	0.29	0.045	4%
8	7.00	0.60		0.36	0.229					1.00	0.50	0.60	0.229	0.30	0.069	7%
9	7.50	0.57		0.34	0.216					1.00	0.50	0.57	0.216	0.29	0.062	6%
10	8.00	0.66		0.40	0.223					1.00	0.50	0.66	0.223	0.33	0.074	7%
11	8.50	0.64		0.38	0.215					1.00	0.50	0.64	0.215	0.32	0.069	7%
12	9.00	0.60		0.36	0.219					1.00	0.50	0.60	0.219	0.30	0.066	6%
13	9.50	0.69		0.41	0.203					1.00	0.50	0.69	0.203	0.35	0.070	7%
14	10.00	0.68		0.41	0.170					1.00	0.50	0.68	0.170	0.34	0.058	6%
15	10.50	0.71		0.43	0.161					1.00	0.50	0.71	0.161	0.36	0.057	5%
16	11.00	0.60		0.36	0.185					1.00	0.50	0.60	0.185	0.30	0.056	5%
17	11.50	0.52		0.31	0.180					1.00	0.50	0.52	0.180	0.26	0.047	4%
18	12.00	0.49		0.29	0.183					1.00	0.50	0.49	0.183	0.25	0.045	4%
19	12.50	0.41		0.25	0.166					1.00	0.50	0.41	0.166	0.21	0.034	3%
20	13.00	0.40		0.24	0.146					1.00	0.60	0.40	0.146	0.24	0.035	3%
LB	13.70	0.00	0.00		0.00				0.00	1.00	0.35	0.00	0.000	0.00	0.000	
Total Flow														1.05	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -8m downstream of bridge

Meas. Start Time (MST):	15:15
Meas. End Time (MST):	15:34
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Beaver affected, clear
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly sunny, 18C

Flow characteristics:

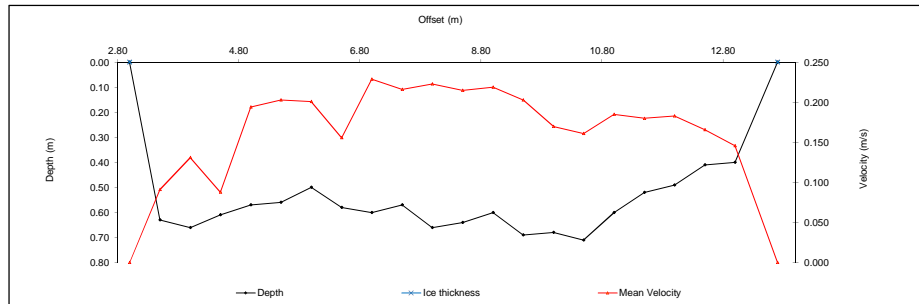
Total Flow:	1.05	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.88	(m ²)
Wetted Width:	10.70	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	0.18	(m/s)
Reynolds Number:	7.63E+04	
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	0.812	1.044
Water (°C):	11.0	11.1
Datalogger Clock:	14:47	15:54
Laptop Clock:	14:47	15:54
Battery:	13.7	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-07	2.336	300.768		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.337	298.431	298.420	3/4" Pipe 20m ESE of logger
S02-05			3.072	297.696	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut		3.505	297.263		Time WL Surveyed: 14:56
Temporary BM			3.087	297.681	0.000	
Turn						
Temporary BM	3.066	300.747		297.681		
Water Level:	Cut		3.485	297.262		Time WL Surveyed: 15:00
S02-05			3.053	297.694	297.670	3/4" Pipe 5m South of logger
S02-06			2.317	298.430	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.316	298.431	298.432	3/4" Pipe 15m SSE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S02-05	3.051	300.745		297.694		Time WL Surveyed: 15:48
Water Level:	Cut		3.484	297.261		Time WL Surveyed: 15:50
Water Level:	Cut		3.472	297.260		
S02-05	3.038	300.732		297.694		

WL Survey Summary

	Before	After
Average WL:	297.263	297.261
Closing Error:	0.001	0.001
WL Check:	0.001	0.001
Transducer Elevation	296.451	296.217

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

	SM JC	Trip Date:	10-Sep-15
Data Entry Personnel:	SM	Date:	10-Sep-15
Data Check Personnel:	DW	Date:	24-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: October 14, 2015
 Site Visit Time (MST): 14:53

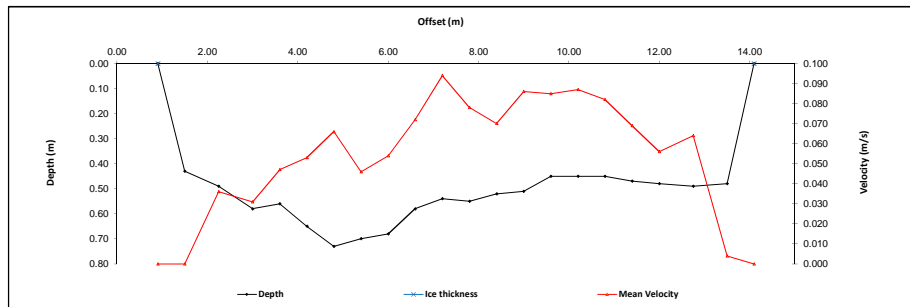


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	14.10	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	13.50	0.48		0.29	0.004					1.00	0.68	0.48	0.004	0.32	0.001	0%
2	12.75	0.49		0.29	0.064					1.00	0.75	0.49	0.064	0.37	0.024	6%
3	12.00	0.48		0.29	0.056					1.00	0.68	0.48	0.056	0.32	0.018	5%
4	11.40	0.47		0.28	0.069					1.00	0.60	0.47	0.069	0.28	0.019	5%
5	10.80	0.45		0.27	0.082					1.00	0.60	0.45	0.082	0.27	0.022	6%
6	10.20	0.45		0.27	0.087					1.00	0.60	0.45	0.087	0.27	0.023	6%
7	9.60	0.45		0.27	0.085					1.00	0.60	0.45	0.085	0.27	0.023	6%
8	9.00	0.51		0.31	0.086					1.00	0.60	0.51	0.086	0.31	0.026	7%
9	8.40	0.52		0.31	0.070					1.00	0.60	0.52	0.070	0.31	0.022	6%
10	7.80	0.55		0.33	0.078					1.00	0.60	0.55	0.078	0.33	0.026	7%
11	7.20	0.54		0.32	0.094					1.00	0.60	0.54	0.094	0.32	0.030	8%
12	6.60	0.58		0.35	0.072					1.00	0.60	0.58	0.072	0.35	0.025	6%
13	6.00	0.68		0.41	0.054					1.00	0.60	0.68	0.054	0.41	0.022	6%
14	5.40	0.70		0.42	0.046					1.00	0.60	0.70	0.046	0.42	0.019	5%
15	4.80	0.73		0.44	0.066					1.00	0.60	0.73	0.066	0.44	0.029	7%
16	4.20	0.65		0.39	0.053					1.00	0.60	0.65	0.053	0.39	0.021	5%
17	3.60	0.56		0.34	0.047					1.00	0.60	0.56	0.047	0.34	0.016	4%
18	3.00	0.58		0.35	0.031					1.00	0.68	0.58	0.031	0.39	0.012	3%
19	2.25	0.49		0.29	0.036					1.00	0.75	0.49	0.036	0.37	0.013	3%
20	1.50	0.43		0.26	0.000					1.00	0.68	0.43	0.000	0.29	0.000	0%
RB	0.90	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
Total Flow														0.392	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -10m upstream of logger

Meas. Start Time (MST):	15:13
Meas. End Time (MST):	15:40
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Banks are slightly flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 10c



Flow characteristics:

Total Flow:	0.392	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.77	(m ²)
Wetted Width:	13.20	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.06	(m/s)
Reynolds Number:	1.98E+04	
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	1.135	1.135
Water (°C):	5.9	5.9
Datalogger Clock:	14:56	15:43
Laptop Clock:	14:56	15:42
Battery:	13.5	13.6
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Station area slightly flooded due to beaver-caused backwater

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-07	0.979	299.411		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-05			1.716	297.695	297.695	3/4" Pipe 5m South of logger
S02-06			0.982	298.429	298.430	3/4" Pipe 20m ESE of logger
Water Level:	Cut		2.054	297.357		Time WL Surveyed: 15:04
Temporary BM			1.413	297.998	0.000	-
Turn						
Temporary BM	1.387	299.385		297.998		
Water Level:	Cut		2.026	297.359		Time WL Surveyed: 15:07
S02-06			0.953	298.432	298.430	3/4" Pipe 20m ESE of logger
S02-05			1.688	297.697	297.695	3/4" Pipe 5m South of logger
S02-07			0.852	298.433	298.432	3/4" Pipe 15m SSE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S02-05	1.658	269.384		267.696		Time WL Surveyed: 15:44
Water Level:	Cut		2.024	267.360		Time WL Surveyed: 15:47
Water Level:	Cut		1.994	267.360		
S02-05	1.658	269.354		267.696		

WL Survey Summary

	Before	After
Average WL:	267.358	267.360
Closing Error:	-0.001	
WL Check:	0.002	0.000
Transducer Elevation	296.223	266.225

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	GG, JC	Trip Date:	14-Oct-15
Data Entry Personnel:	GG	Date:	14-Oct-15
Data Check Personnel:	CJ	Date:	15-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road
 UTM Location: 474961 E, 6344087 N

Site Visit Date: November 30, 2015
 Site Visit Time (MST): 13:24

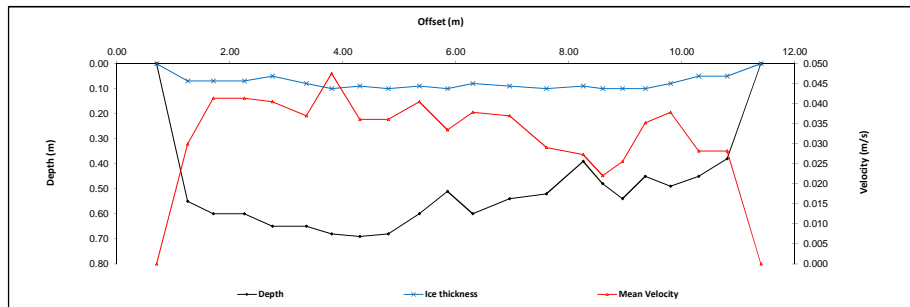


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.70	0.00	0.00		0.000				0.000	0.88	0.28	0.00	0.000	0.00	0.000	
1	1.25	0.55	0.07	0.31	0.034					0.88	0.50	0.48	0.030	0.24	0.007	4%
2	1.70	0.60	0.07	0.34	0.047					0.88	0.50	0.53	0.041	0.27	0.011	6%
3	2.25	0.60	0.07	0.34	0.047					0.88	0.53	0.53	0.041	0.28	0.012	7%
4	2.75	0.65	0.05	0.35	0.046					0.88	0.55	0.60	0.040	0.33	0.013	8%
5	3.35	0.65	0.08	0.37	0.042					0.88	0.53	0.57	0.037	0.30	0.011	7%
6	3.80	0.68	0.10	0.39	0.054					0.88	0.48	0.58	0.048	0.28	0.013	8%
7	4.30	0.69	0.09	0.39	0.041					0.88	0.50	0.60	0.036	0.30	0.011	6%
8	4.80	0.68	0.10	0.39	0.041					0.88	0.52	0.58	0.036	0.30	0.011	6%
9	5.35	0.60	0.09	0.35	0.046					0.88	0.53	0.51	0.040	0.27	0.011	6%
10	5.85	0.51	0.10	0.31	0.038					0.88	0.48	0.41	0.033	0.19	0.007	4%
11	6.30	0.60	0.08	0.34	0.043					0.88	0.55	0.52	0.038	0.29	0.011	6%
12	6.95	0.54	0.09	0.32	0.042					0.88	0.65	0.45	0.037	0.29	0.011	6%
13	7.60	0.52	0.10	0.31	0.033					0.88	0.65	0.42	0.029	0.27	0.008	5%
14	8.25	0.39	0.09	0.24	0.031					0.88	0.50	0.30	0.027	0.15	0.004	2%
15	8.60	0.48	0.10	0.29	0.025					0.88	0.35	0.38	0.022	0.13	0.003	2%
16	8.95	0.54	0.10	0.32	0.029					0.88	0.38	0.44	0.026	0.17	0.004	2%
17	9.35	0.45	0.10	0.28	0.040					0.88	0.43	0.35	0.035	0.15	0.005	3%
18	9.80	0.49	0.08	0.29	0.043					0.88	0.48	0.41	0.038	0.19	0.007	4%
19	10.30	0.45	0.05	0.25	0.032					0.88	0.50	0.40	0.028	0.20	0.006	3%
20	10.80	0.38	0.05	0.22	0.032					0.88	0.55	0.33	0.028	0.18	0.005	3%
LB	11.40	0.00	0.00		0.00				0.00	0.88	0.30	0.00	0.000	0.00	0.000	
Total Flow														0.170	100%	

Flow Measurement Details:

Metering Section Location (describe) at station 7m downstream of station

Meas. Start Time (MST):	14:15
Meas. End Time (MST):	14:48
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Good
Weather:	Sunny, -3c



Flow characteristics:

Total Flow:	0.170	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.78	(m ²)
Wetted Width:	10.70	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.04	(m/s)
Reynolds Number:	9.17E+03	
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	1.058	
Water (°C):	1.1	
Datalogger Clock:	14:27	
Laptop Clock:	13:26	
Battery:	14.3	
Battery Condition:	Good	
Battery Serial #:	-	
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S02-06	0.937	299.367		298.430	298.430	3/4" Pipe 20m ESE of logger
S02-07			0.936	298.431	298.432	3/4" Pipe 15m SSE of logger
S02-05			1.674	297.693	297.695	3/4" Pipe 5m South of logger
Water Level:	Cut		2.091	297.276		Time WL Surveyed: 14:04
Temporary BM			2.034	297.333	0.000	
Turn						
Temporary BM	1.998	299.331		297.333		
Water Level:	Cut		2.051	297.280		Time WL Surveyed: 14:07
S02-05			1.635	297.696	297.695	3/4" Pipe 5m South of logger
S02-07			0.898	298.433	298.432	3/4" Pipe 15m SSE of logger
S02-06			0.900	298.431	298.430	3/4" Pipe 20m ESE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	297.278	-
Closing Error:	-0.001	-
WL Check:	0.004	-
Transducer Elevation	296.220	-

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	GG, JM	Trip Date:	30-Nov-15
Data Check Personnel:	CJ	Date:	30-Nov-15
Entered Digitally in the Field:	Yes	Date:	11-Dec-15

Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kearl Lake
 UTM Location: 489491 E, 6345029 N

Site Visit Date: June 13, 2015
 Site Visit Time (MST): 11:23

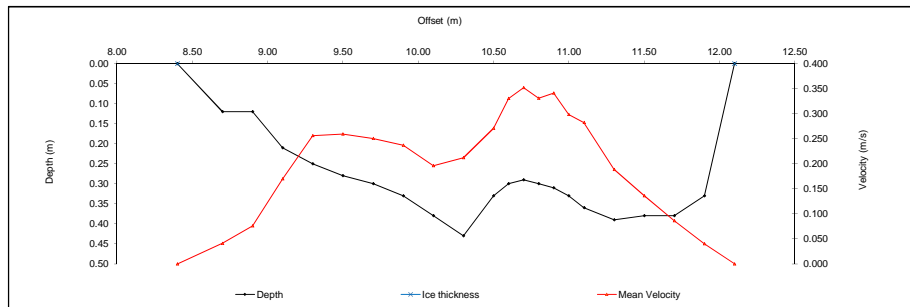


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	12.10	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	11.90	0.33		0.20	0.040					1.00	0.20	0.33	0.040	0.07	0.003	1%
2	11.70	0.38		0.23	0.086					1.00	0.20	0.38	0.086	0.08	0.007	3%
3	11.50	0.38		0.23	0.136					1.00	0.20	0.38	0.136	0.08	0.010	5%
4	11.30	0.39		0.23	0.188					1.00	0.20	0.39	0.188	0.08	0.015	7%
5	11.10	0.36		0.22	0.282					1.00	0.15	0.36	0.282	0.05	0.015	7%
6	11.00	0.33		0.20	0.298					1.00	0.10	0.33	0.298	0.03	0.010	5%
7	10.90	0.31		0.19	0.341					1.00	0.10	0.31	0.341	0.03	0.011	5%
8	10.80	0.30		0.18	0.331					1.00	0.10	0.30	0.331	0.03	0.010	5%
9	10.70	0.29		0.17	0.352					1.00	0.10	0.29	0.352	0.03	0.010	5%
10	10.60	0.30		0.18	0.330					1.00	0.10	0.30	0.330	0.03	0.010	5%
11	10.50	0.33		0.20	0.271					1.00	0.15	0.33	0.271	0.05	0.013	6%
12	10.30	0.43		0.26	0.212					1.00	0.20	0.43	0.212	0.09	0.018	8%
13	10.10	0.38		0.23	0.196					1.00	0.20	0.38	0.196	0.08	0.015	7%
14	9.90	0.33		0.20	0.237					1.00	0.20	0.33	0.237	0.07	0.016	7%
15	9.70	0.30		0.18	0.250					1.00	0.20	0.30	0.250	0.06	0.015	7%
16	9.50	0.28		0.17	0.259					1.00	0.20	0.28	0.259	0.06	0.015	7%
17	9.30	0.25		0.15	0.256					1.00	0.20	0.25	0.256	0.05	0.013	6%
18	9.10	0.21		0.13	0.170					1.00	0.20	0.21	0.170	0.04	0.007	3%
19	8.90	0.12		0.07	0.076					1.00	0.20	0.12	0.076	0.02	0.002	1%
20	8.70	0.12		0.07	0.041					1.00	0.25	0.12	0.041	0.03	0.001	1%
LB	8.40	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
Total Flow														0.215	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -3m downstream of stalling well

Meas. Start Time (MST):	12:00
Meas. End Time (MST):	12:25
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, breezy, 15 C



Flow characteristics:

Total Flow:	0.215	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.04	(m ²)
Wetted Width:	3.70	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.21	(m/s)
Reynolds Number:	4.65E+04	
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.355	0.356
Water (°C):	11.9	12.3
TBRG Tested?:	Yes	
Datalogger Clock:	11:25	12:32
Laptop Clock:	11:24	12:31
Battery:	13.8	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-Station damaged by wildlife, TBRG knocked over, vent tube pinched, omni antenna cable disconnected.
 -TBRG repositioned, vent tube unpinched, and antenna cable reconnected.
 -RSSI: -93

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S03-05	1.152	362.740		361.588	361.588	3/4" Pipe 10m NW of logger
S03-03			1.359	361.381	361.382	3/4" Pipe 3m East of logger
S03-04			1.173	361.567	361.565	3/4" Pipe 5m West of logger
Water Level:	Cut		3.570	359.170		Time WL Surveyed: 11:48
S03-04			1.173	361.567	361.565	3/4" Pipe 5m West of logger
Turn						
S03-04	1.144	362.711		361.567	361.565	3/4" Pipe 5m West of logger
Water Level:	Cut		3.539	359.172		Time WL Surveyed: 11:50
S03-04			1.144	361.567	361.565	3/4" Pipe 5m West of logger
S03-03			1.330	361.381	361.382	3/4" Pipe 3m East of logger
S03-05			1.123	361.588	361.588	3/4" Pipe 10m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S03-04	1.145	362.712		361.567		
Water Level:	Cut		3.543	359.169		Time WL Surveyed: 12:25
Water Level:	Cut		3.523	359.168		Time WL Surveyed: 12:27
S03-04	1.124	362.691		361.567		

WL Survey Summary

	Before	After
Average WL:	359.171	359.169
Closing Error:	0.000	-
WL Check:	0.002	0.001
Transducer Elevation	358.816	358.813

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	13-Jun-15
Data Check Personnel:	CJ	Date:	17-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: January 15, 2015
 Site Visit Time (MST): 13:20



Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	9.10	0.00	0.00		0.000		0.000		0.000	1.00	0.24	0.00	0.000	0.00	0.000	
1	8.62	1.10	0.20		0.92	0.012	0.38	0.004	0.004	1.00	0.55	0.90	0.008	0.50	0.004	3%
2	8.00	1.30	0.25		1.09	0.011	0.46	0.014	0.014	1.00	0.48	1.05	0.013	0.51	0.006	4%
3	7.65	1.30	0.30		1.10	0.016	0.50	0.015	0.015	1.00	0.40	1.00	0.016	0.40	0.006	4%
4	7.20	1.30	0.30		1.10	0.006	0.50	0.001	0.001	1.00	0.43	1.00	0.004	0.43	0.002	1%
5	6.79	1.40	0.34		1.19	0.016	0.55	0.010	0.010	1.00	0.37	1.06	0.013	0.39	0.005	3%
6	6.47	1.50	0.30		1.26	0.020	0.54	0.020	0.020	1.00	0.32	1.20	0.020	0.38	0.008	5%
7	6.15	1.53	0.33		1.29	0.023	0.57	0.022	0.022	1.00	0.33	1.20	0.023	0.39	0.009	6%
8	5.82	1.50	0.35		1.27	0.019	0.58	0.016	0.016	1.00	0.31	1.15	0.018	0.35	0.006	4%
9	5.54	1.50	0.35		1.27	0.026	0.58	0.022	0.022	1.00	0.27	1.15	0.024	0.31	0.007	5%
10	5.28	1.50	0.35		1.27	0.014	0.58	0.017	0.017	1.00	0.31	1.15	0.016	0.36	0.006	4%
11	4.92	1.48	0.35		1.25	0.023	0.58	0.026	0.026	1.00	0.31	1.13	0.025	0.34	0.008	6%
12	4.67	1.40	0.35		1.19	0.020	0.56	0.020	0.020	1.00	0.23	1.05	0.020	0.24	0.005	3%
13	4.46	1.45	0.33		1.23	0.025	0.55	0.016	0.016	1.00	0.40	1.12	0.021	0.44	0.009	6%
14	3.88	1.48	0.35		1.25	0.024	0.58	0.016	0.016	1.00	0.45	1.13	0.020	0.51	0.010	7%
15	3.56	1.46	0.35		1.24	0.022	0.57	0.019	0.019	1.00	0.39	1.11	0.021	0.43	0.009	6%
16	3.10	1.48	0.33		1.25	0.023	0.06	0.024	0.024	1.00	0.38	1.15	0.024	0.43	0.010	7%
17	2.81	1.35	0.30		1.14	0.021	0.51	0.022	0.022	1.00	0.33	1.05	0.022	0.34	0.007	5%
18	2.45	1.30	0.33		1.11	0.013	0.52	0.027	0.027	1.00	0.58	0.97	0.020	0.56	0.011	7%
19	1.65	1.40	0.25		1.17	0.017	0.48	0.020	0.020	1.00	0.68	1.15	0.019	0.78	0.014	10%
20	1.10	1.32	0.18		1.10	0.013	0.41	0.012	0.012	1.00	0.58	1.14	0.013	0.66	0.008	5%
LB	0.50	0.00	0.00		0.00		0.00		0.00	0.88	0.30	0.00	0.000	0.00	0.000	
Total Flow														0.151	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -2m upstream of station

Meas. Start Time (MST):	13:50
Meas. End Time (MST):	14:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover, flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -16C

Flow characteristics:

Total Flow:	0.151	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.75	(m ²)
Wetted Width:	8.60	(m)
Hydraulic Depth:	1.02	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

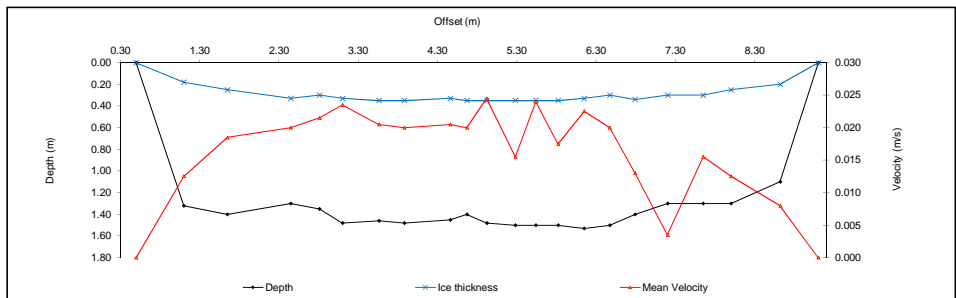
Logger Details:

	Before	After
Transducer Reading (m):	1.439	-
Water (°C):	0.3	-
Datalogger Clock:	13:21	-
Laplog Clock:	13:21	-
Battery (Main):	12.8	13.2
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-BM 1 seems to be moving

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.174	99.690		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.318	98.372	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.216	98.474	98.476	T-post close to old stilling well
Water Level:	Cut		2.411	97.279	Time WL Surveyed:	13:34
Temporary BM			2.369	97.321	0.000	
Turn						
Temporary BM	2.348	99.669		97.321		
Water Level:	Cut		2.389	97.280	Time WL Surveyed:	13:36
S05-03			1.197	98.472	98.476	T-post close to old stilling well
S05-01			1.289	98.370	98.360	Old 3/4" Pipe, 4m West of logger
S05-02			1.156	98.513	98.516	3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	97.280	-
Closing Error:	0.003	-
WL Check:	0.001	-
Transducer Elevation	95.841	-

Field Personnel:

	DW, MP	Trip Date:	15-Jan-15
Data Entry Personnel:	DW, MP	Date:	15-Jan-15
Data Check Personnel:	GG	Date:	26-Jan-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: February 11, 2015
 Site Visit Time (MST): 11:30

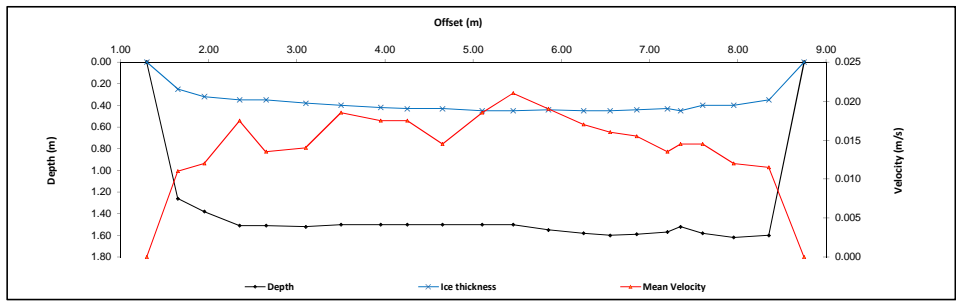


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	8.75	0.00	0.00		0.000	1.35	0.000	0.000	0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	8.35	1.60	0.35			1.35	0.009	0.60	0.014	1.00	0.40	1.25	0.012	0.50	0.006	5%
2	7.95	1.62	0.40			1.38	0.008	0.64	0.016	1.00	0.38	1.22	0.012	0.46	0.005	4%
3	7.60	1.58	0.40			1.34	0.012	0.64	0.017	1.00	0.30	1.18	0.015	0.35	0.005	4%
4	7.35	1.52	0.45			1.31	0.013	0.66	0.016	1.00	0.20	1.07	0.015	0.21	0.003	3%
5	7.20	1.57	0.43			1.34	0.009	0.66	0.018	1.00	0.25	1.14	0.014	0.29	0.004	3%
6	6.85	1.59	0.44			1.36	0.016	0.67	0.015	1.00	0.33	1.15	0.016	0.37	0.006	5%
7	6.55	1.60	0.45			1.37	0.013	0.68	0.019	1.00	0.30	1.15	0.016	0.34	0.006	4%
8	6.25	1.58	0.45			1.35	0.015	0.68	0.019	1.00	0.35	1.13	0.017	0.40	0.007	5%
9	5.85	1.55	0.44			1.33	0.018	0.66	0.020	1.00	0.40	1.11	0.019	0.44	0.008	7%
10	5.45	1.50	0.45			1.29	0.021	0.66	0.021	1.00	0.38	1.05	0.021	0.39	0.008	7%
11	5.10	1.50	0.45			1.29	0.018	0.66	0.019	1.00	0.40	1.05	0.019	0.42	0.008	6%
12	4.65	1.50	0.43			1.29	0.016	0.64	0.013	1.00	0.43	1.07	0.015	0.45	0.007	5%
13	4.25	1.50	0.43			1.29	0.017	0.64	0.018	1.00	0.35	1.07	0.018	0.37	0.007	5%
14	3.95	1.50	0.42			1.28	0.015	0.64	0.020	1.00	0.38	1.08	0.018	0.41	0.007	6%
15	3.50	1.50	0.40			1.28	0.017	0.62	0.020	1.00	0.43	1.10	0.019	0.47	0.009	7%
16	3.10	1.52	0.38			1.29	0.012	0.61	0.016	1.00	0.43	1.14	0.014	0.48	0.007	6%
17	2.65	1.51	0.35			1.28	0.008	0.58	0.019	1.00	0.38	1.16	0.014	0.44	0.006	5%
18	2.35	1.51	0.35			1.28	0.014	0.58	0.021	1.00	0.35	1.16	0.018	0.41	0.007	6%
19	1.95	1.38	0.32			1.17	0.013	0.53	0.011	1.00	0.35	1.06	0.012	0.37	0.004	4%
20	1.65	1.26	0.25			1.06	0.009	0.45	0.013	1.00	0.33	1.01	0.011	0.33	0.004	3%
RB	1.30	0.00	0.00		0.00					0.88	0.18	0.00	0.000	0.00	0.000	
Total Flow														0.123	100%	

Flow Measurement Details:

Metering Section Location (describe): -4m upstream of station

Meas. Start Time (MST):	12:12
Meas. End Time (MST):	13:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, -30 C



Flow characteristics:

Total Flow:	0.123	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.91	(m ²)
Wetted Width:	7.45	(m)
Hydraulic Depth:	1.06	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.00	

Logger Details:

	Before	After
Transducer Reading (m):	1.427	
Water (°C):	0.3	
Datalogger Clock:	11:50	
Laptop Clock:	11:50	
Battery (Main):	15.0	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.344	99.860		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.490	98.370	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.392	98.468	98.476	T-post close to old stilling well
Water Level:	Cut		2.603	97.257		Time WL Surveyed: 11:57
Temporary BM			2.534	97.326	0.000	
Turn						
Temporary BM	2.512	99.838		97.326		
Water Level:	Cut		2.579	97.259		Time WL Surveyed: 12:01
S05-03			1.368	98.470	98.476	T-post close to old stilling well
S05-01			1.467	98.371	98.360	Old 3/4" Pipe, 4m West of logger
S05-02			1.322	98.516	98.516	3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.258	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	95.831	-

Field Personnel:

GG, MP	Trip Date:	11-Feb-15
Data Entry Personnel: GG	Date:	11-Feb-15
Data Check Personnel: CJ	Date:	4-May-15
Entered Digitally in the Field: Yes		

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: March 8, 2015
 Site Visit Time (MST): 12:20

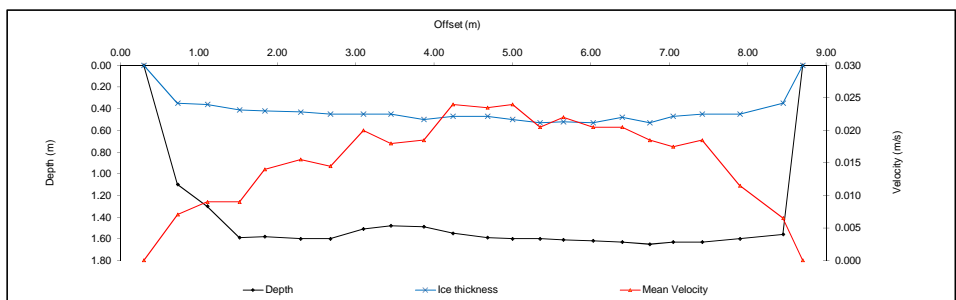


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	8.70	0.00		0.000					1.00	0.13	0.00	0.000	0.00	0.000	
1	8.45	1.56	0.35		1.32	0.007	0.59	0.006	1.00	0.40	1.21	0.007	0.48	0.003	2%
2	7.90	1.60	0.45		1.37	0.007	0.68	0.016	1.00	0.52	1.15	0.012	0.59	0.007	5%
3	7.42	1.63	0.45		1.39	0.018	0.69	0.019	1.00	0.43	1.18	0.019	0.50	0.009	6%
4	7.05	1.63	0.47		1.40	0.015	0.70	0.020	1.00	0.33	1.16	0.018	0.39	0.007	5%
5	6.75	1.65	0.53		1.43	0.018	0.75	0.019	1.00	0.33	1.12	0.019	0.36	0.007	5%
6	6.40	1.63	0.48		1.40	0.020	0.71	0.021	1.00	0.36	1.15	0.021	0.41	0.008	6%
7	6.03	1.62	0.53		1.40	0.021	0.75	0.020	1.00	0.38	1.09	0.021	0.41	0.008	6%
8	5.65	1.61	0.52		1.39	0.022	0.74	0.022	1.00	0.34	1.09	0.022	0.37	0.008	6%
9	5.35	1.60	0.53		1.39	0.023	0.74	0.018	1.00	0.33	1.07	0.021	0.35	0.007	5%
10	5.00	1.60	0.50		1.38	0.023	0.72	0.025	1.00	0.34	1.10	0.024	0.37	0.008	6%
11	4.68	1.59	0.47		1.37	0.022	0.69	0.025	1.00	0.38	1.12	0.024	0.43	0.010	7%
12	4.24	1.55	0.47		1.33	0.027	0.69	0.021	1.00	0.41	1.08	0.024	0.44	0.010	7%
13	3.87	1.49	0.50		1.29	0.016	0.70	0.021	1.00	0.40	0.99	0.019	0.39	0.007	5%
14	3.45	1.48	0.45		1.27	0.014	0.66	0.022	1.00	0.39	1.03	0.018	0.40	0.007	5%
15	3.10	1.51	0.45		1.30	0.018	0.66	0.022	1.00	0.39	1.06	0.020	0.41	0.008	6%
16	2.68	1.60	0.45		1.37	0.010	0.68	0.019	1.00	0.40	1.15	0.015	0.46	0.007	5%
17	2.30	1.60	0.43		1.37	0.012	0.66	0.019	1.00	0.42	1.17	0.016	0.49	0.008	5%
18	1.84	1.58	0.42		1.35	0.011	0.65	0.017	1.00	0.39	1.16	0.014	0.45	0.006	4%
19	1.52	1.59	0.41		1.35	0.005	0.65	0.013	1.00	0.37	1.18	0.009	0.43	0.004	3%
20	1.11	1.30	0.36		1.11	0.006	0.55	0.012	1.00	0.40	0.94	0.009	0.37	0.003	2%
21	0.73	1.10	0.35	0.73	0.008				0.88	0.41	0.75	0.007	0.30	0.002	1%
RB	0.30	0.00			0.00				0.88	0.22	0.00	0.000	0.00	0.000	
Total Flow													0.147	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -5m upstream of station

Meas. Start Time (MST):	13:00
Meas. End Time (MST):	13:35
Equipment:	ADV
Method:	Ice
River Condition:	Flowing well under ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -1C



Flow characteristics:

Total Flow:	0.147	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.81	(m ²)
Wetted Width:	8.40	(m)
Hydraulic Depth:	1.05	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	1.424	
Water (°C):	0.3	Good
Datalogger Clock:	12:28	
Laptop Clock:	12:29	
Battery (Main):	14.3	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.257	99.773		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.405	98.368	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.313	98.460	98.476	T-post close to old stilling well
Water Level:	Cut		2.530	97.243		Time WL Surveyed: 12:43
S05-03			1.313	98.460	98.476	T-post close to old stilling well
Turn						
S05-03	1.286	99.746		98.460	98.476	T-post close to old stilling well
Water Level:	Cut		2.505	97.241		Time WL Surveyed: 12:45
S05-03			1.286	98.460	98.476	T-post close to old stilling well
S05-01			1.380	98.366	98.360	Old 3/4" Pipe, 4m West of logger
S05-02			1.233	98.513	98.516	3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.242	-
Closing Error:	0.003	-
WL Check:	0.002	-
Transducer Elevation	95.818	-

Field Personnel:

	MP, GG	Trip Date:	8-Mar-15
Data Entry Personnel:	MP	Date:	8-Mar-15
Data Check Personnel:	CJ	Date:	4-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: April 16, 2015
 Site Visit Time (MST): _____



Flow Measurement Details:	
Metering Section Location (describe): -15m downstream of station	
Meas. Start Time (MST):	14:39
Meas. End Time (MST):	15:02
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Fully open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 12C, calm

Flow characteristics:	
Total Flow:	1.671 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	13.60 (m ²)
Wetted Width:	11.32 (m)
Hydraulic Depth:	1.20 (m)
Mean Velocity:	0.12 (m/s)
Froude Number:	0.04

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.9	2.2
Datalogger Clock:	13:33	15:11
Laptop Clock:	13:33	15:11
Battery (Main):	14.0	0.6
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTA (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Installed cableway

ADCP Flow Measurement Summary:					
System Information:			System Setup:		Bank Offsets:
System Type:	Sonotek RS-M9	Transducer Depth (m):	0.05	LB:	20.10
Serial Number:	4712	Salinity (ppt):	-	RB:	9.37
Firmware Version:	3.8	Magnetic Declination (°):	14.33		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	5.4		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	11.00	13.32	0.122
Coordinate System:	ENR	2	10.97	13.33	0.126
Left Method:	Sloped bank	3	11.32	13.71	0.123
Right Method:	Sloped bank	4	11.99	14.03	0.121
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	11.32	13.60	0.123
		SD:	0.41	0.30	0.002
		COV:	0.04	0.02	0.015
					1.67
					0.026
					0.016

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.250	99.766		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.397	98.369	98.365	Old 3/4" Pipe, 4m West of logger
S05-03			1.282	98.484	98.476	T-post close to old stilling well
Water Level:	Cut	2.265	97.501			
Temporary BM		1.282	98.484			
Turn					0.000	
Temporary BM	1.261	99.745		98.484		
Water Level:	Cut	2.247	97.498			
S05-03		1.261	98.484			
S05-01		1.376	98.369			
S05-02		1.231	98.514			
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S05-03	1.282	99.746		98.484		
Water Level:	Cut	2.249	97.497			
Water Level:	Cut	2.230	97.497			
S05-03	1.243	99.727		98.484		

WL Survey Summary		
	Before	After
Average WL:	97.550	97.497
Closing Error:	0.002	-
WL Check:	0.003	0.000
Transducer Elevation	95.805	95.811

Field Personnel:			
Field Personnel:	GG, SM	Trip Date:	16-Apr-15
Data Entry Personnel:	GG	Date:	16-Apr-15
Data Check Personnel:	CJ	Date:	4-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: May 10, 2015
 Site Visit Time (MST): 12:55



Flow Measurement Details:	
Metering Section Location (describe): -20m downstream of station at cableway	
Meas. Start Time (MST):	13:19
Meas. End Time (MST):	13:27
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 19C

Flow characteristics:	
Total Flow:	1.45 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	12.46 (m ²)
Wetted Width:	10.29 (m)
Hydraulic Depth:	1.21 (m)
Mean Velocity:	0.78 (m/s)
Froude Number:	0.23

Logger Details:		
	Before	After
Transducer Reading (m):	1.632	1.632
Water (°C):	7.9	8.0
Datalogger Clock:	12:59	13:32
Laptop Clock:	12:59	13:32
Battery (Main):	13.8	13.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

ADCP Flow Measurement Summary:					
System Information:		System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	40.00
Serial Number:	4712	Salinity (ppt):	-	RB:	29.90
Firmware Version:	3.80	Magnetic Declination (°):	14.3		
Software Version:	3.80	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	-		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	10.45	12.53	0.119
Coordinate System:	ENR	2	10.37	12.64	0.114
Left Method:	Sloped bank	3	10.00	12.12	0.116
Right Method:	Sloped bank	4	10.32	12.56	0.117
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	10.29	12.46	0.784
		SD:	0.17	0.20	0.668
		COV:	0.02	0.02	0.852
					1.45
					0.032
					0.022

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.149	99.665		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.291	98.374	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.173	98.492	98.476	T-post close to old stilling well
Water Level:	Cut	2.220		97.445		
S05-03			1.173	98.492	98.476	
Turn						
S05-03	1.148	99.640		98.492	98.476	T-post close to old stilling well
Water Level:	Cut		2.194	97.446		
S05-03			1.148	98.492	98.476	T-post close to old stilling well
S05-01			1.265	98.375	98.360	Old 3/4" Pipe, 4m West of logger
S05-02			1.122	98.518	98.516	3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S05-03	1.147	99.639		98.492		
Water Level:	Cut		2.194	97.445		
S05-03			1.123	98.492	98.476	
Water Level:	Cut		2.169	97.446		
S05-03	1.123	99.615		98.492	98.476	

WL Survey Summary		
	Before	After
Average WL:	97.446	97.446
Closing Error:	-0.002	-
WL Check:	0.001	-0.001
Transducer Elevation	95.814	95.814

Field Personnel:			
Field Personnel:	TR, CJ	Trip Date:	10-May-15
Data Entry Personnel:	CJ	Date:	10-May-15
Data Check Personnel:	CJ	Date:	2-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: June 9, 2015
 Site Visit Time (MST): 15:24



Flow Measurement Details:	
Metering Section Location (describe): 10m downstream of station at cableway	
Meas. Start Time (MST):	15:40
Meas. End Time (MST):	16:03
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 19 C

Flow characteristics:	
Total Flow:	0.828 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	11.11 (m ²)
Wetted Width:	10.42 (m)
Hydraulic Depth:	1.07 (m)
Mean Velocity:	0.07 (m/s)
Reynolds Number:	7.01E+04
Froude Number:	0.62

Logger Details:		
	Before	After
Transducer Reading (m):	1.576	1.330
Water (°C):	15.6	15.6
Datalogger Clock:	15:25	16:14
Laptop Clock:	15:26	16:14
Battery (Minn):	13.8	13.8
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Descendant:	-	Replaced
Mini Tube Descendant:	-	Good
PTF # (if replaced):	-	-
Logger # (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	19.50	
Serial Number:	4712	Safety (gpd):	-	-	RB:	8.95	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.33	Compass Calibration Passed: Yes		
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes		
		ADCP Temperature (°C):	-	17.6			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom Track	3	0.00	10.43	11.12	0.816	-1.45%	81.4
Depth Reference: Vertical Beam	4	0.00	10.67	11.32	0.075	0.846	80.4
Coordinate System: FTM	5	0.00	10.24	10.68	0.074	0.809	81.2
Left Method: Sloped Bank	6	0.00	10.38	11.20	0.074	0.833	81.1
Right Method: Sloped Bank	7	0.00	10.41	11.04	0.076	0.837	81.4
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
	Mean:	10.42	11.11	0.074	0.828		
	SD:	0.14	0.15	0.001	0.014		
	COV:	0.01	0.01	0.014	0.017		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.163	99.679		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.306	98.373	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.194	98.485	98.476	T-post close to old stilling well
Turn						
Water Level:			2.293	97.369		Time WL Surveyed: 15:32
Temporary BM			1.194	98.485		0.000
Turn						
Temporary BM	1.168	99.653		98.485		
Water Level:			2.268	97.365		Time WL Surveyed: 15:33
S05-03			1.168	98.485	98.476	T-post close to old stilling well
S05-01			1.280	98.373	98.360	Old 3/4" Pipe, 4m West of logger
S05-02			1.136	98.517	98.516	3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S05-03	1.168	99.653		98.485		
Water Level:			2.267	97.369		Time WL Surveyed: 16:10
Water Level:			2.253	97.369		Time WL Surveyed: 16:12
S05-03	1.147	99.632		98.485		

WL Survey Summary			Level Survey Equipment:	
Average WL:	Before	After	Level #:	Level#4
Closing Error:	-0.001	-	Make & Model:	Nikon AC-2S
WL Check:	0.001	-0.003	Serial #:	668785
Transducer Elevation:	95.810	95.808		

Field Personnel:			
Data Entry Personnel:	GG	TR, TB	Trip Date: 9-Jun-15
Data Check Personnel:	GG		Date: 9-Jun-15
Entered Digitally in the Field:	CJ		Date: 2-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: August 16, 2015
 Site Visit Time (MST): 14:00



Flow Measurement Details:	
Metering Section Location (describe): -10m downstream of station at cableway	
Meas. Start Time (MST):	14:30
Meas. End Time (MST):	14:45
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Moderate flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Mixed sun and rain, 23C

Flow characteristics:	
Total Flow:	0.274 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	11.00 (m ²)
Wetted Width:	10.03 (m)
Hydraulic Depth:	1.10 (m)
Mean Velocity:	0.02 (m/s)
Reynolds Number:	2.35E+04
Froude Number:	0.01

Logger Details:		Before	After
Transducer Reading (m):		1.605	1.237
Water (°C):		13.9	15.4
Datalogger Clock:		13:54	14:47
Laptop Clock:		13:54	14:47
Battery (Minn):		14.2	13.8
Battery:		Good	
Battery Serial #:		-	-
Enclosure Desiccant:		Replaced	
Mini Tube Desiccant:		Good	
PTF (if replaced):		284728	284727
Logger# (if replaced):		26850	-

Datalogger / Station Notes:	
Sonde readings:	
-Temp:	15.03
-speed:	424.9
-turb:	7.7
-pH:	7.29
-DO:	2.45
-Replaced PLS for calibration	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	LB:	13.25		
Serial Number:	4712	Safety (gpd):	-	RB:	2.00		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	-	System Test Passed: Yes			
		ADCP Temperature (°C):	17.5				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom Track	1	0.00	9.64	0.026	0.278	1.37%	75.5
Depth Reference: Vertical Beam	2	0.00	10.22	11.29	0.024	-2.28%	74.9
Coordinate System: ENL	3	0.00	9.97	10.77	0.027	1.00%	75.3
Left Method: Sloped Bank	5	0.00	10.30	11.32	0.024	-0.09%	75.8
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
		Mean:	10.03	11.00	0.025	0.274	
		SD:	0.26	0.28	0.001	0.004	
		COV:	0.03	0.03	0.040	0.014	

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.128	99.644		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.272	98.372	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.161	98.483	98.476	T-post close to old stilling well
Water Level:						
			2.293	97.351	97.351	Time WL Surveyed: 14:03
S05-01			1.272	98.372	98.360	Old 3/4" Pipe, 4m West of logger
Turn						
S05-01	1.254	99.626		98.372	98.360	Old 3/4" Pipe, 4m West of logger
Water Level:						
			2.277	97.349	97.349	Time WL Surveyed: 14:04
S05-03			1.142	98.484	98.476	T-post close to old stilling well
S05-01			1.254	98.372	98.360	Old 3/4" Pipe, 4m West of logger
S05-02			1.106	98.516	98.516	3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S05-03	1.144	99.628		98.484	98.484	
Water Level:						
			2.273	97.355	97.355	Time WL Surveyed: 14:53
Water Level:						
			2.256	97.366	97.366	Time WL Surveyed: 14:54
S05-03	1.128	99.612		98.484	98.484	

WL Survey Summary			Level Survey Equipment:	
Average WL:	Before	After	Level #:	Level#2
Closing Error:	-0.002	-	Make & Model:	Nikon AC-2S
WL Check:	0.002	-0.001	Serial #:	668859
Transducer Elevation:	95.745	96.119		

Field Personnel:			
Data Entry Personnel:	DW, GG	Trip Date:	16-Aug-15
Data Check Personnel:	GG	Date:	16-Aug-15
Entered Digitally in the Field:	Yes	Date:	5-Apr-16

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: September 14, 2015
 Site Visit Time (MST): 11:00



Flow Measurement Details:	
Metering Section Location (describe): At cableway, 8m downstream of station	
Meas. Start Time (MST):	11:51
Meas. End Time (MST):	12:15
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Overcast, breezy, BC

Flow characteristics:	
Total Flow:	0.560 (m ³ /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	10.89 (m ²)
Wetted Width:	10.14 (m)
Hydraulic Depth:	1.07 (m)
Mean Velocity:	0.05 (m/s)
Reynolds Number:	4.05E+04
Froude Number:	0.62

Logger Details:		
	Before	After
Transducer Reading (m):	1.216	1.217
Water (°C):	9.0	9.0
Datalogger Clock:	11:09	12:20
Laptop Clock:	11:09	13:20
Battery (Mains):	14.5	13.5
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Mem Tube Dessicant:	-	Good
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	
*Old sonde readings:	
sonde b4 6.42	
water temp 9.98	
spc 389.87	
urb 0.93	
phmv -21.21	
do 6.2	
do sat 55	

General Notes:	

ADCP Flow Measurement Summary:									
System Information:				System Setup:		Bank Offsets:			
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	10.00			
Serial Number:	9712	Bainly (ppt):	-	-	RB:	0.50			
Firmware Version:	3.8	Magnetic Declination (°):	-	14.33	Compass Calibration Passed: Yes				
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes				
		ADCP Temperature (°C):	-	10.6					
Discharge Calculation Settings:				Measurement Results:					
	Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)	
Track Reference:	Bottom Track	1	0.00	10.28	10.58	0.054	0.574	2.46%	81
Depth Reference:	Vertical Beam	3	0.00	9.79	10.64	0.053	0.562	0.32%	80.3
Coordinate System:	ENR	4	0.00	10.36	11.31	0.049	0.559	-0.39%	80.4
Left Method:	Sloped Bank	5	0.00	10.07	10.87	0.05	0.547	-2.36%	80.8
Right Method:	Sloped Bank	6	0.00	10.199	11.066	0.051	0.56	-0.04%	80.4
Top Fit Type:	Power Fit			Mean:	10.14	10.89	0.051	0.560	
Bottom Fit Type:	Power Fit			SD:	0.20	0.27	0.002	0.009	
				COV:	0.02	0.02	0.038	0.015	

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.238	99.754		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.344	98.410	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.272	98.482	98.476	T-post close to old stilling well
S05-04			0.831	98.523	0.000	Lag bolt in conifer 10m SE of logger
Water Level:			2.359	97.395		Time WL Surveyed: 11:25
Temporary BM			1.942	97.812		0.000
Turn						
Temporary BM	1.961	99.773		97.812		
Water Level:			2.378	97.395		Time WL Surveyed: 11:27
S05-04			0.849	98.524		Lag bolt in conifer 10m SE of logger
S05-03			1.291	98.482		T-post close to old stilling well
S05-01			1.403	98.370		Old 3/4" Pipe, 4m West of logger
S05-02			1.259	98.515		3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S05-03	1.290	99.772		98.482		
Water Level:			2.375	97.397		Time WL Surveyed: 12:33
Water Level:			2.385	97.397		Time WL Surveyed: 12:34
S05-03	1.300	99.782		98.482		

WL Survey Summary		
	Before	After
Average WL:	97.395	97.397
Closing Error:	0.001	-
WL Check:	0.000	0.000
Transducer Elevation	98.179	98.180

Level Survey Equipment:	
Level #:	Level#3
Make & Model:	Carsel AT-24
Serial #:	112990

Field Personnel:			
Data Entry Personnel:	TL, CJ	Trip Date:	14-Sep-15
Data Check Personnel:	TL	Date:	14-Sep-15
Entered Digitally in the Field:	CJ	Date:	8-Oct-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: October 17, 2015
 Site Visit Time (MST): 11:10



Flow Measurement Details:	
Metering Section Location (describe): At cableway	
Meas. Start Time (MST):	11:30
Meas. End Time (MST):	11:50
Equipment:	ADCP#1
Method:	Cableway
River Condition:	Normal
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Errors (see reverse):	Facilities
Weather:	Clear, Calm, BC

Flow characteristics:	
Total Flow	0.333 (m³/s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	11.13 (m²)
Wetted Width:	12.19 (m)
Hydraulic Depth:	0.91 (m)
Mean Velocity:	0.03 (m/s)
Reynolds Number:	1.77E+04
Roude Number:	0.01

Logger Details:	
Transducer Reading (m):	Before: 1.108, After: 1.109
PT Water (°C):	4.9, 4.9
Datalogger Clock:	11:11, 12:03
Laptop Clock:	11:11, 12:03
Station Battery Voltage:	14.4, 14.4
Station Battery:	Good
Station Battery Serial #:	-
Enclosure Descant:	Replaced
Vent Tube Descant:	Good
PT# if replaced:	-
Logger# if replaced:	-

Sonde Details:	
Sonde Water (°C):	Before: 4, After: 4
Specific Conductance (µS):	407, 407
pH:	7, 7
Turbidity (FNU):	11, 11
Dissolved Oxygen Conc. (mg/L):	6, 6
Dissolved Oxygen Sat. (%):	45, 45
Sonde Battery Voltage:	6.3, 6.3
Sonde # if replaced:	-

Datalogger, Sonde and Station Notes:

ADCP Flow Measurement Summary:									
System Information:		System Setup:		Bank Offsets:					
System Type:	Sosiek BSM#	Transducer Depth (m):	0.05	LB:	12.20				
Serial Number:	4712	Salinity (ppt):	0.0	RB:	1.60				
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes					
Software Version:	3.8	Measured Temperature (°C):	-	System Test Passed: Yes					
		ADCP Temperature (°C):	-						
Discharge Calculation Settings:		Measurement Results:							
Track Reference:	Bottom Track	Pass (#):	Screening Distance (m):	Width (m):	Area (m²):	Mean Pass Velocity (m/s):	Discharge (m³/s):	Discharge Difference From Mean:	Percent of Pass Measured (%)
Depth Reference:	Vertical Beam	1	0.00	11.09	11.02	0.029	0.335	0.60%	74.7
Coordinate System:	ENU	5	0.00	12.56	11.27	0.029	0.33	-0.90%	75.3
Left Method:	Sloped Bank	6	0.00	12.35	11.15	0.029	0.318	-4.50%	75.3
Right Method:	Sloped Bank								
Top FI Type:	Power FI								
Bottom FI Type:	Power FI								
		Mean:	12.19	11.13	0.052	0.333			
		SD:	0.32	0.09	0.023	0.011			
		COV:	0.03	0.01	0.447	0.033			

Level Survey:						
Station	BS + (m)	RI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.019	99.535		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.163	98.372	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.055	98.480	98.476	T-post close to old sitting well
Turn						
Water Level:	Cut	2.255	97.280	97.280	97.280	Time WL Surveyed: 11:22
Temporary BM		1.055	98.480	98.480	98.480	Time WL Surveyed: 0.000
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut	1.022	99.502	98.480	98.480	Time WL Surveyed: 11:23
Water Level:	Cut	2.221	97.281	97.281	97.281	Time WL Surveyed: 11:23
S05-03			1.022	98.480	98.476	T-post close to old sitting well
S05-01			1.130	98.372	98.360	Old 3/4" Pipe, 4m West of logger
S05-02			0.987	98.515	98.516	3/4" Pipe 8m SW of logger
Level Survey Equipment:						
Level #:		Level#2				
Make & Model:		IN/A				
Serial #:		IN/A				

WL Survey Summary	
Average WL:	Before: 97.281, After: 97.284
Closing Error:	0.001
WL Check:	0.001, 0.000
Transducer Elevation:	98.173, 98.175

General Notes:

Field Personnel:		TR, GG	Trip Date:
Data Entry Personnel:	TR		17-Oct-15
Data Check Personnel:	GG		17-Oct-15
Entered Digitally in the Field:	Yes		26-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek
 UTM Location: 489491 E, 6345029 N

Site Visit Date: December 12, 2015
 Site Visit Time (MST): 09:46

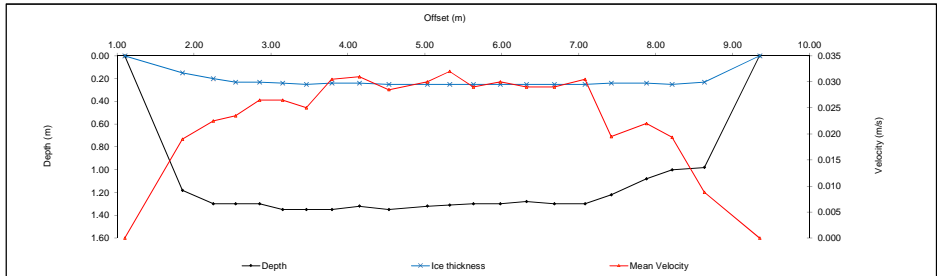


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	9.35	0.00	0.00		0.000		0.000		0.000	0.88	0.36	0.00	0.000	0.00	0.000	
1	8.63	0.98	0.23	0.61	0.010					0.88	0.57	0.75	0.009	0.43	0.004	2%
2	8.21	1.00	0.25	0.63	0.022					0.88	0.38	0.75	0.019	0.28	0.005	3%
3	7.89	1.08	0.24			0.91	0.015	0.41	0.029	1.00	0.40	0.84	0.022	0.33	0.007	4%
4	7.42	1.22	0.24			1.02	0.010	0.44	0.029	1.00	0.40	0.98	0.020	0.39	0.008	4%
5	7.08	1.30	0.25			1.09	0.031	0.46	0.030	1.00	0.37	1.05	0.031	0.39	0.012	6%
6	6.68	1.30	0.25			1.09	0.030	0.46	0.028	1.00	0.38	1.05	0.029	0.40	0.012	6%
7	6.32	1.28	0.25			1.07	0.029	0.46	0.029	1.00	0.35	1.03	0.029	0.36	0.010	5%
8	5.98	1.30	0.25			1.09	0.031	0.46	0.029	1.00	0.35	1.05	0.030	0.36	0.011	6%
9	5.63	1.30	0.25			1.09	0.031	0.46	0.027	1.00	0.33	1.05	0.029	0.35	0.010	5%
10	5.32	1.31	0.25			1.10	0.031	0.46	0.033	1.00	0.30	1.06	0.032	0.32	0.010	5%
11	5.03	1.32	0.25			1.11	0.028	0.46	0.032	1.00	0.40	1.07	0.030	0.42	0.013	7%
12	4.53	1.35	0.25			1.13	0.028	0.47	0.029	1.00	0.44	1.10	0.029	0.48	0.014	7%
13	4.15	1.32	0.24			1.10	0.027	0.46	0.035	1.00	0.37	1.08	0.031	0.40	0.012	6%
14	3.79	1.35	0.24			1.13	0.030	0.46	0.031	1.00	0.35	1.11	0.031	0.38	0.012	6%
15	3.46	1.35	0.25			1.13	0.018	0.47	0.032	1.00	0.32	1.10	0.025	0.35	0.009	5%
16	3.15	1.35	0.24			1.13	0.022	0.46	0.031	1.00	0.31	1.11	0.027	0.34	0.009	5%
17	2.85	1.30	0.23			1.09	0.021	0.44	0.032	1.00	0.31	1.07	0.027	0.33	0.009	4%
18	2.54	1.30	0.23			1.09	0.018	0.44	0.029	1.00	0.30	1.07	0.024	0.32	0.008	4%
19	2.25	1.30	0.20			1.08	0.013	0.42	0.032	1.00	0.35	1.10	0.023	0.30	0.009	4%
20	1.85	1.18	0.15			0.97	0.018	0.36	0.022	1.00	0.58	1.03	0.019	0.59	0.011	6%
RB	1.10	0.00	0.00		0.00		0.00		0.00	0.88	0.38	0.00	0.000	0.00	0.000	
Total Flow														0.193	100%	

Flow Measurement Details:

Metering Section Location (describe): Adjacent to helicopter landing pad

Meas. Start Time (MST): 10:24
 Meas. End Time (MST):
 Equipment: ADV#1
 Flow Meter Make & Model: Sontek FlowTracker
 Flow Meter Serial #: P3398
 Method: Ice
 River Condition: Full ice cover
 Channel Edges: Trapezoidal Edge (e.g. stream)
 Quality/Error (see reverse): Good
 Weather: Windy, cloudy, -5c



Flow characteristics:

Total Flow: 0.193 (m³/s)
 Perceived Measurement Quality: Good
 Gross Section Area: 7.61 (m²)
 Wetted Width: 8.85 (m)
 Hydraulic Depth: 0.82 (m)
 Mean Velocity: 0.03 (m/s)
 Reynolds Number:
 Froude Number: 0.01

Logger Details:

	Before	After
Transducer Reading (m):	1.068	
PT Water (°C):	1.3	
Datalogger Clock:	10:50	
Laptop Clock:	09:50	11:21
Station Battery Voltage:	12.6	Good
Station Battery Serial #:	-	Good
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Sonde Details:

	Before	After
Sonde Water (°C):	0	
Specific Conductance (uS):	524	
pH:	7	
Turbidity (FNU):	34	
Dissolved Oxygen Conc. (mg/L):	0	
Dissolved Oxygen Sat. (%):	2	
Sonde Battery Voltage:	6.4	
Sonde # (if replaced):	-	

Sonde Visit Details:

Visit Type:
 Deployed Sonde:
 Downloaded:
 WQ Samples Taken:
 Photos Taken:
 US, DS, CS:
 Sonde Housing (In Situ):
 Sonde Probes (Before Cleaning):
 Datalogger:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05-02	1.113	99.629		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.257	98.372	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.147	98.482	98.476	T-post close to old stilling well
Water Level:			2.408	97.221		Time WL Surveyed: 10:14
Temporary BM			2.388	97.241	0.000	
Turn						
Temporary BM	2.357	99.598		97.241		
Water Level:			2.374	97.224		Time WL Surveyed: 10:18
WQ Samples Taken:						
S05-03			1.117	98.481	98.476	#N/A
S05-01			1.228	98.370	98.360	Old 3/4" Pipe, 4m 1
S05-02			1.085	98.513	98.516	3/4" Pipe 8m SW c/N/A

Secondary Water Level Survey (pick any BM e.g. closest to water's edge)

Water Level:	Time WL Surveyed:
Cut	
Water Level:	Time WL Surveyed:
Cut	

WL Survey Summary

	Before	After
Average WL:	97.223	-
Closing Error:	0.003	-
WL Check:	0.003	-
Transducer Elevation	96.165	-

General Notes:

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668765

Datalogger, Sonde and Station Notes:

-Sent new program to logger

Field Personnel:

Personnel	Role	Trip Date:	Date:
GG, JC		12-Dec-15	
GG		12-Dec-15	
CJ		21-Dec-15	
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek
 UTM Location: 476100 E, 6351600 N

Site Visit Date: January 9, 2015
 Site Visit Time (MST): 09:52



Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	2.10	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.38	0.00	0.000	0.00	0.000	
1	2.85	0.67	0.23	0.45	-0.002				0.88	0.75	0.44	-0.002	0.33	-0.001	0%
2	3.60	1.00	0.25	0.63	0.005				0.88	0.60	0.75	0.004	0.45	0.002	1%
3	4.05	1.00	0.30	0.65	0.009				0.88	0.55	0.70	0.008	0.39	0.003	2%
4	4.70	1.28	0.35			1.09	-0.001	0.54	1.00	0.60	0.93	0.011	0.56	0.006	3%
5	5.25	1.33	0.37			1.14	0.013	0.56	1.00	0.58	0.96	0.025	0.55	0.014	7%
6	5.85	1.33	0.37			1.14	0.018	0.56	1.00	0.52	0.96	0.028	0.50	0.014	7%
7	6.30	1.35	0.55			1.19	0.035	0.71	1.00	0.55	0.80	0.040	0.44	0.017	9%
8	6.95	1.33	0.53			1.17	0.036	0.69	1.00	0.48	0.80	0.040	0.38	0.015	8%
9	7.25	1.37	0.55			1.21	0.041	0.71	1.00	0.25	0.82	0.050	0.21	0.010	5%
10	7.45	1.39	0.55			1.22	0.051	0.72	1.00	0.33	0.84	0.054	0.27	0.015	8%
11	7.90	1.39	0.55			1.22	0.038	0.72	1.00	0.43	0.84	0.048	0.36	0.017	9%
12	8.30	1.30	0.55	0.93	0.049				0.88	0.47	0.75	0.043	0.36	0.015	8%
13	8.85	1.27	0.48			1.11	0.037	0.64	1.00	0.50	0.79	0.035	0.40	0.014	7%
14	9.30	1.32	0.47			1.15	0.023	0.64	1.00	0.48	0.85	0.032	0.40	0.013	7%
15	9.80	1.39	0.45			1.20	0.009	0.64	1.00	0.57	0.94	0.020	0.54	0.011	6%
16	10.45	1.40	0.42			1.20	0.018	0.62	1.00	0.60	0.98	0.016	0.59	0.009	5%
17	11.00	1.42	0.38			1.21	0.017	0.59	1.00	0.58	1.04	0.017	0.60	0.010	5%
18	11.60	1.39	0.36			1.18	0.013	0.57	1.00	0.52	1.03	0.010	0.54	0.005	3%
19	12.05	1.15	0.35			0.99	0.002	0.51	1.00	0.60	0.80	0.003	0.48	0.001	1%
20	12.80	1.12	0.32			0.96	0.001	0.48	1.00	0.68	0.80	0.003	0.54	0.001	1%
RB	13.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.30	0.00	0.000	0.00	0.000	
Total Flow													0.193	100%	

Flow Measurement Details:

Metering Section Location (describe): 4m downstream of station

Meas. Start Time (MST):	10:26
Meas. End Time (MST):	11:22
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -25C

Flow characteristics:

Total Flow:	0.193	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.88	(m ²)
Wetted Width:	11.30	(m)
Hydraulic Depth:	0.79	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

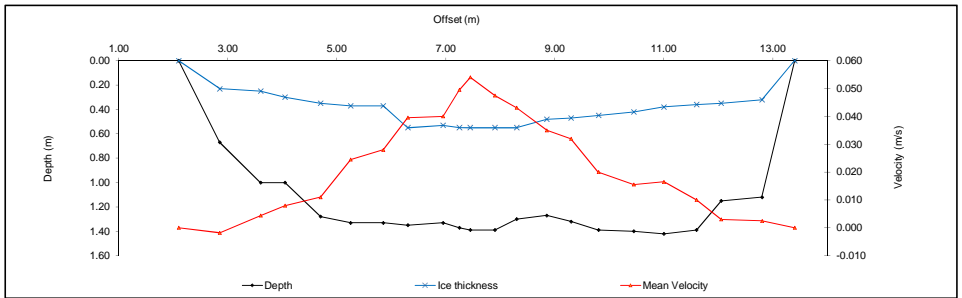
Logger Details:

	Before	After
Transducer Reading (m):	1.451	-
Water (°C):	0.2	-
Barometric Pressure (kPa):	98.84	-
Datalogger Clock:	09:57	-
Laptop Clock:	09:57	-
Battery (Main):	14.1	15.0
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Note

General Notes:

-Ran adv test: passed



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05A-02	1.703	283.862		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			1.118	282.744	282.726	T-post 4m NW of logger
S05A-03			1.521	282.341	282.344	Pipe 3m N of logger
Water Level:	Cut		2.923	280.939	Time WL Surveyed: 10:11	
Temporary BM			2.852	281.010	0.000	-
Turn						
Temporary BM	2.826	283.836		281.010		-
Water Level:	Cut		2.897	280.939	Time WL Surveyed: 10:16	
S05A-03			1.493	282.343	282.344	Pipe 3m N of logger
S05A-01			1.082	282.744	282.726	T-post 4m NW of logger
S05A-02			1.677	282.159	282.159	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	280.939	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	279.488	-

Field Personnel:

Data Entry Personnel:	GG, MP	Trip Date:	9-Jan-15
Data Check Personnel:	GG	Date:	9-Jan-15
Entered Digitally in the Field:	CJ	Date:	20-Jan-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek
 UTM Location: 476100 E, 6351600 N

Site Visit Date: February 13, 2015
 Site Visit Time (MST): 09:20

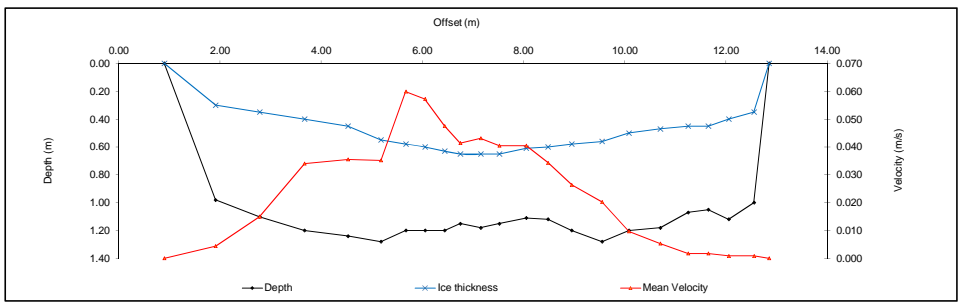


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	12.85	0.00	0.00		0.000		0.000		0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	12.55	1.00	0.35	0.68	0.001					0.88	0.40	0.65	0.001	0.26	0.000	0%
2	12.05	1.12	0.40	0.76	0.001					0.88	0.45	0.72	0.001	0.32	0.000	0%
3	11.65	1.05	0.45	0.75	0.002					0.88	0.40	0.60	0.002	0.24	0.000	0%
4	11.25	1.07	0.45	0.76	0.002					0.88	0.48	0.62	0.002	0.29	0.001	0%
5	10.70	1.18	0.47	0.83	0.006					0.88	0.58	0.71	0.005	0.42	0.002	1%
6	10.08	1.20	0.50	0.85	0.011					0.88	0.57	0.70	0.010	0.40	0.004	2%
7	9.55	1.28	0.56	0.92	0.023					0.88	0.57	0.72	0.020	0.41	0.008	5%
8	8.95	1.20	0.58	0.89	0.030					0.88	0.54	0.62	0.026	0.33	0.009	5%
9	8.48	1.12	0.60	0.86	0.039					0.88	0.45	0.52	0.034	0.23	0.008	4%
10	8.05	1.11	0.61	0.86	0.046					0.88	0.48	0.50	0.040	0.24	0.010	5%
11	7.52	1.15	0.65	0.90	0.046					0.88	0.45	0.50	0.040	0.23	0.009	5%
12	7.15	1.18	0.65	0.92	0.049					0.88	0.39	0.53	0.043	0.20	0.009	5%
13	6.75	1.15	0.65	0.90	0.047					0.88	0.36	0.50	0.041	0.18	0.007	4%
14	6.44	1.20	0.63	0.92	0.054					0.88	0.35	0.57	0.048	0.20	0.009	5%
15	6.05	1.20	0.60	0.90	0.065					0.88	0.39	0.60	0.057	0.23	0.013	7%
16	5.67	1.20	0.58	0.89	0.068					0.88	0.44	0.62	0.060	0.27	0.016	9%
17	5.18	1.28	0.55	0.92	0.040					0.88	0.57	0.73	0.035	0.42	0.015	8%
18	4.53	1.24	0.45			1.08	0.020	0.61	0.051	1.00	0.76	0.79	0.036	0.60	0.021	12%
19	3.67	1.20	0.40			1.04	0.033	0.56	0.035	1.00	0.88	0.80	0.034	0.70	0.024	13%
20	2.78	1.10	0.35	0.73	0.017					0.88	0.88	0.75	0.015	0.66	0.010	6%
21	1.91	0.98	0.30	0.64	0.005					0.88	0.94	0.68	0.004	0.64	0.003	2%
LB	0.90	0.00	0.00		0.00					0.88	0.51	0.00	0.000	0.00	0.000	
Total Flow														0.179	100%	

Flow Measurement Details:

Metering Section Location (describe): Adjacent to station

Meas. Start Time (MST):	9:47
Meas. End Time (MST):	10:21
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -16 C



Flow Characteristics:

Total Flow:	0.179	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.47	(m ²)
Wetted Width:	11.95	(m)
Hydraulic Depth:	0.62	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	1.418	-
Water (°C):	0.2	-
Barometric Pressure (kPa):	99.57	-
Datalogger Clock:	09:24	-
Laptop Clock:	09:23	-
Battery (Main):	13.2	13.4
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Note

General Notes:

Level Survey:	BS (+m)	HI (m)	FS (-m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05A-02	1.776	283.935		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			1.182	282.753	282.726	T-post 4m NW of logger
S05A-03			1.583	282.352	282.344	Pipe 3m N of logger
Water Level:	Cut	3.028		280.907		Time WL Surveyed: 9:33
Temporary BM			2.903	281.032	0.000	-
Turn						
Temporary BM	2.888	283.920		281.032		-
Water Level:	Cut		3.014	280.906		Time WL Surveyed: 9:36
S05A-03			1.567	282.353	282.344	Pipe 3m N of logger
S05A-01			1.166	282.754	282.726	T-post 4m NW of logger
S05A-02			1.761	282.159	282.159	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	280.907	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	279.489	-

Field Personnel:

Data Entry Personnel:	GG, MP	Trip Date:	13-Feb-15
Data Check Personnel:	GG	Date:	13-Feb-15
Entered Digitally in the Field:	CJ	Date:	23-Feb-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek
 UTM Location: 476100 E, 6351600 N

Site Visit Date: April 28, 2015
 Site Visit Time (MST): 09:40



Flow Measurement Details:	
Metering Section Location (describe): adjacent to station	
Meas. Start Time (MST):	10:30
Meas. End Time (MST):	10:56
Equipment:	ADCP
Method:	Boat
River Condition:	Open, no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 16C

Flow characteristics:	
Total Flow:	1.76 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	16.23 (m ²)
Wetted Width:	13.63 (m)
Hydraulic Depth:	1.19 (m)
Mean Velocity:	0.11 (m/s)
Froude Number:	0.03

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	15.5	15.7
Barometric Pressure (kPa):	14.52	11.31
Datalogger Clock:	09:45	11:06
Laptop Clock:	09:44	11:05
Battery (Main):	14.2	13.7
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTA (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:					
System Information:			System Setup:		Bank Offsets:
System Type:	Sonotek RS-M9	Transducer Depth (m):	0.05	LB:	8.50
Serial Number:	4712	Salinity (ppt):	-	RB:	22.10
Firmware Version:	3.8	Magnetic Declination (°):	14.33		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	8.9		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom Track	Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	3	13.99	16.95	0.099
Coordinate System:	ENU	4	13.41	16.07	0.108
Left Method:	Sloped Bank	5	13.88	16.01	0.115
Right Method:	Sloped Bank	7	13.76	16.09	0.110
Top Fit Type:	Power Fit	8	13.412	16.012	0.111
Bottom Fit Type:	Power Fit				1.76
			Mean:	13.63	16.23
			SD:	0.22	0.36
			COV:	0.02	0.02
				0.049	0.029

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05A-02	1.649	283.808		282.159	282.159	3/4" Pipe 10m W of logger
S05A-03			1.447	282.361	282.344	Pipe 3m N of logger
S05A-01			1.043	282.765	282.726	T-post 4m NW of logger
Water Level:	Cut	2.660	281.148			Time WL Surveyed: 9:50
Temporary BM		1.193	282.615		0.000	
Turn						
Temporary BM	1.173	283.788		282.615		
Water Level:	Cut		2.643	281.145		Time WL Surveyed: 9:53
S05A-01			1.024	282.764	282.726	T-post 4m NW of logger
S05A-03			1.427	282.361	282.344	Pipe 3m N of logger
S05A-02			1.831	282.157	282.159	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S05A-03	1.427	283.788		282.361		
Water Level:	Cut		2.637	281.151		Time WL Surveyed: 11:00
Water Level:	Cut		2.622	281.148		Time WL Surveyed: 11:01
S05A-03	1.410	283.771		282.361		

WL Survey Summary		
Average WL:	Before	After
Closing Error:	0.002	-
WL Check:	0.003	0.002
Transducer Elevation	278.487	278.481

Field Personnel:		SM, GG	Trip Date:	28-Apr-15
Data Entry Personnel:	SM	Date:	28-Apr-15	
Data Check Personnel:	CJ	Date:	30-Apr-15	
Entered Digitally in the Field:	Yes			

Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek
 UTM Location: 476100 E, 6351600 N

Site Visit Date: May 12, 2015
 Site Visit Time (MST): 10:50



Flow Measurement Details:

Metering Section Location (describe): 20 m upstream of monitoring station.	
Meas. Start Time (MST):	11:15
Meas. End Time (MST):	11:30
Equipment:	ADCP
Method:	Boat
River Condition:	Moderate flow, no ice
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 15 C

Flow characteristics:

Total Flow:	1.76	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.55	(m ²)
Wetted Width:	14.63	(m)
Hydraulic Depth:	0.65	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	1.669	1.670
Water (C):	9.8	10.0
Datalogger Clock:	10:54	11:53
Laptop Clock:	10:52	11:52
Battery (Main):	13.7	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTM (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

ADCP Flow Measurement Summary:

System Information:		System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	15.40
Serial Number:	4712	Salinity (ppt):	-	RB:	1.00
Firmware Version:	3.8	Magnetic Declination (°):	14.33		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	12.1		

Discharge Calculation Settings:					
Track Reference:	Bottom Track				
Depth Reference:	Vertical Beam				
Coordinate System:	ENU				
Left Method:	Sloped Bank				
Right Method:	Sloped Bank				
Top Fit Type:	Power Fit				
Bottom Fit Type:	Power Fit				

Measurement Results:					
Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean
1	14.37	9.37	0.189	1.774	0.95%
2	15.02	10.00	0.176	1.763	0.33%
3	14.85	9.84	0.181	1.745	-0.70%
5	14.29	9.18	0.19	1.747	-1.89%
Mean:	14.63	9.55	0.184	1.76	
SD:	0.31	0.31	0.006	0.012	
COV:	0.02	0.03	0.031	0.007	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05A-02	1.553	283.712		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			0.946	282.768	282.726	T-post 4m NW of logger
S05A-03			1.346	282.366	282.344	Pipe 3m N of logger
Water Level:	Cut	2.555		281.157		Time WL Surveyed: 10:58
Temporary BM			1.094	282.618	0.000	
Turn						
Temporary BM	1.075	283.693		282.618		
Water Level:	Cut		2.534	281.159		Time WL Surveyed: 11:00
S05A-03			1.326	282.367	282.344	Pipe 3m N of logger
S05A-01			0.926	282.768	282.726	T-post 4m NW of logger
S05A-02			1.533	282.160	282.159	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S05A-01	0.887	283.654		282.767		
Water Level:	Cut		2.495	281.159		Time WL Surveyed: 11:50
Water Level:	Cut		2.511	281.160		Time WL Surveyed: 11:48
S05A-01	0.904	283.671		282.767		

WL Survey Summary	Before	After
Average WL:	281.158	281.160
Closing Error:	-0.001	-
WL Check:	0.002	-0.001
Transducer Elevation	279.489	279.490

Field Personnel:	TR, SM	Trip Date:	12-May-15
Data Entry Personnel:	TR	Date:	12-May-15
Data Check Personnel:	CJ	Date:	1-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek
 UTM Location: 476100 E, 6351600 N

Site Visit Date: June 12, 2015
 Site Visit Time (MST): 09:40



Flow Measurement Details:	
Metering Section Location (describe): Across from station	
Meas. Start Time (MST):	10:15
Meas. End Time (MST):	10:30
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20 C

Flow characteristics:	
Total Flow:	1.22 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	15.42 (m ²)
Wetted Width:	13.05 (m)
Hydraulic Depth:	1.18 (m)
Mean Velocity:	0.08 (m/s)
Reynolds Number:	8.44E+04
Froude Number:	0.62

Logger Details:		
	Before	After
Transducer Reading (m):	1.531	1.531
Water (°C):	16.1	16.5
Barometric Pressure (kPa):	96.72	96.69
Datalogger Clock:	09:43	10:37
Laptop Clock:	09:41	10:36
Battery:	13.9	13.7
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	1.20		
Serial Number:	4712	Bainby (ppt):	0.0	RB:	14.00		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	-	System Test Passed: Yes			
		ADCP Temperature (°C):	-				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom Track	1	0.00	13.08	15.39	0.08	1.234	0.78%
Depth Reference: Vertical Beam	2	0.00	12.69	15.35	0.083	1.271	3.87%
Coordinate System: FNE	3	0.00	13.24	15.39	0.077	1.186	-2.98%
Left Method: Sloped Bank	5	0.00	13.20	15.55	0.078	1.205	-1.52%
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
Mean:		13.05	15.42	0.080	1.22		
SD:		0.22	0.07	0.002	0.031		
COV:		0.02	0.00	0.029	0.026		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
SOSA-02	1.569	283.728		282.159	282.159	3/4" Pipe 10m W of logger
SOSA-01			0.963	282.765	282.726	T-post 4m NW of logger
SOSA-03			1.365	282.363	282.344	Pipe 3m N of logger
Water Level:			2.708	281.020		Time WL Surveyed: 9:44
Temporary BM			1.117	282.611		0.000
Turn						
Temporary BM	1.097	283.708		282.611		
Water Level:			2.692	281.016		Time WL Surveyed: 9:46
SOSA-03			1.342	282.366	282.344	Pipe 3m N of logger
SOSA-01			0.944	282.764	282.726	T-post 4m NW of logger
SOSA-02			1.550	282.158	282.159	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
SOSA-01	0.944	283.709		282.765		
Water Level:			2.690	281.019		Time WL Surveyed: 10:37
Water Level:			2.668	281.023		Time WL Surveyed: 10:39
SOSA-01	0.926	283.691		282.765		

WL Survey Summary			Level Survey Equipment	
Average WL:	Before	After	Level #:	Level#4
Closing Error:	0.001	-	Make & Model:	Nikon AC-2S
WL Check:	0.004	-0.004	Serial #:	558785
Transducer Elevation:	279.487	279.490		

Field Personnel:			
Date Entry Personnel:	TR, GG	Trip Date:	12-Jun-15
Data Check Personnel:	GG	Date:	12-Jun-15
Entered Digitally in the Field:	CJ	Date:	25-Jun-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek
 UTM Location: 476100 E, 6351600 N

Site Visit Date: August 11, 2015
 Site Visit Time (MST): 11:20



Flow Measurement Details:	
Metering Section Location (describe): Across from station	
Meas. Start Time (MST):	11:45
Meas. End Time (MST):	12:15
Equipment:	ADCP/HI
Method:	Cableway
River Condition:	Low flow
Channel/Edor:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, windy, Zbc

Flow characteristics:	
Total Flow:	0.427 (m ³ /s)
Perceived Measurement Quality:	Good
Cross Section Area:	13.49 (m ²)
Wetted Width:	12.44 (m)
Hydraulic Depth:	1.08 (m)
Mean Velocity:	0.03 (m/s)
Reynolds Number:	3.37E+04
Froude Number:	0.01

Logger Details:		
	Before	After
Transducer Reading (m):	1.441	1.442
Water (°C):	19.6	19.7
Barometric Pressure (kPa):	97.24	97.19
Datalogger Clock:	11:32	12:24
Laptop Clock:	11:31	12:23
Battery:	13.5	13.5
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	352305	-
Logger# (if replaced):	8105	-

Datalogger / Station Notes:
 -Bank holding pressure transducer conduit and anchor cable sloughed away

General Notes:

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	1.20	
Serial Number:	4712	Bainby (ppt):	-	-	RB:	13.80	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed:	Yes	
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed:	Yes	
ADCP Temperature (°C):	21.1						
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom Track	1	0.00	12.31	13.25	0.032	0.427	0.06%
Depth Reference: Vertical Beam	2	0.00	12.84	13.96	0.031	0.431	1.00%
Coordinate System: FNE	4	0.00	12.36	13.29	0.032	0.430	0.79%
Left Method: Sloped Bank	5	0.00	12.24	13.44	0.031	0.419	-1.82%
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
	Mean:	12.44	13.49	0.032	0.427		
	SD:	0.24	0.28	0.001	0.005		
	COV:	0.02	0.02	0.016	0.011		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
SOSA-02	1.364	283.523		282.159	282.159	3/4" Pipe 10m W of logger
SOSA-01			0.762	282.761	282.726	T-post 4m NW of logger
SOSA-03			1.158	282.365	282.344	Pipe 3m N of logger
Water Level:	Cut		2.586	280.937		Time WL Surveyed: 11:38
SOSA-03			1.158	282.365	282.344	Pipe 3m N of logger
Turn						
SOSA-03	1.199	283.564		282.365	282.344	Pipe 3m N of logger
Water Level:	Cut		2.628	280.636		Time WL Surveyed: 11:39
SOSA-03			1.199	282.365	282.344	Pipe 3m N of logger
SOSA-01			0.802	282.762	282.726	T-post 4m NW of logger
SOSA-02			1.406	282.158	282.159	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
SOSA-03	1.199	283.564		282.365		
Water Level:	Cut		2.629	280.936		Time WL Surveyed: 12:19
Water Level:	Cut		2.600	280.936		Time WL Surveyed: 12:20
SOSA-03	1.171	283.536		282.365		

WL Survey Summary	
Average WL:	280.937
Closing Error:	0.001
WL Check:	0.001
Transducer Elevation:	279.496

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:	
Date Entry Personnel:	TR, JC
Data Check Personnel:	CJ
Entered Digitally in the Field:	Yes

Trip Date:	
Date:	11-Aug-15
Date:	17-Aug-15

Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek
 UTM Location: 476100 E, 6351600 N

Site Visit Date: September 21, 2015
 Site Visit Time (MST): 11:35

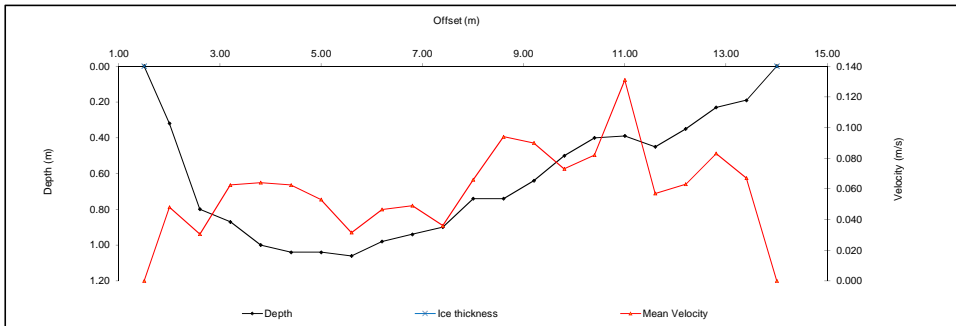


Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.50	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
1	2.00	0.32		0.19	0.048	0.64	0.000	0.16	0.061	1.00	0.55	0.32	0.048	0.18	0.008	2%
2	2.60	0.80				0.70	0.061	0.17	0.064	1.00	0.60	0.80	0.031	0.48	0.015	3%
3	3.20	0.87				0.80	0.066	0.20	0.062	1.00	0.60	0.87	0.063	0.52	0.033	7%
4	3.80	1.00				0.83	0.067	0.21	0.058	1.00	0.60	1.00	0.064	0.60	0.038	8%
5	4.40	1.04				0.83	0.056	0.21	0.050	1.00	0.60	1.04	0.063	0.62	0.039	8%
6	5.00	1.04				0.85	0.012	0.21	0.051	1.00	0.60	1.06	0.032	0.64	0.020	4%
7	5.60	1.06				0.78	0.049	0.20	0.044	1.00	0.60	0.98	0.047	0.59	0.027	6%
8	6.20	0.98				0.75	0.049	0.19	0.049	1.00	0.60	0.94	0.049	0.56	0.028	6%
9	6.80	0.94				0.72	0.020	0.18	0.052	1.00	0.60	0.90	0.036	0.54	0.019	4%
10	7.40	0.90	0.44	0.066						1.00	0.60	0.74	0.065	0.44	0.029	6%
11	8.00	0.74	0.44	0.094						1.00	0.60	0.74	0.094	0.44	0.042	9%
12	8.60	0.74	0.38	0.090						1.00	0.60	0.64	0.090	0.38	0.035	7%
13	9.20	0.64	0.30	0.073						1.00	0.60	0.50	0.073	0.30	0.022	5%
14	9.80	0.50	0.24	0.082						1.00	0.60	0.40	0.082	0.24	0.020	4%
15	10.40	0.40	0.23	0.131						1.00	0.60	0.39	0.131	0.23	0.031	6%
16	11.00	0.39	0.27	0.057						1.00	0.60	0.45	0.057	0.27	0.015	3%
17	11.60	0.45	0.21	0.063						1.00	0.60	0.35	0.063	0.21	0.013	3%
18	12.20	0.35	0.14	0.083						1.00	0.60	0.23	0.083	0.14	0.011	2%
19	12.80	0.23	0.11	0.067						1.00	0.60	0.19	0.067	0.11	0.008	2%
20	13.40	0.19								1.00	0.30	0.00	0.000	0.00		
RB	14.00	0.00	0.00		0.00		0.00		0.00							
Total Flow														0.486	100%	

Flow Measurement Details:

Metering Section Location (describe):
At crossing location, 30m upstream of transducer

Meas. Start Time (MST):	12:30
Meas. End Time (MST):	13:05
Equipment:	ADV #2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low stage and flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, BC



Flow characteristics:

Total Flow:	0.486	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.13	(m ²)
Wetted Width:	12.50	(m)
Hydraulic Depth:	0.65	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	1.454	1.455
Water (°C):	9.4	9.5
Barometric Pressure (kPa):	97.39	97.49
Datalogger Clock:	11:38	13:13
Laptop Clock:	11:37	13:11
Battery (Main):	14.5	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Note

-Vegetation growing along bottom of channel

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05A-02	1.428	283.587		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			0.823	282.764	282.726	T-post 4m NW of logger
S05A-03			1.218	282.369	282.344	Pipe 3m N of logger
Water Level:	Cut	0.058	2.692	280.953	Time WL Surveyed:	11:59
S05A-02			1.428	282.159	282.159	3/4" Pipe 10m W of logger
Turn						
S05A-02	1.402	283.561		282.159	282.159	3/4" Pipe 10m W of logger
Water Level:	Cut	0.059	2.668	280.952	Time WL Surveyed:	12:02
S05A-03			1.193	282.368	282.344	Pipe 3m N of logger
S05A-01			0.799	282.762	282.726	T-post 4m NW of logger
S05A-02			1.402	282.159	282.159	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S05A-03	1.218	283.587		282.369		
Water Level:	Cut	0.262	2.897	280.952	Time WL Surveyed:	13:07
Water Level:	Cut	0.262	2.876	280.951	Time WL Surveyed:	13:09
S05A-03	1.196	283.565		282.369		

WL Survey Summary

	Before	After
Average WL:	280.953	280.952
Closing Error:	0.000	-
WL Check:	0.001	0.001
Transducer Elevation	279.499	279.497

Level Survey Equipment:

Level #:	Level #3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	21-Sep-15
Data Check Personnel:	TR	Date:	21-Sep-15
Entered Digitally in the Field:	CJ	Date:	30-Sep-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek
 UTM Location: 476100 E, 6351600 N

Site Visit Date: October 14, 2015
 Site Visit Time (MST): 09:37



Flow Measurement Details:	
Metering Section Location (describe): Adjacent to station, at cableway	
Meas. Start Time (MST):	10:04
Meas. End Time (MST):	10:44
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 12c

Flow characteristics:	
Total Flow:	0.398 (m ³ /s)
Perceived Measurement Quality:	Good
Cross Section Area:	12.85 (m ²)
Wetted Width:	13.88 (m)
Hydraulic Depth:	0.93 (m)
Mean Velocity:	0.03 (m/s)
Reynolds Number:	2.02 E+04
Froude Number:	0.61

Logger Details:		
	Before	After
Transducer Reading (m):	1.398	1.400
Water (°C):	9.5	5.7
Barometric Pressure (kPa):	97.56	97.61
Datalogger Clock:	09:43	10:59
Laptop Clock:	09:41	10:58
Battery:	14.5	14.5
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	16.20	
Serial Number:	4712	Bainby (gpd):	-	-	RB:	30.00	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.33	Compass Calibration Passed: Yes		
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: -		
		ADCP Temperature (°C):	-	6.6			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom Track	1	0.00	13.80	13.42	0.029	0.394	-1.01%
Depth Reference: Vertical Beam	2	0.00	14.12	13.48	0.029	0.396	-0.50%
Coordinate System: FNE	3	0.00	13.84	13.31	0.029	0.419	5.29%
Left Method: Sloped Bank	5	0.00	13.75	11.19	0.034	0.383	-3.77%
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
Mean:		13.88	12.85	0.030	0.398		
SD:		0.14	0.96	0.003	0.013		
COV:		0.01	0.07	0.097	0.033		

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
SOSA-02	1.488	283.647		282.159	282.159	3/4" Pipe 10m W of logger
SOSA-01			0.884	282.763	282.765	T-post 4m NW of logger
SOSA-03			1.278	282.369	282.367	Pipe 3m N of logger
Turn						
Water Level:	Cut		2.754	280.893		Time WL Surveyed: 9:45
Temporary BM			1.278	282.369	0.000	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
SOSA-03	1.252	283.621		282.369		
Water Level:	Cut		2.728	280.653		Time WL Surveyed: 9:46
SOSA-03			1.252	282.369	282.367	Pipe 3m N of logger
SOSA-01			0.857	282.754	282.755	T-post 4m NW of logger
SOSA-02			1.461	282.160	282.159	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
SOSA-03	1.252	283.621		282.369		
Water Level:	Cut		2.727	280.654		Time WL Surveyed: 10:47
Water Level:	Cut		2.693	280.698		Time WL Surveyed: 10:50
SOSA-03	1.222	283.591		282.369		

WL Survey Summary			Level Survey Equipment	
Average WL:	Before	After	Level #:	Level#2
Closing Error:	-0.001	-	Make & Model:	Nikon AC-2S
WL Check:	0.000	-0.004	Serial #:	568859
Transducer Elevation:	279.495	279.496		

Field Personnel:			
Date Entry Personnel:	GG, JC	Trip Date:	14-Oct-15
Data Check Personnel:	GG	Date:	14-Oct-15
Entered Digitally in the Field:	CJ	Date:	15-Oct-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek
 UTM Location: 476100 E, 6351600 N

Site Visit Date: December 1, 2015
 Site Visit Time (MST): 09:52

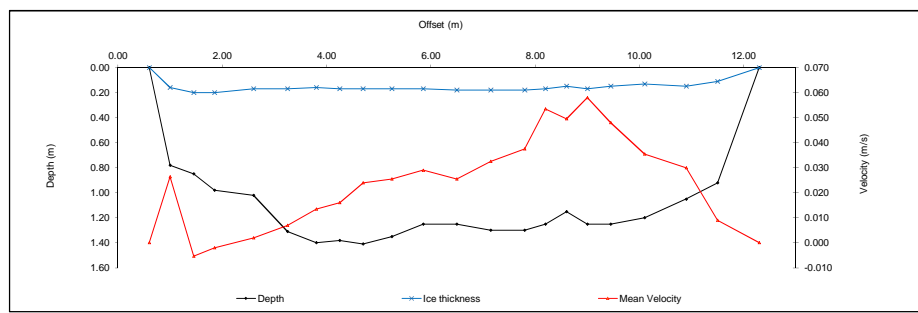


Measured Data										Calculated Data						
Bank/ Mnt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.60	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	1.00	0.78	0.16	0.47	0.030					0.88	0.43	0.62	0.026	0.26	0.007	2%
2	1.45	0.85	0.20	0.53	-0.006					0.88	0.43	0.65	-0.005	0.28	-0.001	0%
3	1.85	0.98	0.20			0.82	-0.001	0.36	-0.003	1.00	0.58	0.78	-0.002	0.45	-0.001	0%
4	2.60	1.02	0.17			0.85	0.000	0.34	0.004	1.00	0.70	0.85	0.002	0.60	0.001	0%
5	3.25	1.31	0.17			1.08	0.003	0.40	0.011	1.00	0.60	1.14	0.007	0.68	0.005	2%
6	3.80	1.40	0.16			1.15	0.019	0.41	0.008	1.00	0.50	1.24	0.014	0.62	0.008	3%
7	4.25	1.38	0.17			1.14	0.026	0.41	0.006	1.00	0.45	1.21	0.016	0.54	0.009	3%
8	4.70	1.41	0.17			1.16	0.025	0.42	0.023	1.00	0.50	1.24	0.024	0.62	0.015	5%
9	5.25	1.35	0.17			1.11	0.026	0.41	0.025	1.00	0.58	1.18	0.026	0.68	0.017	6%
10	5.85	1.25	0.17			1.03	0.028	0.39	0.030	1.00	0.63	1.08	0.029	0.68	0.020	7%
11	6.50	1.25	0.18			1.04	0.024	0.39	0.027	1.00	0.65	1.07	0.026	0.70	0.019	6%
12	7.15	1.30	0.18			1.08	0.038	0.40	0.027	1.00	0.65	1.12	0.033	0.73	0.024	8%
13	7.80	1.30	0.18			1.08	0.030	0.40	0.045	1.00	0.53	1.12	0.038	0.59	0.023	8%
14	8.20	1.25	0.17			1.03	0.062	0.39	0.045	1.00	0.40	1.08	0.054	0.43	0.023	8%
15	8.60	1.15	0.15			0.95	0.052	0.35	0.047	1.00	0.40	1.00	0.050	0.40	0.020	7%
16	9.00	1.25	0.17			1.00	0.047	0.39	0.069	1.00	0.42	1.08	0.058	0.46	0.027	9%
17	9.45	1.25	0.15			1.03	0.043	0.37	0.053	1.00	0.55	1.10	0.048	0.60	0.029	10%
18	10.10	1.20	0.13			0.99	0.029	0.34	0.042	1.00	0.73	1.07	0.036	0.78	0.028	9%
19	10.90	1.05	0.15			0.87	0.026	0.33	0.034	1.00	0.70	0.90	0.030	0.63	0.019	6%
20	11.50	0.92	0.11			0.76	-0.002	0.27	0.020	1.00	0.70	0.81	0.009	0.57	0.005	2%
LB	12.30	0.00	0.00		0.00		0.00		0.00	0.88	0.40	0.00	0.000	0.00	0.000	
Total Flow														0.293	100%	

Flow Measurement Details:

Metering Section Location (describe): Adjacent to station

Meas. Start Time (MST):	10:22
Meas. End Time (MST):	11:10
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Straight Edge (e.g. bridge/piar)
Quality/Error (see reverse):	Good
Weather:	Clear, -5c



Flow characteristics:

Total Flow:	0.293	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.29	(m ²)
Wetted Width:	11.70	(m)
Hydraulic Depth:	0.96	(m)
Mean Velocity:	0.03	(m/s)
Reynolds Number:	1.41E+04	
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	1.372	
Water (°C):	0.3	
Barometric Pressure (kPa):	97.46	
Datalogger Clock:	10:55	
Laptop Clock:	09:54	
Battery:	14.8	
Battery Condition:	-	Good
Battery Serial #:	-	
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-ADV test passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S05A-02	1.682	283.841		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			1.073	282.768	282.765	T-post 4m NW of logger
S05A-03			1.473	282.368	282.367	Pipe 3m N of logger
Water Level:	Cut		2.975	280.866		Time WL Surveyed: 10:09
Temporary BM			2.963	280.878	0.000	-
Turn						
Temporary BM	2.938	283.816		280.878		
Water Level:	Cut		2.947	280.869		Time WL Surveyed: 10:13
S05A-03			1.449	282.367	282.367	Pipe 3m N of logger
S05A-01			1.050	282.766	282.765	T-post 4m NW of logger
S05A-02			1.657	282.159	282.159	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	280.868	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	279.496	-

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC 2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, JM	Trip Date:	1-Dec-15
Data Check Personnel:	CJ	Date:	3-Dec-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63
 UTM Location: 463829 E, 6344743 N

Site Visit Date: January 9, 2015
 Site Visit Time (MST): 14:30

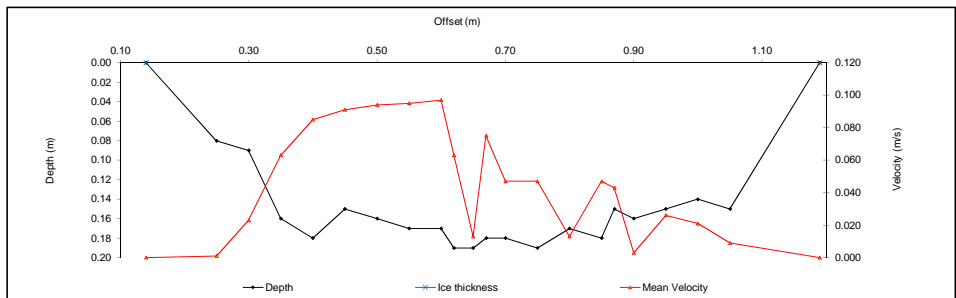


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.06	0.00	0.000	0.00	0.000	
1	0.25	0.08	0.05	0.001					1.00	0.08	0.08	0.001	0.01	0.000	0%
2	0.30	0.09	0.05	0.023					1.00	0.05	0.09	0.023	0.00	0.000	2%
3	0.35	0.16	0.10	0.063					1.00	0.05	0.16	0.063	0.01	0.001	7%
4	0.40	0.18	0.11	0.085					1.00	0.05	0.18	0.085	0.01	0.001	11%
5	0.45	0.15	0.09	0.091					1.00	0.05	0.15	0.091	0.01	0.001	10%
6	0.50	0.16	0.10	0.094					1.00	0.05	0.16	0.094	0.01	0.001	11%
7	0.55	0.17	0.10	0.095					1.00	0.05	0.17	0.095	0.01	0.001	12%
8	0.60	0.17	0.10	0.097					1.00	0.04	0.17	0.097	0.01	0.001	9%
9	0.62	0.19	0.11	0.063					1.00	0.03	0.19	0.063	0.00	0.000	4%
10	0.65	0.19	0.11	0.013					1.00	0.03	0.19	0.013	0.00	0.000	1%
11	0.67	0.18	0.11	0.075					1.00	0.03	0.18	0.075	0.00	0.000	5%
12	0.70	0.18	0.11	0.047					1.00	0.04	0.18	0.047	0.01	0.000	5%
13	0.75	0.19	0.11	0.047					1.00	0.05	0.19	0.047	0.01	0.000	7%
14	0.80	0.17	0.10	0.013					1.00	0.05	0.17	0.013	0.01	0.000	2%
15	0.85	0.18	0.11	0.047					1.00	0.04	0.18	0.047	0.01	0.000	4%
16	0.87	0.15	0.09	0.043					1.00	0.03	0.15	0.043	0.00	0.000	2%
17	0.90	0.16	0.10	0.003					1.00	0.04	0.16	0.003	0.01	0.000	0%
18	0.95	0.15	0.09	0.026					1.00	0.05	0.15	0.026	0.01	0.000	3%
19	1.00	0.14	0.08	0.021					1.00	0.05	0.14	0.021	0.01	0.000	2%
20	1.05	0.15	0.09	0.009					1.00	0.10	0.15	0.009	0.01	0.000	2%
LB	1.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.07	0.00	0.000	0.00	0.000	
Total Flow													0.007	100%	

Flow Measurement Details:

Metering Section Location (describe): 1m downstream of weir

Meas. Start Time (MST):	14:45
Meas. End Time (MST):	15:10
Equipment:	ADV
Method:	Wading
River Condition:	Small open lead in centre
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, -18C



Flow characteristics:

Total Flow:	0.007	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	0.14	(m ²)
Wetted Width:	1.05	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.681	-
Water (°C):	1.6	-
Datalogger Clock:	14:31	-
Laptop Clock:	14:30	-
Battery (Main):	14.2	-
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S06-04	0.643	274.756		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.648	274.108	274.105	3/4" Pipe 6m NW of data logger
S06-01			1.247	273.509	273.541	Rebar
Water Level:	Cut		2.744	272.012	Time WL Surveyed: 14:44	
Temporary BM			2.703	272.053	0.000	
Turn						
Temporary BM	2.684	274.737		272.053		
Water Level:	Cut		2.724	272.013	Time WL Surveyed: 14:46	
S06-01			1.227	273.510	273.541	Rebar
S06-03			0.629	274.108	274.105	3/4" Pipe 6m NW of data logger
S06-04			0.623	274.114	274.113	3/4" Pipe 7m W of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	272.013	-
Closing Error:	-0.001	-
WL Check:	0.001	-
Transducer Elevation	271.332	-

Field Personnel:

	GG, MP	Trip Date:	9-Jan-15
Data Entry Personnel:	GG	Date:	9-Jan-15
Data Check Personnel:	GG	Date:	26-Jan-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63
 UTM Location: 463829 E, 6344743 N

Site Visit Date: February 13, 2015
 Site Visit Time (MST): 13:42

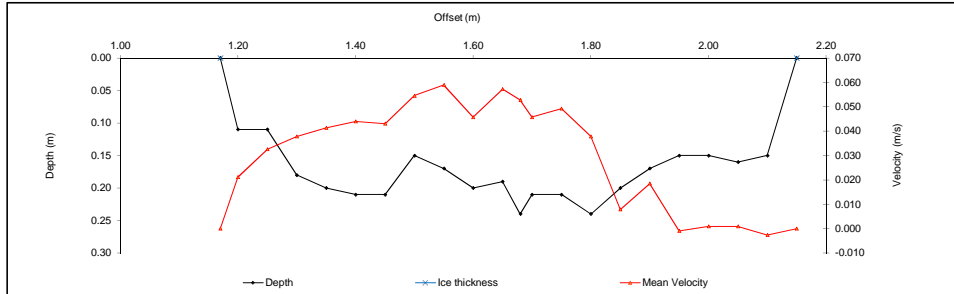


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.02	0.00	0.000	0.00	0.000	
1	1.20	0.11	0.06	0.024					0.88	0.04	0.11	0.021	0.00	0.000	2%
2	1.25	0.11	0.06	0.037					0.88	0.05	0.11	0.033	0.01	0.000	3%
3	1.30	0.18	0.09	0.043					0.88	0.05	0.18	0.038	0.01	0.000	6%
4	1.35	0.20	0.10	0.047					0.88	0.05	0.20	0.041	0.01	0.000	7%
5	1.40	0.21	0.11	0.050					0.88	0.05	0.21	0.044	0.01	0.000	8%
6	1.45	0.21	0.11	0.049					0.88	0.05	0.21	0.043	0.01	0.000	8%
7	1.50	0.15	0.08	0.062					0.88	0.05	0.15	0.055	0.01	0.000	7%
8	1.55	0.17	0.09	0.067					0.88	0.05	0.17	0.059	0.01	0.001	9%
9	1.60	0.20	0.10	0.052					0.88	0.05	0.20	0.046	0.01	0.000	8%
10	1.65	0.19	0.10	0.065					0.88	0.04	0.19	0.057	0.01	0.000	8%
11	1.68	0.24	0.12	0.080					0.88	0.02	0.24	0.053	0.01	0.000	6%
12	1.70	0.21	0.11	0.052					0.88	0.04	0.21	0.046	0.01	0.000	6%
13	1.75	0.21	0.11	0.056					0.88	0.05	0.21	0.049	0.01	0.001	9%
14	1.80	0.24	0.12	0.043					0.88	0.05	0.24	0.038	0.01	0.000	8%
15	1.85	0.20	0.10	0.009					0.88	0.05	0.20	0.008	0.01	0.000	1%
16	1.90	0.17	0.09	0.021					0.88	0.05	0.17	0.018	0.01	0.000	3%
17	1.95	0.15	0.08	-0.001					0.88	0.05	0.15	-0.001	0.01	0.000	0%
18	2.00	0.15	0.08	0.001					0.88	0.05	0.15	0.001	0.01	0.000	0%
19	2.05	0.16	0.08	0.001					0.88	0.05	0.16	0.001	0.01	0.000	0%
20	2.10	0.15	0.08	-0.003					0.88	0.05	0.15	-0.003	0.01	0.000	0%
LB	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.02	0.00	0.000	0.00	0.000	
Total Flow													0.006	100%	

Flow Measurement Details:

Metering Section Location (describe):
Just downstream of the weir

Meas. Start Time (MST):	14:03
Meas. End Time (MST):	14:29
Equipment:	ADV
Method:	Ice
River Condition:	Partial ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -10C



Flow characteristics:

Total Flow:	0.006	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.17	(m ²)
Wetted Width:	0.98	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.673	
Water (°C):	1.2	
Datalogger Clock:	13:46	
Laptop Clock:	13:45	
Battery (Main):	15.3	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S06-04	0.733	274.846		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.737	274.109	274.105	3/4" Pipe 6m NW of data logger
S06-01			1.346	273.500	273.541	Rebar
Water Level:	Cut		2.851	271.995	Time WL Surveyed: 13:54	
Temporary BM		2.492		272.354	0.000	
Turn						
Temporary BM	2.475	274.829		272.354		
Water Level:	Cut		2.836	271.993	Time WL Surveyed: 13:57	
S06-01			1.328	273.501	273.541	Rebar
S06-03			0.719	274.110	274.105	3/4" Pipe 6m NW of data logger
S06-04			0.715	274.114	274.113	3/4" Pipe 7m W of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	271.994	-
Closing Error:	-0.001	-
WL Check:	0.002	-
Transducer Elevation	271.321	-

Field Personnel:

	GG, MP	Trip Date:	13-Feb-15
Data Entry Personnel:	GG	Date:	13-Feb-15
Data Check Personnel:	CJ	Date:	4-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63
 UTM Location: 463829 E, 6344743 N

Site Visit Date: March 2, 2015
 Site Visit Time (MST): 14:00

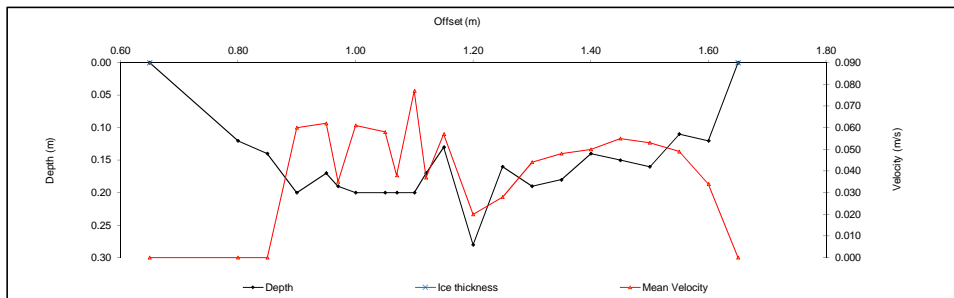


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.65	0.00	0.00		0.000		0.000		0.000	1.00	0.02	0.00	0.000	0.00	0.000	
1	1.60	0.12		0.07	0.034					1.00	0.05	0.12	0.034	0.01	0.000	3%
2	1.55	0.11		0.07	0.049					1.00	0.05	0.11	0.049	0.01	0.000	4%
3	1.50	0.16		0.10	0.053					1.00	0.05	0.16	0.053	0.01	0.000	7%
4	1.45	0.15		0.09	0.055					1.00	0.05	0.15	0.055	0.01	0.000	7%
5	1.40	0.14		0.08	0.050					1.00	0.05	0.14	0.050	0.01	0.000	6%
6	1.35	0.18		0.11	0.048					1.00	0.05	0.18	0.048	0.01	0.000	7%
7	1.30	0.19		0.11	0.044					1.00	0.05	0.19	0.044	0.01	0.000	7%
8	1.25	0.16		0.10	0.028					1.00	0.05	0.16	0.028	0.01	0.000	4%
9	1.20	0.28		0.17	0.020					1.00	0.05	0.28	0.020	0.01	0.000	5%
10	1.15	0.13		0.08	0.057					1.00	0.04	0.13	0.057	0.01	0.000	5%
11	1.12	0.17		0.10	0.037					1.00	0.02	0.17	0.037	0.00	0.000	3%
12	1.10	0.20		0.12	0.077					1.00	0.03	0.20	0.077	0.01	0.000	6%
13	1.07	0.20		0.12	0.038					1.00	0.02	0.20	0.038	0.00	0.000	3%
14	1.05	0.20		0.12	0.058					1.00	0.04	0.20	0.058	0.01	0.000	7%
15	1.00	0.20		0.12	0.061					1.00	0.04	0.20	0.061	0.01	0.000	8%
16	0.97	0.19		0.11	0.035					1.00	0.03	0.19	0.035	0.00	0.000	3%
17	0.95	0.17		0.10	0.062					1.00	0.03	0.17	0.062	0.01	0.000	6%
18	0.90	0.20		0.12	0.060					1.00	0.05	0.20	0.060	0.01	0.001	10%
19	0.85	0.14		0.08	0.000					1.00	0.05	0.14	0.000	0.01	0.000	0%
20	0.80	0.12		0.07	0.000					1.00	0.10	0.12	0.000	0.01	0.000	0%
LB	0.65	0.00	0.00		0.00		0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
Total Flow														0.006	100%	

Flow Measurement Details:

Metering Section Location (describe):
3m downstream of weir

Meas. Start Time (MST):	14:30
Meas. End Time (MST):	14:59
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -14C



Flow characteristics:

Total Flow:	0.006	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.15	(m ²)
Wetted Width:	1.00	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.673	
Water (°C):	1.2	
Datalogger Clock:	14:09	
Laptop Clock:	14:08	
Battery (Main):	15.2	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S06-04	0.915	275.028		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.924	274.104	274.105	3/4" Pipe 6m NW of data logger
S06-01			1.537	273.491	273.541	Rebar
Water Level:	Cut		3.039	271.989	Time WL Surveyed:	14:23
Temporary BM			2.691	272.337	0.000	-
Turn						
Temporary BM	2.673	275.010		272.337		-
Water Level:	Cut		3.019	271.991	Time WL Surveyed:	14:28
S06-01			1.518	273.492	273.541	Rebar
S06-03			0.905	274.105	274.105	3/4" Pipe 6m NW of data logger
S06-04			0.899	274.112	274.113	3/4" Pipe 7m W of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	271.990	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	271.317	-

Field Personnel:

	MP, TR	Trip Date:	2-Mar-15
Data Entry Personnel:	MP	Date:	2-Mar-15
Data Check Personnel:	CJ	Date:	4-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement /

Site: S9 Kears Lake Outlet
 UTM Location: 483962 E, 6346990 N

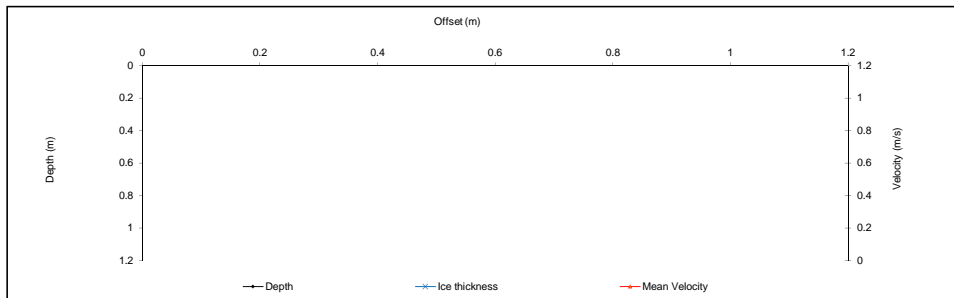
Site Visit Date: January 7, 2015
 Site Visit Time (MST): 10:39



Flow Measurement:															
Measured Data											Calculated Data				
Bank/ Mnt #	Offset (m)	Depth from WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
No Flow Measurement Conducted															
Total Flow															-

Flow Measurement Details:
Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:

	Before	After
Transducer Reading (m):	0.878	
Water (°C):	0.4	
Datalogger Clock:	10:38	
Laptop Clock:	10:38	
Battery (Main):	13.9	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:
 -Flow measurement not conducted due to safety concerns.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S09-05	0.393	331.028		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			0.683	330.345	330.294	3/4" Pipe 10m E of logger
S09-04			0.723	330.305	330.299	3/4" Pipe 6m NE of logger
Water Level:	Cut		1.813	329.215	Time WL Surveyed:	10:44
Temporary BM			1.744	329.284	0.000	-
Turn						
Temporary BM	1.727	331.011		329.284		-
Water Level:	Cut		1.796	329.215	Time WL Surveyed:	10:46
S09-04			0.706	330.305	330.299	3/4" Pipe 6m NE of logger
S09-03			0.665	330.346	330.294	3/4" Pipe 10m E of logger
S09-05			0.375	330.636	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	329.215	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	328.337	-

Field Personnel:

	GG, TR	Trip Date:	7-Jan-15
Data Entry Personnel:	GG	Date:	7-Jan-15
Data Check Personnel:	CJ	Date:	19-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement /

Site: S9 Kearsal Lake Outlet
 UTM Location: 483962 E, 6346990 N

Site Visit Date: February 4, 2015
 Site Visit Time (MST): 10:45



Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of ice to bottom of WS (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.00	0.00	0.00	0.00	0.000				0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	0.40	0.40	0.24	0.32	-0.006					0.88	0.35	0.16	-0.005	0.06	0.000	0%
2	0.70	0.80	0.21	0.51	0.318					0.88	0.20	0.59	0.280	0.12	0.033	24%
3	0.80	0.80	0.24	0.52	0.344					0.88	0.08	0.56	0.303	0.04	0.013	9%
4	0.85	0.80	0.22	0.51	0.343					0.88	0.08	0.58	0.302	0.04	0.013	9%
5	0.95	0.79	0.24	0.52	0.289					0.88	0.13	0.55	0.254	0.07	0.017	13%
6	1.10	0.78	0.25	0.52	0.272					0.88	0.18	0.53	0.239	0.09	0.022	16%
7	1.30	0.79	0.24	0.52	0.146					0.88	0.18	0.55	0.128	0.10	0.012	9%
8	1.45	0.72	0.25	0.49	0.123					0.88	0.13	0.47	0.108	0.06	0.006	5%
9	1.55	0.70	0.25	0.48	0.130					0.88	0.13	0.45	0.114	0.06	0.006	5%
10	1.70	0.69	0.25	0.47	0.129					0.88	0.13	0.44	0.114	0.06	0.006	4%
11	1.80	0.68	0.25	0.47	0.121					0.88	0.13	0.43	0.106	0.05	0.006	4%
12	1.95	0.62	0.25	0.44	0.082					0.88	0.10	0.37	0.072	0.04	0.003	2%
13	2.00	0.60	0.25	0.43	0.056					0.88	0.10	0.35	0.049	0.04	0.002	1%
14	2.15	0.60	0.25	0.43	0.024					0.88	0.15	0.35	0.021	0.05	0.001	1%
15	2.30	0.62	0.25	0.44	0.021					0.88	0.18	0.37	0.018	0.06	0.001	1%
16	2.50	0.60	0.25	0.43	-0.001					0.88	0.25	0.35	-0.001	0.09	0.000	0%
17	2.80	0.60	0.25	0.43	0.000					0.88	0.38	0.35	0.000	0.13	0.000	0%
18	3.25	0.70	0.35	0.53	-0.006					0.88	0.48	0.35	-0.005	0.17	-0.001	-1%
19	3.75	0.70	0.38	0.54	-0.005					0.88	0.53	0.32	-0.004	0.17	-0.001	-1%
20	4.30	0.60	0.30	0.45	-0.007					0.88	0.52	0.30	-0.006	0.16	-0.001	-1%
LB	4.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.139	100%	

Flow Measurement Details:

Metering Section Location (describe): 20m downstream of station

Meas. Start Time (MST):	11:39
Meas. End Time (MST):	12:02
Equipment:	ADV
Method:	Ice
River Condition:	Overflow ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, light breeze, -20C

Flow characteristics:

Total Flow:	0.139	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.64	(m ²)
Wetted Width:	4.80	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.05	

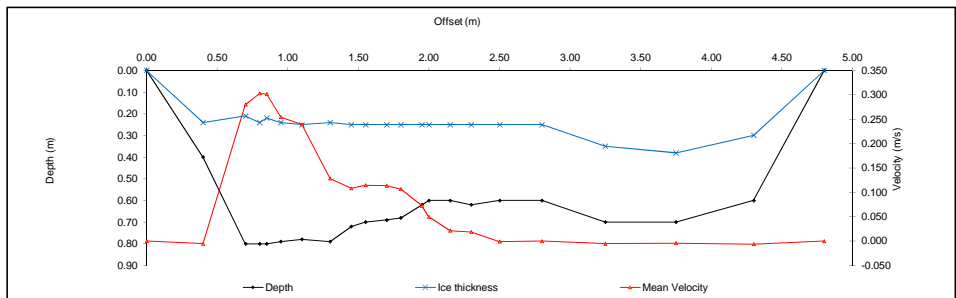
Logger Details:

	Before	After
Transducer Reading (m):	0.966	
Water (°C):	0.2	
Datalogger Clock:	10:50	
Laptop Clock:	10:50	
Battery (Main):	14.6	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-ADV Test good



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S09-05	0.619	331.254		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			0.890	330.364	330.294	3/4" Pipe 10m E of logger
S09-04			0.946	330.308	330.299	3/4" Pipe 6m NE of logger
Water Level:	Cut		1.960	329.294	Time WL Surveyed:	11:33
Temporary BM			1.915	329.339		-
Turn						
Temporary BM	1.907	331.246		329.339		-
Water Level:	Cut		1.951	329.295	Time WL Surveyed:	11:35
S09-04			0.936	330.310	330.299	3/4" Pipe 6m NE of logger
S09-03			0.882	330.364	330.294	3/4" Pipe 10m E of logger
S09-05			0.610	330.636	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	329.295	-
Closing Error:	-0.001	-
WL Check:	0.001	-
Transducer Elevation	328.329	-

Field Personnel:

	SM, CJ	Trip Date:	4-Feb-15
Data Entry Personnel:	CJ	Date:	4-Feb-15
Data Check Personnel:	CJ	Date:	19-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement /

Site: S9 Kears Lake Outlet
 UTM Location: 483962 E, 6346990 N

Site Visit Date: March 15, 2015
 Site Visit Time (MST): 10:37

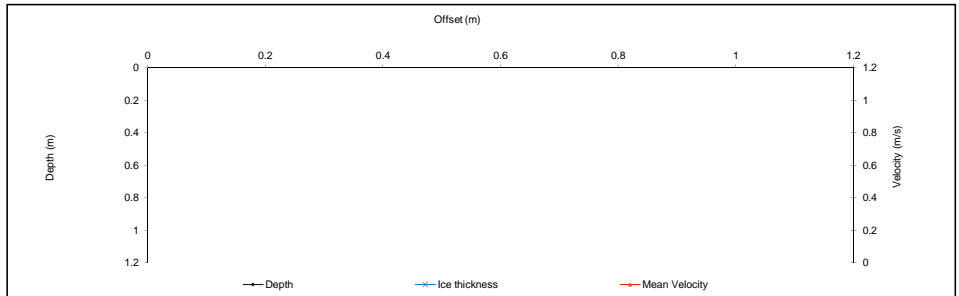


Flow Measurement:																
Measured Data											Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
No Flow Measurement Conducted																
															Total Flow	-

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:

	Before	After
Transducer Reading (m):	0.744	-
Water (°C):	0.5	-
Datalogger Clock:	10:40	-
Laptop Clock:	10:39	-
Battery (Main):	14.6	14.5
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- Flow measurement not conducted due to thin ice conditions and safety concerns

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S09-05	0.593	331.228		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			0.852	330.376	330.294	3/4" Pipe 10m E of logger
S09-04			0.905	330.323	330.299	3/4" Pipe 6m NE of logger
Water Level:	Cut		2.160	329.068	Time WL Surveyed:	10:46
Temporary BM			2.036	329.192	0.000	-
Turn						
Temporary BM	2.006	331.198		329.192		-
Water Level:	Cut		2.128	329.070	Time WL Surveyed:	10:48
S09-04			0.875	330.323	330.299	3/4" Pipe 6m NE of logger
S09-03			0.822	330.376	330.294	3/4" Pipe 10m E of logger
S09-05			0.562	330.636	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	329.069	-
Closing Error:	-0.001	-
WL Check:	0.002	-
Transducer Elevation	328.325	-

Field Personnel:

	MP, GG	Trip Date:	15-Mar-15
Data Entry Personnel:	MP	Date:	15-Mar-15
Data Check Personnel:	CJ	Date:	19-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement /

Site: S9 Kearl Lake Outlet
 UTM Location: 483962 E, 6346990 N

Site Visit Date: April 25, 2015
 Site Visit Time (MST): 08:52



Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	7.75	0.00	0.00													
1	7.90	0.52		0.31	0.009					1.00	0.08	0.00	0.000	0.00	0.000	
2	8.20	0.58		0.35	-0.002					1.00	0.23	0.52	0.009	0.12	0.001	535%
3	8.50	0.64		0.38	0.006					1.00	0.30	0.58	-0.002	0.17	0.000	-177%
4	8.80	0.74		0.44	0.002					1.00	0.30	0.64	0.006	0.19	0.001	585%
5	9.00	0.88				0.70	-0.006	0.18	0.011	1.00	0.25	0.74	0.002	0.19	0.000	188%
6	9.20	0.82				0.66	-0.006	0.16	0.008	1.00	0.20	0.88	0.003	0.18	0.000	223%
7	9.40	0.86				0.69	-0.003	0.17	0.009	1.00	0.20	0.82	0.001	0.16	0.000	83%
8	9.60	0.80				0.64	-0.006	0.16	0.004	1.00	0.20	0.86	0.003	0.17	0.001	262%
9	9.80	0.75		0.45	0.000					1.00	0.20	0.80	-0.001	0.16	0.000	-81%
10	10.00	0.74		0.44	-0.002					1.00	0.20	0.75	0.000	0.15	0.000	0%
11	10.20	0.74		0.44	-0.004					1.00	0.20	0.74	-0.002	0.15	0.000	-150%
12	10.40	0.68		0.41	-0.004					1.00	0.25	0.68	-0.004	0.15	-0.001	-301%
13	10.70	0.58		0.35	0.001					1.00	0.30	0.58	0.001	0.17	0.000	88%
14	11.00	0.54		0.32	0.004					1.00	0.30	0.54	0.004	0.16	0.001	329%
15	11.30	0.50		0.30	0.006					1.00	0.30	0.50	0.006	0.15	0.001	457%
16	11.60	0.49		0.29	0.002					1.00	0.30	0.49	0.002	0.15	0.000	149%
17	11.90	0.51		0.31	0.000					1.00	0.30	0.51	0.000	0.15	0.000	0%
18	12.20	0.50		0.30	-0.004					1.00	0.30	0.50	-0.004	0.15	-0.001	-305%
19	12.50	0.44		0.26	-0.010					1.00	0.30	0.44	-0.010	0.13	-0.001	-670%
20	12.80	0.46		0.28	-0.011					1.00	0.30	0.46	-0.011	0.14	-0.002	-771%
RB	13.10	0.00	0.00							1.00	0.15	0.00	0.000	0.00	0.000	
Total Flow														0.000	100%	

Flow Measurement Details:

Metering Section Location (describe): At station

Meas. Start Time (MST):	9:23
Meas. End Time (MST):	10:07
Equipment:	ADV
Method:	Wading
River Condition:	Open, very low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Sunny, -3C

Flow characteristics:

Total Flow:	0.000	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	3.16	(m ²)
Wetted Width:	5.35	(m)
Hydraulic Depth:	0.59	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.00	

Logger Details:

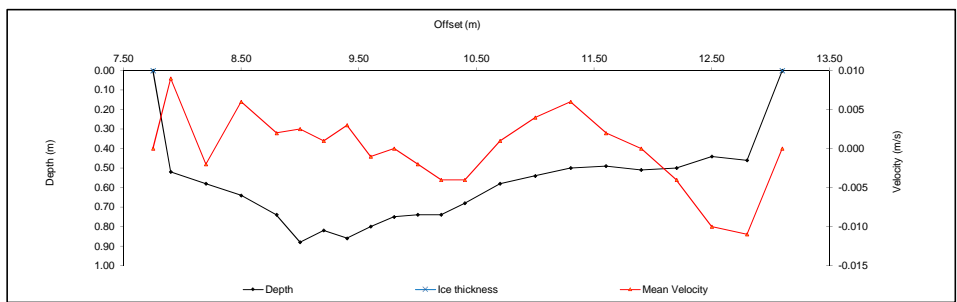
	Before	After
Transducer Reading (m):	0.939	0.940
Water (°C):	8.4	8.3
Datalogger Clock:	08:56	10:17
Laptop Clock:	08:56	10:17
Battery (Main):	14.3	14.3
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-stream dammed 10m upstream of road

-ADV test passed

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S09-05	0.517	331.152		330.635	330.635	3/4" Pipe 10m NE of logger
S09-04			0.823	330.329	330.299	3/4" Pipe 6m NE of logger
S09-03			0.768	330.384	330.294	3/4" Pipe 10m E of logger
Water Level:	Cut		1.887	329.265		Time WL Surveyed: 9:06
S09-03			0.768	330.384	330.294	3/4" Pipe 10m E of logger
Turn						
S09-03	0.751	331.135		330.384	330.294	3/4" Pipe 10m E of logger
Water Level:	Cut		1.868	329.267		Time WL Surveyed: 9:08
S09-03			0.751	330.384	330.294	3/4" Pipe 10m E of logger
S09-04			0.806	330.329	330.299	3/4" Pipe 6m NE of logger
S09-05			0.499	330.636	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S09-05	0.493	331.129		330.636		
Water Level:	Cut		1.866	329.263		Time WL Surveyed: 10:11
Water Level:	Cut		1.847	329.264		Time WL Surveyed: 10:12
S09-05	0.475	331.111		330.636		

WL Survey Summary

	Before	After
Average WL:	329.266	329.264
Closing Error:	-0.001	-
WL Check:	0.002	-0.001
Transducer Elevation	328.327	328.324

Field Personnel:

GG, RM	Trip Date:	25-Apr-15
GG	Date:	25-Apr-15
CJ	Date:	20-May-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S9 Kears Lake Outlet
 UTM Location: 483962 E, 6346990 N

Site Visit Date: May 13, 2015
 Site Visit Time (MST): 11:00



Flow Measurement Details:	
Metering Section Location (describe): 4m downstream of station	
Meas. Start Time (MST):	10:15
Meas. End Time (MST):	11:45
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Very slow flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, 20C

Flow characteristics:	
Total Flow:	0.016 (m ³ /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	3.18 (m ²)
Wetted Width:	5.22 (m)
Hydraulic Depth:	0.61 (m)
Mean Velocity:	0.00 (m/s)
Froude Number:	0.00

Logger Details:		
	Before	After
Transducer Reading (m):	1.051	1.051
Water (C):	8.6	8.6
Datalogger Clock:	11:00	11:58
Laptop Clock:	11:00	11:57
Battery (Main):	13.7	13.7
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PTB (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- discharge very low, surface velocities affected by wind, ADCP measurement affected
- upstream side of culvert 10cm above water level, no water flowing down

ADCP Flow Measurement Summary:					
System Information:		System Setup:		Bank Offsets:	
System Type:	Sonist RS-M9	Transducer Depth (m):	0.06	LB:	6.50
Serial Number:	4712	Sensitivity (g/s):	-	RB:	0.70
Firmware Version:	3.80	Magnetic Declination (°):	14.33		
Software Version:	3.80	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	15.4		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom Track	Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	5.21	3.21	0.004
Coordinate System:	ENI	4	5.31	3.24	0.003
Left Method:	Sloped Bank	5	5.25	3.15	0.003
Right Method:	Sloped Bank	8	5.10	3.11	0.004
Top Fit Type:	Power Fit				
Bottom Fit Type:	Power Fit				
		Mean:	5.22	3.18	0.004
		SD:	0.08	0.05	0.001
		COV:	0.01	0.02	0.143
					0.016
					0.001
					0.072

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S09-05	0.526	331.161		330.635	330.635	3/4" Pipe 10m NE of logger
S09-04			0.828	330.333	330.299	3/4" Pipe 6m NE of logger
S09-03			0.774	330.387	330.294	3/4" Pipe 10m E of logger
Water Level:	Cut	0.270	2.051	329.350	329.350	Time WL Surveyed: 11.04
Temporary BM			2.051	329.110	329.110	Time WL Surveyed: 11.06
Turn						
Temporary BM	2.018	331.128		329.110	329.110	
Water Level:	Cut	0.270	2.018	329.380	329.380	Time WL Surveyed: 11.06
S09-03			0.741	330.387	330.294	3/4" Pipe 10m E of logger
S09-04			0.795	330.333	330.299	3/4" Pipe 6m NE of logger
S09-05			0.469	330.639	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S09-03	0.741	331.128		330.387	330.387	
Water Level:	Cut	0.265	2.012	329.351	329.351	Time WL Surveyed: 11.54
Water Level:	Cut	0.265	1.981	329.376	329.376	Time WL Surveyed: 11.55
S09-03	0.707	331.084		330.387	330.387	

WL Survey Summary		
	Before	After
Average WL	329.380	329.380
Closing Error:	-0.004	-
WL Check:	0.000	0.003
Transducer Elevation	328.329	328.329

Field Personnel:			
	TR, MK	Trip Date:	13-May-15
Data Entry Personnel:	TR	Date:	13-May-15
Data Check Personnel:	CJ	Date:	20-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S9 Kearsal Lake Outlet
 UTM Location: 483962 E, 6346990 N

Site Visit Date: June 11, 2015
 Site Visit Time (MST): 11:25

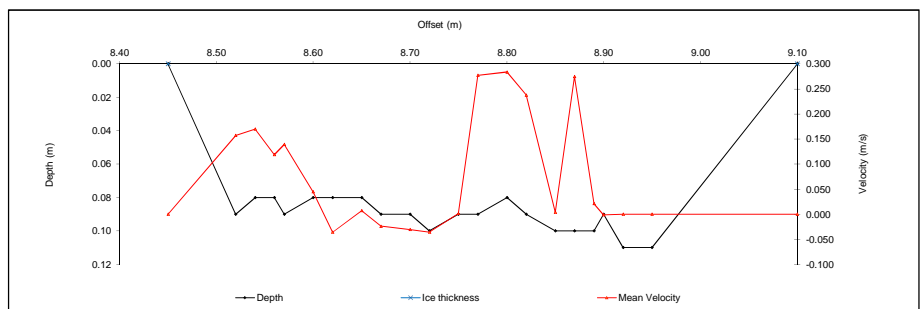


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.45	0.00	0.00		0.000				0.000	1.00	0.04	0.00	0.000	0.00	0.000	
1	8.52	0.09		0.05	0.157					1.00	0.04	0.09	0.157	0.00	0.001	18%
2	8.54	0.08		0.05	0.170					1.00	0.02	0.08	0.170	0.00	0.000	8%
3	8.56	0.08		0.05	0.119					1.00	0.02	0.08	0.119	0.00	0.000	4%
4	8.57	0.09		0.05	0.139					1.00	0.02	0.09	0.139	0.00	0.000	7%
5	8.60	0.08		0.05	0.045					1.00	0.02	0.08	0.045	0.00	0.000	3%
6	8.62	0.08		0.05	-0.036					1.00	0.03	0.08	-0.036	0.00	0.000	-2%
7	8.65	0.08		0.05	0.007					1.00	0.03	0.08	0.007	0.00	0.000	0%
8	8.67	0.09		0.05	-0.024					1.00	0.02	0.09	-0.024	0.00	0.000	-2%
9	8.70	0.09		0.05	-0.031					1.00	0.03	0.09	-0.031	0.00	0.000	-2%
10	8.72	0.10		0.06	-0.036					1.00	0.02	0.10	-0.036	0.00	0.000	-3%
11	8.75	0.09		0.05	0.001					1.00	0.03	0.09	0.001	0.00	0.000	0%
12	8.77	0.09		0.05	0.277					1.00	0.03	0.09	0.277	0.00	0.001	18%
13	8.80	0.08		0.05	0.284					1.00	0.03	0.08	0.284	0.00	0.001	17%
14	8.82	0.09		0.05	0.238					1.00	0.03	0.09	0.238	0.00	0.001	16%
15	8.85	0.10		0.06	0.004					1.00	0.02	0.10	0.004	0.00	0.000	0%
16	8.87	0.10		0.06	0.275					1.00	0.02	0.10	0.275	0.00	0.001	16%
17	8.89	0.10		0.06	0.021					1.00	0.02	0.10	0.021	0.00	0.000	1%
18	8.90	0.09		0.05	-0.001					1.00	0.02	0.09	-0.001	0.00	0.000	0%
19	8.92	0.11		0.07	0.000					1.00	0.02	0.11	0.000	0.00	0.000	0%
20	8.95	0.11		0.07	0.000					1.00	0.09	0.11	0.000	0.01	0.000	0%
LB	9.10	0.00	0.00		0.00				0.00	1.00	0.08	0.00	0.000	0.00	0.000	
Total Flow														0.003	100%	

Flow Measurement Details:

Metering Section Location (describe):
new location downstream approx. 500m

Meas. Start Time (MST):	12:02
Meas. End Time (MST):	12:23
Equipment:	ADV#1
Flow Meter Make & Model:	Sortek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, 15C



Flow characteristics:

Total Flow:	0.003	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	0.05	(m ²)
Wetted Width:	0.65	(m)
Hydraulic Depth:	0.08	(m)
Mean Velocity:	0.07	(m/s)
Reynolds Number:	4.35E+03	
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	1.089	1.089
Water (°C):	13.0	13.0
Datalogger Clock:	11:34	12:49
Laptop Clock:	11:34	12:48
Battery:	14.3	13.6
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dissicant:	Replaced	-
Vent Tube Dissicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- ADV test good
- very low flow, lots of small rocks in stream
- Flow mmt location coordinates: 483393 E, 6346955 N

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S09-05	0.637	331.272		330.635	330.635	3/4" Pipe 10m NE of logger
S09-04			0.945	330.327	330.299	3/4" Pipe 6m NE of logger
S09-03			0.888	330.384	330.294	3/4" Pipe 10m E of logger
Water Level:	Cut		1.857	329.415		Time WL Surveyed: 11:36
S09-03			0.888	330.384	330.294	3/4" Pipe 10m E of logger
Turn						
S09-03	0.862	331.246		330.384	330.294	3/4" Pipe 10m E of logger
Water Level:	Cut		1.828	329.418		Time WL Surveyed: 11:39
S09-03			0.862	330.384	330.294	3/4" Pipe 10m E of logger
S09-04			0.917	330.329	330.299	3/4" Pipe 6m NE of logger
S09-05			0.611	330.635	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S09-03	0.863	331.247		330.384		
Water Level:	Cut		1.829	329.418		Time WL Surveyed: 12:45
Water Level:	Cut		1.814	329.416		Time WL Surveyed: 12:47
S09-03	0.848	331.232		330.384		

WL Survey Summary

	Before	After
Average WL:	329.417	329.418
Closing Error:	0.000	-
WL Check:	0.003	0.000
Transducer Elevation	328.328	328.329

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC 2S
Serial #:	668859

Field Personnel:

	GG, TR	Trip Date:	11-Jun-15
Data Entry Personnel:	GG	Date:	11-Jun-15
Data Check Personnel:	CJ	Date:	3-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S9 Kearl Lake Outlet
 UTM Location: 483962 E, 6346990 N

Site Visit Date: August 8, 2015
 Site Visit Time (MST): 12:19

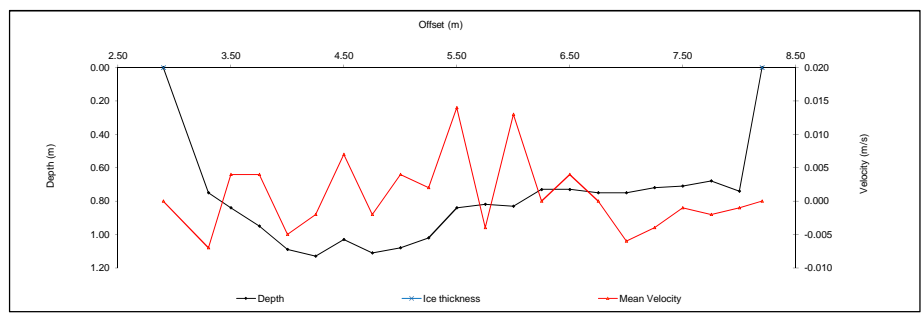


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	2.90	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	3.30	0.75		0.45	-0.007			0.17		1.00	0.30	0.75	-0.007	0.23	-0.002	-39%
2	3.50	0.84			0.004	0.67		0.17		1.00	0.23	0.84	0.004	0.19	0.001	19%
3	3.75	0.95			0.004	0.76		0.19		1.00	0.25	0.95	0.004	0.24	0.001	23%
4	4.00	1.09			-0.005	0.87		0.22		1.00	0.25	1.09	-0.005	0.27	-0.001	-34%
5	4.25	1.13			-0.002	0.90		0.23		1.00	0.25	1.13	-0.002	0.28	-0.001	-14%
6	4.50	1.03			0.007	0.82		0.21		1.00	0.25	1.03	0.007	0.26	0.002	44%
7	4.75	1.11			-0.002	0.89		0.22		1.00	0.25	1.11	-0.002	0.28	-0.001	-14%
8	5.00	1.08			0.004	0.86		0.22		1.00	0.25	1.08	0.004	0.27	0.001	27%
9	5.25	1.02			0.002	0.82		0.20		1.00	0.25	1.02	0.002	0.26	0.001	13%
10	5.50	0.84			-0.014	0.67		0.17		1.00	0.25	0.84	-0.014	0.21	-0.003	72%
11	5.75	0.82			-0.004	0.66		0.17		1.00	0.25	0.82	-0.004	0.21	-0.001	-20%
12	6.00	0.83			0.013	0.66		0.17		1.00	0.25	0.83	0.013	0.21	0.003	66%
13	6.25	0.73	0.44		0.000					1.00	0.25	0.73	0.000	0.18	0.000	0%
14	6.50	0.73	0.44	0.44	0.004					1.00	0.25	0.73	0.004	0.18	0.001	18%
15	6.75	0.75	0.45	0.45	0.000					1.00	0.25	0.75	0.000	0.19	0.000	0%
16	7.00	0.75	0.45	0.45	-0.006					1.00	0.25	0.75	-0.006	0.19	-0.001	-28%
17	7.25	0.72	0.43	0.43	-0.004					1.00	0.25	0.72	-0.004	0.18	-0.001	-18%
18	7.50	0.71	0.43	0.43	-0.001					1.00	0.25	0.71	-0.001	0.18	0.000	-4%
19	7.75	0.68	0.41	0.41	-0.002					1.00	0.25	0.68	-0.002	0.17	0.000	-8%
20	8.00	0.74	0.44	0.44	-0.001					1.00	0.23	0.74	-0.001	0.17	0.000	-4%
LB	8.20	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
Total Flow														0.004	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	12:31
Meas. End Time (MST):	12:56
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Banks flooded, backwatered
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, 25C



Flow characteristics:

Total Flow:	0.004	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	4.32	(m ²)
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.82	(m)
Mean Velocity:	0.00	(m/s)
Reynolds Number:	6.29E+02	
Froude Number:	0.00	

Logger Details:

	Before	After
Transducer Reading (m):	1.152	1.152
Water (°C):	13.0	13.0
Datalogger Clock:	12:22	13:05
Laptop Clock:	12:22	13:04
Battery:	13.5	13.5
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-station area flooded
 -lots of vegetation in channel
 -no visible flow
 -negligible flow in one culvert, no flow in other

General Notes:

-station area flooded
 -lots of vegetation in channel
 -no visible flow
 -negligible flow in one culvert, no flow in other

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S09-05	0.725	331.360		330.635	330.635	3/4" Pipe 10m NE of logger
S09-04			1.032	330.328	330.299	3/4" Pipe 6m NE of logger
S09-03			0.977	330.383	330.294	3/4" Pipe 10m E of logger
Water Level:	Cut	0.078	1.962	329.476		Time WL Surveyed: 12:28
Temporary BM			1.962	329.398	0.000	
Turn						
Temporary BM	1.937	331.335		329.398		
Water Level:	Cut	0.078	1.937	329.476		Time WL Surveyed: 12:30
S09-03			0.952	330.383	330.294	3/4" Pipe 10m E of logger
S09-04			1.006	330.329	330.299	3/4" Pipe 6m NE of logger
S09-05			0.700	330.635	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S09-04	1.006	331.335		330.329		Time WL Surveyed: 13:00
Water Level:	Cut		1.857	329.478		Time WL Surveyed: 13:02
Water Level:	Cut		1.843	329.478		
S09-04	0.992	331.321		330.329		

WL Survey Summary

	Before	After
Average WL:	329.476	329.478
Closing Error:	0.000	0.000
WL Check:	0.000	0.000
Transducer Elevation	328.324	328.326

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	8-Aug-15
Data Check Personnel:	CJ	Date:	8-Aug-15
Entered Digitally in the Field:	Yes	Date:	3-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S9 Kearl Lake Outlet
 UTM Location: 483962 E, 6346990 N

Site Visit Date: September 9, 2015
 Site Visit Time (MST): 13:02



Flow Measurement Details:	
Metering Section Location (describe): 8m downstream of station	
Meas. Start Time (MST):	13:40
Meas. End Time (MST):	14:25
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Clear, vegetation in channel
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, light breeze, 13C

Flow characteristics:	
Total Flow:	0.084 (m ³ /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	4.57 (m ²)
Wetted Width:	5.71 (m)
Hydraulic Depth:	0.80 (m)
Mean Velocity:	0.02 (m/s)
Reynolds Number:	1.12E+04
Froude Number:	0.61

Logger Details:		
	Before	After
Transducer Reading (m):	1.150	1.149
Water (°C):	10.2	10.2
Datalogger Clock:	13:04	14:47
Laptop Clock:	13:03	14:47
Battery (Main):	13.8	13.7
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Mini Tube Dessiccant:	-	Good
PT# (if replaced):	346256	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	
Conducted 11 passes with ADCP but were not able to achieve 4 measurements with less than 5% difference. Best 3 chosen.	

ADCP Flow Measurement Summary:								
System Information:				System Setup:		Bank Offsets:		
System Type:	Sontek RS-M9	Transducer Depth (m):	-	0.05	LB:	15.40		
Serial Number:	4712	Bainby (ppt):	-	-	RB:	20.70		
Firmware Version:	3.8	Magnetic Declination (°):	-	14.33	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes			
		ADCP Temperature (°C):	-	14.2				
Discharge Calculation Settings:				Measurement Results:				
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean:	Percent of Pass Measured (%)	
Track Reference: Bottom Track	1	0.00	5.51	2.39	0.036	1.98%	48.9	
Depth Reference: Vertical Beam	4	0.00	5.58	3.48	0.023	0.081	-3.95%	48.2
Coordinate System: FTM	8	0.00	6.03	7.65	0.011	0.066	1.98%	55.6
Left Method: Sloped Bank								
Right Method: Sloped Bank								
Top Fit Type: Power Fit								
Bottom Fit Type: Power Fit								
	Mean:	5.71	4.57	0.023	0.084			
	SD:	0.23	2.36	0.010	0.002			
	COV:	0.04	0.52	0.438	0.028			

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S09-06	0.915	331.150		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			0.767	330.383	330.294	3/4" Pipe 10m E of logger
S09-04			0.822	330.328	330.299	3/4" Pipe 6m NE of logger
Water Level:	Cut		1.674	329.476	Time WL Surveyed: 13:12	
S09-04			0.822	330.328	330.299	3/4" Pipe 6m NE of logger
Turn						
S09-04	0.840	331.168		330.328	330.299	3/4" Pipe 6m NE of logger
Water Level:	Cut		1.692	329.476	Time WL Surveyed: 13:19	
S09-04			0.840	330.328	330.299	3/4" Pipe 6m NE of logger
S09-03			0.785	330.383	330.294	3/4" Pipe 10m E of logger
S09-05			0.533	330.635	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S09-04	0.822	331.150		330.328		
Water Level:	Cut		1.671	329.479	Time WL Surveyed: 14:43	
Water Level:	Cut		1.659	329.490	Time WL Surveyed: 14:44	
S09-04	0.811	331.139		330.328		

WL Survey Summary		
Average WL:	Before	After
Closing Error:	0.000	-
WL Check:	0.000	-0.001
Transducer Elevation	328.326	328.331

Level Survey Equipment:	
Level #:	Level#3
Make & Model:	Carsel AT-24
Serial #:	112990

Field Personnel:			
Data Entry Personnel:	JC	Trip Date:	9-Sep-15
Data Check Personnel:	CJ	Date:	9-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S9 Kearsal Lake Outlet
 UTM Location: 483962 E, 6346990 N

Site Visit Date: October 22, 2015
 Site Visit Time (MST): 13:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.60	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	8.00	0.72		0.43	-0.013		0.66	-0.026	0.17	1.00	0.80	0.72	-0.013	0.58	-0.007	51%
2	7.00	0.73		0.44	0.001		0.87	-0.001	0.22	1.00	1.00	0.73	0.001	0.73	0.001	-5%
3	6.00	0.83					0.82	0.008	0.20	1.00	1.00	0.83	-0.023	0.83	-0.019	127%
4	5.00	1.09					0.82	0.008	0.20	1.00	1.00	1.09	-0.001	1.09	-0.001	4%
5	4.00	1.02					0.82	0.008	0.20	1.00	1.05	1.02	0.011	1.07	0.011	-77%
LB	2.90	0.00	0.00		0.00				0.00	1.00	0.55	0.00	0.000	0.00	0.000	
Total Flow														-0.015	100%	

Flow Measurement Details:

Metering Section Location (describe):
 In front of station

Meas. Start Time (MST):	13:18
Meas. End Time (MST):	13:27
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow, backwatered
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Sunny, windy, BC

Flow characteristics:

Total Flow:	-0.015	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	4.30	(m ²)
Wetted Width:	5.70	(m)
Hydraulic Depth:	0.75	(m)
Mean Velocity:	0.00	(m/s)
Reynolds Number:	-1.74E+03	
Froude Number:	0.00	

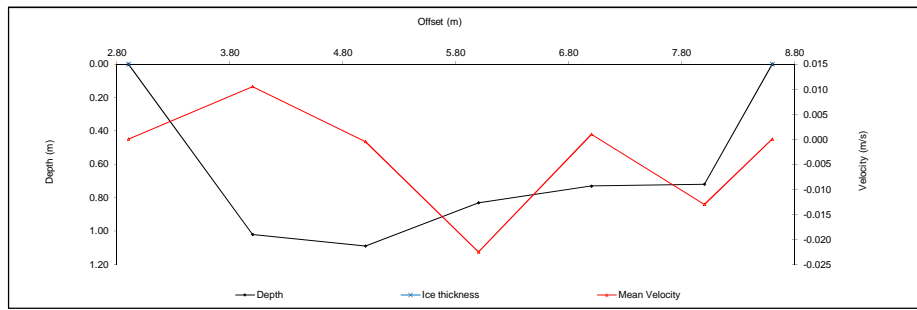
Logger Details:

	Before	After
Transducer Reading (m):	1.146	1.145
Water (°C):	6.2	6.2
Datalogger Clock:	13:02	13:30
Laptop Clock:	13:01	13:30
Battery:	14.0	13.9
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Negligible flow coming from culverts, causing pooling and negative readings for flow measurement



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S09-05	0.529	331.164		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			0.781	330.383	330.383	3/4" Pipe 10m E of logger
S09-04			0.836	330.328	330.328	3/4" Pipe 6m NE of logger
Water Level:	Cut		1.686	329.478		Time WL Surveyed: 13:11
S09-04			0.836	330.328	330.328	3/4" Pipe 6m NE of logger
Turn						
S09-04	0.820	331.148		330.328	330.328	3/4" Pipe 6m NE of logger
Water Level:	Cut		1.669	329.479		Time WL Surveyed: 13:13
S09-04			0.820	330.328	330.328	3/4" Pipe 6m NE of logger
S09-03			0.765	330.383	330.383	3/4" Pipe 10m E of logger
S09-05			0.513	330.635	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S09-04	0.820	331.148		330.328		
Water Level:	Cut		1.669	329.479		Time WL Surveyed: 13:33
Water Level:	Cut		1.648	329.480		Time WL Surveyed: 13:35
S09-04	0.800	331.128		330.328		

WL Survey Summary	Before	After
Average WL:	329.479	329.480
Closing Error:	0.000	-
WL Check:	0.001	-0.001
Transducer Elevation	328.333	328.335

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:	JC, GG	Trip Date:	22-Oct-15
Data Entry Personnel:	JC	Date:	22-Oct-15
Data Check Personnel:	GG	Date:	26-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S9 Kearl Lake Outlet
 UTM Location: 483962 E, 6346990 N

Site Visit Date: December 9, 2015
 Site Visit Time (MST): 09:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	6.80	0.00	0.00	0.40	0.002	0.53	0.000	0.000	0.000	0.88	0.64	0.00	0.000	0.00	0.000	
1	5.53	0.65	0.15	0.40	0.002					0.88	0.89	0.50	0.002	0.45	0.001	-23%
2	5.02	0.73	0.15	0.44	0.000					0.88	0.52	0.58	0.000	0.30	0.000	0%
3	4.50	0.80	0.15	0.48	-0.004					0.88	0.49	0.65	-0.004	0.32	-0.001	33%
4	4.03	0.70	0.18	0.44	-0.010					0.88	0.58	0.52	-0.009	0.30	-0.003	76%
5	3.34	0.57	0.18	0.38	-0.001					0.88	1.39	0.39	-0.001	0.54	0.000	14%
RB	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	1.05	0.00	0.000	0.00	0.000	
Total Flow														-0.003	100%	

Flow Measurement Details:

Metering Section Location (describe):
 Adjacent to station

Meas. Start Time (MST):	9:16
Meas. End Time (MST):	9:24
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen with some overflow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Snowing, -5C

Flow characteristics:

Total Flow:	-0.003	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.91	(m ²)
Wetted Width:	5.55	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.00	(m/s)
Reynolds Number:	-3.69E+02	
Froude Number:	0.00	

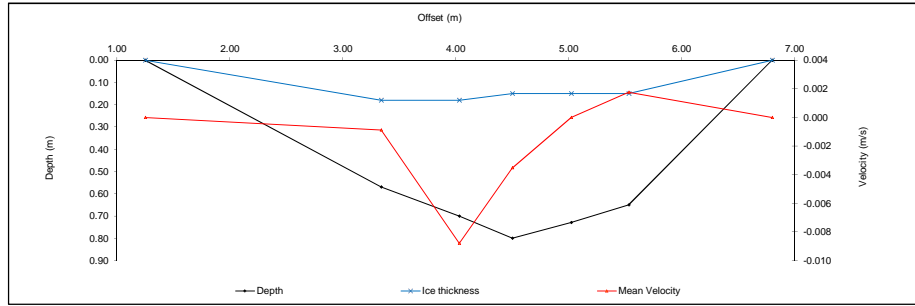
Logger Details:

	Before	After
Transducer Reading (m):	0.394	
Water (°C):	1.7	
Datalogger Clock:	10:01	
Laptop Clock:	09:01	
Battery:	12.7	
Battery Condition:	Good	
Battery Serial #:	-	
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-Similar flow conditions to open-water season - water is backed up and extremely slow flowing (if flowing at all)



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S09-05	0.798	331.433		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			1.050	330.383	330.383	3/4" Pipe 10m E of logger
S09-04			1.104	330.329	330.328	3/4" Pipe 6m NE of logger
Water Level:	Cut		2.109	329.324	Time WL Surveyed:	9:09
Temporary BM			2.120	329.313	0.000	-
Turn						
Temporary BM	2.104	331.417		329.313		
Water Level:	Cut		2.093	329.324	Time WL Surveyed:	9:12
S09-04			1.089	330.328	330.328	3/4" Pipe 6m NE of logger
S09-03			1.033	330.384	330.383	3/4" Pipe 10m E of logger
S09-05			0.792	330.635	330.635	3/4" Pipe 10m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:	329.324	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	328.330	-

Level Survey Equipment:	Level #:	Level #4
Make & Model:	Nikon AC-2S	
Serial #:	668785	

Field Personnel:	DW, GG	Trip Date:	9-Dec-15
Data Entry Personnel:	DW, GG	Date:	9-Dec-15
Data Check Personnel:	CJ	Date:	16-Dec-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: January 15, 2015
 Site Visit Time (MST): 11:20

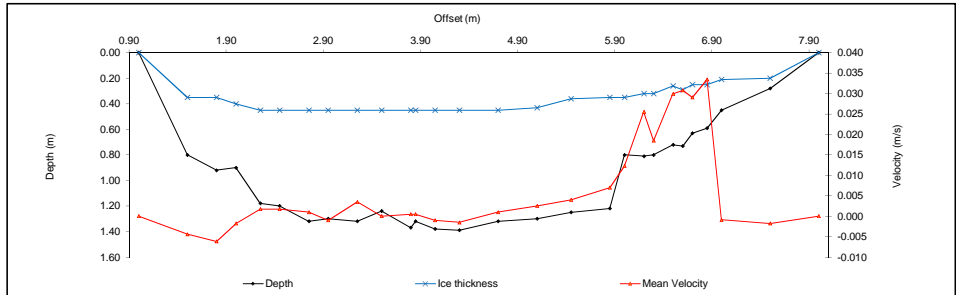


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)	
LB	8.00	0.00	0.00	0.000				0.000	0.88	0.25	0.00	0.000	0.00	0.000		
1	7.50	0.28	0.20	0.24	-0.002				0.88	0.50	0.08	-0.002	0.04	0.000	-1%	
2	7.00	0.45	0.21	0.33	-0.001				0.88	0.33	0.24	-0.001	0.08	0.000	0%	
3	6.85	0.59	0.25	0.42	0.038				0.88	0.15	0.34	0.033	0.05	0.002	12%	
4	6.70	0.63	0.25	0.44	0.033				0.88	0.13	0.38	0.029	0.05	0.001	10%	
5	6.60	0.73	0.29	0.51	0.035				0.88	0.10	0.44	0.031	0.04	0.001	10%	
6	6.50	0.72	0.26	0.49	0.034				0.88	0.15	0.46	0.030	0.07	0.002	15%	
7	6.30	0.80	0.32	0.56	0.021				0.88	0.15	0.48	0.018	0.07	0.001	10%	
8	6.20	0.81	0.32	0.57	0.029				0.88	0.15	0.49	0.026	0.07	0.002	14%	
9	6.00	0.80	0.35	0.58	0.014				0.88	0.18	0.45	0.012	0.08	0.001	7%	
10	5.95	1.22	0.35			1.05	0.004	0.52	1.00	0.27	0.87	0.007	0.24	0.002	12%	
11	5.45	1.25	0.36			1.07	0.005	0.54	1.00	0.38	0.89	0.004	0.33	0.001	10%	
12	5.10	1.30	0.43			1.13	0.002	0.60	1.00	0.38	0.87	0.003	0.33	0.001	6%	
13	4.70	1.32	0.45			1.15	0.000	0.62	1.00	0.40	0.87	0.001	0.35	0.000	3%	
14	4.30	1.39	0.45			1.20	-0.001	0.64	1.00	0.33	0.94	-0.002	0.31	0.000	-3%	
15	4.05	1.38	0.45			1.19	-0.003	0.64	1.00	0.23	0.93	-0.001	0.21	0.000	-2%	
16	3.85	1.32	0.45			1.15	-0.001	0.62	1.00	0.13	0.87	0.001	0.11	0.000	0%	
17	3.80	1.37	0.45			1.19	-0.002	0.63	1.00	0.18	0.92	0.001	0.16	0.000	1%	
18	3.50	1.24	0.45			1.08	-0.001	0.61	1.00	0.28	0.79	0.001	0.22	0.000	0%	
19	3.25	1.32	0.45			1.15	0.010	0.62	1.00	0.28	0.87	0.004	0.24	0.001	6%	
20	2.95	1.30	0.45			1.13	-0.001	0.62	1.00	0.25	0.85	-0.001	0.21	0.000	-2%	
21	2.75	1.32	0.45			1.15	0.004	0.62	1.00	0.25	0.87	0.001	0.22	0.000	2%	
22	2.45	1.20	0.45	0.83	0.002				0.88	0.25	0.75	0.002	0.19	0.000	2%	
23	2.25	1.18	0.45	0.82	0.002				0.88	0.23	0.73	0.002	0.16	0.000	2%	
24	2.00	0.90	0.40	0.65	-0.002				0.88	0.23	0.50	-0.002	0.11	0.000	-1%	
25	1.80	0.92	0.35	0.64	-0.007				0.88	0.25	0.57	-0.006	0.14	-0.001	-6%	
26	1.50	0.80	0.35	0.58	-0.005				0.88	0.40	0.45	-0.004	0.18	-0.001	-6%	
RB	1.00	0.00	0.00	0.00				0.00	0.88	0.25	0.00	0.000	0.00	0.000		
Total Flow													0.014	100%		

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of helicopter

Meas. Start Time (MST):	11:49
Meas. End Time (MST):	12:49
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Overcast, -20C



Flow characteristics:

Total Flow:	0.014	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	4.26	(m ²)
Wetted Width:	7.00	(m)
Hydraulic Depth:	0.61	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.00	

Logger Details:

	Before	After
Transducer Reading (m):	0.550	0.552
Water (°C):	0.3	0.3
Datalogger Clock:	11:24	11:38
Laptop Clock:	11:23	11:37
Battery (Main):	12.6	13.3
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-02	1.410	101.410		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.164	100.246	100.240	3/4" Pipe NW of logger
S10A-03			1.273	100.137	100.136	3/4" Pipe N of logger
Water Level:						
Water Level:	Cut		2.625	98.785		Time WL Surveyed: 11:40
Temporary BM			2.499	98.911		0.000
Turn						
Temporary BM	2.483	101.394		98.911		-
Water Level:	Cut		2.607	98.787		Time WL Surveyed: 11:45
S10A-03			1.256	100.138	100.136	3/4" Pipe N of logger
S10A-01			1.148	100.246	100.240	3/4" Pipe NW of logger
S10A-02			1.395	99.999	100.000	3/4" Pipe W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.786	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	98.236	-

Field Personnel:

Personnel	Role	Trip Date
MP, DW		15-Jan-15
MP, DW		15-Jan-15
GG		26-Jan-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: February 5, 2015
 Site Visit Time (MST): 14:25

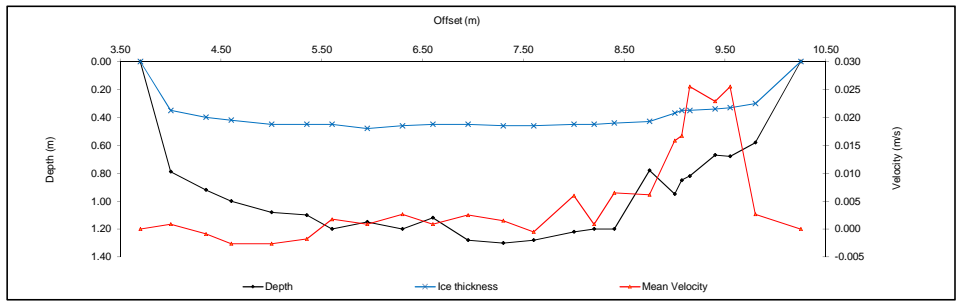


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	3.70	0.00	0.00		0.000				0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	4.00	0.79	0.35		0.57	0.001			0.001	0.88	0.33	0.44	0.001	0.14	0.000	1%
2	4.35	0.92	0.40		0.66	-0.001			-0.001	0.88	0.30	0.52	-0.001	0.16	0.000	-1%
3	4.60	1.00	0.42		0.71	-0.003			-0.003	0.88	0.33	0.58	-0.003	0.19	0.000	-4%
4	5.00	1.08	0.45		0.77	-0.003			-0.003	0.88	0.38	0.63	-0.003	0.24	-0.001	-5%
5	5.35	1.10	0.45		0.78	-0.002			-0.002	0.88	0.30	0.65	-0.002	0.20	0.000	-3%
6	5.60	1.20	0.45		0.83	0.002			0.002	0.88	0.30	0.75	0.002	0.23	0.000	3%
7	5.95	1.15	0.48		0.82	0.001			0.001	0.88	0.35	0.67	0.001	0.23	0.000	2%
8	6.30	1.20	0.46		0.83	0.003			0.003	0.88	0.32	0.74	0.003	0.24	0.001	2%
9	6.60	1.12	0.45		0.79	0.001			0.001	0.88	0.33	0.67	0.001	0.22	0.000	2%
10	6.95	1.28	0.45		0.95	0.003	1.11	0.002	0.62	1.00	0.35	0.83	0.003	0.29	0.001	6%
11	7.30	1.30	0.46		0.96	0.003	1.13	0.003	0.63	1.00	0.32	0.84	0.002	0.27	0.000	3%
12	7.60	1.28	0.46		0.96	0.002	1.12	0.002	-0.003	1.00	0.35	0.82	-0.001	0.29	0.000	-1%
13	8.00	1.22	0.45		0.93	0.007	1.07	0.007	0.60	1.00	0.30	0.77	0.006	0.23	0.001	11%
14	8.20	1.20	0.45	0.83	0.001					0.88	0.20	0.75	0.001	0.15	0.000	1%
15	8.40	1.20	0.44		0.007	1.05	0.001	0.59	0.012	1.00	0.27	0.76	0.007	0.21	0.001	11%
16	8.75	0.78	0.43		0.61	0.018			0.018	0.88	0.30	0.58	0.018	0.11	0.001	5%
17	9.00	0.95	0.37		0.66	0.019			0.019	0.88	0.16	0.58	0.016	0.09	0.001	12%
18	9.07	0.85	0.35		0.60	0.029			0.029	0.88	0.07	0.50	0.029	0.04	0.001	5%
19	9.15	0.82	0.35		0.59	0.026			0.026	0.88	0.17	0.47	0.026	0.08	0.002	16%
20	9.40	0.67	0.34		0.51	0.029			0.029	0.88	0.20	0.33	0.029	0.07	0.002	12%
21	9.55	0.68	0.33		0.51	0.003			0.003	0.88	0.20	0.35	0.003	0.07	0.002	15%
22	9.80	0.58	0.30		0.44	0.000			0.000	0.88	0.35	0.28	0.003	0.10	0.000	2%
LB	10.25	0.00	0.00		0.00				0.00	0.88	0.23	0.00	0.000	0.00	0.000	
Total Flow														0.012	100%	

Flow Measurement Details:

Metering Section Location (describe):
30m downstream of pressure transducer

Meas. Start Time (MST):	15:00
Meas. End Time (MST):	15:45
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Partial cloud, light breeze, -25 C



Flow characteristics:

Total Flow:	0.012	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	3.82	(m ²)
Wetted Width:	6.55	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.00	

Logger Details:

	Before	After
Transducer Reading (m):	0.557	
Water (°C):	0.3	
Datalogger Clock:	14:44	
Laptop Clock:	14:44	
Battery (Main):	13.1	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-Ran ADV Test, results good

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-03	1.314	101.450		100.136	100.136	3/4" Pipe N of logger
S10A-01			1.204	100.246	100.240	3/4" Pipe NW of logger
S10A-02			1.452	99.998	100.000	3/4" Pipe W of logger
Water Level:	Cut		2.666	98.784	Time WL Surveyed: 14:50	
Temporary BM			2.493	98.957	0.000	
Turn						
Temporary BM	2.479	101.436		98.957		
Water Level:	Cut		2.655	98.781	Time WL Surveyed: 14:52	
S10A-02			1.439	99.997	100.000	3/4" Pipe W of logger
S10A-01			1.191	100.245	100.240	3/4" Pipe NW of logger
S10A-03			1.302	100.134	100.136	3/4" Pipe N of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	98.783	-
Closing Error:	0.002	-
WL Check:	0.003	-
Transducer Elevation	98.226	-

Field Personnel:

TR, CJ	Trip Date:	5-Feb-15
CJ	Date:	5-Feb-15
CJ	Date:	20-May-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: March 8, 2015
 Site Visit Time (MST): 14:18

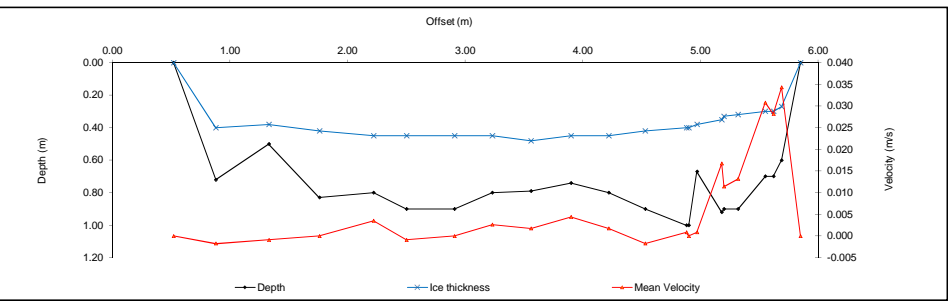


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
LB	5.85	0.00	0.00		0.000		0.000		0.000	0.88	0.08	0.00	0.000	0.00	0.000	
1	5.69	0.60	0.27	0.44	0.039					0.88	0.11	0.33	0.034	0.04	0.001	17%
2	5.62	0.70	0.30	0.50	0.032					0.88	0.07	0.40	0.028	0.03	0.001	10%
3	5.55	0.70	0.30	0.50	0.035					0.88	0.15	0.40	0.031	0.06	0.002	24%
4	5.32	0.90	0.32	0.61	0.015					0.88	0.18	0.58	0.013	0.10	0.001	17%
5	5.20	0.90	0.33	0.62	0.013					0.88	0.07	0.57	0.011	0.04	0.000	6%
6	5.18	0.92	0.35	0.64	0.019					0.88	0.12	0.57	0.017	0.07	0.001	14%
7	4.97	0.67	0.38	0.53	0.001					0.88	0.14	0.29	0.001	0.04	0.000	0%
8	4.90	1.00	0.40	0.70	0.000					0.88	0.04	0.60	0.000	0.03	0.000	0%
9	4.88	1.00	0.40	0.70	0.001					0.88	0.19	0.60	0.001	0.11	0.000	1%
10	4.53	0.90	0.42	0.66	-0.002					0.88	0.33	0.48	-0.002	0.16	0.000	-4%
11	4.22	0.80	0.45	0.63	0.002					0.88	0.32	0.35	0.002	0.11	0.000	2%
12	3.90	0.74	0.45	0.60	0.005					0.88	0.33	0.29	0.004	0.10	0.000	5%
13	3.56	0.79	0.48	0.64	0.002					0.88	0.34	0.31	0.002	0.10	0.000	2%
14	3.23	0.80	0.45	0.63	0.003					0.88	0.33	0.35	0.003	0.11	0.000	4%
15	2.91	0.90	0.45	0.68	0.000					0.88	0.37	0.45	0.000	0.16	0.000	0%
16	2.50	0.90	0.45	0.68	-0.001					0.88	0.35	0.45	-0.001	0.16	0.000	-2%
17	2.22	0.80	0.45	0.63	0.004					0.88	0.37	0.35	0.004	0.13	0.000	6%
18	1.76	0.83	0.42	0.63	0.000					0.88	0.45	0.41	0.000	0.18	0.000	0%
19	1.33	0.50	0.38	0.44	-0.001					0.88	0.44	0.12	-0.001	0.05	0.000	-1%
20	0.88	0.72	0.40	0.56	-0.002					0.88	0.41	0.32	-0.002	0.13	0.000	-3%
RB	0.52	0.00	0.00		0.00		0.00		0.00	0.88	0.18	0.00	0.000	0.00	0.000	
Total Flow														0.008	100%	

Flow Measurement Details:

Metering Section Location (describe):
40m downstream of station

Meas. Start Time (MST):	14:56
Meas. End Time (MST):	15:22
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Overcast, 4C



Flow characteristics:

Total Flow:	0.008	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.91	(m ²)
Wetted Width:	5.33	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.00	

Logger Details:

	Before	After
Transducer Reading (m):	0.558	
Water (°C):	0.3	
Datalogger Clock:	14:20	
Logger Clock:	14:19	
Battery (Main):	14.3	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-02	1.628	101.628		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.373	100.255	100.240	3/4" Pipe NW of logger
S10A-03			1.494	100.134	100.136	3/4" Pipe N of logger
Water Level:	Cut		2.842	98.786	Time WL Surveyed:	14:38
Temporary BM			2.653	98.975	0.000	-
Turn						
Temporary BM	2.637	101.612		98.975		-
Water Level:	Cut		2.823	98.789	Time WL Surveyed:	14:41
S10A-03			1.477	100.135	100.136	3/4" Pipe N of logger
S10A-01			1.355	100.257	100.240	3/4" Pipe NW of logger
S10A-02			1.612	100.000	100.000	3/4" Pipe W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	98.788	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	98.230	-

Field Personnel:

	GG, MP	Trip Date:	8-Mar-15
Data Entry Personnel:	GG	Date:	8-Mar-15
Data Check Personnel:	CJ	Date:	20-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: April 18, 2015
 Site Visit Time (MST): 14:30

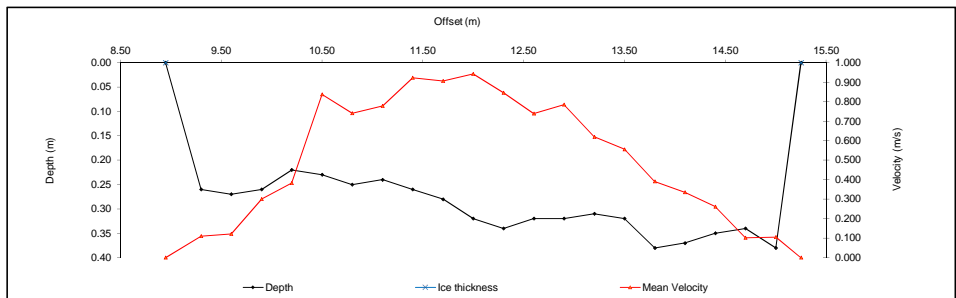


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	8.95	0.00	0.00		0.000		0.000		0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	9.30	0.26		0.16	0.110					1.00	0.32	0.26	0.110	0.08	0.009	1%
2	9.60	0.27		0.16	0.122					1.00	0.30	0.27	0.122	0.08	0.010	1%
3	9.90	0.26		0.16	0.301					1.00	0.30	0.26	0.301	0.08	0.023	2%
4	10.20	0.22		0.13	0.383					1.00	0.30	0.22	0.383	0.07	0.025	3%
5	10.50	0.23		0.14	0.837					1.00	0.30	0.23	0.837	0.07	0.058	6%
6	10.80	0.25		0.15	0.741					1.00	0.30	0.25	0.741	0.07	0.056	6%
7	11.10	0.24		0.14	0.778					1.00	0.30	0.24	0.778	0.07	0.056	6%
8	11.40	0.26		0.16	0.923					1.00	0.30	0.26	0.923	0.08	0.072	8%
9	11.70	0.28		0.17	0.906					1.00	0.30	0.28	0.906	0.08	0.076	8%
10	12.00	0.32		0.19	0.943					1.00	0.30	0.32	0.943	0.10	0.091	10%
11	12.30	0.34		0.20	0.846					1.00	0.30	0.34	0.846	0.10	0.086	9%
12	12.60	0.32		0.19	0.739					1.00	0.30	0.32	0.739	0.10	0.071	7%
13	12.90	0.32		0.19	0.785					1.00	0.30	0.32	0.785	0.10	0.075	8%
14	13.20	0.31		0.19	0.620					1.00	0.30	0.31	0.620	0.09	0.058	6%
15	13.50	0.32		0.19	0.556					1.00	0.30	0.32	0.556	0.10	0.053	6%
16	13.80	0.38		0.23	0.391					1.00	0.30	0.38	0.391	0.11	0.045	5%
17	14.10	0.37		0.22	0.335					1.00	0.30	0.37	0.335	0.11	0.037	4%
18	14.40	0.35		0.21	0.262					1.00	0.30	0.35	0.262	0.11	0.028	3%
19	14.70	0.34		0.20	0.102					1.00	0.30	0.34	0.102	0.10	0.010	1%
20	15.00	0.38		0.23	0.106					1.00	0.28	0.38	0.106	0.10	0.011	1%
RB	15.25	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
Total Flow														0.950	100%	

Flow Measurement Details:

Metering Section Location (describe): 5m downstream of station

Meas. Start Time (MST):	15:01
Meas. End Time (MST):	15:27
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 12C



Flow characteristics:

Total Flow:	0.950	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.80	(m ²)
Wetted Width:	6.30	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.53	(m/s)
Froude Number:	0.31	

Logger Details:

	Before	After
Transducer Reading (m):	0.650	0.650
Water (°C):	2.8	3.1
Datalogger Clock:	14:40	15:37
Laptoe Clock:	14:39	15:36
Battery (Main):	14.0	14.1
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-02	1.389	101.389		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.129	100.260	100.240	3/4" Pipe NW of logger
S10A-03			1.252	100.137	100.136	3/4" Pipe N of logger
Water Level:	Cut	0.340	2.683	99.046	Time WL Surveyed:	14:44
Temporary BM			2.683	98.706	0.000	-
Turn						
Temporary BM	2.656	101.362		98.706		-
Water Level:	Cut	0.340	2.656	99.046	Time WL Surveyed:	14:48
S10A-03			1.226	100.136	100.136	3/4" Pipe N of logger
S10A-01			1.103	100.259	100.240	3/4" Pipe NW of logger
S10A-02			1.383	99.999	100.000	3/4" Pipe W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S10A-01	1.103	101.362		100.259		
Water Level:	Cut	0.130	2.447	99.045	Time WL Surveyed:	15:31
Water Level:	Cut	0.130	2.424	99.045	Time WL Surveyed:	15:34
S10A-01	1.080	101.339		100.259		

WL Survey Summary

	Before	After
Average WL:	99.046	99.045
Closing Error:	0.001	-
WL Check:	0.000	0.000
Transducer Elevation	98.396	98.395

Field Personnel:

GG, RM	Trip Date:	18-Apr-15
GG	Date:	18-Apr-15
CJ	Date:	20-May-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: May 10, 2015
 Site Visit Time (MST): 11:45

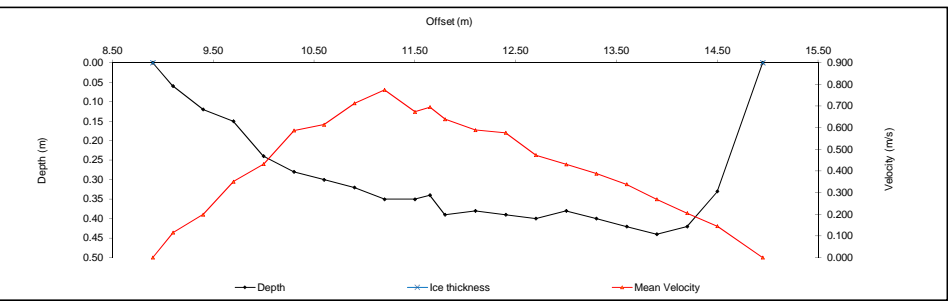


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of ice to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	14.95	0.00	0.00	0.00	0.000	0.00	0.000	0.00	0.000	1.00	0.23	0.00	0.000	0.00	0.000	
1	14.50	0.33		0.20	0.145					1.00	0.38	0.33	0.145	0.12	0.018	2%
2	14.20	0.42		0.25	0.206					1.00	0.30	0.42	0.206	0.13	0.026	3%
3	13.90	0.44		0.26	0.269					1.00	0.30	0.44	0.269	0.13	0.036	4%
4	13.60	0.42		0.25	0.338					1.00	0.30	0.42	0.338	0.13	0.043	5%
5	13.30	0.40		0.24	0.388					1.00	0.30	0.40	0.388	0.12	0.047	5%
6	13.00	0.38		0.23	0.431					1.00	0.30	0.38	0.431	0.11	0.049	6%
7	12.70	0.40		0.24	0.473					1.00	0.30	0.40	0.473	0.12	0.057	7%
8	12.40	0.39		0.23	0.576					1.00	0.30	0.39	0.576	0.12	0.067	8%
9	12.10	0.38		0.23	0.589					1.00	0.30	0.38	0.589	0.11	0.067	8%
10	11.80	0.39		0.23	0.639					1.00	0.22	0.39	0.639	0.09	0.056	6%
11	11.65	0.34		0.20	0.695					1.00	0.15	0.34	0.695	0.05	0.035	4%
12	11.50	0.35		0.21	0.673					1.00	0.23	0.35	0.673	0.08	0.053	6%
13	11.20	0.35		0.21	0.774					1.00	0.30	0.35	0.774	0.11	0.081	9%
14	10.90	0.32		0.19	0.712					1.00	0.30	0.32	0.712	0.10	0.068	8%
15	10.60	0.30		0.18	0.614					1.00	0.30	0.30	0.614	0.09	0.055	6%
16	10.30	0.28		0.17	0.587					1.00	0.30	0.28	0.587	0.08	0.049	6%
17	10.00	0.24		0.14	0.432					1.00	0.30	0.24	0.432	0.07	0.031	4%
18	9.70	0.15		0.09	0.351					1.00	0.30	0.15	0.351	0.04	0.016	2%
19	9.40	0.12		0.07	0.199					1.00	0.30	0.12	0.199	0.04	0.007	1%
20	9.10	0.06		0.04	0.115					1.00	0.25	0.06	0.115	0.02	0.002	0%
LB	8.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.10	0.00	0.000	0.00	0.000		
Total Flow														0.863	100%	

Flow Measurement Details:

Metering Section Location (describe):
3m downstream of pressure transducer

Meas. Start Time (MST):	12:10
Meas. End Time (MST):	12:25
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 10C



Flow characteristics:

Total Flow:	0.863	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.85	(m ²)
Wetted Width:	6.05	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.47	(m/s)
Froude Number:	0.27	

Logger Details:

	Before	After
Transducer Reading (m):	0.625	0.622
Water (°C):	7.9	8.3
Datalogger Clock:	11:50	12:28
Lapto Clock:	11:48	12:26
Battery (Main):	14.0	13.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-02	1.277	101.277		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.020	100.257	100.240	3/4" Pipe NW of logger
S10A-03			1.143	100.134	100.136	3/4" Pipe N of logger
Water Level:	Cut		2.258	99.019	Time WL Surveyed:	11:54
Temporary BM			2.363	98.914	0.000	-
Turn						
Temporary BM	2.355	101.269		98.914		-
Water Level:	Cut		2.249	99.020	Time WL Surveyed:	11:56
S10A-03			1.135	100.134	100.136	3/4" Pipe N of logger
S10A-01			1.011	100.258	100.240	3/4" Pipe NW of logger
S10A-02			1.269	100.000	100.000	3/4" Pipe W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S10A-03	1.135	101.269		100.134		
Water Level:	Cut		2.254	99.015	Time WL Surveyed:	12:31
Water Level:	Cut		2.238	99.019	Time WL Surveyed:	12:32
S10A-03	1.123	101.257		100.134		

WL Survey Summary

	Before	After
Average WL:	99.020	98.017
Closing Error:	0.000	-
WL Check:	0.001	-0.004
Transducer Elevation	98.395	98.395

Field Personnel:

	TR, CJ	Trip Date:	10-May-15
Data Entry Personnel:	TR	Date:	10-May-15
Data Check Personnel:	CJ	Date:	3-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: June 14, 2015
 Site Visit Time (MST): 13:37

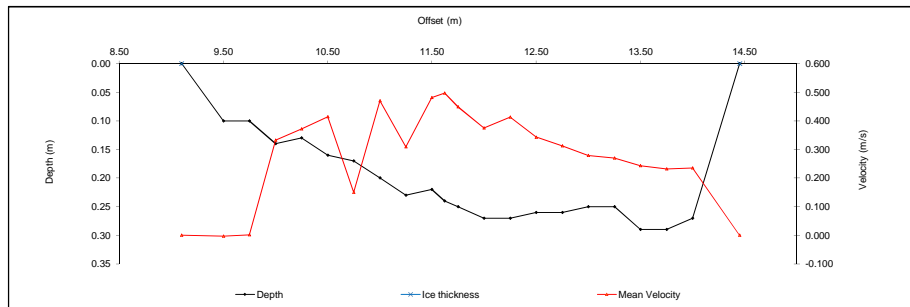


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	8.10	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	9.50	0.10		0.06	-0.003					1.00	0.32	0.10	-0.003	0.03	0.000	0%
2	9.75	0.10		0.06	0.001					1.00	0.25	0.10	0.001	0.03	0.000	0%
3	10.00	0.14		0.08	0.332					1.00	0.25	0.14	0.332	0.04	0.012	4%
4	10.25	0.13		0.08	0.371					1.00	0.25	0.13	0.371	0.03	0.012	4%
5	10.50	0.16		0.10	0.414					1.00	0.25	0.16	0.414	0.04	0.017	5%
6	10.75	0.17		0.10	0.150					1.00	0.25	0.17	0.150	0.04	0.006	2%
7	11.00	0.20		0.12	0.470					1.00	0.25	0.20	0.470	0.05	0.024	7%
8	11.25	0.23		0.14	0.309					1.00	0.25	0.23	0.309	0.06	0.018	5%
9	11.50	0.22		0.13	0.481					1.00	0.18	0.22	0.481	0.04	0.020	6%
10	11.62	0.24		0.14	0.497					1.00	0.13	0.24	0.497	0.03	0.015	5%
11	11.75	0.25		0.15	0.449					1.00	0.19	0.25	0.449	0.05	0.021	6%
12	12.00	0.27		0.16	0.375					1.00	0.25	0.27	0.375	0.07	0.026	8%
13	12.25	0.27		0.16	0.413					1.00	0.25	0.27	0.413	0.07	0.028	8%
14	12.50	0.26		0.16	0.343					1.00	0.25	0.26	0.343	0.07	0.022	7%
15	12.75	0.26		0.16	0.312					1.00	0.25	0.26	0.312	0.07	0.020	6%
16	13.00	0.25		0.15	0.279					1.00	0.25	0.25	0.279	0.06	0.017	5%
17	13.25	0.25		0.15	0.270					1.00	0.25	0.25	0.270	0.06	0.017	5%
18	13.50	0.29		0.17	0.243					1.00	0.25	0.29	0.243	0.07	0.018	5%
19	13.75	0.29		0.17	0.232					1.00	0.25	0.29	0.232	0.07	0.017	5%
20	14.00	0.27		0.16	0.235					1.00	0.35	0.27	0.235	0.09	0.022	7%
RB	14.45	0.00	0.00		0.000		0.000		0.000	1.00	0.23	0.00	0.000	0.00	0.000	7%
Total Flow														0.330	100%	

Flow Measurement Details:

Metering Section Location (describe): at station 3m downstream of station

Meas. Start Time (MST):	13:53
Meas. End Time (MST):	14:28
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 21C



Flow characteristics:

Total Flow:	0.330	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.06	(m ²)
Wetted Width:	5.35	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.31	(m/s)
Reynolds Number:	5.53E+04	
Froude Number:	0.22	

Logger Details:

	Before	After
Transducer Reading (m):	0.529	0.528
Water (°C):	16.1	16.3
Datalogger Clock:	13:40	14:31
Laptop Clock:	13:39	14:30
Battery:	13.8	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-02	1.488	101.488		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.227	100.261	100.240	3/4" Pipe NW of logger
S10A-03			1.352	100.136	100.136	3/4" Pipe N of logger
Water Level:	Cut	0.316	2.878	98.926		Time WL Surveyed: 13:43
S10A-03			1.352	100.136	100.136	3/4" Pipe N of logger
Turn						
S10A-03	1.331	101.467		100.136	100.136	3/4" Pipe N of logger
Water Level:	Cut	0.323	2.867	98.923		Time WL Surveyed: 13:46
S10A-03			1.331	100.136	100.136	3/4" Pipe N of logger
S10A-01			1.207	100.260	100.240	3/4" Pipe NW of logger
S10A-02			1.488	99.999	100.000	3/4" Pipe W of logger
Secondary Water Level Survey (pick any BM e.g. close cv)						
S10A-03	1.330	101.466		100.136		Time WL Surveyed: 14:32
Water Level:	Cut	0.321	2.864	98.923		Time WL Surveyed: 14:33
Water Level:	Cut	0.321	2.862	98.923		
S10A-03	1.318	101.454		100.136		

WL Survey Summary

	Before	After
Average WL:	98.925	98.923
Closing Error:	0.001	-
WL Check:	0.003	0.000
Transducer Elevation	98.396	98.395

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

	GG, MK	Trip Date:	14-Jun-15
Data Entry Personnel:	GG	Date:	14-Jun-15
Data Check Personnel:	CJ	Date:	3-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: August 17, 2015
 Site Visit Time (MST): 13:45

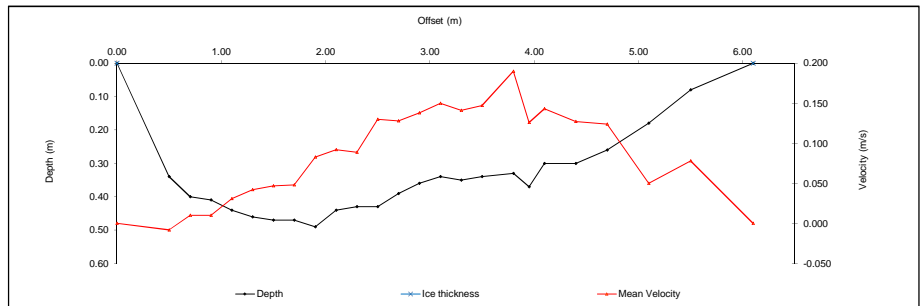


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
RB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.25	0.00	0.00	0.00	0.00	0.00	
1	0.50	0.34	0.20	-0.008					1.00	0.35	0.34	-0.008	0.12	-0.001	-1%	
2	0.70	0.40	0.24	0.010					1.00	0.20	0.40	0.010	0.08	0.001	0%	
3	0.90	0.41	0.25	0.010					1.00	0.20	0.41	0.010	0.08	0.001	1%	
4	1.10	0.44	0.26	0.031					1.00	0.20	0.44	0.031	0.09	0.003	2%	
5	1.30	0.46	0.28	0.042					1.00	0.20	0.46	0.042	0.09	0.004	2%	
6	1.50	0.47	0.28	0.047					1.00	0.20	0.47	0.047	0.09	0.004	3%	
7	1.70	0.47	0.28	0.048					1.00	0.20	0.47	0.048	0.09	0.005	3%	
8	1.90	0.49	0.29	0.083					1.00	0.20	0.49	0.083	0.10	0.008	5%	
9	2.10	0.44	0.26	0.092					1.00	0.20	0.44	0.092	0.09	0.008	5%	
10	2.30	0.43	0.26	0.089					1.00	0.20	0.43	0.089	0.09	0.008	5%	
11	2.50	0.43	0.26	0.130					1.00	0.20	0.43	0.130	0.09	0.011	7%	
12	2.70	0.39	0.23	0.128					1.00	0.20	0.39	0.128	0.08	0.010	6%	
13	2.90	0.36	0.18	0.138					1.00	0.20	0.36	0.138	0.07	0.010	6%	
14	3.10	0.34	0.20	0.150					1.00	0.20	0.34	0.150	0.07	0.010	6%	
15	3.30	0.35	0.21	0.141					1.00	0.20	0.35	0.141	0.07	0.010	6%	
16	3.50	0.34	0.20	0.147					1.00	0.25	0.34	0.147	0.09	0.012	8%	
17	3.80	0.33	0.20	0.190					1.00	0.23	0.33	0.190	0.07	0.014	9%	
18	3.95	0.37	0.22	0.126					1.00	0.15	0.37	0.126	0.06	0.007	4%	
19	4.10	0.30	0.18	0.143					1.00	0.23	0.30	0.143	0.07	0.010	6%	
20	4.40	0.30	0.18	0.127					1.00	0.30	0.30	0.127	0.09	0.011	7%	
21	4.70	0.26	0.16	0.124					1.00	0.35	0.26	0.124	0.09	0.011	7%	
22	5.10	0.18	0.11	0.050					1.00	0.40	0.18	0.050	0.07	0.004	2%	
23	5.50	0.08	0.05	0.078					1.00	0.50	0.08	0.078	0.04	0.003	2%	
LB	6.10	0.00	0.00	0.00					1.00	0.30	0.00	0.000	0.00	0.000		
Total Flow													0.164	100%		

Flow Measurement Details:

Metering Section Location (describe): 4m downstream of station

Meas. Start Time (MST):	14:20
Meas. End Time (MST):	14:45
Equipment:	ADVI/2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 27C



Flow characteristics:

Total Flow:	0.164	(m ³ /s)
Perceived Measuremt. Quality:	Excellent	
Cross Section Area:	1.87	(m ²)
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.09	(m/s)
Reynolds Number:	2.47E+04	
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.582	0.581
Water (°C):	17.1	17.1
Datalogger Clock:	13:56	14:46
Laptop Clock:	13:56	15:46
Battery:	13.7	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
RTX (if replaced):	304019	-
Logger# (if replaced):	16116	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-02	1.424	101.424		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.164	100.260	100.240	3/4" Pipe NW of logger
S10A-03			1.287	100.137	100.136	3/4" Pipe N of logger
Water Level:	Cut		2.451	98.973		Time WL Surveyed: 14:00
Temporary BM			2.954	98.470	0.000	
Turn						
Temporary BM	2.933	101.403		98.470		
Water Level:	Cut		2.432	98.971		Time WL Surveyed: 14:02
S10A-03			1.266	100.137	100.136	3/4" Pipe N of logger
S10A-01			1.142	100.261	100.240	3/4" Pipe NW of logger
S10A-02			1.403	100.000	100.000	3/4" Pipe W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S10A-03	1.265	101.402		100.137		
Water Level:	Cut		2.428	98.974		Time WL Surveyed: 14:47
Water Level:	Cut		2.417	98.971		Time WL Surveyed: 14:48
S10A-03	1.251	101.388		100.137		

WL Survey Summary

	Before	After
Average WL:	98.972	98.973
Closing Error:	0.000	-
WL Check:	0.002	0.003
Transducer Elevation	98.390	98.392

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	DW, SG	Trip Date:	17-Aug-15
Data Entry Personnel:	DW, SG	Date:	17-Aug-15
Data Check Personnel:	CJ	Date:	3-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: September 12, 2015
 Site Visit Time (MST): 09:00

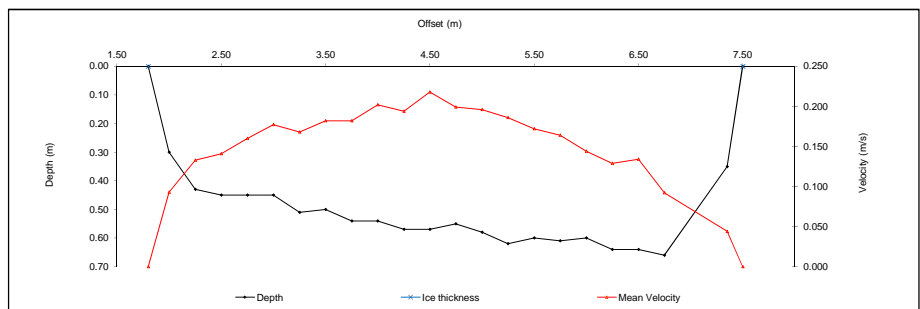


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	7.50	0.00	0.00		0.000				0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	7.35	0.35		0.21	0.044					1.00	0.38	0.35	0.044	0.13	0.006	1%
2	6.75	0.66		0.40	0.092					1.00	0.43	0.66	0.092	0.28	0.026	6%
3	6.50	0.64		0.38	0.134					1.00	0.25	0.64	0.134	0.16	0.021	5%
4	6.25	0.64		0.38	0.129					1.00	0.25	0.64	0.129	0.16	0.021	4%
5	6.00	0.60		0.36	0.144					1.00	0.25	0.60	0.144	0.15	0.022	5%
6	5.75	0.61		0.37	0.164					1.00	0.25	0.61	0.164	0.15	0.025	5%
7	5.50	0.60		0.36	0.172					1.00	0.25	0.60	0.172	0.15	0.026	6%
8	5.25	0.62		0.37	0.186					1.00	0.25	0.62	0.186	0.16	0.029	6%
9	5.00	0.58		0.35	0.196					1.00	0.25	0.58	0.196	0.15	0.028	6%
10	4.75	0.55		0.33	0.199					1.00	0.25	0.55	0.199	0.14	0.027	6%
11	4.50	0.57		0.34	0.218					1.00	0.25	0.57	0.218	0.14	0.031	7%
12	4.25	0.57		0.34	0.194					1.00	0.25	0.57	0.194	0.14	0.028	6%
13	4.00	0.54		0.32	0.202					1.00	0.25	0.54	0.202	0.14	0.027	6%
14	3.75	0.54		0.32	0.182					1.00	0.25	0.54	0.182	0.14	0.025	5%
15	3.50	0.50		0.30	0.182					1.00	0.25	0.50	0.182	0.13	0.023	5%
16	3.25	0.51		0.31	0.168					1.00	0.25	0.51	0.168	0.13	0.021	5%
17	3.00	0.45		0.27	0.177					1.00	0.25	0.45	0.177	0.11	0.020	4%
18	2.75	0.45		0.27	0.160					1.00	0.25	0.45	0.160	0.11	0.018	4%
19	2.50	0.45		0.27	0.141					1.00	0.25	0.45	0.141	0.11	0.016	3%
20	2.25	0.43		0.26	0.133					1.00	0.25	0.43	0.133	0.11	0.014	3%
21	2.00	0.30		0.18	0.093					1.00	0.23	0.30	0.093	0.07	0.006	3%
LB	1.80	0.00	0.00		0.00				0.00	1.00	0.10	0.00	0.000	0.00	0.000	
Total Flow														0.46	100%	

Flow Measurement Details:

Metering Section Location (describe):
4m downstream of monitoring station

Meas. Start Time (MST):	9:25
Meas. End Time (MST):	9:56
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Clear colour, beaver affected
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 14C, calm



Flow characteristics:

Total Flow:	0.460	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.94	(m ²)
Wetted Width:	5.70	(m)
Hydraulic Depth:	0.52	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	6.34E+04	
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	0.888	0.888
Water (°C):	11.4	11.4
Datalogger Clock:	09:06	10:05
Laptop Clock:	09:04	10:04
Battery:	12.8	12.9
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-Installed BM 4 about 15m W of station upslope past BM 2, and at edge of conifers.

General Notes:

-Beaver dam under construction 5m downstream of station

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-03	1.243	101.379		100.136	100.136	3/4" Pipe N of logger
S10A-01			1.119	100.260	100.240	3/4" Pipe NW of logger
S10A-02			1.381	99.998	100.000	3/4" Pipe W of logger
S10A-04			0.613	100.766	0.000	3/4" Pipe 15m W of logger
Water Level:	Cut	0.339	2.439	99.279		Time WL Surveyed: 9:15
Temporary BM			2.439	98.940	0.000	
Turn						
Temporary BM	2.425	101.365		98.940		
Water Level:	Cut	0.339	2.425	99.279		Time WL Surveyed: 9:18
S10A-04			0.600	100.765		3/4" Pipe 15m W of logger
S10A-02			1.366	99.999	100.000	3/4" Pipe W of logger
S10A-01			1.105	100.260	100.240	3/4" Pipe NW of logger
S10A-03			1.228	100.137	100.136	3/4" Pipe N of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S10A-03	1.228	101.365		100.137		
Water Level:	Cut	0.365	2.451	99.279		Time WL Surveyed: 10:00
Water Level:	Cut	0.365	2.436	99.280		Time WL Surveyed: 10:01
S10A-03	1.214	101.351		100.137		

WL Survey Summary	Before	After
Average WL:	99.279	99.280
Closing Error:	-0.001	-
WL Check:	0.000	-0.001
Transducer Elevation	98.391	98.392

Level Survey Equipment:	Level #:	Level #:
Level #:	Level #:	Level #:
Make & Model:	Level #:	Level #:
Serial #:	Level #:	Level #:

Field Personnel:	SM, TL	Trip Date:	12-Sep-15
Data Entry Personnel:	SM	Date:	12-Sep-15
Data Check Personnel:	CJ	Date:	8-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: October 17, 2015
 Site Visit Time (MST): 10:05

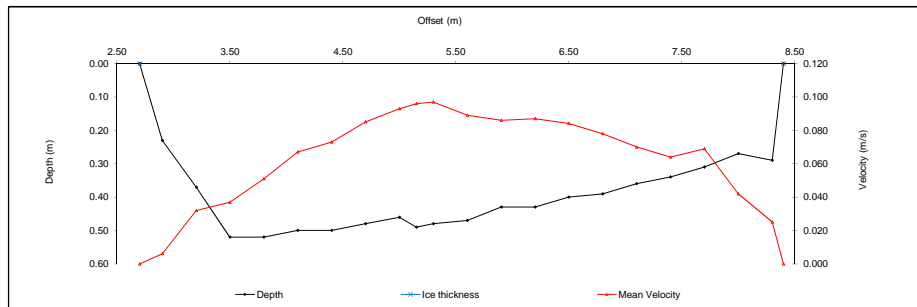


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.70	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.90	0.23		0.14	0.006					1.00	0.25	0.23	0.006	0.06	0.000	0%
2	3.20	0.37		0.22	0.032					1.00	0.30	0.37	0.032	0.11	0.004	2%
3	3.50	0.52		0.31	0.037					1.00	0.30	0.52	0.037	0.16	0.006	4%
4	3.80	0.52		0.31	0.051					1.00	0.30	0.52	0.051	0.16	0.008	5%
5	4.10	0.50		0.30	0.067					1.00	0.30	0.50	0.067	0.15	0.010	6%
6	4.40	0.50		0.30	0.073					1.00	0.30	0.50	0.073	0.15	0.011	7%
7	4.70	0.48		0.29	0.085					1.00	0.30	0.48	0.085	0.14	0.012	8%
8	5.00	0.46		0.28	0.093					1.00	0.23	0.46	0.093	0.10	0.010	6%
9	5.15	0.49		0.29	0.096					1.00	0.15	0.49	0.096	0.07	0.007	4%
10	5.30	0.48		0.29	0.097					1.00	0.23	0.48	0.097	0.11	0.010	7%
11	5.60	0.47		0.28	0.089					1.00	0.30	0.47	0.089	0.14	0.013	8%
12	5.90	0.43		0.26	0.086					1.00	0.30	0.43	0.086	0.13	0.011	7%
13	6.20	0.43		0.26	0.087					1.00	0.30	0.43	0.087	0.13	0.011	7%
14	6.50	0.40		0.24	0.084					1.00	0.30	0.40	0.084	0.12	0.010	6%
15	6.80	0.39		0.23	0.078					1.00	0.30	0.39	0.078	0.12	0.009	6%
16	7.10	0.36		0.22	0.070					1.00	0.30	0.36	0.070	0.11	0.008	5%
17	7.40	0.34		0.20	0.064					1.00	0.30	0.34	0.064	0.10	0.007	4%
18	7.70	0.31		0.19	0.069					1.00	0.30	0.31	0.069	0.09	0.006	4%
19	8.00	0.27		0.16	0.042					1.00	0.30	0.27	0.042	0.08	0.003	2%
20	8.30	0.29		0.17	0.025					1.00	0.20	0.29	0.025	0.06	0.001	1%
LB	8.40	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
Total Flow														0.157	100%	

Flow Measurement Details:

Metering Section Location (describe):
2m downstream of pressure transducer

Meas. Start Time (MST):	10:20
Meas. End Time (MST):	10:45
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Backwatered
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 7C



Flow characteristics:

Total Flow:	0.157	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.29	(m ²)
Wetted Width:	5.70	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.07	(m/s)
Reynolds Number:	1.79E+04	
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.756	0.756
Water (°C):	4.8	5.0
Datalogger Clock:	10:08	10:49
Laptop Clock:	10:06	10:47
Battery:	14.6	14.3
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

ADV test passed.
 Beaver dam just around the bend downstream of station.

General Notes:

ADV test passed.
 Beaver dam just around the bend downstream of station.

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-02	1.388	101.388		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.127	100.261	100.260	3/4" Pipe NW of logger
S10A-03			1.251	100.137	100.136	3/4" Pipe N of logger
Water Level:	Cut	0.224	2.465	99.147		Time WL Surveyed: 10:11
Temporary BM			2.465	98.923	0.000	-
Turn						
Temporary BM	2.428	101.351		98.923		
Water Level:	Cut	0.224	2.428	99.147		Time WL Surveyed: 10:13
S10A-03			1.213	100.138	100.136	3/4" Pipe N of logger
S10A-01			1.091	100.260	100.260	3/4" Pipe NW of logger
S10A-02			1.348	100.003	100.000	3/4" Pipe W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S10A-03	1.213	101.350		100.137		Time WL Surveyed: 10:49
Water Level:	Cut	0.257	2.461	99.146		Time WL Surveyed: 10:50
Water Level:	Cut	0.257	2.418	99.148		
S10A-03	1.172	101.309		100.137		

WL Survey Summary

	Before	After
Average WL:	99.147	99.147
Closing Error:	-0.003	-
WL Check:	0.000	-0.002
Transducer Elevation	98.391	98.391

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	TR, GG	Trip Date:	17-Oct-15
Data Entry Personnel:	TR	Date:	17-Oct-15
Data Check Personnel:	GG	Date:	26-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth
 UTM Location: 488573 E, 6358554 N

Site Visit Date: December 4, 2015
 Site Visit Time (MST): 09:44

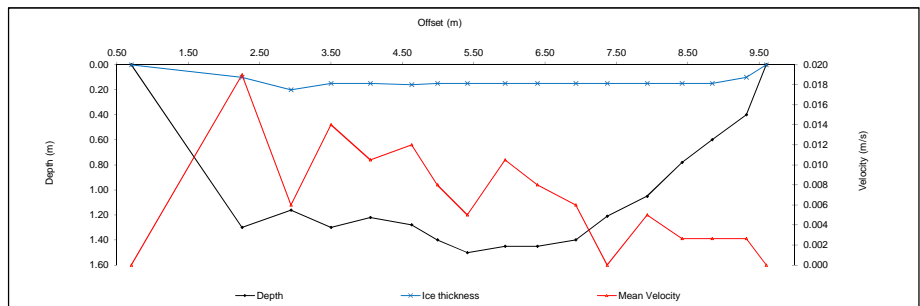


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.60	0.00	0.00		0.000		0.000		0.000	0.88	0.14	0.00	0.000	0.00	0.000	
1	9.32	0.40	0.10	0.25	0.003					0.88	0.38	0.30	0.003	0.11	0.000	0%
2	8.84	0.60	0.15	0.38	0.003					0.88	0.45	0.45	0.003	0.20	0.001	1%
3	8.42	0.78	0.15	0.47	0.003					0.88	0.45	0.63	0.003	0.29	0.001	1%
4	7.93	1.05	0.15			0.87	0.008	0.33	0.002	1.00	0.53	0.90	0.005	0.47	0.002	3%
5	7.37	1.21	0.15			1.00	0.001	0.36	-0.001	1.00	0.50	1.06	0.000	0.53	0.000	0%
6	6.93	1.40	0.15			1.15	-0.002	0.40	0.014	1.00	0.49	1.25	0.006	0.61	0.004	5%
7	6.39	1.45	0.15			1.19	-0.001	0.41	0.017	1.00	0.50	1.30	0.008	0.64	0.005	7%
8	5.94	1.45	0.15			1.19	0.007	0.41	0.014	1.00	0.49	1.30	0.011	0.64	0.007	9%
9	5.41	1.50	0.15			1.23	-0.003	0.42	0.013	1.00	0.48	1.35	0.005	0.64	0.003	4%
10	4.99	1.40	0.15			1.15	0.002	0.40	0.014	1.00	0.39	1.25	0.008	0.49	0.004	5%
11	4.63	1.28	0.16			1.06	0.006	0.38	0.018	1.00	0.47	1.12	0.012	0.53	0.006	8%
12	4.05	1.22	0.15			1.01	0.004	0.36	0.017	1.00	0.57	1.07	0.011	0.60	0.006	8%
13	3.50	1.30	0.15			1.07	0.012	0.38	0.016	1.00	0.56	1.15	0.014	0.64	0.009	12%
14	2.94	1.16	0.20			0.97	0.003	0.39	0.009	1.00	0.63	0.96	0.006	0.60	0.004	5%
15	2.25	1.30	0.10			1.06	0.012	0.34	0.026	1.00	1.12	1.20	0.019	1.34	0.026	33%
LB	0.70	0.00	0.00		0.00				0.00	0.88	0.78	0.00	0.000	0.00	0.000	
Total Flow														0.077	100%	

Flow Measurement Details:

Metering Section Location (describe):
 30m downstream of helicopter landing area

Meas. Start Time (MST):	10:10
Meas. End Time (MST):	10:43
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3338
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Overcast, -1c



Flow characteristics:

Total Flow:	0.077	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	8.34	(m ²)
Wetted Width:	8.90	(m)
Hydraulic Depth:	0.94	(m)
Mean Velocity:	0.01	(m/s)
Reynolds Number:	4.89E+03	
Froude Number:	0.00	

Logger Details:

	Before	After
Transducer Reading (m):	0.597	
Water (°C):	0.3	
Datalogger Clock:	10:48	
Laptop Clock:	09:46	
Battery:	12.7	
Battery Condition:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PTF (if replaced):	-	
Logger (if replaced):	-	

Datalogger / Station Notes:

General Notes:
 -left site early due to freezing rain, flow mmt quality is poor

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S10A-02	1.492	101.492		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.230	100.262	100.260	3/4" Pipe NW of logger
S10A-03			1.353	100.139	100.136	3/4" Pipe N of logger
Water Level:	Cut		2.508	98.984		Time WL Surveyed: 10:05
Temporary BM			2.497	98.995		0.000
Turn						
Temporary BM	2.468	101.463		98.995		
Water Level:	Cut		2.478	98.985		Time WL Surveyed: 10:09
S10A-03			1.327	100.136	100.136	3/4" Pipe N of logger
S10A-01			1.203	100.260	100.260	3/4" Pipe NW of logger
S10A-02			1.464	99.999	100.000	3/4" Pipe W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.985	-
Closing Error:	0.001	-
WL Check:	0.001	-
Transducer Elevation	98.388	-

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

GG, JM	Trip Date:	4-Dec-15
GG	Date:	4-Dec-15
CJ	Date:	22-Dec-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date: January 7, 2015

Site Visit Time (MST): 13:46

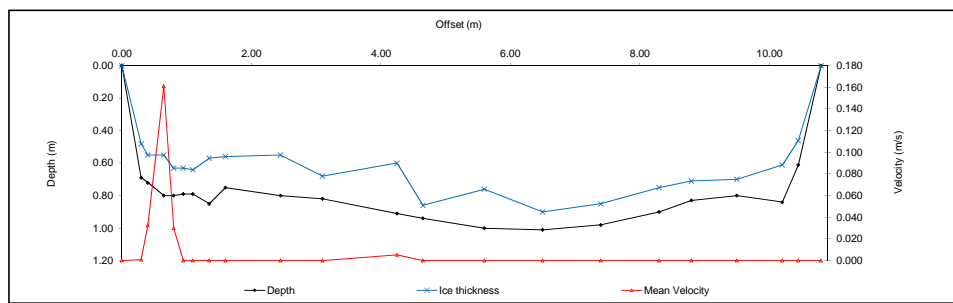


Flow Measurement:													Measured Data				Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)						
LB	0.00	0.00	0.00		0.000				0.000	0.88	0.15	0.00	0.000	0.00	0.000							
1	0.30	0.69	0.48	0.59	0.001				0.88	0.20	0.21	0.001	0.04	0.000	0%							
2	0.40	0.72	0.55	0.64	0.037				0.88	0.18	0.17	0.033	0.03	0.001	9%							
3	0.65	0.80	0.55	0.68	0.183				0.88	0.20	0.25	0.161	0.05	0.008	73%							
4	0.80	0.80	0.63	0.72	0.034				0.88	0.15	0.17	0.030	0.03	0.001	7%							
5	0.95	0.79	0.63	0.71	0.000				0.88	0.15	0.16	0.000	0.02	0.000	0%							
6	1.10	0.79	0.64	0.72	0.000				0.88	0.20	0.15	0.000	0.03	0.000	0%							
7	1.35	0.85	0.57	0.71	0.000				0.88	0.25	0.28	0.000	0.07	0.000	0%							
8	1.60	0.75	0.56	0.66	0.000				0.88	0.55	0.19	0.000	0.10	0.000	0%							
9	2.45	0.80	0.55	0.68	0.000				0.88	0.75	0.25	0.000	0.19	0.000	0%							
10	3.10	0.82	0.68	0.75	0.000				0.88	0.90	0.14	0.000	0.13	0.000	0%							
11	4.25	0.91	0.60	0.76	0.006				0.88	0.78	0.31	0.005	0.24	0.001	11%							
12	4.65	0.94	0.86	0.90	0.000				0.88	0.68	0.08	0.000	0.05	0.000	0%							
13	5.60	1.00	0.76	0.88	0.000				0.88	0.93	0.24	0.000	0.22	0.000	0%							
14	6.50	1.01	0.90	0.96	0.000				0.88	0.90	0.11	0.000	0.10	0.000	0%							
15	7.40	0.98	0.85	0.92	0.000				0.88	0.90	0.13	0.000	0.12	0.000	0%							
16	8.30	0.90	0.75	0.83	0.000				0.88	0.70	0.15	0.000	0.11	0.000	0%							
17	8.80	0.83	0.71	0.77	0.000				0.88	0.60	0.12	0.000	0.07	0.000	0%							
18	9.50	0.80	0.70	0.75	0.000				0.88	0.70	0.10	0.000	0.07	0.000	0%							
19	10.20	0.84	0.61	0.73	0.000				0.88	0.48	0.23	0.000	0.11	0.000	0%							
20	10.45	0.61	0.46	0.54	0.000				0.88	0.30	0.15	0.000	0.05	0.000	0%							
RB	10.80	0.00	0.00		0.00				0.88	0.18	0.00	0.000	0.00	0.000								
													Total Flow	0.011	100%							

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	14:20
Meas. End Time (MST):	14:47
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Snowing, -17C



Flow characteristics:

Total Flow:	0.011	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.82	(m ²)
Wetted Width:	10.80	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.00	

Logger Details:

	Before	After
Transducer Reading (m):	1.681	-
Water (°C):	0.5	-
Datalogger Clock:	13:50	-
Laptop Clock:	13:50	-
Battery (Main):	12.3	13.2
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-ice very high on banks, overflow refroze above previous channel
-ice frozen to depth throughout most of channel

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S11-7	1.431	243.531		242.100	242.100	3/4" Pipe 12m W of logger
S11-5			1.315	242.216	242.212	3/4" Pipe 7m W of logger
S11-6			0.947	242.584	242.579	3/4" Pipe 3m E of logger
Water Level:						
				2.718	240.813	14:10
Temporary BM	Cut			2.633	240.898	3/4" Pipe 12m W of logger
Turn						
Temporary BM	2.607	243.505		240.898	242.100	3/4" Pipe 12m W of logger
Water Level:	Cut		2.688	240.817	240.817	14:14
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
				0.920	242.585	242.579
S11-6				1.268	242.217	242.212
S11-5				1.404	242.101	242.100
S11-7						
Water Level:						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	240.815	-
Closing Error:	-0.001	-
WL Check:	0.004	-
Transducer Elevation	239.134	-

Field Personnel:

	GG, TR	Trip Date:	7-Jan-15
Data Entry Personnel:	GG	Date:	7-Jan-15
Data Check Personnel:	TR	Date:	28-Apr-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date: February 13, 2015
 Site Visit Time (MST): 15:30

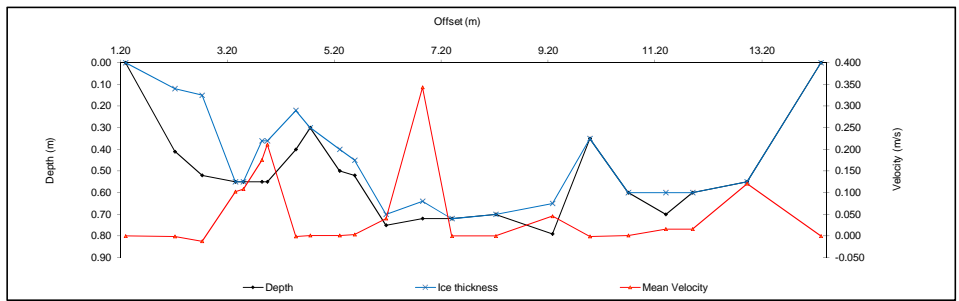


Flow Measurement:													Measured Data				Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)						
LB	1.30	0.00	0.00		0.000				0.000	0.88	0.46	0.00	0.000	0.00	0.000							
1	2.22	0.41	0.12	0.27	-0.001				0.88	0.72	0.29	-0.001	0.21	0.000	0%							
2	2.73	0.52	0.15	0.34	-0.014				0.88	0.57	0.37	-0.012	0.21	-0.003	-6%							
3	3.35	0.55	0.55	0.55	0.116				0.88	0.39	0.00	0.102	0.00	0.000	0%							
4	3.50	0.55	0.55	0.55	0.123				0.88	0.25	0.00	0.108	0.00	0.000	0%							
5	3.85	0.55	0.36	0.46	0.199				0.88	0.23	0.19	0.175	0.04	0.007	18%							
6	3.95	0.55	0.36	0.46	0.240				0.88	0.32	0.19	0.211	0.06	0.013	30%							
7	4.48	0.40	0.22	0.31	-0.001				0.88	0.40	0.18	-0.001	0.07	0.000	0%							
8	4.75	0.30	0.30	0.30	0.001				0.88	0.41	0.00	0.001	0.00	0.000	0%							
9	5.30	0.50	0.40	0.45	0.001				0.88	0.41	0.10	0.001	0.04	0.000	0%							
10	5.59	0.52	0.45	0.49	0.004				0.88	0.44	0.07	0.004	0.03	0.000	0%							
11	6.17	0.75	0.70	0.73	0.046				0.88	0.64	0.05	0.040	0.03	0.001	3%							
12	6.85	0.72	0.64	0.68	0.390				0.88	0.62	0.08	0.343	0.05	0.017	40%							
13	7.40	0.72	0.72	0.72	0.000				0.88	0.69	0.00	0.000	0.00	0.000	0%							
14	8.22	0.70	0.70	0.70	0.000				0.88	0.94	0.00	0.000	0.00	0.000	0%							
15	9.28	0.79	0.65	0.72	0.052				0.88	0.88	0.14	0.046	0.12	0.006	13%							
16	9.98	0.35	0.35	0.35	-0.001				0.88	0.71	0.00	-0.001	0.00	0.000	0%							
17	10.70	0.60	0.60	0.60	0.001				0.88	0.71	0.00	0.001	0.00	0.000	0%							
18	11.40	0.70	0.60	0.65	0.018				0.88	0.60	0.10	0.016	0.06	0.001	2%							
19	11.90	0.60	0.60	0.60	0.018				0.88	0.76	0.00	0.016	0.00	0.000	0%							
20	12.92	0.55	0.55	0.55	0.137				0.88	1.20	0.00	0.121	0.00	0.000	0%							
RB	14.30	0.00	0.00		0.00				0.88	0.69	0.00	0.000	0.00	0.000								
Total Flow														0.042	100%							

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	16:08
Meas. End Time (MST):	17:14
Equipment:	ADV
Method:	Ice
River Condition:	Ice to depth
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, -14C



Flow characteristics:

Total Flow:	0.042	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.93	(m ²)
Wetted Width:	13.00	(m)
Hydraulic Depth:	0.07	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.942	-
Water (°C):	0.5	-
Datalogger Clock:	15:38	-
Laptop Clock:	15:38	-
Battery (Main):	12.8	13.1
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Ice frozen to depth, effecting flow measurements

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S11-6	1.008	243.587		242.579	242.579	3/4" Pipe 3m E of logger
S11-5			1.380	242.207	242.212	3/4" Pipe 7m W of logger
S11-7			1.493	242.094	242.100	3/4" Pipe 12m W of logger
Water Level:						
	Cut		3.447	240.140	Time WL Surveyed: 15:50	
Temporary BM			2.775	240.812	242.100	3/4" Pipe 12m W of logger
Turn						
Temporary BM	2.754	243.566		240.812	242.100	3/4" Pipe 12m W of logger
Water Level:	Cut		3.423	240.143	Time WL Surveyed: 15:53	
S11-7			1.472	242.094	242.100	3/4" Pipe 12m W of logger
S11-5			1.360	242.206	242.212	3/4" Pipe 7m W of logger
S11-6			0.987	242.579	242.579	3/4" Pipe 3m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	240.142	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	239.200	-

Field Personnel:

	MP, GG	Trip Date:	13-Feb-15
Data Entry Personnel:	MP	Date:	13-Feb-15
Data Check Personnel:	TR	Date:	28-Apr-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date: March 12, 2015

Site Visit Time (MST): 08:15



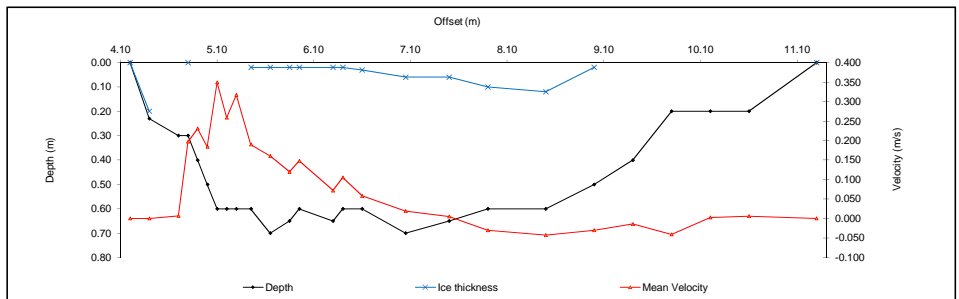
Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	4.20	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.88	0.10	0.00	0.000	0.00	0.000	
1	4.40	0.23	0.20	0.22	0.000					0.88	0.25	0.03	0.000	0.01	0.000	0%
2	4.70	0.30		0.15	0.008					0.88	0.20	0.30	0.007	0.06	0.000	0%
3	4.80	0.30	0.00	0.15	0.224					0.88	0.10	0.30	0.197	0.03	0.006	4%
4	4.90	0.40		0.20	0.262					0.88	0.10	0.40	0.231	0.04	0.009	6%
5	5.00	0.50		0.25	0.209					0.88	0.10	0.50	0.184	0.05	0.009	6%
6	5.10	0.60		0.30	0.397					0.88	0.10	0.60	0.349	0.06	0.021	13%
7	5.20	0.60		0.30	0.294					0.88	0.10	0.60	0.259	0.06	0.016	9%
8	5.30	0.60		0.30	0.360					0.88	0.13	0.60	0.317	0.08	0.024	14%
9	5.45	0.60	0.02	0.31	0.216					0.88	0.18	0.58	0.190	0.10	0.019	12%
10	5.65	0.70	0.02	0.36	0.192					0.88	0.20	0.68	0.160	0.14	0.022	13%
11	5.85	0.65	0.02	0.34	0.136					0.88	0.15	0.63	0.120	0.09	0.011	7%
12	5.95	0.60	0.02	0.31	0.168					0.88	0.23	0.58	0.148	0.13	0.019	12%
13	6.30	0.65	0.02	0.34	0.082					0.88	0.23	0.63	0.072	0.14	0.010	6%
14	6.40	0.60	0.02	0.31	0.120					0.88	0.15	0.58	0.106	0.09	0.009	6%
15	6.60	0.60	0.03	0.32	0.066					0.88	0.32	0.57	0.058	0.19	0.011	7%
16	7.05	0.70	0.06	0.38	0.022					0.88	0.45	0.64	0.019	0.29	0.006	3%
17	7.50	0.65	0.06	0.36	0.006					0.88	0.43	0.59	0.005	0.25	0.001	1%
18	7.90	0.60	0.10	0.35	-0.034					0.88	0.50	0.50	-0.030	0.25	-0.007	-5%
19	8.50	0.60	0.12	0.36	-0.048					0.88	0.55	0.48	-0.042	0.26	-0.011	-7%
20	9.00	0.50	0.02	0.26	-0.034					0.88	0.45	0.48	-0.030	0.22	-0.006	-4%
21	9.40	0.40		0.20	-0.016					0.88	0.40	0.40	-0.014	0.16	-0.002	-1%
22	9.90	0.20		0.10	-0.046					0.88	0.40	0.20	-0.040	0.08	-0.003	-2%
23	10.20	0.20		0.10	0.003					0.88	0.40	0.20	0.003	0.08	0.000	0%
24	10.60	0.20		0.10	0.007					0.88	0.55	0.20	0.006	0.11	0.001	0%
LB	11.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.35	0.00	0.000	0.00	0.000	
Total Flow														0.164	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	8:50
Meas. End Time (MST):	9:30
Equipment:	ADV
Method:	Ice
River Condition:	Overflow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Overcast, -6C



Flow characteristics:

Total Flow:	0.164	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	2.96	(m ²)
Wetted Width:	7.10	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.723	-
Water (°C):	0.6	-
Datalogger Clock:	08:22	-
Laptop Clock:	08:22	-
Battery (Main):	12.8	13.1
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Ice in some areas was above water surface

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S11-6	0.966	243.545		242.579	242.579	3/4" Pipe 3m E of logger
S11-5			1.333	242.212	242.212	3/4" Pipe 7m W of logger
S11-7			1.449	242.096	242.100	3/4" Pipe 12m W of logger
Water Level:	Cut	3.625		239.920		Time WL Surveyed: 8:49
Temporary BM		2.688		240.857	0.000	-
Turn						
Temporary BM	2.666	243.523		240.857		-
Water Level:	Cut		3.605	239.918		Time WL Surveyed: 8:51
S11-7			1.428	242.095	242.100	3/4" Pipe 12m W of logger
S11-5			1.312	242.211	242.212	3/4" Pipe 7m W of logger
S11-6			0.943	242.580	242.579	3/4" Pipe 3m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary	Before	After
Average WL:	239.919	-
Closing Error:	-0.001	-
WL Check:	0.002	-
Transducer Elevation	239.196	-

Field Personnel:	SM, DW	Trip Date:	12-Mar-15
Data Entry Personnel:	SM	Date:	12-Mar-15
Data Check Personnel:	TR	Date:	28-Apr-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date: April 24, 2015
 Site Visit Time (MST): 07:21

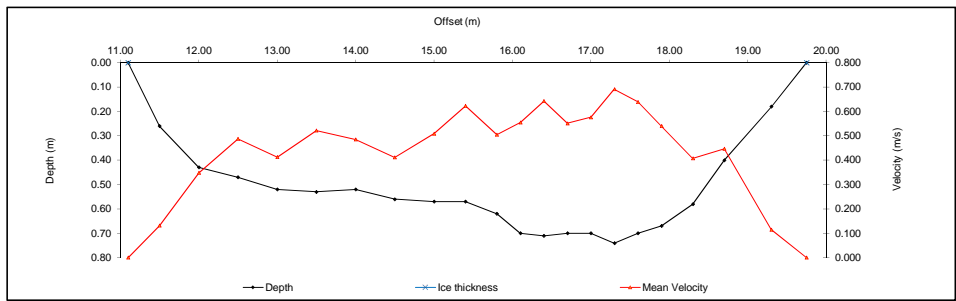


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	11.10	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	11.50	0.26		0.16	0.132					1.00	0.45	0.26	0.132	0.12	0.015	1%
2	12.00	0.43		0.26	0.348					1.00	0.50	0.43	0.348	0.22	0.075	3%
3	12.50	0.47		0.28	0.487					1.00	0.50	0.47	0.487	0.24	0.114	5%
4	13.00	0.52		0.31	0.412					1.00	0.50	0.52	0.412	0.26	0.107	5%
5	13.50	0.53		0.32	0.521					1.00	0.50	0.53	0.521	0.27	0.138	6%
6	14.00	0.52		0.31	0.485					1.00	0.50	0.52	0.485	0.26	0.126	6%
7	14.50	0.56		0.34	0.411					1.00	0.50	0.56	0.411	0.28	0.115	5%
8	15.00	0.57		0.34	0.509					1.00	0.45	0.57	0.509	0.26	0.131	6%
9	15.40	0.57		0.34	0.623					1.00	0.40	0.57	0.623	0.23	0.142	7%
10	15.80	0.62		0.37	0.594					1.00	0.35	0.62	0.594	0.22	0.109	5%
11	16.10	0.70		0.42	0.554					1.00	0.30	0.70	0.554	0.21	0.116	5%
12	16.40	0.71		0.43	0.642					1.00	0.30	0.71	0.642	0.21	0.137	6%
13	16.70	0.70		0.42	0.551					1.00	0.30	0.70	0.551	0.21	0.116	5%
14	17.00	0.70		0.42	0.576					1.00	0.30	0.70	0.576	0.21	0.121	6%
15	17.30	0.74		0.44	0.691					1.00	0.30	0.74	0.691	0.22	0.153	7%
16	17.60	0.70		0.42	0.639					1.00	0.30	0.70	0.639	0.21	0.134	6%
17	17.90	0.67		0.40	0.540					1.00	0.35	0.67	0.540	0.23	0.127	6%
18	18.30	0.58		0.35	0.407					1.00	0.40	0.58	0.407	0.23	0.094	4%
19	18.70	0.40		0.24	0.447					1.00	0.50	0.40	0.447	0.20	0.089	4%
20	19.30	0.18		0.11	0.114					1.00	0.52	0.18	0.114	0.09	0.011	0%
RB	19.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.23	0.00	0.000	0.00	0.000	
Total Flow														2.17	100%	

Flow Measurement Details:

Metering Section Location (describe): 20m downstream from station

Meas. Start Time (MST):	7:47
Meas. End Time (MST):	8:12
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, 5C



Flow characteristics:

Total Flow:	2.17	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.37	(m ²)
Wetted Width:	8.65	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.50	(m/s)
Froude Number:	0.22	

Logger Details:

	Before	After
Transducer Reading (m):	0.906	0.909
Water (°C):	3.5	3.6
Datalogger Clock:	07:24	08:29
Laptop Clock:	07:24	08:29
Battery (Main):	12.6	13.1
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-ADV tested, all results good
 -Water level fluctuating 1-2cm

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S11-7	1.356	243.456		242.100	242.100	3/4" Pipe 12m W of logger
S11-5			1.243	242.213	242.212	3/4" Pipe 7m W of logger
S11-6			0.873	242.583	242.579	3/4" Pipe 3m E of logger
Water Level:						
Water Level:	Cut		3.337	240.119	240.119	Time WL Surveyed: 7:37
Temporary BM			3.337	240.119	0.000	-
Turn						
Temporary BM	3.325	243.444		240.119	240.119	-
Water Level:	Cut		3.325	240.119	240.119	Time WL Surveyed: 7:40
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S11-6	0.863	243.445		242.582	242.582	
Water Level:	Cut		3.325	240.120	240.120	Time WL Surveyed: 8:22
Water Level:	Cut		3.312	240.120	240.120	Time WL Surveyed: 8:24
S11-6	0.850	243.432		242.582	242.582	

WL Survey Summary

	Before	After
Average WL:	240.119	240.120
Closing Error:	0.000	-
WL Check:	0.000	0.000
Transducer Elevation	239.213	239.211

Field Personnel:

Field Personnel:	GG, SM	Trip Date:	24-Apr-15
Data Entry Personnel:	GG	Date:	24-Apr-15
Data Check Personnel:	TR	Date:	5-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date: May 7, 2015

Site Visit Time (MST): 10:30

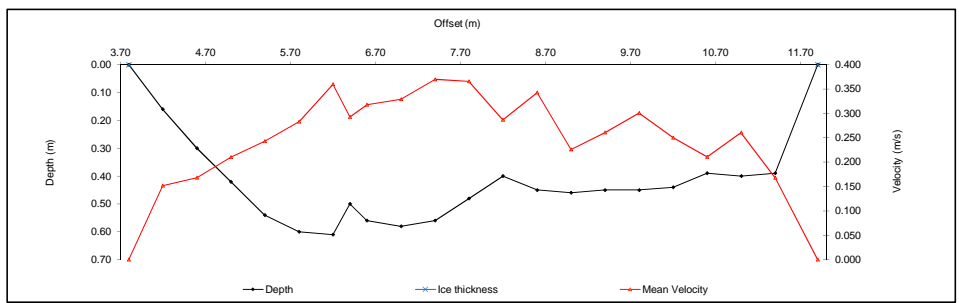


Flow Measurement:													Measured Data				Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)						
LB	11.90	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000							
1	11.40	0.39		0.23	0.168					1.00	0.45	0.39	0.168	0.18	0.029	3%						
2	11.00	0.40		0.24	0.261					1.00	0.40	0.40	0.261	0.16	0.042	4%						
3	10.60	0.39		0.23	0.211					1.00	0.40	0.39	0.211	0.16	0.033	3%						
4	10.20	0.44		0.26	0.250					1.00	0.40	0.44	0.250	0.18	0.044	5%						
5	9.80	0.45		0.27	0.301					1.00	0.40	0.45	0.301	0.18	0.054	6%						
6	9.40	0.45		0.27	0.261					1.00	0.40	0.45	0.261	0.18	0.047	5%						
7	9.00	0.46		0.28	0.226					1.00	0.40	0.46	0.226	0.18	0.042	4%						
8	8.60	0.45		0.27	0.343					1.00	0.40	0.45	0.343	0.18	0.062	6%						
9	8.20	0.40		0.24	0.287					1.00	0.40	0.40	0.287	0.16	0.046	5%						
10	7.80	0.48		0.29	0.366					1.00	0.40	0.48	0.366	0.19	0.070	7%						
11	7.40	0.56		0.34	0.370					1.00	0.40	0.56	0.370	0.22	0.083	9%						
12	7.00	0.58		0.35	0.329					1.00	0.40	0.58	0.329	0.23	0.078	8%						
13	6.60	0.56		0.34	0.318					1.00	0.30	0.56	0.318	0.17	0.053	6%						
14	6.40	0.50		0.30	0.293					1.00	0.20	0.50	0.293	0.10	0.029	3%						
15	6.20	0.61		0.37	0.360					1.00	0.30	0.61	0.360	0.18	0.066	7%						
16	5.80	0.60		0.36	0.283					1.00	0.40	0.60	0.283	0.24	0.068	7%						
17	5.40	0.54		0.32	0.243					1.00	0.40	0.54	0.243	0.22	0.052	5%						
18	5.00	0.42		0.25	0.210					1.00	0.40	0.42	0.210	0.17	0.035	4%						
19	4.60	0.30		0.18	0.168					1.00	0.40	0.30	0.168	0.12	0.020	2%						
20	4.20	0.16		0.10	0.152					1.00	0.40	0.16	0.152	0.06	0.010	1%						
RB	3.80	0.00	0.00		0.00				0.00	1.00	0.20	0.00	0.000	0.00	0.000							
													Total Flow	0.962	100%							

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	11:07
Meas. End Time (MST):	11:34
Equipment:	ADV
Method:	Wading
River Condition:	Medium flow, no ice, turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 8C



Flow Characteristics:

Total Flow:	0.962	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.46	(m ²)
Wetted Width:	8.10	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.14	

Logger Details:

	Before	After
Transducer Reading (m):	0.810	0.813
Water (°C):	5.5	6.2
Datalogger Clock:	10:39	11:45
Laptop Clock:	10:39	11:45
Battery (Main):	12.9	12.9
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S11-7	1.266	243.366		242.100	242.100	3/4" Pipe 12m W of logger
S11-5			1.153	242.213	242.212	3/4" Pipe 7m W of logger
S11-6			0.785	242.581	242.579	3/4" Pipe 3m E of logger
Water Level:						
Water Level:	Cut		3.381	239.985	239.985	Time WL Surveyed: 10:53
Temporary BM			3.381	239.985	0.000	-
Turn						
Temporary BM	3.352	243.337		239.985	239.985	-
Water Level:	Cut		3.352	239.985	239.985	Time WL Surveyed: 10:55
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S11-6	0.759	243.337		242.578	242.578	
Water Level:	Cut		3.346	239.991	239.991	Time WL Surveyed: 11:38
Water Level:	Cut		3.327	239.989	239.989	Time WL Surveyed: 11:39
S11-6	0.738	243.316		242.578	242.578	

WL Survey Summary

	Before	After
Average WL:	239.985	239.990
Closing Error:	0.002	-
WL Check:	0.000	0.002
Transducer Elevation	239.175	239.177

Field Personnel:

SM, CJ	Trip Date:	7-May-15	
Data Entry Personnel:	SM	Date:	7-May-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63
 UTM Location: 472000 E, 6307650 N

Site Visit Date: June 18, 2015
 Site Visit Time (MST): 10:45

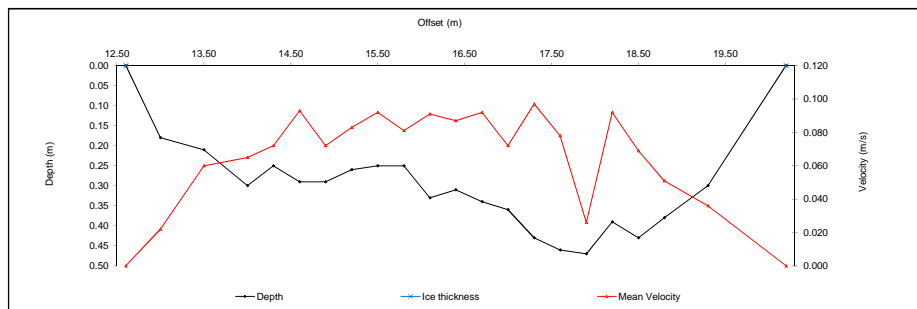


Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)							
LB	12.60	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000								
1	13.00	0.18		0.11	0.022					1.00	0.45	0.18	0.022	0.08	0.002	1%							
2	13.50	0.21		0.13	0.060					1.00	0.50	0.21	0.060	0.11	0.006	4%							
3	14.00	0.30		0.18	0.065					1.00	0.40	0.30	0.065	0.12	0.008	5%							
4	14.30	0.25		0.15	0.072					1.00	0.30	0.25	0.072	0.07	0.005	4%							
5	14.60	0.29		0.17	0.093					1.00	0.30	0.29	0.093	0.09	0.006	5%							
6	14.90	0.29		0.17	0.072					1.00	0.30	0.29	0.072	0.09	0.006	4%							
7	15.20	0.26		0.16	0.083					1.00	0.30	0.26	0.083	0.08	0.006	4%							
8	15.50	0.25		0.15	0.092					1.00	0.30	0.25	0.092	0.08	0.007	5%							
9	15.80	0.25		0.15	0.081					1.00	0.30	0.25	0.081	0.08	0.006	4%							
10	16.10	0.33		0.20	0.091					1.00	0.30	0.33	0.091	0.10	0.009	6%							
11	16.40	0.31		0.19	0.087					1.00	0.30	0.31	0.087	0.09	0.008	5%							
12	16.70	0.34		0.20	0.092					1.00	0.30	0.34	0.092	0.10	0.009	6%							
13	17.00	0.36		0.22	0.072					1.00	0.30	0.36	0.072	0.11	0.008	5%							
14	17.30	0.43		0.26	0.097					1.00	0.30	0.43	0.097	0.13	0.013	8%							
15	17.60	0.46		0.28	0.078					1.00	0.30	0.46	0.078	0.14	0.011	7%							
16	17.90	0.47		0.28	0.026					1.00	0.30	0.47	0.026	0.14	0.004	2%							
17	18.20	0.39		0.23	0.092					1.00	0.30	0.39	0.092	0.12	0.011	7%							
18	18.50	0.43		0.26	0.069					1.00	0.30	0.43	0.069	0.13	0.009	6%							
19	18.80	0.38		0.23	0.051					1.00	0.40	0.38	0.051	0.15	0.008	5%							
20	19.30	0.30		0.18	0.036					1.00	0.70	0.30	0.036	0.21	0.008	5%							
RB	20.20	0.00	0.00		0.00				0.00	1.00	0.45	0.00	0.000	0.00	0.000	5%							
Total Flow														0.151	100%								

Flow Measurement Details:

Metering Section Location (describe):
15m downstream of logger

Meas. Start Time (MST):	11:07
Meas. End Time (MST):	11:30
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 18C



Flow characteristics:

Total Flow:	0.151	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.20	(m ²)
Wetted Width:	7.60	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.07	(m/s)
Reynolds Number:	1.77E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.660	0.660
Water (°C):	15.4	16.4
Datalogger Clock:	10:47	11:38
Laptop Clock:	10:47	11:38
Battery:	12.4	12.9
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S11-7	1.362	243.462		242.100	242.100	3/4" Pipe 12m W of logger
S11-5			1.244	242.218	242.212	3/4" Pipe 7m W of logger
S11-6			0.875	242.587	242.579	3/4" Pipe 3m E of logger
Water Level:	Cut	0.071	3.682	239.851		Time WL Surveyed: 10:55
Temporary BM			3.682	239.780	0.000	
Turn						
Temporary BM	3.668	243.448		239.780		
Water Level:	Cut	0.071	3.668	239.851		Time WL Surveyed: 10:56
S11-6			0.863	242.585	242.579	3/4" Pipe 3m E of logger
S11-5			1.232	242.216	242.212	3/4" Pipe 7m W of logger
S11-7			1.346	242.102	242.100	3/4" Pipe 12m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S11-6	0.863	243.449		242.586		Time WL Surveyed: 11:34
Water Level:	Cut	0.062	3.682	239.849		Time WL Surveyed: 11:36
Water Level:	Cut	0.062	3.675	239.850		
S11-6	0.847	243.433		242.586		

WL Survey Summary

	Before	After
Average WL:	239.851	239.850
Closing Error:	-0.002	-
WL Check:	0.000	-0.001
Transducer Elevation	239.191	239.190

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, MK	Trip Date:	18-Jun-15
Data Check Personnel:	TR	Date:	18-Jun-15
Entered Digitally in the Field:	Yes	Date:	3-Jul-15

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63
 UTM Location: 472000 E, 6307650 N

Site Visit Date: August 15, 2015
 Site Visit Time (MST): 11:42

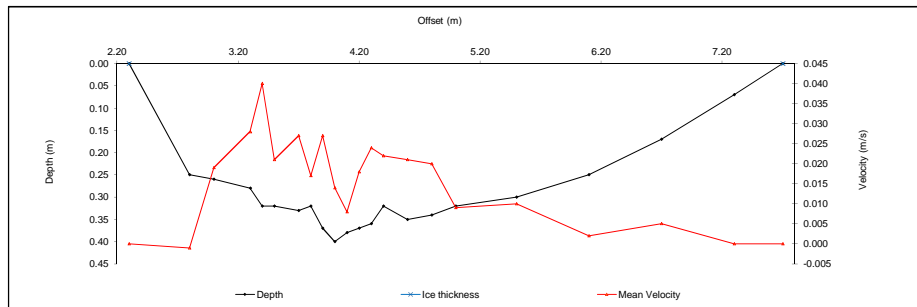


Measured Data										Calculated Data						
Bank/ Mnt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	7.70	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	7.30	0.07		0.04	0.000					1.00	0.50	0.07	0.000	0.04	0.000	0%
2	6.70	0.17		0.10	0.005					1.00	0.60	0.17	0.005	0.10	0.001	3%
3	6.10	0.25		0.15	0.002					1.00	0.60	0.25	0.002	0.15	0.000	2%
4	5.50	0.30		0.18	0.010					1.00	0.55	0.30	0.010	0.17	0.002	9%
5	5.00	0.32		0.19	0.009					1.00	0.35	0.32	0.009	0.11	0.001	6%
6	4.80	0.34		0.20	0.020					1.00	0.20	0.34	0.020	0.07	0.001	6%
7	4.60	0.35		0.21	0.021					1.00	0.20	0.35	0.021	0.07	0.001	8%
8	4.40	0.32		0.19	0.022					1.00	0.15	0.32	0.022	0.05	0.001	6%
9	4.30	0.36		0.22	0.024					1.00	0.10	0.36	0.024	0.04	0.001	5%
10	4.20	0.37		0.22	0.018					1.00	0.10	0.37	0.018	0.04	0.001	4%
11	4.10	0.38		0.23	0.008					1.00	0.10	0.38	0.008	0.04	0.000	2%
12	4.00	0.40		0.24	0.014					1.00	0.10	0.40	0.014	0.04	0.001	3%
13	3.90	0.37		0.22	0.027					1.00	0.10	0.37	0.027	0.04	0.001	6%
14	3.80	0.32		0.19	0.017					1.00	0.10	0.32	0.017	0.03	0.001	3%
15	3.70	0.33		0.20	0.027					1.00	0.15	0.33	0.027	0.05	0.001	8%
16	3.50	0.32		0.19	0.021					1.00	0.15	0.32	0.021	0.05	0.001	6%
17	3.40	0.32		0.19	0.040					1.00	0.10	0.32	0.040	0.03	0.001	7%
18	3.30	0.28		0.17	0.028					1.00	0.20	0.28	0.028	0.06	0.002	9%
19	3.00	0.26		0.16	0.019					1.00	0.25	0.26	0.019	0.07	0.001	7%
20	2.80	0.25		0.15	-0.001					1.00	0.35	0.25	-0.001	0.09	0.000	6%
RB	2.30	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.018	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	12:04
Meas. End Time (MST):	12:30
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow, eddies visible
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partly cloudy, 18C



Flow characteristics:

Total Flow:	0.018	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.31	(m ²)
Wetted Width:	5.40	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.01	(m/s)
Reynolds Number:	3.03E+03	
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	0.587	0.587
Water (°C):	17.3	17.7
Datalogger Clock:	11:44	12:39
Laptop Clock:	11:44	12:39
Battery:	12:46	12:8
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S11-7	1.273	243.373		242.100	242.100	3/4" Pipe 12m W of logger
S11-5			1.159	242.214	242.212	3/4" Pipe 7m W of logger
S11-6			0.792	242.581	242.579	3/4" Pipe 3m E of logger
Water Level:	Cut		3.609	239.764		Time WL Surveyed: 11:56
Temporary BM			3.583	239.790	0.000	
Turn						
Temporary BM	3.556	243.346		239.790		
Water Level:	Cut		3.585	239.761		Time WL Surveyed: 11:58
S11-6			0.766	242.580	242.579	3/4" Pipe 3m E of logger
S11-5			1.133	242.213	242.212	3/4" Pipe 7m W of logger
S11-7			1.247	242.099	242.100	3/4" Pipe 12m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S11-6	0.765	243.346		242.581		Time WL Surveyed: 12:29
Water Level:	Cut		3.587	239.759		Time WL Surveyed: 12:31
Water Level:	Cut		3.568	239.760		
S11-6	0.747	243.328		242.581		

WL Survey Summary

	Before	After
Average WL:	239.763	239.760
Closing Error:	0.001	-
WL Check:	0.003	-0.001
Transducer Elevation	239.176	239.173

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	GG, DW	Trip Date:	15-Aug-15
Data Check Personnel:	TR	Date:	25-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

September 17, 2015

Site Visit Time (MST):

16:55



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of ice WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.95	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	1.00	0.28	0.00	0.000	0.00	0.000	
1	2.90	0.20		0.12	-0.005					1.00	0.48	0.20	-0.005	0.09	0.000	-2%
2	3.30	0.24		0.14	0.015					1.00	0.40	0.24	0.015	0.10	0.001	5%
3	3.70	0.38		0.23	0.010					1.00	0.30	0.38	0.010	0.11	0.001	4%
4	3.90	0.38		0.23	0.020					1.00	0.20	0.38	0.020	0.08	0.002	5%
5	4.10	0.34		0.20	0.023					1.00	0.20	0.34	0.023	0.07	0.002	5%
6	4.30	0.40		0.24	0.026					1.00	0.20	0.40	0.026	0.08	0.002	7%
7	4.50	0.41		0.25	0.022					1.00	0.20	0.41	0.022	0.08	0.002	6%
8	4.70	0.43		0.26	0.010					1.00	0.20	0.43	0.010	0.09	0.001	3%
9	4.90	0.46		0.28	0.021					1.00	0.20	0.46	0.021	0.09	0.002	7%
10	5.10	0.40		0.24	0.028					1.00	0.15	0.40	0.028	0.06	0.002	6%
11	5.20	0.41		0.25	0.028					1.00	0.10	0.41	0.028	0.04	0.001	4%
12	5.30	0.46		0.28	0.021					1.00	0.15	0.46	0.021	0.07	0.001	5%
13	5.50	0.33		0.20	0.020					1.00	0.20	0.33	0.020	0.07	0.001	4%
14	5.70	0.30		0.18	0.024					1.00	0.30	0.30	0.024	0.09	0.002	7%
15	6.10	0.30		0.18	0.022					1.00	0.40	0.30	0.022	0.12	0.003	9%
16	6.50	0.28		0.17	0.015					1.00	0.40	0.28	0.015	0.11	0.002	6%
17	6.90	0.24		0.14	0.019					1.00	0.40	0.24	0.019	0.10	0.002	6%
18	7.30	0.22		0.13	0.014					1.00	0.40	0.22	0.014	0.09	0.001	4%
19	7.70	0.20		0.12	0.024					1.00	0.40	0.20	0.024	0.08	0.002	7%
20	8.10	0.11		0.07	0.021					1.00	0.40	0.11	0.021	0.04	0.001	3%
21	8.50	0.21		0.13	0.006					1.00	0.50	0.21	0.006	0.11	0.001	2%
22	9.10	0.14		0.08	-0.009					1.00	0.80	0.14	-0.009	0.11	-0.001	-3%
LB	10.10	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	1.00	0.50	0.00	0.000	0.00	0.000	
Total Flow														0.030	100%	

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of station

Meas. Start Time (MST):	17:19
Meas. End Time (MST):	17:46
Equipment:	ADV
Method:	Wading
River Condition:	Low flow, turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 17C

Flow characteristics:

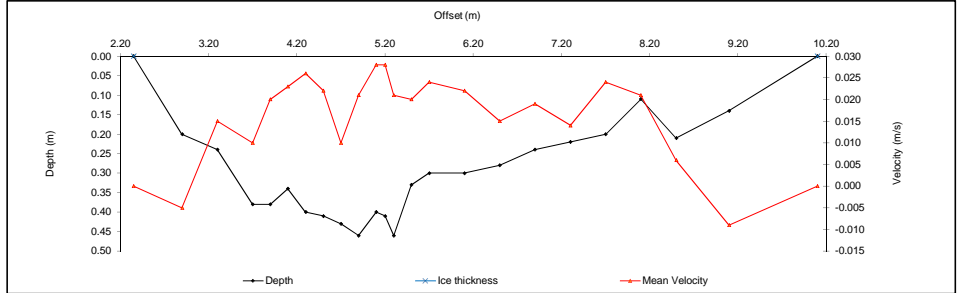
Total Flow:	0.030	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.87	(m ²)
Wetted Width:	7.75	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	0.605	0.606
Water (°C):	10.8	10.9
Datalogger Clock:	16:59	17:55
Laptop Clock:	16:59	17:55
Battery (Main):	12.6	13.0
Battery:	Replaced	
Battery Serial #:	-	1005001
Enclosure Deseccant:	Good	
Vent Tube Deseccant:	Good	
PT# (if replaced):	346253	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S11-6	0.607	243.186		242.579	242.579	3/4" Pipe 3m E of logger
S11-5			0.977	242.209	242.212	3/4" Pipe 7m W of logger
S11-7			1.088	242.098	242.100	3/4" Pipe 12m W of logger
Water Level:	Cut		3.404	239.782		Time WL Surveyed: 17:10
Temporary BM			3.459	239.727	0.000	
Turn						
Temporary BM	3.450	243.177		239.727		
Water Level:	Cut		3.397	239.780		Time WL Surveyed: 17:12
S11-7			1.079	242.098	242.100	3/4" Pipe 12m W of logger
S11-5			0.968	242.209	242.212	3/4" Pipe 7m W of logger
S11-6			0.999	242.578	242.579	3/4" Pipe 3m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S11-6	0.600	243.179		242.579		
Water Level:	Cut		3.396	239.783		Time WL Surveyed: 17:51
Water Level:	Cut		3.380	239.785		Time WL Surveyed: 17:52
S11-6	0.596	243.165		242.579		

WL Survey Summary	Before	After
Average WL:	239.781	239.784
Closing Error:	0.001	-
WL Check:	0.002	-0.002
Transducer Elevation	239.176	239.178

Field Personnel:	SM, CJ	Trip Date:	17-Sep-15
Data Entry Personnel:	SM	Date:	17-Sep-15
Data Check Personnel:	JC	Date:	23-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63
 UTM Location: 472000 E, 6307650 N

Site Visit Date: October 21, 2015
 Site Visit Time (MST): 10:43

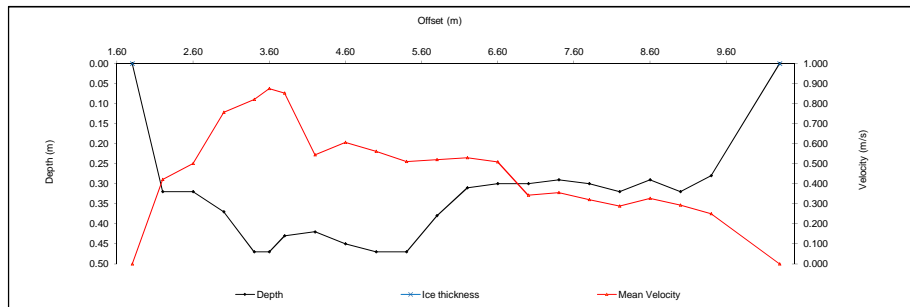


Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)							
RB	1.80	0.00	0.00		0.000				0.000														
1	2.20	0.32		0.19	0.421				1.00	0.40	0.32	0.421	0.13	0.054	4%								
2	2.60	0.32		0.19	0.501				1.00	0.40	0.32	0.501	0.13	0.064	5%								
3	3.00	0.37		0.22	0.756				1.00	0.40	0.37	0.756	0.15	0.112	8%								
4	3.40	0.47		0.28	0.820				1.00	0.30	0.47	0.820	0.14	0.116	8%								
5	3.60	0.47		0.28	0.875				1.00	0.20	0.47	0.875	0.09	0.062	6%								
6	3.80	0.43		0.26	0.852				1.00	0.30	0.43	0.852	0.13	0.110	8%								
7	4.20	0.42		0.25	0.544				1.00	0.40	0.42	0.544	0.17	0.091	6%								
8	4.60	0.45		0.27	0.607				1.00	0.40	0.45	0.607	0.18	0.109	8%								
9	5.00	0.47		0.28	0.562				1.00	0.40	0.47	0.562	0.19	0.106	7%								
10	5.40	0.47		0.28	0.511				1.00	0.40	0.47	0.511	0.19	0.096	7%								
11	5.80	0.38		0.23	0.520				1.00	0.40	0.38	0.520	0.15	0.079	6%								
12	6.20	0.31		0.19	0.530				1.00	0.40	0.31	0.530	0.12	0.066	5%								
13	6.60	0.30		0.18	0.509				1.00	0.40	0.30	0.509	0.12	0.061	4%								
14	7.00	0.30		0.18	0.343				1.00	0.40	0.30	0.343	0.12	0.041	3%								
15	7.40	0.29		0.17	0.355				1.00	0.40	0.29	0.355	0.12	0.041	3%								
16	7.80	0.30		0.18	0.320				1.00	0.40	0.30	0.320	0.12	0.038	3%								
17	8.20	0.32		0.19	0.289				1.00	0.40	0.32	0.289	0.13	0.037	3%								
18	8.60	0.29		0.17	0.327				1.00	0.40	0.29	0.327	0.12	0.038	3%								
19	9.00	0.32		0.19	0.293				1.00	0.40	0.32	0.293	0.13	0.038	3%								
20	9.40	0.28		0.17	0.251				1.00	0.65	0.28	0.251	0.18	0.046	3%								
LB	10.30	0.00	0.00		0.00				0.00	0.45	0.00	0.000	0.00	0.000									
Total Flow														1.42	100%								

Flow Measurement Details:

Metering Section Location (describe):
15m downstream of station

Meas. Start Time (MST):	11:01
Meas. End Time (MST):	11:17
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, 10C



Flow characteristics:

Total Flow:	1.42	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.80	(m ²)
Wetted Width:	8.50	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.51	(m/s)
Reynolds Number:	1.17E+05	
Froude Number:	0.28	

Logger Details:

	Before	After
Transducer Reading (m):	0.827	0.823
Water (°C):	7.4	7.5
Datalogger Clock:	10:45	11:28
Laptop Clock:	10:45	11:28
Battery:	12.2	13.1
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:
-Water level fluctuating by 1cm.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S11-6	0.867	243.446		242.579	242.579	3/4" Pipe 3m E of logger
S11-5			1.237	242.209	242.212	3/4" Pipe 7m W of logger
S11-7			1.350	242.096	242.100	3/4" Pipe 12m W of logger
Water Level:	Cut	0.063	3.507	240.002		Time WL Surveyed: 10:51
Temporary BM			3.507	239.939	0.000	
Turn						
Temporary BM	3.479	243.418		239.939		
Water Level:	Cut	0.063	3.479	240.002		Time WL Surveyed: 10:53
S11-7			1.321	242.097	242.100	3/4" Pipe 12m W of logger
S11-5			1.207	242.211	242.212	3/4" Pipe 7m W of logger
S11-6			0.840	242.578	242.579	3/4" Pipe 3m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S11-6	0.840	243.419		242.579		
Water Level:	Cut	0.063	3.473	240.009		Time WL Surveyed: 11:20
Water Level:	Cut	0.063	3.455	240.008		Time WL Surveyed: 11:22
S11-6	0.821	243.400		242.579		

WL Survey Summary

	Before	After
Average WL:	240.002	240.009
Closing Error:	0.001	-
WL Check:	0.000	0.001
Transducer Elevation	239.175	239.186

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	21-Oct-15
Data Check Personnel:	GG	Date:	21-Oct-15
Entered Digitally in the Field:	Yes	Date:	27-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63
 UTM Location: 472000 E, 6307650 N

Site Visit Date: December 8, 2015
 Site Visit Time (MST): 14:00

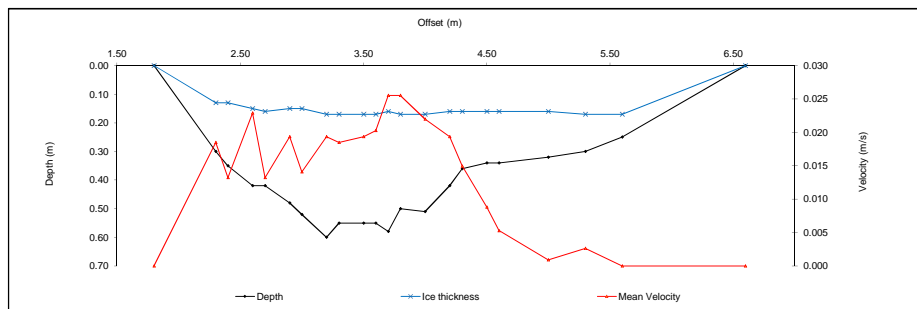


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.80	0.00	0.00		0.000				0.000	0.88	0.25	0.00	0.000	0.00	0.000	
1	2.30	0.30	0.13	0.22	0.021					0.88	0.30	0.17	0.018	0.05	0.001	7%
2	2.40	0.35	0.13	0.24	0.015					0.88	0.15	0.22	0.013	0.03	0.000	3%
3	2.60	0.42	0.15	0.29	0.026					0.88	0.15	0.27	0.023	0.04	0.001	6%
4	2.70	0.42	0.16	0.29	0.015					0.88	0.15	0.26	0.013	0.04	0.001	4%
5	2.90	0.48	0.15	0.32	0.022					0.88	0.15	0.33	0.019	0.05	0.001	7%
6	3.00	0.52	0.15	0.34	0.016					0.88	0.15	0.37	0.014	0.06	0.001	5%
7	3.20	0.60	0.17	0.39	0.022					0.88	0.15	0.43	0.019	0.06	0.001	9%
8	3.30	0.55	0.17	0.36	0.021					0.88	0.15	0.38	0.018	0.06	0.001	7%
9	3.50	0.55	0.17	0.36	0.022					0.88	0.15	0.38	0.019	0.06	0.001	8%
10	3.60	0.55	0.17	0.36	0.023					0.88	0.10	0.38	0.020	0.04	0.001	5%
11	3.70	0.58	0.16	0.37	0.029					0.88	0.10	0.42	0.026	0.04	0.001	7%
12	3.80	0.50	0.17	0.34	0.029					0.88	0.15	0.33	0.026	0.05	0.001	9%
13	4.00	0.51	0.17	0.34	0.025					0.88	0.20	0.34	0.022	0.07	0.001	10%
14	4.20	0.42	0.16	0.29	0.022					0.88	0.15	0.26	0.019	0.04	0.001	5%
15	4.30	0.36	0.16	0.26	0.017					0.88	0.15	0.20	0.015	0.03	0.000	3%
16	4.50	0.34	0.16	0.25	0.010					0.88	0.15	0.18	0.009	0.03	0.000	2%
17	4.60	0.34	0.16	0.25	0.006					0.88	0.25	0.18	0.005	0.05	0.000	2%
18	5.00	0.32	0.16	0.24	0.001					0.88	0.35	0.16	0.001	0.06	0.000	0%
19	5.30	0.30	0.17	0.24	0.003					0.88	0.30	0.13	0.003	0.04	0.000	1%
20	5.60	0.25	0.17	0.21	0.000					0.88	0.65	0.08	0.000	0.05	0.000	0%
LB	6.60	0.00	0.00		0.00				0.00	0.88	0.50	0.00	0.000	0.00	0.000	
Total Flow														0.014	100%	

Flow Measurement Details:

Metering Section Location (describe): -Adjacent to station

Meas. Start Time (MST):	14:35
Meas. End Time (MST):	15:00
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Overflow upstream of station
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -5C



Flow characteristics:

Total Flow:	0.014	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.93	(m ²)
Wetted Width:	4.80	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.02	(m/s)
Reynolds Number:	1.70E+03	
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	0.575	-
Water (°C):	0.5	-
Datalogger Clock:	15:07	-
Laptop Clock:	15:07	-
Battery:	12.6	13.0
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S11-7	1.348	243.448		242.100	242.100	3/4" Pipe 12m W of logger
S11-5			1.236	242.212	242.212	3/4" Pipe 7m W of logger
S11-6			0.867	242.581	242.579	3/4" Pipe 3m E of logger
Water Level:	Cut		3.688	239.760		Time WL Surveyed: 14:15
Temporary BM			3.627	239.821	0.000	
Turn						
Temporary BM	3.601	243.422		239.821		
Water Level:	Cut		3.665	239.757		Time WL Surveyed: 14:19
S11-6			0.843	242.579	242.579	3/4" Pipe 3m E of logger
S11-5			1.212	242.210	242.212	3/4" Pipe 7m W of logger
S11-7			1.325	242.097	242.100	3/4" Pipe 12m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	239.759	-
Closing Error:	0.003	-
WL Check:	0.003	-
Transducer Elevation	239.184	-

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

	GG, DW	Trip Date:	8-Dec-15
Data Entry Personnel:	GG	Date:	8-Dec-15
Data Check Personnel:	CJ	Date:	5-Jan-16
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge
UTM Location: 455748 E, 6344947 N

Site Visit Date: January 6, 2015
Site Visit Time (MST): 09:20



Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	4.50	0.00	0.00		0.000		0.000		0.000	0.88	0.60	0.00	0.000	0.00	0.000	
1	5.70	0.84	0.70	0.77	-0.001					0.88	1.15	0.14	-0.001	0.16	0.000	0%
2	6.80	1.10	0.65	0.88	0.059					0.88	0.95	0.45	0.052	0.43	0.022	1%
3	7.60	1.18	0.70	0.94	0.065					0.88	1.20	0.48	0.057	0.58	0.033	2%
4	9.20	1.20	0.65	0.93	0.098					0.88	1.40	0.55	0.086	0.77	0.066	4%
5	10.40	1.20	0.63	0.92	0.127					0.88	1.25	0.57	0.112	0.71	0.080	5%
6	11.70	1.20	0.62	0.91	0.141					0.88	1.20	0.58	0.124	0.70	0.086	6%
7	12.80	1.22	0.61	0.92	0.166					0.88	1.05	0.61	0.146	0.64	0.094	6%
8	13.80	1.19	0.64	0.92	0.175					0.88	1.10	0.55	0.154	0.61	0.093	6%
9	15.00	1.20	0.65	0.93	0.185					0.88	1.05	0.55	0.163	0.58	0.094	6%
10	15.90	1.20	0.65	0.93	0.175					0.88	0.98	0.55	0.154	0.54	0.083	6%
11	16.95	1.18	0.65	0.92	0.187					0.88	0.90	0.53	0.165	0.48	0.078	5%
12	17.70	1.19	0.67	0.93	0.197					0.88	0.82	0.52	0.173	0.43	0.074	5%
13	18.60	1.23	0.68	0.96	0.174					0.88	0.93	0.55	0.153	0.51	0.078	5%
14	19.55	1.28	0.70	0.99	0.158					0.88	0.82	0.58	0.139	0.48	0.067	4%
15	20.25	1.31	0.73	1.02	0.158					0.88	0.70	0.58	0.139	0.41	0.056	4%
16	20.95	1.41	0.75	1.08	0.147					0.88	0.80	0.66	0.129	0.53	0.068	5%
17	21.85	1.52	0.75			1.37	0.130	0.90	0.166	1.00	0.78	0.77	0.148	0.60	0.088	6%
18	22.50	1.55	0.75			1.39	0.115	0.91	0.135	1.00	0.75	0.80	0.125	0.60	0.075	5%
19	23.35	1.48	0.75	1.12	0.130					0.88	0.80	0.73	0.114	0.58	0.067	4%
20	24.10	1.40	0.76	1.08	0.123					0.88	0.77	0.64	0.108	0.50	0.054	4%
21	24.90	1.55	0.75			1.39	0.103	0.91	0.085	1.00	1.28	0.80	0.094	1.02	0.096	6%
22	26.65	1.50	0.77	1.14	0.053					0.88	1.50	0.73	0.047	1.10	0.051	3%
RB	27.90	0.00	0.00		0.00		0.00		0.00	0.88	0.63	0.00	0.000	0.00	0.000	
Total Flow														1.50	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of station

Meas. Start Time (MST):	10:27
Meas. End Time (MST):	12:05
Equipment:	ADV
Method:	Ice
River Condition:	Ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partly cloudy, -28C

Flow characteristics:

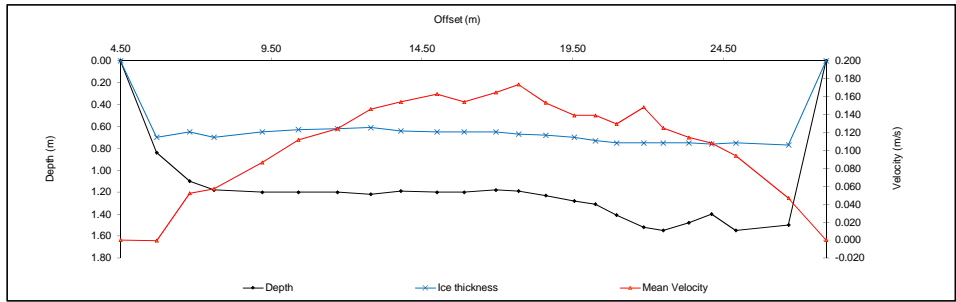
Total Flow:	1.50	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.92	(m ²)
Wetted Width:	23.40	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	0.12	(m/s)
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.897	-
Water (°C):	0.4	-
Datalogger Clock:	09:30	-
Laptop Clock:	09:29	-
Battery (Main):	11.8	12.7
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessiccant:	Good	-
Vent Tube Dessiccant:	Good	-
PTir (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-06	1.848	101.780		99.932	99.932	Bolt in old Logger Tree
S14A-05			1.155	100.625	100.654	Pipe 5m NE of Station
S14A-03			1.747	100.033	100.083	Pipe 3m SW of Station
S14A-04			1.400	100.380	100.407	Pipe 5m SE of Station
Water Level:	Cut		3.746	98.034		Time WL Surveyed: 9:54
Temporary BM			3.716	98.064	0.000	-
Turn						
Temporary BM	3.687	101.751		98.064		-
Water Level:	Cut		3.717	98.034		Time WL Surveyed: 10:02
S14A-04				100.407		Pipe 5m SE of Station
S14A-03			1.718	100.033	100.083	Pipe 3m SW of Station
S14A-05			1.126	100.625	100.654	Pipe 5m NE of Station
S14A-06			1.822	99.929	99.932	Bolt in old Logger Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.034	-
Closing Error:	0.003	-
WL Check:	0.000	-
Transducer Elevation	97.137	-

Field Personnel:

	GG MP	Trip Date:	6-Jan-15
Data Entry Personnel:	GG	Date:	6-Jan-15
Data Check Personnel:	MP	Date:	27-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge
UTM Location: 455748 E, 6344947 N

Site Visit Date: February 2, 2015
Site Visit Time (MST): 12:25

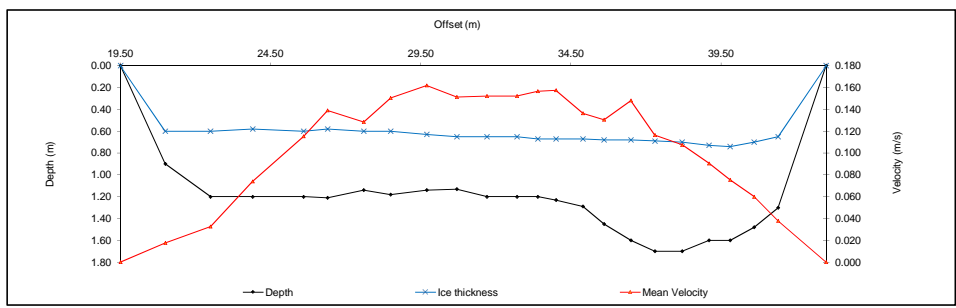


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	19.50	0.00	0.00		0.000				0.000	0.88	0.75	0.00	0.000	0.00	0.000	
1	21.00	0.90	0.60	0.75	0.020					0.88	1.50	0.30	0.018	0.45	0.008	1%
2	22.50	1.20	0.60	0.90	0.037					0.88	1.45	0.60	0.033	0.87	0.028	2%
3	23.90	1.20	0.58	0.89	0.084					0.88	1.55	0.62	0.074	0.96	0.071	5%
4	25.60	1.20	0.60	0.90	0.131					0.88	1.25	0.60	0.115	0.75	0.086	6%
5	26.40	1.21	0.58	0.90	0.158					0.88	1.00	0.63	0.139	0.63	0.088	6%
6	27.60	1.14	0.60	0.87	0.146					0.88	1.05	0.54	0.128	0.57	0.073	5%
7	28.50	1.18	0.60	0.89	0.171					0.88	1.05	0.58	0.150	0.61	0.092	6%
8	29.70	1.14	0.63	0.89	0.184					0.88	1.10	0.51	0.162	0.56	0.091	6%
9	30.70	1.13	0.65	0.89	0.172					0.88	1.00	0.48	0.151	0.48	0.073	5%
10	31.70	1.20	0.65	0.93	0.173					0.88	1.00	0.55	0.152	0.55	0.084	6%
11	32.70	1.20	0.65	0.93	0.173					0.88	0.85	0.55	0.152	0.47	0.071	5%
12	33.40	1.20	0.67	0.94	0.178					0.88	0.65	0.53	0.157	0.34	0.054	4%
13	34.00	1.23	0.67	0.95	0.179					0.88	0.75	0.56	0.158	0.42	0.066	4%
14	34.90	1.29	0.67	0.98	0.155					0.88	0.80	0.62	0.136	0.50	0.068	4%
15	35.60	1.45	0.68			1.30	0.109	0.83	0.152	1.00	0.80	0.77	0.131	0.62	0.080	5%
16	36.50	1.60	0.68			1.42	0.142	0.86	0.154	1.00	0.85	0.92	0.148	0.78	0.116	8%
17	37.30	1.70	0.69			1.50	0.081	0.89	0.152	1.00	0.85	1.01	0.117	0.86	0.100	7%
18	38.20	1.70	0.70			1.50	0.081	0.90	0.134	1.00	0.90	1.00	0.108	0.90	0.097	6%
19	39.10	1.60	0.73			1.43	0.073	0.90	0.108	1.00	0.80	0.87	0.091	0.70	0.063	4%
20	39.80	1.60	0.74			1.43	0.070	0.91	0.081	1.00	0.75	0.86	0.076	0.65	0.049	3%
21	40.60	1.48	0.70			1.32	0.067	0.86	0.053	1.00	0.80	0.78	0.060	0.62	0.037	2%
22	41.40	1.30	0.65	0.98	0.043					0.88	1.20	0.65	0.038	0.78	0.030	2%
RB	43.00	0.00	0.00		0.00				0.00	0.88	0.80	0.00	0.000	0.00	0.000	
Total Flow														1.52	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	13:03
Meas. End Time (MST):	13:52
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -22C



Flow characteristics:

Total Flow:	1.52	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	14.06	(m ²)
Wetted Width:	23.50	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.890	0.891
Water (°C):	0.3	0.3
Datalogger Clock:	12:31	13:57
Laptop Clock:	12:30	13:56
Battery (Main):	13.4	13.7
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-06	2.168	102.100		99.932	99.932	Bolt in old Logger Tree
S14A-04			1.724	100.376	100.407	Pipe 5m SE of Station
S14A-05			1.479	100.621	100.654	Pipe 5m NE of Station
S14A-03			2.063	100.037	100.083	Pipe 3m SW of Station
Water Level:	Cut		4.074	98.026	Time WL Surveyed: 12:50	
Temporary BM			4.055	98.045	0.000	
Turn						
Temporary BM	4.041	102.086		98.045		
Water Level:	Cut		4.062	98.024	Time WL Surveyed: 12:53	
S14A-03			2.048	100.038	100.083	Pipe 3m SW of Station
S14A-05			1.464	100.622	100.654	Pipe 5m NE of Station
S14A-04			1.709	100.377	100.407	Pipe 5m SE of Station
S14A-06			2.152	99.934	99.932	Bolt in old Logger Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	98.025	-
Closing Error:	-0.002	-
WL Check:	0.002	-
Transducer Elevation	97.135	-

Field Personnel:

	SM MP	Trip Date:	2-Feb-15
Data Entry Personnel:	SM	Date:	2-Feb-15
Data Check Personnel:	MP	Date:	27-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge
 UTM Location: 455748 E, 6344947 N

Site Visit Date: March 4, 2015
 Site Visit Time (MST): 11:00



Flow Measurement													Measured Data					Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)								
RB	23.00	0.00	0.00		0.000		0.000		0.000	0.88	0.50	0.00	0.000	0.00	0.000									
1	24.00	1.21	0.79	1.00	0.009					0.88	1.30	0.42	0.008	0.55	0.004	0%								
2	25.60	1.40	0.76	1.08	0.069					0.88	1.60	0.64	0.061	1.02	0.062	3%								
3	27.20	1.40	0.75	1.08	0.163					0.88	1.70	0.65	0.143	1.11	0.159	9%								
4	29.00	1.29	0.76	1.03	0.147					0.88	1.45	0.53	0.129	0.77	0.099	6%								
5	30.10	1.27	0.83	1.05	0.221					0.88	0.95	0.44	0.194	0.42	0.081	5%								
6	30.90	1.28	0.80	1.04	0.169					0.88	0.90	0.48	0.149	0.43	0.064	4%								
7	31.90	1.26	0.82	1.04	0.202					0.88	0.95	0.44	0.178	0.42	0.074	4%								
8	32.80	1.28	0.84	1.06	0.203					0.88	0.90	0.44	0.179	0.40	0.071	4%								
9	33.70	1.28	0.84	1.06	0.189					0.88	0.75	0.44	0.166	0.33	0.055	3%								
10	34.30	1.28	0.85	1.07	0.202					0.88	0.65	0.43	0.178	0.28	0.050	3%								
11	35.00	1.29	0.86	1.08	0.219					0.88	0.80	0.43	0.193	0.34	0.066	4%								
12	35.90	1.30	0.85	1.08	0.202					0.88	0.70	0.45	0.178	0.31	0.056	3%								
13	36.40	1.30	0.87	1.09	0.214					0.88	0.60	0.43	0.188	0.26	0.049	3%								
14	37.10	1.32	0.86	1.09	0.224					0.88	0.83	0.46	0.197	0.38	0.075	4%								
15	38.05	1.37	0.85	1.11	0.186					0.88	1.00	0.52	0.164	0.52	0.085	5%								
16	39.10	1.57	0.84	1.21	0.179					0.88	0.92	0.73	0.158	0.68	0.106	6%								
17	39.90	1.73	0.85			1.55	0.159	1.03	0.194	1.00	0.80	0.88	0.177	0.70	0.124	7%								
18	40.70	1.92	0.85			1.71	0.130	1.06	0.180	1.00	0.88	1.07	0.155	0.94	0.145	8%								
19	41.65	1.97	0.86			1.75	0.118	1.08	0.161	1.00	1.10	1.11	0.140	1.22	0.170	9%								
20	42.90	1.90	0.86			1.69	0.101	1.07	0.103	1.00	1.18	1.04	0.102	1.22	0.125	7%								
21	44.00	1.62	0.85			1.47	0.034	1.00	0.072	1.00	1.05	0.77	0.053	0.81	0.043	2%								
22	45.00	1.33	0.78	1.06	0.078					0.88	1.00	0.55	0.069	0.55	0.038	2%								
LB	46.00	0.00	0.00		0.00		0.00		0.00	0.88	0.50	0.00	0.000	0.00	0.000									
Total Flow														1.80	100%									

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of pressure transducer

Meas. Start Time (MST):	11:30
Meas. End Time (MST):	12:05
Equipment:	ADV
Method:	Ice
River Condition:	Overflow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -22C

Flow characteristics:

Total Flow:	1.80	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	13.65	(m ²)
Wetted Width:	23.00	(m)
Hydraulic Depth:	0.59	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.05	

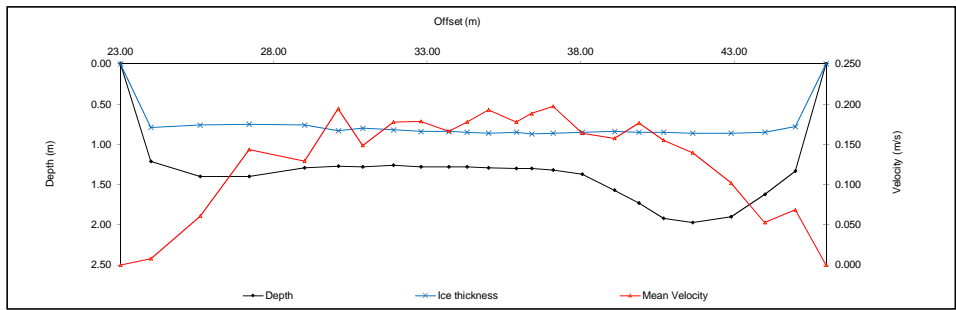
Logger Details:

	Before	After
Transducer Reading (m):	1.010	
Water (°C):	0.2	
Datalogger Clock:	11:09	
Laptop Clock:	11:08	
Battery (Main):	15.3	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

- Large amount of overflow on top of ice



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-06	2.025	101.957		99.932	99.932	Bolt in old Logger Tree
S14A-04			1.594	100.363	100.407	Pipe 5m SE of Station
S14A-03			1.921	100.036	100.083	Pipe 3m SW of Station
Water Level:	Cut		3.815	98.142	Time WL Surveyed: 12:15	
S14A-04			1.594	100.363	100.407	Pipe 5m SE of Station
Turn						
S14A-04	1.626	101.989		100.363	100.407	Pipe 5m SE of Station
Water Level:	Cut		3.848	98.141	Time WL Surveyed: 12:08	
S14A-03			1.953	100.036	100.083	Pipe 3m SW of Station
S14A-04			1.626	100.363	100.407	Pipe 5m SE of Station
S14A-06			2.055	99.934	99.932	Bolt in old Logger Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	98.142	-
Closing Error:	-0.002	-
WL Check:	0.001	-
Transducer Elevation	97.132	-

Field Personnel:

	TR, MP	Trip Date:	4-Mar-15
Data Entry Personnel:	TR	Date:	4-Mar-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge
 UTM Location: 455748 E, 6344947 N

Site Visit Date: April 23, 2015
 Site Visit Time (MST): 14:00



Flow Measurement Details:	
Metering Section Location (describe): 10m downstream of station	
Meas. Start Time (MST):	14:15
Meas. End Time (MST):	14:55
Equipment:	ADCP
Method:	Boat
River Condition:	Moderate flow, ice along left bank
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 13 C

Flow characteristics:	
Total Flow:	24.0 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	35.45 (m ²)
Wetted Width:	29.39 (m)
Hydraulic Depth:	1.21 (m)
Mean Velocity:	0.88 (m/s)
Froude Number:	0.20

Logger Details:		
	Before	After
Transducer Reading (m):	1.025	1.012
Water (°C):	2.5	2.8
Datalogger Clock:	13:34	15:07
Laptop Clock:	13:33	15:06
Battery (Main):	14.2	14.1
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTB (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	
-ADCP data entered in the office by GG	

ADCP Flow Measurement Summary:						
System Information:			System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	0.00	
Serial Number:	4712	Salinity (ppt):	-	RB:	27.70	
Firmware Version:	3.8	Magnetic Declination (°):	14.33			
Software Version:	3.8	Measured Temperature (°C):	-			
		ADCP Temperature (°C):	-			
Discharge Calculation Settings:			Measurement Results:			
Track Reference:	Bottom Track	Pass (#):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):
Depth Reference:	Vertical Beam	2	27.53	34.10	0.689	23.482
Coordinate System:	ENU	3	28.24	35.78	0.685	24.499
Left Method:	Sloped Bank	4	33.92	37.68	0.661	24.889
Right Method:	Sloped Bank	5	27.95	34.22	0.676	23.145
Top Fit Type:	Power Fit					
Bottom Fit Type:	Power Fit					
		Mean:	29.39	35.45	0.678	24.0
		SD:	2.57	1.45	0.011	0.714
		COV:	0.09	0.04	0.016	0.030

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-06	1.950	101.882		99.932	99.932	Bolt in old Logger Tree
S14A-05			1.286	100.616	100.654	Pipe 5m NE of Station
S14A-03			1.841	100.041	100.083	Pipe 3m SW of Station
Water Level:	Cut		3.609	98.273		Time WL Surveyed: 14:01
S14A-04			1.818	100.364	100.407	Pipe 5m SE of Station
Turn						
S14A-04	1.497	101.861		100.364	100.407	Pipe 5m SE of Station
Water Level:	Cut		3.587	98.274		Time WL Surveyed: 14:03
S14A-03			1.820	100.041	100.083	Pipe 3m SW of Station
S14A-05			1.245	100.616	100.654	Pipe 5m NE of Station
S14A-06			1.828	99.933	99.932	Bolt in old Logger Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S14A-04	1.497	101.861		100.364		
Water Level:	Cut		3.694	98.267		Time WL Surveyed: 15:02
Water Level:	Cut		3.578	98.268		Time WL Surveyed: 15:05
S14A-04	1.482	101.848		100.364		

WL Survey Summary		
	Before	After
Average WL:	98.274	98.268
Closing Error:	-0.001	-
WL Check:	0.001	-0.001
Transducer Elevation	97.249	97.256

Field Personnel:			
Data Entry Personnel:	SM, GG	Trip Date:	23-Apr-15
Data Check Personnel:	SM	Date:	23-Apr-15
Entered Digitally in the Field:	GG	Date:	18-May-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge
 UTM Location: 455748 E, 6344947 N

Site Visit Date: May 13, 2015
 Site Visit Time (MST): 14:40



Flow Measurement Details:	
Metering Section Location (describe): 25m downstream of bridge	
Meas. Start Time (MST):	15:40
Meas. End Time (MST):	16:00
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20C

Flow characteristics:	
Total Flow:	14.6 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	22.07 (m ²)
Wetted Width:	32.66 (m)
Hydraulic Depth:	0.68 (m)
Mean Velocity:	0.66 (m/s)
Froude Number:	0.26

Logger Details:		
	Before	After
Transducer Reading (m):	0.961	0.860
Water (°C):	11.3	11.5
Datalogger Clock:	14:44	16:13
Laptop Clock:	14:42	16:12
Battery (Main):	13.9	13.7
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTB (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:						
System Information:			System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	66.20	
Serial Number:	4712	Salinity (ppt):	-	RB:	34.00	
Firmware Version:	3.8	Magnetic Declination (°):	14.3			
Software Version:	3.7	Measured Temperature (°C):	-			
		ADCP Temperature (°C):	16.9			
Discharge Calculation Settings:			Measurement Results:			
Track Reference:	Bottom Track	Pass (#):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):
Depth Reference:	Vertical Beam	1	33.23	22.42	0.664	14.875
Coordinate System:	ENU	2	32.75	21.63	0.661	14.724
Left Method:	Sloped Bank	3	32.17	21.83	0.672	14.666
Right Method:	Sloped Bank	4	32.49	22.41	0.633	14.192
Top Fit Type:	Power Fit					
Bottom Fit Type:	Power Fit					
		Mean:	32.66	22.07	0.663	14.6
		SD:	0.39	0.35	0.016	0.255
		COV:	0.01	0.02	0.027	0.017

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-06	1.790	101.722		99.932	99.932	Bolt in old Logger Tree
S14A-04			1.339	100.383	100.407	Pipe 5m SE of Station
S14A-03			1.667	100.055	100.083	Pipe 3m SW of Station
Water Level:	Cut		3.602	98.120		Time WL Surveyed: 14:56
S14A-04			1.339	100.383	100.407	Pipe 5m SE of Station
Turn						
S14A-04	1.303	101.686		100.383	100.407	Pipe 5m SE of Station
Water Level:	Cut		3.563	98.123		Time WL Surveyed: 14:49
S14A-03			1.630	100.056	100.083	Pipe 3m SW of Station
S14A-04			1.303	100.383	100.407	Pipe 5m SE of Station
S14A-06			1.754	99.932	99.932	Bolt in old Logger Tree
Secondary Water Level Survey (pick any 5m e.g. closest to water's edge)						
S14A-04	1.303	101.686		100.383		
Water Level:	Cut		3.564	98.122		Time WL Surveyed: 16:08
Water Level:	Cut		3.541	98.121		Time WL Surveyed: 16:10
S14A-04	1.279	101.662		100.383		

WL Survey Summary		Before	After
Average WL:		98.122	98.122
Closing Error:		0.000	-
WL Check:		0.003	0.001
Transducer Elevation		97.261	97.262

Field Personnel:		TR, MK	Trip Date:	13-May-15
Data Entry Personnel:		TR	Date:	13-May-15
Data Check Personnel:		DW	Date:	1-Sep-15
Entered Digitally in the Field:		Yes		

Hydrometric Measurement / Site Visit Record

Site: S14A - Ellis River at the CNRL Bridge
 UTM Location: 455748 E, 6344947 N

Site Visit Date: June 12, 2015
 Site Visit Time (MST): 15:15



Flow Measurement Details:	
Metering Section Location (describe): 3m downstream of pressure transducer	
Meas. Start Time (MST):	15:40
Meas. End Time (MST):	16:00
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 20C

Flow Characteristics:	
Total Flow:	4.84 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	25.42 (m ²)
Wetted Width:	23.05 (m)
Hydraulic Depth:	1.10 (m)
Mean Velocity:	0.19 (m/s)
Reynolds Number:	2.91E+05
Froude Number:	0.06

Logger Details:		
	Before	After
Transducer Reading (m):	0.623	0.622
Water (°C):	16.6	16.8
Datalogger Clock:	15:17	16:10
Laptop Clock:	15:16	16:09
Battery (Minn):	13.8	13.8
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Mini Tube Dessiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	2.10	
Serial Number:	9712	Bainy (ppt):	-	-	RB:	27.30	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes		
Software Version:	3.7	Measured Temperature (°C):	-	-	System Test Passed: Yes		
		ADCP Temperature (°C):	-	23.0			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom Track	1	0.00	23.40	25.43	0.19	4.82	-0.42%
Depth Reference: Vertical Beam	2	0.00	18.87	25.12	0.21	4.86	0.40%
Coordinate System: FWD	3	0.00	24.09	25.16	0.195	4.899	1.19%
Left Method: Sloped Bank	4	0.00	25.33	25.98	0.184	4.784	-1.17%
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
	Mean:	23.05	25.42	0.195	4.84		
	SD:	2.51	0.34	0.010	0.043		
	COV:	0.11	0.01	0.049	0.009		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-04	1.537	101.944		100.407	100.407	Pipe 5m SE of Station
S14A-03			1.860	100.084	100.083	Pipe 3m SW of Station
S14A-06			2.008	99.936	99.932	Bolt in old Logger Tree
Turn						
Water Level:	Cut		4.000	97.914	Time WL Surveyed: 16:20	
S14A-04			1.537	100.407	100.407	Pipe 5m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S14A-04	1.500	101.906		100.406		
Water Level:	Cut		3.994	97.912	Time WL Surveyed: 16:05	
Water Level:	Cut		3.957	97.915	Time WL Surveyed: 16:06	
S14A-04	1.466	101.872		100.406		

WL Survey Summary			Level Survey Equipment:	
Average WL:	Before	After	Level #:	Level#4
Closing Error:	0.000	-	Make & Model:	Nikon AC-2S
WL Check:	0.001	-0.003	Serial #:	668785
Transducer Elevation:	97.292	97.292		

Field Personnel:			
Data Entry Personnel:	TR	Trip Date:	12-Jun-15
Data Check Personnel:	DW	Date:	12-Jun-15
Entered Digitally in the Field:	Yes	Date:	1-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S14A - Ellis River at the CNRL Bridge
 UTM Location: 455748 E, 6344947 N

Site Visit Date: August 10, 2015
 Site Visit Time (MST): 16:25



Flow Measurement Details:	
Metering Section Location (describe): 12m upstream of pressure transducer	
Meas. Start Time (MST):	17:15
Meas. End Time (MST):	17:30
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partly cloudy, calm, 25C

Flow characteristics:	
Total Flow:	2.23 (m ³ /s)
Perceived Measurement Quality:	Good
Cross Section Area:	26.85 (m ²)
Wetted Width:	26.85 (m)
Hydraulic Depth:	1.00 (m)
Mean Velocity:	0.08 (m/s)
Reynolds Number:	9.21E+04
Froude Number:	0.63

Logger Details:	
Transducer Reading (m):	0.329 0.776
Water (°C):	24.1 25.0
Datalogger Clock:	16:32 17:55
Laptop Clock:	16:31 17:54
Battery (Minn):	13.3 13.0
Battery:	Good
Battery Serial #:	-
Enclosure Degrassant:	Replaced
Mini Tube Degrassant:	Good
PT# (if replaced):	282388 287962
Logger# (if replaced):	16569 -

Datalogger / Station Notes:	

General Notes:	
- 2-3m of weeds along both banks.	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	3.40	
Serial Number:	4712	Safety (gpd):	-	-	RB:	30.00	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes		
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes		
		ADCP Temperature (°C):	-	26.5			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom Track	1	0.00	26.87	0.121	2.258	1.09%	73.5
Depth Reference: Vertical Beam	2	0.00	26.73	0.123	2.205	-1.29%	73.7
Coordinate System: ENL	3	0.00	27.03	0.127	2.323	4.00%	72.9
Left Method: Sloped Bank	4	0.00	26.76	0.119	2.149	-3.79%	74.1
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
	Mean:	26.85	26.85	0.123	2.23		
	SD:	0.12	0.12	0.003	0.064		
	COV:	0.00	0.00	0.024	0.029		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-04	1.324	101.731		100.407	100.407	Pipe 5m SE of Station
S14A-06			1.799	99.932	99.932	Bolt in old Logger Tree
S14A-03			1.648	100.083	100.083	Pipe 3m SW of Station
Water Level:	Cut	0.360	4.272	97.819	Time WL Surveyed:	16:59
S14A-04			1.324	100.407	100.407	Pipe 5m SE of Station
Turn						
S14A-04	1.290	101.697		100.407	100.407	Pipe 5m SE of Station
Water Level:	Cut	0.360	4.238	97.819	Time WL Surveyed:	17:00
S14A-03			1.615	100.082	100.083	Pipe 3m SW of Station
S14A-06			1.765	99.932	99.932	Bolt in old Logger Tree
S14A-04			1.290	100.407	100.407	Pipe 5m SE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S14A-04	1.289	101.696		100.407		
Water Level:	Cut	0.339	4.217	97.818	Time WL Surveyed:	17:51
Water Level:	Cut	0.339	4.179	97.816	Time WL Surveyed:	17:52
S14A-04	1.249	101.656		100.407		

WL Survey Summary		Level Survey Equipment:	
Average WL:	Before 97.819 After 97.817	Level #:	Level#2
Closing Error:	0.000	Make & Model:	Nikon AC-2S
WL Check:	0.000 0.002	Serial #:	668659
Transducer Elevation	97.290 97.039		

Field Personnel:			
	TR, JC	Trip Date:	16-Aug-15
Data Entry Personnel:	TR	Date:	16-Aug-15
Data Check Personnel:	DW	Date:	1-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge
 UTM Location: 455748 E, 6344947 N

Site Visit Date: September 17, 2015
 Site Visit Time (MST): 14:35



Flow Measurement Details:	
Metering Section Location (describe): 10m downstream of station	
Meas. Start Time (MST):	15:20
Meas. End Time (MST):	15:44
Equipment:	ADCP#1
Method:	Temporary Cableway
River Condition:	Low flow, clear
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (use reverse):	Good
Weather:	Clear, calm, 15C

Flow characteristics:	
Total Flow:	2.88 (m ³ /s)
Perceived Measurement Quality:	Good
Cross Section Area:	15.70 (m ²)
Wetted Width:	25.55 (m)
Hydraulic Depth:	0.61 (m)
Mean Velocity:	0.18 (m/s)
Froude Number:	0.07

Logger Details:		
	Before	After
Transducer Reading (m):	0.086	0.537
Water (°C):	11.9	11.8
Datalogger Clock:	14:17	16:05
Laptop Clock:	14:15	16:03
Battery (Main):	14.1	13.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Good
Vent Tube Desiccant:	-	Good
PTF (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:
 - Moved transducer to deeper water
 - Data sonde was not exchanged during this visit
 sonde batt: 6.42
 exo water temp: 10.53
 Sp. Cond: 240
 Turbidity: 2.1
 pH: 8.36
 DO: 12.02
 DO Sat: 107

General Notes:
 - BM4 and BM5 have been hit by a vehicle, both are damaged; BM5 may still be usable with new elevation, BM4 is unusable. See photos.

ADCP Flow Measurement Summary:																	
System Information:				System Setup:		Bank Offsets:											
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	3.50												
Serial Number:	4712	Salinity (ppt):	-	RB:	30.00												
Firmware Version:	3.8	Magnetic Declination (°):	14.3														
Software Version:	3.8	Measured Temperature (°C):	-														
		ADCP Temperature (°C):	26.5														
Discharge Calculation Settings:				Measurement Results:													
Track Reference:	Bottom Track	Pass (ft):	1	Screening Distance (m):	0.00	Width (m):	25.12	Area (m ²):	14.70	Mean Pass Velocity (m/s):	0.184	Discharge (m ³ /s):	2.882	Discharge Difference From Mean:	-1.02%	Percent of Pass Measured (%):	73.1
Depth Reference:	Vertical Beam		3		0.00		25.70		16.26		0.181		2.946		2.24%	72.5	
Coordinate System:	ENU		5		0.00		25.84		16.13		0.176		2.846		-1.23%	72.4	
Left Method:	Sloped Bank																
River Method:	Sloped Bank																
Top Fit Type:	Power Fit																
Bottom Fit Type:	Power Fit																
		Mean:	25.55	15.70		0.184		2.88									
		SD:	0.31	0.71		0.008		0.046									
		COV:	0.01	0.05		0.041		0.016									

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-03	1.695	101.778		100.083	100.083	Pipe 3m SW of Station
S14A-06			1.844	99.934	99.932	Bolt in old Logger Tree
S14A-05			1.092	100.686	100.686	Pipe 5m NE of Station
Water Level:	Cut		3.959	97.819		Time WL Surveyed: 14:42
			3.733	98.045		
Turn						
Water Level:	3.717	101.762		98.045		
	Cut		3.942	97.820		Time WL Surveyed: 14:46
S14A-05			1.077	100.685	100.686	Pipe 5m NE of Station
S14A-06			1.828	99.934	99.932	Bolt in old Logger Tree
S14A-03			1.678	100.084	100.083	Pipe 3m SW of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S14A-06	1.828	101.762		99.934		
Water Level:	Cut		3.941	97.821		Time WL Surveyed: 15:59
Water Level:	Cut		3.924	97.823		Time WL Surveyed: 16:01
S14A-06	1.813	101.747		99.934		

WL Survey Summary	Before	After
Average WL:	97.820	97.822
Closing Error:	-0.001	-
WL Check:	0.001	-0.002
Transducer Elevation	97.734	97.285

Field Personnel:	SM, CJ	Trip Date:	17-Sep-15
Data Entry Personnel:	SM	Date:	17-Sep-15
Data Check Personnel:	DW	Date:	28-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S14A - Elys River at the CNRL Bridge
 UTM Location: 455748 E, 6344947 N

Site Visit Date: October 15, 2015
 Site Visit Time (MST): 13:37



Flow Measurement Details:	
Metering Section Location (describe): Across from station	
Meas. Start Time (MST):	14:05
Meas. End Time (MST):	14:30
Equipment:	ADCP#1
Method:	Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Errors (see reverse):	Excellent
Weather:	Partly cloudy, calm, 9C.

Flow characteristics:	
Total Flow	1.99 (m³/s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	20.81 (m²)
Wetted Width:	26.87 (m)
Hydraulic Depth:	0.77 (m)
Mean Velocity:	0.10 (m/s)
Reynolds Number:	4.81 E+04
Roude Number:	0.03

Logger Details:	
Transducer Reading (m):	Before: 0.527 After: 0.826
PT Water (°C):	4.8 5.0
Datalogger Clock:	13:43 14:54
Laptop Clock:	13:41 14:53
Station Battery Voltage:	14.3 13.2
Station Battery:	Good
Station Battery Serial #:	-
Enclosure Desiccant:	Replaced
Vent Tube Desiccant:	Good
PT# (if replaced):	-
Logger# (if replaced):	-

Sonde Details:	
Sonde Water (°C):	5 5
Specific Conductance (µS):	243 241
pH:	8 8
Turbidity (FNU):	3 4
Dissolved Oxygen Conc. (mg/L):	13 13
Dissolved Oxygen Sat. (%):	103 104
Sonde Battery Voltage:	6.4 6.4
Sonde # (if replaced):	-

Datalogger, Sonde and Station Notes:
 -Sonde and pressure transducer are 2m from shore, they may have been moved since last deployment.
 -Sonde and transducer repositioned between surveys.

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sosiek BSA#0	Transducer Depth (m):	0.05	LB:	4.10		
Serial Number:	4712	Salinity (ppt):	0.0	RB:	29.10		
Firmware Version:	3.8	Magnetic Declination (°):	14.3				
Software Version:	3.8	Measured Temperature (°C):	-				
		ADCP Temperature (°C):	-				
Discharge Calculation Settings:				Measurement Results:			
Track Reference:	Bottom Track	Pass (#):	1	Screening Distance (m):	27.96	Discharge (m³/s):	1.987
Depth Reference:	Vertical Beam	Width (m):	27.24	Area (m²):	20.26	Discharge Difference From Mean:	-1.61%
Coordinate System:	ENU	Mean Pass Velocity (m/s):	0.097	Discharge (m³/s):	2.032	Percent of Pass Measured (%):	79.8
Left Method:	Sloped Bank	Discharge (m³/s):	2.012	Discharge (m³/s):	1.967	Percent of Pass Measured (%):	80.7
Right Method:	Sloped Bank	Discharge (m³/s):	2.012	Discharge (m³/s):	0.991	Percent of Pass Measured (%):	79.8
Top FI Type:	Power FS						
Bottom FI Type:	Power FS						
		Mean:	26.87	20.81	0.096	1.99	
		SD:	0.78	0.73	0.003	0.030	
		COV:	0.03	0.04	0.034	0.015	

Level Survey:						
Station	BS + (m)	RI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-03	1.597	101.680		100.083	100.083	Pipe 3m SW of Station
S14A-06			1.740	99.934	99.932	Bolt in old Logger Tree
S14A-05			1.013	100.667	100.686	Pipe 5m NE of Station
Turn						
Water Level:	Cut		3.869	97.811	100.686	Time WL Surveyed: 13:54
S14A-05			1.013	100.667	100.686	Pipe 5m NE of Station
Water Level:	Cut		3.843	97.813	100.686	Time WL Surveyed: 13:55
S14A-05			0.989	100.667	100.686	Pipe 5m NE of Station
S14A-06			1.720	99.936	99.932	Bolt in old Logger Tree
S14A-03			1.571	100.085	100.083	Pipe 3m SW of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut		3.869	97.808	100.085	Time WL Surveyed: 14:47
Water Level:	Cut		3.826	97.806	100.085	Time WL Surveyed: 14:48
S14A-03	1.547	101.632		100.085		

WL Survey Summary	
Average WL:	Before: 97.812 After: 97.807
Closing Error:	-0.002
WL Check:	0.002
Transducer Elevation:	97.285 98.981

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	IN/A
Serial #:	IN/A

General Notes:
 -BM 4 is bent, driven over.
 -Surveyed bridge bolt. Setup 1- BM7 (bridge bolt): 0.427m
 BM5: 7.214m
 Setup 2- BM7: 0.377m
 BM5: 7.166m error: 0.002m

Field Personnel:		
Data Entry Personnel:	GG TR	Trip Date: 15-Oct-15
Data Check Personnel:	GG	Date: 15-Oct-15
Entered Digitally in the Field:	GG	Date: 27-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge
 UTM Location: 455748 E, 6344947 N

Site Visit Date:
 Site Visit Time (MST):

December 9, 2015
 12:10

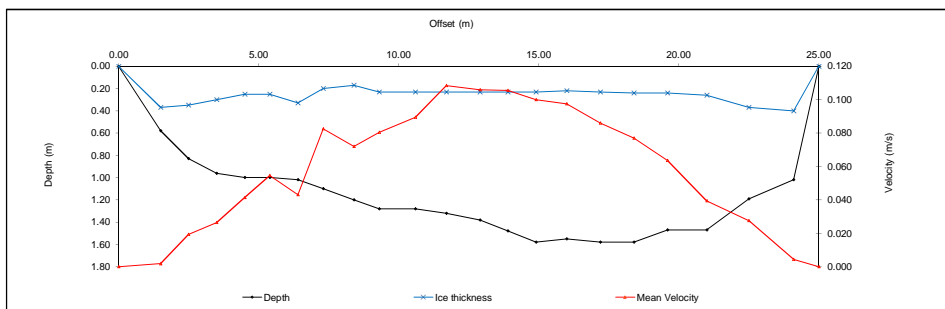


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
1	1.50	0.58	0.37	0.48	0.002				0.000	0.88	0.75	0.00	0.000	0.00	0.000	0%
2	2.50	0.83	0.35	0.59	0.022				0.000	0.88	1.25	0.21	0.002	0.26	0.000	0%
3	3.50	0.96	0.30	0.63	0.030				0.000	0.88	1.00	0.48	0.019	0.48	0.009	1%
4	4.50	1.00	0.25	0.63	0.047				0.000	0.88	0.95	0.75	0.041	0.71	0.029	2%
5	5.40	1.00	0.25	0.63	0.062				0.000	0.88	0.95	0.75	0.055	0.71	0.039	2%
6	6.40	1.02	0.33	0.68	0.049				0.000	0.88	0.95	0.69	0.043	0.66	0.028	2%
7	7.30	1.10	0.20			0.92	0.073	0.38	0.092	1.00	1.00	0.90	0.083	0.90	0.074	5%
8	8.40	1.20	0.17			0.99	0.061	0.38	0.083	1.00	1.00	1.03	0.072	1.03	0.074	5%
9	9.30	1.28	0.23			1.07	0.071	0.44	0.090	1.00	1.10	1.05	0.081	1.16	0.093	6%
10	10.60	1.28	0.23			1.07	0.091	0.44	0.088	1.00	1.20	1.05	0.090	1.26	0.113	7%
11	11.70	1.32	0.23			1.10	0.119	0.45	0.098	1.00	1.15	1.09	0.109	1.25	0.136	8%
12	12.90	1.38	0.23			1.15	0.091	0.46	0.121	1.00	1.10	1.15	0.106	1.27	0.134	8%
13	13.90	1.48	0.23			1.23	0.099	0.48	0.112	1.00	1.00	1.25	0.106	1.25	0.132	8%
14	14.90	1.58	0.23			1.31	0.084	0.50	0.116	1.00	1.05	1.35	0.100	1.42	0.142	9%
15	16.00	1.55	0.22			1.28	0.083	0.49	0.112	1.00	1.15	1.33	0.098	1.53	0.149	9%
16	17.20	1.58	0.23			1.31	0.071	0.50	0.101	1.00	1.20	1.35	0.086	1.62	0.139	8%
17	18.40	1.58	0.24			1.31	0.067	0.51	0.087	1.00	1.20	1.34	0.077	1.61	0.124	8%
18	19.60	1.47	0.24			1.22	0.065	0.49	0.062	1.00	1.30	1.23	0.064	1.60	0.102	6%
19	21.00	1.47	0.26			1.23	0.038	0.50	0.041	1.00	1.45	1.21	0.040	1.75	0.069	4%
20	22.50	1.19	0.37			1.03	0.028	0.53	0.027	0.88	1.25	0.62	0.004	0.78	0.003	0%
21	24.10	1.02	0.40	0.71	0.005					0.88	1.25	0.62	0.004	0.78	0.003	0%
	25.00	0.00	0.00		0.00				0.00	0.88	0.45	0.00	0.000	0.00	0.000	0%
Total Flow														1.64	100%	

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	12:25
Meas. End Time (MST):	13:08
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3396
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light Snow, -5C



Flow characteristics:

Total Flow:	1.640	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	23.17	(m ²)
Wetted Width:	25.00	(m)
Hydraulic Depth:	0.93	(m)
Mean Velocity:	0.07	(m/s)
Reynolds Number:	-	
Froude Number:	0.62	

Logger Details:

	Before	After
Transducer Reading (m):	0.961	0.963
PT Water (°C):	0.2	
Datalogger Clock:	12:15	
Laptop Clock:	12:13	
Station Battery Voltage:	11.5	12.8
Station Battery:	Replaced	
Station Battery Serial #:		
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):		
Logger# (if replaced):		

Sonde Details:

	Before	After
Sonde Water (°C):		
Specific Conductance (µS):		
pH:		
Turbidity (FNU):		
Dissolved Oxygen Conc. (mg/L):		
Dissolved Oxygen Sat. (%):		
Sonde Battery Voltage:		
Sonde # (if replaced):		

Sonde Visit Details:

Visit Type:

Deployed Sonde Downloaded:

Downloaded File Name:

WQ Samples Taken:

Photos Taken:

US, DS, CS:

Sonde Housing (In Situ):

Sonde Probes (Before Cleaning):

Datalogger:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S14A-06	1.734	101.666		99.932	99.932	Bolt in old Logger Tree
S14A-05			1.002	100.664	100.686	Pipe 5m NE of Station
S14A-03			1.585	100.081	100.083	Pipe 3m SW of Station
Water Level:	Cut		3.722	97.944	Time WL Surveyed:	12:17
Turn			3.707	97.959		
Water Level:	3.691	101.650		97.959	Time WL Surveyed:	12:20
Water Level:	Cut		3.702	97.948	Time WL Surveyed:	#N/A
S14A-03			1.572	100.078	100.083	Pipe 3m SW of Sta #N/A
S14A-05			0.989	100.661	100.686	Pipe 5m NE of Sta
S14A-06			1.720	99.930	99.932	Bolt in old Logger #N/A

Secondary Water Level Survey (pick any BM e.g. closest to water's edge)

Water Level:	Cut	Time WL Surveyed:	
Water Level:	Cut	Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	97.946	-
Closing Error:	0.002	-
WL Check:	0.004	-
Transducer Elevation	96.985	-

General Notes:

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

DW, GG	Trip Date:	9-Dec-15
DW, GG	Date:	9-Dec-15
SG	Date:	23-Dec-15
Entered Digitally in the Field:	Yes	

Datalogger, Sonde and Station Notes:

Replaced solar controller and added second batt

Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth
 UTM Location: 458395 E, 6353391 N

Site Visit Date: April 27, 2015
 Site Visit Time (MST): 11:41

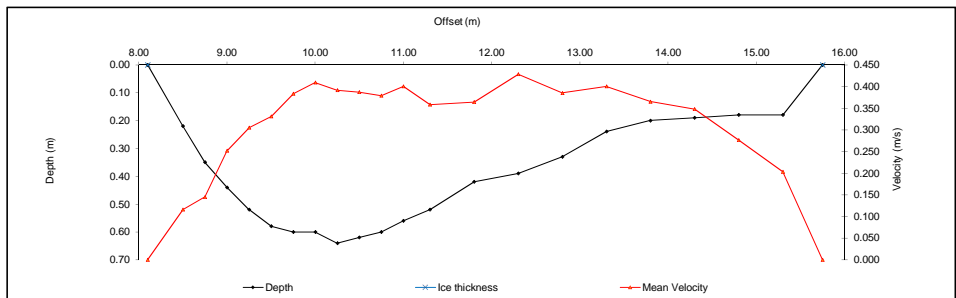


Flow Measurement													Measured Data				Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)						
RB	15.75	0.00	0.00		0.000		0.000		0.000	1.00	0.23	0.00	0.000	0.00	0.000							
1	15.30	0.18		0.11	0.203					1.00	0.48	0.18	0.203	0.09	0.017	2%						
2	14.80	0.18		0.11	0.276					1.00	0.50	0.18	0.276	0.09	0.025	3%						
3	14.30	0.19		0.11	0.348					1.00	0.50	0.19	0.348	0.10	0.033	3%						
4	13.80	0.20		0.12	0.365					1.00	0.50	0.20	0.365	0.10	0.037	4%						
5	13.30	0.24		0.14	0.400					1.00	0.50	0.24	0.400	0.12	0.048	5%						
6	12.80	0.33		0.20	0.385					1.00	0.50	0.33	0.385	0.17	0.064	7%						
7	12.30	0.39		0.23	0.428					1.00	0.50	0.39	0.428	0.20	0.083	9%						
8	11.80	0.42		0.25	0.364					1.00	0.50	0.42	0.364	0.21	0.076	8%						
9	11.30	0.52		0.31	0.358					1.00	0.40	0.52	0.358	0.21	0.074	8%						
10	11.00	0.56		0.34	0.400					1.00	0.28	0.56	0.400	0.15	0.062	6%						
11	10.75	0.60		0.36	0.379					1.00	0.25	0.60	0.379	0.15	0.057	6%						
12	10.50	0.62		0.37	0.387					1.00	0.25	0.62	0.387	0.16	0.060	6%						
13	10.25	0.64		0.38	0.391					1.00	0.25	0.64	0.391	0.16	0.063	7%						
14	10.00	0.60		0.36	0.409					1.00	0.25	0.60	0.409	0.15	0.061	6%						
15	9.75	0.60		0.36	0.383					1.00	0.25	0.60	0.383	0.15	0.057	6%						
16	9.50	0.58		0.35	0.331					1.00	0.25	0.58	0.331	0.15	0.048	5%						
17	9.25	0.52		0.31	0.305					1.00	0.25	0.52	0.305	0.13	0.040	4%						
18	9.00	0.44		0.26	0.252					1.00	0.25	0.44	0.252	0.11	0.028	3%						
19	8.75	0.35		0.21	0.145					1.00	0.25	0.35	0.145	0.09	0.013	1%						
20	8.50	0.22		0.13	0.116					1.00	0.32	0.22	0.116	0.07	0.008	1%						
LB	8.10	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000							
Total Flow														0.954	100%							

Flow Measurement Details:

Metering Section Location (describe): At station

Meas. Start Time (MST):	11:41
Meas. End Time (MST):	11:58
Equipment:	ADV
Method:	Wading
River Condition:	Medium flow, no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze



Flow characteristics:

Total Flow:	0.954	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.73	(m ²)
Wetted Width:	7.65	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.35	(m/s)
Froude Number:	0.19	

Logger Details:

	Before	After
Transducer Reading (m):	1.307	0.774
Water (°C):	2.5	6.2
Datalogger Clock:	10:48	12:08
Laptop Clock:	10:47	12:07
Battery (Main):	14.2	14.2
Battery:	Good	
Battery Serial #:	1302001	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	284722
Logger# (if replaced):	17936	17936

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S15A-03	0.905	100.905		100.000	100.000	3/4" Pipe 3m S of Station
S15A-04			1.087	99.818	99.815	3/4" Pipe 2m E of Station
S15A-05			0.972	99.933	99.929	3/4" Pipe 3m NE of Station
Water Level:						
	Cut		4.100	96.805		Time WL Surveyed: 11:33
S15A-05			0.972	99.933	99.929	3/4" Pipe 3m NE of Station
Turn						
S15A-05	0.953	100.886		99.933	99.929	3/4" Pipe 3m NE of Station
Water Level:						
	Cut		4.083	96.803		Time WL Surveyed: 11:35
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S15A-05	0.953	100.886		99.933		
Water Level:						
	Cut		4.083	96.803		Time WL Surveyed: 12:02
Water Level:						
	Cut		4.067	96.801		Time WL Surveyed: 12:03
S15A-05	0.935	100.868		99.933		

WL Survey Summary

	Before	After
Average WL:	96.804	96.802
Closing Error:	0.000	-
WL Check:	0.002	0.002
Transducer Elevation	95.497	96.028

Field Personnel:

	SM TR	Trip Date:	27-Apr-15
Data Entry Personnel:	SM	Date:	27-Apr-15
Data Check Personnel:	DW	Date:	22-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth
 UTM Location: 458395 E, 6353391 N

Site Visit Date: June 11, 2015
 Site Visit Time (MST): 14:54

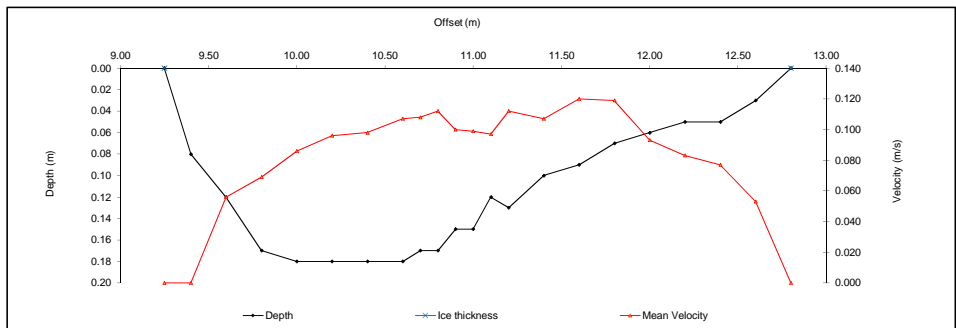


Flow Measurement																
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	12.80	0.00	0.00	0.02	0.053	0.00	0.000	0.00	0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	12.60	0.03		0.02	0.053					1.00	0.20	0.03	0.053	0.01	0.000	1%
2	12.40	0.05		0.03	0.077					1.00	0.20	0.05	0.077	0.01	0.001	2%
3	12.20	0.05		0.03	0.083					1.00	0.20	0.05	0.083	0.01	0.001	2%
4	12.00	0.06		0.04	0.093					1.00	0.20	0.06	0.093	0.01	0.001	3%
5	11.80	0.07		0.04	0.119					1.00	0.20	0.07	0.119	0.01	0.002	5%
6	11.60	0.09		0.05	0.120					1.00	0.20	0.09	0.120	0.02	0.002	6%
7	11.40	0.10		0.06	0.107					1.00	0.20	0.10	0.107	0.02	0.002	6%
8	11.20	0.13		0.08	0.112					1.00	0.15	0.13	0.112	0.02	0.002	6%
9	11.10	0.12		0.07	0.097					1.00	0.10	0.12	0.097	0.01	0.001	3%
10	11.00	0.15		0.09	0.099					1.00	0.10	0.15	0.099	0.02	0.001	4%
11	10.90	0.15		0.09	0.100					1.00	0.10	0.15	0.100	0.01	0.001	4%
12	10.80	0.17		0.10	0.112					1.00	0.10	0.17	0.112	0.02	0.002	5%
13	10.70	0.17		0.10	0.108					1.00	0.10	0.17	0.108	0.02	0.002	5%
14	10.60	0.18		0.11	0.107					1.00	0.15	0.18	0.107	0.03	0.003	8%
15	10.40	0.18		0.11	0.098					1.00	0.20	0.18	0.098	0.04	0.004	10%
16	10.20	0.18		0.11	0.096					1.00	0.20	0.18	0.096	0.04	0.003	10%
17	10.00	0.18		0.11	0.086					1.00	0.20	0.18	0.086	0.04	0.003	9%
18	9.80	0.17		0.10	0.069					1.00	0.20	0.17	0.069	0.03	0.002	7%
19	9.60	0.12		0.07	0.056					1.00	0.20	0.12	0.056	0.02	0.001	4%
20	9.40	0.08		0.05	0.000					1.00	0.18	0.08	0.000	0.01	0.000	0%
LB	9.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.08	0.00	0.000	0.00	0.000	
Total Flow														0.036	100%	

Flow Measurement Details:

Metering Section Location (describe):
 -2m downstream of pressure transducer

Meas. Start Time (MST):	15:05
Meas. End Time (MST):	15:26
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Very low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 20C



Flow characteristics:

Total Flow:	0.036	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.39	(m ²)
Wetted Width:	3.55	(m)
Hydraulic Depth:	0.11	(m)
Mean Velocity:	0.09	(m/s)
Reynolds Number:	8.69E+03	
Froude Number:	0.09	

Logger Details:

	Before	After
Transducer Reading (m):	0.349	0.349
Water (°C):	14.7	14.9
Datalogger Clock:	14:57	15:34
Laptop Clock:	14:55	15:32
Battery:	14.0	
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S15A-05	0.956	100.885		99.929	99.929	3/4" Pipe 3m NE of Station
S15A-04			1.073	99.812	99.815	3/4" Pipe 2m E of Station
S15A-03			0.888	99.997	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut		4.504	96.381		Time WL Surveyed: 14:58
S15A-03			0.888	99.997	100.000	3/4" Pipe 3m S of Station
Turn						
S15A-03	0.867	100.864		99.997	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut		4.483	96.381		Time WL Surveyed: 15:00
S15A-03			0.867	99.997	100.000	3/4" Pipe 3m S of Station
S15A-04			1.052	99.812	99.815	3/4" Pipe 2m E of Station
S15A-05			0.935	99.929	99.929	3/4" Pipe 3m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S15A-05	0.935	100.864		99.929		
Water Level:	Cut		4.486	96.378		Time WL Surveyed: 15:27
Water Level:	Cut		4.469	96.377		Time WL Surveyed: 15:28
S15A-05	0.917	100.846		99.929		

WL Survey Summary

	Before	After
Average WL:	96.381	96.378
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	96.032	96.029

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	GG TR	Trip Date:	11-Jun-15
Data Entry Personnel:	GG	Date:	11-Jun-15
Data Check Personnel:	DW	Date:	22-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth
 UTM Location: 458395 E, 6353391 N

Site Visit Date: August 10, 2015
 Site Visit Time (MST): 14:30

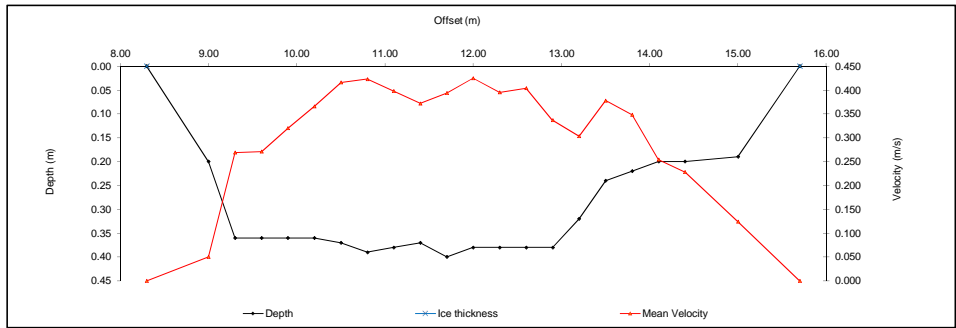


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth from WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	15.70	0.00	0.00	0.11	0.124	0.000	0.000	0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	15.00	0.19		0.12	0.228				1.00	0.65	0.19	0.124	0.12	0.015	2%
2	14.40	0.20		0.12	0.254				1.00	0.45	0.20	0.228	0.09	0.021	3%
3	14.10	0.20		0.12	0.348				1.00	0.30	0.20	0.254	0.06	0.015	2%
4	13.80	0.22		0.13	0.378				1.00	0.30	0.22	0.348	0.07	0.023	3%
5	13.50	0.24		0.14	0.303				1.00	0.30	0.24	0.378	0.07	0.027	4%
6	13.20	0.32		0.19	0.337				1.00	0.30	0.32	0.303	0.10	0.029	4%
7	12.90	0.38		0.23	0.404				1.00	0.30	0.38	0.337	0.11	0.038	6%
8	12.60	0.38		0.23	0.395				1.00	0.30	0.38	0.404	0.11	0.046	7%
9	12.30	0.38		0.23	0.425				1.00	0.30	0.38	0.395	0.11	0.045	7%
10	12.00	0.38		0.23	0.394				1.00	0.30	0.40	0.425	0.11	0.048	7%
11	11.70	0.40		0.24	0.372				1.00	0.30	0.40	0.394	0.12	0.047	7%
12	11.40	0.37		0.22	0.398				1.00	0.30	0.37	0.372	0.11	0.041	6%
13	11.10	0.38		0.23	0.423				1.00	0.30	0.38	0.398	0.11	0.045	7%
14	10.80	0.39		0.23	0.416				1.00	0.30	0.39	0.423	0.12	0.049	7%
15	10.50	0.37		0.22	0.366				1.00	0.30	0.37	0.416	0.11	0.046	7%
16	10.20	0.36		0.22	0.320				1.00	0.30	0.36	0.366	0.11	0.040	6%
17	9.90	0.36		0.22	0.271				1.00	0.30	0.36	0.320	0.11	0.035	5%
18	9.60	0.36		0.22	0.269				1.00	0.30	0.36	0.271	0.11	0.029	4%
19	9.30	0.36		0.22	0.050				1.00	0.50	0.20	0.269	0.11	0.029	4%
20	9.00	0.20		0.12	0.000				1.00	0.50	0.20	0.050	0.10	0.005	1%
LB	8.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.35	0.00	0.000	0.00	0.000	
Total Flow													0.675	100%	

Flow Measurement Details:

Metering Section Location (describe):
4m downstream of pressure transducer

Meas. Start Time (MST):	15:00
Meas. End Time (MST):	15:18
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny



Flow characteristics:

Total Flow:	0.675	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.07	(m ²)
Wetted Width:	7.40	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.33	(m/s)
Reynolds Number:	8.66E+04	
Froude Number:	0.20	

Logger Details:

	Before	After
Transducer Reading (m):	0.700	0.701
Water (°C):	18.3	18.4
Datalogger Clock:	14:40	15:26
Laptop Clock:	14:39	15:25
Battery:	13.7	13.2
Battery Condition:	Good	
Battery Serial #:	-	
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	284722	-
Logger# (if replaced):	17936	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S15A-05	1.027	100.956		99.929	99.929	3/4" Pipe 3m NE of Station
S15A-04			1.145	99.811	99.815	3/4" Pipe 2m E of Station
S15A-03			0.961	99.995	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut		4.287	96.669		Time WL Surveyed: 14:49
S15A-03			0.961	99.995	100.000	3/4" Pipe 3m S of Station
Turn						
S15A-03	0.912	100.907		99.995	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut	0.079	4.313	96.673		Time WL Surveyed: 14:51
S15A-03			0.912	99.995	100.000	3/4" Pipe 3m S of Station
S15A-04			1.099	99.808	99.815	3/4" Pipe 2m E of Station
S15A-05			0.982	99.925	99.929	3/4" Pipe 3m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S15A-03	0.912	100.907		99.995		
Water Level:	Cut	0.096	4.329	96.674		Time WL Surveyed: 15:22
Water Level:	Cut	0.096	4.306	96.671		Time WL Surveyed: 15:23
S15A-03	0.888	100.883		99.995		

WL Survey Summary

	Before	After
Average WL:	96.671	96.673
Closing Error:	0.004	-
WL Check:	0.004	0.003
Transducer Elevation	95.971	95.972

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

TR, JC	Trip Date:	10-Aug-15
TR	Date:	10-Aug-15
DW	Date:	24-Aug-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth
 UTM Location: 458395 E, 6353391 N

Site Visit Date: September 23, 2015
 Site Visit Time (MST): 15:05

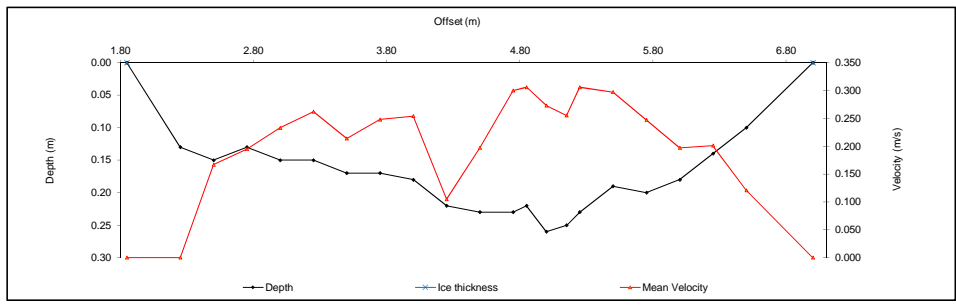


Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	7.00	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	6.50	0.10		0.06	0.121					1.00	0.38	0.10	0.121	0.04	0.005	3%
2	6.25	0.14		0.08	0.201					1.00	0.25	0.14	0.201	0.04	0.007	4%
3	6.00	0.18		0.11	0.197					1.00	0.25	0.18	0.197	0.05	0.009	5%
4	5.75	0.20		0.12	0.247					1.00	0.25	0.20	0.247	0.05	0.012	7%
5	5.50	0.19		0.11	0.297					1.00	0.25	0.19	0.297	0.05	0.014	8%
6	5.25	0.23		0.14	0.306					1.00	0.18	0.23	0.306	0.04	0.012	7%
7	5.15	0.25		0.15	0.255					1.00	0.13	0.25	0.255	0.03	0.008	4%
8	5.00	0.26		0.16	0.273					1.00	0.15	0.26	0.273	0.04	0.011	6%
9	4.85	0.22		0.13	0.306					1.00	0.13	0.22	0.306	0.03	0.008	5%
10	4.75	0.23		0.14	0.300					1.00	0.18	0.23	0.300	0.04	0.012	7%
11	4.50	0.23		0.14	0.197					1.00	0.25	0.23	0.197	0.06	0.011	6%
12	4.25	0.22		0.13	0.105					1.00	0.25	0.22	0.105	0.06	0.006	3%
13	4.00	0.18		0.11	0.254					1.00	0.25	0.18	0.254	0.05	0.011	6%
14	3.75	0.17		0.10	0.248					1.00	0.25	0.17	0.248	0.04	0.011	6%
15	3.50	0.17		0.10	0.214					1.00	0.25	0.17	0.214	0.04	0.009	5%
16	3.25	0.15		0.09	0.262					1.00	0.25	0.15	0.262	0.04	0.010	6%
17	3.00	0.15		0.09	0.233					1.00	0.25	0.15	0.233	0.04	0.009	5%
18	2.75	0.13		0.08	0.195					1.00	0.25	0.13	0.195	0.03	0.006	4%
19	2.50	0.15		0.09	0.167					1.00	0.25	0.15	0.167	0.04	0.006	4%
20	2.25	0.13		0.08	0.000					1.00	0.33	0.13	0.000	0.04	0.000	0%
LB	1.85	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.178	100%	

Flow Measurement Details:

Metering Section Location (describe):
3m downstream of station

Meas. Start Time (MST):	12:58
Meas. End Time (MST):	13:19
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 15C



Flow characteristics:

Total Flow:	0.178	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.82	(m ²)
Wetted Width:	5.15	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.17	

Logger Details:

	Before	After
Transducer Reading (m):	0.500	0.500
Water (°C):	8.7	8.7
Datalogger Clock:	12:40	13:27
Laptop Clock:	12:39	13:27
Battery (Main):	14.3	14.3
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S15A-03	0.775	100.775		100.000	100.000	3/4" Pipe 3m S of Station
S15A-04			0.962	99.813	99.815	3/4" Pipe 2m E of Station
S15A-05			0.841	99.934	99.929	3/4" Pipe 3m NE of Station
Water Level:	Cut		4.200	96.475	Time WL Surveyed:	12:45
Temporary BM			4.069	96.706	0.000	-
Turn						
Temporary BM	4.061	100.767		96.706		-
Water Level:	Cut		4.289	96.478	Time WL Surveyed:	12:47
S15A-05			0.831	99.936	99.929	3/4" Pipe 3m NE of Station
S15A-04			0.948	99.819	99.815	3/4" Pipe 2m E of Station
S15A-03			0.765	100.002	100.000	3/4" Pipe 3m S of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S15A-03	0.767	100.768		100.001		
Water Level:	Cut		4.291	96.477	Time WL Surveyed:	13:22
Water Level:	Cut		4.278	96.473	Time WL Surveyed:	13:24
S15A-03	0.750	100.751		100.001		

WL Survey Summary

	Before	After
Average WL:	96.477	96.475
Closing Error:	-0.002	-
WL Check:	0.003	0.004
Transducer Elevation	95.977	95.975

Field Personnel:

SM, CJ	Trip Date:	17-Sep-15
Data Entry Personnel: SM	Date:	17-Sep-15
Data Check Personnel: DW	Date:	23-Sep-15
Entered Digitally in the Field: Yes		

Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth
 UTM Location: 458395 E, 6353391 N

Site Visit Date: October 30, 2015
 Site Visit Time (MST): 11:22

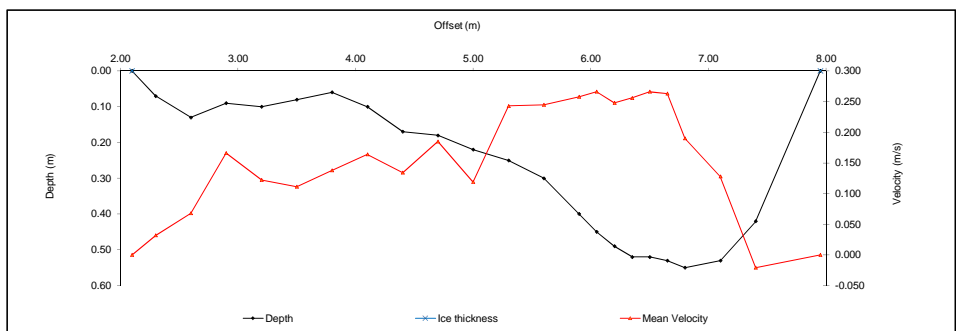


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.10	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.30	0.07		0.04	0.032					1.00	0.25	0.07	0.032	0.02	0.001	0%
2	2.60	0.13		0.08	0.068					1.00	0.30	0.13	0.068	0.04	0.003	1%
3	2.90	0.09		0.05	0.166					1.00	0.30	0.09	0.166	0.03	0.004	2%
4	3.20	0.10		0.06	0.122					1.00	0.30	0.10	0.122	0.03	0.004	1%
5	3.50	0.08		0.05	0.111					1.00	0.30	0.08	0.111	0.02	0.003	1%
6	3.80	0.06		0.04	0.138					1.00	0.30	0.06	0.138	0.02	0.002	1%
7	4.10	0.10		0.06	0.164					1.00	0.30	0.10	0.164	0.03	0.005	2%
8	4.40	0.17		0.10	0.134					1.00	0.30	0.17	0.134	0.05	0.007	3%
9	4.70	0.18		0.11	0.185					1.00	0.30	0.18	0.185	0.05	0.010	4%
10	5.00	0.22		0.13	0.119					1.00	0.30	0.22	0.119	0.07	0.008	3%
11	5.30	0.25		0.15	0.243					1.00	0.30	0.25	0.243	0.07	0.018	7%
12	5.60	0.30		0.18	0.245					1.00	0.30	0.30	0.245	0.09	0.022	9%
13	5.90	0.40		0.24	0.258					1.00	0.23	0.40	0.258	0.09	0.023	9%
14	6.05	0.45		0.27	0.266					1.00	0.15	0.45	0.266	0.07	0.018	7%
15	6.20	0.49		0.29	0.248					1.00	0.15	0.49	0.248	0.07	0.018	7%
16	6.35	0.52		0.31	0.256					1.00	0.15	0.52	0.256	0.08	0.020	8%
17	6.50	0.52		0.31	0.266					1.00	0.15	0.52	0.266	0.08	0.021	8%
18	6.65	0.53		0.32	0.263					1.00	0.15	0.53	0.263	0.08	0.021	8%
19	6.80	0.55		0.33	0.190					1.00	0.23	0.55	0.190	0.12	0.024	9%
20	7.10	0.53		0.32	0.128					1.00	0.30	0.53	0.128	0.16	0.020	8%
21	7.40	0.42		0.25	-0.021					1.00	0.43	0.42	-0.021	0.18	-0.004	-2%
LB	7.95	0.00	0.00		0.00		0.00		0.00	1.00	0.28	0.00	0.000	0.00	0.000	
Total Flow														0.248	100%	

Flow Measurement Details:

Metering Section Location (describe):
 Across from station

Meas. Start Time (MST):	11:40
Meas. End Time (MST):	12:00
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, Calm, 4C



Flow characteristics:

Total Flow:	0.248	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.45	(m ²)
Wetted Width:	5.85	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.17	(m/s)
Reynolds Number:	2.56E+04	
Froude Number:	0.11	

Logger Details:

	Before	After
Transducer Reading (m):	0.557	0.555
Water (°C):	2.6	2.5
Datalogger Clock:	11:24	12:02
Laptop Clock:	11:23	12:00
Battery:	13.5	13.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	284722	Old PT
Logger# (if replaced):	17936	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S15A-05	1.048	100.977		99.929	99.929	3/4" Pipe 3m NE of Station
S15A-04			1.165	99.812	99.815	3/4" Pipe 2m E of Station
S15A-03			0.983	99.994	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut	0.172	4.628	96.521	Time WL Surveyed:	11:32
S15A-06			0.852	100.125	0.000	Bolt in Tree
Turn						
S15A-06	0.826	100.951		100.125		Bolt in Tree
Water Level:	Cut	0.172	4.602	96.521	Time WL Surveyed:	11:33
S15A-03			0.956	99.995	100.000	3/4" Pipe 3m S of Station
S15A-04			1.138	99.813	99.815	3/4" Pipe 2m E of Station
S15A-05			1.021	99.930	99.929	3/4" Pipe 3m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S15A-03	0.956	100.950		99.994		
Water Level:	Cut	0.143	4.573	96.520	Time WL Surveyed:	12:10
Water Level:	Cut	0.143	4.551	96.520	Time WL Surveyed:	12:11
S15A-03	0.934	100.928		99.994		

WL Survey Summary

	Before	After
Average WL:	96.521	96.520
Closing Error:	-0.001	-
WL Check:	0.000	0.000
Transducer Elevation	95.964	95.965

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Cansel AT-24
Serial #:	76710

Field Personnel:

TR JC	Trip Date:	30-Oct-15
JC	Date:	30-Oct-15
DW	Date:	4-Nov-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary

UTM Location: 458130E, 6362062N

Site Visit Date: _____

May 3, 2015

Site Visit Time (MST): _____

12:55



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)	
RB	8.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.13	0.00	0.00	0.00	0.00	0%	
1	8.75	0.16	0.10	0.000					1.00	0.25	0.16	0.000	0.04	0.000	0%	
2	9.00	0.20	0.12	0.141					1.00	0.25	0.20	0.141	0.05	0.007	3%	
3	9.25	0.36	0.22	0.151					1.00	0.25	0.36	0.151	0.09	0.014	5%	
4	9.50	0.31	0.19	0.152					1.00	0.25	0.31	0.152	0.08	0.012	5%	
5	9.75	0.36	0.22	0.157					1.00	0.25	0.36	0.157	0.09	0.014	6%	
6	10.00	0.34	0.20	0.168					1.00	0.25	0.34	0.168	0.09	0.014	6%	
7	10.25	0.38	0.23	0.183					1.00	0.25	0.38	0.183	0.10	0.017	7%	
8	10.50	0.36	0.22	0.186					1.00	0.25	0.36	0.186	0.09	0.017	7%	
9	10.75	0.36	0.22	0.180					1.00	0.25	0.36	0.180	0.09	0.016	6%	
10	11.00	0.34	0.20	0.145					1.00	0.25	0.34	0.145	0.09	0.012	5%	
11	11.25	0.35	0.21	0.081					1.00	0.25	0.35	0.081	0.09	0.007	3%	
12	11.50	0.36	0.22	0.197					1.00	0.25	0.36	0.197	0.09	0.018	7%	
13	11.75	0.36	0.22	0.195					1.00	0.18	0.36	0.195	0.07	0.013	5%	
14	11.87	0.30	0.18	0.218					1.00	0.13	0.30	0.218	0.04	0.008	3%	
15	12.00	0.36	0.22	0.214					1.00	0.19	0.36	0.214	0.07	0.015	6%	
16	12.25	0.36	0.22	0.232					1.00	0.25	0.36	0.232	0.09	0.021	8%	
17	12.50	0.32	0.19	0.232					1.00	0.25	0.32	0.232	0.08	0.019	7%	
18	12.75	0.27	0.16	0.192					1.00	0.25	0.27	0.192	0.07	0.013	5%	
19	13.00	0.26	0.16	0.187					1.00	0.25	0.26	0.187	0.07	0.012	5%	
20	13.25	0.26	0.16	0.038					1.00	0.20	0.26	0.038	0.05	0.002	1%	
LB	13.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.08	0.00	0.00	0.00	0.000	0%	
Total Flow													0.251	100%		

Flow Measurement Details:

Metering Section Location (describe):
Near station

Meas. Start Time (MST):	13:58
Meas. End Time (MST):	14:28
Equipment:	ADV
Method:	Wading
River Condition:	Open, ice on right bank.
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 3C

Flow characteristics:

Total Flow:	0.251	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.50	(m ²)
Wetted Width:	4.90	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.10	

Logger Details:

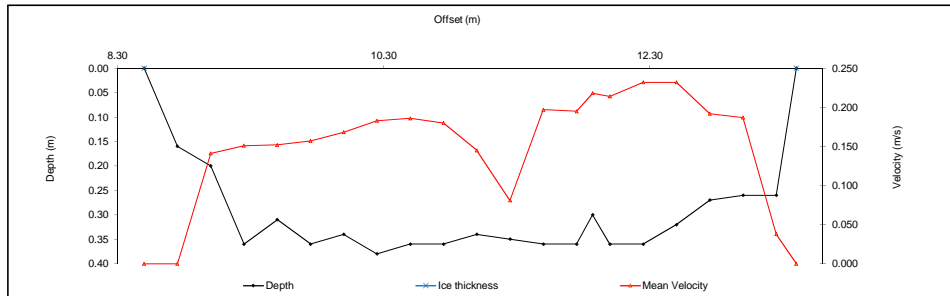
	Before	After
Transducer Reading (m):	0.674	0.674
Water (°C):	5.3	5.7
Datalogger Clock:	13:00	14:42
Laptop Clock:	13:00	14:42
Battery (Main):	12.8	12.9
Battery:	-	New
Battery Serial #:	-	-
Enclosure Dessicant:	-	New
Vent Tube Dessicant:	-	New
PT# (if replaced):	276581	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-Installed station at new location approx 300m downstream of old location.

General Notes:

-Cleared helicopter landing area



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S16A-10	2.062	102.062		100.000	100.000	Bolt in conifer 5M S
S16A-11			0.929	101.133	101.133	Bolt in conifer 6m N
Temporary BM			0.939	101.123	0.000	-
Water Level:	Cut	0.700	6.263	96.399	Time WL Surveyed:	13:35
Temporary BM			6.363	95.699	0.000	-
Turn						
Temporary BM	6.345	102.044		95.699		-
Water Level:	Cut	0.700	6.345	96.399	Time WL Surveyed:	13:38
Temporary BM			0.924	101.120		-
S16A-11			0.914	101.130	101.133	Bolt in conifer 6m N
S16A-10			2.046	99.998	100.000	Bolt in conifer 5M S
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S16B-01	2.046	102.044		99.998		-
Water Level:	Cut	0.700	6.348	96.396	Time WL Surveyed:	14:36
Water Level:	Cut	0.700	6.369	96.395	Time WL Surveyed:	14:37
S16B-01	2.066	102.064		99.998		-

WL Survey Summary	Before	After
Average WL:	96.399	96.396
Closing Error:	0.002	-
WL Check:	0.000	0.001
Transducer Elevation	95.725	95.722

Field Personnel:	SM CP	Trip Date:	3-May-15
Data Entry Personnel:	SM	Date:	3-May-15
Data Check Personnel:	GG	Date:	28-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary

UTM Location: 458130E, 6362062N

Site Visit Date:

June 15, 2015

Site Visit Time (MST):

15:12



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	13.60	0.00	0.00		0.17	0.002			0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	13.40	0.29			0.002				0.000	1.00	0.20	0.29	0.002	0.06	0.000	0%
2	13.20	0.35			0.010				0.000	1.00	0.20	0.35	0.010	0.07	0.001	2%
3	13.00	0.40			0.017				0.000	1.00	0.20	0.40	0.017	0.08	0.001	4%
4	12.80	0.42			0.025				0.000	1.00	0.20	0.42	0.025	0.08	0.001	3%
5	12.60	0.40			0.016				0.000	1.00	0.20	0.40	0.016	0.08	0.001	4%
6	12.40	0.43			0.026				0.000	1.00	0.20	0.43	0.026	0.09	0.001	4%
7	12.20	0.49			0.029				0.000	1.00	0.20	0.49	0.028	0.10	0.003	8%
8	12.00	0.49			0.029				0.000	1.00	0.20	0.49	0.029	0.10	0.003	8%
9	11.80	0.37			0.022				0.000	1.00	0.15	0.37	0.028	0.06	0.002	4%
10	11.70	0.34			0.035				0.000	1.00	0.10	0.34	0.035	0.03	0.001	3%
11	11.60	0.34			0.034				0.000	1.00	0.15	0.34	0.034	0.05	0.002	5%
12	11.40	0.49			0.029				0.000	1.00	0.20	0.49	0.034	0.10	0.003	9%
13	11.20	0.49			0.031				0.000	1.00	0.20	0.49	0.031	0.10	0.003	8%
14	11.00	0.50			0.026				0.000	1.00	0.20	0.50	0.026	0.10	0.003	7%
15	10.80	0.51			0.025				0.000	1.00	0.20	0.51	0.025	0.10	0.003	7%
16	10.60	0.54			0.017				0.000	1.00	0.20	0.54	0.017	0.11	0.002	5%
17	10.40	0.55			0.020				0.000	1.00	0.20	0.55	0.020	0.11	0.002	6%
18	10.20	0.57			0.015				0.000	1.00	0.20	0.57	0.015	0.11	0.002	5%
19	10.00	0.57			0.015				0.000	1.00	0.20	0.57	0.015	0.11	0.002	5%
20	9.80	0.50			0.034				0.000	1.00	0.12	0.50	0.014	0.06	0.001	2%
LB	9.75	0.00	0.00		0.00				0.000	1.00	0.03	0.00	0.000	0.00	0.000	
Total Flow														0.036	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of station

Meas. Start Time (MST):	15:42
Meas. End Time (MST):	16:10
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny breaks

Flow characteristics:

Total Flow:	0.036	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.70	(m ²)
Wetted Width:	3.85	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.02	(m/s)
Reynolds Number:	8.60E+03	
Froude Number:	0.01	

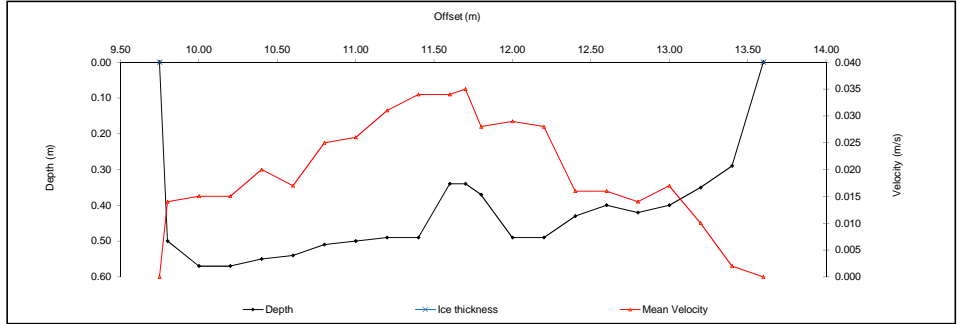
Logger Details:

	Before	After
Transducer Reading (m):	0.549	0.550
Water (°C):	17.2	17.3
Datalogger Clock:	15:16	16:51
Laptop Clock:	15:16	16:51
Battery:	11.6	13.0
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Old solar panel failed because wires were pulled
- The solar panel was replaced and tested

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S16A-10	1.813	101.813		100.000	100.000	Bolt in conifer 5M S
Temporary BM			0.689	101.124	0.000	
S16A-11			0.683	101.130	0.000	Bolt in conifer 6m N
Water Level:	Cut	0.330	5.873	96.270		Time WL Surveyed: 15:22
Temporary BM			5.873	95.940	0.000	
Turn						
Temporary BM	5.864	101.804		95.940		
Water Level:	Cut	0.330	5.864	96.270		Time WL Surveyed: 15:25
S16A-11			0.672	101.132		Bolt in conifer 6m N
Temporary BM			0.681	101.123		
S16A-10			1.804	100.000	100.000	Bolt in conifer 5M S
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S16A-01	1.804	101.804		100.000		
Water Level:	Cut	0.105	5.637	96.272		Time WL Surveyed: 16:56
Water Level:	Cut	0.105	5.623	96.274		Time WL Surveyed: 16:58
S16A-01	1.792	101.792		100.000		

WL Survey Summary	Before	After
Average WL:	96.270	96.273
Closing Error:	0.000	-
WL Check:	0.000	-0.002
Transducer Elevation	95.721	95.723

Level Survey Equipment:	
Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:	GG MK	Trip Date:	15-Jun-15
Data Entry Personnel:	GG	Date:	15-Jun-15
Data Check Personnel:	DW	Date:	24-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary
 UTM Location: 458130E, 6362062N

Site Visit Date: August 17, 2015
 Site Visit Time (MST): 15:27

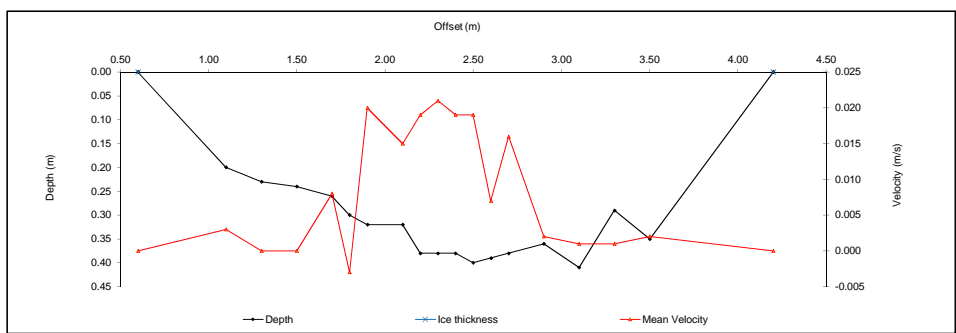


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 (m)	Velocity @ 0.2 (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	0.60	0.00	0.00							1.00	0.25	0.00	0.000	0.00	0.000	
1	1.10	0.20		0.12	0.003					1.00	0.35	0.20	0.003	0.07	0.000	3%
2	1.30	0.23		0.14	0.000					1.00	0.20	0.23	0.000	0.05	0.000	0%
3	1.50	0.24		0.14	0.000					1.00	0.20	0.24	0.000	0.05	0.000	0%
4	1.70	0.26		0.16	0.008					1.00	0.15	0.26	0.008	0.04	0.000	5%
5	1.80	0.30		0.18	-0.003					1.00	0.10	0.30	-0.003	0.03	0.000	-1%
6	1.90	0.32		0.19	0.020					1.00	0.15	0.32	0.020	0.05	0.001	14%
7	2.10	0.32		0.19	0.015					1.00	0.15	0.32	0.015	0.05	0.001	10%
8	2.20	0.38		0.23	0.019					1.00	0.10	0.38	0.019	0.04	0.001	10%
9	2.30	0.38		0.23	0.021					1.00	0.10	0.38	0.021	0.04	0.001	12%
10	2.40	0.38		0.23	0.019					1.00	0.10	0.38	0.019	0.04	0.001	10%
11	2.50	0.40		0.24	0.019					1.00	0.10	0.40	0.019	0.04	0.001	11%
12	2.60	0.39		0.23	0.007					1.00	0.10	0.39	0.007	0.04	0.000	4%
13	2.70	0.38		0.23	0.016					1.00	0.15	0.38	0.016	0.06	0.001	13%
14	2.90	0.36		0.22	0.002					1.00	0.20	0.36	0.002	0.07	0.000	2%
15	3.10	0.41		0.25	0.001					1.00	0.20	0.41	0.001	0.08	0.000	1%
16	3.30	0.29		0.17	0.001					1.00	0.20	0.29	0.001	0.06	0.000	1%
17	3.50	0.35		0.21	0.002					1.00	0.45	0.35	0.002	0.16	0.000	5%
RB	4.20	0.00	0.00		0.00					1.00	0.35	0.00	0.000	0.00	0.000	
Total Flow														0.007	100%	

Flow Measurement Details:

Metering Section Location (describe): At station

Meas. Start Time (MST):	15:47
Meas. End Time (MST):	16:10
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	-



Flow characteristics:

Total Flow:	0.007	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	0.95	(m ²)
Wetted Width:	3.60	(m)
Hydraulic Depth:	0.26	(m)
Mean Velocity:	0.01	(m/s)
Reynolds Number:	1.70E+03	
Froude Number:	0.00	

Logger Details:

	Before	After
Transducer Reading (m):	0.500	0.500
Water (°C):	15.8	15.8
Datalogger Clock:	15:29	16:16
Laptop Clock:	15:29	16:16
Battery:	13.7	13.7
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	17935	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S16A-10	1.842	101.842		100.000	100.000	Bolt in conifer 5M S
S16A-11			0.712	101.130	101.133	Bolt in conifer 6m N
Water Level: Cut 0.109 5.738 96.213 Time WL Surveyed: 15:41						
Temporary BM			5.738	96.104	0.000	-
Turn						
Temporary BM	5.695	101.799		96.104		-
Water Level:	Cut	0.109	5.695	96.213		Time WL Surveyed: 15:41
S16A-11			0.673	101.126	101.133	Bolt in conifer 6m N
S16A-10			1.802	99.997	100.000	Bolt in conifer 5M S
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Temporary BM	5.698	101.802		96.104		
Water Level:	Cut	0.109	5.698	96.213		Time WL Surveyed: 16:11
Water Level:	Cut	0.109	5.678	96.213		Time WL Surveyed: 16:11
Temporary BM	5.678	101.782		96.104		

WL Survey Summary

	Before	After
Average WL:	96.213	96.213
Closing Error:	0.003	-
WL Check:	0.000	0.000
Transducer Elevation	95.713	95.713

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	DW, SG	Trip Date:	17-Aug-15
Data Check Personnel:	DW	Date:	17-Aug-15
Entered Digitally in the Field:	Yes	Date:	24-Aug-15

Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary
 UTM Location: 458130E, 6362062N

Site Visit Date: September 15, 2015
 Site Visit Time (MST): 17:05

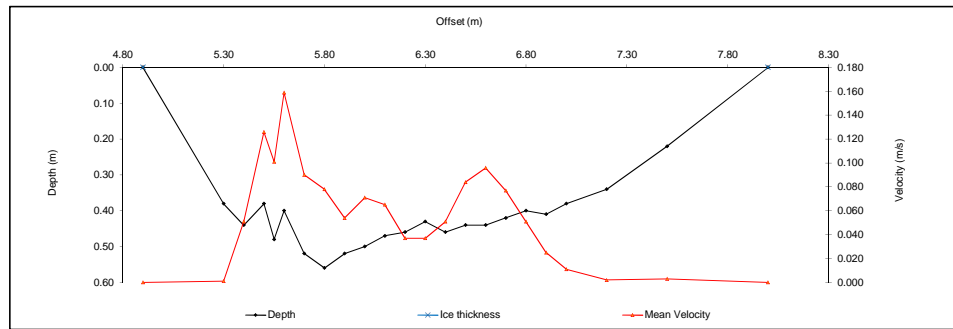


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	4.90	0.00	0.00	0.000	0.000	0.000	0.000	0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	5.30	0.38	0.23	0.001					1.00	0.25	0.38	0.001	0.10	0.000	0%
2	5.40	0.44	0.26	0.051					1.00	0.10	0.44	0.051	0.04	0.002	4%
20	5.50	0.38	0.23	0.126					1.00	0.08	0.38	0.126	0.03	0.004	7%
3	5.55	0.48	0.29	0.101					1.00	0.05	0.48	0.101	0.02	0.002	5%
4	5.60	0.40	0.24	0.159					1.00	0.08	0.40	0.159	0.03	0.005	9%
5	5.70	0.52	0.31	0.090					1.00	0.10	0.52	0.090	0.05	0.005	9%
6	5.80	0.56	0.34	0.078					1.00	0.10	0.56	0.078	0.06	0.004	8%
7	5.90	0.52	0.31	0.054					1.00	0.10	0.52	0.054	0.05	0.003	5%
8	6.00	0.50	0.30	0.071					1.00	0.10	0.50	0.071	0.05	0.004	7%
9	6.10	0.47	0.28	0.065					1.00	0.10	0.47	0.065	0.05	0.003	6%
10	6.20	0.46	0.28	0.037					1.00	0.10	0.46	0.037	0.05	0.002	3%
11	6.30	0.43	0.26	0.037					1.00	0.10	0.43	0.037	0.04	0.002	3%
12	6.40	0.46	0.28	0.051					1.00	0.10	0.46	0.051	0.05	0.002	4%
13	6.50	0.44	0.26	0.084					1.00	0.10	0.44	0.084	0.04	0.004	7%
14	6.60	0.44	0.26	0.096					1.00	0.10	0.44	0.096	0.04	0.004	8%
15	6.70	0.42	0.25	0.077					1.00	0.10	0.42	0.077	0.04	0.003	6%
16	6.80	0.40	0.24	0.051					1.00	0.10	0.40	0.051	0.04	0.002	4%
17	6.90	0.41	0.25	0.025					1.00	0.10	0.41	0.025	0.04	0.001	2%
18	7.00	0.38	0.23	0.011					1.00	0.15	0.38	0.011	0.06	0.001	1%
19	7.20	0.34	0.20	0.002					1.00	0.25	0.34	0.002	0.09	0.000	0%
21	7.50	0.22	0.13	0.003					1.00	0.40	0.22	0.003	0.09	0.000	1%
LB	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.25	0.00	0.000	0.00	0.000	
Total Flow													0.053	100%	

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	17:40
Meas. End Time (MST):	18:15
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear



Flow characteristics:

Total Flow:	0.053	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	1.05	(m ²)
Wetted Width:	3.10	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.05	(m/s)
Reynolds Number:	1.26E+04	
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.588	0.585
Water (°C):	9.7	9.5
Datalogger Clock:	17:14	18:27
Laptop Clock:	17:14	18:27
Battery:	13.3	13.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Established BM3

General Notes:

- Lots of aquatic veg. at flow measurement section

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S16A-11	1.934	103.067		101.133	101.133	Bolt in conifer 6m N
S16A-12			0.429	102.638	102.638	High conifer between BM 1 and 2
S16A-10			3.063	100.004	100.000	Bolt in conifer 5M S
Water Level:	Cut		6.765	96.302		Time WL Surveyed: 17:30
Temporary BM			7.212	95.855	0.000	-
Turn						
Temporary BM	7.179	103.034		95.855		-
Water Level:	Cut		6.732	96.302		Time WL Surveyed: 17:35
S16A-10			3.029	100.005	100.000	Bolt in conifer 5M S
S16A-12			0.396	102.638	102.638	High conifer between BM 1 and 2
S16A-11			1.900	101.134	101.133	Bolt in conifer 6m N
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S16A-10	1.087	101.091		100.004		
Water Level:	Cut		4.795	96.296		Time WL Surveyed: 18:20
Water Level:	Cut		4.824	96.300		Time WL Surveyed: 18:22
S16A-10	1.120	101.124		100.004		

WL Survey Summary

	Before	After
Average WL:	96.302	96.298
Closing Error:	-0.001	-
WL Check:	0.000	-0.004
Transducer Elevation	95.714	95.713

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

	CJ, TL	Trip Date:	15-Sep-15
Data Entry Personnel:	CJ	Date:	15-Sep-15
Data Check Personnel:	DW	Date:	18-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary
 UTM Location: 458130E, 6362062N

Site Visit Date: October 19, 2015
 Site Visit Time (MST): 09:08

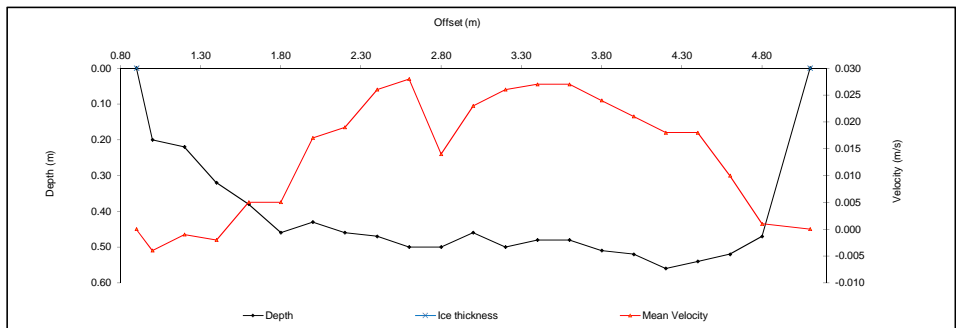


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth from WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.90	0.00	0.00	0.12	0.000	0.000	0.000	0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	1.00	0.20		-0.004					1.00	0.15	0.20	-0.004	0.03	0.000	0%
2	1.20	0.22		-0.001					1.00	0.20	0.22	-0.001	0.04	0.000	0%
3	1.40	0.32		-0.002					1.00	0.20	0.32	-0.002	0.06	0.000	0%
4	1.60	0.38		0.005					1.00	0.20	0.38	0.005	0.08	0.000	1%
5	1.80	0.46		0.005					1.00	0.20	0.46	0.005	0.09	0.000	2%
6	2.00	0.43		0.017					1.00	0.20	0.43	0.017	0.09	0.001	5%
7	2.20	0.46		0.019					1.00	0.20	0.46	0.019	0.09	0.002	6%
8	2.40	0.47		0.026					1.00	0.20	0.47	0.026	0.09	0.002	8%
9	2.60	0.50		0.028					1.00	0.20	0.50	0.028	0.10	0.003	9%
10	2.80	0.50		0.030					1.00	0.20	0.50	0.030	0.10	0.001	5%
11	3.00	0.46		0.028					1.00	0.20	0.46	0.028	0.09	0.002	7%
12	3.20	0.50		0.030					1.00	0.20	0.50	0.030	0.10	0.003	9%
13	3.40	0.48		0.029					1.00	0.20	0.48	0.029	0.10	0.003	9%
14	3.60	0.48		0.029					1.00	0.20	0.48	0.029	0.10	0.003	9%
15	3.80	0.51		0.031					1.00	0.20	0.51	0.031	0.10	0.002	8%
16	4.00	0.52		0.021					1.00	0.20	0.52	0.021	0.10	0.002	7%
17	4.20	0.56		0.018					1.00	0.20	0.56	0.018	0.11	0.002	7%
18	4.40	0.54		0.032					1.00	0.20	0.54	0.032	0.11	0.002	6%
19	4.60	0.52		0.031					1.00	0.20	0.52	0.031	0.10	0.001	3%
20	4.80	0.47		0.028					1.00	0.25	0.47	0.028	0.12	0.000	0%
LB	5.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.15	0.00	0.000	0.00	0.000	
Total Flow													0.030	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of logger

Meas. Start Time (MST):	9:33
Meas. End Time (MST):	9:52
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Open, low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 7C



Flow characteristics:

Total Flow:	0.030	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.81	(m ²)
Wetted Width:	4.20	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.02	(m/s)
Reynolds Number:	4.56E+03	
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	0.543	0.544
Water (°C):	4.2	4.3
Datalogger Clock:	09:12	10:01
Laptop Clock:	09:12	10:01
Battery:	12.6	13.0
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-ADV test passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S16A-10	1.909	101.909		100.000	100.000	Bolt in conifer 5M S
S16A-13			0.785	101.124	0.000	TOP of station mast
S16A-11			0.777	101.132	101.133	Bolt in conifer 6m N
Water Level:	Cut	0.087	5.731	96.265		Time WL Surveyed: 9:18
Temporary BM			5.731	96.178	0.000	-
Turn						
Temporary BM	5.656	101.834		96.178		
Water Level:	Cut	0.087	5.656	96.265		Time WL Surveyed: 9:21
S16A-11			0.698	101.136	101.133	Bolt in conifer 6m N
S16A-13			0.706	101.128		TOP of station mast
S16A-10			1.830	100.004	100.000	Bolt in conifer 5M S
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S16A-10	1.830	101.834		100.004		
Water Level:	Cut	0.087	5.657	96.264		Time WL Surveyed: 9:55
Water Level:	Cut	0.087	5.634	96.263		Time WL Surveyed: 9:57
S16A-10	1.808	101.810		100.004		

WL Survey Summary

	Before	After
Average WL:	96.265	96.264
Closing Error:	-0.004	-
WL Check:	0.000	0.001
Transducer Elevation	95.722	95.720

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	GG TR	Trip Date:	19-Oct-15
Data Entry Personnel:	GG	Date:	19-Oct-15
Data Check Personnel:	GG	Date:	27-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland
 UTM Location: 492230 E, 6354940 N

Site Visit Date: May 13, 2015
 Site Visit Time (MST): 09:40

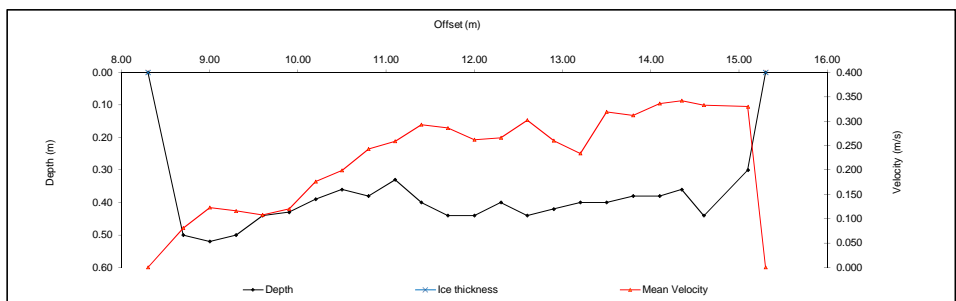


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	15.30	0.00	0.00	0.18	0.330	0.000	0.000	0.000	1.00	0.10	0.00	0.000	0.00	0.000		
1	15.10	0.30		0.26	0.333				1.00	0.35	0.30	0.330	0.11	0.035	5%	
2	14.60	0.44		0.22	0.342				1.00	0.38	0.44	0.333	0.17	0.055	9%	
3	14.35	0.36		0.26	0.336				1.00	0.25	0.36	0.342	0.09	0.031	5%	
4	14.10	0.38		0.23	0.312				1.00	0.28	0.38	0.336	0.10	0.035	5%	
5	13.80	0.38		0.23	0.312				1.00	0.30	0.38	0.312	0.11	0.036	6%	
6	13.50	0.40		0.24	0.319				1.00	0.30	0.40	0.319	0.12	0.038	6%	
7	13.20	0.40		0.24	0.234				1.00	0.30	0.40	0.234	0.12	0.028	4%	
8	12.90	0.42		0.25	0.260				1.00	0.30	0.42	0.260	0.13	0.033	5%	
9	12.60	0.44		0.26	0.302				1.00	0.30	0.44	0.302	0.13	0.040	6%	
10	12.30	0.40		0.24	0.266				1.00	0.30	0.40	0.266	0.12	0.032	5%	
11	12.00	0.44		0.26	0.262				1.00	0.30	0.44	0.262	0.13	0.035	5%	
12	11.70	0.44		0.26	0.286				1.00	0.30	0.44	0.286	0.13	0.038	6%	
13	11.40	0.40		0.24	0.293				1.00	0.30	0.40	0.293	0.12	0.035	5%	
14	11.10	0.33		0.20	0.259				1.00	0.30	0.33	0.259	0.10	0.026	4%	
15	10.80	0.38		0.23	0.243				1.00	0.30	0.38	0.243	0.11	0.028	4%	
16	10.50	0.36		0.22	0.199				1.00	0.30	0.36	0.199	0.11	0.021	3%	
17	10.20	0.39		0.23	0.176				1.00	0.30	0.39	0.176	0.12	0.021	3%	
18	9.90	0.43		0.26	0.120				1.00	0.30	0.43	0.120	0.13	0.015	2%	
19	9.60	0.44		0.26	0.108				1.00	0.30	0.44	0.108	0.13	0.014	2%	
20	9.30	0.50		0.30	0.116				1.00	0.30	0.50	0.116	0.15	0.017	3%	
21	9.00	0.52		0.31	0.123				1.00	0.30	0.52	0.123	0.16	0.019	3%	
22	8.70	0.50		0.30	0.081				1.00	0.35	0.50	0.081	0.18	0.014	2%	
LB	8.30	0.00	0.00	0.30	0.000	0.000	0.000	0.000	1.00	0.20	0.00	0.000	0.00	0.000		
Total Flow														0.645	100%	

Flow Measurement Details:

Metering Section Location (describe):
15m downstream of pressure transducer

Meas. Start Time (MST):	10:00
Meas. End Time (MST):	10:20
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15C



Flow characteristics:

Total Flow:	0.645	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.76	(m ²)
Wetted Width:	7.00	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.536	0.537
Water (°C):	8.9	9.1
Datalogger Clock:	09:46	10:27
Laptop Clock:	09:44	10:26
Battery:	12.8	12.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S20A-03	0.823	331.643		330.820	330.820	3/4" Pipe 4m West of logger
S20A-02			0.739	330.904	330.902	3/4" Pipe 2m NW of logger
S20A-01			0.738	330.905	330.905	3/4" Pipe 2m NE of logger
Water Level:	Cut	0.571	3.112	329.102	Time WL Surveyed: 9:50	
S20A-01			0.738	330.905	330.905	3/4" Pipe 2m NE of logger
Turn						
S20A-01	0.713	331.618		330.905	330.905	3/4" Pipe 2m NE of logger
Water Level:	Cut	0.571	3.091	329.098	Time WL Surveyed: 9:52	
S20A-01			0.713	330.905	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.715	330.903	330.902	3/4" Pipe 2m NW of logger
S20A-03			0.799	330.819	330.820	3/4" Pipe 4m West of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S20A-01	0.713	331.618		330.905		
Water Level:	Cut	0.572	3.090	329.100	Time WL Surveyed: 10:28	
Water Level:	Cut	0.574	3.073	329.098	Time WL Surveyed: 10:29	
S20A-01	0.692	331.597		330.905		

WL Survey Summary

	Before	After
Average WL:	329.100	329.099
Closing Error:	0.001	-
WL Check:	0.004	0.002
Transducer Elevation	328.564	328.562

Field Personnel:

TR, MK	Trip Date:	13-May-15
TR	Date:	13-May-15
CJ	Date:	3-Sep-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland
 UTM Location: 492230 E, 6354940 N

Site Visit Date: June 18, 2015
 Site Visit Time (MST): 09:39

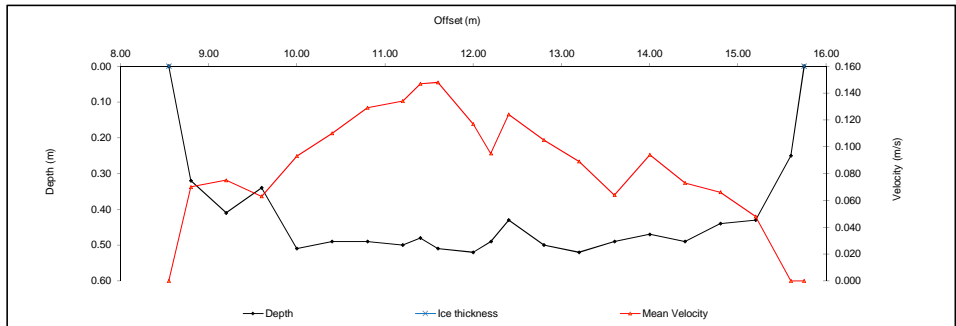


Flow Measurement													Calculated Data			
Bank/ Mmt #	Measured Data			Velocity @ 0.6			Velocity @ 0.8			Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
	Depth from bottom to WS (m)	WS (m)	Depth of Obs. @ 0.6 Depth (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity (m/s)							
RB	8.55	0.00	0.00	0.19	0.070	0.000	0.000	0.000	1.00	0.13	0.00	0.000	0.00	0.000		
1	8.80	0.32		0.25	0.075				1.00	0.32	0.32	0.070	0.10	0.007	2%	
2	9.20	0.41		0.20	0.063				1.00	0.40	0.41	0.075	0.16	0.012	4%	
3	9.60	0.34		0.29	0.093				1.00	0.40	0.34	0.063	0.14	0.009	3%	
4	10.00	0.51		0.29	0.110				1.00	0.40	0.49	0.093	0.20	0.019	6%	
5	10.40	0.49		0.30	0.129				1.00	0.40	0.49	0.110	0.20	0.022	7%	
6	10.80	0.49		0.29	0.134				1.00	0.40	0.49	0.129	0.20	0.025	8%	
7	11.20	0.50		0.30	0.147				1.00	0.30	0.50	0.134	0.15	0.020	7%	
8	11.40	0.48		0.31	0.148				1.00	0.20	0.48	0.147	0.10	0.014	5%	
9	11.60	0.51		0.31	0.117				1.00	0.30	0.51	0.148	0.15	0.023	8%	
10	12.00	0.52		0.29	0.117				1.00	0.30	0.52	0.117	0.16	0.018	6%	
11	12.20	0.49		0.26	0.095				1.00	0.20	0.49	0.095	0.10	0.009	3%	
12	12.40	0.43		0.26	0.124				1.00	0.30	0.43	0.124	0.13	0.016	5%	
13	12.80	0.50		0.30	0.105				1.00	0.40	0.50	0.105	0.20	0.021	7%	
14	13.20	0.52		0.31	0.089				1.00	0.40	0.52	0.089	0.21	0.019	6%	
15	13.60	0.49		0.29	0.064				1.00	0.40	0.49	0.064	0.20	0.013	4%	
16	14.00	0.47		0.28	0.094				1.00	0.40	0.47	0.094	0.19	0.018	6%	
17	14.40	0.49		0.29	0.073				1.00	0.40	0.49	0.073	0.20	0.014	5%	
18	14.80	0.44		0.26	0.066				1.00	0.40	0.44	0.066	0.18	0.012	4%	
19	15.20	0.43		0.26	0.048				1.00	0.40	0.43	0.048	0.17	0.008	3%	
20	15.60	0.25		0.15	0.000				1.00	0.28	0.25	0.000	0.07	0.000	0%	
LB	15.75	0.00	0.00	0.00	0.000	0.000	0.000	0.000	1.00	0.08	0.00	0.000	0.00	0.000		
Total Flow													0.298	100%		

Flow Measurement Details:

Metering Section Location (describe):
15m downstream of bridge

Meas. Start Time (MST):	9:57
Meas. End Time (MST):	10:21
Equipment:	ADC#1
Flow Meter Make & Model:	Ott ADC
Flow Meter Serial #:	258083
Method:	Wading
River Condition:	Moderate flow, clear colour
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 20C



Flow characteristics:

Total Flow:	0.298	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.19	(m ²)
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.09	(m/s)
Reynolds Number:	3.50E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.452	0.449
Water (°C):	13.5	14.5
Datalogger Clock:	09:43	10:46
Laptop Clock:	09:42	10:44
Battery:	12.3	12.9
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S20A-03	0.934	331.754		330.820	330.820	3/4" Pipe 4m West of logger
S20A-02			0.851	330.903	330.902	3/4" Pipe 2m NW of logger
S20A-01			0.848	330.906	330.905	3/4" Pipe 2m NE of logger
Water Level:	Cut	0.613	3.352	329.015		Time WL Surveyed: 9:47
Temporary BM			3.352	328.402	0.000	-
Turn						
Temporary BM	3.335	331.737		328.402	-	
Water Level:	Cut	0.613	3.335	329.015		Time WL Surveyed: 9:49
S20A-01			0.832	330.905	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.833	330.904	330.902	3/4" Pipe 2m NW of logger
S20A-03			0.917	330.820	330.820	3/4" Pipe 4m West of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S20A-01	0.832	331.738		330.906		
Water Level:	Cut	0.608	3.328	329.018		Time WL Surveyed: 10:26
Water Level:	Cut	0.608	3.310	329.017		Time WL Surveyed: 10:28
S20A-01	0.813	331.719		330.906		

WL Survey Summary

	Before	After
Average WL:	329.015	329.018
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	328.563	328.569

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

GG, MK	Trip Date:	18-Jun-15
GG	Date:	18-Jun-15
CJ	Date:	3-Sep-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland
 UTM Location: 492230 E, 6354940 N

Site Visit Date: August 8, 2015
 Site Visit Time (MST): 14:48

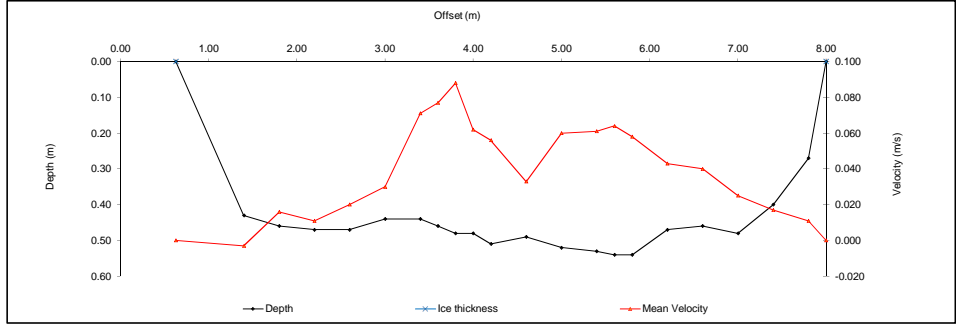


Flow Measurement:																
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.00	0.00	0.00	0.16	0.000	0.000	0.000	0.000	0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	7.80	0.27		0.16	0.011					1.00	0.30	0.27	0.011	0.08	0.001	1%
2	7.40	0.40		0.24	0.017					1.00	0.40	0.40	0.017	0.16	0.003	2%
3	7.00	0.48		0.29	0.025					1.00	0.40	0.48	0.025	0.19	0.005	4%
4	6.60	0.46		0.28	0.040					1.00	0.40	0.46	0.040	0.18	0.007	6%
5	6.20	0.47		0.28	0.043					1.00	0.40	0.47	0.043	0.19	0.008	7%
6	5.80	0.54		0.32	0.058					1.00	0.30	0.54	0.058	0.16	0.009	8%
7	5.60	0.54		0.32	0.064					1.00	0.20	0.54	0.064	0.11	0.007	6%
8	5.40	0.53		0.32	0.061					1.00	0.30	0.53	0.061	0.16	0.010	8%
9	5.00	0.52		0.31	0.060					1.00	0.40	0.52	0.060	0.21	0.012	10%
10	4.60	0.49		0.29	0.033					1.00	0.40	0.49	0.033	0.20	0.006	5%
11	4.20	0.51		0.31	0.056					1.00	0.30	0.51	0.056	0.15	0.009	7%
12	4.00	0.48		0.29	0.062					1.00	0.20	0.48	0.062	0.10	0.006	5%
13	3.80	0.48		0.29	0.088					1.00	0.20	0.48	0.088	0.10	0.008	7%
14	3.60	0.46		0.28	0.077					1.00	0.20	0.46	0.077	0.09	0.007	6%
15	3.40	0.44		0.26	0.071					1.00	0.30	0.44	0.071	0.13	0.009	8%
16	3.00	0.44		0.26	0.030					1.00	0.40	0.44	0.030	0.18	0.005	4%
17	2.60	0.47		0.28	0.020					1.00	0.40	0.47	0.020	0.19	0.004	3%
18	2.20	0.47		0.28	0.011					1.00	0.40	0.47	0.011	0.19	0.002	2%
19	1.80	0.46		0.28	0.016					1.00	0.40	0.46	0.016	0.18	0.003	2%
20	1.40	0.43		0.26	-0.003					1.00	0.59	0.43	-0.003	0.25	-0.001	-1%
LB	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.39	0.00	0.000	0.00	0.000	
Total Flow														0.122	100%	

Flow Measurement Details:

Metering Section Location (describe): 12m downstream of bridge

Meas. Start Time (MST):	15:03
Meas. End Time (MST):	15:33
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 24C



Flow characteristics:

Total Flow:	0.122	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.19	(m ²)
Wetted Width:	7.37	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.04	(m/s)
Reynolds Number:	1.59E+04	
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	0.398	0.398
Water (°C):	18.7	18.8
Datalogger Clock:	14:51	15:47
Laptop Clock:	14:50	15:45
Battery:	12.2	13.6
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	342746	-

Datalogger / Station Notes:

-Replaced solar controller and battery

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S20A-01	0.882	331.787		330.905	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.883	330.904	330.902	3/4" Pipe 2m NW of logger
S20A-03			0.968	330.819	330.820	3/4" Pipe 4m West of logger
Water Level:	Cut	2.829		328.958		Time WL Surveyed: 14:52
S20A-03			0.968	330.819	330.820	3/4" Pipe 4m West of logger
Turn						
S20A-03	0.953	331.772		330.819	330.820	3/4" Pipe 4m West of logger
Water Level:	Cut	2.812		328.960		Time WL Surveyed: 14:54
S20A-03			0.953	330.819	330.820	3/4" Pipe 4m West of logger
S20A-02			0.868	330.904	330.902	3/4" Pipe 2m NW of logger
S20A-01			0.867	330.905	330.905	3/4" Pipe 2m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S20A-01	0.868	331.773		330.905		
Water Level:	Cut	2.813		328.960		Time WL Surveyed: 15:40
Water Level:	Cut	2.799		328.959		Time WL Surveyed: 15:42
S20A-01	0.853	331.758		330.905		

WL Survey Summary

	Before	After
Average WL:	328.959	328.960
Closing Error:	0.000	-
WL Check:	0.002	0.001
Transducer Elevation	328.561	328.562

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

GG, TR	Trip Date:	8-Aug-15
GG	Date:	8-Aug-15
CJ	Date:	3-Sep-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland
 UTM Location: 492230 E, 6354940 N

Site Visit Date: September 9, 2015
 Site Visit Time (MST): 11:10

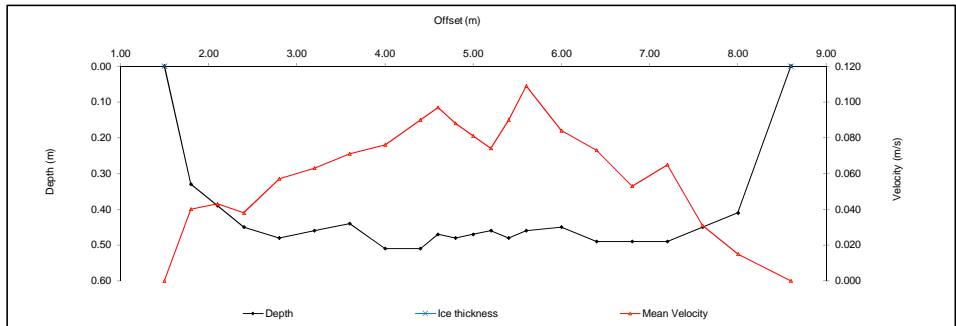


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth from WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.15	0.00	0.00	0.00	0.00	
1	1.80	0.33	0.20	0.040					1.00	0.30	0.33	0.040	0.10	0.004	2%
2	2.10	0.39	0.23	0.043					1.00	0.30	0.39	0.043	0.12	0.005	3%
3	2.40	0.45	0.27	0.038					1.00	0.35	0.45	0.038	0.16	0.006	3%
4	2.80	0.48	0.29	0.057					1.00	0.40	0.48	0.057	0.19	0.011	6%
5	3.20	0.46	0.28	0.063					1.00	0.40	0.46	0.063	0.18	0.012	6%
6	3.60	0.44	0.26	0.071					1.00	0.40	0.44	0.071	0.18	0.012	6%
7	4.00	0.51	0.31	0.076					1.00	0.40	0.51	0.076	0.20	0.016	8%
8	4.40	0.51	0.31	0.090					1.00	0.30	0.51	0.090	0.15	0.014	7%
9	4.60	0.47	0.28	0.097					1.00	0.20	0.47	0.097	0.09	0.009	5%
10	4.80	0.49	0.29	0.089					1.00	0.20	0.49	0.089	0.10	0.008	4%
11	5.00	0.47	0.28	0.081					1.00	0.20	0.47	0.081	0.09	0.008	4%
12	5.20	0.46	0.28	0.074					1.00	0.20	0.46	0.074	0.09	0.007	3%
13	5.40	0.48	0.29	0.090					1.00	0.20	0.48	0.090	0.10	0.009	4%
14	5.60	0.46	0.28	0.109					1.00	0.30	0.46	0.109	0.14	0.015	8%
15	6.00	0.45	0.27	0.084					1.00	0.40	0.45	0.084	0.18	0.015	8%
16	6.40	0.49	0.29	0.073					1.00	0.40	0.49	0.073	0.20	0.014	7%
17	6.80	0.49	0.29	0.053					1.00	0.40	0.49	0.053	0.20	0.010	5%
18	7.20	0.49	0.29	0.065					1.00	0.40	0.49	0.065	0.20	0.013	7%
19	7.60	0.45	0.27	0.031					1.00	0.40	0.45	0.031	0.18	0.006	3%
20	8.00	0.41	0.25	0.015					1.00	0.50	0.41	0.015	0.21	0.003	2%
RB	8.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.30	0.00	0.00	0.00	0.000	
Total Flow													0.196	100%	

Flow Measurement Details:

Metering Section Location (describe):
15m downstream of station

Meas. Start Time (MST):	11:35
Meas. End Time (MST):	12:06
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow, clear colour
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, breezy, 10C



Flow characteristics:

Total Flow:	0.196	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.05	(m ²)
Wetted Width:	7.10	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.06	(m/s)
Reynolds Number:	2.08E+04	
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.432	0.429
Water (°C):	9.9	10.1
Datalogger Clock:	11:16	12:23
Laptop Clock:	11:14	12:21
Battery:	14.1	13.5
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	Replaced
Vent Tube Dessicant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S20A-03	0.962	331.782		330.820	330.820	3/4" Pipe 4m West of logger
S20A-02			0.877	330.905	330.902	3/4" Pipe 2m NW of logger
S20A-01			0.876	330.906	330.905	3/4" Pipe 2m NE of logger
Water Level:	Cut		2.773	329.009		Time WL Surveyed: 11:21
Temporary BM			0.649	331.133	0.000	-
Turn						
Temporary BM	0.634	331.767		331.133		-
Water Level:	Cut		2.761	329.006		Time WL Surveyed: 11:23
S20A-01			0.860	330.907	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.882	330.905	330.902	3/4" Pipe 2m NW of logger
S20A-03			0.945	330.822	330.820	3/4" Pipe 4m West of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S20A-01	0.860	331.767		330.907		
Water Level:	Cut		2.761	329.006		Time WL Surveyed: 12:14
Water Level:	Cut		2.743	329.005		Time WL Surveyed: 12:15
S20A-01	0.841	331.748		330.907		

WL Survey Summary

	Before	After
Average WL:	329.008	329.006
Closing Error:	-0.002	-
WL Check:	0.003	0.001
Transducer Elevation	328.576	328.577

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

SM, JC	Trip Date:	9-Sep-15
SM	Date:	9-Sep-15
CJ	Date:	8-Oct-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland
 UTM Location: 492230 E, 6354940 N

Site Visit Date: October 22, 2015
 Site Visit Time (MST): 09:45

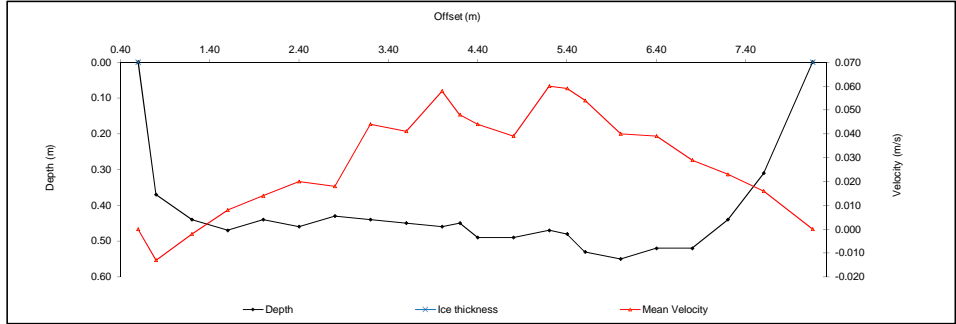


Flow Measurement:															
Measured Data								Calculated Data							
Bank/ Mmt #	Depth from bottom to WS (m)	Depth from WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.15	0.00	0.00	0.19	0.000	0.000	0.000	0.000	1.00	0.28	0.00	0.000	0.00	0.000	
1	7.60	0.31		0.26	0.016				1.00	0.48	0.31	0.016	0.15	0.002	2%
2	7.20	0.44		0.31	0.023				1.00	0.40	0.44	0.023	0.18	0.004	4%
3	6.80	0.52		0.31	0.029				1.00	0.40	0.52	0.029	0.21	0.006	6%
4	6.40	0.52		0.31	0.039				1.00	0.40	0.52	0.039	0.21	0.008	8%
5	6.00	0.55		0.33	0.040				1.00	0.40	0.55	0.040	0.22	0.009	9%
6	5.60	0.53		0.32	0.054				1.00	0.30	0.53	0.054	0.16	0.009	8%
7	5.40	0.48		0.29	0.059				1.00	0.20	0.48	0.059	0.10	0.006	5%
8	5.20	0.47		0.28	0.060				1.00	0.30	0.47	0.060	0.14	0.008	8%
9	4.80	0.49		0.29	0.039				1.00	0.40	0.49	0.039	0.20	0.008	7%
10	4.40	0.49		0.29	0.044				1.00	0.30	0.49	0.044	0.15	0.006	6%
11	4.20	0.45		0.27	0.048				1.00	0.20	0.45	0.048	0.09	0.004	4%
12	4.00	0.46		0.28	0.058				1.00	0.30	0.46	0.058	0.14	0.008	8%
13	3.60	0.45		0.27	0.041				1.00	0.40	0.45	0.041	0.18	0.007	7%
14	3.20	0.44		0.26	0.044				1.00	0.40	0.44	0.044	0.18	0.008	8%
15	2.80	0.43		0.26	0.018				1.00	0.40	0.43	0.018	0.17	0.003	3%
16	2.40	0.46		0.28	0.020				1.00	0.40	0.46	0.020	0.18	0.004	4%
17	2.00	0.44		0.26	0.014				1.00	0.40	0.44	0.014	0.18	0.002	2%
18	1.60	0.47		0.28	0.008				1.00	0.40	0.47	0.008	0.19	0.002	1%
19	1.20	0.44		0.26	-0.002				1.00	0.40	0.44	-0.002	0.18	0.000	0%
20	0.80	0.37		0.22	-0.013				1.00	0.30	0.37	-0.013	0.11	-0.001	-1%
LB	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.10	0.00	0.000	0.00	0.000	
Total Flow													0.103	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m downstream of station

Meas. Start Time (MST):	10:08
Meas. End Time (MST):	10:28
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 5C



Flow characteristics:

Total Flow:	0.103	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.29	(m ²)
Wetted Width:	7.55	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.03	(m/s)
Reynolds Number:	9.17E+03	
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	0.394	0.394
Water (°C):	6.1	6.1
Datalogger Clock:	09:49	10:32
Laptop Clock:	09:47	10:30
Battery:	13.3	14.2
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S20A-03	0.788	331.608		330.820	330.820	3/4" Pipe 4m West of logger
S20A-02			0.704	330.904	330.902	3/4" Pipe 2m NW of logger
S20A-01			0.703	330.905	330.905	3/4" Pipe 2m NE of logger
Water Level:	Cut		2.643	328.965		Time WL Surveyed: 10:00
S20A-01			0.703	330.905	330.905	3/4" Pipe 2m NE of logger
Turn						
S20A-01	0.670	331.575		330.905	330.905	3/4" Pipe 2m NE of logger
Water Level:	Cut		2.614	328.961		Time WL Surveyed: 10:03
S20A-01			0.670	330.905	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.671	330.904	330.902	3/4" Pipe 2m NW of logger
S20A-03			0.755	330.820	330.820	3/4" Pipe 4m West of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S20A-01	0.670	331.575		330.905		
Water Level:	Cut		2.608	328.967		Time WL Surveyed: 10:33
Water Level:	Cut		2.584	328.969		Time WL Surveyed: 10:35
S20A-01	0.648	331.553		330.905		

WL Survey Summary

	Before	After
Average WL:	328.963	328.968
Closing Error:	0.000	-
WL Check:	0.004	-0.002
Transducer Elevation	328.579	328.584

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

GG, JC	Trip Date:	22-Oct-15
JC	Date:	22-Oct-15
GG	Date:	27-Oct-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth
 UTM Location: 481036 E, 6348856 N

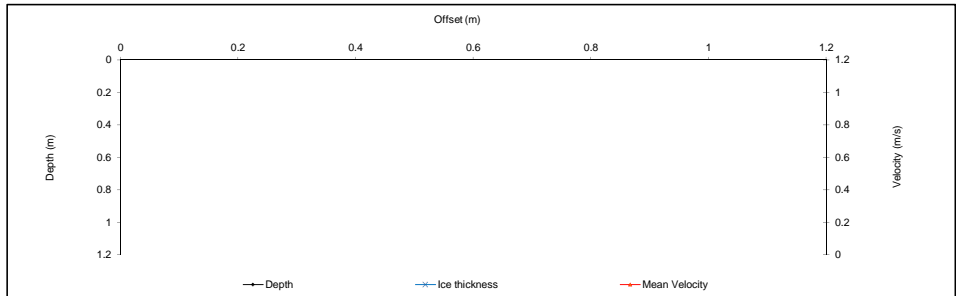
Site Visit Date: January 19, 2015
 Site Visit Time (MST): 11:47



Flow Measurement:																	
Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
Flow Measurement Not Conducted																	
															Total Flow		-

Flow Measurement Details:
 Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:

	Before	After
Transducer Reading (m):	0.968	-
Water (°C):	0.2	-
Datalogger Clock:	11:56	-
Laptop Clock:	11:55	-
Battery (Main):	13.7	13.8
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 -PLS has been fluctuating around 1.0m. Vent tube looks fine

General Notes:
 -Hanging thin ice at flow measurement section caused safety concerns, no measurement conducted

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S22-05	0.931	307.009		306.078	306.078	Pipe 1m SE of Logger
S22-03			1.435	305.574	305.584	Pipe 3m W of Logger
S22-04			1.300	305.709	305.697	Pipe 5m SW of Logger
Water Level:	Cut		3.723	303.286		Time WL Surveyed: 12:15
Temporary BM			3.647	303.362	0.000	-
Turn						
Temporary BM	3.624	306.986		303.362		-
Water Level:	Cut		3.698	303.288		Time WL Surveyed: 12:18
S22-04			1.276	305.710	305.697	Pipe 5m SW of Logger
S22-03			1.410	305.576	305.584	Pipe 3m W of Logger
S22-05			0.906	306.080	306.078	Pipe 1m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	303.287	-
Closing Error:	-0.002	-
WL Check:	0.002	-
Transducer Elevation	302.319	-

Field Personnel:

	GG, TR	Trip Date:	19-Jan-15
Data Entry Personnel:	GG	Date:	19-Jan-15
Data Check Personnel:	CJ	Date:	21-Jan-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth
 UTM Location: 481036 E, 6348856 N

Site Visit Date: February 17, 2015
 Site Visit Time (MST): 10:35

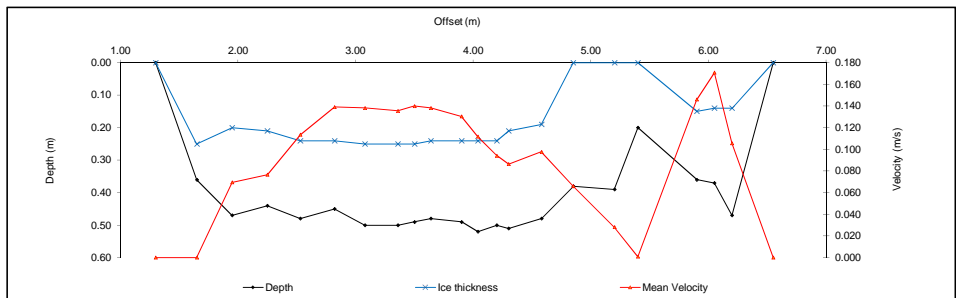


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
LB	1.30	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.18	0.00	0.000	0.00	0.000	0%	
1	1.65	0.36	0.25	0.31	0.079				0.88	0.33	0.11	0.000	0.04	0.000	0%	
2	1.95	0.47	0.20	0.34	0.087				0.88	0.30	0.27	0.070	0.08	0.006	5%	
3	2.25	0.44	0.21	0.33	0.129				0.88	0.29	0.23	0.077	0.07	0.005	4%	
4	2.53	0.48	0.24	0.36	0.158				0.88	0.29	0.24	0.114	0.07	0.008	7%	
5	2.82	0.45	0.24	0.35	0.157				0.88	0.28	0.21	0.139	0.06	0.008	7%	
6	3.08	0.50	0.25	0.38	0.154				0.88	0.27	0.25	0.138	0.07	0.009	8%	
7	3.36	0.50	0.25	0.38	0.154				0.88	0.21	0.25	0.136	0.05	0.007	6%	
8	3.50	0.49	0.25	0.37	0.159				0.88	0.14	0.24	0.140	0.03	0.005	4%	
9	3.64	0.48	0.24	0.36	0.149				0.88	0.20	0.24	0.138	0.05	0.007	6%	
10	3.90	0.49	0.24	0.37	0.127				0.88	0.20	0.25	0.130	0.05	0.007	6%	
11	4.04	0.52	0.24	0.38	0.107				0.88	0.15	0.28	0.112	0.04	0.005	4%	
12	4.20	0.50	0.24	0.37	0.098				0.88	0.13	0.26	0.094	0.03	0.003	3%	
13	4.30	0.51	0.21	0.36	0.111				0.88	0.19	0.30	0.086	0.06	0.005	4%	
14	4.58	0.48	0.19	0.34	0.075				0.88	0.28	0.29	0.098	0.08	0.008	7%	
15	4.85	0.38	0.00	0.19	0.032				0.88	0.31	0.38	0.066	0.12	0.008	7%	
16	5.20	0.39	0.00	0.20	0.001				0.88	0.28	0.39	0.028	0.11	0.003	3%	
17	5.40	0.20	0.00	0.10	0.166				0.88	0.35	0.20	0.001	0.07	0.000	0%	
18	5.90	0.36	0.15	0.26	0.194				0.88	0.32	0.21	0.146	0.07	0.010	9%	
19	6.05	0.37	0.14	0.26	0.120				0.88	0.15	0.23	0.171	0.03	0.006	5%	
20	6.20	0.47	0.14	0.31	0.000	0.000	0.000	0.000	0.88	0.25	0.33	0.106	0.08	0.009	7%	
RB	6.55	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.88	0.18	0.00	0.000	0.00	0.000	0%	
Total Flow													0.117	100%		

Flow Measurement Details:

Metering Section Location (describe): 50m downstream of station

Meas. Start Time (MST):	11:49
Meas. End Time (MST):	12:11
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -20C



Flow characteristics:

Total Flow:	0.117	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.25	(m ²)
Wetted Width:	5.25	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.06	

Logger Details:

	Before	After
Transducer Reading (m):	0.948	-
Water (°C):	0.2	-
Datalogger Clock:	10:53	-
Logger Clock:	10:52	-
Battery (Main):	15.0	-
Battery:	-	Replaced
Battery Serial #:	-	1403008
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Replaced battery and solar controller
- Replaced station modem
- RSSI: -96

General Notes:

ADV test passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S22-05	1.082	307.160		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.451	305.709	305.697	Pipe 5m SW of Logger
S22-03			1.585	305.575	305.584	Pipe 3m W of Logger
Water Level:	Cut		3.913	303.247	Time WL Surveyed:	11:35
Temporary BM			3.706	303.454	0.000	-
Turn						
Temporary BM	3.682	307.136		303.454		-
Water Level:	Cut		3.891	303.245	Time WL Surveyed:	11:42
S22-03			1.558	305.578	305.584	Pipe 3m W of Logger
S22-04			1.424	305.712	305.697	Pipe 5m SW of Logger
S22-05			1.055	306.081	306.078	Pipe 1m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	303.246	-
Closing Error:	-0.003	-
WL Check:	0.002	-
Transducer Elevation	302.298	-

Field Personnel:

	TR, GG	Trip Date:	17-Feb-15
Data Entry Personnel:	TR	Date:	17-Feb-15
Data Check Personnel:	CJ	Date:	23-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth
 UTM Location: 481036 E, 6348856 N

Site Visit Date: March 3, 2015
 Site Visit Time (MST): 11:50

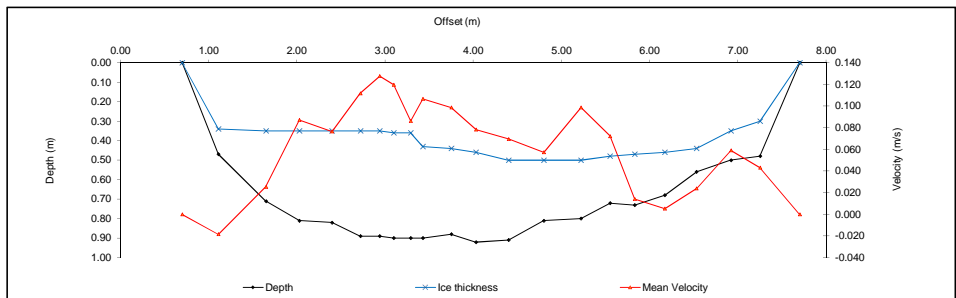


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
LB	7.70	0.00	0.00		0.000		0.000		0.000	0.88	0.23	0.00	0.000	0.00	0.000	
1	7.25	0.48	0.30	0.39	0.049					0.88	0.39	0.18	0.043	0.07	0.003	2%
2	6.92	0.50	0.35	0.43	0.067					0.88	0.36	0.15	0.059	0.05	0.003	2%
3	6.53	0.56	0.44	0.50	0.027					0.88	0.38	0.12	0.024	0.05	0.001	1%
4	6.17	0.68	0.46	0.57	0.006					0.88	0.35	0.22	0.005	0.08	0.000	0%
5	5.83	0.73	0.47	0.60	0.016					0.88	0.31	0.26	0.014	0.08	0.001	1%
6	5.55	0.72	0.48	0.60	0.082					0.88	0.31	0.24	0.072	0.07	0.005	3%
7	5.22	0.80	0.50	0.65	0.112					0.88	0.38	0.30	0.099	0.11	0.011	7%
8	4.80	0.81	0.50	0.66	0.065					0.88	0.41	0.31	0.057	0.13	0.007	5%
9	4.40	0.91	0.50	0.71	0.079					0.88	0.39	0.41	0.070	0.16	0.011	7%
10	4.03	0.92	0.46	0.69	0.089					0.88	0.33	0.46	0.078	0.15	0.012	7%
11	3.75	0.88	0.44	0.66	0.112					0.88	0.30	0.44	0.099	0.13	0.013	8%
12	3.43	0.90	0.43	0.67	0.121					0.88	0.23	0.47	0.106	0.11	0.012	7%
13	3.29	0.90	0.36	0.63	0.098					0.88	0.17	0.54	0.086	0.09	0.008	5%
14	3.10	0.90	0.36	0.63	0.136					0.88	0.18	0.54	0.120	0.09	0.011	7%
15	2.94	0.89	0.35	0.62	0.145					0.88	0.19	0.54	0.128	0.10	0.013	8%
16	2.72	0.89	0.35	0.62	0.127					0.88	0.27	0.54	0.112	0.15	0.016	10%
17	2.40	0.82	0.35	0.59	0.087					0.88	0.35	0.47	0.077	0.16	0.012	8%
18	2.03	0.81	0.35	0.58	0.099					0.88	0.38	0.46	0.087	0.17	0.015	9%
19	1.65	0.71	0.35	0.53	0.029					0.88	0.46	0.36	0.026	0.17	0.004	3%
20	1.11	0.47	0.34	0.41	-0.021					0.88	0.48	0.13	-0.018	0.06	-0.001	-1%
RB	0.70	0.00	0.00		0.00		0.00		0.00	0.88	0.21	0.00	0.000	0.00	0.000	
Total Flow														0.159	100%	

Flow Measurement Details:

Metering Section Location (describe): 45m downstream of station

Meas. Start Time (MST):	12:10
Meas. End Time (MST):	12:35
Equipment:	ADV
Method:	Ice
River Condition:	Moderate flow under ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, windy



Flow characteristics:

Total Flow:	0.159	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.18	(m ²)
Wetted Width:	7.00	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.987	
Water (°C):	0.2	
Datalogger Clock:	11:53	
Laptop Clock:	11:53	
Battery (Main):	14.9	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S22-05	0.979	307.057		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.346	305.711	305.697	Pipe 5m SW of Logger
S22-03			1.482	305.575	305.584	Pipe 3m W of Logger
Water Level:	Cut		3.765	303.292	Time WL Surveyed: 12:42	
Temporary BM			3.606	303.451	0.000	
Turn						
Temporary BM	3.593	307.044		303.451		
Water Level:	Cut		3.755	303.289	Time WL Surveyed: 12:45	
S22-03			1.467	305.577	305.584	Pipe 3m W of Logger
S22-04			1.333	305.711	305.697	Pipe 5m SW of Logger
S22-05			0.965	306.079	306.078	Pipe 1m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	303.291	-
Closing Error:	-0.001	-
WL Check:	0.003	-
Transducer Elevation	302.304	-

Field Personnel:

	TR, MP	Trip Date:	3-Mar-15
Data Entry Personnel:	TR	Date:	3-Mar-15
Data Check Personnel:	CJ	Date:	23-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth
 UTM Location: 481036 E, 6348856 N

Site Visit Date: April 23, 2015
 Site Visit Time (MST): 09:35

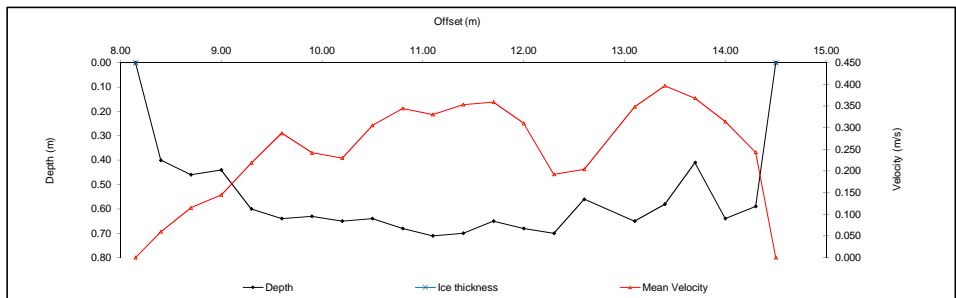


Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
LB	8.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.13	0.00	0.00	0.00	0.00		
1	8.40	0.40	0.24	0.060					1.00	0.28	0.40	0.060	0.11	0.007	1%	
2	8.70	0.46	0.28	0.115					1.00	0.30	0.46	0.115	0.14	0.016	2%	
3	9.00	0.44	0.26	0.145					1.00	0.30	0.44	0.145	0.13	0.019	2%	
4	9.30	0.60	0.36	0.219					1.00	0.30	0.60	0.219	0.18	0.039	4%	
5	9.60	0.64	0.38	0.287					1.00	0.30	0.64	0.287	0.19	0.055	5%	
6	9.90	0.63	0.38	0.242					1.00	0.30	0.63	0.242	0.19	0.046	4%	
7	10.20	0.65	0.39	0.230					1.00	0.30	0.65	0.230	0.19	0.045	4%	
8	10.50	0.64	0.38	0.305					1.00	0.30	0.64	0.305	0.19	0.059	6%	
9	10.80	0.68	0.41	0.344					1.00	0.30	0.68	0.344	0.20	0.070	7%	
10	11.10	0.71	0.43	0.330					1.00	0.30	0.71	0.330	0.21	0.070	7%	
11	11.40	0.70	0.42	0.353					1.00	0.30	0.70	0.353	0.21	0.074	7%	
12	11.70	0.65	0.39	0.359					1.00	0.30	0.65	0.359	0.19	0.070	7%	
13	12.00	0.68	0.41	0.310					1.00	0.30	0.68	0.310	0.20	0.063	6%	
14	12.30	0.70	0.42	0.192					1.00	0.30	0.70	0.192	0.21	0.040	4%	
15	12.60	0.56	0.34	0.204					1.00	0.40	0.56	0.204	0.22	0.046	4%	
16	13.10	0.65	0.39	0.348					1.00	0.40	0.65	0.348	0.26	0.090	9%	
17	13.40	0.58	0.35	0.397					1.00	0.30	0.58	0.397	0.17	0.069	7%	
18	13.70	0.41	0.25	0.368					1.00	0.30	0.41	0.368	0.12	0.045	4%	
19	14.00	0.64	0.38	0.314					1.00	0.30	0.64	0.314	0.19	0.060	6%	
20	14.30	0.59	0.35	0.243					1.00	0.25	0.59	0.243	0.15	0.036	4%	
RB	14.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.10	0.00	0.00	0.00	0.00		
Total Flow													1.02	100%		

Flow Measurement Details:

Metering Section Location (describe): 40m upstream of station near bridge

Meas. Start Time (MST):	10:02
Meas. End Time (MST):	10:27
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow, no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, SC



Flow characteristics:

Total Flow:	1.02	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.68	(m ²)
Wetted Width:	6.35	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	1.167	1.165
Water (°C):	2.8	2.8
Datalogger Clock:	09:42	10:40
Lapto Clock:	09:41	10:39
Battery (Main):	14.1	14.1
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-ADV Test run: results good

General Notes:

-ADV Test run: results good

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S22-05	0.628	306.906		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.194	305.712	305.697	Pipe 5m SW of Logger
S22-03			1.330	305.576	305.584	Pipe 3m W of Logger
Water Level:						
Cut			3.433	303.473		Time WL Surveyed: 9:50
S22-03			1.330	305.576	305.584	Pipe 3m W of Logger
Turn						
S22-03	1.318	306.894		305.576	305.584	Pipe 3m W of Logger
Water Level:	Cut		3.422	303.472		Time WL Surveyed: 9:52
S22-03			1.318	305.576	305.584	Pipe 3m W of Logger
S22-04			1.184	305.710	305.697	Pipe 5m SW of Logger
S22-05			0.817	306.077	306.078	Pipe 1m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S22-03	1.318	306.894		305.576		
Water Level:	Cut	1.080	4.502	303.472		Time WL Surveyed: 10:35
Water Level:	Cut	1.080	4.486	303.472		Time WL Surveyed: 10:37
S22-03	1.302	306.878		305.576		

WL Survey Summary

	Before	After
Average WL:	303.473	303.472
Closing Error:	0.001	-
WL Check:	0.001	0.000
Transducer Elevation	302.306	302.307

Field Personnel:

	SM, GG	Trip Date:	23-Apr-15
Data Entry Personnel:	SM	Date:	23-Apr-15
Data Check Personnel:	CJ	Date:	24-Apr-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth
 UTM Location: 481036 E, 6348856 N

Site Visit Date: June 12, 2015
 Site Visit Time (MST): 11:50



Flow Measurement Details:	
Metering Section Location (describe): 40m upstream of station, under bridge	
Meas. Start Time (MST):	12:20
Meas. End Time (MST):	12:41
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 21 C

Flow Characteristics:	
Total Flow:	0.780 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	3.96 (m ²)
Wetted Width:	8.16 (m)
Hydraulic Depth:	0.49 (m)
Mean Velocity:	0.20 (m/s)
Reynolds Number:	8.27E+04
Froude Number:	0.69

Logger Details:		
	Before	After
Transducer Reading (m):	1.102	1.105
Water (°C):	14.8	14.9
Datalogger Clock:	11:56	12:47
Laptop Clock:	11:55	12:46
Battery (Main):	13.6	13.5
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Mini Tube Desiccant:	-	Good
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:								
System Information:			System Setup:			Bank Offsets:		
System Type:	Sontek RS-M9	Transducer Depth (m):	-	0.05	LB:	10.70		
Serial Number:	4712	Bainby (gpd):	-	-	RB:	3.20		
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes			
		ADCP Temperature (°C):	-	17.0				
Discharge Calculation Settings:			Measurement Results:					
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)	
Track Reference: Bottom Track	3	0.00	8.63	3.99	0.189	0.755	-3.23%	63.4
Depth Reference: Vertical Beam	4	0.00	8.18	4.16	0.191	0.797	2.15%	61.1
Coordinate System: ENL	6	0.00	7.95	3.77	0.210	0.793	1.64%	65.6
Left Method: Sloped Bank	7	0.00	8.09	3.83	0.202	0.776	-0.54%	63.8
Right Method: Sloped Bank	8	0.00	7.95	4.04	0.193	0.78	-0.03%	63.8
Top Fit Type: Power Fit								
Bottom Fit Type: Power Fit								
		Mean:	8.16	3.96	0.197	0.780		
		SD:	0.25	0.14	0.008	0.015		
		COV:	0.03	0.04	0.040	0.019		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S22-06	0.751	306.829	-	306.078	306.078	Pipe 1m SE of Logger
S22-04	-	-	1.116	305.713	305.697	Pipe 5m SW of Logger
S22-03	-	-	1.251	305.578	305.584	Pipe 3m W of Logger
Water Level:						
Cut	-	-	3.420	303.409	303.409	Time WL Surveyed: 12:00
S22-03	-	-	1.251	305.578	305.584	Pipe 3m W of Logger
Turn						
S22-03	1.220	306.798	-	305.578	305.584	Pipe 3m W of Logger
Water Level:						
Cut	-	-	3.389	303.409	303.409	Time WL Surveyed: 12:02
S22-03	-	-	1.220	305.578	305.584	Pipe 3m W of Logger
S22-04	-	-	1.085	305.713	305.697	Pipe 5m SW of Logger
S22-05	-	-	0.721	306.077	306.078	Pipe 1m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S22-03	1.230	306.808	-	305.578	305.578	
Water Level:						
Cut	-	-	3.384	303.424	303.424	Time WL Surveyed: 12:50
Water Level:						
Cut	-	-	3.352	303.423	303.423	Time WL Surveyed: 12:51
S22-03	1.197	306.775	-	305.578	305.578	

WL Survey Summary			Level Survey Equipment:	
	Before	After	Level #:	Level#4
Average WL:	303.409	303.424	Make & Model:	Nikon AC-2S
Closing Error:	0.001	-	Serial #:	668785
WL Check:	0.000	0.001		
Transducer Elevation	302.307	302.319		

Field Personnel:			
Data Entry Personnel:	TR, GG	Trip Date:	12-Jun-15
Data Check Personnel:	TR	Date:	12-Jun-15
Entered Digitally in the Field:	CJ	Date:	25-Jun-15

Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth
 UTM Location: 481036 E, 6348856 N

Site Visit Date: August 11, 2015
 Site Visit Time (MST): 13:20

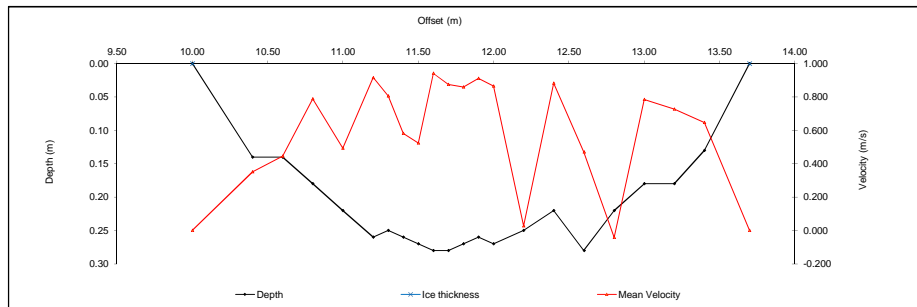


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	13.70	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	13.40	0.13		0.08	0.646					1.00	0.25	0.13	0.646	0.03	0.021	5%
2	13.20	0.18		0.11	0.728					1.00	0.20	0.18	0.728	0.04	0.026	6%
3	13.00	0.18		0.11	0.784					1.00	0.20	0.18	0.784	0.04	0.028	6%
4	12.80	0.22		0.13	-0.041					1.00	0.20	0.22	-0.041	0.04	-0.002	0%
5	12.60	0.28		0.17	0.471					1.00	0.20	0.28	0.471	0.06	0.026	6%
6	12.40	0.22		0.13	0.853					1.00	0.20	0.22	0.853	0.04	0.039	9%
7	12.20	0.25		0.15	0.028					1.00	0.20	0.25	0.028	0.05	0.001	0%
8	12.00	0.27		0.16	0.865					1.00	0.15	0.27	0.865	0.04	0.035	8%
9	11.90	0.26		0.16	0.912					1.00	0.10	0.26	0.912	0.03	0.024	5%
10	11.80	0.27		0.16	0.860					1.00	0.10	0.27	0.860	0.03	0.023	5%
11	11.70	0.28		0.17	0.874					1.00	0.10	0.28	0.874	0.03	0.024	6%
12	11.60	0.29		0.17	0.941					1.00	0.10	0.29	0.941	0.03	0.026	6%
13	11.50	0.27		0.16	0.524					1.00	0.10	0.27	0.524	0.03	0.014	3%
14	11.40	0.26		0.16	0.582					1.00	0.10	0.26	0.582	0.03	0.015	3%
15	11.30	0.25		0.15	0.806					1.00	0.10	0.25	0.806	0.03	0.020	5%
16	11.20	0.26		0.16	0.916					1.00	0.15	0.26	0.916	0.04	0.036	8%
17	11.00	0.22		0.13	0.494					1.00	0.20	0.22	0.494	0.04	0.022	5%
18	10.80	0.18		0.11	0.789					1.00	0.20	0.18	0.789	0.04	0.028	7%
19	10.60	0.14		0.08	0.445					1.00	0.20	0.14	0.445	0.03	0.012	3%
20	10.40	0.14		0.08	0.352					1.00	0.30	0.14	0.352	0.04	0.015	3%
LB	10.00	0.00	0.00		0.00				0.00	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.436	100%	

Flow Measurement Details:

Metering Section Location (describe):
 Across from station

Meas. Start Time (MST):	13:52
Meas. End Time (MST):	14:14
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, light breeze, 25C



Flow characteristics:

Total Flow:	0.436	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.72	(m ²)
Wetted Width:	3.70	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.61	(m/s)
Reynolds Number:	1.15E+05	
Froude Number:	0.44	

Logger Details:

	Before	After
Transducer Reading (m):	0.998	0.999
Water (°C):	19.4	19.4
Datalogger Clock:	13:27	14:22
Laptop Clock:	13:26	14:21
Battery:	13.4	13.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	346248	-
Logger# (if replaced):	18166	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S22-05	0.879	306.957		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.247	305.710	305.697	Pipe 5m SW of Logger
S22-03			1.382	305.575	305.584	Pipe 3m W of Logger
Water Level:	Cut	0.462	4.098	303.311		Time WL Surveyed: 13:42
S22-03			1.382	305.575	305.584	Pipe 3m W of Logger
Turn						
S22-03	1.422	306.997		305.575	305.584	Pipe 3m W of Logger
Water Level:	Cut	0.465	4.147	303.315		Time WL Surveyed: 13:37
S22-03			1.422	305.575	305.584	Pipe 3m W of Logger
S22-04			1.288	305.709	305.697	Pipe 5m SW of Logger
S22-05			0.521	306.076	306.078	Pipe 1m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S22-03	1.381	306.956		305.575		
Water Level:	Cut	0.369	4.007	303.308		Time WL Surveyed: 14:24
Water Level:	Cut	0.362	3.968	303.312		Time WL Surveyed: 14:25
S22-03	1.343	306.918		305.575		

WL Survey Summary

	Before	After
Average WL:	303.313	303.310
Closing Error:	0.002	
WL Check:	0.004	-0.004
Transducer Elevation	302.315	302.311

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, JC	Trip Date:	11-Aug-15
Data Check Personnel:	CJ	Date:	17-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth
 UTM Location: 481036 E, 6348856 N

Site Visit Date: September 21, 2015
 Site Visit Time (MST): 15:12

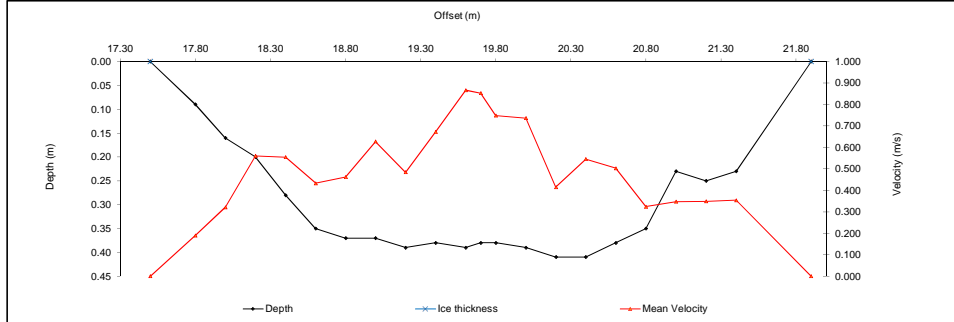


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	17.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	17.80	0.09		0.05	0.190					1.00	0.25	0.09	0.190	0.02	0.004	1%
2	18.00	0.16		0.10	0.321					1.00	0.20	0.16	0.321	0.03	0.010	2%
3	18.20	0.20		0.12	0.561					1.00	0.20	0.20	0.561	0.04	0.022	3%
4	18.40	0.28		0.17	0.555					1.00	0.20	0.28	0.555	0.06	0.031	5%
5	18.60	0.35		0.21	0.433					1.00	0.20	0.35	0.433	0.07	0.030	5%
6	18.80	0.37		0.22	0.462					1.00	0.20	0.37	0.462	0.07	0.034	5%
7	19.00	0.37		0.22	0.627					1.00	0.20	0.37	0.627	0.07	0.046	7%
8	19.20	0.39		0.23	0.485					1.00	0.20	0.39	0.485	0.08	0.038	6%
9	19.40	0.38		0.23	0.673					1.00	0.20	0.38	0.673	0.08	0.051	8%
10	19.60	0.39		0.23	0.867					1.00	0.15	0.39	0.867	0.06	0.051	8%
11	19.70	0.38		0.23	0.853					1.00	0.10	0.38	0.853	0.04	0.032	5%
12	19.80	0.38		0.23	0.748					1.00	0.15	0.38	0.748	0.06	0.043	7%
13	20.00	0.39		0.23	0.736					1.00	0.20	0.39	0.736	0.08	0.057	9%
14	20.20	0.41		0.25	0.415					1.00	0.20	0.41	0.415	0.08	0.034	5%
15	20.40	0.41		0.25	0.546					1.00	0.20	0.41	0.546	0.08	0.045	7%
16	20.60	0.38		0.23	0.503					1.00	0.20	0.38	0.503	0.08	0.038	6%
17	20.80	0.35		0.21	0.324					1.00	0.20	0.35	0.324	0.07	0.023	3%
18	21.00	0.23		0.14	0.347					1.00	0.20	0.23	0.347	0.05	0.016	2%
19	21.20	0.25		0.15	0.349					1.00	0.20	0.25	0.349	0.05	0.017	3%
20	21.40	0.23		0.14	0.354					1.00	0.35	0.23	0.354	0.08	0.028	4%
LB	21.90	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.653	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	15:25
Meas. End Time (MST):	15:50
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 13C



Flow characteristics:

Total Flow:	0.653	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.24	(m ²)
Wetted Width:	4.40	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.53	(m/s)
Froude Number:	0.32	

Logger Details:

	Before	After
Transducer Reading (m):	1.131	1.132
Water (°C):	9.2	9.2
Datalogger Clock:	15:14	15:52
Laptop Clock:	15:13	15:53
Battery (Main):	14.1	13.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Beaver dam observed under the bridge, upstream of the station.

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S22-05	0.984	307.062		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.348	305.714	305.697	Pipe 5m SW of Logger
S22-03			1.486	305.576	305.584	Pipe 3m W of Logger
Water Level:	Cut	0.678	4.300	303.440	Time WL Surveyed:	15:17
Temporary BM			4.300	302.762	0.000	-
Turn						
Temporary BM	4.288	307.050		302.762		-
Water Level:	Cut	0.678	4.288	303.440	Time WL Surveyed:	15:19
S22-03			1.473	305.577	305.584	Pipe 3m W of Logger
S22-04			1.337	305.713	305.697	Pipe 5m SW of Logger
S22-05			0.972	306.078	306.078	Pipe 1m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S22-03	1.473	307.050		305.577		
Water Level:	Cut	0.636	4.243	303.443	Time WL Surveyed:	15:53
Water Level:	Cut	0.636	4.230	303.443	Time WL Surveyed:	15:56
S22-03	1.460	307.037		305.577		

WL Survey Summary

	Before	After
Average WL:	303.440	303.443
Closing Error:	0.000	-
WL Check:	0.000	0.000
Transducer Elevation	302.309	302.311

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

GG, TR	Trip Date:	21-Sep-15
GG	Date:	21-Sep-15
DW	Date:	24-Sep-15
Yes		

Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth
 UTM Location: 481036 E, 6348856 N

Site Visit Date: October 15, 2015
 Site Visit Time (MST): 10:51

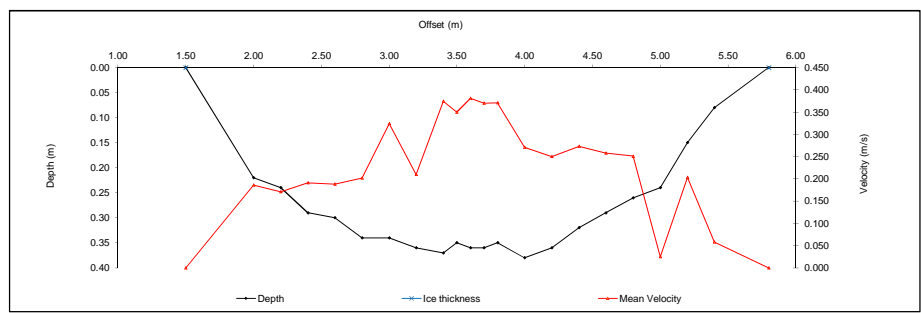


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.50	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	2.00	0.22		0.13	0.186					1.00	0.35	0.22	0.186	0.08	0.014	5%
2	2.20	0.24		0.14	0.171					1.00	0.20	0.24	0.171	0.05	0.008	3%
3	2.40	0.29		0.17	0.191					1.00	0.20	0.29	0.191	0.06	0.011	4%
4	2.60	0.30		0.18	0.188					1.00	0.20	0.30	0.188	0.06	0.011	4%
5	2.80	0.34		0.20	0.202					1.00	0.20	0.34	0.202	0.07	0.014	5%
6	3.00	0.34		0.23	0.224					1.00	0.20	0.34	0.224	0.07	0.022	8%
7	3.20	0.36		0.22	0.210					1.00	0.20	0.36	0.210	0.07	0.015	6%
8	3.40	0.37		0.22	0.374					1.00	0.15	0.37	0.374	0.06	0.021	8%
9	3.50	0.35		0.21	0.350					1.00	0.10	0.35	0.350	0.03	0.012	5%
10	3.60	0.36		0.22	0.381					1.00	0.10	0.36	0.381	0.04	0.014	5%
11	3.70	0.36		0.22	0.370					1.00	0.10	0.36	0.370	0.04	0.013	5%
12	3.80	0.35		0.21	0.371					1.00	0.15	0.35	0.371	0.05	0.019	7%
13	4.00	0.38		0.23	0.271					1.00	0.20	0.38	0.271	0.08	0.021	8%
14	4.20	0.36		0.22	0.250					1.00	0.20	0.36	0.250	0.07	0.018	7%
15	4.40	0.32		0.19	0.273					1.00	0.20	0.32	0.273	0.06	0.017	7%
16	4.60	0.29		0.17	0.258					1.00	0.20	0.29	0.258	0.06	0.015	6%
17	4.80	0.26		0.16	0.251					1.00	0.20	0.26	0.251	0.05	0.013	5%
18	5.00	0.24		0.14	0.025					1.00	0.20	0.24	0.025	0.05	0.001	0%
19	5.20	0.15		0.09	0.203					1.00	0.20	0.15	0.203	0.03	0.006	2%
20	5.40	0.08		0.05	0.058					1.00	0.30	0.08	0.058	0.02	0.001	1%
RB	5.80	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.268	100%	

Flow Measurement Details:

Metering Section Location (describe):
Adjacent to station

Meas. Start Time (MST):	11:02
Meas. End Time (MST):	11:21
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 10C



Flow characteristics:

Total Flow:	0.268	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.09	(m ²)
Wetted Width:	4.30	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.25	(m/s)
Reynolds Number:	4.16E+04	
Froude Number:	0.16	

Logger Details:

	Before	After
Transducer Reading (m):	1.112	1.111
Water (°C):	5.9	5.8
Datalogger Clock:	10:53	11:29
Laptop Clock:	10:53	11:27
Battery:	14.2	14.1
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S22-05	0.840	306.918		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.206	305.712	305.713	Pipe 5m SW of Logger
S22-03			1.342	305.576	305.577	Pipe 3m W of Logger
Water Level:	Cut	0.651	4.148	303.421	Time WL Surveyed: 10:57	
Temporary BM			4.148	302.770	0.000	
Turn						
Temporary BM	4.130	306.900		302.770		
Water Level:	Cut	0.651	4.130	303.421	Time WL Surveyed: 10:59	
S22-03			1.322	305.578	305.577	Pipe 3m W of Logger
S22-04			1.187	305.713	305.713	Pipe 5m SW of Logger
S22-05			0.822	306.078	306.078	Pipe 1m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S22-03	1.322	306.899		305.577		
Water Level:	Cut	0.596	4.089	303.426	Time WL Surveyed: 11:24	
Water Level:	Cut	0.596	4.047	303.425	Time WL Surveyed: 11:26	
S22-03	1.299	306.876		305.577		

WL Survey Summary

	Before	After
Average WL:	303.421	303.426
Closing Error:	0.000	0.001
WL Check:	0.000	0.001
Transducer Elevation	302.309	302.315

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	15-Oct-15
Data Check Personnel:	CJ	Date:	15-Oct-15
Entered Digitally in the Field:	Yes	Date:	19-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth
 UTM Location: 481036 E, 6348856 N

Site Visit Date: November 30, 2015
 Site Visit Time (MST): 11:31

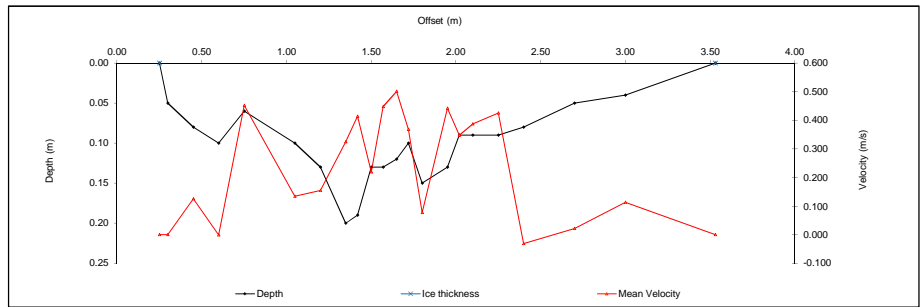


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.25	0.00	0.00		0.000		0.000		0.000	1.00	0.03	0.00	0.000	0.00	0.000	
1	0.30	0.05		0.03	0.000					1.00	0.10	0.05	0.000	0.01	0.000	0%
2	0.45	0.08		0.05	0.126					1.00	0.15	0.08	0.126	0.01	0.002	2%
3	0.60	0.10		0.06	-0.001					1.00	0.15	0.10	-0.001	0.02	0.000	0%
4	0.75	0.06		0.04	0.452					1.00	0.23	0.06	0.452	0.01	0.006	10%
5	1.05	0.10		0.06	0.134					1.00	0.23	0.10	0.134	0.02	0.003	5%
6	1.20	0.13		0.08	0.155					1.00	0.15	0.13	0.155	0.02	0.003	5%
7	1.35	0.20		0.12	0.325					1.00	0.11	0.20	0.325	0.02	0.007	12%
8	1.42	0.19		0.11	0.414					1.00	0.08	0.19	0.414	0.01	0.006	10%
9	1.50	0.13		0.08	0.219					1.00	0.08	0.13	0.219	0.01	0.002	3%
10	1.57	0.13		0.08	0.448					1.00	0.07	0.13	0.448	0.01	0.004	7%
11	1.65	0.12		0.07	0.501					1.00	0.08	0.12	0.501	0.01	0.005	7%
12	1.72	0.10		0.06	0.368					1.00	0.08	0.10	0.368	0.01	0.003	4%
13	1.80	0.15		0.09	0.077					1.00	0.12	0.15	0.077	0.02	0.001	2%
14	1.95	0.13		0.08	0.442					1.00	0.11	0.13	0.442	0.01	0.006	10%
15	2.02	0.09		0.05	0.348					1.00	0.08	0.09	0.348	0.01	0.002	4%
16	2.10	0.09		0.05	0.387					1.00	0.12	0.09	0.387	0.01	0.004	6%
17	2.25	0.09		0.05	0.425					1.00	0.15	0.09	0.425	0.01	0.006	9%
18	2.40	0.08		0.05	-0.031					1.00	0.23	0.08	-0.031	0.02	-0.001	-1%
19	2.70	0.05		0.03	0.021					1.00	0.30	0.05	0.021	0.02	0.000	1%
20	3.00	0.04		0.02	0.113					1.00	0.42	0.04	0.113	0.02	0.002	3%
LB	3.53	0.00	0.00		0.00		0.00		0.00	1.00	0.27	0.00	0.000	0.00	0.000	
Total Flow														0.062	100%	

Flow Measurement Details:

Metering Section Location (describe):
 Adjacent to station

Meas. Start Time (MST):	12:05
Meas. End Time (MST):	12:37
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Partially open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -1C



Flow characteristics:

Total Flow:	0.062	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.27	(m ²)
Wetted Width:	3.28	(m)
Hydraulic Depth:	0.08	(m)
Mean Velocity:	0.23	(m/s)
Reynolds Number:	1.07E+04	
Froude Number:	0.25	

Logger Details:

	Before	After
Transducer Reading (m):	0.933	0.905
Water (°C):	0.7	0.3
Datalogger Clock:	11:35	12:04
Laptop Clock:	11:34	12:03
Battery:	13.8	14.7
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- Transducer moved at 11:48 computer time, auger caught in anchor line
- Flow was turbulent due to upstream ice effects

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S22-05	0.951	307.029		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.317	305.712	305.713	Pipe 5m SW of Logger
S22-03			1.456	305.573	305.577	Pipe 3m W of Logger
Water Level:	Cut		3.787	303.242		Time WL Surveyed: 11:51
Temporary BM			3.742	303.287	0.000	
Turn						
Temporary BM	3.718	307.005		303.287		
Water Level:	Cut		3.767	303.238		Time WL Surveyed: 11:57
S22-03			1.431	305.574	305.577	Pipe 3m W of Logger
S22-04			1.293	305.712	305.713	Pipe 5m SW of Logger
S22-05			0.927	306.078	306.078	Pipe 1m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	303.240	-
Closing Error:	0.000	-
WL Check:	0.004	-
Transducer Elevation	302.307	-

Level Survey Equipment:

Level #:	David#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

	GG, JM	Trip Date:	30-Nov-15
Data Entry Personnel:	GG	Date:	30-Nov-15
Data Check Personnel:	CJ	Date:	10-Dec-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: Site: S24 - Athabasca River below Eymundson Creek
 UTM Location: 466313 E, 6372760 N

Site Visit Date: January 14, 2015
 Site Visit Time (MST): 09:30

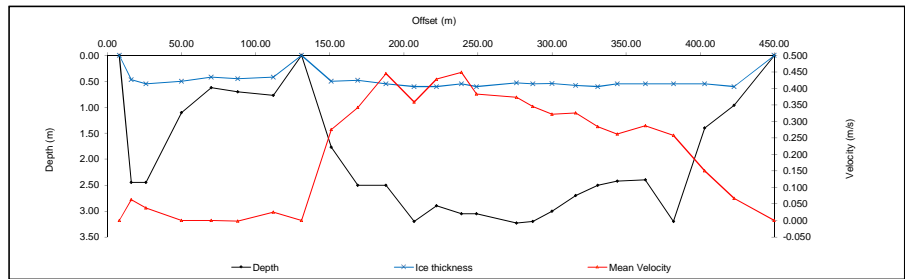


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.00	0.00	0.00		0.000				0.000	1.00	4.00	0.00	0.000	0.00	0.000	
1	16.00	2.45	0.47		2.05	0.070	0.87	0.057	1.00	9.00	1.98	0.064	17.82	1.132	1%	
2	26.00	2.45	0.55		2.07	0.036	0.93	0.039	1.00	17.00	1.90	0.038	32.30	1.211	1%	
3	50.00	1.10	0.50	0.80	0.000				0.88	22.00	0.60	0.000	13.20	0.000	0%	
4	70.00	0.62	0.42	0.52	0.000				0.88	19.00	0.20	0.000	3.80	0.000	0%	
5	86.00	0.70	0.45	0.58	-0.002				0.88	21.00	0.25	-0.002	5.25	-0.009	0%	
6	112.00	0.77	0.42	0.60	0.029				0.88	21.50	0.35	0.026	7.53	0.192	0%	
7	131.00	0.00	0.00	0.00	0.000				0.88	19.50	0.00	0.000	0.00	0.000	0%	
8	151.00	1.77	0.50			1.52	0.272	0.75	0.278	1.00	19.00	1.27	0.275	24.13	6.636	3%
9	169.00	2.50	0.48			2.10	0.357	0.88	0.327	1.00	18.50	2.02	0.342	37.37	12.781	6%
10	188.00	2.50	0.55			2.11	0.443	0.94	0.447	1.00	19.00	1.95	0.445	37.05	16.487	8%
11	207.00	3.20	0.60			2.68	0.317	1.12	0.401	1.00	17.00	2.60	0.359	44.20	15.868	8%
12	222.00	2.90	0.60			2.44	0.411	1.06	0.445	1.00	16.00	2.30	0.428	36.80	15.750	8%
13	239.00	3.05	0.55			2.55	0.432	1.05	0.465	1.00	13.50	2.50	0.449	33.75	15.137	8%
14	249.00	3.05	0.60			2.56	0.369	1.09	0.397	1.00	18.50	2.45	0.383	45.33	17.259	9%
15	276.00	3.23	0.53			2.69	0.356	1.07	0.390	1.00	19.00	2.70	0.373	51.30	19.135	10%
16	287.00	3.20	0.55			2.67	0.308	1.08	0.383	1.00	12.00	2.65	0.346	31.80	10.987	6%
17	300.00	3.00	0.54			2.51	0.305	1.03	0.339	1.00	14.50	2.46	0.322	35.67	11.486	6%
18	316.00	2.70	0.58			2.28	0.310	1.00	0.342	1.00	15.50	2.12	0.326	32.86	10.712	5%
19	331.00	2.50	0.60			2.12	0.293	0.98	0.275	1.00	14.00	1.90	0.284	26.60	7.554	4%
20	344.00	2.42	0.55			2.05	0.222	0.92	0.302	1.00	16.00	1.87	0.262	29.82	7.838	4%
21	363.00	2.40	0.55			2.03	0.273	0.92	0.301	1.00	19.00	1.85	0.287	35.15	10.088	5%
22	382.00	3.20	0.55			2.67	0.266	1.08	0.250	1.00	20.00	2.65	0.258	53.00	13.674	7%
23	403.00	1.40	0.55			1.23	0.166	0.72	0.134	1.00	20.50	0.85	0.150	17.43	2.614	1%
24	423.00	0.96	0.60	0.78	0.076				0.88	23.50	0.36	0.067	8.46	0.566	0%	
LB	450.00	0.00	0.00		0.00				0.00	0.88	13.50	0.00	0.000	0.00	0.000	
Total Flow														197	100%	

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	10:15
Meas. End Time (MST):	11:50
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -5C



Flow characteristics:

Total Flow:	197	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	660.71	(m ²)
Wetted Width:	442.00	
Hydraulic Depth:	1.49	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.88	

Logger Details:

	Before	After
Transducer #1 (0-4m) Reading (m):	-	-
Transducer #2 (0-10m) Reading (m):	2.155	2.155
Water Temperature #1 (°C):	-	-
Water Temperature #2 (°C):	0.5	0.5
Datalogger Clock:	12:13	12:20
Laptop Clock:	12:13	12:20
Battery (Main):	12.5	13.0
Battery:	Replaced	
Battery Serial #:		103001
Enclosure Dissicant:		Good
Vent Tube Dissicant:		Good
PT# (if replaced):		
Logger# (if replaced):		

Datalogger / Station Notes:

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General Notes:

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Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S24-05	0.816	231.881		231.065	231.065	3/4" Pipe 1.5m South of logger
S24-04			1.043	230.838	230.838	3/4" Pipe 5m N of logger
S24-06			1.154	230.727	230.725	3/4" Pipe 3m North of logger
Water Level:			5.789	226.092		
Temporary BM			5.800	226.081	0.000	
Turn						
Temporary BM	5.781	231.862		226.081		
Water Level:			5.773	226.089		
Water Level:						Time WL Surveyed: 12:30
S24-06			1.138	230.724	230.725	3/4" Pipe 3m North of logger
S24-04			1.025	230.837	230.838	3/4" Pipe 5m N of logger
S24-05			0.798	231.064	231.065	3/4" Pipe 1.5m South of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	226.091	-
Closing Error:	0.001	-
WL Check:	0.003	-
Transducer Elevation	-	-

Field Personnel:

MP DW	Trip Date:	14-Jan-15
MP DW	Date:	14-Jan-15
SG	Date:	13-May-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek
 UTM Location: 466313 E, 6372760 N

Site Visit Date: February 9, 2015
 Site Visit Time (MST): 09:45

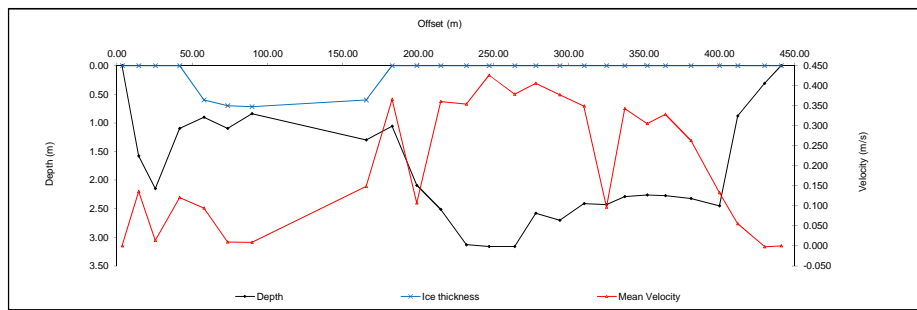


Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mnt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)							
LB	3.40	0.00	0.00		0.000		0.000		0.000	1.00	5.50	0.00	0.000	0.00	0.000								
1	14.40	1.58	0.00		0.136	1.26	0.000	0.32		1.00	11.00	1.58	0.136	17.38	2.364	1%							
2	25.40	2.15	0.00		0.014	1.72	0.43			1.00	13.60	2.15	0.014	29.24	0.409	0%							
3	41.60	1.10	0.00		0.121	0.88	0.22			1.00	16.10	1.10	0.121	17.71	2.143	1%							
4	57.60	0.90	0.60	0.75	0.107					0.88	15.90	0.30	0.094	4.77	0.449	0%							
5	73.40	1.10	0.70		0.011					0.88	16.00	0.40	0.010	6.40	0.062	0%							
6	89.60	0.84	0.72	0.78	0.010					0.88	46.05	0.12	0.009	5.53	0.049	0%							
7	165.50	1.30	0.60	0.95	0.169					0.88	46.50	0.70	0.149	32.55	4.841	3%							
8	182.60	1.06	0.00		0.366	0.85	0.21			1.00	16.75	1.06	0.366	17.76	6.498	3%							
9	199.00	2.09	0.00		0.107	1.67	0.42			1.00	16.20	2.09	0.107	33.86	3.623	2%							
10	215.00	2.51	0.00		0.360	2.01	0.50			1.00	16.50	2.51	0.360	41.42	14.909	8%							
11	232.00	3.13	0.00		0.354	2.50	0.63			1.00	16.00	3.13	0.354	50.08	17.728	9%							
12	247.00	3.16	0.00		0.426	2.53	0.63			1.00	16.00	3.16	0.426	50.56	21.539	11%							
13	264.00	3.16	0.00		0.379	2.53	0.63			1.00	15.50	3.16	0.379	48.98	18.563	10%							
14	278.00	2.58	0.00		0.406	2.06	0.52			1.00	15.00	2.58	0.406	38.70	15.712	8%							
15	294.00	2.70	0.00		0.377	2.16	0.54			1.00	16.00	2.70	0.377	43.20	16.286	9%							
16	310.00	2.41	0.00		0.349	1.93	0.48			1.00	15.50	2.41	0.349	37.36	13.037	7%							
17	325.00	2.43	0.00		0.097	1.94	0.49			1.00	13.50	2.43	0.097	32.81	3.182	2%							
18	337.00	2.29	0.00		0.343	1.83	0.46			1.00	13.50	2.29	0.343	30.92	10.604	6%							
19	352.00	2.26	0.00		0.305	1.81	0.45			1.00	13.50	2.26	0.305	30.51	9.306	5%							
20	364.00	2.27	0.00		0.328	1.82	0.45			1.00	14.50	2.27	0.328	32.92	10.796	6%							
21	381.00	2.32	0.00		0.263	1.86	0.46			1.00	18.00	2.32	0.263	41.76	10.983	6%							
22	400.00	2.45	0.00		0.133	1.96	0.49			1.00	15.50	2.45	0.133	37.98	5.051	3%							
23	412.00	0.88	0.00		0.055	0.70	0.18			1.00	15.00	0.88	0.055	13.20	0.726	0%							
24	430.00	0.31	0.00	0.16	-0.002					1.00	14.50	0.31	-0.002	4.50	-0.009	0%							
RB	441.00	0.00	0.00		0.00		0.00			1.00	5.50	0.00	0.000	0.00	0.000								
Total Flow														189	100%								

Flow Measurement Details:

Metering Section Location (describe):
100 m downstream of helicopter landing area

Meas. Start Time (MST):	10:49
Meas. End Time (MST):	11:54
Equipment:	ADCP#1
Flow Meter Make & Model:	Sontek RS-M9
Flow Meter Serial #:	4712
Method:	Ice
River Condition:	Frozen, sand bar in centre
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -25 C



Flow characteristics:

Total Flow:	189	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	700.05	(m ²)
Wetted Width:	437.60	(m)
Hydraulic Depth:	1.60	(m)
Mean Velocity:	0.27	(m/s)
Reynolds Number:	-	
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer #1 (0-4m) Reading (m)	2.355	-
Transducer #2 (0-10m) Reading (m)	-	11.54
Water Temperature #1 (°C):	0.5	-
Water Temperature #2 (°C):	-	-
Datalogger Clock:	09:46	-
Laptop Clock:	09:46	-
Battery (Main):	14.8	-
Battery:	-	Good
Battery Serial #:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:
 -ADCP with underice ADCP rod used to complete majority of flow measurement (used correction factor of 1.0 in above calculations).
 ADV and flow rod used to complete shallow measurements (sand bar under ice from measurements 4 to 7, correction factor of 0.88 used)

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S24-06	0.987	231.712		230.725	230.725	3/4" Pipe 3m North of logger
S24-04			0.875	230.837	230.838	3/4" Pipe 5m N of logger
S24-05			0.648	231.064	231.065	3/4" Pipe 1.5m South of logger
Water Level:	Cut		5.432	226.280	Time WL Surveyed:	9:55
Temporary BM			5.362	226.350	0.000	-
Turn						
Temporary BM	5.329	231.679		226.350	-	-
Water Level:	Cut		5.398	226.281	Time WL Surveyed:	9:57
S24-05			0.614	231.065	231.065	3/4" Pipe 1.5m South of logger
S24-04			0.842	230.837	230.838	3/4" Pipe 5m N of logger
S24-06			0.953	230.726	230.725	3/4" Pipe 3m North of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	226.281	-
Closing Error:	-0.001	-
WL Check:	0.001	-
Transducer Elevation	223.926	-

Level Survey Equipment:

Level #:	-
Make & Model:	-
Serial #:	-

Field Personnel:

Data Entry Personnel:	TR, CJ	Trip Date:	9-Feb-15
Data Check Personnel:	TR	Date:	9-Feb-15
Entered Digitally in the Field:	CJ	Date:	1-Jun-15

Hydrometric Measurement / Site Visit Record

Site: Site: S24 - Athabasca River below Eymundson Creek
 UTM Location: 466313 E, 6372760 N

Site Visit Date: March 10, 2015
 Site Visit Time (MST): 08:15

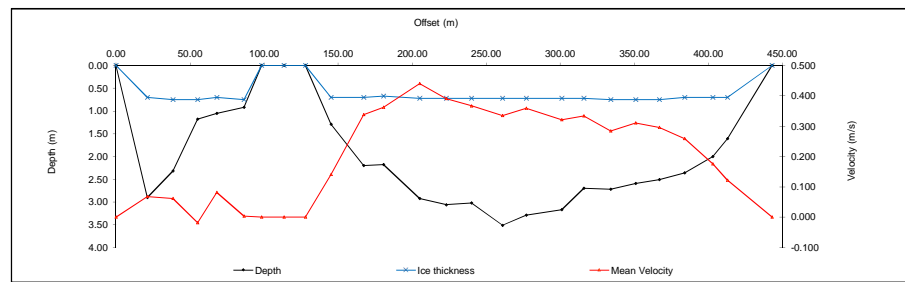


Measured Data										Calculated Data						
Bank/	Offset	Depth from	WS to bottom	Depth of Obs.	Velocity	Depth of	Depth of	Velocity	Velocity	Pannel	Effective Pannel	Effective Average Pannel	Pannel Area	Pannel Discharge	Percent of total flow	
Mnt #	(m)	bottom to WS	of ice	@ 0.5 Depth	@ 0.5	Obs. @	Obs. @	@ 0.2	@ 0.2	Width	Depth	Velocity	(m ²)	(m ³ /s)	(%)	
		(m)	(m)	(m)	(m/s)	(m)	(m)	(m/s)	(m/s)	(m)	(m)	(m/s)	(m ²)	(m ³ /s)	(%)	
LB	0.00	0.00	0.00		0.000	2.46	0.070	1.14	0.066	1.00	10.55	0.000	0.00	0.000		
1	21.10	2.90	0.70		2.46	0.070	1.14	0.066	1.00	19.25	2.20	0.068	42.35	2.880	2%	
2	38.50	2.32	0.75		2.01	0.087	1.06	0.037	1.00	16.95	1.57	0.062	26.61	1.650	1%	
3	55.00	1.18	0.75	0.97	-0.021				0.88	14.80	0.43	-0.018	6.36	-0.118	0%	
4	68.10	1.05	0.70	0.88	0.093				0.88	15.65	0.35	0.082	5.48	0.448	0%	
5	86.30	0.92	0.75	0.84	0.094				0.88	15.05	0.17	0.004	2.56	0.009	0%	
6	98.20	0.00	0.00	0.00	0.000				0.88	13.50	0.00	0.000	0.00	0.000	0%	
7	113.30	0.00	0.00	0.00	0.000				0.88	14.80	0.00	0.000	0.00	0.000	0%	
8	127.80	0.00	0.00	0.00	0.000				0.88	15.90	0.00	0.000	0.00	0.000	0%	
9	145.10	1.29	0.70	1.00	0.160				0.88	19.75	0.59	0.141	11.65	1.641	1%	
10	167.30	2.20	0.70			1.90	0.258	1.00	0.418	1.00	17.80	1.50	0.338	26.70	9.025	5%
11	180.70	2.18	0.67			1.88	0.304	0.97	0.421	1.00	18.85	1.51	0.363	28.46	10.318	6%
12	205.00	2.92	0.72			2.48	0.419	1.16	0.462	1.00	21.15	2.20	0.441	46.53	20.496	11%
13	223.00	3.06	0.72			2.59	0.386	1.19	0.415	1.00	17.50	2.34	0.391	40.95	15.991	9%
14	240.00	3.02	0.72			2.56	0.256	1.18	0.478	1.00	19.00	2.30	0.367	43.70	16.038	9%
15	261.00	3.51	0.72			2.95	0.266	1.28	0.404	1.00	18.50	2.79	0.335	51.62	17.291	10%
16	277.00	3.29	0.72			2.78	0.290	1.23	0.429	1.00	20.00	2.57	0.360	51.40	18.478	10%
17	301.00	3.17	0.72			2.68	0.267	1.21	0.375	1.00	19.50	2.45	0.321	47.78	15.336	8%
18	316.00	2.70	0.72			2.30	0.309	1.12	0.358	1.00	16.50	1.98	0.334	32.67	10.895	6%
19	334.00	2.72	0.75			2.33	0.247	1.14	0.322	1.00	17.50	1.97	0.285	34.48	9.808	5%
20	351.00	2.59	0.75			2.22	0.298	1.12	0.324	1.00	16.50	1.84	0.311	30.36	9.442	5%
21	367.00	2.51	0.75			2.16	0.280	1.10	0.331	1.00	16.50	1.76	0.296	29.04	8.581	5%
22	384.00	2.36	0.70			2.03	0.250	1.03	0.268	1.00	18.00	1.66	0.259	29.88	7.739	4%
23	403.00	2.00	0.70			1.74	0.167	0.96	0.184	1.00	14.50	1.30	0.176	18.85	3.308	2%
24	413.00	1.61	0.70			1.43	0.116	0.88	0.128	1.00	20.00	0.91	0.122	18.20	2.220	1%
RB	443.00	0.00	0.00		0.00					0.88	15.00	0.00	0.00	0.000		
Total Flow													181	100%		

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	9:38
Meas. End Time (MST):	10:51
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, windy, <C



Flow characteristics:

Total Flow:	181	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	625.62	(m ²)
Wetted Width:	443.00	(m)
Hydraulic Depth:	1.41	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer #1 (0-4m) Reading (m):	2.310	
Transducer #2 (0-10m) Reading (m):	-	
Water Temperature #1 (°C):	0.9	
Water Temperature #2 (°C):	-	
Datalogger Clock:	08:14	
Laptop Clock:	08:14	
Battery (Main):	15.1	
Battery:		Good
Battery Serial #:	-	
Enclosure Dissicant:		Replaced
Vent Tube Dissicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-Left bank effected by the sandbar
 98.2m to 127.8m were dry holes

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S24-05	0.861	231.926		231.065	231.065	3/4" Pipe 1.5m South of logger
S24-04			1.088	230.838	230.838	3/4" Pipe 5m N of logger
S24-06			1.200	230.726	230.725	3/4" Pipe 3m North of logger
Water Level:			5.675	226.251		
Temporary BM	Cut		5.689	226.237	0.000	Time WL Surveyed: 8:20
Turn						
Temporary BM	5.662	231.899		226.237		
Water Level:	Cut		5.647	226.252		Time WL Surveyed: 8:25
S24-06			1.175	230.724	230.725	3/4" Pipe 3m North of logger
S24-04			1.062	230.837	230.838	3/4" Pipe 5m N of logger
S24-05			0.834	231.065	231.065	3/4" Pipe 1.5m South of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	226.252	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	223.942	-

Field Personnel:

GG, DW	Trip Date:	10-Mar-15
GG, DW	Date:	10-Mar-15
SG	Date:	13-May-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: January 17, 2015
 Site Visit Time (MST): 14:15

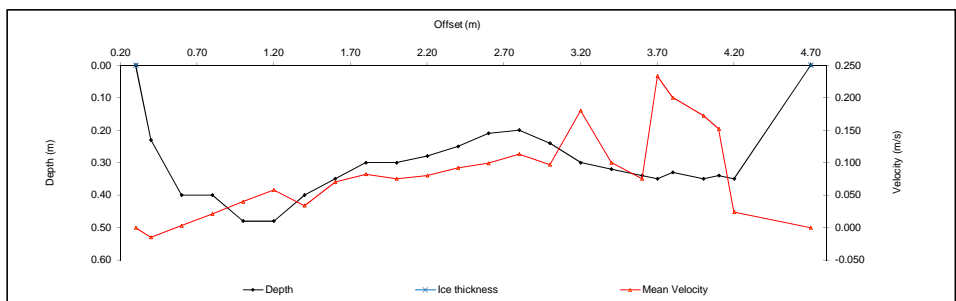


Flow Measurement:																
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	0.30	0.00	0.00							1.00	0.05	0.00	0.000	0.00	0.000	
1	0.40	0.23		0.14	-0.015					1.00	0.15	0.23	-0.015	0.03	-0.001	0%
2	0.60	0.40		0.24	0.003					1.00	0.20	0.40	0.003	0.08	0.000	0%
3	0.80	0.40		0.24	0.021					1.00	0.20	0.40	0.021	0.08	0.002	2%
4	1.00	0.48		0.29	0.040					1.00	0.20	0.48	0.040	0.10	0.004	4%
5	1.20	0.48		0.29	0.058					1.00	0.20	0.48	0.058	0.10	0.006	5%
6	1.40	0.40		0.24	0.034					1.00	0.20	0.40	0.034	0.08	0.003	3%
7	1.60	0.35		0.21	0.070					1.00	0.20	0.35	0.070	0.07	0.005	5%
8	1.80	0.30		0.18	0.082					1.00	0.20	0.30	0.082	0.06	0.005	5%
9	2.00	0.30		0.18	0.075					1.00	0.20	0.30	0.075	0.06	0.005	4%
10	2.20	0.28		0.17	0.080					1.00	0.20	0.28	0.080	0.06	0.004	4%
11	2.40	0.25		0.15	0.092					1.00	0.20	0.25	0.092	0.05	0.005	4%
12	2.60	0.21		0.13	0.099					1.00	0.20	0.21	0.099	0.04	0.004	4%
13	2.80	0.20		0.12	0.113					1.00	0.20	0.20	0.113	0.04	0.005	4%
14	3.00	0.24		0.14	0.097					1.00	0.20	0.24	0.097	0.05	0.005	4%
15	3.20	0.30		0.18	0.180					1.00	0.20	0.30	0.180	0.06	0.011	10%
16	3.40	0.32		0.19	0.100					1.00	0.20	0.32	0.100	0.06	0.006	6%
17	3.60	0.34		0.20	0.075					1.00	0.15	0.34	0.075	0.05	0.004	4%
18	3.70	0.35		0.21	0.233					1.00	0.10	0.35	0.233	0.03	0.008	8%
19	3.80	0.33		0.20	0.200					1.00	0.15	0.33	0.200	0.05	0.010	9%
20	4.00	0.35		0.21	0.172					1.00	0.15	0.35	0.172	0.05	0.009	9%
21	4.10	0.34		0.20	0.152					1.00	0.10	0.34	0.152	0.03	0.005	5%
22	4.20	0.35		0.21	0.024					1.00	0.30	0.35	0.024	0.11	0.003	2%
RB	4.70	0.00	0.00		0.00					1.00	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.106	100%	

Flow Measurement Details:

Metering Section Location (describe):
downstream side of bridge

Meas. Start Time (MST):	14:50
Meas. End Time (MST):	15:25
Equipment:	ADV
Method:	Wading
River Condition:	Open and flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partly cloudy, -1C



Flow characteristics:

Total Flow:	0.106	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.34	(m ²)
Wetted Width:	4.40	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.475	
Water (°C):	0.8	
Rainfall (mm):	-	
Datalogger Clock:	14:20	
Laptop Clock:	14:19	
Battery (Main):	13.1	
Battery:	Replaced	
Battery Serial #:	-	
Enclosure Dessiccant:	Replaced	
Tested TBRG:	-	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-8	1.059	101.416		100.357	100.357	Nail in tree 10m S
S31-7			1.638	99.778	99.785	Rebar 5.5m SE
S31-6			1.462	99.954	99.954	Rebar 5m E
Water Level:	Cut		2.946	98.470	Time WL Surveyed: 14:38	
Temporary BM			1.975	99.441	0.000	-
Turn						
Temporary BM	1.964	101.405		99.441		-
Water Level:	Cut		2.936	98.469	Time WL Surveyed: 14:42	
S31-6			1.452	99.953	99.954	Rebar 5m E
S31-7			1.627	99.778	99.785	Rebar 5.5m SE
S31-8			1.048	100.357	100.357	Nail in tree 10m S
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	98.470	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	97.995	-

Field Personnel:

MP, DW	Trip Date:	17-Jan-15
Data Entry Personnel:	Date:	17-Jan-15
Data Check Personnel:	Date:	18-Feb-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: February 3, 2015
 Site Visit Time (MST): 13:40

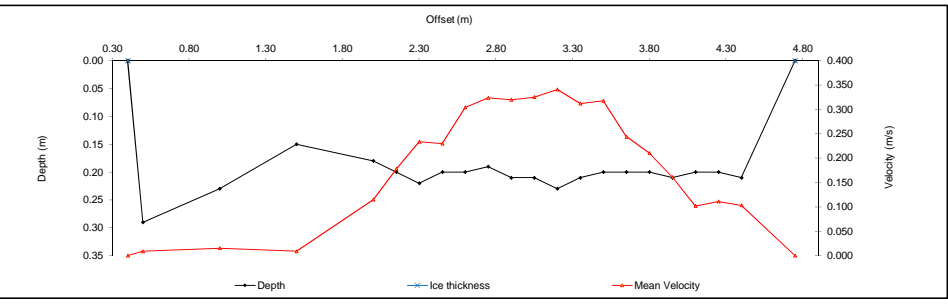


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth from WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	0.40	0.00	0.00	0.000	0.000	0.000	0.000	0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.50	0.29	0.17	0.009					1.00	0.30	0.29	0.009	0.09	0.001	1%
2	1.00	0.23	0.14	0.015					1.00	0.50	0.23	0.015	0.12	0.002	1%
3	1.50	0.15	0.09	0.009					1.00	0.50	0.15	0.009	0.08	0.001	1%
4	2.00	0.18	0.11	0.015					1.00	0.33	0.18	0.015	0.06	0.007	5%
5	2.15	0.20	0.12	0.018					1.00	0.15	0.20	0.018	0.03	0.005	4%
6	2.30	0.22	0.13	0.023					1.00	0.15	0.22	0.023	0.03	0.008	6%
7	2.45	0.20	0.12	0.023					1.00	0.15	0.20	0.023	0.03	0.007	5%
8	2.60	0.20	0.12	0.030					1.00	0.15	0.20	0.030	0.03	0.009	7%
9	2.75	0.19	0.11	0.024					1.00	0.15	0.19	0.024	0.03	0.009	7%
10	2.90	0.21	0.13	0.020					1.00	0.15	0.21	0.020	0.03	0.010	8%
11	3.05	0.21	0.13	0.025					1.00	0.15	0.21	0.025	0.03	0.010	8%
12	3.20	0.23	0.14	0.034					1.00	0.15	0.23	0.034	0.03	0.012	9%
13	3.35	0.21	0.13	0.032					1.00	0.15	0.21	0.032	0.03	0.010	8%
14	3.50	0.20	0.12	0.038					1.00	0.15	0.20	0.038	0.03	0.010	7%
15	3.65	0.20	0.12	0.044					1.00	0.15	0.20	0.044	0.03	0.007	6%
16	3.80	0.20	0.12	0.020					1.00	0.15	0.20	0.020	0.03	0.006	5%
17	3.95	0.21	0.13	0.016					1.00	0.15	0.21	0.016	0.03	0.005	4%
18	4.10	0.20	0.12	0.020					1.00	0.15	0.20	0.020	0.03	0.003	2%
19	4.25	0.20	0.12	0.011					1.00	0.15	0.20	0.011	0.03	0.003	3%
20	4.40	0.21	0.13	0.010					1.00	0.25	0.21	0.010	0.05	0.005	4%
RB	4.75	0.00	0.00	0.000	0.000	0.000	0.000	0.000	1.00	0.18	0.00	0.000	0.00	0.000	
Total Flow													0.130	100%	

Flow Measurement Details:

Metering Section Location (describe):
4m downstream of old station location

Meas. Start Time (MST):	14:30
Meas. End Time (MST):	14:52
Equipment:	ADV
Method:	Wading
River Condition:	Partial ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, -20C



Flow characteristics:

Total Flow:	0.130	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.85	(m ²)
Wetted Width:	4.35	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.15	(m/s)
Froude Number:	0.11	

Logger Details:

	Before	After
Transducer Reading (m):	0.464	
Water (°C):	0.5	
Rainfall (mm):	-	
Datalogger Clock:	13:50	
Laptop Clock:	13:49	
Battery (Main):	14.9	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Good
Tested TBRG:		-
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:
 -All BMs were tied in with survey

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-8	0.625	100.982		100.357	100.357	Nail in tree 10m S
S31-7			1.200	99.782	99.785	Rebar 5.5m SE
S31-6			1.025	99.957	99.954	Rebar 5m E
Water Level:						
			2.524	98.458	Time WL Surveyed: 14:00	
S31-6			1.025	99.957	99.954	Rebar 5m E
Turn						
S31-6	1.006	100.963		99.957	99.954	Rebar 5m E
Water Level:			2.503	98.460	Time WL Surveyed: 14:13	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:					Time WL Surveyed:	
Water Level:					Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	98.459	-
Closing Error:	-0.002	-
WL Check:	0.002	-
Transducer Elevation	97.995	-

Field Personnel:

	SM, TR	Trip Date:	3-Feb-15
Data Entry Personnel:	SM	Date:	3-Feb-15
Data Check Personnel:	TR	Date:	19-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: March 5, 2015
 Site Visit Time (MST): 13:46

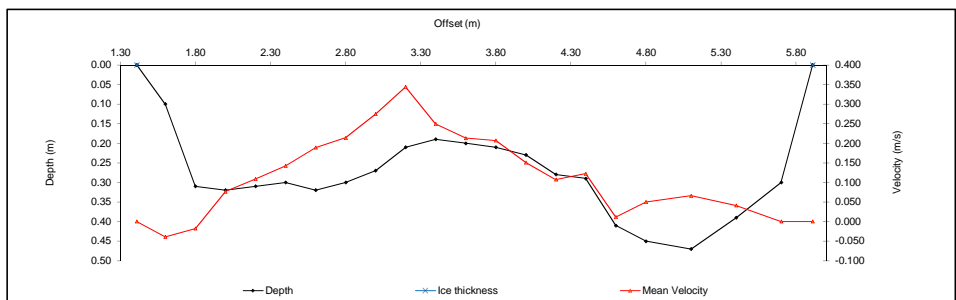


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.41	0.00	0.00							0.88	0.10	0.00	0.000	0.00	0.000	
1	1.60	0.10		0.05	-0.044					0.88	0.20	0.10	-0.039	0.02	-0.001	-1%
2	1.80	0.31		0.16	-0.020					0.88	0.20	0.31	-0.018	0.06	-0.001	-1%
3	2.00	0.32		0.16	0.087					0.88	0.20	0.32	0.077	0.06	0.005	3%
4	2.20	0.31		0.16	0.124					0.88	0.20	0.31	0.109	0.06	0.007	5%
5	2.40	0.30		0.15	0.162					0.88	0.20	0.30	0.143	0.06	0.009	6%
6	2.60	0.32		0.16	0.215					0.88	0.20	0.32	0.189	0.06	0.012	9%
7	2.80	0.30		0.15	0.243					0.88	0.20	0.30	0.214	0.06	0.013	9%
8	3.00	0.27		0.14	0.312					0.88	0.20	0.27	0.275	0.05	0.015	11%
9	3.20	0.21		0.11	0.391					0.88	0.20	0.21	0.344	0.04	0.014	10%
10	3.40	0.19		0.10	0.283					0.88	0.20	0.19	0.249	0.04	0.009	7%
11	3.60	0.20		0.10	0.242					0.88	0.20	0.20	0.213	0.04	0.009	6%
12	3.80	0.21		0.11	0.235					0.88	0.20	0.21	0.207	0.04	0.009	6%
13	4.00	0.23		0.12	0.171					0.88	0.20	0.23	0.150	0.05	0.007	5%
14	4.20	0.28		0.14	0.122					0.88	0.20	0.28	0.107	0.06	0.006	4%
15	4.40	0.29		0.15	0.139					0.88	0.20	0.29	0.122	0.06	0.007	5%
16	4.60	0.41		0.21	0.013					0.88	0.20	0.41	0.011	0.08	0.001	1%
17	4.80	0.45		0.23	0.057					0.88	0.25	0.45	0.050	0.11	0.006	4%
18	5.10	0.47		0.24	0.075					0.88	0.30	0.47	0.066	0.14	0.009	7%
19	5.40	0.39		0.20	0.047					0.88	0.30	0.39	0.041	0.12	0.005	3%
20	5.70	0.30		0.15	0.000					0.88	0.25	0.30	0.000	0.08	0.000	0%
LB	5.91	0.00	0.00							0.88	0.11	0.00	0.000	0.00	0.000	
Total Flow														0.140	100%	

Flow Measurement Details:

Metering Section Location (describe):
downstream side of bridge

Meas. Start Time (MST):	14:22
Meas. End Time (MST):	14:53
Equipment:	ADV
Method:	Ice
River Condition:	Flowing well, frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 1C



Flow characteristics:

Total Flow:	0.140	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.30	(m ²)
Wetted Width:	4.50	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.06	

Logger Details:

	Before	After
Transducer Reading (m):	0.470	
Water (°C):	0.8	
Rainfall (mm):	0.00	
Datalogger Clock:	13:50	
Laptop Clock:	13:49	
Battery (Main):	14.2	
Battery:		Good
Battery Serial #:	-	
Enclosure Desiccant:	Replaced	
Tested TBRG:	-	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

- Bring wooden stakes to mark BMs
- Thin ice in some spots of river, not completely open

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-8	1.252	101.609		100.357	100.357	Rebar 5.5m SE
S31-7			1.826	99.783	99.785	Rebar 5.5m SE
S31-6			1.654	99.955	99.954	Rebar 5m E
Water Level:	Cut		3.147	98.462		Time WL Surveyed: 13:55
Temporary BM			2.670	98.939	99.785	Rebar 5.5m SE
Turn						
Temporary BM	2.647	101.586		98.939	99.785	Rebar 5.5m SE
Water Level:	Cut		3.121	98.465		Time WL Surveyed: 14:01
S31-6			1.630	99.956	99.954	Rebar 5m E
S31-7			1.802	99.784	99.785	Rebar 5.5m SE
S31-8			1.229	100.358	100.357	Rebar 5.5m SE
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.464	-
Closing Error:	-0.001	-
WL Check:	0.003	-
Transducer Elevation	97.994	-

Field Personnel:

	MP GG	Trip Date:	5-Mar-15
Data Entry Personnel:	MP	Date:	5-Mar-15
Data Check Personnel:	TR	Date:	29-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: April 24, 2015
 Site Visit Time (MST): 13:53



Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	7.90	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	8.00	0.54		0.32	0.150					1.00	0.25	0.54	0.150	0.14	0.020	2%
2	8.40	0.57		0.34	0.180					1.00	0.40	0.57	0.180	0.23	0.041	3%
3	8.80	0.58		0.35	0.167					1.00	0.40	0.58	0.167	0.23	0.039	3%
4	9.20	0.58		0.35	0.229					1.00	0.40	0.58	0.229	0.23	0.053	4%
5	9.60	0.59		0.35	0.280					1.00	0.40	0.59	0.280	0.24	0.066	5%
6	10.00	0.58		0.35	0.312					1.00	0.40	0.58	0.312	0.23	0.072	5%
7	10.40	0.59		0.35	0.394					1.00	0.40	0.59	0.394	0.24	0.093	7%
8	10.80	0.57		0.34	0.408					1.00	0.30	0.57	0.408	0.17	0.070	5%
9	11.00	0.59		0.35	0.432					1.00	0.20	0.59	0.432	0.12	0.051	4%
10	11.20	0.56		0.34	0.439					1.00	0.30	0.56	0.439	0.17	0.074	6%
11	11.60	0.56		0.34	0.422					1.00	0.40	0.56	0.422	0.22	0.095	7%
12	12.00	0.55		0.33	0.442					1.00	0.40	0.55	0.442	0.22	0.097	7%
13	12.40	0.56		0.34	0.437					1.00	0.40	0.56	0.437	0.22	0.098	7%
14	12.80	0.55		0.33	0.420					1.00	0.40	0.55	0.420	0.22	0.092	7%
15	13.20	0.56		0.34	0.418					1.00	0.40	0.56	0.418	0.22	0.094	7%
16	13.60	0.58		0.35	0.319					1.00	0.40	0.58	0.319	0.23	0.074	6%
17	14.00	0.64		0.38	0.276					1.00	0.40	0.64	0.276	0.26	0.071	5%
18	14.40	0.62		0.37	0.231					1.00	0.40	0.62	0.231	0.25	0.057	4%
19	14.80	0.57		0.34	0.194					1.00	0.40	0.57	0.194	0.23	0.044	3%
20	15.20	0.46		0.28	0.103					1.00	0.38	0.46	0.103	0.17	0.018	1%
LB	15.55	0.00	0.00		0.00		0.00		0.00	1.00	0.18	0.00	0.000	0.00	0.000	
Total Flow														1.32	100%	

Flow Measurement Details:

Metering Section Location (describe):
25m DS of station

Meas. Start Time (MST):	14:33
Meas. End Time (MST):	14:55
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 7C

Flow characteristics:

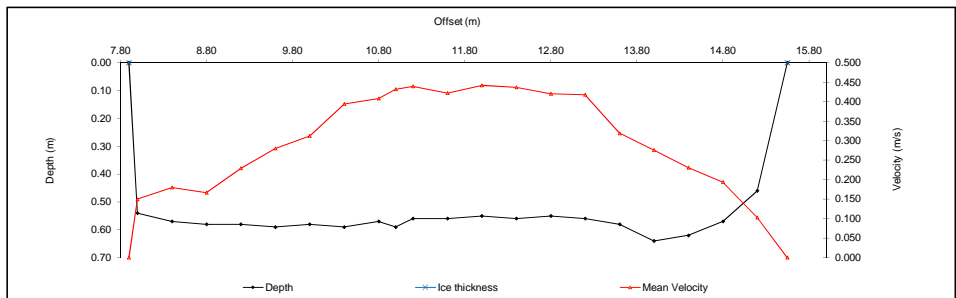
Total Flow:	1.32	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.24	(m ²)
Wetted Width:	7.65	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	0.31	(m/s)
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.718	0.722
Water (°C):	4.7	5.2
Rainfall (mm):	-	0.00
Datalogger Clock:	13:57	15:13
Laptop Clock:	13:55	15:11
Battery (Main):	14.1	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Tested TBRG:	Yes	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:
 -Installed TBRG, changed previous program, new pulse volume (0.254)



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-8	1.147	101.504		100.357	100.357	Nail in tree 10m S
S31-7			1.722	99.782	99.785	Rebar 5.5m SE
S31-6			1.550	99.954	99.954	Rebar 5m E
Water Level:	Cut		2.788	98.716	Time WL Surveyed: 14:19	
Temporary BM			1.461	100.043	0.000	
Turn						
Temporary BM	1.443	101.486		100.043		
Water Level:	Cut		2.772	98.714	Time WL Surveyed: 14:22	
S31-6			1.533	99.953	99.954	Rebar 5m E
S31-7			1.704	99.782	99.785	Rebar 5.5m SE
S31-8			1.129	100.358	100.357	Nail in tree 10m S
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S31-6	1.533	101.487		99.954		
Water Level:	Cut		2.768	98.719	Time WL Surveyed: 15:00	
Water Level:	Cut		2.747	98.720	Time WL Surveyed: 15:02	
S31-6	1.513	101.467		99.954		

WL Survey Summary

	Before	After
Average WL:	98.715	98.720
Closing Error:	-0.001	-
WL Check:	0.002	-0.001
Transducer Elevation	97.997	97.998

Field Personnel:

Data Entry Personnel:	GG, SM	Trip Date:	24-Apr-15
Data Check Personnel:	GG	Date:	24-Apr-15
Entered Digitally in the Field:	TR	Date:	29-Jun-15

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: May 7, 2015
 Site Visit Time (MST): 08:10

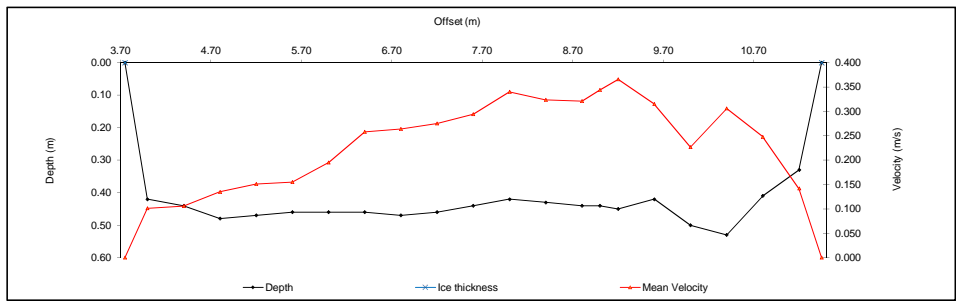


Flow Measurement													Calculated Data			
Bank/ Mmt #	Measured Data			Velocity @ 0.6			Velocity @ 0.8			Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
	Depth from bottom to WS (m)	WS (m)	Depth of Obs. @ 0.6 Depth (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)							
RB	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.13	0.00	0.00	0.00	0.00	0.00	
1	4.00	0.42	0.25	0.101					1.00	0.33	0.42	0.101	0.14	0.014	2%	
2	4.40	0.44	0.26	0.106					1.00	0.40	0.44	0.106	0.18	0.019	2%	
3	4.80	0.48	0.29	0.135					1.00	0.40	0.48	0.135	0.19	0.026	3%	
4	5.20	0.47	0.28	0.151					1.00	0.40	0.47	0.151	0.19	0.028	4%	
5	5.60	0.46	0.28	0.155					1.00	0.40	0.46	0.155	0.18	0.029	4%	
6	6.00	0.46	0.28	0.195					1.00	0.40	0.46	0.195	0.18	0.036	4%	
7	6.40	0.46	0.28	0.258					1.00	0.40	0.46	0.258	0.18	0.047	6%	
8	6.80	0.47	0.28	0.264					1.00	0.40	0.47	0.264	0.19	0.050	6%	
9	7.20	0.46	0.28	0.275					1.00	0.40	0.46	0.275	0.18	0.051	6%	
10	7.60	0.44	0.26	0.294					1.00	0.40	0.44	0.294	0.18	0.052	6%	
11	8.00	0.42	0.25	0.340					1.00	0.40	0.42	0.340	0.17	0.057	7%	
12	8.40	0.43	0.26	0.324					1.00	0.40	0.43	0.324	0.17	0.056	7%	
13	8.80	0.44	0.26	0.321					1.00	0.30	0.44	0.321	0.13	0.042	5%	
14	9.00	0.44	0.26	0.344					1.00	0.20	0.44	0.344	0.09	0.030	4%	
15	9.20	0.45	0.27	0.366					1.00	0.30	0.45	0.366	0.14	0.049	6%	
16	9.60	0.42	0.25	0.315					1.00	0.40	0.42	0.315	0.17	0.053	7%	
17	10.00	0.50	0.30	0.227					1.00	0.40	0.50	0.227	0.20	0.045	6%	
18	10.40	0.53	0.32	0.306					1.00	0.40	0.53	0.306	0.21	0.065	8%	
19	10.80	0.41	0.25	0.248					1.00	0.40	0.41	0.248	0.16	0.041	5%	
20	11.20	0.33	0.20	0.142					1.00	0.32	0.33	0.142	0.11	0.015	2%	
LB	11.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.13	0.00	0.00	0.00	0.00		
Total Flow													0.805	100%		

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of bridge

Meas. Start Time (MST):	8:42
Meas. End Time (MST):	8:59
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 5C



Flow characteristics:

Total Flow:	0.805	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.34	(m ²)
Wetted Width:	7.70	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.24	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.607	0.607
Water (°C):	3.1	3.2
Rainfall (mm):	0.00	0.00
Datalogger Clock:	8:16	9:09
Laptop Clock:	8:16	9:09
Battery (Main):	14.7	14.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Tested TBRG:	No	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-8	1.111	101.468		100.357	100.357	Nail in tree 10m S
S31-7			1.687	99.781	99.785	Rebar 5.5m SE
S31-6			1.514	99.954	99.954	Rebar 5m E
Water Level:	Cut		2.868	98.600	Time WL Surveyed: 8:20	
Temporary BM			1.425	100.043	0.000	-
Turn						
Temporary BM	1.416	101.459		100.043		-
Water Level:	Cut		2.860	98.599	Time WL Surveyed: 8:22	
S31-6			1.508	99.951	99.954	Rebar 5m E
S31-7			1.679	99.780	99.785	Rebar 5.5m SE
S31-8			1.102	100.357	100.357	Nail in tree 10m S
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S31-6	1.507	101.460		99.953		
Water Level:	Cut		2.859	98.601	Time WL Surveyed: 9:06	
Water Level:	Cut		2.850	98.602	Time WL Surveyed: 9:07	
S31-6	1.499	101.452		99.953		

WL Survey Summary

	Before	After
Average WL:	98.600	98.602
Closing Error:	0.000	-
WL Check:	0.001	-0.001
Transducer Elevation	97.993	97.995

Field Personnel:

Data Entry Personnel:	SM, CJ	Trip Date:	7-May-15
Data Check Personnel:	CJ	Date:	7-May-15
Entered Digitally in the Field:	Yes	Date:	19-Jun-15

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: May 19, 2015
 Site Visit Time (MST): 09:30

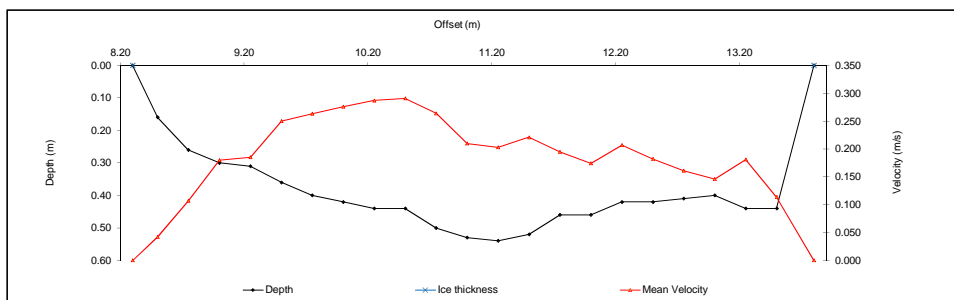


Flow Measurement													Calculated Data			
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.30	0.00	0.00	0.00	0.000	0.00	0.000	0.00	0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	8.50	0.16		0.00	0.042					1.00	0.23	0.16	0.042	0.04	0.002	0%
2	8.75	0.26		0.16	0.107					1.00	0.25	0.26	0.107	0.07	0.007	2%
3	9.00	0.30		0.18	0.180					1.00	0.25	0.30	0.180	0.08	0.014	3%
4	9.25	0.31		0.19	0.185					1.00	0.25	0.31	0.185	0.08	0.014	3%
5	9.50	0.36		0.22	0.250					1.00	0.25	0.36	0.250	0.09	0.023	5%
6	9.75	0.40		0.24	0.263					1.00	0.25	0.40	0.263	0.10	0.026	6%
7	10.00	0.42		0.25	0.276					1.00	0.25	0.42	0.276	0.11	0.029	7%
8	10.25	0.44		0.26	0.287					1.00	0.25	0.44	0.287	0.11	0.032	7%
9	10.50	0.44		0.26	0.291					1.00	0.25	0.44	0.291	0.11	0.032	7%
10	10.75	0.50		0.30	0.264					1.00	0.25	0.50	0.264	0.13	0.033	7%
11	11.00	0.53		0.32	0.210					1.00	0.25	0.53	0.210	0.13	0.028	6%
12	11.25	0.54		0.32	0.203					1.00	0.25	0.54	0.203	0.14	0.027	6%
13	11.50	0.52		0.31	0.221					1.00	0.25	0.52	0.221	0.13	0.029	6%
14	11.75	0.46		0.28	0.195					1.00	0.25	0.46	0.195	0.12	0.022	5%
15	12.00	0.46		0.28	0.174					1.00	0.25	0.46	0.174	0.12	0.020	5%
16	12.25	0.42		0.25	0.207					1.00	0.25	0.42	0.207	0.11	0.022	5%
17	12.50	0.42		0.25	0.182					1.00	0.25	0.42	0.182	0.11	0.019	4%
18	12.75	0.41		0.25	0.161					1.00	0.25	0.41	0.161	0.10	0.017	4%
19	13.00	0.40		0.24	0.146					1.00	0.25	0.40	0.146	0.10	0.015	3%
20	13.25	0.44		0.26	0.181					1.00	0.25	0.44	0.181	0.11	0.020	4%
21	13.50	0.44		0.26	0.114					1.00	0.28	0.44	0.114	0.12	0.014	3%
LB	13.80	0.00	0.00	0.00	0.000	0.00	0.000	0.00	0.000	1.00	0.15	0.00	0.000	0.000		
Total Flow														0.443	100%	

Flow Measurement Details:

Metering Section Location (describe):
12m downstream of pressure transducer

Meas. Start Time (MST):	10:45
Meas. End Time (MST):	11:03
Equipment:	ADV
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20C



Flow characteristics:

Total Flow:	0.443	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.16	(m ²)
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.499	0.500
Water (°C):	9.2	10.1
Rainfall (mm):	0.00	0.00
Datalogger Clock:	9:50	11:07
Laptop Clock:	9:48	11:06
Battery (Main):	14.2	13.7
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Good
Tested TBRG:	No	-
Vent. Tube Dessiccant:	-	Good
PT# (if replaced):	346255	-
Logger# (if replaced):	18168	-

Datalogger / Station Notes:
 -Installed 2 bms, 2 sections of 3/4" pipe
 Connected both sites, use this survey to develop given bm elevations

General Notes:
 -Ran ADV test, all good

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-9	1.189	100.764		99.575	99.575	Bolt under bridge
S31-7			0.979	99.785	99.785	Rebar 5.5m SE
S31-10			0.633	100.131	100.130	Pipe 4m E
S31-8			0.407	100.357	100.357	Nail in tree 10m S
Water Level:	Cut	0.503	2.762	98.505	Time WL Surveyed: 10:24	
S31-11			0.193	100.571	100.571	Pipe 10m S
Turn						
S31-11	0.164	100.735		100.571	100.571	Pipe 10m S
Water Level:	Cut	0.503	2.733	98.505	Time WL Surveyed: 10:26	
S31-8			0.378	100.357	100.357	Nail in tree 10m S
S31-10			0.605	100.130	100.130	Pipe 4m E
S31-7			0.950	99.785	99.785	Rebar 5.5m SE
S31-9			1.161	99.574	99.575	Bolt under bridge
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S31-10	0.605	100.736		100.131		
Water Level:	Cut	0.506	2.742	98.500	Time WL Surveyed: 11:10	
Water Level:	Cut	0.506	2.685	98.503	Time WL Surveyed: 11:11	
S31-10	0.551	100.682		100.131		

WL Survey Summary

	Before	After
Average WL:	98.505	98.502
Closing Error:	0.001	-
WL Check:	0.000	-0.003
Transducer Elevation	98.006	98.002

Field Personnel:

	TR, MK	Trip Date:	19-May-15
Data Entry Personnel:	TR	Date:	19-May-15
Data Check Personnel:	CJ	Date:	19-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: June 18, 2015
 Site Visit Time (MST): 07:40



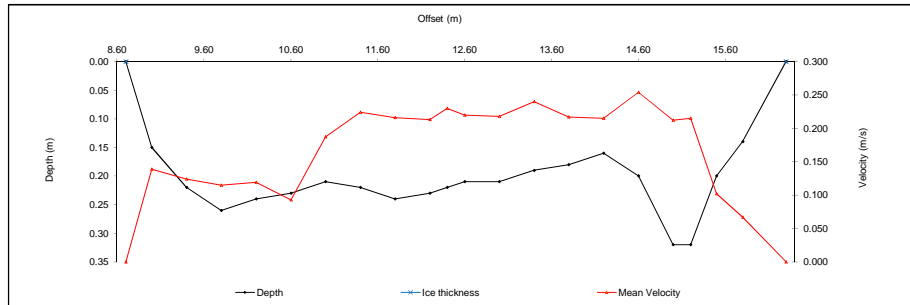
Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.70	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	9.00	0.15		0.09	0.139					1.00	0.35	0.15	0.139	0.05	0.007	3%
2	9.40	0.22		0.13	0.124					1.00	0.40	0.22	0.124	0.09	0.011	4%
3	9.80	0.26		0.16	0.115					1.00	0.40	0.26	0.115	0.10	0.012	4%
4	10.20	0.24		0.14	0.119					1.00	0.40	0.24	0.119	0.10	0.011	4%
5	10.60	0.23		0.14	0.093					1.00	0.40	0.23	0.093	0.09	0.009	3%
6	11.00	0.21		0.13	0.157					1.00	0.40	0.21	0.157	0.08	0.016	6%
7	11.40	0.22		0.13	0.224					1.00	0.40	0.22	0.224	0.09	0.020	7%
8	11.80	0.24		0.14	0.216					1.00	0.40	0.24	0.216	0.10	0.021	7%
9	12.20	0.23		0.14	0.213					1.00	0.30	0.23	0.213	0.07	0.015	5%
10	12.40	0.22		0.13	0.230					1.00	0.20	0.22	0.230	0.04	0.010	4%
11	12.60	0.21		0.13	0.220					1.00	0.30	0.21	0.220	0.06	0.014	5%
12	13.00	0.21		0.13	0.218					1.00	0.40	0.21	0.218	0.08	0.018	7%
13	13.40	0.19		0.11	0.240					1.00	0.40	0.19	0.240	0.08	0.018	7%
14	13.80	0.18		0.11	0.217					1.00	0.40	0.18	0.217	0.07	0.016	6%
15	14.20	0.16		0.10	0.215					1.00	0.40	0.16	0.215	0.06	0.014	5%
16	14.60	0.20		0.12	0.254					1.00	0.40	0.20	0.254	0.08	0.020	7%
17	15.00	0.32		0.19	0.212					1.00	0.30	0.32	0.212	0.10	0.020	7%
18	15.20	0.32		0.19	0.215					1.00	0.25	0.32	0.215	0.08	0.017	6%
19	15.50	0.20		0.12	0.102					1.00	0.30	0.20	0.102	0.06	0.006	2%
20	15.80	0.14		0.08	0.067					1.00	0.40	0.14	0.067	0.06	0.004	1%
LB	16.30	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.279	100%	

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of bridge

Meas. Start Time (MST):	8:00
Meas. End Time (MST):	8:27
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, breezy, 12C



Flow characteristics:

Total Flow:	0.279	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.54	(m ²)
Wetted Width:	7.60	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.18	(m/s)
Reynolds Number:	2.73E+04	
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.386	0.385
Water (°C):	9.3	9.8
TBRG Tested?:		Yes
Datalogger Clock:	07:44	08:33
Laptop Clock:	07:43	08:32
Battery (Main):	14.0	14.3
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:
 -Add new BMs to template
 -Needs BM tags
 -Tested TBRG with 10+ tips, works
 -ADV test passed

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-8	1.179	101.536		100.357	100.357	Nail in tree 10m S
S31-10			1.403	100.133	100.130	Pipe 4m E
S31-11			0.957	100.579	100.571	Pipe 10m S
Water Level:	Cut	0.359	3.507	98.388		Time WL Surveyed: 7:49
Temporary BM			3.507	98.029	0.000	
Turn						
Temporary BM	3.495	101.524		98.029		
Water Level:	Cut	0.359	3.495	98.388		Time WL Surveyed: 7:51
S31-10			0.945	100.579	100.571	Pipe 10m S
S31-11			1.390	100.134	100.130	Pipe 4m E
S31-8			1.167	100.357	100.357	Nail in tree 10m S
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S31-11	0.946	101.525		100.579		
Water Level:	Cut	0.362	3.516	98.391		Time WL Surveyed: 8:33
Water Level:	Cut	0.474	3.538	98.397		Time WL Surveyed: 8:35
S31-11	0.932	101.511		100.579		

WL Survey Summary

	Before	After
Average WL:	98.388	98.389
Closing Error:	0.000	-
WL Check:	0.000	0.004
Transducer Elevation	98.002	98.004

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC 2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, MK	Trip Date:	18-Jun-15
Data Check Personnel:	CJ	Date:	24-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: August 15, 2015
 Site Visit Time (MST): 08:22



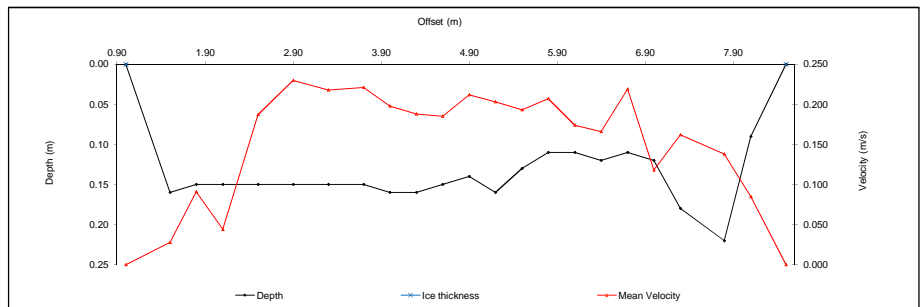
Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	1.50	0.16		0.10	0.028					1.00	0.40	0.16	0.028	0.06	0.002	1%
2	1.80	0.15		0.09	0.091					1.00	0.30	0.15	0.091	0.05	0.004	2%
3	2.10	0.15		0.09	0.044					1.00	0.35	0.15	0.044	0.05	0.002	1%
4	2.50	0.15		0.09	0.187					1.00	0.40	0.15	0.187	0.06	0.011	7%
5	2.90	0.15		0.09	0.230					1.00	0.40	0.15	0.230	0.06	0.014	8%
6	3.30	0.15		0.09	0.218					1.00	0.40	0.15	0.218	0.06	0.013	8%
7	3.70	0.15		0.09	0.221					1.00	0.35	0.15	0.221	0.05	0.012	7%
8	4.00	0.16		0.10	0.198					1.00	0.30	0.16	0.198	0.05	0.010	6%
9	4.30	0.16		0.10	0.188					1.00	0.30	0.16	0.188	0.05	0.009	5%
10	4.60	0.15		0.09	0.185					1.00	0.30	0.15	0.185	0.05	0.008	5%
11	4.90	0.14		0.08	0.212					1.00	0.30	0.14	0.212	0.04	0.009	5%
12	5.20	0.16		0.10	0.203					1.00	0.30	0.16	0.203	0.05	0.010	6%
13	5.50	0.13		0.08	0.193					1.00	0.30	0.13	0.193	0.04	0.008	5%
14	5.80	0.11		0.07	0.207					1.00	0.30	0.11	0.207	0.03	0.007	4%
15	6.10	0.11		0.07	0.174					1.00	0.30	0.11	0.174	0.03	0.006	3%
16	6.40	0.12		0.07	0.166					1.00	0.30	0.12	0.166	0.04	0.006	4%
17	6.70	0.11		0.07	0.219					1.00	0.30	0.11	0.219	0.03	0.007	4%
18	7.00	0.12		0.07	0.118					1.00	0.30	0.12	0.118	0.04	0.004	3%
19	7.30	0.18		0.11	0.162					1.00	0.40	0.18	0.162	0.07	0.012	7%
20	7.80	0.22		0.13	0.138					1.00	0.40	0.22	0.138	0.09	0.012	7%
21	8.10	0.09		0.05	0.085					1.00	0.35	0.09	0.085	0.03	0.003	2%
LB	8.50	0.00	0.00		0.00				0.00	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.167	100%	

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of bridge

Meas. Start Time (MST):	8:51
Meas. End Time (MST):	9:20
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, 15C



Flow characteristics:

Total Flow:	0.167	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.03	(m ²)
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	1.7E+04	
Froude Number:	0.14	

Logger Details:

	Before	After
Transducer Reading (m):	0.273	0.276
Water (°C):	11.8	11.8
TBRG Tested?:	No	
Datalogger Clock:	08:25	09:27
Laptop Clock:	08:24	09:25
Battery (Main):	12.7	12.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-ADV Test passed

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-10	1.200	101.330		100.130	100.130	Pipe 4m E
S31-8			0.982	100.348	100.357	Nail in tree 10m S
S31-11			0.758	100.572	100.571	Pipe 10m S
Water Level:	Cut		3.080	98.270		Time WL Surveyed: 8:29
Temporary BM			3.028	98.302	0.000	
Turn						
Temporary BM	3.152	101.454		98.302		
Water Level:	Cut		3.183	98.271		Time WL Surveyed: 8:31
S31-11			0.883	100.571	100.571	Pipe 10m S
S31-8			1.105	100.349	100.357	Nail in tree 10m S
S31-10			1.323	100.131	100.130	Pipe 4m E
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S31-10	1.323	101.453		100.130		
Water Level:	Cut		3.183	98.270		Time WL Surveyed: 9:30
Water Level:	Cut		3.169	98.269		Time WL Surveyed: 9:32
S31-10	1.308	101.438		100.130		

WL Survey Summary	Before	After
Average WL:	98.271	98.270
Closing Error:	-0.001	-
WL Check:	0.001	0.001
Transducer Elevation	97.998	97.994

Level Survey Equipment:	Level #:	Level#2
Level #:		Level#2
Make & Model:		Nikon AC-2S
Serial #:		668859

Field Personnel:	GG, DW	Trip Date:	15-Aug-15
Data Entry Personnel:	GG	Date:	15-Aug-15
Data Check Personnel:	TR	Date:	25-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: September 18, 2015
 Site Visit Time (MST): 12:45

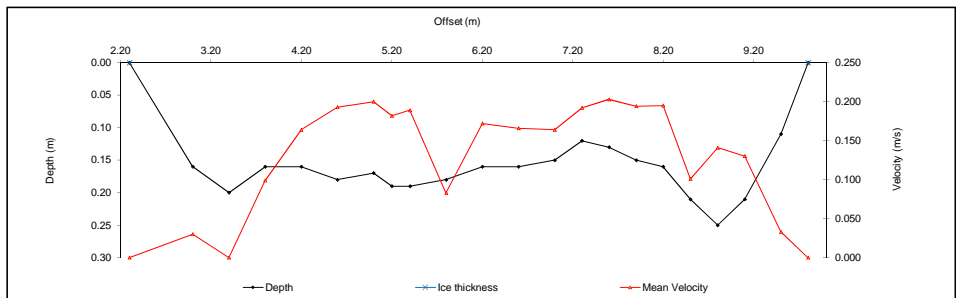


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.30	0.00	0.00	0.00	0.030	0.000	0.000	0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	3.00	0.16		0.10	0.030				1.00	0.55	0.16	0.030	0.09	0.003	2%
2	3.40	0.20		0.12	0.000				1.00	0.40	0.20	0.000	0.08	0.000	0%
3	3.80	0.16		0.10	0.099				1.00	0.40	0.16	0.099	0.06	0.006	4%
4	4.20	0.16		0.10	0.164				1.00	0.40	0.16	0.164	0.06	0.010	7%
5	4.60	0.18		0.11	0.193				1.00	0.40	0.18	0.193	0.07	0.014	9%
6	5.00	0.17		0.10	0.200				1.00	0.30	0.17	0.200	0.05	0.010	6%
7	5.20	0.19		0.11	0.182				1.00	0.20	0.19	0.182	0.04	0.007	4%
8	5.40	0.19		0.11	0.189				1.00	0.30	0.19	0.189	0.06	0.011	7%
9	5.80	0.18		0.11	0.083				1.00	0.40	0.18	0.083	0.07	0.006	4%
10	6.20	0.16		0.10	0.172				1.00	0.40	0.16	0.172	0.06	0.011	7%
11	6.60	0.16		0.10	0.166				1.00	0.40	0.16	0.166	0.06	0.011	7%
12	7.00	0.15		0.09	0.164				1.00	0.35	0.15	0.164	0.05	0.009	5%
13	7.30	0.12		0.07	0.192				1.00	0.30	0.12	0.192	0.04	0.007	4%
14	7.60	0.13		0.08	0.203				1.00	0.30	0.13	0.203	0.04	0.008	5%
15	7.90	0.15		0.09	0.194				1.00	0.30	0.15	0.194	0.05	0.009	6%
16	8.20	0.16		0.10	0.195				1.00	0.30	0.16	0.195	0.05	0.009	6%
17	8.50	0.21		0.13	0.101				1.00	0.30	0.21	0.101	0.06	0.006	4%
18	8.80	0.25		0.15	0.141				1.00	0.30	0.25	0.141	0.07	0.011	7%
19	9.10	0.21		0.13	0.130				1.00	0.35	0.21	0.130	0.07	0.010	6%
20	9.50	0.11		0.07	0.033				1.00	0.35	0.11	0.033	0.04	0.001	1%
LB	9.80	0.00	0.00	0.00	0.000	0.000	0.000	0.000	1.00	0.15	0.00	0.000	0.00	0.000	
Total Flow													0.158	100%	

Flow Measurement Details:

Metering Section Location (describe):
40m downstream of station

Meas. Start Time (MST):	13:06
Meas. End Time (MST):	13:30
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, breeze, 17C



Flow characteristics:

Total Flow:	0.158	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.18	(m ²)
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.11	

Logger Details:

	Before	After
Transducer Reading (m):	0.276	0.278
Water (°C):	8.2	8.4
Rainfall (mm):	12.47	13.34
Datalogger Clock:	12:47	13:34
Laptop Clock:	13.9	13.9
Battery (Main):	-	-
Battery:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Tested TBRG:	No	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-10	1.189	101.319		100.130	100.130	Pipe 4m E of logger
S31-7			1.534	99.785	99.785	Rebar 5.5m SE
S31-11			0.747	100.572	100.571	Pipe 12m S of logger
S31-8			0.969	100.350	100.357	Nail in tree 10m S
Water Level:	Cut	0.098	3.135	98.282	Time WL Surveyed:	12:57
Temporary BM			3.135	98.184	0.000	-
Turn						
Temporary BM	3.125	101.309		98.184	-	-
Water Level:	Cut	0.098	3.125	98.282	Time WL Surveyed:	13:00
S31-8			0.958	100.351	100.357	Nail in tree 10m S
S31-11			0.735	100.574	100.571	Pipe 12m S of logger
S31-7			1.524	99.785	99.785	Rebar 5.5m SE
S31-10			1.177	100.132	100.130	Pipe 4m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S31-10	1.177	101.308		100.131	-	-
Water Level:	Cut	0.099	3.125	98.282	Time WL Surveyed:	13:39
Water Level:	Cut	0.099	3.113	98.282	Time WL Surveyed:	13:40
S31-10	1.165	101.296		100.131	-	-

WL Survey Summary

	Before	After
Average WL:	98.282	98.282
Closing Error:	-0.002	-
WL Check:	0.000	0.000
Transducer Elevation	98.006	98.004

Field Personnel:

	CJ, SM	Trip Date:	18-Sep-15
Data Entry Personnel:	CJ	Date:	18-Sep-15
Data Check Personnel:	JC	Date:	23-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: October 21, 2015
 Site Visit Time (MST): 08:00

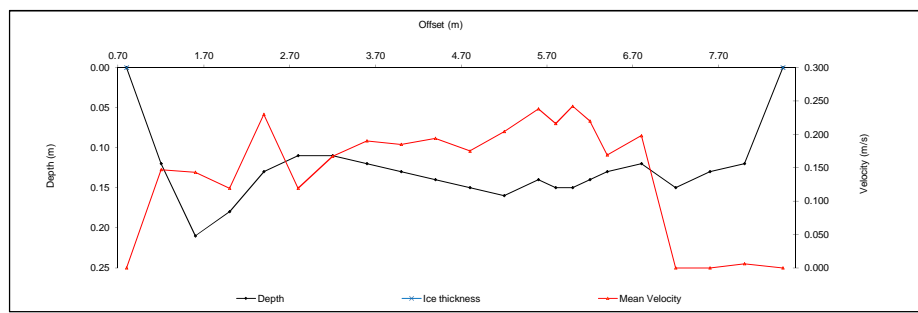


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.45	0.00	0.00		0.000		0.000		0.000	1.00	0.23	0.00	0.000	0.00	0.000	
1	8.00	0.12		0.07	0.006					1.00	0.43	0.12	0.006	0.05	0.000	0%
2	7.60	0.13		0.08	0.000					1.00	0.40	0.13	0.000	0.05	0.000	0%
3	7.20	0.15		0.09	0.000					1.00	0.40	0.15	0.000	0.06	0.000	0%
4	6.80	0.12		0.07	0.198					1.00	0.40	0.12	0.198	0.05	0.010	6%
5	6.40	0.13		0.08	0.169					1.00	0.30	0.13	0.169	0.04	0.007	4%
6	6.20	0.14		0.08	0.220					1.00	0.20	0.14	0.220	0.03	0.006	4%
7	6.00	0.15		0.09	0.242					1.00	0.20	0.15	0.242	0.03	0.007	5%
8	5.80	0.15		0.09	0.216					1.00	0.20	0.15	0.216	0.03	0.006	4%
9	5.60	0.14		0.08	0.238					1.00	0.30	0.14	0.238	0.04	0.010	7%
10	5.20	0.16		0.10	0.204					1.00	0.40	0.16	0.204	0.06	0.013	9%
11	4.80	0.15		0.09	0.175					1.00	0.40	0.15	0.175	0.06	0.011	7%
12	4.40	0.14		0.08	0.194					1.00	0.40	0.14	0.194	0.06	0.011	7%
13	4.00	0.13		0.08	0.185					1.00	0.40	0.13	0.185	0.05	0.010	6%
14	3.60	0.12		0.07	0.190					1.00	0.40	0.12	0.190	0.05	0.009	6%
15	3.20	0.11		0.07	0.167					1.00	0.40	0.11	0.167	0.04	0.007	5%
16	2.80	0.11		0.07	0.119					1.00	0.40	0.11	0.119	0.04	0.005	3%
17	2.40	0.13		0.08	0.230					1.00	0.40	0.13	0.230	0.05	0.012	8%
18	2.00	0.18		0.11	0.119					1.00	0.40	0.18	0.119	0.07	0.009	6%
19	1.60	0.21		0.13	0.143					1.00	0.40	0.21	0.143	0.08	0.012	8%
20	1.20	0.12		0.07	0.147					1.00	0.40	0.12	0.147	0.05	0.007	5%
LB	0.80	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	5%
Total Flow														0.152	100%	

Flow Measurement Details:

Metering Section Location (describe):
25m downstream of bridge

Meas. Start Time (MST):	8:25
Meas. End Time (MST):	8:45
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 3C



Flow characteristics:

Total Flow:	0.152	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.00	(m ²)
Wetted Width:	7.65	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.15	(m/s)
Reynolds Number:	1.22E+04	
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.255	0.254
Water (°C):	3.1	3.2
TBRG Tested?:	No	
Datalogger Clock:	08:03	08:53
Laptop Clock:	08:02	08:52
Battery (Main):	12.8	13.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 -ADV tested, all good

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-10	1.336	101.466		100.130	100.130	3/4" Pipe 4m E
S31-8			1.117	100.349	100.357	Nail in tree 10m S
S31-11			0.893	100.573	100.571	3/4" Pipe 10m S
Water Level:	Cut		3.222	98.244		Time WL Surveyed: 8:12
S31-11			0.893	100.573	100.571	3/4" Pipe 10m S
Turn						
S31-11	0.844	101.417		100.573	100.571	3/4" Pipe 10m S
Water Level:	Cut		3.173	98.244		Time WL Surveyed: 8:13
S31-11			0.844	100.573	100.571	3/4" Pipe 10m S
S31-8			1.088	100.349	100.357	Nail in tree 10m S
S31-10			1.287	100.130	100.130	3/4" Pipe 4m E
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S31-10	1.287	101.417		100.130		
Water Level:	Cut		3.168	98.249		Time WL Surveyed: 8:49
Water Level:	Cut		3.136	98.248		Time WL Surveyed: 8:51
S31-10	1.254	101.384		100.130		

WL Survey Summary

	Before	After
Average WL:	98.244	98.249
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	97.989	97.995

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC 2S
Serial #:	668859

Field Personnel:

	TR, GG	Trip Date:	21-Oct-15
Data Entry Personnel:	TR	Date:	21-Oct-15
Data Check Personnel:	TR	Date:	27-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: November 6, 2015
 Site Visit Time (MST): 09:45

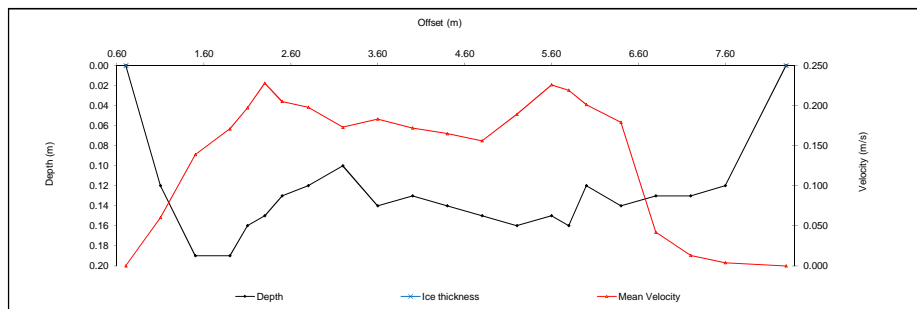


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.30	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	7.60	0.12		0.07	0.004					1.00	0.55	0.12	0.004	0.07	0.000	0%
2	7.20	0.13		0.08	0.013					1.00	0.40	0.13	0.013	0.05	0.001	0%
3	6.80	0.13		0.08	0.042					1.00	0.40	0.13	0.042	0.05	0.002	1%
4	6.40	0.14		0.08	0.179					1.00	0.40	0.14	0.179	0.06	0.010	7%
5	6.00	0.12		0.07	0.201					1.00	0.30	0.12	0.201	0.04	0.007	5%
6	5.80	0.16		0.10	0.219					1.00	0.20	0.16	0.219	0.03	0.007	5%
7	5.60	0.15		0.09	0.226					1.00	0.30	0.15	0.226	0.04	0.010	7%
8	5.20	0.16		0.10	0.189					1.00	0.40	0.16	0.189	0.06	0.012	8%
9	4.80	0.15		0.09	0.156					1.00	0.40	0.15	0.156	0.06	0.009	6%
10	4.40	0.14		0.08	0.165					1.00	0.40	0.14	0.165	0.06	0.009	6%
11	4.00	0.13		0.08	0.172					1.00	0.40	0.13	0.172	0.05	0.009	6%
12	3.60	0.14		0.08	0.153					1.00	0.40	0.14	0.153	0.06	0.010	7%
13	3.20	0.10		0.06	0.173					1.00	0.40	0.10	0.173	0.04	0.007	5%
14	2.80	0.12		0.07	0.198					1.00	0.35	0.12	0.198	0.04	0.008	6%
15	2.50	0.13		0.08	0.205					1.00	0.25	0.13	0.205	0.03	0.007	5%
16	2.30	0.15		0.09	0.228					1.00	0.20	0.15	0.228	0.03	0.007	5%
17	2.10	0.16		0.10	0.197					1.00	0.20	0.16	0.197	0.03	0.006	4%
18	1.90	0.19		0.11	0.171					1.00	0.30	0.19	0.171	0.06	0.010	7%
19	1.50	0.19		0.11	0.139					1.00	0.40	0.19	0.139	0.08	0.011	7%
20	1.10	0.12		0.07	0.060					1.00	0.40	0.12	0.060	0.05	0.003	2%
LB	0.70	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.146	100%	

Flow Measurement Details:

Metering Section Location (describe): Regular location

Meas. Start Time (MST):	11:25
Meas. End Time (MST):	11:50
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Ice on banks, low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light breeze, -2C



Flow characteristics:

Total Flow:	0.146	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.98	(m ²)
Wetted Width:	7.60	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.15	(m/s)
Reynolds Number:	1.11E+04	
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.254	0.357
Water (°C):	1.0	1.3
TBRG Tested?:	-	-
Datalogger Clock:	09:48	11:53
Laptop Clock:	09:46	11:52
Battery (Main):	12.7	13.6
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 -RSSI-98
 -Moved station back to original location downstream of road due to construction upstream of road.

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S31-4	0.767	100.714		99.947	99.947	3/4" Pipe 3m SW of logger
S31-9			1.144	99.570	99.582	Bolt under bridge
S31-5			0.818	99.896	99.896	3/4" Pipe 15m NW of logger
Water Level:	Cut	0.270	2.859	98.125	Time WL Surveyed:	11:08
S31-3			0.988	99.726	99.726	3/4" Pipe 5m NW of logger
Turn						
S31-3	0.952	100.678		99.726	99.726	3/4" Pipe 5m NW of logger
Water Level:	Cut	0.273	2.831	98.120	Time WL Surveyed:	11:13
S31-5			0.782	99.896	99.896	3/4" Pipe 15m NW of logger
S31-9			1.111	99.567	99.582	Bolt under bridge
S31-4			0.731	99.947	99.947	3/4" Pipe 3m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	98.123	-
Closing Error:	0.000	-
WL Check:	0.005	-
Transducer Elevation	97.766	-

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Carsel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	TR, AJ	Trip Date:	6-Nov-15
Data Check Personnel:	TR	Date:	6-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road
 UTM Location: 476969 E, 6236095 N

Site Visit Date: December 4, 2015
 Site Visit Time (MST): 14:18

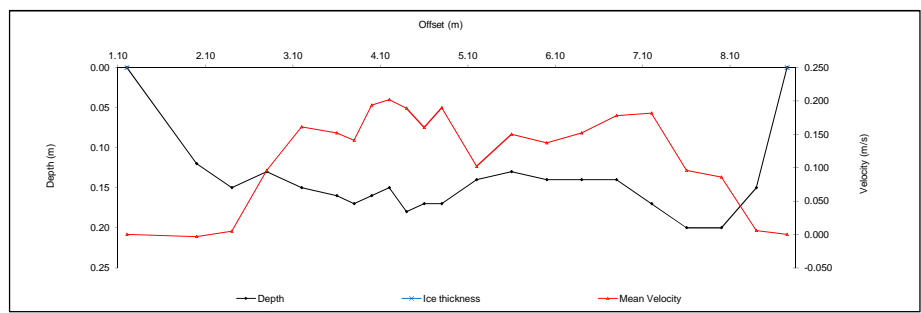


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	8.75	0.00	0.00		0.000		0.000		0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	8.40	0.15		0.09	0.006					1.00	0.38	0.15	0.006	0.06	0.000	0%
2	8.00	0.20		0.12	0.086					1.00	0.40	0.20	0.086	0.08	0.007	5%
3	7.60	0.20		0.12	0.096					1.00	0.40	0.20	0.096	0.08	0.008	6%
4	7.20	0.17		0.10	0.182					1.00	0.40	0.17	0.182	0.07	0.012	10%
5	6.80	0.14		0.08	0.178					1.00	0.40	0.14	0.178	0.06	0.010	8%
6	6.40	0.14		0.08	0.152					1.00	0.40	0.14	0.152	0.06	0.009	7%
7	6.00	0.14		0.08	0.137					1.00	0.40	0.14	0.137	0.06	0.008	6%
8	5.60	0.13		0.08	0.150					1.00	0.40	0.13	0.150	0.05	0.008	6%
9	5.20	0.14		0.08	0.102					1.00	0.40	0.14	0.102	0.06	0.006	4%
10	4.80	0.17		0.10	0.190					1.00	0.30	0.17	0.190	0.05	0.010	8%
11	4.60	0.17		0.10	0.160					1.00	0.20	0.17	0.160	0.03	0.005	4%
12	4.40	0.18		0.11	0.189					1.00	0.20	0.18	0.189	0.04	0.007	5%
13	4.20	0.15		0.09	0.202					1.00	0.20	0.15	0.202	0.03	0.006	5%
14	4.00	0.16		0.10	0.194					1.00	0.20	0.16	0.194	0.03	0.006	5%
15	3.80	0.17		0.10	0.141					1.00	0.20	0.17	0.141	0.03	0.005	4%
16	3.60	0.16		0.10	0.152					1.00	0.30	0.16	0.152	0.05	0.007	6%
17	3.20	0.15		0.09	0.161					1.00	0.40	0.15	0.161	0.06	0.010	8%
18	2.80	0.13		0.08	0.096					1.00	0.40	0.13	0.096	0.05	0.005	4%
19	2.40	0.15		0.09	0.005					1.00	0.40	0.15	0.005	0.06	0.000	0%
20	2.00	0.12		0.07	-0.003					1.00	0.60	0.12	-0.003	0.07	0.000	0%
RB	1.20	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	0%
Total Flow														0.128	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	14:43
Meas. End Time (MST):	15:03
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Open, dammed downstream
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, -2C



Flow characteristics:

Total Flow:	0.128	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.07	(m ²)
Wetted Width:	7.55	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.12	(m/s)
Reynolds Number:	9.82E+03	
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.343	-
Water (°C):	1.2	-
TBRG Tested?:	-	-
Datalogger Clock:	15:21	-
Laptop Clock:	14:20	-
Battery (Main):	13.6	-
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

Noisy data, possible in stream construction upstream of site.
 New beaver activity at pressure transducer.

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
BM4	1.095	101.042		99.947	99.947	3/4" Pipe 3m SW of logger
t post			1.013	100.029	100.571	
BM3			1.317	99.725	99.726	3/4" Pipe 5m NW of logger
Water Level:	Cut		2.953	98.089		Time WL Surveyed: 14:29
BM3			1.317	99.725	#N/A	#N/A
Turn						
BM3	1.297	101.022		99.725	#N/A	#N/A
Water Level:	Cut		2.933	98.089		Time WL Surveyed: 14:32
t post			0.995	100.027	100.571	
BM3			1.297	99.725	99.726	3/4" Pipe 5m NW of logger
BM4			1.077	99.945	99.947	3/4" Pipe 3m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.089	-
Closing Error:	0.002	-
WL Check:	0.000	-
Transducer Elevation	97.746	-

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC 2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG JM	Trip Date:	4-Dec-15
Data Check Personnel:	JC	Date:	8-Jan-16
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881
 UTM Location: 490252 E, 6254511 N

Site Visit Date: January 17, 2015
 Site Visit Time (MST): 12:20

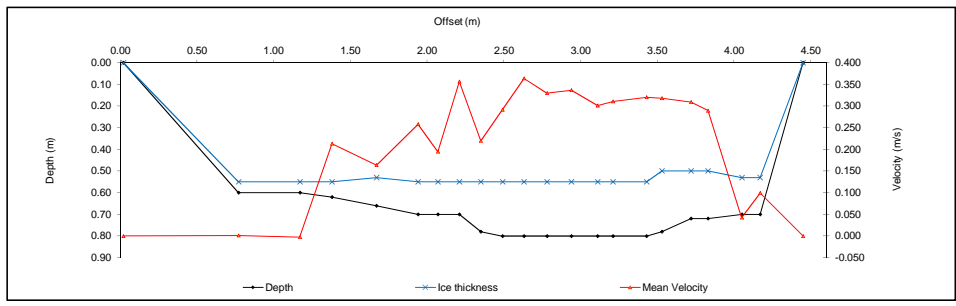


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	4.45	0.00	0.00		0.000		0.000		0.000	0.88	0.14	0.00	0.000	0.00	0.000	
1	4.17	0.70	0.53	0.62	0.113					0.88	0.20	0.17	0.099	0.03	0.003	2%
2	4.05	0.70	0.53	0.62	0.048					0.88	0.17	0.17	0.042	0.03	0.001	1%
3	3.83	0.72	0.50	0.61	0.329					0.88	0.17	0.22	0.290	0.04	0.011	7%
4	3.72	0.72	0.50	0.61	0.351					0.88	0.15	0.22	0.309	0.03	0.010	6%
5	3.53	0.78	0.50	0.64	0.361					0.88	0.15	0.28	0.318	0.04	0.013	8%
6	3.43	0.80	0.55	0.68	0.364					0.88	0.16	0.25	0.320	0.04	0.013	8%
7	3.21	0.80	0.55	0.68	0.353					0.88	0.16	0.25	0.311	0.04	0.012	8%
8	3.11	0.80	0.55	0.68	0.342					0.88	0.14	0.25	0.301	0.03	0.010	6%
9	2.94	0.80	0.55	0.68	0.382					0.88	0.17	0.25	0.336	0.04	0.014	9%
10	2.78	0.80	0.55	0.68	0.375					0.88	0.16	0.25	0.330	0.04	0.013	8%
11	2.63	0.80	0.55	0.68	0.413					0.88	0.15	0.25	0.363	0.04	0.013	8%
12	2.49	0.80	0.55	0.68	0.331					0.88	0.14	0.25	0.291	0.04	0.010	6%
13	2.35	0.78	0.55	0.67	0.250					0.88	0.14	0.23	0.220	0.03	0.007	4%
14	2.21	0.70	0.55	0.63	0.405					0.88	0.14	0.15	0.356	0.02	0.007	5%
15	2.07	0.70	0.55	0.63	0.221					0.88	0.14	0.15	0.194	0.02	0.004	2%
16	1.94	0.70	0.55	0.63	0.293					0.88	0.20	0.15	0.258	0.03	0.008	5%
17	1.67	0.66	0.53	0.60	0.186					0.88	0.28	0.13	0.164	0.04	0.006	4%
18	1.38	0.62	0.55	0.59	0.242					0.88	0.25	0.07	0.213	0.02	0.004	2%
19	1.17	0.60	0.55	0.58	-0.003					0.88	0.31	0.05	-0.003	0.02	0.000	0%
20	0.77	0.60	0.55	0.58	0.001					0.88	0.58	0.05	0.001	0.03	0.000	0%
RB	0.02	0.00	0.00		0.00		0.00		0.00	0.88	0.38	0.00	0.000	0.00	0.000	
Total Flow														0.160	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	12:45
Meas. End Time (MST):	13:15
Equipment:	ADV
Method:	Ice
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 1C



Flow characteristics:

Total Flow:	0.160	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.64	(m ²)
Wetted Width:	4.43	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.21	

Logger Details:

	Before	After
Transducer Reading (m):	0.791	0.788
Water (°C):	0.4	0.4
Datalogger Clock:	12:22	12:28
Logger Clock:	12:22	12:27
Battery (Main):	10.1	112.9
Battery:		Replaced
Battery Serial #:	906001	905005
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-3	1.052	100.170		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.500	98.670	98.664	3/4" Pipe 7m S of logger
S32-5			1.366	98.804	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.327	96.843	Time WL Surveyed: 12:43	
Temporary BM			3.291	96.879	0.000	
Turn						
Temporary BM	3.270	100.149		96.879		
Water Level:	Cut		3.303	96.846	Time WL Surveyed: 12:46	
S32-5			1.342	98.807	98.807	3/4" Pipe 4m S of logger
S32-6			1.478	98.671	98.664	3/4" Pipe 7m S of logger
S32-3			1.031	99.118	99.118	3/4" Pipe 10m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	96.845	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	96.054	-

Field Personnel:

	DW, MP	Trip Date:	17-Jan-14
Data Entry Personnel:	DW, MP	Date:	17-Jan-14
Data Check Personnel:	TR	Date:	4-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881
 UTM Location: 490252 E, 6254511 N

Site Visit Date: February 3, 2015
 Site Visit Time (MST): 11:40

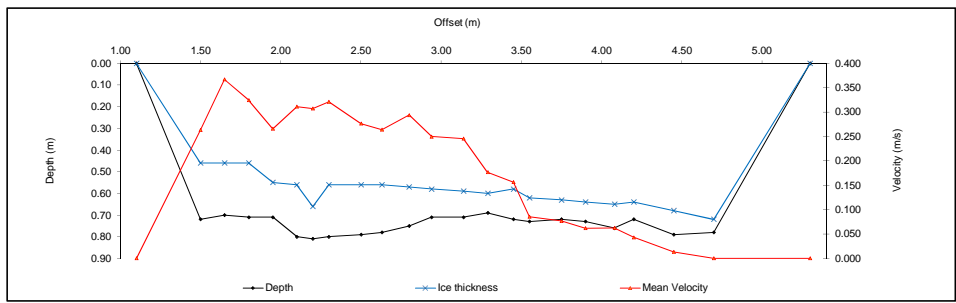


Flow Measurement															
Measured Data								Calculated Data							
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.10	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	1.50	0.72	0.46	0.59	0.299				0.88	0.28	0.26	0.263	0.07	0.019	15%
2	1.65	0.70	0.46	0.58	0.417				0.88	0.15	0.24	0.367	0.04	0.013	11%
3	1.80	0.71	0.46	0.59	0.369				0.88	0.15	0.25	0.325	0.04	0.012	10%
4	1.95	0.71	0.55	0.63	0.302				0.88	0.15	0.16	0.266	0.02	0.006	5%
5	2.10	0.80	0.56	0.68	0.354				0.88	0.13	0.24	0.312	0.03	0.009	7%
6	2.20	0.81	0.66	0.74	0.349				0.88	0.10	0.15	0.307	0.01	0.005	4%
7	2.30	0.80	0.56	0.68	0.365				0.88	0.15	0.24	0.321	0.04	0.012	9%
8	2.50	0.79	0.56	0.68	0.314				0.88	0.17	0.23	0.276	0.04	0.010	8%
9	2.63	0.78	0.56	0.67	0.300				0.88	0.15	0.22	0.264	0.03	0.009	7%
10	2.80	0.75	0.57	0.66	0.334				0.88	0.16	0.18	0.294	0.03	0.008	7%
11	2.94	0.71	0.58	0.65	0.284				0.88	0.17	0.13	0.250	0.02	0.006	4%
12	3.14	0.71	0.59	0.65	0.279				0.88	0.18	0.12	0.246	0.02	0.005	4%
13	3.29	0.69	0.60	0.65	0.201				0.88	0.16	0.09	0.177	0.01	0.002	2%
14	3.45	0.72	0.58	0.65	0.178				0.88	0.13	0.14	0.157	0.02	0.003	2%
15	3.55	0.73	0.62	0.68	0.097				0.88	0.15	0.11	0.085	0.02	0.001	1%
16	3.75	0.72	0.63	0.68	0.087				0.88	0.18	0.09	0.077	0.02	0.001	1%
17	3.90	0.73	0.64	0.69	0.070				0.88	0.17	0.09	0.062	0.01	0.001	1%
18	4.08	0.76	0.65	0.71	0.071				0.88	0.15	0.11	0.062	0.02	0.001	1%
19	4.20	0.72	0.64	0.68	0.049				0.88	0.19	0.08	0.043	0.01	0.001	1%
20	4.45	0.79	0.68	0.74	0.015				0.88	0.25	0.11	0.013	0.03	0.000	0%
21	4.70	0.78	0.72	0.75	0.000				0.88	0.43	0.06	0.000	0.03	0.000	0%
LB	5.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.30	0.00	0.000	0.00	0.000	
Total Flow													0.125	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	12:26
Meas. End Time (MST):	12:50
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, breezy, -22C



Flow characteristics:

Total Flow:	0.125	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	0.56	(m ²)
Wetted Width:	4.20	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.20	

Logger Details:

	Before	After
Transducer Reading (m):	0.832	-
Water (°C):	0.4	-
Datalogger Clock:	11:50	-
Laptop Clock:	11:49	-
Battery (Main):	12.6	13.0
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-3	1.208	100.326		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.657	98.669	98.664	3/4" Pipe 7m S of logger
S32-5			1.525	98.801	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.441	96.885		Time WL Surveyed: 12:18
Temporary BM			3.274	97.052	0.000	-
Turn						
Temporary BM	3.255	100.307		97.052		-
Water Level:	Cut		3.421	96.886		Time WL Surveyed: 12:22
S32-5			1.505	98.802	98.807	3/4" Pipe 4m S of logger
S32-6			1.638	98.669	98.664	3/4" Pipe 7m S of logger
S32-3			1.189	99.118	99.118	3/4" Pipe 10m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.886	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	96.054	-

Field Personnel:

Data Entry Personnel:	SM, TR	Trip Date:	3-Feb-15
Data Check Personnel:	SM	Date:	3-Feb-15
Entered Digitally in the Field:	TR	Date:	4-May-15

Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881
 UTM Location: 490252 E, 6254511 N

Site Visit Date: April 24, 2015
 Site Visit Time (MST): 16:00



Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.65	0.00	0.00							1.00	0.13	0.00	0.000	0.00	0.000	
1	8.90	0.39		0.23	0.015					1.00	0.33	0.39	0.015	0.13	0.002	0%
2	9.30	0.43		0.26	0.077					1.00	0.40	0.43	0.077	0.17	0.013	1%
3	9.70	0.48		0.29	0.151					1.00	0.40	0.48	0.151	0.19	0.029	2%
4	10.10	0.47		0.28	0.296					1.00	0.40	0.47	0.296	0.19	0.056	4%
5	10.50	0.47		0.28	0.283					1.00	0.40	0.47	0.283	0.19	0.053	4%
6	10.90	0.50		0.30	0.375					1.00	0.40	0.50	0.375	0.20	0.075	6%
7	11.30	0.54		0.32	0.358					1.00	0.40	0.54	0.358	0.22	0.077	6%
8	11.70	0.59		0.35	0.356					1.00	0.40	0.59	0.356	0.24	0.084	6%
9	12.10	0.63		0.38	0.334					1.00	0.40	0.63	0.334	0.25	0.084	6%
10	12.50	0.64		0.38	0.468					1.00	0.40	0.64	0.468	0.26	0.120	9%
11	12.90	0.72		0.43	0.459					1.00	0.30	0.72	0.459	0.22	0.099	7%
12	13.10	0.75		0.45	0.512					1.00	0.20	0.75	0.512	0.15	0.077	6%
13	13.30	0.75		0.45	0.378					1.00	0.30	0.75	0.378	0.23	0.085	6%
14	13.70	0.77				0.62	0.226	0.15	0.476	1.00	0.40	0.77	0.351	0.31	0.108	8%
15	14.10	0.72		0.43	0.336					1.00	0.40	0.72	0.336	0.29	0.097	7%
16	14.50	0.64		0.38	0.318					1.00	0.40	0.64	0.318	0.26	0.081	6%
17	14.90	0.65		0.39	0.231					1.00	0.40	0.65	0.231	0.26	0.060	4%
18	15.30	0.60		0.36	0.214					1.00	0.40	0.60	0.214	0.24	0.051	4%
19	15.70	0.63		0.38	0.242					1.00	0.40	0.63	0.242	0.25	0.061	5%
20	16.10	0.55		0.33	0.137					1.00	0.40	0.55	0.137	0.22	0.030	2%
LB	16.50	0.00	0.00							1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														1.34	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	16:36
Meas. End Time (MST):	17:01
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 5C

Flow characteristics:

Total Flow:	1.34	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.44	(m ²)
Wetted Width:	7.85	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.13	

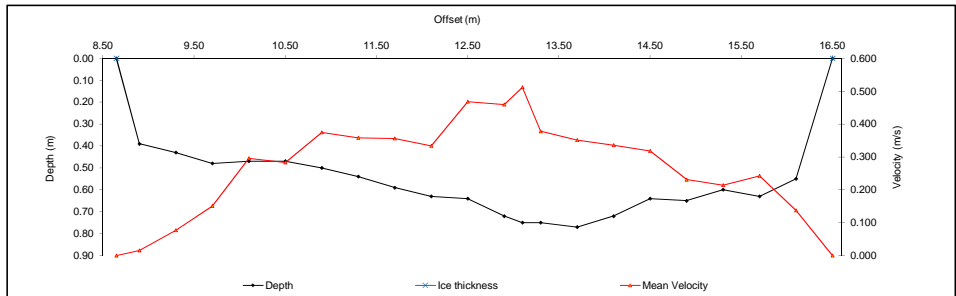
Logger Details:

	Before	After
Transducer Reading (m):	0.891	0.908
Water (°C):	3.3	3.5
Datalogger Clock:	16:11	17:14
Laptop Clock:	16:10	17:13
Battery (Main):	12.2	12.8
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-Left bank undercut to 0.3m

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-3	0.987	100.105		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.438	98.667	98.664	3/4" Pipe 7m S of logger
S32-5			1.303	98.802	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.153	96.952		Time WL Surveyed: 16:21
S32-5			1.303	98.802	98.807	3/4" Pipe 4m S of logger
Turn						
S32-5	1.285	100.087		98.802	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.138	96.949		Time WL Surveyed: 16:25
S32-5			1.285	98.802	98.807	3/4" Pipe 4m S of logger
S32-6			1.421	98.666	98.664	3/4" Pipe 7m S of logger
S32-3			0.988	99.119	99.118	3/4" Pipe 10m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S32-5	1.284	100.086		98.802		
Water Level:	Cut		3.125	96.961		Time WL Surveyed: 17:07
Water Level:	Cut		3.110	96.961		Time WL Surveyed: 17:09
S32-5	1.269	100.071		98.802		

WL Survey Summary

	Before	After
Average WL:	96.951	96.961
Closing Error:	-0.001	-
WL Check:	0.003	0.000
Transducer Elevation	96.060	96.053

Field Personnel:

	SM, GG	Trip Date:	24-Apr-15
Data Entry Personnel:	SM	Date:	24-Apr-15
Data Check Personnel:	TR	Date:	4-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881
 UTM Location: 490252 E, 6254511 N

Site Visit Date: May 7, 2015
 Site Visit Time (MST): 10:43

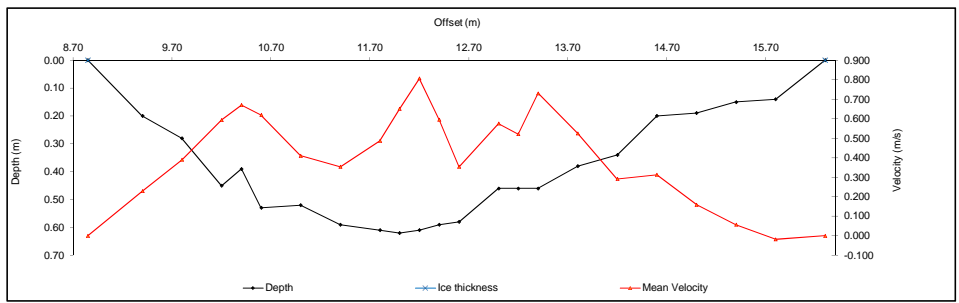


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	16.30	0.00	0.00							1.00	0.25	0.00	0.000	0.00	0.000	
1	15.80	0.14		0.08	-0.018					1.00	0.45	0.14	-0.018	0.06	-0.001	0%
2	15.40	0.15		0.09	0.057					1.00	0.40	0.15	0.057	0.06	0.003	0%
3	15.00	0.19		0.11	0.159					1.00	0.40	0.19	0.159	0.08	0.012	1%
4	14.60	0.20		0.12	0.312					1.00	0.40	0.20	0.312	0.08	0.025	2%
5	14.20	0.34		0.20	0.291					1.00	0.40	0.34	0.291	0.14	0.040	3%
6	13.80	0.38		0.23	0.525					1.00	0.40	0.38	0.525	0.15	0.080	6%
7	13.40	0.46		0.28	0.730					1.00	0.30	0.46	0.730	0.14	0.101	8%
8	13.20	0.46		0.28	0.521					1.00	0.20	0.46	0.521	0.09	0.048	4%
9	13.00	0.46		0.28	0.575					1.00	0.30	0.46	0.575	0.14	0.079	6%
10	12.60	0.58		0.35	0.354					1.00	0.30	0.58	0.354	0.17	0.062	5%
11	12.40	0.59		0.35	0.595					1.00	0.20	0.59	0.595	0.12	0.070	6%
12	12.20	0.61		0.37	0.806					1.00	0.20	0.61	0.806	0.12	0.098	8%
13	12.00	0.62		0.37	0.651					1.00	0.20	0.62	0.651	0.12	0.081	6%
14	11.80	0.61		0.37	0.487					1.00	0.30	0.61	0.487	0.18	0.089	7%
15	11.40	0.59		0.35	0.354					1.00	0.40	0.59	0.354	0.24	0.084	7%
16	11.00	0.52		0.31	0.410					1.00	0.40	0.52	0.410	0.21	0.085	7%
17	10.60	0.53		0.32	0.619					1.00	0.30	0.53	0.619	0.16	0.098	8%
18	10.40	0.39		0.23	0.670					1.00	0.20	0.39	0.670	0.08	0.052	4%
19	10.20	0.45		0.27	0.594					1.00	0.30	0.45	0.594	0.14	0.080	6%
20	9.80	0.28		0.17	0.390					1.00	0.40	0.28	0.390	0.11	0.044	3%
21	9.40	0.20		0.12	0.229					1.00	0.47	0.20	0.229	0.09	0.022	2%
RB	8.85	0.00	0.00		0.00					1.00	0.27	0.00	0.000	0.00	0.000	
Total Flow														1.25	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m downstream of bridge

Meas. Start Time (MST):	10:55
Meas. End Time (MST):	11:30
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, light breeze, 4C



Flow characteristics:

Total Flow:	1.250	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.68	(m ²)
Wetted Width:	7.45	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.47	(m/s)
Froude Number:	0.25	

Logger Details:

	Before	After
Transducer Reading (m):	0.811	0.810
Water (°C):	3.0	3.4
Datalogger Clock:	10:45	11:41
Laptop Clock:	10:44	11:40
Battery (Main):	12.4	12.9
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-3	1.077	100.195		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.528	98.667	98.664	3/4" Pipe 7m S of logger
S32-5			1.398	98.797	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut			96.869	10.49	Time WL Surveyed:
S32-5			1.398	98.797	98.807	3/4" Pipe 4m S of logger
Turn						
S32-5	1.367	100.164		98.797	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.299	96.865	10.51	Time WL Surveyed:
S32-5			1.367	98.797	98.807	3/4" Pipe 4m S of logger
S32-6			1.499	98.665	98.664	3/4" Pipe 7m S of logger
S32-3			1.047	99.117	99.118	3/4" Pipe 10m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S32-5	1.367	100.164		98.797		
Water Level:	Cut		3.301	96.863	11.31	Time WL Surveyed:
Water Level:	Cut		3.280	96.860	11.33	Time WL Surveyed:
S32-5	1.343	100.140		98.797		

WL Survey Summary

	Before	After
Average WL:	96.867	96.862
Closing Error:	0.001	-
WL Check:	0.004	0.003
Transducer Elevation	96.056	96.052

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	7-May-15
Data Check Personnel:	TR	Date:	7-May-15
Entered Digitally in the Field:	Yes	Date:	3-Jul-15

Hydrometric Measurement / Site Visit Record

Site: S32 - Surrmont Creek at Highway 881
 UTM Location: 490252 E, 6254511 N

Site Visit Date: June 4, 2015
 Site Visit Time (MST): 13:40

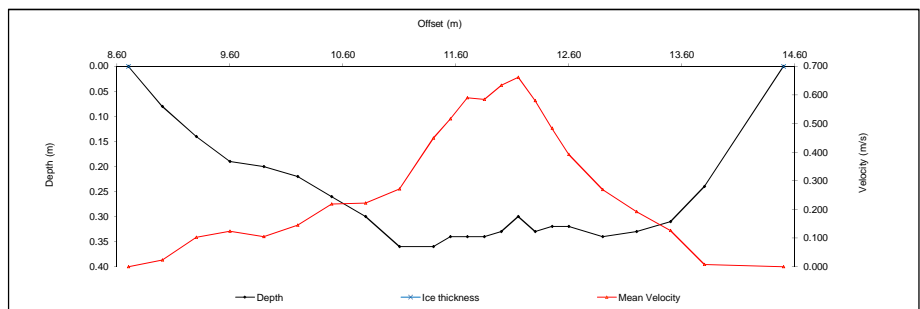


Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)							
RB	14.50	0.00	0.00		0.000				0.000	1.00	0.35	0.00	0.000	0.00	0.000								
1	13.80	0.24		0.14	0.007					1.00	0.50	0.24	0.007	0.12	0.001	0%							
2	13.50	0.31		0.19	0.126					1.00	0.30	0.31	0.126	0.09	0.012	3%							
3	13.20	0.33		0.20	0.192					1.00	0.30	0.33	0.192	0.10	0.019	5%							
4	12.90	0.34		0.20	0.269					1.00	0.30	0.34	0.269	0.10	0.027	7%							
5	12.60	0.32		0.19	0.392					1.00	0.23	0.32	0.392	0.07	0.028	7%							
6	12.45	0.32		0.19	0.454					1.00	0.15	0.32	0.454	0.05	0.023	6%							
7	12.30	0.33		0.20	0.580					1.00	0.15	0.33	0.580	0.05	0.029	7%							
8	12.15	0.30		0.18	0.662					1.00	0.15	0.30	0.662	0.05	0.030	7%							
9	12.00	0.33		0.20	0.634					1.00	0.15	0.33	0.634	0.05	0.031	8%							
10	11.85	0.34		0.20	0.584					1.00	0.15	0.34	0.584	0.05	0.030	7%							
11	11.70	0.34		0.20	0.590					1.00	0.15	0.34	0.590	0.05	0.030	7%							
12	11.55	0.34		0.20	0.516					1.00	0.15	0.34	0.516	0.05	0.026	6%							
13	11.40	0.36		0.22	0.449					1.00	0.23	0.36	0.449	0.08	0.036	9%							
14	11.10	0.36		0.22	0.271					1.00	0.30	0.36	0.271	0.11	0.029	7%							
15	10.80	0.30		0.18	0.222					1.00	0.30	0.30	0.222	0.09	0.020	5%							
16	10.50	0.26		0.16	0.219					1.00	0.30	0.26	0.219	0.08	0.017	4%							
17	10.20	0.22		0.13	0.145					1.00	0.30	0.22	0.145	0.07	0.010	2%							
18	9.90	0.20		0.12	0.105					1.00	0.30	0.20	0.105	0.06	0.006	2%							
19	9.60	0.19		0.11	0.124					1.00	0.30	0.19	0.124	0.06	0.007	2%							
20	9.30	0.14		0.08	0.102					1.00	0.30	0.14	0.102	0.04	0.004	1%							
21	9.00	0.08		0.05	0.023					1.00	0.30	0.08	0.023	0.02	0.001	0%							
LB	8.70	0.00	0.00		0.00				0.00	1.00	0.15	0.00	0.000	0.00	0.000								
Total Flow														0.417	100%								

Flow Measurement Details:

Metering Section Location (describe):
5m downstream of station

Meas. Start Time (MST):	13:59
Meas. End Time (MST):	14:20
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 25C



Flow characteristics:

Total Flow:	0.417	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.44	(m ²)
Wetted Width:	5.80	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.29	(m/s)
Reynolds Number:	6.07E+04	
Froude Number:	0.19	

Logger Details:

	Before	After
Transducer Reading (m):	0.469	0.469
Water (°C):	13.8	14.2
Datalogger Clock:	13:45	14:28
Laptop Clock:	13:44	14:27
Battery:	12.6	13.1
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-3	0.927	100.045		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.377	98.668	98.664	3/4" Pipe 7m S of logger
S32-5			1.243	98.802	98.807	3/4" Pipe 4m S of logger
Turn						
Water Level:	Cut		3.522	96.523	96.523	Time WL Surveyed: 13:52
S32-6			1.243	98.802	98.807	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S32-5	1.217	100.019		98.802	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.496	96.523	96.523	Time WL Surveyed: 13:53
S32-5			1.217	98.802	98.807	3/4" Pipe 4m S of logger
S32-6			1.348	98.671	98.664	3/4" Pipe 7m S of logger
S32-3			0.901	99.118	99.118	3/4" Pipe 10m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S32-5	1.217	100.019		98.802	98.802	Time WL Surveyed: 14:24
Water Level:	Cut		3.499	96.520	96.522	Time WL Surveyed: 14:25
S32-5	1.198	100.000		98.802	98.802	

WL Survey Summary

	Before	After
Average WL:	96.523	96.521
Closing Error:	0.000	-
WL Check:	0.000	-0.002
Transducer Elevation	96.054	96.052

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Cansel AT-24
Serial #:	76710

Field Personnel:

Field Personnel:	TR, MK	Trip Date:	4-Jun-15
Data Entry Personnel:	TR	Date:	4-Jun-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S32 - Surrmont Creek at Highway 881
 UTM Location: 490252 E, 6254511 N

Site Visit Date: August 9, 2015
 Site Visit Time (MST): 16:30

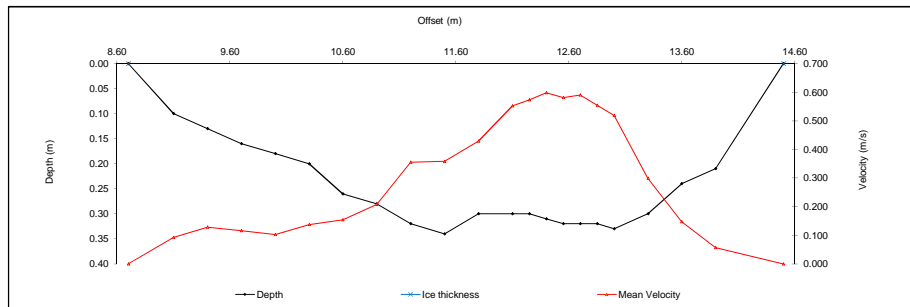


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	14.50	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	13.90	0.21		0.13	0.057					1.00	0.45	0.21	0.057	0.09	0.005	1%
2	13.60	0.24		0.14	0.147					1.00	0.30	0.24	0.147	0.07	0.011	3%
3	13.30	0.30		0.18	0.299					1.00	0.30	0.30	0.299	0.09	0.027	6%
4	13.00	0.33		0.20	0.518					1.00	0.23	0.33	0.518	0.07	0.038	9%
5	12.85	0.32		0.19	0.554					1.00	0.15	0.32	0.554	0.05	0.027	6%
6	12.70	0.32		0.19	0.550					1.00	0.15	0.32	0.550	0.05	0.028	7%
7	12.55	0.32		0.19	0.581					1.00	0.15	0.32	0.581	0.05	0.028	7%
8	12.40	0.31		0.19	0.598					1.00	0.15	0.31	0.598	0.05	0.028	7%
9	12.25	0.30		0.18	0.573					1.00	0.15	0.30	0.573	0.04	0.026	6%
10	12.10	0.30		0.18	0.552					1.00	0.23	0.30	0.552	0.07	0.037	9%
11	11.80	0.30		0.18	0.429					1.00	0.30	0.30	0.429	0.09	0.039	9%
12	11.50	0.34		0.20	0.358					1.00	0.30	0.34	0.358	0.10	0.037	9%
13	11.20	0.32		0.19	0.355					1.00	0.30	0.32	0.355	0.10	0.034	8%
14	10.90	0.28		0.17	0.208					1.00	0.30	0.28	0.208	0.08	0.017	4%
15	10.60	0.26		0.16	0.154					1.00	0.30	0.26	0.154	0.08	0.012	3%
16	10.30	0.20		0.12	0.137					1.00	0.30	0.20	0.137	0.06	0.008	2%
17	10.00	0.18		0.11	0.102					1.00	0.30	0.18	0.102	0.05	0.006	1%
18	9.70	0.16		0.10	0.116					1.00	0.30	0.16	0.116	0.05	0.006	1%
19	9.40	0.13		0.08	0.128					1.00	0.30	0.13	0.128	0.04	0.005	1%
20	9.10	0.10		0.06	0.092					1.00	0.35	0.10	0.092	0.04	0.004	1%
LB	8.70	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.421	100%	

Flow Measurement Details:

Metering Section Location (describe):
12m downstream of bridge

Meas. Start Time (MST):	16:50
Meas. End Time (MST):	17:05
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20C



Flow characteristics:

Total Flow:	0.421	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.32	(m ²)
Wetted Width:	5.80	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.32	(m/s)
Reynolds Number:	6.89E+04	
Froude Number:	0.21	

Logger Details:

	Before	After
Transducer Reading (m):	0.453	0.452
Water (°C):	18.2	18.5
Datalogger Clock:	16:36	17:31
Laptop Clock:	16:35	17:30
Battery:	12.6	13.0
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	352320	-
Logger# (if replaced):	20726	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-3	1.105	100.223		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.553	98.670	98.664	3/4" Pipe 7m S of logger
S32-5			1.422	98.801	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.722	96.501		Time WL Surveyed: 16:41
S32-5			1.422	98.801	98.807	3/4" Pipe 4m S of logger
Turn						
S32-5	1.386	100.187		98.801	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.687	96.500		Time WL Surveyed: 16:42
S32-5				98.801	98.807	3/4" Pipe 4m S of logger
S32-6			1.517	98.670	98.664	3/4" Pipe 7m S of logger
S32-3			1.088	99.118	99.118	3/4" Pipe 10m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S32-5	1.385	100.186		98.801		Time WL Surveyed: 17:15
Water Level:	Cut		3.681	96.495		Time WL Surveyed: 17:19
Water Level:	Cut		3.642	96.490		
S32-5	1.340	100.141		98.801		

WL Survey Summary

	Before	After
Average WL:	96.501	96.497
Closing Error:	-0.001	-
WL Check:	0.001	-0.004
Transducer Elevation	96.048	96.045

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, JC	Trip Date:	9-Aug-15
Data Check Personnel:	TR	Date:	9-Aug-15
Entered Digitally in the Field:	Yes	Date:	25-Aug-15

Hydrometric Measurement / Site Visit Record

Site: S32 - Surrmont Creek at Highway 881
 UTM Location: 490252 E, 6254511 N

Site Visit Date: September 18, 2015
 Site Visit Time (MST): 10:55

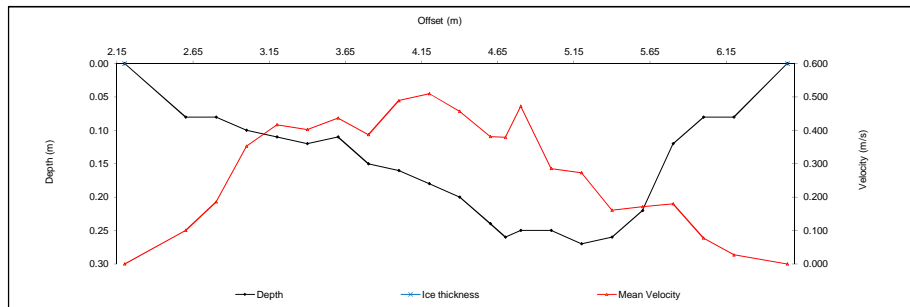


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	6.55	0.00	0.00		0.000				0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	6.20	0.08		0.05	0.027					1.00	0.28	0.08	0.027	0.02	0.001	0%
2	6.00	0.08		0.05	0.077					1.00	0.20	0.08	0.077	0.02	0.001	1%
3	5.80	0.12		0.07	0.180					1.00	0.20	0.12	0.180	0.02	0.004	2%
4	5.60	0.22		0.13	0.171					1.00	0.20	0.22	0.171	0.04	0.008	4%
5	5.40	0.26		0.16	0.161					1.00	0.20	0.26	0.161	0.05	0.008	4%
6	5.20	0.27		0.16	0.273					1.00	0.20	0.27	0.273	0.05	0.015	7%
7	5.00	0.25		0.15	0.285					1.00	0.20	0.25	0.285	0.05	0.014	7%
8	4.80	0.25		0.15	0.472					1.00	0.15	0.25	0.472	0.04	0.018	9%
9	4.70	0.26		0.16	0.379					1.00	0.10	0.26	0.379	0.03	0.010	5%
10	4.60	0.24		0.14	0.381					1.00	0.15	0.24	0.381	0.04	0.014	7%
11	4.40	0.20		0.12	0.457					1.00	0.20	0.20	0.457	0.04	0.018	9%
12	4.20	0.18		0.11	0.510					1.00	0.20	0.18	0.510	0.04	0.018	9%
13	4.00	0.16		0.10	0.489					1.00	0.20	0.16	0.489	0.03	0.016	8%
14	3.80	0.15		0.09	0.387					1.00	0.20	0.15	0.387	0.03	0.012	6%
15	3.60	0.11		0.07	0.437					1.00	0.20	0.11	0.437	0.02	0.010	5%
16	3.40	0.12		0.07	0.402					1.00	0.20	0.12	0.402	0.02	0.010	5%
17	3.20	0.11		0.07	0.417					1.00	0.20	0.11	0.417	0.02	0.009	5%
18	3.00	0.10		0.06	0.352					1.00	0.20	0.10	0.352	0.02	0.007	4%
19	2.80	0.08		0.05	0.186					1.00	0.20	0.08	0.186	0.02	0.003	2%
20	2.60	0.08		0.05	0.100					1.00	0.20	0.08	0.100	0.02	0.002	1%
LB	2.20	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.197	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	11:16
Meas. End Time (MST):	11:39
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow, clear
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 13C



Flow characteristics:

Total Flow:	0.197	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.63	(m ²)
Wetted Width:	4.35	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.31	(m/s)
Reynolds Number:	3.06E+04	
Froude Number:	0.26	

Logger Details:

	Before	After
Transducer Reading (m):	0.328	0.329
Water (°C):	8.2	4.4
Datalogger Clock:	10:59	11:49
Laptop Clock:	11:00	11:47
Battery:	12.5	13.0
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	-
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-5	1.330	100.137		98.807	98.807	3/4" Pipe 4m S of logger
S32-6			1.464	98.673	98.664	3/4" Pipe 7m S of logger
S32-3			1.014	99.123	99.118	3/4" Pipe 10m S of logger
Water Level: Cut 0.391 4.141 96.387 Time WL Surveyed: 11:09						
Temporary BM 4.141 95.996						
Turn						
Temporary BM	4.113	100.109		95.996		
Water Level:	Cut	0.391	4.113	96.387		Time WL Surveyed: 11:11
S32-3			0.988	99.121	99.118	3/4" Pipe 10m S of logger
S32-6			1.437	98.672	98.664	3/4" Pipe 7m S of logger
S32-5			1.303	98.806	98.807	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S32-5	1.303	100.109		98.806		
Water Level:	Cut	0.388	4.117	96.390		Time WL Surveyed: 11:43
Water Level:	Cut	0.388	4.099	96.390		Time WL Surveyed: 11:44
S32-5	1.285	100.091		98.806		

WL Survey Summary

	Before	After
Average WL:	96.387	96.390
Closing Error:	0.001	-
WL Check:	0.000	0.000
Transducer Elevation	96.059	96.061

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cancel AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	SM, CJ	Trip Date:	18-Sep-15
Data Check Personnel:	JC	Date:	18-Sep-15
Entered Digitally in the Field:	Yes	Date:	23-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S32 - Summit Creek at Highway 881
 UTM Location: 490252 E, 6254511 N

Site Visit Date: October 16, 2015
 Site Visit Time (MST): 16:00

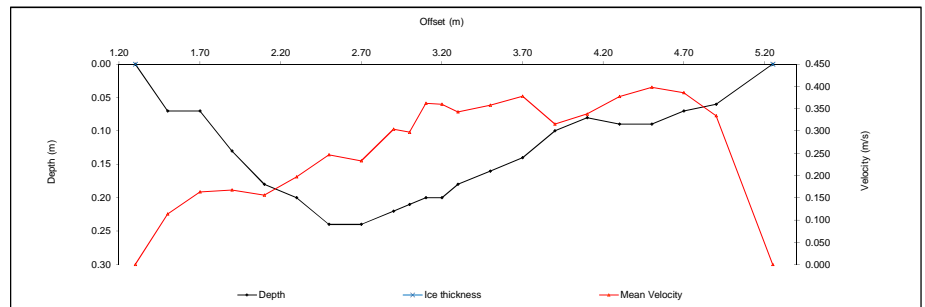


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.30	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.50	0.07		0.04	0.113					1.00	0.20	0.07	0.113	0.01	0.002	1%
2	1.70	0.07		0.04	0.163					1.00	0.20	0.07	0.163	0.01	0.002	2%
3	1.90	0.13		0.08	0.167					1.00	0.20	0.13	0.167	0.03	0.004	3%
4	2.10	0.18		0.11	0.156					1.00	0.20	0.18	0.156	0.04	0.006	4%
5	2.30	0.20		0.12	0.197					1.00	0.20	0.20	0.197	0.04	0.008	6%
6	2.50	0.24		0.14	0.246					1.00	0.20	0.24	0.246	0.05	0.012	8%
7	2.70	0.24		0.14	0.233					1.00	0.20	0.24	0.233	0.05	0.011	8%
8	2.90	0.22		0.13	0.304					1.00	0.15	0.22	0.304	0.03	0.010	7%
9	3.00	0.21		0.13	0.297					1.00	0.10	0.21	0.297	0.02	0.006	4%
10	3.10	0.20		0.12	0.362					1.00	0.10	0.20	0.362	0.02	0.007	5%
11	3.20	0.20		0.12	0.360					1.00	0.10	0.20	0.360	0.02	0.007	5%
12	3.30	0.18		0.11	0.343					1.00	0.15	0.18	0.343	0.03	0.009	6%
13	3.50	0.16		0.10	0.358					1.00	0.20	0.16	0.358	0.03	0.011	8%
14	3.70	0.14		0.08	0.378					1.00	0.20	0.14	0.378	0.03	0.011	7%
15	3.90	0.10		0.06	0.315					1.00	0.20	0.10	0.315	0.02	0.006	4%
16	4.10	0.08		0.05	0.338					1.00	0.20	0.08	0.338	0.02	0.005	4%
17	4.30	0.09		0.05	0.377					1.00	0.20	0.09	0.377	0.02	0.007	5%
18	4.50	0.09		0.05	0.398					1.00	0.20	0.09	0.398	0.02	0.007	5%
19	4.70	0.07		0.04	0.386					1.00	0.20	0.07	0.386	0.01	0.005	4%
20	4.90	0.06		0.04	0.334					1.00	0.27	0.06	0.334	0.02	0.006	4%
LB	5.25	0.00	0.00		0.000				0.000	1.00	0.18	0.00	0.000	0.00	0.000	
Total Flow														0.143	100%	

Flow Measurement Details:

Metering Section Location (describe):
8m downstream of bridge

Meas. Start Time (MST):	16:25
Meas. End Time (MST):	16:45
Equipment:	ADU#1
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 5C



Flow characteristics:

Total Flow:	0.143	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.51	(m ²)
Wetted Width:	3.95	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.28	(m/s)
Reynolds Number:	2.33E+04	
Froude Number:	0.25	

Logger Details:

	Before	After
Transducer Reading (m):	0.301	0.301
Water (°C):	4.6	4.7
Datalogger Clock:	16:11	16:46
Laptop Clock:	16:10	16:45
Battery:	12.8	13.1
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Dessoricant:	Replaced	
Vent Tube Dessoricant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

Beaver dam observed 5m upstream of bridge

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-3	1.021	100.139		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.471	98.668	98.664	3/4" Pipe 7m S of logger
S32-5			1.338	98.801	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.787	96.352	96.352	Time WL Surveyed: 16:17
S32-5			1.338	98.801	98.807	3/4" Pipe 4m S of logger
Turn						
S32-5	1.276	100.077		98.801	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.724	96.353	96.353	Time WL Surveyed: 16:18
S32-5			1.276	98.801	98.807	3/4" Pipe 4m S of logger
S32-6			1.409	98.668	98.664	3/4" Pipe 7m S of logger
S32-3			0.960	99.117	99.118	3/4" Pipe 10m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S32-5	1.276	100.076		98.801	98.801	
Water Level:	Cut		3.724	96.352	96.352	Time WL Surveyed: 16:49
Water Level:	Cut		3.681	96.352	96.352	Time WL Surveyed: 16:50
S32-5	1.232	100.033		98.801	98.801	

WL Survey Summary

	Before	After
Average WL:	96.353	96.352
Closing Error:	0.001	-
WL Check:	0.001	0.000
Transducer Elevation	96.052	96.051

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

TR, GG	Trip Date:	16-Oct-15	
Data Entry Personnel:	TR	Date:	16-Oct-15
Data Check Personnel:	TR	Date:	27-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Alban Boundary
 UTM Location: 474876 E, 6350204 N

Site Visit Date: January 9, 2015
 Site Visit Time (MST): 12:20

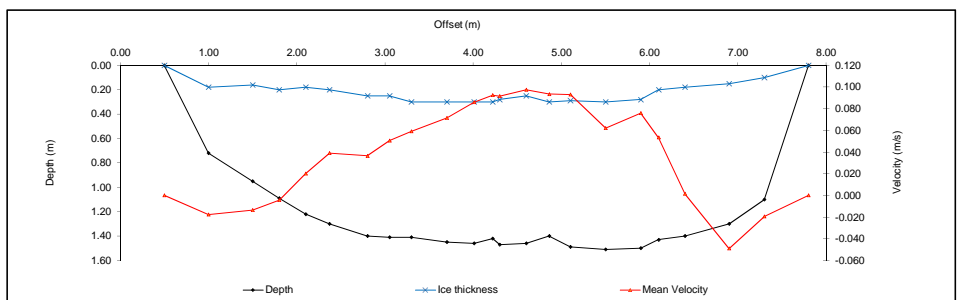


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
LB	0.50	0.00	0.00		0.000		0.000		0.000	0.88	0.25	0.00	0.000	0.00	0.000	
1	1.00	0.72	0.18	0.45	-0.020	0.79	-0.018	0.32	-0.009	1.00	0.50	0.54	-0.018	0.27	-0.005	-2%
2	1.50	0.95	0.16			0.91	-0.007	0.38	-0.002	1.00	0.40	0.79	-0.014	0.32	-0.004	-1%
3	1.80	1.09	0.20			1.01	0.007	0.39	0.033	1.00	0.30	0.89	-0.005	0.27	-0.001	0%
4	2.10	1.22	0.18			1.08	0.032	0.42	0.046	1.00	0.29	1.04	0.020	0.30	0.006	2%
5	2.37	1.30	0.20			1.17	0.025	0.48	0.048	1.00	0.35	1.10	0.039	0.39	0.015	5%
6	2.80	1.40	0.25			1.18	0.038	0.48	0.063	1.00	0.34	1.15	0.037	0.39	0.014	5%
7	3.05	1.41	0.25			1.18	0.038	0.48	0.063	1.00	0.25	1.16	0.051	0.29	0.015	5%
8	3.30	1.41	0.30			1.19	0.058	0.52	0.060	1.00	0.33	1.11	0.059	0.36	0.021	7%
9	3.70	1.45	0.30			1.22	0.068	0.53	0.075	1.00	0.36	1.15	0.072	0.41	0.029	10%
10	4.01	1.46	0.30			1.23	0.068	0.53	0.064	1.00	0.26	1.16	0.066	0.30	0.026	9%
11	4.22	1.42	0.30			1.20	0.084	0.52	0.101	1.00	0.15	1.12	0.093	0.16	0.015	5%
12	4.30	1.47	0.28			1.23	0.091	0.52	0.092	1.00	0.19	1.19	0.092	0.23	0.021	7%
13	4.60	1.46	0.25			1.22	0.091	0.49	0.104	1.00	0.28	1.21	0.098	0.34	0.033	12%
14	4.86	1.40	0.30			1.18	0.087	0.52	0.100	1.00	0.25	1.10	0.094	0.28	0.026	9%
15	5.10	1.49	0.29			1.25	0.105	0.53	0.081	1.00	0.32	1.20	0.093	0.38	0.036	12%
16	5.50	1.51	0.30			1.27	0.065	0.54	0.059	1.00	0.40	1.21	0.062	0.48	0.030	10%
17	5.90	1.50	0.28			1.26	0.061	0.52	0.091	1.00	0.30	1.22	0.076	0.37	0.028	10%
18	6.10	1.43	0.20			1.18	0.068	0.45	0.039	1.00	0.25	1.23	0.054	0.31	0.016	6%
19	6.40	1.40	0.18			1.16	-0.012	0.42	0.015	1.00	0.40	1.22	0.002	0.49	0.001	0%
20	6.90	1.30	0.15			1.07	-0.053	0.38	-0.045	1.00	0.45	1.15	-0.049	0.52	-0.025	-9%
21	7.30	1.10	0.10			1.00	0.018	0.30	-0.057	1.00	0.45	1.00	-0.020	0.45	-0.009	-3%
RB	7.80	0.00	0.00		0.00					0.88	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.287	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	12:50
Meas. End Time (MST):	13:35
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, -24C



Flow characteristics:

Total Flow:	0.287	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	7.29	(m ²)
Wetted Width:	7.30	(m)
Hydraulic Depth:	1.00	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	1.020	-
Water (°C):	0.0	-
Datalogger Clock:	12:33	-
Laptop Clock:	12:33	-
Battery (Main):	-	15.0
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S33-06	0.969	282.479		281.510	281.510	3/4" Pipe 7m W of logger
S33-04			1.003	281.476	281.472	3/4" Pipe 8m S of logger
S33-03			1.168	281.311	281.308	3/4" Pipe 3m W of logger
Water Level:	Cut			279.713	Time WL Surveyed:	12:39
Temporary BM			2.759	279.720	0.000	-
Turn						
Temporary BM	2.742	282.462		279.720	-	-
Water Level:	Cut		2.745	279.717	Time WL Surveyed:	12:42
S33-03			1.153	281.309	281.308	3/4" Pipe 3m W of logger
S33-04			0.987	281.475	281.472	3/4" Pipe 8m S of logger
S33-06			0.955	281.507	281.510	3/4" Pipe 7m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	279.715	-
Closing Error:	0.003	-
WL Check:	0.004	-
Transducer Elevation	278.695	-

Field Personnel:

Data Entry Personnel:	MP, GG	Trip Date:	9-Jan-15
Data Check Personnel:	MP, GG	Date:	9-Jan-15
Entered Digitally in the Field:	CJ	Date:	21-Jan-15

Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Alban Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date:

February 13, 2015

Site Visit Time (MST):

11:00

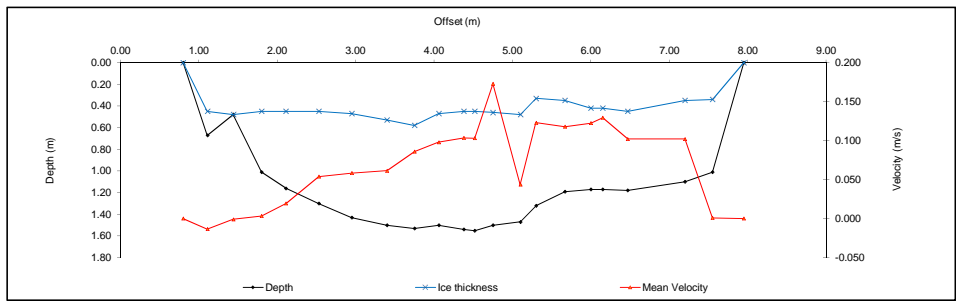


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	7.95	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	7.55	1.01	0.34	0.68	0.001					0.88	0.38	0.67	0.001	0.25	0.000	0%
2	7.20	1.10	0.35	0.73	0.116					0.88	0.54	0.75	0.102	0.41	0.041	9%
3	6.47	1.18	0.45	0.82	0.116					0.88	0.52	0.73	0.102	0.38	0.039	9%
4	6.15	1.17	0.42	0.80	0.147					0.88	0.24	0.75	0.129	0.18	0.023	5%
5	6.00	1.17	0.42	0.80	0.139					0.88	0.24	0.75	0.122	0.18	0.022	5%
6	5.67	1.19	0.35			1.02	0.129	0.52	0.107	1.00	0.35	0.84	0.118	0.29	0.035	8%
7	5.30	1.32	0.33			1.12	0.123	0.53	0.123	1.00	0.29	0.99	0.123	0.28	0.035	8%
8	5.10	1.47	0.48			1.27	0.102	0.68	-0.015	1.00	0.27	0.99	0.044	0.27	0.012	3%
9	4.75	1.50	0.46			1.29	0.238	0.67	0.108	1.00	0.29	1.04	0.173	0.30	0.052	12%
10	4.52	1.55	0.45			1.33	0.100	0.67	0.106	1.00	0.19	1.10	0.103	0.20	0.021	5%
11	4.38	1.54	0.45			1.32	0.101	0.67	0.106	1.00	0.23	1.09	0.104	0.25	0.026	6%
12	4.06	1.50	0.47			1.29	0.094	0.68	0.102	1.00	0.32	1.03	0.098	0.32	0.032	7%
13	3.75	1.53	0.58			1.34	0.088	0.77	0.084	1.00	0.33	0.95	0.086	0.31	0.027	6%
14	3.40	1.50	0.53			1.31	0.046	0.72	0.077	1.00	0.40	0.97	0.062	0.39	0.024	5%
15	2.95	1.43	0.47			1.24	0.035	0.66	0.062	1.00	0.44	0.96	0.059	0.42	0.024	6%
16	2.53	1.30	0.45			1.13	0.044	0.62	0.064	1.00	0.42	0.85	0.054	0.36	0.019	4%
17	2.11	1.16	0.45	0.81	0.022					0.88	0.37	0.71	0.019	0.26	0.005	1%
18	1.80	1.01	0.45	0.73	0.004					0.88	0.34	0.56	0.004	0.19	0.001	0%
19	1.44	0.48	0.48	0.48	-0.001					0.88	0.35	0.00	-0.001	0.00	0.000	0%
20	1.11	0.67	0.45	0.56	-0.015					0.88	0.32	0.22	-0.013	0.07	-0.001	0%
LB	0.80	0.00	0.00		0.00		0.00		0.00	0.88	0.16	0.00	0.000	0.00	0.000	
Total Flow														0.437	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	11:44
Meas. End Time (MST):	12:28
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -14C



Flow characteristics:

Total Flow:	0.437	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.32	(m ²)
Wetted Width:	7.15	(m)
Hydraulic Depth:	0.74	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	1.056	-
Water (°C):	0.0	-
Datalogger Clock:	11:10	-
Logger Clock:	11:10	-
Battery (Main):	15.1	14.3
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S33-03	1.360	282.668		281.308	281.308	3/4" Pipe 3m W of logger
S33-06			1.166	281.502	281.510	3/4" Pipe 7m W of logger
S33-04			1.187	281.481	281.472	3/4" Pipe 8m S of logger
Water Level:	Cut		2.915	279.753		Time WL Surveyed: 11:21
Temporary BM		1.285		281.383		
Turn						
Temporary BM	1.253	282.636		281.383		
Water Level:	Cut		2.882	279.754		Time WL Surveyed: 11:23
S33-04			1.157	281.479	281.472	3/4" Pipe 8m S of logger
S33-06			1.133	281.503	281.510	3/4" Pipe 7m W of logger
S33-03			1.326	281.310	281.308	3/4" Pipe 3m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	279.754	-
Closing Error:	-0.002	-
WL Check:	0.001	-
Transducer Elevation	278.698	-

Field Personnel:

	MP, GG	Trip Date:	13-Feb-15
Data Entry Personnel:	MP	Date:	13-Feb-15
Data Check Personnel:	CJ	Date:	23-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary
 UTM Location: 474876 E, 6350204 N

Site Visit Date: April 28, 2015
 Site Visit Time (MST): 11:47



Flow Measurement Details:	
Metering Section Location (describe): At station	
Meas. Start Time (MST):	12:15
Meas. End Time (MST):	12:50
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Fully open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, windy, 18 C

Flow characteristics:	
Total Flow:	2.96 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	10.78 (m ²)
Wetted Width:	8.39 (m)
Hydraulic Depth:	1.28 (m)
Mean Velocity:	0.28 (m/s)
Froude Number:	0.88

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	5.9	6.2
Datalogger Clock:	11:51	12:50
Laptop Clock:	11:51	12:50
Battery (Main):	13.8	13.7
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Replaced	-
PTB (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:		

General Notes:		

ADCP Flow Measurement Summary:					
System Information:		System Setup:		Bank Offsets:	
System Type:	Sonotek RS-M9	Transducer Depth (m):	0.09	LB:	18.80
Serial Number:	4712	Sainity (ppt):	-	RB:	10.05
Firmware Version:	3.8	Magnetic Declination (°):	14.33		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	9.7		
Discharge Calculation Settings:		Measurement Results:			
Track Reference:	Bottom Track	Pass (#):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	8.45	10.09	0.289
Coordinate System:	ENU	2	8.50	11.28	0.270
Left Method:	Sloped Bank	3	8.30	10.75	0.296
Right Method:	Sloped Bank	5	8.462	10.92	0.272
Top Fit Type:	Power Fit	6	8.228	10.85	0.280
Bottom Fit Type:	Power Fit				
		Mean:	8.39	10.78	0.275
		SD:	0.10	0.39	0.008
		COV:	0.01	0.04	0.030
					2.96
					0.072
					2.38%
					-1.77%
					2.82%
					-3.59%
					0.16%
					2.38%

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S33-03	1.187	282.495		281.308	281.308	3/4" Pipe 3m W of logger
S33-06			1.002	281.493	281.510	3/4" Pipe 7m W of logger
S33-04			1.008	281.487	281.472	3/4" Pipe 8m S of logger
Water Level:	Cut	2.428	280.067			Time WL Surveyed: 11:55
Temporary BM		1.084	281.411		0.000	
Turn						
Temporary BM	1.066	282.477		281.411		
Water Level:	Cut	2.412	280.065			Time WL Surveyed: 11:58
S33-04			0.990	281.487	281.472	3/4" Pipe 8m S of logger
S33-06			0.983	281.494	281.510	3/4" Pipe 7m W of logger
S33-03			1.168	281.309	281.308	3/4" Pipe 3m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S33-06	0.983	282.477		281.494		
Water Level:	Cut	2.412	280.065			Time WL Surveyed: 12:45
Water Level:	Cut	2.397	280.064			Time WL Surveyed: 12:46
S33-06	0.967	282.461		281.494		

WL Survey Summary		
Average WL:	Before	After
Closing Error:	-0.001	280.065
WL Check:	0.002	0.001
Transducer Elevation	278.675	278.670

Field Personnel:			
Data Entry Personnel:	GG, SM	Trip Date:	28-Apr-15
Data Check Personnel:	GG	Date:	28-Apr-15
Entered Digitally in the Field:	Yes	Date:	30-Apr-15

Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albion Boundary
 UTM Location: 474876 E, 6350204 N

Site Visit Date: June 11, 2015
 Site Visit Time (MST): 09:25



Flow Measurement Details:	
Metering Section Location (describe): At station	
Meas. Start Time (MST):	9:55
Meas. End Time (MST):	10:10
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 17C

Flow characteristics:	
Total Flow:	1.78 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	9.81 (m ²)
Wetted Width:	7.91 (m)
Hydraulic Depth:	1.24 (m)
Mean Velocity:	0.18 (m/s)
Reynolds Number:	2.68E+05
Froude Number:	0.65

Logger Details:		
	Before	After
Transducer Reading (m):	1.176	1.177
Water (°C):	17.3	17.3
Datalogger Clock:	09:26	10:12
Laptop Clock:	09:26	10:12
Battery (Main):	14.0	14.4
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Mem Tube Desiccant:	-	Good
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:									
System Information:			System Setup:			Bank Offsets:			
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	3.00				
Serial Number:	4712	Safety (gpd):	0.0	RB:	11.10				
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed:					Yes
Software Version:	3.8	Measured Temperature (°C):	-	System Test Passed:					Yes
		ADCP Temperature (°C):	-						
Discharge Calculation Settings:			Measurement Results:						
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)		
Track Reference: Bottom Track	1	0.00	8.93	0.164	1.74	-2.12%	76.5		
Depth Reference: Vertical Beam	3	0.00	7.72	0.84	1.847	3.90%	77.1		
Coordinate System: FWD	4	0.00	7.33	0.21	1.74	-2.12%	78.2		
Left Method: Sloped Bank	6	0.00	7.69	0.185	1.784	0.35%	78.1		
Right Method: Sloped Bank									
Top Fit Type: Power Fit									
Bottom Fit Type: Power Fit									
		Mean:	7.91	0.61	1.78				
		SD:	0.61	0.49	0.044				
		COV:	0.08	0.05	0.025				

Level Survey:						
Station	BS ± (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S33-03	1.211	282.519		281.308	281.308	3/4" Pipe 3m W of logger
S33-06			1.023	281.496	281.510	3/4" Pipe 7m W of logger
S33-04			1.033	281.486	281.472	3/4" Pipe 6m S of logger
Turn						
Water Level:	Cut		2.685	279.834	Time WL Surveyed:	9:32
Temporary BM			1.116	281.403		0.000
Turn						
Temporary BM	1.086	282.489		281.403		
Water Level:	Cut		2.657	279.632	Time WL Surveyed:	9:34
S33-04			1.005	281.484	281.472	3/4" Pipe 6m S of logger
S33-06			0.994	281.495	281.510	3/4" Pipe 7m W of logger
S33-03			1.190	281.309	281.308	3/4" Pipe 3m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S33-04	1.004	282.489		281.485		
Water Level:	Cut		2.650	279.839	Time WL Surveyed:	10:18
Water Level:	Cut		2.633	279.837	Time WL Surveyed:	10:19
S33-04	0.985	282.470		281.485		

WL Survey Summary			Level Survey Equipment:	
Average WL:	Before	After	Level #:	Level#2
Closing Error:	-0.001	-	Make & Model:	Nikon AC-2S
WL Check:	0.002	0.002	Serial #:	668859
Transducer Elevation	278.657	278.661		

Field Personnel:			
Data Entry Personnel:	TR	Trip Date:	11-Jun-15
Data Check Personnel:	CJ	Date:	25-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albion Boundary
 UTM Location: 474876 E, 6350204 N

Site Visit Date: August 10, 2015
 Site Visit Time (MST): 09:20



Flow Measurement Details:	
Metering Section Location (describe): Adjacent to station, at cableway	
Meas. Start Time (MST):	9:55
Meas. End Time (MST):	10:10
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 29C

Flow characteristics:	
Total Flow:	0.997 (m ³ /s)
Perceived Measurement Quality:	Good
Cross Section Area:	8.27 (m ²)
Wetted Width:	7.65 (m)
Hydraulic Depth:	1.08 (m)
Mean Velocity:	0.12 (m/s)
Reynolds Number:	1.32 E+05
Froude Number:	0.64

Logger Details:		
	Before	After
Transducer Reading (m):	1.204	1.201
Water (°C):	21.0	21.0
Datalogger Clock:	09:28	10:17
Laptop Clock:	09:28	10:17
Battery (Main):	13.9	14.1
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Descendant:	Replaced	-
Mem Tube Descendant:	Good	-
PTF (if replaced):	342875	-
Logger# (if replaced):	6482	-

Datalogger / Station Notes:
 -Vegetation in channel near right bank

General Notes:

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	27.20	
Serial Number:	4712	Bainry (ppt):	-	-	RB:	19.25	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed:	Yes	
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed:	Yes	
ADCP Temperature (°C):							
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom Track	5	0.00	7.71	7.57	0.129	0.975	-2.23%
Depth Reference: Vertical Beam	6	0.00	6.75	7.85	0.128	1.007	0.98%
Coordinate System: ENL	7	0.00	6.36	8.68	0.115	0.999	0.99%
Left Method: Sloped Bank	8	0.00	7.79	8.97	0.113	1.009	1.18%
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
		Mean:	7.65	8.27	0.121	0.997	
		SD:	0.58	0.57	0.007	0.013	
		COV:	0.08	0.07	0.060	0.014	

Level Survey:						
Station	BS ± (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S33-03	1.052	282.360		281.308	281.308	3/4" Pipe 3m W of logger
S33-06			0.865	281.495	281.510	3/4" Pipe 7m W of logger
S33-04			0.879	281.481	281.472	3/4" Pipe 8m S of logger
Water Level:						
	Cut		2.502	279.858	281.308	Time WL Surveyed: 9:34
S33-03			0.879	281.481	281.308	3/4" Pipe 3m W of logger
Turn						
S33-03	0.839	282.320		281.481	281.308	3/4" Pipe 3m W of logger
Water Level:						
	Cut		2.462	279.858	281.308	Time WL Surveyed: 9:35
S33-04			0.839	281.481	281.472	3/4" Pipe 8m S of logger
S33-06			0.826	281.494	281.510	3/4" Pipe 7m W of logger
S33-03			1.012	281.308	281.308	3/4" Pipe 3m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S33-04	0.840	282.321		281.481	281.481	
Water Level:						
	Cut		2.468	279.853	281.308	Time WL Surveyed: 10:21
Water Level:						
	Cut		2.417	279.855	281.308	Time WL Surveyed: 10:23
S33-04	0.791	282.272		281.481	281.481	

WL Survey Summary			Level Survey Equipment:	
Average WL:	279.858	279.854	Level #:	Level#2
Closing Error:	0.000	-	Make & Model:	Nikon AC-2S
WL Check:	0.000	-0.002	Serial #:	668859
Transducer Elevation:	278.654	278.653		

Field Personnel:		Trip Date:	
Data Entry Personnel:	TR, JC	Date:	10-Aug-15
Data Check Personnel:	TR	Date:	16-Aug-15
Entered Digitally in the Field:	CJ	Date:	17-Aug-15

Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albion Boundary
 UTM Location: 474876 E, 6350204 N

Site Visit Date: September 10, 2015
 Site Visit Time (MST): 11:24



Flow Measurement Details:	
Metering Section Location (describe): Adjacent to station	
Meas. Start Time (MST):	12:15
Meas. End Time (MST):	12:30
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Moderate flow, slightly turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 15C

Flow characteristics:	
Total Flow:	1.77 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	9.82 (m ²)
Wetted Width:	7.63 (m)
Hydraulic Depth:	1.29 (m)
Mean Velocity:	0.18 (m/s)
Reynolds Number:	1.88 E+05
Froude Number:	0.65

Logger Details:		Before	After
Transducer Reading (m):		1.397	1.399
Water (°C):		12.5	12.7
Datalogger Clock:		11:27	12:47
Laptop Clock:		11:27	12:47
Battery (Main):		14.3	13.8
Battery:		Good	-
Battery Serial #:		-	-
Enclosure Desiccant:		Replaced	-
Mem Tube Desiccant:		Good	-
PT# (if replaced):		-	-
Logger# (if replaced):		-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:								
System Information:			System Setup:			Bank Offsets:		
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	16.10		
Serial Number:	4712	Safety (gpd):	-	-	RB:	2.00		
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes			
		ADCP Temperature (°C):	-	13.5				
Discharge Calculation Settings:			Measurement Results:					
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)	
Track Reference: Bottom Track	1	0.00	7.53	8.58	0.209	1.794	1.50%	72.1
Depth Reference: Vertical Beam	2	0.00	6.98	10.82	0.168	1.819	2.91%	72.6
Coordinate System: FWD	3	0.00	7.47	10.09	0.17	1.717	-2.86%	73.2
Left Method: Sloped Bank	5	0.00	7.46	9.79	0.178	1.74	-1.56%	74.1
Right Method: Sloped Bank								
Top Fit Type: Power Fit								
Bottom Fit Type: Power Fit								
Mean:		7.63	9.82	0.181	1.77			
SD:		0.26	0.81	0.016	0.041			
COV:		0.03	0.08	0.091	0.023			

Level Survey:						
Station	BS ± (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S33-03	0.995	282.303		281.308	281.308	3/4" Pipe 3m W of logger
S33-04			0.823	281.480	281.472	3/4" Pipe 8m S of logger
S33-06			0.809	281.494	281.510	3/4" Pipe 7m W of logger
Turn						
Water Level:	Cut		2.252	280.051	Time WL Surveyed:	11:56
Temporary BM			0.905	281.398	0.000	-
Turn						
Temporary BM	0.899	282.287		281.398		-
Water Level:	Cut		2.235	280.052	Time WL Surveyed:	11:57
S33-06			0.793	281.494	281.510	3/4" Pipe 7m W of logger
S33-04			0.806	281.481	281.472	3/4" Pipe 8m S of logger
S33-03			0.979	281.308	281.308	3/4" Pipe 3m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S33-04	0.806	282.287		281.481		-
Water Level:	Cut		2.235	280.052	Time WL Surveyed:	12:43
Water Level:	Cut		2.216	280.053	Time WL Surveyed:	12:44
S33-04	0.788	282.269		281.481		-

WL Survey Summary			Level Survey Equipment:	
Average WL:	280.052	280.053	Level #:	Level#3
Closing Error:	0.000	-	Make & Model:	Carsel AT-24
WL Check:	0.001	-0.001	Serial #:	112990
Transducer Elevation	278.655	278.654		

Field Personnel:			
Data Entry Personnel:	JC	Trip Date:	10-Sep-15
Data Check Personnel:	CJ	Date:	10-Sep-15
Entered Digitally in the Field:	Yes	Date:	8-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albion Boundary
 UTM Location: 474876 E, 6350204 N

Site Visit Date: October 15, 2015
 Site Visit Time (MST): 08:54



Flow Measurement Details:	
Metering Section Location (describe): Adjacent to station, at cableway	
Meas. Start Time (MST):	9:15
Meas. End Time (MST):	9:30
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 8C

Flow characteristics:	
Total Flow:	0.691 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	8.01 (m ²)
Wetted Width:	8.34 (m)
Hydraulic Depth:	0.96 (m)
Mean Velocity:	0.09 (m/s)
Reynolds Number:	5.63 E+04
Froude Number:	0.63

Logger Details:		
	Before	After
Transducer Reading (m):	0.997	0.997
Water (°C):	6.5	6.4
Datalogger Clock:	08:56	09:34
Laptop Clock:	08:56	09:34
Battery (Main):	13.0	14.4
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Mem Tube Desiccant:	-	Good
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:								
System Information:			System Setup:			Bank Offsets:		
System Type:	Sontek RS-M9	Transducer Depth (m):	-	0.05	LB:	2.00		
Serial Number:	4712	Saintry (ppt):	-	-	RB:	10.85		
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes			
		ADCP Temperature (°C):	-	7.6				
Discharge Calculation Settings:			Measurement Results:					
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)	
Track Reference: Bottom Track	1	0.00	8.36	8.02	0.087	0.702	1.59%	74.5
Depth Reference: Vertical Beam	2	0.00	8.38	8.13	0.088	0.717	3.76%	74.4
Coordinate System: FTM	3	0.00	8.46	8.09	0.084	0.677	-2.03%	74.6
Left Method: Sloped Bank	5	0.00	8.17	7.80	0.086	0.668	-3.33%	74.8
Right Method: Sloped Bank								
Top Fit Type: Power Fit								
Bottom Fit Type: Power Fit								
		Mean:	8.34	8.01	0.088	0.691		
		SD:	0.11	0.13	0.001	0.020		
		COV:	0.01	0.02	0.017	0.028		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S33-03	1.123	282.431		281.308	281.308	3/4" Pipe 3m W of logger
S33-04			0.953	281.478	281.481	3/4" Pipe 8m S of logger
S33-06			0.939	281.492	281.494	3/4" Pipe 7m W of logger
Water Level:			2.702	279.649		Time WL Surveyed: 9:00
Temporary BM			0.978	281.453		0.000
Turn						
Temporary BM	0.956	282.409		281.453		
Water Level:			2.757	279.652		Time WL Surveyed: 9:03
S33-06			0.915	281.494	281.494	3/4" Pipe 7m W of logger
S33-04			0.932	281.477	281.481	3/4" Pipe 8m S of logger
S33-03			1.100	281.309	281.308	3/4" Pipe 3m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S33-04	0.931	282.409		281.478		
Water Level:			2.758	279.651		Time WL Surveyed: 9:36
Water Level:			2.731	279.652		Time WL Surveyed: 9:38
S33-04	0.905	282.383		281.476		

WL Survey Summary		Level Survey Equipment:	
Average WL:	279.651	Level #:	Level#2
Closing Error:	-0.001	Make & Model:	Nikon AC-2S
WL Check:	0.003	Serial #:	668859
Transducer Elevation:	278.654		
	278.655		

Field Personnel:			
Data Entry Personnel:	GG, TR	Trip Date:	15-Oct-15
Data Check Personnel:	DG	Date:	15-Oct-15
Entered Digitally in the Field:	CJ	Date:	20-Oct-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary
 UTM Location: 474876 E, 6350204 N

Site Visit Date: December 1, 2015
 Site Visit Time (MST): 11:46

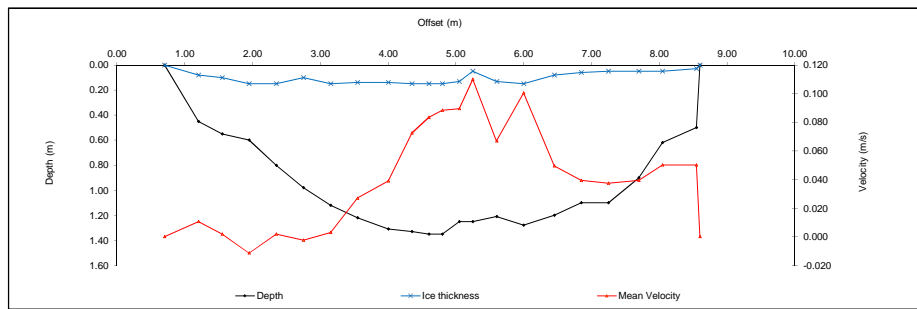


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.60	0.00	0.00		0.000		0.000		0.000	0.88	0.02	0.00	0.000	0.00	0.000	
1	8.55	0.50	0.03	0.27	0.057					0.88	0.27	0.47	0.050	0.13	0.006	2%
2	8.05	0.62	0.05	0.34	0.057					0.88	0.43	0.57	0.050	0.24	0.012	4%
3	7.70	0.90	0.05			0.73	0.022	0.22	0.057	1.00	0.40	0.85	0.040	0.34	0.013	4%
4	7.25	1.10	0.05			0.89	0.012	0.26	0.063	1.00	0.43	1.05	0.038	0.45	0.017	5%
5	6.85	1.10	0.06			0.89	0.043	0.27	0.036	1.00	0.40	1.04	0.040	0.42	0.016	5%
6	6.45	1.20	0.08			0.98	0.021	0.30	0.078	1.00	0.43	1.12	0.050	0.48	0.024	7%
7	6.00	1.28	0.15			1.05	0.072	0.38	0.129	1.00	0.43	1.13	0.101	0.48	0.048	15%
8	5.60	1.21	0.13			0.99	0.038	0.35	0.096	1.00	0.38	1.08	0.067	0.41	0.027	8%
9	5.25	1.25	0.05			1.01	0.089	0.29	0.131	1.00	0.27	1.20	0.110	0.33	0.036	11%
10	5.05	1.25	0.13			1.03	0.061	0.35	0.118	1.00	0.23	1.12	0.090	0.25	0.023	7%
11	4.80	1.35	0.15			1.11	0.095	0.39	0.082	1.00	0.23	1.20	0.089	0.27	0.024	7%
12	4.60	1.35	0.15	0.38	-0.013	1.11	0.078	0.39	0.089	1.00	0.23	1.20	0.084	0.27	0.023	7%
13	4.35	1.33	0.15			1.09	0.058	0.39	0.087	1.00	0.30	1.18	0.073	0.35	0.026	8%
14	4.00	1.31	0.14			1.08	0.010	0.37	0.068	1.00	0.40	1.17	0.039	0.47	0.018	6%
15	3.55	1.22	0.14			1.00	0.018	0.36	0.036	1.00	0.43	1.08	0.027	0.46	0.012	4%
16	3.15	1.12	0.15			0.93	0.002	0.34	0.004	1.00	0.40	0.97	0.003	0.39	0.001	0%
17	2.75	0.98	0.10			0.80	0.002	0.28	-0.007	1.00	0.40	0.88	-0.003	0.35	-0.001	0%
18	2.35	0.80	0.15	0.48	0.002					0.88	0.40	0.65	0.002	0.26	0.000	0%
19	1.95	0.60	0.15	0.38	-0.013					0.88	0.40	0.45	-0.011	0.18	-0.002	-1%
20	1.55	0.55	0.10	0.33	0.002					0.88	0.38	0.45	0.002	0.17	0.000	0%
21	1.20	0.45	0.08	0.27	0.012					0.88	0.43	0.37	0.011	0.16	0.002	1%
LB	0.70	0.00	0.00		0.00		0.00		0.00	0.88	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.326	100%	

Flow Measurement Details:

Metering Section Location (describe):
Adjacent to station

Meas. Start Time (MST):	12:29
Meas. End Time (MST):	13:10
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3298
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Sunny, -5C



Flow characteristics:

Total Flow:	0.326	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	6.84	(m ²)
Wetted Width:	7.90	(m)
Hydraulic Depth:	0.87	(m)
Mean Velocity:	0.05	(m/s)
Reynolds Number:	2.33E+04	
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	0.878	
Water (°C):	0.4	
Datalogger Clock:	12:48	
Laptop Clock:	11:47	
Battery:	13.9	
Battery Condition:	-	Good
Battery Serial #:	-	
Enclosure Desiccant:	-	Good
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S33-03	1.253	262.561		281.308	281.308	3/4" Pipe 3m W of logger
S33-06			1.067	281.494	281.494	3/4" Pipe 7m W of logger
S33-04			1.084	281.477	281.481	3/4" Pipe 8m S of logger
Water Level:	Cut		3.030	279.531	279.529	Time WL Surveyed: 12:06
S33-04			1.253	281.308	281.481	3/4" Pipe 8m S of logger
Turn						
S33-04	1.224	262.532		281.308	281.481	3/4" Pipe 8m S of logger
Water Level:	Cut		3.003	279.529	279.529	Time WL Surveyed: 12:10
S33-04			1.056	281.476	281.481	3/4" Pipe 8m S of logger
S33-06			1.038	281.494	281.494	3/4" Pipe 7m W of logger
S33-03			1.224	281.308	281.308	3/4" Pipe 3m W of logger
Secondary Water Level Survey (pick any BM e.o. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	279.530	
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	278.652	-

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

GG, JM	Trip Date:	1-Dec-15
GG	Date:	1-Dec-15
CJ	Date:	21-Dec-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake
 UTM Location: 440712 E, 6361615 N

Site Visit Date: January 16, 2015
 Site Visit Time (MST): 11:30



Measured Data	Calculated Data
Flow Measurement Not Conducted	
Total Flow	

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:

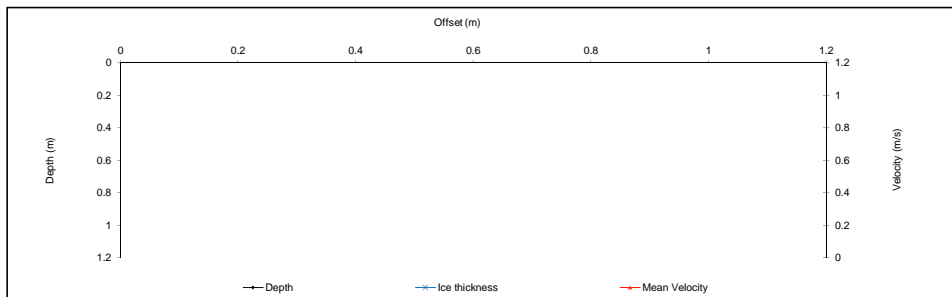
	Before	After
Transducer Reading (m):	0.016	-
Water (°C):	0.6	-
Datalogger Clock:	11:33	-
Laptop Clock:	11:33	-
Battery (Main):	12.5	13.1
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- New modem installed, battery changed

General Notes:

- River frozen to depth at several holes, lots of overflow, no water level survey or flow mmt could be conducted



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
Water Level:	Cut				Time WL Surveyed:	
Turn						
Water Level:	Cut				Time WL Surveyed:	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	-	-
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

Field Personnel:

	MP, DW	Trip Date:	16-Jan-15
Data Entry Personnel:	MP	Date:	16-Jan-15
Data Check Personnel:	MP	Date:	29-Jan-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake
 UTM Location: 440712 E, 6361615 N

Site Visit Date: March 7, 2015
 Site Visit Time (MST): 11:20



Flow Measurement:	
Measured Data	Calculated Data
Flow Measurement Not Conducted	
Total Flow	

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	Clear, 4C

Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

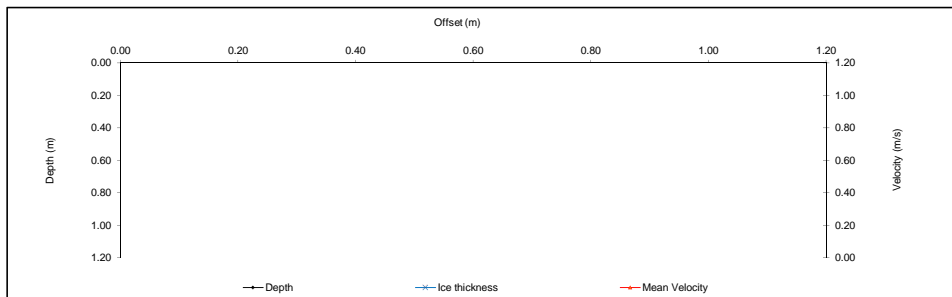
Logger Details:

	Before	After
Transducer Reading (m):	0.091	
Water (°C):	0.4	
Datalogger Clock:	11:33	
Laptop Clock:	11:32	
Battery (Main):	14.7	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-Lots of overflow, frozen to depth, overflow piling up, no flow measurement of water level survey



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
Water Level:	Cut				Time WL Surveyed:	
Turn						
Water Level:	Cut				Time WL Surveyed:	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	-	-
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

Field Personnel:

	MP, GG	Trip Date:	7-Mar-15
Data Entry Personnel:	MP	Date:	7-Mar-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake
 UTM Location: 440712 E, 6361615 N

Site Visit Date: April 29, 2015
 Site Visit Time (MST): 09:41



Measured Data	Calculated Data
Flow Measurement Not Conducted	
Total Flow	

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

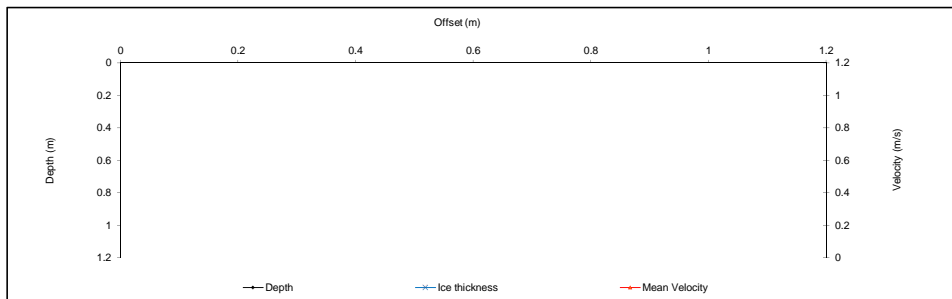
Logger Details:

	Before	After
Transducer Reading (m):	0.848	
Water (°C):	0.1	
Datalogger Clock:	09:45	
Laptop Clock:	09:44	
Battery (Main):	14.1	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Replaced
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

- Flow not confined to channel
- Lots of bed ice
- Too dangerous to measure
- No flow measurement conducted



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S34-06	0.530	99.931		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.263	98.668	98.659	3/4" pipe 2 metres east of logger
S34-05			1.596	98.335	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut		1.818	98.113	Time WL Surveyed: 9:52	
S34-05			1.596	98.335	98.271	3/4" pipe 8 metres south of logger
Turn						
S34-05	1.581	99.916		98.335	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut		1.803	98.113	Time WL Surveyed: 9:53	
S34-05			1.581	98.335	98.271	3/4" pipe 8 metres south of logger
S34-04			1.248	98.668	98.659	3/4" pipe 2 metres east of logger
S34-06			0.516	99.400	99.401	Lag bolt in conifer, 30m Nof logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	98.113	-
Closing Error:	0.001	-
WL Check:	0.000	-
Transducer Elevation	97.265	-

Field Personnel:

	GG, TR	Trip Date:	29-Apr-15
Data Entry Personnel:	GG	Date:	29-Apr-15
Data Check Personnel:	DW	Date:	25-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake
 UTM Location: 440712 E, 6361615 N

Site Visit Date: May 8, 2015
 Site Visit Time (MST): 12:00

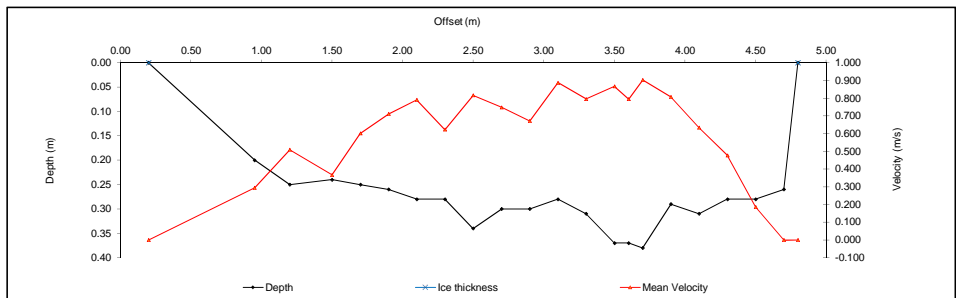


Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.20	0.00	0.00		0.000		0.000		0.000	1.00	0.38	0.00	0.000	0.00	0.000	
1	0.95	0.20		0.12	0.294					1.00	0.50	0.20	0.294	0.10	0.029	4%
2	1.20	0.25		0.15	0.509					1.00	0.28	0.25	0.509	0.07	0.035	5%
3	1.50	0.24		0.14	0.367					1.00	0.25	0.24	0.367	0.06	0.022	3%
4	1.70	0.25		0.15	0.601					1.00	0.20	0.25	0.601	0.05	0.030	4%
5	1.90	0.26		0.16	0.711					1.00	0.20	0.26	0.711	0.05	0.037	5%
6	2.10	0.28		0.17	0.790					1.00	0.20	0.28	0.790	0.06	0.044	6%
7	2.30	0.28		0.17	0.622					1.00	0.20	0.28	0.622	0.06	0.035	5%
8	2.50	0.34		0.20	0.815					1.00	0.20	0.34	0.815	0.07	0.055	8%
9	2.70	0.30		0.18	0.748					1.00	0.20	0.30	0.748	0.06	0.045	6%
10	2.90	0.30		0.18	0.671					1.00	0.20	0.30	0.671	0.06	0.040	6%
11	3.10	0.28		0.17	0.887					1.00	0.20	0.28	0.887	0.06	0.050	7%
12	3.30	0.31		0.19	0.795					1.00	0.20	0.31	0.795	0.06	0.049	7%
13	3.50	0.37		0.22	0.866					1.00	0.15	0.37	0.866	0.06	0.048	7%
14	3.60	0.37		0.22	0.794					1.00	0.10	0.37	0.794	0.04	0.029	4%
15	3.70	0.38		0.23	0.902					1.00	0.15	0.38	0.902	0.06	0.051	7%
16	3.90	0.29		0.17	0.806					1.00	0.20	0.29	0.806	0.06	0.047	6%
17	4.10	0.31		0.19	0.634					1.00	0.20	0.31	0.634	0.06	0.039	5%
18	4.30	0.28		0.17	0.477					1.00	0.20	0.28	0.477	0.06	0.027	4%
19	4.50	0.28		0.17	0.186					1.00	0.20	0.28	0.186	0.06	0.010	1%
20	4.70	0.26		0.16	-0.001					1.00	0.15	0.26	-0.001	0.04	0.000	0%
LB	4.80	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
Total Flow														0.724	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m downstream of station

Meas. Start Time (MST):	12:15
Meas. End Time (MST):	12:40
Equipment:	ADV
Method:	Wading
River Condition:	High flow, bank ice along RB
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 7C



Flow characteristics:

Total Flow:	0.724	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.17	(m ²)
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.62	(m/s)
Froude Number:	0.39	

Logger Details:

	Before	After
Transducer Reading (m):	0.309	0.318
Water (°C):	0.9	1.0
Datalogger Clock:	12:05	12:45
Laptoe Clock:	12:04	12:45
Battery (Main):	14.6	14.4
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S34-06	0.505	99.906		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.238	98.668	98.659	3/4" pipe 2 metres east of logger
S34-05			1.570	98.336	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut		2.791	97.115	Time WL Surveyed:	12:12
Temporary BM			2.818	97.088	0.000	-
Turn						
Temporary BM	2.807	99.895		97.088		-
Water Level:	Cut		2.779	97.116	Time WL Surveyed:	12:14
S34-05			1.559	98.336	98.271	3/4" pipe 8 metres south of logger
S34-04			1.227	98.668	98.659	3/4" pipe 2 metres east of logger
S34-06			0.494	99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-05	1.559	99.895		98.336		
Water Level:	Cut		2.773	97.122	Time WL Surveyed:	12:42
Water Level:	Cut		2.763	97.120	Time WL Surveyed:	12:44
S34-05	1.547	99.883		98.336		

WL Survey Summary

	Before	After
Average WL:	97.116	97.121
Closing Error:	0.000	-
WL Check:	0.001	0.002
Transducer Elevation	96.807	96.803

Field Personnel:

	TR, CJ	Trip Date:	8-May-15
Data Entry Personnel:	TR	Date:	8-May-15
Data Check Personnel:	DW	Date:	25-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake
 UTM Location: 440712 E, 6361615 N

Site Visit Date: June 9, 2015
 Site Visit Time (MST): 13:50

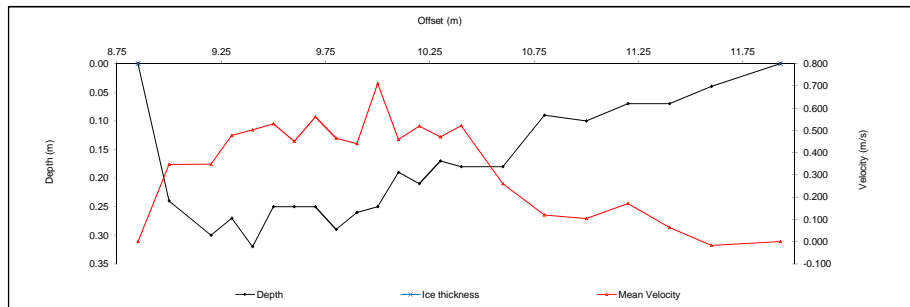


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	11.93	0.00	0.00		0.000		0.000		0.000	1.00	0.17	0.00	0.000	0.00	0.000	
1	11.60	0.04		0.02	-0.017					1.00	0.27	0.04	-0.017	0.01	0.000	0%
2	11.40	0.07		0.04	0.064					1.00	0.20	0.07	0.064	0.01	0.001	0%
3	11.20	0.07		0.04	0.171					1.00	0.20	0.07	0.171	0.01	0.002	1%
4	11.00	0.10		0.06	0.103					1.00	0.20	0.10	0.103	0.02	0.002	1%
5	10.80	0.09		0.05	0.120					1.00	0.20	0.09	0.120	0.02	0.002	1%
6	10.60	0.18		0.11	0.260					1.00	0.20	0.18	0.260	0.04	0.009	5%
7	10.40	0.18		0.11	0.521					1.00	0.15	0.18	0.521	0.03	0.014	7%
8	10.30	0.17		0.10	0.470					1.00	0.10	0.17	0.470	0.02	0.008	4%
9	10.20	0.21		0.13	0.519					1.00	0.10	0.21	0.519	0.02	0.011	5%
10	10.10	0.19		0.11	0.459					1.00	0.10	0.19	0.459	0.02	0.009	4%
11	10.00	0.25		0.15	0.710					1.00	0.10	0.25	0.710	0.03	0.018	9%
12	9.90	0.26		0.15	0.440					1.00	0.10	0.26	0.440	0.03	0.011	6%
13	9.80	0.29		0.17	0.465					1.00	0.10	0.29	0.465	0.03	0.013	7%
14	9.70	0.25		0.15	0.561					1.00	0.10	0.25	0.561	0.03	0.014	7%
15	9.60	0.25		0.15	0.450					1.00	0.10	0.25	0.450	0.02	0.011	6%
16	9.50	0.25		0.15	0.529					1.00	0.10	0.25	0.529	0.03	0.013	7%
17	9.40	0.32		0.19	0.502					1.00	0.10	0.32	0.502	0.03	0.016	8%
18	9.30	0.27		0.16	0.478					1.00	0.10	0.27	0.478	0.03	0.013	6%
19	9.20	0.30		0.18	0.348					1.00	0.15	0.30	0.348	0.05	0.016	8%
20	9.00	0.24		0.14	0.347					1.00	0.17	0.24	0.347	0.04	0.015	7%
LB	8.85	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.00	0.000	
Total Flow														0.199	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of pressure transducer

Meas. Start Time (MST):	14:10
Meas. End Time (MST):	14:35
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow and level
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, calm



Flow characteristics:

Total Flow:	0.199	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.50	(m ²)
Wetted Width:	3.08	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.40	(m/s)
Reynolds Number:	5.73E+04	
Froude Number:	0.32	

Logger Details:

	Before	After
Transducer Reading (m):	0.139	0.135
Water (°C):	15.8	15.7
Datalogger Clock:	13:55	14:38
Laptop Clock:	13:55	14:38
Battery:	14.3	14.0
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S34-06	0.688	100.089		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.427	98.662	98.659	3/4" pipe 2 metres east of logger
S34-05			1.754	98.335	98.335	3/4" pipe 8 metres south of logger
Water Level:	Cut	0.165	3.242	97.012		Time WL Surveyed: 14:01
Temporary BM				96.847		
Turn						
Temporary BM	3.189	100.036		96.847		
Water Level:	Cut	0.165	3.189	97.012		Time WL Surveyed: 14:02
S34-05			1.703	98.333	98.335	3/4" pipe 8 metres south of logger
S34-04			1.375	98.661	98.659	3/4" pipe 2 metres east of logger
S34-06			0.637	99.399	99.401	Lag bolt in conifer, 30m Nof logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S34-04	1.375	100.036		98.661		
Water Level:	Cut	0.208	3.241	97.003		Time WL Surveyed: 14:40
Water Level:	Cut	0.208	3.196	97.000		Time WL Surveyed: 14:41
S34-04	1.327	99.988		98.661		

WL Survey Summary

	Before	After
Average WL:	97.012	97.002
Closing Error:	0.002	-
WL Check:	0.000	0.003
Transducer Elevation	96.873	96.867

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, GG, TB	Trip Date:	9-Jun-15
Data Check Personnel:	DW	Date:	19-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake
 UTM Location: 440712 E, 6361615 N

Site Visit Date: August 16, 2015
 Site Visit Time (MST): 10:45

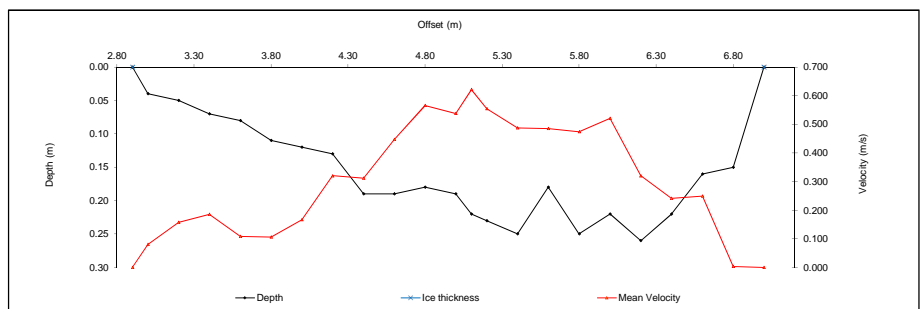


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.90	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	3.00	0.04		0.02	0.080					1.00	0.15	0.04	0.080	0.01	0.000	0%
2	3.20	0.05		0.03	0.157					1.00	0.20	0.05	0.157	0.01	0.002	1%
3	3.40	0.07		0.04	0.185					1.00	0.20	0.07	0.185	0.01	0.003	1%
4	3.60	0.08		0.05	0.108					1.00	0.20	0.08	0.108	0.02	0.002	1%
5	3.80	0.11		0.07	0.106					1.00	0.20	0.11	0.106	0.02	0.002	1%
6	4.00	0.12		0.07	0.166					1.00	0.20	0.12	0.166	0.02	0.004	2%
7	4.20	0.13		0.08	0.320					1.00	0.20	0.13	0.320	0.03	0.008	3%
8	4.40	0.19		0.11	0.312					1.00	0.20	0.19	0.312	0.04	0.012	5%
9	4.60	0.19		0.11	0.447					1.00	0.20	0.19	0.447	0.04	0.017	7%
10	4.80	0.18		0.11	0.565					1.00	0.20	0.18	0.565	0.04	0.020	8%
11	5.00	0.19		0.11	0.538					1.00	0.15	0.19	0.538	0.03	0.015	6%
12	5.10	0.22		0.13	0.621					1.00	0.10	0.22	0.621	0.02	0.014	4%
13	5.20	0.23		0.14	0.554					1.00	0.15	0.23	0.554	0.03	0.019	8%
14	5.40	0.25		0.15	0.487					1.00	0.20	0.25	0.487	0.05	0.024	10%
15	5.60	0.18		0.11	0.485					1.00	0.20	0.18	0.485	0.04	0.017	7%
16	5.80	0.25		0.15	0.474					1.00	0.20	0.25	0.474	0.05	0.024	10%
17	6.00	0.22		0.13	0.521					1.00	0.20	0.22	0.521	0.04	0.023	9%
18	6.20	0.26		0.16	0.320					1.00	0.20	0.26	0.320	0.05	0.017	7%
19	6.40	0.22		0.13	0.241					1.00	0.20	0.22	0.241	0.04	0.011	4%
20	6.50	0.16		0.10	0.249					1.00	0.20	0.16	0.249	0.03	0.008	3%
21	6.80	0.15		0.09	0.003					1.00	0.20	0.15	0.003	0.03	0.000	0%
LB	7.00	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
Total Flow														0.242	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m downstream of station

Meas. Start Time (MST):	11:13
Meas. End Time (MST):	11:36
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 25C



Flow characteristics:

Total Flow:	0.242	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.65	(m ²)
Wetted Width:	4.10	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.37	(m/s)
Reynolds Number:	4.98E+04	
Froude Number:	0.30	

Logger Details:

	Before	After
Transducer Reading (m):	0.138	0.265
Water (°C):	13.8	14.1
Datalogger Clock:	10:53	11:42
Laptop Clock:	10:52	11:42
Battery:	14.3	14.1
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Descicant:	-	Replaced
Vent Tube Descicant:	-	Good
PT# (if replaced):	342749	-
Logger# (if replaced):	6104	-

Datalogger / Station Notes:

- Pressure transducer moved after survey

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S34-06	0.662	100.063		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.388	98.675	98.659	3/4" pipe 2 metres east of logger
S34-05			1.716	98.347	98.271	3/4" pipe 8 metres south of logger
Water Level:						
Water Level:	Cut	0.210		97.045		Time WL Surveyed: 11:00
Temporary BM			3.228	96.835	0.000	
Turn						
Temporary BM	3.213	100.048		96.835		
Water Level:	Cut	0.210	3.213	97.045		Time WL Surveyed: 11:02
Secondary Water Level Survey (pick any BM e.o. closest to water's edge)						
S34-05	1.702	100.049		98.347	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut	0.287	3.297	97.039	98.659	3/4" pipe 2 metres east of logger
S34-04			1.375	98.673	98.659	3/4" pipe 2 metres east of logger
S34-06			0.649	99.399	99.401	Lag bolt in conifer, 30m Nof logger
Water Level:						
Water Level:	Cut	0.287	3.288	97.039		Time WL Surveyed: 11:38
S34-05	1.693	100.040		98.347		Time WL Surveyed: 11:41

WL Survey Summary

	Before	After
Average WL:	97.045	97.039
Closing Error:	0.002	-
WL Check:	0.000	0.000
Transducer Elevation	96.907	96.774

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Personnel:	DW, GG	Trip Date:	16-Aug-15
Data Entry Personnel:	DW, GG	Date:	16-Aug-15
Data Check Personnel:	DW	Date:	24-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake
 UTM Location: 440712 E, 6361615 N

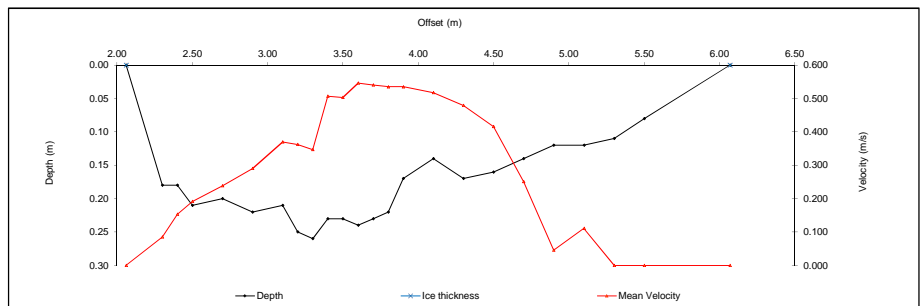
Site Visit Date: September 15, 2015
 Site Visit Time (MST): 15:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	6.07	0.00	0.00		0.000		0.000		0.000	1.00	0.29	0.00	0.000	0.00	0.000	
1	5.50	0.08		0.05	0.000					1.00	0.39	0.08	0.000	0.03	0.000	0%
2	5.30	0.11		0.07	0.000					1.00	0.20	0.11	0.000	0.02	0.000	0%
3	5.10	0.12		0.07	0.111					1.00	0.20	0.12	0.111	0.02	0.003	1%
4	4.90	0.12		0.07	0.046					1.00	0.20	0.12	0.046	0.02	0.001	1%
5	4.70	0.14		0.08	0.251					1.00	0.20	0.14	0.251	0.03	0.007	4%
6	4.50	0.16		0.10	0.416					1.00	0.20	0.16	0.416	0.03	0.013	7%
7	4.30	0.17		0.10	0.479					1.00	0.20	0.17	0.479	0.03	0.016	8%
8	4.10	0.14		0.08	0.517					1.00	0.20	0.14	0.517	0.03	0.014	8%
9	3.90	0.17		0.10	0.535					1.00	0.15	0.17	0.535	0.03	0.014	7%
10	3.80	0.22		0.13	0.535					1.00	0.10	0.22	0.535	0.02	0.012	6%
11	3.70	0.23		0.14	0.540					1.00	0.10	0.23	0.540	0.02	0.012	6%
12	3.60	0.24		0.14	0.546					1.00	0.10	0.24	0.546	0.02	0.013	7%
13	3.50	0.23		0.14	0.503					1.00	0.10	0.23	0.503	0.02	0.012	6%
14	3.40	0.23		0.14	0.507					1.00	0.10	0.23	0.507	0.02	0.012	6%
15	3.30	0.26		0.16	0.347					1.00	0.10	0.26	0.347	0.03	0.009	5%
16	3.20	0.25		0.15	0.362					1.00	0.10	0.25	0.362	0.02	0.009	5%
17	3.10	0.21		0.13	0.370					1.00	0.15	0.21	0.370	0.03	0.012	6%
18	2.90	0.22		0.13	0.290					1.00	0.20	0.22	0.290	0.04	0.013	7%
19	2.70	0.20		0.12	0.238					1.00	0.20	0.20	0.238	0.04	0.010	5%
20	2.50	0.21		0.13	0.191					1.00	0.15	0.21	0.191	0.03	0.006	3%
21	2.40	0.18		0.11	0.153					1.00	0.10	0.18	0.153	0.02	0.003	1%
22	2.30	0.18		0.11	0.085					1.00	0.17	0.18	0.085	0.03	0.003	1%
LB	2.06	0.00	0.00		0.00		0.00		0.00	1.00	0.12	0.00	0.000	0.00	0.000	
Total Flow														0.192	100%	

Flow Measurement Details:
Metering Section Location (describe):
 4m downstream of station

Meas. Start Time (MST):	16:01
Meas. End Time (MST):	16:28
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 10C



Flow characteristics:

Total Flow:	0.192	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.61	(m ²)
Wetted Width:	4.01	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.31	(m/s)
Reynolds Number:	3.45E+04	
Froude Number:	0.26	

Logger Details:

	Before	After
Transducer Reading (m):	0.256	0.268
Water (°C):	8.5	8.4
Datalogger Clock:	15:36	16:30
Laptop Clock:	15:36	16:30
Battery:	14.1	14.2
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 - Checked modem. Cell signal strength low (-97). Station working well otherwise
 - No damage

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S34-06	0.590	99.991		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.323	98.668	98.659	3/4" pipe 2 metres east of logger
S34-05			1.652	98.339	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut	0.401	3.373	97.019		Time WL Surveyed: 15:50
Temporary BM:			3.373	96.618	0.000	
Turn						
Temporary BM	3.349	99.967		96.618		
Water Level:	Cut	0.401	3.349	97.019		Time WL Surveyed: 15:55
S34-05			1.628	98.339	98.271	3/4" pipe 8 metres south of logger
S34-04			1.299	98.668	98.659	3/4" pipe 2 metres east of logger
S34-06			0.566	99.401	99.401	Lag bolt in conifer, 30m Nof logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S34-04	1.299	99.967		98.668		
Water Level:	Cut	0.432	3.382	97.017		Time WL Surveyed: 16:33
Water Level:	Cut	0.432	3.360	97.016		Time WL Surveyed: 16:35
S34-04	1.276	99.944		98.668		

WL Survey Summary

	Before	After
Average WL:	97.019	97.017
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	96.763	96.749

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

Field Personnel:	CJ, TL	Trip Date:	15-Sep-15
Data Entry Personnel:	CJ	Date:	15-Sep-15
Data Check Personnel:	DW	Date:	18-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake
 UTM Location: 440712 E, 6361615 N

Site Visit Date: October 18, 2015
 Site Visit Time (MST): 10:15

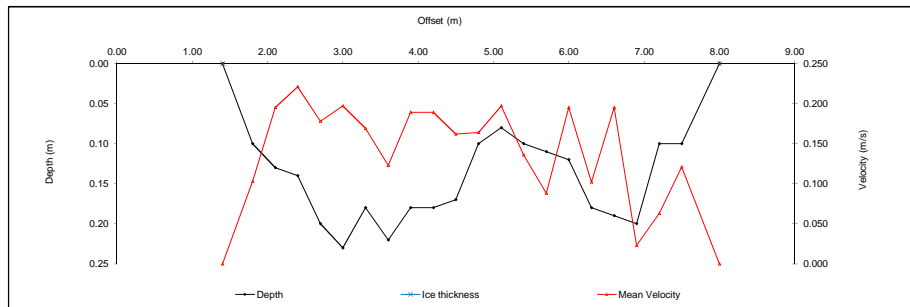


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.40	0.00	0.00		0.000				0.000							
1	1.80	0.10		0.06	0.103					1.00	0.35	0.10	0.103	0.04	0.004	3%
2	2.10	0.13		0.08	0.195					1.00	0.30	0.13	0.195	0.04	0.008	5%
3	2.40	0.14		0.08	0.221					1.00	0.30	0.14	0.221	0.04	0.009	7%
4	2.70	0.20		0.12	0.178					1.00	0.30	0.20	0.178	0.06	0.011	8%
5	3.00	0.23		0.14	0.197					1.00	0.30	0.23	0.197	0.07	0.014	10%
6	3.30	0.18		0.11	0.169					1.00	0.30	0.18	0.169	0.05	0.009	7%
7	3.60	0.22		0.13	0.123					1.00	0.30	0.22	0.123	0.07	0.008	6%
8	3.90	0.18		0.11	0.189					1.00	0.30	0.18	0.189	0.05	0.010	7%
9	4.20	0.18		0.11	0.189					1.00	0.30	0.18	0.189	0.05	0.010	7%
10	4.50	0.17		0.10	0.162					1.00	0.30	0.17	0.162	0.05	0.008	6%
11	4.80	0.10		0.06	0.164					1.00	0.30	0.10	0.164	0.03	0.005	4%
12	5.10	0.08		0.05	0.197					1.00	0.30	0.08	0.197	0.02	0.005	3%
13	5.40	0.10		0.06	0.136					1.00	0.30	0.10	0.136	0.03	0.004	3%
14	5.70	0.11		0.07	0.088					1.00	0.30	0.11	0.088	0.03	0.003	2%
15	6.00	0.12		0.07	0.195					1.00	0.30	0.12	0.195	0.04	0.007	5%
16	6.30	0.18		0.11	0.102					1.00	0.30	0.18	0.102	0.05	0.006	4%
17	6.60	0.19		0.11	0.195					1.00	0.30	0.19	0.195	0.06	0.011	8%
18	6.90	0.20		0.12	0.023					1.00	0.30	0.20	0.023	0.06	0.001	1%
19	7.20	0.10		0.06	0.063					1.00	0.30	0.10	0.063	0.03	0.002	1%
20	7.50	0.10		0.06	0.121					1.00	0.40	0.10	0.121	0.04	0.005	3%
LB	8.00	0.00	0.00		0.000				0.000							
Total Flow														0.139	100%	

Flow Measurement Details:

Metering Section Location (describe):
12m upstream of pressure transducer

Meas. Start Time (MST):	10:25
Meas. End Time (MST):	10:43
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Open, low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, windy, 13C



Flow characteristics:

Total Flow:	0.139	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.92	(m ²)
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.15	(m/s)
Reynolds Number:	1.34E+04	
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.245	0.244
Water (°C):	4.1	4.4
Datalogger Clock:	10:16	10:50
Laptop Clock:	10:15	10:49
Battery:	13.0	13.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 - WL fluctuating 1cm

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S34-06	0.615	100.016		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.348	98.668	98.659	3/4" pipe 2 metres east of logger
S34-05			1.678	98.338	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut	0.243	3.261	96.998	96.998	Time WL Surveyed: 10:19
Turn			3.261	96.755	96.755	
Water Level:	Cut	3.198	99.953	96.755	96.755	Time WL Surveyed: 10:20
S34-05			1.613	98.340	98.271	3/4" pipe 8 metres south of logger
S34-04			1.294	98.669	98.659	3/4" pipe 2 metres east of logger
S34-06			0.551	99.402	99.401	Lag bolt in conifer, 30m Nof logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S34-05	1.613	99.952		96.755	96.755	Time WL Surveyed: 10:46
Water Level:	Cut	0.226	3.174	97.004	97.004	Time WL Surveyed: 10:47
Water Level:	Cut	0.229	3.140	97.004	97.004	
S34-05	1.579	99.918		98.339	98.339	

WL Survey Summary

	Before	After
Average WL:	96.998	97.004
Closing Error:	-0.001	-
WL Check:	0.000	0.000
Transducer Elevation	96.753	96.760

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	18-Oct-15
Data Check Personnel:	TR	Date:	18-Oct-15
Entered Digitally in the Field:	DW	Date:	22-Oct-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake
 UTM Location: 440712 E, 6361615 N

Site Visit Date: December 12, 2015
 Site Visit Time (MST): 12:20

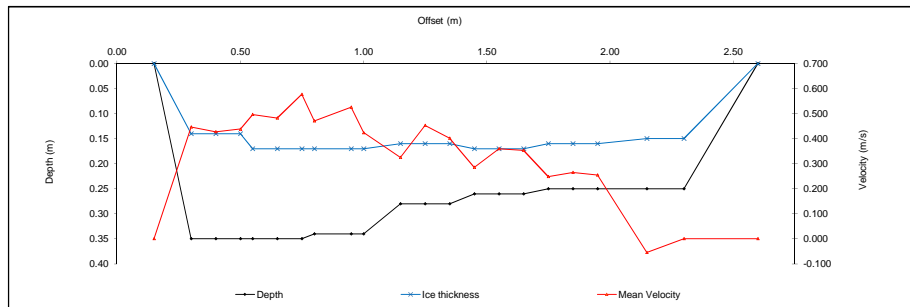


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.60	0.00	0.00		0.000		0.000		0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	2.30	0.25	0.15	0.20	0.000					0.88	0.23	0.10	0.000	0.02	0.000	0%
2	2.15	0.25	0.15	0.20	-0.062					0.88	0.18	0.10	-0.055	0.02	-0.001	-1%
3	1.95	0.25	0.16	0.21	0.290					0.88	0.15	0.09	0.255	0.01	0.003	3%
4	1.85	0.25	0.16	0.21	0.301					0.88	0.10	0.09	0.265	0.01	0.002	2%
5	1.75	0.25	0.16	0.21	0.282					0.88	0.10	0.09	0.249	0.01	0.002	2%
6	1.65	0.26	0.17	0.22	0.402					0.88	0.10	0.09	0.354	0.01	0.003	3%
7	1.55	0.26	0.17	0.22	0.409					0.88	0.10	0.09	0.360	0.01	0.003	3%
8	1.45	0.26	0.17	0.22	0.325					0.88	0.10	0.09	0.286	0.01	0.003	2%
9	1.35	0.28	0.16	0.22	0.456					0.88	0.10	0.12	0.401	0.01	0.005	5%
10	1.25	0.28	0.16	0.22	0.515					0.88	0.10	0.12	0.453	0.01	0.005	5%
11	1.15	0.28	0.16	0.22	0.370					0.88	0.13	0.12	0.326	0.02	0.005	5%
12	1.00	0.34	0.17	0.26	0.462					0.88	0.10	0.17	0.424	0.02	0.007	7%
13	0.95	0.34	0.17	0.26	0.598					0.88	0.10	0.17	0.526	0.02	0.009	8%
14	0.80	0.34	0.17	0.26	0.535					0.88	0.10	0.17	0.471	0.02	0.008	8%
15	0.75	0.35	0.17	0.26	0.656					0.88	0.08	0.18	0.577	0.01	0.008	7%
16	0.65	0.35	0.17	0.26	0.548					0.88	0.10	0.18	0.482	0.02	0.009	8%
17	0.55	0.35	0.17	0.26	0.564					0.88	0.08	0.18	0.496	0.01	0.007	6%
18	0.50	0.35	0.14	0.25	0.498					0.88	0.08	0.21	0.438	0.02	0.007	7%
19	0.40	0.35	0.14	0.25	0.485					0.88	0.10	0.21	0.427	0.02	0.009	8%
20	0.30	0.35	0.14	0.25	0.598					0.88	0.13	0.21	0.447	0.03	0.012	11%
LB	0.15	0.00	0.00		0.00		0.00		0.00	0.88	0.08	0.00	0.000	0.00	0.000	
Total Flow														0.106	100%	

Flow Measurement Details:

Metering Section Location (describe): 8m downstream of station

Meas. Start Time (MST):	13:05
Meas. End Time (MST):	13:27
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, -5C



Flow characteristics:

Total Flow:	0.106	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.30	(m ²)
Wetted Width:	2.45	(m)
Hydraulic Depth:	0.12	(m)
Mean Velocity:	0.36	(m/s)
Reynolds Number:	2.76E+04	
Froude Number:	0.33	

Logger Details:

	Before	After
Transducer Reading (m):	0.245	-
Water (°C):	4.4	-
Datalogger Clock:	13:16	-
Laptop Clock:	12:25	-
Battery:	12.4	13.0
Battery Condition:	Ice	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-WL fluctuating approx. 1cm in hole during water level survey

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S34-06	0.678	100.079		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.411	98.668	98.659	3/4" pipe 2 metres east of logger
S34-05			1.737	98.342	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut		2.924	97.155		Time WL Surveyed: 12:42
S34-05			1.737	98.342	98.271	3/4" pipe 8 metres south of logger
Turn						
S34-05	1.762	100.104		98.342	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut		2.952	97.152		Time WL Surveyed: 12:46
S34-04			1.438	98.666	98.659	3/4" pipe 2 metres east of logger
S34-05			1.762	98.342	98.271	3/4" pipe 8 metres south of logger
S34-06			0.702	99.402	99.401	Lag bolt in conifer, 30m Nof logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.154	-
Closing Error:	-0.001	-
WL Check:	0.003	-
Transducer Elevation	96.909	-

Level Survey Equipment:

Level #:	Level#H
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	JC	Trip Date:	12-Dec-15
Data Check Personnel:	CJ	Date:	21-Dec-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet
 UTM Location: 490626 E, 6384064 N

Site Visit Date: January 13, 2015
 Site Visit Time (MST): 14:00



Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	4.30	0.00	0.00							0.88	0.20	0.00	0.000	0.00	0.000	
1	3.90	0.70	0.35	0.53	0.343					0.88	0.25	0.35	0.302	0.09	0.026	5%
2	3.80	0.70	0.35	0.53	0.309					0.88	0.15	0.35	0.272	0.05	0.014	3%
3	3.60	0.73	0.32	0.53	0.320					0.88	0.18	0.41	0.282	0.07	0.021	4%
4	3.44	0.70	0.32	0.51	0.364					0.88	0.18	0.38	0.320	0.07	0.021	4%
5	3.25	0.78	0.31	0.55	0.395					0.88	0.18	0.47	0.348	0.08	0.029	6%
6	3.09	0.78	0.32	0.55	0.358					0.88	0.14	0.46	0.315	0.06	0.020	4%
7	2.97	0.90	0.32	0.61	0.356					0.88	0.14	0.58	0.313	0.08	0.025	5%
8	2.81	0.90	0.32	0.61	0.374					0.88	0.17	0.58	0.329	0.10	0.031	6%
9	2.64	0.95	0.32	0.64	0.347					0.88	0.17	0.63	0.305	0.10	0.032	6%
10	2.48	0.95	0.32	0.64	0.353					0.88	0.16	0.63	0.311	0.10	0.030	6%
11	2.33	1.00	0.32	0.66	0.374					0.88	0.17	0.68	0.329	0.11	0.037	8%
12	2.15	1.00	0.32	0.66	0.378					0.88	0.15	0.68	0.333	0.10	0.034	7%
13	2.03	0.98	0.31	0.65	0.372					0.88	0.14	0.67	0.327	0.09	0.031	6%
14	1.87	0.98	0.31	0.65	0.434					0.88	0.16	0.67	0.382	0.10	0.040	8%
15	1.72	1.00	0.33	0.67	0.314					0.88	0.14	0.67	0.276	0.09	0.026	5%
16	1.59	1.00	0.33	0.67	0.315					0.88	0.17	0.67	0.277	0.11	0.031	6%
17	1.39	1.00	0.34	0.67	0.252					0.88	0.15	0.66	0.222	0.10	0.021	4%
18	1.30	1.00	0.34	0.67	0.216					0.88	0.16	0.66	0.190	0.11	0.020	4%
19	1.07	0.45	0.35	0.40	0.000					0.88	0.32	0.10	0.000	0.03	0.000	0%
20	0.67	0.40	0.35	0.38	-0.001					0.88	0.49	0.05	-0.001	0.02	0.000	0%
LB	0.10	0.00	0.00							0.88	0.29	0.00	0.000	0.00	0.000	
Total Flow														0.49	100%	

Flow Measurement Details:

Metering Section Location (describe): 10m downstream of station

Meas. Start Time (MST):	14:45
Meas. End Time (MST):	15:10
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -8C

Flow characteristics:

Total Flow:	0.490	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.68	(m ²)
Wetted Width:	4.20	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.15	

Logger Details:

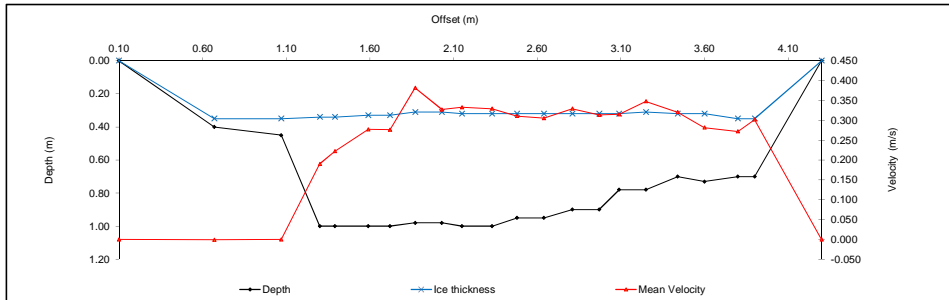
	Before	After
Transducer Reading (m):	0.735	0.734
Water (°C):	0.100	0.100
Datalogger Clock:	14:04	14:21
Laptop Clock:	14:04	14:21
Battery (Main):	12.7	13.0
Battery:	Replaced	
Battery Serial #:	-	1305003
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Argonaut Details:

	Before	After
Water Level (m):		
Index Velocity (m/s):		
Discharge (m ³ /s):		

Datalogger / Station Notes
 - Fluctuations in water level data could be due to low battery
 - Vent tube has no pinches

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
S36-02	1.562	101.485		99.923	99.923	3/4" Pipe 8m North of logger
S36-06			1.075	100.410	100.395	3/4" pipe 6 metres Southwest of logger
S36-04			0.956	100.529	100.206	3/4" Pipe 8m West of logger
S36-05			1.089	100.396	100.395	3/4" pipe 6 metres Southwest of logger
Water Level:			2.055	99.430	99.430	Time WL Surveyed: 14:32
Temporary BM			1.979	99.506	100.395	3/4" pipe 6 metres Southwest of logger
Turn						
Temporary BM	1.963	101.469		99.506	100.395	3/4" pipe 6 metres Southwest of logger
Water Level:			2.043	99.426	99.426	Time WL Surveyed: 14:35
S36-05			1.073	100.396	100.395	3/4" pipe 6 metres Southwest of logger
S36-04			0.941	100.528	100.206	3/4" Pipe 8m West of logger
S36-06			1.058	100.411	100.395	3/4" pipe 6 metres Southwest of logger
S36-02			1.543	99.926	99.923	3/4" Pipe 8m North of logger

Secondary Water Level Survey (pick any BM e.g. closest to water's edge)

Water Level:	Cut				Time WL Surveyed:
Water Level:	Cut				Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	99.428	-
Closing Error:	-0.003	-
WL Check:	0.004	-
Transducer Elevation	98.693	-

Field Personnel:

Field Personnel:	DW, MP	Trip Date:	13-Jan-15
Data Entry Personnel:	DW, MP	Date:	13-Jan-15
Data Check Personnel:	MP	Date:	29-Jan-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet
 UTM Location: 490626 E, 6384064 N

Site Visit Date: February 11, 2015
 Site Visit Time (MST): 09:20

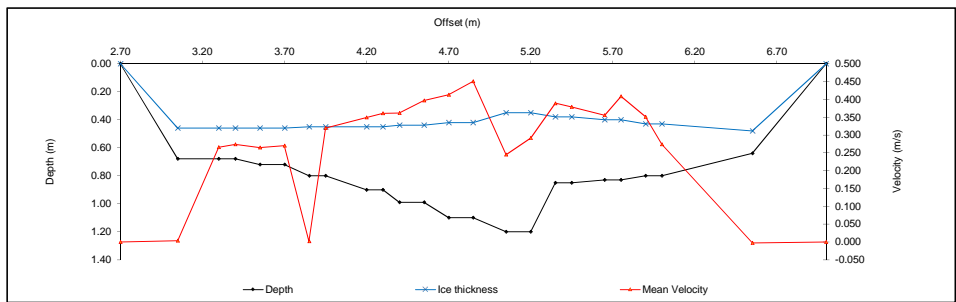


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	7.00	0.00	0.00		0.000		0.000		0.000	0.88	0.23	0.00	0.000	0.00	0.000	
1	6.55	0.64	0.48	0.56	-0.003					0.88	0.50	0.16	-0.003	0.08	0.000	0%
2	6.00	0.80	0.43	0.62	0.311					0.88	0.33	0.37	0.274	0.12	0.033	7%
3	5.90	0.80	0.43	0.62	0.399					0.88	0.13	0.37	0.351	0.05	0.016	3%
4	5.75	0.83	0.40	0.62	0.464					0.88	0.13	0.43	0.408	0.05	0.022	5%
5	5.65	0.83	0.40	0.62	0.404					0.88	0.15	0.43	0.356	0.06	0.023	5%
6	5.45	0.85	0.38	0.62	0.430					0.88	0.15	0.47	0.378	0.07	0.027	6%
7	5.35	0.85	0.38	0.62	0.442					0.88	0.13	0.47	0.389	0.06	0.023	5%
8	5.20	1.20	0.35			1.03	0.101	0.52	0.482	1.00	0.15	0.85	0.292	0.13	0.037	8%
9	5.05	1.20	0.35			1.03	-0.056	0.52	0.546	1.00	0.18	0.85	0.245	0.13	0.036	8%
10	4.85	1.10	0.42	0.76	0.512					0.88	0.17	0.68	0.451	0.12	0.054	11%
11	4.70	1.10	0.42	0.76	0.469					0.88	0.15	0.68	0.413	0.10	0.042	9%
12	4.55	0.99	0.44	0.72	0.451					0.88	0.15	0.55	0.397	0.08	0.033	7%
13	4.40	0.99	0.44	0.72	0.411					0.88	0.13	0.55	0.362	0.07	0.025	5%
14	4.30	0.90	0.45	0.68	0.410					0.88	0.10	0.45	0.361	0.04	0.016	3%
15	4.20	0.90	0.45	0.68	0.397					0.88	0.18	0.45	0.349	0.08	0.028	6%
16	3.95	0.80	0.45	0.63	0.363					0.88	0.18	0.35	0.319	0.06	0.020	4%
17	3.85	0.80	0.45	0.63	0.002					0.88	0.13	0.35	0.002	0.04	0.000	0%
18	3.70	0.72	0.46	0.59	0.307					0.88	0.15	0.26	0.270	0.04	0.011	2%
19	3.55	0.72	0.46	0.59	0.301					0.88	0.15	0.26	0.265	0.04	0.010	2%
20	3.40	0.68	0.46	0.57	0.311					0.88	0.13	0.22	0.274	0.03	0.008	2%
21	3.30	0.68	0.46	0.57	0.302					0.88	0.18	0.22	0.266	0.04	0.010	2%
22	3.05	0.68	0.46	0.57	0.004					0.88	0.30	0.22	0.004	0.07	0.000	0%
RB	2.70	0.00	0.00		0.00		0.00		0.00	0.88	0.18	0.00	0.000	0.00	0.000	
Total Flow														0.473	100%	

Flow Measurement Details:

Metering Section Location (describe): 10m downstream of station

Meas. Start Time (MST):	10:18
Meas. End Time (MST):	10:50
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -36C



Flow characteristics:

Total Flow:	0.473	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.58	(m ²)
Wetted Width:	4.30	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.16	

Logger Details:

	Before	After
Transducer Reading (m):	0.734	-
Water (°C):	0.100	-
Datalogger Clock:	10:02	-
Laptop Clock:	10:01	-
Battery (Main):	13.6	13.1
Battery:	Replaced	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Argonaut Details:

	Before	After
Water Level (m):	-	-
Index Velocity (m/s):	-	-
Discharge (m ³ /s):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S36-05	1.294	101.689		100.395	100.395	3/4" pipe 6 metres Southwest of logger
S36-04			1.128	100.561	100.397	3/4" Pipe 8m West of logger
S36-06			1.253	100.436	100.395	3/4" pipe 6 metres Southwest of logger
Turn						
Temporary BM	2.110	101.657		99.547	100.395	3/4" pipe 6 metres Southwest of logger
Water Level:	Cut		2.239	99.418		Time WL Surveyed: 9:55
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	99.419	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	98.685	-

Field Personnel:

	MP, GG	Trip Date:	11-Feb-15
Data Entry Personnel:	MP	Date:	11-Feb-15
Data Check Personnel:	MP	Date:	25-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet

UTM Location: 490626 E, 6384064 N

Site Visit Date: _____

March 8, 2015

Site Visit Time (MST): _____

10:41

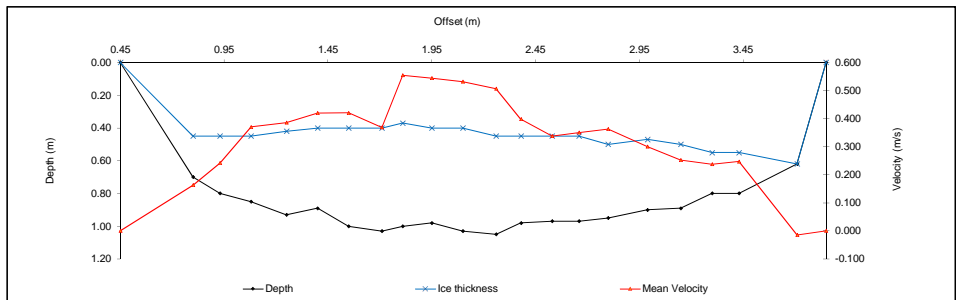


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
1	3.71	0.62	0.62	0.62	-0.016					0.88	0.07	0.00	0.000	0.00	0.000	0%
2	3.43	0.80	0.55	0.68	0.281					0.88	0.21	0.00	-0.014	0.05	0.013	2%
3	3.30	0.80	0.55	0.68	0.270					0.88	0.14	0.25	0.247	0.04	0.008	2%
4	3.15	0.89	0.50	0.70	0.287					0.88	0.15	0.39	0.253	0.06	0.015	3%
5	2.99	0.90	0.47	0.69	0.341					0.88	0.18	0.43	0.300	0.08	0.023	4%
6	2.80	0.95	0.50	0.73	0.413					0.88	0.17	0.45	0.363	0.07	0.027	5%
7	2.66	0.97	0.45	0.71	0.398					0.88	0.14	0.52	0.350	0.07	0.025	5%
8	2.53	0.97	0.45	0.71	0.384					0.88	0.14	0.52	0.338	0.07	0.025	5%
9	2.38	0.98	0.45	0.72	0.453					0.88	0.14	0.53	0.399	0.07	0.029	5%
10	2.26	1.05	0.45	0.75	0.576					0.88	0.14	0.60	0.507	0.08	0.043	8%
11	2.10	1.03	0.40	0.72	0.604					0.88	0.16	0.63	0.532	0.10	0.052	10%
12	1.95	0.98	0.40	0.69	0.618					0.88	0.15	0.58	0.544	0.08	0.046	9%
13	1.81	1.00	0.37	0.69	0.630					0.88	0.12	0.63	0.554	0.08	0.042	8%
14	1.71	1.03	0.40	0.72	0.419					0.88	0.13	0.63	0.369	0.08	0.030	6%
15	1.55	1.00	0.40	0.70	0.478					0.88	0.16	0.60	0.421	0.09	0.039	7%
16	1.40	0.89	0.40	0.65	0.477					0.88	0.15	0.49	0.420	0.07	0.031	6%
17	1.25	0.93	0.42	0.68	0.438					0.88	0.16	0.51	0.385	0.08	0.031	6%
18	1.08	0.85	0.45	0.65	0.421					0.88	0.16	0.40	0.370	0.06	0.024	5%
19	0.93	0.80	0.45	0.63	0.275					0.88	0.14	0.35	0.242	0.05	0.012	2%
20	0.80	0.70	0.45	0.58	0.186					0.88	0.24	0.25	0.164	0.06	0.010	2%
LB	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.18	0.00	0.000	0.00	0.000	0%
Total Flow													0.523	100%		

Flow Measurement Details:

Metering Section Location (describe):
10m downstream station

Meas. Start Time (MST):	11:10
Meas. End Time (MST):	11:50
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, 3C



Flow characteristics:

Total Flow:	0.523	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.36	(m ²)
Wetted Width:	3.40	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.39	(m/s)
Froude Number:	0.20	

Logger Details:

	Before	After
Transducer Reading (m):	0.735	-
Water (°C):	0.100	-
Datalogger Clock:	10:44	-
Laptop Clock:	10:44	-
Battery (Main):	14.1	13.8
Battery:	Replaced	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Argonaut Details:

	Before	After
Water Level (m):	-	-
Index Velocity (m/s):	-	-
Discharge (m ³ /s):	-	-

Datalogger / Station Notes:

- Replaced 1 of 2 batteries
- WL moving 1cm during survey
- BMs still moving, likely due to frost heave

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S36-06	1.206	101.615		100.409	100.409	Lag bolt in tamarack 10m SSW of logger
S36-05			1.281	100.334	100.395	3/4" pipe 6 metres Southwest of logger
S36-07			1.359	100.256	100.529	bolt in tree across heli pad
S36-03			1.102	100.513	100.313	3/4" Pipe 6m North of logger
Water Level:	Cut			99.348		Time WL Surveyed: 11:01
Temporary BM			2.082	99.523		
Turn						
Temporary BM	2.068	101.591		99.523		
Water Level:	Cut		2.241	99.350		Time WL Surveyed: 11:09
S36-03			1.078	100.513	100.313	3/4" Pipe 6m North of logger
S36-07			1.335	100.256	100.529	bolt in tree across heli pad
S36-05			1.257	100.334	100.395	3/4" pipe 6 metres Southwest of logger
S36-06			1.183	100.408	100.409	Lag bolt in tamarack 10m SSW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	99.349	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	98.614	-

Field Personnel:

	GG, MP	Trip Date:	8-Mar-15
Data Entry Personnel:	GG	Date:	8-Mar-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet

UTM Location: 490626 E, 6384064 N

Site Visit Date: _____

April 18, 2015

Site Visit Time (MST): _____

11:23

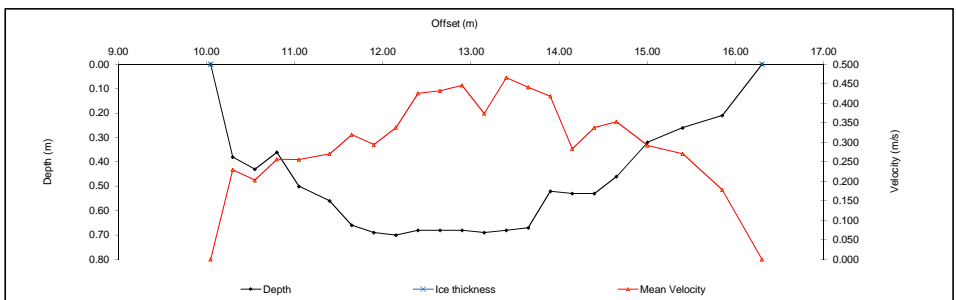


Flow Measurement:																	
Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
LB	10.05	0.00	0.00	0.23	0.230				0.000	1.00	0.13	0.00	0.000	0.00	0.000		
1	10.30	0.38		0.26	0.203				1.00	0.25	0.38	0.230	0.10	0.022	2%		
2	10.55	0.43		0.22	0.257				1.00	0.25	0.43	0.203	0.11	0.022	2%		
3	10.80	0.36		0.30	0.256				1.00	0.25	0.36	0.257	0.09	0.023	2%		
4	11.05	0.50		0.34	0.271				1.00	0.30	0.50	0.256	0.15	0.038	4%		
5	11.40	0.56		0.40	0.320				1.00	0.30	0.56	0.271	0.17	0.046	4%		
6	11.65	0.66		0.41	0.294				1.00	0.25	0.66	0.320	0.17	0.053	5%		
7	11.90	0.69		0.42	0.338				1.00	0.25	0.69	0.294	0.17	0.051	5%		
8	12.15	0.70		0.41	0.426				1.00	0.25	0.70	0.338	0.18	0.059	6%		
9	12.40	0.68		0.41	0.432				1.00	0.25	0.68	0.426	0.17	0.072	7%		
10	12.65	0.68		0.41	0.446				1.00	0.25	0.68	0.432	0.17	0.073	7%		
11	12.90	0.68		0.41	0.446				1.00	0.25	0.68	0.446	0.17	0.076	7%		
12	13.15	0.69		0.41	0.374				1.00	0.25	0.69	0.374	0.17	0.065	6%		
13	13.40	0.68		0.41	0.466				1.00	0.25	0.68	0.466	0.17	0.079	8%		
14	13.65	0.67		0.40	0.441				1.00	0.25	0.67	0.441	0.17	0.074	7%		
15	13.90	0.52		0.31	0.418				1.00	0.25	0.52	0.418	0.13	0.054	5%		
16	14.15	0.53		0.32	0.284				1.00	0.25	0.53	0.284	0.13	0.038	4%		
17	14.40	0.53		0.32	0.338				1.00	0.25	0.53	0.338	0.13	0.045	4%		
18	14.65	0.46		0.28	0.353				1.00	0.30	0.46	0.353	0.14	0.049	5%		
19	15.00	0.32		0.19	0.292				1.00	0.38	0.32	0.292	0.12	0.035	3%		
20	15.40	0.26		0.16	0.271				1.00	0.43	0.26	0.271	0.11	0.030	3%		
21	15.85	0.21		0.13	0.178				1.00	0.45	0.21	0.178	0.09	0.017	2%		
RB	16.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.23	0.00	0.000	0.00	0.000			
														Total Flow	1.02	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	12:12
Meas. End Time (MST):	12:40
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 10 C



Flow characteristics:

Total Flow:	1.02	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.00	(m ²)
Wetted Width:	6.25	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.16	

Logger Details:

	Before	After
Transducer Reading (m):	0.615	0.622
Water (°C):	4.600	5.200
Datalogger Clock:	11:25	12:48
Laptop Clock:	11:25	12:48
Battery (Main):	13.9	13.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Argonaut Details:

	Before	After
Water Level (m):		
Index Velocity (m/s):		
Discharge (m ³ /s):		

Datalogger / Station Notes:

General Notes:

-ADV Test passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S36-06	1.117	101.526	-	100.409	100.409	Lag bolt in tamarack 10m SSW of logger
S36-04	-	-	0.997	100.529		
S36-03	-	-	1.016	100.510		
S36-05	-	-	1.212	100.314	100.334	3/4" pipe 6 metres Southwest of logger
Water Level:	Cut	2.318	99.208		Time WL Surveyed: 11:43	
S36-07	-	-	1.273	100.253	100.256	bolt in tree across hell pad
Turn						
S36-07	1.257	101.510	-	100.253	100.256	bolt in tree across hell pad
Water Level:	Cut	2.301	99.209		Time WL Surveyed: 11:46	
S36-05	-	-	1.193	100.317	100.334	3/4" pipe 6 metres Southwest of logger
S36-03	-	-	0.998	100.512		
S36-04	-	-	0.978	100.532		
S36-06	-	-	1.100	100.410	100.409	Lag bolt in tamarack 10m SSW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S36-03	0.996	101.509	-	100.511		
Water Level:	Cut	2.294	99.215		Time WL Surveyed: 12:43	
Water Level:	Cut	2.274	99.215		Time WL Surveyed: 12:45	
S36-03	0.978	101.489	-	100.511		

WL Survey Summary

	Before	After
Average WL:	99.209	99.215
Closing Error:	-0.001	-
WL Check:	0.001	0.000
Transducer Elevation	98.594	98.593

Field Personnel:

	GG, RM	Trip Date:	18-Apr-15
Data Entry Personnel:	GG	Date:	18-Apr-15
Data Check Personnel:	CJ	Date:	9-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet
 UTM Location: 490626 E, 6384064 N

Site Visit Date: May 10, 2015
 Site Visit Time (MST): 09:45

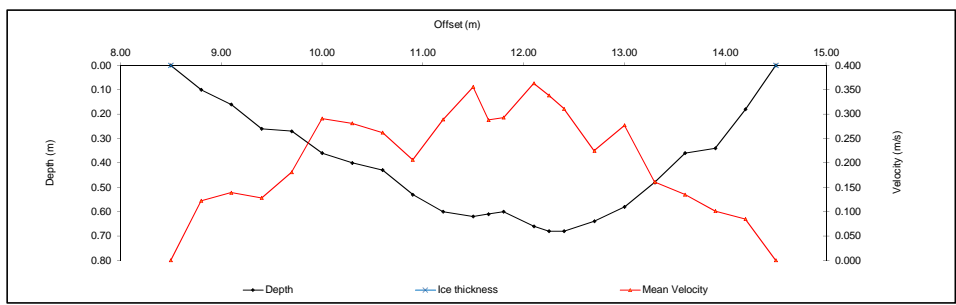


Flow Measurement													Measured Data				Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)						
RB	8.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000							
1	8.80	0.10		0.06	0.122					1.00	0.30	0.10	0.122	0.03	0.004	1%						
2	9.10	0.16		0.10	0.139					1.00	0.30	0.16	0.139	0.05	0.007	1%						
3	9.40	0.26		0.16	0.128					1.00	0.30	0.26	0.128	0.08	0.010	2%						
4	9.70	0.27		0.16	0.181					1.00	0.30	0.27	0.181	0.08	0.015	2%						
5	10.00	0.36		0.22	0.291					1.00	0.30	0.36	0.291	0.11	0.031	5%						
6	10.30	0.40		0.24	0.281					1.00	0.30	0.40	0.281	0.12	0.034	5%						
7	10.60	0.43		0.26	0.262					1.00	0.30	0.43	0.262	0.13	0.034	6%						
8	10.90	0.53		0.32	0.206					1.00	0.30	0.53	0.206	0.16	0.033	5%						
9	11.20	0.60		0.36	0.289					1.00	0.30	0.60	0.289	0.18	0.052	8%						
10	11.50	0.62		0.37	0.356					1.00	0.23	0.62	0.356	0.14	0.050	8%						
11	11.65	0.61		0.37	0.288					1.00	0.15	0.61	0.288	0.09	0.026	4%						
12	11.80	0.60		0.36	0.293					1.00	0.22	0.60	0.293	0.13	0.040	6%						
13	12.10	0.66		0.40	0.363					1.00	0.23	0.66	0.363	0.15	0.054	9%						
14	12.25	0.68		0.41	0.338					1.00	0.15	0.68	0.338	0.10	0.034	6%						
15	12.40	0.68		0.41	0.311					1.00	0.23	0.68	0.311	0.15	0.048	8%						
16	12.70	0.64		0.38	0.225					1.00	0.30	0.64	0.225	0.19	0.043	7%						
17	13.00	0.58		0.35	0.277					1.00	0.30	0.58	0.277	0.17	0.048	8%						
18	13.30	0.48		0.29	0.161					1.00	0.30	0.48	0.161	0.14	0.023	4%						
19	13.60	0.36		0.22	0.135					1.00	0.30	0.36	0.135	0.11	0.015	2%						
20	13.90	0.34		0.20	0.101					1.00	0.30	0.34	0.101	0.10	0.010	2%						
21	14.20	0.18		0.11	0.085					1.00	0.30	0.18	0.085	0.05	0.005	1%						
LB	14.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000							
Total Flow														0.614	100%							

Flow Measurement Details:

Metering Section Location (describe): Adjacent to station

Meas. Start Time (MST):	10:10
Meas. End Time (MST):	10:28
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flpw
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 12C



Flow characteristics:

Total Flow:	0.614	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.48	(m ²)
Wetted Width:	6.00	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.522	0.522
Water (°C):	5.700	6.400
Datalogger Clock:	09:54	10:38
Laptop Clock:	09:54	10:38
Battery (Main):	14.2	14.2
Battery:		Good
Battery Serial #:	-	-
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Argonaut Details:

	Before	After
Water Level (m):	-	-
Index Velocity (m/s):	-	-
Discharge (m ³ /s):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S36-06	0.851	101.260		100.409	100.409	Lag bolt in tamarack 10m SSW of logger
S36-07			1.009	100.251	100.256	bolt in tree across heli pad
S36-05			0.946	100.314	100.334	3/4" pipe 6 metres Southwest of logger
Water Level:	Cut	2.151		99.109		Time WL Surveyed: 10:04
Temporary BM			0.946	100.314		
Turn						
Temporary BM	0.935	101.249		100.314		
Water Level:	Cut		2.137	99.112		Time WL Surveyed: 10:06
S36-05			0.935	100.314	100.334	3/4" pipe 6 metres Southwest of logger
S36-07			0.999	100.250	100.256	bolt in tree across heli pad
S36-06			0.841	100.408	100.409	Lag bolt in tamarack 10m SSW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S36-05	0.935	101.249		100.314		
Water Level:	Cut		2.138	99.111		Time WL Surveyed: 10:35
Water Level:	Cut		2.128	99.111		Time WL Surveyed: 10:36
S36-05	0.925	101.239		100.314		

WL Survey Summary

	Before	After
Average WL:	99.111	99.111
Closing Error:	0.001	-
WL Check:	0.003	0.000
Transducer Elevation	98.589	98.589

Field Personnel:

Field Personnel:	TR, CJ	Trip Date:	10-May-15
Data Entry Personnel:	CJ	Date:	10-May-15
Data Check Personnel:	CJ	Date:	9-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet
 UTM Location: 490626 E, 6384064 N

Site Visit Date: June 14, 2015
 Site Visit Time (MST): 10:29

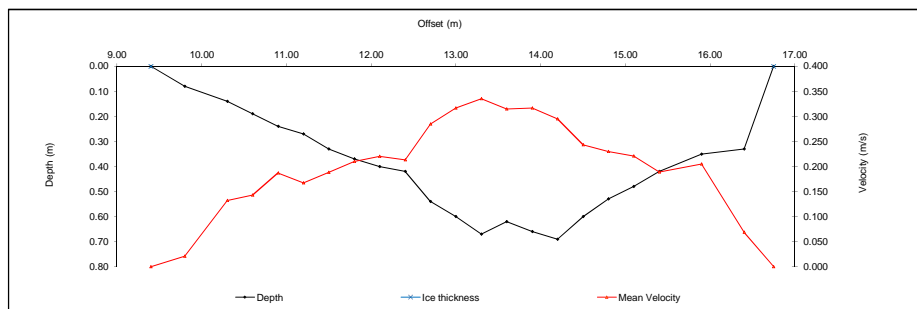


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	9.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	9.80	0.08		0.05	0.021					1.00	0.45	0.08	0.021	0.04	0.001	0%
2	10.30	0.14		0.08	0.132					1.00	0.40	0.14	0.132	0.06	0.007	1%
3	10.60	0.19		0.11	0.143					1.00	0.30	0.19	0.143	0.06	0.008	1%
4	10.90	0.24		0.14	0.187					1.00	0.30	0.24	0.187	0.07	0.013	2%
5	11.20	0.27		0.16	0.167					1.00	0.30	0.27	0.167	0.08	0.014	2%
6	11.50	0.33		0.20	0.158					1.00	0.30	0.33	0.188	0.10	0.019	3%
7	11.80	0.37		0.22	0.210					1.00	0.30	0.37	0.210	0.11	0.023	3%
8	12.10	0.40		0.24	0.220					1.00	0.30	0.40	0.220	0.12	0.026	4%
9	12.40	0.42		0.25	0.213					1.00	0.30	0.42	0.213	0.13	0.027	4%
10	12.70	0.54		0.32	0.285					1.00	0.30	0.54	0.285	0.16	0.046	7%
11	13.00	0.60		0.36	0.317					1.00	0.30	0.60	0.317	0.18	0.057	8%
12	13.30	0.67		0.40	0.335					1.00	0.30	0.67	0.335	0.20	0.067	10%
13	13.60	0.62		0.37	0.315					1.00	0.30	0.62	0.315	0.19	0.059	9%
14	13.90	0.66		0.40	0.317					1.00	0.30	0.66	0.317	0.20	0.063	9%
15	14.20	0.69		0.41	0.295					1.00	0.30	0.69	0.295	0.21	0.061	9%
16	14.50	0.60		0.36	0.243					1.00	0.30	0.60	0.243	0.18	0.044	6%
17	14.80	0.53		0.32	0.230					1.00	0.30	0.53	0.230	0.16	0.037	5%
18	15.10	0.48		0.29	0.221					1.00	0.30	0.48	0.221	0.14	0.032	5%
19	15.40	0.42		0.25	0.189					1.00	0.40	0.42	0.189	0.17	0.032	5%
20	15.90	0.35		0.21	0.205					1.00	0.50	0.35	0.205	0.17	0.036	5%
21	16.40	0.33		0.20	0.069					1.00	0.43	0.33	0.069	0.14	0.010	1%
LB	16.75	0.00	0.00		0.00		0.00		0.00	1.00	0.18	0.00	0.000	0.00	0.000	
Total Flow														0.681	100%	

Flow Measurement Details:

Metering Section Location (describe):
 At station

Meas. Start Time (MST):	11:13
Meas. End Time (MST):	11:36
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, Breezy, 18C



Flow characteristics:

Total Flow:	0.681	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.86	(m ²)
Wetted Width:	7.35	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.24	(m/s)
Reynolds Number:	7.29E+04	
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.596	0.596
Water (°C):	10.8	12.1
Datalogger Clock:	10:33	11:50
Laptop Clock:	10:33	11:50
Battery:	14.1	14.1
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Argonaut Details:

	Before	After
Water Level (m):	-	-
Index Velocity (m/s):	-	-
Discharge (m ³ /s):	-	-

Datalogger / Station Notes:

General Notes:

- Ran ADV test, passed
- Downloaded SL
- Destroyed old BMs 3 and 2

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S36-06	0.953	101.362		100.409	100.409	
S36-05			1.027	100.335	100.334	
S36-07			1.175	100.187	100.256	
S36-04			0.816	100.546		
Water Level:	Cut	0.183	2.342	99.203		Time WL Surveyed: 10:56
Temporary BM				99.020		
Turn						
Temporary BM	2.324	101.344		99.020		
Water Level:	Cut	0.183	2.324	99.203		Time WL Surveyed:
S36-04			0.799	100.545		
S36-07			1.156	100.188	100.256	
S36-05			1.010	100.334	100.334	
S36-06			0.937	100.407	100.409	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S36-04	0.798	101.344		100.546		
Water Level:	Cut	0.184	2.326	99.202		Time WL Surveyed: 11:43
Water Level:	Cut	0.184	2.309	99.204		Time WL Surveyed: 11:45
S36-04	0.783	101.329		100.546		

WL Survey Summary

	Before	After
Average WL:	99.203	99.203
Closing Error:	-0.002	-
WL Check:	0.000	-0.002
Transducer Elevation	98.607	98.607

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

	GG, MK	Trip Date:	14-Jun-15
Data Entry Personnel:	GG	Date:	14-Jun-15
Data Check Personnel:	DW	Date:	30-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet
 UTM Location: 490626 E, 6384064 N

Site Visit Date: August 17, 2015
 Site Visit Time (MST): 11:25



Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)							
RB	1.80	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000								
1	2.10	0.18		0.11	0.082					1.00	0.30	0.18	0.082	0.05	0.004	1%							
2	2.40	0.26		0.16	0.162					1.00	0.30	0.26	0.162	0.08	0.013	3%							
3	2.70	0.30		0.18	0.168					1.00	0.30	0.30	0.168	0.09	0.015	3%							
4	3.00	0.31		0.19	0.155					1.00	0.30	0.31	0.155	0.09	0.014	3%							
5	3.30	0.36		0.22	0.175					1.00	0.30	0.36	0.175	0.11	0.019	4%							
6	3.60	0.38		0.23	0.098					1.00	0.30	0.38	0.098	0.11	0.011	3%							
7	3.90	0.45		0.27	0.011					1.00	0.30	0.45	0.011	0.14	0.001	0%							
8	4.20	0.50		0.30	0.076					1.00	0.30	0.50	0.076	0.15	0.011	3%							
9	4.50	0.57		0.34	0.133					1.00	0.30	0.57	0.133	0.17	0.023	5%							
10	4.80	0.60		0.36	0.261					1.00	0.23	0.60	0.261	0.14	0.035	8%							
11	4.95	0.67		0.40	0.206					1.00	0.15	0.67	0.206	0.10	0.021	5%							
12	5.10	0.67		0.40	0.296					1.00	0.15	0.67	0.296	0.10	0.030	7%							
13	5.25	0.64		0.28	0.282					1.00	0.15	0.64	0.282	0.10	0.027	6%							
14	5.40	0.68		0.41	0.283					1.00	0.15	0.68	0.283	0.10	0.029	7%							
15	5.55	0.68		0.41	0.280					1.00	0.15	0.68	0.280	0.10	0.029	6%							
16	5.70	0.67		0.40	0.272					1.00	0.15	0.67	0.272	0.10	0.027	6%							
17	5.85	0.69		0.41	0.253					1.00	0.15	0.69	0.253	0.10	0.026	6%							
18	6.00	0.67		0.40	0.244					1.00	0.23	0.67	0.244	0.15	0.037	8%							
19	6.30	0.51		0.31	0.082					1.00	0.30	0.51	0.082	0.15	0.013	3%							
20	6.60	0.44		0.28	0.127					1.00	0.30	0.44	0.127	0.13	0.017	4%							
21	6.90	0.39		0.23	0.127					1.00	0.30	0.39	0.127	0.12	0.015	3%							
22	7.20	0.39		0.23	0.014					1.00	0.55	0.39	0.014	0.21	0.003	1%							
23	8.00	0.34		0.20	0.107					1.00	0.60	0.34	0.107	0.20	0.022	5%							
LB	8.40	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000								
Total Flow														0.442	100%								

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	12:20
Meas. End Time (MST):	12:45
Equipment:	ADW#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 25C

Flow characteristics:

Total Flow:	0.442	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.80	(m ²)
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	5.40E+04	
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	0.605	0.606
Water (°C):	11.8	12.8
Datalogger Clock:	11:38	12:50
Laptop Clock:	11:38	12:50
Battery:	13.0	13.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	346254	-
Logger# (if replaced):	18207	-

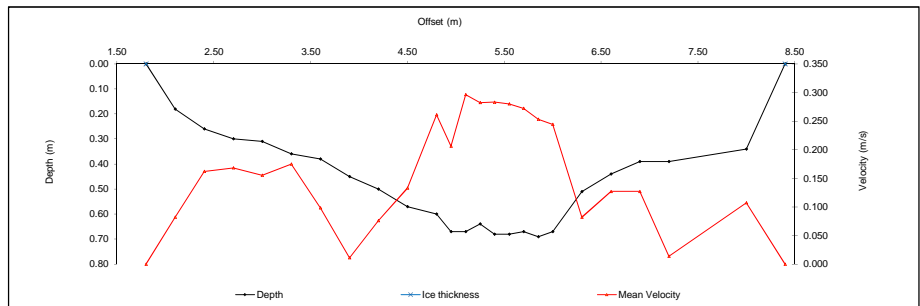
Argonaut Details:

	Before	After
Water Level (m):	99.324	-
Index Velocity (m/s):	7.4	-
Discharge (m ³ /s):	0.177	-

Datalogger / Station Notes:

- SL Removed
 - Weeds on both banks

General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S36-05	0.932	101.266		100.334	100.334	3/4" pipe 6 metres Southwest of logger
S36-06			0.826	100.440	100.409	Lag bolt in tamarack 10m SSW of logger
S36-04			0.617	100.649		
Water Level:	Cut		1.951	99.315		Time WL Surveyed: 12:15
Temporary BM			1.331	99.935	0.000	
Turn						
Temporary BM	1.312	101.247		99.935		
Water Level:	Cut		1.932	99.315		Time WL Surveyed: 12:15
S36-04			0.597	100.650		
S36-06			0.805	100.442	100.409	Lag bolt in tamarack 10m SSW of logger
S36-05			0.911	100.336	100.334	3/4" pipe 6 metres Southwest of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S36-04	0.598	101.248		100.650		
Water Level:	Cut		1.928	99.320		Time WL Surveyed: 12:48
Water Level:	Cut		1.913	99.320		Time WL Surveyed: 12:48
S36-04	0.583	101.233		100.650		

WL Survey Summary	Before	After
Average WL:	99.315	99.320
Closing Error:	-0.002	-
WL Check:	0.000	0.000
Transducer Elevation	98.710	98.714

Level Survey Equipment:	Level #:	Level #:
Level #:	Level #:	Level #:
Make & Model:	ADW#2	Nikon AC-2S
Serial #:	668859	

Field Personnel:	DW, SG	Trip Date:	17-Aug-15
Data Entry Personnel:	DW	Date:	17-Aug-15
Data Check Personnel:	DW	Date:	2-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet
 UTM Location: 490626 E, 6384064 N

Site Visit Date: Sept. 12, 2015
 Site Visit Time (MST): 12:37



Flow Measurement Details:	
Metering Section Location (describe): At station	
Meas. Start Time (MST):	13:25
Meas. End Time (MST):	13:55
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Low, Slow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast

Flow characteristics:	
Total Flow:	0.852 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	4.69 (m ²)
Wetted Width:	5.67 (m)
Hydraulic Depth:	0.93 (m)
Mean Velocity:	0.18 (m/s)
Reynolds Number:	1.27E+05
Froude Number:	0.06

Logger Details:		
	Before	After
Transducer Reading (m):	0.761	0.767
Water (°C):	10.0	10.2
Datalogger Clock:	13:20	14:23
Laptop Clock:	13:19	14:22
Battery (Minn):	12.1	14.1
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Urn Tube Dessiccant:	-	Good
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	
-	Goes antenna replaced

General Notes:	
-	Reconnected solar panel wiring and replaced batteries

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	MP	Transducer Depth (m):	-	0.06	LB:	2.60	
Serial Number:	4712	Safety (gpd):	-	-	RB:	7.60	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes		
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes		
		ADCP Temperature (°C):	-	11.6			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean:	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	5.01	4.53	0.183	0.851	-0.06%
Depth Reference: Vertical beam	4	0.00	4.80	4.41	0.184	0.833	-2.17%
Coordinate System: ENL	6	0.00	5.45	5.18	0.162	0.867	1.82%
Left Method: Sloped bank	8	0.00	5.01	4.64	0.179	0.855	0.41%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
	Mean:	5.07	4.69	0.177	0.852		
	SD:	0.24	0.30	0.009	0.012		
	COV:	0.05	0.06	0.050	0.014		

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S36-05	0.881	101.215		100.334	100.334	3/4" pipe 6 metres Southwest of logger
S36-06			0.989	100.226	100.409	Lag bolt in tamarack 10m SSW of logger
S36-07			1.153	100.062	100.256	bolt in tree across hell pad
Turn						
Water Level:			1.853	99.362		Time WL Surveyed: 13:10
Temporary BM			0.989	100.226	0.000	
Turn						
Temporary BM	0.975	101.201		100.226		
Water Level:			1.840	99.361		Time WL Surveyed: 13:12
S36-07			1.141	100.060	100.256	bolt in tree across hell pad
S36-06			0.975	100.226	100.409	Lag bolt in tamarack 10m SSW of logger
S36-05			0.889	100.332	100.334	3/4" pipe 6 metres Southwest of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S36-05	0.788	101.120		100.332		
Water Level:			1.752	99.358		Time WL Surveyed: 14:19
Water Level:			1.738	99.369		Time WL Surveyed: 14:20
S36-05	0.776	101.108		100.332		

WL Survey Summary		
	Before	After
Average WL:	99.362	99.363
Closing Error:	0.002	-
WL Check:	0.001	-0.001
Transducer Elevation:	98.601	98.602

Level Survey Equipment:	
Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112830

Field Personnel:			
SM, TL	Trip Date:	12-Sep-15	
SM	Date:	12-Sep-15	
DW	Date:	28-Sep-15	
Yes	Entered Digitally in the Field:		

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet
 UTM Location: 490626 E, 6384064 N

Site Visit Date: October 17, 2015
 Site Visit Time (MST): 08:00



Flow Measurement Details:	
Metering Section Location (describe): 5m downstream of hell	
Meas. Start Time (MST):	8:30
Meas. End Time (MST):	8:50
Equipment:	ADCP/H
Method:	Gabwey
River Condition:	Flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 3C

Flow characteristics:	
Total Flow:	0.508 (m ³ /s)
Perceived Measurement Quality:	Good
Cross Section Area:	3.78 (m ²)
Wetted Width:	7.42 (m)
Hydraulic Depth:	0.51 (m)
Mean Velocity:	0.13 (m/s)
Reynolds Number:	4.1E+04
Froude Number:	0.06

Logger Details:		
	Before	After
Transducer Reading (m):	0.784	0.784
Water (°C):	2.8	2.8
Datalogger Clock:	08:00	08:54
Laptop Clock:	08:00	08:54
Battery (Main):	12.8	13.1
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Degrassant:	Replaced	-
Urn Tube Descendant:	Good	-
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	6.00		
Serial Number:	4712	Bainry (ppt):	0.0	RB:	14.10		
Firmware Version:	3.8	Magnetic Declination (°):	14.3				
Software Version:	3.8	Measured Temperature (°C):	-				
				ADCP Temperature (°C):	-		
				Compass Calibration Passed: Yes			
				System Test Passed: Yes			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean:	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	7.46	3.76	0.133	0.5	-1.48%
Depth Reference: Vertical beam	2	0.00	6.23	4.00	0.127	0.508	0.10%
Coordinate System: ENL	3	0.00	7.73	3.85	0.136	0.524	3.25%
Left Method: Sloped bank	5	0.00	6.26	3.53	0.141	0.498	-1.87%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
				Mean:	7.42	3.78	0.134
				SD:	0.72	0.17	0.005
				COV:	0.10	0.05	0.038
						0.020	0.020

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S36-05	0.884	101.218		100.334	100.334	3/4" pipe 6 metres Southwest of logger
S36-06			0.990	100.228	100.409	Lag bolt in tamarack 10m SSW of logger
S36-07			1.155	100.063	100.256	bolt in tree across hell pad
Water Level:	Cut		1.831	99.387	Time WL Surveyed:	8:16
Temporary BM			1.679	99.539	0.000	-
Turn						
Temporary BM	1.643	101.182		99.539		
Water Level:	Cut		1.796	99.386	Time WL Surveyed:	8:16
S36-07			1.121	100.061	100.256	bolt in tree across hell pad
S36-06			0.955	100.227	100.409	Lag bolt in tamarack 10m SSW of logger
S36-05			0.849	100.333	100.334	3/4" pipe 6 metres Southwest of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S36-05	0.849	101.183		100.334		
Water Level:	Cut		1.799	99.384	Time WL Surveyed:	8:51
Water Level:	Cut		1.767	99.355	Time WL Surveyed:	8:52
S36-05	0.818	101.152		100.334		

WL Survey Summary		
Average WL:	Before	After
Closing Error:	0.001	-
WL Check:	0.001	-0.001
Transducer Elevation	98.603	98.601

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:	
Data Entry Personnel:	TR, GG
Data Check Personnel:	TR
Entered Digitally in the Field:	GG

Trip Dates:	
Trip Date:	17-Oct-15
Date:	17-Oct-15
Date:	12-Nov-15

Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet
 UTM Location: 490626 E, 6384064 N

Site Visit Date: December 3, 2015
 Site Visit Time (MST): 08:12

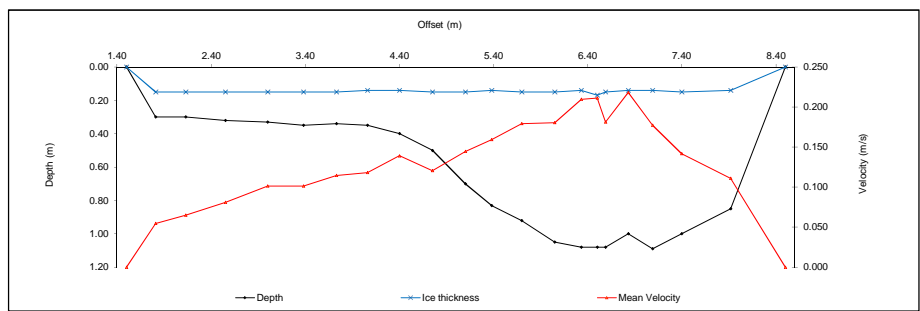


Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.50	0.00	0.00		0.000		0.000		0.000	0.88	0.16	0.00	0.000	0.00	0.000	
1	1.81	0.30	0.15	0.23	0.062					0.88	0.32	0.15	0.055	0.05	0.003	1%
2	2.13	0.30	0.15	0.23	0.074					0.88	0.37	0.15	0.065	0.06	0.004	1%
3	2.55	0.32	0.15	0.24	0.092					0.88	0.44	0.17	0.081	0.07	0.006	1%
4	3.00	0.33	0.15	0.24	0.115					0.88	0.42	0.18	0.101	0.07	0.008	1%
5	3.38	0.35	0.15	0.25	0.115					0.88	0.37	0.20	0.101	0.07	0.007	1%
6	3.73	0.34	0.15	0.25	0.130					0.88	0.34	0.19	0.114	0.06	0.007	1%
7	4.06	0.35	0.14	0.25	0.134					0.88	0.34	0.21	0.118	0.07	0.008	2%
8	4.40	0.40	0.14	0.27	0.158					0.88	0.35	0.26	0.139	0.09	0.012	2%
9	4.75	0.50	0.15	0.33	0.137					0.88	0.35	0.35	0.121	0.12	0.015	3%
10	5.10	0.70	0.15	0.43	0.164					0.88	0.32	0.55	0.144	0.17	0.025	5%
11	5.38	0.83	0.14	0.49	0.181					0.88	0.30	0.69	0.159	0.21	0.033	6%
12	5.70	0.92	0.15			0.77	0.190	0.30	0.168	1.00	0.34	0.77	0.179	0.26	0.046	9%
13	6.05	1.05	0.15			0.87	0.178	0.33	0.183	1.00	0.32	0.90	0.181	0.28	0.051	10%
14	6.33	1.08	0.14			0.89	0.206	0.33	0.213	1.00	0.23	0.94	0.210	0.21	0.044	9%
15	6.50	1.08	0.17			0.90	0.236	0.35	0.186	1.00	0.13	0.91	0.211	0.12	0.025	5%
16	6.59	1.08	0.15			0.89	0.187	0.34	0.175	1.00	0.17	0.93	0.181	0.15	0.028	5%
17	6.83	1.00	0.14			0.83	0.210	0.31	0.226	1.00	0.25	0.86	0.218	0.22	0.047	9%
18	7.09	1.09	0.14			0.90	0.156	0.33	0.198	1.00	0.29	0.95	0.177	0.27	0.048	9%
19	7.40	1.00	0.15			0.83	0.120	0.32	0.163	1.00	0.42	0.85	0.142	0.35	0.050	10%
20	7.92	0.85	0.14	0.50	0.126					0.88	0.55	0.71	0.111	0.39	0.043	8%
LB	8.50	0.00	0.00		0.00		0.00		0.00	0.88	0.29	0.00	0.000	0.00	0.000	
Total Flow														0.51	100%	

Flow Measurement Details:

Metering Section Location (describe):
 10m downstream of helicopter landing area

Meas. Start Time (MST):	8:38
Meas. End Time (MST):	9:12
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, -2C



Flow characteristics:

Total Flow:	0.510	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.31	(m ²)
Wetted Width:	7.00	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.15	(m/s)
Reynolds Number:	4.08E+04	
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	0.797	-
Water (°C):	0.1	-
Datalogger Clock:	09:14	-
Laptop Clock:	08:14	-
Battery:	12.6	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	-
Vant Tube Deseccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

ADV test passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S36-05	1.002	101.336		100.334	100.334	3/4" pipe 6 metres Southwest of logger
S36-06			1.107	100.229	100.409	Lag bolt in tamarack 10m SSW of logger
S36-07			1.276	100.060	100.256	bolt in tree across heli pad
Water Level:	Cut		1.936	99.400		Time WL Surveyed: 8:29
S36-07			1.276	100.060	100.256	bolt in tree across heli pad
Turn						
S36-07	1.250	101.310		100.060	100.256	bolt in tree across heli pad
Water Level:	Cut		1.912	99.398		Time WL Surveyed: 8:33
S36-07			1.250	100.060	100.256	bolt in tree across heli pad
S36-06			1.083	100.227	100.409	Lag bolt in tamarack 10m SSW of logger
S36-05			0.976	100.334	100.334	3/4" pipe 6 metres Southwest of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	99.399	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	98.602	-

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

	GG, JM	Trip Date:	3-Dec-15
Data Entry Personnel:	GG	Date:	3-Dec-15
Data Check Personnel:	JG	Date:	8-Jan-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek
 UTM Location: 487840 E, 6325424 N

Site Visit Date: June 13, 2015
 Site Visit Time (MST): 13:05

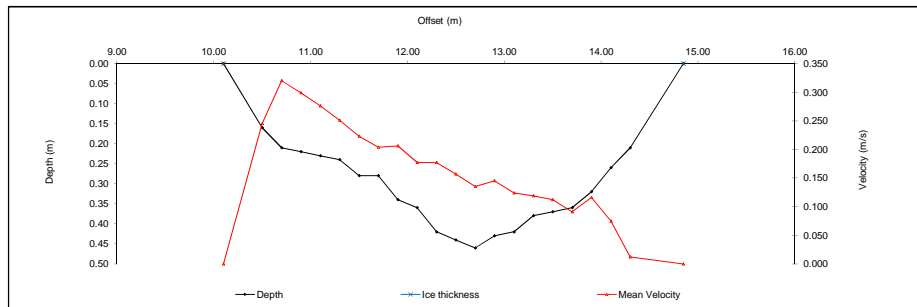


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	10.10	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	10.50	0.16		0.10	0.245					1.00	0.30	0.16	0.245	0.05	0.012	5%
2	10.70	0.21		0.13	0.320					1.00	0.20	0.21	0.320	0.04	0.012	6%
3	10.90	0.22		0.13	0.299					1.00	0.20	0.22	0.299	0.04	0.013	6%
4	11.10	0.23		0.14	0.276					1.00	0.20	0.23	0.276	0.05	0.013	6%
5	11.30	0.24		0.14	0.251					1.00	0.20	0.24	0.251	0.05	0.012	6%
6	11.50	0.28		0.17	0.223					1.00	0.20	0.28	0.223	0.06	0.012	6%
7	11.70	0.28		0.17	0.204					1.00	0.20	0.28	0.204	0.05	0.011	5%
8	11.90	0.34		0.20	0.206					1.00	0.20	0.34	0.206	0.07	0.014	7%
9	12.10	0.36		0.22	0.177					1.00	0.20	0.36	0.177	0.07	0.013	6%
10	12.30	0.42		0.25	0.177					1.00	0.20	0.42	0.177	0.08	0.015	7%
11	12.50	0.44		0.26	0.157					1.00	0.20	0.44	0.157	0.09	0.014	6%
12	12.70	0.46		0.28	0.135					1.00	0.20	0.46	0.135	0.09	0.012	6%
13	12.90	0.43		0.26	0.145					1.00	0.20	0.43	0.145	0.09	0.012	6%
14	13.10	0.42		0.25	0.124					1.00	0.20	0.42	0.124	0.08	0.010	5%
15	13.30	0.38		0.23	0.119					1.00	0.20	0.38	0.119	0.08	0.009	4%
16	13.50	0.37		0.22	0.112					1.00	0.20	0.37	0.112	0.07	0.008	4%
17	13.70	0.36		0.22	0.091					1.00	0.20	0.36	0.091	0.07	0.007	3%
18	13.90	0.32		0.19	0.116					1.00	0.20	0.32	0.116	0.06	0.007	3%
19	14.10	0.26		0.16	0.075					1.00	0.20	0.26	0.075	0.05	0.004	2%
20	14.30	0.21		0.13	0.012					1.00	0.38	0.21	0.012	0.08	0.001	0%
LB	14.85	0.00	0.00		0.000		0.000		0.000	1.00	0.27	0.00	0.000	0.00	0.000	0%
Total Flow														0.214	100%	

Flow Measurement Details:

Metering Section Location (describe): 30m downstream of station

Meas. Start Time (MST):	13:18
Meas. End Time (MST):	13:51
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light breeze, 17 C



Flow characteristics:

Total Flow:	0.214	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.33	(m ²)
Wetted Width:	4.75	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	3.72E+04	
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.714	0.722
Water (°C):	13.1	13.3
Datalogger Clock:	13:08	14:01
Laptop Clock:	13:06	14:00
Battery:	14.3	14.3
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S37-04	1.087	102.159		101.072	101.072	3/4" Pipe 4m SW of logger
S37-03			1.307	100.852	100.845	3/4" Pipe 3m South of logger
S37-05			0.965	101.194	101.178	3/4" Pipe 1.5m from logger
Water Level:	Cut		2.188	99.971		Time WL Surveyed: 13:11
Temporary BM			0.551	101.608	0.000	-
Turn						
Temporary BM	0.489	102.097		101.608		
Water Level:	Cut		2.124	99.973		Time WL Surveyed: 13:14
S37-05			0.904	101.193	101.178	3/4" Pipe 1.5m from logger
S37-03			1.246	100.851	100.845	3/4" Pipe 3m South of logger
S37-04			1.026	101.071	101.072	3/4" Pipe 4m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S37-04	0.992	102.064		101.072		Time WL Surveyed: 13:52
Water Level:	Cut		2.083	99.981		Time WL Surveyed: 13:53
Water Level:	Cut		2.089	99.979		
S37-04	1.006	102.078		101.072		

WL Survey Summary

	Before	After
Average WL:	99.972	99.980
Closing Error:	0.001	-
WL Check:	0.002	0.002
Transducer Elevation	99.258	99.258

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	13-Jun-15
Data Check Personnel:	TR	Date:	13-Jun-15
Entered Digitally in the Field:	CJ	Date:	3-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek
 UTM Location: 487840 E, 6325424 N

Site Visit Date: August 14, 2015
 Site Visit Time (MST): 14:05

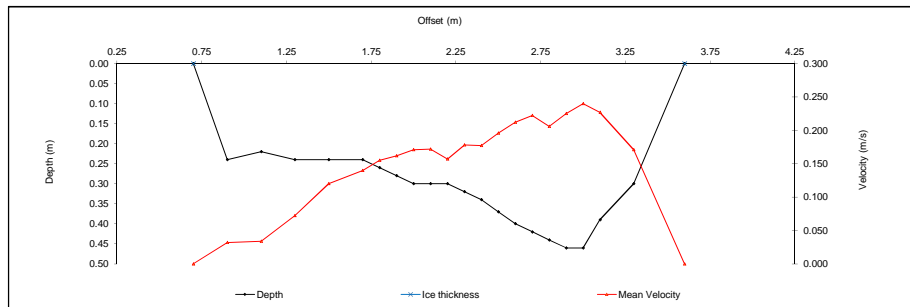


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.70	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	0.90	0.24		0.14	0.032					1.00	0.20	0.24	0.032	0.05	0.002	1%
2	1.10	0.22		0.13	0.034					1.00	0.20	0.22	0.034	0.04	0.001	1%
3	1.30	0.24		0.14	0.072					1.00	0.20	0.24	0.072	0.05	0.003	3%
4	1.50	0.24		0.14	0.120					1.00	0.20	0.24	0.120	0.05	0.006	4%
5	1.70	0.24		0.14	0.140					1.00	0.15	0.24	0.140	0.04	0.005	4%
6	1.80	0.26		0.16	0.155					1.00	0.10	0.26	0.155	0.03	0.004	3%
7	1.90	0.28		0.17	0.162					1.00	0.10	0.28	0.162	0.03	0.005	3%
8	2.00	0.30		0.18	0.171					1.00	0.10	0.30	0.171	0.03	0.005	4%
9	2.10	0.30		0.18	0.172					1.00	0.10	0.30	0.172	0.03	0.005	4%
10	2.20	0.30		0.18	0.157					1.00	0.10	0.30	0.157	0.03	0.005	4%
11	2.30	0.32		0.19	0.178					1.00	0.10	0.32	0.178	0.03	0.006	4%
12	2.40	0.34		0.20	0.177					1.00	0.10	0.34	0.177	0.03	0.006	4%
13	2.50	0.37		0.22	0.196					1.00	0.10	0.37	0.196	0.04	0.007	5%
14	2.60	0.40		0.24	0.212					1.00	0.10	0.40	0.212	0.04	0.008	6%
15	2.70	0.42		0.25	0.222					1.00	0.10	0.42	0.222	0.04	0.009	7%
16	2.80	0.44		0.26	0.206					1.00	0.10	0.44	0.206	0.04	0.009	7%
17	2.90	0.46		0.28	0.225					1.00	0.10	0.46	0.225	0.05	0.010	8%
18	3.00	0.46		0.28	0.240					1.00	0.10	0.46	0.240	0.05	0.011	8%
19	3.10	0.39		0.23	0.227					1.00	0.15	0.39	0.227	0.06	0.013	10%
20	3.30	0.30		0.18	0.171					1.00	0.25	0.30	0.171	0.08	0.013	10%
LB	3.60	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
Total Flow														0.134	100%	

Flow Measurement Details:

Metering Section Location (describe): 30m downstream of station

Meas. Start Time (MST):	14:27
Meas. End Time (MST):	15:05
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 27C



Flow characteristics:

Total Flow:	0.134	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.82	(m ²)
Wetted Width:	2.90	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	4.07E+04	
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.608	0.609
Water (°C):	15.4	15.6
Datalogger Clock:	14:14	15:15
Laptop Clock:	14:12	15:13
Battery:	14.3	4.2
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	298710	-
Logger# (if replaced):	18165	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S37-04	1.194	102.266		101.072	101.072	3/4" Pipe 4m SW of logger
S37-05			1.070	101.196	101.178	3/4" Pipe 1.5m from logger
S37-03			1.416	100.850	100.845	3/4" Pipe 3m South of logger
Water Level:	Cut	0.535	2.936	99.865		Time WL Surveyed: 14:27
Temporary BM			2.981	99.285	0.000	
Turn						
Temporary BM	2.964	102.249		99.285		
Water Level:	Cut	0.530	2.912	99.867		Time WL Surveyed: 14:28
S37-03			1.399	100.850	100.845	3/4" Pipe 3m South of logger
S37-05			1.052	101.197	101.178	3/4" Pipe 1.5m from logger
S37-04			1.174	101.075	101.072	3/4" Pipe 4m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S37-04	1.174	102.248		101.074		Time WL Surveyed: 15:17
Water Level:	Cut	0.540	2.920	99.868		Time WL Surveyed: 15:18
Water Level:	Cut	0.560	2.901	99.866		
S37-04	1.153	102.227		101.074		

WL Survey Summary

	Before	After
Average WL:	99.866	99.867
Closing Error:	-0.003	-
WL Check:	0.002	0.002
Transducer Elevation	99.258	99.258

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	DW, JC	Trip Date:	14-Aug-15
Data Check Personnel:	CJ	Date:	14-Aug-15
Entered Digitally in the Field:	Yes	Date:	3-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek
 UTM Location: 487840 E, 6325424 N

Site Visit Date: September 14, 2015
 Site Visit Time (MST): 14:45

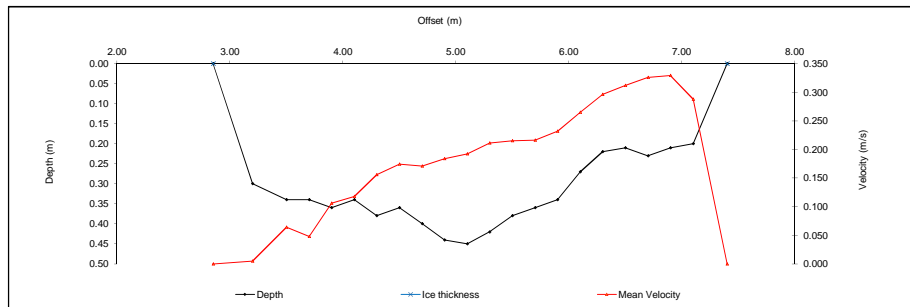


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	7.40	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	7.10	0.20		0.12	0.29					1.00	0.25	0.20	0.288	0.05	0.014	6%
2	6.90	0.21		0.13	0.33					1.00	0.20	0.21	0.329	0.04	0.014	6%
3	6.70	0.23		0.14	0.33					1.00	0.20	0.23	0.326	0.05	0.015	6%
4	6.50	0.21		0.13	0.31					1.00	0.20	0.21	0.312	0.04	0.013	5%
5	6.30	0.22		0.13	0.30					1.00	0.20	0.22	0.296	0.04	0.013	5%
6	6.10	0.27		0.16	0.27					1.00	0.20	0.27	0.265	0.05	0.014	6%
7	5.90	0.34		0.20	0.23					1.00	0.20	0.34	0.232	0.07	0.016	6%
8	5.70	0.36		0.22	0.22					1.00	0.20	0.36	0.216	0.07	0.016	6%
9	5.50	0.38		0.23	0.22					1.00	0.20	0.38	0.215	0.08	0.016	7%
10	5.30	0.42		0.25	0.21					1.00	0.20	0.42	0.211	0.08	0.018	7%
11	5.10	0.45		0.27	0.19					1.00	0.20	0.45	0.192	0.09	0.017	7%
12	4.90	0.44		0.26	0.18					1.00	0.20	0.44	0.194	0.09	0.016	7%
13	4.70	0.40		0.24	0.17					1.00	0.20	0.40	0.171	0.08	0.014	6%
14	4.50	0.36		0.22	0.17					1.00	0.20	0.36	0.174	0.07	0.013	5%
15	4.30	0.38		0.23	0.16					1.00	0.20	0.38	0.156	0.08	0.012	5%
16	4.10	0.34		0.20	0.118					1.00	0.20	0.34	0.118	0.07	0.008	3%
17	3.90	0.36		0.22	0.106					1.00	0.20	0.36	0.106	0.07	0.008	3%
18	3.70	0.34		0.20	0.048					1.00	0.20	0.34	0.048	0.07	0.003	1%
19	3.50	0.34		0.20	0.064					1.00	0.25	0.34	0.064	0.09	0.005	2%
20	3.20	0.30		0.18	0.095					1.00	0.33	0.30	0.095	0.10	0.000	
LB	2.65	0.00	0.00		0.000				0.000	1.00	0.18	0.00	0.000	0.00	0.000	
Total Flow														0.245	100%	

Flow Measurement Details:

Metering Section Location (describe):
30m downstream of station

Meas. Start Time (MST):	15:13
Meas. End Time (MST):	15:55
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 8C



Flow characteristics:

Totall Flow:	0.245	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.37	(m ²)
Wetted Width:	4.55	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.18	(m/s)
Reynolds Number:	3.95E+04	
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.788	0.789
Water (°C):	9.0	9.0
Datalogger Clock:	14:47	15:49
Laptop Clock:	14:47	15:49
Battery:	14.2	14.5
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S37-04	1.306	102.378		101.072	101.072	3/4" Pipe 4m SW of logger
S37-03			1.529	100.849	100.845	3/4" Pipe 3m South of logger
S37-05			1.184	101.194	101.178	3/4" Pipe 1.5m from logger
Water Level:	Cut	2.340		100.038		Time WL Surveyed: 14:50
Temporary BM			3.002	99.376	0.000	-
Turn						
Temporary BM	2.888	102.264		99.376		
Water Level:	Cut	2.225		100.039		Time WL Surveyed: 14:51
S37-05			1.071	101.193	101.178	3/4" Pipe 1.5m from logger
S37-03			1.416	100.848	100.845	3/4" Pipe 3m South of logger
S37-04			1.193	101.071	101.072	3/4" Pipe 4m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S37-04	1.193	102.265		101.072		Time WL Surveyed: 15:44
Water Level:	Cut	2.226		100.039		Time WL Surveyed: 15:47
Water Level:	Cut	2.290		100.037		
S37-04	1.255	102.327		101.072		

WL Survey Summary

	Before	After
Average WL:	100.039	100.038
Closing Error:	0.001	0.002
WL Check:	0.001	0.002
Transducer Elevation	99.251	99.249

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	CJ, TL	Trip Date:	14-Sep-15
Data Check Personnel:	CJ	Date:	14-Sep-15
Entered Digitally in the Field:	Yes	Date:	8-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek
 UTM Location: 487840 E, 6325424 N

Site Visit Date: October 28, 2015
 Site Visit Time (MST): 11:11

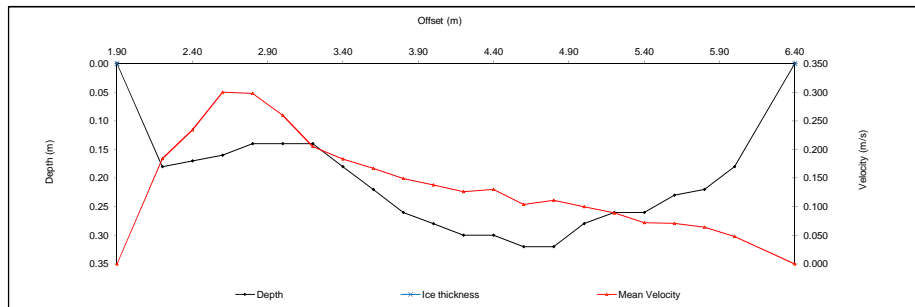


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.90	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.20	0.18		0.11	0.184					1.00	0.25	0.18	0.184	0.05	0.008	6%
2	2.40	0.17		0.10	0.234					1.00	0.20	0.17	0.234	0.03	0.008	6%
3	2.60	0.16		0.10	0.300					1.00	0.20	0.16	0.300	0.03	0.010	8%
4	2.80	0.14		0.08	0.298					1.00	0.20	0.14	0.298	0.03	0.008	7%
5	3.00	0.14		0.08	0.260					1.00	0.20	0.14	0.260	0.03	0.007	6%
6	3.20	0.14		0.08	0.205					1.00	0.20	0.14	0.205	0.03	0.006	4%
7	3.40	0.18		0.11	0.183					1.00	0.20	0.18	0.183	0.04	0.007	5%
8	3.60	0.22		0.13	0.167					1.00	0.20	0.22	0.167	0.04	0.007	6%
9	3.80	0.26		0.16	0.149					1.00	0.20	0.26	0.149	0.05	0.008	6%
10	4.00	0.28		0.17	0.138					1.00	0.20	0.28	0.138	0.06	0.008	6%
11	4.20	0.30		0.18	0.126					1.00	0.20	0.30	0.126	0.06	0.008	6%
12	4.40	0.30		0.18	0.130					1.00	0.20	0.30	0.130	0.06	0.008	6%
13	4.60	0.32		0.19	0.104					1.00	0.20	0.32	0.104	0.06	0.007	4%
14	4.80	0.32		0.19	0.111					1.00	0.20	0.32	0.111	0.06	0.007	6%
15	5.00	0.28		0.17	0.100					1.00	0.20	0.28	0.100	0.06	0.006	4%
16	5.20	0.26		0.16	0.089					1.00	0.20	0.26	0.089	0.05	0.005	4%
17	5.40	0.26		0.16	0.072					1.00	0.20	0.26	0.072	0.05	0.004	3%
18	5.60	0.23		0.14	0.071					1.00	0.20	0.23	0.071	0.05	0.003	3%
19	5.80	0.22		0.13	0.064					1.00	0.20	0.22	0.064	0.04	0.003	2%
20	6.00	0.18		0.11	0.048					1.00	0.20	0.18	0.048	0.05	0.003	2%
LB	6.40	0.00	0.00		0.00				0.00	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.128	100%	

Flow Measurement Details:

Metering Section Location (describe):
At helicopter landing pad

Meas. Start Time (MST):	11:29
Meas. End Time (MST):	11:51
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, OC



Flow characteristics:

Total Flow:	0.128	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.93	(m ²)
Wetted Width:	4.50	(m)
Hydraulic Depth:	0.21	(m)
Mean Velocity:	0.14	(m/s)
Reynolds Number:	1.72E+04	
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.619	0.619
Water (°C):	2.6	2.6
Datalogger Clock:	11:15	11:56
Laptop Clock:	11:13	11:54
Battery:	13.8	14.1
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-ADV tests passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S37-04	1.259	102.331		101.072	101.072	3/4" Pipe 4m SW of logger
S37-05			1.137	101.194	101.194	3/4" Pipe 1.5m from logger
S37-03			1.483	100.848	100.850	3/4" Pipe 3m South of logger
Water Level:	Cut	1.567	4.015	99.883		Time WL Surveyed: 11:17
Temporary BM			4.015	98.316	0.000	-
Turn						
Temporary BM	3.988	102.304		98.316		
Water Level:	Cut	1.567	3.988	99.883		Time WL Surveyed: 11:19
S37-03			1.456	100.848	100.850	3/4" Pipe 3m South of logger
S37-05			1.110	101.194	101.194	3/4" Pipe 1.5m from logger
S37-04			1.233	101.071	101.072	3/4" Pipe 4m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S37-04	1.233	102.305		101.072		Time WL Surveyed: 11:56
Water Level:	Cut	1.569	4.026	99.876		Time WL Surveyed: 11:58
Water Level:	Cut	1.569	4.009	99.880		
S37-04	1.218	102.290		101.072		

WL Survey Summary

	Before	After
Average WL:	99.883	99.879
Closing Error:	-0.001	-
WL Check:	0.000	-0.002
Transducer Elevation	99.264	99.260

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	28-Oct-15
Data Check Personnel:	JC	Date:	28-Oct-15
Entered Digitally in the Field:	Yes	Date:	16-Nov-15

Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge
 UTM Location: 445023 E, 6314256 N

Site Visit Date: February 12, 2015
 Site Visit Time (MST): 15:00

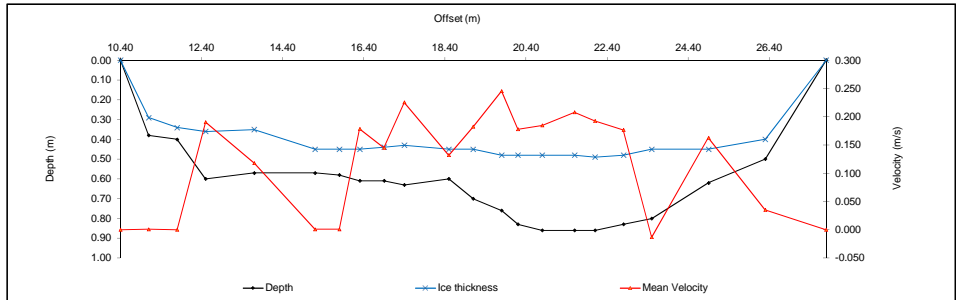


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	10.40	0.00	0.00		0.000		0.000		0.000	0.88	0.35	0.00	0.000	0.00	0.000	
1	11.10	0.38	0.29	0.34	0.001					0.88	0.70	0.09	0.001	0.06	0.000	0%
2	11.80	0.40	0.34	0.37	0.000					0.88	0.70	0.06	0.000	0.04	0.000	0%
3	12.50	0.60	0.36	0.48	0.216					0.88	0.95	0.24	0.190	0.23	0.043	9%
4	13.70	0.57	0.35	0.46	0.134					0.88	1.35	0.22	0.118	0.30	0.035	7%
5	15.20	0.57	0.45	0.51	0.001					0.88	1.05	0.12	0.001	0.13	0.000	0%
6	15.80	0.58	0.45	0.52	0.001					0.88	0.55	0.13	0.001	0.07	0.000	0%
7	16.30	0.61	0.45	0.53	0.203					0.88	0.55	0.16	0.179	0.09	0.016	3%
8	16.90	0.61	0.44	0.53	0.165					0.88	0.55	0.17	0.145	0.09	0.014	3%
9	17.40	0.63	0.43	0.53	0.256					0.88	0.80	0.20	0.225	0.16	0.036	7%
10	18.50	0.60	0.45	0.53	0.150					0.88	0.85	0.15	0.132	0.13	0.017	3%
11	19.10	0.70	0.45	0.58	0.207					0.88	0.65	0.25	0.182	0.16	0.030	6%
12	19.80	0.76	0.48	0.62	0.279					0.88	0.55	0.28	0.246	0.15	0.038	8%
13	20.20	0.83	0.48	0.66	0.202					0.88	0.50	0.35	0.178	0.18	0.031	6%
14	20.80	0.86	0.48	0.67	0.210					0.88	0.70	0.38	0.185	0.27	0.049	10%
15	21.60	0.86	0.48	0.67	0.236					0.88	0.65	0.38	0.208	0.25	0.051	11%
16	22.10	0.86	0.49	0.68	0.219					0.88	0.60	0.37	0.193	0.22	0.043	9%
17	22.80	0.83	0.48	0.66	0.201					0.88	0.70	0.35	0.177	0.24	0.043	9%
18	23.50	0.80	0.45	0.63	-0.015					0.88	1.05	0.35	-0.013	0.37	-0.005	-1%
19	24.90	0.62	0.45	0.54	0.185					0.88	1.40	0.17	0.163	0.24	0.039	8%
20	26.30	0.50	0.40	0.45	0.040					0.88	1.45	0.10	0.035	0.15	0.005	1%
LB	27.80	0.00	0.00		0.00		0.00		0.00	0.88	0.75	0.00	0.000	0.00	0.000	
Total Flow														0.485	100%	

Flow Measurement Details:

Metering Section Location (describe): 10m downstream of station

Meas. Start Time (MST):	16:00
Meas. End Time (MST):	17:00
Equipment:	ADV
Method:	Ice
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -10C



Flow characteristics:

Total Flow:	0.485	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.52	(m ²)
Wetted Width:	17.40	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.557	-
Water (°C):	0.4	-
Rainfall (mm):	-	-
Datalogger Clock:	15:20	-
Laptop Clock:	15:19	-
Battery (Main):	14.9	13.3
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S40-05	1.271	101.406		100.135	100.135	Pipe 4m NE of Logger
S40-07			1.163	100.243	100.227	Pipe 4m SE of logger
S40-06			1.333	100.073	100.067	Pipe 4m S of Logger
Water Level:	Cut	5.008		96.398	Time WL Surveyed:	13:32
S40-06			1.333	100.073	100.067	Pipe 4m S of Logger
Turn						
S40-06	1.315	101.388		100.073	100.067	Pipe 4m S of Logger
Water Level:	Cut		4.990	96.398	Time WL Surveyed:	15:35
S40-06			1.315	100.073	100.067	Pipe 4m S of Logger
S40-07			1.145	100.243	100.227	Pipe 4m SE of logger
S40-05			1.253	100.135	100.135	Pipe 4m NE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	96.398	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	95.811	-

Field Personnel:

Data Entry Personnel:	MP, GG	Trip Date:	12-Feb-15
Data Check Personnel:	MP	Date:	12-Feb-15
Entered Digitally in the Field:	CJ	Date:	11-Jun-15

Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge
 UTM Location: 445023 E, 6314256 N

Site Visit Date: March 4, 2015
 Site Visit Time (MST): 13:30

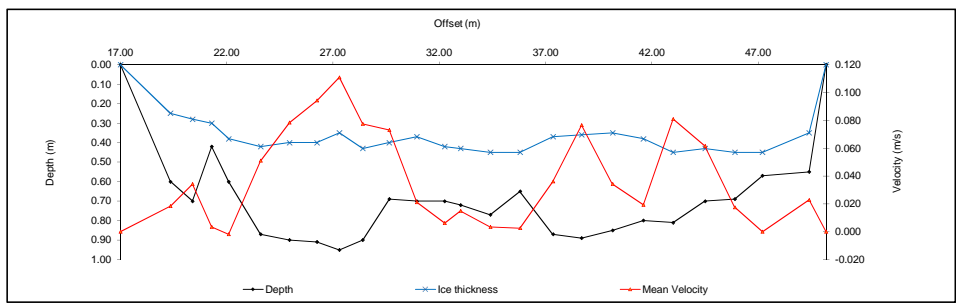


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	50.20	0.00	0.00		0.000				0.000	0.88	0.40	0.00	0.000	0.00	0.000	
1	49.40	0.55	0.35	0.45	0.026					0.88	1.50	0.20	0.023	0.30	0.007	1%
2	47.20	0.57	0.45	0.51	0.000					0.88	1.75	0.12	0.000	0.21	0.000	0%
3	45.90	0.69	0.45	0.57	0.020					0.88	1.35	0.24	0.018	0.32	0.006	1%
4	44.50	0.70	0.43	0.57	0.070					0.88	1.45	0.27	0.062	0.39	0.024	5%
5	43.00	0.81	0.45	0.63	0.092					0.88	1.45	0.36	0.081	0.52	0.042	8%
6	41.60	0.80	0.38	0.59	0.022					0.88	1.43	0.42	0.019	0.60	0.012	2%
7	40.15	0.85	0.35	0.60	0.039					0.88	1.45	0.50	0.034	0.73	0.025	5%
8	38.70	0.89	0.36	0.63	0.087					0.88	1.40	0.53	0.077	0.74	0.057	11%
9	37.35	0.87	0.37	0.62	0.041					0.88	1.45	0.50	0.036	0.73	0.026	5%
10	36.80	0.85	0.45	0.55	0.003					0.88	1.48	0.20	0.003	0.30	0.001	0%
11	34.40	0.77	0.45	0.61	0.004					0.88	1.40	0.32	0.004	0.45	0.002	0%
12	33.00	0.72	0.43	0.58	0.017					0.88	1.08	0.29	0.015	0.31	0.005	1%
13	32.25	0.70	0.42	0.56	0.007					0.88	1.03	0.28	0.006	0.29	0.002	0%
14	30.95	0.70	0.37	0.54	0.024					0.88	1.30	0.33	0.021	0.43	0.009	2%
15	29.65	0.69	0.40	0.55	0.083					0.88	1.28	0.29	0.073	0.37	0.027	5%
16	28.40	0.90	0.43	0.67	0.088					0.88	1.18	0.47	0.077	0.55	0.043	8%
17	27.30	0.95	0.35	0.65	0.126					0.88	1.08	0.60	0.111	0.65	0.072	14%
18	26.25	0.91	0.40	0.66	0.107					0.88	1.18	0.51	0.094	0.60	0.056	11%
19	24.95	0.90	0.40	0.65	0.089					0.88	1.33	0.50	0.078	0.66	0.052	10%
20	23.60	0.87	0.42	0.65	0.058					0.88	1.43	0.45	0.051	0.64	0.033	6%
21	22.10	0.60	0.38	0.49	-0.002					0.88	1.15	0.22	-0.002	0.25	0.000	0%
22	21.30	0.42	0.30	0.36	0.004					0.88	0.85	0.10	0.004	0.10	0.000	0%
23	20.40	0.70	0.28	0.49	0.039					0.88	0.98	0.42	0.034	0.41	0.014	3%
24	19.35	0.60	0.25	0.43	0.021					0.88	1.70	0.35	0.018	0.60	0.011	2%
LB	17.00	0.00	0.00		0.00				0.00	0.88	1.18	0.00	0.000	0.00	0.000	
Total Flow														0.524	100%	

Flow Measurement Details:

Metering Section Location (describe):
7m downstream of station

Meas. Start Time (MST):	13:50
Meas. End Time (MST):	14:25
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -8C



Flow characteristics:

Total Flow:	0.524	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.14	(m ²)
Wetted Width:	33.20	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.531	
Water (°C):	0.4	
Rainfall (mm):	0.00	
Datalogger Clock:	13:39	
Laplace Clock:	13:39	
Battery (Main):	14.7	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S40-05	1.287	101.422		100.135	100.135	Pipe 4m NE of Logger
S40-07			1.184	100.238	100.232	Pipe 4m SE of logger
S40-06			1.352	100.070	100.067	Pipe 4m S of Logger
Turn						
Water Level:	Cut		5.095	96.327		Time WL Surveyed: 14:29
Temporary BM			4.963	96.459	0.000	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.326	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	95.795	-

Field Personnel:

	MP, TR	Trip Date:	4-Mar-15
Data Entry Personnel:	MP	Date:	4-Mar-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge
 UTM Location: 445023 E, 6314256 N

Site Visit Date: April 24, 2015
 Site Visit Time (MST): 09:35



Flow Measurement Details:	
Metering Section Location (describe): 50m downstream of station	
Meas. Start Time (MST):	10:45
Meas. End Time (MST):	11:05
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Open, moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 5C

Flow characteristics:	
Total Flow:	26.9 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	36.58 (m ²)
Wattled Width:	35.15 (m)
Hydraulic Depth:	1.04 (m)
Mean Velocity:	0.74 (m/s)
Froude Number:	0.23

Logger Details:		
	Before	After
Transducer Reading (m):	1.093	1.092
Water (°C):	3.6	3.5
Datalogger Clock:	09:41	11:24
Laptop Clock:	09:41	11:24
Battery (Main):	14.6	14.3
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Replaced	-
PTN (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 -Tipping bucket is missing from station

General Notes:

ADCP Flow Measurement Summary:					
System Information:		System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	17.00
Serial Number:	4712	Salinity (ppt):	-	RB:	52.00
Firmware Version:	3.8	Magnetic Declination (°):	14.33		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	-		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass (ft):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	35.24	37.11	0.732
Coordinate System:	ENR	2	36.00	37.17	0.746
Left Method:	Sloped bank	3	35.56	36.86	0.734
Right Method:	Sloped bank	4	33.80	35.20	0.73
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	35.15	36.58	0.736
		SD:	0.63	0.61	0.006
		COV:	0.02	0.02	0.008
					26.9
					0.757
					0.028

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S40-06	1.204	101.271		100.067	100.067	Pipe 4m S of Logger
S40-05			1.148	100.123	100.135	Pipe 4m NE of Logger
S40-07			1.037	100.234	100.227	Pipe 4m SE of Logger
Water Level:	Cut	0.852	5.237	95.886		Time WL Surveyed: 10:11
Temporary BM			5.237	95.034	0.000	
Turn						
Temporary BM	5.212	101.246		95.034		
Water Level:	Cut	0.852	5.212	95.886		Time WL Surveyed: 10:13
S40-07			1.013	100.233	100.227	Pipe 4m SE of logger
S40-05			1.124	100.122	100.135	Pipe 4m NE of Logger
S40-06			1.178	100.068	100.067	Pipe 4m S of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S40-06	1.178	101.246		100.068		
Water Level:	Cut	0.772	5.132	95.886		Time WL Surveyed: 11:20
Water Level:	Cut	0.772	5.112	95.855		Time WL Surveyed: 11:21
S40-06	1.157	101.225		100.068		

WL Survey Summary		
	Before	After
Average WL:	95.886	95.886
Closing Error:	-0.001	-
WL Check:	0.000	0.001
Transducer Elevation	95.793	95.794

Field Personnel:		SM, GG	Trip Date:	24-Apr-15
Data Entry Personnel:	SM		Date:	24-Apr-15
Data Check Personnel:	SG		Date:	12-May-15
Entered Digitally in the Field:	Yes			

Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge
 UTM Location: 445023 E, 6314256 N

Site Visit Date: May 7, 2015
 Site Visit Time (MST): 13:10



Flow Measurement Details:	
Metering Section Location (describe): 20m downstream of station	
Meas. Start Time (MST):	13:43
Meas. End Time (MST):	14:10
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 7C

Flow characteristics:	
Total Flow:	22.2 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	- (m ²)
Wattled Width:	35.60 (m)
Hydraulic Depth:	- (m)
Mean Velocity:	- (m/s)
Froude Number:	-

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	14.7	14.7
Datalogger Clock:	13:12	14:29
Laptop Clock:	13:12	14:29
Battery (Main):	14.2	14.1
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Good
Vent Tube Desiccant:	-	Good
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 - TBRG: 0.0 mm, not tested

General Notes:

ADCP Flow Measurement Summary:					
System Information:			System Setup:		Bank Offsets:
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	44.70
Serial Number:	4712	Salinity (ppt):	-	RB:	80.30
Firmware Version:	3.8	Magnetic Declination (°):	14.3		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	9.0		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass (ft):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	35.60	-	22.025
Coordinate System:	ENR	2	35.60	-	21.794
Left Method:	Sloped bank	3	35.60	-	22.046
Right Method:	Sloped bank	4	35.6	-	22.538
Top Fit Type:	Power fit	5	35.6	-	22.353
Bottom Fit Type:	Power fit				
		Mean:	35.60		22.2
		SD:	0.00		0.263
		COV:	0.00		0.012

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S40-06	1.130	101.197		100.067	100.067	Pipe 4m S of Logger
S40-07			0.965	100.232	100.227	Pipe 4m SE of Logger
S40-05			1.077	100.120	100.121	Pipe 4m NE of Logger
Water Level:	Cut		4.402	96.795	Time Wl. Surveyed:	13:22
Temporary BM			4.301	96.896		
Turn						
Temporary BM	4.290	101.186		96.896		
Water Level:	Cut		4.387	96.799	Time Wl. Surveyed:	13:24
S40-05			1.065	100.121	100.121	Pipe 4m NE of Logger
S40-07			0.953	100.233	100.227	Pipe 4m SE of Logger
S40-06			1.119	100.067	100.067	Pipe 4m S of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S40-05	1.065	101.186		100.121		
Water Level:	Cut		4.384	96.802	Time Wl. Surveyed:	14:24
Water Level:	Cut		4.375	96.802	Time Wl. Surveyed:	14:27
S40-05	1.056	101.177		100.121		

WL Survey Summary		
Average WL:	Before	After
	95.797	96.802
Closing Error:	0.000	-
WL Check:	0.004	0.000
Transducer Elevation	95.791	95.789

Field Personnel:			
Data Entry Personnel:	SM, CJ	Trip Date:	7-May-15
Data Check Personnel:	CJ	Date:	7-May-15
Entered Digitally in the Field:	DW	Date:	3-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge
 UTM Location: 445023 E, 6314256 N

Site Visit Date: June 18, 2015
 Site Visit Time (MST): 12:41



Flow Measurement Details:	
Metering Section Location (describe): 50m downstream of station	
Meas. Start Time (MST):	13:15
Meas. End Time (MST):	13:28
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Low level, calm
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy

Flow characteristics:	
Total Flow:	4.62 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	16.35 (m ²)
Wetted Width:	31.39 (m)
Hydraulic Depth:	0.52 (m)
Mean Velocity:	0.28 (m/s)
Reynolds Number:	1.25E+05
Froude Number:	0.13

Logger Details:		Before	After
Transducer Reading (m):		0.825	0.825
Water (°C):		14.3	14.3
TBRG Tested?:	Yes		
Datalogger Clock:		12:44	13:47
Laptop Clock:		12:43	13:46
Battery (Main):		13.3	13.4
Battery:	Good		
Battery Serial #:	-	-	-
Enclosure Dissasint:	Replaced		
Vent Tube Dissasint:	Good		
PT# (if replaced):	-	-	-
Logger# (if replaced):	-	-	-

Datalogger / Station Notes:	

General Notes:	
- TBRG tested 2 tips	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	LB:	35.10		
Serial Number:	4712	Bainry (ppt):	-	RB:	3.90		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	-	System Test Passed: Yes			
		ADCP Temperature (°C):	17.8				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	30.33	15.97	0.288	4.599	-0.52%
Depth Reference: Vertical beam	2	0.00	31.93	16.53	0.282	4.696	0.71%
Coordinate System: FNE	3	0.00	31.29	16.34	0.280	4.581	-0.91%
Left Method: Sloped bank	4	0.00	31.99	16.55	0.281	4.657	0.73%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
Mean:		31.39	16.35	0.283	4.62		
SD:		0.67	0.23	0.003	0.034		
COV:		0.02	0.01	0.011	0.007		

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S40-06	1.268	101.335		100.067	100.067	Pipe 4m S of Logger
S40-07			1.104	100.231	100.232	Pipe 4m SE of logger
S40-05			1.215	100.120	100.121	Pipe 4m NE of Logger
Turn						
Water Level:	Cut	0.172	5.106	96.401	Time WL Surveyed: 12:51	
Temporary BM			5.106	96.229	0.000	
Turn						
Temporary BM	5.088	101.317		96.229		
Water Level:	Cut	0.172	5.088	96.401	Time WL Surveyed: 12:53	
S40-05			1.196	100.121	100.121	Pipe 4m NE of Logger
S40-07			1.084	100.233	100.232	Pipe 4m SE of logger
S40-06			1.248	100.069	100.067	Pipe 4m S of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S40-06	1.250	101.318		100.068		
Water Level:	Cut	0.178	5.089	96.407	Time WL Surveyed: 13:43	
Water Level:	Cut	0.178	5.076	96.403	Time WL Surveyed: 13:44	
S40-06	1.233	101.301		100.066		

WL Survey Summary		Before	After	Level Survey Equipment:	
Average WL:		96.401	96.405	Level #:	Level#4
Closing Error:	-0.002	-	-	Make & Model:	Nikon AC-2S
WL Check:	0.000	0.004		Serial #:	668785
Transducer Elevation:		95.776	95.780		

Field Personnel:		GG, MK	Trip Date:	18-Jun-15
Data Entry Personnel:	DG	Date:	18-Jun-15	
Data Check Personnel:	DW	Date:	3-Sep-15	
Entered Digitally in the Field:	Yes			

Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge
 UTM Location: 445023 E, 6314256 N

Site Visit Date: August 15, 2015
 Site Visit Time (MST): 13:46



Flow Measurement Details:	
Metering Section Location (describe): 50m downstream of station	
Meas. Start Time (MST):	15:00
Meas. End Time (MST):	15:33
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Open
Channel/Edor:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 19C

Flow characteristics:	
Total Flow:	6.73 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	21.74 (m ²)
Wetted Width:	33.30 (m)
Hydraulic Depth:	0.65 (m)
Mean Velocity:	0.31 (m/s)
Reynolds Number:	1.88 E+05
Froude Number:	0.12

Logger Details:		Before	After
Transducer Reading (m):		0.801	0.873
Water (°C):		17.3	17.7
TBRG Tested?:		No	
Datalogger Clock:		13:49	15:57
Laptop Clock:		13:48	15:57
Battery (Main):		13.7	13.9
Battery:		Good	
Battery Serial #:		-	-
Enclosure Dissasint:		Replaced	
Vent Tube Dissasint:		Good	
PT# (if replaced):		333043	250998
Logger# (if replaced):		-	-

Datalogger / Station Notes:
 -Replaced pressure transducer for calibration.

General Notes:

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	52.50	
Serial Number:	4712	Bainry (ppt):	-	-	RB:	19.50	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.33	Compass Calibration Passed: Yes		
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes		
		ADCP Temperature (°C):	-	17.7			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	33.33	21.44	0.306	6.554	-2.67%
Depth Reference: Vertical beam	2	0.00	33.21	21.36	0.309	6.786	69.9
Coordinate System: FNE	3	0.00	33.19	21.68	0.312	6.82	70.9
Left Method: Sloped bank	4	0.00	33.05	21.67	0.312	6.774	69.8
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
Mean:				33.20	21.74	0.310	6.73
SD:				0.10	0.21	0.002	0.105
COV:				0.00	0.01	0.008	0.016

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S40-06	1.220	101.287		100.067	100.067	Pipe 4m S of Logger
S40-07			1.054	100.233	100.232	Pipe 4m SE of logger
S40-05			1.167	100.120	100.121	Pipe 4m NE of Logger
Water Level:						
Cut		0.377	5.182	96.482	Time WL Surveyed:	14:30
S40-05			1.167	100.120	100.121	Pipe 4m NE of Logger
Turn						
S40-05	1.138	101.258		100.120	100.121	Pipe 4m NE of Logger
Water Level:						
Cut		0.368	5.148	96.476	Time WL Surveyed:	14:35
S40-05			1.138	100.120	100.121	Pipe 4m NE of Logger
S40-07			1.027	100.231	100.232	Pipe 4m SE of logger
S40-06			1.192	100.066	100.067	Pipe 4m S of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S40-06	1.219	101.285		100.066		
Water Level:						
Cut		0.218	5.029	96.476	Time WL Surveyed:	15:43
Water Level:		0.218	5.048	96.480	Time WL Surveyed:	15:45
S40-06	1.244	101.310		100.066		

WL Survey Summary		
	Before	After
Average WL:	96.480	96.479
Closing Error:	0.001	-
WL Check:	0.004	-0.002
Transducer Elevation	95.879	95.806

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	EC8859

Field Personnel:			
	GG, DW	Trip Date:	15-Aug-15
Data Entry Personnel:	GG	Date:	15-Aug-15
Data Check Personnel:	DW	Date:	3-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge
 UTM Location: 445023 E, 6314256 N

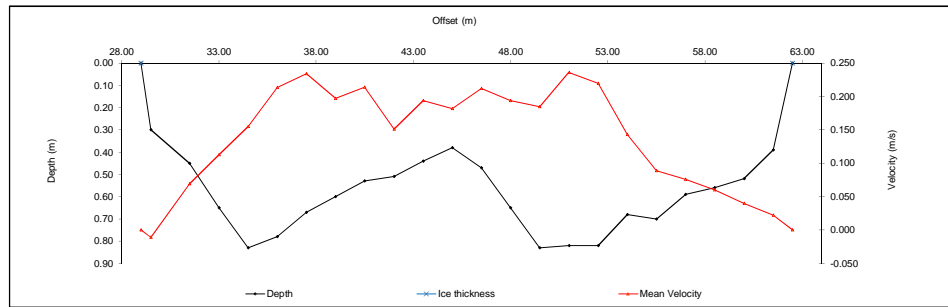
Site Visit Date: September 17, 2015
 Site Visit Time (MST): 10:04



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	29.00	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	29.50	0.30		0.18	-0.011					1.00	1.25	0.30	-0.011	0.38	-0.004	0%
2	31.50	0.45		0.27	0.069					1.00	1.75	0.45	0.069	0.79	0.054	2%
3	33.00	0.65		0.39	0.113					1.00	1.50	0.65	0.113	0.98	0.110	4%
4	34.50	0.83				0.66	0.104	0.17	0.206	1.00	1.50	0.83	0.155	1.25	0.193	6%
5	35.00	0.78				0.62	0.176	0.16	0.251	1.00	1.50	0.78	0.214	1.17	0.250	8%
6	37.50	0.67		0.40	0.234					1.00	1.50	0.67	0.234	1.01	0.235	8%
7	39.00	0.60		0.36	0.197					1.00	1.50	0.60	0.197	0.90	0.177	6%
8	40.50	0.53		0.32	0.214					1.00	1.50	0.53	0.214	0.80	0.170	6%
9	42.00	0.51		0.31	0.151					1.00	1.50	0.51	0.151	0.77	0.116	4%
10	43.50	0.44		0.26	0.194					1.00	1.50	0.44	0.194	0.66	0.128	4%
11	45.00	0.38		0.23	0.182					1.00	1.50	0.38	0.182	0.57	0.104	3%
12	46.50	0.47		0.28	0.212					1.00	1.50	0.47	0.212	0.71	0.149	5%
13	48.00	0.65		0.39	0.194					1.00	1.50	0.65	0.194	0.98	0.189	6%
14	49.50	0.83				0.66	0.155	0.17	0.214	1.00	1.50	0.83	0.185	1.25	0.230	8%
15	51.00	0.82				0.66	0.200	0.16	0.272	1.00	1.50	0.82	0.236	1.23	0.290	9%
16	52.50	0.82				0.66	0.187	0.16	0.252	1.00	1.50	0.82	0.220	1.23	0.270	9%
17	54.00	0.68	0.41		0.143					1.00	1.50	0.68	0.143	1.02	0.146	5%
18	55.50	0.70	0.42		0.089					1.00	1.50	0.70	0.089	1.05	0.093	3%
19	57.00	0.59	0.35		0.076					1.00	1.50	0.59	0.076	0.89	0.067	2%
20	58.50	0.56	0.34		0.060					1.00	1.50	0.56	0.060	0.84	0.050	2%
21	60.00	0.52	0.31		0.040					1.00	1.50	0.52	0.040	0.78	0.031	1%
22	61.50	0.39	0.23		0.022					1.00	1.25	0.39	0.022	0.49	0.011	0%
LB	62.50	0.00	0.00		0.00		0.00		0.00	1.00	0.50	0.00	0.000	0.00	0.000	
Total Flow														3.06	100%	

Flow Measurement Details:
 Metering Section Location (describe):
 50m downstream of station

Meas. Start Time (MST):	10:04
Meas. End Time (MST):	10:40
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Slightly turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze



Flow Characteristics:

Total Flow:	3.06	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	19.70	(m ²)
Wetted Width:	33.50	(m)
Hydraulic Depth:	0.59	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	-	
Froude Number:	0.06	

Logger Details:

	Before	After
Transducer Reading (m):	0.533	0.574
PT Water (°C):	7.4	8.1
TBRG Tested?:	No	No
Datalogger Clock:	08:55	10:55
Laptop Clock:	08:54	10:54
Station Battery Voltage:	14.5	14.1
Station Battery:	-	Good
Station Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Details:

	Before	After
Sonde Water (°C):	7	8
Specific Conductance (µS):	265	260
pH:	8	8
Turbidity (FNU):	7	5
Dissolved Oxygen Conc. (mg/L):	11	12
Dissolved Oxygen Sat. (%):	94	101
Sonde Battery Voltage:	6.0	6.3
Sonde # (if replaced):	15F104199	15F104124

Sonde Visit Details:

Visit Type:	-
Sonde Replacement:	-
Deployed Sonde:	-
Downloaded:	Yes
Downloaded File Name:	-
WQ Samples Taken:	No
Photos Taken:	-
US, DS, CS:	Yes
Sonde Housing (In Situ):	No
Sonde Probes (Before Cleaning):	-
Datalogger:	Yes

Level Survey:

Station	BS (+) (m)	HI (m)	FS (-) (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S40-06	1.451	101.518		100.067	100.067	Pipe 4m S of Logger
S40-07			1.283	100.235	100.232	Pipe 4m SE of logger
S40-05			1.398	100.120	100.121	Pipe 4m NE of Logger
S40-08			1.188	100.330	100.330	Bolt on Bridge Retaining Wall I-Beam, painted orange
Turn						
Temporary BM				96.349	96.204	0.000
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S40-06	1.435	101.503		100.068		
Water Level:	Cut	0.158	5.315	96.346		Time WL Surveyed: 10:50
S40-07				96.347		Time WL Surveyed: 10:51
S40-06	1.421	101.489		100.068		

WL Survey Summary

	Before	After
Average WL:	96.349	96.347
Closing Error:	-0.001	-
WL Check:	0.000	-0.001
Transducer Elevation:	95.816	95.773

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Censat AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	SM, CJ	Trip Date:	17-Sep-15
Data Check Personnel:	SM	Date:	17-Sep-15
Entered Digitally in the Field:	DW	Date:	29-Sep-15

Datalogger, Sonde and Station Notes:

- Precipitation was recorded in the past 24 hours
- PLS transducer was accidentally moved while replacing the data sonde
- Installed new BM: S40-08

Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge
 UTM Location: 445023 E, 6314256 N

Site Visit Date: October 21, 2015
 Site Visit Time (MST): 12:45

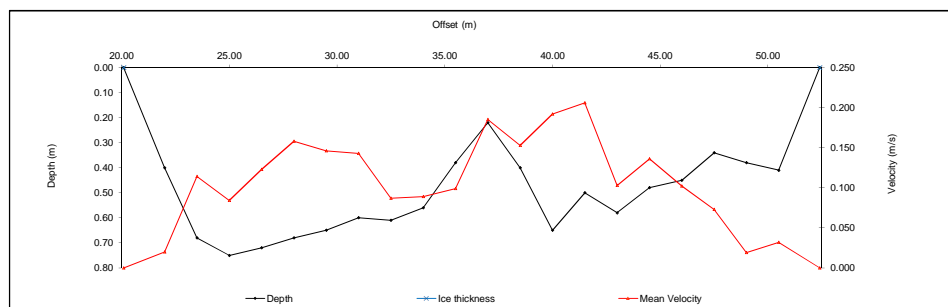


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	20.10	0.00	0.00		0.000				0.000	1.00	0.95	0.00	0.000	0.00	0.000	
1	22.00	0.40		0.24	0.020					1.00	1.70	0.40	0.020	0.68	0.014	1%
2	23.50	0.68		0.41	0.114					1.00	1.50	0.68	0.114	1.02	0.116	6%
3	25.00	0.75		0.45	0.084					1.00	1.50	0.75	0.084	1.13	0.095	5%
4	26.50	0.72		0.43	0.123					1.00	1.50	0.72	0.123	1.08	0.123	7%
5	28.00	0.68		0.41	0.158					1.00	1.50	0.68	0.158	1.02	0.161	9%
6	29.50	0.65		0.39	0.146					1.00	1.50	0.65	0.146	0.98	0.142	8%
7	31.00	0.60		0.36	0.143					1.00	1.50	0.60	0.143	0.90	0.129	7%
8	32.50	0.61		0.37	0.087					1.00	1.50	0.61	0.087	0.92	0.080	4%
9	34.00	0.56		0.34	0.089					1.00	1.50	0.56	0.089	0.84	0.075	4%
10	35.50	0.38		0.23	0.099					1.00	1.50	0.38	0.099	0.57	0.056	3%
11	37.00	0.22		0.13	0.185					1.00	1.50	0.22	0.185	0.33	0.061	3%
12	38.50	0.40		0.24	0.153					1.00	1.50	0.40	0.153	0.60	0.092	5%
13	40.00	0.65		0.39	0.192					1.00	1.50	0.65	0.192	0.98	0.157	10%
14	41.50	0.50		0.30	0.206					1.00	1.50	0.50	0.206	0.75	0.155	8%
15	43.00	0.58		0.35	0.103					1.00	1.50	0.58	0.103	0.87	0.090	5%
16	44.50	0.48		0.29	0.136					1.00	1.50	0.48	0.136	0.72	0.098	5%
17	46.00	0.45		0.27	0.102					1.00	1.50	0.45	0.102	0.68	0.069	4%
18	47.50	0.34		0.20	0.073					1.00	1.50	0.34	0.073	0.51	0.037	2%
19	49.00	0.38		0.23	0.019					1.00	1.50	0.38	0.019	0.57	0.011	1%
20	50.50	0.41		0.25	0.032					1.00	1.70	0.41	0.032	0.70	0.022	1%
LB	52.40	0.00	0.00		0.00				0.00	1.00	0.95	0.00	0.000	0.00	0.000	
Total Flow														1.82	100%	

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of station

Meas. Start Time (MST):	13:00
Meas. End Time (MST):	13:30
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edge:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 7C



Flow characteristics:

Total Flow:	1.82	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	15.82	(m ²)
Wetted Width:	32.30	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.12	(m/s)
Reynolds Number:	-	
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.500	0.500
PT Water (°C):	5.8	5.9
TBRG Tested?:	Yes	
Datalogger Clock:	12:46	13:31
Laptop Clock:	12:46	13:31
Station Battery Voltage:	13.5	13.9
Station Battery:	Good	
Station Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Details:

	Before	After
Sonde Water (°C):	6	6
Specific Conductance (µS):	307	307
pH:	8	8
Turbidity (FNU):	6	6
Dissolved Oxygen Conc. (mg/L):	13	13
Dissolved Oxygen Sat. (%):	104	105
Sonde Battery Voltage:	6.4	6.3
Sonde # (if replaced):	-	-

Sonde Visit Details:

Visit Type: -

Deployed Sonde: -

Downloaded: -

Downloaded File Name: -

WQ Samples Taken: -

Photos Taken:

US, DS, CS: -

Sonde Housing (In Situ): -

Sonde Probes (Before Cleaning): -

Datalogger: -

Level Survey:

Station	BS (+) (m)	HI (m)	FS (-) (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S40-06	1.110	101.177		100.067	100.067	Pipe 4m S of Logger
S40-07			0.948	100.229	100.232	Pipe 4m SE of logger
S40-05			1.057	100.120	100.121	Pipe 4m NE of Logger
Turn						
Temporary BM	4.958	101.150		96.192		
Water Level:	Cut	0.082	4.958	96.274	96.274	
Temporary BM			4.985	96.192	96.192	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S40-06	1.084	101.151		100.067	100.067	
Water Level:	Cut	0.083	4.958	96.276	96.276	
Water Level:	Cut	0.083	4.928	96.275	96.275	
S40-06	1.053	101.120		100.067	100.067	

WL Survey Summary

	Before	After
Average WL:	96.274	96.276
Closing Error:	0.001	-
WL Check:	0.000	0.001
Transducer Elevation:	95.774	95.776

General Notes:

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	688859

Datalogger, Sonde and Station Notes:

Field Personnel:

TR, GG	Trip Date:	21-Oct-15
TR	Date:	21-Oct-15
JC	Date:	10-Nov-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge
 UTM Location: 445023 E, 6314256 N

Site Visit Date: December 9, 2015
 Site Visit Time (MST): 14:57

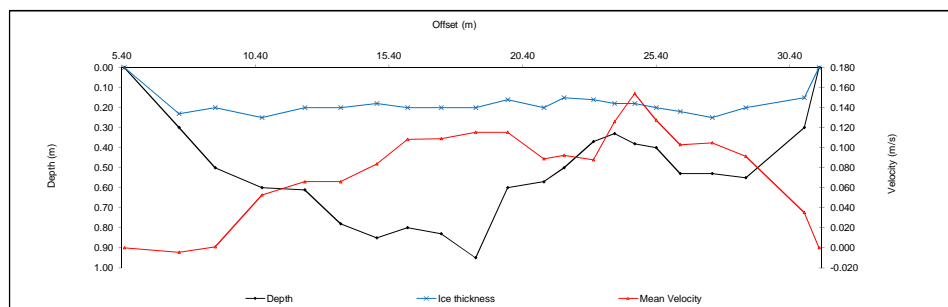


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	31.50	0.00	0.00		0.000				0.000	0.88	0.28	0.00	0.000	0.00	0.000	
1	30.95	0.30	0.15	0.23	0.040					0.88	1.38	0.15	0.035	0.21	0.007	1%
2	28.75	0.55	0.20	0.38	0.104					0.88	1.73	0.35	0.092	0.60	0.055	7%
3	27.50	0.53	0.25	0.39	0.119					0.88	1.23	0.28	0.105	0.34	0.036	4%
4	26.30	0.53	0.22	0.38	0.117					0.88	1.05	0.31	0.103	0.33	0.034	4%
5	25.40	0.40	0.20	0.30	0.145					0.88	0.85	0.20	0.128	0.17	0.022	3%
6	24.60	0.38	0.18	0.28	0.175					0.88	0.77	0.20	0.154	0.16	0.024	3%
7	23.85	0.33	0.18	0.26	0.143					0.88	0.77	0.15	0.126	0.12	0.015	2%
8	23.05	0.37	0.16	0.27	0.100					0.88	0.95	0.21	0.088	0.20	0.018	2%
9	21.95	0.50	0.15	0.33	0.105					0.88	0.93	0.35	0.092	0.32	0.030	4%
10	21.20	0.57	0.20	0.39	0.101					0.88	1.05	0.37	0.089	0.39	0.035	4%
11	19.85	0.60	0.16	0.38	0.131					0.88	1.28	0.44	0.115	0.56	0.065	8%
12	18.65	0.95	0.20	0.58	0.131					0.88	1.25	0.75	0.115	0.94	0.108	13%
13	17.35	0.83	0.20	0.52	0.124					0.88	1.28	0.63	0.109	0.80	0.088	11%
14	16.10	0.80	0.20	0.50	0.123					0.88	1.20	0.60	0.108	0.72	0.078	10%
15	14.95	0.85	0.18	0.52	0.095					0.88	1.25	0.67	0.084	0.84	0.070	9%
16	13.60	0.78	0.20	0.49	0.075					0.88	1.35	0.58	0.066	0.78	0.052	6%
17	12.25	0.61	0.20	0.41	0.075					0.88	1.48	0.41	0.066	0.60	0.040	5%
18	10.65	0.60	0.25	0.43	0.060					0.88	1.68	0.35	0.053	0.59	0.031	4%
19	8.90	0.50	0.20	0.35	0.001					0.88	1.55	0.30	0.001	0.47	0.000	0%
20	7.55	0.23	0.20	0.27	-0.005					0.88	1.70	0.07	-0.004	0.12	-0.001	0%
LB	5.50	0.00	0.00		0.00				0.00	0.88	1.03	0.00	0.000	0.00	0.000	
Total Flow														0.805	100%	

Flow Measurement Details:

Metering Section Location (describe):
50m downstream of station

Meas. Start Time (MST):	15:07
Meas. End Time (MST):	15:35
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen
Channel Edge:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, -5C



Flow characteristics:

Total Flow:	0.805	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.25	(m ²)
Wetted Width:	26.00	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.09	(m/s)
Reynolds Number:	-	
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.600	-
PT Water (°C):	0.5	-
TBRG Tested?:	-	-
Datalogger Clock:	15:59	-
Laptop Clock:	14:58	-
Station Battery Voltage:	12.4	-
Station Battery:	Good	-
Station Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Visit Details:

Visit Type:	-
Deployed Sonde:	-
Downloaded:	-
Laptop Clock:	-
Downloaded File Name:	-
WQ Samples Taken:	-
Photos Taken:	-
US, DS, CS:	-
Sonde Housing (In Situ):	-
Sonde Probes (Before Cleaning):	-
Datalogger:	-

Level Survey:

Station	BS (+) (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S40-05	1.341	101.462		100.121	100.121	Pipe 4m NE of Logger
S40-07			1.228	100.234	100.232	Pipe 4m SE of logger
S40-06			1.396	100.066	100.067	Pipe 4m S of Logger
Water Level:	Cut		5.106	96.356	Time WL Surveyed: 14:45	
Temporary BM			5.087	96.375	0.000	
Turn						
Temporary BM	5.040	101.415		96.375		
Water Level:	Cut		5.063	96.352	Time WL Surveyed: 14:49	
S40-06			1.337	100.078	100.067	Pipe 4m S of Logger
S40-07			1.183	100.232	100.232	Pipe 4m SE of Logger
S40-05			1.295	100.120	100.121	Pipe 4m NE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	96.354	-
Closing Error:	0.001	-
WL Check:	0.004	-
Transducer Elevation	95.754	-

General Notes:

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

GG, DW	Trip Date:	9-Dec-15
GG	Date:	9-Dec-15
CJ	Date:	15-Apr-16
Entered Digitally in the Field:	Yes	

Datalogger, Sonde and Station Notes:

Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag
 UTM Location: 531528 E, 6354782 N

Site Visit Date: January 15, 2015
 Site Visit Time (MST): 09:10

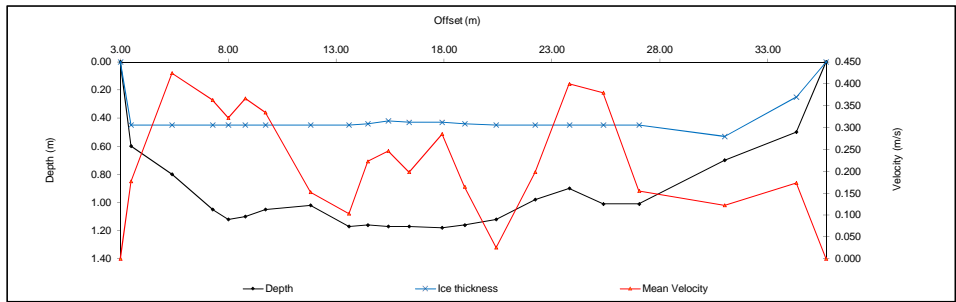


Flow Measurement:																
Measured Data								Calculated Data								
Bank/ Mmt #	Depth from bottom to WS (m)	Depth WS (m)	Depth to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
LB	3.00	0.00	0.00	0.53	0.201				0.000	0.88	0.25	0.00	0.000	0.00	0.000	
1	3.50	0.60	0.45	0.53	0.201				0.88	1.20	0.15	0.177	0.18	0.032	1%	
2	5.40	0.80	0.45	0.63	0.482				0.88	1.89	0.35	0.424	0.66	0.281	8%	
3	7.28	1.05	0.45	0.75	0.412				0.88	1.30	0.60	0.363	0.78	0.283	8%	
4	8.00	1.12	0.45	0.79	0.366				0.88	0.75	0.67	0.322	0.51	0.163	4%	
5	8.79	1.10	0.45	0.78	0.416				0.88	0.86	0.65	0.366	0.56	0.205	6%	
6	9.72	1.05	0.45	0.75	0.380				0.88	1.51	0.60	0.334	0.91	0.303	8%	
7	11.81	1.02	0.45	0.74	0.173				0.88	1.94	0.57	0.152	1.10	0.168	5%	
8	13.59	1.17	0.45	0.81	0.117				0.88	1.33	0.72	0.103	0.96	0.099	3%	
9	14.47	1.16	0.44	0.80	0.253				0.88	0.91	0.72	0.223	0.66	0.146	4%	
10	15.41	1.17	0.42	0.80	0.290				0.88	0.95	0.75	0.246	0.72	0.176	5%	
11	16.38	1.17	0.43	0.80	0.225				0.88	1.25	0.74	0.198	0.93	0.183	5%	
12	17.91	1.18	0.43	0.81	0.324				0.88	1.29	0.75	0.285	0.96	0.275	7%	
13	18.95	1.16	0.44	0.80	0.187				0.88	1.25	0.72	0.165	0.90	0.148	4%	
14	20.41	1.12	0.45	0.79	0.029				0.88	1.64	0.67	0.026	1.10	0.028	1%	
15	22.22	0.98	0.45	0.72	0.225				0.88	1.70	0.53	0.198	0.90	0.178	5%	
16	23.80	0.90	0.45	0.68	0.454				0.88	1.58	0.45	0.400	0.71	0.283	8%	
17	25.37	1.01	0.45	0.73	0.431				0.88	1.62	0.56	0.379	0.90	0.343	9%	
18	27.03	1.01	0.45	0.73	0.176				0.88	2.82	0.56	0.155	1.58	0.244	7%	
19	31.00	0.70	0.53	0.62	0.139				0.88	3.65	0.17	0.122	0.62	0.076	2%	
20	34.32	0.50	0.25	0.38	0.197				0.88	2.35	0.25	0.173	0.59	0.102	3%	
RB	35.70	0.00	0.00	0.00	0.00				0.88	0.69	0.00	0.000	0.00	0.000		
Total Flow														3.71	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	10:07
Meas. End Time (MST):	10:33
Equipment:	ADV
Method:	Ice
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -20°C



Flow Characteristics:

Total Flow:	3.71	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	16.20	(m ²)
Wetted Width:	32.70	(m)
Hydraulic Depth:	0.50	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.879	0.869
Water (°C):	0.1	0.1
Precip Gauge Test:	No	
Datalogger Clock:	09:28	09:40
Laptop Clock:	09:25	09:37
Battery (Main):	12.1	13.2
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Edited GOES program to report average voltage

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S43-05	0.190	101.713		101.523	101.523	Lag bolt 20m N of station
S43-03			1.591	100.122	100.113	3/4" pipe 5m N of data logger
S43-04			1.362	100.351	100.338	3/4" pipe 1m E of data logger
S43-01			1.427	100.286	100.270	3/4" pipe 1m S of data logger
Water Level:	Cut		2.553	99.160		Time WL Surveyed: 9:46
Temporary BM			2.502	99.211		
Turn						
Temporary BM	2.531	101.742		99.211		
Water Level:	Cut		2.584	99.158		Time WL Surveyed: 9:49
S43-01			1.457	100.285	100.270	3/4" pipe 1m S of data logger
S43-04			1.392	100.350	100.338	3/4" pipe 1m E of data logger
S43-03			1.622	100.120	100.113	3/4" pipe 5m N of data logger
S43-05			0.218	101.524	101.523	Lag bolt 20m N of station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	99.159	-
Closing Error:	-0.001	-
WL Check:	0.002	-
Transducer Elevation	98.280	-

Field Personnel:

	DW, MP	Trip Date:	15-Jan-15
Data Entry Personnel:	DW, MP	Date:	15-Jan-15
Data Check Personnel:	NC	Date:	23-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag
 UTM Location: 531528 E, 6354782 N

Site Visit Date: February 11, 2015
 Site Visit Time (MST): 14:00



Flow Measurement																
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000		0.000		0.000	0.88	0.60	0.00	0.000	0.00	0.000	
1	2.00	0.75	0.50	0.63	0.411					0.88	1.38	0.25	0.362	0.34	0.124	3%
2	3.55	0.78	0.55	0.67	0.448					0.88	1.68	0.23	0.394	0.39	0.152	3%
3	5.35	0.88	0.60	0.74	0.478					0.88	1.83	0.28	0.421	0.51	0.215	5%
4	7.20	1.03	0.60	0.82	0.695					0.88	1.90	0.43	0.612	0.82	0.500	11%
5	9.15	1.09	0.60	0.85	0.518					0.88	1.95	0.49	0.456	0.96	0.436	9%
6	11.10	0.98	0.65	0.82	0.544					0.88	1.90	0.33	0.479	0.63	0.300	6%
7	12.95	1.04	0.65	0.85	0.084					0.88	1.70	0.39	0.074	0.66	0.049	1%
8	14.50	1.08	0.60	0.84	0.292					0.88	1.63	0.48	0.257	0.78	0.200	4%
9	16.20	1.18	0.55	0.87	0.371					0.88	1.80	0.63	0.326	1.13	0.370	8%
10	18.10	1.21	0.53	0.87	0.578					0.88	1.50	0.68	0.509	1.02	0.519	11%
11	19.20	1.14	0.63	0.89	0.388					0.88	1.10	0.51	0.324	0.56	0.182	4%
12	20.30	1.17	0.64	0.91	0.045					0.88	1.38	0.53	0.040	0.73	0.029	1%
13	21.95	1.08	0.65	0.87	0.032					0.88	1.80	0.43	0.028	0.77	0.022	0%
14	23.90	0.91	0.60	0.76	0.386					0.88	1.65	0.31	0.340	0.51	0.174	4%
15	25.25	1.09	0.60	0.85	0.662					0.88	1.50	0.49	0.583	0.74	0.428	9%
16	26.90	1.19	0.62	0.91	0.497					0.88	1.68	0.57	0.437	0.95	0.418	9%
17	28.60	1.18	0.66	0.92	0.275					0.88	1.70	0.52	0.242	0.88	0.214	5%
18	30.30	0.90	0.66	0.78	0.261					0.88	1.75	0.24	0.230	0.42	0.096	2%
19	32.10	0.84	0.65	0.75	0.161					0.88	1.80	0.19	0.142	0.34	0.048	1%
20	33.90	0.78	0.55	0.67	0.282					0.88	1.55	0.23	0.248	0.36	0.088	2%
21	35.20	0.64	0.35	0.50	0.441					0.88	1.25	0.29	0.388	0.36	0.141	3%
22	36.40	0.47	0.25	0.36	0.246					0.88	0.90	0.22	0.216	0.20	0.043	1%
LB	37.00	0.00	0.00		0.00		0.00		0.00	0.88	0.30	0.00	0.000	0.00	0.000	
Total Flow														4.75	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	14:41
Meas. End Time (MST):	15:15
Equipment:	ADV
Method:	Ice
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -28C

Flow characteristics:

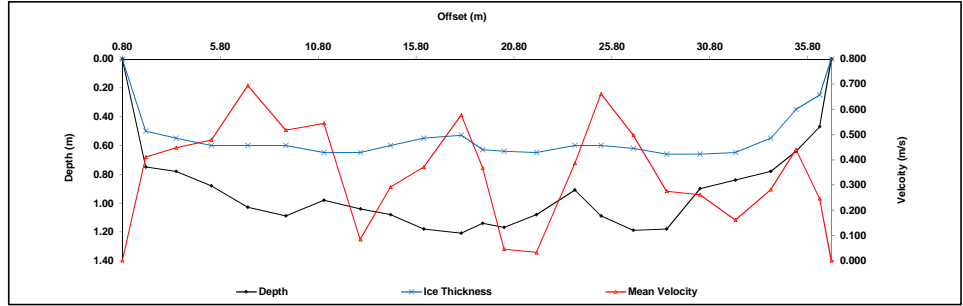
Total Flow:	4.75	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	14.06	(m ²)
Wetted Width:	36.20	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.17	

Logger Details:

	Before	After
Transducer Reading (m):	0.986	-
Water (°C):	0.1	-
Precip Gauge Test:	No	-
Datalogger Clock:	14:04	-
Laptop Clock:	14:01	-
Battery (Main):	15.4	-
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	-
Vent Tube Deseccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S43-05	0.325	101.848		101.523	101.523	Lag bolt 20m N of station
S43-03			1.724	100.124	100.113	3/4" pipe 5m N of data logger
S43-04			1.494	100.354	100.338	3/4" pipe 5m N of data logger
S43-01			1.562	100.286	100.270	3/4" pipe 1 m S of data logger
Water Level:	Cut			2.581	99.267	Time WL Surveyed: 14:28
Temporary BM			2.450		99.398	
Turn						
Temporary BM	2.436	101.834		99.398		
Water Level:	Cut			2.564	99.270	Time WL Surveyed: 14:33
S43-01			1.547	100.287	100.270	3/4" pipe 1 m S of data logger
S43-04			1.479	100.355	100.338	3/4" pipe 5m N of data logger
S43-03			1.707	100.127	100.113	3/4" pipe 5m N of data logger
S43-05			0.309	101.525	101.523	Lag bolt 20m N of station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	99.269	-
Closing Error:	-0.002	-
WL Check:	0.003	-
Transducer Elevation	98.283	-

Field Personnel:

	MP, GG	Trip Date:	11-Feb-15
Data Entry Personnel:	MP	Date:	11-Feb-15
Data Check Personnel:	MP	Date:	9-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag
 UTM Location: 531528 E, 6354782 N

Site Visit Date: March 8, 2015
 Site Visit Time (MST): 08:40



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	0.88	0.35	0.00	0.000	0.00	0.000	
1	1.70	0.88	0.55	0.72	0.338				0.88	1.31	0.33	0.297	0.43	0.129	3%	
2	3.62	0.93	0.60	0.77	0.548				0.88	1.97	0.33	0.482	0.65	0.313	6%	
3	5.63	1.00	0.55	0.78	0.800				0.88	2.03	0.45	0.704	0.91	0.643	13%	
4	7.68	1.06	0.70	0.88	0.684				0.88	2.04	0.36	0.602	0.73	0.441	9%	
5	9.70	1.14	0.75	0.95	0.270				0.88	2.09	0.39	0.238	0.81	0.193	4%	
6	11.85	1.00	0.77	0.89	0.367				0.88	2.07	0.23	0.323	0.48	0.154	3%	
7	13.84	0.96	0.75	0.86	0.443				0.88	1.71	0.21	0.390	0.36	0.140	3%	
8	15.26	1.17	0.75	0.96	0.465				0.88	1.37	0.42	0.409	0.57	0.235	5%	
9	16.57	1.20	0.74	0.97	0.582				0.88	1.27	0.46	0.512	0.58	0.299	6%	
10	17.80	1.17	0.74	0.96	0.681				0.88	1.35	0.43	0.599	0.58	0.348	7%	
11	19.27	1.12	0.77	0.95	0.226				0.88	1.39	0.35	0.199	0.49	0.097	2%	
12	20.58	1.08	0.78	0.93	0.077				0.88	1.45	0.30	0.068	0.43	0.029	1%	
13	22.16	1.00	0.75	0.87	0.284				0.88	1.61	0.23	0.338	0.37	0.125	3%	
14	23.80	1.00	0.70	0.85	0.541				0.88	1.74	0.30	0.476	0.52	0.248	5%	
15	25.63	1.20	0.68	0.94	0.687				0.88	1.72	0.52	0.605	0.89	0.539	11%	
16	27.23	1.26	0.73	1.00	0.309				0.88	1.71	0.53	0.272	0.91	0.246	5%	
17	29.05	1.18	0.77	0.98	0.232				0.88	1.92	0.41	0.204	0.79	0.161	3%	
18	31.07	0.97	0.73	0.85	0.245				0.88	1.94	0.24	0.216	0.46	0.100	2%	
19	32.92	1.10	0.65	0.88	0.301				0.88	2.17	0.45	0.265	0.97	0.258	5%	
20	35.40	0.98	0.75	0.33	0.498				0.88	1.54	0.35	0.357	0.54	0.193	4%	
LB	36.00	0.00	0.00		0.00		0.00		0.88	0.30	0.00	0.000	0.00	0.000		
Total Flow														4.89	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	9:26
Meas. End Time (MST):	9:54
Equipment:	ADV
Method:	Ice
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -1C

Flow characteristics:

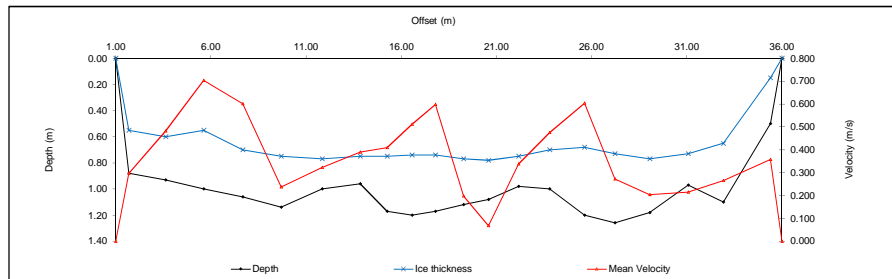
Total Flow:	4.89	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.49	(m ²)
Wetted Width:	35.00	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.39	(m/s)
Froude Number:	0.21	

Logger Details:

	Before	After
Transducer Reading (m):	1.036	-
Water (°C):	0.1	-
Precip Gauge Test:	No	-
Datalogger Clock:	08:53	-
Laptop Clock:	08:49	-
Battery (Main):	14.7	13.3
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent. Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S43-05	0.391	101.914		101.523	101.523	Lag bolt 20m N of station
S43-03			1.787	100.127	100.113	3/4" pipe 5m N of data logger
S43-04			1.559	100.355	100.338	3/4" pipe 1m E of data logger
S43-01			1.627	100.287	100.270	3/4" pipe 1 m S of data logger
Water Level:			2.596	99.318		Time WL Surveyed: 9:07
S43-01			1.627	100.287	100.270	3/4" pipe 1 m S of data logger
Turn						
S43-01	1.613	101.900		100.287	100.270	3/4" pipe 1 m S of data logger
Water Level:			2.582	99.318		Time WL Surveyed: 9:11
S43-01			1.613	100.287	100.270	3/4" pipe 1 m S of data logger
S43-04			1.544	100.356	100.338	3/4" pipe 1m E of data logger
S43-03			1.773	100.127	100.113	3/4" pipe 5m N of data logger
S43-05			0.375	101.525	101.523	Lag bolt 20m N of station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:						Time WL Surveyed:
Water Level:						Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	99.318	-
Closing Error:	-0.002	-
WL Check:	0.000	-
Transducer Elevation	98.282	-

Field Personnel:

	MP, GG	Trip Date:	8-Mar-15
Data Entry Personnel:	MP	Date:	8-Mar-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

April 18, 2015

Site Visit Time (MST):

08:02



Flow Measurement Details:

Metering Section Location (describe):	
At station	
Meas. Start Time (MST):	9:44
Meas. End Time (MST):	10:15
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, BC

Flow characteristics:

Total Flow:	23.4	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	35.29	(m ²)
Wetted Width:	36.27	(m)
Hydraulic Depth:	0.97	(m)
Mean Velocity:	0.66	(m/s)
Froude Number:	0.22	

Logger Details:

	Before	After
Transducer Reading (m):	1.108	1.101
Water (°C):	0.2	0.4
Precip Gauge Test:	No	
Datalogger Clock:	08:09	10:50
Laptop Clock:	08:06	10:46
Battery (Main):	13.5	14.6
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
New Tube Desiccant:	Good	
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-WL fluctuating 1.5cm during survey

ADCP Flow Measurement Summary:

System Information:		System Setup:		Bank Offsets:			
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	3.75		
Serial Number:	4712	Salinity (ppt):	-	RB:	38.75		
Firmware Version:	3.8	Magnetic Declination (°):	14.33				
Software Version:	3.8	Measured Temperature (°C):	-				
		ADCP Temperature (°C):	-				
Discharge Calculation Settings:		Measurement Results:					
Track Reference:	Bottom-Track	Pass (ft):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean:
Depth Reference:	Vertical beam	2	39.07	38.20	0.629	24.038	2.69%
Coordinate System:	ENR	3	34.34	33.28	0.669	22.929	-2.05%
Left Method:	Sloped bank	5	36.75	35.57	0.663	23.585	0.75%
Right Method:	Sloped bank	7	34.91	34.13	0.676	23.084	-1.39%
Top Fit Type:	Power fit						
Bottom Fit Type:	Power fit						
		Mean:	36.27	35.29	0.664	23.4	
		SD:	1.85	1.87	0.022	0.437	
		COV:	0.05	0.05	0.034	0.019	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S43-05	0.677	102.200		101.523	101.523	Lag Bolt in Tree
S43-04			1.843	100.357	100.338	3/4" pipe 1m E of data logger
S43-01			1.913	100.287	100.270	3/4" pipe 1 m S of data logger
S43-03			2.072	100.128	100.113	3/4" pipe 5m N of data logger
Water Level:	Cut	0.090	2.883	99.407		Time WL Surveyed: 9:03
Temporary BM			2.883	99.317		
Turn						
Temporary BM	2.863	102.180		99.317		
Water Level:	Cut	0.090	2.863	99.407		Time WL Surveyed: 9:05
S43-03			2.048	100.131	100.115	3/4" pipe 5m N of data logger
S43-01			1.891	100.288	100.270	3/4" pipe 1 m S of data logger
S43-04			1.822	100.358	100.338	3/4" pipe 1m E of data logger
S43-05			0.656	101.524	101.523	Lag Bolt in Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S43-03	2.052	102.182		100.130		
Water Level:	Cut	0.095	2.880	99.397		Time WL Surveyed: 10:40
Water Level:	Cut	0.095	2.858	99.395		Time WL Surveyed: 10:42
S43-03	2.028	102.158		100.130		

WL Survey Summary	Before	After
Average WL:	99.407	99.395
Closing Error:	-0.001	-
WL Check:	0.000	0.002
Transducer Elevation	98.299	98.295

Field Personnel:	GG, RM	Trip Date:	18-Apr-15
Data Entry Personnel:	GG	Date:	18-Apr-15
Data Check Personnel:	SG	Date:	14-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag
 UTM Location: 531528 E, 6354782 N

Site Visit Date: May 10, 2015
 Site Visit Time (MST): 07:45



Flow Measurement Details:	
Metering Section Location (describe): 40m downstream of station	
Meas. Start Time (MST):	8:40
Meas. End Time (MST):	9:00
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm

Flow characteristics:	
Total Flow:	12.5 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	14.30 (m ²)
Wetted Width:	37.27 (m)
Hydraulic Depth:	0.38 (m)
Mean Velocity:	0.87 (m/s)
Froude Number:	0.45

Logger Details:		
	Before	After
Transducer Reading (m):	0.856	0.856
Water (°C):	5.6	6.5
Datalogger Clock:	07:49	09:14
Laptop Clock:	07:45	09:14
Battery (Main):	14.7	14.6
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTA fill (replaced):	-	-
Loggers (if replaced):	-	-

Datalogger / Station Notes:
 - The bottom prong at the end of the GOES antenna is missing
 - Installed TBRG

General Notes:

ADCP Flow Measurement Summary:					
System Information:			System Setup:		Bank Offsets:
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	68.00
Serial Number:	4712	Salinity (ppt):	-	RB:	30.60
Firmware Version:	3.8	Magnetic Declination (°):	14.33		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	14.6		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	37.07	14.46	0.89
Coordinate System:	ENR	2	37.56	14.13	0.845
Left Method:	Sloped bank	3	37.76	14.64	0.872
Right Method:	Sloped bank	4	36.73	13.99	0.881
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	37.27	14.30	0.872
		SD:	0.40	0.26	0.017
		COV:	0.01	0.02	0.019
					12.5
					0.030

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S43-05	0.563	102.086		101.523	101.523	Lag Bolt in Tree
S43-01			1.729	100.287	100.270	3/4" pipe 1 m S of data logger
S43-04			1.728	100.358	100.338	3/4" pipe 1m E of data logger
S43-03			1.956	100.130	100.113	3/4" pipe 5m N of data logger
Water Level:	Cut	2.939	99.147			Time WL Surveyed: 7:53
Temporary BM			1.956	100.130		
Turn						
Temporary BM	1.932	102.062		100.130		
Water Level:	Cut		2.912	99.150		Time WL Surveyed: 7:55
S43-03			1.932	100.130	100.113	3/4" pipe 5m N of data logger
S43-04			1.705	100.357	100.338	3/4" pipe 1m E of data logger
S43-01			1.773	100.289	100.270	3/4" pipe 1 m S of data logger
S43-05			0.536	101.526	101.523	Lag Bolt in Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S43-03	1.933	102.063		100.130		
Water Level:	Cut		2.915	99.148		Time WL Surveyed: 9:10
Water Level:	Cut		2.900	99.152		Time WL Surveyed: 9:11
S43-03	1.922	102.052		100.130		

WL Survey Summary		
	Before	After
Average WL:	99.149	99.150
Closing Error:	-0.003	-
WL Check:	0.003	-0.004
Transducer Elevation	98.293	98.294

Field Personnel:			
Data Entry Personnel:	TR, CJ	Trip Date:	10-May-15
Data Check Personnel:	TR	Date:	10-May-15
Entered Digitally in the Field:	DW	Date:	5-Sep-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag
 UTM Location: 531528 E, 6354782 N

Site Visit Date: June 14, 2015
 Site Visit Time (MST): 07:53



Flow Measurement Details:	
Metering Section Location (describe): at station At station	
Meas. Start Time (MST):	8:33
Meas. End Time (MST):	9:05
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Open, good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 15C

Flow characteristics:	
Total Flow:	9.89 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	26.82 (m ²)
Wetted Width:	36.65 (m)
Hydraulic Depth:	0.73 (m)
Mean Velocity:	0.37 (m/s)
Reynolds Number:	2.31E+05
Froude Number:	0.14

Logger Details:		Before	After
Transducer Reading (m):		0.754	0.755
Water (°C):		14.3	14.8
TBRG Tested?:	Yes		
Datalogger Clock:		08:01	09:44
Laptop Clock:		07:57	09:40
Battery (Main):		14.5	14.5
Battery:		Good	
Battery Serial #:		-	-
Enclosure Dissasint:		Replaced	
Vent Tube Dissasint:		Good	
PT# (if replaced):		-	-
Logger# (if replaced):		-	-

Datalogger / Station Notes:	

General Notes:	
<ul style="list-style-type: none"> - Station damaged by wildlife - TBRG wires pulled out, solar cable chewed - May need new cable for TBRG, not working in field - Replaced TBRG cable on a June 15 maintenance visit 	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	39.20	
Serial Number:	4712	Bainry (ppt):	-	-	RB:	66.80	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.33	Compass Calibration Passed: Yes		
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes		
		ADCP Temperature (°C):	-	14.6			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	37.57	27.51	0.370	10.18	2.96%
Depth Reference: Vertical beam	3	0.00	36.40	26.75	0.373	9.978	0.92%
Coordinate System: FTM	4	0.00	35.79	26.32	0.371	9.775	-1.14%
Left Method: Sloped bank	5	0.00	36.86	26.70	0.360	9.616	-2.74%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
	Mean:	36.65	26.82	0.369	9.89		
	SD:	0.65	0.43	0.005	0.212		
	COV:	0.02	0.02	0.014	0.021		

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S43-06	0.207	101.730			101.523	Lag Bolt in Tree
S43-03			1.604	100.126	100.113	3/4" pipe 5m N of data logger
S43-04			1.378	100.352	100.338	3/4" pipe 1m E of data logger
Turn						
Water Level:	Cut	0.512	3.198	99.044	Time WL Surveyed:	8:10
Temporary BM			3.198	98.532	0.000	
Turn						
Temporary BM	3.183	101.715		98.532		
Water Level:	Cut	0.512	3.183	99.044	Time WL Surveyed:	8:12
S43-04			1.358	100.357	100.338	3/4" pipe 1m E of data logger
S43-03			1.587	100.128	100.113	3/4" pipe 5m N of data logger
S43-05		0.191		101.524	101.523	Lag Bolt in Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S43-04	1.357	101.712		100.355		
Water Level:	Cut	0.699	3.147	99.044	Time WL Surveyed:	9:33
Water Level:	Cut	0.479	3.164	99.047	Time WL Surveyed:	9:34
S43-04	1.377	101.732		100.355		

WL Survey Summary		Before	After	Level Survey Equipment:	
Average WL:		99.044	99.046	Level #:	Level#4
Closing Error:		-0.001	-	Make & Model:	Nikon AC-2S
WL Check:		0.000	-0.003	Serial #:	658785
Transducer Elevation:		98.290	98.291		

Field Personnel:		GG, MK	Trip Date:	14-Jun-15
Data Entry Personnel:	DG	Date:	14-Jun-15	
Data Check Personnel:	DW	Date:	3-Sep-15	
Entered Digitally in the Field:	Yes			

Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag
 UTM Location: 531528 E, 6354782 N

Site Visit Date: August 17, 2015
 Site Visit Time (MST): 08:45

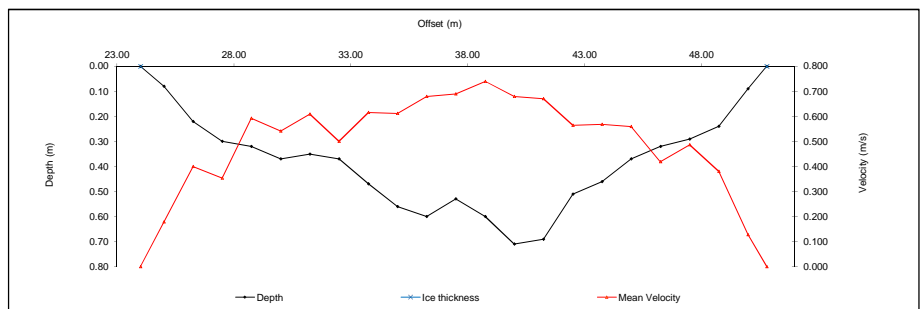


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	24.00	0.00	0.00		0.000		0.000		0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	25.00	0.08		0.05	0.178					1.00	1.13	0.08	0.178	0.09	0.016	0%
2	26.25	0.22		0.13	0.399					1.00	1.25	0.22	0.399	0.28	0.110	2%
3	27.50	0.30		0.18	0.353					1.00	1.25	0.30	0.353	0.38	0.132	2%
4	28.75	0.32		0.19	0.593					1.00	1.25	0.32	0.593	0.40	0.237	4%
5	30.00	0.37		0.22	0.542					1.00	1.25	0.37	0.542	0.46	0.251	4%
6	31.25	0.35		0.21	0.609					1.00	1.25	0.35	0.609	0.44	0.266	4%
7	32.50	0.37		0.22	0.501					1.00	1.25	0.37	0.501	0.46	0.232	4%
8	33.75	0.47		0.28	0.615					1.00	1.25	0.47	0.615	0.59	0.361	6%
9	35.00	0.56		0.34	0.612					1.00	1.25	0.56	0.612	0.70	0.428	7%
10	36.25	0.60		0.36	0.680					1.00	1.25	0.60	0.680	0.75	0.510	8%
11	37.50	0.53		0.32	0.690					1.00	1.25	0.53	0.690	0.66	0.457	7%
12	38.75	0.60		0.36	0.740					1.00	1.25	0.60	0.740	0.75	0.555	9%
13	40.00	0.71		0.43	0.680					1.00	1.25	0.71	0.680	0.89	0.604	10%
14	41.25	0.69		0.41	0.671					1.00	1.25	0.69	0.671	0.86	0.579	9%
15	42.50	0.51		0.31	0.564					1.00	1.25	0.51	0.564	0.64	0.360	6%
16	43.75	0.46		0.28	0.568					1.00	1.25	0.46	0.568	0.58	0.327	5%
17	45.00	0.37		0.22	0.559					1.00	1.25	0.37	0.559	0.46	0.259	4%
18	46.25	0.32		0.19	0.419					1.00	1.25	0.32	0.419	0.40	0.168	3%
19	47.50	0.29		0.17	0.486					1.00	1.25	0.29	0.486	0.36	0.176	3%
20	48.75	0.24		0.14	0.381					1.00	1.25	0.24	0.381	0.30	0.114	2%
21	50.00	0.09		0.05	0.128					1.00	1.03	0.09	0.128	0.09	0.012	0%
RB	50.80	0.00	0.00		0.00		0.00		0.00	1.00	0.40	0.00	0.000	0.00	0.000	
Total Flow														6.15	100%	

Flow Measurement Details:

Metering Section Location (describe):
100m downstream of station, around bend

Meas. Start Time (MST):	9:55
Meas. End Time (MST):	10:35
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 25C



Flow characteristics:

Total Flow:	6.15	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.53	(m ²)
Wetted Width:	26.80	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.58	(m/s)
Reynolds Number:	2.07E+05	
Froude Number:	0.30	

Logger Details:

	Before	After
Transducer Reading (m):	0.668	0.650
Water (°C):	15.1	17.8
TBRG Tested?:		Yes
Datalogger Clock:	08:58	10:52
Laptop Clock:	08:54	10:48
Battery (Main):	14.4	14.3
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	252795	298578
Logger# (if replaced):	9976	-

Datalogger / Station Notes:

- BM3 needs label
- TBRG was displaced by wildlife
- TBRG was repositioned and secured
- PT replaced for calibration

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S43-05	0.099	101.622		101.523	101.523	Lag Bolt in Tree
S43-03			1.497	100.125	100.113	3/4" pipe 5m N of data logger
S43-01			1.337	100.285	100.270	3/4" pipe 1 m S of data logger
Turn						
Water Level:	Cut		2.666	98.956		Time WL Surveyed: 9:00
Temporary BM			3.087	98.535	0.000	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Temporary BM	3.070	101.605		98.535		
Water Level:	Cut	0.420	3.070	98.955		Time WL Surveyed: 9:01
S43-01			1.322	100.283	100.270	3/4" pipe 1 m S of data logger
S43-03			1.483	100.122	100.113	3/4" pipe 5m N of data logger
S43-05			0.085	101.520	101.523	Lag Bolt in Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S43-03	1.483	101.607		100.124		
Water Level:	Cut		2.650	98.957		Time WL Surveyed: 10:55
Water Level:	Cut		2.636	98.958		Time WL Surveyed: 10:55
S43-03	1.470	101.594		100.124		

WL Survey Summary

	Before	After
Average WL:	98.956	98.958
Closing Error:	0.003	-
WL Check:	0.001	-0.001
Transducer Elevation	98.288	98.308

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	DW, SG	Trip Date:	17-Aug-15
Data Check Personnel:	DW	Date:	17-Aug-15
Entered Digitally in the Field:	Yes	Date:	3-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag
 UTM Location: 531528 E, 6354782 N

Site Visit Date: September 12, 2015
 Site Visit Time (MST): 15:25

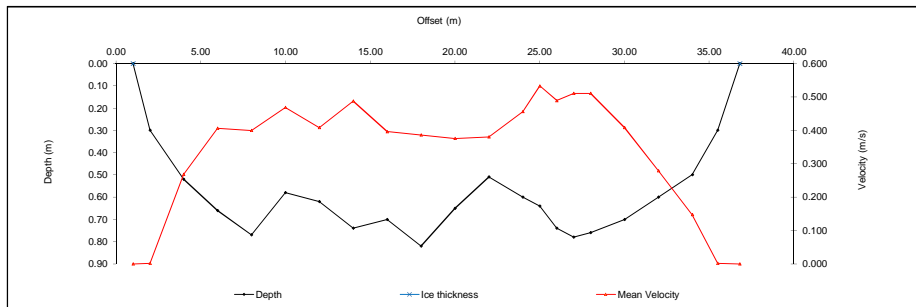


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	2.00	0.30		0.18	0.002					1.00	1.50	0.30	0.002	0.45	0.001	0%
2	4.00	0.52		0.31	0.268					1.00	2.00	0.52	0.268	1.04	0.279	3%
3	6.00	0.66		0.40	0.406					1.00	2.00	0.66	0.406	1.32	0.536	6%
4	8.00	0.77		0.35	0.468	0.62	0.277	0.15	0.521	1.00	2.00	0.77	0.399	1.54	0.614	7%
5	10.00	0.58		0.37	0.408					1.00	2.00	0.58	0.468	1.16	0.543	6%
6	12.00	0.62		0.44	0.488					1.00	2.00	0.62	0.408	1.24	0.506	6%
7	14.00	0.74		0.44	0.488					1.00	2.00	0.74	0.488	1.48	0.722	9%
8	16.00	0.70		0.42	0.396					1.00	2.00	0.70	0.396	1.40	0.554	7%
9	18.00	0.82				0.66	0.317	0.16	0.455	1.00	2.00	0.82	0.386	1.64	0.633	8%
10	20.00	0.65		0.39	0.375					1.00	2.00	0.65	0.375	1.30	0.488	6%
11	22.00	0.51		0.31	0.380					1.00	2.00	0.51	0.380	1.02	0.388	5%
12	24.00	0.60		0.36	0.456					1.00	1.50	0.60	0.456	0.90	0.410	5%
13	25.00	0.64		0.38	0.533					1.00	1.00	0.64	0.533	0.64	0.341	4%
14	26.00	0.74		0.44	0.489					1.00	1.00	0.74	0.489	0.74	0.362	4%
15	27.00	0.78				0.62	0.401	0.16	0.620	1.00	1.00	0.78	0.511	0.78	0.398	5%
16	28.00	0.76				0.61	0.439	0.15	0.583	1.00	1.50	0.76	0.511	1.14	0.583	7%
17	30.00	0.70		0.42	0.408					1.00	2.00	0.70	0.408	1.40	0.571	7%
18	32.00	0.60		0.36	0.279					1.00	2.00	0.60	0.279	1.20	0.335	4%
19	34.00	0.50		0.30	0.147					1.00	1.75	0.50	0.147	0.88	0.129	2%
20	35.00	0.30		0.18	0.002					1.00	1.40	0.30	0.002	0.42	0.001	0%
LB	36.80	0.00	0.00		0.00		0.00		0.00	1.00	0.65	0.00	0.000	0.00	0.000	
Total Flow														8.39	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	15:42
Meas. End Time (MST):	16:19
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, Breezy, 15C



Flow characteristics:

Total Flow:	8.39	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	21.69	(m ²)
Wetted Width:	35.80	(m)
Hydraulic Depth:	0.61	(m)
Mean Velocity:	0.39	(m/s)
Reynolds Number:	1.67E+05	
Froude Number:	0.16	

Logger Details:

	Before	After
Transducer Reading (m):	0.677	0.678
Water (°C):	12.0	12.1
TBRG Tested?:	Yes	
Datalogger Clock:	15:12	16:31
Laptop Clock:	15:08	16:27
Battery (Main):	14.2	13.2
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- TBRG was not functioning upon arrival due to wildlife activity
- Levelled TBRG, repaired wire connection at instrument
- Tested TBRG, 4 tips - good

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S43-05	0.124	101.647		101.523	101.523	Lag Bolt in Tree
S43-04			1.292	100.355	100.338	3/4" pipe 1m E of data logger
S43-01			1.361	100.286	100.270	3/4" pipe 1 m S of data logger
Water Level:	Cut		2.629	99.018		Time WL Surveyed: 15:27
Temporary BM			2.546	99.101		
Turn						
Temporary BM	2.527	101.628		99.101		
Water Level:	Cut		2.606	99.022		Time WL Surveyed: 15:30
S43-01			1.338	100.290	100.270	3/4" pipe 1 m S of data logger
S43-04			1.272	100.356	100.338	3/4" pipe 1m E of data logger
S43-05			0.103	101.525	101.523	Lag Bolt in Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S43-04	1.271	101.626		100.355		
Water Level:	Cut		2.604	99.022		Time WL Surveyed: 16:32
Water Level:	Cut		2.593	99.019		Time WL Surveyed: 16:33
S43-04	1.257	101.612		100.355		

WL Survey Summary

	Before	After
Average WL:	99.020	99.021
Closing Error:	-0.002	
WL Check:	0.004	0.003
Transducer Elevation	98.343	98.343

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

	SM, TL	Trip Date:	12-Sep-15
Data Entry Personnel:	SM	Date:	12-Sep-15
Data Check Personnel:	DW	Date:	28-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag
 UTM Location: 531528 E, 6354782 N

Site Visit Date: October 19, 2015
 Site Visit Time (MST): 10:45



Flow Measurement Details:	
Metering Section Location (describe): Across from station	
Meas. Start Time (MST):	11:05
Meas. End Time (MST):	11:35
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Average flow
Channel/Edor:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, BC

Flow characteristics:	
Total Flow:	6.74 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	25.94 (m ²)
Wetted Width:	36.16 (m)
Hydraulic Depth:	0.72 (m)
Mean Velocity:	0.26 (m/s)
Reynolds Number:	1.20E+05
Froude Number:	0.10

Logger Details:		Before	After
Transducer Reading (m):		0.613	0.614
Water (°C):		4.6	4.8
TBRG Tested?:		No	
Datalogger Clock:		10:51	11:42
Laptop Clock:		10:47	11:38
Battery (Main):		14.0	14.5
Battery:		Good	
Battery Serial #:		-	-
Enclosure Dissasint:		Replaced	
Vent Tube Dissasint:		Good	
PT# (if replaced):		-	-
Logger# (if replaced):		-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.08	LB:	53.00		
Serial Number:	4712	Saintry (ppt):	0.0	RB:	16.60		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	-	System Test Passed: Yes			
		ADCP Temperature (°C):	-				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	36.36	26.23	0.263	6.909	2.54%	72.2
Depth Reference: Vertical beam	2	36.35	25.72	0.26	6.893	-0.66%	71.7
Coordinate System: ENR	4	36.16	25.95	0.26	6.734	-0.60%	71.9
Left Method: Sloped bank	5	35.76	25.38	0.261	6.615	-1.82%	71.8
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
Mean:		36.16	25.94	0.261	6.74		
SD:		0.24	0.21	0.001	0.108		
COV:		0.01	0.01	0.005	0.016		

Level Survey:	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S43-06	0.714	102.237		101.523	101.523	Lag Bolt in Tree
S43-04			1.882	100.355	100.338	3/4" pipe 1m E of data logger
S43-01			1.949	100.288	100.270	3/4" pipe 1 m S of data logger
Water Level:	Cut		3.280	98.957		Time WL Surveyed: 10:53
S43-01			1.949	100.288	100.270	3/4" pipe 1 m S of data logger
Turn						
S43-01	1.909	102.197		100.288	100.270	3/4" pipe 1 m S of data logger
Water Level:	Cut		3.239	98.958		Time WL Surveyed: 10:54
S43-01			1.909	100.288	100.270	3/4" pipe 1 m S of data logger
S43-04			1.842	100.355	100.338	3/4" pipe 1m E of data logger
S43-05			0.874	101.523	101.523	Lag Bolt in Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S43-04	1.842	102.197		100.355		Time WL Surveyed: 11:40
Water Level:	Cut		3.217	98.956		Time WL Surveyed: 11:41
S43-04	1.818	102.173		100.355		

WL Survey Summary		Before	After	Level Survey Equipment:	
Average WL:		98.958	98.957	Level #:	Level#2
Closing Error:		0.000	-	Make & Model:	Nikon AC-2S
WL Check:		0.001	0.001	Serial #:	668859
Transducer Elevation:		98.345	98.343		

Field Personnel:		TR, GG	Trip Date:	19-Oct-15
Data Entry Personnel:	TR	Date:	19-Oct-15	
Data Check Personnel:	GG	Date:	12-Nov-15	
Entered Digitally in the Field:	Yes			

Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag
 UTM Location: 531528 E, 6354782 N

Site Visit Date: December 8, 2015
 Site Visit Time (MST): 08:11

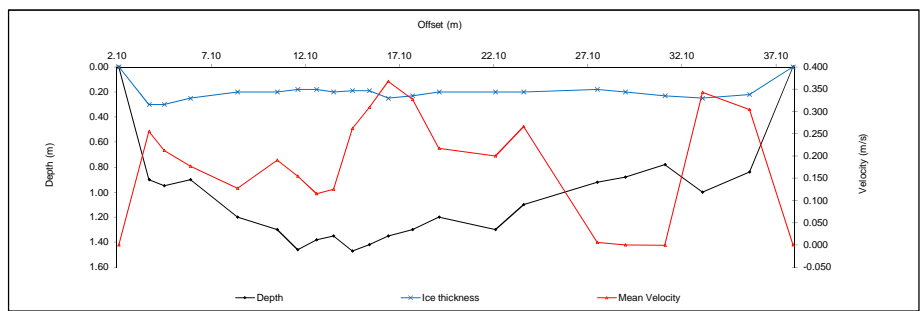


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.20	0.00	0.00		0.000		0.000		0.000	0.88	0.80	0.00	0.000	0.00	0.000	
1	3.80	0.90	0.30	0.60	0.290					0.88	1.20	0.60	0.255	0.72	0.184	3%
2	4.60	0.95	0.30	0.63	0.241					0.88	1.10	0.65	0.212	0.72	0.152	3%
3	6.00	0.90	0.25	0.58	0.201					0.88	1.95	0.65	0.177	1.27	0.224	4%
4	8.50	1.20	0.20			1.00	0.108	0.40	0.146	1.00	2.30	1.00	0.127	2.30	0.292	5%
5	10.60	1.30	0.20			1.08	0.181	0.42	0.200	1.00	1.60	1.10	0.191	1.76	0.336	6%
6	11.70	1.46	0.18			1.20	0.230	0.44	0.079	1.00	1.05	1.28	0.155	1.34	0.208	3%
7	12.70	1.38	0.18			1.14	0.229	0.42	0.001	1.00	0.95	1.20	0.115	1.14	0.131	2%
8	13.60	1.35	0.20			1.12	0.167	0.43	0.083	1.00	0.95	1.15	0.125	1.09	0.137	2%
9	14.60	1.47	0.19			1.21	0.278	0.45	0.245	1.00	0.95	1.28	0.262	1.22	0.318	5%
10	15.50	1.42	0.19			1.17	0.248	0.44	0.371	1.00	0.95	1.23	0.310	1.17	0.362	6%
11	16.50	1.35	0.25			1.13	0.360	0.47	0.375	1.00	1.15	1.10	0.368	1.27	0.465	8%
12	17.80	1.30	0.23			1.09	0.360	0.44	0.295	1.00	1.35	1.07	0.328	1.44	0.473	8%
13	19.20	1.20	0.20			1.00	0.216	0.40	0.219	1.00	2.20	1.00	0.218	2.20	0.479	8%
14	22.20	1.30	0.20			1.08	0.167	0.42	0.233	1.00	2.25	1.10	0.200	2.48	0.495	8%
15	23.70	1.10	0.20			0.92	0.297	0.38	0.235	1.00	2.70	0.90	0.266	2.43	0.646	11%
16	27.60	0.92	0.18	0.55	0.007					0.88	2.70	0.74	0.006	2.00	0.012	0%
17	29.10	0.88	0.20	0.54	0.000					0.88	1.80	0.68	0.000	1.22	0.000	0%
18	31.20	0.78	0.23	0.51	-0.001					0.88	2.05	0.55	-0.001	1.13	-0.001	0%
19	33.20	1.00	0.25	0.63	0.390					0.88	2.25	0.75	0.343	1.69	0.579	10%
20	35.70	0.84	0.22	0.53	0.346					0.88	2.40	0.62	0.304	1.49	0.453	8%
LB	38.00	0.00	0.00		0.00		0.00		0.00	0.88	1.15	0.00	0.000	0.00	0.000	
Total Flow														5.94	100%	

Flow Measurement Details:

Metering Section Location (describe): At station

Meas. Start Time (MST): 8:41
 Meas. End Time (MST): 9:34
 Equipment: ADV#1
 Flow Meter Make & Model: Sontek Flowtracker
 Flow Meter Serial #: P3398
 Method: Ice
 River Condition: Open leads
 Channel Edges: Trapezoidal Edge (e.g. stream)
 Quality/Error (see reverse): Fair
 Weather: Overcast, -6C



Flow characteristics:

Total Flow	5.940	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	30.06	(m ²)
Wetted Width:	35.80	(m)
Hydraulic Depth:	0.84	(m)
Mean Velocity:	0.20	(m/s)
Reynolds Number	9.31E+04	
Froude Number	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	0.931	-
Water (°C):	0.2	-
TBRG Tested?:	-	-
Datalogger Clock:	09:16	10:40
Laptop Clock:	08:12	09:36
Battery (Main):	12.6	12.9
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

Synched data logger clock with computer at 9:36.

General Notes:

Slush under ice affecting flow, graded fair.

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
S43-05	0.213	101.736		101.523	101.523	Lag Bolt in Tree
S43-04			1.379	100.357	100.338	3/4" pipe 1m E of data logger
S43-01			1.449	100.287	100.270	3/4" pipe 1 m S of data logger
Water Level:	Cut		2.460	99.276	Time WL Surveyed: 8:34	
Temporary BM			2.443	99.293		
Turn						
Temporary BM	2.420	101.713		99.293		
Water Level:	Cut		2.437	99.276	Time WL Surveyed: 8:36	
S43-01			1.424	100.289	100.270	3/4" pipe 1 m S of data logger
S43-04			1.353	100.360	100.338	3/4" pipe 1m E of data logger
S43-05			0.189	101.524	101.523	Lag Bolt in Tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	99.276	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	98.345	-

Level Survey Equipment:

Level #:	Lavel#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	DW, JM, GG	Trip Date:	8-Dec-15
Data Check Personnel:	JC	Date:	8-Jan-16
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay
 UTM Location: 460775 E, 6369400 N

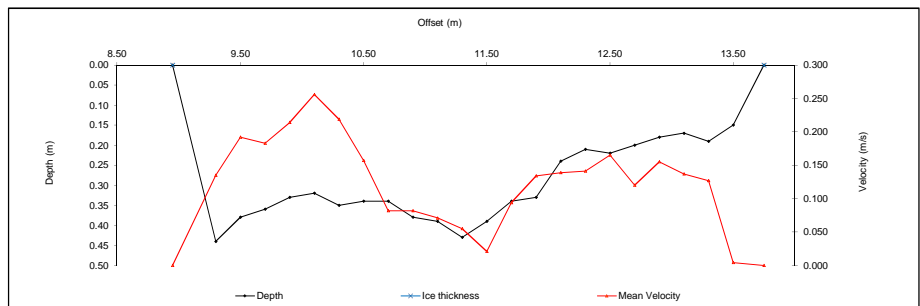
Site Visit Date: June 15, 2015
 Site Visit Time (MST): 13:27



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	13.75	0.00	0.00		0.000				0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	13.50	0.15		0.09	0.004					1.00	0.23	0.15	0.004	0.03	0.000	0%
2	13.30	0.19		0.11	0.127					1.00	0.20	0.19	0.127	0.04	0.005	3%
3	13.10	0.17		0.10	0.137					1.00	0.20	0.17	0.137	0.03	0.005	3%
4	12.90	0.18		0.11	0.155					1.00	0.20	0.18	0.155	0.04	0.006	3%
5	12.70	0.20		0.12	0.120					1.00	0.20	0.20	0.120	0.04	0.005	3%
6	12.50	0.22		0.13	0.165					1.00	0.20	0.22	0.165	0.04	0.007	4%
7	12.30	0.21		0.13	0.141					1.00	0.20	0.21	0.141	0.04	0.006	3%
8	12.10	0.24		0.14	0.139					1.00	0.20	0.24	0.139	0.05	0.007	4%
9	11.90	0.33		0.20	0.134					1.00	0.20	0.33	0.134	0.07	0.009	5%
10	11.70	0.34		0.20	0.094					1.00	0.20	0.34	0.094	0.07	0.006	4%
11	11.50	0.39		0.23	0.021					1.00	0.20	0.39	0.021	0.08	0.002	1%
12	11.30	0.43		0.26	0.055					1.00	0.20	0.43	0.055	0.09	0.005	3%
13	11.10	0.39		0.23	0.071					1.00	0.20	0.39	0.071	0.08	0.006	3%
14	10.90	0.38		0.23	0.082					1.00	0.20	0.38	0.082	0.08	0.006	3%
15	10.70	0.34		0.20	0.082					1.00	0.20	0.34	0.082	0.07	0.006	3%
16	10.50	0.34		0.20	0.157					1.00	0.20	0.34	0.157	0.07	0.011	6%
17	10.30	0.35		0.21	0.219					1.00	0.20	0.35	0.219	0.07	0.015	9%
18	10.10	0.32		0.19	0.256					1.00	0.20	0.32	0.256	0.06	0.016	9%
19	9.90	0.33		0.20	0.214					1.00	0.20	0.33	0.214	0.07	0.014	9%
20	9.70	0.36		0.22	0.183					1.00	0.20	0.36	0.183	0.07	0.013	7%
21	9.50	0.38		0.23	0.192					1.00	0.20	0.38	0.192	0.08	0.015	8%
22	9.30	0.44		0.26	0.135					1.00	0.28	0.44	0.135	0.12	0.016	9%
LB	8.95	0.00	0.00		0.00				0.00	1.00	0.18	0.00	0.000	0.00	0.000	
Total Flow														0.179	100%	

Flow Measurement Details:
 Metering Section Location (describe): 20m downstream of station

Meas. Start Time (MST):	13:50
Meas. End Time (MST):	14:23
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, calm, 19C



Flow characteristics:

Total Flow:	0.179	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.37	(m ²)
Wetted Width:	4.80	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.13	(m/s)
Reynolds Number:	3.18E+04	
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	0.338	0.324
Water (°C):	14.2	14.4
Datalogger Clock:	13:28	14:33
Laptop Clock:	13:28	14:33
Battery:	13.6	14.1
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S44-02	1.054	100.932		99.878	99.878	3/4" Pipe 8m E of logger
S44-04			0.859	100.073	100.073	3/4" Pipe 6m E of logger
S44-03			1.108	99.824	99.810	3/4" Pipe 2m W of logger
Water Level:	Cut		3.209	97.723	Time WL Surveyed:	13:31
Temporary BM:			3.255	97.677	0.000	
Turn						
Temporary BM	3.242	100.919		97.677		
Water Level:	Cut		3.195	97.724	Time WL Surveyed:	13:35
S44-03			1.096	99.823	99.810	3/4" Pipe 2m W of logger
S44-04			0.846	100.073	100.073	3/4" Pipe 6m E of logger
S44-02			1.038	99.881	99.878	3/4" Pipe 8m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S44-03	1.095	100.919		99.824		
Water Level:	Cut		3.196	97.723	Time WL Surveyed:	14:29
Water Level:	Cut		3.183	97.724	Time WL Surveyed:	14:31
S44-03	1.083	100.907		99.824		

WL Survey Summary

	Before	After
Average WL:	97.724	97.724
Closing Error:	-0.003	-
WL Check:	0.001	-0.001
Transducer Elevation	97.386	97.400

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	568785

Field Personnel:

Field Personnel:	GG, MK	Trip Date:	15-Jun-15
Data Entry Personnel:	GG	Date:	15-Jun-15
Data Check Personnel:	DW	Date:	26-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay
 UTM Location: 460775 E, 6369400 N

Site Visit Date: August 16, 2015
 Site Visit Time (MST): 12:23

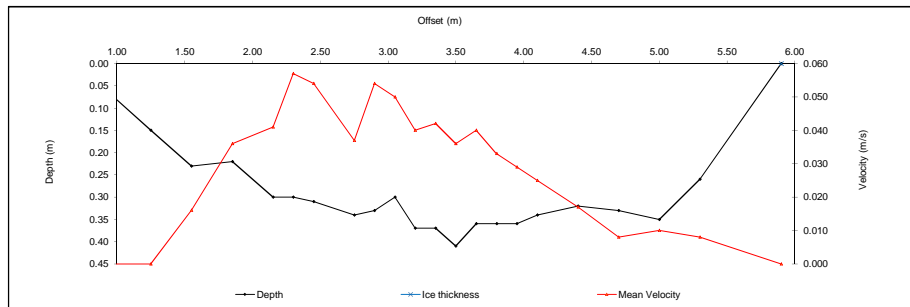


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	5.90	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	5.30	0.26		0.16	0.008					1.00	0.45	0.26	0.008	0.12	0.001	2%
2	5.00	0.35		0.21	0.010					1.00	0.30	0.35	0.010	0.11	0.001	3%
3	4.70	0.33		0.20	0.008					1.00	0.30	0.33	0.008	0.10	0.001	2%
4	4.40	0.32		0.19	0.017					1.00	0.30	0.32	0.017	0.10	0.002	4%
5	4.10	0.34		0.20	0.025					1.00	0.23	0.34	0.025	0.08	0.002	5%
6	3.95	0.36		0.22	0.029					1.00	0.15	0.36	0.029	0.05	0.002	4%
7	3.80	0.36		0.22	0.033					1.00	0.15	0.36	0.033	0.05	0.002	5%
8	3.65	0.36		0.22	0.040					1.00	0.15	0.36	0.040	0.05	0.002	6%
9	3.50	0.41		0.25	0.036					1.00	0.15	0.41	0.036	0.06	0.002	6%
10	3.35	0.37		0.22	0.042					1.00	0.15	0.37	0.042	0.06	0.002	6%
11	3.20	0.37		0.22	0.040					1.00	0.15	0.37	0.040	0.06	0.002	6%
12	3.05	0.30		0.18	0.050					1.00	0.15	0.30	0.050	0.05	0.002	6%
13	2.90	0.33		0.20	0.054					1.00	0.15	0.33	0.054	0.05	0.003	7%
14	2.75	0.34		0.20	0.037					1.00	0.23	0.34	0.037	0.08	0.003	7%
15	2.45	0.31		0.19	0.054					1.00	0.23	0.31	0.054	0.07	0.004	10%
16	2.30	0.30		0.18	0.057					1.00	0.15	0.30	0.057	0.05	0.003	7%
17	2.15	0.30		0.18	0.041					1.00	0.23	0.30	0.041	0.07	0.003	7%
18	1.85	0.22		0.13	0.036					1.00	0.30	0.22	0.036	0.07	0.002	6%
19	1.55	0.23		0.14	0.016					1.00	0.30	0.23	0.016	0.07	0.001	3%
20	1.25	0.15		0.09	0.000					1.00	0.43	0.15	0.000	0.06	0.000	0%
LB	0.70	0.00	0.00		0.000		0.000		0.000	1.00	0.28	0.00	0.000	0.00	0.000	
Total Flow														0.039	100%	

Flow Measurement Details:

Metering Section Location (describe):
3m upstream of trail

Meas. Start Time (MST):	12:40
Meas. End Time (MST):	13:05
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Open, low
Channel Edges:	Straight Edge (e.g. bridge/piar)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 20C



Flow characteristics:

Total Flow:	0.039	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.38	(m ²)
Wetted Width:	5.20	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.03	(m/s)
Reynolds Number:	6.41E+03	
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	0.224	0.311
Water (°C):	14.4	14.6
Datalogger Clock:	12:24	13:09
Laptop Clock:	12:24	13:09
Battery:	13.3	13.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	New	
Vent Tube Desiccant:	Good	
PT# (if replaced):	248902	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:
- PT repositioned

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S44-02	1.050	100.928		99.878	99.878	3/4" Pipe 8m E of logger
S44-04			0.857	100.071	100.073	3/4" Pipe 6m E of logger
S44-03			1.107	99.821	99.810	3/4" Pipe 2m W of logger
Water Level:	Cut		3.303	97.625		Time WL Surveyed: 12:28
S44-03			1.107	99.821	99.810	3/4" Pipe 2m W of logger
Turn						
S44-03	1.083	100.904		99.821	99.810	3/4" Pipe 2m W of logger
Water Level:	Cut		3.278	97.626		Time WL Surveyed: 12:30
S44-03			1.083	99.821	99.810	3/4" Pipe 2m W of logger
S44-04			0.833	100.071	100.073	3/4" Pipe 6m E of logger
S44-02			1.026	99.878	99.878	3/4" Pipe 8m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S44-03	1.083	100.904		99.821		Time WL Surveyed: 13:12
Water Level:	Cut		3.281	97.623		Time WL Surveyed: 13:14
Water Level:	Cut		3.258	97.622		
S44-03	1.059	100.880		99.821		

WL Survey Summary

	Before	After
Average WL:	97.626	97.623
Closing Error:	0.000	-
WL Check:	0.001	0.001
Transducer Elevation	97.402	97.312

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	GG, DW	Trip Date:	16-Aug-15
Data Entry Personnel:	GG	Date:	16-Aug-15
Data Check Personnel:	DW	Date:	3-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay
 UTM Location: 460775 E, 6369400 N

Site Visit Date: Sept. 13, 2015
 Site Visit Time (MST): 12:00



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	6.25	0.00	0.00		0.000				0.000	1.00	0.38	0.00	0.000	0.00	0.000	
1	5.50	0.14		0.08	0.160					1.00	0.48	0.14	0.160	0.07	0.011	9%
2	5.30	0.13		0.08	0.056					1.00	0.20	0.13	0.056	0.03	0.001	1%
3	5.10	0.14		0.08	0.167					1.00	0.20	0.14	0.167	0.03	0.005	4%
4	4.90	0.15		0.09	0.126					1.00	0.20	0.15	0.126	0.03	0.004	3%
5	4.70	0.19		0.11	0.270					1.00	0.20	0.19	0.270	0.04	0.010	9%
6	4.50	0.22		0.13	0.174					1.00	0.20	0.22	0.174	0.04	0.008	7%
7	4.30	0.18		0.11	0.231					1.00	0.15	0.18	0.231	0.03	0.006	6%
8	4.20	0.18		0.11	0.338					1.00	0.10	0.18	0.338	0.02	0.006	5%
9	4.10	0.21		0.13	0.286					1.00	0.15	0.21	0.286	0.03	0.009	8%
10	3.90	0.16		0.10	0.205					1.00	0.20	0.16	0.205	0.03	0.007	6%
11	3.70	0.20		0.12	0.192					1.00	0.20	0.20	0.192	0.04	0.008	7%
12	3.50	0.24		0.14	0.091					1.00	0.20	0.24	0.091	0.05	0.004	4%
13	3.30	0.26		0.16	0.100					1.00	0.20	0.26	0.100	0.05	0.005	5%
14	3.10	0.26		0.16	0.168					1.00	0.15	0.26	0.168	0.04	0.007	6%
15	3.00	0.28		0.17	0.174					1.00	0.10	0.28	0.174	0.03	0.005	4%
16	2.90	0.30		0.18	0.179					1.00	0.10	0.30	0.179	0.03	0.005	5%
17	2.80	0.27		0.16	0.239					1.00	0.10	0.27	0.239	0.03	0.006	6%
18	2.70	0.30		0.18	0.147					1.00	0.15	0.30	0.147	0.05	0.007	6%
19	2.50	0.30		0.18	0.011					1.00	0.20	0.30	0.011	0.06	0.001	1%
20	2.30	0.34		0.20	-0.022					1.00	0.13	0.34	-0.022	0.04	-0.001	-1%
LB	2.25	0.00	0.00		0.00				0.00	1.00	0.02	0.00	0.000	0.00	0.000	
Total Flow														0.113	100%	

Flow Measurement Details:

Metering Section Location (describe):
 50m upstream of station

Meas. Start Time (MST):	13:45
Meas. End Time (MST):	14:11
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 15C

Flow characteristics:

Total Flow:	0.113	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.75	(m ²)
Wetted Width:	4.00	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.15	(m/s)
Reynolds Number:	2.14E+04	
Froude Number:	0.11	

Logger Details:

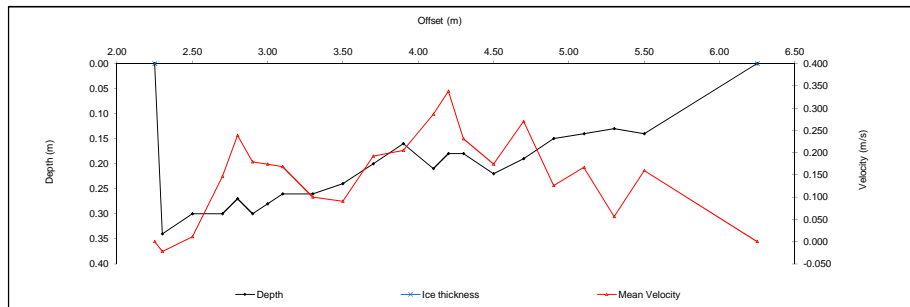
	Before	After
Transducer Reading (m):	0.399	0.405
Water (°C):	10.0	10.2
Datalogger Clock:	12:54	14:34
Laptop Clock:	12:54	14:34
Battery:	13.1	12.9
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	-
Vent Tube Dessicant:	Replaced	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Station went down on 1-Sep-15
- Disconnected solar controller, needs a new one
- Bring a newly charged battery next visit
- Disconnected modem to save power

General Notes:

- Established a new BM



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S44-02	1.412	101.290		99.878	99.878	3/4" Pipe 8m E of logger
S44-04			1.215	100.075	100.073	3/4" Pipe 6m E of logger
S44-03			1.471	99.819	99.810	3/4" Pipe 2m W of logger
S44-05			0.238	101.052	101.054	Lag bolt in tree 6m N of station
Water Level:	Cut		3.611	97.679		Time WL Surveyed: 13:30
Temporary BM			3.658	97.632	0.000	-
Turn						
Temporary BM	3.667	101.299		97.632		-
Water Level:	Cut		3.620	97.679		Time WL Surveyed: 13:32
S44-05			0.243	101.056	101.054	Lag bolt in tree 6m N of station
S44-03			1.477	99.822	99.810	3/4" Pipe 2m W of logger
S44-04			1.222	100.077	100.073	3/4" Pipe 6m E of logger
S44-02			1.418	99.881	99.878	3/4" Pipe 8m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S44-04	1.222	101.298		100.076		
Water Level:	Cut		3.625	97.673		Time WL Surveyed: 14:23
Water Level:	Cut		3.585	97.673		Time WL Surveyed: 14:25
S44-04	1.182	101.258		100.076		

WL Survey Summary

	Before	After
Average WL:	97.679	97.673
Closing Error:	-0.003	-
WL Check:	0.000	0.000
Transducer Elevation	97.280	97.268

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	TL, CJ	Trip Date:	13-Sep-15
Data Check Personnel:	DW	Date:	28-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay
 UTM Location: 460775 E, 6369400 N

Site Visit Date: October 29, 2015
 Site Visit Time (MST): 13:20

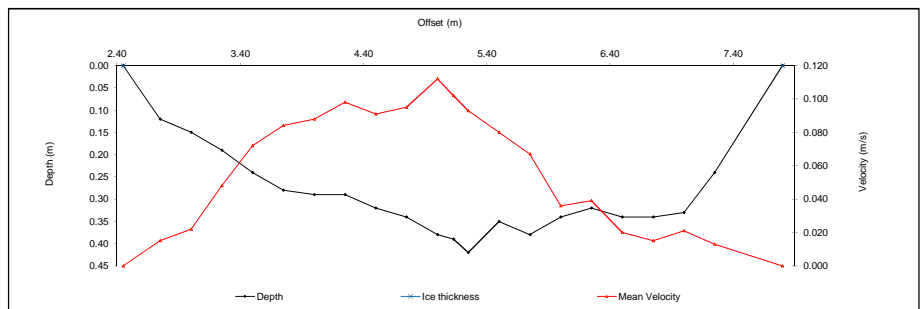


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.45	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.75	0.12		0.07	0.015					1.00	0.28	0.12	0.015	0.03	0.000	1%
2	3.00	0.15		0.09	0.022					1.00	0.25	0.15	0.022	0.04	0.001	1%
3	3.25	0.19		0.11	0.048					1.00	0.25	0.19	0.048	0.05	0.002	3%
4	3.50	0.24		0.14	0.072					1.00	0.25	0.24	0.072	0.06	0.004	5%
5	3.75	0.28		0.17	0.084					1.00	0.25	0.28	0.084	0.07	0.006	7%
6	4.00	0.29		0.17	0.088					1.00	0.25	0.29	0.088	0.07	0.006	7%
7	4.25	0.29		0.17	0.098					1.00	0.25	0.29	0.098	0.07	0.007	8%
8	4.50	0.32		0.19	0.091					1.00	0.25	0.32	0.091	0.08	0.007	8%
9	4.75	0.34		0.20	0.095					1.00	0.25	0.34	0.095	0.09	0.008	9%
10	5.00	0.38		0.23	0.112					1.00	0.19	0.38	0.112	0.07	0.008	9%
11	5.13	0.39		0.23	0.102					1.00	0.13	0.39	0.102	0.05	0.005	6%
12	5.25	0.42		0.25	0.093					1.00	0.19	0.42	0.093	0.08	0.007	8%
13	5.50	0.35		0.21	0.080					1.00	0.25	0.35	0.080	0.09	0.007	8%
14	5.75	0.38		0.23	0.067					1.00	0.25	0.38	0.067	0.10	0.006	7%
15	6.00	0.34		0.20	0.036					1.00	0.25	0.34	0.036	0.09	0.003	3%
16	6.25	0.32		0.19	0.039					1.00	0.25	0.32	0.039	0.08	0.003	4%
17	6.50	0.34		0.20	0.020					1.00	0.25	0.34	0.020	0.09	0.002	2%
18	6.75	0.34		0.20	0.015					1.00	0.25	0.34	0.015	0.09	0.001	1%
19	7.00	0.33		0.20	0.021					1.00	0.25	0.33	0.021	0.08	0.002	2%
20	7.25	0.24		0.14	0.013					1.00	0.40	0.24	0.013	0.10	0.001	1%
LB	7.80	0.00	0.00		0.000				0.000	1.00	0.28	0.00	0.000	0.00	0.000	
Total Flow														0.088	100%	

Flow Measurement Details:

Metering Section Location (describe):
1m downstream of log bridge

Meas. Start Time (MST):	13:40
Meas. End Time (MST):	14:05
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 4c



Flow characteristics:

Total Flow:	0.088	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.45	(m ²)
Wetted Width:	5.35	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.06	(m/s)
Reynolds Number:	1.00E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.371	0.372
Water (°C):	2.6	2.7
Datalogger Clock:	13:20	14:06
Laptop Clock:	13:20	14:06
Battery:	12.6	12.6
Battery Condition:		
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	248902	-
Logger# (if replaced):	16117	-

Datalogger / Station Notes:

-Solar controller was replaced

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S44-02	0.899	100.777		99.878	99.878	3/4" Pipe 8m E of logger
S44-04			0.704	100.073	100.073	3/4" Pipe 6m E of logger
S44-03			0.956	99.821	99.810	3/4" Pipe 2m W of logger
Water Level:	Cut		3.123	97.654		Time WL Surveyed: 13:34
S44-03			0.956	99.821	99.810	3/4" Pipe 2m W of logger
Turn						
S44-03	0.987	100.808		99.821	99.810	3/4" Pipe 2m W of logger
Water Level:	Cut		3.153	97.655		Time WL Surveyed: 13:28
S44-03			0.987	99.821	99.810	3/4" Pipe 2m W of logger
S44-04			0.736	100.072	100.073	3/4" Pipe 6m E of logger
S44-02			0.531	99.877	99.878	3/4" Pipe 8m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S44-03	0.954	100.775		99.821		Time WL Surveyed: 14:15
Water Level:	Cut		3.124	97.651		Time WL Surveyed: 14:16
Water Level:	Cut		3.059	97.653		
S44-03	0.891	100.712		99.821		

WL Survey Summary

	Before	After
Average WL:	97.655	97.652
Closing Error:	0.001	-
WL Check:	0.001	-0.002
Transducer Elevation	97.284	97.280

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Cansel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	29-Oct-15
Data Check Personnel:	JC	Date:	16-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: January 14, 2015
 Site Visit Time (MST): 14:00

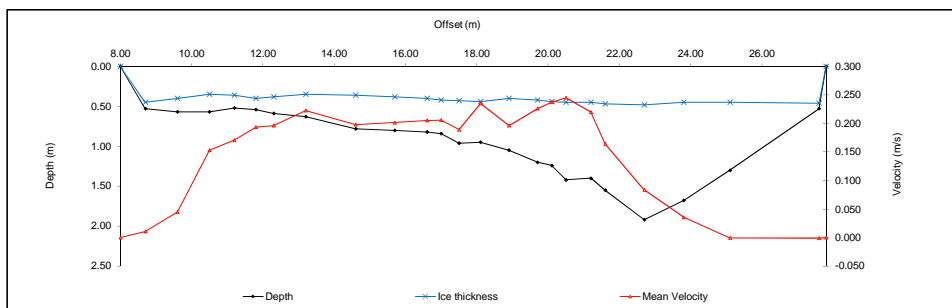


Flow Measurement:																	
Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
RB	8.00	0.00	0.00		0.000		0.000		0.000	0.88	0.35	0.00	0.000	0.00	0.000		
1	8.70	0.53	0.45	0.49	0.012					0.88	0.80	0.08	0.011	0.06	0.001	0%	
2	9.60	0.57	0.40	0.49	0.051					0.88	0.90	0.17	0.045	0.15	0.007	0%	
3	10.50	0.57	0.35	0.46	0.174					0.88	0.80	0.22	0.153	0.18	0.027	2%	
4	11.20	0.52	0.36	0.44	0.194					0.88	0.65	0.16	0.171	0.10	0.018	1%	
5	11.80	0.54	0.40	0.47	0.220					0.88	0.55	0.14	0.194	0.08	0.015	1%	
6	12.30	0.59	0.38	0.49	0.223					0.88	0.70	0.21	0.196	0.15	0.029	2%	
7	13.20	0.63	0.35	0.49	0.253					0.88	1.15	0.28	0.223	0.32	0.072	5%	
8	14.60	0.78	0.36	0.57	0.225					0.88	1.25	0.42	0.198	0.53	0.104	7%	
9	15.70	0.80	0.38	0.59	0.229					0.88	1.00	0.42	0.202	0.42	0.085	6%	
10	16.60	0.82	0.40	0.61	0.233					0.88	0.65	0.42	0.205	0.27	0.056	4%	
11	17.00	0.84	0.42	0.63	0.234					0.88	0.45	0.42	0.206	0.19	0.039	3%	
12	17.50	0.96	0.43	0.70	0.215					0.88	0.55	0.53	0.189	0.29	0.055	4%	
13	18.10	0.95	0.44	0.70	0.267					0.88	0.70	0.51	0.235	0.36	0.084	6%	
14	18.90	1.05	0.40	0.73	0.223					0.88	0.80	0.65	0.196	0.52	0.102	7%	
15	19.70	1.20	0.42			1.04	0.194	0.58	0.258	1.00	0.60	0.78	0.226	0.47	0.106	7%	
16	20.10	1.24	0.44			1.08	0.217	0.60	0.257	1.00	0.40	0.80	0.237	0.32	0.076	5%	
17	20.50	1.42	0.45			1.23	0.247	0.64	0.243	1.00	0.55	0.97	0.245	0.53	0.131	9%	
18	21.20	1.40	0.45			1.21	0.205	0.64	0.235	1.00	0.55	0.95	0.220	0.52	0.115	8%	
19	21.60	1.55	0.47			1.33	0.154	0.69	0.175	1.00	0.75	1.08	0.165	0.81	0.133	9%	
20	22.70	1.92	0.48			1.63	0.061	0.77	0.106	1.00	1.10	1.44	0.084	1.58	0.132	9%	
21	23.80	1.68	0.45			1.43	0.020	0.70	0.051	1.00	1.20	1.23	0.036	1.48	0.052	4%	
22	25.10	1.30	0.45			1.13	0.001	0.62	-0.002	1.00	1.30	0.85	-0.001	1.62	-0.001	0%	
23	27.60	0.53	0.46	0.50	-0.001					0.88	1.35	0.07	-0.001	0.09	0.000	0%	
LB	27.80	0.00	0.00		0.00		0.00		0.00	0.88	0.10	0.00	0.000	0.00	0.000		
Total Flow														1.44	100%		

Flow Measurement Details:

Metering Section Location (describe): 35m downstream of station

Meas. Start Time (MST):	14:40
Meas. End Time (MST):	15:22
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -9C



Flow characteristics:

Total Flow:	1.44	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.04	(m ²)
Wetted Width:	19.80	(m)
Hydraulic Depth:	0.56	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.06	

Logger Details:

	Before	After
Transducer Reading (m):	0.708	-
Water (°C):	0.1	-
Datalogger Clock:	14:10	-
Laptop Clock:	14:10	-
Battery (Main):	12.5	12.7
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- Needs new BM

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-06	0.960	100.840		99.880	99.880	3/4" Pipe 3m E of data logger
S45-05			1.032	99.808	99.784	3/4" Pipe 3m N of data logger
Water Level:	Cut		3.100	97.740		Time WL Surveyed: 15:26
			2.958	97.882		
Turn						
	2.938	100.820		97.882		
Water Level:	Cut		3.078	97.742		Time WL Surveyed: 15:29
S45-05			1.012	99.808	99.784	3/4" Pipe 3m N of data logger
S45-06			0.941	99.879	99.880	3/4" Pipe 3m E of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.741	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	97.033	-

Field Personnel:

Data Entry Personnel:	MP, DW	Trip Date:	14-Jan-15
Data Check Personnel:	MP	Date:	14-Jan-15
Entered Digitally in the Field:	Yes	Date:	10-Mar-14

Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: February 9, 2015
 Site Visit Time (MST): 13:45

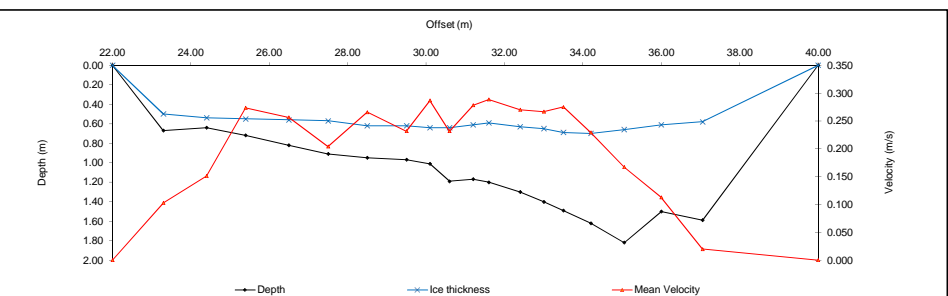


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	22.00	0.00	0.00							0.88	0.65	0.00	0.000	0.00	0.000	
1	23.30	0.67	0.50	0.59	0.117					0.88	1.20	0.17	0.103	0.20	0.021	1%
2	24.40	0.64	0.54	0.59	0.172					0.88	1.05	0.10	0.151	0.11	0.016	1%
3	25.40	0.72	0.55	0.64	0.311					0.88	1.05	0.17	0.274	0.18	0.049	3%
4	26.50	0.82	0.56	0.69	0.291					0.88	1.05	0.26	0.256	0.27	0.070	5%
5	27.50	0.91	0.57	0.74	0.232					0.88	1.00	0.34	0.204	0.34	0.069	5%
6	28.50	0.95	0.62	0.79	0.302					0.88	1.00	0.33	0.266	0.33	0.088	6%
7	29.50	0.97	0.62	0.80	0.263					0.88	0.80	0.35	0.231	0.28	0.065	4%
8	30.10	1.01	0.64	0.83	0.326					0.88	0.55	0.37	0.287	0.20	0.058	4%
9	30.60	1.19	0.64	0.92	0.263					0.88	0.55	0.55	0.231	0.30	0.070	5%
10	31.20	1.17	0.61	0.89	0.316					0.88	0.50	0.56	0.278	0.28	0.078	5%
11	31.60	1.20	0.59	0.90	0.328					0.88	0.60	0.61	0.289	0.37	0.106	7%
12	32.40	1.30	0.63	0.97	0.307					0.88	0.70	0.67	0.270	0.47	0.127	8%
13	33.00	1.40	0.65	1.03	0.303					0.88	0.55	0.75	0.267	0.41	0.110	7%
14	33.50	1.49	0.69			1.33	0.255	0.85	0.295	1.00	0.60	0.80	0.275	0.48	0.132	9%
15	34.20	1.62	0.70			1.44	0.176	0.88	0.283	1.00	0.77	0.92	0.230	0.71	0.164	11%
16	35.05	1.82	0.66			1.59	0.137	0.89	0.198	1.00	0.90	1.16	0.168	1.04	0.175	11%
17	36.00	1.50	0.61			1.32	0.107	0.79	0.118	1.00	1.00	0.89	0.113	0.89	0.100	7%
18	37.05	1.59	0.58			1.39	0.040	0.78		1.00	2.00	1.01	0.020	2.02	0.040	3%
RB	40.00	0.00	0.00							0.88	1.48	0.00	0.000	0.00	0.000	
Total Flow														1.54	100%	

Flow Measurement Details:

Metering Section Location (describe): 30m downstream of station

Meas. Start Time (MST):	14:34
Meas. End Time (MST):	15:20
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light snow, -15C



Flow characteristics:

Total Flow:	1.54	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.89	(m ²)
Wetted Width:	18.00	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	0.820	-
Water (°C):	0.1	-
Datalogger Clock:	13:50	-
Laplace Clock:	13:50	-
Battery (Main):	14.6	12.8
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-Battery replaced

General Notes:

-Old nail in stump BM (BM 4) used in survey

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-06	1.007	100.887		99.880	99.880	3/4" Pipe 3m E of data logger
S45-04			0.840	100.047	100.050	Nail in stump
S45-05			1.079	99.808	99.784	3/4" Pipe 3m N of data logger
Water Level:						
Water Level:	Cut		3.042	97.845		Time WL Surveyed: 14:25
Temporary BM			2.823	98.064		0.000
Turn						
Temporary BM	2.811	100.875		98.064		-
Water Level:	Cut		3.026	97.849		Time WL Surveyed: 14:31
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.847	-
Closing Error:	0.001	-
WL Check:	0.004	-
Transducer Elevation	97.027	-

Field Personnel:

	TR, CJ	Trip Date:	9-Feb-15
Data Entry Personnel:	TR	Date:	9-Feb-15
Data Check Personnel:	CJ	Date:	11-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: March 10, 2015
 Site Visit Time (MST): 12:31

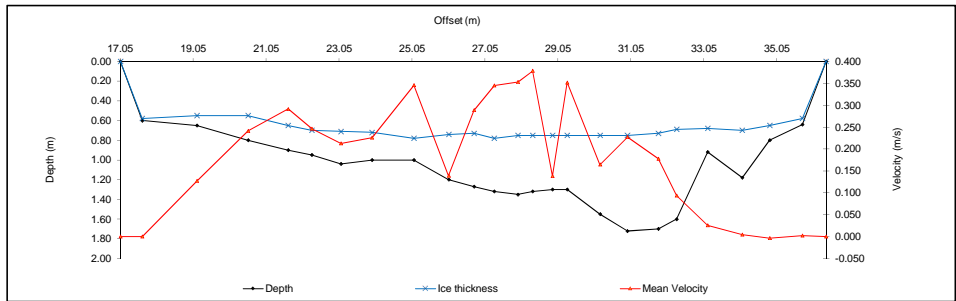


Flow Measurement:																
Measured Data											Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	36.40	0.00	0.00		0.000		0.000		0.000	0.88	0.32	0.00	0.000	0.00	0.000	
1	35.75	0.64	0.58	0.61	0.003					0.88	0.78	0.06	0.003	0.05	0.000	0%
2	34.85	0.80	0.65	0.73	-0.004					0.88	0.82	0.15	-0.004	0.12	0.000	0%
3	34.10	1.18	0.70	0.94	0.005					0.88	0.85	0.48	0.004	0.41	0.002	0%
4	33.15	0.92	0.68	0.80	0.029					0.88	0.90	0.24	0.026	0.22	0.006	0%
5	32.30	1.60	0.69			1.42	0.110	0.87	0.078	1.00	0.67	0.91	0.094	0.61	0.058	4%
6	31.80	1.70	0.73			1.51	0.122	0.92	0.233	1.00	0.67	0.97	0.178	0.65	0.116	8%
7	30.95	1.72	0.75			1.53	0.191	0.94	0.264	1.00	0.80	0.97	0.228	0.78	0.177	12%
8	30.20	1.55	0.75			1.39	0.117	0.91	0.212	1.00	0.82	0.80	0.165	0.66	0.109	7%
9	29.30	1.30	0.75	1.03	0.400					0.88	0.65	0.55	0.352	0.36	0.126	8%
10	28.90	1.30	0.75	1.03	0.157					0.88	0.48	0.55	0.138	0.26	0.036	2%
11	28.35	1.32	0.75	1.04	0.430					0.88	0.48	0.57	0.378	0.27	0.102	7%
12	27.95	1.35	0.75	1.05	0.401					0.88	0.52	0.60	0.353	0.31	0.111	7%
13	27.30	1.32	0.78	1.05	0.392					0.88	0.60	0.54	0.345	0.32	0.112	7%
14	26.75	1.27	0.73	1.00	0.328					0.88	0.63	0.54	0.289	0.34	0.097	6%
15	26.05	1.20	0.74	0.97	0.158					0.88	0.82	0.46	0.139	0.38	0.053	3%
16	25.10	1.00	0.78	0.89	0.393					0.88	1.05	0.22	0.346	0.23	0.080	5%
17	23.95	1.00	0.72	0.86	0.257					0.88	1.00	0.28	0.226	0.28	0.063	4%
18	23.10	1.04	0.71	0.88	0.242					0.88	0.82	0.33	0.213	0.27	0.058	4%
19	22.30	0.95	0.70	0.83	0.280					0.88	0.73	0.25	0.246	0.18	0.045	3%
20	21.65	0.90	0.65	0.78	0.331					0.88	0.88	0.25	0.291	0.22	0.064	4%
21	20.55	0.80	0.55	0.68	0.274					0.88	1.25	0.25	0.241	0.31	0.075	5%
22	19.15	0.65	0.55	0.60	0.145					0.88	1.45	0.10	0.128	0.15	0.019	1%
23	17.65	0.60	0.58	0.59	0.000					0.88	1.05	0.02	0.000	0.02	0.000	0%
LB	17.05	0.00	0.00		0.00		0.00		0.00	0.88	0.30	0.00	0.000	0.00	0.000	
Total Flow														1.51	100%	

Flow Measurement Details:

Metering Section Location (describe):
30m downstream of station

Meas. Start Time (MST):	13:00
Meas. End Time (MST):	13:55
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, -5C



Flow characteristics:

Total Flow:	1.51	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.41	(m ²)
Wetted Width:	19.35	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.11	

Logger Details:

	Before	After
Transducer Reading (m):	0.854	
Water (°C):	0.1	
Datalogger Clock:	12:32	
Laptop Clock:	12:32	
Battery (Main):	14.9	
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-06	1.107	100.987		99.880	99.880	3/4" Pipe 3m E of data logger
S45-05			1.179	99.808	99.809	3/4" Pipe 3m N of data logger
Turn						
Temporary BM	2.765	100.960		98.195		
Water Level:	Cut		3.073	97.914		Time WL Surveyed: 13:59
Temporary BM			2.792	98.195		
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:
Turn						
Temporary BM	2.765	100.960		98.195		
Water Level:	Cut		3.048	97.912		Time WL Surveyed: 14:03
Benchmark						
S45-05			1.153	99.807	99.809	3/4" Pipe 3m N of data logger
S45-06			1.081	99.879	99.880	3/4" Pipe 3m E of data logger

WL Survey Summary

	Before	After
Average WL:	97.913	
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	97.059	-

Field Personnel:

	GG, DW	Trip Date:	10-Mar-15
Data Entry Personnel:	GG	Date:	10-Mar-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S45 - Ellis River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: April 19, 2015
 Site Visit Time (MST): 09:00



Flow Measurement Details:	
Metering Section Location (describe): At station	
Meas. Start Time (MST):	9:10
Meas. End Time (MST):	9:55
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 7C

Flow characteristics:	
Total Flow:	17.4 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	35.49 (m ²)
Wetted Width:	37.03 (m)
Hydraulic Depth:	0.96 (m)
Mean Velocity:	0.49 (m/s)
Froude Number:	0.16

Logger Details:		
Transducer Reading (m):	Before	After
Water (C):	0.1	0.2
Datalogger Clock:	07:45	10:22
Laptop Clock:	07:45	10:23
Battery (Main):	14.8	14.4
Battery:	-	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTA (if replaced):	-	-
Loggert (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Major ice jam released after first download and survey (approx. 8:50)

ADCP Flow Measurement Summary:					
System Information:		System Setup:		Bank Offsets:	
System Type:	Sonotek RS-M9	Transducer Depth (m):	0.05	LB:	42.10
Serial Number:	4712	Salinity (ppt):	-	RB:	4.80
Firmware Version:	3.8	Magnetic Declination (°):	14.33		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	-		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom Track	Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	36.95	35.43	0.49
Coordinate System:	ENU	2	37.11	36.15	0.477
Left Method:	Sloped Bank	3	37.80	35.38	0.506
Right Method:	Sloped Bank	4	36.27	34.99	0.49
Top Fit Type:	Power Fit				
Bottom Fit Type:	Power Fit				
		Mean:	37.03	35.49	0.491
		SD:	0.54	0.42	0.010
		COV:	0.01	0.01	0.021
					17.4
					0.255
					0.017

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-05	1.436	101.245		99.809	99.809	3/4" Pipe 3m N of data logger
S45-06			1.363	99.852	99.850	3/4" Pipe 3m E of data logger
Water Level:	Cut	2.380	98.865			Time WL Surveyed: 7:50
Temporary BM			2.008	99.237	0.000	
Turn						
Temporary BM	1.992	101.229		99.237		
Water Level:	Cut		2.363	98.866		Time WL Surveyed: 7:54
S45-06			1.343	99.886	99.880	3/4" Pipe 3m E of data logger
S45-05			1.417	99.812	99.809	3/4" Pipe 3m N of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S45-05	1.417	101.229		99.812		
Water Level:	Cut		2.617	98.612		Time WL Surveyed: 10:13
Water Level:	Cut		2.602	98.610		Time WL Surveyed: 10:15
S45-05	1.400	101.212		99.812		

WL Survey Summary		
	Before	After
Average WL:	98.866	98.611
Closing Error:	-0.003	-
WL Check:	0.001	0.002
Transducer Elevation	97.039	97.044

Field Personnel:			
Field Personnel:	GG, RM	Trip Date:	19-Apr-15
Data Entry Personnel:	GG	Date:	19-Apr-15
Data Check Personnel:	CJ	Date:	11-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S45 - Ellis River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: May 8, 2015
 Site Visit Time (MST): 13:10



Flow Measurement Details:	
Metering Section Location (describe): 10m upstream of station	
Meas. Start Time (MST):	13:50
Meas. End Time (MST):	14:10
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Light rain, calm, 6C

Flow characteristics:	
Total Flow:	13.4 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	19.20 (m ²)
Wetted Width:	33.64 (m)
Hydraulic Depth:	0.57 (m)
Mean Velocity:	0.70 (m/s)
Froude Number:	0.30

Logger Details:		
Transducer Reading (m):	Before	After
Water (C):	6.6	6.8
Datalogger Clock:	13:22	14:23
Laptop Clock:	13:22	14:23
Battery (Main):	14.2	14.1
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTA (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:
 -First temporary bm is the old nail in stump (BM 4)

General Notes:

ADCP Flow Measurement Summary:					
System Information:		System Setup:		Bank Offsets:	
System Type:	Sonotek RS-M9	Transducer Depth (m):	0.05	LB:	63.50
Serial Number:	4712	Salinity (ppt):	0.0	RB:	30.00
Firmware Version:	3.8	Magnetic Declination (°):	14.33		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	8.1		
Discharge Calculation Settings:		Measurement Results:			
Track Reference:	Bottom Track	Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	33.99	19.11	0.710
Coordinate System:	ENU	2	33.65	18.91	0.706
Left Method:	Sloped Bank	4	33.27	19.38	0.698
Right Method:	Sloped Bank	5	33.35	19.40	0.696
Top Fit Type:	Power Fit				
Bottom Fit Type:	Power Fit				
		Mean:	33.64	19.20	0.700
		SD:	0.23	0.20	0.008
		COV:	0.01	0.01	0.012
					13.4
					0.101
					0.008

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-06	0.928	100.808		99.880	99.880	3/4" Pipe 3m E of data logger
S45-05			0.999	99.809	99.809	3/4" Pipe 3m N of data logger
S45-04			0.763	100.045	100.050	Nail in stump
Water Level:	Cut	2.813	97.995			Time WL Surveyed: 13:29
Temporary BM			2.685	98.123	0.000	
Turn						
Temporary BM	2.648	100.771		98.123		
Water Level:	Cut	2.778	97.993			Time WL Surveyed: 13:30
S45-04			0.724	100.047	100.050	Nail in stump
S45-05			0.961	99.810	99.809	3/4" Pipe 3m N of data logger
S45-06			0.889	99.882	99.880	3/4" Pipe 3m E of data logger
Secondary Water Level Survey (pick only BM e.g. closest to water's edge)						
S45-05	0.961	100.771		99.810		
Water Level:	Cut	2.778	97.993			Time WL Surveyed: 14:21
Water Level:	Cut	2.751	97.991			Time WL Surveyed: 14:22
S45-05	0.932	100.742		99.810		

WL Survey Summary		
	Before	After
Average WL:	97.994	97.992
Closing Error:	-0.002	-
WL Check:	0.002	0.002
Transducer Elevation	97.038	97.035

Field Personnel:			
	TR, CJ	Trip Date:	8-May-15
Data Entry Personnel:	CJ	Date:	8-May-15
Data Check Personnel:	CJ	Date:	11-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: June 13, 2015
 Site Visit Time (MST): 09:40

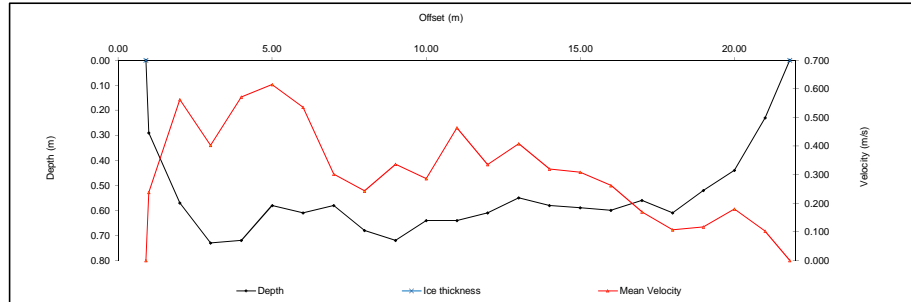


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.90	0.00	0.00		0.000				0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	1.00	0.29		0.17	0.238					1.00	0.55	0.29	0.238	0.16	0.038	1%
2	2.00	0.57		0.34	0.562					1.00	1.00	0.57	0.562	0.57	0.320	8%
3	3.00	0.73		0.44	0.402					1.00	1.00	0.73	0.402	0.73	0.293	7%
4	4.00	0.72		0.43	0.571					1.00	1.00	0.72	0.571	0.72	0.411	10%
5	5.00	0.58		0.35	0.615					1.00	1.00	0.58	0.615	0.58	0.357	9%
6	6.00	0.61		0.37	0.538					1.00	1.00	0.61	0.538	0.61	0.327	8%
7	7.00	0.58		0.35	0.302					1.00	1.00	0.58	0.302	0.58	0.175	4%
8	8.00	0.68		0.41	0.243					1.00	1.00	0.68	0.243	0.68	0.165	4%
9	9.00	0.72		0.43	0.336					1.00	1.00	0.72	0.336	0.72	0.242	6%
10	10.00	0.64		0.38	0.286					1.00	1.00	0.64	0.286	0.64	0.183	4%
11	11.00	0.64		0.38	0.464					1.00	1.00	0.64	0.464	0.64	0.297	7%
12	12.00	0.61		0.37	0.335					1.00	1.00	0.61	0.335	0.61	0.204	5%
13	13.00	0.55		0.33	0.408					1.00	1.00	0.55	0.408	0.55	0.224	2%
14	14.00	0.58		0.35	0.320					1.00	1.00	0.58	0.320	0.58	0.186	5%
15	15.00	0.59		0.35	0.308					1.00	1.00	0.59	0.308	0.59	0.182	4%
16	16.00	0.60		0.36	0.262					1.00	1.00	0.60	0.262	0.60	0.157	4%
17	17.00	0.56		0.34	0.170					1.00	1.00	0.56	0.170	0.56	0.095	2%
18	18.00	0.61		0.37	0.107					1.00	1.00	0.61	0.107	0.61	0.065	2%
19	19.00	0.52		0.31	0.117					1.00	1.00	0.52	0.117	0.52	0.061	1%
20	20.00	0.44		0.26	0.180					1.00	1.00	0.44	0.180	0.44	0.079	2%
21	21.00	0.23		0.14	0.103					1.00	0.90	0.23	0.103	0.21	0.021	1%
LB	21.80	0.00	0.00		0.00				0.00	1.00	0.40	0.00	0.000	0.00	0.000	
Total Flow														4.08	100%	

Flow Measurement Details:

Metering Section Location (describe): 10m downstream of station

Meas. Start Time (MST):	10:00
Meas. End Time (MST):	10:20
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, 1 breeze, 16C



Flow characteristics:

Total Flow:	4.08	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.90	(m ²)
Wetted Width:	20.90	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.34	(m/s)
Reynolds Number:	1.89E+05	
Froude Number:	0.15	

Logger Details:

Transducer Reading (m):	Before	After
Water (°C):	18.2	18.2
Datalogger Clock:	09:43	10:27
Laptop Clock:	09:43	10:27
Battery:	14.4	14.4
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- ADV test passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-06	0.972	100.852		99.880	99.880	3/4" Pipe 3m E of data logger
S45-04			0.807	100.045	-	Nail in stump 15m NE
S45-05			1.043	99.809	99.809	3/4" Pipe 3m N of data logger
Water Level:	Cut		3.185	97.667		Time WL Surveyed: 9:50
Temporary BM			3.202	97.650	0.000	
Turn						
Temporary BM	3.180	100.830		97.650	-	
Water Level:	Cut		3.165	97.665		Time WL Surveyed: 9:52
S45-05			1.023	99.809	99.809	3/4" Pipe 3m N of data logger
S45-04			0.787	100.043	-	Nail in stump 15m NE
S45-06			0.950	99.880	99.880	3/4" Pipe 3m E of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S45-05	1.023	100.831		99.808		
Water Level:	Cut		3.163	97.668		Time WL Surveyed: 10:22
Water Level:	Cut		3.146	97.665		Time WL Surveyed: 10:24
S45-05	1.003	100.811		99.808		

WL Survey Summary

Average WL:	Before	After
Closing Error:	0.000	97.667
WL Check:	0.002	0.003
Transducer Elevation	97.038	97.039

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	13-Jun-15
Data Check Personnel:	DW	Date:	13-Jun-15
Entered Digitally in the Field:	Yes	Date:	26-Jun-15

Hydrometric Measurement / Site Visit Record

Site: S45 - Eells River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: August 16, 2015
 Site Visit Time (MST): 08:15

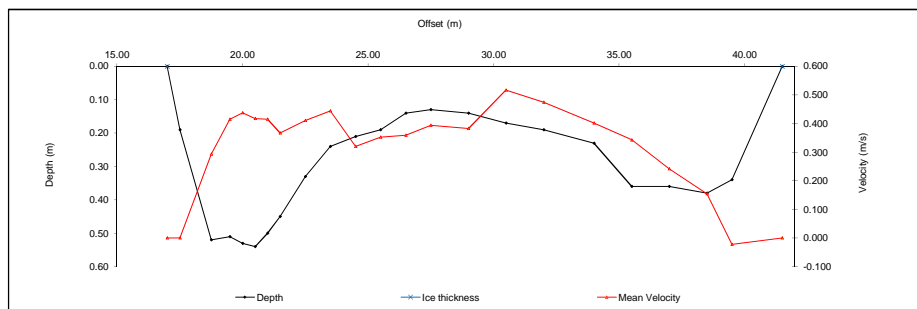


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	17.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	17.50	0.19		0.11	0.000					1.00	0.88	0.19	0.000	0.17	0.000	0%
2	18.75	0.52		0.31	0.293					1.00	1.00	0.52	0.293	0.52	0.152	7%
3	19.50	0.51		0.31	0.415					1.00	0.63	0.51	0.415	0.32	0.132	6%
4	20.00	0.53		0.32	0.437					1.00	0.50	0.53	0.437	0.27	0.116	5%
5	20.50	0.54		0.32	0.417					1.00	0.50	0.54	0.417	0.27	0.113	5%
6	21.00	0.50		0.30	0.415					1.00	0.50	0.50	0.415	0.25	0.104	5%
7	21.50	0.45		0.27	0.367					1.00	0.75	0.45	0.367	0.34	0.124	6%
8	22.50	0.33		0.20	0.411					1.00	1.00	0.33	0.411	0.33	0.136	6%
9	23.50	0.24		0.14	0.444					1.00	1.00	0.24	0.444	0.24	0.107	5%
10	24.50	0.21		0.13	0.320					1.00	1.00	0.21	0.320	0.21	0.067	3%
11	25.50	0.19		0.11	0.352					1.00	1.00	0.19	0.352	0.19	0.067	3%
12	26.50	0.14		0.08	0.359					1.00	1.00	0.14	0.359	0.14	0.050	2%
13	27.50	0.13		0.08	0.394					1.00	1.25	0.13	0.394	0.16	0.064	3%
14	29.00	0.14		0.08	0.383					1.00	1.50	0.14	0.383	0.21	0.080	4%
15	30.50	0.17		0.10	0.517					1.00	1.50	0.17	0.517	0.26	0.132	6%
16	32.00	0.19		0.11	0.474					1.00	1.75	0.19	0.474	0.33	0.158	7%
17	34.00	0.23		0.14	0.402					1.00	1.75	0.23	0.402	0.40	0.162	8%
18	35.50	0.36		0.22	0.343					1.00	1.50	0.36	0.343	0.54	0.185	9%
19	37.00	0.36		0.22	0.242					1.00	1.50	0.36	0.242	0.54	0.131	6%
20	38.50	0.38		0.23	0.155					1.00	1.25	0.38	0.155	0.48	0.074	3%
21	39.50	0.34		0.20	-0.022					1.00	1.50	0.34	-0.022	0.51	-0.011	-1%
LB	41.50	0.00	0.00		0.00				0.00	1.00	1.00	0.00	0.000	0.00	0.000	
Total Flow														2.14	100%	

Flow Measurement Details:

Metering Section Location (describe): 10m downstream of station

Meas. Start Time (MST):	9:00
Meas. End Time (MST):	9:30
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Very low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 23C



Flow characteristics:

Total Flow:	2.14	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.67	(m ²)
Wetted Width:	24.50	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.32	(m/s)
Reynolds Number:	8.06E+04	
Froude Number:	0.28	

Logger Details:

	Before	After
Transducer Reading (m):	0.496	0.496
Water (°C):	17.5	17.0
Datalogger Clock:	08:15	09:48
Laptop Clock:	08:15	09:48
Battery:	11.6	14.1
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	298706	-
Logger# (if replaced):	3630	-

Datalogger / Station Notes:

- Installed lag bolt in conifer 25m NE of logger on bench.
- Bring BM lag (temp in survey) for next visit
- Bring cutters to clear bush for next visit
- Replaced solar controller
- Bring 30m PT

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-06	2.817	102.697		99.880	99.880	3/4" Pipe 3m E of data logger
S45-07			1.225	101.472	101.472	Lag bolt in collifer 25m NE of logger on bench
S45-05			2.887	99.810	99.809	3/4" Pipe 3m N of data logger
Turn						
Water Level:	Cut	0.331	5.493	97.535		Time WL Surveyed: 8:50
Temporary BM				97.204	0.000	
Turn						
Temporary BM	5.482	102.686		97.204		
Water Level:	Cut	0.331	5.482	97.535		Time WL Surveyed: 8:51
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S45-05	2.879	102.687		99.808		
Water Level:	Cut	0.296	5.443	97.540		Time WL Surveyed: 9:35
Water Level:	Cut	0.296	5.429	97.538		Time WL Surveyed: 9:36
S45-05	2.863	102.671		99.808		

WL Survey Summary

	Before	After
Average WL:	97.535	97.539
Closing Error:	0.000	-
WL Check:	0.000	0.002
Transducer Elevation	97.039	97.043

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	DW, GG	Trip Date:	16 Aug. 15
Data Check Personnel:	DW	Date:	16 Aug. 15
Entered Digitally in the Field:	Yes	Date:	16-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: September 15, 2015
 Site Visit Time (MST): 12:10

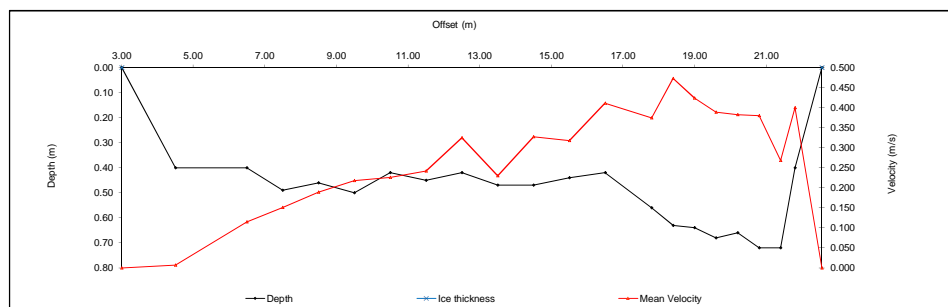


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	3.00	0.00	0.00	0.000	0.000				0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	4.50	0.40		0.24	0.007					1.00	1.75	0.40	0.007	0.70	0.005	0%
2	6.50	0.40		0.24	0.115					1.00	1.50	0.40	0.115	0.60	0.069	3%
3	7.50	0.49		0.29	0.151					1.00	1.00	0.49	0.151	0.49	0.074	3%
4	8.50	0.46		0.28	0.189					1.00	1.00	0.46	0.189	0.46	0.087	3%
5	9.50	0.50		0.30	0.218					1.00	1.00	0.50	0.218	0.50	0.109	4%
6	10.50	0.42		0.25	0.226					1.00	1.00	0.42	0.226	0.42	0.095	4%
7	11.50	0.45		0.27	0.242					1.00	1.00	0.45	0.242	0.45	0.109	4%
8	12.50	0.42		0.25	0.325					1.00	1.00	0.42	0.325	0.42	0.137	5%
9	13.50	0.47		0.28	0.230					1.00	1.00	0.47	0.230	0.47	0.108	4%
10	14.50	0.47		0.28	0.327					1.00	1.00	0.47	0.327	0.47	0.154	6%
11	15.50	0.44		0.26	0.318					1.00	1.00	0.44	0.318	0.44	0.140	6%
12	16.50	0.42		0.25	0.411					1.00	1.15	0.42	0.411	0.48	0.199	8%
13	17.80	0.56		0.34	0.374					1.00	0.95	0.56	0.374	0.53	0.092	4%
14	18.40	0.63		0.38	0.473					1.00	0.60	0.63	0.473	0.38	0.179	7%
15	19.00	0.64		0.38	0.424					1.00	0.60	0.64	0.424	0.38	0.163	7%
16	19.60	0.68		0.41	0.389					1.00	0.60	0.68	0.389	0.41	0.159	6%
17	20.20	0.66		0.40	0.382					1.00	0.60	0.66	0.382	0.40	0.151	6%
18	20.80	0.72		0.43	0.380					1.00	0.60	0.72	0.380	0.43	0.164	7%
19	21.40	0.72		0.43	0.268					1.00	0.50	0.72	0.268	0.36	0.096	4%
20	21.80	0.40		0.24	0.400					1.00	0.60	0.40	0.400	0.23	0.092	4%
RB	22.55	0.00	0.00	0.00	0.00		0.00		0.00	1.00	0.38	0.00	0.000	0.00	0.000	
Total Flow														2.49	100%	

Flow Measurement Details:

Metering Section Location (describe): At station

Meas. Start Time (MST):	13:27
Meas. End Time (MST):	13:50
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edge:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Scattered Showers



Flow characteristics:

Total Flow:	2.49	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.02	(m ²)
Wetted Width:	19.55	(m)
Hydraulic Depth:	0.46	(m)
Mean Velocity:	0.28	(m/s)
Reynolds Number:	-	
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.536	0.535
PT Water (°C):	10.3	10.5
Datalogger Clock:	12:21	13:55
Laptop Clock:	12:21	13:55
Station Battery Voltage:	14.4	14.6
Station Battery:	Good	
Station Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Details:

	Before	After
Sonde Water (°C):	-	-
Specific Conductance (µS):	-	-
pH:	-	-
Turbidity (FNU):	-	-
Dissolved Oxygen Conc. (mg/L):	-	-
Dissolved Oxygen Sat. (%):	-	-
Sonde Battery Voltage:	-	-
Sonde # (if replaced):	151104198	151104126

Sonde Visit Details:

Visit Type: -

Sonde Replacement: -

Deployed Sonde: -

Downloaded: -

Yes

Downloaded File Name: 111_15F104198_081615

WQ Samples Taken: -

Yes

Photos Taken:

US, DS, CS: -

Yes

Sonde Housing (In Situ): -

Yes

Sonde Probes (Before Cleaning): -

Yes

Datalogger: -

Yes

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-05	2.792	102.601		99.809	99.809	3/4" Pipe 3m N of data logger
S45-07			1.131	101.470	101.472	Conifer on ridge 25 m nw of logger
S45-06			2.720	99.881	99.880	3/4" Pipe 3m E of data logger
Water Level:						
Water Level:	Cut		5.029	97.572		Time WL Surveyed: 13:00
S45-07			1.131	101.470		
Turn						
S45-07	1.160	102.630		101.470		
Water Level:	Cut		5.060	97.570		Time WL Surveyed: 13:02
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S45-05	0.925	100.733		99.808		
Water Level:	Cut		3.165	97.568		Time WL Surveyed: 14:00
Water Level:	Cut		3.108	97.571		Time WL Surveyed: 14:05
S45-05	0.871	100.679		99.808		

WL Survey Summary

	Before	After
Average WL:	97.571	97.570
Closing Error:	0.001	-
WL Check:	0.002	-0.003
Transducer Elevation:	97.035	97.035

General Notes:

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

TL, CJ	Trip Date:	15-Sep-15
YL	Date:	15-Sep-15
JC	Date:	10-Nov-15
Entered Digitally in the Field:	Yes	

Datalogger, Sonde and Station Notes:

Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: October 18, 2015
 Site Visit Time (MST): 11:32

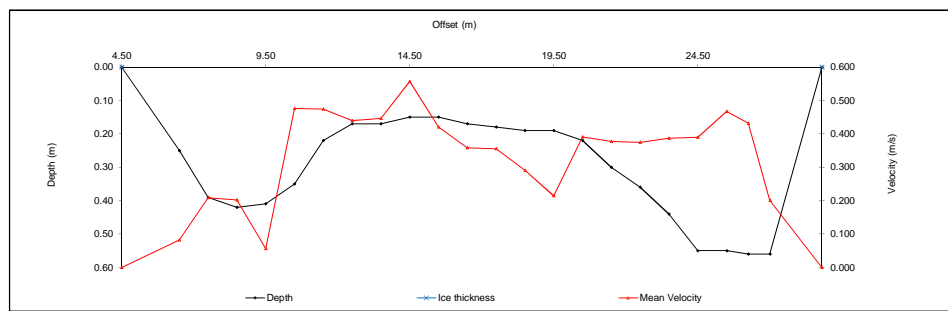


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	4.50	0.00	0.00		0.000		0.000		0.000	1.00	1.00	0.00	0.000	0.00	0.000	
1	6.50	0.25		0.15	0.082					1.00	1.50	0.25	0.082	0.38	0.031	1%
2	7.50	0.39		0.23	0.209					1.00	1.00	0.39	0.209	0.39	0.082	4%
3	8.50	0.42		0.25	0.202					1.00	1.00	0.42	0.202	0.42	0.085	4%
4	9.50	0.41		0.25	0.056					1.00	1.00	0.41	0.056	0.41	0.023	1%
5	10.50	0.35		0.21	0.476					1.00	1.00	0.35	0.476	0.35	0.167	7%
6	11.50	0.22		0.13	0.474					1.00	1.00	0.22	0.474	0.22	0.104	5%
7	12.50	0.17		0.10	0.440					1.00	1.00	0.17	0.440	0.17	0.075	3%
8	13.50	0.17		0.10	0.446					1.00	1.00	0.17	0.446	0.17	0.076	3%
9	14.50	0.15		0.09	0.557					1.00	1.00	0.15	0.557	0.15	0.084	4%
10	15.50	0.15		0.09	0.420					1.00	1.00	0.15	0.420	0.15	0.063	3%
11	16.50	0.17		0.10	0.358					1.00	1.00	0.17	0.358	0.17	0.061	3%
12	17.50	0.18		0.11	0.355					1.00	1.00	0.18	0.355	0.18	0.064	3%
13	18.50	0.19		0.11	0.291					1.00	1.00	0.19	0.291	0.19	0.055	2%
14	19.50	0.19		0.11	0.214					1.00	1.00	0.19	0.214	0.19	0.041	2%
15	20.50	0.22		0.13	0.391					1.00	1.00	0.22	0.391	0.22	0.086	4%
16	21.50	0.30		0.18	0.377					1.00	1.00	0.30	0.377	0.30	0.113	5%
17	22.50	0.36		0.22	0.374					1.00	1.00	0.36	0.374	0.36	0.135	6%
18	23.50	0.44		0.26	0.387					1.00	1.00	0.44	0.387	0.44	0.170	7%
19	24.50	0.55		0.33	0.390					1.00	1.00	0.55	0.390	0.55	0.215	9%
20	25.50	0.55		0.33	0.467					1.00	1.00	0.55	0.467	0.55	0.225	10%
21	26.25	0.56		0.34	0.432					1.00	0.75	0.56	0.432	0.42	0.181	8%
22	27.00	0.56		0.34	0.201					1.00	1.28	0.56	0.201	0.71	0.144	6%
RB	28.80	0.00	0.00		0.00		0.00		0.00	1.00	0.90	0.00	0.000	0.00	0.000	
Total Flow														2.28	100%	

Flow Measurement Details:

Metering Section Location (describe):
 Across from helicopter landing pad

Meas. Start Time (MST): 12:05
 Meas. End Time (MST): 12:30
 Equipment: ADV#2
 Flow Meter Make & Model: Sorita Flowtracker
 Flow Meter Serial #: P4767
 Method: Wading
 River Condition: Low flow
 Channel Edges: Trapezoidal Edge (e.g. stream)
 Quality/Error (see reverse): Excellent
 Weather: Clear, breezy, 12C



Flow characteristics:

Total Flow: 2.28 (m³/s)
 Perceived Measurement Quality: Excellent
 Cross Section Area: 7.02 (m²)
 Wetted Width: 24.30 (m)
 Hydraulic Depth: 0.29 (m)
 Mean Velocity: 0.32 (m/s)
 Reynolds Number: -
 Froude Number: 0.19

Logger Details:

	Before	After
Transducer Reading (m):	0.508	0.509
PT Water (°C):	4.0	4.2
Datalogger Clock:	11:33	12:32
Laptop Clock:	11:33	12:32
Station Battery Voltage:	14.3	14.3
Station Battery:	-	Good
Station Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent. Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Details:

	Before	After
Sonde Water (°C):	0	4
Specific Conductance (µS):	0	230
pH:	0	8
Turbidity (FNU):	0	2
Dissolved Oxygen Conc. (mg/L):	0	13
Dissolved Oxygen Sat. (%):	0	102
Sonde Battery Voltage:	NAN	4.9
Sonde # (if replaced):	-	-

Sonde Visit Details:

Visit Type: -
 Deployed Sonde: -
 Downloaded: -
 Downloaded File Name: -
 WQ Samples Taken: -
 Photos Taken: -
 US, DS, CS: -
 Sonde Housing (In Situ): -
 Sonde Probes (Before Cleaning): -
 Datalogger: -

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-06	2.733	102.613		99.880	99.880	3/4" Pipe 3m E of data logger
S45-07			1.146	101.467	101.472	Lag bolt in cofiler 25m NE of logger on bench
S45-05			2.806	99.807	99.809	3/4" Pipe 3m N of data logger
Water Level:	Cut	0.208	5.273	97.548	Time WL Surveyed:	11:56
S45-05			2.806	99.807	99.809	3/4" Pipe 3m N of data logger
Turn						
S45-05	2.777	102.584		99.807	99.809	3/4" Pipe 3m N of data logger
Water Level:	Cut	0.208	5.243	97.549	Time WL Surveyed:	11:58
S45-05						#N/A
S45-07			2.777	99.807	99.809	3/4" Pipe 3m N of r#N/A
S45-07			1.117	101.467	101.472	Lag bolt in cofiler 2
S45-06			2.706	99.878	99.880	3/4" Pipe 3m E of r#N/A
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S45-05		2.778	102.585	99.807		
Water Level:	Cut	0.279	5.319	97.545	Time WL Surveyed:	12:38
Water Level:	Cut	0.279	5.296	97.547	Time WL Surveyed:	12:40
S45-05		2.757	102.564	99.807		

WL Survey Summary

	Before	After
Average WL:	97.549	97.546
Closing Error:	0.002	-
WL Check:	0.001	-0.002
Transducer Elevation	97.041	97.037

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Field Personnel:	GG, TR	Trip Date:	18-Oct-15
Data Entry Personnel:	GG	Date:	18-Oct-15
Data Check Personnel:	JC	Date:	10-Nov-15
Entered Digitally in the Field:	Yes		

Datalogger, Sonde and Station Notes:

General Notes:

Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion
 UTM Location: 440605 E, 6342459 N

Site Visit Date: December 14, 2015
 Site Visit Time (MST): 09:50



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	10.50	0.00	0.00		0.000				0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	10.90	0.55	0.30	0.43	0.048					0.88	0.70	0.25	0.042	0.18	0.007	0%
2	11.90	0.60	0.30	0.45	0.114					0.88	0.85	0.30	0.100	0.26	0.026	2%
3	12.60	0.65	0.30	0.48	0.104					0.88	0.75	0.35	0.092	0.26	0.024	1%
4	13.40	0.72	0.30	0.51	0.121					0.88	0.75	0.42	0.106	0.32	0.034	2%
5	14.10	0.92	0.30	0.61	0.057					0.88	0.75	0.62	0.050	0.45	0.023	1%
6	14.85	1.00	0.30	0.65	0.107					0.88	0.75	0.70	0.094	0.53	0.049	3%
7	15.60	1.15	0.30			0.98	0.093	0.47	0.168	1.00	0.83	0.85	0.131	0.70	0.052	6%
8	16.50	1.20	0.30			1.02	0.121	0.48	0.135	1.00	0.75	0.90	0.128	0.68	0.086	5%
9	17.10	1.35	0.30			1.14	0.050	0.51	0.179	1.00	0.70	1.05	0.115	0.73	0.084	5%
10	17.90	1.45	0.30			1.22	0.191	0.53	0.197	1.00	0.57	1.15	0.194	0.66	0.128	8%
11	18.25	1.50	0.25			1.25	0.155	0.50	0.223	1.00	0.40	1.25	0.189	0.50	0.095	6%
12	18.70	1.70	0.25			1.41	0.182	0.54	0.182	1.00	0.42	1.45	0.182	0.52	0.112	7%
13	19.10	1.90	0.25			1.57	0.094	0.59	0.198	1.00	0.43	1.65	0.146	0.70	0.102	6%
14	19.55	2.05	0.25			1.69	0.172	0.61	0.216	1.00	0.42	1.80	0.194	0.76	0.148	9%
15	19.95	1.65	0.25			1.37	0.140	0.53	0.182	1.00	0.35	1.40	0.161	0.49	0.079	5%
16	20.25	2.00	0.25			1.65	0.138	0.60	0.181	1.00	0.40	1.75	0.160	0.70	0.112	7%
17	20.75	2.00	0.25			1.65	0.142	0.60	0.193	1.00	0.38	1.75	0.168	0.66	0.110	7%
18	21.00	1.85	0.25			1.53	0.159	0.57	0.182	1.00	0.57	1.60	0.171	0.92	0.157	10%
19	21.90	1.60	0.26			1.33	0.130	0.53	0.083	1.00	0.90	1.34	0.107	1.21	0.128	8%
20	22.80	1.45	0.25			1.21	0.065	0.49	0.040	1.00	0.90	1.20	0.053	1.08	0.057	3%
21	23.70	1.30	0.30			1.10	0.012	0.50	0.017	1.00	0.85	1.00	0.015	0.85	0.012	1%
22	24.50	0.95	0.35	0.65	-0.019					0.88	1.20	0.60	-0.017	0.72	-0.012	-1%
23	26.10	0.82	0.45	0.64	-0.023					0.88	1.60	0.37	-0.020	0.59	-0.012	-1%
RB	27.70	0.00	0.00		0.00				0.00	0.88	0.80	0.00	0.000	0.00	0.000	
Total Flow														1.64	100%	

Flow Measurement Details:

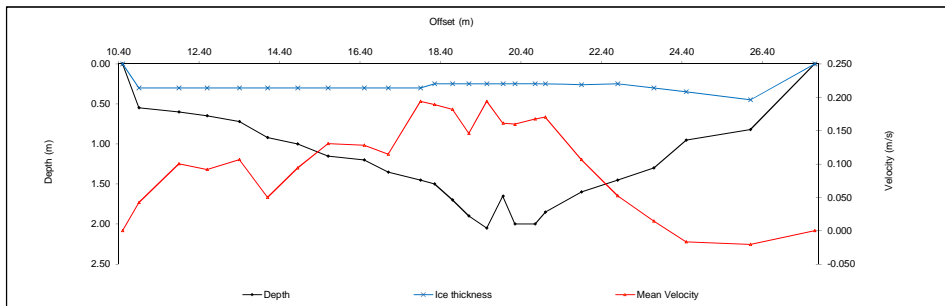
Metering Section Location (describe): 50m downstream of station, around the corner

Meas. Start Time (MST): 10:38
 Meas. End Time (MST): 11:41

Equipment: ADI#1
 Flow Meter Make & Model: Sontek Flowtracker
 Flow Meter Serial #: P3398
 Method: Ice
 River Condition: Full ice cover
 Channel Edges: Trapezoidal Edge (e.g. stream)
 Quality/Error (see reverse): Good
 Weather: Overcast, light breeze

Flow Characteristics:

Total Flow:	1.64	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	14.55	(m ²)
Wetted Width:	17.20	(m)
Hydraulic Depth:	0.85	(m)
Mean Velocity:	0.11	(m/s)
Reynolds Number:		
Froude Number:	0.04	



Longer Details:

	Before	After
Transducer Reading (m):	0.754	-
PT Water (°C):	0.7	-
Datalogger Clock:	10:59	-
Laptop Clock:	09:59	-
Station Battery Voltage:	12.7	12.6
Station Battery:	-	Replaced
Station Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Details:

	Before	After
Sonde Water (°C):	-	-
Specific Conductance (µS):	-	-
pH:	-	-
Turbidity (FNU):	-	-
Dissolved Oxygen Conc. (mg/L):	-	-
Dissolved Oxygen Sat. (%):	-	-
Sonde Battery Voltage:	-	-
Sonde # (if replaced):	-	-

Sonde Visit Details:

Visit Type: -
 Deployed Sonde: Downloaded
 Downloaded File Name: -
 WQ Samples Taken: -
 Photos Taken: -
 US, DS, CS: -
 Sonde Housing (In Situ): -
 Sonde Probes (Before Cleaning): -
 Datalogger: -

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S45-07	1.137	102.609		101.472	101.472	Lag bolt in cofiler 25m NE of logger on bench
S45-06			2.728	99.881	99.880	3/4" Pipe 3m E of data logger
S45-05			2.802	99.807	99.809	3/4" Pipe 3m N of data logger
Water Level:	Cut		4.826	97.783		Time WL Surveyed: 10:24
Turn			4.820	97.789		
Water Level:	Cut		4.810	97.782		Time WL Surveyed: 10:29
S45-05			2.784	99.808	99.809	3/4" Pipe 3m N of #N/A
S45-06			2.714	99.878	99.880	3/4" Pipe 3m E of #N/A
S45-07			1.121	101.471	101.472	Lag bolt in cofiler 2#N/A

Secondary Water Level Survey (pick any BM e.g. closest to water's edge)

Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					

WL Survey Summary

	Before	After
Average WL:	97.793	-
Closing Error:	0.001	-
WL Check:	0.001	-
Transducer Elevation	97.029	-

General Notes:

- Changed antenna cable at relay station. Tried different modem, still no connection to network. Left small antenna from office connected to modem with signal and network connection. Bring new antenna next visit.
- Net RSSI: -104

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Datalogger, Sonde and Station Notes:

-Station was not running upon arrival, no power to logger. Solar controller showing charging, but no power to station. Changed battery. Rewired logger to battery instead of solar controller so logger can operate in event of solar controller fault

Field Personnel:

	SM, JC	Trip Date:	14-Dec-15
Data Entry Personnel:	JC	Date:	14-Dec-15
Data Check Personnel:	JC	Date:	6-Jan-16
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta
 UTM Location: 470235 E, 6463205 N

Site Visit Date: January 13, 2015
 Site Visit Time (MST): 10:15



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	405.00	0.00	0.00		0.000				0.000	1.00	5.00	0.00	0.000	0.00	0.000	
1	395.00	2.00	0.45		1.69	0.189	0.76	0.266	1.00	13.50	1.55	0.228	20.93	4.760	2%	
2	378.00	2.62	0.42		2.18	0.212	0.86	0.251	1.00	16.00	2.20	0.232	35.20	8.149	4%	
3	363.00	3.00	0.45		2.49	0.140	0.96	0.205	1.00	17.00	2.55	0.173	43.35	7.478	4%	
4	344.00	1.90	0.45		1.61	0.007	0.74	0.028	1.00	18.50	1.45	0.018	26.83	0.469	0%	
5	326.00	0.70	0.44	0.57	0.087				0.88	20.00	0.26	0.077	5.20	0.398	0%	
6	304.00	0.58	0.45	0.52	-0.003				0.88	23.00	0.13	-0.003	2.99	-0.008	0%	
7	280.00	0.60	0.50	0.55	0.000				0.88	22.00	0.10	0.000	2.20	0.000	0%	
8	260.00	1.00	0.49	0.75	0.117				0.88	19.50	0.51	0.103	9.95	1.024	1%	
9	241.00	1.32	0.70	1.01	0.278				0.88	19.00	0.62	0.245	11.78	2.882	1%	
10	222.00	1.48	0.54			1.29	0.295	0.73	0.312	1.00	18.50	0.94	0.304	17.39	5.278	3%
11	204.00	1.90	0.65			1.65	0.259	0.90	0.250	1.00	17.50	1.25	0.255	21.88	5.567	3%
12	187.00	2.10	0.45			1.77	0.261	0.78	0.401	1.00	18.00	1.65	0.331	31.35	10.377	5%
13	166.00	3.05	0.55			2.55	0.317	1.05	0.344	1.00	19.50	2.50	0.331	48.75	16.112	8%
14	148.00	2.80	0.46			2.33	0.318	0.93	0.383	1.00	17.50	2.34	0.351	40.95	14.353	7%
15	131.00	3.20	0.40			2.64	0.399	0.96	0.410	1.00	15.50	2.80	0.405	43.40	17.555	9%
16	117.00	3.30	0.55			2.75	0.354	1.10	0.358	1.00	14.50	2.75	0.356	39.88	14.196	7%
17	102.00	3.08	0.38			2.54	0.177	0.92	0.169	1.00	14.00	2.70	0.173	37.80	6.539	3%
18	89.00	3.35	0.38			2.76	0.339	0.97	0.410	1.00	12.00	2.97	0.375	35.64	13.347	7%
19	78.00	3.30	0.40			2.72	0.357	0.98	0.408	1.00	10.50	2.90	0.383	30.45	11.647	6%
20	68.00	3.00	0.35			2.47	0.356	0.88	0.435	1.00	12.50	2.65	0.396	33.13	13.101	7%
21	53.00	3.00	0.35			2.47	0.376	0.88	0.434	1.00	18.50	2.65	0.405	49.03	19.855	10%
22	31.00	3.22	0.33			2.64	0.325	0.91	0.373	1.00	16.00	2.89	0.349	46.24	16.138	8%
23	21.00	3.62	0.35			2.97	0.196	1.00	0.250	1.00	7.50	3.27	0.223	24.53	5.469	3%
LB	16.00	0.00	0.00		0.00				0.00	0.88	2.50	0.00	0.000	0.00	0.000	
Total Flow														195	100%	

Flow Measurement Details:

Metering Section Location (describe):
 105 m downstream of station

Meas. Start Time (MST):	11:03
Meas. End Time (MST):	12:15
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -9C

Flow characteristics:

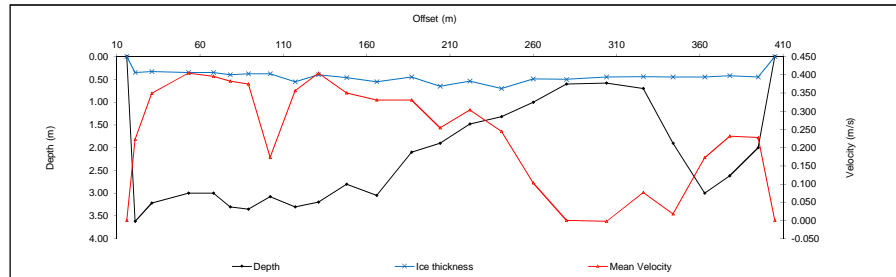
Total Flow:	195	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	658.81	(m ²)
Wetted Width:	389.00	(m)
Hydraulic Depth:	1.69	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer #1 (0-4m) Reading (m):	1.954	
Transducer #2 (0-10m) Reading (m):	3.723	
Water Temperature #1 (°C):	0.1	
Water Temperature #2 (°C):	0.2	
Datalogger Clock:	10:30	
Laptop Clock:	10:29	
Battery (Main):	13.1	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S46-04	1.214	100.962		99.748	99.748	3/4" Pipe 2m S of logger
S46-07			1.105	99.857	99.860	bolt in birch tree
Temporary BM			1.314	99.648	0.000	-
Water Level:	Cut		5.980	94.982		Time WL Surveyed: 10:50
Temporary BM			5.912	95.050	0.000	
Turn						
Temporary BM	5.889	100.939		95.050		
Water Level:	Cut		5.960	94.979		Time WL Surveyed: 10:51
Temporary BM			1.293	99.646		
S46-07			1.084	99.855	99.860	bolt in birch tree
S46-04			1.194	99.745	99.748	3/4" Pipe 2m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	94.981	-
Closing Error:	0.003	-
WL Check:	0.003	-
Transducer Elevation	93.027	-

Field Personnel:	DW, MP	Trnp Date:	13-Jan-15
Data Entry Personnel:	DW, MP	Date:	13-Jan-15
Data Check Personnel:	SG	Date:	1-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta
 UTM Location: 470235 E, 6463205 N

Site Visit Date: February 8, 2015
 Site Visit Time (MST): 11:00



Flow Measurement Details:	
Metering Section Location (describe): 100 m downstream of station	
Meas. Start Time (MST):	11:34
Meas. End Time (MST):	12:29
Equipment:	ADCP#1
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Errors (see reverse):	Good
Weather:	Clear, light breeze, -30C

Flow characteristics:		
Total Flow:	206	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	575.75	(m ²)
Wetted Width:	471.00	(m)
Hydraulic Depth:	1.22	(m)
Mean Velocity:	0.35	(m/s)
Reynolds Number:	2.74E+05	
Froude Number:	0.10	

Logger Details:		
	Before	After
Transducer #1 (0-4m) Reading (m):	2.127	-
Transducer #2 (0-10m) Reading (m):	3.722	-
Water Temperature #1 (°C):	0.2	-
Water Temperature #2 (°C):	0.2	-
Datalogger Clock:	11:28	-
Lighter Clock:	11:28	-
Battery (Main):	15.0	-
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Descant:	Replaced	-
Vent Tube Descant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Flow Measurement conducted with ADCP and under-ice ADCP rod

ADCP Flow Measurement Summary:							
System Information:		System Setup:		Bank Offsets:			
System Type:	Sonotek R2-M9	Transducer Depth (m):	-	LB:	485.00		
Serial Number:	4712	Salinity (ppt):	-	RB:	13.10		
Firmware Version:	3.8	Magnetic Declination (°):	-	Compass Calibration Passed: No			
Software Version:	3.8	Measured Temperature (°C):	-	System Test Passed: No			
		ADCP Temperature (°C):	-				
Discharge Calculation Settings:				Measurement Results:			
Track Reference:	Bottom Track	Pass (#):	1	Screening Distance (m):	-	Mean Pass Velocity (m/s):	0.358
Depth Reference:	Vertical Beam	Width (m):	471.00	Area (m ²):	575.75	Discharge (m ³ /s):	206.628
Coordinate System:	ENU	Discharge Difference From Mean:	0.00%	Percent of Pass Measured (%):	-		
Left Method:	-						
Right Method:	-						
Top Fit Type:	-						
Bottom Fit Type:	-						
		Mean:	471.00	575.75	0.358	206	
		SD:	0.00	0.00	0.000	0.000	
		COV:	0.00	0.00	0.000	0.000	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S46-04	0.691	100.439		99.748	99.748	3/4" Pipe 2m S of logger
S46-07			0.583	99.858	99.860	bolt in birch tree
S46-08			2.535	97.904	97.901	3/4" Pipe behind beam near boat
Water Level:	Cut		5.289	95.150		Time WL Surveyed: 11:39
Temporary BM			2.635	97.904		0.000
Turn						
Temporary BM	2.508	100.412		97.904		
Water Level:	Cut		5.281	95.151		Time WL Surveyed: 11:42
S46-08			2.508	97.904	97.901	3/4" Pipe behind beam near boat
S46-07			0.554	99.858	99.860	bolt in birch tree
S46-04			0.664	99.748	99.748	3/4" Pipe 2m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary			Level Survey Equipment:	
Average WL:	95.151	-	Level #:	Level#3
Closing Error:	0.000	-	Make & Model:	Carsat AT-24
WL Check:	0.001	-	Serial #:	112690
Transducer Elevation	93.024	-		

Field Personnel:	TR, CJ	Trip Date:	8-Feb-15
Data Entry Personnel:	CJ	Date:	8-Feb-15
Data Check Personnel:	CJ	Date:	1-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta
 UTM Location: 470235 E, 6463205 N

Site Visit Date: March 11, 2015
 Site Visit Time (MST): 09:10



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 1.2 Depth (m)	Velocity @ 1.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	413.00	0.00	0.00		0.00					1.00	3.00	0.00	0.00	0.00	0.00	
1	407.00	3.50	0.65		2.93	0.276	1.22	0.314		1.00	7.50	2.85	0.295	21.38	6.306	4%
2	398.00	2.85	0.60		2.40	0.250	1.05	0.247		1.00	11.50	2.25	0.249	25.88	6.430	4%
3	384.00	3.30	0.65		2.77	0.239	1.18	0.265		1.00	12.00	2.65	0.252	31.80	8.014	5%
4	374.00	4.90	0.65		4.05	0.060	1.50	0.010		1.00	13.50	4.25	0.035	57.38	2.008	1%
5	357.00	1.25	0.60	0.93	-0.063					0.88	15.50	0.65	-0.055	10.08	-0.559	0%
6	343.00	1.20	0.60	0.90	-0.085					0.88	14.50	0.60	-0.075	8.70	-0.651	0%
7	328.00	1.20	0.60	0.90	0.004					0.88	18.00	0.60	0.004	10.80	0.038	0%
8	307.00	1.10	0.65	0.88	0.069					0.88	21.00	0.45	0.061	9.45	0.574	0%
9	286.00	1.00	0.65	0.83	-0.205					0.88	20.00	0.35	-0.180	7.00	-1.263	-1%
10	267.00	1.60	0.75			1.43	0.036	0.92	0.067	1.00	20.00	0.85	0.052	17.00	0.876	1%
11	246.00	1.80	0.75			1.59	0.133	0.96	0.152	1.00	18.50	1.05	0.143	19.43	2.768	2%
12	230.00	2.10	0.65			1.81	0.236	0.94	0.232	1.00	16.50	1.45	0.234	23.93	5.598	3%
13	213.00	2.20	0.65			1.89	0.300	0.96	0.180	1.00	15.50	1.55	0.240	24.03	5.765	3%
14	199.00	2.70	0.65			2.29	0.267	1.06	0.096	1.00	17.00	2.05	0.182	34.85	6.325	4%
15	179.00	2.50	0.65			2.13	0.313	1.02	0.273	1.00	19.50	1.85	0.293	36.08	10.570	6%
16	160.00	2.70	0.70			2.30	0.382	1.10	0.443	1.00	18.50	2.00	0.413	37.00	15.263	9%
17	142.00	2.95	0.75			2.51	0.338	1.19	0.438	1.00	18.00	2.20	0.388	39.60	15.365	9%
18	124.00	3.00	0.70			2.54	0.348	1.16	0.355	1.00	15.50	2.30	0.352	35.65	12.531	7%
19	111.00	2.80	0.65			2.37	0.371	1.08	0.401	1.00	16.50	2.15	0.386	35.48	13.693	8%
20	91.00	3.00	0.75			2.55	0.388	1.20	0.368	1.00	18.50	2.25	0.378	41.63	15.734	9%
21	74.00	2.90	0.75			2.47	0.387	1.18	0.422	1.00	19.50	2.15	0.405	41.93	16.959	10%
22	52.00	2.50	0.60			2.12	0.403	0.98	0.432	1.00	23.50	1.90	0.418	44.65	18.641	11%
23	27.00	3.00	0.65			2.53	0.323	1.12	0.404	1.00	16.00	2.35	0.364	37.60	13.668	8%
LB	20.00	0.00	0.00		0.00					0.88	3.50	0.00	0.000	0.00	0.000	
Total Flow														175	100%	

Flow Measurement Details:

Metering Section Location (describe):
 50m downstream

Meas. Start Time (MST):	10:35
Meas. End Time (MST):	11:44
Equipment:	ADV
Method:	Ica
River Condition:	Frozen, some layers
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, -6C

Flow characteristics:

Total Flow:	175	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	651.28	(m ²)
Wetted Width:	393.00	(m)
Hydraulic Depth:	1.66	(m)
Mean Velocity:	0.27	(m/s)
Froude Number:	0.07	

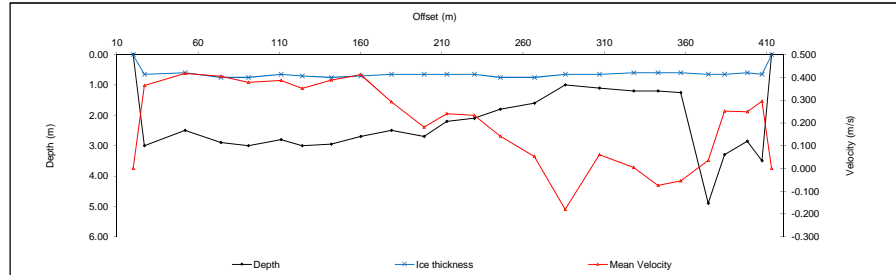
Logger Details:

	Before	After
Transducer #1 (0-4m) Reading (m):	2.098	
Transducer #2 (0-10m) Reading (m):	3.865	
Water Temperature #1 (°C):	0.1	
Water Temperature #2 (°C):	0.2	
Datalogger Clock:	09:13	
Laptop Clock:	09:11	
Battery (Main):	14.8	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PTF (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-Offset 357m to 286m affected by upstream sand bar



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S46-04	1.384	101.132		99.748	99.748	3/4" Pipe 2m S of logger
S46-08			3.213	97.919	97.901	3/4" Pipe behind beam near boat
S46-07			1.271	99.861	99.860	bolt in birch tree
Water Level:	Cut		6.008	95.124		Time WL Surveyed: 10:20
Temporary BM			5.797	95.335	0.000	
Turn						
Temporary BM	5.777	101.112		95.335		
Water Level:	Cut		5.992	95.120		Time WL Surveyed: 10:23
S46-07						
S46-09			1.253	99.859	99.860	bolt in birch tree
S46-06			3.195	97.917	97.901	3/4" Pipe behind beam near boat
S46-04			1.366	99.746	99.748	3/4" Pipe 2m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary	Before	After
Average WL:	95.122	-
Closing Error:	0.002	-
WL Check:	0.004	-
Transducer Elevation	93.024	-

Field Personnel:	SM, DW	Trip Date:	11-Mar-15
Data Entry Personnel:	SM	Date:	11-Mar-15
Data Check Personnel:	SG	Date:	1-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

January 10, 2015

Site Visit Time (MST):

09:10



Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.30	0.00	0.00							0.88	1.05	0.00	0.000	0.00	0.000	
1	4.40	0.79	0.30	0.55	0.633					0.88	1.98	0.49	0.557	0.97	0.539	5%
2	6.25	0.85	0.40	0.63	0.640					0.88	1.85	0.45	0.563	0.83	0.469	5%
3	8.10	0.90	0.42	0.66	0.647					0.88	2.35	0.48	0.569	1.13	0.642	6%
4	10.95	1.02	0.47	0.75	0.638					0.88	2.35	0.55	0.561	1.29	0.726	7%
5	12.80	1.15	0.44	0.80	0.562					0.88	3.23	0.71	0.495	2.29	1.132	11%
6	17.40	1.15	0.45	0.80	0.731					0.88	3.05	0.70	0.643	2.14	1.373	13%
7	18.90	1.21	0.45			1.06	0.572	0.60	0.814	1.00	1.55	0.76	0.693	1.18	0.816	8%
8	20.50	1.21	0.46	0.84	0.725					0.88	1.55	0.75	0.638	1.16	0.742	7%
9	22.00	1.22	0.44			1.06	0.551	0.60	0.814	1.00	1.35	0.78	0.683	1.05	0.719	7%
10	23.20	1.19	0.45	0.82	0.656					0.88	2.05	0.74	0.577	1.52	0.876	8%
11	26.10	1.23	0.47			1.08	0.489	0.62	0.437	1.00	2.95	0.76	0.463	2.24	1.038	10%
12	29.10	1.20	0.83	1.02	0.282					0.88	2.53	0.37	0.248	0.93	0.232	2%
13	31.15	1.20	0.55	0.88	0.040					0.88	2.47	0.65	0.035	1.61	0.057	1%
14	34.05	1.19	0.55	0.87	0.005					0.88	2.88	0.64	0.004	1.84	0.008	0%
15	36.90	1.22	0.86	1.04	-0.002					0.88	3.85	0.36	-0.002	1.39	-0.002	0%
16	41.75	1.23	0.49	0.86	0.202					0.88	5.20	0.74	0.178	3.85	0.684	7%
17	47.30	1.20	0.91	1.06	0.000					0.88	5.23	0.29	0.000	1.52	0.000	0%
18	52.20	1.15	1.05	1.10	0.000					0.88	4.40	0.10	0.000	0.44	0.000	0%
19	56.10	1.20	0.75	0.98	0.001					0.88	4.00	0.45	0.001	1.80	0.002	0%
20	60.20	1.00	0.58	0.79	0.005					0.88	3.83	0.42	0.004	1.61	0.007	0%
21	63.75	1.02	0.51	0.77	0.126					0.88	3.93	0.51	0.111	2.00	0.222	2%
22	68.05	0.61	0.46	0.54	0.200					0.88	3.77	0.15	0.176	0.57	0.100	1%
LB	71.30	0.00	0.00							0.88	1.63	0.00	0.000	0.00	0.000	
Total Flow														10.4	100%	

Flow Measurement Details:

Metering Section Location (describe):
At usual spot

Meas. Start Time (MST):	10:09
Meas. End Time (MST):	10:53
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -27C

Flow characteristics:

Total Flow:	10.4	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	33.34	(m ²)
Wetted Width:	69.00	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.31	(m/s)
Froude Number:	0.14	

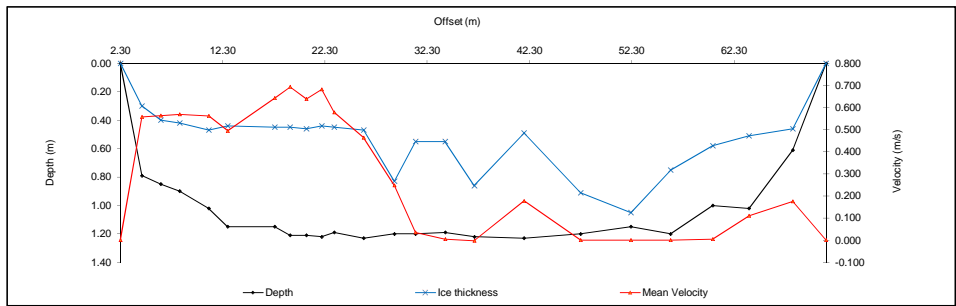
Logger Details:

	Before	After
Transducer Reading (m):	0.791	
Water (°C):	-0.1	
Datalogger Clock:	09:17	
Laptop Clock:	09:17	
Battery (Main):	12.9	
Battery:	Replaced	
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

- Replaced 2 Batteries
- Station was offline upon arrival
- WL fluctuating by 10cm
- Changed GOES program to report average battery voltage
- ADV test passed

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S47A-1	0.195	100.291		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-2			0.407	99.884	99.884	3/4" Pipe 5m S of logger
S47A-3			0.714	99.577	99.579	3/4" Pipe 7m S of logger
Water Level:	Cut		3.465	96.826		Time WL Surveyed: 9:20
Temporary BM			3.282	97.009	0.000	-
Turn						
Temporary BM	3.260	100.269		97.009		
Water Level:	Cut		3.463	96.806		Time WL Surveyed: 9:23
S47A-3			0.693	99.576	99.579	3/4" Pipe 7m S of logger
S47A-2			0.384	99.885	99.884	3/4" Pipe 5m S of logger
S47A-1			0.172	100.097	100.096	3/4" Pipe 6m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.816	-
Closing Error:	-0.001	-
WL Check:	0.020	-
Transducer Elevation	96.025	-

Field Personnel:

	TR, GG, AJ	Trip Date:	10-Jan-15
Data Entry Personnel:	TR	Date:	10-Jan-15
Data Check Personnel:	MP	Date:	10-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

February 7, 2015

Site Visit Time (MST):

11:10



Flow Measurement													Measured Data					Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)								
RB	17.50	0.00	0.00		0.000		0.000		0.000	0.88	0.85	0.00	0.000	0.00	0.000									
1	19.20	0.93	0.35	0.64	0.339					0.88	2.70	0.58	0.298	1.57	0.467	4%								
2	22.90	1.00	0.45	0.73	0.451					0.88	3.33	0.55	0.397	1.83	0.726	6%								
3	25.85	1.10	0.56	0.83	0.425					0.88	2.25	0.54	0.374	1.22	0.454	4%								
4	27.40	1.12	0.55	0.84	0.504					0.88	1.58	0.57	0.444	0.90	0.398	4%								
5	29.00	1.18	0.53	0.86	0.406					0.88	2.73	0.65	0.357	1.77	0.633	6%								
6	32.85	1.22	0.45			1.07	0.374	0.60	0.577	1.00	2.90	0.77	0.476	2.23	1.062	9%								
7	34.80	1.20	0.51	0.86	0.289					0.88	1.77	0.69	0.254	1.22	0.311	3%								
8	36.40	1.29	0.44			1.12	0.437	0.61	0.555	1.00	2.58	0.85	0.496	2.19	1.086	10%								
9	39.95	1.35	0.47			1.17	0.000	0.65	0.551	1.00	3.05	0.88	0.276	2.68	0.739	7%								
10	42.50	1.30	0.66	0.98	0.419					0.88	2.20	0.64	0.369	1.41	0.519	5%								
11	44.35	1.15	0.70	0.93	0.338					0.88	2.05	0.45	0.297	0.92	0.274	2%								
12	46.60	1.32	0.70	1.01	0.235					0.88	2.43	0.62	0.207	1.50	0.311	3%								
13	49.20	1.20	0.64	0.92	0.183					0.88	2.75	0.56	0.161	1.54	0.248	2%								
14	52.10	1.28	0.75	1.02	0.361					0.88	2.47	0.53	0.318	1.31	0.417	4%								
15	54.15	1.32	0.64	0.98	0.480					0.88	1.95	0.68	0.422	1.33	0.560	5%								
16	56.00	1.31	0.57	0.94	0.456					0.88	2.03	0.74	0.401	1.50	0.601	5%								
17	58.20	1.27	0.65	0.96	0.436					0.88	2.55	0.62	0.384	1.58	0.607	5%								
18	61.10	1.30	0.57	0.94	0.350					0.88	3.05	0.73	0.308	2.23	0.686	6%								
19	64.30	1.24	0.65	0.95	0.400					0.88	3.33	0.59	0.352	1.96	0.691	6%								
20	67.75	1.20	0.75	0.98	0.282					0.88	3.60	0.45	0.248	1.62	0.402	4%								
21	71.50	1.10	0.70	0.90	0.100					0.88	4.10	0.40	0.088	1.64	0.144	1%								
22	75.95	1.00	0.65	0.83	-0.002					0.88	3.95	0.35	-0.002	1.38	-0.002	0%								
LB	79.40	0.00	0.00		0.00		0.00		0.00	0.88	1.73	0.00	0.000	0.00	0.000									
Total Flow														11.3	100%									

Flow Measurement Details:

Metering Section Location (describe):
At usual location

Meas. Start Time (MST):	12:25
Meas. End Time (MST):	13:05
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snow, breezy, -22C

Flow characteristics:

Total Flow:	11.3	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	35.53	(m ²)
Wetted Width:	61.90	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.13	

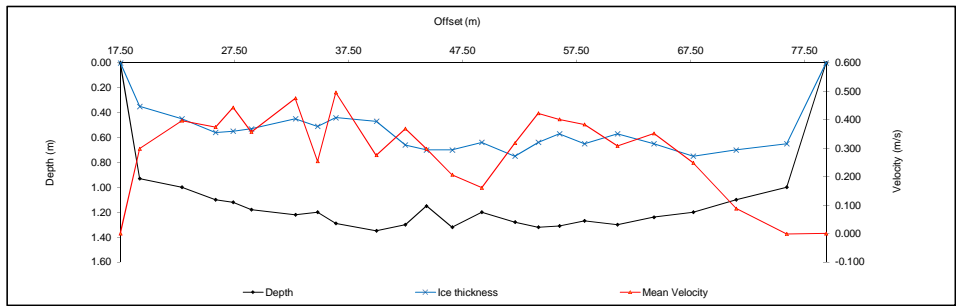
Logger Details:

	Before	After
Transducer Reading (m):	0.687	
Water (°C):	-0.1	
Datalogger Clock:	11:14	
Laptop Clock:	11:14	
Battery (Main):	13.0	
Battery:	Replaced	
Battery Serial #:	-	
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Replaced	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-Replaced 3 batteries



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S47A-3	1.300	100.879		99.579	99.579	3/4" Pipe 7m S of logger
S47A-2			0.992	99.887	99.884	3/4" Pipe 5m S of logger
S47A-1			0.781	100.098	100.096	3/4" Pipe 6m SE of logger
Water Level:	Cut		4.128	96.751		Time WL Surveyed: 11:32
Temporary BM			4.099	96.780		
Turn						
Temporary BM	4.078	100.858		96.780		
Water Level:	Cut		4.104	96.754		Time WL Surveyed: 11:35
S47A-1			0.758	100.100	100.096	3/4" Pipe 6m SE of logger
S47A-2			0.968	99.890	99.884	3/4" Pipe 5m S of logger
S47A-3			1.277	99.581	99.579	3/4" Pipe 7m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.753	-
Closing Error:	-0.002	-
WL Check:	0.003	-
Transducer Elevation	96.066	-

Field Personnel:

	TR, CJ	Trip Date:	7-Feb-15
Data Entry Personnel:	TR	Date:	7-Feb-15
Data Check Personnel:	MP	Date:	10-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

March 9, 2015

Site Visit Time (MST):

08:00

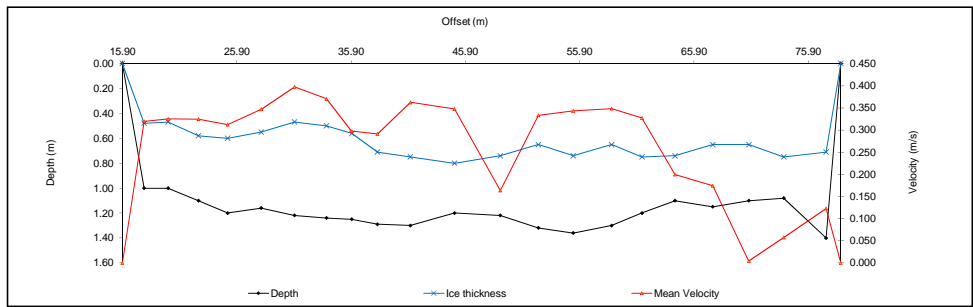


Flow Measurement																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	15.90	0.00	0.00	0.74	0.363					0.88	0.95	0.00	0.000	0.00	0.000	
1	17.80	1.00	0.48	0.74	0.370					0.88	2.00	0.52	0.319	1.04	0.332	3%
2	19.90	1.00	0.47	0.74	0.370					0.88	2.38	0.53	0.326	1.26	0.410	4%
3	22.55	1.10	0.58	0.84	0.369					0.88	2.60	0.52	0.325	1.35	0.439	5%
4	25.10	1.20	0.60	0.90	0.355					0.88	2.75	0.60	0.312	1.65	0.515	5%
5	28.05	1.16	0.55	0.86	0.394					0.88	2.93	0.61	0.347	1.78	0.619	6%
6	30.95	1.22	0.47	0.85	0.452					0.88	2.85	0.75	0.398	2.14	0.850	9%
7	33.75	1.24	0.50	0.87	0.421					0.88	2.50	0.74	0.370	1.85	0.685	7%
8	35.95	1.25	0.56	0.91	0.338					0.88	2.23	0.69	0.297	1.54	0.457	5%
9	38.20	1.29	0.71	1.00	0.331					0.88	2.58	0.58	0.291	1.49	0.435	5%
10	41.10	1.30	0.75	1.03	0.412					0.88	3.38	0.55	0.363	1.86	0.673	7%
11	44.95	1.20	0.80	1.00	0.395					0.88	3.93	0.40	0.348	1.57	0.546	6%
12	48.95	1.22	0.74	0.98	0.186					0.88	3.68	0.48	0.164	1.76	0.289	3%
13	52.30	1.32	0.65	0.99	0.379					0.88	3.20	0.67	0.334	2.14	0.715	8%
14	55.35	1.36	0.74	1.05	0.390					0.88	3.20	0.62	0.343	1.98	0.681	7%
15	58.70	1.30	0.65	0.98	0.396					0.88	3.00	0.65	0.348	1.95	0.680	7%
16	61.35	1.20	0.75	0.98	0.372					0.88	2.77	0.45	0.327	1.25	0.409	4%
17	64.25	1.10	0.74	0.92	0.227					0.88	3.10	0.36	0.200	1.12	0.223	2%
18	67.55	1.15	0.65	0.90	0.198					0.88	3.22	0.50	0.174	1.61	0.281	3%
19	70.70	1.10	0.65	0.88	0.005					0.88	3.10	0.45	0.004	1.40	0.006	0%
20	73.75	1.08	0.75	0.92	0.065					0.88	3.38	0.33	0.057	1.11	0.064	1%
21	77.45	1.40	0.71	1.06	0.140					0.88	2.50	0.69	0.123	1.73	0.213	2%
LB	78.75	0.00	0.00	0.00	0.00					0.88	0.65	0.00	0.000	0.00	0.000	
Total Flow														9.52	100%	

Flow Measurement Details:

Metering Section Location (describe):
At hell pad

Meas. Start Time (MST):	9:05
Meas. End Time (MST):	9:36
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, 4C



Flow characteristics:

Total Flow:	9.52	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	33.58	(m ²)
Wetted Width:	62.85	(m)
Hydraulic Depth:	0.53	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.652	
Water (°C):	-0.1	
Datalogger Clock:	08:04	
Laptop Clock:	08:04	
Battery (Main):	12.9	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

- WL fluctuating 10mm

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S47A-1	0.383	100.479		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-3			0.903	99.576	99.579	3/4" Pipe 7m S of logger
S47A-2			0.594	99.885	99.884	3/4" Pipe 6m S of logger
Water Level:	Cut		3.758	96.721		Time WL Surveyed: 8:16
Temporary BM			3.672	96.807		
Turn						
Temporary BM	3.642	100.449		96.807		
Water Level:	Cut		3.727	96.722		Time WL Surveyed: 8:18
S47A-2			0.564	99.885	99.884	3/4" Pipe 6m S of logger
S47A-3			0.872	99.577	99.579	3/4" Pipe 7m S of logger
S47A-1			0.354	100.095	100.096	3/4" Pipe 6m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.722	-
Closing Error:	0.001	-
WL Check:	0.001	-
Transducer Elevation	96.070	-

Field Personnel:

	GG, DW	Trip Date:	9-Mar-15
Data Entry Personnel:	GG	Date:	9-Mar-15
Data Check Personnel:	MP	Date:	20-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

April 17, 2015

Site Visit Time (MST):

08:00



Flow Measurement Details:

Metering Section Location (describe): At usual location	
Meas. Start Time (MST):	10:00
Meas. End Time (MST):	11:00
Equipment:	ADCP
Method:	Boat
River Condition:	Open, ice floating and on banks
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, 10C

Flow characteristics:

Total Flow:	55.0	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	55.40	(m ²)
Wetted Width:	71.18	(m)
Hydraulic Depth:	0.78	(m)
Mean Velocity:	0.99	(m/s)
Froude Number:	0.36	

Logger Details:

	Before	After
Transducer Reading (m):	0.694	0.732
Water (C):	-0.1	1.9
Datalogger Clock:	08:01	12:28
Laptop Clock:	08:01	12:28
Battery (Main):	12.9	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTB (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- Station was not operating upon arrival, batteries were disconnected
- Boat was transported to flow meas. station

ADCP Flow Measurement Summary:

System Information:		System Setup:		Bank Offsets:	
System Type:	Sonotek RS-M9	Transducer Depth (m):	0.05	LB:	-
Serial Number:	4712	Salinity (ppt):	-	RB:	-
Firmware Version:	3.8	Magnetic Declination (°):	14		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	-		

Discharge Calculation Settings:					
Track Reference:	Bottom-Track				
Depth Reference:	Vertical beam				
Coordinate System:	ENU				
Left Method:	Sloped bank				
Right Method:	Sloped bank				
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				

Measurement Results:					
Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean
2	73.45	56.36	0.979	55.180	0.31%
4	69.66	54.09	1.008	54.512	-0.91%
6	73.70	56.98	0.979	55.401	0.71%
6	67.92	54.57	1.007	54.953	-0.11%
Mean:	71.18	55.40	0.993	55.0	
SD:	2.47	1.09	0.014	0.329	
COV:	0.03	0.02	0.014	0.006	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S47A-1	0.298	100.332		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-2			0.447	99.885	99.884	3/4" Pipe 5m S of logger
S47A-3			0.754	99.579	99.579	3/4" Pipe 7m S of logger
Water Level:	Cut	0.410	3.967	96.775		Time WL Surveyed: 8:06
Temporary BM			3.967	96.365		
Turn						
Temporary BM	3.943	100.308		96.365		
Water Level:	Cut	0.410	3.943	96.775		Time WL Surveyed: 8:08
S47A-3			0.729	99.579	99.579	3/4" Pipe 7m S of logger
S47A-2			0.423	99.885	99.884	3/4" Pipe 5m S of logger
S47A-1			0.212	100.096	100.096	3/4" Pipe 6m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S47A-2	0.423	100.308		99.885		
Water Level:	Cut	0.485	3.991	96.812		Time WL Surveyed: 12:30
Water Level:	Cut	0.485	3.974	96.811		Time WL Surveyed: 12:30
S47A-2	0.405	100.290		99.685		

WL Survey Summary	Before	After
Average WL	96.775	96.812
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	96.081	96.080

Field Personnel:	SM, GG	Trip Date:	17-Apr-15
Data Entry Personnel:	SM	Date:	17-Apr-15
Data Check Personnel:	CJ	Date:	18-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

May 9, 2015

Site Visit Time (MST):

09:15



Flow Measurement Details:	
Metering Section Location (describe): Regular location	
Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:05
Equipment:	ADCP
Method:	Boat
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, 7C

Flow characteristics:	
Total Flow:	53.4 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	67.24 (m ²)
Wetted Width:	72.96 (m)
Hydraulic Depth:	0.92 (m)
Mean Velocity:	27.08 (m/s)
Froude Number:	0.91

Logger Details:		
	Before	After
Transducer Reading (m):	0.636	0.641
Water (°C):	7.4	7.8
Datalogger Clock:	08:29	10:50
Laptop Clock:	08:29	10:51
Battery (Main):	13.7	14.1
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTW (if replaced):	-	-
Loggers (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

ADCP Flow Measurement Summary:					
System Information:			System Setup:		Bank Offsets:
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	73.70
Serial Number:	4712	Salinity (ppt):	0.0	RB:	0.00
Firmware Version:	3.5	Magnetic Declination (°):	14		
Software Version:	3.7	Measured Temperature (°C):	7.5		
		ADCP Temperature (°C):	8.9		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass (ft):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	71.17	65.73	0.803
Coordinate System:	ENU	2	73.60	68.36	0.796
Left Method:	Sloped bank	3	73.16	66.85	0.791
Right Method:	Sloped bank	4	73.70	68.02	0.785
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	72.96	67.24	27.078
		SD:	1.06	1.04	26.286
		COV:	0.01	0.02	0.971
					53.4
					0.612
					0.011

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S47A-3	0.631	100.210		99.579	99.579	3/4" Pipe 7m S of logger
S47A-2			0.323	99.887	99.884	3/4" Pipe 5m S of logger
S47A-1			0.113	100.097	100.096	3/4" Pipe 6m SE of logger
Water Level:	Cut	3.504	96.706			Time WL Surveyed: 8:32
Temporary BM			3.323	96.887	0.000	
Turn						
Temporary BM	3.363	100.250		96.887		
Water Level:	Cut		3.541	96.709		Time WL Surveyed: 8:35
S47A-1			0.153	100.097	100.096	3/4" Pipe 6m SE of logger
S47A-2			0.363	99.887	99.884	3/4" Pipe 6m S of logger
S47A-3			0.671	99.579	99.579	3/4" Pipe 7m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S47A-2	0.363	100.250		99.887		
Water Level:	Cut		3.535	96.715		Time WL Surveyed: 10:45
Water Level:	Cut		3.521	96.712		Time WL Surveyed: 10:47
S47A-2	0.348	100.233		99.887		

WL Survey Summary		
	Before	After
Average WL:	96.708	96.714
Closing Error:	0.000	-
WL Check:	0.003	0.003
Transducer Elevation	96.072	96.073

Field Personnel:			
Data Entry Personnel:	CJ, GG	Trip Date:	9-May-15
Data Check Personnel:	CJ, GG	Date:	9-May-15
Entered Digitally in the Field:	Yes	Date:	3-Jul-15

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

June 16, 2015

Site Visit Time (MST):

12:11



Flow Measurement Details:	
Metering Section Location (describe): Regular location	
Meas. Start Time (MST):	13:15
Meas. End Time (MST):	13:35
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 15C

Flow characteristics:	
Total Flow:	27.0 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	50.73 (m ²)
Wetted Width:	65.08 (m)
Hydraulic Depth:	0.78 (m)
Mean Velocity:	0.53 (m/s)
Reynolds Number:	3.61E+05
Froude Number:	0.19

Logger Details:		
	Before	After
Transducer Reading (m):	0.366	0.369
Water (°C):	14.9	15.3
Datalogger Clock:	12:13	14:27
Laptop Clock:	12:13	14:27
Battery (Minn):	13.6	13.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Mini Tube Desiccant:	-	Good
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	29.75		
Serial Number:	4712	Safety (gpd):	0.0	RB:	94.00		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	15.1	System Test Passed: Yes			
		ADCP Temperature (°C):	15.7				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	65.53	50.99	0.518	26.43	-2.07%
Depth Reference: Vertical beam	2	0.00	65.02	51.20	0.548	26.066	4.00%
Coordinate System: FTM	3	0.00	63.88	49.99	0.536	25.872	-1.54%
Left Method: Sloped bank	4	0.00	65.89	51.15	0.526	26.853	-0.39%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
		Mean:	65.08	50.73	0.532	27.0	
		SD:	0.76	0.67	0.011	0.644	
		COV:	0.01	0.01	0.021	0.024	

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S47A-1	0.162	100.258		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-3			0.678	99.880	99.879	3/4" Pipe 7m S of logger
S47A-2			0.371	99.887	99.884	3/4" Pipe 5m S of logger
Water Level:	Cut	0.026	3.847	96.437	96.411	Time WL Surveyed: 12:14
Temporary BM				3.847	96.411	0.000
Turn						
Temporary BM	3.833	100.244		96.411	96.437	Time WL Surveyed: 12:16
Water Level:	Cut	0.026	3.833	96.437	96.435	
S47A-2			0.357	99.887	99.884	3/4" Pipe 5m S of logger
S47A-3			0.663	99.581	99.579	3/4" Pipe 7m S of logger
S47A-1			0.146	100.098	100.096	3/4" Pipe 6m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S47A-2	0.307	100.244		99.887	99.887	
Water Level:	Cut	0.002	3.608	96.438	96.435	Time WL Surveyed: 14:25
Water Level:	Cut		3.759	96.435	96.435	Time WL Surveyed: 14:26
S47A-2	0.307	100.194		99.887	99.887	

WL Survey Summary		
Average WL:	Before	After
Closing Error:	-0.002	-
WL Check:	0.000	0.003
Transducer Elevation:	96.071	96.069

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:			
Data Entry Personnel:	GG, TR	Trip Date:	16-Jun-15
Data Check Personnel:	GG	Date:	16-Jun-15
Entered Digitally in the Field:	TR	Date:	3-Jul-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

August 13, 2015

Site Visit Time (MST):

10:50



Flow Measurement Details:	
Metering Section Location (describe): Regular location	
Meas. Start Time (MST):	11:01
Meas. End Time (MST):	11:12
Equipment:	ADCP#1
Method:	Side of Boat
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, 23C

Flow characteristics:	
Total Flow:	41.9 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	81.18 (m ²)
Wetted Width:	72.80 (m)
Hydraulic Depth:	0.84 (m)
Mean Velocity:	0.68 (m/s)
Reynolds Number:	5.85E+05
Froude Number:	0.24

Logger Details:		
	Before	After
Transducer Reading (m):	0.527	0.529
Water (°C):	20.5	21.5
Datalogger Clock:	10:52	13:12
Laptop Clock:	10:52	13:12
Battery (Main):	14.0	13.5
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Mini Tube Desiccant:	Good	-
PTF # (if replaced):	28456	-
Logger # (if replaced):	21898	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	89.70		
Serial Number:	4712	Bainry (ppt):	0.0	RB:	18.70		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	20.5	System Test Passed: Yes			
		ADCP Temperature (°C):	21.0				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	72.76	60.43	0.682	41.231	-1.57%
Depth Reference: Vertical beam	2	0.00	71.64	60.62	0.682	41.978	0.21%
Coordinate System: ENL	3	0.00	73.21	62.41	0.681	42.265	1.47%
Left Method: Sloped bank	4	0.00	73.58	61.25	0.683	41.839	-0.12%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
Mean:		72.80	61.18	0.685	41.9		
SD:		0.73	0.77	0.004	0.454		
COV:		0.01	0.01	0.006	0.011		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S47A-1	0.288	100.384		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-3			0.805	99.579	99.579	3/4" Pipe 7m S of logger
S47A-2			0.502	99.882	99.884	3/4" Pipe 5m S of logger
Water Level:	Cut	0.063	3.847	96.600	96.600	Time WL Surveyed: 10:58
Temporary BM			3.847	96.537	96.537	0.000
Turn						
Temporary BM	3.837	100.374		96.537	96.537	
Water Level:	Cut	0.063	3.837	96.600	96.600	Time WL Surveyed: 11:00
S47A-2			0.487	99.887	99.884	3/4" Pipe 5m S of logger
S47A-3			0.793	99.581	99.579	3/4" Pipe 7m S of logger
S47A-1			0.277	100.087	100.086	3/4" Pipe 6m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S47A-2	0.487	100.372		99.885	99.885	
Water Level:	Cut	0.073	3.852	96.593	96.593	Time WL Surveyed: 13:08
Water Level:	Cut	0.073	3.832	96.597	96.597	Time WL Surveyed: 13:10
S47A-2	0.471	100.356		99.885	99.885	

WL Survey Summary		Level Survey Equipment:	
Average WL:	96.600	Level #:	Level#2
Closing Error:	-0.001	Make & Model:	Nikon AC-2S
WL Check:	0.000	Serial #:	668859
Transducer Elevation:	96.073	96.067	

Field Personnel:			
Data Entry Personnel:	TR	Trip Date:	13-Aug-15
Data Check Personnel:	TR	Date:	13-Aug-15
Entered Digitally in the Field:	Yes	Date:	25-Aug-15

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

September 16, 2015

Site Visit Time (MST):

12:10



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000		0.000		0.000	1.00	1.25	0.00	0.000	0.00	0.000	
1	4.50	0.38		0.23	0.239					1.00	3.50	0.38	0.239	1.33	0.318	2%
2	9.00	0.58		0.35	0.270					1.00	4.25	0.58	0.270	2.47	0.666	4%
3	13.00	0.68		0.41	0.339					1.00	4.00	0.68	0.339	2.72	0.922	6%
4	17.00	0.77				0.62	0.261	0.15	0.415	1.00	4.00	0.77	0.338	3.08	1.041	7%
5	21.00	0.70		0.42	0.386					1.00	3.00	0.70	0.386	2.10	0.811	5%
6	23.00	0.76				0.61	0.211	0.15	0.439	1.00	2.50	0.76	0.325	1.90	0.618	4%
7	26.00	0.78				0.62	0.255	0.16	0.431	1.00	4.00	0.78	0.343	3.12	1.070	7%
8	31.00	0.73		0.44	0.414					1.00	4.00	0.73	0.414	2.92	1.209	8%
9	34.00	0.74		0.44	0.349					1.00	3.50	0.74	0.349	2.59	0.904	6%
10	38.00	0.75		0.45	0.356					1.00	3.50	0.75	0.356	2.63	0.935	6%
11	41.00	0.82				0.66	0.302	0.16	0.441	1.00	3.50	0.82	0.372	2.87	1.066	7%
12	45.00	0.80				0.64	0.348	0.16	0.488	1.00	4.00	0.80	0.418	3.20	1.338	8%
13	49.00	0.74		0.44	0.446					1.00	3.00	0.74	0.446	2.22	0.890	6%
14	51.00	0.85				0.68	0.305	0.17	0.421	1.00	2.50	0.85	0.363	2.13	0.771	5%
15	54.00	0.70		0.42	0.348					1.00	2.50	0.70	0.348	1.75	0.609	4%
16	56.00	0.70		0.42	0.292					1.00	2.50	0.70	0.292	1.75	0.511	3%
17	59.00	0.74		0.44	0.307					1.00	2.50	0.74	0.307	1.85	0.568	4%
18	61.00	0.75		0.45	0.339					1.00	3.00	0.75	0.339	2.25	0.763	5%
19	65.00	0.56		0.34	0.265					1.00	4.00	0.56	0.265	2.24	0.594	4%
20	69.00	0.37		0.22	0.198					1.00	3.50	0.37	0.198	1.30	0.256	2%
LB	72.00	0.00	0.00		0.000		0.000		0.000	1.00	1.50	0.00	0.000	0.00	0.000	2%
Total Flow														16.0	100%	

Flow Measurement Details:

Metering Section Location (describe):
Normal flow location

Meas. Start Time (MST):	13:26
Meas. End Time (MST):	14:16
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light breeze, 10C

Flow characteristics:

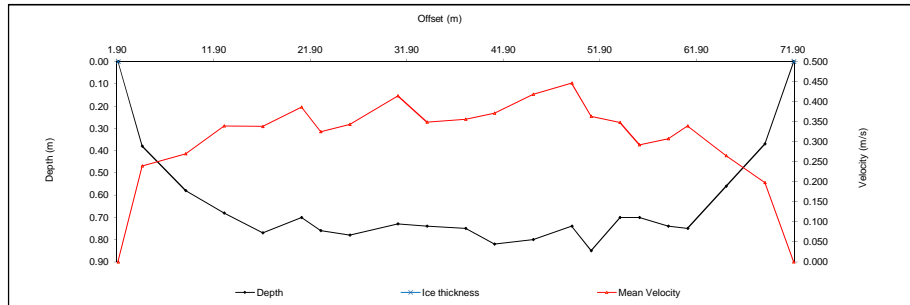
Total Flow:	16.0	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	46.40	(m ²)
Wetted Width:	70.00	(m)
Hydraulic Depth:	0.66	(m)
Mean Velocity:	0.34	(m/s)
Reynolds Number:	1.79E+05	
Froude Number:	0.14	

Logger Details:

	Before	After
Transducer Reading (m):	0.222	0.221
Water (°C):	11.1	11.5
Datalogger Clock:	12:17	14:48
Laptop Clock:	12:17	14:48
Battery:	14.4	14.0
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S47A-1	0.819	100.915		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-3			1.336	99.579	99.579	3/4" Pipe 7m S of logger
S47A-2			1.029	99.886	99.884	3/4" Pipe 5m S of logger
S47A-4			0.080	100.835		Lag bolt in conifer 10m ESE of logger
Water Level:	Cut	0.247	4.871	96.291		Time WL Surveyed: 12:29
Temporary BM			4.871	96.044		
Turn						
Temporary BM	4.861	100.905		96.044		
Water Level:	Cut	0.247	4.861	96.291		Time WL Surveyed: 12:31
S47A-4			0.073	100.832		Lag bolt in conifer 10m ESE of logger
S47A-2			1.022	99.883	99.884	3/4" Pipe 5m S of logger
S47A-3			1.329	99.578	99.579	3/4" Pipe 7m S of logger
S47A-1			0.813	100.092	100.096	3/4" Pipe 6m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S47A-2	1.023	100.908		99.885		
Water Level:	Cut	0.250	4.885	96.293		Time WL Surveyed: 14:43
Water Level:	Cut	0.250	4.881	96.296		Time WL Surveyed: 14:45
S47A-2	1.012	100.897		99.885		

WL Survey Summary	Before	After
Average WL:	96.291	96.295
Closing Error:	0.004	-0.003
WL Check:	0.000	-0.003
Transducer Elevation	96.069	96.074

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:	SM, CJ	Trip Date:	16-Sep-15
Data Entry Personnel:	SM	Date:	16-Sep-15
Data Check Personnel:	TR	Date:	27-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

October 20, 2015

Site Visit Time (MST):

07:35



Flow Measurement Details:	
Metering Section Location (describe): Regular location	
Meas. Start Time (MST):	8:25
Meas. End Time (MST):	8:45
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, light rain, 8C

Flow characteristics:	
Total Flow:	12.4 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	39.32 (m ²)
Wetted Width:	67.53 (m)
Hydraulic Depth:	0.58 (m)
Mean Velocity:	0.31 (m/s)
Reynolds Number:	1.24E+05
Froude Number:	0.13

Logger Details:		
	Before	After
Transducer Reading (m):	0.126	0.332
Water (°C):	6.3	6.4
Datalogger Clock:	07:43	09:43
Laptop Clock:	07:43	09:43
Battery (Minn):	12.7	13.2
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Mini Tube Desiccant:	Good	-
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	
-Moved and trenched pressure transducer, chained boat to tree at treeline	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	11.10		
Serial Number:	4712	Safety (gpd):	0.0	RB:	79.20		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	6.3	System Test Passed: Yes			
		ADCP Temperature (°C):	-				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	68.44	39.86	0.313	12.495	0.97%	67.7
Depth Reference: Vertical beam	2	67.55	39.01	0.312	12.162	-1.72%	67.6
Coordinate System: ENL	3	69.99	39.29	0.303	12.663	2.49%	68.9
Left Method: Sloped bank	4	67.14	39.11	0.311	12.159	-1.74%	68.7
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
Mean:		67.53	39.32	0.315	12.4		
SD:		0.56	0.33	0.005	0.224		
COV:		0.01	0.01	0.015	0.018		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S47A-1		100.369		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-3	0.273		0.791	99.578	99.579	3/4" Pipe 7m S of logger
S47A-2			0.483	99.886	99.884	3/4" Pipe 5m S of logger
Turn						
Water Level:	Cut	0.186	4.322	96.203		Time WL Surveyed: 7:46
Temporary BM			4.322	96.047	0.000	
Turn						
Temporary BM	4.298	100.345		96.047		
Water Level:	Cut	0.186	4.298	96.203		Time WL Surveyed: 7:46
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S47A-1				100.096		
S47A-2	0.460	100.346		99.886		
Water Level:	Cut	0.297	4.437	96.206		Time WL Surveyed: 9:35
Water Level:	Cut	0.297	4.417	96.205		Time WL Surveyed: 9:37
S47A-2	0.439	100.325		99.886		

WL Survey Summary		
Average WL:	96.203	96.206
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	96.075	95.874

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:			
Data Entry Personnel:	GG	Trip Date:	20-Oct-15
Data Check Personnel:	TR	Date:	20-Oct-15
Entered Digitally in the Field:	Yes	Date:	27-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

December 11, 2015

Site Visit Time (MST):

12:49



Flow Measurement:										Calculated Data						
Bank/ Mmt #	Offset (m)	Measured Data			Measured Data					Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
		Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)							
RB	13.00	0.00	0.00		0.000					0.88	1.35	0.00	0.000	0.00	0.000	
1	15.70	0.48	0.18	0.33	-0.003					0.88	2.55	0.30	-0.003	0.77	-0.002	0%
2	18.10	0.77	0.25	0.51	0.034					0.88	2.20	0.52	0.030	1.14	0.034	0%
3	20.10	0.83	0.15	0.49	0.138					0.88	2.60	0.68	0.121	1.77	0.215	2%
4	23.30	0.90	0.20	0.55	0.002					0.88	2.50	0.70	0.002	1.75	0.003	0%
5	25.10	0.84	0.15	0.50	0.065					0.88	2.05	0.69	0.057	1.41	0.081	1%
6	27.40	0.80	0.25	0.53	0.231					0.88	2.05	0.55	0.203	1.13	0.229	3%
7	29.20	1.00	0.15			0.83	0.001	0.32	0.001	1.00	1.90	0.85	0.001	1.62	0.002	0%
8	31.20	0.90	0.25	0.58	0.168					0.88	2.15	0.65	0.148	1.40	0.207	2%
9	33.50	0.98	0.18			0.82	0.126	0.34	0.011	1.00	2.40	0.80	0.069	1.92	0.132	2%
10	36.00	0.96	0.15			0.80	0.203	0.31	-0.001	1.00	2.30	0.81	0.101	1.86	0.188	2%
11	38.10	0.86	0.16	0.51	0.002					0.88	2.50	0.70	0.002	1.75	0.003	0%
12	41.00	0.92	0.20	0.56	0.345					0.88	2.25	0.72	0.304	1.62	0.482	6%
13	42.60	0.90	0.20	0.55	0.260					0.88	2.00	0.70	0.229	1.40	0.320	4%
14	45.00	0.98	0.15			0.81	0.448	0.32	0.001	1.00	2.50	0.83	0.225	2.08	0.466	5%
15	47.60	1.02	0.15			0.85	0.633	0.32	0.000	1.00	2.55	0.87	0.317	2.22	0.702	8%
16	50.10	0.96	0.21	0.59	0.491					0.88	2.50	0.75	0.432	1.88	0.810	9%
17	52.60	0.96	0.13			0.79	0.573	0.30	0.605	1.00	2.25	0.83	0.589	1.87	1.100	13%
18	54.60	0.95	0.14			0.79	0.515	0.30	0.665	1.00	2.00	0.81	0.590	1.62	0.956	11%
19	56.60	0.96	0.30	0.63	0.501					0.88	2.50	0.66	0.441	1.72	0.757	9%
20	59.80	0.80	0.30	0.55	0.601					0.88	2.70	0.50	0.529	1.35	0.714	8%
21	62.00	0.78	0.30	0.54	0.524					0.88	2.65	0.48	0.461	1.27	0.587	7%
22	65.10	0.76	0.35	0.56	0.308					0.88	3.10	0.41	0.271	1.27	0.344	4%
23	68.20	0.65	0.35	0.50	0.255					0.88	3.05	0.30	0.224	0.91	0.205	2%
24	71.20	0.42	0.20	0.31	0.145					0.88	2.65	0.22	0.128	0.58	0.074	1%
LB	73.50	0.00	0.00		0.00					0.88	1.15	0.00	0.000	0.00	0.000	
Total Flow														8.62	100%	

Flow Measurement Details:

Metering Section Location (describe):
Usual location

Meas. Start Time (MST):	13:40
Meas. End Time (MST):	14:26
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Overcast, -1C

Flow characteristics:

Total Flow:	8.620	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	36.30	(m ²)
Wetted Width:	60.50	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.24	(m/s)
Reynolds Number:	7.97E+04	
Froude Number:	0.10	

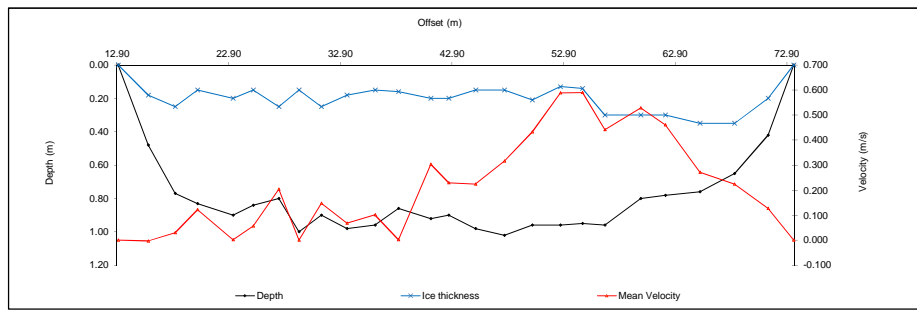
Logger Details:

	Before	After
Transducer Reading (m):	0.655	-
Water (°C):	0.1	-
Datalogger Clock:	13:48	-
Laptop Clock:	12:48	-
Battery:	12.6	13.0
Battery Condition:	Replaced	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- Right bank - variable depths and flows due to rocks.
- Slush affecting flow, especially near right bank.
- Flow mmt graded fair.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S47A-1	0.347	100.443		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-3			0.866	99.577	99.579	3/4" Pipe 7m S of logger
S47A-2			0.556	99.887	99.884	3/4" Pipe 6m S of logger
Water Level:	Cut		3.923	96.520		Time WL Surveyed: 13:05
Temporary BM			3.789	96.654		0.000
Turn						
Temporary BM	3.765	100.420		96.654		
Water Level:	Cut		3.900	96.520		Time WL Surveyed: 13:09
S47A-2			0.532	99.888	99.884	3/4" Pipe 6m S of logger
S47A-3			0.841	99.579	99.579	3/4" Pipe 7m S of logger
S47A-1			0.322	100.098	100.096	3/4" Pipe 6m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary	Before	After
Average WL:	96.520	-
Closing Error:	-0.002	-
WL Check:	0.000	-
Transducer Elevation	95.365	-

Level Survey Equipment:	Level #:
Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:	GG, DW, AJ	Trip Date:	11-Dec-15
Data Entry Personnel:	GG	Date:	11-Dec-15
Data Check Personnel:	JC	Date:	8-Jan-16
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek

UTM Location: 470895 E, 6389207 N

Site Visit Date:

April 29, 2015

Site Visit Time (MST):

12:48



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.50	0.00	0.00							1.00	0.25	0.00	0.000	0.00	0.000	
1	9.00	0.13		0.08	0.021					1.00	0.50	0.13	0.021	0.07	0.001	0%
2	9.50	0.18		0.11	0.330					1.00	0.50	0.18	0.330	0.09	0.030	4%
3	10.00	0.22		0.13	0.324					1.00	0.50	0.22	0.324	0.11	0.036	4%
4	10.50	0.20		0.12	0.260					1.00	0.50	0.20	0.260	0.10	0.026	3%
5	11.00	0.18		0.11	0.288					1.00	0.40	0.18	0.288	0.07	0.021	3%
6	11.30	0.30		0.18	0.234					1.00	0.30	0.30	0.234	0.09	0.021	3%
7	11.60	0.41		0.25	0.286					1.00	0.30	0.41	0.286	0.12	0.035	4%
8	11.90	0.46		0.28	0.288					1.00	0.30	0.46	0.288	0.14	0.040	5%
9	12.20	0.52		0.31	0.315					1.00	0.30	0.52	0.315	0.16	0.049	6%
10	12.50	0.58		0.35	0.307					1.00	0.30	0.58	0.307	0.17	0.053	7%
11	12.80	0.55		0.33	0.326					1.00	0.30	0.55	0.326	0.16	0.054	7%
12	13.10	0.52		0.31	0.337					1.00	0.30	0.52	0.337	0.16	0.053	7%
13	13.40	0.32		0.19	0.365					1.00	0.30	0.32	0.365	0.10	0.035	4%
14	13.70	0.50		0.30	0.339					1.00	0.30	0.50	0.339	0.15	0.051	6%
15	14.00	0.51		0.31	0.310					1.00	0.30	0.51	0.310	0.15	0.047	6%
16	14.30	0.54		0.32	0.360					1.00	0.30	0.54	0.360	0.16	0.058	7%
17	14.60	0.58		0.35	0.311					1.00	0.30	0.58	0.311	0.17	0.054	7%
18	14.90	0.58		0.35	0.299					1.00	0.30	0.58	0.299	0.17	0.052	6%
19	15.20	0.56		0.34	0.153					1.00	0.30	0.56	0.153	0.17	0.026	3%
20	15.50	0.49		0.29	0.226					1.00	0.58	0.49	0.226	0.28	0.064	8%
LB	16.35	0.00	0.00							1.00	0.43	0.00	0.000	0.00	0.000	
Total Flow														0.806	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of station

Meas. Start Time (MST):	13:36
Meas. End Time (MST):	13:54
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, 14C

Flow characteristics:

Total Flow:	0.806	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.80	(m ²)
Wetted Width:	7.85	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.15	

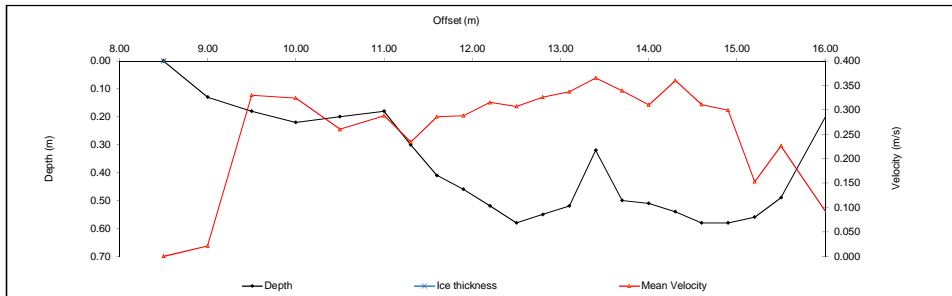
Logger Details:

	Before	After
Transducer Reading (m):	1.151	0.880
Water (°C):	14	8.7
Datalogger Clock:	12:53	14:09
Lapto Clock:	12:51	14:06
Battery (Main):	13.9	14.5
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	298684
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Installed pls, s/n #: 298684
- Installed radio to communicate with repeater station
- Returned to the station on May 3 to correct modem and timer wiring.

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S48-03	1.373	101.171		99.798	99.798	3/4" Pipe 6m NE of datalogger
S48-04			1.500	99.671	99.671	3/4" Pipe 6m E of datalogger
S48-01			0.971	100.200	100.198	3/4" Pipe 2m SE of datalogger
Water Level:	Cut		2.627	98.544	Time WL Surveyed:	13:21
Temporary BM			0.971	100.200		
Turn						
Temporary BM	0.953	101.153		100.200		
Water Level:	Cut		2.607	98.546	Time WL Surveyed:	13:24
S48-01			0.953	100.200	100.198	3/4" Pipe 2m SE of datalogger
S48-04			1.482	99.671	99.671	3/4" Pipe 6m E of datalogger
S48-03			1.353	99.800	99.798	3/4" Pipe 6m NE of datalogger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S48-01	0.953	101.153		100.200		
Water Level:	Cut		2.597	98.556	Time WL Surveyed:	13:58
Water Level:	Cut		2.578	98.558	Time WL Surveyed:	14:00
S48-01	0.936	101.136		100.200		

WL Survey Summary	Before	After
Average WL:	98.545	98.557
Closing Error:	-0.002	-
WL Check:	0.002	-0.002
Transducer Elevation	97.394	97.877

Field Personnel:	GG, TR	Trip Date:	29-Apr-15
Data Entry Personnel:	GG	Date:	29-Apr-15
Data Check Personnel:	DW	Date:	26-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek
 UTM Location: 470895 E, 6389207 N

Site Visit Date: June 15, 2015
 Site Visit Time (MST): 10:27

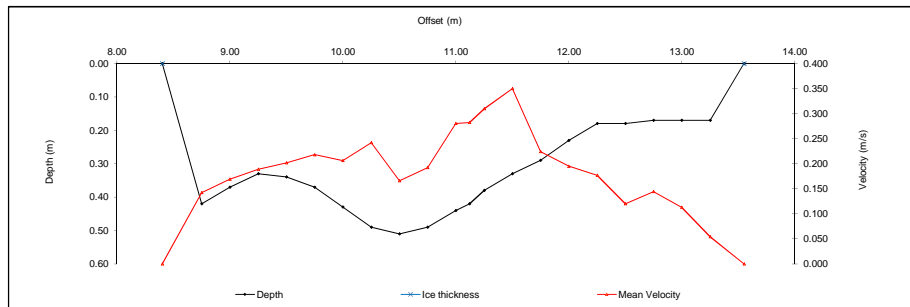


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.40	0.00	0.00		0.000		0.000		0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	8.75	0.42		0.25	0.142					1.00	0.30	0.42	0.142	0.13	0.018	5%
2	9.00	0.37		0.22	0.169					1.00	0.25	0.37	0.169	0.09	0.016	5%
3	9.25	0.33		0.20	0.189					1.00	0.25	0.33	0.189	0.08	0.016	5%
4	9.50	0.34		0.20	0.202					1.00	0.25	0.34	0.202	0.09	0.017	5%
5	9.75	0.37		0.22	0.218					1.00	0.25	0.37	0.218	0.09	0.020	6%
6	10.00	0.43		0.26	0.206					1.00	0.25	0.43	0.206	0.11	0.022	7%
7	10.25	0.49		0.29	0.242					1.00	0.25	0.49	0.242	0.12	0.030	9%
8	10.50	0.51		0.31	0.166					1.00	0.25	0.51	0.166	0.13	0.021	6%
9	10.75	0.49		0.29	0.192					1.00	0.25	0.49	0.192	0.12	0.024	7%
10	11.00	0.44		0.26	0.280					1.00	0.18	0.44	0.280	0.08	0.023	7%
11	11.12	0.42		0.25	0.282					1.00	0.13	0.42	0.282	0.05	0.015	5%
12	11.25	0.38		0.23	0.310					1.00	0.19	0.38	0.310	0.07	0.022	7%
13	11.50	0.33		0.20	0.350					1.00	0.25	0.33	0.350	0.08	0.029	9%
14	11.75	0.29		0.17	0.224					1.00	0.25	0.29	0.224	0.07	0.016	5%
15	12.00	0.23		0.14	0.195					1.00	0.25	0.23	0.195	0.06	0.011	3%
16	12.25	0.18		0.11	0.177					1.00	0.25	0.18	0.177	0.05	0.008	2%
17	12.50	0.18		0.11	0.120					1.00	0.25	0.18	0.120	0.05	0.005	2%
18	12.75	0.17		0.10	0.144					1.00	0.25	0.17	0.144	0.04	0.006	2%
19	13.00	0.17		0.10	0.113					1.00	0.25	0.17	0.113	0.04	0.005	1%
20	13.25	0.17		0.10	0.054					1.00	0.28	0.17	0.054	0.05	0.003	1%
LB	13.55	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
Total Flow														0.326	100%	

Flow Measurement Details:

Metering Section Location (describe):
50 m downstream of pressure transducer

Meas. Start Time (MST):	10:46
Meas. End Time (MST):	11:05
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm



Flow characteristics:

Total Flow:	0.326	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.60	(m ²)
Wetted Width:	5.15	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.20	(m/s)
Reynolds Number:	5.27E+04	
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.431	0.431
Water (°C):	13.4	13.6
Datalogger Clock:	10:32	11:20
Laptop Clock:	10:30	11:18
Battery:	14.7	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- Ran adv test, passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S48-04	1.399	101.070		99.671	99.671	3/4" Pipe 6m E of datalogger
S48-03			1.269	99.801	99.798	3/4" Pipe 6m NE of datalogger
S48-01			0.872	100.198	100.198	3/4" Pipe 2m SE of datalogger
Water Level:	Cut		2.748	98.322		Time WL Surveyed: 10:33
S48-01			0.872	100.198	100.198	3/4" Pipe 2m SE of datalogger
Turn						
S48-01	0.861	101.059		100.198	100.198	3/4" Pipe 2m SE of datalogger
Water Level:	Cut		2.736	98.323		Time WL Surveyed: 10:35
S48-01			0.861	100.198	100.198	3/4" Pipe 2m SE of datalogger
S48-03			1.257	99.802	99.798	3/4" Pipe 6m NE of datalogger
S48-04			1.587	99.672	99.671	3/4" Pipe 6m E of datalogger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S48-01	0.861	101.059		100.198		Time WL Surveyed: 11:13
Water Level:	Cut		2.736	98.323		Time WL Surveyed: 11:15
Water Level:	Cut		2.721	98.323		
S48-01	0.846	101.044		100.198		

WL Survey Summary

	Before	After
Average WL:	98.323	98.323
Closing Error:	-0.001	-
WL Check:	0.001	0.000
Transducer Elevation	97.892	97.892

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, MK	Trip Date:	15-Jun-15
Data Check Personnel:	DW	Date:	15-Jun-15
Entered Digitally in the Field:	Yes	Date:	16-Jun-15

Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek
 UTM Location: 470895 E, 6389207 N

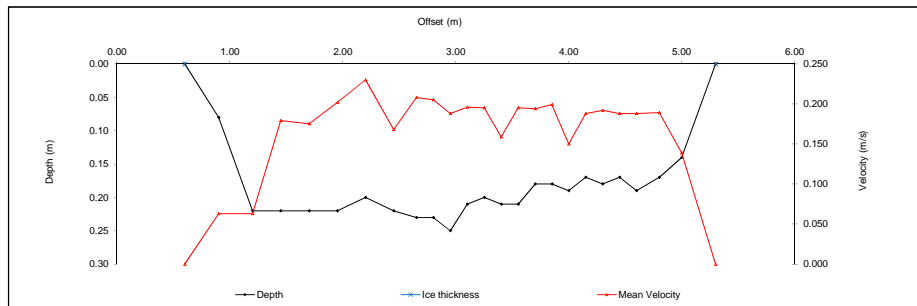
Site Visit Date: August 18, 2015
 Site Visit Time (MST): 10:35



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	5.30	0.00	0.00		0.000				0.000							
1	5.00	0.14		0.08	0.139					1.00	0.25	0.14	0.139	0.04	0.005	3%
2	4.80	0.17		0.10	0.189					1.00	0.20	0.17	0.189	0.03	0.006	4%
3	4.60	0.19		0.11	0.188					1.00	0.17	0.19	0.188	0.03	0.006	4%
4	4.45	0.17		0.10	0.188					1.00	0.15	0.17	0.188	0.03	0.005	3%
5	4.30	0.18		0.11	0.192					1.00	0.15	0.18	0.192	0.03	0.005	3%
6	4.15	0.17		0.10	0.188					1.00	0.15	0.17	0.188	0.03	0.005	3%
7	4.00	0.19		0.11	0.150					1.00	0.15	0.19	0.150	0.03	0.004	3%
8	3.85	0.18		0.11	0.199					1.00	0.15	0.18	0.199	0.03	0.005	4%
9	3.70	0.18		0.11	0.194					1.00	0.15	0.18	0.194	0.03	0.005	4%
10	3.55	0.21		0.13	0.195					1.00	0.15	0.21	0.195	0.03	0.006	4%
11	3.40	0.21		0.13	0.159					1.00	0.15	0.21	0.159	0.03	0.005	3%
12	3.25	0.20		0.12	0.195					1.00	0.15	0.20	0.195	0.03	0.006	4%
13	3.10	0.21		0.13	0.196					1.00	0.15	0.21	0.196	0.03	0.006	4%
14	2.95	0.25		0.15	0.188					1.00	0.15	0.25	0.188	0.04	0.007	5%
15	2.80	0.23		0.14	0.205					1.00	0.15	0.23	0.205	0.03	0.007	5%
16	2.65	0.23		0.14	0.208					1.00	0.18	0.23	0.208	0.04	0.008	6%
17	2.45	0.22		0.13	0.168					1.00	0.23	0.22	0.168	0.05	0.008	6%
18	2.20	0.20		0.12	0.230					1.00	0.25	0.20	0.230	0.05	0.012	8%
19	1.95	0.22		0.13	0.202					1.00	0.25	0.22	0.202	0.06	0.011	7%
20	1.70	0.22		0.13	0.175					1.00	0.25	0.22	0.175	0.06	0.010	6%
21	1.45	0.22		0.13	0.179					1.00	0.25	0.22	0.179	0.06	0.010	7%
22	1.20	0.22		0.13	0.063					1.00	0.28	0.22	0.063	0.06	0.004	3%
23	0.90	0.08		0.05	0.063					1.00	0.30	0.08	0.063	0.02	0.002	1%
LB	0.60	0.00			0.000				0.000							
Total Flow														0.149	100%	

Flow Measurement Details:
 Metering Section Location (describe):

Meas. Start Time (MST):	11:00
Meas. End Time (MST):	11:24
Equipment:	ADP62
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 20C



Flow characteristics:

Total Flow:	0.149	(m ³ /s)
Perceived Measuremt Quality:	Excellent	
Cross Section Area:	0.85	(m ²)
Wetted Width:	4.70	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.18	(m/s)
Reynolds Number:	2.59E+04	
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.310	0.311
Water (°C):	12.7	12.8
Datalogger Clock:	10:43	11:33
Laptop Clock:	10:40	11:30
Battery:	13.9	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT8 (if replaced):	298684	-
Logger# (if replaced):	16118	-

Datalogger / Station Notes:
 - Update elevations

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S48-01	1.452	101.123		99.671	99.671	3/4" Pipe 6m E of datalogger
S48-04			0.925	100.198	100.198	3/4" Pipe 2m SE of datalogger
S48-03			1.323	99.800	99.798	3/4" Pipe 6m NE of datalogger
Water Level:				Cut	2.928	98.195
Temporary BM					2.801	98.322
Time WL Surveyed:						10:50
Turn						
Temporary BM	2.787	101.109		98.322		
Water Level:				Cut	2.910	98.199
Time WL Surveyed:						10:51
S48-03			1.313	99.796	99.798	3/4" Pipe 6m NE of datalogger
S48-01			0.912	100.197	100.198	3/4" Pipe 2m SE of datalogger
S48-04			1.438	99.671	99.671	3/4" Pipe 6m E of datalogger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S48-01		0.912		100.198		
Water Level:				Cut	2.908	98.202
Water Level:				Cut	2.858	98.200
Time WL Surveyed:						11:29
Time WL Surveyed:						11:29
S48-01	0.860	101.058		100.198		

WL Survey Summary

	Before	After
Average WL:	98.197	98.201
Closing Error:	0.000	-
WL Check:	0.004	0.002
Transducer Elevation	97.887	97.890

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	DW, SG	Trip Date:	18-Aug-15
Data Entry Personnel:	DW	Date:	18-Aug-15
Data Check Personnel:	DW	Date:	16-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek
 UTM Location: 470895 E, 6389207 N

Site Visit Date: September 13, 2015
 Site Visit Time (MST): 16:00

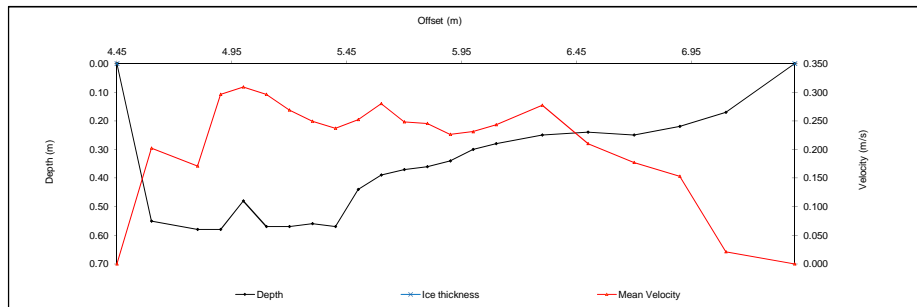


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
ib	4.45	0.00	0.00		0.000		0.000		0.000	1.00	0.07	0.00	0.000	0.00	0.000	
1	4.60	0.55		0.33	0.202					1.00	0.17	0.55	0.202	0.10	0.019	8%
2	4.80	0.58		0.35	0.171					1.00	0.15	0.58	0.171	0.09	0.015	6%
3	4.90	0.58		0.35	0.296					1.00	0.10	0.58	0.296	0.06	0.017	7%
4	5.00	0.48		0.29	0.309					1.00	0.10	0.48	0.309	0.05	0.015	6%
5	5.10	0.57		0.34	0.296					1.00	0.10	0.57	0.296	0.06	0.017	7%
6	5.20	0.57		0.34	0.269					1.00	0.10	0.57	0.269	0.06	0.015	7%
7	5.30	0.56		0.34	0.249					1.00	0.10	0.56	0.249	0.06	0.014	6%
8	5.40	0.57		0.34	0.237					1.00	0.10	0.57	0.237	0.06	0.014	6%
9	5.50	0.44		0.26	0.252					1.00	0.10	0.44	0.252	0.04	0.011	5%
10	5.60	0.39		0.23	0.280					1.00	0.10	0.39	0.280	0.04	0.011	5%
11	5.70	0.37		0.22	0.248					1.00	0.10	0.37	0.248	0.04	0.009	4%
12	5.80	0.36		0.22	0.245					1.00	0.10	0.36	0.245	0.04	0.009	4%
13	5.90	0.34		0.20	0.226					1.00	0.10	0.34	0.226	0.03	0.008	3%
14	6.00	0.30		0.18	0.231					1.00	0.10	0.30	0.231	0.03	0.007	3%
15	6.10	0.28		0.17	0.243					1.00	0.15	0.28	0.243	0.04	0.010	4%
16	6.30	0.25		0.15	0.277					1.00	0.20	0.25	0.277	0.05	0.014	6%
17	6.50	0.24		0.14	0.210					1.00	0.20	0.24	0.210	0.05	0.010	4%
18	6.70	0.25		0.15	0.177					1.00	0.20	0.25	0.177	0.05	0.009	4%
19	6.90	0.22		0.13	0.153					1.00	0.20	0.22	0.153	0.04	0.007	3%
20	7.10	0.17		0.10	0.021					1.00	0.25	0.17	0.021	0.04	0.001	0%
ib	7.40	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	0%
Total Flow														0.231	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m upstream of station

Meas. Start Time (MST):	16:45
Meas. End Time (MST):	17:10
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy



Flow characteristics:

Total Flow:	0.231	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.01	(m ²)
Wetted Width:	2.95	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.23	(m/s)
Reynolds Number:	5.83E+04	
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading []	0.389	0.392
Water (°C):	9.5	9.6
Datalogger Clock:	16:01	17:23
Laptop Clock:	16:01	17:20
Battery:	13.9	14.3
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S48-04	1.200	100.871		99.671	99.671	3/4" Pipe 6m E of datalogger
S48-03			1.074	99.797	99.798	3/4" Pipe 6m NE of datalogger
S48-01			0.677	100.194	100.198	3/4" Pipe 2m SE of datalogger
S48-05			1.121	99.750	99.750	Lag bolt in tree 8m SE of logger
Water Level:	Cut			2.599	98.272	Time WL Surveyed: 16:38
Temporary BM			1.299	99.572		
Turn						
Temporary BM	1.292	100.864		99.572		
Water Level:	Cut			2.592	98.272	Time WL Surveyed: 16:40
S48-05			1.115	99.749	99.750	Lag bolt in tree 8m SE of logger
S48-01			0.670	100.194	100.198	3/4" Pipe 2m SE of datalogger
S48-03			1.068	99.798	99.798	3/4" Pipe 6m NE of datalogger
S48-04			1.193	99.671	99.671	3/4" Pipe 6m E of datalogger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S48-04	1.193	100.864		99.671		
Water Level:	Cut			2.586	98.276	Time WL Surveyed: 17:15
Water Level:	Cut			2.590	98.280	Time WL Surveyed: 17:16
S48-04	1.199	100.870		99.671		

WL Survey Summary

	Before	After
Average WL:	98.272	98.279
Closing Error:	0.000	-
WL Check:	0.000	-0.002
Transducer Elevation	97.883	97.887

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Camsel AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	CJ, TL	Trip Date:	13-Sep-15
Data Check Personnel:	JC	Date:	16-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek
 UTM Location: 470895 E, 6389207 N

Site Visit Date: October 29, 2015
 Site Visit Time (MST): 10:45

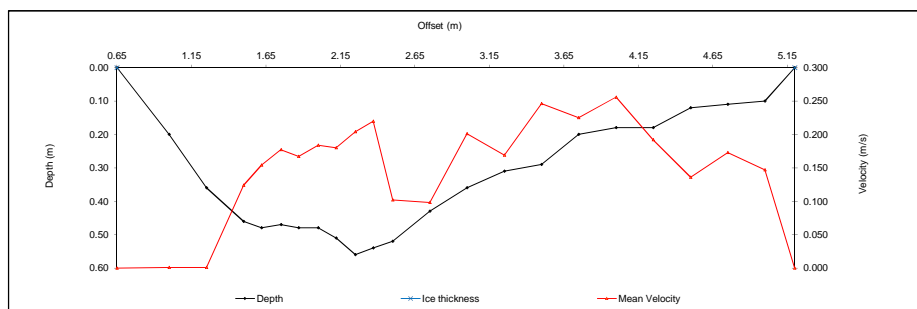


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	0.65	0.00	0.00		0.000				0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	1.00	0.20		0.12	0.001					1.00	0.30	0.20	0.001	0.06	0.000	0%
2	1.25	0.36		0.22	0.001					1.00	0.25	0.36	0.001	0.09	0.000	0%
3	1.50	0.46		0.28	0.124					1.00	0.19	0.46	0.124	0.09	0.011	5%
4	1.62	0.48		0.29	0.154					1.00	0.13	0.48	0.154	0.06	0.009	5%
5	1.75	0.47		0.28	0.177					1.00	0.13	0.47	0.177	0.06	0.010	5%
6	1.87	0.48		0.29	0.167					1.00	0.13	0.48	0.167	0.06	0.010	5%
7	2.00	0.48		0.29	0.184					1.00	0.13	0.48	0.184	0.06	0.011	5%
8	2.12	0.51		0.31	0.180					1.00	0.13	0.51	0.180	0.06	0.011	6%
9	2.25	0.56		0.34	0.204					1.00	0.13	0.56	0.204	0.07	0.014	7%
10	2.37	0.54		0.32	0.220					1.00	0.13	0.54	0.220	0.07	0.015	7%
11	2.50	0.52		0.31	0.102					1.00	0.19	0.52	0.102	0.10	0.010	5%
12	2.75	0.43		0.26	0.098					1.00	0.25	0.43	0.098	0.11	0.011	5%
13	3.00	0.36		0.22	0.201					1.00	0.25	0.36	0.201	0.09	0.018	5%
14	3.25	0.31		0.19	0.169					1.00	0.25	0.31	0.169	0.08	0.013	6%
15	3.50	0.29		0.17	0.246					1.00	0.25	0.29	0.246	0.07	0.018	9%
16	3.75	0.20		0.12	0.225					1.00	0.25	0.20	0.225	0.05	0.011	5%
17	4.00	0.18		0.11	0.256					1.00	0.25	0.18	0.256	0.05	0.012	6%
18	4.25	0.18		0.11	0.192					1.00	0.25	0.18	0.192	0.05	0.009	4%
19	4.50	0.12		0.07	0.136					1.00	0.25	0.12	0.136	0.03	0.004	2%
20	4.75	0.11		0.07	0.173					1.00	0.25	0.11	0.173	0.03	0.005	2%
21	5.00	0.10		0.06	0.147					1.00	0.23	0.10	0.147	0.02	0.003	2%
RB	5.20	0.00	0.00		0.00				0.00	1.00	0.10	0.00	0.000	0.00	0.000	
Total Flow														0.205	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	11:07
Meas. End Time (MST):	11:21
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3098
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, 3C



Flow characteristics:

Total Flow:	0.205	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.34	(m ²)
Wetted Width:	4.55	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.15	(m/s)
Reynolds Number:	2.69E+04	
Froude Number:	0.69	

Logger Details:

	Before	After
Transducer Reading (m):	0.388	0.394
Water (°C):	2.2	2.2
Datalogger Clock:	10:50	11:27
Laptop Clock:	10:47	14:7
Battery:	14.7	14.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	298684	-
Logger# (if replaced):	16118	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S48-03	1.248	101.046		99.798	99.798	3/4" Pipe 6m NE of datalogger
S48-04			1.375	99.671	99.671	3/4" Pipe 6m E of datalogger
S48-05			1.297	99.749	99.750	Lag bolt in tree 8m SE of logger
Turn						
Water Level:	Cut		2.777	98.269	98.269	Time WL Surveyed: 10:53
S48-05			1.297	99.749	99.750	Lag bolt in tree 8m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S48-04	1.344	101.015		99.671	99.671	Lag bolt in tree 8m SE of logger
Water Level:	Cut		2.742	98.273	98.273	Time WL Surveyed: 11:28
Water Level:	Cut		2.718	98.271	98.271	Time WL Surveyed: 11:30
S48-04	1.318	100.989		99.671	99.671	3/4" Pipe 6m NE of datalogger

WL Survey Summary

	Before	After
Average WL:	98.268	98.272
Closing Error:	0.001	-
WL Check:	0.002	0.002
Transducer Elevation	97.880	97.878

Level Survey Equipment:

Level #:	Basel#1
Make & Model:	Cansel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	29-Oct-15
Data Check Personnel:	JC	Date:	29-Oct-15
Entered Digitally in the Field:	Yes	Date:	16-Nov-15

Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek
 UTM Location: 465524 E, 6372768 N

Site Visit Date: June 15, 2015
 Site Visit Time (MST): 11:50



Flow Measurement Details:	
Metering Section Location (describe): at hell pad	
Meas. Start Time (MST):	12:26
Meas. End Time (MST):	12:45
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Good flow, turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy

Flow characteristics:		
Total Flow:	0.649	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.98	(m ²)
Wetted Width:	7.84	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	7.14E+04	
Froude Number:	0.67	

Logger Details:		
	Before	After
Transducer Reading (m):	0.396	0.393
Water (°C):	14.7	14.9
Datalogger Clock:	11:51	13:00
Laptop Clock:	11:51	13:00
Battery (Minn):	14.3	13.8
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Mini Tube Dessiccant:	-	Good
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	
- Eight total passes needed with ADCP	

ADCP Flow Measurement Summary:										
System Information:					System Setup:			Bank Offsets:		
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	14.50				
Serial Number:	4712	Bainry (ppt):	-	-	RB:	7.10				
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes					
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes					
		ADCP Temperature (°C):	-	15.4						
Discharge Calculation Settings:					Measurement Results:					
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)			
Track Reference: Bottom-Track	2	0.00	8.25	4.23	0.148	0.625	-3.62%	53.8		
Depth Reference: Vertical beam	3	0.00	7.53	3.77	0.18	0.68	4.86%	51.4		
Coordinate System: FTM	6	0.00	8.05	4.15	0.168	0.656	1.10%	53.4		
Left Method: Sloped bank	8	0.00	7.52	3.76	0.168	0.633	-2.39%	51.5		
Right Method: Sloped bank										
Top Fit Type: Power fit										
Bottom Fit Type: Power fit										
		Mean:	7.84	3.98	0.164	0.649				
		SD:	0.32	0.21	0.012	0.021				
		COV:	0.04	0.05	0.073	0.033				

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S49-01	1.034	101.034		100.000	100.000	3/4" Pipe 6m N of data logger
S49-03			1.135	99.899	99.935	3/4" Pipe 5m NE of data logger
S49-04			0.763	100.271	100.290	3/4" Pipe 7m E of data logger
Water Level						
Water Level:	Cut		3.031	98.003		Time WL Surveyed: 11:54
Temporary BM			3.187	97.847	0.000	
Turn						
Temporary BM	3.171	101.018		97.847		
Water Level:	Cut		3.011	98.007		Time WL Surveyed: 11:56
S49-04			0.746	100.272	100.290	3/4" Pipe 7m E of data logger
S49-03			1.117	99.901	99.935	3/4" Pipe 5m NE of data logger
S49-01			1.017	100.001	100.000	3/4" Pipe 6m N of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S49-01	1.017	101.018		100.001		
Water Level:	Cut		3.022	97.994		Time WL Surveyed: 12:55
Water Level:	Cut		3.007	97.984		Time WL Surveyed: 12:57
S49-01	1.000	101.001		100.001		

WL Survey Summary			Level Survey Equipment:	
	Before	After	Level #:	Level#4
Average WL:	98.005	97.995	Make & Model:	Nikon AC-2S
Closing Error:	-0.001	-	Serial #:	868785
WL Check:	0.004	0.002		
Transducer Elevation:	97.807	97.802		

Field Personnel:			
Data Entry Personnel:	GG, MK	Trip Date:	15-Jun-15
Data Check Personnel:	DG	Date:	15-Jun-15
Entered Digitally in the Field:	DW	Date:	17-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek
 UTM Location: 465524 E, 6372768 N

Site Visit Date: August 18, 2015
 Site Visit Time (MST): 12:30

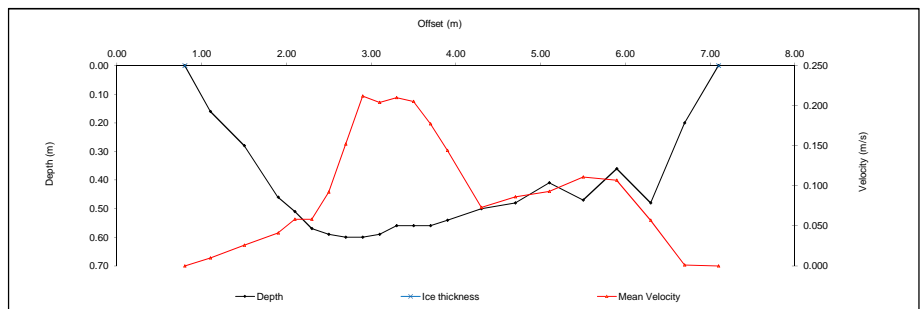


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.10	0.16		0.10	0.010					1.00	0.35	0.16	0.010	0.06	0.001	0%
2	1.50	0.28		0.17	0.026					1.00	0.40	0.28	0.026	0.11	0.003	1%
3	1.90	0.46		0.28	0.041					1.00	0.30	0.46	0.041	0.14	0.006	2%
4	2.10	0.51		0.31	0.058					1.00	0.20	0.51	0.058	0.10	0.006	2%
5	2.30	0.57		0.34	0.058					1.00	0.20	0.57	0.058	0.11	0.007	2%
6	2.50	0.59		0.35	0.052					1.00	0.20	0.59	0.052	0.12	0.011	4%
7	2.70	0.60		0.36	0.152					1.00	0.20	0.60	0.152	0.12	0.018	6%
8	2.90	0.60		0.36	0.212					1.00	0.20	0.60	0.212	0.12	0.025	9%
9	3.10	0.59		0.35	0.204					1.00	0.20	0.59	0.204	0.12	0.024	8%
10	3.30	0.56		0.34	0.210					1.00	0.20	0.56	0.210	0.11	0.024	8%
11	3.50	0.56		0.34	0.205					1.00	0.20	0.56	0.205	0.11	0.023	8%
12	3.70	0.56		0.34	0.177					1.00	0.20	0.56	0.177	0.11	0.020	7%
13	3.90	0.54		0.32	0.144					1.00	0.30	0.54	0.144	0.16	0.023	8%
14	4.30	0.50		0.30	0.073					1.00	0.40	0.50	0.073	0.20	0.015	5%
15	4.70	0.48		0.29	0.086					1.00	0.40	0.48	0.086	0.19	0.017	6%
16	5.10	0.41		0.25	0.093					1.00	0.40	0.41	0.093	0.16	0.015	5%
17	5.50	0.47		0.28	0.111					1.00	0.40	0.47	0.111	0.19	0.021	7%
18	5.90	0.36		0.22	0.107					1.00	0.40	0.36	0.107	0.14	0.015	5%
19	6.30	0.48		0.29	0.057					1.00	0.40	0.48	0.057	0.19	0.011	4%
20	6.70	0.20		0.12	0.001					1.00	0.40	0.20	0.001	0.08	0.000	0%
LB	7.10	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.284	100%	

Flow Measurement Details:

Metering Section Location (describe): at helicopter pad

Meas. Start Time (MST):	12:55
Meas. End Time (MST):	13:21
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Light rain, 18C



Flow characteristics:

Total Flow:	0.284	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.66	(m ²)
Wetted Width:	6.30	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.11	(m/s)
Reynolds Number:	4.01E+04	
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.238	0.234
Water (°C):	15.6	16.1
Datalogger Clock:	12:34	13:28
Laptop Clock:	12:34	13:28
Battery:	13.7	13.7
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	248958	-
Logger# (if replaced):	17937	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S49-01	1.017	101.017		100.000	100.000	3/4" Pipe 6m N of data logger
S49-03			1.116	99.901	99.935	3/4" Pipe 5m NE of data logger
S49-04			0.945	100.072	100.290	3/4" Pipe 7m E of data logger
Water Level:	Cut		3.192	97.825		Time WL Surveyed: 12:50
Temporary BM			3.168	97.849	0.000	-
Turn						
Temporary BM	3.158	101.007		97.849		-
Water Level:	Cut		3.179	97.828		Time WL Surveyed: 12:51
S49-04			0.932	100.075	100.290	3/4" Pipe 7m E of data logger
S49-03			1.105	99.902	99.935	3/4" Pipe 5m NE of data logger
S49-01			1.005	100.002	100.000	3/4" Pipe 6m N of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S49-01	1.005	101.006		100.001		Time WL Surveyed: 13:27
Water Level:	Cut		3.178	97.828		Time WL Surveyed: 13:27
Water Level:	Cut		3.162	97.831		
S49-01	0.992	100.993		100.001		

WL Survey Summary

	Before	After
Average WL:	97.827	97.830
Closing Error:	-0.002	-
WL Check:	0.003	-0.003
Transducer Elevation	97.589	97.596

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	DW, SG	Trip Date:	18-Aug-15
Data Check Personnel:	DW	Date:	18-Aug-15
Entered Digitally in the Field:	Yes	Date:	16-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek
 UTM Location: 465524 E, 6372768 N

Site Visit Date: September 13, 2015
 Site Visit Time (MST): 10:09



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.80	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.00	0.56		0.34	0.020					1.00	0.20	0.56	0.020	0.11	0.002	1%
2	2.20	0.46		0.28	0.037					1.00	0.20	0.46	0.037	0.09	0.003	1%
3	2.40	0.50		0.30	0.018					1.00	0.20	0.50	0.018	0.10	0.002	1%
4	2.60	0.50		0.30	0.019					1.00	0.20	0.50	0.019	0.10	0.002	1%
5	2.80	0.48		0.29	0.103					1.00	0.20	0.48	0.103	0.10	0.010	4%
6	3.00	0.50		0.30	0.148					1.00	0.15	0.50	0.148	0.08	0.011	4%
7	3.10	0.52		0.31	0.119					1.00	0.10	0.52	0.119	0.05	0.006	2%
8	3.20	0.58		0.35	0.116					1.00	0.15	0.58	0.116	0.09	0.010	4%
9	3.40	0.58		0.35	0.178					1.00	0.20	0.58	0.178	0.12	0.021	8%
10	3.60	0.59		0.35	0.204					1.00	0.15	0.59	0.204	0.09	0.018	7%
11	3.70	0.57		0.34	0.253					1.00	0.10	0.57	0.253	0.06	0.014	6%
12	3.80	0.57		0.34	0.299					1.00	0.10	0.57	0.299	0.06	0.017	7%
13	3.90	0.71		0.43	0.220					1.00	0.10	0.71	0.220	0.07	0.016	6%
14	4.00	0.69		0.41	0.255					1.00	0.10	0.69	0.255	0.07	0.018	7%
15	4.10	0.68		0.41	0.182					1.00	0.10	0.68	0.182	0.07	0.012	5%
16	4.20	0.67		0.40	0.175					1.00	0.15	0.67	0.175	0.10	0.018	7%
17	4.40	0.53		0.32	0.180					1.00	0.20	0.53	0.180	0.11	0.019	8%
18	4.60	0.50		0.30	0.179					1.00	0.20	0.50	0.179	0.10	0.018	7%
19	4.80	0.47		0.28	0.183					1.00	0.25	0.47	0.183	0.12	0.022	8%
20	5.10	0.31		0.19	0.134					1.00	0.35	0.31	0.134	0.11	0.015	6%
21	5.50	0.28		0.17	0.000					1.00	0.63	0.28	0.000	0.18	0.000	0%
LB	6.35	0.00	0.00		0.00		0.00		0.00	1.00	0.43	0.00	0.000	0.00	0.000	
Total Flow														0.253	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of station

Meas. Start Time (MST):	10:26
Meas. End Time (MST):	11:04
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 15C

Flow characteristics:

Total Flow:	0.253	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.95	(m ²)
Wetted Width:	4.55	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.13	(m/s)
Reynolds Number:	4.24E+04	
Froude Number:	0.66	

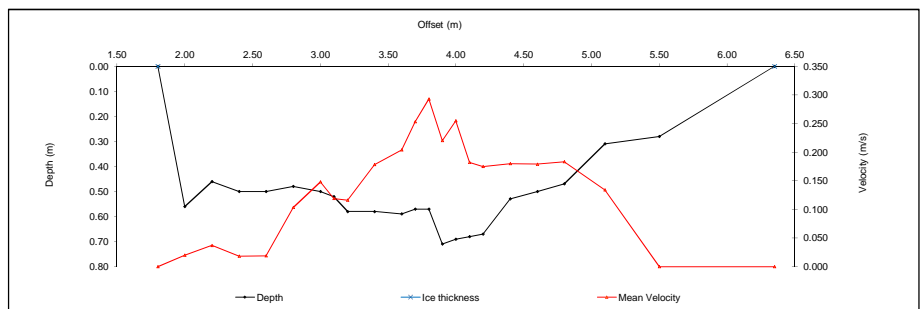
Logger Details:

	Before	After
Transducer Reading (m):	0.272	0.275
Water (°C):	10.2	10.6
Datalogger Clock:	10:11	11:12
Laptop Clock:	10:11	11:12
Battery:	14.5	14.3
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Secondary survey not completed due to equipment malfunction.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S49-01	1.009	101.009		100.000	100.000	3/4" Pipe 6m N of data logger
S49-03			1.108	99.901	99.935	3/4" Pipe 5m NE of data logger
S49-04			0.736	100.273	100.290	3/4" Pipe 7m E of data logger
Water Level						
Water Level:	Cut		3.162	97.847		Time WL Surveyed: 10:17
Temporary BM			3.151	97.858	0.000	
Turn						
Temporary BM	3.140	100.998		97.858		
Water Level:	Cut		3.148	97.850		Time WL Surveyed: 10:21
S49-04			0.728	100.270	100.290	3/4" Pipe 7m E of data logger
S49-03			1.100	99.898	99.935	3/4" Pipe 5m NE of data logger
S49-01			1.001	99.997	100.000	3/4" Pipe 6m N of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S49-01	0.991	100.990		99.999		
Water Level:	Cut		3.123	97.867		Time WL Surveyed: 11:10
Water Level:	Cut		-	-		Time WL Surveyed: -
S49-01	-	-	-	-	-	-

WL Survey Summary		
	Before	After
Average WL:	97.849	97.867
Closing Error:	0.003	-
WL Check:	0.003	-
Transducer Elevation	97.577	97.592

Level Survey Equipment:		
Level #:	Level #:	Serial #:
	Banfield#3	
Make & Model:	Cancel AT-24	
Serial #:	112890	

Field Personnel:			
		Trip Date:	
Data Entry Personnel:	CJ, TL	Date:	13-Sep-15
Data Check Personnel:	DW	Date:	13-Sep-15
Entered Digitally in the Field:	Yes	Date:	17-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek
 UTM Location: 465524 E, 6372768 N

Site Visit Date: October 29, 2015
 Site Visit Time (MST): 12:05

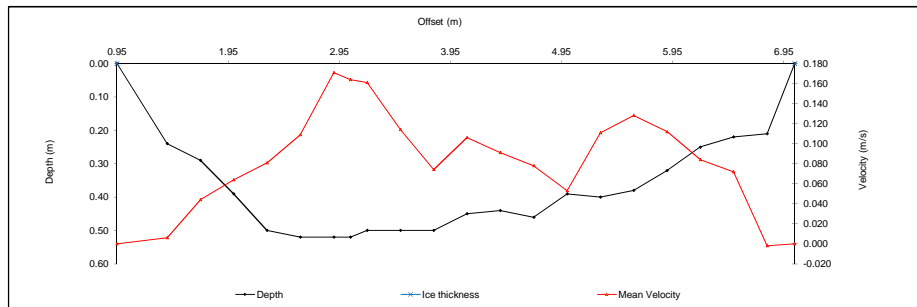


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.95	0.00	0.00		0.000		0.000		0.000	1.00	0.23	0.00	0.000	0.00	0.000	
1	1.40	0.24		0.14	0.006					1.00	0.38	0.24	0.006	0.09	0.001	0%
2	1.70	0.29		0.17	0.044					1.00	0.30	0.29	0.044	0.09	0.004	2%
3	2.00	0.39		0.23	0.064					1.00	0.30	0.39	0.064	0.12	0.007	4%
4	2.30	0.50		0.30	0.081					1.00	0.30	0.50	0.081	0.15	0.012	6%
5	2.60	0.52		0.31	0.109					1.00	0.30	0.52	0.109	0.16	0.017	8%
6	2.90	0.52		0.31	0.171					1.00	0.23	0.52	0.171	0.12	0.020	9%
7	3.05	0.52		0.31	0.164					1.00	0.15	0.52	0.164	0.08	0.013	6%
8	3.20	0.50		0.30	0.161					1.00	0.23	0.50	0.161	0.11	0.018	9%
9	3.50	0.50		0.30	0.114					1.00	0.30	0.50	0.114	0.15	0.017	8%
10	3.80	0.50		0.30	0.074					1.00	0.30	0.50	0.074	0.15	0.011	5%
11	4.10	0.45		0.27	0.106					1.00	0.30	0.45	0.106	0.14	0.014	7%
12	4.40	0.44		0.26	0.091					1.00	0.30	0.44	0.091	0.13	0.012	6%
13	4.70	0.46		0.28	0.078					1.00	0.30	0.46	0.078	0.14	0.011	5%
14	5.00	0.39		0.23	0.053					1.00	0.30	0.39	0.053	0.12	0.008	3%
15	5.30	0.40		0.24	0.111					1.00	0.30	0.40	0.111	0.12	0.013	6%
16	5.60	0.38		0.23	0.128					1.00	0.30	0.38	0.128	0.11	0.015	7%
17	5.90	0.32		0.19	0.112					1.00	0.30	0.32	0.112	0.10	0.011	5%
18	6.20	0.25		0.15	0.084					1.00	0.30	0.25	0.084	0.07	0.006	3%
19	6.50	0.22		0.13	0.072					1.00	0.30	0.22	0.072	0.07	0.005	2%
20	6.80	0.21		0.13	-0.002					1.00	0.27	0.21	-0.002	0.06	0.000	0%
LB	7.05	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
Total Flow														0.213	100%	

Flow Measurement Details:

Metering Section Location (describe):
 Across from helicopter landing area

Meas. Start Time (MST):	12:30
Meas. End Time (MST):	12:50
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Average flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 3C



Flow characteristics:

Total Flow:	0.213	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.26	(m ²)
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.09	(m/s)
Reynolds Number:	2.04E+04	
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.201	0.203
Water (°C):	1.4	1.5
Datalogger Clock:	12:10	12:56
Laptop Clock:	12:10	12:56
Battery:	12.3	12.3
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S49-04	1.593	101.865		100.272	100.272	3/4" Pipe 7m E of data logger
S49-05			0.473	101.392	-	Bolt 20m SSE of station
S49-03			1.968	99.897	99.900	3/4" Pipe 5m NE of data logger
Water Level:	Cut		4.073	97.792		Time WL Surveyed: 12:20
Temporary BM			1.968	99.897	-	
Turn						
Temporary BM	1.940	101.837		99.897	-	
Water Level:	Cut		4.047	97.790		Time WL Surveyed: 12:21
S49-03			1.940	99.897	99.900	3/4" Pipe 5m NE of data logger
S49-05			0.446	101.391	-	Bolt 20m SSE of station
S49-04			1.567	100.270	100.272	3/4" Pipe 7m E of data logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S49-03	1.941	101.838		99.897	-	
Water Level:	Cut		4.043	97.795		Time WL Surveyed: 12:59
Water Level:	Cut		4.003	97.795		Time WL Surveyed: 13:00
S49-03	1.901	101.798		99.897	-	

WL Survey Summary

	Before	After
Average WL:	97.791	97.795
Closing Error:	0.002	-
WL Check:	0.002	0.000
Transducer Elevation	97.590	97.592

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Camsel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	29-Oct-15
Data Check Personnel:	JC	Date:	16-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S50A Redclay Creek
 UTM Location: 474872 E, 6400203 N

Site Visit Date: June 16, 2015
 Site Visit Time (MST): 08:20

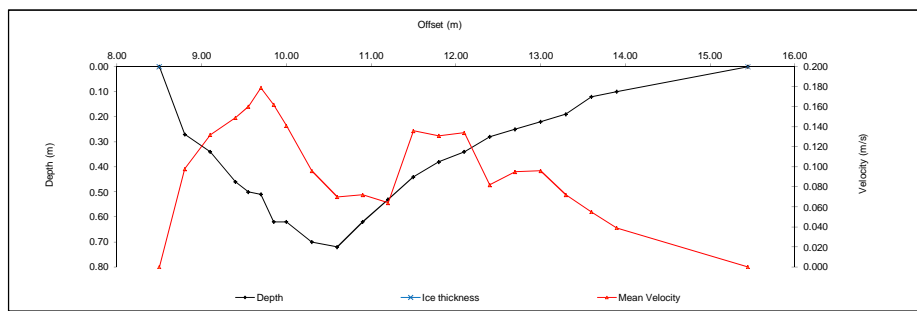


Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)							
LB	8.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000								
1	8.80	0.27		0.16	0.098					1.00	0.30	0.27	0.098	0.08	0.008	3%							
2	9.10	0.34		0.20	0.132					1.00	0.30	0.34	0.132	0.10	0.013	6%							
3	9.40	0.46		0.28	0.149					1.00	0.23	0.46	0.149	0.10	0.015	7%							
4	9.55	0.50		0.30	0.160					1.00	0.15	0.50	0.160	0.07	0.012	5%							
5	9.70	0.51		0.31	0.179					1.00	0.15	0.51	0.179	0.08	0.014	6%							
6	9.85	0.62		0.37	0.162					1.00	0.15	0.62	0.162	0.09	0.015	6%							
7	10.00	0.62		0.37	0.141					1.00	0.23	0.62	0.141	0.14	0.020	8%							
8	10.30	0.70		0.42	0.096					1.00	0.30	0.70	0.096	0.21	0.020	9%							
9	10.60	0.72		0.43	0.070					1.00	0.30	0.72	0.070	0.22	0.015	6%							
10	10.90	0.62		0.37	0.072					1.00	0.30	0.62	0.072	0.19	0.013	6%							
11	11.20	0.53		0.32	0.064					1.00	0.30	0.53	0.064	0.16	0.010	4%							
12	11.50	0.44		0.26	0.136					1.00	0.30	0.44	0.136	0.13	0.018	8%							
13	11.80	0.38		0.23	0.131					1.00	0.30	0.38	0.131	0.11	0.015	6%							
14	12.10	0.34		0.20	0.134					1.00	0.30	0.34	0.134	0.10	0.014	6%							
15	12.40	0.28		0.17	0.082					1.00	0.30	0.28	0.082	0.08	0.007	3%							
16	12.70	0.25		0.15	0.095					1.00	0.30	0.25	0.095	0.07	0.007	3%							
17	13.00	0.22		0.13	0.096					1.00	0.30	0.22	0.096	0.07	0.006	3%							
18	13.30	0.19		0.11	0.072					1.00	0.30	0.19	0.072	0.06	0.004	2%							
19	13.60	0.12		0.07	0.055					1.00	0.30	0.12	0.055	0.04	0.002	1%							
20	13.90	0.10		0.06	0.039					1.00	0.30	0.10	0.039	0.09	0.004	2%							
RB	15.45	0.00	0.00		0.00		0.00		0.00	1.00	0.77	0.00	0.000	0.00	0.000								
Total Flow														0.233	100%								

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of station

Meas. Start Time (MST):	8:59
Meas. End Time (MST):	9:19
Equipment:	ADV#1
Flow Meter Make & Model:	Sortek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly Cloudy, 15C



Flow characteristics:

Total Flow:	0.233	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.20	(m ²)
Wetted Width:	6.95	(m)
Hydraulic Depth:	0.32	(m)
Mean Velocity:	0.11	(m/s)
Reynolds Number:	2.55E+04	
Froude Number:	0.06	

Logger Details:

	Before	After
Transducer Reading (m):	0.489	0.489
Water (°C):	10.3	10.3
Datalogger Clock:	08:58	09:26
Laptop Clock:	08:57	09:25
Battery:	12.9	13.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	298707	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Pressure transducer found pulled out of data logger by wildlife upon arrival to station.
- Replaced pressure transducer during visit.

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S50A-02	1.512	101.672		100.160	100.160	Pipe 8m S of logger
S50A-03			1.653	100.019	100.019	Pipe 7m SW of logger
S50A-04			0.793	100.879	100.879	Pipe 10m SE of logger
Water Level:	Cut		3.367	98.305		Time WL Surveyed: 8:44
S50A-04			0.793	100.879	100.879	Pipe 10m SE of logger
Turn						
S50A-04	0.777	101.656		100.879	100.879	Pipe 10m SE of logger
Water Level:	Cut		3.350	98.306		Time WL Surveyed: 8:47
S50A-04			0.777	100.879	100.879	Pipe 10m SE of logger
S50A-03			1.637	100.019	100.019	Pipe 7m SW of logger
S50A-02			1.496	100.160	100.160	Pipe 8m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S50A-03	1.637	101.656		100.019		
Water Level:	Cut		3.348	98.307		Time WL Surveyed: 9:21
Water Level:	Cut		3.334	98.306		Time WL Surveyed: 9:23
S50A-03	1.623	101.642		100.019		

WL Survey Summary

	Before	After
Average WL:	98.306	98.308
Closing Error:	0.000	-
WL Check:	0.001	-0.001
Transducer Elevation	97.817	97.819

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	16-Jun-15
Data Check Personnel:	DW	Date:	25-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S50A Redclay Creek
 UTM Location: 474872 E, 6400203 N

Site Visit Date: August 18, 2015
 Site Visit Time (MST): 09:10

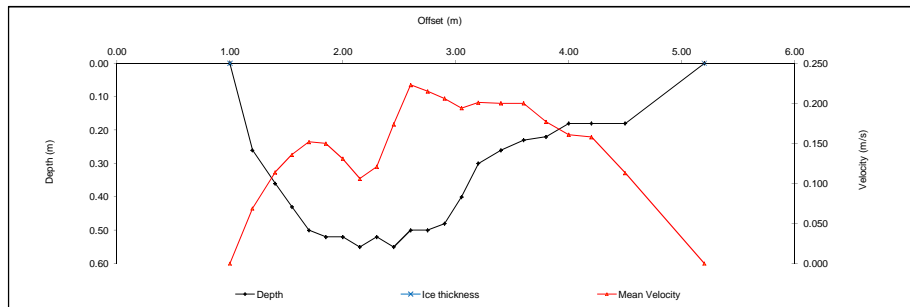


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.20	0.26		0.16	0.069					1.00	0.20	0.26	0.069	0.05	0.004	2%
2	1.40	0.36		0.22	0.114					1.00	0.18	0.36	0.114	0.06	0.007	3%
3	1.55	0.43		0.26	0.136					1.00	0.15	0.43	0.136	0.06	0.009	4%
4	1.70	0.50		0.30	0.152					1.00	0.15	0.50	0.152	0.08	0.011	6%
5	1.85	0.52		0.31	0.150					1.00	0.15	0.52	0.150	0.08	0.012	6%
6	2.00	0.52		0.31	0.131					1.00	0.15	0.52	0.131	0.08	0.010	5%
7	2.15	0.55		0.33	0.106					1.00	0.15	0.55	0.106	0.08	0.009	4%
8	2.30	0.52		0.31	0.121					1.00	0.15	0.52	0.121	0.08	0.009	5%
9	2.45	0.55		0.33	0.174					1.00	0.15	0.55	0.174	0.08	0.014	7%
10	2.60	0.50		0.30	0.223					1.00	0.15	0.50	0.223	0.07	0.017	8%
11	2.75	0.50		0.30	0.215					1.00	0.15	0.50	0.215	0.08	0.016	8%
12	2.90	0.48		0.29	0.206					1.00	0.15	0.48	0.206	0.07	0.015	7%
13	3.05	0.40		0.24	0.194					1.00	0.15	0.40	0.194	0.06	0.012	6%
14	3.20	0.30		0.18	0.201					1.00	0.18	0.30	0.201	0.05	0.011	5%
15	3.40	0.26		0.16	0.200					1.00	0.20	0.26	0.200	0.05	0.010	5%
16	3.60	0.23		0.14	0.200					1.00	0.20	0.23	0.200	0.05	0.009	4%
17	3.80	0.22		0.13	0.177					1.00	0.20	0.22	0.177	0.04	0.008	4%
18	4.00	0.18		0.11	0.161					1.00	0.20	0.18	0.161	0.04	0.006	3%
19	4.20	0.18		0.11	0.158					1.00	0.25	0.18	0.158	0.05	0.007	3%
20	4.50	0.18		0.11	0.113					1.00	0.50	0.18	0.113	0.09	0.010	5%
RB	5.20	0.00	0.00		0.00				0.00	1.00	0.35	0.00	0.000	0.00	0.000	
Total Flow														0.206	100%	

Flow Measurement Details:

Metering Section Location (describe): 20m downstream of station

Meas. Start Time (MST):	9:35
Meas. End Time (MST):	10:00
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 17C



Flow characteristics:

Totall Flow:	0.206	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.30	(m ²)
Wetted Width:	4.20	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	3.91E+04	
Froude Number:	0.09	

Logger Details:

	Before	After
Transducer Reading (m):	0.260	0.256
Water (°C):	11.9	11.9
Datalogger Clock:	09:14	10:07
Laptop Clock:	09:13	10:07
Battery:	14.5	14.3
Battery Condition:	Good	Low
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	298707	-
Logger# (if replaced):	18203	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S50A-02	1.385	101.545		100.160	100.160	Pipe 15m SE of logger
S50A-03			1.526	100.019	100.019	Pipe 10m SSE of logger
S50A-04			0.663	100.882	100.879	Pipe 7m South of logger
Water Level:	Cut		3.382	98.163		Time WL Surveyed: 9:20
Temporary BM			3.113	98.432	0.000	
Turn						
Temporary BM	3.095	101.527		98.432		
Water Level:	Cut		3.364	98.163		Time WL Surveyed: 9:20
S50A-04			0.647	100.880	100.879	Pipe 7m South of logger
S50A-03			1.508	100.019	100.019	Pipe 10m SSE of logger
S50A-02			1.367	100.160	100.160	Pipe 15m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S50A-03	1.508	101.527		100.019		Time WL Surveyed: 10:05
Water Level:	Cut		3.364	98.163		Time WL Surveyed: 10:05
Water Level:	Cut		3.353	98.159		Time WL Surveyed: 10:05
S50A-03	1.493	101.512		100.019		

WL Survey Summary

	Before	After
Average WL:	98.163	98.161
Closing Error:	0.000	-
WL Check:	0.000	0.004
Transducer Elevation	97.903	97.905

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	DW, SG	Trip Date:	18-Aug-15
Data Entry Personnel:	DW	Date:	18-Aug-15
Data Check Personnel:	DW	Date:	17-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S50A Redclay Creek
 UTM Location: 474872 E, 6400203 N

Site Visit Date: September 13, 2015
 Site Visit Time (MST): 08:00

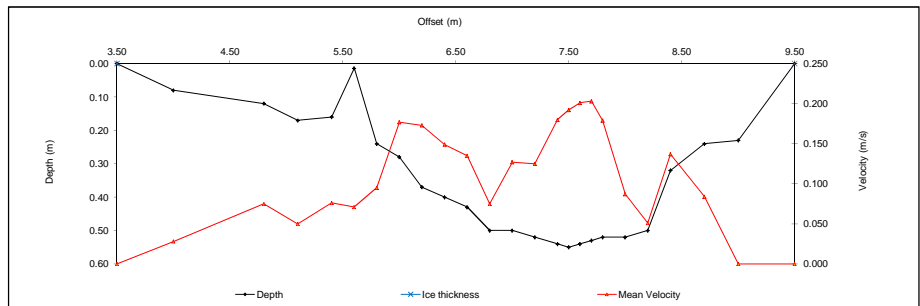


Flow Measurement:										Measured Data							Calculated Data						
Bank/	Offset	Depth from bottom to WS	WS to bottom of ice	Depth of Obs. @ 0.8 Depth	Velocity @ 0.5 Depth	Depth of Obs. @ 0.8 Depth	Velocity @ 0.8 Depth	Depth of Obs. @ 0.2 Depth	Velocity @ 0.2 Depth	Velocity Correction Factor	Pannel Width	Effective Pannel Depth	Effective Average Pannel Velocity	Pannel Area	Pannel Discharge	Percent of total flow							
Mmt #	(m)	(m)	(m)	(m)	(m/s)	(m)	(m/s)	(m)	(m/s)	(m)	(m)	(m)	(m/s)	(m ²)	(m ³ /s)	(%)							
RB	3.50	0.00	0.00		0.000				0.000														
1	4.00	0.08		0.05	0.028				1.00	0.65	0.08	0.028	0.05	0.001	1%								
2	4.80	0.12		0.07	0.075				1.00	0.55	0.12	0.075	0.07	0.005	3%								
3	5.10	0.17		0.10	0.050				1.00	0.30	0.17	0.050	0.05	0.003	1%								
4	5.40	0.16		0.10	0.076				1.00	0.25	0.16	0.076	0.04	0.003	2%								
5	5.60	0.01		0.01	0.071				1.00	0.20	0.01	0.071	0.00	0.000	0%								
6	5.80	0.24		0.14	0.095				1.00	0.20	0.24	0.095	0.05	0.005	2%								
7	6.00	0.28		0.17	0.177				1.00	0.20	0.28	0.177	0.06	0.010	5%								
8	6.20	0.37		0.22	0.173				1.00	0.20	0.37	0.173	0.07	0.013	7%								
9	6.40	0.40		0.24	0.149				1.00	0.20	0.40	0.149	0.08	0.012	6%								
10	6.60	0.43		0.26	0.135				1.00	0.20	0.43	0.135	0.09	0.012	6%								
11	6.80	0.50		0.30	0.075				1.00	0.20	0.50	0.075	0.10	0.008	4%								
12	7.00	0.50		0.30	0.127				1.00	0.20	0.50	0.127	0.10	0.013	7%								
13	7.20	0.52		0.31	0.125				1.00	0.20	0.52	0.125	0.10	0.013	7%								
14	7.40	0.54		0.32	0.180				1.00	0.15	0.54	0.180	0.08	0.015	8%								
15	7.50	0.55		0.33	0.192				1.00	0.10	0.55	0.192	0.05	0.011	6%								
16	7.60	0.54		0.32	0.201				1.00	0.10	0.54	0.201	0.05	0.011	6%								
17	7.70	0.53		0.32	0.203				1.00	0.10	0.53	0.203	0.05	0.011	6%								
18	7.80	0.52		0.31	0.179				1.00	0.15	0.52	0.179	0.08	0.014	7%								
19	8.00	0.52		0.31	0.087				1.00	0.20	0.52	0.087	0.10	0.009	5%								
20	8.20	0.50		0.30	0.051				1.00	0.20	0.50	0.051	0.10	0.005	3%								
21	8.40	0.32		0.19	0.137				1.00	0.25	0.32	0.137	0.08	0.011	6%								
22	8.70	0.24		0.14	0.084				1.00	0.30	0.24	0.084	0.07	0.006	3%								
23	9.00	0.23		0.14	0.000				1.00	0.40	0.23	0.000	0.09	0.000	0%								
LB	9.50	0.00	0.00		0.00				1.00	0.25	0.00	0.000	0.00	0.000									
Total Flow														0.188	100%								

Flow Measurement Details:

Metering Section Location (describe): 20m downstream of station

Meas. Start Time (MST):	8:40
Meas. End Time (MST):	9:10
Equipment:	ADP#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear



Flow characteristics:

Total Flow:	0.188	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.63	(m ²)
Wetted Width:	6.00	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.12	(m/s)
Reynolds Number:	2.25E+04	
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	0.286	0.294
Water (°C):	8.4	8.3
Datalogger Clock:	08:06	09:25
Laptop Clock:	08:06	09:25
Battery:	12.8	14.1
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT9 (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-No new BMs installed, no good trees for a lag bolt. Will need to drive a pipe in for a new benchmark

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S50A-02	1.543	101.703		100.160	100.160	Pipe 15m SE of logger
S50A-03			1.683	100.020	100.019	Pipe 10m SSE of logger
S50A-04			0.826	100.877	100.879	Pipe 7m South of logger
Water Level:				3.510	98.193	Time WL Surveyed: 8:29
Temporary BM			2.888	98.815		
Turn						
Temporary BM	2.804	101.619		98.815		
Water Level:			3.425	98.194		Time WL Surveyed: 8:30
S50A-04			0.742	100.877	100.879	Pipe 7m South of logger
S50A-03			1.601	100.018	100.019	Pipe 10m SSE of logger
S50A-02			1.461	100.158	100.160	Pipe 15m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S50A-03	1.801	101.620		100.019		
Water Level:			3.421	98.199		Time WL Surveyed: 9:15
Water Level:			3.449	98.202		Time WL Surveyed: 9:18
S50A-03	1.632	101.651		100.019		

WL Survey Summary

	Before	After
Average WL:	98.194	98.201
Closing Error:	0.002	-
WL Check:	0.001	-0.003
Transducer Elevation	97.908	97.907

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Cansel AT-24
Serial #:	76710

Field Personnel:

	CJ, TL	Trip Date:	13-Sep-15
Data Entry Personnel:	CJ	Date:	13-Sep-15
Data Check Personnel:	DW	Date:	17-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S50A Redclay Creek
 UTM Location: 474872 E, 6400203 N

Site Visit Date: October 29, 2015
 Site Visit Time (MST): 09:25

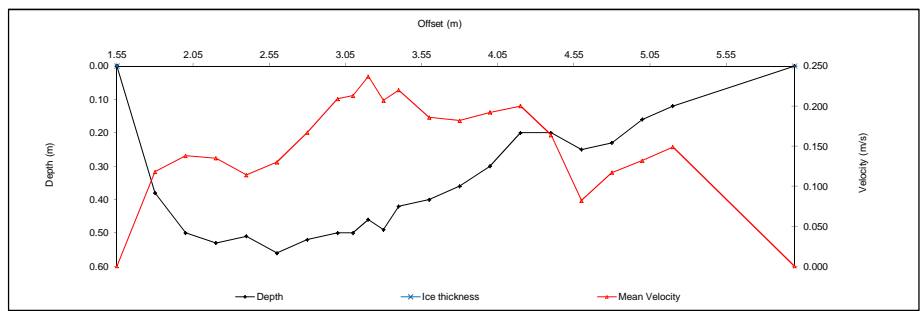


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	6.00	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	5.20	0.12		0.07	0.149					1.00	0.50	0.12	0.149	0.06	0.009	4%
2	5.00	0.16		0.10	0.132					1.00	0.20	0.16	0.132	0.03	0.004	2%
3	4.80	0.23		0.14	0.117					1.00	0.20	0.23	0.117	0.05	0.005	2%
4	4.60	0.25		0.15	0.082					1.00	0.20	0.25	0.082	0.05	0.004	2%
5	4.40	0.20		0.12	0.164					1.00	0.20	0.20	0.164	0.04	0.007	3%
6	4.20	0.20		0.12	0.200					1.00	0.20	0.20	0.200	0.04	0.008	4%
7	4.00	0.30		0.18	0.192					1.00	0.20	0.30	0.192	0.06	0.012	5%
8	3.80	0.36		0.22	0.182					1.00	0.20	0.36	0.182	0.07	0.013	6%
9	3.60	0.40		0.24	0.186					1.00	0.20	0.40	0.186	0.08	0.015	7%
10	3.40	0.42		0.25	0.220					1.00	0.15	0.42	0.220	0.06	0.014	6%
11	3.30	0.49		0.29	0.207					1.00	0.10	0.49	0.207	0.05	0.010	5%
12	3.20	0.46		0.28	0.237					1.00	0.10	0.46	0.237	0.05	0.011	5%
13	3.10	0.50		0.30	0.213					1.00	0.10	0.50	0.213	0.05	0.011	5%
14	3.00	0.50		0.30	0.209					1.00	0.15	0.50	0.209	0.08	0.016	7%
15	2.80	0.52		0.31	0.167					1.00	0.20	0.52	0.167	0.10	0.017	8%
16	2.60	0.56		0.34	0.130					1.00	0.20	0.56	0.130	0.11	0.015	7%
17	2.40	0.51		0.31	0.114					1.00	0.20	0.51	0.114	0.10	0.012	5%
18	2.20	0.53		0.32	0.135					1.00	0.20	0.53	0.135	0.11	0.014	7%
19	2.00	0.50		0.30	0.138					1.00	0.20	0.50	0.138	0.10	0.014	6%
20	1.80	0.38		0.23	0.118					1.00	0.23	0.38	0.118	0.09	0.010	5%
LB	1.55	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
Total Flow														0.220	100%	

Flow Measurement Details:

Metering Section Location (describe):
15m downstream from station

Meas. Start Time (MST):	9:47
Meas. End Time (MST):	10:05
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 3C



Flow characteristics:

Total Flow	0.220	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.37	(m ²)
Wetted Width:	4.45	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number	2.93E+04	
Froude Number:	0.09	

Logger Details:

	Before	After
Transducer Reading (m):	0.294	0.293
Water (°C):	1.9	1.9
Datalogger Clock:	09:27	10:10
Laptop Clock:	09:26	10:09
Battery:	13.1	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Descicant:	Replaced	
Vant Tube Descicant:	Good	
PT# (if replaced):	298707	old pt
Logger# (if replaced):	-	16203

Datalogger / Station Notes:

Bottom of channel very muddy
 ADV test passed

General Notes:

Bottom of channel very muddy
 ADV test passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S50A-02	1.413	101.573		100.160	100.160	Pipe 15m SE of logger
S50A-03			1.555	100.018	100.019	Pipe 10m SSE of logger
S50A-04			0.699	100.874	100.879	Pipe 7m South of logger
Water Level:	Cut		3.372	98.201		Time WL Surveyed: 9:38
S50A-BM5			0.607	100.966		Bolt in tree 8m US of station
Turn						
S50A-BM5	0.572	101.538		100.966		Bolt in tree 8m US of station
Water Level:	Cut		3.336	98.202		Time WL Surveyed: 9:39
S50A-04			0.662	100.876	100.879	Pipe 7m South of logger
S50A-03			1.520	100.019	100.019	Pipe 10m SSE of logger
S50A-02			1.380	100.158	100.160	Pipe 15m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S50A-03	1.520	101.538		100.018		
Water Level:	Cut		3.338	98.200		Time WL Surveyed: 10:17
Water Level:	Cut		3.298	98.200		Time WL Surveyed: 10:18
S50A-03	1.480	101.498		100.018		

WL Survey Summary

	Before	After
Average WL:	98.202	98.200
Closing Error:	0.002	-
WL Check:	0.001	0.000
Transducer Elevation	97.908	97.907

Level Survey Equipment:

Level #:	LAV#1
Make & Model:	Carsel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	29-Oct-15
Data Check Personnel:	JC	Date:	10-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: January 15, 2016
 Site Visit Time (MST): 13:30

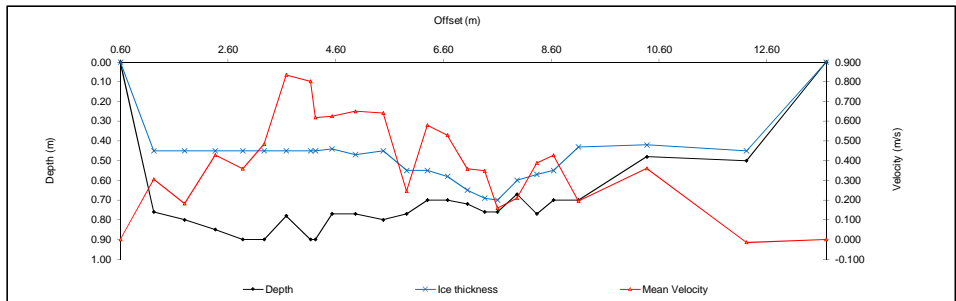


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	13.70	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.74	0.00	0.000	0.00	0.000	
1	12.22	0.50	0.45	0.48	-0.017					0.88	1.67	0.05	-0.015	0.08	-0.001	0%
2	10.37	0.48	0.42	0.45	0.410					0.88	1.56	0.06	0.361	0.09	0.034	3%
3	9.10	0.70	0.43	0.57	0.222					0.88	0.86	0.27	0.195	0.23	0.046	4%
4	8.64	0.70	0.55	0.63	0.486					0.88	0.39	0.15	0.428	0.06	0.025	2%
5	8.33	0.77	0.57	0.67	0.441					0.88	0.34	0.20	0.388	0.07	0.026	2%
6	7.96	0.67	0.60	0.64	0.238					0.88	0.37	0.07	0.209	0.03	0.005	0%
7	7.60	0.76	0.70	0.73	0.181					0.88	0.30	0.06	0.159	0.02	0.003	0%
8	7.36	0.76	0.69	0.73	0.396					0.88	0.28	0.07	0.348	0.02	0.007	1%
9	7.04	0.72	0.65	0.69	0.407					0.88	0.35	0.07	0.358	0.02	0.009	1%
10	6.67	0.70	0.58	0.64	0.601					0.88	0.37	0.12	0.529	0.04	0.023	2%
11	6.30	0.70	0.55	0.63	0.659					0.88	0.38	0.15	0.580	0.06	0.033	3%
12	5.91	0.77	0.55	0.66	0.279					0.88	0.41	0.22	0.246	0.09	0.022	2%
13	5.48	0.80	0.45	0.63	0.729					0.88	0.48	0.35	0.642	0.17	0.107	9%
14	4.96	0.77	0.47	0.62	0.739					0.88	0.48	0.30	0.650	0.14	0.093	8%
15	4.53	0.77	0.44	0.61	0.710					0.88	0.37	0.33	0.625	0.12	0.076	7%
16	4.22	0.90	0.45	0.68	0.703					0.88	0.20	0.45	0.619	0.09	0.056	5%
17	4.13	0.90	0.45	0.68	0.911					0.88	0.27	0.45	0.802	0.12	0.097	9%
18	3.68	0.78	0.45	0.62	0.949					0.88	0.43	0.33	0.835	0.14	0.119	10%
19	3.27	0.90	0.45	0.68	0.551					0.88	0.41	0.45	0.485	0.18	0.088	8%
20	2.87	0.90	0.45	0.68	0.408					0.88	0.46	0.45	0.359	0.20	0.074	7%
21	2.36	0.85	0.45	0.65	0.488					0.88	0.54	0.40	0.429	0.22	0.093	8%
22	1.79	0.80	0.45	0.63	0.207					0.88	0.57	0.35	0.182	0.20	0.036	3%
23	1.22	0.76	0.45	0.61	0.347					0.88	0.60	0.31	0.305	0.18	0.056	5%
RB	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.31	0.00	0.000	0.00	0.000	
Total Flow														1.13	100%	

Flow Measurement Details:

Metering Section Location (describe): 50m upstream of station

Meas. Start Time (MST):	14:15
Meas. End Time (MST):	15:00
Equipment:	ADV
Method:	Ice
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snowing, -5C



Flow characteristics:

Total Flow:	1.13	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.59	(m ²)
Wetted Width:	13.10	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.44	(m/s)
Froude Number:	0.31	

Logger Details:

	Before	After
Transducer Reading (m):	0.255	0.256
Water (°C):	0.3	0.3
Datalogger Clock:	13:29	13:39
Laptop Clock:	13:29	13:39
Battery (Main):	12.5	12.9
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Replaced 1 battery

General Notes:

-WL fluctuating 2cm in WL survey hole

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-4	1.186	101.211		100.025	100.025	Lag Bolt 7m SE of logger
S51-1			1.213	99.998	100.000	Pipe 3m SE of logger
S51-2			1.132	100.079	100.058	Pipe 3m S of logger
S51-3			0.728	100.483	100.474	Pipe 2m W of logger
Water Level:	Cut		3.429	97.782		Time WL Surveyed: 14:07
Temporary BM			2.682	98.529		
Turn						
Temporary BM	2.656	101.185		98.529		
Water Level:	Cut		3.403	97.782		Time WL Surveyed: 14:10
S51-3			0.707	100.478	100.474	Pipe 2m W of logger
S51-2			1.111	100.074	100.058	Pipe 3m S of logger
S51-1			1.188	99.997	100.000	Pipe 3m SE of logger
S51-4			1.163	100.022	100.025	Lag Bolt 7m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.782	
Closing Error:	0.003	-
WL Check:	0.000	-
Transducer Elevation	97.527	-

Field Personnel:

	DW, MP	Trip Date:	16-Jan-15
Data Entry Personnel:	DW, MP	Date:	16-Jan-15
Data Check Personnel:	MP	Date:	16-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: February 12, 2015
 Site Visit Time (MST): 10:47

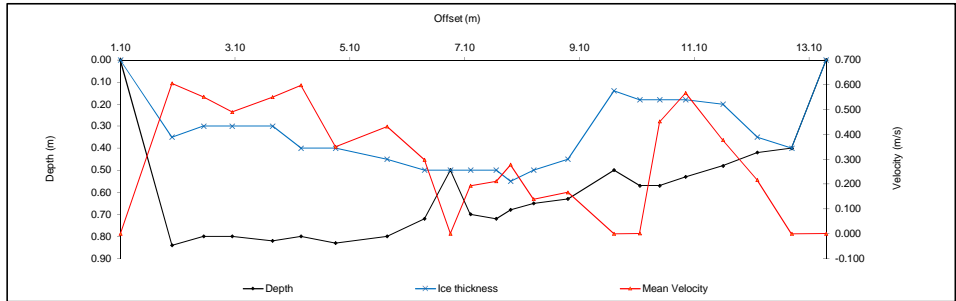


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	13.40	0.00	0.00	0.40	0.000	0.000	0.000	0.000	0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	12.80	0.40	0.40	0.40	-0.001					0.88	0.60	0.00	-0.001	0.00	0.000	0%
2	12.20	0.42	0.35	0.39	0.246					0.88	0.60	0.07	0.216	0.04	0.009	1%
3	11.60	0.48	0.20	0.34	0.429					0.88	0.63	0.28	0.378	0.18	0.066	5%
4	10.95	0.53	0.18	0.36	0.645					0.88	0.55	0.35	0.568	0.19	0.109	8%
5	10.50	0.57	0.18	0.38	0.514					0.88	0.40	0.39	0.452	0.16	0.071	5%
6	10.15	0.57	0.18	0.38	0.001					0.88	0.40	0.39	0.001	0.16	0.000	0%
7	9.70	0.50	0.14	0.32	-0.001					0.88	0.63	0.36	-0.001	0.23	0.000	0%
8	8.90	0.63	0.45	0.54	0.189					0.88	0.70	0.18	0.166	0.13	0.021	1%
9	8.30	0.65	0.50	0.58	0.157					0.88	0.50	0.15	0.138	0.08	0.010	1%
10	7.90	0.68	0.55	0.62	0.316					0.88	0.33	0.13	0.278	0.04	0.012	1%
11	7.65	0.72	0.50	0.61	0.239					0.88	0.35	0.22	0.210	0.08	0.016	1%
12	7.20	0.70	0.50	0.60	0.219					0.88	0.40	0.20	0.193	0.08	0.015	1%
13	6.85	0.50	0.50	0.50	0.000					0.88	0.40	0.00	0.000	0.00	0.000	0%
14	6.40	0.72	0.50	0.61	0.338					0.88	0.55	0.22	0.297	0.12	0.036	3%
15	5.75	0.80	0.45	0.63	0.490					0.88	0.78	0.35	0.431	0.27	0.117	8%
16	4.85	0.83	0.40	0.62	0.398					0.88	0.75	0.43	0.350	0.32	0.113	8%
17	4.25	0.80	0.40	0.60	0.679					0.88	0.55	0.40	0.598	0.22	0.131	9%
18	3.75	0.82	0.30	0.56	0.625					0.88	0.60	0.52	0.550	0.31	0.172	12%
19	3.05	0.80	0.30	0.55	0.557					0.88	0.60	0.50	0.490	0.30	0.147	10%
20	2.55	0.80	0.30	0.55	0.627					0.88	0.53	0.50	0.552	0.26	0.145	10%
21	2.00	0.84	0.35	0.60	0.688					0.88	0.73	0.49	0.605	0.36	0.215	15%
LB	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.45	0.00	0.000	0.00	0.000	
Total Flow														1.41	100%	

Flow Measurement Details:

Metering Section Location (describe): 50m upstream of station

Meas. Start Time (MST):	12:25
Meas. End Time (MST):	12:58
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snowing, -10C



Flow characteristics:

Total Flow:	1.41	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.51	(m ²)
Wetted Width:	12.30	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.40	(m/s)
Froude Number:	0.24	

Logger Details:

	Before	After
Transducer Reading (m):	0.265	
Water (°C):	0.1	
Datalogger Clock:	10:55	
Laptop Clock:	10:55	
Battery (Main):	13.1	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

- WL fluctuating 3cm

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-4	1.128	101.153		100.025	100.025	Lag Bolt 7m SE of logger
S51-1			1.153	100.000	100.000	Pipe 3m SE of logger
S51-2			1.076	100.077	100.058	Pipe 3m S of logger
S51-3			0.671	100.482	100.474	Pipe 2m W of logger
Water Level:	Cut		3.387	97.766	Time WL Surveyed: 11:30	
Temporary BM			2.657	98.496	0.000	
Turn						
Temporary BM	2.677	101.173		98.496		
Water Level:	Cut		3.406	97.767	Time WL Surveyed: 11:32	
S51-3			0.692	100.481	100.474	Pipe 2m W of logger
S51-2			1.097	100.076	100.058	Pipe 3m S of logger
S51-1			1.174	99.999	100.000	Pipe 3m SE of logger
S51-4			1.150	100.023	100.025	Lag Bolt 7m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	97.767	-
Closing Error:	0.002	-
WL Check:	0.001	-
Transducer Elevation	97.502	-

Field Personnel:

GG MP	Trip Date:	12-Feb-15
GG	Date:	12-Feb-15
MP	Date:	10-Mar-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: March 13, 2014
 Site Visit Time (MST): 07:45



Flow Measurement:															
Measured Data								Calculated Data							
Bank/ Mmt #	Depth from bottom to WS (m)	Depth to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	0.30	1.00	0.35	0.68	0.871				0.88	0.38	0.65	0.766	0.24	0.187	8%
2	0.75	0.95	0.35	0.65	0.855				0.88	0.45	0.60	0.752	0.27	0.203	9%
3	1.20	1.00	0.40	0.70	0.808				0.88	0.43	0.60	0.711	0.26	0.181	8%
4	1.60	0.90	0.40	0.65	0.695				0.88	0.50	0.50	0.612	0.25	0.153	7%
5	2.20	0.85	0.35	0.60	0.718				0.88	0.55	0.50	0.632	0.28	0.174	8%
6	2.70	0.90	0.35	0.63	0.648				0.88	0.50	0.55	0.570	0.28	0.157	7%
7	3.20	0.90	0.30	0.60	0.619				0.88	0.48	0.60	0.545	0.29	0.155	7%
8	3.65	0.90	0.30	0.60	0.614				0.88	0.45	0.60	0.540	0.27	0.146	6%
9	4.10	0.89	0.35	0.62	0.603				0.88	0.48	0.54	0.531	0.26	0.136	6%
10	4.60	0.88	0.45	0.67	0.494				0.88	0.50	0.43	0.426	0.22	0.092	4%
11	5.10	0.90	0.60	0.75	0.419				0.88	0.50	0.30	0.369	0.15	0.055	2%
12	5.60	0.82	0.60	0.71	0.346				0.88	0.45	0.22	0.304	0.10	0.030	1%
13	6.00	0.80	0.60	0.70	0.187				0.88	0.60	0.20	0.165	0.12	0.020	1%
14	6.80	0.75	0.55	0.65	0.237				0.88	0.75	0.20	0.209	0.15	0.031	1%
15	7.50	0.75	0.55	0.65	0.327				0.88	0.68	0.20	0.288	0.14	0.039	2%
16	8.15	0.70	0.55	0.63	0.387				0.88	0.60	0.15	0.341	0.09	0.031	1%
17	8.70	0.65	0.50	0.58	0.414				0.88	0.77	0.15	0.364	0.12	0.042	2%
18	9.70	0.65	0.35	0.50	0.565				0.88	0.80	0.30	0.497	0.24	0.119	5%
19	10.30	0.58	0.22	0.40	0.707				0.88	0.65	0.36	0.622	0.23	0.146	6%
20	11.00	0.60	0.20	0.40	0.555				0.88	0.70	0.40	0.488	0.28	0.137	6%
21	11.70	0.60	0.35	0.48	0.396				0.88	0.80	0.25	0.348	0.20	0.070	3%
22	12.60	0.40	0.35	0.38	-0.112				0.88	0.80	0.05	-0.099	0.04	-0.004	0%
RB	13.30	0.00	0.00	0.00					0.88	0.35	0.00	0.000	0.00	0.000	
Total Flow													2.30	100%	

Flow Measurement Details:

Metering Section Location (describe):
50m upstream of station

Meas. Start Time (MST):	8:25
Meas. End Time (MST):	9:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, -7C

Flow Characteristics:

Total Flow:	2.30	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	4.45	(m ²)
Wetted Width:	13.30	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.52	(m/s)
Froude Number:	0.29	

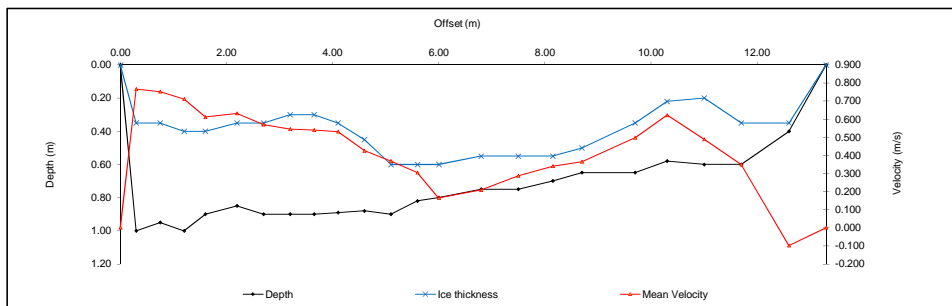
Logger Details:

	Before	After
Transducer Reading (m):	0.333	-
Water (°C):	0.2	-
Datalogger Clock:	07:51	-
Laptop Clock:	07:51	-
Battery (Main):	12.8	-
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Good	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- WL fluctuating 5-10 cm, so crew could not achieve better precision than 10.0mm during WL survey
- Crew tried multiple holes for WL survey



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-4	1.088	101.113		100.025	100.025	Lag Bolt 7m SE of logger
S51-1			1.116	99.997	100.000	Pipe 3m SE of logger
S51-2			1.039	100.074	100.076	Pipe 3m S of logger
Water Level:	Cut		3.210	97.903		Time WL Surveyed: 8:14
Temporary BM			2.560	98.553	0.000	-
Turn						
Temporary BM	2.540	101.093		98.553		-
Water Level:	Cut		3.180	97.913		Time WL Surveyed: 8:19
S51-2			1.017	100.076	100.076	Pipe 3m S of logger
S51-1			1.095	99.998	100.000	Pipe 3m SE of logger
S51-4			1.066	100.027	100.025	Lag Bolt 7m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.908	-
Closing Error:	-0.002	-
WL Check:	0.010	-
Transducer Elevation	97.575	-

Field Personnel:

	SM, DW	Trip Date:	13-Mar-15
Data Entry Personnel:	SM	Date:	13-Mar-15
Data Check Personnel:	MP	Date:	20-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: April 19, 2015
 Site Visit Time (MST): 13:11



Flow Measurement Details:	
Metering Section Location (describe): At cableway	
Meas. Start Time (MST):	14:45
Meas. End Time (MST):	15:30
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Mainly open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Sunny, 13C
Flow characteristics:	
Total Flow:	9.21 (m ³ /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	9.78 (m ²)
Wetted Width:	18.54 (m)
Hydraulic Depth:	0.53 (m)
Mean Velocity:	0.97 (m/s)
Froude Number:	0.43

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.7	0.6
Datalogger Clock:	13:14	16:02
Laptop Clock:	13:14	16:02
Battery (Main):	14.3	14.1
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PTF (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	
-Installed cableway	
-Could only measure 3 ADCP passes within 5%, mmt graded as Fair	
-Ice shelves along shore	

ADCP Flow Measurement Summary:					
System Information:		System Setup:		Bank Offsets:	
System Type:	Sonotek RS-M9	Transducer Depth (m):	0.09	LB:	26.60
Serial Number:	4712	Sainity (ppt):	-	RB:	7.90
Firmware Version:	3.8	Magnetic Declination (°):	14		
Software Version:	3.8	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	-		
Discharge Calculation Settings:		Measurement Results:			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	5	18.28	8.19	1.080
Coordinate System:	ENU	6	21.57	9.46	0.948
Left Method:	Sloped bank	7	14.36	12.59	0.722
Right Method:	Sloped bank	8	19.96	8.90	1.121
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	18.54	9.78	0.968
		SD:	2.68	1.68	0.156
		COV:	0.14	0.17	0.161
					9.21
					0.446
					0.048
					-4.10%
					-2.74%
					-1.38%
					8.22%

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-3	0.642	101.126		100.484	100.484	Pipe 2m W of logger
S51-2			1.047	100.079	100.076	Pipe 3m S of logger
S51-1			1.125	100.001	100.000	Pipe 3m SE of logger
Water Level:	Cut		3.043	98.083		Time WL Surveyed: 13:23
S51-3			0.642	100.484	100.484	Pipe 2m W of logger
Turn						
S51-3	0.623	101.107		100.484	100.484	Pipe 2m W of logger
Water Level:	Cut		3.022	98.085		Time WL Surveyed: 13:29
S51-1			1.107	100.000	100.000	Pipe 3m SE of logger
S51-2			1.029	100.076	100.076	Pipe 3m S of logger
S51-3			0.623	100.484	100.484	Pipe 2m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S51-3	0.623	101.107		100.484		
Water Level:	Cut		2.993	98.114		Time WL Surveyed: 15:57
Water Level:	Cut		2.976	98.115		Time WL Surveyed: 15:58
S51-3	0.607	101.091		100.484		

WL Survey Summary		
Average WL:	Before	After
Closing Error:	0.000	-
WL Check:	0.002	-0.001
Transducer Elevation	97.493	97.491

Field Personnel:			
Data Entry Personnel:	GG	Trip Date:	19-Apr-15
Data Check Personnel:	SG	Date:	19-Apr-15
Entered Digitally in the Field:	Yes	Date:	14-May-15

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: May 11, 2015
 Site Visit Time (MST): 07:55



Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	11.90	0.00	0.00							1.00	0.30	0.00	0.000	0.00	0.000	
1	12.50	0.14		0.08	0.041					1.00	0.80	0.14	0.041	0.11	0.005	0%
2	13.50	0.20		0.12	0.204					1.00	1.00	0.20	0.204	0.20	0.041	1%
3	14.50	0.22		0.13	0.397					1.00	1.00	0.22	0.397	0.22	0.087	2%
4	15.50	0.24		0.14	0.510					1.00	1.00	0.24	0.510	0.24	0.122	3%
5	16.50	0.32		0.19	0.529					1.00	1.00	0.32	0.529	0.32	0.169	4%
6	17.50	0.38		0.23	0.593					1.00	1.00	0.38	0.593	0.38	0.225	5%
7	18.50	0.43		0.26	0.632					1.00	1.00	0.43	0.632	0.43	0.272	6%
8	19.50	0.50		0.30	0.769					1.00	1.00	0.50	0.769	0.50	0.385	8%
9	20.50	0.58		0.35	0.655					1.00	1.00	0.58	0.655	0.58	0.380	8%
10	21.50	0.61		0.37	0.543					1.00	1.00	0.61	0.543	0.61	0.331	7%
11	22.50	0.58		0.35	0.615					1.00	1.00	0.58	0.615	0.58	0.357	7%
12	23.50	0.60		0.36	0.631					1.00	1.00	0.60	0.631	0.60	0.379	8%
13	24.50	0.66		0.40	0.624					1.00	0.75	0.66	0.624	0.50	0.309	6%
14	25.00	0.70		0.42	0.609					1.00	0.50	0.70	0.609	0.35	0.213	4%
15	25.50	0.66		0.40	0.703					1.00	0.50	0.66	0.703	0.33	0.232	5%
16	26.00	0.56		0.34	0.782					1.00	0.50	0.56	0.782	0.28	0.219	5%
17	26.50	0.55		0.33	0.814					1.00	0.75	0.55	0.814	0.41	0.336	7%
18	27.50	0.44		0.26	0.716					1.00	1.00	0.44	0.716	0.44	0.315	7%
19	28.50	0.45		0.27	0.459					1.00	1.00	0.45	0.459	0.45	0.207	4%
20	29.50	0.37		0.22	0.478					1.00	1.00	0.37	0.478	0.37	0.177	4%
LB	30.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.50	0.00	0.000	0.00	0.000	
Total Flow														4.76	100%	

Flow Measurement Details:

Metering Section Location (describe): At cableway

Meas. Start Time (MST):	8:15
Meas. End Time (MST):	8:45
Equipment:	ADV
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 8C

Flow characteristics:

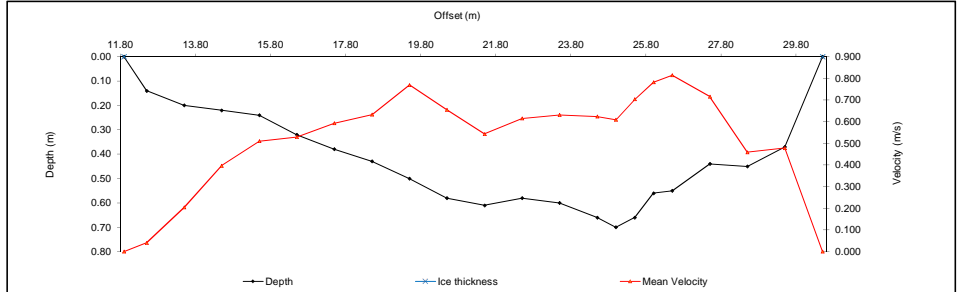
Total Flow:	4.76	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.90	(m ²)
Wetted Width:	18.60	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.60	(m/s)
Froude Number:	0.30	

Logger Details:

	Before	After
Transducer Reading (m):	0.357	0.355
Water (°C):	8.0	8.4
Datalogger Clock:	07:54	09:08
Laptop Clock:	07:54	09:08
Battery (Main):	12.9	13.3
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-4	0.913	100.938		100.025	100.025	Lag Bolt 7m SE of logger
S51-1			0.938	100.000	100.000	Pipe 3m SE of logger
S51-2			0.863	100.075	100.076	Pipe 3m S of logger
Water Level:	Cut		3.091	97.847		Time WL Surveyed: 7:59
			2.411	98.527		
Turn						
	2.385	100.912		98.527		
Water Level:	Cut		3.068	97.844		Time WL Surveyed: 8:01
S51-2			0.838	100.074	100.076	Pipe 3m S of logger
S51-1			0.912	100.000	100.000	Pipe 3m SE of logger
S51-4			0.889	100.024	100.025	Lag Bolt 7m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S51-2	0.838	100.913		100.075		
Water Level:	Cut		3.065	97.846		Time WL Surveyed: 9:12
Water Level:	Cut		3.027	97.846		Time WL Surveyed: 9:13
S51-2	0.798	100.873		100.075		

WL Survey Summary

	Before	After
Average WL:	97.846	97.847
Closing Error:	0.001	-
WL Check:	0.003	0.002
Transducer Elevation	97.489	97.492

Field Personnel:

	TR, CJ	Trip Date:	11-May-15
Data Entry Personnel:	TR	Date:	11-May-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: June 16, 2015
 Site Visit Time (MST): 10:25

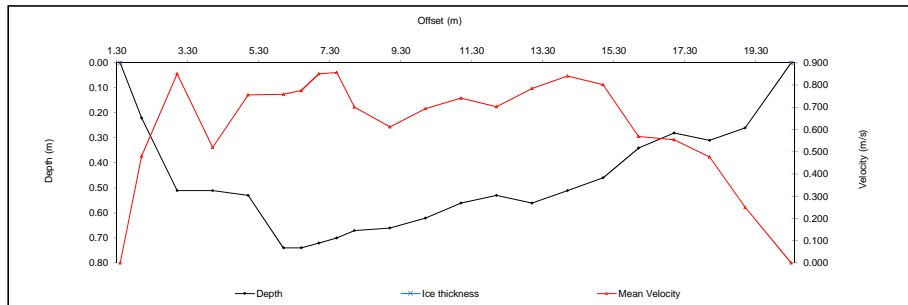


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.40	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	2.00	0.22		0.13	0.481					1.00	0.80	0.22	0.481	0.18	0.085	1%
2	3.00	0.51		0.31	0.851					1.00	1.00	0.51	0.851	0.51	0.434	7%
3	4.00	0.51		0.31	0.520					1.00	1.00	0.51	0.520	0.51	0.265	4%
4	5.00	0.53		0.32	0.755					1.00	1.00	0.53	0.755	0.53	0.400	6%
5	6.00	0.74		0.44	0.759					1.00	0.75	0.74	0.759	0.56	0.421	7%
6	6.50	0.74		0.44	0.775					1.00	0.50	0.74	0.775	0.37	0.287	5%
7	7.00	0.72		0.43	0.850					1.00	0.50	0.72	0.850	0.36	0.306	5%
8	7.50	0.70		0.42	0.856					1.00	0.50	0.70	0.856	0.35	0.300	5%
9	8.00	0.67		0.40	0.701					1.00	0.75	0.67	0.701	0.50	0.352	6%
10	9.00	0.66		0.40	0.612					1.00	1.00	0.66	0.612	0.66	0.404	6%
11	10.00	0.62		0.37	0.694					1.00	1.00	0.62	0.694	0.62	0.430	7%
12	11.00	0.56		0.34	0.741					1.00	1.00	0.56	0.741	0.56	0.415	7%
13	12.00	0.53		0.32	0.702					1.00	1.00	0.53	0.702	0.53	0.372	6%
14	13.00	0.56		0.34	0.784					1.00	1.00	0.56	0.784	0.56	0.439	7%
15	14.00	0.51		0.31	0.841					1.00	1.00	0.51	0.841	0.51	0.429	7%
16	15.00	0.46		0.28	0.801					1.00	1.00	0.46	0.801	0.46	0.368	6%
17	16.00	0.34		0.20	0.569					1.00	1.00	0.34	0.569	0.34	0.193	3%
18	17.00	0.28		0.17	0.554					1.00	1.00	0.28	0.554	0.28	0.155	2%
19	18.00	0.31		0.19	0.476					1.00	1.00	0.31	0.476	0.31	0.148	2%
20	19.00	0.26		0.16	0.251					1.00	1.15	0.26	0.251	0.30	0.075	1%
RB	20.30	0.00	0.00		0.00		0.00		0.00	1.00	0.65	0.00	0.000	0.00	0.000	
Total Flow														6.28	100%	

Flow Measurement Details:

Metering Section Location (describe):
 At cableway

Meas. Start Time (MST):	10:45
Meas. End Time (MST):	11:06
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, 14C



Flow characteristics:

Total Flow:	6.28	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.99	(m ²)
Wetted Width:	18.90	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.70	(m/s)
Reynolds Number:	2.63E+05	
Froude Number:	0.32	

Logger Details:

	Before	After
Transducer Reading (m):	0.446	0.447
Water (°C):	11.6	11.8
Datalogger Clock:	10:26	11:11
Laptop Clock:	10:26	11:10
Battery:	13.7	14.0
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-4	0.997	101.022		100.025	100.025	Lag Bolt 7m SE of logger
S51-1			1.017	100.005	100.000	Pipe 3m SE of logger
S51-2			0.942	100.080	100.076	Pipe 3m S of logger
Water Level:	Cut		3.065	97.957		Time WL Surveyed: 10:33
Temporary BM			0.942	100.080	0.000	-
Turn						
Temporary BM	0.906	100.986		100.080		
Water Level:	Cut		3.029	97.957		Time WL Surveyed: 10:35
S51-2			0.906	100.080	100.076	Pipe 3m S of logger
S51-1			0.982	100.004	100.000	Pipe 3m SE of logger
S51-4			0.859	100.027	100.025	Lag Bolt 7m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S51-2	0.905	100.985		100.080		Time WL Surveyed: 11:14
Water Level:	Cut		3.027	97.958		Time WL Surveyed: 11:16
Water Level:	Cut		3.004	97.957		
S51-2	0.881	100.961		100.080		

WL Survey Summary

	Before	After
Average WL:	97.957	97.958
Closing Error:	-0.002	0.001
WL Check:	0.000	0.001
Transducer Elevation	97.511	97.511

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC 2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	16-Jun-15
Data Check Personnel:	TR	Date:	16-Jun-15
Entered Digitally in the Field:	Yes	Date:	3-Jul-15

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: August 7, 2015
 Site Visit Time (MST): 14:50

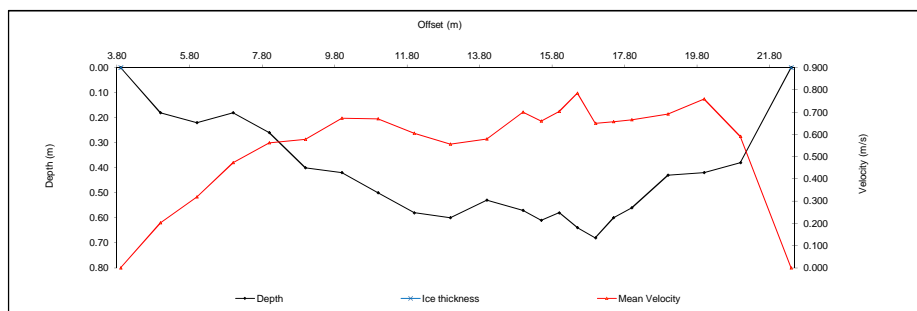


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	3.90	0.00	0.00		0.000				0.000	1.00	0.55	0.00	0.000	0.00	0.000	
1	5.00	0.18		0.11	0.202					1.00	1.05	0.18	0.202	0.19	0.038	1%
2	6.00	0.22		0.13	0.319					1.00	1.00	0.22	0.319	0.22	0.070	1%
3	7.00	0.18		0.11	0.473					1.00	1.00	0.18	0.473	0.18	0.085	2%
4	8.00	0.26		0.16	0.561					1.00	1.00	0.26	0.561	0.26	0.146	3%
5	9.00	0.40		0.24	0.577					1.00	1.00	0.40	0.577	0.40	0.231	5%
6	10.00	0.42		0.25	0.673					1.00	1.00	0.42	0.673	0.42	0.283	6%
7	11.00	0.50		0.30	0.670					1.00	1.00	0.50	0.670	0.50	0.335	7%
8	12.00	0.58		0.35	0.605					1.00	1.00	0.58	0.605	0.58	0.351	7%
9	13.00	0.60		0.36	0.556					1.00	1.00	0.60	0.556	0.60	0.334	7%
10	14.00	0.53		0.32	0.579					1.00	1.00	0.53	0.579	0.53	0.307	7%
11	15.00	0.57		0.34	0.700					1.00	0.75	0.57	0.700	0.43	0.299	6%
12	15.50	0.61		0.37	0.659					1.00	0.50	0.61	0.659	0.31	0.201	4%
13	16.00	0.58		0.35	0.703					1.00	0.50	0.58	0.703	0.29	0.204	4%
14	16.50	0.64		0.38	0.785					1.00	0.50	0.64	0.785	0.32	0.251	5%
15	17.00	0.68		0.41	0.649					1.00	0.50	0.68	0.649	0.34	0.221	5%
16	17.50	0.60		0.36	0.656					1.00	0.50	0.60	0.656	0.30	0.197	4%
17	18.00	0.56		0.34	0.665					1.00	0.75	0.56	0.665	0.42	0.279	6%
18	19.00	0.43		0.26	0.691					1.00	1.00	0.43	0.691	0.43	0.297	6%
19	20.00	0.42		0.25	0.759					1.00	1.00	0.42	0.759	0.42	0.319	7%
20	21.00	0.38		0.23	0.591					1.00	1.20	0.38	0.591	0.46	0.269	6%
LB	22.40	0.00	0.00		0.000				0.000	1.00	0.70	0.00	0.000	0.000	0.000	
Total Flow														4.72	100%	

Flow Measurement Details:

Metering Section Location (describe): At cableway

Meas. Start Time (MST):	15:20
Meas. End Time (MST):	15:45
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, calm, 25C



Flow characteristics:

Total Flow:	4.72	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.59	(m ²)
Wetted Width:	18.50	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.62	(m/s)
Reynolds Number:	2.36E+05	
Froude Number:	0.31	

Logger Details:

	Before	After
Transducer Reading (m):	0.361	0.357
Water (°C):	17.2	17.6
Datalogger Clock:	14:53	16:08
Laptop Clock:	14:53	16:08
Battery:	13.3	13.3
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Sonde cover was full of sediment upon arrival

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-3	0.568	101.052		100.484	100.484	Pipe 2m W of logger
S51-1			1.051	100.001	100.000	Pipe 3m SE of logger
S51-2			0.976	100.076	100.076	Pipe 3m S of logger
Water Level:	Cut		3.199	97.853		Time WL Surveyed: 15:07
S51-2			0.976	100.076	100.076	Pipe 3m S of logger
Turn						
S51-2	0.937	101.013		100.076	100.076	Pipe 3m S of logger
Water Level:	Cut		3.158	97.855		Time WL Surveyed: 15:09
S51-2			0.937	100.076	100.076	Pipe 3m S of logger
S51-1			1.013	100.000	100.000	Pipe 3m SE of logger
S51-3			0.528	100.485	100.484	Pipe 2m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S51-3	0.528	101.012		100.484		Time WL Surveyed: 16:03
Water Level:	Cut		3.158	97.853		Time WL Surveyed: 16:05
Water Level:	Cut		3.128	97.853		
S51-3	0.497	100.981		100.484		

WL Survey Summary

	Before	After
Average WL:	97.854	97.853
Closing Error:	-0.001	
WL Check:	0.002	0.000
Transducer Elevation	97.493	97.496

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC 2S
Serial #:	668785

Field Personnel:

	TR, JC	Trip Date:	7-Aug-15
Data Entry Personnel:	TR	Date:	7-Aug-15
Data Check Personnel:	TR	Date:	25-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: September 16, 2015
 Site Visit Time (MST): 15:45

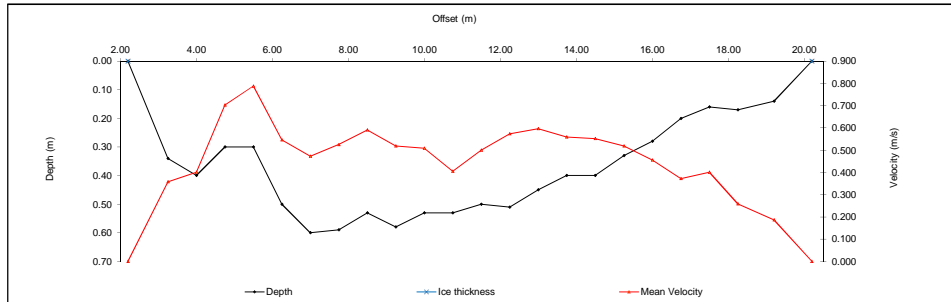


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	20.20	0.00	0.00		0.000		0.000		0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	19.20	0.14		0.08	0.186					1.00	0.97	0.14	0.186	0.14	0.025	1%
2	18.25	0.17		0.10	0.258					1.00	0.85	0.17	0.258	0.14	0.037	1%
3	17.50	0.16		0.10	0.401					1.00	0.75	0.16	0.401	0.12	0.048	1%
4	16.75	0.20		0.12	0.372					1.00	0.75	0.20	0.372	0.15	0.056	2%
5	16.00	0.28		0.17	0.455					1.00	0.75	0.28	0.455	0.21	0.096	3%
6	15.25	0.33		0.20	0.519					1.00	0.75	0.33	0.519	0.25	0.128	4%
7	14.50	0.40		0.24	0.551					1.00	0.75	0.40	0.551	0.30	0.165	5%
8	13.75	0.40		0.24	0.559					1.00	0.75	0.40	0.559	0.30	0.168	5%
9	13.00	0.45		0.27	0.596					1.00	0.75	0.45	0.596	0.34	0.201	6%
10	12.25	0.51		0.31	0.573					1.00	0.75	0.51	0.573	0.38	0.219	7%
11	11.50	0.50		0.30	0.500					1.00	0.75	0.50	0.500	0.38	0.188	6%
12	10.75	0.53		0.32	0.495					1.00	0.75	0.53	0.495	0.40	0.161	5%
13	10.00	0.53		0.32	0.509					1.00	0.75	0.53	0.509	0.40	0.202	6%
14	9.25	0.58		0.35	0.518					1.00	0.75	0.58	0.518	0.44	0.225	7%
15	8.50	0.53		0.32	0.591					1.00	0.75	0.53	0.591	0.40	0.235	7%
16	7.75	0.59		0.35	0.525					1.00	0.75	0.59	0.525	0.44	0.232	7%
17	7.00	0.60		0.36	0.472					1.00	0.75	0.60	0.472	0.45	0.212	6%
18	6.25	0.50		0.30	0.546					1.00	0.75	0.50	0.546	0.38	0.205	6%
19	5.50	0.30		0.18	0.788					1.00	0.75	0.30	0.788	0.23	0.177	5%
20	4.75	0.30		0.18	0.703					1.00	0.75	0.30	0.703	0.23	0.158	5%
21	4.00	0.40		0.24	0.400					1.00	0.75	0.40	0.400	0.30	0.120	4%
22	3.25	0.34		0.20	0.357					1.00	0.90	0.34	0.357	0.31	0.109	3%
LB	2.20	0.00	0.00		0.00		0.00		0.00	1.00	0.53	0.00	0.000	0.00	0.000	
Total Flow														3.37	100%	

Flow Measurement Details:

Metering Section Location (describe):
At cableway

Meas. Start Time (MST):	16:16
Meas. End Time (MST):	16:43
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow, clear
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 13C



Flow characteristics:

Total Flow:	3.37	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.65	(m ²)
Wetted Width:	18.00	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.51	(m/s)
Reynolds Number:	-	
Froude Number:	0.27	

Logger Details:

	Before	After
Transducer Reading (m):	0.267	0.267
PT Water (°C):	8.2	8.2
Datalogger Clock:	15:50	16:52
Laptop Clock:	15:50	16:52
Station Battery Voltage:	13.1	12.9
Station Battery:	-	Good
Station Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Details:

	Before	After
Sonde Water (°C):	8	8
Specific Conductance (µS):	230	229
pH:	8	8
Turbidity (FNU):	14	6
Dissolved Oxygen Conc. (mg/L):	11	11
Dissolved Oxygen Sat. (%):	92	92
Sonde Battery Voltage:	6.4	6.4
Sonde # (if replaced):	-	-

Sonde Visit Details:

Visit Type:	-
Sonde Replacement:	-
Deployed Sonde:	-
Downloaded:	-
Water Level:	Cut
Temporary BM:	3.290
Downloaded File Name:	-
Turn:	-
Temporary BM:	3.273
Water Level:	Cut
WQ Samples Taken:	-
Photos Taken:	-
S51-3:	0.408
S51-2:	0.817
US, DS, CS:	Yes
S51-1:	0.892
Sonde Housing (In Situ):	Yes
S51-2:	0.817
Sonde Probes (Before Cleaning):	-
S51-2:	0.804
Datalogger:	Yes

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-1	0.910	100.910		100.000	100.000	Pipe 3m SE of logger
S51-2			0.836	100.074	100.076	Pipe 3m S of logger
S51-3			0.427	100.483	100.484	Pipe 2m W of logger
Water Level:	Cut		3.143	97.767		Time WL Surveyed: 15:57
Temporary BM			3.290	97.620	0.000	-
Turn						
Temporary BM	3.273	100.893		97.620		-
Water Level:	Cut		3.129	97.764		Time WL Surveyed: 16:01
Photos Taken:						
S51-3:			0.408	100.485	100.484	Pipe 2m W of logger
S51-2:			0.817	100.076	100.076	Pipe 3m S of logger
S51-1:			0.892	100.001	100.000	Pipe 3m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S51-2:	0.817	100.893		100.076		
Water Level:	Cut		3.127	97.766		Time WL Surveyed: 16:48
Water Level:	Cut		3.112	97.768		Time WL Surveyed: 16:49
S51-2:	0.804	100.880		100.076		
Datalogger:	Yes					

WL Survey Summary

	Before	After
Average WL:	97.766	97.767
Closing Error:	-0.001	-
WL Check:	0.003	-0.002
Transducer Elevation	97.499	97.500

General Notes:

-

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Carlisle AT-24
Serial #:	112890

Field Personnel:

SM, CJ	Trip Date:	16-Sep-15
SM	Date:	16-Sep-15
JC	Date:	23-Oct-15
Yes	Entered Digitally in the Field:	

Datalogger, Sonde and Station Notes:

-Removed debris from sonde housing

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: October 19, 2015
 Site Visit Time (MST): 15:15

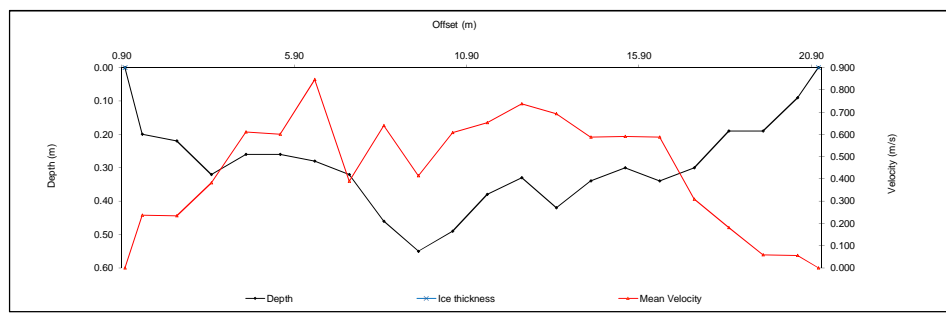


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	1.50	0.20		0.12	0.237					1.00	0.75	0.20	0.237	0.15	0.036	1%
2	2.50	0.22		0.13	0.234					1.00	1.00	0.22	0.234	0.22	0.051	2%
3	3.50	0.32		0.19	0.382					1.00	1.00	0.32	0.382	0.32	0.122	4%
4	4.50	0.26		0.16	0.610					1.00	1.00	0.26	0.610	0.26	0.159	5%
5	5.50	0.26		0.16	0.601					1.00	1.00	0.26	0.601	0.26	0.156	5%
6	6.50	0.28		0.17	0.946					1.00	1.00	0.28	0.946	0.28	0.237	7%
7	7.50	0.32		0.19	0.389					1.00	1.00	0.32	0.389	0.32	0.124	4%
8	8.50	0.46		0.28	0.639					1.00	1.00	0.46	0.639	0.46	0.294	9%
9	9.50	0.55		0.33	0.413					1.00	1.00	0.55	0.413	0.55	0.227	7%
10	10.50	0.49		0.29	0.608					1.00	1.00	0.49	0.608	0.49	0.298	9%
11	11.50	0.38		0.23	0.652					1.00	1.00	0.38	0.652	0.38	0.248	8%
12	12.50	0.33		0.20	0.737					1.00	1.00	0.33	0.737	0.33	0.243	8%
13	13.50	0.42		0.25	0.692					1.00	1.00	0.42	0.692	0.42	0.291	9%
14	14.50	0.34		0.20	0.588					1.00	1.00	0.34	0.588	0.34	0.200	6%
15	15.50	0.30		0.18	0.590					1.00	1.00	0.30	0.590	0.30	0.177	6%
16	16.50	0.34		0.20	0.588					1.00	1.00	0.34	0.588	0.34	0.200	6%
17	17.50	0.30		0.18	0.308					1.00	1.00	0.30	0.308	0.30	0.092	3%
18	18.50	0.19		0.11	0.180					1.00	1.00	0.19	0.180	0.19	0.034	1%
19	19.50	0.19		0.11	0.059					1.00	1.00	0.19	0.059	0.19	0.011	0%
20	20.50	0.00		0.05	0.055					1.00	1.00	0.09	0.055	0.07	0.004	0%
LB	21.10	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
Total Flow														3.20	100%	

Flow Measurement Details:

Metering Section Location (describe):
15m upstream of heli

Meas. Start Time (MST):	15:42
Meas. End Time (MST):	16:00
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Average flow
Channel Edge:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 8C



Flow characteristics:

Total Flow:	3.20	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.17	(m ²)
Wetted Width:	20.10	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.52	(m/s)
Reynolds Number:	-	
Froude Number:	0.30	

Logger Details:

	Before	After
Station Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Details:

	Before	After
Sonde Water (°C):	5	5
Specific Conductance (µS):	224	224
pH:	8	8
Turbidity (FNU):	5	5
Dissolved Oxygen Conc. (mg/L):	12	12
Dissolved Oxygen Sat. (%):	93	93
Sonde Battery Voltage:	6.4	6.4
Sonde # (if replaced):	-	-

Sonde Visit Details:

Visit Type: -

Deployed Sonde: -

Downloaded: -

Downloaded File Name: -

WQ Samples Taken: -

Photos Taken: -

US, DS, CS: -

Sonde Housing (In Situ): -

Sonde Probes (Before Cleaning): -

Datalogger: -

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-1	1.049	101.049		100.000	100.000	Pipe 3m SE of logger
S51-2			0.977	100.072	100.076	Pipe 3m S of logger
S51-3			0.568	100.481	100.484	Pipe 2m W of logger
Water Level:	Cut	0.270	3.574	97.745	Time WL Surveyed: 15:28	
Temporary BM			0.568	100.481	100.025	Lag Bolt 7m SE of logger
Turn						
Temporary BM	0.523	101.004		100.481	100.025	Lag Bolt 7m SE of logger
Water Level:	Cut	0.270	3.533	97.741	Time WL Surveyed: 15:29	
S51-3			0.523	100.481	100.484	Pipe 2m W of logger
S51-2			0.932	100.072	100.076	Pipe 3m S of logger
S51-1			1.006	99.998	100.000	Pipe 3m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S51-3	0.523	101.004		100.481		
Water Level:	Cut	0.270	3.532	97.742	Time WL Surveyed: 16:19	
Water Level:	Cut	0.270	3.509	97.742	Time WL Surveyed: 16:20	
S51-3	0.590	100.981		100.481		

WL Survey Summary

	Before	After
Average WL:	97.743	97.742
Closing Error:	0.002	-
WL Check:	0.004	0.000
Transducer Elevation:	97.509	97.507

General Notes:

-WL fluctuating 1cm during survey

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	19-Oct-15
Date Check Personnel:	TR	Date:	19-Oct-15
Entered Digitally in the Field:	Yes	Date:	27-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River
 UTM Location: 533925 E, 6291921 N

Site Visit Date: December 11, 2015
 Site Visit Time (MST): 11:20

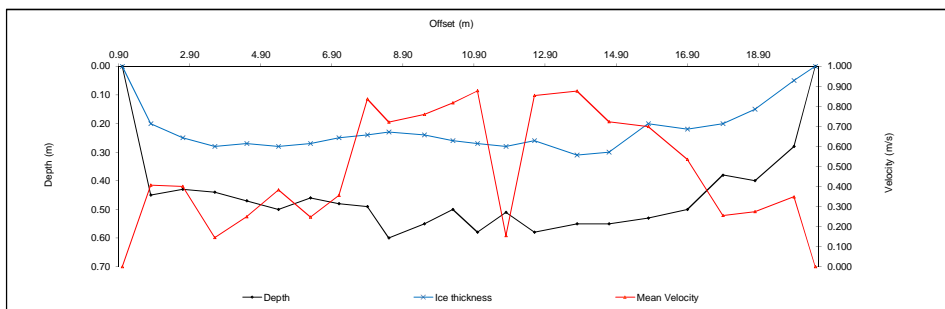


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	0.88	0.40	0.00	0.000	0.00	0.000	
1	1.80	0.45	0.20	0.33	0.462					0.88	0.85	0.25	0.407	0.21	0.086	3%
2	2.70	0.43	0.25	0.34	0.455					0.88	0.90	0.18	0.400	0.16	0.065	2%
3	3.60	0.44	0.28	0.36	0.165					0.88	0.90	0.16	0.145	0.14	0.021	1%
4	4.50	0.47	0.27	0.37	0.283					0.88	0.90	0.20	0.249	0.18	0.049	2%
5	5.40	0.50	0.28	0.39	0.435					0.88	0.90	0.22	0.383	0.20	0.076	3%
6	6.30	0.46	0.27	0.37	0.281					0.88	0.85	0.19	0.247	0.16	0.040	2%
7	7.10	0.48	0.25	0.37	0.404					0.88	0.80	0.23	0.356	0.18	0.065	2%
8	7.90	0.49	0.24	0.37	0.951					0.88	0.70	0.25	0.837	0.18	0.146	6%
9	8.50	0.60	0.23	0.42	0.820					0.88	0.80	0.37	0.722	0.30	0.214	8%
10	9.50	0.55	0.24	0.40	0.863					0.88	0.90	0.31	0.759	0.28	0.212	8%
11	10.30	0.50	0.26	0.38	0.928					0.88	0.75	0.24	0.817	0.18	0.147	6%
12	11.00	0.58	0.27	0.43	0.997					0.88	0.75	0.31	0.877	0.23	0.204	8%
13	11.80	0.51	0.28	0.40	0.175					0.88	0.80	0.23	0.154	0.18	0.028	1%
14	12.60	0.58	0.26	0.42	0.970					0.88	1.00	0.32	0.854	0.32	0.273	10%
15	13.80	0.55	0.31	0.43	0.996					0.88	1.05	0.24	0.876	0.25	0.221	8%
16	14.70	0.55	0.30	0.43	0.821					0.88	1.00	0.25	0.722	0.25	0.181	7%
17	15.80	0.53	0.20	0.37	0.795					0.88	1.10	0.33	0.700	0.36	0.254	10%
18	16.90	0.50	0.22	0.36	0.607					0.88	1.05	0.28	0.534	0.29	0.157	6%
19	17.90	0.38	0.20	0.29	0.290					0.88	0.95	0.18	0.255	0.17	0.044	2%
20	18.80	0.40	0.15	0.29	0.311					0.88	1.00	0.25	0.274	0.25	0.068	3%
21	19.90	0.28	0.05	0.17	0.396					0.88	0.85	0.23	0.348	0.20	0.068	3%
LB	20.50	0.00	0.00		0.00				0.00	0.88	0.30	0.00	0.000	0.00	0.000	
Total Flow														2.62	100%	

Flow Measurement Details:

Metering Section Location (describe):
 At usual location

Meas. Start Time (MST):	11:40
Meas. End Time (MST):	12:08
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3396
Method:	Ice
River Condition:	Partially open, overflow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Overcast, -3C



Flow characteristics:

Total Flow:	2.62	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	4.68	(m ²)
Wetted Width:	19.50	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.56	(m/s)
Reynolds Number:	-	
Froude Number:	0.36	

Logger Details:

	Before	After
Transducer Reading (m):	0.295	-
PT Water (°C):	0.1	-
Datalogger Clock:	12:25	-
Laptop Clock:	11:25	-
Station Battery Voltage:	12.1	12.5
Station Battery:	Replaced	-
Station Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Details:

	Before	After
Sonde Water (°C):	-	-
Specific Conductance (µS):	-	-
pH:	-	-
Turbidity (FNU):	-	-
Dissolved Oxygen Conc. (mg/L):	-	-
Dissolved Oxygen Sat. (%):	-	-
Sonde Battery Voltage:	-	-
Sonde # (if replaced):	-	-

Sonde Visit Details:

Visit Type: -

Deployed Sonde: -

Downloaded: -

Downloaded File Name: -

WQ Samples Taken: -

Photos Taken:

US, DS, CS: -

Sonde Housing (In Situ): -

Sonde Probes (Before Cleaning): -

Datalogger: -

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S51-1	1.158	101.158		100.000	100.000	Pipe 3m SE of logger
S51-2			1.082	100.076	100.076	Pipe 3m S of logger
S51-3			0.674	100.484	100.484	Pipe 2m W of logger
Water Level:			3.372	97.786		Time WL Surveyed: 11:42
Temporary BM			2.978	98.180		
Turn						
Temporary BM	2.949	101.129		98.180		
Water Level:			3.339	97.790		Time WL Surveyed: 11:48
S51-3			0.650	100.479	100.484	Pipe 2m W of logger
S51-2			1.057	100.072	100.076	Pipe 3m S of logger
S51-1			1.133	99.996	100.000	Pipe 3m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:						Time WL Surveyed: -
Water Level:						Time WL Surveyed: -

WL Survey Summary

	Before	After
Average WL:	97.788	-
Closing Error:	0.004	-
WL Check:	0.004	-
Transducer Elevation	97.493	-

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	665785

Field Personnel:

DW, AJ, GG	Trip Date:	11-Dec-15
DW	Date:	11-Dec-15
JC	Date:	8-Jan-16
Entered Digitally in the Field:	Yes	

General Notes:

Water level fluctuating 1-2cm during survey

Datalogger, Sonde and Station Notes:

Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River
 UTM Location: 451994 E, 6336589 N

Site Visit Date: January 11, 2015
 Site Visit Time (MST): 12:48

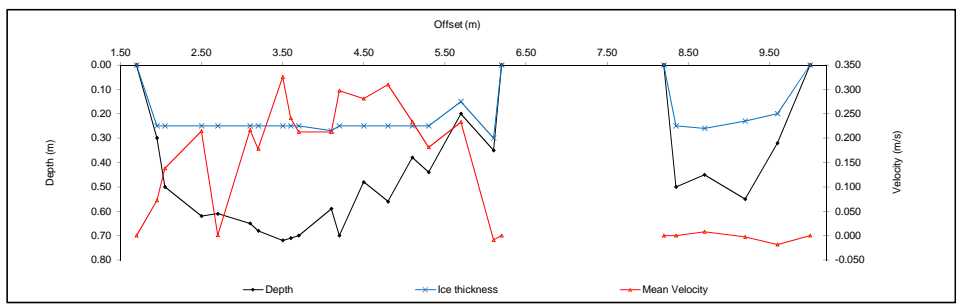


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.70	0.00	0.00		0.000		0.082		0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	1.95	0.30	0.25	0.28	0.157		0.157		0.157	0.88	0.18	0.05	0.072	0.01	0.001	0%
2	2.05	0.50	0.25	0.38	0.244		0.244		0.244	0.88	0.28	0.25	0.138	0.07	0.009	4%
3	2.50	0.62	0.25	0.44	0.001		0.001		0.001	0.88	0.33	0.37	0.215	0.12	0.026	10%
4	2.70	0.61	0.25	0.43	0.246		0.246		0.246	0.88	0.30	0.36	0.001	0.11	0.000	0%
5	3.10	0.65	0.25	0.45	0.202		0.202		0.202	0.88	0.25	0.40	0.216	0.10	0.022	9%
6	3.20	0.68	0.25	0.47	0.370		0.370		0.370	0.88	0.20	0.43	0.178	0.09	0.015	6%
7	3.50	0.72	0.25	0.49	0.274		0.274		0.274	0.88	0.20	0.47	0.326	0.09	0.031	12%
8	3.60	0.71	0.25	0.48	0.242		0.242		0.242	0.88	0.10	0.46	0.241	0.05	0.011	4%
9	3.70	0.70	0.25	0.48	0.242		0.242		0.242	0.88	0.25	0.45	0.213	0.11	0.024	10%
10	4.10	0.59	0.27	0.43	0.242		0.242		0.242	0.88	0.25	0.32	0.213	0.08	0.017	7%
11	4.20	0.70	0.25	0.48	0.338		0.338		0.338	0.88	0.20	0.45	0.297	0.09	0.027	11%
12	4.50	0.48	0.25	0.37	0.319		0.319		0.319	0.88	0.30	0.23	0.281	0.07	0.019	8%
13	4.80	0.56	0.25	0.41	0.352		0.352		0.352	0.88	0.30	0.31	0.310	0.09	0.029	11%
14	5.10	0.38	0.25	0.32	0.266		0.266		0.266	0.88	0.25	0.13	0.234	0.03	0.008	3%
15	5.30	0.44	0.25	0.35	0.206		0.206		0.206	0.88	0.30	0.19	0.181	0.06	0.010	4%
16	5.70	0.20	0.15	0.18	0.265		0.265		0.265	0.88	0.40	0.05	0.233	0.02	0.005	2%
17	6.10	0.35	0.30	0.33	-0.010		-0.010		-0.010	0.88	0.25	0.05	-0.009	0.01	0.000	0%
LB	6.20	0.00	0.00	0.00	0.000		0.000		0.000	0.88	0.05	0.00	0.000	0.00	0.000	
Frozen To Depth										0.88	0.08	0.00	0.000	0.00	0.000	
RB	8.20	0.00	0.00	0.00	0.000		0.000		0.000	0.88	0.25	0.25	0.000	0.06	0.000	0%
18	8.35	0.50	0.25	0.38	0.009		0.009		0.009	0.88	0.43	0.19	0.008	0.08	0.001	0%
19	8.70	0.45	0.26	0.36	0.009		0.009		0.009	0.88	0.43	0.19	0.008	0.08	0.001	0%
20	9.20	0.55	0.23	0.39	-0.003		-0.003		-0.003	0.88	0.45	0.32	-0.003	0.14	0.000	0%
21	9.60	0.32	0.20	0.26	-0.021		-0.021		-0.021	0.88	0.40	0.12	-0.018	0.05	-0.001	0%
LB	10.00	0.00	0.00	0.00	0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.252	100%	

Flow Measurement Details:

Metering Section Location (describe): At hell landing

Meas. Start Time (MST):	13:55
Meas. End Time (MST):	14:35
Equipment:	ADV
Method:	Ice
River Condition:	Frozen to depth in places
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, -25C



Flow characteristics:

Total Flow:	0.252	(m ³ /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	1.53	(m ²)
Wetted Width:	8.30	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.444	0.444
Water (°C):	0.0	0.0
Datalogger Clock:	12:50	12:59
Laptop Clock:	12:49	12:59
Battery (Main):	14.9	13.3
Battery:	Replaced	
Battery Serial #:	1403002	1407002
Enclosure Dissicant:	Replaced	
Vent Tube Dissicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Changed modem, replaced one battery at repeater

General Notes:

- Frozen to bottom between 6.1m and 8.35m. Flow on either side treated as two separate channels
- Rocks in auger hole

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S53-04	1.297	101.462		100.165	100.165	Pipe 2m SE of logger
S53-05			1.074	100.388	100.388	Pipe 5m E of logger
S53-03			1.103	100.359	100.361	Pipe 5m N of logger
Water Level:	Cut		3.889	97.573		Time WL Surveyed: 13:38
Temporary BM			3.647	97.815		
Turn						
Temporary BM	3.627	101.442		97.815		
Water Level:	Cut		3.871	97.571		Time WL Surveyed: 13:41
S53-03			1.063	100.359	100.361	Pipe 5m N of logger
S53-05			1.053	100.389	100.388	Pipe 5m E of logger
S53-04			1.277	100.165	100.165	Pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.572	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	97.128	-

Field Personnel:

	DW, GG	Trip Date:	11-Jan-15
Data Entry Personnel:	DW, GG	Date:	11-Jan-15
Data Check Personnel:	DW	Date:	12-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

February 8, 2015

Site Visit Time (MST):

15:10

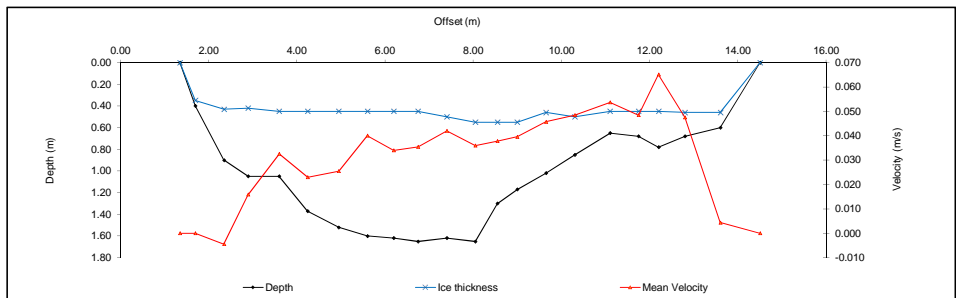


Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.35	0.00	0.00		0.000		0.000		0.000	0.88	0.18	0.00	0.000	0.00	0.000	
1	1.70	0.40	0.35	0.38	0.000					0.88	0.50	0.05	0.000	0.03	0.000	0%
2	2.35	0.90	0.43	0.67	-0.005					0.88	0.60	0.47	-0.004	0.28	-0.001	0%
3	2.90	1.05	0.42	0.74	0.018					0.88	0.63	0.63	0.016	0.39	0.006	2%
4	3.60	1.05	0.45	0.75	0.037					0.88	0.68	0.60	0.033	0.41	0.013	5%
5	4.25	1.37	0.45			1.19	0.016	0.63	0.030	1.00	0.68	0.92	0.023	0.62	0.014	5%
6	4.95	1.52	0.45			1.31	0.014	0.66	0.037	1.00	0.68	1.07	0.026	0.72	0.018	7%
7	5.60	1.60	0.45			1.37	0.037	0.68	0.043	1.00	0.63	1.15	0.040	0.72	0.029	11%
8	6.20	1.62	0.45			1.39	0.029	0.68	0.039	1.00	0.57	1.17	0.034	0.67	0.023	8%
9	6.75	1.65	0.45			1.41	0.030	0.69	0.041	1.00	0.60	1.20	0.036	0.72	0.026	9%
10	7.40	1.62	0.50			1.40	0.041	0.72	0.043	1.00	0.65	1.12	0.042	0.73	0.031	11%
11	8.05	1.65	0.55			1.43	0.028	0.77	0.044	1.00	0.58	1.10	0.036	0.63	0.023	8%
12	8.55	1.30	0.55	0.93	0.043					0.88	0.48	0.75	0.038	0.36	0.013	5%
13	9.00	1.17	0.55	0.86	0.045					0.88	0.55	0.62	0.040	0.34	0.014	5%
14	9.65	1.02	0.46	0.74	0.052					0.88	0.65	0.56	0.046	0.36	0.017	6%
15	10.30	0.85	0.50	0.68	0.055					0.88	0.72	0.35	0.048	0.25	0.012	5%
16	11.10	0.65	0.45	0.55	0.061					0.88	0.73	0.20	0.054	0.15	0.008	3%
17	11.75	0.68	0.45	0.57	0.055					0.88	0.55	0.23	0.048	0.13	0.006	2%
18	12.20	0.78	0.45	0.62	0.074					0.88	0.53	0.33	0.065	0.17	0.011	4%
19	12.80	0.68	0.46	0.57	0.054					0.88	0.70	0.22	0.048	0.15	0.007	3%
20	13.60	0.60	0.46	0.53	0.005					0.88	0.85	0.14	0.004	0.12	0.001	0%
LB	14.50	0.00	0.00		0.00		0.00		0.00	0.88	0.45	0.00	0.000	0.00	0.000	
Total Flow														0.270	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of bend by hell landing

Meas. Start Time (MST):	15:45
Meas. End Time (MST):	16:25
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -15C



Flow characteristics:

Total Flow:	0.270	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.95	(m ²)
Wetted Width:	13.15	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	0.515	
Water (°C):	0.1	
Datalogger Clock:	15:14	
Laptop Clock:	15:14	
Battery (Main):	14.9	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S53-05	1.006	101.394		100.388	100.388	Pipe 5m E of logger
S53-04			1.228	100.166	100.165	Pipe 2m SE of logger
S53-03			1.034	100.360	100.361	Pipe 5m N of logger
Water Level:	Cut		3.761	97.633	Time WL Surveyed:	15:31
Temporary BM				3.649	97.745	0.000
Turn						
Temporary BM	3.563	101.308		97.745		
Water Level:	Cut		3.675	97.633	Time WL Surveyed:	15:33
S53-03			0.948	100.360	100.361	Pipe 5m N of logger
S53-04			1.141	100.167	100.165	Pipe 2m SE of logger
S53-05			0.919	100.389	100.388	Pipe 5m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	97.633	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	97.118	-

Field Personnel:

	TR, CJ	Trip Date:	8-Feb-15
Data Entry Personnel:	CJ	Date:	8-Feb-15
Data Check Personnel:	DW	Date:	12-Feb-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

March 10, 2015

Site Visit Time (MST):

14:30

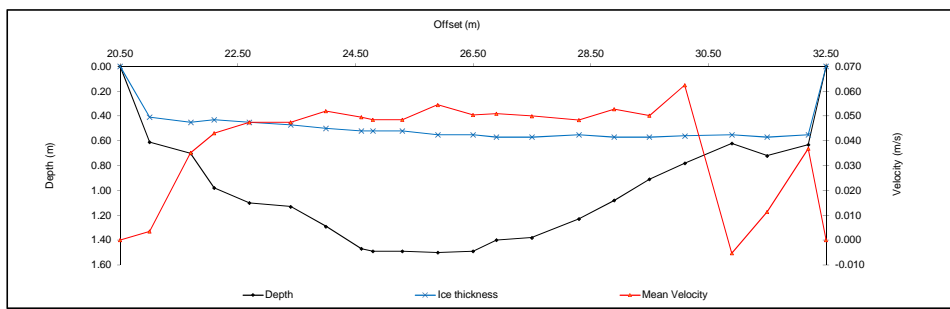


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	32.50	0.00	0.00		0.000		0.000		0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	32.20	0.63	0.55	0.59	0.042					0.88	0.50	0.08	0.037	0.04	0.001	0%
2	31.50	0.72	0.57	0.65	0.013					0.88	0.65	0.15	0.011	0.10	0.001	0%
3	30.90	0.62	0.55	0.59	-0.006					0.88	0.70	0.07	-0.005	0.05	0.000	0%
4	30.10	0.78	0.56	0.67	0.071					0.88	0.60	0.22	0.062	0.13	0.008	3%
5	29.50	0.91	0.57	0.74	0.057					0.88	0.60	0.34	0.050	0.20	0.010	3%
6	28.90	1.08	0.57	0.83	0.060					0.88	0.70	0.51	0.053	0.36	0.019	6%
7	28.30	1.23	0.55	0.89	0.055					0.88	0.70	0.68	0.048	0.48	0.023	8%
8	27.50	1.38	0.57			1.22	0.044	0.73	0.056	1.00	0.50	0.81	0.050	0.41	0.020	7%
9	26.90	1.40	0.57			1.23	0.046	0.74	0.056	1.00	0.50	0.83	0.051	0.42	0.021	7%
10	26.50	1.49	0.55			1.30	0.045	0.74	0.056	1.00	0.60	0.94	0.051	0.56	0.028	9%
11	25.90	1.50	0.55			1.31	0.053	0.74	0.056	1.00	0.55	0.95	0.055	0.52	0.028	9%
12	25.30	1.49	0.52			1.30	0.045	0.71	0.052	1.00	0.35	0.97	0.049	0.34	0.016	5%
13	24.80	1.49	0.52			1.30	0.046	0.71	0.051	1.00	0.40	0.97	0.049	0.39	0.019	6%
14	24.60	1.47	0.52			1.28	0.046	0.71	0.053	1.00	0.60	0.95	0.050	0.57	0.028	9%
15	24.00	1.29	0.50			1.13	0.052	0.66	0.052	1.00	0.65	0.79	0.052	0.51	0.027	9%
16	23.40	1.13	0.47	0.80	0.054					0.88	0.65	0.66	0.048	0.43	0.020	7%
17	22.70	1.10	0.45	0.78	0.054					0.88	0.50	0.65	0.048	0.33	0.015	5%
18	22.10	0.98	0.43	0.71	0.049					0.88	0.55	0.55	0.043	0.30	0.013	4%
19	21.70	0.70	0.45	0.58	0.040					0.88	0.60	0.25	0.035	0.15	0.005	2%
20	21.00	0.61	0.41	0.51	0.004					0.88	0.60	0.20	0.004	0.12	0.000	0%
RB	20.50	0.00	0.00		0.00		0.00		0.00	0.88	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.306	100%	

Flow Measurement Details:

Metering Section Location (describe):
At hell landing

Meas. Start Time (MST):	15:20
Meas. End Time (MST):	16:00
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, -7C



Flow characteristics:

Total Flow:	0.306	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	6.40	(m ²)
Wetted Width:	12.00	(m)
Hydraulic Depth:	0.53	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	0.537	
Water (°C):	0.1	
Datalogger Clock:	14:42	
Laptop Clock:	14:41	
Battery (Main):	14.4	
Battery:		Good
Battery Serial #:	-	
Enclosure Diccant:		Replaced
Vent Tube Diccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S53-03	1.112	101.473		100.361	100.361	Pipe 5m N of logger
S53-05			1.085	100.388	100.388	Pipe 5m E of logger
S53-04			1.307	100.166	100.165	Pipe 2m SE of logger
Water Level:	Cut		3.811	97.662		Time WL Surveyed: 16:07
Temporary BM			3.567	97.906	0.000	-
Turn						
Temporary BM	3.546	101.452		97.906		-
Water Level:	Cut		3.788	97.664		Time WL Surveyed: 16:11
S53-04			1.284	100.168	100.165	Pipe 2m SE of logger
S53-05			1.062	100.390	100.388	Pipe 5m E of logger
S53-03			1.090	100.362	100.361	Pipe 5m N of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.663	-
Closing Error:	-0.001	-
WL Check:	0.002	-
Transducer Elevation	97.126	-

Field Personnel:

	DW, GG	Trip Date:	10-Mar-15
Data Entry Personnel:	DW, GG	Date:	10-Mar-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River
 UTM Location: 451994 E, 6336589 N

Site Visit Date: April 19, 2015
 Site Visit Time (MST): 11:00

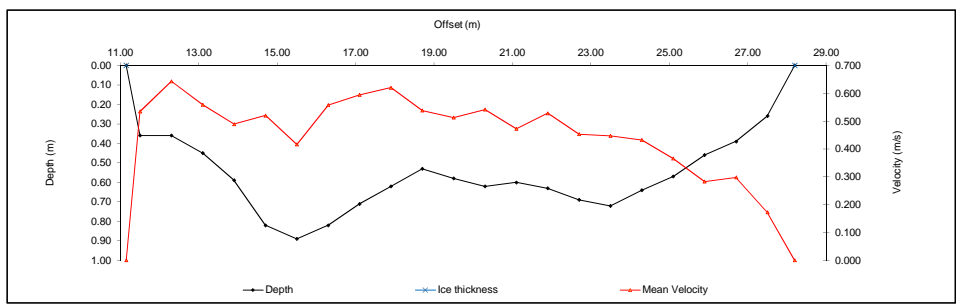


Measured Data													Calculated Data				
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
LB	11.15	0.00	0.00							1.00	0.18	0.00	0.000	0.00	0.000		
1	11.50	0.36		0.22	0.534					1.00	0.58	0.36	0.534	0.21	0.111	2%	
2	12.30	0.36		0.22	0.643					1.00	0.80	0.36	0.643	0.29	0.185	4%	
3	13.10	0.45		0.27	0.559					1.00	0.80	0.45	0.559	0.36	0.201	4%	
4	13.90	0.59		0.35	0.489					1.00	0.80	0.59	0.489	0.47	0.231	5%	
5	14.70	0.82				0.66	0.505	0.16	0.535	1.00	0.80	0.82	0.520	0.66	0.341	7%	
6	15.50	0.89				0.71	0.336	0.18	0.497	1.00	0.80	0.89	0.417	0.71	0.297	6%	
7	16.30	0.82				0.66	0.511	0.16	0.604	1.00	0.80	0.82	0.558	0.66	0.366	8%	
8	17.10	0.71		0.43	0.594					1.00	0.80	0.71	0.594	0.57	0.337	7%	
9	17.90	0.62		0.37	0.620					1.00	0.80	0.62	0.620	0.50	0.308	7%	
10	18.70	0.53		0.32	0.538					1.00	0.80	0.53	0.538	0.42	0.228	5%	
11	19.50	0.58		0.35	0.513					1.00	0.80	0.58	0.513	0.46	0.238	5%	
12	20.30	0.62		0.37	0.541					1.00	0.80	0.62	0.541	0.50	0.268	6%	
13	21.10	0.60		0.36	0.472					1.00	0.80	0.60	0.472	0.48	0.227	5%	
14	21.90	0.63		0.38	0.528					1.00	0.80	0.63	0.528	0.50	0.266	6%	
15	22.70	0.69		0.41	0.453					1.00	0.80	0.69	0.453	0.55	0.250	5%	
16	23.50	0.72		0.43	0.447					1.00	0.80	0.72	0.447	0.58	0.257	5%	
17	24.30	0.64		0.38	0.432					1.00	0.80	0.64	0.432	0.51	0.221	5%	
18	25.10	0.57		0.34	0.366					1.00	0.80	0.57	0.366	0.46	0.167	4%	
19	25.90	0.46		0.28	0.283					1.00	0.80	0.46	0.283	0.37	0.104	2%	
20	26.70	0.39		0.23	0.298					1.00	0.80	0.39	0.298	0.31	0.093	2%	
21	27.50	0.26		0.16	0.173					1.00	0.75	0.26	0.173	0.20	0.034	1%	
RB	28.20	0.00	0.00		0.00					1.00	0.35	0.00	0.000	0.00	0.000		
													Total Flow	4.73	100%		

Flow Measurement Details:

Metering Section Location (describe): 10m downstream from hell

Meas. Start Time (MST):	11:32
Meas. End Time (MST):	12:02
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, 13C



Flow characteristics:

Total Flow:	4.73	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.75	(m ²)
Wetted Width:	17.05	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.48	(m/s)
Froude Number:	0.20	

Logger Details:

	Before	After
Transducer Reading (m):	0.646	0.657
Water (°C):	1.3	2.0
Datalogger Clock:	11:02	12:20
Laptop Clock:	11:01	12:19
Battery (Main):	14.2	14.4
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-WL fluctuating 1cm during survey

General Notes:

-WL fluctuating 1cm during survey

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S53-04	1.213	101.378		100.165	100.165	Pipe 2m SE of logger
S53-05			0.990	100.388	100.388	Pipe 5m E of logger
S53-03			1.018	100.360	100.361	Pipe 5m N of logger
Water Level:	Cut	0.407	3.897	97.888	Time WL Surveyed:	11:11
Temporary BM			3.897	97.481	0.000	-
Turn						
Temporary BM	3.882	101.363		97.481		-
Water Level:	Cut	0.407	3.882	97.888	Time WL Surveyed:	11:17
S53-03			1.002	100.361	100.361	Pipe 5m N of logger
S53-05			0.973	100.390	100.388	Pipe 5m E of logger
S53-04			1.197	100.166	100.165	Pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S53-04	1.197	101.363		100.166		
Water Level:	Cut	0.432	3.900	97.895	Time WL Surveyed:	12:11
Water Level:	Cut	0.434	3.883	97.897	Time WL Surveyed:	12:15
S53-04	1.180	101.346		100.166		

WL Survey Summary

	Before	After
Average WL:	97.888	97.896
Closing Error:	-0.001	-
WL Check:	0.000	-0.002
Transducer Elevation	97.242	97.239

Field Personnel:

Data Entry Personnel:	GG, RM	Trip Date:	19-Apr-15
Data Check Personnel:	GG	Date:	19-Apr-15
Entered Digitally in the Field:	SG	Date:	14-May-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River
 UTM Location: 451994 E, 6336589 N

Site Visit Date: June 13, 2015
 Site Visit Time (MST): 07:50



Flow Measurement Details:	
Metering Section Location (describe): 6m downstream of hell landing	
Meas. Start Time (MST):	8:15
Meas. End Time (MST):	8:30
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 15C

Flow characteristics:	
Total Flow:	1.35 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	13.95 (m ²)
Wetted Width:	14.98 (m)
Hydraulic Depth:	0.93 (m)
Mean Velocity:	0.10 (m/s)
Reynolds Number:	8.43E+04
Froude Number:	0.63

Logger Details:		
	Before	After
Transducer Reading (m):	0.426	0.424
Water (°C):	17.8	16.0
Datalogger Clock:	07:53	08:38
Laptop Clock:	07:52	08:37
Battery (Main):	14.1	14.3
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Urea Tube Desiccant:	Good	-
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:-

General Notes:

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	16.60	
Serial Number:	4712	Bainby (ppt):	-	-	RB:	1.60	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes		
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes		
		ADCP Temperature (°C):	-	17.8			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	14.39	13.59	0.099	1.339	-0.50%
Depth Reference: Vertical Beam	2	0.00	15.34	14.24	0.099	1.408	4.63%
Coordinate System: FNE	4	0.00	15.61	14.16	0.092	1.305	-3.63%
Left Method: Sloped Bank	5	0.00	14.59	13.78	0.097	1.331	-1.10%
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
		Mean:	14.98	13.95	0.097	1.35	
		SD:	0.51	0.27	0.003	0.038	
		COV:	0.03	0.02	0.030	0.028	

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S53-03	0.980	101.321		100.361	100.361	Pipe 5m N of logger
S53-05			0.933	100.388	100.388	Pipe 5m E of logger
S53-04			1.154	100.167	100.165	Pipe 2m SE of logger
Water Level:	Cut		3.650	97.671	Time WL Surveyed:	8:02
S53-04			1.154	100.167	100.165	Pipe 2m SE of logger
Turn						
S53-04	1.124	101.291		100.167	100.165	Pipe 2m SE of logger
Water Level:	Cut		3.618	97.673	Time WL Surveyed:	8:04
S53-04			1.124	100.167	100.165	Pipe 2m SE of logger
S53-05			0.902	100.389	100.388	Pipe 5m E of logger
S53-03			0.929	100.362	100.361	Pipe 5m N of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S53-03	0.929	101.290		100.361		
Water Level:	Cut		3.622	97.669	Time WL Surveyed:	8:39
Water Level:	Cut		3.560	97.672	Time WL Surveyed:	8:40
S53-03	0.871	101.232		100.361		

WL Survey Summary			Level Survey Equipment:	
Average WL:	Before	After	Level #:	Level#4
Closing Error:	-0.001	-	Make & Model:	Nikon AC-2S
WL Check:	0.002	-0.004	Serial #:	868785
Transducer Elevation	97.246	97.246		

Field Personnel:			
Data Entry Personnel:	TR	Trip Date:	13-Jun-15
Data Check Personnel:	DW	Date:	13-Jun-15
Entered Digitally in the Field:	Yes		17-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River
 UTM Location: 451994 E, 6336589 N

Site Visit Date: September 14, 2015
 Site Visit Time (MST): 08:20



Flow Measurement Details:	
Metering Section Location (describe): At station	
Meas. Start Time (MST):	9:15
Meas. End Time (MST):	9:53
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, light rain

Flow characteristics:	
Total Flow:	0.403 (m ³ /s)
Perceived Measurement Quality:	-
Cross Section Area:	6.88 (m ²)
Wetted Width:	15.04 (m)
Hydraulic Depth:	0.46 (m)
Mean Velocity:	0.06 (m/s)
Reynolds Number:	2.11E+04
Froude Number:	0.63

Logger Details:		
	Before	After
Transducer Reading (m):	0.314	0.314
Water (°C):	11.4	11.6
Datalogger Clock:	08:19	10:05
Laptop Clock:	08:18	10:14
Battery (Minn):	13.1	13.9
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Mem Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	34.35	
Serial Number:	4712	Bainby (ppt):	-	-	RB:	19.40	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes		
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes		
ADCP Temperature (°C):		-		-		-	
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	3	0.00	14.78	6.69	0.058	0.391	-2.92%
Depth Reference: Vertical Beam	4	0.00	15.22	7.09	0.059	0.417	-3.54%
Coordinate System: FWD	7	0.00	14.94	6.69	0.059	0.394	-2.17%
Left Method: Sloped Bank	9	0.00	15.21	7.05	0.058	0.409	-1.55%
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
Mean:		15.04	6.98	0.059	0.403		
SD:		0.19	0.19	0.000	0.011		
COV:		0.01	0.03	0.009	0.027		

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S53-04	1.118	101.283		100.165	100.165	Pipe 2m SE of logger
S53-05			0.897	100.386	100.165	Pipe 2m SE of logger
S53-03			0.924	100.359	100.361	Pipe 5m N of logger
S53-06			1.054	100.229	0.000	tree 9 m E of logger
Water Level:			3.710	97.573		Time WL Surveyed: 8:35
Temporary BM			3.552	97.631		0.000
Turn						
Temporary BM	3.562	101.193		97.631		-
Water Level:			3.617	97.576		Time WL Surveyed: 8:36
S53-06			0.954	100.229		tree 9 m E of logger
S53-03			0.832	100.361		Pipe 5m N of logger
S53-05			0.805	100.388		Pipe 2m SE of logger
S53-04			1.028	100.165		Pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S53-05	0.804	101.191		100.387		
Water Level:			3.624	97.567		Time WL Surveyed: 10:10
Water Level:			3.612	97.570		Time WL Surveyed: 10:11
S53-05	0.795	101.182		100.387		

WL Survey Summary			Level Survey Equipment:	
	Before	After	Level #:	Level#1
Average WL:	97.575	97.569	Make & Model:	Carsel AT-24
Closing Error:	0.000	-	Serial #:	76710
WL Check:	0.003	-0.003		
Transducer Elevation:	97.261	97.255		

Field Personnel:			
Data Entry Personnel:	TL, CJ	Trip Date:	14-Sep-15
Data Check Personnel:	TL	Date:	14-Sep-15
Entered Digitally in the Field:	GG	Date:	16-Nov-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River
 UTM Location: 451994 E, 6336589 N

Site Visit Date: October 17, 2015
 Site Visit Time (MST): 12:30



Flow Measurement Details:	
Metering Section Location (describe): At helicopter	
Meas. Start Time (MST):	12:52
Meas. End Time (MST):	13:16
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Open, low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, 13c

Flow characteristics:	
Total Flow:	0.406 (m ³ /s)
Perceived Measurement Quality:	-
Cross Section Area:	12.90 (m ²)
Wetted Width:	15.09 (m)
Hydraulic Depth:	0.85 (m)
Mean Velocity:	0.03 (m/s)
Reynolds Number:	1.68 E+04
Froude Number:	0.61

Logger Details:		
	Before	After
Transducer Reading (m):	0.297	0.320
Water (°C):	3.6	3.8
Datalogger Clock:	12:36	13:29
Laptop Clock:	12:34	13:28
Battery (Minn):	14.4	13.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	New
Mini Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	
-Moved pressure transducer deeper	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	3.00	
Serial Number:	4712	Bainly (ppt):	-	-	RB:	17.80	
Firmware Version:	3.8	Magnetic Declination (°):	-	-	Compass Calibration Passed:	Yes	
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed:	Yes	
ADCP Temperature (°C):		-		-		-	
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	14.23	12.98	0.032	0.416	2.46%
Depth Reference: Vertical Beam	3	0.00	13.85	14.47	0.031	0.391	-3.69%
Coordinate System: FWD	5	0.00	14.37	11.33	0.037	0.421	3.69%
Left Method: Sloped Bank	6	0.00	17.92	12.82	0.031	0.396	-2.46%
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
Mean:		15.09	12.90	0.033	0.406		
SD:		1.64	1.11	0.002	0.013		
COV:		0.11	0.09	0.076	0.031		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S53-06	1.131	101.360		100.229	100.229	Lag bolt in console 8m E of logger
S53-04			1.194	100.166	100.165	Pipe 2m SE of logger
S53-05			0.973	100.387	100.388	Pipe 5m E of logger
Water Level:						
Cut	0.141	3.842		97.559	Time WL Surveyed: 12:44	
S53-03			1.001	100.359	100.361	Pipe 5m N of logger
Turn						
S53-03	0.942	101.301		100.359	100.361	Pipe 5m N of logger
Water Level:						
Cut	0.141	3.883		97.559	Time WL Surveyed: 12:45	
S53-05			0.913	100.388	100.388	Pipe 5m E of logger
S53-04			1.136	100.165	100.165	Pipe 2m SE of logger
S53-06			1.072	100.229	100.229	Lag bolt in console 8m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S53-03	0.942	101.301		100.359		
Water Level:						
Cut	0.069	3.815		97.555	Time WL Surveyed: 13:22	
Water Level:						
Cut		3.723		97.556	Time WL Surveyed: 13:24	
S53-03	0.920	101.279		100.359		

WL Survey Summary		
	Before	After
Average WL:	97.559	97.556
Closing Error:	0.000	-
WL Check:	0.000	-0.001
Transducer Elevation	97.262	97.036

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:			
Data Entry Personnel:	TR	Trip Date:	17-Oct-15
Data Check Personnel:	GG	Date:	16-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River
 UTM Location: 451994 E, 6336589 N

Site Visit Date: December 3, 2015
 Site Visit Time (MST): 10:55

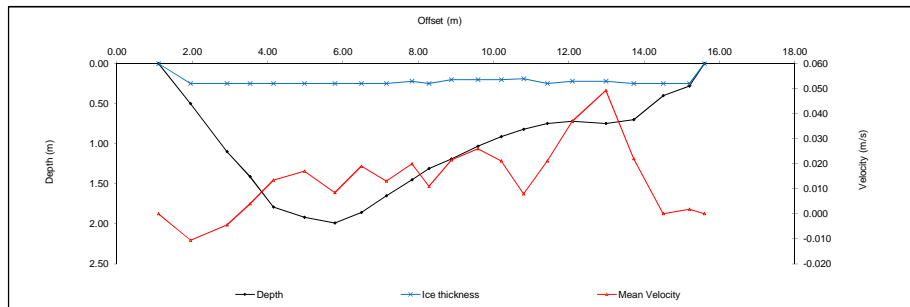


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.10	0.00	0.00		0.000		0.000		0.000	0.88	0.43	0.00	0.000	0.00	0.000	
1	1.95	0.50	0.25	0.38	-0.012	0.93	-0.004	0.42	-0.005	0.88	0.91	0.25	-0.011	0.23	-0.002	-1%
2	2.92	1.10	0.25			1.18	0.006	0.48	0.002	1.00	0.79	0.85	-0.005	0.67	-0.003	-2%
3	3.53	1.41	0.25			1.48	0.013	0.56	0.014	1.00	0.62	1.16	0.004	0.71	0.003	2%
4	4.15	1.79	0.25			1.59	0.008	0.58	0.026	1.00	0.73	1.54	0.014	1.12	0.015	8%
5	4.98	1.92	0.25			1.64	-0.008	0.60	0.025	1.00	0.82	1.67	0.017	1.36	0.023	12%
6	5.78	1.99	0.25			1.64	0.012	0.57	0.026	1.00	0.69	1.74	0.009	1.31	0.011	6%
7	6.49	1.86	0.25			1.37	0.018	0.53	0.008	1.00	0.67	1.40	0.013	0.94	0.012	6%
8	7.15	1.65	0.25			1.20	0.025	0.47	0.015	1.00	0.57	1.23	0.020	0.69	0.014	7%
9	7.83	1.45	0.22			1.10	0.003	0.46	0.019	1.00	0.53	1.06	0.011	0.56	0.006	3%
10	8.28	1.31	0.25			0.99	0.002	0.40	0.041	1.00	0.65	0.99	0.022	0.64	0.014	7%
11	8.88	1.19	0.20			0.86	0.013	0.37	0.039	1.00	0.66	0.83	0.026	0.55	0.014	7%
12	9.58	1.03	0.20							0.88	0.61	0.71	0.021	0.43	0.009	5%
13	10.20	0.91	0.20	0.56	0.024					0.88	0.62	0.63	0.008	0.39	0.003	2%
14	10.80	0.82	0.19	0.51	0.009					0.88	0.65	0.50	0.021	0.32	0.007	4%
15	11.43	0.75	0.25	0.50	0.024					0.88	0.78	0.50	0.037	0.39	0.014	8%
16	12.09	0.72	0.22	0.47	0.042					0.88	0.82	0.53	0.049	0.43	0.021	11%
17	12.98	0.75	0.22	0.49	0.056					0.88	0.76	0.45	0.022	0.34	0.008	4%
18	13.72	0.70	0.25	0.48	0.025					0.88	0.74	0.15	0.000	0.11	0.000	0%
19	14.50	0.40	0.25	0.33	0.000					0.88	0.55	0.03	0.002	0.02	0.000	0%
20	15.20	0.28	0.25	0.27	0.002					0.88	0.20	0.00	0.000	0.00	0.000	0%
LB	15.60	0.00	0.00		0.00				0.00				0.000			
Total Flow														0.190	100%	

Flow Measurement Details:

Metering Section Location (describe): At helicopter landing area

Meas. Start Time (MST):	11:32
Meas. End Time (MST):	12:12
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, 0C



Flow characteristics:

Total Flow:	0.190	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.32	(m ²)
Wetted Width:	14.50	(m)
Hydraulic Depth:	0.85	(m)
Mean Velocity:	0.02	(m/s)
Reynolds Number:	7.31E+03	
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	0.735	-
Water (°C):	0.0	-
Datalogger Clock:	12:01	-
Laptop Clock:	11:00	-
Battery:	13.1	-
Battery Condition:	Good	-
Battery Serial #:	-	Replaced
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S53-04	1.287	101.452		100.165	100.165	Pipe 2m SE of logger
S53-05			1.063	100.389	100.388	Pipe 5m E of logger
S53-03			1.091	100.361	100.361	Pipe 5m N of logger
Water Level:	Cut		3.693	97.759		Time WL Surveyed: 11:19
Temporary BM			3.704	97.748	0.000	-
Turn						
Temporary BM	3.678	101.426		97.748	-	-
Water Level:	Cut		3.665	97.761		Time WL Surveyed: 11:22
S53-03			1.063	100.363	100.361	Pipe 5m N of logger
S53-05			1.037	100.389	100.388	Pipe 5m E of logger
S53-04			1.259	100.167	100.165	Pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.760	-
Closing Error:	-0.002	-
WL Check:	0.002	-
Transducer Elevation	97.025	-

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, JM	Trip Date:	3-Dec-15
Data Check Personnel:	JC	Date:	3-Dec-15
Entered Digitally in the Field:	Yes	Date:	8-Jan-15

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

January 16, 2015

Site Visit Time (MST):

09:30



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.60	0.00	0.00		0.000		0.000		0.000	0.88	0.44	0.00	0.000	0.00	0.000	
1	1.47	0.50	0.45	0.48	0.001					0.88	1.55	0.05	0.001	0.08	0.000	0%
2	3.70	0.00	0.00	0.00	0.000					0.88	1.73	0.00	0.000	0.00	0.000	0%
3	4.93	0.62	0.45	0.54	0.129					0.88	1.01	0.17	0.114	0.17	0.019	6%
4	5.72	0.67	0.45	0.56	0.196					0.88	0.70	0.22	0.172	0.15	0.027	8%
5	6.33	0.65	0.45	0.55	0.230					0.88	0.57	0.20	0.202	0.12	0.023	7%
6	6.87	0.65	0.40	0.53	0.251					0.88	0.50	0.25	0.221	0.12	0.027	8%
7	7.32	0.69	0.40	0.55	0.232					0.88	0.49	0.29	0.204	0.14	0.029	8%
8	7.85	0.69	0.40	0.55	0.196					0.88	0.72	0.29	0.137	0.21	0.029	8%
9	8.77	0.59	0.43	0.51	0.142					0.88	0.68	0.16	0.125	0.11	0.013	4%
10	9.20	0.60	0.47	0.54	0.097					0.88	0.62	0.13	0.085	0.08	0.007	2%
11	10.00	0.81	0.50	0.56	0.055					0.88	0.86	0.11	0.048	0.09	0.005	1%
12	10.91	0.70	0.48	0.59	0.089					0.88	0.85	0.22	0.078	0.19	0.015	4%
13	11.69	0.70	0.48	0.59	0.104					0.88	0.79	0.22	0.092	0.17	0.016	5%
14	12.50	0.77	0.50	0.64	0.130					0.88	1.02	0.27	0.114	0.27	0.031	9%
15	13.72	0.81	0.48	0.65	0.120					0.88	0.86	0.33	0.106	0.28	0.030	9%
16	14.22	0.83	0.48	0.66	0.137					0.88	0.62	0.35	0.121	0.22	0.026	7%
17	14.95	0.80	0.46	0.63	0.102					0.88	0.89	0.34	0.090	0.30	0.027	8%
18	16.00	0.73	0.47	0.60	0.093					0.88	1.24	0.26	0.082	0.32	0.026	8%
19	17.43	0.65	0.50	0.58	-0.001					0.88	1.37	0.15	-0.001	0.20	0.000	0%
20	18.73	0.60	0.50	0.55	-0.001					0.88	1.24	0.10	-0.001	0.12	0.000	0%
21	19.90	0.56	0.45	0.51	-0.001					0.88	1.39	0.11	-0.001	0.15	0.000	0%
22	21.50	0.50	0.40	0.45	0.006					0.88	1.20	0.10	0.005	0.12	0.001	0%
LB	22.30	0.00	0.00		0.00		0.00		0.00	0.88	0.40	0.00	0.000	0.00	0.000	
Total Flow														0.351	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	10:00
Meas. End Time (MST):	10:40
Equipment:	ADV
Method:	Ice
River Condition:	Flowing moderately
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, 1C

Flow characteristics:

Total Flow:	0.351	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.64	(m ²)
Wetted Width:	21.70	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.08	

Logger Details:

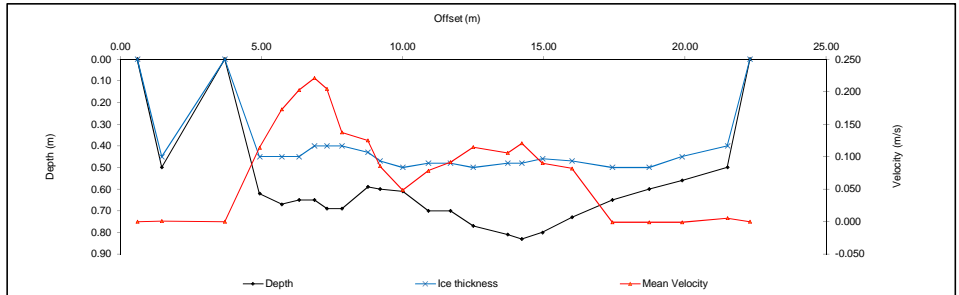
	Before	After
Transducer Reading (m):	0.563	0.563
Water (°C):	0.1	0.1
Datalogger Clock:	09:34	09:46
Laptop Clock:	09:34	09:46
Battery (Main):	11.7	13.1
Battery:		Replaced
Battery Serial #:		
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):		
Logger# (if replaced):		

Datalogger / Station Notes:

- Edited GOES program to report average voltage

General Notes:

- Added BM S54-04, bolt in coniferous tree



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-02	1.018	100.717		99.699	99.699	Pipe 2m SE of logger
S54-03			0.812	99.905	99.908	Pipe 6m SE of Logger
S54-04			0.664	100.053		Lag bolt in conifer
Water Level:	Cut		3.174	97.543		Time WL Surveyed: 10:00
Temporary BM			3.116	97.601		0.000
Turn						
Temporary BM	3.102	100.703		97.601		
Water Level:	Cut		3.157	97.546		Time WL Surveyed: 10:02
S54-04			0.646	100.057		Lag bolt in conifer
S54-03			0.798	99.905	99.908	Pipe 6m SE of Logger
S54-02			1.005	99.698	99.699	Pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.545	-
Closing Error:	0.001	-
WL Check:	0.003	-
Transducer Elevation	96.982	-

Field Personnel:

	DW, MP	Trip Date:	16-Jan-15
Data Entry Personnel:	DW, MP	Date:	16-Jan-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date: February 10, 2015

Site Visit Time (MST): 13:10

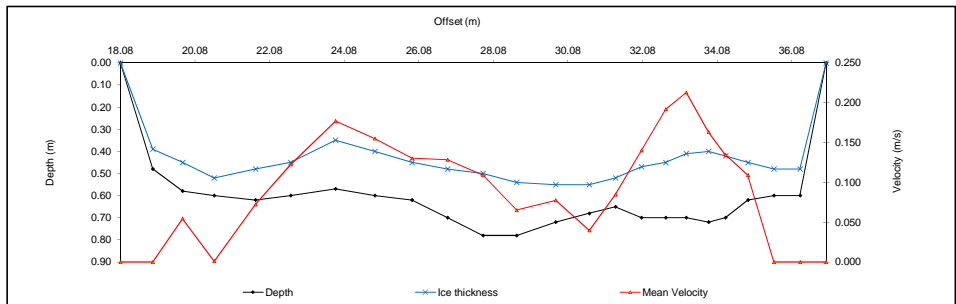


Flow Measurement:																
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	37.00	0.00	0.00	0.54	0.000	0.000	0.000	0.000	0.000	0.88	0.35	0.00	0.000	0.00	0.000	
1	36.30	0.60	0.48	0.54	0.000					0.88	0.70	0.12	0.000	0.08	0.000	0%
2	35.60	0.60	0.48	0.54	0.000					0.88	0.70	0.12	0.000	0.08	0.000	0%
3	34.90	0.62	0.45	0.54	0.124					0.88	0.65	0.17	0.109	0.11	0.012	3%
4	34.30	0.70	0.42	0.56	0.153					0.88	0.52	0.28	0.135	0.15	0.020	5%
5	33.85	0.72	0.40	0.56	0.185					0.88	0.53	0.32	0.163	0.17	0.027	7%
6	33.25	0.70	0.41	0.56	0.242					0.88	0.57	0.29	0.213	0.17	0.036	10%
7	32.70	0.70	0.45	0.58	0.218					0.88	0.60	0.25	0.192	0.15	0.029	8%
8	32.05	0.70	0.47	0.59	0.159					0.88	0.68	0.23	0.140	0.16	0.022	6%
9	31.35	0.65	0.52	0.59	0.096					0.88	0.70	0.13	0.084	0.09	0.008	2%
10	30.65	0.68	0.55	0.62	0.045					0.88	0.80	0.13	0.040	0.10	0.004	1%
11	29.75	0.72	0.55	0.64	0.088					0.88	0.97	0.17	0.077	0.17	0.013	3%
12	28.70	0.78	0.54	0.66	0.074					0.88	0.98	0.24	0.065	0.23	0.015	4%
13	27.80	0.78	0.50	0.64	0.124					0.88	0.92	0.28	0.109	0.26	0.028	8%
14	26.85	0.70	0.48	0.59	0.146					0.88	0.95	0.22	0.128	0.21	0.027	7%
15	25.90	0.62	0.45	0.54	0.148					0.88	0.98	0.17	0.130	0.17	0.022	6%
16	24.90	0.60	0.40	0.50	0.176					0.88	1.03	0.20	0.155	0.21	0.032	9%
17	23.85	0.57	0.35	0.46	0.201					0.88	1.13	0.22	0.177	0.25	0.044	12%
18	22.65	0.60	0.45	0.53	0.139					0.88	1.08	0.15	0.122	0.16	0.020	5%
19	21.70	0.62	0.48	0.55	0.082					0.88	1.03	0.14	0.072	0.14	0.010	3%
20	20.60	0.60	0.52	0.56	0.001					0.88	0.97	0.08	0.001	0.08	0.000	0%
21	19.75	0.58	0.45	0.52	0.062					0.88	0.82	0.13	0.055	0.11	0.006	2%
22	18.95	0.48	0.39	0.44	0.000					0.88	0.84	0.09	0.000	0.08	0.000	0%
LB	18.08	0.00	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.88	0.44	0.00	0.000	0.00	0.000	
Total Flow														0.373	100%	

Flow Measurement Details:

Metering Section Location (describe): At hell pad

Meas. Start Time (MST):	13:54
Meas. End Time (MST):	14:38
Equipment:	ADV
Method:	Ice
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, -23C



Flow characteristics:

Total Flow:	0.373	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.31	(m ²)
Wetted Width:	18.92	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.09	

Logger Details:

	Before	After
Transducer Reading (m):	0.626	-
Water (°C):	0.1	-
Datalogger Clock:	13:02	-
Laptop Clock:	13:01	-
Battery (Main):	15.1	14.4
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-03	0.897	100.805		99.908	99.908	Pipe 2m SE of logger
S54-02			1.105	99.700	99.699	Pipe 2m SE of logger
S54-04			0.747	100.058		Lag bolt in conifer 7m N of logger
Water Level:	Cut	3.207		97.598		Time WL Surveyed: 13:39
S54-03		0.897		99.908	99.699	Pipe 2m SE of logger
Turn						
S54-03	0.868	100.776		99.908	99.699	Pipe 2m SE of logger
Water Level:	Cut		3.172	97.602		Time WL Surveyed: 13:42
S54-04			0.717	100.059	0.000	Lag bolt in conifer 7m N of logger
S54-02		1.077		99.699	99.699	Pipe 2m SE of logger
S54-03		0.868		99.908	99.908	Pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.600	-
Closing Error:	0.000	-
WL Check:	0.004	-
Transducer Elevation	96.974	-

Field Personnel:

	GG, MP	Trip Date:	10-Feb-15
Data Entry Personnel:	GG	Date:	10-Feb-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 39S657 E, 6302612 N

Site Visit Date: _____

March 11, 2015

Site Visit Time (MST): _____

15:05



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.00	0.00	0.00	0.48	0.000	0.000	0.000	0.000	0.000	0.88	0.08	0.00	0.000	0.00	0.000	0%
1	1.15	0.50	0.45	0.48	0.000					0.88	0.60	0.05	0.000	0.03	0.000	0%
2	2.20	0.60	0.45	0.53	-0.004					0.88	1.00	0.15	-0.004	0.15	-0.001	0%
3	3.15	0.62	0.35	0.49	0.217					0.88	0.75	0.27	0.191	0.20	0.039	14%
4	3.70	0.70	0.35	0.53	0.211					0.88	0.43	0.35	0.186	0.15	0.028	10%
5	4.00	0.62	0.35	0.49	0.231					0.88	0.40	0.27	0.203	0.11	0.022	8%
6	4.50	0.63	0.44	0.54	0.255					0.88	0.48	0.19	0.224	0.09	0.020	7%
7	4.95	0.65	0.47	0.56	0.152					0.88	0.65	0.18	0.134	0.12	0.016	6%
8	5.80	0.60	0.54	0.57	0.148					0.88	0.93	0.06	0.130	0.06	0.007	3%
9	6.80	0.62	0.55	0.59	0.000					0.88	0.95	0.07	0.000	0.07	0.000	0%
10	7.70	0.63	0.53	0.58	0.015					0.88	0.90	0.10	0.013	0.09	0.001	0%
11	8.60	0.60	0.53	0.57	-0.010					0.88	0.80	0.07	-0.009	0.06	0.000	0%
12	9.30	0.64	0.50	0.57	0.164					0.88	0.63	0.14	0.144	0.09	0.013	4%
13	9.85	0.58	0.48	0.53	0.245					0.88	0.73	0.10	0.216	0.07	0.016	6%
14	10.75	0.60	0.43	0.52	0.113					0.88	0.88	0.17	0.099	0.15	0.015	5%
15	11.60	0.55	0.45	0.50	0.164					0.88	0.72	0.10	0.144	0.07	0.010	4%
16	12.20	0.67	0.43	0.55	0.157					0.88	0.63	0.24	0.138	0.15	0.021	7%
17	12.85	0.60	0.35	0.48	0.188					0.88	0.58	0.25	0.165	0.14	0.024	8%
18	13.35	0.58	0.35	0.47	0.000					0.88	0.45	0.23	0.000	0.10	0.000	0%
19	13.75	0.60	0.35	0.48	0.186					0.88	0.67	0.25	0.164	0.17	0.028	10%
20	14.70	0.60	0.40	0.50	0.121					0.88	0.92	0.20	0.106	0.19	0.020	7%
21	15.60	0.60	0.45	0.53	0.014					0.88	0.85	0.15	0.012	0.13	0.002	1%
22	16.40	0.60	0.45	0.53	0.034					0.88	0.90	0.15	0.030	0.12	0.004	1%
23	17.20	0.59	0.45	0.52	0.010					0.88	0.83	0.14	0.009	0.12	0.001	0%
24	18.05	0.50	0.40	0.45	0.000					0.88	0.70	0.10	0.000	0.07	0.000	0%
RB	18.60	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.88	0.28	0.00	0.000	0.00	0.000	0%
Total Flow														0.283	100%	

Flow Measurement Details:

Metering Section Location (describe): At station

Meas. Start Time (MST):	15:45
Meas. End Time (MST):	16:21
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light snow, breezy, -4C

Flow characteristics:

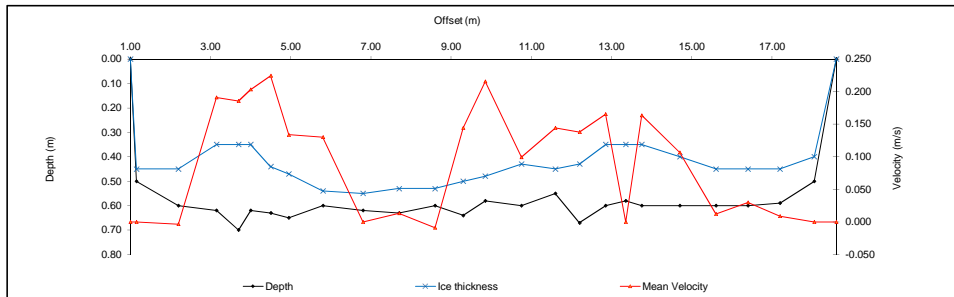
Total Flow:	0.283	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.68	(m ²)
Wetted Width:	17.60	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.09	

Logger Details:

	Before	After
Transducer Reading (m):	0.607	-
Water (°C):	0.1	-
Datalogger Clock:	15:13	-
Laptop Clock:	15:13	-
Battery (Main):	14.1	12.9
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-04	0.767	100.829		100.062	100.062	Lag bolt in tree 5m NW of logger
S54-03			0.917	99.912	99.908	Pipe 5m SE of Logger
S54-02			1.126	99.703	99.699	Pipe 2m SE of logger
Turn						
Water Level:	Cut		3.242	97.587		Time WL Surveyed: 15:36
Temporary BM			2.950	97.879	0.000	-
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary	Before	After
Average WL:	97.589	-
Closing Error:	0.001	-
WL Check:	0.003	-
Transducer Elevation	96.982	-

Field Personnel:	SM, DW	Trip Date:	11-Mar-15
Data Entry Personnel:	SM	Date:	11-Mar-15
Data Check Personnel:	MP	Date:	24-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River
 UTM Location: 395657 E, 6302612 N

Site Visit Date: April 16, 2015
 Site Visit Time (MST):



Measured Data	Calculated Data
No Flow Measurement Conducted	
Total Flow	

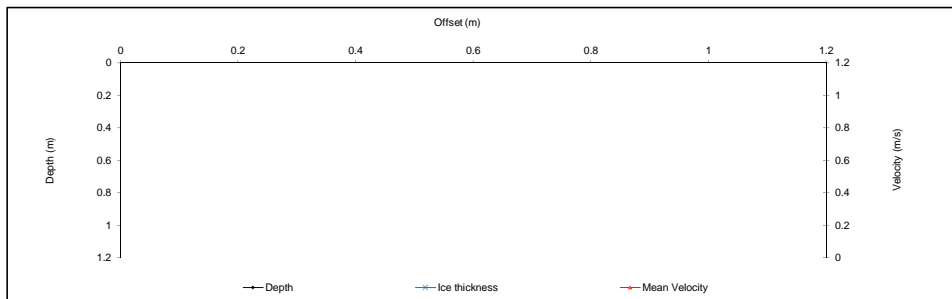
Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	

Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	



Logger Details:

	Before	After
Transducer Reading (m):	1.003	1.006
Water (°C):	0.1	0.1
Datalogger Clock:	10:00	10:22
Laptop Clock:	10:00	10:22
Battery (Main):	14.4	13.4
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-TSS sample collected at left bank.
 -Discharge means not conducted. Most of flow is between 2.0 layers of ice. Channel partly open along left bank. Ice layers not safe for working on.

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-04	0.678	100.740		100.062	100.062	Lag bolt in tree 5m NW of logger
S54-02			1.038	99.702	99.699	Pipe 2m SE of logger
S54-03			0.830	99.910	99.908	Pipe 6m SE of Logger
Water Level:	Cut		2.744	97.996		Time WL Surveyed: 10:17
Temporary BM			1.530	99.210	0.000	-
Turn						
Temporary BM	1.512	100.722		99.210		-
Water Level:	Cut		2.726	97.996		Time WL Surveyed: 10:19
S54-03			0.812	99.910	99.908	Pipe 6m SE of Logger
S54-02			1.020	99.702	99.699	Pipe 2m SE of logger
S54-04			0.661	100.061	100.062	Lag bolt in tree 5m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.996	-
Closing Error:	0.001	-
WL Check:	0.000	-
Transducer Elevation	96.993	-

Field Personnel:

	SM, GG	Trip Date:	16-Apr-15
Data Entry Personnel:	SM	Date:	16-Apr-15
Data Check Personnel:	CJ	Date:	16-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River
 UTM Location: 395657 E, 6302612 N

Site Visit Date: May 8, 2015
 Site Visit Time (MST): 08:15



Flow Measurement Details:	
Metering Section Location (describe): 25m upstream of helicopter landing area	
Meas. Start Time (MST):	9:00
Meas. End Time (MST):	9:30
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Moderate to high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 5 C

Flow characteristics:	
Total Flow:	11.8 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	20.55 (m ²)
Wetted Width:	29.09 (m)
Hydraulic Depth:	0.71 (m)
Mean Velocity:	0.57 (m/s)
Reynolds Number:	2.61E+05
Froude Number:	0.22

Logger Details:		
	Before	After
Transducer Reading (m):	1.250	1.250
Water (°C):	4.5	4.7
Datalogger Clock:	08:24	09:32
Laptop Clock:	08:23	09:32
Battery (Minn):	13.8	14.2
Battery:	Good	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Mini Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 -Anchor cable found broken, PT was pulled after second survey and cable reattached.
 -New WL: 1.126 m

General Notes:

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	61.90	
Serial Number:	4712	Bainby (gpd):	-	-	RB:	33.40	
Firmware Version:	3.8	Magnetic Declination (°):	-	14.33	Compass Calibration Passed: Yes		
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes		
		ADCP Temperature (°C):	-	6.4			
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean:	Percent of Pass Measured (%)
Track Reference: Bottom Track	1	0.00	28.99	20.35	0.563	11.455	-2.89%
Depth Reference: Vertical Beam	2	0.00	29.49	20.89	0.583	12.181	3.26%
Coordinate System: FWD	3	0.00	29.14	20.65	0.573	11.838	0.30%
Left Method: Sloped Bank	4	0.00	28.74	20.31	0.577	11.71	-0.73%
Right Method: Sloped Bank							
Top Fit Type: Power Fit							
Bottom Fit Type: Power Fit							
Mean:				29.09	20.55	0.574	11.8
SD:				0.27	0.24	0.007	0.262
COV:				0.01	0.01	0.013	0.022

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-03	0.728	100.636		99.908		Pipe 6m SE of Logger
S54-02			0.935	99.701	99.699	Pipe 2m SE of logger
S54-04			0.576	100.060	100.062	Lag bolt in tree 5m NW of logger
Water Level:	Cut	0.848	3.447	98.037		Time WL Surveyed: 8:30
Temporary BM			3.447	97.189		0.000
Turn						
Temporary BM	3.504	100.693		97.189		
Water Level:	Cut	0.848	3.504	98.037		Time WL Surveyed: 8:32
S54-04			0.633	100.060	100.062	Lag bolt in tree 5m NW of logger
S54-02			0.993	99.700	99.699	Pipe 2m SE of logger
S54-03			0.796	99.907	99.908	Pipe 6m SE of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S54-02	0.904	100.695		99.701		
Water Level:	Cut		2.657	98.039		Time WL Surveyed: 9:34
Water Level:	Cut		2.656	98.037		Time WL Surveyed: 9:36
S54-02	0.982	100.683		99.701		

WL Survey Summary	
Average WL:	98.037
Closing Error:	0.001
WL Check:	0.000
Transducer Elevation:	98.787

Level Survey Equipment:	
Level #:	Level#3
Make & Model:	Carsel AT-24
Serial #:	112990

Field Personnel:			
Data Entry Personnel:	TR	Trip Date:	8-May-15
Data Check Personnel:	CJ	Date:	8-May-15
Entered Digitally in the Field:	Yes	Date:	16-Jun-15

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River
 UTM Location: 395657 E, 6302612 N

Site Visit Date: June 9, 2015
 Site Visit Time (MST): 08:20

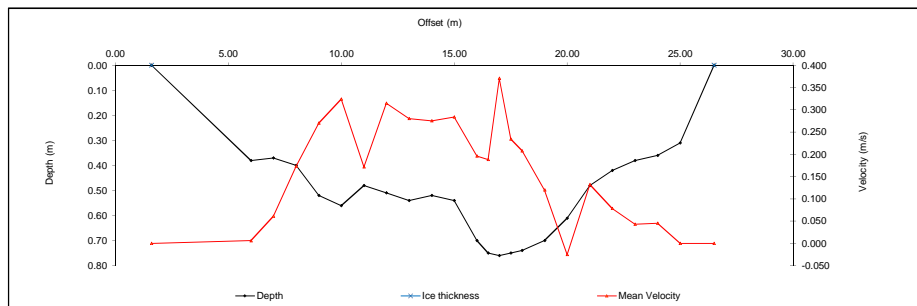


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.60	0.00	0.00		0.000		0.000		0.000	1.00	2.20	0.00	0.000	0.00	0.000	
1	6.00	0.38		0.23	0.006					1.00	2.70	0.38	0.006	1.03	0.006	0%
2	7.00	0.37		0.22	0.061					1.00	1.00	0.37	0.061	0.37	0.023	1%
3	8.00	0.40		0.24	0.173					1.00	1.00	0.40	0.173	0.40	0.069	4%
4	9.00	0.52		0.31	0.270					1.00	1.00	0.52	0.270	0.52	0.140	8%
5	10.00	0.56		0.34	0.324					1.00	1.00	0.56	0.324	0.56	0.191	10%
6	11.00	0.48		0.29	0.172					1.00	1.00	0.48	0.172	0.48	0.083	5%
7	12.00	0.51		0.31	0.315					1.00	1.00	0.51	0.315	0.51	0.161	9%
8	13.00	0.54		0.32	0.280					1.00	1.00	0.54	0.280	0.54	0.151	8%
9	14.00	0.52		0.31	0.275					1.00	1.00	0.52	0.275	0.52	0.143	8%
10	15.00	0.54		0.32	0.284					1.00	1.00	0.54	0.284	0.54	0.153	8%
11	16.00	0.70		0.42	0.196					1.00	0.75	0.70	0.196	0.53	0.103	6%
12	16.50	0.75		0.45	0.188					1.00	0.50	0.75	0.188	0.38	0.071	4%
13	17.00	0.76				0.61	0.218	0.15	0.523	1.00	0.50	0.76	0.371	0.38	0.141	8%
14	17.50	0.75		0.45	0.234					1.00	0.50	0.75	0.234	0.38	0.088	5%
15	18.00	0.74		0.44	0.208					1.00	0.75	0.74	0.208	0.56	0.115	6%
16	19.00	0.70		0.42	0.120					1.00	1.00	0.70	0.120	0.70	0.084	5%
17	20.00	0.61		0.37	-0.025					1.00	1.00	0.61	-0.025	0.61	-0.015	-1%
18	21.00	0.48		0.29	0.132					1.00	1.00	0.48	0.132	0.48	0.063	3%
19	22.00	0.42		0.25	0.078					1.00	1.00	0.42	0.078	0.42	0.033	2%
20	23.00	0.38		0.23	0.043					1.00	1.00	0.38	0.043	0.38	0.016	1%
21	24.00	0.36		0.22	0.045					1.00	1.00	0.36	0.045	0.36	0.016	1%
22	25.00	0.31		0.19	0.000					1.00	1.25	0.31	0.000	0.39	0.000	0%
LB	26.50	0.00	0.00		0.00		0.00		0.00	1.00	0.75	0.00	0.000	0.00	0.000	0%
Total Flow														1.83	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	8:45
Meas. End Time (MST):	9:08
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20C



Flow characteristics:

Total Flow:	1.83	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.01	(m ²)
Wetted Width:	24.90	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.17	(m/s)
Reynolds Number:	6.84E+04	
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	0.640	0.639
Water (°C):	16.4	16.5
Datalogger Clock:	08:23	09:12
Laptop Clock:	08:22	09:11
Battery:	14.1	14.3
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-04	0.664	100.726		100.062	100.062	Lag bolt in tree 5m NW of logger
S54-02			1.023	99.703	99.699	Pipe 2m SE of logger
S54-03			0.816	99.910	99.908	Pipe 6m SE of Logger
Water Level:	Cut		3.173	97.553	Time WL Surveyed: 8:28	
S54-03			0.816	99.910	99.908	Pipe 6m SE of Logger
Turn						
S54-03	0.761	100.671		99.910	99.908	Pipe 6m SE of Logger
Water Level:	Cut		3.118	97.553	Time WL Surveyed: 8:33	
S54-03			0.761	99.910	99.908	Pipe 6m SE of Logger
S54-02			0.968	99.703	99.699	Pipe 2m SE of logger
S54-04			0.607	100.064	100.062	Lag bolt in tree 5m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S54-02	0.968	100.671		99.703		
Water Level:	Cut		3.475	3.537	97.549	Time WL Surveyed: 9:12
Water Level:	Cut		0.449	3.531	97.549	Time WL Surveyed: 9:12
S54-02			0.928	100.631	99.703	

WL Survey Summary

	Before	After
Average WL:	97.553	97.549
Closing Error:	-0.002	-
WL Check:	0.000	0.000
Transducer Elevation	96.913	96.910

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Field Personnel:	TR, GG, TB	Trip Date:	9-Jun-15
Data Entry Personnel:	TR	Date:	9-Jun-15
Data Check Personnel:	DW	Date:	19-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River
 UTM Location: 395657 E, 6302612 N

Site Visit Date: 08-14-2015
 Site Visit Time (MST): 10:20



Flow Measurement Details:	
Metering Section Location (describe): At station	
Meas. Start Time (MST):	10:01
Meas. End Time (MST):	10:10
Equipment:	ADCPH
Method:	Cableway
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly Sunny, windy, 24C

Flow characteristics:	
Total Flow:	2.87 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	15.57 (m ²)
Wetted Width:	24.41 (m)
Hydraulic Depth:	0.64 (m)
Mean Velocity:	0.18 (m/s)
Reynolds Number:	1.10E+05
Froude Number:	0.67

Logger Details:		
	Before	After
Transducer Reading (m):	0.850	0.851
Water (°C):	17.6	17.9
Datalogger Clock:	10:23	11:18
Laptop Clock:	10:22	11:17
Battery (Minn):	14.0	14.2
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Mini Tube Dessiccant:	Replaced	-
PTF # (if replaced):	278500	-
Logger # (if replaced):	13899	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:								
System Information:			System Setup:			Bank Offsets:		
System Type:	Sonnet RS-M9	Transducer Depth (m):	-	0.05	LB:	5.80		
Serial Number:	4712	Safety (gpd):	-	-	RB:	27.00		
Firmware Version:	3.8	Magnetic Declination (°):	-	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	-	-	System Test Passed: Yes			
		ADCP Temperature (°C):	-	18.2				
Discharge Calculation Settings:			Measurement Results:					
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)	
Track Reference: Bottom Track	2	0.00	25.19	15.40	0.185	2.848	-0.90%	71.4
Depth Reference: Vertical Beam	3	0.00	23.93	15.45	0.186	2.876	0.07%	70.2
Coordinate System: ENL	4	0.00	24.71	15.57	0.186	2.901	0.94%	69.9
Left Method: Sloped Bank	5	0.00	23.82	15.86	0.181	2.871	-0.10%	71.2
Right Method: Sloped Bank								
Top Fit Type: Power Fit								
Bottom Fit Type: Power Fit								
Mean:				24.41	15.57	0.185	2.87	
SD:				0.56	0.18	0.002	0.019	
COV:				0.02	0.01	0.011	0.007	

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-04	0.983	100.645		100.062	100.062	Lag bolt in tree 5m NW of logger
S54-02			0.943	99.702	99.699	Pipe 2m SE of logger
S54-03			0.736	99.909	99.908	Pipe 6m SE of Logger
Turn						
Water Level:	Cut	0.600	3.592	97.653	Time WL Surveyed: 10:35	
Temporary BM			3.592	97.053	0.000	
Turn						
Temporary BM	3.571	100.624		97.053		
Water Level:	Cut	0.600	3.571	97.653	Time WL Surveyed: 10:36	
S54-03			0.713	99.911	99.908	Pipe 6m SE of Logger
S54-02			0.922	99.702	99.699	Pipe 2m SE of Logger
S54-04			0.952	100.062	100.062	Lag bolt in tree 5m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S54-03	0.713	100.623		99.910		
Water Level:	Cut	0.595	3.581	97.637	Time WL Surveyed: 11:23	
Water Level:	Cut	0.595	3.587	97.637	Time WL Surveyed: 11:24	
S54-03	0.699	100.609		99.910		

WL Survey Summary			Level Survey Equipment:	
Average WL:	Before	After	Level #:	Level#2
Closing Error:	0.000	-	Make & Model:	Nikon AC-2S
WL Check:	0.000	0.000	Serial #:	668859
Transducer Elevation:	96.803	96.786		

Field Personnel:			
Data Entry Personnel:	DW, JC	Trip Date:	14-Aug-15
Data Check Personnel:	DW	Date:	14-Aug-15
Entered Digitally in the Field:	Yes	Date:	18-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

September 15, 2015

Site Visit Time (MST):

07:00



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	3.70	0.00			0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	4.50	0.10		0.06	0.158					1.00	1.15	0.10	0.158	0.12	0.018	1%
2	6.00	0.22		0.13	0.103					1.00	1.75	0.22	0.103	0.39	0.040	2%
3	8.00	0.33		0.20	0.230					1.00	1.50	0.33	0.230	0.50	0.114	6%
4	9.00	0.38		0.23	0.203					1.00	1.00	0.38	0.203	0.38	0.077	4%
5	10.00	0.40		0.24	0.222					1.00	1.00	0.40	0.222	0.40	0.089	5%
6	11.00	0.40		0.24	0.189					1.00	1.00	0.40	0.189	0.40	0.076	4%
7	12.00	0.42		0.25	0.257					1.00	1.00	0.42	0.257	0.42	0.108	6%
8	13.00	0.38		0.23	0.343					1.00	1.00	0.38	0.343	0.38	0.130	7%
9	14.00	0.40		0.24	0.325					1.00	1.00	0.40	0.325	0.40	0.130	7%
10	15.00	0.37		0.22	0.360					1.00	1.00	0.37	0.360	0.37	0.133	7%
11	16.00	0.40		0.24	0.374					1.00	1.00	0.40	0.374	0.40	0.150	8%
12	17.00	0.38		0.23	0.228					1.00	1.00	0.38	0.228	0.38	0.087	5%
13	18.00	0.32		0.19	0.392					1.00	1.00	0.32	0.392	0.32	0.125	7%
14	19.00	0.28		0.17	0.414					1.00	1.00	0.28	0.414	0.28	0.116	6%
15	20.00	0.32		0.19	0.341					1.00	1.00	0.32	0.341	0.32	0.109	6%
16	21.00	0.34		0.20	0.250					1.00	1.25	0.34	0.250	0.43	0.106	6%
17	22.50	0.28		0.17	0.185					1.00	1.50	0.28	0.185	0.42	0.078	4%
18	24.00	0.21		0.13	0.113					1.00	1.75	0.21	0.113	0.37	0.042	2%
19	26.00	0.12		0.07	0.202					1.00	2.25	0.12	0.202	0.27	0.055	3%
20	28.50	0.10		0.06	0.133					1.00	2.35	0.10	0.133	0.24	0.031	2%
RB	30.70	0.00	0.000		0.00		0.00		0.00	1.00	1.10	0.00	0.000	0.00	0.000	
Total Flow														1.81	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	7:42
Meas. End Time (MST):	8:10
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear

Flow characteristics:

Total Flow:	1.81	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.16	(m ²)
Wetted Width:	27.00	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.16	

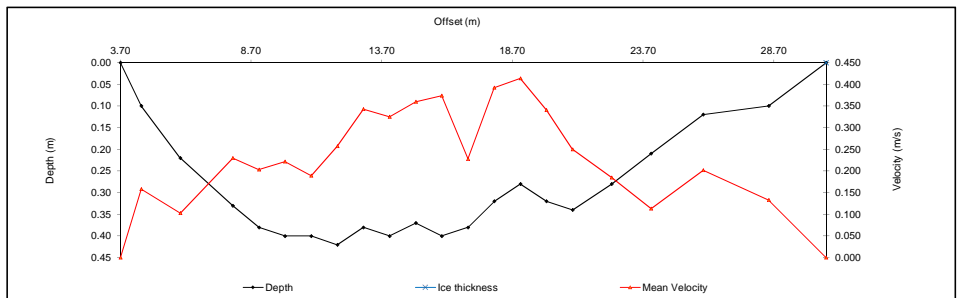
Logger Details:

	Before	After
Transducer Reading (m):	0.771	0.770
Water (°C):	8.7	8.6
Datalogger Clock:	07:05	08:25
Laptop Clock:	07:05	08:25
Battery (Main):	13.0	13.3
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-BM S54-05, lag bolt was installed

General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-02	0.955	100.654		99.699	99.699	Pipe 2m SE of logger
S54-03			0.748	99.906	99.906	Pipe 6m SE of Logger
S54-04			0.596	100.058	100.062	Lag bolt in tree 5m NW of logger
S54-05			0.622	100.032	100.032	Lag bolt in conifer about 25 m nw of station
Water Level:	Cut		3.082	97.572	Time WL Surveyed:	
Temporary BM			2.778	97.876	0.000	7:28
Turn						
Temporary BM	2.731	100.607		97.876		-
Water Level:	Cut		3.032	97.575	Time WL Surveyed:	7:29
S54-05			0.575	100.032	100.032	Lag bolt in conifer about 25 m nw of station
S54-04			0.549	100.058	100.062	Lag bolt in tree 5m NW of logger
S54-03			0.701	99.906	99.906	Pipe 6m SE of Logger
S54-02			0.908	99.699	99.699	Pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S54-02	0.908	100.607		99.699		
Water Level:	Cut		3.035	97.572	Time WL Surveyed:	8:21
Water Level:	Cut		3.060	97.569	Time WL Surveyed:	8:22
S54-02	0.930	100.629		99.699		

WL Survey Summary	Before	After
Average WL:	97.574	97.571
Closing Error:	0.000	-
WL Check:	0.003	0.003
Transducer Elevation	96.803	96.801

Field Personnel:	CJ, TL	Trip Date:	15-Sep-15
Data Entry Personnel:	CJ	Date:	15-Sep-15
Data Check Personnel:	JC	Date:	10-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River
 UTM Location: 395657 E, 6302612 N

Site Visit Date: October 17, 2015
 Site Visit Time (MST): 14:11

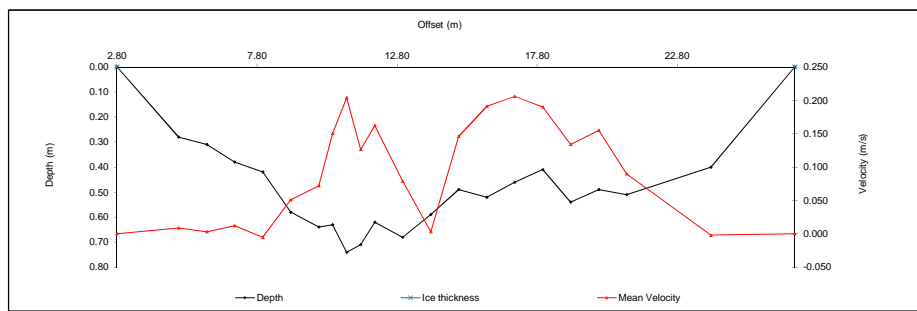


Measured Data										Calculated Data						
Bank/ Mnt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	2.80	0.00	0.00		0.000		0.000		0.000	1.00	1.10	0.00	0.000	0.00	0.000	
1	5.00	0.28		0.17	0.009					1.00	1.60	0.28	0.009	0.45	0.004	0%
2	6.00	0.31		0.19	0.003					1.00	1.00	0.31	0.003	0.31	0.001	0%
3	7.00	0.38		0.23	0.012					1.00	1.00	0.38	0.012	0.38	0.005	0%
4	8.00	0.42		0.25	-0.005					1.00	1.00	0.42	-0.005	0.42	-0.002	0%
5	9.00	0.58		0.35	0.051					1.00	1.00	0.58	0.051	0.58	0.030	3%
6	10.00	0.64		0.38	0.072					1.00	0.75	0.64	0.072	0.48	0.035	4%
7	10.50	0.63		0.38	0.150					1.00	0.50	0.63	0.150	0.32	0.047	5%
8	11.00	0.74		0.44	0.204					1.00	0.50	0.74	0.204	0.37	0.075	8%
9	11.50	0.71		0.43	0.126					1.00	0.50	0.71	0.126	0.36	0.045	5%
10	12.00	0.62		0.37	0.162					1.00	0.75	0.62	0.162	0.47	0.075	8%
11	13.00	0.68		0.41	0.079					1.00	1.00	0.68	0.079	0.68	0.054	6%
12	14.00	0.59		0.35	0.003					1.00	1.00	0.59	0.003	0.59	0.002	0%
13	15.00	0.49		0.29	0.146					1.00	1.00	0.49	0.146	0.49	0.072	8%
14	16.00	0.52		0.31	0.191					1.00	1.00	0.52	0.191	0.52	0.099	10%
15	17.00	0.46		0.28	0.206					1.00	1.00	0.46	0.206	0.46	0.095	10%
16	18.00	0.41		0.25	0.190					1.00	1.00	0.41	0.190	0.41	0.078	8%
17	19.00	0.54		0.32	0.134					1.00	1.00	0.54	0.134	0.54	0.072	8%
18	20.00	0.49		0.29	0.155					1.00	1.00	0.49	0.155	0.49	0.076	8%
19	21.00	0.51		0.31	0.090					1.00	2.00	0.51	0.090	1.02	0.092	10%
20	24.00	0.40		0.24	-0.002					1.00	3.00	0.40	-0.002	1.20	-0.002	0%
RB	27.00	0.00	0.00		0.00		0.00		0.00	1.00	1.50	0.00	0.000	0.00	0.000	
Total Flow														0.951	100%	

Flow Measurement Details:

Metering Section Location (describe):
At hell

Meas. Start Time (MST):	14:23
Meas. End Time (MST):	14:42
Equipment:	ADV#1
Flow Meter Make & Model:	Sortek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, 14C



Flow characteristics:

Total Flow:	0.951	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.52	(m ²)
Wetted Width:	24.20	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.09	(m/s)
Reynolds Number:	2.48E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.719	0.719
Water (°C):	4.0	4.0
Datalogger Clock:	14:14	14:46
Laptop Clock:	14:13	14:45
Battery:	14.2	14.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dissicant:	-	-
Vent Tube Dissicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-04	0.630	100.692		100.062	100.062	Lag bolt in tree 5m NW of logger
S54-02			0.991	99.701	99.699	Pipe 2m SE of logger
S54-03			0.783	99.909	99.908	Pipe 6m SE of Logger
Water Level:	Cut	0.298	3.465	97.525		Time WL Surveyed: 14:16
Temporary BM			3.465	97.227	0.000	
Turn						
Temporary BM	3.439	100.666		97.227		
Water Level:	Cut	0.298	3.439	97.525		Time WL Surveyed: 14:20
S54-03			0.753	99.913	99.908	Pipe 6m SE of Logger
S54-02			0.982	99.704	99.699	Pipe 2m SE of logger
S54-04			0.601	100.065	100.062	Lag bolt in tree 5m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S54-02	0.962	100.665		99.703		
Water Level:	Cut	0.086	3.229	97.532		Time WL Surveyed: 14:48
Water Level:	Cut	0.101	3.213	97.529		Time WL Surveyed: 14:51
S54-02	0.937	100.640		99.703		

WL Survey Summary

	Before	After
Average WL:	97.525	97.530
Closing Error:	-0.003	0.004
WL Check:	0.000	0.004
Transducer Elevation	96.806	96.811

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC 2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	17-Oct-15
Data Check Personnel:	JC	Date:	16-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River
 UTM Location: 395657 E, 6302612 N

Site Visit Date: December 3, 2015
 Site Visit Time (MST): 12:49

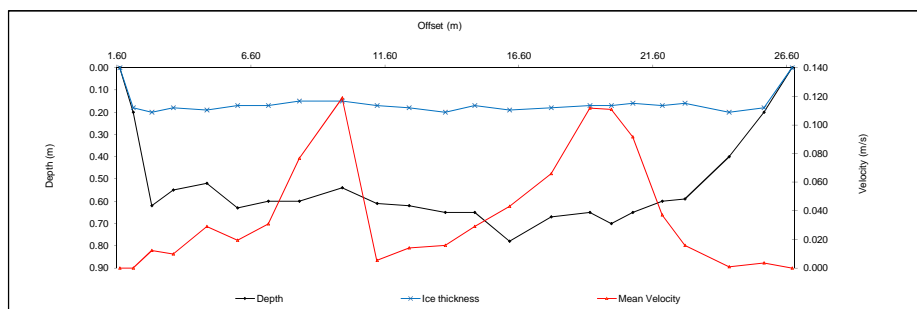


Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.70	0.00	0.00		0.000				0.000	0.88	0.25	0.00	0.000	0.00	0.000	
1	2.20	0.20	0.18	0.19	0.000				0.88	0.60	0.02	0.000	0.01	0.000	0%	
2	2.90	0.62	0.20	0.41	0.014				0.88	0.75	0.42	0.012	0.32	0.004	1%	
3	3.70	0.55	0.18	0.37	0.011				0.88	1.03	0.37	0.010	0.38	0.004	1%	
4	4.95	0.52	0.19	0.36	0.033				0.88	1.20	0.33	0.029	0.40	0.011	3%	
5	6.10	0.63	0.17	0.40	0.022				0.88	1.15	0.46	0.019	0.53	0.010	2%	
6	7.25	0.60	0.17	0.39	0.035				0.88	1.15	0.43	0.031	0.49	0.015	3%	
7	8.40	0.60	0.15	0.38	0.087				0.88	1.38	0.45	0.077	0.62	0.047	10%	
8	10.00	0.54	0.15	0.35	0.135				0.88	1.45	0.39	0.119	0.57	0.067	15%	
9	11.30	0.61	0.17	0.39	0.006				0.88	1.25	0.44	0.005	0.55	0.003	1%	
10	12.50	0.62	0.18	0.40	0.016				0.88	1.28	0.44	0.014	0.56	0.008	2%	
11	13.85	0.65	0.20	0.43	0.018				0.88	1.23	0.45	0.016	0.55	0.009	2%	
12	14.95	0.65	0.17	0.41	0.033				0.88	1.20	0.48	0.029	0.58	0.017	4%	
13	16.25	0.78	0.19	0.49	0.049				0.88	1.43	0.59	0.043	0.84	0.036	8%	
14	17.80	0.67	0.18	0.43	0.075				0.88	1.50	0.49	0.066	0.74	0.049	11%	
15	19.25	0.65	0.17	0.41	0.127				0.88	1.13	0.48	0.112	0.54	0.060	13%	
16	20.05	0.70	0.17	0.44	0.126				0.88	0.80	0.53	0.111	0.42	0.047	10%	
17	20.85	0.65	0.16	0.41	0.104				0.88	0.95	0.49	0.092	0.47	0.043	9%	
18	21.95	0.60	0.17	0.39	0.042				0.88	0.98	0.43	0.037	0.42	0.015	3%	
19	22.80	0.59	0.16	0.38	0.018				0.88	1.25	0.43	0.016	0.54	0.009	2%	
20	24.45	0.40	0.20	0.30	0.001				0.88	1.48	0.20	0.001	0.30	0.000	0%	
21	25.75	0.20	0.18	0.19	0.004				0.88	1.18	0.02	0.004	0.02	0.000	0%	
RB	26.80	0.00	0.00		0.00				0.88	0.53	0.00	0.000	0.00	0.000		
Total Flow														0.454	100%	

Flow Measurement Details:

Metering Section Location (describe):
At helicopter landing area.

Meas. Start Time (MST):	13:31
Meas. End Time (MST):	14:05
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3098
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, -2C



Flow characteristics:

Total Flow:	0.454	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.83	(m ²)
Wetted Width:	25.10	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.05	(m/s)
Reynolds Number:	1.02E+04	
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	0.704	-
Water (°C):	0.3	-
Datalogger Clock:	13:51	-
Laptop Clock:	12:50	-
Battery:	12.8	-
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-04	0.787	100.849		100.062	100.062	Lag bolt in tree 5m NW of logger
S54-02			1.145	99.704	99.699	Pipe 2m SE of logger
S54-03			0.939	99.910	99.908	Pipe 6m SE of Logger
Water Level:						
Temporary BM	Cut		3.342	97.507		Time WL Surveyed: 13:20
			3.320	97.529	0.000	
Turn						
Temporary BM	3.300	100.829		97.529		
Water Level:	Cut		3.318	97.511		Time WL Surveyed: 13:24
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.539	-
Closing Error:	0.001	-
WL Check:	0.004	-
Transducer Elevation	96.805	-

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

GG, JM	Trip Date:	3-Dec-15
GG, JM	Date:	3-Dec-15
JC	Date:	8-Jan-16
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: January 12, 2015
 Site Visit Time (MST): 15:00

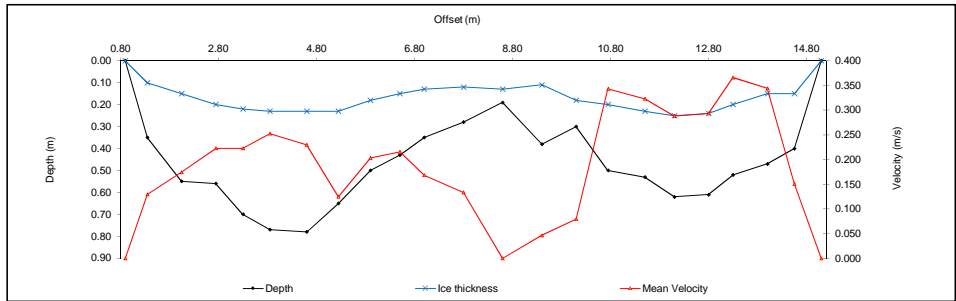


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
LB	0.90	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.23	0.00	0.000	0.00	0.000	
1	1.35	0.35	0.10	0.23	0.147				0.88	0.58	0.25	0.129	0.14	0.019	2%
2	2.05	0.55	0.15	0.35	0.198				0.88	0.70	0.40	0.174	0.28	0.049	5%
3	2.75	0.56	0.20	0.38	0.253				0.88	0.63	0.36	0.223	0.23	0.050	5%
4	3.30	0.70	0.22	0.46	0.253				0.88	0.55	0.48	0.223	0.26	0.059	6%
5	3.85	0.77	0.23	0.50	0.287				0.88	0.65	0.54	0.253	0.35	0.089	9%
6	4.60	0.78	0.23	0.51	0.261				0.88	0.70	0.55	0.230	0.39	0.088	9%
7	5.25	0.65	0.23	0.44	0.142				0.88	0.65	0.42	0.125	0.27	0.034	4%
8	5.90	0.50	0.18	0.34	0.231				0.88	0.63	0.32	0.203	0.20	0.041	4%
9	6.50	0.43	0.15	0.29	0.245				0.88	0.55	0.28	0.216	0.15	0.033	3%
10	7.00	0.35	0.13	0.24	0.191				0.88	0.65	0.22	0.168	0.14	0.024	3%
11	7.80	0.28	0.12	0.20	0.151				0.88	0.80	0.16	0.133	0.13	0.017	2%
12	8.60	0.19	0.13	0.16	0.000				0.88	0.80	0.06	0.000	0.05	0.000	0%
13	9.40	0.38	0.11	0.25	0.053				0.88	0.75	0.27	0.047	0.20	0.009	1%
14	10.10	0.30	0.18	0.24	0.090				0.88	0.68	0.12	0.079	0.08	0.006	1%
15	10.75	0.50	0.20	0.35	0.390				0.88	0.70	0.30	0.343	0.21	0.072	8%
16	11.50	0.53	0.23	0.38	0.367				0.88	0.68	0.30	0.323	0.20	0.065	7%
17	12.10	0.62	0.25	0.44	0.327				0.88	0.65	0.37	0.288	0.24	0.069	7%
18	12.80	0.61	0.24	0.43	0.333				0.88	0.60	0.37	0.293	0.22	0.065	7%
19	13.30	0.52	0.20	0.36	0.416				0.88	0.60	0.32	0.366	0.19	0.070	7%
20	14.00	0.47	0.15	0.31	0.391				0.88	0.63	0.32	0.344	0.20	0.069	7%
21	14.55	0.40	0.15	0.28	0.171				0.88	0.55	0.25	0.150	0.14	0.021	2%
RB	15.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.27	0.00	0.000	0.00	0.000	
Total Flow													0.950	100%	

Flow Measurement Details:

Metering Section Location (describe):
4m upstream of PT

Meas. Start Time (MST):	15:55
Meas. End Time (MST):	15:30
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -12C



Flow characteristics:

Total Flow:	0.950	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.28	(m ²)
Wetted Width:	14.20	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.713	0.715
Water (°C):	0.4	0.4
Datalogger Clock:	15:12	15:20
Laptop Clock:	15:09	15:17
Battery (Main):	12.8	13.2
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S55-6	0.876	101.151		100.275	100.275	3/4" pipe 2m SE of logger
S55-5			1.342	99.809	99.810	3/4" Pipe 4m N of logger
S55-1			1.153	99.998	100.000	Bolt in Spruce tree
Water Level:	Cut		4.162	96.989	Time WL Surveyed: 15:23	
Temporary BM			3.901	97.250	0.000	-
Turn						
Temporary BM	3.889	101.139		97.250		-
Water Level:	Cut		4.152	96.987	Time WL Surveyed: 15:26	
S55-1			1.143	99.996	100.000	Bolt in Spruce tree
S55-5			1.330	99.809	99.810	3/4" Pipe 4m N of logger
S55-6			0.865	100.274	100.275	3/4" pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	96.988	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	96.275	-

Field Personnel:

	DW, TR	Trip Date:	12-Jan-15
Data Entry Personnel:	DW	Date:	12-Jan-15
Data Check Personnel:	TR	Date:	4-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: February 7, 2015
 Site Visit Time (MST): 13:40

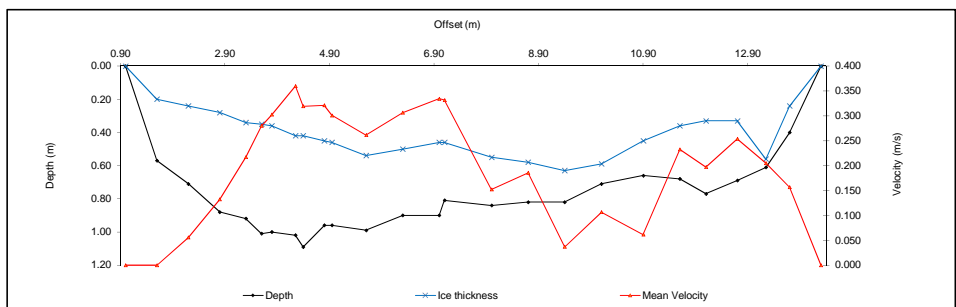


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000				0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	1.60	0.57	0.20	0.39	0.000				0.000	0.88	0.60	0.37	0.000	0.22	0.000	0%
2	2.20	0.71	0.24	0.48	0.063				0.000	0.88	0.60	0.47	0.055	0.28	0.016	2%
3	2.80	0.88	0.28	0.58	0.150				0.000	0.88	0.55	0.60	0.132	0.33	0.044	4%
4	3.30	0.92	0.34	0.63	0.247				0.000	0.88	0.40	0.58	0.217	0.23	0.050	5%
5	3.60	1.01	0.35	0.68	0.318				0.000	0.88	0.25	0.66	0.280	0.17	0.046	5%
6	3.80	1.00	0.36	0.68	0.344				0.000	0.88	0.33	0.64	0.303	0.21	0.063	6%
7	4.25	1.02	0.42	0.72	0.409				0.000	0.88	0.30	0.60	0.360	0.18	0.065	7%
8	4.40	1.09	0.42	0.76	0.363				0.000	0.88	0.27	0.67	0.319	0.18	0.059	6%
9	4.80	0.96	0.45	0.71	0.365				0.000	0.88	0.28	0.51	0.321	0.14	0.045	5%
10	4.95	0.96	0.46	0.71	0.342				0.000	0.88	0.40	0.50	0.301	0.20	0.060	6%
11	5.60	0.99	0.54	0.77	0.297				0.000	0.88	0.67	0.45	0.261	0.30	0.079	8%
12	6.30	0.90	0.50	0.70	0.348				0.000	0.88	0.70	0.40	0.306	0.28	0.086	9%
13	7.00	0.90	0.46	0.68	0.390				0.000	0.88	0.40	0.44	0.334	0.18	0.059	6%
14	7.10	0.81	0.46	0.64	0.377				0.000	0.88	0.50	0.35	0.332	0.18	0.058	6%
15	8.00	0.84	0.55	0.70	0.173				0.000	0.88	0.80	0.29	0.152	0.23	0.035	4%
16	8.70	0.82	0.58	0.70	0.211				0.000	0.88	0.70	0.24	0.186	0.17	0.031	3%
17	9.40	0.82	0.63	0.73	0.042				0.000	0.88	0.70	0.19	0.037	0.13	0.005	1%
18	10.10	0.71	0.59	0.65	0.121				0.000	0.88	0.75	0.12	0.106	0.09	0.010	1%
19	10.90	0.68	0.45	0.56	0.070				0.000	0.88	0.75	0.21	0.062	0.16	0.010	1%
20	11.60	0.68	0.36	0.52	0.264				0.000	0.88	0.60	0.32	0.232	0.19	0.045	5%
21	12.10	0.77	0.33	0.55	0.224				0.000	0.88	0.55	0.44	0.197	0.24	0.048	5%
22	12.70	0.69	0.33	0.51	0.288				0.000	0.88	0.58	0.36	0.253	0.21	0.052	5%
23	13.25	0.61	0.56	0.59	0.233				0.000	0.88	0.50	0.05	0.205	0.03	0.005	1%
24	13.70	0.40	0.24	0.32	0.178				0.000	0.88	0.53	0.16	0.157	0.08	0.013	1%
RB	14.30	0.00	0.00		0.00				0.00	0.88	0.30	0.00	0.000	0.00	0.000	
Total Flow														0.983	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m upstream of station

Meas. Start Time (MST):	14:16
Meas. End Time (MST):	14:47
Equipment:	ADY
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -20C



Flow characteristics:

Total Flow:	0.983	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.61	(m ²)
Wetted Width:	13.30	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.756	
Water (°C):	0.3	
Datalogger Clock:	13:48	
Laptop Clock:	13:48	
Battery (Main):	14.3	
Battery:	Good	
Battery Serial #:	-	
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PTir (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S55-1	1.284	101.284		100.000	100.000	Bolt in Spruce tree
S55-5			1.471	99.813	99.810	3/4" Pipe 4m N of logger
S55-6			1.003	100.281	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut		4.298	96.986		Time WL Surveyed: 14:05
Temporary BM			4.164	97.120	0.000	-
Turn						
Temporary BM	4.153	101.273		97.120		-
Water Level:	Cut		4.290	96.983		Time WL Surveyed: 14:07
S55-6			0.990	100.283	100.275	3/4" pipe 2m SE of logger
S55-5			1.459	99.814	99.810	3/4" Pipe 4m N of logger
S55-1			1.272	100.001	100.000	Bolt in Spruce tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.985	-
Closing Error:	-0.001	-
WL Check:	0.003	-
Transducer Elevation	96.229	-

Field Personnel:

	TR, CJ	Trip Date:	7-Feb-15
Data Entry Personnel:	CJ	Date:	7-Feb-15
Data Check Personnel:	TR	Date:	4-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: March 9, 2015
 Site Visit Time (MST): 10:30

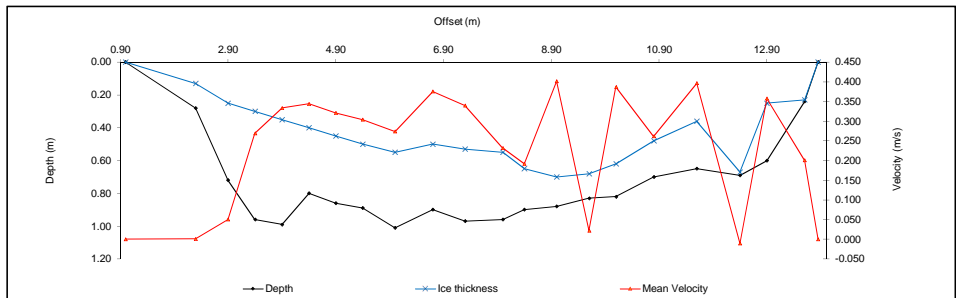


Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.65	0.00	0.000	0.00	0.000	
1	2.30	0.28	0.13	0.21	0.001				0.88	0.95	0.15	0.001	0.14	0.000	0%
2	2.90	0.72	0.25	0.49	0.057				0.88	0.55	0.47	0.050	0.26	0.013	1%
3	3.40	0.96	0.30	0.63	0.306				0.88	0.50	0.66	0.269	0.33	0.089	8%
4	3.90	0.99	0.35	0.67	0.379				0.88	0.50	0.64	0.334	0.32	0.107	10%
5	4.40	0.80	0.40	0.60	0.391				0.88	0.50	0.40	0.344	0.20	0.069	6%
6	4.90	0.86	0.45	0.66	0.365				0.88	0.50	0.41	0.321	0.21	0.066	6%
7	5.40	0.89	0.50	0.70	0.345				0.88	0.55	0.39	0.304	0.21	0.065	6%
8	6.00	1.01	0.55	0.78	0.311				0.88	0.65	0.46	0.274	0.30	0.082	8%
9	6.70	0.90	0.50	0.70	0.427				0.88	0.65	0.40	0.376	0.26	0.098	9%
10	7.30	0.97	0.53	0.75	0.386				0.88	0.65	0.44	0.340	0.29	0.097	9%
11	8.00	0.96	0.55	0.76	0.283				0.88	0.55	0.41	0.231	0.23	0.052	5%
12	8.40	0.90	0.65	0.78	0.218				0.88	0.50	0.25	0.192	0.13	0.024	2%
13	9.00	0.88	0.70	0.79	0.456				0.88	0.60	0.18	0.401	0.11	0.043	4%
14	9.60	0.83	0.68	0.76	0.025				0.88	0.55	0.15	0.022	0.08	0.002	0%
15	10.10	0.82	0.62	0.72	0.440				0.88	0.60	0.20	0.387	0.12	0.046	4%
16	10.80	0.70	0.48	0.59	0.297				0.88	0.75	0.22	0.261	0.17	0.043	4%
17	11.60	0.65	0.36	0.51	0.451				0.88	0.80	0.29	0.397	0.23	0.092	9%
18	12.40	0.69	0.67	0.68	-0.012				0.88	0.65	0.02	-0.011	0.01	0.000	0%
19	12.90	0.60	0.25	0.43	0.406				0.88	0.60	0.35	0.357	0.21	0.075	7%
20	13.60	0.24	0.23	0.24	0.228				0.88	0.48	0.01	0.201	0.00	0.001	0%
LB	13.85	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.88	0.13	0.00	0.000	0.00	0.000	
Total Flow													1.06	100%	

Flow Measurement Details:

Metering Section Location (describe):
 At station

Meas. Start Time (MST):	11:10
Meas. End Time (MST):	11:45
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 5C



Flow characteristics:

Total Flow:	1.06	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.80	(m ²)
Wetted Width:	12.85	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.16	

Logger Details:

	Before	After
Transducer Reading (m):	0.733	
Water (°C):	0.3	
Datalogger Clock:	10:42	
Laptop Clock:	10:39	
Battery (Main):	14.7	
Battery:	Good	
Battery Serial #:	-	
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S55-1	1.449	101.449		100.000	100.000	Bolt in Spruce tree
S55-5			1.637	99.812	99.810	3/4" Pipe 4m N of logger
S55-6			1.173	100.276	100.275	3/4" pipe 2m SE of logger
Temporary BM					0.000	-
Water Level:	Cut		4.466	96.983		Time WL Surveyed: 10:52
Temporary BM			4.377	97.072	0.000	-
Turn						
Temporary BM	4.357	101.429		97.072		-
Water Level:	Cut		4.443	96.986		Time WL Surveyed: 10:56
Temporary BM						-
S55-6			1.148	100.281	100.275	3/4" pipe 2m SE of logger
S55-5			1.614	99.815	99.810	3/4" Pipe 4m N of logger
S55-1			1.426	100.003	100.000	Bolt in Spruce tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.985	-
Closing Error:	-0.003	-
WL Check:	0.003	-
Transducer Elevation	96.252	-

Field Personnel:

	GG, DW	Trip Date:	9-Mar-15
Data Entry Personnel:	GG	Date:	9-Mar-15
Data Check Personnel:	TR	Date:	4-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: April 17, 2015
 Site Visit Time (MST): 15:20

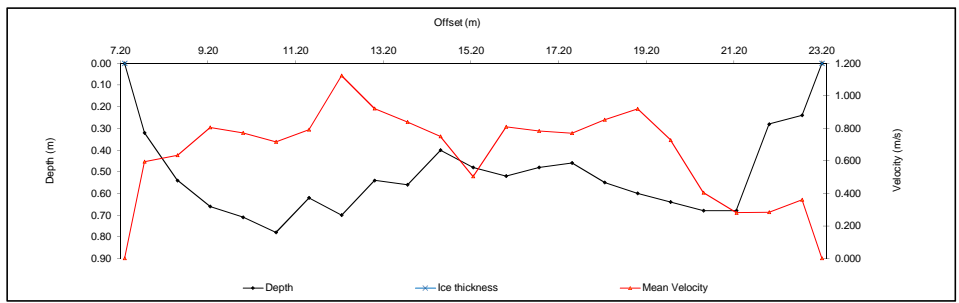


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	23.20	0.00	0.00		0.000		0.000		0.000	1.00	0.23	0.00	0.000	0.00	0.000	
1	22.75	0.24		0.14	0.361					1.00	0.60	0.24	0.361	0.14	0.052	1%
2	22.00	0.28		0.17	0.284					1.00	0.75	0.28	0.284	0.21	0.060	1%
3	21.25	0.68		0.41	0.281					1.00	0.75	0.68	0.281	0.51	0.143	2%
4	20.50	0.68		0.41	0.404					1.00	0.75	0.68	0.404	0.51	0.206	3%
5	19.75	0.64		0.38	0.728					1.00	0.75	0.64	0.728	0.48	0.349	6%
6	19.00	0.60		0.36	0.920					1.00	0.75	0.60	0.920	0.45	0.414	7%
7	18.25	0.55		0.33	0.853					1.00	0.75	0.55	0.853	0.41	0.352	6%
8	17.50	0.46		0.28	0.771					1.00	0.75	0.46	0.771	0.35	0.266	4%
9	16.75	0.48		0.29	0.784					1.00	0.75	0.48	0.784	0.36	0.282	5%
10	16.00	0.52		0.31	0.810					1.00	0.75	0.52	0.810	0.39	0.316	5%
11	15.25	0.48		0.29	0.505					1.00	0.75	0.48	0.505	0.36	0.182	3%
12	14.50	0.40		0.24	0.750					1.00	0.75	0.40	0.750	0.30	0.225	4%
13	13.75	0.56		0.34	0.839					1.00	0.75	0.56	0.839	0.42	0.352	6%
14	13.00	0.54		0.32	0.922					1.00	0.75	0.54	0.922	0.41	0.373	6%
15	12.25	0.70		0.42	1.125					1.00	0.75	0.70	1.125	0.53	0.591	10%
16	11.50	0.62		0.37	0.792					1.00	0.75	0.62	0.792	0.47	0.368	6%
17	10.75	0.78		0.43	0.773	0.62	0.506	0.16	0.929	1.00	0.75	0.78	0.718	0.59	0.420	7%
18	10.00	0.71		0.40	0.806					1.00	0.75	0.71	0.773	0.53	0.412	7%
19	9.25	0.66		0.40	0.634					1.00	0.75	0.66	0.806	0.50	0.399	7%
20	8.50	0.54		0.32	0.634					1.00	0.75	0.54	0.634	0.41	0.257	4%
21	7.75	0.32		0.19	0.595					1.00	0.60	0.32	0.595	0.19	0.114	2%
RB	7.30	0.00	0.00		0.00		0.00		0.00	1.00	0.23	0.00	0.000	0.00	0.000	
Total Flow														6.13	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	15:53
Meas. End Time (MST):	16:21
Equipment:	ADV
Method:	Wading
River Condition:	Open, ice along right bank.
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Light rain, breezy, 8C



Flow characteristics:

Total Flow:	6.13	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.50	(m ²)
Wetted Width:	15.90	(m)
Hydraulic Depth:	0.53	(m)
Mean Velocity:	0.72	(m/s)
Froude Number:	0.32	

Logger Details:

	Before	After
Transducer Reading (m):	0.913	0.903
Water (°C):	0.5	0.4
Datalogger Clock:	15:36	16:39
Laptop Clock:	15:33	16:36
Battery (Main):	13.9	13.8
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S55-1	1.141	101.141		100.000	100.000	Both in Spruce tree
S55-5			1.328	99.813	99.810	3/4" Pipe 4m N of logger
S55-6			0.864	100.277	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut	0.185	4.139	97.187	Time WL Surveyed:	15:39
Temporary BM			4.139	97.002	0.000	-
Turn						
Temporary BM	4.120	101.122		97.002		-
Water Level:	Cut	0.185	4.120	97.187	Time WL Surveyed:	15:41
S55-6			0.844	100.278	100.275	3/4" pipe 2m SE of logger
S55-5			1.309	99.813	99.810	3/4" Pipe 4m N of logger
S55-1			1.121	100.001	100.000	Both in Spruce tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S55-6	0.844	101.122		100.278		
Water Level:	Cut	0.170	4.102	97.190	Time WL Surveyed:	16:28
Water Level:	Cut	0.150	4.064	97.186	Time WL Surveyed:	16:29
S55-6	0.822	101.100		100.278		

WL Survey Summary

	Before	After
Average WL:	97.187	97.188
Closing Error:	-0.001	-
WL Check:	0.000	0.004
Transducer Elevation	96.274	96.285

Field Personnel:

Data Entry Personnel:	SM, GG	Trip Date:	17-Apr-15
Data Check Personnel:	SM	Date:	17-Apr-15
Entered Digitally in the Field:	TR	Date:	4-May-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: May 9, 2015
 Site Visit Time (MST): 14:00



Flow Measurement Details:	
Metering Section Location (describe): At cableway	
Meas. Start Time (MST):	14:43
Meas. End Time (MST):	14:55
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, light breeze, 12C
Flow characteristics:	
Total Flow:	4.87 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	11.62 (m ²)
Wetted Width:	21.75 (m)
Hydraulic Depth:	0.53 (m)
Mean Velocity:	2.64 (m/s)
Froude Number:	1.15

Logger Details:		
	Before	After
Transducer Reading (m):	0.877	0.860
Water (°C):	8.9	9.4
Datalogger Clock:	14:14	15:21
Laptop Clock:	14:10	15:17
Battery (Main):	14.0	13.9
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTN (if replaced):	-	-
Loggers (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

ADCP Flow Measurement Summary:					
System Information:			System Setup:		Bank Offsets:
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	33.30
Serial Number:	4712	Salinity (ppt):	0.0	RB:	85.00
Firmware Version:	3.5	Magnetic Declination (°):	14		
Software Version:	3.7	Measured Temperature (°C):	9.2		
		ADCP Temperature (°C):	10.2		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass (ft):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	21.47	11.51	0.428
Coordinate System:	ENU	2	21.72	11.66	0.404
Left Method:	Sloped bank	3	21.75	11.60	0.432
Right Method:	Sloped bank	4	22.04	11.69	0.412
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	21.75	11.62	2.642
		SD:	0.20	0.07	2.225
		COV:	0.01	0.01	0.842
					0.023
					4.87
					0.114
					0.023

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S55-1	1.141	101.141		100.000	100.000	Bolt in Spruce tree
S55-5			1.320	99.811	99.810	3/4" Pipe 4m N of logger
S55-6			0.864	100.277	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut	4.000	97.141			Time WL Surveyed: 14:13
Temporary BM			3.988	97.153	0.000	
Turn						
Temporary BM	4.107	101.260		97.153		
Water Level:	Cut		4.116	97.144		Time WL Surveyed: 14:19
S55-6			0.982	100.278	100.275	3/4" pipe 2m SE of logger
S55-5			1.452	99.808	99.810	3/4" Pipe 4m N of logger
S55-1			1.259	100.001	100.000	Bolt in Spruce tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S55-6	0.982	101.260		100.278		
Water Level:	Cut	4.107	97.153			Time WL Surveyed: 15:10
Water Level:	Cut		4.094	97.140		Time WL Surveyed: 15:13
S55-6	0.956	101.234		100.278		

WL Survey Summary	Before	After
Average WL:	97.143	97.147
Closing Error:	-0.001	-
WL Check:	0.003	0.013
Transducer Elevation	96.266	96.267

Field Personnel:	GG, CJ	Trip Date:	9-May-15
Data Entry Personnel:	GG	Date:	9-May-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: June 14, 2015
 Site Visit Time (MST): 15:23



Flow Measurement Details:	
Metering Section Location (describe): At cableway location	
Meas. Start Time (MST):	15:56
Meas. End Time (MST):	16:15
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, 22C

Flow Characteristics:	
Total Flow:	1.95 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	9.62 (m ²)
Wetted Width:	21.46 (m)
Hydraulic Depth:	0.42 (m)
Mean Velocity:	0.22 (m/s)
Reynolds Number:	8.63 E+04
Froude Number:	0.11

Logger Details:		
	Before	After
Transducer Reading (m):	0.697	0.696
Water (°C):	16.3	16.4
Datalogger Clock:	15:28	16:37
Laptop Clock:	15:25	16:34
Battery (Minn):	13.8	13.8
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Mem Tube Desiccant:	-	Good
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:									
System Information:					System Setup:			Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	4.00				
Serial Number:	4712	Safety (gpd):	0.0	RB:	25.10				
Firmware Version:	3.8	Magnetic Declination (°):	0	Compass Calibration Passed: Yes					
Software Version:	3.8	Measured Temperature (°C):	18.4	System Test Passed: Yes					
		ADCP Temperature (°C):	19.2						
Discharge Calculation Settings:					Measurement Results:				
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)		
Track Reference: Bottom-Track	1	0.00	21.34	8.98	0.217	1.946	-0.26%	54.9	
Depth Reference: Vertical beam	3	0.00	21.36	8.98	0.215	1.931	-1.03%	56.8	
Coordinate System: ENL	4	0.00	21.63	9.17	0.213	1.951	0.00%	56.8	
Left Method: Sloped bank	5	0.00	21.52	8.97	0.22	1.976	1.28%	57	
Right Method: Sloped bank									
Top Fit Type: Power fit									
Bottom Fit Type: Power fit									
		Mean:	21.46	9.02	0.216	1.95			
		SD:	0.12	0.08	0.003	0.016			
		COV:	0.01	0.01	0.012	0.008			

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S55-1	1.014	101.014		100.000	100.000	Boil in Spruce tree
S55-5			1.203	99.811	99.810	3/4" Pipe 4m N of logger
S55-6			0.737	100.277	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut	0.118	4.159	96.973		Time WL Surveyed: 15:29
Temporary BM			4.159	96.955	0.000	
Turn						
Temporary BM	4.145	101.000		96.855		
Water Level:	Cut	0.118	4.145	96.973		Time WL Surveyed: 15:31
S55-6			0.721	100.279	100.275	3/4" pipe 2m SE of logger
S55-5			1.187	99.813	99.810	3/4" Pipe 4m N of logger
S55-1			0.998	100.002	100.000	Boil in Spruce tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S55-5	1.187	100.999		99.812		
Water Level:	Cut	0.111	4.135	96.975		Time WL Surveyed: 16:26
Water Level:	Cut	0.111	4.116	96.975		Time WL Surveyed: 16:28
S55-5	1.168	100.980		99.812		

WL Survey Summary			Level Survey Equipment:	
	Before	After	Level #:	Level#4
Average WL:	96.973	96.975	Make & Model:	Nikon AC-2S
Closing Error:	-0.002	-	Serial #:	668785
WL Check:	0.000	0.000		
Transducer Elevation:	96.276	96.279		

Field Personnel:			
	GG, MK	Trip Date:	14-Jun-15
Data Entry Personnel:	GG	Date:	14-Jun-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: August 14, 2015
 Site Visit Time (MST): 16:14



Flow Measurement Details:	
Metering Section Location (describe): At cableway	
Meas. Start Time (MST):	17:13
Meas. End Time (MST):	17:20
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 25C

Flow Characteristics:	
Total Flow:	1.52 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	9.91 (m ²)
Wetted Width:	11.06 (m)
Hydraulic Depth:	0.90 (m)
Mean Velocity:	0.15 (m/s)
Reynolds Number:	1.40E+05
Froude Number:	0.65

Logger Details:		
	Before	After
Transducer Reading (m):	0.649	0.857
Water (°C):	20.9	20.9
Datalogger Clock:	16:21	17:53
Laptop Clock:	16:17	17:49
Battery (Main):	13.6	13.8
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Good	-
Urea Tube Desiccant:	Replaced	-
PTF (if replaced):	342745	-
Logger# (if replaced):	9723	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:								
System Information:			System Setup:			Bank Offsets:		
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.5	LB:	1.40			
Serial Number:	4712	Safety (gpd):	0.0	RB:	12.20			
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed:		Yes		
Software Version:	3.8	Measured Temperature (°C):	20.9	System Test Passed:		Yes		
		ADCP Temperature (°C):	21.4					
Discharge Calculation Settings:			Measurement Results:					
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)	
Track Reference: Bottom-Track	1	0.00	11.11	9.98	0.147	1.465	-3.58%	74.4
Depth Reference: Vertical beam	2	0.00	11.08	9.92	0.151	1.5	-1.59%	73.7
Coordinate System: FNU	3	0.00	10.96	9.75	0.164	1.599	4.91%	72.9
Left Method: Sloped bank	4	0.00	10.84	9.75	0.152	1.481	-2.83%	72.9
Right Method: Sloped bank	5	0.00	11.3	10.169	0.155	1.576	3.40%	73.7
Top Fit Type: Power fit								
Bottom Fit Type: Power fit								
			Mean:	11.06	9.91	0.154	1.52	
			SD:	0.15	0.16	0.006	0.053	
			COV:	0.01	0.02	0.037	0.035	

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S55-6	0.718	100.993		100.275	100.275	3/4" pipe 2m SE of logger
S55-5			1.186	99.807	99.810	3/4" Pipe 4m N of logger
S55-1			0.996	99.997	100.000	Bolt in Spruce tree
Water Level:	Cut	0.210	4.267	96.936	Time WL Surveyed:	16:32
Temporary BM			4.216	96.777		0.000
Turn						
Temporary BM	4.204	100.981		96.777		
Water Level:	Cut	0.209	4.251	96.939	Time WL Surveyed:	16:33
S55-1			0.980	100.001	100.000	Bolt in Spruce tree
S55-5			1.168	99.813	99.810	3/4" Pipe 4m N of logger
S55-6			0.702	100.279	100.275	3/4" pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S55-6	0.702	100.979		100.277		
Water Level:	Cut	0.210	4.252	96.937	Time WL Surveyed:	17:42
Water Level:	Cut	0.210	4.219	96.936	Time WL Surveyed:	17:43
S55-6	0.668	100.945		100.277		

WL Survey Summary			Level Survey Equipment:	
	Before	After	Level #:	Level#1
Average WL:	96.938	96.937	Make & Model:	Carsel AT-24
Closing Error:	-0.004	-	Serial #:	76710
WL Check:	0.003	0.001		
Transducer Elevation:	96.289	96.290		

Field Personnel:			
Data Entry Personnel:	DW, JC	Trip Date:	14-Aug-15
Data Check Personnel:	DW	Date:	14-Aug-15
Entered Digitally in the Field:	TR	Date:	25-Aug-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: September 16, 2015
 Site Visit Time (MST): 10:30

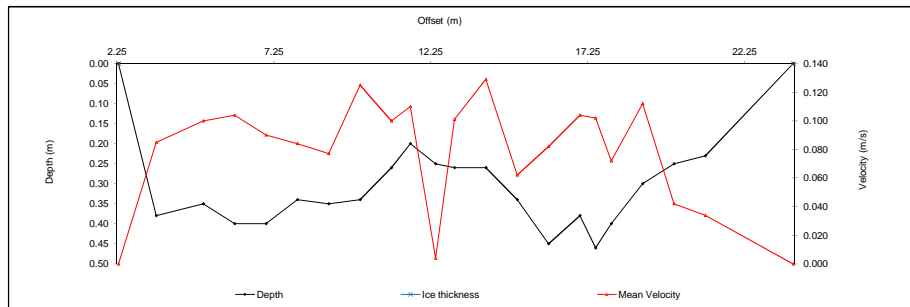


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	2.30	0.00	0.00		0.000		0.000		0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	3.50	0.38		0.23	0.085					1.00	1.35	0.38	0.085	0.51	0.044	8%
2	5.00	0.35		0.21	0.100					1.00	1.25	0.35	0.100	0.44	0.044	8%
3	6.00	0.40		0.24	0.104					1.00	1.00	0.40	0.104	0.40	0.042	8%
4	7.00	0.40		0.24	0.090					1.00	1.00	0.40	0.090	0.40	0.036	7%
5	8.00	0.34		0.20	0.084					1.00	1.00	0.34	0.084	0.34	0.029	5%
6	9.00	0.35		0.21	0.077					1.00	1.00	0.35	0.077	0.35	0.027	5%
7	10.00	0.34		0.20	0.125					1.00	1.00	0.34	0.125	0.34	0.043	8%
8	11.00	0.26		0.16	0.100					1.00	0.80	0.26	0.100	0.21	0.021	4%
9	11.60	0.20		0.12	0.110					1.00	0.70	0.20	0.110	0.14	0.015	3%
10	12.40	0.25		0.15	0.004					1.00	0.70	0.25	0.004	0.18	0.001	0%
11	13.00	0.26		0.16	0.101					1.00	0.80	0.26	0.101	0.21	0.021	4%
12	14.00	0.26		0.16	0.129					1.00	1.00	0.26	0.129	0.26	0.024	6%
13	15.00	0.34		0.20	0.062					1.00	1.00	0.34	0.062	0.34	0.021	4%
14	16.00	0.45		0.27	0.082					1.00	1.00	0.45	0.082	0.45	0.037	7%
15	17.00	0.38		0.23	0.104					1.00	0.75	0.38	0.104	0.29	0.030	5%
16	17.50	0.46		0.28	0.102					1.00	0.50	0.46	0.102	0.23	0.023	4%
17	18.00	0.40		0.24	0.072					1.00	0.75	0.40	0.072	0.30	0.022	4%
18	19.00	0.30		0.18	0.112					1.00	1.00	0.30	0.112	0.30	0.034	6%
19	20.00	0.25		0.15	0.042					1.00	1.00	0.25	0.042	0.25	0.011	2%
20	21.00	0.23		0.14	0.034					1.00	1.00	0.23	0.034	0.44	0.015	3%
RB	23.80	0.00	0.00		0.00		0.00		0.00	1.00	1.40	0.00	0.000	0.00	0.000	
Total Flow														0.546	100%	

Flow Measurement Details:

Metering Section Location (describe):
 Measurement was conducted at cableway

Meas. Start Time (MST):	10:56
Meas. End Time (MST):	11:23
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow, clear
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 10C



Flow characteristics:

Total Flow:	0.546	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.36	(m ²)
Wetted Width:	21.50	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.09	(m/s)
Reynolds Number:	1.67E+04	
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.549	0.551
Water (°C):	9.1	9.2
Datalogger Clock:	10:33	11:38
Laptop Clock:	10:29	11:34
Battery:	14.6	14.5
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S55-1	1.108	101.108		100.000	100.000	Bolt in Spruce tree
S55-5			1.297	99.811	99.810	3/4" Pipe 4m N of logger
S55-6			0.832	100.276	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut		4.281	96.827		Time WL Surveyed: 10:45
Temporary BM			0.832	100.276	0.000	-
Turn						
Temporary BM	0.846	101.122		100.276		
Water Level:	Cut		4.292	96.830		Time WL Surveyed: 10:48
S55-6			0.846	100.276	100.275	3/4" pipe 2m SE of logger
S55-5			1.311	99.811	99.810	3/4" Pipe 4m N of logger
S55-1			1.123	99.999	100.000	Bolt in Spruce tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S55-6	0.832	101.108		100.276		Time WL Surveyed: 11:29
Water Level:	Cut		4.282	96.826		Time WL Surveyed: 11:32
Water Level:	Cut		4.266	96.824		
S55-6	0.814	101.090		100.276		

WL Survey Summary

	Before	After
Average WL:	96.829	96.825
Closing Error:	0.001	-
WL Check:	0.003	0.002
Transducer Elevation	96.280	96.274

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Camsel AT-24
Serial #:	112890

Field Personnel:

	SM, CJ	Trip Date:	16-Sep-15
Data Entry Personnel:	SM	Date:	16-Sep-15
Data Check Personnel:	JC	Date:	23-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: October 18, 2015
 Site Visit Time (MST): 14:10

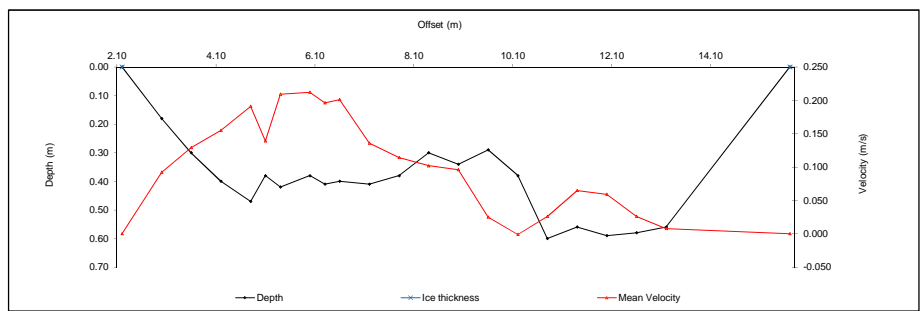


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.20	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	3.00	0.18		0.11	0.092					1.00	0.70	0.18	0.092	0.13	0.012	3%
2	3.60	0.30		0.18	0.129					1.00	0.60	0.30	0.129	0.18	0.023	5%
3	4.20	0.40		0.24	0.155					1.00	0.60	0.40	0.155	0.24	0.037	9%
4	4.80	0.47		0.28	0.191					1.00	0.45	0.47	0.191	0.21	0.040	9%
5	5.10	0.38		0.23	0.139					1.00	0.30	0.38	0.139	0.11	0.016	4%
6	5.40	0.42		0.25	0.209					1.00	0.45	0.42	0.209	0.19	0.040	9%
7	6.00	0.38		0.23	0.212					1.00	0.45	0.38	0.212	0.17	0.036	8%
8	6.30	0.41		0.25	0.196					1.00	0.30	0.41	0.196	0.12	0.024	6%
9	6.60	0.40		0.24	0.201					1.00	0.45	0.40	0.201	0.18	0.036	8%
10	7.20	0.41		0.25	0.136					1.00	0.60	0.41	0.136	0.25	0.033	8%
11	7.80	0.38		0.23	0.114					1.00	0.60	0.38	0.114	0.23	0.026	6%
12	8.40	0.30		0.18	0.102					1.00	0.60	0.30	0.102	0.18	0.018	4%
13	9.00	0.34		0.20	0.096					1.00	0.60	0.34	0.096	0.20	0.020	5%
14	9.60	0.29		0.17	0.025					1.00	0.60	0.29	0.025	0.17	0.004	1%
15	10.20	0.38		0.23	-0.001					1.00	0.60	0.38	-0.001	0.23	0.000	0%
16	10.80	0.60		0.36	0.026					1.00	0.60	0.60	0.026	0.36	0.009	2%
17	11.40	0.56		0.34	0.065					1.00	0.60	0.56	0.065	0.34	0.022	5%
18	12.00	0.59		0.35	0.059					1.00	0.60	0.59	0.059	0.35	0.021	5%
19	12.60	0.58		0.35	0.026					1.00	0.60	0.58	0.026	0.35	0.009	2%
20	13.20	0.56		0.34	0.008					1.00	1.55	0.56	0.008	0.87	0.007	2%
LB	15.70	0.00	0.00		0.00		0.00		0.00	1.00	1.25	0.00	0.000	0.00	0.000	
Total Flow														0.434	100%	

Flow Measurement Details:

Metering Section Location (describe):
 15m upstream of station

Meas. Start Time (MST):	14:30
Meas. End Time (MST):	14:49
Equipment:	ADV#1
Flow Meter Make & Model:	Sortek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 17C



Flow characteristics:

Total Flow:	0.434	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.06	(m ²)
Wetted Width:	13.50	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.09	(m/s)
Reynolds Number:	2.13E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.537	0.537
Water (°C):	5.6	5.7
Datalogger Clock:	14:21	14:53
Laptop Clock:	14:17	14:57
Battery:	13.8	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dissicant:	Replaced	
Vent Tube Dissicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S55-1	1.054	101.054		100.000	100.000	Bolt in Spruce tree
S55-5			1.242	99.812	99.810	3/4" Pipe 4m N of logger
S55-6			0.778	100.276	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut	0.163	4.392	96.825		Time WL Surveyed: 14:22
Temporary BM			4.392	96.662	0.000	
Turn						
Temporary BM	4.335	100.997		96.662	-	
Water Level:	Cut	0.163	4.335	96.825		Time WL Surveyed: 14:24
S55-6			0.718	100.279	100.275	3/4" pipe 2m SE of logger
S55-5			1.183	99.814	99.810	3/4" Pipe 4m N of logger
S55-1			0.998	99.999	100.000	Bolt in Spruce tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S55-6	0.718	100.995		100.277		
Water Level:	Cut	0.123	4.295	96.823		Time WL Surveyed: 14:56
Water Level:	Cut	0.125	4.207	96.825		Time WL Surveyed: 14:57
S55-6	0.630	100.907		100.277		

WL Survey Summary

	Before	After
Average WL:	96.825	96.824
Closing Error:	0.001	-
WL Check:	0.000	-0.002
Transducer Elevation	96.288	96.287

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC 2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	18-Oct-15
Data Check Personnel:	TR	Date:	18-Oct-15
Entered Digitally in the Field:	Yes	Date:	3-Nov-15

Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River
 UTM Location: 510862 E, 6260508 N

Site Visit Date: December 14, 2015
 Site Visit Time (MST): 12:56

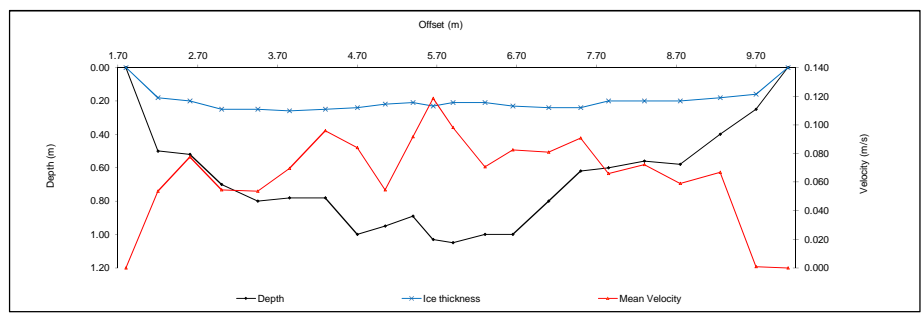


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	10.10	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	9.70	0.25	0.16	0.21	0.001					0.88	0.42	0.09	0.001	0.04	0.000	0%
2	9.25	0.40	0.18	0.29	0.076					0.88	0.48	0.22	0.067	0.10	0.007	2%
3	8.75	0.58	0.20	0.39	0.067					0.88	0.48	0.38	0.059	0.18	0.011	4%
4	8.30	0.56	0.20	0.38	0.082					0.88	0.45	0.36	0.072	0.16	0.012	4%
5	7.85	0.60	0.20	0.40	0.075					0.88	0.40	0.40	0.066	0.16	0.011	3%
6	7.50	0.62	0.24	0.43	0.103					0.88	0.38	0.38	0.091	0.14	0.013	4%
7	7.10	0.80	0.24	0.52	0.092					0.88	0.43	0.56	0.081	0.24	0.019	6%
8	6.65	1.00	0.23			0.85	0.046	0.38	0.119	1.00	0.40	0.77	0.083	0.31	0.025	8%
9	6.30	1.00	0.21			0.84	0.020	0.37	0.121	1.00	0.38	0.79	0.071	0.30	0.021	7%
10	5.90	1.05	0.21			0.88	0.071	0.38	0.125	1.00	0.32	0.84	0.098	0.27	0.027	9%
11	5.65	1.03	0.23			0.87	0.106	0.39	0.131	1.00	0.25	0.80	0.119	0.20	0.024	8%
12	5.40	0.89	0.21	0.55	0.104					0.88	0.30	0.68	0.092	0.20	0.019	6%
13	5.05	0.95	0.22	0.59	0.062					0.88	0.35	0.73	0.055	0.26	0.014	5%
14	4.70	1.00	0.24			0.85	0.050	0.39	0.118	1.00	0.38	0.76	0.084	0.29	0.024	8%
15	4.30	0.78	0.25	0.52	0.109					0.88	0.43	0.53	0.096	0.23	0.022	7%
16	3.85	0.78	0.26	0.52	0.079					0.88	0.43	0.52	0.070	0.22	0.015	5%
17	3.45	0.80	0.25	0.53	0.061					0.88	0.43	0.55	0.054	0.23	0.013	4%
18	3.00	0.70	0.25	0.48	0.062					0.88	0.43	0.45	0.055	0.19	0.010	3%
19	2.60	0.52	0.20	0.36	0.088					0.88	0.40	0.32	0.077	0.13	0.010	3%
20	2.20	0.50	0.18	0.34	0.061					0.88	0.40	0.32	0.054	0.13	0.007	2%
LB	1.80	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000	2%
Total Flow														0.302	100%	

Flow Measurement Details:

Metering Section Location (describe):
25m upstream of station

Meas. Start Time (MST):	13:33
Meas. End Time (MST):	14:00
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -6C



Flow characteristics:

Total Flow:	0.302	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.97	(m ²)
Wetted Width:	8.30	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.08	(m/s)
Reynolds Number:	2.05E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.613	-
Water (°C):	0.3	-
Datalogger Clock:	14:02	-
Laptop Clock:	12:59	-
Battery:	12.8	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

Left extra batteries and enclosure at relay station, ran out of daylight to install them.

General Notes:

Left extra batteries and enclosure at relay station, ran out of daylight to install them.

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S55-1	1.092	101.092		100.000	100.000	Bolt in Spruce tree
S55-5			1.278	99.814	99.810	3/4" Pipe 4m N of logger
S55-6			0.814	100.278	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut		4.210	96.882		Time WL Surveyed: 13:21
Temporary BM			4.169	96.923	0.000	
Turn						
Temporary BM	4.151	101.074		96.923		
Water Level:	Cut		4.193	96.881		Time WL Surveyed: 13:24
S55-6			0.798	100.276	100.275	3/4" pipe 2m SE of logger
S55-5			1.262	99.812	99.810	3/4" Pipe 4m N of logger
S55-1			1.074	100.000	100.000	Bolt in Spruce tree
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.882	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	96.269	-

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC 2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	JC	Trip Date:	14-Dec-15
Data Check Personnel:	JC	Date:	14-Dec-15
Entered Digitally in the Field:	Yes	Date:	8-Jan-16

Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake
 UTM Location: 493711 E, 6169759 N

Site Visit Date: January 17, 2015
 Site Visit Time (MST): 09:15

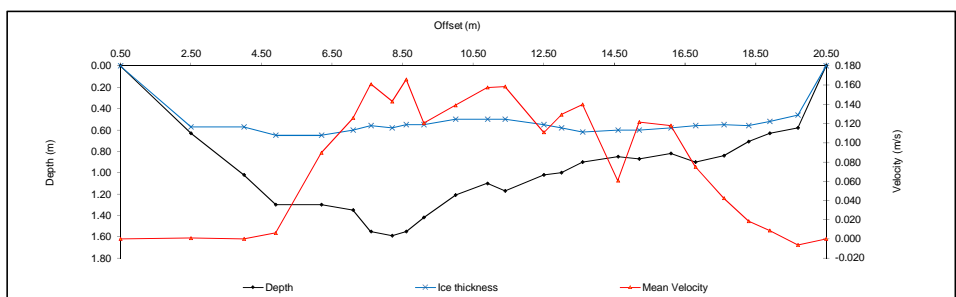


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	20.50	0.00	0.00		0.000			0.000	0.000	0.88	0.40	0.00	0.000	0.00	0.000	
1	19.70	0.58	0.46	0.52	-0.007					0.88	0.80	0.12	-0.006	0.10	-0.001	0%
2	18.90	0.63	0.52	0.58	0.010					0.88	0.70	0.11	0.009	0.08	0.001	0%
3	18.30	0.71	0.56	0.64	0.021					0.88	0.65	0.15	0.018	0.10	0.002	0%
4	17.60	0.84	0.55	0.70	0.048					0.88	0.75	0.29	0.042	0.22	0.009	1%
5	16.80	0.90	0.56	0.73	0.085					0.88	0.75	0.34	0.075	0.26	0.019	2%
6	16.10	0.82	0.58	0.70	0.134					0.88	0.80	0.24	0.118	0.19	0.023	3%
7	15.20	0.87	0.60	0.74	0.138					0.88	0.75	0.27	0.121	0.20	0.025	3%
8	14.60	0.85	0.60	0.73	0.069					0.88	0.80	0.25	0.061	0.20	0.012	1%
9	13.60	0.90	0.62	0.76	0.159					0.88	0.80	0.28	0.140	0.22	0.031	4%
10	13.00	1.00	0.58	0.79	0.147					0.88	0.55	0.42	0.129	0.23	0.030	3%
11	12.50	1.02	0.55	0.79	0.126					0.88	0.80	0.47	0.111	0.38	0.042	5%
12	11.40	1.17	0.50	0.84	0.180					0.88	0.80	0.67	0.158	0.54	0.085	10%
13	10.90	1.10	0.50	0.80	0.179					0.88	0.70	0.60	0.158	0.42	0.066	8%
14	10.00	1.21	0.50	0.86	0.158					0.88	0.90	0.71	0.139	0.64	0.089	10%
15	9.10	1.42	0.55			1.25	0.114	0.72	0.127	1.00	0.70	0.87	0.121	0.61	0.073	8%
16	8.60	1.55	0.55			1.35	0.117	0.75	0.215	1.00	0.45	1.00	0.166	0.45	0.075	9%
17	8.20	1.59	0.58			1.39	0.086	0.78	0.200	1.00	0.50	1.01	0.143	0.50	0.072	8%
18	7.60	1.55	0.56			1.35	0.111	0.76	0.211	1.00	0.55	0.99	0.161	0.54	0.088	10%
19	7.10	1.35	0.60	0.98	0.143					0.88	0.70	0.75	0.126	0.53	0.066	8%
20	6.20	1.30	0.65	0.98	0.102					0.88	1.10	0.65	0.090	0.72	0.064	7%
21	4.90	1.30	0.65	0.98	0.007					0.88	1.10	0.65	0.006	0.72	0.004	1%
22	4.00	1.02	0.57	0.80	0.000					0.88	1.20	0.45	0.000	0.54	0.000	0%
23	2.50	0.63	0.57	0.60	0.001					0.88	1.75	0.06	0.001	0.11	0.000	0%
LB	0.50	0.00	0.00		0.00			0.00	0.00	0.88	1.00	0.00	0.000	0.00	0.000	
Total Flow														0.875	100%	

Flow Measurement Details:

Metering Section Location (describe):
 At station

Meas. Start Time (MST):	9:53
Meas. End Time (MST):	10:40
Equipment:	ADV
Method:	Ice
River Condition:	Frozen, overflow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 0C



Flow characteristics:

Total Flow:	0.875	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.47	(m ²)
Wetted Width:	20.00	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.944	-
Water (°C):	0.4	-
Datalogger Clock:	09:22	-
Laptop Clock:	09:20	-
Battery (Main):	12.5	13.2
Battery Serial #:	-	Replaced
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 - Replaced modem and battery

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-2	1.427	101.394		99.967	99.967	3/4" Pipe 2m E of logger
S56-3			1.341	100.053	100.051	3/4" Pipe 4m S of logger
S56-4			1.338	100.056	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut		2.717	98.677		Time WL Surveyed: 9:45
Temporary BM			2.722	98.672	0.000	
Turn						
Temporary BM	2.710	101.382		98.672		
Water Level:	Cut		2.707	98.675		Time WL Surveyed: 9:48
S56-4			1.326	100.056	100.056	3/4" Pipe 3m NW of logger
S56-3			1.329	100.053	100.051	3/4" Pipe 4m S of logger
S56-2			1.418	99.964	99.967	3/4" Pipe 2m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.676	-
Closing Error:	0.003	-
WL Check:	0.002	-
Transducer Elevation	97.732	-

Field Personnel:

MP, DW	Trip Date:	17-Jan-15	
Data Entry Personnel:	MP	Date:	17-Jan-15
Data Check Personnel:	MP	Date:	11-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake
 UTM Location: 493711 E, 6169759 N

Site Visit Date: February 6, 2015
 Site Visit Time (MST): 09:45

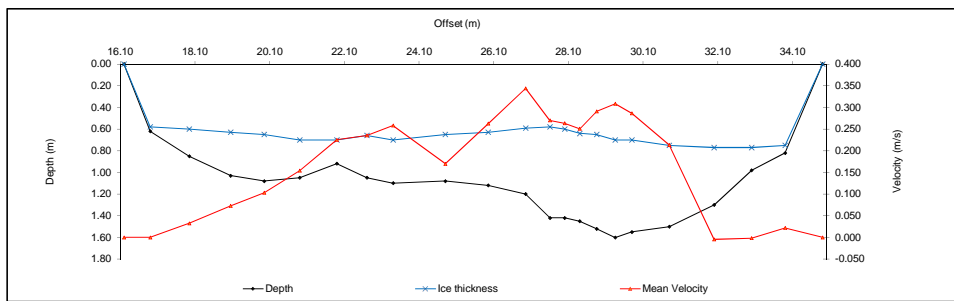


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	16.20	0.00	0.00		0.000			0.000		0.88	0.35	0.00	0.000	0.00	0.000	
1	16.90	0.62	0.58	0.60	0.000					0.88	0.88	0.04	0.000	0.04	0.000	0%
2	17.95	0.85	0.60	0.73	0.037					0.88	1.08	0.25	0.033	0.27	0.009	1%
3	19.05	1.03	0.63	0.83	0.083					0.88	1.00	0.40	0.073	0.40	0.029	2%
4	19.95	1.08	0.65	0.87	0.117					0.88	0.92	0.43	0.103	0.40	0.041	2%
5	20.90	1.05	0.70	0.88	0.175					0.88	0.98	0.35	0.154	0.34	0.053	3%
6	21.90	0.92	0.70	0.81	0.256					0.88	0.90	0.22	0.225	0.20	0.045	3%
7	22.70	1.05	0.66	0.86	0.267					0.88	0.75	0.39	0.235	0.29	0.069	4%
8	23.40	1.10	0.70	0.90	0.293					0.88	1.05	0.40	0.258	0.42	0.108	7%
9	24.80	1.08	0.65	0.87	0.193					0.88	1.28	0.43	0.170	0.55	0.093	6%
10	25.95	1.12	0.63	0.88	0.298					0.88	1.08	0.49	0.262	0.53	0.138	8%
11	26.95	1.20	0.59	0.90	0.391					0.88	0.82	0.61	0.344	0.50	0.173	10%
12	27.60	1.42	0.58			1.25	0.154	0.75	0.386	1.00	0.53	0.84	0.270	0.44	0.119	7%
13	28.00	1.42	0.60			1.26	0.178	0.76	0.349	1.00	0.40	0.82	0.264	0.33	0.086	5%
14	28.40	1.45	0.64			1.29	0.173	0.80	0.328	1.00	0.43	0.81	0.251	0.34	0.086	5%
15	28.85	1.52	0.65			1.35	0.201	0.82	0.380	1.00	0.48	0.87	0.291	0.41	0.120	7%
16	29.35	1.60	0.70			1.42	0.204	0.88	0.413	1.00	0.48	0.90	0.309	0.43	0.132	8%
17	29.80	1.55	0.70			1.38	0.178	0.87	0.394	1.00	0.72	0.85	0.286	0.62	0.176	11%
18	30.80	1.50	0.75	1.13	0.242					0.88	1.10	0.75	0.213	0.82	0.176	11%
19	32.00	1.30	0.77	1.04	-0.005					0.88	1.10	0.53	-0.004	0.58	-0.003	0%
20	33.00	0.98	0.77	0.88	-0.002					0.88	0.95	0.21	-0.002	0.20	0.000	0%
21	33.90	0.82	0.75	0.79	0.025					0.88	0.95	0.07	0.022	0.07	0.001	0%
LB	34.90	0.00	0.00		0.00			0.00		0.88	0.50	0.00	0.000	0.00	0.000	0%
Total Flow														1.65	100%	

Flow Measurement Details:

Metering Section Location (describe):
3m upstream of station

Meas. Start Time (MST):	10:20
Meas. End Time (MST):	11:05
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snow, breezy, -22C



Flow characteristics:

Total Flow:	1.65	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.18	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	#VALUE!	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	#VALUE!	

Logger Details:

	Before	After
Transducer Reading (m):	1.034	
Water (°C):	0.3	
Datalogger Clock:	09:54	
Laptop Clock:	09:54	
Battery (Main):	12.9	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessoricant:	-	Replaced
Vent Tube Dessoricant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

- ADV test good

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-3	1.259	101.310		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.346	99.964	99.967	3/4" Pipe 2m E of logger
S56-4			1.257	100.053	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut		2.553	98.757		Time WL Surveyed: 10:09
Temporary BM			2.434	98.876		
Turn						
Temporary BM	2.422	101.298		98.876		
Water Level:	Cut		2.540	98.758		Time WL Surveyed: 10:10
S56-4			1.244	100.054	100.056	3/4" Pipe 3m NW of logger
S56-2			1.333	99.965	99.967	3/4" Pipe 2m E of logger
S56-3			1.248	100.050	100.051	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.758	-
Closing Error:	0.001	-
WL Check:	0.001	-
Transducer Elevation	97.724	-

Field Personnel:

	TR, CJ	Trip Date:	6-Feb-15
Data Entry Personnel:	CJ	Date:	6-Feb-15
Data Check Personnel:	MP	Date:	11-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake
 UTM Location: 493711 E, 6169759 N

Site Visit Date: March 6, 2015
 Site Visit Time (MST): 13:55

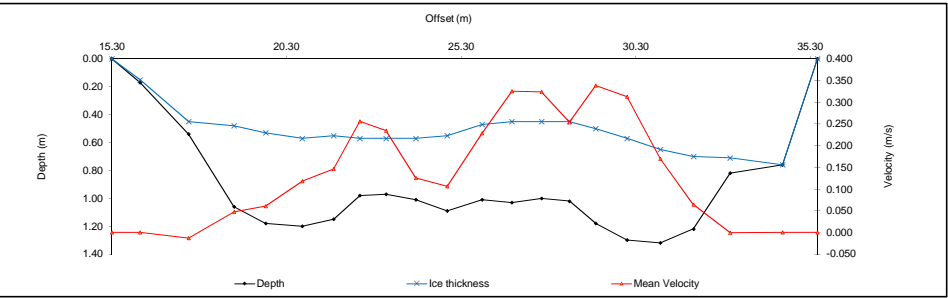


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	15.30	0.00	0.00		0.000			0.000		0.88	0.40	0.00	0.000	0.00	0.000	
1	16.10	0.17	0.15	0.16	0.000					0.88	1.10	0.02	0.000	0.02	0.000	0%
2	17.50	0.54	0.45	0.50	-0.015					0.88	1.35	0.09	-0.013	0.12	-0.002	0%
3	18.80	1.06	0.48	0.77	0.054					0.88	1.10	0.58	0.048	0.64	0.030	2%
4	19.70	1.18	0.53	0.86	0.069					0.88	0.98	0.65	0.061	0.63	0.038	2%
5	20.75	1.20	0.57	0.89	0.134					0.88	0.97	0.63	0.118	0.61	0.072	5%
6	21.65	1.15	0.55	0.85	0.166					0.88	0.82	0.60	0.146	0.49	0.072	5%
7	22.40	0.98	0.57	0.78	0.291					0.88	0.75	0.41	0.256	0.31	0.079	5%
8	23.15	0.97	0.57	0.77	0.267					0.88	0.80	0.40	0.235	0.32	0.075	5%
9	24.00	1.01	0.57	0.79	0.143					0.88	0.88	0.44	0.126	0.39	0.048	3%
10	24.90	1.09	0.55	0.82	0.121					0.88	0.95	0.54	0.106	0.51	0.055	4%
11	25.90	1.01	0.47	0.74	0.260					0.88	0.93	0.54	0.229	0.50	0.114	7%
12	26.75	1.03	0.45	0.74	0.370					0.88	0.85	0.58	0.326	0.49	0.161	10%
13	27.60	1.00	0.45	0.73	0.368					0.88	0.82	0.55	0.324	0.45	0.147	9%
14	28.40	1.02	0.45	0.74	0.289					0.88	0.77	0.57	0.254	0.44	0.112	7%
15	29.15	1.18	0.50	0.84	0.385					0.88	0.83	0.68	0.339	0.56	0.190	12%
16	30.05	1.30	0.57	0.94	0.356					0.88	0.92	0.73	0.313	0.68	0.212	14%
17	31.00	1.32	0.65	0.99	0.193					0.88	0.95	0.67	0.170	0.64	0.108	7%
18	31.95	1.22	0.70	0.96	0.073					0.88	1.00	0.52	0.064	0.52	0.033	2%
19	33.00	0.62	0.71	0.77	-0.001					0.88	1.28	0.11	-0.001	0.14	0.000	0%
20	34.50	0.76	0.76	0.76	0.000					0.88	1.25	0.00	0.000	0.00	0.000	0%
LB	35.50	0.00	0.00		0.00		0.00	0.00		0.88	0.50	0.00	0.000	0.00	0.000	
Total Flow														1.55	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	14:20
Meas. End Time (MST):	14:55
Equipment:	ADV
Method:	Ice
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 2C



Flow characteristics:

Total Flow:	1.55	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.47	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	#VALUE!	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	#VALUE!	

Logger Details:

	Before	After
Transducer Reading (m):	0.937	
Water (°C):	0.3	
Datalogger Clock:	14:02	
Laptop Clock:	14:00	
Battery (Main):	14.6	
Battery:	Replaced	
Battery Serial #:	-	
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-4	1.473	101.529		100.056	100.056	3/4" Pipe 3m NW of logger
S56-2			1.564	99.965	99.967	3/4" Pipe 2m E of logger
S56-3			1.478	100.051	100.051	3/4" Pipe 4m S of logger
Water Level:	Cut	2.860		98.669		Time WL Surveyed: 14:13
Temporary BM		2.644		98.885	0.000	-
Turn						
Temporary BM	2.627	101.512		98.885		
Water Level:	Cut		2.841	98.671		Time WL Surveyed: 14:15
S56-3			1.461	100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.547	99.965	99.967	3/4" Pipe 2m E of logger
S56-4			1.458	100.054	100.056	3/4" Pipe 3m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.670	-
Closing Error:	0.002	-
WL Check:	0.002	-
Transducer Elevation	97.733	-

Field Personnel:

MP GG	Trip Date:	6-Mar-15
MP	Date:	6-Mar-05
MP	Date:	23-Mar-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake
 UTM Location: 493711 E, 6169759 N

Site Visit Date: April 14, 2015
 Site Visit Time (MST): 13:02

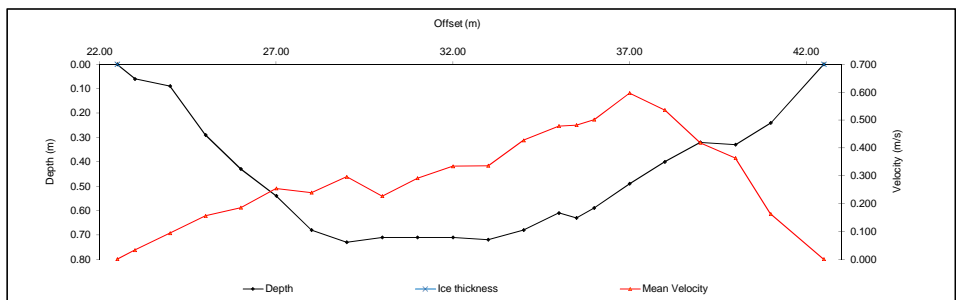


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	22.50	0.00	0.00		0.000			0.000	0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	23.00	0.06		0.04	0.033					1.00	0.75	0.06	0.033	0.05	0.001	0%
2	24.00	0.09		0.05	0.094					1.00	1.00	0.09	0.094	0.09	0.008	0%
3	25.00	0.29		0.17	0.156					1.00	1.00	0.29	0.156	0.29	0.045	1%
4	26.00	0.43		0.26	0.185					1.00	1.00	0.43	0.185	0.43	0.080	2%
5	27.00	0.54		0.32	0.254					1.00	1.00	0.54	0.254	0.54	0.137	4%
6	28.00	0.68		0.41	0.239					1.00	1.00	0.68	0.239	0.68	0.163	5%
7	29.00	0.73		0.44	0.296					1.00	1.00	0.73	0.296	0.73	0.216	7%
8	30.00	0.71		0.43	0.227					1.00	1.00	0.71	0.227	0.71	0.161	5%
9	31.00	0.71		0.43	0.291					1.00	1.00	0.71	0.291	0.71	0.207	6%
10	32.00	0.71		0.43	0.334					1.00	1.00	0.71	0.334	0.71	0.237	7%
11	33.00	0.72		0.43	0.336					1.00	1.00	0.72	0.336	0.72	0.242	8%
12	34.00	0.68		0.41	0.427					1.00	1.00	0.68	0.427	0.68	0.290	9%
13	35.00	0.61		0.37	0.478					1.00	0.75	0.61	0.478	0.46	0.219	7%
14	35.50	0.63		0.38	0.482					1.00	0.50	0.63	0.482	0.32	0.152	5%
15	36.00	0.59		0.35	0.501					1.00	0.75	0.59	0.501	0.44	0.222	7%
16	37.00	0.49		0.29	0.597					1.00	1.00	0.49	0.597	0.49	0.293	9%
17	38.00	0.40		0.24	0.536					1.00	1.00	0.40	0.536	0.40	0.214	7%
18	39.00	0.32		0.19	0.418					1.00	1.00	0.32	0.418	0.32	0.134	4%
19	40.00	0.33		0.20	0.363					1.00	1.00	0.33	0.363	0.33	0.120	4%
20	41.00	0.24		0.14	0.162					1.00	1.25	0.24	0.162	0.30	0.049	2%
LB	42.50	0.00	0.00		0.00		0.00	0.00		1.00	0.75	0.00	0.000	0.00	0.000	
Total Flow															3.19	100%

Flow Measurement Details:

Metering Section Location (describe):
 Measurement conducted 20m downstream of bridge

Meas. Start Time (MST):	13:25
Meas. End Time (MST):	13:48
Equipment:	ADY
Method:	Wading
River Condition:	Open, ice along banks
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, Breezy, 10C



Flow characteristics:

Total Flow:	3.19	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.39	(m ²)
Wetted Width:	20.00	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.16	

Logger Details:

	Before	After
Transducer Reading (m):	0.768	0.768
Water (°C):	3.7	3.7
Datalogger Clock:	13:03	14:08
Laptop Clock:	13:01	14:06
Battery (Main):	14.2	14.4
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent. Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Ice in channel along LB, this obscured small portion of flow.
 Graded as good

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-3	1.339	101.390		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.427	99.963	99.967	3/4" Pipe 2m E of logger
S56-4			1.336	100.054	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut		2.892	98.498	Time WL Surveyed:	13:07
Temporary BM			2.757	98.633	0.000	-
Turn						
Temporary BM	2.737	101.370		98.633		
Water Level:	Cut		2.875	98.495	Time WL Surveyed:	13:15
S56-4			1.317	100.053	100.056	3/4" Pipe 3m NW of logger
S56-2			1.407	99.963	99.967	3/4" Pipe 2m E of logger
S56-3			1.319	100.051	100.051	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S56-3	1.318	101.369		100.051	98.497	
Water Level:	Cut		2.872	98.497	Time WL Surveyed:	14:00
Water Level:	Cut		2.852	98.496	Time WL Surveyed:	14:03
S56-3	1.297	101.348		100.051		

WL Survey Summary

	Before	After
Average WL:	98.497	98.497
Closing Error:	0.000	-
WL Check:	0.003	0.001
Transducer Elevation	97.729	97.729

Field Personnel:

	GG SM	Trip Date:	14-Apr-15
Data Entry Personnel:	GG	Date:	14-Apr-15
Data Check Personnel:	SG	Date:	15-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake
 UTM Location: 493711 E, 6169759 N

Site Visit Date: May 15, 2015
 Site Visit Time (MST): 14:15



Flow Measurement Details:	
Metering Section Location (describe): 20m downstream of bridge	
Meas. Start Time (MST):	14:50
Meas. End Time (MST):	15:15
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25C

Flow characteristics:	
Total Flow:	7.32 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	12.93 (m ²)
Wetted Width:	21.76 (m)
Hydraulic Depth:	0.59 (m)
Mean Velocity:	0.57 (m/s)
Froude Number:	0.23

Logger Details:		
Transducer Reading (m):	Before	After
Water (C):	10.0	10.1
Datalogger Clock:	14:22	15:36
Laptop Clock:	14:19	15:33
Battery (Main):	14.0	14.1
Battery:	Replaced	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Replaced	-
PTB (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

ADCP Flow Measurement Summary:					
System Information:			System Setup:		Bank Offsets:
System Type:	Sonotek RS-M9	Transducer Depth (m):	0.05	LB:	51.70
Serial Number:	4712	Salinity (ppt):	0.0	RB:	31.90
Firmware Version:	3.5	Magnetic Declination (°):	14		
Software Version:	3.7	Measured Temperature (°C):	10.0		
		ADCP Temperature (°C):	-		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	22.93	13.05	0.563
Coordinate System:	ENU	3	20.98	12.63	0.570
Left Method:	Sloped bank	4	21.85	13.06	0.568
Right Method:	Sloped bank	5	20.20	12.63	0.574
Top Fit Type:	Power fit	6	22.86	13.31	0.554
Bottom Fit Type:	Power fit				
		Mean:	21.76	12.93	0.566
		SD:	1.06	0.27	0.007
		COV:	0.05	0.02	0.012
					7.32
					0.084
					0.012
					0.86%
					0.34%
					-1.65%
					1.44%
					-0.98%
					0.86%

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-3	1.216	101.267		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.200	99.967	99.967	3/4" Pipe 2m E of logger
S56-4			1.212	100.055	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut	2.603	88.664			Time WL Surveyed: 14.25
S56-4		1.212	100.055		100.056	3/4" Pipe 3m NW of logger
Turn						
S56-4	1.193	101.248		100.055	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut	2.581	88.667			Time WL Surveyed: 14.26
S56-4		1.193	100.055		100.056	3/4" Pipe 3m NW of logger
S56-2		1.282	99.966		99.967	3/4" Pipe 2m E of logger
S56-3		1.197	100.051		100.051	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick only BM e.g. closest to water's edge)						
S56-4	1.193	101.248		100.055		
Water Level:	Cut	2.584	88.664			Time WL Surveyed: 15.29
Water Level:	Cut	2.556	88.668			Time WL Surveyed: 15.31
S56-4	1.169	101.224		100.055		

WL Survey Summary		
Average WL	Before	After
Closing Error:	0.000	98.668
WL Check:	0.003	-0.004
Transducer Elevation	97.722	97.723

Field Personnel:			
Data Entry Personnel:	TR, MK	Trip Date:	15-May-15
Data Check Personnel:	TR	Date:	15-May-15
Entered Digitally in the Field:	Yes	Date:	3-Jul-15

Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake
UTM Location: 493711 E, 6169759 N

Site Visit Date: June 17, 2015
Site Visit Time (MST): 11:11

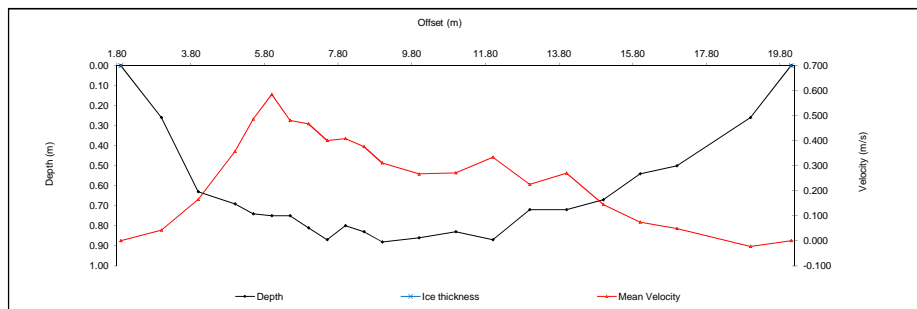


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.90	0.00	0.00		0.000		0.000		0.000	1.00	0.55	0.00	0.000	0.00	0.000	
1	3.00	0.26		0.16	0.043					1.00	1.05	0.26	0.043	0.27	0.012	0%
2	4.00	0.63		0.38	0.165					1.00	1.00	0.63	0.165	0.63	0.104	3%
3	5.00	0.69		0.41	0.357					1.00	0.75	0.69	0.357	0.52	0.185	6%
4	5.50	0.74		0.44	0.486					1.00	0.50	0.74	0.486	0.37	0.180	6%
5	6.00	0.75		0.45	0.585					1.00	0.50	0.75	0.585	0.38	0.219	7%
6	6.50	0.75		0.45	0.481					1.00	0.50	0.75	0.481	0.38	0.180	6%
7	7.00	0.81				0.65	0.388	0.16	0.547	1.00	0.50	0.81	0.468	0.41	0.189	6%
8	7.50	0.87				0.70	0.313	0.17	0.488	1.00	0.50	0.87	0.401	0.44	0.174	6%
9	8.00	0.80				0.64	0.327	0.16	0.489	1.00	0.50	0.80	0.408	0.40	0.163	5%
10	8.50	0.83				0.66	0.319	0.17	0.433	1.00	0.50	0.83	0.376	0.42	0.156	5%
11	9.00	0.88				0.70	0.270	0.18	0.352	1.00	0.75	0.88	0.311	0.66	0.205	7%
12	10.00	0.86				0.69	0.238	0.17	0.296	1.00	1.00	0.86	0.257	0.86	0.230	9%
13	11.00	0.83				0.66	0.229	0.17	0.313	1.00	1.00	0.83	0.271	0.83	0.225	7%
14	12.00	0.87				0.70	0.278	0.17	0.389	1.00	1.00	0.87	0.334	0.87	0.290	10%
15	13.00	0.72	0.43		0.225					1.00	1.00	0.72	0.225	0.72	0.162	5%
16	14.00	0.72	0.43		0.270					1.00	1.00	0.72	0.270	0.72	0.194	6%
17	15.00	0.67	0.40		0.145					1.00	1.00	0.67	0.145	0.67	0.097	3%
18	16.00	0.54	0.32		0.075					1.00	1.00	0.54	0.075	0.54	0.041	1%
19	17.00	0.50	0.30		0.049					1.00	1.50	0.50	0.049	0.75	0.037	1%
20	19.00	0.26	0.16		-0.023					1.00	1.55	0.26	0.023	0.40	-0.009	
RB	20.10	0.00	0.00		0.00		0.00		0.00	1.00	0.55	0.00	0.000	0.00	0.000	
Total Flow														3.03	100%	

Flow Measurement Details:

Metering Section Location (describe):
Downstream side of bridge

Meas. Start Time (MST):	11:30
Meas. End Time (MST):	12:05
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, light breeze, 12C



Flow characteristics:

Total Flow:	3.03	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.22	(m ²)
Wetted Width:	18.20	(m)
Hydraulic Depth:	0.62	(m)
Mean Velocity:	0.27	(m/s)
Reynolds Number:	1.39E+05	
Froude Number:	0.11	

Logger Details:

	Before	After
Transducer Reading (m):	0.763	0.762
Water (°C):	13.7	13.7
Datalogger Clock:	11:17	12:20
Laptop Clock:	11:15	12:17
Battery:	14.4	14.4
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Pressure transducer may have moved June 13

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-3	1.093	101.144		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.177	99.967	99.967	3/4" Pipe 2m E of logger
S56-4			1.088	100.056	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut		2.657	98.487		Time WL Surveyed: 11:17
Temporary BM			2.699	98.445	0.000	
Turn						
Temporary BM	2.687	101.132		98.445		
Water Level:	Cut	0.039	2.687	98.484		Time WL Surveyed: 11:19
S56-4			1.077	100.055	100.055	3/4" Pipe 3m NW of logger
S56-2			1.165	99.967	99.967	3/4" Pipe 2m E of logger
S56-3			1.081	100.051	100.051	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S56-4	1.077	101.133		100.056		
Water Level:	Cut	0.040	2.687	98.486		Time WL Surveyed: 12:15
Water Level:	Cut	0.040	2.654	98.458		Time WL Surveyed: 12:16
S56-4	1.046	101.102		100.056		

WL Survey Summary

	Before	After
Average WL:	98.486	98.487
Closing Error:	0.000	-
WL Check:	0.003	-0.002
Transducer Elevation	97.723	97.725

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	17-Jun-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record
Site: S56 Jackfish River Below Christina Lake
UTM Location: 493711 E, 6169759 N

Site Visit Date: August 9, 2015
 Site Visit Time (MST): 13:45



Flow Measurement Details:	
Metering Section Location (describe): downstream end of bridge	
Meas. Start Time (MST):	14:15
Meas. End Time (MST):	14:30
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 25C

Flow characteristics:	
Total Flow:	3.33 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	11.28 (m ²)
Wetted Width:	19.65 (m)
Hydraulic Depth:	0.57 (m)
Mean Velocity:	0.29 (m/s)
Reynolds Number:	1.70E+05
Froude Number:	0.12

Logger Details:	
Transducer Reading (m):	Before: 0.735, After: 1.344
Water (°C):	16.1, 23.1
Datalogger Clock:	13:52, 15:17
Laptop Clock:	13:49, 15:14
Battery (Minn):	13.9, 13.9
Battery:	Good
Battery Serial #:	-
Enclosure Descendant:	Replaced
Mini Tube Descendant:	Good
PT# (if replaced):	322937, 357985
Logger# (if replaced):	20963, -

Datalogger / Station Notes:	
-Replaced PT for calibration	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	24.30		
Serial Number:	4712	Bainry (ppt):	0.0	RB:	4.60		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	23.1	System Test Passed: Yes			
		ADCP Temperature (°C):	23.8				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	20.59	11.45	0.301	3.449	3.69%
Depth Reference: Vertical beam	2	0.00	19.34	11.28	0.286	3.222	-3.13%
Coordinate System: FNU	3	0.00	20.17	11.33	0.306	3.469	4.29%
Left Method: Sloped bank	4	0.00	18.50	11.03	0.287	3.166	-4.85%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
Mean:		19.65	11.28	0.295	3.33		
SD:		0.60	0.15	0.009	0.134		
COV:		0.04	0.01	0.029	0.040		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-3	1.256	101.307		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.342	99.965	99.967	3/4" Pipe 2m E of logger
S56-4			1.252	100.055	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut	0.068	2.858	98.517	98.517	Time WL Surveyed: 13:55
Temporary BM			2.858	98.449	98.449	0.000
Turn						
Temporary BM	2.818	101.267		98.449	98.449	Time WL Surveyed: 13:55
Water Level:	Cut	0.068	2.818	98.517	98.517	13:55
S56-3			1.216	100.051	100.051	3/4" Pipe 4m S of logger
S56-4			1.212	100.055	100.056	3/4" Pipe 3m NW of logger
S56-2			1.301	99.966	99.967	3/4" Pipe 2m E of logger
S56-3			1.216	100.051	100.051	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S56-3	1.216	101.267		100.051	100.051	Time WL Surveyed: 15:11
Water Level:	Cut	0.061	2.818	98.510	98.510	15:12
Water Level:	Cut	0.061	2.772	98.512	98.512	
S56-3	1.172	101.223		100.051	100.051	

WL Survey Summary		Level Survey Equipment:	
Average WL:	Before: 98.517, After: 98.511	Level #:	Level#2
Closing Error:	0.000	Make & Model:	Nikon AC-2S
WL Check:	0.000, -0.002	Serial #:	668859
Transducer Elevation:	97.732, 97.167		

Field Personnel:			
Data Entry Personnel:	TR, JC	Trip Date:	9-Aug-15
Data Check Personnel:	TR	Date:	9-Aug-15
Entered Digitally in the Field:	Yes	Date:	25-Aug-15

Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake
 UTM Location: 493711 E, 6169759 N

Site Visit Date: September 18, 2015
 Site Visit Time (MST): 08:30

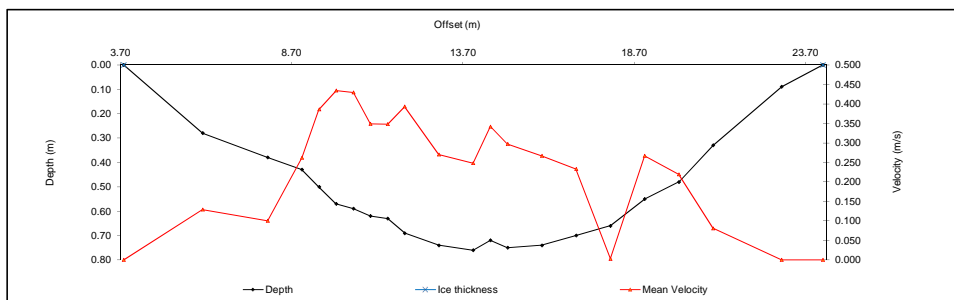


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	24.20	0.00	0.00		0.000				0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	23.00	0.09		0.05	0.000					1.00	1.60	0.09	0.000	0.14	0.000	0%
2	21.00	0.33		0.20	0.081					1.00	1.50	0.33	0.081	0.50	0.040	2%
3	20.00	0.48		0.29	0.219					1.00	1.00	0.48	0.219	0.48	0.105	5%
4	19.00	0.55		0.33	0.267					1.00	1.00	0.55	0.267	0.55	0.147	6%
5	18.00	0.66		0.40	0.003					1.00	1.00	0.66	0.003	0.66	0.002	0%
6	17.00	0.70		0.42	0.233					1.00	1.00	0.70	0.233	0.70	0.163	7%
7	16.00	0.74		0.44	0.267					1.00	1.00	0.74	0.267	0.74	0.198	9%
8	15.00	0.75		0.45	0.297					1.00	0.75	0.75	0.297	0.56	0.167	7%
9	14.50	0.72		0.43	0.342					1.00	0.50	0.72	0.342	0.36	0.123	5%
10	14.00	0.76			0.248	0.61		0.15		1.00	0.75	0.76	0.248	0.57	0.141	6%
11	13.00	0.74		0.44	0.270					1.00	1.00	0.74	0.270	0.74	0.200	9%
12	12.00	0.69		0.41	0.393					1.00	0.75	0.69	0.393	0.52	0.203	9%
13	11.50	0.63		0.38	0.348					1.00	0.50	0.63	0.348	0.32	0.110	5%
14	11.00	0.62		0.37	0.349					1.00	0.50	0.62	0.349	0.31	0.108	5%
15	10.50	0.59		0.35	0.429					1.00	0.50	0.59	0.429	0.30	0.127	6%
16	10.00	0.57		0.34	0.434					1.00	0.50	0.57	0.434	0.29	0.124	5%
17	9.50	0.50		0.30	0.386					1.00	0.50	0.50	0.386	0.25	0.097	4%
18	9.00	0.43		0.26	0.262					1.00	0.75	0.43	0.262	0.32	0.084	4%
19	8.00	0.38		0.23	0.100					1.00	1.45	0.38	0.100	0.55	0.055	2%
20	6.10	0.28		0.17	0.129					1.00	2.10	0.28	0.129	0.59	0.076	3%
LB	3.80	0.00	0.00		0.00					1.00	1.15	0.00	0.000	0.00	0.000	
Total Flow														2.27	100%	

Flow Measurement Details:

Metering Section Location (describe):
40m upstream of station near bridge

Meas. Start Time (MST):	8:56
Meas. End Time (MST):	9:20
Equipment:	ADV
Method:	Wading
River Condition:	Low flow, weeds in channel
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 8C



Flow characteristics:

Total Flow:	2.27	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.44	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	#VALUE!	(m)
Mean Velocity:	0.24	(m/s)
Froude Number:	#VALUE!	

Logger Details:

	Before	After
Transducer Reading (m):	1.276	1.276
Water (°C):	11.4	11.5
Datalogger Clock:	08:36	09:28
Laptop Clock:	08:36	09:28
Battery (Main):	13.5	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- ADV test run, results good
- Boulder upstream of offset 18m, causing slow flow

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-3	1.144	101.195		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.228	99.967	99.967	3/4" Pipe 2m E of logger
S56-4			1.141	100.054	100.056	3/4" Pipe 3m NW of logger
Water Level:						
Water Level:	Cut	2.730		98.465		Time WL Surveyed: 8:42
Temporary BM			2.448	98.747	0.000	-
Turn						
Temporary BM	2.438	101.185		98.747		-
Water Level:	Cut		2.721	98.464		Time WL Surveyed: 8:44
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S56-3	1.113	101.164		98.465		
Water Level:	Cut		2.702	98.462		Time WL Surveyed: 9:29
Water Level:	Cut		2.714	98.462		Time WL Surveyed: 9:31
S56-3	1.125	101.176		100.051		

WL Survey Summary

	Before	After
Average WL:	98.465	98.462
Closing Error:	0.001	-
WL Check:	0.001	0.000
Transducer Elevation	97.189	97.186

Field Personnel:

	CJ, SM	Trip Date:	18-Sep-15
Data Entry Personnel:	CJ	Date:	18-Sep-15
Data Check Personnel:	TR	Date:	26-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake
UTM Location: 493711 E, 6169759 N

Site Visit Date: October 16, 2015
Site Visit Time (MST): 13:50

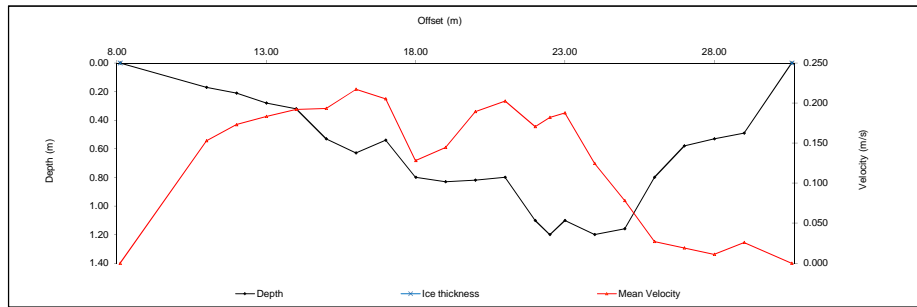


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	30.60	0.00	0.00		0.000		0.000		0.000	1.00	0.80	0.00	0.000	0.00	0.000	
1	29.00	0.49		0.29	0.026					1.00	1.30	0.49	0.026	0.64	0.017	1%
2	28.00	0.53		0.32	0.011					1.00	1.00	0.53	0.011	0.53	0.006	0%
3	27.00	0.58		0.35	0.019					1.00	1.00	0.58	0.019	0.58	0.011	1%
4	26.00	0.80				0.64	-0.001	0.16	0.055	1.00	1.00	0.80	0.027	0.80	0.022	1%
5	25.00	1.16				0.93	0.073	0.23	0.083	1.00	1.00	1.16	0.078	1.16	0.090	5%
6	24.00	1.20				0.96	0.070	0.24	0.179	1.00	1.00	1.20	0.125	1.20	0.149	8%
7	23.00	1.10				0.88	0.145	0.22	0.230	1.00	0.75	1.10	0.188	0.83	0.155	9%
8	22.50	1.20				0.96	0.136	0.24	0.228	1.00	0.50	1.20	0.182	0.60	0.109	6%
9	22.00	1.10				0.88	0.121	0.22	0.220	1.00	0.75	1.10	0.171	0.83	0.141	8%
10	21.00	0.80				0.64	0.167	0.16	0.238	1.00	1.00	0.80	0.203	0.80	0.162	9%
11	20.00	0.82				0.66	0.165	0.16	0.213	1.00	1.00	0.82	0.189	0.82	0.155	9%
12	19.00	0.83				0.66	0.088	0.17	0.201	1.00	1.00	0.83	0.145	0.83	0.120	7%
13	18.00	0.80				0.64	0.041	0.16	0.215	1.00	1.00	0.80	0.128	0.80	0.102	6%
14	17.00	0.54		0.32	0.205					1.00	1.00	0.54	0.205	0.54	0.111	6%
15	16.00	0.63		0.38	0.217					1.00	1.00	0.63	0.217	0.63	0.137	8%
16	15.00	0.53		0.32	0.193					1.00	1.00	0.53	0.193	0.53	0.102	6%
17	14.00	0.32		0.19	0.192					1.00	1.00	0.32	0.192	0.32	0.081	3%
18	13.00	0.28		0.17	0.183					1.00	1.00	0.28	0.183	0.28	0.051	3%
19	12.00	0.21		0.13	0.173					1.00	1.00	0.21	0.173	0.21	0.036	2%
20	11.00	0.17		0.10	0.153					1.00	1.95	0.17	0.153	0.33	0.051	3%
RB	8.10	0.00	0.00		0.00				0.00	1.00	1.45	0.00	0.000	0.00	0.000	
Total Flow														1.79	100%	

Flow Measurement Details:

Metering Section Location (describe):
Across from station

Meas. Start Time (MST):	14:07
Meas. End Time (MST):	14:40
Equipment:	ADV#1
Flow Meter Make & Model:	Sortek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Flowing Well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 13C



Flow characteristics:

Total Flow:	1.79	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	13.25	(m ²)
Wetted Width:	22.50	(m)
Hydraulic Depth:	0.59	(m)
Mean Velocity:	0.14	(m/s)
Reynolds Number:	5.51E+04	
Froude Number:	0.06	

Logger Details:

	Before	After
Transducer Reading (m):	1.235	1.237
Water (°C):	7.0	7.2
Datalogger Clock:	13:55	14:45
Laptop Clock:	13:55	14:43
Battery:	14.3	14.3
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Descicant:	Replaced	-
Vent Tube Descicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:
-ADV test good

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-3	1.247	101.298		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.333	99.965	99.967	3/4" Pipe 2m E of logger
S56-4			1.245	100.053	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut	0.091	2.963	98.426		Time WL Surveyed: 13:58
Temporary BM			2.963	98.335	0.000	
Turn						
Temporary BM	2.933	101.268		98.335	-	
Water Level:	Cut	0.091	2.933	98.426		Time WL Surveyed: 14:00
S56-4			1.214	100.054	100.056	3/4" Pipe 3m NW of logger
S56-2			1.302	99.966	99.967	3/4" Pipe 2m E of logger
S56-3			1.218	100.050	100.051	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S56-4	1.214	101.268		100.054		
Water Level:	Cut	0.090	2.932	98.426		Time WL Surveyed: 14:45
Water Level:	Cut	0.090	2.903	98.426		Time WL Surveyed: 14:47
S56-4	1.187	101.241		100.054		

WL Survey Summary

	Before	After
Average WL:	98.426	98.427
Closing Error:	0.001	-0.002
WL Check:	0.000	-0.002
Transducer Elevation	97.191	97.190

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC 2S
Serial #:	668859

Field Personnel:

	TR,GG	Trip Date:	16-Oct-15
Data Entry Personnel:	TR	Date:	16-Oct-15
Data Check Personnel:	TR	Date:	3-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake
 UTM Location: 493711 E, 6169759 N

Site Visit Date: December 2, 2015
 Site Visit Time (MST): 11:45

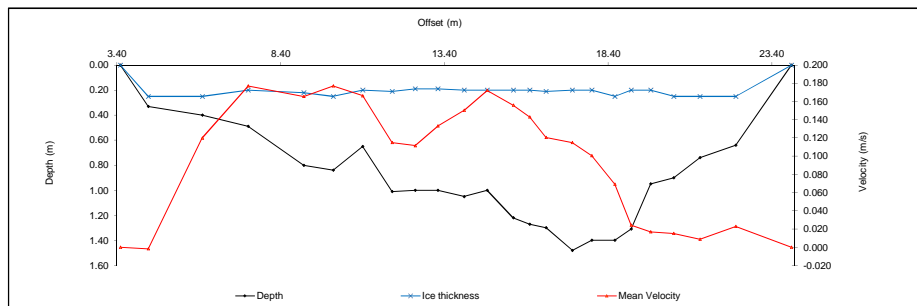


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	24.00	0.00	0.00		0.000		0.000		0.000	0.88	0.85	0.00	0.000	0.00	0.000	
1	22.30	0.64	0.25	0.45	0.026					0.88	1.40	0.39	0.023	0.55	0.012	1%
2	21.20	0.74	0.25	0.50	0.010					0.88	0.95	0.49	0.009	0.47	0.004	0%
3	20.40	0.90	0.25	0.58	0.017					0.88	0.75	0.65	0.015	0.49	0.007	1%
4	19.70	0.95	0.20	0.58	0.019					0.88	0.65	0.75	0.017	0.49	0.008	1%
5	19.10	1.31	0.20			1.09	0.092	0.42	0.046	1.00	0.55	1.11	0.024	0.61	0.015	1%
6	18.60	1.40	0.25			1.17	0.062	0.48	0.076	1.00	0.60	1.15	0.069	0.69	0.048	4%
7	17.90	1.40	0.20			1.16	0.096	0.44	0.105	1.00	0.65	1.20	0.101	0.78	0.078	6%
8	17.30	1.48	0.20			1.22	0.088	0.46	0.142	1.00	0.70	1.28	0.115	0.90	0.103	8%
9	16.50	1.30	0.21			1.08	0.084	0.43	0.157	1.00	0.65	1.09	0.121	0.71	0.085	6%
10	16.00	1.27	0.20			1.06	0.095	0.41	0.191	1.00	0.50	1.07	0.143	0.54	0.077	6%
11	15.50	1.22	0.20			1.02	0.135	0.40	0.177	1.00	0.65	1.02	0.156	0.66	0.103	8%
12	14.70	1.00	0.20			0.84	0.161	0.36	0.163	1.00	0.75	0.80	0.172	0.60	0.103	8%
13	14.00	1.05	0.20			0.88	0.131	0.37	0.170	1.00	0.75	0.85	0.151	0.64	0.080	6%
14	13.20	1.00	0.19			0.84	0.094	0.35	0.172	1.00	0.75	0.81	0.133	0.61	0.081	6%
15	12.50	1.00	0.19			0.84	0.074	0.35	0.149	1.00	0.70	0.81	0.112	0.57	0.063	5%
16	11.80	1.01	0.21			0.85	0.066	0.37	0.164	1.00	0.80	0.80	0.115	0.64	0.074	5%
17	10.90	0.65	0.20	0.43	0.189					0.88	0.90	0.45	0.166	0.41	0.067	5%
18	10.00	0.84	0.25	0.55	0.201					0.88	0.90	0.59	0.177	0.53	0.094	7%
19	9.10	0.80	0.22	0.51	0.188					0.88	1.30	0.58	0.165	0.75	0.125	9%
20	7.40	0.49	0.20	0.35	0.201					0.88	1.55	0.29	0.177	0.45	0.080	6%
21	6.00	0.40	0.25	0.33	0.136					0.88	1.53	0.15	0.120	0.23	0.027	2%
22	4.35	0.33	0.25	0.29	-0.002					0.88	1.25	0.08	-0.002	0.10	0.000	0%
RB	3.50	0.00	0.00		0.00		0.00		0.00	0.88	0.43	0.00	0.000	0.00	0.000	0%
Total Flow														1.35	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	12:14
Meas. End Time (MST):	12:59
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P3338
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, calm, 0C



Flow characteristics:

Total Flow:	1.35	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.39	(m ²)
Wetted Width:	20.50	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.11	(m/s)
Reynolds Number:	3.72E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	1.391	-
Water (°C):	0.4	-
Datalogger Clock:	12:50	-
Laptop Clock:	11:47	-
Battery:	12.6	-
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Overflow occurring during visit.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-2	1.485	101.452		99.967	99.967	3/4" Pipe 2m E of logger
S56-4			1.397	100.055	100.056	3/4" Pipe 3m NW of logger
S56-3			1.400	100.052	100.051	3/4" Pipe 4m S of logger
Water Level:	Cut		2.869	98.583		Time WL Surveyed: 12:03
Temporary BM:			2.900	98.552	0.000	
Turn						
Temporary BM	2.874	101.426		98.552		
Water Level:	Cut		2.843	98.583		Time WL Surveyed: 12:07
S56-3			1.371	100.055	100.051	3/4" Pipe 4m S of logger
S56-4			1.369	100.057	100.056	3/4" Pipe 3m NW of logger
S56-2			1.457	99.969	99.967	3/4" Pipe 2m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.583	-
Closing Error:	-0.002	-
WL Check:	0.000	-
Transducer Elevation	97.192	-

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

GG, JM	Trip Date:	2-Dec-15
GG	Date:	2-Dec-15
JC	Date:	8-Jan-16
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake

UTM Location: 506232E 6158404N

Site Visit Date: _____

January 8, 2015

Site Visit Time (MST): _____

11:40



Flow Measurement:

Bank/ Mmt #	Measured Data							Calculated Data								
	Depth from bottom to WS (m)	WS (m)	Depth of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.20	0.00	0.00	0.38	0.048			0.000		0.88	0.28	0.00	0.000	0.00	0.000	
1	1.75	0.40	0.35	0.38	0.048				0.88	0.65	0.05	0.042	0.03	0.001	1%	
2	2.50	0.42	0.35	0.39	0.111				0.88	0.75	0.07	0.098	0.05	0.005	3%	
3	3.25	0.35	0.30	0.33	0.040				0.88	0.58	0.05	0.035	0.03	0.001	1%	
4	3.65	0.30	0.23	0.27	0.093				0.88	0.48	0.07	0.082	0.03	0.003	2%	
5	4.20	0.32	0.27	0.30	0.088				0.88	0.53	0.05	0.077	0.03	0.002	1%	
6	4.70	0.30	0.26	0.28	0.089				0.88	0.52	0.04	0.078	0.02	0.002	1%	
7	5.25	0.30	0.27	0.29	0.058				0.88	0.55	0.03	0.051	0.02	0.001	1%	
8	5.80	0.35	0.28	0.32	0.080				0.88	0.48	0.07	0.070	0.03	0.002	2%	
9	6.20	0.35	0.28	0.32	0.100				0.88	0.40	0.07	0.088	0.03	0.002	2%	
10	6.60	0.35	0.25	0.30	0.113				0.88	0.50	0.10	0.099	0.05	0.005	3%	
11	7.20	0.40	0.22	0.31	0.142				0.88	0.57	0.18	0.125	0.10	0.013	9%	
12	7.75	0.50	0.25	0.38	0.174				0.88	0.35	0.25	0.153	0.09	0.013	9%	
13	7.90	0.50	0.25	0.38	0.160				0.88	0.28	0.25	0.141	0.07	0.010	6%	
14	8.30	0.52	0.25	0.39	0.186				0.88	0.27	0.27	0.164	0.07	0.012	8%	
15	8.45	0.55	0.23	0.39	0.163				0.88	0.25	0.32	0.143	0.08	0.011	8%	
16	8.80	0.55	0.20	0.38	0.135				0.88	0.25	0.35	0.119	0.09	0.010	7%	
17	8.95	0.55	0.25	0.40	0.145				0.88	0.18	0.30	0.128	0.05	0.007	4%	
18	9.15	0.60	0.20	0.40	0.158				0.88	0.27	0.40	0.139	0.11	0.015	10%	
19	9.50	0.45	0.25	0.35	0.128				0.88	0.45	0.20	0.113	0.09	0.010	7%	
20	10.05	0.50	0.23	0.37	0.107				0.88	0.58	0.27	0.094	0.16	0.015	10%	
21	10.65	0.35	0.23	0.29	0.150				0.88	0.55	0.12	0.132	0.07	0.009	6%	
22	11.15	0.30	0.25	0.28	0.026				0.88	0.48	0.05	0.023	0.02	0.001	0%	
RB	11.60	0.00	0.00	0.28	0.00			0.00	0.88	0.23	0.00	0.000	0.00	0.000		
Total Flow														0.151	100%	

Flow Measurement Details:

Metering Section Location (describe):
3m upstream of pressure transducer

Meas. Start Time (MST):	12:35
Meas. End Time (MST):	13:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, -20C

Flow characteristics:

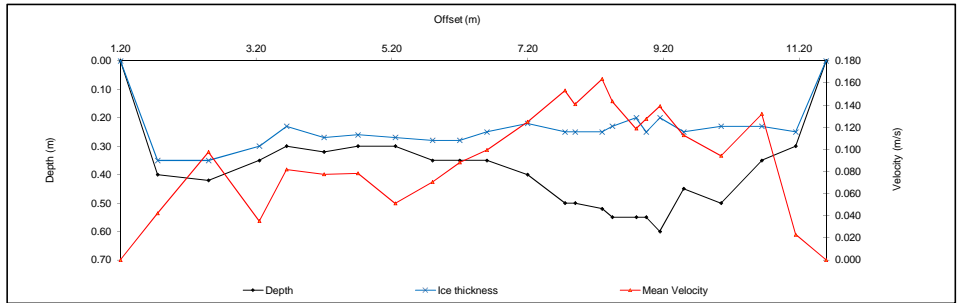
Total Flow:	0.151	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.32	(m ²)
Wetted Width:	10.40	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.427	
Water (°C):	0.2	
Datalogger Clock:	11:47	
Laptop Clock:	11:46	
Battery (Main):	14.9	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S57-3	1.471	101.531		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.568	99.963	99.960	3/4" Pipe 5m W of logger
S57-1			1.528	100.003	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.732	97.799	Time WL Surveyed:	13:05
Temporary BM			3.698	97.833	0.000	-
Turn						
Temporary BM	3.666	101.499		97.833		
Water Level:	Cut		3.698	97.801	Time WL Surveyed:	13:08
S57-1			1.494	100.005	100.000	3/4" Pipe closest to logger
S57-2			1.533	99.966	99.960	3/4" Pipe 5m W of logger
S57-3			1.436	100.063	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	97.800	-
Closing Error:	-0.003	-
WL Check:	0.002	-
Transducer Elevation	97.373	-

Field Personnel:

Field Personnel:	TR, GG	Trip Date:	8-Jan-15
Data Entry Personnel:	TR	Date:	8-Jan-15
Data Check Personnel:	MP	Date:	11-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake

UTM Location: 506232E 6158404N

Site Visit Date: _____

January 30, 2015

Site Visit Time (MST): _____

15:00



Flow Measurement:															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.20	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.24	0.00	0.000	0.00	0.000	
1	1.68	0.43	0.35	0.39	0.001				0.88	0.51	0.08	0.001	0.04	0.000	0%
2	2.22	0.51	0.35	0.43	0.084				0.88	0.54	0.16	0.074	0.09	0.006	3%
3	2.76	0.50	0.36	0.43	0.092				0.88	0.57	0.14	0.081	0.08	0.006	3%
4	3.36	0.48	0.36	0.42	0.080				0.88	0.57	0.12	0.070	0.07	0.005	3%
5	3.89	0.42	0.36	0.39	0.004				0.88	0.52	0.06	0.004	0.03	0.000	0%
6	4.40	0.42	0.36	0.39	0.039				0.88	0.44	0.06	0.034	0.03	0.001	0%
7	4.76	0.42	0.37	0.40	0.044				0.88	0.30	0.05	0.039	0.02	0.001	0%
8	5.00	0.41	0.36	0.39	0.004				0.88	0.31	0.05	0.004	0.02	0.000	0%
9	5.38	0.44	0.36	0.40	-0.007				0.88	0.37	0.08	-0.006	0.03	0.000	0%
10	5.73	0.42	0.37	0.40	0.029				0.88	0.33	0.05	0.025	0.02	0.000	0%
11	6.04	0.45	0.36	0.41	0.004				0.88	0.37	0.09	0.004	0.03	0.000	0%
12	6.47	0.44	0.36	0.40	0.068				0.88	0.57	0.08	0.060	0.05	0.003	1%
13	7.17	0.44	0.35	0.40	0.119				0.88	0.69	0.09	0.105	0.06	0.006	3%
14	7.84	0.50	0.34	0.42	0.193				0.88	0.64	0.16	0.170	0.10	0.017	9%
15	8.45	0.54	0.28	0.41	0.243				0.88	0.46	0.26	0.214	0.12	0.026	14%
16	8.76	0.58	0.28	0.43	0.261				0.88	0.30	0.30	0.230	0.09	0.021	11%
17	9.05	0.58	0.27	0.43	0.155				0.88	0.43	0.31	0.136	0.13	0.018	10%
18	9.62	0.52	0.25	0.39	0.152				0.88	0.58	0.27	0.134	0.16	0.021	11%
19	10.21	0.51	0.26	0.39	0.250				0.88	0.39	0.25	0.220	0.10	0.021	11%
20	10.40	0.50	0.26	0.38	0.237				0.88	0.29	0.24	0.209	0.07	0.014	8%
21	10.78	0.50	0.28	0.39	0.210				0.88	0.47	0.22	0.185	0.10	0.019	10%
22	11.34	0.41	0.32	0.37	0.064				0.88	0.41	0.09	0.056	0.04	0.002	1%
RB	11.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.13	0.00	0.000	0.00	0.000	
Total Flow													0.188	100%	

Flow Measurement Details:

Metering Section Location (describe):
4m upstream of pressure transducer

Meas. Start Time (MST):	15:30
Meas. End Time (MST):	16:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -18C

Flow characteristics:

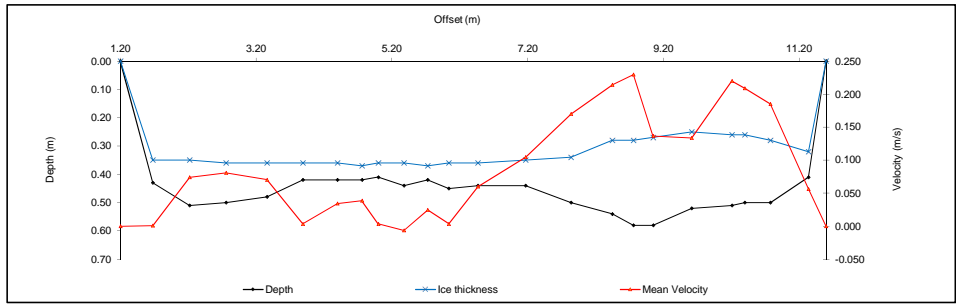
Total Flow:	0.188	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.46	(m ²)
Wetted Width:	10.40	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.11	

Logger Details:

	Before	After
Transducer Reading (m):	0.442	
Water (°C):	0.2	
Datalogger Clock:	15:12	
Laptop Clock:	15:11	
Battery (Main):	13.8	
Battery:	Good	
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S57-3	1.492	101.552		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.591	99.961	99.960	3/4" Pipe 5m W of logger
S57-1			1.553	99.999	100.000	3/4" Pipe closest to logger
Water Level:	Cut	3.737		97.815	Time WL Surveyed:	15:16
S57-3		1.492		100.060	100.060	3/4" Pipe 10m W of logger
Turn						
S57-3	1.458	101.518		100.060	100.060	3/4" Pipe 10m W of logger
Water Level:	Cut		3.699	97.819	Time WL Surveyed:	15:19
S57-1			1.522	99.996	100.000	3/4" Pipe closest to logger
S57-2			1.558	99.960	99.960	3/4" Pipe 5m W of logger
S57-3			1.458	100.060	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	97.817	-
Closing Error:	0.000	-
WL Check:	0.004	-
Transducer Elevation	97.375	-

Field Personnel:

	MP, TR	Trip Date:	30-Jan-15
Data Entry Personnel:	MP	Date:	30-Jan-15
Data Check Personnel:	MP	Date:	12-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake

UTM Location: 506232E 6158404N

Site Visit Date:

February 27, 2015

Site Visit Time (MST):

12:30

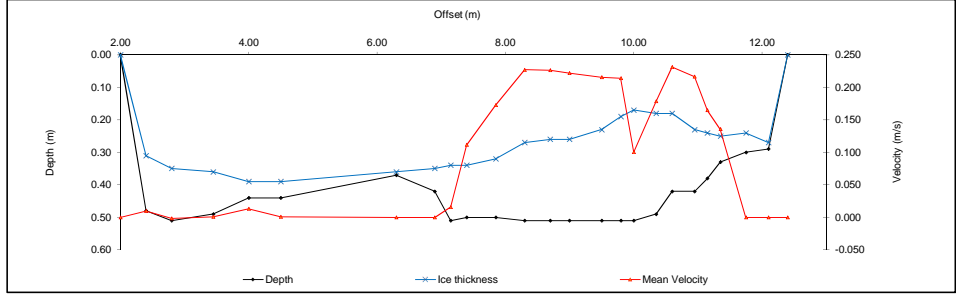


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	12.40	0.00	0.00	0.28	0.000	0.000	0.000	0.000	0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	12.10	0.29	0.27	0.28	0.000					0.88	0.32	0.02	0.000	0.01	0.000	0%
2	11.75	0.30	0.24	0.27	0.000					0.88	0.38	0.06	0.000	0.02	0.000	0%
3	11.35	0.33	0.25	0.29	0.154					0.88	0.30	0.08	0.136	0.02	0.003	2%
4	11.15	0.38	0.24	0.31	0.187					0.88	0.20	0.14	0.165	0.03	0.005	2%
5	10.95	0.42	0.23	0.33	0.246					0.88	0.28	0.19	0.216	0.05	0.011	6%
6	10.60	0.42	0.18	0.30	0.263					0.88	0.30	0.24	0.231	0.07	0.017	9%
7	10.35	0.49	0.18	0.34	0.203					0.88	0.30	0.31	0.179	0.09	0.017	9%
8	10.00	0.51	0.17	0.34	0.114					0.88	0.28	0.34	0.100	0.09	0.009	5%
9	9.80	0.51	0.19	0.35	0.243					0.88	0.25	0.32	0.214	0.08	0.017	9%
10	9.50	0.51	0.23	0.37	0.245					0.88	0.40	0.28	0.216	0.11	0.024	13%
11	9.00	0.51	0.26	0.39	0.252					0.88	0.40	0.25	0.222	0.10	0.022	12%
12	8.70	0.51	0.26	0.39	0.257					0.88	0.35	0.25	0.226	0.09	0.020	10%
13	8.30	0.51	0.27	0.39	0.258					0.88	0.43	0.24	0.227	0.10	0.023	12%
14	7.85	0.50	0.32	0.41	0.196					0.88	0.45	0.18	0.172	0.08	0.014	7%
15	7.40	0.50	0.34	0.42	0.127					0.88	0.35	0.16	0.112	0.06	0.006	3%
16	7.15	0.51	0.34	0.43	0.018					0.88	0.25	0.17	0.016	0.04	0.001	0%
17	6.90	0.42	0.35	0.39	0.000					0.88	0.43	0.07	0.000	0.03	0.000	0%
18	6.30	0.37	0.36	0.37	0.000					0.88	1.20	0.01	0.000	0.01	0.000	0%
19	4.50	0.44	0.39	0.42	0.001					0.88	1.15	0.05	0.001	0.06	0.000	0%
20	4.00	0.44	0.39	0.42	0.015					0.88	0.53	0.05	0.013	0.03	0.000	0%
21	3.45	0.49	0.36	0.43	0.001					0.88	0.60	0.13	0.001	0.08	0.000	0%
22	2.90	0.51	0.35	0.43	-0.002					0.88	0.53	0.16	-0.002	0.08	0.000	0%
23	2.40	0.48	0.31	0.40	0.011					0.88	0.40	0.17	0.010	0.07	0.001	0%
LB	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.190	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m upstream of pressure transducer

Meas. Start Time (MST):	12:55
Meas. End Time (MST):	13:30
Equipment:	ADV
Method:	Ice
River Condition:	Slush under ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partly cloudy, calm, -15C



Flow characteristics:

Total Flow:	0.190	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.41	(m ²)
Wetted Width:	10.40	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.406	
Water (°C):	0.1	
Datalogger Clock:	12:45	
Laptop Clock:	12:43	
Battery (Main):	14.7	
Battery:	Good	
Battery Serial #:		
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):		
Logger# (if replaced):		

Datalogger / Station Notes:
-Slush under ice is very dirty

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S57-3	1.405	101.465		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.502	99.963	99.960	3/4" Pipe 5m W of logger
S57-1			1.465	100.000	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.671	97.794		Time WL Surveyed: 13:42
Temporary BM			3.613	97.852	0.000	
Turn						
Temporary BM	3.574	101.426		97.852		
Water Level:	Cut		3.628	97.798		Time WL Surveyed: 13:48
S57-1			1.427	99.999	100.000	3/4" Pipe closest to logger
S57-2			1.465	99.961	99.960	3/4" Pipe 5m W of logger
S57-3			1.367	100.059	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.796	-
Closing Error:	0.001	-
WL Check:	0.004	-
Transducer Elevation	97.390	-

Field Personnel:

	TR, RM	Trip Date:	27-Feb-15
Data Entry Personnel:	TR	Date:	27-Feb-15
Data Check Personnel:	SG	Date:	2-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake
 UTM Location: 506232E 6158404N

Site Visit Date: April 15, 2015
 Site Visit Time (MST): 09:20



Flow Measurement:	
Measured Data	Calculated Data
Flow Measurement Not Conducted	
Total Flow	

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	

Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

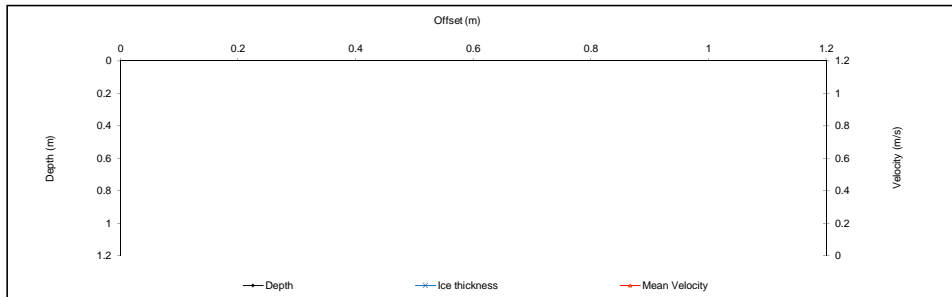
Logger Details:

	Before	After
Transducer Reading (m):	0.809	0.804
Water (°C):	0.2	0.2
Datalogger Clock:	09:23	09:44
Laptop Clock:	09:22	09:42
Battery (Main):	14.2	14.2
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-No flow measurement conducted, too much bed ice, also dangerous. 30-40cm water above bed ice, same conditions upstream



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S57-3	1.328	101.388		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.432	99.956	99.960	3/4" Pipe 5m W of logger
S57-1			1.393	99.995	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.207	98.181		Time WL Surveyed: 9:33
Temporary BM			3.536	97.852	0.000	-
Turn						
Temporary BM	3.516	101.368		97.852		-
Water Level:	Cut		3.186	98.182		Time WL Surveyed: 9:36
S57-1			1.373	99.995	100.000	3/4" Pipe closest to logger
S57-2			1.412	99.956	99.960	3/4" Pipe 5m W of logger
S57-3			1.309	100.059	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.182	-
Closing Error:	0.001	-
WL Check:	0.001	-
Transducer Elevation	97.373	-

Field Personnel:

	GG SM	Trip Date:	15-Apr-15
Data Entry Personnel:	GG	Date:	15-Apr-15
Data Check Personnel:	SG	Date:	2-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake
 UTM Location: 506232 E 6158404 N

Site Visit Date: May 14, 2015
 Site Visit Time (MST): 11:50



Flow Measurement Details:	
Metering Section Location (describe): 3m upstream of pressure transducer	
Meas. Start Time (MST):	12:10
Meas. End Time (MST):	12:30
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20C

Flow characteristics:	
Total Flow:	3.68 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	8.95 (m ²)
Wetted Width:	13.49 (m)
Hydraulic Depth:	0.66 (m)
Mean Velocity:	0.31 (m/s)
Froude Number:	0.12

Logger Details:		
	Before	After
Transducer Reading (m):	0.725	0.723
Water (°C):	9.7	10.0
Datalogger Clock:	11:57	12:40
Laptop Clock:	11:55	12:39
Battery (Main):	13.7	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTN (if replaced):	-	-
Loggers (if replaced):	-	-

Datalogger / Station Notes:
 -Cleared debris from transducer anchor cable

General Notes:

ADCP Flow Measurement Summary:					
System Information:			System Setup:		Bank Offsets:
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	14.80
Serial Number:	4712	Salinity (ppt):	0.0	RB:	1.70
Firmware Version:	3.5	Magnetic Declination (°):	14.3		
Software Version:	3.7	Measured Temperature (°C):	9.8		
		ADCP Temperature (°C):	-		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass (ft):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	13.74	9.01	0.404
Coordinate System:	ENU	2	13.84	9.21	0.408
Left Method:	Sloped bank	3	13.98	8.63	0.410
Right Method:	Sloped bank	4	13.39	-	0.000
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	13.49	8.95	0.306
		SD:	0.34	0.24	0.176
		COV:	0.03	0.03	0.577
					3.681
					0.100
					0.027

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S57-3	1.380	101.440		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.478	99.962	99.960	3/4" Pipe 5m W of logger
S57-1			1.439	100.001	100.000	3/4" Pipe closest to logger
Water Level:	Cut	3.323	98.117			Time WL Surveyed: 12:01
S57-1			1.439	100.001	100.000	3/4" Pipe closest to logger
Turn	1.421	101.422		100.001	100.000	3/4" Pipe closest to logger
Water Level:	Cut	3.303	98.119			Time WL Surveyed: 12:02
S57-1			1.421	100.001	100.000	3/4" Pipe closest to logger
S57-2			1.460	99.962	99.960	3/4" Pipe 5m W of logger
S57-3			1.362	100.060	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S57-1	1.421	101.422		100.001		
Water Level:	Cut	3.304	98.118			Time WL Surveyed: 12:34
Water Level:	Cut	3.281	98.116			Time WL Surveyed: 12:35
S57-1	1.399	101.397		100.001		

WL Survey Summary		
	Before	After
Average WL:	98.118	98.117
Closing Error:	0.000	-
WL Check:	0.002	0.002
Transducer Elevation	97.393	97.384

Field Personnel:		Trip Date:	14-May-15
Data Entry Personnel:	TR	Date:	14-May-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake
 UTM Location: 506232E 6158404N

Site Visit Date: June 10, 2015
 Site Visit Time (MST): 09:30

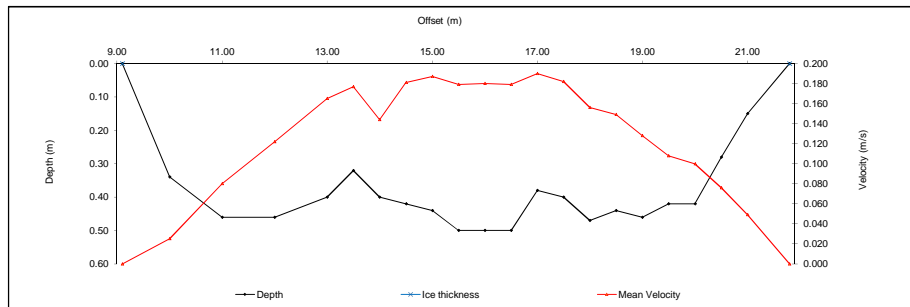


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	21.80	0.00	0.00		0.000				0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	21.00	0.15		0.09	0.049					1.00	0.65	0.15	0.049	0.10	0.005	1%
2	20.50	0.28		0.17	0.076					1.00	0.50	0.28	0.076	0.14	0.011	2%
3	20.00	0.42		0.25	0.100					1.00	0.50	0.42	0.100	0.21	0.021	3%
4	19.50	0.42		0.25	0.108					1.00	0.50	0.42	0.108	0.21	0.023	3%
5	19.00	0.46		0.28	0.128					1.00	0.50	0.46	0.128	0.23	0.029	5%
6	18.50	0.44		0.26	0.149					1.00	0.50	0.44	0.149	0.22	0.033	5%
7	18.00	0.47		0.28	0.156					1.00	0.50	0.47	0.156	0.24	0.037	6%
8	17.50	0.40		0.24	0.182					1.00	0.50	0.40	0.182	0.20	0.036	6%
9	17.00	0.38		0.23	0.190					1.00	0.50	0.38	0.190	0.19	0.036	6%
10	16.50	0.50		0.30	0.179					1.00	0.50	0.50	0.179	0.25	0.045	7%
11	16.00	0.50		0.30	0.180					1.00	0.50	0.50	0.180	0.25	0.045	7%
12	15.50	0.50		0.30	0.179					1.00	0.50	0.50	0.179	0.25	0.045	7%
13	15.00	0.44		0.26	0.187					1.00	0.50	0.44	0.187	0.22	0.041	6%
14	14.50	0.42		0.25	0.181					1.00	0.50	0.42	0.181	0.21	0.038	6%
15	14.00	0.40		0.24	0.144					1.00	0.50	0.40	0.144	0.20	0.029	4%
16	13.50	0.32		0.19	0.177					1.00	0.50	0.32	0.177	0.16	0.028	4%
17	13.00	0.40		0.24	0.165					1.00	0.75	0.40	0.165	0.30	0.050	8%
18	12.00	0.46		0.28	0.122					1.00	1.00	0.46	0.122	0.46	0.056	9%
19	11.00	0.46		0.28	0.080					1.00	1.00	0.46	0.080	0.46	0.037	6%
20	10.00	0.34		0.20	0.025					1.00	0.95	0.34	0.025	0.32	0.008	1%
LB	9.10	0.00	0.00		0.000				0.000	1.00	0.45	0.00	0.000	0.000	0.000	
Total Flow														0.652	100%	

Flow Measurement Details:

Metering Section Location (describe):
4m upstream of PT

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:10
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, 15C



Flow characteristics:

Total Flow:	0.652	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.82	(m ²)
Wetted Width:	12.70	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.14	(m/s)
Reynolds Number:	4.43E+04	
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	0.422	0.420
Water (°C):	14.6	14.9
Datalogger Clock:	09:37	10:20
Laptop Clock:	09:35	10:18
Battery:	13.8	13.7
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S57-3	1.365	101.425		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.462	99.963	99.960	3/4" Pipe 5m W of logger
S57-1			1.424	100.001	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.613	97.812		Time WL Surveyed: 9:41
S57-1			1.424	100.001	100.000	3/4" Pipe closest to logger
Turn						
S57-1	1.389	101.390		100.001	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.574	97.816		Time WL Surveyed: 9:43
S57-1			1.389	100.001	100.000	3/4" Pipe closest to logger
S57-2			1.427	99.963	99.960	3/4" Pipe 5m W of logger
S57-3			1.326	100.064	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S57-1	1.389	101.390		100.001		
Water Level:	Cut		3.575	97.815		Time WL Surveyed: 10:14
Water Level:	Cut		3.552	97.813		Time WL Surveyed: 10:15
S57-1	1.364	101.365		100.001		

WL Survey Summary

	Before	After
Average WL:	97.814	97.814
Closing Error:	-0.004	
WL Check:	0.004	0.002
Transducer Elevation	97.392	97.394

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, MK	Trip Date:	10-Jun-15
Data Check Personnel:	TR	Date:	10-Jun-15
Entered Digitally in the Field:	Yes	Date:	3-Jul-15

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake
UTM Location: 506232E 6158404N

Site Visit Date: August 12, 2015
Site Visit Time (MST): 12:05

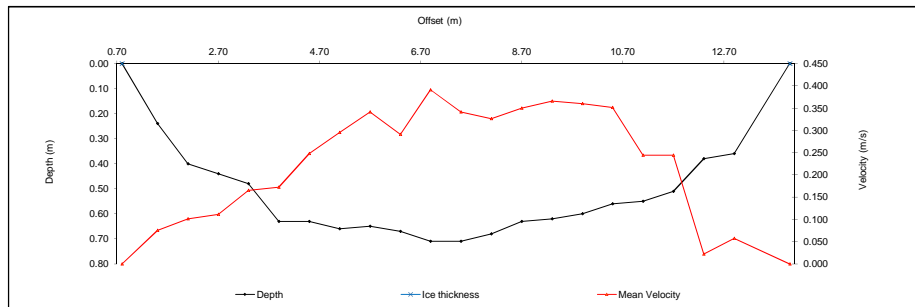


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	0.80	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	1.50	0.24		0.14	0.075					1.00	0.65	0.24	0.075	0.16	0.012	1%
2	2.10	0.40		0.24	0.101					1.00	0.60	0.40	0.101	0.24	0.024	1%
3	2.70	0.44		0.26	0.111					1.00	0.60	0.44	0.111	0.26	0.029	2%
4	3.30	0.48		0.29	0.165					1.00	0.60	0.48	0.165	0.29	0.048	3%
5	3.90	0.63		0.38	0.172					1.00	0.60	0.63	0.172	0.38	0.065	4%
6	4.50	0.63		0.38	0.248					1.00	0.60	0.63	0.248	0.38	0.094	5%
7	5.10	0.66		0.40	0.295					1.00	0.60	0.66	0.295	0.40	0.117	7%
8	5.70	0.65		0.39	0.341					1.00	0.60	0.65	0.341	0.39	0.133	7%
9	6.30	0.67		0.40	0.291					1.00	0.60	0.67	0.291	0.40	0.117	7%
10	6.90	0.71		0.43	0.391					1.00	0.60	0.71	0.391	0.43	0.167	9%
11	7.50	0.71		0.43	0.341					1.00	0.60	0.71	0.341	0.43	0.145	8%
12	8.10	0.68		0.41	0.326					1.00	0.60	0.68	0.326	0.41	0.133	7%
13	8.70	0.63		0.38	0.350					1.00	0.60	0.63	0.350	0.38	0.132	7%
14	9.30	0.62		0.37	0.366					1.00	0.60	0.62	0.366	0.37	0.136	8%
15	9.90	0.60		0.36	0.360					1.00	0.60	0.60	0.360	0.36	0.130	7%
16	10.50	0.56		0.34	0.351					1.00	0.60	0.56	0.351	0.34	0.118	7%
17	11.10	0.55		0.33	0.244					1.00	0.60	0.55	0.244	0.33	0.081	5%
18	11.70	0.51		0.31	0.244					1.00	0.60	0.51	0.244	0.31	0.075	4%
19	12.30	0.38		0.23	0.022					1.00	0.60	0.38	0.022	0.23	0.005	0%
20	12.90	0.36		0.22	0.057					1.00	0.65	0.36	0.057	0.31	0.017	1%
RB	14.00	0.00	0.00		0.00		0.00		0.00	1.00	0.55	0.00	0.000	0.00	0.000	1%
Total Flow														1.78	100%	

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of bridge

Meas. Start Time (MST):	12:24
Meas. End Time (MST):	12:40
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 28C



Flow characteristics:

Total Flow:	1.78	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.77	(m ²)
Wetted Width:	13.20	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.26	(m/s)
Reynolds Number:	1.29E+05	
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.576	0.574
Water (°C):	18.6	18.9
Datalogger Clock:	12:11	12:50
Laptop Clock:	12:09	12:48
Battery:	13.6	13.5
Battery Condition:	Good	Low
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S57-3	1.462	101.522		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.559	99.963	99.960	3/4" Pipe 5m W of logger
S57-1			1.521	100.001	100.000	3/4" Pipe closest to logger
Water Level:	Cut	0.336	3.887	97.971		Time WL Surveyed: 12:17
S57-1			1.521	100.001	100.000	3/4" Pipe closest to logger
Turn						
S57-1	1.493	101.494		100.001	100.000	3/4" Pipe closest to logger
Water Level:	Cut	0.327	3.852	97.969		Time WL Surveyed: 12:18
S57-1			1.493	100.001	100.000	3/4" Pipe closest to logger
S57-2			1.532	99.962	99.960	3/4" Pipe 5m W of logger
S57-3			1.433	100.061	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S57-1	1.493	101.494		100.001		Time WL Surveyed: 12:45
Water Level:	Cut	0.328	3.852	97.970		Time WL Surveyed: 12:45
Water Level:	Cut	0.329	3.842	97.969		
S57-1	1.482	101.483		100.001		

WL Survey Summary

	Before	After
Average WL:	97.970	97.970
Closing Error:	-0.001	0.001
WL Check:	0.002	0.001
Transducer Elevation	97.394	97.396

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Cansel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	DW, TR	Trip Date:	12-Aug-15
Data Check Personnel:	TR	Date:	25-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake
UTM Location: 506232E 6158404N

Site Visit Date: September 8, 2015
Site Visit Time (MST): 14:40

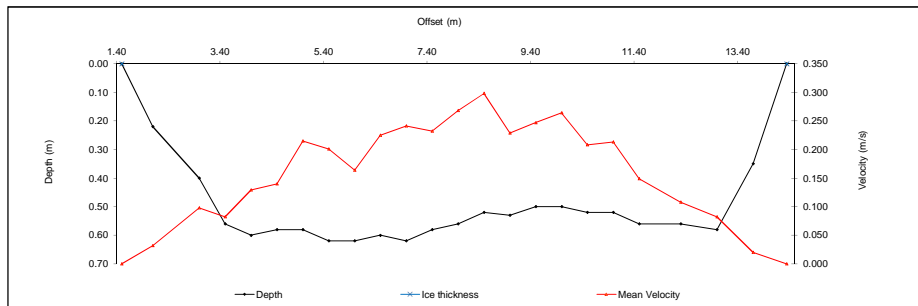


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.50	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	2.10	0.22		0.13	0.032					1.00	0.75	0.22	0.032	0.17	0.005	0%
2	3.00	0.40		0.24	0.098					1.00	0.70	0.40	0.098	0.28	0.027	2%
3	3.50	0.56		0.34	0.082					1.00	0.50	0.56	0.082	0.28	0.023	2%
4	4.00	0.60		0.36	0.129					1.00	0.50	0.60	0.129	0.30	0.039	3%
5	4.50	0.58		0.35	0.140					1.00	0.50	0.58	0.140	0.29	0.041	4%
6	5.00	0.58		0.35	0.215					1.00	0.50	0.58	0.215	0.29	0.062	6%
7	5.50	0.62		0.37	0.201					1.00	0.50	0.62	0.201	0.31	0.062	6%
8	6.00	0.62		0.37	0.164					1.00	0.50	0.62	0.164	0.31	0.051	5%
9	6.50	0.60		0.36	0.225					1.00	0.50	0.60	0.225	0.30	0.068	6%
10	7.00	0.62		0.37	0.241					1.00	0.50	0.62	0.241	0.31	0.075	7%
11	7.50	0.58		0.35	0.232					1.00	0.50	0.58	0.232	0.29	0.067	6%
12	8.00	0.56		0.34	0.268					1.00	0.50	0.56	0.268	0.28	0.075	7%
13	8.50	0.52		0.31	0.298					1.00	0.50	0.52	0.298	0.26	0.077	7%
14	9.00	0.53		0.32	0.229					1.00	0.50	0.53	0.229	0.27	0.061	5%
15	9.50	0.50		0.30	0.247					1.00	0.50	0.50	0.247	0.25	0.062	6%
16	10.00	0.50		0.30	0.264					1.00	0.50	0.50	0.264	0.25	0.066	6%
17	10.50	0.52		0.31	0.208					1.00	0.50	0.52	0.208	0.26	0.054	5%
18	11.00	0.52		0.31	0.213					1.00	0.50	0.52	0.213	0.26	0.055	5%
19	11.50	0.56		0.34	0.149					1.00	0.65	0.56	0.149	0.36	0.054	5%
20	12.30	0.56		0.34	0.108					1.00	0.75	0.56	0.108	0.42	0.045	4%
21	13.00	0.58		0.35	0.082					1.00	0.70	0.58	0.082	0.41	0.033	3%
22	13.70	0.35		0.21	0.020					1.00	0.67	0.35	0.020	0.24	0.005	0%
LB	14.35	0.00	0.00		0.00		0.00		0.00	1.00	0.33	0.00	0.000	0.00	0.000	
Total Flow														1.11	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m upstream of pressure transducer

Meas. Start Time (MST):	15:23
Meas. End Time (MST):	15:46
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Mostly sunny, 15C



Flow characteristics:

Total Flow:	1.11	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.38	(m ²)
Wetted Width:	12.85	(m)
Hydraulic Depth:	0.50	(m)
Mean Velocity:	0.17	(m/s)
Reynolds Number:	6.76E+04	
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	0.529	0.529
Water (°C):	11.1	11.5
Datalogger Clock:	14:52	16:01
Laptop Clock:	14:50	16:59
Battery:	13.8	13.3
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S57-3	1.230	101.290		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.328	99.962	99.960	3/4" Pipe 5m W of logger
S57-1			1.290	100.000	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.378	97.912		Time WL Surveyed: 15:05
Temporary BM			3.600	97.690	0.000	
Turn						
Temporary BM	3.577	101.267		97.690		
Water Level:	Cut		3.355	97.912		Time WL Surveyed: 15:13
S57-1			1.270	99.997	100.000	3/4" Pipe closest to logger
S57-2			1.308	99.959	99.960	3/4" Pipe 5m W of logger
S57-3			1.210	100.057	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S57-1	1.270	101.267		99.997		
Water Level:	Cut		3.355	97.912		Time WL Surveyed: 15:55
Water Level:	Cut		3.335	97.916		Time WL Surveyed: 15:56
S57-1	1.254	101.251		99.997		

WL Survey Summary

	Before	After
Average WL:	97.912	97.914
Closing Error:	0.003	-
WL Check:	0.000	-0.004
Transducer Elevation	97.383	97.385

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

SM, JC	Trip Date:	8-Sep-15
SM	Date:	8-Sep-15
TR	Date:	26-Oct-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake
 UTM Location: 506232E 6158404N

Site Visit Date: October 13, 2015
 Site Visit Time (MST): 10:21

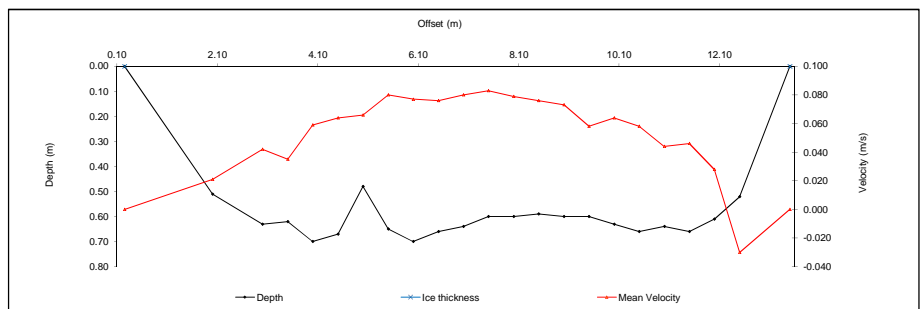


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	13.50	0.00	0.00		0.000				0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	12.50	0.52		0.31	-0.030					1.00	0.75	0.52	-0.030	0.39	-0.012	-3%
2	12.00	0.61		0.37	0.028					1.00	0.50	0.61	0.028	0.31	0.009	2%
3	11.50	0.66		0.40	0.046					1.00	0.50	0.66	0.046	0.33	0.015	4%
4	11.00	0.64		0.38	0.044					1.00	0.50	0.64	0.044	0.32	0.014	4%
5	10.50	0.66		0.40	0.058					1.00	0.50	0.66	0.058	0.33	0.019	5%
6	10.00	0.63		0.38	0.064					1.00	0.50	0.63	0.064	0.32	0.020	5%
7	9.50	0.60		0.36	0.058					1.00	0.50	0.60	0.058	0.30	0.017	5%
8	9.00	0.60		0.36	0.073					1.00	0.50	0.60	0.073	0.30	0.022	6%
9	8.50	0.59		0.35	0.076					1.00	0.50	0.59	0.076	0.30	0.022	6%
10	8.00	0.60		0.36	0.079					1.00	0.50	0.60	0.079	0.30	0.024	6%
11	7.50	0.60		0.36	0.083					1.00	0.50	0.60	0.083	0.30	0.025	7%
12	7.00	0.64		0.38	0.080					1.00	0.50	0.64	0.080	0.32	0.026	7%
13	6.50	0.66		0.40	0.076					1.00	0.50	0.66	0.076	0.33	0.025	7%
14	6.00	0.70		0.42	0.077					1.00	0.50	0.70	0.077	0.35	0.027	7%
15	5.50	0.65		0.39	0.080					1.00	0.50	0.65	0.080	0.33	0.026	7%
16	5.00	0.48		0.29	0.066					1.00	0.50	0.48	0.066	0.24	0.016	4%
17	4.50	0.67		0.40	0.064					1.00	0.50	0.67	0.064	0.34	0.021	6%
18	4.00	0.70		0.42	0.059					1.00	0.50	0.70	0.059	0.35	0.021	5%
19	3.50	0.62		0.37	0.035					1.00	0.50	0.62	0.035	0.31	0.011	3%
20	3.00	0.63		0.38	0.042					1.00	0.75	0.63	0.042	0.47	0.020	5%
21	2.00	0.51		0.31	0.021					1.00	1.38	0.51	0.021	0.70	0.015	4%
RB	0.25	0.00	0.00		0.00				0.00	1.00	0.88	0.00	0.000	0.00	0.000	
Total Flow														0.383	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	10:37
Meas. End Time (MST):	10:58
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 12C



Flow characteristics:

Total Flow:	0.383	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.22	(m ²)
Wetted Width:	13.25	(m)
Hydraulic Depth:	0.54	(m)
Mean Velocity:	0.05	(m/s)
Reynolds Number:	1.87E+04	
Froude Number:	0.02	

Logger Details:

Transducer Reading (m):	Before	0.621	After	0.621
Water (°C):		4.8		4.8
Datalogger Clock:		10:26		11:10
Laptop Clock:		10:24		11:08
Battery:		14.5		14.4
Battery Condition:		Good		
Battery Serial #:		-		-
Enclosure Deseccant:		Replaced		
Vent Tube Deseccant:		Good		
PT# (if replaced):		-		-
Logger# (if replaced):		-		-

Datalogger / Station Notes:

General Notes:

- Data has strange WL fluctuations
- ADV test passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S57-3	1.313	101.373		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.413	99.960	99.960	3/4" Pipe 5m W of logger
S57-1			1.375	99.998	100.000	3/4" Pipe closest to logger
Water Level:						
S57-3	Cut		3.352	98.021	100.060	Time WL Surveyed: 10:27
Turn						
S57-3	1.289	101.349		100.060	100.060	3/4" Pipe 10m W of logger
Water Level:						
S57-1	Cut		3.331	98.018	100.060	Time WL Surveyed: 10:30
S57-1			1.348	100.001	100.000	3/4" Pipe closest to logger
S57-2			1.388	99.961	99.960	3/4" Pipe 5m W of logger
S57-3			1.289	100.060	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S57-1	1.348	101.348		100.000	98.015	Time WL Surveyed: 11:02
Water Level:						
S57-1	Cut		3.333	98.015	98.015	Time WL Surveyed: 11:04
S57-1	1.334	101.334		100.000		

WL Survey Summary

Average WL:	Before	98.020	After	98.015
Closing Error:		0.000		-
WL Check:		0.003		0.000
Transducer Elevation		97.399		97.394

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Cansel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	13-Oct-15
Data Check Personnel:	TR	Date:	13-Oct-15
Entered Digitally in the Field:	Yes	Date:	3-Nov-15

Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake
 UTM Location: 506232E 6158404N

Site Visit Date: December 7, 2015
 Site Visit Time (MST): 09:59

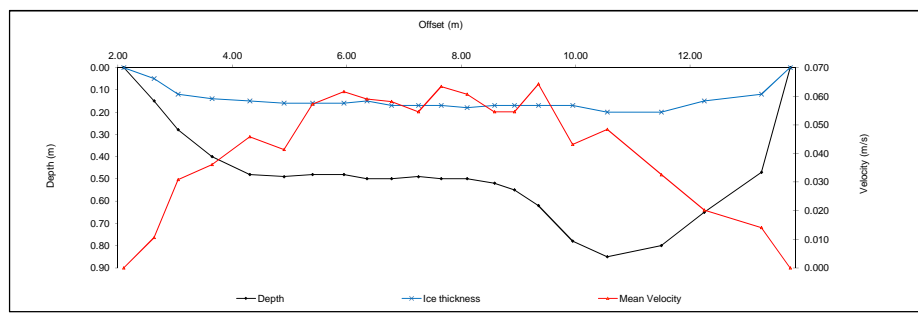


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	13.75	0.00	0.00		0.000		0.000		0.000	0.88	0.25	0.00	0.000	0.00	0.000	
1	13.25	0.47	0.12	0.30	0.016					0.88	0.75	0.35	0.014	0.26	0.004	2%
2	12.25	0.65	0.15	0.40	0.023					0.88	0.88	0.50	0.020	0.44	0.009	5%
3	11.50	0.80	0.20	0.50	0.037					0.88	0.85	0.60	0.033	0.51	0.017	9%
4	10.55	0.85	0.20	0.53	0.055					0.88	0.78	0.65	0.048	0.50	0.024	13%
5	9.95	0.78	0.17	0.48	0.049					0.88	0.60	0.61	0.043	0.37	0.016	8%
6	9.35	0.62	0.17	0.40	0.073					0.88	0.51	0.45	0.054	0.23	0.015	8%
7	8.93	0.55	0.17	0.36	0.062					0.88	0.39	0.38	0.055	0.15	0.008	4%
8	8.58	0.52	0.17	0.35	0.062					0.88	0.41	0.35	0.055	0.15	0.008	4%
9	8.10	0.50	0.18	0.34	0.069					0.88	0.47	0.32	0.061	0.15	0.009	5%
10	7.65	0.50	0.17	0.34	0.072					0.88	0.43	0.33	0.063	0.14	0.009	5%
11	7.25	0.49	0.17	0.33	0.062					0.88	0.44	0.32	0.065	0.14	0.008	4%
12	6.78	0.50	0.17	0.34	0.066					0.88	0.45	0.33	0.059	0.15	0.009	5%
13	6.35	0.50	0.15	0.33	0.067					0.88	0.41	0.35	0.059	0.15	0.009	5%
14	5.95	0.48	0.16	0.32	0.070					0.88	0.48	0.32	0.062	0.15	0.009	5%
15	5.40	0.48	0.16	0.32	0.065					0.88	0.53	0.32	0.057	0.17	0.010	5%
16	4.90	0.49	0.16	0.33	0.047					0.88	0.55	0.33	0.041	0.18	0.008	4%
17	4.30	0.48	0.15	0.32	0.052					0.88	0.63	0.33	0.046	0.21	0.010	5%
18	3.64	0.40	0.14	0.27	0.041					0.88	0.63	0.26	0.036	0.16	0.006	3%
19	3.05	0.28	0.12	0.20	0.035					0.88	0.51	0.16	0.031	0.08	0.002	1%
20	2.63	0.15	0.05	0.10	0.012					0.88	0.48	0.10	0.011	0.05	0.001	0%
LB	2.10	0.00	0.00		0.00		0.00		0.00	0.88	0.27	0.00	0.000	0.00	0.000	
Total Flow														0.188	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	10:20
Meas. End Time (MST):	10:42
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, -3C



Flow characteristics:

Total Flow:	0.188	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.32	(m ²)
Wetted Width:	11.65	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.04	(m/s)
Reynolds Number:	9.09E+03	
Froude Number:	0.02	

Logger Details:

	Before	After
Transducer Reading (m):	0.494	0.494
Water (°C):	0.3	0.3
Datalogger Clock:	11:02	12:04
Laptop Clock:	10:00	11:04
Battery:	13.3	12.9
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	20959	25575

Datalogger / Station Notes:

General Notes:

-Replace data logger:
 Old S/N 20959
 New S/N 25575

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S57-3	1.406	101.466		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.503	99.963	99.960	3/4" Pipe 5m W of logger
S57-1			1.465	100.001	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.580	97.886		Time WL Surveyed: 10:56
Temporary BM			3.569	97.897	0.000	
Turn						
Temporary BM	3.607	101.504		97.897		
Water Level:	Cut		3.622	97.882		Time WL Surveyed: 11:00
S57-1			1.505	99.999	100.000	3/4" Pipe closest to logger
S57-2			1.543	99.961	99.960	3/4" Pipe 5m W of logger
S57-3			1.447	100.057	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.884	-
Closing Error:	0.003	-
WL Check:	0.004	-
Transducer Elevation	97.390	-

Level Survey Equipment:

Level #:	Level#H
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, DW	Trip Date:	7-Dec-15
Data Check Personnel:	JC	Date:	7-Dec-15
Entered Digitally in the Field:	Yes	Date:	8-Jan-16

Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake
 UTM Location: 511444E 6167182N

Site Visit Date: April 15, 2015
 Site Visit Time (MST): 14:35



Flow Measurement Details:	
Metering Section Location (describe): 10m downstream of bridge	
Meas. Start Time (MST):	15:35
Meas. End Time (MST):	16:00
Equipment:	ADCP
Method:	Boat
River Condition:	Mostly ice covered
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, windy, 10C

Flow Characteristics:	
Total Flow:	0.273 (m ³ /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	6.50 (m ²)
Wetted Width:	5.49 (m)
Hydraulic Depth:	1.18 (m)
Mean Velocity:	0.04 (m/s)
Froude Number:	0.01

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.9	1.0
Datalogger Clock:	14:48	16:07
Laptop Clock:	14:47	16:06
Battery (Main):	14.0	13.9
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Replaced	-
PTM (if replaced):	-	-
Logger (if replaced):	-	-

Argonaut Details:		
Water Level (m):	Before	After
Index Velocity (m/s):	12.400	-0.500
Discharge (m ³ /s):	0.000	0.000

Datalogger / Station Notes:
 -SL may be encased in ice
 -Station needs battery enclosure

General Notes:
 -Creek mostly ice covered, open section 10m downstream of bridge
 -Flow measurements largely inconsistent, graded as fair

ADCP Flow Measurement Summary:					
System Information:		System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	23.50
Serial Number:	4712	Salinity (ppt):	0.0	RB:	18.00
Firmware Version:	3.5	Magnetic Declination (°):	0		
Software Version:	3.7	Measured Temperature (°C):	1.0		
		ADCP Temperature (°C):	5.2		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	2	5.89	6.78	0.042
Coordinate System:	ENU	7	5.22	6.31	0.041
Left Method:	Sloped bank	9	5.36	6.41	0.043
Right Method:	Sloped bank				
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	5.49	6.50	0.042
		SD:	0.29	0.20	0.001
		COV:	0.05	0.03	0.019
					0.273
					0.010
					0.037

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S58-2	1.302	101.192		99.890	99.890	3/4" Pipe SW of logger
S58-1			1.230	99.962	100.000	3/4" Pipe W of logger
S58-3			1.326	99.866	99.869	3/4" Pipe S of logger
Water Level:	Cut		2.145	99.047	Time WL Surveyed:	15:11
Temporary BM			2.352	98.840	0.000	
Turn						
Temporary BM	2.338	101.178		98.840		
Water Level:	Cut		2.130	99.048	Time WL Surveyed:	15:13
S58-3			1.311	99.867	99.869	3/4" Pipe S of logger
S58-1			1.215	99.963	100.000	3/4" Pipe W of logger
S58-2			1.287	99.891	99.890	3/4" Pipe SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S58-3			1.310	101.177	99.867	
Water Level:	Cut		2.130	99.047	Time WL Surveyed:	16:14
Water Level:	Cut		2.108	99.051	Time WL Surveyed:	16:15
S58-3	1.292	101.159		99.867		

WL Survey Summary		
Average WL:	Before	After
Closing Error:	99.048	99.049
WL Check:	-0.001	-
Transducer Elevation	0.001	-0.004
	96.859	96.858

Field Personnel:			
Data Entry Personnel:	SM, GG	Trip Date:	15-Apr-15
Data Check Personnel:	SM	Date:	15-Apr-15
Entered Digitally in the Field:	TR	Date:	3-Jul-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake
 UTM Location: 511444E 6167182N

Site Visit Date: June 10, 2015
 Site Visit Time (MST): 14:00



Flow Measurement Details:	
Metering Section Location (describe): 4m upstream of SL	
Meas. Start Time (MST):	15:05
Meas. End Time (MST):	15:30
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Light rain, calm, 20C

Flow characteristics:	
Total Flow:	0.091 (m ³ /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	3.49 (m ²)
Wetted Width:	4.97 (m)
Hydraulic Depth:	0.70 (m)
Mean Velocity:	0.03 (m/s)
Reynolds Number:	1.58E+04
Froude Number:	0.01

Logger Details:	
Transducer Reading (m):	2.252
Water (°C):	14.8
Datalogger Clock:	14:10
Laptop Clock:	14:10
Battery (Minn):	13.3
Battery:	New
Battery Serial #:	-
Enclosure Descendant:	Good
Mini Tube Descendant:	Good
PTF# (if replaced):	-
Logger# (if replaced):	-

Argonaut Details:	
Water Level (m):	-1.76
Index Velocity (m/s):	-3.5
Water (°C):	15.65
Discharge (m ³ /s):	0.096

Datalogger / Station Notes:
 -Level logger and BMs observed at old station location

General Notes:
 -Velocities were very high in middle of channel (0.8m/s), for about 2m, this caused flow to be overestimated by ADCP

-Station shutting off at night, minimum voltage looks fine in 24hr but no way to know 15min minimum. Added battery enclosure and new batteries
 -Second survey was placed on SL

ADCP Flow Measurement Summary:									
System Information:					System Setup:			Bank Offsets:	
System Type:	Sonotek RS-M9	Transducer Depth (m):	0.05	LB:	8.00				
Serial Number:	4712	Bainity (ppt):	0.0	RB:	1.00				
Firmware Version:	3.8	Magnetic Declination (°):	14.3						
Software Version:	3.8	Measured Temperature (°C):	14.8						
		ADCP Temperature (°C):	17.2						
Discharge Calculation Settings:					Measurement Results:				
Pass (#):	Screening Distance (m):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean:	Percent of Pass Measured (%):		
Track Reference: Bottom-Track	2	0.00	4.53	3.44	0.025	0.086	-5.23%	63.6	
Depth Reference: Vertical beam	3	0.00	5.33	3.99	0.024	0.094	3.58%	66.7	
Coordinate System: ENL	9	0.00	4.83	3.10	0.029	0.09	-0.83%	70.0	
Left Method: Sloped bank	11	0.00	5.19	3.42	0.027	0.093	2.48%	65.1	
Right Method: Sloped bank									
Top Fit Type: Power fit									
Bottom Fit Type: Power fit									
Mean:				4.97	3.49	0.028	0.091		
SD:				0.31	0.32	0.002			
COV:				0.06	0.09	0.073			

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S58-2	0.886	100.776		99.890	99.890	3/4" Pipe SW of logger
S58-1			0.814	99.962	100.000	3/4" Pipe W of logger
S58-3			0.909	99.867	99.869	3/4" Pipe S of logger
Water Level:	Cut	0.572	2.237	99.111	Time WL Surveyed:	14:39
Top of SL white box			2.237	98.539	0.000	
Turn						
Top of SL white box	2.210	100.749		98.539		
Water Level:	Cut	0.572	2.210	99.111	Time WL Surveyed:	14:40
S58-3			0.882	99.867	99.869	3/4" Pipe S of logger
S58-1			0.787	99.962	100.000	3/4" Pipe W of logger
S58-2			0.858	99.891	99.890	3/4" Pipe SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S58-3	0.883	100.750		99.867		
Water Level:	Cut	0.572	2.209	99.113	Time WL Surveyed:	15:38
Water Level:	Cut	0.572	2.189	99.112	Time WL Surveyed:	15:39
S58-3	0.882	100.729		99.867		

WL Survey Summary		
Average WL:	Before	After
Closing Error:	-0.001	99.113
WL Check:	0.000	0.001
Transducer Elevation:	98.859	98.860

Level Survey Equipment:		
Level #:	Level#2	
Make & Model:	Nikon AC-2S	
Serial #:	668859	

Field Personnel:			
Data Entry Personnel:	TR_MK	Trip Date:	10-Jun-15
Data Check Personnel:	TR	Date:	10-Jun-15
Entered Digitally in the Field:	Yes	Date:	3-Jul-15

Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake
 UTM Location: 511444E 6167182N

Site Visit Date: August 9, 2015
 Site Visit Time (MST): 11:25



Flow Measurement Details:	
Metering Section Location (describe): 7m upstream of bridge	
Meas. Start Time (MST):	12:20
Meas. End Time (MST):	12:45
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Flooded banks
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, 25C

Flow characteristics:	
Total Flow:	0.566 (m ³ /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	4.18 (m ²)
Wetted Width:	5.56 (m)
Hydraulic Depth:	0.75 (m)
Mean Velocity:	0.14 (m/s)
Reynolds Number:	9.06.E+04
Froude Number:	0.05

Logger Details:		
	Before	After
Transducer Reading (m):	2.498	2.488
Water (°C):	15.7	16.2
Datalogger Clock:	11:39	13:01
Laptop Clock:	11:38	13:00
Battery (Main):	13.5	13.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Descant:	Replaced	
Vent Tube Descant:	Replaced	
PT# (if replaced):	284729	-
Logger# (if replaced):	20953	-

Argonaut Details:		
	Before	After
Water Level (m):	-1.515	-1.512
Index Velocity (m/s):	11.9	5.6
Water (°C):	15.77	16.42
Discharge (m ³ /s):	0.661	0.458

Datalogger / Station Notes:

General Notes:
 -Bed very windy and banks flooded

ADCP Flow Measurement Summary:								
System Information:		System Setup:		Bank Offsets:				
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	7.50			
Serial Number:	4712	Safety (gpd):	0.0	RB:	1.10			
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes				
Software Version:	3.8	Measured Temperature (°C):	16.2	System Test Passed: Yes				
		ADCP Temperature (°C):	16.2					
Discharge Calculation Settings:		Measurement Results:						
	Pass (#)	Screening Distance (m)	Width (m)	Area (m ²)	Mean Pass Velocity (m/s)	Discharge (m ³ /s)	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference:	Bottom-Track	1	0.00	4.93	3.25	0.169	0.546	-3.14%
Depth Reference:	Vertical beam	5	0.00	5.90	3.83	0.155	0.593	-4.82%
Coordinate System:	ENU	7	0.00	4.93	3.06	0.183	0.56	-1.02%
Left Method:	Sloped bank	12	0.00	6.49	6.59	0.085	0.562	-0.66%
Right Method:	Sloped bank							
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit							
		Mean:	5.56	4.18	0.148	0.566		
		SD:	0.67	1.42	0.038	0.017		
		COV:	0.12	0.34	0.255	0.029		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S58-2	1.101	100.991		99.890	99.890	3/4" Pipe SW of logger
S58-1			1.029	99.962	100.000	3/4" Pipe W of logger
S58-3			1.124	99.867	99.869	3/4" Pipe S of logger
Water Level:	Cut		1.638	99.353	Time WL Surveyed: 11:47	
S58-3			1.124	99.867	99.869	3/4" Pipe S of logger
Turn						
S58-3	1.084	100.951		99.867	99.869	3/4" Pipe S of logger
Water Level:	Cut		1.594	99.357	Time WL Surveyed: 11:49	
S58-3			1.084	99.867	99.869	3/4" Pipe S of logger
S58-1			0.960	99.961	100.000	3/4" Pipe W of logger
S58-2			1.062	99.889	99.890	3/4" Pipe SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S58-3	0.985	100.852		99.867		
Water Level:	Cut		1.510	99.342	Time WL Surveyed: 12:51	
Water Level:	Cut		1.552	99.344	Time WL Surveyed: 12:52	
S58-3	1.029	100.896		99.867		

WL Survey Summary		
Average WL:	Before	After
	99.355	99.343
Closing Error:	0.001	-
WL Check:	0.004	-0.002
Transducer Elevation	96.867	96.845

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	662859

Field Personnel:			
	TR, JC	Trip Date:	9-Aug-15
Data Entry Personnel:	TR	Trip Date:	9-Aug-15
Data Check Personnel:	TR	Trip Date:	28-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake
 UTM Location: 511444E 6167182N

Site Visit Date: September 11, 2015
 Site Visit Time (MST): 11:00



Flow Measurement Details:	
Metering Section Location (describe): 5m upstream of SL	
Meas. Start Time (MST):	11:50
Meas. End Time (MST):	12:18
Equipment:	ADCP/H
Method:	Cableway
River Condition:	High, clear water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, breezy, 18C

Flow characteristics:	
Total Flow:	0.260 (m ³ /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	8.76 (m ²)
Wetted Width:	5.68 (m)
Hydraulic Depth:	1.54 (m)
Mean Velocity:	0.03 (m/s)
Reynolds Number:	3.53E+04
Froude Number:	0.01

Logger Details:	
Transducer Reading (m):	Before: 2.416 After: 2.419
Water (°C):	10.6 10.9
Datalogger Clock:	11:06 12:32
Laptop Clock:	11:05 12:31
Battery (Minn):	14.2 13.6
Battery:	Good
Battery Serial #:	-
Enclosure Desiccant:	Replaced
Mem Tube Desiccant:	Good
PTF (if replaced):	-
Logger# (if replaced):	-

Argonaut Details:	
Water Level (m):	Before: -1.615 After: -1.584
Index Velocity (m/s):	0.114 0.089
Water (°C):	10.65 10.89
Discharge (m ³ /s):	0.807 0.656

Datalogger / Station Notes:

General Notes:

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.08	LB:	6.80		
Serial Number:	4712	Bainby (gpd):	0.0	RB:	1.50		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	10.7	System Test Passed: Yes			
		ADCP Temperature (°C):	12.5				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean:	Percent of Pass Measured (%)
Track Reference: Bottom-Track	11	0.00	5.89	9.29	0.028	0.264	1.54%
Depth Reference: Vertical beam	12	0.00	5.88	8.51	0.03	0.255	-1.92%
Coordinate System: ENL	15	0.00	5.29	8.47	0.031	0.261	0.38%
Left Method: Sloped bank							
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
	Mean:	5.68	8.76	0.030	0.260		
	SD:	0.28	0.38	0.001	0.004		
	COV:	0.05	0.04	0.042	0.014		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S58-2	0.975	100.865		99.890	99.890	3/4" Pipe SW of logger
S55-1			0.903	99.962	100.000	3/4" Pipe W of logger
S58-3			0.998	99.867	99.869	3/4" Pipe S of logger
Water Level:	Cut		1.580	99.277		Time WL Surveyed: 11:20
Temporary BM			0.830	100.235		0.000
Turn						
Temporary BM	0.619	100.854		100.235		
Water Level:	Cut		1.580	99.274		Time WL Surveyed: 11:25
S58-3			0.985	99.869	99.869	3/4" Pipe S of logger
S55-1			0.881	99.963	100.000	3/4" Pipe W of logger
S58-2			0.963	99.891	99.890	3/4" Pipe SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S58-3	0.985	100.853		99.868		
Water Level:	Cut		1.580	99.273		Time WL Surveyed: 12:26
Water Level:	Cut		1.569	99.274		Time WL Surveyed: 12:29
S58-3	0.975	100.843		99.868		

WL Survey Summary		
Average WL:	Before	After
Closing Error:	-0.001	-
WL Check:	0.003	-0.001
Transducer Elevation:	96.858	96.856

Level Survey Equipment:	
Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:			
Data Entry Personnel:	SM, JC	Trip Date:	11-Sep-15
Data Check Personnel:	SM	Date:	11-Sep-15
Entered Digitally in the Field:	Yes	Date:	26-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake
 UTM Location: 511444E 6167182N

Site Visit Date: October 16, 2015
 Site Visit Time (MST): 11:30



Flow Measurement Details:	
Metering Section Location (describe): Under bridge	
Meas. Start Time (MST):	12:10
Meas. End Time (MST):	12:35
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Low flow, high WL
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, light breeze, BC

Flow characteristics:	
Total Flow:	0.129 (m ³ /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	8.58 (m ²)
Wetted Width:	8.83 (m)
Hydraulic Depth:	0.97 (m)
Mean Velocity:	0.02 (m/s)
Reynolds Number:	9.27E+03
Froude Number:	0.00

Logger Details:		
	Before	After
Transducer Reading (m):	2.360	2.361
Water (°C):	4.0	4.2
Datalogger Clock:	11:36	13:01
Laptop Clock:	11:35	13:00
Battery (Minn):	14.0	14.4
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	-
Mem Tube Deseccant:	Good	-
PTF# (if replaced):	-	-
Logger# (if replaced):	-	-

Argonaut Details:		
	Before	After
Water Level (m):	-1.653	-1.655
Index Velocity (m/s):	0.015	-1.6
Water (°C):	3.8	0.025
Discharge (m ³ /s):	0.041	-0.11

Datalogger / Station Notes:

General Notes:

-Crew did 10 passes with ADCP, no consistent flow

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	7.15		
Serial Number:	4712	Safety (gpd):	0.0	RB:	1.30		
Firmware Version:	3.8	Magnetic Declination (°):	14.3				
Software Version:	3.8	Measured Temperature (°C):	4.0				
		ADCP Temperature (°C):	5.5				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean:	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	8.91	8.48	0.016	0.135	4.38%
Depth Reference: Vertical beam	5	0.00	8.79	8.92	0.016	0.143	10.57%
Coordinate System: ENL	9	0.00	8.78	8.35	0.013	0.11	-14.95%
Left Method: Sloped bank							
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
				Mean:	8.63	8.58	0.015
				SD:	0.06	0.25	0.001
				COV:	0.01	0.03	0.094
						0.129	0.014
						0.109	

Level Survey:						
Station	BS - (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S58-2	1.175	101.065		99.890	99.890	3/4" Pipe SW of logger
S58-1			1.103	99.962	100.000	3/4" Pipe W of logger
S58-3			1.199	99.866	99.869	3/4" Pipe S of logger
Turn						
Water Level:	Cut		1.849	99.216		Time WL Surveyed: 11:57
Temporary BM			0.474	100.591	0.000	Lowest I beam corner on RB, closest to SL
Turn						
Temporary BM	0.398	100.989		100.591		Lowest I beam corner on RB, closest to SL
Water Level:	Cut		1.772	99.217		Time WL Surveyed: 11:56
S58-3			1.121	99.868	99.869	3/4" Pipe S of logger
S58-1			1.027	99.962	100.000	3/4" Pipe W of logger
S58-2			1.098	99.891	99.890	3/4" Pipe SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S58-3	1.122	100.989		99.867		
Water Level:	Cut		1.772	99.217		Time WL Surveyed: 12:41
Water Level:	Cut		1.742	99.220		Time WL Surveyed: 12:43
S58-3	1.095	100.962		99.867		

WL Survey Summary		
	Before	After
Average WL:	99.217	99.219
Closing Error:	-0.001	-
WL Check:	0.001	-0.003
Transducer Elevation:	96.857	96.858

Level Survey Equipment:		
Level #:		Level#2
Make & Model:		Nikon AC-2S
Serial #:		668859

Field Personnel:			
Data Entry Personnel:	TR, GG	Trip Date:	16-Oct-15
Data Check Personnel:	TR	Date:	16-Oct-15
Entered Digitally in the Field:	Yes	Date:	3-Nov-15

Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake
 UTM Location: 511145E 6159877N

Site Visit Date: April 15, 2015
 Site Visit Time (MST): 10:18



Flow Measurement:

Flow Measurement Not Conducted

Total Flow -

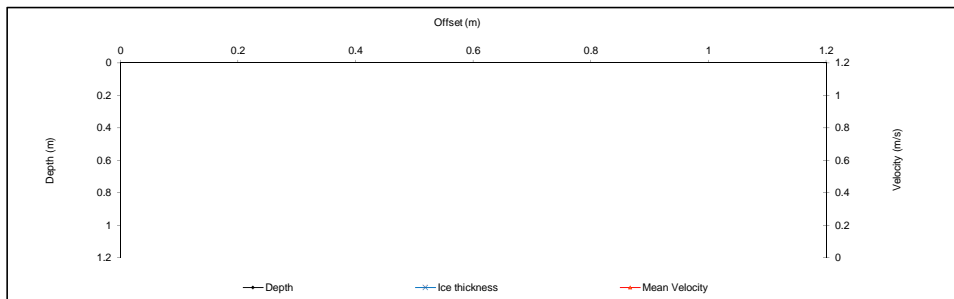
Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	

Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	



Logger Details:

	Before	After
Transducer Reading (m):	1.461	1.462
Water (°C):	0.4	0.4
Datalogger Clock:	10:18	10:31
Laptop Clock:	10:18	10:31
Battery (Main):	13.8	13.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Discharge measurement not conducted due to bed ice and submerged ice in channel. Unsafe access

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S60-1	0.757	100.757		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			0.810	99.947	99.947	3/4" Pipe 4m E of logger
S60-3			0.963	99.794	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.092	97.665	Time WL Surveyed:	10:26
Temporary BM			3.223	97.534	0.000	-
Turn						
Temporary BM	3.207	100.741		97.534		-
Water Level:	Cut		3.074	97.667	Time WL Surveyed:	10:28
S60-3			0.947	99.794	99.798	3/4" Pipe 6m E of logger
S60-2			0.795	99.946	99.947	3/4" Pipe 4m E of logger
S60-1			0.743	99.998	100.000	3/4" Pipe 8m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	97.665	-
Closing Error:	0.002	-
WL Check:	0.002	-
Transducer Elevation	96.205	-

Field Personnel:

	SM, GG	Trip Date:	15-Apr-15
Data Entry Personnel:	SM	Date:	15-Apr-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake
 UTM Location: 511145E 6159877N

Site Visit Date: May 14, 2015
 Site Visit Time (MST): 10:15

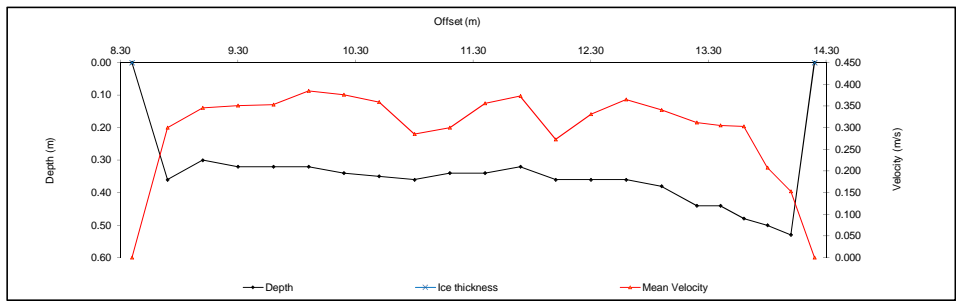


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.40	0.00	0.00	0.00	0.000	0.00	0.000	0.00	0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	8.70	0.36		0.22	0.300					1.00	0.30	0.36	0.300	0.11	0.032	5%
2	9.00	0.30		0.18	0.346					1.00	0.30	0.30	0.346	0.09	0.031	5%
3	9.30	0.32		0.19	0.351					1.00	0.30	0.32	0.351	0.10	0.034	5%
4	9.60	0.32		0.19	0.353					1.00	0.30	0.32	0.353	0.10	0.034	5%
5	9.90	0.32		0.19	0.385					1.00	0.30	0.32	0.385	0.10	0.037	6%
6	10.20	0.34		0.20	0.376					1.00	0.30	0.34	0.376	0.10	0.038	6%
7	10.50	0.35		0.21	0.359					1.00	0.30	0.35	0.359	0.11	0.038	6%
8	10.80	0.36		0.22	0.285					1.00	0.30	0.36	0.285	0.11	0.031	5%
9	11.10	0.34		0.20	0.300					1.00	0.30	0.34	0.300	0.10	0.031	5%
10	11.40	0.34		0.20	0.356					1.00	0.30	0.34	0.356	0.10	0.036	6%
11	11.70	0.32		0.19	0.373					1.00	0.30	0.32	0.373	0.10	0.036	6%
12	12.00	0.36		0.22	0.273					1.00	0.30	0.36	0.273	0.11	0.029	5%
13	12.30	0.36		0.22	0.331					1.00	0.30	0.36	0.331	0.11	0.036	6%
14	12.60	0.36		0.22	0.365					1.00	0.30	0.36	0.365	0.11	0.039	6%
15	12.90	0.38		0.23	0.341					1.00	0.30	0.38	0.341	0.11	0.039	6%
16	13.20	0.44		0.26	0.312					1.00	0.25	0.44	0.312	0.11	0.034	5%
17	13.40	0.44		0.26	0.305					1.00	0.20	0.44	0.305	0.09	0.027	4%
18	13.60	0.48		0.29	0.303					1.00	0.20	0.48	0.303	0.10	0.029	4%
19	13.80	0.50		0.30	0.208					1.00	0.20	0.50	0.208	0.10	0.021	3%
20	14.00	0.53		0.32	0.153					1.00	0.20	0.53	0.153	0.11	0.016	3%
LB	14.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.10	0.00	0.000	0.00	0.000		
Total Flow														0.648	100%	

Flow Measurement Details:

Metering Section Location (describe):
15m upstream of pressure transducer

Meas. Start Time (MST):	10:30
Meas. End Time (MST):	10:55
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 15C



Flow characteristics:

Total Flow:	0.648	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.04	(m ²)
Wetted Width:	5.80	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.17	

Logger Details:

	Before	After
Transducer Reading (m):	1.247	1.248
Water (°C):	8.5	8.6
Datalogger Clock:	10:19	10:56
Logger Clock:	10:18	10:55
Battery (Main):	14.1	14.3
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	298705	-
Logger# (if replaced):	25573	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S60-1	0.461	100.461		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			0.514	99.947	99.947	3/4" Pipe 4m E of logger
S60-3			0.667	99.794	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.013	97.448	Time WL Surveyed:	10:26
S60-3			0.667	99.794	99.798	3/4" Pipe 6m E of logger
Turn						
S60-3	0.642	100.436		99.794	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		2.992	97.444	Time WL Surveyed:	10:27
S60-3			0.642	99.794	99.798	3/4" Pipe 6m E of logger
S60-2			0.492	99.944	99.947	3/4" Pipe 4m E of logger
S60-1			0.438	99.998	100.000	3/4" Pipe 8m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S60-2	0.492	100.438		99.946		
Water Level:	Cut		2.969	97.449	Time WL Surveyed:	10:59
Water Level:	Cut		2.963	97.449	Time WL Surveyed:	11:00
S60-2	0.466	100.412		99.946		

WL Survey Summary

	Before	After
Average WL:	97.446	97.449
Closing Error:	0.002	-
WL Check:	0.004	0.000
Transducer Elevation	96.199	96.201

Field Personnel:

	TR, MK	Trip Date:	14-May-15
Data Entry Personnel:	TR	Date:	14-May-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake
 UTM Location: 511145E 6159877N

Site Visit Date: June 10, 2015
 Site Visit Time (MST): 08:25

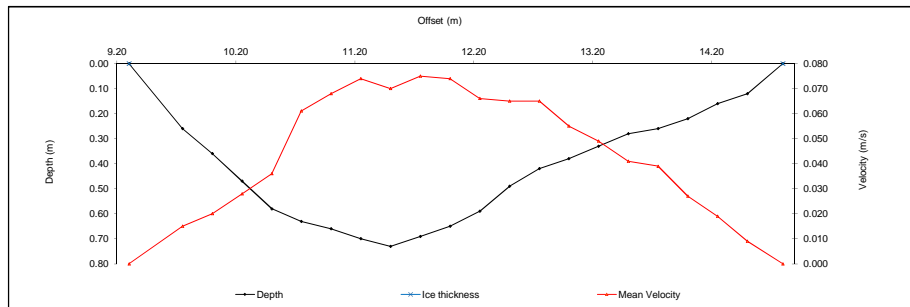


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	9.30	0.00	0.00		0.000				0.000	1.00	0.23	0.00	0.000	0.00	0.000	
1	9.75	0.26		0.16	0.015					1.00	0.35	0.26	0.015	0.09	0.001	1%
2	10.00	0.36		0.22	0.020					1.00	0.25	0.36	0.020	0.09	0.002	1%
3	10.25	0.47		0.28	0.028					1.00	0.25	0.47	0.028	0.12	0.003	3%
4	10.50	0.58		0.35	0.036					1.00	0.25	0.58	0.036	0.15	0.005	4%
5	10.75	0.63		0.38	0.061					1.00	0.25	0.63	0.061	0.16	0.010	8%
6	11.00	0.66		0.40	0.069					1.00	0.25	0.66	0.069	0.17	0.011	9%
7	11.25	0.70		0.42	0.074					1.00	0.25	0.70	0.074	0.18	0.013	10%
8	11.50	0.73		0.44	0.070					1.00	0.25	0.73	0.070	0.18	0.013	10%
9	11.75	0.69		0.41	0.075					1.00	0.25	0.69	0.075	0.17	0.013	10%
10	12.00	0.65		0.39	0.074					1.00	0.25	0.65	0.074	0.16	0.012	10%
11	12.25	0.59		0.35	0.066					1.00	0.25	0.59	0.066	0.15	0.010	8%
12	12.50	0.49		0.29	0.065					1.00	0.25	0.49	0.065	0.12	0.008	6%
13	12.75	0.42		0.25	0.065					1.00	0.25	0.42	0.065	0.11	0.007	5%
14	13.00	0.38		0.23	0.055					1.00	0.25	0.38	0.055	0.10	0.005	4%
15	13.25	0.33		0.20	0.049					1.00	0.25	0.33	0.049	0.08	0.004	3%
16	13.50	0.28		0.17	0.041					1.00	0.25	0.28	0.041	0.07	0.003	2%
17	13.75	0.26		0.16	0.039					1.00	0.25	0.26	0.039	0.07	0.003	2%
18	14.00	0.22		0.13	0.027					1.00	0.25	0.22	0.027	0.06	0.001	1%
19	14.25	0.16		0.10	0.019					1.00	0.25	0.16	0.019	0.04	0.001	1%
20	14.50	0.12		0.07	0.009					1.00	0.28	0.12	0.009	0.03	0.000	0%
LB	14.80	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	0%
Total Flow														0.125	100%	

Flow Measurement Details:

Metering Section Location (describe):
15m upstream of pressure transducer

Meas. Start Time (MST):	8:42
Meas. End Time (MST):	9:03
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15C



Flow characteristics:

Total Flow:	0.125	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.27	(m ²)
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.05	(m/s)
Reynolds Number:	1.88E+04	
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.906	0.908
Water (°C):	13.3	13.3
Datalogger Clock:	08:27	09:11
Laptop Clock:	08:26	09:12
Battery:	13.9	14.1
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:
-Ran ADV test, all good

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S60-1	0.916	100.916		100.000	100.000	3/4" Pipe 8m NE of logger
S60-3			1.122	99.794	99.798	3/4" Pipe 6m E of logger
S60-2			0.971	99.945	99.947	3/4" Pipe 4m E of logger
Water Level:	Cut		3.809	97.107		Time WL Surveyed: 8:32
S60-2			0.971	99.945	99.947	3/4" Pipe 4m E of logger
Turn						
S60-2	0.947	100.892		99.945	99.947	3/4" Pipe 4m E of logger
Water Level:	Cut		3.786	97.106		Time WL Surveyed: 8:33
S60-2			0.947	99.945	99.947	3/4" Pipe 4m E of logger
S60-3			1.099	99.793	99.798	3/4" Pipe 6m E of logger
S60-1			0.893	99.999	100.000	3/4" Pipe 8m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S60-3	1.099	100.893		99.794		Time WL Surveyed: 9:08
Water Level:	Cut		3.787	97.106		Time WL Surveyed: 9:09
Water Level:	Cut		3.748	97.109		
S60-3	1.063	100.857		99.794		

WL Survey Summary

	Before	After
Average WL:	97.107	97.108
Closing Error:	0.001	-
WL Check:	0.001	-0.003
Transducer Elevation	96.201	96.200

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	TR, MK	Trip Date:	10-Jun-15
Data Entry Personnel:	TR	Date:	10-Jun-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake
 UTM Location: 511145E 6159877N

Site Visit Date: August 12, 2015
 Site Visit Time (MST): 10:30

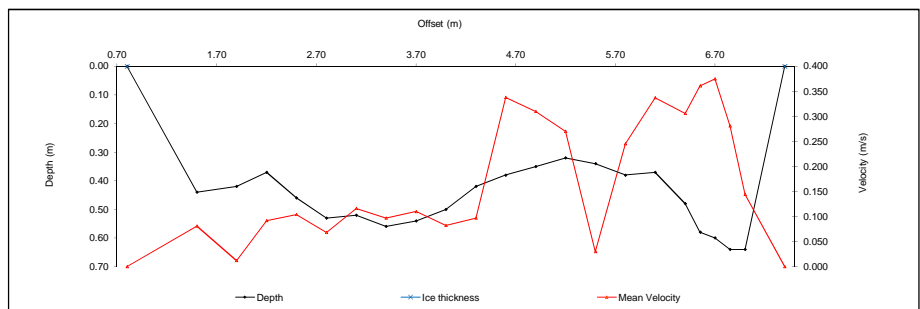


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000				0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	1.50	0.44		0.26	0.081					1.00	0.55	0.44	0.081	0.24	0.020	4%
2	1.90	0.42		0.25	0.012					1.00	0.35	0.42	0.012	0.15	0.002	0%
3	2.20	0.37		0.22	0.092					1.00	0.30	0.37	0.092	0.11	0.010	2%
4	2.50	0.46		0.28	0.104					1.00	0.30	0.46	0.104	0.14	0.014	3%
5	2.80	0.53		0.32	0.068					1.00	0.30	0.53	0.068	0.16	0.011	2%
6	3.10	0.52		0.31	0.116					1.00	0.30	0.52	0.116	0.16	0.018	4%
7	3.40	0.56		0.34	0.097					1.00	0.30	0.56	0.097	0.17	0.016	4%
8	3.70	0.54		0.32	0.110					1.00	0.30	0.54	0.110	0.16	0.018	4%
9	4.00	0.50		0.30	0.082					1.00	0.30	0.50	0.082	0.15	0.012	3%
10	4.30	0.42		0.25	0.097					1.00	0.30	0.42	0.097	0.13	0.012	3%
11	4.60	0.38		0.23	0.338					1.00	0.30	0.38	0.338	0.11	0.039	9%
12	4.90	0.35		0.21	0.310					1.00	0.30	0.35	0.310	0.11	0.033	7%
13	5.20	0.32		0.19	0.270					1.00	0.30	0.32	0.270	0.10	0.028	6%
14	5.50	0.34		0.20	0.030					1.00	0.30	0.34	0.030	0.10	0.003	1%
15	5.80	0.38		0.23	0.245					1.00	0.30	0.38	0.245	0.11	0.028	6%
16	6.10	0.37		0.22	0.337					1.00	0.30	0.37	0.337	0.11	0.037	8%
17	6.40	0.48		0.29	0.306					1.00	0.23	0.48	0.306	0.11	0.033	7%
18	6.55	0.58		0.35	0.361					1.00	0.15	0.58	0.361	0.09	0.031	7%
19	6.70	0.60		0.36	0.375					1.00	0.15	0.60	0.375	0.09	0.034	8%
20	6.85	0.64		0.38	0.281					1.00	0.15	0.64	0.281	0.10	0.027	6%
21	7.00	0.64		0.38	0.144					1.00	0.28	0.64	0.144	0.18	0.025	6%
LB	7.40	0.00	0.00		0.00				0.00	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.449	100%	

Flow Measurement Details:

Metering Section Location (describe):
8m upstream of pressure transducer

Meas. Start Time (MST):	10:55
Meas. End Time (MST):	11:20
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 25C



Flow characteristics:

Total Flow:	0.449	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.76	(m ²)
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	6.48E+04	
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	1.254	0.997
Water (°C):	17.3	19.6
Datalogger Clock:	10:39	11:43
Laptop Clock:	10:38	11:42
Battery:	13.8	14.1
Battery Condition:		Good
Battery Serial #:		
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	298705	252793
Logger# (if replaced):	25573	-

Datalogger / Station Notes:

- Ran ADV test, all good
- Some veg. present in channel
- Pressure transducer replaced for calibration

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S60-1	0.887	100.887		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			0.940	99.947	99.947	3/4" Pipe 4m E of logger
S60-3			1.090	99.797	99.798	3/4" Pipe 6m E of logger
Water Level:						
S60-3	Cut		3.430	97.457	97.457	Time WL Surveyed: 10:45
S60-3			1.090	99.797	99.798	
Turn						
S60-3	1.057	100.854		99.797	99.798	
Water Level:						
S60-3	Cut		3.401	97.453	97.453	Time WL Surveyed: 10:47
S60-3			1.057	99.797	99.798	3/4" Pipe 6m E of logger
S60-2			0.907	99.947	99.947	3/4" Pipe 4m E of logger
S60-1			0.853	100.001	100.000	3/4" Pipe 8m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S60-2	0.907	100.854		99.947	99.947	
Water Level:						
S60-2	Cut		3.404	97.450	97.450	Time WL Surveyed: 11:39
S60-2			3.377	97.452	97.452	Time WL Surveyed: 11:40
S60-2	0.882	100.829		99.947	99.947	

WL Survey Summary

	Before	After
Average WL:	97.455	97.451
Closing Error:	-0.001	-
WL Check:	0.004	-0.002
Transducer Elevation	96.201	96.454

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Field Personnel:	TR, DW	Trip Date:	12-Aug-15
Data Entry Personnel:	TR	Date:	12-Aug-15
Data Check Personnel:	TR	Date:	25-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake
 UTM Location: 511145E 6159877N

Site Visit Date: September 8, 2015
 Site Visit Time (MST): 12:55

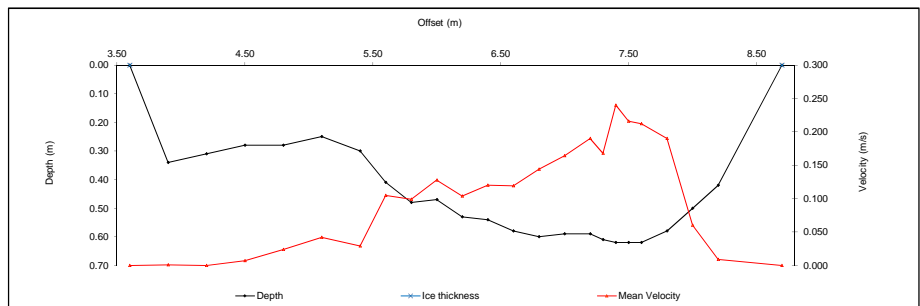


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	3.60	0.00	0.00		0.000		0.000		0.000							
1	3.90	0.34		0.20	0.001					1.00	0.30	0.34	0.001	0.10	0.000	0%
2	4.20	0.31		0.19	0.000					1.00	0.30	0.31	0.000	0.09	0.000	0%
3	4.50	0.28		0.17	0.007					1.00	0.30	0.28	0.007	0.08	0.001	0%
4	4.80	0.28		0.17	0.024					1.00	0.30	0.28	0.024	0.08	0.002	1%
5	5.10	0.25		0.15	0.042					1.00	0.30	0.25	0.042	0.08	0.003	1%
6	5.40	0.30		0.19	0.029					1.00	0.25	0.30	0.029	0.08	0.002	1%
7	5.60	0.41		0.25	0.105					1.00	0.20	0.41	0.105	0.08	0.009	4%
8	5.80	0.48		0.29	0.099					1.00	0.20	0.48	0.099	0.10	0.010	4%
9	6.00	0.47		0.28	0.128					1.00	0.20	0.47	0.128	0.09	0.012	6%
10	6.20	0.53		0.32	0.104					1.00	0.20	0.53	0.104	0.11	0.011	5%
11	6.40	0.54		0.32	0.120					1.00	0.20	0.54	0.120	0.11	0.013	6%
12	6.60	0.58		0.35	0.119					1.00	0.20	0.58	0.119	0.12	0.014	6%
13	6.80	0.58		0.35	0.144					1.00	0.20	0.60	0.144	0.12	0.017	8%
14	7.00	0.59		0.35	0.164					1.00	0.20	0.59	0.164	0.12	0.019	9%
15	7.20	0.59		0.35	0.190					1.00	0.15	0.59	0.190	0.09	0.017	8%
16	7.30	0.61		0.37	0.168					1.00	0.10	0.61	0.168	0.06	0.010	5%
17	7.40	0.62		0.37	0.240					1.00	0.10	0.62	0.240	0.06	0.015	7%
18	7.50	0.62		0.37	0.216					1.00	0.10	0.62	0.216	0.06	0.013	6%
19	7.60	0.62		0.37	0.212					1.00	0.15	0.62	0.212	0.09	0.020	9%
20	7.80	0.58		0.35	0.190					1.00	0.20	0.58	0.190	0.12	0.022	10%
21	8.00	0.50		0.30	0.060					1.00	0.20	0.50	0.060	0.10	0.006	3%
22	8.20	0.42		0.25	0.009					1.00	0.35	0.42	0.009	0.15	0.001	1%
LB	8.70	0.00	0.00		0.00		0.00		0.00							
Total Flow														0.217	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m upstream of bridge

Meas. Start Time (MST):	13:31
Meas. End Time (MST):	14:03
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow, clear
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 11C



Flow characteristics:

Total Flow:	0.217	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.08	(m ²)
Wetted Width:	5.10	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.10	(m/s)
Reynolds Number:	3.30E+04	
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.834	0.833
Water (°C):	10.8	11.1
Datalogger Clock:	13:02	14:17
Laptop Clock:	13:01	14:16
Battery:	14.4	13.9
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S60-3	1.747	101.545		99.798	99.798	3/4" Pipe 6m E of logger
S60-2			1.596	99.949	99.947	3/4" Pipe 4m E of logger
S60-1			1.543	100.002	100.000	3/4" Pipe 8m NE of logger
Water Level:	Cut		4.260	97.285		Time WL Surveyed: 13:13
Temporary BM			3.369	98.176	0.000	
Turn						
Temporary BM	3.351	101.527		98.176		
Water Level:	Cut		4.246	97.281		Time WL Surveyed: 13:17
S60-1			1.524	100.003	100.000	3/4" Pipe 8m NE of logger
S60-2			1.578	99.949	99.947	3/4" Pipe 4m E of logger
S60-3			1.727	99.800	99.798	3/4" Pipe 6m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S60-3	1.728	101.526		99.798		
Water Level:	Cut		4.247	97.279		Time WL Surveyed: 14:10
Water Level:	Cut		4.220	97.278		Time WL Surveyed: 14:13
S60-3	1.700	101.498		99.798		

WL Survey Summary

	Before	After
Average WL:	97.283	97.279
Closing Error:	-0.002	-
WL Check:	0.004	0.001
Transducer Elevation	96.449	96.446

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	SM, JC	Trip Date:	8-Sep-15
Data Check Personnel:	SM	Date:	8-Sep-15
Entered Digitally in the Field:	TR	Date:	26-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake
 UTM Location: 511145E 6159877N

Site Visit Date: October 13, 2015
 Site Visit Time (MST): 11:50

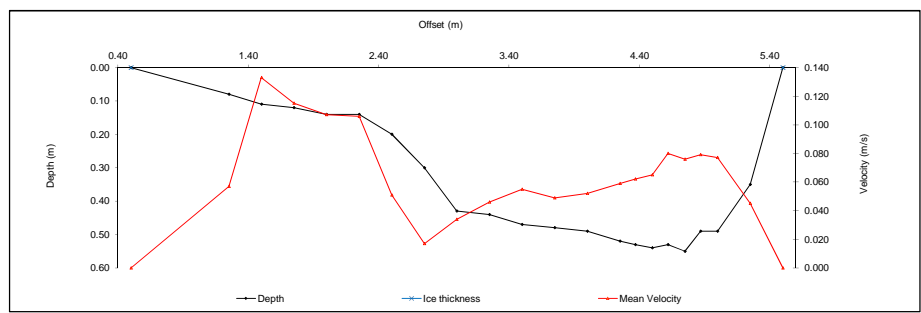


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	5.50	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	5.25	0.35		0.21	0.045					1.00	0.25	0.35	0.045	0.09	0.004	4%
2	5.00	0.49		0.29	0.077					1.00	0.19	0.49	0.077	0.09	0.007	8%
3	4.87	0.49		0.29	0.079					1.00	0.13	0.49	0.079	0.06	0.005	5%
4	4.75	0.55		0.33	0.076					1.00	0.13	0.55	0.076	0.07	0.005	6%
5	4.62	0.53		0.32	0.080					1.00	0.13	0.53	0.080	0.07	0.005	6%
6	4.50	0.54		0.32	0.065					1.00	0.13	0.54	0.065	0.07	0.004	5%
7	4.37	0.53		0.32	0.062					1.00	0.13	0.53	0.062	0.07	0.004	5%
8	4.25	0.52		0.31	0.059					1.00	0.19	0.52	0.059	0.10	0.006	6%
9	4.00	0.49		0.29	0.052					1.00	0.25	0.49	0.052	0.12	0.006	7%
10	3.75	0.48		0.29	0.049					1.00	0.25	0.48	0.049	0.12	0.006	7%
11	3.50	0.47		0.28	0.055					1.00	0.25	0.47	0.055	0.12	0.006	7%
12	3.25	0.44		0.26	0.046					1.00	0.25	0.44	0.046	0.11	0.005	6%
13	3.00	0.43		0.25	0.034					1.00	0.25	0.43	0.034	0.11	0.004	4%
14	2.75	0.30		0.18	0.017					1.00	0.25	0.30	0.017	0.08	0.001	1%
15	2.50	0.20		0.12	0.051					1.00	0.25	0.20	0.051	0.05	0.003	3%
16	2.25	0.14		0.08	0.106					1.00	0.25	0.14	0.106	0.04	0.004	4%
17	2.00	0.14		0.08	0.107					1.00	0.25	0.14	0.107	0.04	0.004	4%
18	1.75	0.12		0.07	0.115					1.00	0.25	0.12	0.115	0.03	0.003	4%
19	1.50	0.11		0.07	0.133					1.00	0.25	0.11	0.133	0.03	0.004	4%
20	1.25	0.08		0.05	0.057					1.00	0.50	0.08	0.057	0.04	0.002	2%
LB	0.50	0.00	0.00		0.000		0.000		0.000	1.00	0.38	0.00	0.000	0.00	0.000	
Total Flow														0.089	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m upstream of pressure transducer

Meas. Start Time (MST):	12:05
Meas. End Time (MST):	12:30
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 8C



Flow characteristics:

Total Flow:	0.089	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.48	(m ²)
Wetted Width:	5.00	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.06	(m/s)
Reynolds Number:	1.17E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.672	0.672
Water (°C):	5.3	5.7
Datalogger Clock:	11:52	12:40
Laptop Clock:	11:51	12:39
Battery:	14.1	14.4
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dissicant:	-	Replaced
Vent Tube Dissicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S60-1	0.697	100.697		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			0.749	99.948	99.947	3/4" Pipe 4m E of logger
S60-3			0.901	99.796	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.564	97.133		Time WL Surveyed: 11:57
S60-3			0.901	99.796	99.798	3/4" Pipe 6m E of logger
Turn						
S60-3	0.867	100.663		99.796	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.527	97.136		Time WL Surveyed: 12:00
S60-3			0.967	99.796	99.798	3/4" Pipe 6m E of logger
S60-2			0.715	99.948	99.947	3/4" Pipe 4m E of logger
S60-1			0.683	100.000	100.000	3/4" Pipe 8m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S60-2	0.716	100.664		99.948		Time WL Surveyed: 12:34
Water Level:	Cut		3.527	97.137		Time WL Surveyed: 12:36
Water Level:	Cut		3.447	97.136		
S60-2	0.637	100.585		99.948		

WL Survey Summary

	Before	After
Average WL:	97.135	97.138
Closing Error:	0.000	-
WL Check:	0.003	-0.001
Transducer Elevation	96.463	96.466

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

	TR, GG	Trip Date:	13-Oct-15
Data Entry Personnel:	TR	Date:	13-Oct-15
Data Check Personnel:	TR	Date:	3-Nov-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake
 UTM Location: 511145E 6159877N

Site Visit Date: December 7, 2015
 Site Visit Time (MST): 11:50

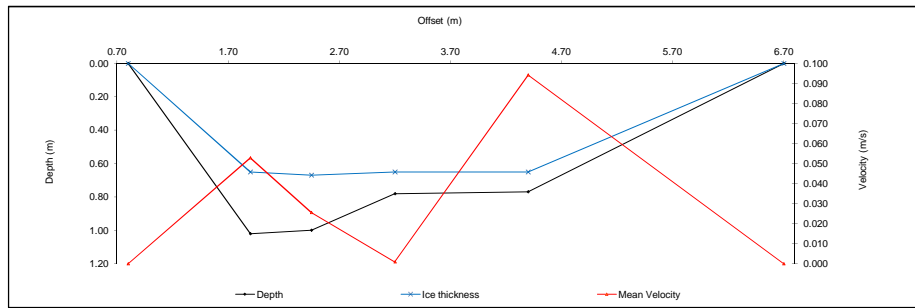


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.80	0.00	0.00	0.84	0.060	0.00	0.00	0.00	0.00	0.88	0.55	0.00	0.000	0.00	0.000	
1	1.90	1.02	0.65	0.84	0.060					0.88	0.83	0.37	0.053	0.31	0.016	39%
2	2.45	1.00	0.67	0.84	0.029					0.88	0.65	0.33	0.026	0.21	0.005	13%
3	3.20	0.78	0.65	0.72	0.001					0.88	0.98	0.13	0.001	0.13	0.000	0%
4	4.40	0.77	0.65	0.71	0.107					0.88	1.75	0.12	0.094	0.21	0.020	48%
LB	6.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	1.15	0.00	0.000	0.00	0.000	
Total Flow														0.042	100%	

Flow Measurement Details:

Metering Section Location (describe):
20m US of station

Meas. Start Time (MST):	12:20
Meas. End Time (MST):	12:30
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Overflow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Sunny, -2C



Flow characteristics:

Total Flow:	0.042	(m ³ /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.86	(m ²)
Wetted Width:	5.90	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.05	(m/s)
Reynolds Number:	4.67E+03	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.671	-
Water (°C):	5.7	-
Datalogger Clock:	12:56	-
Laptop Clock:	11:55	-
Battery:	12.5	13.0
Battery Condition:	Replaced	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Many layers of ice and slush under ice. Lots of overflow. Poor flow measurement. Assesed river for other locations for flow measurement, but conditions are consistently poor.

Many ADV errors. Only 4 mmt panels possible.

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S60-1	0.472	100.472		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			0.525	99.947	99.947	3/4" Pipe 4m E of logger
S60-3			0.677	99.795	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		2.820	97.652		Time WL Surveyed: 12:12
S60-1			0.472	100.000	100.000	3/4" Pipe 8m NE of logger
Turn						
S60-1	0.449	100.449		100.000	100.000	3/4" Pipe 8m NE of logger
Water Level:	Cut		2.800	97.649		Time WL Surveyed: 12:14
S60-3			0.655	99.794	99.798	3/4" Pipe 6m E of logger
S60-2			0.503	99.946	99.947	3/4" Pipe 4m E of logger
S60-1			0.449	100.000	100.000	3/4" Pipe 8m NE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.651	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	96.980	-

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Canseal AT-24
Serial #:	76710

Field Personnel:

	DW, GG	Trip Date:	7-Dec-15
Data Entry Personnel:	DW, GG	Date:	7-Dec-15
Data Check Personnel:	JG	Date:	8-Jan-16
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leismor
 UTM Location: 466037E 6193791N

Site Visit Date: January 12, 2015
 Site Visit Time (MST): 13:30



Flow Measurement:													
Measured Data								Calculated Data					
Bank/	Depth from	Depth of Obs.	Velocity @ 0.5	Depth of Obs.	Velocity @ 0.2	Velocity @ 0.2	Velocity Correction	Pannel Width	Effective Pannel	Effective Average Pannel	Pannel Area	Pannel Discharge	Percent of total flow
Mm#	WS	@ 0.5 Depth	Depth	@ 0.8	Depth	Depth	Factor	(m)	Depth	Velocity	(m ²)	(m ³ /s)	(%)
(m)	(m)	(m)	(m/s)	(m)	(m/s)	(m)	(m)	(m)	(m)	(m/s)	(m ²)	(m ³ /s)	(%)
LB	1.50	0.00	0.00	0.00	0.00	0.00	0.88	0.48	0.00	0.00	0.00	0.00	
1	2.45	0.40	0.28	0.34	0.000		0.88	0.75	0.12	0.000	0.09	0.000	0%
2	3.00	0.41	0.28	0.35	0.158		0.88	0.83	0.13	0.139	0.11	0.015	1%
3	4.10	0.51	0.26	0.39	0.186		0.88	1.10	0.25	0.164	0.28	0.045	4%
4	5.20	0.61	0.28	0.45	0.214		0.88	0.95	0.33	0.188	0.31	0.059	5%
5	6.00	0.62	0.30	0.46	0.224		0.88	0.90	0.32	0.197	0.29	0.057	5%
6	7.00	0.70	0.33	0.52	0.231		0.88	0.80	0.37	0.203	0.30	0.060	6%
7	7.60	0.63	0.31	0.47	0.208		0.88	0.75	0.32	0.183	0.24	0.044	4%
8	8.50	0.58	0.31	0.45	0.200		0.88	0.70	0.27	0.176	0.19	0.033	3%
9	9.00	0.58	0.30	0.44	0.171		0.88	0.57	0.28	0.150	0.16	0.024	2%
10	9.65	0.59	0.31	0.45	0.170		0.88	0.63	0.28	0.150	0.18	0.026	2%
11	10.25	0.61	0.33	0.47	0.170		0.88	0.63	0.28	0.150	0.18	0.026	2%
12	10.90	0.68	0.34	0.51	0.206		0.88	0.68	0.34	0.181	0.23	0.042	4%
13	11.60	0.70	0.30	0.50	0.223		0.88	0.68	0.40	0.196	0.27	0.053	5%
14	12.25	0.69	0.31	0.50	0.266		0.88	0.70	0.38	0.234	0.27	0.062	6%
15	13.00	0.80	0.30	0.55	0.243		0.88	0.73	0.50	0.214	0.36	0.078	7%
16	13.70	0.82	0.29	0.56	0.250		0.88	0.75	0.53	0.220	0.40	0.087	8%
17	14.50	0.80	0.27	0.54	0.296		0.88	0.73	0.53	0.260	0.38	0.100	9%
18	15.15	0.80	0.26	0.53	0.307		0.88	0.70	0.54	0.270	0.38	0.102	9%
19	15.90	0.63	0.24	0.44	0.330		0.88	0.87	0.39	0.290	0.34	0.099	9%
20	16.90	0.56	0.23	0.40	0.251		0.88	1.05	0.33	0.221	0.35	0.077	7%
RB	18.00	0.00	0.00	0.00	0.00	0.00	0.88	0.55	0.00	0.000	0.00	0.000	
Total Flow											1.09	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of station

Meas. Start Time (MST):	14:12
Meas. End Time (MST):	14:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -14C

Flow characteristics:

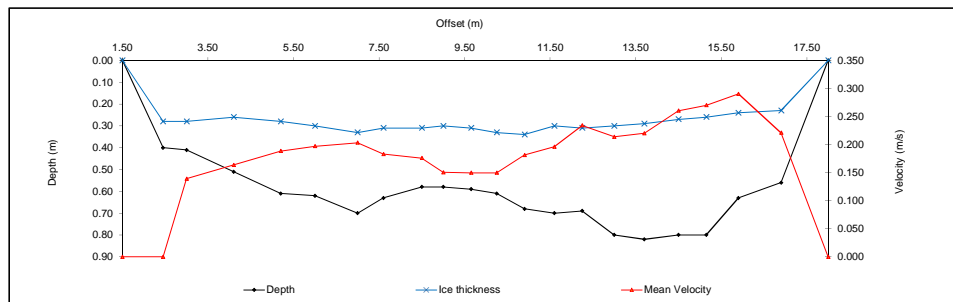
Total Flow:	1.09	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.29	(m ²)
Wetted Width:	16.50	(m)
Hydraulic Depth:	0.32	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.406	-
Water (°C):	0.2	-
Datalogger Clock:	13:38	-
Laptop Clock:	13:39	-
Battery (Main):	12.7	-
Battery:	Replaced	-
Battery Serial #:	-	1407008
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S61-3	1.429	101.449		100.020	100.020	3/4" Pipe 4m NW of logger
S61-2			0.924	100.525	100.525	3/4" Pipe 8m SW of logger
S61-1			1.451	99.998	100.000	3/4" Pipe 6m S of logger
Water Level:	Cut		5.057	96.392		Time WL Surveyed: 13:53
Temporary BM			5.055	96.394		
Turn						
Temporary BM	5.012	101.406		96.394		
Water Level:	Cut		5.016	96.390		Time WL Surveyed: 13:55
S61-1			1.407	99.999	100.000	3/4" Pipe 6m S of logger
S61-2			0.881	100.525	100.525	3/4" Pipe 8m SW of logger
S61-3			1.386	100.020	100.020	3/4" Pipe 4m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.391	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	95.985	-

Field Personnel:

Data Entry Personnel:	TR, DW	Trip Date:	12-Jan-15
Data Check Personnel:	TR, DW	Date:	12-Jan-15
Entered Digitally in the Field:	MP	Date:	12-Mar-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leismar
 UTM Location: 466037E 6193791N

Site Visit Date: February 7, 2015
 Site Visit Time (MST): 09:30

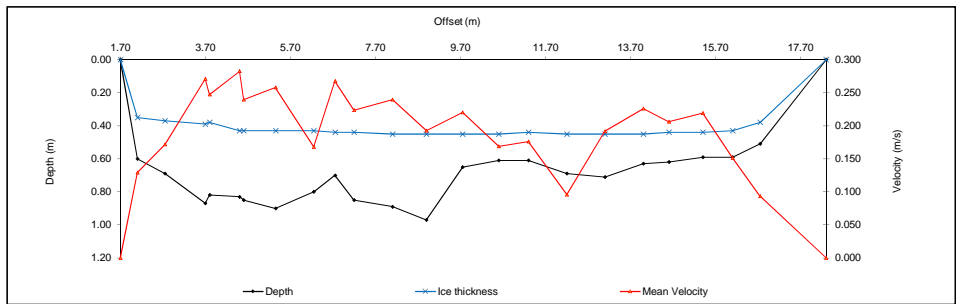


Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	18.30	0.00	0.00		0.000		0.000		0.000	0.88	0.78	0.00	0.000	0.00	0.000	
1	16.75	0.51	0.38	0.45	0.106					0.88	1.10	0.13	0.093	0.14	0.013	1%
2	16.10	0.59	0.43	0.51	0.172					0.88	0.68	0.16	0.151	0.11	0.016	2%
3	15.40	0.59	0.44	0.52	0.249					0.88	0.75	0.15	0.219	0.11	0.025	3%
4	14.60	0.62	0.44	0.53	0.234					0.88	0.70	0.18	0.206	0.13	0.026	3%
5	14.00	0.63	0.45	0.54	0.257					0.88	0.75	0.18	0.226	0.14	0.031	3%
6	13.10	0.71	0.45	0.58	0.218					0.88	0.90	0.26	0.192	0.23	0.045	5%
7	12.20	0.69	0.45	0.57	0.109					0.88	0.90	0.24	0.096	0.22	0.021	2%
8	11.30	0.61	0.44	0.53	0.200					0.88	0.80	0.17	0.176	0.14	0.024	3%
9	10.60	0.61	0.45	0.53	0.192					0.88	0.77	0.16	0.169	0.12	0.021	2%
10	9.75	0.65	0.45	0.55	0.250					0.88	0.85	0.20	0.220	0.17	0.037	4%
11	8.90	0.97	0.45	0.71	0.219					0.88	0.82	0.52	0.193	0.43	0.083	9%
12	8.10	0.89	0.45	0.67	0.272					0.88	0.85	0.44	0.239	0.37	0.090	10%
13	7.20	0.85	0.44	0.65	0.254					0.88	0.68	0.41	0.224	0.28	0.062	7%
14	6.75	0.70	0.44	0.57	0.304					0.88	0.48	0.26	0.268	0.12	0.033	4%
15	6.25	0.80	0.43	0.62	0.191					0.88	0.70	0.37	0.168	0.26	0.044	5%
16	5.35	0.90	0.43	0.67	0.293					0.88	0.83	0.47	0.258	0.39	0.100	11%
17	4.60	0.85	0.43	0.64	0.272					0.88	0.43	0.42	0.239	0.18	0.043	5%
18	4.50	0.83	0.43	0.63	0.321					0.88	0.40	0.40	0.282	0.16	0.045	5%
19	3.80	0.82	0.38	0.60	0.281					0.88	0.40	0.44	0.247	0.18	0.044	5%
20	3.70	0.87	0.39	0.63	0.308					0.88	0.53	0.48	0.271	0.25	0.068	7%
21	2.75	0.69	0.37	0.53	0.195					0.88	0.80	0.32	0.172	0.26	0.044	5%
22	2.10	0.60	0.35	0.48	0.147					0.88	0.53	0.25	0.129	0.13	0.017	2%
RB	1.70	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.930	100%	

Flow Measurement Details:

Metering Section Location (describe): 8m downstream of station

Meas. Start Time (MST):	9:55
Meas. End Time (MST):	10:18
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light snow, -20C



Flow characteristics:

Total Flow:	0.930	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.51	(m ²)
Wetted Width:	16.60	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.484	
Water (°C):	0.2	
Datalogger Clock:	09:35	
Laptop Clock:	09:35	
Battery (Main):	12.9	
Battery:	Good	
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-Ran ADV test, results good

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S61-3	1.680	101.700		100.020	100.020	3/4" Pipe 4m NW of logger
S61-2			1.172	100.528	100.525	3/4" Pipe 8m SW of logger
S61-1			1.699	100.001	100.000	3/4" Pipe 6m S of logger
Water Level:	Cut	5.235		96.465	Time WL Surveyed: 9:47	
Temporary BM		5.185		96.515	0.000	-
Turn						
Temporary BM	5.171	101.686		96.515		
Water Level:	Cut		5.217	96.469	Time WL Surveyed: 9:49	
S61-1			1.688	99.998	100.000	3/4" Pipe 6m S of logger
S61-2			1.159	100.527	100.525	3/4" Pipe 8m SW of logger
S61-3			1.667	100.019	100.020	3/4" Pipe 4m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	96.467	-
Closing Error:	0.001	-
WL Check:	0.004	-
Transducer Elevation	95.983	-

Field Personnel:

	TR, CJ	Trip Date:	7-Feb-15
Data Entry Personnel:	CJ	Date:	7-Feb-15
Data Check Personnel:	MP	Date:	12-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leisner
 UTM Location: 466037E 6193791N

Site Visit Date: March 9, 2015
 Site Visit Time (MST): 13:30

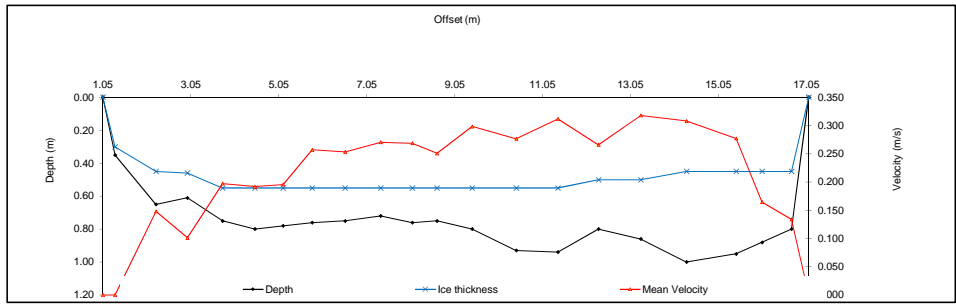


Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.05	0.00	0.00	0.33	0.000	0.000	0.000	0.000	0.000	0.88	0.14	0.00	0.000	0.00	0.000	
1	1.33	0.35	0.30	0.33	0.000					0.88	0.61	0.05	0.000	0.03	0.000	0%
2	2.26	0.65	0.45	0.55	0.168					0.88	0.82	0.20	0.148	0.16	0.024	2%
3	2.97	0.61	0.46	0.54	0.115					0.88	0.76	0.15	0.101	0.11	0.011	1%
4	3.77	0.75	0.55	0.65	0.224					0.88	0.77	0.20	0.197	0.15	0.030	3%
5	4.51	0.80	0.55	0.68	0.218					0.88	0.69	0.25	0.192	0.17	0.033	3%
6	5.15	0.78	0.55	0.67	0.222					0.88	0.65	0.23	0.195	0.15	0.029	3%
7	5.81	0.76	0.55	0.66	0.292					0.88	0.70	0.21	0.257	0.15	0.038	3%
8	6.56	0.75	0.55	0.65	0.288					0.88	0.78	0.20	0.253	0.16	0.040	3%
9	7.37	0.72	0.55	0.64	0.307					0.88	0.77	0.17	0.270	0.13	0.035	3%
10	8.09	0.76	0.55	0.66	0.305					0.88	0.64	0.21	0.268	0.13	0.036	3%
11	8.65	0.75	0.55	0.65	0.285					0.88	0.68	0.20	0.251	0.14	0.034	3%
12	9.45	0.80	0.55	0.68	0.339					0.88	0.90	0.25	0.298	0.23	0.067	6%
13	10.45	0.93	0.55	0.74	0.314					0.88	0.98	0.38	0.276	0.37	0.102	9%
14	11.40	0.94	0.55	0.75	0.354					0.88	0.93	0.39	0.312	0.36	0.114	10%
15	12.32	0.80	0.50	0.65	0.302					0.88	0.94	0.30	0.266	0.28	0.075	6%
16	13.28	0.86	0.50	0.68	0.361					0.88	1.00	0.36	0.318	0.36	0.114	10%
17	14.32	1.00	0.45	0.73	0.350					0.88	1.09	0.55	0.308	0.60	0.184	16%
18	15.45	0.95	0.45	0.70	0.315					0.88	0.86	0.50	0.277	0.43	0.119	10%
19	16.04	0.88	0.45	0.67	0.187					0.88	0.63	0.43	0.165	0.27	0.045	4%
20	16.71	0.80	0.45	0.63	0.152					0.88	0.53	0.35	0.134	0.19	0.025	2%
RB	17.10	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.88	0.20	0.00	0.000	0.00	0.000	
Total Flow														1.16	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	14:05
Meas. End Time (MST):	14:26
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, 4C



Flow characteristics:

Total Flow:	1.16	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.57	(m ²)
Wetted Width:	16.05	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.15	

Logger Details:

	Before	After
Transducer Reading (m):	0.595	
Water (°C):	0.2	
Datalogger Clock:	13:37	
Laptop Clock:	13:37	
Battery (Main):	14.3	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S61-3	1.397	101.417		100.020	100.020	3/4" Pipe 4m NW of logger
S61-2			0.888	100.529	100.525	3/4" Pipe 8m SW of logger
S61-1			1.416	100.001	100.000	3/4" Pipe 6m S of logger
Water Level:	Cut	4.825		96.592		Time WL Surveyed: 13:49
Temporary BM			4.827	96.590	0.000	
Turn						
Temporary BM	4.806	101.396		96.590		
Water Level:	Cut		4.803	96.593		Time WL Surveyed: 13:51
S61-1			1.394	100.002	100.000	3/4" Pipe 6m S of logger
S61-2			0.867	100.529	100.525	3/4" Pipe 8m SW of logger
S61-3			1.373	100.023	100.020	3/4" Pipe 4m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.593	-
Closing Error:	-0.003	-
WL Check:	0.001	-
Transducer Elevation	95.998	-

Field Personnel:

	DW, GG	Trip Date:	9-Mar-15
Data Entry Personnel:	DW, GG	Date:	9-Mar-15
Data Check Personnel:	MP	Date:	23-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leismer
 UTM Location: 466037E 6193791N

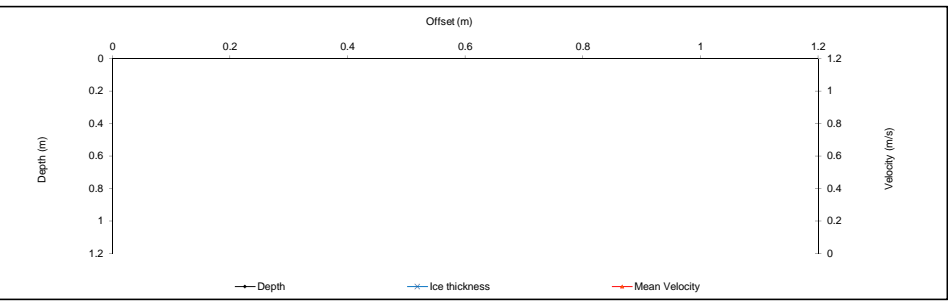
Site Visit Date: April 16, 2015
 Site Visit Time (MST): 08:01



Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
Flow Measurement Not Conducted																
															Total Flow	-

Flow Measurement Details:
 Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



Flow characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:

	Before	After
Transducer Reading (m):	1.066	1.067
Water (°C):	0.2	0.2
Datalogger Clock:	08:04	08:55
Laptop Clock:	08:05	08:56
Battery (Main):	13.3	13.8
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:
 -Installed cableway

General Notes:
 -No flow measurement because of multiple ice layers and dangerous ice conditions

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S61-1	1.448	101.448		100.000	100.000	3/4" Pipe 6m S of logger
S61-2			0.922	100.526	100.525	3/4" Pipe 8m SW of logger
S61-3			1.427	100.021	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut	0.425	4.826	97.047		Time WL Surveyed: 8:12
Temporary BM			4.826	96.622	0.000	-
Turn						
Temporary BM	4.809	101.431		96.622		-
Water Level:	Cut	0.425	4.809	97.047		Time WL Surveyed: 8:15
S61-3			1.413	100.018	100.020	3/4" Pipe 4m NW of logger
S61-2			0.906	100.525	100.525	3/4" Pipe 8m SW of logger
S61-1			1.433	99.998	100.000	3/4" Pipe 6m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.047	-
Closing Error:	0.002	-
WL Check:	0.000	-
Transducer Elevation	95.961	-

Field Personnel:

	GG, SM	Trip Date:	16-Apr-15
Data Entry Personnel:	GG	Date:	16-Apr-15
Data Check Personnel:	SG	Date:	2-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoio Leismer
 UTM Location: 466037E 6193791N

Site Visit Date: May 9, 2015
 Site Visit Time (MST): 11:40



Flow Measurement Details:	
Metering Section Location (describe): At cableway	
Meas. Start Time (MST):	12:56
Meas. End Time (MST):	13:05
Equipment:	ADCP
Method:	Cableway
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 7C

Flow Characteristics:	
Total Flow:	4.83 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	10.33 (m ²)
Wetted Width:	17.21 (m)
Hydraulic Depth:	0.60 (m)
Mean Velocity:	0.47 (m/s)
Froude Number:	0.19

Logger Details:		
	Before	After
Transducer Reading (m):	0.393	0.393
Water (°C):	6.2	6.8
Datalogger Clock:	11:44	13:18
Laptop Clock:	11:44	13:18
Battery (Main):	14.2	14.1
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PTH (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

ADCP Flow Measurement Summary:					
System Information:		System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	34.10
Serial Number:	4712	Stability (ppm):	0.0	RB:	51.00
Firmware Version:	3.8	Magnetic Declination (°):	14		
Software Version:	3.8	Measured Temperature (°C):	6.5		
		ADCP Temperature (°C):	8.0		
Discharge Calculation Settings:		Measurement Results:			
Track Reference:	Bottom-Track	Pass (ft):	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	17.06	10.44	0.460
Coordinate System:	ENU	2	17.06	10.28	0.466
Left Method:	Sloped bank	3	17.10	10.15	0.475
Right Method:	Sloped bank	4	17.61	10.46	0.469
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	17.21	10.33	0.468
		SD:	0.23	0.13	0.005
		COV:	0.01	0.01	0.012
					4.83
					0.045
					0.009

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S61-2	0.668	101.193		100.525	100.525	3/4" Pipe 6m SW of logger
S61-3			1.171	100.022	100.020	3/4" Pipe 6m NW of logger
S61-1			1.192	100.001	100.000	3/4" Pipe 6m S of logger
Water Level:	Cut		4.731	96.462	Time WL Surveyed:	11:48
Temporary BM			1.192	100.001	0.000	-
Turn						
Temporary BM	1.174	101.175		100.001		
Water Level:	Cut		4.712	96.463	Time WL Surveyed:	11:52
S61-1			1.174	100.001	100.000	3/4" Pipe 6m S of logger
S61-3			1.154	100.021	100.020	3/4" Pipe 4m NW of logger
S61-2			0.649	100.526	100.525	3/4" Pipe 6m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S61-1	1.174	101.175		100.001		
Water Level:	Cut		4.717	96.458	Time WL Surveyed:	13:10
Water Level:	Cut		4.699	96.460	Time WL Surveyed:	13:12
S61-1	1.158	101.159		100.001		

WL Survey Summary	Before	After
Average WL:	96.463	96.459
Closing Error:	-0.001	-
WL Check:	0.001	-0.002
Transducer Elevation	96.070	96.066

Field Personnel:	CJ, GG	Trip Date:	9-May-15
Data Entry Personnel:	CJ	Date:	9-May-15
Data Check Personnel:	CJ	Date:	16-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leismer
 UTM Location: 466037E 6193791N

Site Visit Date: June 16, 2015
 Site Visit Time (MST): 15:10

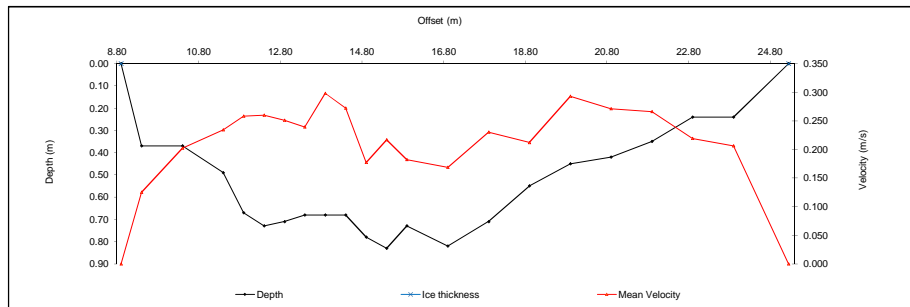


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.90	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	9.40	0.37		0.22	0.125					1.00	0.75	0.37	0.125	0.28	0.035	2%
2	10.40	0.37		0.22	0.202					1.00	1.00	0.37	0.202	0.37	0.075	4%
3	11.40	0.49		0.29	0.234					1.00	0.75	0.49	0.234	0.37	0.086	5%
4	11.90	0.67		0.40	0.258					1.00	0.50	0.67	0.258	0.34	0.086	5%
5	12.40	0.73		0.44	0.260					1.00	0.50	0.73	0.260	0.37	0.095	5%
6	12.90	0.71		0.43	0.251					1.00	0.50	0.71	0.251	0.36	0.089	5%
7	13.40	0.68		0.41	0.239					1.00	0.50	0.68	0.239	0.34	0.081	4%
8	13.90	0.68		0.41	0.298					1.00	0.50	0.68	0.298	0.34	0.101	5%
9	14.40	0.68		0.41	0.272					1.00	0.50	0.68	0.272	0.34	0.092	5%
10	14.90	0.78				0.62	0.177	0.16	0.177	1.00	0.50	0.78	0.177	0.39	0.069	4%
11	15.40	0.83				0.66	0.145	0.17	0.288	1.00	0.50	0.83	0.217	0.42	0.090	5%
12	15.90	0.73	0.44		0.182					1.00	0.75	0.73	0.182	0.55	0.100	5%
13	16.90	0.82				0.66	0.080	0.16	0.257	1.00	1.00	0.82	0.169	0.82	0.138	7%
14	17.90	0.71		0.43	0.230					1.00	1.00	0.71	0.230	0.71	0.163	9%
15	18.90	0.55		0.33	0.212					1.00	1.00	0.55	0.212	0.55	0.117	6%
16	19.90	0.45		0.27	0.293					1.00	1.00	0.45	0.293	0.45	0.132	7%
17	20.90	0.42		0.25	0.271					1.00	1.00	0.42	0.271	0.42	0.114	6%
18	21.90	0.35		0.21	0.266					1.00	1.00	0.35	0.266	0.35	0.093	5%
19	22.90	0.24		0.14	0.219					1.00	1.00	0.24	0.219	0.24	0.053	3%
20	23.90	0.24		0.14	0.206					1.00	1.18	0.24	0.206	0.28	0.058	3%
LB	25.25	0.00	0.00		0.000		0.000		0.000	1.00	0.68	0.00	0.000	0.00	0.000	
Total Flow															1.87	100%

Flow Measurement Details:

Metering Section Location (describe): 6m upstream of cableway

Meas. Start Time (MST):	15:25
Meas. End Time (MST):	15:55
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 18C



Flow characteristics:

Total Flow:	1.87	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.26	(m ²)
Wetted Width:	16.35	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.23	(m/s)
Reynolds Number:	9.42E+04	
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	0.204	0.203
Water (°C):	13.1	13.1
Datalogger Clock:	15:09	16:03
Laptop Clock:	15:09	16:03
Battery:	14.2	14.1
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S61-2	1.172	101.697		100.525	100.525	3/4" Pipe 8m SW of logger
S61-3			1.681	100.016	100.020	3/4" Pipe 4m NW of logger
S61-1			1.701	99.996	100.000	3/4" Pipe 6m S of logger
Water Level:	Cut		5.478	96.219		Time WL Surveyed: 15:17
S61-1			1.701	99.996	100.000	3/4" Pipe 6m S of logger
Turn						
S61-1	1.641	101.637		99.996	100.000	3/4" Pipe 6m S of logger
Water Level:	Cut		5.421	96.216		Time WL Surveyed: 15:18
S61-1			1.641	99.996	100.000	3/4" Pipe 6m S of logger
S61-3			1.621	100.016	100.020	3/4" Pipe 4m NW of logger
S61-2			1.112	100.525	100.525	3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S61-2	1.112	101.637		100.525		Time WL Surveyed: 16:00
Water Level:	Cut		5.421	96.216		Time WL Surveyed: 16:01
Water Level:	Cut		5.389	96.219		
S61-2	1.082	101.607		100.525		

WL Survey Summary

	Before	After
Average WL:	96.218	96.217
Closing Error:	0.000	-
WL Check:	0.003	-0.002
Transducer Elevation	96.014	96.014

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

	TR, GG	Trip Date:	16-Jun-15
Data Entry Personnel:	TR	Date:	16-Jun-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer
 UTM Location: 466037E 6193791N

Site Visit Date: August 13, 2015
 Site Visit Time (MST): 14:15



Flow Measurement Details:	
Metering Section Location (describe): At cableway	
Meas. Start Time (MST):	14:40
Meas. End Time (MST):	14:55
Equipment:	ADCP/H
Method:	Cableway
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, calm, 25C

Flow characteristics:	
Total Flow:	3.66 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	9.31 (m ²)
Wetted Width:	15.82 (m)
Hydraulic Depth:	0.59 (m)
Mean Velocity:	0.39 (m/s)
Reynolds Number:	2.25E+05
Froude Number:	0.16

Logger Details:		
	Before	After
Transducer Reading (m):	0.375	0.449
Water (°C):	16.6	19.7
Datalogger Clock:	14:20	15:11
Laptop Clock:	14:20	15:11
Battery (Main):	13.6	-
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Descendant:	-	Replaced
Mini Tube Descendant:	-	Good
PT# (if replaced):	284721	296883
Logger# (if replaced):	25577	-

Datalogger / Station Notes:	
pressure transducer replaced for calibration	

General Notes:	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	1.20		
Serial Number:	4712	Bainity (ppt):	0.0	RB:	17.80		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	19.7	System Test Passed: Yes			
		ADCP Temperature (°C):	20.7				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference:	1	0.00	16.49	9.15	0.398	3.641	-0.61%
Depth Reference:	2	0.00	15.59	9.27	0.408	3.763	2.72%
Coordinate System:	3	0.00	15.59	9.33	0.38	3.545	-3.23%
Left Method:	4	0.00	15.60	9.50	0.39	3.704	1.11%
Right Method:							
Top Fit Type:							
Bottom Fit Type:							
		Mean:	15.82	9.31	0.394	3.66	
		SD:	0.39	0.13	0.010	0.081	
		COV:	0.02	0.01	0.024	0.022	

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S61-3	1.212	101.232		100.020	100.020	3/4" Pipe 4m NW of logger
S61-2			0.709	100.523	100.525	3/4" Pipe 8m SW of logger
S61-1			1.233	99.999	100.000	3/4" Pipe 6m S of logger
Water Level:				4.849	96.383	Time WL Surveyed: 14:26
Temporary BM				4.738	96.494	0.000
Turn						
Temporary BM	4.703	101.197		96.494		
Water Level:				4.812	96.385	Time WL Surveyed: 14:27
S61-1				1.197	100.000	3/4" Pipe 6m S of logger
S61-2				0.673	100.524	3/4" Pipe 8m SW of logger
S61-3				1.172	100.020	3/4" Pipe 4m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S61-1	1.198	101.198		100.000		
Water Level:				4.812	96.385	Time WL Surveyed: 15:15
Water Level:				4.787	96.385	Time WL Surveyed: 15:16
S61-1	1.172	101.172		100.000		

WL Survey Summary		Level Survey Equipment:	
Average WL:	96.384	Level #:	Level#2
Closing Error:	0.000	Make & Model:	Nikon AC-2S
WL Check:	0.002	Serial #:	668859
Transducer Elevation:	96.009		

Field Personnel:			
Data Entry Personnel:	DW, TR	Trip Date:	13-Aug-15
Data Check Personnel:	DW	Date:	13-Aug-15
Entered Digitally in the Field:	TR	Date:	25-Aug-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leismer
 UTM Location: 466037E 6193791N

Site Visit Date: September 16, 2015
 Site Visit Time (MST): 07:30

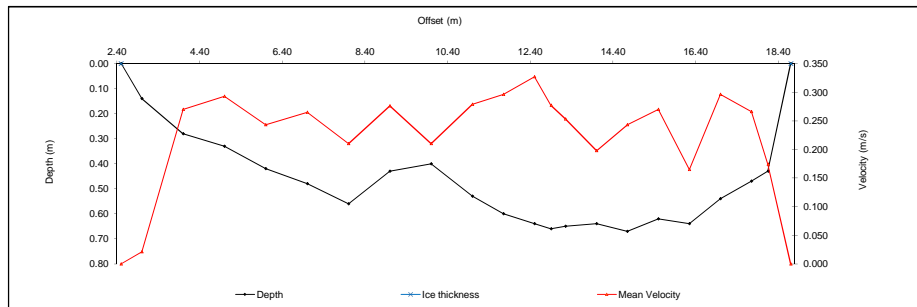


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	18.70	0.00	0.00		0.000		0.000		0.000	1.00	0.28	0.00	0.000	0.00	0.000	
1	18.15	0.43		0.26	0.174					1.00	0.47	0.43	0.174	0.20	0.036	2%
2	17.75	0.47		0.28	0.266					1.00	0.57	0.47	0.266	0.27	0.072	4%
3	17.00	0.54		0.32	0.296					1.00	0.75	0.54	0.296	0.41	0.120	6%
4	16.25	0.64		0.38	0.165					1.00	0.75	0.64	0.165	0.48	0.079	4%
5	15.50	0.62		0.37	0.270					1.00	0.75	0.62	0.270	0.47	0.126	7%
6	14.75	0.67		0.40	0.243					1.00	0.75	0.67	0.243	0.50	0.122	6%
7	14.00	0.64		0.38	0.198					1.00	0.75	0.64	0.198	0.48	0.095	5%
8	13.25	0.65		0.39	0.253					1.00	0.55	0.65	0.253	0.36	0.090	5%
9	12.90	0.66		0.40	0.277					1.00	0.38	0.66	0.277	0.25	0.069	4%
10	12.50	0.64		0.38	0.327					1.00	0.57	0.64	0.327	0.37	0.120	6%
11	11.75	0.60		0.36	0.296					1.00	0.75	0.60	0.296	0.45	0.133	7%
12	11.00	0.53		0.32	0.279					1.00	0.88	0.53	0.279	0.46	0.129	7%
13	10.00	0.40		0.24	0.210					1.00	1.00	0.40	0.210	0.40	0.084	4%
14	9.00	0.43		0.26	0.276					1.00	1.00	0.43	0.276	0.43	0.119	6%
15	8.00	0.56		0.34	0.210					1.00	1.00	0.56	0.210	0.56	0.118	6%
16	7.00	0.48		0.29	0.265					1.00	1.00	0.48	0.265	0.48	0.127	7%
17	6.00	0.42		0.25	0.243					1.00	1.00	0.42	0.243	0.42	0.102	5%
18	5.00	0.33		0.20	0.293					1.00	1.00	0.33	0.293	0.33	0.097	5%
19	4.00	0.28		0.17	0.270					1.00	1.00	0.28	0.270	0.28	0.076	4%
20	3.00	0.14		0.08	0.021					1.00	0.75	0.14	0.021	0.11	0.002	0%
LB	2.50	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
Total Flow														1.92	100%	

Flow Measurement Details:

Metering Section Location (describe):
6m downstream of pressure transducer

Meas. Start Time (MST):	8:18
Meas. End Time (MST):	8:40
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low to moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Rain, calm, 6C



Flow characteristics:

Total Flow:	1.92	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.70	(m ²)
Wetted Width:	16.20	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.25	(m/s)
Reynolds Number:	8.53E+04	
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.309	0.309
Water (°C):	8.4	8.4
Datalogger Clock:	07:56	08:48
Laptop Clock:	07:56	08:48
Battery:	13.2	13.5
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	Replaced
Vent Tube Desiccant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S61-1	1.541	101.541		100.000	100.000	3/4" Pipe 6m S of logger
S61-2	1.506		1.013	100.528	100.525	3/4" Pipe 8m SW of logger
S61-3			1.520	100.021	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut	0.253	5.536	96.258		Time WL Surveyed: 8:04
Temporary BM			5.536	96.005	0.000	
Turn						
Temporary BM	5.545	101.550		96.005		
Water Level:	Cut	0.253	5.545	96.258		Time WL Surveyed: 8:06
S61-3			1.528	100.022	100.020	3/4" Pipe 4m NW of logger
S61-2			0.978	100.572	100.525	3/4" Pipe 8m SW of logger
S61-1			1.549	100.001	100.000	3/4" Pipe 6m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S61-3	1.520	101.542		100.022		Time WL Surveyed: 8:45
Water Level:	Cut	0.260	5.542	96.260		Time WL Surveyed: 8:46
Water Level:	Cut	0.260	5.535	96.260		
S61-3	1.513	101.535		100.022		

WL Survey Summary

	Before	After
Average WL:	96.258	96.260
Closing Error:	-0.001	-
WL Check:	0.000	0.000
Transducer Elevation	95.949	95.951

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	SM, CJ	Trip Date:	16-Sep-15
Data Check Personnel:	TR	Date:	16-Sep-15
Entered Digitally in the Field:	Yes	Date:	26-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leismer
 UTM Location: 466037E 6193791N

Site Visit Date: October 20, 2015
 Site Visit Time (MST): 10:31

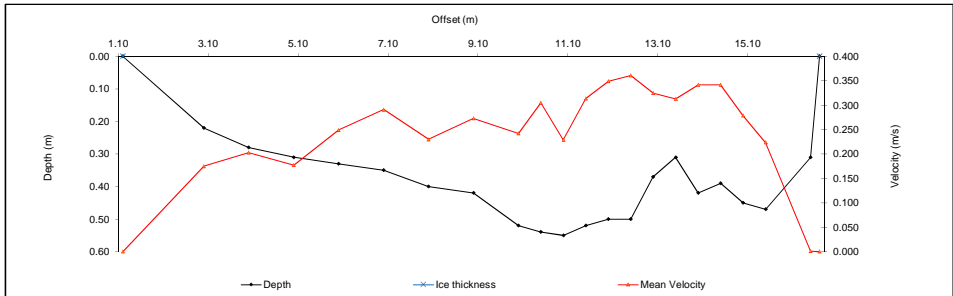


Flow Measurement													Calculated Data			
Measured Data													Calculated Data			
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	16.70	0.00	0.00							1.00	0.10	0.00	0.000	0.00	0.000	
1	16.50	0.31		0.19	0.001					1.00	0.60	0.31	0.001	0.19	0.000	0%
2	15.50	0.47		0.28	0.224					1.00	0.75	0.47	0.224	0.35	0.079	5%
3	15.00	0.45		0.27	0.279					1.00	0.50	0.45	0.279	0.23	0.063	4%
4	14.50	0.39		0.23	0.342					1.00	0.50	0.39	0.342	0.20	0.067	5%
5	14.00	0.42		0.25	0.342					1.00	0.50	0.42	0.342	0.21	0.072	5%
6	13.50	0.31		0.19	0.313					1.00	0.50	0.31	0.313	0.16	0.049	3%
7	13.00	0.37		0.22	0.325					1.00	0.50	0.37	0.325	0.19	0.060	4%
8	12.50	0.50		0.30	0.361					1.00	0.50	0.50	0.361	0.25	0.090	6%
9	12.00	0.50		0.30	0.349					1.00	0.50	0.50	0.349	0.25	0.087	6%
10	11.50	0.52		0.31	0.314					1.00	0.50	0.52	0.314	0.26	0.082	6%
11	11.00	0.55		0.33	0.229					1.00	0.50	0.55	0.229	0.28	0.083	4%
12	10.50	0.54		0.32	0.305					1.00	0.50	0.54	0.305	0.27	0.082	6%
13	10.00	0.52		0.31	0.242					1.00	0.75	0.52	0.242	0.39	0.094	7%
14	9.00	0.42		0.25	0.273					1.00	1.00	0.42	0.273	0.42	0.115	8%
15	8.00	0.40		0.24	0.230					1.00	1.00	0.40	0.230	0.40	0.092	6%
16	7.00	0.35		0.21	0.291					1.00	1.00	0.35	0.291	0.35	0.102	7%
17	6.00	0.33		0.20	0.249					1.00	1.00	0.33	0.249	0.33	0.082	6%
18	5.00	0.31		0.19	0.177					1.00	1.00	0.31	0.177	0.31	0.055	4%
19	4.00	0.28		0.17	0.203					1.00	1.00	0.28	0.203	0.28	0.057	4%
20	3.00	0.22		0.13	0.175					1.00	1.40	0.22	0.175	0.31	0.054	4%
LB	1.20	0.00	0.00							1.00	0.90	0.00	0.000	0.00	0.000	
Total Flow															1.44	100%

Flow Measurement Details:

Metering Section Location (describe):
10m upstream station

Meas. Start Time (MST):	10:45
Meas. End Time (MST):	11:05
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 5C



Flow characteristics:

Total Flow:	1.44	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.60	(m ²)
Wetted Width:	15.50	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.14	

Logger Details:

	Before	After
Transducer Reading (m):	0.221	0.220
Water (°C):	4.5	4.5
Datalogger Clock:	10:32	11:13
Laptop Clock:	10:33	11:14
Battery (Main):	13.7	14.7
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- ADV test good
- Removed cableway, pulley was left at station

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S61-2	0.737	101.262		100.525	100.525	3/4" Pipe 8m SW of logger
S61-1			1.262	100.000	100.000	3/4" Pipe 6m S of logger
S61-3			1.241	100.021	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut	0.243	5.329	96.176	Time WL Surveyed:	10:37
Temporary BM			5.329	95.933	-	-
Turn						
Temporary BM	5.298	101.231		95.933	-	-
Water Level:	Cut	0.243	5.298	96.176	Time WL Surveyed:	10:39
S61-3			1.209	100.022	100.020	3/4" Pipe 4m NW of logger
S61-1			1.230	100.001	100.000	3/4" Pipe 6m S of logger
S61-2			0.708	100.525	100.525	3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S61-1	1.230	101.231		100.001		
Water Level:	Cut	0.289	5.347	96.173	Time WL Surveyed:	11:08
Water Level:	Cut	0.289	5.321	96.177	Time WL Surveyed:	11:09
S61-1	1.208	101.209		100.001		

WL Survey Summary

	Before	After
Average WL:	96.176	96.175
Closing Error:	0.000	-
WL Check:	0.000	-0.004
Transducer Elevation	95.955	95.955

Level Survey Equipment:

Level #:	Level#3
Make & Model:	#NA
Serial #:	#NA

Field Personnel:

GG, TR	Trip Date:	20-Oct-15
GG	Date:	20-Oct-15
TR	Date:	3-Nov-15
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoio Leisner
 UTM Location: 466037E 6193791N

Site Visit Date: December 11, 2015
 Site Visit Time (MST): 08:34

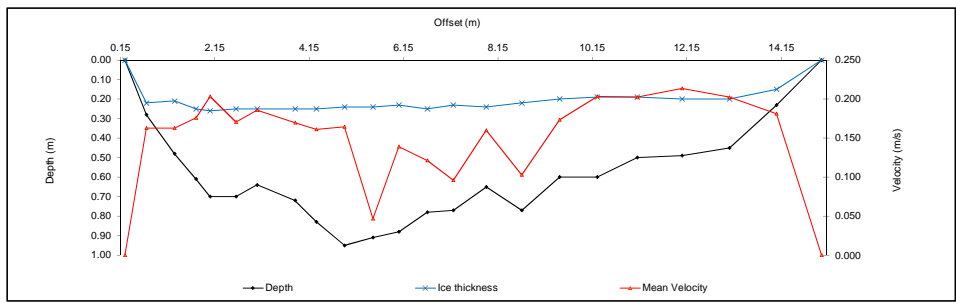


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	15.00	0.00	0.00	0.19	0.000	0.000	0.000	0.000	0.000	0.88	0.48	0.00	0.000	0.00	0.000	
1	14.05	0.23	0.15	0.19	0.206					0.88	0.98	0.08	0.181	0.08	0.014	2%
2	13.05	0.45	0.20	0.35	0.230					0.88	1.00	0.25	0.202	0.25	0.051	6%
3	12.05	0.49	0.20	0.35	0.243					0.88	0.98	0.29	0.214	0.28	0.060	7%
4	11.10	0.50	0.19	0.35	0.230					0.88	0.90	0.31	0.202	0.28	0.056	6%
5	10.25	0.60	0.19	0.40	0.231					0.88	0.83	0.41	0.203	0.34	0.069	8%
6	9.45	0.60	0.20	0.40	0.197					0.88	0.80	0.40	0.173	0.32	0.055	6%
7	8.65	0.77	0.22	0.50	0.117					0.88	0.78	0.55	0.103	0.43	0.044	5%
8	7.90	0.65	0.24	0.45	0.182					0.88	0.73	0.41	0.160	0.30	0.048	5%
9	7.20	0.77	0.23	0.50	0.109					0.88	0.63	0.54	0.096	0.34	0.032	4%
10	6.65	0.78	0.25	0.52	0.138					0.88	0.58	0.53	0.121	0.30	0.037	4%
11	6.05	0.88	0.23	0.56	0.158					0.88	0.57	0.65	0.139	0.37	0.052	6%
12	5.50	0.91	0.24	0.58	0.053					0.88	0.58	0.67	0.047	0.39	0.018	2%
13	4.90	0.95	0.24	0.60	0.187					0.88	0.60	0.71	0.165	0.43	0.070	8%
14	4.30	0.83	0.25	0.54	0.183					0.88	0.52	0.58	0.161	0.30	0.049	6%
15	3.85	0.72	0.25	0.49	0.193					0.88	0.63	0.47	0.170	0.29	0.050	6%
16	3.05	0.64	0.25	0.45	0.211					0.88	0.63	0.39	0.186	0.24	0.045	5%
17	2.60	0.70	0.25	0.48	0.194					0.88	0.50	0.45	0.171	0.23	0.038	4%
18	2.05	0.70	0.26	0.48	0.231					0.88	0.43	0.44	0.203	0.19	0.038	4%
19	1.75	0.61	0.25	0.43	0.200					0.88	0.38	0.36	0.176	0.14	0.024	3%
20	1.30	0.48	0.21	0.35	0.185					0.88	0.53	0.27	0.163	0.14	0.023	3%
21	0.70	0.28	0.22	0.25	0.185					0.88	0.53	0.06	0.163	0.03	0.005	1%
RB	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.23	0.00	0.000	0.00	0.000	
Total Flow														0.879	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	8:51
Meas. End Time (MST):	9:21
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, -3C



Flow characteristics:

Total Flow:	0.879	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.66	(m ²)
Wetted Width:	14.75	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	0.353	-
Water (°C):	0.2	-
Datalogger Clock:	09:35	-
Laptop Clock:	08:36	-
Battery (Main):	12.8	-
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	-
Vent Tube Deseccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S61-2	0.918	101.443		100.525	100.525	3/4" Pipe 8m SW of logger
S61-3			1.415	100.028	100.020	3/4" Pipe 4m NW of logger
S61-1			1.436	100.007	100.000	3/4" Pipe 6m S of logger
Water Level:	Cut		5.132	96.311	Time WL Surveyed: 8:45	
S61-1			1.436	100.007	100.000	3/4" Pipe 6m S of logger
Turn						
S61-1	1.413	101.420		100.007	100.000	3/4" Pipe 6m S of logger
Water Level:	Cut		5.112	96.308	Time WL Surveyed: 8:49	
S61-1			1.413	100.007	100.000	3/4" Pipe 6m S of logger
S61-3			1.396	100.024	100.020	3/4" Pipe 4m NW of logger
S61-2			0.891	100.529	100.525	3/4" Pipe 8m SW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	96.310	-
Closing Error:	-0.004	-
WL Check:	0.003	-
Transducer Elevation	95.957	-

Level Survey Equipment:

Level #:	Level#3
Make & Model:	#N/A
Serial #:	#N/A

Field Personnel:

GG DW AJ	Trip Date:	11-Dec-15
GG	Date:	11-Dec-15
JC	Date:	8-Jan-16
Entered Digitally in the Field:	Yes	

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: January 8, 2015
 Site Visit Time (MST): 08:20

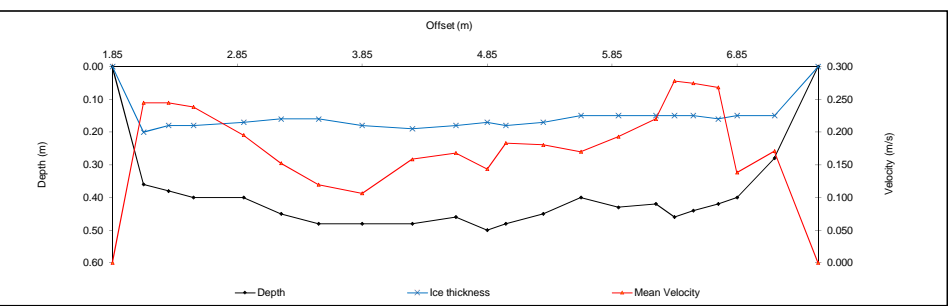


Flow Measurement																
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.85	0.00	0.00	0.28	0.000	0.278	0.000	0.000	0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	2.10	0.36	0.20	0.28	0.278					0.88	0.23	0.16	0.245	0.04	0.009	3%
2	2.30	0.38	0.18	0.28	0.278					0.88	0.20	0.20	0.245	0.04	0.010	4%
3	2.50	0.40	0.18	0.29	0.271					0.88	0.30	0.22	0.238	0.07	0.016	6%
4	2.90	0.40	0.17	0.29	0.222					0.88	0.35	0.23	0.195	0.08	0.016	6%
5	3.20	0.45	0.16	0.31	0.173					0.88	0.30	0.29	0.152	0.09	0.013	5%
6	3.50	0.48	0.16	0.32	0.136					0.88	0.33	0.32	0.120	0.10	0.012	5%
7	3.85	0.48	0.18	0.33	0.121					0.88	0.38	0.30	0.106	0.11	0.012	5%
8	4.25	0.48	0.19	0.34	0.180					0.88	0.38	0.29	0.158	0.11	0.017	7%
9	4.60	0.46	0.18	0.32	0.191					0.88	0.30	0.28	0.168	0.08	0.014	6%
10	4.85	0.50	0.17	0.34	0.163					0.88	0.20	0.33	0.143	0.07	0.009	4%
11	5.00	0.48	0.18	0.33	0.208					0.88	0.23	0.30	0.183	0.07	0.012	5%
12	5.30	0.45	0.17	0.31	0.205					0.88	0.30	0.28	0.180	0.08	0.015	6%
13	5.60	0.40	0.15	0.28	0.193					0.88	0.30	0.25	0.170	0.08	0.013	5%
14	5.90	0.43	0.15	0.29	0.219					0.88	0.30	0.28	0.193	0.08	0.016	6%
15	6.20	0.42	0.15	0.29	0.250					0.88	0.23	0.27	0.220	0.06	0.013	5%
16	6.35	0.46	0.15	0.31	0.316					0.88	0.15	0.31	0.278	0.05	0.013	5%
17	6.50	0.44	0.15	0.30	0.312					0.88	0.18	0.29	0.275	0.05	0.014	6%
18	6.70	0.42	0.16	0.29	0.305					0.88	0.18	0.26	0.268	0.05	0.012	5%
19	6.85	0.40	0.15	0.28	0.157					0.88	0.23	0.25	0.138	0.06	0.008	3%
20	7.15	0.28	0.15	0.22	0.194					0.88	0.33	0.13	0.171	0.04	0.007	3%
LB	7.50	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.88	0.18	0.00	0.000	0.00	0.000	
Total Flow														0.252	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m downstream of culvert

Meas. Start Time (MST):	8:55
Meas. End Time (MST):	9:20
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, -25C



Flow characteristics:

Total Flow:	0.252	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.40	(m ²)
Wetted Width:	5.65	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.12	

Logger Details:

	Before	After
Transducer Reading (m):	0.883	
Water (°C):	0.2	
Datalogger Clock:	08:26	
Laptop Clock:	08:27	
Battery (Main):	12.5	
Battery:	Good	
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

- Replaced modem

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-3	1.206	101.239		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.287	99.952	99.948	3/4" Pipe 5m W of Station
S62-1			1.238	100.001	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		3.028	98.211		Time WL Surveyed: 8:41
Temporary BM			2.960	98.279	0.000	-
Turn						
Temporary BM	2.917	101.196		98.279	-	
Water Level:	Cut		2.986	98.210		Time WL Surveyed: 8:43
S62-1			1.195	100.001	100.000	3/4" Pipe 2m N of Station
S62-2			1.246	99.950	99.948	3/4" Pipe 5m W of Station
S62-3			1.163	100.033	100.034	3/4" Pipe 8m W of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.211	-
Closing Error:	0.001	-
WL Check:	0.001	-
Transducer Elevation	97.328	-

Field Personnel:

TR, GG	Trip Date:	8-Jan-15
Data Entry Personnel: TR	Date:	8-Jan-15
Data Check Personnel: MP	Date:	12-Mar-15
Entered Digitally in the Field: Yes		

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: February 6, 2015
 Site Visit Time (MST): 11:55

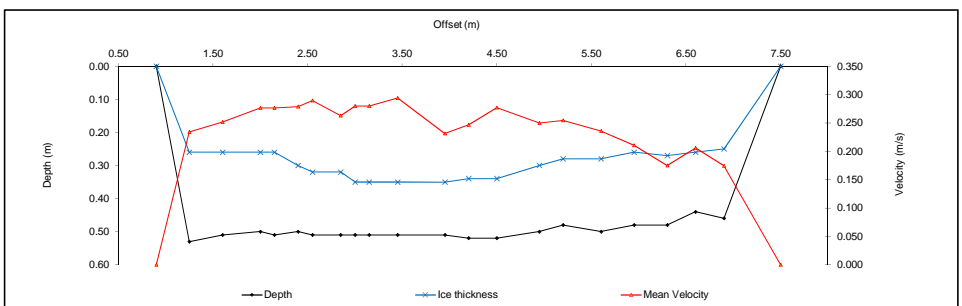


Flow Measurement:															
Measured Data							Calculated Data								
Bank/ Mmt #	Depth from bottom to WS (m)	Depth from WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	7.50	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	6.90	0.46	0.25	0.36	0.198				0.88	0.45	0.21	0.174	0.09	0.016	5%
2	6.60	0.44	0.26	0.35	0.234				0.88	0.30	0.18	0.206	0.05	0.011	4%
3	6.30	0.48	0.27	0.38	0.199				0.88	0.32	0.21	0.175	0.07	0.012	4%
4	5.95	0.48	0.26	0.37	0.239				0.88	0.35	0.22	0.210	0.08	0.016	5%
5	5.60	0.50	0.28	0.39	0.268				0.88	0.38	0.22	0.236	0.08	0.019	6%
6	5.20	0.48	0.28	0.38	0.289				0.88	0.33	0.20	0.254	0.07	0.017	5%
7	4.95	0.50	0.30	0.40	0.284				0.88	0.35	0.20	0.250	0.07	0.017	6%
8	4.50	0.52	0.34	0.43	0.315				0.88	0.38	0.18	0.277	0.07	0.019	6%
9	4.20	0.52	0.34	0.43	0.280				0.88	0.27	0.18	0.246	0.05	0.012	4%
10	3.95	0.51	0.35	0.43	0.263				0.88	0.38	0.16	0.231	0.06	0.014	5%
11	3.45	0.51	0.35	0.43	0.334				0.88	0.40	0.16	0.294	0.06	0.019	6%
12	3.15	0.51	0.35	0.43	0.318				0.88	0.23	0.16	0.280	0.04	0.010	3%
13	3.00	0.51	0.35	0.43	0.318				0.88	0.15	0.16	0.280	0.02	0.007	2%
14	2.85	0.51	0.32	0.42	0.299				0.88	0.23	0.19	0.263	0.04	0.011	4%
15	2.55	0.51	0.32	0.42	0.329				0.88	0.23	0.19	0.290	0.04	0.012	4%
16	2.40	0.50	0.30	0.40	0.317				0.88	0.20	0.20	0.279	0.04	0.011	4%
17	2.15	0.51	0.26	0.39	0.314				0.88	0.20	0.25	0.276	0.05	0.014	5%
18	2.00	0.50	0.26	0.38	0.314				0.88	0.28	0.24	0.276	0.07	0.018	6%
19	1.60	0.51	0.26	0.39	0.286				0.88	0.38	0.25	0.252	0.09	0.024	8%
20	1.25	0.53	0.26	0.40	0.266				0.88	0.35	0.27	0.234	0.09	0.022	7%
RB	0.90	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.88	0.18	0.00	0.000	0.00	0.000	
Total Flow													0.302	100%	

Flow Measurement Details:

Metering Section Location (describe):
downstream of culvert

Meas. Start Time (MST):	13:20
Meas. End Time (MST):	13:40
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snowing, -20C



Flow characteristics:

Total Flow:	0.302	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.24	(m ²)
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.24	(m/s)
Froude Number:	0.18	

Logger Details:

	Before	After
Transducer Reading (m):	0.897	
Water (°C):	0.2	
Datalogger Clock:	11:59	
Laptop Clock:	11:59	
Battery (Main):	14.6	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-3	1.229	101.263		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.314	99.949	99.948	3/4" Pipe 5m W of Station
S62-1			1.265	99.998	100.000	3/4" Pipe 2m N of Station
Water Level:				Cut	3.039	98.224
Temporary BM					2.993	98.270
Time WL Surveyed:						13:02
Turn						
Temporary BM	2.887	101.157		98.270		
Water Level:				Cut	2.936	98.221
Time WL Surveyed:						13:09
S62-1			1.160	99.997	100.000	3/4" Pipe 2m N of Station
S62-2			1.208	99.949	99.948	3/4" Pipe 5m W of Station
S62-3			1.125	100.032	100.034	3/4" Pipe 8m W of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:				Cut		
Time WL Surveyed:						
Water Level:				Cut		
Time WL Surveyed:						

WL Survey Summary

	Before	After
Average WL:	98.223	-
Closing Error:	0.002	-
WL Check:	0.003	-
Transducer Elevation	97.326	-

Field Personnel:

	TR, CJ	Trip Date:	6-Feb-15
Data Entry Personnel:	TR	Date:	6-Feb-15
Data Check Personnel:	MP	Date:	12-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: March 6, 2015
 Site Visit Time (MST): 10:06

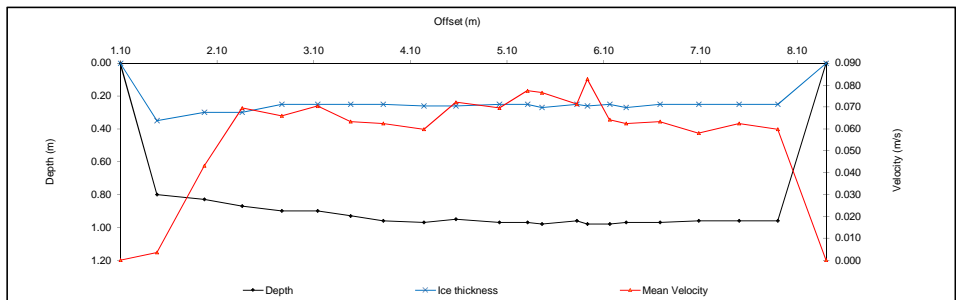


Flow Measurement:															
Measured Data								Calculated Data							
Bank/ Mmt #	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.10	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.88	0.19	0.00	0.000	0.00	0.000	
1	1.48	0.80	0.35	0.58	0.004				0.88	0.44	0.45	0.004	0.20	0.001	0%
2	1.97	0.83	0.30	0.57	0.049				0.88	0.44	0.53	0.043	0.23	0.010	4%
3	2.36	0.87	0.30	0.59	0.079				0.88	0.40	0.57	0.070	0.23	0.016	6%
4	2.77	0.90	0.25	0.58	0.075				0.88	0.39	0.65	0.066	0.25	0.017	6%
5	3.14	0.90	0.25	0.58	0.080				0.88	0.36	0.65	0.070	0.23	0.016	6%
6	3.48	0.93	0.25	0.59	0.072				0.88	0.34	0.68	0.063	0.23	0.015	5%
7	3.82	0.96	0.25	0.61	0.071				0.88	0.38	0.71	0.062	0.27	0.017	6%
8	4.24	0.97	0.26	0.62	0.068				0.88	0.38	0.71	0.060	0.27	0.016	6%
9	4.57	0.95	0.26	0.61	0.082				0.88	0.39	0.69	0.072	0.27	0.019	7%
10	5.02	0.97	0.25	0.61	0.079				0.88	0.37	0.72	0.070	0.27	0.019	6%
11	5.31	0.97	0.25	0.61	0.088				0.88	0.22	0.72	0.077	0.16	0.012	4%
12	5.46	0.98	0.27	0.63	0.087				0.88	0.26	0.71	0.077	0.18	0.014	5%
13	5.82	0.96	0.25	0.61	0.081				0.88	0.23	0.71	0.071	0.17	0.012	4%
14	5.93	0.98	0.26	0.62	0.094				0.88	0.17	0.72	0.083	0.12	0.010	4%
15	6.16	0.98	0.25	0.62	0.073				0.88	0.20	0.73	0.064	0.15	0.009	3%
16	6.33	0.97	0.27	0.62	0.071				0.88	0.26	0.70	0.062	0.18	0.011	4%
17	6.68	0.97	0.25	0.61	0.072				0.88	0.38	0.72	0.063	0.27	0.017	6%
18	7.08	0.96	0.25	0.61	0.066				0.88	0.41	0.71	0.058	0.29	0.017	6%
19	7.50	0.96	0.25	0.61	0.071				0.88	0.41	0.71	0.062	0.29	0.018	6%
20	7.90	0.96	0.25	0.61	0.068				0.88	0.45	0.71	0.060	0.32	0.019	7%
RB	8.40	0.00	0.00	0.00					0.88	0.25	0.00	0.000	0.00	0.000	
Total Flow													0.285	100%	

Flow Measurement Details:

Metering Section Location (describe):
At station

Meas. Start Time (MST):	10:51
Meas. End Time (MST):	11:17
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, 1C



Flow characteristics:

Total Flow:	0.285	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.57	(m ²)
Wetted Width:	7.30	(m)
Hydraulic Depth:	0.63	(m)
Mean Velocity:	0.06	(m/s)
Floude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.831	-
Water (°C):	-0.1	-
Datalogger Clock:	10:04	-
Laptop Clock:	10:04	-
Battery (Main):	3.5	13.3
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Solar controller not working, removed it, replaced with 2 batteries
- Bring new controller next visit

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-3	1.300	101.334		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.286	99.948	99.948	3/4" Pipe 5m W of Station
S62-1			1.333	100.001	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		3.176	98.158		Time WL Surveyed: 10:40
Temporary BM			3.057	98.277	0.000	-
Turn						
Temporary BM	3.037	101.314		98.277		-
Water Level:	Cut		3.157	98.157		Time WL Surveyed: 10:44
S62-1			1.313	100.001	100.000	3/4" Pipe 2m N of Station
S62-2			1.365	99.949	99.948	3/4" Pipe 5m W of Station
S62-3			1.278	100.036	100.034	3/4" Pipe 8m W of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.158	-
Closing Error:	-0.002	-
WL Check:	0.001	-
Transducer Elevation	97.327	-

Field Personnel:

Field Personnel:	GG, MP	Trip Date:	6-Mar-15
Data Entry Personnel:	GG	Date:	6-Mar-15
Data Check Personnel:	MP	Date:	23-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: April 14, 2015
 Site Visit Time (MST): 09:00

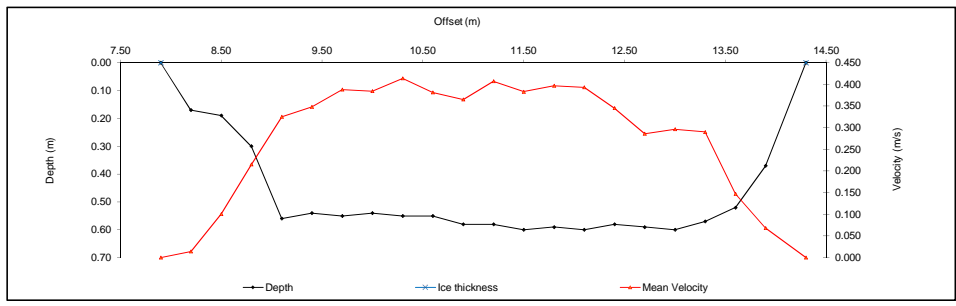


Flow Measurement													Calculated Data						
Bank/ Mmt #	Measured Data			Depth of Obs. @ 0.6			Depth of Obs. @ 0.8			Depth of Obs. @ 0.2			Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
	Offset (m)	Depth from bottom to WS (m)	Depth of WS to bottom of ice (m)	Depth of Obs. @ 0.6 (m)	Velocity @ 0.6 (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 (m)	Velocity @ 0.2 (m/s)										
RB	7.90	0.00	0.00	0.10	0.000	0.000	0.000	0.000	1.00	0.15	0.00	0.000	0.00	0.00	0.000	0.00	0.000		
1	8.20	0.17		0.10	0.014				1.00	0.30	0.17	0.014	0.05	0.001	0%				
2	8.50	0.19		0.11	0.101				1.00	0.30	0.19	0.101	0.06	0.006	1%				
3	8.80	0.30		0.18	0.215				1.00	0.30	0.30	0.215	0.09	0.019	2%				
4	9.10	0.56		0.34	0.325				1.00	0.30	0.56	0.325	0.17	0.055	6%				
5	9.40	0.54		0.32	0.348				1.00	0.30	0.54	0.348	0.16	0.056	6%				
6	9.70	0.55		0.33	0.388				1.00	0.30	0.55	0.388	0.16	0.064	7%				
7	10.00	0.54		0.32	0.384				1.00	0.30	0.54	0.384	0.16	0.062	6%				
8	10.30	0.55		0.33	0.414				1.00	0.30	0.55	0.414	0.16	0.068	7%				
9	10.60	0.55		0.33	0.381				1.00	0.30	0.55	0.381	0.17	0.063	6%				
10	10.90	0.58		0.35	0.365				1.00	0.30	0.58	0.365	0.17	0.064	6%				
11	11.20	0.58		0.35	0.407				1.00	0.30	0.58	0.407	0.17	0.071	7%				
12	11.50	0.60		0.36	0.383				1.00	0.30	0.60	0.383	0.18	0.069	7%				
13	11.80	0.59		0.35	0.397				1.00	0.30	0.59	0.397	0.18	0.070	7%				
14	12.10	0.60		0.36	0.393				1.00	0.30	0.60	0.393	0.18	0.071	7%				
15	12.40	0.58		0.35	0.345				1.00	0.30	0.58	0.345	0.17	0.060	6%				
16	12.70	0.59		0.35	0.286				1.00	0.30	0.59	0.286	0.18	0.051	5%				
17	13.00	0.60		0.36	0.296				1.00	0.30	0.60	0.296	0.18	0.053	5%				
18	13.30	0.57		0.34	0.290				1.00	0.30	0.57	0.290	0.17	0.050	5%				
19	13.60	0.52		0.31	0.147				1.00	0.30	0.52	0.147	0.16	0.023	2%				
20	13.90	0.37		0.22	0.068				1.00	0.35	0.37	0.068	0.13	0.009	1%				
LB	14.30	0.00	0.00	0.00	0.000	0.000	0.000	0.000	1.00	0.20	0.00	0.000	0.00	0.000					
Total Flow																0.984	100%		

Flow Measurement Details:

Metering Section Location (describe):
2m downstream of culvert

Meas. Start Time (MST):	10:01
Meas. End Time (MST):	10:25
Equipment:	ADV
Method:	Wading
River Condition:	Partial ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 3C



Flow characteristics:

Total Flow:	0.984	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.06	(m ²)
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.15	

Logger Details:

	Before	After
Transducer Reading (m):	1.024	1.015
Water (°C):	0.2	0.2
Datalogger Clock:	09:18	10:40
Laptop Clock:	09:18	10:40
Battery (Main):	14.4	13.6
Battery:	-	Replaced
Battery Serial #:	-	1108001
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Installed new solar controller
- Installed 2 batteries at station

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-1	1.385	101.385		100.000	100.000	3/4" Pipe 2m N of Station
S62-2			1.435	99.950	99.948	3/4" Pipe 5m W of Station
S62-3			1.349	100.036	100.034	3/4" Pipe 5m W of Station
S62-4			1.280	100.105	0.000	Bolt in Tree
Water Level:	Cut	3.035		98.350	Time WL Surveyed:	9:45
S62-1		1.385		100.000		3/4" Pipe 2m N of Station
Turn						
S62-1	1.367	101.367		100.000	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		3.015	98.352	Time WL Surveyed:	9:46
S62-4			1.261	100.106		Bolt in Tree
S62-3			1.332	100.035	100.034	3/4" Pipe 5m W of Station
S62-2			1.416	99.951	99.948	3/4" Pipe 5m W of Station
S62-1			1.367	100.000	100.000	3/4" Pipe 2m N of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S62-1	1.332	101.332		100.000		
Water Level:	Cut		2.967	98.345	Time WL Surveyed:	10:38
Water Level:	Cut	3.001		98.345	Time WL Surveyed:	10:35
S62-1	1.346	101.346		100.000		

WL Survey Summary

	Before	After
Average WL:	98.351	98.345
Closing Error:	0.000	-
WL Check:	0.002	0.000
Transducer Elevation	97.327	97.330

Field Personnel:

	SM, GG	Trip Date:	14-Apr-15
Data Entry Personnel:	SM	Date:	14-Apr-15
Data Check Personnel:	SG	Date:	4-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: May 14, 2015
 Site Visit Time (MST): 15:30



Flow Measurement Details:	
Metering Section Location (describe): 4m upstream of station	
Meas. Start Time (MST):	15:50
Meas. End Time (MST):	16:15
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 22 C

Flow characteristics:	
Total Flow:	1.32 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	6.65 (m ²)
Wetted Width:	7.71 (m)
Hydraulic Depth:	0.86 (m)
Mean Velocity:	0.20 (m/s)
Froude Number:	0.07

Logger Details:		
Transducer Reading (m):	Before	After
Water (C):	10.9	11.2
Datalogger Clock:	15:32	16:22
Laptop Clock:	15:32	16:22
Battery (Main):	13.8	13.7
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PTA (if replaced):	-	-
Logger (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

ADCP Flow Measurement Summary:					
System Information:			System Setup:		Bank Offsets:
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	29.60
Serial Number:	4712	Salinity (ppt):	0.0	RB:	37.90
Firmware Version:	3.8	Magnetic Declination (°):	14.3		
Software Version:	3.8	Measured Temperature (°C):	11.1		
		ADCP Temperature (°C):	14.8		
Discharge Calculation Settings:			Measurement Results:		
Track Reference:	Bottom-Track	Pass #:	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	2	7.50	6.53	0.199
Coordinate System:	ENU	3	7.71	6.58	0.199
Left Method:	Sloped bank	4	7.87	6.83	0.202
Right Method:	Sloped bank	5	7.75	6.65	0.192
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		Mean:	7.71	6.65	0.198
		SD:	0.13	0.11	0.004
		COV:	0.02	0.02	0.019
					1.32
					0.038
					0.029

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-3	1.017	101.051		100.034	100.034	3/4" Pipe 8m W of Station
S62-4			0.948	100.103	-	Bolt in Tree
S62-2			1.101	99.950	99.948	3/4" Pipe 5m W of Station
S62-1			1.051	100.000	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut	0.539	3.397	88.193	Time WL Surveyed:	15.37
Temporary BM			1.051	100.000		
Turn						
Temporary BM	1.022	101.022		100.000	-	
Water Level:	Cut	0.538	3.370	88.190	Time WL Surveyed:	15.39
S62-1			1.022	100.000	100.000	3/4" Pipe 2m N of Station
S62-2			1.072	99.950	99.948	3/4" Pipe 5m W of Station
S62-4			0.919	100.103	-	Bolt in Tree
S62-3			0.988	100.034	100.034	3/4" Pipe 8m W of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S62-2	1.072	101.022		99.950	-	
Water Level:	Cut	0.795	3.593	88.184	Time WL Surveyed:	16.20
Water Level:	Cut	0.781	3.585	88.185	Time WL Surveyed:	16.21
S62-2	1.039	100.989		99.950	-	

WL Survey Summary		
	Before	After
Average WL:	98.192	98.185
Closing Error:	0.000	-
WL Check:	0.003	-0.001
Transducer Elevation	97.333	97.329

Field Personnel:			
	TR_MK	Trip Date:	14-May-15
Data Entry Personnel:	TR	Date:	14-May-15
Data Check Personnel:	CJ	Date:	16-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: June 17, 2015
 Site Visit Time (MST): 08:30



Flow Measurement Details:

Metering Section Location (describe): at station 5m upstream of station	
Meas. Start Time (MST):	8:52
Meas. End Time (MST):	9:15
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 12C

Flow characteristics:		
Total Flow:	0.447	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.88	(m ²)
Wetted Width:	7.98	(m)
Hydraulic Depth:	0.89	(m)
Mean Velocity:	0.06	(m/s)
Reynolds Number:	4.22E+04	
Froude Number:	0.62	

Logger Details:		
	Before	After
Transducer Reading (m):	0.912	0.911
Water (°C):	9.9	10.0
Datalogger Clock:	08:32	09:19
Laptop Clock:	08:33	09:19
Battery (Minn):	12.5	14.0
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Mini Tube Desiccant:	-	Good
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

ADCP Flow Measurement Summary:

System Information:		System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	0.70
Serial Number:	4712	Bainry (ppt):	0.0	RB:	8.10
Firmware Version:	3.8	Magnetic Declination (°):	0	Compass Calibration Passed: Yes	
Software Version:	3.8	Measured Temperature (°C):	10.0	System Test Passed: Yes	
		ADCP Temperature (°C):	10.7		

Discharge Calculation Settings:		Measurement Results:						
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)	
Track Reference: Bottom-Track	2	0.00	8.03	7.18	0.061	0.439	-1.73%	
Depth Reference: Vertical beam	4	0.00	8.15	7.12	0.064	0.457	2.29%	
Coordinate System: ENL	5	0.00	7.86	7.00	0.062	0.431	-3.53%	
Left Method: Sloped bank	6	0.00	7.88	7.02	0.066	0.46	2.97%	
Right Method: Sloped bank								
Top Fit Type: Power fit								
Bottom Fit Type: Power fit								
		Mean:	7.98	7.08	0.063	0.447		
		SD:	0.12	0.08	0.002	0.012		
		COV:	0.01	0.01	0.030	0.027		

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-3	1.208	101.242		100.034	100.034	3/4" Pipe 8m W of Station
S62-4			1.142	100.100	100.105	Bolt in Tree
S62-2			1.293	99.949	99.948	3/4" Pipe 5m W of Station
Water Level:						
Cut			3.007	98.235	98.235	Time WL Surveyed: 8:40
S62-2			1.253	99.949	99.948	3/4" Pipe 5m W of Station
Turn						
S62-2	1.276	101.225		99.949	99.948	3/4" Pipe 5m W of Station
Water Level:	Cut		2.990	98.235	98.235	Time WL Surveyed: 8:42
S62-2			1.276	99.949	99.948	3/4" Pipe 5m W of Station
S62-4			1.123	100.102	100.105	Bolt in Tree
S62-3			1.192	100.033	100.034	3/4" Pipe 8m W of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S62-2	1.276	101.225		99.949	99.948	
Water Level:	Cut		2.987	98.238	98.238	Time WL Surveyed: 9:22
Water Level:	Cut		2.971	98.240	98.240	Time WL Surveyed: 9:24
S62-2	1.262	101.211		99.949	99.949	

WL Survey Summary			Level Survey Equipment:		
Average WL:	Before	After	Level #:	Level#4	
Closing Error:	0.001	-	Make & Model:	Nikon AC-2S	
WL Check:	0.000	-0.002	Serial #:	868785	
Transducer Elevation:	97.323	97.328			

Field Personnel:	TR, GG	Trip Date:	17-Jun-15
Data Entry Personnel:	TR	Date:	17-Jun-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: August 12, 2015
 Site Visit Time (MST): 14:50

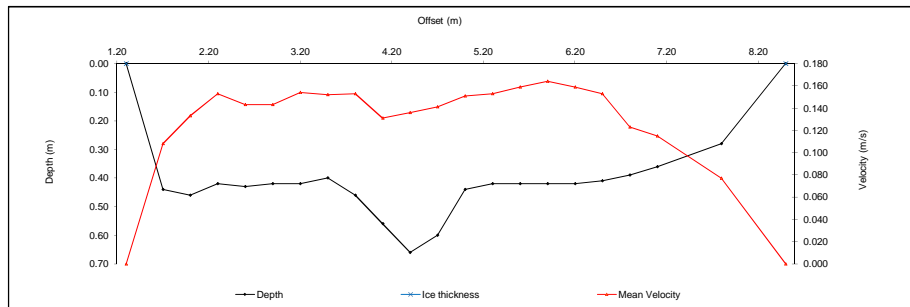


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	1.30	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	1.70	0.44		0.26	0.108					1.00	0.35	0.44	0.108	0.15	0.017	4%
2	2.00	0.46		0.28	0.133					1.00	0.30	0.46	0.133	0.14	0.018	5%
3	2.30	0.42		0.25	0.153					1.00	0.30	0.42	0.153	0.13	0.019	5%
4	2.60	0.43		0.26	0.143					1.00	0.30	0.43	0.143	0.13	0.018	5%
5	2.90	0.42		0.25	0.143					1.00	0.30	0.42	0.143	0.13	0.018	5%
6	3.20	0.42		0.25	0.154					1.00	0.30	0.42	0.154	0.13	0.019	5%
7	3.50	0.40		0.24	0.152					1.00	0.30	0.40	0.152	0.12	0.018	5%
8	3.80	0.46		0.28	0.153					1.00	0.30	0.46	0.153	0.14	0.021	5%
9	4.10	0.56		0.34	0.131					1.00	0.30	0.56	0.131	0.17	0.022	6%
10	4.40	0.66		0.40	0.136					1.00	0.30	0.66	0.136	0.20	0.027	7%
11	4.70	0.60		0.36	0.141					1.00	0.30	0.60	0.141	0.18	0.025	6%
12	5.00	0.44		0.26	0.151					1.00	0.30	0.44	0.151	0.13	0.020	5%
13	5.30	0.42		0.25	0.153					1.00	0.30	0.42	0.153	0.13	0.019	5%
14	5.60	0.42		0.25	0.159					1.00	0.30	0.42	0.159	0.13	0.020	5%
15	5.90	0.42		0.25	0.164					1.00	0.30	0.42	0.164	0.13	0.021	5%
16	6.20	0.42		0.25	0.159					1.00	0.30	0.42	0.159	0.13	0.020	5%
17	6.50	0.41		0.25	0.153					1.00	0.30	0.41	0.153	0.12	0.019	5%
18	6.80	0.39		0.23	0.123					1.00	0.30	0.39	0.123	0.12	0.014	4%
19	7.10	0.36		0.22	0.115					1.00	0.50	0.36	0.115	0.18	0.021	5%
20	7.80	0.28		0.17	0.077					1.00	0.70	0.28	0.077	0.20	0.015	4%
RB	8.50	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
Total Flow														0.393	100%	

Flow Measurement Details:

Metering Section Location (describe): 5m upstream of station

Meas. Start Time (MST):	15:07
Meas. End Time (MST):	15:28
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Backwater from beaver dam
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 28C



Flow characteristics:

Total Flow:	0.393	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.86	(m ²)
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.14	(m/s)
Reynolds Number:	5.14E+04	
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	1.090	1.090
Water (°C):	17.9	18.2
Datalogger Clock:	14:46	15:37
Laptop Clock:	14:46	15:37
Battery:	13.5	13.6
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	352321, 323017	-
Logger# (if replaced):	26153	-

Datalogger / Station Notes:

-2nd pressure transducer stuck in sediment
 -RSSI: -100 (omni antenna)

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-3	1.217	101.251		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.301	99.950	99.948	3/4" Pipe 5m W of Station
S62-1			1.251	100.000	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		2.829	98.422		Time WL Surveyed: 14:58
Temporary BM			2.917	98.334	0.000	-
Turn						
Temporary BM	2.905	101.239		98.334		-
Water Level:	Cut		2.818	98.421		Time WL Surveyed: 15:00
S62-1			1.239	100.000	100.000	3/4" Pipe 2m N of Station
S62-2			1.288	99.951	99.948	3/4" Pipe 5m W of Station
S62-3			1.205	100.034	100.034	3/4" Pipe 8m W of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S62-1	1.240	101.240		100.000		
Water Level:	Cut		2.823	98.417		Time WL Surveyed: 15:40
Water Level:	Cut		2.816	98.421		Time WL Surveyed: 15:42
S62-1	1.237	101.237		100.000		

WL Survey Summary

	Before	After
Average WL:	98.422	98.419
Closing Error:	0.000	-
WL Check:	0.001	-0.004
Transducer Elevation	97.332	97.329

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Camel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	DW, TR	Trip Date:	12-Aug-15
Data Check Personnel:	TR	Date:	25-Aug-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: September 11, 2015
 Site Visit Time (MST): 13:35

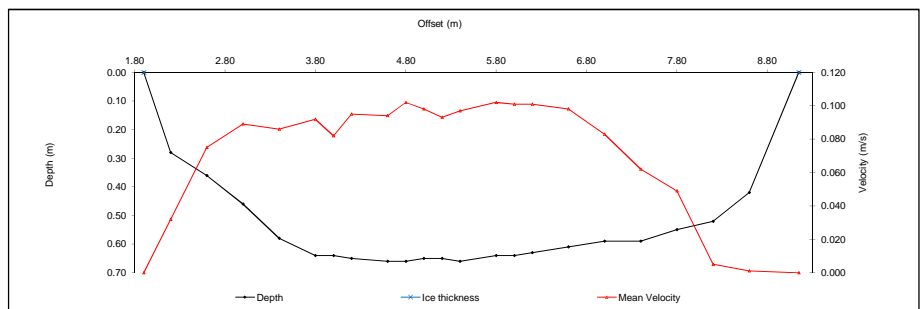


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.15	0.00	0.00		0.000				0.000	1.00	0.28	0.00	0.000	0.00	0.000	
1	8.60	0.42		0.25	0.001					1.00	0.48	0.42	0.001	0.20	0.000	0%
2	8.20	0.52		0.31	0.005					1.00	0.40	0.52	0.005	0.21	0.001	0%
3	7.80	0.55		0.33	0.049					1.00	0.40	0.55	0.049	0.22	0.011	4%
4	7.40	0.59		0.35	0.062					1.00	0.40	0.59	0.062	0.24	0.015	5%
5	7.00	0.59		0.35	0.083					1.00	0.40	0.59	0.083	0.24	0.020	7%
6	6.60	0.61		0.37	0.098					1.00	0.40	0.61	0.098	0.24	0.024	8%
7	6.20	0.63		0.38	0.101					1.00	0.30	0.63	0.101	0.19	0.019	6%
8	6.00	0.64		0.38	0.101					1.00	0.20	0.64	0.101	0.13	0.013	4%
9	5.80	0.64		0.38	0.102					1.00	0.30	0.64	0.102	0.19	0.020	7%
10	5.40	0.66		0.40	0.097					1.00	0.30	0.66	0.097	0.20	0.019	7%
11	5.20	0.65		0.39	0.093					1.00	0.20	0.65	0.093	0.13	0.012	4%
12	5.00	0.65		0.39	0.098					1.00	0.20	0.65	0.098	0.13	0.013	4%
13	4.80	0.66		0.40	0.102					1.00	0.20	0.66	0.102	0.13	0.013	4%
14	4.60	0.66		0.40	0.094					1.00	0.30	0.66	0.094	0.20	0.019	6%
15	4.20	0.65		0.39	0.095					1.00	0.30	0.65	0.095	0.20	0.019	6%
16	4.00	0.64		0.38	0.082					1.00	0.20	0.64	0.082	0.13	0.010	4%
17	3.80	0.64		0.38	0.092					1.00	0.30	0.64	0.092	0.19	0.018	6%
18	3.40	0.58		0.35	0.086					1.00	0.40	0.58	0.086	0.23	0.020	7%
19	3.00	0.46		0.28	0.089					1.00	0.40	0.46	0.089	0.18	0.016	6%
20	2.80	0.36		0.22	0.075					1.00	0.40	0.36	0.075	0.14	0.011	4%
21	2.20	0.28		0.17	0.032					1.00	0.35	0.28	0.032	0.10	0.003	1%
LB	1.90	0.00	0.00		0.00				0.00	1.00	0.15	0.00	0.000	0.00	0.000	
Total Flow														0.295	100%	

Flow Measurement Details:

Metering Section Location (describe):
 5m downstream of bridge, downstream of beaver dam

Meas. Start Time (MST):	14:00
Meas. End Time (MST):	14:22
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Flowing well, turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 20C



Flow characteristics:

Total Flow:	0.295	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.81	(m ²)
Wetted Width:	7.25	(m)
Hydraulic Depth:	0.53	(m)
Mean Velocity:	0.08	(m/s)
Reynolds Number:	3.11E+04	
Froude Number:	0.93	

Logger Details:

	Before	After
Transducer Reading (m):	1.188	1.188
Water (°C):	10.2	10.8
Datalogger Clock:	13:33	14:40
Laptop Clock:	13:33	14:40
Battery:	13.7	13.7
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-Water in channel was too deep to enable the old PLS to be dug out

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-3	1.072	101.106		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.156	99.950	99.948	3/4" Pipe 5m W of Station
S62-1			1.106	100.000	100.000	3/4" Pipe 2m N of Station
Turn						
Water Level:	Cut		2.610	98.496		Time WL Surveyed: 13:39
Temporary BM			2.738	98.367	0.000	
Turn						
Temporary BM	2.728	101.095		98.367		
Water Level:	Cut		2.598	98.497		Time WL Surveyed: 13:42
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S62-1	1.094	101.095		100.001		
Water Level:	Cut		2.597	98.498		Time WL Surveyed: 14:35
Water Level:	Cut		2.588	98.497		Time WL Surveyed: 14:37
S62-1	1.084	101.085		100.001		

WL Survey Summary

	Before	After
Average WL:	98.497	98.498
Closing Error:	-0.001	-
WL Check:	0.001	0.001
Transducer Elevation	97.309	97.310

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Cansel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	SM, JC	Trip Date:	11-Sep-15
Data Check Personnel:	TR	Date:	11-Sep-15
Entered Digitally in the Field:	Yes		26-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: October 13, 2015
 Site Visit Time (MST): 14:30

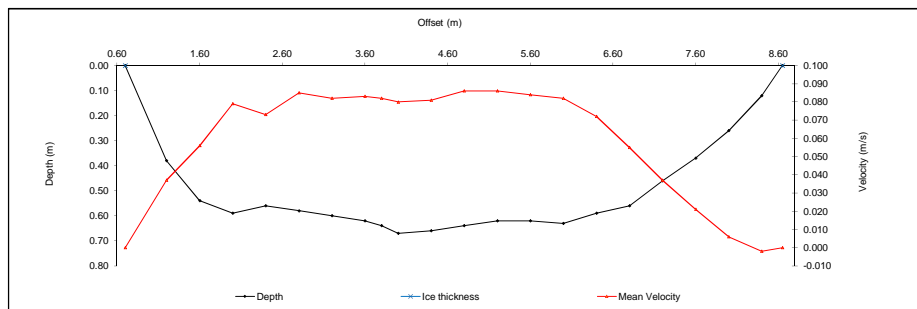


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.70	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	1.20	0.38		0.23	0.037					1.00	0.45	0.38	0.037	0.17	0.006	2%
2	1.60	0.54		0.32	0.056					1.00	0.40	0.54	0.056	0.22	0.012	4%
3	2.00	0.59		0.35	0.079					1.00	0.40	0.59	0.079	0.24	0.019	7%
4	2.40	0.56		0.34	0.073					1.00	0.40	0.56	0.073	0.22	0.016	6%
5	2.80	0.58		0.35	0.085					1.00	0.40	0.58	0.085	0.23	0.020	7%
6	3.20	0.60		0.36	0.082					1.00	0.40	0.60	0.082	0.24	0.020	7%
7	3.60	0.62		0.37	0.083					1.00	0.30	0.62	0.083	0.19	0.015	5%
8	3.80	0.64		0.38	0.082					1.00	0.20	0.64	0.082	0.13	0.010	4%
9	4.00	0.67		0.40	0.080					1.00	0.30	0.67	0.080	0.20	0.016	6%
10	4.40	0.66		0.40	0.081					1.00	0.40	0.66	0.081	0.26	0.021	8%
11	4.80	0.64		0.38	0.086					1.00	0.40	0.64	0.086	0.26	0.022	8%
12	5.20	0.62		0.37	0.086					1.00	0.40	0.62	0.086	0.25	0.021	8%
13	5.60	0.62		0.37	0.084					1.00	0.40	0.62	0.084	0.25	0.021	8%
14	6.00	0.63		0.38	0.082					1.00	0.40	0.63	0.082	0.25	0.021	7%
15	6.40	0.59		0.35	0.072					1.00	0.40	0.59	0.072	0.24	0.017	6%
16	6.80	0.56		0.34	0.055					1.00	0.40	0.56	0.055	0.22	0.012	4%
17	7.20	0.46		0.28	0.037					1.00	0.40	0.46	0.037	0.18	0.007	2%
18	7.60	0.37		0.22	0.021					1.00	0.40	0.37	0.021	0.15	0.003	1%
19	8.00	0.26		0.16	0.006					1.00	0.40	0.26	0.006	0.10	0.001	0%
20	8.40	0.12		0.07	-0.002					1.00	0.33	0.12	-0.002	0.04	0.000	0%
LB	8.65	0.00	0.00		0.00				0.00	1.00	0.13	0.00	0.000	0.00	0.000	0%
Total Flow														0.281	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m downstream of bridge

Meas. Start Time (MST):	14:45
Meas. End Time (MST):	15:10
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Beaver affected
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 8C



Flow characteristics:

Total Flow:	0.281	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.04	(m ²)
Wetted Width:	7.95	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.07	(m/s)
Reynolds Number:	2.23E+04	
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	1.222	1.220
Water (°C):	3.9	4.0
Datalogger Clock:	14:29	15:20
Laptop Clock:	14:30	15:20
Battery:	13.9	13.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-1	1.298	101.298		100.000	100.000	3/4" Pipe 2m N of Station
S62-2			1.347	99.951	99.948	3/4" Pipe 5m W of Station
S62-3			1.263	100.035	100.034	3/4" Pipe 8m W of Station
Water Level:	Cut		2.767	98.531		Time WL Surveyed: 14:37
S62-3			1.263	100.035	100.034	3/4" Pipe 8m W of Station
Turn						
S62-3	1.188	101.223		100.035	100.034	3/4" Pipe 8m W of Station
Water Level:	Cut		2.693	98.530		Time WL Surveyed: 14:38
S62-3			1.188	100.035	100.034	3/4" Pipe 8m W of Station
S62-2			1.273	99.950	99.949	3/4" Pipe 5m W of Station
S62-1			1.223	100.000	100.000	3/4" Pipe 2m N of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S62-1	1.223	101.223		100.000		Time WL Surveyed: 15:18
Water Level:	Cut		2.693	98.530		Time WL Surveyed: 15:19
Water Level:	Cut		2.551	98.530		
S62-1	1.081	101.081		100.000		

WL Survey Summary

	Before	After
Average WL:	98.531	98.530
Closing Error:	0.000	-
WL Check:	0.001	0.000
Transducer Elevation	97.309	97.310

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	13-Oct-15
Data Check Personnel:	TR	Date:	13-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881
 UTM Location: 492149E 6163182N

Site Visit Date: December 2, 2015
 Site Visit Time (MST): 13:44

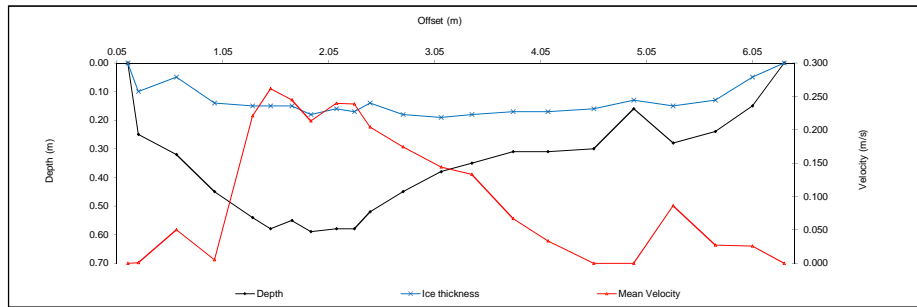


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	6.35	0.00	0.00		0.000		0.000		0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	6.05	0.15	0.05	0.10	0.029					0.88	0.32	0.10	0.026	0.03	0.001	0%
2	5.70	0.24	0.13	0.19	0.031					0.88	0.38	0.11	0.027	0.04	0.001	1%
3	5.30	0.28	0.15	0.22	0.098					0.88	0.39	0.13	0.086	0.05	0.004	2%
4	4.93	0.16	0.13	0.15	0.001					1.00	0.38	0.03	0.01	0.01	0.000	0%
5	4.55	0.30	0.16	0.23	0.000					0.88	0.41	0.14	0.033	0.05	0.002	1%
6	4.12	0.31	0.17	0.24	0.038					0.88	0.38	0.14	0.033	0.05	0.002	1%
7	3.79	0.31	0.17	0.24	0.076					0.88	0.46	0.14	0.067	0.05	0.003	2%
8	3.40	0.35	0.18	0.27	0.151					0.88	0.34	0.17	0.133	0.06	0.008	4%
9	3.11	0.38	0.19	0.29	0.164					0.88	0.33	0.19	0.144	0.06	0.009	5%
10	2.75	0.45	0.18	0.32	0.198					0.88	0.34	0.27	0.174	0.09	0.016	9%
11	2.44	0.52	0.14	0.33	0.232					0.88	0.23	0.38	0.204	0.09	0.018	10%
12	2.29	0.58	0.17	0.38	0.271					0.88	0.16	0.41	0.238	0.07	0.016	9%
13	2.12	0.58	0.16	0.37	0.272					0.88	0.21	0.42	0.239	0.09	0.021	11%
14	1.88	0.59	0.18	0.39	0.242					0.88	0.21	0.41	0.213	0.09	0.018	10%
15	1.70	0.55	0.15	0.35	0.278					0.88	0.19	0.40	0.245	0.08	0.019	10%
16	1.50	0.58	0.15	0.37	0.297					0.88	0.19	0.43	0.261	0.08	0.021	11%
17	1.33	0.54	0.15	0.35	0.251					0.88	0.27	0.39	0.221	0.10	0.023	12%
18	0.97	0.45	0.14	0.30	0.006					0.88	0.36	0.31	0.005	0.11	0.001	0%
19	0.61	0.32	0.05	0.19	0.057					0.88	0.36	0.27	0.050	0.10	0.005	3%
20	0.25	0.25	0.10	0.18	0.001					0.88	0.23	0.15	0.001	0.03	0.000	0%
LB	0.15	0.00	0.00		0.00		0.00		0.00	0.88	0.05	0.00	0.000	0.00	0.000	
Total Flow														0.184	100%	

Flow Measurement Details:

Metering Section Location (describe):
30m downstream of culvert

Meas. Start Time (MST):	14:16
Meas. End Time (MST):	14:39
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, calm, -1C



Flow characteristics:

Total Flow:	0.184	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.33	(m ²)
Wetted Width:	6.20	(m)
Hydraulic Depth:	0.21	(m)
Mean Velocity:	0.14	(m/s)
Reynolds Number:	1.67E+04	
Froude Number:	0.10	

Logger Details:

	Before	After
Transducer Reading (m):	1.176	-
Water (°C):	0.3	-
Datalogger Clock:	14:44	-
Laptop Clock:	13:45	-
Battery:	14.3	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dissicant:	Replaced	-
Vent Tube Dissicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S62-3	1.297	101.331		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.383	99.948	99.948	3/4" Pipe 5m W of Station
S62-1			1.331	100.000	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		2.847	98.484	Time WL Surveyed: 13:58	
Temporary BM			2.822	98.509	0.000	-
Turn						
Temporary BM	2.795	101.304		98.509	-	
Water Level:	Cut		2.820	98.484	Time WL Surveyed: 14:02	
S62-1			1.303	100.001	100.000	3/4" Pipe 2m N of Station
S62-2			1.352	99.952	99.948	3/4" Pipe 5m W of Station
S62-3			1.267	100.037	100.034	3/4" Pipe 8m W of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	98.484	-
Closing Error:	-0.003	-
WL Check:	0.000	-
Transducer Elevation	97.308	-

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, JM	Trip Date:	2-Dec-15
Data Check Personnel:	JC	Date:	2-Dec-15
Entered Digitally in the Field:	Yes	Date:	8-Jan-16

Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881
 UTM Location: 494283E 6157255N

Site Visit Date: January 8, 2015
 Site Visit Time (MST): 09:39

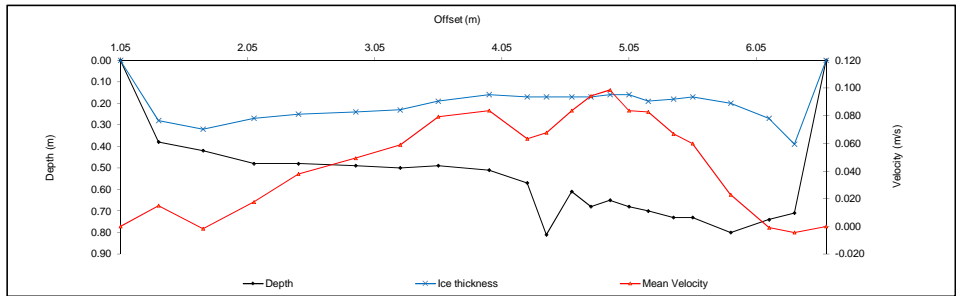


Flow Measurement															
Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	Depth from WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	6.60	0.00	0.00	0.000				0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	6.35	0.71	0.39	0.55	-0.005				0.88	0.23	0.32	-0.004	0.07	0.000	0%
2	6.15	0.74	0.27	0.51	-0.001				0.88	0.25	0.47	-0.001	0.12	0.000	0%
3	5.85	0.80	0.20	0.50	0.026				0.88	0.30	0.60	0.023	0.18	0.004	4%
4	5.55	0.73	0.17	0.45	0.068				0.88	0.23	0.56	0.060	0.13	0.008	8%
5	5.40	0.73	0.18	0.46	0.076				0.88	0.17	0.55	0.067	0.10	0.006	6%
6	5.20	0.70	0.19	0.45	0.094				0.88	0.18	0.51	0.083	0.09	0.007	7%
7	5.05	0.68	0.16	0.42	0.095				0.88	0.15	0.52	0.084	0.08	0.007	7%
8	4.90	0.65	0.16	0.41	0.112				0.88	0.15	0.49	0.099	0.07	0.007	7%
9	4.75	0.68	0.17	0.43	0.107				0.88	0.15	0.51	0.094	0.08	0.007	7%
10	4.60	0.61	0.17	0.39	0.095				0.88	0.18	0.44	0.084	0.08	0.006	6%
11	4.40	0.81	0.17	0.49	0.077				0.88	0.18	0.64	0.068	0.11	0.008	8%
12	4.25	0.57	0.17	0.37	0.072				0.88	0.23	0.40	0.063	0.09	0.006	6%
13	3.95	0.51	0.16	0.34	0.095				0.88	0.35	0.35	0.084	0.12	0.010	10%
14	3.55	0.49	0.19	0.34	0.090				0.88	0.35	0.30	0.079	0.11	0.008	8%
15	3.25	0.50	0.23	0.37	0.067				0.88	0.33	0.27	0.059	0.09	0.005	5%
16	2.90	0.49	0.24	0.37	0.056				0.88	0.40	0.25	0.049	0.10	0.005	5%
17	2.45	0.48	0.25	0.37	0.043				0.88	0.40	0.23	0.038	0.09	0.003	3%
18	2.10	0.48	0.27	0.38	0.020				0.88	0.38	0.21	0.018	0.08	0.001	1%
19	1.70	0.42	0.32	0.37	-0.002				0.88	0.38	0.10	-0.002	0.04	0.000	0%
20	1.35	0.38	0.28	0.33	0.017				0.88	0.33	0.10	0.015	0.03	0.000	0%
RB	1.05	0.00	0.00	0.00		0.00		0.00	0.88	0.15	0.00	0.000	0.00	0.000	
Total Flow													0.100	100%	

Flow Measurement Details:

Metering Section Location (describe):
5 m downstream of pressure transducer

Meas. Start Time (MST):	10:03
Meas. End Time (MST):	10:39
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -19C



Flow characteristics:

Total Flow:	0.100	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.84	(m ²)
Wattted Width:	5.55	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.03	

Logger Details:

	Before	After
Transducer Reading (m):	0.820	
Water (°C):	0.4	
Datalogger Clock:	09:44	
Laptop Clock:	09:44	
Battery (Main):	12.5	
Battery:	Good	
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

- 5cm water on top of the ice during survey

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S63-1	0.623	100.623		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.792	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.165	99.458	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		4.011	96.612		Time WL Surveyed: 10:02
Temporary BM			4.059	96.564	0.000	-
Turn						
Temporary BM	4.036	100.600		96.564		-
Water Level:	Cut		3.987	96.613		Time WL Surveyed: 10:06
S63-3			1.142	99.458	99.444	3/4" Pipe 10m E of Station
S63-2			0.768	99.832	99.830	3/4" Pipe 7m E of Station
S63-1			0.599	100.001	100.000	3/4" Pipe 5m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.613	-
Closing Error:	-0.001	-
WL Check:	0.001	-
Transducer Elevation	95.793	-

Field Personnel:

	GG, TR	Trip Date:	8-Jan-15
Data Entry Personnel:	GG	Date:	8-Jan-15
Data Check Personnel:	MP	Date:	12-Mar-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881
 UTM Location: 494283E 6157255N

Site Visit Date: February 6, 2015
 Site Visit Time (MST): 14:00

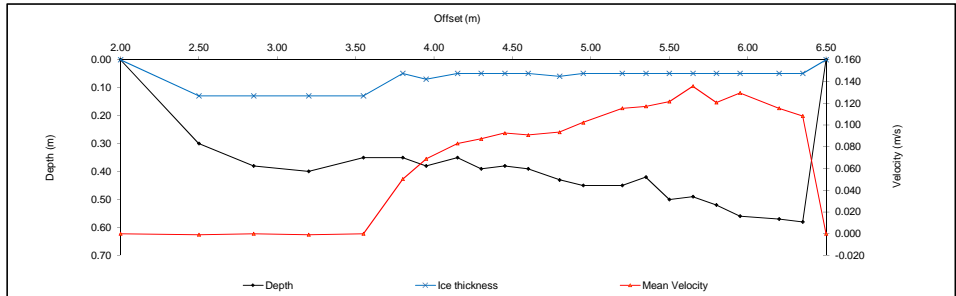


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of ice from bottom to WS (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.00	0.00	0.00	0.22	0.000	-0.001	0.000	0.000	0.000	0.88	0.25	0.00	0.000	0.00	0.000	0%
1	2.50	0.30	0.13	0.22	0.000	-0.001	0.000	0.000	0.88	0.43	0.17	-0.001	0.07	0.000	0%	
2	2.85	0.38	0.13	0.26	0.000	-0.001	0.000	0.000	0.88	0.35	0.25	0.000	0.09	0.000	0%	
3	3.20	0.40	0.13	0.27	0.000	-0.001	0.000	0.000	0.88	0.35	0.27	-0.001	0.09	0.000	0%	
4	3.55	0.35	0.13	0.24	0.000	-0.001	0.000	0.000	0.88	0.30	0.22	0.000	0.07	0.000	0%	
5	3.80	0.35	0.05	0.20	0.057	0.057	0.057	0.057	0.88	0.20	0.30	0.050	0.06	0.003	3%	
6	3.95	0.38	0.07	0.23	0.078	0.078	0.078	0.078	0.88	0.18	0.31	0.069	0.05	0.004	3%	
7	4.15	0.35	0.05	0.20	0.094	0.094	0.094	0.094	0.88	0.17	0.30	0.083	0.05	0.004	4%	
8	4.30	0.39	0.05	0.22	0.099	0.099	0.099	0.099	0.88	0.15	0.34	0.087	0.05	0.004	4%	
9	4.45	0.38	0.05	0.22	0.105	0.105	0.105	0.105	0.88	0.15	0.33	0.092	0.05	0.005	4%	
10	4.60	0.39	0.05	0.22	0.103	0.103	0.103	0.103	0.88	0.17	0.34	0.091	0.06	0.005	5%	
11	4.80	0.43	0.06	0.25	0.106	0.106	0.106	0.106	0.88	0.18	0.37	0.093	0.06	0.006	5%	
12	4.95	0.45	0.05	0.25	0.116	0.116	0.116	0.116	0.88	0.20	0.40	0.102	0.08	0.008	7%	
13	5.20	0.45	0.05	0.25	0.131	0.131	0.131	0.131	0.88	0.20	0.40	0.115	0.08	0.009	8%	
14	5.35	0.42	0.05	0.24	0.133	0.133	0.133	0.133	0.88	0.15	0.37	0.117	0.06	0.006	6%	
15	5.50	0.50	0.05	0.28	0.138	0.138	0.138	0.138	0.88	0.15	0.45	0.121	0.07	0.008	7%	
16	5.65	0.49	0.05	0.27	0.154	0.154	0.154	0.154	0.88	0.15	0.44	0.136	0.07	0.009	8%	
17	5.80	0.52	0.05	0.29	0.137	0.137	0.137	0.137	0.88	0.15	0.47	0.121	0.07	0.008	7%	
18	5.95	0.56	0.05	0.31	0.147	0.147	0.147	0.147	0.88	0.20	0.51	0.129	0.10	0.013	11%	
19	6.20	0.57	0.05	0.31	0.131	0.131	0.131	0.131	0.88	0.20	0.52	0.115	0.10	0.012	10%	
20	6.35	0.58	0.05	0.32	0.123	0.123	0.123	0.123	0.88	0.15	0.53	0.108	0.08	0.009	7%	
LB	6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.08	0.00	0.000	0.00	0.000	0%	
Total Flow														0.115	100%	

Flow Measurement Details:

Metering Section Location (describe):
7m downstream of pressure transducer

Meas. Start Time (MST):	14:35
Meas. End Time (MST):	15:05
Equipment:	ADV
Method:	Ice
River Condition:	Thick ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snow, breezy, -22C



Flow characteristics:

Total Flow:	0.115	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.42	(m ²)
Wetted Width:	4.50	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.05	

Logger Details:

	Before	After
Transducer Reading (m):	0.613	
Water (°C):	0.4	
Datalogger Clock:	14:10	
Laptop Clock:	14:10	
Battery (Main):	14.9	
Battery:	Good	
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

- Power plug on logger found unplugged on arrival

General Notes:

- Thick overflow ice
- Very low water level down in hole
- Slush under ice

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S63-1	1.100	101.100		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			1.268	99.832	99.830	3/4" Pipe 7m E of Station
S63-3			1.643	99.457	99.444	3/4" Pipe 10m E of Station
Water Level:						
Water Level:	Cut	4.703		96.397		Time WL Surveyed: 14:21
Temporary BM		4.189		96.911	0.000	-
Turn						
Temporary BM	4.169	101.080		96.911		-
Water Level:	Cut		4.685	96.395		Time WL Surveyed: 14:24
S63-3			1.624	99.456	99.444	3/4" Pipe 10m E of Station
S63-2			1.249	99.831	99.830	3/4" Pipe 7m E of Station
S63-1			1.082	99.998	100.000	3/4" Pipe 5m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.396	-
Closing Error:	0.002	-
WL Check:	0.002	-
Transducer Elevation	95.783	-

Field Personnel:

Data Entry Personnel:	TR, CJ	Trip Date:	6-Feb-15
Data Check Personnel:	CJ	Date:	6-Feb-15
Entered Digitally in the Field:	Yes	Date:	12-Mar-15

Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881
 UTM Location: 494283E 6157255N

Site Visit Date: February 27, 2015
 Site Visit Time (MST): 14:45

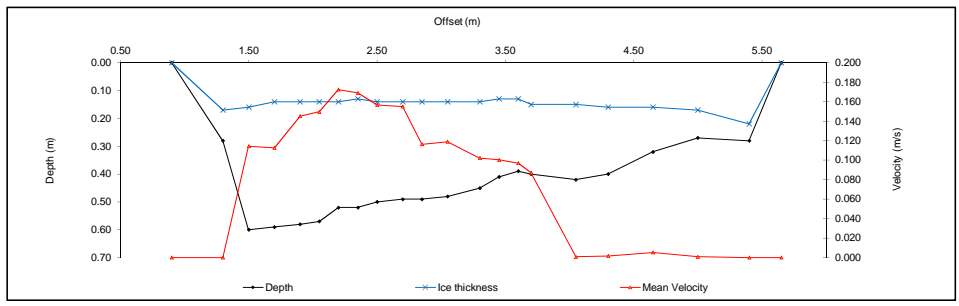


Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	5.65	0.00	0.00		0.000		0.000		0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	5.40	0.28	0.22	0.25	0.000					0.88	0.33	0.06	0.000	0.02	0.000	0%
2	5.00	0.27	0.17	0.22	0.001					0.88	0.38	0.10	0.001	0.04	0.000	0%
3	4.65	0.32	0.16	0.24	0.006					0.88	0.35	0.16	0.005	0.06	0.000	0%
4	4.30	0.40	0.16	0.28	0.002					0.88	0.30	0.24	0.002	0.07	0.000	0%
5	4.05	0.42	0.15	0.29	0.001					0.88	0.30	0.27	0.001	0.08	0.000	0%
6	3.70	0.40	0.15	0.28	0.009					0.88	0.23	0.25	0.007	0.06	0.005	4%
7	3.60	0.39	0.13	0.26	0.110					0.88	0.13	0.26	0.097	0.03	0.003	3%
8	3.45	0.41	0.13	0.27	0.114					0.88	0.15	0.28	0.100	0.04	0.004	4%
9	3.30	0.45	0.14	0.30	0.116					0.88	0.20	0.31	0.102	0.06	0.006	6%
10	3.05	0.48	0.14	0.31	0.135					0.88	0.23	0.34	0.119	0.08	0.009	8%
11	2.85	0.49	0.14	0.32	0.132					0.88	0.18	0.35	0.116	0.06	0.007	6%
12	2.70	0.49	0.14	0.32	0.176					0.88	0.18	0.35	0.155	0.06	0.009	8%
13	2.50	0.50	0.14	0.32	0.178					0.88	0.18	0.36	0.157	0.06	0.010	9%
14	2.35	0.52	0.13	0.33	0.192					0.88	0.15	0.39	0.169	0.06	0.010	9%
15	2.20	0.52	0.14	0.33	0.196					0.88	0.15	0.38	0.172	0.06	0.010	9%
16	2.05	0.57	0.14	0.36	0.170					0.88	0.15	0.43	0.150	0.06	0.010	8%
17	1.90	0.58	0.14	0.36	0.165					0.88	0.18	0.44	0.145	0.08	0.011	10%
18	1.70	0.59	0.14	0.37	0.128					0.88	0.20	0.45	0.113	0.09	0.010	9%
19	1.50	0.60	0.16	0.38	0.130					0.88	0.20	0.44	0.114	0.09	0.010	9%
20	1.30	0.28	0.17	0.23	0.000					0.88	0.30	0.11	0.000	0.03	0.000	0%
LB	0.90	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.115	100%	

Flow Measurement Details:

Metering Section Location (describe):
12m downstream of pressure transducer

Meas. Start Time (MST):	15:05
Meas. End Time (MST):	15:35
Equipment:	ADV
Method:	Ice
River Condition:	Thick ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -15C



Flow characteristics:

Total Flow:	0.115	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.19	(m ²)
Wetted Width:	4.75	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.06	

Logger Details:

	Before	After
Transducer Reading (m):	0.620	0.620
Water (°C):	0.4	0.4
Datalogger Clock:	14:48	14:55
Laptop Clock:	14:48	14:55
Battery (Main):	14.5	14.2
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S63-3	1.299	100.758		99.459	99.459	3/4" Pipe 10m E of Station
S63-2			0.926	99.832	99.830	3/4" Pipe 7m E of Station
S63-1			0.758	100.000	100.000	3/4" Pipe 5m NE of Station
Water Level:	Cut		4.250	96.408	Time WL Surveyed: 15:40	
Temporary BM			3.891	96.867	0.000	
Turn						
Temporary BM	3.860	100.727		96.867		
Water Level:	Cut		4.319	96.408	Time WL Surveyed: 15:43	
S63-1			0.728	99.999	100.000	3/4" Pipe 5m NE of Station
S63-2			0.897	99.830	99.830	3/4" Pipe 7m E of Station
S63-3			1.289	99.459	99.459	3/4" Pipe 10m E of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	96.408	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	95.788	-

Field Personnel:

	TR, RM	Trip Date:	27-Feb-15
Data Entry Personnel:	TR	Date:	27-Feb-15
Data Check Personnel:	SG	Date:	5-Jun-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881
 UTM Location: 494283E 6157255N

Site Visit Date: April 14, 2015
 Site Visit Time (MST): 11:00

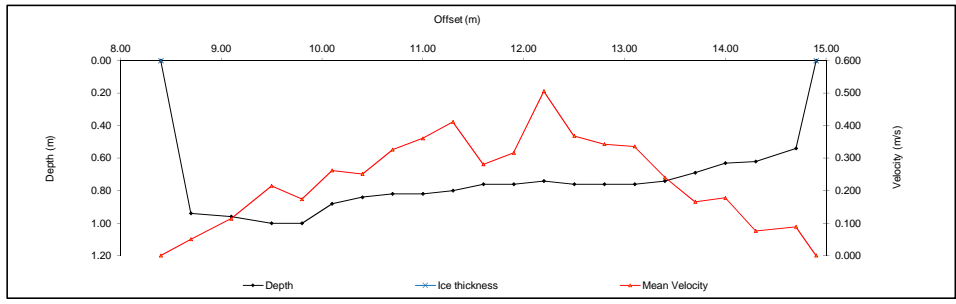


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 (m/s)	Depth of Obs. @ 0.2 (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	8.40	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	8.70	0.94			0.75	0.012	0.19	0.089		1.00	0.35	0.94	0.051	0.33	0.017	1%
2	9.10	0.96			0.77	0.084	0.19	0.144		1.00	0.40	0.96	0.114	0.38	0.044	4%
3	9.50	1.00			0.80	0.130	0.20	0.300		1.00	0.35	1.00	0.215	0.35	0.075	6%
4	9.80	1.00			0.80	0.040	0.20	0.308		1.00	0.30	1.00	0.174	0.30	0.052	4%
5	10.10	0.88			0.70	0.126	0.18	0.398		1.00	0.30	0.88	0.262	0.26	0.069	6%
6	10.40	0.84			0.67	0.131	0.17	0.372		1.00	0.30	0.84	0.252	0.25	0.063	5%
7	10.70	0.82			0.66	0.177	0.16	0.476		1.00	0.30	0.82	0.327	0.25	0.080	7%
8	11.00	0.82			0.66	0.180	0.16	0.542		1.00	0.30	0.82	0.361	0.25	0.089	7%
9	11.30	0.80			0.64	0.262	0.16	0.561		1.00	0.30	0.80	0.412	0.24	0.099	8%
10	11.60	0.76			0.61	0.000	0.15	0.561		1.00	0.30	0.76	0.281	0.23	0.064	5%
11	11.90	0.76			0.61	0.063	0.15	0.570		1.00	0.30	0.76	0.317	0.23	0.072	6%
12	12.20	0.74		0.44	0.506					1.00	0.30	0.74	0.506	0.22	0.112	9%
13	12.50	0.76			0.61	0.190	0.15	0.547		1.00	0.30	0.76	0.369	0.23	0.084	7%
14	12.80	0.76			0.61	0.217	0.15	0.469		1.00	0.30	0.76	0.343	0.23	0.078	6%
15	13.10	0.76			0.61	0.251	0.15	0.421		1.00	0.30	0.76	0.336	0.23	0.077	6%
16	13.40	0.74		0.44	0.241					1.00	0.30	0.74	0.241	0.22	0.054	4%
17	13.70	0.69		0.41	0.166					1.00	0.30	0.69	0.166	0.21	0.034	3%
18	14.00	0.63		0.38	0.178					1.00	0.30	0.63	0.178	0.19	0.034	3%
19	14.30	0.62		0.37	0.076					1.00	0.35	0.62	0.076	0.22	0.016	1%
20	14.70	0.54		0.32	0.089					1.00	0.30	0.54	0.089	0.16	0.014	1%
RB	14.90	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
Total Flow														1.23	100%	

Flow Measurement Details:

Metering Section Location (describe): 10m downstream of station

Meas. Start Time (MST):	11:25
Meas. End Time (MST):	12:04
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, 4C



Flow characteristics:

Total Flow:	1.23	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.97	(m ²)
Wetted Width:	6.50	(m)
Hydraulic Depth:	0.76	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.09	

Logger Details:

	Before	After
Transducer Reading (m):	1.038	1.051
Water (°C):	1.5	1.7
Datalogger Clock:	11:10	12:13
Laptoe Clock:	11:10	12:13
Battery (Main):	14.1	13.4
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S63-1	0.857	100.857		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			1.026	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.402	99.455	99.459	3/4" Pipe 10m E of Station
Water Level:	Cut		4.038	96.819		Time WL Surveyed: 11:15
S63-1		0.857		100.000	100.000	3/4" Pipe 5m NE of Station
Turn						
S63-1	0.835	100.835		100.000	100.000	3/4" Pipe 5m NE of Station
Water Level:	Cut		4.016	96.819		Time WL Surveyed: 11:17
S63-3			1.379	99.456	99.459	3/4" Pipe 10m E of Station
S63-2			1.004	99.831	99.830	3/4" Pipe 7m E of Station
S63-1		0.835		100.000	100.000	3/4" Pipe 5m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S63-1	0.835	100.835		100.000		
Water Level:	Cut		4.010	96.825		Time WL Surveyed: 12:09
Water Level:	Cut		3.989	96.826		Time WL Surveyed: 12:11
S63-1	0.815	100.815		100.000		

WL Survey Summary

	Before	After
Average WL:	96.819	96.826
Closing Error:	0.000	-
WL Check:	0.000	-0.001
Transducer Elevation	95.781	95.775

Field Personnel:

Data Entry Personnel:	SM, GG	Trip Date:	14-Apr-15
Data Check Personnel:	SM	Date:	14-Apr-15
Entered Digitally in the Field:	Yes	Date:	5-Jun-15

Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881
 UTM Location: 494283E 6157255N

Site Visit Date: June 17, 2015
 Site Visit Time (MST): 09:47



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)	
LB	15.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	1.00	0.15	0.00	0.000	0.00	0.000		
1	14.70	0.40	0.24	-0.010					1.00	0.30	0.40	-0.010	0.12	-0.001	-1%	
2	14.40	0.46	0.28	0.001					1.00	0.30	0.46	0.001	0.14	0.000	0%	
3	14.10	0.42	0.25	0.009					1.00	0.30	0.42	0.009	0.13	0.001	1%	
4	13.80	0.40	0.24	0.005					1.00	0.30	0.40	0.005	0.12	0.001	0%	
5	13.50	0.46	0.28	0.033					1.00	0.30	0.46	0.033	0.14	0.005	2%	
6	13.20	0.50	0.30	0.057					1.00	0.30	0.50	0.057	0.15	0.009	5%	
7	12.90	0.53	0.32	0.040					1.00	0.30	0.53	0.040	0.16	0.006	3%	
8	12.60	0.51	0.31	0.073					1.00	0.30	0.51	0.073	0.15	0.011	6%	
9	12.30	0.46	0.28	0.108					1.00	0.30	0.46	0.108	0.14	0.015	8%	
10	12.00	0.42	0.25	0.139					1.00	0.30	0.42	0.139	0.13	0.018	9%	
11	11.70	0.39	0.23	0.140					1.00	0.23	0.39	0.140	0.09	0.012	7%	
12	11.55	0.41	0.25	0.138					1.00	0.15	0.41	0.138	0.06	0.008	5%	
13	11.40	0.42	0.25	0.161					1.00	0.23	0.42	0.161	0.09	0.015	8%	
14	11.10	0.40	0.24	0.153					1.00	0.23	0.40	0.153	0.09	0.014	7%	
15	10.95	0.40	0.24	0.184					1.00	0.15	0.40	0.184	0.06	0.011	6%	
16	10.80	0.40	0.24	0.139					1.00	0.23	0.40	0.139	0.09	0.013	7%	
17	10.50	0.40	0.24	0.134					1.00	0.30	0.40	0.134	0.12	0.016	9%	
18	10.20	0.32	0.19	0.109					1.00	0.30	0.32	0.109	0.10	0.010	6%	
19	9.90	0.28	0.17	0.091					1.00	0.30	0.28	0.091	0.08	0.008	4%	
20	9.60	0.23	0.14	0.092					1.00	0.30	0.23	0.092	0.07	0.006	3%	
21	9.30	0.20	0.12	0.077					1.00	0.30	0.20	0.077	0.06	0.005	2%	
22	9.00	0.16	0.10	0.074					1.00	0.35	0.16	0.074	0.06	0.004	2%	
RB	8.60	0.00	0.00	0.000	0.000	0.000	0.000	0.000	1.00	0.20	0.00	0.000	0.00	0.000		
Total Flow													0.186	100%		

Flow Measurement Details:

Metering Section Location (describe):
 10m downstream of logger

Meas. Start Time (MST):	9:55
Meas. End Time (MST):	10:21
Equipment:	ADJVI
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3338
Method:	Wading
River Condition:	Low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, light breeze, 13C

Flow characteristics:

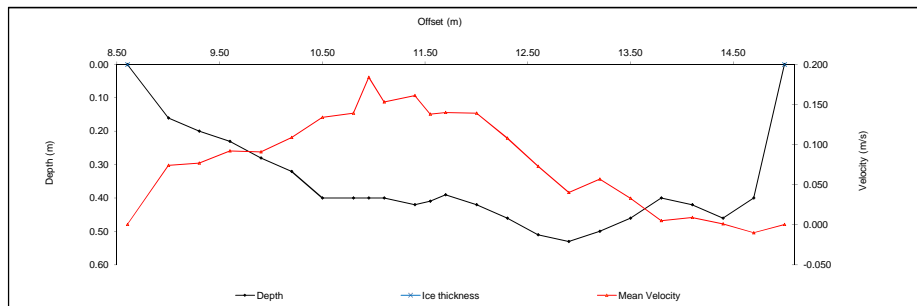
Total Flow:	0.186	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.34	(m ²)
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.08	(m/s)
Reynolds Number:	2.25E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.648	0.644
Water (°C):	10.9	11.0
Datalogger Clock:	09:49	10:23
Laptop Clock:	09:49	10:23
Battery:	13.9	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S63-1	0.609	100.609		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.778	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.152	99.457	99.459	3/4" Pipe 10m E of Station
Water Level:	Cut	0.127	4.316	96.420	96.420	Time WL Surveyed: 9:51
Temporary BM			4.316	96.293	96.293	0.000
Turn						
Temporary BM	4.300	100.593		96.293	96.293	
Water Level:	Cut	0.127	4.300	96.420	96.420	Time WL Surveyed: 9:53
S63-3			1.134	99.459	99.459	3/4" Pipe 10m E of Station
S63-2			0.763	99.830	99.830	3/4" Pipe 7m E of Station
S63-1			0.583	100.000	100.000	3/4" Pipe 5m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S63-1	0.583	100.582		96.420	96.420	Time WL Surveyed: 10:24
Water Level:	Cut	0.126	4.286	96.422	96.422	Time WL Surveyed: 10:26
S63-1	0.582	100.582		100.000	100.000	

WL Survey Summary	Before	After
Average WL:	96.420	96.421
Closing Error:	0.000	-
WL Check:	0.000	-0.002
Transducer Elevation	95.772	95.777

Level Survey Equipment:	Level#4
Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:	GG, TR	Trip Date:	17-Jun-15
Data Entry Personnel:	GG	Date:	17-Jun-15
Data Check Personnel:	TR	Date:	3-Jul-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881
 UTM Location: 494283E 6157255N

Site Visit Date: August 12, 2015
 Site Visit Time (MST): 13:30

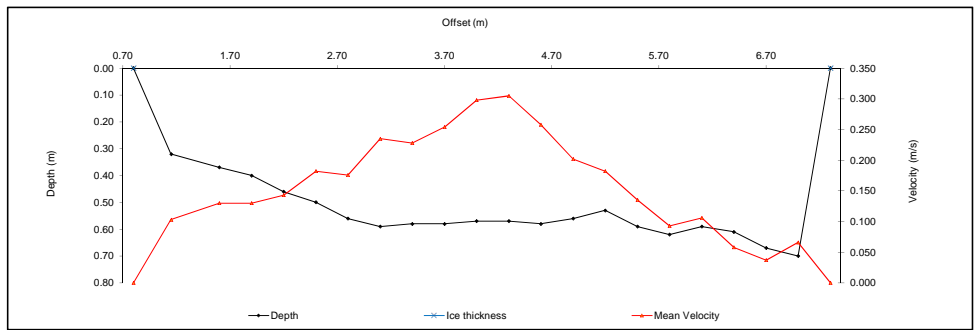


Flow Measurement:																
Measured Data								Calculated Data								
Bank/ Mmt #	Depth from bottom to WS (m)	WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	7.30	0.00	0.00							1.00	0.15	0.00	0.000	0.00	0.000	
1	7.00	0.70		0.42	0.066					1.00	0.30	0.70	0.066	0.21	0.014	3%
2	6.70	0.67		0.40	0.037					1.00	0.30	0.67	0.037	0.20	0.007	1%
3	6.40	0.61		0.37	0.058					1.00	0.30	0.61	0.058	0.18	0.011	2%
4	6.10	0.59		0.35	0.106					1.00	0.30	0.59	0.106	0.18	0.019	3%
5	5.80	0.62		0.37	0.093					1.00	0.30	0.62	0.093	0.19	0.017	3%
6	5.50	0.59		0.35	0.135					1.00	0.30	0.59	0.135	0.18	0.024	4%
7	5.20	0.53		0.32	0.182					1.00	0.30	0.53	0.182	0.16	0.029	5%
8	4.90	0.56		0.34	0.202					1.00	0.30	0.56	0.202	0.17	0.034	6%
9	4.60	0.58		0.35	0.258					1.00	0.30	0.58	0.258	0.17	0.045	8%
10	4.30	0.57		0.34	0.305					1.00	0.30	0.57	0.305	0.17	0.052	9%
11	4.00	0.57		0.34	0.298					1.00	0.30	0.57	0.298	0.17	0.051	9%
12	3.70	0.58		0.35	0.254					1.00	0.30	0.58	0.254	0.17	0.044	8%
13	3.40	0.58		0.35	0.228					1.00	0.30	0.58	0.228	0.17	0.040	7%
14	3.10	0.59		0.35	0.235					1.00	0.30	0.59	0.235	0.18	0.042	8%
15	2.80	0.56		0.34	0.176					1.00	0.30	0.56	0.176	0.17	0.030	5%
16	2.50	0.50		0.30	0.182					1.00	0.30	0.50	0.182	0.15	0.027	5%
17	2.20	0.46		0.28	0.143					1.00	0.30	0.46	0.143	0.14	0.020	4%
18	1.90	0.40		0.24	0.130					1.00	0.30	0.40	0.130	0.12	0.016	3%
19	1.60	0.37		0.22	0.130					1.00	0.38	0.37	0.130	0.14	0.018	3%
20	1.15	0.32		0.19	0.103					1.00	0.40	0.32	0.103	0.13	0.013	2%
LB	0.80	0.00	0.00		0.00		0.00		0.00	1.00	0.18	0.00	0.000	0.00	0.000	
Total Flow														0.552	100%	

Flow Measurement Details:

Metering Section Location (describe): 8m upstream of culvert

Meas. Start Time (MST):	13:50
Meas. End Time (MST):	14:10
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, light breeze, 27C



Flow characteristics:

Total Flow:	0.552	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.34	(m ²)
Wetted Width:	6.50	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.17	(m/s)
Reynolds Number:	8.28E+04	
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	0.517	0.587
Water (°C):	19.0	19.7
Datalogger Clock:	13:36	14:26
Laptop Clock:	13:36	14:26
Battery:	13.5	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	278402	298681
Logger# (if replaced):	25574	-

Datalogger / Station Notes:

-Pressure transducer replaced for calibration

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S63-1	0.651	100.651		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.821	99.830	99.830	3/4" Pipe 7m E of Station
S63-3			1.192	99.459	99.459	3/4" Pipe 10m E of Station
Water Level:	Cut		4.062	96.589		Time WL Surveyed: 13:41
Temporary BM			3.878	96.773	0.000	-
Turn						
Temporary BM	3.857	100.630		96.773		
Water Level:	Cut		4.041	96.589		Time WL Surveyed: 13:43
S63-3			1.171	99.459	99.459	3/4" Pipe 10m E of Station
S63-2			0.799	99.831	99.830	3/4" Pipe 7m E of Station
S63-1			0.631	99.999	100.000	3/4" Pipe 5m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S63-1	0.631	100.631		100.000		
Water Level:	Cut		4.041	96.590		Time WL Surveyed: 14:23
Water Level:	Cut		4.006	96.592		Time WL Surveyed: 14:24
S63-1	0.598	100.598		100.000		

WL Survey Summary

	Before	After
Average WL:	96.589	96.591
Closing Error:	0.001	-
WL Check:	0.000	-0.002
Transducer Elevation	95.772	95.904

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

TR, DW	Trip Date:	12-Aug-15
TR	Date:	12-Aug-15
TR	Date:	25-Aug-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881
 UTM Location: 494283E 6157255N

Site Visit Date: September 11, 2015
 Site Visit Time (MST): 15:05

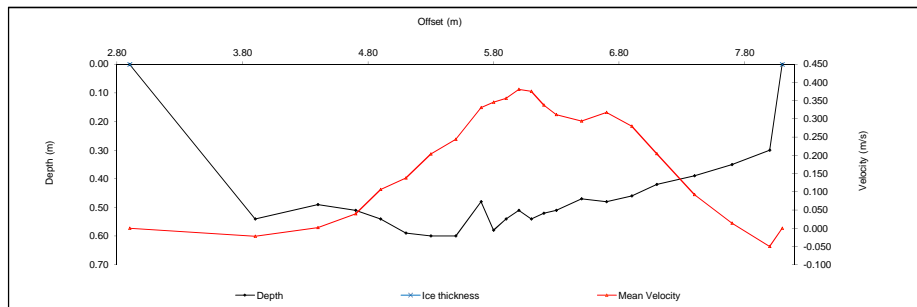


Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)							
RB	8.10	0.00	0.00		0.000				0.000														
1	8.00	0.30		0.18	-0.050				1.00	0.05	0.00	0.000	0.00	0.000									
2	7.70	0.35		0.21	0.014				1.00	0.20	0.30	-0.050	0.06	-0.003		-1%							
3	7.40	0.39		0.23	0.092				1.00	0.30	0.35	0.014	0.11	0.001		0%							
4	7.10	0.42		0.25	0.205				1.00	0.30	0.39	0.092	0.12	0.011		3%							
5	6.90	0.46		0.28	0.280				1.00	0.25	0.42	0.205	0.11	0.022		6%							
6	6.70	0.48		0.29	0.316				1.00	0.20	0.46	0.280	0.09	0.026		8%							
7	6.50	0.47		0.28	0.294				1.00	0.20	0.48	0.316	0.10	0.031		9%							
8	6.30	0.51		0.31	0.312				1.00	0.20	0.47	0.294	0.09	0.028		8%							
9	6.20	0.52		0.31	0.338				1.00	0.15	0.51	0.312	0.08	0.024		7%							
10	6.10	0.54		0.32	0.376				1.00	0.10	0.52	0.338	0.05	0.018		5%							
11	6.00	0.51		0.31	0.381				1.00	0.10	0.54	0.376	0.05	0.020		6%							
12	5.90	0.54		0.32	0.357				1.00	0.10	0.51	0.381	0.05	0.019		6%							
13	5.80	0.58		0.35	0.346				1.00	0.10	0.54	0.357	0.05	0.019		6%							
14	5.70	0.48		0.29	0.331				1.00	0.10	0.58	0.346	0.06	0.020		6%							
15	5.50	0.60		0.36	0.244				1.00	0.15	0.48	0.331	0.07	0.024		7%							
16	5.30	0.60		0.36	0.204				1.00	0.20	0.60	0.244	0.12	0.029		9%							
17	5.10	0.59		0.35	0.138				1.00	0.20	0.60	0.204	0.12	0.024		7%							
18	4.90	0.54		0.32	0.106				1.00	0.20	0.59	0.138	0.12	0.016		5%							
19	4.70	0.51		0.31	0.039				1.00	0.20	0.54	0.106	0.11	0.011		3%							
20	4.40	0.49		0.29	0.002				1.00	0.25	0.51	0.039	0.13	0.005		1%							
21	3.90	0.54		0.32	-0.022				1.00	0.40	0.49	0.002	0.20	0.000		0%							
LB	2.90	0.00	0.00		0.00				1.00	0.75	0.54	-0.022	0.41	-0.009		-3%							
Total Flow													0.337	100%									

Flow Measurement Details:

Metering Section Location (describe):
8m upstream of culvert

Meas. Start Time (MST):	15:25
Meas. End Time (MST):	15:51
Equipment:	ADV#3
Flow Meter Make & Model:	Sontek FlowTracker
Flow Meter Serial #:	P2494
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 22C



Flow characteristics:

Total Flow:	0.337	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.28	(m ²)
Wetted Width:	5.20	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.15	(m/s)
Reynolds Number:	5.29E+04	
Froude Number:	0.07	

Logger Details:

	Before	After
Transducer Reading (m):	0.581	0.580
Water (°C):	12.4	12.6
Datalogger Clock:	15:12	16:01
Laptop Clock:	15:12	16:01
Battery:	13.6	13.6
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dissicant:	-	Replaced
Vent Tube Dissicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S63-1	0.657	100.657		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.826	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.198	99.459	99.459	3/4" Pipe 10m E of Station
Turn						
Water Level:	Cut	0.189	4.359	96.487		Time WL Surveyed: 15:16
Temporary BM			4.359	96.298	0.000	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S63-1	0.648	100.648		100.000		
Water Level:	Cut	0.189	4.350	96.497		Time WL Surveyed: 15:55
Water Level:	Cut	0.189	4.340	96.486		Time WL Surveyed: 15:58
S63-1	0.637	100.637		100.000		

WL Survey Summary

	Before	After
Average WL:	96.487	96.487
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	96.906	96.907

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	SM, JC	Trip Date:	11-Sep-15
Data Check Personnel:	TR	Date:	11-Sep-15
Entered Digitally in the Field:	Yes	Date:	26-Oct-15

Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881
 UTM Location: 494283E 6157255N

Site Visit Date: October 13, 2015
 Site Visit Time (MST): 13:33

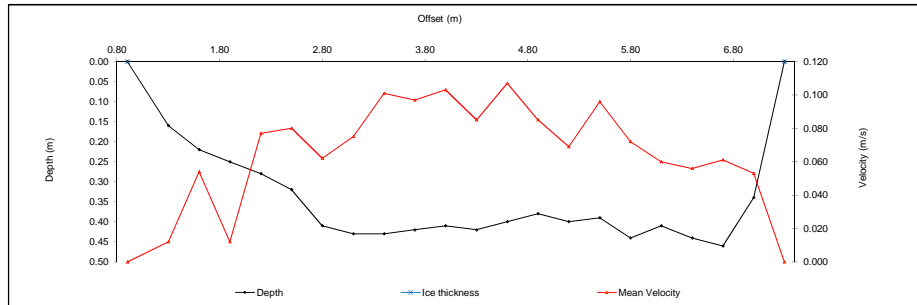


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	7.30	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	7.00	0.34		0.20	0.053					1.00	0.30	0.34	0.053	0.10	0.005	3%
2	6.70	0.46		0.28	0.061					1.00	0.30	0.46	0.061	0.14	0.008	5%
3	6.40	0.44		0.26	0.056					1.00	0.30	0.44	0.056	0.13	0.007	4%
4	6.10	0.41		0.25	0.060					1.00	0.30	0.41	0.060	0.12	0.007	4%
5	5.80	0.44		0.26	0.072					1.00	0.30	0.44	0.072	0.13	0.010	6%
6	5.50	0.39		0.23	0.096					1.00	0.30	0.39	0.096	0.12	0.011	7%
7	5.20	0.40		0.24	0.069					1.00	0.30	0.40	0.069	0.12	0.008	5%
8	4.90	0.38		0.23	0.085					1.00	0.30	0.38	0.085	0.11	0.010	6%
9	4.60	0.40		0.24	0.107					1.00	0.30	0.40	0.107	0.12	0.013	8%
10	4.30	0.42		0.25	0.085					1.00	0.30	0.42	0.085	0.13	0.011	6%
11	4.00	0.41		0.25	0.103					1.00	0.30	0.41	0.103	0.12	0.013	8%
12	3.70	0.42		0.25	0.097					1.00	0.30	0.42	0.097	0.13	0.012	7%
13	3.40	0.43		0.26	0.101					1.00	0.30	0.43	0.101	0.13	0.013	8%
14	3.10	0.43		0.26	0.075					1.00	0.30	0.43	0.075	0.13	0.010	6%
15	2.80	0.41		0.25	0.062					1.00	0.30	0.41	0.062	0.12	0.008	5%
16	2.50	0.32		0.19	0.080					1.00	0.30	0.32	0.080	0.10	0.008	5%
17	2.20	0.28		0.17	0.077					1.00	0.30	0.28	0.077	0.08	0.006	4%
18	1.90	0.25		0.15	0.012					1.00	0.30	0.25	0.012	0.08	0.001	1%
19	1.60	0.22		0.13	0.054					1.00	0.30	0.22	0.054	0.07	0.004	2%
20	1.30	0.16		0.10	0.012					1.00	0.35	0.16	0.012	0.06	0.001	0%
RB	0.90	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
Total Flow														0.165	100%	

Flow Measurement Details:

Metering Section Location (describe):
10m downstream of station

Meas. Start Time (MST):	13:43
Meas. End Time (MST):	14:02
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 14C



Flow characteristics:

Total Flow:	0.165	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.23	(m ²)
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.07	(m/s)
Reynolds Number:	1.71E+04	
Froude Number:	0.04	

Logger Details:

	Before	After
Transducer Reading (m):	0.525	0.525
Water (°C):	5.6	5.6
Datalogger Clock:	13:35	14:09
Laptop Clock:	13:35	14:10
Battery:	13.9	13.7
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S63-1	0.587	100.587		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.756	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.127	99.460	99.459	3/4" Pipe 10m E of Station
Water Level:	Cut	0.128	4.281	96.434		Time WL Surveyed: 13:39
Temporary BM			4.281	96.306	0.000	-
Turn						
Temporary BM	4.205	100.511		96.306		
Water Level:	Cut	0.128	4.205	96.434		Time WL Surveyed: 13:40
S63-3			1.051	99.460	99.459	3/4" Pipe 10m E of Station
S63-2			0.678	99.833	99.830	3/4" Pipe 7m E of Station
S63-1			0.511	100.000	100.000	3/4" Pipe 5m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S63-3	1.051	100.511		96.460		
Water Level:	Cut	0.128	4.205	96.437		Time WL Surveyed: 14:06
Water Level:	Cut	0.129	4.074	96.437		Time WL Surveyed: 14:07
S63-3	0.922	100.382		99.460		

WL Survey Summary

	Before	After
Average WL:	96.434	96.437
Closing Error:	0.000	-
WL Check:	0.000	0.000
Transducer Elevation	95.909	95.912

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	13-Oct-15
Data Check Personnel:	TR	Date:	13-Oct-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881
 UTM Location: 494283E 6157255N

Site Visit Date: December 7, 2015
 Site Visit Time (MST): 13:52

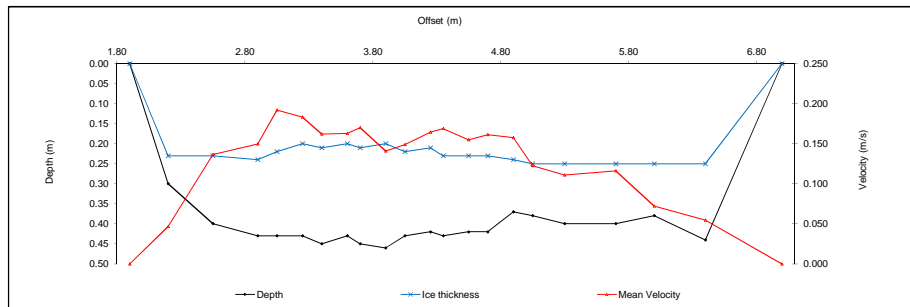


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.90	0.00	0.00		0.000				0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	2.20	0.30	0.23	0.27	0.053					0.88	0.33	0.07	0.047	0.02	0.001	1%
2	2.55	0.40	0.23	0.32	0.155					0.88	0.35	0.17	0.136	0.06	0.008	7%
3	2.90	0.43	0.24	0.34	0.170					0.88	0.25	0.19	0.150	0.05	0.007	7%
4	3.05	0.43	0.22	0.33	0.218					0.88	0.18	0.21	0.192	0.04	0.007	6%
5	3.25	0.43	0.20	0.32	0.208					0.88	0.18	0.23	0.183	0.04	0.007	7%
6	3.40	0.45	0.21	0.33	0.184					0.88	0.18	0.24	0.162	0.04	0.007	6%
7	3.60	0.43	0.20	0.32	0.185					0.88	0.15	0.23	0.163	0.03	0.006	5%
8	3.70	0.45	0.21	0.33	0.193					0.88	0.15	0.24	0.170	0.04	0.006	6%
9	3.90	0.46	0.20	0.33	0.160					0.88	0.18	0.26	0.141	0.05	0.006	6%
10	4.05	0.43	0.22	0.33	0.169					0.88	0.18	0.21	0.149	0.04	0.005	5%
11	4.25	0.42	0.21	0.32	0.187					0.88	0.15	0.21	0.165	0.03	0.005	5%
12	4.35	0.43	0.23	0.33	0.192					0.88	0.15	0.20	0.169	0.03	0.005	5%
13	4.55	0.42	0.23	0.33	0.176					0.88	0.18	0.19	0.152	0.03	0.005	5%
14	4.70	0.42	0.23	0.33	0.183					0.88	0.18	0.19	0.161	0.03	0.005	5%
15	4.90	0.37	0.24	0.31	0.179					0.88	0.17	0.13	0.158	0.02	0.004	3%
16	5.05	0.38	0.25	0.32	0.139					0.88	0.20	0.13	0.122	0.03	0.003	3%
17	5.30	0.40	0.25	0.33	0.126					0.88	0.33	0.15	0.111	0.05	0.005	5%
18	5.70	0.40	0.25	0.33	0.132					0.88	0.35	0.15	0.116	0.05	0.006	6%
19	6.00	0.38	0.25	0.32	0.082					0.88	0.35	0.13	0.072	0.05	0.003	3%
20	6.40	0.44	0.25	0.35	0.062					0.88	0.50	0.19	0.055	0.10	0.005	5%
LB	7.00	0.00	0.00		0.00				0.00	0.88	0.30	0.00	0.000	0.00	0.000	
Total Flow														0.109	100%	

Flow Measurement Details:

Metering Section Location (describe):
 10m upstream of culvert

Meas. Start Time (MST):	14:09
Meas. End Time (MST):	14:32
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, DC



Flow characteristics:

Total Flow:	0.109	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.82	(m ²)
Wetted Width:	5.10	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.13	(m/s)
Reynolds Number:	1.21E+04	
Froude Number:	0.11	

Logger Details:

	Before	After
Transducer Reading (m):	0.489	-
Water (°C):	0.6	-
Datalogger Clock:	14:50	-
Laptop Clock:	13:51	-
Battery:	13.3	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S63-1	0.731	100.731		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.900	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.270	99.461	99.459	3/4" Pipe 10m E of Station
Water Level:	Cut		4.348	96.383		Time WL Surveyed: 14:01
S63-1			0.731	100.000	100.000	3/4" Pipe 5m NE of Station
Turn						
S63-1	0.714	100.714		100.000	100.000	3/4" Pipe 5m NE of Station
Water Level:	Cut		4.331	96.383		Time WL Surveyed: 14:03
S63-3			1.252	99.462	99.459	3/4" Pipe 10m E of Station
S63-2			0.883	99.831	99.830	3/4" Pipe 7m E of Station
S63-1			0.714	100.000	100.000	3/4" Pipe 5m NE of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	96.383	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	95.894	-

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Camsel AT-24
Serial #:	78710

Field Personnel:

Data Entry Personnel:	DW, GG	Trip Date:	7-Dec-15
Data Check Personnel:	JC	Date:	7-Dec-15
Entered Digitally in the Field:	Yes	Date:	8-Jan-16

Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake
 UTM Location: 517644E 6163643N

Site Visit Date: April 15, 2015
 Site Visit Time (MST): 12:43

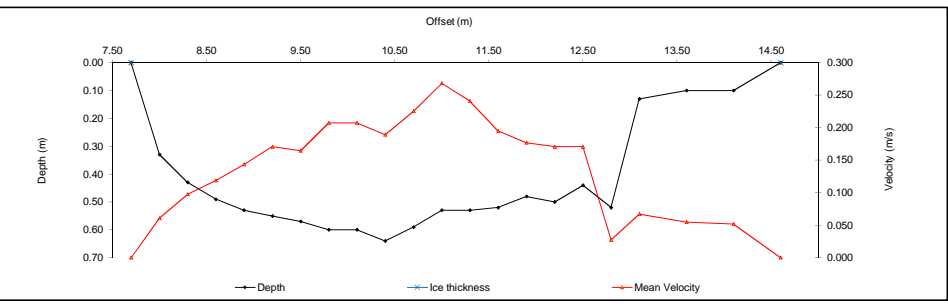


Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	7.70	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	8.00	0.33		0.20	0.061					1.00	0.30	0.33	0.061	0.10	0.006	1%
2	8.30	0.43		0.26	0.098					1.00	0.30	0.43	0.098	0.13	0.013	3%
3	8.60	0.49		0.29	0.119					1.00	0.30	0.49	0.119	0.15	0.017	4%
4	8.90	0.53		0.32	0.143					1.00	0.30	0.53	0.143	0.16	0.023	5%
5	9.20	0.55		0.33	0.171					1.00	0.30	0.55	0.171	0.16	0.028	6%
6	9.50	0.57		0.34	0.165					1.00	0.30	0.57	0.165	0.17	0.028	6%
7	9.80	0.60		0.36	0.207					1.00	0.30	0.60	0.207	0.18	0.037	8%
8	10.10	0.60		0.36	0.207					1.00	0.30	0.60	0.207	0.18	0.037	8%
9	10.40	0.64		0.38	0.189					1.00	0.30	0.64	0.189	0.19	0.036	8%
10	10.70	0.59		0.35	0.226					1.00	0.30	0.59	0.226	0.18	0.040	9%
11	11.00	0.53		0.32	0.268					1.00	0.30	0.53	0.268	0.16	0.043	9%
12	11.30	0.53		0.32	0.241					1.00	0.30	0.53	0.241	0.16	0.038	8%
13	11.60	0.52		0.31	0.195					1.00	0.30	0.52	0.195	0.16	0.030	7%
14	11.90	0.48		0.29	0.177					1.00	0.30	0.48	0.177	0.14	0.025	5%
15	12.20	0.50		0.30	0.171					1.00	0.30	0.50	0.171	0.15	0.026	6%
16	12.50	0.44		0.26	0.171					1.00	0.30	0.44	0.171	0.13	0.023	5%
17	12.80	0.52		0.31	0.027					1.00	0.30	0.52	0.027	0.16	0.004	1%
18	13.10	0.13		0.08	0.067					1.00	0.40	0.13	0.067	0.05	0.003	1%
19	13.60	0.10		0.06	0.055					1.00	0.50	0.10	0.055	0.05	0.003	1%
20	14.10	0.10		0.06	0.052					1.00	0.50	0.10	0.052	0.05	0.003	1%
LB	14.60	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
Total Flow														0.464	100%	

Flow Measurement Details:

Metering Section Location (describe): 30m downstream of station

Meas. Start Time (MST):	13:18
Meas. End Time (MST):	13:51
Equipment:	ADV
Method:	Wading
River Condition:	Bed Ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, breezy, 10C



Flow characteristics:

Total Flow:	0.464	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.81	(m ²)
Wetted Width:	6.90	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.08	

Logger Details:

	Before	After
Transducer Reading (m):	0.594	0.590
Water (°C):	0.5	0.5
Datalogger Clock:	12:47	14:06
Laptop Clock:	12:46	14:04
Battery (Main):	14.1	14.1
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

Some bed ice from LB to offset 13m.

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S64-3	1.528	101.377		99.849	99.849	3/4" Pipe 8m E of Logger
S64-2			1.576	99.801	99.801	3/4" Pipe 11m E of Logger
S64-1			1.338	100.039	100.020	3/4" Pipe 6m SE of Logger
Water Level:	Cut		2.983	98.394	Time WL Surveyed:	13.03
Temporary BM			3.019	98.358		-
Turn						
Temporary BM	3.001	101.359		98.358		-
Water Level:	Cut		2.967	98.392	Time WL Surveyed:	13.06
S64-1			1.319	100.040	100.020	3/4" Pipe 6m SE of Logger
S64-2			1.556	99.803	99.801	3/4" Pipe 11m E of Logger
S64-3			1.509	99.850	99.849	3/4" Pipe 8m E of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S64-3	1.508	101.358		99.850		
Water Level:	Cut		2.966	98.392	Time WL Surveyed:	13.59
Water Level:	Cut		2.942	98.391	Time WL Surveyed:	14.01
S64-3	1.483	101.333		99.850		

WL Survey Summary

	Before	After
Average WL:	98.393	98.392
Closing Error:	-0.001	-
WL Check:	0.002	0.001
Transducer Elevation	97.799	97.802

Field Personnel:

GG, SM	Trip Date:	15-Apr-15
GG	Date:	15-Apr-15
SG	Date:	5-Jun-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake
 UTM Location: 517644E 6163643N

Site Visit Date: June 10, 2015
 Site Visit Time (MST): 12:10

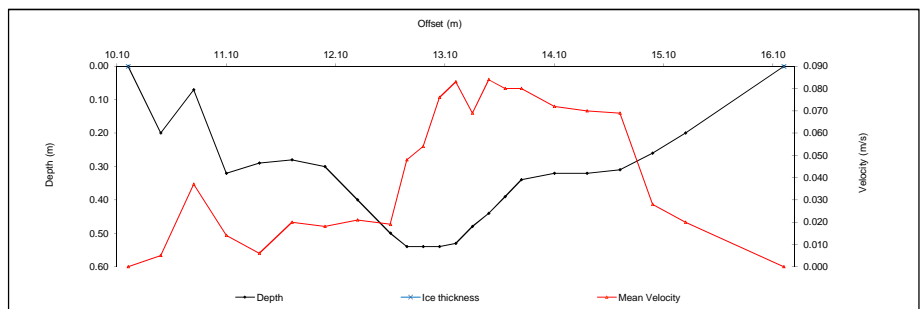


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	10.20	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	10.50	0.20		0.12	0.005					1.00	0.30	0.20	0.005	0.06	0.000	0%
2	10.80	0.07		0.04	0.037					1.00	0.30	0.07	0.037	0.02	0.001	1%
3	11.10	0.32		0.19	0.014					1.00	0.30	0.32	0.014	0.10	0.001	2%
4	11.40	0.29		0.17	0.006					1.00	0.30	0.29	0.006	0.09	0.001	1%
5	11.70	0.28		0.17	0.020					1.00	0.30	0.28	0.020	0.08	0.002	2%
6	12.00	0.30		0.18	0.018					1.00	0.30	0.30	0.018	0.09	0.002	2%
7	12.30	0.40		0.24	0.021					1.00	0.30	0.40	0.021	0.12	0.003	3%
8	12.60	0.50		0.30	0.019					1.00	0.23	0.50	0.019	0.11	0.002	3%
9	12.75	0.54		0.32	0.048					1.00	0.15	0.54	0.048	0.08	0.004	5%
10	12.90	0.54		0.32	0.054					1.00	0.15	0.54	0.054	0.08	0.004	6%
11	13.05	0.54		0.32	0.076					1.00	0.15	0.54	0.076	0.08	0.006	8%
12	13.20	0.53		0.32	0.063					1.00	0.15	0.53	0.063	0.08	0.007	8%
13	13.35	0.48		0.29	0.069					1.00	0.15	0.48	0.069	0.07	0.005	6%
14	13.50	0.44		0.26	0.084					1.00	0.15	0.44	0.084	0.07	0.006	7%
15	13.65	0.39		0.23	0.080					1.00	0.15	0.39	0.080	0.06	0.005	6%
16	13.80	0.34		0.20	0.080					1.00	0.22	0.34	0.080	0.08	0.006	8%
17	14.10	0.32		0.19	0.072					1.00	0.30	0.32	0.072	0.10	0.007	9%
18	14.40	0.32		0.19	0.070					1.00	0.30	0.32	0.070	0.10	0.007	9%
19	14.70	0.31		0.19	0.069					1.00	0.30	0.31	0.069	0.09	0.006	8%
20	15.00	0.26		0.16	0.028					1.00	0.30	0.26	0.028	0.08	0.002	3%
21	15.30	0.20		0.12	0.020					1.00	0.60	0.20	0.020	0.12	0.002	3%
LB	16.20	0.00	0.00		0.00				0.00	1.00	0.45	0.00	0.000	0.00	0.000	
Total Flow														0.078	100%	

Flow Measurement Details:

Metering Section Location (describe):
30m upstream of pressure transducer

Meas. Start Time (MST):	12:35
Meas. End Time (MST):	12:50
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, 24C



Flow characteristics:

Total Flow:	0.078	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.75	(m ²)
Wetted Width:	6.00	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.04	(m/s)
Reynolds Number:	1.22E+04	
Froude Number:	0.63	

Logger Details:

Transducer Reading (m):	Before	After
Water (°C):	17.6	18.6
Datalogger Clock:	12:13	13:07
Laptop Clock:	12:11	13:06
Battery:	13.8	13.7
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Good
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Two large water levels jumps since last visit, data suggests beaver activity
- Modem logs onto network okay
- Level logger and some BMs installed 5m upstream of PT

General Notes:

Vegetation along bottom from RB until offset 12.4m

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S64-3	1.098	100.947		99.849	99.849	3/4" Pipe 8m E of Logger
S64-2			1.144	99.803	99.801	3/4" Pipe 11m E of Logger
S64-1			0.909	100.038	100.020	3/4" Pipe 6m SE of Logger
Water Level:						
S64-1	Cut			2.647	98.300	Time WL Surveyed: 12:17
			0.909	100.038	100.020	3/4" Pipe 6m SE of Logger
Turn						
S64-1	0.877	100.915		100.038	100.020	3/4" Pipe 6m SE of Logger
Water Level:						
S64-1	Cut		2.612	98.303		Time WL Surveyed: 12:08
S64-1			0.877	100.038	100.020	3/4" Pipe 6m SE of Logger
S64-2			1.111	99.804	99.801	3/4" Pipe 11m E of Logger
S64-3			1.065	99.850	99.849	3/4" Pipe 8m E of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S64-1	0.877	100.915		100.038		
Water Level:						
S64-1	Cut		2.612	98.303		Time WL Surveyed: 13:03
Water Level:						
S64-1	Cut		2.580	98.305		Time WL Surveyed: 13:04
S64-1	0.847	100.885		100.038		

WL Survey Summary

	Before	After
Average WL:	98.302	98.304
Closing Error:	-0.001	-
WL Check:	0.003	-0.002
Transducer Elevation	97.801	97.803

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, MK	Trip Date:	10-Jun-15
Data Check Personnel:	TR	Date:	10-Jun-15
Entered Digitally in the Field:	Yes	Date:	3-Jul-15

Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake
 UTM Location: 517644E 6163643N

Site Visit Date: August 9, 2015
 Site Visit Time (MST): 09:30



Flow Measurement Details:	
Metering Section Location (describe): 6m downstream of bridge	
Meas. Start Time (MST):	10:10
Meas. End Time (MST):	10:30
Equipment:	ADCP/H
Method:	Gateway
River Condition:	Flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 29C

Flow characteristics:		
Total Flow:	1.19	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	6.57	(m ²)
Wetted Width:	5.34	(m)
Hydraulic Depth:	1.23	(m)
Mean Velocity:	0.18	(m/s)
Reynolds Number:	1.93E+05	
Froude Number:	0.65	

Logger Details:		
	Before	After
Transducer Reading (m):	1.252	0.914
Water (°C):	14.8	15.2
Datalogger Clock:	09:37	11:01
Laptop Clock:	09:36	11:00
Battery (Minn):	13.7	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Mini Tube Desiccant:	Good	
PTF# (if replaced):	322936	333232
Logger# (if replaced):	25578	-

Datalogger / Station Notes:
 -Replaced pressure transducer for calibration
 -Bed is weedy and banks flooded

General Notes:

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sonnet RS-M9	Transducer Depth (m):	0.05	LB:	26.00		
Serial Number:	4712	Bainry (ppt):	0.0	RB:	20.00		
Firmware Version:	3.8	Magnetic Declination (°):	14.3				
Software Version:	3.8	Measured Temperature (°C):	15.2				
		ADCP Temperature (°C):	16.7				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	4.25	5.44	0.21	1.141	-3.71%
Depth Reference: Vertical beam	6	0.00	6.24	7.78	0.155	1.205	1.69%
Coordinate System: FNU	8	0.00	9.72	6.88	0.177	1.219	2.87%
Left Method: Sloped bank	9	0.00	5.17	6.18	0.19	1.175	-0.84%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
		Mean:	5.34	6.57	0.183	1.19	
		SD:	0.74	0.86	0.020	0.030	
		COV:	0.14	0.13	0.109	0.025	

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S64-3	1.501	101.350		99.849	99.849	3/4" Pipe 8m E of Logger
S64-2			1.547	99.803	99.801	3/4" Pipe 11m E of Logger
S64-1			1.311	100.039	100.020	3/4" Pipe 6m SE of Logger
Water Level:			2.292	99.058		Time WL Surveyed: 9:46
S64-1			1.311	100.039	100.020	3/4" Pipe 6m SE of Logger
Turn						
S64-1	1.232	101.271		100.039	100.020	3/4" Pipe 6m SE of Logger
Water Level:			2.212	99.059		Time WL Surveyed: 9:46
S64-1			1.232	100.039	100.020	3/4" Pipe 6m SE of Logger
S64-2			1.468	99.803	99.801	3/4" Pipe 11m E of Logger
S64-3			1.422	99.849	99.849	3/4" Pipe 8m E of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S64-1	1.232	101.271		100.039		
Water Level:			2.213	99.058		Time WL Surveyed: 10:55
Water Level:			2.169	99.058		Time WL Surveyed: 10:56
S64-1	1.188	101.227		100.039		

WL Survey Summary			
Average WL:	Before	After	
Closing Error:	99.059	99.058	
WL Check:	0.000	-	
Transducer Elevation:	0.001	0.000	
	97.807	98.144	

Level Survey Equipment:	
Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:			
Data Entry Personnel:	TR	Trip Date:	9-Aug-15
Data Check Personnel:	TR	Date:	9-Aug-15
Entered Digitally in the Field:	Yes	Date:	25-Aug-15

Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake
 UTM Location: 517644E 6163643N

Site Visit Date: September 10, 2015
 Site Visit Time (MST): 09:15



Flow Measurement Details:	
Metering Section Location (describe): 5m downstream of bridge	
Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:10
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Clear water, weeds in channel
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, breezy, 12C

Flow characteristics:	
Total Flow:	0.287 (m ³ /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	5.32 (m ²)
Wetted Width:	5.17 (m)
Hydraulic Depth:	1.03 (m)
Mean Velocity:	0.05 (m/s)
Reynolds Number:	4.18E+04
Froude Number:	0.62

Logger Details:		Before	After
Transducer Reading (m):		0.387	0.387
Water (°C):		9.9	10.1
Datalogger Clock:		09:18	10:22
Laptop Clock:		09:17	10:20
Battery (Main):		14.1	13.9
Battery:		Good	-
Battery Serial #:		-	-
Enclosure Deseccant:		Replaced	-
Mini Tube Deseccant:		Good	-
PT# (if replaced):		-	-
Logger# (if replaced):		-	-

Datalogger / Station Notes:	

General Notes:	
-One ADCP pass slightly above 5% discharge mmt graded fair	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.08	LB:	7.30		
Serial Number:	4712	Safety (gpd):	0.0	RB:	2.00		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	10.0	System Test Passed: Yes			
		ADCP Temperature (°C):	11.4				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	2	0.00	5.46	6.06	0.048	0.292	1.74%
Depth Reference: Vertical beam	5	0.00	5.15	5.15	0.058	0.287	0.07%
Coordinate System: FNU	7	0.00	4.82	4.84	0.065	0.271	-5.57%
Left Method: Sloped bank	9	0.00	5.24	5.11	0.058	0.298	3.83%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
Mean:				5.17	5.32	0.054	0.287
SD:				0.23	0.44	0.004	0.010
COV:				0.04	0.08	0.069	0.035

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S64-3	1.420	101.269		99.849	99.849	3/4" Pipe 8m E of Logger
S64-2			1.465	99.804	99.801	3/4" Pipe 11m E of Logger
S64-1			1.229	100.040	100.020	3/4" Pipe 6m SE of Logger
Water Level:						
Cut			2.538	98.731		Time WL Surveyed: 9:30
S64-1			1.229	100.040	100.020	3/4" Pipe 6m SE of Logger
Turn						
S64-1	1.214	101.254		100.040	100.020	3/4" Pipe 6m SE of Logger
Water Level:						
Cut			2.525	98.729		Time WL Surveyed: 9:32
S64-1			1.214	100.040	100.020	3/4" Pipe 6m SE of Logger
S64-2			1.452	99.802	99.801	3/4" Pipe 11m E of Logger
S64-3			1.406	99.848	99.849	3/4" Pipe 8m E of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S64-1	1.214	101.254		100.040		
Water Level:						
Cut			2.528	98.729		Time WL Surveyed: 10:17
Water Level:			2.816	98.727		Time WL Surveyed: 10:18
S64-1	1.203	101.243		100.040		

WL Survey Summary		Before	After	Level Survey Equipment:	
Average WL:		98.730	98.727	Level #:	Level#3
Closing Error:		0.001	-	Make & Model:	Carsel AT-24
WL Check:		0.002	-0.001	Serial #:	112890
Transducer Elevation:		98.143	98.140		

Field Personnel:		SM, JC	Trip Date:	11-Sep-15
Data Entry Personnel:	JC		Date:	11-Sep-15
Data Check Personnel:	TR		Date:	26-Oct-15
Entered Digitally in the Field:	Yes			

Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake
 UTM Location: 517644E 6163643N

Site Visit Date: October 16, 2015
 Site Visit Time (MST): 10:02



Flow Measurement Details:	
Metering Section Location (describe): 10m downstream of bridge	
Meas. Start Time (MST):	10:25
Meas. End Time (MST):	10:47
Equipment:	ADCP#1
Method:	Tethered Boat
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 10C

Flow characteristics:	
Total Flow:	0.132 (m ³ /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	5.10 (m ²)
Wetted Width:	5.48 (m)
Hydraulic Depth:	0.93 (m)
Mean Velocity:	0.03 (m/s)
Reynolds Number:	1.50E+04
Froude Number:	0.01

Logger Details:		
	Before	After
Transducer Reading (m):	0.352	0.352
Water (°C):	3.4	3.5
Datalogger Clock:	10:07	10:58
Laptop Clock:	10:05	10:56
Battery (Minn):	14.2	14.2
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Mem Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	
-Transducer may have been moved since last visit	
-BM4 was installed on left bank edge of foot bridge piling	

ADCP Flow Measurement Summary:							
System Information:				System Setup:		Bank Offsets:	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	7.30		
Serial Number:	4712	Safety (gpd):	0.0	RB:	1.90		
Firmware Version:	3.8	Magnetic Declination (°):	14.3	Compass Calibration Passed: Yes			
Software Version:	3.8	Measured Temperature (°C):	3.4	System Test Passed: Yes			
		ADCP Temperature (°C):	5.5				
Discharge Calculation Settings:				Measurement Results:			
Pass (#):	Screening Distance (m)	Width (m):	Area (m ²):	Mean Pass Velocity (m/s):	Discharge (m ³ /s):	Discharge Difference From Mean	Percent of Pass Measured (%)
Track Reference: Bottom-Track	1	0.00	5.74	5.25	0.024	0.127	-3.97%
Depth Reference: Vertical beam	4	0.00	5.25	4.98	0.028	0.138	4.35%
Coordinate System: FNU	6	0.00	5.33	4.91	0.026	0.13	-1.70%
Left Method: Sloped bank	8	0.00	5.62	5.27	0.025	0.134	1.32%
Right Method: Sloped bank							
Top Fit Type: Power fit							
Bottom Fit Type: Power fit							
		Mean:	5.48	5.10	0.028	0.132	
		SD:	0.20	0.16	0.001	0.004	
		COV:	0.04	0.03	0.057	0.031	

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S64-3	1.483	101.332		99.849	99.849	3/4" Pipe 8m E of Logger
S64-4			1.066	100.266	0.000	Bridge piling, US side, middle of stream, LB side of piling
S64-2			1.529	99.803	99.801	3/4" Pipe 11m E of Logger
S64-1			1.293	100.039	100.020	3/4" Pipe 6m SE of Logger
Water Level:			2.636	98.694		
Temporary BM			1.293	100.039		Time WL Surveyed: 10:13
Turn						
Temporary BM	1.269	101.308		100.039		
Water Level:			2.614	98.694		Time WL Surveyed: 10:16
S64-1			1.269	100.039	100.020	3/4" Pipe 6m SE of Logger
S64-2			1.506	99.802	99.801	3/4" Pipe 11m E of Logger
S64-4			1.044	100.264		Bridge piling, US side, middle of stream, LB side of piling
S64-3			1.462	99.846	99.849	3/4" Pipe 8m E of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S64-1	1.270	101.309		100.039		
Water Level:			2.616	98.693		Time WL Surveyed: 10:52
Water Level:			2.690	98.695		Time WL Surveyed: 10:54
S64-1	1.246	101.285		100.039		

WL Survey Summary			Level Survey Equipment:	
	Before	After	Level #:	Level#2
Average WL:	98.694	98.694	Make & Model:	Nikon AC-2S
Closing Error:	0.003	-	Serial #:	668659
WL Check:	0.000	-0.002		
Transducer Elevation:	98.142	98.142		

Field Personnel:			
Data Entry Personnel:	GG, TR	Trip Date:	16-Oct-15
Data Check Personnel:	GG	Date:	16-Oct-15
Entered Digitally in the Field:	Yes	Date:	3-Nov-15

Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake
 UTM Location: 517644E 6163643N

Site Visit Date: December 2, 2015
 Site Visit Time (MST): 09:02

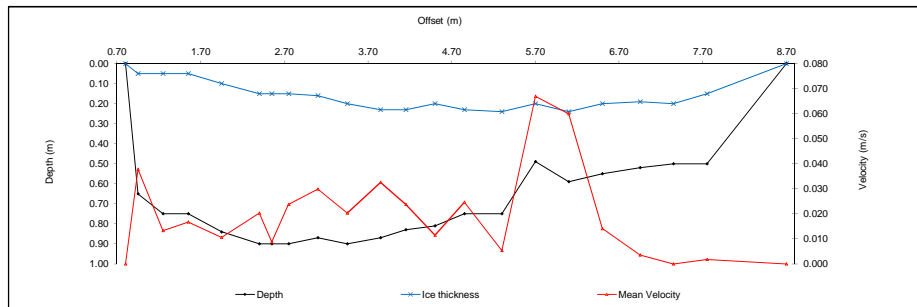


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000		0.000		0.000	0.88	0.08	0.00	0.000	0.00	0.000	
1	0.95	0.65	0.05	0.35	0.043					0.88	0.23	0.60	0.038	0.14	0.005	7%
2	1.25	0.75	0.05	0.40	0.015					0.88	0.30	0.70	0.013	0.21	0.003	4%
3	1.55	0.75	0.05	0.40	0.019					0.88	0.35	0.70	0.017	0.25	0.004	5%
4	1.95	0.84	0.10	0.47	0.012					0.88	0.43	0.74	0.011	0.31	0.003	4%
5	2.40	0.90	0.15	0.53	0.023					0.88	0.30	0.75	0.020	0.23	0.005	6%
6	2.55	0.90	0.15	0.53	0.010					0.88	0.18	0.75	0.009	0.13	0.001	1%
7	2.75	0.90	0.15	0.53	0.027					0.88	0.28	0.75	0.024	0.21	0.005	6%
8	3.10	0.87	0.16	0.52	0.034					0.88	0.35	0.71	0.030	0.25	0.007	9%
9	3.45	0.90	0.20	0.55	0.023					0.88	0.38	0.70	0.020	0.26	0.005	7%
10	3.85	0.87	0.23	0.55	0.037					0.88	0.35	0.64	0.033	0.22	0.007	9%
11	4.15	0.83	0.23	0.53	0.027					0.88	0.33	0.60	0.024	0.20	0.005	6%
12	4.50	0.81	0.20	0.51	0.013					0.88	0.35	0.61	0.011	0.21	0.002	3%
13	4.85	0.75	0.23	0.49	0.028					0.88	0.40	0.52	0.025	0.21	0.005	7%
14	5.30	0.75	0.24	0.50	0.006					0.88	0.43	0.51	0.005	0.22	0.001	1%
15	5.70	0.49	0.20	0.35	0.076					0.88	0.40	0.29	0.067	0.12	0.008	10%
16	6.10	0.59	0.24	0.42	0.068					0.88	0.40	0.35	0.060	0.14	0.008	11%
17	6.50	0.55	0.20	0.38	0.016					0.88	0.43	0.35	0.014	0.15	0.002	3%
18	6.95	0.52	0.19	0.36	0.004					0.88	0.43	0.33	0.004	0.14	0.000	1%
19	7.35	0.50	0.20	0.35	0.000					0.88	0.40	0.30	0.000	0.12	0.000	0%
20	7.75	0.50	0.15	0.33	0.002					0.88	0.68	0.35	0.002	0.24	0.000	1%
LB	8.70	0.00	0.00		0.00		0.00		0.00	0.88	0.48	0.00	0.000	0.00	0.000	
Total Flow														0.078	100%	

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of bridge

Meas. Start Time (MST):	9:27
Meas. End Time (MST):	9:56
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (a.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, light breeze, -1C



Flow characteristics:

Total Flow:	0.078	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.94	(m ²)
Wetted Width:	7.90	(m)
Hydraulic Depth:	0.50	(m)
Mean Velocity:	0.02	(m/s)
Reynolds Number:	5.54E+03	
Froude Number:	0.01	

Logger Details:

	Before	After
Transducer Reading (m):	0.561	-
Water (°C):	0.0	-
Datalogger Clock:	10:06	-
Laptop Clock:	09:04	-
Battery:	12.8	-
Battery Condition:	Good	-
Battery Serial #:	-	Replaced
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S64-3	1.384	101.233		99.849	99.849	3/4" Pipe 8m E of Logger
S64-2			1.430	99.803	99.801	3/4" Pipe 11m E of Logger
S64-1			1.193	100.040	100.020	3/4" Pipe 6m SE of Logger
Water Level:	Cut		2.612	98.621		Time WL Surveyed: 9:18
Temporary BM			1.193	100.040		
Turn						
Temporary BM	1.173	101.213		100.040		
Water Level:	Cut		2.589	98.624		Time WL Surveyed: 9:22
S64-1			1.173	100.040	100.020	3/4" Pipe 6m SE of Logger
S64-2			1.408	99.804	99.801	3/4" Pipe 11m E of Logger
S64-3			1.384	99.849	99.849	3/4" Pipe 8m E of Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.623	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	98.062	-

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, JM	Trip Date:	2-Dec-15
Data Check Personnel:	JC	Date:	2-Dec-15
Entered Digitally in the Field:	Yes	Date:	8-Jan-16

Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek
 UTM Location: 489845 E, 6333039 N

Site Visit Date: May 13, 2015
 Site Visit Time (MST): 08:00

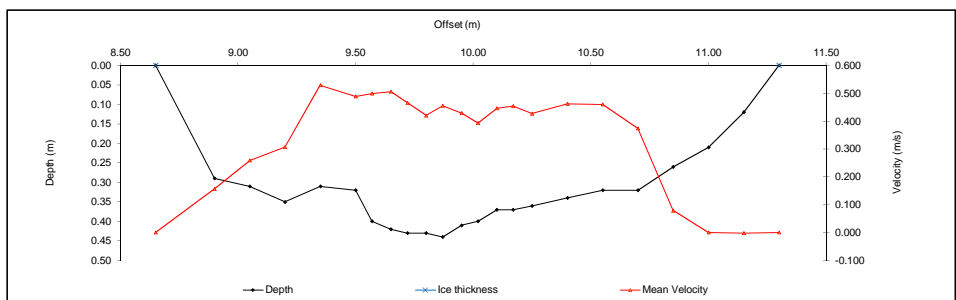


Flow Measurement																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Panel Width (m)	Effective Panel Depth (m)	Effective Average Panel Velocity (m/s)	Panel Area (m ²)	Panel Discharge (m ³ /s)	Percent of total flow (%)
RB	8.65	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	8.90	0.29		0.17	0.157					1.00	0.20	0.29	0.157	0.06	0.009	3%
2	9.05	0.31		0.19	0.259					1.00	0.15	0.31	0.259	0.05	0.012	4%
3	9.20	0.35		0.21	0.307					1.00	0.15	0.35	0.307	0.05	0.016	6%
4	9.35	0.31		0.19	0.529					1.00	0.15	0.31	0.529	0.05	0.025	9%
5	9.50	0.32		0.19	0.488					1.00	0.11	0.32	0.488	0.04	0.017	6%
6	9.57	0.40		0.24	0.499					1.00	0.07	0.40	0.499	0.03	0.015	5%
7	9.65	0.42		0.25	0.506					1.00	0.08	0.42	0.506	0.03	0.016	6%
8	9.72	0.43		0.26	0.466					1.00	0.08	0.43	0.466	0.03	0.015	5%
9	9.80	0.43		0.26	0.420					1.00	0.07	0.43	0.420	0.03	0.014	5%
10	9.87	0.44		0.26	0.455					1.00	0.07	0.44	0.455	0.03	0.015	5%
11	9.95	0.41		0.25	0.429					1.00	0.07	0.41	0.429	0.03	0.013	5%
12	10.02	0.40		0.24	0.393					1.00	0.07	0.40	0.393	0.03	0.012	4%
13	10.10	0.37		0.22	0.446					1.00	0.08	0.37	0.446	0.03	0.012	4%
14	10.17	0.37		0.22	0.454					1.00	0.08	0.37	0.454	0.03	0.013	4%
15	10.25	0.36		0.22	0.427					1.00	0.11	0.36	0.427	0.04	0.018	6%
16	10.40	0.34		0.20	0.462					1.00	0.15	0.34	0.462	0.05	0.024	8%
17	10.55	0.32		0.19	0.460					1.00	0.15	0.32	0.460	0.05	0.022	8%
18	10.70	0.32		0.19	0.374					1.00	0.15	0.32	0.374	0.05	0.018	6%
19	10.85	0.26		0.16	0.079					1.00	0.15	0.26	0.079	0.04	0.003	1%
20	11.00	0.21		0.13	0.000					1.00	0.15	0.21	0.000	0.03	0.000	0%
21	11.15	0.12		0.07	-0.002					1.00	0.15	0.12	-0.002	0.02	0.000	0%
LB	11.30	0.00	0.00		0.00		0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
Total Flow														0.288	100%	

Flow Measurement Details:

Metering Section Location (describe):
30m upstream of bridge

Meas. Start Time (MST):	8:25
Meas. End Time (MST):	8:55
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 10C



Flow Characteristics:

Total Flow:	0.288	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.79	(m ²)
Wetted Width:	2.65	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.36	(m/s)
Froude Number:	0.21	

Logger Details:

	Before	After
Transducer Reading (m):	0.868	0.867
Water (°C):	3.8	4.1
Datalogger Clock:	08:03	08:59
Laptop Clock:	08:05	09:01
Battery (Main):	14.4	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S65-01	0.611	100.611		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.878	99.733	99.732	3/4" Pipe 5m SW of logger
S65-03			0.984	99.627	99.623	3/4" Pipe 6m W of logger
Water Level:	Cut	0.796	3.646	97.761		Time WL Surveyed: 8:12
S65-03			0.984	99.627	99.623	3/4" Pipe 6m W of logger
Turn						
S65-03	0.956	100.583		99.627	99.623	3/4" Pipe 6m W of logger
Water Level:	Cut	0.796	3.618	97.761		Time WL Surveyed: 8:15
S65-03			0.956	99.627	99.623	3/4" Pipe 6m W of logger
S65-02			0.851	99.732	99.732	3/4" Pipe 5m SW of logger
S65-01			0.582	100.001	100.000	3/4" Pipe 5m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S65-03	0.956	100.583		99.627		
Water Level:	Cut	0.668	3.489	97.762		Time WL Surveyed: 8:58
Water Level:	Cut	0.868	3.468	97.760		Time WL Surveyed: 8:59
S65-03	0.933	100.560		99.627		

WL Survey Summary

	Before	After
Average WL:	97.761	97.761
Closing Error:	-0.001	-
WL Check:	0.000	0.002
Transducer Elevation	96.893	96.894

Field Personnel:

Data Entry Personnel:	TR, MK	Trip Date:	13-May-15
Data Check Personnel:	TR	Date:	13-May-15
Entered Digitally in the Field:	CJ	Date:	3-Sep-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek
 UTM Location: 489845 E, 6333039 N

Site Visit Date: June 19, 2015
 Site Visit Time (MST): 07:58

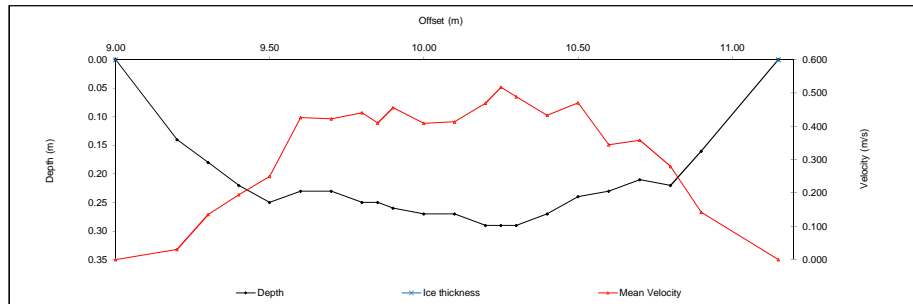


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	11.15	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	10.90	0.16		0.10	0.142					1.00	0.17	0.16	0.142	0.03	0.004	3%
2	10.80	0.22		0.13	0.279					1.00	0.10	0.22	0.279	0.02	0.006	4%
3	10.70	0.21		0.13	0.358					1.00	0.10	0.21	0.358	0.02	0.008	5%
4	10.60	0.23		0.14	0.344					1.00	0.10	0.23	0.344	0.02	0.008	5%
5	10.50	0.24		0.14	0.470					1.00	0.10	0.24	0.470	0.02	0.011	7%
6	10.40	0.27		0.16	0.433					1.00	0.10	0.27	0.433	0.03	0.012	8%
7	10.30	0.29		0.17	0.488					1.00	0.08	0.29	0.488	0.02	0.011	7%
8	10.25	0.29		0.17	0.517					1.00	0.05	0.29	0.517	0.01	0.007	5%
9	10.20	0.29		0.17	0.469					1.00	0.08	0.29	0.469	0.02	0.010	7%
10	10.10	0.27		0.16	0.413					1.00	0.10	0.27	0.413	0.03	0.011	7%
11	10.00	0.27		0.16	0.409					1.00	0.10	0.27	0.409	0.03	0.011	7%
12	9.90	0.26		0.16	0.456					1.00	0.07	0.26	0.456	0.02	0.009	6%
13	9.85	0.25		0.15	0.410					1.00	0.05	0.25	0.410	0.01	0.005	3%
14	9.80	0.25		0.15	0.440					1.00	0.07	0.25	0.440	0.02	0.008	5%
15	9.70	0.23		0.14	0.422					1.00	0.10	0.23	0.422	0.02	0.010	6%
16	9.60	0.23		0.14	0.426					1.00	0.10	0.23	0.426	0.02	0.010	6%
17	9.50	0.25		0.15	0.249					1.00	0.10	0.25	0.249	0.03	0.006	4%
18	9.40	0.22		0.13	0.195					1.00	0.10	0.22	0.195	0.02	0.004	3%
19	9.30	0.18		0.11	0.135					1.00	0.10	0.18	0.135	0.02	0.002	2%
20	9.20	0.14		0.08	0.031					1.00	0.15	0.14	0.031	0.02	0.001	0%
LB	9.00	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
Total Flow														0.154	100%	

Flow Measurement Details:

Metering Section Location (describe):
20m downstream of station

Meas. Start Time (MST):	8:12
Meas. End Time (MST):	8:42
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 16C



Flow characteristics:

Total Flow	0.154	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.44	(m ²)
Wetted Width:	2.15	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.35	(m/s)
Reynolds Number	5.29E+04	
Froude Number:	0.25	

Logger Details:

	Before	After
Transducer Reading (m):	0.725	0.727
Water (°C):	9.1	9.4
Datalogger Clock:	07:58	08:45
Laptop Clock:	08:00	08:47
Battery:	14.4	14.0
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Descicant:	Replaced	-
Vent Tube Descicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

-ADV test passed

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S65-01	0.602	100.602		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.871	99.731	99.732	3/4" Pipe 5m SW of logger
S65-03			0.976	99.626	99.623	3/4" Pipe 6m W of logger
Water Level:	Cut	0.515	3.489	97.628	Time WL Surveyed:	8:03
Temporary BM			3.489	97.113	0.000	-
Turn						
Temporary BM	3.476	100.589		97.113	-	-
Water Level:	Cut	0.515	3.476	97.628	Time WL Surveyed:	8:05
S65-03			0.963	99.626	99.623	3/4" Pipe 6m W of logger
S65-02			0.857	99.732	99.732	3/4" Pipe 5m SW of logger
S65-01			0.587	100.002	100.000	3/4" Pipe 5m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S65-03	0.963	100.589		99.626	-	-
Water Level:	Cut	0.545	3.499	97.635	Time WL Surveyed:	8:48
Water Level:	Cut	0.545	3.486	97.635	Time WL Surveyed:	8:50
S65-03	0.950	100.576		99.626	-	-

WL Survey Summary

	Before	After
Average WL:	97.628	97.635
Closing Error:	-0.002	-
WL Check:	0.000	0.000
Transducer Elevation	96.903	96.908

Level Survey Equipment:

Level #:	Lavel#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

Data Entry Personnel:	GG, MK	Trip Date:	19-Jun-15
Data Check Personnel:	CJ	Date:	3-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek
 UTM Location: 489845 E, 6333039 N

Site Visit Date: August 8, 2015
 Site Visit Time (MST): 10:25

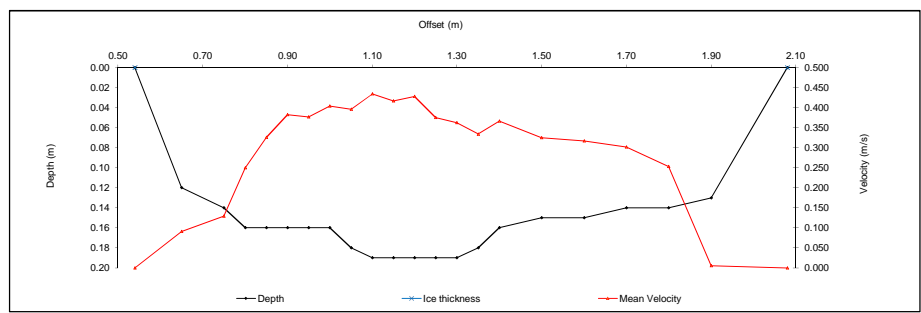


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.54	0.00	0.00		0.000				0.000	1.00	0.06	0.00	0.000	0.00	0.000	
1	0.65	0.12		0.07	0.091					1.00	0.11	0.12	0.091	0.01	0.001	2%
2	0.75	0.14		0.08	0.129					1.00	0.08	0.14	0.129	0.01	0.001	2%
3	0.80	0.16		0.10	0.250					1.00	0.05	0.16	0.250	0.01	0.002	3%
4	0.85	0.16		0.10	0.326					1.00	0.05	0.16	0.326	0.01	0.003	4%
5	0.90	0.16		0.10	0.382					1.00	0.05	0.16	0.382	0.01	0.003	5%
6	0.95	0.16		0.10	0.377					1.00	0.05	0.16	0.377	0.01	0.003	5%
7	1.00	0.16		0.10	0.404					1.00	0.05	0.16	0.404	0.01	0.003	5%
8	1.05	0.18		0.11	0.396					1.00	0.05	0.18	0.396	0.01	0.004	6%
9	1.10	0.19		0.11	0.434					1.00	0.05	0.19	0.434	0.01	0.004	6%
10	1.15	0.19		0.11	0.417					1.00	0.05	0.19	0.417	0.01	0.004	6%
11	1.20	0.19		0.11	0.428					1.00	0.05	0.19	0.428	0.01	0.004	6%
12	1.25	0.19		0.11	0.375					1.00	0.05	0.19	0.375	0.01	0.004	6%
13	1.30	0.19		0.11	0.362					1.00	0.05	0.19	0.362	0.01	0.003	5%
14	1.35	0.18		0.11	0.334					1.00	0.05	0.18	0.334	0.01	0.003	5%
15	1.40	0.16		0.10	0.366					1.00	0.08	0.16	0.366	0.01	0.004	7%
16	1.50	0.15		0.09	0.325					1.00	0.10	0.15	0.325	0.02	0.005	8%
17	1.60	0.15		0.09	0.317					1.00	0.10	0.15	0.317	0.02	0.005	7%
18	1.70	0.14		0.08	0.302					1.00	0.10	0.14	0.302	0.01	0.004	7%
19	1.80	0.14		0.08	0.253					1.00	0.10	0.14	0.253	0.01	0.004	6%
20	1.90	0.13		0.08	0.095					1.00	0.14	0.13	0.095	0.02	0.000	0%
LB	2.08	0.00	0.00		0.000				0.000	1.00	0.09	0.00	0.000	0.00	0.000	0%
Total Flow														0.064	100%	

Flow Measurement Details:

Metering Section Location (describe): 23m upstream of bridge

Meas. Start Time (MST):	10:40
Meas. End Time (MST):	11:00
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 22C



Flow characteristics:

Total Flow:	0.064	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.22	(m ²)
Wetted Width:	1.54	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.30	(m/s)
Reynolds Number:	3.77E+04	
Froude Number:	0.25	

Logger Details:

	Before	After
Transducer Reading (m):	0.621	0.538
Water (°C):	15.1	18.1
Datalogger Clock:	10:28	11:13
Laptop Clock:	10:29	11:15
Battery:	13.8	13.5
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	322938	304028
Logger# (if replaced):	25582	-

Datalogger / Station Notes:

-Replaced PLS for calibration between surveys

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S65-01	0.628	100.628		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.897	99.731	99.732	3/4" Pipe 5m SW of logger
S65-03			1.002	99.626	99.623	3/4" Pipe 6m W of logger
Water Level:	Cut	0.603	3.731	97.500		Time WL Surveyed: 10:35
Temporary BM			3.731	96.897	0.000	
Turn						
Temporary BM	3.701	100.598		96.897		
Water Level:	Cut	0.603	3.701	97.500		Time WL Surveyed: 10:36
S65-03			0.972	99.626	99.623	3/4" Pipe 6m W of logger
S65-02			0.867	99.731	99.732	3/4" Pipe 5m SW of logger
S65-01			0.598	100.000	100.000	3/4" Pipe 5m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S65-03	0.972	100.598		99.626		Time WL Surveyed: 11:18
Water Level:	Cut	0.663	3.759	97.502		Time WL Surveyed: 11:19
Water Level:	Cut	0.663	3.719	97.502		
S65-03	0.932	100.558		99.626		

WL Survey Summary

	Before	After
Average WL:	97.500	97.502
Closing Error:	0.000	0.000
WL Check:	0.000	0.000
Transducer Elevation	96.879	96.964

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Camel AT-24
Serial #:	76710

Field Personnel:

Data Entry Personnel:	TR, GG	Trip Date:	8-Aug-15
Data Check Personnel:	TR	Date:	8-Aug-15
Entered Digitally in the Field:	CJ	Date:	3-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek
 UTM Location: 489845 E, 6333039 N

Site Visit Date: September 9, 2015
 Site Visit Time (MST): 09:00

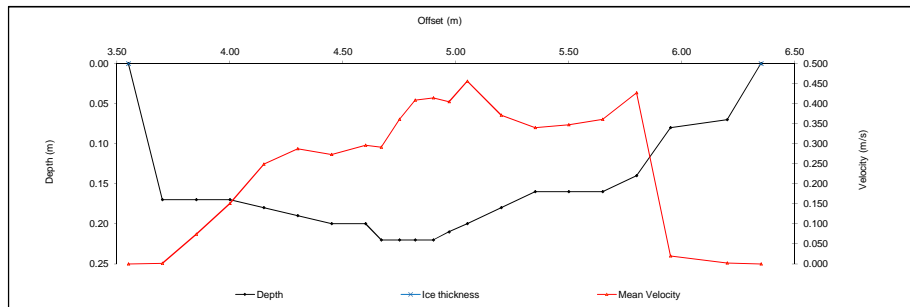


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	3.55	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	3.70	0.17		0.10	0.001					1.00	0.15	0.17	0.001	0.03	0.000	0%
2	3.85	0.17		0.10	0.074					1.00	0.15	0.17	0.074	0.03	0.002	2%
3	4.00	0.17		0.10	0.151					1.00	0.15	0.17	0.151	0.03	0.004	3%
4	4.15	0.18		0.11	0.249					1.00	0.15	0.18	0.249	0.03	0.007	6%
5	4.30	0.19		0.11	0.287					1.00	0.15	0.19	0.287	0.03	0.008	7%
6	4.45	0.20		0.12	0.273					1.00	0.15	0.20	0.273	0.03	0.008	7%
7	4.60	0.20		0.12	0.296					1.00	0.11	0.20	0.296	0.02	0.007	5%
8	4.67	0.22		0.13	0.291					1.00	0.08	0.22	0.291	0.02	0.005	4%
9	4.75	0.22		0.13	0.361					1.00	0.08	0.22	0.361	0.02	0.006	5%
10	4.82	0.22		0.13	0.409					1.00	0.08	0.22	0.409	0.02	0.007	6%
11	4.90	0.22		0.13	0.414					1.00	0.08	0.22	0.414	0.02	0.007	6%
12	4.97	0.21		0.13	0.405					1.00	0.07	0.21	0.405	0.02	0.006	5%
13	5.05	0.20		0.12	0.456					1.00	0.12	0.20	0.456	0.02	0.010	9%
14	5.20	0.18		0.11	0.371					1.00	0.15	0.18	0.371	0.03	0.010	8%
15	5.35	0.16		0.10	0.340					1.00	0.15	0.16	0.340	0.02	0.008	7%
16	5.50	0.16		0.10	0.347					1.00	0.15	0.16	0.347	0.02	0.008	7%
17	5.65	0.16		0.10	0.361					1.00	0.15	0.16	0.361	0.02	0.009	7%
18	5.80	0.14		0.08	0.427					1.00	0.15	0.14	0.427	0.02	0.009	7%
19	5.95	0.08		0.05	0.020					1.00	0.20	0.08	0.020	0.02	0.000	0%
20	6.20	0.07		0.04	0.002					1.00	0.20	0.07	0.002	0.01	0.000	0%
RB	6.35	0.00	0.00		0.000		0.000		0.000	1.00	0.07	0.00	0.000	0.00	0.000	0%
Total Flow														0.121	100%	

Flow Measurement Details:

Metering Section Location (describe):
20 m upstream of bridge

Meas. Start Time (MST):	9:36
Meas. End Time (MST):	9:59
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Slightly turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 7C



Flow characteristics:

Total Flow:	0.121	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.44	(m ²)
Wetted Width:	2.80	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.28	(m/s)
Reynolds Number:	3.07E+04	
Froude Number:	0.22	

Logger Details:

	Before	After
Transducer Reading (m):	0.614	0.615
Water (°C):	7.9	8.0
Datalogger Clock:	09:10	10:15
Laptop Clock:	09:11	10:17
Battery:	13.8	13.7
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- Needs BM tags
- ADV test result good

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S65-01	0.499	100.499		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.768	99.731	99.732	3/4" Pipe 5m SW of logger
S65-03			0.873	99.626	99.623	3/4" Pipe 6m W of logger
Water Level:	Cut		2.911	97.588		Time WL Surveyed: 9:27
Temporary BM			3.308	97.191	0.000	
Turn						
Temporary BM	3.295	100.486		97.191		
Water Level:	Cut		2.898	97.588		Time WL Surveyed: 9:29
S65-03			0.960	99.626	99.623	3/4" Pipe 6m W of logger
S65-02			0.754	99.732	99.732	3/4" Pipe 5m SW of logger
S65-01			0.485	100.001	100.000	3/4" Pipe 5m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S65-03	0.815	100.441		99.626		Time WL Surveyed: 10:14
Water Level:	Cut		2.851	97.590		Time WL Surveyed: 10:11
Water Level:	Cut		2.882	97.591		
S65-03	0.847	100.473		99.626		

WL Survey Summary

	Before	After
Average WL:	97.588	97.591
Closing Error:	-0.001	-
WL Check:	0.000	-0.001
Transducer Elevation	96.974	96.976

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Field Personnel:

Data Entry Personnel:	SM, JC	Trip Date:	9-Sep-15
Data Check Personnel:	SM	Date:	9-Sep-15
Entered Digitally in the Field:	CJ	Date:	8-Oct-15
	Yes		

Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek
 UTM Location: 489845 E, 6333039 N

Site Visit Date: October 21, 2015
 Site Visit Time (MST): 08:07

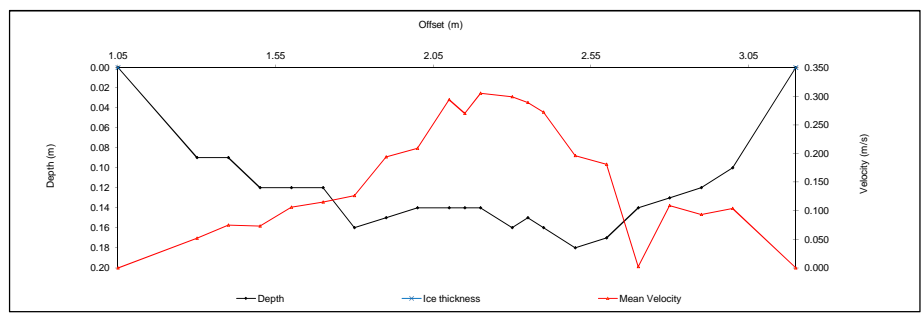


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	1.05	0.00	0.00		0.000				0.000		1.00	0.13	0.00	0.000	0.00	0.000
1	1.30	0.09		0.05	0.052					1.00	0.18	0.09	0.052	0.02	0.001	2%
2	1.40	0.09		0.05	0.075					1.00	0.10	0.09	0.075	0.01	0.001	2%
3	1.50	0.12		0.07	0.073					1.00	0.10	0.12	0.073	0.01	0.001	2%
4	1.60	0.12		0.07	0.106					1.00	0.10	0.12	0.106	0.01	0.001	3%
5	1.70	0.12		0.07	0.115					1.00	0.10	0.12	0.115	0.01	0.001	3%
6	1.80	0.16		0.10	0.126					1.00	0.10	0.16	0.126	0.02	0.002	5%
7	1.90	0.15		0.09	0.194					1.00	0.10	0.15	0.194	0.02	0.003	7%
8	2.00	0.14		0.08	0.209					1.00	0.10	0.14	0.209	0.01	0.003	7%
9	2.10	0.14		0.08	0.294					1.00	0.08	0.14	0.294	0.01	0.003	8%
10	2.15	0.14		0.08	0.270					1.00	0.05	0.14	0.270	0.01	0.002	5%
11	2.20	0.14		0.08	0.305					1.00	0.08	0.14	0.305	0.01	0.003	8%
12	2.30	0.16		0.10	0.299					1.00	0.08	0.16	0.299	0.01	0.004	9%
13	2.35	0.15		0.09	0.289					1.00	0.05	0.15	0.289	0.01	0.002	5%
14	2.40	0.16		0.10	0.272					1.00	0.08	0.16	0.272	0.01	0.003	8%
15	2.50	0.18		0.11	0.196					1.00	0.10	0.18	0.196	0.02	0.004	9%
16	2.60	0.17		0.10	0.181					1.00	0.10	0.17	0.181	0.02	0.003	8%
17	2.70	0.14		0.08	0.002					1.00	0.10	0.14	0.002	0.01	0.000	0%
18	2.80	0.13		0.08	0.109					1.00	0.10	0.13	0.109	0.01	0.001	3%
19	2.90	0.12		0.07	0.093					1.00	0.10	0.12	0.093	0.01	0.001	3%
20	3.00	0.10		0.06	0.104					1.00	0.15	0.10	0.104	0.02	0.002	4%
LB	3.20	0.00	0.00		0.000				0.000		1.00	0.10	0.000	0.00	0.000	0%
Total Flow														0.041	100%	

Flow Measurement Details:

Metering Section Location (describe):
15m downstream from logger

Meas. Start Time (MST):	8:19
Meas. End Time (MST):	8:47
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, calm, 2C



Flow characteristics:

Total Flow:	0.041	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.25	(m ²)
Wetted Width:	2.15	(m)
Hydraulic Depth:	0.12	(m)
Mean Velocity:	0.16	(m/s)
Reynolds Number:	1.18E+04	
Froude Number:	0.15	

Logger Details:

	Before	After
Transducer Reading (m):	0.518	0.519
Water (°C):	3.6	3.6
Datalogger Clock:	08:08	08:47
Laptop Clock:	08:09	08:49
Battery:	13.5	14.7
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

-On next visit, bring solar panel with mounts, current one is attached with zip ties

General Notes:

-ADV test good

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S65-01	0.575	100.575		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.844	99.731	99.732	3/4" Pipe 5m SW of logger
S65-03			0.950	99.625	99.623	3/4" Pipe 6m W of logger
Water Level:	Cut	0.377	3.463	97.489		Time WL Surveyed: 8:13
Temporary BM			3.463	97.112	0.000	-
Turn						
Temporary BM	3.436	100.548		97.112		
Water Level:	Cut	0.377	3.436	97.489		Time WL Surveyed: 8:15
S65-03			0.923	99.625	99.623	3/4" Pipe 6m W of logger
S65-02			0.818	99.730	99.732	3/4" Pipe 5m SW of logger
S65-01			0.549	99.999	100.000	3/4" Pipe 5m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S65-03	0.923	100.548		99.625		
Water Level:	Cut	0.389	3.458	97.489		Time WL Surveyed: 8:50
Water Level:	Cut	0.399	3.432	97.490		Time WL Surveyed: 8:52
S65-03	0.898	100.523		99.625		

WL Survey Summary

	Before	After
Average WL:	97.489	97.490
Closing Error:	0.001	-
WL Check:	0.000	-0.001
Transducer Elevation	96.971	96.971

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	GG, TR	Trip Date:	21-Oct-15
Data Check Personnel:	JC	Date:	21-Oct-15
Entered Digitally in the Field:	Yes	Date:	16-Nov-15

Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence
 UTM Location: 491458 E, 6302625 N

Site Visit Date: January 10, 2015
 Site Visit Time (MST): 13:00



Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.90	0.00	0.00		0.000		0.000		0.000	0.88	0.48	0.00	0.000	0.00	0.000	
1	1.85	0.42	0.25	0.34	0.119					0.88	1.00	0.17	0.105	0.17	0.018	4%
2	2.90	0.76	0.25	0.51	0.119					0.88	0.95	0.51	0.105	0.48	0.051	11%
3	3.75	0.85	0.30	0.58	0.102					0.88	0.85	0.55	0.090	0.47	0.042	9%
4	4.60	0.84	0.33	0.59	0.135					0.88	0.88	0.51	0.119	0.45	0.053	11%
5	5.50	0.80	0.35	0.58	0.153					0.88	0.83	0.45	0.135	0.37	0.050	11%
6	6.25	0.70	0.35	0.53	0.163					0.88	0.65	0.35	0.143	0.23	0.033	7%
7	6.80	0.64	0.35	0.50	-0.001					0.88	0.57	0.29	-0.001	0.17	0.000	0%
8	7.40	0.63	0.40	0.52	0.079					0.88	0.78	0.23	0.070	0.18	0.012	3%
9	8.35	0.61	0.30	0.46	0.103					0.88	0.90	0.31	0.091	0.28	0.025	5%
10	9.20	0.64	0.25	0.45	0.112					0.88	0.68	0.39	0.099	0.26	0.026	6%
11	9.70	0.32	0.20	0.26	0.114					0.88	0.45	0.12	0.100	0.05	0.005	1%
12	10.10	0.35	0.20	0.28	0.107					0.88	0.48	0.15	0.094	0.07	0.007	1%
13	10.65	0.62	0.22	0.42	0.151					0.88	0.63	0.40	0.133	0.25	0.033	7%
14	11.35	0.60	0.25	0.43	0.139					0.88	0.65	0.35	0.122	0.23	0.028	6%
15	11.95	0.58	0.25	0.42	0.088					0.88	0.83	0.33	0.077	0.27	0.021	4%
16	13.00	0.52	0.25	0.39	0.054					0.88	0.98	0.27	0.048	0.26	0.013	3%
17	13.90	0.50	0.28	0.39	0.012					0.88	0.93	0.22	0.011	0.20	0.002	0%
18	14.85	0.30	0.26	0.28	0.153					0.88	0.88	0.04	0.135	0.04	0.005	1%
19	15.65	0.40	0.25	0.33	0.095					0.88	0.95	0.15	0.084	0.14	0.012	3%
20	16.75	0.34	0.18	0.26	0.148					0.88	1.03	0.16	0.130	0.16	0.021	5%
21	17.70	0.24	0.10	0.17	0.135					0.88	0.82	0.14	0.119	0.12	0.014	3%
LB	18.40	0.00	0.00		0.00		0.00		0.00	0.88	0.35	0.00	0.000	0.00	0.000	
Total Flow														0.470	100%	

Flow Measurement Details:

Metering Section Location (describe):
 12m upstream of PT

Meas. Start Time (MST):	13:49
Meas. End Time (MST):	14:45
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -24 C

Flow characteristics:

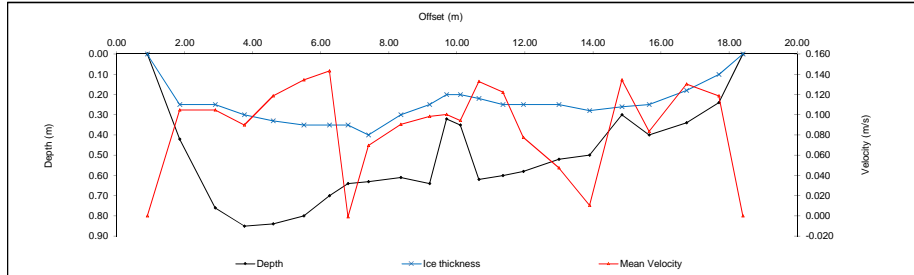
Total Flow:	0.470	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.85	(m ²)
Wetted Width:	17.50	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.06	

Logger Details:

	Before	After
Transducer Reading (m):	0.356	-
Water (°C):	0.2	-
Datalogger Clock:	13:09	-
Laptop Clock:	13:09	-
Battery:	12.6	12.8
Battery Condition:	Replaced	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S66-04	1.703	101.222		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-03			1.640	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-01			1.047	100.175	100.177	Bolt in Tree 10 E from Logger
S66-02			1.158	100.064	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut		3.664	97.558	97.558	Time WL Surveyed: 13:37
S66-01			1.047	100.175	100.177	Bolt in Tree 10 E from Logger
Turn						
S66-01	1.027	101.202		100.175	100.177	Bolt in Tree 10 E from Logger
Water Level:	Cut		3.640	97.562	97.562	Time WL Surveyed: 13:42
S66-02			1.136	100.066	100.064	Bolt in Tree 12 N from Logger
S66-01			1.027	100.175	100.177	Bolt in Tree 10 E from Logger
S66-03			1.618	99.584	99.583	3/4" Pipe 5 m NW from Logger
S66-04			1.683	99.519	99.519	3/4" Pipe 7 m West from Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary	Before	After
Average WL:	97.560	-
Closing Error:	0.000	-
WL Check:	0.004	-
Transducer Elevation	97.204	-

Field Personnel:	GG, TR, AJ	Trip Date:	10-Jan-15
Data Entry Personnel:	GG	Date:	10-Jan-15
Data Check Personnel:	CJ	Date:	22-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence
 UTM Location: 491458 E, 6302625 N

Site Visit Date: February 12, 2015
 Site Visit Time (MST): 08:46

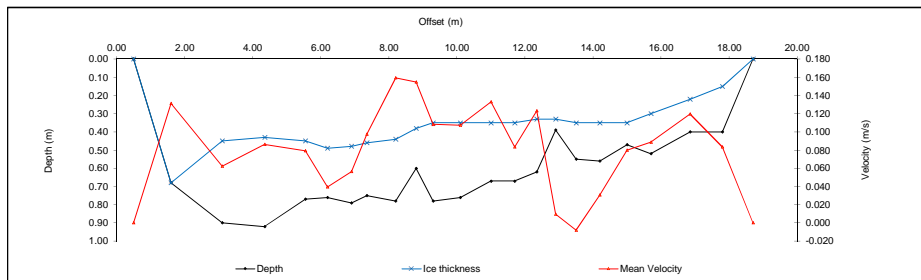


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.50	0.00	0.00		0.000		0.000		0.000	0.88	0.55	0.00	0.000	0.00	0.000	
1	1.60	0.68	0.68	0.68	0.149					0.88	1.30	0.00	0.131	0.00	0.000	0%
2	3.10	0.90	0.45	0.68	0.071					0.88	1.38	0.45	0.062	0.62	0.039	9%
3	4.35	0.92	0.43	0.68	0.098					0.88	1.23	0.49	0.086	0.60	0.052	12%
4	5.55	0.77	0.45	0.61	0.090					0.88	0.93	0.32	0.079	0.30	0.023	6%
5	6.20	0.76	0.49	0.63	0.045					0.88	0.68	0.27	0.040	0.18	0.007	2%
6	6.90	0.79	0.45	0.64	0.054					0.88	0.57	0.31	0.056	0.18	0.010	2%
7	7.35	0.75	0.46	0.61	0.111					0.88	0.65	0.29	0.098	0.19	0.018	4%
8	8.20	0.78	0.44	0.61	0.181					0.88	0.73	0.34	0.159	0.25	0.039	9%
9	8.80	0.60	0.38	0.49	0.176					0.88	0.55	0.22	0.155	0.12	0.019	4%
10	9.30	0.78	0.35	0.57	0.123					0.88	0.65	0.43	0.108	0.28	0.030	7%
11	10.10	0.76	0.35	0.56	0.122					0.88	0.85	0.41	0.107	0.35	0.037	9%
12	11.00	0.67	0.35	0.51	0.151					0.88	0.80	0.32	0.133	0.26	0.034	8%
13	11.70	0.67	0.35	0.51	0.095					0.88	0.67	0.32	0.084	0.22	0.018	4%
14	12.35	0.62	0.33	0.48	0.140					0.88	0.60	0.29	0.123	0.17	0.021	5%
15	12.90	0.39	0.33	0.36	0.011					0.88	0.57	0.06	0.010	0.03	0.000	0%
16	13.50	0.55	0.35	0.45	-0.009					0.88	0.65	0.20	-0.008	0.13	-0.001	0%
17	14.20	0.56	0.35	0.46	0.035					0.88	0.75	0.21	0.031	0.16	0.005	1%
18	15.00	0.47	0.35	0.41	0.091					0.88	0.75	0.12	0.080	0.09	0.007	2%
19	15.70	0.52	0.30	0.41	0.101					0.88	0.92	0.22	0.089	0.20	0.018	4%
20	16.85	0.60	0.22	0.31	0.136					0.88	1.05	0.18	0.120	0.19	0.023	5%
21	17.80	0.40	0.15	0.28	0.095					0.88	0.92	0.25	0.084	0.23	0.019	5%
LB	18.70	0.00	0.00		0.00		0.00		0.00	0.88	0.45	0.00	0.000	0.00	0.000	
Total Flow														0.420	100%	

Flow Measurement Details:

Metering Section Location (describe):
14m upstream of station

Meas. Start Time (MST):	9:15
Meas. End Time (MST):	10:05
Equipment:	ADV
Method:	Ice
River Condition:	Moderate flow under ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -12 C



Flow characteristics:

Total Flow:	0.420	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.74	(m ²)
Wetted Width:	18.20	(m)
Hydraulic Depth:	0.26	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.06	

Logger Details:

	Before	After
Transducer Reading (m):	0.297	-
Water (°C):	0.2	-
Datalogger Clock:	08:50	-
Laptop Clock:	08:48	-
Battery:	12.5	13.1
Battery Condition:	Replaced	-
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	-
Vent Tube Desiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S66-04	1.620	101.139		99.519	99.519	3/4" Pipe 5 m NW from Logger
S66-03			1.557	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-01			0.959	100.180	100.177	Bolt in Tree 10 E from Logger
S66-02			1.068	100.071	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut			3.545	97.594	Time WL Surveyed: 9:19
Temp BM			3.408	97.731	0.000	
Turn						
Temp BM	3.389	101.120		97.731		
Water Level:	Cut			3.525	97.595	Time WL Surveyed: 9:21
S66-01			1.049	100.071	100.064	Bolt in Tree 12 N from Logger
S66-01			0.938	100.182	100.177	Bolt in Tree 10 E from Logger
S66-03			1.536	99.584	99.583	3/4" Pipe 5 m NW from Logger
S66-04			1.600	99.520	99.519	3/4" Pipe 5 m NW from Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.595	-
Closing Error:	-0.001	-
WL Check:	0.001	-
Transducer Elevation	97.298	-

Field Personnel:

Personnel	MP, GG	Trip Date:	12-Feb-15
Data Entry Personnel:	MP	Date:	12-Feb-15
Data Check Personnel:	CJ	Date:	22-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence
 UTM Location: 491458 E, 6302625 N

Site Visit Date: March 13, 2015
 Site Visit Time (MST): 15:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	2.30	0.00	0.00		0.000				0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	2.90	0.40	0.22	0.31	0.050					0.88	0.69	0.18	0.044	0.12	0.005	2%
2	3.67	0.50	0.38	0.44	0.276					0.88	0.63	0.12	0.243	0.08	0.018	5%
3	4.15	0.54	0.35	0.45	0.309					0.88	0.32	0.19	0.272	0.06	0.016	5%
4	4.30	0.63	0.35	0.49	0.303					0.88	0.43	0.28	0.267	0.12	0.032	9%
5	5.00	0.55	0.40	0.48	0.081					0.88	0.52	0.15	0.071	0.08	0.006	2%
6	5.35	0.50	0.40	0.45	0.002					0.88	0.38	0.10	0.002	0.04	0.000	0%
7	5.75	0.65	0.40	0.53	0.284					0.88	0.53	0.25	0.250	0.13	0.033	10%
8	6.40	0.73	0.43	0.58	0.198					0.88	0.73	0.30	0.174	0.22	0.038	11%
9	7.20	0.78	0.45	0.62	0.175					0.88	0.82	0.33	0.154	0.27	0.042	12%
10	8.05	0.82	0.48	0.65	0.084					0.88	0.93	0.34	0.074	0.31	0.023	7%
11	9.05	0.65	0.45	0.55	-0.003					0.88	0.88	0.20	-0.003	0.20	-0.001	0%
12	10.00	0.60	0.44	0.52	0.005					0.88	0.90	0.16	0.004	0.14	0.001	0%
13	10.85	0.56	0.28	0.42	0.125					0.88	0.80	0.28	0.110	0.22	0.025	7%
14	11.60	0.30	0.20	0.25	0.053					0.88	0.63	0.10	0.047	0.06	0.003	1%
15	12.10	0.50	0.20	0.35	-0.002					0.88	0.45	0.30	-0.002	0.14	0.000	0%
16	12.50	0.40	0.24	0.32	0.411					0.88	0.57	0.16	0.362	0.09	0.033	10%
17	13.25	0.35	0.25	0.30	0.001					0.88	0.75	0.10	0.001	0.08	0.000	0%
18	14.00	0.50	0.25	0.38	0.001					0.88	0.82	0.25	0.001	0.21	0.000	0%
19	14.90	0.43	0.32	0.38	0.057					0.88	0.83	0.11	0.050	0.09	0.005	1%
20	15.85	0.37	0.33	0.35	0.165					0.88	0.73	0.04	0.145	0.03	0.004	1%
21	16.35	0.45	0.30	0.38	0.131					0.88	0.73	0.15	0.115	0.11	0.013	4%
22	17.10	0.24	0.19	0.22	0.236					0.88	0.80	0.05	0.208	0.04	0.008	2%
23	17.95	0.40	0.20	0.30	0.018					0.88	0.85	0.20	0.016	0.17	0.003	1%
24	18.80	0.40	0.00	0.20	0.110					0.88	0.83	0.40	0.097	0.33	0.032	9%
LB	19.60	0.00	0.00		0.00		0.00		0.00	0.88	0.40	0.00	0.000	0.00	0.000	
Total Flow															0.338	100%

Flow Measurement Details:

Metering Section Location (describe):
 15m upstream of station

Meas. Start Time (MST):	15:50
Meas. End Time (MST):	16:25
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 16C

Flow characteristics:

Total Flow:	0.338	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.33	(m ²)
Wetted Width:	17.30	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.07	

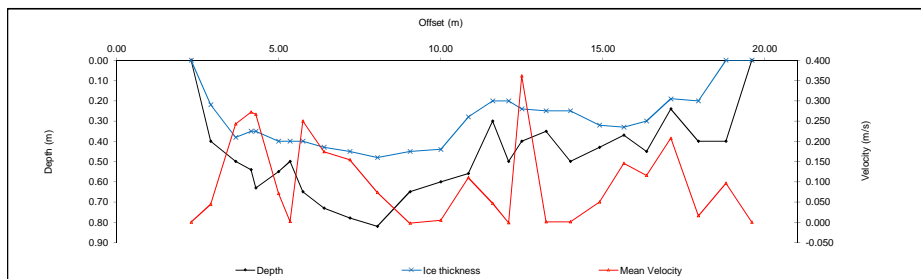
Logger Details:

	Before	After
Transducer Reading (m):	0.332	
Water (°C):	0.1	
Datalogger Clock:	15:14	
Laptop Clock:	15:13	
Battery:	13.9	
Battery Condition:	-	Good
Battery Serial #:	-	
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

Datalogger / Station Notes:

General Notes:

-Low flows in metering section



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S66-04	1.678	101.197		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-01			1.016	100.181	100.177	Bolt in Tree 10 E from Logger
S66-03			1.616	99.581	99.583	3/4" Pipe 5 m NW from Logger
S66-02			1.127	100.070	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut		3.578	97.619		Time WL Surveyed: 15:32
Temp BM			3.272	97.925	99.519	3/4" Pipe 7 m West from Logger
Turn						
Temp BM	3.249	101.174		97.925	99.519	3/4" Pipe 7 m West from Logger
Water Level:	Cut		3.558	97.616		Time WL Surveyed: 15:35
S66-02			1.102	100.072	100.064	Bolt in Tree 12 N from Logger
S66-03			1.592	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-01			0.993	100.181	100.177	Bolt in Tree 10 E from Logger
S66-04			1.655	99.519	99.519	3/4" Pipe 7 m West from Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary	Before	After
Average WL:	97.618	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	97.286	-

Field Personnel:	DW, SM	Trip Date:	13-Mar-15
Data Entry Personnel:	DW, SM	Date:	13-Mar-15
Data Check Personnel:	CJ	Date:	22-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence
 UTM Location: 491458 E, 6302625 N

Site Visit Date: April 17, 2015
 Site Visit Time (MST): 13:24



Flow Measurement:										Calculated Data						
Measured Data																
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
No Flow Measurement Conducted																
Total Flow															-	

Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	

Flow Characteristics:

Total Flow:	-	(m ³ /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m ²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:

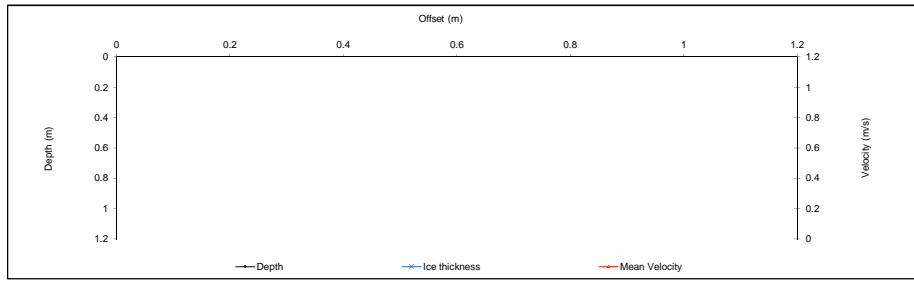
	Before	After
Transducer Reading (m):	0.731	0.818
Water (°C):	0.2	0.2
Datalogger Clock:	13:29	14:46
Laptop Clock:	13:28	14:45
Battery:	13.2	13.2
Battery Condition:		Replaced
Battery Serial #:	-	-
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Cableway was installed.
- Flow measurement was not conducted; channel had 80% ice cover which was unstable, unsafe for walking.

General Notes:

- Data logger was off prior to visit due to power supply issues. Changed batteries, running fine now, may need new solar controller.



Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S66-04	1.470	100.989		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-01			1.407	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-03			0.807	100.182	100.177	Bolt in Tree 10 E from Logger
S66-02			0.918	100.071	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut		2.904	98.085		Time WL Surveyed: 13:59
Temporary BM			2.823	98.166		
Turn						
Temporary BM	2.878	101.044		98.166	-	
Water Level:	Cut		2.955	98.089		Time WL Surveyed: 14:01
S66-02			0.973	100.071	100.064	Bolt in Tree 12 N from Logger
S66-01			0.863	100.181	100.177	Bolt in Tree 10 E from Logger
S66-03			1.462	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-04			1.524	99.520	99.519	3/4" Pipe 7 m West from Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	98.087	-
Closing Error:	-0.001	-
WL Check:	0.004	-
Transducer Elevation	97.356	-

Field Personnel:

	GG, SM	Trip Date:	17-Apr-15
Data Entry Personnel:	GG	Date:	17-Apr-15
Data Check Personnel:	CJ	Date:	22-May-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence

UTM Location: 491458 E, 6302625 N

Site Visit Date: June 13, 2015

Site Visit Time (MST): 14:25

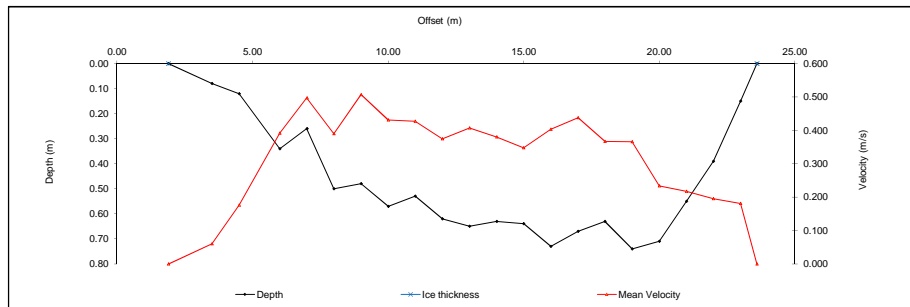


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	23.60	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	23.00	0.15		0.09	0.181					1.00	0.80	0.15	0.181	0.12	0.022	1%
2	22.00	0.39		0.23	0.195					1.00	1.00	0.39	0.195	0.39	0.076	2%
3	21.00	0.55		0.33	0.217					1.00	1.00	0.55	0.217	0.55	0.119	3%
4	20.00	0.71		0.43	0.234					1.00	1.00	0.71	0.234	0.71	0.166	5%
5	19.00	0.74		0.44	0.366					1.00	1.00	0.74	0.366	0.74	0.271	7%
6	18.00	0.63		0.38	0.367					1.00	1.00	0.63	0.367	0.63	0.231	6%
7	17.00	0.67		0.40	0.438					1.00	1.00	0.67	0.438	0.67	0.293	8%
8	16.00	0.73		0.44	0.403					1.00	1.00	0.73	0.403	0.73	0.294	8%
9	15.00	0.64		0.38	0.348					1.00	1.00	0.64	0.348	0.64	0.223	6%
10	14.00	0.63		0.38	0.380					1.00	1.00	0.63	0.380	0.63	0.239	7%
11	13.00	0.65		0.39	0.407					1.00	1.00	0.65	0.407	0.65	0.265	7%
12	12.00	0.62		0.37	0.374					1.00	1.00	0.62	0.374	0.62	0.232	6%
13	11.00	0.53		0.32	0.427					1.00	1.00	0.53	0.427	0.53	0.226	6%
14	10.00	0.57		0.34	0.431					1.00	1.00	0.57	0.431	0.57	0.246	7%
15	9.00	0.48		0.29	0.507					1.00	1.00	0.48	0.507	0.48	0.243	7%
16	8.00	0.50		0.30	0.390					1.00	1.00	0.50	0.390	0.50	0.195	5%
17	7.00	0.26		0.16	0.497					1.00	1.00	0.26	0.497	0.26	0.129	4%
18	6.00	0.34		0.20	0.392					1.00	1.25	0.34	0.392	0.43	0.167	5%
19	4.50	0.12		0.07	0.176					1.00	1.25	0.12	0.176	0.15	0.026	1%
20	3.50	0.08		0.05	0.060					1.00	1.30	0.08	0.060	0.10	0.006	0%
LB	1.90	0.00	0.00		0.000		0.000		0.000	1.00	0.80	0.00	0.000	0.00	0.000	0%
Total Flow														3.67	100%	

Flow Measurement Details:

Metering Section Location (describe):
8m upstream of station at cableway

Meas. Start Time (MST):	14:50
Meas. End Time (MST):	15:15
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light breeze, 17C



Flow characteristics:

Total Flow:	3.67	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.10	(m ²)
Wetted Width:	21.70	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.36	(m/s)
Reynolds Number:	1.49E+05	
Froude Number:	0.17	

Logger Details:

	Before	After
Transducer Reading (m):	0.437	0.437
Water (°C):	15.5	15.7
Datalogger Clock:	14:29	15:23
Laptop Clock:	14:28	15:21
Battery:	13.7	13.8
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S66-04	1.631	101.150		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-03			1.568	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-01			0.972	100.178	100.177	Bolt in Tree 10 E from Logger
Water Level:	Cut	0.255	3.667	97.738		Time WL Surveyed: 14:39
Temporary BM			3.667	97.483	0.000	-
Turn						
Temporary BM	3.602	101.085		97.483		
Water Level:	Cut	0.255	3.602	97.738		Time WL Surveyed: 14:40
S66-01			0.907	100.178	100.177	Bolt in Tree 10 E from Logger
S66-03			1.503	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-04			1.566	99.519	99.519	3/4" Pipe 7 m West from Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S66-03	1.503	101.085		99.582		Time WL Surveyed: 15:19
Water Level:	Cut	0.240	3.582	97.743		Time WL Surveyed: 15:20
Water Level:	Cut	0.240	3.529	97.742		
S66-03	1.449	101.031		99.582		

WL Survey Summary

	Before	After
Average WL:	97.738	97.743
Closing Error:	0.000	0.001
WL Check:	0.000	0.001
Transducer Elevation	97.301	97.306

Level Survey Equipment:

Level #:	Level#1
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

	TR, GG	Trip Date:	13-Jun-15
Data Entry Personnel:	TR	Date:	13-Jun-15
Data Check Personnel:	CJ	Date:	4-Sep-15
Entered Digitally in the Field:	Yes		

Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence
 UTM Location: 491458 E, 6302625 N

Site Visit Date: August 13, 2015
 Site Visit Time (MST): 08:00

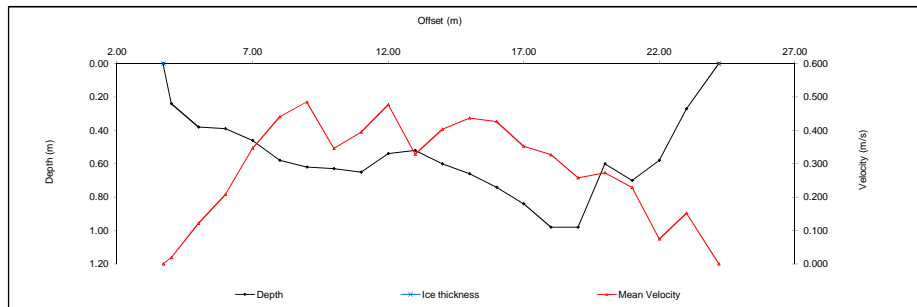


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	24.20	0.00	0.00		0.000		0.000		0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	23.00	0.27		0.16	0.152					1.00	1.10	0.27	0.152	0.30	0.045	1%
2	22.00	0.58		0.35	0.074					1.00	1.00	0.58	0.074	0.58	0.043	1%
3	21.00	0.70		0.42	0.229					1.00	1.00	0.70	0.229	0.70	0.160	4%
4	20.00	0.60		0.36	0.273					1.00	1.00	0.60	0.273	0.60	0.164	4%
5	19.00	0.98				0.78	0.137	0.20	0.378	1.00	1.00	0.98	0.259	0.98	0.252	7%
6	18.00	0.98				0.78	0.263	0.20	0.391	1.00	1.00	0.98	0.327	0.98	0.320	8%
7	17.00	0.84				0.67	0.255	0.17	0.450	1.00	1.00	0.84	0.353	0.84	0.296	8%
8	16.00	0.74		0.44	0.426					1.00	1.00	0.74	0.426	0.74	0.315	8%
9	15.00	0.66		0.40	0.437					1.00	1.00	0.66	0.437	0.66	0.288	7%
10	14.00	0.60		0.36	0.403					1.00	1.00	0.60	0.403	0.60	0.242	6%
11	13.00	0.52		0.31	0.328					1.00	1.00	0.52	0.328	0.52	0.171	4%
12	12.00	0.54		0.32	0.477					1.00	1.00	0.54	0.477	0.54	0.258	7%
13	11.00	0.65		0.39	0.395					1.00	1.00	0.65	0.395	0.65	0.257	7%
14	10.00	0.63		0.38	0.346					1.00	1.00	0.63	0.346	0.63	0.218	6%
15	9.00	0.62		0.37	0.485					1.00	1.00	0.62	0.485	0.62	0.301	8%
16	8.00	0.58		0.35	0.441					1.00	1.00	0.58	0.441	0.58	0.256	7%
17	7.00	0.46		0.28	0.347					1.00	1.00	0.46	0.347	0.46	0.160	4%
18	6.00	0.39		0.23	0.208					1.00	1.00	0.39	0.208	0.39	0.081	2%
19	5.00	0.38		0.23	0.121					1.00	1.00	0.38	0.121	0.38	0.046	1%
20	4.00	0.24		0.14	0.019					1.00	0.65	0.24	0.019	0.16	0.003	0%
LB	3.70	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
Total Flow														3.88	100%	

Flow Measurement Details:

Metering Section Location (describe): 3m upstream of cableway

Meas. Start Time (MST):	8:50
Meas. End Time (MST):	9:15
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 20C



Flow characteristics:

Total Flow:	3.88	(m ³ /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.90	(m ²)
Wetted Width:	20.50	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.33	(m/s)
Reynolds Number:	1.70E+05	
Froude Number:	0.14	

Logger Details:

	Before	After
Transducer Reading (m):	0.464	0.446
Water (°C):	16.0	16.3
Datalogger Clock:	08:30	09:23
Laptop Clock:	08:29	09:22
Battery:	13.1	13.2
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Replaced	
PT# (if replaced):	253472	-
Logger# (if replaced):	12686	-

Datalogger / Station Notes:

- Station found laying on its side upon arrival. Mast had been unthreaded. Station was reinstated. -Ran ADV test, all good
- Moved PT to check SN
- Sonde in: 15F104203, out: 15F104200
- No TSS/TDS, full WQ sample set collected

General Notes:

- Sonde parameter readings, before and after:
- V- 6.45, 6.33
- TEMP- 15.77, 15.97
- COND- 184.44, 192.76
- TURB- 3, 2.18
- PH- 8.17, 7.83
- PHMV- -79.63, -68.19
- DO- 9.79, 9.55
- DO%- 98.79, 96.75

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S66-04	1.449	100.968		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-03			1.386	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-02			0.907	100.061	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut	0.267	3.469	97.766		Time WL Surveyed: 8:45
Temporary BM			3.469	97.499	0.000	
Turn						
Temporary BM	3.440	100.939		97.499		
Water Level:	Cut	0.267	3.440	97.766		Time WL Surveyed: 8:46
S66-02			0.877	100.062	100.064	Bolt in Tree 12 N from Logger
S66-03			1.355	99.584	99.583	3/4" Pipe 5 m NW from Logger
S66-04			1.419	99.520	99.519	3/4" Pipe 7 m West from Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S66-03	1.355	100.938		99.583		
Water Level:	Cut	0.259	3.438	97.758		Time WL Surveyed: 9:18
Water Level:	Cut	0.259	3.408	97.756		Time WL Surveyed: 9:19
S66-03	1.322	100.905		99.583		

WL Survey Summary

	Before	After
Average WL:	97.766	97.757
Closing Error:	-0.001	0.002
WL Check:	0.000	0.002
Transducer Elevation	97.302	97.311

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Field Personnel:

Data Entry Personnel:	TR, DW	Trip Date:	13-Aug-15
Data Check Personnel:	CJ	Date:	13-Aug-15
Entered Digitally in the Field:	Yes	Date:	4-Sep-15

Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluenc
 UTM Location: 491458 E, 6302625 N

Site Visit Date:
 Site Visit Time (MST):

September 14, 2015
 16:15

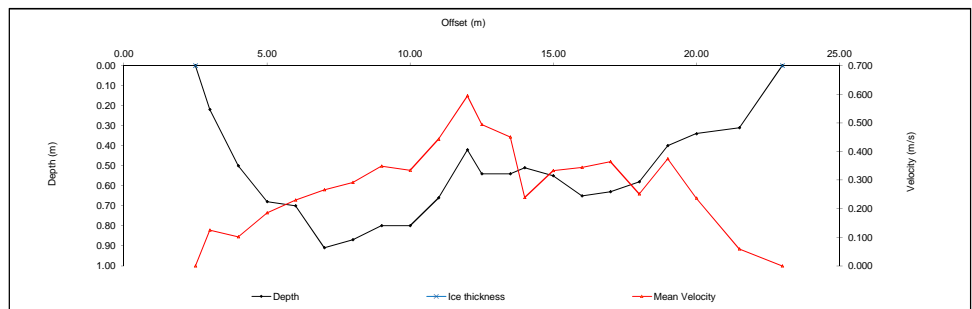


Measured Data										Calculated Data						
Bank/ Nmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	2.50	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	3.00	0.22		0.13	0.125					1.00	0.75	0.22	0.125	0.17	0.021	1%
2	4.00	0.50		0.30	0.101					1.00	1.00	0.50	0.101	0.50	0.051	1%
3	5.00	0.68		0.41	0.185					1.00	1.00	0.68	0.185	0.68	0.126	4%
4	6.00	0.70		0.42	0.230					1.00	1.00	0.70	0.230	0.70	0.161	5%
5	7.00	0.91				0.73	0.239	0.18	0.292	1.00	1.00	0.91	0.266	0.91	0.242	7%
6	8.00	0.87				0.70	0.283	0.17	0.301	1.00	1.00	0.87	0.292	0.87	0.254	7%
7	9.00	0.80				0.64	0.284	0.16	0.414	1.00	1.00	0.80	0.349	0.80	0.279	8%
8	10.00	0.80				0.64	0.188	0.16	0.480	1.00	1.00	0.80	0.334	0.80	0.267	8%
9	11.00	0.66		0.40	0.443					1.00	1.00	0.66	0.443	0.66	0.292	9%
10	12.00	0.42		0.25	0.594					1.00	0.75	0.42	0.594	0.32	0.187	5%
11	12.50	0.54		0.32	0.494					1.00	0.75	0.54	0.494	0.41	0.200	6%
12	13.50	0.54		0.32	0.450					1.00	0.75	0.54	0.450	0.41	0.182	5%
13	14.00	0.51		0.31	0.239					1.00	1.00	0.51	0.239	0.38	0.091	3%
14	15.00	0.55		0.33	0.333					1.00	1.00	0.55	0.333	0.55	0.183	5%
15	16.00	0.65		0.39	0.344					1.00	1.00	0.65	0.344	0.65	0.224	7%
16	17.00	0.63		0.38	0.364					1.00	1.00	0.63	0.364	0.63	0.229	7%
17	18.00	0.58		0.35	0.251					1.00	1.00	0.58	0.251	0.58	0.146	4%
18	19.00	0.40		0.24	0.374					1.00	1.00	0.40	0.374	0.40	0.150	4%
19	20.00	0.34		0.20	0.237					1.00	1.25	0.34	0.237	0.43	0.101	3%
20	21.50	0.31		0.19	0.059					1.00	1.50	0.31	0.059	0.47	0.027	1%
LB	23.00	0.00	0.00		0.00				0.00	1.00	0.75	0.00	0.000	0.00	0.000	
Total Flow														3.41	100%	

Flow Measurement Details:

Metering Section Location (describe):
5m upstream of station

Meas. Start Time (MST):	17:00
Meas. End Time (MST):	17:30
Equipment:	ADV#2
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P4767
Method:	Wading
River Condition:	Low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 10C



Flow characteristics:

Total Flow:	3.41	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.29	(m²)
Wetted Width:	20.50	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	0.30	(m/s)
Reynolds Number:	-	
Froude Number:	0.13	

Logger Details:

	Before	After
Transducer Reading (m):	0.406	
PT Water (°C):	10.0	
Datalogger Clock:	16:21	
Laptop Clock:	16:21	
Station Battery Voltage:	13.2	
Station Battery:	Good	
Station Battery Serial #:	-	
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

Sonde Details:

	Before	After
Sonde Water (°C):	9	9
Specific Conductance (µS):	198	200
pH:	8	7
Turbidity (FNU):	1	2
Dissolved Oxygen Conc. (mg/L):	12	11
Dissolved Oxygen Sat. (%):	99	95
Sonde Battery Voltage:	6.0	6.5
Sonde # (if replaced):	15F104120	15F104126

Sonde Visit Details:

Visit Type: Sonde Replacement

Sonde Replaced:

Deployed Sonde:

Downloaded:

Yes No

Downloaded File Name:

WQ Samples Taken:

No

Photos Taken:

US, DS, CS:

Yes No

Sonde Housing (In Situ):

-

Sonde Probes (Before Clearing):

-

Datalogger:

Yes

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S66-04	1.415	100.834		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-03			1.350	99.584	99.583	3/4" Pipe 5 m NW from Logger
S66-01			0.761	100.173	100.177	Bolt in Tree 10 E from Logger
S66-02			0.872	100.062	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut		3.201	97.733		Time WL Surveyed: 16:28
			3.178	97.756		
Turn						
Water Level:	3.219	100.975		97.756		
Water Level:	Cut		3.239	97.736		Time WL Surveyed: 16:30
S66-02			0.914	100.061	100.064	Bolt in Tree 12 N ft #N/A
S66-01			0.802	100.173	100.177	Bolt in Tree 10 E ft #N/A
S66-03			1.392	99.583	99.583	3/4" Pipe 5 m NW #N/A
S66-04			1.456	99.519	99.519	3/4" Pipe 7 m West #N/A
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary

	Before	After
Average WL:	97.735	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	97.329	-

General Notes:

Level Survey Equipment:

Level #:	Level#3
Make & Model:	Cansel AT-24
Serial #:	112890

Datalogger, Sonde and Station Notes:

- Sonde swapped. New sonde installed Sept 16, 2015 15:25
- Reoriented GOES antenna

Field Personnel:

Data Entry Personnel:	TL, CJ	Trip Date:	14-Sep-15
Data Check Personnel:	CJ	Date:	14-Sep-15
Entered Digitally in the Field:	SG	Date:	7-Oct-15
	No		

Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence
 UTM Location: 491458 E, 6302625 N

Site Visit Date: October 19, 2015
 Site Visit Time (MST): 13:04

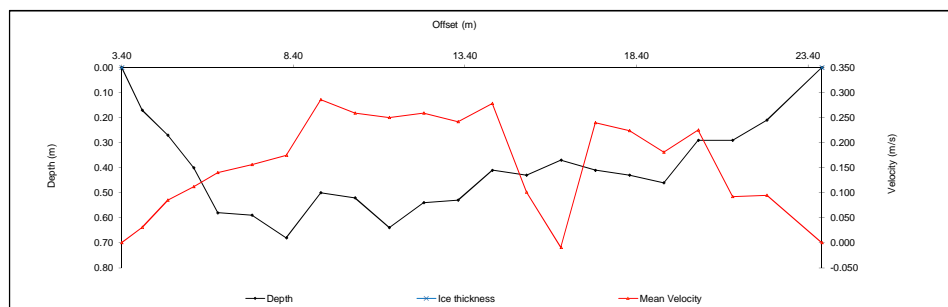


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
LB	23.80	0.00	0.00		0.000		0.000		0.000	1.00	0.80	0.00	0.000	0.00	0.000	
1	22.20	0.21		0.13	0.095					1.00	1.30	0.21	0.095	0.27	0.026	2%
2	21.20	0.29		0.17	0.092					1.00	1.00	0.29	0.092	0.29	0.027	2%
3	20.20	0.29		0.17	0.225					1.00	1.00	0.29	0.225	0.29	0.065	4%
4	19.20	0.46		0.28	0.181					1.00	1.00	0.46	0.181	0.46	0.083	5%
5	18.20	0.43		0.26	0.224					1.00	1.00	0.43	0.224	0.43	0.096	6%
6	17.20	0.41		0.25	0.240					1.00	1.00	0.41	0.240	0.41	0.098	6%
7	16.20	0.37		0.22	-0.009					1.00	1.00	0.37	-0.009	0.37	-0.003	0%
8	15.20	0.43		0.26	0.101					1.00	1.00	0.43	0.101	0.43	0.043	3%
9	14.20	0.41		0.25	0.278					1.00	1.00	0.41	0.278	0.41	0.114	7%
10	13.20	0.53		0.32	0.242					1.00	1.00	0.53	0.242	0.53	0.128	8%
11	12.20	0.54		0.32	0.259					1.00	1.00	0.54	0.259	0.54	0.140	9%
12	11.20	0.64		0.38	0.250					1.00	1.00	0.64	0.250	0.64	0.160	10%
13	10.20	0.52		0.31	0.259					1.00	1.00	0.52	0.259	0.52	0.135	8%
14	9.20	0.50		0.30	0.286					1.00	1.00	0.50	0.286	0.50	0.143	9%
15	8.20	0.68		0.41	0.175					1.00	1.00	0.68	0.175	0.68	0.119	7%
16	7.20	0.59		0.35	0.156					1.00	1.00	0.59	0.156	0.59	0.092	6%
17	6.20	0.58		0.35	0.140					1.00	0.85	0.58	0.140	0.49	0.069	4%
18	5.50	0.40		0.24	0.112					1.00	0.73	0.40	0.112	0.29	0.032	2%
19	4.75	0.27		0.16	0.085					1.00	0.75	0.27	0.085	0.20	0.017	1%
20	4.00			0.10	0.031					1.00	0.68	0.17	0.031	0.11	0.004	0%
RB	3.40	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
Total Flow														1.59	100%	

Flow Measurement Details:

Metering Section Location (describe):
At cableway

Meas. Start Time (MST):	13:25
Meas. End Time (MST):	13:50
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Wading
River Condition:	Low flow
Channel Edge:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, windy, 8C



Flow characteristics:

Total Flow:	1.59	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.46	(m ²)
Wetted Width:	20.40	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.19	(m/s)
Reynolds Number:	-	
Froude Number:	0.09	

Logger Details:

	Before	After
Transducer Reading (m):	0.299	0.300
PT Water (°C):	4.6	4.7
Datalogger Clock:	13:07	13:54
Laptop Clock:	13:06	13:52
Station Battery Voltage:	13.7	14.1
Station Battery:	Good	
Station Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Details:

	Before	After
Sonde Water (°C):	4	5
Specific Conductance (µS):	257	257
pH:	8	8
Turbidity (FNU):	2	2
Dissolved Oxygen Conc. (mg/L):	13	13
Dissolved Oxygen Sat. (%):	101	101
Sonde Battery Voltage:	6.3	6.3
Sonde # (if replaced):	-	-

Sonde Visit Details:

Visit Type: -

Deployed Sonde: -

Downloaded: -

Downloaded File Name: -

WQ Samples Taken: -

Photos Taken:

US, DS, CS: -

Sonde Housing (In Situ): -

Sonde Probes (Before Cleaning): -

Datalogger: -

Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S66-04	1.478	100.997		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-03			1.417	99.580	99.583	3/4" Pipe 5 m NW from Logger
S66-02			0.936	100.061	100.064	Bolt in Tree 12 N from Logger
Turn						
S66-02	0.908	100.969		100.061	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut	0.057	3.395	97.631		Time WL Surveyed: 13:18
S66-02			0.908	100.061	100.064	Bolt in Tree 12 N from Logger
S66-03			1.388	99.581	99.583	3/4" Pipe 5 m NW from Logger
S66-04			1.451	99.518	99.519	3/4" Pipe 7 m West from Logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S66-03	1.389	100.969		99.580		
Water Level:	Cut	0.236	3.572	97.633		Time WL Surveyed: 13:55
Water Level:	Cut	0.236	3.547	97.631		Time WL Surveyed: 13:56
S66-03	1.382	100.942		99.580		

WL Survey Summary

	Before	After
Average WL:	97.632	97.632
Closing Error:	0.001	-
WL Check:	0.001	0.002
Transducer Elevation:	97.333	97.332

General Notes:

Level Survey Equipment:

Level #:	Level#2
Make & Model:	Nikon AC-2S
Serial #:	668859

Datalogger, Sonde and Station Notes:

Field Personnel:

GG, TR	Trip Date:	19-Oct-15
GG	Date:	19-Oct-15
JC	Date:	10-Nov-15
Yes	Entered Digitally in the Field:	

Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluenc
 UTM Location: 491458 E, 6302625 N

Site Visit Date:
 Site Visit Time (MST):

December 8, 2015
 11:14

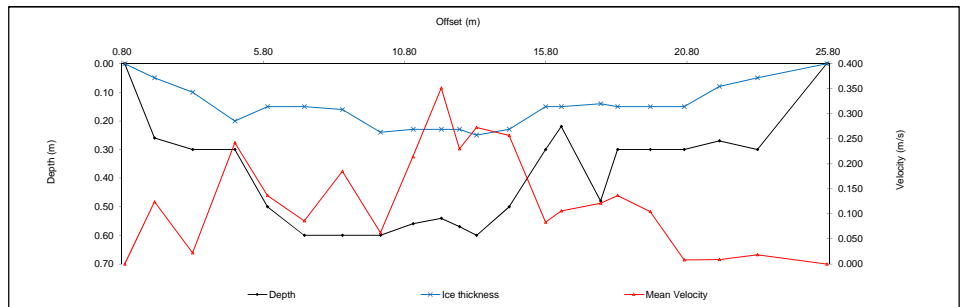


Measured Data									Calculated Data							
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m ²)	Pannel Discharge (m ³ /s)	Percent of total flow (%)
RB	0.90	0.00	0.00	0.00	0.000				0.000	0.88	0.53	0.00	0.000	0.00	0.000	
1	1.95	0.26	0.05	0.16	0.141					0.88	1.20	0.21	0.124	0.25	0.031	4%
2	3.30	0.30	0.10	0.20	0.025					0.88	1.43	0.20	0.022	0.29	0.006	1%
3	4.80	0.30	0.20	0.25	0.275					0.88	1.33	0.10	0.242	0.13	0.032	4%
4	5.95	0.50	0.15	0.35	0.155					0.88	1.23	0.35	0.136	0.43	0.058	7%
5	7.25	0.60	0.15	0.38	0.098					0.88	1.33	0.45	0.086	0.60	0.051	6%
6	8.60	0.60	0.16	0.38	0.210					0.88	1.35	0.44	0.185	0.59	0.110	14%
7	9.95	0.60	0.24	0.42	0.071					0.88	1.25	0.36	0.062	0.45	0.028	3%
8	11.10	0.56	0.23	0.40	0.243					0.88	1.08	0.33	0.214	0.35	0.076	9%
9	12.10	0.54	0.23	0.39	0.399					0.88	0.83	0.31	0.351	0.26	0.090	11%
10	12.75	0.57	0.23	0.40	0.261					0.88	0.63	0.34	0.230	0.21	0.049	6%
11	13.55	0.60	0.25	0.43	0.310					0.88	0.88	0.35	0.273	0.31	0.084	10%
12	14.50	0.50	0.23	0.37	0.292					0.88	1.23	0.27	0.257	0.33	0.085	11%
13	15.80	0.30	0.15	0.23	0.095					0.88	0.93	0.15	0.084	0.14	0.012	1%
14	16.35	0.22	0.15	0.19	0.120					0.88	0.97	0.07	0.106	0.07	0.007	1%
15	17.75	0.48	0.14	0.31	0.138					0.88	1.00	0.34	0.121	0.34	0.041	5%
16	18.35	0.30	0.15	0.23	0.155					0.88	0.88	0.15	0.136	0.13	0.018	2%
17	19.50	0.30	0.15	0.23	0.119					0.88	1.18	0.15	0.105	0.18	0.018	2%
18	20.70	0.30	0.15	0.23	0.009					0.88	1.23	0.15	0.105	0.18	0.018	2%
19	21.95	0.27	0.09	0.18	0.010					0.88	1.30	0.19	0.009	0.25	0.002	0%
20	23.30	0.30	0.05	0.18	0.021					0.88	1.90	0.25	0.018	0.48	0.009	1%
LB	25.75	0.00	0.00		0.00				0.00	0.88	1.23	0.00	0.000	0.00	0.000	
Total Flow														0.809	100%	

Flow Measurement Details:

Metering Section Location (describe): At station

Meas. Start Time (MST):	11:38
Meas. End Time (MST):	12:03
Equipment:	ADV#1
Flow Meter Make & Model:	Sontek Flowtracker
Flow Meter Serial #:	P3398
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -9C



Flow characteristics:

Total Flow:	0.809	(m ³ /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.96	(m ²)
Wetted Width:	24.85	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.14	(m/s)
Reynolds Number	-	
Froude Number	0.09	

Logger Details:

	Before	After
Transducer Reading (m):	0.335	-
PT Water (°C):	0.1	-
Datalogger Clock:	12:15	-
Laptop Clock:	11:13	-
Station Battery Voltage:	12.8	-
Station Battery:	-	Replaced
Station Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Sonde Visit Details:

Visit Type:	-
Deployed Sonde Downloaded:	-
Downloaded File Name:	-
WQ Samples Taken:	-
Photos Taken:	-
US, DS, CS:	-
Sonde Housing (In Situ):	-
Sonde Probes (Before Cleaning):	-
Datalogger:	-

Level Survey:

Station Benchmark	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
S66-04	1.688	101.217		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-03			1.634	99.583	99.583	3/4" Pipe 5 m NW from Logger
S66-02			1.153	100.064	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut		3.557	97.660	Time WL Surveyed:	11:27
Temporary BM			3.362	97.855	99.519	
Turn						
Temporary BM	3.332	101.187		97.855	99.519	
Water Level:	Cut		3.527	97.660	Time WL Surveyed:	11:29
S66-02			1.125	100.062	100.064	Bolt in Tree 12 N from Logger
S66-03			1.603	99.584	99.583	3/4" Pipe 5 m NW from Logger
S66-04			1.667	99.520	99.519	3/4" Pipe 7 m West from Logger

Secondary Water Level Survey (pick any BM e.g. closest to water's edge)

Water Level:	Cut			Time WL Surveyed:	
Water Level:	Cut			Time WL Surveyed:	

WL Survey Summary

	Before	After
Average WL:	97.660	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	97.325	-

General Notes:

Level Survey Equipment:

Level #:	Level#4
Make & Model:	Nikon AC-2S
Serial #:	668785

Field Personnel:

DW, JM, GG	Trip Date:	8-Dec-15
DW, JM, GG	Date:	8-Dec-15
JC	Date:	8-Jan-16
Yes	Entered Digitally in the Field:	

Datalogger, Sonde and Station Notes:

-Station not running upon arrival. Replaced battery and reinstated station.

Appendix D

**Benthic Invertebrate
Communities and Sediment
Quality Component**

D BENTHIC INVERTEBRATE COMMUNITIES AND SEDIMENT QUALITY COMPONENT

D.1 INTRODUCTION

The objective of this appendix is to provide technical details on laboratory methods used for the processing and identification of the benthic samples collected during the fall of 2015. Included in the appendix are the calculations used to estimate the normal ranges of variability for benthic invertebrate community measurement endpoints, the calculations used to adjust or correct benthic invertebrate community measurement endpoints, and the calculations used to estimate predicted PAH toxicity in sediments.

D.2 BENTHIC INVERTEBRATE SAMPLE PROCESSING PROCEDURES

D.2.1 Laboratory Methods

In preparation for laboratory processing, samples were checked upon arrival to the laboratory to ensure that they were adequately sealed, labeled and that the preservative had effectively penetrated the entire sample. Samples were then rinsed of the residual fine debris and preservative (provided a minimum exposure of 72 hours to formalin occurred). Samples were either sorted immediately or transferred to 80% ethanol prior to sorting and taxonomic work. After sorting and identification, freshwater macro-invertebrates were stored in a solution of 70 to 80% ethanol, and 5% glycerin in vials or jars with airtight lids.

To expedite the sorting process, samples with large pieces of organic matter were divided in the laboratory into appropriate size fractions. The most commonly used fractions were coarse (> 1.00 mm) and fine (250 µm - 1.00 mm), which corresponded to the divisions used to define coarse and fine particulate organic matter (CPOM and FPOM), respectively. Where there were very large pieces of organic material or large invertebrates, they were separated from the rest of the sample with a 4.00-mm sieve. All fractions were sorted. If warranted by large numbers of organisms, the fractions were sub-sampled (as described below, see Figure D.2-1). After the initial washing and fractionation of samples, the invertebrates were sorted from the debris by trained technicians on a gridded tray or petri dish under a dissecting microscope at 10X to 20X magnification. Samples that contained large amounts of debris, or large numbers of organisms were further sub-sampled as per Figure D.2-1.

D.2.2 Coarse Fraction

The coarse fraction (contents of the 2-mm and 1-mm sieves) was transferred into individual containers and 70% alcohol added, prior to sorting. At least ¼ of the coarse fraction was sorted, with the amount of material sorted determined either by volume or weight.

D.2.3 Fine Fraction

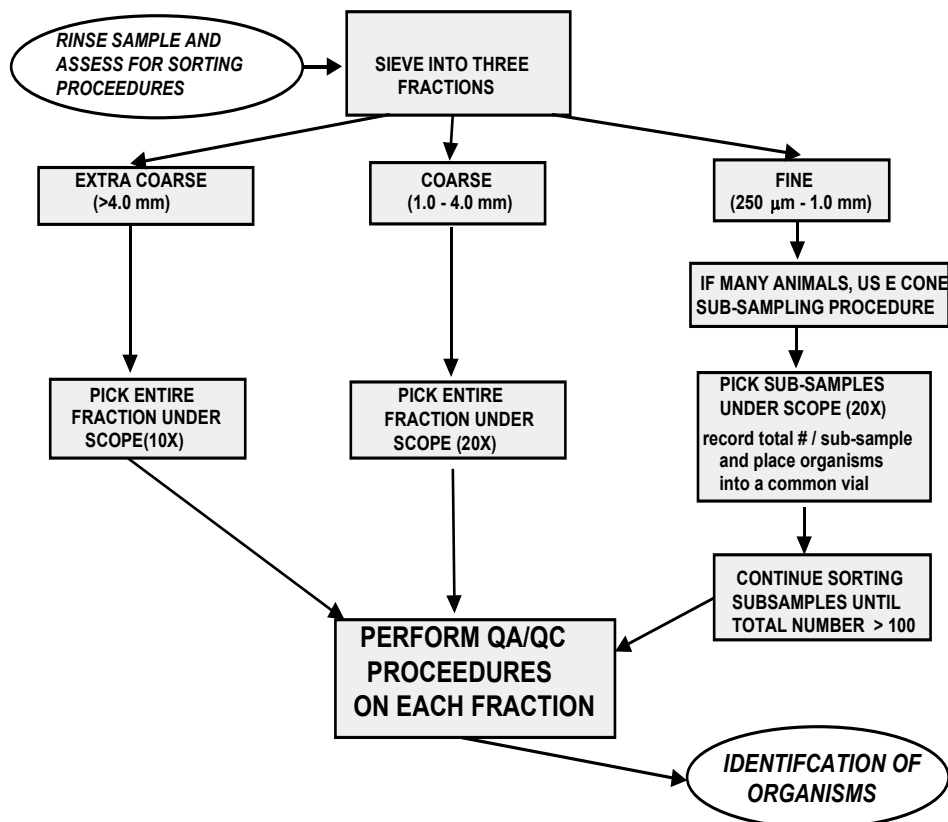
The fine fraction (contents of 0.180-mm sieve) was transferred into a 2-L container for decanting. Warm water was added to the 2-L container, swirled and decanted to mobilize organic material into a 0.180 mm

sieve. This was repeated until all organic material was washed out of the sand. The sand was scanned under a magnifying glass for heavy-shelled or stone-cased animals.

When there was a lot of organic material in the fine fractions and/or large numbers of organisms, a sub-sampling of the fine fractions was done as described below (see Figure D.2-1).

The fine fraction was sorted in its entirety when possible. When there were large amounts of the fine fraction, the material was sub-sampled using an Imhoff Cone and bubbler (Wrona *et al.* 1982). Either ¼ of the sample was sorted, or at least 100 animals were removed from the debris. The fine fraction was stained with haematoxylin or rose Bengal to improve sorting.

Figure D.2-1 Benthic invertebrate sorting and sub-sampling protocol, applicable for samples with large detrital material and large numbers of small organisms.



Note: This is an illustrative example only, which is modified as necessary for station-specific samples.

D.2.4 Identification

Invertebrates were identified using recognized taxonomic keys (Brooks and Kelton 1967; Teskey 1969; Edmunds *et al.* 1976; Oliver and Roussel 1983; Currie 1986; Wiederholm 1983; McCafferty and Randolph 1988; Stewart and Stark 1988; Brinkhurst 1989; Pennak 1989; Clifford 1991; Merritt and Cummins 1996; Westfall and May 1996; Wiggins 1996; Zloty and Pritchard 1997; Epler 2001). Animals were identified to

the lowest practical level, typically genus with the exception of Oligochaeta, which were identified to family (Table D.2-1). Small, early-instar or damaged specimens were identified to the lowest level possible, generally to family.

Table D.2-1 Level of taxonomic identification.

Group	Level
Nematoda	Phylum
Oligochaeta	Family
Gastropoda	Genus/Species
Turbellaria	Family
Hirudinea	Species
Mollusca	Genus/Species
Acari	Subclass
Cladocera	Genus/Species
Copepoda	Order
Ostracoda	Class
Amphipoda	Genus
Insecta	Genus/Species

Organisms that require detailed microscopic examination for identification (e.g., Chironomidae and Oligochaeta) were mounted onto microscope slides using an appropriate mounting media (e.g., Canada balsam, Permout, Hohers's). The most common species that were distinguishable on the basis of gross morphology were mounted less frequently as double checks. All rare or less commonly occurring species are mounted for identification.

D.3 CALCULATION OF MEASUREMENT ENDPOINTS

Total abundance, richness, equitability, and percent EPT (i.e. %EPT; the percentage of fauna as Ephemeroptera, Plecoptera, and Trichoptera) were calculated from the counts of organisms. Taxa were typically identified to genus, and at times to species. Some small or immature specimens were identified to Family, Order, or other applicable (but lower possible) higher taxonomic level. Taxa richness was; therefore, the total number of taxa determined using lower practical taxonomic level.

Equitability was calculated using:

$$\text{Equitability} = \frac{1}{\sum \frac{(p_i)^2}{S}}$$

Where,

p_i was the fraction of the total count in a sample accounted for by taxon i , and S was the number of taxa.

A multivariate ordination (Correspondence Analysis, CA; Gauch 1982) was also calculated in addition to these conventional measures of community composition. The CA was carried out using the logarithms of abundances (\log of x_i+1 , where x is number of individuals of taxon i per sample) of taxa that comprised a minimum of 0.5% of the total number of organisms in the dataset under examination (Gauch 1982). Four separate ordinations were carried out: (i) erosional reaches; (ii) depositional reaches; (iii) delta Channels; and (iv) lakes. Two CA axes were 'kept' and used as measurement endpoints, from each of the four ordinations, with 'site scores' on those two axes being the endpoint values used in subsequent analyses similar to analyses for abundance, richness, equitability, and %EPT.

To expedite the analysis processes, some CA axes site scores were projected using:

$$\text{Site Score} = \frac{(\sum TS \cdot TA) / \sum TA}{\sqrt{\text{eigenvalue}}}$$

Where, TS is the taxa score and TA is the taxa abundance calculate from all available sites (RAMP 1998 to 2015).

D.4 CALCULATION OF NORMAL RANGES

Though rigorous analyses of variance can be used to test for effects of oil sands operations by comparison of potentially influenced watercourses to those that are not, the design of the benthic invertebrate community component has considerable statistical power, and thus the potential to detect statistical differences that are negligible in magnitude. The "normal range of variation" is an alternative complimentary approach to determining if significant differences in measurement endpoints are unusual. Use of the "normal range of variation" of a reference or *baseline* condition as an ecological criterion implies that some fraction of a *baseline* data set is used to define the expected range of values for a measurement endpoint. The use of normal ranges for the assessment of benthic invertebrate communities has precedence (e.g., see numerous chapters in Davis and Simon 1995; numerous chapters in Simon 1998; and Bailey et al. 2004). Measurement endpoints inside the normal range are considered an indication of an acceptable condition; values outside the range indicate potential or likely impairment. Different authors have used different "fractions" of the *baseline* data to define the normal range. Reynoldson et al. (1995; 1999; 2003; 2004) and Bailey et al. (2004) indicated that values inside the 90th percentile were "acceptable", values between the 90th and 99th percentiles were potentially impaired, and values outside the 99th percentile indicated impaired benthic communities. Kilgour et al. (1998) suggested that the 95% region provided a general rule of thumb that could be used to denote a reach that is "in" its expected range of reference values, compared to a community that is potentially unusual. Other authors using the 95% region as the normal range of variation for a target ecological reference condition have included Bloom (1980); Kersting (1991); Yan et al. (1996); and Findlay and Kasian (1996).

The limits of the normal range, based on 95% of possible observations, can be approximated using:

$$\bar{x} \pm 2SD$$

Where, SD is the standard deviation of observations (in this case natural differences in reach annual means in the *baseline* period).

With a relatively large number of samples, includes about 95% of possible observations. Standard deviations, like any statistic, are estimated with error. When sample sizes are small, that quantity may enclose considerably more or less than 95% of possible observations.

Like a mean, the 5th and 95th percentiles are estimated imprecisely from a sample of the data (Berthouex and Hau 1991). Tolerance limits are confidence regions for extreme percentiles. Tolerance limits were calculated for the p^{th} percentile of the *baseline* data (per Hunt et al. 2001; Smith 2002; and Krishnamoorthy and Mathew 2009).

The tolerance limit for the p^{th} percentile is:

$$\bar{x} \pm k \bullet \text{sd}$$

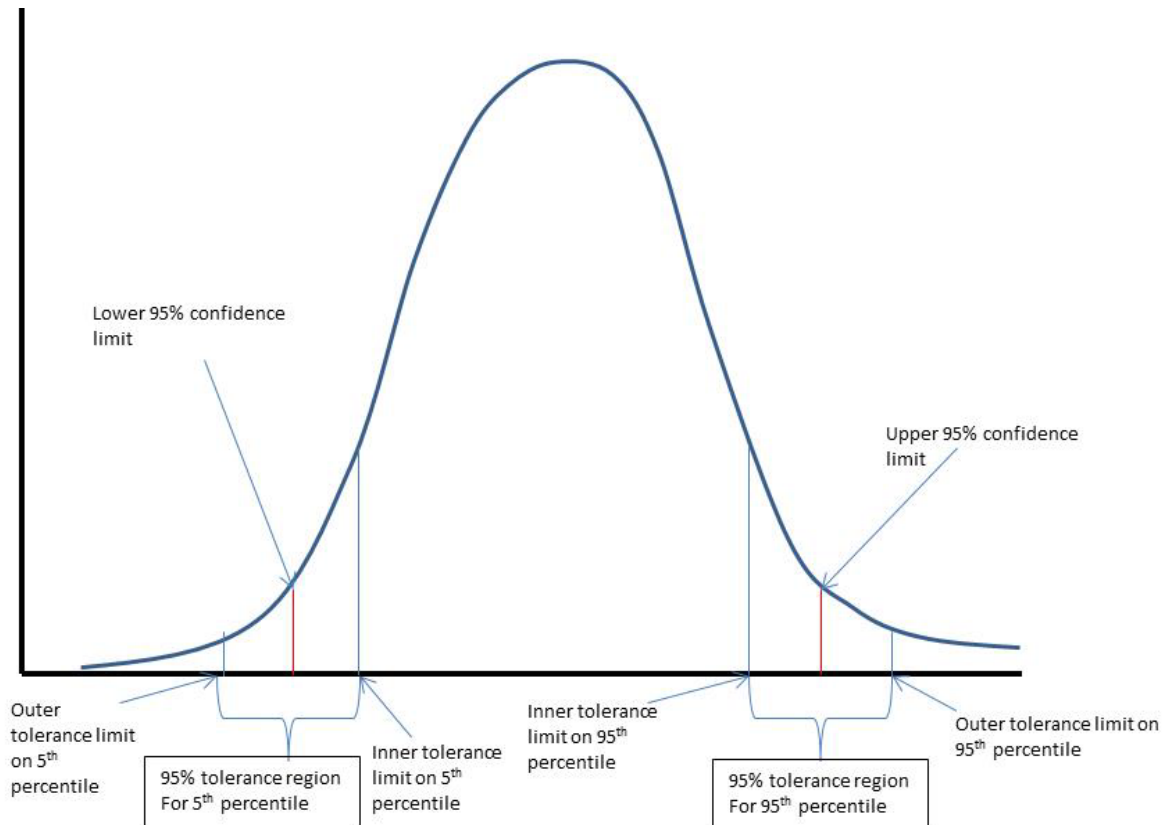
Where,

- $k = \frac{t_{\gamma, N-1, \delta}}{\sqrt{N}}$;
- $t_{\gamma, N-1, \delta}$ is a non-central t-statistic (where γ is set and determines the lower 5th or upper 95th percentile of the non-central t distribution);
- $\delta = z_p \sqrt{N}$; and
- Z_p is the Z-statistic at the p^{th} percentile.

Here, and for the 95th percentile of the data, $Z = 1.96$. The value for δ depends on sample size, as then does the non-central t statistic and ultimately k .

There are two intrinsic benefits of using confidence limits on percentiles. Values inside the inner tolerance limit clearly are not unusual, while values outside the outer tolerance limit clearly are unusual, relative to the 'normal range' (see also Figure D.4-1). Values that fall between the inner and outer tolerance limits are in a grey zone of uncertainty that may or may not truly be unusual depending on what would be determined from the collection of more data. Values in the 'grey' zone might be considered a trigger for further examination (or monitoring). Industry is often criticized for trying to keep sample sizes low, because doing so reduces the likelihood of detecting effects particularly when conventional statistical approaches are being used (e.g., two-sample contrasts). The concern of using small sample sizes diminishes when 'one-sample' contrasts are used for inner and outer tolerance limits: small sample sizes will lead to broad limits on extreme percentiles, resulting in more observations being classed as 'potentially' unusual, an incentive for industry to collect more data.

Figure D.4-1 Schematic of a normal distribution showing the relationship between inner and outer tolerance limits on the lower 5th and upper 95th percentiles.



Two sets of normal ranges were computed for illustration purposes here for each of the case studies explored.

1. The first normal range was for annual means within the *test* reach being assessed. Normal ranges were computed for any given year of assessment using the data for all prior years. The within-reach normal range for the middle Muskeg River (station MUR-D2) in 2015, for example, was computed using annual averages of indices of composition (i.e., measurement endpoints) from samples collected from the middle Muskeg River reach in 1998 through to and including 2014. This method was used only if the reach had more than eight years of prior data (Figure D.4-2 and Figure D.4-3 and Table D.4-1 to Table D.4-4).
2. The second normal range was the among-*baseline*-reach normal ranges computed in any year using all of the available annual averages of indices of composition from *baseline* reaches up to and including the previous year for which the reach was being assessed. The among-*baseline*-reach normal range for 2015, for example, was computed using data from regional *baseline* reaches sampled in 1998 through to and including 2014. The inner and outer tolerance limits on the lower 5th and upper 95th percentiles of the normal ranges were computed as described previously. This method was used for depositional and erosional river reaches and lakes when there were less than eight years of prior data (Table D.4-1 to Table D.4-4).

Figure D.4-2 Example time trend chart for the number of benthic invertebrate taxa relative to the normal range of variation, in this case, from all previous years at Shipyard Lake.

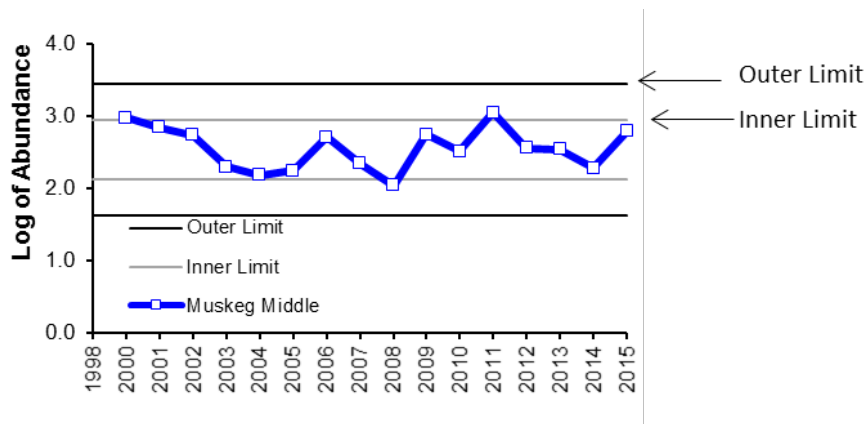


Figure D.4-3 Example bi-plot showing time trend of CA Axis scores for benthic invertebrate communities relative to the normal range of variation, in this case, from all previous years at the middle reach of the Muskeg River.

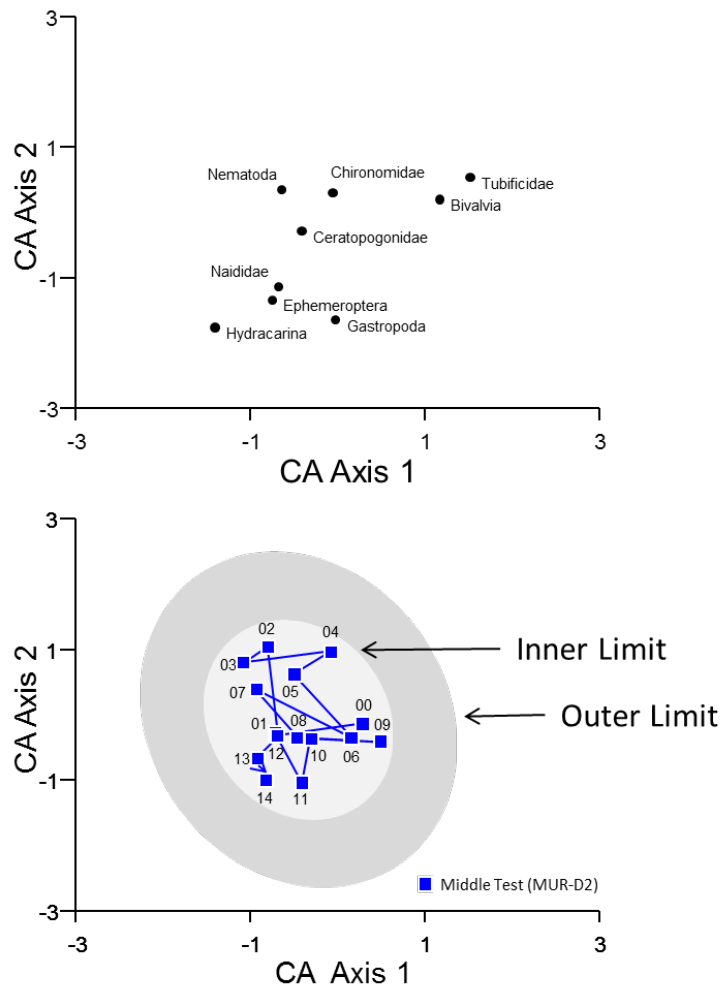


Table D.4-1 Tolerance limits calculated for erosional and depositional rivers, delta reaches, and lakes for abundance (\log_{10} -transformed).

Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>baseline</i>	3.78	3.49	2.34	2.05
	Muskeg Lower (MUR-E1)	3.77	3.35	2.60	2.17
Depositional Rivers	Regional <i>baseline</i>	3.12	2.78	1.29	0.95
	Lower Christina (CHR-D1)	3.51	2.59	1.61	0.69
	Lower-Middle Christina (CHR-D2)	6.17	1.67	1.46	-3.04
	Ells Lower (ELR-D1)	3.46	2.64	1.65	0.83
	Fort Creek (FOC-D1)	3.10	2.03	0.87	-0.20
	Jackpine Lower (JAC-D1)	3.80	2.88	1.69	0.78
	Muskeg Middle (MUR-D2)	3.44	2.95	2.12	1.63
	Muskeg Upper (MUR-D3)	2.80	2.49	2.02	1.70
	Tar Lower (TAR-D1)	4.06	2.78	1.11	-0.16
Delta	Fletcher (FLC-1), Goose Island (GIC-1), and Big Point (BPC-1) channels, Embarras River (EMR-2)	3.54	3.02	1.25	0.73
Lakes	Christina (CHL-1)	3.94	2.65	2.15	0.87
	Isadore's (ISL-1)	3.45	2.31	1.07	-0.07
	Johnson (JOL-1)	2.28	2.06	1.98	1.76
	Kearl (KEL-1)	3.06	2.36	1.24	0.54
	McClelland (MCL-1)	3.97	3.00	1.53	0.56
	Shipyard (SHL-1)	3.41	2.68	1.46	0.73

Table D.4-2 Tolerance limits calculated for erosional and depositional rivers, delta reaches, and lakes for richness (log₁₀-transformed).

Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>baseline</i>	1.74	1.66	1.35	1.27
	Muskeg Lower (MUR-E1)	1.68	1.60	1.45	1.37
Depositional Rivers	Regional <i>baseline</i>	1.49	1.35	0.71	0.57
	Lower Christina (CHR-D1)	1.57	1.20	0.79	0.42
	Lower-Middle Christina (CHR-D2)	0.86	0.84	0.84	0.83
	Ells Lower (ELR-D1)	1.64	1.22	0.71	0.28
	Fort Creek (FOC-D1)	1.55	1.07	0.54	0.06
	Jackpine Lower (JAC-D1)	1.74	1.38	0.92	0.56
	Muskeg Middle (MUR-D2)	1.70	1.48	1.11	0.89
	Muskeg Upper (MUR-D3)	1.43	1.23	0.92	0.72
	Tar Lower (TAR-D1)	1.78	1.26	0.60	0.08
Delta	Fletcher (FLC-1), Goose Island (GIC-1), and Big Point (BPC-1) channels, Embarras River (EMR-2)	1.37	1.22	0.68	0.53
Lakes	Christina (CHL-1)	1.86	1.39	1.21	0.74
	Isadore's (ISL-1)	1.51	1.01	0.46	-0.04
	Johnson (JOL-1)	1.56	1.08	0.89	0.41
	Kearl (KEL-1)	1.47	1.58	0.66	0.35
	McClelland (MCL-1)	1.74	1.37	0.80	0.43
	Shipyard (SHL-1)	1.57	1.26	0.73	0.42

Table D.4-3 Tolerance limits calculated for erosional and depositional rivers, delta reaches, and lakes for equitability.

Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>baseline</i>	0.45	0.39	0.16	0.10
	Muskeg Lower (MUR-E1)	0.45	0.34	0.15	0.04
Depositional Rivers	Regional <i>baseline</i>	0.75	0.66	0.24	0.15
	Lower Christina (CHR-D1)	0.65	0.49	0.32	0.15
	Lower-Middle Christina (CHR-D2)	2.83	0.59	0.49	-1.75
	Ells Lower (ELR-D1)	0.74	0.53	0.27	0.06
	Fort Creek (FOC-D1)	1.21	0.82	0.38	-0.02
	Jackpine Lower (JAC-D1)	0.73	0.55	0.32	0.14
	Muskeg Middle (MUR-D2)	0.56	0.42	0.17	0.03
	Muskeg Upper (MUR-D3)	0.67	0.52	0.30	0.15
	Tar Lower (TAR-D1)	0.90	0.62	0.26	-0.02
Delta	Fletcher (FLC-1), Goose Island (GIC-1), and Big Point (BPC-1) channels, Embarras River (EMR-2)	0.84	0.67	0.10	-0.06
Lakes	Christina (CHL-1)	0.78	0.41	0.26	-0.11
	Isadore's (ISL-1)	1.13	0.76	0.36	-0.02
	Johnson (JOL-1)	0.64	0.48	0.41	0.24
	Kearl (KEL-1)	0.97	0.70	0.27	0.01
	McClelland (MCL-1)	0.94	0.64	0.19	-0.11
	Shipyard (SHL-1)	0.92	0.67	0.26	0.01

Table D.4-4 Tolerance limits calculated for erosional and depositional rivers, delta reaches, and lakes for the percentage of EPT taxa (\log_{10} -transformed).

Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>baseline</i>	2.01	1.83	1.14	0.97
	Muskeg Lower (MUR-E1)	2.07	1.75	1.18	0.86
Depositional Rivers	Regional <i>baseline</i>	0.90	0.72	-0.11	-0.29
	Lower Christina (CHR-D1)	0.52	0.34	0.15	-0.03
	Lower-Middle Christina (CHR-D2)	6.37	0.68	0.42	-5.27
	Ells Lower (ELR-D1)	0.33	0.17	-0.02	-0.18
	Fort Creek (FOC-D1)	1.31	0.81	0.28	-0.21
	Jackpine Lower (JAC-D1)	0.91	0.54	0.05	-0.33
	Muskeg Middle (MUR-D2)	1.08	0.72	0.10	-0.27
	Muskeg Upper (MUR-D3)	1.41	0.85	0.00	-0.56
	Tar Lower (TAR-D1)	0.51	0.28	-0.03	-0.26
Delta	Fletcher (FLC-1), Goose Island (GIC-1), and Big Point (BPC-1) channels, Embarras River (EMR-2)	0.87	0.64	-0.17	-0.41
Lakes	Christina (CHL-1)	1.96	0.73	0.25	-0.98
	Isadore's (ISL-1)	0.60	0.24	-0.14	-0.50
	Johnson (JOL-1)	0.50	0.10	-0.06	-0.46
	Kearl (KEL-1)	0.68	0.38	-0.09	-0.38
	McClelland (MCL-1)	1.58	1.00	0.12	-0.47
	Shipyard (SHL-1)	1.35	0.76	-0.22	-0.80

D.5 CALCULATION OF ADJUSTED MEASUREMENT ENDPOINTS

Multiple-regression was used to test whether current velocity, percent sand, and water depth at the point of sampling, explained any variation in measurement endpoints. Models were constructed using backward-stepwise multiple regression. Substrate texture was only used as a template variable for the Athabasca River Delta (ARD) reaches (Fletcher, Goose Island, and Big Point channels, and Embarras River) because it can be influenced by changes in hydrodynamics, which are one of the predicted stressors in watercourses influenced by oil sands operations.

Adjusted models for erosional and depositional rivers were not calculated due to missing data points for template variables; therefore, only unadjusted values were used. Models for lakes were adjusted to a common depth of 2 m and models for reaches of the ARD were adjusted to a common percent sand composition of 50% (Table D.5-1 and Table D.5-2 and Figure D.5-1 and Figure D.5-2).

Table D.5-1 Results of the ANOVA showing the relationship between water depth and measurement endpoints of benthic invertebrate communities in lakes.

Predictor	Measurement Endpoint					
	Log of Abundance	Log of Richness	Equitability	Log of EPT	CA Axis 1 Scores	CA Axis 2 Scores
Constant	2.599	1.287	0.273	0.477	0.165	0.054
Depth	-0.167	-0.087	0.052	-0.085	0.028	-0.066
MSE	0.370	0.065	0.043	0.166	0.710	0.922
SD	0.618	0.259	0.214	0.406	0.868	0.933

MSE = mean square error

SD = standard deviation

Table D.5-2 Results of the ANOVA showing the relationship between the percentage of sand substrate and measurement endpoints of benthic invertebrate communities for reaches of the Athabasca River Delta.

Predictor	Measurement Endpoint					
	Log of Abundance	Log of Richness	Equitability	Log of EPT	CA Axis 1 Scores	CA Axis 2 Scores
Constant	2.244	0.932	0.419	0.145	0.052	-0.164
Sand	-0.007	-0.001	0.001	0.000	-0.005	0.004
MSE	0.566	0.053	0.046	0.004	0.940	1.100
SD	0.587	0.202	0.190	0.375	0.999	1.058

MSE = mean square error

SD = standard deviation

Figure D.5-1 Relationship between measurement endpoints and water depth used in the adjustment model for lakes.

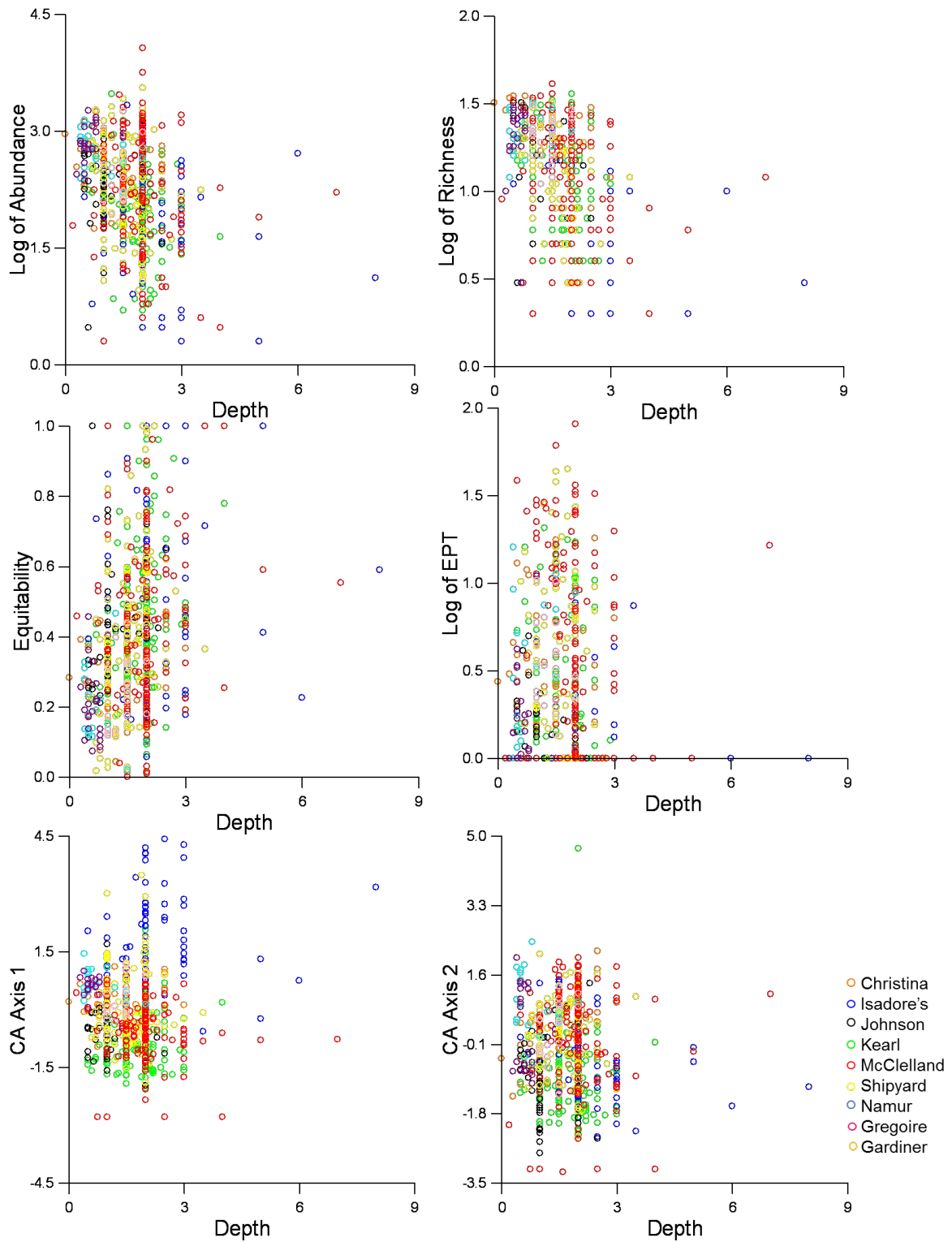
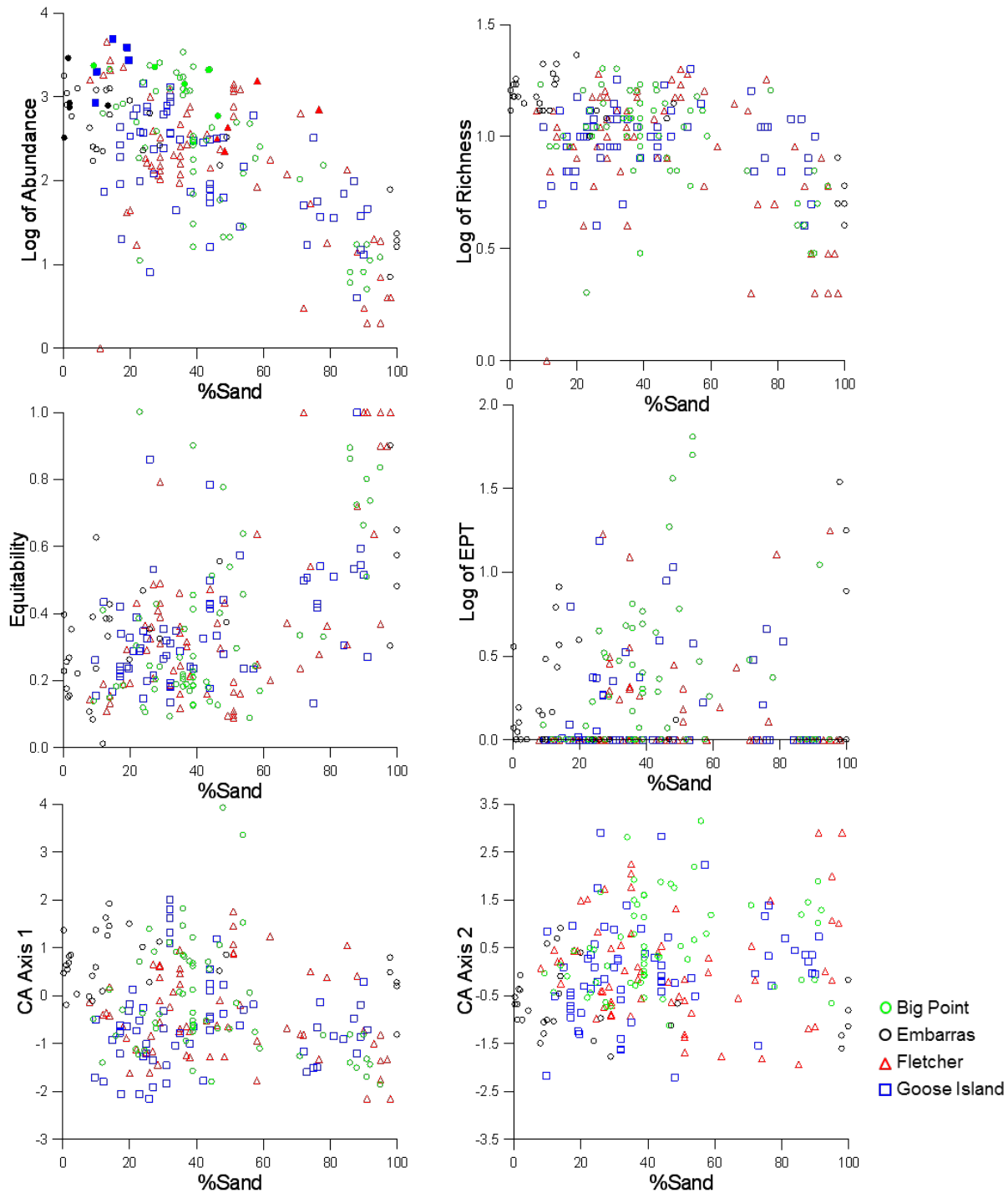


Figure D.5-2 Relationship between measurement endpoints and the percentage of sand substrate used in the adjustment model for reaches of the Athabasca River Delta.



Note: In the abundance plot, filled in data points represent 2015 data for each channel.

D.6 CALCULATING CORRECTION FACTORS

Benthic invertebrate communities in erosional reaches (with riffle and/or coarse substrate) were sampled using Neil-Hess cylinders from 1998 to 2014 and using the CABIN travelling-kick methodology (Environment Canada 2012) in 2015. Three replicate three-minute traveling-kick samples were collected from each erosional reach using a D-framed net with a 400 µm mesh. Full CABIN supporting data were collected from the reach (Table D.6-1). Measurement endpoint values for benthic invertebrate communities of erosional reaches in fall 2015 were 'adjusted' using a correction factor (from CABIN kick to Neil-Hess) in order to be as comparable as possible to data collected in previous years.

Correction factors were developed using duplicate samples collected from 44 erosional habitats in the Ells, MacKay and Steepbank rivers in 2012 and 2013. Modeling using simple linear regressions was conducted to determine if there was a significant relationship between measurement endpoints of samples collected with a Neil-Hess cylinder (\hat{y}) and a CABIN kicknet (x). Models were developed separately for abundance, richness, equitability, % EPT taxa, and CA axes scores. Data for abundance, richness, and percent EPT were $\log_{10}(x+1)$ transformed. CA axes scores for the 44 sites were projected using all RAMP data from erosional reaches (1998 to 2014).

The 95% confidence intervals for the regressions were calculated using:

$$\hat{y} \pm t_{\text{crit}} * s_{y \cdot x} \sqrt{\frac{1}{n} + \frac{(x - \bar{x})^2}{SS_x}}$$

Where, t_{crit} is Student's t for $n-2$ degrees of freedom and SS_x is the sum of squares of the kicknet observations.

The normal range limits, based on 95% of the possible observations, were also approximated using:

$$\bar{x} \pm 2SD$$

Where, SD is the standard deviation of the kicknet observations.

The relationships between Neil-Hess cylinder and CABIN kicknet samples were significant for all measurement endpoints, with the exception of equitability (Table D.6-2). The data were closest to the fitted regression line in the abundance (Figure D.6-1) and CA axis 1 models (Figure D.6-2). All measurement endpoints, with the exception of equitability, were converted from a Kicknet to Neil-Hess index (Table D.6-3).

Table D.6-1 Average habitat characteristics of benthic invertebrate community sampling locations for erosional rivers, fall 2015.

Variable	Units	Muskeg River	Tar River	High Hills River	Christina River	Jackfish River	Gregoire River	Hangingstone River	Red Clay River
		MUR-E-1	TAR-E2	HHR-E1	CHR-E2A	JAR-E1	GRR-E1	HAR-E1	RCC-E1
		Lower Test Reach	Upper Baseline Reach	Lower Baseline Reach	Upper-Middle Test Reach	Lower Test Reach	Lower Test Reach	Lower Test Reach	Lower Baseline Reach
Sample date	-	Sept. 8, 2015	Sept.10, 2015	Sept. 9, 2015	Sept. 9, 2015	Sept. 11, 2015	Sept. 9, 2015	Sept. 9, 2015	Sept. 10, 2015
Habitat	-	Erosional	Erosional	Erosional	Erosional	Erosional	Erosional	Erosional	Erosional
Sampled Habitat	-	Run	Riffle/Straight	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle/Straight
Water depth	m	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.1
Current velocity	m/s	0.5	0.2	1.2	0.49	0.6	0.3	0.3	0.56
Field Water Quality									
Dissolved oxygen	mg/L	9	9.6	10.5	10.5	8	9.8	10	11.5
Conductivity	µS/cm	246	310	205	253	178	368	387	440
pH	pH units	8.3	8.2	8.3	8.46	8.1	8.6	8.7	8
Turbidity	NTU	4.4	9	6.9	4.4	0.2	3.8	5.1	1.1
Water temperature	°C	12.5	11.9	9.5	12.7	14.3	8.4	14.9	10.4
Reach Habitat									
Substrate	-	Fine sand, silt or clay	Gravel	Gravel	Gravel	Small cobble	Coarse sand	Small cobble	Coarse sand
Pebble diameter	cm	7.1	9.7	4.9	9.3	13.8	8.3	9.6	8
Embeddedness	%	45	13	28	55	30	43	38	41
Periphyton on substrate	mm	< 0.5	1 - 5	0.5 - 1	4	5 - 20	1 - 5	1 - 5	0.5 - 1
Macrophyte cover	%	1 - 25	0	0	1 - 25	26 - 50	0	1 - 25	1 - 25
Streamside									
Land use	-	Forest	Forest	Forest	Forest	Forest	Forest	Forest	Forest
Other land use	-	Mining	Commercial/Industrial	-	Logging	-	-	Commercial/Industrial	-
Vegetation	-	Shrubs	Shrubs	Ferns/Grasses	Deciduous Trees	Deciduous Trees	Ferns/Grasses	Deciduous Trees	Ferns/Grasses
Canopy coverage	-	1 - 25	26 - 50	1 - 25	1 - 25	1 - 25	1 - 25	1 - 25	1 - 25

Table D.6-2 Results of linear regressions showing relationship between Neil-Hess sample observations and kicknet observations (n = 44).

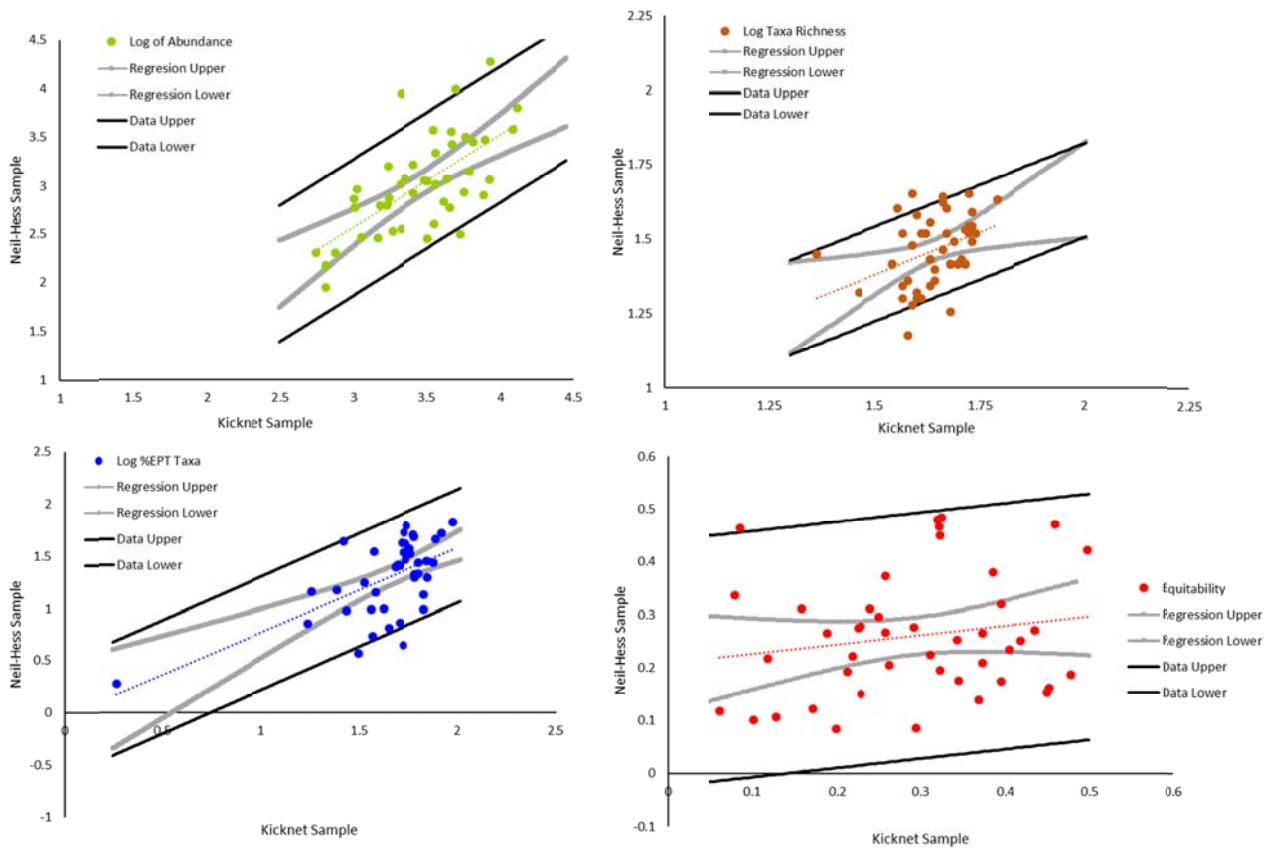
Predictor	Measurement Endpoint					
	Log of Abundance	Log of Richness	Equitability	Log of EPT	CA Axis 1 Scores	CA Axis 2 Scores
Constant	-0.306	0.536	0.208	-0.078	-0.529	0.139
Kick	0.959	0.564	0.176	0.835	0.548	0.292
SE (Kick)	0.166	0.217	0.151	0.163	0.082	0.121
p-value (Kick)	<0.001	0.013	0.248	<0.001	<0.001	0.019
R ²	0.444	0.139	0.032	0.383	0.517	0.122

Notes:

Bold values indicate significant difference (p<0.05).

Data for abundance, richness and %EPT were log₁₀(x+1) transformed.

Figure D.6-1 Relationship between measurement endpoints of Neil-Hess samples and kicknet samples at erosional reaches.

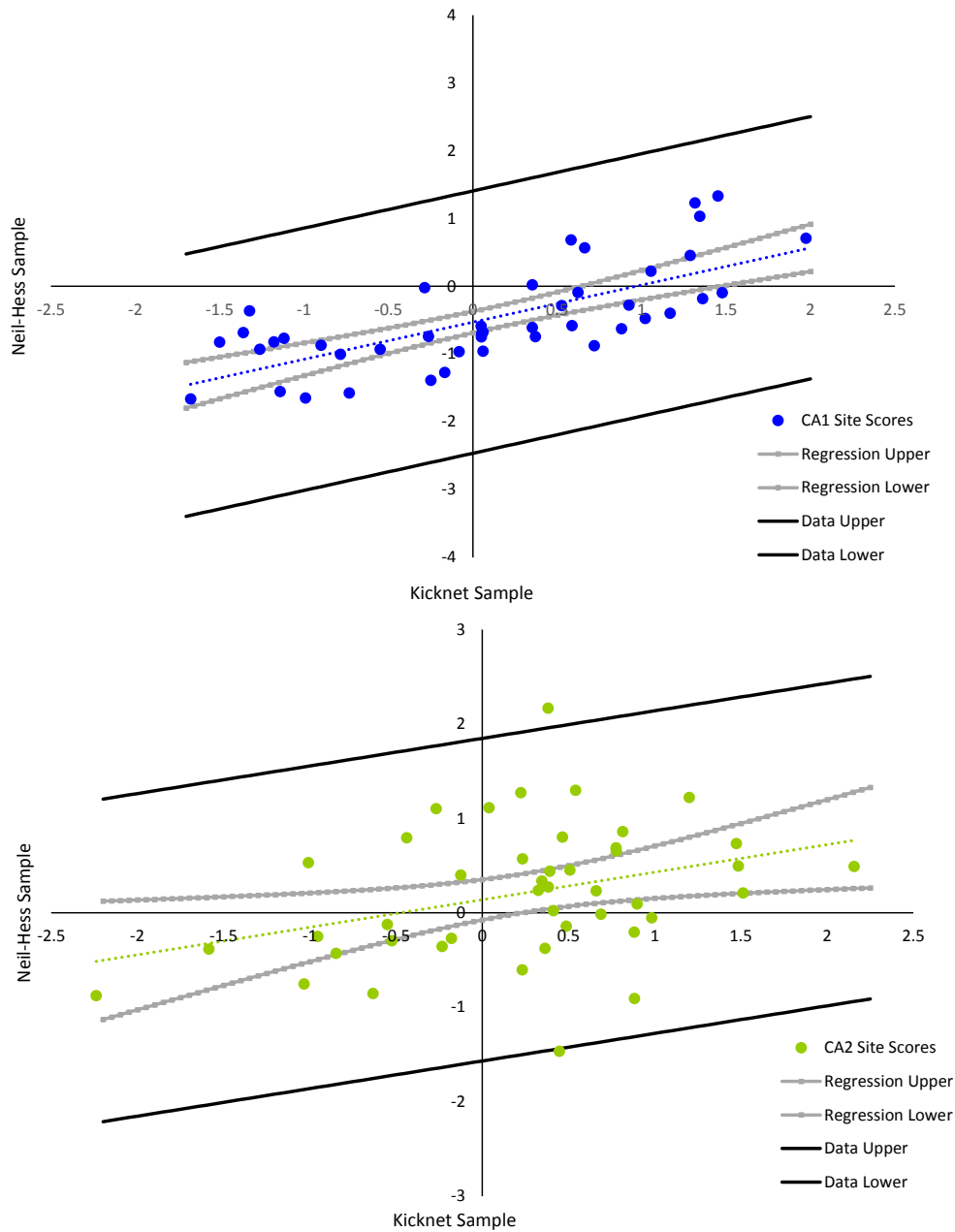


Notes:

Confidence intervals for the regression line (grey) and data range (black) were calculated.

Abundance, richness and %EPT were log₁₀(x+1) transformed.

Figure D.6-2 Relationship between Canonical Correspondence site scores of benthic invertebrate taxa for Neil-Hess samples and kicknet samples at erosional reaches.



Notes:

Confidence intervals for the regression line (grey) and data range (black) were calculated.
Abundance data was $\log_{10}(x+1)$ transformed.

Table D.6-3 Summary of measurement endpoints for benthic invertebrate communities at erosional reaches from samples collected using a kicknet and converted to represent a Neil-Hess sample.

Reach	Location	Measurement Endpoint					
		Total Abundance per sample		Richness		% EPT	
		Kicknet	Converted	Kicknet	Converted	Kicknet	Converted
MUR-E1	Lower <i>test</i> reach	5,788	2,004	52	32	38	18
TAR-E2	Upper <i>baseline</i> reach	728	274	45	30	75	31
HHR-E1	Lower <i>baseline</i> reach	2,667	951	36	26	82	33
CHR-E2A	Upper-middle <i>test</i> reach	5,749	1,990	42	29	38	17.8
JAR-E1	Lower <i>test</i> reach	4,791	1,670	50	31	66	28
GRR-E1	Lower <i>test</i> reach	9,533	3,235	48	31	48	22
HAR-E1	Lower <i>test</i> reach	8,670	2,931	43	29	43	20
RCC-E1	Lower <i>baseline</i> reach	4,075	1,431	46	30	43	20

D.7 SEDIMENT QUALITY

D.7.1 Predicted PAH Toxicity

PAH toxicity in sediments was estimated using an equilibrium-partitioning method described by Neff et al. (2005). Hydrocarbons are present in sediments as complex mixtures of compounds with widely varying physical, chemical, and toxicological properties. PAHs found in aquatic environments originate from three possible sources, and can generally be identified by the composition of the PAH mixture within the sediments (Neff et al. 2005; USEPA 2004):

- *Pyrogenic PAHs*, which result from the incomplete but high-temperature, short duration combustion of organic matter, and are most abundant in non-alkylated (parent) form;
- *Petrogenic PAHs*, which are created by the application of relatively low temperatures over geologic time scales, and are most abundant in alkylated form; and
- *Diagenic / Biogenic PAHs*, which are formed from biological precursors such as plants, bacteria, fungi, and animals, and result in the production of compounds such as retene, perylene, and derivatives of phenanthrene and chrysene.

PAHs present in the Athabasca oil sands region can be categorized as being derived from petrogenic sources, as indicated by the significantly higher concentrations of alkylated PAHs relative to parent PAHs.

During development of this report, the method employed by the US Environmental Protection Agency (USEPA) and described in USEPA (2004) for calculating potential PAH toxicity of sediments also was considered as a comparison to hazard index values obtained using the Neff et al. (2005) method. Calculations used for both methods are similar in that they compare measured PAH concentrations to PAH-specific toxicities, estimate bioavailability, and use these individual toxicity and bioavailability estimates to produce an aggregate hazard value for the sum of all PAHs in a sample. However, the USEPA method normalizes PAHs to the total organic fraction of sediment (rather than the total non-aqueous-phase-liquids [NAPL] fraction), and uses fewer individual PAH measurements than the Neff et al. method. Additionally, the USEPA method focuses heavily on the contribution of parent PAHs to sediment toxicity, given it was developed for assessment of sediments containing predominantly

pyrogenic PAHs. Given sediments in the Athabasca oil sands region are primarily petrogenic and dominated by alkylated PAHs rather than parent species, the USEPA method may underestimate potential toxicity of oil-sands-affected sediments. Additionally, the standard PAH package does not include the entire list of PAHs required to accurately calculate toxicity using the USEPA method. For these reasons, results obtained from the USEPA method were not considered in this report.

Estimation of PAH toxicity in sediments was conducted using methods described by Neff et al. (2005). This method incorporates 41 individual PAH compounds into the PAH toxicity calculation. PAH concentrations are distributed between three phases in sediments: dissolved (pore water), particulate (sediment and organic matter), and non-aqueous-phase-liquids (NAPL: an oil coating associated with sediment particles and comprised of hydrocarbons such as petroleum). The fraction of PAHs in solution are much more bioavailable and toxic than those complexed to sediment particles via the other two phases. Neff et al. (2005) stated that PAHs have a higher affinity to NAPL (estimated using total recoverable hydrocarbons measured in each sample) than to the other two phases of sediments and are; therefore, quickly deposited into sediments. Consequently, each individual PAH concentration measured in a sediment sample is first normalized to total recoverable hydrocarbons to produce an estimate of the combined PAH concentration available within the pore water and particulate fractions of sediments:

$$PAH_{(normalized)} = \frac{PAH \text{ concentration}}{\text{total recoverable hydrocarbons}}$$

Where,

- PAH_(normalized) refers to the estimate of PAHs available in pore water and complexed to the particulate fraction of sediment;
- PAH concentration refers to the absolute concentration of specific PAH species; and
- Total recoverable hydrocarbons (TRH) refer to the total amount of hydrocarbons representing NAPL. TRH was measured directly from 1997 to 2004, and replaced in 2005 by the more detailed, higher-resolution measure, CCME total hydrocarbons, with both methods overlapping in 2004. To allow long-term comparisons using data from 2005 onward, TRH in each sample was estimated using the concentration of CCME total hydrocarbons adjusted using the following equation, which was based on direct within-sample comparisons made using 2004 data:

$$TRH = \text{total CCME hydrocarbons} * 2.183$$

Where,

- Total CCME hydrocarbons are equal to the sum of CCME Fractions 2 to 4.

PAH_(normalized) concentrations then were divided by the octanol/water partition coefficient (K_{ow}) to estimate the concentration of each PAH that is bioavailable in the dissolved (pore water) phase of sediment. These estimates are divided by a chronic toxicity value (compiled from Mackay et al. 1992; Neff and Burns 1996; Ran et al. 2002; and references cited in Neff et al. 2005) to produce a hazard quotient (HQ) for each PAH measured in the sediment sample:

$$HQ = \left(\frac{PAH_{(normalized)}}{K_{ow}} \right) + \text{Chronic Toxicity}$$

Finally, all HQs calculated using this method are summed to produce a hazard index (HI) for total PAHs in sediment pore water:

$$HI = \sum HQ$$

Sediments with a calculated hazard index value greater than 1.0 have the potential to be toxic to aquatic organisms (Neff et al. 2005).



Appendix E

Fish Populations Component



E FISH POPULATIONS COMPONENT

E.1 NOMENCLATURE OF FISH SPECIES OF THE OIL SANDS REGION

Table E.1-1 summarizes the common and scientific names of fish species captured in the oil sands region during fish monitoring activities undertaken by JOSMP in 2015.

Table E.1-1 Common and scientific names of fish species captured during fish monitoring activities undertaken by JOSMP, 2015.

Common Name	Scientific Name	Code
Arctic grayling	<i>Thymallus arcticus</i>	ARGR
brook stickleback	<i>Culaea inconstans</i>	BRST
burbot	<i>Lota lota</i>	BURB
finescaled dace	<i>Phoxinus neogaeus</i>	FNDC
lake chub	<i>Couesius plumbeus</i>	LKCH
longnose dace	<i>Rhinichthys cataractae</i>	LNDC
longnose sucker	<i>Catostomus catostomus</i>	LNSC
northern pike	<i>Esox Lucius</i>	NRPK
northern redbelly dace	<i>Phoxinus eos</i>	NRDC
Pearl dace	<i>Margariscus margarita</i>	PRDC
slimy sculpin	<i>Cottus cognatus</i>	SLSC
spoonhead sculpin	<i>Cottus ricei</i>	SPSC
spottail shiner	<i>Notropis hudsonius</i>	SPSH
trout-perch	<i>Percopsis omiscomaycus</i>	TRPR
walleye	<i>Sander vitreus</i>	WALL
white sucker	<i>Catostomus commersoni</i>	WHSC
yellow perch	<i>Perca flavescens</i>	YLPR

E.2 HEALTH ASSESSMENT CODES FOR FISH EXAMINATION

Fish body part and abnormality codes were developed to rapidly assess the external health of captured fish in an effort to minimize the fish holding time in the field prior to release (Table E.2-1). These codes were also developed to assess the internal health of fish captured for dissection and tissue analyses. For each abnormality that was observed, the severity of the abnormality was recorded (1-mild; 2-moderate; 3-severe) as well as the location of the abnormality (Table E.2-2).

Table E.2-1 External and internal health assessment codes for fish examinations.

Variable	Variable Code	Variable Condition	Variable Condition Code
eyes	EYE	no aberrations; good "clear" eye	N
		exophthalmia (popeye)	EX
		blind; an opaque eye (one or both)	BL
		cloudy cornea	CC
		lens deformed	LD
		lens parasites	LP
		lens cataract	LC
		hemorrhaging or bleeding in the eye (one or both)	HM
		missing one or both eyes	MI
		other; any condition not covered above	OT
gills	GIL	normal; no apparent aberrations	N
		frayed; erosion of tips of gill lamellae resulting in "ragged" gills	FR
		clubbed; swelling of the tips of gill lamellae	CL
		marginate; gills with light, discoloured margin along tips the lamellae	MA
		pale; very light in colour	DI
		parasites	PA
		gas bubbles	GB
		other; any condition not covered above	OT
		pseudobranchs	PSD
swollen; convex in aspect	SW		
lithic; mineral deposits, white, somewhat amorphous spots	LI		
other; any condition not covered above	OT		
thymus	THY	no hemorrhage	0
		hemorrhagic	HM
		other; any condition not covered above	OT

Table E.2-1 (Cont'd.)

Variable	Variable Code	Variable Condition	Variable Condition Code
skin	BOS	normal; no skin aberrations	N
		lesion	LE
		raised or missing scales	RM
		reoriented scales	RS
		swollen	SW
		exceeds mucus	EX
		growths and/or tumours	GR
		parasites	PA
		wounds and/or scars	WO
		other; any condition not covered above	OT
fins	FIN	no active erosion	N
		frayed-eroded	FE
		parasites	PA
		hemorrhagic	HM
		gas bubbles	GB
opercle	OPR	no shortening	N
		incomplete	IN
hindgut	ANU	normal; no inflammation or reddening	N
		inflamed	IN
body deformities	BOF	none	N
		emaciated	EM
		truncate	TR
		scoliosis	SC
		lordosis	LO
mesenteric fat	MF	none	0
		<50% coverage of mesentery	1
		50% coverage of mesentery	2
		>50% coverage of mesentery	3
		100% of mesentery covered	4

Table E.2-1 (Cont'd.)

Variable	Variable Code	Variable Condition	Variable Condition Code
liver	LI	normal; solid red or light red colour	A
		"fatty" liver; "coffee with cream" colour	C
		nodules in the liver; cysts or nodules	D
		focal discolouration; distinct localized colour changes	E
		general discolouration; colour change in whole liver	F
		other; any condition not covered above	OT
spleen	SP	normal; black, very dark red, or red	B
		granular; rough appearance of spleen	G
		nodular; containing fistulas or nodules of varying sizes	D
		enlarged; noticeable enlarged	E
		other; any condition not covered above	OT
gall bladder	GA	normal	0
		enlarged	1
		parasites	2
kidney	KI	normal; firm dark red colour, lying relatively flat along vertebral column	N
		swollen; enlarged or swollen wholly or in part	S
		mottled; gray discolouration	M
		granular; granular appearance and texture	G
		urolithiasis/nephrocalcinosis; white/cream mineral material in tubules	U
		other; any condition not covered above	OT
parasites	PA	no observed parasites	0
		few observed parasites	1
		moderate parasite infestation	2
		numerous parasites	3

Table E.2-2 Codes for the location of external fish abnormalities.

Variable	Location	Code
Body surface	fins	1
	head	2
	eyes	3
	mouth	4
	peduncle	5
	ventral	6
	dorsal	7
	lateral	8
Fins	dorsal	1
	pectoral	2
	pelvic	3
	anal	4
	adipose	5
	caudal	6
Eyes	right	1
	left	2

E.3 ANALYSIS OF FISH COMMUNITY MONITORING DATA

The analysis of the JOSMP fish community monitoring data involved four steps to determine if fish measurement endpoints varied in relation to physical or chemical habitat descriptors, and to identify which habitat variables would help to classify *baseline* reaches to calculate the normal ranges of variability in measurement endpoints:

1. A Principal Component Analysis (PCA) was conducted on habitat variables from *baseline* reaches to examine the variability of each characteristic within reaches.
2. Correlation of key physical and chemical habitat data from the PCA with measurement endpoints to identify habitat variables that strongly relate or drive the variability in measurement endpoints.
3. A cluster analysis in order to group each reach-year combination based on similarities in key habitat variables.
4. Calculation of normal ranges of variability for all regional *baseline* reaches of similar habitat characteristics for comparison to data from *test* reaches of similar habitat characteristics.

E.3.1 Principal Components Analysis of Habitat Data

A PCA was conducted on habitat variables using the 53 *baseline* reach-year combinations to summarize the variability in habitat conditions. Data for all habitat variables were scaled by unit variance prior to conducting the PCA to ensure that all data were comparable. Principal component axes explaining >10% of the total variance (Jackson 1993) were used in subsequent correlation analyses with habitat variables. Pearson correlations (i.e., Pearson r-values) between individual variables and PCA axes that were >|0.6| were considered strongly correlated with an axis.

PCA axes 1, 2, and 3 explained 16%, 14%, and 12%, respectively, of the variance in habitat variables (Table E.3-1). Scores on the first axis were strongly correlated with:

- small tree canopy cover for both left and right banks;
- understory shrub cover for both left and right banks;
- small wood debris (SWD) for both left and right banks; and
- large woody debris (LWD) for both left and right banks.

The first PCA axis; therefore, indicated that the greatest variation among reach-year combinations was mostly instream vegetation cover.

PCA scores on the second axis were strongly correlated with:

- bankful width;
- wetted width;
- boulders; and
- big tree canopy on the right banks.

Scores on the third PCA axis were strongly correlated with depth at mid-channel, instream cover as macrophytes, and SWD for left banks. The third axis; therefore, explained a large amount of variation related to stream depth. All variables that were strongly correlated with PCA axes were carried forward in subsequent correlation analyses with the fish assemblage measurement endpoints.

Table E.3-1 Principal Component axes correlated with habitat variables for baseline fish assemblages reaches, 2009 to 2015.

Habitat Variable	PC1	PC2	PC3
Maximum depth	0.1	-0.3	0.5
Bankful width	0.0	-0.9	0.2
Wetted width	0.0	-0.9	0.3
Bank height LDB	0.4	0.1	-0.4
Bank height RDB	0.4	0.1	-0.4
Bank angle RDB	0.1	0.1	-0.1
Bank angle LDB	-0.2	0.1	-0.1
Flow at mid-channel	0.1	-0.4	-0.4
Depth at mid-channel	0.0	-0.2	0.6
Instream macrophytes	-0.2	-0.2	0.7
Instream LWD	0.4	0.0	0.4
Instream SWD	0.1	0.1	0.5
Live trees	0.4	0.4	0.3
Undercut banks	0.0	0.4	0.0
Boulders	0.0	-0.7	-0.2
Big tree canopy RDB	0.3	-0.6	-0.3
Big tree canopy LDB	0.5	-0.5	-0.2
Small tree canopy RDB	0.7	-0.3	0.0
Small tree canopy LDB	0.6	-0.1	0.4
Under shrub LDB	0.7	0.3	-0.2
Under shrub RDB	0.6	0.3	-0.3
Canopy SWD RDB	0.8	0.2	0.2
Canopy SWD LDB	0.6	0.1	0.6
Canopy LWD RDB	0.7	0.0	-0.1
Canopy LWD LDB	0.6	0.0	0.0
Instream algae	-0.2	-0.4	-0.2
Dissolved oxygen	0.0	0.2	-0.5
Conductivity	-0.2	0.4	0.4
pH	0.0	-0.1	-0.4
Temperature (°C)	0.1	-0.3	-0.1
% of Variance Explained	16%	14%	12%

Note: Values are Pearson Correlations (r); values in bold >|0.6| indicate strong associations with the PC axis.

LWD – large woody debris; SWD – small woody debris; LDB – left downstream bank; RDB – right downstream bank

E.3.2 Correlation Analyses

Spearman rank correlations were calculated between habitat variables that were highly correlated with PCA axes 1, 2, and 3 and measurement endpoints (catch per unit effort [CPUE], abundance, total richness, diversity, and an assemblage tolerance index [ATI]). This step identified which habitat characteristics were driving changes in measurement endpoints.

Abundance was not significantly correlated with any habitat characteristic (Table E.3-2). Richness was correlated with boulders. Diversity was significantly correlated with understory shrub scores for the left and right banks. ATI was significantly correlated with depth at mid-channel and instream cover as macrophytes. CPUE was significantly correlated with depth at mid-channel.

Table E.3-2 Spearman correlations between measurement endpoints and habitat variables for *baseline* fish assemblages reaches, 2009 to 2014.

	Total Abundance	Richness	Diversity	ATI	CPUE
Bankful width	-0.044	0.244	0.205	-0.101	-0.122
Wetted width	-0.203	0.200	0.216	0.049	-0.253
Depth at mid-channel	-0.401	-0.098	-0.063	0.601	-0.458
Instream macrophytes	-0.086	0.095	0.163	0.569	-0.040
Boulders	0.209	0.305	0.166	-0.124	0.126
Big tree canopy RDB	0.095	0.225	0.002	-0.052	0.106
Small tree canopy RDB	0.205	0.097	-0.017	0.081	0.217
Small tree canopy LDB	0.171	0.069	-0.001	-0.074	0.160
Under shrub LDB	0.046	-0.127	-0.280	0.184	0.069
Under shrub RDB	0.043	-0.084	-0.300	0.051	0.089
Canopy SWD RDB	0.019	0.097	-0.224	-0.061	-0.020
Canopy SWD LDB	0.022	-0.031	-0.236	-0.214	0.001
Canopy LWD RDB	0.047	0.075	-0.107	-0.026	0.058
Canopy LWD LDB	0.166	0.107	-0.023	-0.111	0.182

Bold signifies a significant correlation $p \leq 0.05$, r_s of $|0.271|$

LWD – large woody debris; SWD – small woody debris; LDB – left downstream bank; RDB – right downstream bank

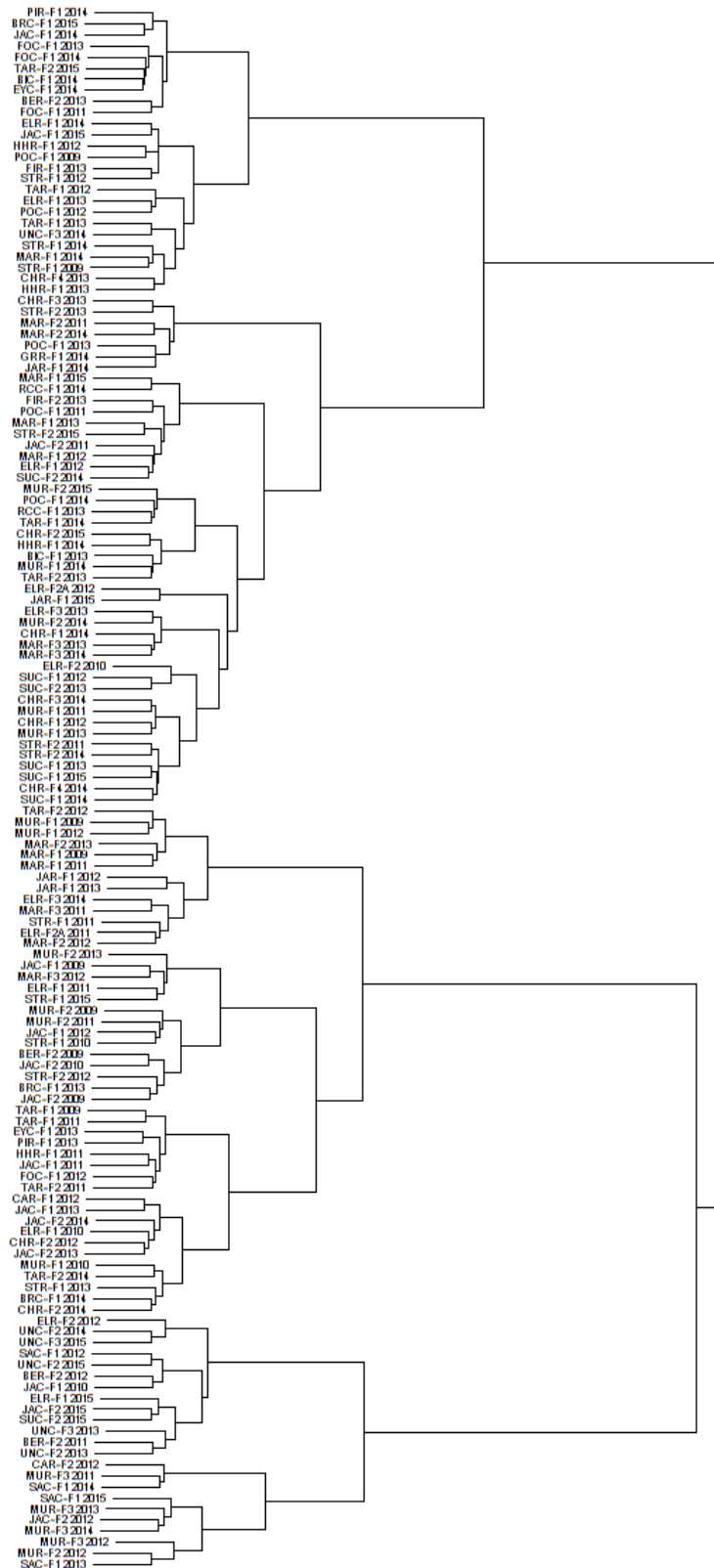
E.3.3 Cluster Analysis of Habitat Data

A cluster analysis was conducted using significant habitat variables identified in the PCA to group the 142 reach x year (*baseline and test*) combinations based on similar habitat conditions. Ward's hierarchical clustering using Euclidean distance was used in the cluster analysis. Prior to clustering, data for each variable was scaled by unit variance to ensure that data for every descriptor was comparable. Habitat variables that were highly correlated (Spearman $r_s > 0.9$) with other habitat variables were excluded from the cluster analysis given that the inclusion of several highly correlated variables would result in clusters being overly influenced by what is essentially the same descriptor (Mooi and Sastedt 2011). Only left bank understory shrub cover was removed from the analysis based on this criterion.

Three main groupings of *baseline* and *test* reaches were observed (Figure E.3-1):

- Cluster 1 – shallow channel with few instream macrophytes, few boulders, and an abundance of understory shrubs;
- Cluster 2 – deep channel with abundant instream macrophytes, few boulders, and few understory shrubs; and
- Cluster 3 – shallow channel with few instream macrophytes, an abundance of boulders, and few understory shrubs.

Figure E.3-1 Dendrogram based on cluster analysis of all reach-year combinations of measurement endpoints based on significant habitat variables.



E.3.4 Calculation of Normal *Baseline* Ranges

Baseline reaches were grouped into the clusters to develop normal *baseline* ranges of variability for all measurement endpoints (Table E.3-3). As more data are collected over time, analysis of habitat variables and their influence on fish assemblages will be refined.

Table E.3-3 Summary of normal *baseline* ranges, classified by cluster groups.

Cluster Group	Measurement Endpoint	Outer Tolerance Limit on the 5th Percentile	5th percentile	Inner Tolerance Limit on the 5th Percentile	Inner Tolerance Limit on the 95th Percentile	95th percentile	Outer Tolerance Limit on the 95th Percentile
1	Average Abundance	0.00	0.01	0.00	0.65	0.73	1.09
	Total Richness	0.00	0.34	0.00	5.18	6.40	9.32
	Average Diversity	0.00	0.00	0.00	0.68	0.67	1.08
	Average ATI	0.00	0.60	0.00	6.26	8.20	12.80
	CPUE (No./100 sec)	0.00	0.15	0.00	8.78	10.37	15.44
2	Average Abundance	0.00	0.06	0.00	0.21	0.29	0.62
	Total Richness	0.00	1.60	0.00	4.24	6.50	12.90
	Average Diversity	0.00	0.03	0.00	0.56	0.62	1.54
	Average ATI	2.25	6.18	0.00	2.48	8.99	12.40
	CPUE (No./100 sec)	0.00	1.28	0.00	4.80	6.47	13.35
3	Average Abundance	0.00	0.06	0.00	0.45	0.52	0.70
	Total Richness	0.00	2.00	0.00	5.26	8.55	10.50
	Average Diversity	0.00	0.13	0.00	0.47	0.71	0.96
	Average ATI	0.00	0.04	0.00	5.24	6.99	10.21
	CPUE (No./100 sec)	0.00	1.37	0.00	5.95	7.36	10.16

Appendix F
Acid-Sensitive Lakes Component

F ACID-SENSITIVE LAKES COMPONENT

This appendix provides the descriptive information for the Acid-Sensitive Lakes (ASL) component in 2015 and includes the following:

- Water yields and runoff estimates for the individual lakes;
- Calculation of the ANC_{lim} in the critical load calculations;
- Calculation of the original base cation concentrations in the lakes for the critical load calculations;
- Comparison of the chemistry of the 50 lakes in 2015 to that in 450 lakes within the oil sands region reported by the NO_xSO_x Management Working Group (NSMWG);
- The characterization of the ion chemistry of the lakes in 2015;
- A summary of trace metal concentrations in the lakes (2003 to 2015), and the relationship between trace metals, lake location, and guideline exceedances;
- A Mann-Kendall trend analysis on selected metals to determine whether increases in these metals have occurred in the lakes over the thirteen years of monitoring; and
- A summary of low-level mercury and methylmercury concentrations in the ASL component lakes.

F.1 RUNOFF CALCULATIONS FOR EACH LAKE

The runoff (Q) to each lake, was calculated by Dr. John Gibson (University of Victoria) from analyses of heavy isotopes of oxygen (^{18}O) and (2H) in each lake. With this technique, the natural evaporative enrichment of ^{18}O and 2H in each lake is used to partition water losses between evaporation and liquid outflow and hence derive an estimate of runoff (Gibson 2002; Gibson et al. 2002; Gibson and Edwards 2002; Gibson et al. 2010). This isotopic mass balance (IMB) technique utilizes a different set of assumptions from traditional hydrometric methods, which extrapolate water yields from one or more gauged catchments to the ungauged lake catchments.

The water yields for each lake catchment and the runoff to each lake are provided in Table F.1-1 and Table F.1-2, respectively. The runoff was calculated from the water yield by incorporating the lake catchment areas and represents the discharge that would be measured at the lake outlet. For 2011 to 2015, the runoff values using the IMB method were unavailable. Therefore, the mean yield and runoff values from 2002 to 2010 were applied to calculate the critical loads for these years. The runoff estimates for the lakes ranged from $0.001 \text{ m}^3/\text{s}$ to $2.43 \text{ m}^3/\text{s}$, with a median of $0.072 \text{ m}^3/\text{s}$. As evident in Table F.1-2, the runoff for an individual lake can vary considerably between years. The median coefficient of variation of the runoff over all 45 ASL lakes from 2002 to 2010 was 36.6%. Annual variability in the yield and runoff to a lake will have a direct effect on its critical load and acid sensitivity (Gibson et al. 2010).

Table F.1-1 Water yields to the ASL component lakes, 2002 to 2015¹.

Lake ID No.	AESRD Label	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2015 ²	Lake Area (km ²)	Catchment Area (km ²)
		Water Yields (mm/y)											
168	SM10	95	124	136	135	149	90	195	197	154	142	1.4	18.18
169	SM9	156	205	204	412	259	225	289	266	256	253	1.1	8.28
170	SM6	39	51	60	84	69	53	86	84	74	67	0.7	13.06
167	SM5	241	258	260	347	274	218	587	525	506	357	1.1	3.67
166	SM7	56	117	142	193	171	116	295	338	263	188	1.5	6.94
287	SM8	144	213	230	323	256	70	326	314	278	239	1.9	9.63
289	SM3	182	260	236	433	296	211	359	428	374	309	1.9	7.39
290	SM4	29	73	57	72	69	58	88	97	86	70	0.5	11.74
342	SM2	31	33	72	126	65	10	129	141	118	80	2.0	15.36
354	SM1	132	181	230	277	143	49	387	383	314	233	2.4	9.61
165	WF1	98	235	252	305	218	200	523	427	311	285	3.2	10.43
171	WF2	46	96	81	182	69	-	232	161	119	123	0.8	4.30
172	WF3	19	35	51	91	43	34	101	88	44	56	2.2	51.55
223	WF4	9	8	10	78	17	9	29	28	16	23	0.0	1.79
225	WF5	14	38	30	156	49	34	62	68	81	59	0.2	5.04
226	WF6	27	99	77	196	81	61	78	133	121	97	0.2	4.19
227	WF7	34	138	73	214	105	62	115	174	173	121	0.1	1.59
267	WF8	20	42	38	93	61	25	-	95	39	52	2.0	23.08
452	NE1	197	194	133	265	180	98	383	201	88	193	0.7	16.75
470	NE2	153	111	79	152	161	66	146	130	94	121	0.3	15.13
471	NE3	88	132	112	232	248	58	140	136	104	139	0.6	23.98
400	NE4	606	503	449	869	409	260	587	708	369	529	1.2	3.17
268	NE5	267	488	379	480	303	101	410	560	426	379	1.9	7.32
182	NE6	156	148	91	260	101	192	42	155	282	159	0.4	8.34
185	NE7	166	125	101	162	126	132	172	121	140	138	0.1	5.91
209	NE8	753	586	373	861	461	349	985	669	831	652	0.1	0.82
270	NE9	176	245	255	339	319	106	279	491	354	285	3.2	11.21
271	NE10	132	128	230	373	246	189	245	426	240	246	4.2	17.09
418	NE11	-	167	140	239	112	47	129	144	96	134	5.8	77.17
436	BM2	353	536	472	410	487	263	551	577	518	463	44.0	165.55
442	BM9	179	288	246	295	326	239	278	311	248	268	3.5	33.26
444	BM1	431	660	595	435	607	343	703	697	615	565	17.0	58.72
447	BM6	393	455	285	733	407	284	429	570	520	453	1.3	13.67
448	BM7	430	444	531	514	287	245	351	509	365	408	0.7	4.66
454	BM8	121	168	101	289	151	69	115	213	114	149	1.2	32.49
455	BM4	167	232	119	455	274	112	303	422	270	262	4.3	37.33
457	BM5	141	244	118	455	232	92	262	322	162	225	2.6	30.59
464	BM3	77	141	87	168	112	59	134	182	97	117	1.0	29.75
175	BM10	30	25	27	92	51	33	76	192	50	64	0.4	5.15
199	BM11	75	117	121	133	116	69	79	130	87	103	0.1	0.57
473	S4	23	30	24	57	38	38	42	39	28	35	1.4	114.65
118	S1	425	482	387	389	452	349	502	438	424	428	3.4	13.40
84	S2	43	51	42	65	39	-	54	71	33	50	1.0	112.59
88	S5	113	122	108	116	127	-	118	144	81	116	0.3	4.48
90	S3	112	159	130	140	148	139	150	187	115	142	1.4	37.89
146	CM1	240	310	235	378	455	551	728	603	545	449	1.6	24.11
152	CM2	304	328	234	447	404	328	401	485	452	376	9.6	46.77
89	CM3	189	162	111	331	275	249	220	346	285	241	2.3	27.95
97	CM4	242	275	182	219	228	308	394	503	383	304	2.6	38.05
91	CM5	225	212	136	697	704	175	212	391	408	351	0.6	2.78
	Min	9.0	8.0	10.0	57.0	17.0	9.0	29.0	28	16.0	23.0		
	Max	753	660	595	869	704	551	985	708	831	652		
	Mean	171	209	177	295	220	150	276	300	243	226		
	Median	141	165	131	263	176	106	232	240	207	191		

¹ Data provided by Dr. John Gibson.

² Water yields were not available from 2011 to 2015; therefore, the mean value from 2002 to 2010 was used for each lake.

Table F.1-2 Runoff to the ASL component lakes, 2002 to 2015.

Lake ID No.	AESRD Label	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011 to 2015 ¹
Runoff (m ³ /s)											
168	SM10	0.055	0.071	0.078	0.078	0.086	0.052	0.112	0.114	0.089	0.082
169	SM9	0.041	0.054	0.054	0.108	0.068	0.059	0.076	0.070	0.067	0.066
170	SM6	0.016	0.021	0.025	0.035	0.029	0.022	0.036	0.035	0.031	0.028
167	SM5	0.028	0.030	0.030	0.040	0.032	0.025	0.068	0.061	0.059	0.042
166	SM7	0.012	0.026	0.031	0.042	0.038	0.025	0.065	0.074	0.058	0.041
287	SM8	0.044	0.065	0.070	0.099	0.078	0.021	0.100	0.096	0.085	0.073
289	SM3	0.043	0.061	0.055	0.101	0.069	0.049	0.084	0.100	0.088	0.072
290	SM4	0.011	0.027	0.021	0.027	0.026	0.022	0.033	0.036	0.032	0.026
342	SM2	0.015	0.016	0.035	0.062	0.032	0.005	0.063	0.069	0.057	0.039
354	SM1	0.040	0.055	0.070	0.084	0.044	0.015	0.118	0.117	0.096	0.071
165	WF1	0.032	0.078	0.083	0.101	0.072	0.066	0.173	0.141	0.103	0.094
171	WF2	0.006	0.013	0.011	0.025	0.009	-	0.032	0.022	0.016	0.017
172	WF3	0.031	0.057	0.083	0.149	0.070	0.056	0.165	0.144	0.072	0.092
223	WF4	0.0005	0.0004	0.0005	0.0044	0.0009	0.0005	0.0016	0.0016	0.0009	0.001
225	WF5	0.002	0.006	0.005	0.025	0.008	0.005	0.010	0.011	0.013	0.009
226	WF6	0.004	0.013	0.010	0.026	0.011	0.008	0.010	0.018	0.016	0.013
227	WF7	0.002	0.007	0.004	0.011	0.005	0.003	0.006	0.009	0.009	0.006
267	WF8	0.015	0.031	0.028	0.068	0.045	0.018	-	0.070	0.029	0.038
452	NE1	0.105	0.103	0.070	0.141	0.096	0.052	0.204	0.107	0.047	0.103
470	NE2	0.073	0.053	0.038	0.073	0.077	0.032	0.070	0.062	0.045	0.058
471	NE3	0.067	0.100	0.085	0.176	0.188	0.044	0.107	0.103	0.079	0.106
400	NE4	0.061	0.051	0.045	0.087	0.041	0.026	0.059	0.071	0.037	0.053
268	NE5	0.062	0.113	0.088	0.112	0.070	0.024	0.095	0.130	0.099	0.088
182	NE6	0.041	0.039	0.024	0.069	0.027	0.051	0.011	0.041	0.075	0.042
185	NE7	0.031	0.023	0.019	0.030	0.024	0.025	0.032	0.023	0.026	0.026
209	NE8	0.020	0.015	0.010	0.022	0.012	0.009	0.026	0.017	0.022	0.017
270	NE9	0.062	0.087	0.090	0.121	0.113	0.038	0.099	0.174	0.126	0.101
271	NE10	0.072	0.069	0.125	0.202	0.133	0.103	0.133	0.231	0.130	0.133
418	NE11	-	0.409	0.342	0.584	0.273	0.115	0.315	0.353	0.235	0.328
436	BM2	1.851	2.815	2.476	2.155	2.557	1.383	2.890	3.029	2.719	2.431
442	BM9	0.189	0.304	0.259	0.311	0.344	0.253	0.294	0.328	0.262	0.282
444	BM1	0.803	1.229	1.107	0.810	1.130	0.638	1.309	1.297	1.145	1.052
447	BM6	0.170	0.197	0.123	0.318	0.177	0.123	0.186	0.247	0.225	0.196
448	BM7	0.064	0.066	0.078	0.076	0.042	0.036	0.052	0.075	0.054	0.060
454	BM8	0.125	0.174	0.104	0.298	0.155	0.071	0.119	0.220	0.117	0.154
455	BM4	0.198	0.274	0.141	0.538	0.324	0.133	0.358	0.500	0.320	0.310
457	BM5	0.137	0.237	0.115	0.441	0.225	0.089	0.254	0.312	0.157	0.219
464	BM3	0.072	0.133	0.082	0.159	0.105	0.055	0.127	0.172	0.092	0.111
175	BM10	0.005	0.004	0.004	0.015	0.008	0.005	0.012	0.031	0.008	0.010
199	BM11	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002
473	S4	0.082	0.110	0.089	0.206	0.138	0.139	0.152	0.143	0.102	0.129
118	S1	0.180	0.205	0.165	0.165	0.192	0.148	0.213	0.186	0.180	0.182
84	S2	0.153	0.182	0.149	0.232	0.139	-	0.191	0.253	0.118	0.177
88	S5	0.016	0.017	0.015	0.016	0.018	-	0.017	0.020	0.012	0.016
90	S3	0.135	0.191	0.156	0.169	0.178	0.167	0.180	0.225	0.138	0.171
146	CM1	0.184	0.237	0.180	0.289	0.348	0.421	0.556	0.461	0.417	0.344
152	CM2	0.452	0.487	0.347	0.662	0.599	0.487	0.594	0.720	0.670	0.558
89	CM3	0.168	0.144	0.099	0.293	0.244	0.220	0.195	0.307	0.253	0.214
97	CM4	0.292	0.332	0.220	0.264	0.275	0.371	0.476	0.607	0.462	0.366
91	CM5	0.020	0.019	0.012	0.061	0.062	0.015	0.019	0.034	0.036	0.031
	Min	0.0005	0.0004	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001
	Max	1.851	2.815	2.476	2.155	2.557	1.383	2.890	3.029	2.719	2.431
	Mean	0.128	0.181	0.151	0.204	0.181	0.122	0.214	0.233	0.187	0.178
	Median	0.055	0.065	0.074	0.101	0.071	0.049	0.100	0.105	0.082	0.077

¹ Water yields were not available between 2011 and 2015; therefore, the mean runoff value from 2002 to 2010 was used for each lake.

F.2 CALCULATION OF THE ORIGINAL BASE CATION CONCENTRATIONS TO DETERMINE CRITICAL LOADS OF ACIDITY

In order to be consistent with international methods for calculating critical loads, the original base cation concentration in each ASL component lake, $[BC_o]$, was calculated using the equation published in the “Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads” (CLRTAP 2004) and Henriksen et al. (2002):

$$[BC_o] = [BC_T] - F(SO_{4,T} - SO_{4,o} + NO_{3,T} - NO_{3,o})$$

Where,

- $[BC_T]$ is the current base cation concentration;
- F is the “F factor” describing the ratio of the change in base cations to the addition of strong acids to each lake from acid deposition;
- $SO_{4,T}$ and $SO_{4,o}$ are the current and original sulphate concentrations in each lake, respectively; and
- $NO_{3,T}$ and $NO_{3,o}$ are the current and original nitrate concentrations in each lake, respectively.

The F factor is defined as:

$$F = \sin(\pi/2 Q [BC_T]/S)$$

Where,

- Q is the runoff and S is the base cation flux when all of the acid deposition is neutralized in the catchment ($F=1$); and
- S is assumed to be $400 \text{ meq/m}^2/\text{y}$.

The original sulphate concentration ($SO_{4,o}$) for each lake was assumed to be the 5th percentile of sulphate concentrations from all ASL component lakes.

The predicted original base cation concentrations $[BC_o]$ are provided in Table F.2-1. The final column of the table indicates the percent difference between the current 2015 base cation concentration $[BC_T]$ and the original base cation concentration $[BC_o]$. The mean difference between the two estimates was 4.4%, with only six lakes having a difference greater than 10%. In all cases, the current base cation concentrations overestimated the predicted original base cation concentrations. All six lakes were found to have relatively high sulphate concentrations. Four were found in the Birch Mountains and one in the Caribou Mountains. Similar results were reported in 2013 and 2014 for the same lakes. As shown in Figure F.2-1, the discrepancy between BC_T and BC_o increases as a function of the sulphate concentration in a lake. This relationship occurs because the estimate of $SO_{4,o}$ as the 5th percentile of sulphate concentration for all the lakes was not universally applicable and far too low for lakes with relatively high sulphate concentrations. Given that the Birch Mountains subregion and the Caribou Mountains are remote from major sources of acidic emissions, the high sulphate concentrations in these lakes were likely natural in origin rather than the result of acidic deposition.

In applying the Henriksen model in previous years, it was assumed that base cations have not increased in the ASL component lakes as a result of acidic deposition; that is, the current base cation concentrations $[BC_T]$ were equivalent to the original base cations concentrations $[BC_o]$. Based on

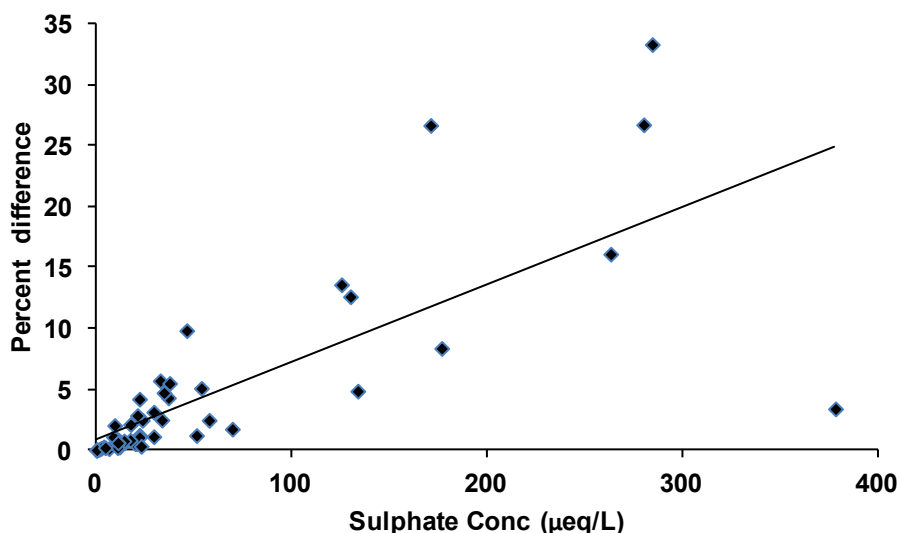
Table F.2-1, this assumption appears to be valid. The assumption is further supported by Whitfield et al. (2010) who applied the Magic Model to soils in the oil sands region and concluded that, to date, sulphate deposition in the oil sands region has resulted in limited removal of base cations from the soil.

Table F.2-1 Comparison of the calculated BC₀ to the current BC_T in the ASL component lakes in 2015.

AESRD Label	Lake ID No.	Sulphate (mg/L)	Sulphate (µeq/L)	Runoff (m/y)	F Factor	BC _T (µeq/L)	BC ₀ (Predicted) (µeq/L)	% Difference between BC _T and BC ₀
SM10	168	1.07	22.3	0.142	0.085	153	151.2	1.2
SM9	169	0.49	10.2	0.253	0.177	179	177.1	1.0
SM6	170	1.00	20.8	0.067	0.035	135	133.8	0.5
SM5	167	0.020	0.4	0.357	0.369	269	269.3	0.0
SM7	166	1.62	33.8	0.188	0.220	301	293.1	2.5
SM8	287	1.42	29.6	0.239	0.149	159	153.7	3.1
SM3	289	0.85	17.7	0.309	0.244	203	198.9	2.1
SM4	290	0.96	20.0	0.070	0.033	120	119.3	0.5
SM2	342	0.020	0.4	0.080	0.096	302.8	302.8	0.0
SM1	354	0.020	0.4	0.233	0.403	453.9	453.8	0.0
WF1	165	6.03	125.6	0.285	0.697	688.5	600.9	13.6
WF2	171	1.07	22.3	0.123	0.203	423.6	419.2	1.1
WF3	172	0.58	12.1	0.056	0.069	310.6	309.8	0.3
WF4	223	18.16	378.3	0.023	0.142	1613.7	1559.8	3.4
WF5	225	2.47	51.5	0.059	0.214	926.4	915.3	1.2
WF6	226	1.42	29.6	0.097	0.200	529.1	523.2	1.1
WF7	227	0.71	14.8	0.121	0.512	1130.6	1123.2	0.7
WF8	267	0.32	6.7	0.052	0.188	932.8	931.6	0.1
NE1	452	0.55	11.5	0.193	0.177	234.9	232.9	0.8
NE2	470	0.84	17.5	0.121	0.191	402.3	399.1	0.8
NE3	471	0.69	14.4	0.139	0.325	607.8	603.2	0.8
NE4	400	1.07	22.3	0.529	0.704	376.2	360.8	4.2
NE5	268	0.43	9.0	0.379	0.840	669.5	662.3	1.1
NE6	182	0.08	1.7	0.159	0.775	1424.0	1422.9	0.1
NE7	185	0.55	11.5	0.138	0.167	309.3	307.4	0.6
NE8	209	0.46	9.6	0.652	0.828	380.9	373.2	2.0
NE9	270	0.19	4.0	0.285	0.998	1343.5	1339.9	0.3
NE10	271	0.13	2.7	0.246	0.992	1499.8	1497.5	0.2
NE11	418	2.78	57.9	0.134	0.906	2150.5	2098.4	2.5
BM2	436	8.22	171.3	0.463	0.950	690.1	527.7	26.7
BM9	442	1.14	23.8	0.268	0.269	259.0	252.7	2.5
BM1	444	2.23	46.5	0.565	0.662	326.1	295.6	9.8
BM6	447	1.58	32.9	0.453	0.493	290.1	274.0	5.7
BM7	448	0.02	0.4	0.408	0.065	40.5	40.5	0.0
BM8	454	12.64	263.3	0.149	0.423	747.0	635.7	16.1
BM4	455	13.66	284.6	0.262	0.662	704.1	503.0	33.3
BM5	457	13.45	280.2	0.225	0.513	609.1	465.5	26.7
BM3	464	8.49	176.9	0.117	0.279	614.6	565.2	8.4
BM10	175	3.35	69.8	0.064	0.314	1272.2	1250.3	1.7
BM11	199	6.43	134.0	0.103	0.773	2181.3	2078.0	4.8
S4	473	1.11	23.1	0.035	0.090	649.4	647.3	0.3
S1	118	1.02	21.3	0.428	0.907	676.8	657.8	2.8
S2	84	0.53	11.0	0.050	0.133	683.6	682.2	0.2
S5	88	0.23	4.8	0.116	0.225	497.3	496.3	0.2
S3	90	0.54	11.3	0.142	0.299	543.9	540.7	0.6
CM1	146	6.25	130.2	0.449	1.000	1102.9	972.1	12.6
CM2	152	1.81	37.7	0.376	0.427	298.7	282.8	5.5
CM3	89	2.59	54.0	0.241	0.403	438.2	416.5	5.1
CM4	97	1.78	37.1	0.304	0.491	430.0	411.9	4.3
CM5	91	1.67	34.8	0.351	0.422	316.0	301.5	4.7
							Mean	4.4

Note: BC_T=current (2015) base cation concentration; BC₀=original base cation concentration predicted from the F factor.

Figure F.2-1 Relationship between the percent difference between BC_T and BC_o and the sulphate concentration in each lake.

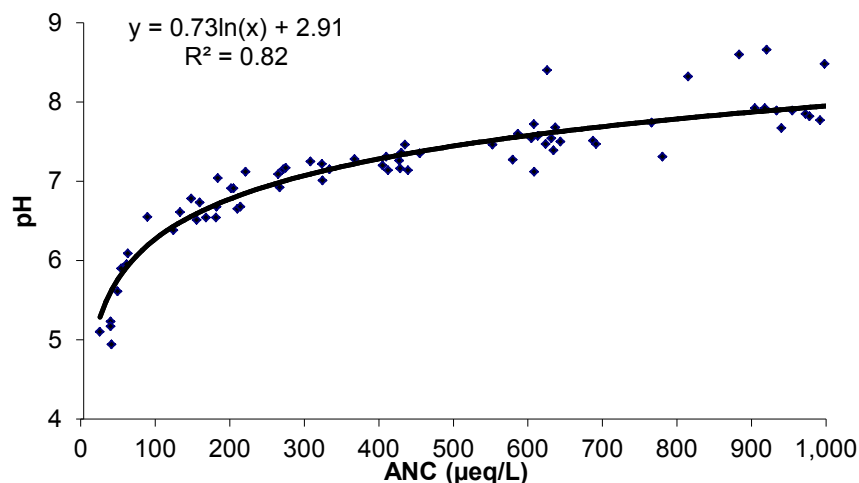


F.3 CALCULATION OF ANC_{LIM} IN THE CALCULATION OF CRITICAL LOAD OF ACIDITY

The limiting critical load (ANC_{lim}) of 75 µeq/L, used to calculate the critical load of acidity to each lake was derived in a study by WRS (2001) from data on 180 lakes within the oil sands region of northern Alberta. The critical load concept assumes a dose-response relationship between a water quality variable and an aquatic indicator organism. In this case, the water quality variable is the acid neutralizing capacity (ANC) required to maintain a healthy fish population. In applying the Henriksen model in Europe, a critical threshold ANC (ANC_{lim}) was set to protect brown trout, the most common European salmonid, to ensure that no toxic acidic episodes occur to this species during the year. The ANC_{lim} was derived from a survey of water chemistry data, critical load exceedances, and fish population status in 1,000 lakes in Norway in 1986 (Henriksen et al. 1988; Lien et al. 1991). A value of 20 µeq/L seemed to be the most appropriate for evaluating critical loads in Norway and this value has been adapted by most of the Scandinavian countries (Henriksen et al. 1992).

In North America, the effects of acidification on fish have been historically related to pH rather than ANC. Research on pH tolerance of a wide range of aquatic organisms has shown that a pH greater than six is required to maintain aquatic ecosystem function and protect both fish and other organisms (RMCC 1990; Environment Canada 1997; Jeffries and Lam 1993). Within a given region, lake pH has been empirically and theoretically related to ANC (alkalinity) as an inverse hyperbolic sine function (Small and Sutton 1986) and this relationship has been used to equate the two variables for the purpose of critical load modelling (e.g., Jeffries and Lam 1993). A similar approach was taken in the WRS study to estimate ANC_{lim} (WRS 2001). The relationship between pH and Gran alkalinity was derived for 180 lakes surveyed by ALPAC in 1998 and is presented in Figure F.3-1. For simplicity, a logarithmic function was fitted to the data. Interpolation indicated that for all lakes, a pH of 6.0 was associated with an alkalinity of approximately 75 µeq/L. This value was; therefore, chosen for the ANC_{lim} .

Figure F.3-1 Lake pH vs. Gran alkalinity for 180 lakes within the oil sands region of northern Alberta.



F.4 COMPARISON OF ASL COMPONENT LAKE CHEMISTRY IN 2015 TO REGIONAL LAKE CHEMISTRY

In order to determine whether the water chemistry of the ASL component lakes was representative of regional lake chemistry, data collected from the ASL component lakes in 2015 were compared to a database of 450 lakes within the oil sands region reported by the NO_xSO_x Management Working Group (NSMWG) (WRS 2004). Key results were as follows (Table F.4-1 and Figure F.4-1):

- The ASL component lakes covered a slightly narrower pH range (4.58 to 9.19) with a lower median value than the regional lakes (7.14 vs. 7.70). The median pH of the ASL component lakes was significantly less than that of the regional lakes ($p < 0.05$);
- Total alkalinity in the ASL component lakes ranged from 25 µeq/L to 1,852 µeq/L, with a median of 263 µeq/L, significantly lower than the regional lake median of 1,020 µeq/L ($p < 0.05$);
- Conductivity was relatively low in the ASL component lakes, ranging from 9.99 µS/cm to 200 µS/cm. The median conductivity of the ASL component lakes (37.5 µS/cm) was significantly lower than that of the regional lakes (125 µS/cm, $p < 0.05$);
- Consistent with lower conductivity in the ASL component lakes, the median concentrations of the principal cations (calcium, magnesium, and potassium), and the sum of base cations (SBC) in the 50 ASL component lakes were all significantly lower than those in the regional lakes ($p < 0.05$). The median SBC in the regional lakes (1,247 µeq/L) was more than twice that in the ASL component lakes in 2015 (476 µeq/L);
- The mean and median concentrations of the anions chloride and sulphate were significantly lower in the ASL component lakes ($p < 0.05$);

- Total phosphorus was quite variable in both the ASL component lakes and the regional lakes, with individual lakes attaining concentrations that would classify them as eutrophic or hypereutrophic (Wetzel 2001). The highest concentration of total phosphorus observed in the ASL component lakes in 2015 was 332 µg/L in BM 8/454 in the Birch Mountains subregion. The highest concentration of total phosphorus in the regional lakes was 495 µg/L. The median concentration of total phosphorus in the ASL component lakes was 36.5 µg/L compared to 49 µg/L in the regional lakes. There was no significant difference in the median concentrations of total phosphorus between the ASL component lakes and the regional lakes ($p < 0.05$);
- Compared with previous years, concentrations of nitrate in the ASL component lakes in 2015 were extremely low (median: non-detectable), although several lakes had values that were two orders of magnitude higher (e.g., 276 µg/L in Lake BM4/455 in the Birch Mountains). Concentrations of nitrate in the regional lakes were similarly variable, ranging from 0.02 µg/L to 1860 µg/L. The median concentration of nitrate in 2015 in the ASL component lakes was significantly less than that of the regional lakes ($p < 0.05$);
- The median concentration of total dissolved nitrogen in the ASL component lakes in 2015 was significantly less than that in the regional lakes ($p < 0.05$); and
- There was no significant difference in DOC between the ASL component lakes in 2015 and the regional lakes.

The chemical differences between the ASL component lakes and the regional lakes reflected the bias in the selection process for lakes in the ASL component. The ASL component lakes were historically selected for their acid sensitivity which, in practice, meant selecting lakes with the lowest pH, alkalinity, conductivity, and base cation concentrations. Lakes with these characteristics are often the smallest lakes and are often located in the upland regions where catchments are dominated by fens and organic soils.

Table F.4-1 Comparison between ASL component lakes in 2015 and 450 regional lakes in the NSMWG¹ database (WRS 2004).

Variable	Units	ASL Component Lakes (2015)				Regional Lakes				
		Min	Max	Median	Mean	No.	Min	Max	Median	Mean
Lake Area	km ²	0.03	43.40	1.30	2.86	431	0.01	214	1.60	6.26
Catchment Area	km ²	0.7	224	15.3	28.1	432	0.1	1,769	17.4	89.3
Drainage Ratio	ratio	0.2	88.6	10.1	15.7	431	1.4	1,178	13.0	26.2
Runoff	m ³ /s	0.001	2.431	0.077	0.178	432	0.0002	4.67	0.04	0.26
Lab pH	pH units	4.58	9.19	7.14	7.12	432	4.2	10.0	7.7	7.7
Total Alkalinity	µeq/L	25	1852	263	421	432	0	4,797	1,020	1,241
Specific Conductivity	µS/cm	9.99	200	37.5	53.4	399	11	481	125	144
Dissolved Organic Carbon	mg/L	6.6	43.2	20.3	20.4	383	0.2	60.0	19.4	20.4
Sodium	mg/L	0.21	10.8	1.7	2.45	432	0.28	49.0	2.00	4.07
Potassium	mg/L	0.05	1.75	0.40	0.581	432	0.05	14.0	0.620	0.943
Calcium	mg/L	0.28	24.1	5.27	6.78	432	0.25	64.0	14.3	17.0
Magnesium	mg/L	0.005	10.1	1.52	2.10	432	0.05	28.0	4.30	5.34
Sum of Base Cations	µeq/L	40.5	2181	476	632	432	46	5,770	1,247	1,487
Chloride	mg/L	0.04	2.37	0.110	0.295	429	0.01	18.0	0.49	1.09
Sulphate	mg/L	0.02	18.2	1.07	2.70	431	0.03	99.0	2.50	6.73
Nitrate + Nitrite	µg/L	1.0	276	1.0	8.22	445	0.02	1,860	2.0	21.0
Ammonia	µg/L	1.5	586	8.0	19.5	320	0.2	650	11.4	31.8
Total Dissolved Nitrogen	µg/L	270	2750	629	776	150	183	1,904	861	869
Total Phosphorus	µg/L	3	332	36.5	65.8	426	3.0	495	49.0	66.6

Note: Shading denotes significantly different median concentrations using a non-parametric Mann-Whitney test (p<0.05).

¹ NSMWG: NO_xSO_x Management Working Group

Figure F.4-1 Box plots of selected chemical variables for the ASL lakes in 2015 versus 450 regional lakes reported by the NSMWG¹ (WRS 2004).

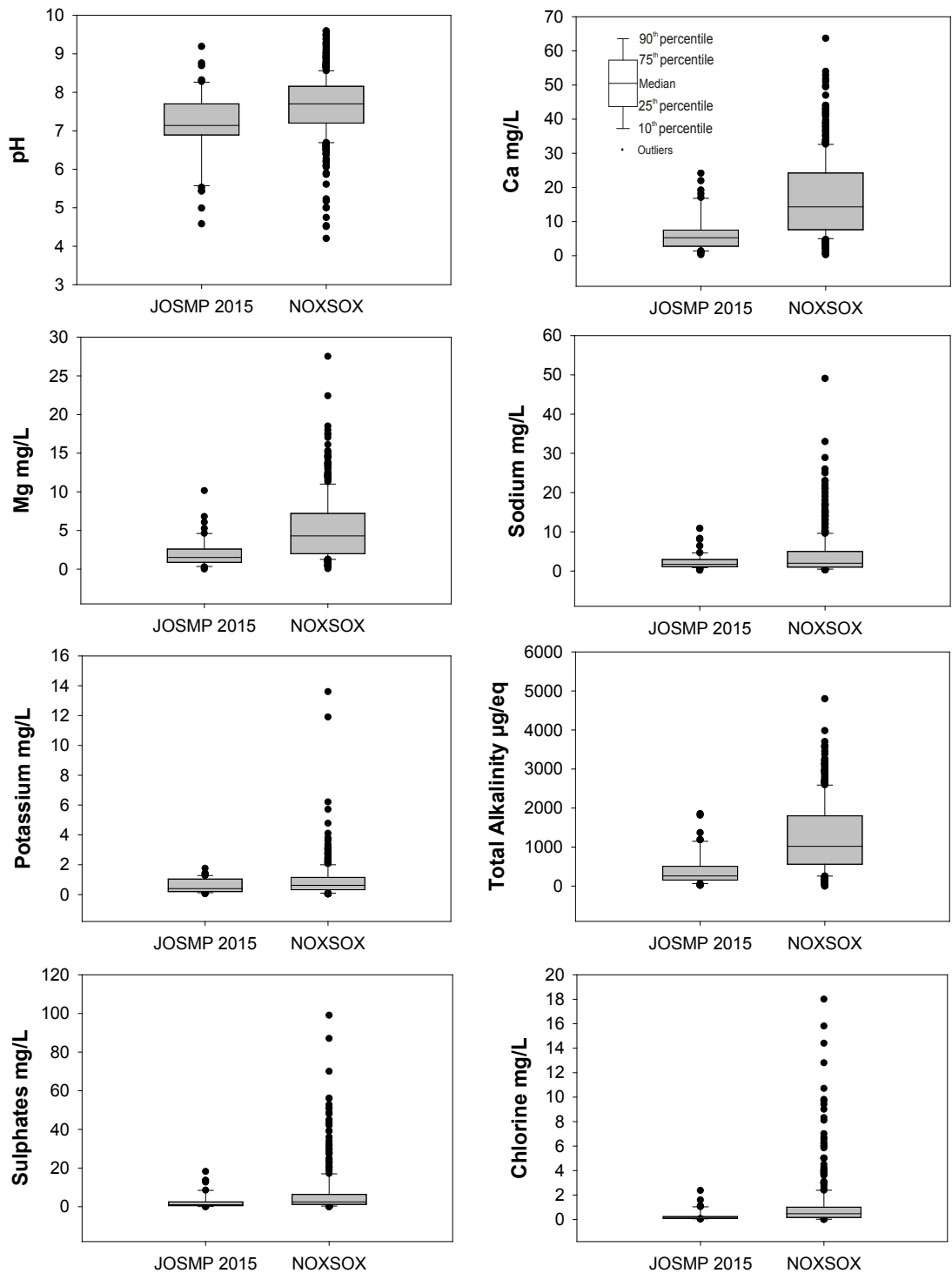
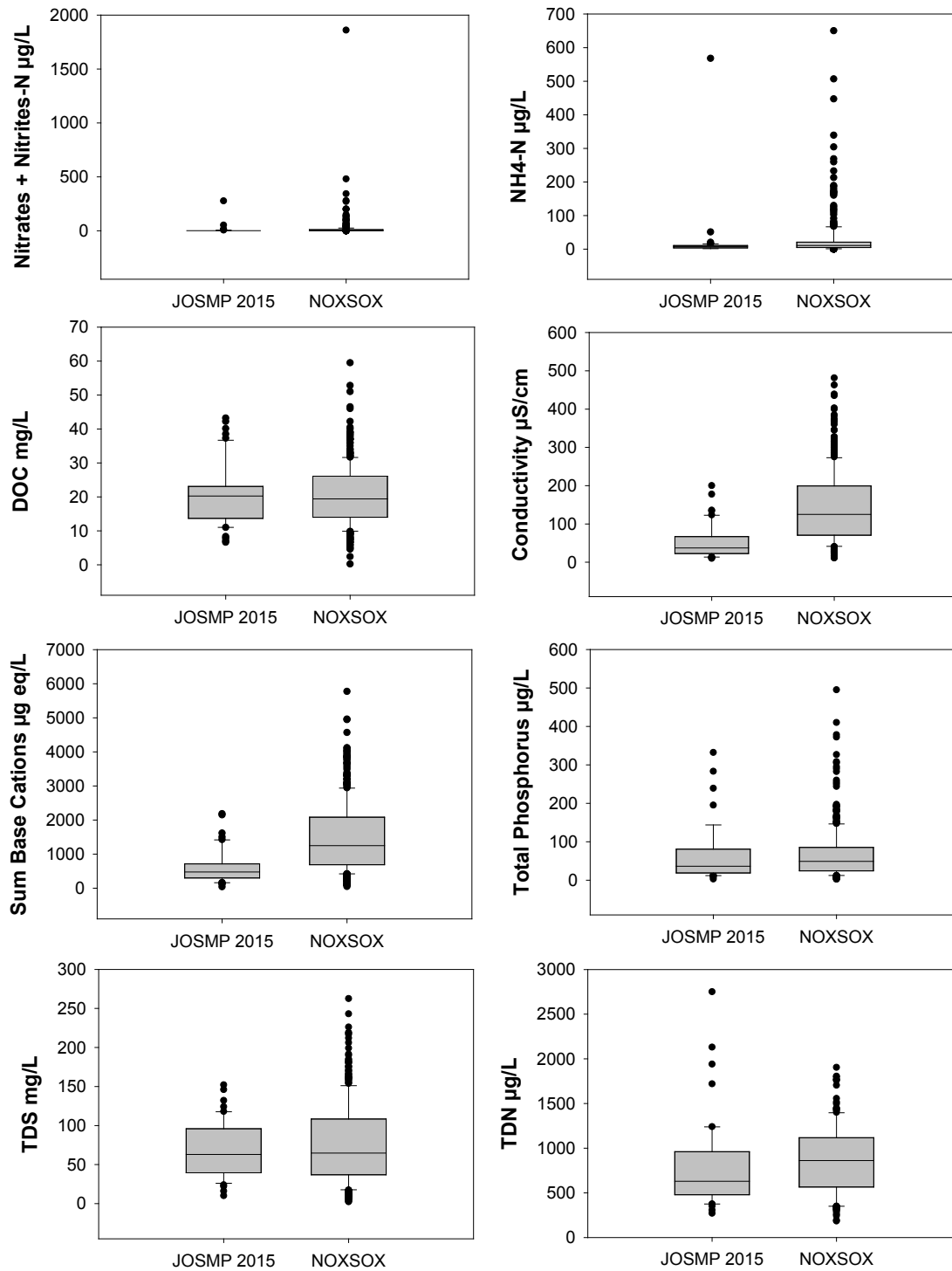


Figure F.4-1 (Cont'd.)



¹ NSMWG: NO_xSO_x Management Working Group.

F.5 CHARACTERIZATION OF ION CHEMISTRY IN THE ASL COMPONENT LAKES

In order to characterize the water of the ASL component lakes, the major anions and cations were displayed in a Piper plot (Figure F.5-1). A Piper plot is a multivariate graphical technique that is used to divide the lakes into four water types on the basis of major cation constituents (Güler et al. 2002; Freeze and Cherry 1979; Back and Hanshaw 1965):

- Type I: Ca^{2+} - Mg^{2+} - HCO_3^- ;
- Type II: Na^+ - K^- - HCO_3^- ;
- Type III: Na^+ - K^- - Cl^- - SO_4^{2-} ; and
- Type IV: Ca^{2+} - Mg^{2+} - Cl^- - SO_4^{2-} .

As in previous years, the Piper plot showed that the majority of the lakes were designated as Type I, dominated by calcium and magnesium bicarbonates. Twelve lakes had greater than 25% of their anionic charge attributable to sulphate and chloride rather than bicarbonates/carbonates (Table F.5-1). These lakes also had a large proportion of their cationic charge (21.7% to 48.8%) attributable to sodium and potassium rather than magnesium and calcium. These twelve lakes therefore tended towards a mixed Type IV – Type II designation. Lake SM5 with 62.1 % of its cationic charge attributable to sodium and potassium and 95% of its anions attributable to bicarbonate/carbonate was unusual in approaching a pure Type II designation.

Most of the 12 lakes in Table F.5-1 were found in the upland areas in the Birch and Stony Mountains. The chemistry of the 12 lakes covers a large range of pH, conductivity, DOC, and Gran alkalinity. The large range in water types shown in the Piper plot (Figure F.5-1) and Table F.5-1 reflects the variability in the source waters to the individual ASL component lakes (e.g., groundwater vs. surface runoff).

Figure F.5-1 Piper plot showing the proportion of major cations and anions in the ASL component lakes in 2015.

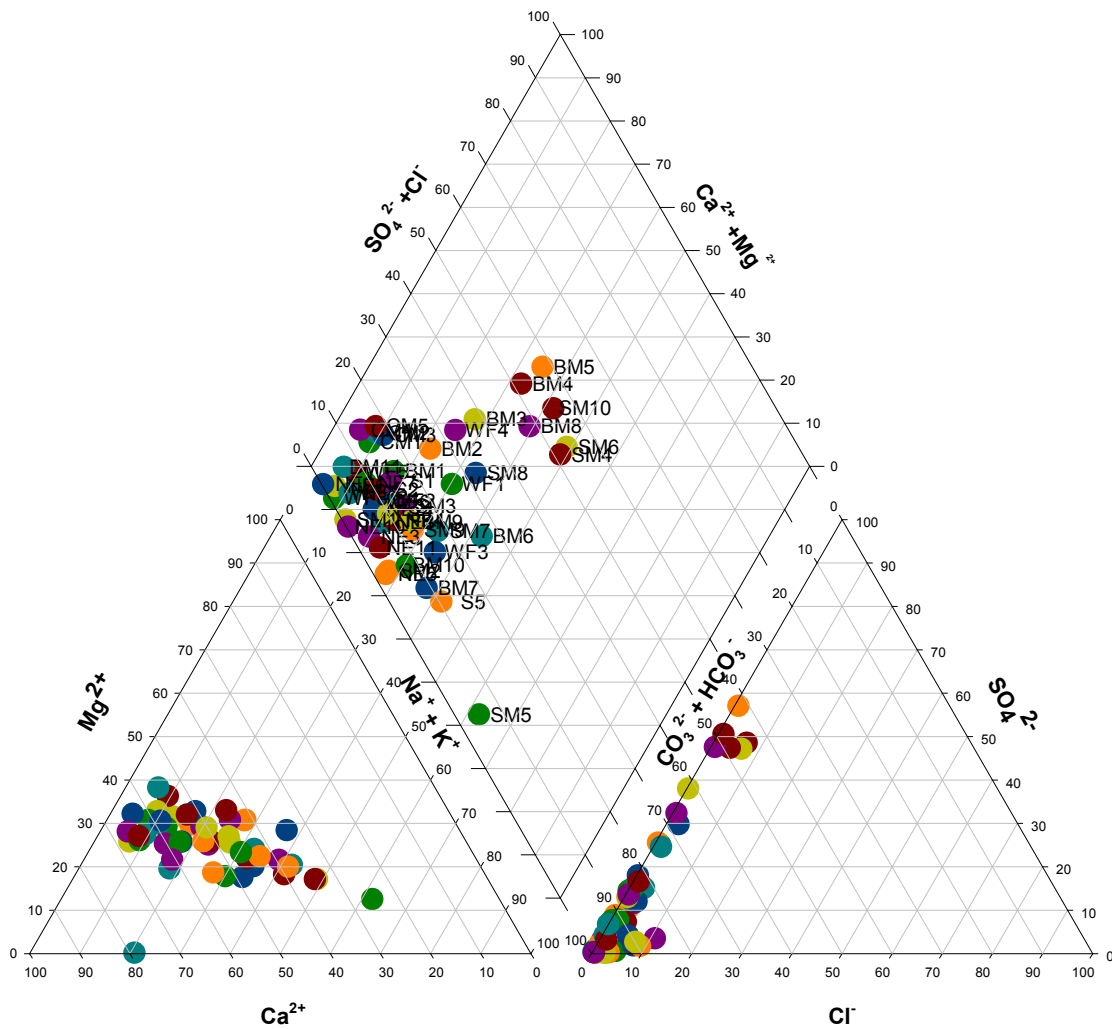


Table F.5-1 Key chemical characteristics of ASL component lakes with greater than 25% of anion charge attributed to sulphate and chloride.

Lake	% Ionic Charge in SO ₄ and CL	% Cationic Charge in Na and K	pH	Gran Alkalinity (µeq/L)	Conductivity (µS/cm)	DOC (mg/L)	Lake Area (km ²)
Stony Mountains Subregion							
SM10	55.3	41.6	5.44	19	12.5	15.5	1.38
SM6	53.6	48.8	4.99	3.6	14.4	17.3	0.71
SM8	32.4	33.6	6.14	31.8	13.0	11.6	2.18
SM4	51.4	48.3	5.47	21.4	10.0	12.5	0.54
West of Fort McMurray Subregion							
WF1	26.3	30.1	6.95	343	42.4	40.1	3.2
WF4	33.3	24.5	7.70	774	134	42.2	0.03
Birch Mountains Subregion							
BM2/Namur	26.1	21.7	7.65	461	67.8	7.0	43.4
BM6	26.3	42.1	5.98	68	20.8	24.2	1.3
BM8/Bayard	48.5	38.9	7.02	258	63.1	19.5	1.2
BM4	51.7	32.3	6.99	245	66.8	18.6	4.37
BM5	57.9	34.7	7.02	184	58.9	21.2	2.61
BM3	38.4	27.2	9.19 *	288	56.9	18.0	0.91

* Identified as outlier in 2015 (> 3SD from mean value). Mean value was 7.17 pH units over the 13 year monitoring program.

F.6 ANALYSIS OF METALS IN THE ASL COMPONENT LAKES

Elevated concentrations of metals, in particular aluminum, have traditionally served as important indicators of lake acidification. Concentrations of metals in the ASL component lakes are summarized in Table F.6-1 and Table F.6-2 for total and dissolved fractions, respectively. Results from both 2015 and the entire monitoring record (2003-2015) are provided in each table. Table F.6-3 presents the mean concentration of each dissolved and total trace metal for the lakes in each subregion over all the monitoring years.

In general, concentrations of trace metals were quite low although individual metals often ranged over two-three orders of magnitude (e.g., aluminum and cadmium). Table F.6-3 shows that the highest concentrations of trace metals were found in lakes located in the upland regions, in particular the Birch and Stony Mountains. The mean concentrations of almost all the dissolved metals including silver, aluminum, arsenic, barium, boron, beryllium, bismuth, cobalt, chromium, copper, iron, lithium, manganese nickel, lead, selenium, vanadium and zinc were greatest in the Birch Mountain lakes. In this subregion, 46 individual metals over eleven lakes had mean dissolved metal concentrations greater than the 95th percentile for each metal calculated over all lakes and years (Table F.6-4). For comparison, the NE of Fort McMurray subregion, containing the same number of lakes (11) had only 7 trace metals exceeding the 95th percentile for each metal.

Table F.6-1 Statistical summary of total trace metals in the ASL Component lakes, 2003 to 2015.

Metal (µg/L)	2003 to 2015						2015					
	Minimum	Maximum	Mean	Median	95%tile	N	Minimum	Maximum	Mean	Median	95%tile	% Non-Detects
Ag	0.00025	0.103	0.00678	0.0025	0.00025	664	0.001	0.02	0.003	0.001	0.010	48
Al	0.25	8690	187	61.7	8.75	664	3.1	3000	217	54.3	652	0
As	0.127	4.43	0.519	0.391	0.181	663	0.127	2.12	0.473	0.366	1.22	0
Ba	0.63	83.2	14.9	12	4.51	664	0.63	73.1	16.6	12.2	47.8	0
B	0.002	71.2	12.7	8.77	2.8	664	1.7	57.9	13.6	9.4	35.9	0
Be	0.0015	9.3	0.0684	0.0104	0.0015	620	0.004	0.135	0.0156	0.004	0.047	76
Bi	0.0005	0.359	0.00637	0.0025	0.0005	664	0.0005	0.031	0.0065	0.002	0.029	60
Ca	0.25	24.1	5.86	4.83	1.02	664	0.33	24.1	6.83	5.37	18.7	0
Cd	0.001	9.94	0.0324	0.01	0.001	664	0.001	0.119	0.013	0.0075	0.037	38
Cl	0.02	9.2	0.475	0.192	0.05	664	0.02	2.26	0.283	0.165	1.13	14
Co	0.0005	2.2	0.166	0.087	0.0151	664	0.003	0.742	0.135	0.079	0.495	2
Cr	0.015	7.3	0.386	0.24	0.06	664	0.04	3.61	0.362	0.21	0.858	26
Cu	0.025	23.6	0.618	0.318	0.0789	664	0.025	2.55	0.36	0.19	1.32	22
Fe	2.37	6750	648	384	27	664	9	5990	636	323	1760	0
Li	0.01	16.9	2.65	1.76	0.11	664	0.5	11.5	3.14	2.04	9.53	0
Mn	3.24	469	46.1	33.1	8.81	664	4.76	137	39.5	31.4	114	0
Mo	0.0005	1.1	0.119	0.0831	0.0113	664	0.007	0.591	0.132	0.091	0.337	2
Ni	0.0025	46	0.717	0.28	0.0025	664	0.004	11.2	0.807	0.259	3.57	26
Pb	0.0005	95.3	0.343	0.106	0.018	664	0.0015	1.47	0.156	0.065	0.543	14
Sb	0.00025	0.2	0.0282	0.0192	0.00781	664	0.007	0.144	0.0292	0.021	0.090	4
Se	0.02	0.9	0.106	0.05	0.03	664	0.03	0.3	0.0596	0.03	0.171	74
Sn	0.0015	3.02	0.0777	0.015	0.009	664	0.0015	0.113	0.0191	0.013	0.047	4
Sr	1.9	109	24.3	19.5	5.69	664	2.27	78.5	26.2	22.3	68.9	0
Th	0.00015	0.72	0.0334	0.00975	0.00015	664	0.00045	0.493	0.0303	0.00375	0.114	40
Ti	0.1	79	2.91	1.15	0.3	664	0.21	27.3	3.01	1.36	8.70	2
Tl	0.00015	0.077	0.00396	0.0022	0.00015	664	0.00045	0.0478	0.00631	0.00355	0.020	10
U	0.0004	0.432	0.0417	0.0139	0.0015	664	0.0015	0.386	0.043	0.015	0.164	22
V	0.0025	15.5	0.747	0.36	0.0741	664	0.03	9.93	0.782	0.31	2.37	0
Zn	0.05	34.4	3.38	2.48	0.4	664	0.2	11.2	2.5	1.9	8.43	6
Hg T ng/L	0.25	6.36	2.02	1.72	0.514	195	0.25	8.46	2.25	1.89	5.58	6
Hg M ng/L	0.005	0.528	0.0942	0.064	0.0157	135	0.005	0.343	0.0812	0.062	0.263	6.12

non-detectable with the value in each cell equivalent to one-half of the detection limit.

Table F.6-2 Statistical summary of dissolved trace metals in the ASL lakes, 2003 to 2015.

Metal (µg/L)	2003 to 2015						2015					
	Minimum	Maximum	Mean	Median	95%tile	N	Minimum	Maximum	Mean	Median	95%tile	% Non-Detects
Ag	0.00025	0.102	0.00231	0.0005	0.008	561	0.0005	0.008	0.00154	0.001	0.006	48
Al	0.1	850	71.5	24	327	561	0.66	828	65.8	18.7	222	0
As	0.08	2.94	0.439	0.33	1.17	561	0.112	1.17	0.375	0.305	0.855	0
Ba	0.35	57.9	11.4	9.66	25.2	561	0.35	57.9	12	9.45	27.	0
B	1.71	62.3	11.1	7.2	27.9	561	1.71	54.6	12	7.07	32.5	0
Be	0.0015	0.3	0.0139	0.0055	0.053	561	0.0045	0.06	0.00894	0.0045	0.029	76
Bi	0.0005	0.089	0.00448	0.0018	0.0156	561	0.0015	0.03	0.00616	0.0015	0.026	60
Ca	0.21	21.9	5.58	4.57	15.8	561	0.25	21.9	6.39	5	17.2	0
Cd	0.001	5.82	0.021	0.005	0.0371	561	0.001	0.078	0.0072	0.003	0.021	38
Cl	0.015	2.88	0.301	0.138	1.2	561	0.015	2.1	0.269	0.15	1.050	14
Co	0.0005	1.59	0.112	0.0435	0.43	561	0.001	0.318	0.0708	0.03	0.287	2
Cr	0.02	1.88	0.242	0.187	0.658	561	0.05	1.2	0.239	0.2	0.555	26
Cu	0.005	2.13	0.395	0.257	1.33	561	0.04	1.7	0.286	0.15	1.0	22
Fe	0.01	3890	393	145	1710	561	2	2170	313	138	1250	0
Li	0.01	16.4	2.48	1.58	7.8	517	0.39	11.3	2.92	1.94	8.12	0
Mn	0.06	388	19.1	4.07	77.1	561	0.07	116	10.6	2.54	44.6	0
Mo	0.0005	1.43	0.0996	0.0667	0.325	561	0.001	0.563	0.111	0.0765	0.308	2
Ni	0.0025	4.18	0.473	0.177	2.47	561	0.003	2.52	0.366	0.104	1.87	26
Pb	0.0005	16.3	0.121	0.039	0.391	561	0.002	0.585	0.0658	0.0245	0.257	14
Sb	0.00025	0.179	0.0271	0.0185	0.0824	561	0.004	0.142	0.0288	0.021	0.089	4
Se	0.005	0.9	0.0785	0.05	0.25	561	0.02	0.24	0.0372	0.02	0.106	74
Sn	0.0015	0.0889	0.0188	0.015	0.05	561	0.0015	0.04	0.0135	0.010	0.030	4
Sr	1.62	101	22.9	18.3	58	561	1.7	76.4	24.2	20	66.9	0
Th	0.00015	0.438	0.0276	0.0088	0.129	561	0.0004	0.257	0.0235	0.0028	0.110	40
Ti	0.02	15.9	1.25	0.522	6.2	561	0.04	13	1.32	0.72	3.41	2
Tl	0.00015	0.043	0.00289	0.0018	0.0084	561	0.0002	0.0206	0.00493	0.0031	0.017	10
U	0.0002	0.365	0.0305	0.0088	0.127	561	0.001	0.303	0.0316	0.0085	0.111	22
V	0.01	3.94	0.377	0.195	1.57	561	0.02	2.84	0.312	0.16	0.901	0
Zn	0.045	29.5	2.56	1.9	6.54	561	0.045	5.62	1.43	0.85	3.480	6

Note: For the purpose of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory. Shaded values are non-detectable with the value in each cell equivalent to one-half of the detection limit.

Table F.6-3 Mean concentrations of total and dissolved trace metals in the ASL component lakes in each subregion, 2003 to 2015.

Metal	Mean Concentrations µg/L – Dissolved Metals						Mean Concentrations µg/L – Total Metals					
	SM	WFM	NEFM	BM	CS	CM	SM	WFM	NEFM	BM	CS	CM
Ag	0.00122	0.00188	0.00108	0.00439	0.00319	0.00233	0.00576	0.00595	0.00568	0.00935	0.00589	0.00761
Al	78.1	17.8	35.1	162	17	61.9	227	49.3	61.2	451	39.5	135
As	0.324	0.335	0.395	0.743	0.182	0.495	0.383	0.399	0.435	0.91	0.201	0.586
Ba	7.42	9.74	10.4	17.8	6.18	15.8	9.54	14.2	13.2	23.5	7.41	17.9
B	6.44	12.4	11.3	18.5	6.14	5.24	8.39	15	12.9	19.5	7.51	6.48
Be	0.0147	0.00473	0.00769	0.026	0.0126	0.013	0.0216	0.00719	0.0131	0.0344	0.00996	0.497
Bi	0.00465	0.00403	0.0044	0.00564	0.00267	0.00402	0.00637	0.00543	0.00682	0.00868	0.00294	0.00489
Ca	1.85	8.02	8.46	4.73	5.48	5.53	1.98	8.55	8.53	4.99	5.82	5.74
Cd	0.0143	0.00829	0.0543	0.0159	0.0033	0.0108	0.0214	0.0158	0.0802	0.025	0.00629	0.0187
Cl	0.167	0.189	0.233	0.161	1.38	0.213	0.367	0.342	0.389	0.333	1.56	0.31
Co	0.163	0.0491	0.0693	0.207	0.0172	0.0622	0.216	0.0871	0.0993	0.313	0.0374	0.119
Cr	0.216	0.157	0.195	0.374	0.21	0.261	0.321	0.204	0.262	0.753	0.243	0.364
Cu	0.341	0.204	0.214	0.669	0.323	0.663	0.68	0.446	0.414	0.882	0.377	0.852
Fe	282	122	234	879	192	480	447	302	457	1330	381	719
Li	0.798	2.76	2.03	5.19	1.2	1.6	0.859	2.95	2.06	5.54	1.35	1.72
Mn	27.7	22.4	14.6	24.8	2.44	6.51	43.2	69.8	49.3	50.1	26.6	17.5
Mo	0.0858	0.038	0.0426	0.178	0.149	0.124	0.0971	0.0569	0.0596	0.2	0.176	0.142
Ni	0.312	0.113	0.142	1.27	0.107	0.635	0.881	0.228	0.203	1.62	0.138	0.772
Pb	0.0962	0.0541	0.178	0.185	0.0256	0.0977	0.201	0.132	0.781	0.353	0.133	0.184
Sb	0.0216	0.0179	0.0154	0.0549	0.0103	0.0311	0.0223	0.0191	0.0162	0.0573	0.0106	0.0316
Se	0.0719	0.0641	0.0647	0.11	0.0786	0.0714	0.0964	0.0827	0.0876	0.15	0.103	0.0997
Sn	0.0185	0.018	0.0187	0.0198	0.0181	0.0196	0.0674	0.0225	0.0473	0.105	0.12	0.148
Sr	8.38	33	25.2	27.7	31.2	13.4	9.08	35.4	25.9	29.5	32.9	13.9
Th	0.0199	0.00547	0.0107	0.0685	0.0158	0.0334	0.0229	0.00861	0.0113	0.0881	0.0159	0.0337
Ti	1.03	0.395	0.587	3.08	0.468	0.998	2.54	1.13	1.2	7.22	0.9	2.22
Tl	0.00423	0.00162	0.00158	0.004	0.00278	0.00235	0.0049	0.00232	0.00173	0.00746	0.00241	0.00297
U	0.0122	0.00462	0.00594	0.048	0.105	0.0546	0.02	0.00849	0.00829	0.065	0.134	0.0641
V	0.325	0.191	0.292	0.785	0.0884	0.291	0.607	0.351	0.463	1.74	0.175	0.559
Zn	3.05	2.22	2.16	3.55	0.742	2.27	3.82	2.77	3.08	4.83	1.03	3.08
Hg T ng/L							2.18	1.6	1.67	2.66	1.26	2.64
Hg M ng/L							0.0797	0.137	0.0679	0.116	0.0487	0.101

Notes: SM = Stony Mountains, WFM = west of Fort McMurray, NEFM = north east of Fort McMurray, BM = Birch Mountains, CS = Canadian Shield, CM = Caribou Mountains.
For purpose of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory.

Table F.6-4 Number of lakes in each subregion with mean concentrations of trace metals greater than the 95th percentile.

Subregion	No. of Lakes in Region	No. of Trace Metals with Mean > 95 th Percentile ¹	Ratio of No. of Trace Metals > 95 th Percentile to No. of Lakes ²	Mean pH (2015)
Stony Mountains	10	1	0.10	6.05
West of Fort McMurray	8	2	0.25	7.17
North-East of Fort McMurray	11	7	0.64	7.42
Birch Mountains	11	46	4.18	6.74
Canadian Shield	5	4	0.80	7.43
Total	45	60		

¹ Mean metal concentration for each lake calculated across all years.

² 95th percentile calculated for each metal across all lakes and years.

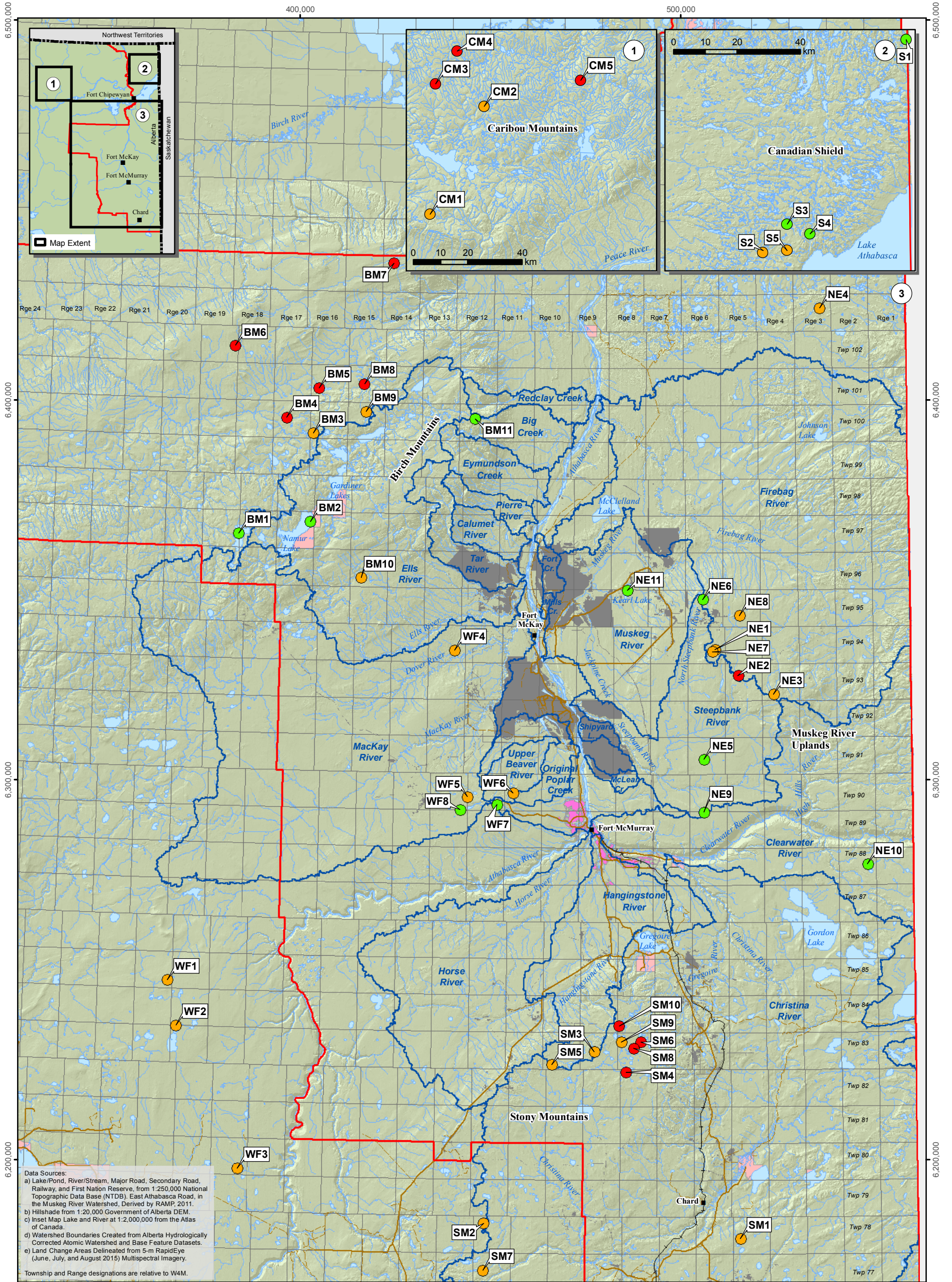
Maps of dissolved aluminum, lead, iron, and cobalt in the ASL component lakes clearly show the higher concentrations of trace metals in the upland regions, especially the Birch and Stony Mountain subregions (Figure F.6-1 to Figure F.6-4). The lakes with the highest concentrations of metals included those identified in the Piper plot as having a high proportion of the anionic charge attributed to chloride and sulphate rather than bicarbonates.

The reason for the higher concentrations of metals in the upland regions, especially in the Birch Mountains subregion, was unclear but may be related to the relatively low mean pH in these lakes (Table F.6-4). The high concentrations of metals in lakes of the Birch Mountains subregion may also be related to the known presence of poly-metallic black shales in the Birch Mountains (DNI 2012). The high concentrations of chloride and sulphate, as well as high concentrations of barium in lakes of the Birch Mountains subregion suggest a potential groundwater source for these metals. The relatively high concentrations of metals in these lakes; therefore, are natural in origin rather than the result of emissions from regional industry.

To determine whether metal concentrations are increasing in the ASL component lakes, the potential result of acidification, a Mann-Kendall trend analysis was conducted on dissolved aluminum, arsenic, chromium, cobalt, iron, and lead in all 50 lakes from 2003 to 2015. Significant increases in the concentrations of these metals included:

- aluminum in lake NE9/270;
- arsenic in lakes WF2/171, BM1/444 (Legend L.), CM4/97;
- chromium in Sm5/167; and
- iron in lakes WF5/225, WF7/227, S2/84, and CM4/97.

Figure F.6-1 Concentrations of dissolved aluminum in the ASL component lakes, 2015.



Data Sources:
a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, and First Nation Reserve, from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.
b) Hillshade from 1:20,000 Government of Alberta DEM.
c) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.
d) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.
e) Land Change Areas Delineated from 5-m RapidEye (June, July, and August 2015) Multispectral Imagery.
Township and Range designations are relative to W4M.

Legend

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Town of Fort McMurray
- Land Change Area as of 2015^e

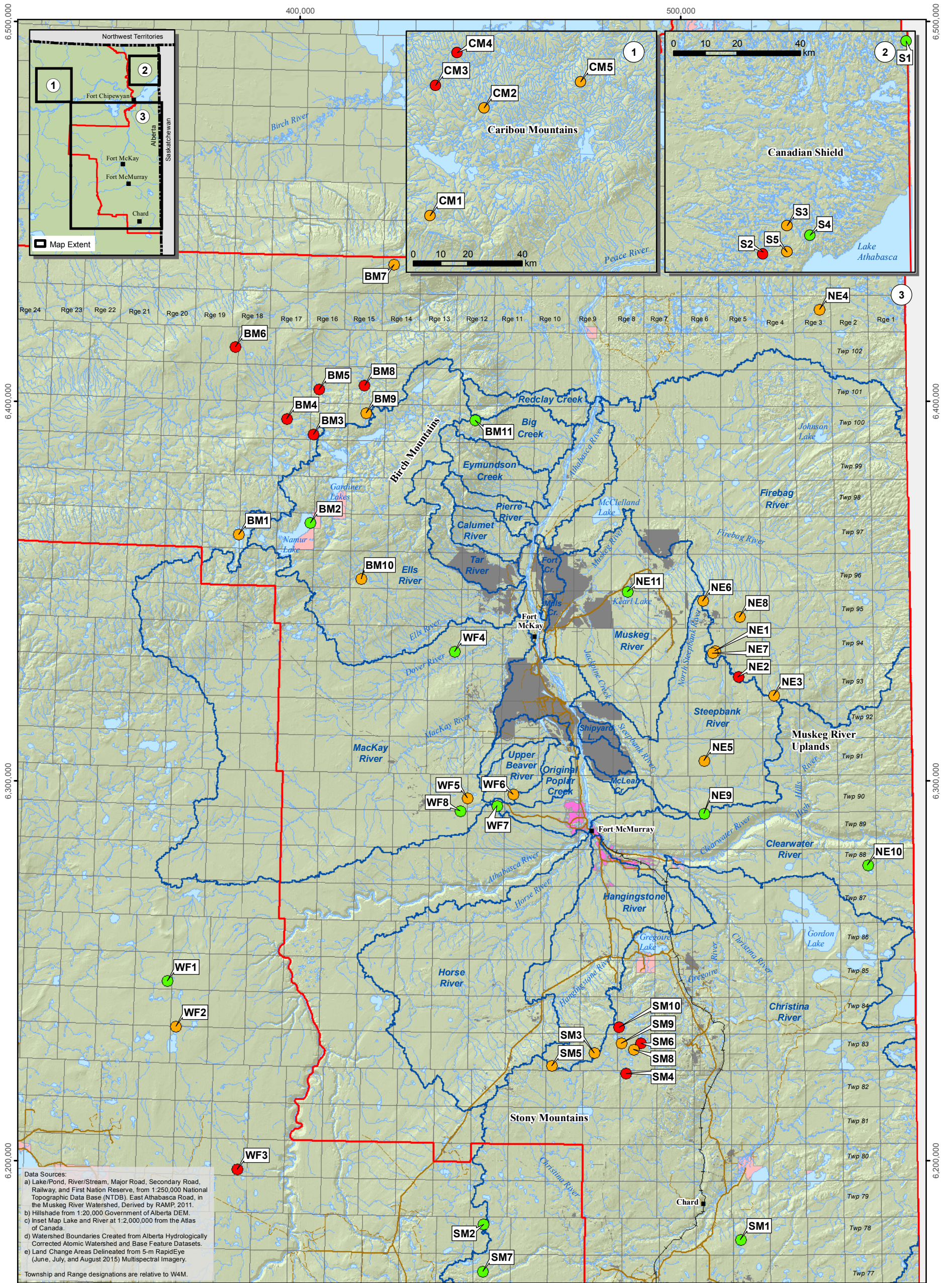
Dissolved Aluminum Concentration

- Low ($\le 6.45 \mu\text{g/L}$)
- Medium (6.46 to 64.6 $\mu\text{g/L}$)
- High (> 64.6 $\mu\text{g/L}$)

0 5 10 20 km
Scale: 1:1,000,000
Projection: NAD 1983 UTM Zone 12N



Figure F.6-2 Concentrations of dissolved iron in the ASL component lakes, 2015.



Data Sources:
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, and First Nation Reserve, from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.
 b) Hillshade from 1:20,000 Government of Alberta DEM.
 c) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.
 d) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.
 e) Land Change Areas Delineated from 5-m RapidEye (June, July, and August 2015) Multispectral Imagery.
 Township and Range designations are relative to W4M.

Legend

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Town of Fort McMurray
- Land Change Area as of 2015^e

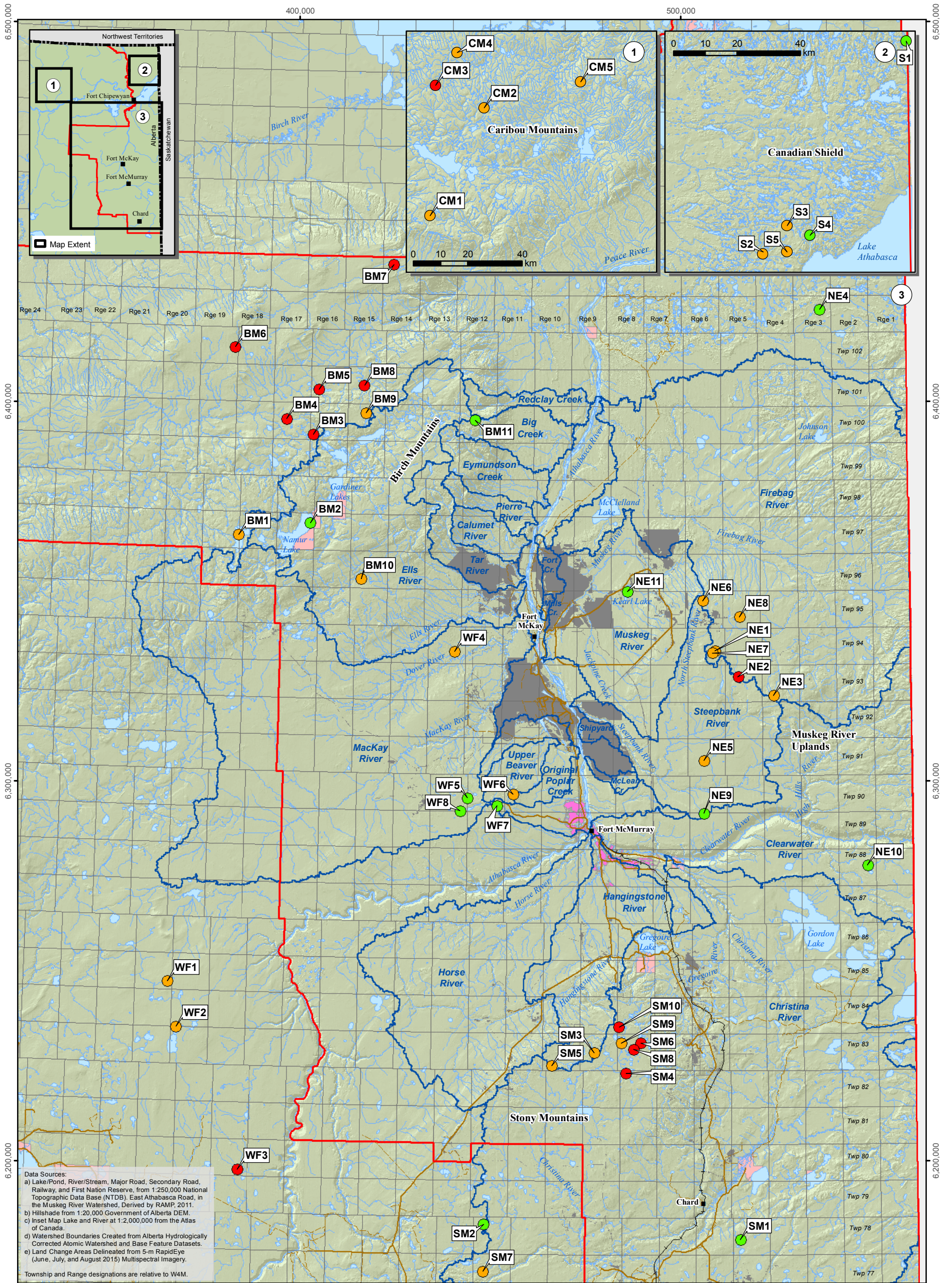
Dissolved Iron Concentration

- Low ($\leq 24.5 \mu\text{g/L}$)
- Medium (24.6 to $344 \mu\text{g/L}$)
- High ($> 344 \mu\text{g/L}$)

0 5 10 20 km
 Scale: 1:1,000,000
 Projection: NAD 1983 UTM Zone 12N



Figure F.6-3 Concentrations of dissolved cobalt in the ASL component lakes, 2015.



Legend

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Town of Fort McMurray
- Land Change Area as of 2015^e

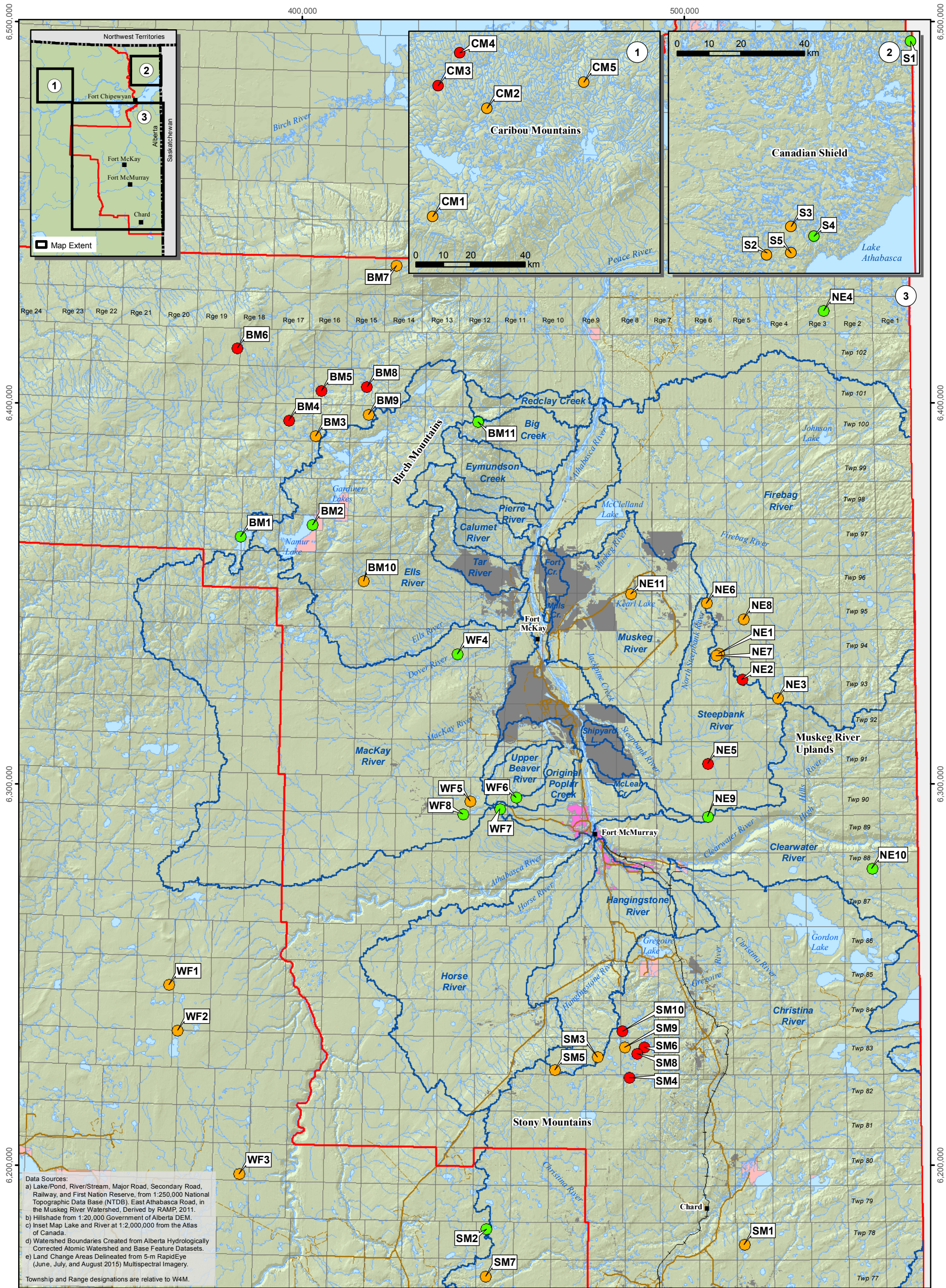
Dissolved Cobalt Concentration

- Low ($\leq 0.015 \mu\text{g/L}$)
- Medium ($0.016 \text{ to } 0.078 \mu\text{g/L}$)
- High ($> 0.078 \mu\text{g/L}$)

0 5 10 20 km
Scale: 1:1,000,000
Projection: NAD 1983 UTM Zone 12N



Figure F.6-4 Concentrations of dissolved lead in the ASL component lakes, 2015.



Data Sources:
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, and First Nation Reserve, from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.
 b) Hillshade from 1:20,000 Government of Alberta DEM.
 c) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.
 d) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.
 e) Land Change Areas Delineated from 5-m RapidEye (June, July, and August 2015) Multispectral Imagery.
 Township and Range designations are relative to W4M.

Legend

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Town of Fort McMurray
- Land Change Area as of 2015^e

Dissolved Lead Concentration

- Low ($\leq 0.008 \mu\text{g/L}$)
- Medium (0.009 to 0.041 $\mu\text{g/L}$)
- High ($> 0.041 \mu\text{g/L}$)

0 5 10 20 km
 Scale: 1:1,000,000
 Projection: NAD 1983 UTM Zone 12N



These variables were plotted in control plots in Figure F.6-5 to Figure F.6-7. When the rules for interpreting control charts are applied (Section 3.2.5.2), none of the metals showed an increasing trend. Exceedances of the 2SD limit were observed in several metals including aluminum in Lake NE9, chromium in Lake SM5 and iron in Lakes WF5, WF7 and S2. However, in most cases, metal concentrations returned to more typical levels the following year. Most of these exceedances of the 2SD limit occurred in 2013, which had higher than normal metal concentrations noted in the 2014 technical report. Many of the control charts in Figure F.6-5 to Figure F.6-7 (e.g., aluminum in NE9 and arsenic in BM1) indicate that the levels of these metals are extremely low and that the trend analysis is actually capturing natural variability that is well within the analytical error itself and of little ecological significance. The fact that these increasing trends in iron were observed in *baseline* Lakes S2 in the Canadian Shield and CM4 in the Caribou Mountains, both remote from acidifying emissions, also suggested that these changes are regional and unrelated to acidification.

F.6.1 Guideline Exceedances of Metals in the ASL Lakes

The exceedances of the CCME and AEP Surface Water Quality Guidelines for the protection of aquatic life in 2015 (CCME 2007; AESRD 2014) are provided in Table F.6-5. When required, the guidelines were corrected for water hardness (AESRD 2014). Exceedances were observed in concentrations of aluminum, iron, cadmium, copper, nickel and mercury. The guideline exceedances were scattered throughout the various subregions, with a large number occurring in lakes in the Birch Mountains subregion, consistent with higher concentrations of metals found in lakes in this subregion. The AEP guideline for mercury was exceeded in one Birch Mountain lakes (BM8).

F.6.2 Analysis of Low-Level Mercury and Methylmercury in the ASL Component Lakes

In 2015, low-level inorganic mercury and methyl mercury analyses were conducted on water from the 50 ASL component lakes (Table F.6-6). Concentrations of inorganic mercury ranged from 0.290 ng/L to 5.26 ng/L (median: 1.36 ng/L), while methylmercury ranged from non-detectable to 0.343 ng/L (median: 0.062 ng/L). A regression of methylmercury against inorganic mercury (Figure F.6-8) indicated a significant relationship between the two variables ($p < 0.0007$). There was one exceedance of the Alberta guideline for inorganic mercury observed in Lake SM8 in the Stony Mountains.

Figure F.6-5 Control charts for ASL component lakes showing significant increases in concentrations of dissolved aluminum and arsenic, 2003 to 2015.

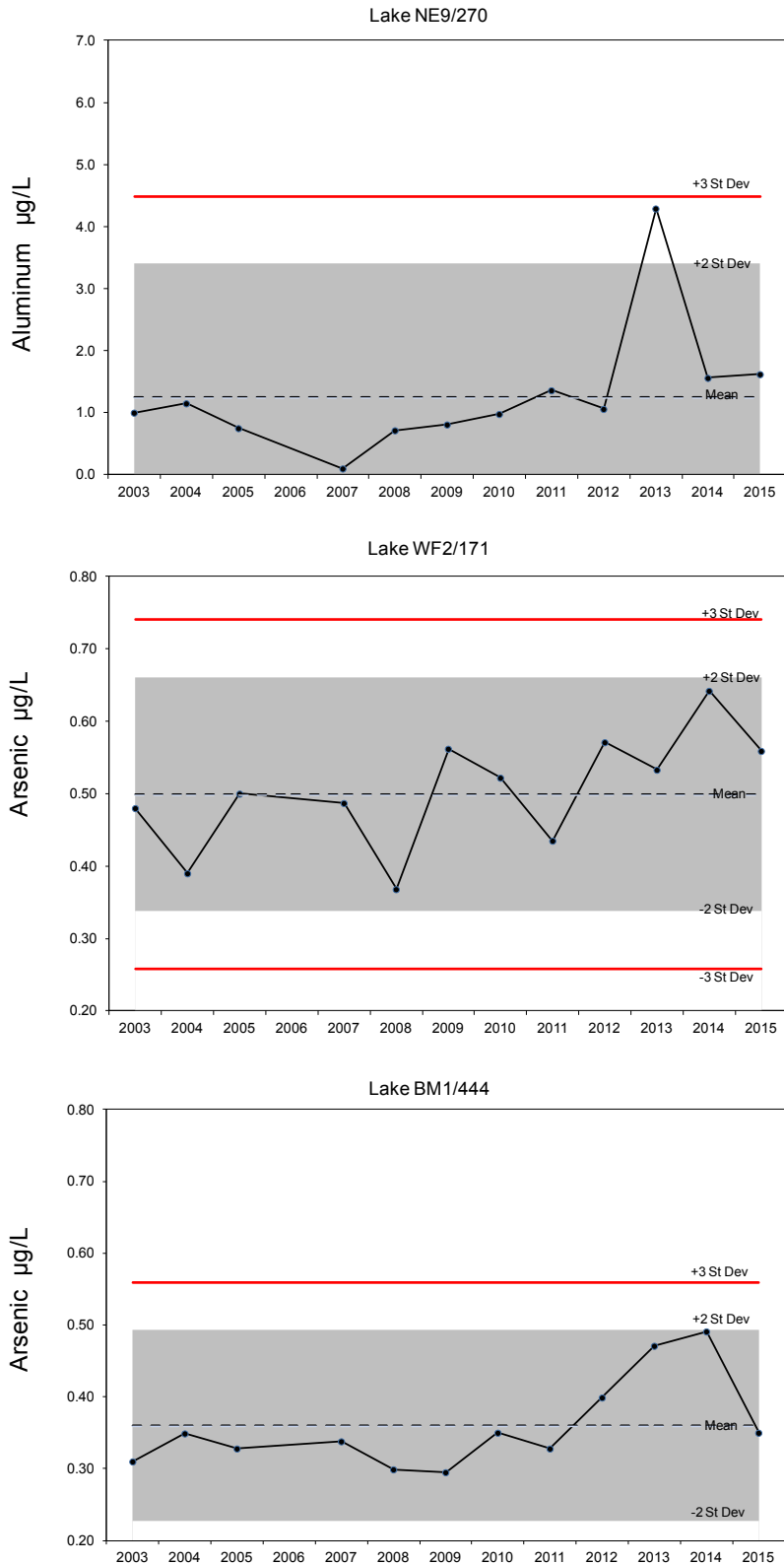


Figure F.6-6 Control charts for ASL component lakes showing significant increases in concentrations of dissolved arsenic, chromium and iron, 2003 to 2015.

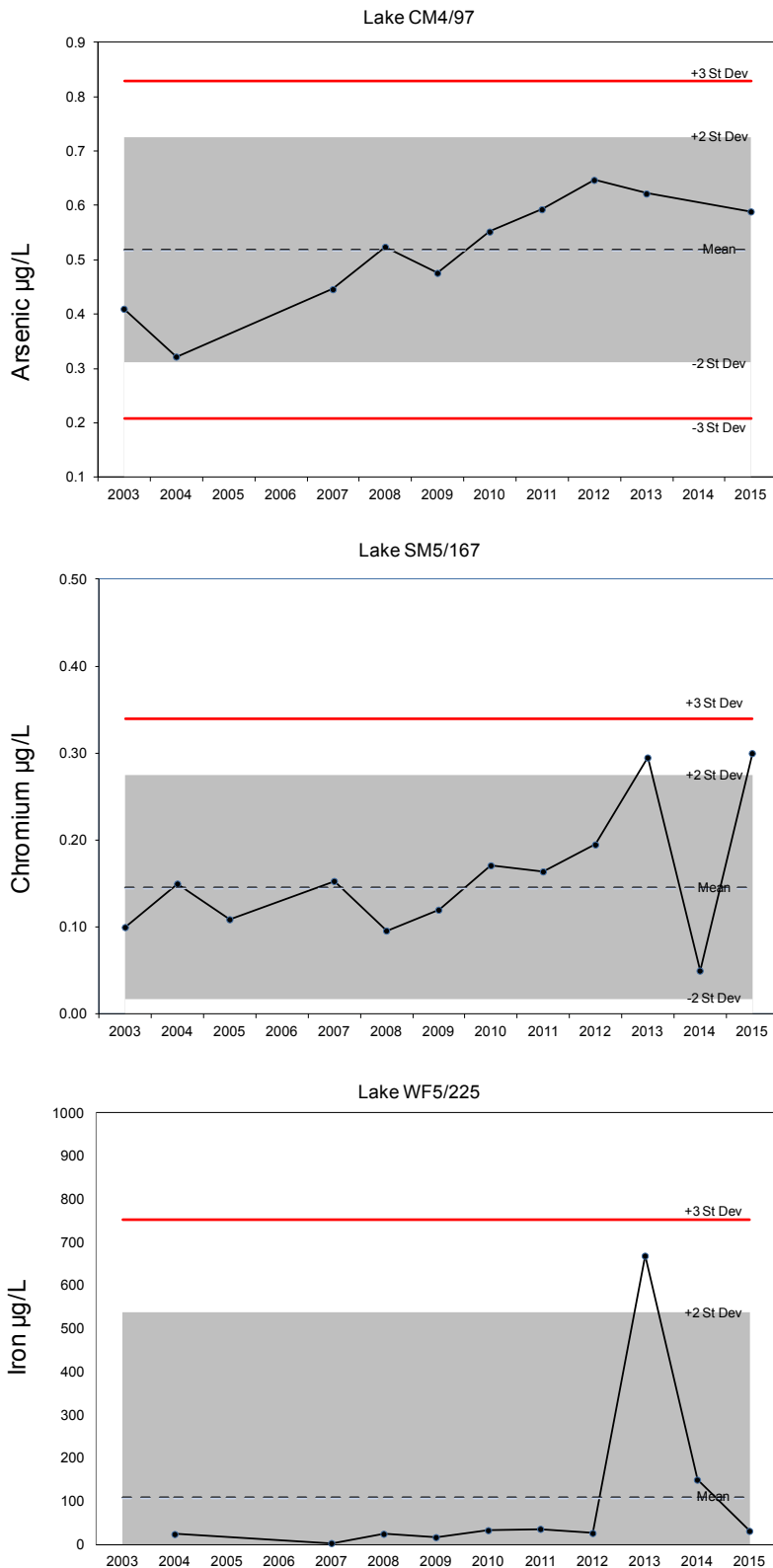


Figure F.6-7 Control charts for ASL component lakes showing significant increases in concentrations of dissolved iron, 2003 to 2015.

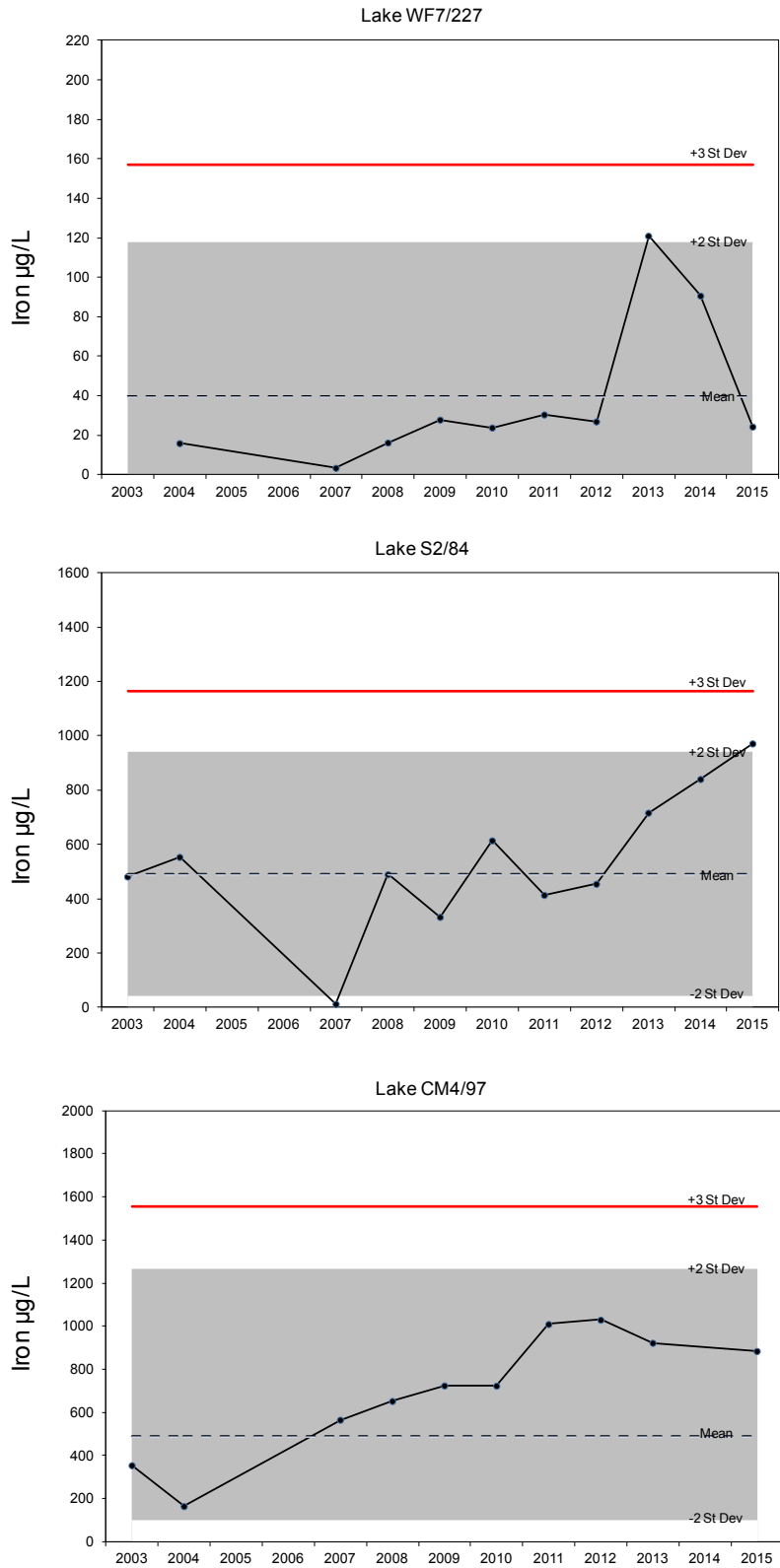


Table F.6-5 ASL component lakes with exceedances of CCME and AEP surface water quality guidelines for total metals in 2015.

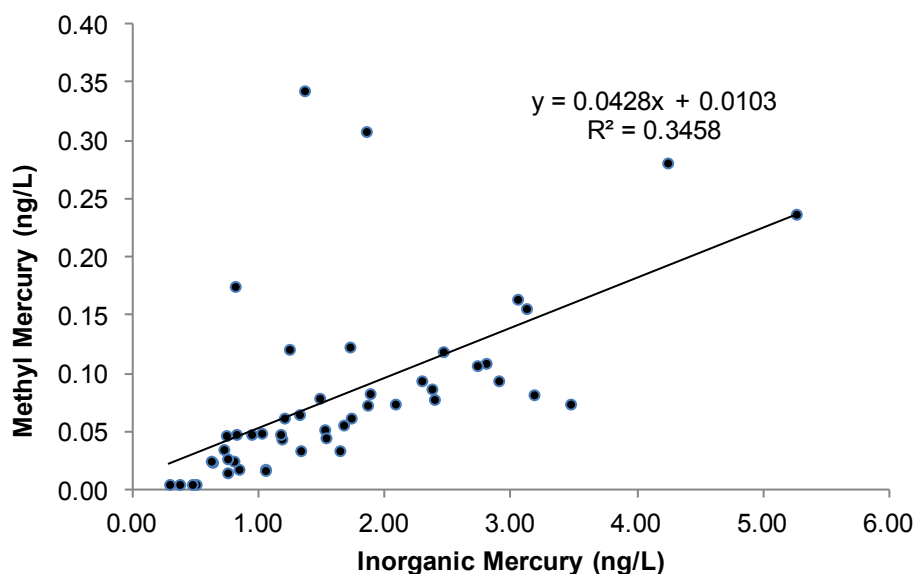
Metal	Number of Exceedances	Lakes with Exceedances
Al	18	SM10, SM9, SM6, SM5, SM8, SM4, WF3, NE1, NE2, BM6, BM7, BM8, BM4, BM5, S5, CM3, CM4, CM5
Fe	13	SM10, SM6, SM4, WF3, NE2, BM6, BM8, BM4, BM5, BM3, S2, CM3, CM4
Cd	1	CM2
Cu	2	BM8, BM9
Ni	1	SM3
Hg total	1	BM8

Table F.6-6 Concentrations of low-level inorganic mercury and methylmercury in the ASL component lakes in 2015.

	Inorganic Mercury (ng/L)	Methyl Mercury (ng/L)
Min	0.290	0.005
Max	5.260	0.343
Mean	1.657	0.081
Median	1.360	0.062
No. of Exceedances	1	0
CCME PAL Guideline	26.0	4.0
AESRD Guideline	5.0	1.0

Shaded value is non-detectable with the value equivalent to one-half of the detection limit

Figure F.6-8 Regression of methyl mercury on total mercury in the ASL Component Lakes.



Appendix G
Special Studies

G SPECIAL STUDIES COMPONENT

G.1 STATUS OF FISH IN THE ATHABASCA RIVER – PILOT STUDY

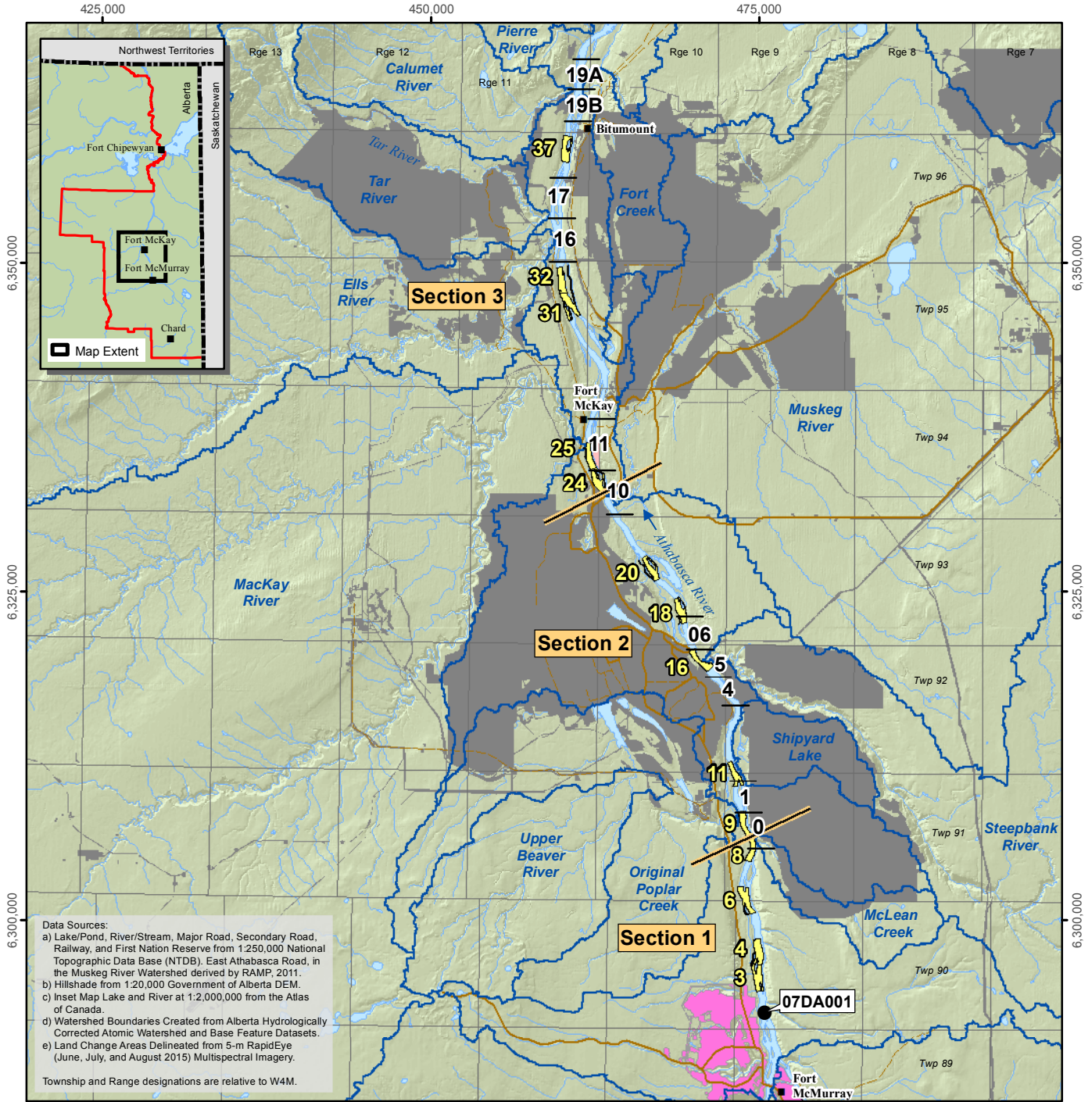
G.1.1 Reach Selection and Mapping

Fish sampling for the Athabasca River pilot study was conducted within 14 randomly-selected reaches, each 2 km long, located within an 80 km stretch of the Athabasca River between Fort McMurray and Bitumont, Alberta (Figure G.1-1). The standard reach selection approach defined by ASRD (2011) was modified to incorporate a stratified random sampling design. Forty 2 km long reaches were created within the 80 km stretch of the Athabasca River between Fort McMurray and Bitumont. These 40 reaches were divided into three sections based on confluences of the river with major tributaries and oil sands developments:

- Section 1 – section of river largely uninfluenced by oil sands mining development (although downstream from in situ developments in the Christina River watershed), but downstream of town of Fort McMurray, extending from just below the Clearwater River confluence to Poplar Creek);
- Section 2 – section of river adjacent to Suncor and Syncrude oil sands development, extending from McLean Creek to just upstream of the Muskeg River confluence; and
- Section 3 – section of river adjacent to oil sands development in the Muskeg, Ells, Tar rivers, and Fort Creek, extending downstream to Bitumont.

Four or five of the 2 km sampling reaches were randomly selected using a random number generator within each of the three river sections. Each 2 km sampling reach was further sub-divided into four 500 m sub-reaches. Maps of each sampling reach were created using 5 m RapidEye satellite imagery, with each sub-reach demarcated to facilitate logistical planning and to verify habitat characteristics. Individual reach maps are provided in Figure G.1-2 to Figure G.1-15.

Figure G.1-1 Overview of sampling area and sampling reaches for the Athabasca Summer Fish Inventory Pilot Study.



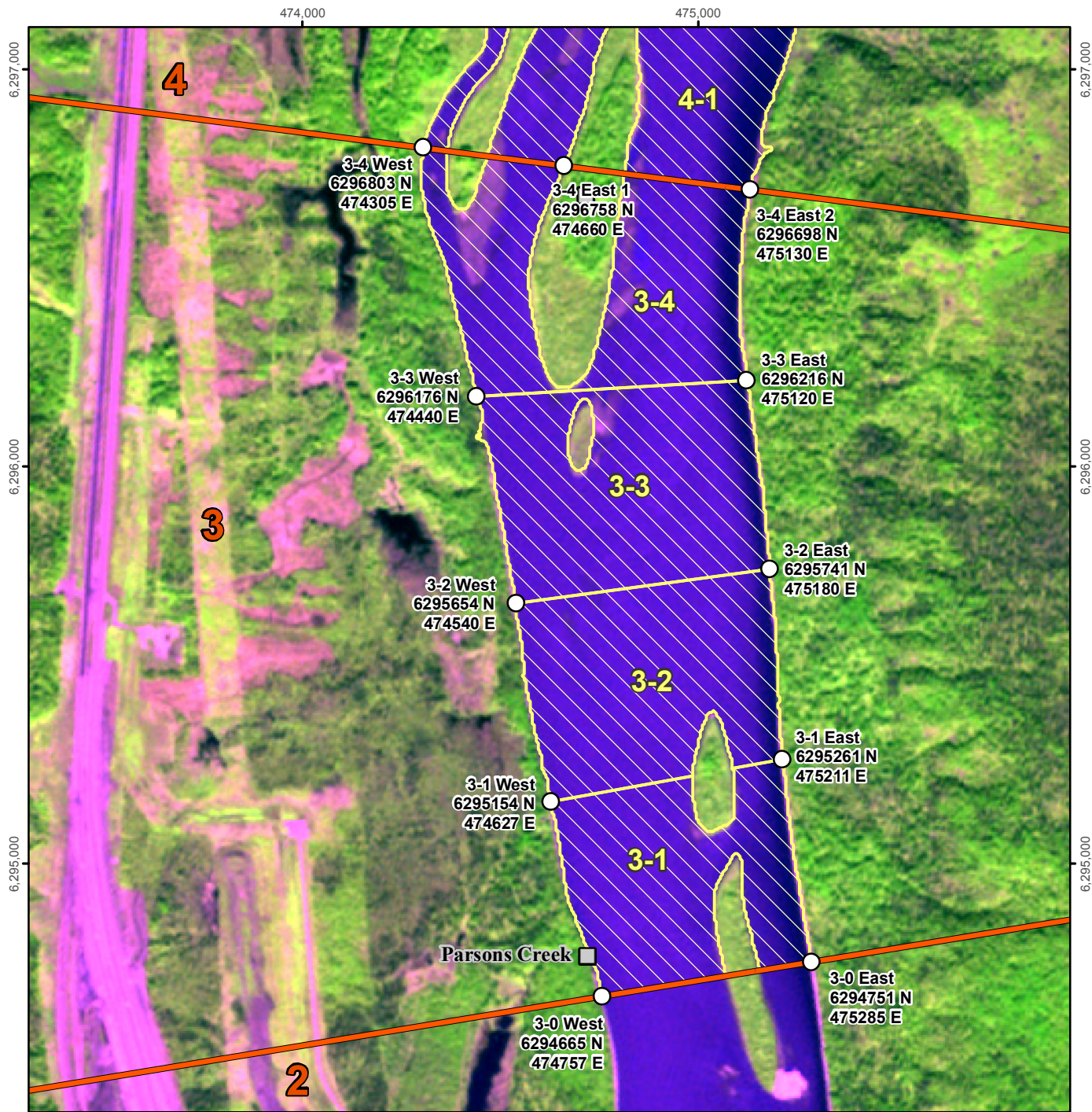
Legend

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Town of Fort McMurray
- Land Change Area as of 2015^e
- Water Survey of Canada Hydrometric Monitoring Station (Year-Round)
- RAMP/JOSMP Fish Inventory Reach
- Section Break
- Fish Inventory Pilot Study Reach

0 2.5 5 10 km
 Scale: 1:450,000
 Projection: NAD 1983 UTM Zone 12N

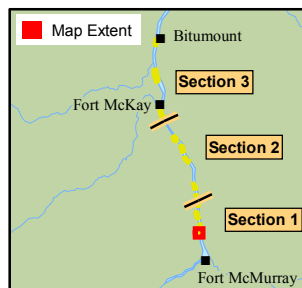


Figure G.1-2 Athabasca River, Section 1 - Reach 3.



Legend

- Section # Section Break
- # Reach Break
- #-# Sub-Reach Sampled



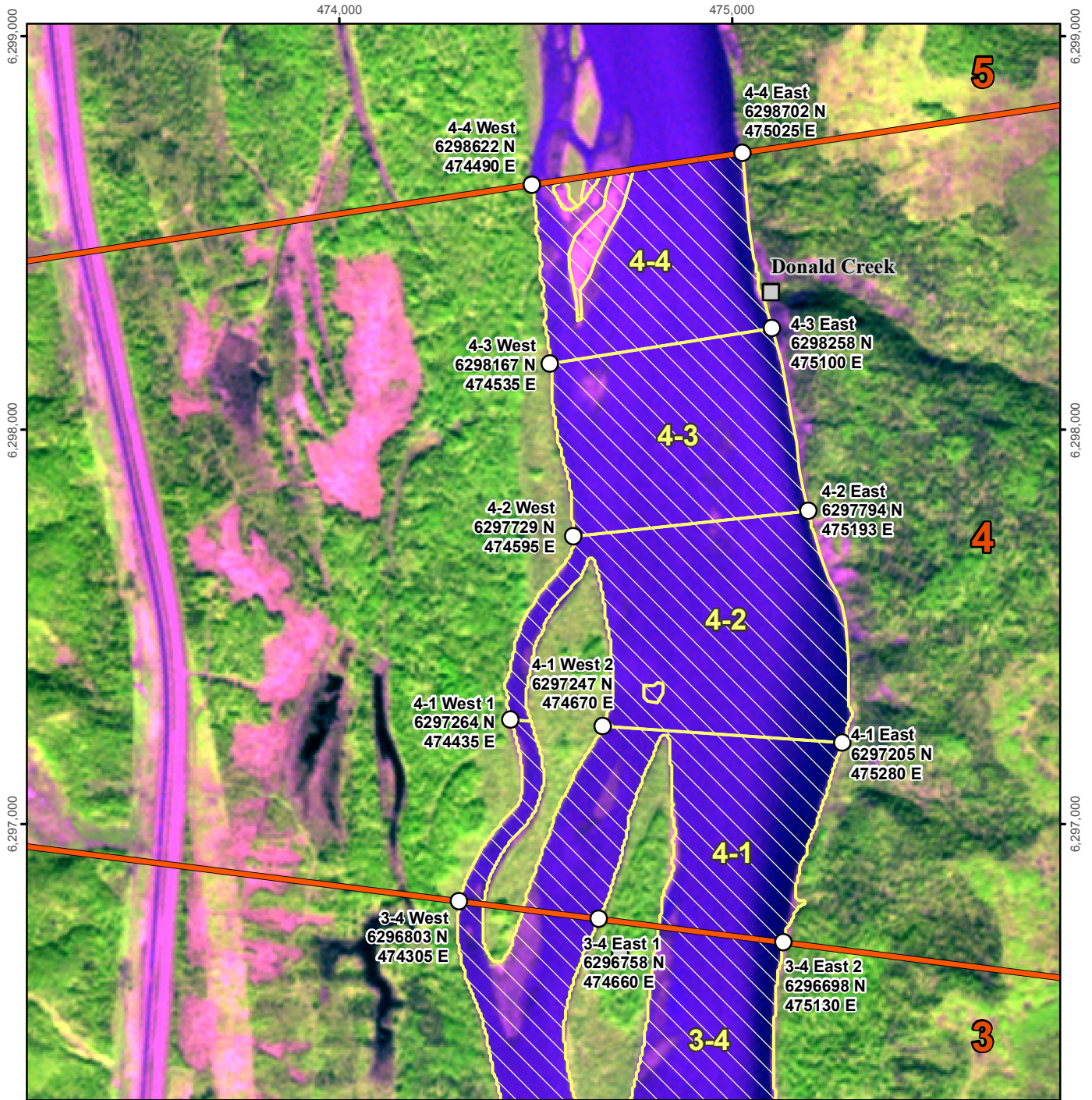
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N




Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m imagery.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

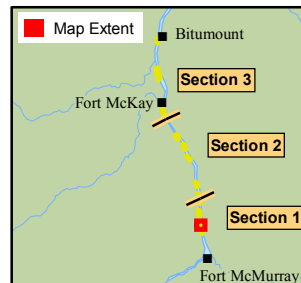


Figure G.1-3 Athabasca River, Section 1 - Reach 4.



Legend

-  Section #
-  Reach Break
-  Sub-Reach Sampled
- Section #
- Reach Break
- Sub-Reach Sampled



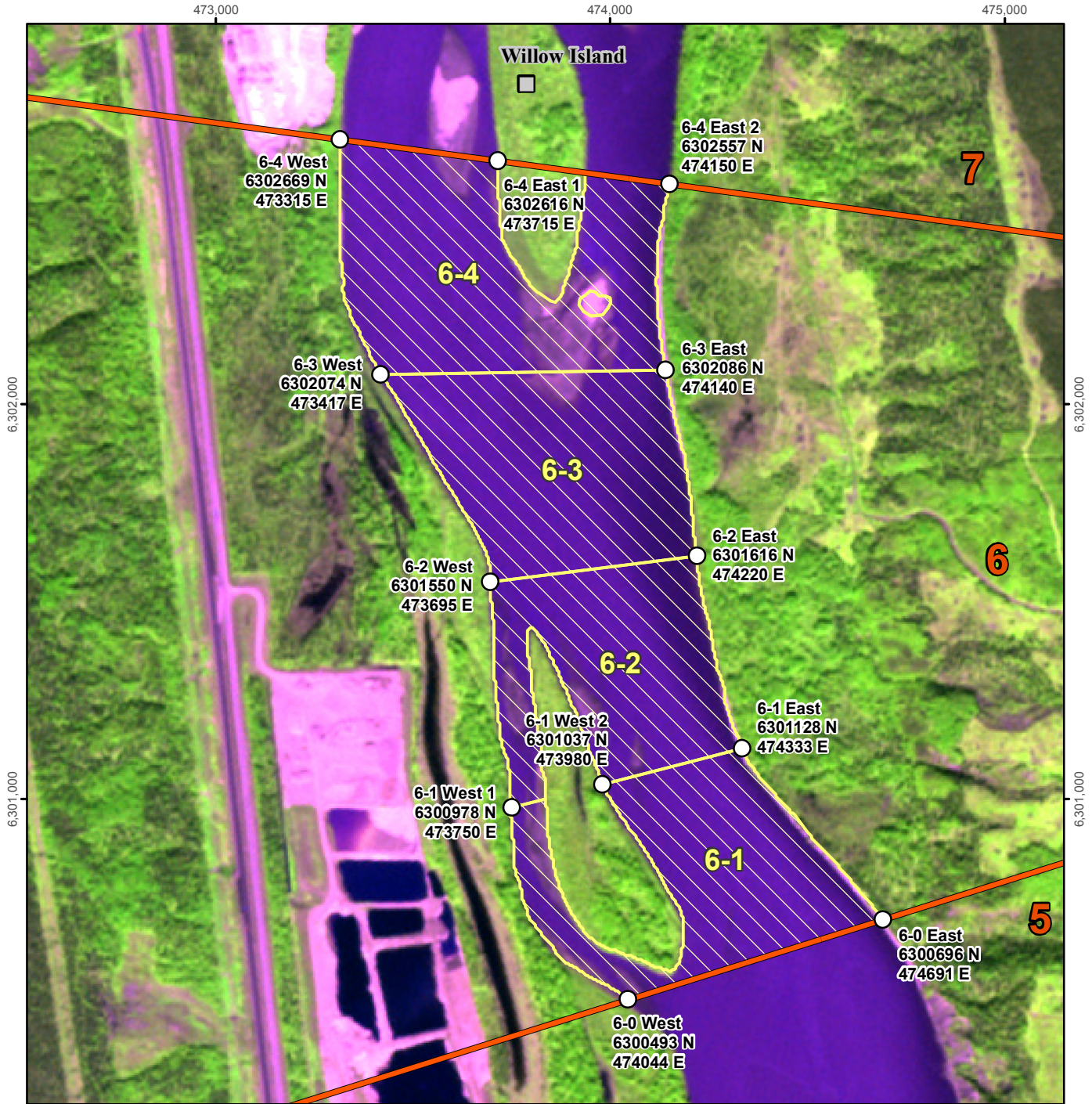
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N

Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m image.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

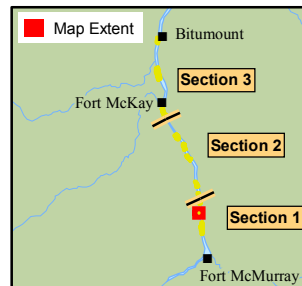


Figure G.1-4 Athabasca River, Section 1 - Reach 6.



Legend

- Section # Section Break
- # Reach Break
- #-# Sub-Reach Sampled



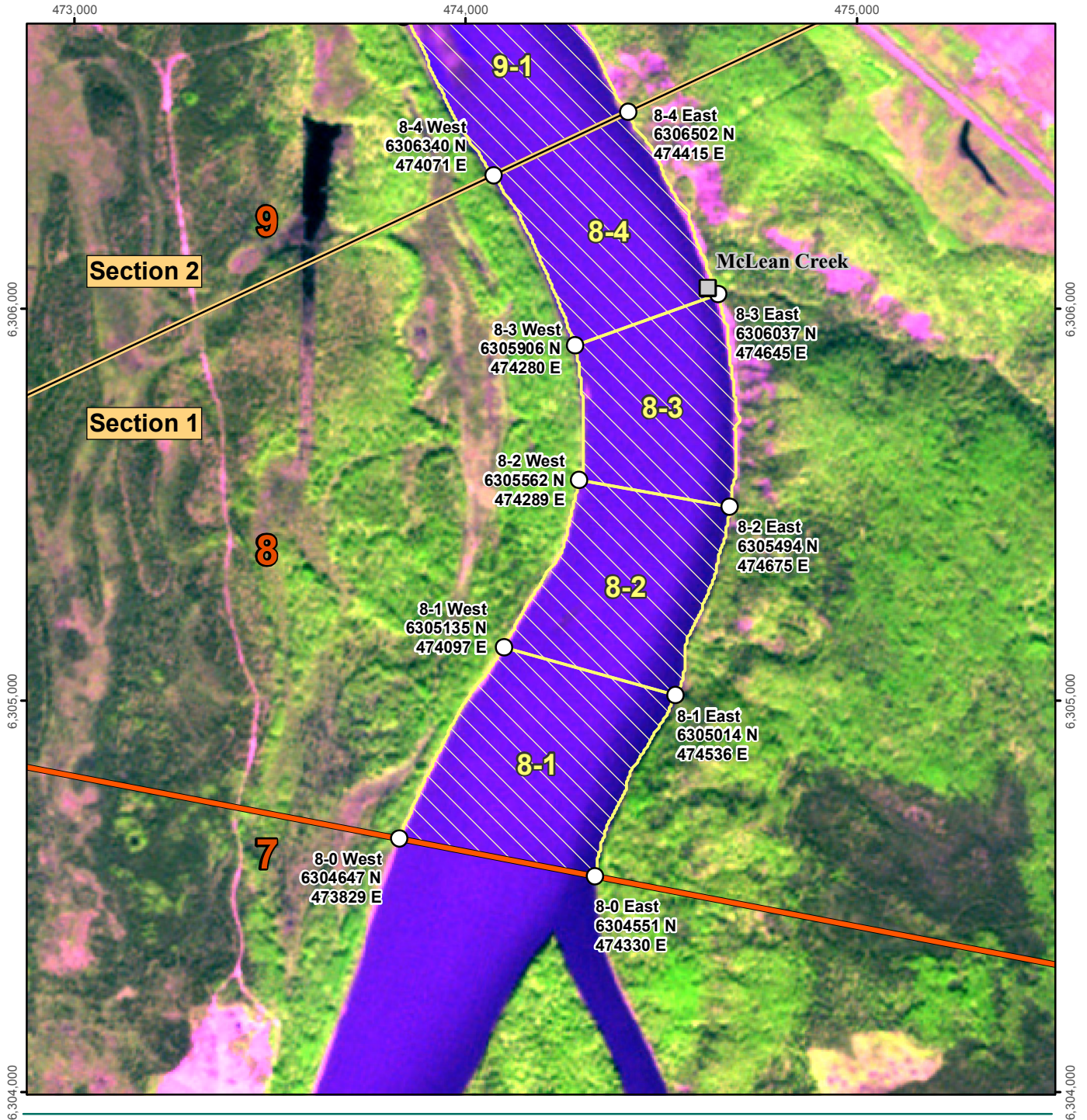
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N




Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m image.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

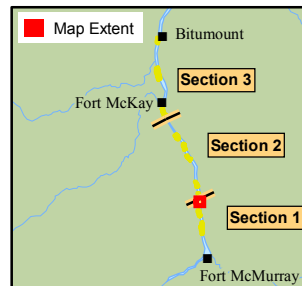


Figure G.1-5 Athabasca River, Section 1 - Reach 8.



Legend

-  Section Break
-  Reach Break
-  Sub-Reach Sampled



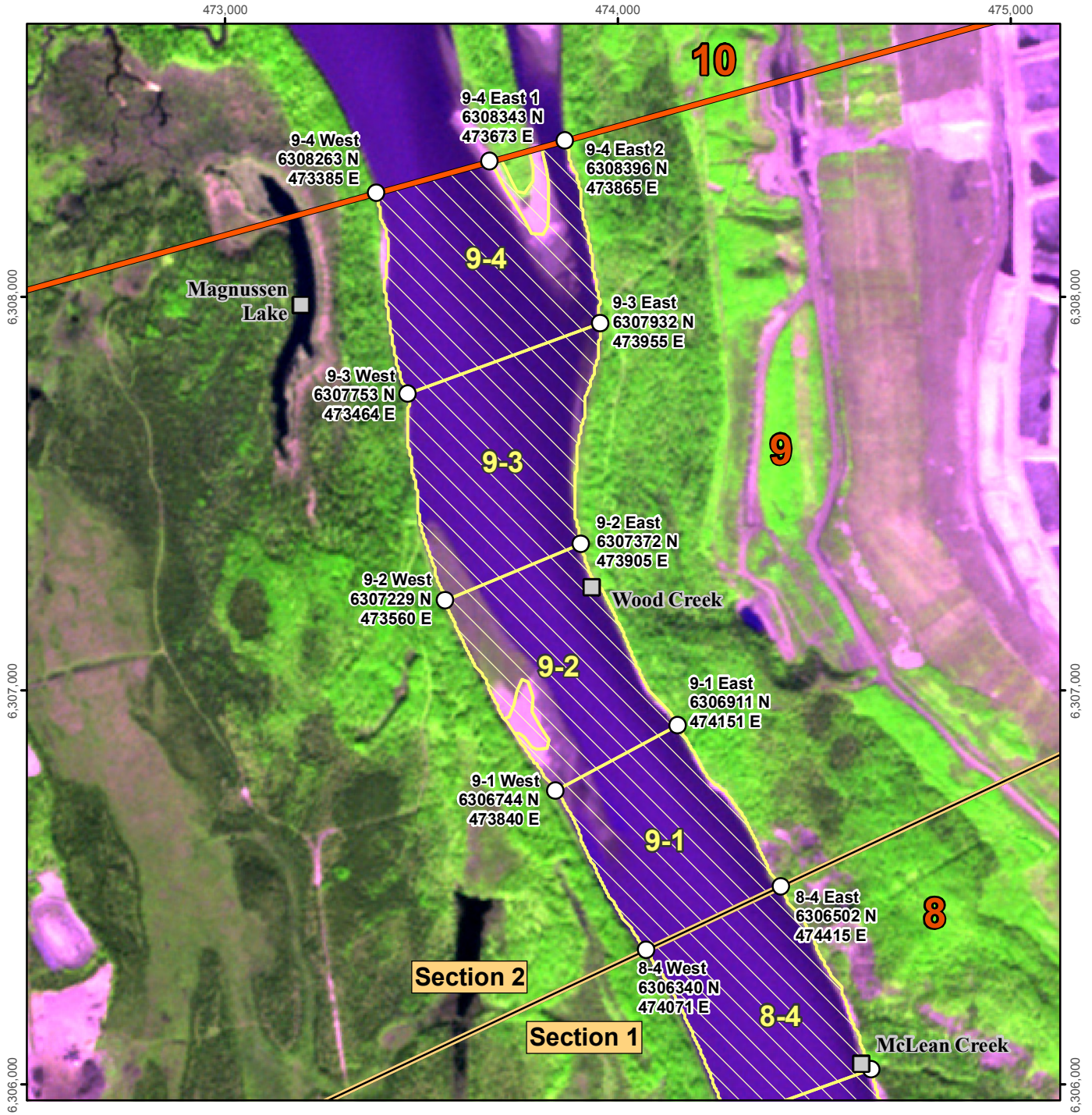
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N

Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m image.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

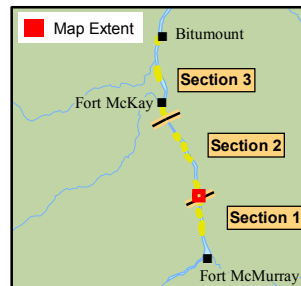


Figure G.1-6 Athabasca River, Section 2 - Reach 9.



Legend

- Section # Section Break
- # Reach Break
- #-# Sub-Reach Sampled



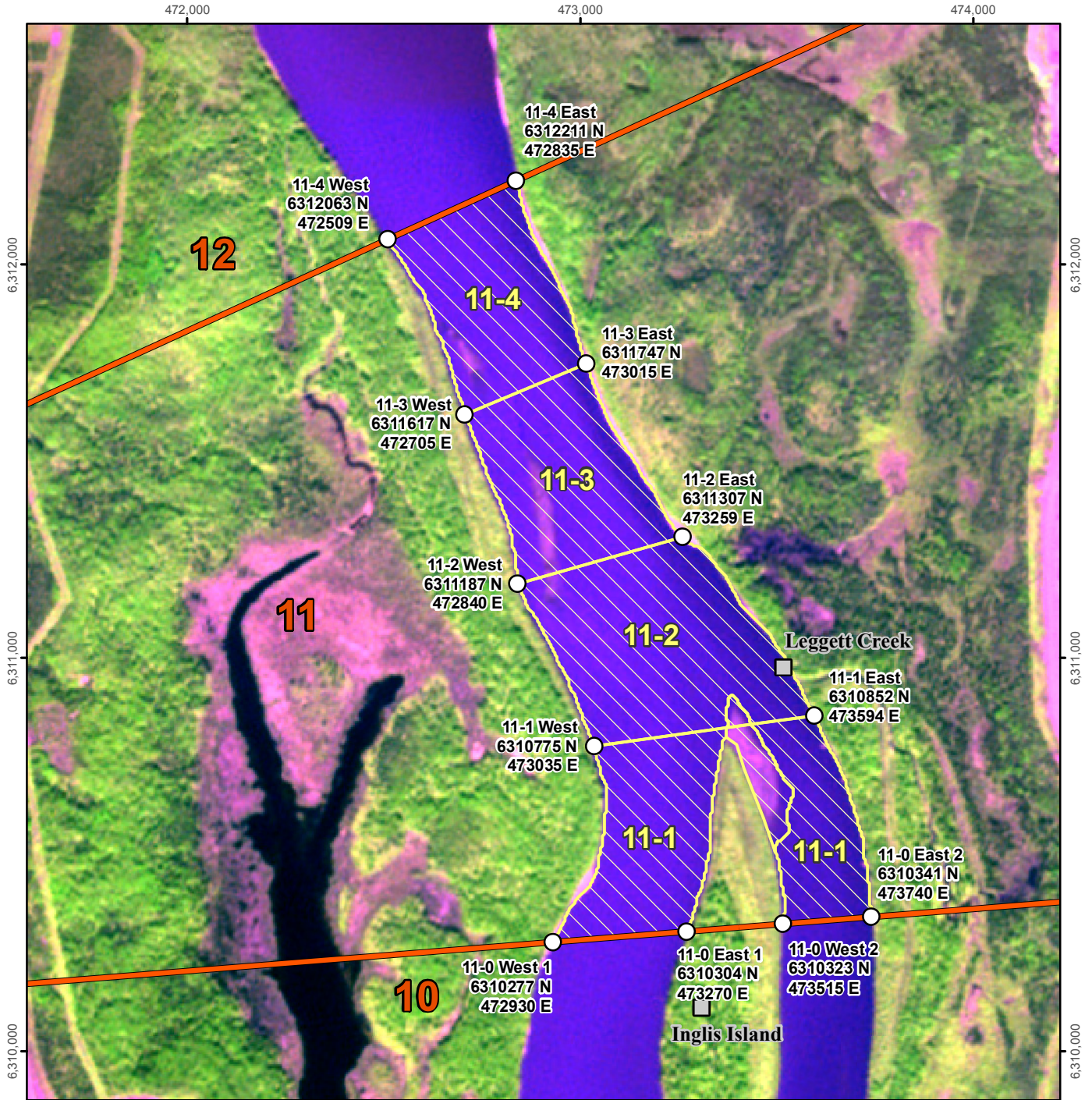
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N

Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m image.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

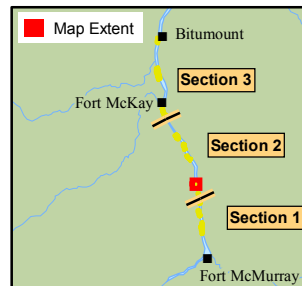


Figure G.1-7 Athabasca River, Section 2 - Reach 11.



Legend

- Section # Section Break
- # Reach Break
- #-# Sub-Reach Sampled



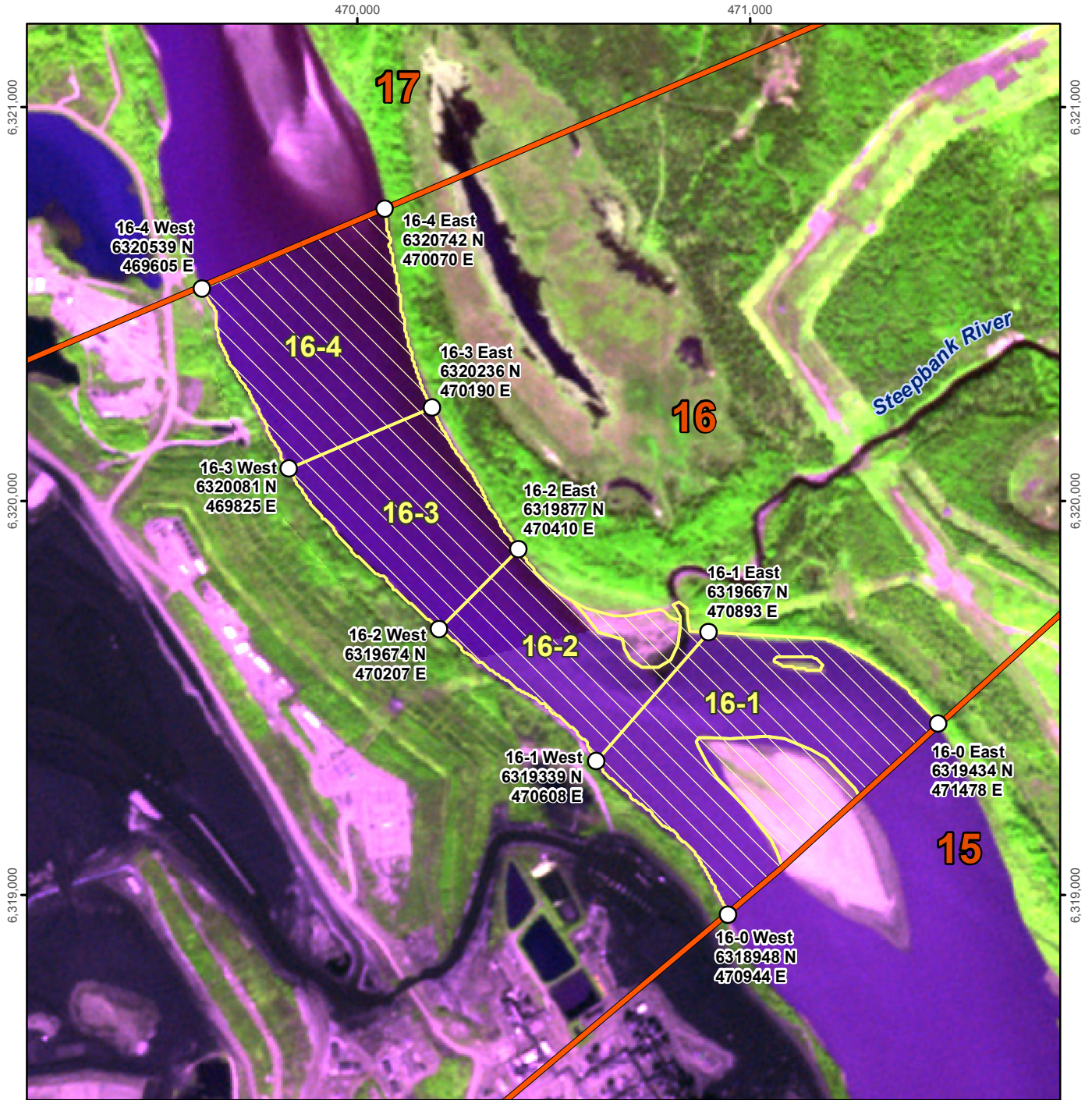
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N

Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m image.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

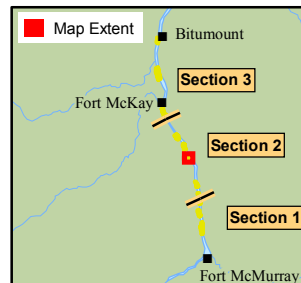


Figure G.1-8 Athabasca River, Section 2 - Reach 16.



Legend

- Section # Section Break
- # Reach Break
- #-# Sub-Reach Sampled



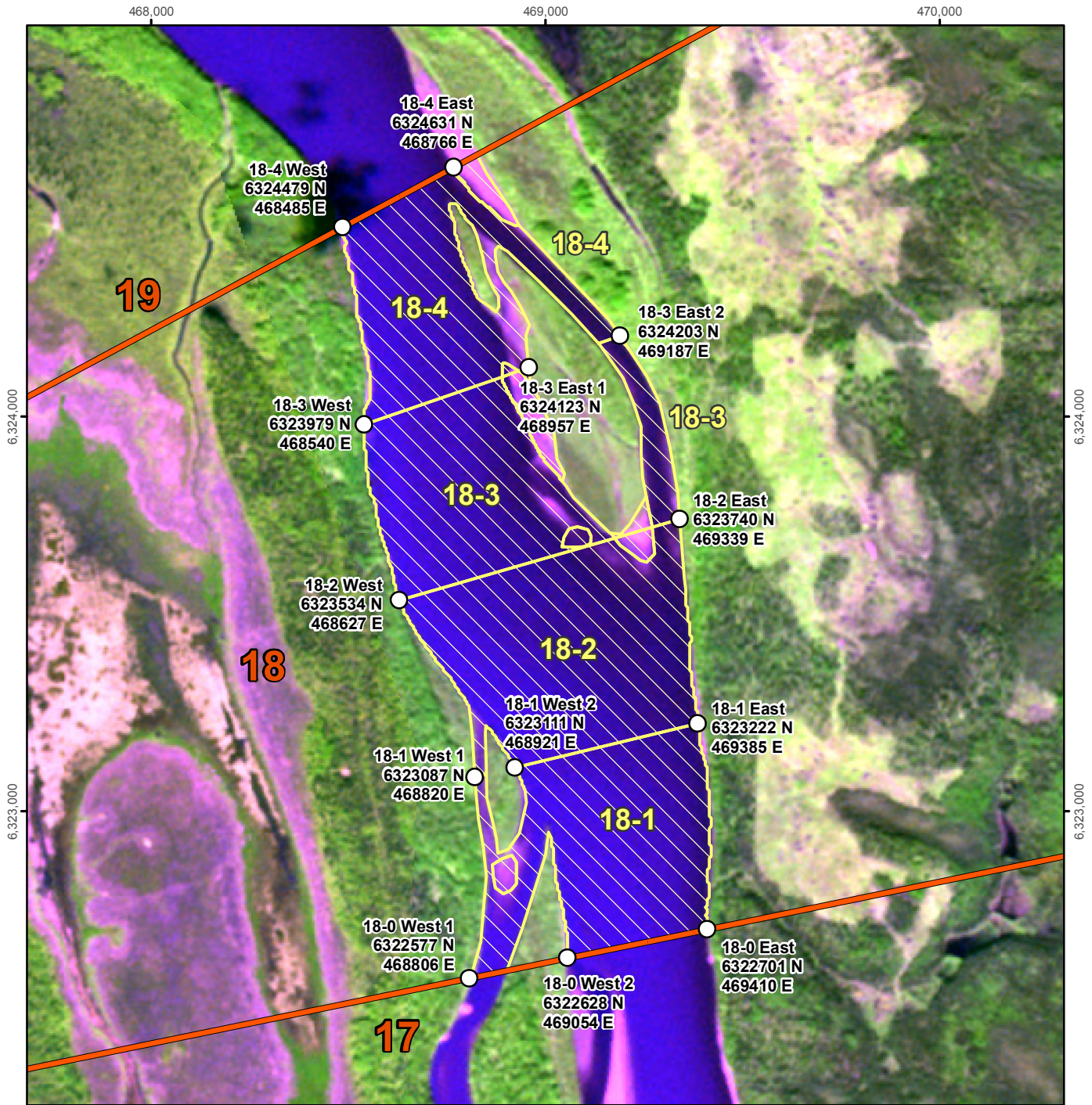
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N




Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m imagery.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

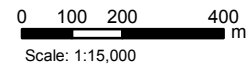
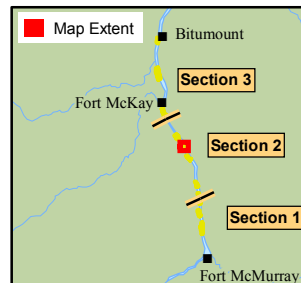


Figure G.1-9 Athabasca River, Section 2 - Reach 18.



Legend

-  Section #
-  Reach Break
-  Sub-Reach Sampled

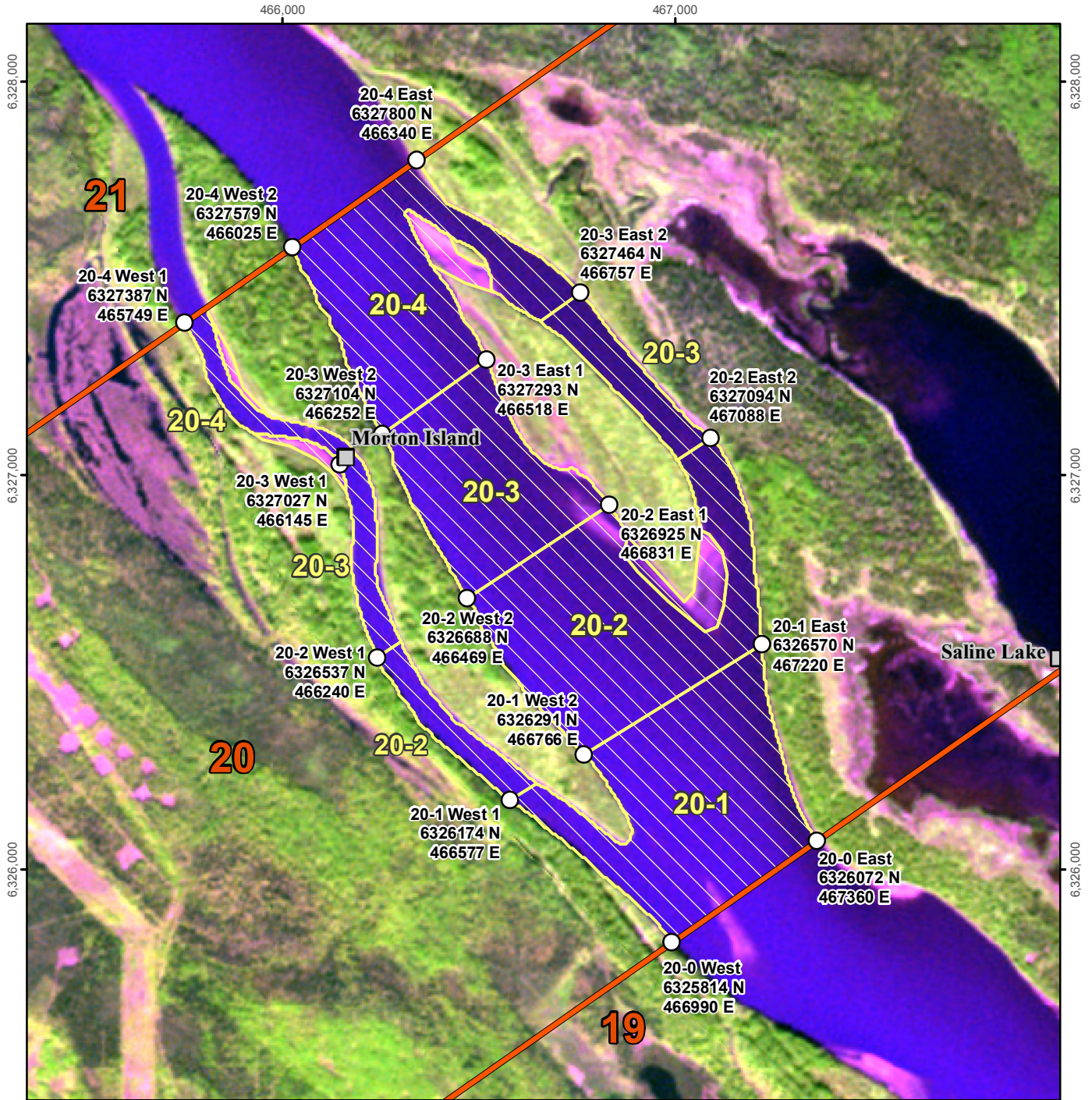


Projection: NAD 1983 UTM Zone 12N

Data Sources:
 a) Athabasca River delineated from July 2014 RapidEye 5-m image.
 b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

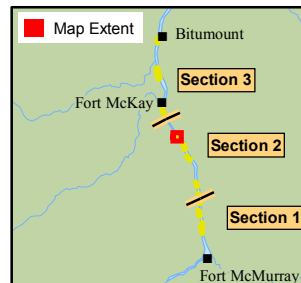


Figure G.1-10 Athabasca River, Section 2 - Reach 20.



Legend

- Section # Section Break
- Reach Break
- #-# Sub-Reach Sampled



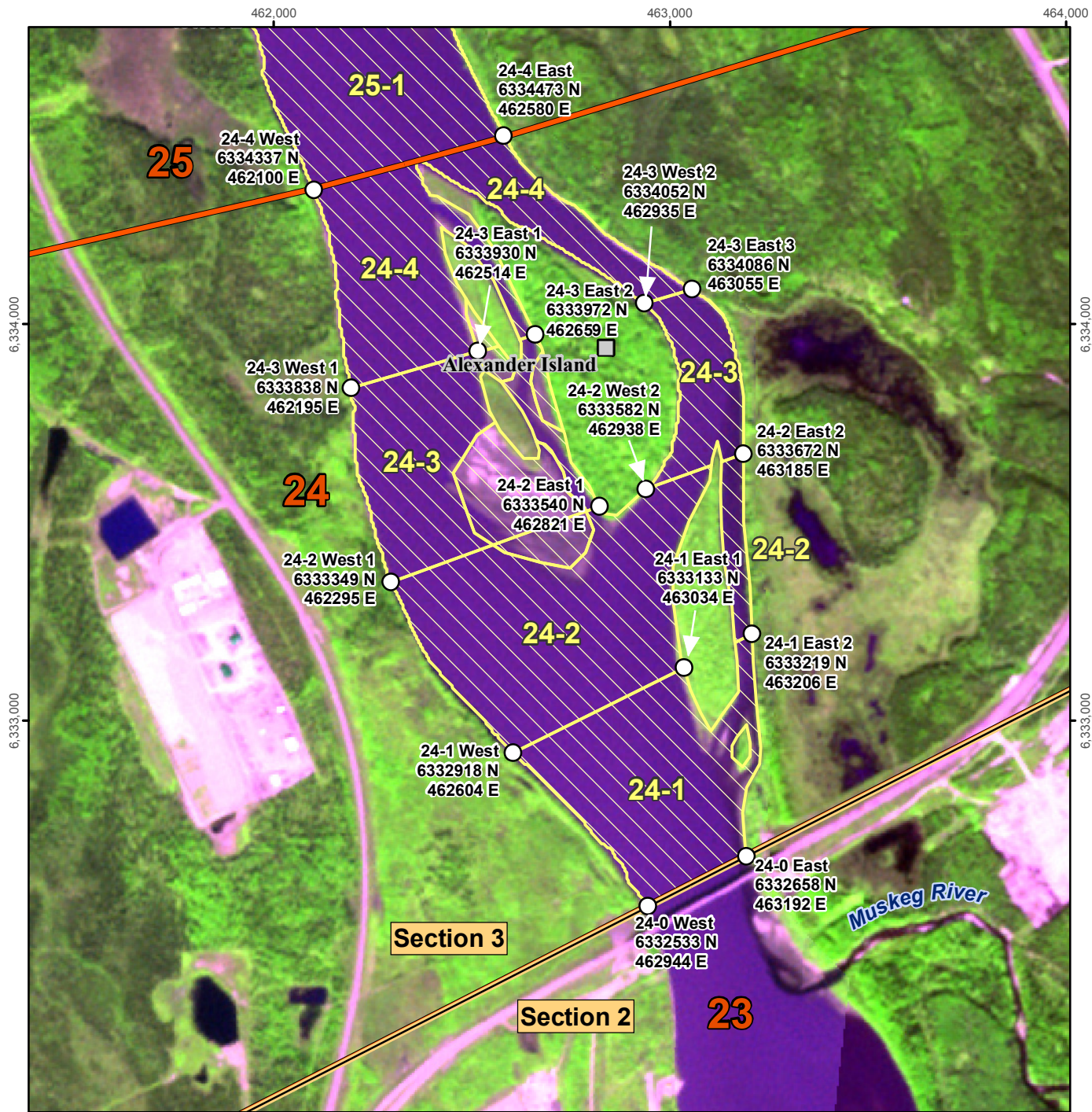
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N

Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m image.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

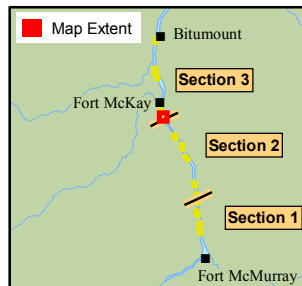


Figure G.1-11 Athabasca River, Section 3 - Reach 24.



Legend

- Section # Section Break
- # Reach Break
- #-# Sub-Reach Sampled



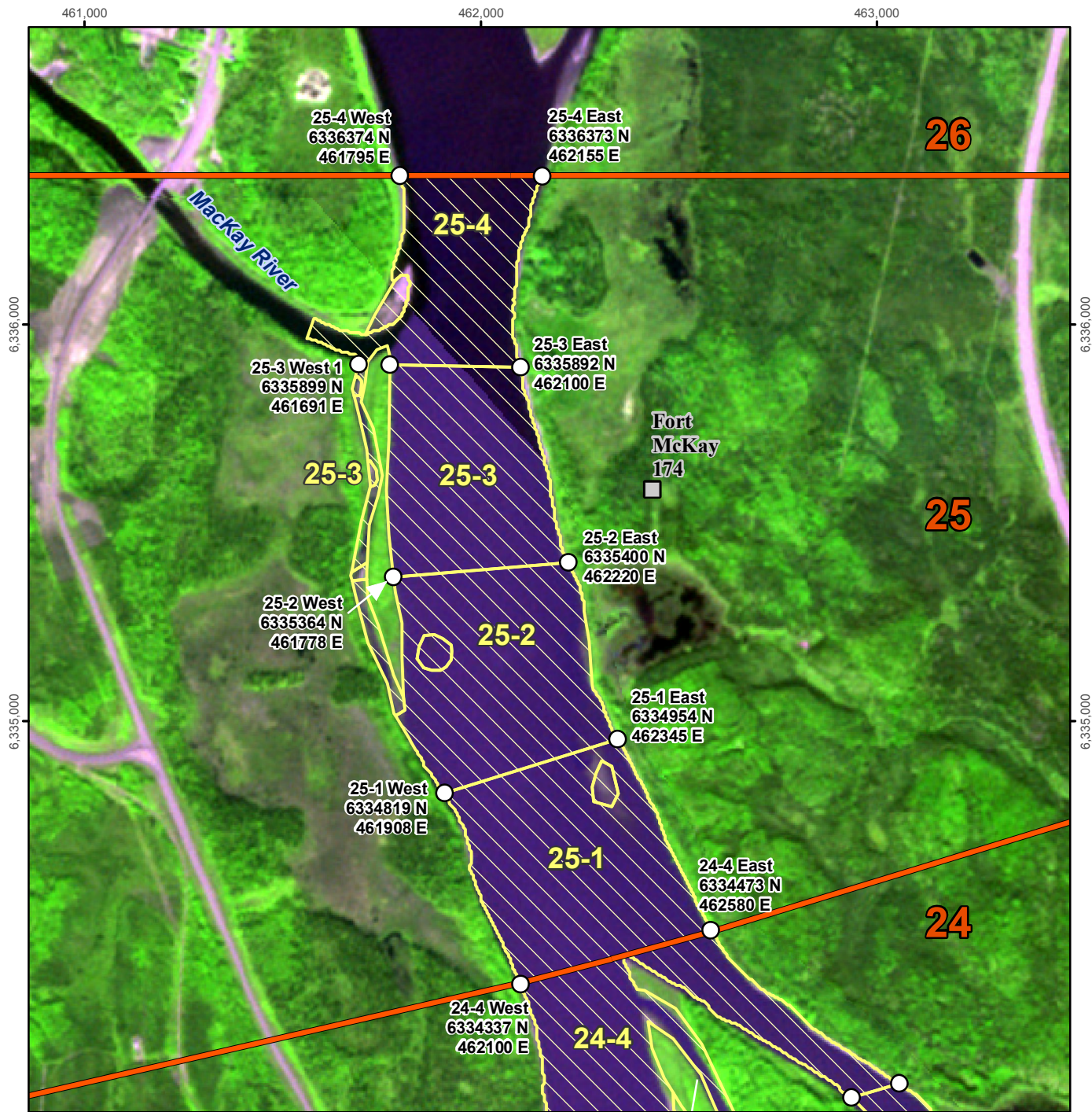
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N

Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m image.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

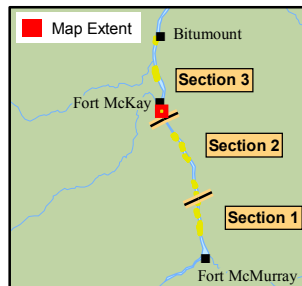


Figure G.1-12 Athabasca River, Section 3 - Reach 25.



Legend

- Section # Section Break
- Reach Break
- #-# Sub-Reach Sampled



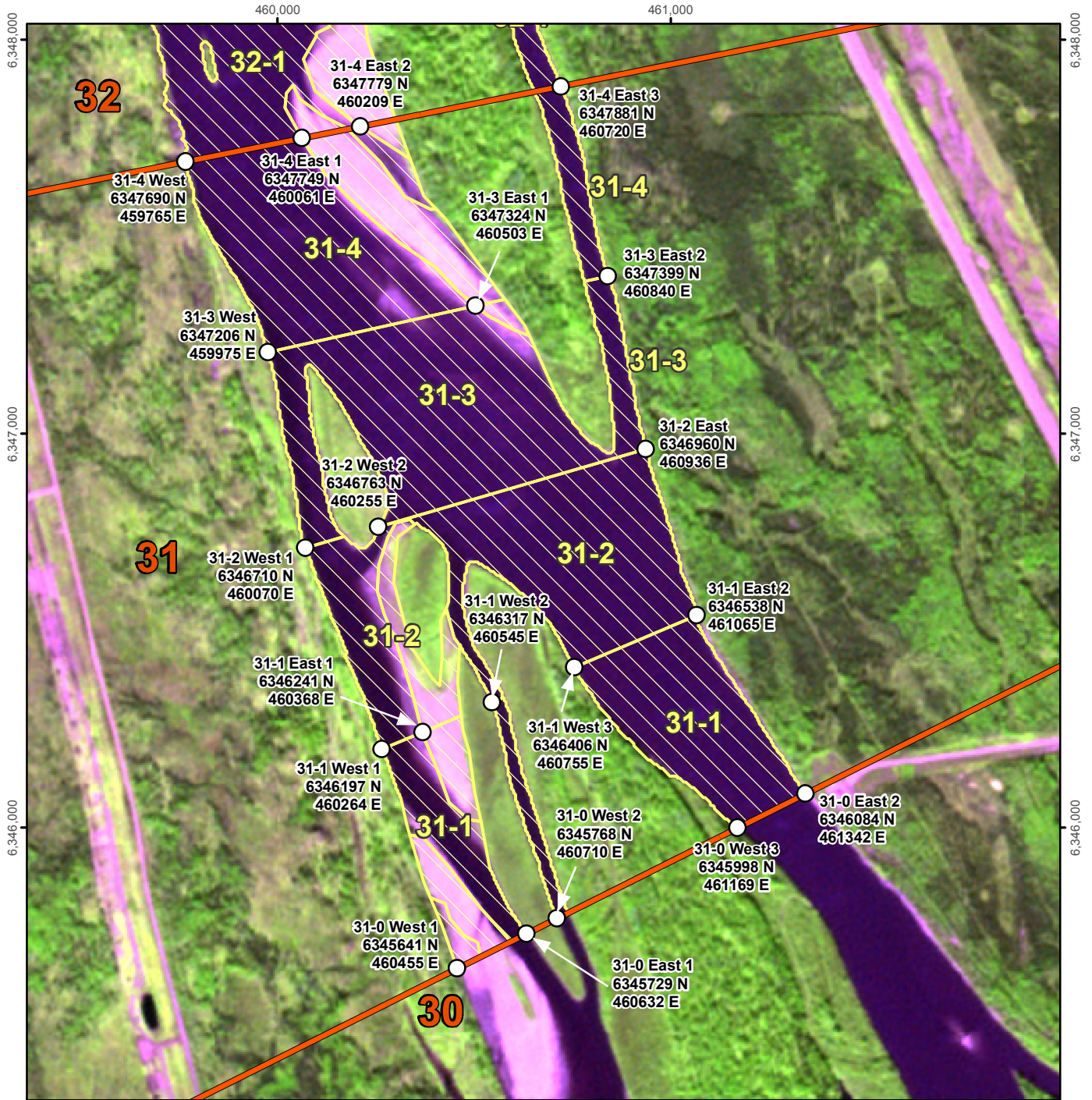
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N

Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m imagery.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

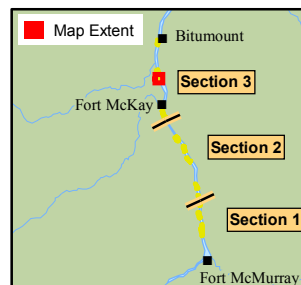


Figure G.1-13 Athabasca River, Section 3 - Reach 31.



Legend

- Section # Section Break
- # Reach Break
- #-# Sub-Reach Sampled



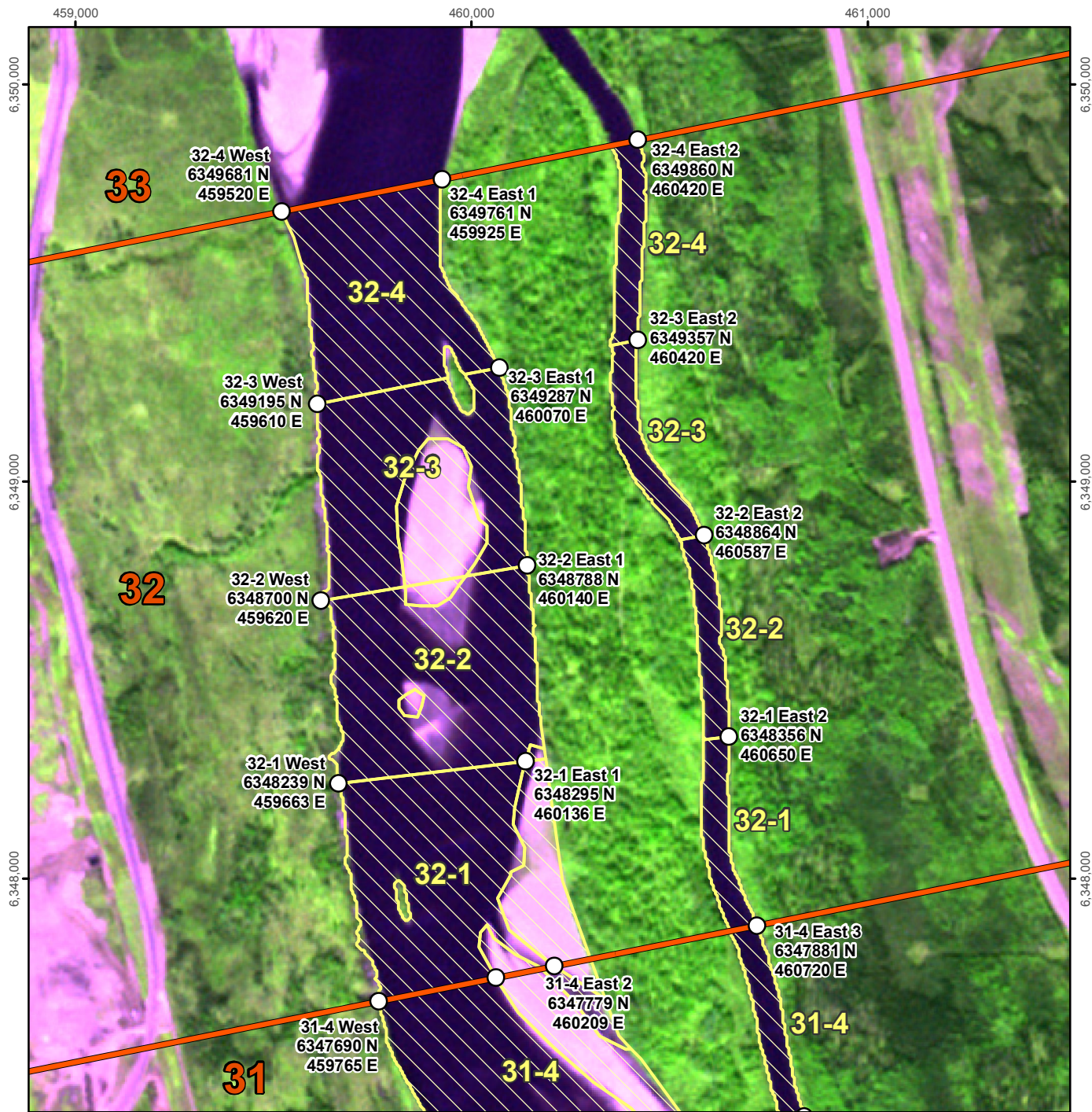
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N

Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m imagery.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

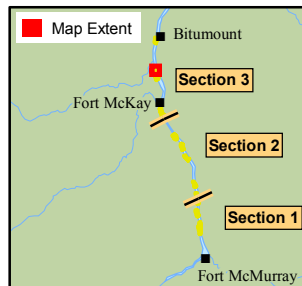


Figure G.1-14 Athabasca River, Section 3 - Reach 32.



Legend

- Section # Section Breaks
- # Reach Break
- #-# Sub-Reach Sampled



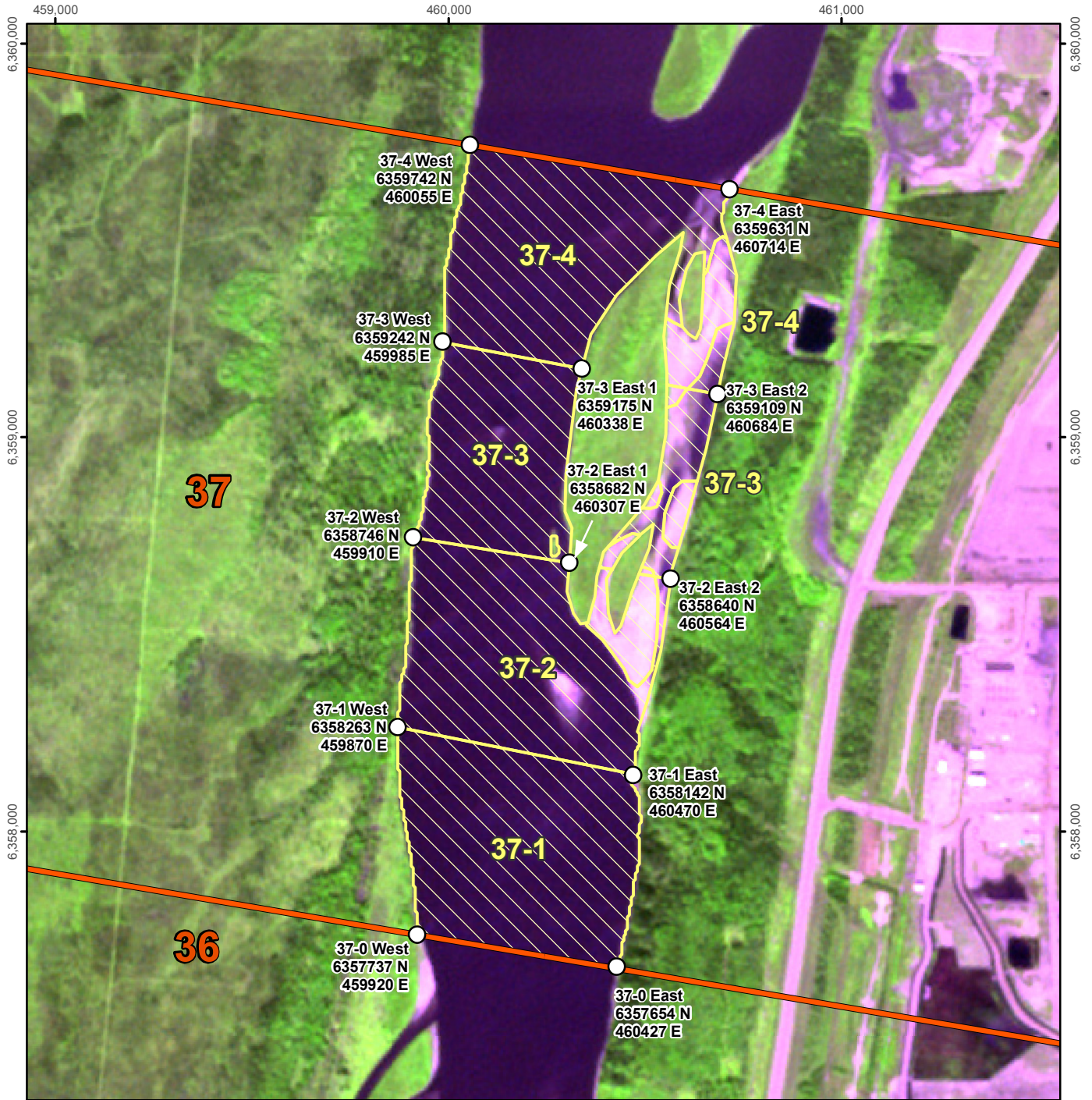
0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N




Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m image.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

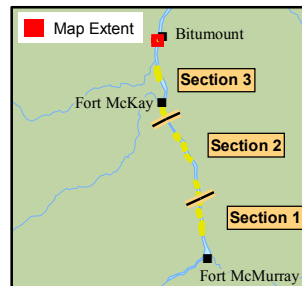


Figure G.1-15 Athabasca River, Section 3 - Reach 37.



Legend

-  Section Break
-  Reach Break
-  Sub-Reach Sampled



0 100 200 400 m
Scale: 1:15,000

Projection: NAD 1983 UTM Zone 12N

Data Sources:
a) Athabasca River delineated from July 2014 RapidEye 5-m image.
b) RapidEye multispectral 5-m imagery acquired in June, July, and August 2015.

